(No Model.) 3 Sheets—Sheet 1.

H. AIKEN & F. W. WOOD.

APPARATUS FOR EXTRACTING INGOTS.

No. 526,094. Patented Sept. 18, 1894.

Fig. 1.

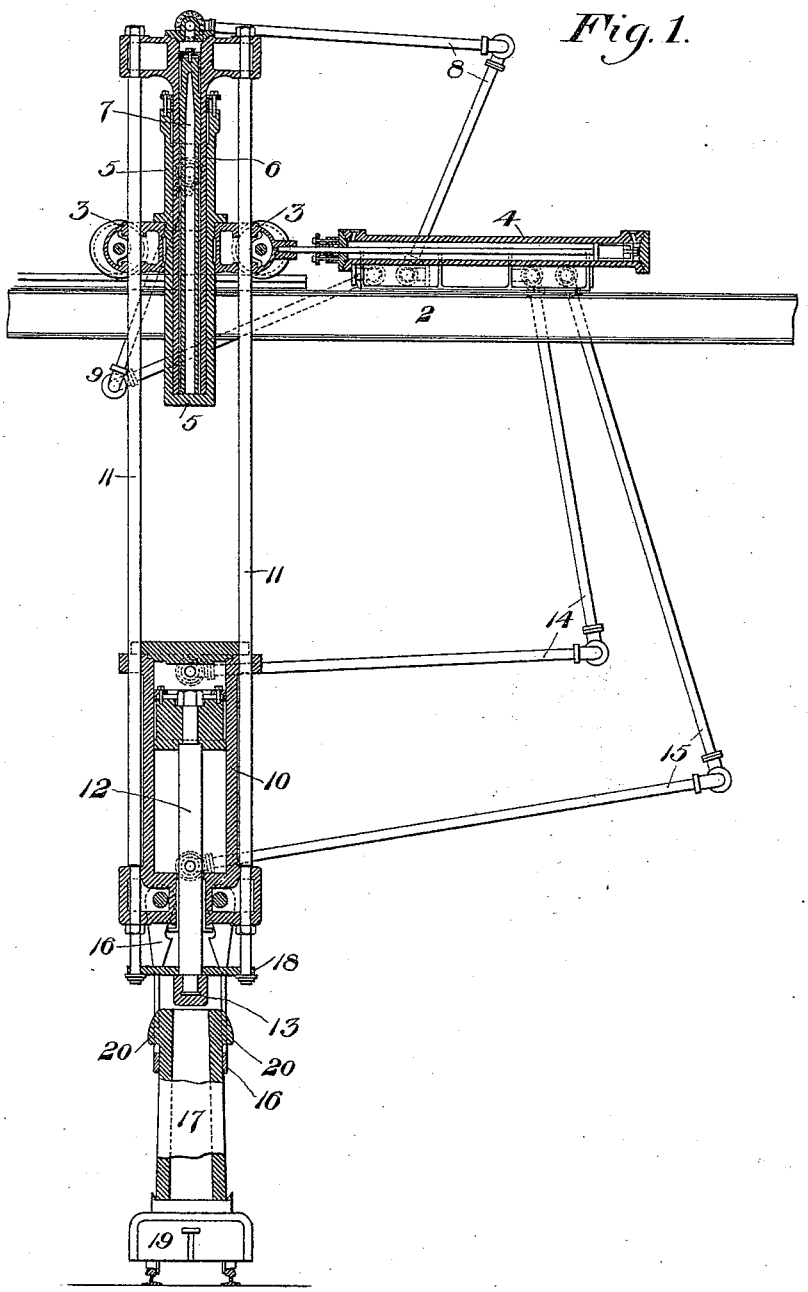

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Fig. 2.

