July 22, 1958 H. B. HALLSWORTH 2,843,895

APPARATUS FOR USE IN THE CASTING OF METALS

Filed June 15, 1956 4 Sheets-Sheet 1

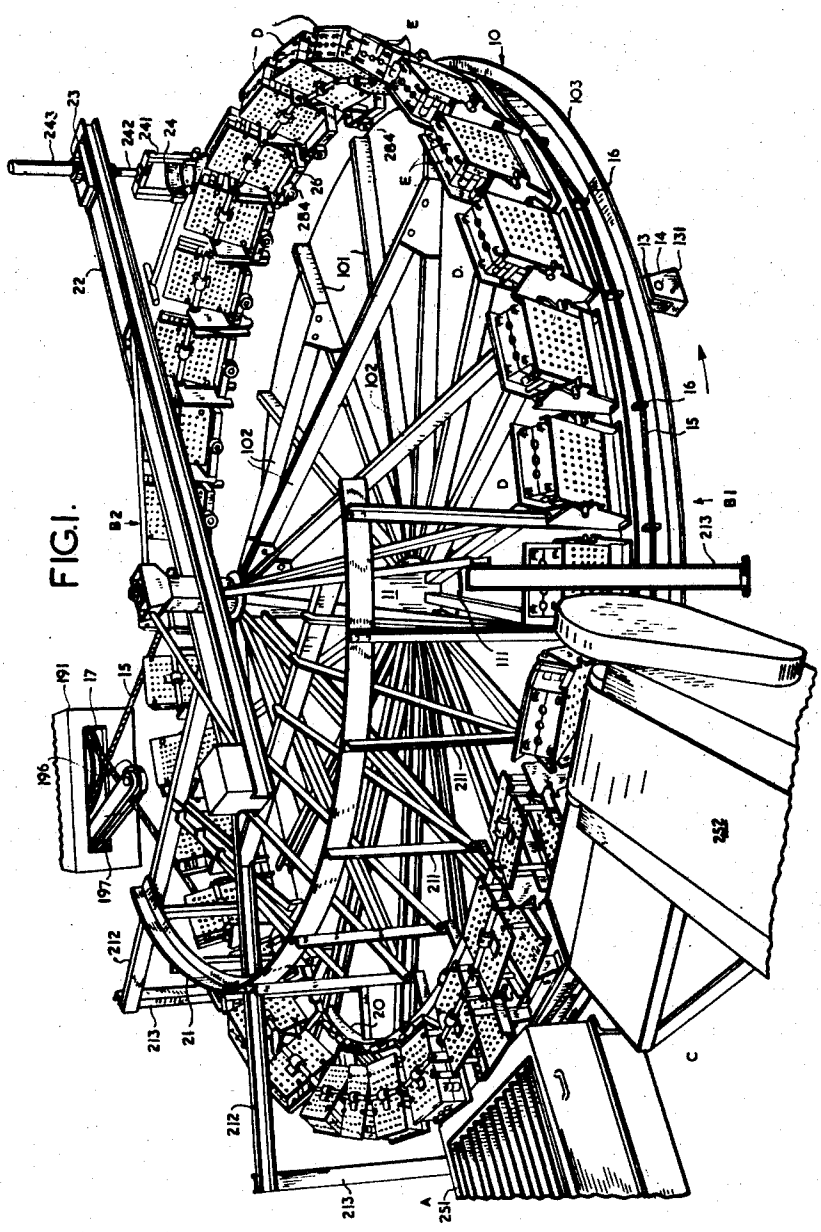


FIG. 1.

Henry Bertram Hallsworth.
by Hanway, Janney, Witte & Hildreth.
Attys.

July 22, 1958 H. B. HALLSWORTH 2,843,895

APPARATUS FOR USE IN THE CASTING OF METALS

Filed June 15, 1956 4 Sheets-Sheet 2

FIG2.

