June 9, 1925.

1,540,909

W. A. SMITH

PNEUMATIC TOOL

Filed Sept. 5, 1922

2 Sheets-Sheet 1

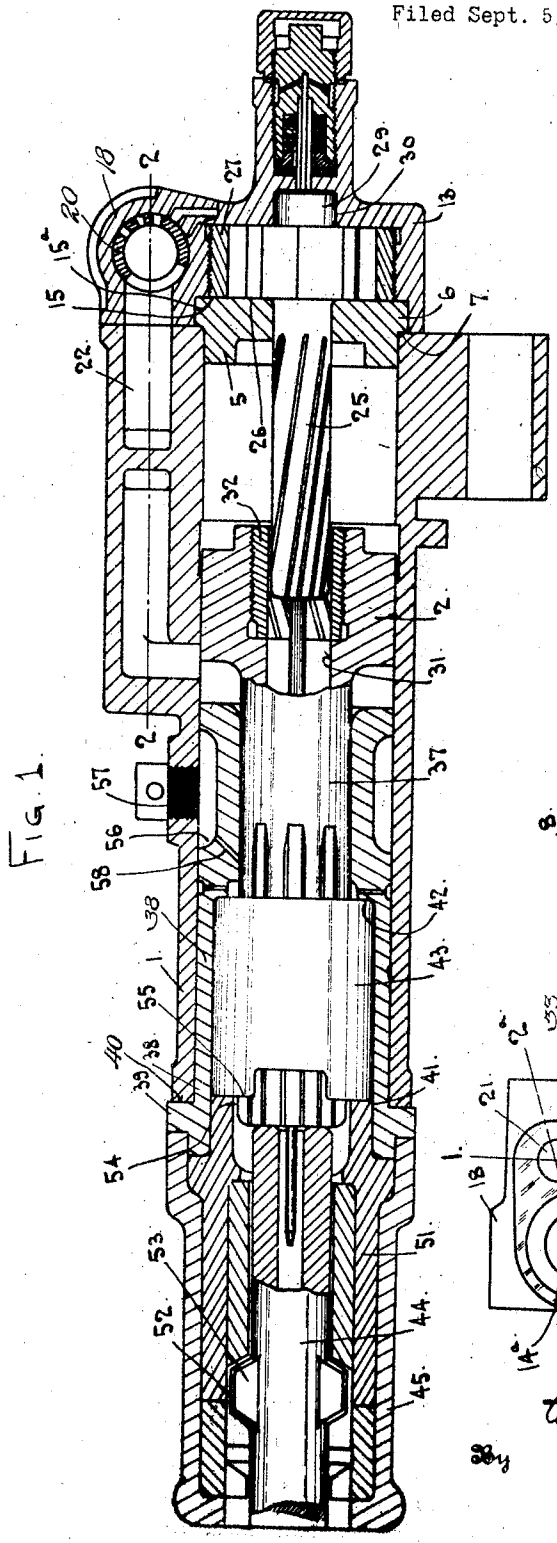


FIG. 1.

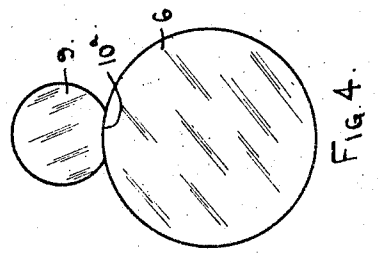


FIG. 4.

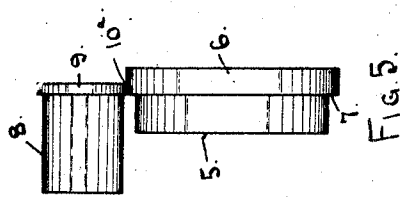


FIG. 5.

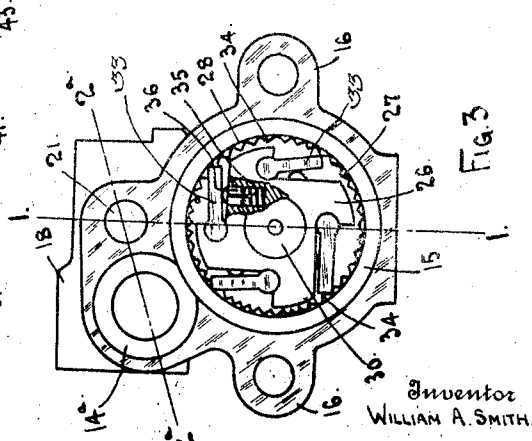


FIG. 3.