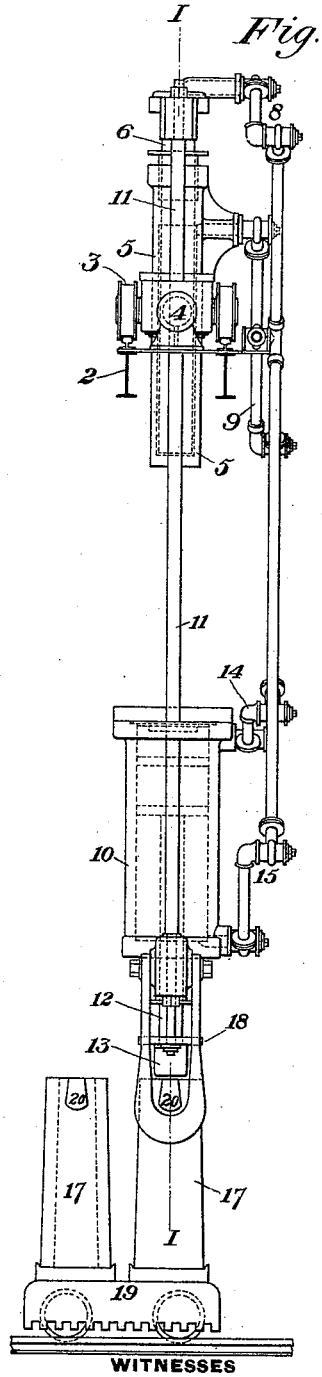
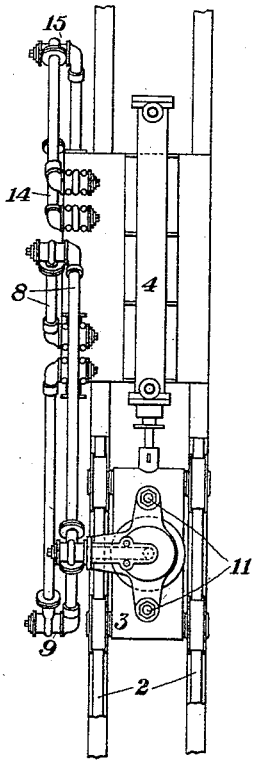


Fig. 3.



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APPARATUS FOR EXTRACTING INGOTS.

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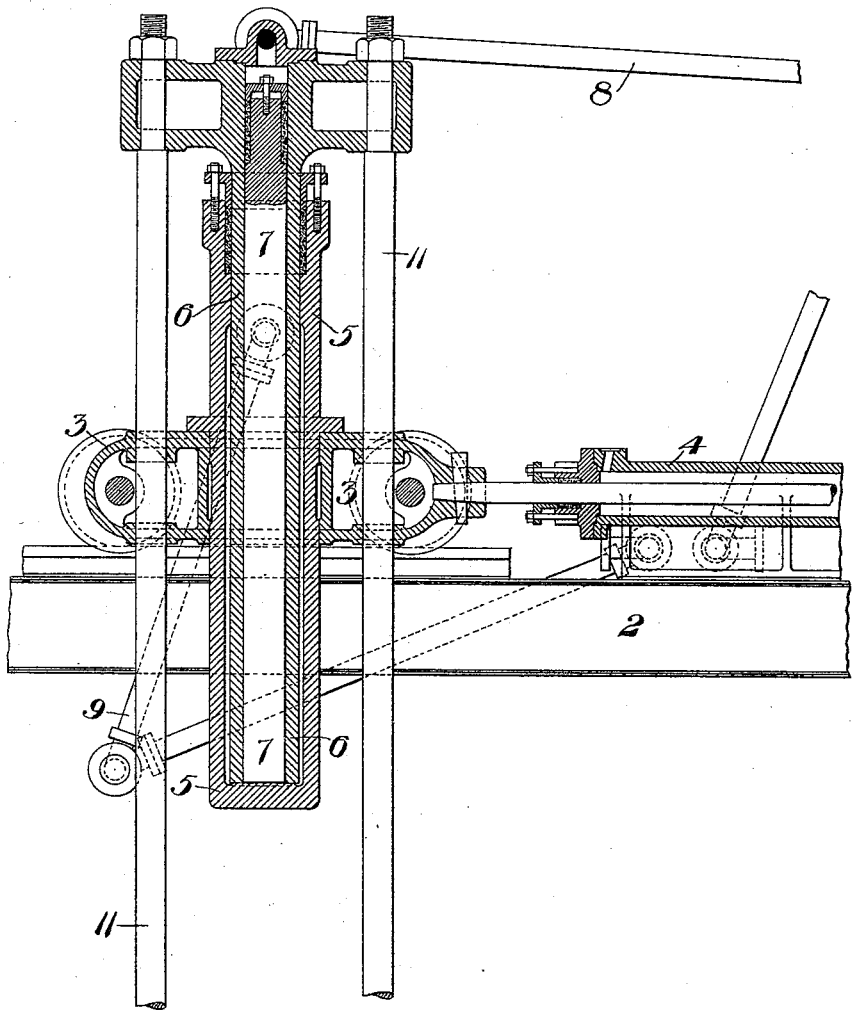
Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF PITTSBURG, PENNSYLVANIA, AND FREDERICK W. WOOD, OF BALTIMORE, MARYLAND.

