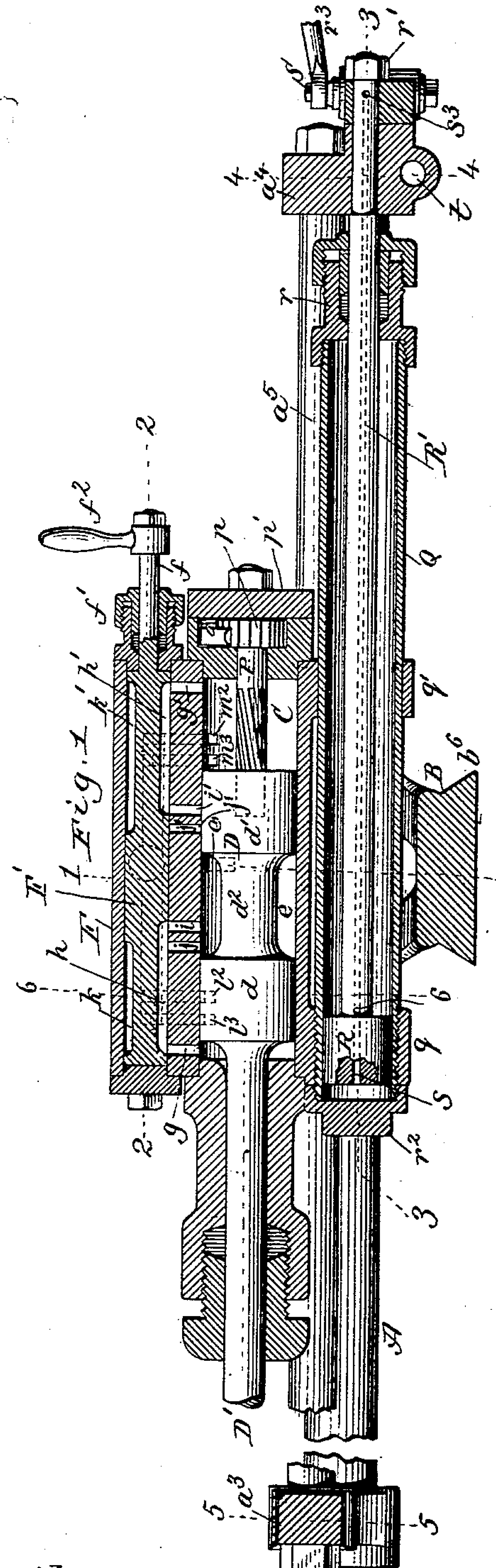
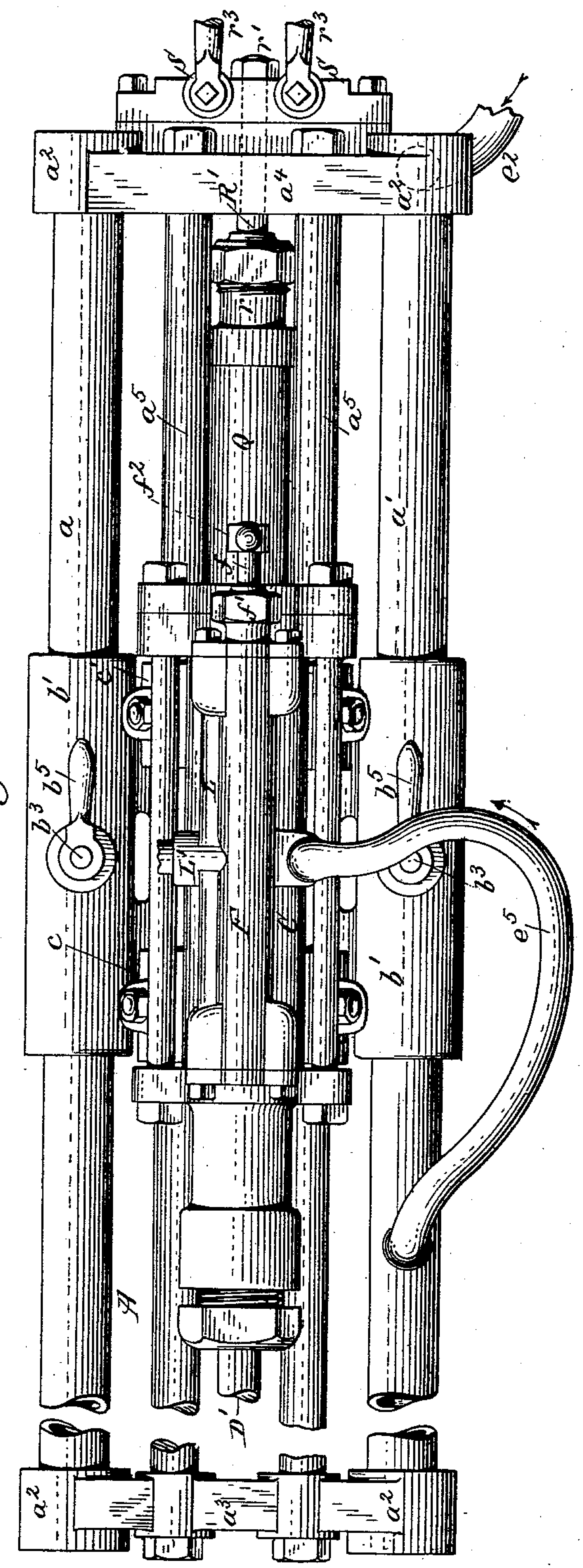
(No Model.) 3 Sheets—Sheet 1.

U. CUMMINGS.

ROCK DRILL.

No. 432,794. Patented July 22, 1890.





Witnesses:
Chas. J. Buchheit.
Emil J. Neuhart.

Inventor:
U. Cummings
By Wilhelm Bonner. Attorneys.

(No Model.) 3 Sheets—Sheet 2.

U. CUMMINGS.

ROCK DRILL.

No. 432,794. Patented July 22, 1890.

Fig. 3.

