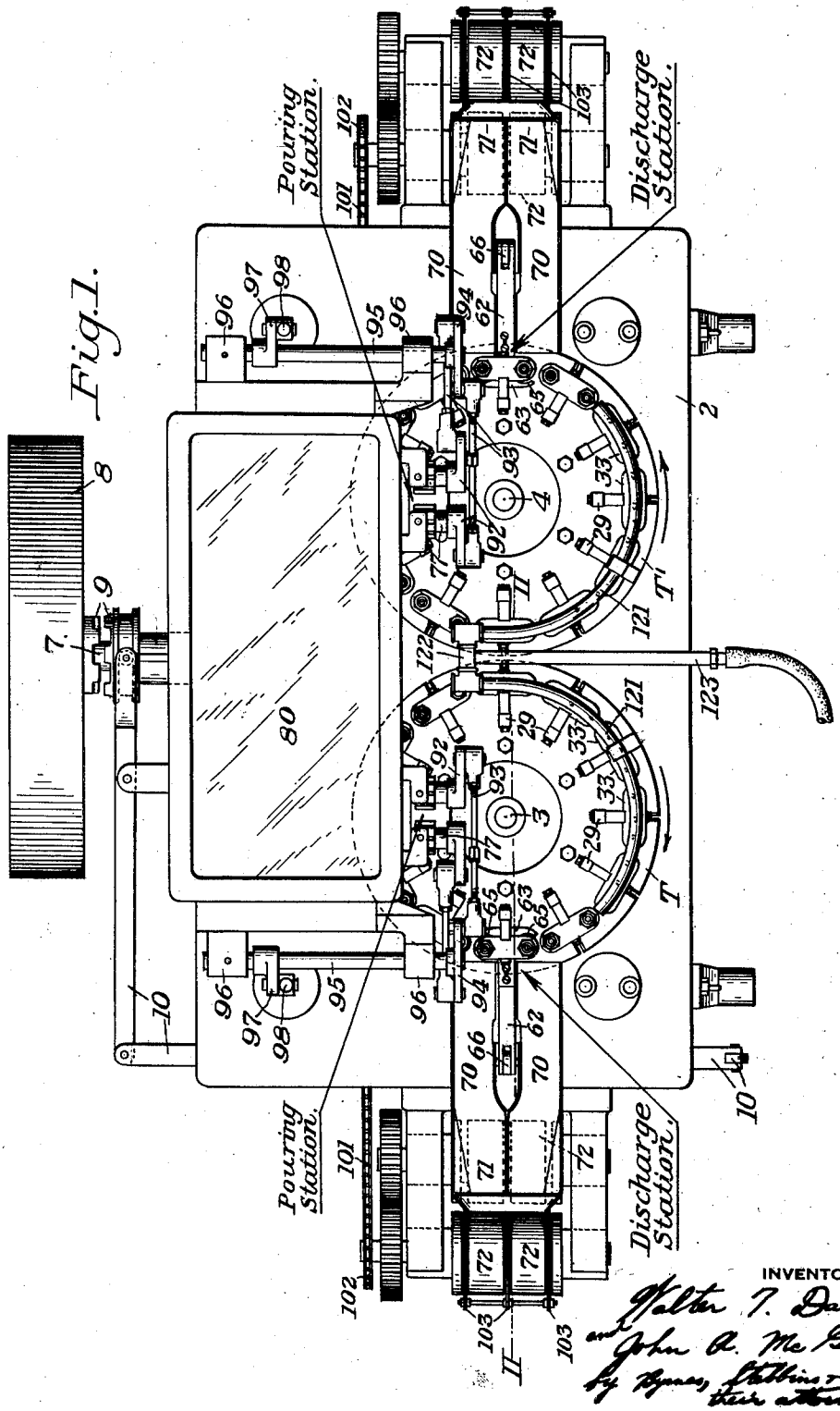
Aug. 20, 1929. W. T. DAVIS ET AL 1,724,914

CASTING MACHINE

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Fig. 1.



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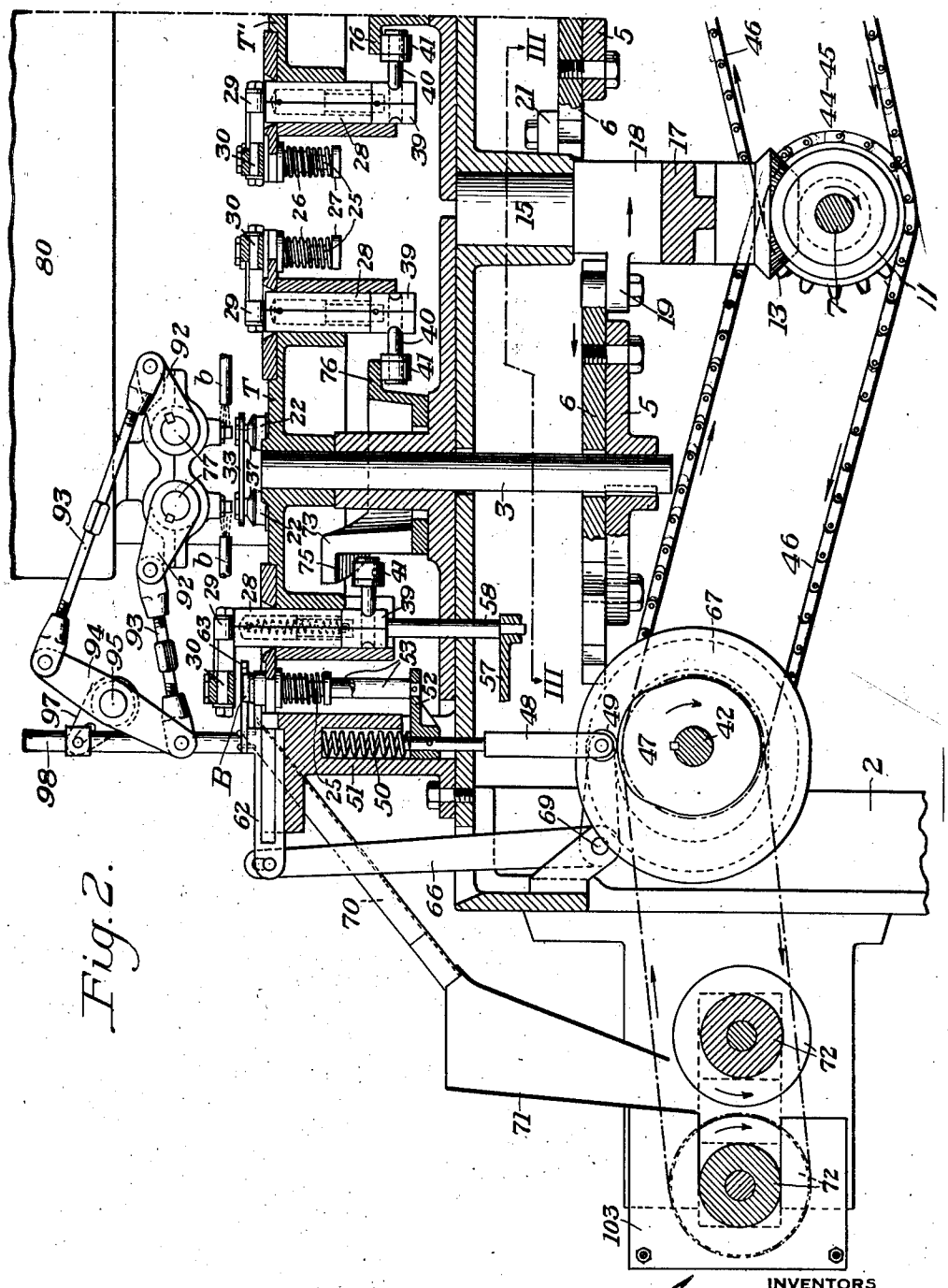


Fig. 2.

