

(No Model.)

4 Sheets—Sheet 1.

J. L. MITCHELL.
MINING MACHINE.

No. 469,260.

Patented Feb. 23, 1892.

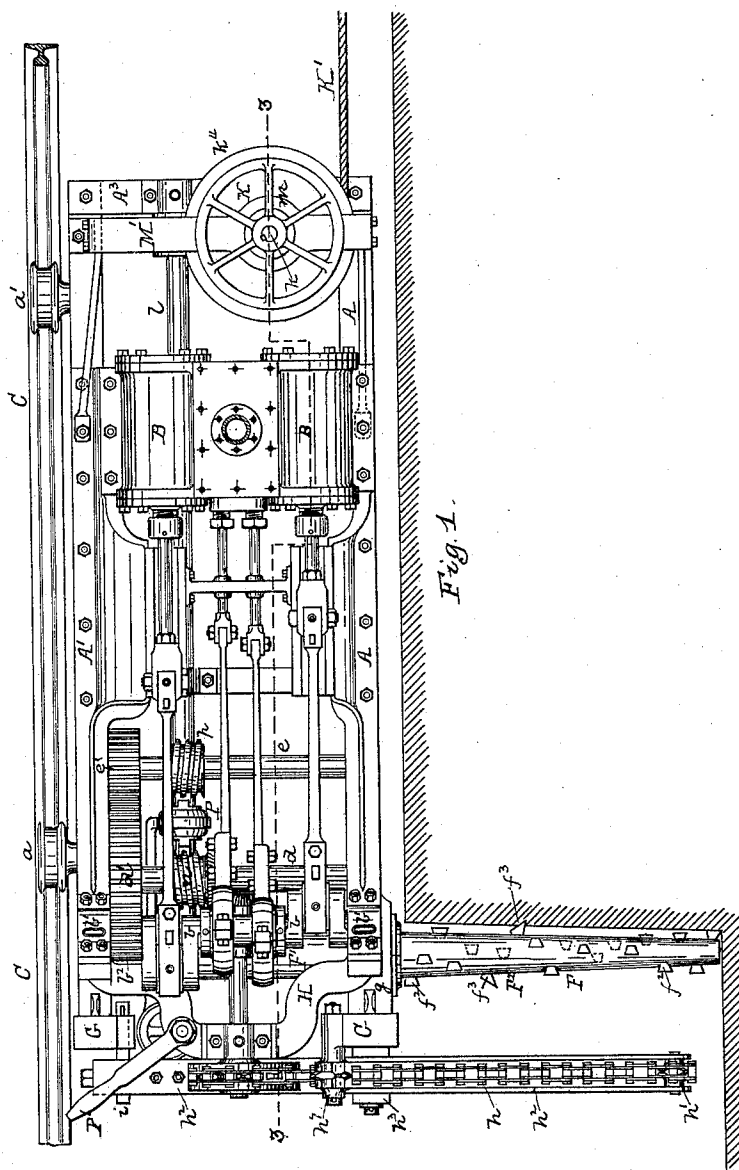


Fig. 1.

Witnesses.
J. A. Cooke
Robt. D. Totten

Inventor
Jonas L. Mitchell
By *his* Attorney *James D. Ray*

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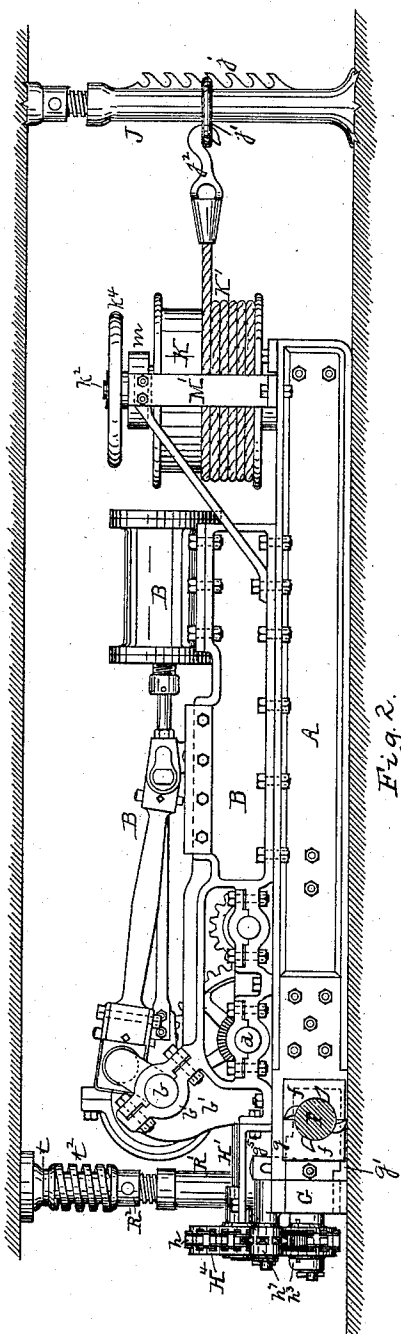


Fig. 2.

