May 21, 1940. J. D. PUGH 2,201,920

HOT METAL CAR

Original Filed Jan. 22, 1935 2 Sheets-Sheet 1

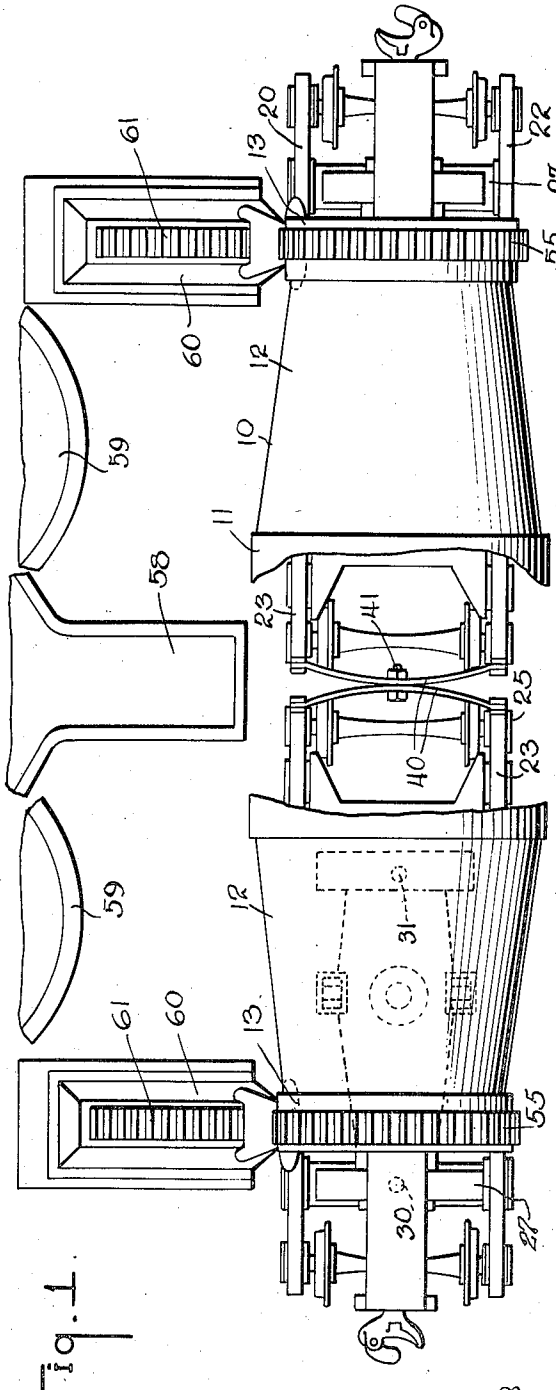


Fig. 1

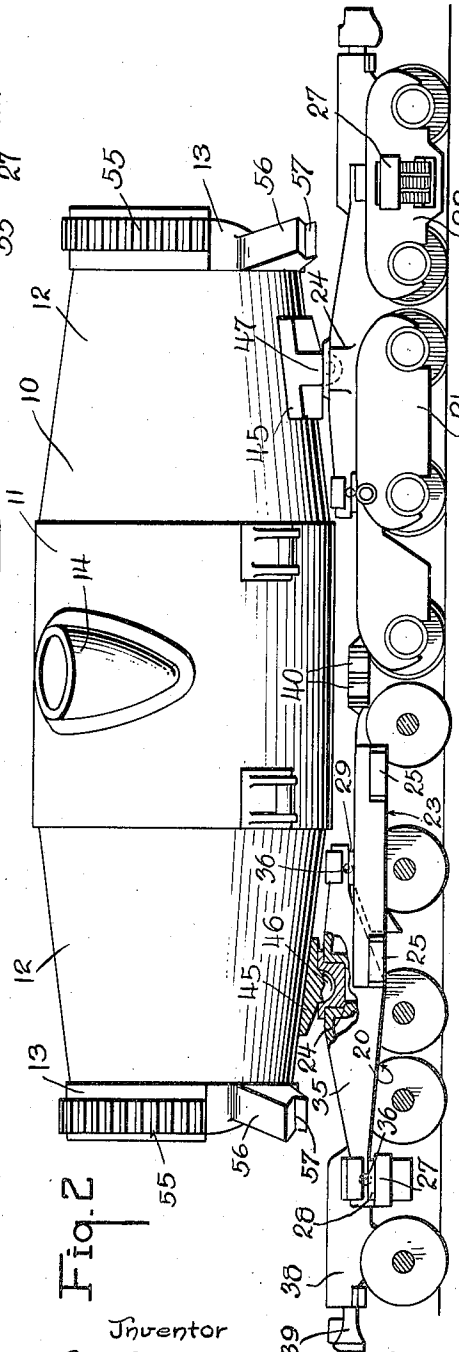


Fig. 2

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Fig. 3

