No. 736,758.

PATENTED AUG. 18, 1903.

C. MEAD.

ROCK DRILL.

APPLICATION FILED SEPT. 25, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.

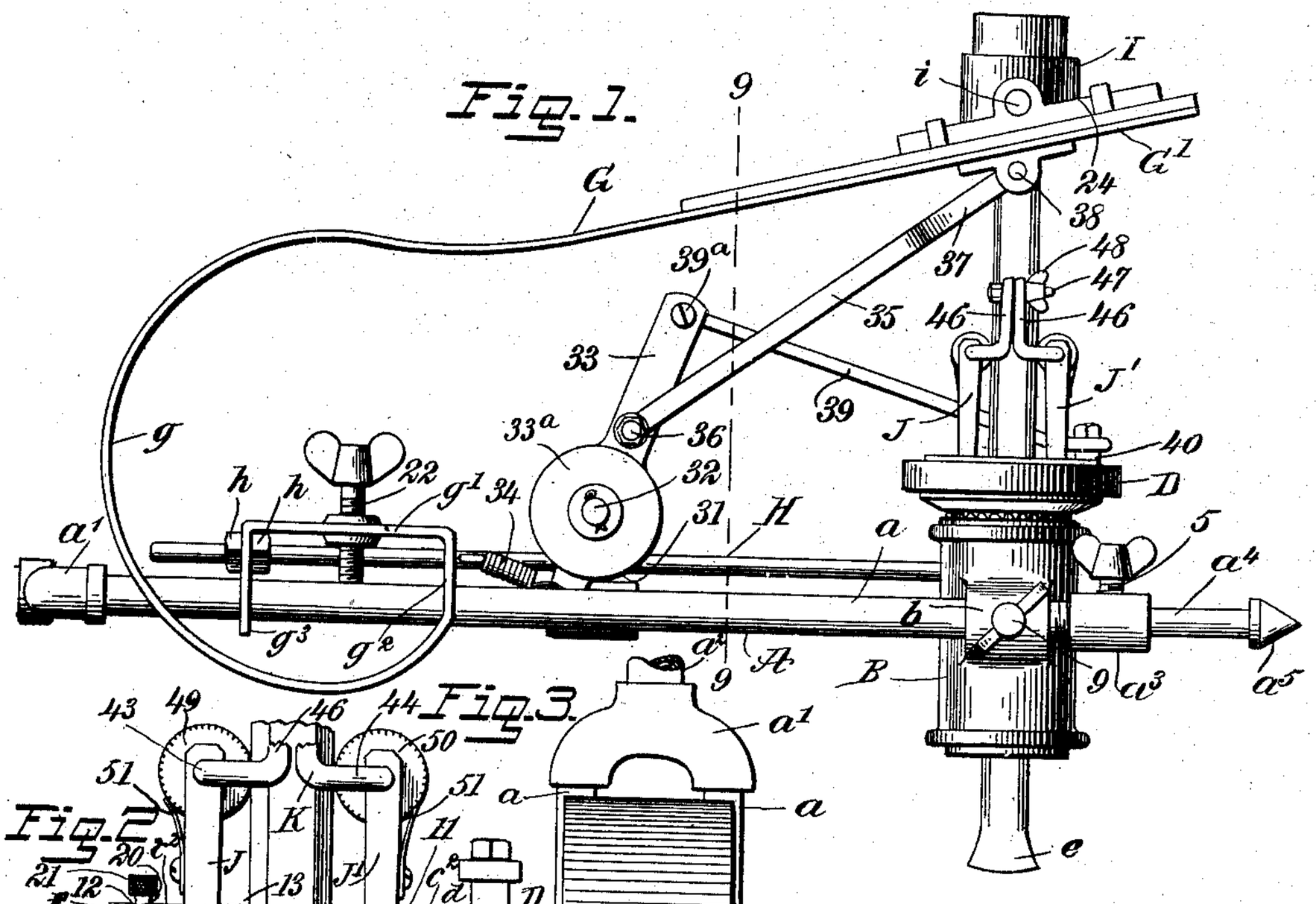

Fig. 3.

