J. G. LEYNER.

FLUID OPERATED DRILL STEEL GRIPPING VISE FOR DRILL BIT SHARPENING MACHINES.

APPLICATION FILED APR. 15, 1912.

1,040,221.

Patented Oct. 1, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

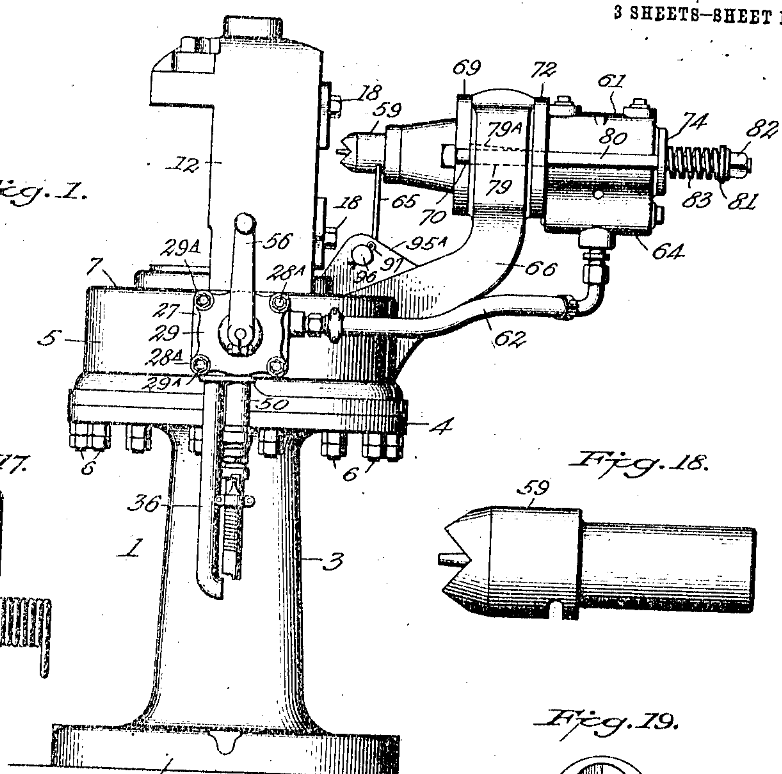


Fig. 17.

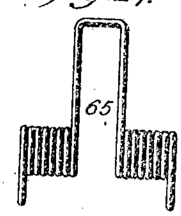


Fig. 18.

Fig. 19.

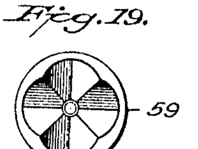
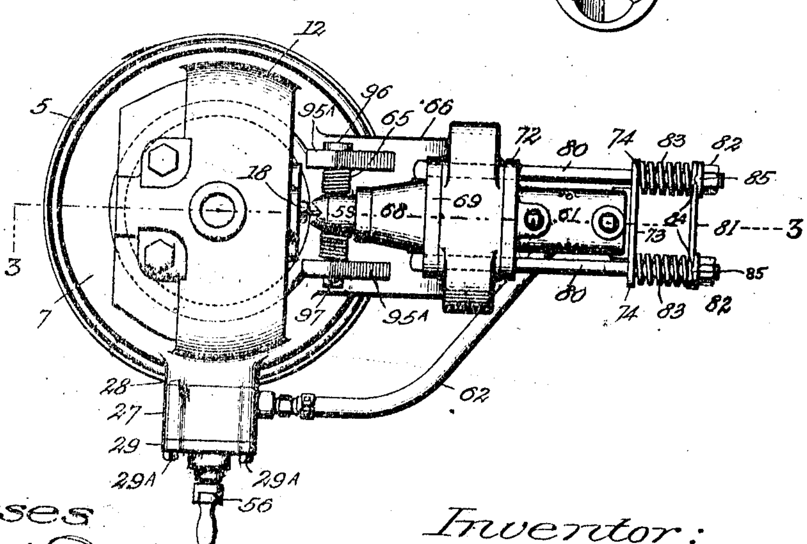


Fig. 2.



