W. A. LEDDELL.

DIE CASTING APPARATUS.

APPLICATION FILED MAY 6, 1909.

1,013,665.

Patented Jan. 2, 1912.

9 SHEETS—SHEET 1.

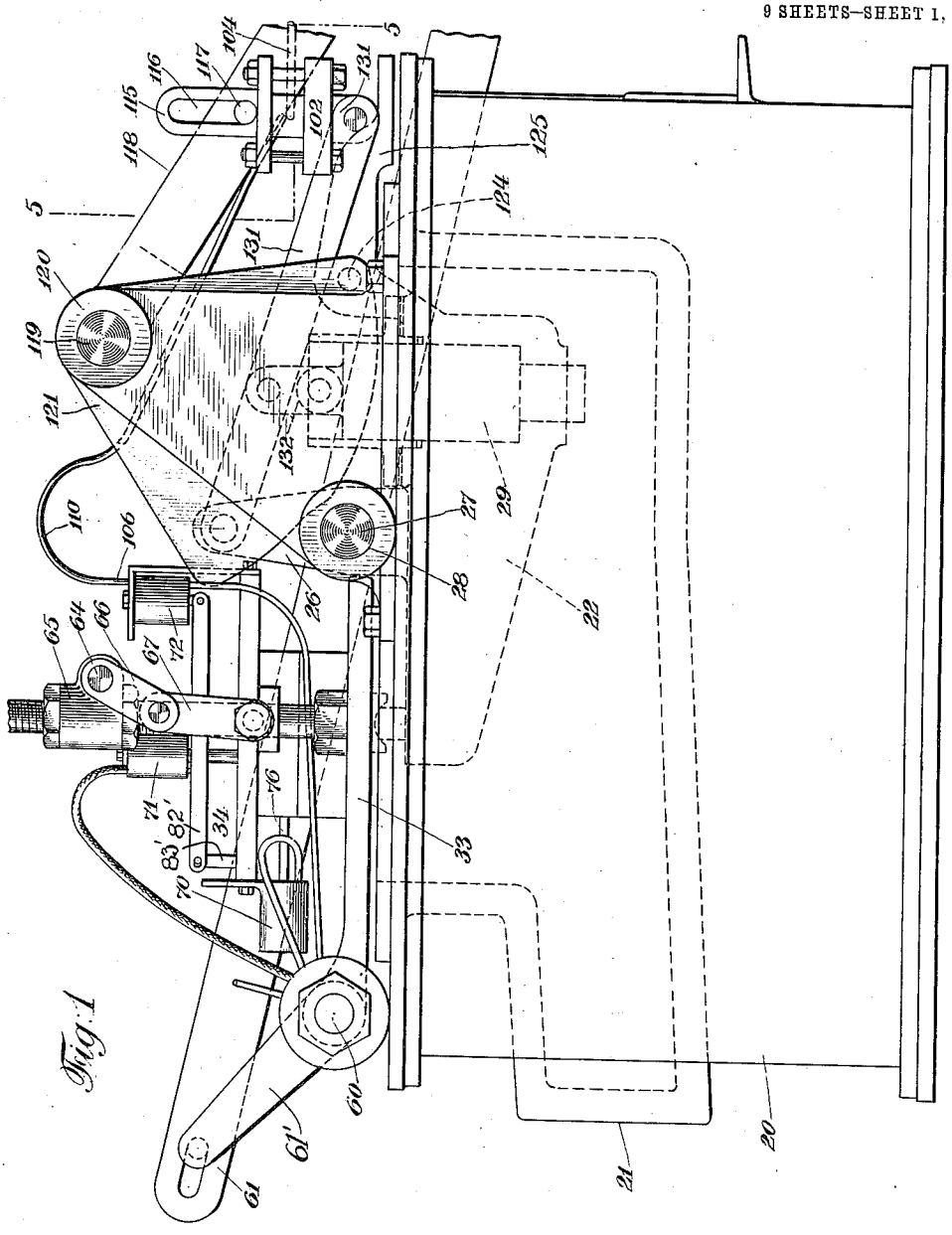

Fig. 1.

WITNESSES

A. Faber du Faur

F. N. Roehrich

INVENTOR

William A. Leddell

BY

Fredk F. Schuch

ATTORNEY

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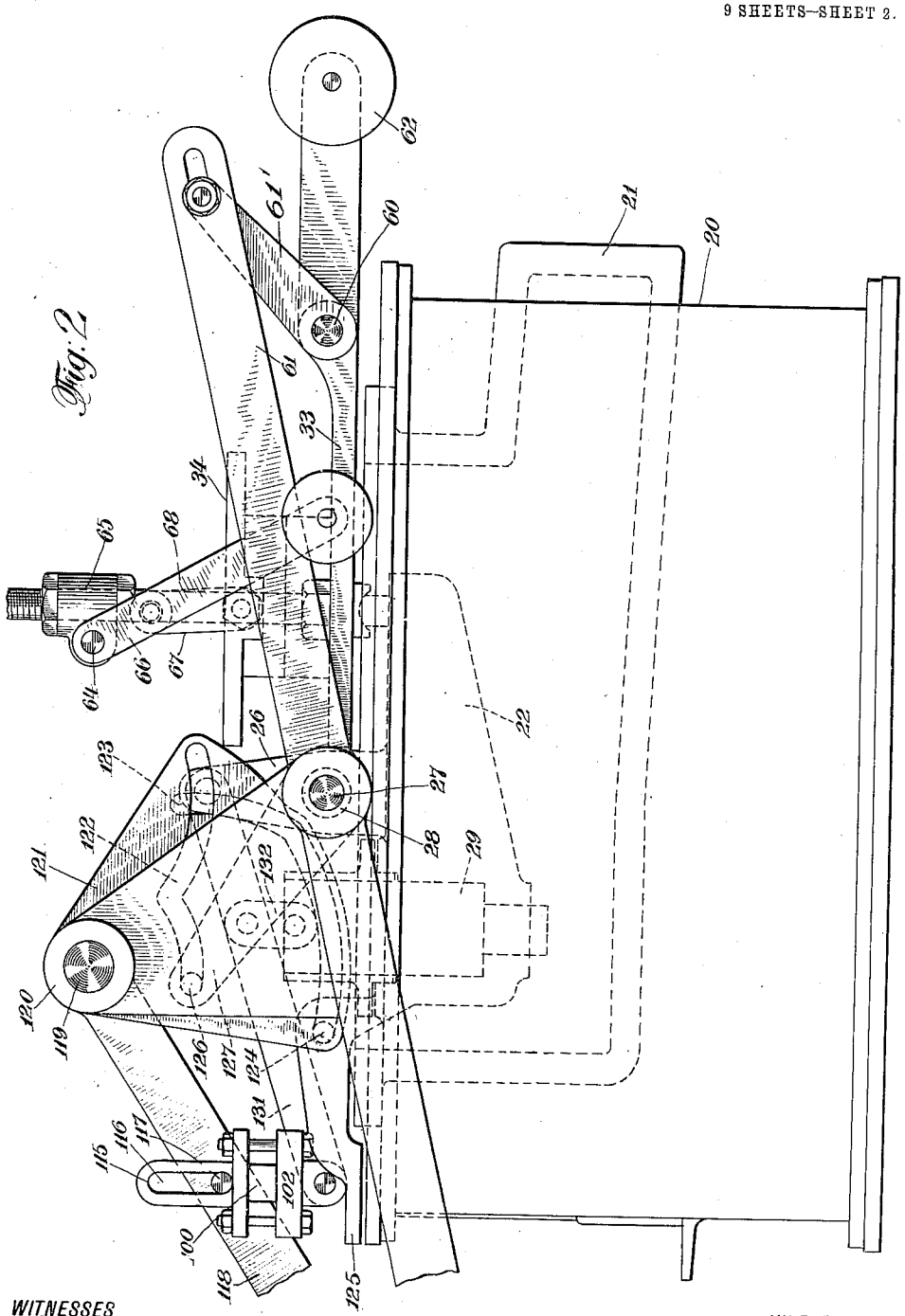
9 SHEETS—SHEET 2.

