

April 11, 1944.

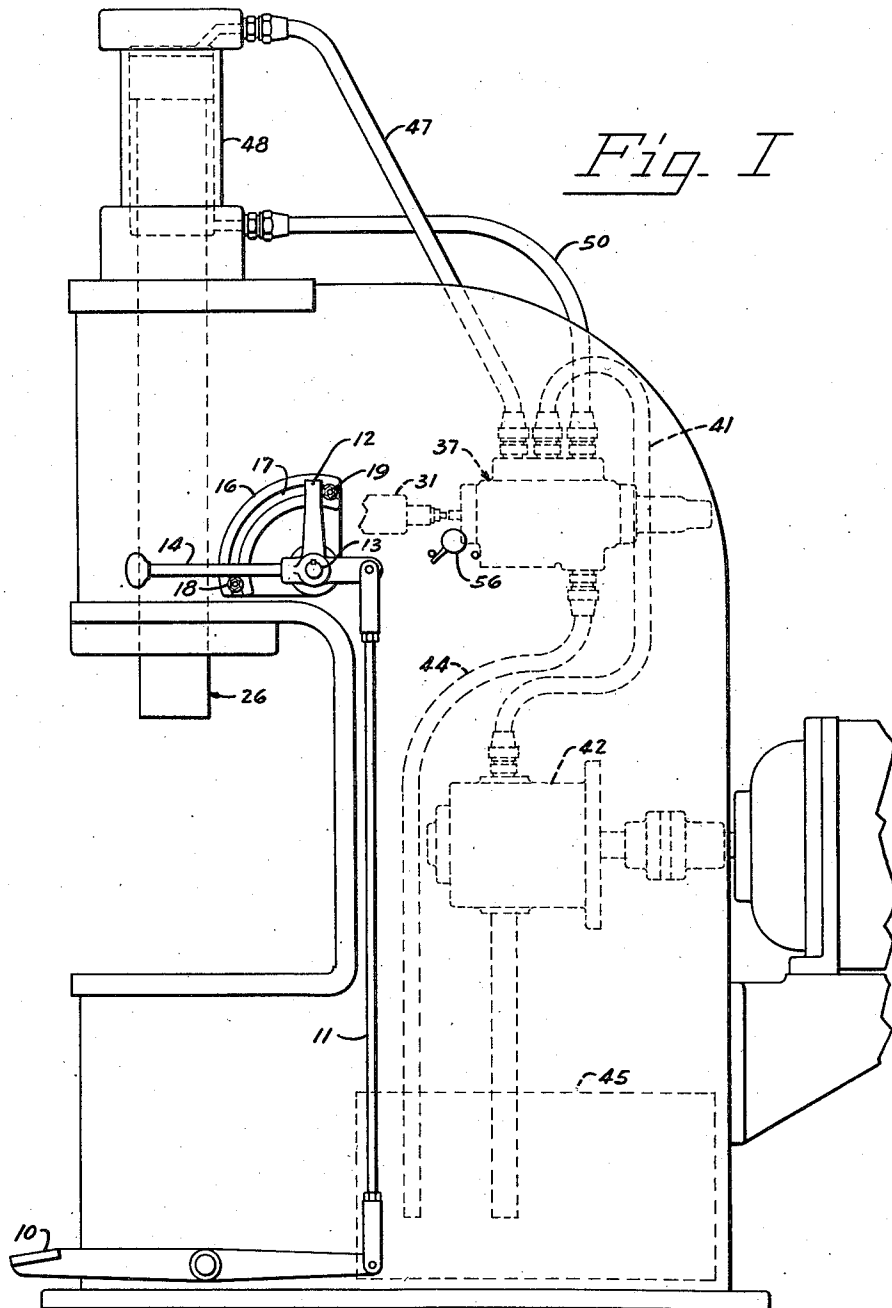
W. J. SNYDER

2,346,141

HYDRAULIC PRESS CONTROL

Filed May 2, 1941

3 Sheets-Sheet 1



Willis Jay Snyder
INVENTOR

BY *Marshall and Marshall*
ATTORNEYS

April 11, 1944.

