

July 12, 1960

P. L. TOLLISON ET AL

2,944,306

MACHINE FOR CASTING PRINTING PLATES

Filed June 2, 1955

19 Sheets-Sheet 1

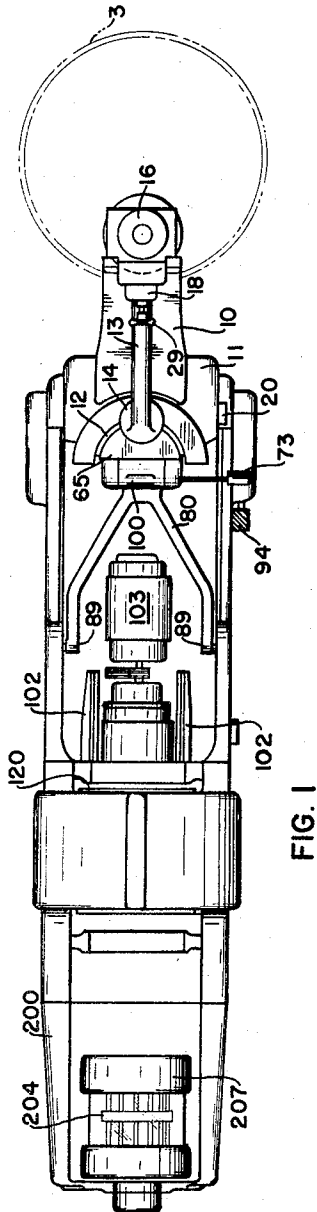


FIG. 1

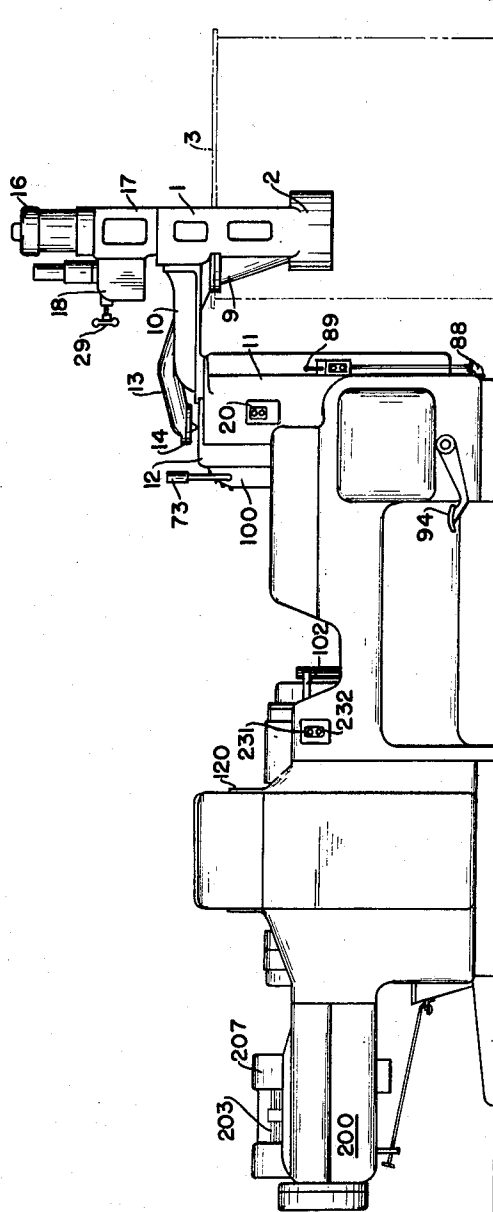


FIG. 2

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19 Sheets-Sheet 2

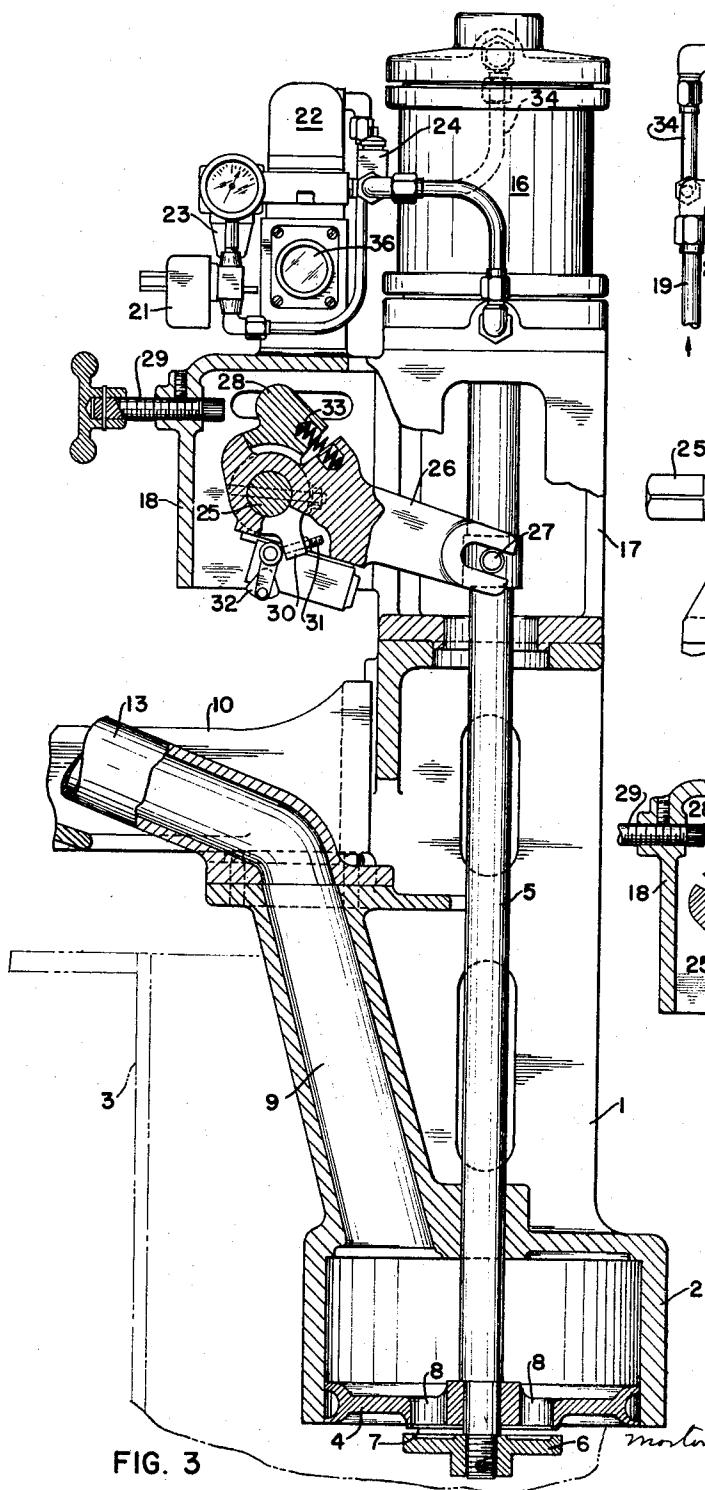


FIG. 3

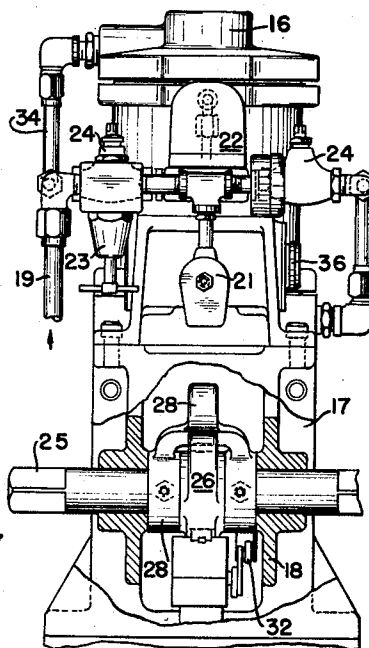


FIG. 4

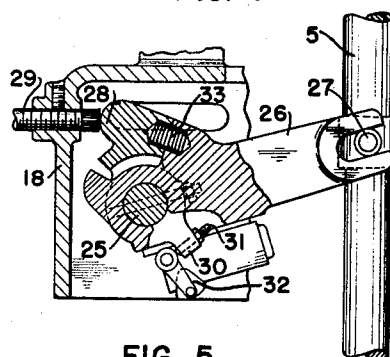


FIG. 5

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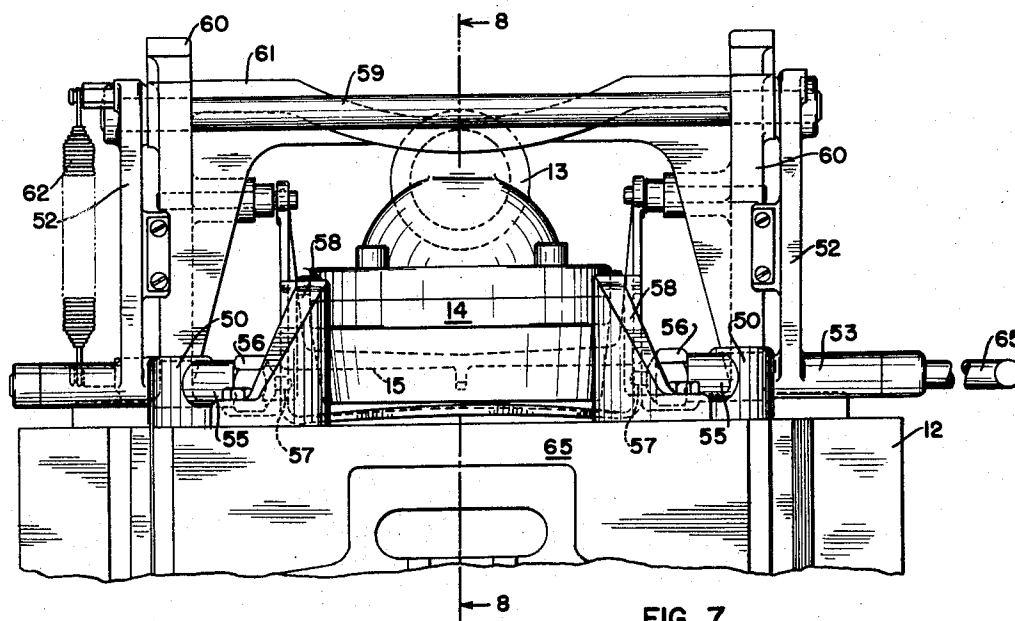
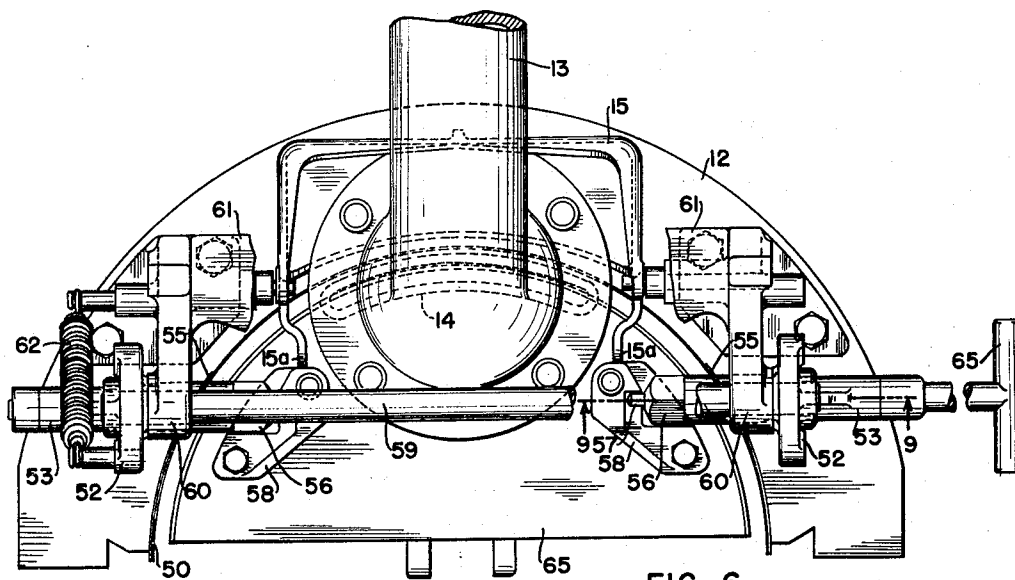
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INVENTORS
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19 Sheets-Sheet 4