Fig. 2



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F. N. Roehrich

INVENTOR

William A. Leddell

BY

Brady & Schuetz

ATTORNEY

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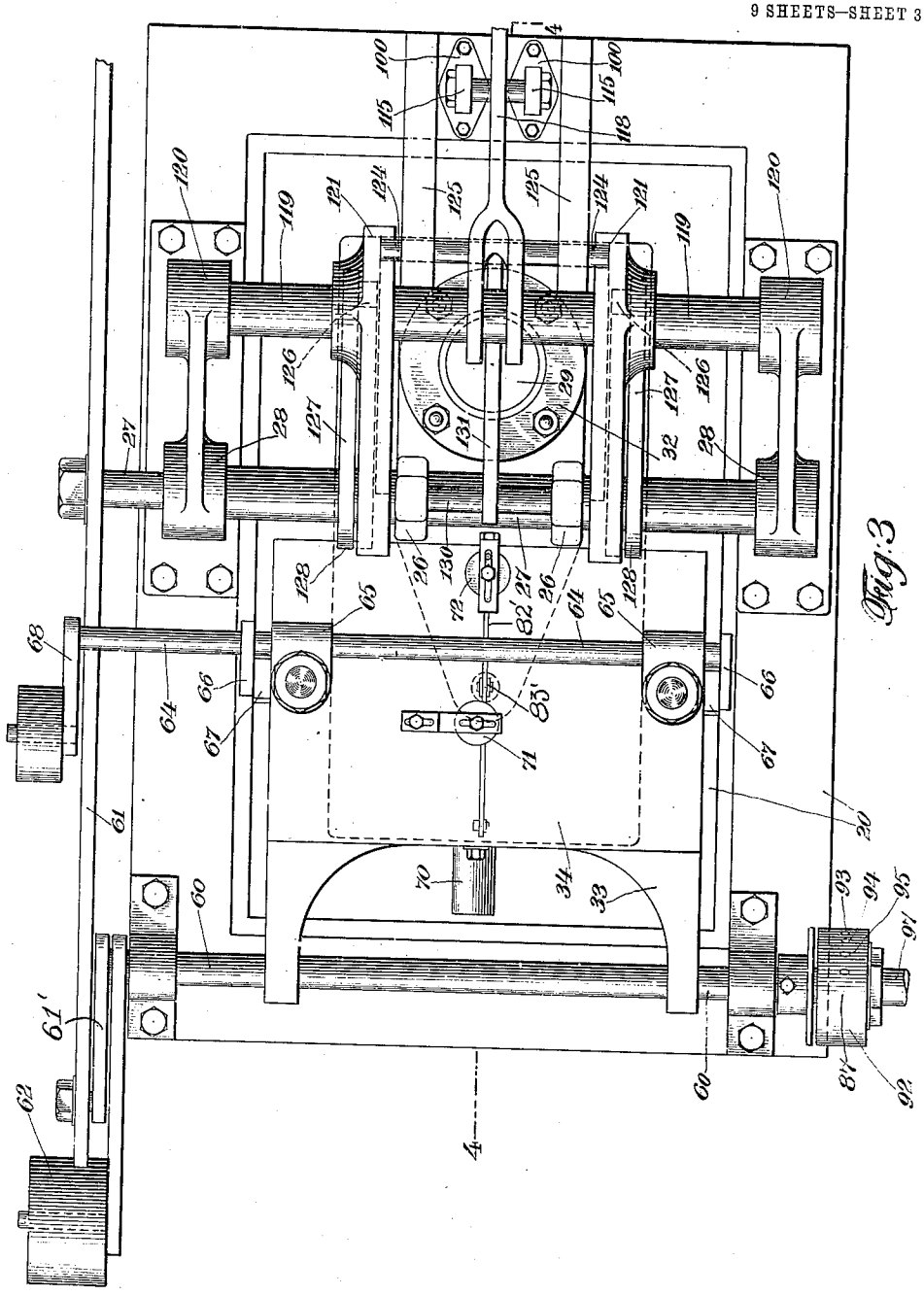

Fig. 3.

WITNESSES

A. Faber du Faur

F. N. Rochrich

INVENTOR

William A. Leddell

BY

Brach & Schuetz

ATTORNEY

W. A. LEDDELL.

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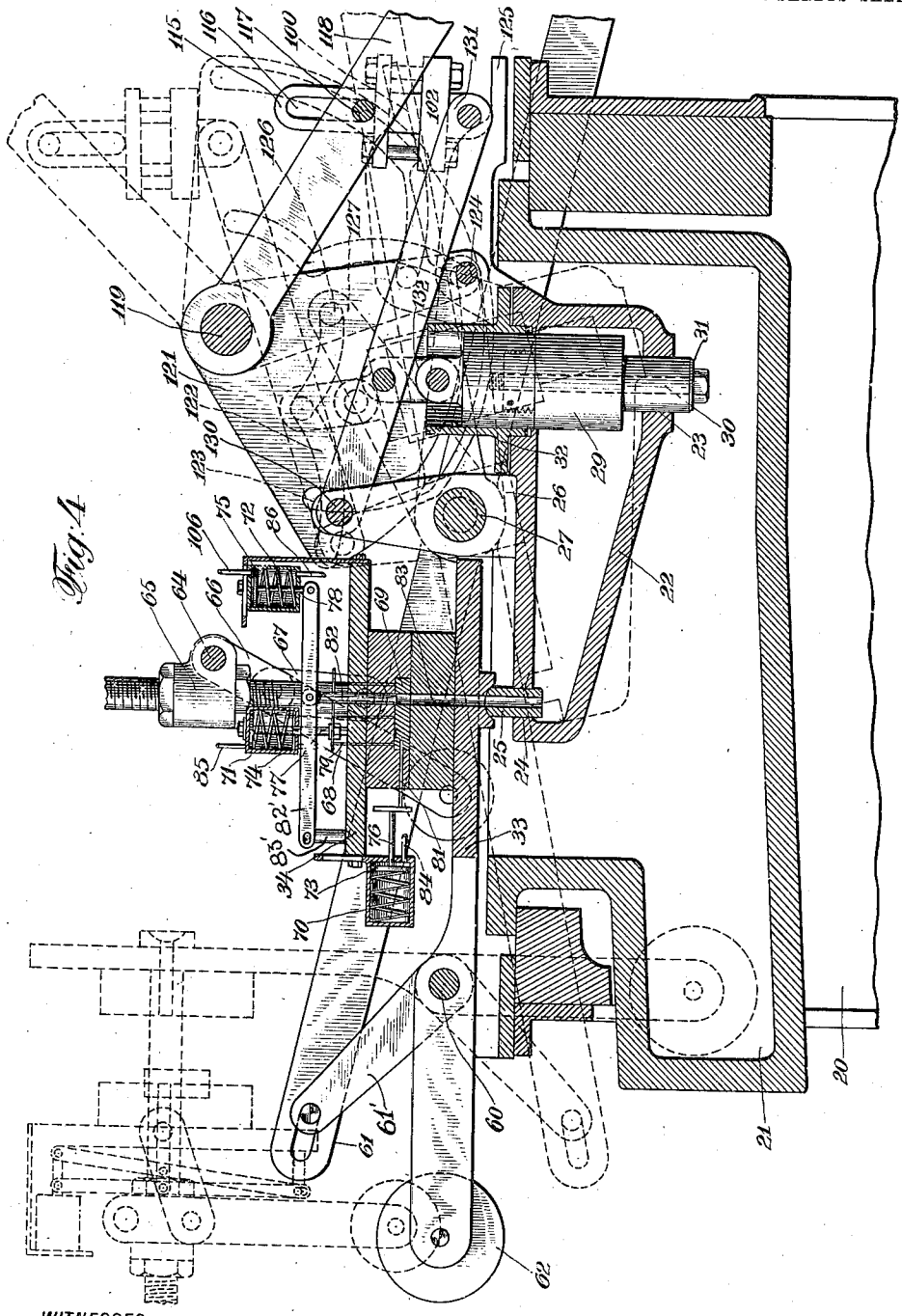
9 SHEETS—SHEET 4.

