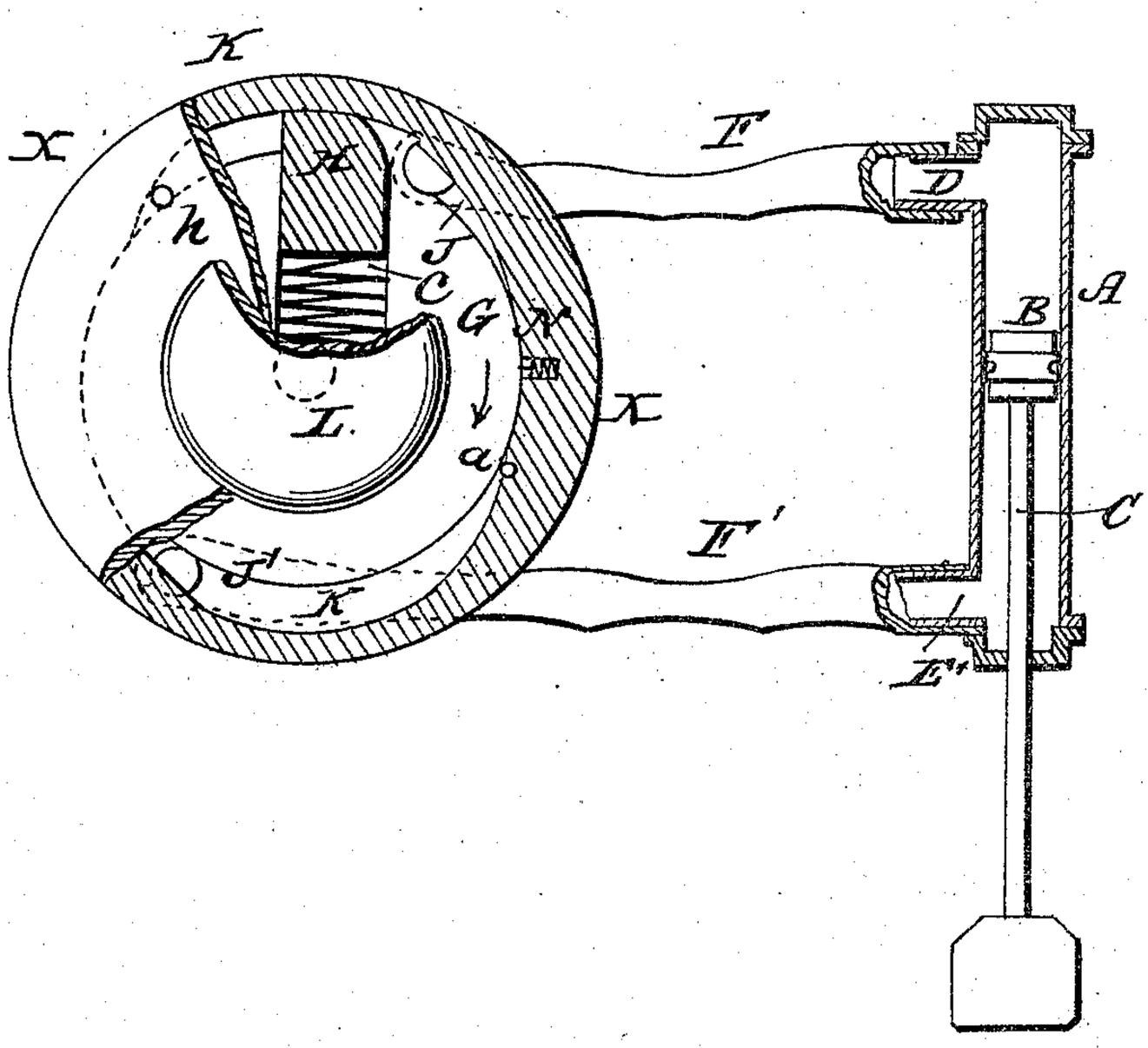
DE V. WOOD.

Pneumatic Reciprocating Movement.

No. 98,901. Patented Jan. 18, 1870.



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DE VOLSON WOOD, OF ANN ARBOR, MICHIGAN.

IMPROVEMENT IN PNEUMATIC RECIPROCATING MOVEMENTS.

Specification forming part of Letters Patent No. **98,901**, dated January 18, 1870; antedated January 10, 1870.