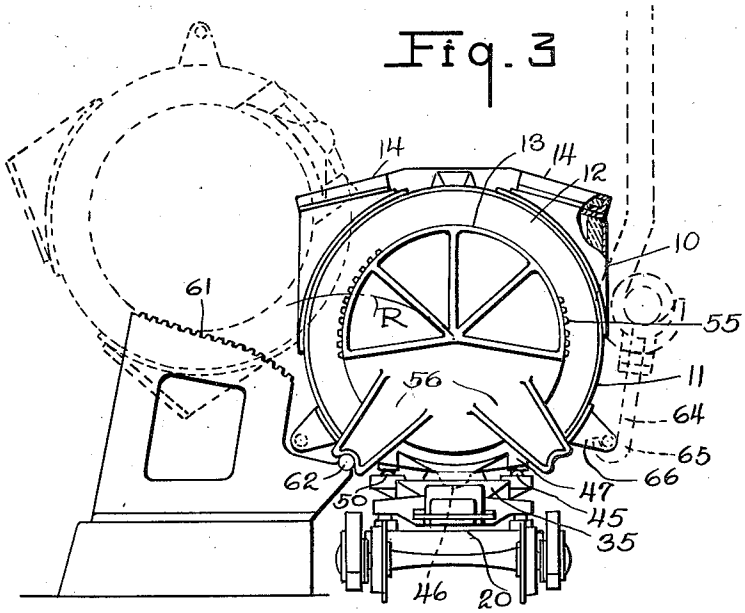


Fig. 7

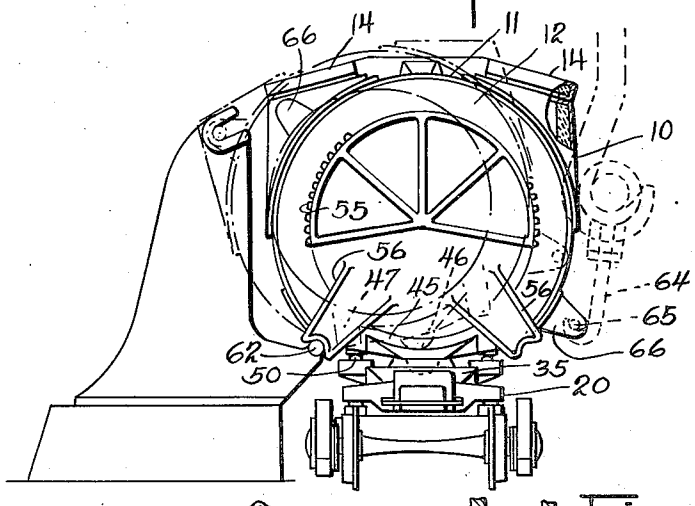


Fig. 4

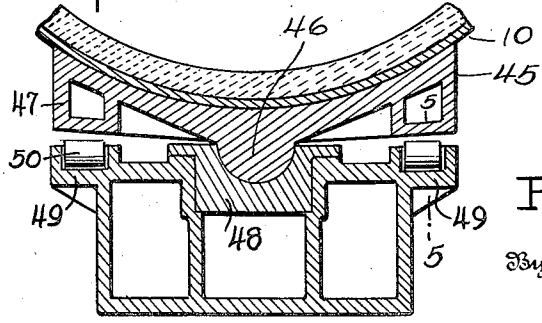


Fig. 5

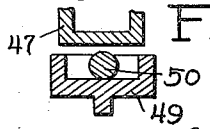
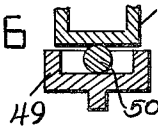