Fig. 4.



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F. N. Roehrich

INVENTOR

William A. Leddell

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Fred'k P. Schuch

ATTORNEY

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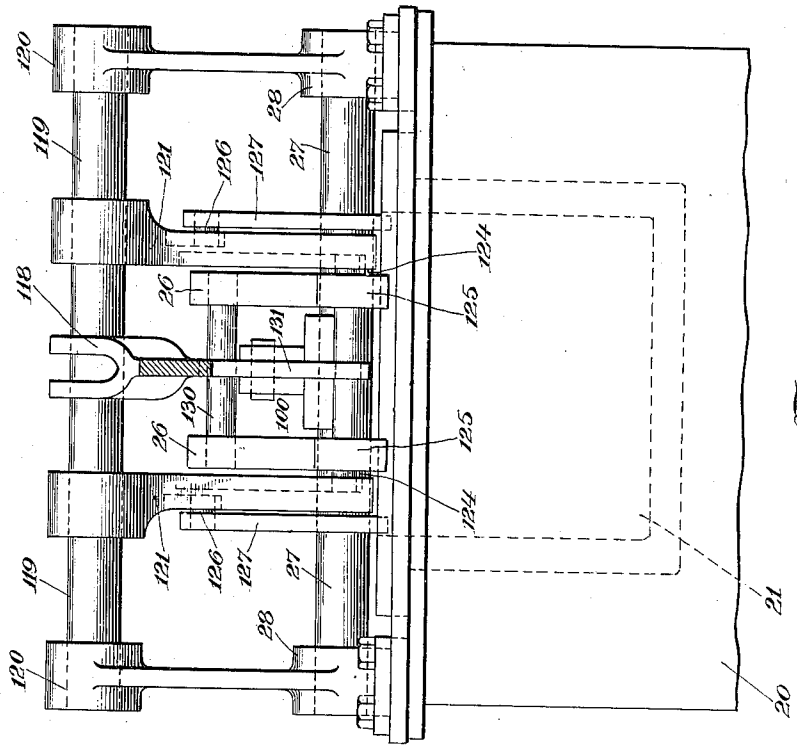

Fig. 5

WITNESSES

A. Faber du Faur

F. A. Roehrich

INVENTOR

William A. Leddell

BY

Read P. Schuetz

ATTORNEY

W. A. LEDDELL.

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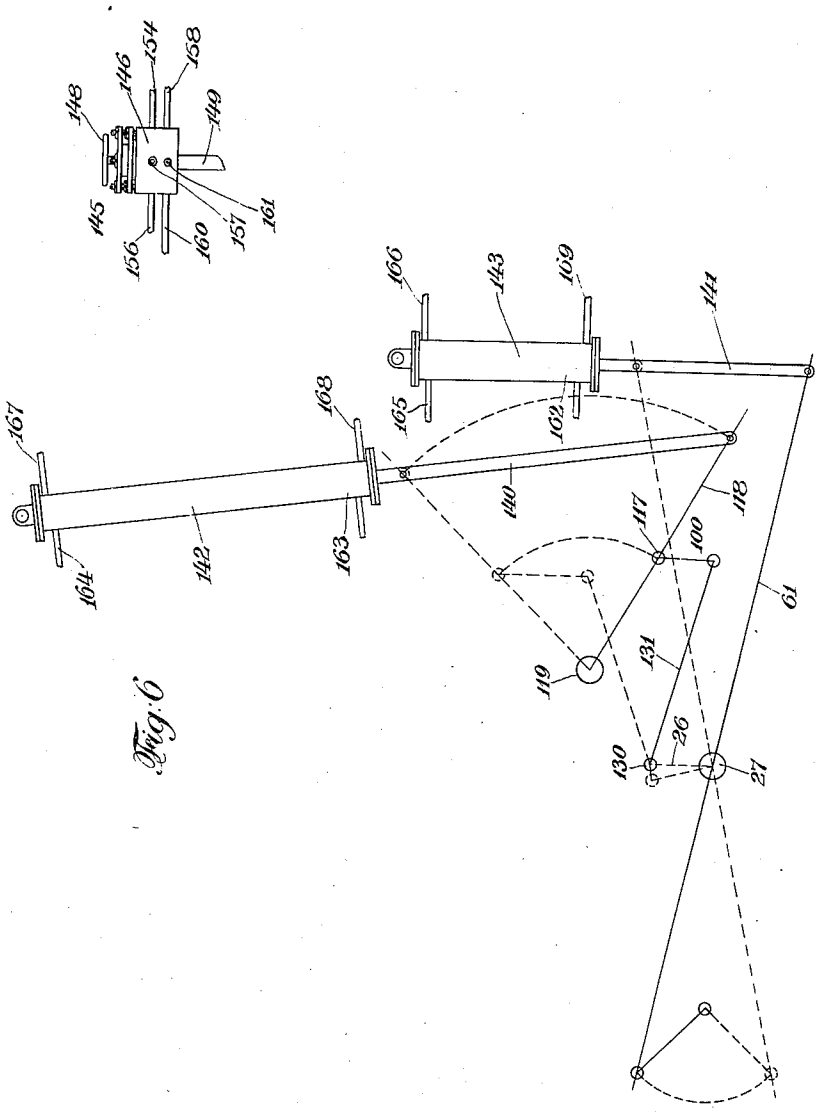

Fig. 6.

WITNESSES

A. Faber du Faur

F. N. Roehrich

INVENTOR

William A. Leddell

BY

Frank D. Schuetz

ATTORNEY

W. A. LEDDELL.

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9 SHEETS—SHEET 7.

