May 13, 1930. L. A. MAXSON 1,758,846

HOLE OPENING PUNCH

Filed Oct. 8, 1921

Fig. 1.

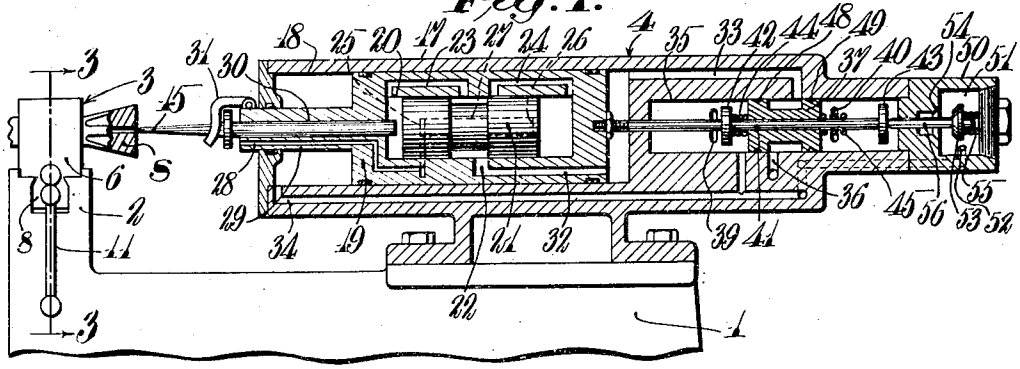


Fig. 2.

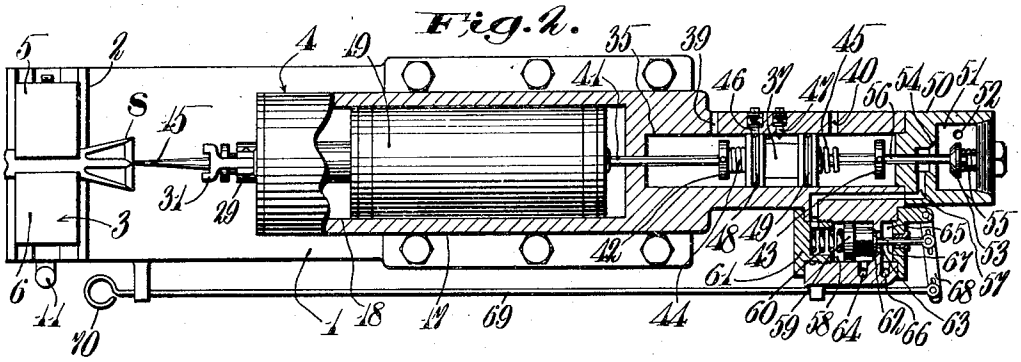


Fig. 3.

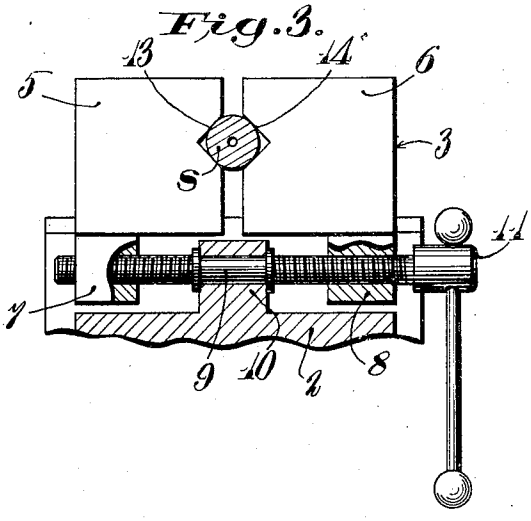
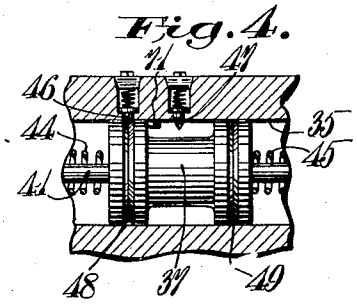


Fig. 4.



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Patented May 13, 1930 1,758,846

UNITED STATES PATENT OFFICE

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HOLE-OPENING PUNCH

Application filed October 8, 1921. Serial No. 506,383.