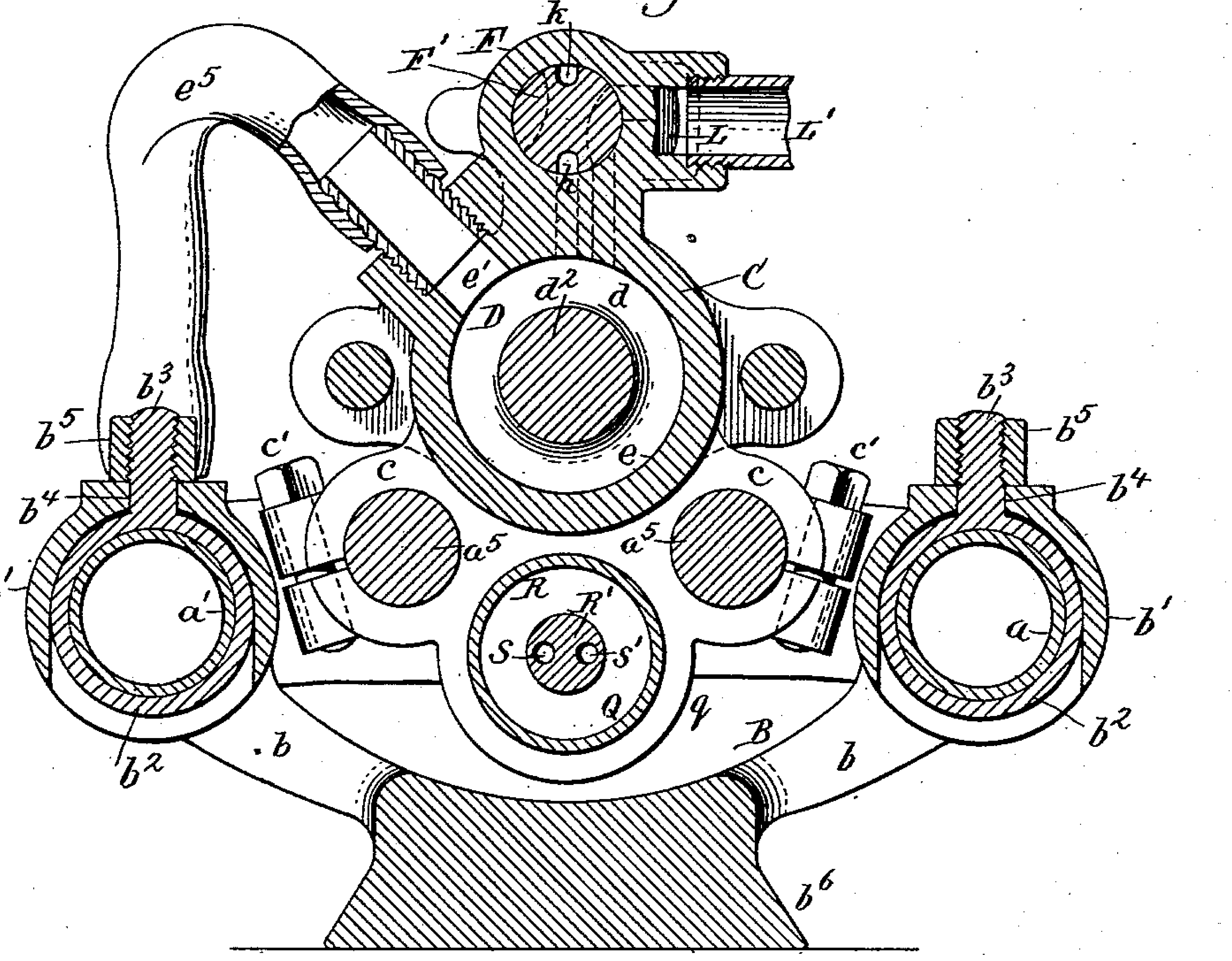


Fig. 4.

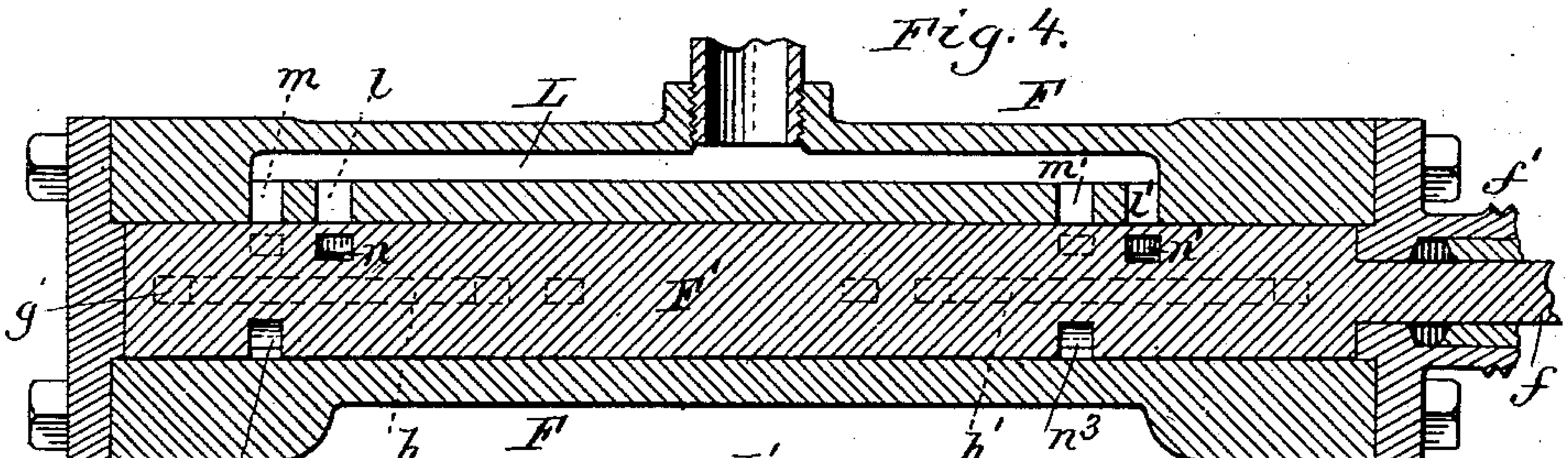


Fig. 5.