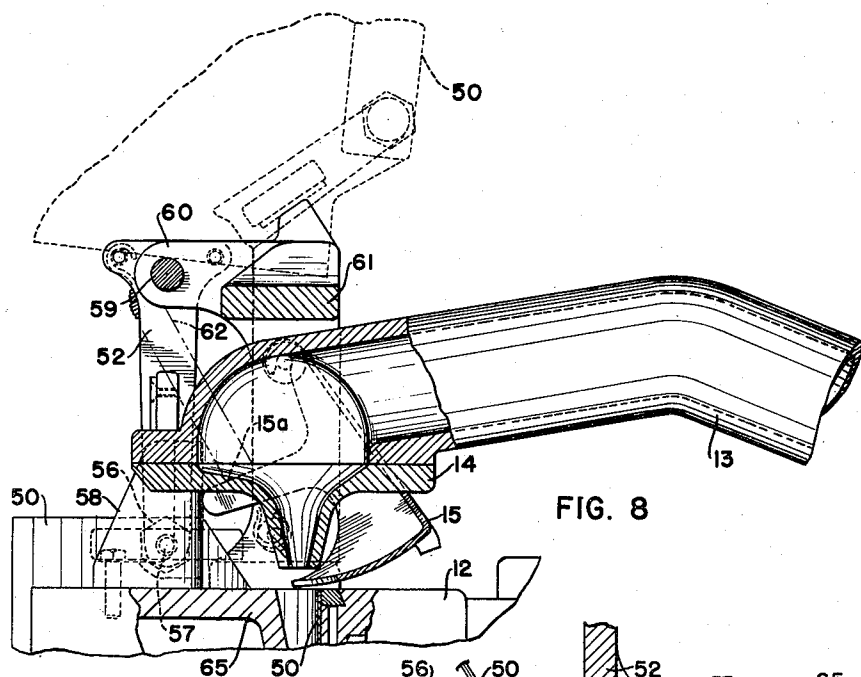


FIG. 8

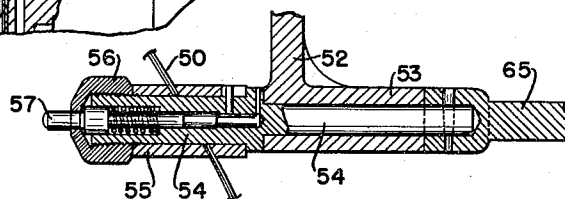


FIG. 9

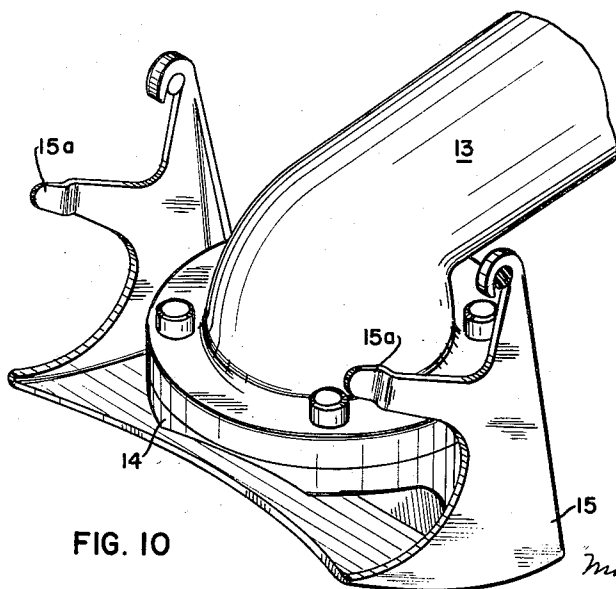


FIG. 10

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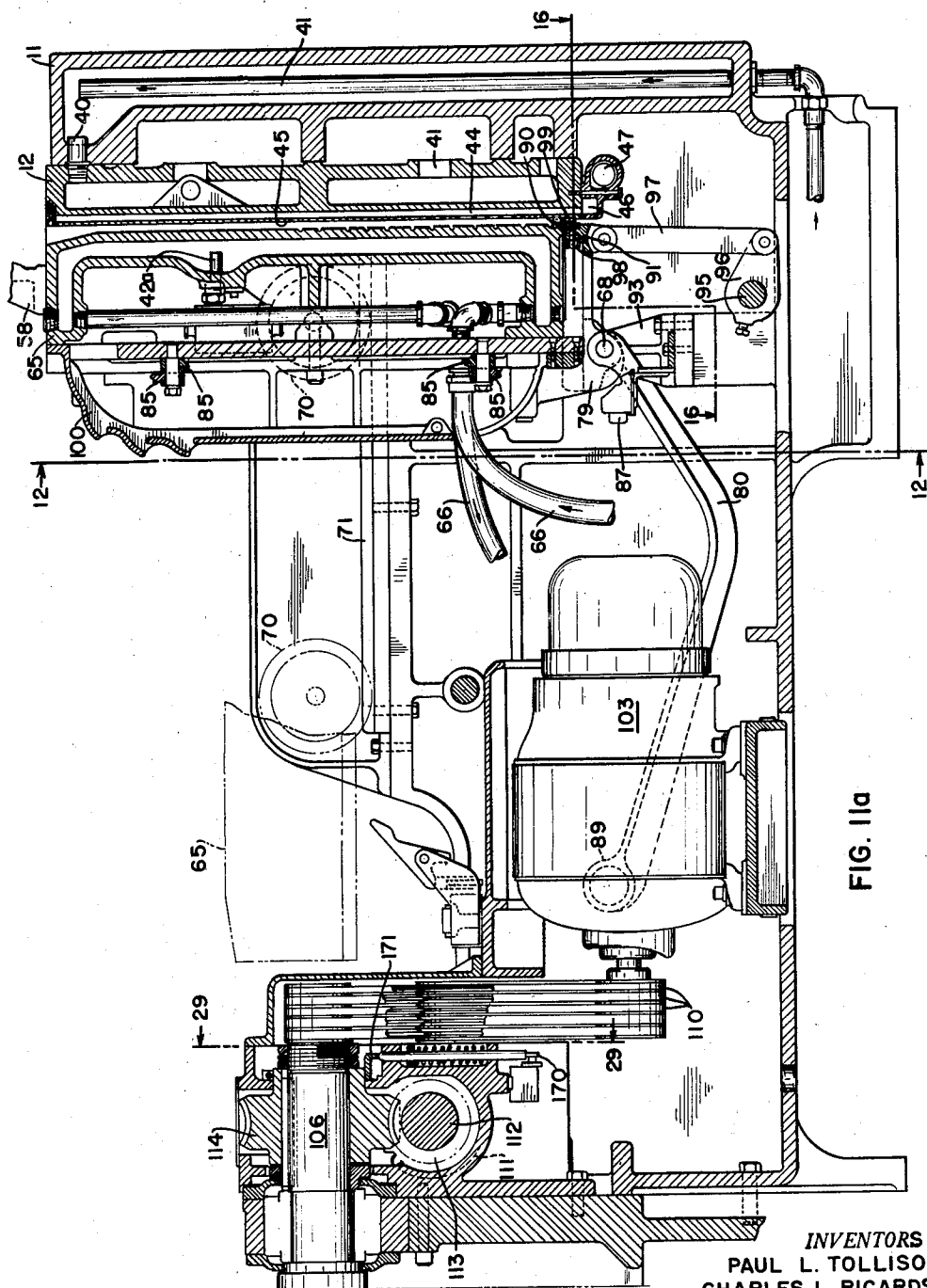


FIG. 11a

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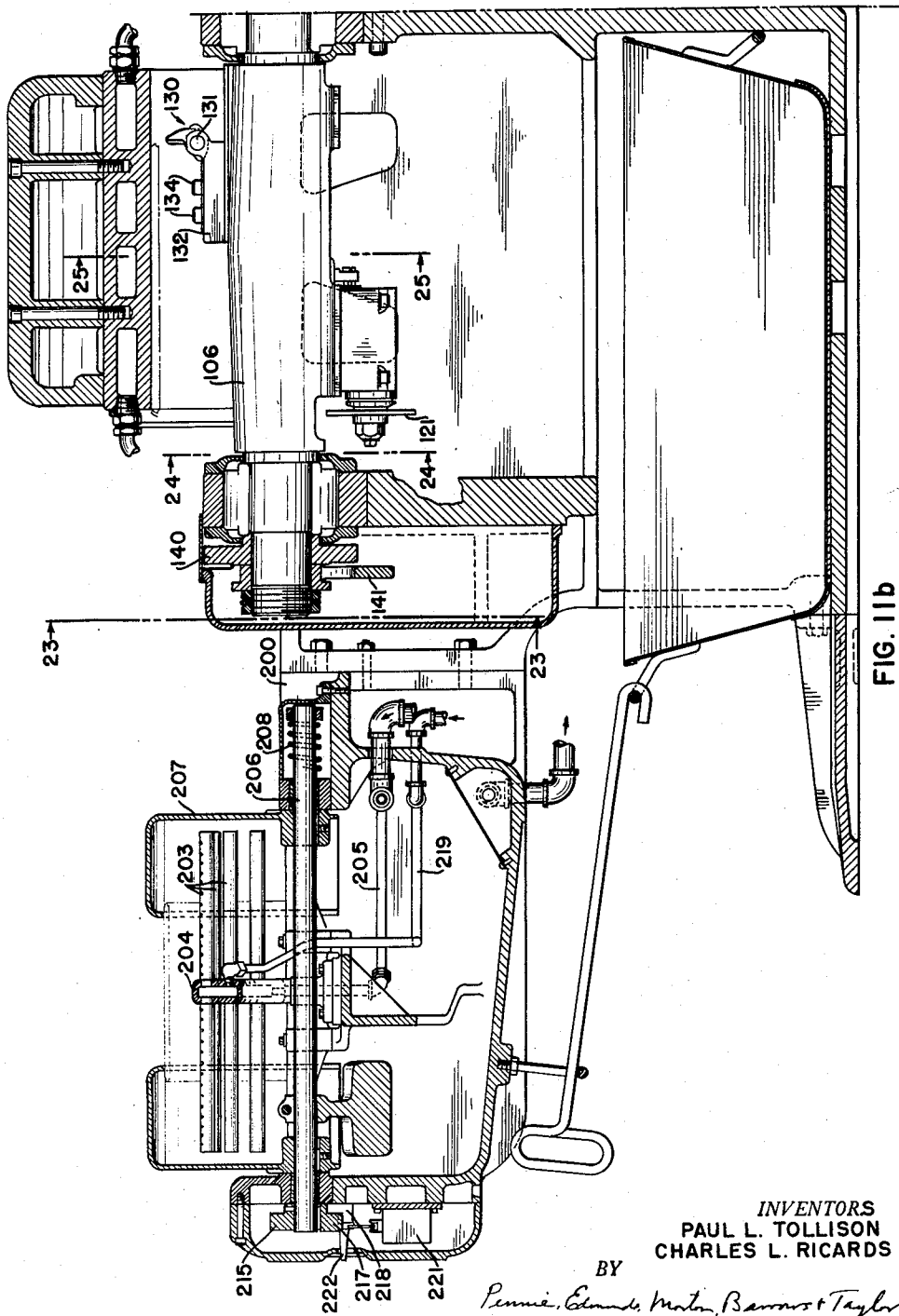


FIG. 11b

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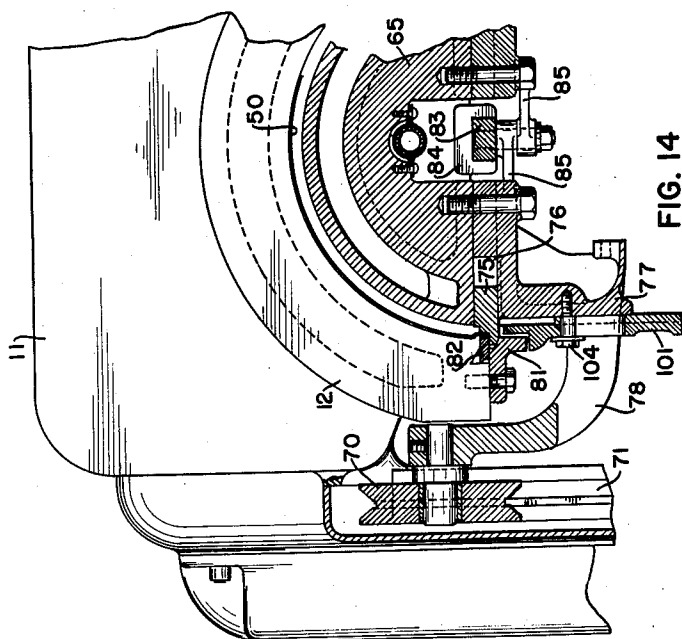


FIG. 14

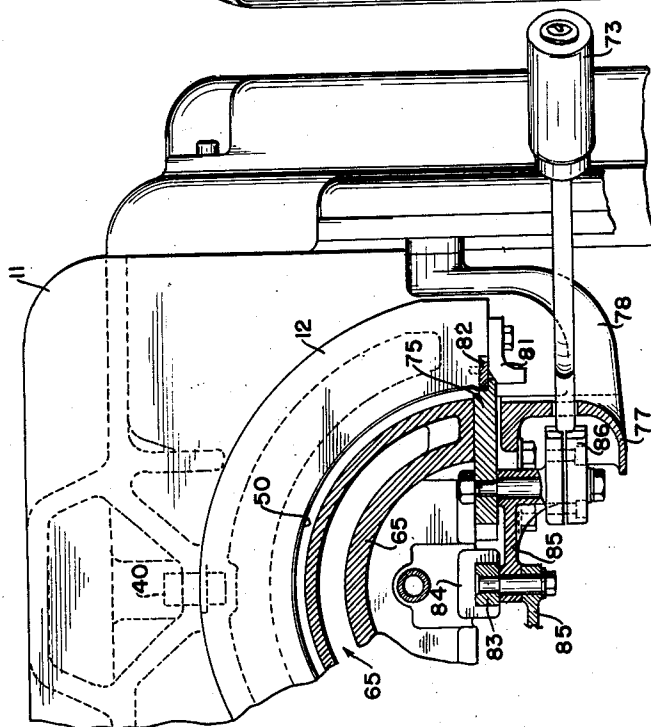


FIG. 13

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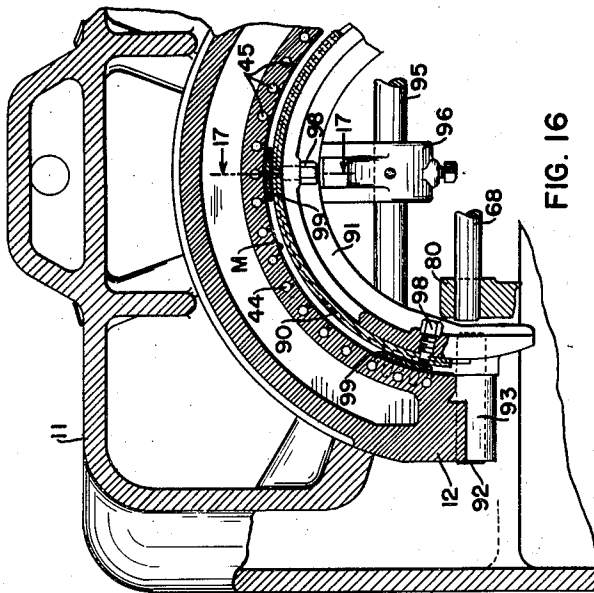


