(No Model.) 2 Sheets—Sheet 1.

S. G. BRYER.

Rock-Drilling Machine.

No. 227,878. **Patented May 25, 1880.**

Fig. 3.

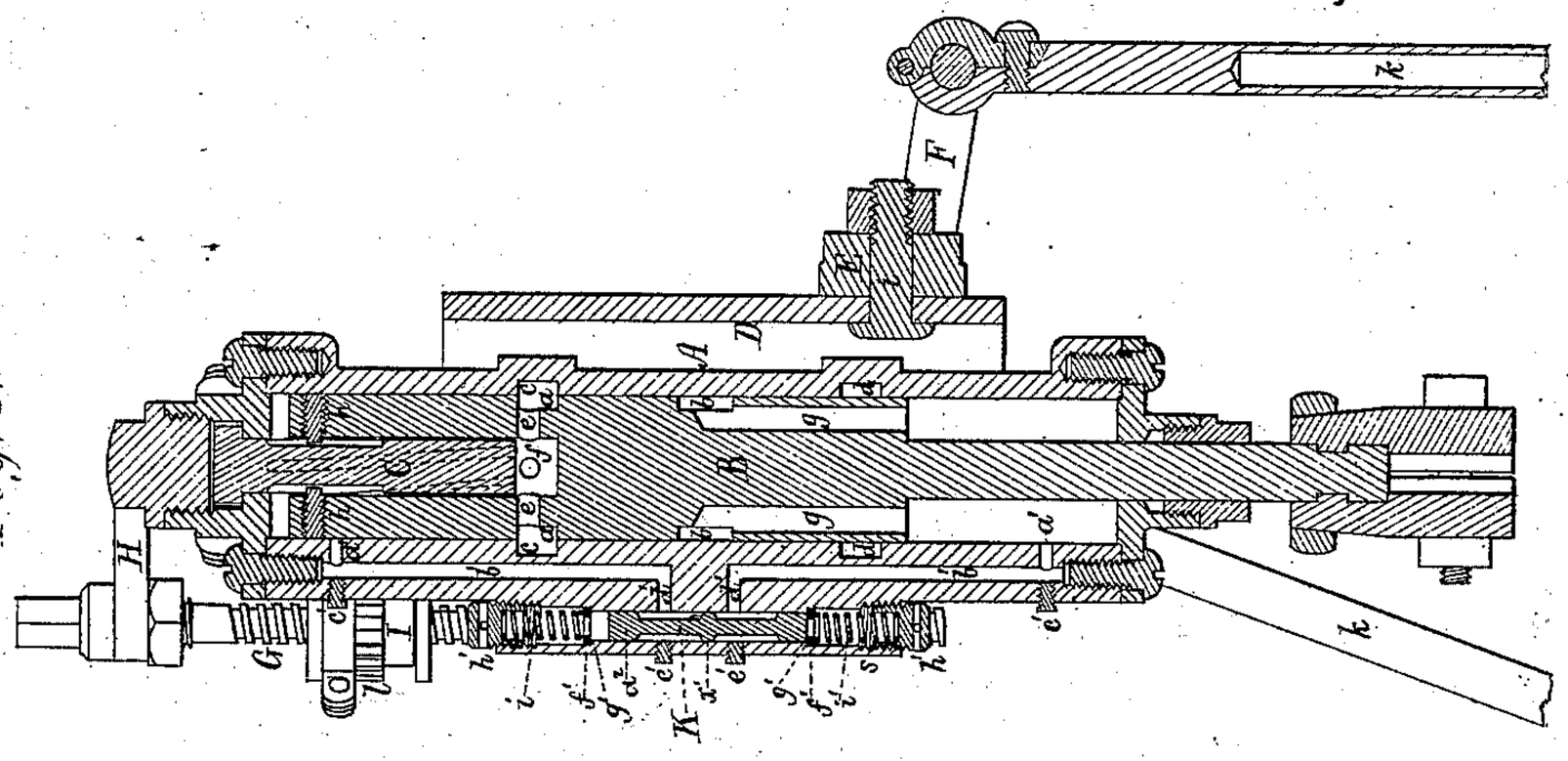


Fig. 1.

