

(No Model.)

# C. FRANKE. ROCK DRILL.

No. 442,731.

Patented Dec. 16, 1890.

Fig. 2.

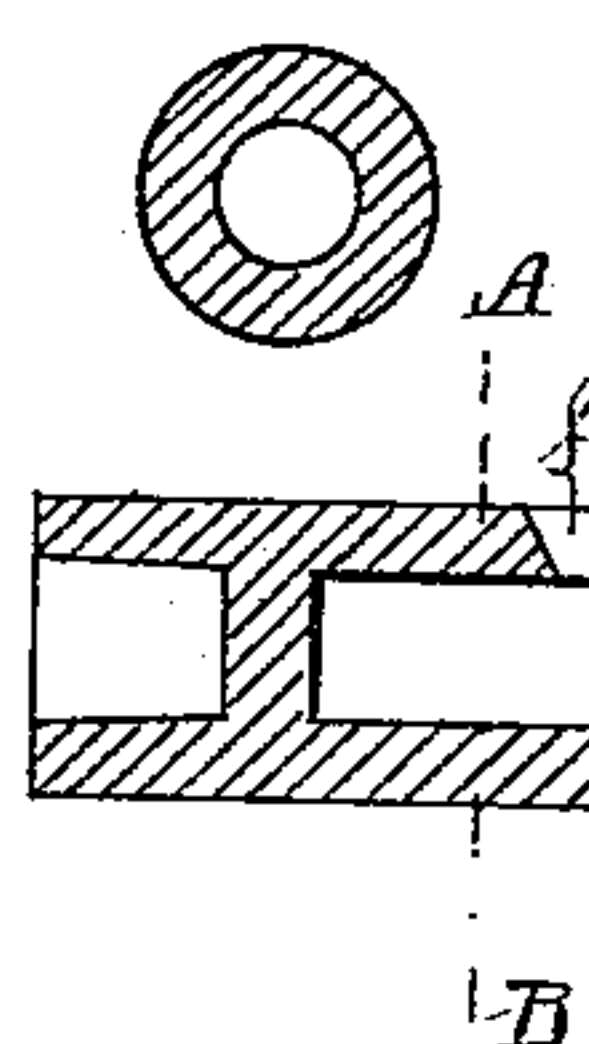


Fig. 1.