Fig. 6



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UNITED STATES PATENT OFFICE

2,201,920

HOT METAL CAR

John D. Pugh, Baltimore, Md.; Addie A. Pugh and F. Howard Smith, executors of said John D. Pugh, deceased, assignors to Addie A. Pugh, Baltimore, Md.

Original application January 22, 1935, Serial No. 2,955. Divided and this application December 9, 1936, Serial No. 115,009

4 Claims. (Cl. 214—64)

The present invention relates to mobile containers for molten materials, generally designated "hot metal cars" and this application comprises a division of my copending application Serial No. 2,955, filed January 22, 1935, now Patent No. 2,144,637.

Mobile containers of the type made use of in the transportation of molten materials such as iron and steel from a point of origin in a steel plant to one or more points of destination, are now well-known and widely used. Such containers of the larger capacities are generally mounted upon wheeled trucks for transportation along suitable trackways and are provided with heavy insulating linings. Molten material introduced into such a car will not lose its heat rapidly during transportation but will remain in molten condition for long periods of time so as to be fluid when the car reaches its destination or discharging point. In my prior Patent No. 1,251,283, issued December 25, 1917 is described a form of mobile container or hot metal car, and the present car, while generally similar in its broader aspects to that disclosed in the aforementioned patent, includes a number of novel features which make it more useful for certain purposes.

An object of the invention is to provide a hot metal car having a maximum capacity for a given overall length and height and which is so designed, and so supported, that its molten contents may be discharged in a novel manner, and by the use of novel and improved dumping or tilting means which is auxiliary to the container itself. Thus, in accordance with the present invention, the operator is enabled to discharge either the entire contents of the container by a continuous pouring operation, or any portion of such contents, the container being lifted bodily from its mobile supporting means and tilted or lowered upon auxiliary devices positioned adjacent the same, complete inversion of the container for cleaning purposes also being possible and the container being readily replaceable after such discharging operation, upon the mobile supporting means upon which it normally rests. In order that the container may be lifted bodily from its mobile support and manipulated for discharging purposes in the manner just described, the connections between the container and its supporting trucks are so designed that, while preventing relative bodily movement of the container for support in a horizontal plane under the influence of draft forces, disconnection of the container and supporting means is easily effected by the application of simple lifting forces to one side of the container body, and reconnection of the container to the mobile supports is automatically effected simply by the lowering of the container onto the supporting tracks.

In the various embodiments of the present invention selected for disclosure by way of example, the hot metal car as an entirety is so constructed as to be movable along the trackway to a point of discharge, at which point of discharge the container body is positioned directly opposite certain fulcrum or skid devices mounted alongside the trackway upon which the car moves. Such devices are mounted in fixed position so as to be engageable by certain cooperating means on the container when the container is manipulated for dumping purposes. Contact is made between the container and the fulcrum means about which it turns with the aid of a hook and cable depending from an overhead crane and in tilting or dumping movement the container body is moved along a curved path, upwardly and outwardly, until all portions thereof are entirely clear of the supporting trucks, the tilting movement of the container being continued to the desired extent. Any molten material or other substance which may be in the container is, of course, discharged when such tilting or inversion takes place and, if the container is completely inverted, its interior lining may be conveniently examined and cleaned if necessary.