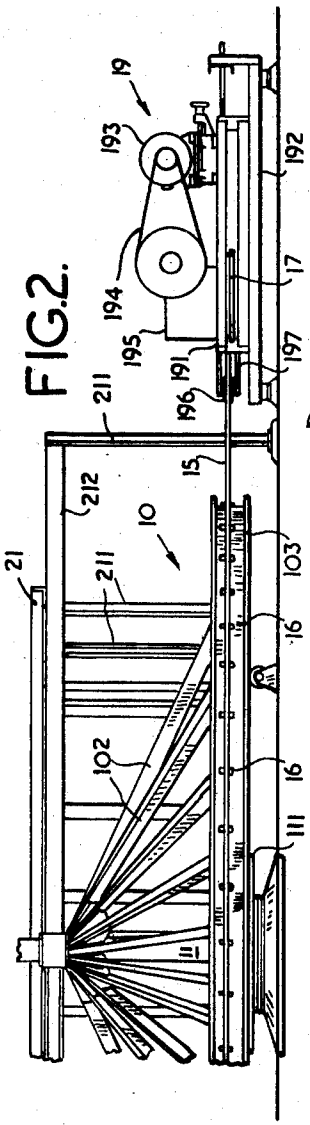
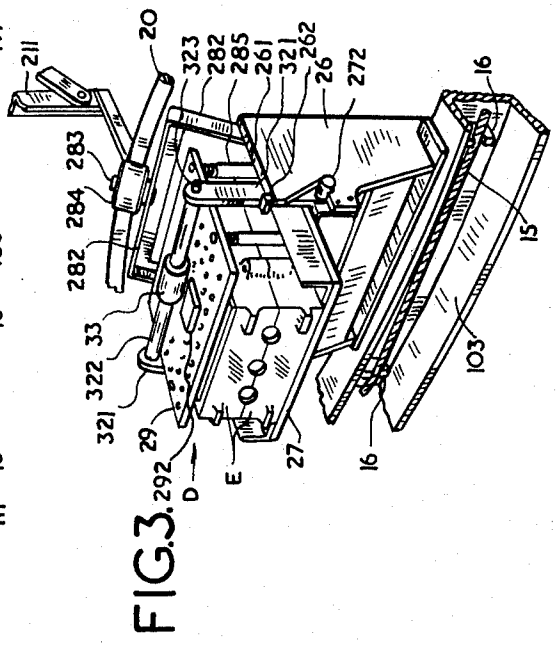


FIG3.



Henry Bertram Hallsworth.
By Kenway, Jenney, Witter & Hildreth.
Attys.

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APPARATUS FOR USE IN THE CASTING OF METALS

Filed June 15, 1956 4 Sheets-Sheet 3

FIG.4.

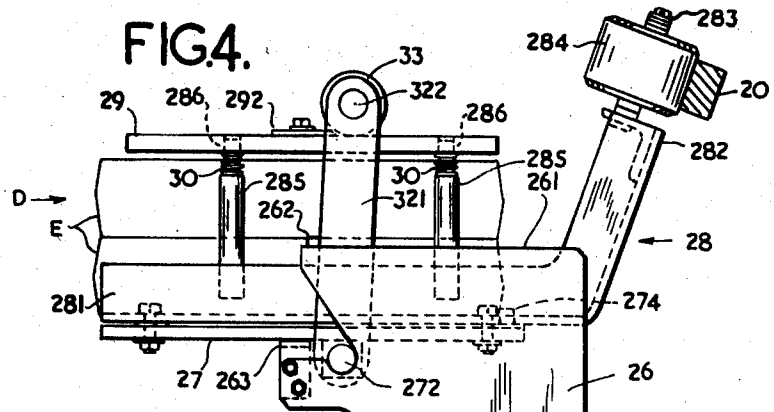
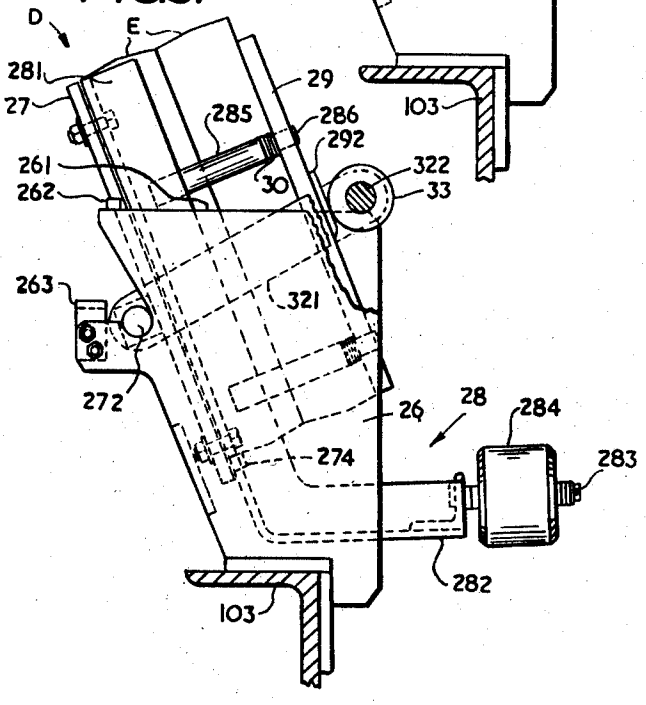


