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H. A. SCHWARTZ

1,491,173

METHOD OF CASTING

Filed Feb. 6, 1922

2 Sheets-Sheet 1

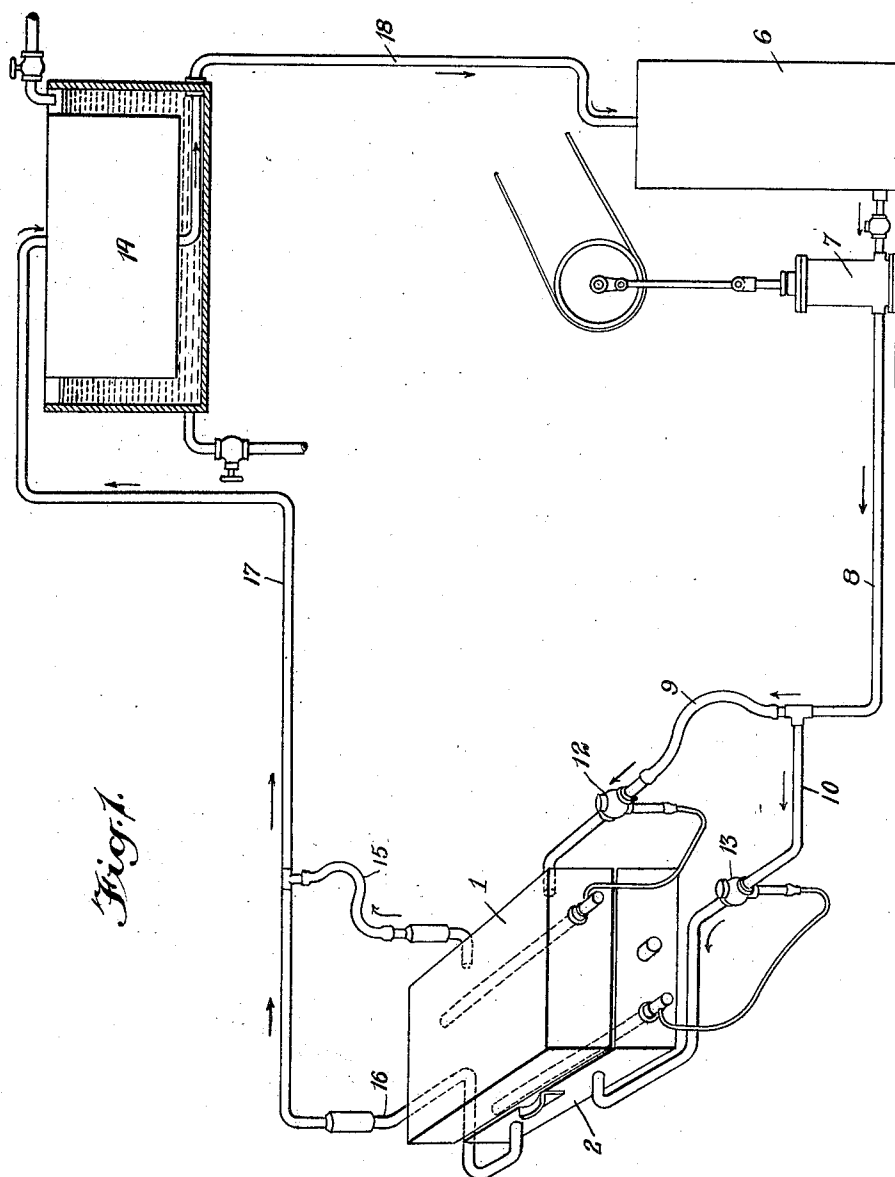


Fig. 1.

