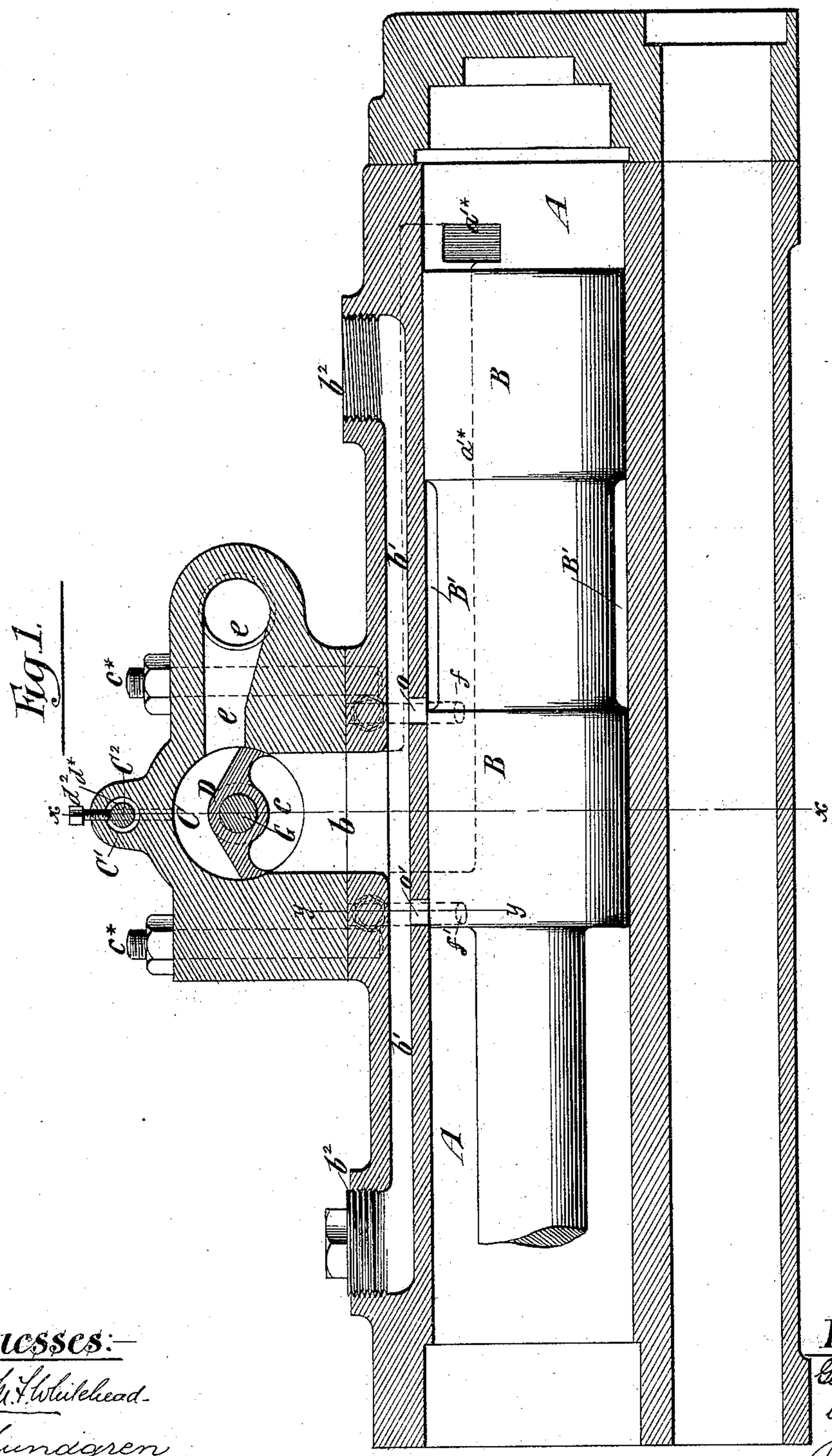
(No Model.) 3 Sheets—Sheet 1.

G. R. CULLINGWORTH.

VALVE FOR ROCK DRILLS.

No. 310,653. Patented Jan. 13, 1885.



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by his Attys.
Brown & Hall

(No Model.) G. R. CULLINGWORTH. 3 Sheets—Sheet 2.

VALVE FOR ROCK DRILLS.

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Fig. 3.