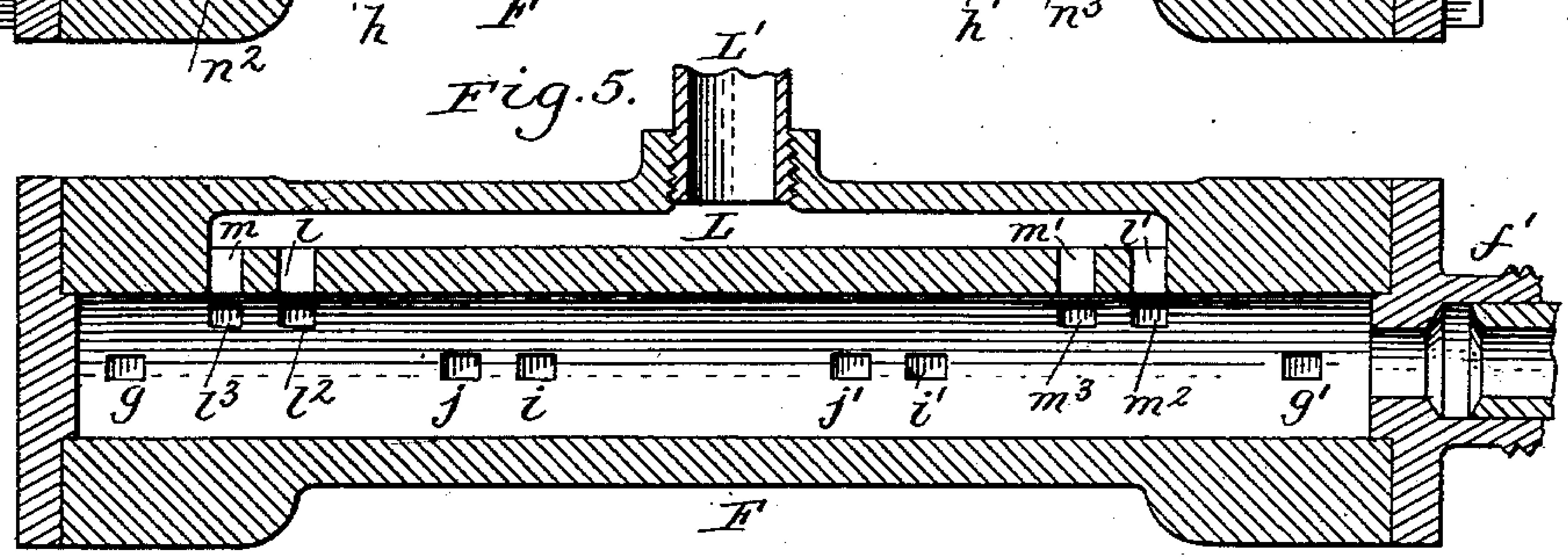
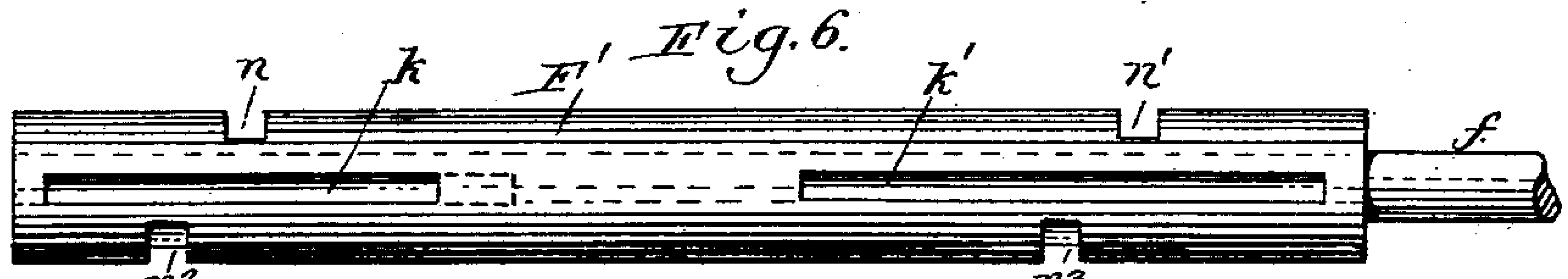


Fig. 6.



Witnesses: Chas. J. Buchheit. Emil J. Neuhart.

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(No Model.) 3 Sheets—Sheet 3.

U. CUMMINGS.

ROCK DRILL.

No. 432,794. Patented July 22, 1890.

Fig. 7.