My invention relates to hole opening punches and more particularly to punches for opening the holes in drill steels after they have been operated upon by forging machines for the purpose of forming bits or lugs thereon.

An object of my invention is to provide an improved hole opening punch. Another object of my invention is to provide an improved punch for opening the holes in hollow drill steels. A further object of my invention is to provide an improved punching mechanism operative to open the hole in a hollow drill steel and thereafter to automatically withdraw the punch from said hole and shut down the machine. Other objects and advantages of my improved mechanism will be apparent from the following specification and appended claims.

In the accompanying drawings I have shown for purposes of illustration one embodiment which my invention may assume in practice.

In these drawings,—

Fig. 1 is a view partially in elevation and partially in central vertical longitudinal section through my improved hole opening mechanism.

Fig. 2 is a view partially in plan and partially in horizontal longitudinal central section through my improved mechanism.

Fig. 3 is a detail partially in elevation and partially in section, the section being taken on line 3—3 of Fig. 1, through my improved steel clamping mechanism.

Fig. 4 is a detail on an enlarged scale of a portion of the mechanism shown in Fig. 2.

It is well known that the swaging operations used in forming the wings at the ends of drill steels frequently result in a partial closure or obstruction of the hole through which fluid is adapted to be supplied to the bottom of the drill hole when the steel is in use. It is also well known that the formation of lugs by certain processes is likely to close partially, or in some instances completely, the hole through drill steels. I have provided improved mechanism for opening these holes.

In the illustrative form of my invention it is shown disposed upon a main frame 1 having at the forward end thereof an upright transversely extending member 2 upon which clamping mechanism generally indicated by 3 is disposed, and likewise comprises a hole opening punch mechanism generally designated 4 disposed in alinement with the jaws of the clamp mechanism 3. The clamping mechanism comprises a pair of oppositely movable jaw members 5 and 6 (see Fig. 3) each provided with a depending lug, respectively numbered 7 and 8, internally threaded and forming nuts cooperating with a member 9 which is held against longitudinal movement in a block 10, but is rotatable by a handle 11, the member 9 having right and left hand threads at the opposite ends thereof cooperating with the nuts 7 and 8. The adjacent faces of the jaws 5 and 6 are provided with notches whose upper and lower sides make respectively angles of 45° with the horizontal. It will be evident that these notches which are designated 13 and 14 will automatically center drill steels of different sizes and place them with their axial bores always in substantially the same position irrespective of the sizes of the steels.

To cooperate with steels, one of which is illustrated at S, in the clamp mechanism 3, I have provided as stated, hole opening mechanism 4. This mechanism comprises a punch 15 which is longitudinally movable with respect to the steel and is adapted to be hammered as well as moved forwardly, whereby to effect an easy and very efficient opening of the partially or entirely closed holes in the steels. Mounted upon the base 1 is a cylinder member 17 having a bore 18 in which there is longitudinally reciprocable a member 19 which comprises a motor having a cylinder 20 in which a piston 21 is reciprocable in a well known manner, fluid being supplied to said cylinder by way of a central inlet supply passage 22 and distributed to the opposite ends of the motor by bypass passages 23 and 24, and fluid being exhausted by exhaust passages 25 and 26 communicating with a longitudinally extending passage 27 which is connected by one or more holes 28 as may be desired with the atmosphere, these holes ex-

tending through a forwardly extending reduced piston rod 29 formed upon the member 19. The member 29 is centrally bored as indicated at 30 and supports as a chuck the pin or hole opening punch 15, the latter being held in operative relation to this chuck by a retainer 31 pivoted to the front end of the member 29. It will be noted that the inlet port 22 is connected by a passage 32 with the rear end of the cylinder 18 and that a fluid supply passage 33 of larger diameter than the passage 32 communicates with the rear end of the cylinder 18. A passage 34 communicates with the forward end of the cylinder 18, the passages 33 and 34 communicating at opposite sides thereof with a bore 35 coaxially arranged with the bore 18. A fluid inlet 36 enters the bore 35 mid-way between the passages 33 and 34. A piston valve 37 is adapted to control the connection of the inlet 36 with the passages 33 and 34, respectively, and also the connection of these last named passages with the exhaust passages 39 and 40 formed in the wall of the chamber 35. A rod 41 is secured to the rear end of the member 19 and is provided with collars 42 and 43 and springs 44 and 45 to cooperate with the piston valve 37 and to cause the latter to move longitudinally in such manner as to connect alternately the port 33 with the inlet 36 and the port 34 with the exhaust 39, or the port 34 with the inlet 36 and the port 33 with the exhaust 40.

