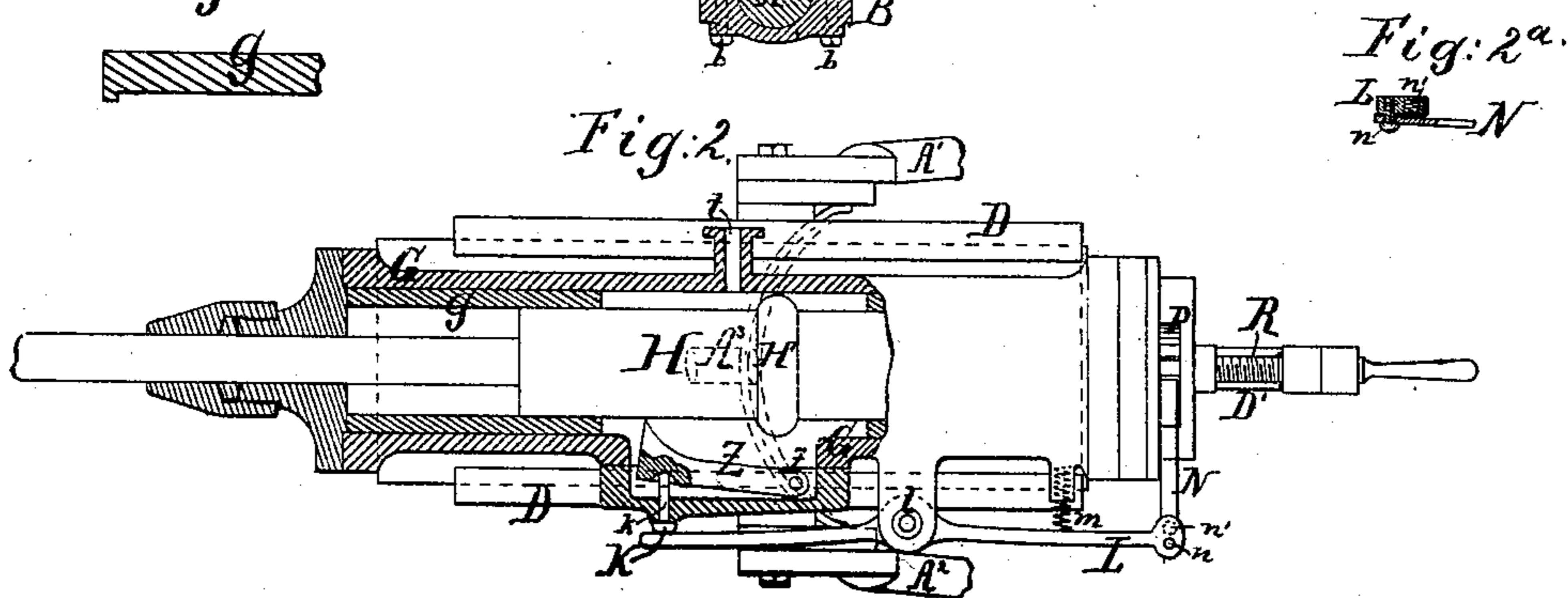
