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R. K. SEDGWICK  
TURRET INDEXING MEANS

2,557,149

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2 Sheets-Sheet 1

*Fig. 1.*

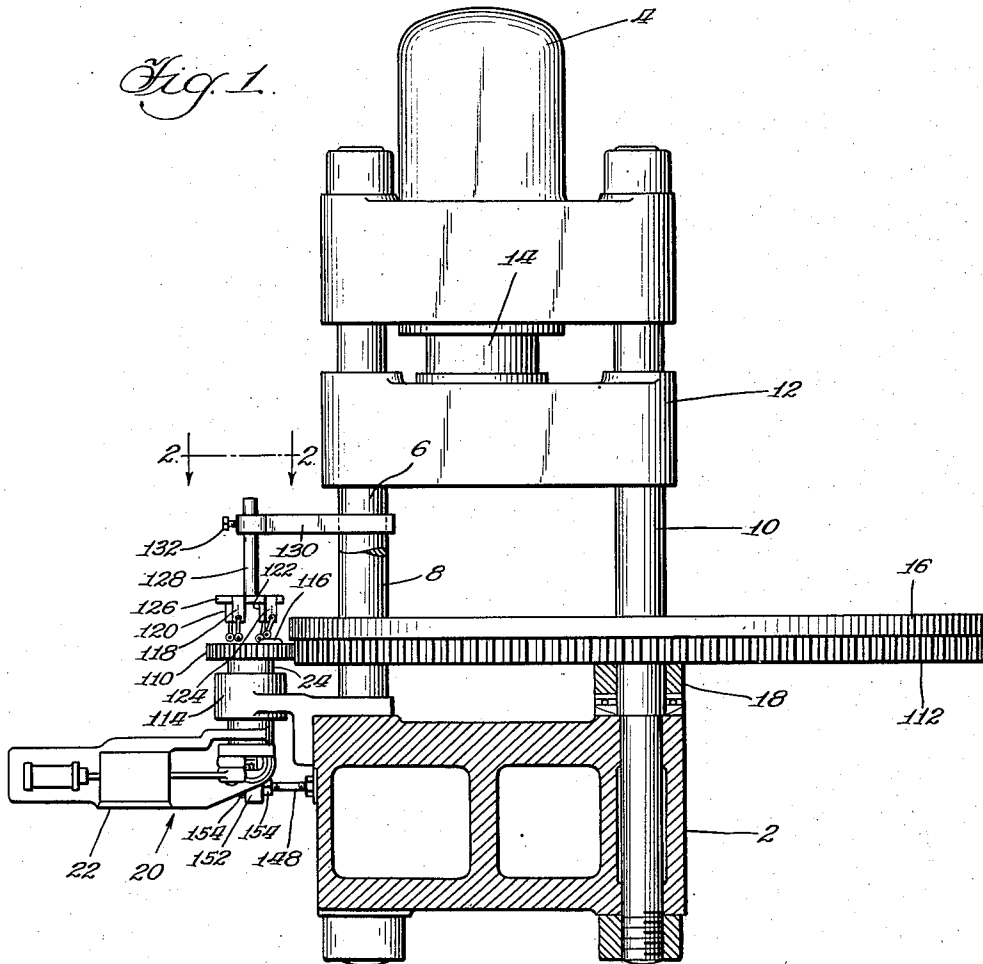
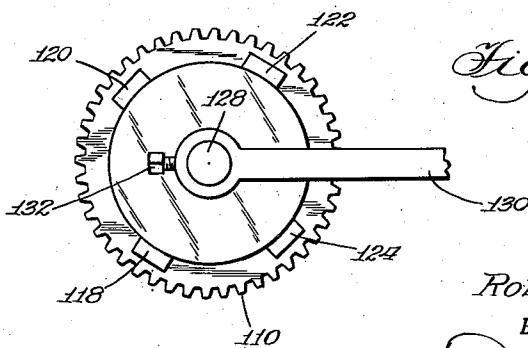