FIG.5.



Henry Bertram Hallsworth
by Kenway, Jenney, Witter & Hildreth
Attys.

July 22, 1958 H. B. HALLSWORTH 2,843,895

APPARATUS FOR USE IN THE CASTING OF METALS

Filed June 15, 1956 4 Sheets-Sheet 4

FIG.6.

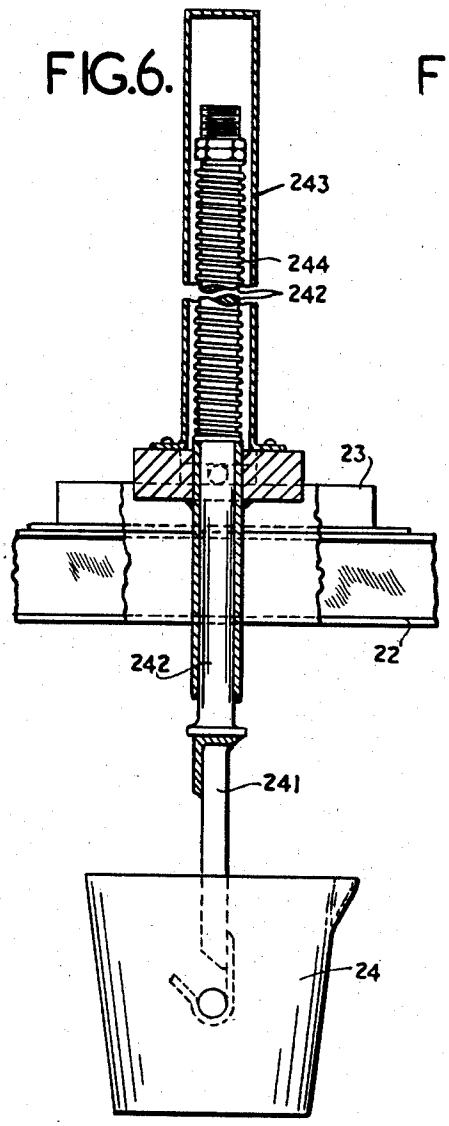
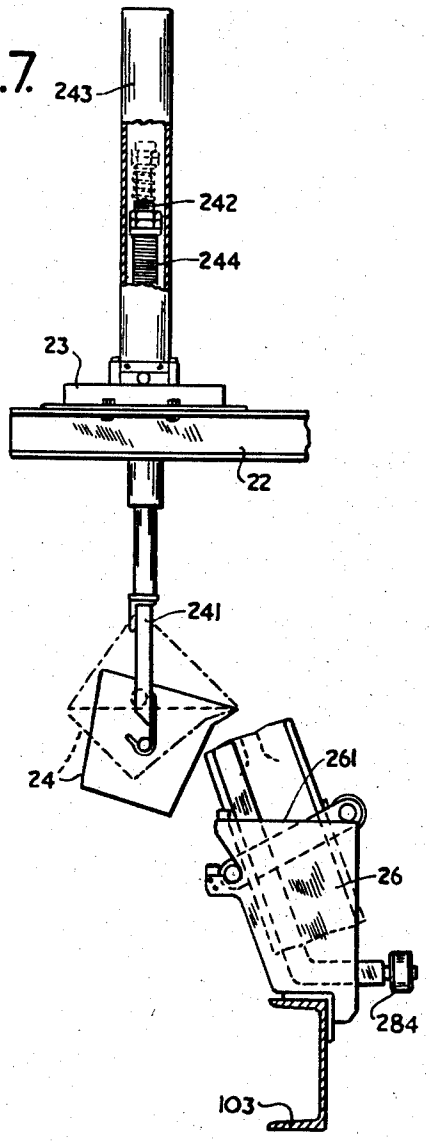