Witnesses

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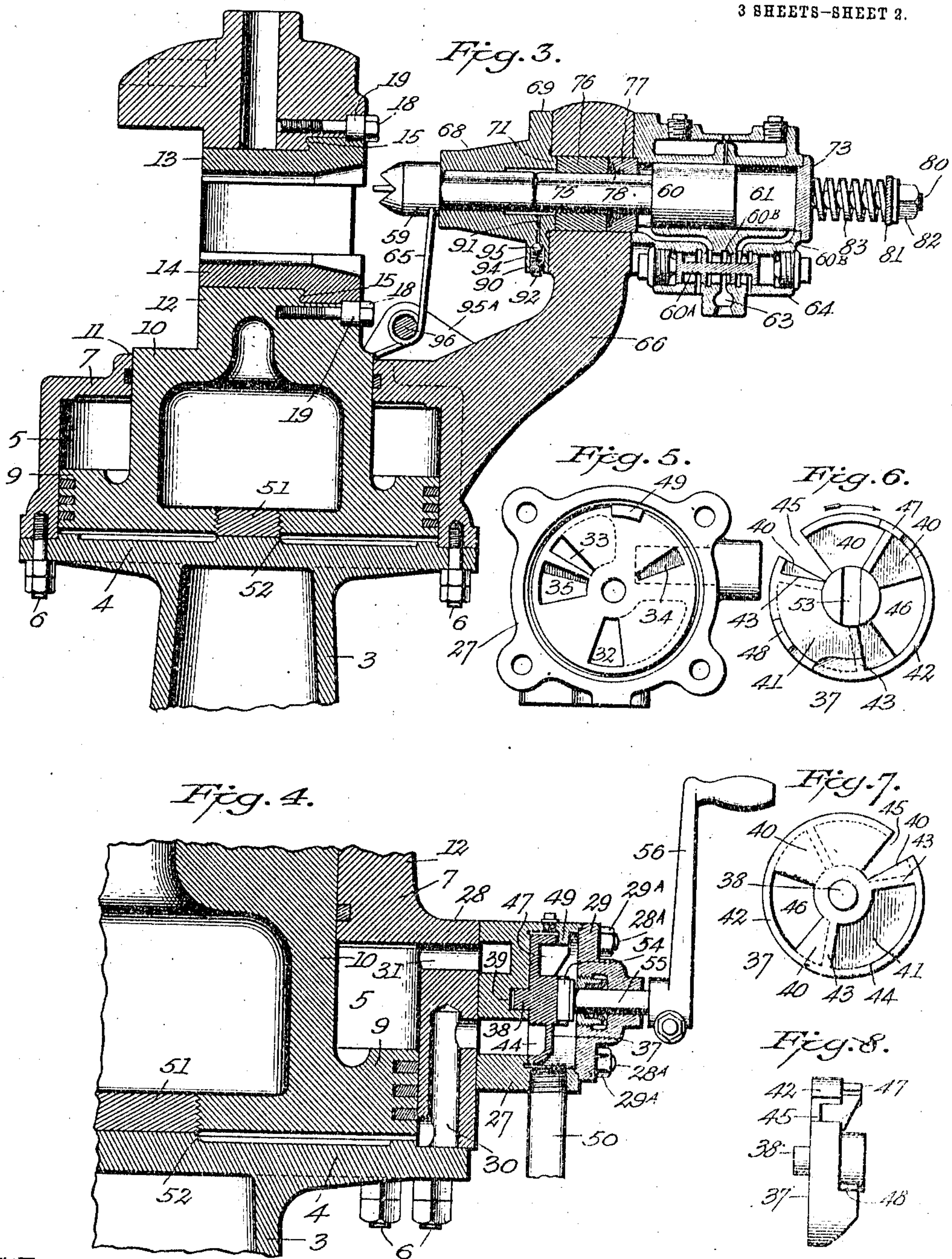

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3 SHEETS—SHEET 3.

