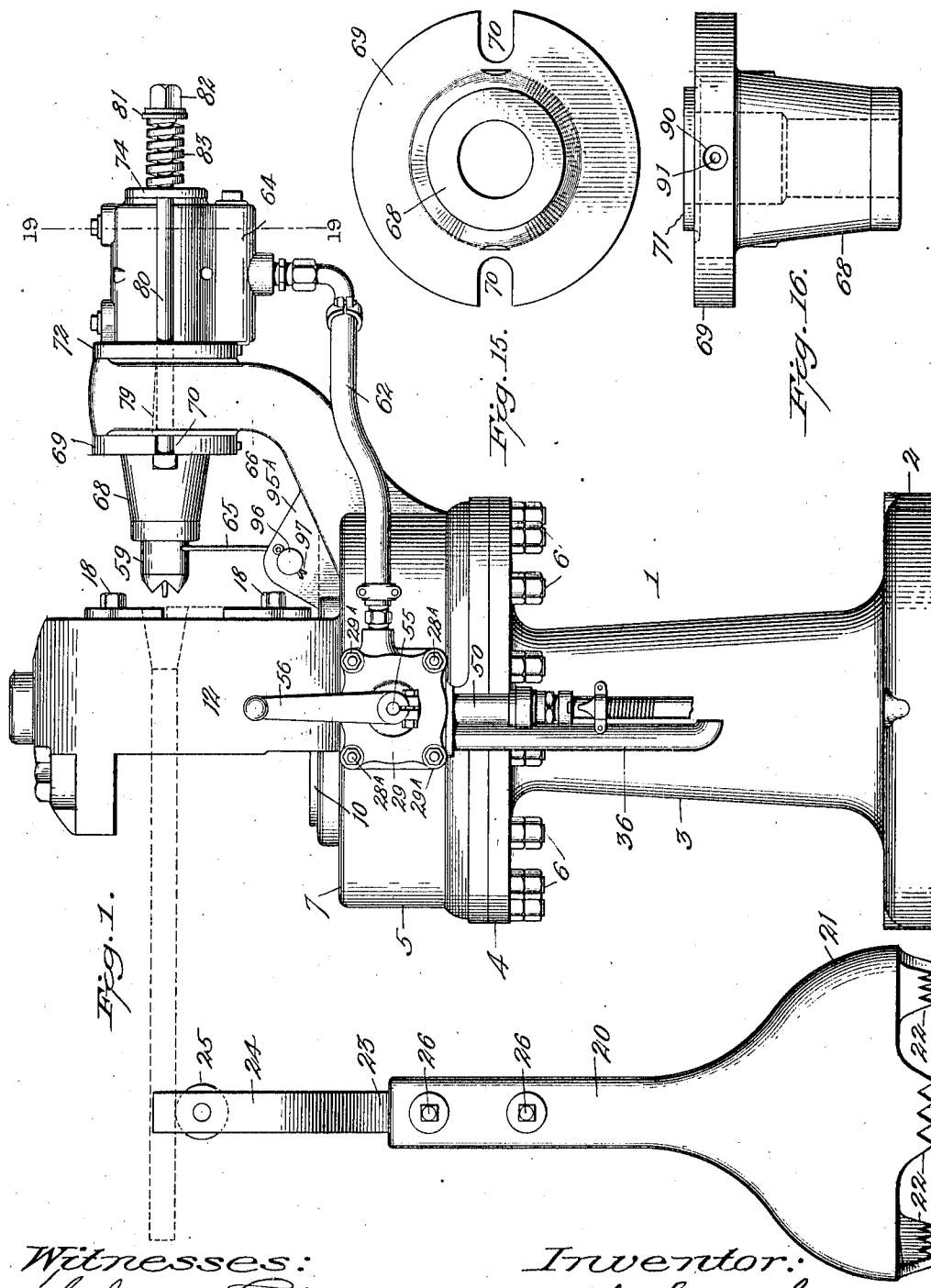


J. G. LEYNER.
 FLUID CONTROLLED DRILL STEEL FORMING AND DRILL BIT SHARPENING MACHINE.
 APPLICATION FILED OCT. 18, 1910.

1,026,872. Patented May 21, 1912.

