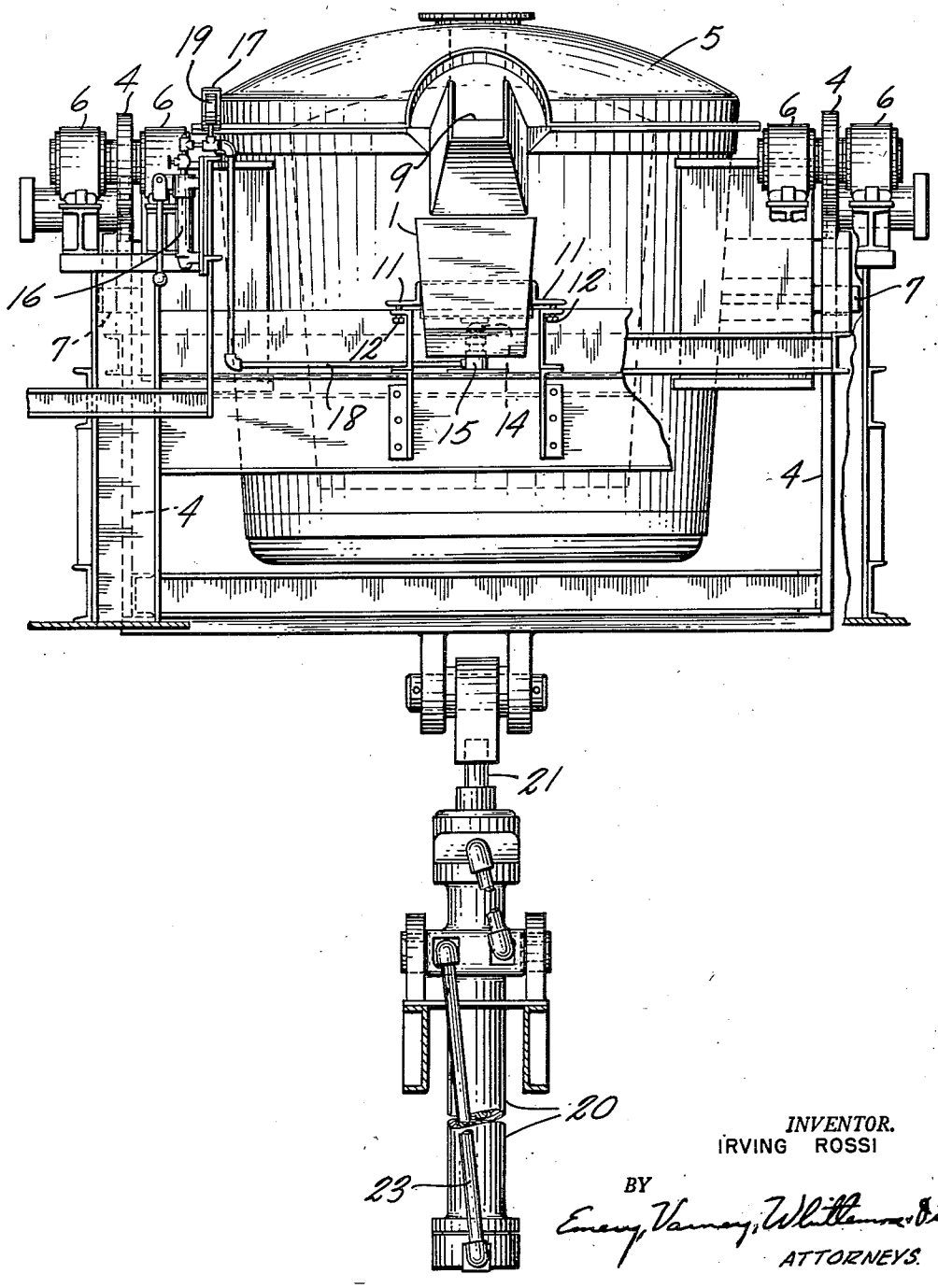
May 21, 1957 I. ROSSI 2,792,602

APPARATUS FOR CONTROLLING THE SUPPLY OF MOLTEN METAL TO A CASTING MOLD

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FIG. 1.



