

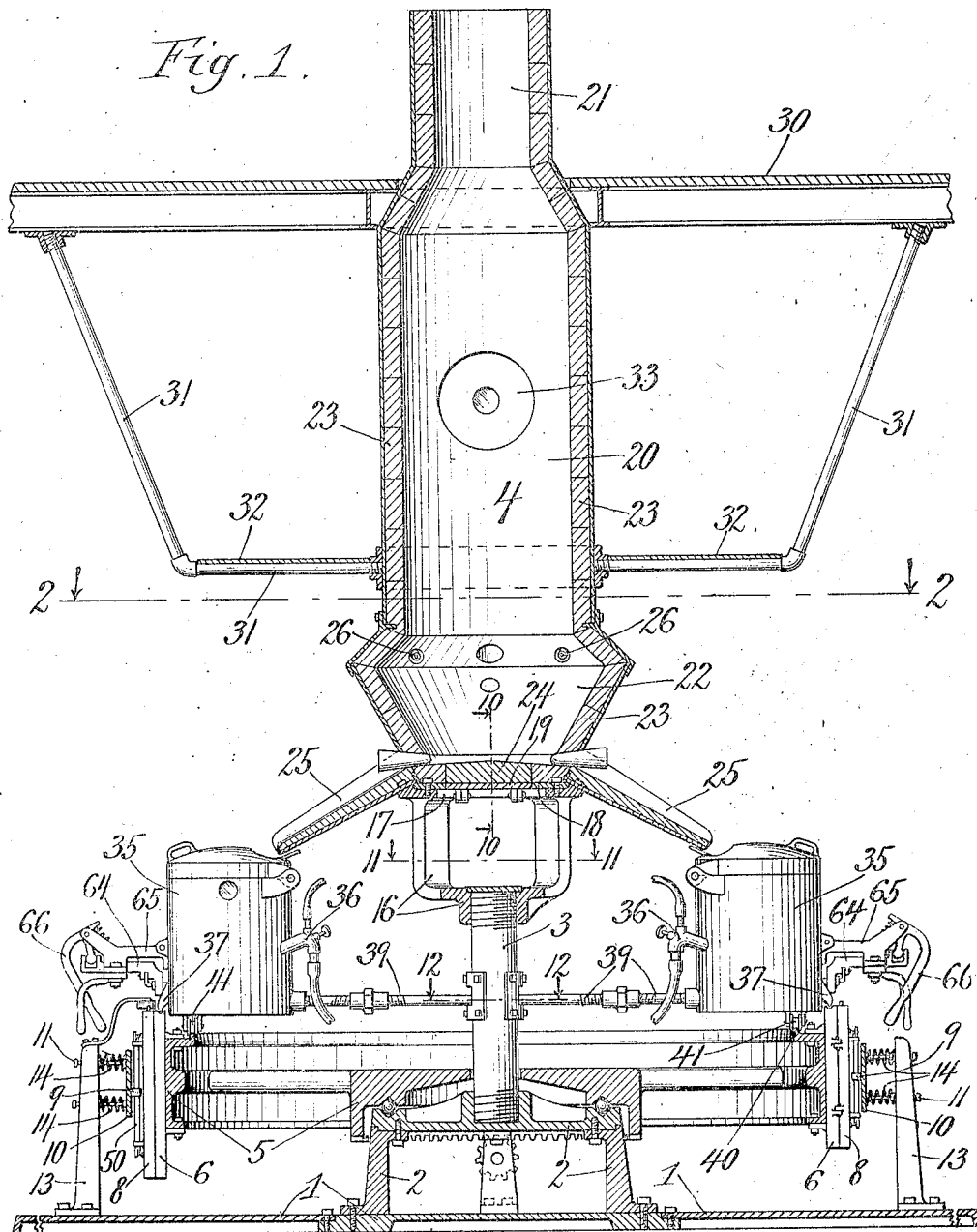
F. N. CLINE.
CASTING MACHINE.

APPLICATION FILED FEB. 3, 1911. RENEWED SEPT. 20, 1912.

1,057,528.

Patented Apr. 1, 1913.

4 SHEETS—SHEET 1.



Witnesses.
Edward T. Wray
Robert H. Burton

Inventor.
Fred N. Cline.
by Chas. D. Burton
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his Attys.

