April 16, 1957 H. R. FISCHER 2,788,768

DISTRIBUTING VALVE ARRANGEMENT FOR CHIPPING HAMMER

Original Filed March 17, 1949 4 Sheets-Sheet 1

Fig. 1

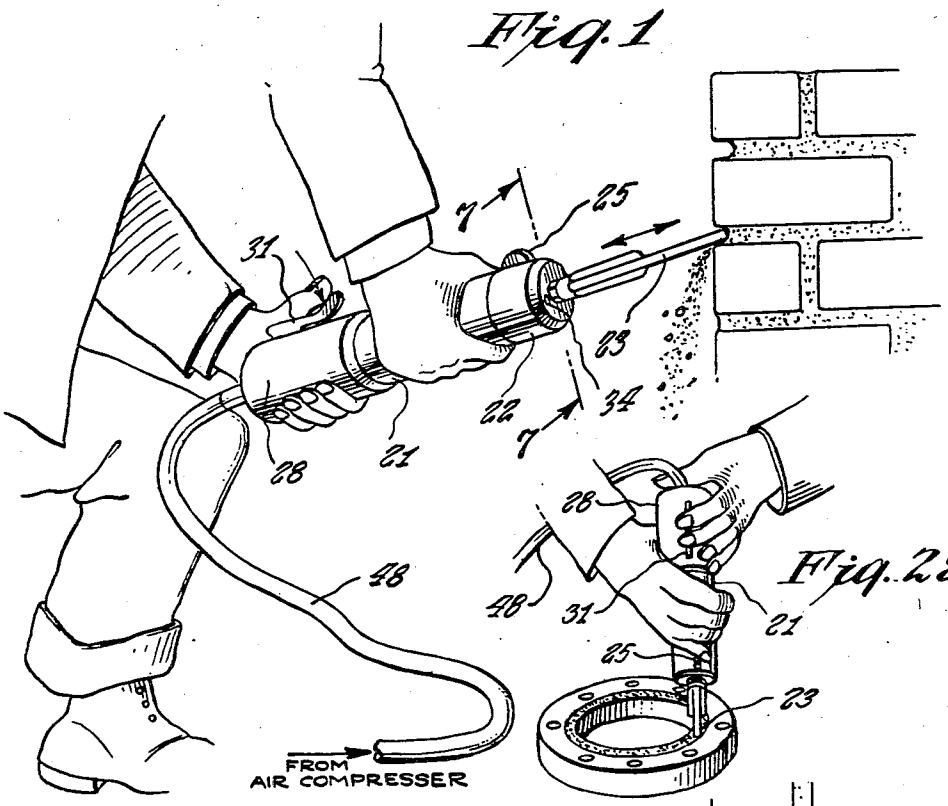


Fig. 2a

Fig. 2

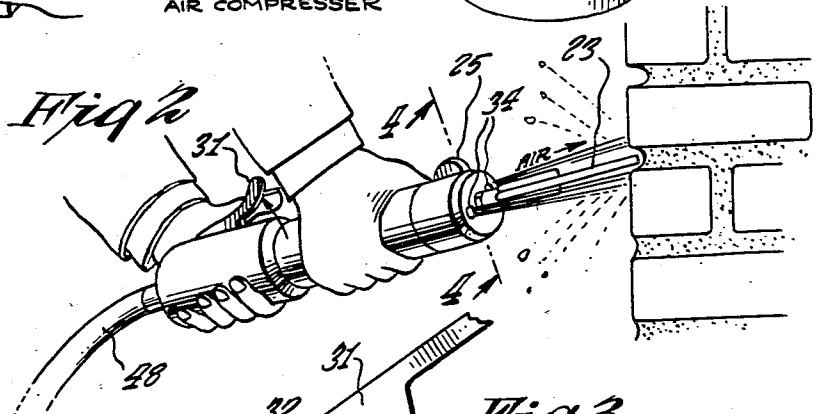
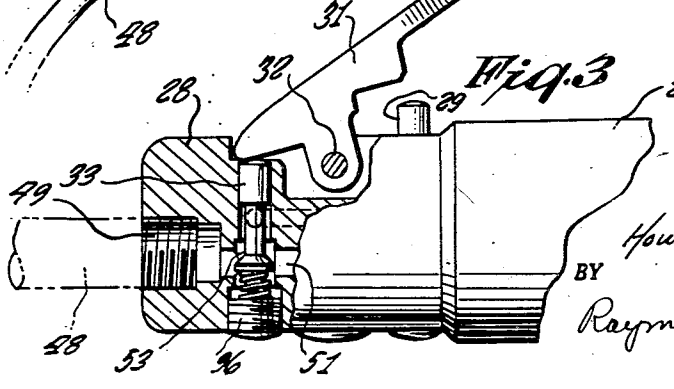


