(No Model.)

C. O. PALMER.

MINING MACHINE.

No. 534,349. Patented Feb. 19, 1895.

Fig. 2.

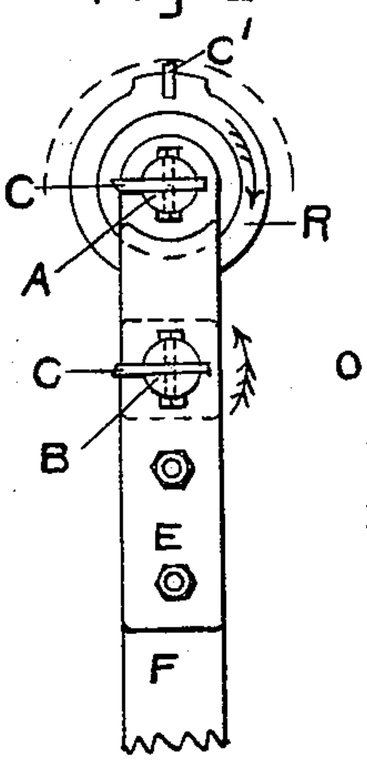


Fig. 1.

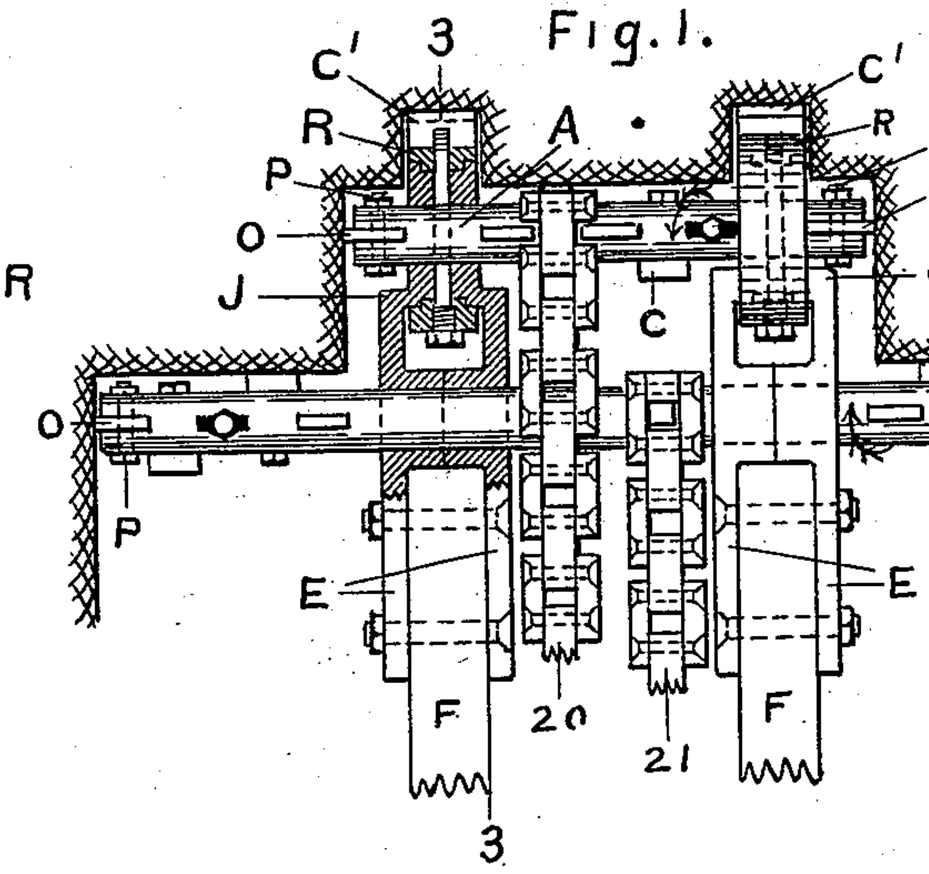


Fig. 3.

