M. F. BUCKMAN.

PNEUMATIC IMPLEMENT.

APPLICATION FILED APR. 12, 1915.

1,179,893.

Patented Apr. 18, 1916.

2 SHEETS—SHEET 1.

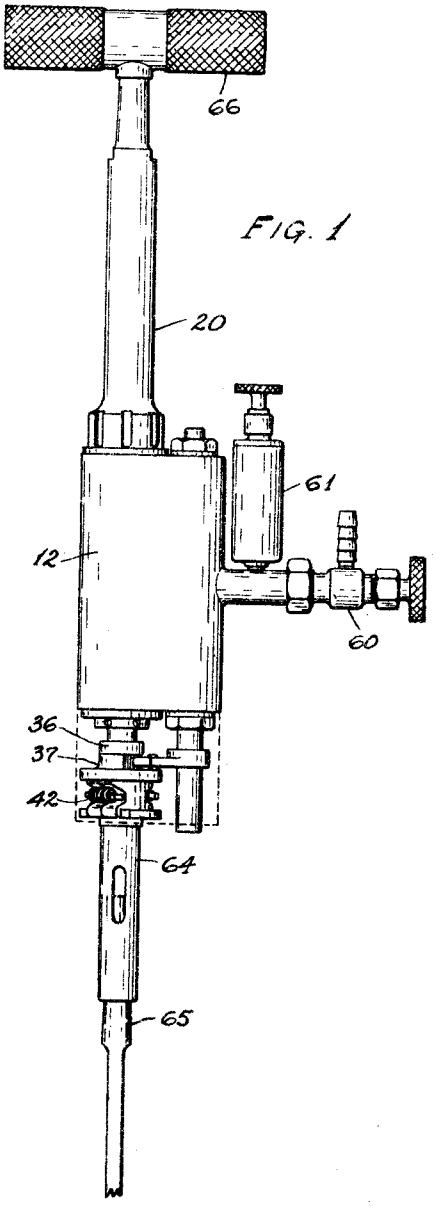


FIG. 1

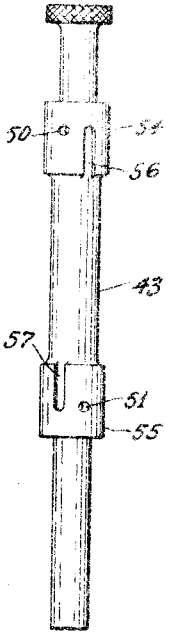


FIG. 2

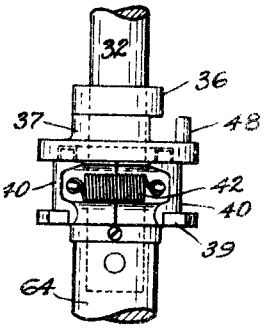


FIG. 3

WITNESS.

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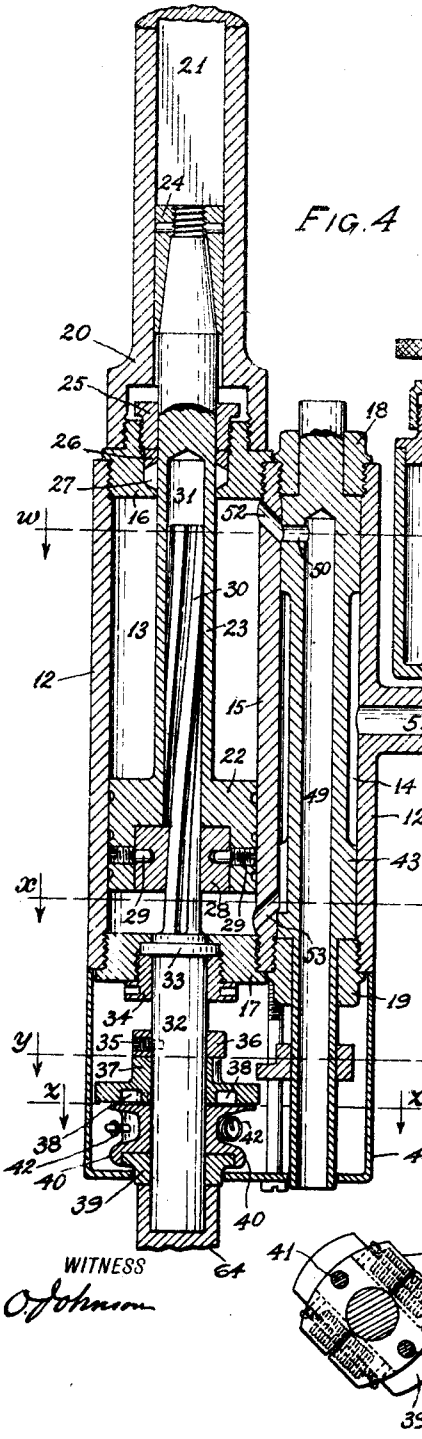