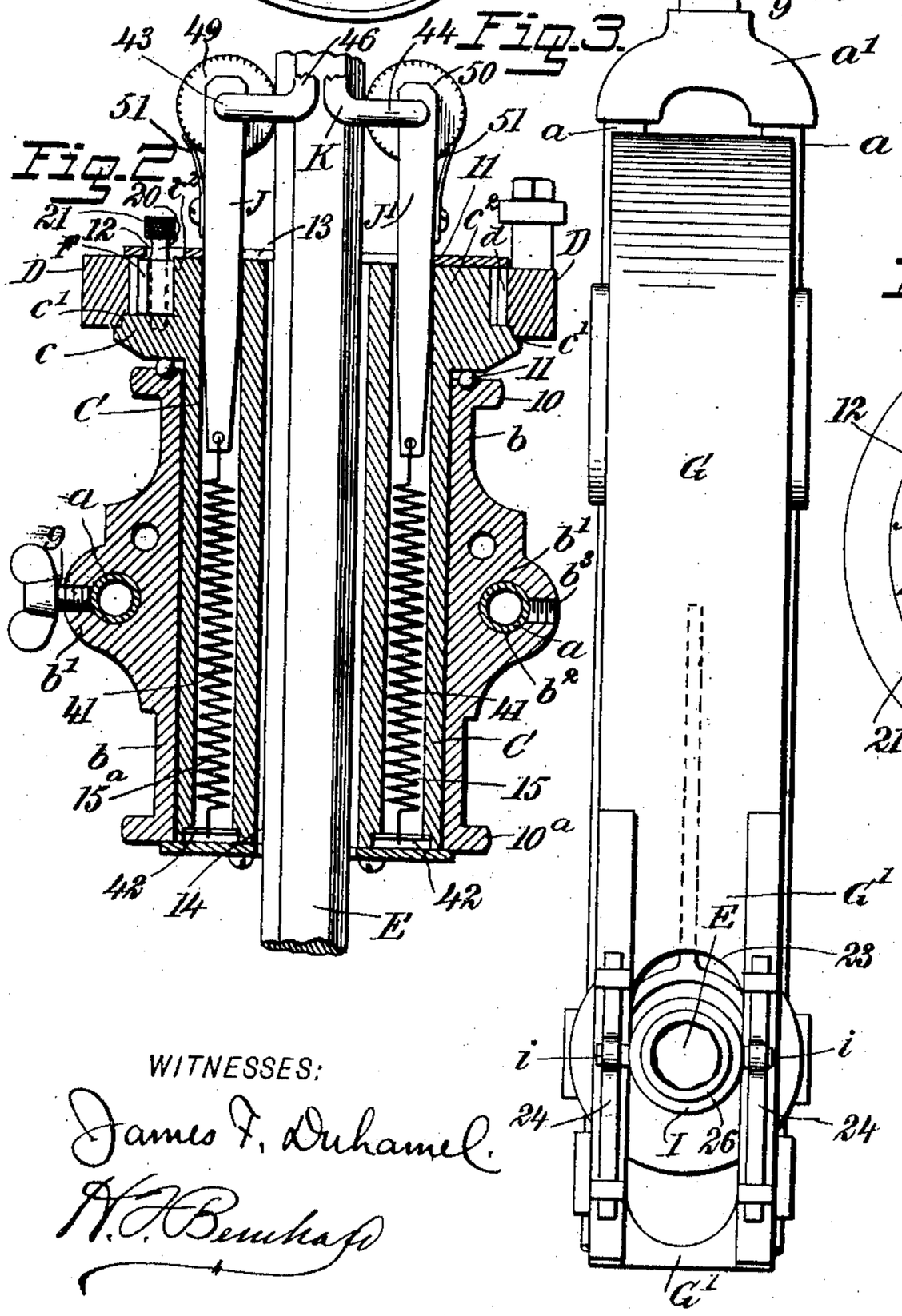

Fig. 4.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 5.

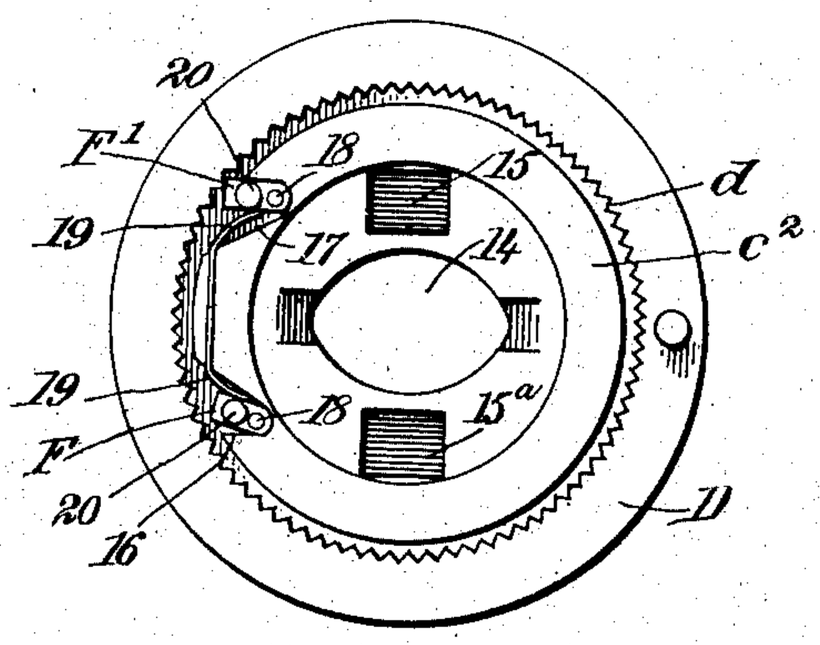


Fig. 6.