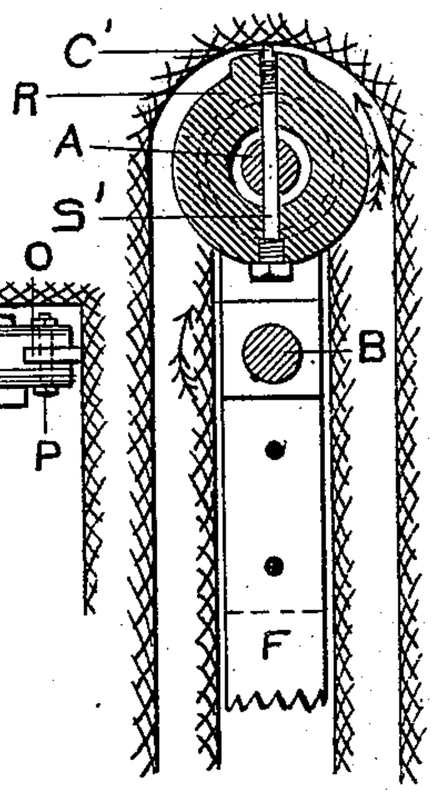


Fig. 7.

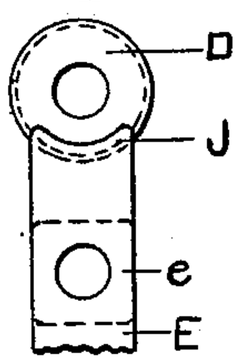


Fig. 6

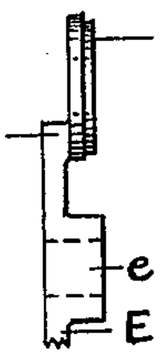


Fig. 8.

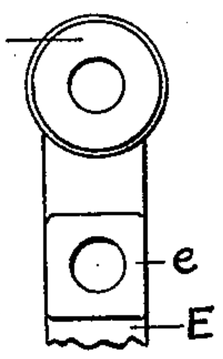


Fig. 9.

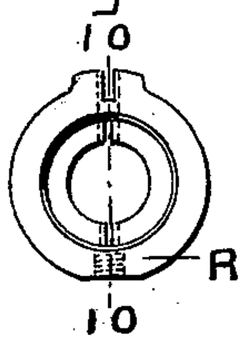


Fig. 10

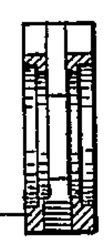


Fig. 11.

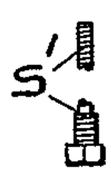


Fig. 4.

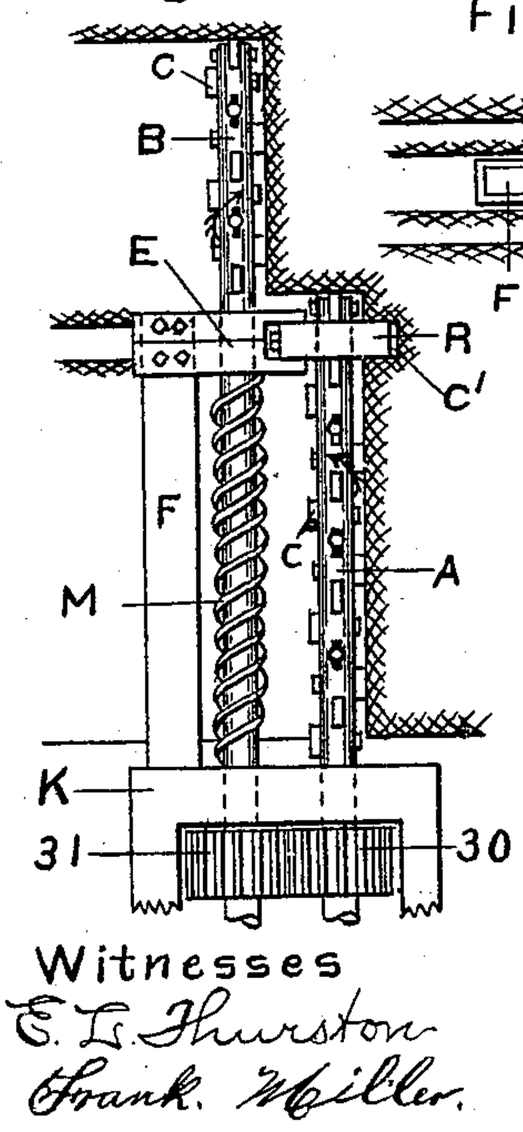


Fig. 5.

