

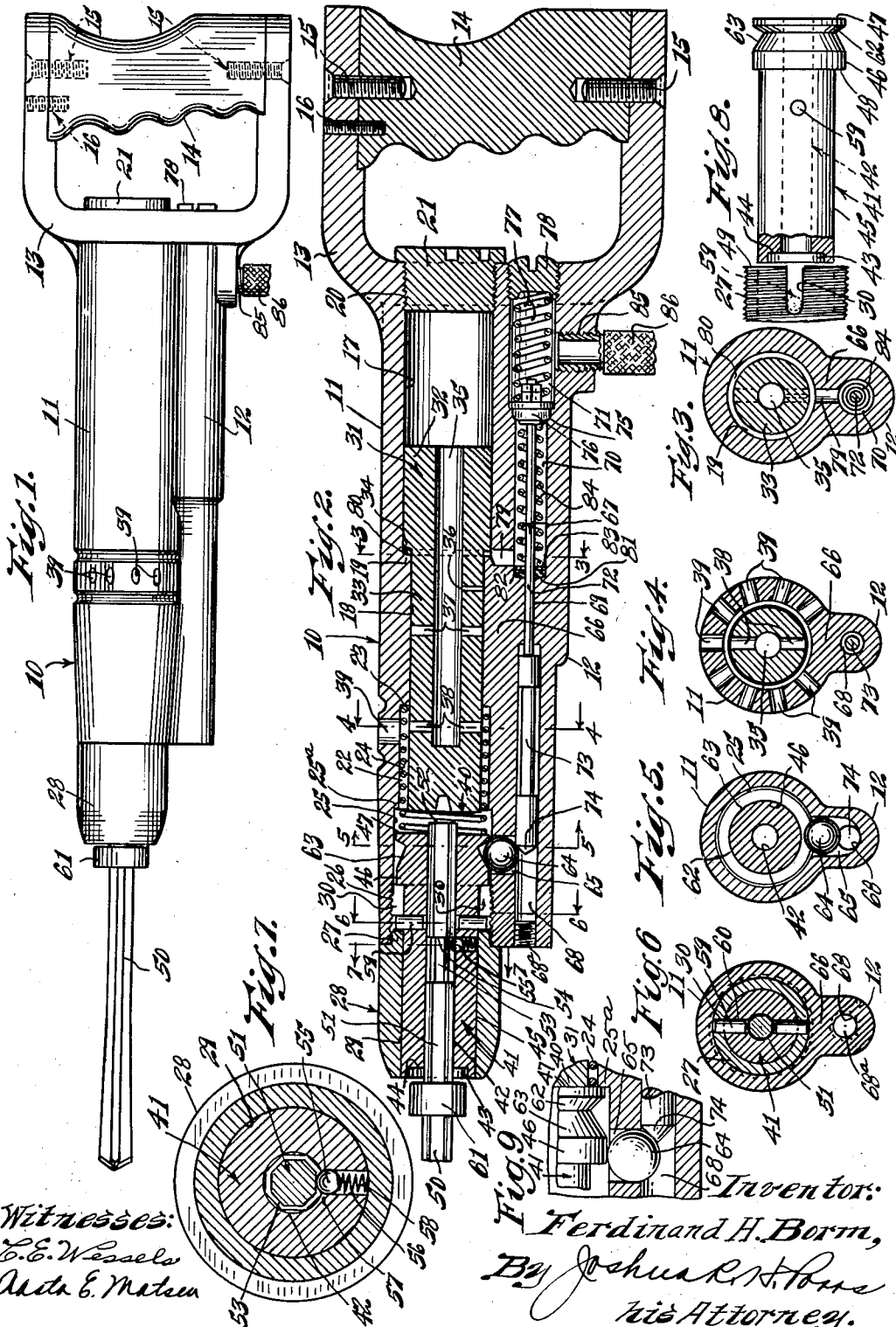
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PNEUMATIC HAMMER

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PNEUMATIC HAMMER

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This invention relates to pneumatic tools, and more especially to portable, pneumatic hammers for drilling.

5 An object of my invention is to provide a simple, practical and efficient device of the character described.

A further object is to provide an improved form of pneumatic hammer of the portable type for drilling and like operations wherein the hammer is automatically set in operation merely by applying the drill or other tool to the work, no levers, plungers or other device being necessary to be hand operated in order to start the hammer action.

