

April 17, 1951

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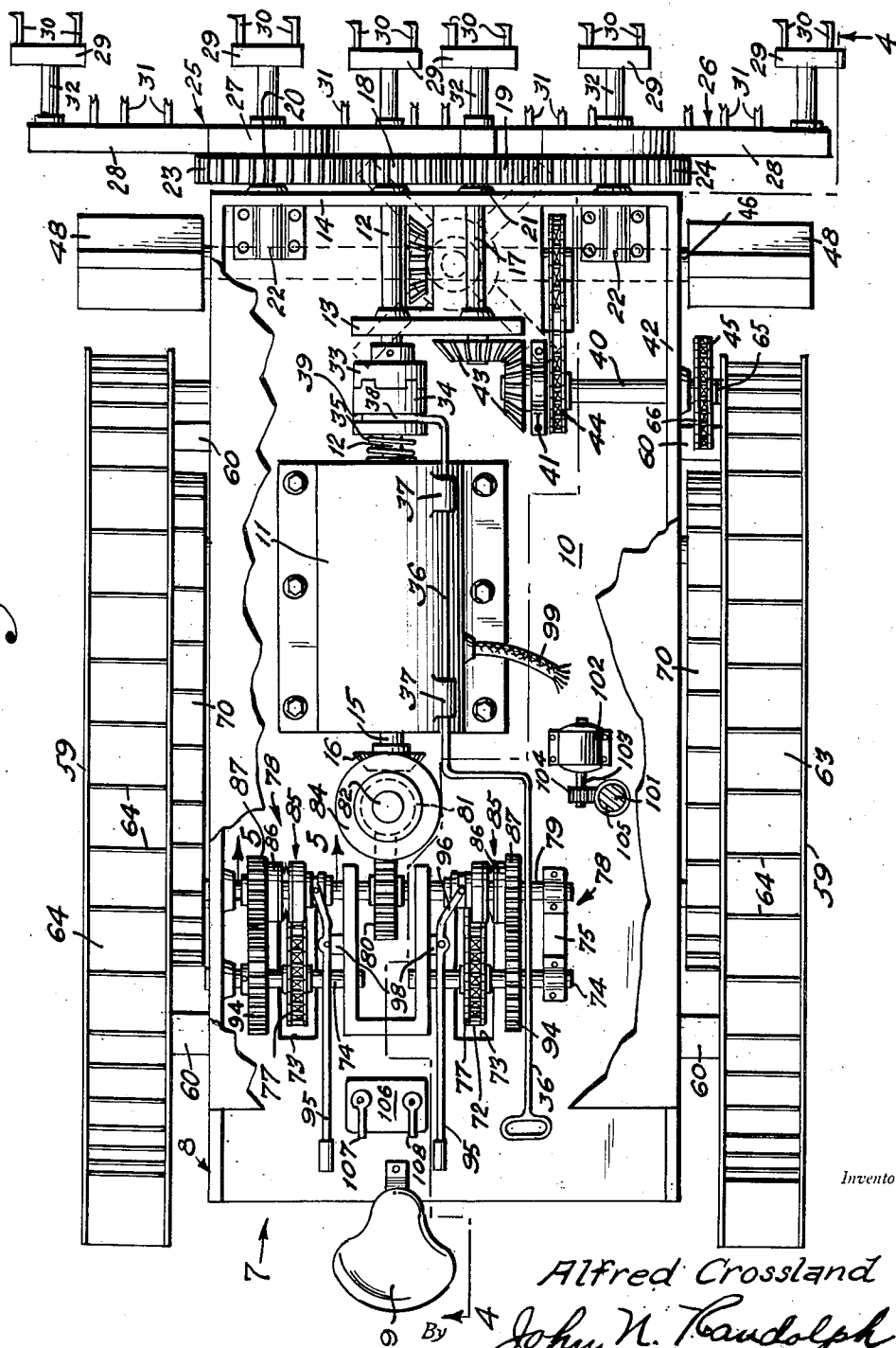
2,548,952

COAL MINING AND CONVEYING MACHINE

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3 Sheets-Sheet 1

Fig. 1.



