J. F. CONRAD & J. WALKER.

COAL MINING MACHINE.

APPLICATION FILED FEB. 9, 1917.

1,257,582.

Patented Feb. 26, 1918.

7 SHEETS—SHEET 1.

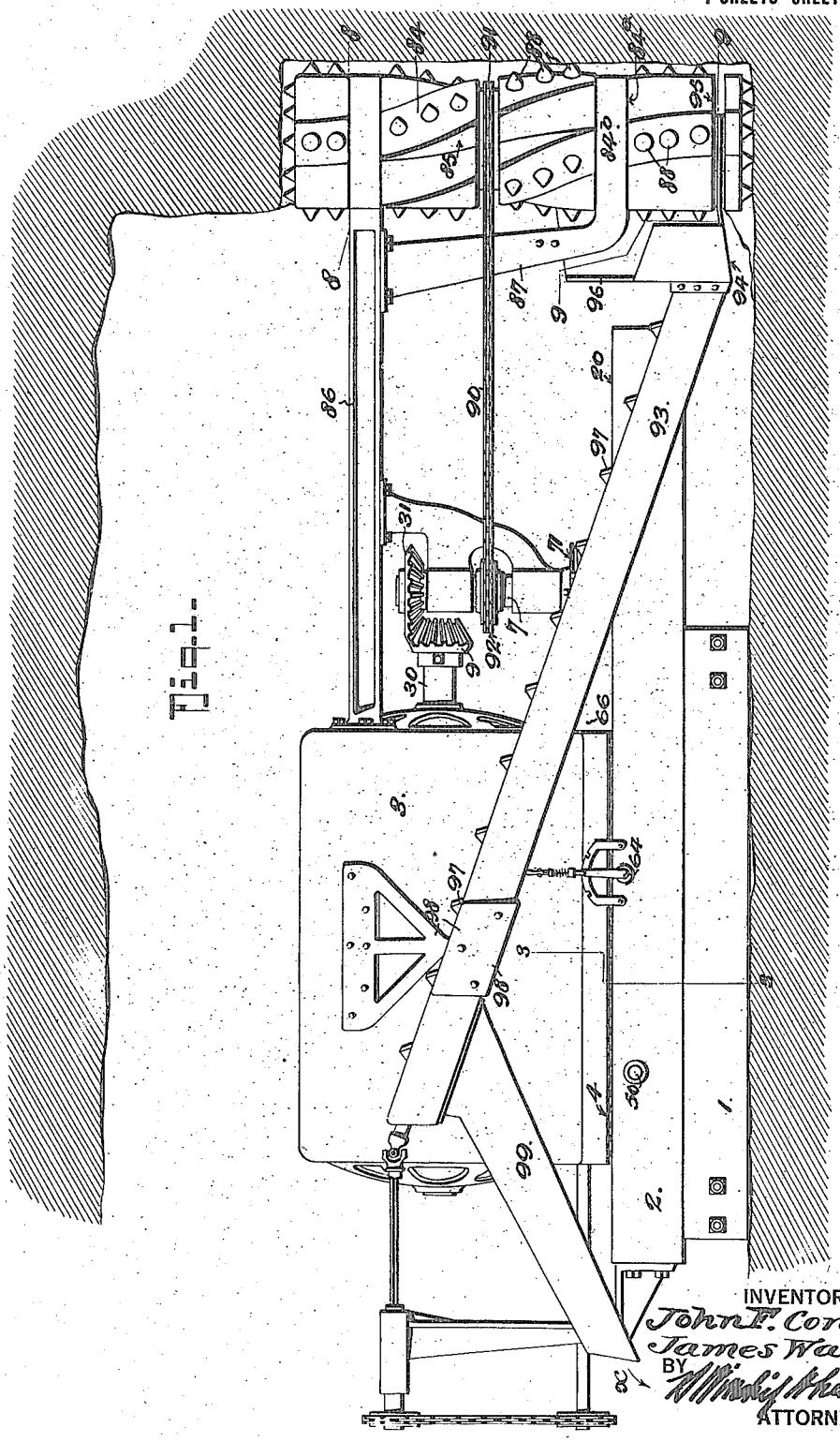


Fig. 1.