4 SHEETS—SHEET 1.



Witnesses:
 G. Sargent Elliott
 Adella M. Fowle

Inventor:
 John George Leyner.
 H. S. Bailey, Attorney.

J. G. LEYNER.

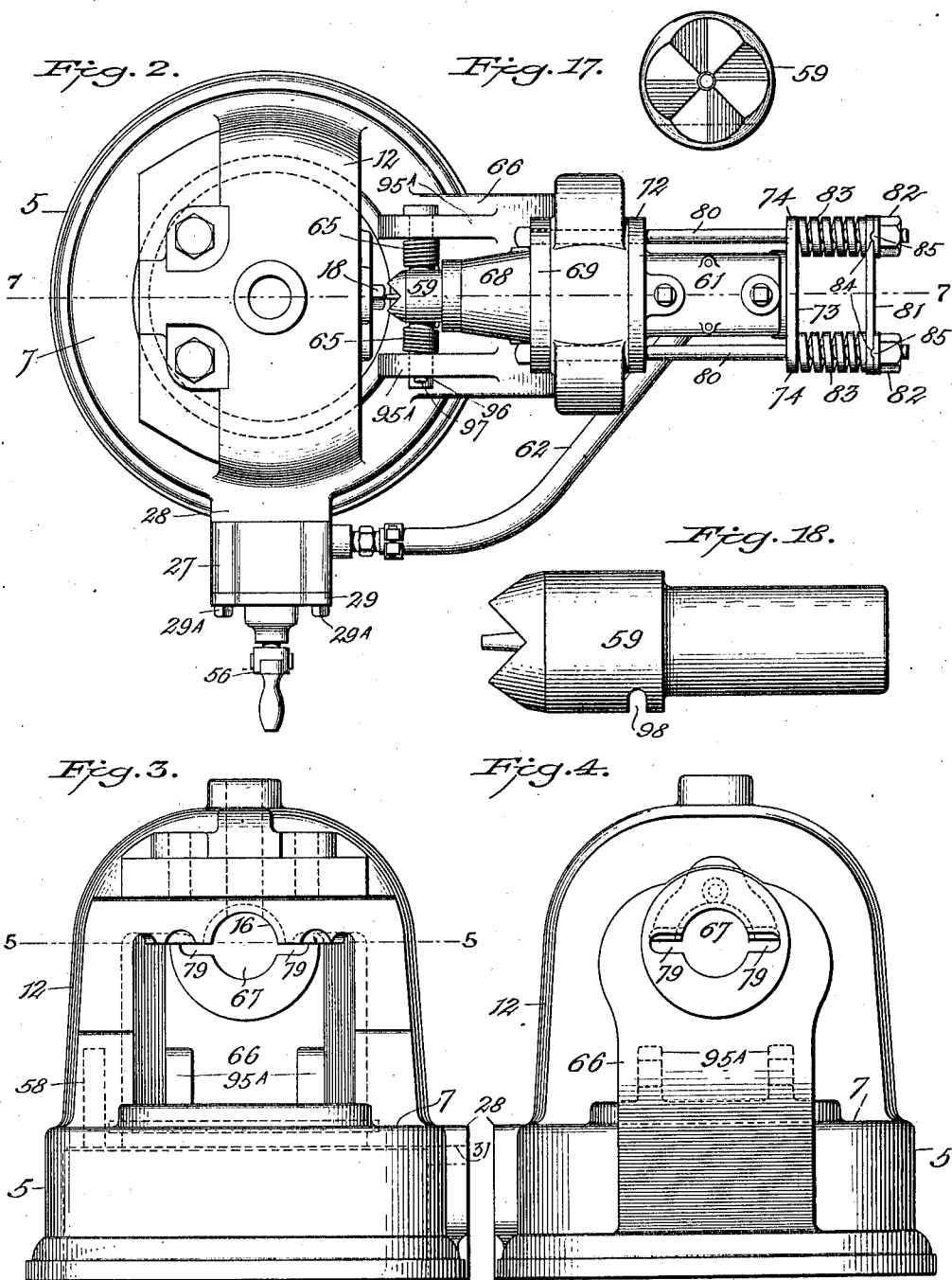
FLUID CONTROLLED DRILL STEEL FORMING AND DRILL BIT SHARPENING MACHINE.

