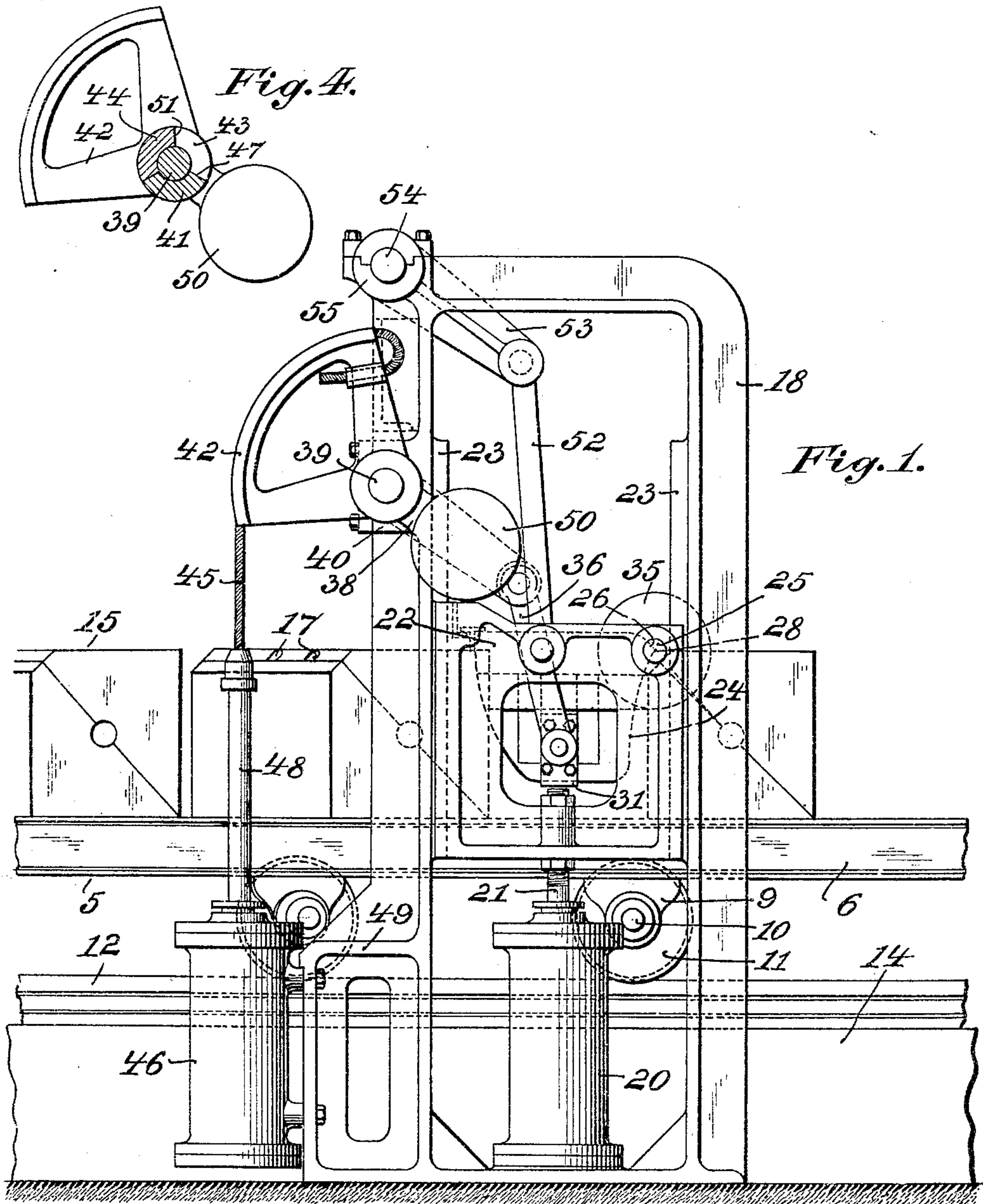


E. A. CUSTER.
METAL POURING MECHANISM FOR PIPE CASTING APPARATUS.
APPLICATION FILED MAR. 14, 1908.

898,631.

Patented Sept. 15, 1908.

