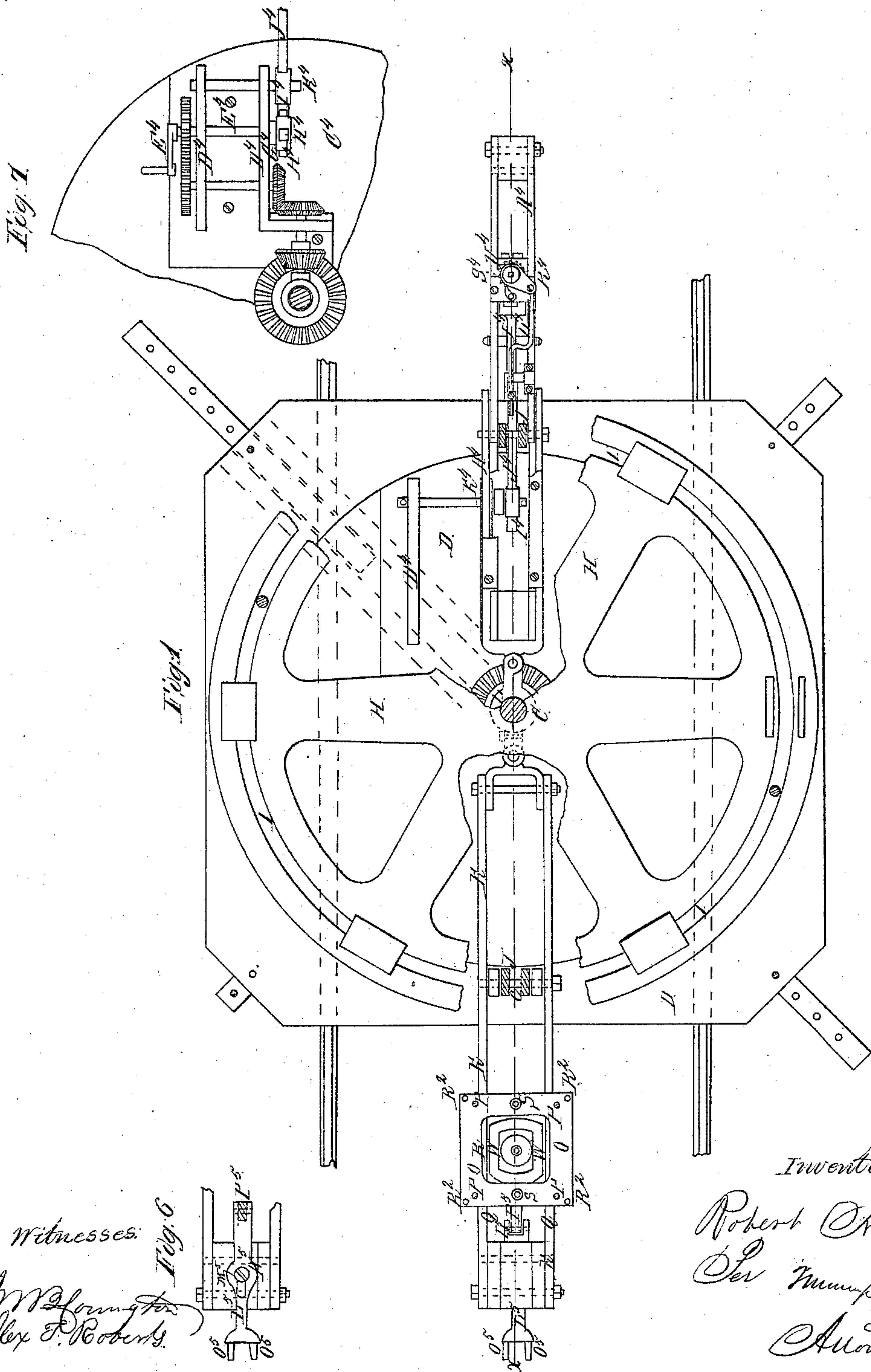


R. Mitty,
Stone Drill.

2 Sheets, Sheet 1.

N^o 58,175.

Patented Sep. 18, 1866.



Witnesses:
J. W. Lorington
Alex. F. Roberts

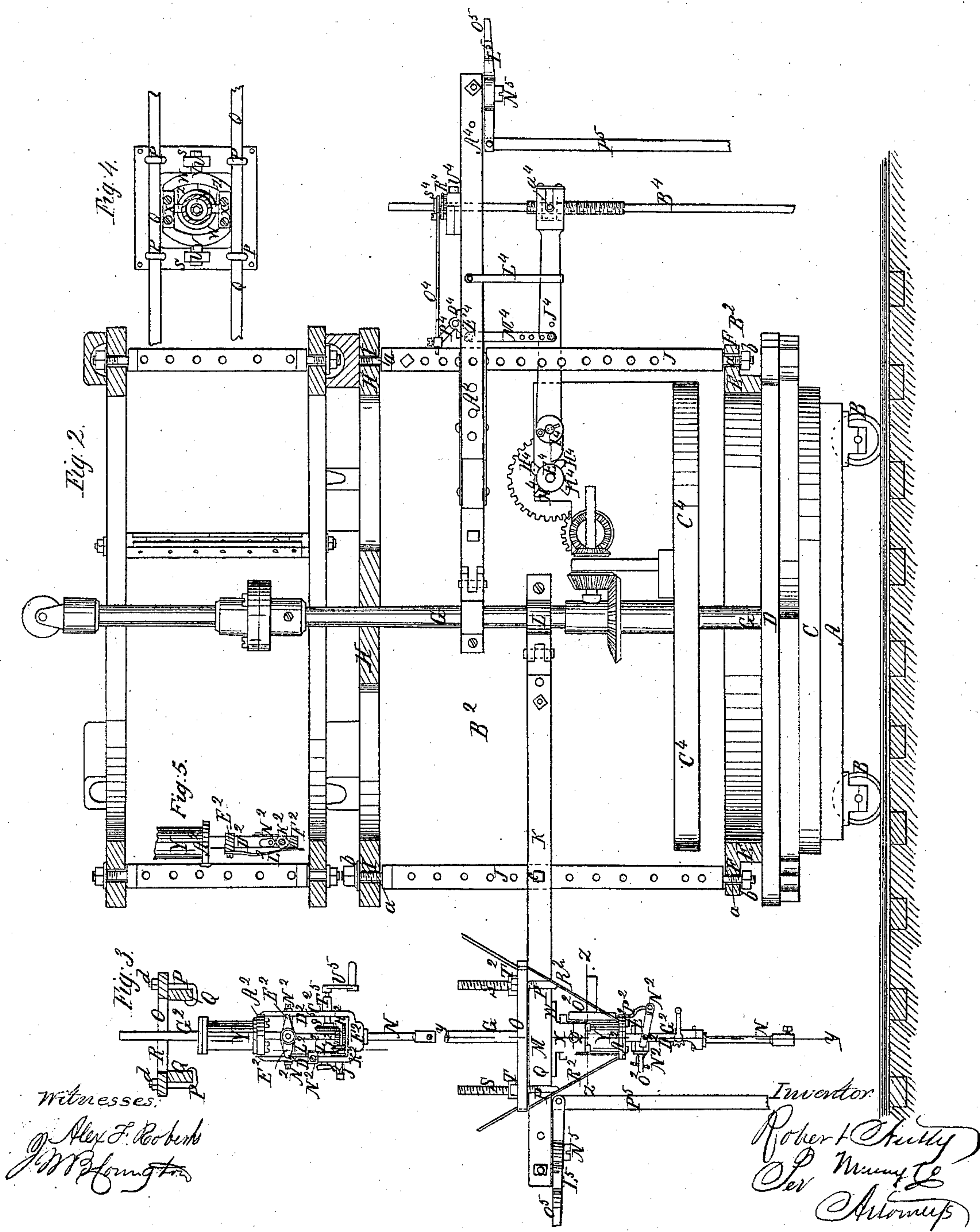
Inventor:
Robert Mitty
Per Munnell
Attorneys

P. Muttys,
Stone Drill.

2 Sheets, Sheet 2.

N^o 58,175.

Patented Sep. 18, 1866.



UNITED STATES PATENT OFFICE

ROBERT NUTTY, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND JOHN SCOTT, OF SAME PLACE.

IMPROVED DRILLING-MACHINES.

Specification forming part of Letters Patent No. 58,175, dated September 18, 1866.

To all whom it may concern:

Be it known that I, ROBERT NUTTY, of the city, county, and State of New York, have invented new and useful Improvements in Drilling-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

As is well known, the chief and most important expense in quarrying is the boring of the holes necessary for the insertion of the charge, and when the rock is very hard this is not only a slow and tedious operation, but also very expensive, thereby rendering any practical contrivance or machine for facilitating it or for abridging the time required for its performance very desirable and of decided importance and advantage.

To produce a machine for quarrying purposes, more especially by means of which the holes for the blasting-charges could be drilled, has long been desired, and in those machines which have heretofore been experimented with and used in and for quarrying, owing to the continual and irregular change and variation in the face of the quarry, occasioned by the blasting, the greatest difficulty has been experienced in properly bringing the drill or drills used to bear against the face of the quarry, in many cases it being impossible to obtain the desired adjustment of the drill, and consequently rendering the machine at times, and in the majority of cases, useless and of no avail, the advantages gained by such machines hardly compensating for their cost and the trouble and annoyance experienced in their use and operation.

In the machine embraced in the present invention the drill or drills are so hung and arranged that, whether to operate or work against the face of the quarry or rock in a vertical, horizontal, or in any plane between the two, it can be readily adjusted and brought to the proper position therefor, and when in any of such positions be operated in the desired manner, as will be obvious from the following detailed description of the machine, as well as of the manner in which it is used, the drilling-machine being adapted to any and all species of

rock-work, in addition to quarrying—such, for instance, as tunneling, mining, sewerage, and submarine drilling.

In accompanying plate of drawings my improved drilling-machine is illustrated.

Figure 1, Plate 1, is a plan or top view of the machine, with portions broken out to more fully show it; Fig. 2, Plate 2, a longitudinal vertical section taken in the plane of the line $x x$, Fig. 1, Plate 1; Fig. 3, Plate 2, a vertical section taken in the plane of the line $y y$, Fig. 2, Plate 2; Fig. 4, Plate 2, a horizontal section taken in the plane of the line $z z$, Fig. 2, Plate 2; Fig. 5, Plate 2, and Figs. 6 and 7, Plate 1, detail views to be hereinafter referred to.

Similar letters of reference indicate like parts.

A in the drawings represents the platform of the machine, which is supported upon four or more wheels, B, like the platform of an ordinary railway-car, and is to be of suitable shape and size to sustain the various working parts and frame-work of the drilling-machine, which are to be soon explained; B² B², the frame-work of the machine, the lower portion of which consists of a circular disk, C, to the upper side of which is secured a platform or table, D, having fixed or attached to its upper side a raised annular ring-flange, E, having an annular slotted ring, F, with tie or link pieces at suitable points of its slot; H, a circular disk, placed above the slotted annular ring F, and in a plane parallel therewith, which disk at its center is secured to a center vertical shaft or mast, G, passing down through the lower parts of the frame-work into suitable bearings of the platform A. The disk H has a slot, I, extending entirely around it, which slot is in a corresponding vertical plane to the slotted ring F, and both are at all points at equal distances from the center shaft or mast, G, or, in other words, concentric therewith. Between the slotted ring F and disk H are uprights J, at suitable distances apart to sufficiently brace and support the upper disk, H, which uprights are arranged by the pins a of their two ends in the slots of the said disk and ring, thus enabling them to be moved around upon the same and brought to any desired point thereof, where, by screw-nuts b , or other suitable means, they may be

securely fastened. K, a boom or arm, that by means of a clamp, L, at one end is secured to the center mast or shaft, G, between the disk H and platform, and, extending in a radial line, is hung, by a bolt, c, passing through it, to one of the uprights J, beyond which it projects, and has hung to its outer end, M, a drill-rod, N, the peculiar arrangement and manner of operating which will be now described.

O is a plate placed upon the upper side of the boom K, where it is held by means of bolt-hooks P passing through the same and around the bars Q of the boom by their hook ends, on which bolts nuts d are screwed, firmly and tightly binding the plate to the boom. The central portion, R, of the plate O is cut out, and through it loosely pass two vertical screw-rods, S S, that upon their upper ends have screw-nuts T², and in the eyes U of their lower ends (see Fig. 4) have hung the trunnion-pins V of a frame or yoke, W, in the arms X, upon the lower side of which the upper end of a steam-piston cylinder, Y, is suspended by its trunnion-pins Z Z upon opposite sides of the cylinder, and at points diametrically opposite each other, the said yoke or frame W and piston-cylinder swinging in planes at right angles to each other.

To the lower head, A², of the piston-cylinder a vertical frame, C², is secured, consisting of two parallel uprights, D², and end piece or bar F², between which uprights is arranged a sliding head, E², so as to move and slide upon the same; G², a hollow piston-rod or tube passing up through the center of the piston-cylinder and each head of the same, to which rod the piston-head is secured, as in ordinary piston-cylinders of steam or other engines. This rod G² at its lower end is secured to the sliding head E², so that as the rod is moved up and down by the action of the steam admitted to the piston-cylinder in any proper manner, the sliding head will also be carried up and down with it, playing upon the guide-bars of the frame C².

Through the center of the rod G² the drill-rod N is passed, and down through the sliding head E², in which, by its screw-threaded portion, it screws, and from thence down loosely through the cross-bar F² of the frame C², hereinbefore referred to, with a socket in its lower end suitable for receiving a drill.

The drill-rod N is made of a square or other suitable shape, and has a loose small bevel-pinion wheel, H², through which the rod can loosely play, but yet be turned by it as it is revolved through the small bevel-pinion I², turning, by its spindle J², in bearings of one of the uprights D².

K² is a ratchet-wheel, secured to pinion I², with the teeth of which ratchet engages the spring hook or pawl L², secured to the sliding cross-head E²; M², a spring-pawl, fastened to upright D², which pawl is engaged with the opposite side of the ratchet-wheel K² to that of the spring-pawl L²; N², a square-shaped frame or yoke, hung so as to swing upon the

uprights D², which frame, upon one side, is engaged with the arm O² of the sliding cross-head E², so that as such cross-head moves up and down the frame will spring upon the uprights D², to which it is hung, and thus move the spindle or shaft P² into or out of the valve seat or box Q², attached to one side of the piston-cylinder.

From the above description of the manner in which the piston-cylinder is hung in and to the outer end of the boom, it is plainly apparent that it can be swung into any desired position with regard thereto, and also either raised or lowered at pleasure, and there secured by adjusting the suspension chains or wires R², extending from the plate of the boom to the lower end or head-plate of the piston-cylinder; and, furthermore, the position of the piston-cylinder on the boom may be changed at pleasure by simply loosening the nuts that hold the plate in which it is hung to the boom and then sliding such plate along and upon the boom until, having brought it to the desired position, it is there secured by tightening the said nuts, thus causing the bolt-hooks to firmly grasp the side bars constituting the boom.

As the piston-cylinder is thus susceptible of being swung and brought to various positions upon the boom to which it is hung, it is obvious, if a connection between the cylinder and a steam-generating apparatus be made, that will admit of such change in position and adjustment of the cylinder—as, for instance, through a flexible conducting pipe or tube—that the drill-rod can be made to move or act against the face of the quarry in any desired direction, whether in a vertical or horizontal plane, or in any plane between the two, according as it may be necessary to accommodate it to the direction or course of the layers or laminae of the rock; and that, furthermore, if the clamp by which the boom is clamped to the center mast or shaft be loosened, as well as the upright to which the boom is hung, the boom can be swung around upon the framework of the machine, so that its drill can be brought into position to operate against the side of the quarry, whether to the right or left, the importance of which is obvious.

In lieu of using steam as the motive power for the drill, atmospheric air may be employed, or any other suitable motor, and therefore I do not intend to limit myself to any particular power to be used, so long as that power is communicated to or connected with the drill in any suitable manner that will permit the drill to be adjusted in position, as above explained, and yet be operated thereby.

Although only one boom with its drill has been described as connected with the center mast of the machine, it is obvious that more than one may be employed and arranged within the frame-work of the machine, so that any desired number of drills may be working or in operation at one and the same time.

As the drill-rod is operated by the forward

and backward play of the piston within its cylinder, it is partially rotated upon each stroke by the action of the spring hook or pawl L^2 attached to the sliding cross-head E^2 upon the ratchet-pinion I^2 , interlocked or engaged with the bevel-pinion wheel on the drill-rod, the object of which is to cause the drill to properly act upon the rock to drill a perfectly round hole therein.

It may be here remarked that it is plainly obvious from a close examination of the turning motion of the drill that the hole produced by it must be perfectly round, and with no projections or depressions, as are left by all drills if turned irregularly, such projections and depressions being in most cases the principal cause of the drill breaking; and, furthermore, to alter the speed at which the drill is turned, it is only necessary to raise or lower the spring hook or pawl L^2 , attached to the cross-head E^2 , the spring for this purpose being secured to the said cross-head by a slot and set-screw, or in any other suitable manner therefor.

In order to increase the efficiency of the machine two or more tiers of drills may be arranged one above another; but I do not think more than two tiers will be required or rendered necessary for ordinary quarry work.

In addition to the boom or arm of the machine carrying a drill which is arranged to be worked by steam, air, or other similar power, I have similarly hung another boom or arm, A^4 , to the frame-work, on which boom a drill-rod, B^4 , is hung, as will be now described, as well as the manner in which it is operated.

C^4 is a platform, placed just above the main platform of the machine, turning upon the center mast or shaft, G . To this platform are secured two upright frames, D^4 D^4 , across which extends a horizontal shaft, E^4 , turning in bearings of each of the same. On one end of this shaft E^4 is a crank-handle, F^4 , for convenience in turning it, and on its other end a wheel, G^4 , having a series of teeth, H^4 , that in turn, acting against the inner end, I^4 , of a lever or beam, J^4 , hung upon a fulcrum at K^4 of the platform C^4 , depresses such end of the beam, consequently lifting its outer end and the drill-rod B^4 , hung by its trunnion-pins a^4 in the slotted arms or ends of the beam, when, the wheel-tooth having passed by the beam J^4 , the outer end of the beam then falls by its own weight, bringing the drill to bear against the rock that is to be drilled, the play of the beam in a downward direction being limited by the frame L^4 , secured to the boom.

To rotate the drill-rod as it either moves up or down, or both, I have pivoted to the walking beam or lever J^4 one end of a connecting bar or rod, M^4 , the other end of which is hung to one arm, N^4 , of a double-crank shaft, O^4 , turning in bearings of the boom, the arm P^4 of which is connected through a rod, Q^4 , upon the upper side of the boom to the crank-arm R^4 , hung upon a loose collar, S^4 , upon the square portion of the drill-rod. To the under

side of this crank-arm R^4 a spring-pawl is hung that engages with the ratchet-teeth U^4 , formed around the loose collar S^4 , hereinbefore referred to, which pawl, through the movement of the parts connecting it with the walking-beam, rotates the ratchet-wheel, and through it the drill-rod, each time the said beam is raised and drops or falls, as hereinbefore explained. This boom or arm, having the drill-rod B^4 hung in it, as above described, is susceptible of being moved about and around in the frame-work of the machine, and brought either to the right or left and front or rear side of the same, according as may be necessary for the operation of the drill against the rock of the quarry.

To the under side of the outer end of each boom an arm, L^5 , is hung by its elongated slot M^5 over and upon a square-headed pin or stud, N^5 , one end of which arm is made or provided with two forks or prongs, O^5 , and to the other a long lever or bar, P^5 , is pivoted, the use of this pronged or forked arm and bar P^5 hung to it being for and as a means of bracing the boom in position as the drill of the boom is worked or operated.

In the use of the drilling-machine hereinabove explained, it is intended to place the engine from which the power is transmitted to the drill through flexible connecting pipes or tubes upon the platform of the machine, so that the whole can be run out of and away from or into the quarry, according as may be desired or necessary, the machine by its car-wheels running upon any suitable rails laid upon the ground in any proper manner.

There are many ways in which the booms holding the drills can be constructed to allow of their being extended or lengthened and shortened at pleasure; and, furthermore, there are various modes by which the booms can be adjusted in height according as may be necessary, the above adjustments of the booms being susceptible of being accomplished without regard to the many adjustments of the drills, as is obvious by an inspection of the drawings.

With slight changes or modifications in the machine, it can be adapted to various styles of rock-work, such as tunneling, sewerage, submarine work, &c., as well as to drilling in a quarry, and therefore I do not intend to limit myself to any one particular use or purpose to which it may be applied or be adaptable, the present invention principally consisting in hanging the drills in such a manner to the boom and in so operating it that whether working in a horizontal or vertical plane, or in a plane between the two, it can be brought to bear against the rock or quarry in a proper manner to drill the same.

It may be here remarked that by means of the screw-thread upon the drill-rod, in each case, the drill-rod, as it is turned by the action of the devices arranged therefor, is necessarily fed downward as fast as the hole is drilled in the rock, so that when the desired depth has been

reached to run the drill back or out of the hole, a bevel pinion-wheel, S^5 , is hung by its spindle T^5 in one of the side pieces, D^2 , in proper position for meshing with the bevel-gear or pinion H^2 upon the drill-rod, whereby by turning the said pinion S^5 through the crank-handle U^5 of its spindle in the proper direction the drill-rod can be raised or lifted and brought back to its original position, as is obvious without any further explanation.

What I claim as new, and desire to secure by Letters Patent, is—

1. The piston-cylinder of a steam, atmospheric, or other suitable engine, with the piston of which a drill-rod is suitably connected, so hung that it can be adjusted to enable the drill to be brought to bear against the surface of the rock or other surface to be drilled in any desired direction, whether in a vertical or horizontal plane, or in any intermediate plane, substantially as described.

2. A piston-cylinder through which a drill-rod is operated, hung upon the boom or supporting-beam therefor in such a manner that it can be moved thereon and set at any desired position, according to the point of the rock or other surface against which the drill is to act, substantially as and for the purpose described.

3. The pronged lever L^5 , hung to the outer end of the drill-boom, and having an extension-arm, P^5 , swiveled or pivoted to it, substantially as described, and for the purpose specified.

4. The piston-cylinder hung by trunnion-pins to and in a frame, W , that by trunnion-pins is suspended in the eyes of screw-rods S , having screw-nuts T^2 , said screw-rods passing loosely through the boom K , or its equivalent, substantially as and for the purposes set forth.

5. The extension-frame C^1 , secured to the bottom of the piston-cylinder, in which frame slides a cross-head, E^2 , carrying the drill-rod N , and connected with the piston-head of the cylinder, in connection with which it moves, substantially as and for the purpose described.

6. The arrangement of the bevel-pinion H^2 on the drill-rod, ratchet-pinion I^2 , hung in stationary bearings of the frame C^2 , and spring-pawl L^2 , secured to sliding cross-head E^2 , when arranged and connected together so as to operate upon the drill-rod as the cross-head moves forward and backward, substantially as described, and for the purpose specified.

7. The tappet-wheel G^4 , walking-beam J^4 , having drill-rod B^4 suspended in its outer end, connecting link or piece M , double-crank shaft O^4 , rod Q^4 , connected with crank arm S^4 , carrying a pawl, which engages with the ratchet-wheel U^4 of the said drill-rod B^4 , when the several parts are combined and arranged together so as to operate upon the drill-rod, substantially in the manner and for the purpose described.

8. The arrangement and construction of the frame-work of the machine, the same consisting of the parallel horizontal slotted platforms D and H , connected to a common center-post, G , and supported at suitable points by up-rights J , for holding the drill-booms, the whole being supported upon suitable wheels or friction-rollers, and arranged and connected together substantially in the manner described, and for the purpose specified.

The above specification of my invention signed by me.

ROBT. NUTTY.

Witnesses:

ALBERT W. BROWN,
M. M. LIVINGSTON.