FIG.7.



Henry Bertram Hallsworth

By Kenway, Jenney, Witter & Hildreth

Attys.

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APPARATUS FOR USE IN THE CASTING OF METALS

Henry Bertram Hallsworth, Walsall, England, assignor to Rubery, Owen & Co. Limited, Darlaston, England, a limited liability company of Great Britain

Application June 15, 1956, Serial No. 591,581

Claims priority, application Great Britain June 24, 1955

9 Claims. (Cl. 22—77)

This invention has reference to improved apparatus for use in the casting of metals and has for its object to provide an improved apparatus for the said purpose which is especially suited for employment in conjunction with a moulding machine as described in the specification of my pending United States patent application Serial Number 454,872, filed September 9, 1954, in order to expedite the production of castings from the moulds prepared by the said machine.

According to the invention the improved apparatus for use in the casting of metals is characterized by a plurality of traversable moulding box receiving units, each of which is adapted to be presented in sequence at a moulding box loading station, a pouring location and a moulding box unloading station, and each of which incorporates moulding box clamping means which is released automatically for loading and unloading purposes, but which is locked and maintained locked automatically in the clamping condition during the process of pouring.

According to the invention also the improved apparatus for use in the casting of metals is characterized in that the moulding box receiving units together with the moulding boxes clamped thereby are permitted to or caused to assume the tilted position as entities as the said moulding box receiving units approach the pouring location so as to facilitate the filling of the moulding boxes by end pouring.

The invention further resides in apparatus for use in the casting of metals substantially as will be described hereinafter.

An embodiment of the invention will now be described with particular reference to the accompanying sheets of drawings which illustrate the invention as applied to apparatus intended to be operated in conjunction with a moulding machine as described, and illustrated in the specification of my pending United States patent application Serial Number 454,872, filed September 9, 1954.

In the drawings:

Figure 1 is a perspective view of the improved apparatus for use in the casting of metals,

Figure 2 is a fragmentary view illustrating somewhat diagrammatically the manner of driving the casting apparatus illustrated in Figure 1,

Figure 3 is a fragmentary view in perspective of a moulding box receiving unit as embodied in the apparatus illustrated in Figure 1,

Figure 4 is a side elevation on an enlarged scale of the moulding box receiving unit illustrated in Figure 3 showing a moulding box and the clamping means therefor in the horizontal position,

Figure 5 is a similar view to Figure 4 but showing a moulding box receiving unit and the clamping means therefor in the tilted position,

Figure 6 is a fragmentary view partly in elevation and partly in section and on an enlarged scale of the means for supporting the ladle as illustrated in Figure 1, and

Figure 7 is a diagrammatic view illustrating how the manner of supporting the ladle as shown in Figure 6 ensures that the pouring level of the molten metal in the ladle relatively to the height of the pouring holes in the moulding boxes remains constant irrespective of the quantity of molten metal in the cradle.

In the drawings, where desirable, like numerals of reference are employed to indicate similar parts in the several views.

According to the illustrated embodiment of the invention the improved apparatus for use in the casting of metals incorporates a wheel structure which is designated generically by the reference numeral **10** which is braced from a central upstanding tubular post **11** by means of horizontally and radially disposed arms **101** and radially and upwardly and inwardly inclined struts **102**, said tubular post **11** being rotatably mounted in a base **111**.

