R. A. NORLING.

PNEUMATIC HAMMER.

APPLICATION FILED DEC. 19, 1910.

1,001,297. Patented Aug. 22, 1911

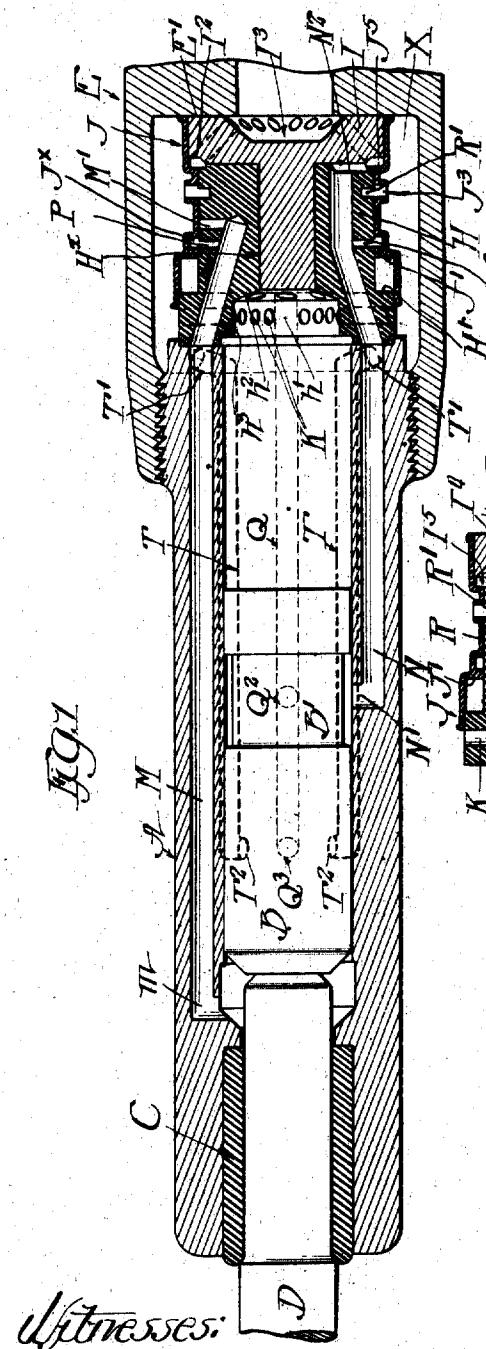

FIG. 1.

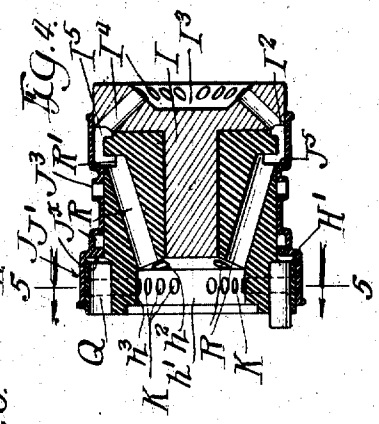

FIG. 4.

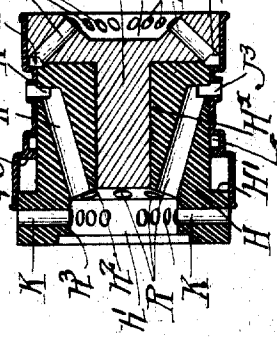

FIG. 3.

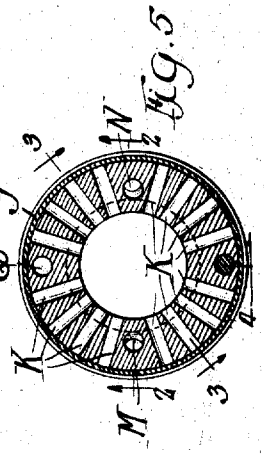

FIG. 5.

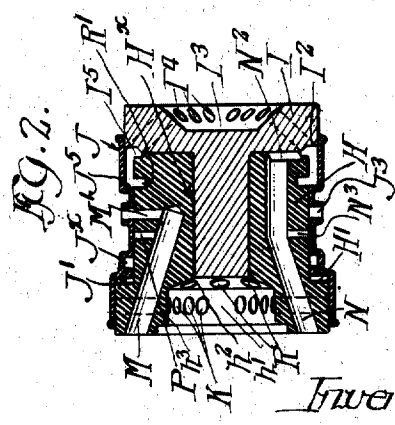

FIG. 2.

