June 9, 1959 C. C. GRIFFITHS 2,889,597

FOUNDRY LADLE TRANSFER CAR

Filed Jan. 18, 1957 4 Sheets-Sheet 1

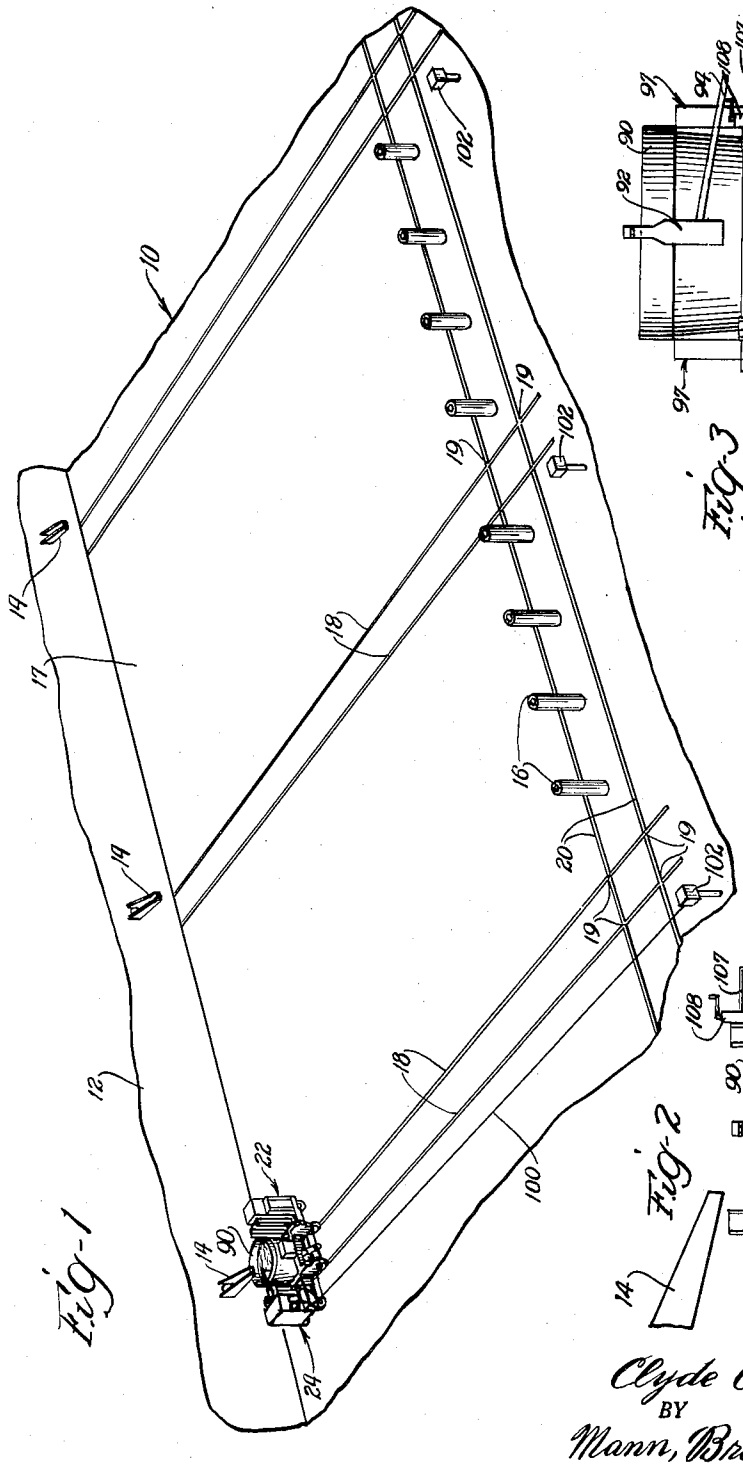


Fig. 1

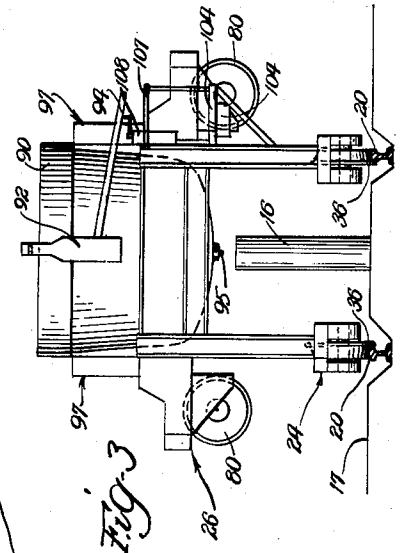


