April 20, 1926. 1,581,668

L. C. BAYLES

ROCK DRILL

Filed Oct. 9, 1924

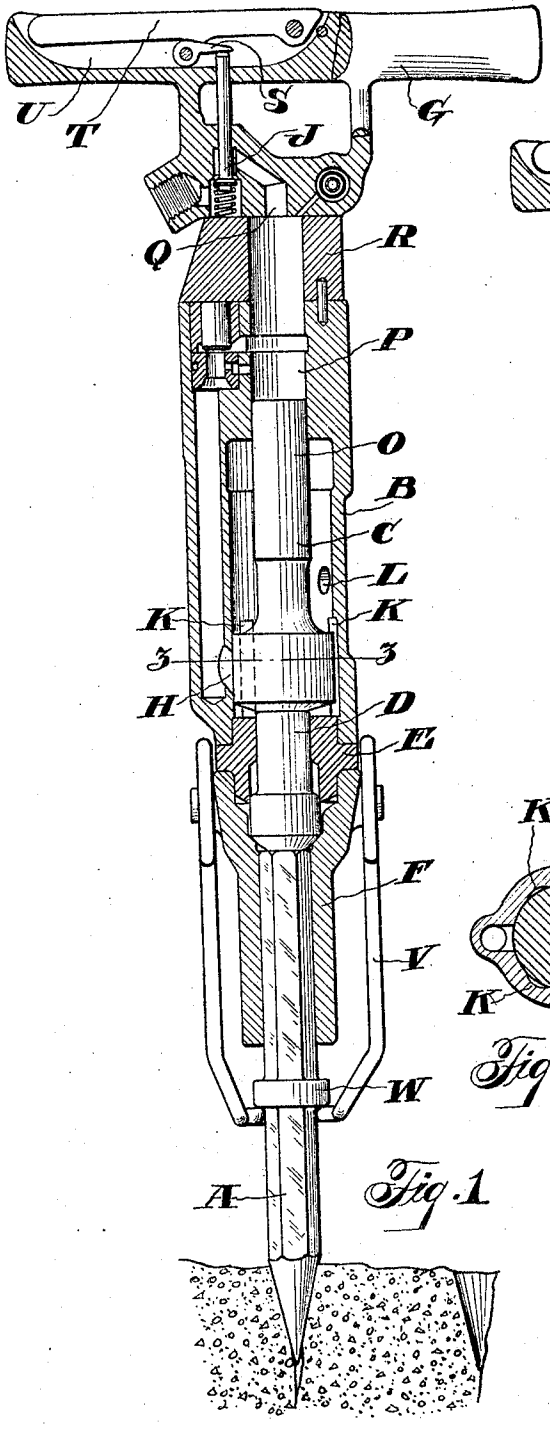


Fig. 1.

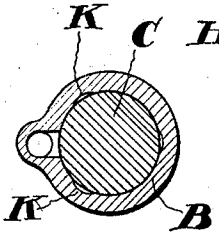


Fig. 3.

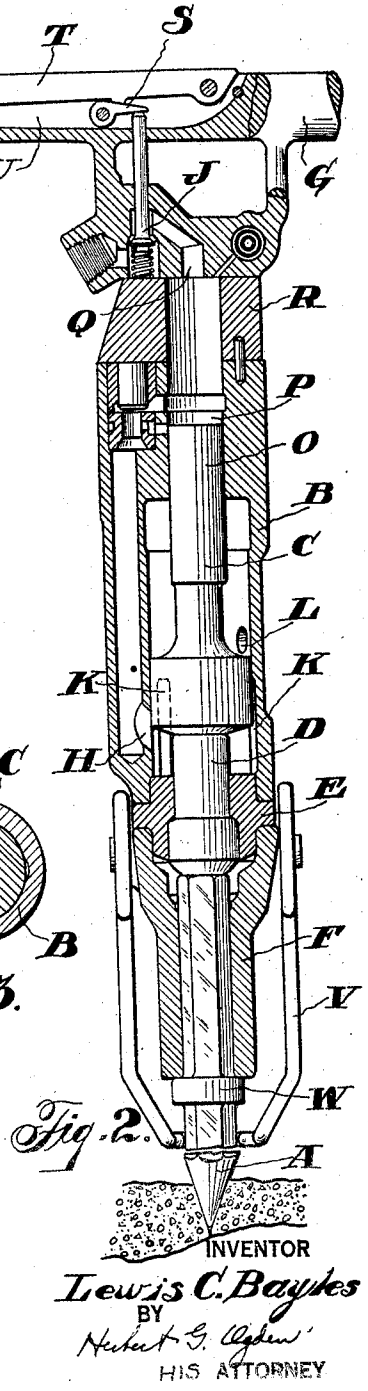


Fig. 2.