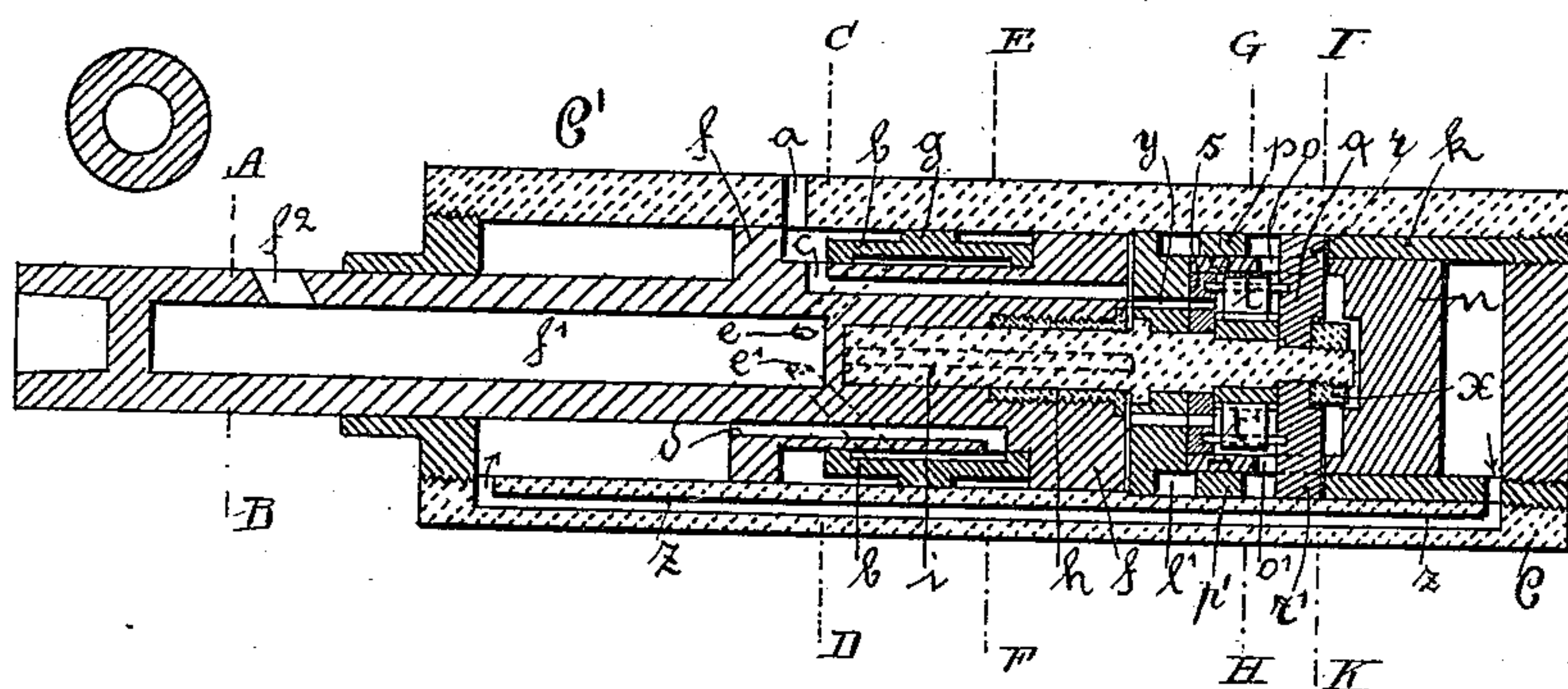


Fig. 7.

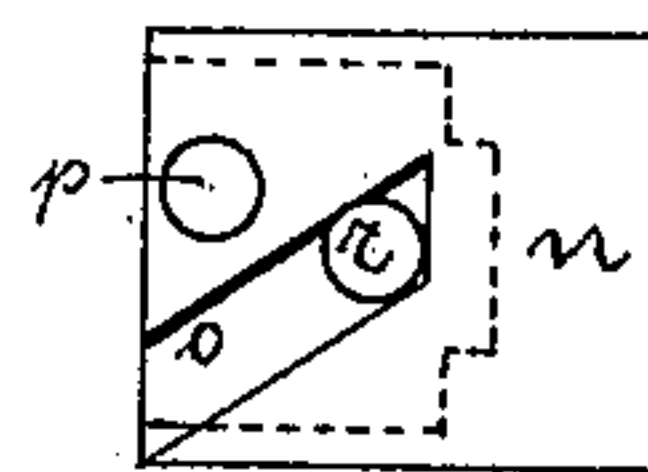


Fig. 8.

