No. 610,892. Patented Sept. 20, 1898.

W. B. BROOKS & T. ALTMAN.

ROCK DRILL.

(Application filed July 20, 1897.)

(No Model.) 3 Sheets—Sheet 1.

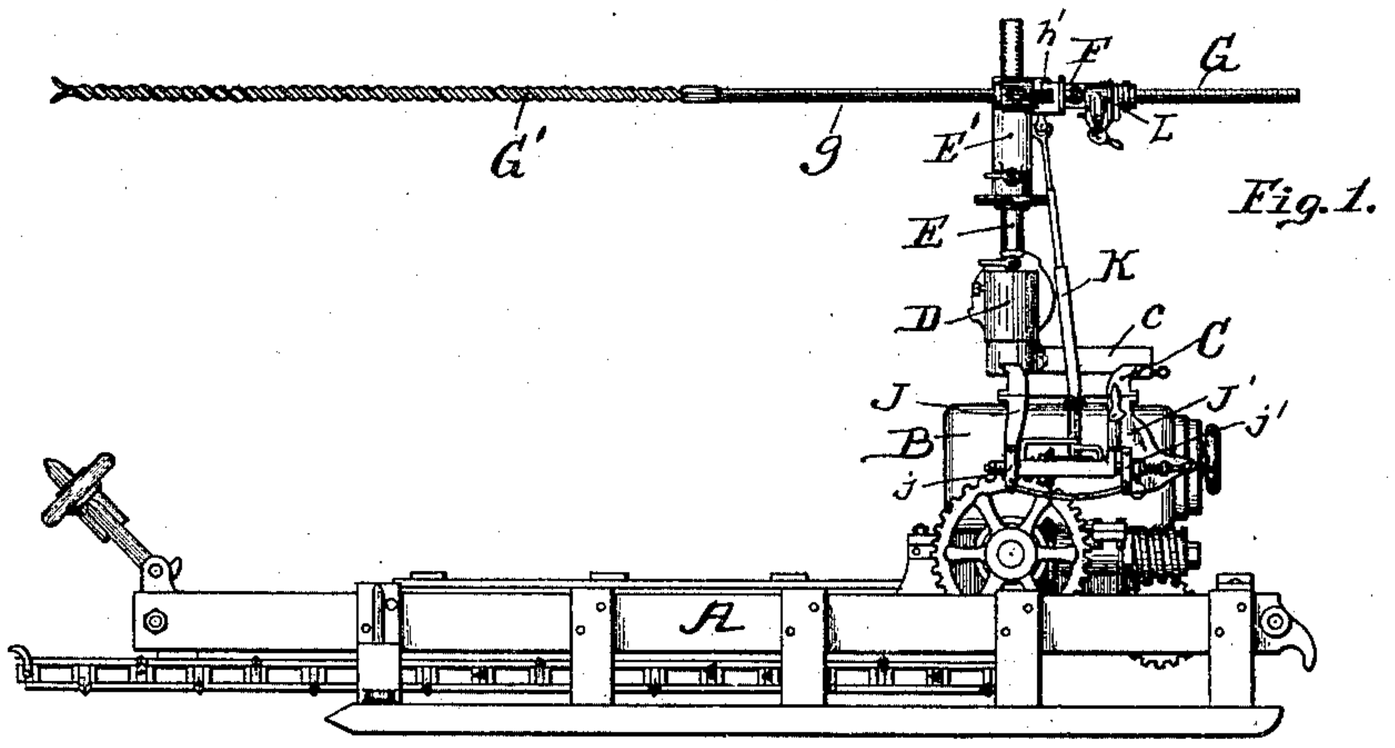

Fig. 1.

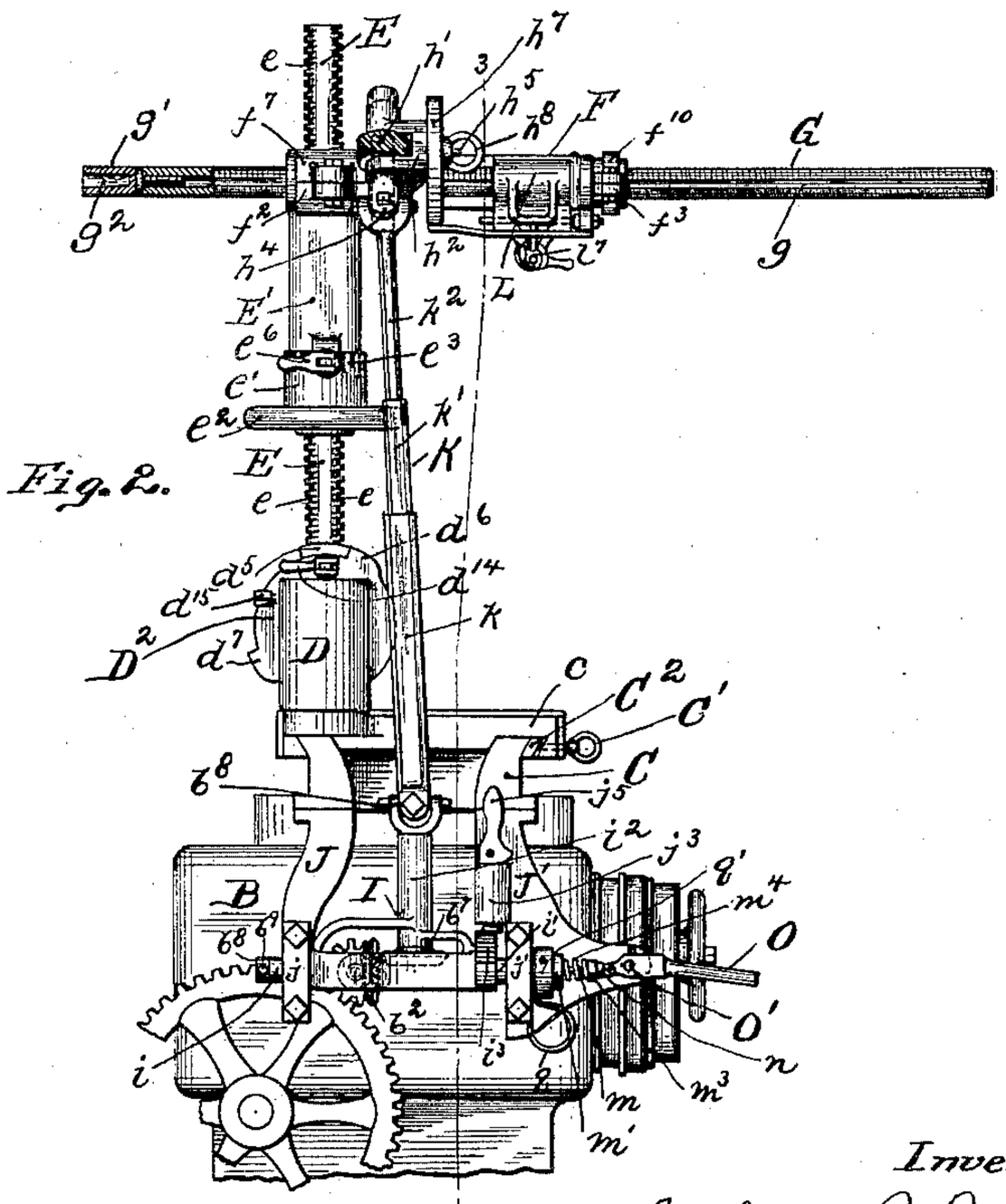

Fig. 2.