3 SHEETS—SHEET 1.



WITNESSES:

Wilhelm Vogt
Thomas M. Smith

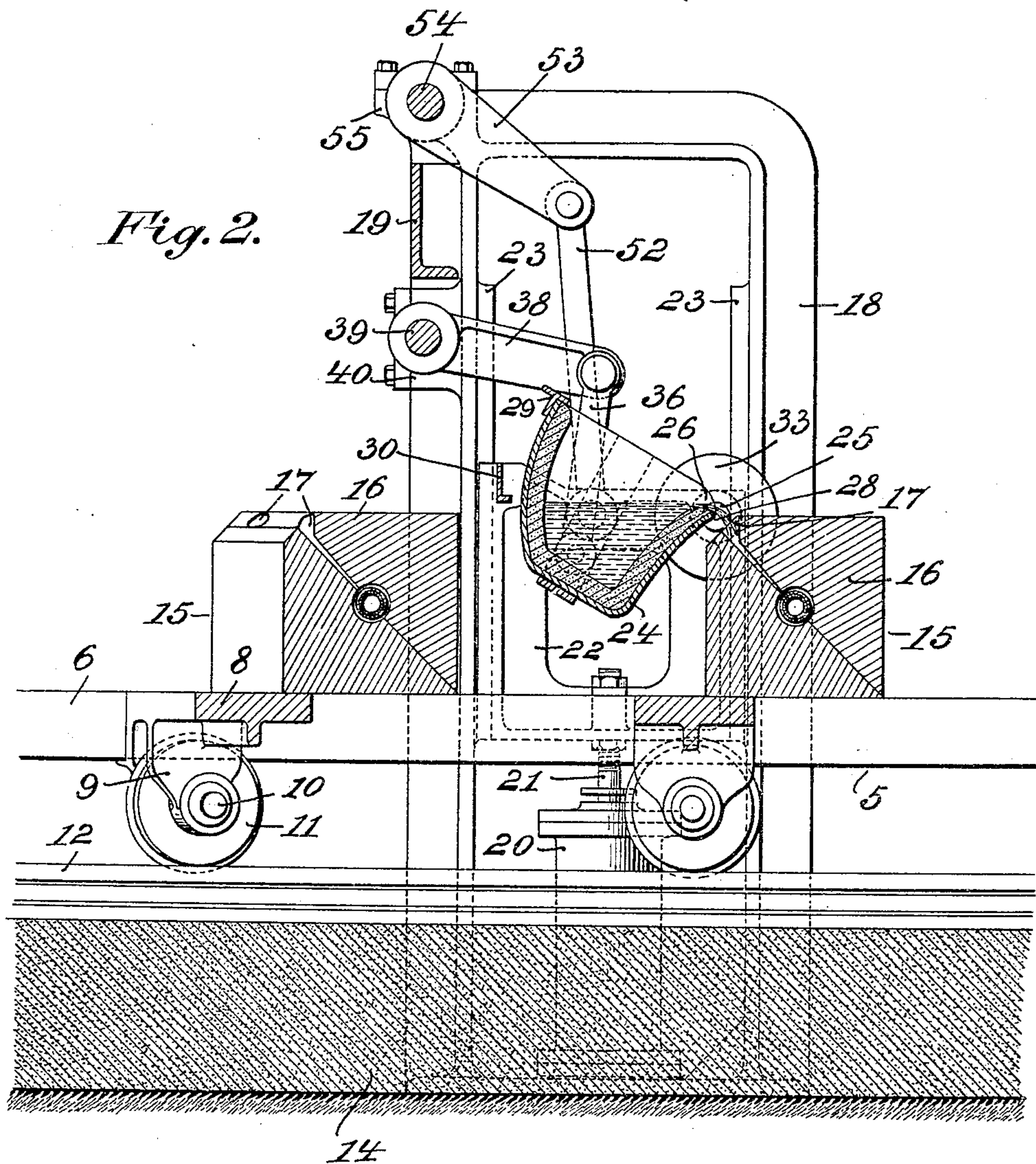
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WITNESSES:

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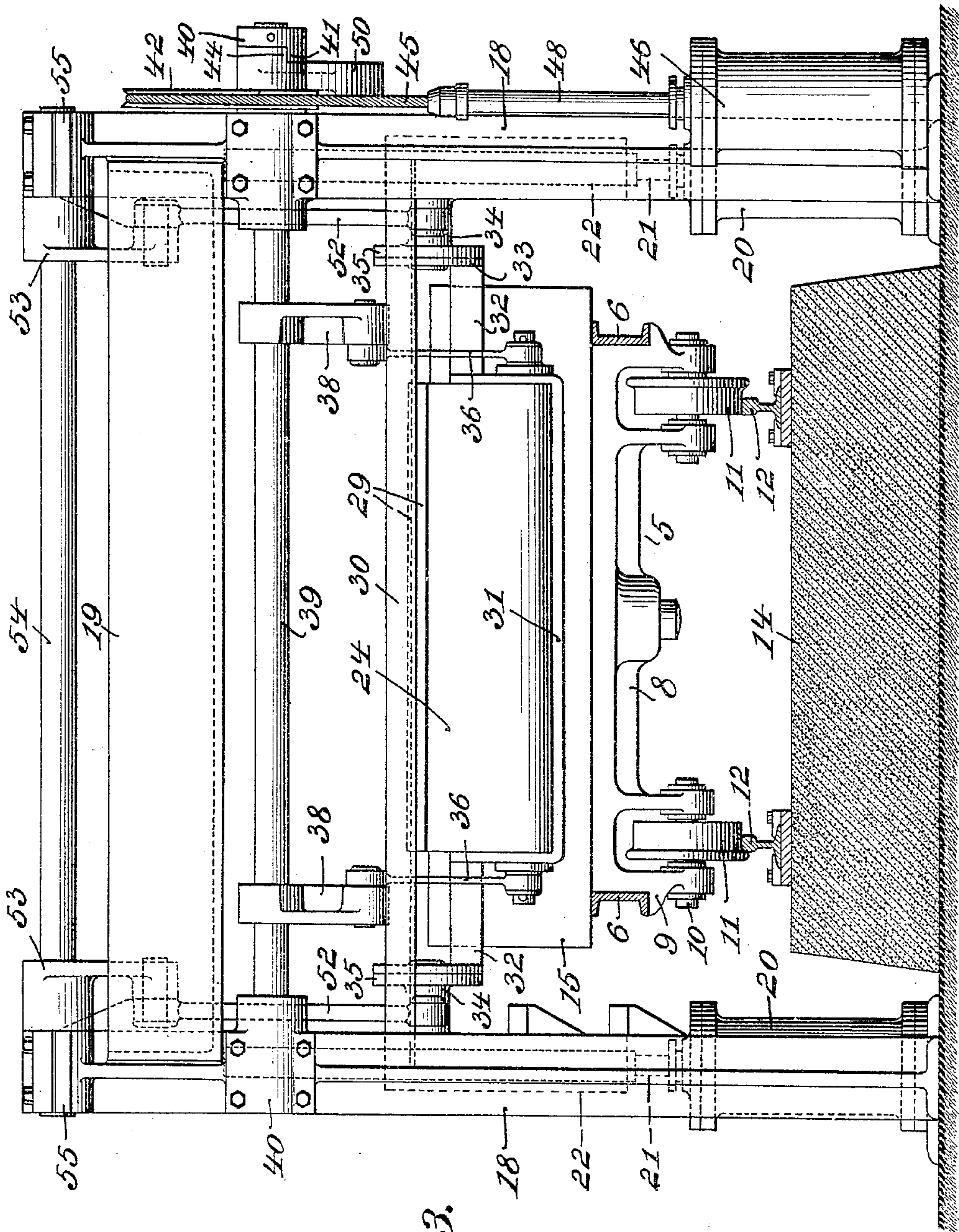


Fig. 3.

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UNITED STATES PATENT OFFICE.

EDGAR ALAN CUSTER, OF PHILADELPHIA, PENNSYLVANIA.

METAL-POURING MECHANISM FOR PIPE-CASTING APPARATUS.

No. 898,631.

Specification of Letters Patent.

Patented Sept. 15, 1908.

Application filed March 14, 1908. Serial No. 421,054.

To all whom it may concern:

Be it known that I, EDGAR ALAN CUSTER, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Metal-Pouring Mechanism for Pipe-Casting Apparatus, of which the following is a specification.

