S. F. Schoonmaker.

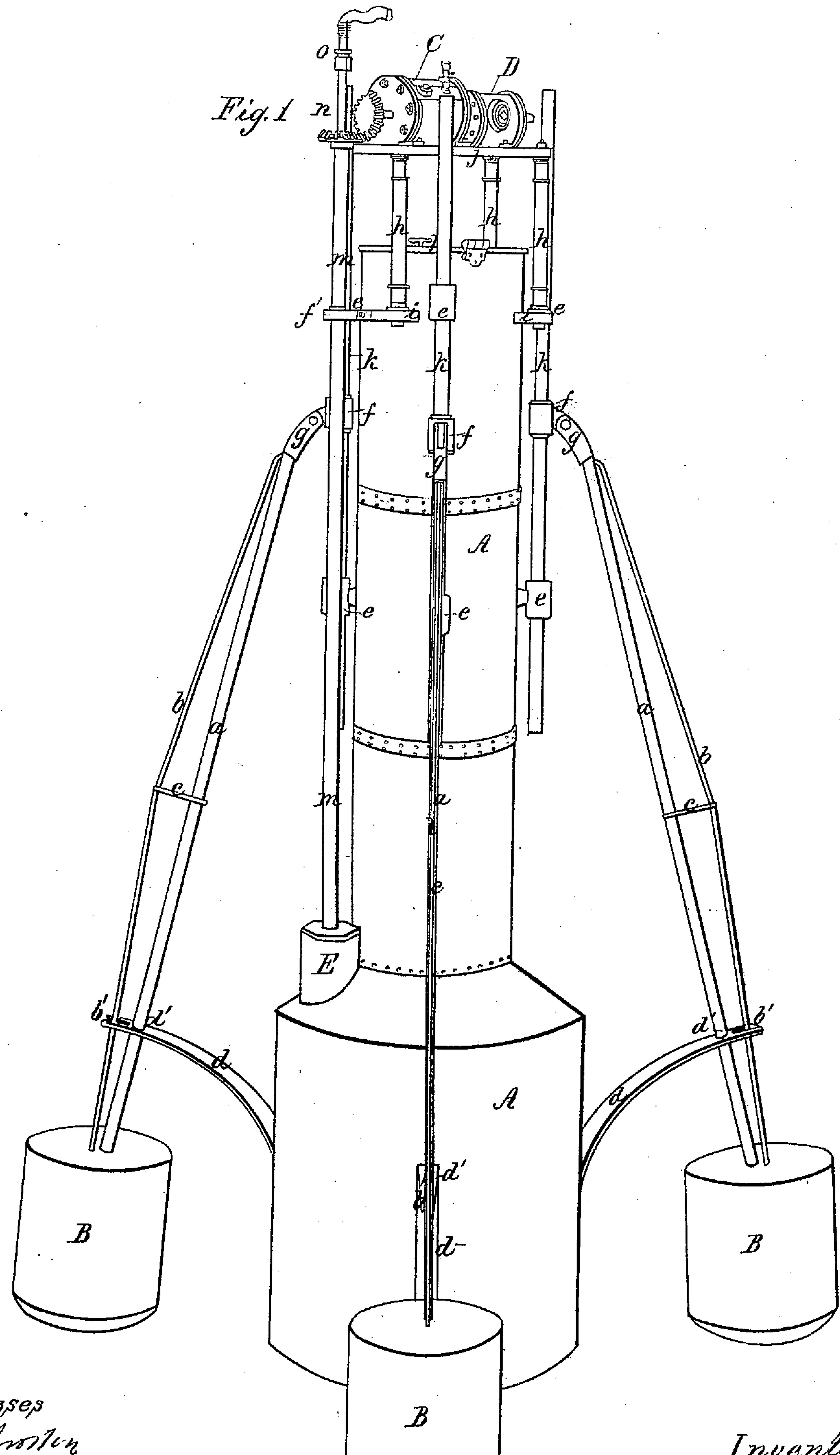
Sheet 1-2 Sheets.

Rock-Drilling Mach.

No. 96,735.

