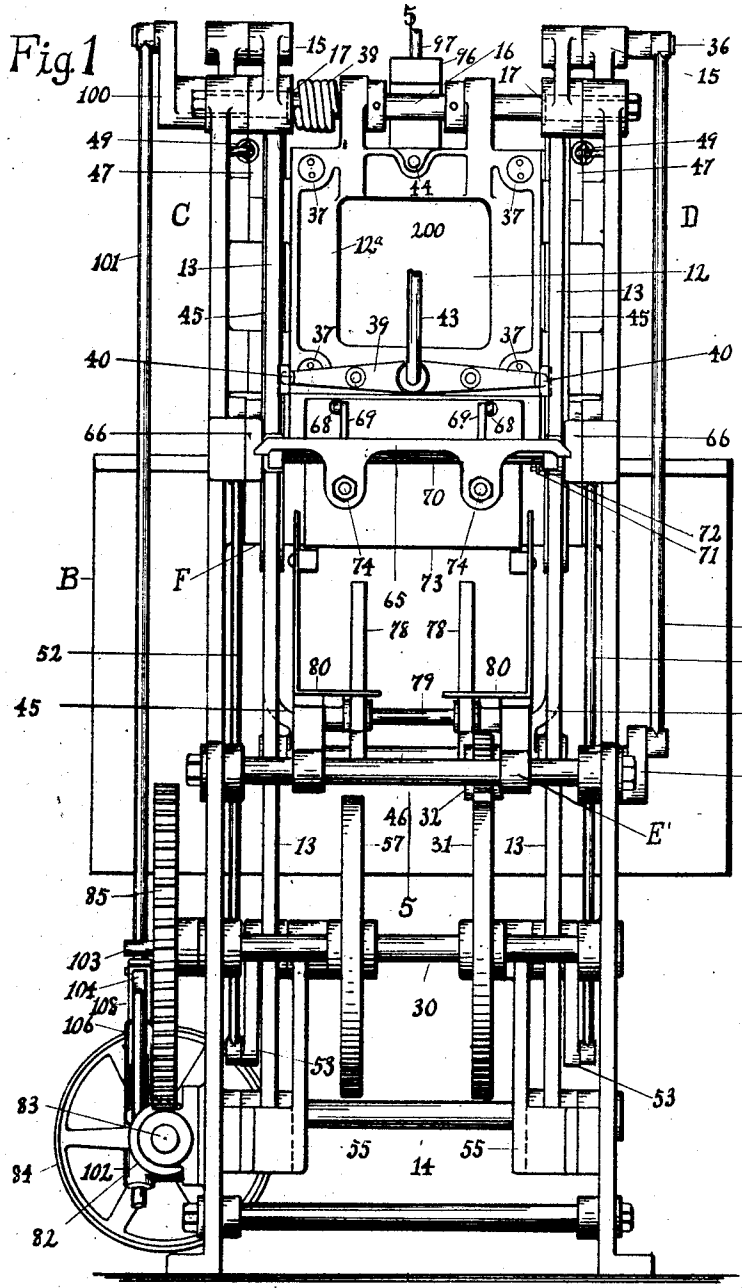
April 21, 1925. 1,534,710

C. E. HOPKINS

CASTING MACHINE

Filed March 2, 1922 7 Sheets-Sheet 1

Fig. 1



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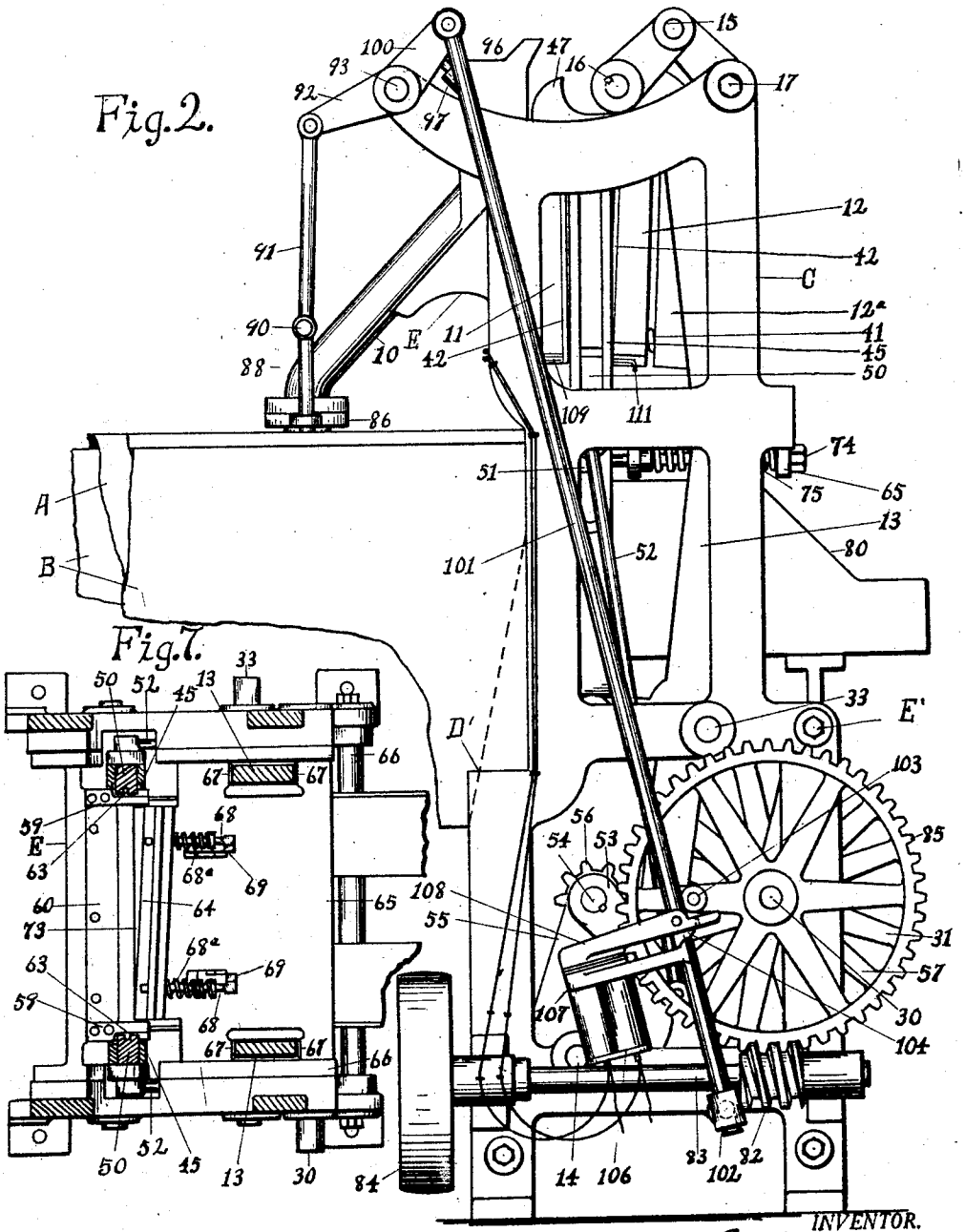
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C. E. HOPKINS

CASTING MACHINE

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Fig.2.