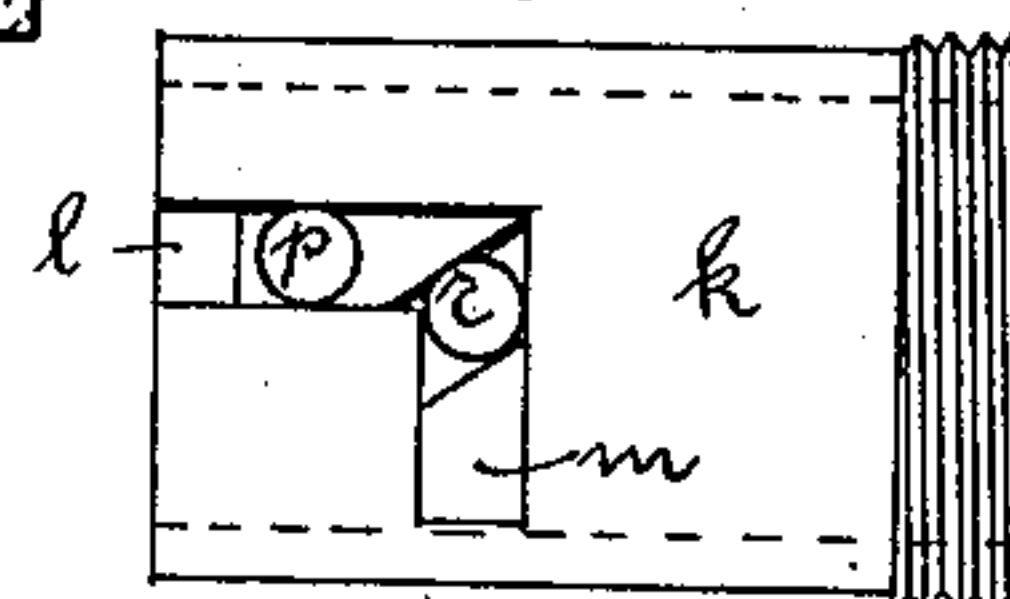


Fig. 9.

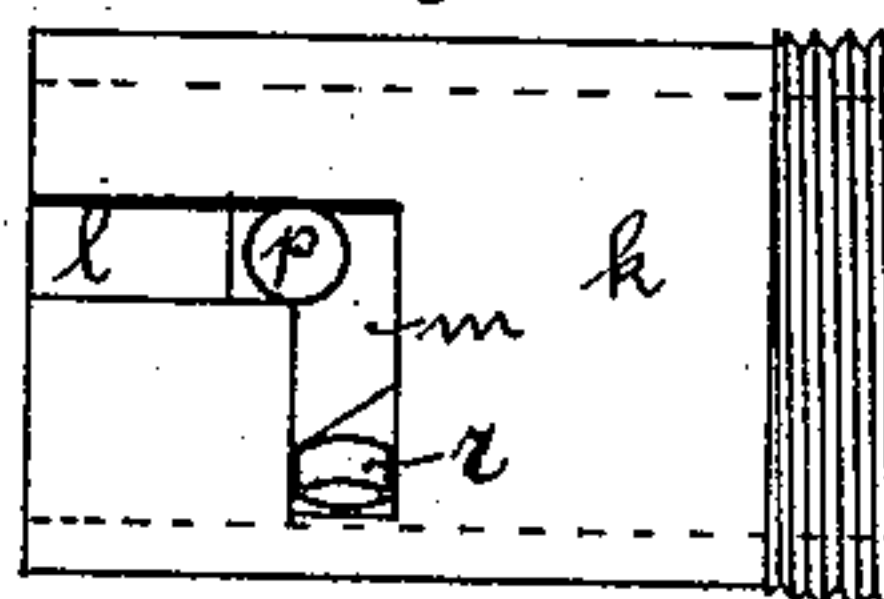


Fig. 3.