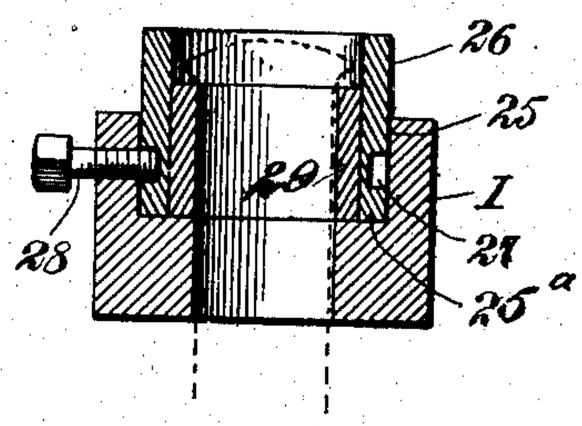


Fig. 7.

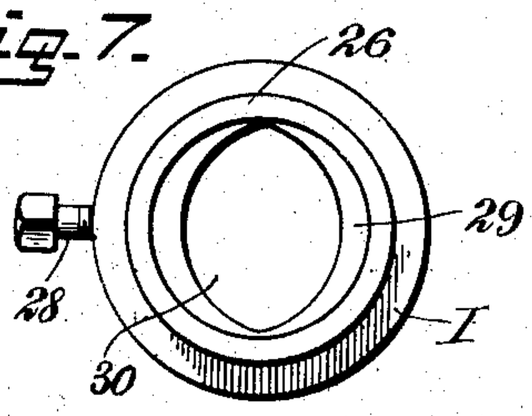


Fig. 8.

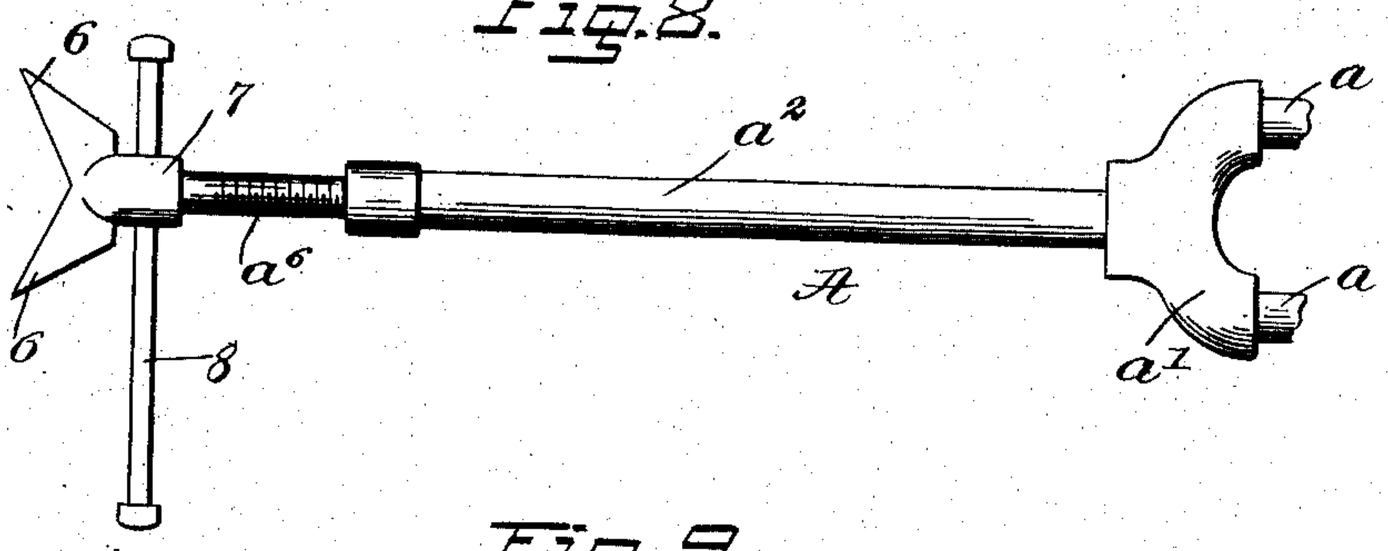
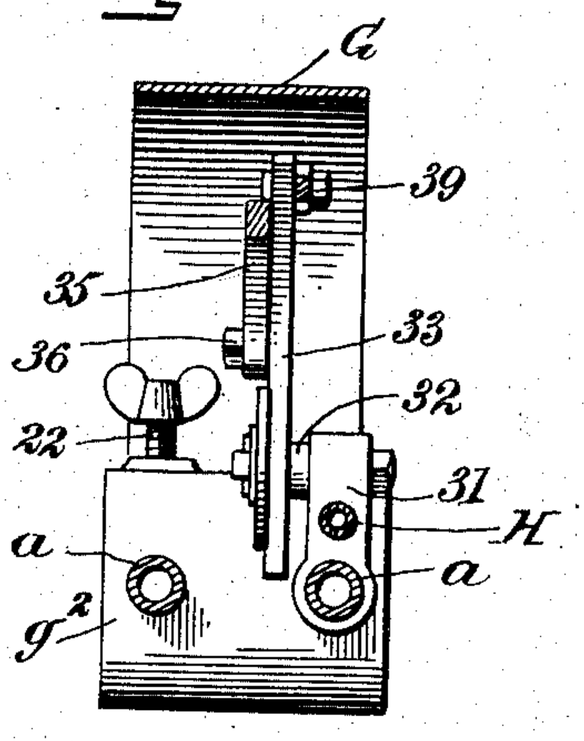


Fig. 9.



