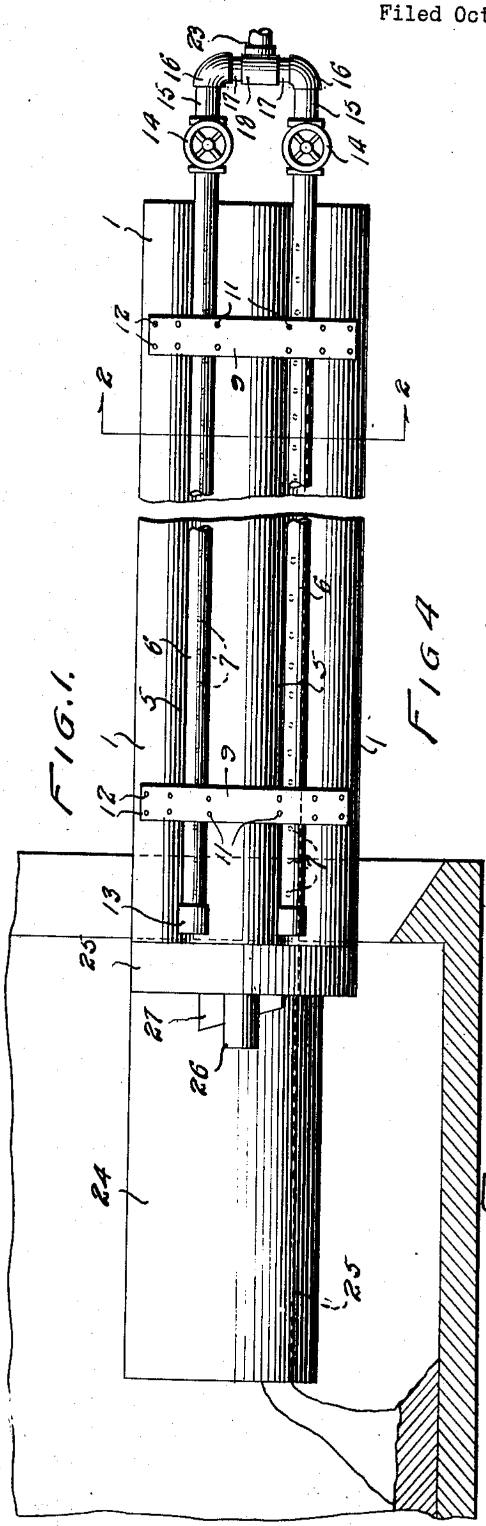
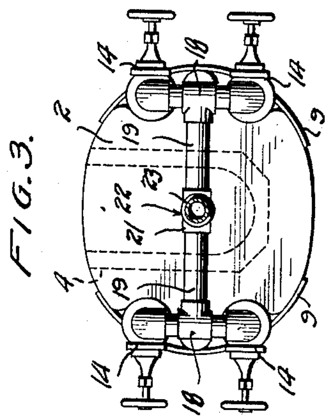
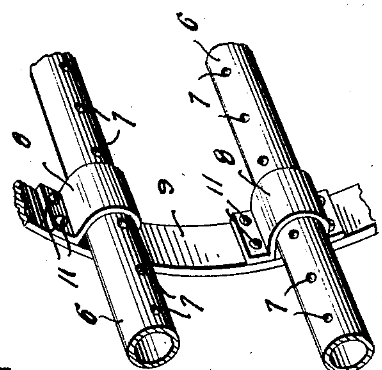
Sept. 23, 1930. F. G. CARRINGTON 1,776,548

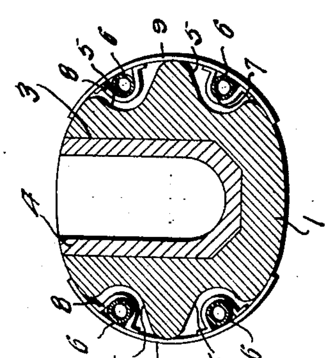
TROUGH

Filed Oct. 26, 1927









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UNITED STATES PATENT OFFICE

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TROUGH

Application filed October 26, 1927. Serial No. 228,845.

This invention relates to centrifugal casting and more particularly has reference to a pouring trough in a centrifugal casting apparatus.

In the centrifugal casting of pipe, or other metal objects, metal is deposited in a rotating mold, and the rotation of the mold is continued until the metal is sufficiently solidified. The metal is usually poured into the mold from a trough, and it is to this feature of the casting apparatus that my invention is particularly directed.