*Fig. 2.*



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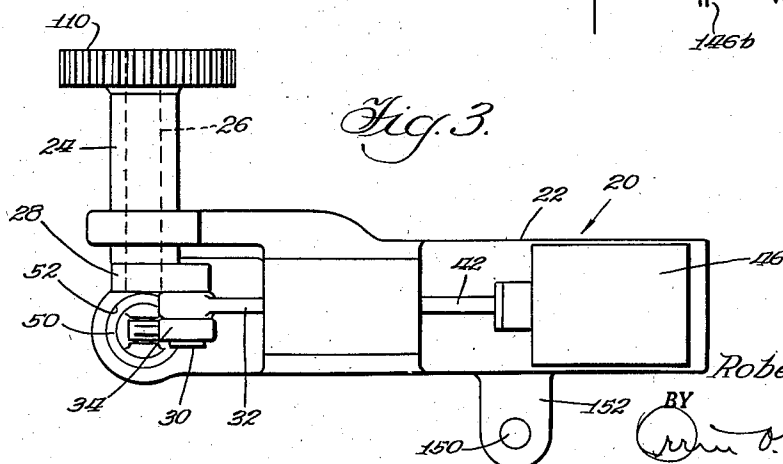
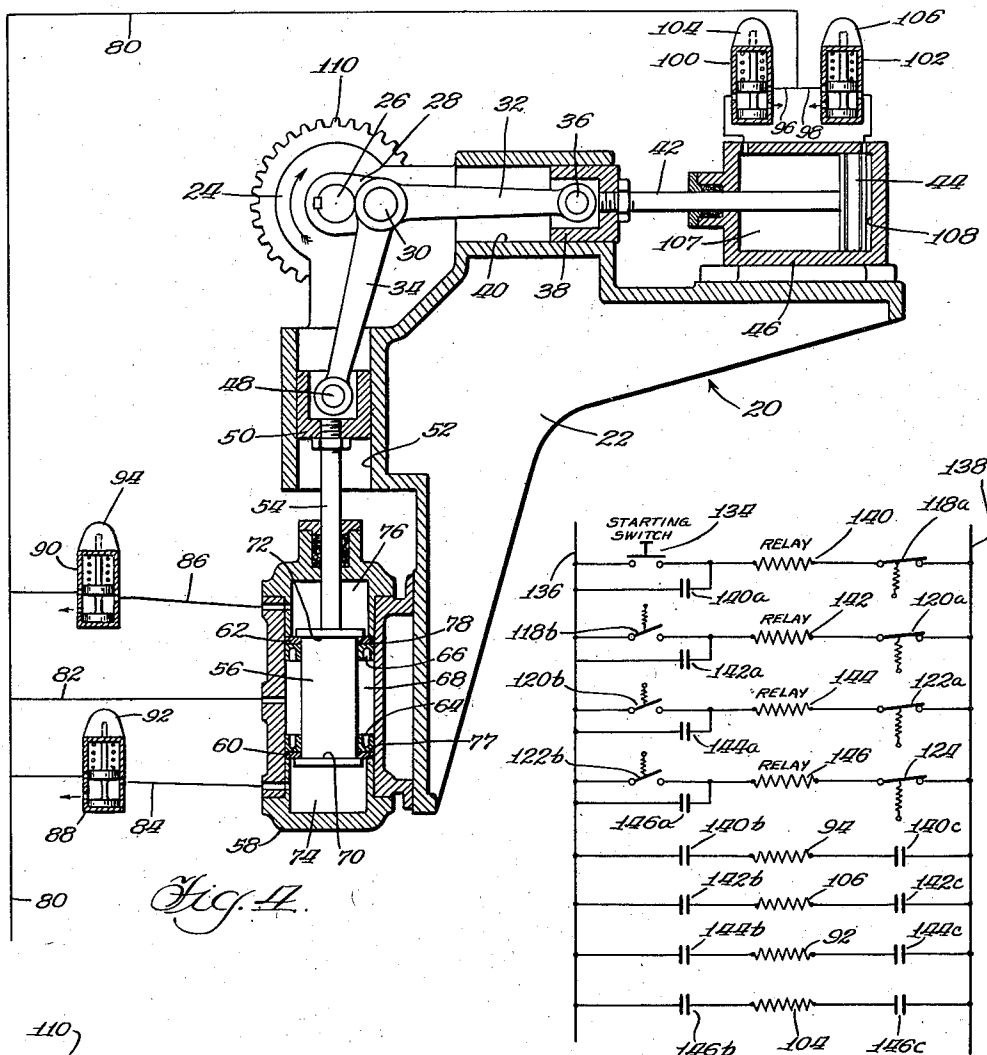
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

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## TURRET INDEXING MEANS

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11 Claims. (Cl. 18—16)

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This invention relates to hydraulic presses and more particularly to a turret type press having a novel mechanism for indexing the press turret.