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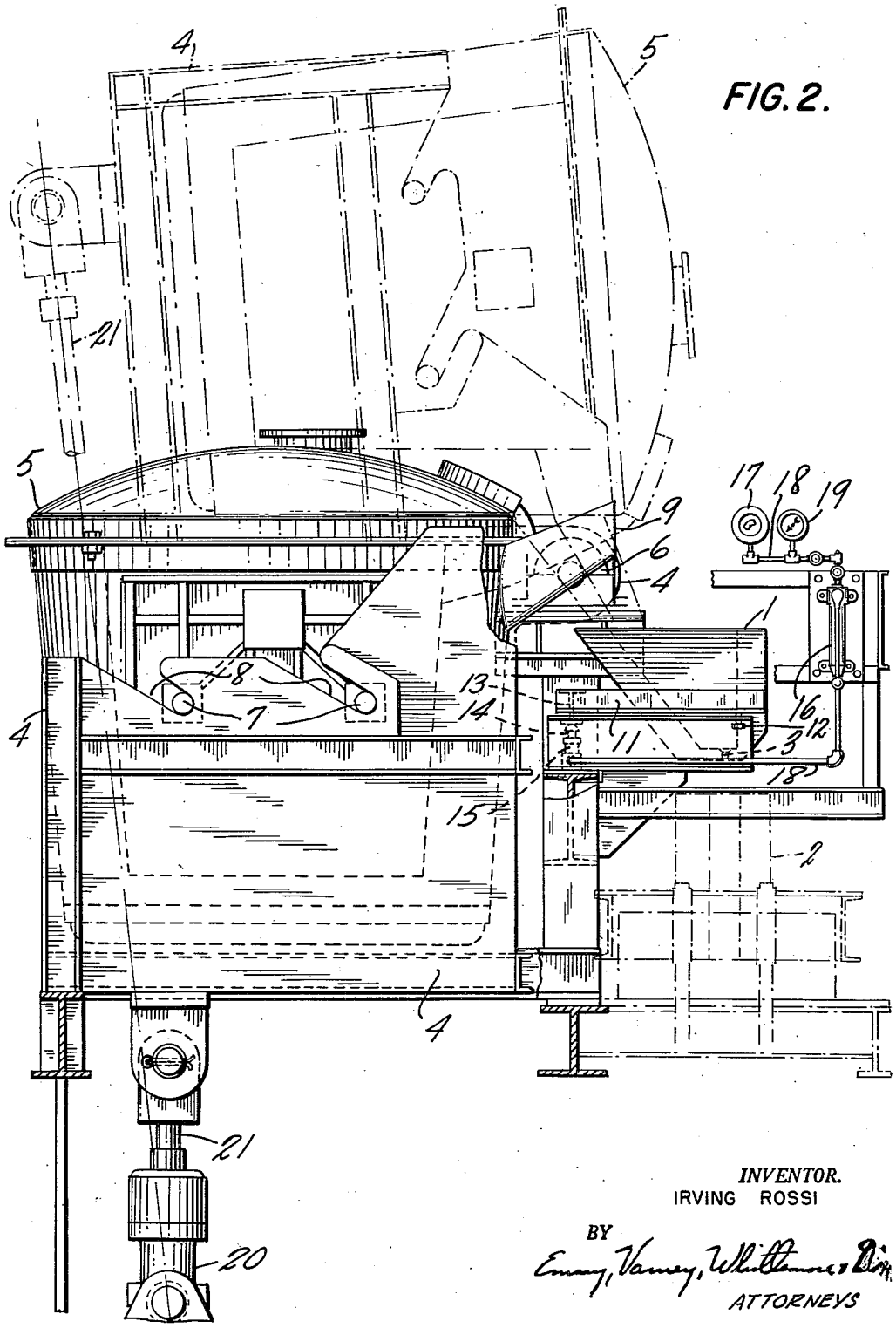
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FIG. 2.



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APPARATUS FOR CONTROLLING THE SUPPLY OF MOLTEN METAL TO A CASTING MOLD

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FIG. 3.

