

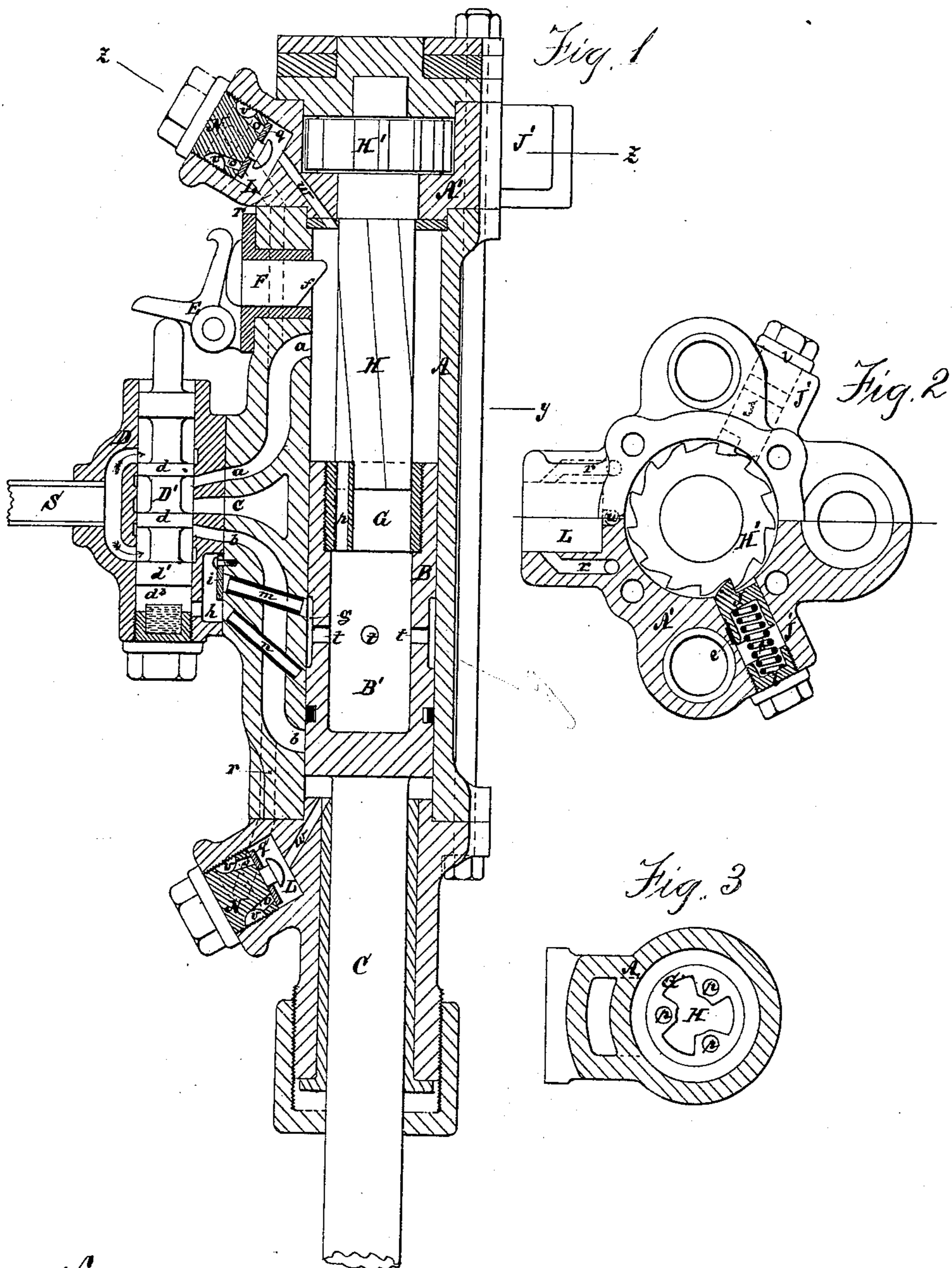
(No Model.)

J. F. ALLEN.

ROCK DRILL.

No. 252,920.

Patented Jan. 31, 1882.



Witnesses.

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ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 252,920, dated January 31, 1882.

Application filed June 11, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. ALLEN, of New York, in the State of New York, have invented a new and useful Improvement in Rock-Drills; and I do hereby declare the following to be a full, clear, and exact description thereof.