Fig. 9.

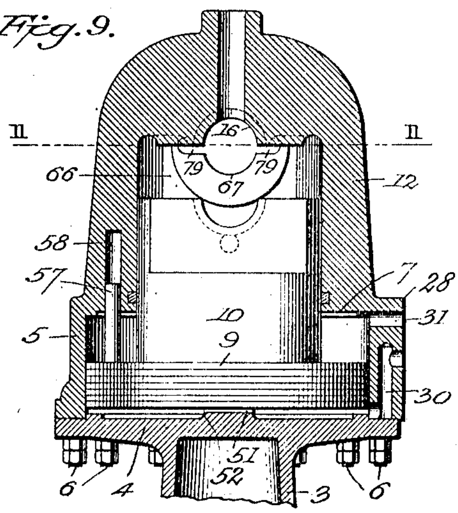


Fig. 10.

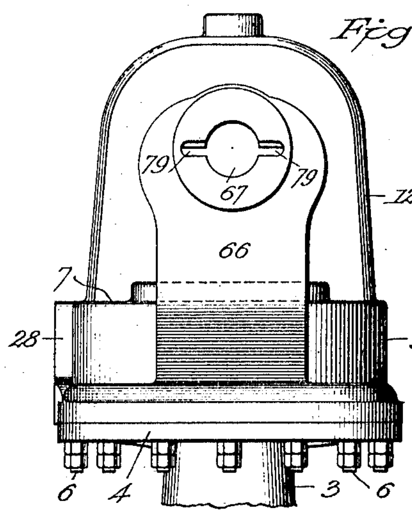


Fig. 11.

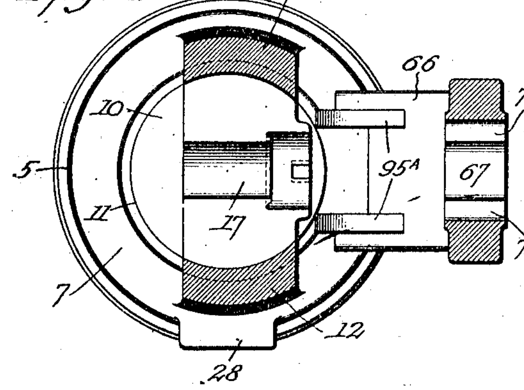


Fig. 12.

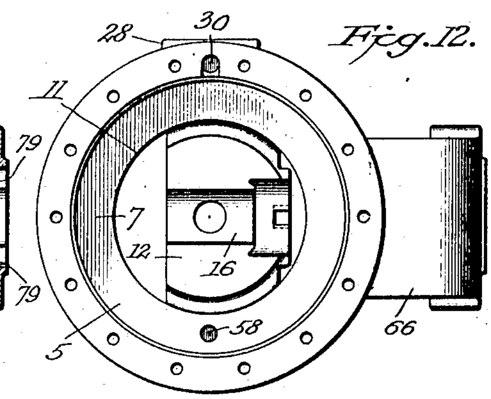


Fig. 13.

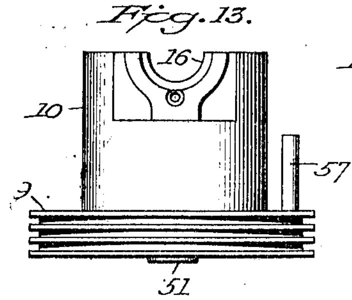


Fig. 14.

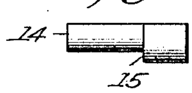


Fig. 15.

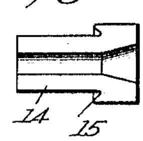
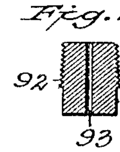


Fig. 16.

Fig. 20.



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UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO.

FLUID-OPERATED DRILL-STEEL-GRIPPING VISE FOR DRILL-BIT-SHARPENING MACHINES.

1,040,221. Specification of Letters Patent. Patented Oct. 1, 1912.

