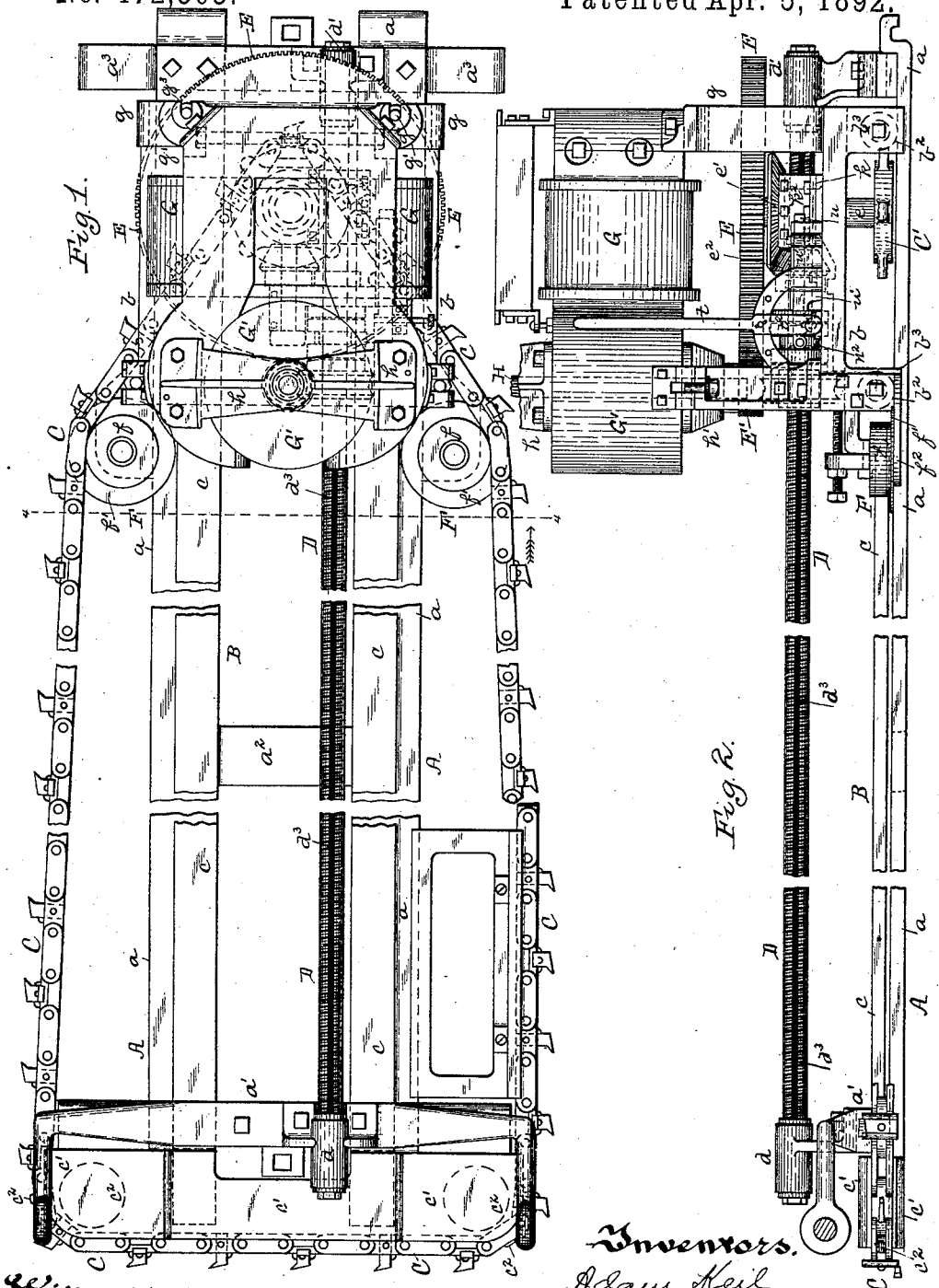
(No Model.) 2 Sheets—Sheet 1.

A. KEIL & A. R. WESTERDAHL.

MINING MACHINE.

No. 472,503. Patented Apr. 5, 1892.



Witnesses:
J. N. Cooley.
H. D. Kramm.