Fig: 7

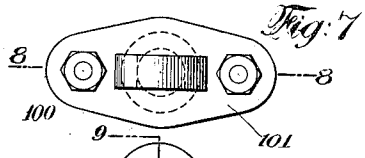


Fig: 8

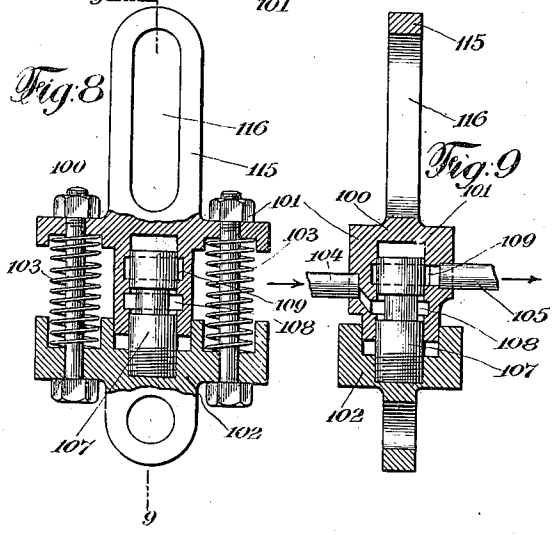


Fig: 9

Fig: 14

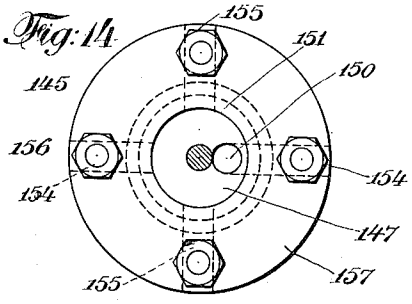


Fig: 13

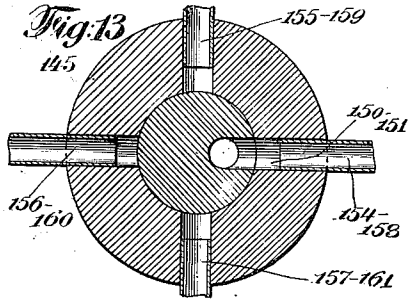


Fig: 10

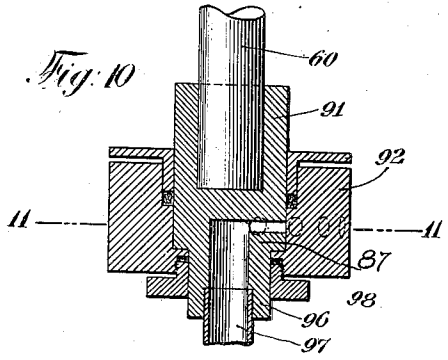


Fig: 11

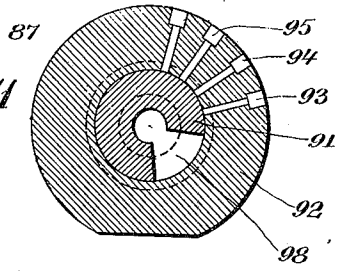
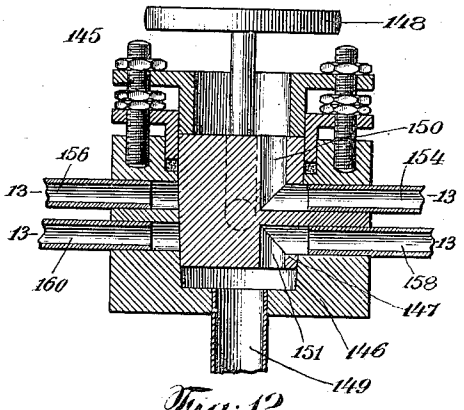


Fig: 12



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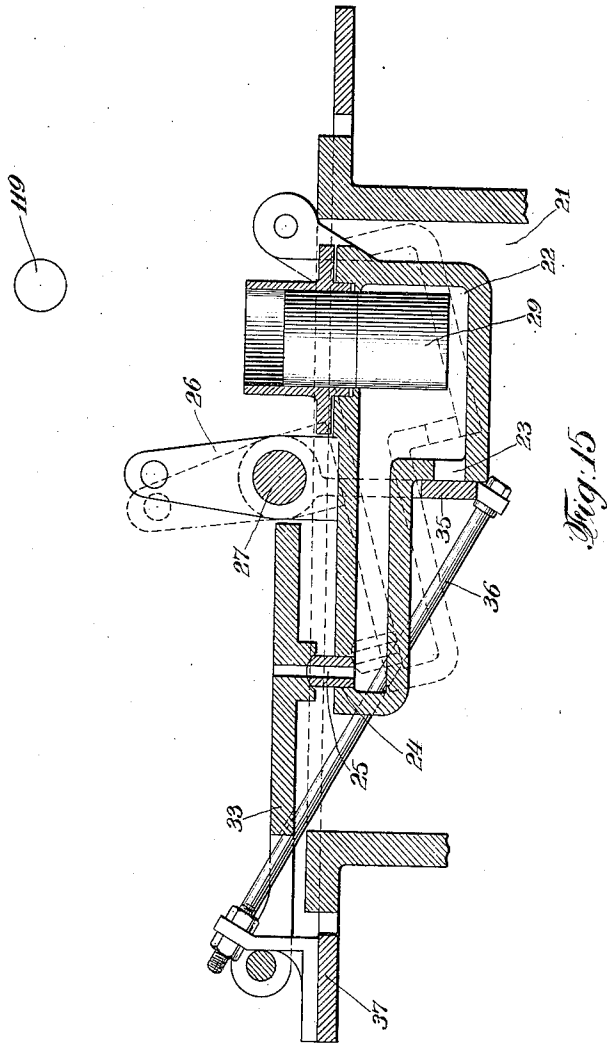

Fig. 15

WITNESSES

A. Faber du Faur

F. N. Roehrich

INVENTOR

William A. Leddell

BY Dodd & Schuch

ATTORNEY

W. A. LEDDELL.

DIE CASTING APPARATUS.

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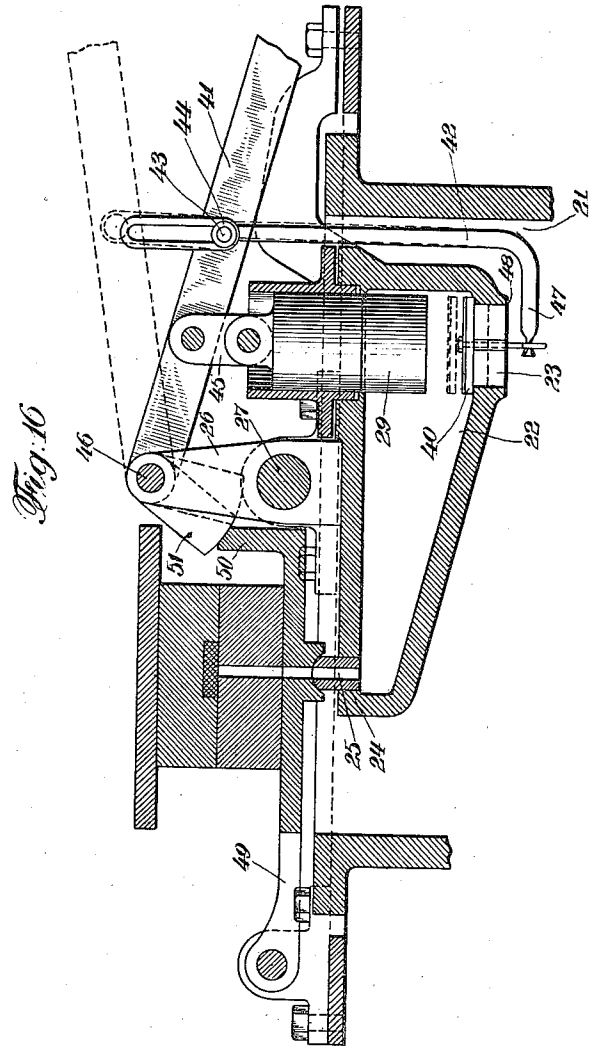

Fig. 16

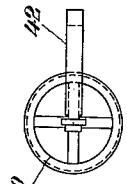

Fig. 17

WITNESSES

A. Faber du Faur

F. N. Roehrich

INVENTOR

William A. Leddell

BY

Frank F. Schuetz

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM A. LEDDELL, OF RED BANK, NEW JERSEY, ASSIGNOR TO HENRY F. MERRIAM, OF SUMMIT, NEW JERSEY.

