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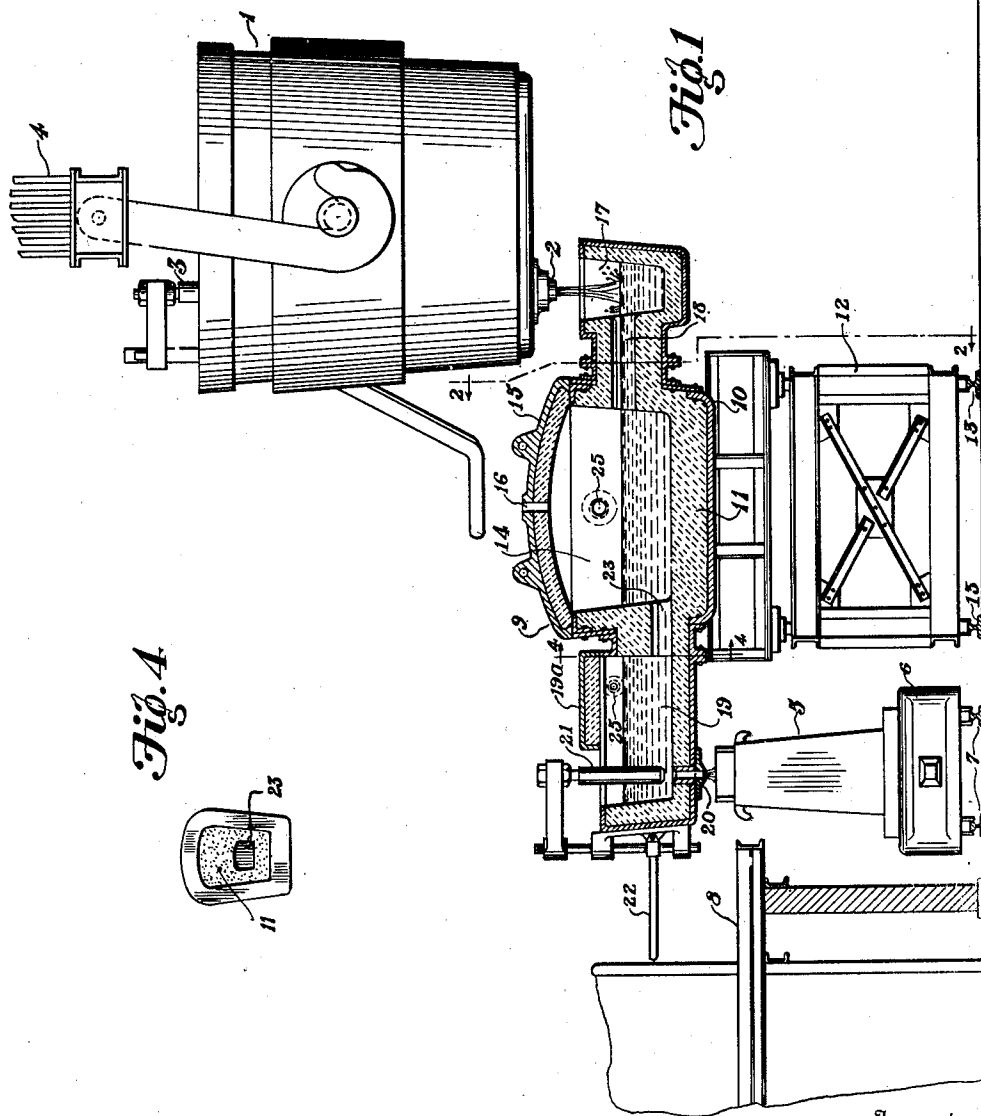
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F. H. MOYER