Inventors.
Adam Keil
Anton R. Westerdahl
By James S. Kay
Attorney

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

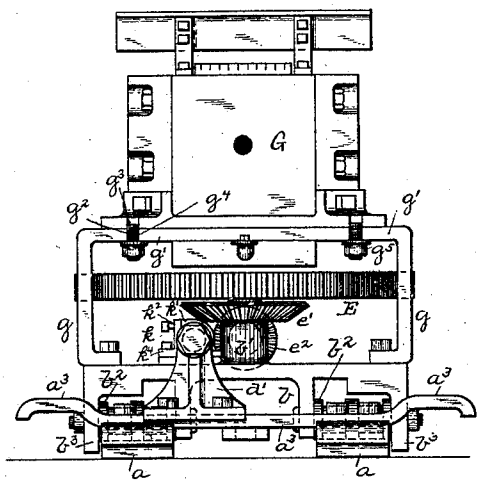


Fig. 4.

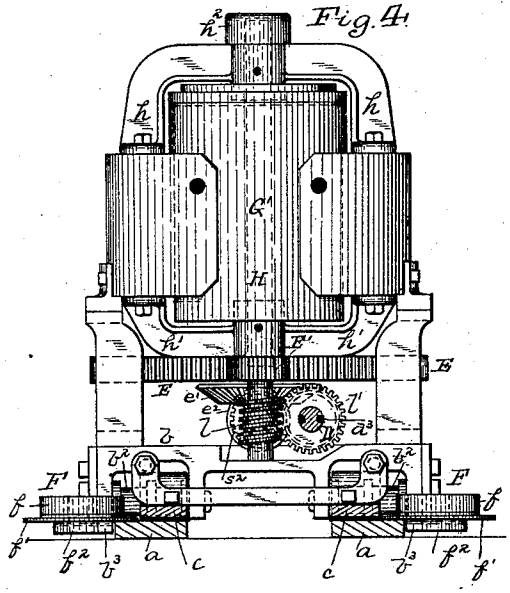


Fig. 5.

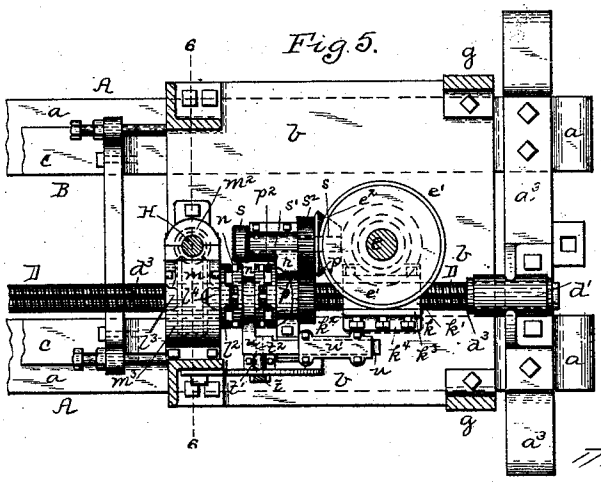
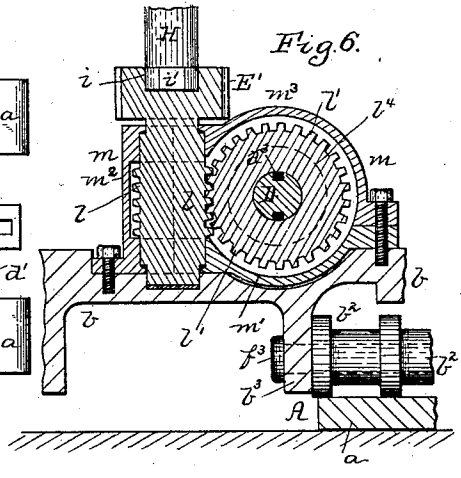


Fig. 6.



Witnesses:

J. N. Cooke.

W. D. Kearns.

Inventors.

Adam Keil

Arthur R. Westerdahl

By James S. Kay

Attorney

UNITED STATES PATENT OFFICE.

ADAM KEIL, OF McKEESPORT, AND ANTON R. WESTERDAHL, OF PITTSBURG, ASSIGNORS TO SAMUEL S. BROWN, OF PITTSBURG, PENNSYLVANIA.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 472,503, dated April 5, 1892.