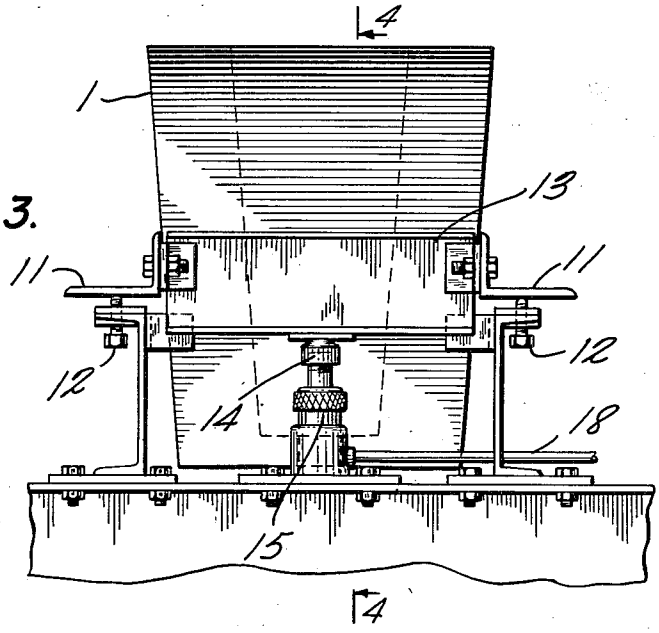
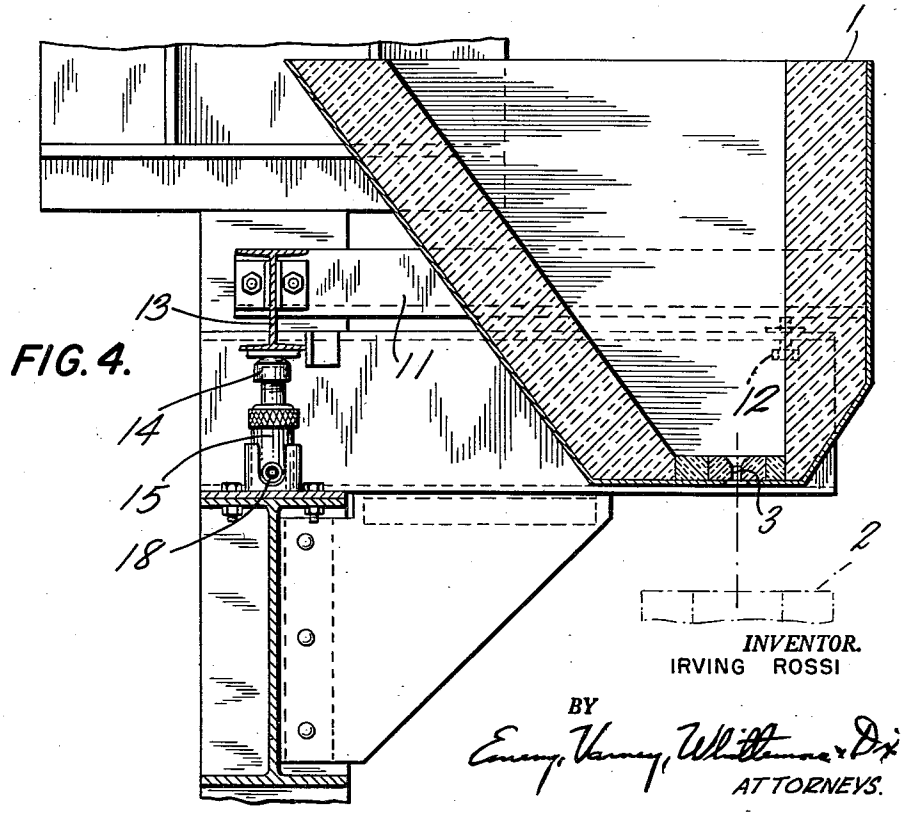


FIG. 4.