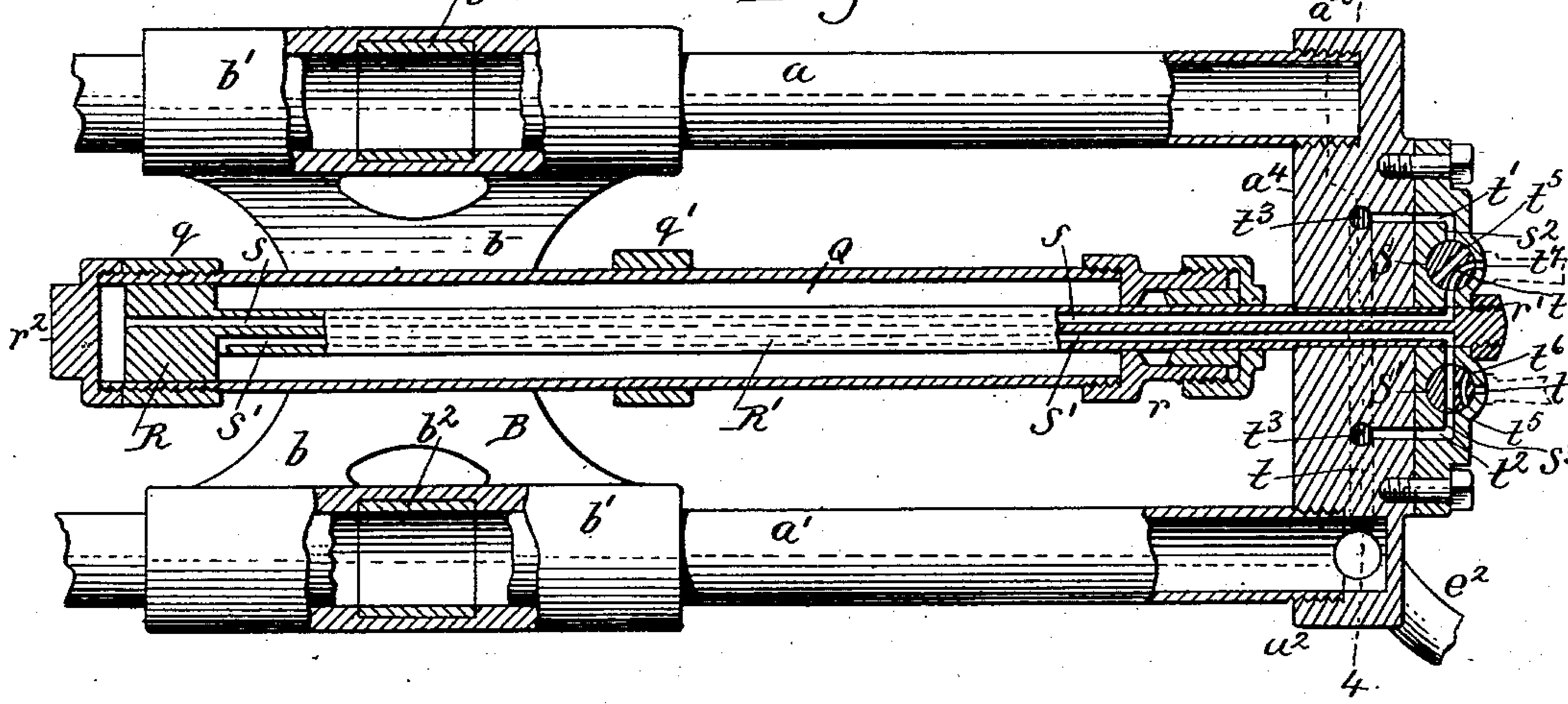


Fig. 8.

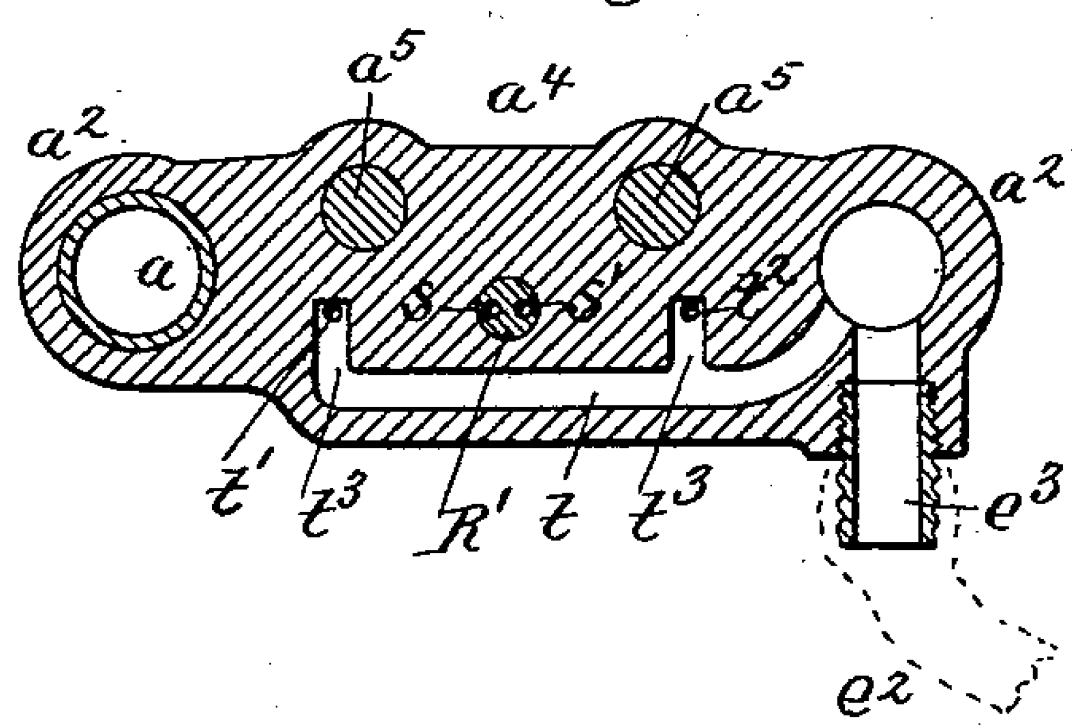


Fig. 9.

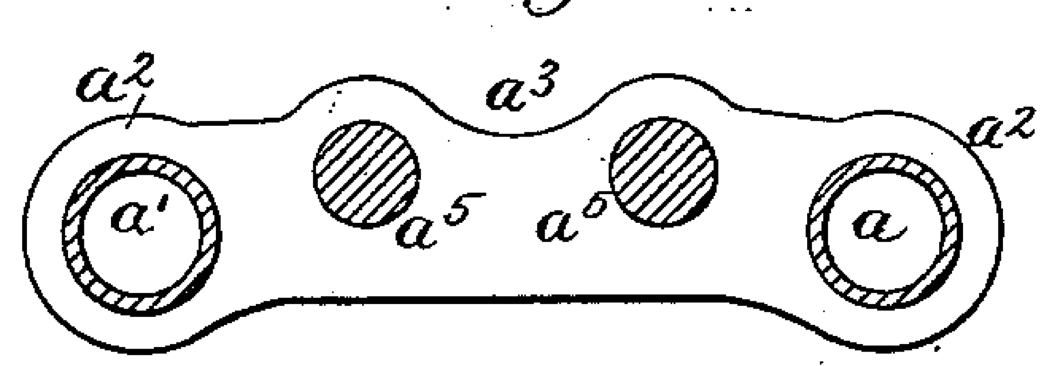


Fig. 10.