Application filed July 11, 1891. Serial No. 399,123. (No model.)

To all whom it may concern:

Be it known that we, ADAM KEIL, a resident of McKeesport, in the county of Allegheny and State of Pennsylvania, and ANTON R. WESTERDAHL, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Mining-Machines; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention relates to mining-machines, and has particular reference to certain improvements on what are known as "cutter-chain mining-machines," its object being to improve the construction of the driving mechanism and the feed and recede mechanism for such machines, as well as to improve the same in other particulars.

The particular points of invention desired to be covered will be hereinafter described and claimed.

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

Figure 1 is a plan view of the machine embodying our invention. Fig. 2 is a side view of the same. Fig. 3 is a rear view. Fig. 4 is a cross-section on the line 4 4, Fig. 1; and Figs. 5 and 6 are detail views illustrating some of the improvements forming the subject-matter of this specification.

Like letters of reference indicate like parts in each.

The mining-machine has a bed-frame or stationary bed A, which is formed of the longitudinally-extending horizontal flat plates a, which plates are connected at the forward end by a cross-bar a', in the center by the cross-bar a^2, and at the rear end by the cross-bar plate a^3. The sliding frame B of the machine has the carriage b, which is supported on the rollers b^2, traveling on the flat plates a of the bed-frame and held in line by the guide-plates b^3, fitting on the outer edges of the plates a. The forward end of the sliding frame is formed of the flat plates c, which extend forward above the plates a, and have at their forward ends the cross-frame c', around which the cutter-chain C passes, said cross-frame c' having the sprocket-wheels c^2 mounted in such position as to guide the cutter-chain across the front end of the sliding frame. The rear ends of these plates c are connected to the carriage in any suitable way and are guided at the front end of the bed by means of suitable guideways in a guide-block.

Secured to the stationary bed A at the front and rear ends thereof are the brackets d d', in which the screw-bar D is mounted, said screw-bar having grooves or guideways d^3 therein, with which the clutch controlling the feed and recede mechanism is connected.

The carriage b of the machine has formed in the center thereof the boss b', in which is journaled the sprocket-wheel shaft e, carrying at its lower end the driving sprocket-wheel C', around which the cutter-chain C passes, and by means of which its driving is hereinafter described. In order to give the proper support and guidance to this cutter-chain and at the same time to relieve the friction thereof as much as possible, instead of guiding-sprockets on each side of the carriage near the rear end of the machine, we form the flanged guide-wheels F, these guide-wheels having the central portion or body f of sufficient height to take the pressure of the chain, and extending out below the central body f is the annular flange f', which is of sufficient width to give support to the entire body of the cutter-chain as it passes around the wheel, such construction being found to give a firm support to the cutter-chain on these guiding-wheels and relieve the chain from the wear of the sprockets entering within the same, the chain being only subject to the wear of the driving sprocket or sprockets at the forward ends of the sliding frame. These guiding-wheels are supported on arms or brackets f^2, which are bolted to the carriage b, and have formed thereon vertical pins or journals on which the guiding-wheels are mounted.

The machine is arranged to be operated by an electric motor; and one of the objects of the present invention is to so arrange the machine that it will drive with a very compact form of gearing, and so that the motor can be arranged above the sprocket-wheel, and so occupy practically no additional space other than that required for the driving mechanism. Secured to the sprocket-wheel shaft e