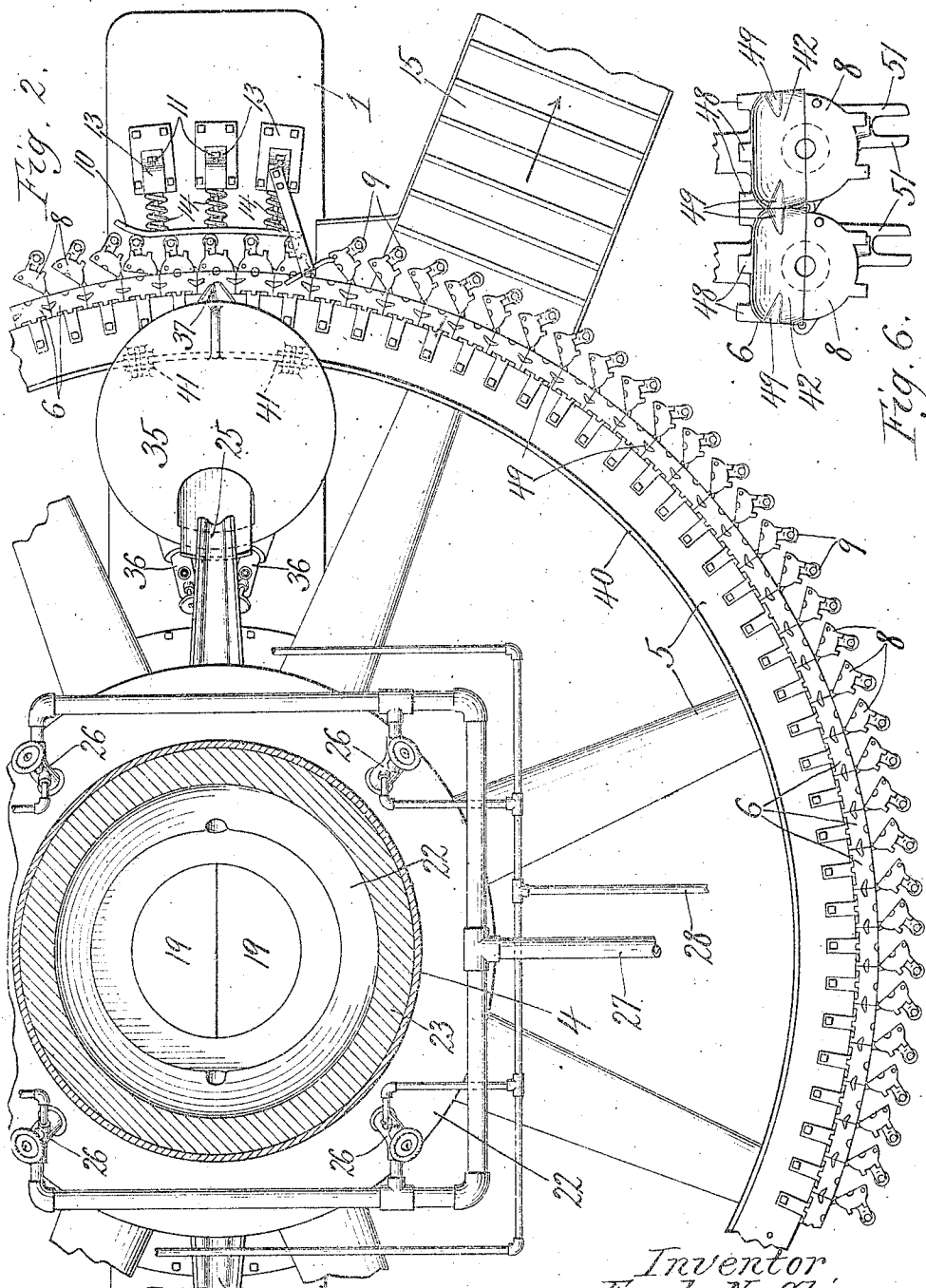
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Fig. 3.

Fig. 4.

