(No Model.) 2 Sheets—Sheet 1.

R. DALZELL.

ROCK DRILLING AND TUNNELING MACHINE.

No. 332,592. Patented Dec. 15, 1885.

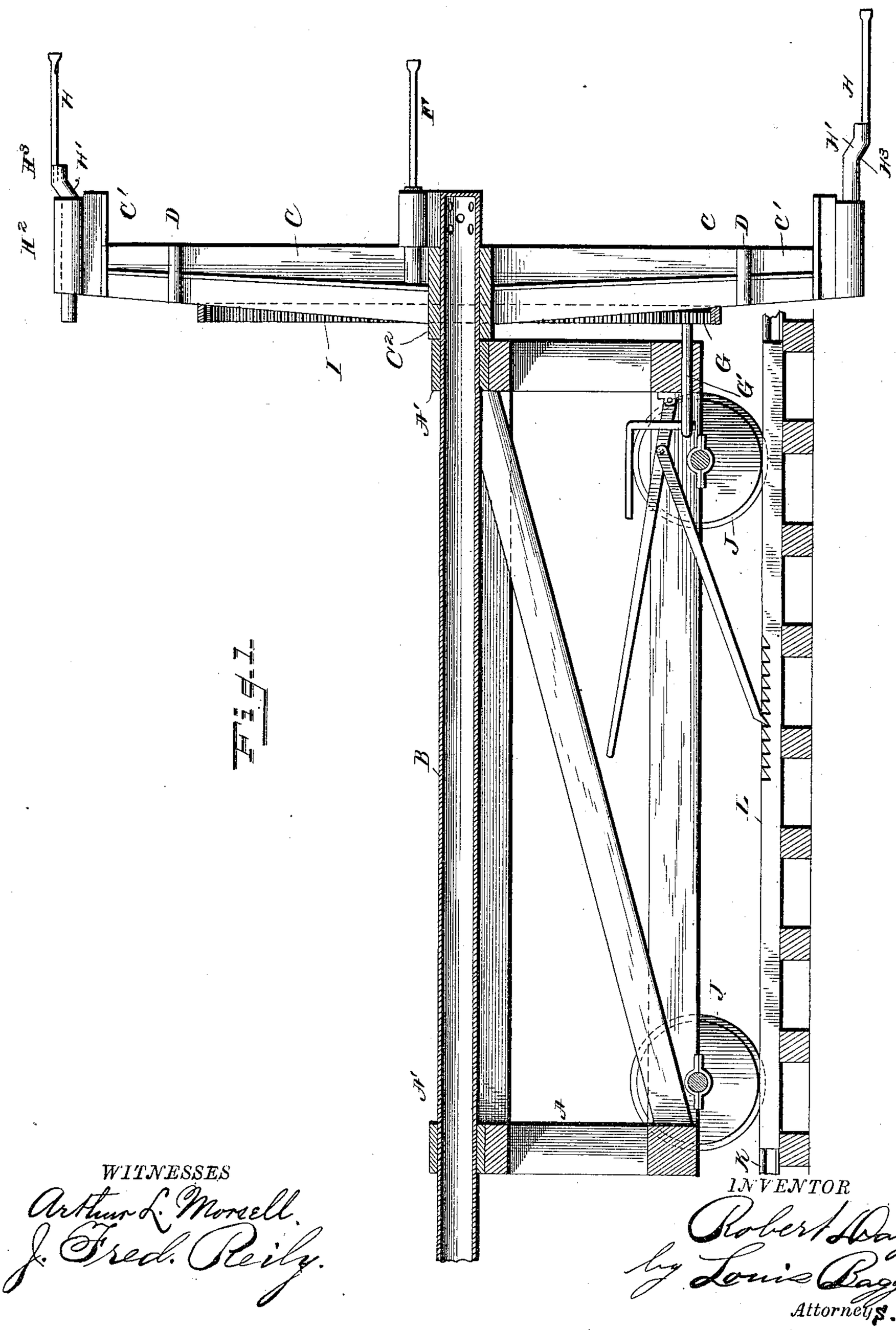

FIG. 1.

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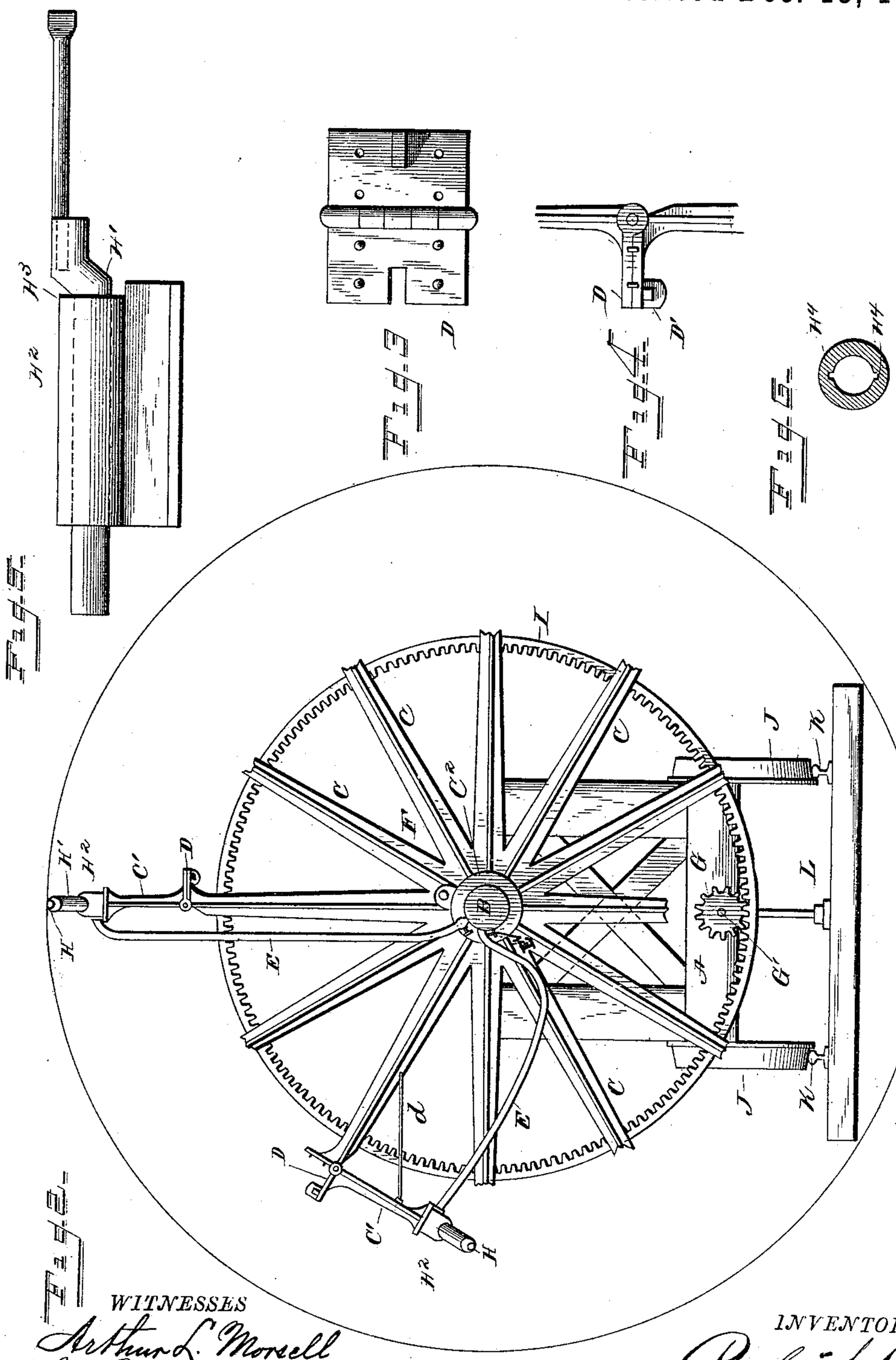

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UNITED STATES PATENT OFFICE.

ROBERT DALZELL, OF WADDINGTON, NEW YORK.

ROCK-DRILLING AND TUNNELING MACHINE.

SPECIFICATION forming part of Letters Patent No. 332,592, dated December 15, 1885.

Application filed September 7, 1885. Serial No. 176,400. (No model.)

To all whom it may concern:

Be it known that I, ROBERT DALZELL, a citizen of the United States, and a resident of Waddington, in the county of St. Lawrence and State of New York, have invented certain new and useful Improvements in Rock-Drilling and Tunneling Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention has relation to rock-drilling and tunneling machines; and it consists in the improved construction, arrangement, and combinations of parts of a machine of this class which will be hereinafter fully described, and particularly pointed out in the claims.

Referring to the annexed drawings, Figure 1 is a longitudinal sectional view of my improved rock-drilling and tunneling machine. Fig. 2 is a front end view of the same; and Figs. 3, 4, 5, and 6 are detail views, the nature of which will be hereinafter described.

The same letters of reference indicate corresponding parts in all the figures.

Referring to the several parts by letter, A represents a suitable frame, which supports in bearings A′ A′ a rotating or oscillating tubular shaft, B, which has secured near its forward end a series of laterally-radiating arms, C, to the outer ends of which are hinged, by means of the connections D, which will be hereinafter described, the short adjustable arms or brackets C′, which carry at their outer ends the reciprocating or rotary drills H, the mechanism of which may be of any well-known construction, and which are connected to the forward end of the tubular shaft B by means of flexible tubing E E, to adapt them to be operated by steam or compressed air fed through the said tubular shaft both simultaneously and independently or separately—that is to say, all of the drills may be, and normally are operated together; but when any of the drills enter a crevice in the rock, and there is danger of its becoming broken, it can be thrown out of operation, or its operation entirely stopped, by cutting off the supply of steam or compressed air from the drill-piston H′, which is effected by closing or shutting off the cock or valve E′, which governs the entrance of steam into the flexible tubing E, each of the said tubes E being provided with a valve, E′, at the point where they communicate with the forward end of the tubular shaft B, as clearly shown in Fig. 2 of the drawings. The adjustable arms or brackets C′ are connected to the outer ends of the radiating arms C preferably by means of the hinge-connections D here shown, the projecting free ends of each of the said hinges being provided, respectively, with a staple and a notch adapted to receive the same, a pin or key, D′, being inserted through the said staple to secure the hinged arm or bracket C′ in its extended position.

Each of the drill tubes or pistons H′, which fits within the sleeve or bearing H^2, is formed near its forward end with the shoulder H^3, which serves to elevate the forward end of the tube or piston slightly above the level of the sleeve in which the tube is seated, so as to raise the drill-bit above the level of the sleeve or bearing H^2, and thereby prevent the said bearing or sleeve from coming in contact with the outer wall of the tunnel or shaft which is being drilled, as will be readily understood.

The hinged arms C′, which carry the drills, may be secured in their adjusted positions by a suitable catch or retaining device, *d*, and it will thus be seen that the diameter of the tunnel being drilled may be regulated as desired.

To one side of the extreme forward end of the tubular shaft B is adjustably secured a rotating or reciprocating drill, F, which is adapted to be operated by the steam or compressed air from the tubular shaft B, and which, as the tubular shaft B is gradually turned or rotated through the mechanism which will be hereinafter described cuts a small circular channel, thereby forming a small central core in the core which is cut by the drills on the ends of the radiating arms to facilitate the blasting out of the said core.

It will be seen that the tubular shaft carrying the drill-supporting arms may be rotated to any extent, this rotation being accomplished by means of a pinion, G, mounted upon a crank-shaft, G′, turning in bearings in the forward end of the frame A, and meshing with the teeth of a circular rack, I, secured to the inner side of the arms C, as shown.

Each of the bearings in which the drill tubes

or pistons H′ are seated is formed with the interior longitudinal grooves or recesses H⁴, (shown in Fig. 6 of the drawings,) in which fit wings or projections formed on the outer surface of the drill-tube, this arrangement preventing the said tubes from turning in the said bearings.

It is obvious that my improved drilling-machine may be mounted in any suitable form of supporting-frame, so as to adapt it not only to work horizontally, as shown in Fig. 1, but also to adapt it to drill in a vertical line for cutting shafts, or it may be employed at any desired angle or inclination.

The supporting-frame A is usually mounted upon wheels J, and the machine then travels upon a sectional movable track, K, having secured between the two rails a rack, L, with which engages the lower end of a pivoted pawl secured to the supporting-frame, this arrangement preventing retrograde movement of the machine when at work.

The hinged brackets C′ may be folded in when it is desired to repair any of the drills or to withdraw the machine from the tunnel being cut.

The inner ends of the radiating arms C are preferably secured to a hub, C², which is in turn secured rigidly near the forward end of the tubular shaft B; or the arms and hub may be formed integral, the arms corresponding to the spokes of a wheel.

If desired, the radiating arms C might be replaced by a suitable wheel carrying on its periphery the rotating or reciprocating drills, the rest of the mechanism being in that case precisely similar to that here shown and described.

From the foregoing description, taken in connection with the accompanying drawings, the construction, operation, and advantages of my improved rock-drilling and tunneling machine will be readily understood without requiring further explanation. When the circular series of drills on the ends of the radiating arms have drilled one series of holes, they are withdrawn from the apertures which they have just formed and the arms are rotated for a short distance by the device previously described, so as to cause the drills to operate between the series of holes first formed, these apertures being formed side by side until the diameter of the shaft has been entirely perforated or cut away, leaving a core, which is then removed by blasting. It will be seen that when any one of the drills enters a crevice or comes in contact with any obstruction which threatens to break it it may be instantly stopped and thrown out of operation, as previously described, by shutting off the feed-cock E′ of its feed-tube E.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a rock-drilling machine, the combination of a suitable frame carrying a rotating or oscillating tubular shaft having near its forward end a series of laterally-radiating arms having adjustably secured to their outer ends one or more reciprocating or rotary drills, with mechanism for operating the same both simultaneously and separately, substantially as set forth.

2. In a rock-drilling machine, the combination, with a suitable frame carrying a rotating or oscillating tubular shaft having adjustably connected to one side of the forward end thereof a rotating or reciprocating drill, of a series of laterally-radiating arms securely attached to said shaft at or near its forward end and carrying at their forward ends a series of rotating or reciprocating drills, and mechanism for operating the same both simultaneously and separately, substantially as and for the purpose shown and set forth.

3. In a rock-drilling machine, the combination of a suitable frame carrying a rotating or oscillating tubular shaft carrying a series of radiating arms, said arms being composed of two sections, the outer section of which is adjustably connected to the inner section by hinge or sliding mechanism, whereby the arm may be lengthened or shortened, and carrying upon the outer end a series of rotating or reciprocating drills, with mechanism for operating the same, substantially as described.

4. In a rock-drilling machine, the combination of a suitable frame carrying a rotating or oscillating tubular shaft mounted longitudinally upon the same, and carrying at its forward end a series of laterally-radiating arms having an extension or bracket hinged to the outer end thereof, and carrying a series of reciprocating drills arranged parallel with said shaft, and mechanism for operating the same.

5. In a rock-drilling machine, the combination of a frame or truck with a rotating or oscillating tubular shaft carrying upon its outer end a hub or wheel having upon the periphery thereof a series of rotating or reciprocating drills adjustably connected thereto and arranged parallel to said shaft, with means for operating the same both simultaneously and separately, substantially as set forth.

6. In a rock-drilling machine, the combination, with the brackets formed at their outer ends with the sockets or bearings, of the drill tubes or pistons, having the curved or bent forward ends forming shoulders and adapted to be secured in the said bearings in the manner shown and described.

7. In a rock-drilling machine, the combination of a suitable frame supporting a rotating or oscillating tubular shaft carrying a series of radiating arms, each arm being composed of two sections, the outer section of which is adjustably connected to the inner section by hinged or sliding mechanism, and having upon the outer end of each outer section a cylinder, a piston working therein and carrying a drill, and mechanism for operating the drills both simultaneously and separately.

8. In a rock-drilling machine, the combi-

nation of a suitable frame supporting a rotating or oscillating shaft carrying one or more radial arms having upon their outer end a cylinder, a piston working in said cylinder and so constructed as to carry a drill in one end thereof, said piston having a bend or set-off for the purpose of enabling the drills to cut an excavation larger in diameter than a circle described by said arms and cylinders thereon combined, so that a clearance will be cut to allow the machine to advance as the work progresses.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

ROBERT DALZELL.

Witnesses:
CHARLES N. DALZELL,
J. FRED. REILY.