The turrets of presses, such as molding presses, have conventionally been indexed by various means which have been unsatisfactory from a viewpoint of economy and maintenance. For example, devices of the type comprising an hydraulic motor with a brake and latch pin are satisfactory from a standpoint of accuracy but are expensive and involve high maintenance costs due to frequent breakage of latch pins. For this reason another type of indexing device has been utilized comprising an electric motor and a brake. However, as will be readily understood by those skilled in the art, such a device is not satisfactory where accuracy is required.

Accordingly, a primary object of the invention is to devise a novel indexing device of the above-described type which may be economically manufactured and is capable of long life in service without the necessity of frequent inspection and repair.

A more specific object of the invention is to devise an indexing mechanism which is accurate and capable of shockless operation.

Another object of the invention is to provide a pneumatically operated indexing device which may be conveniently connected to a shop air line.

Still another object of the invention is to devise an indexing mechanism which may be simply and quickly preadjusted to facilitate the setting up of a press preparatory to operation thereof.

The foregoing and other objects and advantages of the invention will become apparent from a consideration of the following specification and the accompanying drawings, wherein:

Figure 1 is a front elevational view of an hydraulic press embodying the invention, portions of the structure being broken away for the sake of clarity;

Figure 2 is a fragmentary top plan view taken on the line 2—2 of Figure 1;

Figure 3 is an enlarged side elevational view of the indexing mechanism;

Figure 4 is an enlarged bottom plan view of the indexing mechanism with the supporting frame shown in horizontal section, in combination with a piping diagram illustrating the pneumatic actuating system for the indexing mechanism; and

Figure 5 is a wiring diagram illustrating the electrical system for automatically operating the pneumatic motors of the indexing mechanism.

Describing the invention in detail and referring first to Figure 1, a conventional turret type press

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is illustrated including a bed 2 supporting an hydraulic cylinder 4 by means of three columns 6, 8, and 10, the column 6 and the bed 2 being broken away to clarify the construction. The columns are adapted for reception in the usual manner with complementary openings (not shown) in a platen 12 operated by a ram 14 reciprocal within the cylinder 4.

The column 10 also affords rotatable support for a turret 16 which is mounted on a conventional bearing 18 and is adapted to carry a plurality of molds or other work-supporting means to be selectively registered with the platen 12 by indexing of the turret, as hereinafter described.

According to the invention, the turret is indexed by a device, generally designated 20. As best seen in Figures 3 and 4, the indexing device 20 comprises a frame 22 having a bearing portion 24 affording a journal for a shaft 26 keyed to a crank arm 28 pivotally connected as at 30 to connecting rods 32 and 34. The connecting rod 32 is pivotally connected at 36 to a crosshead 38 reciprocal within a guide channel 40 of the frame 22, and the crosshead 38 is operatively connected to a piston rod 42 of a double acting piston 44 reciprocal within a cylinder 46 mounted in any convenient manner on the frame 22.

The connecting rod 34 is pivotally connected at 48 to a crosshead 50 reciprocal within a guide channel 52 in the frame, and the crosshead 50 is operatively connected to a piston rod 54 of a double acting piston 56 reciprocal within a cylinder 58. The cylinder 58 is provided with a pair of slidably fitted annular rings 60 and 62 and a pair of annular packing rings 64 and 66 defining the ends of a centering chamber 68, and the ends of the piston 56 are provided with shoulders 70 and 72 engageable with the respective rings 60 and 62 in the centered or neutral position of the piston 56. The cylinder 58 is provided with chambers 74 and 76 at the ends of the piston 56. In the centered position of the piston 56, the rings 60 and 62 are seated against shoulders 77 and 78 within the cylinder 58.