above the boss b' is first the beveled gear e', hereinafter referred to, and above that the driving gear-wheel E, which is made of large diameter, so as to obtain the necessary power and reduce the speed by one reduction from the motor. It will be evident that such a driving gear-wheel occupies a comparatively large space, though it does not require a larger carriage than would be necessitated under any construction of the machine to arrange the feed and recede mechanism. Extending up from the carriage b is the rear frame g for the support of the motor G, this rear frame being directly secured to the carriage and having the cross-brace g', on which the body of the motor rests. In order to secure the motor directly to this rear supporting frame or bracket, we employ bolts g^2, which are preferably constructed with hinges or pintles g^3, mounted in seats in the body of the motor and extending down and fitting into grooves or seats g^4 in the cross-brace g' of the bracket g and securely clamped thereto by the nuts g^5. This supporting bracket or frame g is placed to the rear of the driving gear-wheel e, and it brings the body of the motor directly over the gear-wheel, as is clearly shown in Figs. 1 and 2. To support the forward end of the motor, a cross-brace—such as is used at rear end of motor—could not well be employed on account of the yoke for the armature-shaft necessarily extending down at this point, and the front supporting-frame is formed of the standards which extend up from the carriage b, and upon which the pole-pieces G′ of the motor rest directly, these pole-pieces being clamped to the standards by the same kind of hinged bolts above described in connection with the rear bracket g. A firm support for the motor is thus provided on the body of the carriage and in such position that the motor-armature can be arranged to run in a vertical position, and the motor being secured to the carriage in this manner and connected to the armature-pinion hereinafter described it can be removed from the carriage by simply loosening the nuts g^5.

The armature-shaft H of the motor is supported in yokes $h\,h'$, secured to the pole-pieces, the armature-shaft having above the upper yoke a collar h^2, by which it is hung within said yokes, and to reduce the friction caused by the weight of the armature a ball-bearing may be arranged between the bottom face of collar h^2 and top face of upper yoke. This armature-shaft has directly connected thereto or, as preferred by us, engages by means of an angular pin-and-socket connection with the pinion E′, which drives the gear-wheel E, the power being thus transmitted directly from the vertical motor to the gear-wheel on the driving-sprocket-wheel shaft, and the simplest and strongest form of mechanism practical for the purpose being employed.

It will be noticed that the body of the motor is placed directly above the gear-wheel E, and that its pole-pieces extend forward in such position as to bring the armature-shaft in line with the edge of the driving gear-wheel. By this construction the weight of the motor is brought centrally over the carriage, while the power is applied at the edge of the driving gear wheel and a compact form of driving mechanism obtained.

For the purpose of feeding the machine forward and withdrawing the same the screw-bar D is rotated in different directions and screws through the nut k, which is secured directly to the carriage b, this nut being divided longitudinally into two parts $k'\,k^2$, the main body k' being bolted to the carriage, while the part k^2 is provided with the flanges $k^3\,k^4$, which are bolted to the part k', the particular part k^2 being arranged to be withdrawn sidewise from the part k' when the bolts are removed, so that the screw-bar can be quickly removed from the nut when necessary. To feed the machine forward we employ a worm l at the base of the armature-shaft, meshing with the worm-wheel l', encircling the screw-bar, the power being thus applied directly from the armature-shaft to the feeding mechanism, and a very simple form of feed being thus obtained. This worm and worm-wheel are both mounted within the box m, which is bolted to the carriage, as more clearly shown in Figs. 5 and 6, the worm and the pinion E′ being formed in one piece and angular socket i being formed at the upper end of the same, in which the angular pin or end i' of the armature-shaft enters. The box m has the bearing m' with the cap-piece m^2, which incloses the worm, the shaft carrying the worm and pinion being seated within this bearing m', the lower end of the shaft being seated in a Babbitt-metal or like seat, while between the worm l and the pinion E′ is the annular groove or bearing, so that the shaft is properly supported within the box or bearing, and as the armature-shaft is seated in the shaft formed with the pinion and worm this bearing also gives support to the armature-shaft both through the seat at the base of the box m' and through the bearing at the upper end thereof, the pinion E′ resting on the upper face of the bearing. The box m has also the removable cap m^3, which, with the box, forms the bearing for the worm-gear l', the said worm-gear having formed with it the journals $l^3\,l^4$ and the clutch-face l^2, which engages with the clutch n. The worm and the worm-gear are thus inclosed within the box m and protected from the dust or cuttings, while at the same time they may be run in oil, so as to reduce friction.

