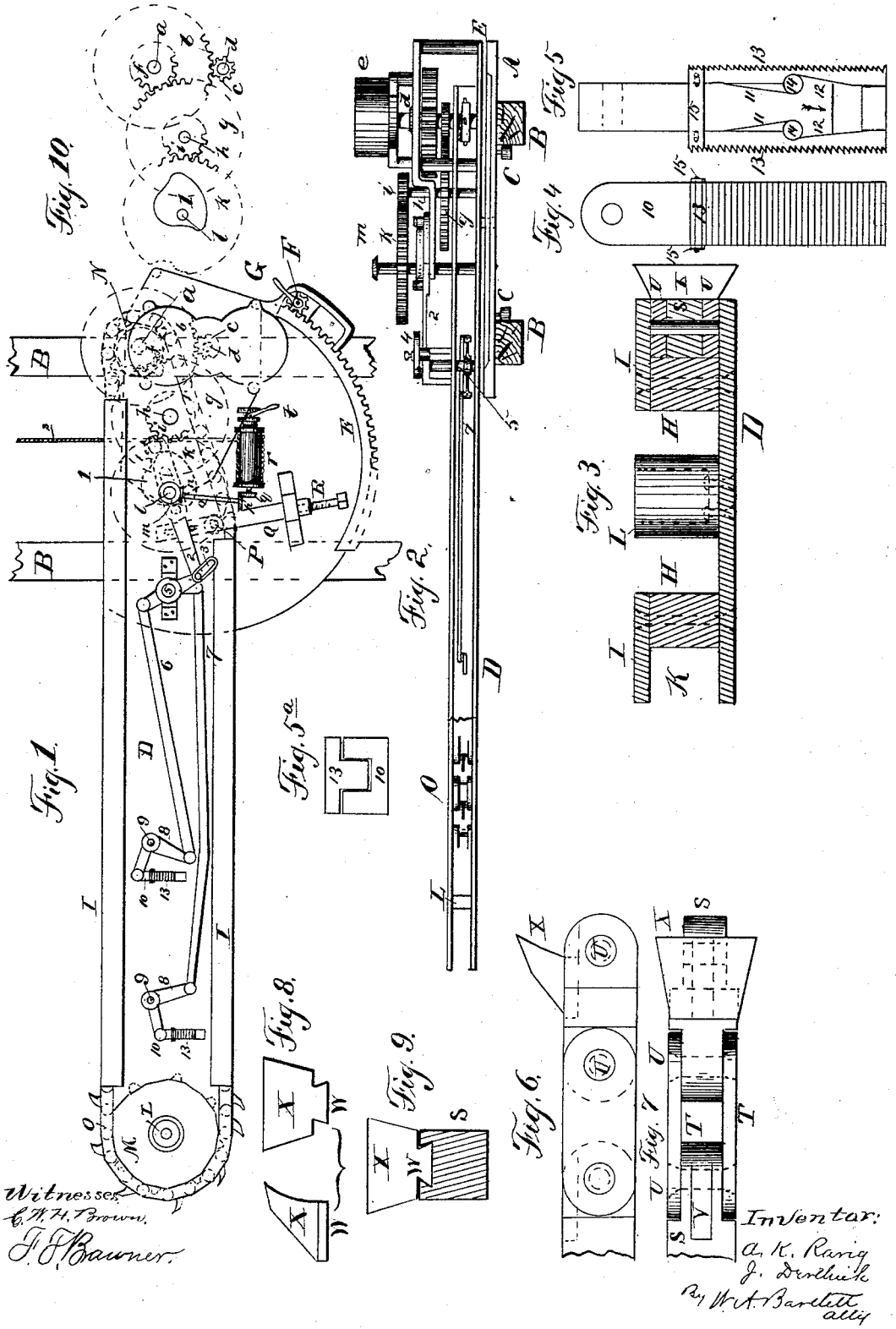
(No Model.)

A. K. RARIG & J. DERTHICK.

MINING MACHINE.

No. 346,172. Patented July 27, 1886.



UNITED STATES PATENT OFFICE.

ALEXANDER K. RARIG AND JOHN DERTHICK, OF COLUMBUS, OHIO.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 346,172, dated July 27, 1886.

