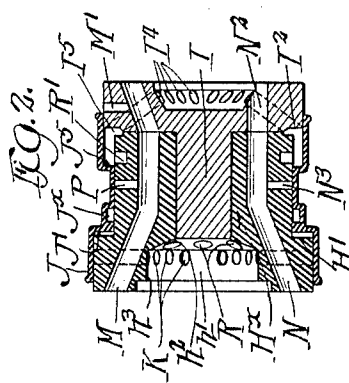
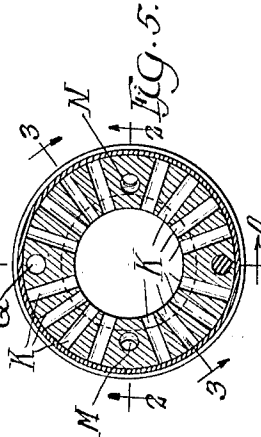
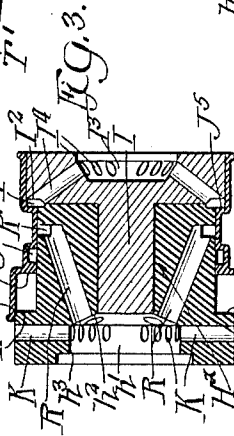
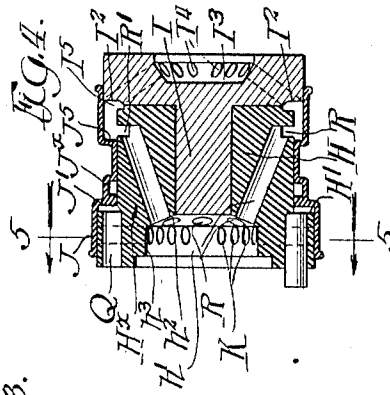


1,001,298.



Inventor:
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by Pool & Brin Attys

UNITED STATES PATENT OFFICE.

REINHOLD A. NORLING, OF AURORA, ILLINOIS, ASSIGNOR TO AURORA AUTOMATIC MACHINERY COMPANY, OF AURORA, ILLINOIS, A CORPORATION OF ILLINOIS.

PNEUMATIC HAMMER.

1,001,298.

Specification of Letters Patent.

Patented Aug. 22, 1911.

Application filed December 19, 1910. Serial No. 598,060.

To all whom it may concern:

Be it known that I, REINHOLD A. NORLING, a citizen of the United States, and a resident of Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Pneumatic Hammers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a portable pneumatic tool or hammer of that class embracing a barrel or cylinder, a piston or plunger adapted to move therein, and a controlling valve through which the air or other fluid under pressure is admitted to and permitted to escape from the opposite end of the barrel or cylinder to give reciprocatory movement to the plunger therein.

The invention is illustrated and described herein as applied to a chipping hammer, otherwise known as a short stroke hammer, and consists of the combination of parts hereinafter described and more particularly pointed out in the appended claims.

In the drawings:—Figure 1 represents a longitudinal sectional view through the hammer in a plane containing the central axis of the barrel or cylinder. Fig. 2 is a longitudinal section through the valve which controls the supply and exhaust of air to and from the opposite ends of the cylinder, the section being in the same plane as that of Fig. 1, but the movable member of the valve being shown in a different position than that in which it is shown in Fig. 1. Fig. 3 is a longitudinal sectional view of the central axis of the valve, the plane of the section being at an angle to that of the section shown in Figs. 1 and 2. Fig. 4 is a longitudinal section through the central axis of the valve, the plane of the section being at an angle to that of Fig. 3, with the movable member of the valve in a different position from that shown in Fig. 3. Fig. 5 is a cross-section through Fig. 4 on the line 5—5 thereof, the planes of the sections of Figs. 2, 3 and 4 being respectively indicated by the lines 2—2, 3—3 and 4—4 on said Fig. 5.

The main features of the hammer are

substantially identical with those of the hammer shown in an application for Letters Patent of the United States, filed by me on the 17th day of December, 1910, Serial Number 597,865, the particular improvements referred to herein relating to certain novel features of construction in the valve block and valve ring.

In the drawings, A represents the barrel or cylinder of the hammer; B, the piston or plunger adapted to reciprocate therein; C the tool-carrying nozzle; D the tool, in this case, a chisel; and E the hollow head which is rigidly secured to the rear end of the cylinder or barrel A and has a rear end wall E¹.

The valve mechanism for controlling the admission and exhaust of air into and from the cylinder embraces a valve block H* provided with exhaust and admission ports and an annular or cylindric valve-ring J surrounding said valve-block, and arranged to slide endwise thereon to open and close said ports, said valve-ring being provided with oppositely facing differential pressure areas. Said valve-block is confined between the rear end of the barrel and the end wall E¹ of the hollow head and, as shown in the drawings, is made in two parts, a body member H and a cap member I. The valve block H* is provided with a recess or chamber h¹ at its forward end, said chamber having a rear end wall h² and an annular wall h³, and with a recess or chamber I³ at its rear end. The valve-ring member has a larger pressure area J¹ and a smaller pressure area J² which are respectively opposed to annular shoulders H¹ and I² formed in the outer annular surface of the valve block H*.

