March 4, 1924. 1,485,860

J. B. LADD

CENTRIFUGAL CASTING MACHINE

Filed Nov. 28, 1922 5 Sheets-Sheet 1

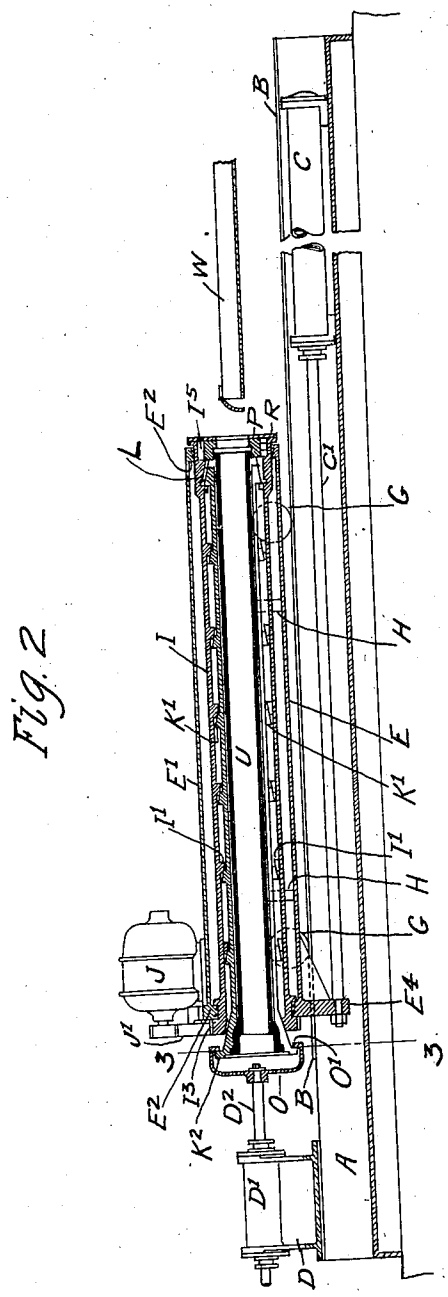


Fig. 2

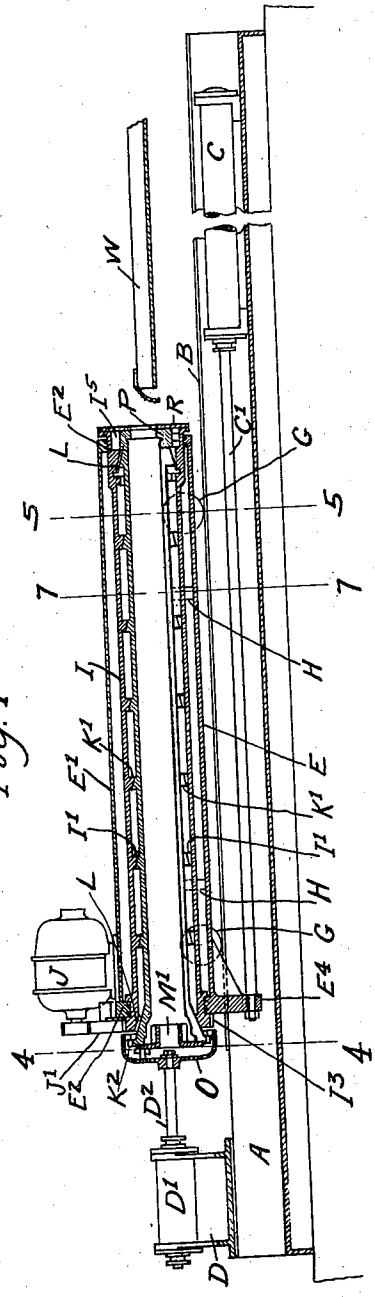


Fig. 1

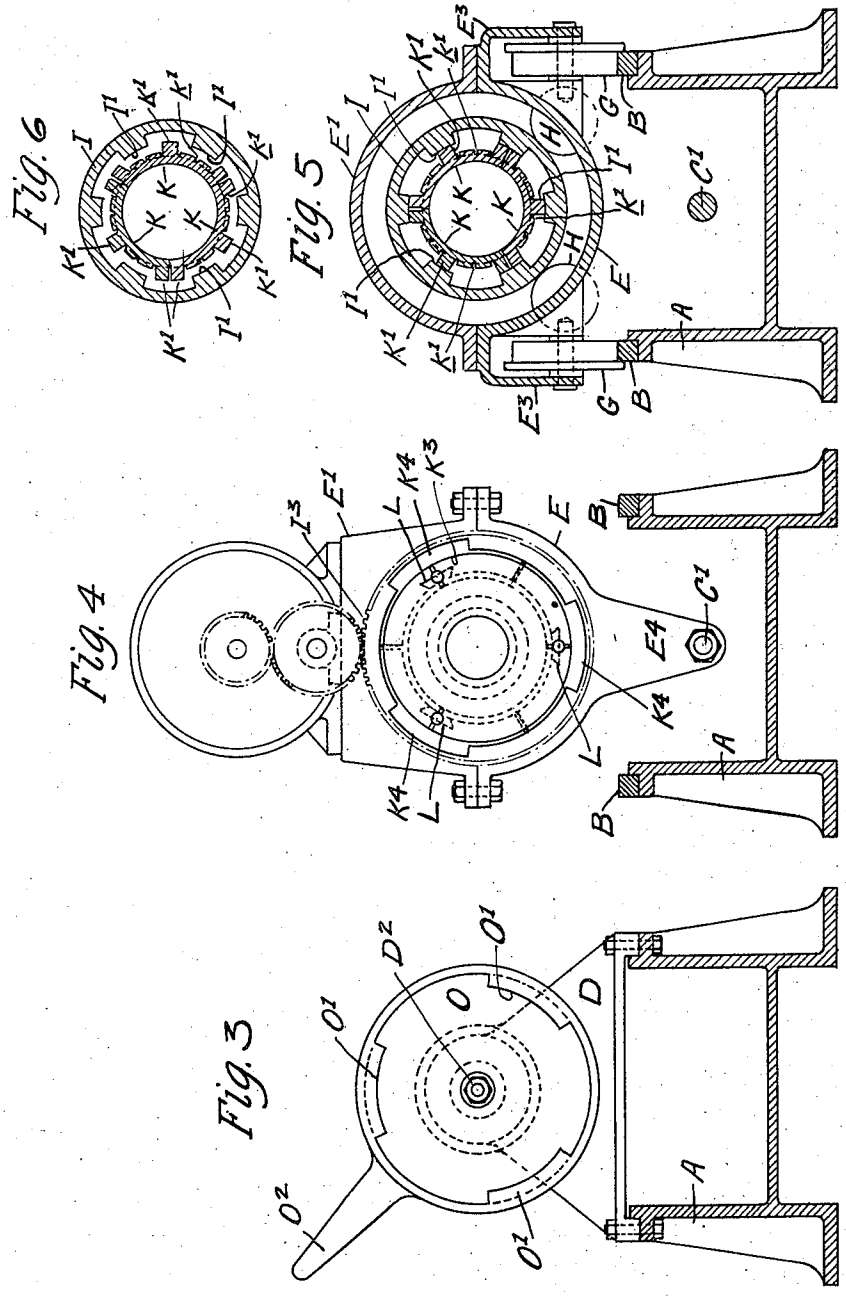
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CENTRIFUGAL CASTING MACHINE

Filed Nov. 28, 1922 5 Sheets-Sheet 2



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CENTRIFUGAL CASTING MACHINE

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Fig. 8

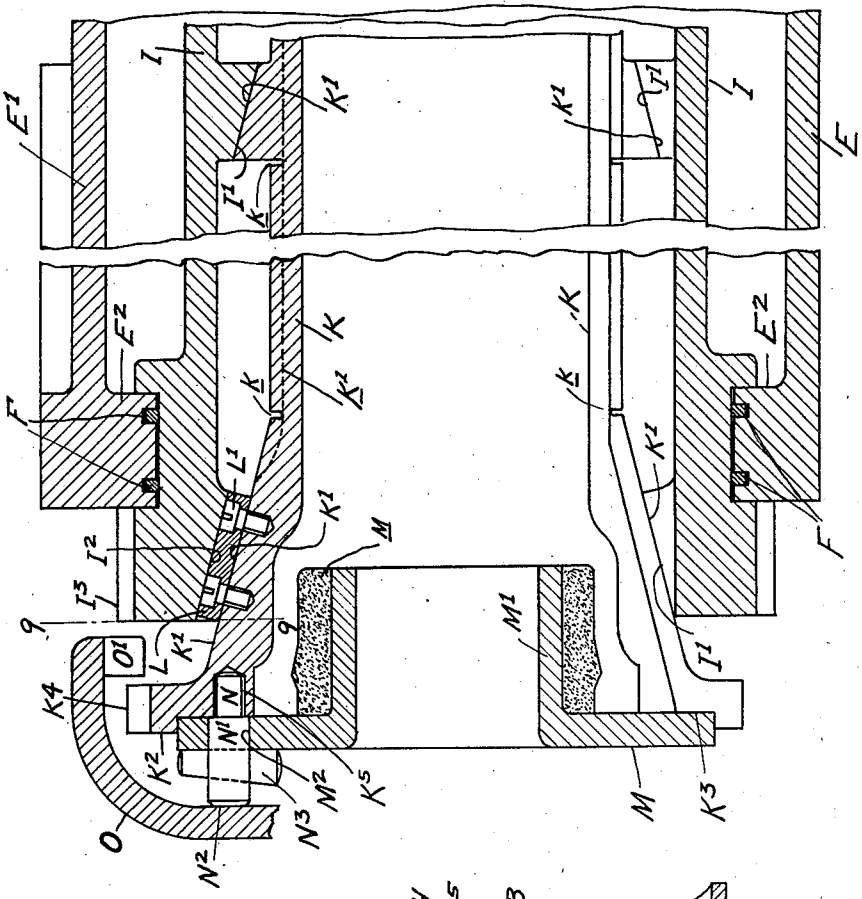


Fig. 9

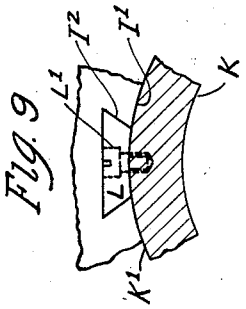
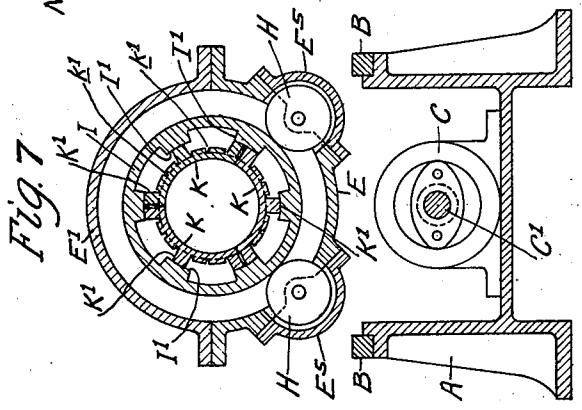


Fig. 7



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CENTRIFUGAL CASTING MACHINE

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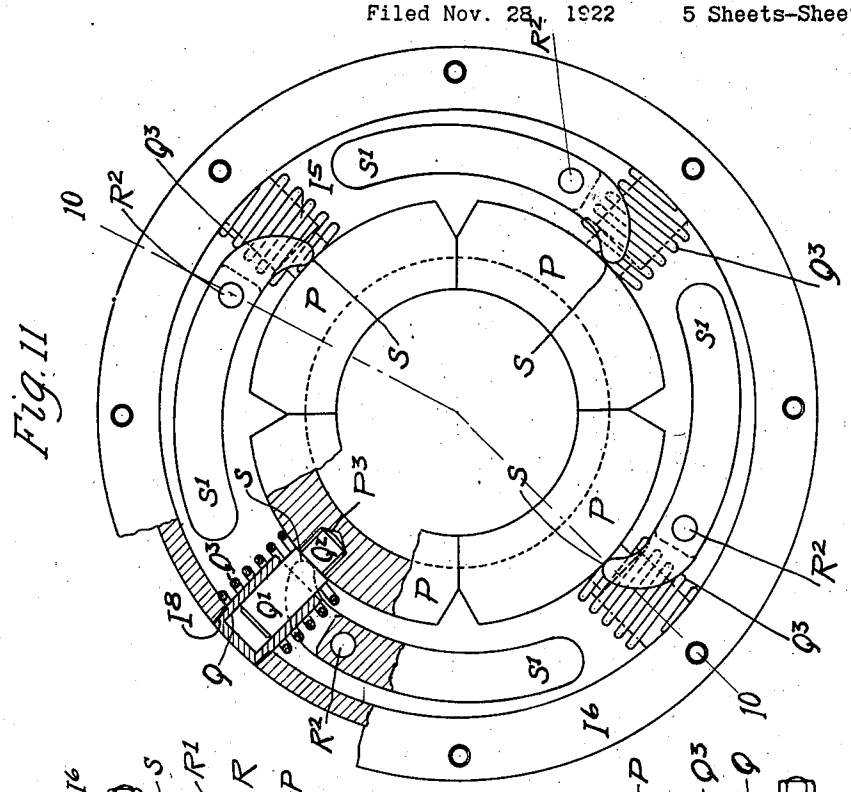


Fig. 11

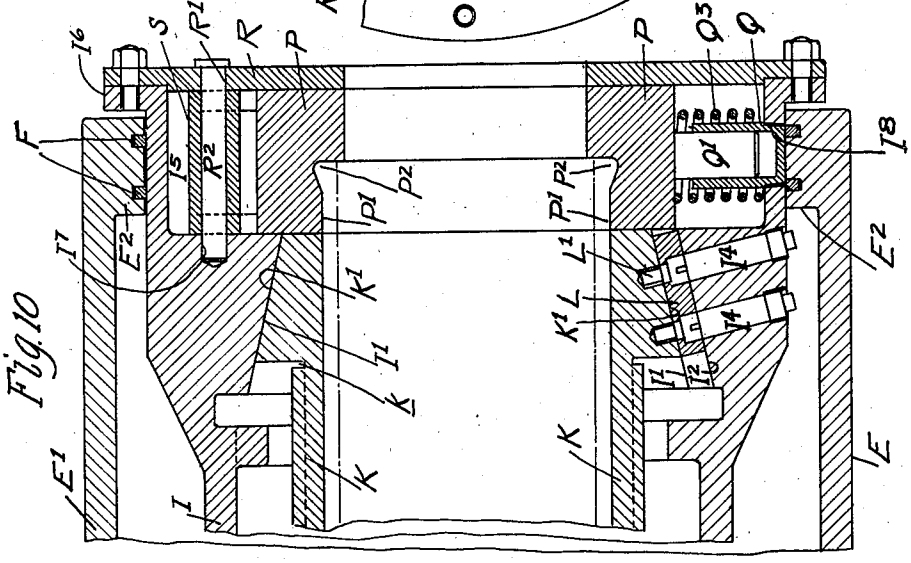


Fig. 10

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CENTRIFUGAL CASTING MACHINE

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Fig. 12

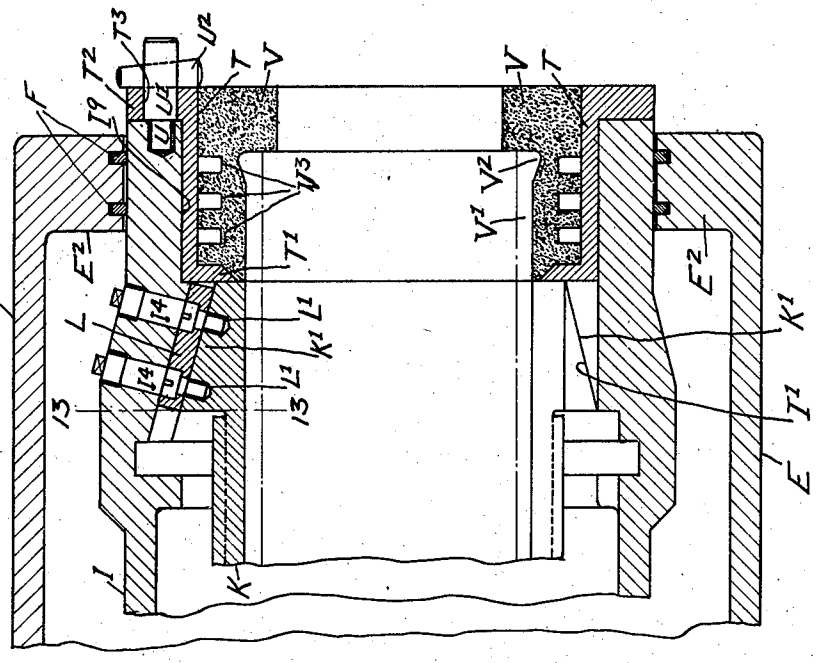


Fig. 13

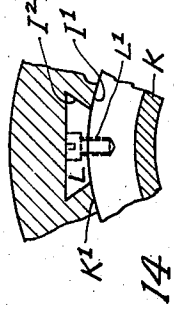
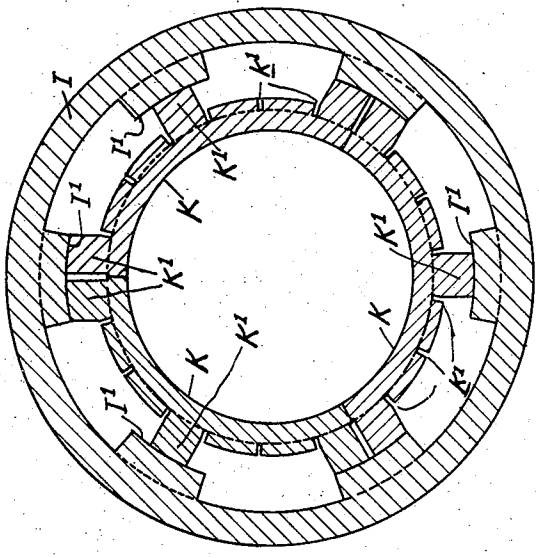


Fig. 14



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UNITED STATES PATENT OFFICE.

JAMES B. LADD, OF ARDMORE, PENNSYLVANIA, ASSIGNOR TO UNITED STATES CAST IRON PIPE & FOUNDRY COMPANY, OF BURLINGTON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

CENTRIFUGAL CASTING MACHINE.

Application filed November 28, 1922. Serial No. 603,757.

To all whom it may concern:

Be it known that I, JAMES B. LADD, a citizen of the United States of America, and resident of Ardmore, in the county of Montgomery, in the State of Pennsylvania, have invented certain new and useful Improvements in Centrifugal Casting Machines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to a machine for the centrifugal casting of pipes and particularly of pipes having bell ends at one end and beads at the opposite end, which variety of pipes cannot, for obvious reasons, be cast in a solid metal mold. The object of my invention is primarily to provide a mold made up of separable segments which, under the strains incident to the solidification and contraction of the pipe casting, will separate to a sufficient extent to permit of the longitudinal contraction of the pipe. By preference, and this is an important feature of my invention, I make the mold of two sections, both segmental in construction, one segment being adapted for the casting of the main body of the pipe and the other segment adapted for casting the beaded end of the pipe and further adapted to yield and permit the longitudinal movement of the beaded end of the pipe when the pipe casting contracts.

Another feature of my invention has to do with the mechanism for shifting the mold longitudinally in the casing.

Other features of the casting machine illustrated in the drawings are also new with me but are not herein claimed for the reason that they form the subject matter of a co-pending application for Letters Patent filed November 28, 1922 Serial No. 603,756, reference being now had to the drawings in which my invention is illustrated and in which—

Figure 1 is a longitudinal, sectional elevation of my centrifugal casting machine with the mold sections in the position they occupy immediately after they have been forced together, and with the mold entirely retracted from the pouring trough.

Figure 2 is a similar view showing the mold shifted in the casing to the position it occupies when retracted from the casting.

Figure 3 is a sectional view on the line 3—3 of Fig. 2, looking toward the left but with the mold and cast pipe shown in Fig. 2 omitted.

Figure 4, a sectional view on the line 4—4 of Fig. 1 looking toward the right.

Figure 5, a sectional view on the line 5—5 of Fig. 1.

Figure 6, a sectional view taken through the mold sectors and the casing but showing the mold sectors in the position they occupy with regard to the casing when being inserted therein.

Figure 7, a cross sectional view on the line 7—7 of Fig. 1.

Figure 8, is a sectional elevation on a larger scale of a portion of the mechanism, as shown in Fig. 1.

Figure 9, a sectional view on the line 9—9 of Fig. 8, looking toward the right.

Figure 10 is a section on the line 10—10 of Fig. 11 of the right hand end of the apparatus shown in Fig. 1, with details supplied which are omitted in the views shown in Fig. 1.

Figure 11 is an end view of the mechanism shown in Fig. 10, partly shown in section.

Figure 12 is a view generally similar to Fig. 10, but showing a modified mold section for the formation of the beaded ends of the pipe.

Figure 13 is a cross sectional view on the line 13—13 of Fig. 12, and

Figure 14 is an enlarged sectional view of the casing and mold, as shown in Fig. 5.

A is the frame of the machine supporting tracks indicated at B, and a power cylinder indicated at C, C′ being the piston rod extending from the piston within the power cylinder and connected to actuate the mold supporting carriage as will be described. The framing also supports at its left hand end a bracket indicated at D which in turn supports the cylinder indicated at D′ in which, in turn, is adjustably supported the rod D^2.

E and E′ are respectively the lower and upper sections of a longitudinal casing which is formed with inwardly turned flanges, as indicated at E^2, forming a bearing for the mold supporting cylinder indicated at I. E^3, E^3, are brackets extending out from the lower section of the casing

and supporting the wheels G, G, etc. which in turn rest upon the tracks B, B. E^4 is a lug extending from the lower end of the casing to which is attached the piston rod C'. F, F, indicate packing rings by which the joints between the flanged ends E^2 of the cylinder and the casing I are made sufficiently tight to enable the space between the two casings to be used as a water jacket. H, H, are wheels or rollers supported within the removable portion E^5 of the lower casing section and which, in turn, support the longitudinal casing I, as best shown in Fig. 7.

The casing I has extending from its inner surface lugs I' arranged in circularly disposed groups and also so arranged as to lie in longitudinally parallel lines. These lugs have beveled faces, as indicated, and the end lugs of the longitudinal lines are, as indicated at I^2 and as best shown in Figs. 9 and 13, undercut for a purpose which will be explained. I^3 is a gear wheel formed on or attached to the left hand end of the casing I by which it is rotated through gears indicated at J' by an electric motor indicated at J.

K, K, K, are the sectors or segments making up the mold in which the pipe is cast. Extending out from the outer face of the mold sectors are the lugs indicated at K', K', etc. which are bevel faced and arranged in circular and longitudinally aligned groups so that when the mold is assembled in the casing I these lugs will rest in contact with the bevel face lugs I'. The end lugs K' which contact with the end lugs of the casing have attached to them dove tail lugs L which fit in the under-cut recess I^2 of the lugs I' and are secured to the mold sectors by screws L', and, to enable these screws to be inserted after the parts are in place, openings I^4, I^4, are formed in the casing I, as shown in Fig. 12. At the left hand end the mold sectors are extended beyond the casing I, as shown in Fig. 8, and flanged outward, as indicated at K^2, a seat being formed at K^3 for the core iron and the outer edge of the flange K^2 being notched, as indicated at K^4 for a purpose which will be explained. In order to make the mold sectors sufficiently flexible to insure that they will be forced into intimate contact with each other at their edges I form circumferential and longitudinal grooves in the outer surface of the mold sectors, as indicated at *k* and *k'*. M is a core iron having a longitudinal extension M' on which is supported the sand core for forming the bell end of the pipe The core iron is secured to one sector of the mold by a wedge N^3 passing through an eye in the head N' of a screw which in turn is secured to the mold sector, as shown in Fig. 8. The head of the screw indicated at N^3 forms an abutment which, when the mold is moved toward the left, comes in contact with a head O, as shown in Fig. 8. This head O is pivotally secured on the end of the rod D^2 and is formed, as shown, so as not only to afford an abutment for the head N^2 of the screw N but also to extend over the end of the mold sectors, the over extending portion being formed with inwardly projecting lugs O' which in one position can pass through the notches K^4 and in another position will engage with the inside of the flange K^2. The angular adjustment is made through the handle indicated at O^2.

