(No Model.)

T. HAMPTON.

COMPOUND INGOT FOR ARMOR PLATES.

No. 547,010. Patented Oct. 1, 1895.

Fig. 1.

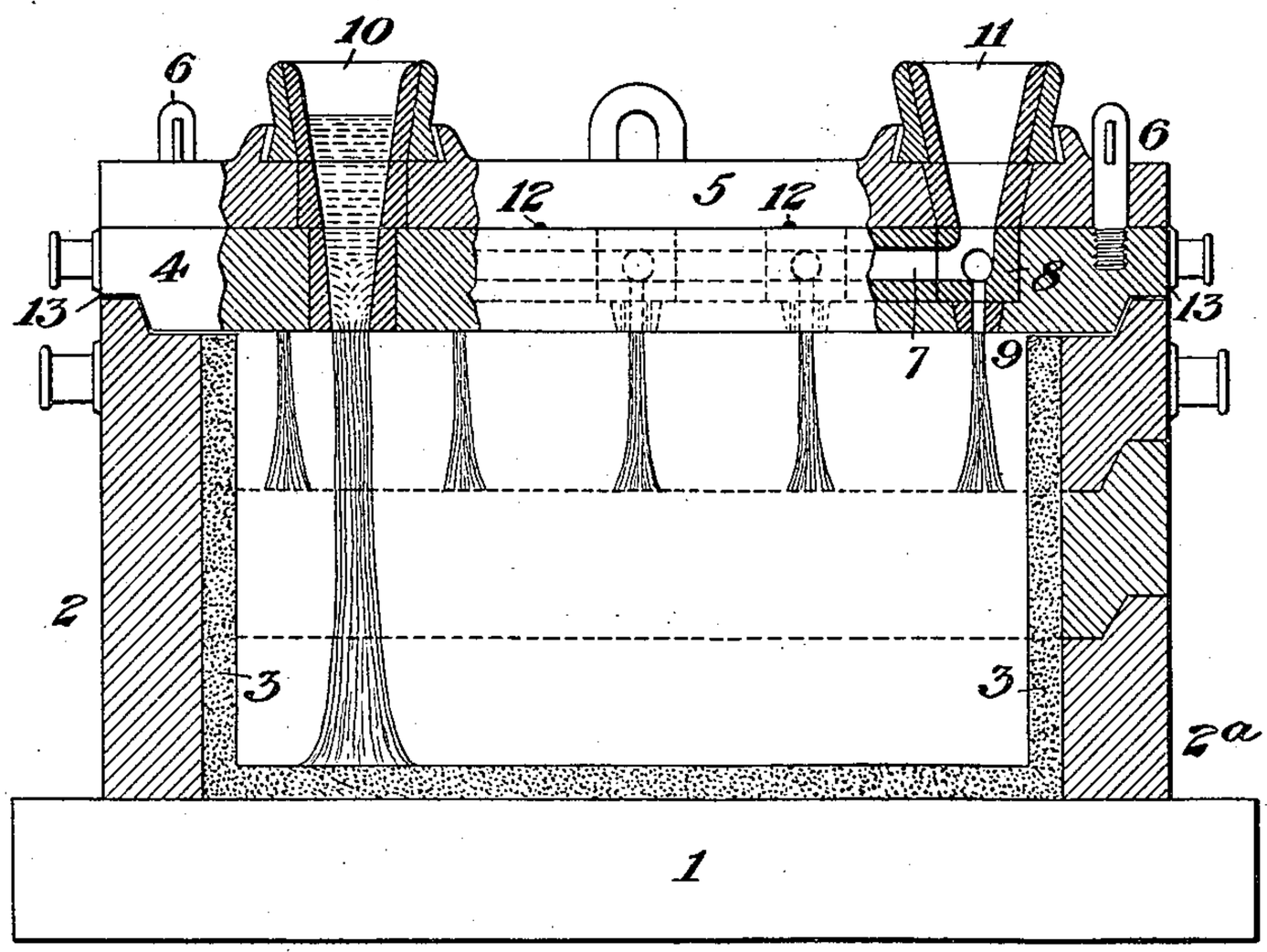


Fig. 2.