Fig. 3

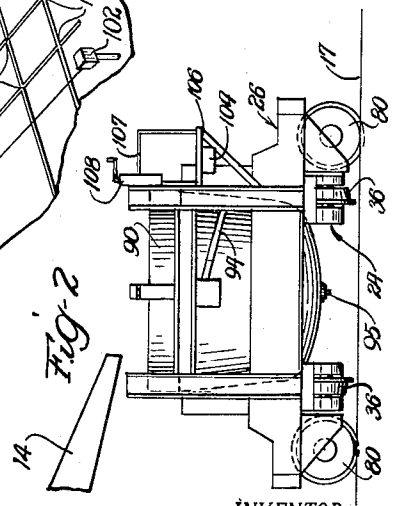


Fig. 2

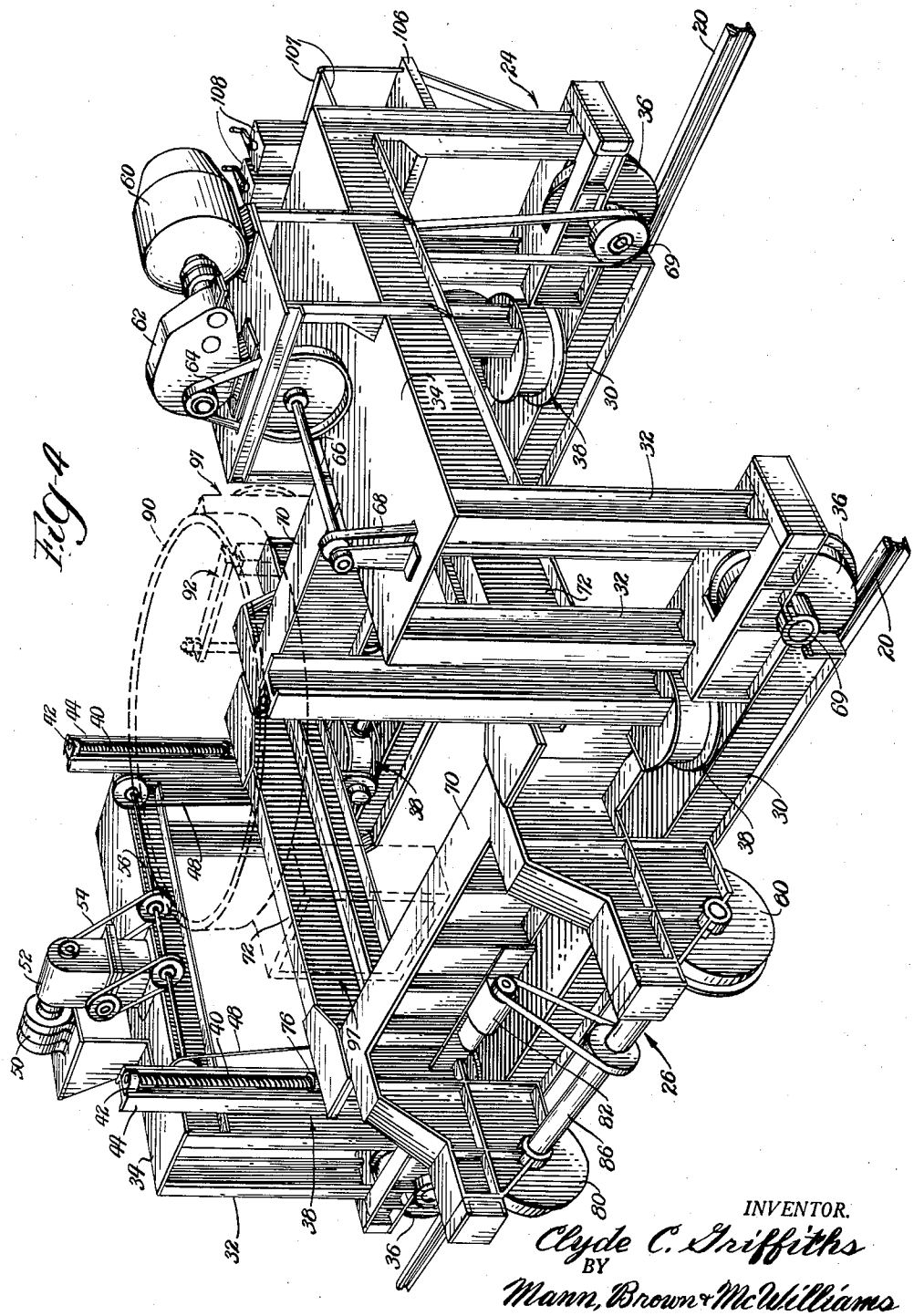
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FOUNDRY LADLE TRANSFER CAR