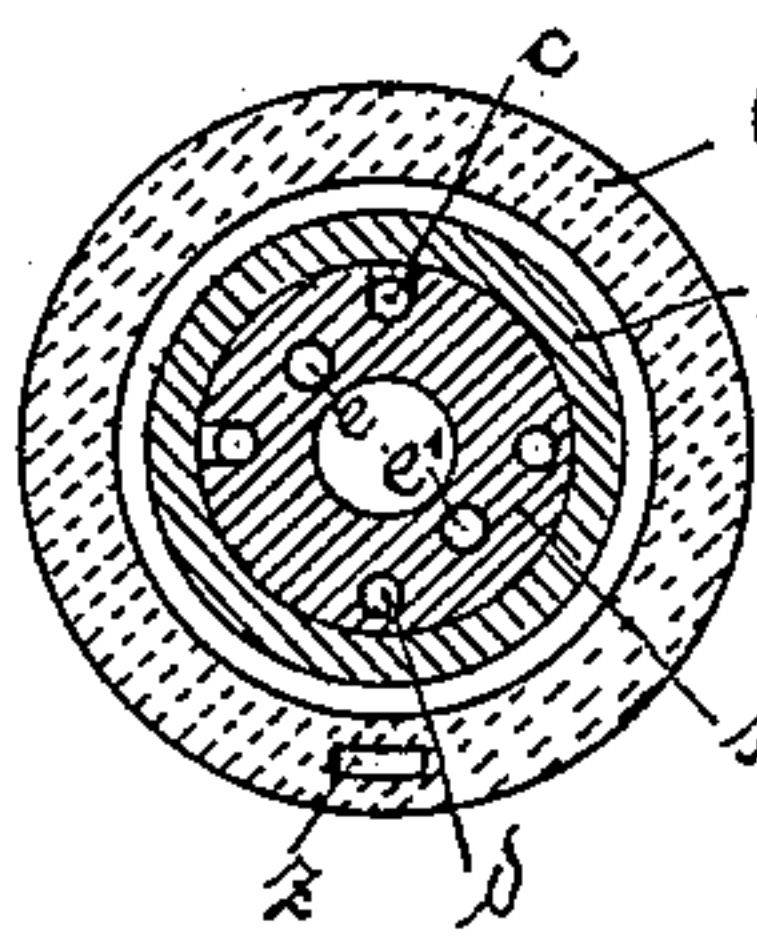


Fig. 4.

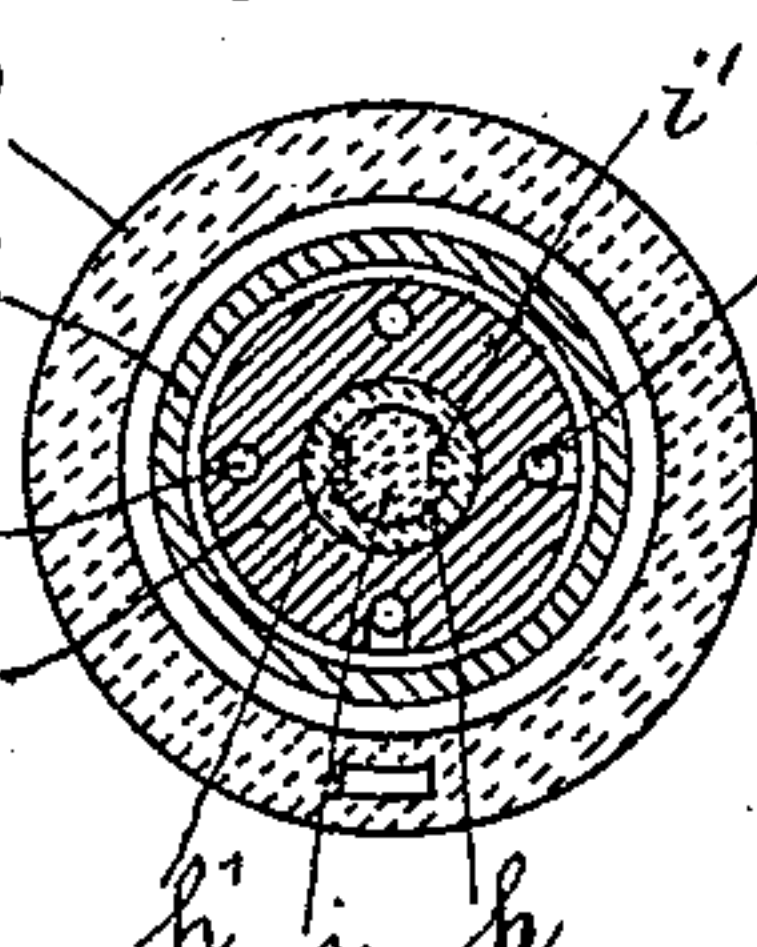


Fig. 5.