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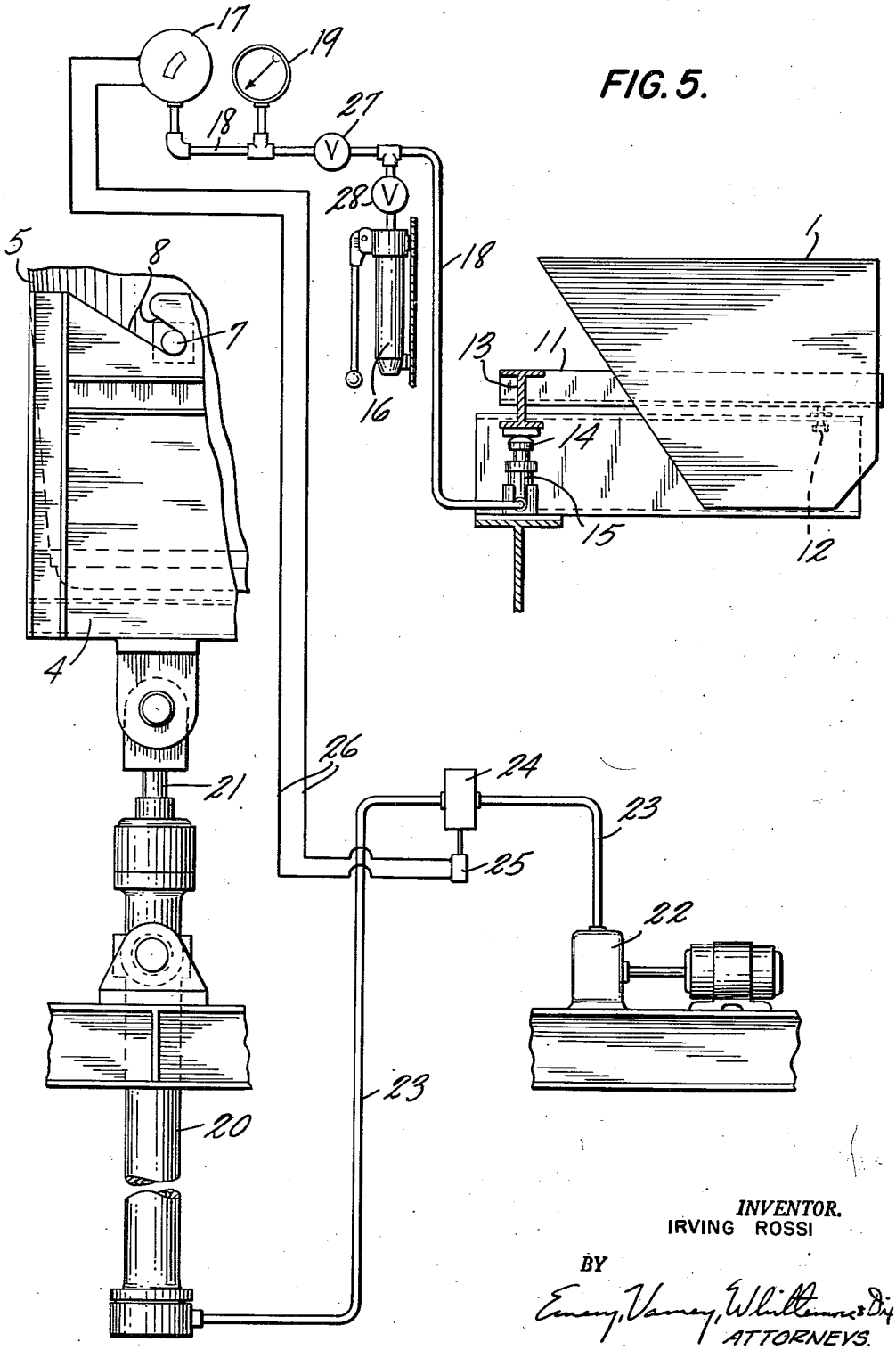
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APPARATUS FOR CONTROLLING THE SUPPLY OF MOLTEN METAL TO A CASTING MOLD

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FIG. 5.



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United States Patent Office 2,792,602 Patented May 21, 1957

2,792,602

APPARATUS FOR CONTROLLING THE SUPPLY OF MOLTEN METAL TO A CASTING MOLD

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Application April 26, 1954, Serial No. 425,351

2 Claims. (Cl. 22—79)

This invention relates to the art of continuous casting of metal and pertains more particularly to apparatus for controlling the supply of molten metal to a casting mold.

In most continuous casting processes molten metal is poured continuously at a constant rate into one end of a casting mold and solidified metal is withdrawn continuously at a constant rate from the other end. Commonly, the molten metal which is poured into the casting mold is held in a suitable reservoir which is replenished from time to time from ladles in which fresh molten metal is conveyed from the melting furnaces.

In casting non-ferrous metals, it is possible to control the rate of flow from the reservoir to the casting mold by means of an adjustable valve or stopper. In casting steel, however, this is not practical for there is no refractory material now available which will adequately withstand the erosive effects of molten steel.

It is an object of the present invention to provide means for controlling the rate of flow of molten metal to the casting mold which is particularly adapted for the casting of steel, but which may also be used to advantage in the casting of non-ferrous metals.

Other objects and advantages of the invention will appear hereinafter.

A preferred embodiment of the invention selected for purposes of illustration is shown in the accompanying drawings, in which:

Figure 1 is a front elevation of the apparatus.

Figure 2 is a side elevation.

Figure 3 is an enlarged rear elevation of the pouring reservoir or tundish.

Figure 4 is a section on the line 4—4 of Figure 3.

Figure 5 is a semi-diagrammatic view of the controlling mechanism.