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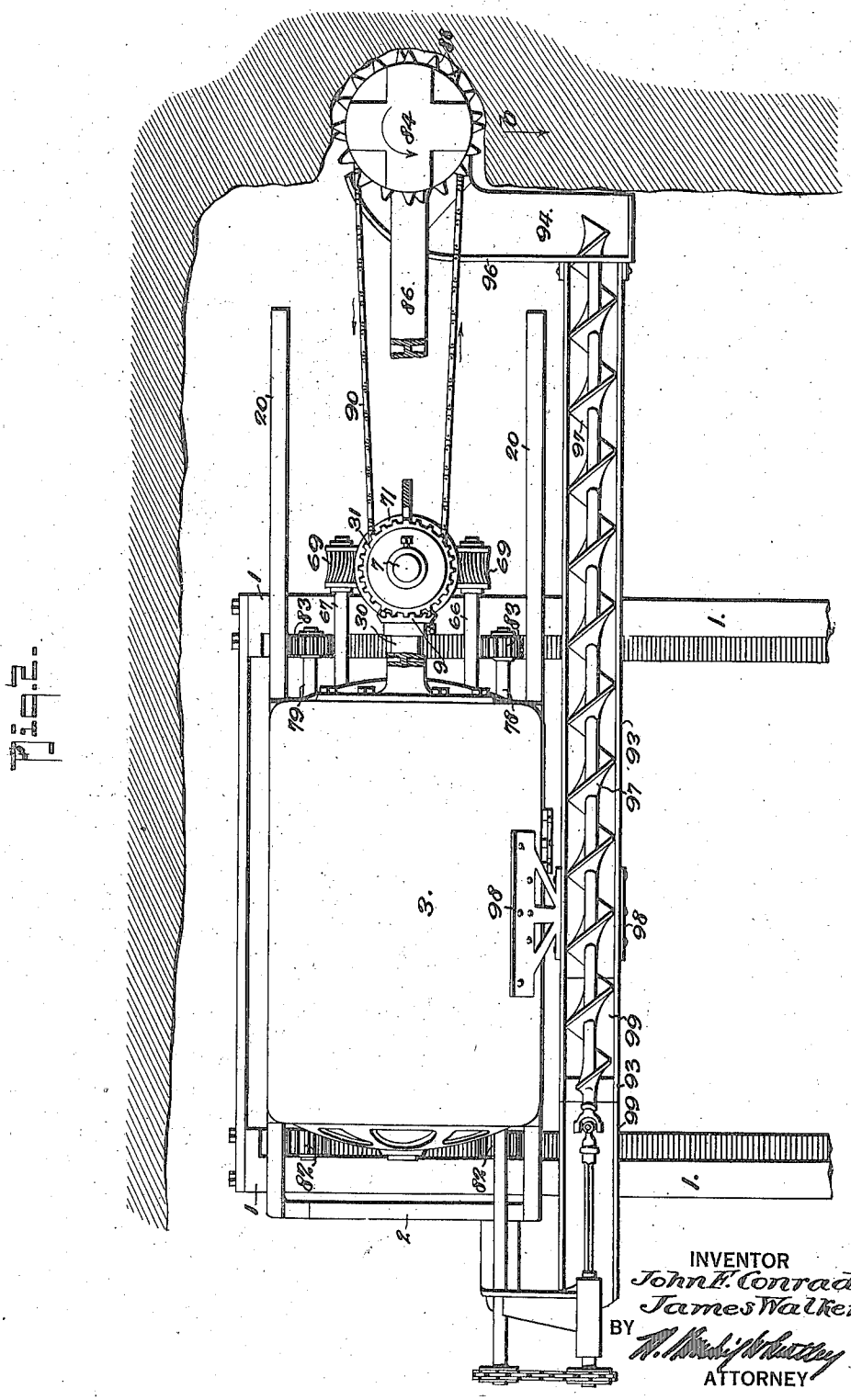


FIG. 2.

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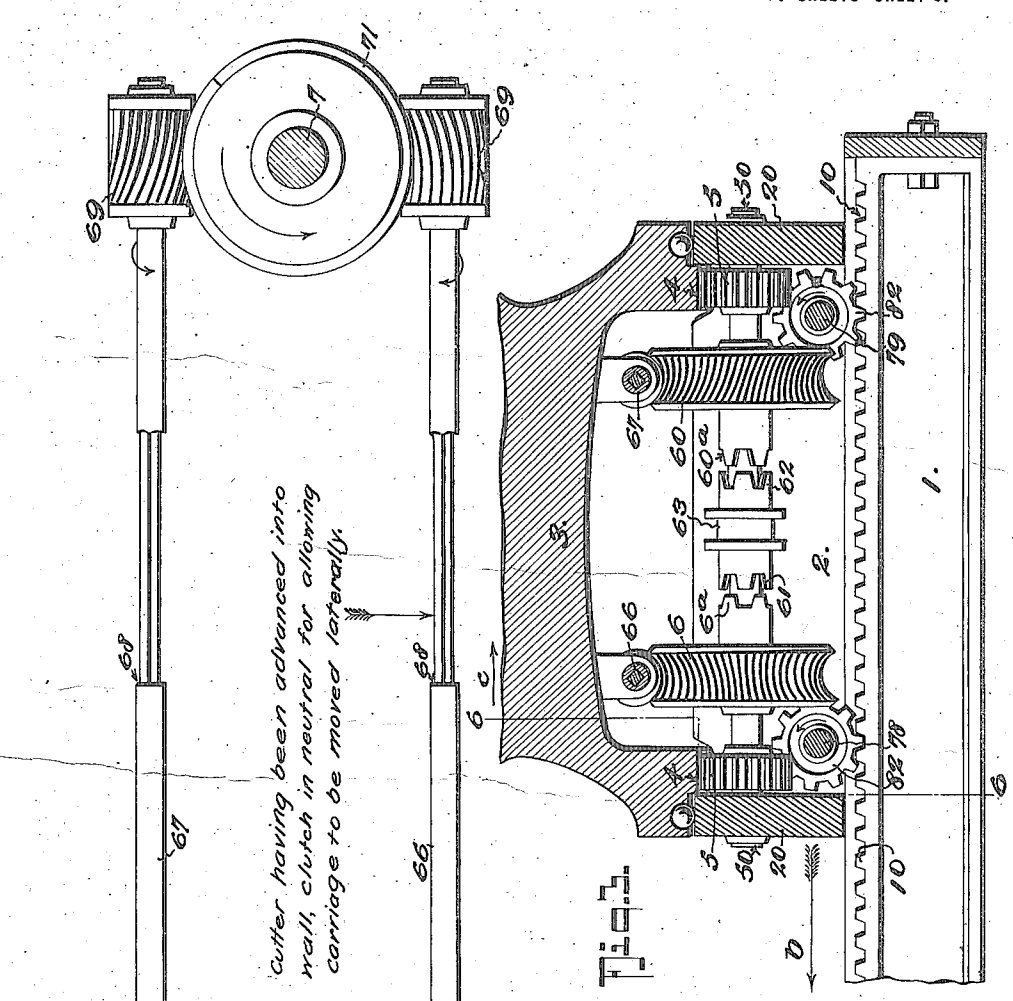


Fig. 3.

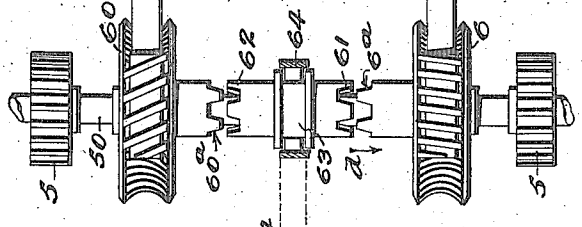


Fig. 4.