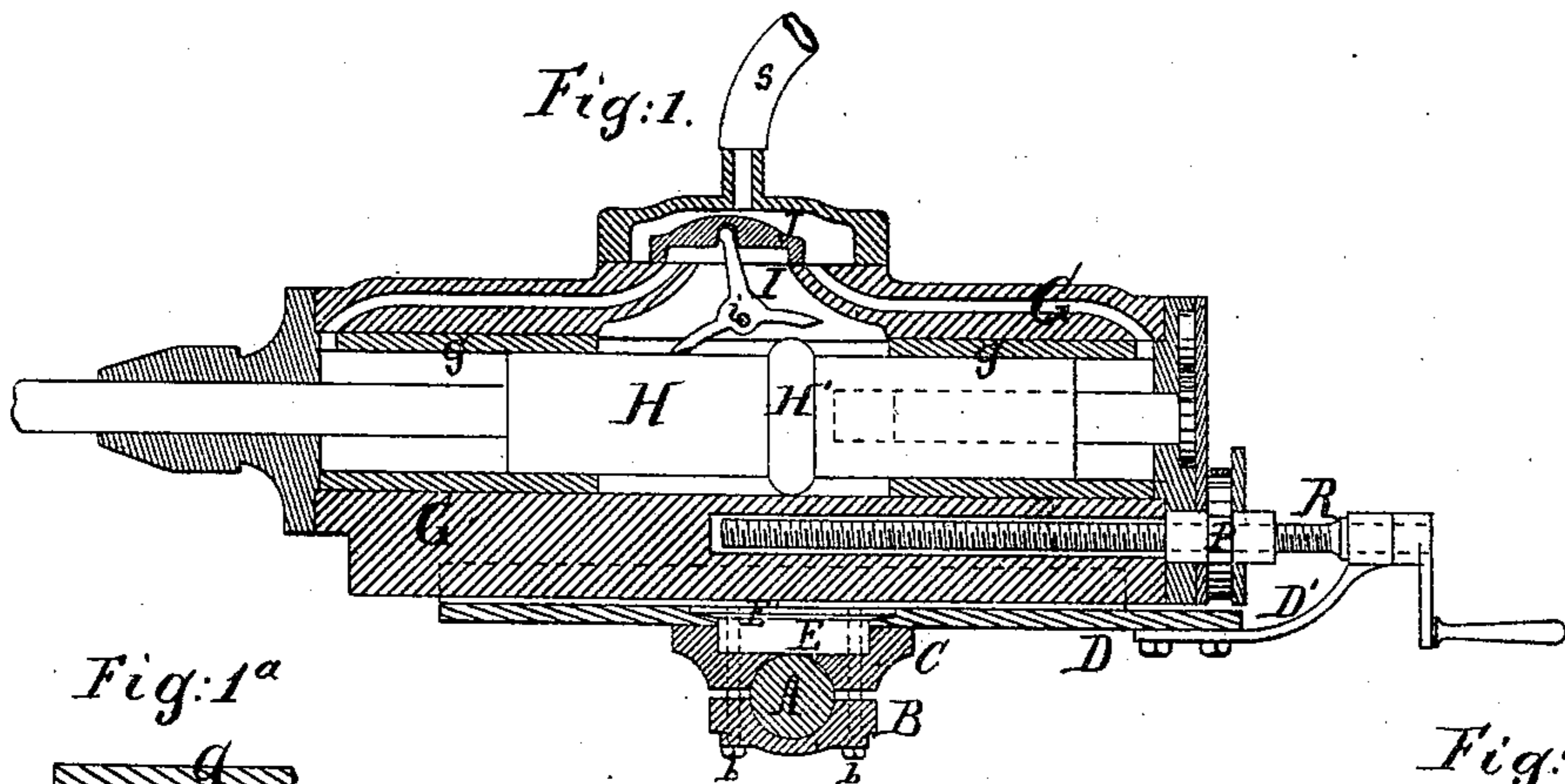


