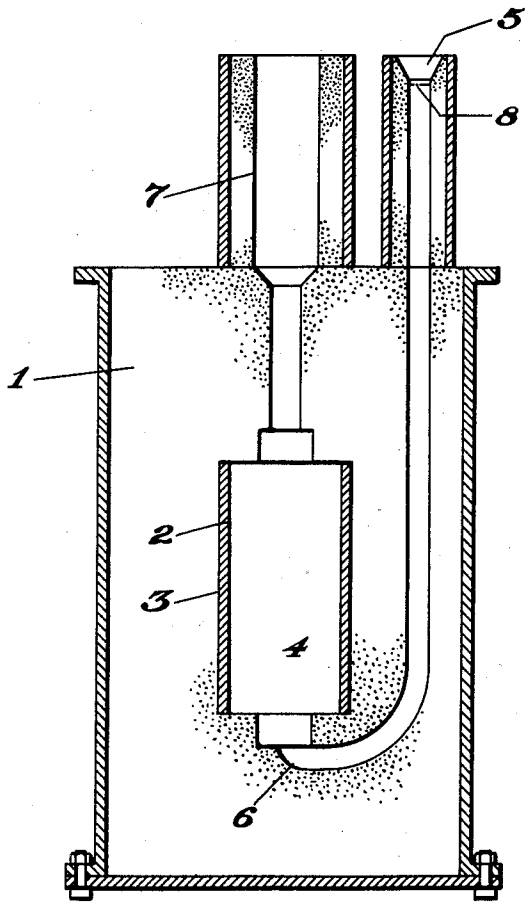
July 24, 1928. 1,677,979

W. M. MITCHELL

METHOD OF CASTING ARTICLES HAVING CHROMIUM ALLOY SURFACES

Filed Sept. 24, 1924



W. M. Mitchell, Inventor.

By his Attorney.
F. R. Squair.

Patented July 24, 1928. 1,677,979

UNITED STATES PATENT OFFICE.

WALTER M. MITCHELL, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ELECTRO METALLURGICAL COMPANY, A CORPORATION OF WEST VIRGINIA.

METHOD OF CASTING ARTICLES HAVING CHROMIUM-ALLOY SURFACES.

Application filed September 24, 1924. Serial No. 739,459.

This invention relates to the making of ferrous metal castings the surfaces of which are alloyed with chromium, and in detail the invention relates to a particular method of casting whereby in the making of castings of the stated type there is avoided the production of articles the upper parts of which may be without the desired alloy. It is the principal object of the invention to provide such a method. The method is a particular improvement upon, and incorporated in, the method of producing castings disclosed in U. S. application Serial No. 463,565 filed April 22, 1921 by Charles B. Jacobs, entitled "Castings having chromium alloy surfaces".

In brief, the Jacobs invention comprises bringing the base metal (for example, steel) during the casting into contact with chromium, this being conveniently accomplished by coating the surfaces of the green mold or cores in which the casting is made, and which correspond with the surfaces of the casting on which the alloy is required, with chromium in granular condition (15 to 40 mesh) and associated with a suitable binder, for example, sodium silicate, and baking the mold to fix the coating; wherefore the casting metal flows over and melts or dissolves the coating giving a casting with the desired chromium alloy surface. The present invention has to do with a procedure for guarding against the alloy surface coating running or flowing down the side of the base casting, thus leaving the upper part of the side or wall bare and without coating and resulting in the production of castings not having at the upper portions of their walls the desired alloy surface.

I have found that, when practicing the Jacobs method, by using a high pouring gate, rising from, say, 20 to 30 inches above the top of the mold cavity, and pouring rapidly, thereby to ensure the creation, well prior to the solidification of the casting and during the pouring, of a column of metal reaching well toward the top of the gate, the indicated difficulty can be avoided and castings unfailingly produced which are free from runs and which have a satisfactory alloy surface from top to bottom. The speed of pouring will depend somewhat on the cross-sectional area of the gate, in consideration of the fact that it is the rapid creation of a high column that is desired. With a gate 2 to 3 inches in diameter a pouring speed of 100 pounds or more per 5 seconds, indicating approximately 4 pounds per second per square inch of area, has been found generally satisfactory; however, with the primary consideration in mind the foundryman will readily arrive at the pouring speed desirable in any particular case. With regard to the height of the gate, a height of about 20 inches is advisable and generally satisfactory, while a gate higher than 30 inches may well be avoided to ensure that excessive ferrostatic pressure, which might cause leakage from the mold, shall not be created.