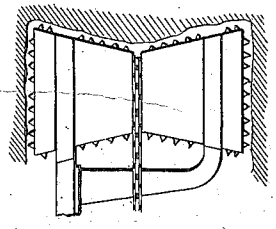


Fig. 5.

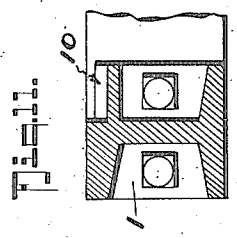


Fig. 11.

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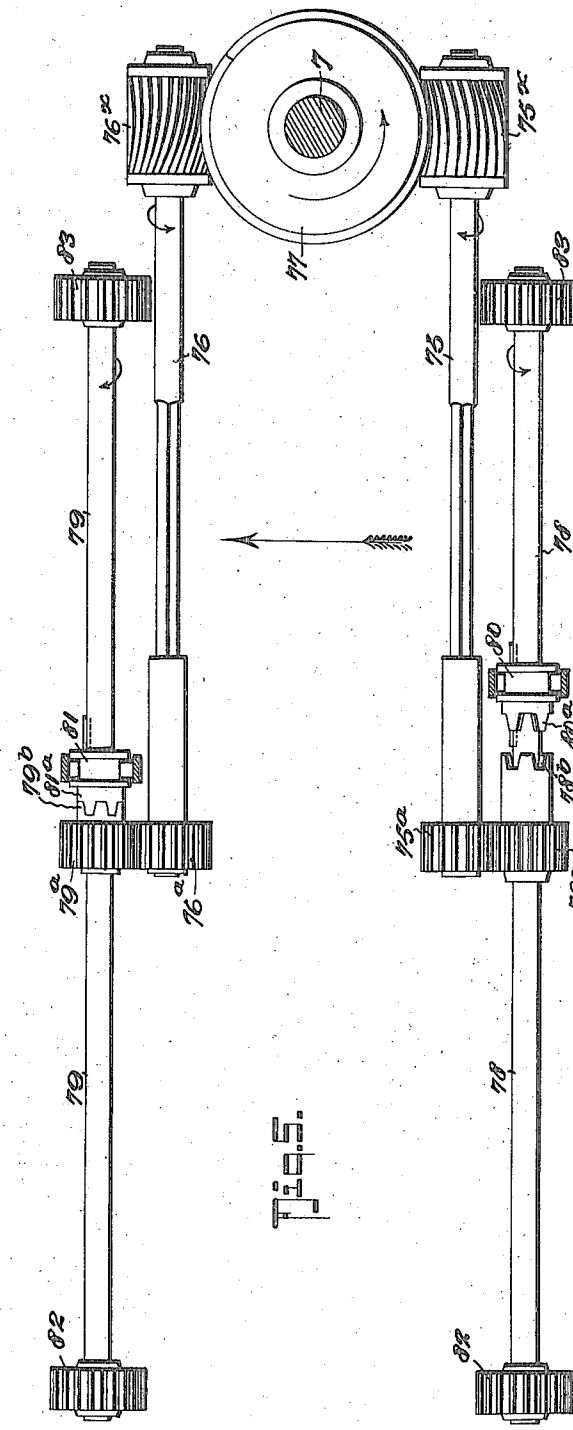


Fig. 5.

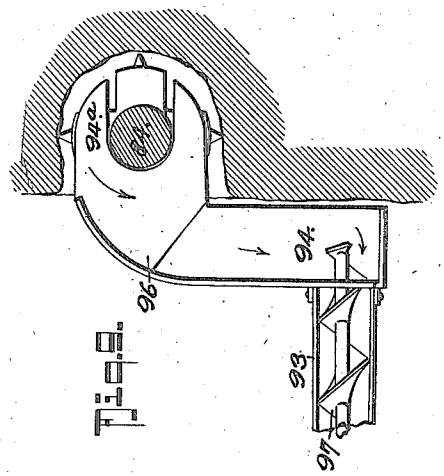


Fig. 8.

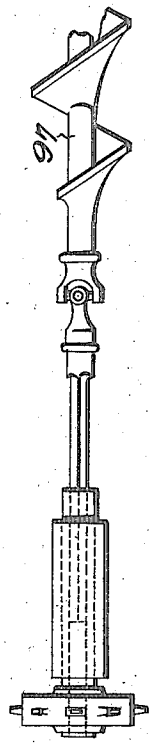


Fig. 10.

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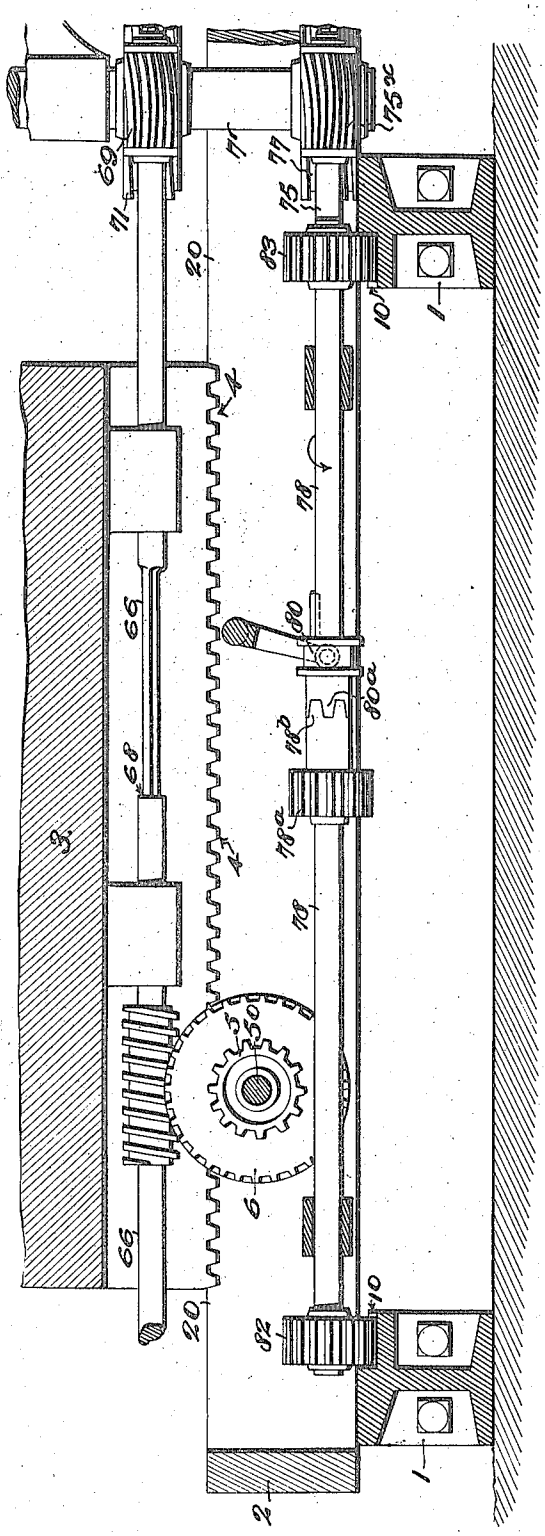