Patented Nov. 9, 1869.

Fig. 1



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Rock-Drilling Mach.

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Fig. 2

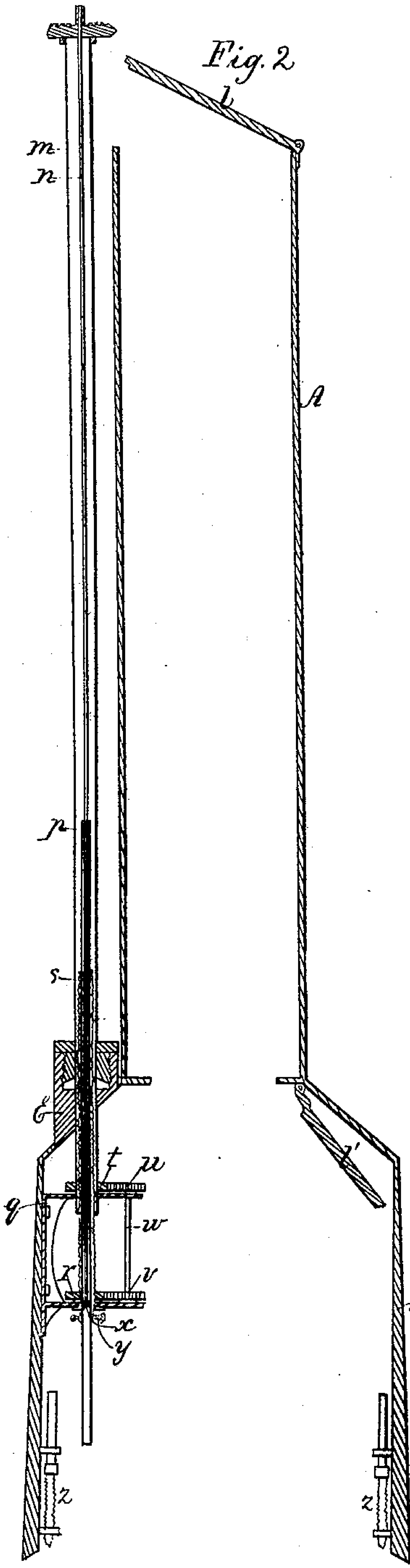
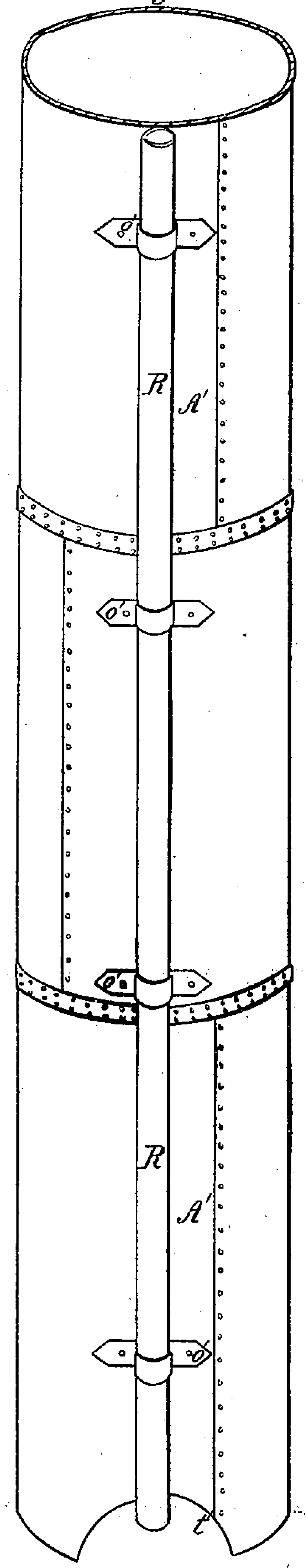


Fig. 3



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S. FRANKLIN SCHOONMAKER, OF NEW YORK, N. Y.

Letters Patent No. 96,735, *dated November* 9, 1869; *antedated November* 3, 1869.

IMPROVED SUBMARINE ROCK-DRILLING MACHINE.