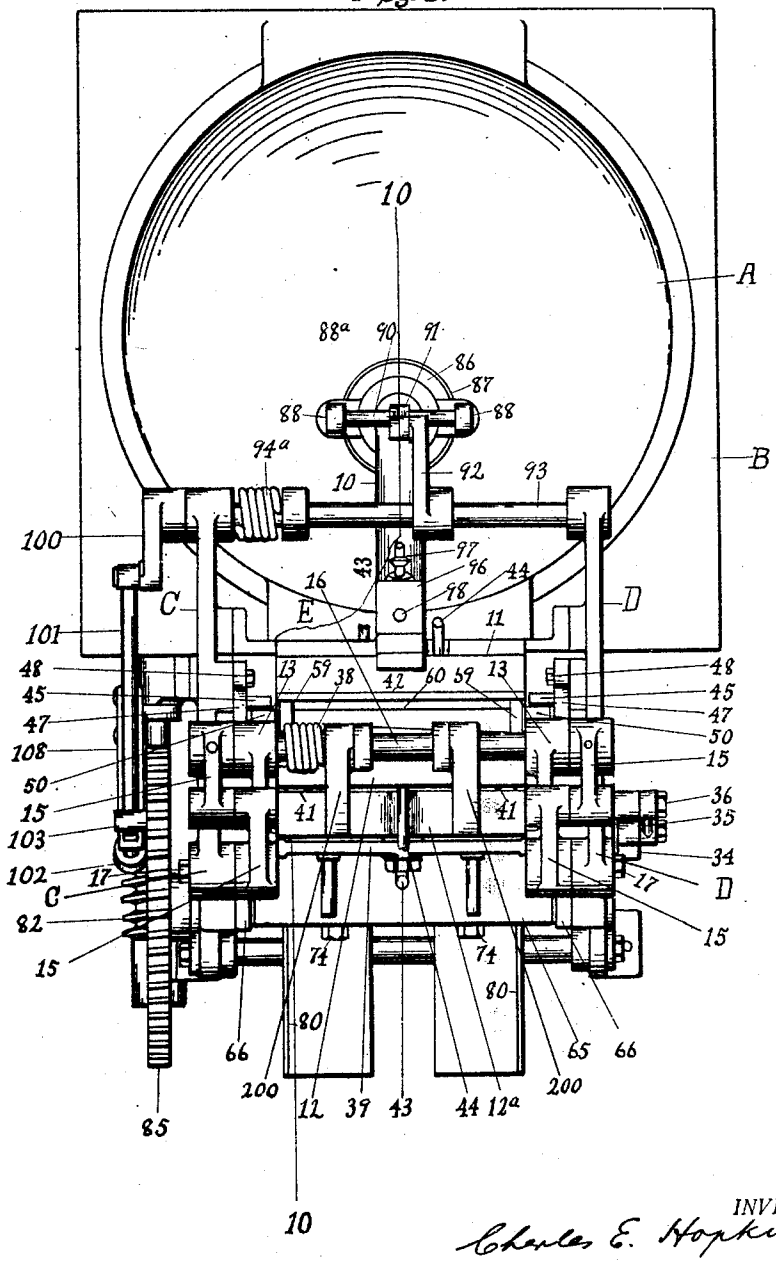
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Fig. 3.



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April 21, 1925. 1,534,710

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Fig. 4.

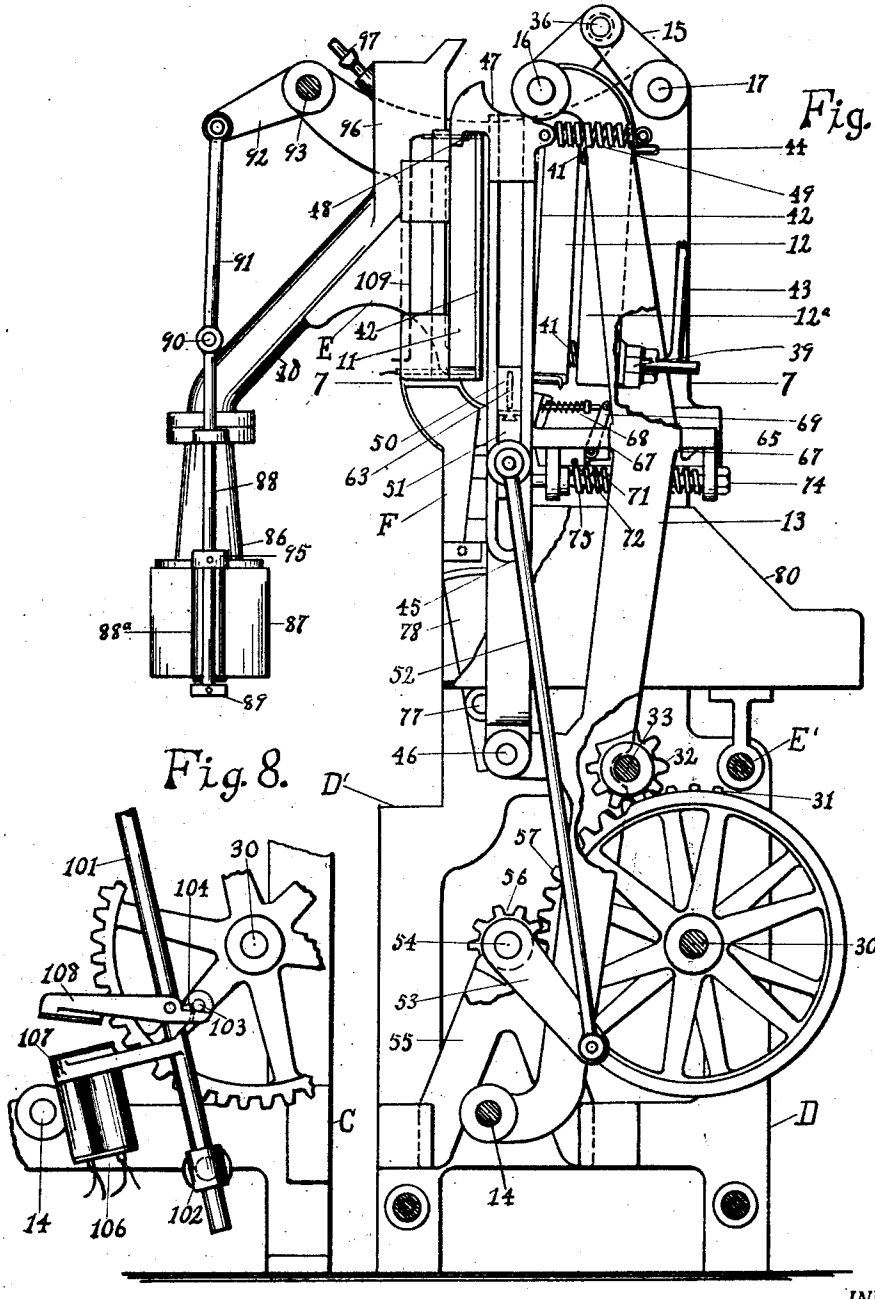


Fig. 8.