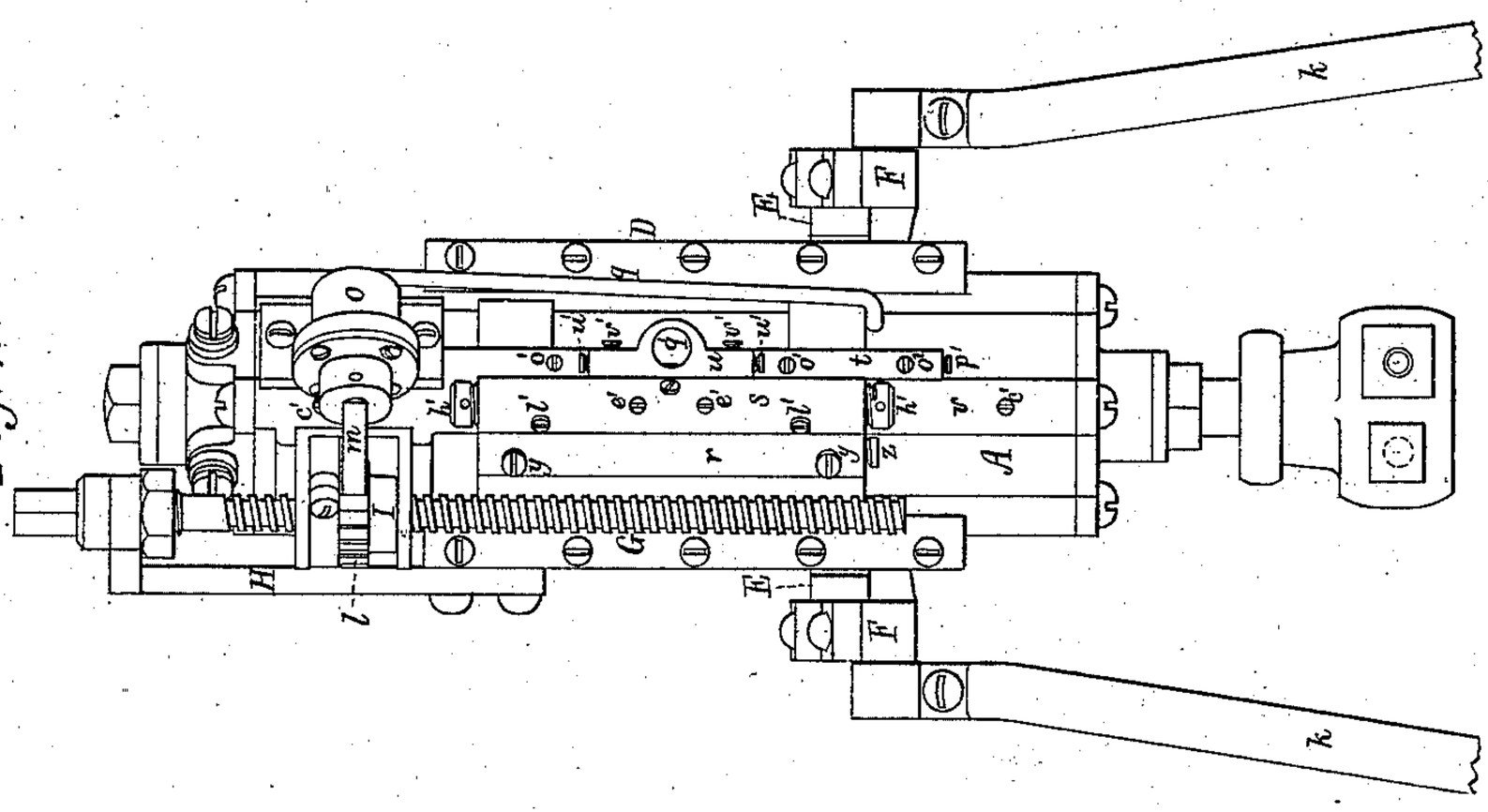