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Patented Apr. 20, 1926. 1,581,668

UNITED STATES PATENT OFFICE.

LEWIS C. BAYLES, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ROCK DRILL.

Application filed October 9, 1924. Serial No. 742,615.

To all whom it may concern:

Be it known that I, LEWIS C. BAYLES, a citizen of the United States, and a resident of Easton, county of Northampton, State of Pennsylvania, have invented a certain Rock Drill, of which the following is a specification, accompanied by drawings.

This invention relates to pneumatic drills.

In operating certain types of pneumatic drills, such as for instance, those that are supported by hand, it is desirable that the operator press against the tool with considerable force in order that the drill may operate efficiently. This is particularly true of percussive tools which are designed to be held with great pressure against the work. Operators are apt to be careless about pressing down hard on such tools with the result that the machine does not produce the desired results. It has been proposed heretofore to construct such tools so that they stop operating unless the operator bears down on the tool. This has been accomplished by constructing the cylinder so that the hammer piston reciprocating therein will overrun the air admission port at the forward end of the cylinder unless sufficient weight is applied at the handle end of the tool to keep the steel or anvil block shoved well up into the path of the piston. In this case the hammer piston stops, being beyond the admission port so as to close it off. This arrangement is not always effectual for the reason that compression forms on the forward blow of the hammer and causes it to bounce back and re-open the admission port with the result that the machine continues to operate.

It is an object of this invention to relieve such compression and leakage of live air in the front end of the cylinder thereby preventing the hammer piston from returning when insufficient pressure is applied to the handle end of the drill.

Other objects and advantages will be in part obvious and in part pointed out hereinafter.

In the drawing in which similar reference characters refer to similar parts,

Figure 1 is a longitudinal sectional view of a rock drill adapted to break concrete and shows the hammer piston in position covering the admission port at the front end to prevent operation of the tool,

Figure 2 is a longitudinal section of the rock drill shown in Figure 1 in which the drill is shown pushed forward so that the piston cannot advance to cover the admission port, and

Figure 3 is a cross sectional view taken along the line 3—3.

The drawing illustrates a drill in the form of a concrete breaker which is provided with a sharp pointed steel A for splitting off concrete in chunks and is a substitute for the old fashioned method of using a hand hammer and chisel. The drill for operating against the steel A may be of any suitable type, that shown in the drawing being of the well known semi-valveless type.

The drill comprises a cylinder B within which there is provided a reciprocating piston C adapted to strike against an anvil block D supported in the anvil block seat E and in contact with the drill steel A supported by a front head F. The anvil block D is arranged to move forwardly or back in the seat E so as to provide a certain freedom of movement desirable to permit the steel A to move forwardly and back with respect to the cylinder B.

As these tools have usually been constructed, it is necessary to press with considerable force on a handle G provided at the rear end of the drill in order to keep the anvil block D pushed well up into the cylinder B, for if the anvil block D is permitted to slide forwardly while the piston C is reciprocating, the latter will either strike against the anvil block seat E or will strike the anvil block when it is in contact with the front head F as shown in Figure 1 and the force of the hammer blows is taken up by the drill structure instead of the drill steel A. Ordinarily, the drill is not designed to withstand shocks of this sort and after a short time the drill is ruined. It has heretofore been proposed to avoid this difficulty by locating the admission port H so that the piston C overruns it and cuts off the supply of motive fluid to the front end of the cylinder B when the anvil block D is permitted to advance in the seat E beyond a certain limit. The piston C is then supposed to stop operating although the throttle valve J may still be opened because substantially no motive fluid is admitted in the cylinder B ahead of the piston C to drive it back.