My invention has relation to a metal pouring mechanism for pipe casting apparatus especially such as has been described and claimed in the United States Patent No. 870,817 granted to me under date of November 12th, 1907; and in such connection it relates more particularly to means for supporting, raising, lowering and tilting a ladle containing molten metal for such patented pipe casting operations.

The principal objects of my invention are first, to so arrange the pouring mechanism as to permit the operation of pouring of the metal to be performed in a positive manner; second to permit by this mechanism of the holding of the tips of the pouring lips of the ladle containing the molten metal in a horizontal line irrespective of the position of the ladle so as to maintain equal height, velocity and pressure of the molten metal at the tips of these lips during pouring; third to provide means to permit of the partial rotating of the ladle around a horizontal line; and fourth to provide means for raising and lowering the ladle.

The nature and scope of my present invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof, in which

Figure 1 is a view illustrating in side elevation the pouring mechanism, embodying the features of my invention, and a portion of a rotating table and permanent molds carried by the same. Fig. 2 is a central vertical sectional view of Fig. 1, illustrating the ladle in the tilted or pouring position. Fig. 3 is an end elevational view of Fig. 1; and Fig. 4 is a detail view, illustrating partly in elevation and partly in section, a sector-arm employed in connection with said tilting and pouring mechanism.

Referring to the drawings 5, is a turn-table of the type described and shown in Letters Patent No. 870,817 and No. 870,870 granted

to me under date of November 12th, 1907, preferably consisting of channel-irons 6, connected with each other by cross-pieces 8, having formed integral therewith bearings 9, for the shafts 10, of traction-wheels 11, engaging rails 12, supported in the present instance by a base or foundation 14. Upon the table so formed are placed permanent molds 15, preferably of the type described and shown in an application filed by me under date of July 26th, 1907, under the Serial No. 385,612, the parting line of which is arranged at an angle to the horizontal and having pour-holes 17, arranged in the cope 16 at the upper end of the parting line as shown in Fig. 2. On each side of the table 5, and the molds 15, and base 14, is arranged a standard or frame 18, substantially U-shaped in outline, which standards at their upper ends are connected with each other by a bar or beam 19.

Within each of the standards 18, is located a hydraulic cylinder 20, of well known construction, to the piston-rod 21, of which is suitably secured a head or support 22, held in position in the standard 19, by guides 23. The heads 22, serve as supports for trunnions 25, of a tilting or pouring ladle 24, which trunnions 25, pass through the heads at a point located adjacent to one of the upper corners thereof. As shown in Figs. 1 and 2, the tips 28, of the pouring spouts or lips 26, of the ladle 24, terminate in the longitudinal central axis of the trunnions 25, and the position in which the ladle 25, is held by the heads 22, is such as to maintain the tips 28, of the spouts 26, in a horizontal line irrespective of the position the ladle occupies in the standards 19. At the point opposite the trunnions 25, the ladle 24, is provided with a projecting ledge 29, preferably formed of a T-shaped bar, which in the normal position of the ladle engages an L-shaped bar or beam 30, secured at the respective ends to heads 22, thus the ladle at the rear portion is loosely supported by the beam 30. As shown in Fig. 3, the preferred mode of supporting the ladle 24, within the standards 19, consists of a bail or holder 31, partially surrounding the same and having outwardly extending arms 32, terminating in an annular portion 33, carrying the trunnions 25, and resting against similar shaped bearings 35, formed by an extension 34, of the heads 22.

To the holder 31, are pivotally secured one end of links 36, to the other end of which are similarly connected crank-arms 38, rigidly secured to a shaft 39, loosely mounted in bearings 40, of the standards 18. As shown in Figs. 3 and 4, to one end of the shaft 39, is secured a collar 40, having a substantially semi-circular projection 41, forming one member of a clutch, the other member of which is formed by a similarly shaped projection 44, formed integral with the bearing 43, of a sector 42, loosely mounted on the shaft 39, and held in proper position thereon by being placed between the collar 40, and one of the standards 19. To the sector 42, is suitably secured one end of a cable 45, the other end of which is connected with the piston-rod 48, of a hydraulic cylinder 46, of any well known construction and which is bolted to an extension 49, of one of the standards 18, and is thereby supported by the same. To hold the cable 45, taut the sector 42, is provided with a counter-weight 50. However, the position of the sector 42, is determined by the position 41, of the collar 40, of the shaft 39, as will be hereinafter more fully described.

