

March 4, 1930.

R. H. STEVENS

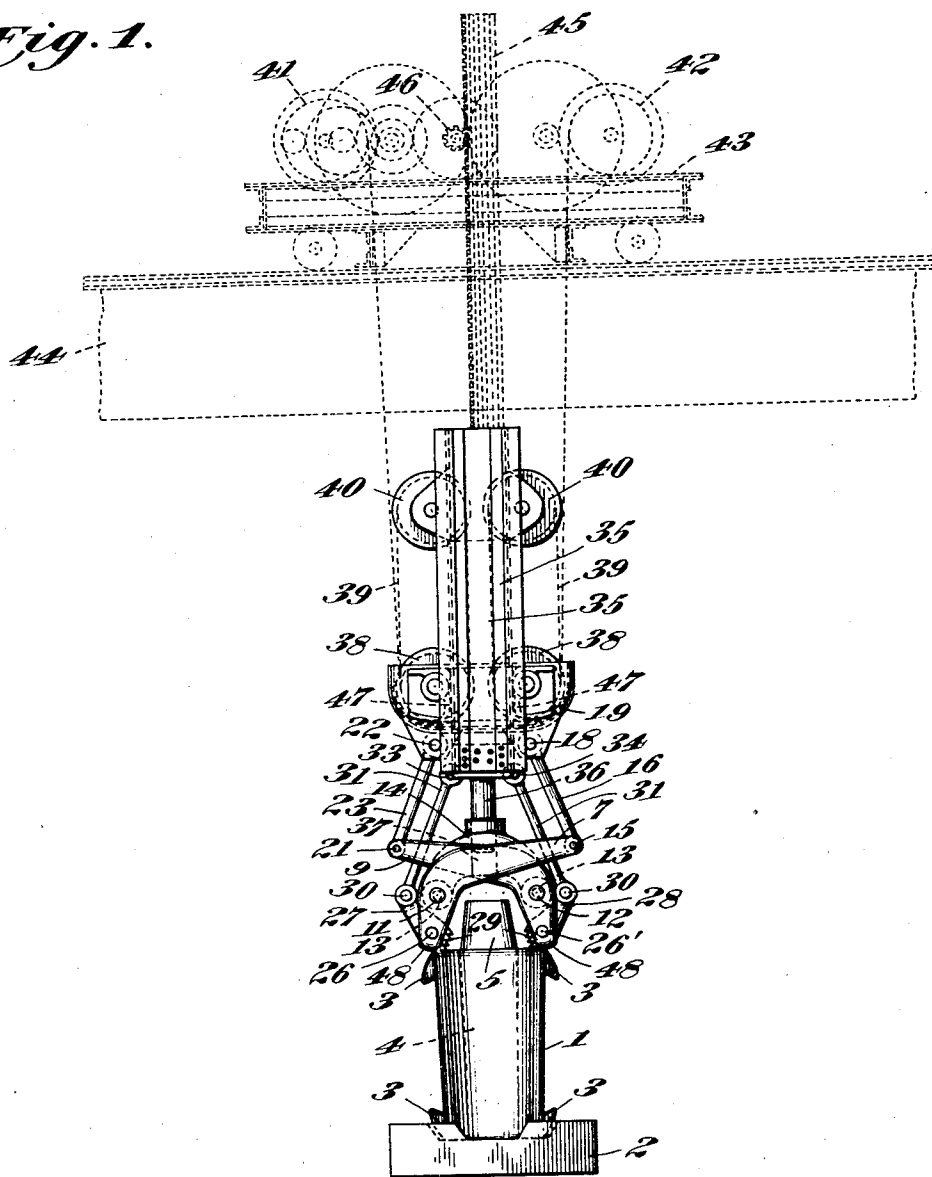
1,749,723

INGOT STRIPPER

Filed Aug. 23, 1928

5 Sheets-Sheet 1

Fig. 1.



INVENTOR

Richard H. Stevens.

BY

R. S. C. Wougherty.
ATTORNEY

March 4, 1930.