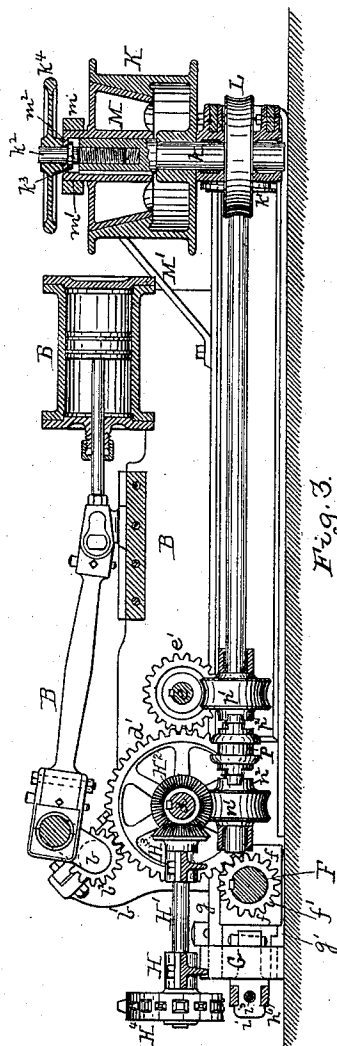


Fig. 3.

Witnesses
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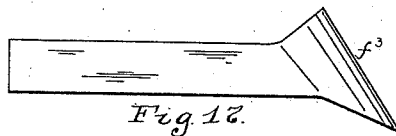
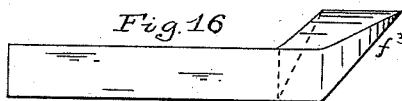
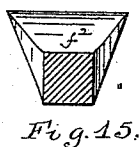
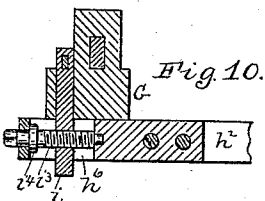
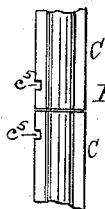
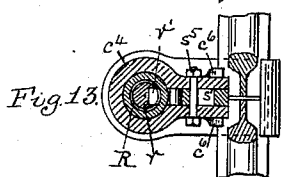
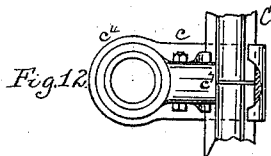
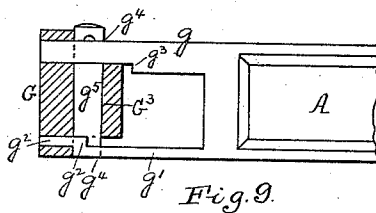
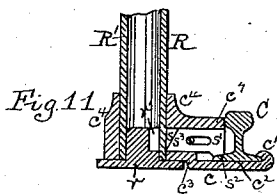
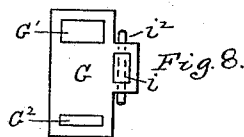
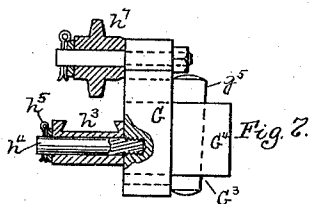
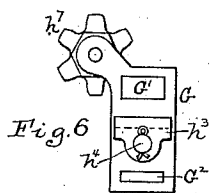
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4 Sheets—Sheet 4.

J. L. MITCHELL.
MINING MACHINE.

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Patented Feb. 23, 1892.



Witnesses
J. A. Cooley
R. D. Totten

Inventor
Jonas L. Mitchell
By his Attorney James D. Ray

UNITED STATES PATENT OFFICE.

JONAS L. MITCHELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE DIAMOND PROSPECTING COMPANY, OF SAME PLACE.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 469,260, dated February 23, 1892.

Application filed May 2, 1891. Serial No. 391,371. (No model.)