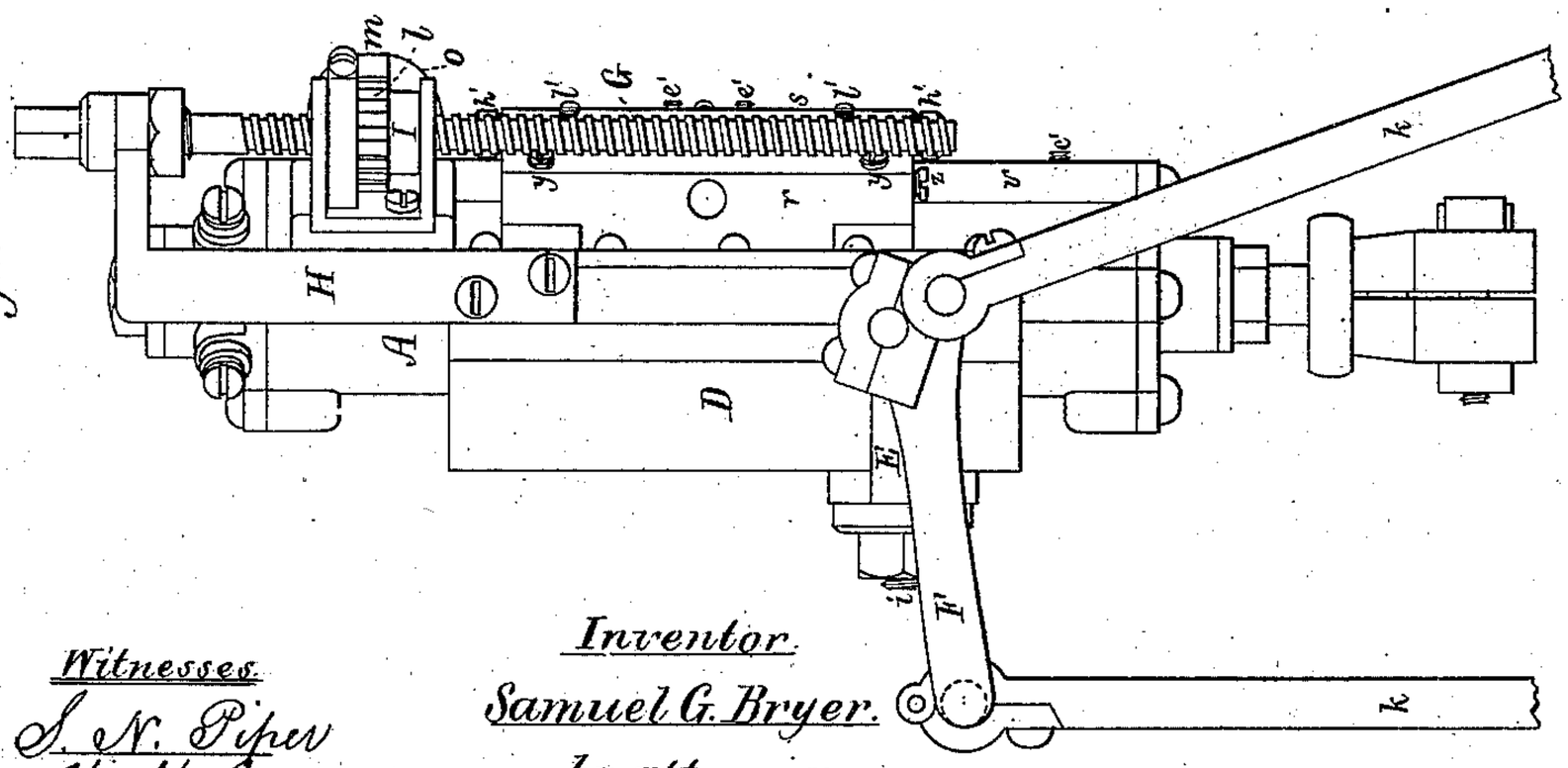