Three general types of apparatus are employed. In the first, metal is deposited just within one end of the mold, and the mold is manipulated to distribute the metal on its interior circumference. In the second type of mold, a trough projects within the mold, and upon rotation of the trough, metal is poured substantially the length of the mold. In the third type of apparatus the mold telescopes over a so-called end pouring trough, and each particle of metal is deposited in the mold in substantially that position it is found in the finished casting, the casting being composed of spirally related columns of metal.

While my invention is particularly adapted for the third type of apparatus, its application is not limited thereto, for it may be used with any of the types of apparatus.

Considerable difficulty has been experienced with the molds heretofore employed. The principal trouble has resided in a tendency for the troughs to warp. In the second and third types of apparatus this warpage is particularly to be avoided, for when it occurs to a marked extent, especially in an apparatus providing only a slight clearance between the trough and mold, the trough scrapes against either the metal deposited or against the mold itself. Even when the warpage is less pronounced, it nevertheless constitutes a distinct disadvantage in that it makes for an inaccuracy in the pouring of metal. Particularly in the third type of apparatus, it is essential that close regulation of the amount of metal poured, and its place of deposition, be possible. Without close control, difference in thickness will result in the finished casting, for after the metal is deposited in the mold there is little opportunity for adjustment of the mass to uniform thickness.

One of the objects of this invention is to provide a trough capable of long and continuous use.

Another object is to provide a non-warping trough.

A further object is to provide a cooling device for a trough.

A still further object is to devise a method of pouring metal in the rotary casting of pipe.

To accomplish the above and other important objects, as will more fully appear herein, my invention in general comprises a trough having a minimum tendency to warp, and means for regulating the cooling of the trough.

To insure a complete comprehension of my invention, reference is made to the accompanying drawings, in which similar numerals indicate the same parts, but I wish it to be clearly understood that many modifications may be made therein without departing from the scope of my invention:

Figure 1 is a side view in elevation of a trough and cooling device.

Fig. 2 is a cross sectional view along the line 2—2 of Figure 1 looking in the direction of the arrows.

Fig. 3 is a view in elevation of the receiving end of the trough and cooling device.

Fig. 4 is a view in detail of a portion of the cooling system showing the supporting means therefor.

I have shown in Figure 1 a trough 1 in which metal is deposited and conveyed to that part of the mold 28 where it is desired to pour the metal. Referring to Fig 3, the rear of the trough is provided with a plate 2, which fits the trough and prevents the discharge of any metal from that end of the trough.

As indicated in Fig. 3, and more particularly in Fig. 2, a channel 3 is provided in the trough. A lining 4, of suitable refractory material is adapted to fit into the channel. This lining may be either of any conventional type, or may be of the form shown in my copending application Serial No. 170,-547, filed February 24, 1927. The channel 3 may be of any shape desired, depending upon the character of apparatus employed and the kind of casting desired.

The molten metal when deposited in the trough is at an extremely high temperature, and would injure an ordinary trough without a suitable lining as shown herein. This lining is adapted to withstand the high temperatures of the molten metal and usually retards a transfer of the heat of the metal to the trough.

Referring particularly to Fig. 2, the trough is shown provided with serrations 5, which extend longitudinally of the trough. While I have shown only four serrations, it is to be understood that under appropriate conditions this number may be varied. The extent of these serrations along the length of the trough, will depend upon certain conditions as will appear hereinafter. It will be observed that two of the serrations are adjacent the bottom of the channel, and, inasmuch as the greatest heat is in this region of the trough, they will expedite the escape of heat from the trough. By reducing the thickness of the trough at these points, there is also a decrease in the cross sectional heat differential, thus diminishing the tendency of warpage.

Mounted in the serrations are pipes 6. These pipes are provided with apertures 7, permitting an escape of a fluid from the pipes. As is shown in Figure 1, the pipes 6 extend substantially the length of the trough, but as hereinbefore stated, variations in the length of the serrations, and of the pipe, may be made should it be desired to cool only a portion of the trough.

