3 Sheets--Sheet 1.

S. HIPKINS, Jr.

Coal Boring-Machines.

No. 134,804. Patented Jan. 14, 1873.

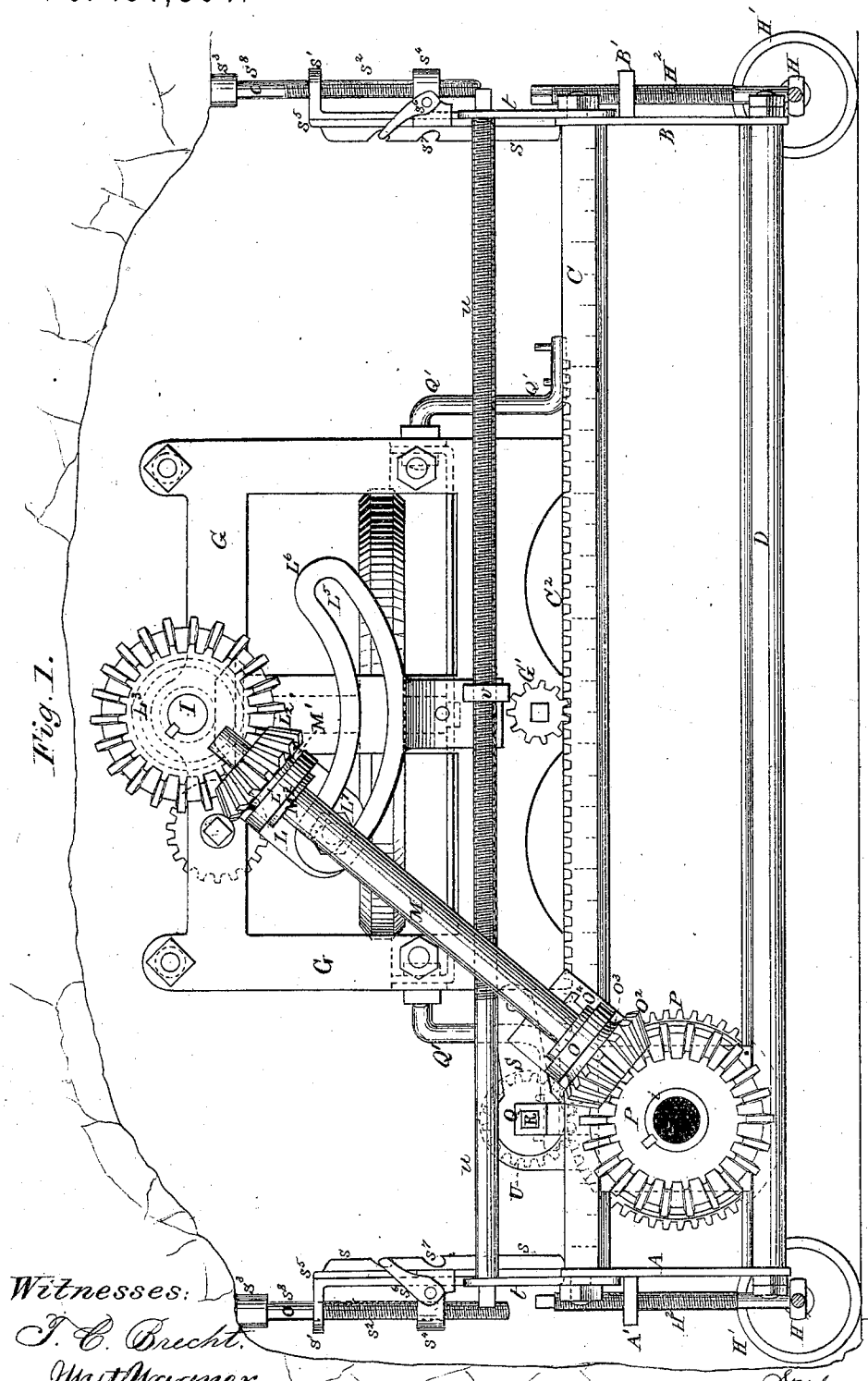

Fig. 1.

