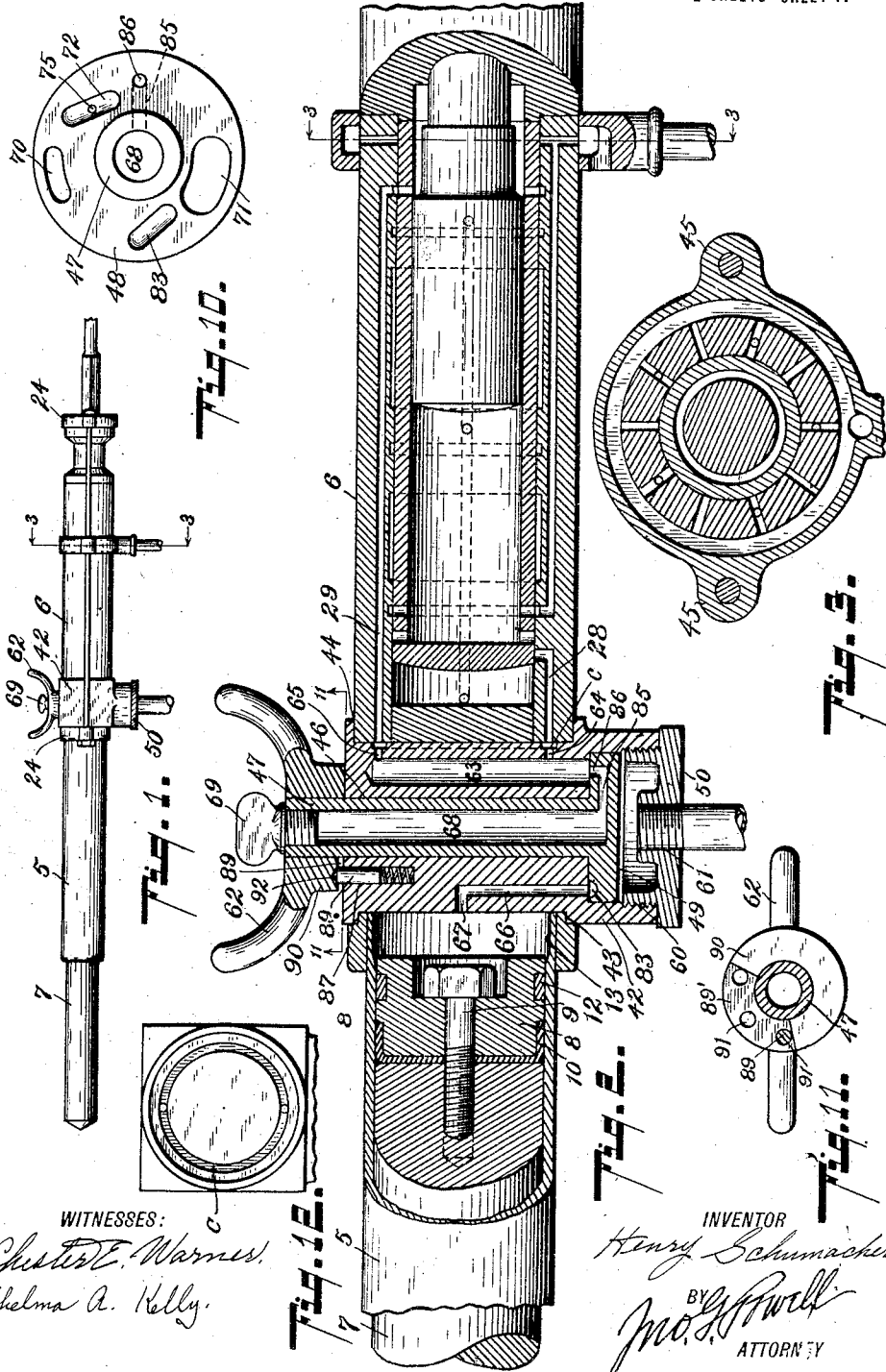


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PNEUMATIC HAMMER DRILL.
APPLICATION FILED MAR. 19, 1912.

1,205,485.

Patented Nov. 21, 1916.
2 SHEETS—SHEET 1.