Inventor
WILLIAM A. SMITH

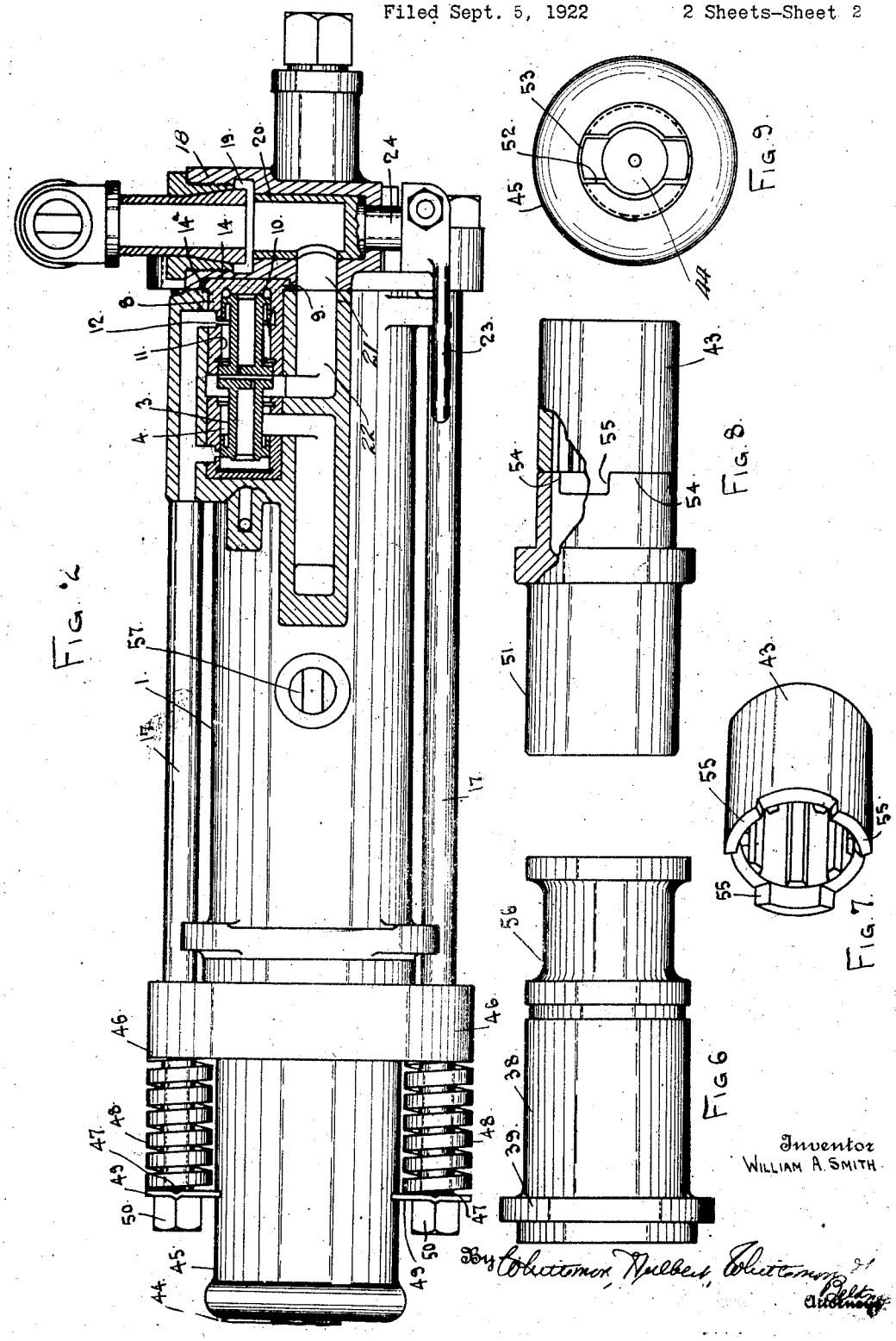
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Attorneys.

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Filed Sept. 5, 1922 2 Sheets-Sheet 2



Patented June 9, 1925. 1,540,000

UNITED STATES PATENT OFFICE.