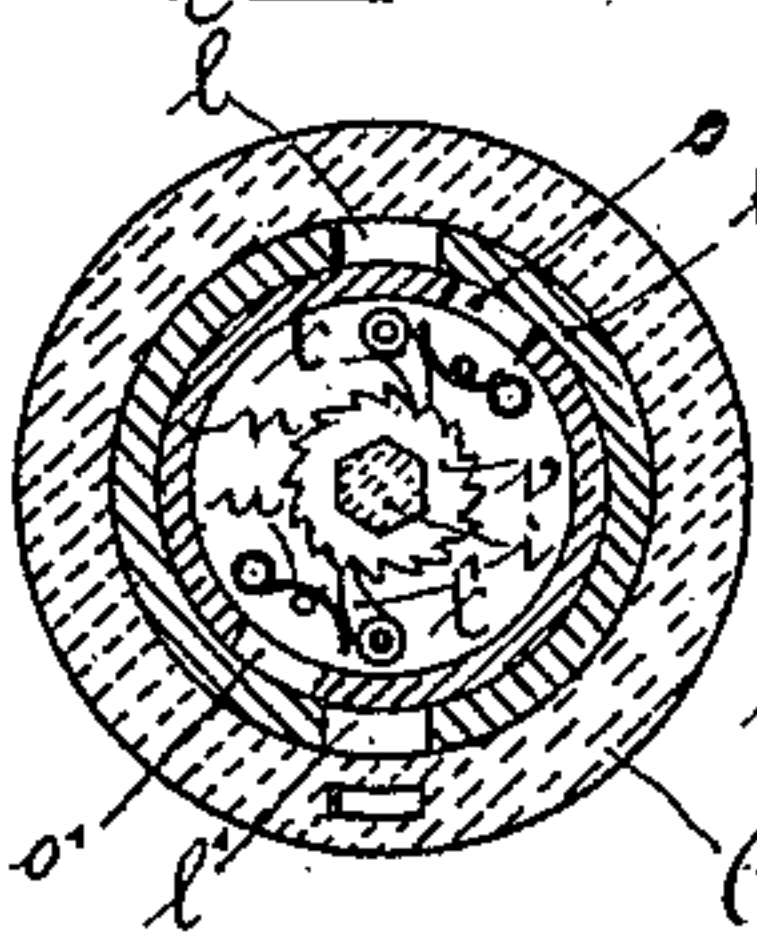
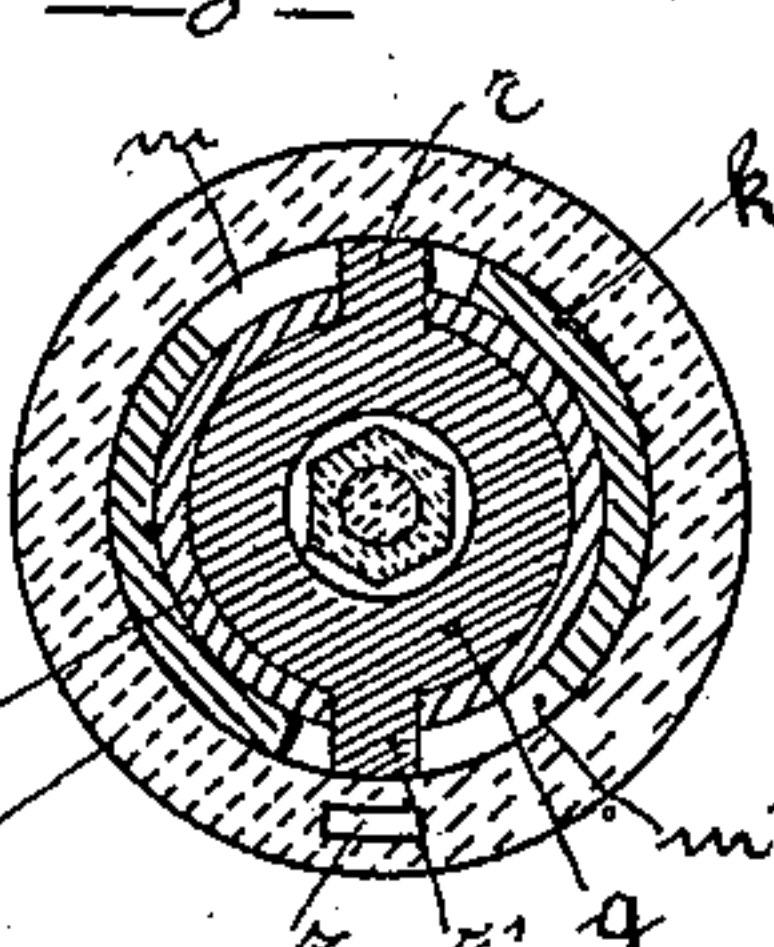


