April 3, 1928. 1,664,452

S. DANIELS ET AL

MOLD

Filed Dec. 4, 1925

FIG. 1.

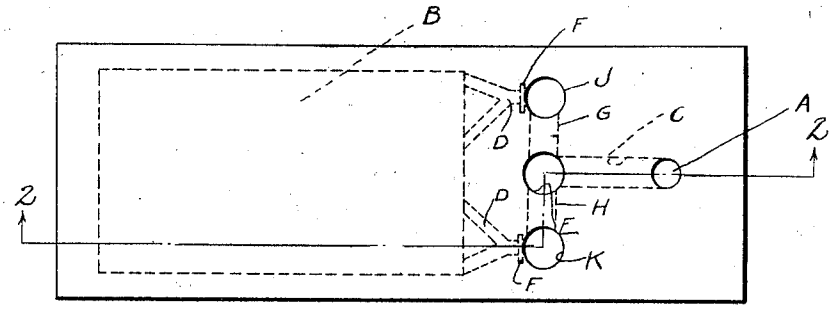
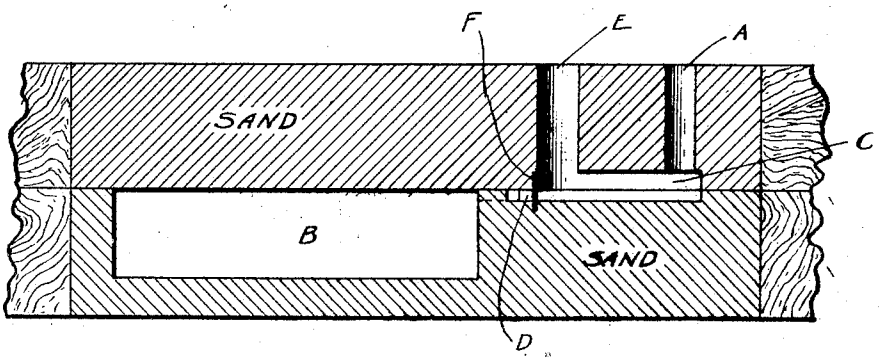


FIG. 2.



INVENTOR
SAMUEL DANIELS
GEORGE J. HIMMELEIN
BY
Robert H. Young
ATTORNEY

Patented Apr. 3, 1928. 1,664,452

UNITED STATES PATENT OFFICE.

SAMUEL DANIELS AND GEORGE J. HIMMELEIN, OF DAYTON, OHIO.

MOLD.

Application filed December 4, 1925. Serial No. 73,200.

This invention relates to the manner in which skins or dross or those impurities which rise to or are formed on the surface of molten metal are prohibited from entering the molds and consequently forming imperfections in the resulting casting.

It is ordinarily possible initially to remove the impurities or foreign matters from molten metal by the ordinary process of skimming or of employing skim gates but in making magnesium and magnesium alloy castings, this is impossible, as skins or dross, etc., form on top of the metal as fast as it is skimmed, because of the great affinity of this metal for oxygen and for nitrogen. Further, froth and dross rise from below to or form on the surface of the molten metal from the time it leaves the crucible or pouring vessel until it enters the mold cavity. Even after the metal has entered the mold cavity proper this scumming and oxidizing process may continue, but this action is generally of negligible effect. As a result of this characteristic of magnesium and its alloys it was heretofore necessary to provide pads on the pattern, which, impressed as a cavity in the mold, formed an additional thickness of metal on the top or cope surface of the otherwise normal casting, in which additional mass of metal were gathered the froth, dross, skins, etc., which rise to or are formed in the uppermost part of the molten metal in the mold and consequently in the solid casting. This additional surface pad of metal on the casting, containing these imperfections necessitated both that the casting have superfluous metal which must be machined away and that castings could not be made which need not be machined, all of which involves unnecessary labor and expense in time and in waste of material. Furthermore, it was no guarantee even when this pad was used that the imperfections resident therein could be removed by machining, without impairing the required dimensions of the casting.

It is the object of this invention to overcome this undesirable obstacle inherent in the use of magnesium and its alloys, and in so doing means have been provided for entrapping or self-skimming the first of the metal poured, which usually is the most drossy and frothy because of its uncushioned fall into the mold, and which by ordinary methods of pouring and gating enters the mold cavity proper and is consequently responsible for practically all imperfections in the cope surface of the finished casting. Means have also been provided for cushioning the fall of the metal entering the mold after the first metal poured has been entrapped or self-skimmed and for allowing nothing but clean and skimmed metal to enter the mold cavity proper, so that the cope surfaces in the resulting casting are substantially free from dross and other undesirable imperfections. The manner in which this is accomplished will be fully understood from the following specification and attached drawings in which—

Fig. 1 is a cross sectional plan view of the mold, and

Fig. 2 a cross sectional side view of the mold on the line 2—2 of Fig. 1.