FIG. 16

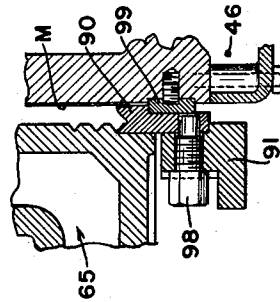


FIG. 17

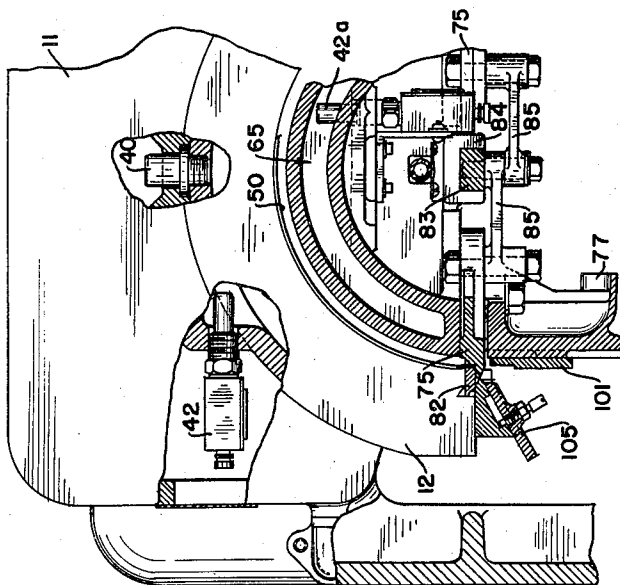


FIG. 15

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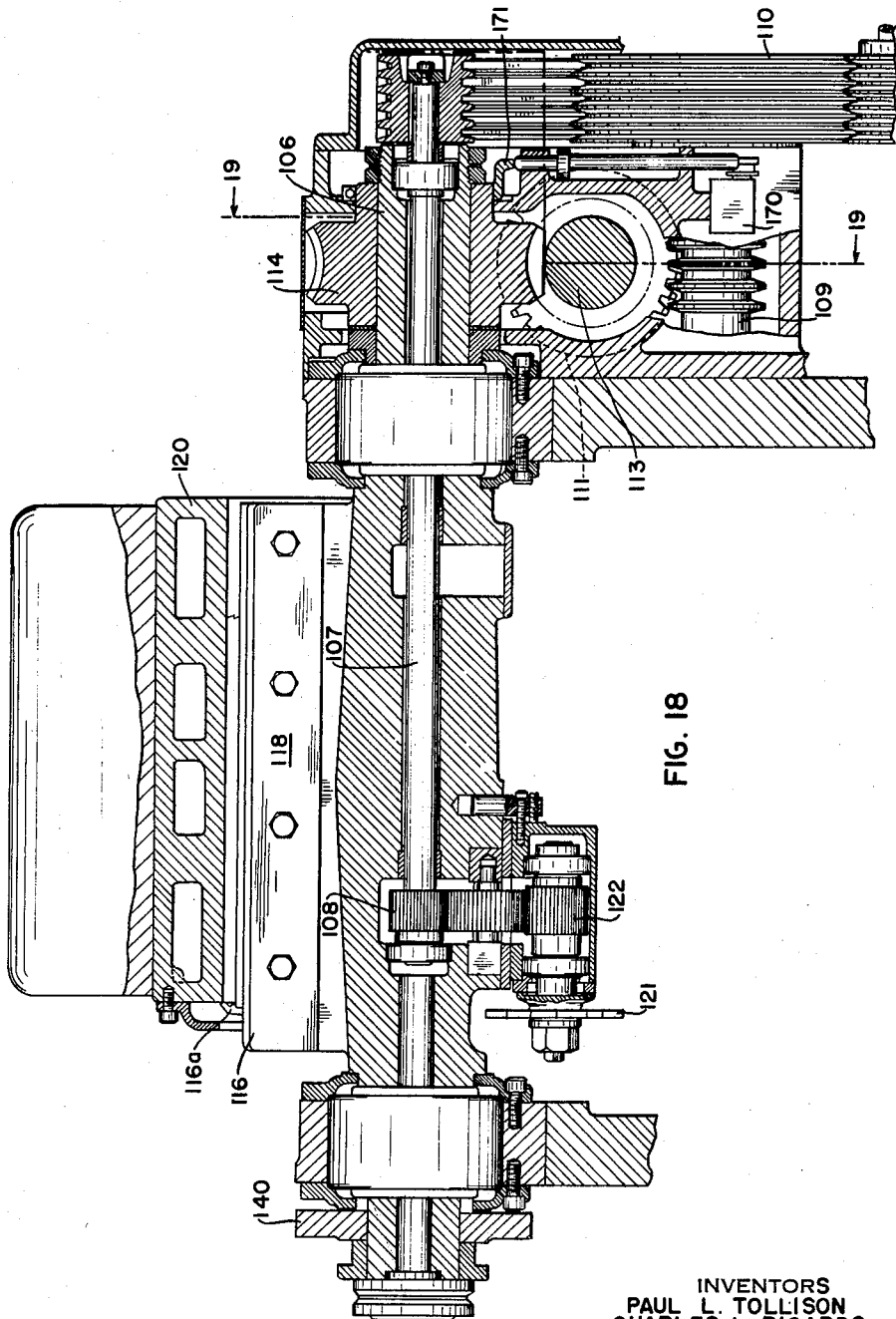


FIG. 18

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MACHINE FOR CASTING PRINTING PLATES

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19 Sheets-Sheet 11

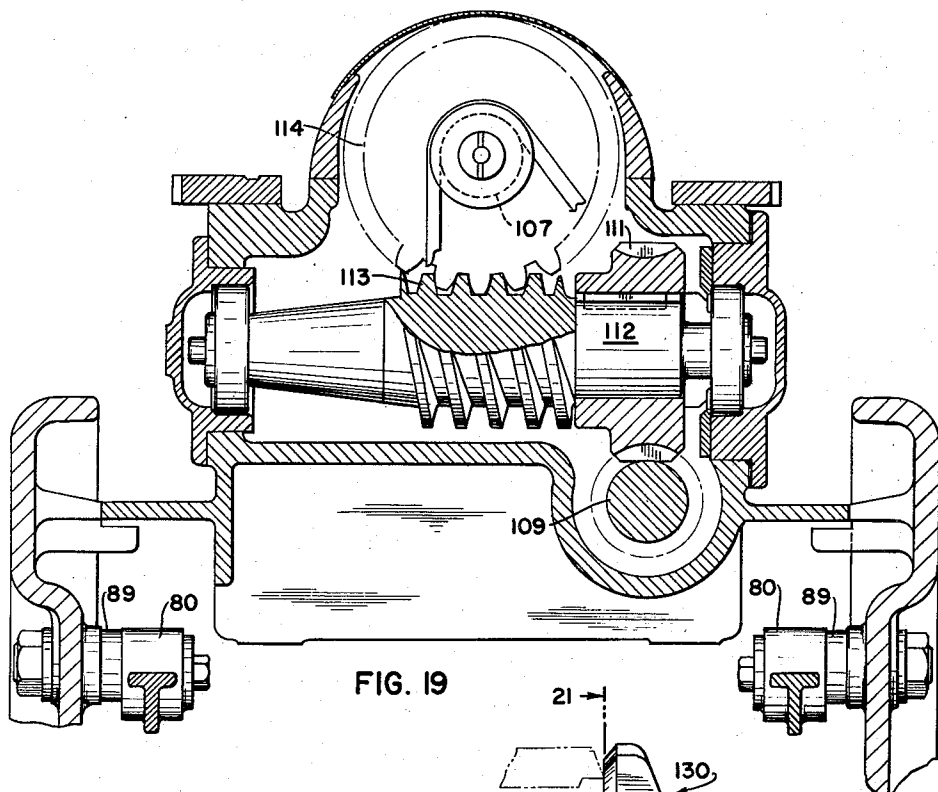


FIG. 19

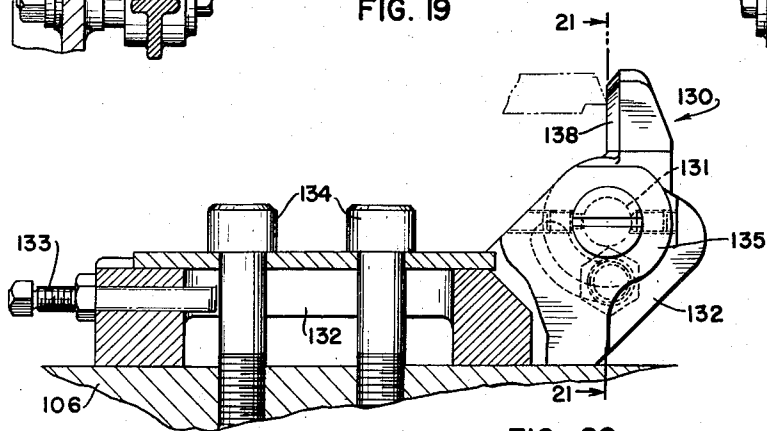


FIG. 20

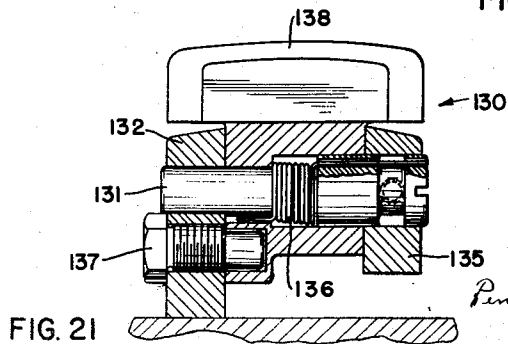


FIG. 21

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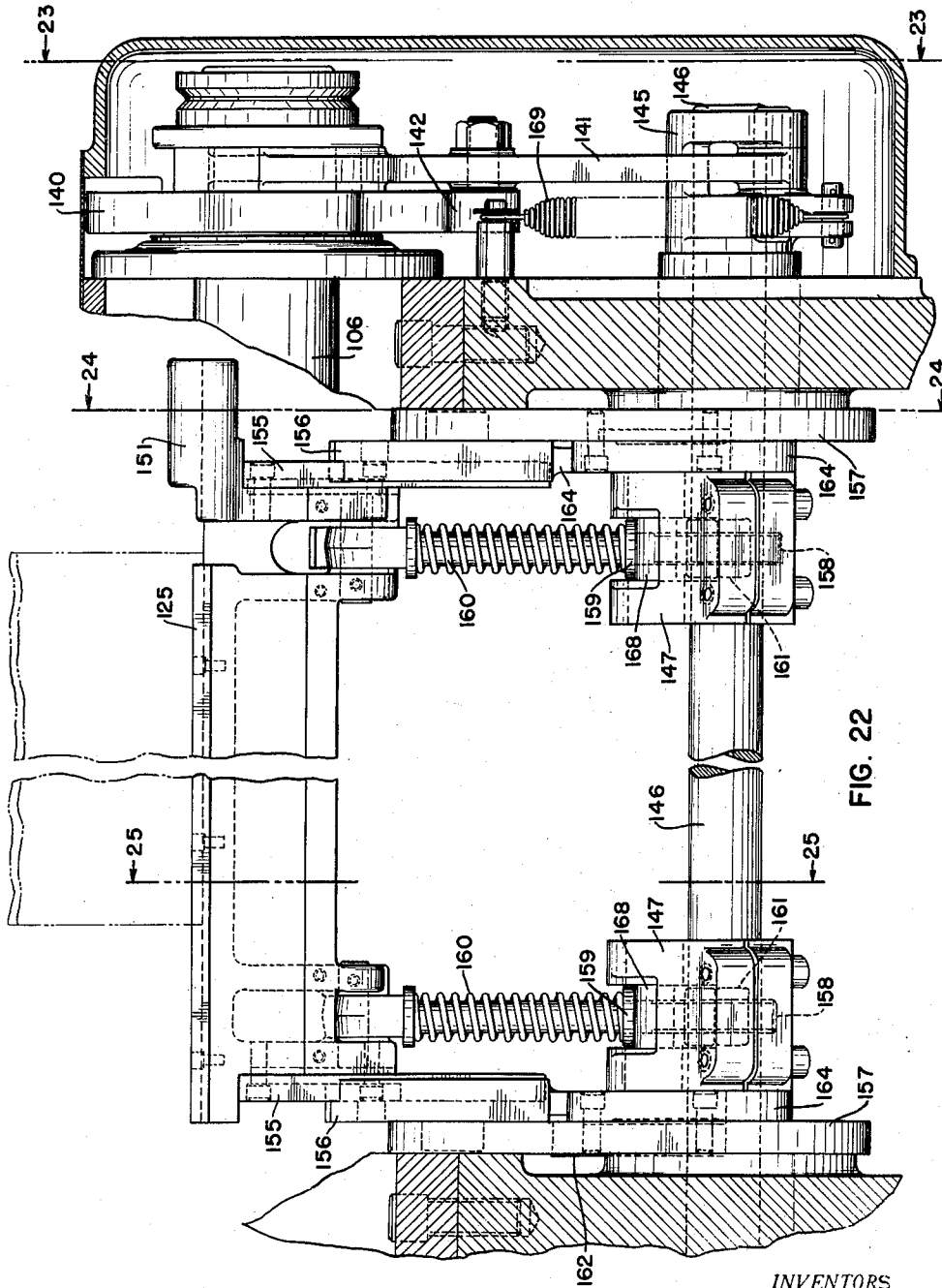
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MACHINE FOR CASTING PRINTING PLATES

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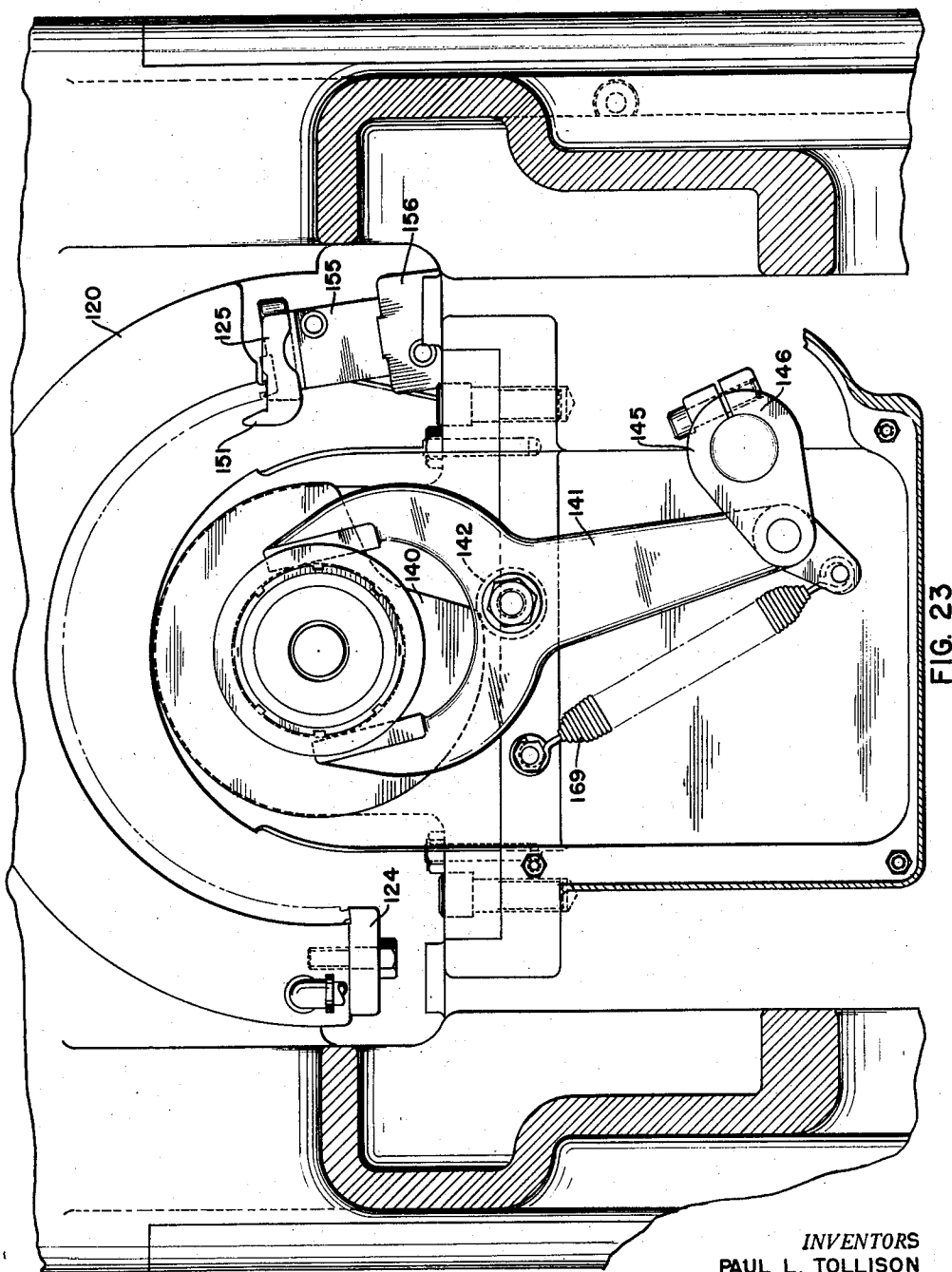


