G. K. HOOPER.

DUPLEX SPOUT FOR FURNACES.

APPLICATION FILED DEC. 1, 1910.

**1,016,013.** Patented Jan. 30, 1912.

Fig. 1.

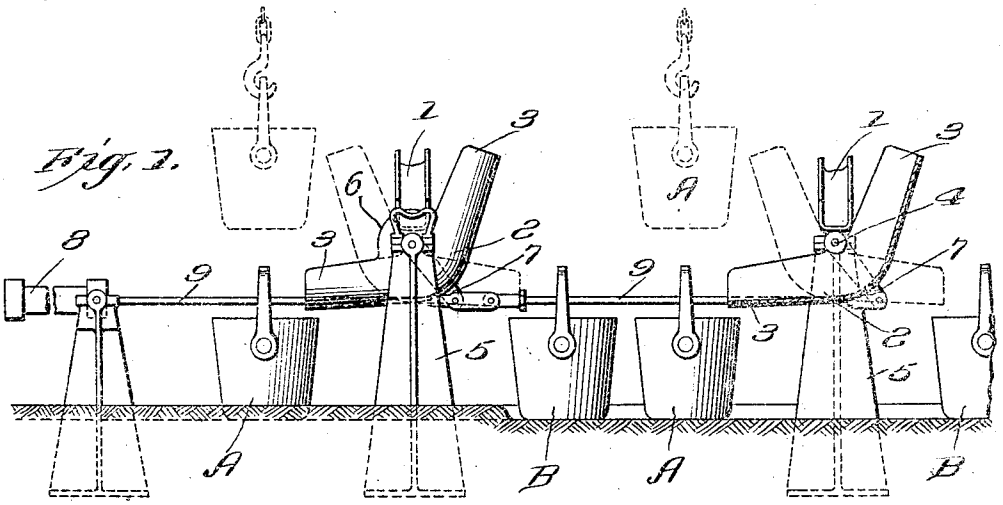



Fig. 2.

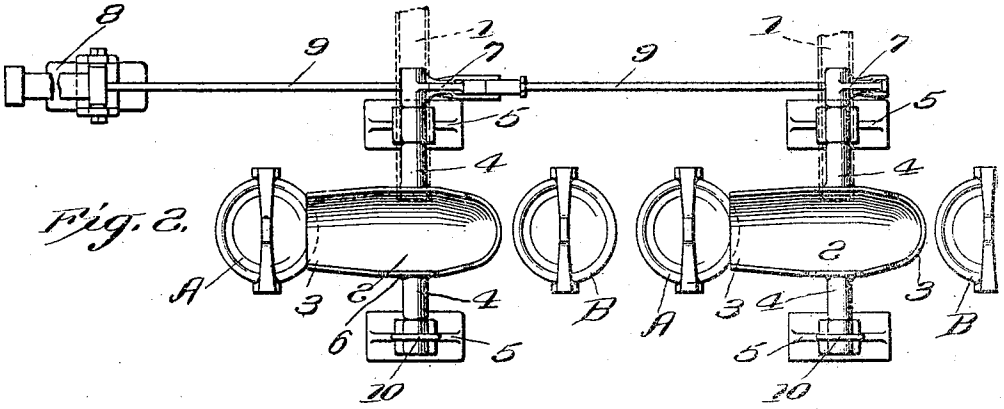
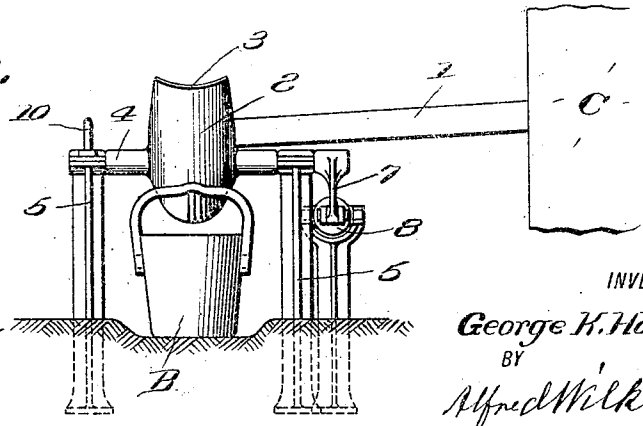



Fig. 3.