For the purpose of holding the piston valve in fixed position except at times when it is positively moved by the action of the collars 42 and 43 and springs 44 and 45, spring controlled plungers 46 and 47 are arranged to cooperate with grooves 48 and 49 in the spools of the valve 37, the plunger 46 being adapted to cooperate with the groove 48 and the plunger 47 with the groove 49. Disposed rearwardly of the bore 35 is a closure member 50 in which there is a chamber 51 connected by a passage 52 with the passage 34. A valve 53 is disposed in the chamber 51 and cooperates with the seat 54, being adapted to be seated upon said seat by a spring 55 and unseated by a plunger 56 which is engaged by the collar 43 upon the rod 41 just as or slightly after the piston valve 37 begins to be moved to the position shown in Fig. 1. It will be noted that this valve controls a passage 57 which leads to a chamber 58 in which a piston 59 is reciprocable. The piston 59 is normally moved toward the right hand end of the chamber by a spring 60 whose tension may be adjusted by means including the threaded follower 61. The plunger 59 is provided with a valve member 62 cooperating with a port 63 which opens through the right hand end wall of the chamber 58. A passage 64 connected with a receiver or other source of compressed air opens into the chamber 58 slightly to the right of the extreme right hand position of the piston 59. It will also be noted that a chamber 65 is arranged on the opposite side of the end wall of the chamber 58 and that from this chamber 65 a port 66 is connected to the passage 36. For the purpose of moving the valve 62 to the left, a properly packed stem 67 is provided, and this stem may be caused to move by a lever 68 and a rod 69 provided with a grasping loop 70 extending into convenient relation to the operator as he stands adjacent the vise member 3. A stop member 71 is arranged to limit the range of movement of valve 37.

The mode of operation of this mechanism will, it is believed, be readily apparent from the preceding description. A steel, the hole in which has been somewhat obstructed, is inserted between the jaws 5 and 6 of the vise and by turning the handle 11 is clamped therein in horizontal position. The operator then pulls upon the grasping ring 70 and pivotal movement of the lever 68 causes the plunger 67 to unseat the valve 62. This valve is, it will be noted, always possessed of a bias toward open position due to the larger area of the piston 59 than the area of the valve member 62, this bias, however, being overcome when the valve is seated by the pressure of the spring 60. When, however, the valve has been opened, due to the relatively large additional area exposed to pressure, it will be understood that the valve will remain open until closed by means hereinafter described. The opening of the valve 62 will permit the passage of pressure from any suitable source, for example a receiver, through the port 64, the port 66, and the passage 36 into the chamber 35 where it will be distributed due to the position of the piston valve 37 by way of the port 33 to the rear end of chamber 18 and by way of ports 32 and 22 to cause reciprocation of the piston 21. It will thus be obvious that upon opening of the valve 62 the piston 21 will reciprocate and hammer upon the pin 15 and also that the pressure acting upon the right hand end of the member 19 will cause the latter to move bodily toward the left and so move the pin as the hole increases in depth. The feeding movement of the piston will be designed in practice in accordance with the purpose for which it is to be used, for ordinary requirements, however, four or five inches being sufficient. When the pin has been driven in to its full distance into the steel S and has opened the hole therein it will be evident that the member 19 will be at the forward end of its stroke, and this member will likewise have moved with it the rod 41 whereby the collar 43 will have caused the piston valve 37 to so move as to cut off communication between the passages 33 and 36 and connect the passages 33 to the exhaust port 40, and to open communication between the passage 36 and the passage 34. As a result, the member 19 will reverse its movement and