When the ladle 24, by means of the heads 22, of the standards 18, is held in the lowermost or pouring position between two adjacent molds 15, in which position as shown in Fig. 1, the pouring lips 26, are held in proximity to the pour-holes 17, of one of the molds 15, fluid under pressure is introduced into the cylinder 46, forcing the piston-rod 48, downward. This movement of the piston-rod 48, by means of the cable 45, sector 42, and the projection 44, engaging the projection 41, of the collar 40, is transmitted to the shaft 39, which through the intervention of the crank-arms 38, and links 36, and the holder 31, lifts the ladle 24, and by turning the same on the fulcrum points or trunnions 25, gradually tilts the said ladle. The tips 28, of the lips or spouts 26, of the ladle 24, terminate in the longitudinal central axis of the trunnions 25; and moreover, these tips being held in a horizontal line, it follows that by the tilting movement of the ladle an equal quantity of molten metal will be introduced by the same into each of the pour-holes 17, of a mold 15, occupying the pouring position and from the same height and with the same velocity and pressure. Due to such introduction of molten metal into the mold pipe is cast with the aid of the same, perfect in formation with a smooth exterior, and ready for use or shipment, after natural cooling. After the mold has been filled with molten metal the tilted ladle 24, is returned to its initial horizontal inoperative position by discharging the fluid under pressure from the cylinder 46, and permitting its piston-rod 48, to ascend aided therein by the weight of the ladle.

In order to permit of the shifting of an-

other mold into the pouring position by the turn-table 5, it is necessary to raise the ladle 24, into a position above the upper surface of the molds, and this is accomplished by introducing fluid under pressure into each of the cylinders 20, which now by means of their piston-rods 21, move the heads 22, and by the same the ladle upwards in the frames 18. This movement of the ladle 24, although being transmitted by the links 36, and crank-arms 38, to the shaft 39, is not transmitted to the sector 42, in that in this instance the projection 41, of the collar 40, by the shaft 39, is merely moved out of the position shown in Fig. 4, in which the surface 47, of the projection 41, abuts against the surface 51, of the projection 44, of the sector 42, and by means of the counter-weight 50, is held in a position to maintain the cable 45, in a taut condition. If, however, for one reason or the other the upward movement of the ladle 24, be transmitted to the sector 42, by means of the shaft 39, and the clutch collar 40, such movement due to the flexible cable 45, will not be transmitted by the sector 42, to the piston-rod 48, of the tilting cylinder 46. On the other hand, if the piston-rod 48, of the cylinder 46, by introducing fluid under pressure therein should be moved back into the cylinder at a time when the ladle 24, occupies a raised position such movement of the piston-rod will fail to tilt the ladle, in such position. In this instance, the projection 41, of the collar 40, will abut against the surface 51 of the projection 44, and will thus prevent the actuation of the shaft 39, and the arms 38 and links 36. After another mold has been shifted into the pouring position the ladle 24, is again lowered into the position shown in Fig. 1, by permitting the fluid under pressure to gradually escape from the ladle raising cylinders 20.

In order to prevent unequal raising and lowering of the ladle 24, by the piston-rods 21, of the raising and lowering cylinders 20, and to maintain the ladle at all times in a horizontal position and the spouts thereof, in a horizontal line, during tilting, the following mechanism is employed. To each of the heads 22, of the standards 18, is pivotally secured one end of a link 52, the other end of which is similarly connected by a crank-arm 53, on a shaft 54, mounted in bearings 55, of the standards 18. If for one reason or the other one of the piston-rods 21, of the ladle 24, actuating cylinders 20, should move upwards faster than the other of the piston-rods such movement by means of the links 52, crank-arms 53, and shaft 54, will be transmitted to the head 22, of the slower moving piston-rod 21. Thus the piston-rods 21, and heads 22, will be forced to move upwards or downwards with exactly the same speed and by this control of their movement, the ladle

will be maintained in a horizontal position and molten metal will be prevented from being spilled by the ladle or pass in unequal quantities from the pouring spouts thereof, while the ladle is in a tilted position.