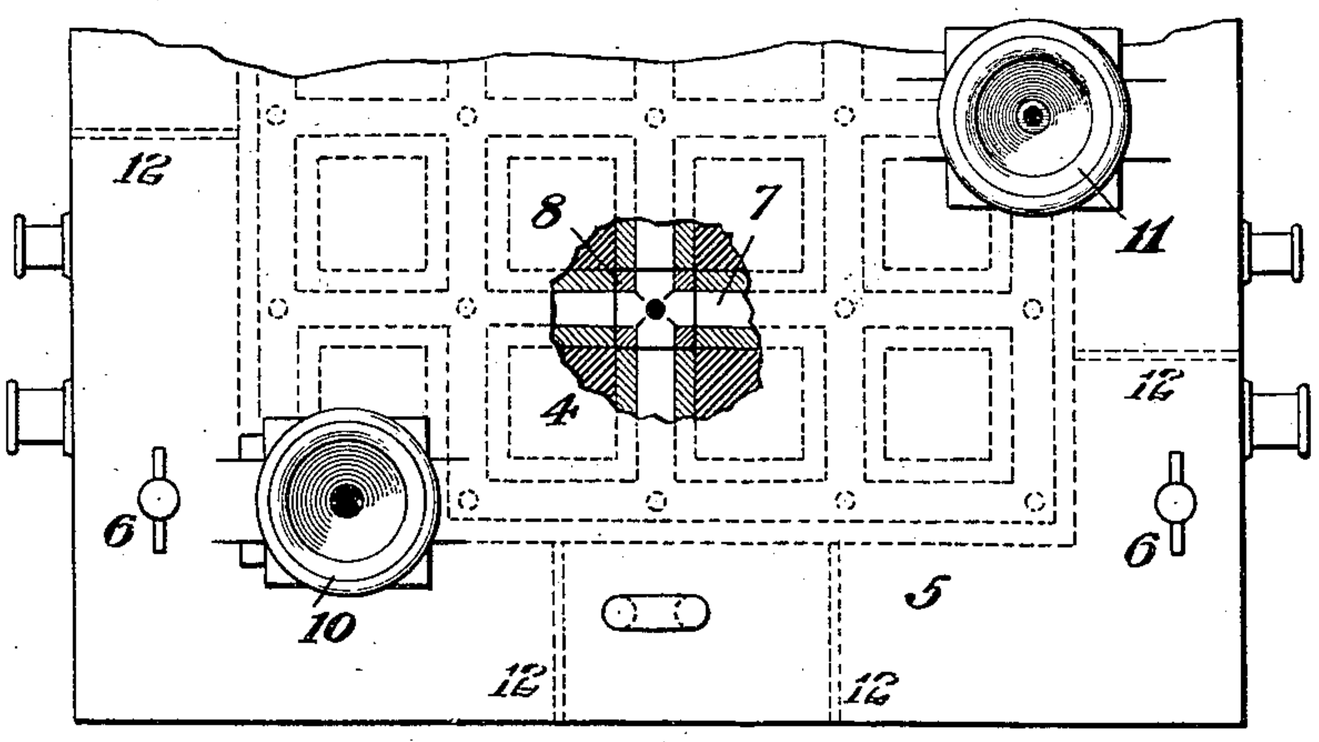
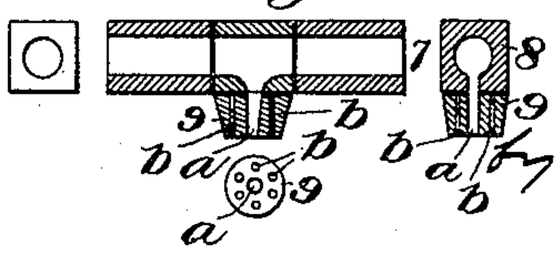


Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

THOMAS HAMPTON, OF SHEFFIELD, ENGLAND.

COMPOUND INGOT FOR ARMOR-PLATES.

SPECIFICATION forming part of Letters Patent No. 547,010, dated October 1, 1895.

Application filed August 15, 1894. Serial No. 520,399. (No model.) Patented in England December 8, 1893, No. 23,636.

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 certain new and useful Improvements in Compound Ingots for Armor-Plates, (patented to me in Great Britian by Letters Patent dated December 8, 1893, No. 23,636;) 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.

The object of the invention is the production of a compound armor-plate superior to those heretofore manufactured, the said plate having a hard face, a soft back, and a much softer intermediate or central part, the said parts being in perfect combination and severally retaining their separate qualities. In order to produce such a compound plate, I first cast an ingot combining the three qualities of steel in layers—namely, a hard quality of special composition, hereinafter termed "hard steel," upon one surface, a milder quality, hereinafter termed "mild steel," upon the reverse side, and a still milder quality, hereinafter termed "soft steel," in the center—that is, between the two former. The ingot-mold is arranged horizontally, so that the several layers of steel which compose the ingot may flow to a uniform thickness throughout, and I prefer to cast the hard quality of steel first, then I cast the soft center layer, and lastly the mild quality for the back.