The outer member **103** of the wheel structure **10** is of channel shape in cross section and is supported on a plurality of equidistantly spaced rollers **13** which are carried by spindles **131** rotatably mounted in pedestals **14** which are sunken into the floor in order to avoid tilting of the said wheel structure **10** during rotation.

The wheel structure **10** hereinafter termed the "wheel **10**" is adapted to be driven by an endless cable **15** which is located by means of forked radially projecting brackets **16** which are located between the flanges of the wheel **10** said cable **15** being crossed and then wound round a horizontally disposed pulley **17** of smaller diameter than the wheel **10** and which is rotatably mounted in a housing **191** of a driving unit indicated generically by the reference numeral **19** which is mounted adjacent to the wheel **10**.

This driving unit **19** incorporates a base **192** on which is mounted a constant speed electric motor **193** which is adapted to drive the horizontally disposed pulley **17** aforesaid through variable speed V-belt gearing **194** and a reduction gear **195**.

The housing **191** of the driving unit **19** is provided with a jockey roller **196** carried by a resiliently mounted arm **197** for maintaining the tension of the cable **15** aforesaid.

Associated with the wheel **10** in a fixed relationship is a cam track **20** which is supported by an arcuate gantry structure **21** in conjunction with supports **211**, beams **212** and posts **213**.

The peak of the cam track **20** is located adjacent to the unloading station denoted by the reference letter A and descends in a graded slope on either side thereof.

Turnably mounted within the upper end of the tubular post **11** is the pivot of a horizontally disposed counterbalanced arm **22** within the outer and overhanging end of which is adjustably mounted a carrier **23** within which is turnably mounted a cradle **241** for a ladle **24**, said cradle **241** being provided with an upstanding portion **242** which is displaceably mounted within a sleeve **243** pivotally mounted in the carrier **23**. The upstanding portion **242** cooperates with a counterbalancing spring **244** located in the sleeve **243** and the trunnions by means of which the ladle is mounted in the cradle are located so that the action of the counterbalancing spring **244** in conjunction with the placing of the trunnions results in the effective pouring height of the molten metal in the ladle **24** during pouring remaining constant relatively to the height of the pouring holes in the moulding boxes irrespective of the quantity of the metal in the ladle **24** at any time, see Figure 7.

The pouring locations may extend from the place marked B_1 in Figure 1 to the place marked B_2.

Located adjacent to the unloading station A is a grid **251** on which the unloaded moulding boxes are stripped and the sand shaken out.

Adjacent to the loading station designated C in Figure 1 is an endless belt conveyor **252** for feeding the moulding boxes from the moulding machine, not shown, into the space between the separated upper and lower clamping plates of the unloaded moulding box conveyor unit in register therewith. Conveniently the moulding box conveyor units are in the partially tilted position when in register with the belt conveyor **252** for facilitating loading.

The wheel **10** is provided with a plurality of equidistantly spaced pairs of upstanding standards **26** each pair of which is adapted to support a moulding box receiving unit designated generically by the reference letter **D**.

Each moulding box receiving unit incorporates a lower clamping plate **27** which is provided at each end with a trunnion pin **272** which is rotatably mounted in bearings carried by the relevant standard **26**. Each lower clamping plate **27** is bolted to the free ended arms **281** of a U-shaped bracket **28** the connecting limb **282** of which is provided with an axial spindle **283** on which is mounted a roller **284** which cooperates with the cam track **20** in a manner to be described hereinafter.

The free ended arms **281** of the bracket **28** to which the lower clamping plate **27** is bolted have secured thereto as by welding pairs of upstanding posts **285** the shouldered upper end portions **286** of which engage freely with holes formed in the marginal side portions of the upper clamping plate **29**. Each of the shouldered portions of the posts **285** has mounted thereon a coiled spring **30** the upper end of which abuts the underside of the upper clamping plate **29**, said springs **30** tending to lift the upper clamping plate **29** away from the lower clamping plate **27**.

At the centre the upper clamping plate **29** is provided on its upper surface with a transversely arranged pressure plate **292** for a purpose to be described hereinafter.

