April 1, 1930. J. T. McGRATH 1,752,448

PNEUMATIC HAMMER

Filed March 5, 1929

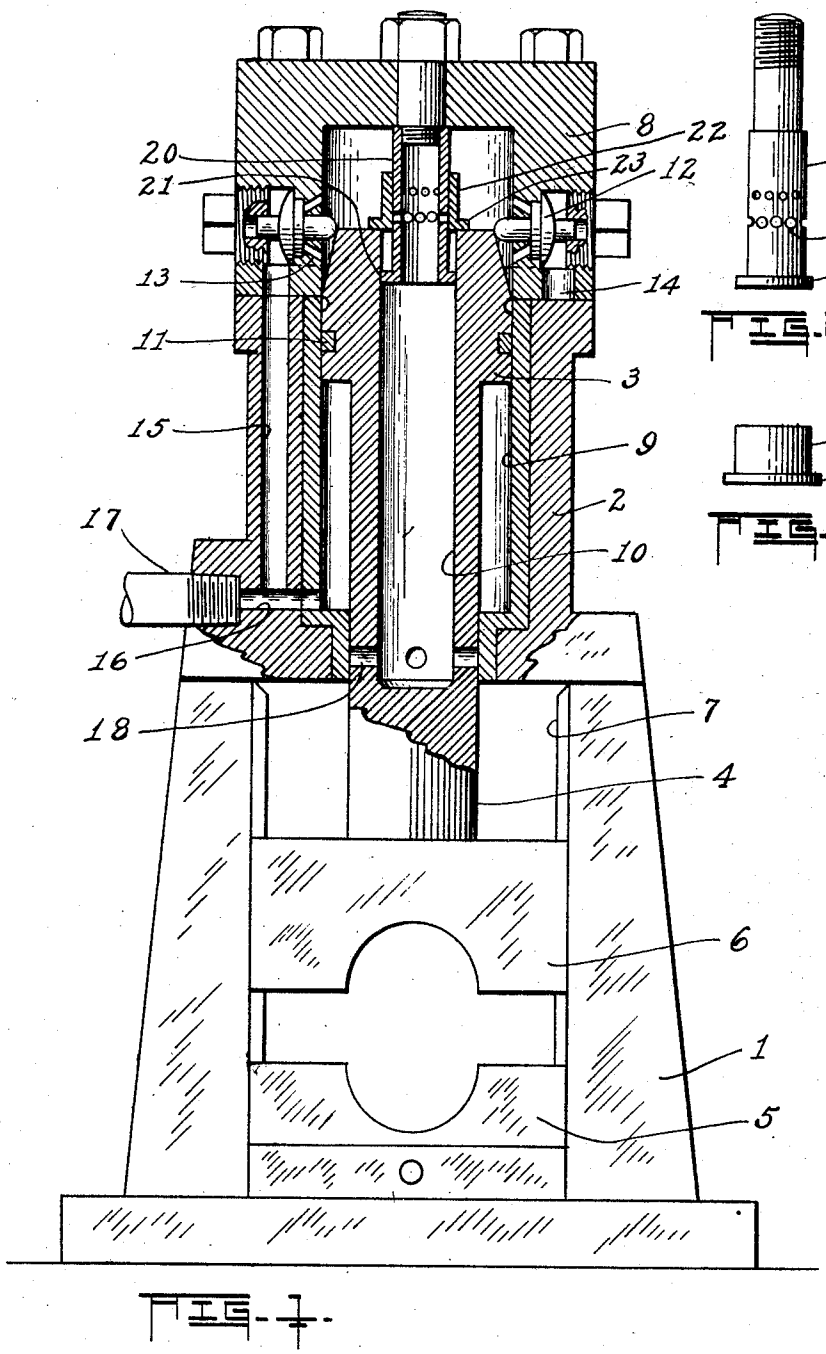


FIG. 1.

FIG. 2.

FIG. 3.