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CASTING MACHINE

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Fig. 3.

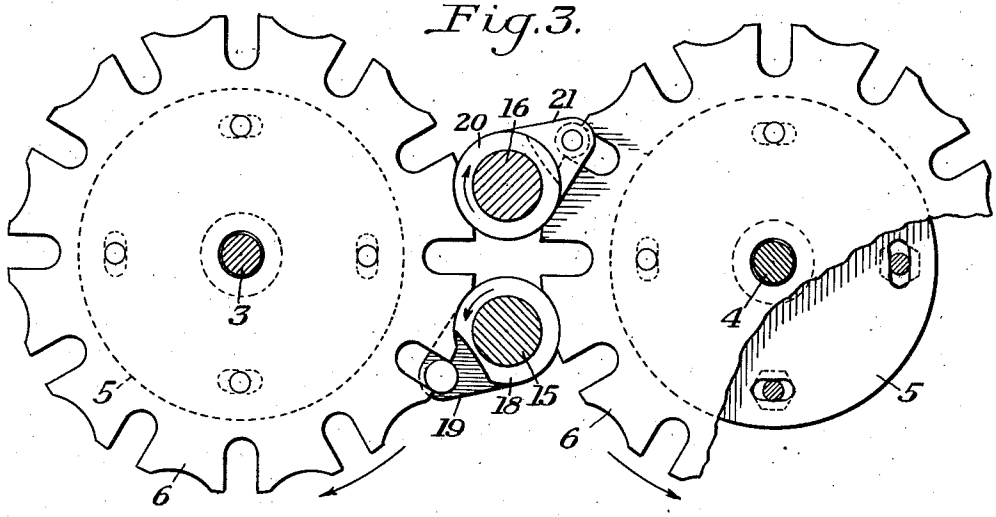


Fig. 4.

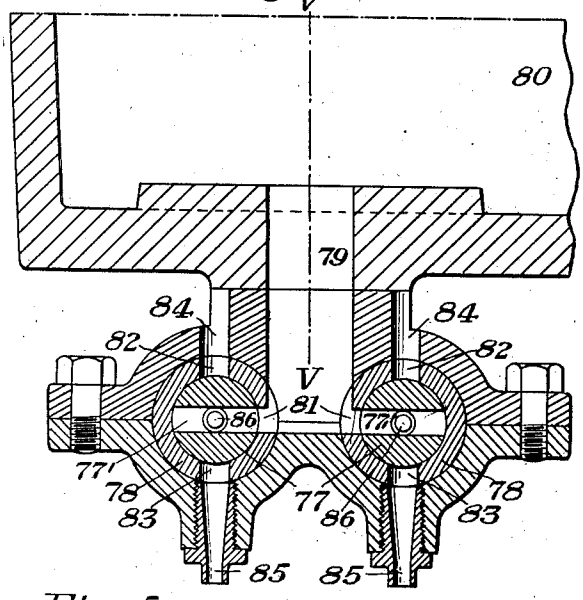


Fig. 6.

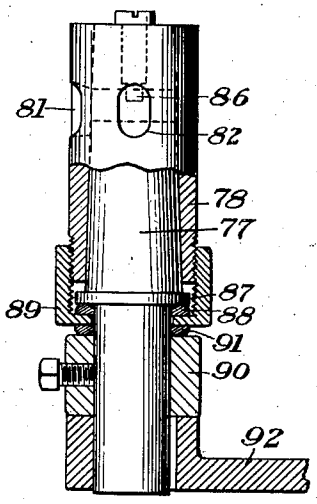


Fig. 5.

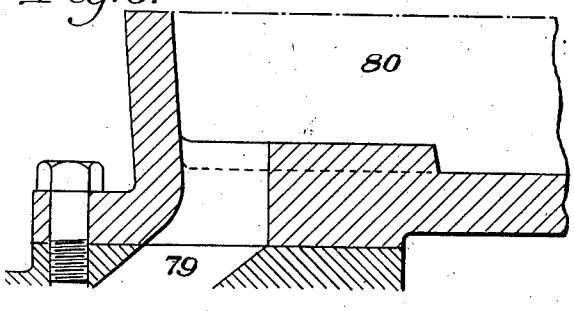
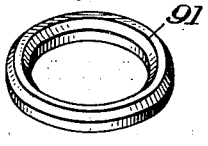


Fig. 7.



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CASTING MACHINE

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Fig. 8.

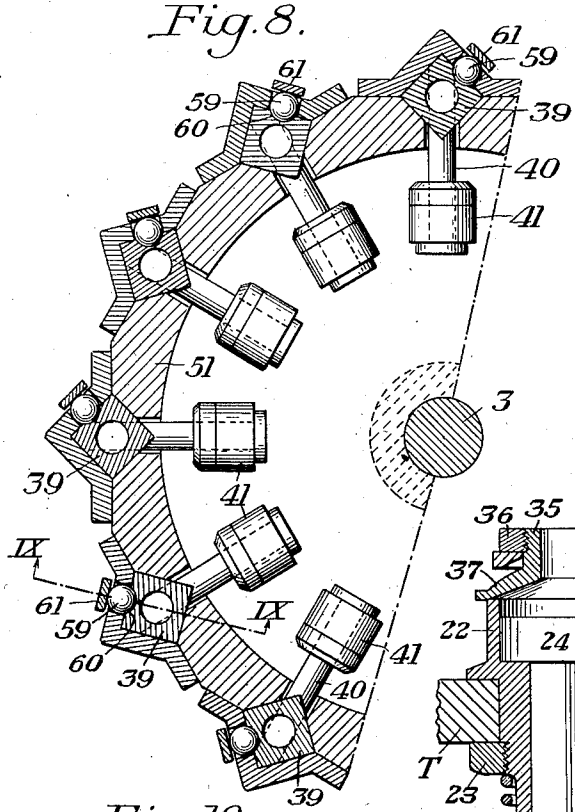


Fig. 9.

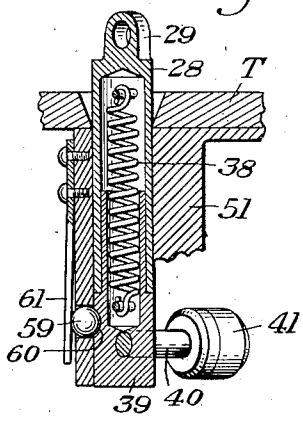


Fig. 11.

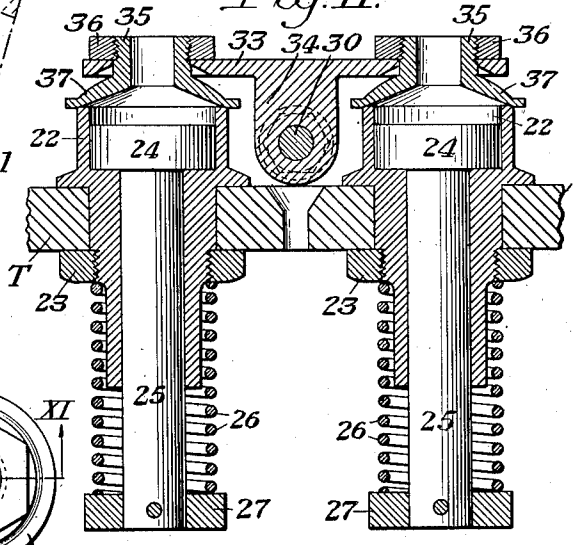


Fig. 10.