3

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No. 610,892. Patented Sept. 20, 1898.

W. B. BROOKS & T. ALTMAN.

ROCK DRILL.

(Application filed July 20, 1897.)

(No Model.) 3 Sheets—Sheet 2.

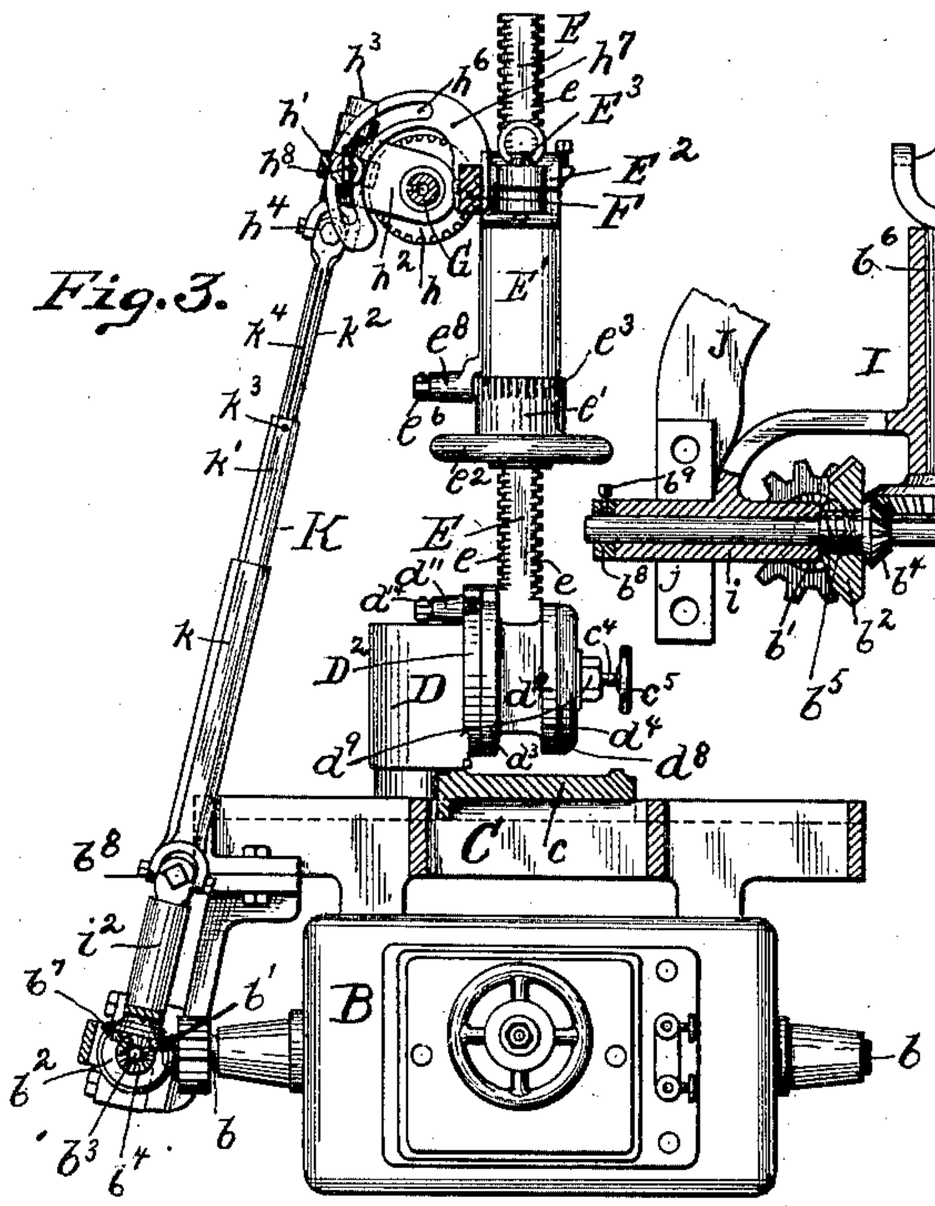

Fig. 3.

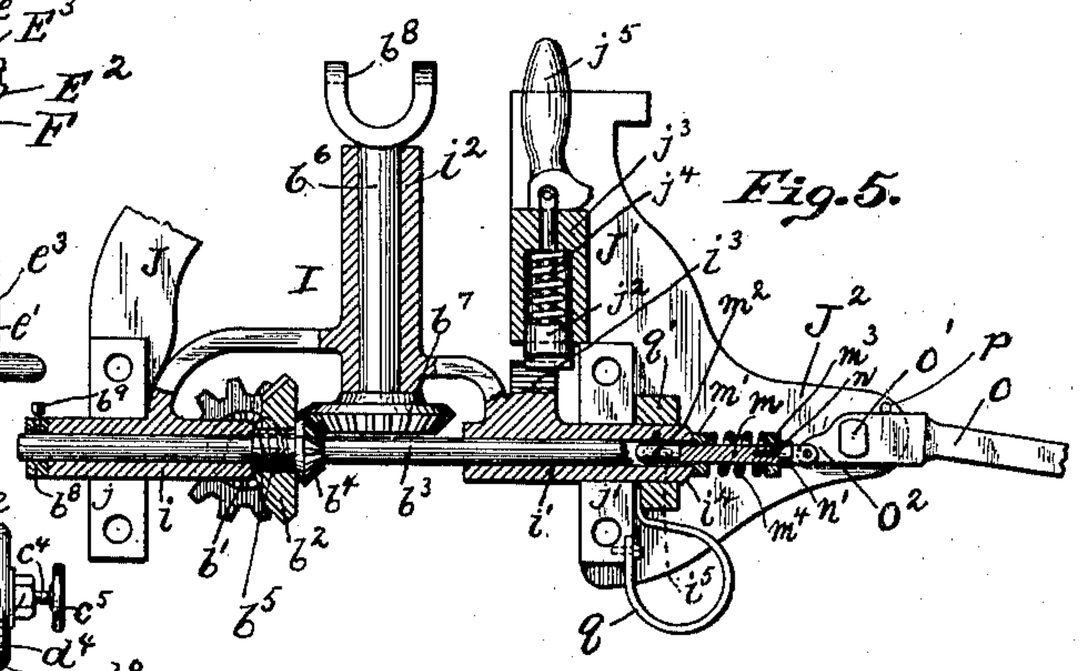

Fig. 5.