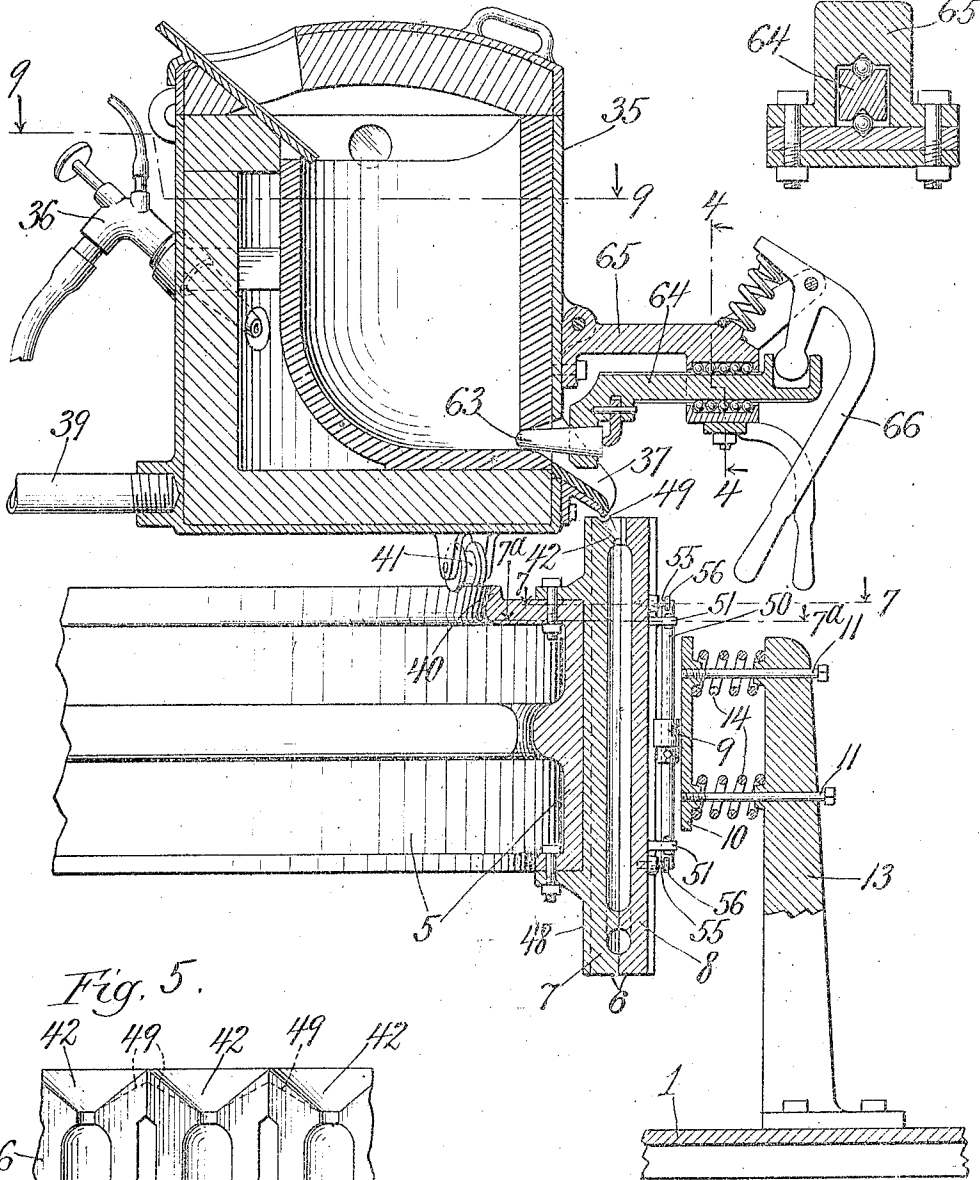
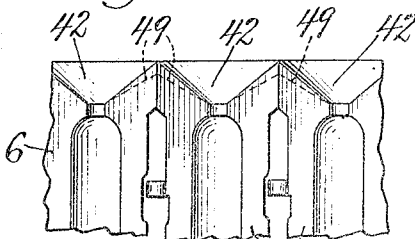


Fig. 5.



