Dec. 4, 1923. 1,476,503

H. C. GAMMETER

MACHINE FOR CASTING COLUMN RULES

Filed Nov. 27, 1920 9 Sheets-Sheet 1

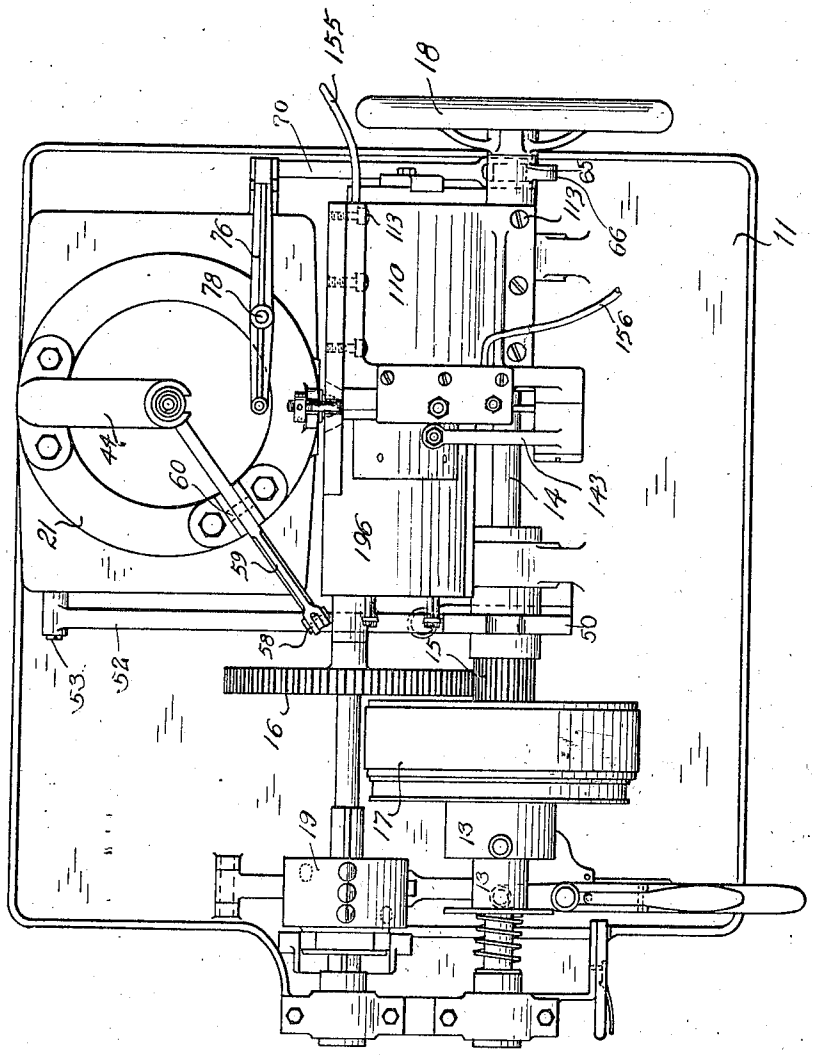


Fig. 1.

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MACHINE FOR CASTING COLUMN RULES

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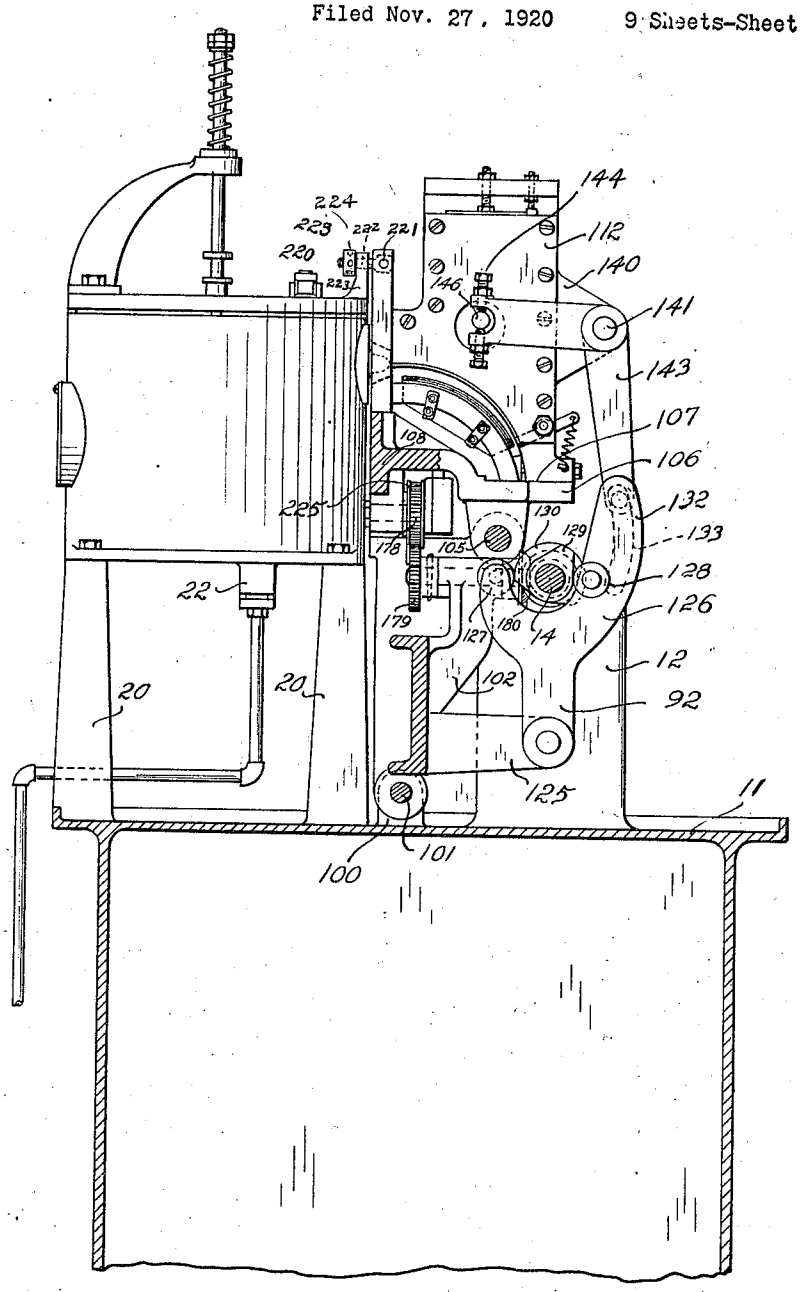


Fig-2

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MACHINE FOR CASTING COLUMN RULES

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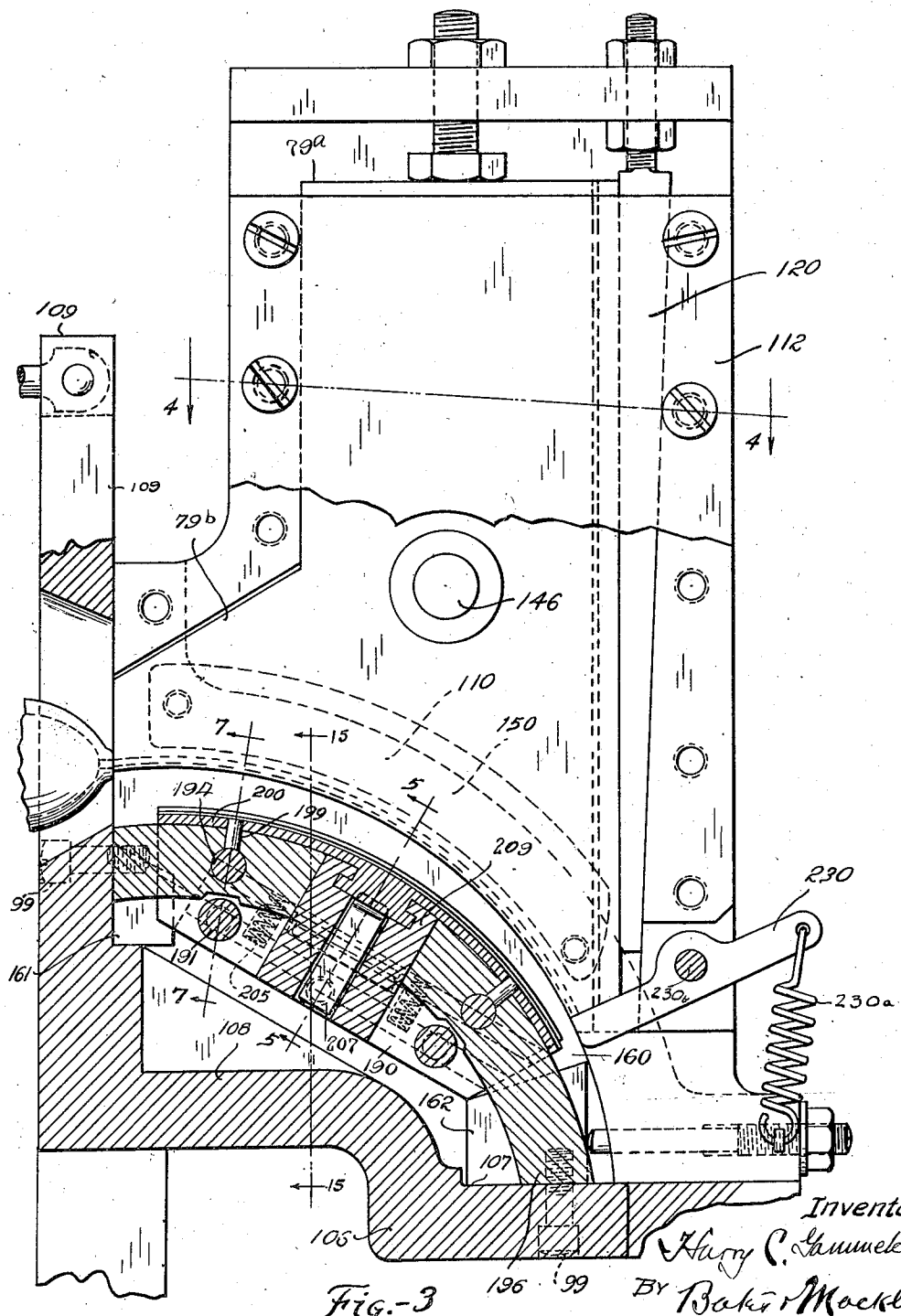