Fig. 3



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Original Filed March 17, 1949 4 Sheets-Sheet 2

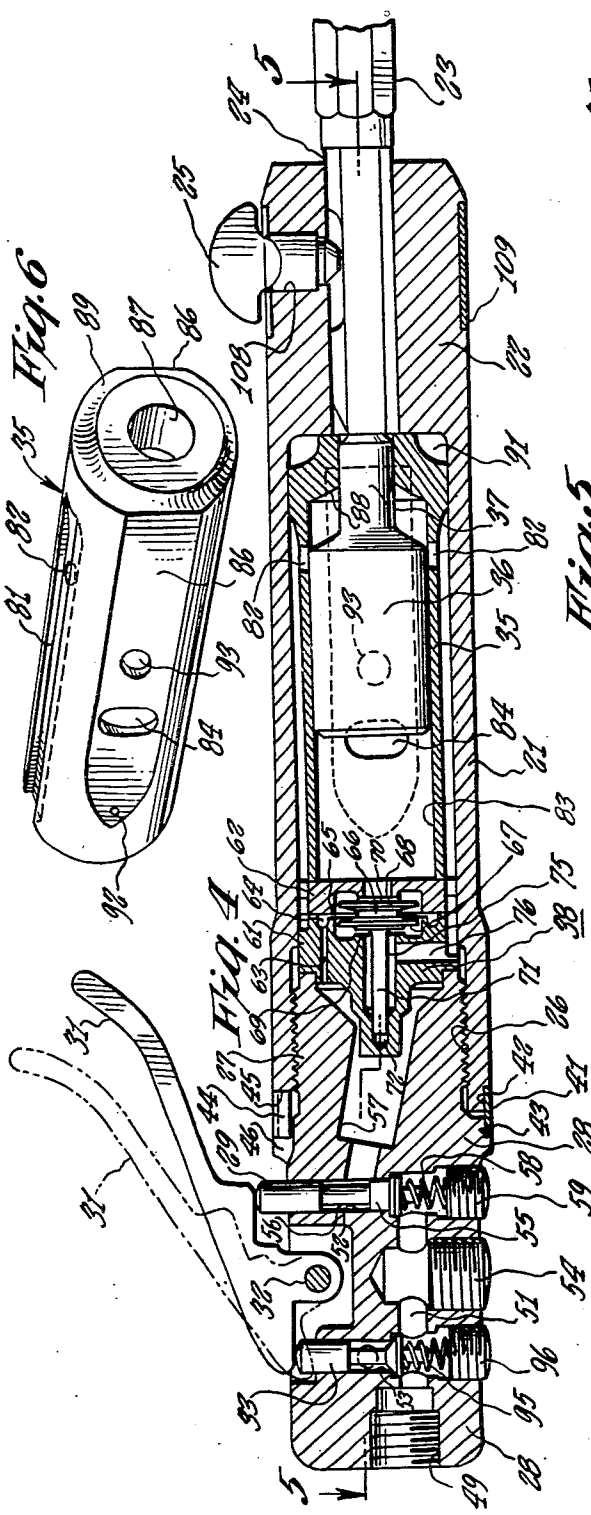

Fig. 6

Fig. 4