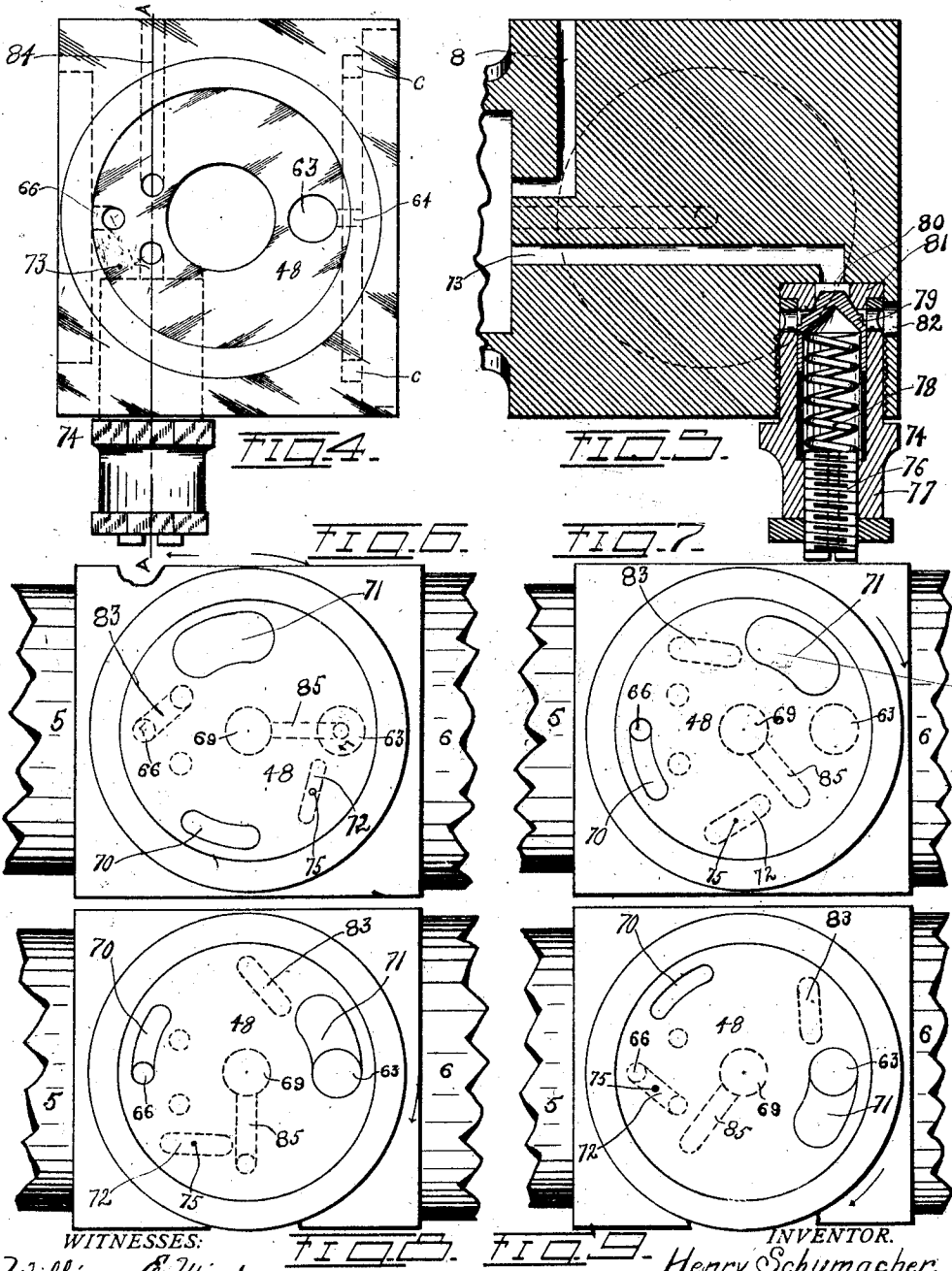
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PNEUMATIC HAMMER-DRILL.

1,205,485.

Specification of Letters Patent.

Patented Nov. 21, 1916.

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To all whom it may concern:

Be it known that I, HENRY SCHUMACHER, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Pneumatic Hammer Drills; and I do declare the following to be a full, clear, and exact description of my invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in pneumatic rock drills and has for its object the provision of a machine of this character constructed to maintain a constant air pressure between the feed cylinder and the motor.

Another object of my invention resides in the provision of a pneumatic drill, simple and inexpensive in manufacture and effective and economical in operation.

Another object of my invention is to provide novel fluid controlling means of an exceedingly simple character for controlling the fluid to the feed cylinder and the motor.

Another object is to provide a simple valve for controlling the motive fluid to the feed cylinder and the motor.

Another object of my invention resides in the provision of means for supplying lubricant to the different parts of the motor.

Another object of my invention is to provide novel and efficient means for controlling the air pressure in the feed cylinder in accordance with the nature of the work to be performed by the drill.

With these and other objects in view I will proceed to describe my invention with reference to the accompanying drawings forming a part hereof.

In the drawings:—Figure 1, is a side elevation of the drill, showing the same in assembled condition. Fig. 2, is a longitudinal section of the drill. Fig. 3 is a cross sectional view taken on the line 3—3 of Figs. 1 and 2. Fig. 4 is a bottom view of the valve block. Fig. 5 is a view taken on the line A—A, Fig. 4, looking in the direction of the arrow. Fig. 6 is a view illustrating the position of the valve piece to cut off the motive fluid from the feed cylinder and the motor. Fig. 7 is a view illustrating the po-

sition of the valve piece to admit motive fluid to the feed cylinder. Fig. 8 is a view illustrating the position of the valve piece to admit motive fluid to both the feed cylinder and the motor. Fig. 9 is a view illustrating the position of the valve piece to admit motive fluid to the motor and to admit motive fluid to the feed cylinder under control. Fig. 10 is a view of the face side of the valve piece. Fig. 11 is a section taken on the line 11—11 Fig. 2. Fig. 12 is a side elevation of the valve block showing the motor induction passages and circumferential passage with which the latter communicates.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the feed cylinder of my improved drill, and 6 the motor thereof. In the feed cylinder 5, I arrange a piston stem or rod 7, which is adapted to engage the wall or other suitable stop. To this piston stem or rod 7, within the cylinder 5, I secure a head 8 by means of a screw 9, which passes through the head 8 and enters the stem 7. Interposed between the head 8 and the stem 7, I arrange a leather gasket 10 and surrounding the head 8, I mount an expansion ring, 12, which is adapted to expand into an enlarged portion 13, of the cylinder 5 for holding the piston stem 7 in position in the cylinder 5 when the drill is in an in-operative position or the portable position. This ring 12 expands into the enlarged portion 13 of the cylinder 5 and thus holds the piston stem 7 against displacement or movement in the cylinder 5.

I will now proceed to describe the construction and arrangement of the valve for controlling the motive fluid to the motor and feed cylinder. By referring to Fig. 2, it will be noticed that this valve is interposed between the feed cylinder and the motor as is usual in machines of this character.

My improved valve consists of a block 42 having sockets 43 and 44 formed on opposite sides thereof and adapted to respectively receive one extremity of the feed cylinder 5 and one extremity of the motor 6. Therefore when my improved machine is assembled it consists of three sections formed by the feed cylinder, the valve block and the motor. These three sections may be held or secured in their connected or operative positions by any suitable means.

I have shown in the drawings collars 2

one of which is secured to the said cylinder, while the other is secured to the chuck end of the motor 6, the said collars having ears through which rods are passed for connecting said collars. Another collar 45 is interposed between the collars 24, and is provided with ears through which the said rods also pass

The valve block 42 is provided with an opening 46 passing therethrough and adapted to receive a hollow stem 47 of a disk valve piece 48. One side of the valve block 42 is cut out to form a cup or recess 49 adapted to receive the disk valve piece 48. Into this cup or cut out portion 49, I thread a cap 50 as shown at 60. This cap is provided with a centrally located threaded opening 61, adapted to receive the motive fluid feed pipe. To the extremity of the valve stem 47 opposite the disk valve 48, I secure an operating handle or member 62. This operating handle 62 also serves the purpose of a washer or lock for holding the disk valve 48 in close engagement with its seat. Also arranged in the valve block 42, parallel with the valve stem 47, is a passage 63, which passage communicates with the induction passages 28 and 29 of the motor respectively, through ports 64 and 65 leading from a circumferential passage C formed in the valve block 42, with which the passage 63 is in direct communication. The valve block 42 opposite the passage 63 is provided with a longitudinally arranged passage 66, which passage communicates with the feed cylinder 5 through a port 67. The hollow 68 of the valve stem 47 is adapted to receive a supply of lubricant, which is fed to the motor in a manner which will hereinafter be described. This hollow 68, of the valve stem 47, is adapted to be closed by means of a threaded plug or thumb screw 69.

In Fig. 4, I have illustrated a diametrical arrangement of the ports and passages formed in the valve block and in this view the position and direction of the passages is indicated. Now by referring to Fig. 6, the position of the disk valve piece, to close off the motive fluid from the feed cylinder and motor, is indicated. By turning the disk valve piece 48 to the right, or to the position indicated in Fig. 7, the communication will be established with the feed cylinder through an elongated slot 70, with which the disk valve piece is provided and through the passage 66, which leads to the interior of the cylinder 5 in the rear of the piston, whereby the live motive fluid will maintain the stem 7 of the piston in close engagement with the wall or other support or stop and will carry the motor 6 forwardly toward the surface to be worked or drilled. When the disk valve piece 48 is in the position indicated in Fig. 7, the induction is established

only with the feed cylinder 5, while the induction of the motive fluid to the motor is closed off. In other words, the motive fluid is first admitted to the feed cylinder 5 so as to set the drill for work. Now by turning the disk valve piece 48 to the position indicated in Fig. 8, a relatively large enlarged slot 71 will be brought into register or communication with the passage 63 which leads to the motor. Thus, the induction of the motive fluid will be established in the motor and will start the latter in operation. The slot 70 is of sufficient length to remain in register with the passage 66 during the turning of the valve piece 48 to bring its slots 71 into register with the passage 63. Now when the valve piece 48 is in the position represented in Fig. 8, the drill is set for operation.

Now assuming that it is desired to regulate the pressure in the feed cylinder 5 according to the character of the material in which the drill is working the disk valve piece 48 may be turned to the position represented in Fig. 9, whereby an elongated recess 72 formed on the side of the valve piece 48, adjacent the seat of the latter, will be brought into register with the passage 66 and a passage 73, which leads to a relief valve 74, while the elongated slot 71 of the valve piece 48 will still be in register with the passage 63 leading to the motor. Thus, the motor is allowed to be operated at full speed by virtue of the motive fluid, while the pressure in the feed cylinder 5 is reduced and is governed by virtue of the relief valve 74. The valve piece 48 is provided with a relatively small opening 75 which communicates with the recess 72. Therefore only a limited amount of motive fluid can pass through the valve piece 48 into the recess 72, from whence it passes into the feed cylinder 5 through the passage 66. By adjusting a set screw 76 threaded in the casing 77, of the relief valve 74, the tension of a spring 78 may be regulated for controlling a valve piece 79. Now if it is desired to operate the motor under a relatively low pressure in the feed cylinder, the tension of the spring 78 may be lessened by the adjustment of the screw 76, whereby, whenever the pressure in the feed cylinder 5 becomes high the motive fluid will operate the valve piece 79 to move the latter away from an opening 80 formed in the seat 81 and communication of the feed cylinder 5 with the atmosphere will be thus established through the passage 66, recess 72, passage 73 and opening 80 formed in the valve sleeve 81, and opening 82 formed in the valve piece 42 and communicating with the atmosphere. When drill is working in soft material, it is very necessary to prevent the drill steel from being moved too rapidly into the material and thus choking up the drill. Therefore, my arrangement wherein

the pressure in the feed cylinder is regulated in accordance with the material in which the drill is working, is an important feature in a machine of this character.

Now, if it is desired to cut off the motive fluid from the feed cylinder and motor for stopping the operation of the drill, the valve piece 48 may be turned to the position indicated in Fig. 6, whereby a recess 83, formed on the side of the valve piece 48, adjacent the seat of the latter, will be brought into register with the passage 66 and an exhaust passage 84, leading through the valve piece 42 to the atmosphere. Thus the induction of the motive fluid to the motor and the feed cylinder will be cut off and the feed cylinder placed in communication with the exhaust through the passage 66, recess 83 and passage 84, allowing the motive fluid in the feed cylinder to exhaust so that the stem 47 of the feed cylinder piston may be disengaged from the wall or support for removing the drill.

The valve piece 48 is provided with a passage 85, communicating with the chamber 68, formed in the stem 47 of the valve piece. This passage 85 is provided with a port 86, which is adapted to be brought into register with the passage 63, whereby the oil or lubricant may be supplied from the chamber 68 to the motor 6. When the lubricant has been once admitted, it will be carried into the motor along with the induction of the motive fluid.