Fig. 6.

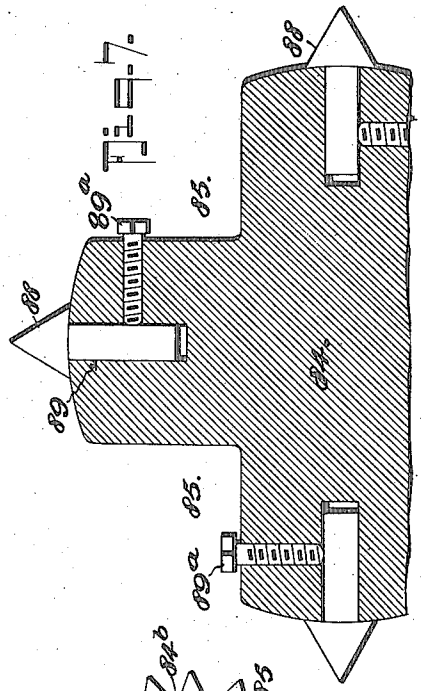


Fig. 7.

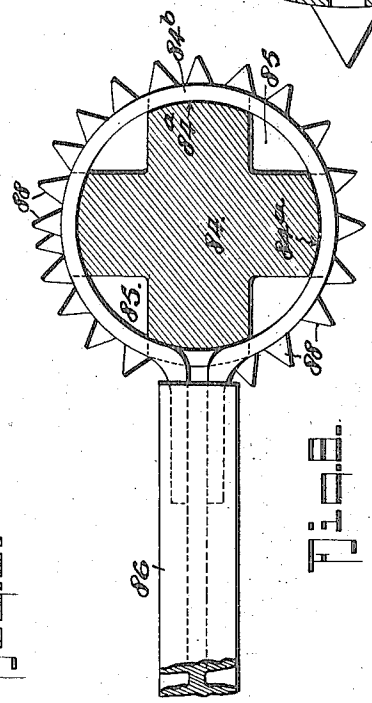


Fig. 8.

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7 SHEETS—SHEET 6.

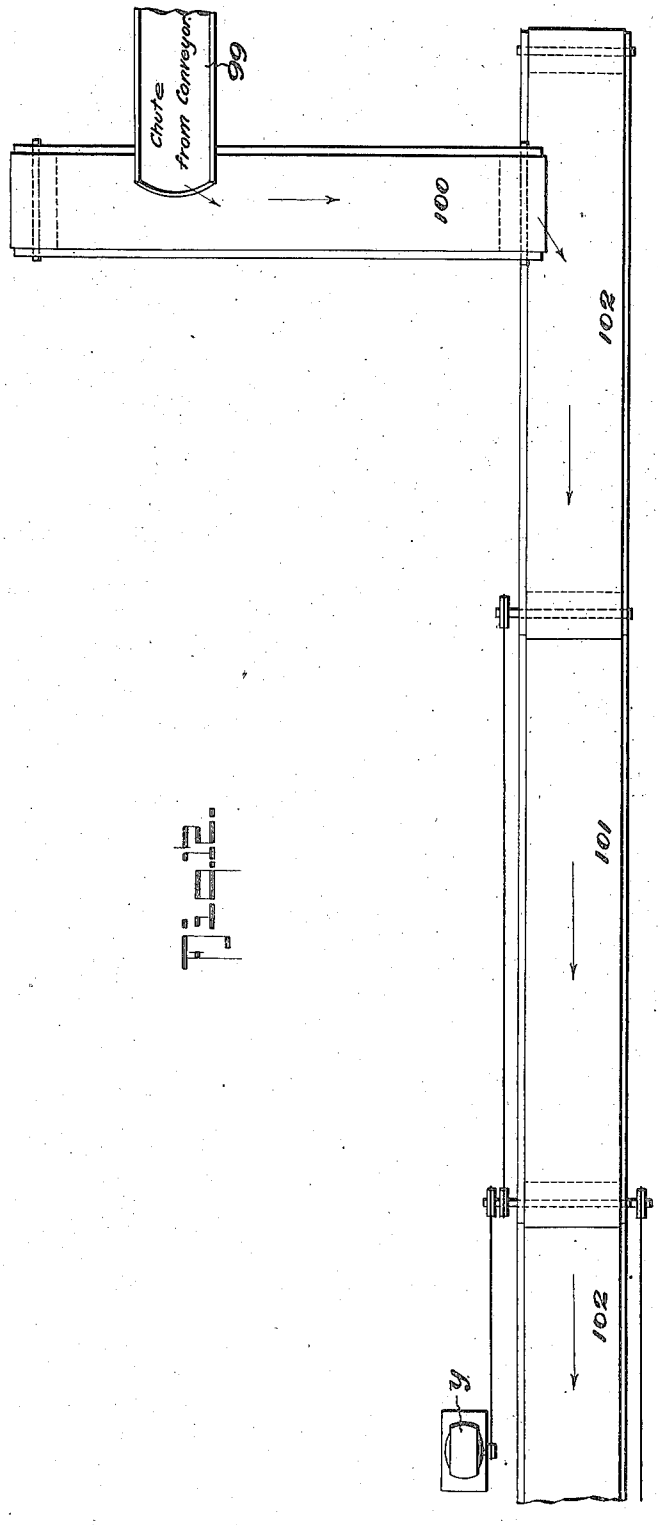


Fig. 12.