R. H. STEVENS

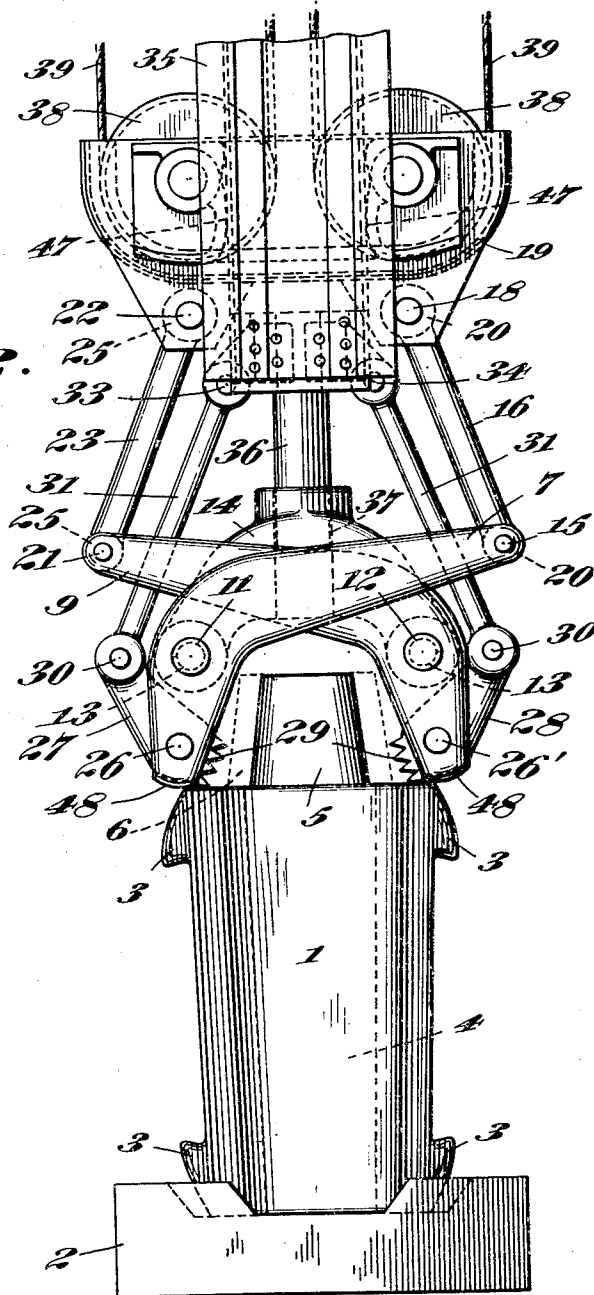
1,749,723

INGOT STRIPPER

Filed Aug. 23, 1928

5 Sheets-Sheet 2

Fig. 2.



INVENTOR

Richard H. Stevens.

BY

R. S. O. Dougherty.

ATTORNEY

March 4, 1930.

R. H. STEVENS

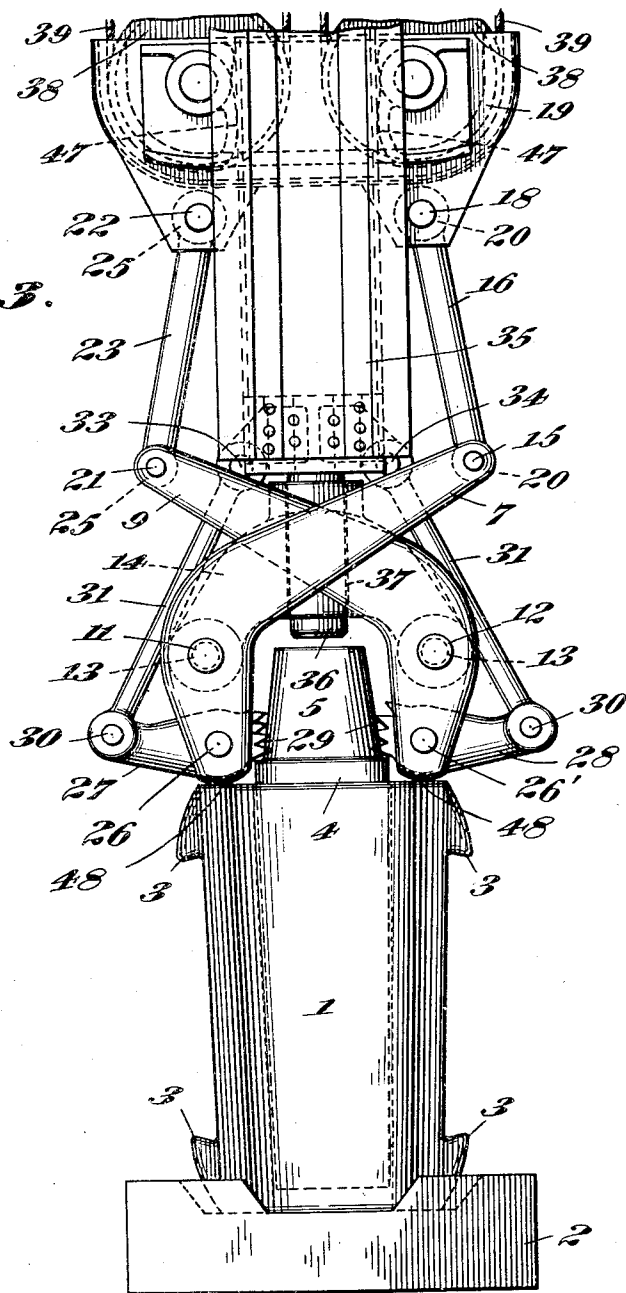
1,749,723

INGOT STRIPPER

Filed Aug. 23, 1928

5 Sheets-Sheet 3

Fig. 3.



