W. H. WARREN.

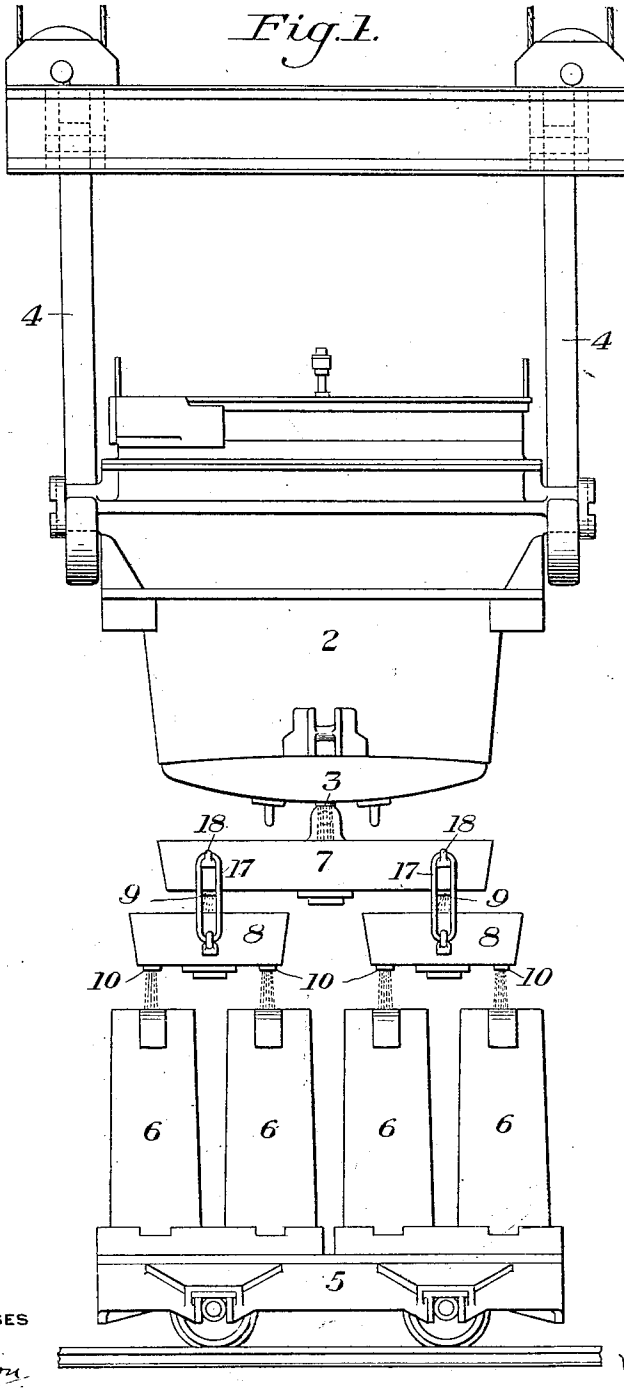
METAL CASTING APPARATUS.

APPLICATION FILED DEC. 6, 1916.

1,336,767. Patented Apr. 13, 1920.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 2.