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7 SHEETS—SHEET 7.

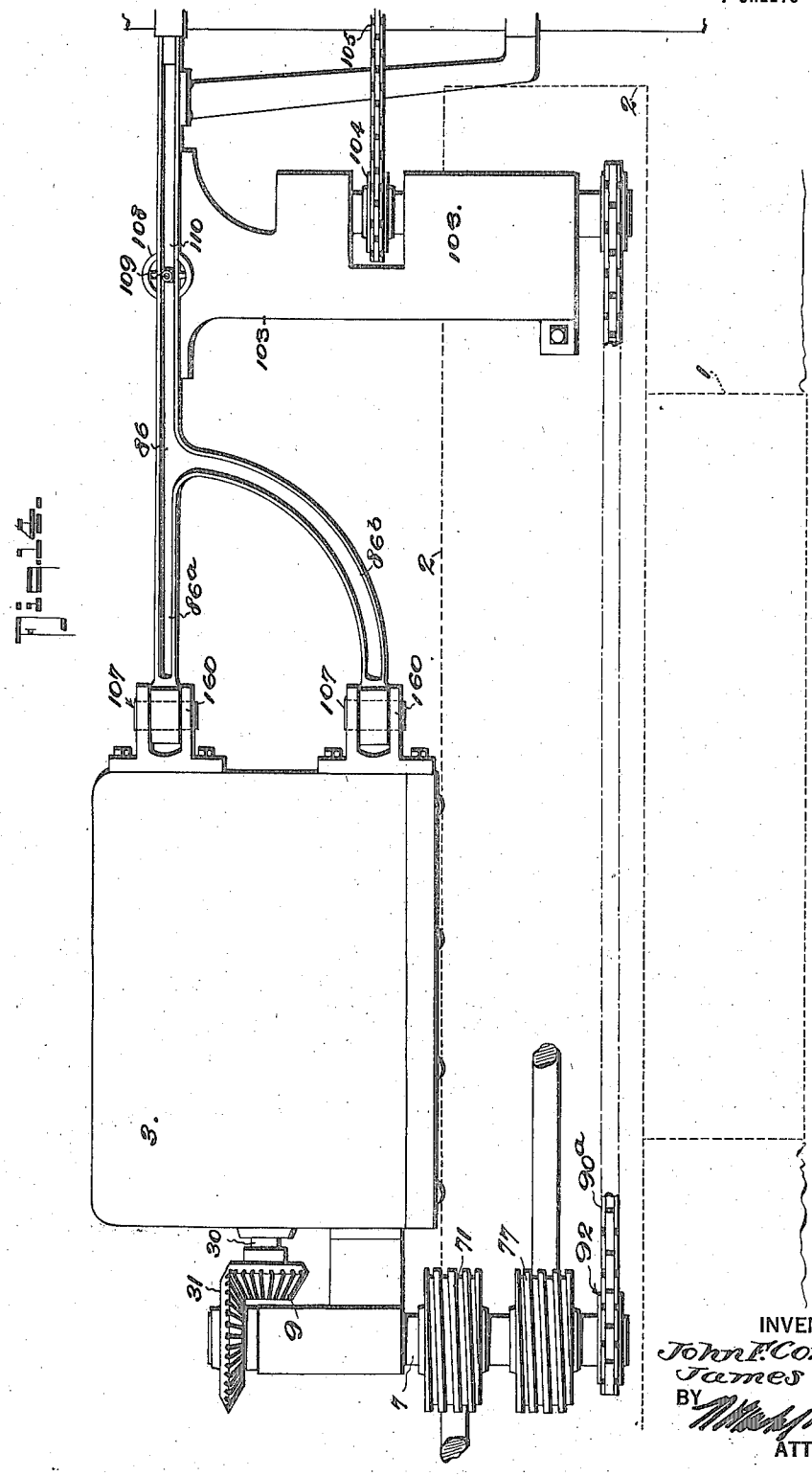


Fig. 14.

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UNITED STATES PATENT OFFICE.

JOHN F. CONRAD AND JAMES WALKER, OF NETTLETON, PENNSYLVANIA.

COAL-MINING MACHINE.

1,257,582. Specification of Letters Patent. Patented Feb. 26, 1918.

Application filed February 9, 1917. Serial No. 147,689.

To all whom it may concern:

Be it known that we, JOHN F. CONRAD and JAMES WALKER, residing at Nettleton, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Coal-Mining Machines, of which the following is a specification.

This invention has reference to improvements in motor actuated mining machines of that class in which the cutting elements are slowly advanced against the coal bed while effecting a cutting operation, and in which is included means for quickly withdrawing the said cutting elements from the cut when they are to be set for making another cut or when otherwise necessary.

In its generic nature, our invention embodies an improved arrangement of a base frame, a carriage longitudinally movable on the said base frame, cutting elements mounted on the carriage and adapted for being projected into the wall to be drilled or cut as the carriage is moved forwardly, a motor operator mechanism for actuating the cutting elements as they are directed toward the work, and power transmission mechanism driven from the motor, coöperative with the carriage, and adapted, under proper adjustments, to operate under motor energy to slowly move the cutting elements for effecting the desired cutting of the wall and for rapidly pulling the said elements back out of the cut.

Our invention also includes in connection with the base frame, and the power transmission and cutting elements in coöperation therewith, a sub-base or rack frame disposed in a plane at right angles to the said subframe and the power and cutting mechanisms, and power transmission mechanism in connection with the motor mechanism, adapted, under proper adjustments, for moving the motor, the cutting elements and the motor driven means that actuate the said elements, laterally, with respect to the wall being cut, whereby to provide for cutting the wall sidewise or for setting the cutting elements for making straight ahead cuts as conditions may make necessary.