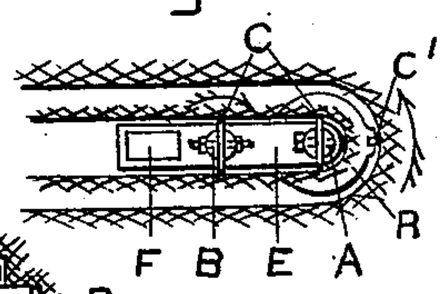


Fig. 14.

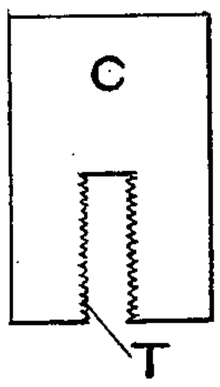
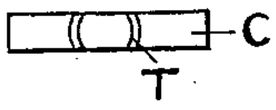


Fig. 15.



Witnesses
E. L. Thurston
Frank. Miller.

Fig. 12.

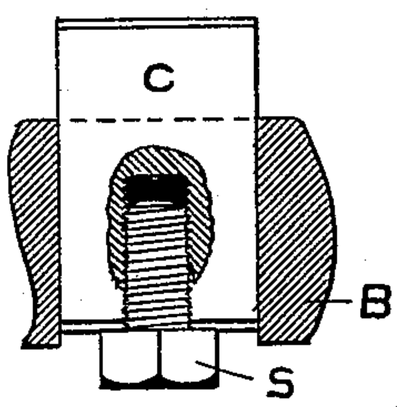


Fig. 13.

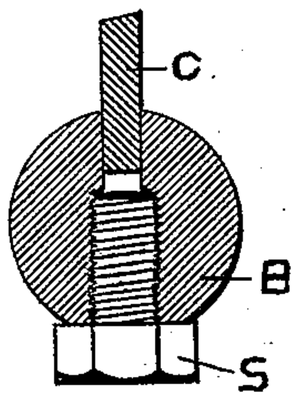


Fig. 16.

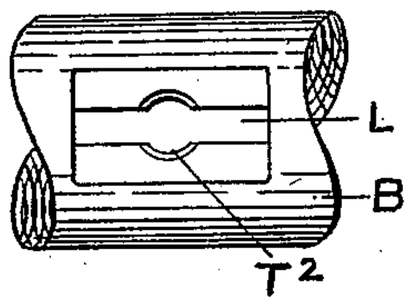
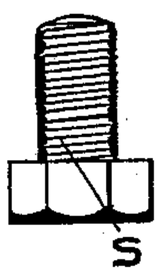


Fig. 17.



Inventor.
Charles O. Palmer.

UNITED STATES PATENT OFFICE.

CHARLES O. PALMER, OF CLEVELAND, OHIO.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 534,349, dated February 19, 1895.

Application filed February 8, 1892. Serial No. 420,743. (No model.)

To all whom it may concern:

Be it known that I, CHARLES O. PALMER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Mining-Machines, of which the following is a specification.

My invention relates to that class of mining machines, having rotating cutter bars, each of which has a series of cutters projecting from its side,—which cutter bars perform their intended work when they are fed in a path transverse to their axes.

The principal objects of my invention are;—first, to provide means for relieving the frame which carries cutter bars, either wholly or partially, from the upward or downward stress due to the reaction of the coal, or other material being mined, against the cutters as the cutter bar is revolved; second, to provide novel mechanism for cutting the coal, or other material, in front of the bearings of the cutter bar, and third, to provide an improved cutter and means for adjustably connecting the cutters with the cutter bar.