FIG. 4

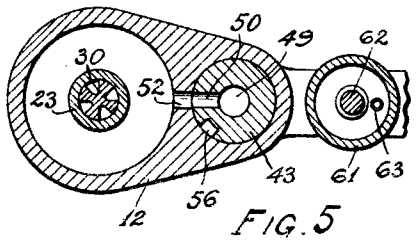


FIG. 5

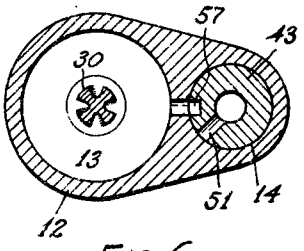


FIG. 6

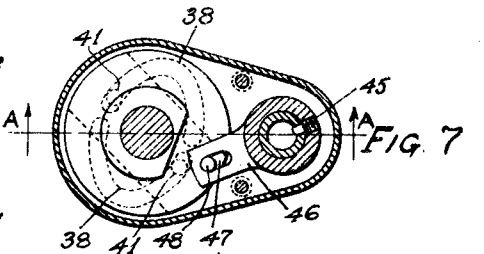


FIG. 7

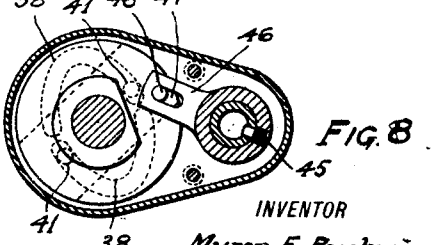


FIG. 8

FIG. 9

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PNEUMATIC IMPLEMENT.

1,179,893. Specification of Letters Patent. Patented Apr. 18, 1916.

Application filed April 12, 1915. Serial No. 20,623.

To all whom it may concern:

Be it known that I, MYRON F. BUCKMAN, citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented a certain new and useful Improvement in Pneumatic Implements, of which the following is a specification.

My invention relates to improvements in pneumatic implements whose operative parts are adapted to be actuated by compressed air; and the object of my improvements is to provide an implement for use in the operation of grinding valves, like the puppet valves of automobile engines, which implement shall be adapted to be flexibly connected with a source of compressed air and which shall embody a shaft with mechanism which may be pneumatically operated to impart to said shaft alternating rotary movements together with impulses which tend to cause successive endwise movements thereof, to which shaft is removably attached a spindle which is adapted to be disposed in engagement with a puppet valve to operate to impart successive impulses thereagainst while communicating alternating rotary movements thereto during the operation of grinding the engaging surfaces of such puppet valve and its seat. I accomplish this object by devices illustrated in the accompanying drawings wherein—