These pipes are supported in brackets 8, which are secured to ribs 9 by means of rivets 11 or other suitable means. The ribs 9 are secured to the trough by means of rivets 12, or other suitable means. In Fig. 2 it will be observed that the brackets 8 fit in the serrations, but do not contact with the trough. It will be observed that there is very little additional space required, for the pipes 6 are positioned within the projected contour of the trough. The only increase in size of the trough is that occasioned by the ribs 9, and the thickness of the ribs may be restricted. This space economy is of importance, for frequently there is allowed only a slight clearance between the trough and the mold.

On the forward end of each pipe there is threaded, or secured in some other appropriate manner, end plugs 13, which prevent any discharge or leakage from the pipe at that end.

Mounted on the pipes 6 are valves 14. While I have shown these valves adjacent to the trough, it is obvious that under certain conditions they may be located at other places. By means of the valves 14 each pipe is susceptible of individual operation. I have shown a short section of pipe 15 joining the valves 14 to elbows 16. It will be observed, therefore, that each of the valves on the same side of the trough are supplied from a common source with the fluid that is to be dispersed upon the trough. Threaded to the stock of the T joint 18 is a section of pipe 19, which is also threaded to an arm 21 of another T joint 22. The base 23 of the T joint is connected to the source of supply of the fluid. It will be observed from Fig. 3 that the arrangements and devices on the two sides of the trough are identical.

The pipes 6 are adapted to receive and disperse along the length of the mold a fluid. The fluid is preferably in the form of a gas, for inasmuch as the trough herein shown extends within the mold, it would be undesirable to have a liquid for a cooling medium, because a liquid would fall upon the interior surface of the mold. Of course, in the application of my invention to a trough that is used in the first type of casting apparatus, namely where the metal is poured just within the end of the mold, the cooling medium might be a liquid for the trough is outside of the mold. The spacing of the apertures 7 would of course serve to determine the amount of cooling effected. The apertures 7 may be placed at points along the length of the pipe depending upon the particular conditions of operation. The valves 14, of course, control the amount of fluid admitted to the pipes 6 and therefore also govern the degree of cooling produced by the pipes.

I have shown in Figure 1 a spout 24 for the trough, which is provided with a channel indicated by the dotted lines 25. The side and shape of this channel is optional, but usually at its discharge end it is slightly enlarged in order to deposit the molten metal in the mold in a sheet-like formation. The spout 24 is shown provided with a flanged portion 25′. Apertures are provided in the flange 25′ through which lugs 26, integral with the trough 1, may project. The lugs 26 are provided with slots adapted to receive wedges 27. A lug and wedge, similar to the ones shown in Figure 1, are provided on the opposite side of the trough. By inserting the wedge 27 to the maximum extent in the slot, a tight joint between the spout and trough is obtained. It is obvious that any of the conventional spouts may be employed under suitable conditions.

The operation and application of my invention are apparent. A fluid, gaseous or liquid, as may be necessary, is carried by the pipe 23 to the T joint 22. At the T joint 22, a portion of the fluid is diverted to one side of the trough and another portion to the other side. At the T joint 18 there is a further division of the fluid, a portion going to the upper pipe and the remainder flowing to the lower pipe. The fluid passes through the elbows 16 and sections 15 into the valves 14. At this point there is a regulation of the amount of fluid admitted to the pipes 6. These valves 14 may be regulated manually, or there may be a mechanical control device. The fluid passes into the pipes 6 and is dispersed onto the trough 1 through the apertures 7 in the pipes. The only escape for the fluid is through the apertures 7, for the ends of the pipe are securely closed by end plugs 13.

In the case of the trough employed in the second type of casting apparatus, there can be supports for the trough at both ends of the mold, but that portion of the trough within the mold is obviously incapable of being supported. With an apparatus of the third type, however, the trough can be supported at only one end, for the telescoping of the mold over the trough prevents any support at the discharge end of the trough. Under ordinary conditions this would tend to cause a warpage by reason of the weight of the trough alone, but when the trough contains molten metal, there is an increase in the weight of the trough and an increased plasticity, by reason of the heat of the metal.

To counteract this tendency to warp, I have devised my invention whereby it is possible to regulate the temperature of the trough at various points. When the trough sags or warps downwardly at its end, there is set up in the upper region of the trough a tension, and in the lower portion of the trough, a pressure. Inasmuch as heat tends to create a tension by expanding material, and cold tends to cause a pressure by reason of shrinkage, it is obvious that differentials in temperature between the top of the trough and the bottom may be employed to govern the relative expansion.