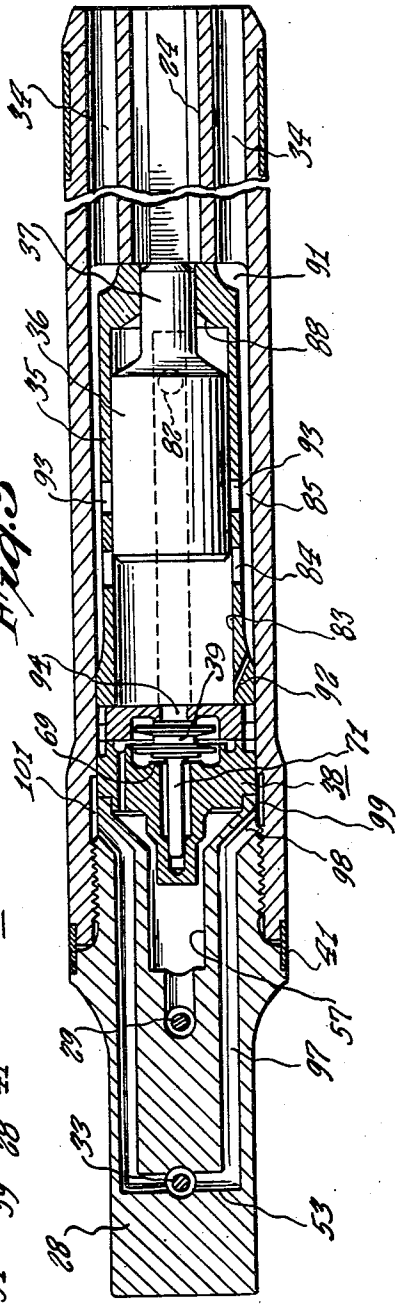

Fig. 5

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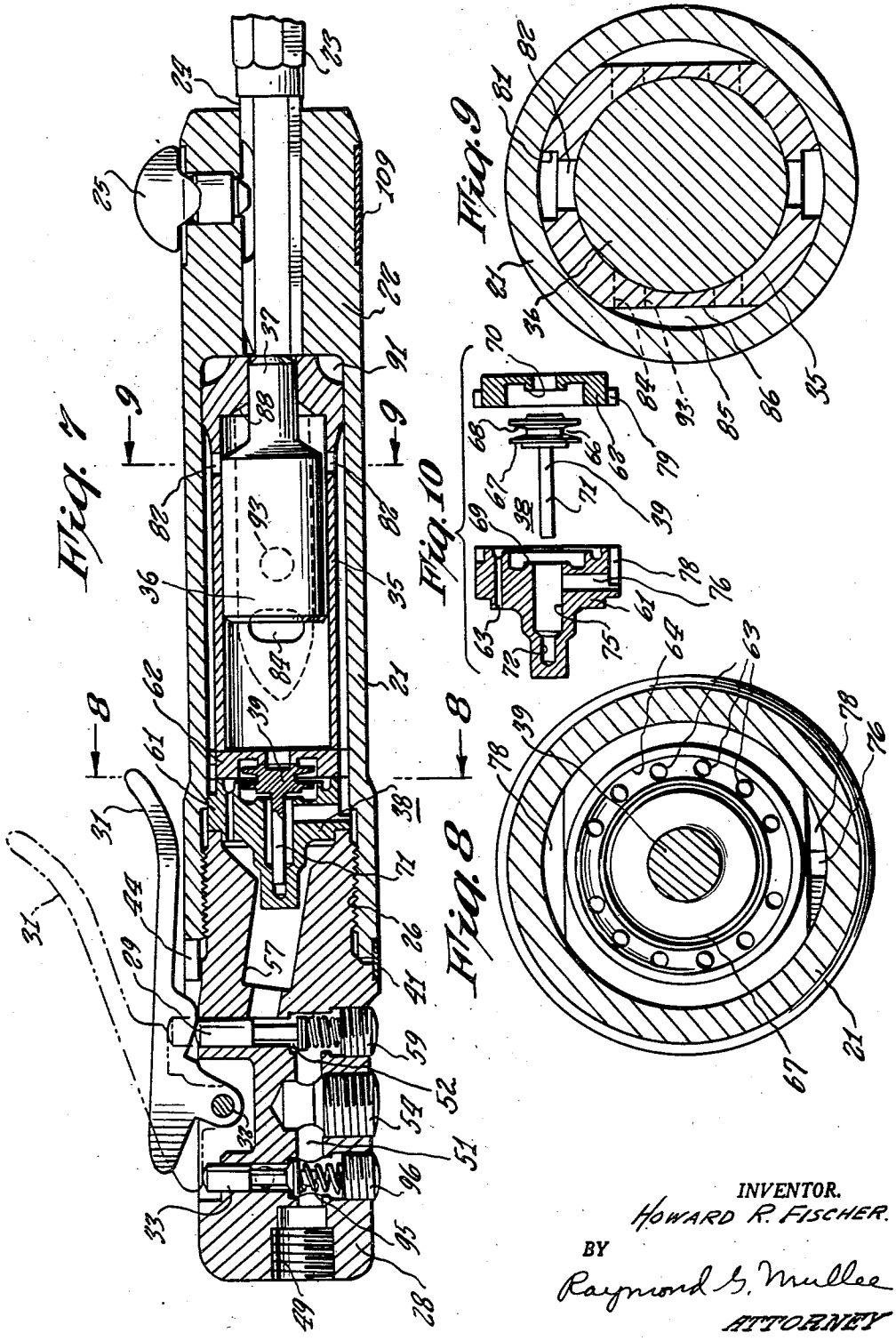
DISTRIBUTING VALVE ARRANGEMENT FOR CHIPPING HAMMER