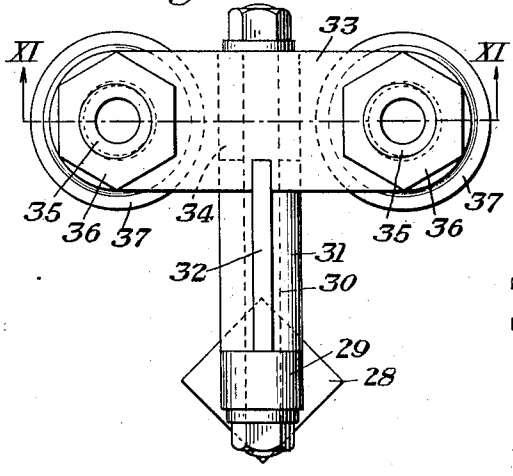


Fig. 12.

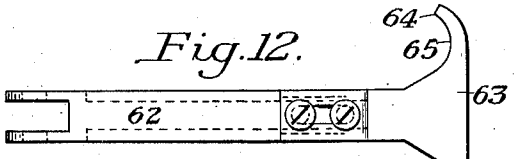
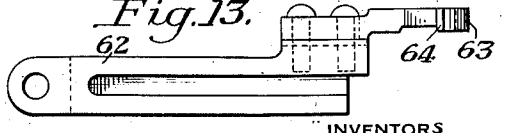


Fig. 13.



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Aug. 20, 1929. W. T. DAVIS ET AL 1,724,914

CASTING MACHINE

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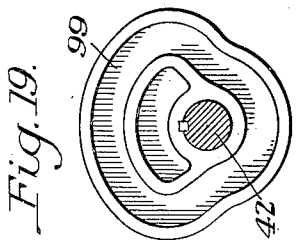


Fig. 19.

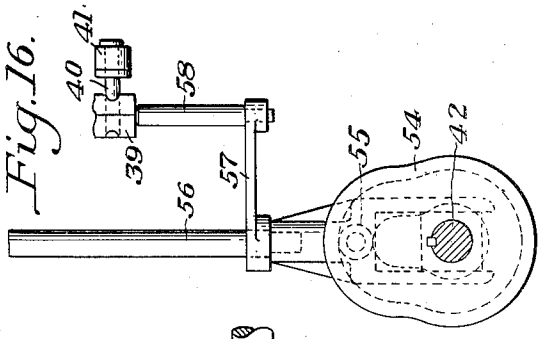


Fig. 16.

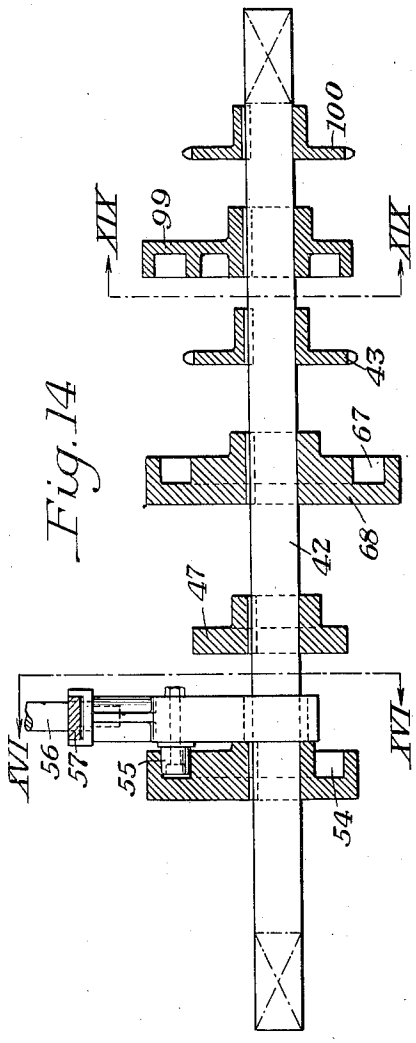


Fig. 14.

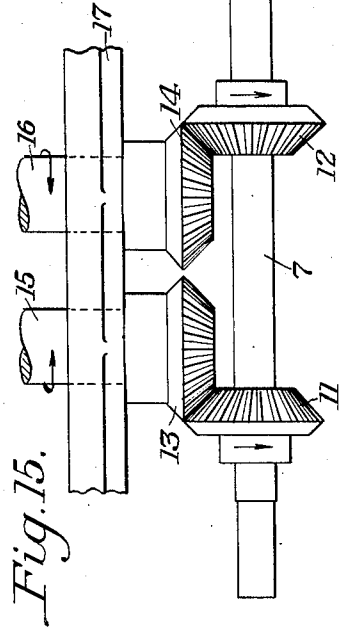


Fig. 15.

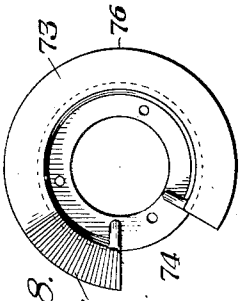


Fig. 18.

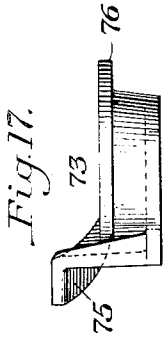


Fig. 17.

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Aug. 20, 1929. W. T. DAVIS ET AL 1,724,914

CASTING MACHINE

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Fig. 20.

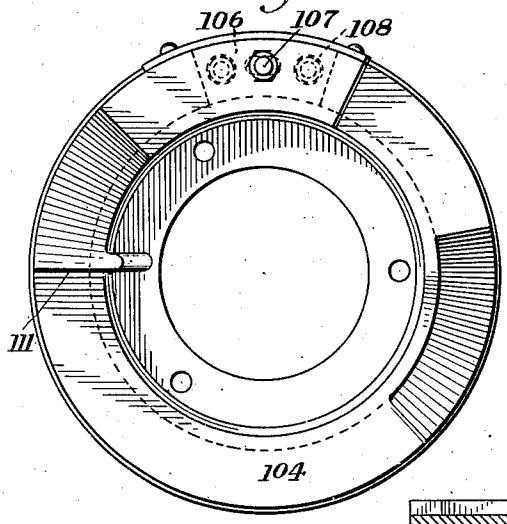


Fig. 21.

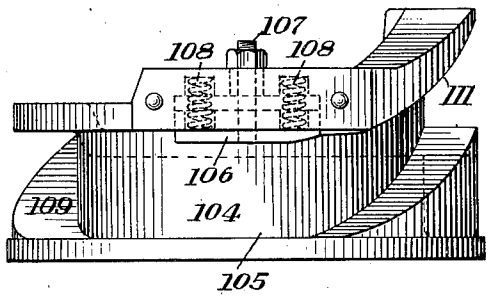
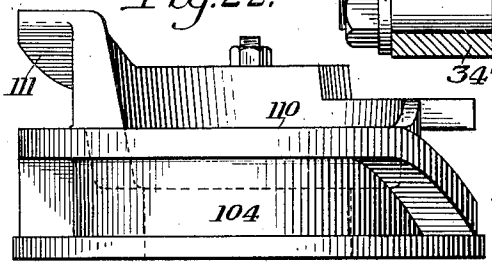


Fig. 22.



