

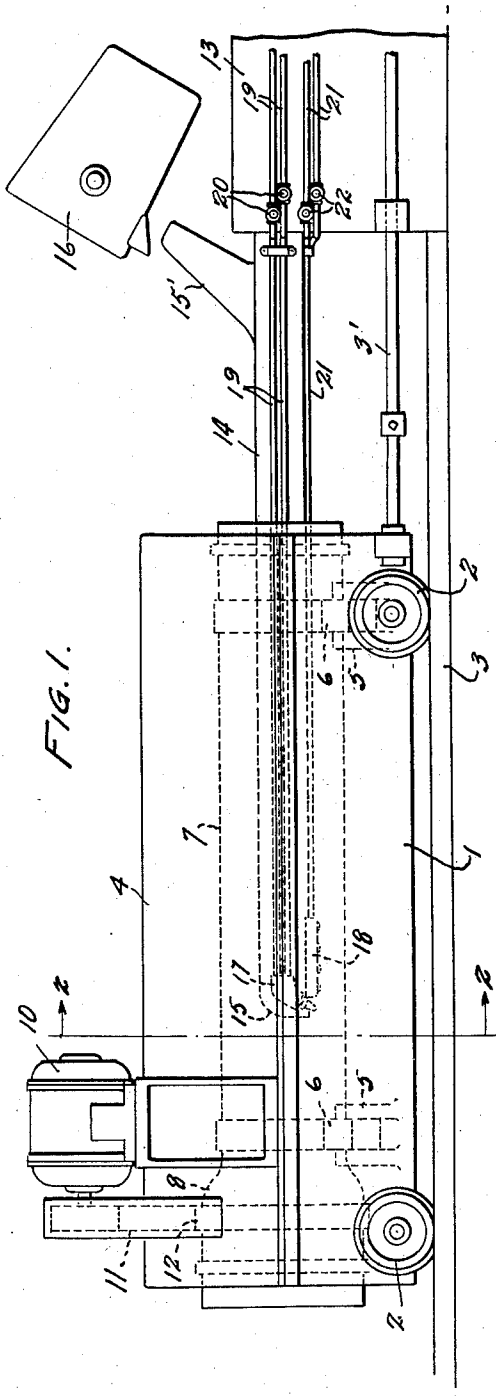
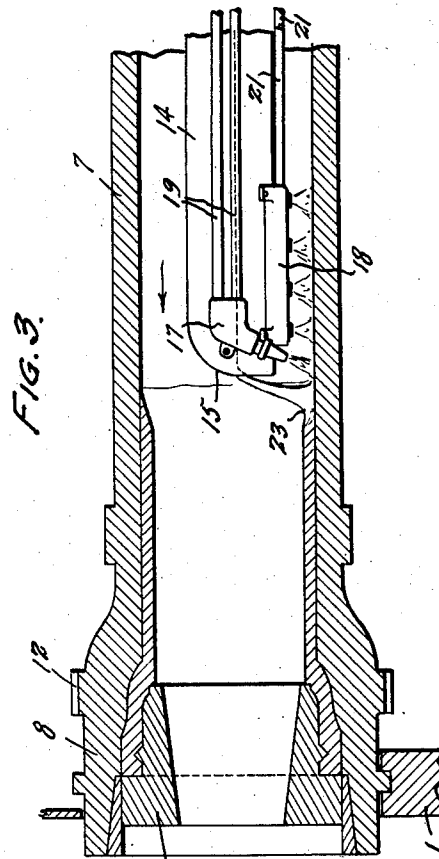
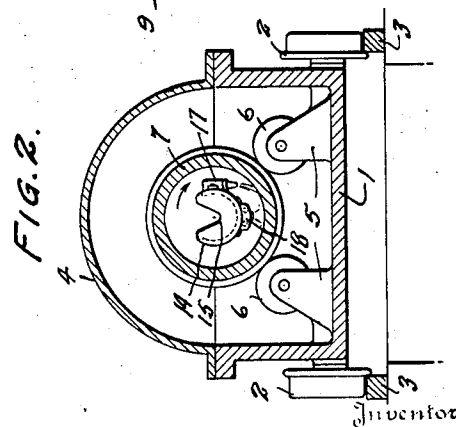
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CASTING APPARATUS AND METHOD

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CASTING APPARATUS AND METHOD

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7 Claims. (Cl. 22-65)

My invention relates to casting processes, and in particular it relates to casting of metal articles wherein the molten metal is at a high temperature when poured into the mold

In casting objects in metal molds, where the molten material is at high temperature, fluid metal such as, for instance, is the case in centrifugal casting of pipe, the cast objects are often chilled. This chilling of the surface of the cast articles causes them to be uneven in their characteristics. This is highly undesirable in many cases, such, for example, as in the casting of cast iron pipe. Since articles chilled at certain spots of the surface are of uneven strength, it is difficult to determine the size and weight of any particular article to withstand a certain given usage.