To all whom it may concern:

Be it known that I, JONAS L. MITCHELL, a resident of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Mining-Machines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to mining-machines, and to that class of machines generally known as "long-wall mining-machines," these machines being arranged to travel parallel with the working face of the coal, and by means of a rotating cutter-bar or other cutting mechanism cutting a kerf under the coal, which kerf is made continuous along the face of the coal, the entire body of coal being removed and the roof of the mine settling down in the space from which the coal is taken.

My invention has for its object the improving of these machines in certain particulars, such as certain improvements in the cutter-bar and the method of attaching the same to the machine-frame, in the cleaner-chain mechanism, in the feed mechanism, in the devices for holding the guide-rail in place and to sustain the outward pressure of the machine during its operation, and in the jack to which the feeding mechanism is connected in drawing the machine forward during the cutting operation.

The particular points of invention desired to be covered by Letters Patent will be hereinafter particularly described and claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a top or plan view of the mining-machine. Fig. 2 is a side view thereof. Fig. 3 is a longitudinal section thereof on the line 3 3, Fig. 1. Fig. 4 is a rear view thereof, showing the position of the machine in the mine and during the cutting operation. Fig. 5 is a plan view partly in section, the engines and power-shaft being removed; and Figs. 6 to 10 are detail views of certain parts of the machine. Figs. 11 to 14 are detail views illustrating the rail and jack for securing the same, and Figs. 15 to 17 are detail views of the inclined-face cutters.

Like letters of reference indicate like parts in each.

The mining-machine is provided with a frame composed of the longitudinal beams A A', the transverse brace or beam A² at the rear of the machine, the transverse brace or beam A³ at the forward end thereof, and the intermediate transverse brace or beam A⁴. The engines B are supported on the longitudinal beams A A', and the engine-shaft *b* is mounted on suitable brackets *b'* extending up from the longitudinal beams A A'. The longitudinal beam A, which is next to the face of the coal, may be supported on suitable wheels, if desired, but, as shown, and for general purposes, is generally employed with a shoe, which rests upon the floor of the mine and travels thereon, said shoe forming the lower edge of the beam. The beam A' has the flanged wheels *a a'* mounted in bearings thereon and extending out to the side thereof to travel on the rail C, which is secured in place in the manner hereinafter described, said flanged wheels holding the machine in proper line with relation to the cut to be made, and as the rail C is firmly secured in place said rail sustaining the outward pressure of the machine during its operation.

Mounted in suitable bearings in the machine are the cross-shafts *d e*, the cross-shaft *d* being below the crank-shaft *b*, which has a pinion *b²* engaging with the gear-wheel *d'* on the shaft *d*, and the gear-wheel *d'* in its turn meshes with a smaller gear-wheel or pinion *e'* on the cross-shaft *e*, which is employed, as hereinafter described, to operate part of the feeding mechanism.

The cutter-bar F is mounted at the rear of the frame in suitable bearing-boxes *f*, the method of mounting the same being hereinafter described, and said cutter-bar consists of the shaft F', fitting in said bearing-boxes at the rear ends of the two beams A A', and the forward portion F² carrying the cutters, as hereinafter described. Said cutter-bar is driven by the gear-wheel *d'*, which meshes with a pinion *f'* on the cutter-bar shaft F'. As it is desirable to quickly remove this cutter-bar from the machine, as in cases where the machine is transported from place to

place, I have secured the same in the following manner: At the rear end of each of the beams $A A'$ are formed the straps $g g'$, which extend out from the body of the beam and form the square seats for the reception of the journal-boxes f of the cutter-shaft. It will be noticed that the lower strap g' has the shouldered extension g^2 above the body of the strap, and that in the straps $g g'$ are angular mortises g^4 for the reception of the key g^5 .

