Dec. 29, 1925. 1,567,431

B. S. ELROD

BAR CASTING DIE AND METHOD FOR SEASONING THE SAME

Filed April 17, 1922

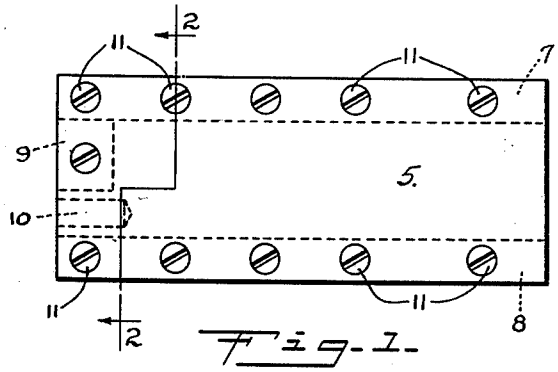


Fig. 1.

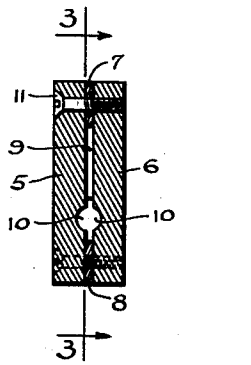


Fig. 2.

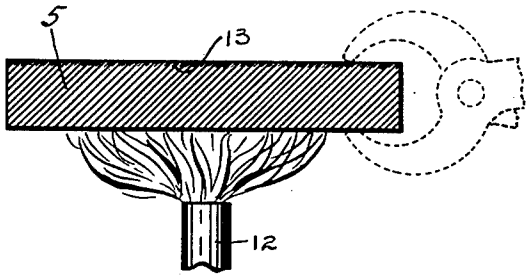


Fig. 4.

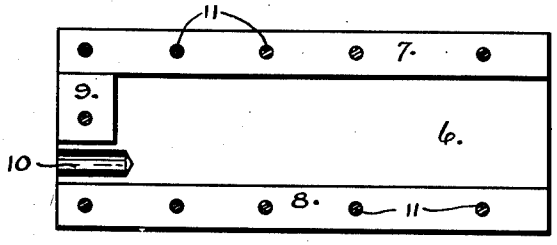


Fig. 3.

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Patented Dec. 29, 1925. 1,567,431

UNITED STATES PATENT OFFICE.

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BAR-CASTING DIE AND METHOD FOR SEASONING THE SAME.

Application filed April 17, 1922. Serial No. 554,084.

To all whom it may concern:

Be it known that I, BENJAMIN S. ELROD, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Bar-Casting Dies and Methods for Seasoning the Same, of which the following is a specification.

My invention relates to machines for casting continuous bars of soft metal, particularly of type-metal and similar alloys, wherein the continuous bars are formed by extrusion or eduction, or both, through a die which is associated with cooling means by which the molten metal is solidified while passing through the mold-channel. My present invention is adapted especially for use with the dies employed in bar-casting machines of the type disclosed in my application, Serial No. 168,546, filed May 14, 1917, and in the application of Elrod and Hector, Serial No. 416,904, filed October 14, 1920. It is the object of my invention to provide a simple, efficient and inexpensive method of producing a die for the purpose stated, having upon the surfaces of the die-channel in which the soft-metal bar is cast, a smooth, protective, permanently adherent, and substantially integral skin or layer of such composition as to have substantially no chemical affinity for the soft metal which is cast in the die, whereby seizing, soldering or adhesion of the soft metal to the die is prevented. A further object of my invention is to produce a die having the above characteristics, without the same being first used in the machine through a preliminary or "seasoning" period.

In the accompanying drawings Fig. 1 is a side view of a die of the type with which my seasoning method is used, Fig. 2 is a transverse section of the same on the line 2—2 of Fig. 1, Fig. 3 is a longitudinal section on the line 3—3 of Fig. 2, and Fig. 4 is a sectional view of one of the die parts, representing diagrammatically the formation of the protective layer upon the working surface of the part.

In the construction of continuous bar-casting machines of the type above mentioned, the die or member forming the channel in which the bar is cast, or in which the molten metal is cooled to form the solid bar, is preferably made of cast-iron; it having been ascertained that this is the best material commonly available for the purpose and having the requisite characteristics of low heat-expansibility, capability of being easily machined to form smooth and uniform surfaces, low chemical affinity for the type-metal or similar soft metals employed in casting the continuous bars, and capability of seasoning to form upon the surfaces of the die-channel a composition or material which is substantially permanent and unaffected by the passage of the bar through the channel.

Referring to the drawings, the die there represented comprises two similar side-pieces 5 and 6, between which are the two longitudinal liners or upper and lower spacing-strips 7 and 8, and a baffle or end-plate 9 which partially closes the upper part of the mold-channel at the receiving end and constrains the molten metal to enter at the lower part of the channel. To compensate for the partial closing of the channel by the baffle or end-plate 9, the side-pieces 5 and 6 have opposite cylindro-segmental grooves 10 therein below said end-plate and extending from the receiving end of the die inwardly past the end-plate. The die-parts are secured together by a plurality of transversely extending screws 11, as shown. The here described and illustrated form of the die is the same as that employed in the machine described in the application of Elrod and Hector, hereinbefore referred to. In the use of the die there is supplied to the mold-channel, together with the molten metal, a limited quantity of lubricant, the same preferably being a heavy mineral oil, which facilitates the eduction of the formed bar from the channel, in two ways, namely, by its action as a lubricant in reducing friction between the formed bar and the walls of the channel, and by tending to prevent seizing or soldering of the congealing soft metal to the metal from which the die is formed.