For instance, suppose a cast iron pipe has upon it sections of chilled surface. It is then impossible to tell what metal thickness for a given size of pipe should be used for any given operating conditions, since the pipe is not uniform in its characteristics.

A present-day method which manufactures pipe, and which is in large usage today, is the centrifugal method of casting. Under this present method, a rotary mold has deposited on its inner surface molten cast iron. The mold is usually of steel and is rotated at high speed. The fluid cast iron is deposited evenly on the interior surface of the mold. When the pipe cools, it is extracted from the mold. At present probably the most efficient centrifugal casting is the process in which a powder, that is, a mixture of ferro-silicon and finely divided sand and air, is deposited on the interior surface of the rotating mold just prior to the deposition of the molten metal on such surface. It is practically impossible to prevent an uneven deposition of the ferro-silicon, divided silica sand and air, and this results, in many instances, in serious chilling of certain surface areas of the centrifugally cast pipe. The reason for this is that the mixture is supposed to have an insulating effect to insulate the mold from the molten metal and retard the cooling, thus eliminating the chill. Where the mixture is unevenly deposited, there may be insufficient insulation at any particular point and this causes the chill.

The present method, which is the subject matter of this invention, contemplates heating the mold prior to the contact of the mold with the molten metal. In centrifugal casting of pipe, it is desirable to heat the interior surface of the revolving mold a short time prior to the depo-

sition of the molten metal on this interior surface. By my method, I can eliminate the necessity for the insulating layer between the pipe and the interior surface of the mold. In general, I may use burners having a high temperature flame that plays directly on the interior of the revolving mold just prior to the initial contact of the molten metal with the mold's interior surface. The type of flame, the direction in which it is directed, the number of heat units transferred to the interior surface of the mold in a given time, are all factors which must be determined empirically in any given operation. In general, I mount the burners on some portion of the spout, or the trough, which carries the molten metal to the interior of the mold, though, obviously, any other means of producing the desired effect may be employed, such as, for instance, having a separate carrying mechanism for the burners.

In my present invention, without limiting myself to any particular apparatus further than is called for by the appended claims, I have in mind that one of the objects of the invention is to prevent chilling of the surface of the cast articles. Another object of the invention is to use cast iron mixtures of varying composition. Heretofore, where using the process of centrifugal casting in a metal mold for making cast iron pipe, it has been necessary to employ a mixture of cast iron having a high total carbon content to maintain a high fluidity and also to prevent chill. The higher carbon content iron does not chill as readily as the lower carbon content. By my present method, I can obtain a desirable product with a much lower total carbon content than has heretofore been the practice in this art. A product of substantially lower total carbon content than has been, heretofore, permissible in the centrifugal casting of pipe in a metal mold is highly desirable from the standpoint of the physical properties of the finished product. A product of substantially lower total carbon content than has heretofore been feasible has much more uniform impact values among other desirable qualities. This minimizes cracking of the pipe under water hammer and from external forces.

To insure an adequate comprehension of my invention, there is shown in the accompanying drawing, one specific embodiment, but it will, of course, be appreciated that my invention is capable of other embodiments and modifications.

In the drawing, in which similar numerals indicate the same part,

Figure 1 is a view in side elevation showing my manner of heating a rotary mold prior to the contact of the molten material with the mold.

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

Figure 3 is a fragmental sectional view through the mold showing the manner in which the mold is heated prior to the contact of the metal with the mold.

Referring to the drawing and more particularly to Figures 1 and 2, there is shown a carriage 1 mounted on flanged rollers 2. The rollers 2 are adapted to travel on tracks 3. A suitable operating rod 3' attached to the carriage is adapted to impart reciprocating movement to the carriage from a source of power (not shown). A closure or hood 4 is removably affixed to the carriage 1. Supported within the interior of the carriage 1 on ears 5 are a plurality of rollers 6. A rotary mold depicted 7 is supported by the rollers 6. While I have shown the use of four rollers supporting the mold, it is, of course, obvious that a greater number can be used or some equivalent mechanism can be employed in lieu of that shown. As shown in Figure 3, the mold 7 is provided at one end with the usual bell-shaped portion 8, and a core 9 inserted therein.

In order to impart rotary movement to the mold 7, there is provided an electric motor 10 which is suitably mounted on the top of the carriage 1 as shown in Figure 1. A drive connection 11 is adapted to impart movement to a gear 12 provided on the outer periphery of the bell-shaped portion 8 of the mold 7. Of course, any other type of power transmission device may be used.

Suitably secured to a support 13 is a pouring trough 14 having a spout 15 which is adapted to extend into the interior of the mold 7. As best shown in Figure 1, the trough 14 is provided with a guideway 15' for directing the molten material poured from a ladle 16 into the trough.