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CASTING MACHINE

Filed March 2, 1922 7 Sheets-Sheet 5

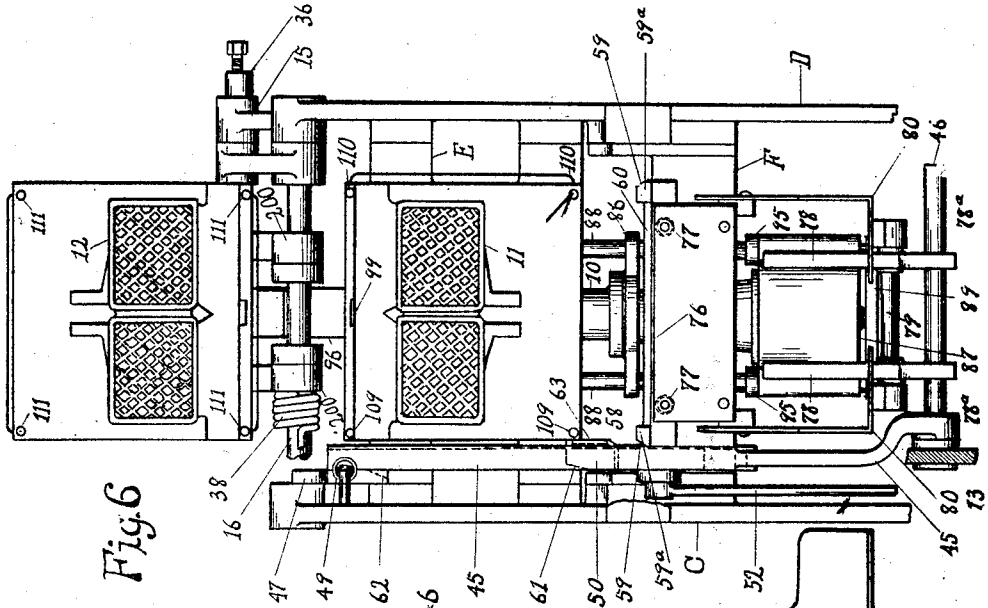


Fig. 6

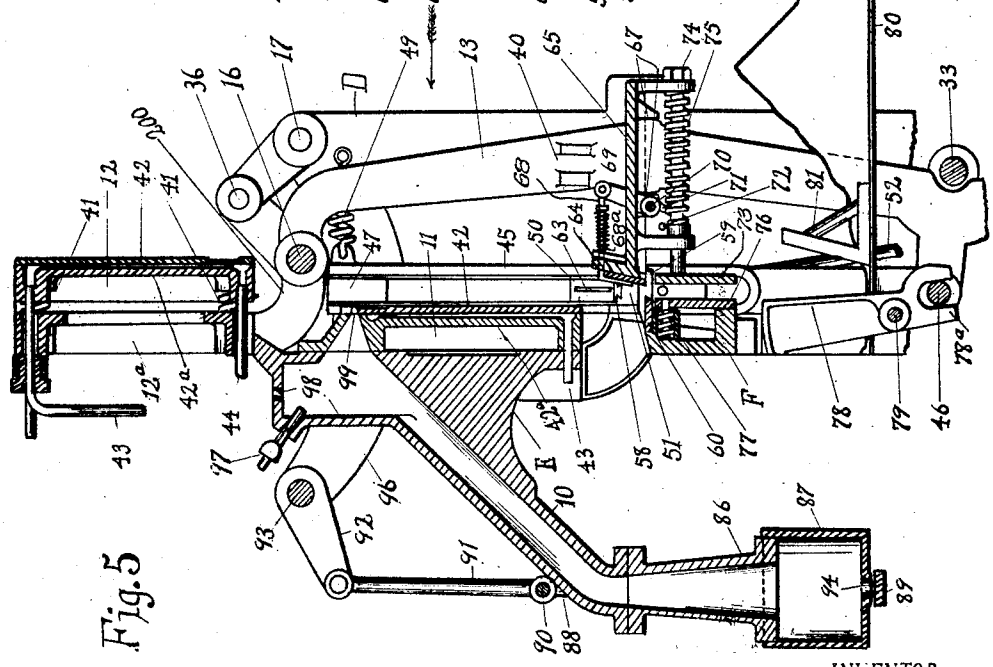


Fig. 5

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Fig. 9.

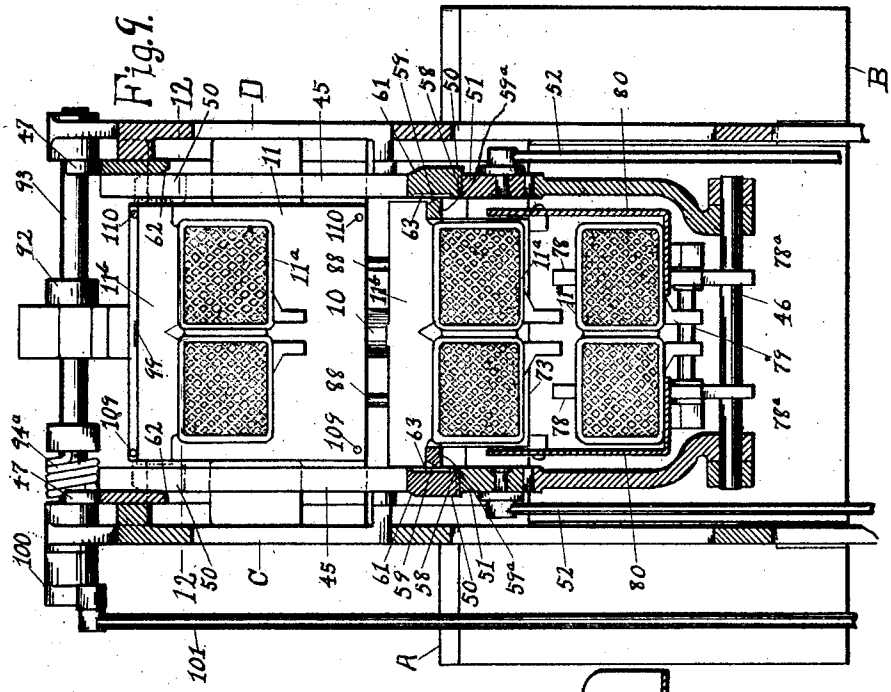
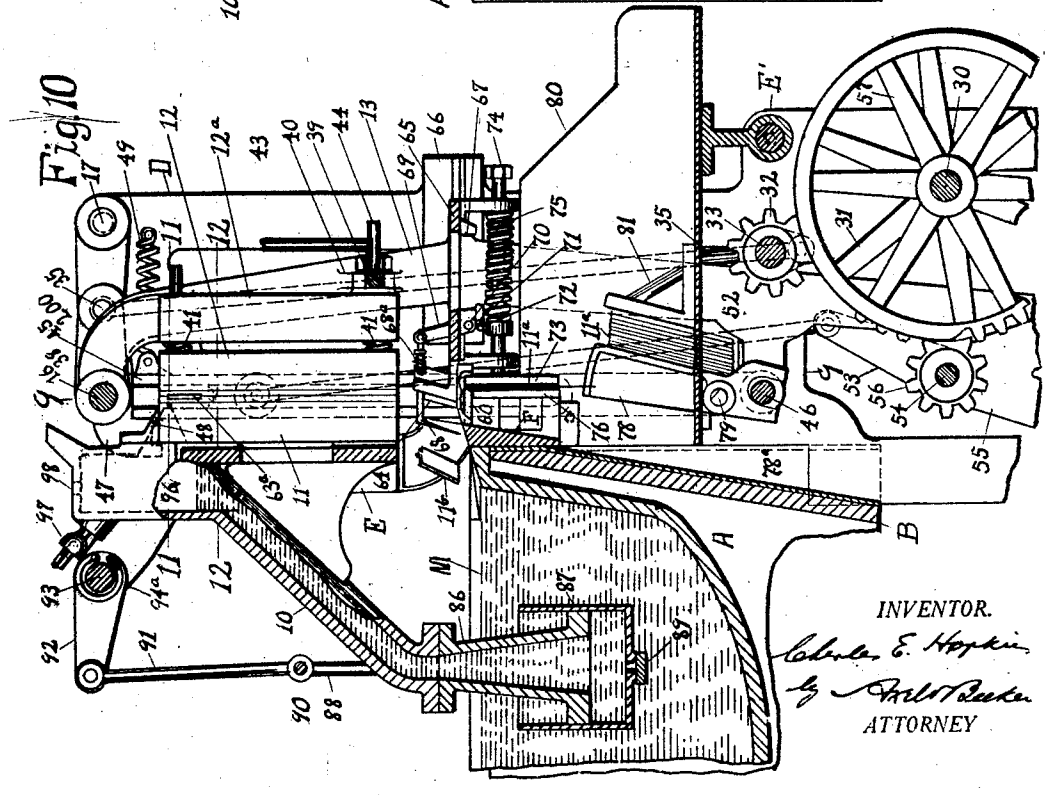


Fig. 10



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CASTING MACHINE

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Fig. 11.

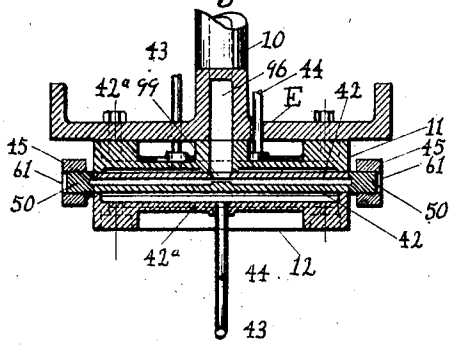


Fig. 12.