STEEL POURING DEVICE

Filed Aug. 17, 1926

2 Sheets-Sheet 1



Inventor

Fredellia H. Moyer

Freese and Bond

Attorneys

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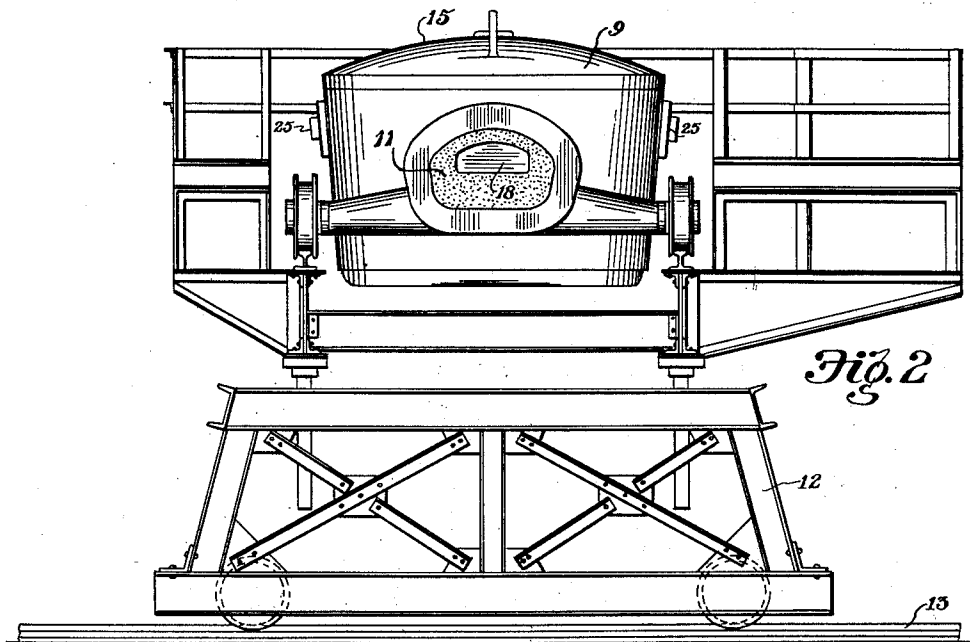
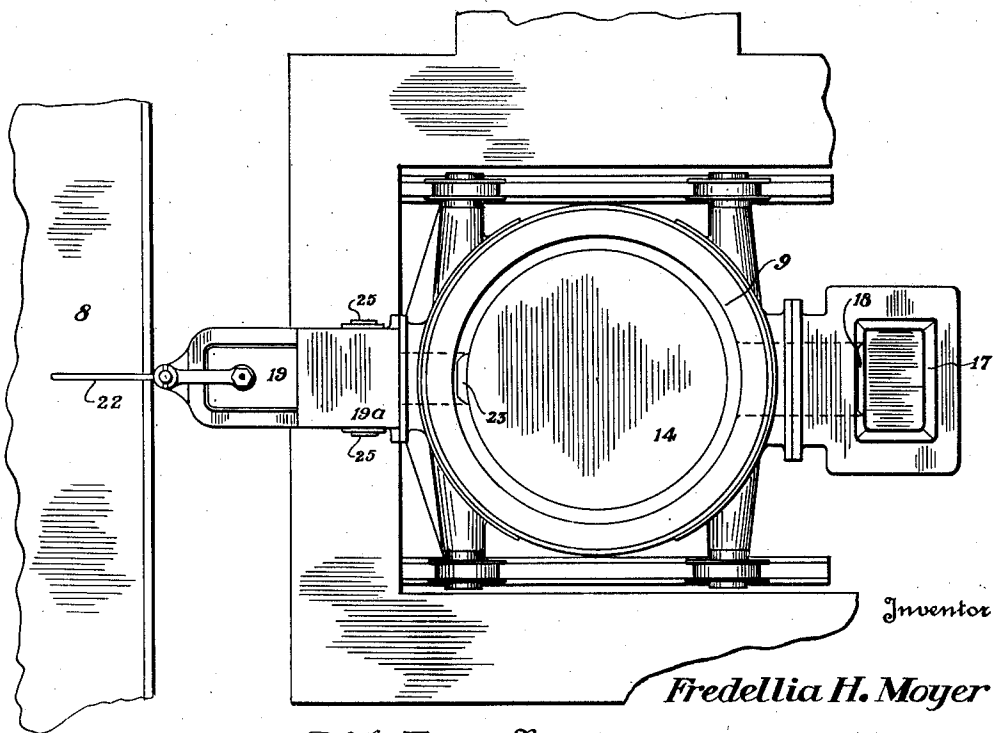
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Inventor

Fredellia H. Moyer

By Trease and Bond
Attorneys

UNITED STATES PATENT OFFICE.