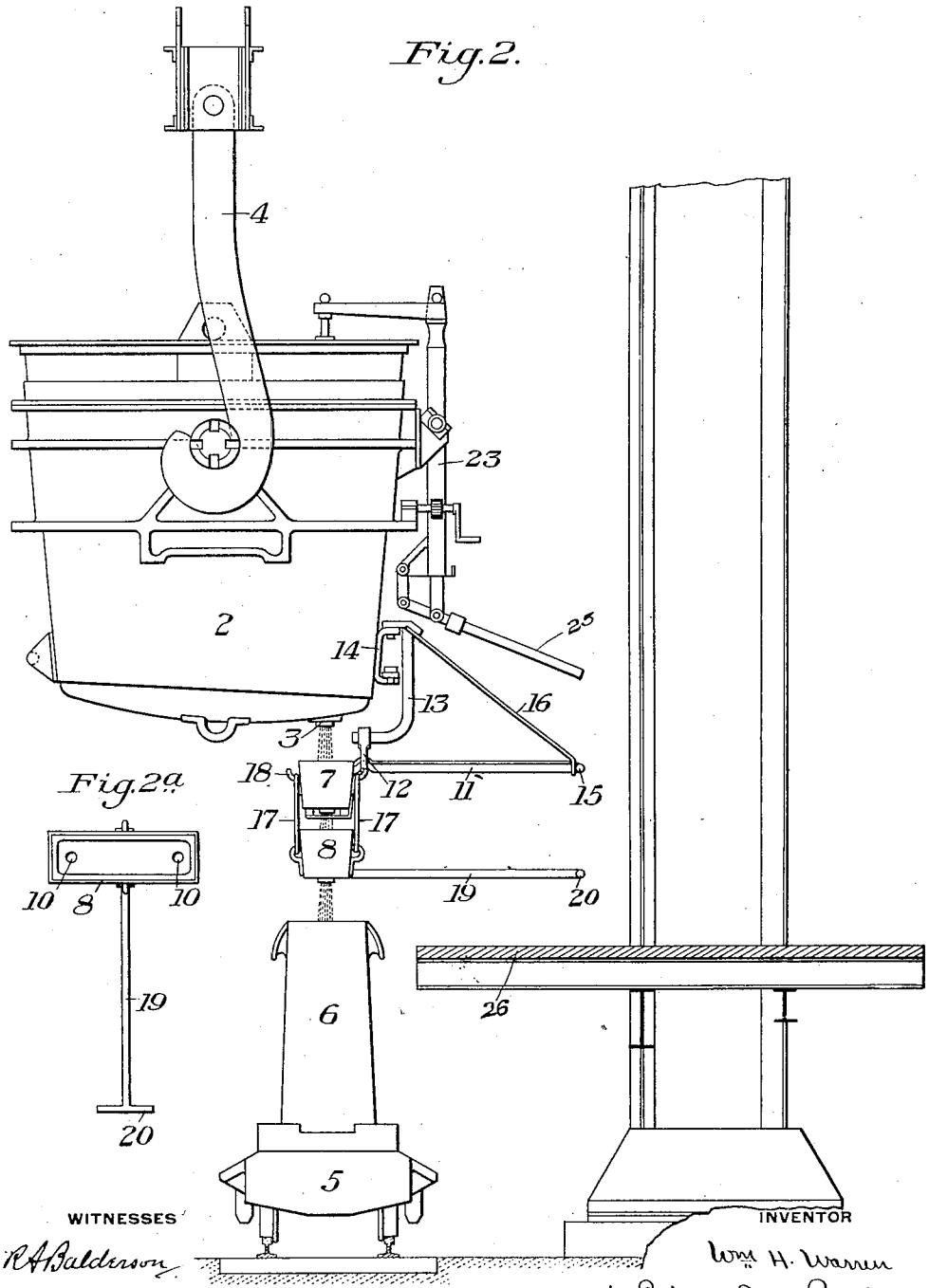


Fig. 2a.

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3 SHEETS—SHEET 3.

Fig. 3.

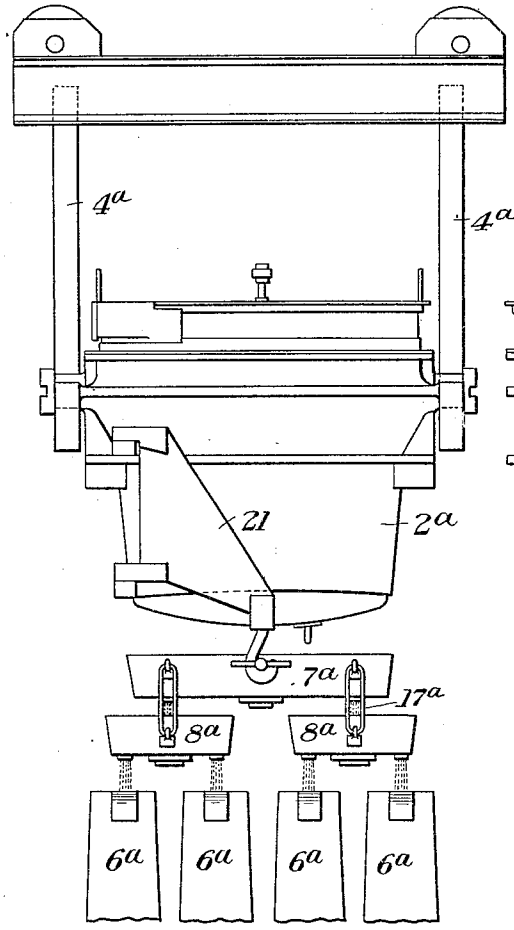


Fig. 4.