Fig.-3

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MACHINE FOR CASTING COLUMN RULES

Filed Nov. 27, 1920 9 Sheets-Sheet 4

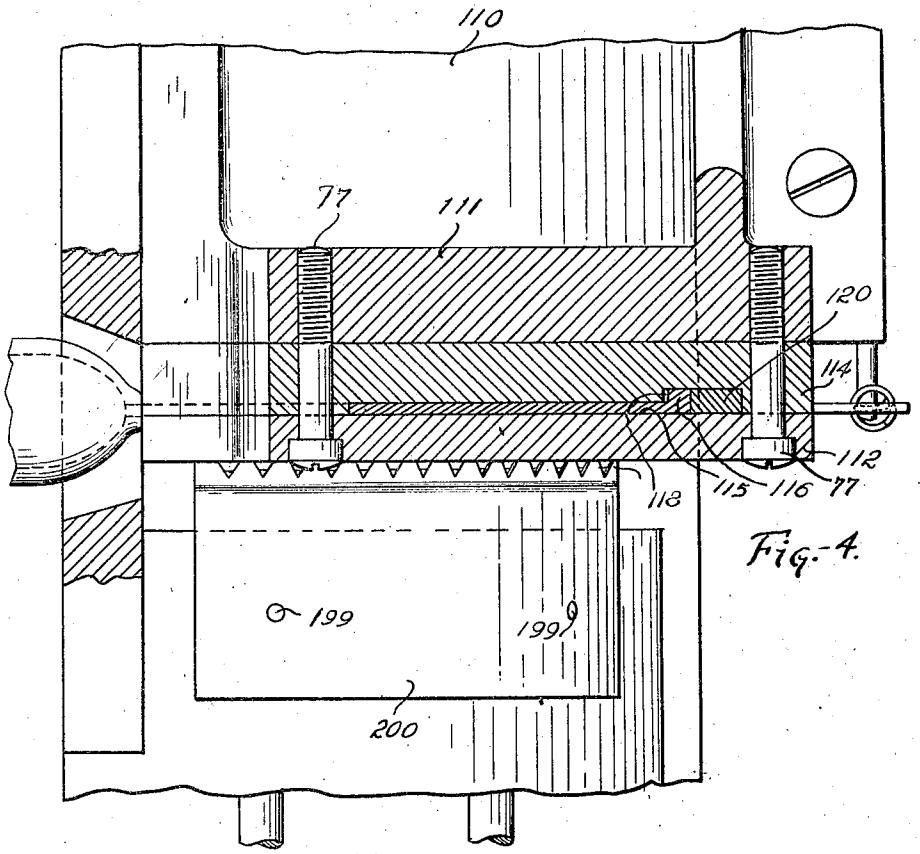


Fig.-4.

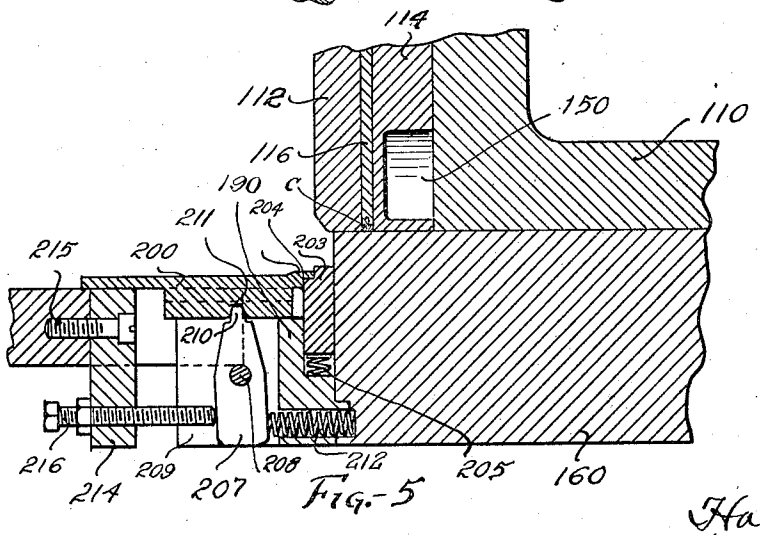


Fig.-5

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MACHINE FOR CASTING COLUMN RULES

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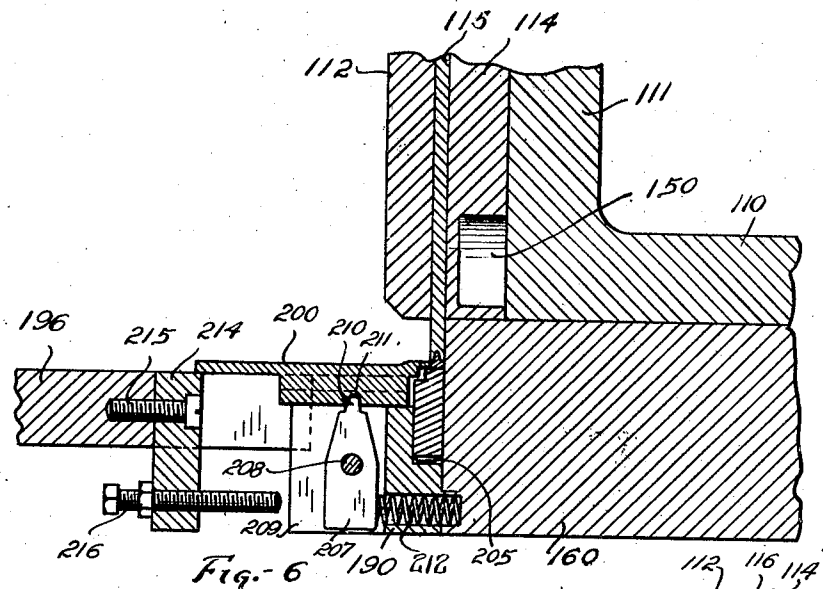