Attention is here called to the fact that the extremity of the valve block 42 adjacent the handle or operating member 62, is provided with a recess or chamber 87 in which I arrange a spring 88 and a pin or plug 89, which is engaged by the said spring 88 and is normally extended beyond the said chamber 87, under the influence of the spring 88, into engagement with a recess 89 formed on the lower edge of a collar 90 of the handle 62. This recess 89 is provided with notches or recesses 91, which are adapted to receive the beveled extremity 92 of the pin 89, when the valve piece 48 is in any of the positions corresponding with that illustrated in Figs. 6 to 9 inclusive, for maintaining the valve piece 48 in position against displacement.

Now assuming that it is desired to set the drill for operation the piston 7 of the cylinder 5 is placed in engagement with the wall of a tunnel or any other suitable stop and the handle 62 is turned, whereby the disk 48 is given a corresponding turn to bring the slot 70 of the said disk into register with the passage 66 as indicated in Fig. 7, whereby the motive fluid is allowed to enter the feed cylinder 5 and cause the motor to move forwardly into engagement with the face of the surface to be drilled, then by further turning of the handle 62, the disk 48 may be

turned to a position to admit motive fluid to the motor for operating the latter. This position is indicated in Fig. 8 and as shown, the elongated slot 71 of the disk 48 is in register with the passage 63, while the elongated slot 70 of the disk 48 is still in register with the passage 66 leading to the feed cylinder, consequently motive fluid is simultaneously admitted to both the feed cylinder and the motor. Now supposing that the drill is operating in soft material and it is desired to lessen the pressure upon the drill against the material the handle 62 may be turned for imparting a corresponding turn to the disk 48 for bringing the recess 72 into register with the passages 73 and 66, whereby the motive fluid will pass through the relatively small opening 75 in the disk 48 into the recess 72 and thence through the recess and passage 66 to the feed cylinder 5 and as soon as the pressure in the cylinder 5 increases to too great a degree, the valve piece 79 will be forced from its seat and communication between the feed cylinder and the atmosphere established through the recess 72, passage 73, openings 80 and 82, whereby the pressure in the feed cylinder will be decreased sufficiently. The pressure to be maintained in the feed cylinder is determined and the valve 74 is set accordingly to relieve the pressure in the feed cylinder before it goes above the desired degree. Now supposing that the drilling operation has been completed and it is desired to move the drill to another location, the handle 62 may be turned to impart a corresponding movement 48 to bring the latter to a position indicated in Fig. 6, whereby the slot 83 will connect the two passages 66 and 84 and will place the feed cylinder 5 in communication with the atmosphere through the passage 66, recess 83 and passage 84. Thus the motive fluid in the feed cylinder 5 will exhaust and release the piston 7 from engagement with the wall or support, whereupon the piston 7 may be moved inwardly to bring the expansion ring 12 into the elongated portion 13 of the cylinder 5. In this position the expansion ring 12 will expand into the elongated portion 13 and secure the piston 7 in position against movement or disengagement from its inward drawn position. Of course, when the valve piece 48 has been turned to the position indicated in Fig. 6, the motive fluid supply has been cut off from both the feed cylinder and the motor and consequently the feed cylinder and motor are both in-operative and as soon as the air exhausts from the feed cylinder in the manner above described, the drill may be removed and placed in any other desired location.

Having thus described my invention, what I claim is:—

1. The combination with a motor and fluid

supply means therefor, of means for controlling the fluid supply to said motor, comprising a disk valve piece interposed between the motor and fluid supply means, a valve block in which said disk valve piece is rotatable, said valve piece having its axis of rotation disposed at right angles to the longitudinal axis of the motor, said valve block having a passage extending at right angles to the axis of the motor and communicating with the latter, and said valve piece having an opening adapted to register with said passage for establishing communication of said motive fluid with said motor.

2. In a machine of the character set forth, the combination with a fluid operated motor, and fluid operated feeding means for the motor, of controlling means interposed between the motor and the motor feeding means, the said means having passages communicating respectively with the motor and the motor feeding means, a disk valve having slots therein adapted to be brought into register with the aforesaid passages, and said disk valve having a restricted opening adapted to register with the passage leading to the feeding means after the said slot has been moved out of register with the latter, substantially as described.