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No. 736,758. Patented August 18, 1903.

UNITED STATES PATENT OFFICE.

CHARLES MEAD, OF MURRAY, IDAHO, ASSIGNOR OF FIVE-EIGHTHS TO THE M. PRAGER COMPANY, LIMITED, AND LOUIS A. SCHLESINGER AND LEWIS PRAGER, OF MURRAY, IDAHO.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 736,758, dated August 18, 1903.

Application filed September 25, 1902. Serial No. 124,782. (No model.)

To all whom it may concern:

Be it known that I, CHARLES MEAD, a citizen of the United States, and a resident of Murray, in the county of Shoshone and State of Idaho, have invented a new and Improved Rock-Drill, of which the following is a full, clear, and exact description.

My invention relates to improvements in rock-drills of that class which are actuated by striking the drill forcibly with a sledge or hammer in the hands of a hammersman, and one object that I have in view is the provision of a simple, strong, and compact machine which may be easily set up or adjusted to work in any desired position for the purpose of drilling a hole in the floor, wall, roof, or any other surface in a mine or other place.

A further object of the invention is to equip the machine with means which will minimize the effects of the blows on the several working parts and also serve to quickly lift the drill-tool, so as to restore it to a raised position ready to receive the next blow.

A further object of the invention is to equip the machine with automatic means to effect the partial rotation of the drill-tool at each blow of the hammer, and thereby impart a step-by-step rotary movement to the tool in order to change the angle of presentation of the cutting edge of the tool to the bottom of the hole, so as to insure maximum efficiency in the cutting operation of the tool.

A further object of the invention is to provide means which will automatically check or retard the upward movement of the tool under the energy of the lifting devices and at the same time allow a practically unrestrained downward movement of the tool when driven by the hammer. This checking mechanism is in coöperative relation to the step-by-step feed mechanism, so as to regulate the number of turns of the tool under a given number of quick or slow successive blows of the hammer, and said checking mechanism also tends to pull or return the tool to the bottom of the hole immediately following the blow and the reaction of the lifting-spring.

The further objects and advantages of the invention will appear in the course of the subjoined description, and the novelty will be defined by the annexed claims.

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 rock-drill constructed in accordance with my invention. Fig. 2 is an enlarged vertical section through the revoluble cylindrical casing, which is mounted in the cross-head, the latter being shown in cross-section, said view also illustrating a portion of the drill and the drill-retracting devices in elevation, the section being taken in an irregular direction to illustrate one of the pawls and its operating stem. Fig. 3 is a plan view of the machine shown by Fig. 1. Fig. 4 is a plan view of the cylindrical turning-casing and the checking device to retard the upward movement of the rock-drill, the latter being shown in cross-section. Fig. 5 is a plan view of the turning cylindrical casing and the feed-collar, the cap-plate of said casing being removed. Fig. 6 is a detail vertical section through the striking-head removed from the machine. Fig. 7 is a plan view of the striking-head. Fig. 8 is a detail view of the extensible rear holding-rod, and Fig. 9 is a cross-section through the machine on the line 9 9 of Fig. 1.

The operative parts of my improved machine are mounted on a suitable carrier-frame A. In the preferred form of this frame I employ two parallel tubular members a a, which are united at the rear ends by a coupling a', from which extends a single tubular member a^2. (See Figs. 1, 3, and 8.) The parallel members a are provided at their front ends with enlarged sockets a^3, in which are slidably fitted the rods a^4, each having a pointed extremity a^5. In the socket a^3 of each member a is mounted a set-screw 5, adapted to impinge the slidable rod a^4 and clamp the same at any desired point of adjustment in the socket a^3, said rod a^4 being adapted to extend into the frame member a when it is moved inward. The rear member a^2 is provided with a threaded socket into which is screwed an extensible rod a^6, and this rod is

provided with the prongs 6, which are made integral with a sleeve 7, that is rigidly attached to the member a^6, and this sleeve is furthermore provided with a transverse opening to receive the hand-pin 8, by which the rod a^6 may be turned in order to adjust it within the member a^2, thus providing for the convenient extension of the rod a^6 in order to secure the prongs 6 against the rock. It is evident that the rods a^4 and a^6 may be extended any desired distance in order to firmly fasten the frame A in place for operation.

B designates a cross-head which is mounted on the parallel members a of the frame, and this cross-head in the preferred embodiment of the invention is cast in a single piece of metal, so as to produce a substantial construction. The cross-head consists of a vertical sleeve b, provided on opposite sides thereof with laterally-extending lugs b', in which lugs are produced the transverse horizontal openings b^2, adapted to receive the tubular members a of the frame. These lugs are provided with threaded openings b^3 to receive the clamping-screws 9, and these clamping-screws are adapted to impinge the members a for the purpose of securely attaching the cross-head to the frame A. It is evident that the clamping-screws may be released from engagement with the frame members a, and the cross-head may then be shifted or adjusted lengthwise of the tubular frame members a, so as to occupy any desired position thereon, thus providing means for uncovering the hole in which the drill is adapted to operate. The sleeve b of the adjustable cross-head is provided at its upper and lower ends with the flanges 10 10^a, and in the upper flange 10 is provided a ball-race to accommodate a series of bearing-balls 11.