W. J. SNYDER

2,346,141

HYDRAULIC PRESS CONTROL

Filed May 2, 1941

3 Sheets-Sheet 2

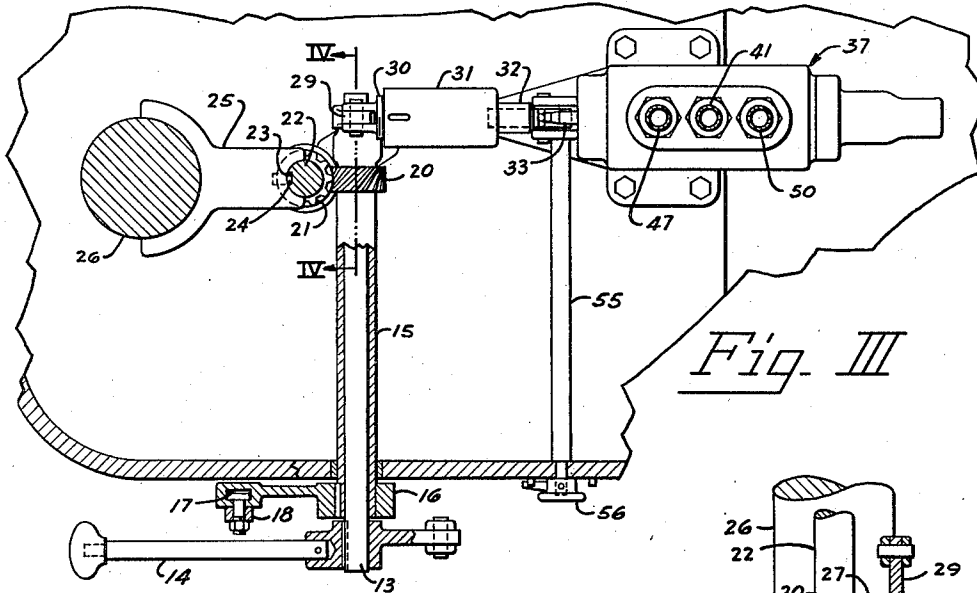


Fig. III

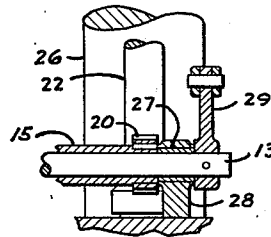


Fig. IV

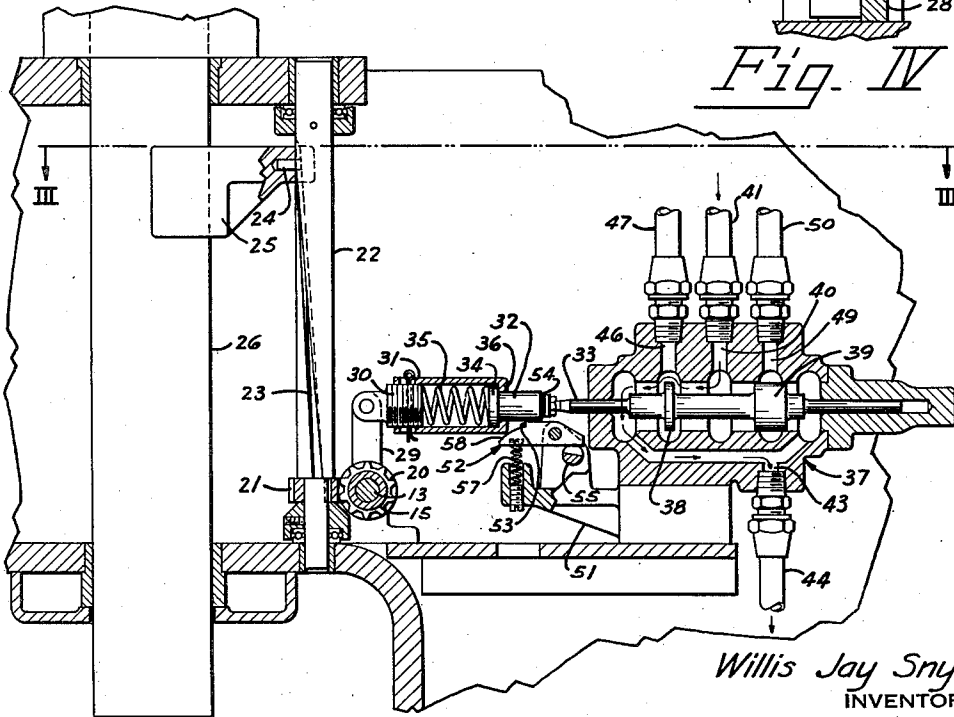


Fig. II

Willis Jay Snyder
INVENTOR

BY Marshall Marshall
ATTORNEYS

April 11, 1944.