INVENTOR

Richard H. Stevens.

BY

R. S. C. Dougherty
ATTORNEY

March 4, 1930.

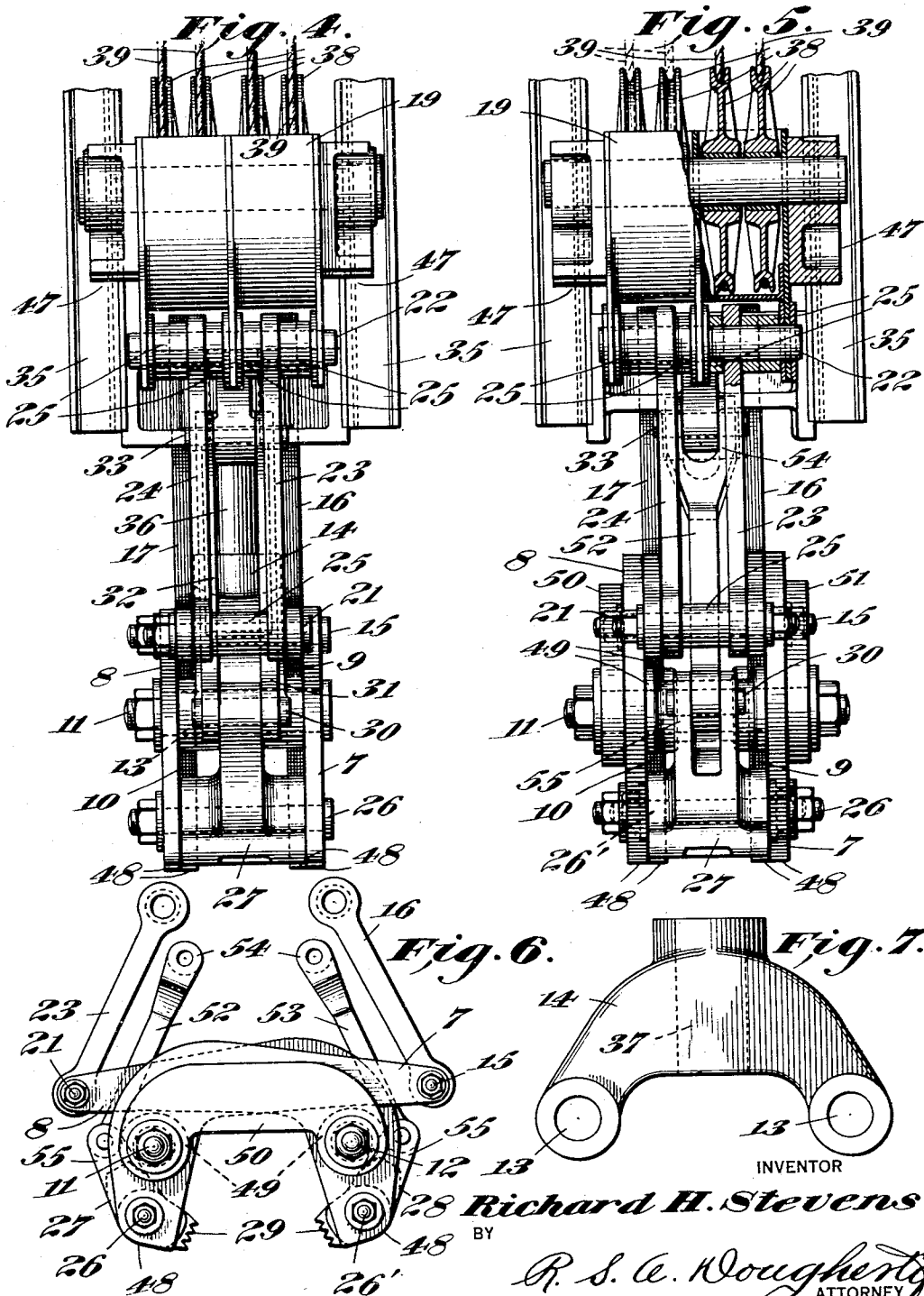
R. H. STEVENS

1,749,723

INGOT STRIPPER

Filed Aug. 23, 1928

5 Sheets-Sheet 4



INVENTOR

Richard H. Stevens.

BY

R. S. C. Dougherty.
ATTORNEY

March 4, 1930.

R. H. STEVENS

1,749,723

INGOT STRIPPER

Filed Aug. 23, 1928

5 Sheets-Sheet 5

Fig. 8.