3. In a machine of the character set forth, the combination with a motor and a motor feeding cylinder, of means for controlling the supply of motive fluid to the motor and the motor feeding cylinder, comprising a valve interposed between the motor and the motor feeding cylinder, the block having passages communicating respectively with the motor and the motor feeding cylinder, a valve piece for controlling the said passages, said valve piece having slots adapted to register with the passages in the valve block, one of the said slots of the valve piece being located to register with the passage communicating with the feed cylinder before the other slot registers with the passage communicating with the motor, and said valve piece having a restricted opening adapted to follow the first named slot into register with the passage communicating with the feed cylinder.

4. In a machine of the character set forth, the combination with a motor and feeding means for the motor, of means for controlling the supply of motive fluid to the motor and the motor feeding means, comprising a valve interposed between the motor and the motor feeding means, the valve block having passages communicating respectively with the motor and the motor feeding means, and a valve piece for controlling the said passages, said valve piece having slots adapted to be brought into register with the passages in the valve block, one of the said slots in the valve piece being adapted to be brought into register with the passage

leading to the feeding means, before the other slot comes into register with the passage leading to the motor, and said valve piece having a reduced opening adapted to register with said passage leading to the feeding means after the said slot has been moved out of register therewith for admitting motive fluid to the feeding means under control, substantially as described.

5. In a machine of the class described the combination with a motor and a feed cylinder, of motive fluid controlling means interposed between the motor and the feed cylinder, said means comprising a valve block having passages formed therein and respectively communicating with the motor and feed cylinder, and a valve piece operable in the said valve block and having slots, one of which is adapted to register with the passage leading to the motor, while the other is adapted to register with the passage leading to the feed cylinder, the slot adapted to register with the passage leading to the feed cylinder being positioned in the disk with respect to the slot adapted to register with the passage leading to the motor so that the slot adapted to register with the passage leading to the feed cylinder will register with the said passage before the other slot registers with the passage leading to the motor, and said valve piece having a restricted opening positioned to register with the passage leading to the feed cylinder while the first named slot is still in register with the passage leading to the motor.

6. In a machine of the class described, the combination with a motor and a feed cylinder, of motive fluid controlling means, for the motor and the feed cylinder, said means comprising a valve, and passages controlled by the said valve leading respectively to the motor and feed cylinder, the valve having openings positioned with respect to the said passages so that one of the openings will register with the passage leading to the feed cylinder before the other opening registers with the passage leading to the motor, and said valve having a restricted opening adapted to register with the passage leading to the feed cylinder while one of said openings remains in register with the passage leading to the motor, substantially as described.

7. In a machine of the character set forth, the combination with a motor and a motor feeding cylinder, of means for controlling the supply of motive fluid to the motor and motor feeding cylinder, the valve block having a feeding cylinder supply passage and a motor supply passage, a valve piece for controlling said passage, said valve piece having an elongated slot adapted to register with the feed cylinder supply passage, said valve piece having a second elongated slot

adapted to register with the motor supply passage after the first named slot has registered with the feed cylinder supply passage, and said valve piece having a restricted opening adapted to register with the feed cylinder supply passage after the first named slot has been moved out of register with the latter and while the second named slot yet remains in register with the motor supply passage.

8. In a structure of the character set forth, the combination with a motor and a motor feeding means, of means for controlling the supply of motive fluid to the motor and motor feeding means, comprising a feeding means supply passage and a motor supply passage, a valve piece controlling said passages, said valve piece having a slot adapted to be moved into register with the feeding means supply passage, said valve piece having a second slot adapted to register with the motor supply passage after the first named slot has registered with the feeding means supply passage, the structure also having an exhaust passage, and the valve piece having an elongated recess adapted to connect the feeding means supply passage and the said exhaust passage after the first named slot has been moved out of register with the feeding means supply passage and while the second named slot yet

remains in register with the motor supply passage, and said valve piece having a restricted opening communicating with said recess.

9. In a machine of the class described, the combination with a motor and a motor feeding means, of means for controlling the supply of motive fluid to the motor and motor feeding means, comprising a feeding means supply passage and a motor supply passage, a valve piece controlling said passages, said valve piece having an opening adapted to be moved into register with the feeding means supply passage, said valve piece having a second opening adapted to be moved into register with the motor supply passage after the first named opening has registered with the feeding means supply passage and while the second named opening is still in register with the motor supply passage, the valve piece having a restricted opening communicating with said recess, and an exhaust valve controlling the said exhaust passage.

In testimony whereof I affix my signature in the presence of two witnesses.

HENRY SCHUMACHER.

Witnesses:

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JNO. G. POWELL.