Original application filed October 18, 1910, Serial No. 587,650. Divided and this application filed April 15, 1912. Serial No. 690,837.

To all whom it may concern:

Be it known that I, JOHN GEORGE LEYNER, a citizen of the United States of America, residing at 1707 Glenarm street, Denver, Colorado, have invented a new and useful Fluid-Operated Drill-Steel-Gripping Vise for Drill-Bit-Sharpening Machines, of which the following is a specification.

My invention relates to improvements in fluid operated drill steel gripping vise for drill-bit sharpening machines, and the objects of my invention are: first, to provide a fluid operated drill steel gripping vise for gripping and continuously holding drill steel while it is being sharpened into rock cutting drill-bits, and, second, to provide means by which the different parts of the machine are supported on one base plate. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1 is a side view of a drill-bit forming and sharpening machine, provided with the improved valve mechanism. Fig. 2 is a plan view of the same. Fig. 3 is a central vertical sectional view of the machine on the line 3—3 of Fig. 2, showing a portion only of the supporting stand. Fig. 4 is an enlarged vertical sectional view through a portion of the drill clamping cylinder, showing the improved valve and ports controlled thereby. Fig. 5 is a front view of the valve chest, the valve being removed. Fig. 6 is a front view of the improved valve. Fig. 7 is a rear view of the same. Fig. 8 is an edge view thereof. Fig. 9 is a vertical sectional view through the drill clamping cylinder and standard thereon, which supports the upper drill-bit clamping die, and showing the operating piston and extension thereon which carries the lower drill-bit clamping die. Fig 10 is a rear view of the portion of the machine shown in Fig. 9. Fig. 11 is a horizontal sectional view on the line 11—11 of Fig. 9. Fig. 12 is a bottom view of the cylinder, the piston being removed. Fig. 13 is an elevation of the piston shown in Fig. 9, looking at the opposite side thereof. Figs. 14, 15 and 16 are, respectively, a side view, a plan view, and an end view, of one of the drill-bit clamping dies. Fig. 17 is a front view of the spring for retracting the dolly. Fig. 18 is a side view of the dolly. Fig. 19 is an end view thereof. And Fig. 20 is an enlarged sectional view through the apertured plug which closes the vent in the dolly support.

Similar letters of reference refer to similar parts throughout the several views.

My present invention relates to a divisional part of my pending application No. 587,650, filed October 18, 1910, for improvements in fluid controlled drill steel forming and drill-bit sharpening machines, my present application relating to the operation of the drill steel gripping vise by fluid pressure, preferably compressed air.

My invention also relates to improvements in the general construction and arrangement in the coöperating elements of the machine on one base or foundation casting, all of which are described, inasmuch as they form coacting and coöperating parts of those features that are made the objects of this application.

Referring to the accompanying drawings: The numeral 1 designates the supporting stand of my fluid or pneumatic controlled drill sharpener. This integral and monolithic form of base or foundation stand comprises a floor or base portion 2, a hollow vertical column or standard 3 and a table portion 4, all of which are preferably made of circular form. Upon this supporting stand is placed the drill sharpener and holder, which comprises a cylinder 5, which sits on and is secured to the table top of the stand by any suitable means, but preferably by studs 6, which project from the lower edge of the cylinder through holes in the table, nuts being screwed upon their lower ends. This cylinder is open at its bottom, the table top forming its lower cylinder head, and it is closed at its top end by an integral head 7. This cylinder is provided with an axial bore, and a piston head 9 is reciprocally fitted in the axial bore of the cylinder, which is provided with an axial extension 10, which projects through a circular opening 11 formed in the top head portion of the cylinder.