withdraw the pin 15 from the now open hole. Slightly before the member 19 has moved sufficiently far to the right to reverse the piston valve 37 so as to cause the opening of communication between the passage 34 and the exhaust port 39, the collar 43 will engage the stem 56 and will open the valve 53. As a result, fluid from the forward end of the cylinder will pass by way of the passage 52, passage 57, etc., into the chamber 58 and acting upon the left hand side of the piston 59 will cause the valve 62 to again be seated. When the member 19 has reached its extreme right hand position, the valve 37 will be restored to the position shown in Fig. 1 and so the parts will be in position for the operation to be repeated. It will be thus evident that I have provided automatic means for opening the hole, retracting the punch from the hole, and shutting down the machine, the sole manual operation requisite for producing this result being the mere opening of a single control valve. As stated above, the advantage of this construction will be clearly apparent for the throwing of the valve 37 will be made more instantaneous by reason of the delay in throwing the same until the compression of the springs 44 and 45 is such as to overcome the action of the spring latches 46 and 47 and accordingly the valve will not begin to move until such time as the piston travel is nearly completed.

While I have in this application specifically described and shown one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a drill steel hole opening mechanism, a hole opening punch, hammer mechanism cooperating therewith, and pressure fluid actuated means including relatively reciprocable cylinder and piston elements for feeding said hammering mechanism forwardly to feed said punch into a hole and for automatically withdrawing said punch when a predetermined forward movement thereof has taken place.

2. In a hole forming mechanism, a tool, hammer mechanism cooperating therewith, pressure fluid actuated means including relatively reciprocable cylinder and piston elements for positively feeding said hammering mechanism to feed said tool forwardly into a hole, and means automatically operative to positively withdraw said tool when a predetermined forward movement of the tool has taken place.

3. In a drill sharpening mechanism, a hole opening punch, means for imparting a rapid series of blows thereon, fluid actuated means for feeding said punch bodily toward a member in which a hole is to be opened, and means for automatically stopping said first mentioned means when said punch reaches its forward limit of movement.

4. In a drill sharpening mechanism, a hole opening punch, hammering mechanism associated therewith, means under manual control for forcing said punch into a member having an obstructed hole therein, and automatic fluid actuated means for withdrawing said punch.

5. In a drill sharpening mechanism, a hole opening punch, hammering mechanism associated therewith including an actuating motor therefor, means under manual control for feeding said punch toward the work, and fluid actuated means controlled by movement of said motor for automatically effecting return movement of said punch.

6. In a drill sharpening mechanism, a hole opening punch, a percussive motor cooperating therewith, means for feeding said percussive motor bodily toward the work, and fluid actuated means automatically operative when the hole has been opened to withdraw the punch therefrom.

7. In a hole opening punch mechanism, a pin, percussive actuating means therefor, fluid means for moving the pin toward the work, fluid pressure means for withdrawing the pin from the work, manual means for initiating movement of the pin toward the work, and automatic means for effecting withdrawal of said pin and the cessation of the operation of said actuating means simultaneously with the initiation of withdrawal.

8. In a drill sharpening mechanism, a pin, means including a relatively reciprocatory piston and cylinder type motor for moving said pin toward and into its work and for withdrawing the same therefrom, manual means for initiating movement of said pin towards its work including a manually opened valve, and automatic means for withdrawing said pin and closing said valve to thereby stop operation of said mechanism.

9. In a drill sharpening mechanism, a pin operating motor, a feeding motor therefor, manually controlled means for initiating the supply of fluid to both of said motors, and means controlled by the movement of said feeding motor for controlling said first mentioned means.

10. In a drill steel hole opening mechanism, a hole opening punch, means to feed said punch forwardly, and control means therefor including manual control means and fluid pressure controlled means adapted to control said manual means.

11. In a drill steel hole opening mechanism, a hole opening punch, means to feed said punch forwardly into the hole in the drill steel, and means automatically operative

when the punch has moved a predetermined distance to initiate withdrawal and simultaneously stop operation of said punch including an element connected to said punch and constantly movable during movement of said punch.

12. In a drill steel hole opening mechanism, a hole opening punch, fluid actuated feeding means for said punch including relatively reciprocable cylinder and piston elements having a cycle of operation, means to start operation of said feeding means, and means to automatically stop the operation of said feeding means when said cycle is completed.

13. In a drill steel hole opening mechanism, a hole opening punch, means to feed said punch forwardly, and control means including a member adapted to be manually operated to initiate operation of said punch and to be actuated by fluid pressure to prevent further operation of the same.

14. In a drill steel hole opening mechanism, a hole opening punch, means to feed said punch forwardly and control means including a member adapted to be manually operated to initiate operation of said punch and to be automatically actuated by fluid pressure to prevent further operation of the same.

