

(No Model.)

T. HAMPTON.

PROCESS OF AND MOLD FOR CASTING COMPOUND INGOTS FOR ARMOR
PLATES.

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b Inventor.
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UNITED STATES PATENT OFFICE.

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PROCESS OF AND MOLD FOR CASTING COMPOUND INGOTS FOR ARMOR-PLATES.

SPECIFICATION forming part of Letters Patent No. 547,009, dated October 1, 1895.

Application filed July 21, 1894. Serial No 518,266. (No model.) Patented in England March 8, 1894, No. 4,533.

To all whom it may concern:

Be it known that I, THOMAS HAMPTON, a subject of the Queen of Great Britain, and a resident of Sheffield, in the county of York, England, have invented a certain new and useful Improved Process of and Mold for Casting Compound Ingots for Armor and other Plates, (patented to me in Great Britain by Letters Patent No. 4,533, dated March 3, 1894;) and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to improvements in the process of casting compound ingots for the manufacture of armor-plates and other like plates and to improvements in the molds used in carrying out such process.

The object of the invention is to enable the second and any additional layers of special metals or alloys to be poured into the mold while the preceding layer or layers are in a fluid or semi-fluid condition in such a manner as to cause as small a disturbance of the preceding layer as possible, and thus to prevent the several layers mixing or amalgamating and losing their distinct characteristics, or, in other words, to insure the production of a compound ingot having its layers in their prearranged positions with their characteristic qualities distinct and at the same time perfectly united and consolidated with each other at their junctions.

By the use of my improved mold and my peculiar process, which I designate "spray-casting," I obtain a perfect compound ingot having, for example, a hard face, a soft center, and a semi-hard back, suitable for armor-plates. A mold suitable for the purpose is shown in the annexed sheet of drawings, in which—

Figure 1 represents an end elevation of a mold with the end removed, showing two funnels in section; Fig. 2, a plan of part of the cover-plate with two funnels in position and a portion removed, showing the conduits, which are also indicated by dotted lines; and Fig. 3 details of conduit pipes, blocks, and nozzle.

The mold shown in the drawings includes a separate base-plate 1; but this may, if pre-

ferred, be cast in one piece with the sides 2 and 2^a. The sides and the ends may be made in one piece, as the side 2, or built up in sections, as 2^a, or the sides and ends may be made separately and fastened together, and I prefer to line the interior of the mold with a coating of some refractory material 3 or some portion only of the interior.

On the top of the mold and resting upon the sides I place a heavy cover, consisting of an under plate or frame 4 and a top plate 5, the two plates being secured together by bolts and cotters 6 or by other means. In the upper face of the plate 4 I form intersecting channels to receive the conduit-pipes 7 and open recesses to hold the blocks 8 and the spray-nozzles 9, these several appliances being made of fire-clay or the like. The upper plate 5 is prepared for and provided with funnels 10 and 11, into which the molten metal is poured in the process of casting the ingot. These funnels may be of any suitable form, and their number and position may be varied according to the size of the ingot and for other reasons. The arrangement of the conduits may also be varied, but the plan indicated in Fig. 2 will be found satisfactory for general use. The idea is to distribute the spray-nozzles 9 uniformly over the horizontal area of the interior of the mold, hereinafter termed the "mold-chamber," the horizontal extent of which is determined by the size of the ingot desired for a plate of given dimensions.

The process of casting an ingot of three layers—for example, for an armor-plate with a hard face, a soft central body, and a semi-hard back—is as follows: The molten steel for the hard face is first poured into the mold through the funnel 10, which communicates direct with the interior of the mold either in the manner shown or the funnel may be carried down the outside of the mold and enter through the side near the bottom, as preferred. The molten metal for the center layer is then poured into one or more of the funnels 11, in communication with the conduit-pipes 7, the conduit-blocks 8, and the nozzles 9, from which it descends in small streams or "spray," so called, upon the surface of the still molten body of hard steel already in the mold. The division of the molten metal into small streams

diminishes its power of disturbing the metal upon which it falls, which is a matter of the utmost importance in retaining the characteristics of each layer intact. The third layer is poured into the mold in a similar manner, but it may be advisable to use a separate set of funnels and conduits. For this purpose the conduits may be divided into sections, each section having one or more funnels.

To permit the escape of gas generated in the mold, the nozzles 9, in addition to their central passages *a*, Fig. 3, are provided with vertical vent-holes *b*, Figs. 1 and 3, which communicate at top with the spaces between the nozzles 9 and the conduit-blocks 8, and between said conduit-blocks 8 and the conduit-pipes 7 and the walls of the channels *c*, Figs. 1 and 2, formed in the under plate or frame 4 of the cover of the mold, as aforesaid, and communicating, as in dotted lines in Fig. 2, with grooves 12, formed in the bottom of the top plate 5 and extending to one or more of its edges, the loose fit of the conduit pipes and blocks within said channels permitting a considerable amount of gas to escape in this way; but to insure a free escape of the gas I also furnish the mold with grooves 13 at the bottom of the cover-plate 4.

I am aware that it is not broadly new to cast two or more ingot-layers successively in one mold nor to pour the metal into a mold through a number of openings simultaneously, and I am also aware of the previous use of strainers, as set forth in the Patent No. 304,314 to Francis K. Haffey; but so far as I am informed ingots have never before been cast with successive layers intimately united with each other and with the distinguishing characteristics of the respective layers fully preserved by pouring the metal for the second and third layers or a second layer simultaneously through numerous nozzles distributed over the horizontal area of the still molten layer previously cast, or, in other

words, according to the process hereinafter claimed.

What I claim, and desire to secure by Letters Patent, is—

1. In the manufacture of compound ingots, the within-described process of spray-casting, which consists in casting a first layer in horizontal position, and while the same remains in said position and is still molten pouring in the metal for a second layer in numerous small streams or "spray" distributed over the horizontal area of the first layer, whereby seriously disturbing the molten metal of such first layer is avoided, and perfectly united layers possessing distinct qualities are insured.

2. A horizontal mold for casting compound ingots having a cover provided with one or more funnels 11, connected by means of conduit-pipes 7 and conduit-blocks 8 with a number of spray-nozzles 9 opening into a mold-chamber common to all, for the purpose of distributing the molten metal in small streams or "spray" over the horizontal area of a subjacent molten layer, as hereinbefore described.

3. In a mold for the production of compound ingots, the combination with the funnel 10, having a direct passage for the molten metal into the mold-chamber, of one or more funnels 11 having indirect passages for the molten metal through horizontal conduits and vertical spray-nozzles, the latter distributed horizontally above the area of said mold-chamber, substantially as hereinbefore specified.

In testimony that I claim the foregoing as my own I have affixed hereto my signature, in presence of two witnesses, this 5th day of July, 1894.

THOMAS HAMPTON.

Witnesses:
ROBT. F. DRURY,
ENSOR D. DRURY.