A vertically extending standard 12 is formed on the top of the cylinder and is adapted to form a supporting frame for the upper drill-bit holding jaw or die 13, which is a stationary die, but is removably secured to the upper portion of the standard, the lower die 14 being secured to the upper end of the piston extension 10 and is adapted to be reciprocally moved to and from the stationary jaw. The dies 13 and 14 are semi-circular in cross section, and are provided with under-cut shoulders 15. These dies are adapted to be supported in corresponding recesses 16 and 17 in the top of the standard 12 and the upper end of the piston extension 10, respectively, their under-cut shoulders 15 interlocking with similar shoulders in the said recesses 16 and 17, and the dies are held in their respective recesses by bolts 18, which pass through collars 19, which lie in circular recesses formed partly in the dies and in the standard 12 and piston extension 10 respectively, as will appear by reference to Fig. 3. The bolts 18 bear against the collars 19, which are thus held against the dies, holding the shoulders 15 in engagement and thereby locking the dies in their respective recesses.

The drill-bit receiving recesses in the dies are made to receive drill steel of any form of cross section, but in the accompanying drawings these recesses are of semi-circular form to receive a drill, which is circular in cross section.

The recesses in the dies are made large enough to grip the standard size tool steel used, which is generally seven-eighths inch steel, but if any other size tool steel is used a set of dies are made for it, and in case either hexagonal or cross ribbed tool steel is used the dies are made with correspondingly shaped recesses. The diameter of the axial drill steel gripping recesses formed by the two dies is slightly less than the diameter of the drill steel, so that the jaws will grip the said drill very firmly.

The cylinder is provided with a valve chest 27, which is preferably secured to a boss 28 on the cylinder by studs 28^A, which are screwed into the cylinder and extend through holes in the valve chest and a cap 29 which closes the front of said chest, nuts 29^A being threaded to the ends of the studs to clamp the cap and also the valve chest to the cylinder. A vertical port 30 is formed in the boss 28, the upper end of which opens out through the face of the boss while its lower end communicates with the cylinder 5 below the piston 9. A horizontal port 31 is formed through the upper part of the boss and opens into the upper end of the cylinder 5 above the piston 9.

A circular valve receiving chamber is formed in the outer face of the valve chest, and the rear wall of the chest is formed with ports 32, 33, 34 and 35, the ports 32 and 33 communicating respectively with the ports 30 and 31. The port 34 is adapted to be connected with a hammer piston cylinder, to be presently described, while the port 35 is an exhaust port and opens out through the under side of the valve chest. An exhaust pipe 36 of suitable length is preferably screwed into this port.

Within the valve chest is rotatably mounted a circular valve 37, of the form shown in Figs. 6, 7 and 8, and comprising a central hub, from the inner end of which projects a short spindle 38, which is adapted to enter a bearing recess 39 in the rear wall of the chest, and segmental plate or wing members 40 and 41, which extend from opposite sides of the hub and on different planes. The wing 40 extends from the inner end of the hub and is adapted to rest against the rear wall of the chest, while the wing 41 extends from about midway of the length of the hub. An annular rim or band 42 extends around the wings in such a manner as to project from the outer face of the wing 40 and from the inner face of the wing 41, and the extremities of the wings 40 and 41 are integrally connected by radial ribs 43, and these ribs, with the wing 41 and band 42, form a pocket or port 44, as clearly shown by Fig. 7. The wing 40 is formed with a radial port 45, which extends through the rim 42 and with a similar but wider port 46, which extends from the hub to the rim, as shown in Figs. 6 and 7.

Projections 47 and 48 extend outward from the rim 42, and these projections are adapted to engage the opposite sides of a stop 49, which depends from the upper portion of the valve chamber into the path of said projections. When the machine is not in operation the valve stands in the position shown in Fig. 6, and the projection 47 engages the stop 49. When the valve is rotated to open the ports 32 and 34 its movement is defined by the engagement of the projection 48 with the stop 49.