Original Filed March 17, 1949 4 Sheets-Sheet 3



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DISTRIBUTING VALVE ARRANGEMENT FOR CHIPPING HAMMER

Original Filed March 17, 1949 4 Sheets-Sheet 4

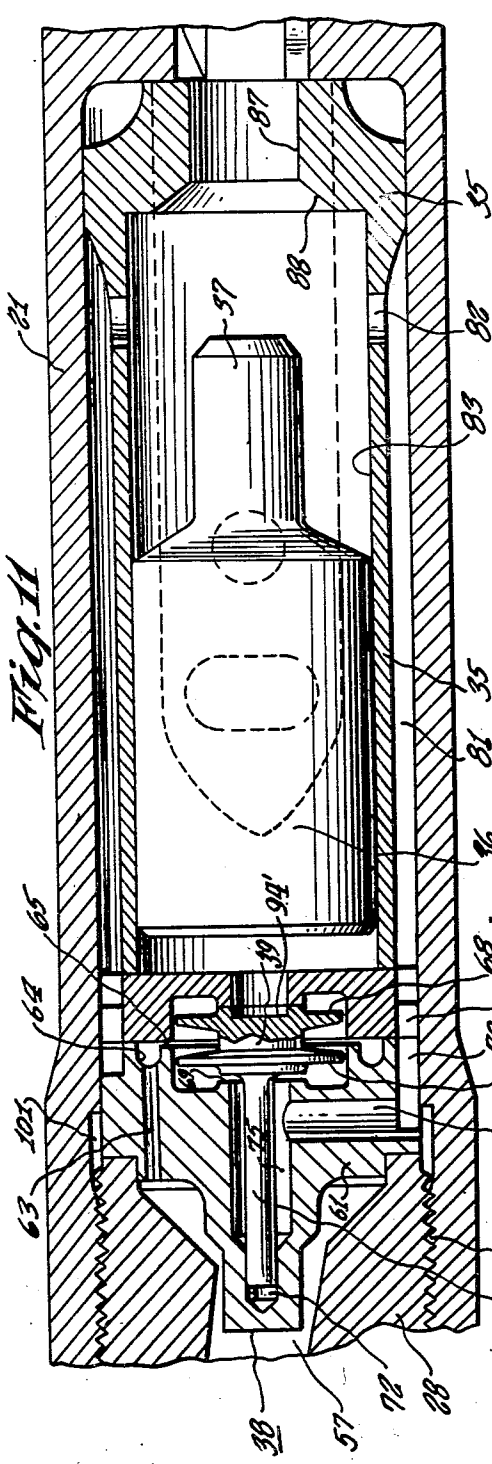

Fig. 11

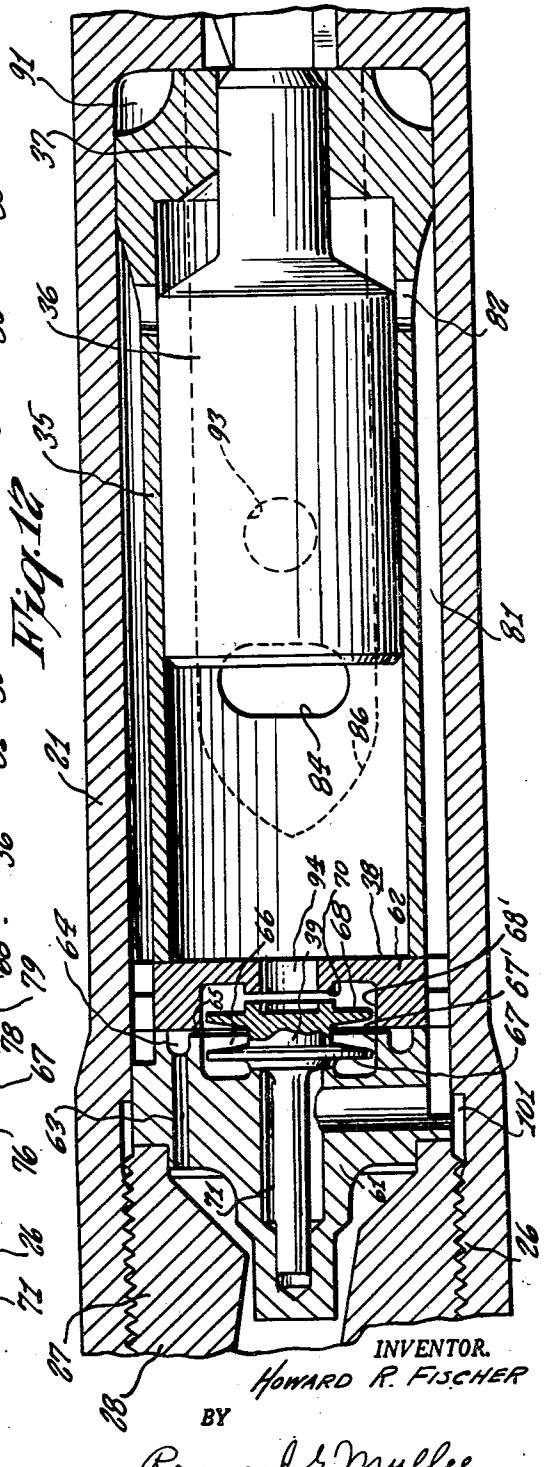

Fig. 12

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DISTRIBUTING VALVE ARRANGEMENT FOR CHIPPING HAMMER

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Application July 10, 1953, Serial No. 367,215, now Patent No. 2,716,393, dated August 30, 1955, which is a division of application Serial No. 81,935, March 17, 1949, now Patent No. 2,672,129, dated March 16, 1954. Divided and this application May 12, 1954, Serial No. 429,209

2 Claims. (Cl. 121—29)

This application is a division of parent application Serial No. 367,215, filed July 10, 1953, now Patent 2,716,393, August 30, 1955, which in turn is a division of original application Serial No. 81,935, filed March 17, 1949, now Patent No. 2,672,129, March 16, 1954.

It is an object of the invention to provide a chipping hammer which may be easily regulated to deliver either light, delicate taps, or heavy, hammer-like blows and whereby to render the hammer adapted for use for many different purposes.

It is another object of the invention to provide an automatic distributing valve arrangement for delivering air under presure alternately to opposite sides of the hammering piston comprising separable valve case sections and a valve element having two thin flanges spaced apart and an integral stem guided by the valve case sections and wherein the flanges need not have air tight connection with the walls of the case sections, but between their peripheries and the walls provide the passages through which the air is diverted to the opposite sides of the valve to effect the movement of the valve from one position to the other and to pass the air to the opposite sides of the hammering piston, whereby to provide a valve arrangement for chipping hammers which will have little wear and long life.

It is another object of the invention to provide a chipping hammer comprising a cylinder sleeve, hammering piston and distributing valve parts which can be loosely assembled in order in the outer casing and which will be held in place by the single connection of a throttle and blower valve containing cylinder head to the outer casing.