Again, our invention seeks to provide, in a mechanism of the character stated, an improved means for gathering and conveying the coal cuttings, including a special construction of conveyer, whereby the latter is automatically adjusted for maintaining a proper relation to the cutting elements as they are gradually advanced during the cutting operation.

In its more complete nature, our invention embodies in a coal mining mechanism of the general character stated, a cutting element in the nature of a rotary head having a special construction and coöperative arrangement of cutting bits, whereby the operation of cutting is expeditiously and effectively accomplished.

In its subordinate features, our invention embodies an improved coöperative arrangement of a main support or base, a supporting frame or carriage mounted on the base and adapted for being laterally adjusted thereon, a motor actuated cutting mechanism carrying frame mounted upon the supporting frame and power transmission that includes means for shifting the direction of rotation of the said transmission, whereby to provide for feeding the motor actuated cutting mechanism carrying frame slowly forward and rapidly backward on the supporting frame or carriage and for reciprocating the said carriage with the motor actuated mechanism laterally on the base, other minor features of construction being also included, all of which will be hereinafter fully explained, particularly pointed out in the appended claims and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of our new and improved coal mining mechanism, the parts being shown in operative position.

Fig. 2 is a top plan view thereof.

Fig. 3 is a transverse section of our improved coal mining mechanism taken substantially on the line 3—3 on Fig. 1, the power transmission gearing being shown adjusted for moving the cutting elements and the motive power laterally; see arrow *b*.

Fig. 4 is a diagrammatic plan view of the power transmission elements for effecting the longitudinal reciprocation of the motor

and the cutting mechanism carriage, the said mechanism being shown at a neutral position to permit the carriage to move laterally.

Fig. 5 is a diagrammatic plan view of the power transmission gear elements for shifting the operating mechanism laterally.

Fig. 6 is a longitudinal section taken on the line 6—6 on Fig. 3 and looking in the direction of the arrow *c*.

Fig. 7 is a detail horizontal section of the rotary cutter hereinafter referred to.

Fig. 8 is a similar view of the cutter taken on the line 8—8 of Fig. 1.

Fig. 9 is a horizontal section on the line 9—9 on Fig. 1, and shows the connection of the gathering pan to the delivery end of the rotary cutter.

Fig. 10 is a detail plan view of the universal or articulated power transmission for the rotary conveyer.

Fig. 11 is a detail cross section of the base or rack frame hereinafter specifically referred to.

Fig. 12 is a diagrammatic plan view of a supplemental conveyer for delivering the mined product to a car or other point of collection.

Fig. 13 is a side elevation of a modified form of the rotary cutter and hereinafter described.

Fig. 14 is a diagrammatic side elevation of a modified construction of parts of our improved coal mining machine, hereinafter specifically referred to.

In the practical application of our invention, we provide a base frame that is hereinafter termed the rack rail frame 1, and the said frame, when applying our mechanism for use, is suitably anchored or otherwise held on the bottom or floor of the mine and which, by any suitable means, from time to time, is moved forwardly relatively to the wall being operated on, as the adjustment of the cutting mechanism, and the cutter actuated means therefor may make necessary.

2 designates what is hereinafter described as the carriage or bed frame, since upon it is mounted the motor 3, of any suitable type, and which has, on the under side of its casing, oppositely disposed rack guides 4—4 that are engaged by pinions 5—5 on the opposite ends of a transversely positioned driving shaft 50 that is journaled in the side beams 20—20 of the carriage frame, as is best shown in Fig. 3, by reference to which and to Fig. 4, it will be observed that upon the shaft 50 is loosely mounted two worm gears 6—60, of different pitch and each provided with a clutch face 6^a and 60^a for being alternately engaged by the opposite clutch faces 61—62 of a clutch 63 keyed on the shaft 50 and through the operation of a clutch lever 64 (see Figs. 1 and 4) is movable to couple either the low pitch worm gear 6 or the high speed gear 60 with the shaft 50 as desired, it being understood that the clutch lever mechanism in practice includes the usual form of detent devices for holding the lever to its shifted position.

66 and 67 designate a pair of power transmission shafts, which for reasons hereinafter more fully explained, are each composed of telescopic sections, one of the said sections of each shaft having a portion non-circular in cross section for slidably engaging a correspondingly shaped socket 68 in the other section, as is clearly shown in Fig. 4.

The front end of each of the said shafts 66 and 67 has a worm gear 69 and the said gears 69 are held in mesh with a worm gear 71 on a driven shaft 7 mounted upon the motor frame or carriage and vertically located adjacent to the motor 3, and it should be here stated, the motor and the coal cutting and gathering mechanisms are correlatively so arranged and interconnected that the motor and the said mechanisms are advanced or pulled back under motor energy.

30 designates the motor driven shaft and 9 a pinion on the said shaft that meshes with a pinion 31 on the vertical shaft 7 and is fixedly connected with the motor and the cutting mechanism to be reciprocated with the said mechanism in the manner presently explained.

By reason of the construction and coöperative arrangement of the power transmitting devices, so far explained and shown, it is obvious that when the said parts are adjusted to bring the clutch face 61 into engagement with the clutch face 66^a of the slow speed worm gear 6, as is indicated by the arrow *d* on Fig. 4, the motor and the cutting mechanism operated thereby are moved toward the work under a slow speed through the power that is transmitted to the flexible shafts 66—67 from the gear 71, the said shafts running in opposite directions, the slow speed gear 6 now turning the shaft 50 whose pinion 5—5 now feeds the carriage frame to slowly advance the cutting elements against the wall to be drilled, the forward sections of the shaft 66—67 now sliding out of the rear or fixedly held sections of such shafts 66—67, the worm gear 6 now running loosely on the shaft 50.