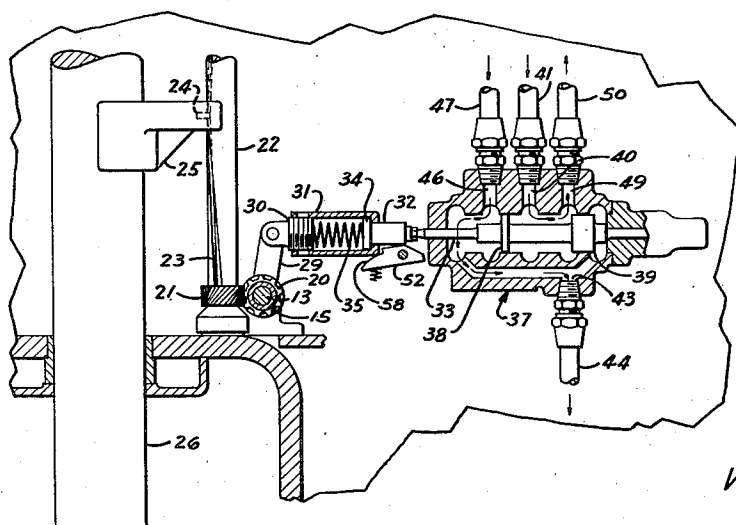
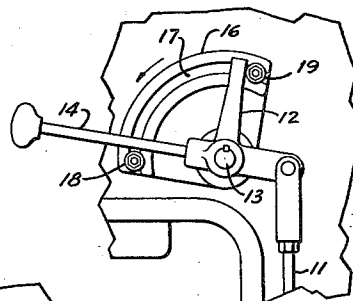
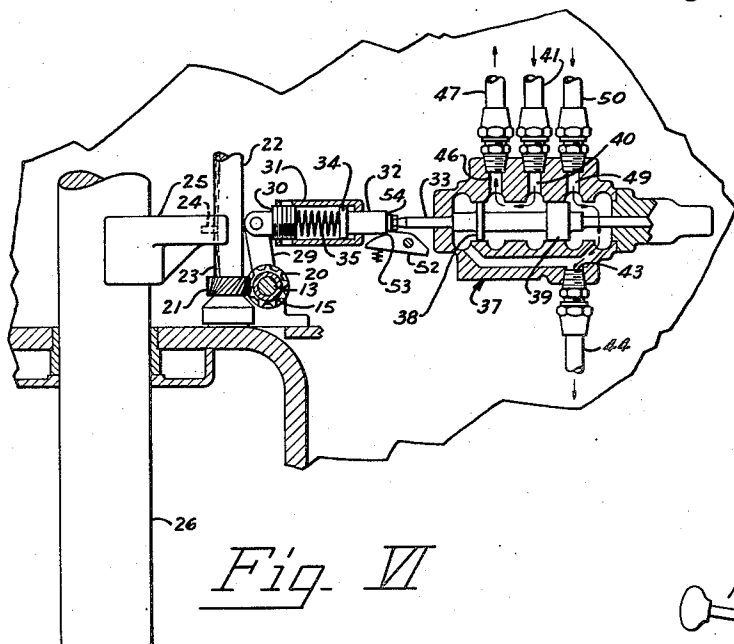
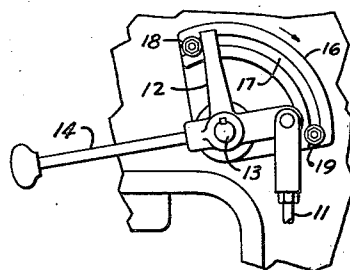
W. J. SNYDER

2,346,141

HYDRAULIC PRESS CONTROL

Filed May 2, 1941

3 Sheets-Sheet 3



Willis Jay Snyder
INVENTOR

Fig. VIII

BY *Marshall and Marshall*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,346,141

HYDRAULIC PRESS CONTROL

Willis Jay Snyder, Defiance, Ohio, assignor to
Defiance Machine Works, Inc., Defiance, Ohio,
a corporation of Ohio

Application May 2, 1941, Serial No. 391,556

5 Claims. (Cl. 121—38)

The invention relates to hydraulically-operated presses, and particularly to the operating controls thereof.