APPARATUS FOR EXTRACTING INGOTS.

SPECIFICATION forming part of Letters Patent No. 526,094, dated September 18, 1894.

Application filed March 9, 1894. Serial No. 502,979. (No model.)

To all whom it may concern:

Be it known that we, HENRY AIKEN, of Pittsburg, in the county of Allegheny, State of Pennsylvania, and FREDERICK W. WOOD, of Baltimore, in the State of Maryland, have invented a new and useful Improvement in Ingot-Extracting Apparatus, of which the following is a full, clear, and exact description.

Our invention is an improvement upon apparatus for which Henry Aiken has already obtained Letters Patent No. 439,828, dated November 4, 1890. It is illustrated in the accompanying drawings, in which—

Figure 1 shows our improved apparatus in vertical section, the section being on the line I—I of Fig. 2. Fig. 2 is a side elevation thereof; Fig. 3 is a plan view; and Fig. 4 is a vertical sectional view on a larger scale of the upper cylinder and plunger.

Like symbols of reference indicate like parts in each.

In the said prior patent is shown an apparatus for extracting ingots from their molds, in which there is a mold-lifting mechanism, and a stop which restrains the ingot from being lifted with the mold, the parts being so arranged that the ingot-mold, with its contained ingot standing on a car in an upright position, is brought beneath the mold-lifting device, the mold is raised therefrom, and the ingot left upon the car ready to be carried at once to the reheating furnace. The apparatus of the present application, though embodying the same principle of operation, is improved in construction for the purpose of simplifying the construction of the parts, and rendering their operation simpler and more effective.

In the apparatus described herein, the mold-lifting cylinder is carried by an overhead trolley or carriage. A second cylinder is carried by the plunger of the upper cylinder, and has itself a plunger adapted to engage the ingot in the mold and to act as a stop therefor when the mold is raised by the upper cylinder. The invention consists in this and in certain other items hereinafter described and claimed.

In the drawings, 2 represents an overhead track, which may be the jib of a rotating or traveling crane.

3 is a movable trolley or carriage mounted thereon, and 4 is a motor by which the trolley may be caused to move on the jib for the purpose of shifting the ingot-extracting apparatus laterally and transferring a removed mold from the ingot car to another adjacent car, as described and claimed in a prior patent granted to Henry Aiken on November 4, 1890, and numbered 439,829.

5 is a mold-lifting cylinder carried in upright position by the trolley and having a plunger 6 which projects from the upper end thereof. For reasons hereinafter explained, we prefer to make the plunger 6 hollow so that it may act as a counterbalancing cylinder, and to set therein a plunger 7, which may be hollow as shown in Fig. 1, or solid as shown in Fig. 4.

