J. B. LADD.

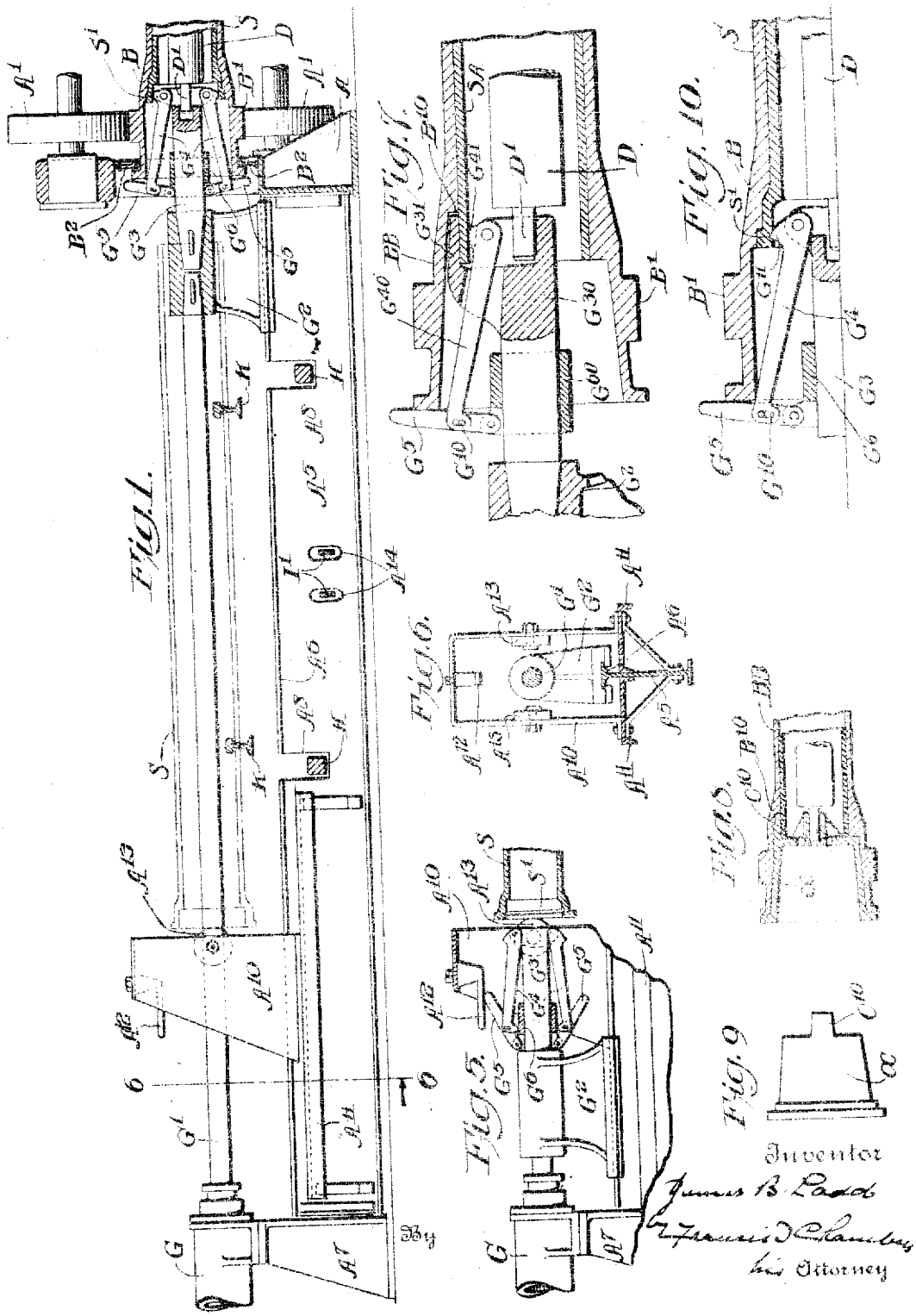
CENTRIFUGAL CASTING MACHINE.

APPLICATION FILED NOV. 1, 1918.

1,344,409.

Patented June 22, 1920.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 2.