15 Other objects and advantages will appear and be brought out more fully in the following specification, reference being had to the accompanying drawing wherein:

Fig. 1 is a side view of a tool showing a preferred embodiment of my invention;

Fig. 2 is a view in central section of the tool shown in Fig. 1;

Fig. 3 is a cross section view on the line 3-3 of Fig. 2;

Fig. 4 is a similar cross section taken on the line 4-4 of Fig. 2;

Fig. 5 is a similar cross section taken on the line 5-5 of Fig. 2;

Fig. 6 is a similar cross section view taken on the line 6-6 of Fig. 2;

Fig. 7 is a similar cross section view enlarged, taken on the line 7-7 of Fig. 2;

Fig. 8 is a detailed view showing the tool holding sleeve and its associated member; and

Fig. 9 is an enlarged section, similar to Fig. 2, showing the parts in complete valve opening position.

Referring more particularly to the drawing, I show a pneumatic hammer drill 10, having a hammer cylinder portion 11, a valve cylinder portion 12 and a U-shaped handle portion 13, the latter being provided with the usual removable hand piece 14, secured thereto by screws 15 and 16. The hammer cylinder 11 is provided with a hammer cylinder bore 17, having a reduced bore portion 18, there being a shoulder 19 at the meeting point of bores 17 and 18. Cylinder 17 is provided with a threaded end portion 20 for reception of a flange plug 21, by which the end of the cylinder 17 is closed. A spring bore 22 is formed adjacent bore 18, and a spring shoulder 23 is provided at the base of bore 22 and adapted to provide a seat for one end of a coiled spring 24. Formed adjacent bore 22 is an enlarged bore 25, there being a shoulder

25a for a purpose to be apparent hereinafter. Bore 25 is provided with an internal threaded end portion 26, for engagement with the reduced threaded end 27 of a locking sleeve 28. Sleeve 28 has a bore 29 and, at the threaded portion 27, a pair of diametrically opposite slots 30 are formed.

A hammer member 31, cylindrical in shape, extends through and reciprocates in bores 17, 18 and 22, and is provided with an enlarged cylindrical portion 32, and a reduced cylindrical portion 33. A shoulder 34, formed on the enlarged portion 32, is complementary to shoulder 19, these shoulders serving to limit the movements of the hammer member 31 in the hammer cylinder. Hammer 31 is provided with an internal bore 35 which is closed at one, that is, the outer end, but opening at the other or inner into bore 17. A small radial drill hole 36 and a pair of larger drill holes 37 are formed in the hammer 31, and serve as inlet ports for passage of air as will be more fully apparent hereinafter. A similar pair of ports 38 are provided for exhausting the air from the hammer cylinder. A plurality of outlet ports 39 are formed in the hammer cylinder 11. The hammer 31 has the usual hammer striking face 40.

A valve operating piston 41 is reciprocable in bore 29 of the locking sleeve 28, and has a central bore 42, and at its outer end a recess 43 the base of which forms a shoulder 44. Member 41 has a cylindrical outer surface 45 adapted to fit loosely in bore 29 and has an enlarged cylindrical portion 46 adapted to fit in bore 25. Member 41 is further provided with an inner face 47 which face is adapted for engagement with one end of spring 24, the spring normally being under compression between shoulder 23 and face 47 to normally maintain piston 41 away from hammer face 40. The enlarged portion of 46 of member 41 has a shoulder 48 for seating against a corresponding shoulder 49 on the threaded end 27 of locking sleeve 28 as will be clear from Fig. 8.

I show a tool such as a star drill 50 having an octagonal shank portion 51 and impact end surface 52, a reduced portion 53 having one or more flat faces and a shoulder 54 adjacent to the reduced portion 53.

A locking ball 55 is retained in a bore 56 in member 41, the bore having a tapering retaining shoulder 57 and containing a spring 58, the free end of which bears against the inner surface of bore 29 of locking sleeve 28. The ball 55 is adapted to hold the drill 50 in the valve

operating piston or member 41, the ball being maintained by spring 58 against a flat face of the reduced portion 53 and the shoulder 54 of the drill. It will be apparent from this construction that the drill will be maintained in position against turning or dropping out by its own weight, although the drill may be removed if pulled away by sufficient force.

A pair of pins 59 are secured in recess 60 in the member 41 in diametrically opposite positions and adapted to reciprocate in slots 30 of the reduced portion 27 of the locking sleeve 28. A collar 61 is integrally secured to the shank 51 of drill 50 and is adapted to seat against shoulder 44 of recess 43. Cylindrical portion 46 of member 41 has a V-shaped groove 62, one face portion or edge of which forms a conical portion or cam surface 63, in which groove a ball 64 is adapted to rest, ball 64 being further positioned in an aperture 65 formed in a partition wall 66 common to cylinders 11 and 12.