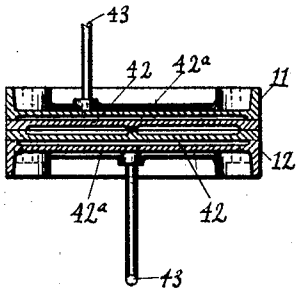


Fig. 13.

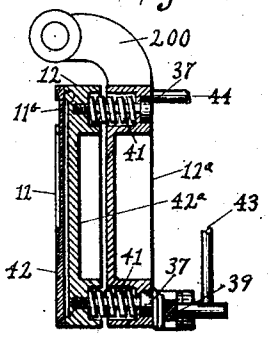


Fig. 14.

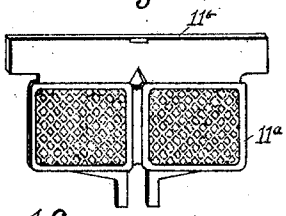


Fig. 16.

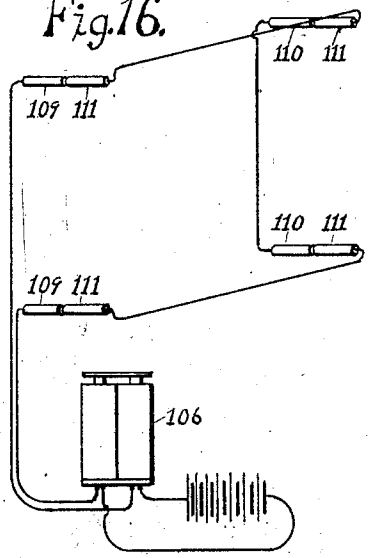
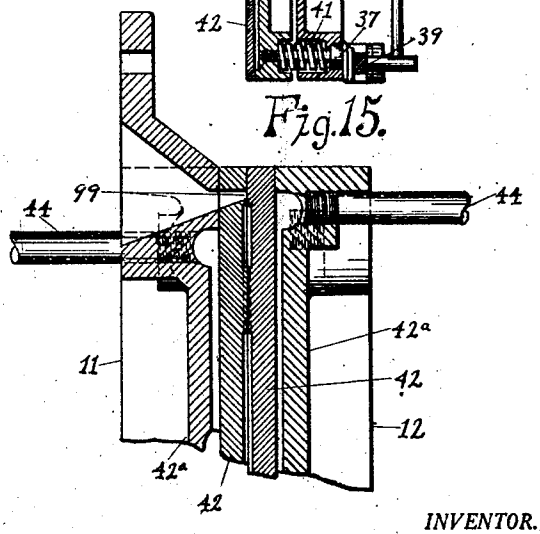


Fig. 15.



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Charles E. Hopkins

BY

ATTORNEYS.

Patented Apr. 21, 1925. 1,534,710

UNITED STATES PATENT OFFICE.

CHARLES E. HOPKINS, OF PLAINFIELD, NEW JERSEY; THE PLAINFIELD TRUST COMPANY, ADMINISTRATOR OF SAID CHARLES E. HOPKINS, DECEASED.

CASTING MACHINE.

Application filed March 2, 1922. Serial No. 540,481.

To all whom it may concern:

Be it known that I, CHARLES E. HOPKINS, a citizen of the United States, and a resident of Plainfield, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Casting Machines, of which the following is a specification.

This invention relates to casting machines and has for its main object the production of a machine for automatically forming, trimming and delivering castings; the particular casting chosen for exemplification being a battery grid.

One of the features of the invention centers around the mold construction whereby some of the mold members are used as conveying means for the casting, said casting being preferably provided with an overcast or sprue by means of which it is supported on the mold members that convey it.

Another feature of the invention resides in combining with the casting mechanism a trimming mechanism for finishing the casting before it is finally delivered thereby saving an extra handling of the casting.

Yet another feature of the invention is the provision of means for preventing the pump from delivering molten metal to the mold in case it is not properly closed.

Other features of invention will appear as the specification proceeds.

Many of the features of invention constitute improvements that are independent one of the other and which may be used in widely different machines, but inventive features also reside in combining these improvements in a unitary structure properly coordinated with respect to each other. The finishing device is not claimed per se in this application, but is covered in an application filed November 17, 1924, Ser. No. 750,241. So likewise the metal pump, equalizing chamber and auxiliary burner are not claimed herein but form the subject matter of application Ser. No. 750,242, filed November 17, 1924.

In the accompanying drawings the invention is disclosed in a concrete and preferred form in which

Fig. 1 is a front elevation of a machine embodying the invention, with parts broken away.

Fig. 2 is a side elevation of the machine shown in Fig. 1 with parts of the furnace and melting pot broken away the mold being in its open position.

Fig. 3 is a top plan view of the machine.

Fig. 4 is a vertical sectional view on a plane just inside the near side frame, with parts broken away and with the furnace and melting pot omitted; the mold being shown open.

Fig. 5 is a vertical sectional view on the plane of line 5—5 of Fig. 1 of the upper part of the machine and with the movable mold section swung into its upper position for inspection and with parts broken away.

Fig. 6 is a view looking in the direction of the arrow 6 of Fig. 5 with parts omitted.

Fig. 7 is a fragmentary horizontal sectional view on line 7—7 of Fig. 4.

Fig. 8 is a detail view of the lower left hand part of Fig. 2 showing the effect of breaking the circuit through the magnet.

Fig. 9 is a vertical sectional view on the plane of line 9—9 of Fig. 10.

Fig. 10 is a vertical sectional view of the upper part of the machine taken substantially on the plane of the irregular line 10—10 of Fig. 3, showing the mold in its closed position.

Fig. 11 is a horizontal sectional view through the mold section on the plane of line 11—11 of Fig. 10 with the mold closed.

Fig. 12 is a horizontal sectional view through the mold on the plane of line 12—12 of Figs. 9 or 10; the mold being shown closed.

Fig. 13 is a transverse sectional detail view through one end of the movable mold member and its support showing the spring means for aligning the movable mold element against the fixed mold element.

Fig. 14 is a diagrammatic view of the shape of the casting made by the form of machine in which the invention is clothed in this instance.

Fig. 15 is a vertical sectional detail view through the mold members, when closed, showing more particularly the relation of the intake to the fixed and movable mold members.

Fig. 16 is a diagrammatic view indicating the wiring of the mold faces for controlling the pump magnet.

A indicates a melting pot supported in a furnace frame B. The casting mechanism is carried by side frames C and D suitably con-

nected by cross frames E and F and by cross brace E'. One end of the furnace is conveniently supported by ledges D' formed on side frames C and D.

The mold consists here of two main sections, one a stationary member 11 and the other a movable member 12, and two auxiliary sections consisting of movable members 50 (Fig. 11). Member 12 has a closing and opening movement toward stationary member 11, and side members 50 move with the movable member during the opening and closing movement of the mold and in addition thereto have an up and down movement for the purpose of conveying the casting out of the mold and a transverse in and out movement to release the casting. Referring to Figs. 9, 11 and 14 it will be observed that casting 11^a has an overcast or sprue 11^b which is substantially in the form of a T-shaped head the major portion of which is produced by members 11 and 12 and the outer ends of which are produced by members 50 having recesses 63 that complete the sides of the mold at the upper end thereof, said recesses also acting as supporting ledges for the casting after the mold is opened.