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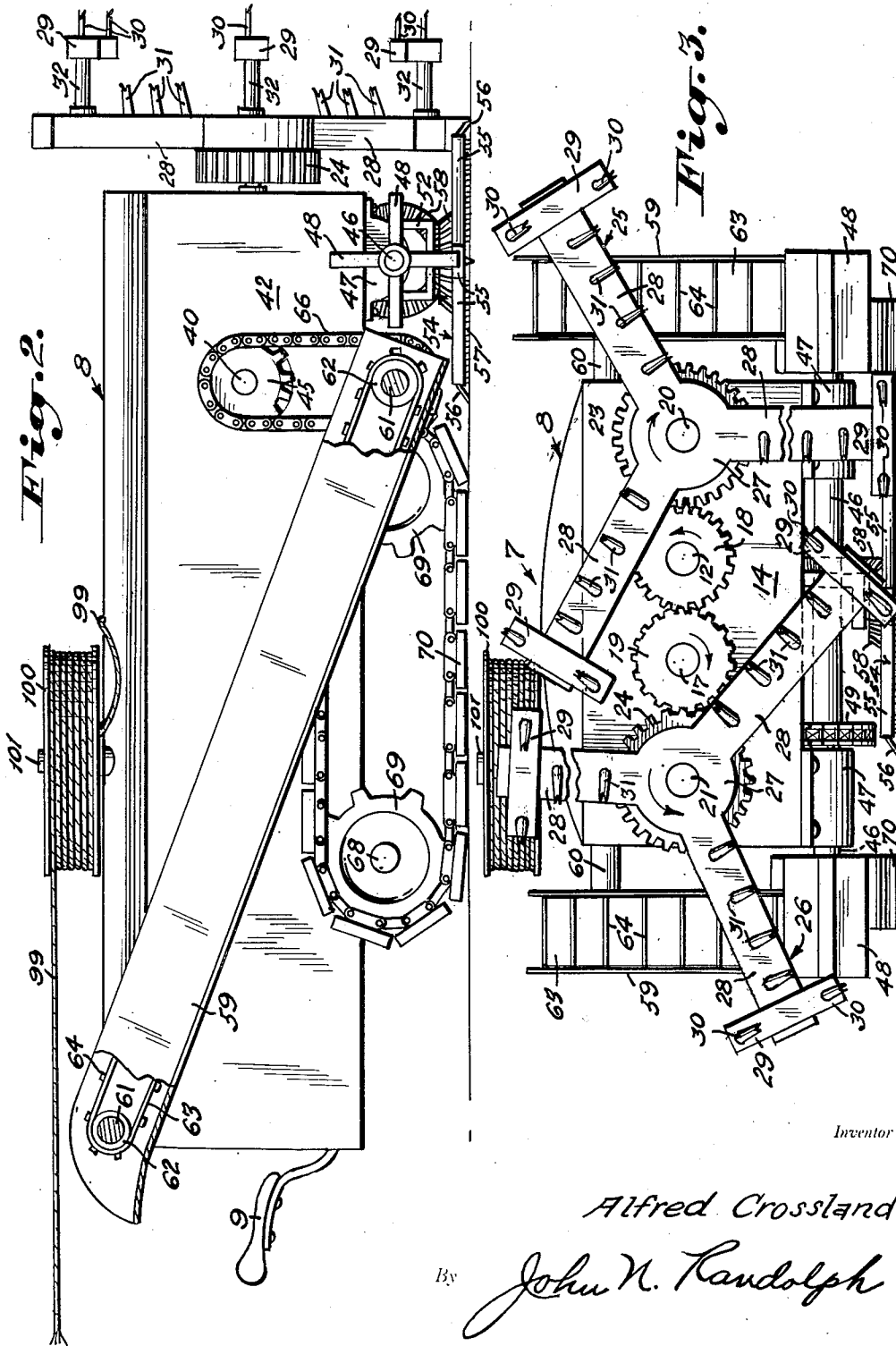
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