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

S. G. BRYER.
Rock-Drilling Machine.

No. 227,378. **Patented May 25, 1880.**

Fig. 5.

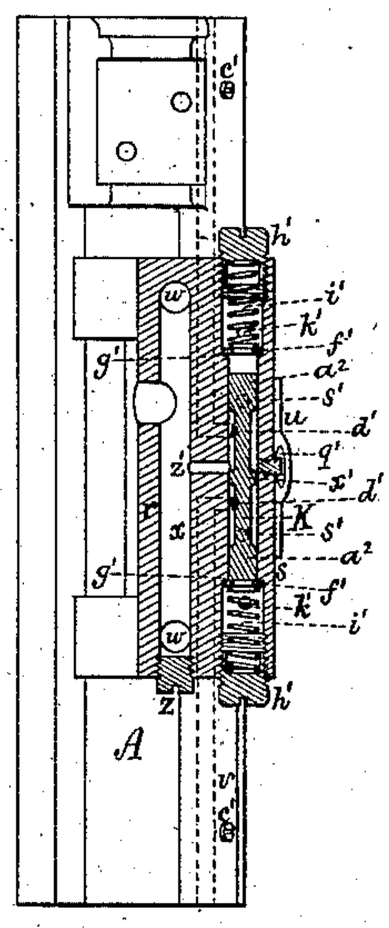


Fig. 6.

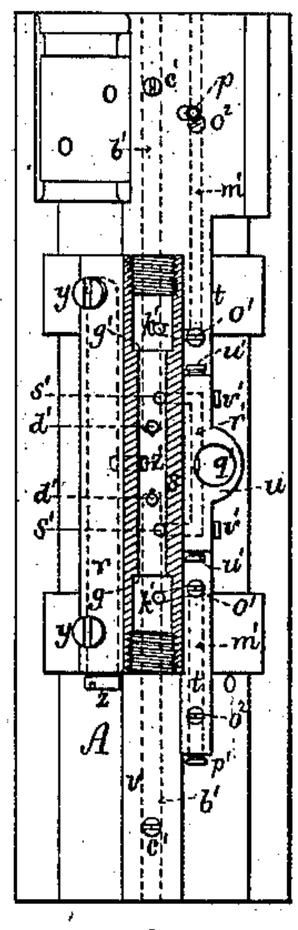


Fig. 7.

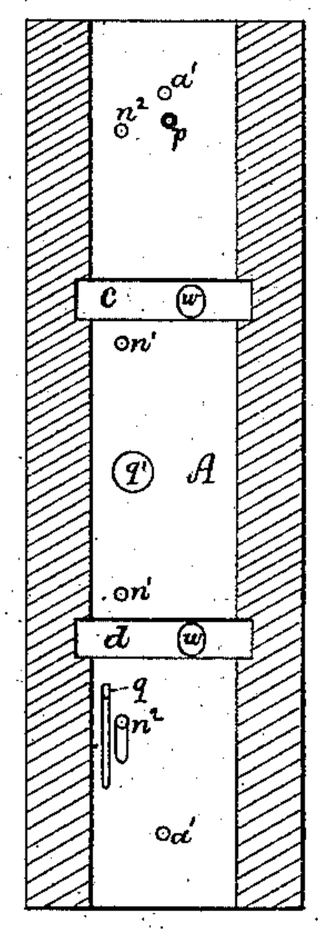


Fig. 9.

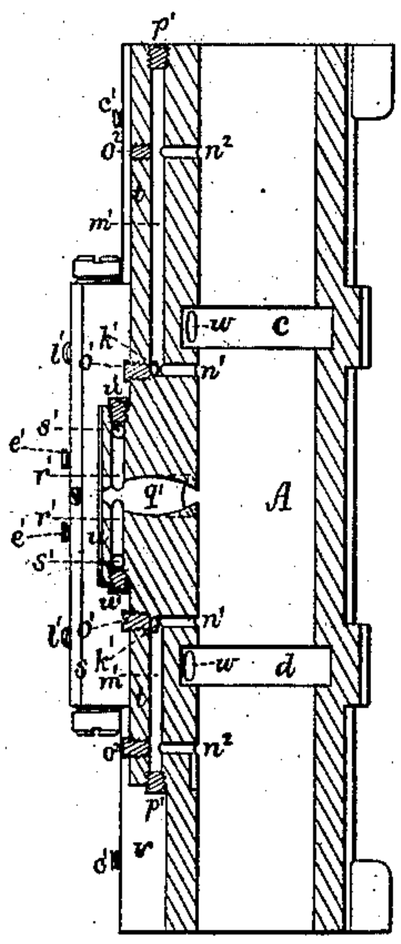


Fig. 4.