Fitting on the end of the straps $g g'$, above described, is the bearing-block G , in which block are formed the mortises $G' G^2$ for the reception of the ends of the straps $g g'$, the shouldered extension g^2 of the strap g' entering the lower mortise G^2 . By forming this extension g^2 above the body of the strap g' the bearing-block is secured in place with its lower face flush with the base of the strap and with the frame of the machine. The bearing-block g has also the mortise G^3 , the inner face of which is formed inclined, as shown in dotted lines, this mortise being formed in the extension G^4 of said block, which fits between the straps and bears against the journal-box f . By driving in the wedge g^5 through the mortises g^4 on the straps $g g'$, and through the inclined mortise g^3 of the bearing-block, the block is forced against the journal-box f , so firmly securing the same in place. It will be noticed that the shoulder g^2 is closer to the rear end of the strap g' than the shoulder g^3 is to the rear end of the strap g , the distance between them being slightly greater than the width of one of the half-boxes forming the boxes f . It is so constructed in order that one of said half-boxes may be slipped longitudinally between the straps $g g'$, its flanges fitting along the sides thereof until it strikes the shoulder g^3 , then dropped past the shoulder g^2 , and passes forward to its seat, and the shaft F' of the cutter-bar may be inserted in the same way, and finally the other half-box be inserted between the straps, the bearing-blocks G passed over the ends thereof and the wedges g^5 driven to place, so firmly securing the cutter-bar in place. In order to remove the cutter-bar, all that is necessary is to drive out said wedges, when the bearing-block G can be drawn from the straps and the cutter-bar and its journal-boxes quickly removed in the manner above described. The portion F^2 of the cutter-bar carrying the cutters f^2 , and by which the cutting operation is performed, is preferably made tapering, as shown, so that as the bar is mounted in the frame on a slight incline the lower face of the knives f^2 , carried by the cutter-bar, may come flush with the floor and cut a kerf having its lower surface level with the floor, while the upper face of the kerf is on a slight incline, this being a common practice in such machines. This cutter-bar is provided with a suitable number of knives or cutters f^2 , which act in succession to cut away the coal, so forming the kerf. As the strain upon the machine by the operation of the

cutters is an outward strain or pressure, on account of the tapering form of the cutter-bar and for other reasons, it has been considered necessary to support the machine against such pressure through the rail C and flange-wheels traveling thereon and by other means bearing on the outer portion of the machine-frame. I find, however, that I can overcome to a great extent the tendency of the machine to move outward by the employment on some of the cutters of an inclined face, as shown in the cutters f^3 . It will be seen in the drawings that the cutter-bar itself is tapering from the machine toward the outer end thereof. The cutting-faces of these cutters f^3 are made at an incline from the outer edge thereof inwardly toward the center line of the cutter-bar, the incline of the face of the teeth shown being at about an angle of sixty degrees, and their incline being in the opposite direction to that of the taper of the cutter-bar. The action of these cutters is such that as they will cut an inclined face in the kerf in the opposite direction to the kerf cut by the other teeth of the cutter-bar they will act to hold the cutter-bar in the kerf and act against the natural pressure of the other cutters, which are either square or slightly inclined in the opposite direction, and will so act to hold the machine up to its work, overcoming to a large extent the outward pressure of the machine during its operation.

The cleaning mechanism for drawing out the cuttings is illustrated as cleaner-chain mechanism and is mounted and operated in the following way: Extending across the machine-frame and supported on the beams $A A'$ is the bracket H , in which is mounted a shaft H' extending longitudinally of the machine, and in the same horizontal plane as the shaft d , said shaft being operated by a bevel-pinion H^2 on the shaft d' , meshing with the bevel-pinion H^3 on the shaft H' .

Secured to the rear end of the shaft H' is the sprocket-wheel H^4 , over which the sprocket cleaner chain h passes, and by means of which said chain is operated. The outer end of the chain is supported back of the cutter-bar F on a wheel h' , mounted at the outer end of a guide or tension bar h^2 , which guide or tension bar extends across the rear end of the machine back of the frame. This tension-bar is supported by the beam A by means of a guide-block h^3 on a stud or cylindrical bearing h^4 , extending out from either the beam itself or the bearing-block G secured at the end thereof, (the latter being illustrated,) and the guide-block h^3 is secured in place upon said trunnion by a pin or key h^5 passing through the stud h^4 . The guide-block h^3 is provided with a dovetail-seat to hold the tension-bar h^2 in line with the machine-frame, but which permits the longitudinal movement of the tension-bar, while at the same time, in order to remove said bar, it is only necessary to remove the key h^5 and slip off the guide-block h^3 . Though this bar may be secured