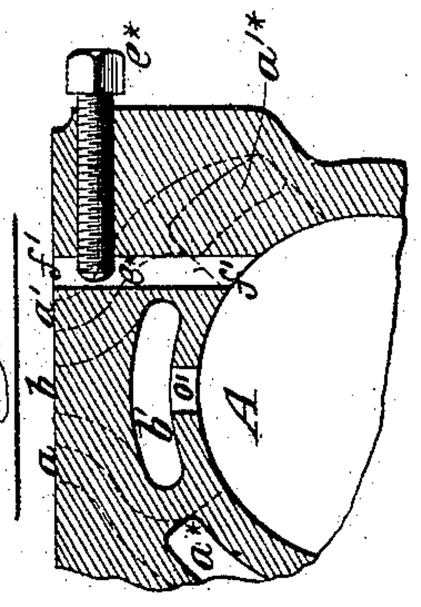

Fig. 2.

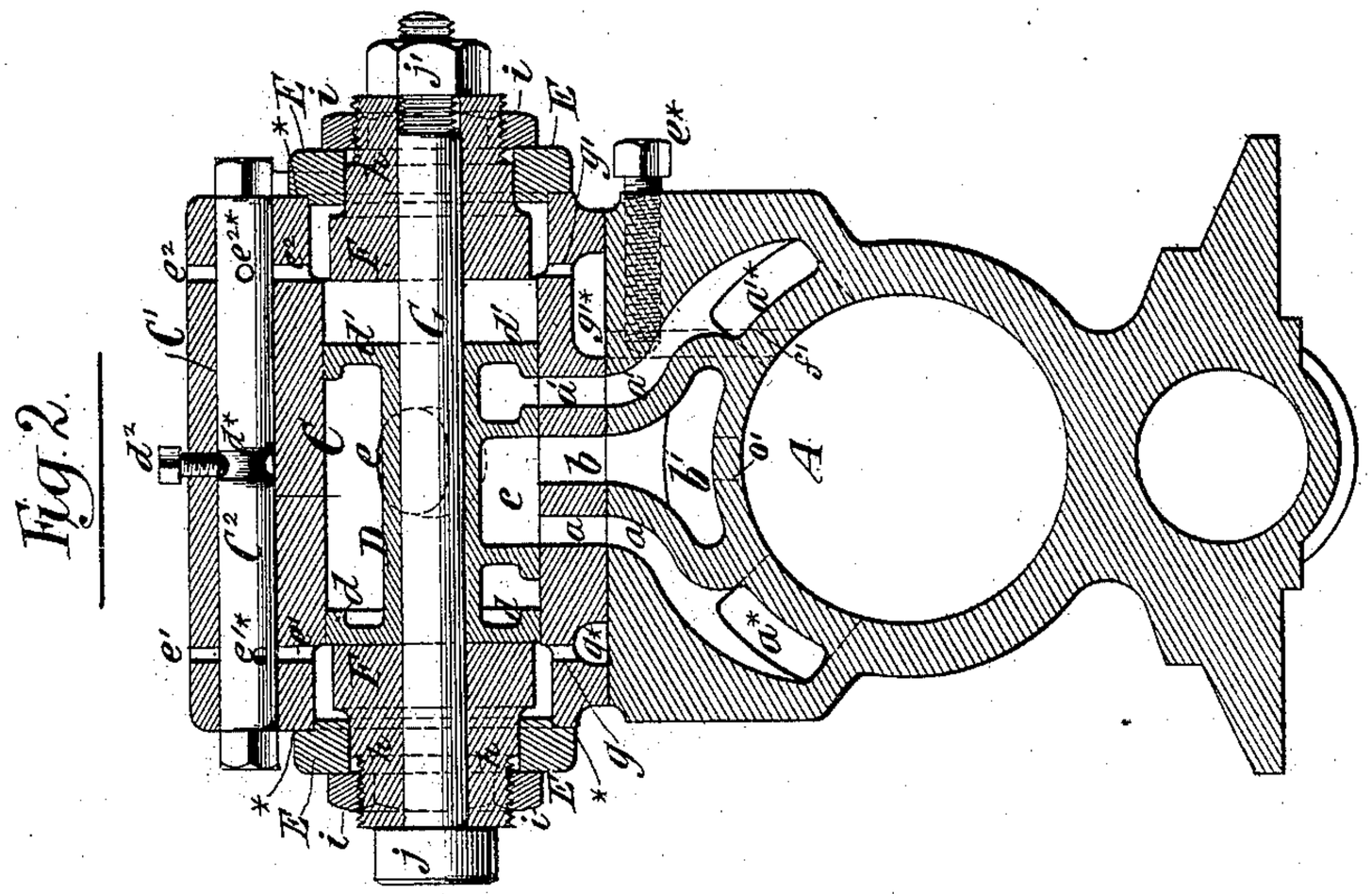

Fig. 1.