An air inlet aperture is formed in the lower side of the valve chest, which receives a pipe 50 which connects with a supply of air under pressure. When the valve 37 is in the position shown in Fig. 6, its port 45 registers with the port 33 of the chest which communicates with the port 31, which opens into the cylinder 5 above the piston 9, and the said piston is thus held down by the pressure of air above the same, the port 32 being closed. As the valve is rotated in the direction of the arrow (Fig. 6) the port 33 is first closed by the wing 40 and then uncovered so as to communicate through the valve port 44 with the exhaust port 35, and thereby permit the air above the piston 9 to escape. Immediately thereafter the port 32 is uncovered as the opposite end of the wing 40 passes beyond it, and air passes through the valve port 46, and ports 32 and 30 to the under side of the piston 9, which is thereby lifted, and as the valve reaches the limit of its movement its port 45 registers with the chest port 34 and air is admitted to the valve chest of the hammer piston cylinder, as will be presently described. As the valve is rotated in the reverse direction, the port

34 is closed and then the opposite end of the wing 40 closes the port 32 to entrance of air and as the end of the said wing passes the port 32 the valve port of pocket 44 permits the air beneath the piston 9 to pass through the port 32 and out through the exhaust port 35 to the atmosphere, and when the valve reaches the limit of this reverse movement or when the projection 47 engages the stop 49 the valve port 45 again registers with the chest port 33 and air is admitted above the piston 9, which is thereby forced down.

It will be noted that the piston 9 has an axial plug 51, which projects slightly below the bottom of the piston, and this plug when the piston is down rests upon an axial boss 52, which projects slightly above the table. A space is thus provided between the piston and the table which permits the air to pass beneath the piston, as will be seen by reference to Figs. 3, 4, and 9.

The outer face of the valve hub is formed with a groove or recess 53, which is adapted to receive a key 54 on the end of a stem 55, which projects out through an axial hub in the cap 29, and receives an operating crank handle 56.

A vertically extending pin 57 is secured in the upper face of the piston 9, which enters a guide hole 58 in one side of the standard 12 and thereby prevents the piston from turning on its axis, thus insuring the proper position of the die 14 relatively to the die 13.

The drill-bits to be resharpened, or upon which it is desired to form rock cutting lips, are heated in a forge to a suitable degree and each drill-bit is gripped and held between the dies 13 and 14 by the pneumatic pressure upon the under side of the cylinder 9, and the rock cutting lips are formed on it by a reciprocating dolly 59 which is operated by a reciprocating hammer piston 60, which is mounted in a cylinder 61 that receives a supply of air through a pipe 62, one end of which connects with a hub on the valve chest 27, through which hub the port 34 extends, while the other end thereof connects with an inlet port 63, which opens out through a hub on a valve chest 64, which is integrally connected to the under side of the cylinder 61. The reciprocating movements of the hammer piston are controlled by a valve 60^A and an operative port system 60^B.

My invention contemplates a reciprocating dolly actuated in its drill striking movements by the pneumatically operated reciprocating hammer piston 60 and on its rearward non-striking movements by suction in conjunction with the action of a resilient spring 65, and while there are many ways in which these features of my invention may be carried out, I preferably carry them out in the following manner: The casing of the cylinder 5 is formed with an integral standard 66, which is of the form shown in Figs. 1, 2, and 3, the upper end of which standard is provided with a circular opening 67, the axis of which is in line with the axial center of the dies 13 and 14, when the die 14 is raised to the limit of its upward movement. A dolly support is secured to the front side of the standard 66, and this support comprises a hub 68, from the rear end of which extends a circular flange 69 having a pair of oppositely positioned recesses 70 which extend in from its periphery on a horizontal plane. The flanged end of the hub 68 is formed with a circular boss 71, which is adapted to extend into the opening 67 and thus center the dolly support. The hammer piston cylinder 61 is secured upon the rear side of the standard 66 in axial line with the dolly support, a flange 72 being formed on this end of the cylinder corresponding to the flange 69 of the dolly support. A removable head 73 closes the rear end of the hammer piston cylinder. This head is provided with a centering boss which extends into the cylinder, and with apertured ears 74 which project from the opposite sides of the said head, the cylinder and its head and the dolly support being secured to the standard in a manner to be presently described.

