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APPARATUS FOR MINING COAL

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2 Sheets-Sheet 1

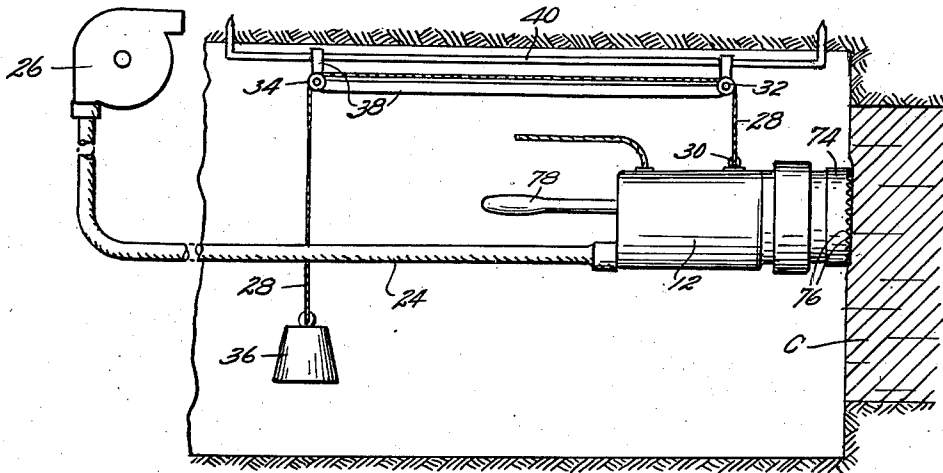


Fig. 1

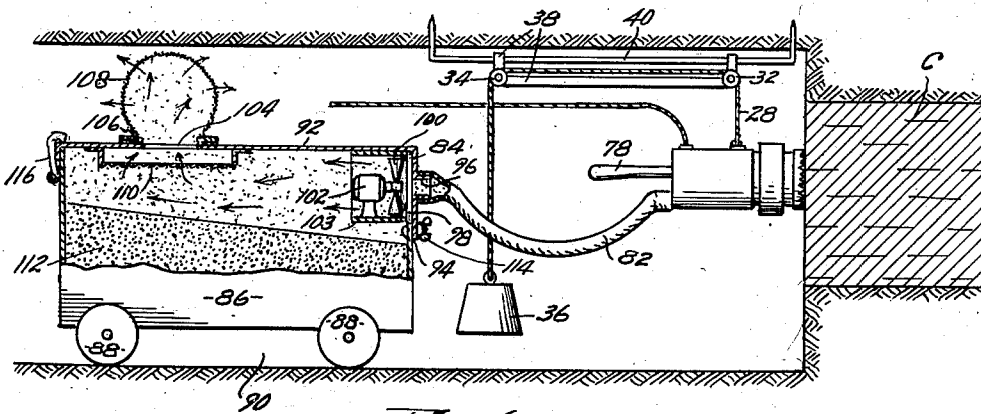


Fig. 6

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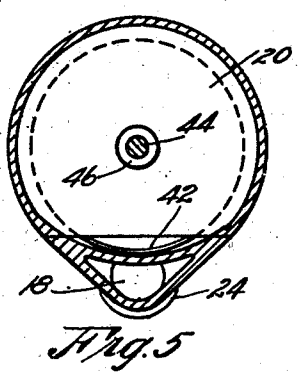
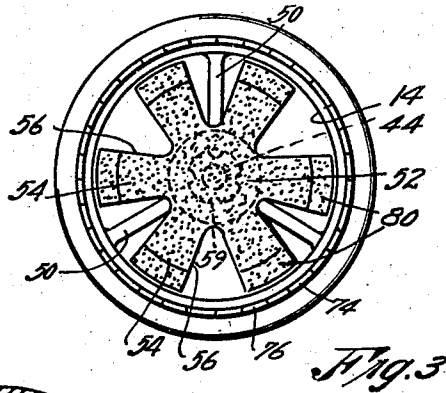
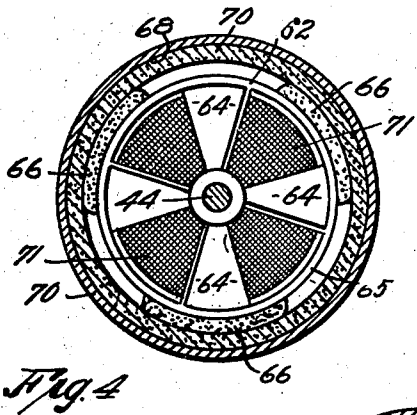
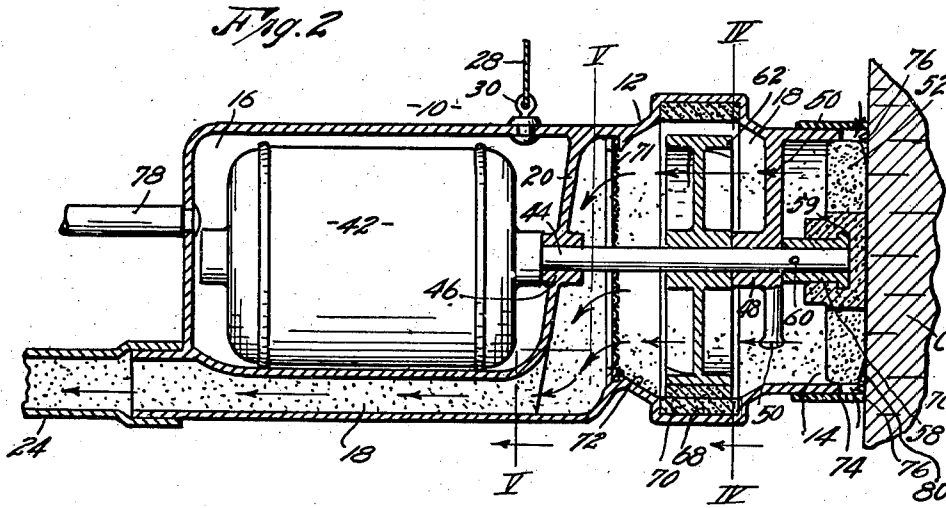
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APPARATUS FOR MINING COAL

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7 Claims. (Cl. 262-8)

The invention relates to improvement in the apparatus for mining coal or other earth materials and has particular reference to the removal of the coal in a powdered form direct from the coal vein.

An object of the invention is the provision of an apparatus whereby a coal vein may be pulverized and the pulverized coal removed therefrom by suction for commercial use.

A further object of the invention is the provision of an apparatus provided with a rotary grinding wheel adapted to be operatively positioned against a vein of coal whereby the coal is pulverized and provided with a suction means whereby the pulverized coal is moved from said grinding wheel to a receptacle.

A still further object of the invention is the provision of an apparatus for pulverizing coal at the coal vein having means for screening the coal dust and means for further grinding the larger particles whereby they will pass through said screen.

Other objects are simplicity and economy of construction, ease and efficiency of operation, and adaptability for use in mining, tunneling, or removing any earth structure in pulverized form.

Reference will now be had to the drawings wherein:

Figure 1 is an elevational view of the apparatus of the present invention in use in a mine.