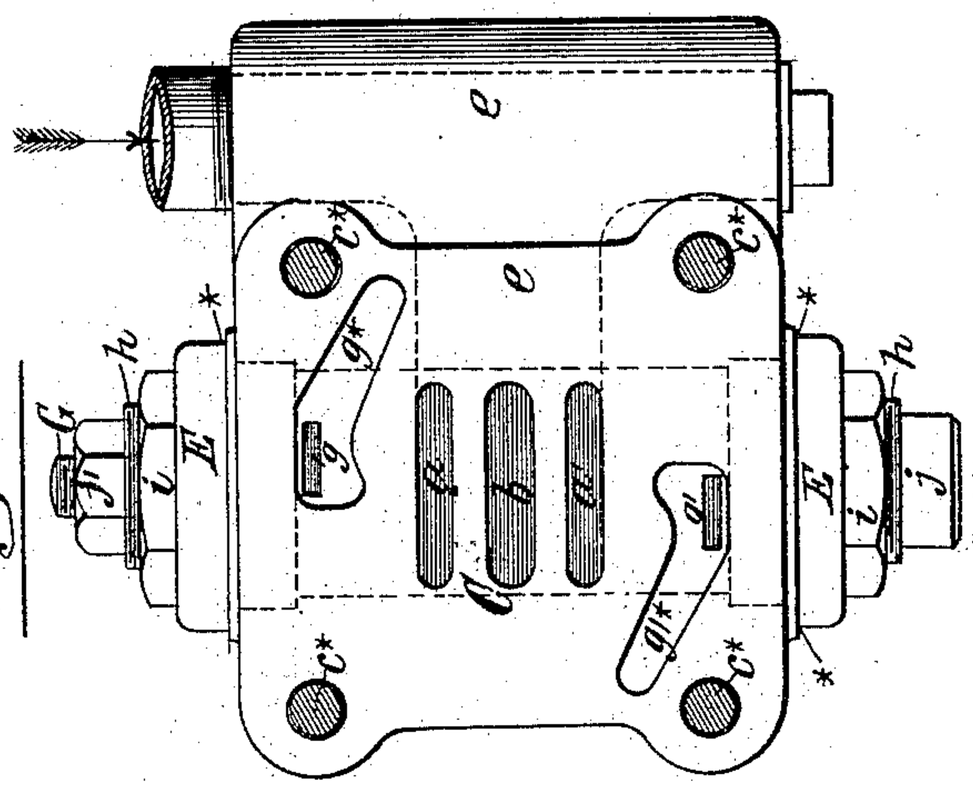

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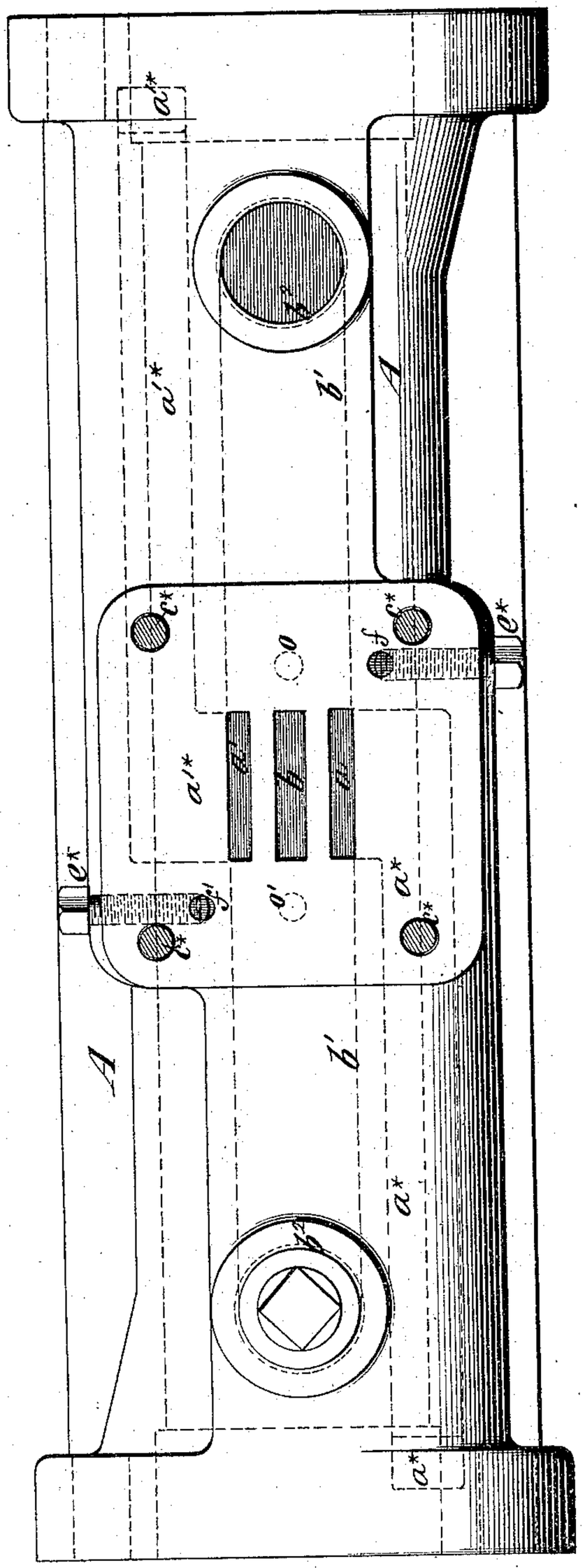
Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE R. CULLINGWORTH, OF NEW YORK, N. Y.

VALVE FOR ROCK-DRILLS.

SPECIFICATION forming part of Letters Patent No. 310,653, dated January 13, 1885.

Application filed July 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE R. CULLINGWORTH, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Valves for Rock-Drills, of which the following is a specification.

My invention relates to direct-acting valves, and more particularly to the valve shown and described in United States Letters Patent No. 202,060, granted April 6, 1878, to Henry C. Sergeant, for improvement in rock-drills. The general form of that valve is cylindric, and it is arranged to reciprocate in a cylindric valve-chest. At opposite ends the valve is provided with circular heads or flanges, and on the under side of the valve, between said heads or flanges, but isolated from them, is an exhaust cavity or cove, whereby the ports leading to opposite ends of the main cylinder are alternately placed in communication with an intermediate exhaust-port, and are alternately exposed or uncovered to admit the motive agent to the main cylinder. The supply-pipe for the motive agent leading to the valve-chest is arranged between the circular heads or flanges of the valve, and the movement of the valve is effected by placing the opposite ends of the valve-chest alternately in communication with the main exhaust, the reciprocating piston of the rock-drill serving to accomplish this purpose. The leakage of steam, air, or other motive agent past the circular heads or flanges of the valve will be sufficient to move the valve when a diminution of pressure on either end thereof is effected, by placing that end of the valve-chest in communication with the main exhaust.

In the operation of a drill of the kind above described it is never known where the valve is when the engine or drill is stopped. Sometimes the drill sticks and the piston stops at the middle of its stroke, the valve being somewhere intermediate between the ends of its stroke.

The object of one feature of the invention is to facilitate the starting of the drill under the circumstances above referred to, and this result I accomplish by providing ports leading from the ends of the valve-chest direct to the atmosphere, and cocks or valves for controlling these ports, capable of operation by hand. The opening of either hand valve or cock to place the end of the valve-chest in communication with the atmosphere has practically the same effect as placing that end of the valve-chest in communication with the exhaust, for the diminution of pressure on one side of the automatic valve permits the pressure on the other side of the valve to throw the valve over, and thereby effects the starting of the engine or drill, no matter at what point its valve has stopped.

Another feature of my invention consists in a novel combination of parts, hereinafter particularly described, and including valves or throttling devices, whereby the small ports or passages leading from the ends of the valve-chest to the cylinder, and which, by the operation of the main piston, are placed in alternate communication with the exhaust, may be throttled, so as to regulate the flow of motive fluid through them to cause a uniform operation of the valve under different pressures and other varying conditions of working.