APPLICATION FILED OCT. 18, 1910.

1,026,872.

Patented May 21, 1912.

4 SHEETS-SHEET 2.



Witnesses:

G. Sargent Elliott
Adella M. Towle

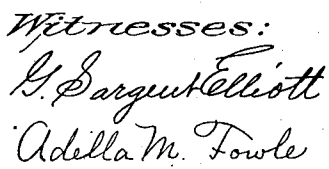
Inventor:

By John George Leyner.
H. S. Bailey. Attorney

FLUID CONTROLLED DRILL STEEL FORMING AND DRILL BIT SHARPENING MACHINE.

Patented May 21, 1912.

1,026,872.



John George Leyner.

By
A. S. Bailey. Attorney.

J. G. LEYNER.

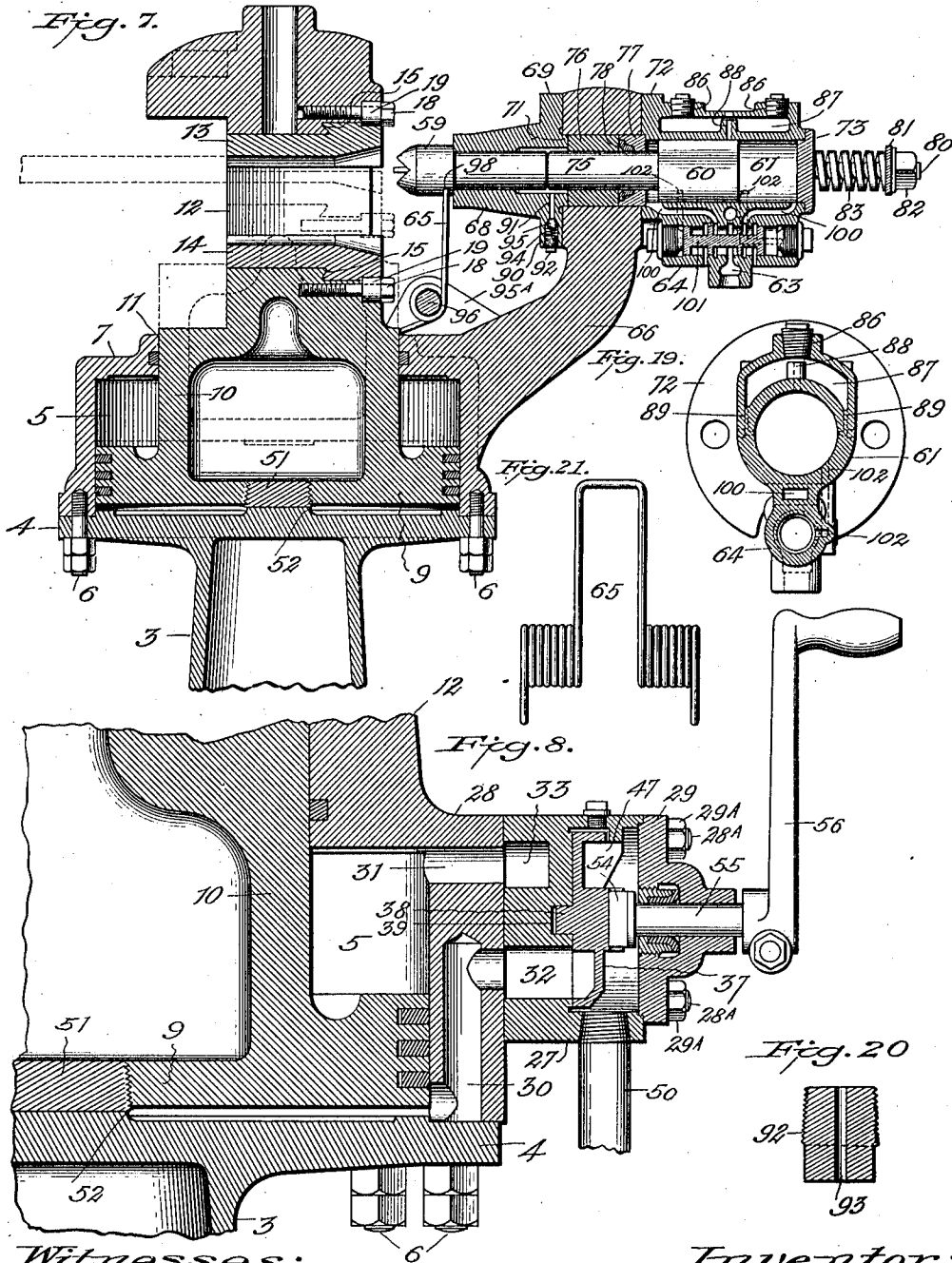
FLUID CONTROLLED DRILL STEEL FORMING AND DRILL BIT SHARPENING MACHINE.