Figure 1 is a view in side elevation of a pneumatic implement embodying my invention; Fig. 2 is an enlarged view in side elevation of a detail of the same; Fig. 3 is an enlarged view of other details of the same; Fig. 4 is an enlarged view of the same in vertical mid-section on broken line A, A of Fig. 7, showing some parts broken away and some internal parts in side elevation; Fig. 5 is a view of the same in horizontal cross-section on broken line W, W of Fig. 4; Fig. 6 is a view of the same in horizontal cross-section on broken line *x*, *x* of Fig. 4; Fig. 7 is a view of the same in horizontal cross-section on broken line *y*, *y* of Fig. 4; Fig. 8 is a view of the same in the same horizontal cross-section on broken line *y*, *y* of Fig. 4, and Fig. 9 is a view of the same in cross-section on broken line *z*, *z*, of Fig. 4.

Referring to the drawings, throughout which like reference numerals indicate like parts, 12 is a metal portion provided with a large bore 13 and a smaller bore 14 which extend throughout the length thereof in positions parallel with each other and separated by a partition 15, both end portions of each of said bores 13 and 14 being provided with internal screw-threads.

Within the screw-threaded portion of the upper end of the larger bore 13 is screwed a removable end wall 16 while within the like portion of its lower end is screwed a removable end wall 17, and in corresponding end portions of the smaller bore 14 are screwed, respectively, end walls 18 and 19.

The end wall 16 is provided with a concentrically disposed hole through which a piston-rod may extend and integrally disposed on its outer side is an outwardly projecting annular flange which is provided with internal and external screw-threads and screwed on to said external screw-threads of said annular flange is an internally screw-threaded end portion of a guiding member 20 which is provided with a square hole 21 which extends longitudinally throughout its length.

Within the bore 13 is disposed a piston 22 which is provided with an integral piston-rod 23 which extends upwardly through the end wall 16 into the square hole 21 of the guiding member 20 where it is securely connected with a square block 24 which is adapted to slidably move within the square hole 21 whereby said piston-rod 23 may move in endwise direction without making rotary movements.

An annular packing gland-nut 25 is disposed to surround the piston-rod 23 and is screwed into the internal screw-threads of said annular flange, which projects from the outer side of the end wall 16, to engage with an annular collar 26 which may serve to compress suitable packing which may be disposed in a space 27 between said collar 26 and an annular seat provided in the end wall 16, as shown in Fig. 4, whereby air may not escape between the surfaces of the piston-rod 23 and the hole through the end wall 16.

Within the lower side of the piston 22 is formed a concentrically disposed recess within which is disposed a cylindrically formed

block 28 secured by screws 29, which block 28 is bored and rifled to adapt it to engage with a spirally fluted spindle 30 which is disposed to extend through it to project upwardly into a hole which is provided within the piston-rod 23 whereby when the piston 22 is moved throughout its stroke within said bore 13 then said spirally fluted spindle 30 will be rotated to the extent of ninety degrees, said spindle 30 being integrally attached to the upper end of a shaft 32 which is rotatably journaled in bearings formed in the end wall 17 where it is secured from endwise movement by a collar 33 which engages with a screw-threaded collar 34 that is screwed into said end wall 17, as shown in Fig. 4. The spindle 30 by its engagement with the walls of the hole 31 in the piston-rod 23 also serves to aid in supporting said shaft 32 in its position for rotary movements.

Secured on the shaft 32 near the collar 34 by a set-screw 35 is a collar 36 and adjacent to said collar 36 on said shaft 32 is mounted a flanged sleeve 37 that may freely turn on said shaft 32. Within the underside of the flange portion of said sleeve 37 are formed oppositely and symmetrically disposed cam slots 38 of the shape indicated by dotted lines in Figs. 7 and 8.