It is important that the controls of a hydraulic press be readily adjustable to determine the length of the stroke of the ram, and it is important that the controls be so arranged as to enable the operator to determine at a glance just how nearly the ram has approached the limit of its stroke.

The principal object of the invention is to provide a hydraulic press having simple and efficient controls which are conveniently adjustable to determine the length of stroke, and which enable the operator to determine at a glance how nearly the ram has completed its stroke. More specific objects and advantages are apparent from the description, in which reference is had to the accompanying drawings illustrating a preferred form of press embodying the invention.

In the drawings:

Fig. I is a side elevation of the press, certain hidden parts being shown in dotted lines to indicate their position relative to each other and to the operating controls of the press.

Fig. II is a vertical longitudinal section of the controls and valve mechanism of the press.

Fig. III is a horizontal section taken on the line III—III of Fig. II.

Fig. IV is a fragmentary vertical section taken on the line IV—IV of Fig. III.

Fig. V is an elevation of an adjustable portion of the controls, shown in the position it occupies when the ram is near the limit of its downward stroke.

Fig. VI is a vertical section, similar to Fig. II, illustrating the position of the controls and the controlling valve, as set for semiautomatic operation, when the ram is near the limit of its downward stroke.

Fig. VII is a view similar to Fig. V, showing the position of the parts when the ram is near the limit of its upward stroke.

Fig. VIII is a view similar to Fig. VI, showing the position of the controls and controlling valve when the ram is near the limit of its upward stroke.

These specific drawings and the specific description that follows merely disclose and illustrate the invention and are not intended to impose limitations upon the claims.

The press shown in the drawings can be set for manual operation under the control of a foot pedal or a hand lever throughout its cycle, the downward movement of the ram being started by

depression of the foot pedal and continuing only while the pedal is so depressed, and the movement of the ram being reversed at any point in the cycle by the release of the foot pedal; or the press can be set to operate semiautomatically, each cycle of operation being started by a momentary depression of the foot pedal or hand lever, and each cycle being automatically terminated by the adjustable controls upon the return of the ram to its uppermost position.

A foot pedal 10 is pivoted beneath the worktable of the press, and has pivoted to its inner end a pedal push rod 11. The upper end of the pedal push rod 11 is pivoted to a bell crank having a vertically-disposed arm 12 and being keyed on the shaft 13. A hand lever 14 is fastened to the bell crank 12 as an alternative control. A sleeve 15 (Fig. III) is concentrically mounted upon the shaft 13 and extends horizontally toward the center of the press housing. Keyed on the outer end of the sleeve 15 is an arcuate member 16 (Fig. I) having a slot 17 in which are carried two slidable lugs 18 and 19. The lugs 18 and 19 are adjustable along the slot 17, and protrude from the arcuate member 16 sufficiently to engage the vertically-disposed arm 12 of the bell crank lever.

A spiral gear 20 (Fig. III) is keyed on the inner end of the sleeve 15. The spiral gear 20 meshes with a spiral gear 21 which is keyed near the lower end of a vertically-disposed shaft 22. In the shaft 22 is cut a vertically-spiralled slot 23, which is engaged by a dog 24 mounted in the extended arm of a bracket 25 carried by a ram 26.

The inner end of the shaft 13 is rotatably mounted in a bushing 27 (Fig. IV), supported by a bracket 28, and has pinned to its innermost extremity an arm 29. The arm 29 is pivotally connected to a plug 30 (Fig. II), which is screwed in the end of a cylinder 31 that has mounted therein a plunger 32 connected by a swivel joint to a valve stem 33. The plunger 32 has a shoulder 34, which is engaged by a lip 36 of the cylinder 31 and held against the lip 36 by a spring 35 mounted within the cylinder 31. The valve stem 33 extends into a three-way valve 37 and has integral pistons 38 and 39. The valve 37 has therein a port 40 to which is connected a pipe 41 leading from a pump 42 (Fig. I), and a port 43 connected to which is a pipe 44 leading to an oil tank 45. The valve 37 also has a port 46 to which is connected a pipe 47 leading to the upper end of a ram piston cylinder 48 and a port 49

to which is connected a pipe 50 leading to the lower end of the ram piston cylinder 48.