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J. Mist Wagner

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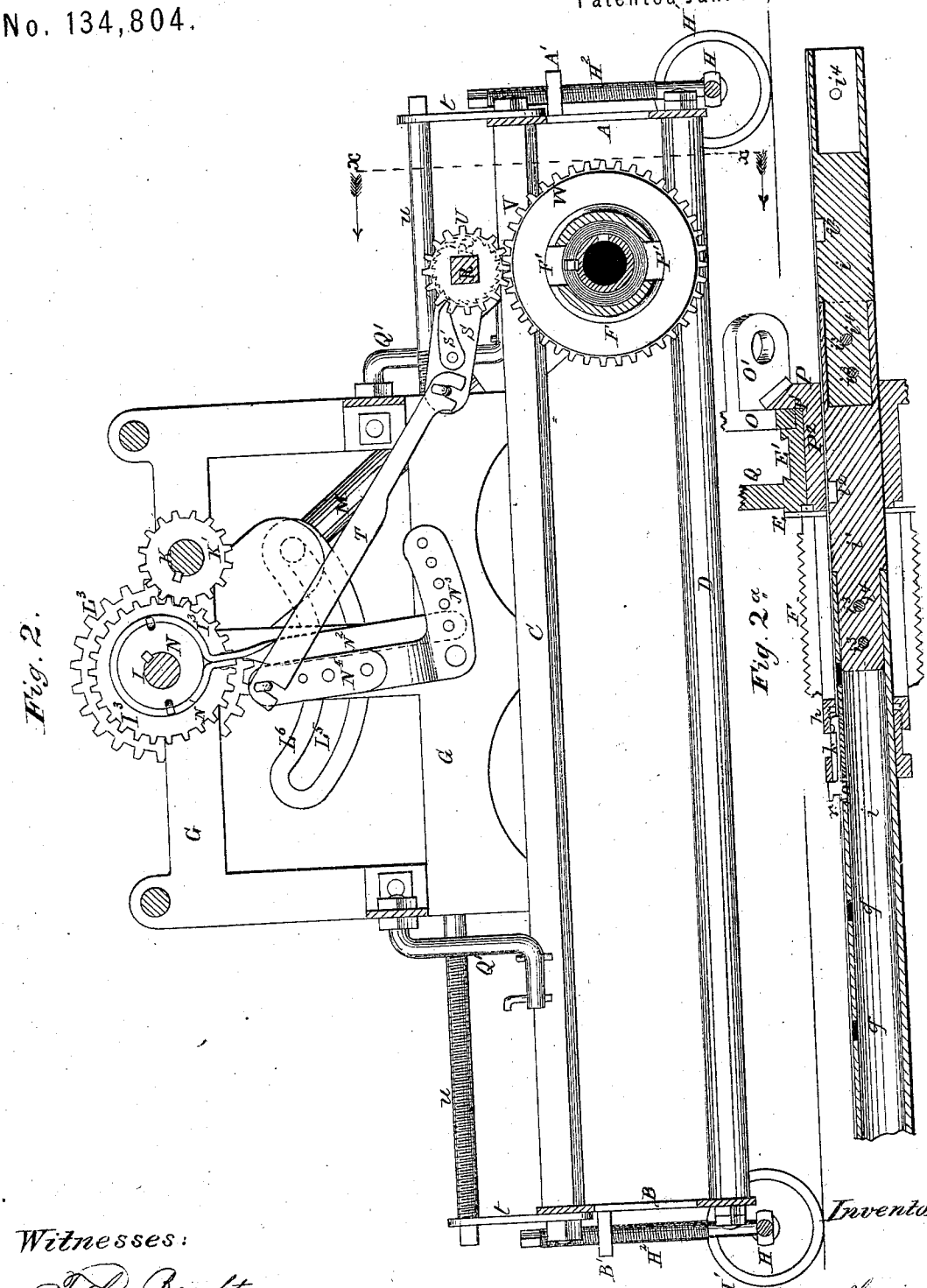

Fig. 2.

Fig. 2a.

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Coal Boring-Machines.

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Fig. 3.