The Schedule referred to in these Letters Patent and making part of the same.

To whom it may concern:

Be it known that I, S. FRANKLIN SCHOONMAKER, of the city, county, and State of New York, have invented a new and useful Apparatus for Drilling or Perforating Rocks Under Water; and I hereby declare that the hereinafter-contained representation is a true and exact description thereof, reference being had to the accompanying drawings, numbered Figures 1, 2, and 3, on sheets 1 and 2.

The object sought to be attained by this invention is to render the process of blasting submarine rock (which has heretofore been uncertain, difficult, and almost impracticable, on account of the enormous expense,) certain, and as practicable, and nearly as cheap as blasting on land.

Heretofore steam-power has not been used in drilling holes in submarine rock, perhaps because of the difficulty of securing the stability of the machinery involved, except by the employment of extensive framing, with the necessity of tearing away the whole structure when the blast is to be exploded.

It has been sought, in this invention, to combine in one machine the necessary parts to the employment of steam-power, so that the power and the means of transmitting it to the point to be operated upon should be invariable to each other, and, at the same time, making its application possible and practicable by the use of other parts, to render the perfect stability and steadiness of the whole attainable.

In order that others familiar with the operations connected with blasting may be able to understand, construct, and use the machinery or apparatus of my invention, reference is made, in my explanation thereof, to the drawings hereto belonging, where, in sheet 1, I have given a perspective view of the more desirable form of the whole machine; and, in sheet 2, I have given, in fig. 2, a vertical section of the body of the machine represented in perspective in fig. 1; and, in Figure 3, I have given a perspective of a cylindrical support or body which may be advantageously employed in certain situations or in particular cases.

On sheet 1—

A A represent the body of the machine, which is made of boiler-iron, or boiler-iron with a cast-iron enlargement for the base, in which case the base will have a diameter, inside, of about four feet, while the upper portion of the body may be about two feet two inches. The base casting may be made thick, to give weight to the lower end of the body.

Two doors, *l* and *l'*, fig. 2, sheet 2, are fitted to the body, one near the top and the other at the enlarged portion, near the bottom.

A stuffing-box, E, fig. 1, is fitted on the enlarged portion of the body, to receive through it the outer tube, *m*, of the drill-shaft.

Near the upper end of the body A are firmly riveted lugs or projections *i i*, which are preferably welded on a wrought-iron ring or band encircling the body, and strongly riveted to it.

These lugs or projections *i i* form supports for the columns *h h h*, to which is firmly attached the engine-frame *j*.

The engine C is a small rotary one, the shaft of which is also the shaft of the rotary air-pump D, which has, therefore, the same centre of motion as the said engine.

The outer tube *m* of the drill-shaft passes, near its upper end, through a journal-box, *f'*, and down through the stuffing-box E into the enlarged portion of the body of the machine.

This tube has a mitre-wheel gearing at its upper end, by which it receives a rotary motion from the engine

There are two mitre-wheels at the upper end of the drill-shaft, one of which is not shown in the drawings, either of which, by means of a clutch-arrangement, is put in gear with the engine at pleasure, thus reversing the motion of the drill.

A small tube, *n*, is carried down the centre of the tube *m*, and, being rigidly secured in the top of the tube *m*, it passes upward through the axes of the mitre-wheels, and is fitted with a small stuffing-box, *o*.

The portion below the said stuffing-box revolves with the tube *m*, while, to the portion above, which is stationary, a short, flexible tube is attached to supply water to the drill below, through the said tube *n*.

It will be seen, on referring to fig. 2, sheet 2, that there are two other tubes, S and P, within the tube *m*. The offices of these tubes will now be explained.

Within the enlargement of the body A, and attached to one side of it, is a double bracket, *q*.

The upper support of this bracket forms a bearing for the lower end of the tube *m*, which first passes through it, downward.

Firmly fixed on the tube *m*, and resting on the upper support of the bracket, is a gear-wheel, *t*.

This wheel *t* causes to revolve another wheel, *u*, fixed upon a short shaft, *w*, the upper end of which has a bearing in the upper support of the bracket, while the lower end carries a gear-wheel, *v*, having a bearing in the lower support of the bracket.