Application filed March 22, 1886. Serial No. 196,095. (No model.)

To all whom it may concern:

Be it known that we, ALEXANDER K. RARIG and JOHN DERTHICK, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Mining-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to mining-machines of the class more especially used in coal mining.

The invention consists in certain improvements in the frame or support of the machine; also in certain improvements in the endless-chain cutter and in the mechanism for driving the same; also in the improved feeding mechanism by which the machine is fed forward to its work, and in the construction of the feed-clamp.

In the drawings, Figure 1 is a plan of the mining-machine, showing the relative location of parts. Fig. 2 is a side elevation, parts being omitted. Fig. 3 is a cross-section on line *x x*, Fig. 1, of the frame and pivot for sprocket-wheel. Fig. 4 is a plan, and Fig. 5 an elevation, of the expanding-clamp which serves to force the feed forward; and Fig. 5ª a section of same. Fig. 6 is a plan, and Fig. 7 an elevation, of a section of the endless-chain cutter. Fig. 8 represents a cutter-tooth detached. Fig. 9 is a section of the cutter-holding link in the endless-chain cutter; Fig. 10, a detail of gearing.

A supporting-plate, A, of cast or plate metal, preferably circular with a segment removed, forms the foundation of the machine proper. This plate rests on the track pieces or stringers B B, and has bearing rolls or pulleys C C resting against the sides thereof.

The entire machine may be drawn longitudinally of the tracks by mechanism hereinafter described. A long arm or plate, D, is pivoted to the plate A, and has a segmental rack, E, projecting from one side. A pinion, F, mounted on plate A, engages said rack, and a lever, G, which turns the pinion, enables the operator to regulate the position and angle of arm D with respect to the supporting-plate and track. The arm D has guide-bars H H near its sides, and a top plate, I, secured to each of the same, so as to form a passage, K, in which the cutter-chain is supported. The bars H need not extend quite to the ends of arm D. At the outer end of said arm D there is a strong pivot, L, for a spocket-wheel, M, round which sprocket-wheel the chain runs. The pivot or stud L may be hollow and contain a lubricant which feeds to the bearing through small perforations. At the inner end of arm D there is a sprocket-wheel, N, which serves as a driver to propel the endless cutter-chain O in its guideway and around the two sprocket-wheels. A tightening-pulley, P, on a slide, Q, bears against the inner side of the cutter-chain O, and by turning screw R, which operates said slide, the chain may be tightened. The endless-chain cutter O is composed of cruciform links S and side plates, T T, alternating and pivoted together by pins or bolts U. The cruciform links S have in their outer faces dovetail grooves V, which receive the shanks W of the teeth or cutters X X. These teeth are made so broad at their outer ends as to make a cut wide enough to receive the entire thickness of arm D and its attachments. The sprocket-wheel N is on a shaft, *a*, which carries spur-wheel *b*, which gears with a driving-spur, *c*, on the shaft *d*, which shaft *d* is driven by a rotary-engine, *e*, or by other suitable motor. The shaft *a* carries a gear, *f*, which engages a series of speed-reducing gears, *g*, on counter-shaft *h*, drives gear *k* on shaft *l*. Shaft *l* carries a bevel-gear, *m*, which drives a similar gear, *n*, on shaft *o*, and through gears *p q* rotates the winding-drum *r*, to which the cable *s* is connected. A lever, *t*, serves to throw the drum or windlass *r* into or out of gear with its driving mechanism in usual manner. The cable *s* is fastened to a suitable support, so that as it is wound on the drum the entire machine is drawn forward. The same shaft, *l*, that carries the driving-gear of the windlass also carries a cam, 1, which reciprocates a pitman, 2. The outer end of pitman 2 engages a slot, 3, in lever 4, which lever is hung on shaft 5. One end of lever 4 has a link, 6, pivoted thereto, and a link, 7, is pivoted at an equal distance on the other side of pivot 5. These links 6 and 7 are connected to the expansible feed mechanism, which works within the cut, and, as the two feed mechanisms are alike and operate alternately to "walk" the inner end of cutter-bar D forward, a description of one