To permit the elevation from and the return to the wheeled supporting trucks of the container body the connections between the container body and wheeled trucks are designed in a novel and improved manner, this novel connecting means being claimed in my copending application Serial No. 2,955 previously referred to. These connections readily permit the desired movements of the container body independently of its supporting means while at the same time permitting, when the container is positioned upon its supporting means, free swiveling movement of the supporting trucks relatively to the container body and at the same time transmitting all draft forces from the trucks to the container body and vice versa, any draft forces imposed upon the car passing through the container body, in every instance the car being unprovided with any continuous underframe, such as generally used in hot metal cars of previous types.

The several embodiments of the invention selected for disclosure by way of example are illustrated in the accompanying drawings in which:

Figure 1 is a plan view of a hot metal car em-

bodying the novel features of the invention, a portion of the container body being broken away to disclose certain features of the supporting trucks;

Figure 2 is a side elevation of the hot metal car, portion of one of the trucks being broken away to show the connecting means between container and truck;

Figure 3 is an end view of the car and one form of the fulcrum means for supporting the container during discharge;

Figure 4 is a transverse vertical section through a portion of the container and a portion of a supporting truck, showing the novel connecting means between container and truck;

Figure 5 is a detailed sectional view taken on line 5—5 of Figure 4;

Figure 6 is a similar section but taken through the corresponding parts located at the other end of the car, and

Figure 7 is a view generally similar to Figure 3, but illustrating a dumping or tilting stand of different construction.

The hot metal container illustrated in Figures 1 and 2 is of the large capacity type, being able to receive and store a body of molten iron or steel weighing in the neighborhood of two hundred tons. It will be appreciated, however, that the actual size and capacity of the container may be varied widely as desired and that the novel features of the invention may be made use of in hot metal cars of all capacities.

The container of the hot metal car illustrated in Figures 1 and 2 is generally indicated at 10 and its shape is that of a form of revolution, with horizontal axis. Preferably it embodies a central cylindrical portion 11 and two frusto conical end portions 12, rigidly attached to the central portion 11 and tapering toward the ends of the container body. The container ends 13 are conveniently formed as castings, rigidly secured to the outer ends of the frusto conical sections 12. The container is lined with suitable insulating material and is provided with charging and discharging spouts 14, through which molten metal or the like may be poured into the container and which permit the ready outflow of such material when the container is tilted.

The container body 10 is mounted directly upon supporting trucks 20, no interposed car platforms or underframes being employed. In cars of large size, such as illustrated in Figures 1 and 2, each of the trucks 20 may have ten supporting wheels and may advantageously comprise a properly equalized and balanced consolidation of a six wheeled truck 21 and a four wheeled truck 22. The six wheeled truck is provided with an H shaped bolster 23 having an intermediate portion 24 and four lateral projections 25 comprising spring seats for connection with the side frames of the six wheeled truck. The four wheeled truck 22 is provided with an ordinary transverse bolster 27 which has at its ends side bearings indicated at 28, and the large bolster 23 is provided with the side bearings 29. These bolsters are also provided respectively with center bearings 30 and 31. Supported upon these side and center bearings is a super-bolster 35 which is shown partly in solid and partly in dotted lines in Figure 1 and illustrated in side elevation in Figure 2. This super-bolster is provided with pins which enter the center bearings 30 and 31 and also with corresponding side bearing portions disposed above the side bearings 28 and 29, rollers or other anti-friction means 36 being located in recesses formed in these side bearings. The outwardly projecting end portion 38 of the super-bolster 35 supports suitable draft mechanism, of which the coupler 39 comprises a portion.

The inner adjacent ends of the trucks are flexibly and adjustably connected together as by means of the two transversely extending curved springs 40 and the connecting bolt 41. This connecting and spacing means maintains the trucks in proper relationship to each other during the time that the container is removed therefrom, as hereinafter to be more fully described. By the use of the springs, or other equivalent flexible connection between the adjacent ends of the trucks, free articulation of the trucks when the car is passing around curves is permitted. The connecting means just described is of course not designed nor intended to transmit any portion of the draft forces, all of which forces are transmitted through the container body 10.

