A. PALMROS.

PRESSURE DEVELOPING AND DRIVEN TOOL.

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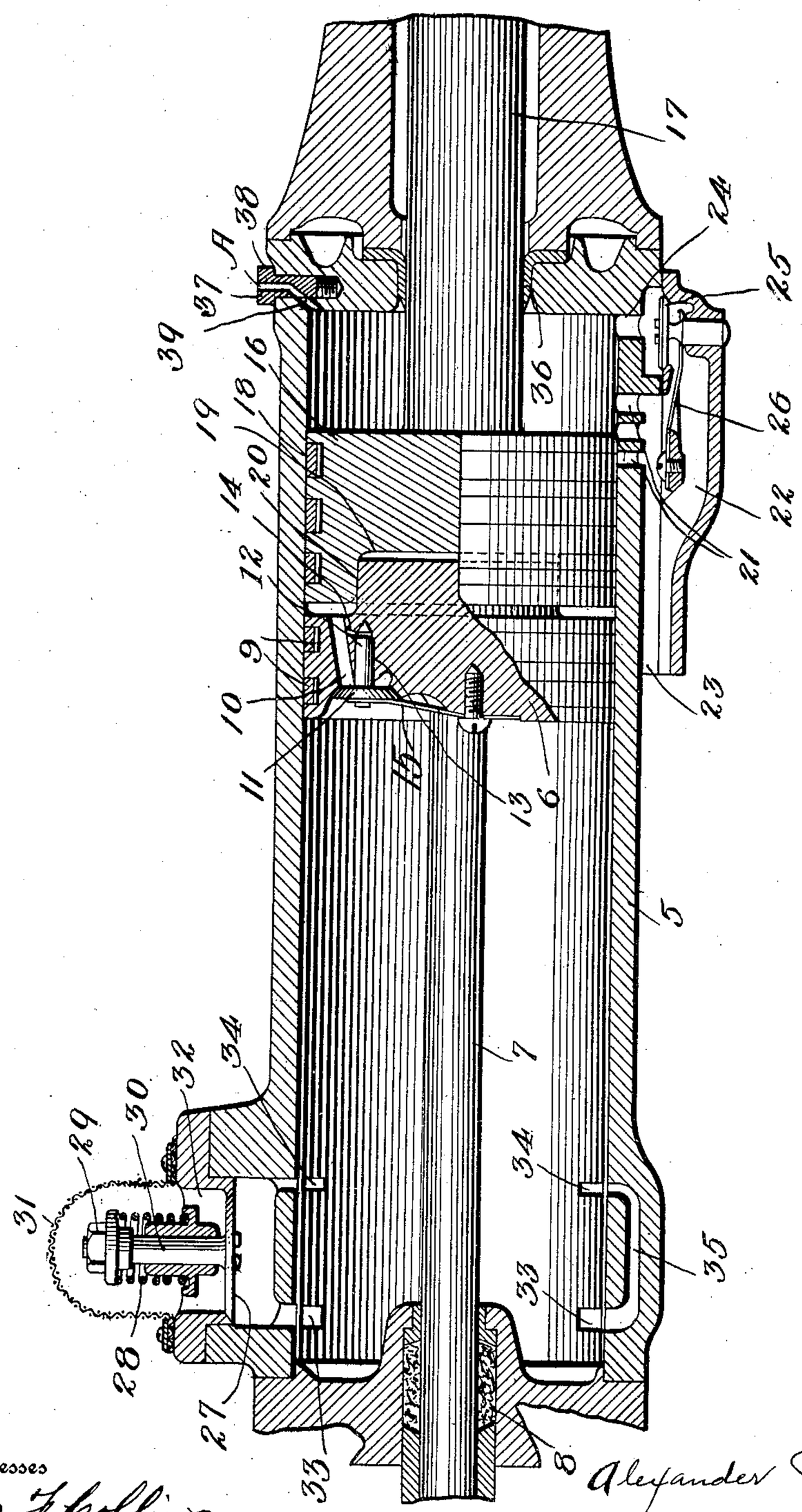
Patented Sept. 28, 1915.



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UNITED STATES PATENT OFFICE.

ALEXANDER PALMROS, OF SYRACUSE, NEW YORK, ASSIGNOR TO THE PNEUMELECTRIC MACHINE COMPANY, OF SYRACUSE, NEW YORK, A CORPORATION OF NEW YORK.

PRESSURE DEVELOPING AND DRIVEN TOOL.