Pivotally mounted on the trunnion pins **272** for the lower clamping plate **27** are a pair of upstanding arms **321** which are interconnected by a transverse member **322** at the centre of which is located a freely rotatable pressure exerting roller **33** said transverse member **322** serving to span the upper clamping plate **29** and having end portions **323** which project outwardly beyond the respective upstanding arms **321**.

Each of the standards **26** aforesaid is provided with a horizontal edge **261** adjacent to the outer end of which is provided a projection **262** which serves as a stop and which cooperates with the presented edge of the upstanding arms **321** aforesaid in a manner to be described hereinafter.

The standards **26** are also provided with supports **263** upon which the respective lower clamping plates **27** rest when the moulding box receiving units are permitted to assume the horizontal position, see Figures 3 and 4.

The stops **262** aforesaid are located so that when the moulding box receiving units are horizontal the stops **262** bear on the upstanding arms **321** and press the said arms **321** inwardly so as to maintain the pressure exerting roller **33** free of and to the rear of the pressure plate **292** of the respective upper clamping plate **29**.

The lower clamping plates **27** are provided on their upper surfaces with projections **274** which serve to prevent slipping of the moulding boxes when the moulding box receiving units D are being tilted.

The centres of gravity of the moulding box receiving units D are such that the said units tend to assume the tilted position insofar as this is permitted by the cooperation between the rollers **284** and the cam track **20**.

The operation of the improved apparatus is as follows:

The electric motor **193** is caused to be set in motion whereby the wheel **10** carrying the moulding box receiving units D is rotated continuously in a counterclockwise direction as viewed in Figure 1 at a constant speed through the medium of the reduction gear **194** and **195** and the endless cable **15**.

The moulding boxes designated by the reference letter E assembled from the half moulds received from the moulding machine according to my prior United States patent application Serial Number 454,872 filed September 9, 1954 are deposited on the endless belt conveyor **252** for feeding by hand to the moulding box receiving units as they register with the loading station C in a manner to be described hereinafter.

The moulding boxes E after casting has been performed and a degree of cooling permitted to ensure solidification are removed at the unloading station A and removed to the shaking out grid **251**.

The cam track is developed so that the moulding box receiving units D are caused to assume the horizontal position as they approach and arrive at the unloading station A and are permitted to tilt as they approach and leave the loading station C.

Pouring is effected at the pouring locations B_1, B_2 by the operator who is able to swing the arm **22** from which the ladle **24** is supported as required.

Whenever a moulding box receiving unit is located at the loading station C, the stops **262** on the standards **26** maintain the pressure exerting roller **33** clear of the relevant pressure plate **292** so that the upper clamping plate **29** is lifted by the springs **30** to an extent which allows of the insertion of a molding box E between the clamping plates **27** and **29**.

After a loaded moulding box receiving unit approaches the pouring location B_1—B_2 the loaded moulding box receiving unit has assumed the fully tilted position under the action of gravity.

As each loaded moulding box receiving unit D approaches the maximum angle of tilt the projecting ends of the transverse locking member **322** come into contact with the horizontal top edges **261** of the pedestals **26** on which the unit is pivoted, so that the arms **321** and the transverse arm **322** cannot follow the moulding box E and clamping plates **27**, **29** as they are tilted to the maximum angle of tilt. This causes relative movement to take place between the upstanding arms **321** and the transverse member **322** and the upper clamping plate **29** so that the pressure exerting roller **33** carried by the transverse member **322** rides on to the pressure plate **292** at the centre of the upper clamping plate **29** and thereby forces the said clamping plate **29** toward the lower clamping plate **27** and so exerts a clamping pressure on the moulding box E. This clamping pressure is maintained so long as the projecting ends **323** of the transverse member **322** are in contact with the horizontal surfaces of the standards **26** which is the state which obtains whenever a moulding box receiving unit approaches and recedes from the pouring location B_1—B_2.

As a moulding box receiving unit approaches the loading station C the upstanding arms **321** carrying the relevant transverse locking member **322** are pressed inwardly by the stops **262** thereby causing the pressure exerting roller **33** to ride away from the pressure plate **292** so relieving the clamping pressure and permitting the upper clamping plate **29** to lift under the action of its springs **30** to permit of the ready removal of the moulding box E and casting at the unloading station A.