15. In a hole forming mechanism, a tool, means for feeding the same forwardly and for automatically withdrawing and stopping the same including a valve adapted to be held stationary during feeding movement, and means movable with the tool for shifting said valve.

16. A hole forming mechanism comprising a tool, means for feeding the same forwardly including means for initiating said movement after which the feeding will be automatic, said latter means comprising a valve, yieldable means for holding the same seated, manual means for unseating the same, and means whereby the same is held unseated by fluid pressure.

17. A hole forming mechanism comprising a feed cylinder, a pneumatic hammer having a cylinder reciprocable in said feed cylinder and carrying a tool, means for controlling flow of fluid to said hammer, means for controlling feeding movement of said hammer cylinder including a valve adapted to be stationary during portions of the feeding movement, and means operable during other portions of the movement thereof by said latter cylinder for actuating said valve.

18. A hole forming mechanism comprising a tool, means for feeding the same forwardly, and controlling means therefor including a plurality of mutually dependently operable valves.

19. A hole forming mechanism comprising a tool, feeding means therefor, means for controlling said feeding means including a plurality of valves. and means for actuating the same in sequence during a predetermined cycle of operation of said mechanism and to restore automatically said valves to their initial position when said cycle is completed.

20. A hole forming mechanism comprising a tool, means for feeding the same, and control means therefor including a valve adapted to be directly subjected to live pressure fluid for seating the same or holding the same open.

21. In a hole forming mechanism, a tool, a feed cylinder, a piston in said cylinder carrying said tool, a valve for admitting live pressure fluid to one end of said cylinder to feed said piston, and means for moving said valve controlled by fluid pressure in the end of said cylinder.

22. A hole forming mechanism comprising a feed cylinder, a piston therein carrying a tool, a hammering mechanism associated with said tool, feed control means therefor including a valve adapted to control a supply of live pressure fluid to said cylinder, means for unseating said valve to permit said tool to have feeding movement, and means for automatically closing said valve.

23. A hole forming mechanism comprising a hammer, pressure fluid means including an element surrounding said hammer for feeding the same forwardly during operation thereof, and means for automatically withdrawing the same.

24. In a hole forming mechanism, a pressure fluid actuated hammer, a forward and reverse feed mechanism therefor, common control means for causing operation of said hammer and forward feed simultaneously including a valve influenced by pressure fluid, and means for automatically stopping said simultaneous operation and rendering said reverse feed automatically operative.

25. In a hole forming mechanism, a hammer, reversible fluid actuated feeding means therefor including relatively reciprocable cylinder and piston elements, and means for causing forward feed and to automatically reverse the same including means responsive to movement of the hammer.

26. In a hole forming mechanism, a pressure fluid actuated hammer comprising a cylinder and piston, feeding means therefor including a cylinder, means for supplying pressure fluid to said cylinders to actuate said piston and feed the hammer in one direction, and means for stopping operation of said hammer piston and for automatically reversing said feeding means on stopping of the hammer.

27. In a hole forming mechanism, a pressure fluid actuated hammer comprising a cylinder and piston, feeding means therefor including a cylinder, means for supplying pressure fluid to said cylinders to actuate said piston and feed the hammer in one direction, and means for reversing said feeding means,

the reverse feed being operative only when said piston is substantially inoperative.

28. In a hole forming mechanism, a pressure fluid actuated hammer, means for feeding the same in one direction during operation of said hammer, and means simultaneously automatically operative for reversing said feed and stopping said hammer.

29. A hole forming mechanism comprising a motor, forward and reverse positive feeding means therefor, a main control valve for said motor and feeding means, and auxiliary valve means cooperating with said main control valve for controlling both of said feeds.

30. A hole forming mechanism comprising a motor, forward and reverse positive feeding means therefor, a main control valve for said motor and feeding means, and auxiliary valve means including a valve reciprocably mounted in alinement with said main control valve for controlling both of said feeds.

31. A hole forming mechanism comprising a fluid actuated element, and means for controlling fluid flow thereto including a plurality of longitudinally movable valves one of which is manually controlled.

32. A hole forming mechanism comprising a fluid actuated element, and means for controlling fluid flow thereto including a plurality of longitudinally movable valves, one of which is operable independently of the other.