Referring to Figs. 4 and 10, the stationary mold member 11 is carried by cross frame E and the movable member 12 is located in front thereof and is given movement toward and away from said stationary member by any suitable means. In the present instance this movement is a horizontal rocking movement produced by two vertical rocker-arms 13 on which the movable mold member is carried. Auxiliary mold members 50 also move with the vertical rocker arms by reason of the fact that they are mounted in guides 45 which latter partake of the rocking movement of vertical rocker arms 13. Rocker arms 13 are mounted at their lower ends on rockshaft 14 supported in bearings in the side frames of the machine and are actuated at their upper ends by toggles 15 connected to shaft 16, carrying member 12, and to studs 17 fast on the side frames. Guide arms 45, in which the auxiliary mold members slide are pivoted at their lower ends on a shaft 46 carried by rocker arms 13 and their upper ends are sustained by springs 49 anchored on the framework and which normally tend to move guides 45 away from the stationary mold member, said movement being limited by stationary pin 48 coming in engagement with the underside of plate 47 of guide arms 45. Movement of guide arms 45 toward the fixed mold member is effected by toggles 15 through the instrumentality of the bushing of shaft 16 coming in contact with the upper cam-shaped surface of plates 47. Toggles 15 are preferably actuated as follows: mounted on constantly rotating shaft 30 is a mutilated gear 31 for actuating mutilated pinion 32, carried by shaft 33, intermittently. Shaft 33 is mounted to rotate in the side frames of the machine and carries at one end (Fig. 1) a crank 34 from which latter extends a connecting rod 35 connected to pin 36 of one pair of toggle links 15. Auxiliary mold members 50 are preferably moved intermittently up and down in guide arms 45 in the following manner. Connected to each slide block 51 of auxiliary mold member 50 is a connecting rod 52 which receives motion from a crank 53 mounted on shaft 54, carried by bearings 55. Shaft 54 carries a mutilated pinion 56 actuated by mutilated gear 57 carried by shaft 30.

Referring to Figs. 5, 6 and 9, each of the sliding mold members 50 has an in and out movement transversely of the machine and this movement is produced in the following manner: each member 50 is slidingly mounted in sliding block 51 by reason of a dovetail connection (Fig. 5) admitting of transverse movement of members 50 with respect to sliding blocks 51. Each member 50 is provided with a bevel surface 58 at the lower end of its inside face which engages with a corresponding bevel 59 on positioning support 59^a. There are two supports 59^a one on each side of fixed knife 60 carried by cross brace F. Each member 50 is also provided with a bevel surface 61 at its upper outer face to engage a similar bevel surface 62 on each plate 47 carried by each guideway 45. The up and down movement of the vertically reciprocating members 50 will therefore also cause an in-and-out movement of said members transversely of the machine.

The detail construction of the main mold members 11 and 12 is preferably as follows: rocking mold member 12 is carried by a supporting frame 12^a, which frame is pivotally supported on shaft 16 of rocker arms 13 by means of arms 200. The object of this feature is to admit of member 12 being swung into the position shown in Figs. 5 and 6 so that both of the mold faces can be inspected and when in this position spring 38, coiled about shaft 16 and anchored on one of arms 200 and on one of rocker arms 13 acts as a counter-balance. Normally, however, said mold member 12 is held in the position shown in Figs. 1, 2 and 4 by means of a controlling pivoted lever 39 (Fig. 1), carried by frame 12^a, the outer ends of which enter recesses 40 in rocker arms 13, so that said mold member will rock with said arms. Rocking mold member 12 is supported by four studs 37 passing through supporting frame 12^a, and surrounding each stud is a spring 41 (Fig. 13). The purpose of these springs is to give a certain amount of flexibility to the movable mold section so as to

allow it to adjust itself against the face of stationary mold section 11 so that, in case any foreign substance or particles of metal should collect on the die faces, the danger of damaging the die faces by unequal pressure may be eliminated. Each of the mold members 11 and 12 is formed with a face plate 42 and with a backing member 42ª, there being a water back formed between 42 and 42ª, the intake pipe of which is indicated at 43 and the outlet of which is shown at 44. Flexible connections lead to these pipes from a suitable source and exhaust.

The operation of the apparatus so far described is as follows: during the casting operation the mold members are in the closed position indicated in Fig. 10, that is to say the toggles are straightened and the auxiliary mold members are in their upper position with recess 63 in alinement with opening 63ª of the main mold members (Fig. 10). The rocking movement of rocker arms 13 around center 14 opening and closing the mold and the up and down movement of the auxiliary members 50 is intermittent and takes place after each casting is solidified, consuming about one-fifth of the time required to make a cycle of operations to produce a casting and the two sets of mutilated gears are timed accordingly. Upon actuation of rocker arms 13, by the breaking of toggle links 15, movable mold member 12 is rocked away from stationary member 11, guide arms 45 being likewise moved away from member 11 on account of the bodily movement of shaft 46 effected by rocker arms 13 and by reason of the pull of springs 49 on the upper ends of said guide arms. This separates the casting from stationary member 11 and the continued movement of movable member 12 separates it from the casting thereby leaving said casting suspended by means of its T-head on ledges formed by recesses 63 of auxiliary members 50 (see upper part of Fig. 9). The downward movement of said members 50 now begins and continues until bevels 58 encounter bevels 59 of support 59ª when members 50 move outwardly in a transverse direction owing to the dovetail connection with sliding blocks 51, thereby releasing the casting and placing it on support 59ª, that is the projecting ends of T-head overcast 11ᵇ rest on said support (see middle part of Fig. 9). Continued rotation of the mutilated gears now cause the auxiliary members 50 to rise and rocking member 12 to return and with it guide arms 45 carrying said members 50 the bushing of shaft 16 engaging cam face on top of plate 47 to bring the parts properly together against the action of spring 49. When members 50 approach their upper position bevels 61 on members 50 encounter bevels 62 on plates 47 whereby an inward movement transversely is imparted to said members 50 and they are brought home tightly against members 11 and 12 so as to form a part of the side walls of the mold at the upper end thereof. The connections that control the up and down movement of members 50 are so arranged and timed that, on the up movement, members 50 move to the top of the guideways and then down a short distance after movable member 12 has engaged stationary member 11. By this means the vertical dead center of the operating crank is passed, and the succeeding downward movement of members 50 can therefore be quickly initiated.

It is desirable to avoid a separate handling of the casting to remove the overcast or sprue and for this reason I have provided a finishing mechanism that automatically takes the casting, removes the overcast and deposits said overcast in the melting pot.

In the previous part of the description we have traced the casting to the point where it is delivered to a support 59ª located on either side of a stationary knife 60.

Referring now particularly to Figs. 5, 6, 7, 9 and 10 reference numeral 64 indicates a movable knife mounted on a horizontally movable supporting slide 65 moving in guideways formed in brackets 66 carried by the frame. Looking at the movable knife in plan (Fig. 7) it will be noted that it is disposed at a slight angle to the stationary knife so that a shearing cut will be imparted to the metal. The plane of these knives is coincident with the line that separates the overcast or sprue 11ᵇ from the cast 11ª proper so that the T-head is severed from the main part of the casting. The movable knife may receive its motion from any suitable source but as a matter of convenience rock arms 13 produce this motion, said rock arms extending through vertical ways or openings 67 in the supporting slide. Thus, when the casting chamber of the mold is being closed to produce a new casting, the previously made casting is being trimmed. For the purpose of holding the casting firmly while the trimming or cutting operation takes place I provide a yielding vise or clamp (Fig. 5) consisting of a clamping plate 73 carried by a pair of push rods 74 slidingly mounted in bearings formed on the underside of sliding support 65. Surrounding each rod is an expansion spring 75. Facing this clamping plate is an abutment plate 76 yieldingly held by springs 77 in a position slightly in advance of the cutting edge of the fixed knife. When sliding support 65 advances, springs 75 are thereby compressed and, these springs being stronger than springs 77, the backing plate of the clamp is moved against solid cross frame F. When sliding support 65 is withdrawn the movable clamp 73 is likewise withdrawn and

springs 77 will then push back plate 76 inward thereby stripping the cast from the stationary knife and allowing said cast to slide down between the clamping plates to support 80.