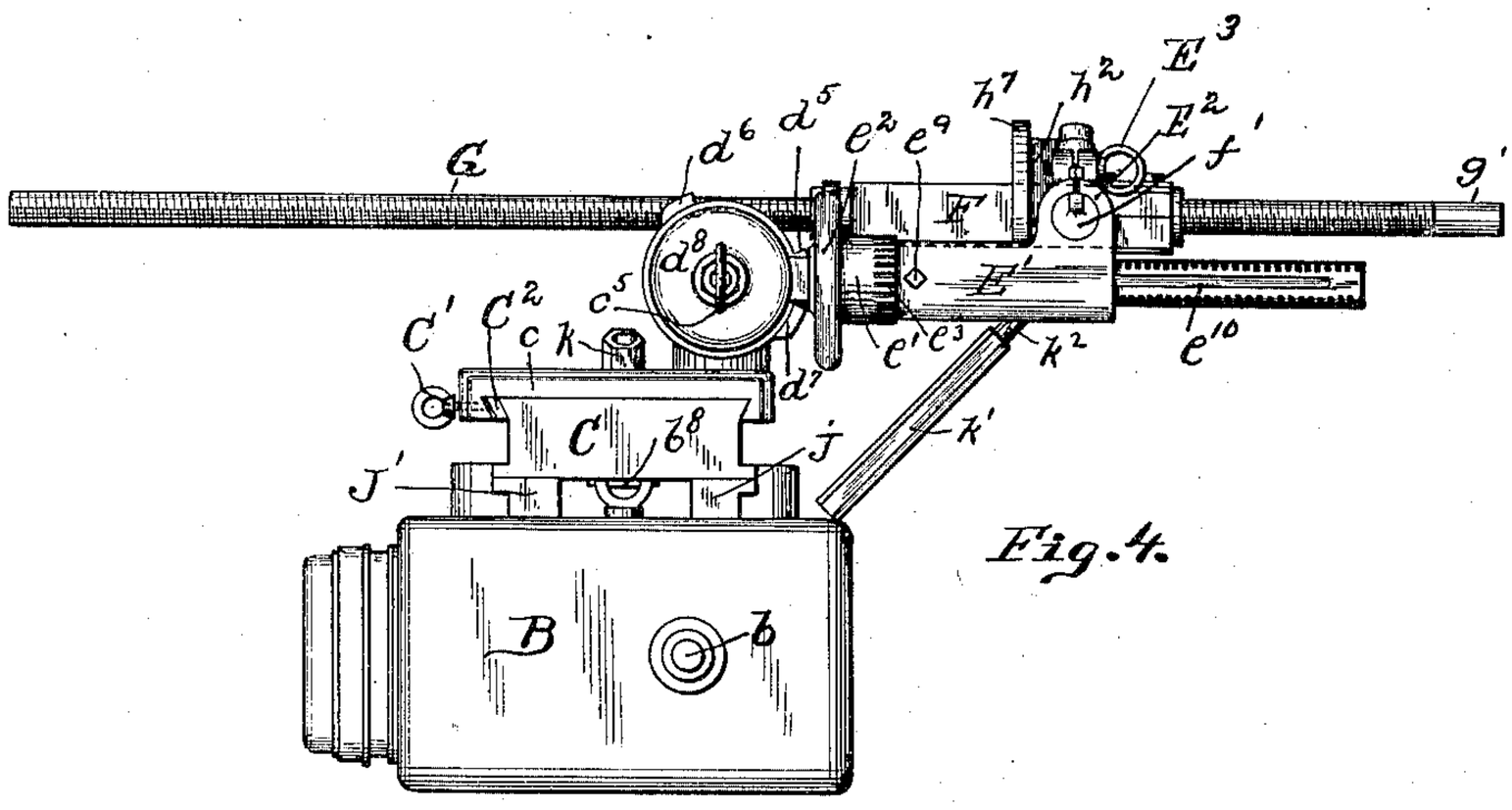

Fig. 4.

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No. 610,892. Patented Sept. 20, 1898.

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ROCK DRILL.

(Application filed July 20, 1897.)

(No Model.) 3 Sheets—Sheet 3.

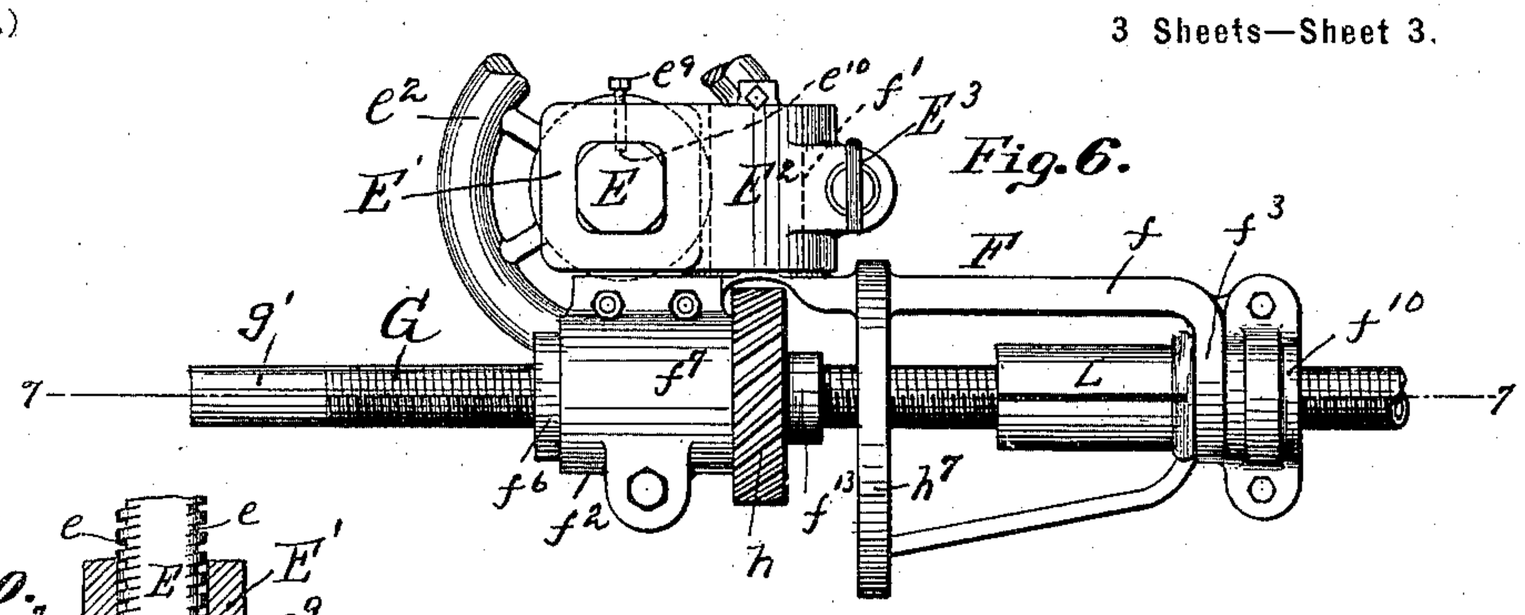

Fig. 6.