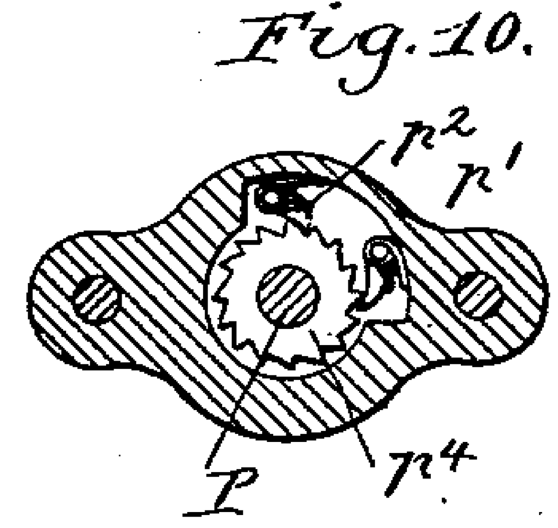
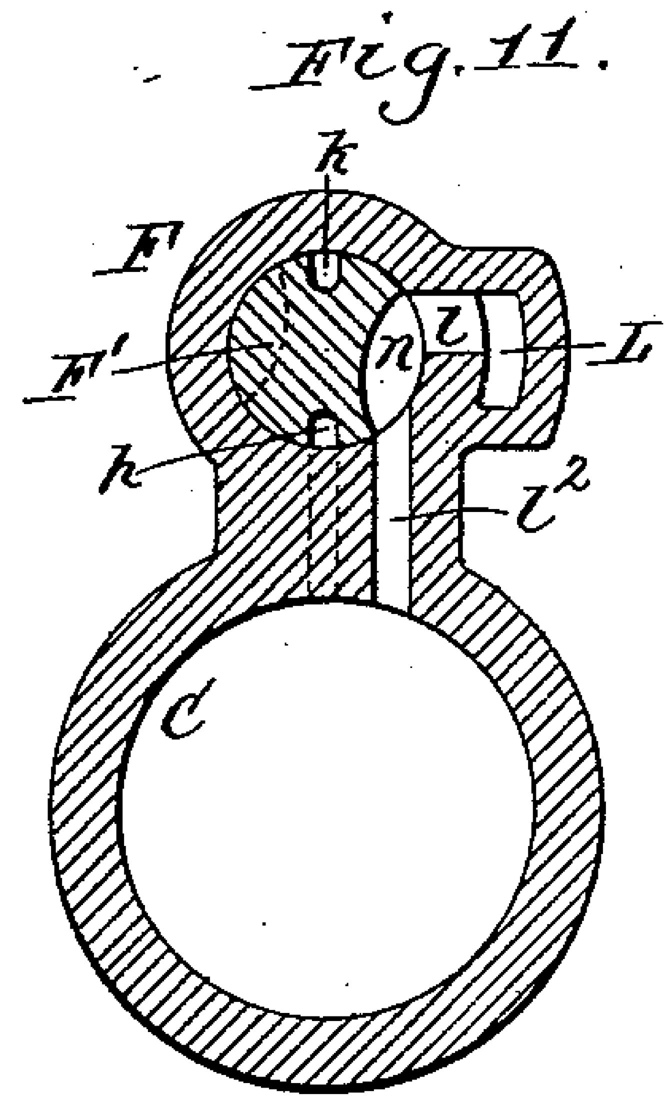


Fig. 11.



Witnesses:
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U. Cummings
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By Wilhelm & Bonner
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UNITED STATES PATENT OFFICE.

URIAH CUMMINGS, OF NEW HAVEN, CONNECTICUT.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 432,794, dated July 22, 1890.

Application filed March 11, 1890. Serial No. 343,485. (No model.)

To all whom it may concern:

Be it known that I, URIAH CUMMINGS, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented new and useful Improvements in Rock-Drills, of which the following is a specification.

My invention relates to that class of rock-drilling machines which are provided with a reciprocating piston to the rod of which the drilling-tool is attached.

The objects of my invention are to provide a simple valve mechanism whereby the point of cut-off can be changed so as to increase or reduce the length of the piston-stroke; also, to provide a light and simple drill-supporting frame which can be readily adjusted; also, to provide a simple feed mechanism whereby the cylinder of the drill-actuating piston is automatically fed forward, while it can be readily returned; also, to provide several other novel features of construction, as will be hereinafter fully set forth, and pointed out in the claims.

In the accompanying drawings, consisting of three sheets, Figure 1 is a fragmentary longitudinal sectional elevation of my improved rock-drill. Fig. 2 is a fragmentary top plan view thereof. Fig. 3 is a cross-section in line 1 1, Fig. 1, on an enlarged scale. Fig. 4 is a horizontal section of the valve-casing and valve mechanism in line 2 2, Fig. 1, on an enlarged scale. Fig. 5 is a similar view of the valve-casing with the valve removed. Fig. 6 is a plan view of the valve detached. Fig. 7 is a horizontal section of the drill-feed mechanism and connecting parts in line 3 3, Fig. 1. Fig. 8 is a transverse section in line 4 4, Figs. 1 and 7. Fig. 9 is a similar view in line 5 5, Fig. 1. Fig. 10 is a cross-section of the ratchet mechanism whereby the drill-bar and piston are rotated. Fig. 11 is a cross-section in line 6 6, Fig. 1, on an enlarged scale.

Like letters of reference refer to like parts in the several figures.

A represents the longitudinally-adjustable frame, which is mounted in a yoke or saddle B, so that it can be adjusted toward and from the work. The adjustable frame A is composed of two parallel side tubes or hollow bars a a', secured with their threaded ends in screw-sockets a^2, formed on opposite sides of front and rear cross-bars a^3 a^4, respectively, and two parallel intermediate guide rods or bars a^5 a^5, secured with their ends to the cross-bars a^3 a^4 between the side tubes a a'.