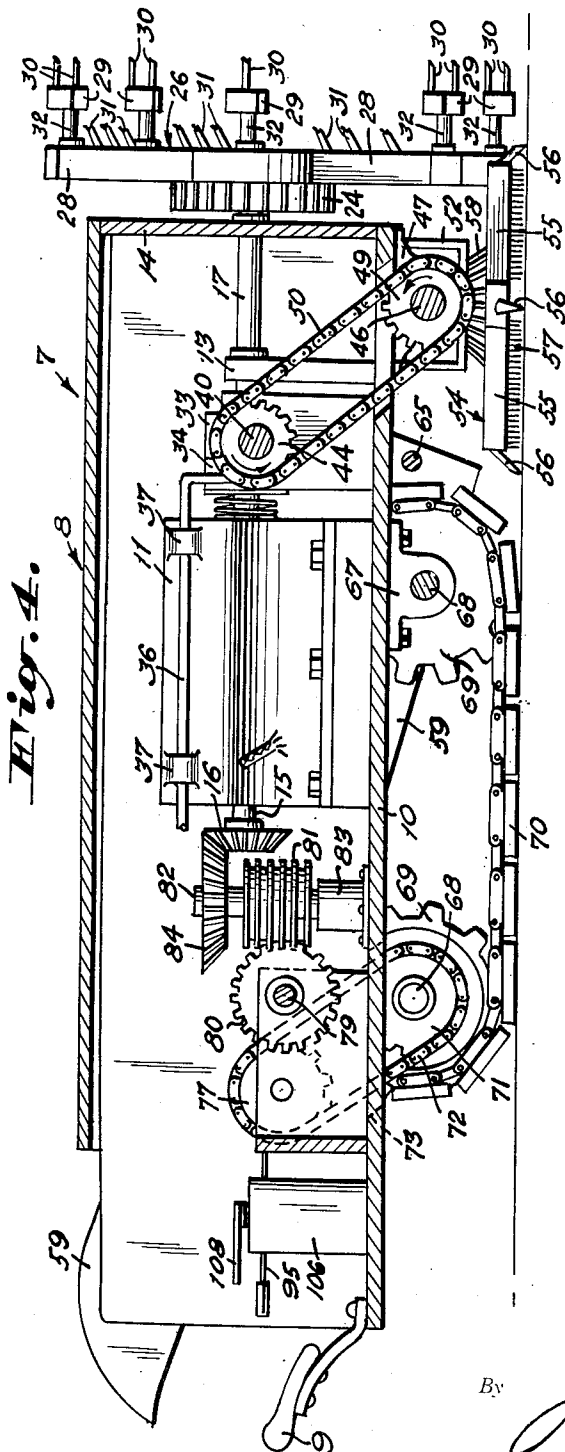
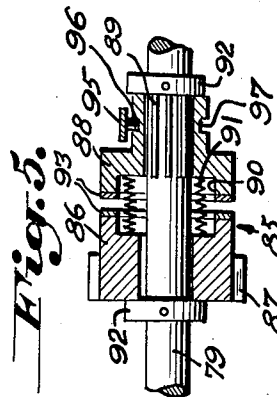
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3 Sheets-Sheet 3