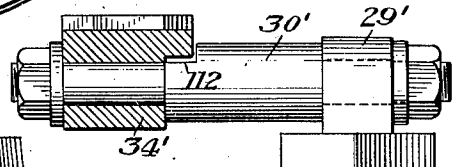


Fig. 24.

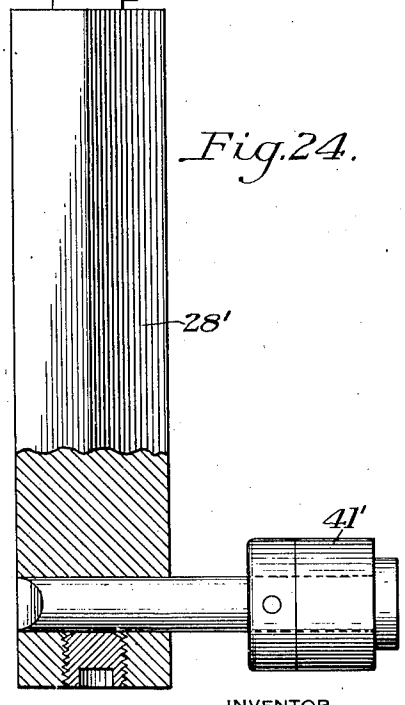
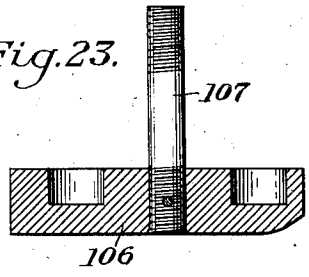


Fig. 23.



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CASTING MACHINE

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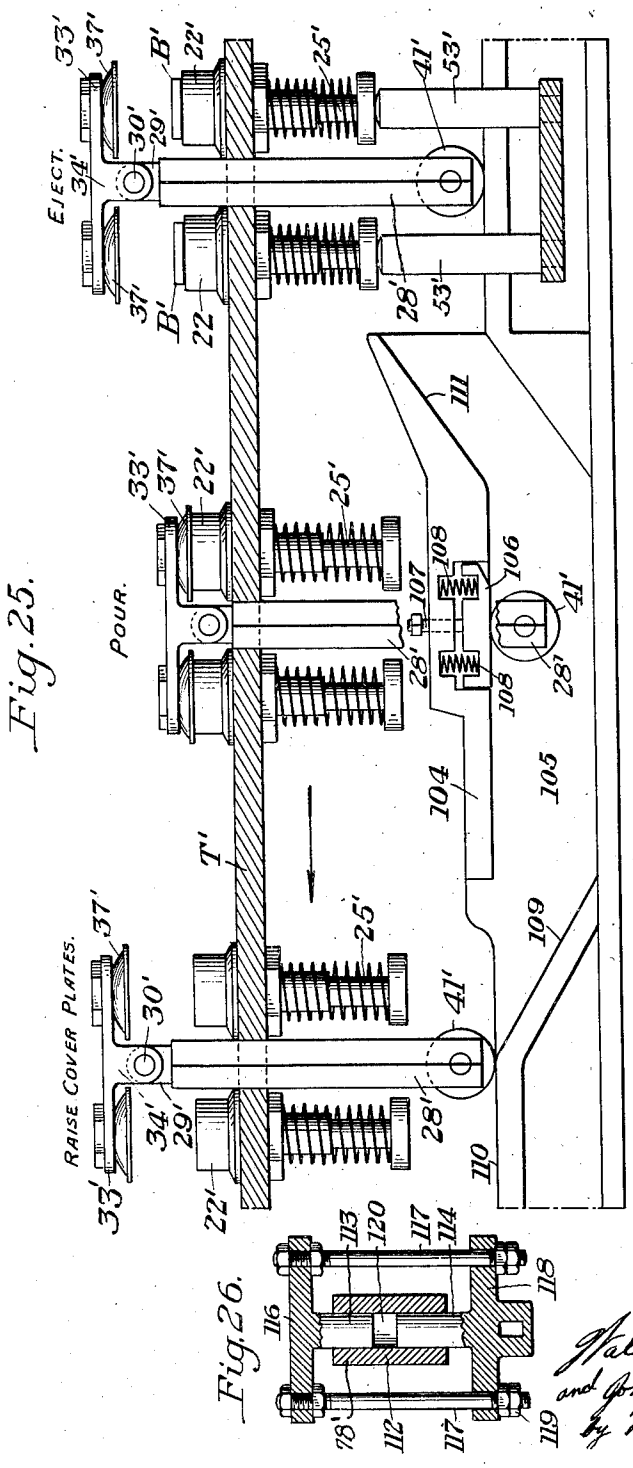


Fig. 25.

Fig. 26.

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Patented Aug. 20, 1929. 1,724,914

UNITED STATES PATENT OFFICE.

WALTER T. DAVIS AND JOHN A. McGINNIS, OF WHEELING, WEST VIRGINIA, ASSIGNORS TO WHEELING STAMPING COMPANY, OF WHEELING, WEST VIRGINIA, A CORPORATION OF WEST VIRGINIA.

CASTING MACHINE.

Application filed October 28, 1925. Serial No. 65,351.

The present invention relates broadly to the art of metal founding, and more particularly to the art of casting. While the invention is especially applicable to the casting of non-ferrous metals to produce blanks of an exact dimension, the utility of the invention is not limited either with respect to the metal being handled or the character of the articles produced.

In the production of blanks as required in some industries for the manufacture of articles, it is not uncommon practice to first mold a slab or billet and thereafter roll the same to the approximate thickness required in the blanks. The sheets thus produced are then punched to produce blanks, and the scrap metal remelted for subsequent use. With some metals and compositions such as lead, tin, or lead and tin in addition to the expense incident to these various operations and the necessary rehandling, there is a very material additional expense represented by the formation of dross during the melting and remelting.

It is one of the objects of the present invention to form blanks, and particularly soft metal or non-ferrous blanks as required, for example, for the manufacture of articles by extrusion or pressing, in such manner that the various mechanical and rehandling operations are obviated, and the blanks directly produced by casting.

In the accompanying drawings there are shown for purposes of illustration only, certain preferred embodiments of the present invention, it being understood that the drawings do not define the limits of our invention, as changes in the construction and operation disclosed therein may be made without departing either from the spirit of the invention or the scope of our broader claims.

