(No Model.)

H. REUSCH & B. PREU.

CASTING HARD METAL OR CHILLED ROLLS.

No. 492,874. Patented Mar. 7, 1893.

Fig. 1.

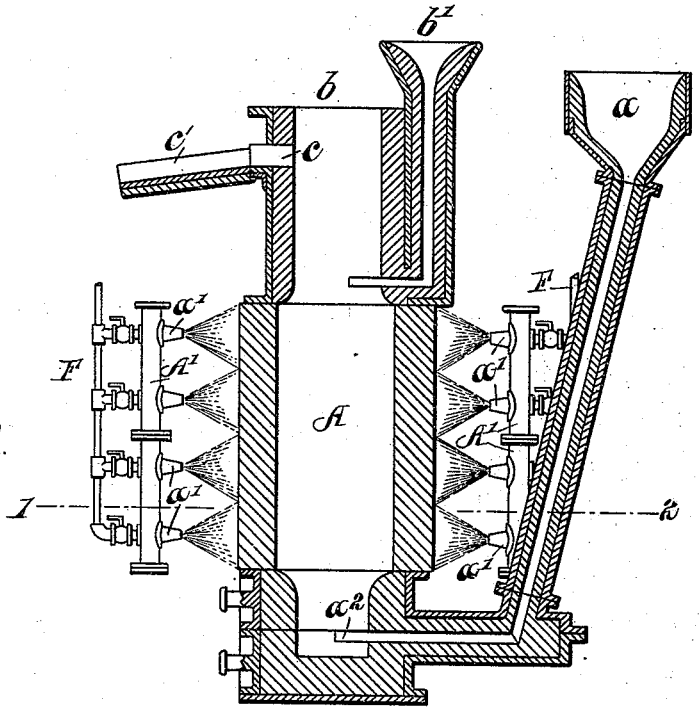
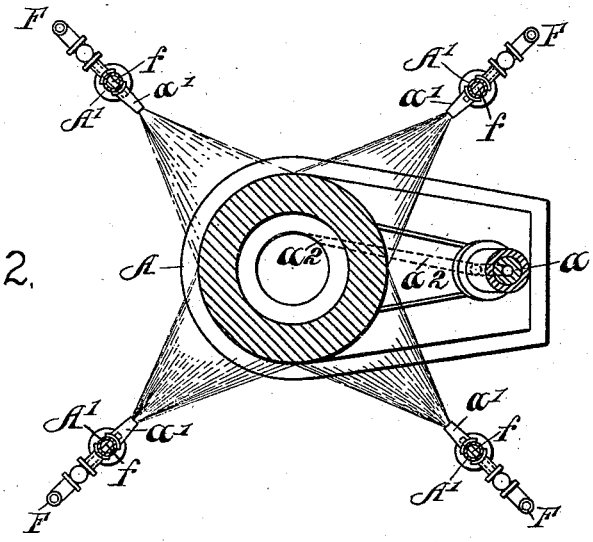


Fig. 2.



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UNITED STATES PATENT OFFICE.

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CASTING HARD-METAL OR CHILLED ROLLS.

SPECIFICATION forming part of Letters Patent No. 492,874, dated March 7, 1893.

Application filed February 19, 1891. Serial No. 382,126. (No model.) Patented in Belgium June 10, 1890, No. 90,851; in Switzerland August 1, 1890, No. 2,590, and in Austria-Hungary October 11, 1890, No. 28,492 and No. 50,000.

To all whom it may concern:

Be it known that we, HERMANN REUSCH, mining-engineer, residing at Senbach, (Tyrol,) in Austria-Hungary, and BERNHARD PREU, engineer, residing at Goerlitz, (Silesia,) in Germany, subjects of the Emperor of Germany, have invented certain new and useful Improvements in or Relating to the Manufacture or Casting of Hard-Metal or Chilled Rolls, (for which we have obtained Letters Patent in Belgium, No. 90,851, dated June 10, 1890; in Switzerland, (provisional,) No. 2,590, dated August 1, 1890, and in Austria-Hungary, No. 28,492 and No. 50,000, dated October 11, 1890;) and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to the art of casting hard metal or chilled rolls.

The mode of casting hard rolls as heretofore practiced, by admitting the metal through one or more runners at the lower journal end of the mold, the latter being in a vertical position, and allowing the metal to rise therein to the dead-head portion, presents serious difficulties. As the metal ascends along the cold surfaces of the mold it cools gradually, so that on reaching the dead-head portion thereof it will rapidly congeal, thereby imprisoning the gases and even dross or impurities in the more fluid portion of the mass of metal, resulting in a product that is more or less porous, especially about the upper journal. To avoid this it has been the custom to extend the dead-head portion of the mold considerably above the upper journal in order to afford space for a greater mass of metal to collect above the said upper journal, but in this case the ferrostatic pressure of the more fluid portion of the metal is correspondingly increased, and as the mold, when it becomes heated expands more or less, while on the contrary that portion of the metal in contact with the surfaces of the mold cools and contracts, a space is left between the thin outer shell of congealed metal and the inner surfaces of the mold, which under the increased ferrostatic pressure is liable to be ruptured, so that the cast roll will have a longitudinally fissured outer face, and is consequently worthless in most cases. This inner ferrostatic pressure is further increased, especially when a harder and more contractible metal is used, by the imprisoned gases, owing to the rapid cooling of the dead-head, which renders their escape impossible. In casting very large and long rolls the outflow of the metal must, moreover, be very long continued, by reason of the greater cooling action of the larger mass of the mold, in order that the metal having passed through the entire length of the mold shall reach the upper dead-head still heated enough to remain fluid, until no danger exists of the hard metal roll becoming fissured. But a very long outflow is costly and causes the mold to become too highly heated and expanded, and, finally, the metal poured in becomes welded to the under part of the mold, which renders both the mold and the roll useless.