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COAL MINING AND CONVEYING MACHINE

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2 Claims. (Cl. 262-7)

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This invention relates to a novel coal mining and conveying machine and more particularly has reference to a machine for use in tubular mining and which is operated by the cutting of a number of circles in the coal.

More particularly, it is an aim of the present invention to provide a mining machine which will cut circles in a vein of coal in advance of the machine and so as to leave a small amount of the coal above the cutters which execute the circular cuts in advance of the machine and beneath the slate so that the coal thus left will form a roof or overhead support for the passage or tunnel formed by the machine thereby eliminating the need for reinforcing the tunnel or passage with timbers to support the slate.

Another object of the invention is to provide a circular cutter wherein the overhead coal left beneath the slate will be of arch-shaped formation which will materially increase its supporting strength.

Another and important object of the invention is to provide a cutter including means for cutting coal from beneath the machine and between the forwardly disposed cutters and by which the cut coal will be swept laterally of the machine and into a position to be received by a conveyor.

A further object of the invention is to provide a coal mining and conveying machine having endless conveyor means on to which the cut coal is swept and by which the coal is conveyed to a point behind the machine for delivery to suitable means on which the cut coal can be removed from the tunnel or passage being formed by the machine.

Numerous other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a top plan view, partly broken away of the coal mining and conveying machine;

Figure 2 is a side elevational view, partly in section thereof;

Figure 3 is a front elevational view of the machine;

Figure 4 is a longitudinal sectional view thereof taken substantially along a plane as indicated by the line 4-4 of Figure 1; and

Figure 5 is a transverse sectional view taken substantially along a plane as indicated by the line 5-5 of Figure 1.

Referring more specifically to the drawings, the coal cutting and conveying machine in its en-

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tirety is designated generally 7 and includes an elongated body 8 the rear end and top rear portion of which is open to accommodate an operator who operates the machine 7 while seated on a seat 9 which is supported by the bottom 10 of the body 8 and which projects outwardly and upwardly from the rear end thereof.

The machine 7 is powered by an electric motor 11 which is disposed within the body 8 and suitably fastened to the bottom 10 thereof and which is provided with a drive shaft having an end or portion 12 extending forwardly from the motor 11 through a bearing 13 and through the front wall 14 of the body 8. The motor 11 is also provided with a rearwardly extending drive shaft portion 15 carrying a beveled gear 16, for a purpose which will hereinafter become apparent. A short shaft 17 is journaled in the bearing 13 and front wall 14, substantially parallel to the drive shaft portion 12 and the forward ends of the shafts 12 and 17 are provided with meshing gears 18 and 19, respectively, which are disposed forwardly of the front wall 14. A pair of corresponding stub shafts 20 and 21 are journaled in and extend forwardly through the front wall 14 and are also journaled by bearings 22 which are disposed within the body 8 and suitably secured thereto. The forward end of the stub shaft 20 carries a gear 23 which meshes with the gear 18 and a similar gear 24 is fixed at the forward end of the stub shaft 21 and meshes with the gear 19. As seen in Figure 3, the gears 23 and 24 are of considerably greater diameter than the gears 18 and 19. Forwardly of the gears 23 and 24, the shafts 20 and 21 each carry a cutter frame, designated generally 25 and 26, respectively. The corresponding cutter frames 25 and 26 each include a hub 27 which is fixed to the forward end of its shaft and which is provided with three equally spaced radially extending arms 28. Each arm 28 carries a crosshead 29 adjacent its outer end from the ends of which project cutting bits 30 which extend forwardly from its cutter 25 or 26 and in a direction forwardly of or away from the machine 7. Each arm 28 is also provided with a plurality of coal picks 31 which are spaced radially with respect thereto and which extend outwardly therefrom at an angle obliquely to the plane of the cutter and toward its direction of rotation. As best illustrated in Figure 1, the crossheads 29 are supported in advance or forwardly of the arms 28 by forwardly projecting rods 32 which extend between said arms and the crosshead 29 supported thereby.

The shaft portion 12 is provided with a clutch

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disposed between the motor 11 and bearing 13 and said part of the shaft portion 12 is formed of sections to the forward section of which a clutch element 33 is secured and to the rear section of which a mating clutch element 34 is slidably splined and normally urged into an engaged position by a clutch spring 35. A clutch actuating rod 36 which is reciprocally mounted in guides 37 which project from the motor 11 has a handle end disposed adjacent the operator's seat 9 to be actuated by the operator and has an opposite forked end 38 which rotatably engages an annular groove 39 of the clutch element 34 whereby said element 34 may be moved rearwardly for disengaging the clutch and so that the forward part of the drive shaft portion 12 will be disengaged from the motor 11.

A short transverse shaft 40 is journaled in a bearing 41 which is suitably secured in the body 8 and in the right-hand side wall 42 of said body, looking from rear to front of the machine 7. The adjacently disposed inner ends of the shafts 17 and 40 carry meshing beveled gears 43 whereby the shaft 40 is driven from the shaft 17 and said shaft 40 is provided with a sprocket wheel 44 located within the body 8 and a sprocket wheel 45 located externally of the body.