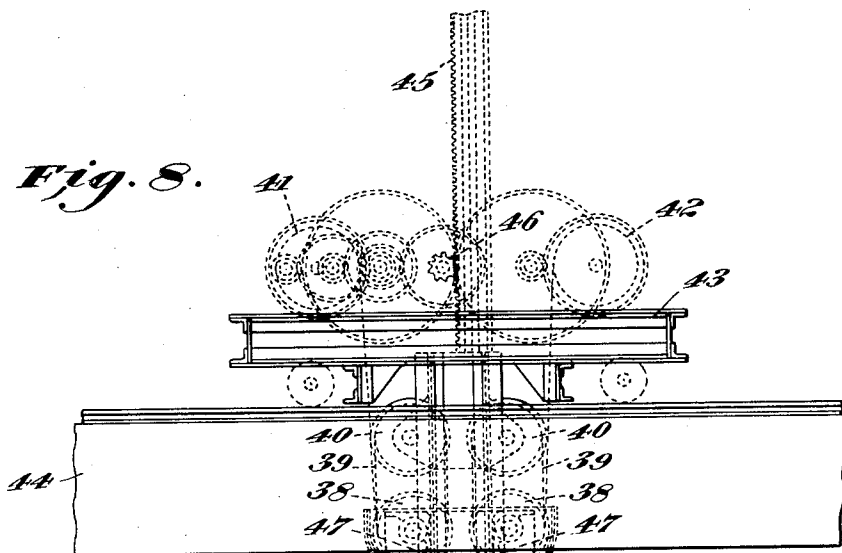


Fig. 9.

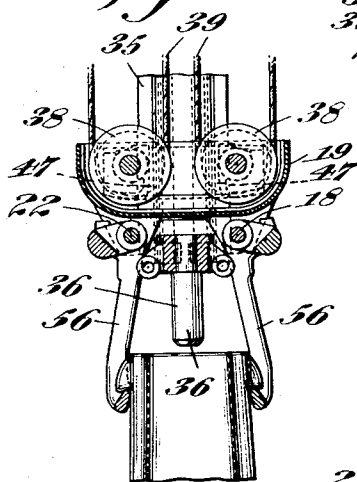
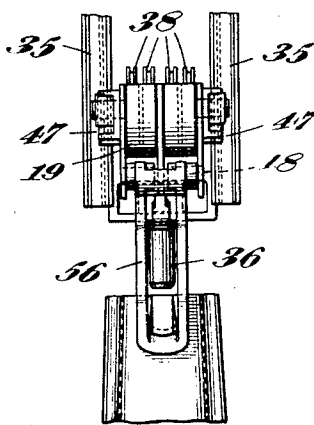


Fig. 10.



INVENTOR

Richard H. Stevens.

BY

R. S. C. Dougherty
ATTORNEY

UNITED STATES PATENT OFFICE

RICHARD H. STEVENS, OF WESTMONT BOROUGH, PENNSYLVANIA, ASSIGNOR TO
BETHLEHEM STEEL COMPANY

INGOT STRIPPER

Application filed August 23, 1928. Serial No. 301,471.

My invention relates to apparatus for stripping ingots from molds and is more particularly designed for use in stripping "big end up" ingots having sinkhead top portions.

It is customary when casting ingots, with the big end up, to place a refractory top or sinkhead mold, of suitable material to form an extension for the mold proper, as by this arrangement ingots more free from piping and segregation are formed, the result being that the metal in the upper or larger end of the ingot and the sinkhead remains fluid for a longer time than the smaller lower end, thus allowing the shrinkage cavity to localize itself in the sinkhead top portion of the ingot. After the ingot becomes sufficiently cooled the refractory top is preferably removed so that this part of the ingot projects out of the mold at the top.

It is the object of my invention to provide a device for gripping the projecting portion of the ingot and means for exerting a pressure on the mold and an oppositely directed pressure on the ingot so as to overcome its resistance to separation from the mold.

Another object of my invention is to provide a simple device for stripping a big end up ingot from its mold, which is easily attached, with slight changes, to a crane adapted to strip big end down ingots.

Having thus given a general description of my invention, I will now, in order to make the same more clear, refer to the accompanying five sheets of drawings, which form part of this specification and in which like characters of reference indicate like parts.