Other objects of the invention are to provide a chipping hamer having distributing valve arrangement which is of simple construction, has a minimum number of parts, easy to assembly, inexpensive to manufacture, easy to operate, compact, and efficient in operation.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawings, in which

Fig. 1 is a perspective view of the chipping hammer embodying the features of the present invention being used on a wall to chip the mortar from between bricks thereof and with the operating lever depressed for chiseling action.

Fig. 2 is a perspective view of the chipping hammer being used on the wall and with the operating lever elevated with the thumb to project the high velocity jet of air upon the work surface to clean the same.

Fig. 2*a* is a perspective view of the chipping hammer being used to remove weld flux.

Fig. 3 is a fragmentary side elevational view of the chipping hammer with a portion thereof broken away and shown in section through the region of the air jet

blower valve and with the operating lever elevated to depress the same for blower action.

Fig. 4 is a longitudinal sectional view of the chipping hammer with the hammering piston projected toward the nose end of the hammer and as viewed on line 4—4 of Fig. 2.

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

Fig. 6 is a perspective view of the cylinder sleeve removed from the main casing.

Fig. 7 is a longitudinal sectional view of the chipping hammer with the operating lever depressed for hammering action and as viewed on line 7—7 of Fig. 1.

Figs. 8 and 9 are respectively enlarged transverse sectional views taken on lines 8—8 and 9—9 of Fig. 7.

Fig. 10 is a collective view of the distributing valve casing sections which are in section and of the valve element which is shown in side elevation.

Fig. 11 is an enlarged fragmentary and sectional view of the hammer taken through the distributing valve arrangement with the hammering piston in its rearward position within the cylinder sleeve and the valve element of the valve arrangement being positioned to extend air to the forward part of the cylinder chamber.

Fig. 12 is a fragmentary sectional view similar to Fig. 11, but with the hammering piston extended forwardly in the cylinder to engage with the end of the chisel and with the valve element positioned to extend air to the rear part of the cylinder sleeve.