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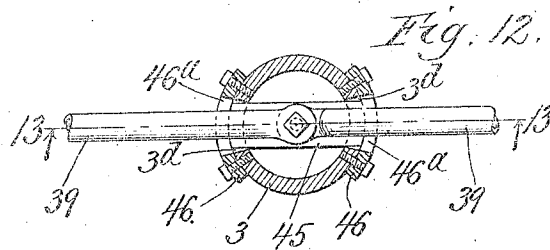
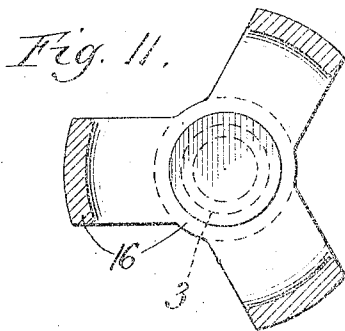
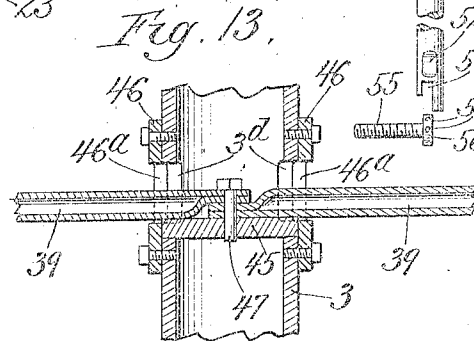
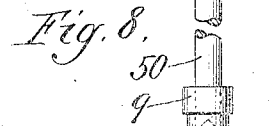
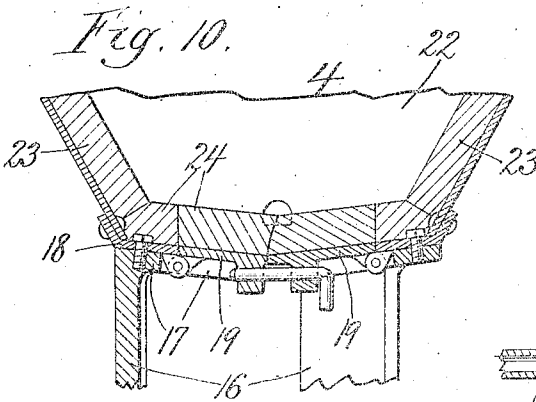
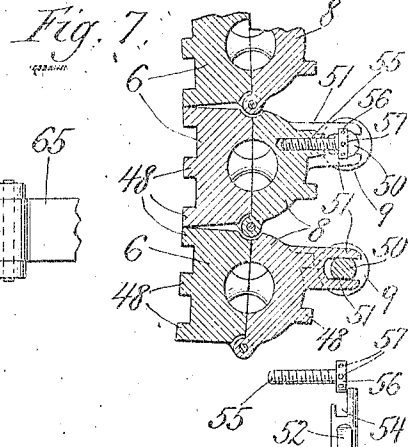
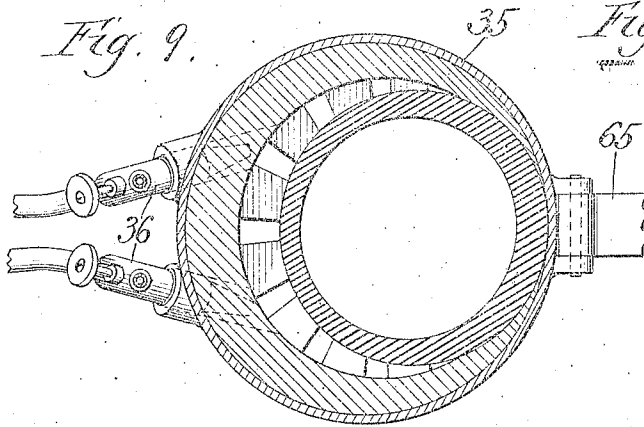
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

FRED N. CLINE, OF CHICAGO, ILLINOIS.

CASTING-MACHINE.

1,057,528.

Specification of Letters Patent.

Patented Apr. 1, 1913.

Application filed February 3, 1911, Serial No. 606,307. Renewed September 20, 1912. Serial No. 721,515.

To all whom it may concern:

Be it known that I, FRED N. CLINE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Casting-Machines, which are, fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved structure for casting metals in metal molds adapted for substantially continuous operation.

It consists in the elements and features of construction shown and described and their combinations as indicated in the claims.

In the drawings:—Figure 1 is a vertical section axial with respect to the mold-carrying member of a structure embodying this invention. Fig. 2 is a section at the line 2—2 on Fig. 1, a portion of the mold-carrying wheel and its molds being broken away to reduce the compass of the figure. Fig. 3 is a vertical section of the pouring device and mold in conjunction therewith, axial in respect to such mold and pouring device. Fig. 4 is a detail section at the line 4—4 on Fig. 3. Fig. 5 is a detail front elevation of the inner mold sections, showing the upper end portions of three of said sections broken out from the remainder. Fig. 6 is a top plan view of two consecutive molds. Fig. 7 is a detail section partly at the line 7—7, and partly at line 7^a—7^a on Fig. 3. Fig. 8 is an elevation of a device employed on each mold for encountering the mold closing shoe for closing the mold. Fig. 9 is a section at the line 9—9, on Fig. 3. Fig. 10 is a detail section at the line 10—10, on Fig. 1. Fig. 11 is a detail section at the line 11—11, on Fig. 1. Fig. 12 is a detail section at the line 12—12, on Fig. 1. Fig. 13 is a detail section at the line 13—13, on Fig. 12.