P, P, P, indicate mold segments forming together a supplemental mold section especially intended for the casting of the bead end of the pipe. These segments are formed so as to make up a cylindrical mold surface indicated at P', P', etc., which registers with the mold surface of the segments K and terminate in sections P^2 adapted to cast the bead at the end of the pipe. The sectors P are assembled in a cylindrical chamber I^5 formed at the right hand end of the casing I, as best shown in Figs. 10 and 11. In this chamber the sectors P are positioned by means of thimbles Q fitting in recesses I^8 in the wall of the chamber I^5 and guiding a plunger Q', a reduced end Q^2 of which enters a recess P^3 in one of the sectors P, and the sectors P are pressed together by the action of coiled springs Q^3 surrounding the thimbles Q. The sectors P are further held in position by an annular plate R bolted to the flange I^6 at the end of the casing I and having pivot pin bearings R' formed in it through which extend pivot pins R^2, the inner ends of which enter holes I^7 in the casing I. Pivoted on the pins R^2 are centrifugal counterbalances having short ends S which rest against the segments P and longer ends S' which, when the mold and casing revolve, tend to move out by centrifugal force and press the short ends S against the mold sectors P, thus counterbalancing the tendency of these sectors to move outward under the influence of centrifugal force, when the mold is in revolution.

m, Fig. 8, is the core for the bell mouth of the pipe supported, as shown, on the core iron M'. W, Figs. 1 and 2, indicates the runner through which the molten metal is introduced into the mold.

Referring to the modified construction shown in Fig. 12, the casing I is here shown as having a chamber I^9 formed on its right hand end in which fits a cylindrical core iron T. This core iron has an inwardly flanged end T' which fits against the end of the mold sectors K and an outwardly flanged end T^2 which fits against the outer end of the casing I to which it is secured by a screw U having an eye head U' which passes through an opening T^3 in the flange and

through the eye of which passes the wedge U^2. V is a sand core formed on the inside of the core ring T having the internal form indicated at V', V^2, for forming the bead end of the pipe and being made with annular recesses indicated at V^3 so that under the stress of a contracting pipe this core can readily yield and collapse, permitting the bead end of the pipe to move toward the left. I am aware that a collapsing core has been proposed as a means for casting the bead end of the pipe and it will be understood that I do not claim this device broadly but only in the new combination with which I employ it.

In operation and preparatory to casting a pipe, the carrier casing E, E', is moved toward the left until the head O abuts against the head N^2 of the screw N, and until the pressure exerted through this head forces the mold sectors to the position indicated best in Fig. 8, that is, the position in which they are firmly abutted against each other in position to cast the pipe. In this position the sectors P of the supplemental mold section at the right hand end of the pipe which are pressed inward by the springs Q^3 will register with the mold sectors K. The mold is then moved toward the right over the runner W until the end of the runner comes close to the bell end of the mold. The mold is then rotated and metal is permitted to run into the mold which may advantageously remain stationary longitudinally until the bell end is filled and the mold being in full rotation is then moved toward the left with the result that the stream of metal running into it is distributed in a helix on the surface of the mold and the casting progressively formed. The metal continues to pour into the moving mold until the entire mold has been charged from end to end and it will readily be understood that this progressive mode of casting the pipe will be such that, especially in a water cooled mold, the portions of the pipe casting first poured will have an opportunity to solidify and partly contract before the bead end of the pipe casting is formed. Obviously, this makes it advisable under certain conditions to open the mold and relieve the pipe casting from contracting strains before these strains have become sufficient to rupture the pipe and this method of casting a bead ended pipe is claimed as my invention in my copending application, Serial No. 603,756 filed November 28, 1922. In my present construction I provide means for preventing the rupture of the pipe during cooling and contracting, either by supplying a contracting core for casting the bead end of the pipe, as shown in Fig. 12, or preferably, by forming the mold with the supplemental mold section for casting the bead end of the pipe made up of the retractible sectors P, P, etc. held in casting position by resilient means, which means will yield, permitting the mold sectors to move apart when the pipe contracts longitudinally so as to draw the bead end of the pipe toward the left and, to insure that the mold sectors P will remain in casting position during the casting operation, I provide not only resilient means as the springs Q^3 for holding them together but also the centrifugal counterbalances S, S', which press against the mold sectors, holding them in operative position when the mold is in rotation.

