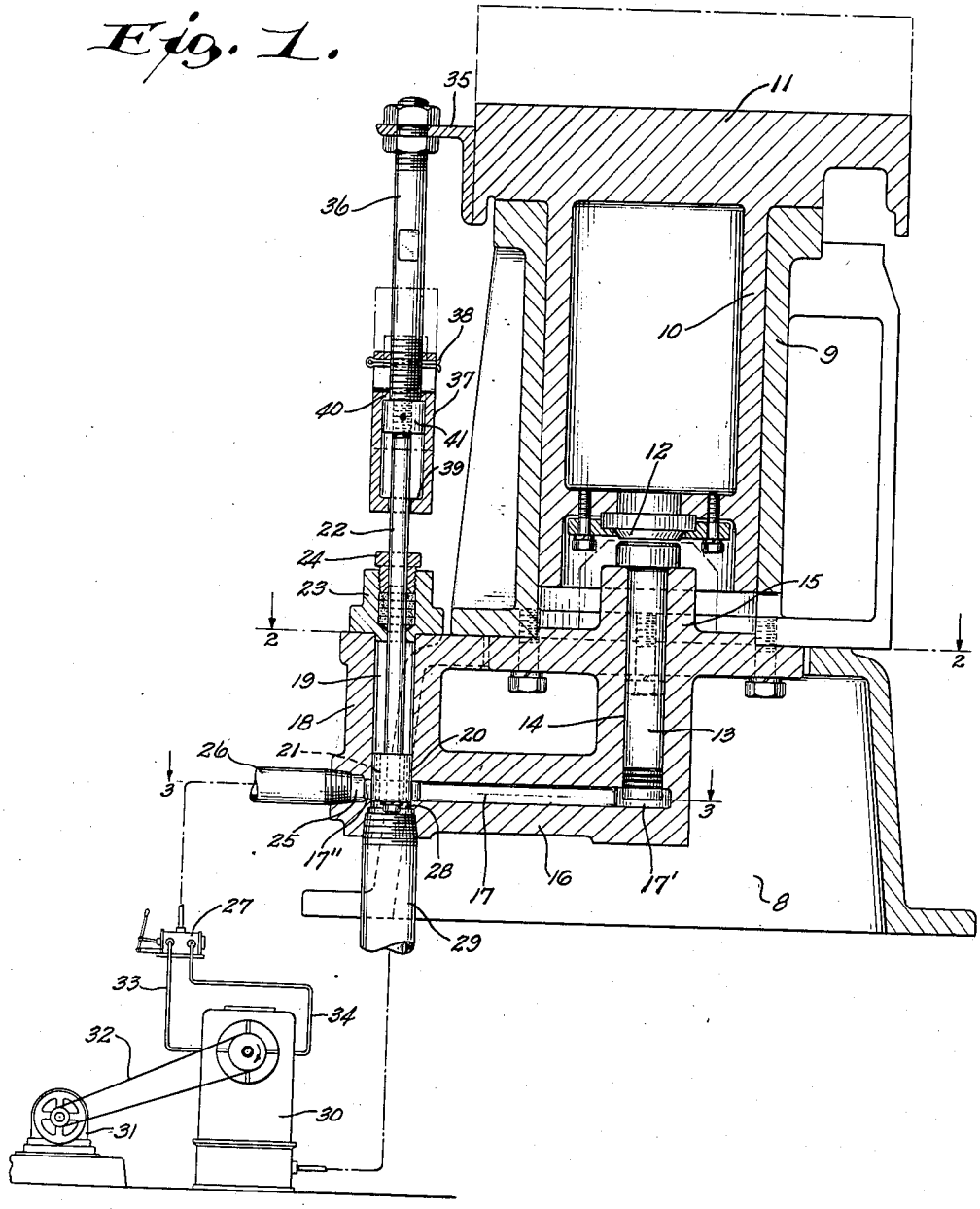
April 23, 1940. H. E. FELLOWS 2,198,078

HYDRAULIC JOLT MACHINE

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Fig. 1.



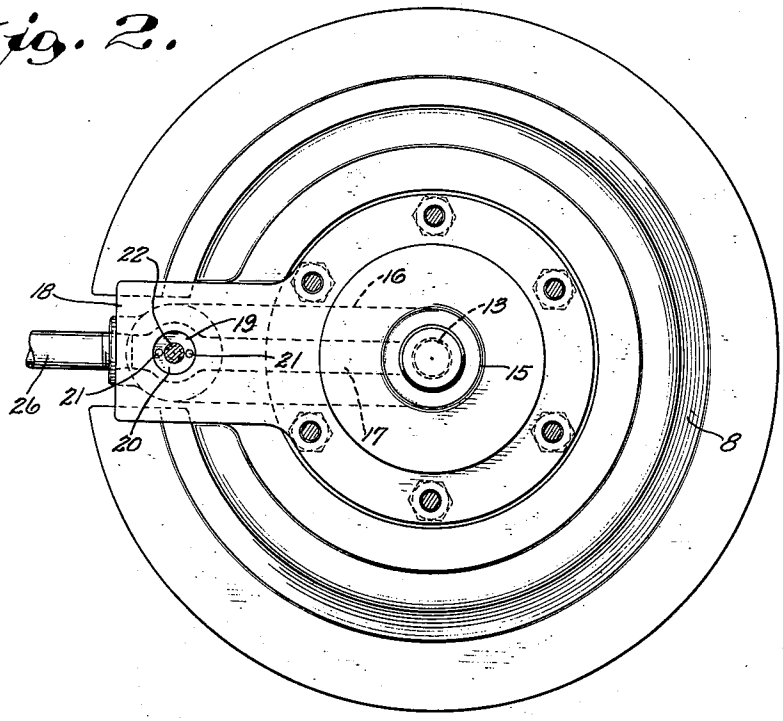
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Fig. 2.



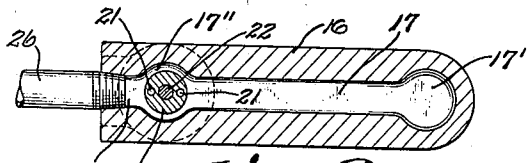


Fig. 3.

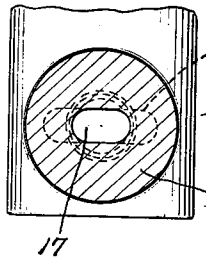


Fig. 5.

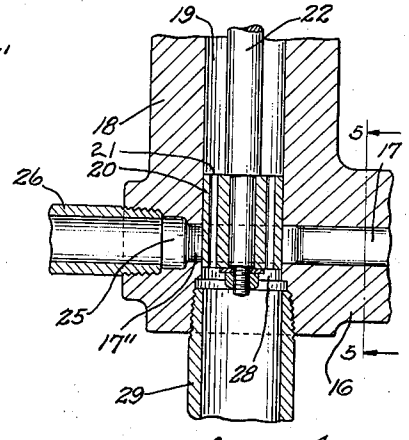


Fig. 4.

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UNITED STATES PATENT OFFICE

2,198,078

HYDRAULIC JOLT MACHINE

Harrison E. Fellows, Wauwatosa, Wis., assignor to Milwaukee Foundry Equipment Company, Milwaukee, Wis., a corporation of Wisconsin

Application July 5, 1938, Serial No. 217,479

5 Claims. (Cl. 22—45)

This invention relates to improvements in hydraulic jolt machines, and more particularly to a foundry jolt machine wherein the reciprocatory parts are hydraulically actuated.

Jolt machines of the ordinary type are usually arranged to impart a rapid reciprocating movement to a molding flask to initially pack the molding sand around the pattern within the flask before the sand is subjected to the final squeeze and the removal of the pattern from the sand and flask. Compressed air has heretofore been used to reciprocate the machine parts, but compressed air is an expensive motivating medium and is not always available.

It is, therefore, the primary object of the present invention to provide a jolt machine wherein the parts are reciprocated through the use of a liquid, such as oil, circulated in a closed circuit without material waste or loss, whereby the machine motivating medium expense is minimized, and the machine is adapted for operation where a suitable supply of compressed air is not available.

If, in a jolt machine, oil for the motivating medium were to be handled in the standard manner indicated in other hydraulic mechanisms, it would seem to be proper to simultaneously control oil inlet and oil exhaust ports of the oil work chamber of the machine. Then, on the descent strokes of the piston the chamber and ducts would completely exhaust their oil through the exhaust port and when the exhaust port was closed and the inlet port opened for the next cycle of operation it would be necessary for the ducts and chamber to fill with oil before movement of the piston occurred. As applied to a jolt machine this would mean that there would be an unduly prolonged dwell of the piston and table at the lower end of each stroke, rendering operation of the machine extremely slow and impractical.

A specific object of the present invention is to overcome the above objection by so handling and regulating the flow of oil that only the exhaust port of the system is controlled whereby the work chamber and ducts are always kept filled with oil so that reciprocation of the piston in opposite directions occurs without delay, due to the constant presence of oil there adjacent to perform lifting work.

A further object of the invention is to provide a hydraulic jolt machine wherein the oil pump, when it is not pumping oil for work purposes, freely by-passes oil from the open inlet port through the open exhaust port, and when motion is desired the exhaust port is closed and oil from the pump, in addition to that continuously in the work chamber and ducts, performs its lifting duties.

A further object of the invention is to provide a hydraulic jolt machine wherein the valve controlled exhaust port of the oil system is so arranged that it will only accommodate the amount of oil delivered through the inlet port by the pump and the normal piston displacement, but will not exhaust or draw oil away from the work chamber and communicating duct, whereby the work chamber always contains an adequate amount of oil.

A further object of the invention is to provide a hydraulic jolt machine wherein the diameter of the work piston bears a direct and predetermined relationship to the delivery capacity of the pump and to the diameter of the exhaust port.

A further object of the invention is to provide a hydraulic jolt machine which is of very simple construction, which is easy to operate and control, which is rapid and efficient and economical in its operation, which is strong and durable, and which is well adapted for the purposes set forth.

With the above and other objects in view the invention consists of the improved hydraulic jolt machine, and its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawings in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a vertical sectional view of the improved hydraulic jolt machine with a schematic showing of the motor, pump and main control valve associated with the machine;

Fig. 2 is a horizontal sectional view of the machine taken on the irregular line 2—2 of Fig. 1;

Fig. 3 is a horizontal sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is an enlarged, fragmentary detail sectional view of the inlet and exhaust ports of the machine and the valve for said latter port; and

Fig. 5 is a detail sectional view taken on line 5—5 of Fig. 4.

Referring now more particularly to the drawings, it will appear that the machine is mounted upon a substantially annular, hollow base 8 on the top of which is supported a stationary cylinder 9 within which a guide piston 10 is adapted to be vertically reciprocated. The upper end of the guide piston is formed with an integral, horizontal table 11 on which a molding flask (not shown) is adapted to be positioned.

The guide piston 10 is actuated by the im-

proved hydraulic jolting mechanism which is of the essence of the present invention. Within the lower recessed portion of the guide piston 10 there is secured a downwardly projecting striker pad 12 having a surface to engage the enlarged head of a jolt piston 13. Said jolt piston is slidably mounted vertically in the bore 14 of a body member 15 of the machine. The machine also includes a horizontal and radial body portion 16 whose inner end is integral with the lower end of the body member 15 and having a horizontal duct or chamber 17 therein, into the enlarged inner end 17' of which the lower end of the jolt piston 13 extends, when in lowered position.

The horizontal and radial body portion 16 of the machine merges, at its outer end, into the lower portion of a vertical boss portion 18 which has a bore 19. The lower end of said bore opens into the enlarged outer end 17'' of the duct 17 and slidably accommodates a jolt valve 20. Said jolt valve is of cylindrical formation and is provided with a pair of vents 21 so that fluid pressure on opposite ends or faces of the valve may be equalized. The lower end of a valve stem 22 is secured to said valve and said valve stem extends vertically upwardly through the bore of the boss 18 and also through a stuffing box 23 and a gland 24 at the upper end of said boss.

The outer end of the body portion 16 has a fluid inlet port 25 opening into the enlarged end 17'' of the duct 17, and a fluid inlet pipe 26, extending from the outlet port of a three-way control valve 27, communicates with said inlet port 25. Within the lower portion of said body portion 16 there is also a liquid exhaust port 28 registering with the portion 17'' of the duct 17 and adapted to be controlled by said jolt valve 20. A tubular connection 29 leads from said exhaust port 28 and enters one side of the reservoir of a high pressure oil pump 30. The pump is actuated by a suitable motor 31, through a driving belt 32, and from the pressure side of the pump a pressure line or tubular connection 33 extends to an inlet port of the main control valve 27. By means of a tubular connection 34 between another port of said valve 27 and a port in said pump, oil may be by-passed when the pump is operating and when the valve 27 is manipulated to prevent oil flow through the fluid inlet pipe 26. This latter contingency occurs when the jolt machine is idling.

It should be observed that the jolt valve 20 does not control the liquid inlet port 25, but only controls the liquid exhaust port 28. Also the size of the exhaust port 28 is such that it can only accommodate the amount of oil delivered through the inlet port 25 and normal piston displacement and cannot handle any oil in excess of such amount when the pump and valve 27 are operating to deliver oil under pressure through the port 25. The diameter of the jolt piston 13 also bears a direct and predetermined relationship to the delivery capacity of the pump and to the size of the exhaust port 28.

Affixed to one side of the jolt table 11 is a bracket 35 to which the upper end of a reciprocable rod 36 is adjustably secured. The lower end portion of said rod is threaded into the upper end of a clevis 37 and is secured thereto against rotation by a cotter pin 38 which extends through slots in the upper side walls of the clevis. Within the clevis and having free movement or play as between the lower and intermediate walls 39 and 40 thereof, is a cylindrical nut 41 secured to the upper end portion of the valve rod 22. By virtue of the adjustments of the member 36 relative to the bracket 35 and clevis 37 the amount of movement of the valve 20 can be regulated and controlled. Also, because of the free movement or play of the nut 41 within the clevis only a small portion of the movement of the table 11 is utilized for the transmission of motion to the valve rod 22 for actuation of the jolt valve 20.

The operation of the improved hydraulic jolt machine is as follows: The main control valve 27 is operated to open the inlet line 26 and the motor and pump are set into operation. Oil under pressure, and at a fixed volume, is delivered by the pump through said inlet line 26 into the port 25 from whence it flows in the enlargement 17'' around the jolt valve 20 which is in closed or lowered position. The oil thus admitted fills the duct 17 and exerts lifting force against the bottom of the jolt piston 13. The jolt piston and parts carried thereby then rise at a speed commensurate with the piston's displacement of the pump capacity. The piston engages the striker pad 12 and elevates the guide piston 10 and the table 11. The initial elevation of said members is substantially the same as the amount of play in the clevis 37 with relation to the movement of the nut 41 thereon, said clevis being raised from the full line position of Fig. 1 to a position wherein the lower wall 39 of the clevis will engage the nut 41 and thereafter exert a lifting effect on the valve stem 22. The table 11 and piston 13 move upwardly slightly beyond the position described, and this additional rise causes the jolt valve 20 to be lifted sufficiently to open the oil exhaust port 28. The oil under pressure is then free to exhaust from the duct 17 to the pump via the port 28 and pipe 29. The pressure in the pipe 29 is at atmospheric pressure. The pump continues in operation, but due to the size of the exhaust port 28 new oil pumped into the machine is immediately exhausted through said port 28 without influencing the supply or pressure within the duct 17 and acting on the piston 13. At this stage there is not sufficient pressure below the piston 13 to support it, together with the table and load thereon. Hence the table and associated parts drop rapidly due to gravity and the vacuum within the chambers (particularly that below the guide piston) developed during the up-stroke of the parts. This vacuum condition causes descent of the parts at a greater rate of speed than would be the case if gravity was the only factor.

As the table and pistons descend, the nut 41 has a predetermined amount of free movement within the clevis 37 and thereafter it is engaged by the rod 36 so that a downward push is imposed on the valve stem 22 to lower and seat the jolt valve 20 and thereby close the exhaust port 28. As long as the valve 27 is positioned to allow flow through the pipe 26 and the pump is in operation, the cycle will repeat. It should be observed that this operation results in very rapid reciprocations of the table and flask thereon. The movements are so synchronized that on each table up-stroke, at the proper time, the jolt valve is raised or opened, and on each table down-stroke the jolt valve is closed.

From the foregoing description it will be seen that the improved hydraulic jolt machine is of simple and novel construction, and is well adapted for the purposes described.

What is claimed as the invention is:

1. A molding machine, comprising a unitary

body formed with a cylinder, a reciprocatory member mounted in said cylinder, said body having a liquid duct therein opening adjacent said reciprocatory member, said duct having, when the machine is operating, an uncontrolled and continuously open inlet port and a controlled exhaust port, means for circulating liquid under pressure in said duct and adjacent said reciprocatory member to rapidly actuate it, a valve only controlling said exhaust port, and means actuated by said reciprocatory member for opening said valve upon movements of the reciprocatory member in one direction and for closing said valve upon movements of the reciprocatory member in the other direction.

2. A molding machine, comprising a unitary body formed with a cylinder, a reciprocatory member mounted in said cylinder, said body having a liquid duct therein opening adjacent said reciprocatory member, said duct having, when the machine is operating, an uncontrolled and continuously open inlet port and a controlled exhaust port, means for circulating liquid under pressure in said duct and adjacent said reciprocatory member to rapidly actuate it, a valve only controlling said exhaust port, and means carried by said reciprocatory member for automatically opening said valve upon a predetermined movement of said reciprocatory member in one direction and for automatically closing said valve upon a predetermined movement of the reciprocatory member in the other direction.

3. A molding machine, comprising a unitary body formed with a cylinder, a reciprocatory member mounted in said cylinder, said body having a liquid duct therein opening adjacent said reciprocatory member, said duct having, within the body an uncontrolled and continuously open inlet port and a controlled exhaust port, means for circulating liquid under pressure in said duct and adjacent said reciprocatory member to rapidly actuate it, a valve only controlling said exhaust port, and adjustable means carried by said reciprocatory member for automatically opening said valve upon a predetermined movement of said reciprocatory member in one direction and for automatically closing said valve upon a predetermined movement of the reciprocatory member in the other direction.

4. A foundry jolt machine, comprising a body formed with a cylinder, a reciprocatory member mounted in said cylinder, said body having a liquid duct therein opening adjacent said reciprocatory member and adapted to be maintained filled with liquid, said duct having an uncontrolled and continuously open inlet port and a controlled exhaust port, means including a circuit for supplying liquid under pressure into said duct with the liquid alternately displacing said reciprocatory member and being displaced thereby, a valve only controlling said exhaust port, and means influenced by reverse movements of said reciprocatory member for alternately opening and closing said valve, said exhaust port being of a size when open, to only accommodate the liquid being delivered through the inlet port plus that displaced by said reciprocatory member.

5. In a foundry jolt machine, in combination, a unitary body formed with a cylinder and a liquid duct in the body communicating with the lower end of the cylinder, a jolt piston vertically reciprocally mounted in said cylinder, a guide piston above the jolt piston and mounted to be vertically reciprocated thereby, a flask supporting table carried by the guide piston, said liquid duct being maintained filled with liquid and having, when the machine is operating, an uncontrolled and continuously open inlet port and a controlled exhaust port adjacent the inlet port, a valve controlling only the exhaust port, means carried by said table for opening said valve upon a predetermined upward movement of the table and for closing said valve upon a predetermined downward movement of the table, and an oil pump having tubular connections extending both to said inlet port and to said exhaust port.

HARRISON E. FELLOWS.