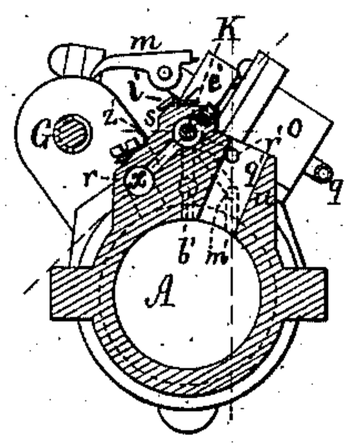
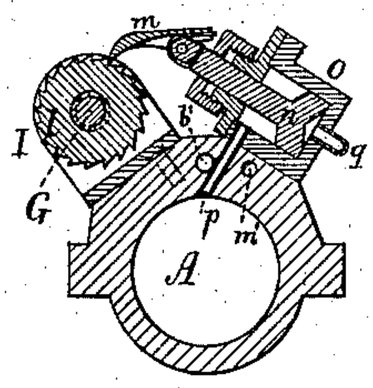


Fig. 8.



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UNITED STATES PATENT OFFICE.

SAMUEL G. BRYER, OF SAUGUS, MASSACHUSETTS.

ROCK-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 227,878, dated May 25, 1880.

Application filed March 12, 1880. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL G. BRYER, of Saugus, in the county of Essex and State of Massachusetts, have invented a new and useful Improvement in Rock-Drilling Machines; and I do hereby declare the same to be described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a front elevation, Fig. 2 a side elevation, and Fig. 3 a vertical and longitudinal section, of a machine containing my invention. Fig. 4 is a transverse section taken through the steam-cylinder at or about the middle thereof. Fig. 5 is a longitudinal section taken through the induction and valve chambers. Fig. 6 is a longitudinal section, showing the valve-chamber and its inducts and educts. Fig. 7 is a longitudinal section of the cylinder, showing its front half and the passages leading to and from its bore. Fig. 8 is a transverse section of the cylinder, with its auxiliary cylinder and piston, the pawl of the latter, and a ratcheted nut to engage with the said pawl. Fig. 9 is a longitudinal section, showing the passages m' n' n^2, through which the steam passes in operating the valve.

My present invention relates to the kind of drilling-machine as represented and described in the United States Patents Nos. 205,998 and 207,162, granted to me, such invention consisting, first, in mechanism for moving the pawl of the ratchet of the screw-nut, by which and by a screw the cylinder is gradually moved rectilinearly within its supporting-arch, such mechanism consisting of an auxiliary piston hinged to the pawl, and of a small auxiliary cylinder for such piston to work in, the said cylinder being provided with ducts leading into the main cylinder, as hereinafter explained.

The invention further consists in the main or larger cylinder as made or provided with its inducts, educts, and valve-chamber, and ducts of the latter, arranged, as hereinafter described, in it (the said cylinder) and in projections therefrom, each of which is bored lengthwise and crosswise, and provided with stopping-screws, as shown and explained, one great advantage of this latter improvement being to bring upon the front of the cylinder, where easy access may be had to them, the valve-chamber and the parts for the induction and eduction of steam.

In the drawings, A represents the main steam-cylinder, and B its piston, there being extended down from the upper head of the cylinder a helically-grooved cylindrical projection, C, to work within the piston to aid in effecting its intermittent rotation. The piston is provided between its two ends, or has arranged in it and around it transversely, two annular grooves, *a b*, to co-operate with two other such grooves, *c d*, arranged within the cylinder, as represented. From the upper groove of the piston one or more holes or passages, *e*, lead into a chamber, *f*, arranged in the upper part of the piston and opening through its top. So from the lower groove, *b*, of the piston one or more ducts or passages, *g*, lead down through the piston to its lower end, through which such duct or ducts open. Furthermore, in the upper part of the piston are screws or studs *h h*, to engage with the helical grooves of the projection C.

The cylinder is adapted to slide rectilinearly within a housing or arch, D, arranged to span the rear half of the cylinder, and pivoted, as shown at *i*, to an arched piece, E, which, in turn, is pivoted at its ends to another arched piece, F, constituting the upper part of a tripod whose legs are shown at *k k k*. The housing D is applied to the arched piece E so as to swing or turn therein in a direction at right angles to that in which the said arched piece swings or turns in the tripod, from which it will be seen that the housing is applied to the tripod by what are termed "gimbals."

The drill is to be secured in the usual or in any proper manner to the lower part of the piston.

A long screw, G, adapted to revolve in a bent arm, H, fixed to and projecting from the housing D, screws down through a nut, I, provided with a ratchet, *l*, and adapted to the cylinder A, so as to be capable of revolving, but not of being moved endwise independently of the cylinder, the screw G being similarly applied to its sustaining-arm. On revolving the nut on the screw the cylinder may be moved either upward or downward. In order to effect the downward motion of the cylinder,

there engages with the ratchet a pawl, *m*, which is hinged to the rod of an auxiliary piston, *n*, arranged within a small auxiliary steam-cylinder, *o*, fixed to and extending across the upper part of the main cylinder A. From or near one end of the bore of the cylinder *o* a duct, *p*, leads into the upper part of the bore of the main cylinder. Opening into the other end of the bore of the auxiliary cylinder is a duct or pipe, *q*, which extends downward and opens into the main cylinder at the lower part thereof.

When steam is operating in the upper part of the main cylinder to depress the piston the elastic power of such steam will move the auxiliary piston so as to retract the pawl connected therewith, exhaust-steam from the auxiliary cylinder passing through the duct or pipe *q* into the lower part of the main cylinder and escaping therefrom at the proper time with the exhaust-steam thereof. On the piston reaching its lowest limit the groove *b* thereof will open communication with the groove *d* of the cylinder and the duct *q*, and steam will flow upward through the said duct, and cause the lesser piston with its pawl to be moved forward, the exhaust-steam of the auxiliary cylinder escaping through the duct *p* into the main cylinder. From this it will be seen that the lesser piston will have rectilinear movements imparted to it, such as will cause the nut I to be intermittently revolved on the screw G.

In constructing the main cylinder I make it with a series of ribs or projections, *r s t u v*, extending from its front and arranged close together in manner as shown—that is to say, the projection *v* is arranged immediately between the projections *r* and *t*, and the projection *s* is arranged on the projection *v*, and to extend from it and the projections *r* and *t*, in manner as shown. The projection *u* is aside of the middle part of the projection *s*, and extends from that to the projection *t*. All the said projections are in one piece with each other and the cylinder, and each of them is bored lengthwise, as represented.

The steam is let into the middle or other proper part of the bore of the projection *r*, and there are bored through the projection *r* and into the cylinder, to the two grooves in its bore, two lateral passages, *w w*, the bore of said projection *r* being shown at *x*. Screws *y y* are inserted in the outer ends of the passages *w w* to stop them, and a screw, *z*, is also inserted in the open end of the bore *x* in order to close such end. The passages *a' a'*, leading out of the cylinder near its ends, are made by boring laterally through the projection *v* and into the bore of the cylinder and across the bores *b' b'* of the projection *v*. Screws *c' c'* are inserted in the outer ends of the lateral bores *a' a'* in order to stop them. It will be observed that the projection *v* is bored from each end of it toward its middle; but the bores *b' b'* do not come in contact, but open into lateral bores or passages *d' d'*, leading transversely through the projection *s* and across its bore, and provided with the stopping-screws *e' e'*, arranged as shown.

