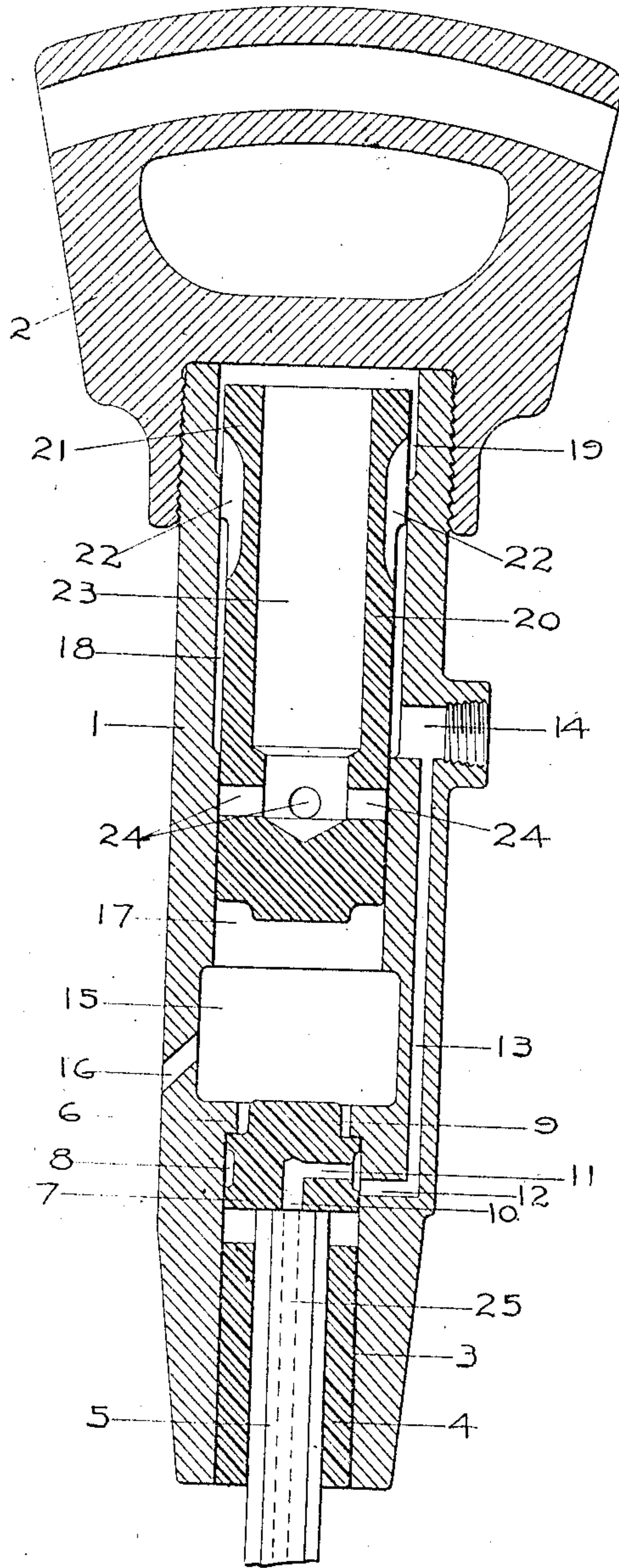


904,725.

C. B. RICHARDS.
IMPACT TOOL.
APPLICATION FILED DEC. 20, 1906.

Patented Nov. 24, 1908.



WITNESSES
J. W. Greve
J. L. Hank

C. B. Richards,
INVENTOR
By J. W. Greve
ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES B. RICHARDS, OF CLEVELAND, OHIO, ASSIGNOR TO THE CLEVELAND PNEUMATIC TOOL COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

IMPACT-TOOL.

No. 904,725.

Specification of Letters Patent.

Patented Nov. 24, 1908.

Application filed December 20, 1906. Serial No. 348,708.

To all whom it may concern:

Be it known that I, CHARLES B. RICHARDS, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Impact-Tools, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The annexed drawing and the following description set forth in detail, one mechanical form embodying the invention; such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

Said annexed drawing represents an axial section of a pneumatic impact tool embodying my invention.