Filed Jan. 18, 1957 4 Sheets-Sheet 2

Fig. 4



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FOUNDRY LADLE TRANSFER CAR

Filed Jan. 18, 1957 4 Sheets-Sheet 3

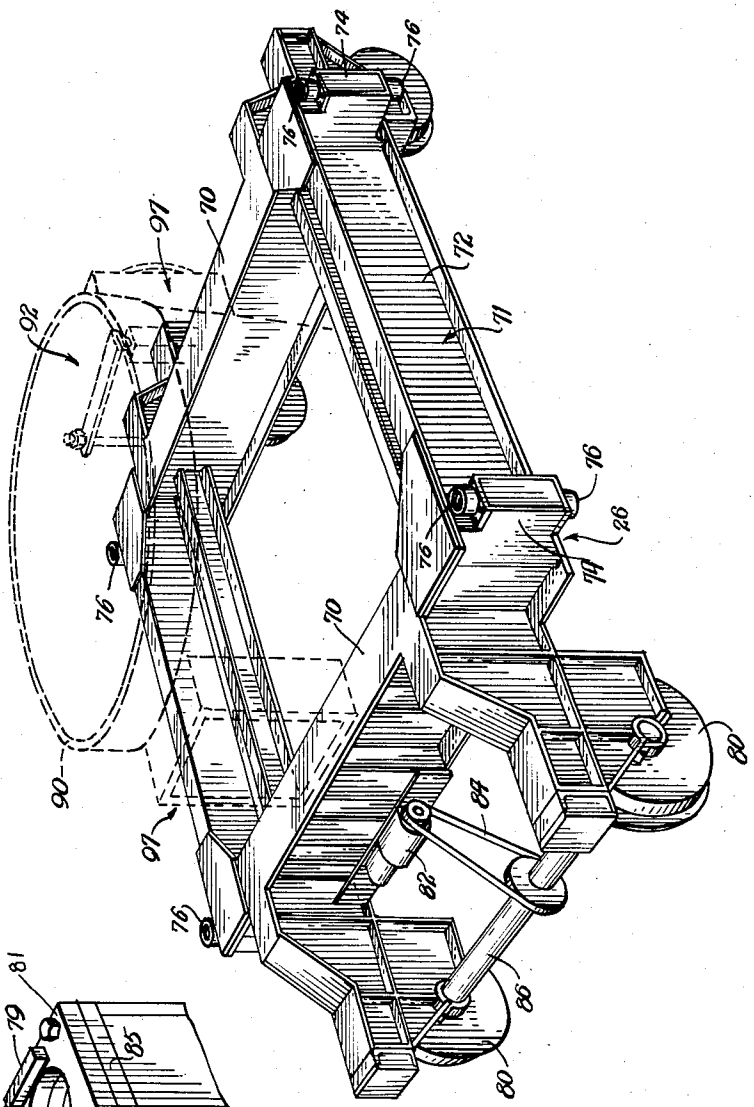


Fig. 5

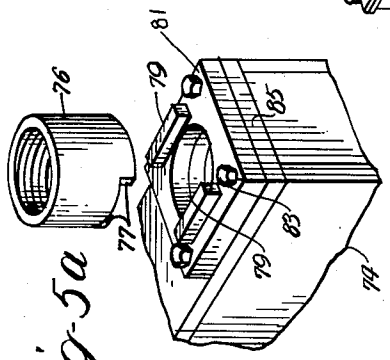


Fig. 5a

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FOUNDRY LADLE TRANSFER CAR

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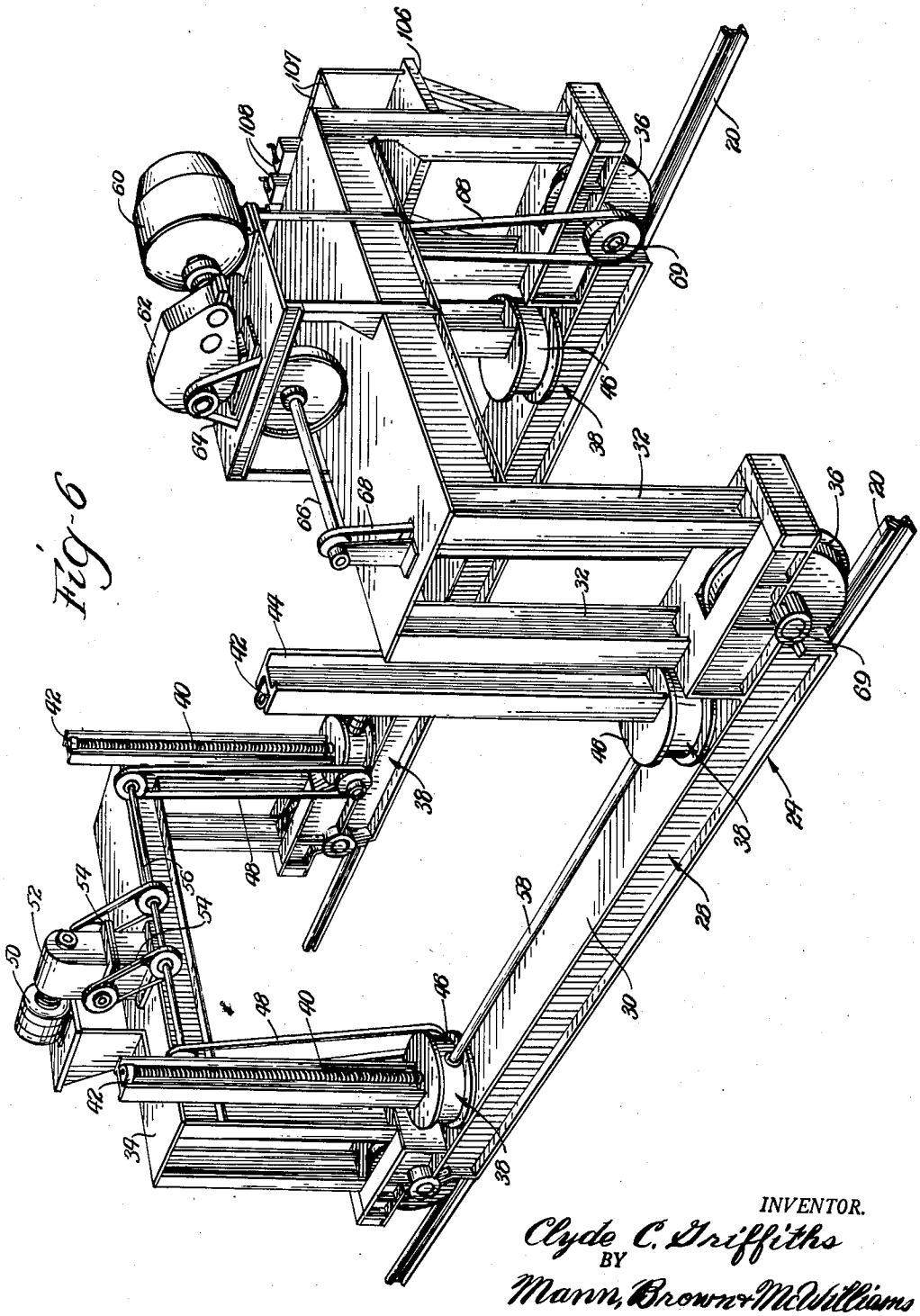


Fig. 6

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FOUNDRY LADLE TRANSFER CAR

Clyde C. Griffiths, Harvey, Ill., assignor to Whiting Corporation, a corporation of Illinois

Application January 18, 1957, Serial No. 634,956

5 Claims. (Cl. 22—82)

My invention relates to a foundry arrangement and ladle transfer car therefor, and more particularly, to a foundry arrangement for pouring ingots in which the molten material is carried in a ladle that is supported on the floor of the foundry during its transfer between the furnace tap and the ingot molds.