In the accompanying drawings, Figure 1 represents a vertical section of my improved rock-drill. Fig. 2 represents, one half a top view of the same and the lower half a horizontal section at line $z z$ of Fig. 1. Fig. 3 is a horizontal section at line $y y$ of Fig. 1.

Similar letters represent similar parts in all the figures.

My invention relates to that class of direct-acting engines, operated either by air or steam, where the drill is operated direct from the piston moving in the cylinder.

My invention consists in a peculiar arrangement of valves and ports, whereby the piston is cushioned to allow a high speed without striking the ends of the cylinder, and for making the pressure more effective at the upper end of the piston, and that the drill may strike a dead blow before the pressure acting upon the piston is reversed.

A is the cylinder in which the piston B works.

C is the piston-rod, to the end of which the drill is attached in any desired manner.

D is the valve-chest, either cast on or screwed to the cylinder, and in which a piston-valve, D' , works. This piston-valve D' is provided with four rings or pistons. The two central pistons, $d d$, are arranged in relation with the ports $a b$ and the exhaust-port c in the usual manner, and the lower piston, d' , works in a cylindrical chamber, d^3 , provided in the valve-chest D.

Above the valve D' a trigger, E, is arranged, acting upon the stem of the valve D' and in contact with a plug, F, passing into the cylinder A. This plug F is forced outward, so as to act upon the valve D' through the trigger E, either by the pressure compressed between the top of the piston and the cylinder-head or by the top edge of the piston B coming in contact with the projecting and inclined surface f of said plug F. By this arrangement the valve D' is moved downward as soon as the piston arrives near its top stroke, so as to allow the pressure of air or steam to enter the port a .

The chamber d^3 , below the lowest position of

the piston d' , is connected by a suitable opening with a chamber, h , in the valve-chest. This chamber h is connected by means of suitable pipes or passages, n and m , with the inside of the cylinder A. The end of the pipe m in the chamber h is closed by a self-acting valve, i . The piston B is provided with an annular recess, g , supplied with the working pressure, as will be hereinafter described. Supposing the valve D' in its lowest position, to allow the pressure to enter the port a to act upon the top of the piston B, moving the same downward, the recess g will, when the piston B has arrived near its bottom stroke, come opposite the end of the pipe m , thereby allowing the pressure to enter and pass through said pipe or passage m , force the valve i open, and enter through the chamber h into the chamber d^3 under the piston d' of the valve D' , thereby forcing said valve D' upward, so that the direct pressure can pass from the air or steam pipe S into the port b , as shown in Fig. 1. It will thus be seen that when the piston arrives near the upper end of its stroke the valve D' is moved through the action of the plug F and trigger E so as to admit the direct pressure into the upper port, a , and when the piston arrives near to its bottom stroke the valve D' is moved through the action of the pressure operating in the cylinder upward again to admit the direct pressure into the lower port, b . When the cylinder-piston B moves upward the pressure, acting upon said piston, will pass through the passage n into the chamber d^3 , and act likewise against the under side of the valve D' , thereby keeping the said valve in its desired upper position. Whenever the plug F is forced outward, either by the compressed vapor in top of cylinder or by the action of the piston B, and the valve D' is thereby forced downward, so as to change the position in such a manner that the pressure will be admitted upon the top of the piston B and the lower port of the cylinder will be opened to the exhaust, this pressure, previously acting against the bottom of the valve D' , will escape through the passage n into the cylinder, and through the same into the exhaust, while, when the acting pressure is again admitted to the under side of the piston B, this passage n will be closed by the surface of said piston.

The piston B is made hollow, with a cavity,

B', in the upper part of which a suitable nut, G, is fastened, in which a rod, H, provided with suitable inclined ribs and attached to the cover A' of the cylinder A, capable of turning, is made to work. The inclined or diagonal ribs on the rod H work in corresponding grooves in the nut G, and the upper end of the rod H is provided with a ratchet-wheel, H', into the teeth of which the cylindrical or plug pawls J J are made to work. During the downward stroke of the piston B the pawls J J will allow the rod H to turn in its bearings in the cover A', while in the upward stroke of said piston B the action of these pawls J J engage against the teeth of the ratchet-wheel H', holding the same, and consequently the rod H, stationary, whereby the piston B, and consequently the rod C, with the drill attached, is made to turn partly around a distance corresponding with the pitch or inclination of the diagonal ribs on the body of said rod H. The pawls J J are cylindrical plugs, fitting into suitable holes in the bosses J' J', cast on the cylinder-cover A', acted upon by suitable springs, s, retained in their position by screw-caps l, fitted into the ends of the bosses J' J'. A feather, e, prevents the cylindrical plug-pawls J from turning. There are two pawls, J J, arranged in such a manner in relation to the teeth in the ratchet-wheel that while one pawl has a firm gripe against one of the teeth the other pawl shall be half-way between one tooth and the next.