Fig. 6

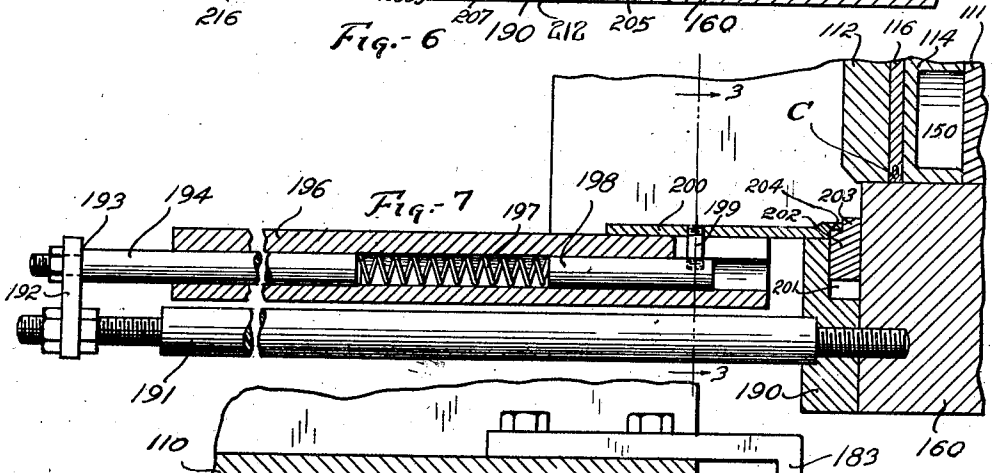


Fig. 7

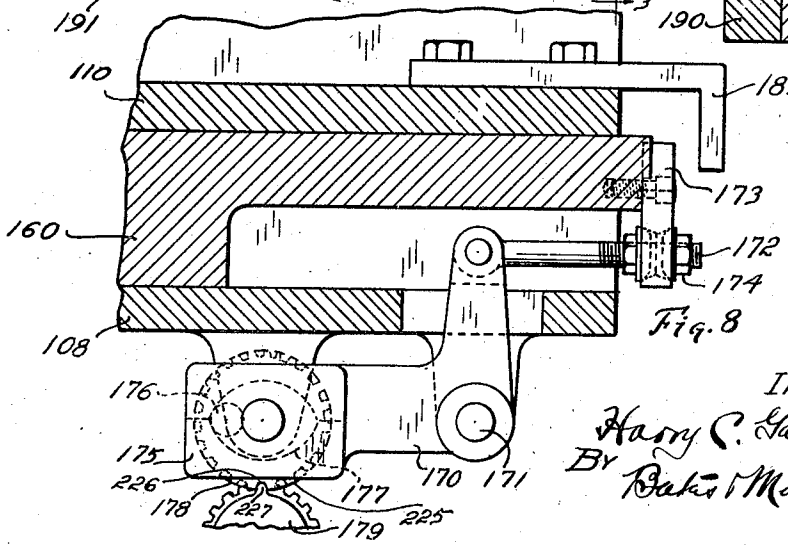


Fig. 8

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MACHINE FOR CASTING COLUMN RULES

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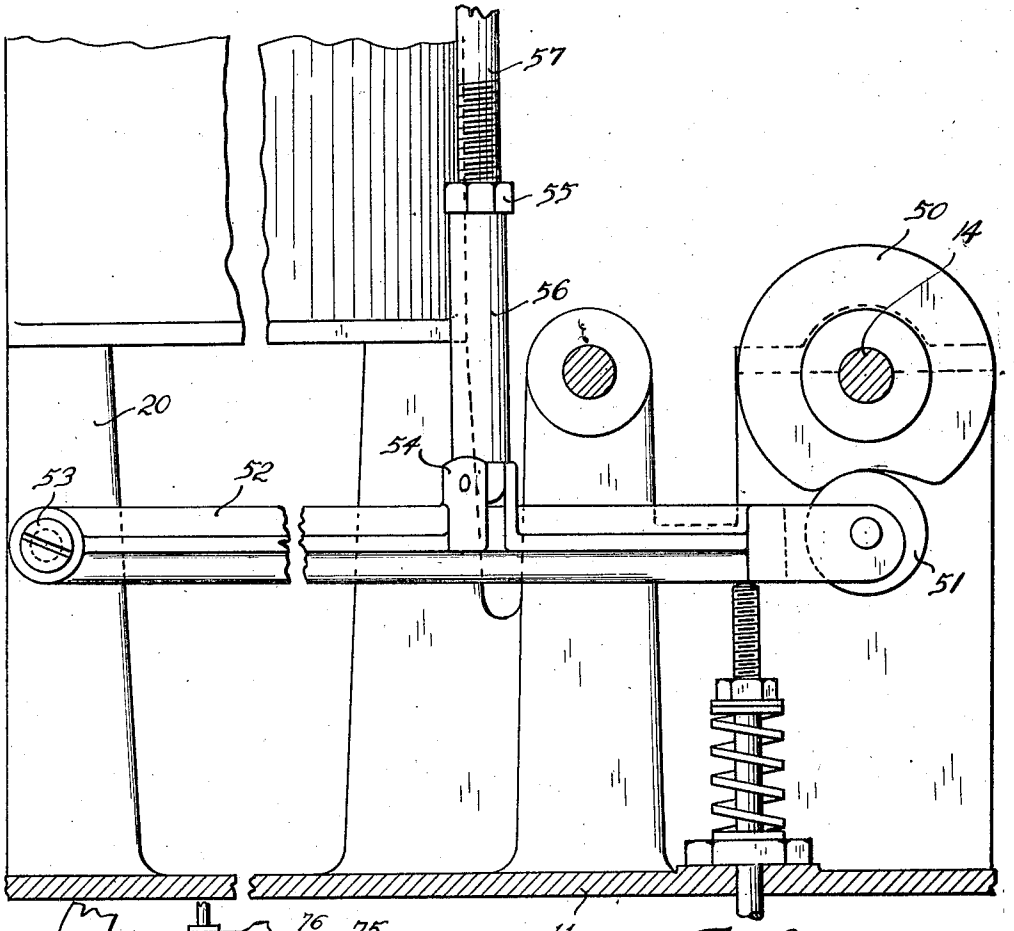


Fig-9

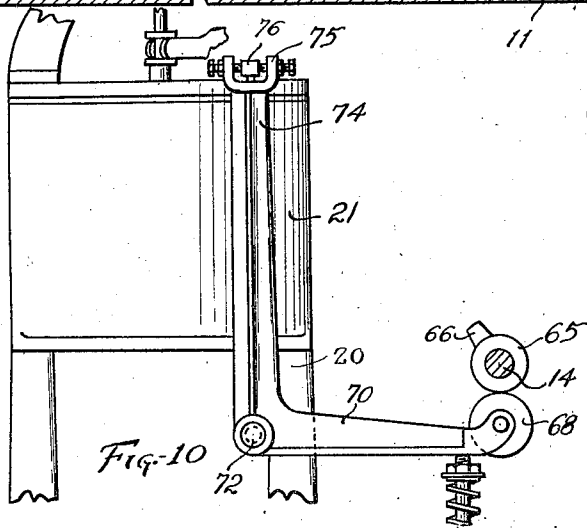


Fig-10

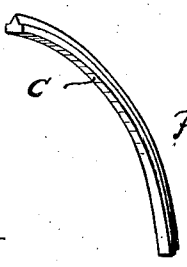


Fig-13

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MACHINE FOR CASTING COLUMN RULES

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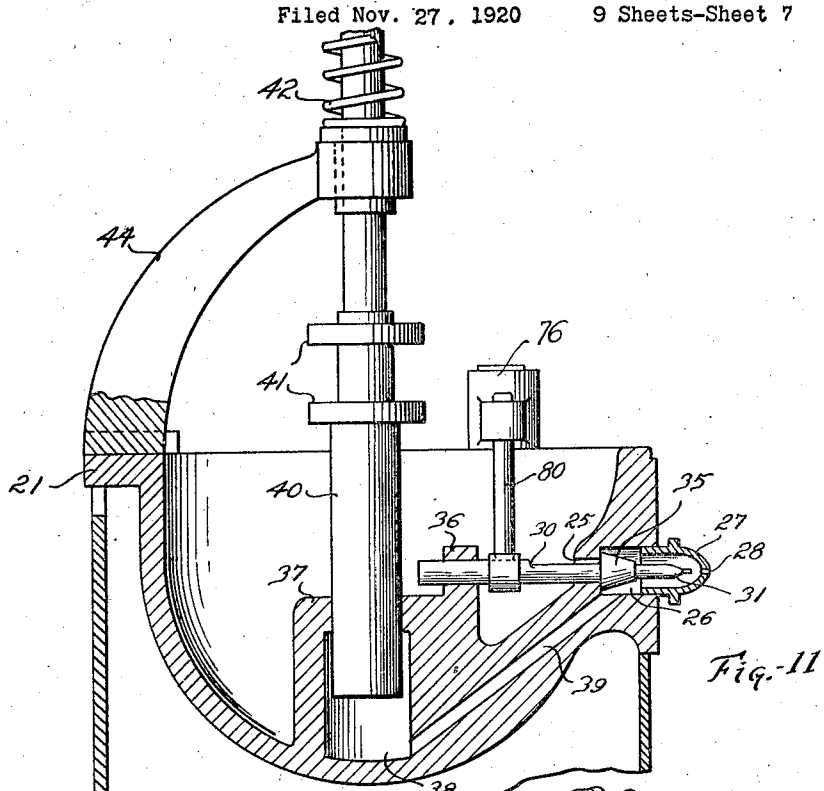