The castings can be poured without heads and with the mold carefully and thoroughly vented around the top, as usual in the art, to ensure the escape of gas from the metal and molding sand and the mold being completely filled. Or the castings can be poured with heads, provided that the heads are of the same height as the pouring gate to prevent loss of metal. However, it will be understood that the invention is not restricted to the particular manner of venting the mold.

It is believed that the ferrostatic pressure produced in the mold by the molten base metal, when poured through a high gate, holds in place the chromium coating, which has been rendered plastic or semifluid by the heat from the molten base metal, and prevents the running down the sides of the casting before it has solidified. This is in accord with the found desirability of rapid pouring since the rapid pouring builds up the ferrostatic pressure very quickly over the whole casting, rendering it available to serve as suggested. However, the invention is not confined to any particular theory of operation.

I have further found that a high pouring temperature results in a better casting; the temperature should desirably be 2850° F. or over. Also, the more quickly the mold can be filled, the better the character of the casting. Furthermore, the mold should be entirely dried, after the chromium coating has been applied, in order to drive off moisture, etc., which would tend to create gases or other vapors. Again, as a matter of conservation of heat in the molten base metal, the

mold should be heated and the casting poured while the mold is as hot as possible.

In the accompanying drawing I have shown a vertical cross-sectional view of a mold for the present casting operation, it being understood that it is merely exemplary. In this drawing the sand 1 has chromium paste 2 applied thereto upon the wall 3 corresponding to the exterior wall of the casting (a roll) to be formed in the cavity 4. The high pouring gate 5 communicates with the cavity 4 at 6. A head is indicated at 7 for escape of gases from the cavity 4. The height of the casting metal permitted by the gate and ensured by the rapid pouring is approximately indicated by the phantom dot-and-dash line 8.

I claim:

1. In the production of ferrous metal castings having an alloy surface, which production includes coating the mold surface with the metal desired for said surface, and casting in such mold a casting of desired given size; the method of preventing the running of the alloy coating on the casting which comprises pouring the base metal under a ferrostatic pressure substantially greater than that that would commonly be employed in the pouring of a casting of the said given size in an uncoated mold.

2. In the production of ferrous metal castings having a chromium alloy surface, which production includes coating the mold surface, with chromium and a binder, and casting in such mold; the method of preventing the running of the alloy coating on the casting comprising pouring the base metal under high ferrostatic pressure.

3. In the production of ferrous metal castings having a chromium alloy surface, which production includes coating the mold surface, with chromium and a binder, and casting in such mold; the method of preventing the running of the alloy coating on the casting comprising pouring the base metal under ferrostatic pressure substantially greater than that given by a six-inch column, and of sufficient magnitude to prevent the running of said alloy coating.

4. In the production of ferrous metal castings having a chromium alloy surface, which production includes coating the mold surface, with chromium and a binder, and casting in such mold; the method of preventing the running of the alloy coating on the casting comprising pouring the base metal with a high gate and at a speed to give a high column of metal during pouring

5. In the production of ferrous metal castings having a chromium alloy surface, which production includes coating the mold surface, with chromium and a binder, and casting in such mold; the method of preventing the running of the alloy coating on the casting comprising pouring the base metal under a ferrostatic head substantially between 20 and 30 inches.

6. In the production of ferrous metal castings having a chromium alloy surface, which production includes coating the mold surface, with chromium and a binder, and casting in such mold; the method of preventing the running of the alloy coating on the casting comprising pouring the base metal with a gate substantially between 20 to 30 inches in height and at a speed to approximately fill the gate.

7. In the production of ferrous metal castings having a chromium alloy surface, which production includes coating the mold surface, with chromium and a binder, and casting in such mold; the method of preventing the running of the alloy coating on the casting comprising pouring the base metal under high ferrostatic pressure and at a temperature of at least 2850° F.

8. In the production of ferrous metal castings having an alloy surface, which production includes coating the mold surface with the metal desired in said surface and casting said ferrous metal in such a mold of a desired given size; the step which comprises pouring the metal with sufficient rapidity and under a ferrostatic head of sufficient magnitude to prevent the running of said alloy coating, said ferrostatic head being greater than the head that would commonly be employed in pouring a casting of similar size in an uncoated mold.

In testimony whereof, I affix my signature.

WALTER M. MITCHELL.