Fig. 6.



Witnesses.

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# UNITED STATES PATENT OFFICE.

CARL FRANKE, OF EISLEBEN, PRUSSIA, GERMANY.

## ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 442,731, dated December 16, 1890.

Application filed June 10, 1890. Serial No. 354,987. (No model.)

*To all whom it may concern:*

Be it known that I, CARL FRANKE, a subject of the German Emperor, residing at No. 30 Breiter Weg, Eisleben, in the Kingdom of Prussia, Germany, have invented a certain new and useful Improvement in Rock-Drills, of which the following is a specification.

This invention relates to motors designed principally to be operated by compressed air or other motive fluid to give a percussive and rotary movement to a drilling-tool fitted thereon.

The improved motor is represented in the annexed drawings, in which—

Figure 1 is a longitudinal section. Figs. 2, 3, 4, 5, and 6 are cross-sections on lines A B, C D, E F, G H, and I K, respectively, of Fig. 1. Figs. 7, 8, and 9 are side elevations of certain parts removed from the motor.

C' is the cylinder of the motor; *f*, the piston sliding therein and having formed or fixed on it the hollow piston-rod *f'*. The piston *f* is made with an annular space surrounding it, and in said space slides an annular slide-valve *b*, having outside around its center an annular flange or projection fitting accurately to the inside of the cylinder C', and inside an annular recess forming a way or passage for the exhaust.

*a* is the compressed-air inlet in the cylinder C'.

*c* is a passage leading through the body of the piston *f* from near the one end of the annular space around said piston to the opposite end of the piston, and *d* is a similar passage from near the other end of the said annular space to the other end of the piston opposite thereto.

*e e'* are passages connecting the inner annular recess of the slide-valve *b* with the interior of the hollow piston-rod *f'*, and *f<sup>2</sup>* is an outlet from the interior of said piston-rod *f'* into the outer air.

The compressed air passes into the working-cylinder C' through the port *a*, thence through the channel *c* behind the piston *f*, and pushes the latter forward simultaneously with the slide-valve *b*. The used air in front of the piston passes through the channel *d* underneath the slide-valve and through the channel *e'* into the hollow piston-rod *f'*, from where it escapes into the open air through

the opening *f<sup>2</sup>*. As soon as during the forward motion of the piston *f* the ring *g* on the slide-valve *b* covers the port *a* the inlet of compressed air is shut off and the piston works now with expansion. When the ring *g* has passed the port *a*, the compressed air passes behind the ring *g* of the slide-valve, and as now a diminution of pressure has taken place in the meantime on the left-hand side of the ring by the expansion of the air the slide is thrown to the left and the action of the piston reversed. The back motion now takes place, the pressure-air surrounding the slide-valve arriving at the front of the piston through the channel *d*, while the previously-used-up air escapes through the channel *c* below the slide *b* to the channel *e* and the hollow piston-rod. The slide *b*, as soon as it has passed the port *a*, is then thrown back again toward the right into the position illustrated.