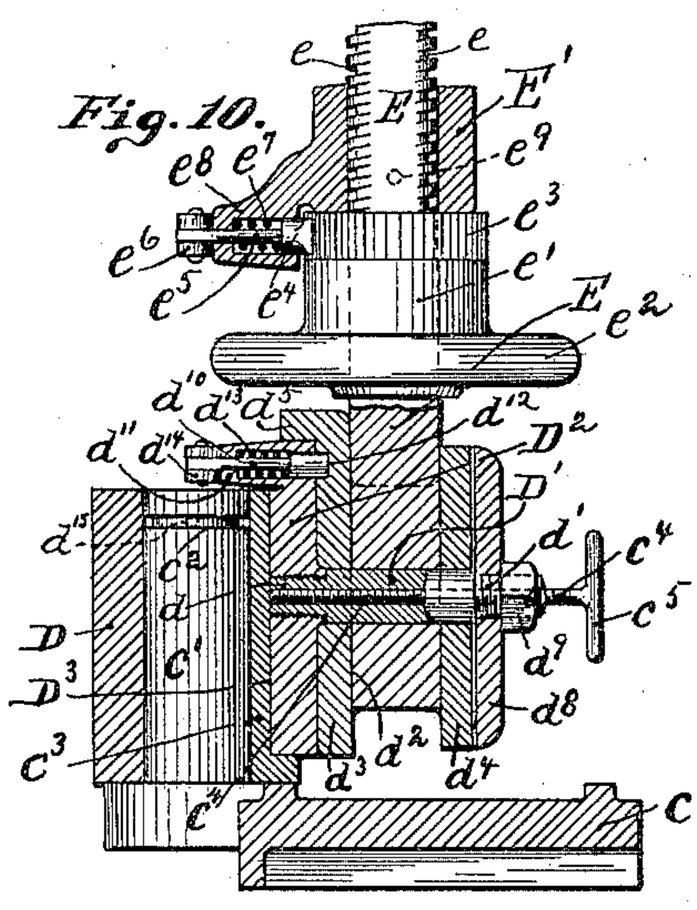

Fig. 10.

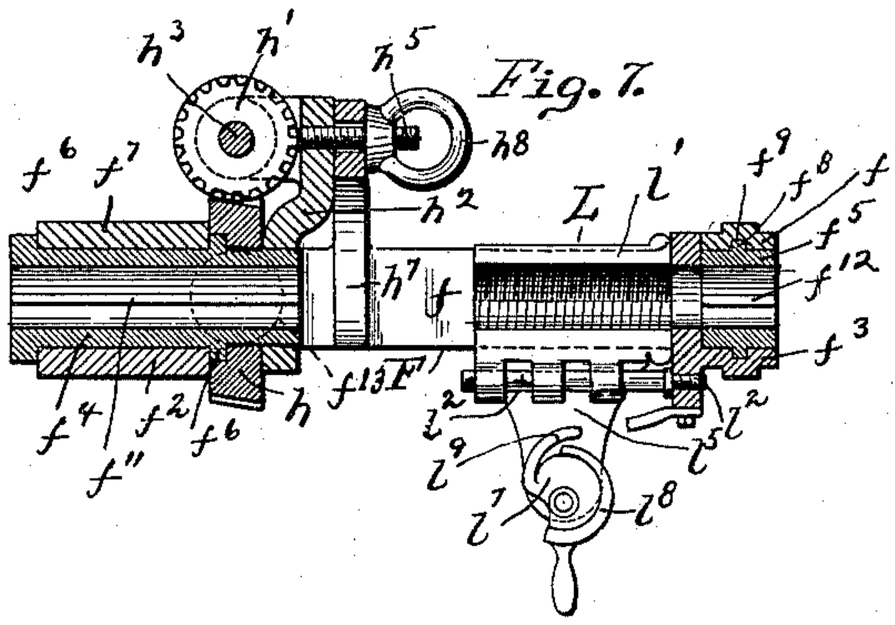

Fig. 7.

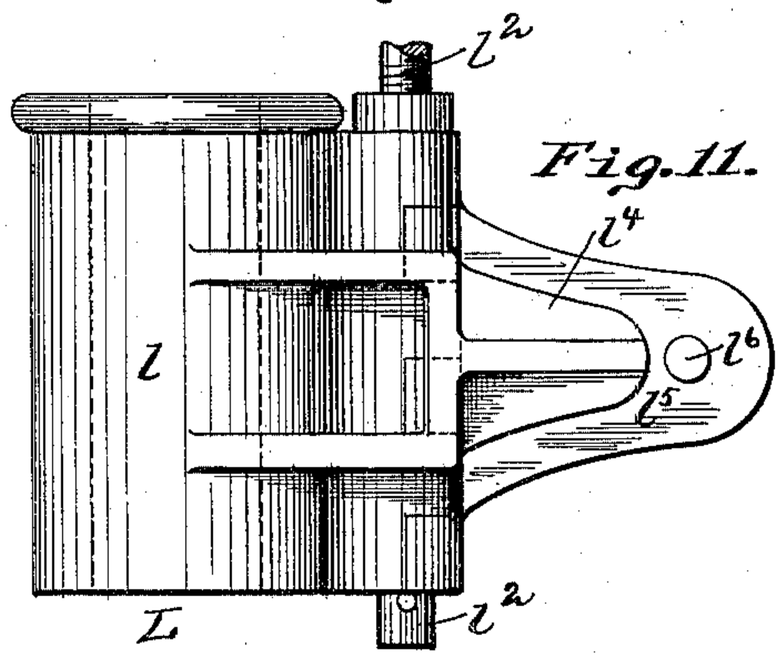

Fig. 11.

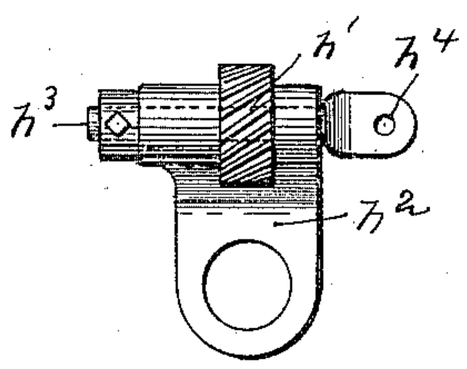

Fig. 8.