The frusto conical portions 12 of the container or ladle are provided with saddles 45 centrally of which are formed the rounded king pins 46. Upon either side of the king pin each saddle is provided with an upper side bearing portion 47, most clearly shown in Figure 4. Each of the super-bolsters 35 is provided with a socketed center bearing member 48 and side bearing portions 49 directly underlying the side bearing portions 37 of the saddle 45. Cylindrical rollers 50 are carried in suitable recesses formed in the side bearing portions 49 and are normally spaced slightly below the side bearing portions 47 of the saddle, at one end of the car. At the opposite end of the car the side bearings 47 are in contact with the rollers 50, the relationships of these parts at the two ends of the cars being illustrated most clearly in Figures 5 and 6. This affords a substantially three-point suspension of the ladle on the two trucks and permits a certain flexibility or tilting of the relatively elongated car when rounding banked turns. This arrangement is only necessary in the case of exceptionally long cars having ladles or containers of large capacity. It will also be observed that, partially encircling each of the container ends 13, and rigidly secured thereto, is a toothed segment or segmental gear 55, extending circumferentially slightly more than half way around the container end and also that each container end is provided with two downwardly and outwardly extending legs 56, each terminating in a concave seat 57.

The car thus far described may be charged at any desired point and is freely movable along a trackway to any desired destination point, sometimes miles away from the charged point. In Figure 1 of the drawings the car is shown at a discharging point, the apparatus employed for assisting in the discharge of the container 10 being illustrated. A runner for molten material to be discharged from a pouring spout 14, is indicated at 58 and transfer ladles are illustrated, in part, at 59, ladle supporting stands one positioned to each side of runner 58, are indicated at 60, each of these stands having spaced teeth 61 formed upon its curved upper surface, the teeth 61 being so formed and so spaced as to comprise what may be designated a rack adapted to receive and mesh with toothed segments 55 upon the ladle body 10, the toothed racks 61 being spaced apart a distance equal to the horizontal distance between the segments 55, and being disposed, when the car is positioned as shown, in planes normal to the longitudinal axis of the ladle 10. Each stand is likewise provided

with a pin or fulcrum member 62 projecting toward the trackway upon which the car is adapted to stand. When the car has been moved into the position shown the concave seats 57 at the lower ends of the legs 56 will be in close proximity to the fulcrum member 62 of the stand 60, the fulcrum member 62 being preferably tapered longitudinally of the trackway to facilitate the movement of the legs 56 into proper relationship therewith as the car moves slowly into final position for discharge.

For ladle lifting purposes hooks, one of which is indicated at 64 in Figure 3, are employed, these hooks depending from an overhead crane and being operatively engageable with one or the other of lugs 65 mounted upon brackets 66, rigid with the container body. Elevation of the crane hooks 64 first causes positive engagement of the seats 57 of legs 56 with fulcrum members 62, the container body being thereafter, by the continued application of lifting forces to the bracket 66, lifted from its supporting trucks and caused to rotate about a horizontal axis defined by fulcrum members 62. After rotation of the container body about the axis of fulcrum members 62 to a limited extent, the teeth of the segments 55 come into engagement with the teeth of racks 61, respectively, and further movement of the container body is one of translation, the body being rolled upwardly along the toothed racks 61 to desired dumping position. It may be rolled in this manner until the body occupies the position in which it is shown in dotted lines in Figure 3, in which position its molten contents will be fully and completely discharged. For partial discharge of its contents the container will be rotated only to some intermediate position.

Obviously the means mounting the container body 10 upon the supporting trucks must be designed and constructed especially to permit the ready elevation of the container in the manner described and the ready return of the container to original position upon the trucks. This connecting means will now be described in detail.