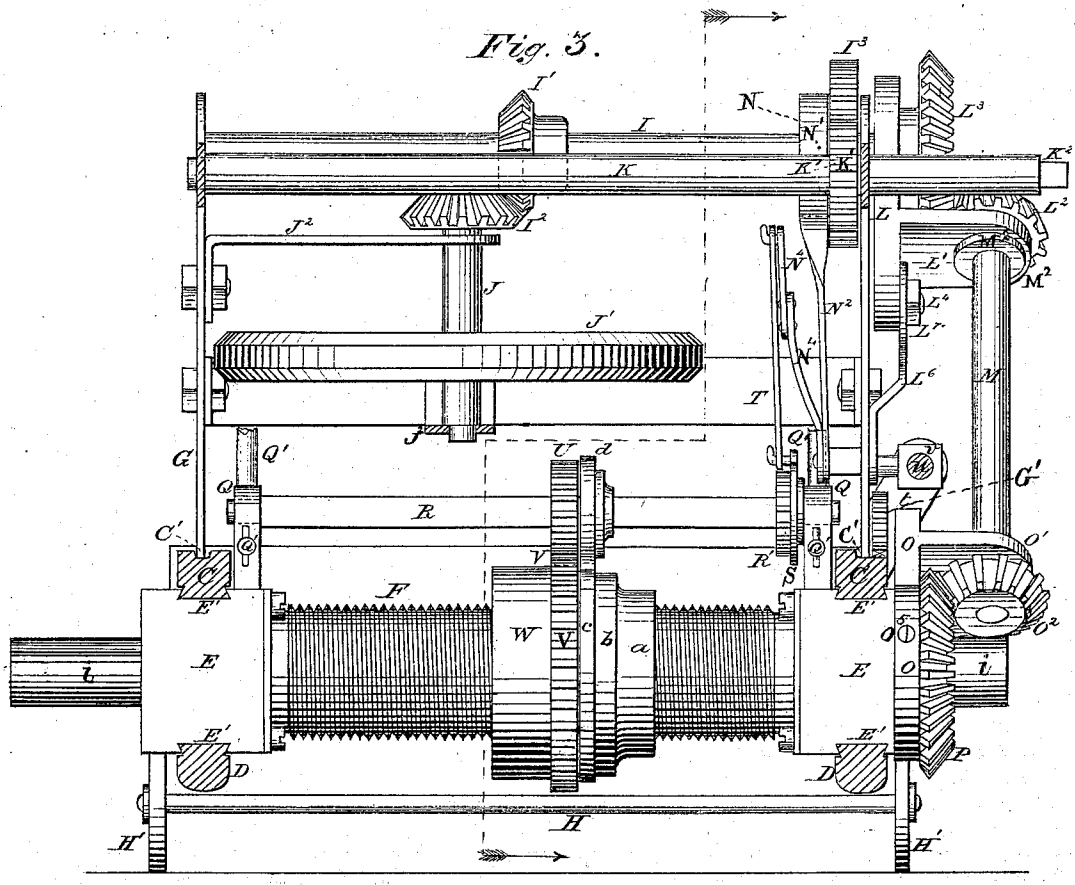


Fig. 4.

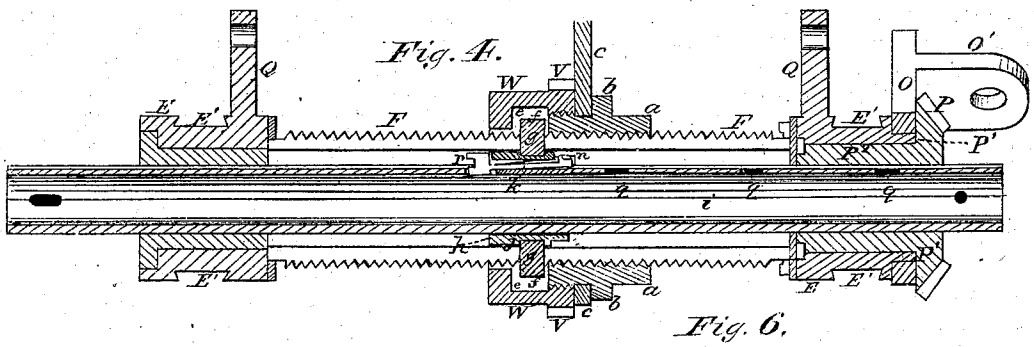
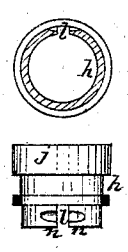


Fig. 6.

Fig. 7.



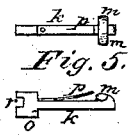
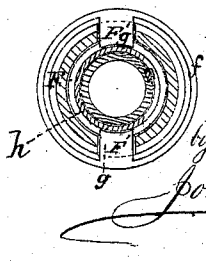


Fig. 5.



Witnesses:

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Wm. Wagner.