FIG. 23

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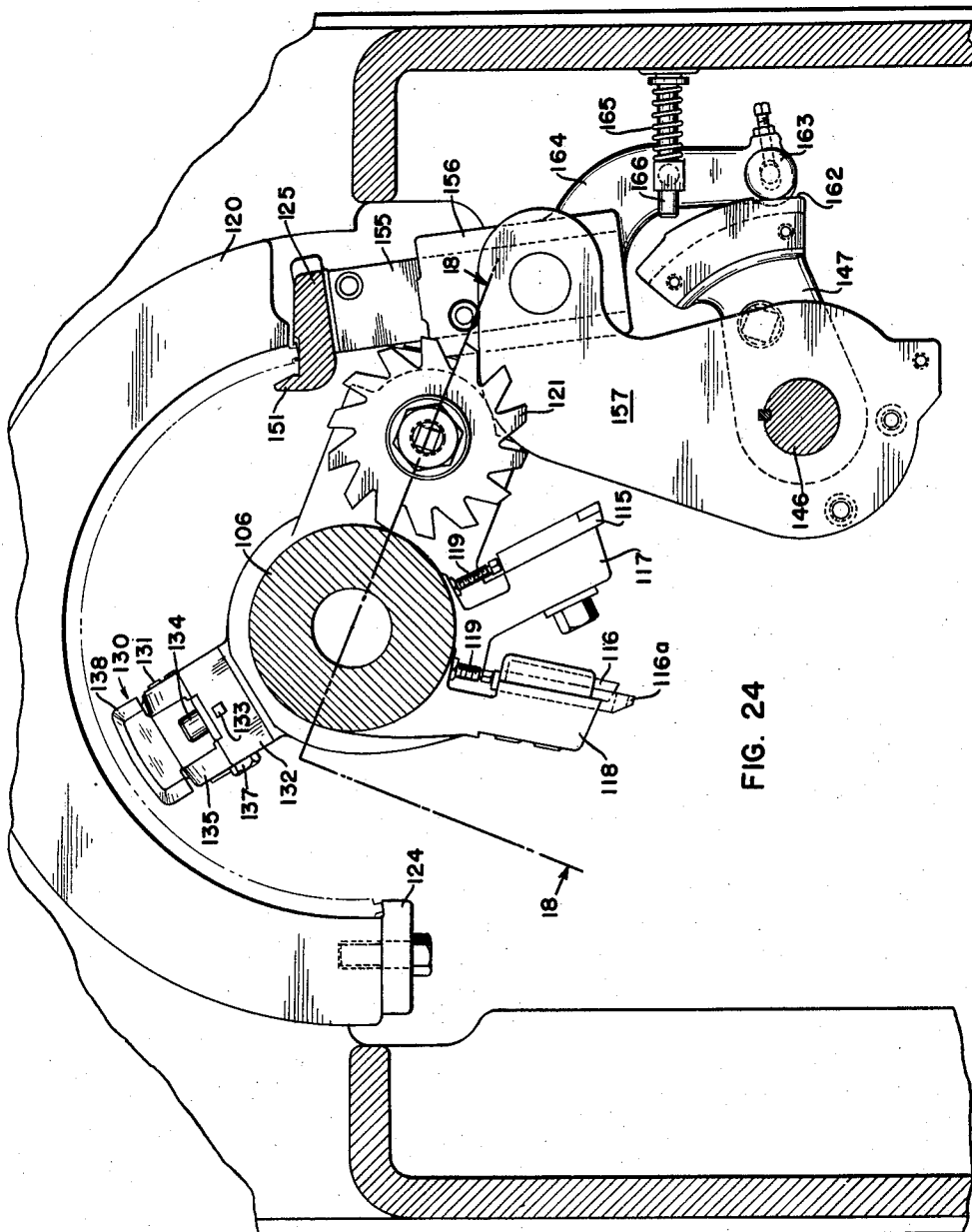
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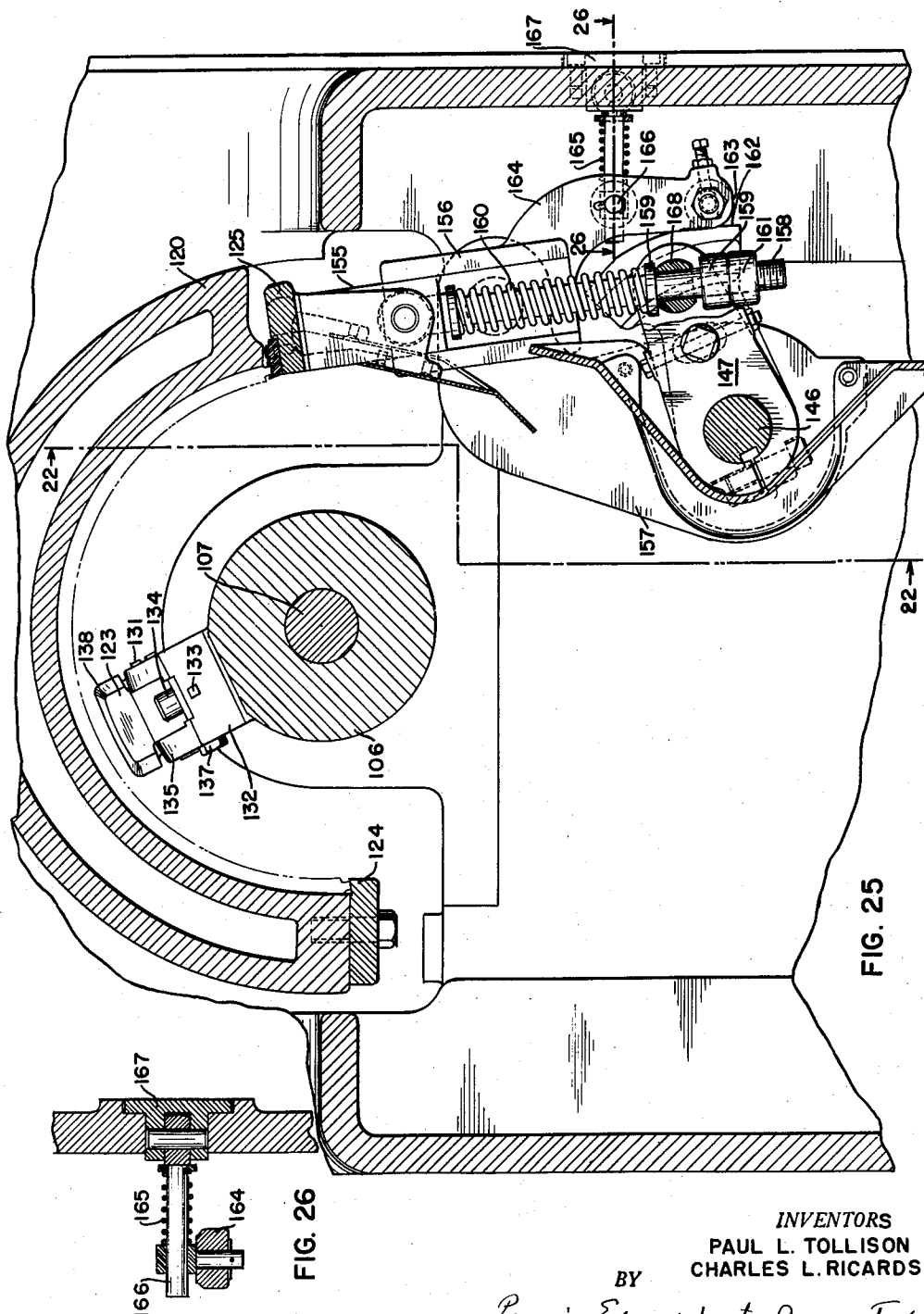


FIG. 25

FIG. 26

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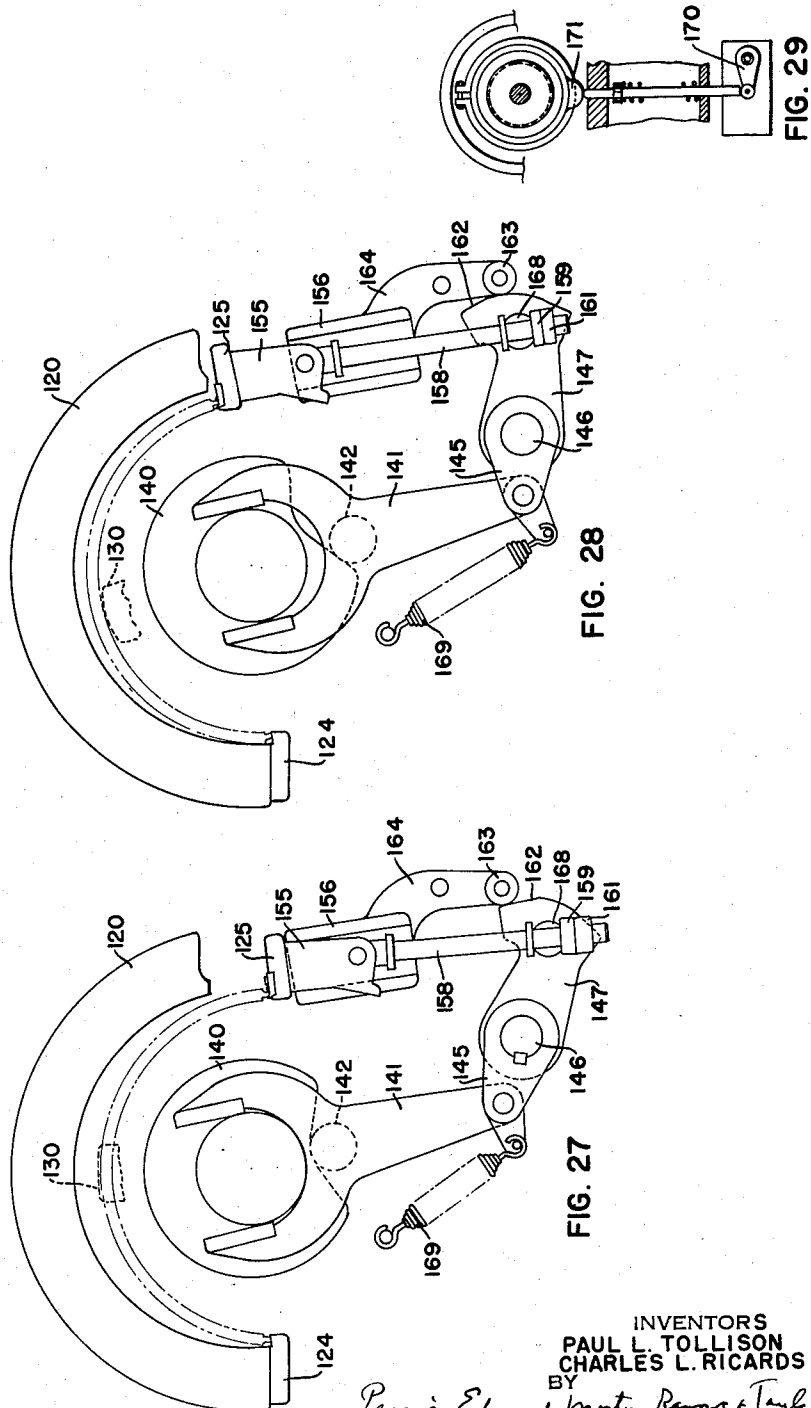
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MACHINE FOR CASTING PRINTING PLATES

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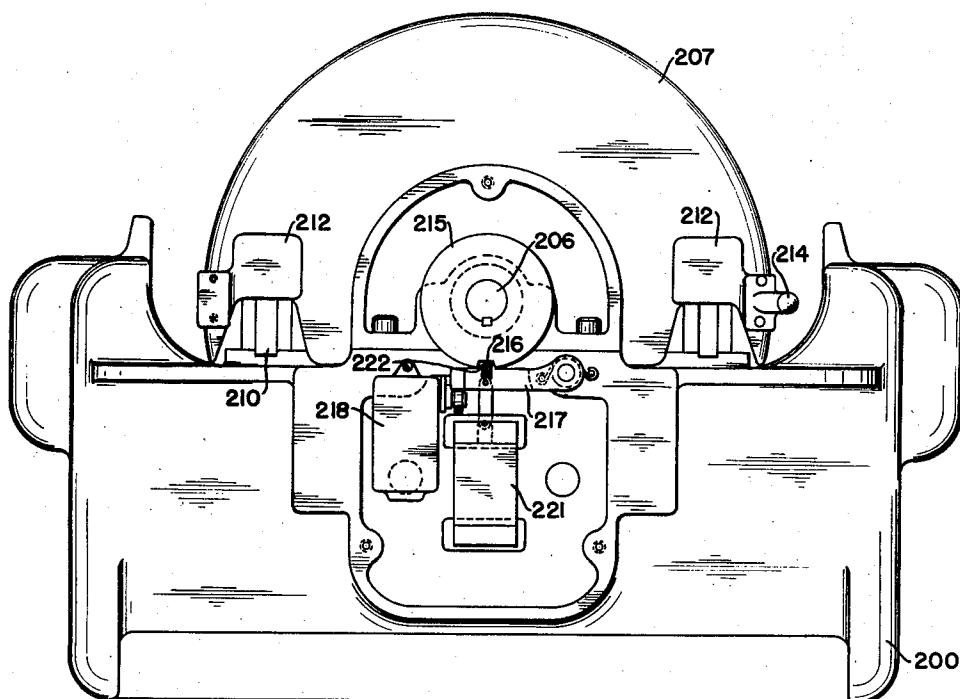