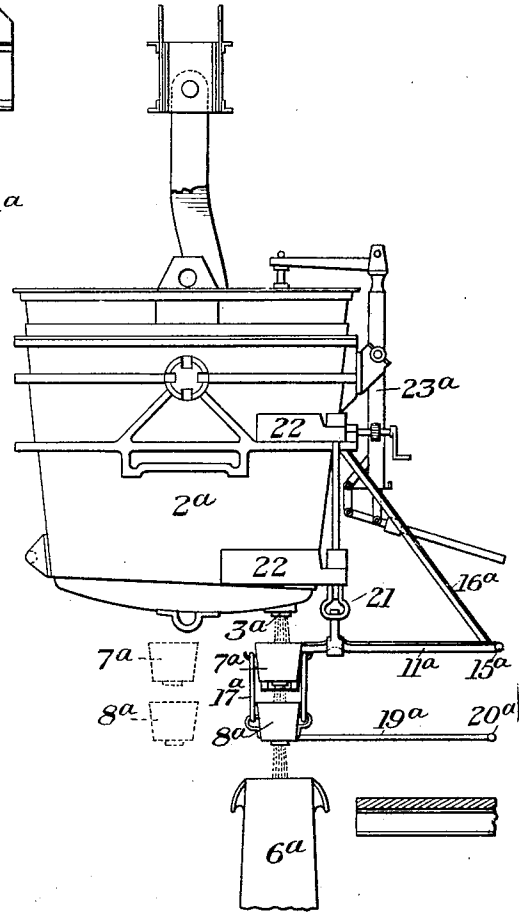
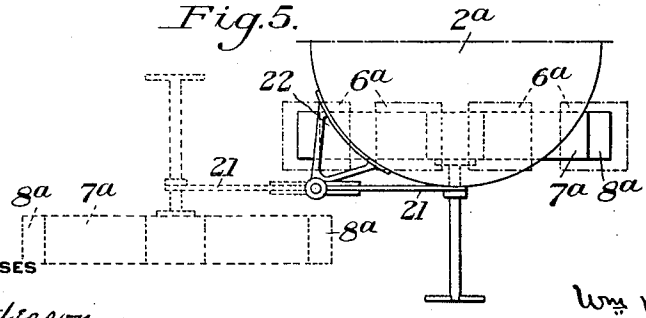


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM H. WARREN, OF YOUNGSTOWN, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE REALTY TRUST COMPANY AND ROLLIN C. STEESE, TRUSTEES, OF YOUNGSTOWN, OHIO.

METAL-CASTING APPARATUS.

1,336,767. Specification of Letters Patent. Patented Apr. 13, 1920.

Application filed December 6, 1916. Serial No. 135,306.

To all whom it may concern:

Be it known that I, WILLIAM H. WARREN, a citizen of the United States, residing at Youngstown, Mahoning county, Ohio, have invented a new and useful Improvement in Metal-Casting Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of a metal casting apparatus embodying my invention.

Fig. 2 is an end view of the same.

Fig. 2ª is a detail plan view of one of the trough members.

Figs. 3 and 4 are side and end views, respectively, showing another form of my invention, and

Fig. 5 is a partial plan view of the casting ladle and auxiliary trough members shown in Figs. 3 and 4.

My invention has relation to metal casting apparatus and is designed to provide means whereby one or more ingots can be cast at the same time from a ladle through a single nozzle. My invention provides means whereby the molds or flasks may be filled at a much slower rate, without decreasing the rate of flow from the ladle, thus giving more time and opportunity for the gases to escape from the hot metal, and thereby eliminating, to a large extent, piping, segregation and blow-holes or honey-combing.