WITNESSES

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## DUPLEX SPOUT FOR FURNACES.

1,016,013. Specification of Letters Patent. Patented Jan. 30, 1912.

Application filed December 1, 1910. Serial No. 595,129.

*To all whom it may concern:*

Be it known that I, GEORGE K. HOOPER, a citizen of the United States, residing at Madison, in the county of Morris and State of New Jersey, have invented new and useful Improvements in Duplex Spouts for Furnaces, of which the following is a specification.

My invention relates to a reversible trough for drawing molten metal rapidly and continuously from the furnace without loss, or damage to the mechanism.

In the usual method of drawing molten metal from the furnace in which it is melted in quantities greater than ladles carried by hand can contain, it is customary to place the ladles by means of cars, or overhead handling appliances, under the end of the spout of the furnace when no metal is flowing therefrom, and then by suitable means to cause the molten metal to flow down the spout into the ladle until the latter is full when the flow is stopped, the first ladle removed and a second ladle substituted. The desirability has been recognized of drawing the fluid metal continuously and it has been sought to gain this end by means of movable spouts which could be moved to direct the stream of molten metal away from a filled ladle to an adjacent empty one. Movable spouts operating or swinging in a horizontal plane have been tried, but these are defective because in moving from one ladle to another much molten metal is spilled, involving a loss, as well as the annoyance of having the metal often lodge in the mechanism by which the larger ladles are operated, thus interfering seriously with their operation and damaging them, sometimes to the extent of rendering them useless.

It has become the modern practice, especially in melting iron for making "malleable" castings, to use furnaces of comparatively large capacity and to draw the molten metal from them by more than one spout; the most important reason for this is that it is essential to remove all of the molten metal as rapidly as possible, when the proper temperature and chemical composition are attained, to avoid both a loss in burning, through over-heating, and also to avoid a change in chemical composition. Also in operating plants in which such large furnaces are used, it is desirable to have the ladles accurately spaced to conform with the spacing of the spouts, that these ladles may be removed and replaced by one carrying apparatus.

My invention comprises a means for facilitating the above operations and preventing the losses above mentioned, permitting however the usual method of "stopping" and "tapping" the furnaces of whatever form they may be.

It is particularly adapted to be used as a supplementary device between the furnace and the ladle, so that when one ladle is filled, the trough may be shifted instantaneously without spilling any metal to deliver into a second ladle, while the first is being removed.

My invention will be understood by reference to the drawing herewith in which the reference numerals of this description indicate the corresponding parts in all the figures.

Figures 1, 2 and 3 are respectively a side elevation, plan and an end elevation showing my invention embodied in a pair of double nosed reversible or shifting troughs, arranged and connected to be operated simultaneously, in connection with two adjacent tapping spouts on one furnace. A single trough could be used with a single spout, or more than two troughs simultaneously, but the latter arrangement would be seldom desirable.

First to describe the mechanism of each trough and then the means by which two or more are connected to be operated together: In the figures, 1 indicates the spout, from the cupola C, or other furnace, to conduct the molten metal to the reversible rocking trough 2, having the similar delivery ends 3 3 and journaled on trunnions 4 4 in suitable standards 5 5, so as to be tilted in one direction or the other to deliver the molten metal into the ladles A or B on one side or the other. As will be seen, the delivery ends

of each trough the arranged at such an angle to each other that when one is depressed the other is sufficiently elevated, so that all the metal will flow out of the depressed end, and the elevation of the other end will permit the previously filled ladles to be removed and an empty one substituted desirably by means of overhead cranes or travelers, without the spill and drip usual to the "stopping off" or "shifting" of ladles already referred to. The angle between the two noses should approach 90° and should not be greater than about 135° to 140°. The form shown with an angle of about 110° to 120° is desirable.