Fig.-11

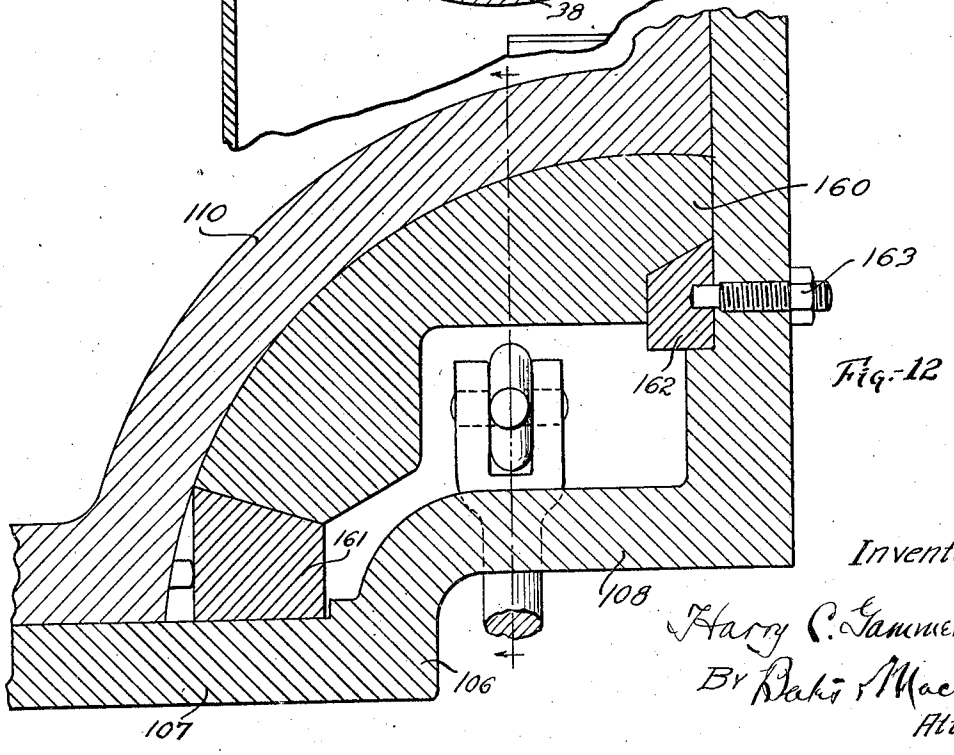


Fig.-12

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MACHINE FOR CASTING COLUMN RULES

Filed Nov. 27, 1920 9 Sheets-Sheet 8

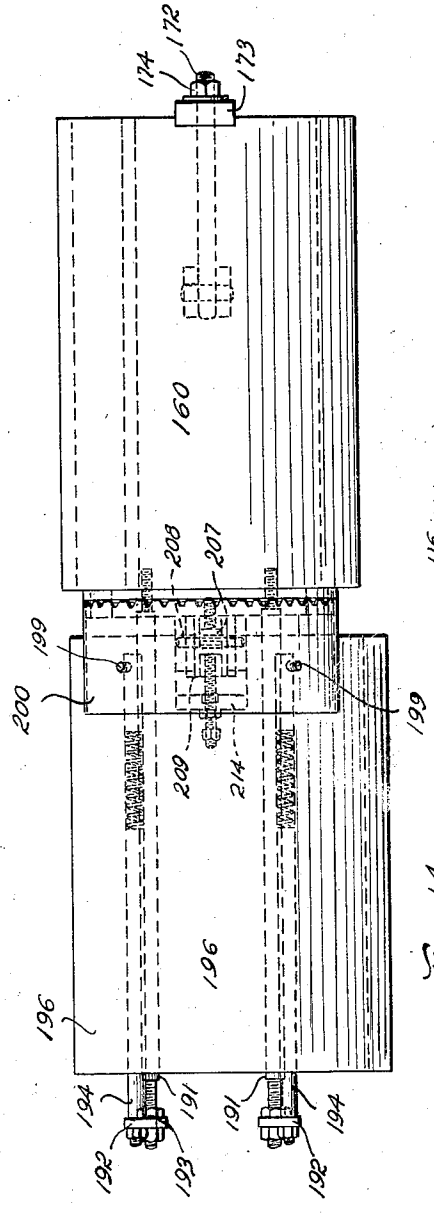


Fig.-14

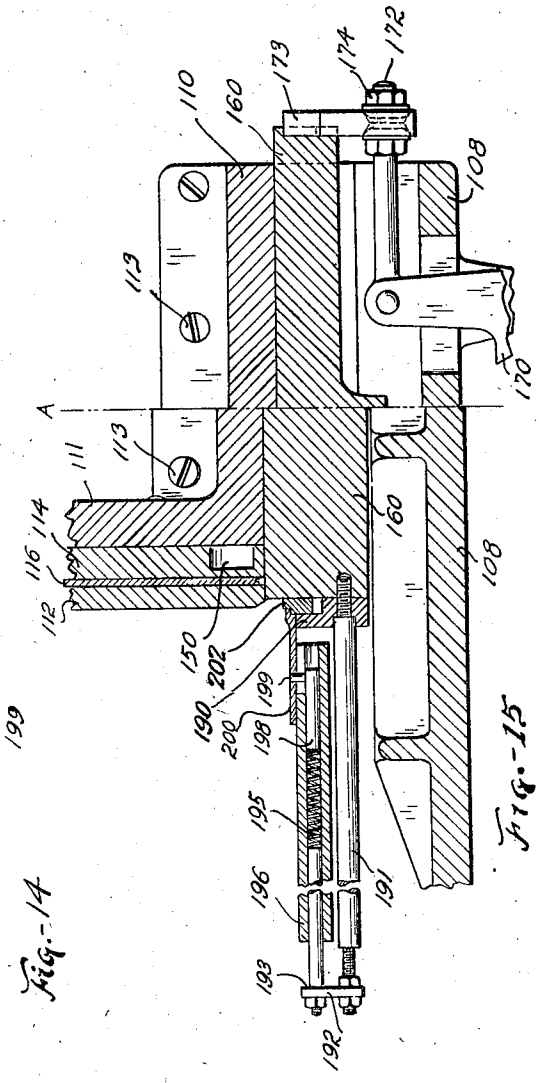


Fig.-15

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MACHINE FOR CASTING COLUMN RULES