APPLICATION FILED OCT. 18, 1910.

1,026,872.

Patented May 21, 1912.

4 SHEETS-SHEET 4.



Witnesses:

G. Sargent Kelliott
Adella M. Fowle

Inventor:

By John George Leyner.
H. S. Bailey. Attorney

UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO, ASSIGNOR TO THE J. GEO. LEYNER ENGINEERING WORKS COMPANY, OF LITTLETON, COLORADO, A CORPORATION OF COLORADO.

FLUID-CONTROLLED DRILL-STEEL-FORMING AND DRILL-BIT-SHARPENING MACHINE.

1,026,872.

Specification of Letters Patent.

Patented May 21, 1912.

Application filed October 18, 1910. Serial No. 587,650.

To all whom it may concern:

Be it known that I, JOHN GEORGE LEYNER, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented a new and useful Fluid-Controlled Drill-Steel-Forming and Drill-Bit-Sharpening Machine, of which the following is a specification.

My invention relates to improvements in fluid controlled drill-steel-forming and drill-bit sharpening machines, and the objects of my invention are: first—to provide an improved drill-steel forming and drill-bit sharpening machine, in which the hammer piston cylinder and the dolly support are capable of a resilient yielding movement that enables the dolly to resist twisting, torsional and other strains imparted to them by the operative impingement of the dolly against unevenly ended drill-bits. Second—to provide a means for moving the dolly away from the hot drill-bits after each stroke of the piston hammer, which means includes a pneumatic suction action exerted through the medium of the reciprocal movement of the hammer piston; and other co-operating mechanism. Third—to provide a drill sharpener that embodies numerous improvements that will be fully described in the following specification. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of the improved drill sharpener, also showing a stand for supporting the rear portions of the drills. Fig. 2 is a plan view of the machine. Fig. 3 is a front elevation of the drill clamping cylinder. Fig. 4 is a rear view thereof. Fig. 5 is a horizontal, sectional view thereof on the line 5—5 of Fig. 3. Fig. 6 is a bottom view of the same. Fig. 7 is a vertical, sectional view of the machine on the line 7—7 of Fig. 2. Fig. 8 is an enlarged, sectional view through a portion of the drill clamping cylinder, showing the throttle valve, and ports controlled thereby. Fig. 9 is a front view of the piston, to which the lower die is secured. Fig. 10 is a rear elevation of the same. Fig. 11 is a front view of the throttle valve chest. Fig. 12 is a front view of the throttle valve. Fig. 13 is a rear view of the same. Fig. 14 is an edge view thereof.