C designates a cylindrical casing which is loosely fitted within the vertical sleeve b of the cross-head, so as to occupy a vertical position therein and to be capable of turning freely on a vertical axis, and this cylindrical casing is provided near its upper end with the radial flange c, the latter being adapted to overhang the flange 10 of the cross-head and to ride directly upon the bearing-balls 11, whereby the casing C is adapted to turn within the cross-head with a minimum of friction. The flange c, near the upper end of the axial turning casing, is rabbeted at c', (see Fig. 2,) and the upper extremity of the cylindrical casing is extended, as at c^2, above the flange c. Around this extended edge c^2 of the cylindrical casing is loosely arranged a feed-collar D, which is fitted snugly to the rabbeted edge c' of the flange c, and this feed-collar is capable of turning freely in either direction on the flange c of the casing. The inner face of the feed-collar D is provided with a series of ratchet-teeth d, and the upper edge of this feed-collar is preferably disposed flush with the extended edge c^2 of the cylindrical casing. The feed-collar is held against vertical displacement in one direction and against lateral displacement by seating it on the rabbeted edge of the flange c, and the upward movement of said feed-collar in a direction away from the cylindrical casing is prevented by a cap-plate 11, the latter being firmly secured in any way to the edge c^2 of the casing and arranged to overhang the inner edge of the ratchet-formed feed-collar D. This cap-plate 11 should be provided with two slots 12 to accommodate the stems 20 of the two pawls F F'; but only one of these slots is indicated in Figs. 2 and 4, and said cap-plate is also provided with suitable slots 13, at the middle portion thereof, thus providing for the free passage of the drill-tool E and certain parts of the mechanism to check the upward travel of said drill-tool.

The cylindrical casing B is provided with a vertical passage 14, which admits the drill-tool E, and this passage is of such shape and dimensions that the drill-tool will travel or play freely through the casing, the passage opening through the upper and lower ends of the casing, as shown by Fig. 2. The cylindrical casing is furthermore provided with longitudinal sockets 15 15^a, which are disposed on opposite sides of the passage 14 and extend parallel therewith, said longitudinal sockets accommodating certain parts of the tool-checking mechanism, which will be hereinafter described. The extended edge c^2 of the cylindrical casing is furthermore provided with the recesses 16 17, which are shown more clearly by Fig. 5 of the drawings, and in these recesses are housed the feed-pawls F F'. These pawls are pivoted individually to the extended edge c^2 of the casing, as at 18, and each pawl is acted upon by a spring 19, adapted to throw it into position for engagement with the ratchet-teeth d on the inner edge of the feed-collar D. Each pawl F F' is provided with an upstanding stem 20, arranged to pass through one of the slots 12 in the cap-plate 11, and this upper end of the stem is provided with a binding-nut 21, adapted to bear against the cap-plate 11 in a manner to hold the pawl in a retracted position against the energy of the spring 19. If it is desired to turn the collar D and the cylindrical casing in one direction, the binding-nut 21 of the pawl F is released, so that the spring 19 may press said pawl into engagement with the ratchet-teeth d; but the other pawl, F', should be held in a position within the recess 17 so that it will clear the ratchet-teeth d. If the cylinder is to be turned in the opposite direction, the pawl F should be held in its retracted position in the recess 16 by the nut 21 while the other pawl, F', should be released, so that the spring 19 will press it into engagement with the teeth of the collar.

I will now proceed to describe the means which cushions the blow of the hammer upon the machine and automatically returns the drill-tool E to a raised position. One element of this mechanism is preferably embodied in the form of a powerful heavy leaf-spring G,

which preferably takes the shape shown more clearly by Fig. 1. The lower rear part of this leaf-spring is bowed, as at g, and doubled upon itself to form the horizontal plate g' and the vertical portions g^2 g^3. The vertical portions of this bent spring are provided with openings adapted to receive the horizontal members a of the frame, and this lower bent portion of the spring is secured rigidly to this frame in any suitable way—as, for example, by mounting the thumb-screws 22 in the horizontal plate g' of the spring, said thumb-screws impinging the members a of the frame. This frame is also equipped with a longitudinal rod or bar H, which is fixed to one of the members a in any suitable way so as to lie above the horizontal plane of said member a, and the rear portion of this bar H is carried through the vertical portions g^2 g^3 of the spring so as to lie below the plate g', thus making provision for mounting the nuts h on the rear portion of the bar, said nuts being arranged to engage with the vertical portion g^3 of the spring and to assist in holding the spring from movement or displacement on the frame. The opposite upper end of the strong spring G is extended in a forwardly and upwardly inclined direction to form an arm G′, which is arranged to overhang the cross-head and the parts mounted thereon, and this arm of said spring is provided with a slot 23, through which is adapted to pass the upper portion of the drill-tool E. (See Figs. 1 and 3.) In this slot 23 of the spring-arm G′ is arranged a striking-head I. This striking-head is provided on opposite sides with trunnions i, which are loosely mounted in suitable bearings 24, the latter being rigidly secured to the spring-arm G′ on opposite sides of the slot 23 therein, thus pivotally mounting the striking-head on the spring-arm G′. These bearings 24 may be of any suitable construction, and, if desired, the striking-head may be pivotally mounted on the arm G′ by any suitable means.