Fig. 2 is an enlarged sectional view of the power grinding unit shown in the operative position in a coal mine.

Fig. 3 is a front end elevation of the power grinding unit.

Fig. 4 is a cross sectional view taken on line IV-IV of Fig. 2.

Fig. 5 is a cross sectional view taken on line V-V of Fig. 2.

Fig. 6 is a modified form of the apparatus wherein the pulverized coal is delivered to a car within the mine adjacent the point of mining.

Throughout the several views like reference characters refer to similar parts and the numeral 10 designates a power grinding unit having a casing 12 open at its forward end 14 and provided at its rear portion with a motor compartment 16 separated from the open front compartment 18 by a partition wall 20. A passageway 22 is provided to extend from compartment 18 to the rear of the power unit to receive a conduit 24. Conduit 24 is made of a flexible material and serves as a conductor for conducting the powdered product from the mine and permits of free movement of the power grinding unit to operate over the

full face of the coal vein C. A suction device 26 may be provided at the outer extremity of conduit 24 to create a suctional force therein for moving the powdered product from the mine.

Since the power grinding unit will necessarily be quite heavy it is thought best to counter-balance the same sufficiently so that it may be easily handled by the operator during the grinding operation. This counter-balancing means comprises a cable 28 secured at its one end to an eyelet 30 anchored to casing 12, passed over sheave wheels 32 and 34 and provided at its other end with a weight 36. A frame 38 carrying sheave wheels 32 and 34 is mounted for free longitudinal movement on track 40 secured in the top of the mine shaft, thus permitting movement of the grinding unit to any position on the face of the coal vein.