Inventor:

Stephen Hipkins Jr.

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UNITED STATES PATENT OFFICE.

STEPHEN HIPKINS, JR., OF WHEELING, WEST VIRGINIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO RALPH HEATHERINGTON, OF SAME PLACE.

IMPROVEMENT IN COAL-BORING MACHINES.

Specification forming part of Letters Patent No. **134,804**, dated January 14, 1873.

To all whom it may concern:

Be it known that I, STEPHEN HIPKINS, Jr., of Wheeling, in the county of Ohio and State of West Virginia, have invented certain new and useful Improvements in Coal-Boring Machines, of which the following is a specification:

My invention relates to that class of coal-boring machines operated by hand; and my said invention consists, first, in combining the movable frame and the gearing which it carries for operating the bit-stock with the screw-sleeve and its parts carrying the bit-stock, when both are arranged to be moved in the same direction in different planes upon and within a fixed frame, as hereinafter described; second, in the arrangement and construction of the mechanism for operating the bit-stock and the parts carrying the same, whereby they may be readily connected to and disconnected from each other, as will be more particularly hereinafter described; third, in the arrangement of the carrying-frame, the bit-stock-carrying parts, and their slides, whereby the bit-stock may be moved upon the main frame in opposite directions and from the opposite ends of said carrying-frame to obtain the advantage of back-and-forth cuts upon the same frame; fourth, in the feeding-tube for the bit-stock, constructed, connected, and carrying the bit-stock in its compound movement; fifth, in the construction and arrangement of devices for feeding the bit-stock into and toward the wall; sixth, in the construction and arrangement of devices for disconnecting the bit-stock from the feeding-tube without removing the connecting-sleeve from said tube or any of the other parts; seventh, in the construction and arrangement of the devices for connecting the feeding devices of the screw-tube with the operating parts of the machine; eighth, in the construction and arrangement of devices for raising and lowering the main frame; and, finally, in the construction and relative arrangement of the operative parts of my improved machine, whereby an efficient and compact new coal-borer is produced.

In the accompanying drawing, Figure 1, Sheet 1, represents a side elevation of my improved coal-boring machine; Fig. 2, Sheet 2, represents a longitudinal vertical section of the same, indicated by the dotted line, Fig. 3, and looking in the direction shown by the arrows; Fig. 2ª, Sheet 2, represents a longitudinal vertical section of the bit-stock-carrying parts with the extension of the bit-stock; Fig. 3, Sheet 3, represents a vertical cross-section of the machine at line *x x* of Fig. 2; Fig. 4, Sheet 3, represents a longitudinal vertical section of the bit-stock-carrying parts; and Figs. 5, 6, and 7, Sheet 3, represent detached views of parts of the bit-stock.

The main frame of my improved coal-boring machine consists of two end pieces, A B, connected to each other on each side by upper bars C and lower bars D, the lower edges of the bars C and the upper edges of bars D being dovetailed, as shown in Fig. 3, to fit into dovetailed grooves E′ in the upper and lower faces of slides E, one on each side, which slides E are provided with central circular side openings, and are connected to each other by means of a tube, F, provided on its outer surface with a male-screw thread, and with longitudinal openings F′, Fig. 6, at top and bottom. In the upper faces of the bars C are formed grooves C^1, Fig. 3, in which the lower edges of a frame, G, move freely forward and backward, the outer edge forming the groove on the face of bar C, at one side being formed, for a suitable distance, into a rack, C^2, Fig. 1, into which a cog-wheel, G′, on the corresponding side of frame G gears. From bars H, at each of the end pieces A B, and which bars carry at each end a wheel, H^1, rise standards H^2, provided with screw-threads and a square top, which standards, passing through lugs A′ B′ on the end pieces of the frame, support the frame on the wheels, and thereby render it movable; and the lower ends of these standards revolving freely in the bars H, on which they rest by means of shoulders, they will, when turned in one direction or the other, elevate or lower the frame vertically, and thus serve to make the machine level. A shaft, I, has its bearings in the upper bars of the frame G, and carries, at a suitable point between the sides of the frame, a beveled cog-wheel, I^1, gearing with a horizontal beveled cog-wheel, I^2, on the upper end of the shaft J of a fly-wheel, J^1, which shaft J has suitable bearings in pieces J^2 secured to the frame G. On the shaft I, just