The structure shown in the drawings is designed as an improvement upon a casting machine for which Patent No. 928,246, was granted to me July 20, 1909, and in respect to general arrangement and many details of construction, it is substantially the same as that shown in said patent, and in respect to these general features and details it will be described only so far as necessary for understanding of the features constituting the present invention.

The machine as a whole comprises a base plate, 1, upon which there is erected a ball-bearing table, 2, which, at its center, supports the central standard, 3, of a cupola, 4, from which the molten metal is designed to be supplied to the molds which are mounted upon the mold-carrying element, which is a horizontal wheel, 5, mounted for rotation about the axis of the standard, 3, on the ball-bearing table, 2, said wheel being centrally apertured for, and adapted, if desired, to be journaled upon, the central cupola standard 3. The means for rotating this wheel about its vertical axis are not shown. It may be understood that it is rotated by any convenient means adapted for arresting it in any point in its rotation, as may be required by the exigencies of the process of casting. The molds, 6, of which a multiplicity are mounted upon the periphery of the wheel, 5, are substantially of the construction shown in my said former patent, each comprising a member 7 mounted rigidly upon the wheel, 5, and a member, 8, hinged to said rigidly mounted member for opening and closing the mold. Each of the hinged members is provided with an anti-friction pulley, 9, for encounter with the mold-closing cams 10, of which one is shown at one side of the machine, a similar and similarly positioned device being shown at the opposite side of the machine, it being intended that the machine shall have at least these two operating stations where molds will be filled as the wheel revolves to carry the molds past said stations respectively. Each of the cams 10 is extended so as to hold a plurality of molds closed at one time. As illustrated, the extent of the cam is such as to hold four molds completely closed while the fifth one is engaged and being closed. This cam plate is mounted by means of a plurality of stems 11, 11, which extend through horizontal slide-bearings in a rigid post, 13, springs 14 being coiled about said stems and reacting between the post and the cam plate for holding the cam plate thrust toward the axis of the mold-carrying-wheel, for pressing the hinged mold members which are engaged by it into closed position with the amount of force determined by the tension of the springs, 14. The molds are designed to be tripped open after they have traveled past the cam 10, and to a sufficient distance from the point

at which they were filled when shut by the cam, so that the casting is sufficiently cooled to retain the form after the mold is opened, and any convenient means not shown may be provided for thus opening the mold, the means shown in my former patent being suitable. At the point in the travel of the molds with the mold-carrying wheel at which it is considered suitable to open the molds, there is provided an endless conveyor, 15, which extends under the path of the molds for receiving the castings dropped therefrom, and carrying them away to a proper point for deposit.

The cupola, 4, is supported upon the post or central standard 3, by means of a spider or skeleton urn, 16, which is mounted upon the top of said post, and terminates in an annular top flange, 17, onto which the annular base 18 of the crucible shell is bolted, said base having its central opening provided with a trap bottom, 19, adapted to be withdrawn to permit the dumping of the contents of the cupola, when so desired, such dumped contents being received in the skeleton urn or spider, 16, and removed through the openings between its skeleton arms. The cupola comprises a cylindrical chamber 20, terminating at the upper end in a reduced cylindrical mouth 21, for discharge of gases, and at the lower end, in a melting chamber 22, which is enlarged in diameter intermediate its upper and lower ends, being in general comprised of two cone frustums mounted with their larger bases together, as seen clearly in Fig. 1. The entire cupola structure is lined with fire-brick 23, the bottom having such fire-brick lining 24, being made crowning, so that the liquid metal will flow off therefrom for discharge through spouts 25, which are provided and distributed about the axis of the cupola in number and position corresponding preferably to the number and position of the stations at which the mold-closing cams 10 are provided and an operator is to be stationed.

The melting of the metal in the cupola is designed to be effected by means of oil burners, 26, of which four are shown distributed about the circumference of the melting chamber of the cupola, and discharging radially and downwardly thereinto for impingement upon the metal in the lower part of said chamber. Said oil burners are all connected to an air-supply trunk, 27, and an oil supply trunk, 28, for producing a proper admixture of air and gas to effect perfect combustion without the other supply of air to the cupola. For starting the melting, it may be desirable to use charcoal or coke placed in the bottom of the cupola and suitably moistened by a combustible liquid so as to be readily ignited by a lighted taper thrown into the crucible, and for supplying air for such combustion, one or more of the

burners may be employed as a blower, the oil supply being cut off from it for the time being. Also, in the ordinary operation of the furnace, under some circumstances it may be found desirable to operate one or more of the burners as blowers only—that is, without admitting oil thereto.