The striking-head I is provided with a recess 25 in its upper end, and in this recess is arranged a guide-collar 26, the latter being provided with an annular groove 27 in its lower portion, in which is fitted the inner end of a set-screw 28, that is mounted in the striking-head I. This guide-collar 26 is seated against a shoulder 25^a, which is provided within the striking-head, and said collar is free to turn on a vertical axis when the drill-tool E is shifted, the groove 27 of said collar permitting it to turn freely within the head and with relation to the screw 28, that serves to hold the collar against dropping out of the striking-head.

The guide-collar 26 is provided with an interior sleeve 29, the same being provided with an opening 30, which may be of the elliptical shape shown by Fig. 7. This internal sleeve is fitted within the guide-collar so as to rest upon the shoulder 25^a of the striking-head, and said sleeve is adapted to fit closely around the upper part of the drill-tool E. I prefer to secure the internal sleeve removably within the collar 26, and sleeves having openings of different contour may be used interchangeably in the guide-collar. The internal sleeve 29 is not as long as the collar 26, and the upper end of this sleeve terminates a short distance below the corresponding end of the collar, thus making provision for the headed upper end of the drill-tool E to rest upon the upper end of the sleeve 29, whereby the drill-tool will be raised by the spring G, because the striking-head, the collar, and the sleeve will be carried in an upward direction on the recoil or rebound of the spring immediately following the blow of the hammer on the striking-head and the tool.

The feed-collar D and the cylindrical casing C are rotated intermittently, but with a step-by-step motion, by the vibratory movement which is given to the spring-arm G′ under the blows of the hammer on the striking-head and the drill-tool, and I have provided mechanism whereby the motion of the spring is communicated automatically to the ratchet-collar D.

31 designates a vertical post which is clamped firmly to one member a of the frame and to the stationary bar H, and this post affords a bearing for a horizontal rock-shaft 32, the latter being disposed above the frame and the bar. This rock-shaft carries a driving-lever 33, which is provided with an enlarged circular portion 33^a, adapted to be secured firmly on the shaft 32, and to the lower end of this lever is connected one end of a retracting-spring 34, which is fastened in a suitable way to the rod or bar H, said spring serving to normally pull the driving-lever 33 to an inclined position with relation to the frame A. (See Fig. 1.) The lever 33 is connected operatively with the spring-arm G′ and with the ratchet-feed collar D. The connection between the driving-lever and the spring is secured by the employment of a driving-rod 35, one end of which is pivoted, as at 36, to the lever 33, while the other end of said rod is forked or bifurcated, as at 37, and pivoted in a substantial way at 38 to the arm G′ of the spring. The connection between the driving-lever and the collar is secured by a link 39, pivoted at 39^a to the upper end of the driving-lever, and the opposite end of this link is connected pivotally and detachably by a post 40 to the collar D, whereby said link 39 is adapted to pull on the collar D when the driving-lever is forced in a rearward direction by the driving-rod 35 on the downward movement of the arm G′ of the spring.

I will now proceed to describe the checking means which restrains the upward movement of the drill-tool E.

In the longitudinal sockets 15 15^a of the cylindrical casing are fitted the slidable bars J J′, and to the lower ends of these bars are attached the coiled springs 41, the latter being housed in the longitudinal sockets 15 15^a. These springs have their lower ends fastened