Referring now to the figures, the chipping hammer of the present invention comprises generally an outer casing 21 having an integral nose end portion 22 adapted to receive a chisel 23 within its opening 24. This chisel 23 is held within the opening 24 by a quick release key plug 25. The outer casing 21 is internally threaded at 26 to receive a threaded portion 27 of a cylinder head 28 having a throttle valve element 29 adapted to be depressed by a manually-operable lever 31 pivotally connected to the cylinder head 28 at 32. This same lever 31 when pivoted away from the throttle valve element 29 is used to depress a blower valve element 33 to cause air to be directed through the cylinder head and casing and holes 34 in the nose end portion 22 of the outer casing 21 to direct air upon the work surface. This air passes to the work surface with great force and removes such particles and chips from the surface which have not been removed by the exhaust air blast and in the manner as illustrated in Fig. 2.

Fitted within the outer casing 21 is a cylinder sleeve 35 having a hammer piston 36 slidable therein. This hammer piston 36 has a projection 37 adapted to tap the end of the chisel 23 which has been extended into the nose end portion 22 of the outer casing 21. Fixed within the outer casing 21 by the cylinder head 28 is a distributing valve arrangement 38 with a double flange valve element 39 and adapted to cause the passage of air to first one end of the cylinder sleeve 35 and then to the opposite end thereof whereby to cause the reciprocation of the hammer piston 36 at a speed dependent upon the extent of downward movement of the lever 31 and of the throttle valve element 29. The hammer piston 36 can accordingly be made to deliver either fast blows upon the chisel 23 or slow taps.

The cylinder head 28 is locked in the outer casing 21, against turning movement by a locking ring 41 seated in aligned recesses 42 and 43 of the respective casing and head parts, and having a radially inwardly bent end 44 within aligned peripheral slots 45 and 46 of the respective casing and head parts. An air hose 48 is connected to a threaded opening 49 in the cylinder head 28. Extending from this threaded opening 49 is a valve chamber 51 into which valve elements 29 and 33 are extended

to open ports 52 and 53 respectively. A plug 54 is disposed in a threaded opening at the bottom of the cylinder head whereby, if desired, an attachment of the hose 48 can be made to the bottom of the cylinder head. The plug 54 can be then inserted in the threaded opening 49.

Air passes from the valve chamber 51 through port 52 when lever 31 is depressed and the valve element 29 lowered into the chamber 51 so that its closing portion 55 drops sufficiently to allow air to pass to a groove 56 on the valve element 29 and to distributing valve chamber 57 in the cylinder head. The valve element 29 is urged toward its elevated and closed position by a spring 58 and plug 59.

The distributing valve arrangement 38 comprises two opposing valve seat parts or casing sections 61 and 62 separable from one another upon the distributing valve arrangement being made free of the casing but held closed upon one another by the cylinder head 28 on being connected with the outer casing 21, Figs. 4, 11 and 12. Circumferentially spaced within the casing section 61 are a plurality of longitudinally-extending holes 63 through which the live air is passed from the valve chamber 57 to an annular manifold recess 64 cut in the face of the casing section 61. From the manifold recess, the live air passes radially inwardly through a thin annular slot 65 provided between the casing sections 61 and 62 and into space 66 provided between flanges 67 and 68 of valve element 39. This space 66 provides a miniature reservoir for the air and permits the valve element 39 to shift from one position to the other. On the valve casing section 61 is a radially flat seat 69 against which a complementary flat face of the valve element is forced when moved into casing section 61. On the casing section 62 is a radially flat valve seat 70 against which on opposite complementary flat face of the valve element 39 is forced when the valve element is moved toward that section. The valve element 39 has a stem 71 which enters a hole 72 to be supported and guided in its axial movement within the distributing valve casing sections.