will answer for both. A bell-crank lever, 8, pivoted at 9, is swung on its pivots in both directions by the link 6. The outer end of the lever draws on the expansion-bar 10. This bar 10 has a double-inclined surface, 11 12, and outside of each incline there is a toothed bearing-plate, 13, having inclined inner faces, and anti-friction rolls 14 are interposed between these bearing-plates and the inclined surfaces of the bar 10. The plates 13, one above and the other below the surface of arm D, are connected together by links 15 15, said links forming a loose hinge, holding the plates from falling apart. When, by the action of the bell-crank lever, the bar 10 is thrust in the direction indicated by the arrow, Fig. 5, this movement will serve to expand the plates 13, so that the teeth on their outer faces come into contact with the coal or rock in the cutting in which the machine is operating, and wedge them firmly in the cut. A further movement of the bell-crank lever will then press the end of the cutter plate or bar and its cutting-chain, which is deepest in the cut, forward into the material on which the machine is operating. A reversal of this movement first releases the pressure on the bearing-plates and then moves the plates and bar 10 forward. The anti-friction rolls 14 impel the bearing-plates 13 to move in one direction with the expansion-bar 10 by reason of the shoulders on the expansion-bar and those on the plates coming in contact with said rolls. The movement of the bell-cranks being alternating, it follows that one pair of expansion-bars will be in position to give a forward feed while the other pair is retracted.

In operation, the machine is placed on the track or skids B B parallel with the bank which is to be undercut. By means of the rack F the arm D and the cutting-chain, which it carries is swung around so as to enter the bank, the cutting-chain being all the while driven from the engine, so as to make the cut or kerf in the bank, the chain-cutter clearing its way as the cut is made. When the arm is about at a right angle to the skids, (and to the face of the bank,) the winding cable *s* should be thrown into operation, when the entire machine will move on the skids parallel with the face of the bank. The expansion feed mechanism engaging with the top and bottom faces of the cut will keep the inner end of arm D moving forward, and, as this movement is caused by the same mechanism which winds the cable, the movement will be practically uniform. The width of teeth is such as to make a kerf a little wider than the thickness of the cutter-bar, and the guideway, in which the endless cutting-chain works, holds the same at all times firmly to working position. The sprocket-wheels at each end of the cutter-chain serve the usual purpose of propelling and supporting the same. Should one of the expansible feed devices within the cut fail to operate, the other will still work with some beneficial effect to feed the arm forward.

We claim—

1. The supporting-platform, the cutter-carrying arm pivoted thereon, the endless chain-cutter carried by said arm, and the chain-tightening slide independent of the chain-supporting arm, engaging the inner surface of the chain, and mechanism for operating said slide, substantially as stated.

2. The combination, with the cutter-bar of a mining-machine, of a feed mechanism connected with the machine outside the cut, and a feed mechanism within the cut having bearings against the walls of the cut, both feed mechanisms operated from the same motor to feed the machine and bar, substantially as described.

3. The combination, with the cutter-carrying arm of a mining-machine, of an expansible bearing-piece on the arm within the cut, and reciprocating mechanism, substantially as described, connected to and operating said expansible bearing-piece, whereby the bearing-piece is brought into contact with the surface of the cut, and is actuated to feed the cutter-carrying arm.

4. In a mining-machine, a toothed bearing-plate at the upper and lower surfaces of the cutter-arm, a wedge for expanding the same, and a train of mechanism from the driving-gear by which the bearing-plates are brought in contact with the wall of the cut.

5. In a mining-machine, the combination, with the cutter-bearing arm, of a pair of expansible feed apparatus, and a train of mechanism from the prime motor by which the feed apparatus are alternately moved to feed the bar.

6. The combination, with the cutter-bar of a mining-engine, of a pair of bearing-plates above and below said bar, an expansion-wedge between said plates, a lever by which said wedge is reciprocated, and a train of mechanism, substantially as described, by which the wedge is made to reciprocate.

In testimony whereof we affix our signatures in presence of two witnesses.

ALEXANDER K. RARIG.
JOHN DERTHICK.

Witnesses:
J. A. KEYHT,
JAMES M. LOREN.