No. 638,856. Patented Dec. 12, 1899.

G. S. ULLATHORNE & H. P. VACHER.

ROCK DRILL.

(Application filed Jan. 25, 1899.)

(No Model.)

Fig. 1.

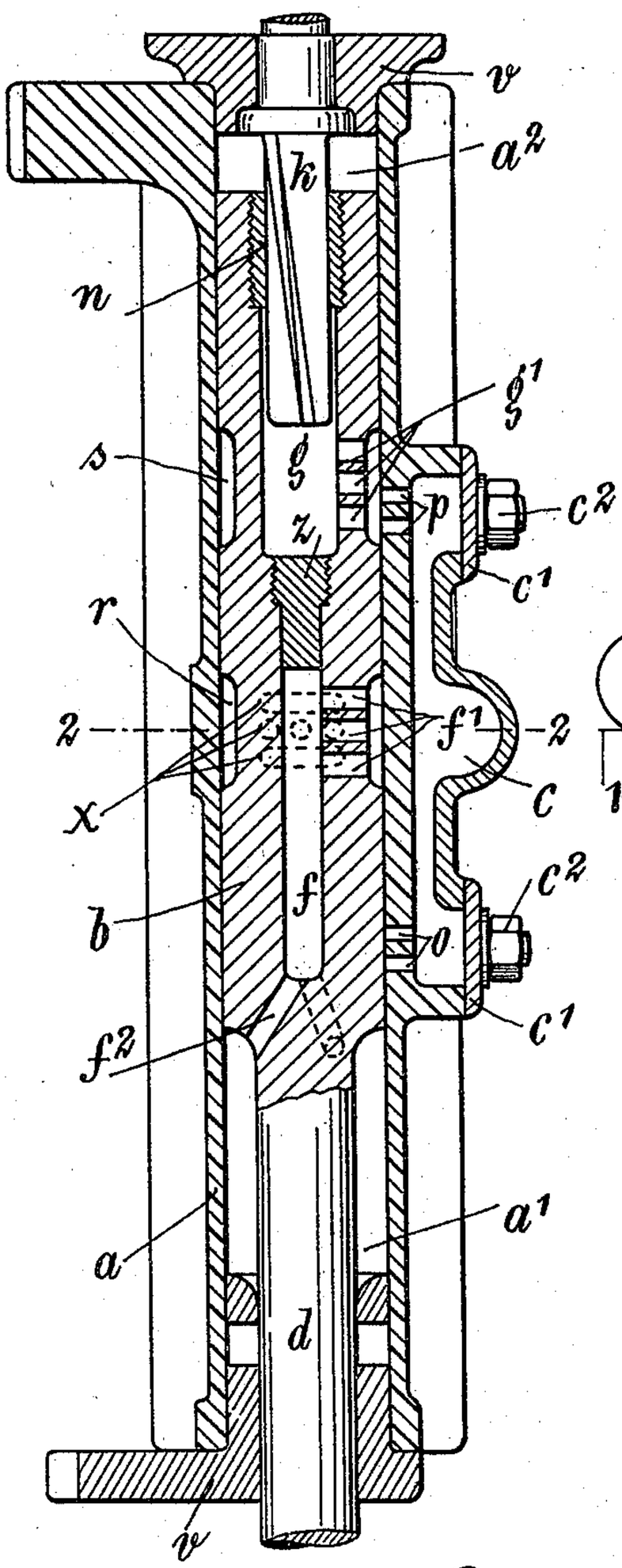
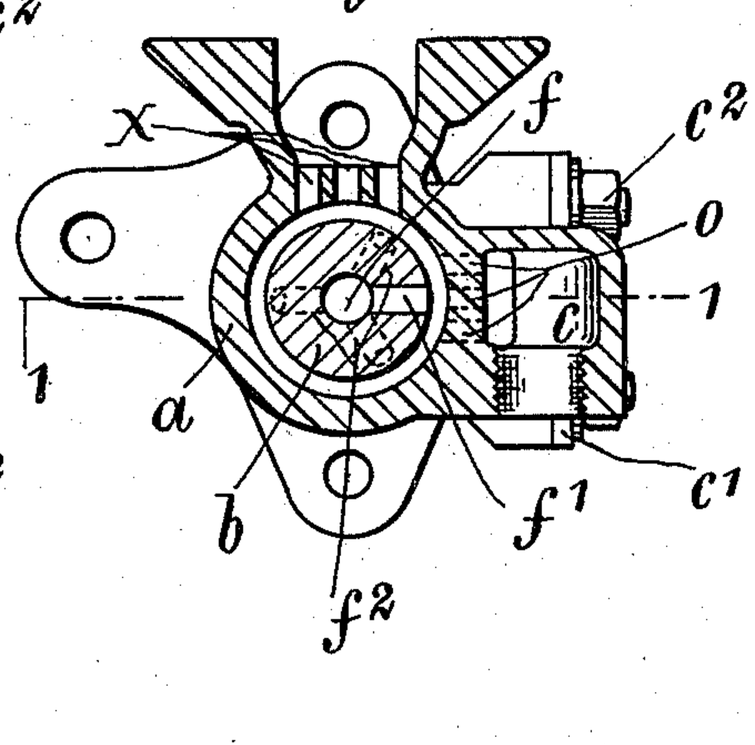


Fig. 2.



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UNITED STATES PATENT OFFICE.

GRANVILLE SHARP ULLATHORNE AND HERBERT PERKINS VACHER, OF LONDON, ENGLAND.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 638,856, dated December 12, 1899.

Application filed January 25, 1899. Serial No. 703,383. (No model.)