inside of one end of the frame G, is keyed a cog-wheel, I^3, gearing with a cog-wheel, K^1, on a shaft, K, which shaft has its bearings in the frame G and is revolved by means of a crank-handle which is secured on its outer square end K^2. On the outside of the frame G, on the shaft I, and capable of being turned upon the latter, is an L-shaped bearing-piece, L, through the horizontal portion L^1 of which a shaft, M, passes, which shaft also passes through a beveled cog-wheel, L^2, above the portion L^1 of the bearing-piece L, the wheel L^2 gearing with another beveled cog-wheel, L^3, keyed on the shaft I outside of the bearing-piece L. The cog-wheel L^2 is formed on a sleeve, M^1, which passes through the extension L^1, and on the under side of the latter extends into a collar, M^2, so that when the shaft M is keyed at its upper end to the cog-wheel L^2 the rotation of the shaft will also rotate the sleeve and the cog-wheel in the extension L^1, but the removal of the shaft will leave the cog-wheel and sleeve securely held in the extension. From the lower end of the piece L extends outwardly a pin, L^4, which has a free movement in a slot, L^5, in a segmental piece, L^6, secured to the outside of the frame G, the slot L^5 forming the periphery of a circle of which the shaft I forms the center. By these means the piece L may be set at any angle toward a vertical line, a nut, L^7, holding the pin L^4 at any desired point of the piece L^6. On the inside of the cog-wheel I^3 an eccentric disk, N, is keyed, around which eccentric disk a band or sleeve, N^1, slides freely, from which sleeve an arm, N^2, extends downwardly, its lower end being connected by a pin to the horizontal arm of an L shaped piece, N^4, which is pivoted at its angle to the frame G. The arms N^4 and N^3 are both provided with several holes to vary their points of attachment to the eccentric rod N^2 and the arm T. The lower end of the shaft M passes through the horizontal extension O^1 of a lower L-shaped bearing-piece, O, which encircles a circular shoulder, P^1, formed on the side face of the slide E, and carries at the under side of this extension O^1 a cog-wheel, O^2, gearing with the cog-wheel P. This cog-wheel O^2 is secured on a sleeve, O^3, Fig. 1, which sleeve passes through the extension O^1 and forms a collar, O^4, on its upper side, being secured in the extension O^1 in the same manner as the cog-wheel L^2 in its extension L^1. The sleeve P^2, Figs. 2^a and 4, of the cog-wheel P extends inwardly into one of the slides E; and between the outer end of the latter and the cog-wheel P the piece O moves freely around the shoulder P^1, unless secured in any desired position by a set-screw, O^5, Fig. 3. From the slides E standards Q extend upwardly, between which a square bar, R, is pivoted, the ends of this bar revolving in suitable bearings in these standards. At the end of the bar R nearest that side of the machine on which the shaft M is located, and just inside of the standard Q, a ratchet-wheel, R′, is secured, and between it and the standard Q an arm, S, revolves freely around the bar R, which latter at that point is rounded. To the arm S is pivoted a pawl, S′, Fig. 2, which seizes against the teeth of the wheel R when the arm is raised, but slips over the teeth without operating the wheel when the arm S is lowered. This arm is connected by a bar, T, Figs. 2 and 3, or in any other suitable manner, to the upper end of the L-shaped piece N^4; and as the latter is operated from the eccentric disk N through the arm N^2 each revolution of the shaft I will once operate the arm S forward and backward or up and down, and therefore also revolve the bar R a certain distance, and this distance can be regulated by the raising, more or less, of the arm S, which is effected by means of adjusting the arm N^2 in the various holes of the arm N^3, and the bar T in the holes of the arm N^4 of the L-shaped piece. Through the standards Q are made openings, through which the lower ends of connecting-rods Q′ pass, they being held in place by means of pins passing through them. The upper ends of these rods Q′ are pivoted in the end pieces of the frame G, and each end of the frame is provided with two such rods in order that either end of the frame may be coupled to the standards Q at pleasure. On the bar R freely slides a cog-wheel, U, which gears with a cog-wheel, V, formed on the outside and on the inner end of a sleeve, W. This sleeve W surrounds the hollow tube F, and is provided on the inside, directly under the cog-wheel V, with a screw-thread, by means of which it is screwed over the inner end of a sleeve, *a*, which screws upon the tube F from the opposite direction to the sleeve W. This sleeve *a* is provided with a shoulder, *b*, between which and the inner end of the sleeve W a guide, *c*, turns loosely over the sleeve *a*, its upper end *d* encircling the bar R and allowing the same to turn within it. On the inside of this sleeve W is formed a recess, *e*, Fig. 4, in which a ring, *f*, encircling and freely sliding over the tube F, has free play. This ring *f* has two inward projections, *g*, which pass through the longitudinal openings F′ at the top and bottom of the tube F and extend into a sleeve, *h*, Fig. 7, surrounding the hollow bit-stock *i*, and made to slide over the same freely, both the upper and lower projections *g* bearing against the shoulder *j* on the sleeve. At the upper part of this sleeve it is provided on its inside with a recess, *l*, in which a pawl, *k*, Fig. 5, has its bearings, which pawl is free to move up and down in the slot or recess *l* in the sleeve *h*, Fig. 7, the pivoted end of the pawl being provided with two projections, *m*, Fig. 5, which have their bearings in depressions *n* at one end of the sleeve *h*, Fig. 7, while the free end of the pawl has a downward projection, *o*, and is forced down by means of a flat spring, *p*. This projection *o* seizes into corresponding openings *q* in the hollow bit-stock *i*, and the pawl *k* has in its face a notch, *r*, Figs. 4 and 5, into which any instrument may be made to seize, being passed through the top