Another feature of the invention consists in a novel construction and arrangement of adjustable buffers, whereby the length of movement allowed the main valve may be controlled and varied to suit the hardness of rock being worked and other varying conditions.

In the accompanying drawings, Figure 1 represents a longitudinal section of a portion of a rock-drill embodying my invention, the axis of the valve-chest being transverse to the axis of the cylinder, and only such parts being shown as are necessary to illustrate the invention. Fig. 2 is a transverse vertical section on the dotted line *x x*, Fig. 1, the piston being omitted. Fig. 3 is a similar section of certain parts on the dotted line *y y*, Fig. 1. Fig. 4 is a plan of the cylinder, the valve-chest and valve being removed, and Fig. 5 is an inverted plan of the valve-chest.

Similar letters of reference designate corresponding parts in all the figures.

A designates the main cylinder, and B the main piston of the drill. C designates the valve-chest, from which ports or passages *a a'* and communicating longitudinal passages *a** *a'** extend to opposite ends of the cylinder A; and *b* designates the main exhaust-port between the ports *a a'*. The exhaust-port *b* communicates directly with a longitudinal pas-

sage, b', formed in the cylinder A, and provided at opposite ends with screw-threaded apertures b^2, for the reception of the exhaust-hose. The exhaust-hose may be put into either aperture b^2, and the other plugged up. The general form of the valve D is cylindric, to fit the cylindric chest C, and the valve itself is of the construction shown and described in the aforesaid Letters Patent.

The valve consists of an exhaust cove or cavity, c, whereby the ports a a' are alternately placed in communication with the main exhaust-port b, as shown in the case of the port a in the drawings, and when the valve is so situated the other port, a', is open or uncovered, so that the steam, air, or other motive agent can pass from the chest C through the port a' and passage $a'*$ to the end of the main cylinder A. The axis and direction of movement of the valve D, as here shown, are transverse to the axis and direction of movement of the main piston. At opposite ends of the valve D, and isolated from the exhaust cove or cavity c, are circular heads or flanges d d', which fit the cylindric interior of the chest C, but are not packed; and hence the motive agent which is supplied to the chest C through an inlet-passage, e, entering the chest between the heads or flanges d d', can pass the heads or flanges to the ends of the chest C. The inlet-passage e extends from end to end of the chest C, and is open at both ends. The supply-pipe may be inserted in either end thereof and the other end plugged.

In the cylinder are formed small ports f f', leading from the port-face of the cylinder, as shown in Fig. 4, and communicating with the interior of the main cylinder A.

Beyond the ports a a' in the valve-chest C are small ports g g', leading to opposite ends of the chest, and in the port-face of the chest are channels or passages $g*$ $g'*$, which are shown in Fig. 5, and which, when the chest is secured on the cylinder by bolts $c*$, establish uninterrupted communication between the ports f g, and also between the ports f' g'.

In the cylinder are formed passages or apertures o o', which lead directly from the interior of the cylinder into the exhaust-passage b'. The passages o o' are shown dotted in Fig. 4 and in full view in Fig. 1.

In the piston B is a portion, of reduced diameter, forming an annular cavity, B', and it will be readily understood that when this annular cavity comes opposite the ports f o or f' o' it places the port f or f' in direct communication with the exhaust-passage b' through the passage o or o'.

In the drawings the piston B is shown at the right-hand end of its movement, and the cavity B' having placed the port f in communication with the passage o, the motive agent at the left hand of the valve in Fig. 2 has passed through the port g, channel $g*$, port f, cavity B', and passage o direct to the exhaust-passage b', and the motive agent at the right of the valve has thrown it toward the left hand, and by so doing has placed the main port a in communication with the exhaust-port b, and has uncovered or opened the main port a'. This is the position of parts shown in Figs. 1 and 2, and by the motive agent admitted to the port a' (the port a being open to the exhaust) the main piston is moved toward the left hand.

At or near the termination of the movement of the main piston B toward the left hand the annular cavity B' will place the ports or passages f' o' in communication, and the motive agent on the right of the head or flange d' will pass from the chest C through the port g', channel $g'*$, port f', cavity B', and passage o' to the exhaust b'. The diminution of pressure thus produced on the right of the valve D will cause the pressure on the left to force the valve over, thereby placing the port a' in communication with exhaust-port b, and uncovering the port a, whereupon the operation will be repeated. I make no claim to the construction of the valve or arrangement of the ports so far as above described.