in the casing by suitable catches 42, and they serve to normally pull the slidable bars downwardly into the sockets of the cylindrical casing when the latter is rotated by the feed-collar and one or the other of the pawls F F'. The slidable bars extend a suitable distance above the casing and the cap-plate 11 thereof, and through the upper extended ends of said bars pass the members 43 44 of a yoke-shaped clamp K. Said clamp members are pivoted together at one end, as at 45, (see Fig. 4,) and the other ends of the members 43 44 are bent to provide the upstanding arms 46, which are disposed in lapping relation and connected together by a bolt 47, having a thumb-nut 48. The clamp is arranged to encircle the drill-tool E at a suitable point above the cross-head, the casing, and the feed-collar, and the members of said clamp are equipped with the gripping rollers or wheels 49 50, which will be loosely mounted on the clamp members and in the upper ends of the slidable bars J J', whereby the clamp and the gripping-rollers are movable with said bars under the influence of the springs 41. The gripping-rollers are disposed on opposite sides of the drill-tool and said rollers are provided with serrated or corrugated faces, as shown by Figs. 2 and 4. The slidable bars J J' carry the dogs or pawls 51, which engage with the serrated faces of the rollers and prevent them from turning in backward directions and away from the drill-tool E; but, on the other hand, these rollers are free to turn inwardly toward each other and toward the drill-tool, so that the latter may pass freely between the gripping-rollers on the downward movement under the blow of the hammer. When the tool is forcibly struck by the hammer, the head I and the spring-arm G' are driven downwardly in order to actuate the mechanism by which the step-by-step movement is given to the feed-collar D and the casing B; but the tool E passes freely through the passage 14 of the casing and between the gripping-rollers 49 50, the latter turning freely toward each other to form the passage of the tool between them. On the upward movement of the drill-tool, due to the lifting action of the sleeve 29, the striking-head, and the arm G' of the spring, the rollers 49 50 engage frictionally with the tool E, thereby raising the clamp K and the bars J J' with said tool. The upward movement of the parts J, J', K, 49, and 50, comprising the checking mechanism, is resisted by the springs 41, and this checking mechanism thereby prevents undue upward movement of the drill-tool and the arm G' of the spring, whereby the checking mechanism has a tendency to return the tool E in a direction toward the bottom of the drill-hole, owing to the actions of the springs 41.

The entire action of the machine is under the control of the hammersman and is regulated by him according to the requirements of the rock to be drilled. After the machine has been set up it should occupy a position so that the bottom of the cylinder is about three inches from the place selected for the drill-hole, and the drill is set in the direction in which the drill-hole is to extend. The drill is inserted through the striking-head and passed downwardly through the clamp K, between the rolls, and then through the cylinder on down to the rock. The clamp is then screwed up tight, so that the gripping-rollers will engage with the drill, and the machine is now ready for operation. A drill of the proper length should be selected for the head thereof to be free in the striking-head after the mainspring shall have been somewhat depressed. The hammersman now strikes the drill-head as hard as he likes. The hammer will first come into contact with the striking-head, so that the blow will depress the mainspring until the head of the drill is reached, said drill receiving the full force of the blow. This action is so quick and the distance between the striking-head and the drill is so short that the blow is almost simultaneous on both parts, whereby the spring G is caused to act in a manner to relieve the working parts of the machine from undue shock. The depression of the mainspring actuates the rod 37 and the lever 33 to pull the rod 39 in one direction, and this rod turns the feed-collar D so that one pawl F or F' will turn the cylinder B, and this operation of the cylinder carries the bars J J' and the rollers 49 50 part way around, thereby turning the drill E and the collar 26 so that the point *e* of the drill will be presented in a new position to the bottom of the drill-hole. The turning motion of the cylindrical casing is given intermittently thereto by the pawl and ratchet feed mechanism on the successive depressions of the spring due to the successive blows of the hammer, and the drill E is thus turned with a step-by-step movement in order that its point *e* will occupy different positions or angles to the bottom of the hole, thus increasing the efficiency of the tool in operation. The tool is drawn to the bottom of the hole by gravity and by the action of the springs 41. As soon as the hammer is withdrawn after every blow the mainspring returns to position, or as far as the springs 41 will allow, which action raises the drill a proper distance from the bottom of the hole, and this action of the mainspring, assisted by the spring 34, operates the lever and the rod 39, so as to turn back the feed-collar D, the latter traveling freely in a backward direction with relation to the pawl which is in use, thus lifting the feed-collar in position to be again turned on the next blow of the hammer. The action of turning and lifting the drill is gaged by a quick return of the hammer, and in some cases the feed-collar and the cylinder are turned completely around by six or seven blows on the tool and the striking-head; but a slower return of the hammer may require from ten to fourteen or more blows in order to feed the collar and the cylinder far enough at each stroke to make a complete turn. The hammersman can gage

the turning of the drill by the number of blows delivered on the striking-head and the pawl. After the drill has been driven home, or until the mainspring has been depressed a sufficient distance, the clamp K is loosened and the drill is lifted through the striking-head. A longer drill can now be inserted until the hole reaches the required depth. The machine can be adapted for drilling a hole seven inches deep with one drill; but it does not require fixed lengths of drills, the drills being interchangeable. When the hole requires cleaning, the screws 9 can be released and the machine can be shifted in one direction on the frame until the drill-hole is exposed, and after cleaning out the hole the machine is again adjusted into position over the hole and the drill is again shoved down into the hole, ready to resume the operation. The action of the gripping-rollers, forming part of the checking mechanism, allows the drill to play freely in one direction; but these rollers must be released in order to withdraw the drill. The dogs 51 allow the rollers to turn inwardly toward the tool; but when the mainspring lifts the tool the dogs prevent the rollers from turning upward. While the blow of the hammer on the striking-head is almost coincident with the blow on the drill-head, the blow on the spring G is sufficient to relieve the shock. Nevertheless the springs 41, in connection with the clamp K, act so quickly in drawing the drill back to the bottom of the hole that by the time the force of the blow reaches the drill-head the drill rests firmly against the bottom of the hole. The striking-head is free to turn and slide in a manner to conform to every motion of the drill, and the latter is thus held in a true and steady position by the cylindrical casing, so as to prevent the drill from "riding the collar," or hugging one side of the drill-hole, thereby insuring a perfectly true hole.