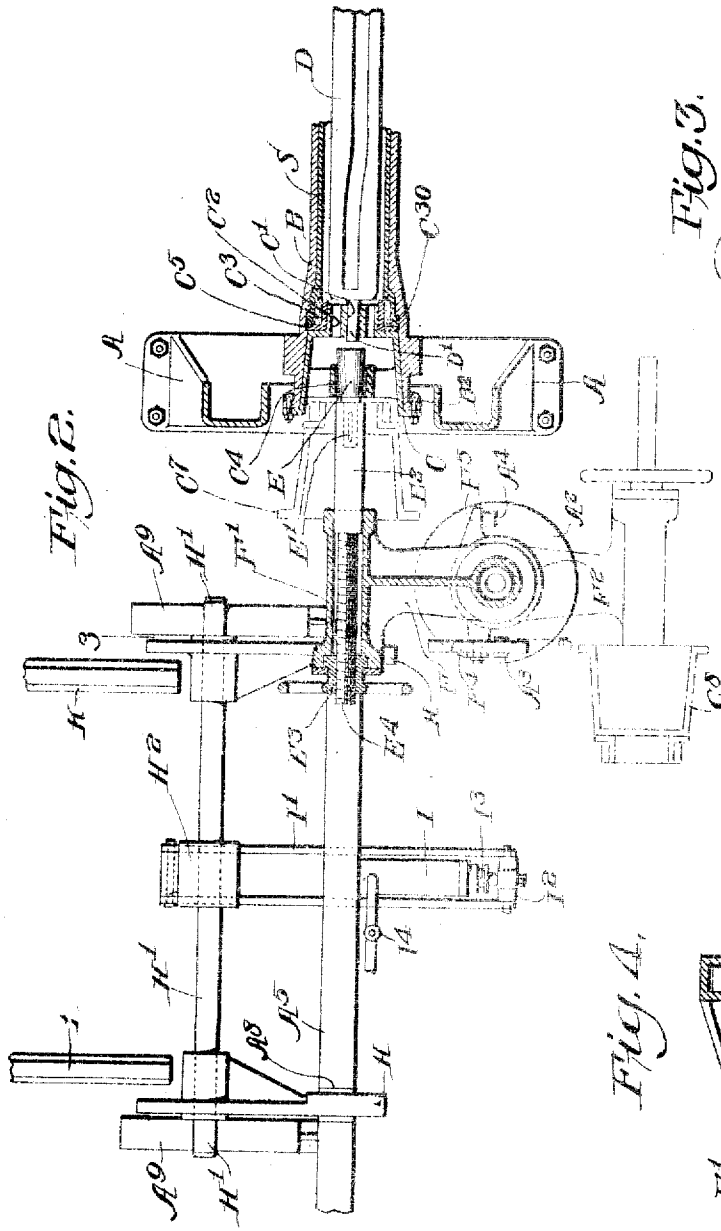


Fig. 3.

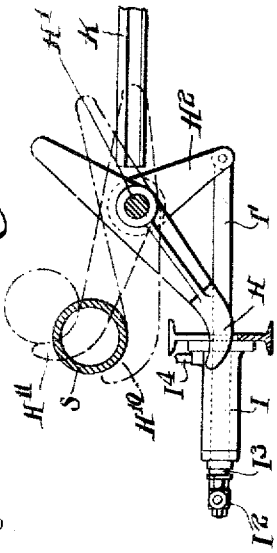
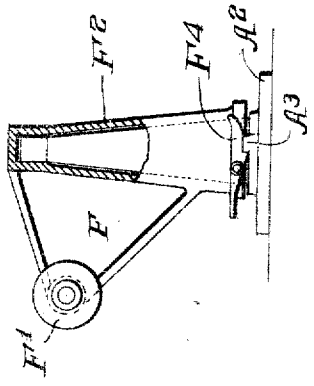


Fig. 4.



Inventor

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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL CASTING-MACHINE.

1,344,409. Specification of Letters Patent. Patented June 22, 1920.

Application filed November 1, 1918. Serial No. 260,655.