The yoke B is provided with arched or outwardly and upwardly curved arms b, which terminate at their upper ends in longitudinal sleeves b', through which the tubes a a' pass, and in which they are movably secured by clamping-rings b^2, as clearly represented in Fig. 3. These clamping-rings are arranged in pockets or openings formed in the sleeves midway of their length and opening downwardly. These rings surround the tubes a a' and are provided with upwardly-projecting screw-stems b^3. The latter pass through openings b^4, formed in the sleeves, and are provided with clamping-nuts or screw-threaded levers b^5, whereby the rings b^2 are caused to tightly draw the tubes against the upper portions of the sleeves, and thereby secure the drill-frame against lengthwise displacement on the saddle. This construction permits a considerable range of adjustment of the frame on the saddle toward and from the work by simply loosening the clamping-rings and shifting the drill-frame and without shifting the position of the tripod or supporting-frame of the machine, whereby a great saving of time is effected, especially when the drill is used in tunneling and similar work. The saddle B is provided at its lower central portion with a circular or beveled base b^6, whereby it is secured to the tripod, column, or other support.

C represents the drill-cylinder, arranged lengthwise between the tubes a a', and movably supported upon the guide-rods a^5 a^5 by laterally-projecting lugs c, formed on opposite sides of the lower front and rear portions of the cylinder C. The lugs c are divided longitudinally at their outer ends, where they are provided with set-screws c', whereby they can be closed upon the guide-rods a^5 to take up wear.

D represents the piston arranged in the drill-cylinder C, and D′ the piston-rod, to the front end of which the drill bar or tool is attached in any well-known manner. The piston D consists of a front head d, a similar rear head d', and an intermediate reduced or connecting portion d^2. The space between the latter and the cylinder-wall forms an annular inlet space or chamber e for the compressed air or other motive fluid.

e' represents the inlet-opening arranged in one side of the cylinder C and communicating with the inlet-chamber e, as represented in dotted lines in Fig. 1 and full lines in Fig. 3.

e^2 represents the main compressed-air supply pipe or hose, attached by a nipple e^3 to the lower side of the socket a^2 of the rear cross-bar a^4, which communicates with the side tube a' of the frame A, as represented in Figs. 2, 7, and 8.

e^5 represents a short flexible pipe or hose attached with one end to the tube a' in front of the saddle B and with its opposite end to the inlet-opening e', whereby communication between the latter and the tube a' and main supply-pipe e^2 is established.

By connecting the main supply-hose with the tube a' of the frame A and the tube a' with the cylinder by the hose e^5 the cylinder is relieved of the weight of the main hose, whereby friction and wear on the parts and the power required to move the cylinder forward and backward is greatly reduced.

F represents the valve-chamber, arranged lengthwise of and above the drill-cylinder C and extending from end to end thereof.

F′ represents the rotary cylindrical valve, arranged snugly within the chamber F and having its valve-stem f, which projects outwardly through a gland or stuffing-box f', provided with a handle f^2, whereby the valve is turned or shifted.

$g\ g'$ represent radial induction-ports connecting the front and rear ends, respectively, of the cylinder C with the front and rear ends of the valve-chamber F, and $i\ i'$ and $j\ j'$ represent similar intermediate inlet-ports which connect the central portion of the cylinder C with the valve-chamber F. The inlet-ports $i'\ j'$ are adapted to communicate with the rear portion of the cylinder through the valve and the port g', and the ports i and j with the front portion of the cylinder through the valve and the front port g.

h represents a horizontal passage formed lengthwise on the front lower portion of the valve F′, and connecting the inlet-ports i and j with the front induction-port g. h' represents a similar passage formed on the lower portion of the valve F′, in rear of and in line with the passage h, and connecting the inlet-port i' with the rear induction-port g'. $k\ k'$ represent similar passages formed in the valve F′, diametrically opposite the passages $h\ h'$. The passage k is shorter than the passage h, and is adapted to connect the front ports g and j, and the passage k' is longer than the passage h', and is adapted to connect the rear ports j', i', and g' when the valve is turned, so that the passages $k\ k'$ register with their ports.

L represents a longitudinal exhaust-passage formed on one side of the valve-chamber F, and communicating at its front end with the valve-chamber by the transverse exhaust-ports l and m and at its rear end by similar ports $l'\ m'$, as represented in Figs. 4 and 5.

L′ represents the main exhaust-opening formed on one side of the exhaust-passage about midway of its length.

$l^2\ l^3$ represent vertical exhaust-passages connecting the forward end of the cylinder C with the valve-chamber F, and $m^2\ m^3$ represent similar passages connecting the rear end of the cylinder with the valve-chamber F.

$n\ n'$ represent curved exhaust-passages formed on one side of the center of the valve F′, opposite the transverse exhaust-ports $l\ l'$ and vertical passages $l^2\ m^2$, respectively, and which are adapted to establish a communication between the vertical exhaust-passages l^2 and m^2 and the transverse exhaust-ports $l\ l'$ when the valve F′ is in the position shown in the drawings.

$n^2\ n^3$ represent curved exhaust-passages formed on the opposite side of the valve F′, in advance of the passages $n\ n'$ and opposite the transverse exhaust-passages $m\ m'$ and vertical exhaust-passages $l^3\ m^3$, and which are adapted to place the vertical passages $l^3\ m^3$ in communication with their respective exhaust-ports $m\ m'$ when the valve F′ is turned or reversed.