INVENTOR
J. T. McGRATH
BY Langan Moore
ATTORNEY

Patented Apr. 1, 1930 1,752,448

UNITED STATES PATENT OFFICE

JOHN THOMAS McGRATH, OF BLOOMINGTON, ILLINOIS

PNEUMATIC HAMMER

Application filed March 5, 1929. Serial No. 344,155.

This invention relates to improvements in pneumatic hammers and more particularly to an improved valve for controlling the exhaust in such devices.

Pneumatic hammers are used for many purposes and are both portable and stationary. This invention relates to the stationary type and it is an object of this improved valve construction to increase the efficiency of the hammer and economize in the air under pressure required for its operation.

With these and other objects in view, reference is made to the accompanying sheet of drawing which illustrates a preferred form of this invention with the understanding that minor detail changes may be made without departing from the scope thereof.

In the drawings:

Figure 1 is a view in front elevation, with parts illustrated in central vertical section.

Figure 2 is a detail view in front elevation of the stationary member of the exhaust valve mechanism.

Figure 3 is a detail view in front elevation of sliding member of the exhaust valve mechanism.

The improved valve is illustrated as embodied in a pneumatic hammer of the stationary type such as employed as a part of the equipment of the flue department of a railroad repair shop, although this improved valve may be employed in pneumatic hammers constructed for other purposes. Furthermore, the part illustrated in Figure 1 is the moving and working parts of the hammer only which in practice is usually mounted on a stand or support, not shown. The particular hammer illustrated is designed for use in welding and swedging the "safe ends" on locomotive boiler flue tubes.

As shown in Figure 1, the body or base 1 is adapted to be rigidly secured to a support not shown, and includes two oppositely disposed parallel vertical members brought together at the top to engage and support the cylinder casing 2 of the hammer within which the piston 3 is mounted for reciprocation. The piston rod 4 passes through the bottom of the cylinder casing and is extended between the vertical supports of the casing 2. In this form of hammer the lower die 5 is held in fixed relation upon the base 1 between the lower ends of the vertical supports for the piston casing and the upper die 6 is secured to the lower end of the piston rod 4 and is mounted for reciprocation therewith upon guides 7 upon the inner sides of said cylinder supports. A cylinder head 8 is bolted to the cylinder casing 2 and forms an extension of the cylinder 9 within which the piston 3 reciprocates.

The piston 3 is of the hollow type, that is, the piston 3 and rod 4 depending therefrom are provided with a central cylindrical cavity 10 and the piston head is tapered, as shown, with a piston ring 11 about the piston below the tapered portion. About the cylinder head 8 a plurality of air valves 12 are provided having stems entering the cylinder and adapted to be engaged and be moved outwardly by the tapered portion of the piston 3 upon the up stroke to uncover air ports 13 leading from an air conduit 14 formed in the cylinder casing 2. The conduit 14 communicates with an air inlet 15 leading upward from the bottom of the cylinder 9 at which point it opens into said cylinder through a port 16, opposite this point said inlet 15 is connected to an air pipe 17 from a source of air under pressure, not shown. The central cavity 10 is provided with one or more ports 18 in the piston rod 4 which are normally closed by the bottom of the cylinder casing 2 during the upper movements of the piston and during the lower movements are uncovered to the atmosphere into which the air confined by the upward stroke of the piston may escape or exhaust.

The passage of air through the pipe 17 from the source of compression may be regu-

lated by a valve, not shown, of any desired type, for instance one operated by a foot treadle, and when opened the operation of the hammer is continuous until the valve is again closed. The air under compression entering from pipe 17 passes through port 16 into the cylinder 9 below the piston 3 causing it to move upwardly, at the same time the air passes through intake 15 to conduit 14 to the closed valves 12. As the piston 3 approaches the upper limit of its travel the tapered piston head engages and opens valves 12 filling the cylinder 9 above the piston 3 and the central cylindrical cavity 10 causing the piston 3 to descend, and, in descending, the exhaust ports from the cavity 10 are uncovered allowing the compressed air to exhaust, the valve 12 having closed as the tapered piston head descends.

The above described construction and operation is of the general type for pneumatic hammers of this general character and is necessary to illustrate the advantages of the improved valve mechanism now to be described.