The pipe having been cast while the mold is moving toward the left I continue this motion of the mold and the carrier after the casting of the pipe until the flange ends K^2 of the mold sectors reach approximately the position shown in Fig. 8, that is, a position in which the flange end of the mold sectors lie within the inwardly projecting lugs O' of the head O. The head O is then turned so that these lugs O' will pass beyond the notches K^4 and on a reversed movement of the carriage and mold the lugs O' engaging the flanges K^2 will draw the mold sectors toward the left while the casing I is still moving toward the right. This, of course, will retract the mold sectors which, being engaged with the casing I as described, will, at the same time move radially outward and away from the cast pipe, as indicated in Fig. 2, and while the sectors are thus retracted the cast pipe is removed.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A centrifugal casting machine comprising a rotatable casing in combination with a segmental mold, means engaging the mold segments with the casing which permit the segments to move radially and resilient means holding the segments together.

2. A centrifugal casting machine comprising a rotatable casing in combination with a segmental mold, means engaging the mold segments with the casing which permit the segments to move radially, resilient means holding the segments together and counterbalances actuated by centrifugal force for balancing the centrifugal force tending to move the mold sectors apart.

3. A centrifugal casting machine comprising a rotatable casing in combination with a segmental mold section, interacting means located between the mold and casing for clamping the mold segments together or permitting them to move apart and a supplemental mold section adapted to yield under strains due to the contraction of the casting secured in the casing in alignment with the first mold section.

4. A centrifugal casting machine comprising a rotatable casing in combination with a segmental mold section, interacting

means located between the mold and casing for clamping the mold segments together or permitting them to move apart, a supplemental segmental mold section secured in the casing in alignment with the first mold section and resilient means for holding the sectors of the supplemental mold section together.

5. A centrifugal casting machine comprising a rotatable casing in combination with a segmental mold section, interacting means located between the mold and casing for clamping the mold segments together or permitting them to move apart, a supplemental segmental mold section secured in the casing in alignment with the first mold section, resilient means for holding the sectors of the supplemental mold section together and counterbalances actuated by centrifugal force for balancing the centrifugal force tending to move the sectors of the supplemental mold section apart.

6. A centrifugal casting machine comprising a rotatable casing in combination with a segmental mold the segments of which are radially and longitudinally movable in the casing, interengaged means whereby a longitudinal movement of the mold segments in the mold moves them together or apart and power mechanism for moving the mold segments longitudinally.

7. A centrifugal casting machine comprising a rotatable casing in combination with a segmental mold the segments of which are radially and longitudinally movable in the casing, interengaged means whereby a longitudinal movement of the mold segments in the mold moves them together or apart, a head engageable at will with the mold segments and power mechanism for moving said head.

8. A centrifugal casting machine comprising a longitudinally movable carriage, in combination with a rotatable casing moving with said carriage, a segmental pipe mold enclosed in the casing with the bell ends of the segments extending outside of the casing, interengaged means whereby longitudinal movements of the mold segments in the casing moves them together and apart and a head engageable with the bell ends of the mold segments for moving them longitudinally in the casing.

9. A centrifugal casting machine comprising a longitudinally movable carriage, in combination with a rotatable casing moving with said carriage, a segmental pipe mold enclosed in the casing with the bell ends of the segments extending outside of the casing, interengaged means whereby longitudinal movements of the mold segments in the casing moves them together and apart, a head engageable with the bell ends of the mold segments for moving them longitudinally in the casing and power mechanism for moving said head.

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