FREDELLIA H. MOYER, OF CANTON, OHIO.

STEEL-POURING DEVICE.

Application filed August 17, 1926. Serial No. 129,806.

The invention relates to devices for pouring steel and the like from the ladle to the ingot molds and more particularly to a device of this character designed for the purpose of cutting down the stream velocity of the metal leaving the ladle, removing slag and gas therefrom, and pouring clean steel into the mold at minimum velocity and with minimum agitation.

It is present practice in pouring steel or other molten metals into molds to either pour the metal direct from the ladle nozzle into the mold, or to pour it through some kind of a pouring box placed between the ladle and mold for the purpose of breaking up or retarding the stream velocity as it enters the mold.

As in the first instance, where the pouring box is not used, the high velocity of the stream of molten metal causes it to splash when it contacts with the bottom of the mold, and as the mold is filled, gas, air which is entrained, and slag are forced into the steel, part of the same remaining in the ingot as it freezes.

A further disadvantage of this method of pouring is that the molten metal which splashes, as it strikes the bottom of the mold, is thrown against the side walls of the mold, adhering thereto and forming scabs or surface defects in the surface of the ingot being poured.

As above mentioned, in order to reduce this stream velocity of the molten metal entering the mold, pouring boxes of various types have been used, whereby the depth of the metal is much reduced and thus a much lower stream velocity may be maintained resulting in less splash and in less beating in of gases and slag into the molten steel in the mold.

Such pouring boxes, however, are extremely small in volume compared with the volume of steel which is to pass therethrough in a given time, and furthermore no means have been provided in these boxes for the elimination of gases and slag or for the prevention of the churning effect on the steel, slag and gas, due to the velocity of the incoming molten metal; these boxes being formed of a single compartment in which all of the molten metal, slag and gas is agitated as it is received into the box and poured therefrom.

Owing to the small volume of such pouring boxes it is practically impossible to maintain a constant flow of metal into and out of the

box as is required in good pouring practice. Neither is it possible to quiet the metal down during its passage through the pouring box to the mold. Thus the elimination of gas and slag from the steel is not accomplished with such pouring boxes.

The improved pouring device to which this invention pertains may be used to receive the molten metal from the ladle into which the metal has been tapped directly from the furnace through the usual tapping spout, or it may be used in conjunction with the improved slag and gas eliminator disclosed in my application for Letters Patent executed June 21, 1926, Serial No. 124,609, in which latter case the results obtained will give much cleaner steel than the old method of running slag and steel directly into the ladle.

The object of the present improvement is to provide a steel pouring device which will overcome the above mentioned objections present in the ordinary method of pouring steel.

The above and other objects may be attained by providing a vessel having a plurality of communicating compartments, which may comprise a receiving compartment; a comparatively large reservoir communicating therewith at points spaced from the bottoms of both of said compartments and a pouring compartment communicating at its lower portion with the lower portion of the reservoir.

An embodiment of the invention thus set forth in general terms is illustrated in the accompanying drawings, in which

Figure 1 is a longitudinal sectional view of the improved pouring device showing the same mounted in position to receive molten metal from the ladle and pour the same into an ingot mold;

Fig. 2, a sectional elevation on the line 2—2, Fig. 1;

Fig. 3, a plan view of the same, and

Fig. 4, a section on the line 4—4, Fig. 1.

Similar numerals of reference indicate corresponding parts throughout the drawings.

A ladle of any suitable and well known design, for receiving molten metal from an open hearth or electric furnace, is indicated generally at 1 and provided with the usual nozzle 2, through which the molten metal is poured, the stopper 3 being provided for shutting off the nozzle when desired.