Fig. 15 is a front view of the dolly support. Fig. 16 is a bottom view thereof. Fig. 17 is a front view of the dolly. Fig. 18 is a side elevation thereof. Fig. 19 is a transverse, sectional view of the hammer piston cylinder, on the line 19—19 of Fig. 1. Fig. 20 is a vertical, sectional view of an apertured nut which is screwed in the lower end of the valved port of the dolly support; and Fig. 21 is a slightly enlarged view of the spring for throwing the dolly.

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

The machine illustrated in the accompanying drawings has in some of its essential features been patented to me in Patents numbered 917,777, dated April 13, 1909; 921,420, dated May 11, 1909, and 931,779, dated August 24, 1909.

My present invention relates to improvements in the manner of holding, securing and releasing the various kinds of drill-bit forming dollies used to sharpen drill-bits, and for moving them on the rearward stroke of their reciprocal movement, rapidly as they are driven forward by the successive blows of the hammer piston.

My invention also relates to improvements in the general construction and arrangement in the coöperative elements of the machine.

Referring to the accompanying drawings: the numeral 1 designates the supporting stand of my fluid or pneumatic controlled drill sharpener. This 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 undercut 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 undercut 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. 7. 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.

In practice, the outer end of the drill-bit is supported by a floor stand, which comprises a hollow standard 20, which terminates in a large base portion 21, the rim of which is provided with groups of saw-tooth shaped projections 22, which rest on the floor and prevent the stand from slipping. A bar or stem 23 is slidably mounted in the upper part of the standard and extends vertically above it, and this bar terminates at its upper end in a yoke 24, in which is mounted a roller 25, upon which the outer ends of the drill-bits rest. The yoke bar 23 is held at the required position relatively to the axial center of the drill-bit by set screws 26.

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. 12, 13 and 14, 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. 13. 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. 12 and 13. 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. 12 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. 12 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. 12) 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. 7 and 8.

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.

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 and 7, 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 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 Figs. 7 and 16. 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 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.

Plugged oil inlet apertures 86 are formed in the top of the cylinder casing and communicate with an oil chamber 87, from which oil passages 88 and 89 extend into the bore of the cylinder and from it into the bore of the valve chest. The oil chamber is large enough to receive a supply of oil sufficient to oil the cylinder and its valve for about a week.

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, 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 pin 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.

The operation of my pneumatic drill sharpener is as follows: A supply of compressed air under any pressure that will cause the piston 9 and its die 14 to clamp a drill-bit between it and the upper die with sufficient pressure to hold it against longitudinal backward movement under the action of the dolly is led from a source of supply through the air inlet pipe 50 to the valve chest of the vise actuating cylinder. A drill-bit or a bar of drill steel, the point of which is to be resharpened, or on which a new rock cutting point is to be formed, is first heated in an adjacently positioned forge to a suitable degree of heat to be forged into a drill-bit. The drill is then