opening F^1 of the tube F to raise the pawl and release it from contact with the bit-stock *i* in order to allow the latter to be moved in and out of the tube F free of any of the operative parts, the free end of the pawl extending outside beyond the sleeve W, and being at all times visible and accessible.

When the machine is in position, as shown in Fig. 1, and has been arranged level by means of the screw-standards H^2, it is locked firmly in place by means of jack-screws of peculiar form. These jack-screws consist of a main stem or standard, *s*, from the upper end of which extends an arm, s^1, provided with an opening, through which a screw-stem, s^2, passes freely. This screw-stem is at its upper end provided with a crown or head, s^3, and passes with its lower end through a socket, s^4, which slides up and down on the stem *s* in grooves s^5, and is held in place by a link, s^6, which, being pivoted on each side of the socket s^4, extends around the stem, and is supported in one of the notches s^7 on the back of the stem *s*. The lower end of the stem *s* being placed against the end pieces A B of the frame, the screw-stem s^2 is turned by means of a lever, which may be passed through an opening, s^8, in the stem, until the head s^3 bears firmly against the roof of the shaft, and until the machine has been firmly secured in place. The machine being thus secured, the tube F being at one end of the same, and the frame G being connected to the standards Q by means of the rods Q′ at one end, a crank-handle is attached to the square end K^2 of shaft K, and the latter revolved. Motion is imparted, through cog-wheels K^1 and I^3, beveled cog-wheel L^3, L^2, shaft M, and beveled cog-wheel O^2, to the beveled cog-wheel P, to which the bit-stock *i* is keyed, as shown in Fig. 1, without preventing its endwise movement, and the bit-stock, which has been provided with a suitable bit, is revolved, thereby boring the bit into the coal. The fly-wheel J′ assists in keeping up the motion and renders it even. Every time the shaft I is revolved the eccentric disk N, through its sleeve N^1, arm N^2, L-shaped piece N^3 N^4, and bar T, operates the arm S, and its pawl S′ revolves the toothed wheel R′, and with it the bar R, the same motion being transmitted, through the gear-wheels U V, to the sleeve W, and as, by a series of revolutions of the shaft I, this sleeve W is moved along by screwing over the tube F, the inner end of the sleeve *a*, screwed to and revolving with the sleeve W, pushes the ring *f* in the same direction, and as this ring, by means of its projections *g*, in a similar manner pushes the sleeve *h*, which, through the pawl *k*, is connected to and revolves with the bit-stock *i*, the latter is gradually but surely and evenly forced into the coal as the bit bores it out and is operated by the machine. The guide *c* moves the small gear-wheel U on the bar R along with the same speed and at the same moment the gear-wheel V on the sleeve W is moved, for the guide *c* is firmly held to the sleeve W by the shoulder *b* on the sleeve *a*. Supposing it to be desired to bore a hole of five feet in depth, and the bit-stock *i* be only two and a half feet long, (for the machine must be limited in its dimensions to certain sizes, as the shafts are seldom over a certain width;) and supposing, further, that the sleeve W, with all the parts attached, has reached the furthest end of the tube F, and cannot be screwed any further; an instrument is inserted, through the top opening F′ of the tube F, into the recess *r* of the pawl *k*, and the projection *o* of the latter raised out of the slot *q* in the bit-stock *i*, separating the latter from the sleeve and its parts; the sleeve W is unscrewed from the sleeve *a*, the latter rapidly revolved around the tube F until it again reaches the opposite end of the tube; the guide *c*, ring *f*, and sleeve W pushed toward the sleeve *a*; the cog-wheel U pushed to the corresponding end of the bar R, and the parts screwed together again, taking care to allow the projection *o* of the pawl *k* to drop into one of the slots *q* in the rear end of the bit-stock *i*, which latter has not been moved back in the tube F; and the boring operation can be continued without trouble until the required depth of hole has been reached. If at that point the sleeve W has not yet reached the end of the tube F, the pawl *k* need merely be raised and the hollow-bit stock *i* moved back through tube F out of the hole it has bored.

