C. SHUNK.

MODES OF CASTING INGOTS OF STEEL.

No. 188,822. Patented March 27, 1877.

Fig 1

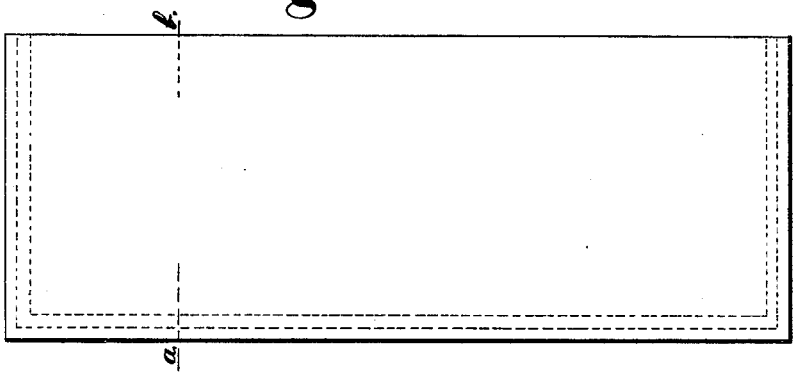


Fig 2

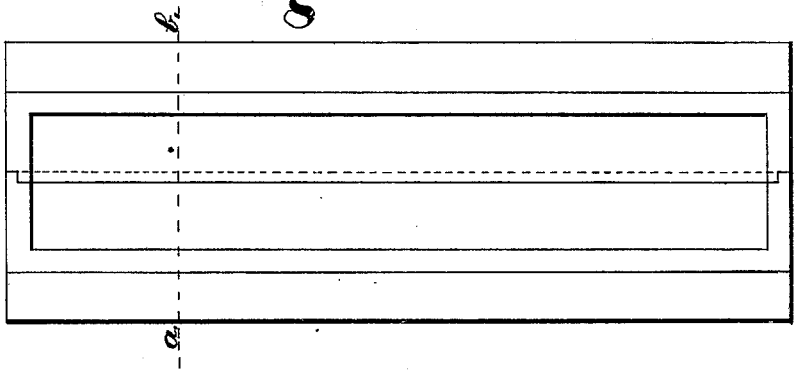
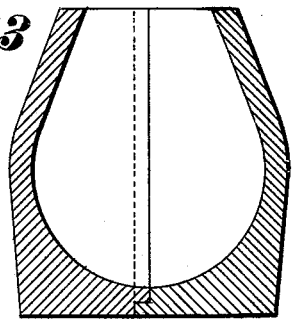


Fig 3



Witnesses

Stanley Williams

H. W. Duff

Inventor:

Christian Shunk

UNITED STATES PATENT OFFICE.

CHRISTIAN SHUNK, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO A. BOYD, OF SAME PLACE.

IMPROVEMENT IN MODES OF CASTING INGOTS OF STEEL.

Specification forming part of Letters Patent No. **188,822**, dated March 27, 1877; application filed November 15, 1876.

To all whom it may concern:

Be it known that I, CHRISTIAN SHUNK, of Philadelphia, Pennsylvania, have invented an improved mode or method of casting ingots or large masses of cast-steel prepared for hammering or rolling purposes, of which the following is a specification:

By the present mode of casting fluid steel in close perpendicular molds, as now practiced, the cast or ingots made are hollow or unsound at the upper end of the mold, extending down more or less the center of the metal. This defect or unsoundness is supposed to take place from the peculiar character of the metal as such; and at the high heat employed in molding or casting it in contact with the body of cold iron of which the molds are composed, the sudden chill and "set" of the steel ensues, and rapid and uneven shrinkage or contraction brings into play forces greater than the cohesive power of the metal is able to withstand, causing the rupture or unsoundness before described.

When wrought or crude iron is converted into refined cast-steel in crucibles or in large converters for railroad purposes, the heat employed is more than twice as great as it is in crude metal for common castings, which contains in it four or five per cent. of free carbon, and retains its molten condition for a considerable time in the process of cooling. Refined cast-steel, on the contrary, has in it but a minimum proportion of carbon, less than one per cent., in a combined state, and becomes chilled or set in some seconds of time after it is cast into the mold.

Various modes or methods have hitherto been attempted to overcome and remedy the said defect or unsoundness, but without satisfactory results.

To remedy the same I have discovered or invented an improved mode or method in the treatment of the fluid steel in the process of molding or casting it; and it consists in the employment of suitable horizontal ingot molds or devices, in the manner hereinafter described.

In the casting of the fluid steel it is let or poured in at a rapid stream or flow of the metal at about midway in the mold, so that, the flow of the metal passing both ways at the same time in filling the mold, the chill or set of the steel in cooling will be uniform in the process of the crystallization of the metal. The rupture or unsoundness at the top end of the cast that takes place in upright molds is overcome and the metal remains sound within.

The face of the ingot will be slightly concave from the shrinkage of the metal in cooling, which soon disappears under the hammer or in rolling it into bars. Thus, a better quality of cast-steel is produced than under the ordinary upright molds in use.

In casting it a "lip" or bit of the steel can be made attached to one end of the ingot, and may be readily broken off to test the quality of the steel before forging it. Ordinary-sized ingot-molds for merchant bar are preferably made in two parts, the connecting-joint being through the bottom and ends of the mold, and the parts being clamped together for use.

The bottom and sides of the mold, made concave, will allow a narrow or small face on the upper side of the ingot, but so as to leave space for a rapid flow of the metal in filling the mold at both ends, or nearly so, alike. (See drawing, Figs. 1, 2, 3.) This form will make a well shaped ingot for forging or rolling into bars.

For casting large ingots of steel for railroad purposes it is preferable to make the mold or device employed in three parts or plates, the bottom and sides being separate, and also concave, so as to form a narrow face on the top when the plates are clamped together before using it, which any practical workman will readily understand.

So soon as the molten steel is cast a cover of fine charcoal or dry sawdust put on will prevent the oxidation of the metal on the surface in cooling; or the molds may be made with a top plate over the face of the ingot, allowing sufficient opening for the flow of the fluid steel in casting it. A flux of carbonate of soda or of fine borax in small quantity in the bottom of the molds will cause the metal to flow more freely in casting large ingots or masses of cast-steel.

Different kinds of metal have been cast in

a horizontal way before, but not in the manner nor for the purpose claimed by me in the manufacture of ingot-steel.

I do not confine myself to any one form or construction of the molds or devices employed to carry out the object or principle of my said invention or discovery.

I claim—

1. The method of casting ingots of steel which consists in casting the same in an open mold having a horizontal or nearly a horizontal dimension greater than its height, and having upwardly-converging sides, for the purpose set forth.

2. An open mold for casting ingots of steel, having a horizontal or nearly horizontal dimension greater than its height, and having upwardly-convergent sides, for the purpose set forth.

CHRISTIAN SHUNK.

Witnesses:
C. H. LIND,
W. H. LACEY.