

G. L. NORRIS.
 APPARATUS FOR REDUCING PIPES IN INGOTS.
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931,792.

Patented Aug. 24, 1909.

Fig. 2.

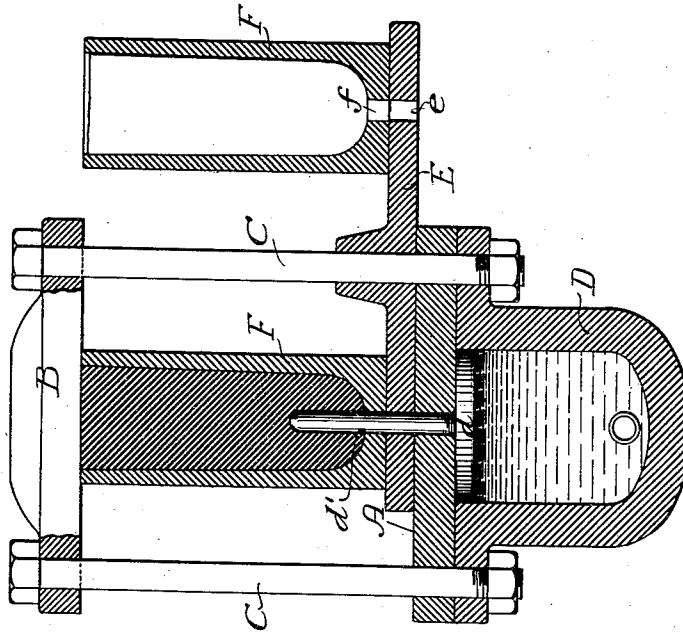
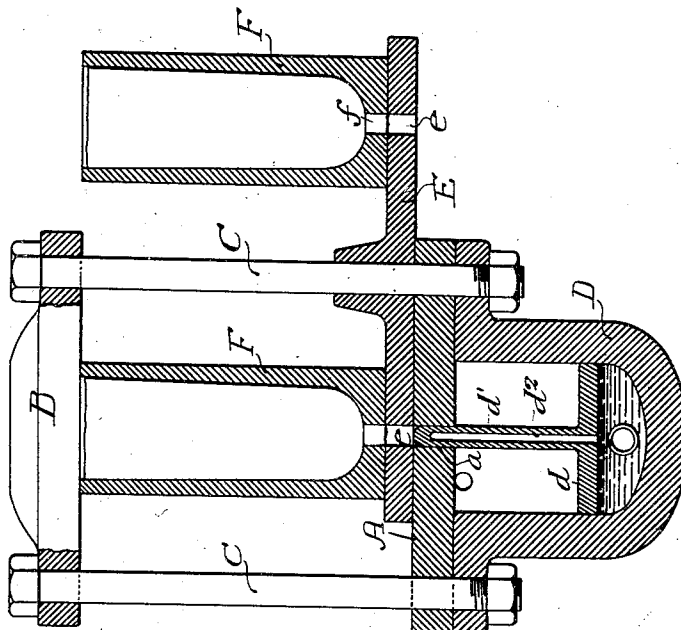


Fig. 1.



Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE L. NORRIS, OF BURNHAM, PENNSYLVANIA, ASSIGNOR TO THE STANDARD STEEL WORKS,
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APPARATUS FOR REDUCING PIPES IN INGOTS.

931,792.

Specification of Letters Patent.

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Application filed May 15, 1907. Serial No. 373,845.

To all whom it may concern:

Be it known that I, GEORGE L. NORRIS, a citizen of the United States, residing in Burnham, Pennsylvania, have invented certain Improvements in Apparatus for Reducing Pipes in Ingots, of which the following is a specification.

One object of my invention is to reduce or prevent the pipe usually formed in the top of an ingot due to the shrinkage of the metal, during solidification, and my invention further contemplates certain improvements in apparatus for carrying out the process as fully described hereafter, reference being had to the accompanying drawings, in which:—

Figure 1, is a vertical section of an apparatus for reducing or preventing the pipe in ingots; the view showing the ingot before the metal is displaced, and Fig. 2, is a view similar to Fig. 1, showing the metal displaced so as to reduce or prevent the formation of the pipe.

In the above drawings, A is the lower platen and B is the upper platen, connected together by rods C—C and having beneath them an hydraulic cylinder D, in which is mounted a piston *d* having a plunger *d'*. There is an opening *a* in the platen A through which the plunger extends. Pivoted on one of the bars C is a table E free to rotate and upon this are mounted the ingot molds F. Said table has a series of openings *e*, so arranged that they may be brought in line with the opening *a* in the platen A; there being in the bottom of each ingot mold, an opening *f* alining with the opening *e*. Either of these platens A or B can be arranged to be movable either by hand or by mechanical means, as desired.