My invention also embodies other novel features as will hereinafter more fully appear.

Referring first to that form of my invention shown in Figs. 1 and 2, the numeral 2 designates a casting ladle of the bottom-pour type, having a single metal pouring nozzle 3. 4 designates a ladle carrier of any suitable or usual form and which may be suspended from an overhead crane, not shown. 5 designates an ingot mold car having a plurality of ingot molds 6.

7 designates a trough which is supported beneath the nozzle 3 of the ladle 2, and 8 and 8 are two smaller troughs which are suspended one underneath each end portion of the trough 7. The trough 7 is shown as having a bottom-pour nozzle 9 at each end portion, and each of the troughs 8 has a bottom-pour nozzle 10 near each end portion thereof.

The upper trough 7 may be attached to the ladle 2 in various ways. In Figs. 1 and 2 I have shown it as having a rigidly projecting lever arm 11 which is arranged to fulcrum and also turn somewhat in a stirrup 12 hung on an arm 13 which is detachably engaged with a bracket 14 on the ladle 2. The outer end of the lever arm 11 has a handle projection 15 extending at substantially right angles; and is also provided with a bearing in the oblique brace member 16. Each of the troughs 8 may be conveniently suspended from the trough 7 by means of the links 17, these engaging open hooks 18 on the trough 7. Each trough 8 is also preferably provided with a laterally extending arm 19 having an actuating handle 20 extending at substantially right angles thereto.

The operation is as follows: The hot metal discharged from the nozzle 3 of the ladle 2 enters the trough 7; and when the latter is in substantially horizontal position, the flow of metal therefrom will be substantially equally distributed between its two nozzles 9 into the troughs 8. The four nozzles of these two troughs will in turn feed the four ingot molds or flasks 6.

It will be readily seen that with this arrangement the rate of filling of each of the molds or flasks is approximately equal to one-fourth of the rate of flow of the metal through the ladle 2. This greatly facilitates the opportunity for the gases escaping from the hot metal entering the molds 6, and thus eliminates to a great extent piping, segregation and blow-holes or honey-combing.

Moreover, as shown for example in Fig. 1, the metal in flowing from the ladle to the molds is exposed to the air in seven streams, one from the ladle to the first trough, two from the first trough to the smaller or additional troughs, and four from the additional troughs to the ingot molds. Thus, the metal in flowing from the ladle to any one of the ingot molds is exposed to the air in three successive streams of successively diminishing volume, the last stream from the troughs to the mold being smaller and exposing a comparatively greater cooling surface to the air than the larger stream from the ladle to the troughs. The metal is thus cooled between the ladle and the molds. The metal in

the ladle may be hot as tapped from the furnace and yet when discharged into the ingot molds the metal is cooled to approximately the best temperature for casting. The cooling and slow pouring into the ingot molds permits the bottom of the ingot to solidify before the upper portion is poured and thereby tends to eliminate the piping and other common defects which occur in the more rapid pour of hotter metal.

By means of the lever arm 11 the trough 7 may be readily tipped toward either end so as to concentrate its discharge through either one of its nozzles 9. In like manner, by means of the lever arms 19, either one or both of the troughs 8 may be tipped. In this manner either two, three or four of the molds or flasks may be simultaneously filled. Instead, however, of tipping the several troughs sufficiently to concentrate the discharge at either end portion thereof, they may be tipped to a less extent, thus giving a different rate of pour into different flasks. This enables flasks of different sizes to be poured simultaneously.

In the form of my invention shown in Fig. 3 the trough system is the same as that just described; but is supported from the ladle in such a manner that the entire series of troughs 7^a and 8^a may be simultaneously swung to one side of the molds or flasks 6^a, as indicated in dotted lines in Figs. 4 and 5, thereby enabling the casting ladle 2^a to be lowered so that its nozzle 3^a may discharge directly into one of the said flasks or molds. Should the troughs freeze, owing to cold metal or a running stopper, it may be necessary at times to revert to single pouring direct from the ladle, in this manner.

To enable this to be done the supporting arm or bracket 21 is journaled in the bearings 22 attached to the ladle 2^a, said arm being rotatable about the vertical axes of these bearings.