Filed Nov. 27, 1920 9 Sheets-Sheet 9

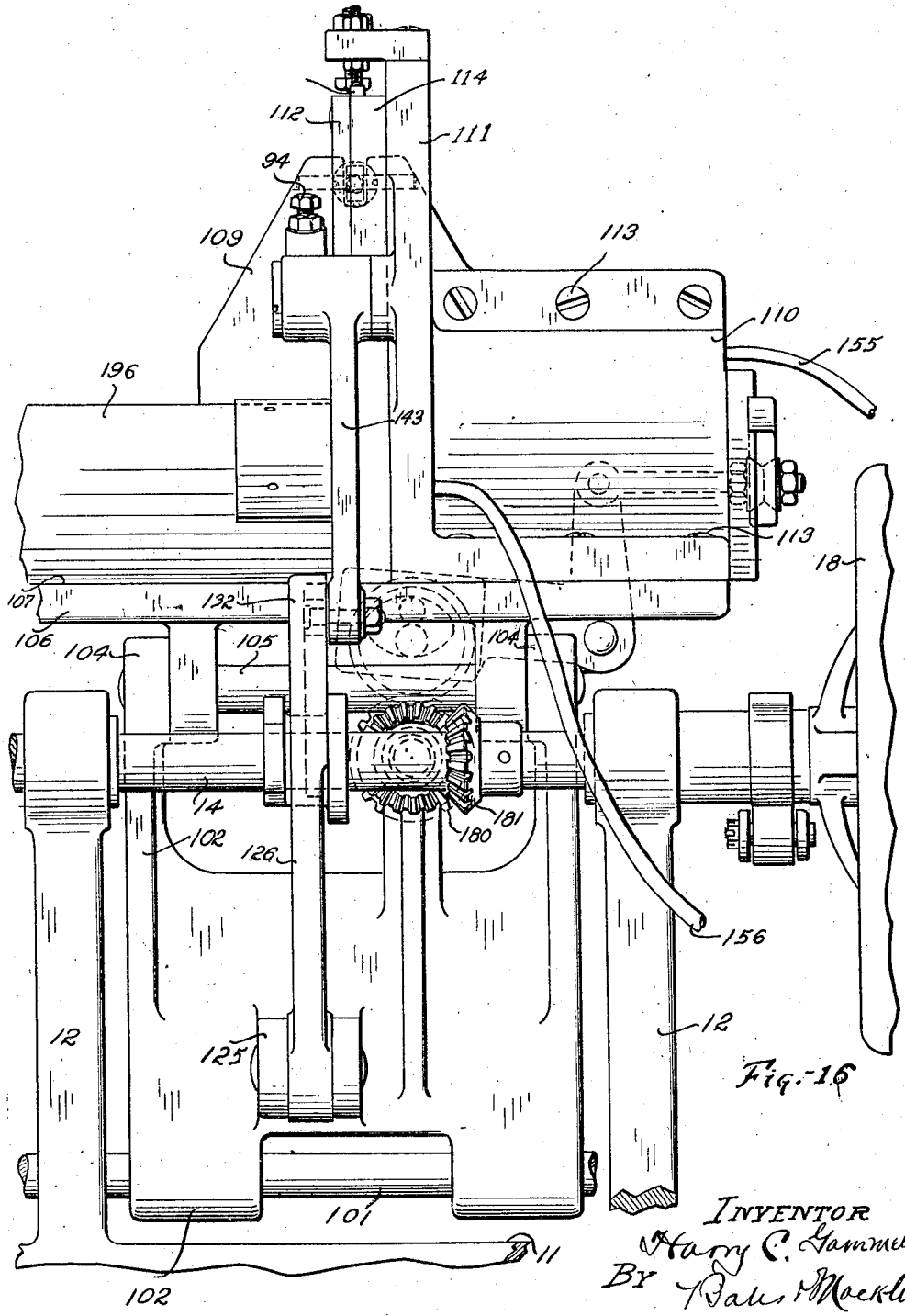


Fig. 16

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Patented Dec. 4, 1923. 1,476,503

UNITED STATES PATENT OFFICE.

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MACHINE FOR CASTING COLUMN RULES.

Application filed November 27, 1920. Serial No. 426,707.

To all whom it may concern:

Be it known that I, HARRY C. GAMMETER, a citizen of the United States, residing at Cleveland Heights, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Machines for Casting Column Rules, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to metal casting machines, and particularly to such machines which are adapted to cast column rules such as are used in printing machines.

The general object of the invention is to construct a machine which will produce finished castings, which will be entirely free of rough parts and which will be perfectly true.

One of the specific objects of the invention is to provide a machine in which curved articles such as column rules may be cast. An additional object of the invention is to provide a casting machine having certain of the mold members fixed and others movable, and wherein the movable members serve to open the mold and eject the casting.

Another object of the invention is to provide means for gripping a casting which has been ejected from the mold cavity, and for moving the gripped casting.

A further object of the invention is to provide suitable means to cast a column rule, combined with means to move it from its molded position and eject it from the moving means. Additional objects of the invention are to construct a machine, which may be adjusted to make castings of different dimensions.

Further objects of the invention will be apparent from the following description, taken in connection with the accompanying drawings wherein Fig. 1 is a top plan view of a casting machine constructed according to my invention; Fig. 2 is a side elevation of the machine, parts thereof being shown in section; Fig. 3 is a sectional view showing the stripper slide with other parts in elevation, the plane of the sectioning being indicated by the line 3—3 in Fig. 7; Fig. 4 is a cross section of the matrix taken along the line 4—4, Fig. 3; Fig. 5 is a longitudinal section of the gripper slide taken along the line 5—5, Fig. 3; Fig. 6 is a view similar to Fig. 5, showing the lock in operation position; Fig. 7 is a section on line 7—7, Fig. 3, showing the adjustable tension control for the gripper lock; Fig. 8 is a fragmentary section showing the means for actuating the stripper slide; Fig. 9 is an elevation showing the control for the plunger; Fig. 10 is an elevation showing the actuating mechanism for the control of the metal feeding valve; Fig. 11 is a central sectional view of the metal pot; Fig. 12 is a sectional view showing the manner of mounting the lower mold member; Fig. 13 is a perspective view of one form of column rule which the machine is adapted to produce; Fig. 14 is a top plan view of the gripper and co-operating parts with the upper plate removed; Fig. 15 is a section taken on two lines, the portion to the left of A being on line 7—7, Fig. 3, and to the portion on the right on line 15—15 same figure. Fig. 16 is an elevation of the casting end of the machine.

Referring to the drawing by reference characters, I have shown at 10 a standard, having a table 11 at its upper end. Carried on the table I have shown a pair of spaced brackets 12, which are adapted to carry suitable bearings for a shaft 14. This shaft 14 may be driven by a belt 17 on a step pulley 13 belted to a pulley 19 splined on a jack shaft carrying the gear 16 which meshes with the pinion 15 tight on the shaft 14. By shifting the pulley 19 and belting it to another portion of the pulley 13 a change of speed may be obtained. Such devices are well known in the art and will not be further described here, it being sufficient to state that the shaft 14 is to be driven at its proper effective speed. To provide means for operating the device slowly I may provide suitable means shown as a hand wheel 18, mounted on one end of the shaft 14.

Carried on the table adjacent the brackets 12 I may provide legs 20, which are adapted to support a metal pot 21, which is shown as provided with suitable heating means 22, such as a gas burner, which serves to maintain the contained metal at the proper temperature. The metal pot 21 is shown in detail in Fig. 11, wherein the basin adapted to contain the molten metal is provided with a port 25 communicating with a chamber 26 in the wall of the basin. This chamber 26 is shown as communicating with a nozzle 27 which may be

a cup like member having an aperture 28 therein. The aperture of the nozzle 27 is adapted to align with the matrix as will be presently described.

In order that the supply of metal to the nozzle 27 may be properly regulated, I may provide a valve comprising a stem 30, having thereon a pointed end 31 which is adapted in one position to close the aperture 28 in the nozzle. The stem is also provided with a closure for the port 25, which closure may comprise a coned member 35, as shown. The valve stem may be suitably supported adjacent the aperture and also have bearing in a lug 36 carried on a protuberance 37 on the basin.

I have shown a chamber 38 in the protuberance 37, which chamber is in communication thru a channel 39 with the valve chamber 26. The upper end of the chamber 38 is adapted to receive a plunger or piston 40 shown as a cylindrical member having a pair of spaced collars 41 thereon. This plunger may be normally urged upwardly by means, such as a spring 42, carried on a bracket 44 on the pot 21. This bracket also provides a bearing for the upper end of the plunger 40.

To afford proper motion for the plunger 40, I have shown the shaft 14 as provided with a cam 50 which is adapted to co-operate with a cam roller 51, the latter being carried on a lever 52, shown as pivoted at 53, on one of the legs 20 (Fig. 9). The lever 52 may be provided with a pair of spaced lugs 54, which are adapted to receive between them a link 55, which may comprise a pair of threaded members 56 and 57. Pivoted to the rod 57, as at 58, I have shown a rocker arm 59, fulcrumed intermediate its ends at 60 to the pot 21, which is adapted to be secured at its other end to the plunger 40.

In order that reciprocating motion may be given to the valve member 30 I may provide on the shaft 14 a suitable cam 65, having a cam surface 66 thereon, which is adapted to coact with a roller 68, shown as carried by a bell crank 70. The bell crank 70 is shown as pivoted at 72 to a leg 20 of the metal pot 21 (Fig. 10). The arm 74 of the bell crank 70 may be adjustably connected at 75 with one end of a lever 76 which is shown as fulcrumed at 78 to the pot 21. The other end of the lever 76 is attached to a rod 80 carried on the valve member 30.

The operation of ejecting a charge of molten metal from the nozzle will now be described. We will assume that the parts are in the position shown in Fig. 11; the plunger is beginning its downward motion and the valve stem is at rest, and that the cavity 26, chamber 38 and connecting channel 39 are filled with molten metal. The shaft 14 rotates the cams 50 and 65 to give motion to the plunger and valve stem. As the plunger descends it ejects a quantity of material from the nozzle aperture 28, the amount depending on the distance the plunger 40 travels. The length of the movement of the plunger may be adjusted by means of the threaded coupling between the members 55, 56 and 57. As soon as the plunger reaches the end of its downward stroke and begins its upward movement, the cam 65 opens the port 25 and as the plunger continues its movement, a portion of the molten metal in the basin 22 passes thru the port and into the chamber 26. This done, the valve stem moves to close the port 25, after which the operation is repeated.

Carried on the table 11, I have shown a pair of lugs 100 adapted to receive a rod 101, the latter being adapted to pivotally mount a supporting frame 102, which may be a casting. This frame 102 is shown as having a pair of spaced arms 104 near its upper end, which are adapted to receive an axle 105. A table 106 is mounted on the axle 105. This table comprises the horizontal portion 107 stepped up at 108, and from this latter portion a vertical back portion 109 extends. I have shown a flanged curved plate 110 secured to the horizontal portion 107 and to the back 109 of the table by screws 113. This plate may be provided at one end with a vertical member 111. A pair of guide plates 112 and 114 are secured upon the face of the vertical member 111 by means of screws 77. The vertical member and the plates before mentioned have a rectangular upper portion 79^a, as shown in Fig. 3, while the lower part thereof flares outwardly as at 79^b. The inner one of the two plates is provided, as shown in Fig. 4, with a depression 118, which is adapted to receive a matrix slide 115, the latter being shown as provided with a lug 116, which engages a tapering gib 120. The slide thus has vertical movement between the plates 112 and 114. The lower edge of the plates 112 and 114, the slide 115 and the lower face of the plate 111 are all curved to correspond to the curvature of the article to be cast. The matrix slide may have a suitable cavity C in its lower face corresponding to the shape of the article to be cast. In the drawings I have shown the cavity C as a character die adapted to make a column rule.