Compressed air is supplied to the indexing device 20 by means of a shop air line 80 having a branch 82 connected to the chamber 68. Branch lines 84 and 86, connected to the chambers 74 and 76 respectively, are opened and closed by conventional shut off valves 88 and 90 respectively, operated by solenoids 92 and 94 respectively.

The air line 80 is also provided with branch lines 96 and 98 having shut off valves 100 and 102 operated by solenoids 104 and 106. The branch line 96 is connected to a return chamber 107 of

the cylinder 46 at one side of the piston 44 and the branch line 98 is connected to an advance chamber 108 at the opposite side of the piston 44.

It may be noted that each of the valves 88, 90, 100, and 102, when actuated to open position by its associated solenoid, is adapted to deliver compressed air from the line 80 to the related motor chamber and is adapted upon deenergization of the associated solenoid to exhaust the related motor chamber.

The crank shaft 26 is keyed to a pinion gear 110 which, as best seen in Figure 1, meshes with a drive gear 112 keyed to the underside of the turret 16. Also, as best seen in Figure 1, the bearing portion 24 of the frame 22 is journaled within a bracket 114 secured in any convenient manner to the bed 2 of the press.

The top of the pinion gear 110 is preferably provided with a cam 116 adapted to successively actuate a plurality of limit switch units illustrated as four in number and identified by the numerals 118, 120, 122, and 124. The switch units are mounted on a support disc 126 carried by a rod 128 adjustably secured to an arm 130 by means of a set screw 132. The arm 130 may be secured in any desired manner to the column 6. It may be noted that the rod 128 may be adjusted rotatably and linearly and is secured in any adjusted position by the set screw 132.

Referring now to Figure 5, the electrical operating system for the novel indexing mechanism will be described in connection with an operating cycle of the mechanism. The cycle is initiated by closing a manually operated switch 134 which closes a circuit between main lines 136 and 138 connected respectively to opposite terminals of a conventional voltage supply (not shown). This circuit is closed through a relay 140 and through a normally closed switch 118a of the before-mentioned switch unit 118. Energization of the relay 140 closes a relay switch 140a establishing a holding circuit through the relay and closes relay switches 140b and 140c establishing a circuit through the before-mentioned solenoid 94 thereby moving valve 90 to open position, actuating the piston 56 to move the crank 28 off dead center. As the crank moves off dead center, the cam 116 engages the switch unit 118 to open switch 118a and closes a normally open switch 118b thereby establishing a circuit through a relay 142 and breaking the circuit through the relay 140.

Energization of relay 142 closes a relay switch 142a thereby establishing a holding circuit through the relay 142 which also closes relay switches 142b and 142c establishing a circuit through the before-mentioned solenoid 106, which thus opens valve 102 to rotate the crank 28 to dead center, 180° from its initial position.

As the crank reaches dead center, the cam 116 engages switch unit 120 opening a normally closed switch 120a and closing a normally open switch 120b thereby breaking the circuit through the relay 142 and establishing a circuit through a relay 144. Energization of relay 144 closes relay switch 144a establishing a holding circuit through the relay 144 and closes relay switches 144b and 144c energizing the before-mentioned solenoid 92, which opens its valve 88, thereby rotating the crank past dead center and engaging the cam 116 with switch unit 122. The cam 116, upon engagement with unit 122, opens a normally closed switch 122a and closing a normally open switch 122b. As the switch 122a opens, the circuit through the relay 144 is broken, and as the switch 122b closes, a circuit is established through

a relay 146 which closes relay switch 146a establishing a holding circuit through relay 146 which closes relay switches 146b and 146c to establish a circuit through the solenoid 104, which opens its valve 100, thereby rotating the crank 28 to its original position having completed a revolution of 360°, whereupon the cam 116 engages the before-mentioned switch unit 124 breaking the circuit through the switch 146, whereupon switches 146b and 146c open to deenergize the solenoid 104 and complete the cycle.

It may be noted that after completion of each cycle, the crank 28 is locked on dead center, as illustrated in Figure 4, inasmuch as the constant air pressure in the chamber 68 of the cylinder 58 centers the piston 56 to hold the crank on dead center. Furthermore, it will be understood that any overtravel or backlash of the crank 28 is cushioned by the compressed air in the chamber 68 thereby insuring shockless operation of the indexing mechanism.