The advantage of cylindrical plug-pawls over the usual hinged pawls consists in their greater strength and solidity and in the simplicity and cheapness of manufacture, all of which are of the greatest consequence in machines subject to such violent jars as rock-drills. The rod H, being of necessity of considerable size to give the required strength, would reduce the effective area of the top of the piston if suitable provisions were not made to allow the pressure to have free access to the hollow part or cavity B'. In a certain measure this may be obtained by an easy fitting of the inclined and diagonal ribs of the rod H into the corresponding grooves of the sleeve or nut G; but this easy fitting of the diagonal ribs of the rod H into the grooves of the nut or sleeve G will cause the piston and drill rod to slide too freely upon the rod H without the certainty of turning the same during its downward motion.

To be able to make a good and tight fit of the diagonal ribs on the rod H in the grooves in the nut or sleeve G, to insure its proper working, and at the same time to give free ingress and egress of the acting pressure into and out of the cavity B' in the piston B, I arrange a number of holes, p p, through the solid part of the nut or sleeve G, through which the pressure of air or steam can enter into and escape from this cavity B'. Through suitable holes or passages, t, this pressure can enter then the annular cavity g, for the purpose above described. In the upward-and-downward motion of the piston B the edges of the same pass

the ports a and b each time, whereby the pressure still remaining in the cylinder between the end of the piston and the cylinder-heads will be compressed, forming a cushioning to prevent this piston striking the cylinder ends, and thus allowing a high speed to be given to the same. By this arrangement of allowing the ends of the piston to pass the ports a or b for the purpose described all passage of the direct pressure to the interior of the cylinder will be cut off when the piston is near its extreme top or bottom stroke. As above described, when the piston B arrives at its top stroke the valve D' is moved to admit the direct pressure into the port-passage a, and when the piston B arrives at its bottom stroke the position of the valve D' has been changed and moved so as to admit the direct pressure into the port-passage b. To allow this direct pressure to pass into the cylinder whenever required, even when the piston B closes the end of said passages, I arrange chambers L L, one at the upper and one at the lower end of the cylinder A. Into these chambers L L plugs N are fitted or screwed, provided with annular recesses v, from which passages o are made to the inner ends of said plugs, closed by a self-acting valve, q.

From the port-passages a and b passages r r are arranged, connecting with the annular recess or space v in the plugs N, and from the inner ends of the chambers L passages w are made to connect the interior of these chambers with the upper and lower ends of the cylinder, respectively. Whenever the piston B is in such a position as to close the port-passages a or b at the end of its stroke the air or steam pressure in the port-passages a or b enters the passages r r, passes into the recess v and through the passages o, lifting the self-acting valves q, and through the passage w into the cylinder A, either above or below the piston B, moving the same till it has passed the opening of the port-passage a or b, when the air or steam pressure will enter through said port-passage in the usual manner and act upon the piston.

Instead of arranging the holes or passages p through the solid part of the nut G, as above described, suitable passages may be arranged through the solid part of the piston B from its upper end and connecting with its cavity B'.

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

1. In a rock-drill provided with a ribbed or feathered rod, H, working in a corresponding nut, G, firmly attached to the piston B, the holes or passages p through the solid part of said nut or piston, in combination with the cavity B', substantially in the manner and for the purpose specified.

2. In a rock-drill provided with a piston or balance slide-valve, the combination of the passages p and t and recess g in the piston B and the passages m and n, connected with the lower part of the valve-chamber, arranged to operate substantially in the manner and for the purpose described.

3. In combination with the cylinder of a
rock-drill, the chambers L L, with plugs N N,
provided with annular recesses *v*, and with
passages *o*, closed by a self-acting valve, *q*,
5 and passages *r r* and *w*, communicating with
the regular port-passages *a* and *b* and with
the upper and lower end of the cylinder, re-

spectively, the whole being arranged to oper-
ate substantially in the manner and for the
purpose herein set forth and described.

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Witnesses:

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