In the operation of the machine the drill will sometimes stick, and when stopped the position of the valve is always a matter of uncertainty.

In order to facilitate the starting of the drill, I form near or at the ends of the valve-chest small ports, which communicate directly with the atmosphere, and are controlled by valves or cocks to be operated by hand.

In Figs. 1 and 2 I have shown the valve-chest as formed with a cylindric bore or plug-seat, C', parallel with the bore of the chest. In this seat is fitted a plug, C^2, which has a square at each end to provide for turning it, and is held against longitudinal movement by a set-screw, d^2, entering a circumferential groove, $d*$. In said plug-seat C', close to opposite ends of the chest C, are passages or ports e' e^2, which lead to the atmosphere and are controlled by the plug C^2, which has ports $e'*$ $e^{2}*$ through it. The plug in reality constitutes two valves, and by turning it one or other end of the valve-chest will be placed in communication with the atmosphere, and the diminution of pressure thus produced will cause the valve to be thrown over and the machine to start, as is the case when one or other end of the chest is placed by the moving piston in communication with the exhaust-passage b'.

One means for controlling or throttling the ports or passages f f', leading to the cylinder interior from the port-face, is shown in Figs. 1, 2, and 3. As there shown, a screw, $e*$, is inserted transversely to the length of the passage, and constitutes a controlling-valve, it being adjustable to more or less close the passage, and thus vary the rapidity with which the fluid escapes from the end of the chest.

Valves or throttling devices of other construction may be used for a like purpose.

The particular construction of the buffers, which form another feature of my invention, is shown in Fig. 2.

Each head E of the chest C consists of a ring, forming a ground joint with the chest at *, to prevent leakage.

Each abutment F consists of a cylindric plug or piece capable of entering the working-bore of the chest, and having an outwardly-projecting cylindric shank or stem, *h*, which passes snugly through a hole in the head E, and has screwed upon it, outside said head, a nut, *i*, which bears against said head.

G designates a bolt, having at one end a head, *j*, and at the other end a nut or nuts, *j'*. This bolt passes centrally or axially through the valve D and the stems or shanks *h* of the abutment F, and its head and nut bear against the outer ends of said stems or shanks, as shown in Fig. 2. This bolt forms a guide to the valve and holds the heads in place.

When it is required to reduce the throw of the valve in either direction or both directions, the nuts *i* are, one or both of them, slackened, to allow the one or both abutments to project more inward from the head or heads, and the nut or nuts of the bolt G are then tightened to bind all the parts together. When the throw of the valve is to be increased, the reverse operation is performed.

My invention is applicable to machines in which the axis of the main cylinder and valve-chest are parallel, as in the patent to Sergeant hereinabove referred to.

I do not claim, broadly, as of my invention a cylinder and valve-chest for a rock-drill connected by ports or passages which are controlled by valves or throttling devices.

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

1. In a rock-drill, the combination of a direct-acting valve, a main cylinder and piston, and a valve-chest, the cylinder and chest being provided with passages communicating with the exhaust and controlled by the main piston, whereby provision is afforded for operating the valve by a diminution of pressure on opposite ends of the valve alternately, and valves capable of operation by hand to place one or other end of the valve-chest in direct communication with the atmosphere, substantially as and for the purpose herein described.

2. The combination, with the valve-chest C, containing the longitudinal bore C', and passages e' e^2, leading from opposite ends of the chest to the atmosphere, of the valve D, having the exhaust-cove *c* and heads *d* *d'*, and the plug C^2, having ports $e'*$ e^2*, and controlling the ports e' e^2, substantially as herein described.

3. The combination of the main cylinder A and chest C, constructed with the main supply and exhaust ports *a* *a'* *b*, the passages *f* *f'* between the cylinder and chest, and the passages *o* *o'* between the cylinder and the main exhaust, and ranging with the passages *f* *f'* in a direction transverse to the cylinder, valves or throttling devices *e**, controlling the passages *f* *f'*, the main valve D, with its heads *d* *d'*, and the main piston B, having the portion B' of reduced diameter, all substantially as herein described.

4. The combination, with the valve-chest and direct-acting valve of a rock-drill, of heads E, abutments F, provided with shank or stems *h* and nuts *i*, and the tie-bolt G, all substantially as herein described.

G. R. CULLINGWORTH.

Witnesses:
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EMIL SCHWARTZ.