To all whom it may concern:

Be it known that I, JAMES B. LADD, a citizen of the United States, residing in Ardmore, in the county of Montgomery and 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 present invention relates to centrifugal casting machines for forming pipes or like tubular castings, and has for its general object to provide improvements in the casting apparatus adapted to facilitate the easy and expeditious removal of castings from the mold of the centrifugal casting machine in which they are cast.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to, and forming a part of this specification. For a better understanding of the invention, however, and the advantages obtained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of my invention.

Of the drawings:

Figure 1 is an elevation, with parts broken away and in section, of a preferred form of centrifugal pipe casting apparatus embodying my present invention.

Fig. 2 is a plan, with parts broken away and in section, of a portion of the apparatus shown in Fig. 1.

Fig. 3 is a partial section on the line 3—3 of Fig. 2.

Fig. 4 is an end elevation, with parts broken away and in section, of a portion of the apparatus shown in Fig. 2.

Fig. 5 is a partial sectional elevation of a portion of the apparatus shown in Fig. 1, illustrating a different condition of the apparatus from that shown in Fig. 1.

Fig. 6 is a section on the line 6—6 of Fig. 1.

Fig. 7 is a partial section taken similarly to Fig. 1 illustrating a modified construction.

Fig. 8 is a section illustrating a detail of construction of the mold employed with the modification illustrated in Fig. 7.

Fig. 9 is a plan view of a mold part shown in Fig. 8.

Fig. 10 is a section taken similarly to Fig. 1, showing a portion of the apparatus shown in that figure on a larger scale.

In the drawings, A represents a pedestal at the bell end of a centrifugal casting machine for casting a metal pipe with a bell at one end. Roller supports A′ for the rotary pipe mold B are journaled in the pedestal A. B′ represents an integral bearing collar formed on the bell end of the revolving metal pipe mold body B which is directly engaged by the peripheries of the supporting rollers A′. The bell end of the pipe mold B is closed during the casting operation by a removable cup shaped end member C formed of metal and detachably secured to the mold B proper as by means of the pivoted clamping bolts B^2. To facilitate the proper insertion and ready removal of the member C from the mold B, the member C is preferably formed with a conical body portion entering a conical portion of the main mold part B at the end of the mold cavity proper, and is provided with a flange at the base of this conical portion which abuts against the end of the mold body B. The mold forming portion of the end member C comprises an axial tubular boss C^2 surrounded by a dried sand core portion in the form of an annular collar C^3, which is provided at its periphery with a rib C^{30} to form the usual packing groove S′ in the bell end of the cast metal pipe S. Advantageously the collar C^3 is supported on a member C^5 removably mounted on the boss C^2 and comprising a tubular portion surrounding the boss C^2, and a radial flange at the outer end of the tubular portion. At its inner end the mold end member C is formed with a bearing C′ for a trunnion D′ formed on the corresponding end of the metal pouring trough D. The end member C is also formed with a spider portion having a conical opening C^4 in its hub portion. The larger end of this conical opening is adjacent the mold cavity.

The end member C is moved into the mold member B, and removed from the latter, by means of an arm F, mounted to swing about a vertical axis. As shown, the arm F comprises a conical hub portion F^2 journaled on

the stationary supporting stand A^2. The arm F is formed with a sleeve F' coaxial with the mold body B when the apparatus is in the position shown in Fig. 2. A plunger F^2, axially movable in the sleeve F', is formed with a threaded end F^3 engaged by a nut F^4 swiveled on the sleeve F', and provided with a hand wheel for its manual actuation. At its opposite end the plunger F^2 is formed with a socket to receive the end of a conical member E which passes through the conical hub opening C^3 in the mold end member C. The member E is detachably secured to the plunger F^2 by a removable key F^5.

Fig. 2 shows in full lines the position of the parts previously referred to during the mold casting operation. The plunger F^2 is then sufficiently advanced so that clearance is provided between the periphery of the member E and the wall of the conical hub opening C^4 in the end member C. The mold end member C is thus free to rotate without interference by, or contact with the member E. The arm F is positively locked in the full line position during the casting operation by means of a lug F^6 carried by the hub of the arm F which then engages the stationary stop A^3, and by means of the latch F^4 journaled on the hub of the arm F and then engaging the stationary stop A^3.