FIG. 30

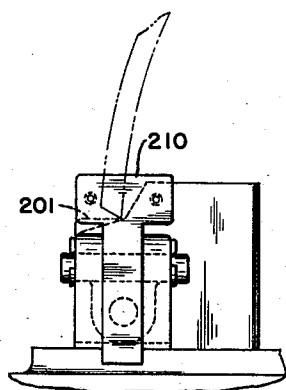


FIG. 31

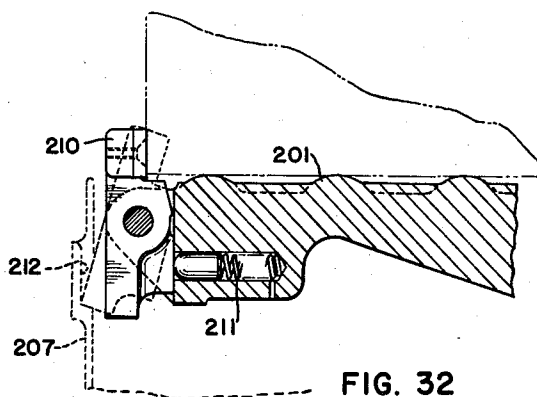


FIG. 32

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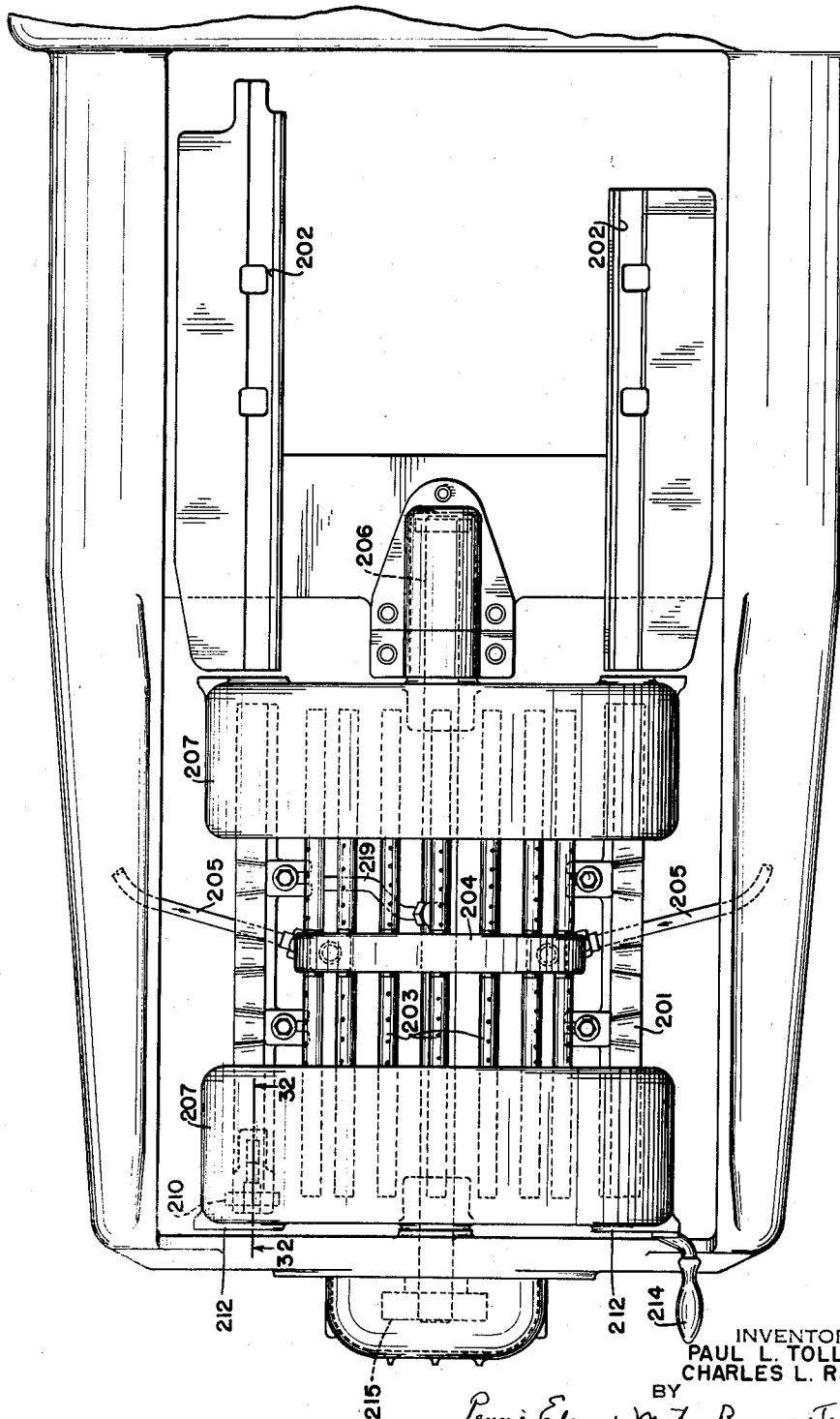


FIG. 33

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MACHINE FOR CASTING PRINTING PLATES

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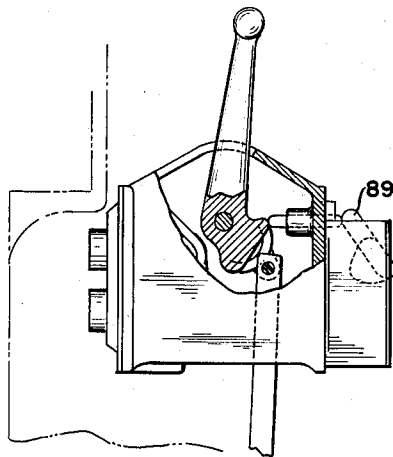


FIG. 34

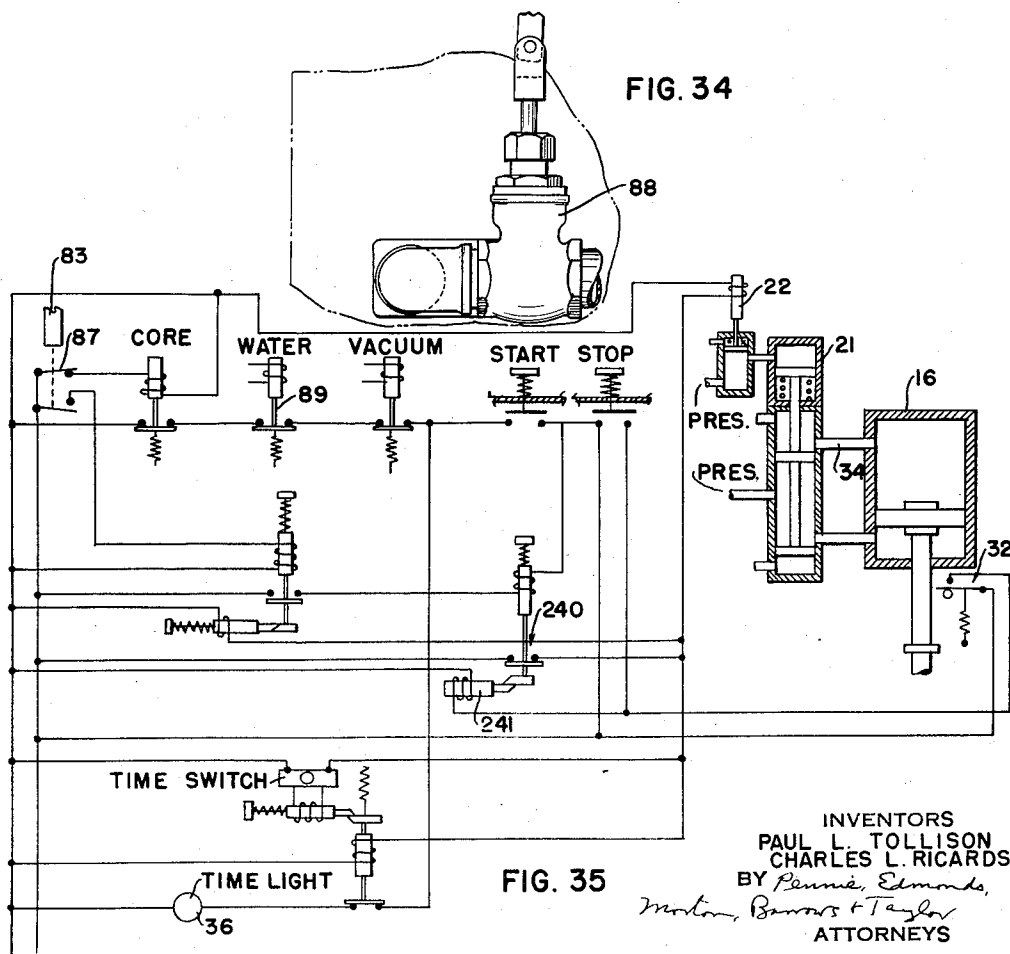


FIG. 35

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1

2,944,306

MACHINE FOR CASTING PRINTING PLATES

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Filed June 2, 1955, Ser. No. 512,822

15 Claims. (Cl. 22—3)

This application relates to machines for casting printing plates of the type wherein segmental cylindrical printing plates are cast against papier-mache matrices, trimmed to accurate size and exact thickness, properly grooved and beveled for attachment to the cylinders of the printing press and cooled.

The principal object of the invention is to provide a machine of this character of simple, compact design with the mechanisms for carrying out the several operations so co-ordinated that one operator can produce finished plates ready for use in a matter of seconds.

A further object to the invention is to provide a machine which is substantially automatic so that the several operations will take place in properly timed sequence without failure and with absolute accuracy even when the machine is operated by an inexperienced operator.

A further object of the invention is to provide a machine in which the various instrumentalities are so designed as to insure absolute safety to the operator, regardless of his inattention and failure to observe the customary precautions.

Other objects of the invention will be apparent from the accompanying drawings and following specification wherein a commercial model of the machine as now being manufactured and sold is shown and described in detail.

Referring to the drawings:

Fig. 1 is a plan view of the entire machine;

Fig. 2 is a side elevation of the entire machine;

Fig. 3 is a side elevation of the pneumatic metal pump, partially in section;

Fig. 4 is a side elevation looking from the left of Fig. 3 of the upper part of the pneumatic pump with parts broken away;

Fig. 5 is a detail view of a part of the pump operating connections and controls;

Fig. 6 is a plan view of the casting box;

Fig. 7 is an elevation of the parts shown in Fig. 6 looking from the left of Fig. 2;

Fig. 8 is a section along line 8—8 of Fig. 7;

Fig. 9 is a section along line 9—9 of Fig. 6;

Fig. 10 is a perspective of the nozzle and its wiper with parts omitted;

Fig. 11a is a longitudinal section of the casting section of the machine;

Fig. 11b is a continuation of Fig. 11a, showing the plate trimming and cooling sections;

Fig. 12 is a transverse section along line 12—12 of Fig. 11a with parts broken away;

Fig. 13 is a section along line 13—13 of Fig. 12, partially broken away;

Fig. 14 is a similar view along line 14—14 of Fig. 12;

Fig. 15 is a similar view along line 15—15 of Fig. 12;

Fig. 16 is a similar view along line 16—16 of Fig. 11a;

Fig. 17 is an enlarged detail view in section along line 17—17 of Fig. 16;

Fig. 18 is an enlarged longitudinal sectional view along the same plane as Figs. 11a and 11b showing the driving mechanism for the shaving and trimming knives;

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Fig. 19 is a detail view, partly in section, along line 19—19 of Fig. 18;

Fig. 20 is a detail view partly in section of the plate position stop;

Fig. 21 is a detail section along line 21—21 of Fig. 20;

Fig. 22 is a longitudinal section of the plate lifting mechanism along line 22—22 of Fig. 25;

Fig. 23 is a transverse section along line 23—23 of Fig. 22;

Fig. 24 is a transverse section along line 24—24 of Fig. 22;

Fig. 25 is a transverse section along line 25—25 of Fig. 22;

Fig. 26 is a sectional detail along line 26—26 of Fig. 25;

Figs. 27 and 28 are diagrammatic views showing the operations of the plate positioning mechanism;

Fig. 29 is a detail section on line 29—29 of Fig. 11a;

Fig. 30 is an end elevation of the plate cooling stand;

Fig. 31 is a fragmentary elevation of the plate stop device;

Fig. 32 is a section along line 32—32 of Fig. 33;

Fig. 33 is a plan view of the cooling stand;

Fig. 34 is a detail view of a portion of the control mechanism; and

Fig. 35 is a wiring diagram of the control mechanisms for the metal pump.

Referring to the drawings, particularly to Figs. 1—5, inclusive, the pump comprises a main casting 1 having at its lower end a cylinder 2 which is normally submerged in the molten metal in the furnace 3. The pump piston 4 consists of a metal disk whose outer perimeter is grooved as is customary in pumps of this character. The piston 4 is mounted on the piston rod 5 adjacent its end for limited lost motion above a disk 6 attached to the lower end of the piston rod. The disk 6 is provided with a marginal flange which is ground to seat against a flange 7 on the under side of the piston 4 surrounding holes 8. When the piston rod is elevated by the pneumatic operating mechanism which will be later described, the flange of the disk 6 seats against the flange 7 of the piston and lifts the piston in the cylinder, thereby forcing the molten metal upward through the discharge passage 9 which is cast integral with the cylinder 2. On the downward stroke the piston 4 is pushed away from the disk 6, allowing the metal to pass through the holes 8 into the cylinder.

The main casting 1 of the pump is fixedly attached to the under side of a bifurcated bracket 10 which projects rearwardly from the main frame casting 11 to which the stationary half of the mold 12 is fixedly attached.

For conveying the molten metal to the mold the passage 9 is provided with an extension 13 which extends upwardly between the two parts of the bifurcated bracket 10 and forwardly to a position immediately overlying the opening between the two halves of the mold, as shown more particularly in Figs. 7 and 8. As here shown the extension 13 is provided with a discharge spout 14 of arcuate configuration overlying the opening into the mold and with a pivoted cutoff lip 15 which normally closes the discharge spout when the mold is open but is swung back from beneath the discharge spout when the mold is closed and locked, as will be later described.

Referring again to Figs. 3, 4 and 5, the pump piston is actuated by compressed air supplied to a cylinder 16 supported at the upper end of the piston rod on a casting 17 fixedly mounted on top of the casting 1. The casting 17 is provided with a forwardly extending portion 18 upon which is mounted the valve mechanism and other parts for controlling the operation of the pump. The compressed air from a source, not shown, is supplied to the intake pipe 19 at approximately 90—100 pounds

pressure. The admission of air to the opposite sides of the piston of the pneumatic cylinder 16 is controlled by an electrically operated valve whose circuit is energized by the operator from the push button 20 mounted in the side wall of the main frame 11, as shown in Fig. 1. The control valve mechanism for the pneumatic cylinder is not shown in detail as it is of conventional design and forms no part of the present invention. Preferably the electrically operated valve controls a pilot motor which in turn operates the valve of the pneumatic cylinder as shown in Fig. 35 wherein the control circuit for the pump is shown diagrammatically. The pilot motor may however be omitted and the main pump valve 21 operated directly by the solenoid 22.

In order to regulate the speed of movement of the pump piston and consequently the rate of discharge of the molten metal, a pressure reducing valve 23 is positioned between the supply pipe 19 and the pressure inlet of the pump control valve 21. The pipes leading from the control valve 21 to the opposite ends of the cylinder 16 are also provided with regulating valves 24 whereby the pressure of the air admitted to the cylinder 16 and also the back pressure on the discharge of air from the other end of the cylinder may be accurately regulated to control the speed of movement of the piston 4.

The length of travel of the piston is also subject to exact regulation. For this purpose there is mounted in the housing 18 a shaft 25 on which is mounted for rotating movement a crank arm 26 whose bifurcated end embraces the piston rod 5 and is operatively connected thereto by pins 27 which extend into slots in the ends of the arm 26. Also mounted on the shaft 25 and fixed thereto is a member 28 which embraces the hub of the arm 26 and provides a lost motion connection between the arm 26 and shaft 25. The arm 26 moves the member 28 in its upward movement through a spring 33 which allows a limited continued movement of the arm 26 after the movement of the member 28 is stopped by an adjustable stop screw 29 carried by the frame portion 18. The member 28 is provided with a downward extension 30 in which is threaded a pin 31 positioned to engage the knob of a switch 32 mounted on the arm 26 and connected to the control circuit of the valve 21. When the member 28 engages the end of the stop screw 29 the continued upward movement of the arm 26 will cause the arm 32 of the switch to be turned to close the circuit through the switch, and through the holding coil of the push button circuit so that the control valve 21, under the influence of its spring, will be shifted to position to connect the pipe 34 leading to the upper end of the cylinder to the pressure supply to thereby move the piston downwardly. The initial downward movement of the piston rod opens the valve formed by the disk 6 and piston 4, thereby allowing the molten metal to flow into the cylinder through the ports 8, which movement continues until the piston is once more at its bottom position. At the initial downward movement of the piston 4 the circuit through the switch 32 is released by the expansion of spring 33 which shifts the stop 31 away from the knob of the spring.

By properly adjusting the stop screw 29 and the contact screw 31 the stroke of the piston rod 5 may be exactly timed to deliver at each operation the required quantity of metal for the plate to be cast.

The push button control includes a "stop" button in parallel with the switch 32 so that the operation may stop the movement of the piston before the end of its stroke as fixed by the adjustment of screw 29.

The circuit of the solenoid of valve 21 contains control relays, to be later described, whereby the solenoid cannot be energized until all parts of the machine are properly positioned for the pouring operation, and included in the circuit is a signal lamp 36 which lights when the push button circuit is fully closed and remains

lit until the casting has cooled sufficiently to be removed from the mold.

The casting section

The mold in which the plate is cast comprises movable and fixed sections. The fixed section 12 consists of a double walled casting of semi-cylindrical contour mounted in vertical position in the main frame casting 11, as shown more particularly in Figs. 11a and 15. The stationary mold proper is removably supported in the main frame casting by bolts not shown. Short pipe sections 40 set in the convex face of the mold section and projecting into holes in the front wall of the double walled rear section of the main frame 11 provide passages for the circulation of the cooling water from the mold section to the water compartment in the frame to which the discharge to the drain is connected. A pipe 41 leads upwardly within the double walled part of the frame 11 to a point adjacent the pipes 40, so that the water from the movable mold section will enter the frame compartment at the top and thus maintain a constant water level in the mold section. Thermostats 42 and 42a mounted respectively in the rear wall of the mold section 12 and the front wall of the movable mold section control the circulation of water through the cooling system (see Fig. 15).

The front face of the mold section 12 is double walled to provide a vacuum chamber 44 by means of which the papier-mache matrix is held firmly seated against the wall of the mold section. The front wall 45 of the double walled section is perforated throughout its lower half against which portion the matrix is seated, and the space 44 between the wall sections is connected through holes in the bottom wall of the mold section 12 with a vacuum manifold 46, see Fig. 11a, to which is connected an exhaust pipe 47 leading to a vacuum pump, not shown. The upper edge of the matrix is covered in the conventional manner by the lower edge of a pouring shield 50 which is suspended from hangers mounted on the stationary part 12 of the mold, which suspension is best shown in Figs. 7 and 8.

The shield consists of a semi-cylindrical piece of sheet metal conforming to the curvature of the fixed mold section and having its lower edge offset slightly, as customary, so as to overlap the upper edge of the matrix. As seen in Fig. 7 the upper edge of the sheet projects above the mold at the sides beyond the pouring spout and is suspended from hangers 52 at each side of the fixed mold section. These hangers 52 have bearings 53 at their lower ends in which are mounted pins 54 on which the pouring shield is supported at its upper edge. The pouring shield is held in place on its bearings by a 2-part sleeve 55 which is mounted on the projecting portion of the pin 54, the two parts being clamped in place on opposite sides of the pouring shield 50 by means of a nut 56 on the end of the pin 54. The pins 54 also have central bores in which are mounted springpressed bolts 57, which, when the mold is closed and the pouring shield in place, latches behind brackets 58 on the top of the movable mold section.

The two hangers 52 are supported for movement in unison by a shaft 59 mounted in fixed bearings carried by a support 60 mounted on top of the stationary mold section 12 and having a cross member 61 extending over the pouring nozzle 14. A spring 62 holds the brackets in latched position as shown in full lines in the drawings or in their fully elevated position as shown in dotted lines in Fig. 8, as the pivot to which the spring is attached passes from one side to the other of the supporting shaft 59 when the hangers are fully elevated. By this construction the pouring shield is normally held completely out of the way when the mold is opened and also held in proper position overlying the matrix when the mold is closed. A handle 65 is attached to one of the pins 54 (see Fig. 9), by means of which the operator may shift

the pouring shield to closed position after the matrix is in place.

The movable mold section is shown more particularly in Figs. 11a and 12. It comprises primarily a double walled casting 65 having water connections, indicated generally at 66, for circulating cooling water. When in closed position the weight of the movable mold sections rests on a semi-circular ring section 91, see Figs. 16 and 17, which is pivoted at its ends on shafts 92 at the upper ends of brackets 67 fixed to the main frame. The ring section 91 is supported at its outer edge by lugs 99 attached to the face of the fixed mold section as will be later described. The movable mold section is provided with rollers 70 projecting from its opposite sides (see Fig. 12) and running on tracks 71 carried by the machine frame intermediate the mold and the trimming section of the machine.

The movable mold section is turned from vertical closed position to horizontal open position by means of a handle 73 mounted on the rear face of the movable mold section (see Fig. 12) and serving also to operate the locking bars 75 which serve to lock the two mold sections firmly together for the molding operation. The locking bars 75 extend along the vertical edges of the semi-cylindrical double walled casting 65 and are supported for lateral movement in recesses 76 in the adjacent faces of the castings 77 which carry the brackets 78 for the supporting rollers 70. The castings 77 extend below the casting 65 and provide hangers 79 for a shaft 68. A pair of arms 80 are connected to the shaft 68 and extend rearwardly to fixed pivots 89 on the main frame of the machine. The arms 80 control the path of movement of mold section as it is swung from closed vertical position to its open position to bring the plate in line with the plate receiving guides of the trimming section.

The locking bars 75 are shifted inwardly by the downward movement of the handle 73 to release the locking bars from engagement behind the lugs 81 bolted to the adjacent edges of the fixed mold section. As shown in Fig. 12, there are three lugs 81 along each side edge of the movable mold section which lugs serve also to hold in place clanking bars 82, between which and the locking bars 75 the edges of the matrix is clamped when the mold is closed and locked. As will be noted in Fig. 14, the recesses in which the bars 82 are supported are so shaped that they have a limited turning movement about their vertical axes when the mold sections are separated to allow the edges of the freshly cast plate to move away from the fixed mold section without injury.

The locking bars 75 are moved in unison by means of a toggle mechanism comprising a bar 83 mounted for sliding movement in guides 84 near the upper and lower ends of the movable mold section, and links 85 connecting the bar 83 with the locking bars 75. As shown in Fig. 13, the hub of one of the links 85 is extended rearwardly to and provided with a divided socket 86 in which the end of the handle 73 is fixed. Downward movement of the handle 73 will first lift the bar 83 thereby withdrawing the locking bars 75 from engagement with the lugs 81 and will then move the top of the movable mold section backward and downward about the axis of the rollers 70 while the bottom of the mold section moves upward in a path defined by the shaft 68. The resultant movement serves to position the movable mold section in horizontal instead of vertical position and at an elevation such that the freshly made casting is in line with the supports for the casting in the trimming section.

As described above, the bottom wall of the mold is formed of a separate ring section 90 carried by an arcuate support 91 (see Figs. 16 and 17), which is pivoted at its ends on stub shafts 92 mounted in fixed bearings 93 so positioned that the shafts 92 are in substantial alignment with the shaft 68 when the mold is closed.

To assist in separating the mold sections after the casting has solidified and cooled sufficiently to be handled

a pedal 94 is provided (see Fig. 1) attached to the end of a cross shaft 95 supported in the machine frame at a point for the pedal to be conveniently stepped on by the operator when operating the handle 73 to open the mold. The shaft 95 extends across the machine frame and at its middle point is provided with a crank arm 96 connected by a link 97 depending from the arcuate support 91 to which is attached the ring section 90, which forms the bottom of the mold. The bottom section 90 of the mold is not rigidly attached to the support 91 but as shown in Fig. 17 is connected thereto by pins 98 on the support 90, which pins fit loosely in holes adjacent the bottom edge of the ring section 90, whereby the part 90 may move relatively to the support, both vertically and horizontally. The part 90 is vertically positioned by lugs 99 attached to the rigid mold section adjacent its bottom edge.

When the operator steps on the pedal 94 the upward movement of the support 91 lifts the movable mold section at its forward end, thereby causing it to turn about the axis of the shaft 68, the rollers 70 moving backward on their tracks 71. The operator at the same time, through the handle 73, shifts the upper portion of the movable mold section backward and downward, thereby causing the section to move bodily backward with the rollers along their tracks while at the same time turning from vertical to horizontal position. The upward movement of the front bottom corner of the mold section, by means of the pedal 94, is of sufficient amplitude for the further movement of the mold section after the support 91 reaches the limit of its upward movement, to be largely a pivotal movement about the axis of the rollers 70 in which movement the downward movement of the upper part of the mold section in large measure counterbalances the upward movement of the lower section.

The pouring plate 50 is moved away from the stationary mold section when the mold sections are separated by the pins 57 which project behind the brackets 58 attached to the upper face of the movable mold sections, as shown more particularly in Fig. 6. As the mold sections are separated at their upper edges the brackets 58 through the pins 57 cause the supporting hangers 52 to turn clockwise about the axes of shaft 59, thereby swinging the pouring plate with the movable mold section and the freshly cast plate. As the opening movement of the movable mold section continues the pins 57 will move upwardly due to their connection with the hangers 52 while the upper part of the mold section turns downwardly about the axes of rollers 70. The pins 57 and the brackets 58 therefore, move out of contact with each other. The parts are so positioned, however, that when the pins 57 are no longer engaged by the brackets 58 the hangers 52 will have been swung backward far enough for the pin to which the spring 62 is connected to pass beyond the center of the supporting shaft 59 so that the spring will thereafter lift the pouring plate as the opening movement of the mold continues to the position shown in dotted lines in Fig. 8.

The movement of the pouring plate also serves to control the movement of the cut off lip 15 of the pouring spout. As shown in Fig. 8, cut off lip 15 is provided with forwardly extending arms 15a at each side, which arms are positioned to engage the brackets 58 attached to the upper face of the movable mold section, so that as the mold section is separated the cutoff lip 15 will swing of its own weight under the pouring spout 14 and prevent dripping of the metal from the pouring spout.

The rear face of the movable mold section is provided with a removable cover 100 and also with side bearing plates 101 which serve as rests for the movable mold section when in open position. The plates 101 in this position are in line with tracks 102 forming part of the machine frame adjacent the driving motor 103. As will be noted in Fig. 14, the bearing plates 101 are attached to the side faces of the castings 77 by shouldered pins 104 working in slots in the bearing plates. The edges of

the bearing plates are aligned with the edges of the cast plate, so that when the movable mold section is turned to horizontal position the plates 101 will engage the machine frame and as the mold section continues to move downwardly will lift the cast plate and the overlying matrix from the mold section.

Carried by the fixed mold section are a pair of matrix positioning plates 105 (see Figs. 12 and 15), which are manually adjustable toward and from the edges of the mold to engage the edges of the matrix and hold the matrix in position until the movable mold section is closed and the edges of the matrix clamped between the locking bars 75 and the bars 82 at the edges of the fixed mold section.

The lamp 36 will remain lighted until a predetermined time has elapsed after the push button 20 is pressed to effect the pouring of the metal. The duration of the time interval may be varied by adjusting a time switch in the push button circuit, as will be later described, to allow the cast plate to solidify and cool to the desired extent before the lamp is cut-off. When the light goes out the operator turns the movable mold section to horizontal position, removes the matrix from the cast plate and shifts the plate which has been lifted away from the face of the mold section, into the shaving and trimming section which will now be described.

The shaving and trimming mechanism

The plate shaving and trimming mechanism is shown in Fig. 11b and Figs. 18 to 29, inclusive. This mechanism consists essentially of an over-hanging arch of accurate dimensions against which the printing plate is fitted and held to insure its accurate trimming, and means for holding the casting against the overlying form while the shaving knives and trimming cutter operates to shave the underside of the casting and trim off the surplus metal at the top end of the casting.

The motor 193 for rotating the shaving and trimming knives, and operating the plate positioned devices, as shown in Figs. 11a and 18 drives through a conventional belt drive, the main shaft 106 which carries the shaving and trimming knives and operates the plate positioning devices, also a shaft 107 which extends through the center of the main shaft 106 and serves, through a gear 108 to rotate the trimming knife on its own axis as it is carried around in contact with the cast plate by the rotation of the main shaft 106.

The main shaft 106 is driven through a double reduction gear comprising a worm 109 on the end of the stub shaft carrying the driving pulley 110, which worm meshes with a worm wheel 111 on the end of a stub shaft 112 supported in hangers transversely of the main frame and beneath the main shaft 106. The stub shaft 112 is formed with a worm 113 which meshes with a worm wheel 114 keyed to the main shaft, thereby effecting the continuous rotation of the main shaft whenever the driving motor is in operation at a greatly reduced speed.

Fixedly attached to the main shaft 106 are the two shaving knives 115 and 116 which extend longitudinally of the main shaft and are supported as shown more particularly in Fig. 24 by radially extending bars 117 and 118, respectively. The knives are mounted on the bars for radial adjustment through threaded stops 119 and suitable clamping bolts. The shaving knife 115 is set with its edge spaced away from the overhanging semi-cylindrical casting 120 which serves as the back for the plate by a distance somewhat greater than the desired thickness of the plate so as to first effect a coarse shaving operation while the knife 116 is accurately positioned to obtain exact thickness. The knife 116 also carries a bevelling tool 116a.

The rotary cutter 121 for cutting off the surplus metal at the upper end of the plate, which in the horizontal position of the plate is at the far end of the backing arch

120, is also carried by the main shaft and is rotated on its own axis from the inner shaft 107 through the gearing 108 and an idler gear meshing with a pinion 122 on the shaft of the cutter 121 as shown more particularly in Fig. 18.

The main driving shaft 106 makes one complete revolution for each trimming operation and in its stationary position, the shaving knives and the cutter project downward from the under side of the shaft while the plate positioning member 130 is projecting radially upward, as shown in dotted lines in Figs. 24 and 27 in position to be engaged by the plate when it is shifted by the operator from the supporting bars 102 alongside the movable mold section to the supporting tracks 124 and 125 by which the plate is held during the shaving and trimming operation. The track 124 is fixedly attached to the under-surface of the arcuate plate backing member 120 and its plate supporting surface is substantially in line with the bars 102 upon which the plate is supported when the movable mold section is open to its horizontal position. The other plate supporting member 125 is mounted for both vertical and horizontal movement in order to hold the plate firmly against the backing member 120 and under the desired pressure. The plate positioning device is shown in detail in Figs. 20 and 21 and, as here shown comprises the upstanding guide member 130 supported for turning movement on a pin 131 carried by a bracket 132 mounted on and extending transversely of the main shaft 106. The bracket 132 is rigidly clamped against the main shaft 106 and is provided with means by which the position of the bracket may be accurately adjusted longitudinally of the main shaft. This means, as shown, comprises an adjusting screw 133 extending through the rear transverse web of the bracket 132, which screw bears against one of the clamping bolts 134 by which the bracket is clamped to the shaft. The shaft 131 is carried by ears 135 extending forwardly from the bracket 132 and is surrounded by a coil spring 136 which serves to normally hold the positioning member 130 in upright position with its plate engaging face normal to the axis of rotation of the main shaft, in which position it is held by a stop pin 137 working in an arcuate recess in the hub of the member 130. By this construction the positioning member 130 can turn downwardly when the plate is shifted into the cutting and trimming section, and will then spring back into the vertical position shown when the trailing edge of the plate clears the member 130. In operation the plate is pushed beyond the positioning member and is then shifted back by the operator until its trailing edge contacts the vertical surface of the plate. After the plate is so positioned with its trailing edge, that is, the edge which was the bottom edge in the casting operation, the motor is started by push button control, turning the main driving shaft 106 in a counter-clockwise direction as shown in Fig. 24. The first operation performed by the rotation of the main shaft is the longitudinal readjustment of the plate in the arch 120. This is accomplished by the relative movement of the guide 130 and the plate, which at the time the plate is pulled back against the member 130, occupy the relative position shown in Fig. 27. The edge of the plate in contact with the guide 130 is V-shaped and consequently when the operator pushes the plate back against the guide 130 the edge of the plate will be more or less flattened by its contact with the guide so that the position of the plate in the housing will vary slightly depending on the force with which the plate is pushed against the guide. This force cannot of course be regulated and consequently the guide 130 is shaped to position the plate by the relative movement of the guide and plate at the beginning of the rotation of the main shaft 106. To this end the side edges of the guide 130 are beveled as shown at 138 in Fig. 20, so that upon relative lateral movement of the plate and guide the plate will be shifted toward

the rear of the machine to the extent that the edge of the plate has been flattened by its impact against the guide. This final adjustment of the plate occurs before the movement of the lock up mechanism is initiated by its cam so that when the plate is finally locked in position for shaving and trimming it will be accurately positioned with respect to the shaving and trimming knives.

The lock up movement of the movable support for the edge of the plate is effected by a cam 140 on the main shaft through the medium of a yoke 141 having a roller 142 which bears on the cam 140. The yoke 141 embraces the main shaft 106, as shown, to maintain the axis of the cam roller in parallelism with the axis of the main shaft. The end of the arm yoke 141 is attached to a crank arm 145 keyed to a shaft 146 supported in fixed bearings in the machine frame. Also attached to the shaft 146, as shown more particularly in Figs. 27 and 28, are two crank arms 147 to the outer ends of which are pivoted rods 158 which support the movable plate supporting track 125 by means of which the plate is elevated from the position shown in Fig. 27 to its position in close contact with the underface of the backing arch 120. The two arms 147 are attached to the shaft 146 at longitudinally separated points to thereby support the movable guide 125 at each end. The mechanisms at each end of the movable guide whereby the guide is moved upwardly and outwardly are identical in design and operation and only one such mechanism will therefore be described.

As shown in Fig. 25, the support 125 consists of a longitudinally extending bar along whose top inner edge is attached a wear plate shaped to fit the edge of the casting but with its inner face at a greater radial distance from the center of the main shaft than the inner face of the plate so that the shaving knives will clear the guide bar 125 in their operation. In order to guide the casting onto the bar 125 it is formed at its front end beyond the path of movement of the shaving knives with an upstanding lip 151. The bar 125 is supported at each end on depending bars 155 of rectangular cross section, mounted in guides 156, which guides are mounted for pivotal movement on arms 157 also supported on the shaft 146. Depending from the bars 155 are rods 158 which at their lower ends extend through pivot pins 168 carried at the ends of the crank arms 147. A spring 160 surrounds the rod 158 between a collar 159 and a fixed collar at the end of the rod adjacent the block 155 and nuts 161 are threaded on the lower end of the rod, the construction being such that counterclockwise movement of the shaft 146 through the agency of the cam 142 will move the bar 125 upwardly in a path determined by the pivotally supported guide 156 and with a pressure determined by the tension of the spring 160 and the extent of movement of the arms 147 after the upward movement of the plate has been stopped by the contact of the casting with the arch 120.

As stated above, the movement of the bar 125 is both upward and outward, the outward movement being effected by tilting the guide 156 about its own axis, during which movement the rod 158 is free to turn about the axis of the pivot 168 while it is also moving upward due to the counterclockwise turning of the arms 147. The outward movement of the guide 156 is accomplished by cams 162 also carried by the shaft 146 alongside the arms 147 to which the cams 162 are attached by connections which permit their relative angular adjustment, as shown more particularly in Fig. 25. The cam face of the cam 162 presses against a roller 163 in the end of an arm 164 fixed to and depending from the guide 156. The cam roller 163 is pressed against the cam surface by a spring 165 carried by a link 166 which is attached to the arm 164 at one end and connected to the main frame of the machine at its other end. For convenience of assembling, the pin 166 is attached to a block 167 which is inset in the side wall of the machine

frame and removable from the outside, as shown. As will be apparent from the above, the bar 125 will be elevated from the position shown in Fig. 27 to the position shown in Fig. 28 by the initial movement of the cam 147 in a counterclockwise direction, during which movement the angle of the guide 156 remains substantially the same due to the shape of the cam 162. When, however, the bar reaches the position shown in Fig. 28, the roller 163 moves inwardly toward the shaft 146 due to the shape of the cam 162, thereby turning the guide about its supporting pivot in the end of the arm 157 so as to shift the bar 125 outwardly away from the main shaft 106 so that when the plate is brought against the backing arch 120 the final angular movement of the cam 162 as the cam follower of the main actuating cam 140 reaches the concentric portion of the cam, will turn the guide 156 about its pivot at the end of cam 164 so that the lip of the wear plate on the bar 125 will be pressed against the grooved edge of the casting and be clear of the shaving knives. This last final outward movement of the guide 156 is also accomplished by spring pressure, that is to say, the spring 165 turns the arm 164 in its clockwise direction to the extent permitted by the cam 162 or the lip of the wear plate and by properly shaping the cam 162 the roller will be out of contact with the cam at the end of the cam's movement. By this construction the plate is held upward against the backing arch by the pressure of the spring 160 and the lip of the guide plate 125 is held against the edge of the casting by the pressure of the spring 165.

The cam 140 is so positioned on the main shaft that the final positioning of the casting is accomplished before the shaving and trimming knives contact the plate. Fig. 24 shows the position of the shaving knives and edge cutter at the point in the revolution of its cam 140 where the casting has been firmly clamped in place. During the continued rotation of the main shaft the cam 140 holds the crank arm in its downward position, the concentric portion of the cam being of such extent that the shaving and trimming operation is completed before the plate is released.

After the shaving knife 116 clears the lower edge of the plate at the conclusion of its shaving operation the cut away portion of the cam 140 contacts the roller of the arm 141, allowing the arm to be elevated by its spring 169, turning the shaft 146 in a clockwise direction to thereby lower the bar 125 and with it the trimmed and shaved casting. When the roller reaches the innermost point on the cut away portion of the cam 140 the motor is stopped by means of a stop switch 170 controlled by a timing cam 171 attached to the main shaft. The cast plate is now sufficiently below the back arch to be conveniently grasped by the operator and shifted to the cooling section.

The cooling section

The cooling section is illustrated primarily in Fig. 11b and Figs. 30-33. The cooling section proper is carried by a subframe 200 which is bolted onto the end of the main frame, as shown in Fig. 11b. The subframe 200 is formed on each side with tracks or ledges 201 for supporting the casting during the cooling operation, which tracks are in line with tracks 202 fixed to the opposite sides of the main frame beyond the backing arch 120 as shown more particularly in Fig. 33.

The cooling mechanism proper comprises a series of spray pipes 203 extending in opposite directions from a middle manifold 204 which is fixedly supported by the subframe 200 at a point about midway the length of the casting when resting on the tracks 201 to which it is shifted by the operator. The manifold 204 is of arcuate shape and is supplied with water under pressure through pipes 205 leading to the opposite ends of the manifold and with air from the compressed air supply through pipe 219.

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Supported beneath the manifold and at a position corresponding with the axis of curvature of the plate when supported on the tracks 201 is a rotary shaft 206 to which shaft semicircular cover sections 207 are fixedly attached at their respective axes of curvature, the two cover sections being of a shape to surround the ends of the casting and the spray pipes 203 when the cover sections are in their upright positions shown in the drawing. The shaft 206 has at one end a coiled spring 203 which is fastened at one end to the shaft and at its other end to the shaft bearing in such manner as to bias the shaft in a counterclockwise direction when viewed from the end of the machine as shown in Fig. 30. Attached to the cover section 207 at the end of the machine is a handle 214 by means of which the shaft 206 may be turned against the tension of the spring 203 to turn the cover sections 207 from a position beneath the shaft 206 after the casting is shifted from the trimming section into the cooling section of the machine for the final cooling operation.

The handle 214 is detachable and bolts are provided at the opposite side of the cover section to which it may be attached if the machine is not able to be operated from that side. When the handle is shifted an oppositely wound spring is substituted for spring 203 to bias the cover in a clockwise direction. In order to prevent the cover being shifted to cover the plate until the plate is properly positioned in the cooling section, a locking means for the cover is provided as shown in Figs. 31 and 32. This locking means comprises two trips 210, which serve as stops for the plate when it is shifted into the cooling section. The trips 210 are pivoted at the opposite sides of the end section of the subframe 200 in position to be engaged by the end of the casting when the latter is shifted by the operator into position overlying the cooling pipes. One of the trips 210 depending on the side to which the handle 214 is attached is normally biased by a spring 211, see Fig. 32, in a direction for its lower end to extend outwardly into the path of movement of the cover section 207 when the latter is turned to its underlying position to which it is adjusted to permit the casting to be placed in the cooling section. The cover section 207 is provided with an offset portion 212 which is engaged by the lower edge of the trip 210 when there is no plate properly positioned on the tracks 201.

The operator therefore has to properly position the plate before the cover can be turned to enclose the plate for the cooling operation.

The position of the cover controls the water supply and means are provided, as shown in Fig. 30, whereby the water cannot be turned on unless the cover is closed. This cut-off mechanism comprises a disk 215 attached to the end of the shaft 206 and provided with a notch 216 positioned to be beneath the shaft 206 when the cover is in closed position. A latch 217 engages a notch in the disk when the cover is closed to hold the cover against opening until the cooling cycle is completed. Mounted on the end of the machine frame adjacent the end of latch 217 is a switch 218 whose movable member projects beneath the end of the latch 217. The switch 218 starts the cycle of a timing motor, which controls the supply of air and water to the pipes 205 and 219 respectively connected to the manifold 204 of the spray pipes 203. This mechanism is not shown as it forms no part of the present invention but it will be understood that the water and air are alternately supplied to the manifold for predetermined intervals which may be varied as desired by adjusting the contacts of the timing motor. The upward movement of the latch into the notch of the disk 215 when the cover is closed closes the switch 218 and initiates the cooling cycle.

Also attached to the latch 217 is the core of a solenoid 221 which is energized by the timing clock of the cooling system, after the final water spraying, to release the latch, permitting the cover 207 to be opened by the

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spring 208. The air supply may be left on a few seconds after the cover opens to facilitate the final drying of the plate. Also attached to the latch 217 is a handle 222 by means of which the operator may release the latch and allow the cover to open.

When the plate is removed from the cooling section the trip 210 is pressed outwardly by its spring 211 thereby locking the cover in open position until the next plate is properly positioned over the spray pipes.

Operation

It will be assumed that power has been supplied to the circuits of the several units, that the casting box is open with the core in horizontal position and a matrix available. The pouring shield is in its elevated position in which it is held by the spring 62. The operator places the matrix in position against the concave wall of the casting box with its lower edge supported on the curved bar as shown in Fig. 17.

The side edges of the matrix are positioned by the plates 105 on the casting box, Fig. 12, and the vacuum pump started to exhaust the air from the vacuum chamber back of the perforated wall of the casting box to hold the matrix during the casting operation. The relay marked "vacuum" in Fig. 35 is energized when the vacuum is supplied to the vacuum chamber and closes the switch in the line to the control solenoid of the valve 21 of the cylinder 16 of the metal pump. This switch will not close until the matrix is in position because the sub-atmospheric pressure required to operate the control valve which closes the circuit through the relay will not be attained until the perforated face of the mold section is covered by the matrix.

The pouring shield is lowered by means of the handle 65, Fig. 12 and held in position by spring 62. The core box is then closed and locked by means of handle 73. When the core box is locked, bar 83, Fig. 12, closes switch 87 at the bottom of the core of the casting box energizing the relay marked "core" in Fig. 35.

The operator now opens the main water valve 83 in Fig. 34, at the same time closing the switch 89 which energizes the relay marked "water" in Fig. 35, thereby completing the circuit to the starting button 20. The machine is now ready for the casting operation. Upon pressing the starting button the solenoid of switch 240 is energized, lifting the switch to the position shown in Fig. 35 and closing the circuit through the control solenoid 22 of the valve 21 thereby connecting the air pressure line to the bottom end of cylinder 16 and the upper end to the exhaust point at the upper end of the valve cylinder. The pump piston commences its upward movement forcing the molten metal through the pipes to the discharge spout whence it flows into the casting box. The switch 240 is held in closed position by the latch 241.

Closing the switch 240 also closes the circuit through the solenoid of the switch of lamp 36 and energizes the motor of the time switch which controls the latch of the lamp switch.

When the pump piston has moved upwardly through the desired distance as determined by the adjustment of stop 29, switch 32 will be closed releasing latch of switch 240 and deenergizing solenoid 22. The valve 21 will then be lifted by its spring to connect the upper end of cylinder 16 with the pressure supply and the lower end with the exhaust thereby stopping the discharge of metal and causing the piston 5 to move downwardly in its cylinder, during which movement the molten metal will flow through the ports 8 in the piston.

The lamp 36 will remain lighted until the time switch opens indicating that the plate is ready to be removed from the casting box. The time switch is adjustable so that the cooling time may be regulated as desired.

The cooling of the casting box is also regulated by valves, not shown, which are controlled by the thermostats 42, 42a to maintain the water in the casting box

and core at the desired temperatures for which the thermostats are set. By the combined time and temperature adjustment an exact regulation of the cooling of the casting is retained.

When the lamp 36 is turned off by the time switch the operator opens the casting box and turns the core back to horizontal position in the manner above described after first pressing down on the handle 73 to lift the bar 83 and thereby withdraw the locking bar 75 and release the core section. As explained, the operator initiates the opening of the casting box by stepping on the pedal 94 to thereby elevate the lower front portion of the core while the upper part is moved rearwardly and turned about the axis of the roller 70. The movement of the locking bar 83 opens the switch 87, thereby de-energizing the relay marked "Core" in the circuit of the push button 20 so that the metal pump cannot be again operated until the core box is closed. As the core box is opened the brackets 58 on top of the core box, by engagement with the pins 57, swing the arms 52 forwardly, thereby lifting the pouring shield away from the matrix, at the same time lifting the pouring shield from between the matrix and the core so that the matrix will remain in position on the plate and will not be disturbed as the core is opened. The initial opening movement of the core also closes a switch not shown which cuts off the vacuum pump from the vacuum chamber at the lower ends of the casting box, thereby leaving the matrix free to move with the plate and the core to horizontal position. As the core approaches the horizontal position the rails 101 at the side contact the machine frame on opposite sides of the driving motor 103 and are held against further movement with the core to thereby lift the cast plate away from the core.

The operator removes the matrix from the plate and shifts the plate into the trimming section beneath the arch 120. At this time the stationary track 124 and movable track 125 are in line with the bars 102 on which the edges of the plate are resting and the stop 130 for the bottom edge of the plate is in the position shown in dotted lines in Fig. 27. As the plate is pushed back by the operator from the bars 102 to the supports 124 and 125 it is shifted a sufficient distance to clear the part 130 so that the part 130 will swing back to vertical position. The operator then pulls the plate back against the stop before pressing the start button 231 for the driving motor.

As described above, the first operation effected by the rotation of the main shaft 106 is to oscillate the shaft 146 through which the movable plate supporting bar 125 is elevated and shifted outwardly to press the plate against the arch 120. During this portion of the rotation of the main shaft 106 the stop 130 which is mounted on the main shaft moves transversely with respect to the plate and thereby serves to shift the plate backward slightly if the operator has moved the plate against the stop with sufficient force to indent the relatively soft metal of the plate. In this way the edge of the plate which is formed at the bottom of the casting is positioned with great accuracy in the trimming arch so that the plates will always be cut to precisely accurate dimensions.

By the time the trimming and shaving knives contact the edge of the plate and commence their cutting and shaving operations the plate will be correctly positioned against the under side of the arch 120 of the trimming section and there held under the pressure of the spring 160 which, as explained above, can be adjusted within fairly wide limits.

After the main shaft has completed its one rotation the cut off switch 170 is operated to stop the driving motor 103 and, as explained above, the cam 140 is so shaped that the plate is properly positioned in the arch before it is engaged by the shaving and trimming knives and there held until the shaving and trimming operation is com-

plete and thereafter lowered out of engagement with the shaving knife and in position to be shifted by the operator into the cooling section of the machine before the one revolution of the main shaft is completed. In normal operation the driving motor 103 is stopped by the one revolution switch through cam 171, but a stop button 232 is connected in parallel with the switch of cam 171 so that the operator may stop the motor at any time should the occasion arise.

After the trimming operation is complete the plate is shifted by the operator, this time from the supporting bars 124, 125 onto the stationary supporting rails of the cooling section. As described above, the cover of the cooling section is held in open position by latches 210 which are released by the movement of the plate in proper position into the cooling section and thereafter serve as stops for properly positioning the plate with regard to the cooling sprays.

When the valves 210 are released the cover section is closed by the operation against the tension of spring 208. At the conclusion of its closing movement latch 217 engages the notch in the disk 215 to hold the cover in closed position until the cooling operation is complete. The movement of the latch also closes the switch 218 which initiates the cooling cycle. At the conclusion of the cooling cycle the latch 217 is released so that the cover may open and the plate removed, leaving all parts of the machine in position for a second casting operation.

Among the important novel features of our improved plate casting machine is the co-ordination of the metal pouring mechanism with the mold and its adjuncts whereby the metal cannot be poured until all parts of the mold and its cooling system are ready for the pouring operation, including the proper positioning of the matrix. No matter how careless the operator, he cannot make a second pour until the mold has been opened, the plate removed, the matrix repositioned, the core closed, and the water circulating system functioning. This is of primary importance because of the injury which might result from the hot metal from inopportune or improper pouring.

The other portions of the machine, namely, the trimming and cooling sections, are also provided with other individual safeguards to prevent operation of their respective parts when the plate is not properly positioned for operation.

An important feature of the invention is the mounting of the metal pump solely on the frame of the casting machine, and with no connection to the metal furnace. The pump is so designed that it may be positioned at any angle around the arcuate opening of the mold, and by providing middle sections on the spout of different lengths the pumps can be set in furnaces on either side of the machine and at varying distances from the machine. Regardless of the distance of the pump from the machine, it is controlled from push buttons on the machine frame adjacent the core locking handle so that the operator can without changing position prepare the mold for the casting operation, pour the metal and complete the casting.

As will be noted the plate supporting rails are in the same horizontal plane throughout the entire length of the machine. By this arrangement the cast plate is shifted manually from one position to another without having to be lifted. This arrangement has practical advantages over previous machines wherein the plate is lifted from position to position and also over automatic machines having mechanical plate handling devices. Plate shifting and lifting devices are not altogether satisfactory for the reason that the soft metal of the plate is quite liable to damage in such operation, whereas with our improved arrangement the plate is manually shifted from position to position with but little effort and quite as rapidly as the shifting of the plate can be accomplished by mechanical devices.

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The mechanism for positioning the plate in the trimming arch provides a more exact trimming of the plate than can be accomplished with previous machines. The plate is not only held fixedly against the trimming arch but the tension under which it is pressed against the arch both upwardly and outwardly may be accurately regulated so that the plate will precisely fit the printing cylinder when under the proper tension. The machine is so constructed that the control parts, namely, the push buttons, levers, etc., which must be manipulated by the operator, can be placed on either side of the machine as may be desired, depending upon the location in which the machine is installed. The machines are so constructed that in assembling the control buttons, handles, valves, etc. can be mounted on either side of the machine, thereby avoiding the necessity of separate controls for right- and left-hand machines as is now the case.

It will be understood that whereas we have shown and described in detail our improved machine as it is now in commercial operation, our invention is not limited to the specific constructions disclosed and includes all modifications thereof which fall within the scope of the appended claims.

We claim:

1. In a plate casting machine a frame, a casting box supported by said frame said casting box having a core section, means for moving the core section of said casting box from open to closed position, means for locking said casting box when said core section is in closed position, a power-operated metal pump supported by said frame, a spout extending from said pump to a position over said casting box, means for operating said pump, and a control for said operating means comprising means operated upon the locking of said casting box for rendering said pump inoperative when said casting box is unlocked.

2. The machine of claim 1 wherein said last named means prevents a second operation of said pump until said box has been unlocked and relocked.

3. The machine of claim 2 wherein said control comprises means for rendering said pump inoperative except when said casting box is closed and locked.

4. In a plate casting machine, a casting box, a pump mounted on said casting box, said pump comprising a cylinder to be submerged in the metal to be pumped, a piston in said cylinder, a pneumatic cylinder supported in line with said pump cylinder, a piston in said pneumatic cylinder, a connecting rod between said pistons, means for admitting air under pressure to said pneumatic cylinder to thereby lift the piston of the metal pump and means for controlling the admission of air to said pneumatic cylinder, said last named means including a member adjustably carried by said piston rod for modifying the extent of movement of said piston.

5. In a plate casting machine, a casting box, a pump mounted on said casting box, said pump comprising a cylinder to be submerged in the metal to be pumped, a piston in said cylinder, a pneumatic cylinder supported in line with said pump cylinder, a piston in said pneumatic cylinder, means for admitting air under pressure to said pneumatic cylinder to thereby lift the piston of the metal pump and means for controlling the admission of air to said pneumatic cylinder, said means comprising an electrically operated valve, a switch in the circuit of said valve and a member adjustably carried by said piston for operating said switch.

6. A plate casting machine comprising a machine frame, a casting box supported on said frame, said casting box having a core section, the core of said casting box being movable from closed position to open position, horizontal tracks for engaging the edges of the plate when the core is in open position, means for pouring molten metal into said casting box, a trimming arch carried by said frame, said arch having supporting tracks

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for the edges of said plate in longitudinal alignment with the edges of said plate when said core is opened, cooling sprays carried by said frame at the end of said arch away from said core section, said frame having supporting tracks for said plate on opposite sides of said sprays, said tracks being in longitudinal alignment with the plate supporting tracks of said arch, and separate means for controlling the pouring of said metal, the operation of said casting box, the operation of the plate trimming devices and the operation of said cooling sprays, said separate control means being located on the same side of said frame and interchangeable from side to side.

7. In a plate casting machine a frame, a casting box supported on said frame, a metal pump supported on said frame, a spout extending from said pump to a position over said casting box having a movable section, a wiper pivoted on said spout for movement between said spout and said casting box and a projection on the movable section of said casting box positioned to engage and move said wiper from beneath said spout when said casting box is positioned to receive the metal.

8. In a plate casting machine having a casting box and a plate trimming mechanism, said casting box having a core mounted for movement from vertical to horizontal position, said trimming mechanism comprising a trimming arch and plate supporting bars within said arch and extending longitudinally adjacent the bottom edges thereof, means for positioning said plate with its edges in line with the supporting bars of said trimming section, and means for shifting one of said bars to press said plate into contact with the trimming arch, said means including springs for pressing the edge of the plate outwardly as the plate is lifted.

9. In a plate casting machine having a casting box and a trimming mechanism, said trimming mechanism comprising a trimming arch and plate supporting bars within said arch, means for positioning said plate with its edges in line with said bars, a back stop for the rear edge of said plate positioned to project radially beyond the edge of said plate, after said plate is positioned in said trimming arch and means for shifting one of said bars to press said plate into contact with the trimming arch.

10. The machine of claim 9, wherein the trimming knives and the plate positioning stop are mounted on a rotatable shaft at the axis of such arch.

11. In a plate casting machine a casting box, a pump mounted on said casting box, said pump comprising a cylinder to be submerged in the metal to be pumped, means for moving the piston of said pump to force molten metal into said casting box, said means comprising a switch, a member adjustably connected with said piston for operating said switch to effect a cessation of movement of said piston in a direction to force metal into said casting box while permitting free return movement of said piston to recharge the cylinder with molten metal.

12. The mechanism of claim 11 wherein the casting box is provided with a locking mechanism and the operation of said switch prevents a second movement of said piston until the casting box has been unlocked and relocked.

13. The mechanism of claim 11 wherein the piston operating mechanism comprises a pneumatic cylinder above said first mentioned cylinder and in vertical alignment with the piston of said cylinder and a connecting rod between said piston and said first mentioned piston.

14. The mechanism of claim 9 wherein said back stop comprises a pivoted member positioned to be engaged by the edge of the plate as it is moved into the controlling arch and is turned on its pivot to permit movement of the plate past the back stop and a spring for returning the pivoted member to upright position, the surface of said stop on the side away from the casting box

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being normal to the axis of the trimming arch when the back stop is in vertical position.

15. The mechanism of claim 9 wherein said back stop is longitudinally adjustable with respect to said trimming arch.

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