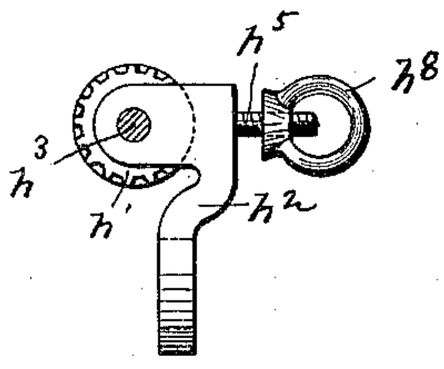

Fig. 9.

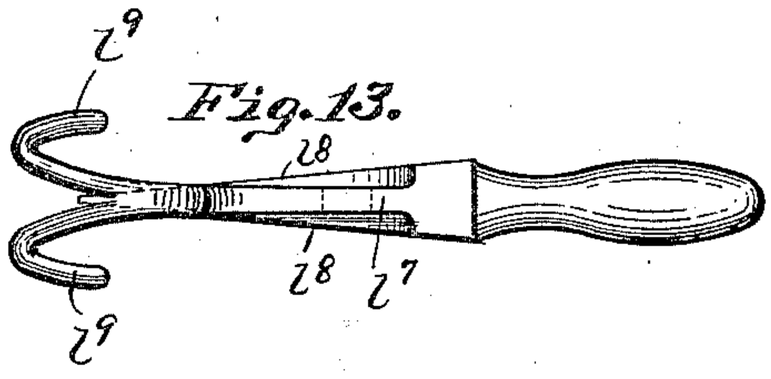

Fig. 13.

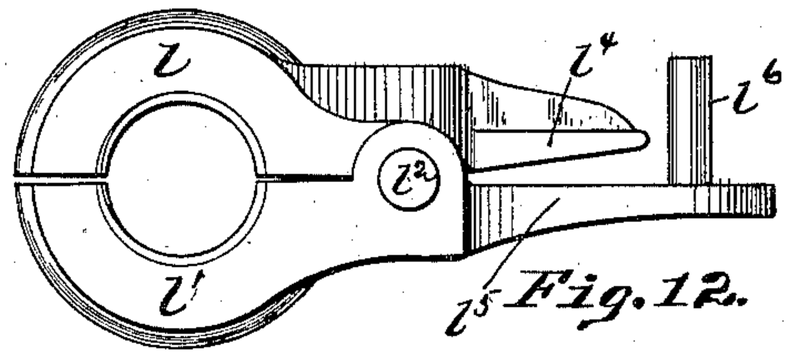

Fig. 12.

Witnesses:

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UNITED STATES PATENT OFFICE.

WILLIAM B. BROOKS AND THOMAS ALTMAN, OF FAIRMONT, WEST VIRGINIA.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 610,892, dated September 20, 1898.

Application filed July 20, 1897. Serial No. 645,213. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM B. BROOKS and THOMAS ALTMAN, residents of Fairmont, in the county of Marion and State of West Virginia, have invented a new and useful Improvement in Rock-Drills; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention relates to drills for drilling coal, rock, &c.

The objects of our invention are to provide a simple form of drill which can be moved in such a manner that the drill-bar can be directed into the material to be drilled in such a way as to give the best results, while at the same time the drill can be mounted, if desired, on a coal-cutting machine, so that immediately after the operation of the coal-cutting machine the drill may be brought into play, the same motor which operates the machine acting to operate the drill. However, the objects of the invention, as well as its novel features, will all appear in the specification and claims which follow.

In the accompanying drawings, Figure 1 is a side elevation of our improved drill mechanism shown in connection with a coal-cutting machine. Fig. 2 is a side elevation of the drill mechanism shown on a larger scale. Fig. 3 is an end elevation, partly in section. Fig. 4 is a side elevation opposite to that shown in Fig. 2, with the drill-post lowered. Fig. 5 is a detailed section of the gearing. Fig. 6 is a plan view of the feed-bar and its bearings. Fig. 7 is a section on the line 7 7, Fig. 6. Figs. 8 and 9 are details of the bracket in which the smaller spiral gear is journaled. Fig. 10 is a section showing the manner of hinging the drill-post. Figs. 11, 12, and 13 are details of the feed-nut and eccentric-wedge.

In the construction shown the drill is attached to a coal-mining machine A of any suitable construction, that illustrated being what is termed a "chain-machine," which is operated by the electric motor B. It is, however, obvious that it may be used in conjunction with any machine operated by any other motive power, such as steam, air, &c.

Secured to the upper face of the motor B is the bed-plate C, upon which is mounted the saddle *c*, said saddle being so mounted that it may slide thereon, as will be more fully hereinafter described. Secured at one corner of the saddle *c* is the stem *c'*, and journaled on this stem is the sleeve D, to which is hinged the drill-post E. The sleeve E' is mounted to slide up and down upon the drill-post E and carries at its upper end the frame F, which supports the feed-bar G, the frame F being mounted to swing in the bearing E^2, which forms a part of the sleeve E'. The frame F is clamped in any desired position by means of the eyebolt E^3. The frame F is composed of the arm *f*, with the trunnion *f'* near one end thereof, which fits in the bearing E^2, and at the ends of the arm *f* are formed the bearings f^2 f^3. Journaled in these bearings f^2 f^3 are the bushings f^4 f^5, the bushing f^4 having the enlarged portions f^6, which form collars and keep the bushing in place in the bearing when the cap f^7 of the bearing f^2 is bolted in place. The bushing f^5 has cast thereon the ring f^8, which fits in the annular groove f^9, formed in the bearing f^3, which is held in place by the cap f^{10}, secured to the bearing by means of bolts.

The feed-bar G has formed therein the keyway *g*, which extends throughout its entire length and into which fit the keys f^{11} f^{12}, which are secured upon the inner faces of the bushings f^4 f^5, respectively. The feed-bar G is hollow and is threaded throughout its entire length for a purpose more fully hereinafter described. Into one end of the bar G is threaded the drill-chuck *g'*, in which is formed the seat g^2 for the purpose of receiving the end of the drill G'. The bushing f^4 extends beyond the bearing f^2 and has threaded thereon the spiral gear *h*, which is countersunk to receive the collar f^6, which is formed on that side of the bushing, and the gear *h* is thus allowed to fit up close to the bearing f^2. A portion of the bushing also extends beyond the gear *h*, as at f^{13}, upon which is mounted the bracket-bearing h^2, in which is journaled the small spiral gear *h'*, which meshes into the gear *h*.

We provide for revolving the feed-bar G in the following manner: Secured to the end of the motor-shaft *b* is the bevel-pinion *b'*, which meshes into the bevel-gear b^2. A shaft b^3 is journaled in the swinging frame I, to which is keyed the bevel-pinion b^4. The pinion b^4

has formed thereon the threaded extension b^5, to which is secured the gear b^2. In this manner the gear b^2 revolves the pinion b^4 and the shaft b^3. The shaft b^3 is journaled in the bearings $i\,i'$ of the swinging frame I, which in turn is mounted to swing in the boxes $j\,j'$ of the depending brackets J J', which are secured to the bed C. The shaft b^6 has the bevel-gear b^7 keyed to its lower end, said gear b^7 being in position to mesh with the pinion b^4 and to be revolved thereby. The shaft b^6 is journaled in the bearing i^2, which forms a part of the frame I.

