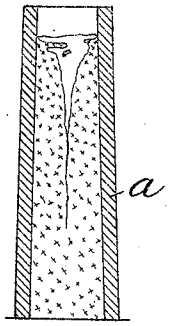
N. KOSTILEFF.

PROCESS FOR CASTING STEEL INGOTS.

APPLICATION FILED APR. 19, 1909.

1,003,275. Patented Sept. 12, 1911.

Fig. 1



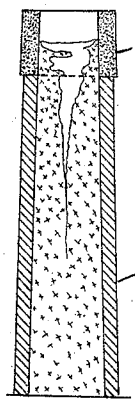


Fig. 2

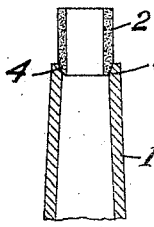
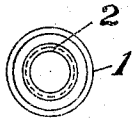
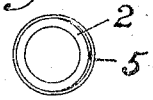


Fig. 3



Witnesses:
I. Spantikow
H. C. Hunsberger

Fig. 8.



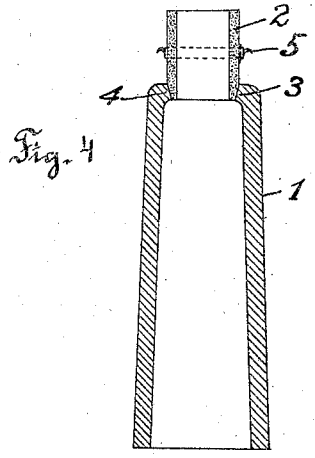


Fig. 4

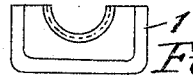


Fig. 9.

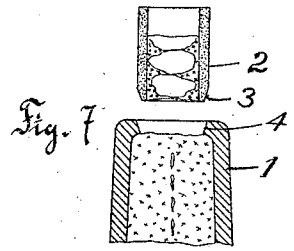


Fig. 7

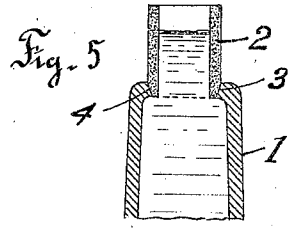


Fig. 5

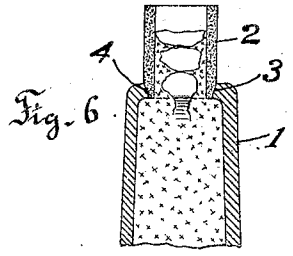


Fig. 6

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UNITED STATES PATENT OFFICE.

NICOLAS KOSTILEFF, OF NISCHNE SALDINSKIJ SAWOD, RUSSIA.

PROCESS FOR CASTING STEEL INGOTS.

1,003,275. Specification of Letters Patent. Patented Sept. 12, 1911.

Application filed April 19, 1909. Serial No. 490,865.

To all whom it may concern:

Be it known that I, NICOLAS KOSTILEFF, of Nischne Saldinskij Sawod, Government of Perm, Russia, a subject of the Czar of Russia, engineer, have invented certain new and useful Improvements in Processes for Casting Steel Ingots, of which the following is a full, clear, and exact description.

This invention relates to a method for casting ingots of steel and other metals.

An object of the invention is to cast a metal in a mold without causing any fissures, pipes or similar detrimental apertures and cavities within the finished ingot.

Another object of the invention is to cast an ingot in which the metal is of uniform structure throughout all the portions of the mass.

Another object of the invention is to cast an ingot which is not provided with a head portion containing metal of poorer quality than the balance of the ingot and necessitating therefore the use of shares or other cutting tools for the removal of said head portions.

Other objects will be more clearly understood by reference to the following specification and they will be more clearly pointed out in and by the appended claims.

In the drawing:—Figure 1 shows a longitudinal section through an ingot and mold of known construction. Fig. 2 shows a similar section, the ingot mold being provided with a head box of known construction. Fig. 3 is a section through an ingot mold, provided with a head box adapted for the use in the process which forms the subject-matter of this invention. Fig. 4 shows in section a modification of the mold and of the box of Fig. 3. Fig. 5 shows in section parts of an ingot mold and the head box pertaining thereto filled with metal. Fig. 6 shows in a similar section the same parts, the liquid metal being in a more advanced state. Fig. 7 shows in section the ingot mold and the head box, the latter being removed from the mold. Fig. 8 is a top plan view of the head box. Fig. 9 is a part of a top plan view of the head box and the mold.