A valve assembly 67 is mounted in valve cylinder 12 having an enlarged valve stem bore 68, the end of which is closed by threaded plug 63a. Valve cylinder 12 is further provided with a reduced valve stem bore 69, an air chamber 70 and an intake chamber 71.

Valve assembly 67 is provided with a stem 72 adapted to pass through bore 69 and a stem extension 73 located in bore 68, the free end of stem extension 73 having a conical portion or cam surface 74 engageable with ball 64. A valve seat 75 is formed between chambers 70 and 71 and a valve 76 secured to stem 72 is adapted to seat on valve seat 75. A spring 77 in chamber 71 bears against an adjustable plug 78 and against valve 76 and normally keeps the valve closed on seat 75. A port or air passage 79 interconnects chamber 70 with a chamber 80 formed between shoulders 19 and 34 when separated. A small pocket 81 is formed at one end of chamber 70 and is adapted to hold a packing element 82 for sealing bore 69 and stem 72 against leakage of air and a collar 83 secures the packing 82 in place under the action of a spring 84, the ends of which seat against collar 83 and the valve 76. A threaded aperture 85 forms a passageway to chamber 71 for the intake for air supply conducted from a supply hose 86.

The operation of my invention is as follows. Air under pressure is supplied through hose 86 to air chamber 71. When the drill or other tool 50 is pressed against the surface of material desired to be drilled, the forward or downward movement of hammer 10 will cause collar 61 to engage shoulder 44, resulting in a shifting of member 41 inwardly, whereupon the cam surface 63 will force ball 64 outwardly against cam surface 74 which will shift the valve assembly 67 and move valve 76 off its seat 75, thus admitting the compressed air into chamber 70 and passageway 79 and chamber 80. The pressure in chamber 80 will retract the hammer 31 until ports 36 and 37 are in communication with passageway 73. This will admit the compressed air into bore 35 and bore 17 and the pressure therein will force the hammer against the tool 50, the face 40 striking against the impact end surface of the tool 50. During the impact movement of the hammer 31, the exhaust ports 38 will open into bore 22 and outlet ports 39 when the ports 38 have reached shoulder 23, thus releasing the shoulder in bore 17 permitting the hammer 31 to be again retracted under the action of the pressure in the passageway 79 and chamber 80, and

the hammer action will be repeated, it being understood that valve 67 is kept open by the cam surface 63 pressing against ball 64, and it in turn presses against cam surface 74 of the valve stem extension 73. Thus the hammer will continue operating as long as tool 50 is kept under pressure against the working material.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An automatic hammer of the character described comprising a hammer cylinder, a hammer therein adapted to be reciprocated under fluid pressure, a tool holding sleeve in said cylinder, said cylinder having an internal outwardly facing shoulder, a spring between the sleeve and shoulder normally moving the sleeve forward, removable guide means coacting between the sleeve and cylinder to prevent turning of the sleeve and permit limited axial movement thereof, a valve cylinder adjacent the hammer cylinder with a passageway therebetween, a valve having a stem in said valve cylinder, a member operable in the valve cylinder adapted to engage the valve for unseating the same and having a cam surface, there being a cam surface around the inner portion of said sleeve formed by a reduced portion thereof, and a ball in said passageway adapted to simultaneously engage said surfaces in opposite directions to open said valve when tool pressure is applied against said sleeve and hold said valve open during the continued application of pressure.

2. An automatic tool of the character described comprising, in combination, an operating cylinder, an operating member constructed and arranged to reciprocate in said operating cylinder, a valve assembly comprising a valve and a valve stem adapted to operate and open said valve, a conical portion on said operating member, a cylindrical portion on said operating member adjacent said operating member conical portion, a conical portion on said valve stem, and an intermediate member adapted to engage both said conical portions and also said cylindrical portion subsequent to action by said operating member conical portion, whereby said valve is held in open position during operation of said tool.

3. An automatic tool of the character described comprising, in combination, an operating cylinder, an operating member constructed and arranged to reciprocate in said operating cylinder, a valve assembly comprising a valve and a valve stem adapted to operate and open said valve, a conical portion on said operating member, a cylindrical portion on said operating member adjacent said operating member conical portion, a conical portion on said valve stem, and an intermediate ball bearing adapted to engage both said conical portions and also said cylindrical portion subsequent to action by said operating member conical portion, whereby said valve is held in open position during operation of said tool and during reciprocation of said operating member.