K indicates the main exhaust ports adapted for the exhaust of air from the inner end of the cylinder, said exhaust ports extending through the annular wall h³ of the chamber at the forward end of the valve block H* and opening through the outer surface of said valve block.

R indicates the main admission ports adapted for the supply of air to the inner end of the cylinder, said ports opening at their inner ends through the rear end wall h² of said chamber h¹ and at their outer ends into an annular groove R¹ formed in the

outer surface of the valve block and located a little forward of the annular shoulder I^2 thereof.

I^4 indicates the main supply ports which extend from the live air chamber I^3 at the rear end of the valve block to an annular groove I^5 formed in the outer surface of the valve block adjacent to and in front of its shoulder I^2 of smaller area. A constant supply of live air is thus provided against the smaller pressure area J^5 of the valve ring.

M is a longitudinal exhaust passage in the wall of the cylinder which opens by a port m into the cylinder at its forward end and extends through the valve-block H^* to an exhaust port M^1 opening through the outer surface of the valve-block at a point near the rear end thereof. The port M constitutes the main exhaust port for the exhaust of air from the forward end of the cylinder. Said exhaust port M^1 is covered by the valve ring J when in its rearward position and is uncovered thereby so as to open into the exhaust space X about the valve, when said valve ring is in its forward position. At a point forward of the admission slot R^1 in the valve block is located a port P which opens into the passage M and constitutes the supply port adapted for the admission of air into the forward end of the cylinder to drive the piston on its return stroke.

Q indicates a longitudinal passage which extends at its rear end into the valve block H^* and there opens by a port Q^1 against the larger pressure area J^1 of the valve ring. At its forward end said passage opens by ports Q^2 and Q^3 into the cylinder, the port Q^2 being an admission port which is adapted to be uncovered by an annular groove or channel B^1 in the piston on its outward stroke, while the port Q^3 , which is located forward of the port Q^2 , is an exhaust port adapted to be covered by the forward end of the piston on the outward stroke but to be uncovered thereby on its return stroke to relieve the pressure on the larger pressure area of the valve-ring J .

T , T indicate auxiliary, longitudinal exhaust passages located in the wall of the barrel A and opening into the cylinder at their forward ends by ports T^2 which are adapted to be uncovered by the forward end of the piston on its return stroke simultaneously with the uncovering of the exhaust port Q^3 , and opening at their rear ends by ports T^1 into the exhaust space X about the controlling valve.

N is a longitudinal passage in the cylinder which opens at its forward end by a port N^1 into the cylinder at a point in a transverse plane with the port Q^2 and adapted to be uncovered simultaneously with said port by the channel or groove B^1 in the piston so as to connect the passage N with the passage

Q leading to the larger pressure area of the valve ring. The rear end of said longitudinal passage N extends through the valve block H^* to a port N^2 by means of which it opens into the live air chamber I^3 at the rear end of the valve block. The passage N thus receives a constant supply of live air which is adapted to be directed through the port N^1 , the port Q^2 , the passage Q and the port Q^1 , the larger pressure area J^1 of the valve ring to shift the same rearwardly against the constant live air pressure on its smaller pressure area J^5 when the piston in its outward stroke, places the ports N^1 and Q^3 in communication by means of the slot B^1 in its outer surface.

Located at the rear of the larger pressure area J^1 of the valve-ring is a channel or groove J^* formed in the inner surface of said valve-ring, which channel is adapted to open into the supply port P adapted for the supply of air to the forward end of the cylinder when the valve-ring is in its rearward position. Said channel at the same time opens into a port N^3 by means of which the live air passage N opens through the outer surface of the valve-block H^* . Thus, when the valve-ring is in its rearward position, the live air passage N is connected by the port N^3 , the channel J^* and the port P with the longitudinal passage M , so as to supply air to the forward end of the cylinder to drive the piston on its return stroke. The passage N thus serves to supply live air not only to the larger pressure area of the valve ring to shift the same rearwardly, but to supply air to the admission port for the forward end of the cylinder when the valve ring has been thus shifted.