To remove the mold end member C at the end of the casting operation the clamping bolts B' are loosened and swung into the inoperative position illustrated in Fig. 1, and the nut F^4 is then rotated to move the plunger F^2 away from the mold. A slight initial movement of withdrawal of the plunger F^2 brings the conical member E into snug engagement with the wall of the hub opening C^3 of the member C. A further movement of withdrawal of the plunger F^2 carries the end member C into the dotted line position marked C' in Fig. 2. The latch F^4 is then moved out of engagement with the stop A^3 and the arm F is turned through an angle of 180°. This moves the end member C into the dotted position marked C^2 in Fig. 2. Preparatory to the next casting operation the dried sand core C^2, carried by the end member C, must be renewed.

To withdraw the cast metal pipe S from the mold B, after the mold is opened by the removal of the end member C, I provide a pipe extracting means comprising, in the preferred construction illustrated, a fluid pressure motor cylinder G, the end adjacent the mold of which is supported on a pedestal A^7. The plunger or piston rod G', projecting out of the cylinder G, is coaxial with the mold B, and is secured at its outer end to a carriage G^2 sliding on a guideway formed by an I beam A^8 extending between the pedestals A and A^7. An extension G^3 of the plunger G', secured in the carriage G^2, is formed at the end adjacent the mold with a head to which are pivoted pipe engaging levers G^4. Each lever G^4 has its end remote from the mold connected by a pin and slot connection G^{10} (see Fig. 10) to a corresponding lever G^5 pivoted at its inner ends to a collar G^6 longitudinally movable upon the stem G^3.

In operation, after the mold has been opened by the removal of the end member C, the plunger G' is advanced from the retracted position previously occupied by it, to bring the spur portion G^{11} of the levers G^4 into the plane of the groove S' formed in the inner surface of the bell of the pipe S by the core rib C^5. The advancing movement of the stem G^3 bringing this about, causes the outer ends of the levers G^5 to engage the end of the mold member B and thus turn the levers G^4 from their released position shown in Fig. 5 into the pipe engaging position shown in Figs. 1 and 10. The cylinder G is then operated to retract the plunger G'. The initial retraction of the plunger G' causes the spurs G^{11} of the levers G^4 to engage the outer wall of the pipe groove S'. The pin and slot connections G^{10} between the levers G^4 and G^5 permits a further turning movement of the levers G^4 insuring effective engagement of the pipe by the spurs G^{11} of the levers G^4, so that as the plunger G^3 is retracted the pipe S is drawn out of the mold with it. When the pipe S is fully withdrawn from the mold B it is automatically released from its engagement with the levers G^4 by means of a cam stop A^{12}, carried by a stationary member A^{10}, which is mounted at a suitable distance from the mold upon a platform or supporting table shown as formed by channel bars A^{11} secured to the opposite sides of the I beam A^8. The cam stop A^{12} engaging the upper lever G^5 forces it from the position shown in Fig. 1 into the position shown in Fig. 5. The collar G^6 slides on the stem G^3 to permit the turning movement of the upper lever G^5, and to cause a corresponding turning movement of the lower lever G^5. Stops A^{13}, shown as in the form of rollers mounted on the frame member A^{10}, positively arrest the movement of the pipe S at the point in its travel at which the spurs G^{11} of the levers G^4 release the pipe.

To support the pipe S in, and to facilitate its ready lateral removal from the position in which it is shown in dotted lines in Fig. 1, I provide pipe supporting arms H which extend beneath the dotted line position of the pipe shown in Fig. 1 having their free ends normally received in notches A^9 formed in the I beam frame member A^8. The arms H are carried by a rock shaft H' parallel to, but located at one side of the frame member A^8. The rock shaft H' is

journaled at its ends in the pedestals A^6, and is provided between the ends with an arm H^2 (see Fig. 3) connected by links I', passing through the openings A^{14} formed in the frame member A^6 to the cross head I^2 carried by the plunger I^3 of a fluid pressure motor cylinder I, shown as secured at one end to the frame member A^5. I^4 represents the pipe for admitting motive fluid to, and permitting its exhaust from the cylinder I.