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

1. A rock-drill, comprising a revoluble casing, a tool mounted in said casing to slide freely therein and to turn axially therewith, a striking-head fitted on and slidable relatively to the head of the tool, and means actuated by movements of the striking-head to impart a step-by-step turning movement to said casing.

2. A rock-drill, having a casing mounted for rotation on its axis, a spring-arm carrying a striking-head, a tool passing through said striking-head and the casing, said head extending normally above the tool and slidable independently thereof for a limited distance in said cylindrical casing to turn therewith, and means actuated by movements of said striking-head to impart a step-by-step rotary movement to the casing and the tool guided thereby.

3. A rock-drill having a suitable frame, a cross-head on said frame, a casing mounted in said cross-head to turn therein, a spring-arm attached to the frame, a hollow striking-head mounted in said arm to turn therein and to move therewith, and means for imparting a step-by-step rotary movement to said casing and a tool which is guided thereby.

4. A rock-drill having a frame, a cross-head mounted thereon, a casing supported by said cross-head to turn therein, a spring-arm attached to said frame and carrying a sleeve-like striking-head, a drill-tool passing through said casing and fitted in said sleeve-like striking-head, and a step-by-step feeding mechanism, actuated by said spring-arm and operatively related to said casing to turn the latter.

5. In a rock-drill, the combination with a casing and a tool guided therein, of a striking-head loosely fitted on the head of the tool, a spring for holding the striking-head in a raised position, means for turning said casing with a step-by-step movement, and a checking mechanism carried by said casing and engaging with said tool to limit the upward movement thereof.

6. In a rock-drill, the combination with a casing, a tool guided therein, and a spring for holding said tool in a raised position, of a checking mechanism connected with the tool and with said casing, said checking mechanism opposing the lifting movement of the tool under the energy of the spring, and being effective in returning the tool toward the bottom of a drill-hole.

7. In a rock-drill, the combination with a casing and a tool guided therein, of a checking mechanism comprising retracted bars, a clamp movable with said bars, and gripping members carried by said clamp and engaging with said tool.

8. In a rock-drill, the combination with a casing and a tool guided therein, of a checking mechanism carried by said casing, and comprising bars slidably mounted in the casing, springs attached to said bars, gripping members carried by the bars and engaging with said tool, and means for tightening said gripping members in frictional engagement with the tool.

9. In a rock-drill, the combination with a casing and a tool guided therein, of a clamp having a tightening device, gripping-rollers carried by the clamp and engaging with the tool, means to prevent the gripping members from turning in one direction, and means connected with the casing for checking the upward movement of the clamp and the gripping members on a like movement of the tool.

10. In a rock-drill, the combination with a casing and a tool guided therein, of bars slidably fitted in said casing, springs connected with said bars to draw them toward the casing, a clamp attached to the bars and having means for tightening the same, corrugated gripping-rollers supported by the clamp and engaging with the tool, and dogs to restrain said rollers from rotating in one direction.

11. In a rock-drill, the combination of a frame, a casing mounted therein, a tool guided through the casing, a collar provided with a ratchet, a dog carried by the casing and engaging with said ratchet, a striking-head loosely fitted on the upper part of the tool, and a lever connected with said striking-head and the collar to actuate the latter each time the striking-head is depressed.

12. In a rock-drill, the combination of a frame, a casing mounted to turn therein, a collar provided with a ratchet, independent dogs carried by the casing and adjustable separately into engagement with said ratchet, a striking-head, and means between the striking-head and the collar for rotating the latter.

13. In a rock-drill, the combination of a frame, a rotary casing therein, a ratchet-collar on said casing, a dog carried by the casing and engaging with said collar, a striking-head, a spring-controlled driving-lever mounted on the frame, a driving-rod connected to said lever and with the striking-head, and a link connecting the lever and the collar.

14. In a rock-drill, the combination of a frame, a casing, a spring-arm mounted on said frame, a striking-head carried by said spring-arm, and a tool slidably fitted in said casing and in the striking-head, said head normally projecting above the striking-face of the tool and having a limited movement with the spring-arm relative to said tool under a blow on the head.

15. In a rock-drill, the combination of a frame, a casing mounted therein, a cushion-spring fastened to said frame and overhanging said casing, a striking-head pivotally supported on the spring and having a freely-turning member, and a tool slidably fitted in said casing, and fitted in said striking-head to play idly therein and to turn the member thereof.

16. In a rock-drill, the combination of a frame, a cross-head adjustably fitted to said frame and having means for holding it firmly in place thereon, a casing revolubly mounted in said cross-head, a tool fitted removably in said casing, a cushion-spring carrying a striking-head, and means actuated by said spring to impart a step-by-step rotary movement to said casing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES MEAD.

Witnesses:
WM. F. MCCOTTER,
LEWIS W. MEAD.