Ingots are conventionally poured from a ladle supported by an overhead crane that transfers the ladle and its charge of molten material between the furnace tap and the mold. An inherent defect in this type of arrangement is that the ladle tends to swing during its movement between the furnace tap and the mold, as well as on starting and stopping of this movement, and its great pendantly mounted bulk makes it difficult to stabilize at its material receiving and pouring positions.

The principal object of my invention is to provide a practical and safe apparatus and method for transferring molten material between a furnace tap and a mold.

Another principal object of my invention is to replace the conventional overhead crane type of foundry arrangement with a more stabilized and a more easily handled arrangement.

A further object of the invention is to provide a ladle transfer car that will transfer molten material between a furnace tap and a mold positioned at different elevations.

Still a further object of the invention is to provide a ladle transfer car that may be operated on both of two intersecting tracks.

Yet a further object of the invention is to provide a ladle transfer car that is economical of manufacture, convenient in use, and readily adapted for application to the industrial operations of the type for which it is designed.

Other objects, uses, and advantages will be obvious or become apparent from a consideration of the following detailed description and the application drawings.

In the drawings:

Figure 1 is a diagrammatic perspective view illustrating a foundry arrangement in accordance with the principles of my invention;

Figure 2 is a diagrammatic side elevational view of the ladle transfer car shown in Figure 1;

Figure 3 is a view similar to that of Figure 2 illustrating the ladle car in pouring position over one of the molds shown in Figure 1;

Figure 4 is a perspective view of the ladle transfer car shown in Figures 1 through 3 on an enlarged scale;

Figure 5 is a perspective view of the ladle supporting frame or truck forming a part of the ladle transfer car;

Figure 5*a* is a perspective view of a portion of the hoisting mechanism shown in Figure 5; and

Figure 6 is a perspective view of the hoisting apparatus support truck forming a part of the ladle transfer car.

Referring first to Figure 1 of the drawings, reference numeral **10** generally indicates a foundry arrangement in accordance with the principles of my invention employing a wall **12** behind which (in the illustrated embodiment) furnaces of the open hearth type (and of any desired structural arrangement) are installed which supply molten material to taps **14** that are only diagrammatically illustrated since they may be of any conventional design. The taps **14** and furnaces are preferably arranged in a row containing any desired number thereof. A plurality of conventional cast iron ingot molds **16** are arranged in a row on the foundry floor **17** in front of the furnace taps **14** and preferably the row of molds is substantially parallel to the row of furnace taps.

Conventional track rails **18** extend from a point under each furnace tap **14** to the row of molds **16** where they intersect track rails **20** that in the illustrated embodiment are positioned on either side of the row of molds. Conventional crossing frogs are applied where the track rails **18** and **20** intersect at **19**.

In accordance with my invention, a specially designed ladle transfer car **22** conveys the molten material from the furnace taps **14** to the individual molds **16**. And since the taps **14** and molds **16** ordinarily are at different elevations, the ladle transfer car also lifts the ladle from its material receiving position shown in Figure 2 to its pouring position shown in Figure 3.

Referring to Figure 4, ladle transfer car **22** generally comprises a car truck **24**, comprising what may be regarded as a lower truck framework, which carries a ladle supporting frame or truck **26**, comprising what may be called an upper truck framework. As shown in Figure 6, the lower truck framework **24** may comprise an appropriate structure **28**, which is only diagrammatically illustrated, including side members **30**, end uprights **32**, end platforms **34**, and rotatably mounted flanged wheels **36**. The rigidly connected uprights **32** and platforms **34** constitute upstanding inverted U-shaped yoke members which rigidly connect the two side members **30** adjacent the ends thereof. The truck **24** has secured thereon in any suitable manner screw type hoisting or lifting jacks **38** that may be of any conventional design. In the illustrated embodiment, they comprise screws **40** extending between bearings **42**, mounted at the tops of upright beams **44**, and gear boxes **46** through which power is transmitted to screws **40** from belts or chains **48** powered by an appropriate motor **50** through suitable gear reducer **52**, belts or chains **54**, and shaft **56**. Longitudinally extending drive shafts **58** interconnect the gear boxes **46** on each side of the truck **24**, which makes it possible to drive all of the screws from a single motor **50** mounted on a platform **34** at one end of the car. Gear box **46** and the gearing thereof may be of any appropriate conventional design, so further illustration thereof is omitted.