Fig. 1 illustrates diagrammatically the general arrangement of a stripping crane with my improved tongs attached thereto in the position they will assume when they are about to grip the sinkhead top portion of the ingot;

Fig. 2 is a side elevation of my invention drawn on a larger scale showing the tongs suspended over the mold of a "large top" ingot having a projecting sinkhead top, and in position to begin to grip the sinkhead portion of the ingot, the cradle being shown in its lowered position;

Fig. 3 is a side elevation similar to Fig. 2, but showing the tongs after the sinkhead portion of the ingot has been gripped and the main and auxiliary levers have been moved to extreme travel by means of raising the ram and cradle while the ingot has been raised slightly to begin the stripping operation;

Fig. 4 is an end elevation of the tongs and lower end of the ram illustrated in Figs. 1 to 3, but drawn on a slightly larger scale;

Fig. 5 is an end elevation similar to Fig. 4 but showing a modified form of tongs, with parts broken away to more clearly illustrate the manner of construction;

Fig. 6 is a side elevation of the tongs detached as used with the construction shown in Fig. 5;

Fig. 7 is a side elevation of the crosshead used with the construction shown in Figs. 1 to 4;

Fig. 8 is a view similar to Fig. 1, but showing the ingot stripped and raised clear of the mold;

Fig. 9 is a vertical sectional elevation through the cradle and the lower portion of the ram, illustrating the usual manner of stripping ingots larger at the bottom than at the top; and

Fig. 10 is an end elevation of the parts shown in Fig. 9.

Referring now to the characters of reference on the drawings and first to Figs. 1, 2, 3, 4, 7 and 8, the numeral 1 indicates the ingot mold seated on a stool 2 with the large end up, having lifting lugs 3 near the top and bottom edges for lifting the same when required. The ingot 4 is cast in the mold with a projecting sinkhead top portion 5, which is accomplished by mounting a refractory extension on top of the mold in any approved manner as indicated in dotted lines in Fig. 2 by the numeral 6. After the ingot has been cast and sufficiently cooled the refractory top is removed thereby allowing my improved stripping tongs to engage and strip the ingot from the mold.

The stripping tongs consist of two pairs of main levers of the bell-crank type 7, 8, 9 and 10. Each pair being connected together intermediately at opposite sides by means of

bolts 11 and 12 forming fulcrum points for the main levers. These bolts extend through eyes 13 in a crosshead 14 thereby maintaining the pairs of levers in spaced relation to each other and are adapted to take the loads directly resulting from the gripping action of the tongs. The upper ends of the bell-crank main levers have a longer leverage than the lower ends. The levers 7 and 8 being connected together at their upper outer ends by means of a bolt 15, having links 16 and 17 attached thereto and secured by means of a pin 18 to the cradle 19.

The links 16 and 17 being spaced apart on the bolt 15 and pin 18 by sleeves 20. The longer ends of the main levers 9 and 10 are also connected together in a similar manner by means of a bolt 21 and attached to the cradle 19, as at 22 by links 23 and 24 spaced apart by sleeves 25. Between the lower shorter ends of the main levers 7, 8, 9 and 10 are fulcrumed as at 26 and 26' auxiliary levers 27 and 28 to which are attached or integrally formed, bits 29 for gripping the sinkhead top portion of the ingot. The auxiliary levers 27 and 28 have their outer ends each connected as at 30 to a pair of links 31 and 32, having their upper ends pivoted as at 33 and 34 to the base casting on the lower end of the ram 35, which also carries the plunger 36 adapted to slide in an opening 37 in the crosshead 14 and forming a guide for the same.

The cradle 19 carries a plurality of sheaves 38 around which wire cables 39 are reeved and extend to sheaves 40 mounted near the upper end of the ram 35, the ends of which extend to the winding drums 41 and 42 on the trolley 43, indicated diagrammatically in Figs. 1 and 8 which is mounted on the traveling crane bridge 44 and enables the tongs to be moved laterally and longitudinally.

The ram 35, has a vertical rack-bar 45 attached to its upper end, meshing with a pinion 46 connected with suitable gearing and driving mechanism, on the trolley 43 by means of which it is raised or lowered to the required height, while the cradle 19 is adapted to slide vertically, in ways 47 on the ram and is raised or lowered by the winding drums 41 and 42 which are connected together by gearing to allow them to rotate at the same rate of speed.

The operation of my device is as follows:— Assuming that the parts are in the position illustrated in Figs. 1 and 2 of the drawings with the tongs suspended from the trolley 43 on the traveling crane bridge 44 the weight of the tongs being carried by the links 16, 17, 22, 23, 31 and 32 will assume a position such that the auxiliary levers 27 and 28 will bear on the main lever bolts 11 and 12 forming fulcrum points therefor. By raising the cradle 19 the bits 29 will come together to grip the sinkhead top position 5 of the ingot and as the load increases on the links, the

bits will be forced into the ingot. During the stripping operation the ram remains stationary and the cradle 19 continues to rise, carrying with it the main tong levers 7, 8, 9 and 10, raising both the ingot and the mold. The auxiliary levers 27 and 28 having their outer ends connected by links to the ram are thus rotated on their fulcrums 26 and 26'. As the auxiliary levers rotate, the lower arc-shaped ends 48 of the main levers 7, 8, 9 and 10 are forced downwardly on the top of the ingot mold, while the bits 29 as they sink into the ingot, are forced upwardly, thus producing two opposing forces, one operating against the mold as a fulcrum and the other pulling the ingot upward and having the effect of forcing the ingot out of the mold thereby assuming the position indicated in Fig. 3 of the drawings.

In the stripping operation both the ingot and the mold will be lifted, but the ingot due to the leverage will be raised at a greater rate of speed than the mold thereby separating the ingot from the mold.

As the auxiliary levers 27 and 28 are rocked the gripping forces are increased thereby stripping the ingot from the mold as indicated in Fig. 8. The ingot can then be transferred directly to the soaking pit furnace or elsewhere as desired. To release the ingot the ram 35 is lowered until the lower end of the ingot engages the floor of the soaking pit furnace or other support, the cradle is then lowered allowing the tongs to move further apart and assume a position similar to that shown in Figs. 1 and 2.

In Figs. 5 and 6 I have shown the tongs constructed in a slightly different manner although the operation is substantially the same. In this construction I dispense with the crosshead 14 and plunger 36 and space the main side levers 7, 8, 9 and 10 apart by means of thimbles 49 through which the bolts 11 and 12 for the main side levers pass, the outer ends of the bolts extending through cheek-plates 50 and 51 and instead of using a pair of links for connecting the outer ends of the auxiliary levers 27 and 28 I use a single link as at 52 and 53 each having a bifurcated upper end 54 attached to the ram, the lower end of each link being connected to the outer bifurcated ends 55 of the auxiliary levers. Otherwise the construction is similar to the first pair of tongs described in detail and the same reference numerals will apply thereto.

As above stated my tongs are adapted to be applied to the usual standard stripping cranes now in use for stripping large end down ingots as indicated in Figs. 9 and 10, the only alteration necessary is to remove the gripping links 56 and substitute my tongs in place thereof by attaching the upper ends of the links 16, 17, 22, 23, 31 and 32, or 16, 17, 22, 23, 52 and 53 to the cradle and the ram respectively.

It has been found in actual practice that a large portion of ingots cast with large tops as indicated may be stripped by simply gripping the top of the ingot and raising it out of the mold in which case my invention may be used as a pair of tongs without engaging the top of the mold. The auxiliary levers will be put into operation only to remove ingots which stick in the mold.

My invention may be easily operated to engage different sized ingot tops as by simply raising the cradle the bits will come nearer together to grip the ingot or by lowering the cradle the bits will move farther apart.

Although I have shown and described my invention in considerable detail, I do not wish to be limited to the exact and specific details thereof, as shown and described, but may use such modifications in, substitutions for, or equivalents thereof as are embraced within the scope of my invention or as pointed out in the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. An ingot stripping mechanism, comprising two pairs of main levers each pair connected together to form a fulcrum in fixed spaced relation to each other at an intermediate point, ingot gripping means pivoted between each pair of main levers, means for operating the main levers and the gripping mechanism, and means adapted to exert a downward pressure on the top of the mold and an upward force on the ingot.

2. An ingot stripping apparatus, the combination of two pairs of main levers having pivotal points in fixed spaced relation to each other, pivoted ingot gripping means attached to the main levers, hoisting means for operating the ingot gripping means and adapted to initially raise both the ingot and mold simultaneously and to exert a downward pressure on the mold and an upward force on the ingot, and means for initially raising the ingot at a greater rate of speed than the mold.

3. An ingot stripping apparatus, comprising oppositely opposed main levers connected together to form a fulcrum at an intermediate point, ingot gripping means pivoted to the main levers, hoisting means connected to the main levers and the ingot gripping means, and means adapted to exert a downward pressure on the mold and an upward force on the ingot.

4. In an ingot stripping apparatus comprising two pairs of oppositely opposed main levers, each pair connected together to form a fulcrum at an intermediate point, ingot gripping means pivoted to the main levers, operating mechanism secured to the main levers and the ingot gripping means adapted to exert a downward pressure on the top of the mold and an upward force on the ingot,

and means for initially raising the ingot at a greater rate of speed than the mold.

5. In an ingot stripping apparatus comprising two pairs of oppositely opposed main levers, each pair connected together to form a fulcrum at an intermediate point in fixed spaced relation to each other, ingot gripping means pivoted to the main levers below their pivoted point, hoisting means having separate connections adapted to operate the main levers and gripping means together, and means adapted to exert a downward pressure on the top of the mold and an upward force on the ingot.

6. In an ingot stripping apparatus, comprising two pairs of oppositely opposed main levers, each pair connected together to form a fulcrum at an intermediate point, auxiliary levers pivoted to the main levers having ingot gripping means formed thereon adapted to engage an ingot, hoisting means for raising and lowering the levers, independent connections between the hoisting means and the main and auxiliary levers, means for initially raising both the ingot and the mold simultaneously, and means for exerting a downward pressure on the top of the mold and an upward force on the ingot.

7. In an ingot stripping mechanism, the combination with the ram, a cradle slidably mounted thereon, oppositely opposed main levers attached to the cradle and pivoted at an intermediate point to form a fulcrum point therefor, auxiliary levers pivoted to the main levers having ingot gripping means thereon adapted to engage an ingot, a connection between the auxiliary levers and the ram and hoisting mechanism for raising and lowering the ram and cradle together and independently of each other.

8. In an ingot stripping mechanism, the combination with a ram, a cradle slidably mounted thereon, two pairs of oppositely opposed main levers attached to the cradle, each spaced apart and pivotally connected together to form a fulcrum at an intermediate point, auxiliary levers pivoted to the main levers below their fulcrum point having ingot gripping means formed thereon at their inner ends and adapted to engage the sides near the top end of the ingot, a connection between the auxiliary levers and the ram, and means for raising and lowering the ram and cradle together and independently of each other.

9. In an ingot stripping mechanism, comprising two pairs of oppositely opposed main levers pivoted together to form fulcrum points therefor at intermediate points and adapted to contact with the top of the mold, means for connecting and spacing the main levers apart, an auxiliary lever pivoted to each pair of the main levers having gripping means formed thereon for engaging the sides near the top of an ingot, hoisting means

connected to the main and auxiliary levers operating to raise the levers thereby exerting a downward pressure on the top of the mold and an upward force on the ingot.

5 10. In an ingot stripping mechanism, comprising two pairs of oppositely opposed bell-crank main levers, spaced apart and pivoted together at an intermediate point adapted to engage the top of the mold, means for connecting the two pairs of bell-crank main levers together, auxiliary levers pivoted to and rotatably mounted between each pair of the bell-crank main levers having bits on their inner ends for engaging the sides near the top of the ingot, and hoisting means connected to the main and auxiliary levers adapted when raised to impart a downward pressure on the top of the mold and an upward force on the ingot.

20 11. In an ingot stripping mechanism comprising two pairs of oppositely opposed bell-crank main levers, spaced apart and pivoted together at an intermediate point and adapted to have their lower ends engage the top of the mold, cheek-plates for connecting the two pairs of bell-crank main levers together, auxiliary levers pivoted to and rotatably mounted between each pair of bell-crank main levers having bits on their inner ends for engaging the sides near the top of the ingot, hoisting means connected to the main and auxiliary levers for initially raising both the ingot and mold simultaneously and thereby exerting a downward pressure on the mold and an upward force on the ingot.

40 12. In an ingot stripping mechanism, comprising two pairs of oppositely opposed bell-crank main levers, spaced apart and pivoted together at an intermediate point, said bell-crank main levers having long horizontal arms and short vertical arms adapted to have their lower ends engage the top of the mold, cheek-plates for connecting the two pairs of bell-crank main levers together, auxiliary levers pivoted to and rotatably mounted between the vertical short arms of each pair of bell-crank main levers having bits on their inner ends for engaging the sides near the top of the ingot, hoisting means connected to the main and auxiliary levers for initially raising both the ingot and the mold simultaneously and adapted to exert a downward pressure on the mold and an upward force of greater speed on the ingot.

55 13. In an ingot stripping machine, the combination with a ram, a reciprocating cradle mounted thereon, tongs comprising oppositely opposed main levers for engaging the top of the mold, means for connecting the main levers together and form a pivotal point thereon, means for connecting the main levers to the cradle, auxiliary levers pivoted to the main levers for engaging the ingot, and means for connecting the auxiliary levers to the ram.

14. In an ingot stripping machine, the combination with a ram, a reciprocating cradle mounted thereon, tongs comprising two pairs of oppositely opposed spaced main levers for engaging the top of the mold, means for connecting the main levers together and form a pivotal point thereon, links for connecting the main levers to the cradle, an auxiliary lever pivoted between each pair of spaced main levers for engaging the ingot, and link connections between the auxiliary levers and the ram.

15. In an ingot stripping machine, the combination with the ram, a reciprocating cradle mounted thereon, tongs comprising two pairs of oppositely opposed main levers, cheek-plates for connecting the two pairs of main levers and adapted to form a pivotal point thereon, link connections between the main levers and the cradle, an auxiliary lever pivoted to each pair of main levers, and link connections between the auxiliary levers and the ram.

16. In an ingot stripping machine, the combination with the ram, a reciprocating cradle mounted thereon, tongs comprising two pairs of oppositely opposed bell-crank main levers arranged to have their lower ends contact with the top of a mold, cheek-plates for connecting the two pairs of bell-crank main levers together and adapted to form a fulcrum point thereon, link connections between the bell-crank main levers and the cradle, and auxiliary lever pivoted between the lower ends of each pair of the bell-crank main levers adapted to form a fulcrum point thereon and having ingot gripping means formed on their inner ends, and link connections between the auxiliary levers and the ram.