As heretofore pointed out, an essential feature of the present invention is to heat the mold prior to the contact of the mold with the molten material. By thus heating the interior of the mold, the necessity of providing an insulating layer between the pipe and the interior surface of the mold can be eliminated. Moreover, it will prevent too rapid chilling of the surface of the cast articles. As shown in Figure 3, a gas burner 17 which is adapted to give an intense flame is secured to the side of the trough adjacent the spout end so that the flame will play directly on the interior of the mold prior to the initial contact of molten material with the mold's interior surface. In addition, a second burner 18 to give a plurality of brush flames is affixed to the bottom of the trough immediately in rear of the burner 17.

Pipes 19 connect the burner 17 with a suitable source of combustion materials (not shown) and valves 20 are provided for regulating the amount of combustion materials fed to the burner. Similarly, pipes 21 are connected with the burner 18 and regulating valves 22 are interposed in the pipe line to control the volume of combustion material fed to the burner.

The operation of my invention is believed readily apparent, but it might be well to summarize briefly the steps of the process. As is well known, when pipe is cast, it is usual to pour the bell end of the pipe first. Therefore, the carriage 1

is moved to such a position that the molten material, which I have designated 23, will first fill up the bell end of the mold 7. The carriage then moves to the left (in Figure 1) at the required rate of speed and the molten material is fed into the interior of the revolving mold by the trough 14. The flames from the burners 17 and 18 by playing directly on the interior of the mold will heat the interior surface thereof just prior to the initial contact of the molten material with the mold, as clearly shown in Figure 3. After the carriage has reached the end of its travel and the required casting has been made, cooled and removed, the foregoing cycle is then ready to start again.

It will be readily apparent that by the use of this process it will enable a cast iron pipe to be made of a much lower total carbon content than has heretofore been possible. Moreover, it will prevent the too rapid chilling of the surface of the finished cast product. Lastly, it will eliminate the use of the insulating material between the pipe and the interior surface of the mold.

While I have shown and described the preferred embodiment of my inventive concept, I wish it to be understood that I do not confine myself to the precise details herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein by those skilled in the art without departing from the spirit of the invention or exceeding the scope of the appended claims.

I claim:

1. A method of centrifugal casting of pipe comprising discharging molten metal from a spout into the interior of a revolving mold while causing relative longitudinal movement between the spout and the mold so that a layer of metal is deposited on the interior surface of the mold to form a pipe and selectively heating the interior surface of the mold in front of the point of deposition of molten metal to a sufficiently high temperature so that there is substantial elimination of chill in the casting.

2. A method of centrifugal casting of pipe comprising discharging molten metal from a spout into the interior of a revolving mold while causing relative longitudinal movement between the spout and the mold so that a layer of metal is deposited on the interior surface of the mold to form a pipe and selectively directing a flame against the interior surface of the mold in front of the deposition of the metal to raise the temperature sufficiently so that there is substantial elimination of chill in the casting.

3. An apparatus for centrifugal casting of pipe comprising a revolving mold; a trough; a spout on the trough; a source of molten metal for the trough; means to cause relative longitudinal movement of the spout and the mold; and means maintaining a fixed position with respect to the spout to selectively heat the interior walls of the mold in front of the deposition of the metal.

4. An apparatus for centrifugal casting of pipe comprising a revolving mold; a trough; a spout on the trough; a source of molten metal for the trough; means to cause relative longitudinal movement of the spout and the mold; and a burner maintaining a fixed position with respect to the spout and selectively directing a flame against the interior walls of the mold in front of the deposition of the metal to raise its temperature prior to its contact with the molten metal.

5. An apparatus for centrifugal casting of pipe comprising a revolving mold; a trough; a spout on the trough; a source of molten metal for the trough and a plurality of burners occupying a relatively fixed position with respect to the spout and selectively directing a series of flames against the interior walls of the mold in front of the deposition of the metal to raise its temperature prior to its contact with the molten metal.

6. A method of centrifugal casting, comprising rotating a mold, depositing a stream of molten metal in the mold while advancing the point of deposition of the molten metal in the mold axially of the mold, and heating a small area of the inner surface of the mold immediately in ad- 15

vance of the point of deposition so that the metal is deposited in a heated portion of the mold.

7. A method of centrifugal casting, comprising rotating a mold, depositing a stream of molten metal in the mold from the spout of a pouring trough while effecting relative axial displacement between the pouring trough and the mold, and simultaneously effecting relative axial displacement between a heating element and the mold with the heating element slightly in advance of the spout of the pouring trough to heat a small area of the mold immediately in advance of the point of deposition of metal.

HENRY E. MCWANE.

CERTIFICATE OF CORRECTION.

Patent No. 2,245,994.

June 17, 1941.

HENRY E. McWANE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 54, claim 2, for the words "raise the" read --raise its--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of September, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.