Rotary motion is given to the piston by the following arrangement. Within the piston slides the arbor *i* with feather and groove *h' i'*, which arbor is turned slightly at each stroke and turns the piston with it. The rotation of the arbor *i* takes place as follows: At the back of the cylinder C' is fastened a small cylinder *k*, preferably screwed into a continuation of the cylinder C'. The cylinder *k* has two oppositely-located longitudinal slots *l l'*, terminating in the cross-slots *m m'* at right angles thereto, Figs. 6 and 8. In the cylinder *k* is the hollow piston *n*, movable at a short stroke. Said piston has two oppositely-located oblique slots *o o'*, and also two pins *p p'*, which latter slide in the slots *l l'* and prevent the hollow piston *n* from rotating during its to-and-fro motion. On the arbor *i* is revolvably arranged a disk *q*, which gears by means of two pins *r r'* through the oblique *o o'* of the hollow piston *n* and into the cross-slots *m m'* of the cylinder *k*. Between the disk *q* and the disk *s*, revolvable likewise on the arbor *i*, are journaled the pawls *t t'*, which gear into the ratchet-wheel *v*, secured on the arbor *i*. The arbor *i* itself is journaled to revolve in the cylinder-lid by means of a band, and is kept in position by a nut *x*. When the hollow piston *n* is moved forward and backward, the disk *q* performs an oscillating motion by the pins *e e'* of the



latter being forced alternately to the left and right by the action of the oblique slots  $o o'$  and the cross-slots  $m m'$ . This oscillating motion is given to the arbor  $i$  and the piston  $f$  by means of the pawls  $t t'$  and the ratchet-wheel  $v$ , so that the piston can rotate only in one direction. The to-and-fro motion of the hollow piston  $n$  is also operated by means of air-pressure. When the latter pushes the piston  $f$  forward, it drives also the hollow piston  $n$  backward, traveling through the channels  $y y'$ , while the air located behind  $n$  escapes through the channel  $z$  and through the channel  $d$  underneath the slide  $b$ . When, on the contrary, the pressure-air pushes the piston  $f$  back, the former travels also through the channel  $z$  and pushes the piston  $n$  forward.

I claim—

1. In a motor, the combination, with the cylinder  $C'$ , having the lateral inlet-port  $a$ , of the piston  $f$ , with contrary passages  $c$  and  $d$  therein, and the annular slide-valve  $b$ , adapted to slide on said piston and having the ring  $g$  thereon, for the purpose set forth, the hollow piston-rod  $f'$ , with outlet  $f^2$  and passages  $e e'$ , the whole substantially as illustrated and described.

2. In a motor, the combination, with the cylinder  $C'$  and piston  $f$ , sliding therein, of a shaft  $i$ , rotarily journaled in the cylinder-head and tongued to said piston, a cylinder  $k$ , having slots  $m m'$  in the wall thereof, a piston  $n$ , movable longitudinally in said cylinder  $k$  and having inclined slots  $o o'$  in the walls thereof, a disk  $q$ , having lugs  $r r$  engaging in said slots  $m o m' o'$ , respectively, ratchet-wheel  $o$  on shaft  $i$ , and a pawl or pawls on said disk  $q$ , adapted to rotate said ratchet-wheel, for the purpose set forth.

3. In a motor, the combination of the cylinder  $C'$ , the piston  $f$ , sliding therein, the shaft  $i$ , rotarily journaled in one of the cylinder-heads and tongued to said piston, passages  $y$  in said cylinder-head, the cylinder  $k$ , fitted into an extension of the cylinder  $C'$ , a piston  $n$ , sliding in said cylinder  $k$  and connected to rotate the shaft  $i$ , and a passage  $z$  in said cylinders  $C'$  and  $k$ , the whole substantially as and for the purpose set forth.

In witness whereof I have signed this specification in presence of two witnesses.

CARL FRANKE.

Witnesses:

CARL BORNGRAEBER,  
BERNH. REINS DORF.