Assuming that the mold is drooping while metal is being poured therefrom, this drooping may be prevented, by cooling the upper portion of the trough at a greater rate than the lower portion. Such a differential cooling may be accomplished by means of the valves 14. In Figure 1, for instance, the upper valve would be opened to a greater extent than the lower valve, causing a greater cooling at the top part of the trough, and consequently diminishing the expansion there, at a greater rate than the bottom part of the trough.

The warpage of a trough is not confined to a vertical plane, for frequently there is a warpage to one side or the other. My invention makes provision for this also, for, referring to Fig. 3, the valves on one side of the trough may be opened to a greater extent than the valves on the other. Referring to this same figure, and assuming that there is a warpage to the left, the valves on the right hand side of the trough should be opened to a greater extent than those on the left hand side, which would cause a greater cooling and consequent tendency to shrink on the right than on the left.

It will, therefore, be obvious that warpage of the trough may be prevented by means of the cooling system herein set forth. Of course, the actual position of the cooling pipes on the trough may be varied, although the arrangement herein set forth seems to be preferable. The pipes, positioned as they are, provide a cooling of the trough at appropriate locations on the circumference of the trough under ordinary circumstances.

It will be seen that I have provided a device that is simple, inexpensive to construct, and that permits a close control of the cooling of the trough. As above pointed out, this increases the life of the trough and effects a material reduction in the cost of operation. There are comparatively few members in my device and slight chance for the apparatus to get out of order. It can also be seen that the degree of cooling at different points on the trough can be changed from time to time as circumstances demand. This last feature is essential for during the life of a trough, or even during a single casting operation, there are frequently variations in the heat properties of given sections of the trough. It would therefore be inadvisable to establish fixed differentials in the cooling.

While I have shown in the accompanying drawings and have described in this specification, a particular embodiment of my invention, it is to be understood that this is exemplary only, and that various modifications may be made in the specific structure shown and described without exceeding the scope of the appended claims, by which alone I wish the extent of my invention to be determined.

I claim as my invention:

1. A centrifugal casting device comprising a trough and a fluid dispersing means mounted exteriorly on said trough and means to supply a cooling fluid to said dispersing means.

2. A centrifugal casting apparatus comprising a trough and means on the exterior of the trough for regulating its temperature, said means comprising dispersing conduits and valve controlled conduits for supplying a cooling fluid to said dispersing conduits.

3. A centrifugal casting apparatus comprising a serrated trough and means to regulate the temperature of the trough, said means comprising fluid dispersing conduits and valve controlled conduits for supplying a cooling fluid to said dispersing conduits.

4. A centrifugal casting apparatus comprising a serrated trough, and means adjacent the serrations to regulate the temperature of the trough and means for supplying a cooling medium to said means.

5. A rotary casting apparatus comprising a trough, serrations in the trough, and means positioned in the serrations for controlling the temperature of the trough, said means comprising a plurality of fluid spraying devices.

6. A pouring trough in a centrifugal casting apparatus, on each side and mounted one above the other a plurality of fluid dispersing members, and independent means for controlling each of the fluid dispersing members.

7. A trough in a centrifugal casting apparatus and means mounted on its exterior for effecting a temperature differential in substantially a vertical plane, said means comprising cooling devices positioned adjacent the upper and lower portions of the trough and means for independently controlling the cooling of the upper and lower portions.

8. In a centrifugal casting apparatus, a pouring trough, a plurality of serrations extending longitudinally of said trough, a plurality of supporting members arranged transversely of the serrations and secured to the exterior of said trough, apertured conduits for a cooling medium carried by the supporting members and disposed in said serrations and means for supplying a cooling medium to said conduits.

9. A trough in a centrifugal casting apparatus and means mounted on its exterior for effecting a temperature differential of the trough in substantially a horizontal plane, said means comprising a plurality of horizontally spaced fluid dispersing conduits connected with a supply of cooling fluid and valve controlled means for independently controlling the flow of fluid from said supply to each of said dispersing conduits.

10. A pouring trough for a centrifugal casting apparatus comprising an elongated trough, serrations positioned in each side of said trough adjacent the upper and lower portions thereof, a perforated pipe positioned in each of said serrations, a conduit for supplying a cooling medium to said pipes and means for independently controlling the supply of cooling medium to each of said pipes.

In testimony whereof I affix my signature.

FRANK G. CARRINGTON.