A transverse shaft 46 is journaled beneath the forward part of the body 8 by bearings 47 which depend from the bottom 10. The ends of the shaft 46 which extend beyond the sides of the body 8 each carry a kicker wheel 48 which is fixed thereto and which is cross-shaped in cross section or looking from an end thereof, as seen in Figure 2. The shaft 46 has a sprocket wheel 49 fixed thereto and an endless chain 50 is trained over the sprocket wheels 44 and 49 for driving the shaft 46 from the shaft 40. The chain 50 passes through an elongated opening 51 of the bottom 10, as illustrated in Figure 4. The bottom 10 supports a depending hanger bracket 52 of U-shaped construction. As seen in Figure 3, a short shaft 53 is supported by and journaled in the intermediate portion of the bracket 52 and depends therefrom to provide a support for a horizontal cutter, designated generally 54 which is likewise cross-shaped and provided with four radially projecting arms 55 from the outer end of each of which a cutting bit 56 extends downwardly and outwardly. The arms 55 are also provided with depending brush elements 57 for a purpose which will hereinafter become apparent. The shafts 46 and 53 are provided with meshing beveled gears 58 for causing the horizontal cutter 54 to be driven by the shaft 46.

An upwardly and rearwardly inclined trough 59 is supported at each side of the body 8 and outwardly thereof by supporting arms 60. The troughs 59 are open at their tops and ends and the lower forward ends thereof are disposed behind and adjacent the kicker wheels 48, as best illustrated in Figures 1 and 2. As seen in Figure 2, a shaft 61 carrying a pulley 62 is journaled adjacent each end of each trough 59 and transversely thereof and an endless conveyor 63 is disposed for movement longitudinally in each trough 59 and is trained over the pulleys 62 thereof. The endless conveyors 63 are provided with external slots 64 which are arranged transversely thereof. The two lower shafts 61 constitute the end portions of a transverse shaft 65 which extends across the machine 7 below the body 8 and to which a sprocket wheel is secured beneath the sprocket wheel 45. This sprocket wheel is connected to the sprocket wheel 45 by an end-

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less chain 66 for causing the endless conveyors 63 to be driven by the shaft 40 and in the same direction as said shaft.

As best seen in Figure 4, the bottom 10 is provided adjacent each side of the body 8 with longitudinally spaced depending bearings 67 for journaling stub axles 68 which extend outwardly from the sides of the body 8. A sprocket wheel 69 is fixed to the outer end of each stub axle 68 so that each side of the machine 7 is provided with a front and rear stub axle and a front and rear sprocket wheel. An endless surface engaging track or tread 70 is trained over the longitudinally aligned sprocket wheels 69 and is disposed outwardly of and adjacent each side of the body 8. A sprocket wheel 71, of smaller diameter than the sprocket wheels 69, is fixed to an inner portion of each of the rear stub axles 68 and is connected by an endless chain 72, which extends through an opening 73 in the bottom 10, and which is trained over a sprocket wheel 77 fixed to a shaft 74 which is disposed within the body 8 and which is journaled in bearings 75 and 76. The transversely spaced shafts 74 each constitute a part of a power-takeoff unit, designated generally 78 and which additionally includes a transversely disposed shaft 79 which is journaled in the bearings 75 and 76 and which is common to the right and left-hand power-takeoff units 78. A worm gear 80 is fixed to the intermediate portion of the shaft 79 and meshes with a worm 81 which is fixed to a shaft 82 which is disposed in an upright position in the body 8 and which is supported by and journaled in a thrust bearing 83 which is secured to and rises from the bottom 10. A beveled gear 84 is fixed to the upper portion of the shaft 82 and meshes with the smaller beveled gear 16 whereby the shaft 82 and the shaft 79 will be revolved at a reduced speed by the drive shaft portion 15 of the engine 11, as best illustrated in Figure 4. A friction clutch unit, designated generally 85, forms a part of each of the two power take-off units 78 and said clutch units 85 are mounted on the shaft 79 and adjacent the ends thereof. Each clutch unit 85, as best illustrated in Figure 5, includes a clutch half 86 which is turnably disposed on the shaft 79 and which has a gear 87 forming an integral part thereof. The other clutch half 88 is slidably splined as seen at 89 to the shaft 79. The adjacent ends of the clutch halves 86 and 88 are recessed as seen at 90 to accommodate an expansion spring 91 which normally urges the clutch halves away from one another and to disengaged positions. The movement of the clutch halves away from one another is limited by collars 92 which are fixed to the shaft 79 and between which each of the clutches 85 are disposed. The annular adjacent faces of the clutch halves 86 and 88 carry annular friction elements 93 which engage when the clutch half 88 is moved toward the clutch half 86 for causing said clutch half 86 to be revolved with the shaft 79. A larger gear 94 is fixed to each shaft 74 and meshes with one of the gears 87 so that the shaft 74 of each power take-off unit 78 is driven when the clutch 85 thereof is in an engaged position. Each clutch 85 also includes a clutch actuating rod 95 having a projection 96 at one end thereof loosely engaging an annular groove 97 in the clutch half 88, as best illustrated in Figure 5. The clutch actuators 95 are pivotally mounted adjacent said aforementioned ends on brackets 98, as seen in Figure 1, for horizontal swinging movement and have