DIE-CASTING APPARATUS.

1,013,665. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed May 6, 1909. Serial No. 494,481.

To all whom it may concern:

Be it known that I, WILLIAM A. LEDDELL, a citizen of the United States, and a resident of Red Bank, in the county of Monmouth and State of New Jersey, have invented certain new and useful Improvements in Die-Casting Apparatus, of which the following is a specification.

My invention relates to die-casting apparatus; and particularly to apparatus in which the various operations may be made entirely automatic.

It has for its object to simplify apparatus of this character, and to so construct the same that the various parts are readily accessible and removable; also, to so arrange the various mechanisms that all of the operations may be made entirely automatic.

It has for its further object to prevent fouling of the outlet port of the casting pot; and, also, to automatically lock off the metal from said outlet port when the pressure exerted upon said metal has attained a predetermined degree.

The nature of my invention will be best understood in connection with the accompanying drawings, in which—

Figure 1 is an elevation of one side of the improved casting apparatus. Fig. 2 is an elevation of the opposite side. Fig. 3 is a plan view. Fig. 4 is a section on the line 4—4, Fig. 3, the non-casting position of the apparatus being illustrated in dotted lines. Fig. 5 is a section taken on the line 5—5, Fig. 1. Fig. 6 is a diagrammatic view of the apparatus. Fig. 7 is a plan view of the pressure controlling valve. Fig. 8 is a section taken on the line 8—8, Fig. 7. Fig. 9 is a section taken on the line 9—9, Fig. 8. Fig. 10 is a vertical section of an air controlling valve. Fig. 11 is a section taken on the line 11—11, Fig. 10. Fig. 12 is a vertical section of a fluid controlling valve. Fig. 13 is a section taken on the line 13—13, Fig. 12. Fig. 14 is a plan view of said valve. Figs. 15 and 16 are fragmentary views illustrating modifications in the closing means for the casting pot. Fig. 17 is a view of the underside of the closing valve and lever, Fig. 16.

Similar characters of reference designate corresponding parts throughout the several views.

Referring now to the drawings, Figs. 1 to 5, 20 designates a suitable heating chamber containing a melting pot 21 adapted to retain a suitable metal. Within the pot 21 is a casting pot or pressure chamber 22. This casting pot is provided with an inlet port 23 to communicate with the melting pot 21, and with an outlet port 24. This outlet port 24 is preferably in the form of a nozzle 25 extending a slight distance above the casting pot; and, also, within the said pot so as to draw metal from a lower level to more securely prevent including drosses which might form in the said casting pot.

The casting pot 22 is hung by arms 26 on a rod 27 mounted to swing in suitable bearings 28. The said pot 22 may be tilted, as hereinafter more fully set forth, for the purpose of stirring the metal both within said casting pot 22 and the melting pot 21, so that it will be kept of substantially the same density throughout as well as to retain the nozzle 25 below the surface of the metal in the pot 21 when the said pot is not casting, and thereby avoid the accumulation of dross upon same. The upper portion of said casting pot is recessed to receive a gland or stuffing box 32 which acts also as a guide for a piston 29 of double diameter. The piston is preferably in two parts, the lower portion being in contact with the metal in the casting pot 22, and composed of some heat resisting material such as graphite, lava, fused quartz, etc. This lower portion may be integral with the upper portion; or, as shown may be screwed into the upper portion and held thereto by a bolt 30 and washer 31 thereby relieving the strain on same.

The lower portion, of reduced diameter, of the piston 29 is adapted to fit and to close, as the piston descends, the inlet port 23. The further descent of the piston 29 displaces the metal in said casting pot 22, forcing it through the outlet port 24 into a suitable die mounted upon the die-plates 33 and 34. The pressure upon said metal is dependent upon the distance the piston 29 descends, and is controlled as hereinafter described.

In Fig. 15, the piston 29 is shown of the same diameter throughout, and the inlet port 23 in this modification is closed from the outside by means of a stationary valve piece 35 hung from the rod 27. This valve piece is capable of slight adjustment through rods 36 which are secured to the

top plates 37 of the furnace. The tilting of the casting pot 22 will carry inlet port 23 away from the valve piece 35 and thereby open same; and, when the pot is in casting position again, the said port is closed by the said valve piece.

In Figs. 16 and 17 another method of closing the inlet port 23 is shown. In this modification, a valve piece 40 is provided within the casting pot and seats upon the said inlet port. The valve piece 40 is connected to a lever 41 by means of a rod 42, whose lever end is slotted and receives a pin 43 projecting from said lever 41. The pin 43 carries a spring washer 44 which bears against the face of the rod to provide friction in excess of the force required to move the valve piece 40. Lever 41 is connected to the piston 29 by means of a link 45, and is fulcrumed at 46. As lever 41 is raised to lift the piston 29, rod 42 travels upwardly being held by the friction connection above explained. This causes the valve piece 40 to lift until a portion 47 of said rod strikes a shoulder 48 of the casting pot 22, when the friction is overcome and pin 43 slides in the slotted end of said rod. Upon the downward movement of lever 41, the friction connection holds the rod 42 to said lever 41, and the valve piece 40 seats on said inlet port, closing the same. Further downward movement causes the pin 43 to slide in the slotted end as the seated valve piece 40 can move no farther.

A die-plate 49 coöperates with the outlet port 24 of the casting pot and is provided with a lug 50. This lug is adapted to be engaged by a rocking arm 51 of lever 41 to lock the said die plate against the nozzle 25, while the piston is descending. The engaging faces of the said lug 50 and arm 51 are portions of a surface of cylinders whose axes pass through the fulcrum 46, so that the said arm rides freely on the top of said lug. This lug and arm insure, not only that the die is properly locked when the piston is exerting pressure upon the metal in said casting pot; but, also prevent the lever 41 from descending and exerting such pressure unless the die plate 49 is properly located, the said lug in such instance acting as a stop for the arm 51 and not permitting the same to ride over it.

The die-plate 33, Figs. 1 to 5, is keyed to a rod 60 mounted to turn in suitable bearings carried by the frame 20, and is adapted to be rocked by a lever 61 through an arm 61′ extending from said plate. A counterweight 62 is attached to said rod 60 to partly overcome the weight of the die-plates, the dies, and other mechanism. Lever 61 is fulcrumed on the rod 27 and may be operated by hand or by suitable mechanical means as hereinafter set forth.

The upper die-plate 34 is connected to a rod 64 mounted in adjustable blocks carried on uprights 65 secured to the lower die-plate 33. A weighted arm 68 is attached to the rod 64, and the said rod is connected to the die-plate 33 by means of two links 66 and 67 forming a toggle. As the die-plate 33 is rotated with rod 66 by means of lever 61, the links 66 and 67 are drawn together due to the movement of the said weighted arm 68 turning said rod. The upper die-plate is thereby drawn away from the lower, separating their two members and allowing of the removal of a casting 69.