WITNESSES

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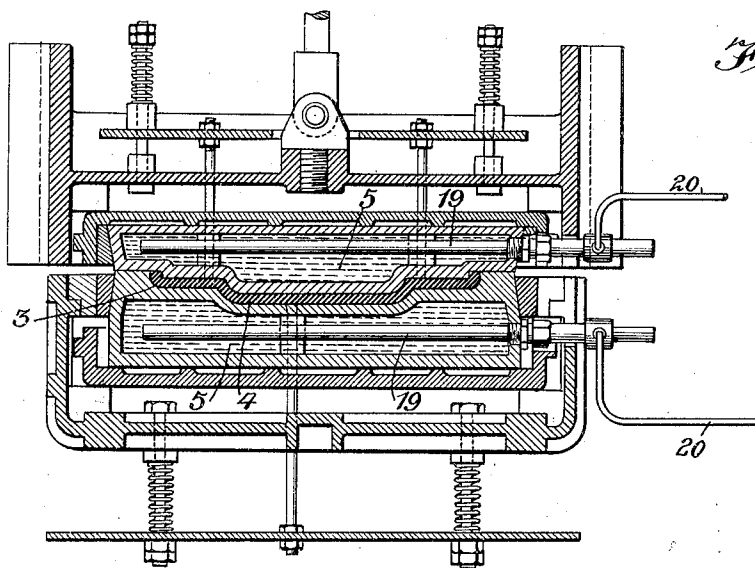


Fig. 2.

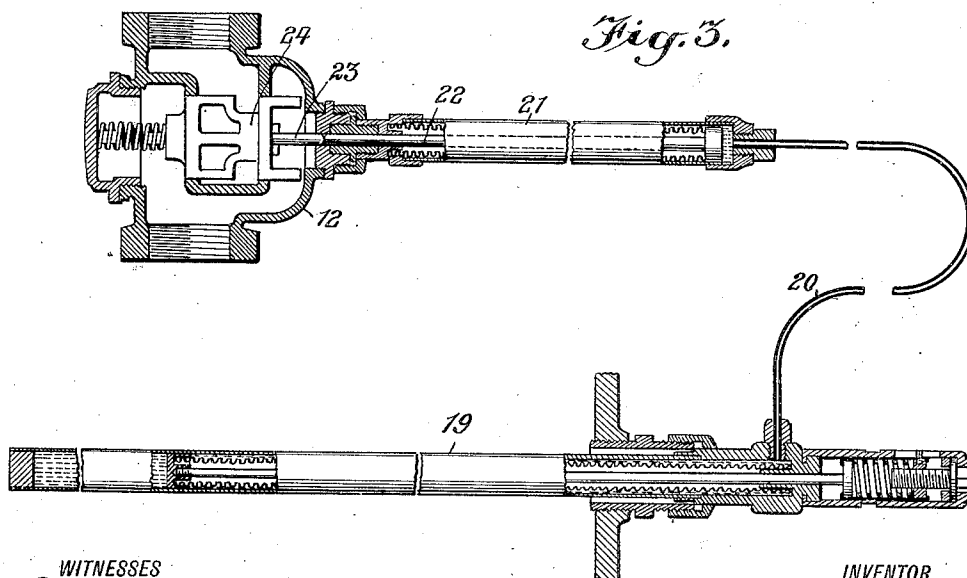


Fig. 3.

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UNITED STATES PATENT OFFICE.

HARRY A. SCHWARTZ, OF DEFIANCE, OHIO.

METHOD OF CASTING.

Application filed February 6, 1922. Serial No. 534,543.

To all whom it may concern:

Be it known that I, HARRY A. SCHWARTZ, a citizen of the United States, and a resident of Defiance, in the county of Defiance and State of Ohio, have invented a new and Improved Method of Casting, of which the following is a full, clear, and exact description.

This invention relates to improvements in method of casting, and more particularly to an improved method of casting in permanent molds, an object of the invention being to maintain within a constant range, the temperature of the mold during the casting operation and between casting operations where the molds are used continuously, so that uniform castings may be made in permanent molds without material or injurious deterioration of the mold itself.

A further object is to automatically maintain within a constant range, the temperature of the mold, so that all castings will be uniform and possibility of human error eliminated.

A further object is to improve upon the method of casting disclosed in my pending application filed June 8, 1921, Serial No. 475,968.

In casting in permanent molds the following five factors govern to a large extent the method of casting;

(1) Temperature control of the molten metal at the pouring.

(2) Controlling the molten stream as to cross section and flow when entering the mold.

(3) Maintaining the mold within a constant range of temperature.

(4) Controlling the ejection of the casting on its completion.

(5) Preserving the physical condition of the mold.

In the improved method forming the subject matter of this application, as in the original application above-identified, the factors numbered 3 and 5 are those with which the invention has particularly to do; namely, maintaining the mold within a constant range of temperature which will result in preserving the physical condition of the mold, and this application distinguishes from the former application in that this method is automatic, whereas the other application covered the idea broadly and automatic means were not shown or described.