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their opposite ends extending rearwardly to adjacent the operator's seat 9 so that the rear, handle end of the actuating lever 95 can be moved inwardly for moving either or both of the clutch elements 85 to engaged positions. When both of the clutches 85 are engaged, both shafts 74 will be driven and by means of the chains 72 will drive the two rear stub axles 68 for revolving the endless treads 70 in a direction for causing the machine 7 to move forwardly. To turn the machine in either direction, the clutch actuator 95 located at the side of the machine toward which the turn is to be made is released so that the other endless tread 70 only will be driven for turning the machine. The endless treads 70 are driven at a very slow speed due to the reduction gearing between the shaft portion 15 and the stub axles 68, preferably so that the machine 7 will travel two feet a minute.

Power is furnished to the electric motor 11 through an electrical conductor line 99 one end of which, not shown, is connected to a suitable source of electric current. The conductor line 99 is wound on a reel 100 which is fixed to a shaft 101 which is journaled in a portion of the body 8. As best seen in Figure 1, a small shunt wound electric motor 102 which is secured in the body 8 has a suitable electric connection, not shown, to the conductor line 99 and is provided with a driven shaft 103 to which is fixed a worm gear 104. The worm gear 104 meshes with a worm 105 fixed to the shaft 101 for turning said shaft and the reel 100 in a direction for winding the conductor line 99 thereon. A very slight current is supplied to the shunt motor 102 so that as the machine 7 advances forwardly said motor will permit the reel 100 to turn in a direction to allow the conductor line 99 to be unwound therefrom but in the event that the machine is backed, the shunt motor will revolve the shaft and reel in a direction for winding the line 99 thereon to prevent any slack occurring in said line. The end of the conductor 99 which leads from the reel to the motor 11 may be separate from the part wound on the reel and electrically connected thereto in a conventional manner as by conductor strips on the reel bottom or through the shaft 101. From the foregoing it will be apparent that as the machine 7 is advanced through a vein of coal within a mine, the vertical cutters 25 and 26 will be revolved in opposite directions and the bits 30 thereof will cut circular cuts in the wall of the vein of coal. The picks 31 carried by the arms 28 of the vertical cutters 25 and 26 will chop out the coal left within the circles formed by the bits 30 and in relatively large chunks. The bits 30 in executing their circular cuts will leave an over-head layer of coal above said cutters 25 and 26 for supporting the slate above the coal and due to the arcs described by the cutting bits 30, the roof of the passage thus formed will be provided with two substantially identical and parallel arch portions with a thick, tapered depending portion therebetween. A similar up-standing projection will be left at the bottom of the passage and between and centrally of the cutters 25 and 26 and which will be cut-out by the horizontal cutter 54 which is disposed behind and between the cutters 25 and 26. The cutter 54 will be revolved in a clockwise direction, looking down on the cutter from above or as seen in Figure 1 and the coal cut thereby will be swept by the brush means 57 laterally and to the right of the machine 7, looking from rear to front and so as to be engaged by the right-hand kicker