The king pins 46, previously referred to, and which normally rest within sockets formed in members 48, are constructed in such manner as to decrease in horizontal cross-sectional area downwardly from the saddle 45, being in the form of inverted dome-shaped members in the form of connecting means shown in Figure 4 or they may be conical or have a similar downwardly tapering configuration. This arrangement permits the ready titlting or rotation of the car about an exterior axis, parallel to the axis of the container, without interference of the king pin with its bearing or any other portion of a supporting truck. As before indicated, the precise configuration of the king pin may be varied somewhat but the profile thereof must in every instance have certain characteristics. Thus all points on that surface of the pin remote from the fulcrum axis should lie within a circle drawn through the uppermost point of contact of said surface with the bearing socket, the circle being described about the fulcrum axis as a center. The radius of this circle is indicated in Figure 3 by the letter R. When the container is rocked about the axis of the fulcrum member 62, the king pins, upon being lifted, will be freely drawn out of their recesses in the socket members 48 and likewise, during the final lowering movement of the container into position on the trucks, the king pins will freely enter the sockets provided for their reception. This objective must be obviously attained with the use of king pins which fit closely within the sockets provided for their reception in order that there may be no looseness in the connections between container body and trucks when the car is being drawn along the trackway. The king pins must also be symmetrically formed about the longitudinal vertical plane of the vertical body in order that the container may be rocked in either direction for dumping purposes.

It will be appreciated that the hot metal car illustrated, and which has been described in detail, is set forth by way of example only and that the invention is applicable to still other forms of hot metal cars. In every instance, however, the means connecting the container body to the supporting trucks will be so designed and constructed as to permit ready removal and replacement of the container body and associated with this means will be a container supporting mechanism separate from the supporting trucks and upon which the container may be rolled, supported for pivotal movement, or otherwise supported during a discharging operation. The discharging motion is brought about by the application of lifting forces to one side of the container body but the return motion is under the influence of gravity, although closely controlled by the operator. The use of power dumping appliances which form parts of the hot metal car itself is avoided and a container of maximum capacity for the weight of the car and the overall dimensions thereof is provided.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. The combination of a hot metal car or the like with means for discharging the contents thereof comprising a container mounted upon wheeled supporting trucks, a stationary fulcrum disposed laterally adjacent said car, and a way provided beyond said fulcrum, cooperating means disposed upon one side of said container for contacting said fulcrum, and a surface of revolution provided on said container for contacting with and rolling upon said way after said container is tilted upon said fulcrum, whereby said container may be substantially inverted for dumping purposes.

2. The combination of a hot metal car or the like with means for discharging the contents thereof comprising a container mounted upon wheeled supporting trucks, a stationary fulcrum disposed laterally adjacent and projecting toward said car, and a rack positioned beyond said fulcrum, cooperating means disposed upon one side of said container for contacting said fulcrum, and a toothed segment provided on said container for contacting with and rolling upon said rack after said container is tilted upon said fulcrum, whereby said container may be substantially inverted for dumping purposes.

3. The combination of a hot metal car or the like with means for discharging the contents thereof comprising a container mounted upon wheeled supporting trucks by means of tapering king pins, a stationary fulcrum disposed laterally adjacent said car, and a way provided beyond said fulcrum, cooperating means disposed upon one side of said container for contacting said fulcrum, and a surface of revolution provided on said container for contacting with and rolling upon said way after said container is tilted upon said fulcrum, whereby said container may be substantially inverted for dumping purposes, the remote side wall of each of said king pins having

a configuration such that no point thereof will lie beyond a substantially circular arc centered upon said fulcrum and including the uppermost point of contact of said remote wall with the king pin bearing socket.

4. The combination of a hot metal car or the like with means for discharging the contents thereof, comprising a container mounted upon wheeled supporting trucks, a container support disposed laterally of and adjacent said car, vertically spaced support engaging means on the container, and vertically spaced stationary seating means on said support to be engaged by said support engaging means, the uppermost seating means being spaced horizontally more remotely from the car than the lower seating means so that the container will be tilted successively about horizontally and vertically spaced axes when rocked toward said support.

JOHN D. his × mark PUGH.

Witnesses:
ADDIE A. PUGH.
ELLEN CLARK.