1,155,264. Specification of Letters Patent. **Patented Sept. 28, 1915.**

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To all whom it may concern:

Be it known that I, ALEXANDER PALMROS, a citizen of Finland, and resident of Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Pressure Developing and Driven Tools, of which the following is a specification.

My present invention relates to improvements in the construction of that type of tools for percussion machinery in which a tool actuating member is driven forward by the expansive force of compressed air developed by means contained within the machine.

In my Letters Patent No. 1072,358 September 2, 1913, I have disclosed and broadly claimed a machine embodying a cylinder, a motor driven pressure developing piston, and a pressure driven tool carrying piston; the motor driven piston, for each working stroke of the machine compressing a charge of air from which the percussive stroke of the machine is developed, by releasing the charge and permitting it to act expansively against the tool carrying piston which has in the meantime been suitably retracted; the illustrative embodiment disclosed in said application also including the features of causing the motor driven piston, by its rearward stroke, to compress the charge of air behind it, and at the same time to retract the tool carrying piston.

In the present invention means are provided for admitting air between the forward end of the cylinder and the piston when said piston is to be retracted to thereby destroy any vacuum or partial vacuum that may have formed within the forward end of the cylinder by the leakage of air about the piston rod or past the piston rings.

My present invention consists of means for accomplishing the objects above outlined and certain novel features of construction incident thereto.

In the accompanying drawing, the figure shows a longitudinal vertical section of a pressure developing and driven tool, constructed in accordance with the invention.

Referring to the drawing, the numeral 5 designates a cylinder or barrel in which a pressure developing piston 6 is slidably mounted. Reciprocatory movement may be imparted to this piston through the medium of a piston rod 7 which is suitably packed at 8 to prevent the escape of the pressure fluid therearound. Piston rings 9 serve to form the usual fluid tight contact between the piston and the walls of the cylinder. A port 10 is formed through the piston 6 and is controlled by a check valve 11. The stem 12 of this check valve is guided in a recess 13 of the piston and a small port 14 establishes communication between the inner end of this recess and the port 10, whereby a free action of the valve 11 is insured.

A spring 15 is secured to the piston 6 and bears against the valve 11, normally tending to seat the same. A pressure driven piston 16 is also slidably disposed within the cylinder 5 in advance of the piston 6. The piston rod 17 of the piston 16 may be connected directly to a percussion tool or may be arranged to strike against such tool, as desired. Piston rings 18 serve to form a fluid tight contact with the walls of the cylinder 5.

It will be noted that the piston 16 is provided with a recess 19 into which an extension 20 of the piston 6 projects. The wall of the cylinder 5 is pierced by a row of openings 21 which communicate with a chamber 22, this chamber being open at 23 to the atmosphere. A port 24 is formed through the wall of the cylinder 5 at the extreme forward end thereof and a check valve 25 is disposed between this port and the chamber 22. A spring 26 normally tends to seat this check valve, said check valve tending to open inwardly.

At the rear end of the cylinder, a check valve 27 is arranged to open inwardly against the tension of a spring 28, this spring being adjustable through the medium of a nut 29 upon the valve stem 30. A screen 31 is preferably arranged about the inlet passage 32 that is controlled by the valve 27. It will be noted that ports 33 and 34 lead from the storage chamber 35 to the interior of the cylinder 5.

To suitably pack the rod 17 and to prevent the leakage of air therearound, a packing member 36, preferably of leather, is employed. When this leather is new and fits tightly, the amount of leakage past the piston rod 17 is very slight, but as the leather wears, this leakage increases and it is desirable to employ means for compensating for this leakage as far as possible. To this end, a screw 37 having a port 38 formed therethrough is threaded into the cylinder and

the port 38 is adapted to be brought into communication with a port 39 which communicates with the interior of the cylinder 5. When the leather is new and fits tightly, the vent formed by the port 38 is opened to its fullest extent, but as the leather wears and the leakage along the piston rod is thereby increased, this vent is gradually closed to compensate for this leakage, and when the vent is entirely closed, it is necessary to insert a new packing member 36.

The operation of the device is as follows: When the piston 6 moves toward the left, the air between said piston and the piston 16 is rarefied and atmospheric air passes the check valve 25 and through port 24, to cause the piston 16 to follow the piston 6. At this time, the air contained within the left hand end of the cylinder is being compressed and is highly compressed by the time said piston reaches a position between the ports 33 and 34. When the piston reaches this position, the air passes through ports 34 to the left hand face of the piston 16, driving said piston forward with great force and causing the tool actuated by rod 17, to deliver a percussive blow.