The present embodiment of my improvements herein disclosed is an impact tool of the so-called valveless type, in which the reciprocating plunger which impacts upon the shank of the working-tool acts as a distributing valve to control the distribution of the motive fluid to reciprocate the plunger.

The particular type of impact tool herein disclosed is a so-called plug-drill, that is, an impact tool in which the impact of the reciprocating plunger is delivered to a stone-drilling bit for the purpose of drilling holes in stone or similar substance to admit of the insertion of wedges for cleavage, lewis-pins for the attachment of hoisting devices, or for similar purposes.

A further improvement disclosed in the present impact tool resides in the provision of means for conducting a continuous stream or jet of live-air down through the drill-bit and into the hole in the stone for the purpose of "mucking" the drilled hole, that is, blowing out the dust or debris produced by the drill-bit in drilling the hole in the stone.

It will be evident to any one familiar with the art to which this class of tools belongs, that the construction of the barrel and plunger of the tool may be employed in other impact tools besides plug-drills, and that also the device for conveying fluid under pressure through the drill-bit may be applied to other forms of rock-drilling tools besides the specific form herein disclosed.

The tool has a barrel, 1, the upper or inner end of which is externally screw

threaded for the attachment of a grasping and manipulating handle, 2, which in the present instance is illustrated in the form of a spade-handle, although it may, of course, be of any other desired or convenient form. The lower or outer end of the barrel has a bore, 3, into the lower or outer part of which a tool-nose, 4, is secured. The axial bore of this tool-nose is polygonal and serves to receive and hold the polygonal shank, 5, of the drill-bit or other working-tool. At the upper end of the bore 3 is formed an annular shoulder or rib, 6, so that a cylindrical chamber is formed between the upper or inner end of the tool-nose or socket and said shoulder. A cylindrical striker, 7, has play within this chamber, and is formed with a circumferential annular groove, 8, and with a nose or projection, 9, upon its upper end and adapted to be struck by the reciprocating plunger. The striker is formed with an axial bore, 10, extending from its under side up into the body of the striker and then by a lateral channel, 11, out into the bottom of the circumferential annular groove.

A port, 12, is formed in the side of the striker-chamber so as to register and communicate with the circumferential groove of the striker in whatever position within its chamber the latter may be, and this port communicates with a channel, 13, in the wall of the hammer-barrel, which channel extends into and communicates with the live-air inlet, 14, formed in the side of the barrel a short distance above the middle of the same and at the middle of the plunger-chamber within the barrel. The lower end of the plunger-chamber, above the annular rib or shoulder 6, is formed into a large-diameter chamber, 15, having one or more exhaust-ports, 16, through its wall out into the atmosphere. A smaller-diameter chamber, 17, is formed between this exhaust-chamber and the point in the plunger-chamber at which the live-air inlet enters the plunger-chamber, at which point the diameter of the plunger-chamber is enlarged to form a piston-chamber, 18, which extends up to a distance from the upper end of the plunger-chamber, where it is again enlarged to form a live-air chamber, 19. A two-diameter or differential plunger, 20, reciprocates within the plunger-chamber, and is for the greater portion of its length of the diameter of the small-diameter portion

of the same. The upper portion of the plunger is formed with a piston, 21, which is of the diameter of and reciprocates within the piston-chamber 18. Slots or grooves, 22, are milled or otherwise formed at points in the circumference of the plunger and longitudinally extend from a point in the small-diameter portion of the plunger a distance below the piston of the same, to a point in the piston near the upper end of the plunger. The plunger is formed with an axial bore, 23, which extends from the upper end of the plunger and down for the greater part of the length of the same, where such bore is intersected by a number of exhaust-ports, 24, radiating from the lower end of the bore and out through the side of the plunger, so as to connect with the exhaust-chamber in the lower portion of the plunger-chamber when the plunger is at the lower end of its down-stroke. The drill-bit is formed with an axial bore, 25, which registers with the axial bore 10 in the striker and extends to the cutting end of the drill so as to conduct live-air to such end or point and into the bottom of the drilled hole so as to blow the debris out of the same.