If desired, a normally open, manually operated switch may be substituted for the switch 120b so that the crank 28 will be locked on dead center after rotation through 180°. Thus the turntable 16 may be indexed in smaller increments of rotation. It will also be readily apparent that by selecting any predetermined gear ratio between the pinion gear 110 and the drive gear 122 and utilizing any desired number of switches to be actuated by the cam 116, the turret 16 may be indexed in any desired increments of rotational movement.

In setting up the press to align the successive work positions with the press ram, the gear 110 may be operated without actuating the indexing mechanism 120 by means of a stud 148 secured to the press bed and received within an opening 150 (Figure 3) in a lug 152 on the frame 22. A pair of adjusting nuts 154 are threaded on the stud 148, and by means of these nuts, the entire frame 22 may be rotated to rotate the bearing portion 24 within the bracket 114 thereby rotating the pinion gear 110 to preadjust the work positions of the turret 16. As best seen in Figure 3, the crank shaft 26 and the bearing portion 24 of the frame 22 are substantially concentric, and the frame lug 152 is positioned at one side of the bearing portion 24 whereby, as the lug 152 is moved toward or away from the bed 2 by means of the adjusting nuts 154, the bearing portion 24 is rotated in its bracket 114. Inasmuch as the crank 28 is normally locked on its dead center position against movement relative to the frame 22, as above described, rotation of the frame on its bearing portion 24 is effective to rotate the pinion gear 110 thereby actuating the turret 16 independently of the motor 44, 46.

I claim:

1. An indexing mechanism for a rotatable turret adapted to selectively register work pieces carried thereby with a working element of a power machine, said mechanism comprising a gear system operatively connected to the turret for rotating the same, a crank operatively connected to the gear system for actuation thereof, a pneumatic motor including a cylinder with advance and return chambers, a piston therein, and a rod connected to the piston and to the crank for actuation of the latter, means for locking the crank on dead center comprising a second pneumatic motor comprising a cylinder with a piston therein, spaced stops intermediate the ends of the last-mentioned cylinder, a pair of piston rings within the last-mentioned cylinder

engageable with respective stops and with portions of the last-mentioned piston in the neutral position thereof, said last-mentioned piston and rings defining an advance chamber at one end of the last-mentioned cylinder, a return chamber at the other end of the last-mentioned cylinder, and a central chamber between the rings, the last-mentioned piston being connected to the crank, and means for constantly admitting pneumatic pressure fluid to the central chamber thereby urging the last-mentioned piston to neutral position whereat the crank is on dead center, and means for moving the crank off dead center comprising valve means for selectively admitting pneumatic fluid to and exhausting pneumatic fluid from the advance and return chambers of said motors.

2. An indexing mechanism for a rotatable turret adapted to selectively register work pieces carried thereby with a working element of a power device, said mechanism comprising a frame carried by the device, a reciprocating motor carried by the frame, a crank operatively connected to the motor for actuation thereby, a gear system operated by the crank and connected to the turret for rotating the latter, another reciprocative motor connected to the crank and having a centered position whereat said crank is on dead center, said other motor having advance and return positions whereat said crank is off dead center, means for shifting said other motor to one of said advance or return positions, and means responsive to shifted position of said other motor for automatically advancing the first-mentioned motor, then shifting the other motor to the other of said advance or return positions thereof, then retracting the first-mentioned motor, and then actuating said other motor to its centered position, to lock said crank on dead center.

3. An indexing mechanism for a rotatable turret adapted to selectively register work pieces carried thereby with a working element of a power machine, said mechanism comprising a frame carried by the machine, a crank carried by the frame, means operatively connecting the crank to the turret for rotating the latter in response to rotation of the crank, a reciprocating motor carried by the frame and operatively connected to the crank for actuation thereof, and a locking device carried by the frame for locking the crank on dead center at the termination of each stroke of the motor, said device comprising means for moving the crank to each side of dead center.