It is highly desirable not only to cushion the piston 16 at the end of its stroke toward the right, but to afford it progressively increasing relief as its rearward travel accelerates. It has heretofore been proposed to locate a port near the end of the cylinder in such position that when the port is covered by the piston in its travel, the air remaining in the cylinder is trapped and compressed to form a cushion during the remainder of the piston stroke. When only one port has been provided, the air thus trapped is very rapidly compressed and forms a highly resilient and expansive cushion. Moreover relief on the rearward stroke is slow. To render this cushion less expansive, and admit atmospheric pressure in progressively increasing quantity as the rearward stroke of the pressure driven piston accelerates in response to the retraction of the pressure developing piston, the series of openings 21 are provided. These openings are successively cut off by the piston in its travel forward, whereby the air is not as rapidly compressed as would be the case if only one opening were provided and a less expansive cushion of air is formed, and these openings, preceded by opening 24 are progressively opened on the rearward stroke of piston 16. It is apparent that at this time, the check valve 25 prevents the passage of air through the port 24. When the piston 6 starts upon its forward travel, the air between the pistons 6 and 16 passes through the port 10, unseating the valve 11 and entering the cylinder upon the left hand side of the piston 6. If, by reason of leakage past the piston rod or the piston rings, the air within the cylinder is at less than atmospheric pressure, the check valve 27 opens enough to renew the air supply. Since these tools are used in mines and other places where the air is heavily dust-laden, the screen 31 is employed to prevent the passage of particles of dirt and grit from passing the cylinder 27 at this time. It will therefore be seen that the air within the cylinder 5 is used over and over again and only enough additional air enters the cylinder to replace the air that is lost by leakage. This is a very advantageous feature, because, as has been before stated, the air from which the tool must draw its supply is laden with grit and other foreign particles, that it is highly undesirable to have enter the tool.

Having described my invention, what I claim is:

1. The combination with a single cylinder closed at its rear end, of a fluid pressure driven piston and a fluid pressure creating piston therein, a port formed through the fluid pressure creating piston and a spring actuated valve therein controlling said port for conducting the fluid from the space between said pistons to the space at the rear of the fluid pressure creating piston during the complete forward stroke of the fluid pressure creating piston and means for delivering the fluid from said last-named space to the space between the pistons when the fluid pressure creating piston reaches a predetermined point in its travel.

2. The combination with a single cylinder closed at both ends, of a pressure actuated piston therein, a pressure creating piston therein, both pistons being in alinement, means in said pressure creating piston for permitting escape of air from the space between said pistons to the space in the rear of the pressure creating piston during the complete forward stroke of said pressure creating piston, a flap valve in said pressure creating piston controlling said means, and means for delivering the air from the last named space to the space between said pistons when the pressure creating piston reaches a predetermined point in its travel.

3. The combination with a single cylinder closed at both ends, of a pressure driven piston and a pressure creating piston therein, both pistons in alinement and of the same diameter, a port formed through the pressure creating piston and a spring actuated valve therein controlling said port for conducting the air from the space between said pistons to the space at the rear of the pressure creating piston during the complete forward stroke of the pressure creating piston, and means for delivering the air from said last named space to the space between the pistons, when the pressure creating piston reaches a predetermined point in its travel.

4. The combination with a single cylinder

closed at both ends, of a pressure driven piston and a pressure creating piston therein, a port formed through the pressure creating piston and a spring actuated valve therein controlling said port for conducting the air from the space between said pistons, to the space at the rear of the pressure creating piston during the complete forward stroke of the pressure creating piston, means for delivering the air from said last named space to the space between the pistons, when the pressure creating piston reaches a predetermined point in its travel, and an inwardly opening valve adapted to supply air to the space in the rear of the pressure creating piston when said pressure falls below atmospheric.

5. The combination with a single cylinder closed at both ends, of a pressure driven piston and a pressure creating piston therein, a port formed through the pressure creating piston and a spring actuated valve controlling said port for conducting the air from the space between said pistons to the space at the rear of the pressure creating piston during the complete forward stroke of the pressure creating piston, means for delivering air from said last named space to a space between the pistons, when the pressure creating piston reaches a predetermined point in its travel, an inwardly opening valve adapted to supply atmospheric air to said air delivering means when said pressure falls below atmospheric during the forward stroke of said pressure creating piston, said inwardly opening valve being situated at one end of the cylinder so as to communicate directly with the surrounding atmosphere.

The foregoing specification signed at New York city, N. Y. this 9th day of June, 1910.

ALEXANDER PALMROS.

In presence of—
JOHN L. WAGNER,
M. G. CRAWFORD.