17. In an ingot stripping machine, the combination with a ram, a reciprocating cradle mounted thereon, tongs comprising two pairs of oppositely opposed bell-crank main levers, each having a comparatively long horizontal arm and a short vertical arm arranged to have their lower ends contact with the top of a mold, thimbles for spacing the bell-crank main levers apart, cheek-plates for connecting the two pairs of bell-crank main levers together and adapted to form a fulcrum therefor at the point of juncture between the horizontal and vertical arms, links connecting the outer ends of the bell-crank main levers with the cradle, an auxiliary lever pivoted between the vertical arms of the bell-crank main levers below their pivotal point and adapted to form a fulcrum therefor, ingot gripping means formed on the inner ends of the auxiliary levers, and link connections between the outer ends of the auxiliary levers and the ram.

18. In an ingot stripping machine, the combination with a ram, a reciprocating cradle mounted thereon, tongs comprising

two pairs of oppositely opposed bell-crank main levers each having a comparatively long horizontal arm and a short vertical arm arranged to have their lower ends contact with the top of a mold, thimbles for spacing the bell-crank main levers apart, cheek-plates for connecting the two pairs of bell-crank main levers together and adapted to form a fulcrum therefor at the point of juncture between the horizontal and vertical arms around which the arms are rocked, links connecting the outer ends of the bell-crank main levers with the cradle, an auxiliary lever pivoted between each of the vertical short arms of the bell-crank main levers below their pivotal point and adapted to form a fulcrum therefor around which the said auxiliary arms may rock, ingot gripping bits formed on the inner ends of the auxiliary levers adapted to engage the ingot, link connections between the outer ends of the auxiliary levers and the ram, and means for raising the ram and cradle thereby exerting a downward pressure on the top of the mold and an upward force on the ingot.

19. An ingot stripping mechanism comprising a hoist, a ram, main levers and a rotatably mounted ingot gripping device attached thereto having link connections depending from said ram and operatively connected to said hoist.

20. An ingot stripping mechanism comprising a hoist, a ram, a pair of pivoted tong members, an ingot gripping jaw pivoted to each tong member, a link connecting each jaw to said ram, and a link connecting each tong member to said hoist.

21. An ingot stripping mechanism comprising a hoist, a ram having a guideway, a member slidably mounted on said guideway, a pair of tong members pivoted to said member, an ingot gripping jaw pivoted to each of said tong members, a link connecting each tong member to said hoist, and a link connecting each jaw to said ram.

22. An ingot stripping mechanism comprising a hoist, a ram depending therefrom, a cradle slidably mounted thereon, a pair of tongs connected to the cradle, a jaw pivoted to said tongs, means to operate said tongs and means connected to the ram to rock said jaw.

23. An ingot stripping mechanism comprising a hoist, a ram depending therefrom, a cradle slidably mounted thereon, a pair of tongs connected to the cradle, a jaw rotatably mounted to said tongs and connected to the ram, said jaw having an ingot gripping face eccentric to its axis of rotation, means to operate said tongs, and means to rotate said jaw.

24. A device for stripping an ingot from its mold comprising main lever members for engaging the mold, means rotatably mounted on said main lever members adapted to grip the ingot, and means to rotate said means to move the ingot relatively to the mold.

25. A device for stripping an ingot, a pivoted member for engaging the end of a mold, means for supporting said pivoted member, a jaw member pivoted to said pivoted member adapted to grip the ingot, said jaw member having its gripping face eccentric to its axis of rotation, and means to rotate said jaw.

26. A device for stripping an ingot, a pair of tongs adapted to rest on the end of the mold in its open position, a jaw member pivoted to said tongs and having an ingot gripping face eccentric to its axis of rotating, means to close said tongs, and means to rotate said jaw.

27. An ingot stripping mechanism comprising means to grip an ingot, pivoted means for supporting the ingot gripping means adapted to engage the top of the mold and to withdraw the ingot from a mold, and means to move said ingot relatively to said withdrawing means.

28. An ingot stripping mechanism comprising means to grip an ingot, pivoted main means to engage the top of the mold and to move the ingot, and auxiliary means pivoted to the main means for moving the ingot independent of said main means.

29. An ingot stripping mechanism comprising means to grip an ingot, pivoted lever means adapted to engage the ingot mold top while moving the ingot, and means adapted to simultaneously apply pressure on the ingot mold and an oppositely directed pressure on the ingot actuated by the movement of the ingot.

In testimony whereof I hereunto affix my signature.

RICHARD H. STEVENS.