Pivoted on a frame bracket 51, and located beneath the plunger 32, is a spring actuated latch 52. The latch 52 has a step 53 which is adapted to be positioned back of a shoulder 54 on the plunger 32. Mounted beneath the end of the latch 52 opposite the step 53 is a horizontally extending shaft 55 (Fig. III). At the innermost end of the shaft 55, immediately beneath the end of the latch 52, is a semi-cylindrical portion which is adapted to be rotated against the end of the latch 52 by an operating knob 56 to force the opposite end of the latch 52 against a spring 57 and hold the latch away from the plunger 32. The latch 52 also has, immediately below its step 53, a cam surface 58 which is adapted to be engaged by the end of the cylinder 31 to release the plunger 32 from the step 53.

Operation

The operation of the press is illustrated by Figs. II, V, VI, VII and VIII. The valve 37 has three positions. When the press is idle, the valve is in the intermediate position illustrated by Fig. II of the drawings, and the ram 26 is at the uppermost limit of its stroke. In this position of the mechanism the operating controls are as shown in Fig. I, and the connecting shafts and members are as shown in Fig. II. Another position is illustrated in Figs. V and VI; and the last position by Figs. VII and VIII. When the valve stem 33 and its integrally constructed pistons 38 and 39 are in the intermediate or center position of the three which they are capable of assuming (Fig. II), the pump 42 pumps the hydraulic fluid through the pipe 41 into the port 40, where it is by-passed around the piston 38 through the port 43 and the pipe 44 back to the tank 45. The port 49 is closed by the piston 39, to retain the fluid in the pipe 50 and the lower end of the ram piston cylinder 48 and to hold the ram at the uppermost end of its stroke.

When the operator desires to operate the machine with full manual control, he turns the knob 56 until the semi-cylindrical part of the shaft 55 forces the latch 52 out of the line of movement of the plunger 32. The foot pedal 10 is then depressed, which raises the rod 11 and turns the shaft 13 and the arm 29 in a counterclockwise direction, thus pulling the valve stem 33 to the left. This moves the pistons 38 and 39 into the position shown in Fig. VI. The pump 42 now pumps the fluid through the pipe 41, the port 40, the valve 37 and the pipe 47 to the uppermost end of the cylinder 48 where it forces the ram 26 downward. As the ram 26 descends in its stroke, the dog 24 carried by the bracket 25 and engaged in the slot 23 of the shaft 22 rotates the shaft 22 in a clockwise direction. The shaft 22 rotates the spiral gear 21, thus turning the spiral gear 20, the sleeve 15 and the arcuate member 16 mounted thereon in a clockwise direction.

When the arcuate member has been rotated through a sufficient arc, the adjustable lug 18 strikes against the arm 12 (as shown in Fig. V) and rotates the shaft 13 in a clockwise direction, moving the valve stem 33 to the right until it again assumes the position shown in Fig. II. At this point, the pipe 50 being blocked off by the piston 39, the ram will remain stationary at the bottom of its stroke until the operator releases the foot pedal 10. When the pedal is released, the weight of the rod 11 causes the shaft 13 to

turn in a clockwise direction and thus, by means of the arm 29 and its connections, moves the valve stem 33 and the pistons 38 and 39 to the position shown in Fig. VIII. The pump 42 now pumps the fluid through the pipe 41, the port 40, the valve 37 and the pipe 50 to the lower end of the ram piston cylinder and causes the ram 26 to start on its upward stroke. When the ram 26 reaches the uppermost limit of its stroke, the dog 24 causes the shaft 22 to reassume the position shown in Fig. II, and the fluid is once more by-passed through the valve 37 from the pump 42 to the tank 45.

If the operator desires to halt the movement of the ram 26, or to change its direction of movement at any time during the downward stroke, he has merely to release the foot pedal 10 sufficiently to permit its weight to carry the valve stem 33 and the pistons 38 and 39 either to the position shown in Fig. II, in which case the ram will halt, or to the position shown in Fig. VIII, in which case the ram will be moved upward. If he desires to change the direction of the stroke of the ram during its upward movement, he has merely to depress the foot pedal 10 sufficiently to bring the valve stem 33 and the pistons 38 and 39 to the position shown in Fig. II, in which case the upward movement of the ram will be halted, or to the position shown in Fig. VI, in which case the direction of movement of the ram will be reversed and it will move downward. Thus the operator has complete control over the movement of the tool-holding ram at all times during the cycle of operations. Because the lug 18 engages the arm 12 before the end of the downward stroke, and because this lug may be adjusted along the arcuate groove 17 to determine the length of stroke desired, and is rotated with the arcuate member 16 by the machine itself, it is impossible for the operator to hold the foot pedal 10 depressed after the desired limit of the downward stroke of the ram 26 has been reached and thus permit a dangerous pressure to be built up.

When it is desired to operate the machine semi-automatically, the operator turns the knob 56 so that the semi-cylindrical portion of the shaft 55 is removed from the path of the latch 52, thus permitting the latch to be held against the body of the plunger 32. With the mechanism in its neutral or idling position as shown in Fig. II, the operator can start the operation of the machine by depressing the foot pedal 10, which raises the rod 11 and rotates the shaft 13 and the arm 29 in a counterclockwise direction. This pulls the cylinder 31 and plunger 32 to the left, and the latch 52 is permitted to snap upward, engaging its step 53 with the shoulder 54 of the plunger 32. The operator may then release the foot pedal 10, and the latch 52 holds the valve stem 33 and the pistons 38 and 39 in the position shown in Fig. VI. The ram 26, under impetus of the pressure built up by liquid pumped through the port 40, the port 46 and pipe 47 to the top of the cylinder 48, is forced downward. As the ram 26 approaches the lower limit of its stroke, the dog 24, operating in the slot 23, has rotated the shaft 22, the gears 21 and 20 and the sleeve 15 far enough to bring the lug 18 into contact with the arm 12 (as shown in Fig. V). The clockwise rotation of the shaft 13 and the arm 29 then moves the cylinder 31 to the right, and since the plunger 32 is held by the latch 52 (as shown in Fig. VI), the spring 35 is compressed, permitting the sleeve 31 to continue to move to the right until it comes into contact with the cam surface 58 of the latch 52 to disen-

gage the step 53 from the shoulder 54 and permit the spring 35 to snap the plunger 32, the valve stem 33 and the pistons 38 and 39 to the position shown in Fig. VIII. This changes the direction of flow of the fluid through the valve 37 and consequently reverses the direction of movement of the ram 26. As the ram 26 moves upward, the dog 24 rotates the shaft 22, the gears 21 and 20 and the sleeve 15 in a counterclockwise direction, moving the arcuate member 16 until the lug 19 engages the right-hand side of the vertically disposed arm 12 (as shown in Fig. VII). This then rotates the shaft 13 and the arm 29 in a counterclockwise direction, pulling the cylinder 31, the plunger 32, the valve stem 33 and the integral pistons 38 and 39 to the left until they reach the position shown in Fig. II. Thus the fluid is again by-passed through the valve 37, from the pump to the tank, and the piston 39 closes the port 49 and the pipe 50, retaining the oil in the lower end of the cylinder 48 and holding the ram at the upward limit of its stroke.

If the operator desires to stop the ram 26, or reverse the direction of its movement while it is moving downward after the latch 52 has engaged the shoulder 54 of the plunger 32, he has only to rotate the knob 56, thus forcing the latch 52 out of engagement with the plunger 32. He can then control the press as described above for full manual control. If he desires to stop the movement of the ram 26 or reverse its direction when the ram is moving upward, he has only to depress the foot pedal 10 sufficiently to bring the valve to the position shown in Fig. II, in which case the ram movement is stopped; or he may depress the foot pedal 10 sufficiently to move the interconnected parts to the position shown in Fig. VI, in which case the ram will move downward and complete an additional cycle unless further interrupted.

It should be noted that the lugs 18 and 19 are readily accessible to the operator. Since the two lugs are both located on the arcuate member 16, they are both visible, and the operator may observe their relative spacing in adjusting them to provide the desired length of stroke.