The upper die plate carries a number of adjustably mounted cylinders 70, 71 and 72 containing spring pressed pistons 73, 74 and 75 which reciprocate piston rods 76, 77 and 78 respectively. The piston rod 77 is connected to a number of ejector pins 79 adapted to eject the casting 69 from the dies, when separated as explained. Piston rod 76 operates a core-pin 81 which is normally held within said dies. These pistons 73, 74 and 75 may be actuated by air or any other suitable medium, and may be manually or automatically controlled. The cylinder 72, similarly mounted, controls the piston rod 78 which actuates a locking pin 82, controlled through a lever 82′ fulcrumed upon a stud 83′, and is adapted to pass into the gate 83 communicating with the nozzle 25, and thereby lock the metal in said die. An additional control is provided for the piston 75, actuating this pin 82; and may likewise be manually or automatically operated as hereinafter described. The inlets 84, 85 and 86 of the cylinders 70, 71 and 72 are connected to a valve device 87 (Figs. 3, 10 and 11) mounted upon and operated by the movement of the rod 60, and controlling the medium supplied to said cylinders.

The valve itself (Figs. 10 and 11) consists of an inner movable member 91 keyed to, or otherwise secured to the rod 60, so as to share the movements of same, and an outer surrounding cylinder 92 suitably placed with respect to the inner member and provided with a number of outlets 93, 94 and 95 etc., connected respectively to the inlets 86, 84 and 85 of said cylinders 72, 70 and 71. The cylinder 92 is flattened on one side which rests on the frame 20, or may be secured to same or otherwise prevented from turning. The inner member 91 is provided with a hollow extension 96 which connects with a supply tube 97 communicating with the source (not shown) supplying the actuating fluid, such as air, for operating the said pistons. This hollow extension 96 is provided with a passage 98 adapted to register with the outlets 93, 94 and 95 when the said movable member is turned by the movement of rod 60, thus supplying the actuating medium through said outlets and suitable connecting pipes, or the like, to the re-

spective cylinders. These outlets are so positioned with respect to the passage 98 and so timed with respect to the movement of the inner member 91, due to movement of rod 60, that the medium is first supplied to the cylinder 72 to raise its piston 75 and lift pin 82. The cylinder 70 is then supplied, and the core pin 81 withdrawn thereby. Finally the cylinder 71 is supplied, and the ejector pins 79 operate to eject the casting 69, the die plates having in the meantime been raised and separated.

The movement of the various pins may of course be accomplished by other means than a piston working in a cylinder, as for example, by means (not shown) consisting of an electric solenoid having a controlling device in the nature of suitable contact mechanism actuated by the rod 60 as before.

The medium for the additional control of the movement of the pin 82, to lower same into the gate 83, is controlled by means of a valve 100, Figs. 1, 3, 4, 5, and 7 to 9. This valve consists of two adjustable parts 101 and 102 held apart by means of suitable springs 103 and adapted under suitable conditions to be drawn together. The upper part 101 is provided with inlet 104 communicating with a source (not shown) supplying the actuating medium such as air, and an outlet 105 adapted to be connected to the inlet 106 at the upper end of cylinder 72. A piston 107 of the lower member 102 extends up into the member 101 and normally closes the outlet 105. This piston is provided with a reduced portion 108 which provides a chamber communicating through the passage 109 with the inlet 104. When the piston 107 is advanced upon the two members being drawn together, this reduced portion 108 communicates also with the outlet 105 and thereby permits the medium supplied from the inlet 104 to be supplied through outlet 105 and a suitable connecting pipe or the like 110 to the cylinder 72.

The upper part 101 of valve 100 is provided with an extension or arm 115 having a vertical slot 116 into which fits a pin 117 extending from a lever 118. The valve 100 is in duplicate and arranged on each side of said lever 118, being connected through pin 117 as above set forth. One end of lever 118 is forked and secured to a rod 119 mounted to turn in bearings 120. Duplicate plates 121, each provided with two compound grooves 122 and 123, upon opposite faces of said plate are also secured to this rod 119, and are adapted to be moved by same. The first portion of groove 122 lies in the arc of a circle whose center is determined by the degree of angular movement of the lever 127; and the first portion of groove 123 lies in the arc of a circle whose center is determined by the desired movement of the casting pot. The latter portion of both grooves lie in arcs described about a center lying in the axis of shaft 119. Pins 124, extending from the lugs 125 of the casting pot 22, engage the grooves 123; and the movement of said casting pot is controlled thereby through the movement of the plates 121. The other grooves 122 are engaged by pins 126 of levers 127 (in duplicate) mounted to turn on the rod 27. The said levers 127 carry also a nose 128 adapted to fit over and to lock the lower die plate 33.

The upper end of arms 26 by which the casting pot 22 is hung are connected to a rod 130, which is connected by means of a link 131 to the lower portion 102 of valve 100. A link 132 connects the piston 29 with said link 131.

The lever 118 as well as lever 61 may be operated manually, but are preferably operated by power such for example as by means of the piston rods 140 and 141 respectively (Fig. 6) to which they are connected, and which are operated by air or steam; or the said rods may be operated by electric solenoids (not shown). In the example shown, the medium supplied to the cylinders 142, 143 to move the piston rods 140 and 141 is controlled by means of a valve device 145. This device (Figs. 12 to 14) consists of an outer fixed member 146 and an inner rotatable member 147 adapted to be rotated through pulley 148 which may be connected to a suitable source of power (not shown) and running at the required speed. The inner member connects with the source (not shown) supplying the medium for the cylinders 142, 143 through a pipe 149, and is provided with an exhaust outlet 150 and pressure inlet 151 located in different planes. The upper outlet is adapted to register with exhaust ports 154, 155, 156, and 157, while the lower, pressure inlet is adapted to register with pressure ports 158, 159, 160, and 161. The ports 154, 155, 156 and 157 are connected by any suitable hose or pipe to the inlets 162, 163, 164 and 165 respectively of cylinder 142 and 143; and the ports 158, 159, 160 and 161 to the inlets 166, 167, 168 and 169 respectively.

The operation of the apparatus is as follows—With the apparatus in the dotted or non-casting position, the valve 145 is in the condition illustrated in Fig. 13, and the outlet 162 is connected with the exhaust, while pressure is being supplied through inlet 166 to the upper portion of cylinder 143 driving downwardly the piston rod 141 and lowering lever 61 and returning the die plates to casting position (shown in full lines Fig. 4). As these die plates are returned, the valve 87 shuts off the pressure to the various cylinders controlling the core-pin, ejector pins and the locking pin, inserting the core-pin and withdrawing the