As seen in Figs. 5 and 10 the cutting elements just described are spaced some distance from the lower end of the casting mold, there being an opening in the framework at that point that opens on the melting pot. Overcast 11^b when held on support 59^a is therefore slightly above said melting pot. This arrangement is made for the purpose of permitting the severed overcast or sprue 11^b to be expelled or ejected into the melting pot. The means for accomplishing this are as follows: 68 indicate two rods, extending through movable knife blade 64, and carried by two arms 69 mounted on a small rock shaft 70 movably carried in bearings on the underside of supporting slide 65. Rods 68 are surrounded by springs 68^a and are bent down at their outer ends to conform to the angle of the knife and are flat and somewhat flexible as shown. 71 indicates a projection on shaft 70 for engagement with pin 72 on the side frames. As supporting slide 65 advances, to sever the metal, projection 71 engages pin 72 just prior to the time the overcast is cut off, thereby tilting arms 69 so that when the overcast is severed, said rock arms 69 will make a quick forward motion and kick the overcast 11^b into the melting pot. Springs 68^a retract the ejector on the return movement of the slide.

Support 80 on which the cast proper 11^a drops may conveniently be in the form of two members spaced transversely of the machine on which slide upright supports 81. 78 indicate packer arms pivotally supported on rod 79 and actuated from shaft 46 by means of the yoke 78^a carried at the lower end of packer arms 78. As has previously been described shaft 46 is carried by rocker arms 13 and therefore the closing movement of the mold packs the second previously made casting against upright 81 and out of the way so that the next severed casting coming from supports 59^a may be received. The parts will preferably be so arranged that said next casting slides down over packer arm 78 and lands gently on support 80.

It will be understood that any suitable means may be employed for feeding molten metal into the gate of the mold. The pump construction that I use, however, involves features of novelty in itself and may be applied to molding mechanisms of widely different construction from that herein disclosed.

10 indicates a spout, which may conveniently be formed integral with cross frame E, terminating in what is virtually a fixed hollow plunger 86. 87 is a pump chamber sliding up and down with respect to plunger 86, said chamber having a valve opening 94 in its bottom. Said pump chamber is actuated by a tie rod 89, extending below opening 94, and this tie rod is carried by two vertical rods 88, one on each side of the cylinder or pump chamber and extending loosely through guides 88^a thereof. At their upper ends rods 88 are connected by a short shaft 90, and connected to this shaft is a rod 91 the upper end of which is mounted on arm 92 of rock shaft 93 carried by the framework of the machine. 94^a is a spring coiled about shaft 93 and with one end anchored on the framework. The tension of this spring normally tends through the connections described to move the pump cylinder down. Other means, to be presently described, turn shaft 93 in the other direction to lift the pump chamber. It will be understood that, when the connections are raised, cross piece 89 will be moved upwardly until opening 94 is closed and that thereafter said cross piece will lift the pump cylinder, thereby feeding metal up through the spout. On the reverse movement, when spring 94^a is effective, collars 95, on rods 88, will engage the top of the cylinder and force it down, thereby overcoming the tendency of the plunger and cylinder to adhere and thereby, at the same time, opening valve 94. Continued movement of the parts in the same direction will then lower the pump cylinder completely and allow metal to flow in through opening 94.

Another feature of the pump construction is the provision of an equalizing chamber 96 above nozzle 99. The capacity of the pump cylinder, the spout and the equalizing chamber is such that a full stroke of the cylinder will raise the molten metal to a level above nozzle 99 so that the equalizing chamber acts as a head for the casting chamber. This construction renders unnecessary the usual spring relief generally employed in connection with pumps that feed metal into a closed chamber, and also avoids the disadvantage of the usual open-mouthed casting chamber which is devoid of a feeding head at a higher level than the nozzle. This construction also permits the use of a heating element, such as the Bunsen burner 97, in the equalizing chamber; this burner being preferably so positioned that its flame is directed toward nozzle 99. The metal is thus prevented from congealing. Nozzle 99 is always open and the flow of metal therethrough is governed entirely by the pump. 98 indicates an air vent to permit the air to escape as the metal rises and also to admit air to sustain combustion in the gas burner.

Any suitable means may be employed to

actuate rock shaft 93 to effect the pumping operation, but preferably the parts are so arranged that, when the mold is not properly closed, no metal will be delivered to it by the pump. In the present instance these parts take the following form: Mounted on rock shaft 93 is an arm 100, the free end of which is connected to connecting rod 101 sliding in bearing 102 pivotally supported on the framework. Mounted on worm wheel 85 is a pin 103 that engages and thereafter slides by a projection 104 (Fig. 8) on rod 101, thereby depressing the latter; this engagement raising the pump about one-half of its stroke (Fig. 10) which is not sufficient to supply metal to the casting chamber. This action takes place once to each revolution of the worm wheel and during the closing movement of the casting chamber. Carried by rod 101 is an electro-magnet 106 which finds its support in arm 107. 108 is an armature pivoted on rod 101, said armature constituting a trip lever adjacent to projection 104. 108 is somewhat longer than 104 so that when pin 103 leaves projection 104 it will still be in engagement with trip lever armature 108. So long as the magnet is energized said armature forms a rigid connection against which pin 103 acts thereby completing the stroke of the pump to fill the casting chamber, but if magnet 106 is deenergized the armature will swing around its pivot under the influence of pin 103 and therefore the pump will not deliver molten metal to the casting chamber. Magnet 106 is controlled by the casting mold and is energized only when the mold is completely and properly closed.

Proper wire connections are made from the electro-magnet to a pair of plugs 109 located one at the top and one at the bottom of mold 11. On the opposite corners of the mold are located similar plugs which are connected by a suitable wire. Similar plugs 112 are located on mold member 12 and are wired in cross pairs. This arrangement of wires form, when the mold members are in proper contact, a closed circuit through which the electro-magnet is energized from any suitable source.

The machine is driven by worm 82 mounted on shaft 83 carried by bearings in the side frames. Shaft 83 is driven from pulley 84 or in any other suitable way. Worm 82 meshes with and drives worm wheel 85 on shaft 30.

I claim:

1. In a casting machine, a pump, an operating connection, an actuating member for moving said operating connection a part of its stroke, a trip on said connection to be engaged by said actuating member to move the connection the remainder of its stroke, and an electro-magnet controlling the trip and positioning it for engagement with said actuating member only when the magnet is energized.

2. In a casting machine, a pump, an operating connection, an actuating member for moving said operating connection a part of its stroke, an electro-magnet, a trip pivotally supported on said connection, forming an armature for said magnet and positioned by said magnet, when the latter is energized only to be engaged by the actuating member and thereby move the connection the remainder of its stroke.

3. In a casting machine, a pump, an operating connection, an actuating member for moving said operating connection a part of its stroke, a trip on said connection to be engaged by said actuating member to move the connection the remainder of its stroke, and an electro-magnet controlling the trip and positioning it for engagement with said actuating member only when the magnet is energized, mold members having an opening and closing movement, and a circuit, for energizing the electro-magnet, controlled by the mold members and completed only when the mold members are closed.

4. In a casting machine, a pump, an operating connection, an actuating member for moving said operating connection a part of its stroke, an electro-magnet, a trip pivotally supported on said connection, forming an armature for said magnet and positioned by said magnet, when the latter is energized, only to be engaged by the actuating member and thereby move the connection the remainder of its stroke, mold members having an opening and closing movement, and a circuit, for energizing the electro-magnet, controlled by the mold members and completed only when the mold members are closed.

5. In a casting machine, a pump, an operating connection for the pump, a rotating actuating member, a projection on the connection for engagement with the actuating member to move the connection part of its stroke, and a trip, which when properly positioned, is engaged by said actuating member to move the connection the remainder of its stroke.

6. In a casting machine, a pump, an operating connection for the pump, a rotating actuating member, a projection on the connection for engagement with the actuating member to move the connection part of its stroke, and a trip, which when properly positioned, is engaged by said actuating member to move the connection the remainder of its stroke, mold members having an opening and a closing movement and controlling the trip to properly position it only when the mold members are closed.