As the object of my machine is to make a continuous horizontal opening in the side of a wall of coal near the bottom of the shaft with a great saving in the waste of coal, which is unavoidable in the use of the pick by hand, the machine must, after one hole has been bored, be moved so as to bore another hole without leaving a wall or partition of coal between the two openings. This requires a very accurate resetting and releveling of the machine after the same has been moved, and occupies much time and labor. To obviate this, and to accomplish the arrangement of the bit for the next hole with accuracy and in the shortest space of time possible, I have arranged the frame G so as to be connected to or disconnected from the tube F and slides E at pleasure, in order that the latter parts may slide from one end of the machine to the other, independent of their relative position with the frame G above them. The bit-stock and bit having been removed out of the hole just finished by the means above described, the frame G, drawing (or pushing, as the case may be) the slides E, and with them all the operative parts, is moved along in its ways C^1, through the operation of the cog-wheel G′ on frame G gearing with the rack C^2, the frame G moving the slides E in their ways by means of the connecting-bars Q′; and in order to attain this perfect accuracy in moving these parts for the proper distance only, I divide

the inner face of that bar C nearest the wall to be bored, or being bored, by inches and feet, as shown in Fig. 1, so that, knowing the exact diameter of the bit and of the hole bored, I can set the machine to a hair-line by this scale on the face of the bar C, and thus insure a consecutive boring without leaving walls between any two holes bored. In this manner hole after hole is rapidly bored until the frame G has reached the end B of the lower frame, at which point the tube F has only reached one-half of the distance. Instead of being obliged to move the entire machine and to return the tube F and frame G toward the end A of the machine in order to continue the work, I disconnect the shaft M, which is easily accomplished by merely removing the keys which secure it to cog-wheel L^2 and the sleeve O^3, and also disconnect the rods Q′ from the standards Q, turning them upwardly to allow them to pass over the standards, move the frame G to the opposite end A of the lower frame, and connect the rods Q′ on its other end to the standards Q. I then loosen the set-screw O^5, Fig. 3, and turn the piece O on the shoulder P′ of the slide E to the opposite side, and by loosening the set-screw L^7 reverse the piece L in the same manner, until the gear-wheels L^2 and O^2 are in line again. The shaft M is then passed through these gear-wheels and secured by its pins, the set-screws O^5 and L^7, after the several parts have been arranged, tightened, and the work can continue as before. In this way, by disconnecting the frame G, shifting it over the tube F, and reconnecting it to the same at the other end, I save the trouble of moving the entire machine, and this is especially accomplished by the arrangement of the gear-wheels L^2 and O^2 on the swinging pieces L and O, whereby the gear-wheels are always kept in gear with their large main gear-wheels L^3 and P.

I can use my machine for boring holes in a coal-mine in a vertical line as well as in a horizontal one. For that purpose the wheels H^1 and their bars H and screw-stems H^2 are dispensed with; and as in moving the frame G up or down the gear-wheel G′ and rack C^2 would afford no security, I provide other means for that purpose when using my machine vertically. From the end pieces A B extend from that side of the machine on which the shaft M is located arms *t*, in which the ends of a screw rod or bar *u* have their bearings, in which the bar *u* revolves freely. This bar passes through a nut, *v*, so arranged on the inner end of the frame G as nearly central as possible, as to be easily attached to or removed from said frame. The ends of the bar *u* outside of the arms *t* are provided with square ends, so that by attaching a crank-handle and revolving the same the frame G may be moved up or down on the bar *u*. In this case I provide bands or clamps of any suitable construction to keep the frame G firmly to the bars C of the lower frame. When the machine is used horizontally, as shown in the drawing, it will be understood that the lower frame may be fastened to the floor in any suitable manner, in addition to the jack-screws *s* to hold the machine firmly down in position.