In carrying out this invention, the mold is provided with a pouring sprue, A, which communicates with a passageway C which connects with an unstopped skim-gate E, and then branches into two passages G and H. Just before entering the mold cavity proper, these passages are restricted in cross-section as indicated at D. At these points of restriction, there are provided skim-gates, J and K, similar to the sprue A, but preferably larger in cross section. At each of the points D, a metal plate F is inserted to stop the passage. These metal plates are composed of metal similar in composition to that of the molten metal to be formed into the casting and are thus fusible with said metal. However, these plates may be of entirely different material, but such that it will not affect the physical characteristics of the casting other than desired. These plates are usually made of thin metal, so that they will quickly melt and only momentarily stop the passage, their thickness being determined by the melting point, the degree of heat at which the metal is poured, and the size of the skim-gate. The plate is always in a location closer to the mold cavity proper than any skim-gate.

The method of pouring is as follows: The metal is initially poured in the sprue A. By reason of the metal plates F, the first molten metal poured rises in the gate E and in skim-gates J and K. Thus the skins, dross and other impurities which may

be on the surface of the pouring vessel or the frothy metal which is formed by the uncushioned drop of the first metal down the sprue cavity A and first to enter the mold, rise in the skim-gates J and K to the top, due to the obstructions F in the passages. The heat of the metal subsequently melts the plates F in a short time. When this happens, the metal starts to fall in the skim-gates and when the operator observes this fall, he quickly starts to pour more metal into the sprue A, which he endeavors, subsequent to the melting of plates F, to keep filled with metal so that the latter at all times has little or no uncushioned fall from the pouring vessel.

The location of the skim-gates J and K at the points where the passageways are restricted tends to keep in said skim-gates after the plates have melted, the undesirable part of the metal which was initially poured. The pressure of the metal poured after the plate has melted also tends to keep the initially poured and undesirable metal in these skim-gates.

The initial skim-gate E, which is not stopped off by a stop plate, is effective in keeping some of the frothy dross from entering the skim gates J and K, by retaining this dross when the first metal poured first rushes up in the gate E. An additional function is to form a reservoir for the quick supply of molten metal to the skim-gates J and K to keep these gates partly filled after the plates F melt; and thus effectively prevent any of the dross and impurities at the top of the metal in the gates J and K from entering the mold.

The surfaces of the resulting castings are substantially clean, and the invention above described does away with the need for pads to trap the skins and dross which must otherwise be later machined away.

The number and size of pouring sprues and of skim-gates stopped off by one or more metal strips or plates F will vary with different castings, the nature of the casting determining this construction. It is also to be understood that the skim-gates J and K which are stopped off close to the mold cavity proper, may be used without the use of the unstopped initial gate E.

While this invention is particularly adapted to making magnesium castings or other metals which rapidly oxidize, it can also be adapted to the casting of other metals.

Having fully described our invention, what we claim as new is:

1. In a mold, a mold cavity proper, a pouring sprue, a passageway between the cavity and sprue, a fusible plate in said passageway and a skim-gate connected in said passageway between the plate and the sprue.

2. In a mold, in combination, a mold cavity proper, a pouring sprue, a passageway therefrom to the mold cavity proper, a fusible plate stopping said passageway of composition similar to the metal to be cast and a skim-gate connected in the passageway between the plate and sprue and close to the plate.

3. The combination as set forth in claim 2, the passageway being restricted in cross section before entering the mold cavity proper, the plate being placed at this point of restriction.

4. The combination as set forth in claim 2, the skim-gate being connected to the passageway at the point of restriction but between the plate and sprue.

5. In a mold for a magnesium or magnesium alloy casting, in combination, a mold cavity proper, a pouring sprue, a passageway therefrom to the mold cavity proper, a fusible plate stopping said passageway of composition similar to the metal to be cast, a skim-gate, connecting with said passageway and located close to the plate between the plate and the pouring sprue, and an intermediate gate located between the pouring sprue and the stopped-off skim-gate and connecting with said passage.

6. In a mold for a magnesium or magnesium alloy casting, in combination, a mold cavity proper, a pouring sprue, a passageway therefrom, of comparatively large size to the molding cavity proper dividing into a plurality of branches a fusible plate stopping each branch of said passageways of a composition similar to the metal to be cast, a skim-gate, connecting with each of said passageway branches and located close to the plate between the plate and the pouring sprue, an intermediate skim-gate located between the pouring sprue and the stopped-off skim-gate and at the point of union of said branches and connecting with said passage.

In testimony whereof we affix our signatures.

SAMUEL DANIELS.
GEORGE J. HIMMELEIN.