The primary object, therefore, of this invention is to maintain the mold within a constant range of temperature during the casting period or operation, to prevent the mold from deteriorating, due to temperature fluctuation.

I am, of course, aware that it is old in the art of casting to cast in permanent molds, and it is also old to chill or cool molds, but I believe that I am the first to cast in molds, where the temperature of the mold is maintained within a constant range.

The art of casting in permanent molds has been developed extensively in the low melting alloy metal field by the die casting process; that is, forming castings of alloy metal in metal dies by placing the metal in dies under pressure. The cause of the development of this particular field is due to the fact that alloys of comparatively low melting temperature are used, the dies or molds not being subjected to comparatively extreme temperatures which are necessary in the metal group, such as iron, etc.

When permanent molds, such as in ordinary use, are subjected to extreme heat and allowed to cool repeatedly, they will deteriorate to a more or less rapid extent. When a metal is subjected to a repeated temperature fluctuation, it disintegrates to a more or less degree. The cellular structure of the metal in the mold opens, due probably to an oxidizing process, causing the so-called iron "growth." This deterioration of the metal mold makes it absolutely worthless in a short time. Unsuccessful attempts have been made in the past to reduce this temperature fluctuation in permanent metal molds by making them of so large a cross section so that the heat would have a chance to distribute itself.

When molten metal is poured into a permanent mold, at intervals, as is the case under normal casting conditions, the mold is subjected to a repeated heating and cooling. This temperature fluctuation of the mold makes the time interval for ejecting each successive casting very erratic.

The problem, therefore, of casting in permanent molds, resolves itself into the question of first quickly taking away the surplus heat, which the mold takes from the castings, and second maintaining the mold within a constant range of temperature throughout the casting operation. By accomplish-

ing the two things just mentioned, a repeated use of the mold would be permitted, thus making for a highly productive operation, without injury to the mold. The mold life would be preserved, since I would have eliminated the cause of mold deterioration; wide temperature fluctuation. The tendency would be removed for the mold, due to temperature fluctuation, to make the time interval for ejecting the successive castings erratic.

With these and other objects in view the invention consists in certain novel features of the mold and means and steps in the operation of maintaining the mold within a constant range of temperature during the casting operation, as will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings I illustrate one form of apparatus which is capable of use in carrying out my improved method, and in which drawings—

Figure 1 is a view showing more or less diagrammatically an apparatus in which my improved method of casting may be carried out.

Figure 2 is a view in longitudinal section through the mold.

Figure 3 is a view mainly in section and partly in elevation illustrating the thermostatically controlled valve, this structure being a standard construction of apparatus known on the market as the "Sarco temperature regulator."

I would have it understood that this invention is not limited to any particular form of mold or mold support, although it is to be understood that the mold will be preferably of metal, comprising two or more sections 1 and 2 having a mold space 3 between them in which the casting 4 is formed. The mold sections 1 and 2 are hollow forming fluid chambers 5 and these fluid chambers may be arranged and shaped in any desired way to give the best results.

In carrying out my improved method I preferably employ a storage tank or reservoir 6, from which the fluid is forced by means of a pump 7 through a pipe 8 and branch pipes 9 and 10 into the fluid chambers 5 of the upper and lower mold sections. In the branch pipes 9 and 10 I provide thermostatically operated valves 12 and 13 respectively, so that the flow of fluid to the mold sections can be automatically controlled.

14 represents a refrigerating device of any approved construction, and I do not wish to be limited to the arrangement of tank shown and may employ any refrigerating device desired. Branch outlet pipes 15 and 16 communicate with the upper and lower mold sections 1 and 2 respectively and discharge into a pipe 17 communicating with

the condenser tank 14 and a pipe 18 connects the condenser tank with the storage tank 6, so that a circulation may be maintained or cut off as desired.

While I have illustrated in the drawings as a refrigerating or temperature controlling medium a liquid, it is obvious that I may employ any fluid, either gas or liquid, which will perform the functions intended.

It is to be understood that the system is preferably full of the fluid so that when the pump 7 is operated, the fluid will be caused to circulate through the system as rapidly as the position of the valves 12 and 13 will permit.