To all whom it may concern:

Be it known that we, GRANVILLE SHARP ULLATHORNE and HERBERT PERKINS VACHER, of the city of London, England, have invented certain new and useful Improvements in Rock-Drills, (for which we have obtained Letters Patent of Great Britain, dated October 10, 1898, No. 21,282,) of which the following is a full, clear, and exact specification, reference being had to the accompanying drawings, wherein—

Figure 1 is a longitudinal sectional view of our improved rock-drill on line 1 1, indicated in Fig. 2; and Fig. 2, a cross-sectional view on line 2 2, indicated in Fig. 1.

Our invention relates to machines for boring rock or other hard substances which are worked by steam, compressed air, or other motive fluid and in which the boring-tool is coupled or otherwise secured to the piston-rod of the machine; and it consists of the hereinafter-described construction of such drill, wherein the piston acts as a slide-valve opening and closing inlet and exhaust ports of the cylinder and also regulates the distribution of the motive fluid in the cylinder as required to effect its motion.

The drill consists of a working cylinder *a*, closed on both ends by suitably-shaped covers and provided with inlet-ports *o* and *p* and with exhaust-ports *x*, a chest *c* located on one side of the cylinder, approximately in the middle thereof, piston *b*, fitted in the cylinder, piston-rod *d*, integral with or rigidly secured to the piston, a cutter or bit rigidly coupled to the piston-rod *d*, and a device for imparting to the piston a partly rotary motion in its stroke, and which may be either such as the twisted or rifled stud *k*, engaging with the correspondingly-shaped sleeve *n*, as shown in the drawings, or some other equivalent device suitable for the purpose. Working cylinder *a* is of the usual shape employed for this purpose. Chest *c* is partly integral therewith and closed by covers *c'*, secured thereto by screws c^2. This chest *c* is connected to a boiler, air-compressor, or other source of expansive liquid and communicates with the interior of the cylinder through the ports *o* and *p*. Piston *b* fills about two-thirds of the length of the interior of the working cylinder and is provided with two annular recesses *r* and *s*, concentrical bores *f* and *g*, and ports *f'*, f^2, and *g'*. The annular recesses *r* and *s* are located correspondingly to the position of the inlet-ports *o* and *p* and of the exhaust-ports *x*. Ports *f'* and *g'* constitute passages between the spaces created by the annular recesses *r* and *s* of the piston and the bores *f* and *g*, respectively. Bore *g* opens toward the space a^2 between the rear end of the piston *b* and the cover *v* of the cylinder, whereas bore *f* communicates with the space *a'* in front of the piston. Plug *z* closes up bore *f* and divides it from bore *g*. Ports *o* and *p* are equidistant or approximately equidistant from exhaust-ports *x*, which are located between them, and the distance between the centers of the annular recesses *r* and *s* corresponds approximately to that between the exhaust-ports *x* and either of the ports *o* and *p*.

In the position shown in Fig. 1 the piston is at the end of its return stroke, and, as will be observed in the drawings, there is a small space a^2 left between the rear end of the piston and the cover *v*, which, as stated above, communicates with the bore *g* of the piston. In this position the annular recess *s* stands opposite the inlet-ports *p* and the annular recess *r* opposite the exhaust-ports *x*. The motive fluid flows then from chest *c*, through ports *p* and *g'*, into the bore *g* and space a^2 in the rear of the piston and exerts its pressure upon it and drives it forwardly, while the expanded motive fluid escapes from the space *a'* in front of the piston, through the passages f^2, into the bore *f*, and, through the passages *f'*, into the annular space formed by recess *r* and exhaust-ports *x*. As the piston advances on its forward stroke it closes ports *p*, but not until a sufficient quantity of the motive fluid has been admitted in the working cylinder to drive the piston for the full length of its stroke. At the end of its forward stroke the relative positions of the ports of the cylinder and of the piston are reversed. The annular recess *r* is then situated opposite the inlet-ports *o* and the motive fluid flows through these inlet-ports and passages *f'* into the bore *f* and through ports f^2 into the space *a'* in front of the piston, while the expanded fluid escapes from space a^2 through bore *g*, com-

municating through ports g' and the annular recess s with the exhaust-ports x of the cylinder. The motive fluid thus escapes from the space a^2, while a fresh charge is admitted, as explained above, into the space a' in front of the piston. This fresh charge drives the piston on its return stroke, and when the end of its stroke is reached the cyclus of action is repeated, as explained above.

Machines of this kind have to stand rough handling and almost incalculable concussions while working. It is therefore of great advantage if delicate parts, such as slides or valves generally, can be avoided in their construction.

It is not a question of economy or highest possible utilization of the motive fluid in their operation, but the most durable construction, and one that will withstand the greatest possible wear, which is the desideratum of the users of such machines.

It will be seen that in the above-described construction there are practically no parts that can in any manner be affected by jolting or concussions, and consequently that a drill of the construction described is practically indestructible and certainly not liable to be disabled by disarrangement of its parts. This is the most important merit of our invention.

We claim—

1. A rock-drill comprising a working cylinder closed on both ends by suitable covers and having inlet and exhaust ports located approximately equidistantly from each other, a chest inclosing the inlet-ports, a piston fitted in the working cylinder and provided with a concentrical bore and two annular recesses in positions approximately corresponding to the relative position of the inlet and exhaust ports of the cylinder, a plug set in the bore of the piston between the two annular recesses, passages connecting the bore of the piston with the annular recesses in the body of the piston and with the interior of the cylinder, one with that in front and the other with that in the rear of the piston, and a piston-rod journaled in one cover of the working cylinder.

2. The combination of the working cylinder a closed on both ends by suitably-shaped covers and provided with inlet-ports o and p and with exhaust-ports x, chest c, piston b, provided with the annular recesses r and s, concentrical bores f and g and ports f' and f^2 and g', piston-rod d and of means for imparting a partly-rotary reciprocating motion to the piston at each stroke.

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