The cupola is represented as extending up through the roof 30 of the building in which it is located, for the discharge of gases, and from the roof there is suspended, by means of a pipe structure 31, an annular platform 32 encompassing the cupola above the combustion chamber for accommodating the attendant who will supply the ore to the cupola through the latter door 33.

The molten metal is designed to be drawn from the discharge spouts 25 into pourers 35, which are, in effect, crucibles adapted to be kept hot by oil burners, 36, with which they are respectively provided, such burners being supplied with oil and air by flexible pipe connections leading from the trunks, 27 and 28, respectively. These metal receptacles or pourers 35 are provided in number corresponding to the number of stations, and are mounted for swinging in a horizontal plane about the axis of the mold-carrying wheel, so that their pouring spouts 37 may overhang and follow through their swinging movement the path of the molds to be filled. For mounting these pourers, they are each connected by a radius rod 39 with the central post or standard, 3, such connection being pivotal at the center of said post, as hereinafter more particularly explained. These radius rods, however, are not relied upon for holding the weight of the pourers, but for that purpose there is formed on the mold-carrying wheel an annular track flange 40, and each of the pourers is provided with two wheels 41 resting upon such track.

The molds are each provided with flaring or funnel-shaped, but horizontally oblong receiving mouths 42, said mouths being rendered oblong by elongation toward each other in the line of the circumference of a circle about the axis of the mold-carrying wheel, the radius of such circle being less than the distance from said axis to the parting plane of the molds; from which it results that the meetings of said elongated funnel-shaped mouths, being in the circumference of such circle are positioned on the members of the funnel-shaped mouths which pertain to the fixed members respectively of the molds. The discharge spouts 37 of the pourers terminate for causing the path of discharge of the molten metal therefrom to intersect said circle at which the meetings of the elongated funnel mouths of the molds are situated, that is, so that the stream of molten metal will be carried by the swinging of the pourer in a path which will cross said meetings. This enables the operator to

pass from mold to mold in pouring without interrupting the flow of the metal; and when the molds are of such a capacity that they can be filled substantially during the length of time occupied by the molds in passing a given point in their travel with the carrying wheel, the operator needs only to watch the molds and swing the pourer a little one way or the other, so as to pass from one mold to the next immediately upon the completion of filling of each; that is, he will need only to accommodate the varying time of filling different molds by a little movement of the pourer one way or the other.

When the molds are of such capacity that the length of time required for filling them is materially greater than the time which they occupy in passing a given point, the operator will be able to avoid either interrupting the rotation of the carrying wheel or interrupting the flow of metal for a considerable time, because there are at all times four molds in position and condition for filling, and by beginning to pour with any given mold immediately upon its entrance back of the closing cam, the operator may swing the pourer so as to remain with the mold until it is filled. Then swinging back to the next following mold, the same process may be repeated until the margin afforded by the length of travel of the molds past the cam is exhausted. It will then be necessary to halt the carrier while filling the remainder of the molds which are engaged with the cam, after which it may be started and the order of operations repeated. When the capacity of the molds is such that each mold can be filled in less time than is occupied by its travel past a given point, the operator will swing the pourer so as to begin filling with the mold which is nearest to the point for passing out from behind the cam, provided it has yet sufficient travel to permit it to be filled before escaping the cam, and will swing the pourer from that point back successively over the molds which are engaged with the cam until he has filled a mold which has just entered behind the cam and been closed thereby. It will then be necessary to interrupt the flow of metal while additional molds enter behind the cam and are closed ready for filling. Usually it will be impossible to increase the speed of the carrier so as to avoid any loss of time by reason of the molds filling in less time than they pass a given point. And similarly, when all the molds are alike, it may be preferred to slow up the rotation of the mold carrier for molds which require more time in filling; but the opportunity for swinging the pourer over the full range of the mold-closing cam adapts the machine to be operated with the minimum loss of time and minimum number of interruptions of either the rotation of the carrier or the flow

of the metal, when either the molds are too small or too large to permit the necessary adaptation of the speed of the carrier to the time required for filling, or when the carrier has molds of a variety of sizes at different parts of its circumference, so that it is impossible to accommodate all of them by adjusting the speed of the carrier.