7. A casting machine comprising mold members, a reservoir of molten metal, connections, including a nozzle, for conducting

metal from the reservoir to the mold members, an auxiliary reservoir in communication with said connections and nozzle and located above the latter, and a pump for feeding metal through said connections and nozzle and into the auxiliary reservoir to create a head of metal above the nozzle, actuating means for said pump having a two-stage movement, and means for controlling, by the mold members, the second stage of movement of the actuating means.

8. A casting machine comprising mold members, a reservoir of molten metal, connections, including a nozzle, for conducting metal from the reservoir to the mold members, an auxiliary reservoir in communication with said connections and nozzle and located above the latter, and a pump for feeding metal through said connections and nozzle and into the auxiliary reservoir to create a head of metal above the nozzle, actuating means for said pump having a two-stage movement the first of which is ineffective to deliver metal to the mold members, and means for preventing the second stage of movement when the mold members fail to close properly.

9. A casting device including: a casting mold composed of several portions, means for opening said mold after a casting has been made thereby releasing the casting from a portion of the mold and leaving it supported by another portion of the mold, a casting receiving means, means for moving the casting carrying portion of the mold to the receiving means, and means for releasing the casting from said casting carrying portion.

10. A casting device including: a casting mold composed of main members and auxiliary members to produce a casting having overhanging portions extending into the auxiliary members, means for separating said main members after a casting has been made thereby releasing said casting from the main members and leaving it supported on the auxiliary members, means for moving the auxiliary members to deliver the casting out of the plane of the mold, and means for separating the auxiliary members to release the casting.

11. A casting device including: a casting mold composed of two main mold members capable of separation by a movement in one plane, and two auxiliary mold members for supporting the casting after it has been separated from the main members and having a movement, substantially at right angles to the movement of the main members, to deliver the casting out of the mold, and means for releasing the auxiliary members from the casting.

12. A casting device including: a casting mold composed of two main mold members capable of separation from each other and from the casting by a movement in one plane, and two auxiliary mold members for supporting the freed casting, movable with one of said main members and having a movement, substantially at right angles to the movement of the main members, to deliver the casting out of the mold, and means for releasing the auxiliary members from the casting.

13. A casting device including: two main mold members occupying an upright position, a rocking member carrying one of said main mold members and moving it in a substantially horizontal plane, vertical guide arms movable with said rocking members, auxiliary mold members mounted in said vertical guide arms, and means for vertically moving said auxiliary members in said guide arms.

14. A casting device including: two main mold members occupying an upright position, a rocking member carrying one of said main mold members and moving it in a substantially horizontal plane, vertical guide arms movable with said rocking members, auxiliary mold members mounted in said vertical guide arms, means for vertically moving said auxiliary members in said guide arms, and means for moving said auxiliary members toward and away from each other transversely in said guide arms.

15. A casting device including: two main mold members occupying an upright position, a rocking member carrying one of said main mold members and moving it in a substantially horizontal plane, vertical guide arms pivotally supported on said rocking members and movable with said rocking member, auxiliary mold members mounted in said vertical guide arms, and means for vertically moving said auxiliary members in said guide arms.

16. A casting device including: two main mold members occupying an upright position, a rocking member carrying one of said main mold members and moving it in a substantially horizontal plane, vertical guide arms pivotally supported on said rocking members and movable with said rocking member, auxiliary mold members mounted in said vertical guide arms, means for vertically moving said auxiliary members in said guide arms and means for moving said auxiliary members toward and away from each other transversely in said guide arms.

17. A casting device including: two main mold members occupying an upright position, a rocking member carrying one of said main mold members and moving it in a substantially horizontal plane, vertical guide arms movable with said rocking members, auxiliary mold members mounted in said vertical guide arms, means for verti-

cally moving said auxiliary members in said guide arms and toggles for actuating said rocking member and said guide arms.

18. A casting device including: two main mold members occupying an upright position, a rocking member carrying one of said main mold members and moving it in a substantially horizontal plane, vertical guide arms pivotally supported on said rocking members and movable with said rocking member, auxiliary mold members mounted in said vertical guide arms, means for vertically moving said auxiliary members in said guide arms, and toggles for actuating said rocking member and said guide arms.

19. A casting device including: two main mold members occupying an upright position vertical rocking members pivoted at their lower ends and carrying at their upper ends one of said main mold members and moving it substantially in a horizontal plane, vertical guide arms pivotally supported at their lower ends on said rocking members, springs connecting the upper ends of the guide arms with a stationary part of the framework to cause the guide arms to follow the opening movement of the main mold member carried by the rocking members, a cam surface on each vertical guide arm, toggles at the upper ends of the rocking members for effecting a rocking movement thereof and for acting against the cam surface of the vertical guide arms to cause the latter to follow the closing movement of the main mold member carried by the rocking member, and auxiliary mold members mounted to slide vertically in the guide arms.

20. A casting device including: two main mold members occupying an upright position, vertical rocking members pivoted at their lower ends and carrying at their upper ends one of said main mold members and moving it substantially in a horizontal plane, vertical guide arms pivotally supported at their lower ends on said rocking members, springs connecting the upper ends of the guide arms with a stationary part of the framework to cause the guide arms to follow the opening movement of the main mold member carried by the rocking members, a cam surface on each vertical guide arm, toggles at the upper ends of the rocking members for effecting a rocking movement thereof and for acting against the cam surface of the vertical guide arms to cause the latter to follow the closing movement of the main mold member carried by the rocking member, auxiliary mold members mounted to slide vertically in the guide arms and means for moving said auxiliary members toward and away from each other transversely in said guide arms.

21. A casting device including: two main mold members occupying an upright position, a movable support for one of said main mold members for moving it in a substantially horizontal plane, vertical guide arms extending along the sides of the main mold members, and auxiliary mold members mounted to slide vertically in said guide arms.

22. A casting device including: two main mold members occupying an upright position, a movable support for one of said main mold members for moving it in a substantially horizontal plane, vertical guide arms extending along the sides of the main mold members, auxiliary mold members mounted to slide vertically in said guide arms, and means for moving said auxiliary member toward and away from each other transversely in said guide arms.

23. A casting device including: two main mold members occupying an upright position, a movable support for one of said main mold members for moving it in a substantially horizontal plane, vertical guide arms extending along the sides of the main mold members, means for moving said guide arms in a substantially horizontal plane, and auxiliary mold members mounted to slide vertically in said guide arms.

24. A casting device including: two main mold members occupying an upright position, a movable support for one of said main mold members for moving it in a substantially horizontal plane, vertical guide arms extending along the sides of the main mold members, means for moving said guide arms in a substantially horizontal plane, auxiliary mold members mounted to slide vertically in said guide arms, and means for moving said auxiliary members toward and away from each other transversely in said guide arms.

25. A casting device comprising: two main mold members movable toward and away from each other and which when closed form a casting chamber having an opening near its upper end at each side of the mold at the point where the two members meet, and auxiliary mold members, each having a recess arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will project into said recesses.

26. A casting device comprising: two main mold members movable toward and away from each other and which when closed form a casting chamber having an opening near its upper end at each side of the mold at the point where the two members meet, auxiliary mold members, each having a recess, arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will pro-

ject into said recesses, means for opening the mold to free the casting from the main mold members and to leave it suspended by the extensions projecting into the auxiliary members, and means for moving the auxiliary mold members to deliver the casting.

27. A casting device comprising: two main mold members arranged in an upright position and movable toward and away from each other in a substantially horizontal plane and which when closed form an upright casting chamber having an opening near its upper end at each side of the mold at the point where the two members meet, and auxiliary mold members, each having a recess, arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will project into said recesses, means for horizontally opening the mold to free the casting from the main mold members and to leave it suspended by the extensions projecting into the auxiliary members, and means for moving the auxiliary mold members vertically while supporting the freed casting.

28. A casting device comprising: two main mold members arranged in an upright position and movable toward and away from each other in a substantially horizontal plane and which when closed form an upright casting member having an opening near its upper end at each side of the mold at the point where the two members meet, and auxiliary mold members, each having a recess, arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will project into said recesses, means for horizontally opening the mold to free the casting from the main mold members and to leave it suspended by the extensions projecting into the auxiliary members, and means for moving the auxiliary mold members downwardly while supporting the freed casting.