With these ends in view, my invention consists in the construction and combination of the parts shown in the drawings and hereinafter described, as pointed out definitely in the claims.

In the accompanying drawings, I have only shown so much of an entire machine as is necessary to disclose the invention, that is to say the forward end of the frame, and the parts mounted thereon. The means for feeding the cutter bars to their work, and means for rotating the cutter bars, and all the other necessary parts of a complete machine may be of any of the suitable constructions well known in this art.

In the drawings, Figure 1 is a plan view, partly in section, in which the cutter bars are journaled transversely to the forward end of a machine adapted to be fed forward in a direction at right angles to the working breast of the coal. Fig. 2 is an end view of the parts shown in Fig. 1. Fig. 3 is a sectional view on line 3—3 of Fig. 1. Fig. 4 is a plan view of my invention applied to a machine in which the cutter bars project from the side of a machine adapted to be fed in a direction parallel to the working breast. Fig. 5 is an end view of the parts shown in Fig. 4. Fig. 6 is a top view of the left bearing bracket E. Fig. 7 is a view of the left side thereof. Fig. 8 is a view of the right side thereof. Fig. 9 is a side view of the cutter ring. Fig. 10 is a sectional view on line 10—10 in Fig. 9. Fig. 11 is a detail of the cutter ring bolt. Fig. 12 is a view of the cutter bar and one cutter, said view being partly in section. Fig. 13 is a transverse sectional view through the cutter and cutter bar. Fig. 14 is a detail side view of the cutter. Fig. 15 is an end view thereof. Fig. 16 is a view of a part of the cutter bar with the cutter removed; and Fig. 17 is a detail of the screw for holding the cutter in the bar.

Referring now to the parts by letters, and considering particularly for the time being the specific construction shown in Figs. 1, 2 and 3, F F represent the forward ends of arms attached to and forming part of the frame of the machine which carries the cutter bars. These arms F F are moved longitudinally as the frame is moved forward or backward by any suitable mechanism of the general character well known in this art. To the sides of the forward ends of each arm F, two brackets E E are attached by means of suitable bolts. In the parts *e* of these brackets, nearest the arms F F, the rear cutter bar B is journaled. The outer ends of the brackets E E are separated sufficiently to permit a screw bolt S′ to pass between them, as and for the purposes hereinafter described. The outer ends of these brackets are provided with cylindrical bosses D D, and these bosses are off set toward each other substantially as shown, and a ring R, carrying one or more cutters, is placed between said brackets E E, and journaled and wholly supported upon said cylindrical bosses D D. Passing centrally between these cylindrical bosses D D, and consequently through the ring R, is the forward cutter bar A,—said brackets forming the bearings by which said cutter bar is supported, and in which it revolves. The ring R entirely covers the edges of the cylindrical bosses D; and the cutter or cutters which are attached to said ring extend across its entire face, whereby when the cutter ring is revolved upon its bearing, a channel is cut in front of the bosses in which the cutter bar A is journaled. Upon the ends of the cutter bar A which lie outside of the bearings, one or more cutters are placed which cut away the coal in front of the part J of the brackets. The means which I have

shown for revolving the ring R, and which I prefer to employ, consists of the screw bolt S′ which passes through a hole in the cutter bar A, and between the brackets D D, and engages with the said ring.

Projecting in a substantially radial direction from both of the cutter bars A and B are the cutters C arranged spirally upon said bars, and so placed with reference to each other that each cuts a continuation of the kerf cut by the cutter on each side of it; and the cutters on the bar B are so placed that they extend sidewise the kerf made by the cutters on the bar A. The cutter bars A B are revolved in opposite directions by suitable mechanism. In Fig. 1, I show two drive chains intended to be operated by any suitable mechanism. The chain 20 revolves the cutter bar A in one direction, and the chain 21 revolves the cutter bar B in the opposite direction.