placed between the jaws of the vise so that its heated end is just about even with the front end of the die. The throttle valve crank handle is then moved in the direction of the arrow (Fig. 12) and air is admitted to the under side of the piston 9 in the manner before described and raises the piston and die 14 and clamps the drill-bit against the fixed upper die 13. The crank handle of the throttle valve is then moved in the same direction until the said valve opens the port 34, through which the air flows into and through the pipe 62 to the valve chest of the hammer piston cylinder and starts the hammer piston to reciprocating, which drives the dolly to strike the heated end of the drill-bit on the forward strokes of the hammer piston's reciprocating movement, while the automatically operating ball valve is automatically opened to permit any air to escape that is compressed on the forward stroke of the hammer piston that has leaked into the bore of the dolly support around its rear end; then when the hammer piston makes its rearward stroke it exerts a suction pulling effect on the dolly, as the instant the piston starts backward the ball valve is closed by its spring, and there being no air around the dolly a vacuum of sufficient strength is formed to exert a suction pull on the dolly which moves it rearward as rapidly as the piston moves. I preferably use an air pressure of about eighty pounds per square inch, but a much less pressure will hold the drill-bits satisfactorily. This pressure is so great that the half dies will make indentations in a cold bar of tool drill steel. A partial right hand movement of the throttle valve crank opens the air inlet port 32 to the under side of the piston 9, just before it reaches and opens the air inlet port to the hammer piston cylinder, which gives the operator time enough to insert his drill-bit in the jaws and grip it with the full pressure of the air before he turns the crank to open the port 34 and start the hammer piston to striking the dolly, but the instant the air enters the hammer piston cylinder the air reciprocates the hammer piston and strikes the dolly at each forward stroke in the following manner: The air on entering the hammer piston cylinder enters its valve chest 64 and flows through the ports 100 into the cylinder to the opposite end portions of the piston bore of the cylinder, and very rapidly reciprocates the hammer piston, the slide valve 101 being reciprocated by air which enters the opposite ends of the valve chest through ports 102 which lead from the hammer piston cylinder to the said valve chest, these ports being opened alternately by the hammer piston. This very rapid reciprocative movement of the hammer piston causes the dolly to strike with great rapidity against

the drill bit, and the spring 65, assisted by the suction movement of the hammer piston, draws the dolly backward after it strikes each blow. The dolly being driven forward by the hammer piston and moved rearward by its suction actions strikes reciprocating blows. During the reciprocal movement of the hammer piston and the dolly, should a drill-bit be inserted in the dies enough out of alinement to cause the dolly to ride up over its end the dolly support will spring upward, as will side rod bolts 80 of the cylinder, which move upwardly with the dolly support in the slots 79 in the standard 66, through which these bolts pass, and as these bolts are drawn up by such a movement of the dolly and the dolly support they draw against and slightly compress the springs 83, and when the dolly and its support are relieved of this upwardly tilting strain these springs draw the bolts and the bolts draw the support back into their normal positions. This resilient yielding movement of the dolly support and the bolts saves the dolly and its support from being broken.

My invention contemplates broadly an air controlled drill clamping device, and a reciprocating drill-bit sharpening dolly actuated on its drill sharpening strokes by an air driven hammer piston and actuated on its rearward or inoperative strokes by a combined suction action of the hammer piston and suitably arranged spring; and, while I have illustrated and described the preferred construction and arrangement of my improved pneumatically operating drill-steel forming and drill-bit sharpening machine, I do not wish to be limited to the construction and arrangement shown and described, 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. In a fluid controlled drill-steel forming and drill-bit sharpening machine, the combination with a supporting base having a projecting arm, of a hammer piston cylinder provided with a hammer piston, a support, a drill-bit sharpening dolly mounted in the support and arranged to be actuated by said hammer piston, a rear cylinder head, and resiliently yielding bolt rods for clamping said cylinder and its cylinder head and dolly support to said arm with a yielding clamping pressure that permits said dolly support and its securing bolts to yield resiliently under torsional and lateral strains imparted to it during the operative drill sharpening movements of said dolly.

2. A fluid controlled drill sharpener comprising a supporting base provided with a fluid controlled drill-bit holding vise, an

arm projecting from said base having a circular opening, a fluid receiving cylinder arranged to be clamped to the opposite side of said arm from said fluid controlled drill-bit holding vise and in axial line with the opening in said arm, a hammer piston reciprocally mounted in said cylinder, and the aperture in said arm, a dolly support mounted on the opposite side of said arm from said cylinder, said arm being provided with tapering apertures on the opposite sides of the circular opening therein, bolt rods extending loosely through the tapering apertures in said arm and through said dolly support and along the sides of and beyond the rear end of said cylinder, a rear cylinder head provided with laterally extending apertured ears through which said bolts extend, a spanner plate over the ends of said bolts, nuts threaded to the ends of said bolts against the outside of said spanner plate, and expansive coiled springs mounted on said bolts between said spanner plate and the ears of said rear cylinder head, a drill sharpening dolly reciprocally mounted in the dolly support in the reciprocal path of said hammer piston and adapted to be driven by said hammer piston on its drill sharpening strokes, and means connected with said dolly and independent of the fluid controlled reciprocal movement of said hammer piston for moving said dolly on the inoperative strokes of its reciprocal movement.