The truck **24** is driven by a motor **60** through a suitable gear reducer **62**, belt or chain **64**, shaft **66**, and belts or chains **68** that drive shafts **69** to which two wheels **36** are keyed. The motor **60** and its associated devices, such as the gear reducer **62**, are preferably mounted on the other platform **34**.

As shown in Figure 5, the ladle supporting frame or truck **26**, referred to in the claims as the upper framework, comprises a suitable generally rectangular struc-

ture 71 including lifting beams 70 connected at their ends by appropriate cross beams 72. The lifting beams 70 in the illustrated embodiment at their ends include projections 74 on the tops and bottoms of which are mounted jack nuts 76 that engage the screws of jacks 38. As shown in Figure 5a, nuts 76 are formed with teeth 77 that interlock with teeth 79 fixed to a plate 81 that is in turn fixed to projections 74 in any suitable manner, as by bolts 83 received in plate 85 welded or otherwise fixed to projections 74. It is to be understood, however, that this structural arrangement is shown for illustrative purposes only, and other conventional screw actuated devices of appropriate design may be employed.

The truck 26 includes flanged wheels 80 rotatably mounted to the truck frame in any suitable manner. The wheels 80 at one end of the frame are driven by an appropriate motor 82 through belt or chain 84 trained over wheel shaft 86 to which two of the wheels 80 are keyed.

As indicated in dotted lines in Figures 4 and 5, a ladle 90 is mounted on the frame or truck 26. The ladle 90 is preferably of the bottom tap type, and is shown only in dotted lines since it may be any conventional model. The ladles of the type illustrated ordinarily include a bottom tap rig generally indicated at 92, which conventionally includes a hand operated lever 94 (see Figures 2 and 3) that actuates the rig to tap the ladle. The molten material carried by the ladle leaves the ladle through a nozzle 95 (see Figure 3). Ladle tapping mechanisms of this type are well known in the art, so no further description is considered necessary. Moreover, the manner in which the ladle 90 is secured to frame or truck 26 is not critical, as any suitable mounting may be employed, so a detailed description of this structure, aside from the diagrammatic showing, generally indicated by reference numerals 97, is also omitted.

As shown in Figure 4, the ladle supporting frame or upper truck framework 26 is mounted on the lower truck framework 24 and extends across and beyond it. Jack nuts 76 are received on screws 40, and when screws 40 are turned in the appropriate direction, truck or frame 26 is raised or lowered with respect to the foundry floor. The trucks 24 and 26 are so proportioned that when the frame or truck 26 is lowered to a position of minimum elevation, or a position in which the trucks are in vertical juxtaposition, the rail wheels of the truck 26 will lift the car off of the tracks that the rail wheels of the truck 24 engage. These different positions are shown in Figures 2 and 3.

Referring now to Figure 1, the foundry arrangement 10 is preferably operated in the following manner. The ladle transfer car is positioned so that the wheels 80 of ladle support frame or truck 26 engage track rails 18. This insures that the ladle will be in its lowermost position when it is disposed underneath furnace tap 14. After the furnace has been tapped, the car 22 proceeds to the row of molds 16 and the tracks 20. When the car 22 is correctly positioned over the tracks 20 so that the wheels 36 of truck 24 are vertically aligned with rails 20, the hoisting mechanisms 38 are actuated to lower the truck or frame 24 sufficiently to bring the wheels 36 of the truck 24 into engagement with track rails 20; continued operation of the hoisting mechanisms raises the frame 26 and its ladle 90 to the appropriate height so that the ladle will be positioned above and pass over molds 16. The transfer car 22 then is moved to a mold 16 on one side or the other of the track 18 from which the transfer car just left. When the car 22 is correctly spotted over a mold 16, lever 94 of the bottom tap rig is actuated to tap the ladle and fill the mold. The ladle transfer car then proceeds to the next mold until the ladle charge is exhausted.