29. A casting device comprising: two main mold members movable toward and away from each other and which when closed form a casting chamber having an opening near its upper end at each side of the mold at the point where the two members meet, auxiliary mold members, each having a recess, arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will project into said recesses, means for opening the mold to free the casting from the main mold members and to leave it suspended by the extensions projecting into the auxiliary members, means for moving the auxiliary mold members to deliver the casting, and means for releasing the casting from the auxiliary members.

30. A casting device comprising: two main mold members arranged in an upright position and movable toward and away from each other in a substantially horizontal plane and which when closed form an upright casting chamber having an opening near its upper end at each side of the mold at the point where the two members meet, and auxiliary mold members, each having a recess, arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will project into said recesses, means for horizontally opening the mold to free the casting from the main mold members and to leave it suspended by the extensions projecting into the auxiliary members, means for moving the auxiliary mold members vertically while supporting the freed casting, and means for releasing the casting from the auxiliary members.

31. A casting device comprising: two main mold members arranged in an upright position and movable toward and away from each other in a substantially horizontal plane and which when closed form an upright casting chamber having an opening near its upper end at each side of the mold at the point where the two members meet, and auxiliary mold members, each having a recess, arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will project into said recesses, means for horizontally opening the mold to free the casting from the main mold members and to leave it suspended by the extensions projecting into the auxiliary members, means for moving the auxiliary mold members downwardly while supporting the freed casting and means for releasing the casting from the auxiliary members.

32. A casting device comprising: two main mold members movable toward and away from each other and which when closed form a casting chamber having an opening near its upper end at each side of the mold at the point where the two members meet and auxiliary mold members, each having a recess, arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will project into said recesses, means for opening the mold to free the casting from the main mold members and to leave it suspended by the extensions projecting into the auxiliary members, and means for reciprocating the auxiliary molding members to deliver the casting.

33. A casting device comprising: two

main mold members movable toward and away from each other and which when closed form a casting chamber having an opening near its upper end at each side of the mold at the point where the two members meet, auxiliary mold members, each having a recess, arranged at the sides of the main mold members with their recesses in alinement with the openings of the casting chamber so that extensions of the casting will project into said recesses, means for opening the mold to free the casting from the main mold members and to leave it suspended by the extensions projecting into the auxiliary members, means for reciprocating the auxiliary molding members to deliver the casting, and means for separating the auxiliary members on their stroke in one direction and for moving them toward each other on their stroke in the other direction.

34. A casting mold including: two mold members, one of which is movable toward and away from the other, a member for effecting such movement, a pivotal support on said member on which the movable mold member is mounted to admit of its being swung open to expose the faces of both mold members, and means for locking the movable mold member to prevent it from being swung open.

35. A casting device including: a mold in an upright position, a finishing device located below the mold to receive the casting in an upright position, a conveying device for transporting the casting from the mold to the finishing device.

36. A casting device including: a mold in an upright position, a finishing device to receive the casting in an upright position, and a reciprocating conveying device for transporting the casting from the mold to the finishing device.

37. A casting device including: a mold in an upright position, a finishing device located below the mold in spaced relation therefrom to receive the casting in an upright position with its top part occupying the space between the mold and the finishing device, a conveying device for transporting the casting from the mold to the finishing device, means for actuating the finishing device to sever the top part from the main part of the casting, and an ejector for ejecting the severed top part of the casting.

38. A casting device including: a mold in an upright position, a finishing device located below the mold in spaced relation therefrom to receive the casting in an upright position with its top part occupying the space between the mold and the finishing device, a conveying device for transporting the casting from the mold to the finishing device, means for actuating the finishing device to sever the top part from the main part of the casting, an ejector for ejecting the severed top part of the casting, a melting pot located adjacent to the top of the finishing device and adapted to receive the ejected top part.

39. A casting device including: a mold in an upright position having two members one of which is movable toward and away from the other, a shearing device located below the mold to receive the casting in an upright position, conveying means for transporting a casting from the mold to the shearing device, actuating means for opening and closing the mold and for operating the shearing device so timed that when the mold is being closed to produce a casting the shearing device is acting on the previously made casting.

40. A casting device including: a mold in an upright position having two members, one of which is movable toward and away from the other, a shearing device located below the mold to receive the casting in an upright position, conveying means for transporting a casting from the mold to the shearing device, actuating means for opening and closing the mold and for operating the shearing device so timed that when the mold is being closed to produce a casting the shearing device is acting on the previously made casting, a receiving means for the finished casting below the shearing device, and a packer for moving the finished castings facewise while the shearing device is acting on the succeeding casting to be received by the receiving means.

41. A casting device including a mold in an upright position having two members, one of which is rocked into and out of contact with the other, a reciprocating sheering device located below the mold to receive the casting in an upright position, conveying means for transporting a casting from the mold to the shearing device, a rocking member for actuating one of the mold members and connected with shearing device to reciprocate the same.

42. A casting device including a mold in an upright position having two members, one of which is rocked into and out of contact with the other, a reciprocating shearing device located below the mold to receive the casting in an upright position, conveying means for transporting a casting from the mold to the shearing device, a rocking member for actuating one of the mold members and connected with shearing device to reciprocate the same, a receiving means for the finished casting below the shearing device, and a packer, for having the finished castings facewise, also actuated from said rocking member.

43. A casting device including: two main mold members occupying an upright position, a rocking member carrying one of said main mold members and moving it in a

substantially horizontal plane, vertical guide arms movable with said rocking members, auxiliary mold members mounted in said vertical guide arms, and means for vertically moving said auxiliary members in said guide arms, a support for receiving the casting from the auxiliary members by acting to sustain the extensions, and means for removing the upper end of the casting including the extensions to free it from said support.

44. A casting device including: two main mold members occupying an upright position, a rocking member carrying one of said main mold members and moving it in a substantially horizontal plane, vertical guide arms movable with said rocking members, auxiliary mold members mounted in said vertical guide arms, and means for vertically moving said auxiliary members in said guide arms, a support for receiving the casting from the auxiliary members by acting to sustain the extensions thereof, a clamp below said support for clamping the main portion of the casting; and knives for shearing off the top of the casting including the extension while the main portion is clamped.

45. A casting device including: a casting mold composed of several portions, means for opening said mold after a casting has been made thereby releasing the casting from a portion of the mold and leaving it supported by another portion of the mold, a casting receiving means, means for moving the casting carrying portion of the mold to the receiving means, and means for releasing the casting from said casting carrying portion, and a finishing device associated with said receiving means for acting upon the casting.

46. A casting device including: a casting mold composed of main members and auxiliary members to produce a casting having overhanging portions extending into the auxiliary members, means for separating said main members after a casting has been made thereby releasing said casting from the main members and leaving it supported on the auxiliary members, means for moving the auxiliary members to deliver the casting out of the plane of the mold, and means for separating the auxiliary members to release the casting; and a finishing device for receiving the casting from the auxiliary members to sever a part including the overhanging portions from said casting.

47. A casting device including: a casting mold composed of two main mold members capable of separation by a movement in one plane, and two auxiliary mold members for supporting the casting after it has been separated from the main members and having movement substantially at right angles to the movement of the main members, to deliver the casting out of the mold, and means for releasing the auxiliary members from the casting; and a finishing device for receiving the casting from the auxiliary mold members.

48. A casting device including a casting mold composed of two main mold members capable of separation from each other and from the casting by a movement in one plane and two auxiliary mold members for supporting the freed casting, movable with one of said main members and having a movement, substantially at right angles to the movement of the main members, to deliver the casting out of the mold, and means for releasing the auxiliary members from the casting; and a finishing device for receiving the casting from the auxiliary mold members.

Signed at New York, in the county of New York and State of New York, this 1st day of March, 1922.

CHARLES E. HOPKINS.