Figure 1 of the drawings represents a sectional elevation of a suitable mold, which is the subject-matter of a companion specification forming part of an application for patent, filed July 21, 1894, Serial No. 518,266. Fig. 2 is a partial plan view of said mold with a portion of its cover in section, and Fig. 3 represents certain mold details hereinafter referred to.

Like letters and numbers refer to like parts in all the figures.

The mold may have a base-plate 1 separate from its sides and ends, and these may each be made in one piece, as at 2, or built up in sections, as at 2^a. The interior of the mold, hereinafter termed the "mold-chamber," is provided with a lining of refractory material 3, and the mold is closed at top by a heavy cover, consisting of an under plate or frame 4, a top plate 5, secured together by bolts and cotters 6, said frame 4 being provided with top channels and recesses to receive, respectively, conduit-pipes and conduit-blocks 7 and 8 and spray-nozzles 9, of fire-clay or the like, while the upper plate 5 is provided with a funnel or funnels 10, communicating directly with the mold-chamber, as in Fig. 1, for use in casting said layer of hard steel, and with one or more funnels 11, preferably at least two, communicating indirectly with the mold-chamber by way of said conduits and spray-nozzles for use in casting the soft-steel layer upon such layer of hard steel and the mild-steel layer upon such layer of soft steel, said spray-nozzles being distributed over the horizontal area of the mold-chamber, so as thus to distribute the molten steel as it enters the mold-chamber. 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 around said conduit-blocks 8 and the conduit-pipes 7, within the channels *c*, Figs. 1 and 2, said conduit-blocks and conduit-pipes fitting loosely within said channels, and the latter 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 mold is also furnished with gas-escape grooves 13 at the bottom of the cover-plate.

In casting the compound ingot I take care to obtain a perfect combination or junction of the layers of steel without detrimental amalgamation or destruction of their distinctive qualities. By using such mold and pouring the molten steel for the second layer before a crust of oxidation is formed on the first layer and the molten steel for the third before oxidation takes place upon the surface of the second, such perfect combination or cohesion of the layers is insured; and also, by virtue of said spray-nozzles distributed horizontally, as above, any detrimental amalgamation or destruction of the distinctive qualities of the respective layers is avoided in the most simple manner known to me. To pre-

vent oxidation a suitable flux may be introduced into the mold-chamber through one of the funnels 10 and 11 as soon as the first layer is cast, so as to protect its surface and to rise upon the surface of the second layer when the latter is cast. The steel used may be produced by the processes known as "Bessemer," "Siemens-Martin," "crucible," or other process or combination of processes.

From the experiments and practice I find that the hard-quality steel for the face of the plate should contain carbon, which may vary in quantity from 0.50 to 2.00 per cent.; silicon, 0.02 to 0.15 per cent.; phosphorus and sulphur not to exceed 0.10 per cent., respectively, and manganese 0.25 to 2.00 per cent., with chromium up to five per cent.

The soft steel should contain carbon, which may vary up to 0.30 per cent.; silicon, up to 0.15 per cent.; phosphorus and sulphur, 0.02 to 0.10 per cent., respectively, and manganese 0.25 to 2.00 per cent.

The mild quality should contain carbon, 0.25 up to 0.50 per cent.; nickel, 0.50 to 5.00 per cent.; silicon, 0.02 to 0.15; sulphur and phosphorus, 0.02 to 0.10 per cent., respectively, and manganese 0.25 to 2.00 per cent. The ingot so composed and cast may then be rolled, forged, pressed, or otherwise formed into a plate, and after being bored for bolts and otherwise machined the finished plate may be subjected to a hardening process, if desired.

Having now particularly described and ascertained the nature of my invention and in what manner the same is to be performed, I declare that what I claim is—

A compound ingot for armor-plates consisting of three layers and distinct qualities of cast-steel in perfect cohesion, including a face-layer of hard steel containing a proportion of chromium, a back-layer of mild steel containing a proportion of nickel, and a middle layer of soft steel, softer than said back-layer, substantially as hereinbefore described.

In testimony that I claim the foregoing as my own I have affixed hereto my signature, in presence of two witnesses, this 4th day of August, 1894.

THOMAS HAMPTON.

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