rigidly in place and so act simply as a supporting-bar for the chain, the tension of the chain being regulated by other means, I prefer to use it as a tension-bar, and the tension mechanism is preferably constructed as follows: At the rear end of the tension-bar h^2 is a yoke h^6 , within which fits a guide-nut i , which moves in the guideway formed by the yoke h^6 , having flanges extending along the rear face thereof, while the yoke fits against the rear face of the bearing-block G at the rear end of the beam A', and said guide-nut passes through a mortise formed in said bearing-block, and is secured therein by means of a pin or key i^2 extending through the inner end of said guide-nut. The guide-nut i is suitably threaded, and through the same passes the tension-bolt i^3 , which bolt has the collar i^4 fitting against the end of the yoke, and its inner end is journaled in the end of the tension-bar, so holding the bolt from longitudinal movement within the yoke and providing for the longitudinal adjustment of the tension-bar by screwing of said tension-bolt through the guide-nut i , the operation being simply to turn the bolt within the nut to increase or diminish the tension on the chain, or, if it is desired, to remove the chain to loosen the same, so that the chain may be lifted from the sprocket. It is evident that to remove the chain and tension-bar all that is necessary is to loosen the tension on the chain, drive out the wedge or key h^5 , by which the guide-block h^3 is secured in the bearing-block G of the beam A, and slide the guide-block from its trunnion, and to drive out the key i^2 , so that the guide-nut i may be slipped from the bearing-block G of the beam A', when the tension-bar and chain can be removed from the machine, as is sometimes necessary in transporting the same. It may be as quickly secured in place and adjusted for work in the same manner.

To guide the cleaner-chain h in its movement into and out of the kerf, I employ the two idle sprocket-wheels h^6 h^7 , the chain passing from the wheel H⁴ under the wheel h^7 , thence forward along the upper part of the kerf around the wheel h' and back along the lower part of the kerf and under the wheel h^6 to the driving-wheel H⁴. The sprocket-wheel h^7 is mounted on a pin rigidly secured to the extension G⁴ at the upper end of the bearing-block G of the beam A, and the sprocket-wheel h^6 is mounted in bearings on the tension-bar h^2 .

The advance motion for feeding of the machine is obtained by means of a rope attached to a jack placed forward of the machine, this jack being shown in Fig. 2, and being an ordinary expansible screw-jack, as shown at J, having teeth on its lower and upper ends to engage with the main floor and roof. As in the operation of the machine it is desirable that the rope shall be adjusted at different heights, according to the pressure on the machine, or rather that the end of the rope may

be adjusted on the jack to keep it as nearly on the same horizontal plane as the drum on the machine, I have provided the jack with what I term a "hooked rack" j , consisting of a series of hooks on the one face thereof with which the link j' engages, the link being supported at the desired height by the particular hook of the rack with which it engages, and the rope K' being connected to said link by a hook j^2 , as shown, the end of this rope being connected to the drum K at the forward end of the machine. To feed the machine forward this drum K is rotated, and I have illustrated the preferred mechanism for this purpose. The vertical shaft k is mounted in a suitable journal-bearing k' formed on a cross-beam at the forward end of the frame, and secured to said shaft k is the worm-wheel L. The drum K is mounted on said shaft above the bearing k' , and above the same, sliding on the same shaft k and connected thereto by a feather, is the friction-clutch M, which has an inclined outer face fitting into a correspondingly inclined or tapering inner face within the drum K, so that when said clutch is forced downwardly it will engage with and rotate the drum. The clutch M encircles the upper end of the shaft K, and the bracket M' has a box m fitting around the journal-face m' , formed at the upper end of the clutch, said bracket extending down to the machine-frame to form a support for the upper end of the drum and clutch mechanism. Extending inwardly from the journal-face m' , formed on the clutch M, is an annular collar m^2 , and the upper end of the shaft k is bored out and tapped centrally to receive a bolt k^2 , which has a collar k^3 engaging with the flange m^2 of the clutch, so as to raise the clutch when the bolt is screwed up, so lifting the clutch out of engagement with the drum K. Keyed to the upper end of said bolt k' is the hand-wheel k^4 , which bears upon the upper face of the flange m^2 and acts to force the clutch M downwardly when said bolt is screwed by the hand-wheel down into the threaded seat formed therefor in the upper end of the shaft, so connecting the drum K firmly to the shaft k . This shaft is rotated by means of a worm-wheel l , meshing with the worm L, the worm l being secured to a shaft l' , mounted in bearings l^2 in the cross-beams A² A³ A⁴ of the machine-frame, said shaft extending, as shown, under the cross-shafts d e , above referred to. Secured on the shaft d above the shaft l' is a worm n , and mounted loosely on said shaft l' under said worm n and meshing therewith is the worm-wheel n' . Secured to the shaft e is the worm p , and mounted loosely upon the shaft l' , under and meshing with said worm, is the worm-wheel p' , these two worm-wheels having the clutch-faces n^2 p^2 with which the clutch P may engage, said clutch being connected by a feather to and rotating with the shaft l , said clutch being thrown into connection with either worm-wheel, as may be de-

sired by the lever P' . The two worms n p and their worm-wheels are arranged to drive the shaft l' and through it the drum K in the same direction but at different speeds, according as it is found desirable to feed the machine up to the work, or in cutting through the soft coal, or where a hard body of coal is to be cut, or for other like purposes.