6 is a shield on the side of the trough opposite the spout end to prevent any possible splashing over of metal.

One of the trunnions or axles is provided with a crank 7, and where two or more tilting troughs are arranged adjacent, the cranks are connected together and to a motor 8 or other source of power by connecting rods 9, whereby all the troughs may be shifted simultaneously.

By my special form of tilting trough or spout constructed as shown and adapted to be arranged in two positions and to be quickly and positively shifted from one position to the other, when the ladle is full, I am enabled to withdraw the molten metal very quickly from the reverberatory or other furnace when it has reached the proper temperature, so as not to expose it too long to the heat with danger of burning. When ladle A is filled, the trough or series of troughs are quickly tilted to deliver into ladle B while ladle A is being removed and emptied and brought back for re-filling. Thus, the furnace may be emptied entirely or partially so far as may be desirable without interruption and very fast. Such rapid handling is effected without any spill or drip. The shifting of the trough to deliver into ladle B and the removal of the first filled ladle by an overhead carrier is indicated by dotted lines in Fig. 1.

A bar rest 10 is provided for the bar used in stopping the tap-holes of reverberatory furnaces.

Having described my invention, I claim,

1. In a mechanism for delivering molten metal from a furnace to the ladle, the combination with a suitable standard, of a double nosed delivery trough journaled in the standard, said trough consisting of two delivery ends oppositely extending in the same vertical plane and arranged at an angle of not more than about 140° and more than 90° to each other and of means to rock the trough from one to the other of two positions, whereby one end of the trough is inclined downwardly to deliver all the metal and the other end is inclined upwardly at a sharp angle to prevent the metal flowing out in the reverse direction and to permit lifting of the ladles past the trough.

2. In a rocking trough mechanism for delivering molten metal from the furnace to oppositely arranged ladles, the combination with a suitable standard, of a delivery trough journaled thereon and having delivery ends oppositely extending and arranged at such an angle to each other that when one end is inclined downwardly to deliver the metal, the other end will be inclined upwardly to prevent the flow of the metal, said trough being formed on its central front portion to provide a shield for the metal entering from the rear and a stop bar rest secured on the standard forwardly of the baffle, and means to rock the trough.

3. In an apparatus for the delivery of molten metal from furnaces, the combination with a furnace having a plurality of outlets, of a plurality of suitable standards set adjacent to the respective outlets, delivery troughs journaled on the standards, said troughs each being provided with delivery ends oppositely extended and having continuous side walls on the sides to prevent the escape of the metal except through the ends, said troughs being arranged at such an angle to each other that when one end is in the first position inclined downwardly the other end will be inclined upwardly to prevent the metal flowing out from the opposite side, cranks on the trough journals, and a connection between said cranks to communicate the tilting of one trough to the other.

4. A rocking trough mechanism for delivering molten metal from a furnace to oppositely arranged ladles, comprising a suitable standard, a delivery trough journaled thereon and having delivery ends oppositely extending and arranged at such an angle to each other that when one end is inclined downwardly to deliver the metal from said end the other end will be inclined upwardly to prevent the flow of the metal from said second end, means disconnected from the trough to deliver the molten metal into the trough from one side and a shield on the trough on the opposite side to prevent splashing over of the metal being delivered to the trough.

5. A rocking trough mechanism for delivering molten metal from a furnace to oppositely arranged ladles, comprising a suitable standard, a delivery trough journaled thereon and having delivery ends oppositely extending and arranged at such an angle to each other that, when one end is inclined downwardly to deliver the metal from said end, the other end will be inclined upwardly to prevent the flow of the metal from said second end, said trough being provided with practically parallel, continuous side walls

extending unbroken from end to end to prevent the escape of metal except through the ends, and a spout disconnected from the trough to deliver the molten metal into the trough over one of the continuous side walls, intermediate of the ends, substantially as described and shown.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE K. HOOPER.

Witnesses:
J. R. MILLWARD,
M. L. BRESLIN.