The dolly 59 comprises a head portion of a diameter corresponding to the diameter of the cutting end of drill, and a shank portion which extends nearly through the bore of the dolly support. The fore part of the bore of the dolly support fits the dolly shank snugly, but so as to permit the same to reciprocate therein, but the remaining portion of the said bore is slightly enlarged in diameter, as shown in Fig. 3.

The cutting lips of the dolly are arranged in radial form on the face of its head portion. Consequently, it will form a series of radially arranged rock cutting lips on the end of a drill-bit. I preferably form four triangular or V-shaped rock cutting lips on the dolly, but the invention, however, contemplates the use of dollies having any desired number or shape of rock cutting lips arranged in any desired manner and with the head of the dolly of any desired form and adapted to form a rock cutting end on or to resharpen the dulled edges of solid or hollow drill-bits.

The bore of the cylinder is of uniform diameter, and the hammer piston which is arranged to be driven reciprocally in it by air pressure is provided on its end adjacent to the dolly with a hammer bar extension 75, which impinges against the adjacent end of the shank of the dolly. Steel rings 76 and 77 are placed in the opening 67 of the standard 66 and fit snugly around the hammer bar 75, which passes through them. The ring 77 extends slightly beyond the rear face of the standard 66 and enters a counterbore in the adjacent end of the hammer piston cylinder, whereby the cylinder is centered relatively to the standard. This ring is also formed with a recess on its side adjoining the ring 76, and in this recess is placed a flexible washer 78, preferably leather, which is adapted to fit tightly around the hammer bar and thus form an air tight packing.

From the opposite sides of the opening 67 two bolt-rod slots 79 are formed through the standard, the upper walls of which incline upward from the rear side of the head to its front or dolly side. These side slots are adapted to receive bolt-rods 80, which are arranged to secure the cylinder and the dolly support to the opposite sides of the standard 66 and also to secure the rear cylinder head to the rear end of the hammer piston cylinder. The flanges of the dolly support and of the front cylinder head are secured to the standard by these side bolt-rods, which are inserted through the recesses 70 in the flange 69 of the dolly support with the heads of the bolts against the said flange and the body of the bolts extending through the slots 79 in the standard through holes in the cylinder flange 72 and along the sides of the cylinder and through the ears 74 of the rear cylinder head 73. The rear ends of the bolts 80 extend through holes in a nut-lock plate 81, which forms a spanner washer, and nuts 82 are threaded to the ends of the rods which are screwed up against the nut-lock plate. Expansive springs 83 are mounted on the bolts between the nut-lock plate and the rear cylinder head and are placed under sufficient expansive pressure to clamp the cylinder and the front head to the head-end of the arm. The nut-lock plate 81 is provided with grooves 84, which intersect their bolt holes, and are adapted to receive ribs 85, which are formed on the nuts 82, and thus prevent the nuts from becoming loose. The dolly support and the cylinder are thus clamped to opposite sides of the standard 66, and these bolts permit the dolly supporting head to resiliently yield by drawing on the springs of the side rods when the dolly is subjected to upward twisting or lateral or other strains, which condition occurs when drill-bits are uneven on their ends and the dolly at the commencement of forming a new drill point on them strikes on only one side of them.

My invention contemplates means for moving the dolly backward away from the drill-bit the instant it has delivered its blow against it. Consequently, the dolly should have in addition to its forward movement under the action of the hammer piston, a rearward movement sufficient to move it backward entirely clear of the drill-bit after each blow of the hammer piston against it. My invention contemplates any means of effecting this backward stroke of the reciprocal movement of the dolly, but I preferably use, however, a suction action which is effected by the rearward stroke of the hammer piston and operates to assist in drawing the dolly away from the drill-bits after each of its impinging blows against them. This suction action is effected by the rearward strokes of the hammer piston, by which a vacuum is created in the rear of the dolly shank, which acts in coöperation with the spring 65 to draw or throw the dolly back after each of its forward movements.