A hollow cylindrical member 20, of less diameter than that of the cavity 10, and having a horizontally extending flange 21 about its lower open end to snugly be received within said cavity when the piston is at the lower limit of its stroke is rigidly secured to the upper portion of the cylinder casing 8 as shown. A sliding sleeve 22 is mounted upon the cylindrical member 20 having an outstanding flange 23 about its lower end adapted to engage and rest upon the top of the piston head about the cavity 10 which sleeve travels up and down about the member 20 as the piston 3 reciprocates. The stationary member 20 is provided with a series of graduated exhaust ports 24 about its circumference so arranged that at the end of the down stroke all will be uncovered by the sleeve 22 allowing the compressed air in the cylinder 9 above the piston to exhaust through all of the ports 24, through cavity 10, and ports 18 to the atmosphere, and to be gradually closed as the piston moves upward until the sleeve 22 covers them all as the upper limit of the piston movement is reached, and the valves 12 are completely opened.

In this construction the cylinder head 8 carries all of the valves including the sliding sleeve valve 23, as the flange 21 on the stationary member 20 engages the bottom of the sleeve 22. The head 8 is preferably secured to the cylinder casing 2 by a series of bolts, as shown, which bolts may be circumferentially undercut where they pass through the air conduit 14 to allow free passage therethrough.

It is readily seen from the operation of the sliding sleeve valve that the compressed air admitted through ports 12 into the cylinder 9 above the piston acts immediately upon the piston more quickly than if it had to first fill the cavity 10 in the piston and piston rod and the hammer is more efficient and consumes less air and is therefore more economical than a hammer of the same type without the improved sliding sleeve valve mechanism.

What I claim is:

1. In a pneumatic hammer comprising a closed cylinder, a piston mounted for reciprocation therein, a piston rod thereon passing through one end of the cylinder, a central cavity formed in said piston and piston rod opening through said piston into the cylinder thereabove and having a port in said piston rod adapted to exhaust into the atmosphere as the piston rod approaches the outward limit of its stroke, normally closed automatic air inlet valves between the open side of the piston and adjacent end of the cylinder adapted to be opened by the piston approaching that end of the cylinder in its upward stroke and an air port opening into the cylinder on the other side of the piston adjacent that end of the cylinder, and means connecting said air inlet and air port to a source of air under pressure, the combination with an automatic exhaust valve between the piston cavity and the adjacent end of the piston, including a stationary hollow member entering the piston cavity and a sleeve mounted to reciprocate thereon with the piston.

2. In a pneumatic hammer comprising a closed cylinder, a piston mounted for reciprocation therein, a piston rod thereon passing through one end of the cylinder, a central cavity formed in said piston and piston rod opening through said piston into the cylinder thereabove and having a port in said piston rod adapted to exhaust into the atmosphere as the piston rod approaches the outward limit of its stroke, normally closed automatic air inlet valves between the open side of the piston and adjacent end of the cylinder adapted to be opened by the piston approaching that end of the cylinder in its upward stroke and an air port opening into the cylinder on the other side of the piston adjacent that end of the cylinder, and means connecting said air inlet and air port to a source of air under pressure, the combination with an automatic exhaust valve between the piston cavity and the adjacent end of the piston, including a stationary hollow member entering the piston cavity and provided with ports there about communicating with the cylinder and a sleeve mounted upon said member to reciprocate with the piston to cover and uncover said ports.

3. In a pneumatic hammer comprising a cylinder and a reciprocating hollow piston and piston rod opening into the cylinder through the piston and to the atmosphere through the piston rod, means to admit air under pressure to the cylinder on sides oppo-

site the piston, in combination with an exhaust valve within the cylinder having a hollow member adapted to be received in the hollow piston secured to end of the cylinder and provided with a plurality of ports about its circumference and a sleeve mounted to travel upon said stationary member provided with means adapted to be engaged by the piston and cause the sleeve to reciprocate therewith, said ports in the stationary member arranged to be successively uncovered by the sleeve as the piston departs from the stationary member and successively covered as the piston approaches the end of the cylinder.

JOHN THOMAS McGRATH.