Having thus described the nature and objects of my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a mechanism of the character described, standards, a ladle having trunnions, means slidably arranged in the standards and engaged by the trunnions of said ladle, means for supporting, raising and lowering the slidable means and by the same said ladle, means for partially rotating the ladle on said trunnions, and means for connecting the slidable means with the ladle rotating means, said connecting means being arranged to prevent simultaneous actuation of the slidable and ladle rotating means.

2. In a mechanism of the character described, standards, means slidably arranged in the standards, means for supporting, raising and lowering said slidable means, means carried by said slidable means, a ladle having trunnions pivotally engaging said slidable means and a projection loosely engaging said carried means, and means for tilting said ladle by partially rotating the same on said trunnions and by lifting the same from said carried means.

3. In a mechanism of the character described, standards, means slidably arranged in said standards, means for supporting, raising and lowering said slidable means, means carried by said slidable means, a ladle having trunnions and a ledge arranged opposite to each other, means for tilting said ladle by lifting the ledge of the same out of engagement with said carried means and by partially rotating the ladle on the trunnions, and means for connecting the slidable means with each other, said connecting means arranged to permit of the holding of the spouts of said ladle in all positions thereof, in a horizontal line.

4. In a mechanism of the character described, standards, a ladle having trunnions and a projection, means slidably arranged in said standards and engaging the trunnions of said ladle, means carried by said slidable means and loosely engaging the projection of said ladle, means for supporting, raising and lowering said slidable means and by the same said ladle, and means for tilting said ladle by lifting the ledge thereof out of engagement with said carried means and by partially rotating the ladle on said trunnions, said tilting means, consisting of sections arranged to be coupled to each other in the lowered position of the ladle and to be substantially uncoupled in the raised position thereof.

5. In a mechanism of the character described, standards, a ladle having trunnions

and a projection, means slidably arranged in said standards and engaging the trunnions of said ladle, means carried by said slidable means and loosely engaging the projection of said ladle, means for supporting, raising and lowering said slidable means and by the same said ladle, means for tilting said ladle by lifting the ledge thereof out of engagement with said carried means and by partially rotating the ladle on said trunnions, said tilting means, consisting of sections arranged to be coupled to each other in the lowered position of the ladle and to be substantially uncoupled in the raised position thereof, and means for connecting the slidable means with each other to permit of the movement of the same with uniform speed.

6. The combination of a mold having pour-holes and a table carrying the same, of standards arranged at the respective sides of said mold and table, means slidably arranged in said standards, means for supporting, raising and lowering the slidable means, a ladle having pouring spouts and trunnions engaging said slidable means adapted when lowered by the same to be brought with their spouts into proximity to the pour-holes of said mold and when raised to permit of the shifting of the mold by the table, means for tilting the ladle, said ladle when tilted adapted to introduce into each of the pour-holes of said mold an equal quantity of molten metal, with equal velocity and pressure, means connecting the slidable means with each other so as to hold by controlling the movement of the same the spouts of said ladle in all positions thereof, in a horizontal line, and interposed coupling means connected with said tilting means adapted to prevent actuation of said tilting means, when said ladle occupies a raised position.

7. In a mechanism of the character described, standards, heads slidably arranged in said standards, cylinders having piston-rods supporting said heads and raising and lowering the same in said standards, a ladle having trunnions engaging said heads and pouring spouts arranged with their tips in the longitudinal central axis of said trunnions.

8. In a mechanism of the character described, standards, heads slidably arranged in said standards, cylinders having piston-rods supporting said heads and raising and lowering the same in said standards, a bar connecting said heads with each other, a ladle having trunnions, and spouts terminating with their tips in the longitudinal central axis of the trunnions and a projecting ledge opposite said trunnions, the trunnions and ledge of said ladle adapted respectively to pivotally engage said heads and loosely the bar thereof so as to tiltably connect the ladle with said heads.

9. In a mechanism of the character de-

scribed, standards, heads slidably arranged in said standards, cylinders having piston-rods supporting said heads and raising and lowering the same in said standards, a bar
5 connecting said heads with each other, a ladle having trunnions, and spouts terminating with their tips in the longitudinal central axis of the trunnions and a projecting ledge
10 opposite said trunnions, the trunnions and ledge of said ladle adapted respectively to pivotally engage said heads and loosely the bar thereof so as to tiltably connect the ladle with said heads, and means for tilting said ladle by rotating the same on said trunnions.