The telescopic shaft K is secured to the shaft b^6 at its upper end by means of the universal joint b^8. The telescopic shaft K, as shown, is formed in three parts $k\,k'\,k^2$, which fit the one into the other, the part k^2 fitting into the part k' and the part k' in turn fitting into the part k, for the purpose more fully hereinafter described. A pin k^3, passing through one side of the part k', near its upper end, slides in the groove k^4 and keeps the part k^2 from being withdrawn from the part k'. The groove k^4 extends nearly to the bottom of the part k^2, the parts being formed polygonal in cross-section, so that they will revolve in unison. The part k^2 is attached at its upper end to the shaft h^3 of the small spiral gear h' by means of the universal joint h^4. The teeth of the gears h and h' are preferably cut at an angle of forty-five degrees to their axes. This is found to be the most convenient form of connecting the shaft K with the feed-bar G; but it is obvious that bevel-gears or any other known form of connection might be used without departing from the spirit of our invention.

The bracket-bearing h^2 is mounted to swing upon the portion f^{13} of the bushing f^4, as before mentioned. This is for the purpose of placing the shaft h^3, carrying the spiral gear h', so that said shaft h^3 and telescopic shaft K may be placed as near in line as possible. A bolt h^5 is secured to the bracket h^2 and passes through the slot h^6 of the segmental guide-arm h^7, said guide-arm being connected to the arm f of the frame F and has threaded upon its outer end the ring-nut h^8. By this means the bearing h^4 is clamped in any desired position in reference to the shaft K, and at the same time the gear h' is kept in such a position that it will always mesh with the gear h, the bracket-bearing h^2 being mounted to swing on the same center upon which the gear h revolves. By means of the gearing just described the motion of the motor-shaft b is imparted through the bevel-pinion b' to the bevel-gear b^2 and to the shaft b^3, which in turn revolves the shaft b^6 through the bevel-pinion b^4 and the bevel-gear b^7. The motion is thus imparted to the telescopic shaft K and thence to the shaft h^3 and spiral gear h' thereon through the universal joints b^8 and h^4. The spiral gear h', meshing with the spiral gear h, imparts motion to the bushing f^4, which through the key f^{11}, sliding in the keyway g of the feed-bar G, imparts motion thereto to revolve the same and the drill which is seated in the end of said feed-bar G. As the feed-bar G is revolved a feeding or forward motion is imparted thereto in the following manner: A feed-nut L, formed in two parts $l\,l'$, is hinged upon the bolt l^2, whose end is threaded into the depending lug l^3 of the bearing f^5. The parts $l\,l'$ of the nut L form the jaws of the nut and are internally threaded to correspond to and receive the thread formed upon the periphery of the feed-bar G. The fingers $l^4\,l^5$ extend beyond the hinge, the lower finger l^5 having attached thereto the pin l^6, upon which is pivoted the eccentric wedge l^7. This eccentric wedge has the wedge-faces l^8 thereon, which slide between the fingers l^4 and l^5, and when the eccentric l^7 is turned in the proper direction these faces act to force the fingers $l^4\,l^5$ apart and close the jaws $l\,l'$ upon the feed-bar G. The internal threads cut upon the interior of the jaws $l\,l'$, entering the threads upon the feed-bar G, and thus acting to feed the bar G forward as said bar is revolved. The fingers l^9, which are formed upon the eccentric, straddle the fingers $l^4\,l^5$ of the nut L and act to force the jaws $l\,l'$ open when the eccentric is turned to withdraw the wedge from between the fingers $l^4\,l^5$. When the jaws of the nut L are thus opened, the feed-bar G can be withdrawn from the frame F.

The sleeve E' is free to slide up or down upon the drill-post E, and we provide for raising and lowering the same in the following manner: The drill-post E is square in cross-section, and upon its corners we cut the threads e. A sleeve e' immediately below the sleeve E' surrounds the post E and is internally threaded to fit the threads e, and when said sleeve is revolved upon the post E by means of the hand-wheel e^2 it is propelled up or down the post, as may be desired, and the sleeve E', carrying the frame F, the feed-bar G, and drill G', is thus raised or lowered to any desired position. The telescopic shaft K will either be extended or shortened as the drill and feed-bar are thus raised or lowered, so that the shaft K will take the required length between the universal joints b^8 and h^4, the parts k, k', and k^2 of said shaft K sliding in or out of each other, as required for adjustment. A bearing e^8 projects from the sleeve E', in which is mounted to slide the plunger e^4 at the end of the stem e^5. A lever e^6 is pivoted to the outer end of the stem e^5, a spring e^7 acting to force the plunger against the upper end of the sleeve e'. Teeth are cut on the inner face of the plunger e^4, which fit into the teeth e^3, formed on the upper periphery of the sleeve e'. When the lever e^6 is in its normal position, the spring e^7 forces the teeth of the plunger e^4 into engagement with the teeth e^3 of the sleeve e' and holds the sleeve from revolving upon the drill-post E. When it is desired to raise or lower the sleeve E', the operator grasps the lever e^6 and operates it to withdraw the teeth of the plunger e^4 from

engagement with the teeth e^3 of the sleeve e'. The sleeve e^2 is then free to be revolved by means of the hand-wheel e^2, and the sleeve E may thus be raised or lowered to the desired position, when it may be locked in place by operating the lever e^6, so that the teeth of the plunger may again engage the teeth e^3 of the sleeve e'. A pin or bolt e^9 passes through the sleeve E′ and engages with the groove e^{10}, cut in one side of the drill-post E. The slot e^{10} does not extend quite the full length of the post, and the pin e^9 thus keeps the sleeve E′ from sliding off the post E, while at the same time allowing it free movement upon said drill-post.