33. In a hole forming mechanism, a cylinder, a fluid actuated hammer piston therein, fluid actuated forward and reverse feeding means therefor, means for supply pressure fluid to said cylinder and to said feeding means to feed the cylinder forwardly and for thereafter automatically diminishing the pressure fluid supply to said cylinder and means for effecting reverse feed upon the diminishing of pressure fluid supply to said cylinder.

34. A hole forming mechanism comprising a fluid pressure actuated motor, feeding means therefor, a single manually operable valve for controlling said feeding means, and means for subjecting a portion of said valve to fluid pressure in said motor to effect a controlling action on said valve.

35. A hole forming mechanism comprising a fluid pressure actuated motor, feeding means therefor, a single manually operable valve for controlling said feeding means, and means for automatically subjecting a portion of said valve to fluid pressure in said motor upon operation of the same to thereby effect a controlling action on said valve.

36. A hole forming mechanism comprising a motor, automatic feeding means therefor, a main control valve for said motor, and a control valve coaxially disposed with said main valve for automatically controlling said feeding means.

37. In a drill steel hole opening punch mechanism, a pin adapted to be hammered into an obstructed bore and penetrate to a point beyond the obstruction, a hammering motor associated with said pin and adapted to actuate the same, means for effecting bodily movement of said pin and hammering motor towards a hollow steel to open the bore therein and in an opposite direction to withdraw the pin including relatively reciprocable feed cylinder and piston elements one rigidly connected to the hammering motor and the other held stationary during feeding, and means for controlling the operation of said hammering motor and said means for effecting bodily movement including motive fluid supply connections to said hammering motor and movement effecting means and controlling means therefor including a valve controlling the supply to effect operation of said hammering motor and feed in each direction, and automatic controlling means therefor for shifting said valve without manual intervention to interrupt forward feed and initiate reverse feed.

38. In a drill steel hole opening punch mechanism, a pin adapted to be hammered into an obstructed bore and penetrate to a point beyond the obstruction, a hammering motor associated with said pin and adapted to actuate the same, means for effecting bodily movement of said pin and hammering motor towards a hollow steel to open the bore therein and in an opposite direction to withdraw the pin including relatively reciprocable feed cylinder and piston elements one rigidly connected to the hammering motor and the other held stationary during feeding, and means for controlling the operation of said hammering motor and said means for effecting bodily movement including motive fluid supply connections to said hammering motor and movement effecting means and controlling means therefor including a valve controlling the supply to effect operation of said hammering motor and feed in each direction, and automatic controlling means therefor for shifting said valve without manual intervention to interrupt the forward feed and initiate reverse feed, and an operator controlled valve movable to put said mechanism in operation.

39. A hole forming mechanism comprising a tool, a hammer type motor adapted to actuate the same, and feeding means therefor including a pressure fluid cylinder, a passage to each end of said cylinder, a valve for controlling said passages, manual means for starting delivery of pressure fluid for initiating forward feeding, automatic controlling means for reversing said controlling valve after a predetermined forward movement of the tool has taken place to reverse the feed, and automatic means for stopping delivery of fluid at the end of the reverse feed to stop the feed.

40. In a drill sharpening mechanism, a

hole opening punch, a fluid presser actuated hammer type motor cooperating therewith, and means for feeding said motor toward and from the work including a pressure fluid cylinder, a valve controlling the flow of pressure fluid both to the cylinder and to the motor, manual means for starting delivery of pressure fluid for initiating feeding movement toward the work, and automatic means controlling said valve for reversing the feed after the punch has been driven into the work.

41. In a drill sharpening mechanism, a hole opening punch, a fluid pressure actuated hammer type motor cooperating therewith, means for feeding said motor toward and from the work including a pressure fluid cylinder, a valve controlling the flow of pressure fluid both to the cylinder and to the motor, manual means for starting delivery of pressure fluid for initiating feeding movement toward the work, and automatic means controlling said valve for reversing the feed after the punch has been driven into the work, and automatic means for stopping delivery of fluid at the end of the reverse feed to stop the operation of the drill sharpening mechanism.