As clearly shown in Fig. 5, the front exhaust-port m and vertical exhaust-passage l^3 are arranged in advance of the exhaust-port l and vertical exhaust-passage l^2 in the forward end of the valve-chamber, and the exhaust-port m' and vertical exhaust-passage m^3 are arranged in advance of the exhaust-port l' and vertical exhaust-passage m^2 in the rear portion of the valve-chamber. When the valve is in the position represented in Fig. 1, the exhaust-passages l^2 and m^2 communicate with the main exhaust-passage L by means of the curved valve-passages $n\ n'$, as represented in Fig. 11, and the inlet-chamber e' can be placed in communication with the front portion of the cylinder through the intermediate inlet-ports $i\ j$, passage h, and front induction-port g, and with the rear portion of the cylinder through the intermediate inlet-port i', passage h', and rear induction-port g'. When the piston is at the limit of its forward movement, ready to begin its return-stroke, as shown in Fig. 1, the rear exhaust-port m^2 is open, the inlet-port i' is closed by the rear head d' of the piston, the inlet-ports i and j, leading to the front end of the cylinder, are open and the front exhaust-passage l^2 is closed by the front head d of the piston. Compressed air will now pass from the inlet-chamber e to the front portion of the cylinder through the inlet-ports $i\ j$, passage h, and front induction-port g, and cause the piston to move backwardly. During the backward movement of the piston the intermediate inlet-ports $i\ j$ are closed by the front head d of the piston, and as soon as these ports have been closed the exhaust-passage l^2 is opened, and at the same time that the latter is opening the inlet-port i', leading to the rear portion of the cylinder, is also opened by the front portion of the rear head d' of the piston, so as to allow compressed air to enter back of the piston. The latter continues its backward movement by the momentum until the backward movement is arrested by cushioning against the increasing compressed air. When the piston is at the limit of its backward movement, as indicated in dotted lines in Fig. 1, the rear exhaust-passage m^2 is closed, the intermediate inlet-passage i', leading to the rear portion of the cylinder, is open, the intermediate inlet-ports i j, leading to the front portion of the cylinder, are closed, and the front exhaust-port l^2 is open. The compressed air back of the piston will now cause the latter to move forwardly. During this forward movement the intermediate inlet-port i' is closed by the rear head d' of the piston, and as soon as this port is closed the rear exhaust-passage m^2 is opened, and at the same time that the latter is opening the inlet-port i, leading to the front portion of the cylinder, is also opened by the front head d of the piston, so as to allow compressed air to pass to the front portion of the cylinder in front of the piston. The forward movement of the piston continues until it is arrested by cushioning against the incoming compressed air, when it is ready for the return-stroke.

When it is desired to shorten the stroke of the piston, so as to increase its speed and cause the drill to render quicker blows, as in starting a hole, the valve F′ is turned by the handle f^2 until the passages k k' register with the inlet-ports g j and j' i' g', respectively. This adjustment of the valve F′ causes the exhaust-passages l^2 and m^2 to be closed and the exhaust-passages l^3 and m^3 to be placed in communication with the respective exhaust-ports m m' and the exhaust-passage L by the valve-passages n^2 n^3, respectively, and the front inlet-port i to be closed and the rear inlet-port i' to remain open. In this position of the valve compressed air is admitted to the front portion of the cylinder through the front inlet-port j, passage k, and front induction-port g, and to the rear portion of the cylinder through the rear inlet-ports j' i', passage k', and rear induction-port g'. When the piston is in the position indicated in Fig. 1, ready to begin its backward movement, the inlet-port j is open, the front exhaust-port l^3 is closed, the rear inlet-ports j' and i' are closed, and the rear exhaust-port m^3 is open It will now be apparent that the piston D will move backwardly only one-half the distance before its front head d will close the front inlet-port j and open the front exhaust-port l^3, and its rear head d' open the rear inlet-ports j' i' and close the rear exhaust-port m^3, whereby the piston will be reversed at about one-half of its former stroke both forwardly and backwardly. The valve F′ is allowed to remain in this position until the drilling-tool has entered the hole sufficiently to be guided therein, when the valve is shifted so as to cause the piston to make full strokes.

In my improved valve-construction the valve is stationary and the compressed air or other actuating-fluid is quickly directed to one side of the piston or the other without requiring the moving or shifting of the valve for this purpose, whereby the piston-speed is greatly increased. The points of cut-off and exhaust are shifted by simply turning or reversing the valve, which is an extremely simple operation and renders this mechanism very convenient in use.

P represents a spirally-grooved rod journaled in the rear head of the cylinder C and engaging with its front end in a spiral socket in the rear head d' of the piston.

p represents a ratchet-wheel secured to the outer end of the spiral rod P and arranged in a cap or casing p', secured to the outer side of the rear cylinder-head.

p^2 represents pawls, whereby the ratchet-wheel is held against retrograde movement. This mechanism serves to rotate the piston and drill at each backward stroke in a well-known manner.

Q represents the feed-cylinder arranged longitudinally underneath the drill-cylinder C, and secured at its front end in a threaded lug q, formed on the lower front portion of the cylinder C and supported about midway of its length in a loop q', formed on the lower rear portion of the cylinder C.

R represents a stationary piston fitted snugly in the feed-cylinder Q, and R′ the piston-rod passing through a gland r, and secured with its rear end to the central lower portion of the rear cross-bar a^4 by a screw-nut r'.

r^2 is a screw-cap closing the front end of the cylinder Q.

s s' represent longitudinal passages formed in the piston-rod R and communicating on opposite sides of the rear portion of the piston-rod R′ with the transverse passages s^2 s^3, provided with stop-cocks S S′. The latter are provided at their upper ends with handles r^3, whereby they can be turned. The passage s passes through the piston and opens into the cylinder in front of the piston, and the passage s' terminates immediately in rear of the piston R and opens into the cylinder in rear of the piston.

As represented in Figs. 1 and 8, t represents a transverse feed-passage formed in the lower portion of the cross-bar a^4 and opening into the socket a^2, connected with the main air-supply pipe e^2, and t' t^2 represent longitudinal passages connecting the outer ends of the transverse passages s^2 s^3, respectively, with vertical ports t^3 t^3, leading to the transverse feed-passage t.

t^5 represents the transverse inlet-passages of the stop-cocks S S′, and t^6 curved outlet or exhaust passages formed on one side of the stop-cocks S S′, and which are adapted to connect the inner portions of the passages s^2 s^3 with exhaust-openings t^7, formed in the casings of the cocks and leading to the outer air.