It will be understood that two or more ingots may be placed on the table according to its diameter and the size of the plant, while in place of a rotating table I may employ a reciprocating table which shall be capable of holding any desired number of ingots.

The plungers *d'* is preferably made hollow; its interior passage *d''* being connected with the space under the piston so that the plunger will be cooled by the fluid under pressure.

The operation of the apparatus is as follows:—An ingot, as soon after casting as is practical, is placed in an upright position, between the two platens and the holes *e* and *f* are made to coincide with the hole *a* in the

lower platen; one of the platens being moved so as to hold the mold and its ingot rigidly in place. The piston *d* is then forced upwardly thereby projecting its plunger *d'* through the openings *e* and *f* in the table and the platen, into the still molten, semi-molten or plastic metal of the interior of the ingot in the mold, thereby displacing an amount of metal equal to or greater in volume than the pipe cavity which would ordinarily form in the top end. As the plunger is projected upward it displaces the metal of the ingot, keeping said metal under pressure and completely preventing the formation of piping or gas cavities ordinarily occurring in the upper end of the ingot. The introduction of the water cooled plunger *d'* hastens the solidification of the metal and greatly reduces the length of time which the metal has to be held under pressure before it has solidified sufficiently to preclude the subsequent formation of any pipe cavities and allow of the withdrawal of the said plunger *d'*. This complete obliterating of the piping results in the saving of the greater portion if not all of the upper end of the ingot. After the metal has solidified, the plunger *d* is withdrawn and the platens are shifted so as to release the mold, which is withdrawn and another mold placed in its stead. This leaves a cylindrical hole in the bottom of the ingot, but as the walls of this hole are perfect it does not prevent the use of that portion of the ingot. On the other hand there is no piping at the opposite end of the ingot, which may therefore be entirely used without waste. Heretofore, a large portion of the upper half of the ingot had to be discarded as the piping made flaws in the metal when reduced.

I claim:—

1. The combination in means for reducing the pipe in ingots, of an ingot mold, means for closing the upper end of the mold, and means for displacing the semi-fluid metal from one part of the mold so as to close the pipe or opening in the upper end of the ingot while leaving an opening elsewhere, said means consisting of a plunger and mechanism for forcing the same into and withdrawing it from the body of the metal in the mold.

2. The combination in means for reducing the pipes in ingots of two platens, a mold arranged to be clamped between said platens,

said ingot mold and the lower platen having coinciding openings, an elongated plunger of small diameter relatively to the diameter of the mold, and means whereby said plunger
5 may be forced through the openings and into the interior of the lower portion of an ingot in the mold so as to displace the metal therefrom.

3. The combination of an upper and lower
10 platen, the lower platen having an opening, a cylinder under the lower platen, a piston in the cylinder, an elongated plunger connected to the piston and arranged to pass through the opening in the platen, an ingot
15 mold having an opening and arranged to be clamped between the two platens, with its opening in line with the opening in the lower platen, with means for forcing the plunger through the two openings into the
20 interior of the body of metal forming the ingot and thereby displacing the metal therein so as to close the piping, substantially as described.

4. The combination of an upper and a
25 lower platen, one movable in respect to the other, the lower platen having an opening, a cylinder under the lower platen, a piston in the cylinder, a plunger actuated by the piston and fitting the opening in the lower
30 platen, a table also having an opening, an ingot mold mounted on the table and having an opening alining with the opening in the lower platen, and means for causing the
35 plunger to be forced through the opening in the table through the opening in the ingot mold and into the molten metal forming the ingot so as to displace said metal and close the piping therein, substantially as described.

5. The combination of an upper and a
40 lower platen, said lower platen having an opening, a plunger adapted to be forced through the opening, a table pivotally mounted so as to swing between the upper
45 and lower platen, said table having an opening or openings alining with the opening in the lower platen, one or more ingot molds mounted on the table and each having an opening alining with the opening in the
50 table with means for actuating the plunger to cause it to be forced through the openings in the platen, the table and the ingot mold so as to displace the metal of the ingot and close the piping, substantially as described.

6. The combination of an upper platen, a
55 lower platen having an opening, a cylinder under the lower platen, a piston mounted in the cylinder, a plunger for the piston, vertical-rods connecting the upper and lower
60 platens, a table pivotally mounted on one of said rods and having a series of openings capable of alining with the opening in the lower platen when the table is rotated, ingot
65 molds carried by the table and each having an opening in the bottom alining with the openings in the table, with means for forcing the plunger up through the openings in the
70 lower platen and the ingot mold so as to displace the metal of the ingot when one of said molds is brought between the upper and lower platens, substantially as described.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

GEORGE L. NORRIS.

Witnesses:

GEO. J. PARKER,
A. A. STEVENSON.