10. In a mechanism of the character described, standards, heads slidably arranged in said standards, means for supporting, raising and lowering said heads, means for connecting said heads, a ladle having trunnions, a ledge and spouts terminating with their tips in the longitudinal central axis of said trunnions, the trunnions and the ledge of said ladle adapted respectively to pivotally
20 connect the same with said heads and loosely to engage said connecting means, a shaft carried by standards having crank-arms and links engaging said heads and adapted to permit of uniform movements and of maintaining uniform positions of said heads in
30 said standards.

11. In a mechanism of the character described, standards, heads slidably arranged in said standards, means for supporting, raising and lowering said heads, means for
35 connecting said heads, a ladle having trunnions, a ledge and spouts terminating with their tips in the longitudinal central axis of said trunnions, the trunnions and the ledge of said ladle adapted respectively to pivotally
40 connect the same with said heads and loosely to engage said connecting means, a shaft carried by standards having crank-arms and links engaging said ladle, a collar having a projection forming one member of a clutch
45 secured to said shaft, and a sector having a projection forming the second member of a clutch loosely mounted on said shaft, means for engaging and actuating said sector, said sector when actuated by said engaging
50 means adapted to partially rotating said shaft to partially rotate by said crank-arms and links said ladle on said trunnions, and when said shaft is actuated by the raising of said ladle to prevent transmitting movement
55 to said engaging means.

12. In a mechanism of the character described, standards, heads slidably arranged in said standards, means for supporting, raising and lowering said heads, means for connecting said heads, a ladle having trunnions, a ledge and spouts terminating with their tips in the longitudinal central axis of said trunnions, the trunnions and the ledge of said ladle adapted respectively to pivotally

connect the same with said heads and loosely
65 to engage said connecting means, a shaft carried by standards having crank-arms and links engaging said ladle, a collar having a projection forming one member of a clutch
70 secured to said shaft, a sector having a projection forming the second member of a clutch loosely mounted on said shaft, means for engaging and actuating said sector, said sector when actuated by said engaging means
75 adapted by partially rotating said shaft to partially rotate by said crank-arms and links said ladle on said trunnions, and when said shaft is actuated by the raising of said ladle to prevent transmitting movement to said
80 engaging means, and a second shaft carried by said standards having crank-arms and links engaging said heads said second shaft, crank-arms and links thereof adapted to control the movements of said heads and to
85 maintain the same in uniform position in said standards so as to hold the spouts of said ladle at all times, in a horizontal line.

13. In a mechanism of the character described, standards, heads slidably arranged therein, cylinders having piston-rods engaging, raising and lowering said heads, a ladle
90 having pouring spouts and trunnions pivotally connecting the same with said heads, a shaft carried by said standards and having crank-arms and links, a collar having a projection secured to said shaft, a sector loosely
95 mounted on said shaft and having a projection held in the path of the projection of said collar, a cylinder having a piston-rod, means for flexibly connecting said sector with the
100 piston-rod of said cylinder, said sector when actuated by said flexible means and the piston-rod of said cylinder adapted to rotate said shaft and by the same, crank-arms and links to tilt the ladle on said trunnions and to
105 prevent tilting thereof, when the ladle is raised.

14. In a mechanism of the character described, standards, heads slidably arranged therein, cylinders having piston-rods engaging, raising and lowering said heads, a ladle
110 having pouring spouts and trunnions pivotally connecting the same with said heads, a shaft carried by said standards and having crank-arms and links, a collar having a projection secured to said shaft, a sector loosely
115 mounted on said shaft and having a projection held in the path of the projection of said collar, a cylinder having a piston-rod, means for flexibly connecting said sector with the
120 piston-rod of said cylinder, said sector when actuated by said flexible means and the piston-rod of said cylinder adapted to rotate said shaft and by the same, crank-arms and links to tilt the ladle on said trunnions and to
125 prevent tilting thereof, when the ladle is raised, and a second shaft carried by said standards having crank-arms and links en-

gaging said heads, said second shaft and the crank-arms and links thereof, adapted to control the movements of said heads so as to maintain the same in uniform position in
5 said standards and to hold the tips of the spouts of said ladle at all times, in a horizontal line.

In witness whereof, I have hereunto set my signature in the presence of two subscribing witnesses.

EDGAR ALAN CUSTER.

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.