The tube *s* is about four feet long, and has a thread cut upon it. It slides freely up or down within the tube *m*, but has a groove cut down its length, across the threads, and a feather within the lower end of the tube *m*, working in this groove, causes the tube *s* to revolve uniformly with the tube *m*.

The lower support of the bracket *q* has fitted in it a wheel, *r*, in such a manner that the said wheel is free to revolve in a horizontal direction, but has no motion upward from the bracket, because of a collar which projects outward below the bracket from the bearing of the wheel.

The axis of this wheel *r* has a thread in it, which takes the thread on the tube *s*.

It will be seen that by the revolution of the tube *m*, carrying the wheel *t*, motion is communicated to the equal-wheel *u*, and, through it, to the wheel *v*, on the lower extremity of the same shaft with it.

The wheel *v* communicates motion to the wheel *r*, which, being slightly larger than the equal-wheels *v*, *u*, and *t*, revolves in the same direction as, but more slowly than the wheel *t*.

This retard of the motion of the wheel *r* causes the threaded tube *s* to advance slowly downward, while, by means of the groove and feather, it has the same rotary motion as the tube *m*.

The tube *s* is fitted, at its lower end, with pins *y*, or a chuck, by which it grasps firmly a light, smooth tube, *p*, which passes upward and downward through it.

This tube *p* is the immediate tube, to which, at its lower end, is fixed the ring, stock, or tool containing the diamonds, or is fitted with other hard minerals for boring the rock.

By means of the pins or chuck *y*, the drill can be extended or let out, downward from the tube *s*, as the hole being drilled becomes of increasing depth.

Water to wash away the debris is supplied to the drill from the top of the machine, through the already-described small tube *n*.

This tube passes down within the tube *p*, extending downward as low as, or a little lower than the lower support of the bracket.

It has fitted to its lower end a conical leather mouth, *x*, by which, under the pressure of the water passing downward through it, it hugs the interior of the tube *p*, and prevents the escape of the water at that point, thus causing the water to pass down within the tube *p* to the cutting-edges of the tool at its lower extremity.

The body A A of the machine is provided with adjusting-screws *z z z*, which are used, when the body stands on rugged or shelving rock, to fix its rest and steady the working of the drill.

An indispensable requisite in apparatus or structures for operating in water of considerable depth, is a great stability. This is absolutely necessary, not only to protect the lives of those who are often required to descend many feet below the surface of the water, as in coffer-dams, and in excavations for sinking cylinders for foundations by the atmospheric system, but also to secure certainty of operation, and avoid the great delay and still greater expense attending the collapse or carrying away of the structure or apparatus.

In operating upon submarine rock, which is usually a ridge or series of ridges or reefs, and often exceedingly irregular, if it is sought to give to the body of the machine or apparatus, within which the water is to be excluded by air-pressure, a sufficient breadth of base to realize the proper stability, the whole, to overcome the buoyancy of the water, must be of great weight and unwieldy proportions, so as to become, in effect, a structure, instead of an efficient and portable machine. Besides, in such cases, the base, having no means of accommodating itself to the irregularity of the rock, except by inclining the whole structure from a perpendicular, in proportion to the degree of shelving or inclination of the rock itself, the use of such apparatus upon submarine rock has been so nearly impracticable, that the operation of submarine drilling has been a work quite too bold for contractors to undertake with any reliability of either effort or estimate.

To reduce such apparatus to a machine, light and readily portable, capable of an upright position, whatever may be the irregularity of the rock, and with a stability which insures steadiness and security, the body A is guardedly made a cylinder of small diameter, even at the base, while at its top it may be reduced to a size only sufficient to permit the entrance or exit of the workman who operates the machine.

To this body, at its base, are firmly secured the curved arms *d d d*.

These arms have holes *d′ d′ d′* through them, at a distance from the body A, horizontally, of six feet, more or less.

Through these holes *d′ d′ d′* slide freely the legs or stays *a a a* of the machine.