After the drilling or cutting elements are entered in the wall to their limit, the supporting frame therefor and the motor can be quickly pulled back, under motor energy, by shifting the clutch lever 64 to uncouple the slow worm gear 6 from the shaft 50 and to couple the fast worm gear 60 with the said shaft 50, the shaft 67 now acting as the power transmitter to impart a reverse or back motion to the shaft 50.

In operating our coal mining machine, the

cutting cylinder, the peculiar construction of which forms an essential part of our invention, is slowly advanced into the wall beyond the face of the wall, or it is advanced laterally, see the arrow *b* on Fig. 2, for edgewise cutting the wall surface as the cutter and the cutter operating mechanism is moved laterally.

For advancing the entire mechanism laterally, as indicated, a supplemental power transmission is provided which is also driven from the shaft 7 and, at this point, it should be stated, when the lateral shifting of the operating mechanism is effected under the motor energy, the clutch mechanism 64 for the fast and slow worm gears 6—60 is at neutral, see Fig. 4, and the said gears 6--60 run loosely, hence no longitudinal feeding of the operating mechanism occurs.

The supplemental mechanism, best shown in Fig. 5, consists of a pair of driving shafts 75—75 disposed lengthwise of the carriage frame and also formed of telescopic sections, the front members of which carry worm gears 75^{x}—75^{x} that are at all times held in mesh with the master gear 77 on the driven shaft 7.

The shaft 75 carries a pinion 75^{a} and the shaft 76 a pinion 76^{a} and the said gear 75^{a} meshes with a pinion 78^{a} on a driven shaft 78 while the pinion 76^{a} meshes with a pinion 79^{a} on a shaft 79, the said pinions 78^{a} and 79^{a} being loosely mounted on their respective shafts, and the said shafts, which are in parallel, are extended lengthwise of the carriage and each is provided with a shiftable clutch 80—81 whose clutch faces 80^{a} and 81^{a} are adapted for being shifted into mesh with the clutch faces 78^{b} and 79^{b} on the gears 78^{a} and 79^{a} on the shafts 78 and 79, each of which carries rack gears 82—83 at the opposite ends that engage the rack rails 10—10 on the rack rail or base frame 1, as is clearly shown in Figs. 3 and 6, by reference to which it will be readily apparent that when the mechanism is adjusted as shown, the shaft 50 being out of gear with its power transmission and the shaft 78 clutched up with its power transmission, the entire operating mechanism including the now working rotary cutter is slowly fed laterally in the direction of the arrow *b* on Fig. 2, it being also understood that if shaft 79 instead of shaft 78 is thrown into clutch with the power transmission, best shown in Fig. 5, the operating mechanism will be moved quickly backward in a direction reverse to that indicated by the arrow *b* on Fig. 2.

84 designates the cutting cylinder, which is preferably—on account of the coöperative connection therewith of the gathering means presently described, constructed in the manner best shown in Figs. 1, 7, 8 and 9, and the said cylinder, which is vertically positioned in a plane parallel with the driving shaft 7, is formed with a number, preferably four, spirally directed channels or pockets 85 that extend from the upper to the lower end and are so projected at the said lower end that they direct the coal cuttings in a direction outwardly from the wall being cut, to provide for gathering the said cuttings in a collecting pocket or chute with which the lower or receiving end of a conveyer mechanism connects in the manner presently explained.

The rotary cutter 84 is formed with annular grooves 84^{a}, see Figs. 1 and 8, for receiving the yoke-like bearing bands 84^{b} secured to the upper and lower supporting arms 86—87 attached to and movable with the motor casing or frame, the bearings for the said cylinder being such that the lower end of the cylinder engages the base of the cut being made and thereby forms a front support for the machine.

Drill bits 88, of any approved construction, are attached to the sides, the top, and to the bottom of the cylinder 84, and for convenience of attaching and removing the bits, they may be secured to the cylinder stock by forming the said stock with sockets 89 for receiving the bit shanks and holding them in a position for being secured by clamp bolts 89^{a}, as clearly shown in Fig. 7.

Motion is at all times imparted to the drill or cutting cylinder by a chain transmission 90 that passes over a chain gear 91 on the cylinder and the chain gear 92 on the shaft 7.

In practice, the cutting cylinder will be formed of sections to suit the thickness of the coal seam and instead of making the said cylinder of uniform diameter throughout, as shown in Fig. 1, it may be of double cone shape, as shown in Fig. 13, to provide for using a greater number of drills or bits for engaging the upper and lower or hard edges of the seam than midway thereof.

The conveyer mechanism in our construction of coal mining machine has a relatively fixed relation with respect to the rotary cutter, and the motor driven mechanism that operates the cutter actuated mechanism as the cutter is projected longitudinally or laterally to the work.

By referring particularly to Figs. 1 and 9, it will be noticed that the lower end of the U-shape conveyer trough 93 is attached to and is in communication with a pocket-like chute 94 which includes a bifurcated bottom 94^{a} that projects in the longitiudinal plane of the trough and fits into an annular groove 95 in the lower edge of the cutter and a vertically projected outer wall or pocket portion 96 with which the mined products, as they are directed, by centrifugal

force contact and by which the said products are deflected or dropped into position for being gathered by the lower end of the auger 97, as is clearly shown in Fig. 1, from which it will be seen that the conveyer trough inclines upwardly to a point near the rear end of the motor casing, is fixedly connected to the said casing by a hanger bracket 98 secured to such casing.

99 designates a discharging leg attached to the outer end of the trough which delivers the mined coal over the rear end of the machine, see arrow *x*.

When the conditions are adapted therefor, we prefer to project the discharging leg or chute 99 onto an endless conveyer belt 100 that is suitably located and driven by power transmission from the motor or by any other suitable means and to extend the said belt 100 so that it discharges the collections onto a supplemental endless conveyer 101, that consists of coupled sections 102, all driven by a separate motor, designated *y*, the said supplemental conveyer being provided for directing the coal products from the main conveyer into cars or to other suitable points for loading.