The principal advantage of two cutter bars revolving in opposite directions is this, viz: When only one bar is used the reaction of the coal against the cutters tends to raise or lower the cutter bar and the frame to which it is journaled, as the case may be, depending upon the direction in which said bar is revolving; but when two cutter bars are used, revolving in opposite directions, such a tendency on the part of one cutter bar is counteracted by a like tendency in the opposite direction from the other cutter bar. It is obvious that the greater the chip taken by the cutters, the greater is the reaction of the coal against the cutter.

In the form of the machine shown in Fig. 1, the forward cutter bar A has the greater leverage on the frame, wherefore the cutting surface on said bar and rings should be somewhat less than the cutting surface on the bar B, in order that the reaction of the coal on one bar may balance that on the other. In the form of machine shown in Figs. 4 and 5, the rear cutter bar B has the greater leverage on the frame, wherefore its cutting surface should be less than the cutting surface on the forward bar A. The end cutters O are simply flat pieces of steel which are inserted in longitudinal slots in the ends of the cutter bars, and are held in place by bolts P or by any other well known means.

In the form of the machine shown in Figs. 4 and 5, the bars A B project from the side of the machine, and it is not necessary that the extreme outer end of the rear bar be supported in bearings. It is only necessary, therefore, to provide one set of bearing brackets E and cutter carrying ring R, above explained, which are mounted on the end of the bar F, in which the outer end of the bar A is journaled. The inner ends of the cutter bars A B are supported in bearings in the frame K, which frame is moved forward outside of and parallel to the working face of the coal.

30 and 31 represent meshing pinions, secured to the cutter bars A B respectively whereby when one bar is revolved by suitable mechanism, the other is revolved in the opposite direction. In this form of the machine, as shown, that part of the rear cutter bar B which lies behind the cutter bar A is provided with a screw conveyer M by which the débris made by the bar A may be carried toward the working face of the coal and out of the kerf. The slack formed by the rear cutter bar may be removed by hand, or a second screw conveyer may be journaled behind and parallel to said rear cutter bar, in a manner well-known in the art.

The cutter bars are placed approximately parallel, one in advance of the other, and preferably in the plane of their movement.

I have only shown two cutter bars, but it is clear that three or more might be employed if each cutter bar were placed with reference to the one in advance of it, substantially as the bar B is placed with reference to the bar A, as shown. In such case the cutter bars should be divided into sets, one set revolving in one direction, and the other set in the opposite direction, so that the reaction of the coal against one set of cutter bars is counteracted by the reaction against the other set, substantially as it is between the two cutter bars shown.

The cutters C each consists of a flat piece of hardened steel which projects substantially radially from the cutter bar. In the form shown, the rear end of the cutter C is slotted, and the sides of the slots are tapped so as to engage with a screw S which is preferably larger in diameter than the thickness of the cutter, as shown in Figs. 13 to 16 inclusive.

The cutter bars A B are provided with radial slots into which the cutters are inserted. In the sides of the slots concave grooves T^2 are formed, and these grooves are tapped whereby they also engage with the screw S. A cutter C having been placed in one of the slots projecting the proper distance therefrom, a screw S is inserted, from the opposite side of the cutter bar and screwed up to a stop, which may be either the head of the screw, or it may be the point of said screw against the bottom of the tapped hole T^2 in the cutter bar. The screw engages with both the cutter and cutter bar in the same part of its length, but in different parts of its circumference, thereby securing the cutter in the cutter bar. The cutter C′ which is carried by the ring R is similarly formed, except that the tapped hole for the screw S′ is of less diameter than the thickness of the cutter C′. It enters a radial slot in the ring, from one side thereof, and a screw bolt S′ entering said ring from the opposite side passes through the cutter bar B and screws into the end of said cutter. The bolt S′ lies between the two parts of the brackets D D and has the double function of securing the cutter to the ring and of so connecting the ring and cutter bar A that, as the latter is revolved, the former is also revolved.