My boring-machine is very simple in construction, and occupies but little space, but its construction renders it very effective. If it is desired to bore holes of greater depth than the length of the bit-stock *i* will allow, an extension, i^1, (see Fig. 2,) may be placed into its rear end. This extension i^1 may be made of wood or metal, and solid, and is provided with a groove in order to be keyed to the sleeve P^2 of cog-wheel P, like the hollow bit-stock *i*, so as to revolve with the cog-wheel, yet retaining a free longitudinal movement, and with notches i^2 to receive the projection *o* of the pawl *k*, and a couple of holes, i^3, in its stem i^4 to attach it by means of a pin to the bit-stock; and several such extensions i^1 may be placed one upon the other until the required depth is reached; and in retracting the bit-stock it is merely necessary to remove each extension as it passes out back from the tube F. The tube F and bit-stock *i* being hollow, they can be easily cleaned from any dust or particles of coal settling in them, and the bit-stock may be run back from time to time for this purpose, and the operative parts of that portion of my machine, therefore, are not liable to get out of order.

Having described my invention, I claim—

1. The combination and arrangement of the movable frame G and the gearing which it carries, and by which the bit-stock *i* is operated, with the feeding-tube F, which carries the bit-stock, and serves to connect the latter with the said frame, the bit-stock tube F and frame G sliding in the same direction in different planes upon the main frame A B, when these several parts are constructed and arranged to operate essentially as described.

2. The arrangement of the frame G relatively to the slides E E, to which it is connected, and the bit-stock-carrying parts, whereby the latter may be moved from one end to the other of the frame A B to continue in the same line of cuts, essentially as described.

3. The screw-standards H^2 H^2 arranged upon the axles H, into which they are swiveled, and connected to the main frame A B by the screw-lugs A′ B′ as a means for raising and lowering the frame, as described.

4. The hinged or swinging connecting-rods Q′ of the moving frame G, arranged as and for the purpose described.

5. The swinging L-shaped pieces L and O, the former on the frame G and the latter on one of the slides E, both carrying gear-wheels, and both adjustable in different positions, by means of which the relative position of the frame G toward the slides E may be changed without changing the gearing by removal, essentially as described.

6. The slides E provided with standards Q,

and connected to each other by means of a tube, F, provided with a screw-thread on its outer surface, and with longitudinal openings F^1 at top and bottom, and serving to carry the hollow bit-stock *i*, essentially as described.

7. The device for feeding the bit-stock toward the coal, consisting of the sleeves W and *a*, inner sleeve *h*, ring *f* with its projections *g*, and pawl *k*, all operated and operating essentially as described.

8. The combination, with the hollow bit-stock *i* provided with slots *q*, of the sleeve *h* provided with a slot, *l*, shoulder *j*, and depressions *n*, and a pawl having projections *m* and *o*, essentially as described.

9. The pawl *k* provided with a notch, *r*, by which to raise the pawl and disconnect the bit-stock *i* from the tube F without removing the sleeves W *a* or any of the other parts, essentially as described.

10. The swinging L-shaped piece L having a pin, L^4, in combination with the segmental slotted piece L^6 secured to the frame G, and operating in connection with a nut, L^7, to clamp the piece L when the reversible shaft M is changed, as described.

11. The beveled gear-wheels L^2 and O^2, secured to the extensions L^1 and O^1 of swinging pieces L and O by means of sleeves M^1 and O^3 and collars M^2 and O^4, to allow the shaft M to be removed for the reversal of the gearing, essentially as described.

12. The combination, with the sleeve W and its gear-wheel V, of the gear-wheel U sliding on the bar R, essentially as described.

13. The combination, with the gear-wheel U and bar R, of the toothed wheel R′, arm S, pawl S′, arm T, L-shaped piece N^3 N^4, arm N^2, sleeve N^1, and eccentric disk N on shaft I for feeding the sleeves W *a* on the tube F, and thereby the bit-stock *i*, essentially as described.

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