S. INGERSOLL.

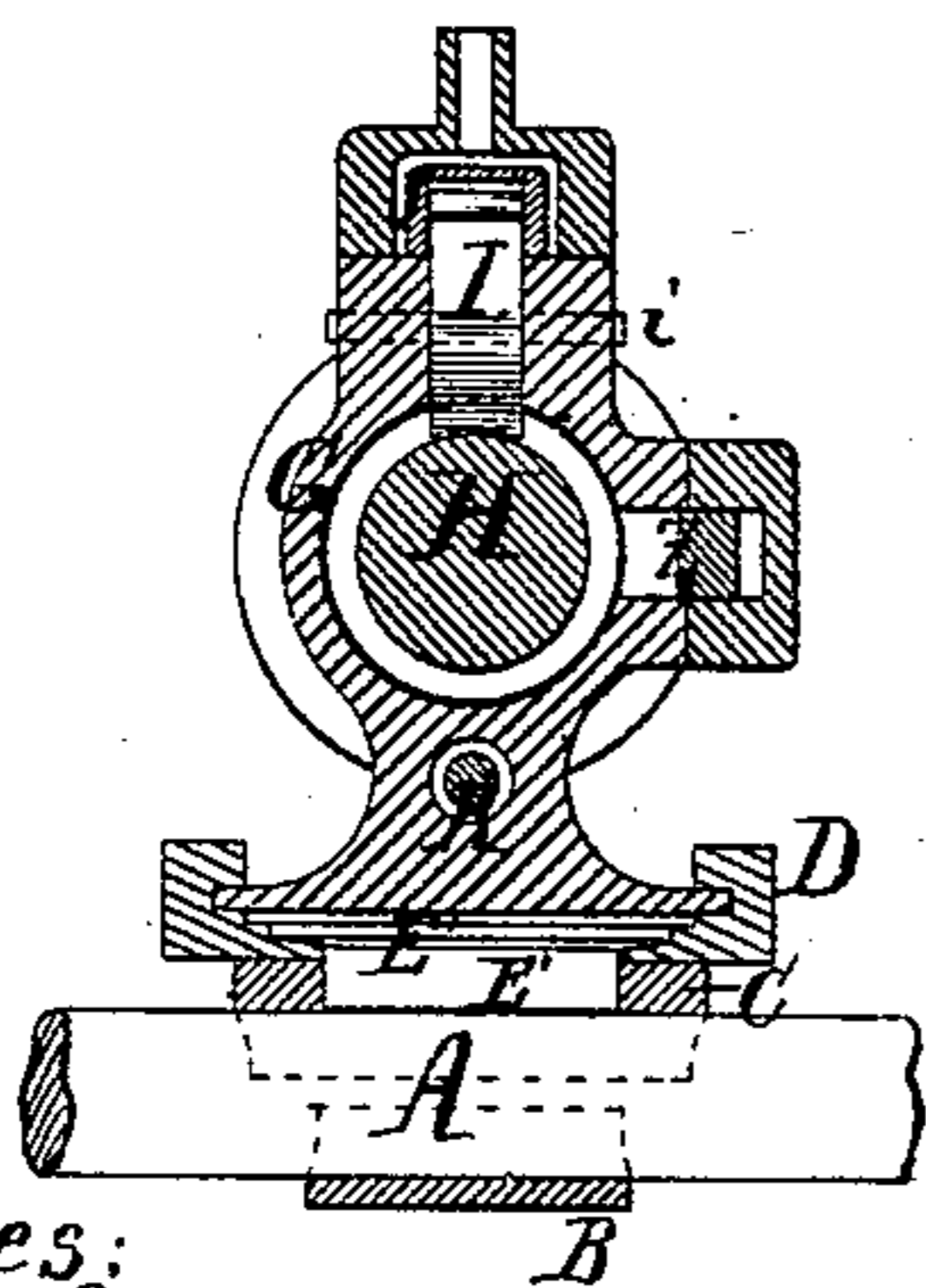
ROCK DRILLING MACHINERY.

No. 179,561.

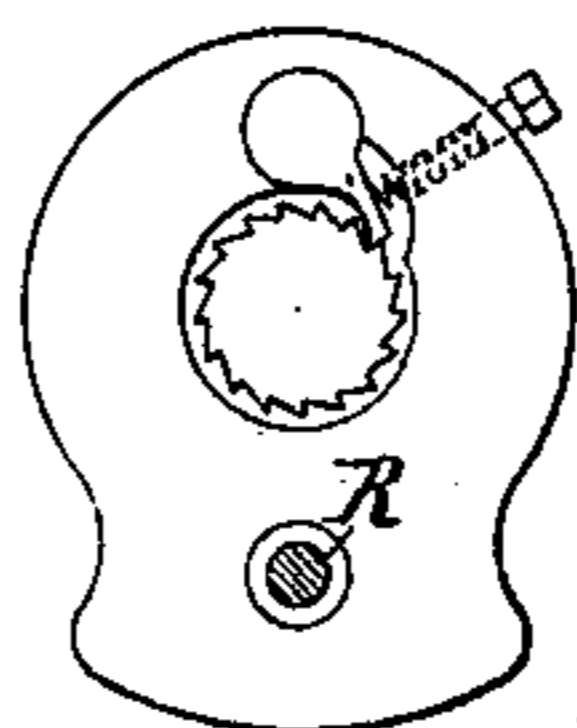
Patented July 4, 1876.



*Fig:3.*



*Fig:4.*



Witnesses:

Harry Gentner

C. C. Stetson

Inventor:

Simon Ingersoll,

by his attorney

Thomas G. Stetson

# UNITED STATES PATENT OFFICE

SIMON INGERSOLL, OF STAMFORD, CONNECTICUT.

## IMPROVEMENT IN ROCK-DRILLING MACHINERY.

Specification forming part of Letters Patent No. **179,561**, dated July 4, 1876; application filed November 13, 1875.

*To all whom it may concern:*

Be it known that I, SIMON INGERSOLL, of Stamford, Fairfield county, in the State of Connecticut, have invented certain Improvements relating to Rock-Drilling Machinery, of which the following is a specification:

The invention pertains to apparatus for drilling by steam or analogous power, mounted on a suitable tripod, and capable of being conveniently shifted in position to drill in various directions. One portion relates to means for reciprocating the valve, and another to means for operating the feed mechanism.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

Figure 1 is a central longitudinal section. Fig. 1<sup>a</sup> represents a part in section on a larger scale. Fig. 2 is a section in a plane at right angles to Fig. 1. Fig. 2<sup>a</sup> is a cross-section through a portion of the details. Fig. 3 is a cross-section on the line *xx* in Figs. 1 and 2. Fig. 4 is a view of the head with the outer plate removed.

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

A is a shaft or axis, having legs, (not represented,) forming therewith a tripod for supporting the other parts, and equipped with ordinary or suitable facilities for standing firmly on the rock, and for being set in adjustable positions. B C are cheeks, embracing the shaft A, and adapted to be firmly set thereon by means of the screw-bolts *bb*. G is a cylinder, of considerably larger bore than the piston, and having bushings *g g* applied in each end, reaching inward toward each other, but leaving a considerable space between their inner ends. The interior of these bushings is the true cylinder, within which works the tight-fitting piston H, of sufficient length to always extend across the intermediate space and form a tight-working piston in each of the bushings. A swell, H', is cast, welded, or otherwise firmly set, extending around this long piston at the center of its length.

The steam is admitted alternately through ports to the opposite ends of the cylinder, and acts against the two ends of the long piston.

The exhaust-passages are so arranged that

the space around the piston between the inner ends of the bushings *g g* is a part of the exhaust-cavity. As the piston reciprocates the swell H' works backward and forward in the clear space thus provided for it, and strikes alternately the widely-forked lower ends of a three-armed lever, I, which turns on a fixed center, *i*, in the exhaust-cavity. The upper arm of this lever engages in a recess in the exhaust-cavity in the slide-valve J. This valve is mounted in a suitable steam-chest, receiving steam from a steam-boiler or other source, (not represented,) and operating the piston by alternately inducting and educting steam from the two ends of the cylinder, all being conducted in the ordinary manner, except in the means employed for working the valve. The swell H', being continuous and smoothly rounded, is adapted to strike the lower arms of the three-armed lever I alternately, and to throw the valve, and the piston may be revolved at will without affecting the action. The swell H' may move past either arm without producing any effect after the arm is passed, and in such condition no contact is possible between the arms of the lever I and the working-surface H of the piston.