The end cutters O extend slightly beyond

the respective ends of their cutter bars and are held in place by bolts passing through the cutter bar at right angles to the cutter in a well known manner.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a mining machine, in combination,—a frame adapted to enter the kerf cut by the cutter bars,—two parallel cutter bars arranged one behind the other and journaled on said frame, the rear cutter bar being extended longitudinally beyond the end of the forward cutter bar,—a series of cutters secured to and projecting from the side of said cutter bars, the cutters on the rear cutter bar being secured to the part thereof which extends beyond the end of the forward cutter bar,—and means for revolving said cutter bars in opposite directions,—said cutters being adapted to cut a deep kerf when the frame on which they are mounted is moved in a direction transverse to the axes of the cutter bars—the cutting surfaces on the two bars being so proportioned that the reaction of the coal on each bar tends to balance the reaction of the coal on the other,—substantially as and for the purpose specified.

2. In a mining machine, in combination,—two arms F F,—two parallel cutter bars journaled on said two arms, the rear bar being extended longitudinally beyond the ends of the forward cutter bar,—a series of radial cutters secured to and projecting from the side of that part of the forward cutter bar which lies between its bearings in the two arms,—a series of cutters which are secured to and project from the side of the parts of the rear cutter bar which extend beyond its bearings as described,—cutters connected with the forward cutter bar and adapted to cut in front of its bearings,—and mechanism for revolving said cutter bars in opposite directions, substantially as and for the purpose specified.

3. In a mining machine, a bearing bracket having at its end a cylindrical boss, a bearing for a cutter bar formed in said boss, and a cutter bar journaled in said bearing, combined with a cutter-carrying ring journaled on said boss, and suitable connections between said ring and cutter bar and mechanism for revolving the cutter bar, substantially as set forth.

4. In a mining machine, in combination, an arm extending from the frame, two separated brackets secured to the forward end of said arm, each bracket having a cylindrical boss at its end through which an orifice is formed, a cutter bar journaled in said orifices, a cutter-carrying ring mounted on said bosses, and a driving connection between said cutter bar and ring, substantially as set forth.

5. In a mining machine, in combination, an arm extending from the frame, two separated brackets secured to the forward end of said arm, each bracket having a cylindrical boss at its end through which an orifice is formed, a cutter bar journaled in said orifices, a cutter-carrying ring mounted on said bosses, and a bolt passing between said bosses and connecting said cutter bar and ring, substantially as set forth.

6. In a mining machine, in combination, an arm extending from the frame, two separated brackets secured to the forward end of said arm, each bracket having a cylindrical boss at its end in which an orifice is centrally formed, a cutter bar journaled in said orifice, a ring mounted on said bosses, and having a radial slot, a cutter in said slot, and a bolt entering said ring from a point diametrically opposite to said slot, passing through the cutter bar, and engaging said cutter, substantially as set forth.

7. In a mining machine, in combination, a revoluble cutter bar having radial slots each of which is provided with threaded grooves in its sides, a cutter having a screw threaded slot in its end, fitted to each of said slots in the cutter bar, and a screw of greater diameter than the thickness of the cutter which enters the cutter bar from a point diametrically opposite to the slots therein and engages with the threaded parts of the cutter bar and cutter, substantially as set forth.

8. In a mining machine, in combination, a cutter bar having tapped radial openings for the reception of cutters, a cutter fitted in each of said openings, each of said cutters having in its inner end a tapped longitudinal opening, and retaining bolts which enter said cutter bar at points diametrically opposite to said radial openings therein and engage with the threads in both the cutters and cutter bar, substantially as and for the purpose specified.

9. A cutter for a mining machine, consisting of a flat steel bar having a cutting edge at one end, and having a longitudinal slot in the other end, the sides of said slot being threaded, substantially as set forth.

10. In a mining machine, in combination, two supports for the cutter bar, a cutter bar A journaled in said supports, a series of removable cutters projecting from that part of said cutter bar which lies between said supports, a cutter bar B journaled in said supports behind and parallel with the cutter bar A and extending longitudinally beyond the end of said cutter bar A, a series of cutters which project from that part of the cutter bar B which extends beyond the end of cutter bar A, and means for revolving said cutter bars, substantially as and for the purpose specified.

CHARLES O. PALMER.

Witnesses:
E. L. THURSTON,
FRANK. MILLER.