As above stated, the valves 12 and 13 are thermostatically controlled by the temperature of the mold members, or more directly by the temperature of the fluid in the hollow mold. It is, of course, obvious that this method is not limited to any particular construction of thermostatic apparatus, but I have found in actual use that a thermostatic element which constitutes a standard apparatus in general use and known on the market as the "Sarco regulator" is well adapted for the purpose.

I have illustrated more particularly in Figures 2 and 3 the thermostatic elements. 19, 19, represent the thermostats per se, which are projected into the liquid or fluid chambers of the mold members and secured therein. These thermostats 19 are connected by flexible tubes 20 with tubular members 21 in which plungers 22 are located and operatively engage the stems 23 of valve elements 24 within the valves 12 and 13 respectively. Each thermostat 19 is in the form of a tube containing an expansible fluid with a fluid transmission in the tube 20, and the rod 22 is operated by the expansion and contraction of the fluid in the thermostatic element.

It is to be understood, of course, that the increase and decrease of temperature in the mold members through the medium of the thermostatic elements function to open and close the elements 24 of the valves 12 and 13, so that the flow through the mold chambers is automatically controlled.

It is to be understood that in carrying out my improved method, my primary object is to maintain the temperature of the mold members within a constant range. It is, of course, to be assumed that an absolutely constant temperature is practically impossible, but it is possible to maintain a constant range of temperature which will prevent alternate heating and cooling of the mold members which would result in deterioration thereof and prevent uniform castings.

In carrying out my improved method I repeat the casting operation as rapidly as desired and form standard castings without appreciable deterioration of the mold. It

is also to be understood that I do not rely upon the fluid as a refrigerating medium, employing this language such as it has ordinarily been employed in the past, but employ the fluid as a medium for carrying off the excess heat and the excess heat only. Hence, when the temperature rises, the valves will be opened so as to allow the maximum flow of fluid to carry off the excess heat, but as the temperature of the mold members decreases, the flow will be automatically cutoff or reduced so as to maintain constant the temperature within a properly operating range of temperature.

In the specification and in the claims hereinafter submitted I employ two terms which, for clearness, I shall define just what I mean by these terms.

In employing the term "constant" with reference to the temperature of the mold members, it is to be understood that this term is employed in its broadest sense to indicate an operable range of temperature which will prevent a deterioration of the mold. In employing the term "thermostatic means," it is to be understood that this includes broadly any means which is governed by the temperature of the mold members or the fluid within the mold members to automatically operate the valves controlling the movement of the fluid element to carry off excess heat.

While I have illustrated my method in connection with an ordinary form of mold, it is to be understood, of course, that it applies equally as well where molds have cores and in which latter instance, the core will be first released before the casting has entirely set, and I would, therefore, have it understood that my improved method of casting is applicable in connection with molds either with or without cores, and, in fact, in connection with permanent molds of practically any type.

I claim:

1. The herein described method of casting, consisting in introducing molten metal into a mold, maintaining the temperature of the mold within a constant range by a cir-

culating fluid and automatically controlling the volume of flow of said fluid.

2. The herein described method of casting, consisting in introducing molten metal into a mold, maintaining the temperature of the mold within a constant range by an even or constant temperature circulating fluid in contact with the mold, and automatically controlling the volume of flow of said fluid.

3. The herein described method of casting, consisting in introducing molten metal into a mold, maintaining the temperature of the mold within a constant range by a circulating fluid, and automatically controlling the volume of flow of said fluid, through the medium of thermostatic means.

4. The herein described method of casting, consisting in introducing molten metal into a mold, maintaining the temperature of the mold within a constant range by a circulating fluid in contact with the mold, and automatically controlling the volume of flow of said fluid through the medium of thermostatic means.

5. The herein described method of casting, consisting in introducing molten metal into a mold, maintaining the temperature of the mold within a constant range by a circulating fluid, and automatically controlling the volume of flow of said fluid through the medium of thermostatic means in direct contact with the mold.

6. The herein described method of casting, consisting in introducing molten metal into a mold, maintaining the temperature of the mold within a constant range by a circulating fluid in contact with the mold, and automatically controlling the volume of flow of said fluid through the medium of thermostatic means in direct contact with the mold.

7. Casting means including the mold, means for forcing a circulating fluid in contact with the mold, and thermostatic means in contact with the mold automatically controlling the volume of flow of said fluid in accordance with the temperature of the mold.

HARRY A. SCHWARTZ.