WILLIAM A. SMITH, OF DETROIT, MICHIGAN, ASSIGNOR TO CHICAGO PNEUMATIC TOOL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

PNEUMATIC TOOL.

Application filed September 5, 1923. Serial No. 662,501.

To all whom it may concern:

Be it known that I, WILLIAM A. SMITH, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Pneumatic Tools, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to pneumatic tools and more particularly to the type in which the operating tool is intermittently rotated between the reciprocations of the piston.

The objects of the invention are to produce a simpler construction, one which is easier to manufacture and assemble and one which is more durable under operating conditions. These objects are attained by a number of novel features of construction among which are, first, the provision of a valve bushing inserted in the end of the valve chest and having a flanged head which has a cut away portion inter-locking with the flange on the main cylinder head. The bushing is ported to correspond with passage-ways in the valve chest and by the inter-locking device the bushing is prevented from rotational displacement thereby insuring accurate registration of the ports.

Second, the back head construction has been simplified in a manner which lends itself to easy assembly by providing it with recesses for receiving the flanges of the cylinder head and valve bushing and also the ratchet mechanism for rotating the piston. By this construction, the back head serves to retain the cylinder head and valve bushing and at the same time form a housing for the ratchet mechanism.

Third, the coupling for driving the rotary tool holder from the piston is journalled in a bushing within the main cylinder casing thereby providing a rigid bearing. In prior constructions it has been the usual practice to place the coupling in the tool holder casing but this has a tendency under operating conditions to cause mis-alignment between the piston guide in the main cylinder and the tool holder due to the lateral stresses on the tool. In my construction any mis-alignment will be compensated for by the coupling.

Other features of construction will be more apparent in the detailed description hereinafter set forth and by reference to the accompanying drawings in which:—

Figure 1 is a longitudinal section through my improved pneumatic tool on the line 1—1 of Figure 3;

Figure 2 is a longitudinal section through the valve chest on the line 2—2 of Figure 1 and line 2^a—2^a of Figure 3;

Figure 3 is an end elevation of the back head showing the recesses for receiving the ratchet mechanism, the valve bushing and the cylinder head;

Figure 4 is a detailed view showing the inter-locking of the valve bushing and cylinder head in end elevation;

Figure 5 is a side elevation of the same;

Figure 6 is an elevation of the bushing forming the journal for the coupling sleeve;

Figure 7 is a perspective view of the coupling sleeve;

Figure 8 is a detail view showing the engagement of the coupling sleeve and the rotary tool holder;

Figure 9 is an end elevation of the tool holder showing the tool engaging with the same.

1 is a cylinder casing containing the free flying piston 2 which is controlled by the valve 3 reciprocable within the valve chest 4. The cylinder is closed by means of a cylinder head 5 having the flange 6 forming an annular shoulder 7 for engaging with the cylinder. A valve bushing 8 is inserted in the outer end of the valve chest 4 and has shouldered engagement therewith by means of the flange 9 and the end of the valve bushing 10 forms the rear head of the valve chest. The internal bore of the bushing 11 forms a cylinder in which the valve 3 reciprocates and is provided with suitable ports

12 for admitting fluid pressure from the valve chest to control the position thereof in the usual manner. In order that the ports in the bushing may be accurately registered with the passage-ways in the valve chest the flange 9 is cut away to form a concavity 10^a which is adapted to receive the flange 6 of the cylinder head thereby forming an interlocking device preventing the rotation of the valve bushing.

For securing the cylinder head 5 and the valve bushing 8 to the cylinder casing a back head 13 is provided which is recessed at 14 to receive the end of the valve bushing 8, which abuts against the annular shoulder 14^a, and also recessed at 15 to receive the cylinder head 5, which abuts against the annular shoulders 15^a. The back head has the ears 16 which are apertured to receive the clamping rods 17 for securing the back head to the cylinder casing and holding the valve bushing and cylinder head from longitudinal displacement. The back head has the enlargement 18 which contains a chamber 19 for receiving a throttle valve 20 and the passage-way 21 extends transversely of the chamber 19 registering with the inlet passage-way 22 in the cylinder casing. The throttle valve is controlled by means of a handle 23 which is suitably secured to an extension 24 of the throttle valve which extends through the enlargement 18 of the back head.