It should also be noted that the oscillatory rather than reciprocatory movement of the arcuate member 16 makes it easy for the operator to observe at a glance the exact position of the arcuate member so as to determine just how nearly the ram has approached the limit of its stroke. For example, the relative displacement of the parts in Figs. I and VIII is much more easily observed by looking at the arcuate member 16 than by looking at the ram 26.

Similarly, the condition of the controlling valve is more easily observable by reason of the fact that the arm 12 has an oscillatory rather than a reciprocatory movement. The combination of the arcuate member 16 with the arm 12 thus enables the operator to observe at a glance both the exact position of the ram and the exact condition of the controlling valve.

The embodiment of the invention that has been disclosed may be modified to meet various requirements.

Having described my invention, I claim:

1. In a hydraulic press having a movable ram and a controlling valve, an oscillatory sleeve, motion transmitting means operatively connecting said oscillatory sleeve and said ram, and causing said oscillatory sleeve to move concurrently with and proportionately to the movement of said ram, said sleeve having an end exposed to view, a radial extension on said end of the sleeve, a pair of ad-

justable stops on said extension, an oscillatory valve-actuating shaft in said sleeve, and an arm on said shaft overlying the extension on said sleeve and extending between said stops, said arm being movable into a first extreme position to cause said ram to be driven downward, an intermediate position to cause said ram to remain stationary, and a second extreme position to cause said ram to be driven upward, and said stops determining the limit of the stroke of the ram by moving said arm out of its first or second extreme position to terminate the downward or upward movement of the ram.

2. In a hydraulic press having a ram and controlling valve, a pair of spaced bearings in which the ram slides, mechanism for converting translatory into oscillatory movement driven from said ram at a point between said bearings, an oscillatory member driven by said mechanism, a pair of adjustable stops on said member, and a valve-actuating arm extending between said stops, said arm being movable into a first extreme position to cause said ram to be driven downward, an intermediate position to cause said ram to remain stationary, and a second extreme position to cause said ram to be driven upward, and said stops determining the limit of the stroke of the ram by moving said arm out of its first or second extreme position to terminate the downward or upward movement of the ram.

3. In a hydraulic press having a ram and a controlling valve, a pair of bearings in which the ram slides, spaced apart a distance as great as the maximum working stroke of the ram, a projection on the ram between said bearings, mechanism for converting translatory into oscillatory movement driven by said projection, an oscillatory member driven by said mechanism and so located as to be exposed to view, a pair of adjustable stops on said member, and a valve-actuating arm extending between said stops, said arm being movable into a first extreme position to cause said ram to be driven downward, an intermediate position to cause said ram to remain stationary, and a second extreme position to cause said ram to be driven upward, and said stops determining the limit of the stroke of the ram by moving said arm out of its first or second extreme position to terminate the downward or upward movement of the ram.

4. In a hydraulic press, in combination, a movable ram, a three-position controlling valve for said ram, an oscillatory valve actuating shaft, an oscillatory sleeve surrounding said shaft, mechanism driven by said ram for oscillating said sleeve concurrently with and proportionately to the movement of said ram, a pair of adjustable stops on said sleeve, an arm on said shaft extending between said stops, said arm and said valve being movable into a first extreme position to cause said ram to be moved downwardly, a second extreme position to cause said ram to be moved upwardly and an intermediate position to cause said ram to remain stationary, said stops being adapted to move said arm from either extreme position to the intermediate position, and disengageable mechanism connecting said shaft to said valve to cause said valve to be moved from the first extreme position to the second extreme position upon movement of said shaft from the first extreme position to the intermediate position.

5. In a hydraulic press, in combination, a ram, a pair of spaced bearings in which said ram slides, a control valve for said ram, said valve having an extreme position to cause said ram

to be driven downward, a second extreme position to cause said ram to be driven upward and an intermediate position to cause said ram to be held stationary, an oscillatory valve actuating shaft, an oscillatory member having a pair of adjustable stops, an arm on said shaft extending between said stops, a drive shaft parallel to said

ram, and having a spiral groove, a projection on said ram located between said bearings and engaged in said slot and means operatively connecting said drive shaft to said oscillatory member.

WILLIS JAY SNYDER.