In the drawings:—

Figure 1 is a top plan view of one form of apparatus embodying the present invention;

Figure 2 is a partial vertical sectional view, on an enlarged scale, through the apparatus of Figure 1, the section being taken along the line II—II;

Figure 3 is a horizontal sectional view, on an enlarged scale, illustrating a portion of the table operating mechanism, the section being taken along the line III—III of Figure 2 looking in the direction of the arrows, and the upper bearings for the Geneva gear shafts being omitted for sake of clearness;

Figure 4 is a vertical sectional view, on an enlarged scale, through a portion of the melting tank and delivery valves for one of the tables;

Figure 5 is a detail sectional view along the line V—V of Figure 4;

Figure 6 is a detail view, partly in section and partly in elevation, illustrating one of the valves;

Figure 7 is a perspective view showing one of the combined bearing and packing rings for the delivery valves;

Figure 8 is a horizontal sectional view, on an enlarged scale, through a portion of one of the casting tables illustrating more particularly part of the cover plate operating mechanism;

Figure 9 is a vertical sectional view along the line IX—IX of Figure 8, looking in the direction of the arrows;

Figure 10 is a top plan view of one of the cover plate units;

Figure 11 is a vertical sectional view through one of the cover plate units and a pair of adjacent molds, the section being taken along the line XI—XI of Figure 10;

Figure 12 is a top plan view, partly broken away, and illustrating one of the rake-off or ejecting members;

Figure 13 is a side elevational view of an ejector as illustrated in Figure 12;

Figure 14 is a partial sectional view taken transversely of the apparatus as shown in Figure 1, and lengthwise of the cam shaft for one of the tables, the shaft itself being shown in elevation;

Figure 15 is a view similar to Figure 14 showing partially in elevation a portion of the main driving shaft and Geneva gear operating mechanism, and in section a pair of operating sprockets for the table cam shafts;

Figure 16 is a transverse sectional view along the line XVI—XVI of Figure 14 looking in the direction of the arrows;

Figure 17 is a side elevational view of the pull down cam for the cover plates;

Figure 18 is a top plan view of the cam shown in Figure 17;

Figure 19 is a sectional view on the line XIX—XIX of Figure 14 looking in the direction of the arrows;

Figure 20 is a top plan view of a modified form of cam adapted to perform the functions of the parts shown in Figures 16, 17 and 18;

Figure 21 is a side elevational view of the cam of Figure 20, showing one half of the contour;

Figure 22 is a view similar to Figure 21 showing the other half of the contour;

Figure 23 is a detail view of a portion of the cam of Figures 20–22;

Figure 24 is a detail view, partly in section and partly in elevation, of a portion of a cover plate unit;

Figure 25 is a developed view of the cam of Figures 20–23 showing three of the cover plate units and three pairs of molds, and

Figure 26 is a detail view partly in section and partly in elevation showing a modified form of delivery valve.

In carrying out the present invention there may be provided a suitable supporting frame 2 preferably formed with a substantially flat upper surface. The apparatus disclosed herein is illustrated as comprising a pair of casting tables T and T′, but inasmuch as these tables are of similar construction, the detailed description of one will be understood as generally applicable to both. The table T is operatively secured to the upper end of a Geneva gear shaft 3, while the table T′ is similarly secured to the upper end of a second Geneva gear shaft 4, both shafts having their intermediate portions journaled in the main supporting frame. Each shaft carries at its lower end a hub 5 to which is adjustably secured a Geneva gear 6, whereby the gears are circumferentially adjustable with respect to their shafts and relatively with respect to each other for accurately adjusting the same.

Extending transversely of the supporting frame, as clearly shown in Figure 2, is a main driving shaft 7 suitably journaled in the frame, and carrying at its rear end a driving pulley 8 adapted to be operatively connected to the shaft at will by means of a clutch 9 as illustrated in Figure 1. Preferably the clutch is operable from the front of the frame 2 by a system of links and levers 10, as well understood by those skilled in the art.

Secured to an intermediate portion of the main driving shaft, as clearly shown in Figure 15, is a pair of bevel gears 11 and 12, meshing respectively with similar gears 13 and 14 on the lower ends of vertical shafts 15 and 16, one of these shafts appearing in elevation in Figure 2, and both of the shafts appearing in section in Figure 3. The shafts are journaled in a transversely extending bracket 17 at their intermediate portions, and in the main supporting frame at their upper ends. Adjacent its upper end the shaft 15 has secured thereto a locking hub 18 from which projects an operating lever 19 for the gear on shaft 3, while secured adjacent the upper end of shaft 16 is a similar hub 20 and lever 21 for the gear on shaft 4. From Figure 2 it is obvious that the respective gears and their operating mechanism lie in different horizontal planes whereby while they are simultaneously operable, the operation of one occurs without interference with the operation of the other. By reason of this construction the two tables are simultaneously operable, each operation effecting a predetermined movement of the tables, the rotation being in opposite directions as indicated by the arrows in Figure 1.

Secured adjacent the periphery of each of the tables is a plurality of molds 22, the molds preferably each comprising a bushing extending through the table and held in position by means of a nut 23, as clearly shown in Figure 11. Located in the bottom of each mold cavity is a knock-out disk 24 having a downwardly projecting stem 25. Surrounding each stem, and bearing at its upper end against the nut 23, is a compression spring 26, the lower end bearing against a keeper 27 secured to the stem. The springs thus normally tend to urge the stems and disks into their lower position, thereby providing a cavity of predetermined depth above each disk for the reception of molten metal to form the blanks.

While the molds are preferably equi-distantly spaced on the tables, they are conveniently operated in pairs both with respect to casting and ejecting, each movement of the table being sufficient to move a pair of molds into charging position and another pair into discharging position. To this end there is provided a cover plate unit for each pair of molds, each unit comprising a vertically extending operating stem 28, preferably angular in cross section as clearly shown in Figures 8, 9 and 10, whereby the stem may be held against turning while being freely movable vertically through suitable guide openings in the respective tables. Each operating stem at its upper end carries a lug 29 having an opening for the reception of a horizontally extending pin 30. Around each pin is a spacer sleeve 31 carrying a key 32, the outer end of which engages a slot in one side of a cover plate carrier 33 having a hub 34 through which also passes the pin 30. When the parts are firmly clamped in position, the cover plate carrier is held against rotation. Formed in each end of each carrier 33 is an opening through which passes a hollow projection 35 externally threaded for the reception of a nut 36. The under side of the carrier surrounding each of the openings may be countersunk and the upper surfaces of the cover plates 37, from which extend the projections 35, may be similarly shaped, where-

by with the nuts 36 in position a slight vertical and rocking, or substantially universal movement of the cover plates relative to their carrier is permitted.

Each operating stem 28 is preferably hollow, as clearly shown in Figure 9, and has connected therein the upper end of a tension spring 38, the lower end of which is secured to a telescopic extension 39 from which there projects inwardly, substantially parallel to the pin 30 but in the opposite direction, a pin 40 carrying at its inner end a roller 41.

It will be apparent that it is necessary to provide means for lifting a cover plate unit at predetermined times to permit the discharge of the blanks, and to operate the ejector disks to effect ejection of the blanks from the molds. Both of these operations occur in definite time relation one to the other for each table by means of a cam shaft 42, Figures 2 and 14, extending transversely of the supporting frame, one shaft being provided adjacent each end of the frame. Secured to each shaft 42 is a sprocket 43, the sprocket 43 on one of the shafts extending substantially in line with a similar sprocket 44 on the main driving shaft, and the corresponding sprocket 43 on the other shaft extending substantially in line with a second sprocket 45 on the main driving shaft. The cam shafts 42 may thus be rotated in unison with the main driving shaft by sprocket chains 46 indicated in chain lines in Figure 2, the parts rotating or traveling in the directions indicated by the arrows.

Each cam shaft 42 has secured adjacent the front end thereof a knock-out cam 47 with each of which cooperates a tappet 48 guided at its upper end in the supporting frame, and carrying at its lower end an anti-friction roller 49. Each tappet is normally urged downwardly to maintain its roller in engagement with the periphery of its knock-out cam by means of a compression spring 50 mounted in a recess formed in the base of an ejector or off-take support 51 extending upwardly from the supporting frame adjacent the periphery of the respective tables. Extending toward the center of the apparatus from each of the tappets 48 is a bracket 52 carrying at its inner end a pair of vertically projecting rods 53 adapted to extend in alignment with a pair of ejector stems 25 in position at the discharge station, as indicated in Figure 1. The cam is so timed that when the table has come to rest with a pair of molds in this position, it will be operative for knocking the blanks B from that pair of molds and holding the same in elevated position as indicated in Figure 2.

Either prior to or simultaneously with the knocking-out operation the cover plate unit for this pair of molds is raised to the inoperative position of Figure 1. This is accomplished by means of the mechanisms shown more particularly in Figures 2, 14 and 16. Secured to each cam shaft 42 is a cover plate raising cam 54 cooperating with a roller 55 on a tappet 56. Each of these tappets has projecting from an intermediate portion thereof an arm 57, the outer end of which carries a vertically projecting rod 58 adapted to extend in alignment with the operating stem 28 of the cover plate unit located as desired, either at the discharge station or one step before such station is reached. Thus, as the rod 58 rises it lifts the cover plate unit to permit knocking-out of a blank. As illustrated in the drawings, the cover plate unit is adapted to be raised one step before such unit reaches the discharge station, and is held raised at such station by a detent 59, see Figures 8 and 9, adapted to engage a depression 60 in the extension 39. Normally each detent is urged inwardly by a spring 61.

With the cover plate unit in raised position, and the blanks elevated, parts are in position to permit ejection of the blanks. This is accomplished by an ejector, Figures 1, 2, 12 and 13. This ejector comprises a slide 62 movable horizontally in the upper end of the ejector support 51. At its inner end the slide carries a double ejector 63 having reversely curved outer ends 64 adapted to provide two blank receiving pockets 65, these pockets being spaced to exactly receive the blanks in an adjacent pair of molds. The ejector slide is moved inwardly and outwardly by means of a bell crank lever 66, the long arm of which has a pin and slot connection with the outer end of the slide, and the shorter arm of which carries a roller extending into the cam groove 67 of an ejector cam 68, Figures 2 and 14. The bell crank lever has a pivotal mounting 69 on the main supporting frame 2 of the apparatus. The cam groove is shaped to move the ejector slide inwardly after the cover plate unit is raised but before the blanks are knocked-out of the molds. After the blanks are knocked-out, the parts are in the position of Figure 2. Thereafter, the cam groove actuates the bell crank to move the slide outwardly, this movement stripping the blanks from the knock-out disks and delivering them to a chute 70. The chutes 70 in turn each deliver the blanks to a guide 71 substantially vertically positioned above pairs of shaping and compressing rollers 72, these rollers being intergeared for rotation in opposite directions, and being spaced a distance corresponding to the desired thickness of the blanks. Thus the blanks are automatically subjected to a shaping operation, effective for removing any imperfections on the tops of the blanks resulting from the casting operation, thus preparing them for a subsequent extruding or other shaping operation.

Surrounding the shafts 3 and 4 is a pull down cam 73, Figures 2, 17 and 18. Each of

these cams has a cut-away portion 74 located to permit free passage of the rollers 41 of the cover plate units as required when they are successively raised to permit knocking out and ejection of the blanks. As the rollers 41 successively leave the discharge station they are engaged by the downwardly inclined portions 75 of the cams, these portions overcoming the action of the detents 59, and effective through the springs 38 for yieldingly drawing the cover plates into cooperative engagement with the molds. This cooperative relationship is maintained until the units again reach the discharge station, or a predetermined station in advance thereof, by means of the portions 76 of the pull down cams. While in this position, the molds reach the pouring station at which they are adapted to receive a supply of molten metal in predetermined amounts through the openings in the hollow projections 35 of the cover plates.

The molten metal supply means at each of the pouring stations comprises a pair of valves 77 rotatably mounted in bushings 78 secured on opposite sides of a molten metal delivery passage 79 communicating with the interior of the molten metal pot 80. The bushings constitute valve casings, and each is provided with an inlet port 81, an air admission port 82, and a discharge port 83. The air admission ports in the casings are at all times in communication with air passages 84, while the discharge ports are at times in alignment with discharge nozzles 85. These nozzles are spaced to exactly deliver to the openings through the projections 35 of a pair of adjacent molds. Each valve has a metal receiving pocket 77′ in the form of a through passage, intersecting which is a screw 86 adapted to be moved inwardly or outwardly for varying the capacity of the pockets. With the valves in metal receiving position, as shown in Figure 4, the pockets are out of communication with both the air admission and the metal discharge ports. When the valves are rotated 90° inwardly and downwardly as viewed in this figure, the pockets are brought into communication with such ports, and the metal is free to flow outwardly through the nozzles and into the molds.

Each of the valves is preferably tapered slightly to conform to a corresponding taper of the bushings, Figure 6, whereby movement of the valves longitudinally with respect to the bushings tends to increase or decrease the clearance between them. Such adjustment is effected by providing the valves with shoulders 87 with one side of which cooperates a bearing ring 88 of heat resistant material such as German silver. The opposite side of each ring 88 bears against an adjusting nut 89 threaded onto the bushing. A spacer sleeve 90 is mounted around each valve, and cooperates with a second bearing ring 91. It will be seen that by rotating the adjusting nut 89 in one direction the clearance may be decreased, while by rotation in the opposite direction this clearanace may be increased.

Operation of the valves is obtained by securing thereto cranks 92, the opposite ends of which are connected by adjustable links 93 with opposite ends of a rocking lever 94. Each rocking lever is operatively carried by one end of a shaft 95 mounted in suitable bearings 96. Adjacent the opposite end of each of the shafts is a crank 97 to each of which is secured a pitman 98 extending upwardly through the frame, and cooperating at their lower ends with valve cams 99 on the cam shafts 42. These cams are effective when the tables are stationary for rotating the shafts 95 and thus moving the valves to effect discharge of molten metal from the pockets of the valves through the nozzles 85 and into the molds, the valves being almost immediately moved to the other extreme to receive a fresh supply of metal preparatory to their next operation.

The cam shafts 42 may also be utilized for effecting driving of the shaping rolls 72. To this end they each carry a sprocket 100 adapted to receive sprocket chains 101 extending around similar sprockets 102 secured to one of the shafts carrying the rolls 72.

From the foregoing it will be obvious that the main drive shaft 7 is effective for intermittently rotating the mold tables and also for driving the cam shafts. The timing of the parts is such that each table operation brings a pair of molds on each table to the discharge station and another pair of molds on each table to the pouring station. When the table is at rest the cam shafts operate the cams thereon to raise the cover units, knock-out the blanks, eject the same and to operate the valves. Also, the shaping rolls are continuously driven for operation on all blanks delivered thereto. In order to prevent possibility of piling or overlapping of the blanks while between the rolls, each of the blank receiving pockets 65 of the ejectors may deliver to a separate division of the chutes 70, and the rolls may be effectively divided by partition plates 103. Thus every blank is subjected to a uniform shaping operation and uniformity of successive blanks is insured.