One difficulty with this arrangement as

heretofore proposed is that when the piston is exposed to atmospheric pressure on its rearward face and to compression on its forward face, the piston bounces back and continues to operate. In addition to these unbalanced forces, a little wear on the piston C or the walls of the cylinder B permits leakage of live air through the port H along the piston to both its front and rear faces. Air thus leaking in unbalances the piston C for the reason that the space behind the piston is in communication with atmosphere while the space ahead of the piston is not. Practically full live air pressure slowly builds up at the front of the piston C which eventually drives the piston back to uncover the port H and therefore to recommence its reciprocation. If the drill is comparatively new the same result obtains for the reason that the compression pressure is relatively high ahead of the piston because of the tight fit between it and the cylinder B. The piston C bounces back and reopens the admission port H. This condition is probably worse than when the drill is old and the cylinder walls and piston become somewhat worn because the reciprocation due to high compression is much more rapid.

By this invention the return of the piston C after passing the port H and closing it off is prevented by means to eliminate compression at this point, including longitudinal grooves K in the cylinder walls, extending from the forward end of the cylinder B beyond the inlet port H, which are arranged to connect the spaces on opposite sides of the piston only when the piston is permitted to advance to cover the inlet port H. The grooves K extend from the extreme end of the cylinder B to a point located at the rear end of the head of the piston C when the front edge of the piston is just covering the port H. Therefore, when the drill is operating normally, the grooves K are inoperative, they do not relieve the compression at the front end of the cylinder nor do they in any way effect the operation of the tool. However, when the pressure on the handle G is insufficient to hold the drill properly down against the steel A the anvil block D advances permitting the piston C to lengthen its stroke beyond the port H, and therefore, to cease operating, the compression ahead of the piston being relieved by leaking out through the grooves K to atmosphere through the main air exhaust L. Nor can the piston C be caused to start again by air leaking down past the piston from the port H because such leakage air also finds its way to atmosphere by way of the grooves K.

During normal operation the piston C advances no farther than approximately half way covering the port H as shown in Figure 2 and the anvil block D is seated in the anvil block seat E. However, as the pressure is relieved on the handle G the anvil block D is pushed forwardly with respect to the seat E and the return of the piston C on the back stroke is feebler since the admission of live air through the port H is somewhat cut off.

Although the main object of stopping the operation of the piston C as above described is to prevent the piston from breaking the front parts of the drill, in addition, the arrangement insures that the operator will press sufficiently hard against the handle G of the tool to keep the steel A pressed hard against the work, and therefore, to prevent careless operation on the part of the operator. Poor operators are apt to allow their tools to keep on operating with the least possible exertion on their part with the result that very little work is done by the tool. With the above described arrangement as soon as the operator relaxes the tool stops operating automatically.

Any suitable piston and valve action may be employed for the drill. That shown in the drawing is of the semi-valveless type in which the piston C is provided with the rearward extension O working in a small bore P of the cylinder B and subjected to constant pressure admitted through the passage Q in the back head R. The control of the air for operating the piston is well known, having been described in patent to L. C. Bayles, No. 1,096,987, issued May 19, 1914.

The throttle valve J is controlled by means of a lever S arranged to press against the stem of the valve J and adapted to be manually controlled by a lever T working in a slot U in the handle G. The steel A is held within the front head F by means of a suitable steel retainer V cooperating with the usual form of collar W upset on the shank of the steel.

I claim:

1. A rock drill comprising a cylinder having inlet and exhaust ports, an anvil block normally adapted to extend a substantial distance into said cylinder, a hammer piston in the cylinder for delivering blows to the anvil block and adapted to close the inlet port when the anvil block is moved forwardly from its normal position, said cylinder being provided with grooves to by-pass leakage air from the front end of the cylinder to atmosphere when the inlet port is closed by the piston in order to prevent the piston from rebounding upon the completion of its forward stroke due to an air cushion built up in the forward end of the cylinder.

2. A rock drill comprising a cylinder having inlet and exhaust ports, an anvil block normally adapted to extend a substantial distance into said cylinder, a hammer pis-

ton in the cylinder for delivering blows to the anvil block and adapted to close the inlet port when the anvil is moved forwardly from its normal position, said cylinder having longitudinal grooves on opposite sides of the inlet port to permit the escape of leakage air from the front end of the cylinder to atmosphere when the anvil block is moved forwardly and the port is covered by the piston in order to prevent the piston from rebounding upon the completion of its forward stroke due to an air cushion built up in the forward end of the cylinder.

In testimony whereof I have signed this specification.

LEWIS C. BAYLES.