In operation the motive fluid as admitted to the cylinder I is required to bring the arms H up against the underside of the pipe S before the spigot end of the latter leaves the supporting surface formed by the cylindrical body portion of the mold member B. The arms H then occupy the dotted line position marked H^{10} in Fig. 3. After the pipe is moved into the dotted line position shown in Fig. 1 and is disengaged from the retracting means, more motive fluid is admitted to the cylinder I to move the arms H into the dotted line position marked H^{11} in Fig. 3. The pipe S then rolls off the arms H on to the track rails K, provided to receive the cast pipe. The cylinder I is then operated to return the arms H to the full line position shown in Fig. 3, and when an end member C, carrying a fresh core collar C^2, is put in place and secured to the mold B the latter is in condition for a following casting operation.

Where the pipe cast is cylindrical and of uniform thickness from end to end, as is usually the case with thin pipes, such as the pipe SA, shown in Fig. 7, the modified form of apparatus, shown in Figs. 7, 8 and 9 may be used. The pipe retracting means proper, shown in Fig. 7, comprises a stem G^{30} secured to a sliding carriage G^2 which may be mounted and operated as is the carriage G^2 in the construction first described. The stem G^{30} is provided, as shown, with a single gripping lever G^{40} pivoted to the stem G^{30}, and the latter is also provided with a stationary claw G^{31} which engages the outer surface of the pipe, the latter being gripped between the claw G^{31} and the roughened portion G^{41} of the lever G^{40} in the pipe withdrawal operation. The lever G^{40} is connected by a pin and slot connection G^{10} to a lever G^5 pivoted to a collar G^{60} sliding on the stem G^{30}. The levers G^{40} and G^5 are thus connected and are automatically adjusted in the pipe gripping and releasing operations in the same manner as are the levers G^4 and G^5 in the construction first described. To provide the clearance space necessary to permit of the movement of the claw G^{31} into the pipe engaging position shown in Fig. 7, the mold end member CC is formed with a projection C^{10}. The latter is in the form of a portion of a cylinder, and is received in a corresponding shaped recess B^{10} formed in the main pipe mold member BB when the mold is in the assembled position for casting. The inner surface of the projection C^{10} then forms a portion of the cylindrical wall of the mold cavity.

While in accordance with the provisions of the statutes I have illustrated and described the best forms of apparatus embodying my invention now known to me it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention as set forth in the appended claims and that certain features of my invention may sometimes be used to advantage without the corresponding use of other features.

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

1. In a centrifugal casting apparatus, the combination with a mold body and a support in which said body is rotatably mounted, of an end member adapted to be inserted in and detachably secured to said mold body and means for moving said end member into and out of the mold body comprising a pivoted arm mounted to turn about an axis transverse to, and at one side of the axis of said mold body.

2. In a centrifugal casting machine, the combination with a rotatable mold body and a support in which it is rotatably mounted, of an end member for removably closing one end of the mold, means for moving said end member from the position in which it closes the mold body end into a position out of alinement with the mold body, comprising an arm pivoted to turn about the axis transverse to, and laterally displaced from the axis of the mold.

3. In a centrifugal casting apparatus, the combination with a mold body and a support in which said body is rotatably mounted, of an end member adapted to be inserted in and detachably connected to said mold body, and means for moving it into and out of the mold body comprising a pivoted arm mounted to turn about an axis transverse to and at one side of the axis of said mold body, and means mounted on said arm and adjustable with respect to the arm in the direction of the axis of said body in one position of said arm connecting the latter to said member.

4. In a centrifugal casting machine, the combination with a rotatable mold body and a support in which it is rotatably mounted, of an end member for removably closing one end of the mold, and means for moving said end member from the position in which it closes the mold end into a position out of alinement with the mold body, comprising an arm pivoted to turn about an axis transverse to and laterally displaced from the

axis of the mold, and a pivotal connection between said arm and end member coaxial with the mold when the end member is in its mold closing position.

5. In a centrifugal casting machine, the combination with a rotatable mold body and a support in which it is rotatably mounted, of an end member for removably closing one end of the mold and formed with a conical opening coaxial with the mold and having its larger end adjacent the mold cavity, an arm pivoted to turn about an axis transverse to and laterally displaced from the mold axis and provided with a conical stud received in said conical opening.