For intermittently rotating the piston there is provided the rifle bar 25 which extends through the cylinder head 5 and is provided at its outer end with a head 26 containing suitable ratchet means for engaging with the ratchet ring 27 which is positioned in the recess 28 in the inner face of the back head. The rifle bar is provided with a bearing surface 29 which is journalled within the bore 30 of the back head. The piston 2 contains an axial bore 31 for allowing longitudinal movement of the piston relative to the rifle bar and is also provided with an internally splined bushing 32 for engaging the rifle bar 25. Thus in the reciprocation of the piston there is a relative rotary motion between the piston and the rifle bar and by means of the ratchet mechanism the rifle bar is held stationary during one stroke of the piston thereby causing the piston to rotate and during the opposite stroke the piston is held from rotation while the rifle bar correspondingly revolves.

By placing the ratchet mechanism within a recess in the back head I have provided a very simple construction which lends itself readily to the quick assembly and disassembly of the parts. The mechanism itself may be of any suitable type but as specifically shown consists of the pawls 33 which are pivoted in the head 26 and are held in engagement with the ratchet teeth 34 by means of springs 35 which are inserted in the bores 36 in the member 26.

The piston 2 is provided with a shank 37 which is guided in a guide bushing 38 inserted in the forward end of the cylinder. The bushing has the flange 39 in engagement with the end face 40 of the cylinder. The bushing is formed with the counter-bore 41 which forms the annular shoulder 42 and within the counter-bore is the internally splined sleeve 43 which is journalled in the bushing and abuts against the shoulder 42. The shank 37 is also splined and engages with the sleeve 43 thereby transmitting any rotational movement of the piston to the sleeve. For receiving the operating tool 44 there is the tool holder casing 45 which is sleeved upon the bushing 38 and is held in engagement with the flange 39 by means of the clamping rods 17 which extend through the ears 46 upon the casing 45. The rods 17 are threaded at 47 and have a coil spring 48 sleeved thereon and held in engagement with the ears 46 by means of the washers 49 and the nuts 50. Thus the end thrust of the pneumatic tool due to the free flying piston and the fluid pressure used for its operation is resiliently taken up by means of the rods 17. Within the casing 45 is the tool holder 51 which is adapted to receive and retain the tool 44 by suitable means, such as the slots 52 for engaging lugs 53 on the tool 44. The tool holder 51 is provided at its inner end with the clutch jaws 54 (Fig. 8) which engage with corresponding clutch jaws 55 upon the sleeve 43 and in this manner the rotational movement of the sleeve is transmitted to the tool.

In order to provide lubrication for the splined sleeve 43, the inner end of the bushing 38 contains a circumferential recess 56 in which lubricant may be introduced by removing the plug 57 in the cylinder casing. A passage 58 leads from the recess to the inner surface of the bushing forming the guide for the piston shank 37 and the lubricant flows through the passage to the splines during the reciprocation and rotation of the piston shank.

In the operation of my improved pneumatic tool the piston is reciprocated in the cylinder by fluid pressure in the usual manner and the shank 37 impinges against the end of the tool 44 thereby operating the same. During the rearward stroke of the piston the pawls upon the ratchet head engage with the teeth of the ratchet ring thereby holding the rifle bar from rotation. The bushing 32 is, therefore, rotated by the splines of the rifle bar and the motion is transmitted through the shank 37, the splined sleeve 43, the tool holder 51 to the tool 44. On the forward stroke of the pis-

ton the pawls 28 of the ratchet mechanism are free to ride over the teeth 34 and the rifle bar is rotated relative to the back head thus allowing the piston to advance without rotation.

What I claim as my invention is:—

1. In a percussive tool the combination with a cylinder and a valve chest in substantial parallelism therewith, of a cylinder head flanged for shouldered engagement with said cylinder, a valve bushing, a flanged head on said bushing for shouldered engagement with said valve chest, and a back head recessed to receive the flanges of said cylinder head and valve bushing and secure the same from longitudinal displacement.

2. In a percussive tool the combination with a cylinder and a valve chest disposed in parallel juxtaposition, of a cylinder head engaging said cylinder and projecting therebeyond, a valve bushing for said valve chest extending therebeyond, and a back head recessed to receive the projecting portions of said cylinder head and valve bushing and securing the same from longitudinal displacement.