The particular means shown for pivotally connecting the radius rod to the center post, 3, consists in making in the posts, at points corresponding to the position of the radius, apertures 3^a of angular extent corresponding to the necessary swinging of the pourer, inserting through said slots a pivot plate 45, whose length is equal to the exterior diameter of the post, so that its ends lodge upon the lower margins of the slots and are flush with the outside of the post. Reinforcing plates 46 are bolted onto the outside of the post to make good the loss of strength caused by the slots, and these reinforcing plates have slots 46^a only sufficient in width to permit the emergence through them of the radius rods, the slots 3^a being in vertical width as much greater than that as the thickness of the pivot plate 45, so that the reinforcing plates lap the ends of the pivot plate, and retain it in the post. The radius rods having their inner ends flattened are inserted through the slots in the reinforcing plates and post, and the pivot pin 47 is inserted through them and through the plate from the upper end of the post.

In order to facilitate the cooling of the molds, and also to reinforce them against liability of warping, they are provided with exterior vertical ribs 48, which tend to form vertical channels, tending to induce upward circulation of the air through them, between the ribs, and thus increase the cooling effect, in addition to the ordinary increase due to the increase of the radiating surface.

In order that the material flowing from the spout of the pourer may be delivered centrally into the mold with minimum liability to be lodged upon the margin of the opening, with the resulting tendency to clog the same by cooling in that position, it is desirable that the spout should extend a little downward in the flaring funnel mouth-piece, as seen in Fig. 3, and in order that it may thus extend and still permit the molds to travel past it, the bridge or partition between the consecutive funnel mouths at the meeting point is provided with a slight notch 49, which makes a path for the lower lip of the spout, as the molds travel past it, or as the filler is swung from mold to mold, as described.

For closing the spout of the pourer, there is shown a device, which is also shown in my Patent, No. 928,246, consisting of the plug 63, carried in a slide-bar 64, mounted in the bracket arm 65, and operated by a lever 66.

In order that any metal in the funnel mouth of the molds, which may be lodged thereon by splashing and solidified thereon so as to constitute a sprue or jet on the casting, may not operate to impede the discharge or delivery of the casting from the mold, the hinged member 8 has the mouth-piece formed with the inner wall substantially vertical at the parting plane of the two members, as seen in Fig. 2, so that the resulting sprue is prevented from being wider than the opening between the mold members when the member 8 is swung open to the limited extent permitted by the close assemblage of the molds.

In order that there may be mounted upon the mold-carrying wheel as many molds as possible, avoiding waste intervals between them, the hinge of each mold is accommodated by a recess in the proximate side of the adjacent mold, as seen in Figs. 5 and 6, the hinge and swinging member of all the molds being exteriorly in general of cylindrical form, so that the proximate sides of said hinge members curve away from each other at the closed position of the mold. This provision for accommodating the hinges does not interfere with sufficiently free opening of the molds for discharging the castings.

Since it is important that all of the molds which are engaged behind the closing cam at any one time shall be held fully closed by the cam, it is essential that the cam is not held back by any one of the molds out of contact with the others. This involves substantial uniformity in the dimensions of all the molds measuring from the outer side of the circumference of the roll upon each mold which bears against the cam radially inward, and in fact, substantial uniformity in the distances from said outer side of the roll to the axis of the carrier. Perfect uniformity in dimensions, it is well understood, will not result in the ordinary process of casting or forging the molds, slight variation in the shrinking in cooling being unavoidable and the size when cast due to variation arising from rapping the flasks. In order to compensate for this variation, so as to make the outer side of the circumference of the roll which bears against the cam in all cases equi-distant from the axis of the carrier, the roll on each mold is journaled on a spindle or shaft 50, which is mounted at its upper and lower ends in forked lugs 51, projecting from the outer or hinged member of the mold, the fork slot being narrower than the diameter of the shaft 50, and said shaft being flattened as shown at 52, for sufficient distance to admit the shaft into the slot in which it has a range of sliding movement toward and from the parting plane of the mold members. The ends of the shaft 50 are each provided with a notch 54, and into

the mold member there is screwed an adjusting bolt 55, having its head 56 adapted to engage the notch 54, so that by screwing the bolts 55 in and out, the shaft 50 may be adjusted in and out,—that is, toward and from the parting plane of the mold members, being held safely at all positions by the bolts whose threads may be fitted tightly enough to be secured against being jarred out of adjustment. The heads 56 may be provided with radial apertures 57, so that they may be rotated by means of a pin to adjust the shaft and thereby position the roll on each mold properly, compensating for any difference in size of the molds or inaccuracy in the carrier, and causing all the molds to be held fully closed by the cam, preventing any one from holding the cam away from the roll of others which may be engaged at the same time.