On the shaft 32 below the flanged sleeve 37 and spaced therefrom is transversely disposed and securely fastened a bar 39 having parallel sides and curved ends, and slidably mounted on said bar 39, to extend between it and the flanged sleeve 37, are two blocks 40, disposed one on each of opposite sides of the shaft 32, which blocks 40 are guided in their sliding movements by their side flanges which engage with the parallel sides of said bar 39. Each of said blocks 40 is provided with a stud 41 which is disposed to project into the adjacent one of the cam slots 38 whereby relative rotary movements of the flanged sleeve 37 and the bar 39 will actuate the blocks 40 to slide toward or from each other.

The two blocks 40 are provided with strong helical springs 42, indicated by dotted lines in Fig. 9, which tend to maintain said blocks in positions nearest to the shaft 32 whereby said blocks 40 may quickly be pulled toward each other when their studs 41 pass the apices of the cam slots 38, thus to accelerate the alternating rotative movements of the flanged sleeve 37.

Within the bore 14 is disposed a rotary valve 43 whose upper end projects through the end wall 18 and whose lower end projects downwardly through the end wall 19 to extend therefrom to and through the wall of an inclosing member 44 which serves to cover the operative mechanism comprising the flanged sleeve 37 and the blocks 40.

On the downwardly projecting portion of the valve 43 at a point adjacent to the upper side surface of the flange of the flanged sleeve 37 is secured, by a set-screw 45, an arm 46 which is provided with a slotted hole 47 extending through its end portion as more clearly shown in Figs. 7 and 8, and extending upwardly from the flanged portion of the flanged sleeve 37 is a stud 48 which projects through said slotted hole 47 whereby alternating rotative movements of the flanged sleeve 37 may be communicated to the valve 43, for instance, the travel back and forth of the piston 22 in the bore 13 will impart rotary movements alternating in direction to the shaft 32 through a distance of ninety degrees, and such alternating rotary movements (acting through the bar 39, the blocks 40, cam slots 38 of the flanged sleeve 37, the studs 41, and the arm 46) will cause the valve 43 to make alternating rotative movements through a distance of about forty five degrees between relative positions indicated in Figs. 7 and 8.

The valve 43 is provided with a concentric longitudinal boring which serves as an exhaust passageway 49 and extending radially between such exhaust passageway 49 and the inner surface of the wall of the bore 14, within each end portion thereof, are ports 50 and 51 disposed on lines about forty five degrees apart, and extending through the partition 15 between the bores 13 and 14 in the opposite end portions thereof, and on the same line, are ports 52 and 53 which register with the path traveled by ports 50 and 51, respectively, during the alternating rotative movements of the valve 43.

The valve 43 is reduced in diameter along the central portion of its length, as more clearly shown in Fig. 2, whereby is provided an air chamber within the bore 14 and the larger end portions 54 and 55 are provided with slotted recesses 56 and 57, respectively, each of which extends from the inner edge of its respective larger end portion to such point as will cause it to form an inlet passageway from said air chamber to the respective one of the ports 52 and 53, the circumferential positions of said slotted recesses 56 and 57 with relation to the ports 50 and 51 and the ports 52 and 53 are such that when the port 50 is opposite the port 52 then the slotted recess 57 will be opposite the port 53 whereby air from the bore 14 may enter the bore 13 on the under side of the piston 22 and air from the upper side of said piston 22 may escape from the bore 13 through the ports 52 and 50 and the exhaust passageway 49; and in a corresponding manner such operation will be reversed when the port 51 is opposite the port 53 and the slotted recess 56 is opposite the port 52.

Projecting outwardly from the wall of

the bore 14, at a point near its central portion is an integral nipple 58 which is provided with a passageway 59 leading into the air chamber within the bore 14 and to the outer end of said nipple 58 is connected a needle valve 60 which is adapted to be connected with a flexible hose, not shown, that leads to a source of compressed air, and fixed in the upper side of said nipple 58 is a lubricating cup 61 which is provided with a needle valve 62 which may regulate the flow of a lubricant from said cup 61 into the passageway 59, there being provided within said cup 61 a vent-tube 63 through which air may pass from the passageway 59 into said cup 61 at a point above the surface of the lubricant that may be contained therein.