The steam is inducted through the flexible hose *s*. It is discharged through the passage *t*, in free communication with the entire space around the piston H, between the bushings *g g*. The strong blast of exhaust drives out any water or oil which might otherwise accumulate within the cavity.

K *k* is a tappet or sliding pin, adapted to move inward and outward to a limited extent. The part *k* is cylindrical, and fits its inclosing hole with only tolerable tightness. The head K has a ground face, adapted to match against the seat when the pin is forced inward. The inner end of the pin K *k* presses against a lever, Z, turning on a center, *z*, and having an inclined end, which is in position to be touched by the swell H', and forced outward at the extreme end of its downstroke. Unless the piston makes a full downstroke it will not push out the tappet K *k* to its full extent.

L is a lever, pivoted to the cylinder G at the point *l*. One arm is acted on by a spring, *m*; the other presses inward the tappet K *k* by

the force of such spring. One end of the lever L beyond the spring *m* is widened, and carries a pin, *n*, and a spring, *n'*. A pawl, N, is fitted on the pin *n*, and is pressed by the force of the spring *n'* into contact with rigid teeth, which are formed on the periphery of the stout nut-piece P, which is housed in a lateral extension of one head of the cylinder G, as represented. The feed-screw R is equipped with a crank, as shown, and takes hold of an arm, D', from the cradle D, by holding it between the hub of the crank and a collar on the feed-screw. The feed-screw is threaded through the nut-piece P. When desired, the attendant turns the feed-screw R by its crank, and thus raises it up or feeds it down, as desired. When the drill is in operation and it is desired to feed automatically he allows the pawl N to act on the ratchet-teeth of the nut-piece P.

Where I have spoken of the steam-admission, &c., it will be understood to apply equally well if the machine is worked by other fluids, as compressed air.

I propose to employ india-rubber under the head K of the pin K *k* to aid in forming a tight seat.

Figure 1<sup>a</sup> shows a slight flange on the end of the bushing. This is matched into a corresponding rabbet in the cylinder; and, although too small to be well shown in Fig. 1, performs an important duty by keeping the bushing firmly in place.

I propose to employ all the ordinary adjuncts for the successful working of my apparatus. Thus, the piston-rod should have a stuffing-box, and the cylinder ends may each have a thick rubber cushion.

By removing one of the bushings *g g* I am able to get the piston H in and out—an operation which would otherwise be prevented by the swell H', provided the swell were always larger than the working part of the piston.

Some of the advantages, due to certain features of the invention, may be separately enumerated as follows: First, by reason of

my partial bushings *g g*, I not only obtain easily exchangeable surfaces to receive the wear, but also allow the introduction of a piston with a fixed swell in the center of its length, having a larger diameter than the working portion of the piston; second, by reason of my swell H' in the piston, I am able to throw the lever I, and consequently the valve J, with certainty, to effect those ends with light and compact mechanism, and to allow the piston to move beyond the levers to any desired extent without rubbing or in any way affecting the working-surfaces of the piston; third, by reason of the construction of the tappet K *k* and its seat, fitting steam-tight when the tappet is moved inward, I insure that no steam or water shall be thrown out, and that no grit shall be drawn inward in consequence of any partial vacuum in the exhaust-passages; fourth, by reason of my mechanism having independently of the hinge *n* the little spring *n'* under the widened end of the lever L, I am able, by light and simple means, to hold the pawl N in contact with the ratchet with certainty.

I claim as my improvements in rock-drilling machines—

1. The swell H', of larger diameter than the central part of the piston H, and extending around the same, in combination with the partial bushings *g g*, arranged at a distance apart, as shown, and with the cylinder G, as specified.

2. The pins K *k*, having the head K fitted steam-tight, in combination with the piston H H', and with the pawl N *n*, spring *n'*, spring *m*, and levers L *l* Z *z*, as herein specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

SIMON INGERSOLL.

Witnesses:

C. C. STETSON,  
HENRY GENTNER.