It is to be understood that the invention need not necessarily be employed in conjunction with a moulding machine as described in the specification of my prior pending United States patent application Serial Number 454,872 filed September 9, 1954 but may be employed in conjunction with moulding machines of other descriptions or with moulding boxes for moulds prepared in other manners than by such machines.

I claim:

1. Apparatus for use in the casting of metals comprising a traversable carrier means, a plurality of moulding box receiving means pivotally mounted on said carrier means each of which incorporates a relatively fixed and a relatively displaceable clamping element, said car-

rier means serving to traverse the moulding box receiving means in sequence from a moulding box loading location to a molten metal pouring location, thence to a moulding box unloading station and back to the loading location for a repetition of the cycle, means for automatically unclamping said clamping elements as an unloading location is approached and for engaging the said elements in a clamping relationship after a moulding box has been inserted therebetween and as a moulding box receiving means recedes from the loading location and means for automatically tilting the moulding box receiving means and the moulding boxes clamped therein into position for pouring as the said means approach the pouring location and for automatically tilting the said moulding box receiving means and the moulding boxes clamped therein into position for unloading as the said moulding box receiving means recede from the pouring location and approach the unloading location.

2. Apparatus for use in the casting of metals according to claim 1 in which the clamping pressure exerting means is in the form of a bridging means which is moved automatically into wedging engagement with a surface on the displaceable clamping element as the moulding box receiving means are tilted after receding from the loading location and moved automatically out of wedging engagement as the moulding box receiving means approach the unloading location after pouring.

3. Apparatus for use in the casting of metals comprising a traversable carrier means, a plurality of moulding box receiving means pivotally mounted on said carrier means each of which incorporates a relatively fixed and a relatively displaceable clamping element, said carrier means serving to traverse the moulding box receiving means in sequence from a moulding box loading location to a molten metal pouring location, thence to a moulding box unloading station and back to the loading location for a repetition of the cycle, means tending to separate the clamping elements and a clamping pressure exerting means which automatically exerts clamping pressure on the said elements after a moulding box has been inserted therebetween and as the moulding box receiving means recede from the loading location and which automatically relieves the clamping pressure as the unloading location is approached and means for automatically tilting the moulding box receiving means and the moulding boxes clamped therein into position for pouring as the said means approach the pouring location and for automatically tilting the said moulding box receiving means and the moulding boxes clamped therein into position for unloading as the said moulding box receiving means recede from the pouring location and approach the unloading location.

4. Apparatus for use in the casting of metals according to claim 3 in which spring means is provided which tends to move the displaceable clamping element away from the fixed clamping element.

5. Apparatus for use in the casting of metals comprising a traversable carrier means, a plurality of moulding box receiving means pivotally mounted on said carrier means each of which incorporates a relatively fixed and a relatively displaceable clamping element, said carrier means serving to traverse the moulding box receiving means in sequence from a moulding box loading location to a molten metal pouring location, thence to a moulding box unloading station and back to the loading location for a repetition of the cycle, means for automatically tilting the moulding box receiving means and the moulding boxes clamped therein into position for pouring as the said means approach the pouring location and for automatically tilting the said moulding box receiving means and the moulding boxes clamped therein into position for unloading as the said moulding box receiving means recede from the pouring location and approach the unloading location and clamping pressure exerting means which comes into action automatically

for exerting clamping pressure when the moulding box receiving means and the moulding boxes contained therein are tilted preparatory to pouring and which is caused auaomatically to relieve the clamping pressure upon tilting after pouring and preparatory to unloading.