3. In a percussive tool the combination with a cylinder and a valve chest, of a cylinder head provided with a flange for engaging said cylinder, a valve bushing, said valve bushing having a flanged head for engaging said valve chest, the flange on said bushing being cut away to inter-lock with the flange on said cylinder head to prevent rotation of said bushing.

4. In a percussive tool the combination with a cylinder, and a ported valve chest, of a cylinder head having a flange engaging said cylinder, a valve bushing in one end of said valve chest having ports therein registering with the ports in said valve chest, and a flanged head on said bushing for engaging said valve chest, the flange on said bushing being cut away to receive the flange on said cylinder head and form an interlock to prevent rotation of the bushing.

5. In a percussive tool the combination with a cylinder, and a ported valve chest, of a cylinder head having a flange engaging said cylinder, a valve bushing in one end of said valve chest having ports therein registering with the ports in said valve chest, a flanged head on said bushing for engaging said valve chest, the flange on said bushing being cut away to receive and inter-lock with the flange on said cylinder head, and a back head recessed to receive said cylinder head and said valve bushing, and means for clamping said back head to said cylinder.

6. In a percussive tool the combination with a cylinder and a ported valve chest of a cylinder head engaging said cylinder and projecting therebeyond, a valve bushing in said valve chest having a port therein registering with a port in said valve chest, said bushing having a portion projecting beyond said chest, means locking said bushing in place to maintain said ports in registry, and a back head recessed to receive the projecting portions of said cylinder head and valve bushing and securing the same against displacement.

7. In a percussive tool the combination with a cylinder casing, a revoluble tool holder secured thereto, a piston having a shank for impinging against the tool, and means for rotating said piston, of a coupling sleeve engaging said tool holder and in splined engagement with said shank, and a bushing within said cylinder casing forming a rigid bearing for said coupling sleeve.

8. In a percussive tool the combination with a cylinder casing, a revoluble tool holder secured thereto, a piston having a shank for impinging against the tool, and means for rotating said piston, of a bushing within said casing forming a guide for said shank, a sleeve in splined engagement with said shank and journalled in said bushing, and clutch teeth on said sleeve engaging with said tool holder for rotating the latter from the former.

9. In a percussive tool the combination with a cylinder casing, a revoluble tool holder secured thereto, a piston having a shank for impinging against the tool, of a sleeve engaging said tool holder and in splined engagement with said shank, a bushing within said cylinder casing forming a rigid bearing for said sleeve and a guideway for said piston shank, said bushing having a circumferential recess for receiving lubricant, and a passage from said recess to the inner surface of said bushing for lubricating the splines of said shank and sleeve.

10. In a percussive tool the combination with a cylinder casing, a revoluble tool holder secured thereto, a piston having a shank for impinging against the tool, of a bushing within said cylinder casing forming a guideway for said shank, a flange on said bushing engaging said cylinder casing, a sleeve journaled in said bushing and in splined engagement with said shank, annular shoulders in said bushing forming a thrust bearing for said sleeve, clutch teeth on said sleeve engaging said tool holder, a tool holder casing sleeved upon said bushing and abutting against said flange, and means for clamping said tool holder casing to said cylinder casing thereby positioning said bushing and sleeve.

11. In a percussive tool the combination with a cylinder casing, a tool holder casing secured thereto, a revoluble tool holder, a piston having a shank for impinging against the tool and means for rotating said piston, of a bushing within said casing forming a guide for said shank, a flange on said

bushing clamped between said cylinder casing and said tool holder casing, a sleeve in splined engagement with said shank and journalled in said bushing and clutch teeth on said sleeve engaging said tool holder for rotating the latter from the former.

12. In a percussive tool the combination with a cylinder casing, a tool holder casing secured thereto, a revoluble tool holder, a piston having a shank for impinging against the tool and means for rotating said piston, of a bushing within said casing forming a guide for said shank, a flange on said bushing clamped between said cylinder casing and said tool holder casing, a sleeve in splined engagement with said shank and journalled in said bushing, and clutch teeth on said sleeve engaging said tool holder for rotating the latter from the former, said bushing having a recess for receiving lubricant and a passage for conducting said lubricant to the inner surface of said bushing for lubricating the engaging portions of said shank and said sleeve.

In testimony whereof I affix my signature.

WILLIAM A. SMITH.