I claim:—

1. In a casting machine, in combination with a cupola having a central support, a mold carrier mounted for horizontal rotation about such support; a plurality of molds mounted on the carrier in circular series about the axis of rotation of the carrier; a pourer mounted for receiving metal from the cupola and swinging about said axis, and having a discharge which overhangs the path of the molds, the molds having receiving funnels extending toward each other and meeting in the path of discharge of the metal from the pourer and having their bottoms sloped up from the mold entrance to the meeting point of said funnels.

2. In a casting machine, in combination with a cupola and its support, a mold-carrier mounted for horizontal rotation about the support; a plurality of molds on the carrier in a circular series about the axis thereof, a pourer mounted for receiving metal from the cupola and swinging about said axis, having a discharge spout which terminates overhanging the path of the molds, the molds having receiving funnels into which the spout terminal protrudes, the funnels being extended toward each other and meeting in the path of said spout terminal, and being notched at their meetings to clear the path of the spout.

3. In a casting machine, in combination with a cupola having a central support, a mold carrier mounted for horizontal rotation about such support; a plurality of molds on the carrier in a circular series about the axis thereof; a pourer mounted for receiving metal from the cupola swinging about said axis, and having a discharge spout which terminates overhanging the path of the molds for a distance corresponding to a plurality of molds, and adapted to hold such plurality of molds closed at one time, the range of movement of the pourer

about the axis of the carrier being sufficient to reach with the spout all the molds which are closed at one time.

4. In a casting machine, in combination with the cupola having a central support, a ball-bearing table concentric with such support; a mold carrier mounted for rotation about the support on the ball-bearing table; a plurality of molds on the carrier in a circular series about the axis of rotation; a pourer supported upon the carrier; a radius rod pivoted to the central cupola support and connected to the pourer for controlling its movement in a circular path about the axis of the carrier, the pourer having a discharge spout which overhangs the path of the molds and provided with means for swinging it in said path at will.

5. In a casting machine, in combination with a cupola having a central support; a fixed table having a ball-bearing concentric with the cupola support and encompassing the same; a mold-carrying wheel mounted for rotation about the support of such ball-bearing; a mold-carrier pivotally connected to the support for rotation thereabout overhanging the mold-carrier, the latter being provided with a circular track, and the pourer being provided with wheels for traveling on such track, whereby the pourer is supported on the carrier, the cupola having a central discharge spout overhanging the pourer for supplying the latter from the former; the pourer having a discharge spout overhanging the path of the molds, and means for swinging the pourer at will about the axis of the carrier.

6. In a casting machine, in combination with a cupola having a central support, a mold-carrier mounted for horizontal rotation about such support; a pourer located above the carrier in position to receive metal from the cupola, pivotally connected to the support for horizontal rotation thereabout, and having its discharge overhanging the path of the molds on the carrier; the carrier having an annular track and the pourer having wheels which travel on such track, whereby the carrier supports the pourer; the pivotal connection of the pourer with the central support consisting of a radius rod, the central support being tubular; a pivot plate lodged within the tubular support, the

latter having an aperture through which the radius rod enters for connection with the pivot plate.

7. In combination with the central tubular cupola support having opposite lateral apertures; a pivot plate adapted to be entered through said apertures and having its ends lodged upon the margins thereof; reinforcing plates applied outside the tubular support lapping said apertures and the ends of the pivot plate for retaining the latter, said reinforcing plates having apertures corresponding to the remaining uncovered portion of the apertures in the support; the radius rod which enters through said apertures for connection with the pivot plate.

8. In a casting machine, in combination with a rotary mold-carrier and molds mounted thereon, having each a member hinged for opening and closing the mold; a clamping shoe by which the molds are closed and held closed at filling position while the carrier rotates, said shoe being extended to hold a plurality of molds closed at the same time; abutments mounted movably on the molds respectively, against which the shoe bears to hold the molds closed, and means for adjusting said abutments.

9. In a casting machine, in combination with the rotary mold carrier, a plurality of molds mounted thereon comprising each a member hinged for opening and closing the mold; a shoe by which the molds are closed and held closed as the carrier rotates, said shoe being extended to engage at the same time a plurality of molds; abutments on the respective molds by which the shoe engages the hinged mold members; shafts on the respective molds which carry said abutments, said shafts being mounted on the respective mold members for lateral movement toward and from the shoe, and having their ends notched; and bolts screwed into the mold members having heads which engage the notches of the shafts to carry the latter in and out as the bolts are screwed in and out.

In testimony whereof, I have hereunto set my hand, at Chicago, Illinois, this 30th day of January, 1911.

FRED N. CLINE.

Witnesses:

CHAS. S. BURTON,
M. G. ADY.