The bore of the projection *s* constitutes a valve-chamber to receive the piston slide-valve K, which plays between two perforated disks, *f'*, arranged in the said bore, and with respect to the piston-valve and against shoulders *g'* in the bore, as shown. At its opposite ends the bore of the projection *s* is plugged by screws *h'*, between each of which and the next adjacent perforated disk *f'* is a helical spring, *i'*, and from those parts of the bore in which the springs are placed passages *k'* are made transversely through the projection *s* and into the bores *m' m'* of the projection *t*, the outer ends of the said cross-passages being plugged by screws *l'*.

The projection *t* is bored lengthwise from each outer end of it, as shown at *m'* in Fig. 9, to meet the cross-passages *k'*, (shown in dotted lines in Fig. 6,) and it also has four cross-passages, *n' n' n² n²*, leading through it transversely into the bore of the cylinder, each passage at its outer end being stopped by a screw, *o' o²*. Furthermore, the projection *t* at its opposite ends is provided with stopping-screws *p'*.

The projection *u* has in it at its middle the main steam-eduction passage *q'*, which opens out of the bore of the cylinder. A passage, *r'*, (see Fig. 9,) extends longitudinally through the projection *u*, and opens into the passage *q'* and also into cross-passages *s'*, (shown in dotted lines in Fig. 6,) which lead through the projection *u* into the valve-chamber. At its outer ends the passage *r'* is stopped by screws *u'*, while at their outer ends the passages *s'* are stopped by screws *v'*.

The operation of the machine may be thus described: On steam being let into the induction-chamber *x* it will flow through the passages *w w* and fill the grooves *c d* of the cylinder, and also the short passage *z'*, that part of the valve-chamber included between the parts *x'* and *a²* of the valve, and one of the two sets of passages *d'*, *b'*, and *a'*. The piston being in its highest position and the valve down, as shown in Fig. 3, steam will flow through the groove *a*, passages *e*, chamber *f*, and the helical grooves of the projection C into the upper part of the cylinder, and the piston will commence to descend. As soon as the upper end thereof shall have passed the upper passage, *a'*, steam will flow through said passage *a'* and those communicating therewith, and assist in forcing the piston toward the other end of the cylinder. On the groove *b* of the piston reaching the groove *d* of the cylinder communication will be opened with the lower passage, *n'*, (see Fig. 9,) and steam will flow through said passage and the passage *k'* (see dotted lines in Fig. 6) into the spring-chamber and against the lower end of the valve K, and force it upward, the part *x'* of the valve in the meantime having cut off the flow of steam through the upper set of passages, *d'*, *b'*, and *a*, and caused it to flow through the

lower set of said passages to the end of the cylinder. The steam which was used in forcing the piston downward will also have been exhausted into the main eduction-passage q' through the groove a, passages e, and chamber f at the same time that the groove b of the piston was brought into communication with the groove d of the cylinder. Steam will now flow through the ducts g into the lower end of the cylinder and the piston will rise. As soon as the lower end thereof shall have passed the lower passage, a', steam will flow through the set of passages communicating therewith and assist in raising the piston. As soon as the piston-groove a brings the cylinder-groove c into communication with the upper passage, n', steam will flow through the upper set of passages, n' and k', and force the valve down, the dead steam in the lower set of passages k' and n' escaping through the passages m' and n^2 into the lower end of the cylinder. When the piston is approaching either end of the cylinder any steam that may have been exhausted therein through the passages n^2 or p and q will be forced out through the passages a', b', d', s', and r' into the main eduction-passage q'.

The parts a^2 of the valve operate with the openings of the passages s' to allow at the proper time any dead steam that may be in that part of the valve-chamber into which said passages s' open to escape through said passages and the passages r' into the main eduction-passage q'.

What I claim as my invention is as follows, viz:

The cylinder provided with the series of projections r s t u v, arranged with it, and bored both lengthwise and crosswise, and having screw-plugs, all substantially as set forth, so as to communicate with each other and the cylinder and furnish it with a valve-chamber, and to form, with said valve-chamber and the cylinder, grooved internally, as described, and having a piston, substantially as set forth, the necessary passages for the induction and eduction of steam to cause the piston to reciprocate within the cylinder.

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