In some cases it may be desirable to dispense with the separate means for effecting movement of the cover plate units in opposite directions, and provide a single means for this purpose. This may be accomplished by replacing the cam 73 of Figures 17 and 18 on each of the tables with a cam 104, Figures 20–23 and 25. As illustrated in these figures, the cams have a groove comprising a horizontally extending portion 105 adapted

to cooperate with the rollers 41′ for holding the cover plates 37′ in position on the molds 22′ during the pouring operation illustrated diagrammatically as taking place at the central position of Figure 25. The upper portion of the cam groove at this position has a spring pressed block 106 carried by a stem 107 and urged downwardly by springs 108. This spring pressed block compensates for any variations, and permits the use of operating stems 28′ of a single piece of material. These stems have lugs 29′ receiving one of the reduced ends of pins 30′, the intermediate portions of which are enlarged to take the place of the spacer sleeves 31 of Figure 10. These pins on their other ends pass loosely through cover plate carriers 34′ on which are mounted the cover plates 37′. The downwardly projecting stems 25′ of the knock-out disks may be of the construction before described, and are operated at the knock-out and ejecting stations, shown at the right of Figure 25, by means of the rods 53′.

The table T′ travels in the direction indicated by the arrow in Figure 25, so that the rollers 41′ after leaving the portion 105 of the cam, travel up the incline 109 onto the upper horizontal portion 110 of the cam. In this position, illustrated at the left of Figure 25, the cover plates are raised preparatory to the knock-out operation. Thereafter, continued travel brings the parts to the position illustrated at the right in this figure at which time the knocking-out actually takes place, the blanks then being held in the elevated position shown ready for ejection. Continued travel brings the rollers 41′ into engagement with the downwardly inclined portion 111 of the cam whereby the cover plates are drawn downwardly into cooperative engagement with the molds. The necessary relative movement of the cover plates is permitted by providing the enlarged intermediate portions of the pins 30′ with squared portions 112 cooperating with one edge of the carriers 34′ to permit a limited rocking movement of the carriers as required.

In Figure 26 there is illustrated more or less diagrammatically a modified form of valve suitable for the feeding of molten metal in predetermined amounts without any possibility of delivering trapped air to the bath of metal. This may comprise a casing 78′ similar in construction to that of the bushings 78 and having ports (not shown) corresponding thereto. Extending into the casing from one end is a plunger 113, while extending into the other end of the casing is a similar plunger 114. Each of the plungers is carried by a cross head, the cross head 116 having securely and adjustably mounted therein operating rods 117, while these rods extend loosely through the head 118. The head 118 is adapted to slide on the rods 117 in one direction an amount determined by the distance between the inner ends of the plungers 113 and 114, while the movement in the opposite direction is adjustably variable by means of nuts 119. The valve is adapted to be operated through the medium of the head 118. Due to this construction, movement of the head 118 in one direction tends to bring the plunger 114 into contact with the plunger 113 thereby first closing the metal receiving pocket 120, and thereafter moving the plunger 113. This movement continues until the parts are in metal receiving position. Thereafter, the plunger 114 moves in the opposite direction to separate the plungers to form the pocket 120, and then the plungers move simultaneously to bring the pocket to discharge position. The closing of the pocket on the return movement of the parts prevents the carrying of trapped air into the metal, and consequently decreases the possibility of dross formation.

In order to hasten the cooling of the blanks during the operation of the apparatus there may be provided pipes 121 closed at their outer ends and communicating with a manifold 122 at their inner ends. The manifold receives a supply of cooling fluid, such as air under pressure, through a supply line 123 communicating with a suitable source. The pipes 121 may each be provided with a series of perforations in their bottom walls, which perforations may be spaced to deliver blasts of cooling fluid through the openings in the hollow projections 35 while the tables are stationary, to thereby expedite the solidification of the castings.

It has been found desirable in many cases to provide means preventing the metal from freezing in the valves and nozzles 85, and to this end there may be utilized burners b so positioned as to direct flames onto the desired operating parts.

The advantages of the present invention arise from the provision of an apparatus adapted for the accurate production of blanks, and more particularly soft metal blanks of the character adapted for the formation of articles, such as tubes, caps and the like by extrusion, pressing or threading.

Other advantages arise from the mold construction and the means for delivering measured charges thereto.

Still other advantages arise from the provision of the cover plates, whereby the tops of the blanks are smoothed automatically during casting.

Still further advantages arise from the means for effecting cooling of the metal preparatory to the discharge of the blanks.

We claim:

1. In a casting machine, a plurality of molds, measuring means for delivering molten metal to said molds in predetermined quantities in timed relation to the operation of the machine, means producing a relative

movement between said molds and said means, and closure means adapted to cooperate with said molds during the solidification of the castings therein.

2. In a casting machine, a plurality of molds, means for delivering molten metal to said molds, means producing a relative movement between said molds and said means, and closure means supplemental to said molds and adapted to cooperate with said molds during the solidification of the castings therein, said closure means having continuously open openings therethrough permitting the delivery of molten metal to the molds while the closure means are in cooperative relation to the molds.

3. In a casting machine, a plurality of molds, means for delivering molten metal in predetermined measured quantities to said molds, means producing relative movement between said molds and said means, closure means for said molds movable therewith, and means for destroying cooperative relationship between said molds and closure means to permit discharge of castings from the molds.

4. In a casting machine, a plurality of molds, means for delivering molten metal to said molds, means producing relative movement between said molds and said means, closure means for said molds, and means for destroying cooperative relationship between said molds and closure means to permit discharge of castings from the molds, said closure means having continuously open openings therethrough permitting the delivery of molten metal to the molds while the closure means are in cooperative relation thereto.

5. In a casting machine, a plurality of molds, means for delivering molten metal to said molds, means producing relative movement between said molds and said means, closure means for said molds, means for destroying cooperative relationship between said molds and closure means to permit discharge of castings from the molds, means for effecting discharge of the castings from said molds, and means for moving the discharged castings laterally from the molds.

6. In a casting machine, a plurality of molds, means for delivering molten metal to said molds, means producing relative movement between said molds and said means, closure means for said molds, means for destroying cooperative relationship between said molds and closure means to permit discharge of castings from the molds, knockout means for the castings in said molds, and ejecting means cooperating with said knockout means.

7. In a casting machine, a mold, means for delivering molten metal thereto, yieldingly seated closure means for said mold movable therewith, means for destroying cooperative relationship between said mold and closure means to permit discharge of castings from the mold, and means effecting discharge of said castings.

8. In a casting machine, a mold, means for delivering molten metal thereto, closure means for said mold, means for destroying cooperative relationship between said mold and cloosure means to permit discharge of castings from the mold, and means for directing cooling fluid against the mold closure means during solidification of a casting in the mold.

9. In a casting machine, a mold, means for delivering molten metal thereto, closure means for said mold, means for destroying cooperative relationship between said mold and closure means to permit discharge of castings from the mold, said closure means having an opening therethrough for the delivery of molten metal to the mold while the closure means and mold are in cooperative relation, and means for directing cooling fluid through said opening during solidification of a casting in the mold.

10. In a casting machine, a mold, means for delivering molten metal thereto, closure means for said mold, means for destroying cooperative relationship between said mold and closure means to permit discharge of castings from the mold, said closure means having an opening therethrough for the delivery of molten metal to the mold while the closure means and mold are in cooperative relation, means for directing cooling fluid through said opening during solidfication of a casting in the mold, and means effecting discharge of a solidified casting.

11. In a casting machine, a mold, means for delivering molten metal thereto, closure means for said mold, means for destroying cooperative relationship between said mold and closure means to permit discharge of castings from the mold, said closure means having an opening therethrough for the delivery of molten metal to the mold while the closure means and mold are in cooperative relation, means for directing cooling fluid through said opening during solidification of a casting in the mold, means destroying cooperative relationship between the mold and said closure means, and means for thereafter effecting discharge of a solidified casting from the mold.