The means for actuating the slide 115 will now be described. A pair of spaced lugs 125 carried on the frame member 102 are shown as provided with means to pivotally mount a Y-shaped link 126, the Y of the link being arranged to straddle the drive shaft 14. The arms of the link 126 are provided with cam rollers 127 and 128, which are adapted to coact with cam surfaces 129 and 130 mounted on the drive shaft 14. One of the arms of the Y-member 132 extends beyond the other and is slotted as shown at 133 for

a purpose to be later described. Mounted on the vertical member 111 I show a bracket 140 and pivoted thereon at 141 is a bell crank 143, one end of which has slidable engagement with the slot in the arm 132. The other end of the bell crank may be provided with suitable adjustable bearing 144 for a projection 146 carried by the slide 116.

It will thus be seen from Fig. 2 that as the drive shaft 14 rotates the cams 129 and 130, the link 126 will have movement about its pivot and will rock the lower arm 143 of the bell crank to the right and left, thus causing the upper arm of the bell crank to have an up and down motion and consequently causing the slide 115 to have a similar motion.

The inner plate 114 may be provided adjacent the lower end thereof with a channel 150, the latter corresponding in outline to, and being arranged adjacent, the lower end of the slide 115. This channel is adapted to have communication thru hose members 155 and 156 (see Fig. 16) with a source of water, whereby the plate 114. the slide, and adjacent portions may be cooled.

Between a portion of the table 106 and the curved plate 110, I slidably mount a curved plate 160, which is shown as held in place by gibs 161—162, which may be prevented from moving by a set screw 163. The plate 160 in one position extends beneath the slide 116.

In order that reciprocating movement may be given to the curved plate, I may provide a suitable bell crank 170, (see Fig. 8) shown as pivoted to the horizontal portion of the table 108, at 171. One end of the bell crank may carry an eye bolt 172 which is connected at its end to a bar 173 on the slide 160. The connection may be adjustably made by a pair of coned washers and nuts 174. The portion 175 of the bell crank is shown as provided with a cam roller 176, which is adapted to coact with the cam surface 177, the latter being shown as carried on a spur gear 178, driven thru a suitable mechanism, shown as a gear 179 driven thru a bevel gear 180 (see Fig. 2), the latter being driven by a second bevel gear 181 keyed on the main drive shaft 14.

From the description it will be seen that as the shaft 14 rotates, the plate 160 will be moved back and forth beneath the slide 115. The plate 110 may carry an L-shaped member 183, which is adapted to have contact with the projection 173 when the latter is at one extreme position.

Since the curvature of the upper face of the plate 160 corresponds to the curvature of the plates 112, 114, and to the slide 116 these four members form a moulding cavity. Adjacent the curved plate 160 I have shown a curved plate 196 which may be secured to the frame by screws 99.

I have shown a plate 190 abutting the front face of the plate 160 (Fig. 7). This plate is secured in position by a pair of rods 191, the ends of which are threaded to receive a pair of nuts between which bars 192 may be adjustably secured. The bars 192 are shown as seated on shoulder 193 on plunger rods 194. The rods 194 move in suitable recesses 195 in the curved plate 196, the latter being secured to the table by screws 99 and bear against springs 197 (Fig. 7), the latter in turn bearing upon plungers 198 which are connected thru pins 199 with a gripper 200.

As will be noted the upper end of the block 190 is recessed as shown at 201, and in this recess a block 202 is mounted. This block may have a notch 203, forming a shoulder 204, adjacent its upper edge. The block 202 is adapted to move up and down and is normally urged upward by springs 205. The shoulder of the block 202 is adapted to engage the gripper 200 carried on the plunger 198, and thus be prevented from being moved upwardly by the springs.

To afford movement of the gripper 200, I may employ a trigger 207 pivoted at 208 to a pair of lugs 209 carried by the slide 160. The trigger is shown as having a tooth 210 at its upper end which coacts with a notch 211 in the gripper, a spring 212 serves to normally urge the top of the gripper toward the casting. The frame 196 is notched as at 230 (Fig. 14) to receive the lugs 209 and at the base of the notched portion I secure a bar 214 which may be held to the plate 196 by a screw 215. This bar may be provided with an adjustable stop member 216. The operation of the mechanism just described is as follows: When the slide 160 moves to the right of the position shown in Fig. 6, the spring 212 acting thru the trigger serves to hold the gripper against the casting. After the slide 116 is elevated and as the horizontal slide 160 moves to the left in said figure it carries the trigger with it until the lower portion of the latter engages the stop member 216, and causes the slide 200 to be moved away from the casting, and allowing the spring 205 acting thru the block 202 to eject the casting.

As stated, the table 106 is pivoted on the rod 105 and is normally held in this position by a bolt 220, pivoted at 221 to the upper portion of the mold supporting member. This bolt is adapted to enter a slot 222, in a lug 223 on the pot 21. A suitable nut 224 may be used to firmly hold the parts in position.

When, for any purpose, it is desired to have access to the nozzle of the metal pot, or to the parts comprising the mold cavity, or for other purposes, the nut 224 is removed, after which the entire table 106 and the parts upon it are swung upon the rod 105. As this is done the projection on the

bell crank 143 moves down the curved slot 133, which movement necessitates no change in the position of the drive or driven parts. As the table is tilted it will be noted that the gears 178, 179, are separated and in order that they may be repositioned accurately so that the parts will have proper relative movement I may provide disks 225 upon the faces of the gear wheel 178 and in one of these disks I provide a notch 226, best shown in Fig. 8. Upon the gear wheel 179 I provide a tooth 227, which is adapted, during each revolution of the gears, to fit the notch 226. In order that the parts may be properly positioned when the casting mechanism is returned to operative position it is only necessary to see that the tooth 227 fits the notch 226 and thus all danger of improper synchronism is obviated.

The operation of the device is as follows:—

Assuming that the parts are in the position shown in Fig. 2 and that the mold cavity is empty, movement of the plunger 40 causes a charge of material to be ejected into the mold cavity C. The hot metal runs down a cavity C, which is closed at its extremity by the plate 230, the plunger is adjusted to cause the proper amount of material, to form a column rule to be ejected, and, as soon as this amount is discharged, the valve closes, the plate 230 being yieldably held in position by the spring 230^a to permit the escape of air from the molding chamber. As soon as this is done the lower sliding member 160 is moved to the right by the bell crank 170, acting thru the gears 178, 179, in Fig. 6, until its front face aligns with the face of the plate 114. As soon as this occurs the bell crank 143, operated thru the link 126, moves the slide 116 downward and this slide carries the cast column rule with it. The plate 230 is swung about its pivot point 230^b by the movement of the slide 116, when the slide is moving downward. The column rule impinges on and depresses the ejector 202. The ejector being depressed a sufficient amount to clear the shoulder on the gripper 200, the latter moves to gripping position. This is shown in Fig. 6, where it will be noted that the casting is gripped between the face of the mold member and the gripper. As soon as the gripper has become operative the plate 116 is elevated, leaving the casting held by the gripper. The lower mold plate now moves to the left carrying the casting with it. The spring pressure exerted on the gripper 200 is sufficient to prevent the casting from being pulled upward between the slide and the mold member 160. After the mold member 160 is moved to the left a sufficient distance the trigger 207, which has engagement with the gripper, strikes the adjustable member 216 which causes the trigger to move the gripper from operative position. This done the ejector 202 is forced up by the spring 205 and the casting is consequently thrown out. After this is done another charge of metal is forced into the mold cavity and the operation repeated. Water circulating thru the channel 150 serves to keep the parts at the proper temperature.

Having thus described my invention, I claim:—

1. In a column rule casting machine, a curved mold member forming the upper face of the mold, a pair of stationary mold members, one on either side of said curved member, and a curved mold block beneath said other members and co-operating therewith to form a mold cavity.

2. A column rule casting machine having a curved mold cavity therein refined by four wall portions, one of said portions being movable to eject a casting.

3. In a column rule casting machine, a curved sliding mold member, a pair of stationary mold members, one on either side of said sliding member, and a curved mold block beneath said other members and co-operating therewith to form a mold cavity.