6. In a centrifugal casting machine, the combination with a rotatable mold body and a support in which it is rotatably mounted, of an end member for removably closing one end of the mold and means for moving said member into and out of its mold closing position comprising a member movable relative to said support pivotally connected to said end member to permit the end member to turn with said mold body without disconnecting said members.

7. In a centrifugal casting machine, the combination with a rotatable mold body and a support in which it is rotatably mounted, of an end member for removably closing one end of the mold and means for moving said member into and out of its mold closing position comprising a member movable relative to said support pivotally connected to said end member by means of a conical stud carried by one of said members and a conical bearing for the stud formed in the other member to permit the end member to turn with said mold body without disconnecting said members.

8. In a centrifugal pipe casting apparatus, the combination with a rotatable tubular mold body, of an end member detachably secured to one end of the mold body and provided with a portion projecting into the mold cavity, and comprising a tubular metallic member removably mounted on said projection, and a frangible core portion secured to said metallic member.

9. In a centrifugal casting apparatus, the combination with a rotatable mold body, of an end member detachably secured to one end of said mold body and provided with a projection extending centrally into the mold cavity and a tubular metallic member removably mounted on said projection and provided with a radial flange adjacent the end of the mold cavity and a frangible collar surrounding said tubular member.

10. In a centrifugal pipe casting machine, the combination with a rotating mold body and the support in which said mold body is journaled, of a removable end member for one end of the mold, a pipe extracting plunger movable axially of the mold toward and away from the open end of the mold, and pipe gripping means carried by said plunger.

11. In a centrifugal pipe casting machine, the combination with a rotating mold body and a support in which said mold body is journaled, of a removable end member for closing one end of the mold, means for moving it between its mold closing position and a position in which it is out of alinement with the mold body, a pipe extracting plunger movable axially of the mold toward and away from the open end of the mold, and pipe gripping means carried by said plunger.

12. In centrifugal pipe casting apparatus comprising in combination a rotating mold body, an end member closing one end of the mold in the casting operation, means for moving said end member between its mold closing position and a position in which it is out of alinement with the mold body, means for forcing a pipe cast in the mold axially out of the latter through the end of the mold closed by the end member during the casting operation, and means for engaging said pipe when moved out of the mold and moving the pipe axially out of alinement with the mold.

13. In centrifugal pipe casting apparatus, the combination with a rotatable mold, of pipe extracting means comprising a part movable axially of the mold, and pipe gripping means carried thereby and automatically actuated by the movement of said part toward and away from the mold to grip and release the pipe.

14. In centrifugal pipe casting apparatus the combination with a rotatable mold, of pipe extracting means comprising a rod movable axially of the mold, a pipe gripping lever pivoted to said rod, a collar slidably mounted on said rod, and a second lever pivoted to said collar and to the first mentioned lever.

15. In centrifugal pipe casting apparatus, the combination with a rotating mold, of pipe extracting means comprising a member movable axially of the mold, a pipe gripping lever pivoted to the said member, a part slidably mounted on the member and a second lever pivoted to said part and to the pipe gripping lever.

16. In centrifugal pipe casting apparatus, the combination with a rotating mold, of pipe extracting means comprising a member movable axially of the mold, a pipe gripping lever pivoted to the said member, a part slidably mounted on the member and a second lever pivoted to said part and connected to said pipe gripping member by a pin and slot connection.

17. In centrifugal pipe casting apparatus the combination of a rotating mold and the support in which it is journaled, a pipe ex-

tracting plunger movable axially of the mold, and pipe gripping means carried by said plunger and comprising a lever having a portion adapted to engage the inner wall of the casting and a second lever engaging the mold on the movement of the plunger into the pipe gripping position and shifting the first named lever into engagement with the inner wall of the pipe.

18. In centrifugal pipe casting apparatus the combination of a rotating mold and a body in which it is journaled, a plunger movable axially of the mold and pipe gripping means carried by said plunger comprising a lever having a portion adapted to engage the inner wall of the casting and a second lever automatically adjusted by the movement of the plunger into the pipe gripping position for shifting the first named lever into engagement with the inner wall of the pipe.

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