6. Apparatus for use in the casting of metals comprising a traversable carrier means, a plurality of supports mounted on said carrier means, moulding box receiving means pivotally mounted on said supports each of which incorporates a relatively fixed and a relatively displaceable clamping element, said moulding box receiving means tending always to assume a horizontal position under the action of gravity and in conjunction with said supports, said carrier means serving to traverse the moulding box receiving means in sequence from a moulding box loading location to a molten metal pouring location, thence to a moulding box unloading station and back to the loading location for a repetition of the cycle, means for automatically unclamping said clamping elements as an unloading location is approached and for engaging the said elements in a clamping relationship after a moulding box has been inserted therebetween and as the moulding box receiving means recede from the loading location and means for automatically tilting the moulding box receiving means and the moulding boxes clamped therein from the horizontal position into position for pouring as the said means approach the pouring location and for automatically tilting the said moulding box receiving means and the moulding boxes clamped therein into position for unloading as the said moulding box receiving means recede from the pouring location and approach the unloading location.

7. Apparatus for use in the casting of metals comprising a traversable carrier means, a plurality of supports mounted on said carrier means, moulding box receiving means pivotally mounted on said supports each of which incorporates a relatively fixed and a relatively displaceable clamping element said moulding box receiving units tending to assume the horizontal position under the influence of gravity and in conjunction with rests associated with said supports, said carrier means serving to traverse the moulding box receiving means in sequence from a moulding box loading location to a molten metal pouring location, thence to a moulding box unloading station and back to the loading location for a repetition of the cycle, means for automatically unclamping said clamping elements as an unloading location is approached and for engaging the said elements in a clamping relationship after a moulding box has been inserted therebetween and as the moulding box receiving means recede from the loading location and roller and cam track means for automatically tilting the moulding box receiving means and the moulding boxes clamped therein into position for pouring as the said means approach the pouring location and for automatically tilting the said moulding box receiving means and the moulding boxes clamped therein into position for unloading as the said moulding box receiving means recede from the pouring location and approach the unloading location.

8. Apparatus for use in the casting of metals comprising in combination a rotatable circular carrier means, a plurality of supports arranged around the periphery of said circular carrier means, moulding box receiving means pivotally mounted on said supports each of which incorporates a relatively fixed and a relatively displaceable clamping element, said moulding box receiving means tending to assume the horizontal position under the influence of gravity and in conjunction with rest means associated with said supports, said carrier means serving to traverse the moulding box receiving means in sequence from a moulding box loading location to a molten metal pouring location, thence to a moulding box unloading station and back to the loading location for a repetition of the cycle, means for automatically tilting the moulding box receiving means and the moulding boxes clamped

therein from the horizontal position into an inclined position for pouring as the said means approach the pouring location and for automatically tilting the said moulding box receiving means and the moulding boxes clamped therein from the inclined pouring position into the horizontal position for unloading as the said moulding box receiving means recede from the pouring location and approach the unloading location and clamping pressure exerting means which comes into action automatically for exerting clamping pressure when the moulding box receiving means and the moulding boxes contained therein are tilted preparatory to pouring and which is caused automatically to relieve the clamping pressure upon tilting after pouring and preparatory to unloading.

9. Apparatus for use in the casting of metals comprising in combination a rotatable circular carrier means, a plurality of supports arranged around the periphery of said circular carrier means, moulding box receiving means pivotally mounted on said carrier means each of which incorporates a relatively fixed and a relatively displaceable clamping element, said moulding box receiving means tending to assume the horizontal position under the influence of gravity in conjunction with rest means associated with said supports, said carrier means serving to traverse the moulding box receiving means in sequence from a moulding box loading location to a molten metal pouring location, thence to a moulding box unloading station and back to the loading location for a repetition of the cycle, a roller associated with the fixed element of each moulding box receiving means, cam tracks with which said rollers contact as the carrier means rotates whereby the moulding box receiving means and the moulding boxes clamped therein are caused automatically to be tilted into position for pouring as the

said means approach the pouring location and are caused automatically to be tilted into position for unloading as the said moulding box receiving means recede from the pouring location and approach the unloading location, clamping pressure exerting means which comes into action automatically for exerting clamping pressure when the moulding box receiving means and the moulding boxes contained therein are tilted preparatory to pouring and which is caused automatically to relieve the clamping pressure upon tilting after pouring and preparatory to unloading, a turnable arm concentric with said circular carrier means, a pouring ladle supported from said arm and means for maintaining constant the pouring height of said ladle.

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