When the drill-cylinder is in its rearward position on the frame A, as shown in Figs. 1 and 7, and it is desired to feed the same forwardly, the stop-cock S is turned so as to place its inlet-passage t^5 into register with the transverse passage s^2 and admit the compressed air from the latter through the longitudinal passage s to the space of the feed-cylinder Q in front of the piston R. The stop-cock S′ is then turned so that its exhaust-passage t^6 registers with the transverse passage s^3 and exhaust-opening t^7, whereby the space in the feed-cylinder in rear of the piston is placed in communication with the outer air through the longitudinal passage s', transverse passage s^3, cock-exhaust passage t^6, and the exhaust-passage t^7. The compressed air in front of the piston now causes the feed-cylinder to move forwardly, so as to feed the drill-cylinder C and the drill. The speed of this forward movement of the cylinder Q is readily regulated by simply turning the stop-cock S′, so as to increase or diminish the size of the exhaust-orifice and control the escape of the air from the cylinder in rear of the piston. When it is desired to return the cylinder Q to its normal position after the feed-cylinder has been moved to the limit of its forward movement or at any other point, the cock S is turned so as to allow the air in front of the piston to exhaust through the cock-passage t^6 and exhaust-opening t^7, and the cock S′ is turned to admit the compressed air to the space in rear of the piston, thereby moving the feed-cylinder and drill-cylinder backward to the point of beginning. This backward movement of the cylinders is much more rapid than when a feed-screw is employed, whereby a great saving of time and labor is effected.

I prefer to employ compressed air as the motive power; but it is obvious that in its stead any other suitable fluid under pressure may be used.

I claim as my invention—

1. The combination, with a valve-chamber provided with different ports, of an adjustable stationary valve arranged in said chamber and provided with corresponding ports, whereby different ports in the valve-chamber can be called into action at desire by adjusting the valve, substantially as set forth.

2. The combination, with a valve-chamber provided with end ports and with a plurality of intermediate ports for each end port, of an adjustable stationary valve provided with longitudinal ports of different length, whereby either of the intermediate ports can be placed in communication with the corresponding end port by adjusting the valve, substantially as set forth.

3. The combination, with the cylinder provided with a central inlet for the actuating-fluid and with end ports and intermediate ports, of a piston provided with a central cavity for the reception of said fluid and an adjustable stationary valve provided with different ports, whereby the stroke of the piston can be changed by adjusting the valve, substantially as set forth.

4. The combination, with the supporting yoke or saddle, of a longitudinal drill-frame provided with parallel side bars, which are adjustably secured to the yoke or saddle, and with intermediate guide-bars arranged parallel with the side bars, and a drill-cylinder movably supported on the intermediate guide-bars, substantially as set forth.

5. The combination, with the supporting yoke or saddle, of a longitudinal drill-frame provided with parallel side bars, which are adjustably secured to the yoke or saddle, and with intermediate guide-bars arranged parallel with the side bars, a drill-cylinder movably supported on said intermediate guide-bars, and feed mechanism connected with the drill-cylinder, whereby the latter is moved on the guide-bars, substantially as set forth.

6. The combination, with the supporting-yoke provided with longitudinal fixed sleeves, of a drill-frame having its side bars arranged adjustably in said sleeves and clamping-sleeves arranged in said fixed sleeves and embracing the side bars of the drill-frame, whereby the latter is secured in place, substantially as set forth.

7. The combination, with the supporting-yoke provided with longitudinal fixed sleeves having pockets opening through the walls of said sleeves, of a drill-frame having its side bars arranged adjustably in said sleeves and clamping-sleeves embracing the side bars of the drill-frame in said pockets and provided with screw-shanks and nuts, whereby the side bars of the frame are tightened against the sleeves of the yoke, substantially as set forth.

8. The combination, with the drill-cylinder, of a hollow supporting-frame, a flexible pipe or hose connecting the hollow frame with the drill-cylinder, and a supply pipe or hose connected with the hollow frame, whereby the drill-cylinder is relieved from the weight of the supply-pipe, substantially as set forth.

9. The combination, with the drill-cylinder and piston and its supporting-frame, of a feed-cylinder and piston, whereby the drill-cylinder is moved on the supporting-frame, substantially as set forth.

10. The combination, with the drill-cylinder and piston and its supporting-frame, of a feed-piston secured to said frame and a feed-cylinder secured to the drill-cylinder, substantially as set forth.

11. The combination, with the drill-cylinder and piston and its supporting-frame, of a feed-cylinder secured to the drill-cylinder and a feed piston and rod secured to the frame and provided with longitudinal passages for the

actuating-fluid opening into the feed-cylinder on opposite sides of the piston, substantially as set forth.

12. The combination, with the supporting-frame, of a drill-cylinder movably mounted on said frame, a feed-cylinder attached to the drill-cylinder, a piston and rod arranged in said feed-cylinder and attached to the frame, fluid-passages formed in said piston and rod, and cocks arranged in said fluid-passages, whereby the fluid-pressure can be admitted to or exhausted from either side of the feed-piston, substantially as set forth.

13. The combination, with the drill-cylinder and its hollow supporting-frame connected with a pipe through which the actuating-fluid enters the hollow frame, of a feed-cylinder attached to the drill-cylinder, a piston and rod secured to the hollow frame and arranged in the feed-cylinder, longitudinal fluid-passages formed in said rod and opening into the feed-cylinder on opposite sides of the piston, a transverse passage formed in the frame and communicating with the fluid-cavity of the frame, branch passages connecting said transverse passage with the longitudinal passages in the piston-rod, and cocks arranged in said branch passages, whereby the fluid-pressure can be admitted to or exhausted from either side of the feed-piston, substantially as set forth.

Witness my hand this 21st day of February, 1890.

URIAH CUMMINGS.

Witnesses:
CARL F. GEYER,
F. C. GEYER.