This ladle is arranged to be supported at a

suitable height, by means of cables 4 or the like suspended from a crane whereby the ladle may be moved to a position adjacent to the furnace to receive the molten metal and then moved into position for pouring.

An ingot mold of usual design is shown at 5, being carried by a car 6 mounted upon the tracks 7 located adjacent to the usual pouring platform 8.

The improved pouring device to which the invention pertains comprises the vessel or container indicated generally at 9 and comprising a steel shell 10 lined with suitable refractory material as shown at 11 and carried upon a car 12 mounted on the tracks 13 located parallel to the tracks 7 upon which the mold cars are mounted.

This vessel comprises the large central reservoir 14 covered as by the lid 15 which is provided with a central opening 16 through which the gas may escape.

The receiving compartment 17 communicates with one side of the central reservoir through the wide neck 18 communicating with both of said compartments at points spaced above the bottoms thereof.

The pouring compartment 19 may be closed upon its top by a cover 19^a and is provided with a pouring nozzle 20 controlled by the stopper 21 arranged to be operated by a lever 22 extended across the pouring platform 8 in position to be easily operated by a workman upon said platform.

The lower portion of this pouring compartment communicates with the lower portion of the reservoir through the reduced opening 23, thus permitting the molten metal from the bottom of the reservoir to constantly run into the pouring compartment.

The receiving compartment 17 is of sufficient volume to receive and break the velocity head of the molten metal received from the nozzle of the ladle, the splash and churning or boiling action of the ladle stream being absorbed in this compartment.

When the receiving compartment is filled to the overflow level the molten metal passes into the reservoir in a thin sheet and at a very much reduced velocity due to the wide neck or opening 18.

The metal passes quietly into the reservoir 14 which is of relatively large area and shallow depth which tends to still further retard the action of the molten mass of metal. During the time that this reservoir is being filled the stopper 21 in the pouring or teeming compartment is closed, permitting the incoming molten metal to rise, in both the reservoir and the pouring compartment, to the desired level, preferably two or three inches above the bottom of the neck 18 between the receiving box or compartment and the reservoir.

During this period of filling of the reservoir and pouring trough or compartment, gases and slag will rise to the surface in both

the reservoir and pouring compartment until the metal rises above the opening 23, after which the slag will be retained on the surface of the reservoir only, excepting such slag which has already passed into the pouring trough and has formed a blanket on the top of the metal therein.

Both the reservoir and the pouring compartment may be provided with gas inlets 25 for the purpose of introducing natural gas or other suitable agent to form a non-oxidizing atmosphere over all exposed surfaces. As the level of the molten mass is below the top of the opening 18 the receiving box 17 will also receive the benefit of this non-oxidizing medium and in order to conserve heat of the metal and prevent oxidizing, a cover may be provided for the receiving box also.

As is well known it is the present practice to hold the molten steel in the ladle for eight or ten minutes before pouring, thus the above filling operation does not cause any loss of time and the cleansing action obtained thereby is most effective because of the method of releasing the gas and floating the slag to the surface as above described.

After the reservoir and pouring compartment have been filled to the desired level, above mentioned, the stopper 21 is opened and the teeming of the metal into the molds proceeds in the ordinary manner.

It will be seen that no further slag can enter the pouring trough from the reservoir, all metal passing through the teeming nozzle 20 being free of slag and gas.

It should, of course, be understood that it will be necessary to watch the last ingots being poured as is now the practice in pouring direct from the ladle, and when the slag remaining in the reservoir starts to pass to the pouring trough the stopper 21 must be lowered to cut off the stream to the mold and the slag must then be drained into a suitable slag pot or the like as in ordinary practice.

This device is especially adapted for use in the making of steels where internal and surface cleanliness are of the highest importance; and it will not only improve the above qualities but will also materially increase the yield over present practice, due to the elimination of gases and slag from the steel, the uniformity of pouring and the minimizing of the splash and churning of the steel in the molds.

This method of pouring steel will be effective for sheet bars in the minimizing of the cause of blisters in the finished sheets, and in steels known to the trade as high grade steels for forging and other uses where a clean steel is required.