In the illustrated embodiment, the motors 50, 60, and 82 are electrically operated. Electric energy is supplied to the car through an appropriate cable 100 that extends from a suitable electric outlet 102, where it is plugged in by an appropriate disconnectable connector, to a spring biased reel 104 secured in a suitable manner to the car 22. In the illustrated embodiment, the reel 104 is mounted underneath the operator's platform 106 of the car (platform 106 may include guard rails 107). The conduit 100 is appropriately electrically connected to appropriate motor controls 108 mounted within reach of the operator, which are in turn electrically connected to motors 50, 60, and 82. As the car 22 moves back and forth on the rails 18, the conduit 100 is drawn from the reel 104 or is wound up by it as the case may be. When the car 22 moves down the row of molds 16 to the next set of rails 18, the conduit 100 is connected to the adjacent electrical outlet 102.

Though electric motivation and controls are illustrated, it will be appreciated that other types of power units and controls may be employed as will be necessary or desirable in a particular installation.

I contemplate that appropriate shields may be provided for the motors and operator, though these are omitted for clarity of illustration.

One of the principal advantages of my invention is that it eliminates the overhead crane type of arrangement which, as indicated hereinbefore, is inherently difficult to operate safely due to the extreme weight of the ladle and its load and the tendency of the ladle to swing during movement or upon stopping or starting of movement. In employing my invention, the ladle is kept relatively close to the foundry floor and is inherently much more stable since swinging of the load as a whole is precluded. In accordance with my invention, the molten material is transferred from the tap to the mold while being supported on the foundry floor.

The foregoing description and the drawings are given merely to explain and illustrate my invention and the manner in which it may be performed, and the invention is not to be limited thereto, except in so far as the appended claims are so limited, since those skilled in the art who have my disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

I claim:

1. A ladle transfer car for conveying molten material from a furnace tap successively to molds spaced from the tap and aligned in a row extending generally normal to the movement of the car between the tap and the molds, said car comprising a lower truck framework including a pair of spaced parallel side members having at their opposite ends a pair of upstanding inverted U-shaped yoke members connecting the two side members and having adjacent each end of each side member an upright jack and a supporting wheel rotatable in a vertical plane parallel to said row, in combination with an upper truck framework of generally open horizontal rectangular shape extending across the lower truck framework having an upright ladle of the bottom tap type mounted in its center and having a pair of supporting wheels extending out beyond each of the side members of the lower truck framework and mounted for rotation in vertical planes normal to the planes of the first named wheels and having means engaging each of said jacks for operation thereby to raise the upper truck framework, from a lowermost position in which the wheels of the lower truck framework are elevated, to an uppermost position in which the yoke members of the lower truck framework straddle the row of molds and the ladle surmounts the molds successively for discharging its contents into them.

2. A ladle transfer car as claimed in claim 1 in which each of said jacks is a rotatable screw and the means engaging each jack is a nut threaded on said screw.

3. A ladle transfer car as claimed in claim 1 in which a motor for driving the supporting wheels of the lower

truck framework is mounted on the horizontal portion of one of the yoke members of said framework.

4. A ladle transfer car as claimed in claim 1 in which each of said jacks is a rotatable screw and the means engaging each jack is a nut threaded on said screw and a motor for driving said jacks is mounted on the horizontal portion of one of the yoke members of the lower truck framework.

5. A ladle transfer car as claimed in claim 1 in which each of said jacks is a rotatable screw and the means engaging each jack is a nut threaded on said screw, a motor for driving said jacks is mounted on the horizontal portion of one of the yoke members of the lower truck framework, and a motor for driving the supporting wheels

of the lower truck framework is mounted on the horizontal portion of the other of said yoke members.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,889,597 June 9, 1959

Clyde C. Griffiths

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, lines 66 and 67, for "upper framework," read -- upper truck framework, --.

Signed and sealed this 8th day of December 1959.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents