(No Model.)

4 Sheets—Sheet 1.

J. P. HARTMAN.

PERCUSSION DRILL.

No. 606,139. Patented June 21, 1898.

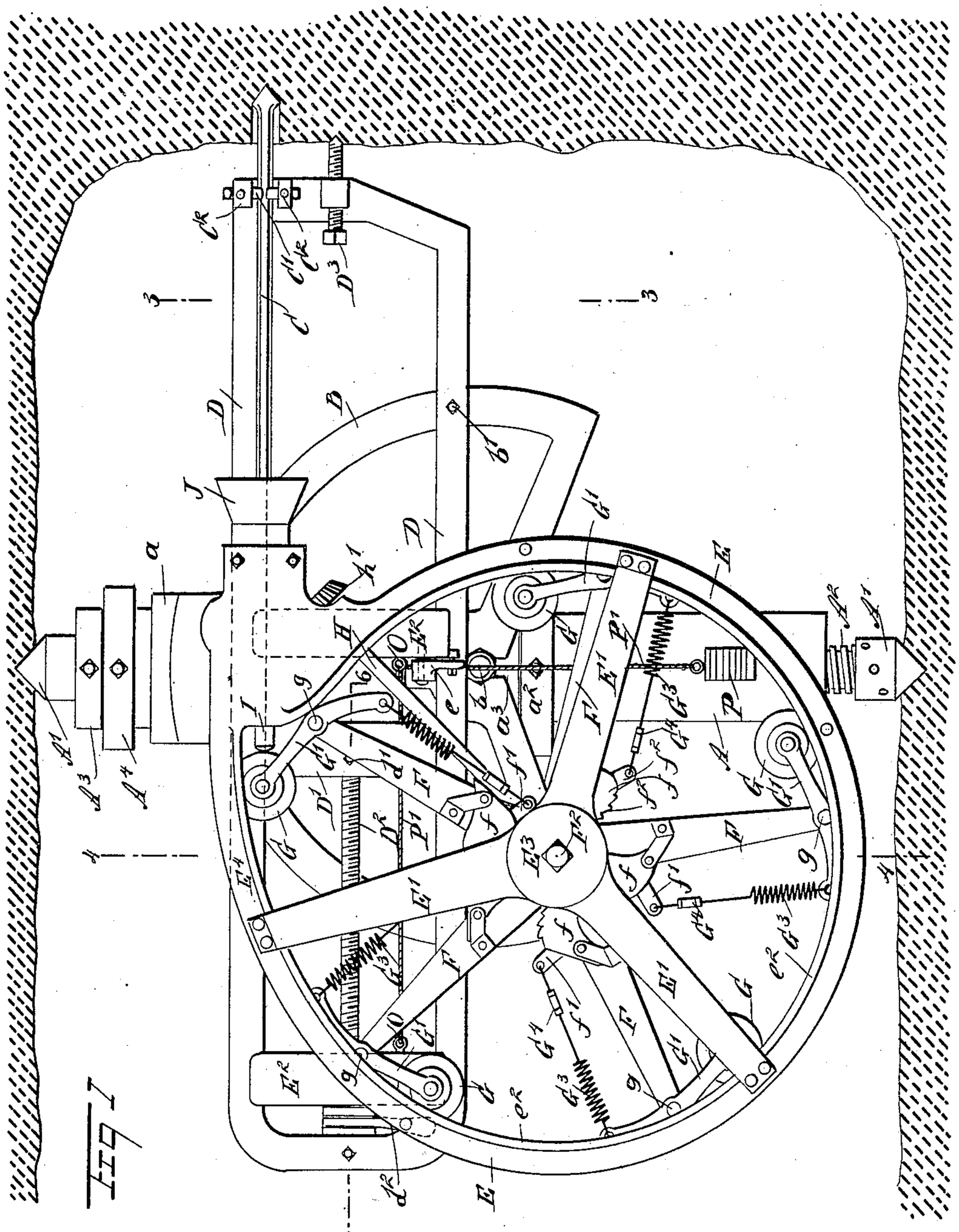

FIG. 1.

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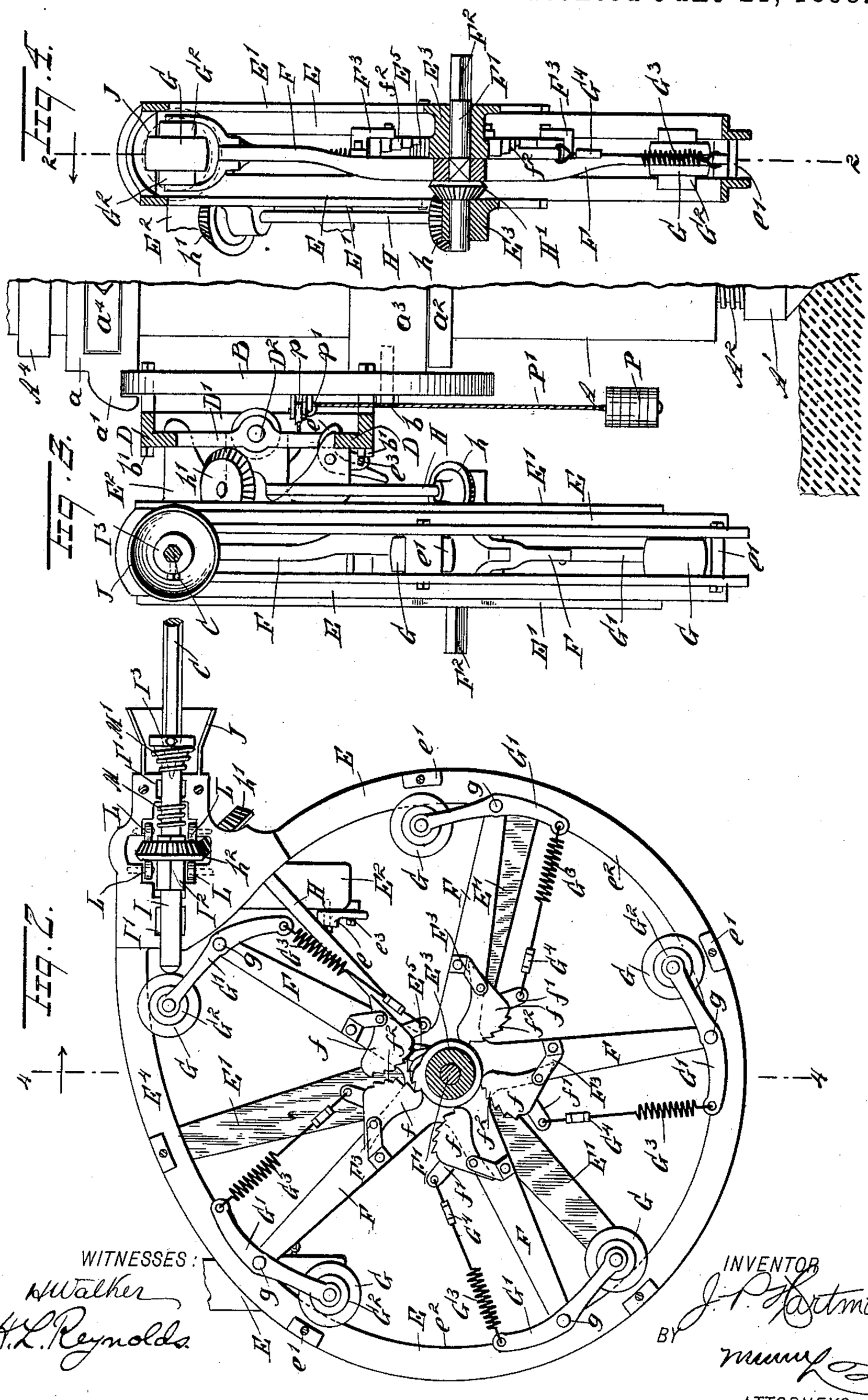

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PERCUSSION DRILL.

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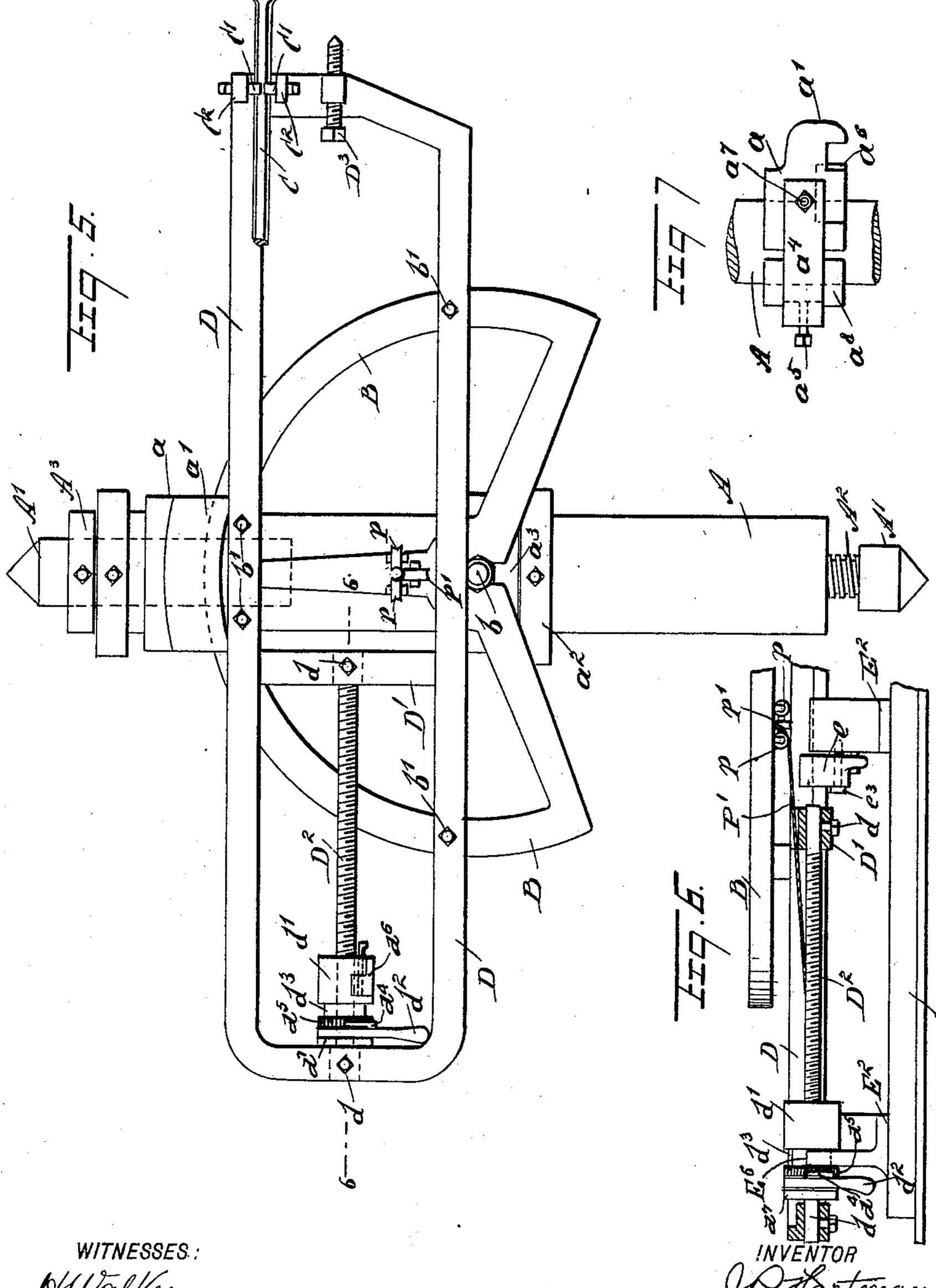

FIG. 5.

FIG. 7.

FIG. 6.

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4 Sheets—Sheet 4.

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Fig 8

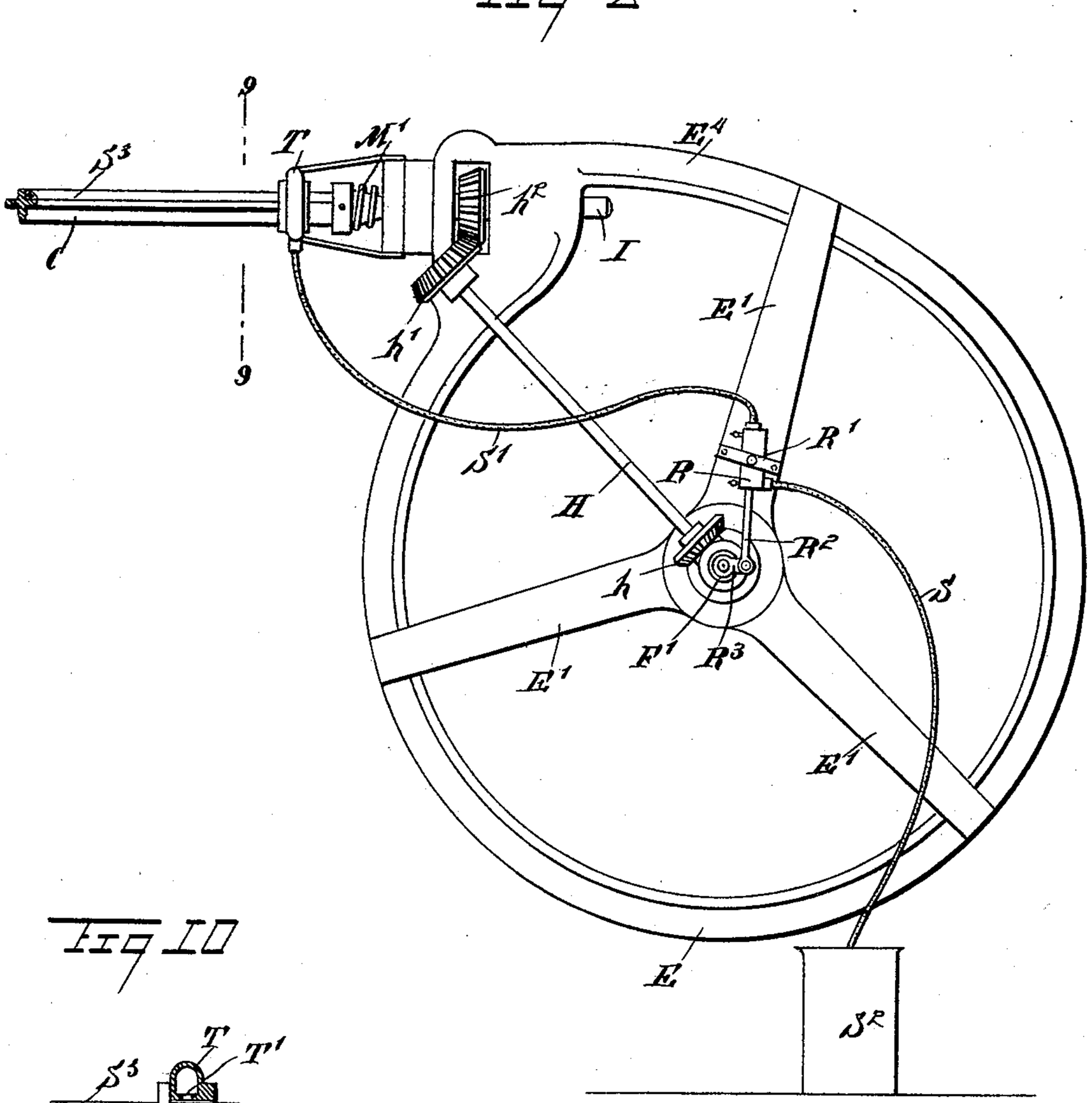


Fig 10

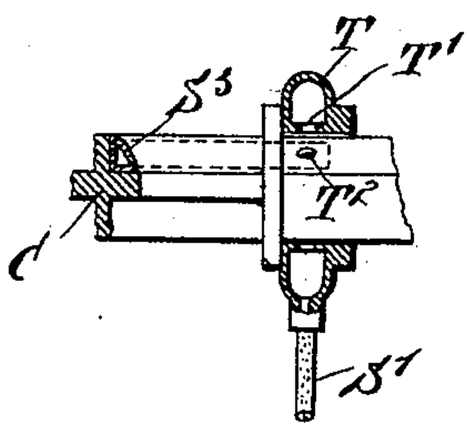
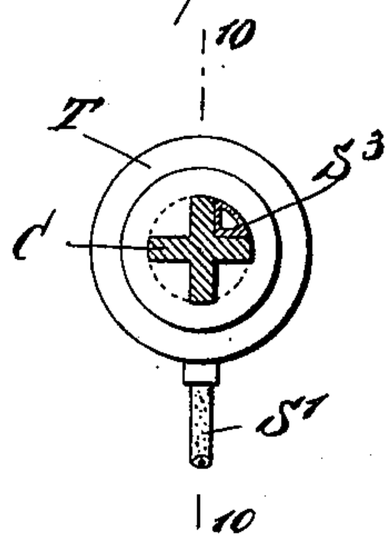


Fig 9



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UNITED STATES PATENT OFFICE.

JOSEPH P. HARTMAN, OF PUEBLO, COLORADO.

PERCUSSION-DRILL.

SPECIFICATION forming part of Letters Patent No. 606,139, dated June 21, 1898.

Application filed August 16, 1897. Serial No. 648,427. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH P. HARTMAN, of Pueblo, in the county of Pueblo and State of Colorado, have invented a new and Improved Percussion-Drill, of which the following is a full, clear, and exact description.

My invention relates to an improvement in percussion-drills, and comprises rotatable arms carrying weights or hammers pivoted by their handles to the arms and which are made to successively contact with the head of the drill or a socket containing the drill and an orbital hammer-track controlling the path of the hammers, springs connected to the hammers and holding them at all times against said track, and means for increasing the tension on the springs at certain predetermined points.

My invention further consists of certain details of constructions, which will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of a drill in position for operation. Fig. 2 is a sectional side elevation, on the line 2 2 in Fig. 4, of the drill-operating mechanism with half of the casing removed. Fig. 3 is a front elevation of the drill in position for operation, the guideways being shown in section on the line 3 3 in Fig. 1. Fig. 4 is a transverse vertical section of the drill-operating mechanism on the lines 4 4 in Figs. 1 and 2. Fig. 5 is a side elevation of the mechanism for supporting the drill-operating mechanism and for changing its position. Fig. 6 is a partial sectional view of the mechanism shown in Fig. 5, being that portion at the left of the central post, the section being taken on the lines 6 6 in Figs. 1 and 5. Fig. 7 is a side elevation of the clamp for securing the arc hereinafter described in place. Fig. 8 is a side elevation showing the operation of a pump and device for clearing the drill-hole. Fig. 9 is a cross-sectional view showing the drill and the water-conducting pipe fixed thereto, and Fig. 10 is a sectional view on the line 10 10 in Fig. 9.

The object of my invention is to produce a percussion-drill which may be easily transported and operated and which may be operated either by any form of power or by hand.

The drill is supported upon a central post A, which is provided at top and bottom with the dogs or centers A′, which engage opposite walls of a tunnel or drift. The dogs A′ are so mounted in the post that the post is extensible and thus adapted to fit in places where the walls vary in distance from each other. The post A is provided with a collar a^2, which supports a sleeve a^3, to which the drill-operating mechanism is pivoted. Above the collar a^3 is another collar a, which has a side projecting lug a' embracing the upper side of the arc B and thus holding the arc against the side of the post.

The arc B may be secured or locked in any position by means of the devices connected with the collar or block a. This latter part may be made in the form of a complete collar or as a semicircular block, as shown in Fig. 7. In the latter case it has a semicircular block or yoke a^4 secured thereto by the bolts a^7 or other suitable means and the rear bearing-block a^8. It is also provided with a clamping-screw a^5 and a block a^6, located in a recess in the under part of the block a back of the lug a' and between the same and the post A. By tightening the bolt or screw a^5 the block or collar a is drawn to the rear, so as to tightly clamp the arc B between the lug a' and the block a^6, the aperture in the block or collar a being large enough to permit such motion.

The lower dog A′ is mounted upon the end of a screw A^2, which screws into the lower end of the post A. The upper dog A′ is held in place by a collar A^3 and a second collar A^4, which are secured, respectively, to the dog and the post A by means of set-screws. Either of these methods of adjustment may be applied to either or both of the dogs, thereby making the post extensible. A bolt or pin b, fixed upon the sleeve a^3, enters a notch in the lower part of the arc B and forms the pivot therefor.

The outer portion of the arc B extends through the major portion of a circle and is held in place by the projecting portion of the lug a'. By this means the entire mechanism of the drill is supported and is thus capable of adjustment at any vertical angle likely to be desired. The sleeve a^3 and a collar may

rotate upon the post A, thus permitting adjustment at any horizontal angle.

To the face of the arc B and slightly removed therefrom by lugs, so as not to interfere with its swinging upon its pivot, are the slides or guideways D, which consist of two parallel bars connected at each end. The cross-bar D′ near the middle of the bars D furnishes a support for one end of the feed-screw D^2, which is secured therein against longitudinal motion, but so that it may revolve, by means of the set-screw d or any other suitable means. Upon this feed-screw is a nut d', having a pivoted half d^6 and also a circular groove d^3. The nut d' is rotated by means of a handle d^2, which carries a pawl d^4, engaging the teeth d^5 upon the nut, or by means of any suitable ratchet mechanism. The nut d' is formed in pivoted halves for convenience in shifting the frame carrying the drill. The forward end of the frame forming the guideways is provided with a set-screw D^3, adapted to engage the face of the tunnel when the drill is put in place. The frame is also provided with adjustable guide-blocks C′, adapted to receive and guide the shank of the drill, the blocks being supported in lugs C^2, attached to the guideways.

The drill-operating mechanism is mounted in a casing which comprises a hammer-track E, which in the main is of circular outline, but at one side (the upper, as shown in the drawings) is of increasing radius. This hammer-track, as shown in Figs. 3 and 4, is composed of two angle-irons slightly separated by blocks e' and the halves secured to each other by means of a bolt passing through each of said blocks. The outline of the hammer-track is preserved by means of the arms E′, connected thereto at intervals in its periphery and also acting as a support for the revolving spider F, upon which the hammers are mounted. Within the central hub E^3 is journaled a shaft F′, upon which is fixedly mounted the spider F, carrying the hammers. This spider F has a series of radial arms, to the outer ends of which are pivoted at g the arms or handles G′ of the hammers G. As shown in the drawings, the spider is provided with five arms and a similar number of hammers. The hammers G are cylindrical in shape, and the central portion thereof is of greater diameter than the ends, thus forming rollers G^2, which roll upon the inner surface of the hammer-track E. The central and larger portion of the hammer is the face which strikes the drill or the socket which receives the drill. One end of the shaft F′ may be provided with a squared portion F^2 or constructed in any other suitable manner, so that a crank or power connections of any sort may be attached thereto.

When the spider F, carrying the hammers, is revolved, the hammers will be caused to travel about the hammer-track, and when they reach the portion E^4 at the top, which is of increased radius, they will travel outward against the inner surface thereof until they contact with the rear end of the drill-socket I, which latter consists of a rod or bar mounted so as to have limited reciprocation in the frame carrying the operating mechanism. The pivot g of the hammer arms or handles is located intermediate its ends. The end opposite the hammer is connected to a spiral spring G^3, and this at its other end is connected, through the medium of a turnbuckle G^4, to an arm f', forming a part of a cam-plate f. The latter is pivoted to the arms of the spider F and to a projecting arm F^3, attached thereto. The cam-plate is also provided with a toothed edge f^2, adapted to engage the toothed outer surface of a central cam E^5, mounted upon the center of the drill-casing. As the spider F is revolved the plates f will engage the toothed cam E^5, and thus oscillate the plates f, which results in bringing an additional tension upon the springs G^3, and thus holding the hammers G out against the hammer-track. The purpose of this construction is to insure the contact of the hammers with the hammer-track during the upper half of their revolution even if the device is not rotated at such a speed as to create sufficient centrifugal force for this purpose. The result of this mechanism is to produce an increased tension upon the springs G^3 through this upper portion of the stroke. As the spider F is revolved so that the plates f clear the cam E^5 the tension upon the spring is released and the hammer is permitted to drop to its normal position.

The drill-socket I, which consists of a steel bar having its rear end tempered, is mounted to slide in bearings I′. The upper portion of the frame or casing is provided with a recess adapted to receive a bevel-gear h^2, mounted upon the socket by means of a square hole in the wheel and a squared section I^2 upon the socket. This construction permits of a longitudinal reciprocation of the socket, while enabling the gear to rotate the socket upon its axis. Journaled in the casing are a series of four small rollers L, which bear against the front and rear surface of the bevel-gear h^2, and thus hold it in its proper position, preventing its being moved by the reciprocation of the socket I. The bevel-gear h^2 meshes with a bevel-gear h, mounted upon the upper end of a shaft H, which is journaled in bearings upon the casing and extends in a radial direction. To the lower end of the shaft H is fixed a bevel-gear h, which meshes with a bevel-gear H′, mounted upon the shaft F′. By this means the drill-socket and drill are given a slow, but constant, rotating movement.

A device for clearing out the drill-hole is shown in Figs. 8, 9, and 10. To the central shaft F′ is fixed a crank-arm R^3, and an oscillating pump, consisting of a cylinder R, is pivoted at R′ to one of the arms E′ and has its pump-rod R^2 connected with the crank R^3. A hose S connects the pump with a bucket S^2

or other convenient supply of water, and a hose S′ connects the pump-discharge with a hollow ring T, surrounding the base of the drill. This ring has a centrally-opening slot T′, so that the water is in contact with the entire circumference of the drill. The drill is either made of steel of a cross or star section or is provided with a longitudinal groove. Within this groove, or one of the grooves of the drill, if of a star-section, is fixed a pipe S^3, which fits closely therein. The rear end of this pipe enters the ring T, and it communicates therewith either by its open end or by a side opening T^2.

That portion of the drill which enters the ring T is of course made of true circular cross-section, so that it may turn in the ring and not unduly leak. It may also permit a slight reciprocation of the drill within the ring T, while maintaining a tight joint about the drill and constant communication between the pipe S′ and tube S^8. By this device a constant discharge of water is maintained at the point of the drill, which will wash out the pulverized rock and keep the hole clear. It is evident that any kind of pump may be used as a substitute for that shown and described. The pump is preferably operated by the rotation of the hammers.

To prevent injury to the mechanism if the spider F is revolved while the drill is not in contact with the wall, a spring M is mounted so that at one end it will press against the casing and at the other end against the end of the squared section I^2 upon the drill-socket. In case the hammers G should strike the rear end of the drill-socket while the drill is not in place, the shock will be taken by the spring M and the mechanism will not be destroyed. To take the backward recoil of the drill-socket and drill, a spiral spring M′ is placed outside the casing and bears against the casing and the head I^3, which receives the end of the drill C. This outer end of the drill-socket is protected by a funnel J.

The drill C is pointed at its rear end and enters a hole or socket in the outer end of the socket-bar I and is secured in place by a set-screw. The forward end of the drill, as previously stated, is guided between the blocks C′ upon the outer end of the guideways D.

The hammers G, being cylindrical in form and journaled upon the ends of the arms G′, roll upon the surface e^2 of the hammer-track E instead of sliding thereon. This prevents a large amount of friction which would otherwise result. It also results in striking the rear end of the drill-socket by a different portion of the hammer at each stroke and thus lengthens the life of the hammer, preventing its being battered up.

The casing E, which forms the hammer-track and support for the drill-operating mechanism, is supported from the guideways D by means of two bars or lugs E^2, which, as shown in Fig. 3, are provided at their upper ends with a hook or notch adapted to engage the under edge of the upper guide-bar D. The lower portions of the brackets or lugs E^2 similarly engage the lower one of the guide-bars D, except that the hook which engages the inner side thereof is upon a pivoted lever *e*, thus permitting the device to be readily detached from the guideways. This lever *e* is held in locked position by means of a pin or bolt e^3, passing through a supplemental lug on the bottom of the bracket or lug E^2. The rear one of these brackets or lugs E^2 has a side projecting flange E^6, which engages the groove d^3 in the nut *d*′. As the nut is revolved by the ratchet-handle d^2 the entire casing carrying the drill-operating mechanism is moved upon the guideways D, thus following the drill as it sinks into the rock.

A counterbalance is provided for supporting the weight of the hammer-track and the mechanism carried thereby when the device is adjusted so that the guides D depart materially from the horizontal, which will be the case when drilling inclined or vertical holes. This consists of pulleys *p* and *p*′, over which passes a cord P′, which has attached to the lower end thereof the removable weights P and at the other end has a hook which may be attached to either of the eyes O, fixed to the brackets E^2 of the frame carrying the drill and its operating mechanism. The pulleys *p* and *p*′ are located centrally of the arc B, and the hook upon the cord P′ may be attached to the eye O at the front or rear end of the frame E, so as to either assist or retard the feeding of the drill, as may be necessary. The attachment of the weights depends upon the direction of the drill and the number of the weights by the angle of the drill. These weights are made so as to be readily attachable or detachable in any suitable manner—as, for instance, by notching or slotting them, as are the weights used with scales.

This drill may be constructed in varying sizes and so that it may be operated by any form of power connections or by a crank and hand-power. It is small and light and in use is easily transported to any point where it may be needed. It is also quickly set up and is of such simple character that it may be operated by any one of ordinary intelligence without previous training or instruction. It is also very effective, as it delivers a rapid series of blows, which may be regulated in strength by the rapidity of revolution. It is also adjustable, so that it may be used to drill in any direction, and is adapted to all kinds of use.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A percussion-drill, comprising a hammer-track which is mainly circular in outline and has a segment of increasing radius, hammer-supports pivoted to revolve within said track,

hammers having arms pivoted to said supports, and rollers engaging the track, substantially as described.

2. A percussion-drill, comprising a hammer-track which is mainly circular in outline and has a segment of increasing radius, hammer-supports pivoted to revolve within said track, hammers connected thereto having cylindrical heads rolling on the track, and positive means for holding the hammers against the upper portion of the track, substantially as described.

3. A percussion-drill, comprising an orbital hammer-track, hammer-supports revolving within said track, hammers mounted on handles which are pivoted to said supports, and springs attached thereto and adapted to at all times hold the hammers against the hammer-track, substantially as described.

4. A percussion-drill, comprising an orbital hammer-track, hammer-supports revolving within said track, hammers mounted on handles which are pivoted to said supports, springs connected to the hammer-handles, levers connected to the opposite ends of the springs, and a cam engaging said levers to tension the springs while the hammers are passing through the upper part of their orbit, substantially as described.

5. A percussion-drill, comprising a hammer-track which is mainly circular and has a segment of increasing radius, hammer-supports pivoted to revolve within said track, hammers having arms pivoted to said supports, and heads engaging said track, and a drill-socket in line with the hammers when in their outermost position, substantially as described.

6. A percussion-drill, comprising a hammer-track which is mainly circular and has a segment of increasing radius, hammer-supports pivoted to revolve within said track, hammers having arms pivoted to said supports and heads engaging said track, a drill-socket in line with the hammers when in their outermost position, and connections between the drill-socket and the revolving hammer-supports, whereby the drill-socket is revolved, substantially as described.

7. A percussion-drill, comprising a hammer-track which is mainly circular and has a segment of increasing radius, hammer-supports pivoted to revolve within said track, hammers having arms pivoted to said supports and heads engaging said track, a drill-socket in line with the hammers when in their outermost position, a gear slidably secured to the drill-socket, and gear connections between the same and the shaft of the hammer-supports, substantially as described.

8. A percussion-drill having a revoluble frame, a series of hammers mounted upon arms which are pivoted to the frame, a central fixed cam having a notched or toothed outer surface, levers pivoted to the frame having notched surfaces engageable with the cam at one point in their revolution, and connections between said levers and the hammer-arms, substantially as described.

9. A percussion-drill having a revoluble frame, a series of hammers mounted upon arms which are pivoted to the frame, a central fixed cam having a notched or toothed outer surface, levers pivoted to the frame having notched surfaces engageable with the cam at one point in their revolution, and a spring connecting said levers and the hammer-arms, substantially as described.

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