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wheel 48. Said right-hand kicker wheel 48 will likewise receive the coal cut by the cutter 26 and the other, left-hand kicker wheel will receive the coal cut by the cutter 25. This cut coal will be thrown upwardly and over the kicker wheels 48 which revolve counter-clockwise, as seen in Figure 2, on to the upper flights of the endless conveyors 63. Said upper flights of the conveyors 63 are moving upwardly and from front to rear of the machine 7 for conveying the cut coal upwardly and rearwardly of the troughs 59 for discharge from the rear end of the machine 7 into any suitable means, not shown, by which the coal can be conveyed from the passage being formed by the machine 7. It will be readily apparent that the cutters 25, 26 and 54 may be readily disengaged by operation of the clutch actuator 36 and is previously described, forward motion and turning of the machine 7 can be controlled by the operator from the seat 9 by operation of the clutch levers 95.

The machine 7 is also equipped with a control box 106 disposed in front of and adjacent the operators seat 9 and having a control lever 107 suitably connected to the motor 11 and providing a switch actuator whereby the flow of current to the motor may be shut off. The motor 11 is of the reversing type and adapted also to be reversed by the switch lever 107 so that with the clutch 33, 34 disengaged the treads 70 may be driven in a direction for backing the machine 7. The control box 106 is provided with a second switch lever 108 for controlling the shunt motor 102.

Various modifications and changes are contemplated and may obviously be resorted to, without departing from the spirit or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. A coal cutting and conveying machine comprising a prime mover, surface engaging rotatable elements driven by said prime mover for propelling the machine, a plurality of vertically disposed rotary cutters rotatably supported on said machine and disposed in advance thereof for cutting a passage ahead of the machine, a driving connection between said vertical cutters and the prime mover, endless conveyors supported at the sides of said machine, power take-off means connecting said endless conveyors to the prime mover for driving the endless conveyors in a direction for causing the upper flights thereof to move rearwardly relatively to the machine, one of said endless conveyors being disposed behind each of said rotary cutters and being adapted to receive and convey the coal cut thereby to a position behind the machine, and a horizontal cutter rotatably supported beneath said machine behind and between the vertical cutters for cutting out a ridge of coal between the vertical cutters, said horizontal cutter comprising arms extending radially outwardly from its axis and having cutting elements mounted on the outer ends of the arms, and radial brush means carried by said horizontal cutter and extending along the undersides of the arms for brushing the coal cut thereby laterally of the machine and to a position in front of one of said endless conveyors.

2. A coal cutting machine having a prime mover, surface engaging elements driven by the prime mover for propelling the machine, a plurality of cutter elements driven by the prime mover disposed in vertical planes in advance of

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the machine and rotatably supported thereby, each of said cutter elements including a plurality of radially extending arms, a plurality of cutter bits supported by each of said arms and projecting forwardly therefrom, said cutter elements being spaced laterally a distance so that the paths of rotation of the cutting bits partially overlap, endless conveyors driven by the prime mover supported at the sides of the machine behind the cutter elements in outwardly offset relationship to the axes thereof each having an upper flight moving in a direction away from the cutter elements for conveying the coal cut thereby rearwardly of the machine, a horizontal cutter driven by the prime mover and rotatably supported beneath the machine behind and between the vertical cutters for cutting out a ridge of coal between the vertical cutters, said horizontal cutter including a plurality of radially extending horizontally disposed arms having cutting elements secured to the outer ends thereof and extending outwardly and downwardly therefrom, an elongated brush element secured to the underside of each of said arms of the

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horizontal cutter and extending radially thereof for brushing the cut coal laterally of the machine and into positions in front of the endless conveyors.

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