When the drill is not in use, it is desirable that it may be lowered, so that it may not be in the way of any projections or obstructions during transportation. To accomplish this, we have hinged the drill-post E to the sleeve D, so that it may be swung down when so desired. The hollow pin or bolt D′ is turned to a smaller diameter at each end, as at d d', these ends being threaded. One end is screwed into the sleeve D, as at d, the sleeve D being formed with the disk-face D^2, into which the bolt is screwed. The drill-post E sets into the socket d^2, which is formed with the disk-faces d^3 d^4. The bolt D′ passes through the socket d^2 and the drill-post E therein. A lug d^5, formed upon the disk d^3, extends over the circumference of the disk D^2 and is designed to engage or abut against one of the lugs d^6 d^7, formed upon the disk D^2. A washer d^8 fits around the threaded end d' of the bolt D′ and is held in place by means of the nut d^9. The face of the disk d^3 of the socket d^2 is thus held against the face of the disk D^2 by means of the washer d^8 and the nut d^9, but not so close but that the socket d^2 may revolve freely around the bolt D′. A plunger d^{10}, sliding loosely in the boss d^{11}, formed on the disk D^2, enters a seat d^{12}, provided therefor in the disk d^3, and holds the drill-post E in a vertical position, the spring d^{13} acting normally to hold the plunger d^{10} in engagement with the seat. A lever d^{14} when operated removes the plunger d^{10} from its seat, so that the drill-post E may be lowered. The lug d^5 abuts against the lug d^6 and limits further movement of the drill-post when the plunger d^{10} enters its seat to hold the drill-post in a vertical position, and likewise the lug d^5, coming into engagement with the lug d^7 when the drill-post E is lowered, limits any further movement in that direction and keeps the drill attachments from coming in contact with any part of the machine to which they may be attached. A pin or bolt d^{15} passes through the sleeve D and engages the annular slot or groove c^2, formed near the upper end of the stem c', and prevents the sleeve D being removed from the stem c', while at the same time it is free to revolve or swing upon said stem, thus allowing the drill to be pointed at any desired angle parallel with the base of the machine.

A clamping-plate c^3, being hollowed out or concaved on one side to conform to the contour of the stem c', sets in a seat D^3, provided therefor in the sleeve D, and is held firmly against the stem c' by means of the screw c^4, which is threaded into the hollow bolt D′, the screw c^4 being provided with a hand-piece c^5, by which it may be turned and the plate c^3 forced into contact with the stem c' and the sleeve D thus clamped to hold the drill in any position desired with reference to the post c'.

It will be observed that the drill-post E is not supported on its axial line, but is supported to one side thereof, as the sleeve D is mounted on the stem c' to one side of the axial line of the said drill-post. This brings the drill-rod, which is also mounted to one side of the axial line of the drill-post E at the upper end thereof, in line with the stem c' upon which the drill-post is mounted. By this construction there is not so much tendency on the part of the drill-rod when in operation to move the drill-post when it is clamped into position.

The saddle c is dovetailed on its under face and slides upon the bed-plate C, so that the drill may be adjusted laterally, a ring-bolt C′ acting upon the clamping-bar C^2 to hold the saddle firmly in any desired position upon the bed-plate C.

As before stated, the frame I is journaled to swing in the bearings j j' of the depending brackets J J′. A toothed segment i^3 is formed upon the frame I, said segment being engaged by the teeth of the plunger j^2, which slides in the hollow lug j^3, formed on the bracket J′, the teeth of the plunger j^2 being held in engagement with the teeth of the segment i^3 by means of the spring j^4. A lever j^5 acts to withdraw the plunger when it is desired to change the position or direction of the bearing i^2 of the frame I. This is for the purpose of keeping the shaft b^6 as near in line as possible with the telescopic shaft K when for any reason they should be thrown out of line—as, for instance, the sliding of the saddle c upon the bed-plate C.

When the drill is not in use, it is desirous that the gearing for operating the same should be thrown out of engagement with the motor-shaft. This is especially the case when the drill is attached to another machine, which in the instance shown is a coal-cutting machine, and the motor is used for operating other mechanism. To provide for this, the shaft-bearings i i' are so mounted in the journal-boxes j j' as to provide for a lateral movement therein. A collar b^8 is secured to the shaft b^3 at the outer end of the bearing i by means of a set-screw b^9, and the hub b^5 of the bevel-pinion b^4 sets against the inner end of the bearing i, the shaft thus being held from lateral movement in the bearings i i'. The outer end of bearings i' has a convex face i^4, against which fits the concave face of the collar m', which slides freely on the rod m. The

rod m extends beyond the collar m' into the bearing i' and carries a pin m^2, which slides in the slots i^5, formed on the inside of the bearing i', as shown in dotted lines, Fig. 5. A collar m^3 is threaded on the outer end of the rod m, and interposed between said collar m^3 and collar m' is the spring m^4. The bolt n is threaded into the end of the rod m and has the head n' thereon, which locks the collar m^3 in place. A lever O is pivoted to the arm j^2 of depending bracket J' at O' and carries the short arm O^2, which is pivoted to the head of the bolt n at O^3. A stop p on the arm J^2 limits the upward movement of lever O. A curved leaf-spring q is attached to the lower end of bearing-box j', its free end bearing against the inner face of the collar q', keyed to the outer end of bearing i'.

In Fig. 5 we have shown the gear b^2 in engagement with the pinion b', the parts thus being in position to operate the drill. When it is desired to throw the drill parts out of engagement with the motor, the operator depresses the lever O, withdrawing the face of the shoulder m' from engagement with the end face of bearing i' and allowing the spring q to act against the collar q', sliding the frame I in bearings j and j'. As the frame thus slides it carries the shaft b^3 with it and disengages the bevel-gear b^2 from the pinion b'. When the parts are in this position, no power is transmitted to the drill.

By raising the lever O the rod m is thrown in and the spring m^4 forces the collar m' against the end of bearing i', forcing the gear b^2 into engagement with the pinion b', and power will then be transmitted through the gearing previously described to operate the drill G'. The pin m^2, passing through end of rod m and sliding in the slots i^5, is for the purpose of keeping rod m from being withdrawn altogether from the end of bearing i', and allows the frame I to be moved by the compression and expansion of the springs m^4 and q, respectively. As the joint O^2 moves around the pivotal point O' the concave face of the collar m' slides upon the convex surface i^4 of the end of bearing i' and allows of a positive bearing between the two surfaces. When the gear b^2 has been thrown into engagement with pinion b', the joint O^2 lies below a horizontal line drawn through the pivotal point O' of lever O and the spring q acts to keep the parts in the position just described, the pin p limiting the upward movement of the lever O.