According to the present invention, advantage is taken of the fact that molten metal will flow at a constant rate through an aperture of given cross sectional area at the bottom of a reservoir provided the level of the molten metal in the reservoir, and hence the hydrostatic pressure forcing the molten metal through the aperture, is maintained substantially constant. According to the present invention, a suitable pouring reservoir, sometimes referred to as a tundish, is mounted above the casting mold, said reservoir having an aperture through which molten metal may flow to the mold. A ladle is mounted to pour molten metal into the reservoir, and means are provided for automatically controlling the pouring from the ladle into the reservoir so that the molten metal in the latter is maintained at a substantially constant level.

Thus, referring to the drawings, a pouring reservoir or tundish 1 is mounted above the open upper end of the casting mold 2, and is provided with an aperture 3 of fixed cross sectional area through which molten metal may flow from the reservoir to the mold. A frame 4 for supporting the ladle 5 is pivotally mounted on bearings 6, the ladle having trunnions 7 which fit into slots 8 of the frame 4. The ladle has a pouring lip

9 which is arranged to pour molten metal into the reservoir 1 when the ladle is tilted on the bearings 6. Whenever the molten metal in a ladle is exhausted, the ladle is lifted from the frame 4 and a new full ladle is put in its place.

The reservoir 1 is supported on frame members 11, with the front ends of the frame members resting on adjustable bolts 12, and with the rear ends of the frame members rigidly connected to a transverse frame member 13 which rests on and is supported by the rounded head of a plunger 14 which is mounted in a hydraulic cylinder 15. The cylinder 15 forms a part of a closed hydraulic pressure system which also includes a hand pump 16 and a pressure responsive electric switch 17, all connected by pipe or tubing 18. The switch 17 is set or adjusted to close when the pressure in the system falls below a certain predetermined level and to open when the pressure is above this level.

During the casting operation, the pressure within the hydraulic system will be affected by the mass of the molten metal in the pouring reservoir 1. Thus, whenever the level of the metal in the reservoir rises, the frame 11, 13 exerts increased pressure on the plunger 14 and increases the pressure in the hydraulic system, and whenever the level of the metal in the reservoir is lowered, the pressure on the plunger 14 is decreased and the pressure in the hydraulic system decreases.

A pressure gauge 19 is included in the hydraulic system, and at the beginning of a casting operation, the hand pump 16 is operated to raise the pressure in the system to some predetermined level which corresponds to the desired metal level in the reservoir. The pressure responsive switch 17 may then be set to open when the pressure in the system exceeds the predetermined level and to close when it falls below that level.

Means are provided for tilting the ladle to cause it to pour additional molten metal into the reservoir whenever the level falls below that desired, such means being under control of the switch 17. In the preferred embodiment illustrated, the ladle tilting means comprises a hydraulic cylinder 20 having a plunger 21 pivotally connected to the ladle frame 4. The interior of the cylinder is connected to a pump 22 through a pipe 23 having a valve 24 therein which is operated by the solenoid 25 which is connected to switch 17 through leads 26. When the switch 17 opens, the valve 24 closes to prevent flow of fluid to the cylinder 20, and when the switch closes, the valve is opened by the solenoid to permit flow to the cylinder. When the plunger 21 is fully extended and the ladle has been emptied, the cylinder may be emptied by opening a valve (not shown) to allow the frame 11 to return to its original position, after which the empty ladle is removed from the frame and replaced by another. When the new ladle is in place the operation proceeds as before.

If desired, needle valves 27 and 28 may be inserted in the hydraulic system in order to prevent sudden, temporary changes in pressure from affecting the switch 17.

It will be understood that the invention may be variously modified and embodied within the scope of the subjoined claims.

I claim as my invention:

1. Apparatus for the continuous casting of metal, comprising, a casting mold, a movably mounted reservoir located above said casting mold having an aperture at the bottom thereof through which molten metal flows by gravity to said casting mold, a pivotally mounted ladle adapted, when tilted, to pour metal into said reservoir, means for tilting said ladle, and means including a closed hydraulic system constantly affected by and responsive to movement of said reservoir caused by variations in the mass of molten metal in said reservoir for controlling the

operation of said ladle tilting means to correct such variations and to maintain a substantially constant mass of molten metal in said reservoir, said closed hydraulic system including a plunger in contact with said movably mounted reservoir and movable thereby to vary the pressure in the system as the mass of molten metal in the reservoir varies.

2. Apparatus according to claim 1, including an electric switch actuated by changes of pressure in said system, and means controlled by said switch for controlling the operation of said ladle tilting means.

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