8 is a pipe by which motive fluid may be supplied to the hollow plunger 6, above the plunger 7, which is loose within the plunger 6 and bears upon the bottom of the cylinder 5, and 9 is a pipe for supplying the cylinder 5, these pipes being jointed or otherwise constructed so that they may accommodate themselves to the movements of the parts.

The lower cylinder 10, which is a greater cross-sectional area than the cylinder 5, is suspended by rods 11. These rods extend vertically downward from the head of the plunger 6, and the piston or plunger 12 of the cylinder 10 projects from the lower end and may be provided with a protecting shoe 13 adapted to engage the top of the ingot in the mold.

14, 15, are pipes entering the end portions of the cylinder 10 and adapted to supply motive fluid to raise or depress the plunger.

16, 16, are pivoted hangers, adapted to engage the ears of an ingot-mold 17. They are pivoted to the frame of the cylinder 10, or to any other convenient part of the lifting structure, and for the purpose of operating them automatically to close in upon or to diverge from the mold, we prefer to use a vertically movable plate 18, having shoulders against which inclined portions of the hangers bear, and set around or connected with the plunger 12, so that when the plunger is lifted the plate shall act upon said wedge-shaped portions of the hangers and shall spread them, and when lowered it shall act reversely and

permit them to close by gravity. The cylinder constituted by the hollow plunger is made of such cross-sectional area, that the water pressure acting therein at the upper end shall exert a lifting force nearly, but not quite, sufficient to raise the plunger 6 and the cylinder 10 suspended therefrom. The fluid pressure admitted through the pipe 8 is preferably maintained constantly in communication with the hollow plunger, the pipe being for this purpose connected directly with the accumulator and not connected with an exhaust during the operation of the apparatus, so that the cylinder constituted by the hollow plunger acts as a counterbalance, and the water supplied thereto, when the plunger 6 is lifted as described below, is not wasted, but is displaced into the accumulator when the plunger moves in the reverse direction. A great economy is thus effected.

The operation of the apparatus, when thus constructed, is as follows: In order to prepare for seizing and lifting an ingot-mold, water is admitted into the lifting-cylinder 5, and this acting on the plunger, adds to the lifting force already exerted within said plunger a sufficient increment of force to raise the plunger within the cylinder, and to carry with it the cylinder 10, which is suspended by the rods 11. The plunger is raised sufficiently to permit a mold to be carried on a car 19 into position below the cylinder 10. The water is then exhausted from the cylinder 5, so that the plunger 6 and cylinder 10 shall descend sufficiently to bring the hangers 16 on opposite sides of the mold, whereupon by exhausting the water from the cylinder 10, the plunger 12 is permitted to descend sufficiently to lower the plate 18 and to bring the arms 16 into engagement with the ears 20 on the mold. Where automatic adjustment of the hangers is not desired, the plate 18 may be omitted, and the preliminary descent of the plunger 12 may be dispensed with. The operator then admits water to the mold-lifting cylinder, so as to exert on the plunger 6 a lifting force. If the mold happens not to stick to the ingot, but to be quite loose thereon, this lifting force will raise the cylinder 10, and the mold, drawing the latter up from the ingot which is left standing on the car. If, however, the ingot should stick in the mold, the operator may exhaust the water from the lower part of the cylinder 10 so as to permit the lower end of the plunger 12 to bear upon the top of the ingot and to act as a stop. It may be that the mere gravity of this plunger will be sufficient to restrain the ingot and to hold it down until the mold is loosened therefrom by the lifting cylinder, but if not, the operator admits water into the upper end of the cylinder, so as to project the plunger and to cause it to bear upon the ingot firmly. Then as the mold-lifting cylinder continues to lift the mold, its lifting action is aided by the upward pressure of the water within the cylinder 10. The mold is thus drawn up and loosened from the ingot, which is restrained by the stop-action of the plunger 12. When the mold has been raised sufficiently to loosen it from the ingot, the water may be shut off from the cylinder 10, and then the cylinder 10 and the mold will be lifted clear of the ingot, which is left standing on the car. The trolley may then be moved laterally to carry the mold over another car, the water exhausted from the lifting-cylinder so as to lower the mold upon the car, the parts raised again, the trolley moved back, and another mold and ingot brought into position beneath the cylinder in order that the operations above described may be repeated.