The attachment can be readily applied to and removed from existing ladles.

23 in Fig. 2 and 23^a in Fig. 4 designate stopper actuating mechanism of any usual or well known character. The stopper actuating mechanism is manually operated by a handle 25 which projects over the pouring platform 26 in position to be grasped by the operator who stands on the casting platform. The handles 15 and 20 by means of which the distributing troughs 7, 8, and 8 are controlled, likewise project over the casting platform where they may be manually operated by the operator, or operators, who pour the metal from the casting ladle. The positioning of the handles for tilting the distributing troughs as well as the handle for the ladle stopper actuating mechanism over the casting platform, gives the operator or operators who are watching the filling of the ingot molds, constant control over the pouring of the metal. The shafts 11 and 19 of the trough tilting handles extend from the troughs to the casting platform in the direction of the length of the tilting axes of the troughs. The handles also extend to a position on the casting platform where they can be continuously held, if necessary, by an operator or operators during the pour. The operator has an instant and continuous control over the positions of the troughs which, by a simple twisting movement of the handles he can turn about their tilting axes. The troughs are mounted not only so that they may be readily tilted by the operator on the casting platform, but are mounted for a bodily movement to maintain their position beneath the ladle and between the ladle and the molds when the ladle is moved to different pouring positions, as for example, if the ladle is moved over different sets of molds to successively pour such different sets.

I do not desire to limit myself to the particular construction and arrangement of parts which I have herein shown and described, as it will be obvious that the details of construction and arrangement may be widely varied within the spirit and scope of my invention as defined in the appended claims.

I claim:

1. Metal-casting apparatus, comprising a casting ladle, a trough member arranged to receive the discharge from said ladle, and having a plurality of discharge nozzles, and other trough members supported in position to receive the metal discharge from the nozzles of the first named trough member, each of the second named trough members having a plurality of discharge nozzles, and means whereby the said trough members may be moved to vary the discharge at the different nozzles, substantially as described.

2. Metal-casting apparatus, comprising a casting ladle having a bottom-pour nozzle, a trough member suspended from the ladle underneath said nozzle, means for tilting said trough member, the latter having a discharge nozzle at each end portion thereof, and additional trough members, one supported underneath each discharge nozzle of the first named trough member, substantially as described.

3. Metal-casting apparatus, comprising a casting ladle having a bottom-pour nozzle, a trough member suspended from the ladle underneath said nozzle, means for tilting said trough member, the latter having a discharge nozzle at each end portion thereof, and additional trough members, one supported underneath each discharge nozzle of the first named trough member, together with means whereby each of the additional trough members may be tilted, substantially as described.

4. The combination with a metal-casting ladle, of a plurality of metal-distributing troughs movably suspended therefrom, and each of said troughs having a discharge nozzle at opposite sides of its point of support, and means for independently tilting the several troughs, substantially as described.

5. The combination with a metal-casting ladle, of a system of metal-distributing troughs suspended therefrom, the suspending means being adapted to permit the system of troughs to be moved into and out of position with respect to the pouring nozzle of said ladle, substantially as described.

6. The combination with a metal-casting ladle, of a system of metal-distributing troughs suspended therefrom, the suspending means being arranged to permit the troughs to be independently tipped on a horizontal axis, substantially as described.

7. The combination with a metal-casting ladle, of a system of metal-distributing troughs suspended therefrom, the suspending means being arranged to permit the troughs to be independently tipped on a horizontal axis, and also to be swung about a vertical axis, substantially as described.

8. Metal pouring apparatus, comprising a closed-end trough adapted to receive the molten metal from a casting ladle or the like and having a plurality of discharge nozzles, and means for tilting the trough to control the discharge of metal from the nozzles; substantially as described.

9. Metal pouring apparatus, comprising a closed-end trough adapted to receive the molten metal from a casting ladle or the like and having a plurality of discharge nozzles, and means for controlling the relative rates of pour from the nozzles; substantially as described.

10. Metal pouring apparatus, comprising a trough adapted to receive the molten metal from a casting ladle or the like and having a plurality of discharge nozzles, means for tilting the trough to control the discharge of metal from the nozzles, and additional troughs one suspended beneath each discharge nozzle of the first trough; substantially as described.