4. In a column rule casting machine, a curved sliding mold member, a pair of stationary mold members, one on either side of said sliding member, and a slidably mounted curved mold block beneath said other members and co-operating therewith to form a mold cavity.

5. A column rule casting machine having a mold cavity therein and having a curved slidable mold block closing said cavity, an ejector plate movable in a plane at right angles to the direction of the movement of said mold block, and a gripper member co-operating with said ejector.

6. In a column rule casting machine having a mold cavity therein, a curved, slidable, mold block closing said cavity, an ejector plate movable in a plane at right angles to the direction of the movement of said mold block, and a gripper member co-operating with said ejector.

7. A column rule casting machine having a mold cavity therein and having a curved slidable mold block closing said cavity, and means including a portion of the wall of the mold cavity for ejecting a casting from the mold cavity.

8. In a casting machine, a top member, a pair of side mold members arranged at each side of the top member, a bottom mold member coacting with the other members to form a mold cavity, one of said side members having a channel therein.

9. In a casting machine, a movable top mold member, a pair of side mold members arranged at each side of the top member, a bottom mold member coacting with the

others to form a mold cavity, one of said mold members being provided with means for cooling the mold cavity.

10. The combination in a casting machine, of a mold member comprising a plurality of members, one of which is movable, and means carried by said movable member for gripping an article cast in said machine.

11. In a casting machine the combination of a mold member provided with a movable mold block on one face thereof, and means adjacent said block for gripping an article cast in said machine.

12. In a casting machine a mold member provided with a movable mold block on one face thereof, and means carried by and movable with said block for gripping and moving an article cast in said machine.

13. The combination of a mold block, a gripper and an ejector, the gripper and ejector being constructed and arranged to first grip a casting and thereafter to lease the casting and eject it.

14. The combination of a movable mold member, a gripper and an ejector, the ejector being arranged to be depressed by an article forced thereupon, and means to urge the gripper into operative position.

15. A casting machine having a mold cavity therein, a movable mold block defining one wall of the cavity, a second mold block defining another wall of the cavity, a gripping and ejecting means carried by one of the movable members, said means comprising a plate secured on said member, a spring pressed ejector movable between said plate and the movable member, said ejector having a shoulder, a spring pressed gripper having a notched portion co-operating with said shoulder, a notch in the lower portion of said gripper, a trigger on said movable member having a tooth coacting with said notch, and an adjustable stop block for the trigger.

16. In a casting machine a top mold member, a pair of side mold members arranged at each side of the top member, a bottom mold member adapted to coact with the other member to form a mold cavity, means to move one of the mold members from engagement with the casting, means to move another of the mold members and to advance the casting therewith, means to grip the casting thruout the entire surface of two of its faces, means to move the gripping means from beneath the mold members and means to eject the casting.

17. In a casting machine a plurality of members having surfaces thereon which define a mold cavity, one of said members being movable and having means thereon for gripping a casting made in said cavity.

18. In a casting machine a plurality of members having surfaces thereon which define a mold cavity, one of said members being movable and having means thereon for first gripping the casting made in said cavity and then removing the casting from the proximity of the cavity.

19. In a casting machine a plurality of members having surfaces thereon which define a mold cavity, one of said members being movable and having means thereon for first gripping a casting made in said cavity, then removing the casting from the proximity of the cavity, and later releasing the casting from the gripping means.

20. In a casting machine means to first move a casting from the mold cavity in one direction, and additional means operative after the operation of the first means to move the casting in another direction.

21. A column rule casting machine having a mold cavity therein and having a curved mold block closing said cavity, means to remove a casting from the cavity, a gripper adapted to grip the casting when removed, means to move the gripped casting and a trigger means to release the gripper.

22. The combination in a casting machine, of a mold member comprising a plurality of members, one of which is movable, means carried by said movable member for gripping a casting, and additional means carried by said member for releasing the gripping means.

23. In a casting machine the combination of a mold member having a movable mold block on the lower face thereof, means adjacent said block for gripping an article cast in said machine, means to move the gripped casting, and means carried by the moving means for releasing the gripping means.

24. The combination of a mold block, a gripper, a trigger and an ejector, the gripper being constructed to first grip a casting after which the trigger becomes operative to eject a casting.

25. The combination of a movable mold member, a gripper and an ejector, the ejector being arranged to be depressed by an article forced thereon, to thereby cause the gripper to become operative, and a trigger adapted to release the gripper.

26. In a casting machine a plurality of mold members, means to move one of the mold members from engagement with a casting, means to move another mold member and to advance the casting therewith, means to grip the casting, and means to move the casting and a trigger mechanism operative at the end of the movement of the moving means to eject the casting.

27. In a casting machine a plurality of mold members, one of which is adapted to move the casting, means to grip the casting, and a trigger to release the gripping means.

28. In a casting machine a plurality of

members having surfaces thereon which define a mold cavity, one of said members being movable and having a slot therein, a trigger pivoted in said slot, and a movable gripper adapted in one position to grip the casting and in another to release the gripper, said gripper being operated by the trigger.

29. A casting machine having a plurality of members thereon which define a mold cavity, one of said members being movable, said movable member having a plate thereon and a spring pressed ejector block mounted between said plate and said member, and a spring pressed gripper serving in one position to keep said ejector block depressed, and in another position serving to grip a casting.

30. In a casting machine, mold members adapted to coact to form a mold cavity, means to move one of said members from engagement with a casting, additional means to move another of the mold members and to remove the casting from its molded position, an ejector carried on said last mentioned mold member, a gripper, said ejector having a portion with which the gripper coacts to normally maintain the ejector inactive, said gripper being operated by a pair of plungers on the machine body, rods secured to the movable member, and each having on one end thereof a bar adjustable lengthwise thereof, a plunger connected to each bar and fitting the aperture in the body, and a spring in each aperture between the two plungers.

31. In a casting machine, mold members adapted to coact to form a mold cavity, means to move one of the mold members from engagement with the casting, additional means to move another mold member and to remove the casting from its molded position, a plate carried on one of the movable mold members, a spring pressed ejector block between said plate and said last mentioned mold member, said ejector block adapted in one position of the movable mold member to align with the casting cavity.

32. In a casting machine, mold members adapted to coact to form a mold cavity, means to move one of the mold members from engagement with the casting, additional means to move another mold member and to remove the casting from its molded position, a plate carried on one of the movable mold members, a spring pressed ejector block between said plate and said mold member, said ejector block adapted in one position of the movable mold member to align with the casting cavity, and a gripper co-operating with said ejector to hold the casting while it is being moved.

33. In a casting machine, mold members adapted to coact to form a mold cavity, means to move one of the mold members from engagement with the casting, additional means to move another mold member and to remove the casting from its molded position, a plate carried on one of the movable mold members, a spring pressed ejector block between said plate and said mold member, said ejector block adapted in one position of the movable mold member to align with the casting cavity, a gripper co-operating with said ejector to hold the casting while it is being moved, and a trigger adapted to release said gripper and cause the ejector to operate.

34. The combination in a casting machine, of mold members adapted to coact to form a mold cavity, one of said mold members being movable, and a gripper adapted to engage a casting, said gripper comprising a plate operated by a plunger slidably fitted in an aperture in the machine body.

35. In a casting machine, mold members adapted to coact to form a mold cavity, one of said mold members being movable, a gripper adapted to engage a casting, said gripper comprising a plate operated by a plunger slidably fitted in an aperture in the machine body, a rod carried by the movable mold member and having connection with a second plunger operating in said cavity, and a spring between the said two plungers.

36. In a casting machine, mold members adapted to coact to form a mold cavity, one of said mold members being movable, a gripper adapted to engage a casting, said gripper comprising a plate operated by a plunger slidably fitted in an aperture in the machine body, and a rod carried by the movable mold member and having connection with a second plunger operating in said cavity, a spring between the said two plungers, and means to adjust the tension of said spring.

37. In a casting machine, mold members adapted to coact to form a mold cavity, means to move one of the mold members from engagement with a casting, additional means to move another of the mold members, and to remove the casting from its molded position, said movable mold member having a pair of spaced lugs thereon, a gripper slidably mounted between said lugs, and a trigger for operating said gripper.

38. In a casting machine, mold members adapted to coact to form a mold cavity, means to move one of the mold members from engagement with a casting, additional means to move another of the mold members, and to remove the casting from its molded position, said movable mold member having a pair of spaced lugs thereon, a gripper slidably mounted between said lugs, and a trigger for operating said gripper, said trigger being pivotally mounted on said lugs beneath said gripper, and having a projection thereon co-operating with a notch in the gripper.