The apparatus is used with great economy of water, for with many ingots the application of pressure within the lower and larger cylinder to hold down the ingot is not required, the use of the lifting-cylinder 5 sufficing for the purpose of stripping the mold.

It will be understood that in employing the terms "cylinder" and "plunger" as used in the claims, we mean by "plunger" the part which is projected from the other portion of the motor, and do not intend to imply necessarily that it operates within the other part, since the parts of the motor may be reversed; the hollow cylinder part, commonly known as the cylinder, being arranged to be projected, and the internal part, commonly known as the plunger, being relatively fixed.

The advantages of our invention will be appreciated by those skilled in the art. By suspending the down-holding cylinder below the lifting-cylinder, or making it separate therefrom and above the position of the mold, we are enabled to make the down-holding cylinder of large area and to obtain therefrom great power, and the apparatus is otherwise improved and its efficiency increased.

The provision of the upper cylinder with a counterbalancing device, as described, is of great advantage, since it results in saving of water and increased economy in operation of the apparatus. The location of the two cylinders 5 and 10 in substantially the same vertical line, and suspending the lower cylinder from the plunger (moving part) of the upper cylinder is of importance, because all the strains exerted on the apparatus are thus rendered direct, and it is enabled to act much more effectively and with less danger of breaking or becoming disordered than if the cylinders were in different vertical lines.

These features of construction, though desirable and claimed by us specifically herein, are not essential to our invention as defined in the broader claims, within the scope of which many modifications in form, construction and arrangement may be made. The counterbalancing cylinder may be made separate from the lifting cylinder.

We claim—

1. In ingot-extracting apparatus, the combination of an upright mold-lifting cylinder and plunger, and a second cylinder situate

below the mold-lifting cylinder, and substantially in the same vertical line therewith, said second cylinder being adapted to be lifted by the mold-lifting cylinder and having a plunger adapted to engage the ingot in a mold suspended beneath both cylinders; substantially as described.

2. In ingot-extracting apparatus, the combination of a trolley carrying an upright mold-lifting cylinder and plunger, and a second lower cylinder suspended below the plunger of the first and adapted to be lifted thereby, said second cylinder having a plunger adapted to engage the ingot in the mold; substantially as described.

3. In ingot-extracting apparatus, the combination of an upright mold-lifting cylinder and plunger, and a second lower cylinder of larger area suspended below the plunger of the first and adapted to be lifted thereby, said second cylinder having a plunger adapted to engage the ingot in the mold; substantially as described.

4. In ingot-extracting apparatus, the combination of an upright mold-lifting cylinder and plunger, provided with mold-suspending devices, a second lower cylinder connected therewith and having a plunger adapted to engage an ingot in a mold, and a counterbalancing cylinder connected to and movable with the mold-suspending devices substantially as described.

5. In ingot-extracting apparatus, an overhead mold-lifting cylinder, a hollow counterbalancing plunger 6, having means for suspending a mold therefrom, a second auxiliary plunger within the hollow plunger, and water inlets leading into the cylinder and into the hollow plunger respectively; substantially as described.

6. In ingot-extracting apparatus, an overhead mold-lifting cylinder, a hollow counterbalancing plunger 6, having means for suspending a mold therefrom, a second auxiliary plunger within the hollow plunger, and water inlets leading into the cylinder and into the hollow plunger respectively, in combination with a second lower cylinder, carried by the plunger 6; substantially as described.

In testimony whereof we have hereunto set our hands.

HENRY AIKEN.
FREDERICK W. WOOD.

Witnesses as to H. Aiken.
W. B. CORWIN,
H. M. CORWIN.
Witnesses as to F. W. Wood:
THOS. KELL BRADFORD,
SAML. D. BRADFORD.