Not only are these advantages obtained but the lining of the reservoir should last many times the regular life of the ladle lining, since it will not receive the scouring action from the steel, to which the ladle lining is

subjected when receiving a heat of steel direct from the furnace.

The receiving and pouring compartments are shown detachable from the reservoir, permitting them to be removed and patched or renewed when necessary without disturbing the reservoir which may be lifted to the ground for relining when necessary.

Although hot tops may be used upon the mold, as illustrated in the drawings, it should be understood that these may be eliminated if desirable, a very good quality of ingot being produced in the mold by this pouring method, without the use of the hot tops.

As illustrated in the drawings, the above described device is mounted upon traveling mechanism arranged to travel parallel with the molds, and designed to be raised or lowered to accommodate the height of the molds and to be moved laterally to locate the center of the mold.

Although the accompanying drawings illustrate the pouring vessel as comprising three communicating compartments, it should be understood that the objects of the invention may be accomplished by providing only two compartments or by providing a single elongated compartment adapted to receive the stream from the ladle at one end and provided with a pouring nozzle at its other end, the vessel being designed to quiet the molten metal and permit degasification before the same is poured to the molds.

It is also pointed out that if desired the vessel may be provided with two pouring nozzles arranged to simultaneously pour ingots into two molds at the same time.

The method of pouring steel disclosed in this application is described and claimed in applicant's copending application filed August 20, 1926, Serial No. 130,517.

I claim:

1. A pouring device including a vessel comprising a receiving compartment, a reservoir of greater capacity when the receiving compartment communicating therewith, and a pouring compartment of less capacity than the reservoir communicating with the reservoir.

2. A pouring device including a vessel comprising a receiving compartment, a reservoir of greater capacity than the receiving compartment communicating therewith through a wide neck, and a pouring compartment of less capacity than the reservoir communicating with the reservoir.

3. A pouring device including a vessel comprising a receiving compartment, a reservoir communicating therewith at points spaced above the bottoms of both compartments, and a pouring compartment communicating with the reservoir.

4. A pouring device including a vessel comprising a receiving compartment, a reservoir communicating therewith and a pouring com-

partment communicating at its lower end with the lower end of the reservoir.

5. A pouring device including a vessel comprising a receiving compartment, a reservoir communicating therewith through a wide neck, and a pouring compartment communicating at its lower portion with the lower portion of the reservoir.

6. A pouring device including a vessel comprising a receiving compartment, a reservoir communicating therewith at points spaced above the bottoms of both compartments, and a pouring compartment communicating at its lower portion with the lower portion of the reservoir.

7. A pouring device including a vessel comprising a receiving compartment, a reservoir communicating therewith through a wide neck spaced above the bottoms of both compartments, and a pouring compartment communicating with the reservoir.

8. A pouring device including a vessel, comprising a receiving compartment, a reservoir communicating therewith through a wide neck spaced above the bottoms of both compartments, and a pouring compartment communicating at its lower portion with the lower portion of the reservoir.

9. A pouring device including a vessel comprising a receiving compartment, a relatively large reservoir communicating therewith at points spaced above the bottoms of both compartments through a wide neck, a pouring compartment communicating at its lower portion with the lower portion of the reservoir and means for maintaining a non-oxidizing atmosphere within said vessel.

10. A pouring device including a vessel comprising a receiving compartment, a covered reservoir communicating therewith at points spaced above the bottoms of both compartments and a pouring compartment communicating at its lower portion with the lower portion of the reservoir.

11. A pouring device including a vessel comprising a receiving compartment, a covered reservoir communicating therewith at points spaced above the bottoms of both compartments, a pouring compartment communicating at its lower portion with the lower portion of the reservoir and means for permitting the escape of gases from the reservoir.

12. A pouring device including a vessel comprising a receiving compartment, a covered reservoir communicating therewith at points spaced above the bottoms of both compartments, a pouring compartment communicating at its lower portion with the lower portion of the reservoir and means for maintaining a non-oxidizing atmosphere in the vessel.

In testimony that I claim the above, I have hereunto subscribed my name.

FREDELLIA H. MOYER.