The object of this invention is to provide means whereby these difficulties are overcome, and for this purpose we arrange an ingate at the lower end of the mold and a second ingate at the upper or dead-head portion of the mold, so causing the molten metal to flow into the mold at or near both ends and through said mold in one and the same direction. We also provide means for abstracting the heat from the mold, and thereby preventing it from unduly expanding, such means consisting of atomizing or spraying devices for atomizing or spraying a cooling agent and projecting the same in a finely divided or sprayed condition upon the outer surfaces of the mold.

Figure 1 shows a vertical section of a roll mold for casting hard metal or chilled rolls according to our invention, and Fig. 2 is a transverse section taken on line 1—2 of Fig. 1.

As shown in Fig. 1, the in-gate a, is preferably located at a higher elevation than usual, said in-gate being connected with the mold at its lower end by a tangential passage or channel, a^2, and at the upper dead-head por-

tion, *b*, of the mold, A, we provide an out-gate, *c*, and a suitable runner, *c'*, located according to the dimensions of the roll, about twenty or thirty centimeters above the upper roll journal, through which out-gate the partially cooled metal can flow until the metal in the upper dead-head portion is of substantially the same temperature as that within the mold. In practice we have found that the out-flow of metal need not exceed the quantity of metal heretofore required to fill an extended upper dead-head portion of a mold.

At the upper or dead-head portion of the mold a second in-gate, *b'*, is arranged tangentially communicating therewith at a proper point. After the mold has been filled through the first in-gate, and the out-flow finished, hot iron of a suitable hard quality is poured into this in-gate, *b'*, which hard iron then flows through the out-gate until the metal runs off sufficiently hot and the upper journal has been entirely filled with hot iron. In this way, the gases contained in the molten mass as well as any dross or scoria, can freely escape, the result being a roll, the upper journal of which will be of the same homogeneity as the body of the roll, while the fluid mass inclosed in the outer partially cooled or congealed shell can freely rise during the gradual congelation and contraction, so that the ferrostatic pressure of the fluid mass will not be increased by any resistance to its upward flow, while the congelation of the metal in the dead-head portion of the mold may be further retarded by the use of non-conductors of heat, such as charcoal or charcoal dust, or a similar material, so that a practically uniform cooling of the entire roll will take place without fissuring or cracking.

In the casting of rolls, more especially of large or heavy rolls, in order to prevent the expansion of the mold and the fissuring of the roll as hereinbefore stated, we provide means for cooling the form or mold, as shown, such cooling taking place before the completion of the operation of casting or immediately thereafter.

It is not only impracticable but dangerous to the workmen to effect the cooling of the mold by means of water applied directly to the mold, and this would also require special arrangements for each mold, while the use of a gaseous cooling agent, such as air, is insufficient, especially in the cooling of the molds for the larger rolls.

In order to effect a uniform and comparatively rapid cooling of the mold we provide atomizers or spraying devices, whereby finely divided or atomized water is projected upon the mold, which water is immediately vaporized or converted into steam, whereby the heat is rapidly taken up and the mold cooled without danger to the attendants.

F, indicates the compressed air supply pipes that are provided with a number of atomizing nozzles, *f*, and A' the water supply pipes provided with a corresponding number of ejector nozzles, *a'*, into which extend the atomizing nozzles, *f*. In Fig. 2 we have shown four atomizers or spraying devices disposed around the mold, and provided with such a number of atomizing or spraying nozzles as to apply the atomized cooling agent over the entire surface of the mold intermediate of the journals.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The mode of casting rolls, which consists in causing the molten metal to flow into the mold at or near both ends and through said mold in one and the same direction, substantially as and for the purpose set forth.

2. The mode of casting rolls, which consists in causing the molten metal to flow tangentially into the mold at or near both ends and through said mold in one and the same direction, substantially as set forth.

3. The mode of casting rolls, which consists in causing the molten metal to flow into the mold at or near both ends and through said mold in one and the same direction, and cooling the metal by projecting atomized water or water in the form of mist onto the mold, substantially as and for the purpose set forth.

4. A mold for casting rolls having a lower and an upper in-gate arranged so as to cause the metal to flow tangentially into the mold, in combination with a spill gate at the upper end of the mold, substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

HERMANN REUSCH.
BERNHARD PREU.

Witnesses as to the signature of Mr. Reusch:
EMIL HENZEL,
F. W. CATLIN.
Witnesses as to the signature of Mr. Preu:
JOSEF B. ZEDLVITCH,
PAUL DRUCKEMÜLLER.