11. Metal pouring apparatus, comprising a trough adapted to receive the molten metal from a casting ladle or the like and having a plurality of discharge nozzles, means for tilting the trough, additional troughs one supported beneath each discharge nozzle of the first trough, and means for independently tilting the additional troughs; substantially as described.

12. Metal pouring apparatus, comprising a trough adapted to receive the molten metal from a casting ladle or the like and having a plurality of discharge nozzles, means for controlling the relative rates of flow from the nozzles, additional troughs one supported beneath each discharge nozzle of the first trough, and means for controlling the relative rates of flow from the nozzles of the additional troughs; substantially as described.

13. Metal pouring apparatus, comprising a trough adapted to receive the molten metal from a casting ladle or the like and having a plurality of discharge nozzles, means for tilting the trough, two additional troughs supported respectively beneath the two nozzles of the first trough, each of these additional troughs having two discharge nozzles, and means for independently tilting the two additional troughs; substantially as described.

14. Metal pouring apparatus, comprising a distributing trough adapted to receive a stream of molten metal from a casting ladle or the like and having a plurality of discharge nozzles, and additional distributing troughs supported to receive streams of metal from the nozzles of the first trough and each having a plurality of discharge nozzles for delivering streams of metal to the molds whereby the metal is distributed to a plurality of molds and is exposed to the air in three successive streams of diminishing volume in its flow from the ladle to any one of the molds; substantially as described.

15. In metal casting apparatus, the combination with a casting platform adjacent to a plurality of ingot molds to be poured and a bottom pour casting ladle movable over the molds, of a distributing trough extending over a plurality of molds and having a plurality of bottom pour discharge nozzles and adapted to receive molten metal from the ladle and subdivide it into a plurality of streams, means for supporting the trough for bodily movement to maintain its position beneath the ladle and between the ladle and the molds in different pouring positions of the ladle, and means for tilting the trough to vary the relative rates of pour through its discharge nozzle including a connection extending from the trough to the casting platform in the direction of the length of the tilting axis of the trough; substantially as described.

16. In metal casting apparatus, the combination with a movable bottom pour casting ladle and a plurality of ingot molds to be poured, of a distributing trough normally located beneath the ladle and between the ladle and molds and having a plurality of bottom pour discharge nozzles and adapted to receive a stream of molten metal from the ladle and subdivide it into a plurality of secondary streams, and a mounting for the trough permitting a bodily movement of the trough in line with the ladle to maintain it in its position between the ladle and molds in different pouring positions of the ladle and including a pivot permitting the trough to be tilted so as to vary the relative rates

of pour through its discharge nozzles; substantially as described.

17. In metal casting apparatus, the combination with a movable bottom pour casting ladle and a plurality of ingot molds to be poured, of a distributing trough having a plurality of bottom pour discharge nozzles and adapted to receive a stream of molten metal from the ladle and subdivide it into a plurality of secondary streams, and means for suspending the trough from the ladle permitting a tilting movement of the trough to vary the relative rates of pour through its discharge nozzles, substantially as described.

18. In metal casting apparatus, the combination with a movable bottom pour casting ladle and a plurality of ingot molds to be poured, of a distributing trough having a plurality of bottom pour discharge nozzles and adapted to receive a stream of molten metal from the ladle and subdivide it into a plurality of secondary streams, and means for detachably suspending the trough from the ladle permitting a tilting movement of the trough to vary the relative rates of pour through its discharge nozzles, substantially as described.

19. In metal casting apparatus, the combination with a movable bottom pour casting ladle and a plurality of ingot molds to be formed, of a distributing trough having a plurality of bottom pour discharge nozzles and adapted to receive a stream of molten metal from the ladle and subdivide it into a plurality of secondary streams, and means for suspending the trough from the ladle permitting a tilting movement of the trough to vary the relative rates of pour through its discharge nozzles, and also permitting the trough to be removed from its position beneath the ladle nozzle if desired, substantially as described.

In testimony whereof, I have hereunto set my hand.

WILLIAM H. WARREN.

Witnesses:
GEORGE R. PERKINS,
LEONARD J. WILSON.