12. In a casting machine, a mold, a cover plate adapted to cooperate with said mold, operating means for said cover plate, said cover plate being movable relatively to said operating means, and means for delivering molten metal to said mold.

13. In a casting machine, a mold, a cover plate adapted to cooperate with said mold, operating means for said cover plate, said cover plate being movable relatively to said operating means, and means for delivering molten metal to said mold while said cover plate is in position thereon.

14. In a casting machine, a mold, a cover plate adapted to cooperate with said mold, operating means for said cover plate, said cover plate being movable relatively to said operating means, and means for delivering molten metal to said mold while said cover plate is in position thereon, said cover plate having an opening for the passage of metal therethrough.

15. In a casting machine, a mold, a cover plate adapted to cooperate with said mold, operating means for said cover plate, said cover plate being movable relatively to said operating means, means for delivering molten metal to said mold, and means for directing cooling fluid against said mold for cooling the metal therein.

16. In a casting machine, a mold, a cover plate adapted to cooperate with said mold, operating means for said cover plate, said cover plate being movable relatively to said operating means, and means for delivering molten metal to said mold in predetermined quantities.

17. In a casting machine, a mold, a cover plate adapted to cooperate with said mold, operating means for said cover plate, said cover plate being movable relatively to said operating means, means for delivering molten metal to said mold, and means for bringing said mold and metal delivery means into cooperative engagement.

18. In a casting machine, a mold, a measuring valve for delivering molten metal thereto, said valve having means for subjecting a measured quantity of metal to atmospheric pressure to assist discharging thereof, a cover for said mold having an opening for the passage of molten metal, and means for destroying cooperative relationship between said cover and mold to permit discharge of a casting from the mold.

19. In a casting machine, a mold, a measuring valve for delivering molten metal thereto, a cover for said mold having an opening for the passage of molten metal, and means for destroying cooperative relationship between said cover and mold to permit discharge of a casting from the mold, said machine including means for delivering cooling fluid through said opening.

20. In a casting machine, a mold, a measuring valve for delivering molten metal thereto, said valve having means for subjecting a measured quantity of metal to atmospheric pressure to assist discharging thereof, a cover for said mold having an opening for the passage of molten metal, means for destroying cooperative relationship between said cover and mold to permit discharge of a casting from the mold, and means for effecting discharge of a casting from the mold.

21. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for measuring and delivering a predetermined amount of molten metal to the molds at such station, means at the discharge station to effect discharge of the castings from the molds at such station, and cover plates periodically cooperating with said molds.

22. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for measuring and delivering a predetermined amount of molten metal to the molds at such station, means at the discharge station to effect discharge of the castings from the molds at such station, and cover plates periodically cooperating with said molds, said cover plates having openings therethrough for the passage of molten metal to the molds.

23. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for measuring and delivering a predetermined amount of molten metal to the molds at such station, means at the discharge station to effect discharge of the castings from the molds at such station, cover plates periodically cooperating with said molds, and means for cooling the metal in the molds during their passage from the pouring station to the discharge station.

24. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for delivering a predetermined amount of molten metal to the molds at such station, means at the discharge station to effect discharge of the castings from the molds at such station, cover plates periodically cooperating with said molds, and means for maintaining yielding engagement between the cover plates and molds when in cooperative engagement.

25. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for delivering a predetermined amount of molten metal to the molds at such station, means at the discharge station to effect discharge of the castings from the molds at such station, cover plates periodically cooperating with said molds, and means for maintaining yielding engagement

between the cover plates and molds when in cooperative engagement, said cover plates having openings therethrough for the passage of molten metal to the molds.

26. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for delivering a predetermined amount of molten metal to the molds at such station, means at the discharge station to effect discharge of the castings from the molds at such station, said last mentioned means including a knock-out and an ejecting mechanism for first raising and thereafter laterally moving a casting, and cover plates periodically cooperating with said molds.

27. In a casting machine, a mold table, a plurality of molds thereon, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, adjustable measuring means at the pouring station for delivering a predetermined amount of molten metal to the molds at such station, means at the discharge station to effect discharge of the castings from the molds at such station, and cover plates periodically cooperating with said molds.

28. In a casting machine, a holder for molten metal, a valve casing having a discharge port and an air admission port, a valve operable in said casing and constructed to provide a molten metal receiving pocket out of communication with said air admission port when the pocket is in metal receiving position and in communication with said air admission port when the pocket is in cooperative relation to said discharge port, and operating means for said valve.

29. In a casting machine, a holder for molten metal, a valve casing having a discharge port and an air admission port, a valve operable in said casing and constructed to provide a molten metal receiving pocket out of communication with said air admission port when the pocket is in metal receiving position and in communication with said air admission port when the pocket is in cooperative relation to said discharge port, and operating means for said valve, said operating means being effective for closing said pocket during movement of the valve into metal receiving position.

30. In a casting machine, a holder for molten metal, a valve casing having a discharge port and an air admission port, a valve operable in said casing and constructed to provide a molten metal receiving pocket out of communication with said air admission port when the pocket is in metal receiving position and in communication with said air admission port when the pocket is in cooperative relation to said discharge port, and operating means for said valve, said operating means being effective for periodically closing said pocket to prevent delivery of trapped air into the bath of metal in said holder.

31. In a casting machine, a plurality of molds, means for measuring and delivering predetermined quantities of molten metal to said molds in timed relation to the operation of the machine, means producing relative movement between said molds and said means, and mechanism effecting removal of the castings from said molds.

32. In a casting machine, a plurality of molds, means for measuring and delivering predetermined quantities of molten metal to said molds in timed relation to the operation of the machine, means producing relative movement between said molds and said means, and means for artificially cooling the castings in said molds during such relative movement.

33. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for delivering only a predetermined amount of molten metal to the molds at such station, and means at the discharge station to effect discharge of the castings from the molds at such station.

34. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for delivering only a predetermined amount of molten metal to the molds at such station in timed relation to the operation of the machine, and means at the discharge station to effect discharge of the castings from the molds at such station.

35. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for delivery only a predetermined amount of molten metal to the molds at such station, and means intermediate said stations for artificially cooling the castings during their travel from one station to the other.

36. In a casting machine, a mold table having a plurality of molds, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, means at the pouring station for delivering a predetermined amount of molten metal to the molds at such station, and means at the discharge station to effect discharge of the castings from the

molds at such station, said last mentioned means including both a knockout and an ejecting mechanism.

37. In a casting machine, a mold table, a plurality of molds thereon, means adapted to effect rotation of said table to bring the molds successively to a pouring station and a discharge station, adjustable measuring means at the pouring station for delivering a predetermined amount of molten metal to the molds at such station, and means for artificially cooling the molten metal during the travel of the molds from the pouring station to the discharge station.

38. In a casting machine, a pot of molten metal, a discharge nozzle cooperating therewith, measuring means in said nozzle for periodically delivering measured quantities of metal through said nozzle, and operating means minimizing the possibility of oxidation of the metal in said pot by the admission of air through said measuring means.

39. In a casting machine, a plurality of molds, closure means therefor, and means for delivering both the material to be cast and a cooling medium through said closure means.

40. In a casting machine, a plurality of molds, universally movable closure means therefor, and means for delivering measured quantities of molten metal and a cooling medium through said closure means.

In testimony whereof we have hereunto set our hands.

WALTER T. DAVIS.
JOHN A. McGINNIS.