4. In an indexing mechanism for a rotatable turret of a power machine; the combination of a frame rotatably connected to the machine for rotation on an axis, means for rotating said frame on said axis and for locking the frame in a predetermined rotational position, a crank carried by the frame and rotatable relative thereto substantially on said axis, means operatively connecting the crank to the turret for rotating the latter in response to rotation of the crank on said axis, a reciprocating motor carried by the frame and operatively connected to the crank for rotating the same, and a locking device carried by the frame for locking the crank on dead center, said locking device comprising means for moving the crank past dead center.

5. An indexing mechanism for a rotatable turret adapted to selectively register work pieces carried thereby with a working element of a power machine, said mechanism comprising a frame carried by the machine, a reciprocating

motor carried by the frame, a crank connected to the motor, a gear system operated by the crank and operatively connected to the turret for rotating the latter, and another reciprocating motor operatively connected to the crank for actuation thereof, said other motor comprising means for yieldingly biasing the first-mentioned motor and crank to dead center, and said other motor comprising means for moving the crank to each side of dead center.

6. In an indexing mechanism for a rotatable turret of a machine; the combination of a support rotatably connected to the machine for rotational movement relative thereto on an axis, a crank carried by the support for rotation relative thereto on said axis, means carried by the support for rotating the crank and for locking the crank against rotation relative thereto, means operatively connecting the crank to the turret for rotation of the latter in response to rotation of the crank, and means connected to the machine and support for adjustably rotating the latter on said axis.

7. An indexing mechanism for a rotatable turret adapted to selectively register work pieces carried thereby with a working element of a power device, said mechanism comprising a crank operatively connected to the turret for rotating the same, a reciprocating motor operatively connected to the crank, and means for locking the crank on dead center at the end of each stroke of said motor, said locking means comprising a reciprocating motor approximately perpendicular to the first-mentioned motor and operatively connected to the crank, said second-mentioned motor having means for yieldingly biasing said crank to dead center and having other means for moving said crank from dead center to accommodate actuation of said crank by the first-mentioned motor.

8. An indexing mechanism for a rotatable turret adapted to selectively register work pieces carried thereby with a working element of a power device, said mechanism comprising a crank operatively connected to the turret for rotating the same, a reciprocating motor operatively connected to the crank, and means for locking the crank on dead center at the end of each stroke of said motor, said locking means comprising a cylinder, a piston in said cylinder connected to the crank, spaced stops within the cylinder, piston rings slidably engaging the piston and the cylinder in fluid-tight engagement therewith, said rings being engageable with said stops and with portions of the piston to center the latter thereby locking the crank on dead center, chambers within the cylinder at opposite ends of the piston, and valve means for alternately admitting pneumatic pressure fluid to and exhausting pneumatic pressure fluid from respective chambers the area between said rings being under constant pneumatic pressure.

9. In an indexing mechanism for a rotatable turret of a machine; the combination of a frame having a bearing portion rotatably connected to the machine, a crank having an element concentric to said portion and rotatably journaled therein, said crank being operatively connected to the turret for rotating the same, means carried by the frame for operating the crank, releasable means carried by the frame for locking the crank element against rotation in said bearing portion, and means for rotating the frame to rotate the turret independently of said operating means when said locking means are effective.

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10. An indexing mechanism for a rotatable turret adapted to selectively register work pieces carried thereby with a working element of a power device, said mechanism comprising a crank operatively connected to the turret for rotating the same, a reciprocating motor operatively connected to the crank, and means for locking the crank on dead center at the end of each stroke of said motor, said locking means comprising a reciprocating pneumatic motor connected to the crank and having a centering chamber under constant pneumatic pressure to yieldingly hold the crank on dead center and having advance and return chambers, and valve means for alternately directing pneumatic pressure fluid to and exhausting pressure fluid from respective advance and return chambers to move the crank off dead center.

11. An indexing mechanism for a rotatable turret adapted to selectively register work pieces carried thereby with a working element of a power device, said mechanism comprising a crank operatively connected to the turret for rotating the same, a reciprocating motor operatively con-

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nected to the crank, and means for locking the crank on dead center at the end of each stroke of said motor, said locking means comprising a reciprocating motor approximately perpendicular to the first-mentioned motor and operatively connected to the crank, said second-mentioned motor having means for yieldingly holding the crank on dead center and having other means for moving the crank past dead center at the end of each stroke of the first-mentioned motor.

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