The intermediate casing 5 and the front head 6 of the drill enclose a drill turning mechanism of conventional design (not illustrated). The cylinder casing consists of a tubular steel body 1, which has a working cylinder and is press fitted in an aluminum casting 2. A differential hammer piston 11 is reciprocable under the action of compressed air in the working cylinder, a first working chamber 12 being formed in the cylinder at the rear end of the hammer piston 11 and a second annular working chamber 13 in the cylinder in front of the hammer piston 11. Compressed air supplied to the first working chamber 12 moves the hammer piston 11 forward to produce the percussion stroke of the piston, said compressed air being admitted by the valve 8 through inlet passages 14. Compressed air for the return stroke of the piston is supplied to the second working chamber through passages 15 in the casing 2, the valve 16 being opened when said port is uncovered by the piston and the valve 8 is in proper position. The casing 2 also contains passages 17 and 18 through which compressed air may be supplied to or vented from a feed leg (not illustrated).

The tubular body 1 is provided with a number of radial openings 19, which form the 1 outlet for the air from the working chambers 12 and 13 through which air is exhausted from said working chambers when the upper edge 20 or the lower edge 21, respectively, of the hammer piston head uncovers the openings 19 behind or in front, respectively, of the piston head. The openings 19 are disposed in one transverse plane of the working cylinder but may also be disposed in two transverse planes or in any other way. The main outlet may be common for the first and second working chambers as illustrated, or separate main outlets may be provided for the first and second working chambers. Auxiliary outlets are formed in the cylinder walls of the working chambers 12 and 13 by series of holes 21, 22, and 23 which outlets each have less total area than the series of holes 19 forming the main outlet. The auxiliary outlet 21, 22, 23 is disposed in the cylinder wall in such a manner that it is uncovered by the hammer piston 11 during the working stroke, before the hammer piston uncovers the main outlet 19. The openings 19, 21, 22, 23 in the tubular body 1 form into a chamber 24 formed in the casing 2 between said casing and the tubular body 1. The openings 23 also serve to reduce the energy involved in the return stroke of the piston, and thus also prevent the piston from hitting the valve casing 4. The openings 21, 22, 23 are of less diameter than the openings 19. The chamber 24 communicates with the atmosphere through two outlet ports 25.

The arrangement of the auxiliary outlets 21, 22, 23 results in such equalization of the exhaust pulses that the noise produced by the exhaust of air from the tool may be reduced with as much as six decibels, which means that the exhaust noise of the tool is reduced to only a fraction of the normal exhaust noise.

The embodiment of the invention above described and illustrated in the drawings should be considered only as an example and the invention may be modified in several different ways within the scope of the claims. For instance, the number of holes of series of holes 19, 21, 22, 23 may be greater or lesser than those illustrated, and in some cases a satisfactory result may be obtained also with an auxiliary outlet comprising one series of holes only in the working chamber 12. The holes of the outlets may be evenly distributed.
around the periphery of the cylinder but they may be distributed also in an uneven manner on zig-zag lines or in any other way in order to produce the desired interference of the exhaust jets from the various holes which appears to be the cause of the reduction of the noise obtained by the invention.

What I claim is:

1. In a pneumatic percussion tool, a casing forming a cylinder, a hammer piston reciprocable in said cylinder, a first working chamber for compressed air in said cylinder for producing the working stroke of said piston, a second working chamber for compressed air in the cylinder for producing the return stroke of the piston, means for admitting compressed air to said first working chamber, a piston controlled main outlet in the cylinder wall of the first working chamber, and a piston controlled auxiliary outlet in the cylinder wall of the first working chamber of less area than said main outlet and disposed so as to be uncovered by the piston during the working stroke before the piston uncovers the main outlet.

2. In a pneumatic percussion tool, a casing forming a cylinder, a hammer piston reciprocable in said cylinder, a first working chamber for compressed air in said cylinder for producing the working stroke of said piston, a second working chamber for compressed air in the cylinder for producing the return stroke of the piston, means for admitting compressed air to said first working chamber, a series of openings in the cylinder wall forming a main outlet from the first working chamber and controlled by the piston, and a second series of openings in the cylinder wall of the first working chamber of less area than said first series of openings and disposed so as to be uncovered by the piston during the working stroke before the piston uncovers the main outlet.

3. A pneumatic percussion tool according to claim 2, in which said openings are circular and the openings of the second series have less diameter than the diameter of the openings of the first series of openings.

4. In a pneumatic percussion tool, a casing forming a cylinder, a hammer piston reciprocable in said cylinder, a first working chamber for compressed air in said cylinder for producing the working stroke of said piston, a second working chamber for compressed air in the cylinder for producing the return stroke of the piston, means for admitting compressed air to said first working chamber, a piston controlled main outlet in the cylinder wall of the first working chamber, and two series of holes in the wall of the first working chamber of less area than said main outlet and disposed in two transverse planes so as to be uncovered by the piston during the working stroke one before the other and both before the piston uncovers the main outlet.

5. In a pneumatic percussion tool, a casing forming a cylinder, a hammer piston reciprocable in said cylinder, a first working chamber for compressed air in said cylinder for producing the working stroke of said piston, a second working chamber for compressed air in the cylinder for producing the return stroke of the piston, means for admitting compressed air to said first working chamber, a piston controlled main outlet in the cylinder wall of the first working chamber, and a series of openings in the cylinder wall of the second working chamber of less area than said main outlet and disposed so as to be uncovered by the piston during the return stroke of the piston before the piston uncovers the main outlet.

6. In a pneumatic percussion tool, a tubular body forming a cylinder, a casing enclosing said tubular body and forming around said tubular body an exhaust chamber, ports in said casing forming a communication between said chamber and the atmosphere for the exhaust of air from the tool, a hammer piston reciprocable in said cylinder, a first working chamber for compressed air in said cylinder for producing the working stroke of the piston, a second working chamber for compressed air in the cylinder for producing the return stroke of the piston, means for admitting compressed air to said first working chamber, means for admitting compressed air to said second working chamber, a series of openings in the tubular body forming a piston controlled main outlet from the first and second working chambers, a series of openings in the cylinder wall forming an auxiliary outlet to the exhaust chamber from the first working chamber of less total area than the total area of said main outlet and disposed so as to be uncovered by the piston during the working stroke before the piston uncovers the main outlet, and a series of openings in the tubular body forming an auxiliary outlet from the second working chamber to the exhaust chamber of less total area than that of said main outlet and disposed so as to be uncovered by the piston during the return stroke before the piston uncovers the main outlet.

7. In a pneumatic percussion tool, a casing forming a cylinder, a hammer piston reciprocable in said cylinder, a first working chamber for compressed air in said cylinder for producing the working stroke of said piston, a second working chamber for compressed air in the cylinder for producing the return stroke of the piston, means for admitting compressed air to said first working chamber, a first series of openings in the cylinder wall forming a main outlet from the first working chamber and controlled by the piston, and a second series of openings in the cylinder wall of the first working chamber of less diameter than said main outlet openings and of such total area and so positioned as to be uncovered by the piston during the working stroke before the piston uncovers the main outlet and to permit air escape from the first working chamber to such an extent that a subsonic flow of air is obtained from the main outlet openings.

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