It will be noticed that, as shown in Fig. 1, the worms are left and right hand worms. This arises from the fact that the shafts d and e rotate in opposite directions. In such case the power is applied, for example, from the worm p , through the worm-wheel p' and clutch P , to the shaft l' , through the worm l and worm-wheel L to the shaft k , and thence through the clutch M to the drum, and the machine may be fed by such mechanism until the loose portion of the rope is wound upon the worm and the machine drawn up to the work, and the clutch may then be thrown into engagement with the worm-wheel n' , which will be driven at a slower speed through the worm n . In order to arrange the machine for further cutting, all that is necessary is to loosen up the wheel k^4 , so raising the clutch portion, when the drum K will be free to rotate on the shaft k , and the jack J may be carried forward and again secured in place, and the operation continued.

As the machine is guided in its movement by the rail C , and said rail sustains the machine against lateral strain—that is, against strain transverse to its movement—it is necessary to support the rail against such strain, and for that purpose I employ the chair c , engaging with the rail and having an annulus or ring at its outer end, within which fits the jack R , which is pressed against the floor or roof of the mine, and so supports the rail against such lateral pressure, the weight of the rail itself being sufficient, however, to hold it down to the floor.

I have illustrated the rail as an ordinary T-rail, and the chair c as provided at one end with the hook c' , fitting over the flange of the rail with a plain or flat face c^2 , on which the rail rests, the chair being inclined upwardly, as at c^3 , and terminating in the horizontal ring or annulus c^4 , through which the jack R extends. The jack may fit loosely within the ring c^4 , if desired.

I have illustrated in Figs. 11 to 14 the preferred manner of securing the rail in the chair, which is as follows: To hold the rails from longitudinal movement, the rails are notched, as at c^5 , and the chair has lugs c^6 fitting in the notches, and has also the shoulder c^7 bearing against the head of the rail. Within the body of the chair, and extending from the face thereof to the interior of the ring c^4 , is the seat or chamber s , in which slides a key s' , the forward edge of which corresponds to the upper face of the rail-tread, as at s^2 , while its rear face is inclined backwardly, as at s^3 . The sliding key is held within the chamber s by a pin s^5 , extend-

ing through the chair and fitting loosely in a longitudinal slot in the key. The foot r of the jack R is made separate from the jack, the body of which is tubular and fits within the jack, and the foot has a recess r' , into which the sliding key may enter, and after the rail is placed in the chair and the foot r is placed under the ring c^4 it is only necessary for the tubular body of the jack to be passed down into the ring c^4 , when it will engage with the inclined face s^3 of the sliding key s' and force it against the rail, the jack-body at the same time fitting around and wedging onto the foot r thereof.

The jack is formed of the tubular threaded base R' and the threaded top portion R^2 , screwing into the same to adjust the jack to the height of the room. It often occurs in these long-wall mining-machines that the roof will yield, as by breaking away a part thereof close to the jack, in which case the jack might lose its hold, and to prevent this I have arranged in the top portion R^2 thereof a sliding head t , entering with a socket in the top portion R^2 , a stiff spring t^2 being confined between the top portion R^2 and the head t , so forming an extensible top portion, which will hold to the roof with sufficient power to sustain the rail in place through the compression of the spring t^2 , and in case of the yielding of the portion against which the jack presses the jack will still maintain its hold. This is of considerable importance, as there is liability of a portion of the floor or roof giving way on account of the jarring action of the machine when in operation.

In employing my improved mining-machine in practical use the operator first secures the rail C in proper line with the coal to be cut, the rail being secured a distance from said wall corresponding to the width of the machine, and he then extends the jack R , forcing its base against the mine-floor and the head t against the roof, being careful to screw up the jack far enough to compress the spring t^2 and give a strong hold to the jack. The rail is secured in this way along any desired distance, as many jacks and chairs as necessary for the purpose being employed, and it being understood that as the machine proceeds the rail from which it passes is lifted and carried forward and again secured in place ready for the machine to pass onto the same. If the cutter-bar and chain have been removed from the machine, the cutter-bar with its bearing-boxes are slipped within the seats made for them by the straps g g' , and the bearing-blocks G are slipped onto the straps which enter the mortises G' , and the wedge g^4 is driven down through the mortise provided for it, so driving the bearing-blocks against the journal-boxes of the cutter-bar, and firmly securing the cutter-bars in place. The chain is then passed over the sprocket-wheel H^4 and the tension-bar h^2 is placed in position, the sprocket-wheel at the end thereof engaging with the chain, and the guide-block