The operation of our improved drill connection is as follows: When the drill is attached to a coal-cutting machine, as illustrated, the power is applied to operate the coal-cutting machine A, the drill mechanism being first thrown out of gear with the motor-shaft by depressing lever O. When the undercutting has been accomplished, the drill-standard is revolved upon the shaft D', raising it to a vertical position, it having been thrown down to a horizontal position, as shown in Fig. 4, during transportation. The plunger d^{10} will be forced by the spring d^{13} to its seat d^{12}, and the drill-post is thus held in the aforesaid vertical position. The drill is then placed in the seat g^2 of the socket g'. By means of the lever e^6 the pawl e^4 may be raised from engagement with the teeth e^3 of the sleeve e^8, and by turning wheel e^2 the drill-bearing may be raised or lowered to the desired height, when the lever e^6 is again operated to lock the collar e' from further motion. By means of the saddle c sliding upon the bed-plate C any lateral adjustment desired may be had and the parts locked by means of the ring-bolt c'. By revolving the parts upon the stem c' the drill may be adjusted in a parallel plane and there clamped by means of the hand-screw c^4, acting to force the segment c^3 against the stem c'. By loosening the eye-bolt E^3 the frame F may be tilted as desired and there clamped by means of the aforesaid eyebolt E^3. When the drill has thus been adjusted to the desired position, the gear-frame I is turned upon the hollow bearings $i\,i'$, so that the shaft b^6 may be as nearly in line as desirable with the telescopic shaft K. The shaft h^3 is then alined with the shaft K by means of the bearing-bracket h^2, moving around the end f^{13} of bushing f^4 and guided by the segment h^7. By raising the lever O the bevel-gear b^2 is thrown into engagement with the bevel-pinion b' on end of motor-shaft b, and power is then transmitted through the parts described to revolve the drill. The gearing operating the coal-cutter is of course first thrown out of engagement. As the drill revolves the feed-bar G is fed forward by means of the nut L, by which it is revolved. In this manner the drill is operated until a hole of the desired depth has been drilled. The motor is then reversed and the drill is then rapidly withdrawn from the hole thus drilled. The drill can then be adjusted in the manner hereinbefore set forth for the operation of drilling another hole.

The parts of the improved drill are so constructed and arranged that they may be quickly adjusted at different positions and held securely in those positions during the drilling operation.

The drill is so compact and easily handled that it may be mounted on the motor or other convenient part of an ordinary coal-mining machine, so that a separate and distinct support is not required for the drill. This is a matter of great convenience, as the same motor is employed for operating both machines and the drill is always in position to be brought into play immediately the undercut has been made by the mining-machine.

When not in use or when in course of transportation from one place to another in the mine, the drill may be lowered into the posi-

tion shown in Fig. 4, so that it may be transported without danger of striking the roof of the mine or any depending obstructions.

By having the drill mounted on the saddle, which can be moved laterally with reference to the wall of coal, the drill-bar can always be fed to the wall of coal at a right angle instead of having to feed the drill at another angle. The drill-bar enters the coal on a line parallel with the undercut. This is the case whether the hole is to be drilled at an elevated point or at a lower level, owing to the fact that the post upon which the drill-bar is mounted, together with the shaft which transmits motion thereto, permit of the adjustment of the drill-bar at different heights without tilting the drill-bar at an angle of incline.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination with a suitable frame, of a threaded upright bar hinged at its lower end thereto, a sliding sleeve on said upright, drilling mechanism carried by said sleeve, a threaded collar on said threaded upright below said sleeve, a telescopic rotary shaft extending up adjacent to said upright, and connections between said telescopic shaft and said drilling mechanism, substantially as set forth.

2. In a drill, the combination of an upright having threads thereon, a sleeve loosely mounted thereon, drilling mechanism carried by said sleeve, a collar engaging said upright below said sleeve, said collar having teeth formed therein around its circumference, a pawl engaging said teeth, and means for operating said drilling mechanism, substantially as set forth.

3. In a drill, the combination of an upright having threads thereon, a sleeve loosely mounted thereon, drilling mechanism carried by said sleeve, a collar engaging said upright below said sleeve, said collar having teeth formed therein, an arm on said sleeve, a plunger in said arm, said plunger having teeth engaging the teeth on said collar, and a spring acting on said plunger, substantially as set forth.

4. In a drill, the combination of an upright having threads thereon, a sleeve loosely mounted thereon, drilling mechanism carried by said sleeve, a collar engaging said upright below said sleeve, said collar having teeth formed therein, an arm on said sleeve, a plunger in said arm, said plunger having teeth engaging the teeth on said collar, a stem on said plunger, a spring interposed between said plunger and arm, and a lever for withdrawing said plunger, substantially as set forth.

5. In a drill, the combination of a suitable frame, an upright stem thereon, a sleeve journaled on said stem, a clamping-plate within said sleeve, an upright mounted on said sleeve, and drilling mechanism carried by said upright, substantially as set forth.

6. In a drill, the combination of a suitable frame, an upright stem thereon, a sleeve journaled on said stem, a clamping-plate within said sleeve, a shaft extending out from said sleeve, a rotatable disk on said shaft, the inner end of said shaft being in contact with said clamping-plate and means for moving said shaft longitudinally, an upright mounted on said disk, and drilling mechanism carried by said upright, substantially as set forth.

7. In a drill, the combination of a suitable frame, an upright mounted thereon, a threaded drill-bar supported by said upright, mechanism for revolving said drill-bar, a two-part hinged sleeve encircling said drill-bar, said sleeve being threaded internally, and a wedge adapted to move between the inner ends of said parts composing said sleeve, and fingers on said wedge adapted to straddle said inner ends, substantially as set forth.

8. In a drill, the combination of a suitable frame, an upright mounted thereon, drilling mechanism carried by said upright, mechanism for raising and lowering said drilling mechanism on said upright, a gear carried by said upright, a rotatable telescopic shaft extending up from said frame, a swinging bracket supported by said upright, a supplemental shaft journaled in said bracket, a gear on said supplemental shaft meshing with the aforesaid gear, said shafts being connected by a universal joint, a rigid arm having a slot therein, said bracket engaging said slot, and means for clamping said bracket at different positions within said slot, substantially as set forth.

9. In a drill, the combination of a suitable frame, an upright mounted thereon, drilling mechanism carried thereby, a longitudinally-movable frame, a horizontal shaft journaled in said movable frame, a vertical shaft journaled in said movable frame, connections between said vertical shaft and the drilling mechanism, connections between said vertical shaft and a power-driven shaft, and means for moving said longitudinally-movable frame to make and break said last-mentioned connections, substantially as set forth.

10. In a drill, the combination of a suitable frame, an upright mounted thereon, drilling mechanism carried thereby, a longitudinally-movable frame, a horizontal shaft journaled in said movable frame, a vertical shaft journaled in said movable frame, connections between said vertical shaft and the drilling mechanism, a bevel-gear on said vertical shaft engaging a bevel-gear on said horizontal shaft, a second bevel-gear on said horizontal shaft engaging a bevel-gear on a power-driven shaft, and means for moving said longitudinally-movable frame to free said last-mentioned gears or throw same into engagement, substantially as set forth.

11. In a drill, the combination of a suitable frame, an upright mounted thereon, drilling mechanism carried thereby, a longitudinally-

movable frame, a horizontal shaft journaled in said movable frame, connections between said vertical shaft and the drilling mechanism, connections between said vertical shaft and a power-driven shaft, and a spring interposed between the main frame and said longitudinally-movable frame, substantially as set forth.

In testimony whereof we, the said WILLIAM B. BROOKS and THOMAS ALTMAN, have hereunto set our hands.

WILLIAM B. BROOKS.
THOMAS ALTMAN.

Witnesses:
A. B. FLEMING,
GEO. DE BOLT.