Witnesses:
F. W. Hefele
H. R. Wilkins

Inventor
Reinhold A. Norling
by Poole & Brown
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.

1,001,297. Specification of Letters Patent. Patented Aug. 22, 1911.

Application filed December 19, 1910. Serial No. 598,059.

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 being 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 No. 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 E^1.

The valve mechanism for controlling the admission and exhaust of air into and from the cylinder embraces a valve block H^x 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 E^1 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^x is provided with a recess or chamber h^1 at its forward end, said chamber having a rear end wall h^2 and an annular wall h^3, and with a recess or chamber I^3 at its rear end. The valve ring member J has a larger pressure area J^1 and a smaller pressure area J^3 which are respectively opposed to annular shoulders H^1 and I^2 formed in the outer annular surface of the valve block H^x.

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 h^3 of the chamber at the forward end of the valve block H^x 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 h^2 of said chamber h^1 and at their outer ends into an annular groove R^1 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^x to an exhaust port M^1 opening through the outer surface of the valve-block at a point forward of the admission slot R^1. The port M^1 constitutes the main exhaust port for the exhaust of air from the forward end of the cylinder. Forward of the exhaust port M^1 is 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^x 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 slot 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 into the valve block H^x to a port N^2 by means of which it opens into the space between the smaller pressure area J^5 of the valve-ring and the shoulder I^2 of the smaller area 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 O and the port Q^1, to 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 M^1 and Q^2 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^x 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^x. 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^x 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.

Intermediate the smaller pressure area J^x of the valve ring and the channel J^x thereof is located a set of circularly arranged exhaust port openings J^3 one of which is adapted, when the valve ring is in its forward position, to register with the exhaust port M^1 through which the exhaust from the forward end of the cylinder escapes. When the valve ring is in its rearward position said ports J^3 register with the admission groove R^1, into which the admission ports R for the rear end of the cylinder open, thus providing an auxiliary exhaust for the rear end of the cylinder through said admission ports R.

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^4 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; one of the port openings J^3 is in register with the exhaust port M^1 so that communication is established between the exhaust space X and the forward end of the barrel; 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^2 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 port openings J^3 of the valve-ring J are shifted rearwardly of the exhaust port M^1, thus cutting off the exhaust from the forward end of the barrel and are brought to register with said admission slot R^1, thus opening the admission ports R for the rear end of the cylinder to the exhaust space X so that said admission ports act as auxiliary exhaust ports for the rear end of the cylinder; and the channel J^x of the valve-ring is brought into the plane of the supply port P opening into the passage M and of the port N^3 leading to the live air passage M, thus connecting the forward end of the barrel with the live air supply, so as to drive the piston on its return-stroke. When 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 return 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, said valve block and cylinder wall being provided with laterally separated, longitudinal passages, each of which has a port opening through the bearing surface of said valve-block, one of said passages opening into said cylinder at a point near its forward end and the other opening into said cylinder at a point intermediate its ends, means providing a constant supply of air to the shorter one of said passages, means controlled by the piston for connecting said shorter passage with the larger pressure area of the valve ring, and said valve ring being provided with a circumferentially extending channel adapted to connect the said ports opening through the bearing surface of the valve block 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, 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 and an admission port, each opening through the bearing surface of said valve-block at longitudinally spaced points intermediate the ends of said valve block, said live air passage having a port opening through the bearing surface of said valve-block, means controlled by the piston for connecting said live air passage with the larger pressure area of the valve ring, said valve ring being provided with a circumferentially extending channel adapted to connect said admission port of the exhaust passage, and said port of the live air passage when said valve ring is in its rear position, and said valve ring being provided with a port opening

adapted to register with said exhaust port when the valve ring is in its forward position.

3. 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, 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 and an admission port each opening through the bearing surface of said valve-block at longitudinally spaced points intermediate the ends of said valve block, said live air passage having a port opening through the bearing surface of said valve-block, means controlled by the piston for connecting said live air passage with the larger pressure area of the valve ring, said valve ring being provided with a circumferentially extending channel adapted to connect said admission port of the exhaust passage and said port of the live air passage when said valve ring is in its rear position, and said valve ring being provided with a plurality of port openings, one of which is adapted to register with said exhaust port when the valve ring is in its forward 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 BROSE,
CHAS. H. GREENE.