To all whom it may concern:

Be it known that I, DE VOLSON WOOD, of the city of Ann Arbor, in the county of Washtenaw and State of Michigan, have invented a new and useful mode of operating a piston and its attachments for certain machines hereinafter mentioned; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, making part of this specification.

The nature of my invention consists in driving a piston by a double pneumatic spring, the spring being operated by another piston.

My invention pertains, principally, to those machines in which the piston-rod is used to drive a tool either by striking it at the end of the stroke, or by attaching the tool directly to the piston-rod, so that it shall reciprocate with it and the tool strike at the end of the stroke. In such machines the piston and piston-rod are by some called a "mechanical jumper." Prominent among such machines are certain forge-hammers, rock-drilling machines, and rock-channeling machines; but my invention may also be used to drive the plunger of a pump, so that the class known as "steam-pumps" may be driven by shafting without the introduction of steam, and hence may be operated at any reasonable distance from the steam-power. It may also be used to drive an ordinary steam-engine having a balance-wheel, as will be sufficiently evident from the following explanations, although I shall confine myself to the class above defined as "mechanical jumpers." In this class of machines it is sometimes desirable to operate at a distance from the motor, and in all cases to relieve, as much as practicable, the shock upon the working parts, due to concussion of the tool upon the material. Both these are secured by my invention.

To enable others skilled in the art to which it pertains to make and use my invention, I will now proceed to describe its construction and operation.

A is an ordinary cylinder, closed at both ends, but having openings or passages D and E at or near the ends.

Within the cylinder is the piston B and piston-rod C, to the latter of which the tool—such as a forge-hammer, a drill, or gang of cutters—may be attached.

X X is a rotary engine, of any approved form, having a single piston, H. The solid cylindrical part G moves air-tight within the case, which forms the engine and carries the piston H, and the whole is so formed as to make two compartments, K K′. The pulley L is attached to the same axle, as G, so that when L is driven by a belt or otherwise attached to other machinery (not shown in the drawing) it will cause G and H to rotate. The piston H will then force the air in K before it, driving it through the opening J along the flexible tube F, through the passage D, and into the rear end of the cylinder A, driving the piston forward. As soon as H passes J the air which was compressed in the rear of the cylinder rushes into the space K, and thus relieves the pressure on the rear of piston B, and piston H passes on, forcing the air before it through J′, F′, and E, and drives the piston back.

Instead of a rotating piston H, it may be made to reciprocate directly between the openings J and J′, compressing the air before it and driving piston B, as before. In this way piston B is made to reciprocate. Also, as explained, a rotary movement may produce a reciprocating movement without the intervention of gearing, and by reversing the operation a reciprocating movement of B may produce a rotary movement of H; also, a reciprocating movement of H may produce a reciprocating movement of B.

Small orifices *a* and *b* permit external air to rush into K K′ when necessary to fill the space. If H reciprocates, a single orifice near the middle may be sufficient; or orifices may be placed near the ends of the stroke and provided with valves, which shall admit air, but which shall prevent its exit by closing automatically. These orifices may also be used to regulate the force of the blow, and may be especially desirable when the same machine is used to work down or up, or horizontal, by regulating the distance between them and the openings J and J′, so that more or less air will be forced before piston B. Thus, if the orifice *a* be near J′, the piston B will not be driven back as far as if it were more remote, and hence the stroke

will be shorter. In this way they may be so regulated as that the blow shall be struck before the pressure on the piston is reversed, which, in the case of rock-drills, is desirable for economizing the motor. The volume of compartment K should be larger than that of cylinder A. Piston B is prevented from striking the ends of the cylinder by passing into an air-cushion, which is constructed and regulated in any of the well-known ways.

I am aware that a piston and its attachments have been operated by forcing it in one direction against the atmosphere by means of compressed air, and then, by producing a partial vacuum, permit the atmosphere to drive it in the opposite direction, in which arrangement the effective pressure will always be small—less than fifteen pounds to the square inch—and would necessitate such large pistons and cylinders as would be fatal to the practical working of many machines. In my invention the atmosphere, as a motor, is excluded, a vacuum is not necessary for its working, and any desired pressure may be secured; and hence the working machine may be correspondingly smaller.

What I claim as new, and desire to secure by Letters Patent, is—

A double-acting pneumatic spring, when operated by a rotating or reciprocating piston, H, as and for the purposes herein set forth.

DE VOLSON WOOD.

Witnesses:
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