39. In a casting machine, mold members adapted to coact to form a mold cavity,

means to move one of the mold members from engagement with a casting, additional means to move another of the mold members, and to remove the casting from its molded position, said movable mold member having a pair of spaced lugs thereon, a gripper slidably mounted on said lugs, a trigger for operating said gripper, said trigger being pivotally mounted on said lugs beneath the gripper, and having a projection thereon co-operating with a notch in the gripper, and a stop for operating said trigger.

40. In a casting machine having a body part, mold members adapted to coact to form a mold cavity, means to move one of the mold members from engagement with a casting, additional means to move another of the mold members, and to remove the casting from its molded position, said movable mold member having a pair of spaced lugs, a pivoted trigger for operating said gripper, and having a projection thereon co-operating with a notch in the gripper, a stop block on the body part, and an adjustable stop on the stop block, for operating the trigger.

41. In a casting machine, mold members adapted to coact to form a mold cavity, means to move one of the mold members from engagement with a casting, additional means to move another of the mold members and to remove the casting from its molded position, an ejector adapted to align with casting cavity, a gripper normally holding said ejector inoperative and adapted after the casting is brought into alignment with the cavity to grip the same on two faces, and means to release the gripper and to cause the ejector to operate.

42. A column rule casting machine having a mold cavity, one wall of which is defined by a movable matrix, a movable slide beneath said matrix, means to move said matrix and said slide, and means acting in conjunction with said slide to grip a column rule.

43. The combination of a pair of stationary mold members, and a pair of movable mold members, said movable mold members having movement at right angles to one another.

44. A casting machine, having a mold cavity therein, means to move a casting from said cavity, additional means to grip the casting, means to move the casting from beneath the mold members, and means to later eject the casting from the gripping means.

45. In a casting machine, a top mold member, a pair of side mold members, and a bottom mold member, all coacting to form a mold cavity, means to move one of the mold members from engagement with a casting, means to move another of the members and to advance the casting therewith, means to grip the casting upon its lateral faces, means to move the gripped casting from beneath the mold members, and means to eject the castings.

46. In a column rule casting machine a metal pot, a mold cavity adjacent said metal pot, means to eject a charge of metal into the mold cavity, means to move one of the mold members from beneath the mold cavity, means to move another mold member to move a casting therewith, and means to grip the casting when in moved position.

47. In a casting machine, a pivoted support having a plurality of members thereon, the surfaces of which define a mold cavity, one of said members being movable and having means thereon for first gripping a casting made in said cavity, then removing the casting from the proximity of the cavity, and later releasing the casting from the gripping means.

48. In a casting machine, a base, a table pivotally mounted thereon, a plurality of mold members on said table. having surfaces thereon which define a mold cavity, one of said mold members being movable, and having a slot therein, a trigger pivoted in said slot, a movable gripper operated by said trigger, and adapted in one position to grip the casting, and in another position to release the gripper.

49. In a casting machine, a base, a table pivotally mounted thereon, a mold member mounted on said table, said mold member comprising a plurality of members, two of which are movable, means to move one of said members vertically, and means including a pair of spur gears to move the other of said movable members horizontally, said parts being constructed and arranged so that the table may turn upon its pivot, said spur gears having means thereon so that the teeth thereof are aligned only when the relative position of the two gears is correct.

50. In a casting machine, a plurality of mold members, defining a mold cavity, and comprising a movable top mold member, a pair of side mold members, and a movable bottom mold member, and means to move the bottom mold member, including a bell crank adjustably connected with the mold member.

51. In a casting machine, a plurality of mold members defining a mold cavity, and comprising a movable top mold member, a pair of side mold members, and a movable bottom, and means to move the top mold member, including a link operated by a cam, and a bell crank, the latter being adjustably connected to the vertical mold member.

52. In a casting machine, a mold cavity defined by a plurality of members, one of said members being movable, means to slidably mount the movable member, including a curved plate, and a pair of gibs.

53. In a casting machine, a mold cavity defined by a plurality of members, one of

said members being movable, means to slidably mount said movable member, comprising a pair of plates secured to a portion of the machine, one of said plates having a depression, in which said movable member is fitted, and a tapering gib fitting said depression.

54. In a casting machine, a table, a curved mold cavity, the sides of which are defined by a pair of plates, the top of the cavity being defined by the end of the curved plate, the latter being slidably mounted in a depression in one of the plates and bearing against the adjacent plate, the bottom of the mold cavity being defined by the top of a slidable curved plate, the curvature of all the plates being the same, means to slidably support the bottom mold member, said supporting means including a curved plate having flanges thereon, one of which is vertical, the two first mentioned plates being secured to the vertical flange, and the other flanges of the curved plate being secured to the back, and the top of the table.

55. A casting machine, including a table, a pair of curved plates secured upon said table, a mold member slidably mounted adjacent one of the curved plates, means mounted on the mold member for gripping a casting, and additional means co-operating with the gripping member to move it, said additional means being mounted on the other curved plate.

56. In a casting machine, a mold member forming the top of a mold cavity, a pair of mold members arranged at each side of the top member, a bottom mold member adapted to coact with the other members to complete the mold cavity, means to move one of the mold members from engagement with the casting, means to grip the casting upon two faces and to remove it from beneath the mold cavity.

57. In a casting machine, a mold member forming the top of a mold cavity, a pair of side mold members arranged at each side of the top member, a bottom mold member adapted to coact with the other members to complete a mold cavity, means to move one of the mold members from engagement with the casting, means to move another of the mold members and to advance the casting in one direction, and means to move the casting in another direction.

58. In a casting machine, a top mold member, a pair of side mold members arranged at each side of the top member, a bottom mold member adapted to coact with the other members to form a mold cavity, means to move one of the mold members from engagement with the casting, means to move another of the mold members and to advance the casting therewith, means depressible by the casting, means operated by the depression of such means to grip the casting on two faces, means to move the casting from beneath the mold cavity, and means to release the gripping means.

59. In a casting machine, a mold cavity defined by a plurality of members, means to move one of the members and to move the casting therewith, means to grip the casting when moved, and means to move the casting in a direction different from the direction of the first movement.

60. In a casting machine, a mold cavity defined by a plurality of mold members, comprising a movable top mold member and a movable bottom mold member, means rendered operative by the movement of a casting thereupon to cause the casting to be gripped, and means to thereafter convey the casting from its gripped position.

61. In a casting machine, a mold cavity defined by a plurality of members, one member being movable in a direction at right angles to the movement of another member, one of said members being constructed and arranged to first grip the casting, then move it, and finally eject it.

62. In a column rule casting machine, a matrix, means to feed metal into the matrix, means for cooling the matrix, means to move a cast rule, means to grip the rule when in moved position, and means to eject said rule from the gripping means.

63. A casting machine, a mold cavity having an opening adjacent a metal pot, means to eject a charge into the mold cavity, means to cool said charge, means to move the cast charge from said cavity, additional means to grip the casting when moved, means to move said casting from beneath said mold members, and means to eject said casting from the gripping means.

64. The apparatus for making a column rule, comprising means for ejecting a charge of metal into a mold member, means for cooling said mold member, means for moving one part of the mold member from engagement with the cast column rule, means for moving another portion of the mold member, means to advance the column rule, means for gripping the column rule upon its lateral faces, and means for moving the gripping means from beneath the mold cavity and ejecting the column rule.

65. In a casting machine, mold members adapted to coact to form a mold cavity, means to move one of the mold members from engagement with the casting, additional means to move another of the mold members and to move the casting from its molded position, an ejector adapted to align with the casting cavity, a gripper, the gripper having a portion to prevent said ejector from moving upwardly, means to operate said gripper, the gripper being mounted on the movable mold member, a

trigger coacting with said gripper, and an adjustable member for operating said trigger.

66. In a casting machine a top mold member, a pair of side movable mold members arranged at each side of the top member, a bottom mold member adapted to coact with the other members to form a mold cavity, means to move one of the mold members from engagement with a casting, additional means to move another of the mold members and to move the casting from its molded position, a plate carried on one of the mold members, a spring pressed ejector block between said plate and said mold member, said ejector block being adapted in one position of the movable mold member to align with the casting cavity, a spring gripper mounted in a pair of lugs on one of the movable mold members, said ejector block having a shoulder, the gripper having a portion co-operating with said shoulder to prevent said ejector block from moving upward, said gripper being operated by a pair of plungers, the latter being positioned in apertures in the body of said machine, rods passing thru said plate and secured to said movable mold member and each having on one end thereof a bar adjustable lengthwise of the rod, a plunger connected to each bar and fitting an aperture, and a spring in each aperture between the two plungers, a trigger pivotally mounted between said lugs and coacting with said gripper, a stop block carried by said body part and an adjustable stop carried by said stop block for operating said trigger.

In testimony whereof, I hereunto affix my signature.

HARRY C. GAMMETER.