In the under edge of the flange 69 of the dolly support an aperture 90 is formed, which forms a continuation of an outlet port 91. The entrance to this aperture is threaded, and a plug 92 is threaded to it. This plug is provided with a small aperture 93, which also becomes a continuation of the outlet port 91. A coiled expansive spring 94 is inserted in the aperture 90, one end of which rests against the plug 92, and its other end bearing upon a ball valve 95, which is placed in the aperture between the end of the said spring and the shoulder formed at the intersection of the aperture 90 and the outlet aperture 91. The shoulder is curved to form a seat for the ball valve. The ball valve and the plug and the spring are so arranged relative to each other that the spring will hold the ball normally against its seat in the port and thus keep the exhaust passage from the bore of the dolly support that surrounds the shank end of the dolly, closed to the atmosphere.

When the hammer piston makes its forward stroke it drives out through the port 91 and plug 92 any air that has leaked into the enlarged portion of the bore of the dolly support by compressing this air around the shank end of the dolly and thereby forcing it through the said port 91, which moves the ball valve down against its spring and opens the exhaust port through the plug 92 to the atmosphere, allowing the air to escape. Then the instant the hammer moves backward on its rearward stroke the spring forces the ball to close the exhaust port, and as the hammer piston moves backward it creates a suction that draws the dolly backward with it. In order, however, to render the rearward movement of the dolly positively certain and quick enough to move the dolly back to the full end of its backward stroke in time to receive the next blow of the hammer piston, I employ a spring 65 to assist this suction action of the hammer piston in effecting this backward movement of the dolly, and preferably arrange it in the following manner: At the junction of the standard 66 with the top of the cylinder 5 a pair of apertured ears 95^{A} are cast, which are spaced a short distance apart and in transverse alinement with each other. A pin 96 is extended through the central portion of these ears and is secured there by cotter or split pins 97. The lower ends of the springs are coiled and these coils are mounted on the pins 96 with their lower ends resting upon the top of the cylinder, while its looped upper end extends vertically up to the under side of the dolly, where a transverse horizontal groove is formed to receive the upper flattened loop portion of the spring. The coiled portions of the spring are arranged to hold the dolly normally back in its support, so that the shouldered portion formed at the junction of its head and shank will rest against the end of the said support.

My fluid operated drill steel gripping vise provides a new way of closing and opening drill steel gripping vises of drill sharpening machines. The air pressure enables the vise to be operated to instantly grip the drill steel with so much pressure as to cause the jaws to indent into the drill steel and to so rigidly hold it that the drill steel can not slip or move under the severe rapid blows of the dolly when sharpening its rock cutting end, and the air pressure opens the vise and releases a drill-bit, and it enables an operator to sharpen a great many drills in a day.

While the compact, firm and practical arrangement of all of the different parts of my drill-bit sharpening machine, on a common foundation base that permits all parts to be operatively controlled by compressed air or other suitable actuating fluid from one valve, has enabled me to provide an operative drill sharpening machine of great merit, novelty, and a machine that permits of great speed and accuracy in sizing and sharpening rock cutting drill bits, and while I have illustrated and described the preferred construction and arrangement of the operative parts of my sharpening machine, I do not wish to be limited to the construction and arrangement shown, as many changes might be made without departing from the spirit of my invention.

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

1. A drill-steel forming and sharpening machine comprising a vise adapted to grip and hold drill steel, a cylinder, a hammer piston reciprocally mounted in said cylinder, a dolly support having a valved outlet port, a dolly arranged to be operated by said piston and thrust against the drill-steel, and a spring for effecting the reverse movement of said dolly, said parts being arranged on a single integral and monolithic base.

2. A drill-steel forming and sharpening machine comprising a vise, a cylinder, a hammer-piston reciprocally mounted in said cylinder, a dolly arranged to be struck by said piston and thrust against the drill-steel, a dolly-support, supporting-means for the cylinder and dolly-support, and means for yieldingly clamping the dolly-support, cylinder, and said supporting-means together.

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

JOHN GEORGE LEYNER.

Witnesses:

G. SARGENT ELLIOTT,

FREDERICK W. KROUMBERG.