ejector pins. By this time ports 154 and 158 have been closed due to the movement of the member 147, and the ports 155 and 159 opened, connecting the lower portion of cylinder 142 with the exhaust and the upper portion with the pressure. This causes the piston rod 140 to descend and to lower the lever 118. As lever 118 is lowered, the rod 119 is turned and with it the plates 121. Pins 124 working in the first part of the groove 123 are thereby depressed, lowering the lugs 125 of casting pot 22, and causing the nozzle 25 of same to be raised into contact with the die plate 33. The first portion of said groove is designed to cause the said lugs to be depressed sufficiently, until a good contact is insured between the nozzle 25 and said die plate 33; whereas the second portion of said groove 123 is in the arc of a circle described about a point the axis of rod 119 so that the movement of the groove with respect to the pins 124 has the effect merely to continue to hold the nozzle 25 firmly against the die plate 33 while the other operations are taking place. During this positioning of the casting pot 22, the other grooves 122 have also been in action due to the movement of plates 121. The pins 126 engaging these grooves, with the movement of said plates, have caused the outer ends of levers 127 to be lifted during said movement through the first portion of the grooves, and thereby have brought the noses 128 of said arms into contact with the upper surface of die plate 33, holding said die plate down and securely locking same. The second portion of the grooves 122 is in an arc of a circle described about a point in the axis of rod 119, and serves merely to maintain the noses 128 in the locking position to lock the die plate during the operation of casting. As the lever 118 is lowered, the pin 107 extending therefrom has descended in the slot 116 of valve 100 and finally comes into contact with the surface of its upper portion 101 and thereby depresses the said valve as a whole. The descent of valve 100 lowers the link 131, which through link 132 causes the piston 29 to advance into the casting pot 22 and close the inlet port 23 as previously explained, the advance of the piston 29 then producing the pressure in the pot 22 and forcing the metal therein out through the nozzle 25 into the dies to form the casting 69. When the pressure thus exerted has reached a predetermined degree (determined by the tension to which the springs 103 of valve 100 have been set) the tension of these springs has been overcome, and the parts 101 and 102 of said valve 100 will be brought together thus supplying the actuating medium to cylinder 72 and forcing the locking pin 82 into gate 83 to lock off the metal, as explained. The rotatable member 147 of the valve device 145 will have by this time, or very shortly thereafter closed the port 156 and 160 and connected inlets 164 and 168 with the exhaust and pressure respectively, thereby driving the piston rod 140 upwardly and with it lever 118 which causes the piston 29 to be drawn upwardly and the casting pot 22 to tilt, as well as unlocking the die plate 33. The member 147 will then connect ports 157 and 161 with the inlets 165 and 169 respectively of cylinder 143, raising its piston rod 141 and revolving thereby, through lever 61, the die plates, which will also automatically separate said dies as well as eject the casting. This completes the cycle. This cycle is repeated for each operation of casting, the castings being removed by a belt conveyer (not shown), or by any suitable means as they are dropped, upon the separation of the die plates 33 and 34, and the action of the ejector pins 79. If it be desired to make a plurality of casting in one cycle, it is necessary only to duplicate, or triplicate etc., the dies and couple the respective locking, core, and ejecting pins, and provide corresponding nozzles all of which, however, communicate with a single casting pot.

I claim:—

1. In a die casting apparatus: a melting pot: a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; and means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position.

2. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; and means to automatically tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position.

3. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; and means to automatically open said inlet port when the said casting pot is tilted.

4. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; and means to close said inlet port when the casting pot is in casting position and to open same when the said casting pot is tilted.

5. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an

outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; and means to automatically close said inlet port when the casting pot is in casting position and to automatically open same when the casting pot is tilted.

6. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; means to automatically close said inlet port when the casting pot is in casting position; and means to exert pressure upon the metal in said casting pot when the casting pot is in casting position.

7. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; means to automatically close said inlet port when the casting pot is in casting position; means to automatically exert pressure upon the metal in said casting pot when the casting pot is in casting position; and means to automatically open said inlet port when the casting pot is in tilted position.

8. In a die casting apparatus: a melting pot; a pivoted casting pot within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; and means to simultaneously close said inlet port and to exert pressure upon the metal in said casting pot when the casting pot is in casting position.

9. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; and means to automatically and simultaneously close said inlet port and to exert pressure upon the metal in said casting pot when the casting pot is in casting position.

10. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; a die; means to automatically position said die to coöperate with said outlet port when the said casting pot is in casting position; means to automatically close said inlet port; means to automatically exert pressure upon the metal in said casting pot when the casting pot is in casting position; and means to automatically open said inlet port when the casting pot is in tilted position.

11. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot; a die; means to automatically position said die to coöperate with said outlet port when the said casting pot is in casting position; means to automatically exert pressure upon the metal in said casting pot when the casting pot is in casting position; means to automatically remove said die when the casting pot is in tilted position; means to automatically open said die when in removed position; and means to automatically open said inlet port when the casting pot is in tilted position.

12. In a die casting apparatus: a casting pot adapted to retain fluid metal, and provided with a suitable outlet port; means to exert pressure upon the metal in said casting pot to force the same into said die; and means controlled by the operation of the said pressure producing means to determine the maximum pressure exerted upon the metal in the die.

13. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; a die; means to automatically position said die to coöperate with said outlet port when the said casting pot is in casting position; means to automatically close said inlet port; means to automatically exert a predetermined pressure upon the metal in said casting pot when the said casting pot is in casting position; and means to automatically open said inlet port when the casting pot is in tilted position.

14. In a die casting apparatus: a melting pot; a casting pot communicating with said melting pot and provided with an inlet port and an outlet port; a die to coöperate with said outlet port; means to exert pressure upon the metal in said casting pot to force the same into said die; and means to automatically lock the metal in said die when the pressure exerted thereon has attained a predetermined degree.

15. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; a die to coöperate with said outlet port; means to exert pressure upon the metal in said casting pot to force

the same into said die; and means to automatically lock the metal in said die when the pressure exerted thereon has attained a predetermined degree.

16. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; a die; means to automatically position said die to coöperate with said outlet port when the said casting pot is in casting position; means to automatically close said inlet port; means to automatically exert pressure upon the metal in said casting pot when the casting pot is in casting position to force the said metal into said die; means to automatically lock the metal in said die when the pressure exerted thereon has attained a predetermined degree; and means to automatically open said inlet port when the casting pot is in tilted position.

17. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; a die; means to automatically position said die to coöperate with said outlet port when the casting pot is in casting position; means to automatically exert pressure upon the metal in said casting pot when the casting pot is in casting position; means to automatically eject the casting from the die; and means to automatically open said inlet port when the casting pot is in tilted position.

18. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; a die; means to automatically position said die to cooperate with said outlet port when the said casting pot is in casting position; means to automatically lock said die in casting position; means to automatically exert pressure upon the metal in said casting pot when the casting pot is in casting position; means to automatically lock the metal in said die when the pressure exerted thereon has attained a predetermined degree; means to automatically remove said die when the casting pot is in tilted position; means to automatically open said die when in removed position; means to automatically eject the casting from said die; and means to automatically open said inlet port when the casting pot is in tilted position.

19. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; means to automatically tilt said casting pot such that the outlet port will be submerged in the metal when the said casting pot is in tilted position; a die; means to automatically position said die to coöperate with said outlet port when the said casting pot is in casting position; means to automatically lock said die in casting position; a core-pin, and means to automatically insert same; means to automatically close said inlet port; means to automatically exert pressure upon the metal in said casting pot when the casting pot is in casting position to force the metal into said die; means to automatically lock the metal in said die when the pressure exerted thereon has attained a predetermined degree; means to automatically open said inlet port when the casting pot is in tilted position; means to automatically open said die when in the removed position; and means to automatically eject the casting from said die.

20. In a die casting apparatus: a melting pot; a pivoted casting pot, communicating therewith, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; and a single, double diameter piston acting within said casting pot to close said inlet port and to exert pressure upon the metal in said casting pot.

21. In a die casting apparatus: a melting pot; a pivoted casting pot, communicating therewith, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; and a single, double diameter piston acting within said casting pot, and adapted to simultaneously and automatically close said inlet port and exert pressure upon the metal in said casting pot.

22. In a die casting apparatus: a melting pot; a pivoted casting pot, communicating therewith, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; and a double diameter piston acting within said casting pot, the portion of smaller diameter being adapted to close said inlet port.

23. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that

the outlet port will be submerged in the metal when the casting pot is in tilted position; a double diameter piston acting within said casting pot; and means to automatically cause said portion of smaller diameter to close said inlet port when the said casting pot is in casting position.

24. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; a double diameter piston acting within said casting pot; and means to automatically cause said portion of smaller diameter to close said inlet port when the said casting pot is in casting position, and to open the same when the casting pot is in tilted position.

25. In a die casting apparatus: a melting pot, and a pivoted casting pot, communicating therewith, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; means to exert pressure upon the metal in said casting pot; yielding means connected to said means; and means controlled by said yielding means to release the pressure upon the casting.

26. In a die casting apparatus: a melting pot, and a pivoted casting pot, communicating therewith, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; means to exert pressure upon the metal in said casting pot; adjustable yielding means connected to said means, and means controlled by said adjustable yielding means to release the pressure upon the casting.

27. In a die casting apparatus: a melting pot, and a pivoted casting pot, communicating therewith, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; a piston acting within said casting pot; a lever operating said piston; yielding means connected to said lever; and means controlled by said yielding means to release the pressure upon the casting.

28. In a die casting apparatus: a melting pot, and a pivoted casting pot, communicating therewith, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; a piston acting within said casting pot; a lever operating said piston; an operating lever; and yielding means connecting said piston lever and said operating lever.

29. In a die casting apparatus: a melting pot, and a pivoted casting pot, communicating therewith, adapted to retain fluid metal, and provided with an inlet port and an outlet port; means to tilt said casting pot such that the outlet port will be submerged in the metal when the casting pot is in tilted position; a piston acting within said casting pot; a lever operating said piston; an operating lever; yielding means connecting said piston lever and said operating lever; and means to actuate said operating lever.

30. In a die casting apparatus: a melting pot, and a casting pot communicating therewith; a piston acting within said casting pot; a lever operating said piston; an operating lever; yielding means connecting said piston lever and said operating lever; and pneumatically actuated means to actuate said operating lever.

31. In a die casting apparatus: a melting pot, and a casting pot communicating therewith; a piston acting within said casting pot; a lever operating said piston; an operating lever; yielding means connecting said piston lever and said operating lever; and means to automatically actuate said operating lever.

32. In a die casting apparatus: a melting pot, and a casting pot communicating therewith; a piston acting within said casting pot; a lever pivotally secured to said piston and adapted to depress same to exert pressure upon the metal in said casting pot; and means connected with said lever adapted to yield when the pressure in said casting pot has attained a predetermined degree.

33. In a die casting apparatus: a melting pot, and a casting pot communicating therewith; a piston acting within said casting pot; a lever pivotally secured to said piston and adapted to depress same to exert pressure upon the metal in said casting pot; means connected with said lever adapted to yield when the pressure in said casting pot has attained a predetermined degree; and a valve controlled by said yielding means.

34. In a die casting apparatus: a melting pot, and a casting pot communicating therewith, and provided with an outlet port; a die coöperating with said outlet port; a piston acting within said casting pot; means to depress said piston to exert pressure upon the metal in said casting pot; yielding means connected with said piston operating means; a valve controlled by said yielding means; a gate; and fluid actuated means controlled by said valve to automatically

close said gate when the pressure upon the metal in said casting pot has attained a predetermined degree.

35. In a die casting apparatus: a melting pot, a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; a lug extending from said casting pot; a pin projecting from said lug; a plate provided with a compound groove adapted to be engaged by the said pin, the first portion of said groove being adapted to swing said casting pot into casting position, and the second portion being adapted merely to hold same in said position; and means to actuate said plate.

36. In a die casting apparatus: a melting pot; a pivoted casting pot; within said melting pot, provided with an inlet port and an outlet port; a lug extending from said casting pot; a pin projecting from said lug; a plate provided with a compound groove engaged by the said pin, the first portion of said groove being adapted to swing said casting pot into casting position, and the second portion being adapted merely to hold same in said position; and means to automatically actuate said plate.

37. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; upper and lower die plates and a die adapted to coöperate with said outlet port; means to revolve said die plates; means to lock the lower die plate when the said die plates have been revolved into casting position; means to tilt said casting pot; a fluid controlling valve; and fluid actuated means controlled by said valve adapted to actuate said lower plate revolving mechanism, and the said mechanism to tilt said casting pot.

38. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; upper and lower die plates and a die adapted to coöperate with said outlet port; means to revolve said die plates; a lever, and a nose projecting from same; a pin carried by said lever; a plate provided with a compound groove engaged by said pin, the first portion of said groove, upon the movement of said plate, being adapted to actuate said lever to cause the said nose to engage and to lock the said lower die plate when the die plates are in casting position, and the second portion of said groove being adapted merely to hold said lever in locking position; a lug extending from said casting pot; a pin projecting from said lug; a second compound groove on said plate and engaged by said lug pin, the first portion of said groove being adapted to swing said casting pot into casting position, and the second portion being adapted merely to hold same in said casting position; means to exert pressure upon the metal in said casting pot when the casting pot is in casting position; and fluid actuated means adapted to actuate said plate.

39. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; upper and lower die plates and a die adapted to coöperate with said outlet port; means to revolve said die plates, a lever and a nose projecting from same; a pin carried by said lever; a plate provided with a compound groove engaged by said pin, the first portion of said groove, upon the movement of said plate, being adapted to actuate said lever to cause the said nose to engage and to lock the said lower die plate when the die plates are in casting position, and the second portion of said groove being adapted merely to hold said lever in locking position; a lug extending from said casting pot; a pin projecting from said lug; a second, compound groove on said plate and engaged by said lug pin, the first portion of said groove being adapted to swing said casting pot into casting position, and the second portion being adapted merely to hold same in said casting position; means to exert pressure upon the metal in said casting pot when the casting pot is in casting position; a fluid controlling valve; and fluid actuated means controlled by said valve adapted to actuate said plate.

40. In a die casting apparatus: a melting pot; a pivoted casting pot, within said melting pot, provided with an inlet port and an outlet port; upper and lower die plates and a die adapted to coöperate with said outlet port; a lever adapted to revolve said die plate; a lever, and a nose projecting from same; a pin carried by said latter lever; a plate provided with a compound groove engaged by said pin, the first portion of said groove upon the movement of said plate, being adapted to actuate said latter lever to cause the said nose to engage and to lock the said lower die plate when the die plates are in casting position, and the second portion of said groove being adapted to merely hold said lever in locking position; a lever actuating said plate; a lug extending from said casting pot; a pin projecting from said lug; a second compound groove on said plate and engaged by said pin, the first portion of said groove being adapted to swing said casting pot into casting position, and the second portion being adapted merely to hold same in said casting position; a piston acting within said casting pot; a lever pivotally secured to said piston and adapted to depress same to exert pressure upon the metal in said casting pot; means connecting said lever and said plate actuating lever, adapted to yield

when the pressure in said casting pot has attained a predetermined degree; a fluid controlling valve operated by said yielding means; a gate; fluid actuated means, controlled by said valve, and adapted to close said gate when the pressure in said casting pot has attained a predetermined degree; a second, fluid controlling valve; and fluid actuated means controlled by said second valve to operate said die plate revolving lever and the said grooved plate actuating lever.

Signed at New York, in the county of New York and State of New York, this 4 day of May, A. D. 1909.

WILLIAM A. LEDDELL.

Witnesses:

A. FABER DU FAVOR,

FREDK. F. SCHUETZ.