In practice, the live-air inlet is connected by means of a suitable pipe or nipple to a hose or other flexible connection which conveys the motive fluid to the tool,—such motive fluid being in a majority of cases compressed air, while it is evident that steam or other elastic fluid under pressure may be employed. If the plunger is in the position illustrated in the drawing, the live-air will pass upward in the space between the small-diameter portion of the plunger and the sides of the piston-chamber in the barrel and will pass to the upper end of the plunger-chamber through the longitudinal grooves in the plunger, so as to drive the piston downward to deliver its blow upon the striker and through the same upon the end of the drill-shank.

It will be seen that by having the live-air supplied to the upper end of the plunger-chamber through the longitudinal grooves, an ample supply of live-air will thus be provided to drive the plunger down and the hammering power of the impact tool will be comparatively great for a valveless tool. When the plunger has reached the lower end of its stroke, the exhaust-ports leading from the axial bore in the plunger will communicate with the exhaust-space 15 in the plunger-chamber, so that the live-air above the piston may escape through the exhaust-port or ports in said chamber,—the admission of air above the plunger having been cut off when the upper ends of the longitudinal grooves in the plunger have passed below the shoulder formed between the uppermost enlargement of the plunger-chamber, which may be termed the live-air chamber,

and the upper end of the piston-chamber 18, so that the last portion of the downward stroke of the plunger is accomplished by the expansion of the live-air back of or above the plunger. As soon as the air above the plunger has been exhausted and its pressure reduced, the constant air-pressure upon the small-area lower face of the piston 21 upon the plunger will again raise or force the plunger upward until the longitudinal grooves in the same communicate with the live-air chamber in the upper end of the barrel, when the plunger will again be driven downward to deliver its blow. It will thus be seen that the plunger is reciprocated by alternate admission and exhaust of live-air chamber in the upper end of the plunger, and by a constant air-pressure upon a small-area piston-surface upon the plunger. This provision for reciprocating the plunger greatly simplifies the provision for distributing the motive fluid in this impact tool, and consequently simplifies construction with accompanying strength of structure, and effecting economy in the cost of construction.

As long as live-air is admitted to the tool, the same is passed through the passage down to the circumferential groove in the striker and through the annular passage in the latter into and through the passage in the drill-bit, thus effecting complete mucking of the drilled hole by the constant stream or jet of live-air through the drill-bit.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism thus disclosed, provided the principles of construction set forth respectively in the following claims are employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In a valveless pneumatic impact tool, the combination with a barrel or working-cylinder having air inlet and outlet, of a differential plunger reciprocating within said barrel or cylinder and having a small-area piston-surface exposed to constant air pressure and a large-area piston-surface and formed with an axial exclusive exhaust-passage and with inlet-passages through the small-area piston-surface.

2. In a valveless pneumatic impact tool, the combination with a barrel or working-cylinder having air inlet and outlet, of a differential plunger reciprocating within said barrel or cylinder and having a small-area piston-surface exposed to live-air pressure and a large-area piston-surface and formed with an exclusive exhaust-passage from the large piston-surface and through the plunger and with a live-air passage communicating with the constant air pressure through the small-area piston-surface.

3. In a valveless pneumatic impact tool,
the combination with a barrel formed with
a plunger-chamber having an exhaust-cham-
ber and exhaust-port at its lower end and a
5 live-air inlet at its middle and having an
enlarged piston-chamber above the inlet and
a further enlarged live-air chamber at the
upper end of said piston-chamber, of a dif-
ferential plunger fitted to reciprocate within
10 the plunger-chamber and having an en-
larged piston at its upper end to reciprocate
within the piston-chamber and formed with
an exclusive longitudinal exhaust-channel

open through the upper end of the plunger
and through the sides of the lower portion 15
of the same and with a longitudinal live-air
passage extending from below the small-
area piston-surface to a point near the upper
end of the enlarged piston.

In testimony that I claim the foregoing 20
to be my invention I have hereunto set my
hand this 7th day of December, A. D. 1906.

CHARLES B. RICHARDS.

Witnesses:

L. W. GREVE,
WM. SECHER.