Attached to the lower end of the shaft 32 is a tool holder 64 within which may be secured a tool 65 a fragment of which is shown in Fig. 1, which tool 65 may be formed to adapt it to engage with the upper side of a puppet valve, not shown, when such puppet valve is disposed within its seat, whereby such puppet valve may be moved rotatively and alternately in opposite directions during the operation of grinding the engaging surfaces of such puppet valve and its seat in response to the operation of the working parts of the implement.

In the operation of grinding a valve the reciprocatory movements of the piston 22 with its attached parts causes successive variations in the downwardly directed pressure of the tool 65 on the puppet valve thus more readily permitting abrasive material to be distributed between the surfaces to be ground, and the action of the rifled nut 28 on the fluted spindle 30 causes the tool 65 to rotate ninety degrees in alternate opposite directions during the operation of grind- implement may be turned to different circumferential positions from time to time by manipulating the handle 66 which is secured to the upper end of the guiding member 20 as shown in Fig. 1.

The pneumatic operative parts of my invention will be readily understood by those skilled in the art and needs no further description. Manifestly, my pneumatic implement may be employed for other purposes than for grinding valves by substituting other tools for the tool 65; and changes may be made in the forms, dimensions and arrangement of parts of my invention without departing from the spirit thereof.

What I claim is:

1. An implement of the class described which embodies a metal body portion provided with a cylindrically formed chamber therewithin; a piston slidably disposed within said chamber and adapted to be movable in a lengthwise direction thereof; means associated with said piston and with metal body portion whereby said piston may not make rotative movements therein; a spirally grooved member in fixed association with said piston; a tool-holding shaft provided with fins corresponding in form with the spiral grooves of said spirally grooved member and rotatably associated with an end wall of said chamber so that said fins may engage with the grooves of said spirally grooved member; means associated with said metal body and with said tool-holding shaft whereby said shaft may be moved only in a circumferential direction with respect to the cylindrical walls of said chamber; valve controlled ports extending through the wall of said chamber through which compressed fluid may pass at required times to effect reciprocatory movements of said piston whereby reciprocatory rotative movements may be communicated to said tool-holding shaft and whereby may be effected a variable tendency to force such shaft to move in an endwise direction, and valve-controlled means for conducting compressed fluid into said port at required different instants of time.

2. An implement of the class described which embodies a shaft adapted to be moved only in circumferential directions, means for actuating said shaft to make successive movements alternating in their directions, a rotary valve disposed with its axis parallel with said shaft and spaced therefrom, a flanged sleeve freely mounted on said shaft to be rotatable therearound, a stud fixed in the flange of said flanged sleeve to project from one side surface thereof, an arm associated with said rotary valve and disposed to be swingingly moved by a movement of said stud, two symmetrically disposed cam-slots disposed in the other side of said flanged sleeve, a rectangular bar fastened on said shaft and disposed transversely thereof, two blocks slidably mounted on said rectangular bar and disposed between said bar and the cam-slotted side of said flanged sleeve one on each of opposite sides of said shaft, helical tension springs disposed on said blocks to adapt them to tend to draw said blocks toward each other, and a stud fixed in one side of each of said blocks and disposed to project into a different one of said cam-slots.

3. An implement of the class described which embodies a rotatably mounted shaft, a flanged member mounted on said shaft and adapted to be moved rotatably thereon, a stud fixed to project from said flanged member, means for limiting the distance through which said flanged member may rotate around said shaft, means for accelerating a circumferential movement of said flanged member with respect to said shaft,

a rotary valve disposed with its axis parallel with the axis of said shaft, and an arm in fixed association with said rotary valve and disposed to engage with said stud of said flanged member.

In witness whereof, I hereunto subscribe my name this third day of April, A. D., 1915.

MYRON F. BUCKMAN.

Witnesses:
O. JOHNSON,
A. HASKINS.