3. A fluid controlled drill sharpener comprising a supporting base provided with a fluid operated drill-bit holding vise, and a projecting arm portion having a central opening and tapered bolt receiving apertures opening out of opposite sides of the same, an operative valve controlled cylinder provided with a rear cylinder head and arranged to be clamped to one side of said arm, a dolly support arranged to be clamped to the opposite side of said arm, bolts extending through said dolly support and through said apertures in said arm and along the side of said cylinder and through and beyond said rear cylinder head, a pair of coiled springs mounted on said bolts and bearing against said rear cylinder head at one end, a washer plate mounted on said rods, nuts threaded to the ends of said rods and arranged to force said plate to compress said springs against said rear cylinder head and thereby clamp said cylinder and dolly support to the opposite sides of said arm, and also to clamp said rear cylinder head to said cylinder, a hammer piston in said cylinder, a drill sharpening dolly reciprocally mounted in the dolly support in the path of said hammer piston and adapted to be actuated by said hammer piston on its drill sharpening stroke, said dolly being provided with apertures in the opposite sides of the

same, and means including springs connected to said apertures for actuating said dolly on the inoperative strokes of its reciprocal movement.

5 4. In a drill-steel forming and sharpening machine, the combination of a support, a drill-bit holding vise thereon, a hammer piston cylinder, a hammer piston reciprocally mounted in said cylinder, a dolly support in axial line with said cylinder, a dolly reciprocally mounted in said support, an automatically operating air pressure exhaust valve for controlling a port extending from said dolly's bearing to the atmosphere, said valve being arranged and adapted to permit the air to exhaust behind the rear end of said dolly when the hammer piston moves forward and to close said port and thus enable said hammer piston to exert a suctional drawing influence on said dolly sufficient to move it on the rearward stroke of its reciprocal movement.

5 5. In a drill-steel forming and sharpening machine, the combination of a hammer piston cylinder, a hammer piston reciprocally mounted therein, a dolly support, a dolly reciprocally mounted in said support and arranged to be driven on its forward strokes by said hammer piston, said dolly support being provided with a port connecting it with the bore in rear of the dolly with the atmosphere, a spring controlled valve in said port adapted to be opened by the forward dolly driving stroke of said hammer piston and arranged to close said port on the rearward stroke of said hammer piston, whereby said hammer piston exerts a suctional pulling influence on said dolly of sufficient force to move said dolly on the rearward stroke of said dolly's reciprocal movement, and means including a spring detachably connected to said dolly for assisting the suction action of said hammer piston to move said dolly on the rearward stroke of its reciprocal movement.

6. 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, and means whereby the reverse movement of said hammer-piston causes the return of the dolly.

7. 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, and means whereby the dolly is returned by suction produced through the reverse movement of said hammer-piston.

8. A drill-steel forming and sharpening machine comprising a vise, a cylinder, a hammer-piston reciprocally mounted in said cylinder, a dolly-support having a valved outlet-port, a dolly arranged to be struck by said piston and thrust against the drill-steel, and means afforded by said valved outlet-port whereby the dolly is returned by suction produced through the reverse movement of said hammer-piston.

9. A drill-steel forming and sharpening machine comprising a vise, a cylinder, a fluid-actuated hammer-piston reciprocally mounted in said cylinder, a dolly-support having a bore of two diameters, a valved outlet port extending from the bore of larger diameter to the atmosphere, a dolly arranged to be struck by said piston and thrust against the drill-steel, and means including suction and an auxiliary spring for returning the dolly when the movement of the hammer-piston is reversed.

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

JOHN GEORGE LEYNER.

Witnesses:

G. SARGENT ELLIOTT,
ROBERT J. WALTMAN.