h^3 slipping on the trunnion and being secured by the pin h^4 , while the guide-nut i is slipped in the mortise at the rear end of the beam A' and secured therein by the pin i^2 . The operator then by turning the tension-bolt tightens up the chain to the proper tension and the machine is ready for operation. The operator then secures the jack J the proper distance in front of the point where the cut is to be made and he loosens the clutch M from the drum K and carries the rope forward to the jack J and hooks it to the same, as shown in Fig. 4, adjusting the link j' on the hooked rack according to the height of the drum on the machine. The proper connections between the air-pressure pipes and engines are of course made through a suitable line of hose. As soon as the air-pressure is admitted to the cylinders the cutter-bar is rotated through the gearing $b^2, d',$ and f' , and the cleaner-chain is caused to travel in the direction indicated by the arrow by the gearing $H^2, H^3,$ shaft H , and sprocket-wheel H^4 being driven from the shaft d . According to the speed that the machine is to operate the clutch P is thrown into engagement with the worm-wheel w' or p' and by said worm-wheel, either through the shaft d or through the shaft e , rotated by the gear-wheel d' and pinion e' , the shaft l' turns the worm l and through that the worm-wheel L and the drum K . As the cutter-bar is rotated, the machine is drawn along by the rope through the feeding-mechanism above described, the rail C sustaining the transverse or cross-strain and guiding the machine in its movement, while at the same time the cutters on the cutter-bar cut the kerf underneath the coal and the cutters f^3 , having the inclined faces above described, overcoming to a great extent the outward strain created by the cutting of the coal, holding the cutter-bar up to its work and materially reducing such strain. In case the coal is of such a hard nature that the machine is fed more rapidly than desirable, its speed may be reduced by easing up the clutch M engaging with the drum K , so that a slight movement of the friction-clutch is permitted and the machine is fed along at a speed corresponding to the cutting of the coal according to the resistance or hardness of the coal cut. The speed can, of course, also be regulated by throwing the clutch into the other worm-wheel n' or p' , as may be desired. During the cutting operation the cleaner-chain passes into the kerf, traveling along the upper part thereof and around the sprocket-wheel h' , and thence passing out of the kerf along the lower part thereof, drawing out the cuttings and depositing them back of the machine in the point about the back of the sprocket-wheel H^4 . This is continued until the rope is wound around the drum K , and the drum is drawn close to the jack J when the operator stops the machine, raises the clutch M out of the drum K , leaving the drum free to revolve, disengages the rope from the jack, carries the

jack the proper distance forward, secures the jack in place, and connects the rope therewith, when the operation can be continued. 70

The machine is of such construction that its parts can be made strong and capable of sustaining all strains to which it is subjected, and the parts are exposed so as to be easily repaired. 75

In case it is desired to transport the machine from one part of the mine to another the cleaner-chain and cutter-bar can be easily removed therefrom by loosening and lifting off the tension-bar and chain and removing the bearing-blocks G and the cutter-bar with its bearings in the manner above described, and as soon as the machine is brought to the place where it is to be used these parts can be quickly secured in place again ready for operation. 85

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a mining-machine of the class described, the combination of a machine-frame having the straps g, g' at the rear end thereof, the cutter-bar with its journal-boxes fitting within said straps, bearing-blocks having mortises formed therein to receive the ends of the straps, said bearing-blocks and straps having mortises formed therein, and a key passing through said mortises to secure the bearing-blocks in place, substantially as and for the purposes set forth. 90

2. In a mining-machine of the class specified, the combination of the machine-frame having the straps g, g' at the rear ends thereof, the lower straps g' , having the extensions g^3 above the bodies of the straps, the journal-boxes carrying the cutter-bar fitting in said straps, and the bearing-blocks provided with mortises to receive the ends of the straps, the extensions g' of the lower straps entering the lower mortises so as to form the lower face of the bearing-block flush with the base of the straps g' , substantially as and for the purposes set forth. 105

3. In a mining-machine of the class specified, the combination of a tension-bar having a sprocket-wheel at the outer end thereof, around which the cleaner-chain passes, said tension-bar having a yoke at the inner end thereof, within which a tension-bolt is mounted, and a guide-nut fitting within said yoke engaging with the tension-bolt, said nut being secured to the machine-frame, substantially as and for the purposes set forth. 115