The operation of the hammer is apparent from the above description. The live air chamber I^3 is directly open to the throttle valve chamber as in the hammer described in the application above referred to, so that the opening of the throttle-valve admits a supply of live air through the ports I^3 to the smaller pressure area J^5 of the valve-ring. Starting with the piston B at the rear end of its return-stroke and the valve-ring J at the forward limit of its movement, the main exhaust ports K for the rear end of the cylinder are closed; the exhaust port M^1 is open, communication of the exhaust space X with the forward end of the barrel being thus established and the smaller pressure area J^5 of the valve ring is forward of the admission slot R^1 in the outer surface of the valve-block so that the live air acting against said smaller pressure area has free access to the admission ports R leading to the rear end of the cylinder. A large amount of air is thus admitted to drive the piston on its power stroke. At this time the channel J^* of the valve-ring is forward of the plane of the admission port P for the admission of air to

the forward end of the cylinder. As the valve nears the outer limit of its power stroke, the port Q^3 is closed by the forward end of the piston and communication is opened between the ports N^1 and Q^2 , by the channel or groove B^1 of the piston, thus connecting the live air passage N with the passage Q leading to the larger pressure area J^1 of the valve-ring. This effects a rearward movement of the valve-ring, against the constant live air pressure on its smaller pressure area J^5 . By this rearward movement, the main exhaust ports K for the rear end of the cylinder are opened; the smaller pressure area J^5 is shifted to the rear of the admission slot R^1 , thus cutting off the supply of live air to the rear end of the cylinder; the exhaust port P for the forward end of the cylinder is closed; and the channel J^x of the valve-ring is brought into the plane of the supply port P and of the port N^3 leading to the live air passage N , thus connecting the forward end of the barrel with the live air supply, so as to drive the piston on its return-stroke. When in this rearward movement of the piston the forward end of the piston uncovers the exhaust port Q^3 of the passage Q leading to the larger pressure area of the valve-ring, it at the same time opens the exhaust ports T^2 opening into the exhaust passages T , thus relieving the pressure on said larger pressure area of the valve-ring and permitting the valve ring to move to its forward position under the constant live air pressure on its smaller pressure area. The parts are then in the position first described, the piston starts back on its power stroke, and the operation continues as before.

It will be noted that in this case as in the case of the hammer described in the application referred to above, the admission ports R for the inner end of the cylinder and the supply ports I^3 are inclined outwardly and the slots R^1 and I^5 in the outer annular surface of the valve-block into which they respectively open are closely adjacent. It will also be seen that the longitudinal passages which pass into or through the valve block are drawn inward toward its longitudinal central axis. A short valve block and one of comparatively small diameter is thus made possible, without limiting the number and cross-sectional area of the ports and passages therein.

I claim as my invention:—

1. The combination with a cylinder and a reciprocating plunger therein, of a controlling valve at the rear of the cylinder for controlling the admission and exhaust of air into and from the cylinder embracing a valve block member and a valve ring member, said valve ring member having oppositely facing differential pressure areas and being adapted to move endwise on said valve

block, and said valve block having annular shoulders, each opposed to one of the pressure areas of said valve ring, said valve block and cylinder wall being provided with a longitudinal exhaust passage adapted for the exhaust of air from the forward end of the cylinder and with a longitudinal live air passage laterally separated therefrom, said exhaust passage having an exhaust port opening through the bearing surface of said valve-block at a point located near the rear end of said valve block and adapted to be uncovered when said valve ring is in its forward position, and an admission port located intermediate the shoulders of said valve block, said live air passage having a port opening through the bearing surface of said valve-block intermediate said valve-block shoulders, means controlled by the piston for connecting said live air passage with the larger pressure area of the valve ring, and said valve ring being provided with a circumferentially extending channel adapted to connect said admission port of the exhaust passage with said port of the live air passage when said valve ring is in its rear position.

2. The combination with a cylinder and a reciprocating plunger therein, of a controlling valve at the rear of the cylinder for controlling the admission and exhaust of air into and from the cylinder embracing a valve block member and a valve ring member, said valve ring member having oppositely facing differential pressure areas and being adapted to move endwise on said valve block, and said valve block having annular shoulders, each opposed to one of the pressure areas of said valve ring, a plurality of supply ports opening through the bearing surface of said valve block at points forward of said valve-block shoulder of smaller area, a plurality of admission ports for the rear end of the cylinder opening through the bearing surface of said valve block at points spaced longitudinally forward of said supply ports, said valve block and cylinder wall being provided with a longitudinal exhaust passage adapted for the exhaust of air from the forward end of the cylinder and with a longitudinal live air passage laterally separated therefrom, said exhaust passage having an exhaust port opening through the bearing surface of said valve-block at a point located near the rear end of said valve block and adapted to be uncovered when said valve ring is in its forward position, and an admission port for the forward end of the cylinder located at a point spaced longitudinally forward of the admission ports for the rear end of the cylinder, said live air passage having a port opening through the bearing surface of said valve-block intermediate said valve-block shoulders, means controlled by the piston for connecting said live air passage with the larger pressure area of the valve ring,

and said valve ring being provided with a circumferentially extending channel adapted to connect said admission port of the exhaust passage with said port of the live air
5 passage when said valve ring is in its rear position.

In testimony, that I claim the foregoing

as my invention I affix my signature in the presence of two witnesses, this 15th day of December A. D. 1910.

REINHOLD A. NORLING.

Witnesses:

CHARLES BROS,

CHAS. H. GREENY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."