For drawing back the machine a pinion p encircles the screw-bar D, being mounted in the bearing-box r, which fits within the annular journal p' of the pinion, and in front of which is the clutch-face p^2 to engage with the clutch n, the pinion p and its clutch-face being formed in one piece. In line with the sprocket-wheel shaft e is the shaft s, which is mounted in the bearing s', forming part of the box r,

and carries the pinion s^2, which meshes with the pinion p, while at the end of the shaft s is the beveled pinion e^2, which meshes with the beveled gear e' on the sprocket-wheel shaft e, the power to rotate the recede pinion p being thus obtained from the sprocket-wheel shaft through the beveled gear and bevel-pinion e' e^2 and the pinion s^2 meshing with the said pinion p. The clutch n engages with the screw-bar by suitable keys or feathers fitting in the keyways or grooves of the screw-bar and slides upon the screw-bar as the machine is fed forward or back, and it engages with the clutch-faces l^2 and p^2 of the worm-gear l' and the pinion p. It is operated by the lever t, mounted in the bearing t' on the carriage and having a lug or tooth t^2, which engages with the slide-bar u, sliding in the bearing u' on the carriage and connected by swivel-pin with the fork n^2, straddling the clutch n, such slide-bar having a recess in the under face thereof to engage with the tooth t^2 of the clutch-lever, such construction providing for the shifting of the clutch without throwing any strain thereon in a line at an angle to the movement of the clutch.

In the operation of the machine constructed as above described the machine is placed with its forward end parallel with the breast of coal to be undercut, and is secured in place by suitable jacks. The operator then starts the motor G and throws the clutch n into engagement with the worm-gear l'. The armature and shaft through the pinion E' then rotates the large gear-wheel E, so turning the vertical sprocket-wheel shaft and so causing the movement of the cutter-chain at the desired speed, the chain traveling around one of the guide-wheels F, and then to the forward end of the sliding frame and around the sprocket-wheels supported in the cross-frame c', and then back along the other side of the machine to the other guide-wheel F and to the driving sprocket-wheel. At the same time the worm l of the armature-shaft turns the worm-gear l' and through the clutch n turns the screw-bar so as to force the machine forward, any back-thrust in this movement being taken by the nut k, through which the bar D screws. The machine is thus fed slowly forward, so as to advance the sliding frame into the coal, while the cutters on the cutter-chain cut the kerf within the coal and carry out with them the coal so cut. This is continued until the machine is fed out its full length, when the clutch is moved either by the operator or by automatic mechanism and is withdrawn from engagement with the worm-wheel l' and thrown into engagement with the pinion p, when, through the beveled gear e' e^2, pinion s^2, pinion p, and clutch n, the screw-bar is rotated in the opposite direction and at a greater speed to withdraw the sliding frame. As soon as the sliding frame is withdrawn its full length the machine is stopped and may be moved over into position to make the next cut, and the operation is repeated.

The gearing employed is simple in construction, the power being applied as directly as possible for the purpose intended, and on account of the employment of a motor having a vertical armature and shaft and the mounting of the same above the carriage and directly above the gear-wheel of the driving sprocket-shaft a very compact machine is obtained, while at the same time all the parts of the machine are protected as fully as practicable, and any part of the machine desired may be quickly reached for repair or replacement in case of wear or breakage.

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

1. In a mining-machine, the combination of an electric motor having a vertical armature-shaft provided with an angular base, a pinion mounted in a suitable bearing directly below such armature-shaft, having an angular socket at the upper end with which such armature-shaft engages, and connections from said pinion to the cutting mechanism of the machine, substantially as and for the purposes set forth.

2. In a mining-machine, the combination of a screw-bar D, the box m, forming the bearing for the worm-gear l', encircling said screw-bar and forming the bearing for the vertical worm l at one side thereof, and a motor having a vertical armature and shaft engaging directly with the shaft carrying said worm by an angular pin-and-socket connection, substantially as and for the purposes set forth.

3. In a mining-machine, the combination of a bed-frame having a grooved screw-bar mounted thereon, a sliding frame carrying a nut engaged with the screw-bar, a vertical sprocket-shaft mounted in said frame and having a beveled gear, and a shaft carrying a bevel-pinion meshing with the beveled gear on the sprocket-wheel shaft and carrying a pinion meshing with a pinion encircling the screw-bar and adapted to be engaged therewith to turn the same, substantially as and for the purposes set forth.

In testimony whereof we, the said ADAM KEIL and ANTON R. WESTERDAHL, have hereunto set our hands.

ADAM KEIL.
ANTON R. WESTERDAHL.

Witnesses:
J. N. COOKE,
S. DUFFIELD MITCHELL.