4. In a mining-machine of the class specified, the combination of the tension-bar having a sprocket-wheel at the forward end, with which the cleaner-chain engages, a guide-block h^3 , secured to the machine-frame, within which the tension-bar slides, and a tension device at the rear end of the bar, substantially as and for the purposes set forth. 120

5. In a mining-machine of the class specified, the combination of the supporting-bar adapted to extend out at the side of the machine and having a sprocket-wheel at the end

thereof, the power-driven sprocket-wheel II⁴, the sprocket-wheels *h*⁶ and *h*⁷ for directing the movement of the chain, and the cleaner-chain passing around said sprocket-wheels 5 H⁴ and *h*⁷ and below the guiding-sprockets *h*⁶ and *h*⁷, substantially as and for the purposes set forth.

6. In a mining-machine of the class specified, the combination, with the machine-frame 10 having a stud *h*⁴ extending out at the rear of one beam and having a guideway *i*⁷ at the rear of the other beam, of the chain-supporting bar *h*², having the guide-block *h*³ fitting on the stud and having the guide-nut *i* entering said guideway, substantially as and 15 for the purposes set forth.

7. The combination of the longitudinal beam A, having the straps *g g*¹, and the bearing-block G, engaging with said straps and 20 closing the journal for the cutter-bar, said block having an extension G⁴, supporting the sprocket-wheel *h*⁶, and a chain traveling over the sprocket-wheel, substantially as and for the purposes set forth.

8. In a mining-machine of the class specified, the combination of cross-shafts mounted in the machine-frame and carrying worm-gear, a longitudinal shaft having worm-wheels 25 mounted thereon and engaging with said worms, a clutch for connecting either of said worm-wheels to said shaft, a worm at the end of said shaft, a vertical drum-shaft having a worm-wheel engaging with said worm, a drum 30 mounted loosely in said shaft, and a friction-clutch carried by said shaft and adapted to engage with said drum, substantially as and 35 for the purposes set forth.

9. As a means for detachably securing a guide-rail for a mining-machine in position, 40 the combination, with the rail, of a chair engaging therewith and having a ring or annulus extending out therefrom and an extensible jack fitting within said ring and adapted to engage with the mine floor and roof, sub- 45 stantially as and for the purposes set forth.

10. As a means for securing a guide-rail for a mining-machine in position, the combination, with the rail, of a chair provided with a 50 ring or annulus and having a seat formed therein to receive the tread, said seat being provided with the hook *e*¹, fitting over the tread of the rail, a key sliding in the seat or chamber in the chair at right angles to the rail to engage with the rail-tread and hold it

within the chair, and a jack adapted to en- 55 gage with the ring of the chair, substantially as and for the purposes set forth.

11. As a means for securing a guide-rail for a mining-machine in position, the combina- 60 tion, with the rail, of a chair having a seat to receive the same, provided with a hook fitting over one edge thereof and provided with a ring or annulus and a guideway or chamber 65 extending through the chair from said ring or annulus, a key sliding in said guideway and adapted to engage with one face of the rail-tread and having its other face inclined, and a jack adapted to pass through said ring 70 or annulus and engage with said inclined face and force the key against the rail, substantially as and for the purposes set forth.

12. As a means for securing a guide-rail for a mining-machine in position, the combina- 75 tion, with the rail, of a chair having a seat to receive the same, provided with a hook fitting over one edge thereof and provided with a ring or annulus and a guideway or chamber 80 extending through the chair from said ring or annulus, a key sliding in said guideway and adapted to engage with one face of the rail-tread and having its other face inclined, a jack adapted to pass through said ring or 85 annulus and engage with said inclined face and force the key against the rail, said jack having a tubular base, and a shoe fitting within said base and provided with a recess 90 into which the end of said key may enter before the jack is placed within the ring, substantially as and for the purposes set forth.

13. As a means for detachably securing a 95 guide-rail for a mining-machine in position, the combination, with the rail, of a chair engaging therewith and having a ring or annulus extending out therefrom and an extensible jack fitting within said ring and engaging 100 with the mine floor and roof, said jack having two parts screwing the one within the other, the upper part having a sliding head, and a spring compressed between said head and the jack-body, substantially as and for the purposes set forth.

In testimony whereof I, the said JONAS L. MITCHELL, have hereunto set my hand.

JONAS L. MITCHELL.

Witnesses:

F. X. COPELAND,
ARTHUR DOLE.