These legs themselves are stiffened by the braces *b b b*, through the medium of the cross-braces *c c c*.

The braces *b b b* freely slide through the slots *b′ b′ b′*, in the noses of the arms *d d d*.

At the lower extremity of the legs *a a a* are attached heavy weights B B B. These weights are preferably made of a shell of cast-iron and filled with lead, so as to admit of being made either lighter or heavier, according to the requirements of the situation or the strength of the current of the water. Their weight may be from one-half to two tons, more or less.

The upper extremities of the legs *a a a* are formed with joints *g g g*, by which they are attached to the thimbles *f f f*.

These thimbles hold firmly the sliding bars *k k k*, which slide vertically through the eyes *e e e e e e*.

These eyes *e e e e e e* are securely attached to the body A, or to wrought-iron rings encircling it.

The eyes, near the top of the body A, are fitted with binding-screws, which are screwed inward against the sliding bars *k k k*.

When the machine has been placed upon the rock, and the legs *a a a*, with the weights B B B, have accommodated themselves to the irregularities of the bottom, the whole machine is suspended and lowered to its position, or moved from one position to another, by means of chains, through the agency of clevises attached to the upper extremities of the sliding bars *k k k*.

Fig. 3, sheet 2, represents a columnar and tubular support for the drill and its necessary machinery, which is not provided with doors, as is the body A, in fig. 2, at *l* and *l′*. In this case it is not intended to exclude the water, as in figs. 1 and 2.

The engine and drilling-apparatus are fitted with a revolving base upon the upper end of the column A′, and the drill is swung round, at pleasure, over the tube R R, and works downward through it.

The tube R R may be fixed, by the straps *o′ o′ o′ o′*, either outside or inside of the column A′, which is cut away at its bottom, as shown at *t′*, for the purpose of allowing the proper insertion of the charge into the hole, and preparing it for firing.

To accomplish this, a diver descends within the column A′, unexposed to the violence of the current, and with the ease and certainty of charging the blast quickly and efficiently.

Legs, each with independent means of adjustment, may be used, as in fig. 1, sheet 1.

The operation of the machine, as shown in figs. 1 and 2, will be readily understood.

The air-pump D has a tube connecting it with the lower part of the interior of the body A.

The door *l′* having been closed previous to lowering the machine, the upper part of the body A is already full of air.

When the machine, suspended from a derrick built upon a scow or barge, has been lowered upon the rock; and the binding-screws, in the eyes *e e e*, set, the workman descends into the body A, and closes the door *l*.

Steam is admitted to the engine by a flexible conductor from the barge or scow, and the drill being disconnected, the air-pump is set in action, driving out the water from the base of the body A.

The workman first opens a cock, to equalize the air between the upper and lower parts of the body A, and then opens the door l' and proceeds to set the drill to its work, having control of the steam-valve to the engine by means of a simple device readily understood.

Having thus explained the nature and operation of the apparatus shown in the drawings, I wish it understood that I do not claim the double doors to the body A, nor any peculiarity of the gearing by which the feed of the drill is obtained; but

What I claim as new and patentable, is—

1. In submarine apparatus, supporting a rotary rock-drill, fitted with diamond cutting-edges, upon or within a tube, open or otherwise, one end of which rests upon or near the rock to be drilled, while the other extends above the surface of the water, in manner as and for the purpose specified.

2. A tube or hollow cylinder, when forming a base or support for a steam or other motor engine, the two being combined in a fixed relation to each other, and forming parts of a submarine rock-drilling machine, substantially as and for the purpose specified.

3. The combination of the engine, hollow cylinder, and a rotary drill, when related to each other, and operating in manner and effect substantially as shown.

4. Providing the lower end of the said hollow cylinder with adjusting-screws, in effect as, and for the purpose herein explained.

5. In apparatus for submarine operations, a tripod or multipod, whose legs, inclining inward and upward toward each other, have each independent means of adjustment, vertically, in substance as shown.

6. In submarine rock-drilling apparatus, adjustable legs, when having anchors or weights attached at or near their lower extremities, substantially as and for the purpose specified.

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Witnesses:

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A. MARTIN.