In casting steel, into ingot molds and other forms, two phenomena occur frequently after it is poured within the mold, the phenomena being usually designated by "segregation" and "forming of pipes." These phenomena cause a shrinkage of the metal, producing thereby a cavity or aperture within the upper portion; the metal in said portions being of poorer quality than the balance of the ingot. It is very frequently necessary to remove 15% or more of the finished ingot for the purpose of obtaining a block of metal of uniform structure and adapted to be rolled or used for industrial purposes. For the purpose of preventing the shrinkage, it has been tried to heat the upper portion of the mold *a* after the metal has been poured into the same or to attach a head box *b* to the top of the mold so that the cavity would principally be formed in the head box, which afterward could be removed from the mold proper. This process was connected with a large plurality of disadvantages, the metal during the pouring operation entering into the interspace between the head box *b* and the mold *a*, so that the upper portion of the ingot would be spread out beyond the body of the ingot proper. Another disadvantage connected with this process was the feature that the metal entering between the head box and the mold prevented the shrinkage of the portion immediately below in uniformity with the balance of the ingot, so that the structure of the steel obtained thereby was not homogeneous. Furthermore very frequently the cavity formed in the head box extended far into the body of the ingot proper.

In the process which forms the subject-matter of this invention means are provided which prevent a spreading of the liquid metal in the interspace between the ingot mold and the head box. For this purpose the ingot mold 1 which is advisably of somewhat conical shape for the purpose of facilitating the withdrawal of the ingot is on its top provided with beveled edges 4. A head box 2, the bottom portion of which is provided with beveled edges 3 adapted to register with the top of the ingot mold may be inserted into the top wall of the ingot mold as clearly shown in Fig. 3. By this means a spreading of the liquid metal between the head box and the mold is prevented, while it is still possible to remove easily the head box from the mold. After the metal has been poured into the ingot mold and box, it is allowed to cool therein to a certain extent, the shrinkage in the beginning of the cooling being comparatively small as indicated in Fig. 5. In the furthe shrink

age the metal in the head box mostly adheres to the side wall thereof as shown in Fig. 6, and when the shrinkage has reached the bottom of the ingot proper the head box with the metal contained therein may be removed from the mold so that the metal contained in the mold now continues the shrinkage but not with the same violence as to the same extent as it would have done if the head box would have been removed, while the metal was still in liquid condition. In removing the head box and the metal contained therein the still viscous metal of the ingot is broken along the plane of the lower edge of the head box, so that the finished ingot will have an approximately flat top surface, (Fig. 7.) It may be advisable to fill the cavity, which has been formed by the shrinkage in the head box, with cold water before the box is removed from the ingot, so that a crust is rapidly formed on top of the ingot proper. It is also possible to remove the head box and to pour the cold water on the top of the ingot after the box has been removed therefrom. After the metal is in viscous state the shrinkage proceeds considerably slower than at the outset of the process and the cavities eventually formed in the body of the ingot are so small that in the finishing process of the ingot through rolling or hammering these cavities are easily closed presenting thereby a material of uniform structure in every cross section.

It may be advisable to prevent breakage of the head box which might be caused by the change of temperature when the cold water is poured into the box. For this purpose the head box shown in Fig. 4 is provided with a means in form of a ring tightly inclosing the same and preventing thereby a cracking of the material of which the box is formed.

The head boxes may be made of brick clay or of any other cheap fire-proof-material as they are only used once.

It will be seen that by this process ingots are obtained which do not necessitate the finishing of the product in ingot shares. Furthermore the upper portion of the ingot is of uniform, homogeneous structure, cavities and segregation being avoided in the described process.

I claim:—

1. A process for casting steel ingots, which consists of placing a head box upon the ingot mold, pouring liquid metal into the mold and head box, pouring cold water into the head box, after the metal in the same has shrunk toward the lower edge thereof, and removing the head box, while the metal is in viscous condition.

2. A process for casting steel ingots, which consists of placing a head box upon the ingot mold, pouring liquid metal into the mold and head box, removing the head box, while the metal is still in viscous condition and pouring cold water on top of the metal within the ingot.

In testimony whereof I have hereunto set my hand this 23 day of February, 1909, at Nischne Saldinskij Sawod, Russia, in the presence of two subscribing witnesses.

NICOLAS KOSTILEFF.

In the presence of—
STEFAN DRAGO,
MICHEL ERICHMANN.