It is understood that the coöperative arrangement of parts, as shown in the accompanying drawings, illustrate but one way of assembling and driving the power transmission and the conveyer mechanisms, it being understood that under the scope of the appended claims, numerous modifications in the details or combination of the several mechanisms described, may be readily made without departing from our invention.

For example, the main drive or master shaft 7 may be located at the rear of the motor and coupled thereto in the manner best shown in Fig. 14, it being understood that when thus positioned, the shafts 69—67 for the power transmission will be suitably mounted relatively to the said shaft 7 and the carriage driving and laterally shifting means.

When the shaft 7 is arranged as shown in Fig. 14, driving gear 92 is preferably located at the lower end of the said shaft 7 and is connected by a long endless drive chain 90^a with a supplemental chain gear 111, that is attached to the lower end of a supplemental vertical shaft 112 mounted in a supplemental bearing or post 103 that is located in advance of the motor and the said shaft 112 is provided with a chain gear 104 over which passes a supplemental endless chain drive 105 which passes to and engages the cutting cylinder, as does the chain 90 in Fig. 1.

By arranging the power transmission for driving the cutter, as in the modifications shown in Fig. 14, the cutter sustaining frame or bracket 46 is constructed and is connected with the motor casing in such manner that it may be readily swung laterally to the right or left to thereby provide for holding the cutting cylinder, with its working face at uniform width.

As shown, the inner end of the bracket 86 is yoked to form upper and lower members 86^a—86^b adapted for fitting bifurcated bearings 106—106 on the motor casing. Pivot pins 107—107 connect the members 86^a—86^b with the brackets 106—106, as shown.

Bracket 86 in the modified showing, rests on the top of the supplemental bearing 103 and it is readily adjusted, laterally, by a hand screw wheel 108 that carries a screw shank 109, operating through a fixed member on the bearing and which engages a swivel nut 110 that works in the grooved side face of the bracket, as shown.

From the foregoing taken in connection with the drawings the manner of operation and the advantages of our coal cutting and loading machine will be readily understood.

What we claim is:—

1. In a mining machine, a base, a carriage movable transversely of itself along said base, a rotary cutter, a motor, an off-take conveyer that receives the cuttings made by the cutter, said cutter, said conveyer and said motor having a relativelv fixed relation, means for mounting said relatively fixedly related parts on said carriage to move in unison toward the work, power transmitting elements between the motor, the cutter and the conveyer whereby the cutter and the conveyer may be driven from the motor, power transmitting elements between the motor and the carriage whereby the motor, conveyer and cutter may be advanced into and withdrawn from the work and power transmitting elements coöperatively connecting the carriage with the base for advancing the carriage bodily along the base.

2. In a coal mining machine, a base, a carriage mounted on said base to move parallel to the work, a motor, a rotary cutter, said motor and said cutter being mounted on the carriage, a conveyer movable with and having a relatively fixed relation to the cutter and the motor, said conveyer including a pocket that receives the coal cuttings, power transmission elements between the motor and the cutter, and a power transmission between the motor and the carriage for advancing the motor, cutter and conveyer along the carriage to the work, and means for driving the conveyer.

3. In a coal mining machine, a base adapted to parallel the coal vein, a bed frame mounted transversely on said base and movable bodily along the same substantially parallel to the work, a motor mounted on said bed frame and movable along the same

toward and from the work, arms projecting from said motor, a rotary cutter sustained by said arms, a conveyer mounted on and movable with the motor along the bed frame, said conveyer having its entrant end projected into juxtaposition with the cutter to receive the cuttings, and means coöperative with the motor for driving said cutter and said conveyer, and for advancing the motor, cutter and conveyer toward and from the work and for moving said bed frame along said base frame substantially as shown and described.

4. In a coal mining machine, a base adapted to parallel the coal vein, a bed frame mounted transversely on said base and movable bodily along the same substantially parallel to the work, a motor mounted on said bed frame and movable along the same toward and from the work, arms projecting from said motor, a rotary cutter sustained by said arms, a conveyer mounted on and movable with the motor along the bed frame, said conveyer having its entrant end projected into juxtaposition with the cutter to receive the cuttings, means coöperative with the motor for driving said cutter, a rack and pinion connection between said bed frame and said base frame and power transmitting connections between said motor and said rack and pinion connections for moving said bed frame along said base frame and power transmitting connections between said motor and said bed for advancing and withdrawing the motor, cutter and conveyer toward and from the work.

5. In a mining machine which includes a cutter, a motor and means for relatively fixedly sustaining said cutter with relation to said motor; a conveyer, means for relatively fixedly sustaining said conveyer with relation to said motor and said cutter, said conveyer including a chute, the entrance end of which is bifurcated, said cutter having a groove near its lower end into which said bifurcated chute end is projected and means for driving said conveyer from said motor.

6. In a coal mining machine wherein is provided a rotary cutter, a motor for driving said cutter, and means for advancing the cutter and motor to the work; said cutter comprising a cylindrical rotating body having a central shaft portion, an off-take conveyer mounted on the motor and having its entrant end bifurcated to receive said cutter shaft and project into the cutter, the cutter having a space to receive the bifurcated end, and means for driving said conveyer from the motor.

7. In a mining machine, a base adapted to lie parallel to the coal vein, a bed frame transversely mounted on the base normal to the coal vein, a motor mounted on the bed frame, a cutter, an arm carried by the motor for supporting said cutter, power transmitting connections between the motor and the cutter, which connections include a driven shaft, rack and pinion connections between said bed frame and said motor, a power transmitting connection between said driven shaft and said rack and pinion connections for advancing the motor at low speed along said bed frame to advance the cutter into the work, a second power transmitting connection between said driven shaft and said rack and pinion devices for moving the motor along said bed frame to withdraw the cutter, clutch devices for rendering either of said power transmission mechanisms effective as desired, and means driven from the motor for moving the bed frame along the base frame, said last named means comprising rack and pinion devices and high and lower speed power transmitting connections between said driven shaft and said rack and pinion devices and such elements for rendering said last named high and low speed power transmitting connections operative or inoperative, as desired.

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Witnesses:
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WALTER JONES.