The two flanges 67 and 68 of the valve element 39 are slightly smaller in diameter than the bores 67' and 68' (Fig. 12) of the valve casing sections which allow the correct volume of air to flow past the flanges to the front and rear of the cylinder sleeve 35 to operate the hammering piston 36. If the valve element 39 has been moved to the right, as viewed in Figs. 5, 7 and 11, air passes flange 67, seat 69, longitudinally-extending chamber 75 in the valve section 61, radially-extending passage 76, aligned peripheral slots 78 and 79 in the respective valve casing sections 61 and 62, longitudinally-extending slot 81 in the cylinder sleeve 35, holes 82 in the cylinder sleeve to the front of the cylinder sleeve chamber 83 and ahead of the piston 36 whereby to return the piston 36 to the rear of the cylinder sleeve chamber. While this is taking place, the air in the rear of the chamber 83 is exhausted through large hole 84 to a longitudinally-extending passage 85, Fig. 5, provided by relief 86 cut from the exterior of the cylinder sleeve 35. This relief begins at a point on the cylinder sleeve removed from the rear thereof and terminates at the forward end of the cylinder sleeve to allow the air to pass forwardly thereof to air holes 34 and exhausted upon the working surface. This air will not have the steady and high pressure blowing effect of the air which is delivered directly when the blowing valve 33 is depressed, but will keep the work surface cleared of the less difficult cuttings to remove. The manner in which the blowing air arrives or is passed through the parts will be set forth later herein.

The cylinder sleeve 35 has an end opening 87 through which the hammering portion 37 of the piston 36 is projected. The portion 37 is guided into the opening 87 by a flaring 88. The nose end of the cylinder 35 is peripherally relieved at 89 to provide an annular passage 91 through which the air leaving longitudinal passage 85 passes to air holes 34. The cylinder sleeve 35 has a small bleed port 92 for relieving any pressure back of the piston during the blowing process, otherwise the piston 36 would have a tendency to flutter or make a short stroke.

Forwardly of the hole 84 in the cylinder sleeve 35, is an exhaust hole 93 which is uncovered by the piston as it moves rearwardly in the chamber 83. The pressure in the front end of the chamber 83 thereupon instantly drops. The hammer piston 36 continues to move rearwardly under its momentum and compresses the air in the rear end of the chamber 83 into an axial counterbore or pocket 39' (Fig. 11) of the valve element, which pressure, together with the pressure of air flowing over the flange 67 through seat opening 69 acts to shift the valve element 39 rearwardly to engage seat 69. The pressure will thereupon drop in the passages leading from the distributing valve 38. The variable force of the blow results from the light sensitive pulley valve element 39, the throttle valve 55 and the control lever 31.

The air from the small chamber 66 between the flanges 67 and 68 of the valve element 39 then passes over the flange 68, through seat 70 and port 94 in the casing section 62, to enter the rear of the chamber 83 to urge the piston forwardly for its next hammering action. As soon as the exhaust port 84 is uncovered on the forward stroke, exhaust port 93 is closed over by the piston, the driving pressure on the piston diminishes and pressure is built up at the opposite seated end 69 of the valve member, which pressure, together with the pressure air flowing over the flange member 68 into the passage 94 moves the valve element forwardly to engage seat 70 and to open the passages to the forward end of the chamber 83 and effect the return of the piston.

While only one relief 86 and one groove 81 has been described, it is to be understood that the cylinder sleeve 35 also has a diametrically opposite relief 86 and a diametrically opposite groove 81. The valve casing sections 61 and 62 likewise have corresponding passages and slots for the delivery of air to the diametrically opposite groove 81. Likewise, the relief 86 at the opposite side of the sleeve has exhaust openings 84, 92 and 93 and terminates at the annular relief 89 on the nose end of the cylinder sleeve.

Upon release of the operating lever 31, the throttle valve 29 is returned to its closed position and the lever 31 is raised to its neutral position, as viewed in Fig. 4. By lifting the lever rearwardly, the blower valve 33 is depressed and air will be admitted from the chamber 51 to the blowing air port 53. This blower valve 33 is normally urged toward a closed position by a spring 95 and a plug 96 threaded into the cylinder head 28. There are two ports 53, Fig. 5, connecting respectively with longitudinally-extending passages 97 in the cylinder head 28 which flare outwardly to provide outlet ports 98 on the forward end of the cylinder head.

The cylinder head 28 is provided with an annular recess 99 whereby to provide an annular chamber 101 between the cylinder head and the casing 21. This annular chamber 101 has communication with slots 78 and 79, Fig. 11, in the respective valve casing sections 61 and 62 and to the grooves 81 on the exterior of the cylinder sleeve 35. From these grooves, the air enters the front of the chamber 83, causing the hammering piston 36 to be moved rearwardly and to uncover the sleeve opening 93 to permit the air to pass through passages 85, annular space 91 and holes 34. This air moves in a steady stream and will be projected with great force upon the working surface to clear away any accumulation of cuttings for which the exhaust air is not sufficient. It will accordingly be seen, that by simply reversing the movement of the manually-operable lever 31 from its position depressing the throttle valve 29 for chipping action to a position to depress the blower valve 33, blower action will be effected and a removal of the cuttings or chips on the surface being worked will result.