When a die of the class described is first used, without preliminary treatment by the method hereinafter set forth, the seizing or soldering of the bar to the die will occur with great frequency, notwithstanding the presence of lubricant in the channel, although the introduction of an excessive quantity of the lubricant will limit the tendency. As the use of the die is continued,

it is found that the tendency to adhesion between the bar and the die is progressively reduced, so that after a time no further adhesion will occur, even though the supply of lubricant be greatly reduced, or for moderate periods completely discontinued. After reaching such a condition, the die is said to be "seasoned", and a special object of my present invention is to effect such seasoning of the die prior to its use in the machine, whereby to avoid the expensive and troublesome method of seasoning by intermittent actual use under excessive lubrication.

In carrying out my invention, the die is formed in the usual way, the parts being machined to size, and the inner surfaces which are to form the walls of the die-channel being accurately ground or polished to form smooth and true plane-surfaces. When the parts are completed and otherwise ready for assembling, they are processed as follows: Each part is coated with a heavy mineral lubricating oil, preferably by immersion therein. The oil-coated part is then heated over the flame of an ordinary Bunsen gas-burner, such as represented at 12 in Fig. 4, there being presented to the flame that side of the part opposite the working face which forms a side of the die-channel in the assembled structure. As the part becomes heated the oil coating is vaporized, ignited and burned off, the heating of the working face being effected principally by conduction through the body of the part from the opposite side which is presented to the burner-flame. When the size of the die-part is greater than the spread of the flame, the part may be moved about sufficiently to insure substantially uniform heating thereof, and the heating is continued until the oil coating is entirely removed by its vaporization and burning, the operation being so controlled that the temperature of the part is not raised so as to show any color. That is to say, that during the entire operation the temperature of the part is below a red heat. If properly carried out, a single immersion of the part, and burning off of the oil coating, is sufficient to effect the desired result, but the operation may be repeated should the appearance of the part after the first burning off indicate insufficient formation of the protective composition upon the working surface. The working surface, after treatment, is black in color, smooth and glossy, and there appears to be no added film or coating extending beyond the normal surface of the metal and removable by friction or abrasion insufficient to remove a portion of the metal itself. It appers that the residues of the oil penetrate the surface of the metal to some extent, or that a chemical union occurs between the metal at the surface and some element or elements derived from the oil, since the surface-composition is obviously not a mere oxide of the metal, formed by combintion thereof with oxygen derived from the air, although it is possible that there is a combination of metallic oxide with carbon or other material derived from the oil. Insufficient treatment or processing of the part is indicated by the appearance of the black, glossy surface irregularly or in spots or blotches. The thickness of the affected portion of the metal indicated at 13, in Fig. 4, is somewhat exaggerated, but it will be understood that the composition or structure of the material is changed to an appreciable depth below the surface. In a die of the form shown in the drawings, where the transverse section of the bar produced is a flat rectangle, only the side-pieces 5 and 6 need be subjected to the seasoning process, although the working edges of the parts 7, 8 and 9, which are exposed to the die-channel, may also be treated if desired. No appreciable change of the dimensions of the die-parts occurs, and the size of the die-channel formed by the assembly of the parts is the same after as before the treatment. The die, after being processed as described, may be placed in the machine and used immediately, without liability of adhesion or soldering of the soft metal thereto occurring. The processed or protected die-surface appears to be substantially the same as is formed when the die is seasoned by actual use in the machine, and the protected surfaces appear to be substantially unaffected by continued use in the machine, there being no appreciable wear of the surfaces as long as a normal amount of lubricant is supplied to the die-channel with the molten metal.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. An extrusion die, comprising body-portions of cast-iron having at the working surfaces thereof and integrally united therewith the composition resulting from coating said surfaces with heavy mineral oil and heating said body-portions to vaporize and burn off the oil coating.

2. An extrusion die, comprising body-portions of cast iron having at the working surfaces thereof and integrally united therewith the composition resulting from heating said body-portions, while said working surfaces are coated with heavy mineral oil, to temperatures high enough to vaporize the oil but below a red heat.

3. An extrusion die, comprising body-portions of cast-iron having formed integrally therewith working surfaces of a black glossy composition consisting of the metal in combination with residues of heavy mineral oil volatilized in contact with the metal.

4. The method of pre-seasoning dies of the class described, consisting in applying

to the working surfaces thereof a coating of heavy mineral oil, and heating the parts sufficiently to vaporize the oil coating.

5. The method of pre-seasoning dies of the class described, consisting in coating the working surfaces of the die-parts with heavy mineral oil, and then burning off the oil.

6. The method of pre-seasoning dies of the class described, consisting in coating the working surfaces of the die-parts with heavy mineral oil, and then vaporizing said oil by heat applied principally through the bodies of the parts.

7. The method of pre-seasoning dies of the class described, consisting in immersing the separated parts of the die in heavy mineral oil, removing the parts from the oil bath, and burning off the adherent coating of oil by a flame directed at the sides of the parts respectively opposite the die-channel in the assembled structure.

8. The method of pre-seasoning dies of the class described, consisting in coating with heavy mineral oil the surfaces of the separate parts of the die, and then heating the oil-coated parts until the coating is dissipated by volatilization and burning.

9. The method of pre-seasoning dies of the class described, consisting in coating the working surfaces with heavy mineral oil, and heating the die to temperatures below a red heat but high enough to vaporize the oil.

10. The method of pre-seasoning dies of the class described, consisting in coating the working surfaces with heavy mineral oil, and then heating the parts by a flame applied at the surfaces opposite said working surfaces, the temperatures attained being sufficient to vaporize the oil at the working surfaces but being below a red heat.

BENJAMIN S. ELROD.