42. In a drill steel hole opening punch mechanism, a pin adapted to be hammered into an obstructed bore and penetrate to a point beyond the obstruction, a hammering motor of the pneumatic percussive type associated with the pin and adapted to impart to the same a rapid series of blows to drive it into an obstructed bore, means for effecting bodily forward feeding movement of said pin and hammering motor and opposite retractive movement thereof including a pneumatic feeding motor comprising relatively reciprocable cylinder and piston elements one rigidly connected to the hammering motor and the other held stationary during feeding, and means for starting operation of said hammering motor and causing said feeding motor to effect forward feed and for subsequently causing interruption of the operation of said hammering motor and retraction thereof without further operator intervention comprising controlling means for said motors including a reciprocatory valve controlling air supply to the hammering motor and also operative in one extreme position to supply air to one end of the feeding motor cylinder and vent the other end to effect forward feed and in its other extreme position to supply air to the other end of the feeding motor cylinder and vent the first end to effect retraction.

43. In a drill steel hole opening punch mechanism, a pin adapted to be hammered into an obstructed bore and penetrate to a point beyond the obstruction, a hammering motor of the pneumatic percussive type associated with the pin and adapted to impart to the same a rapid series of blows to drive it into an obstructed bore, means for effecting bodily forward feeding movement of said pin and hammering motor and opposite retractive movement thereof including a pneumatic feeding motor comprising relatively reciprocable cylinder and piston elements one rigidly connected to the hammering motor and the other held stationary during feeding, and means for starting operation of said hammering motor and causing said feeding motor to effect forward feed and for subsequently causing interruption of the operation of said hammering motor and retraction thereof without further operator intervention comprising controlling means for said motors including a reciprocatory valve controlling air supply to the hammering motor and also operative in one extreme position to supply air to one end of the feeding motor cylinder and vent the other end to effect forward feed and in its other extreme position to supply air to the other end of the feeding motor cylinder and vent the first end to effect retraction.

44. In a drill steel hole opening punch mechanism, a pin adapted to be hammered into an obstructed bore and penetrate to a point beyond the obstruction, a hammering motor of the pneumatic percussive type associated with the pin and adapted to impart to the same a rapid series of blows to drive it into an obstructed bore, means for effecting bodily forward feeding movement of said pin and hammering motor and opposite retractive movement thereof including a pneumatic feeding motor comprising relatively reciprocable cylinder and piston elements one rigidly connected to the hammering motor and the other held stationary during feeding, and means for starting operation of said hammering motor and causing said feeding motor to effect forward feed and for subsequently causing interruption of the operation of said hammering motor and retraction thereof without further operator intervention comprising controlling means for said motors including a valve controllable directly by the operator to effect starting of the series of operations set forth, and a reciprocatory valve controlling air supply to the hammering motor and also operative in one extreme position to supply air to one end of the feeding motor cylinder and vent the other end to effect forward feed and in its other extreme position to supply air to the other end of the feeding motor cylinder and vent the first end to effect retraction.

45. A hole forming mechanism comprising a fluid actuated hammer motor, fluid actuated feeding means for effecting forward and reverse feeding of said motor, a main control valve for controlling supply of fluid to

said hammer motor and to said feeding means and an independently operable valve between said main valve and said feeding means for controlling direction of feeding movement.

46. In combination, in a drill steel hole opening punch, a fluid actuated hammer motor, fluid actuated feeding means of the cylinder and piston type for effecting forward and reverse feeding of said motor, a main control valve for controlling supply of fluid to both said hammer motor and feeding means, and an independently operable longitudinally movable valve between said main valve and said feeding means for controlling supply of motive fluid to opposite ends of said feed cylinder to control the direction of feeding movement.

47. In a hole opening punching mechanism, means for opening an obstructed bore in a hollow drill steel including a hammering motor and a pin actuated thereby, and controlling means for said hole opening mechanism including a sliding valve coaxial with the pin and having different positions for effecting opening of the bore and for effecting release of the pin respectively.

48. In a hole opening punching mechanism, a punch pin, mechanism for hammering it into an obstructed bore in a drill steel and releasing it from such bore, and controlling means for said mechanism including a valve chest in alinement with the pin, and a valve reciprocable therein, said valve having forward and rearward positions in each of which it permits fluid flow, the rearward position corresponding to forward hammering of the pin and the forward position to release of the latter.

In testimony whereof I affix my signature.

LOUIS A. MAXSON.