Referring now particularly to Figs. 4 and 7, there is shown the chisel retaining arrangement. The chisel **23** has a portion thereof adapted to fit the opening **24**. Intermediate the length of this portion is a slot adapted to receive the retaining plug **25**. This retaining plug is round and has a tapered projection adapted to enter the chisel slot and a shoulder adapted to engage with a shoulder of plug opening **108** in the nose end **22** of the casing **21**. The retaining plug **25** is held in place by a split spring ring **109** adapted to fill an annular recess on the exterior of the nose portion **22**. The ends of the ring terminate against a handle portion of the retainer element. The slot in the chisel element is sufficiently long to permit the axial displacement of the chisel resulting from the hammering action.

The sleeve **35** with the piston **36**, the distributing valve sections **61** and **62** with the valve element **39** disposed between them, are easily assembled within the outer casing **21** in the order mentioned and by the mere connection of the cylinder head **28** containing the valves **29** and **33** and the manually-operable lever **31** for operating these valve elements are secured firmly within the casing **21** against axial displacement. The ring **41** is finally snapped into place on the outer casing and the cylinder head to prevent the outward turning of the cylinder head from the outer casing **21**.

The chipping hammer is of light weight, easily handled and has many uses. Some of such uses are channeling brick before repainting, cutting windings in electric motors, scraping barnacles from ship bottoms, cleaning putty from steel window sashes, chiseling wood in pattern shops, making grafting incisions in trees, removing heat treat scale, redressing millstones and numerous other uses.

While various changes may be made in the detail construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. In a pneumatic hammer adapted to deliver rapid blows and having a piston cylinder with a hammer piston slidably arranged therein; a distributing valve arrangement comprising opposed separate casing sections, arranged to form between them a cylindrical valve chamber having an annular surrounding wall and end walls at right angles to the latter; one of the casing sections having a ring of longitudinally extending holes for admittance of pressure air to an annular manifold cavity formed in said casing section; the casing sections providing between them a thin annular slot communicating the manifold cavity directly and radially with the center of the chamber, and the cross sectional area of the manifold cavity being relatively greater than that of the longitudinal holes and the thin slot, whereby a multiplied and uniform thin stream of air pressure is admitted radially through the entirety of the thin slot into the valve chamber; one of the end walls of the valve chamber having an axial passage communicating directly with the driving end of the piston chamber, and the opposite end wall having an outer axial extension into which extends from the valve chamber a second axial passage communicating radially with passages leading to the return end of the piston chamber, a boss about each axial passage projecting slightly into the valve chamber and having a broad radial flat end face forming a valve seat; an elongated valve rod projecting axially from the valve chamber freely into that axial passage which extends into the said end wall extension, and having its end portion supported for slight axial movement in a complementary bore of the latter wall extension; a sheave form valve member disposed in the chamber, axially carried at the opposite end of the valve rod, and including a pair of radial annular flange members spaced by a V groove, and a valve head formed by a boss projecting axially from the outer face of each flange; each valve head having a radially extending broad flat end face adapted for sealing engagement with one of the valve seats; the valve member being axially reciprocable to unseat one valve head from one exit passage and to seat the other over the opposite exit passage upon each directional movement of the valve; the valve member being arranged to reciprocate over a short distance so that the thin annular slot is at all times in communication with the V groove between the flanges, and the peripheries of the flange members being in close spaced relation to the cylindrical wall of the valve chamber whereby the thin stream of pressure air forcefully entering the valve chamber to the V groove flows forcefully and uniformly over the peripheries of the flange members to the opposite sides thereof so as to influence the valve member to move from one seated position to the other; and the piston cylinder including exhaust port means controlled by the movements of the piston hammer for relaxing counter air pressure in the piston cylinder over the unseated end of the valve member and increasing it over the seated end after the piston hammer has reached a predetermined position in moving in either direction, whereby the valve member is readily reciprocable from one position to the other under the influence of the pressure air in the valve chamber and the compressive action of the piston hammer in the cylinder.

2. In a pneumatic hammer as defined in claim 1, wherein that valve head arranged to seat over the exit passage leading directly into the driving end of the piston cylinder is characterized by an outer counterbore equal in diameter to the said passage and of relatively smaller diameter than the piston cylinder, whereby the compression created by the piston hammer on this valve head when the latter is seated in multiplied on a return movement of the piston to cause a swift unseating thereof as well as to enable a full return of the piston and to provide a volume of compressive air effective in supplementing the incoming pressure air in re-driving the piston.

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