A motor 42 is operatively mounted in compartment 16 and has an elongated rotor shaft 44 which extends through bearing 46 formed in wall 20 and through a bearing 48 supported by arms 50 and disposed adjacent the forward end of compartment 18, to receive a grinding wheel 52. Wheel 52 is preferably made of a composition grinding wheel such as Carborundum, sandstone, or any abrasive material that will grind the surface of the coal vein to produce a finely pulverized coal dust suitable for rapid burning. A metal grinding wheel might also be used for certain types of mining or for tunneling through the various earth formations. Wheel 52 as shown is notched inwardly from its outer periphery to present radially disposed arms 54 and notches 56. A sleeve 58 having a notched flange 59 is molded into wheel 52 to receive the forward end of motor shaft 44, to which it is secured by pin 60.

Mounted on shaft 44 adjacent bearing 48 is fan wheel 62 having blades 64 and peripheral band 65 to which is attached a series of spaced apart arcuate grinding members 66. A recess 68 formed in casing 12 serves as a receptacle for an annular grinding wheel 70 which is in operative relation with the rotary grinding members 66. A screen partition 71 is mounted in spaced relation between partition 20 and fan wheel 62 so that the particles of coal ground from the coal vein will be forced against the screen so that the smaller particles will pass therethrough and the particles too large to go through the screen will fall into the inclined surface 72 adjacent the screen and be deposited between the grinding members 66 and 70 where they will be reground and reduced to a sufficiently small size so that they will be forced through the screen portion 71.

This operation will be continued until all the particles of coal are made sufficiently small to pass through the screen and through the conduit to the point of delivery.

A rubber adapter 74 is fitted over the outer extremity of casing 12 and extends therebeyond to contact the surface of the coal vein. Notches 76 formed around the outer edge of member 74 present openings through which air is sucked by the fan when the apparatus is in operation.

The rear end of the power grinding member is provided with an operating handle 78 by means of which the operator may direct the grinding wheel against the surface of the coal vein. Other hand gripping means may be provided whereby the power grinder may be manipulated to properly grind the earth structure. It will be noted that the face of the grinding wheel adjacent its outer periphery is slightly beveled at 80 to allow transverse movement of the wheel across the face of the coal. The inner portion of the grinding wheel will have a much slower movement than the outer portion of the wheel and will not grind as rapidly. For this reason it will be found advisable to maintain a slow transverse movement of the grinding wheel across the face of the coal so that all portions of the vein being ground will be in contact with both the slow and fast moving portions of the grinding wheel, thus making it possible to maintain the exposed surface of the vein in substantially a planar form. In the operation of the device the operator may exert any desired force against the grinding wheel to obtain a rapid or slow cutting of the coal. The contour of the grinding wheel 52 may be varied to obtain any desired cutting effect without departing from the spirit of the invention.

Another method of determining the speed of cut will be by varying the speed of the motor. When the device is in operation and the wheel is rotated against the coal surface air will be drawn in through the slots 56 of the grinding wheel by the action of the fan wheel 62, thence through the screen 71 and into conduit 24 where it will be acted upon by the suction caused by the suction device 26.

The apparatus for mining coal just described contemplates the delivery of the pulverized coal to a point remote from the surface of the coal vein being mined and provides for suction means for delivery of the coal product.

It is quite apparent that several stages of suction units might be provided where the mine shaft is of considerable length. In some instances it might be desirable to collect the pulverized coal adjacent the coal vein and for this purpose the modified form shown in Fig. 6 is provided. The power grinding unit may be the same as provided in the modified form and is provided with a flexible conduit 82 which is operatively connected with the upper end portion 84 of a mine car 86 which is adapted to be moved on its wheels along the mine shaft 90 to the elevator (not shown). This mine car is of the ordinary box type and is provided with a cover member 92 which is adapted to be secured substantially air tight thereon to prevent the passage of coal dust therebetween. Cover 92 has a depending flange 94 provided with a flanged sleeve 96 to which the conduit 82 is attached. This sleeve is in register with a notch 98 formed in the end wall of the car. Within the car 86 and adjacent the notch 98 is a suction fan 100 driven by a motor 102 mounted in fan housing 102 which is rigidly secured to the underside of cover 92.

When fan 100 is operated, it will create a suction in conduit 82 thus causing the powdered coal and air to be forced into the closed car 86.

An opening 104 formed in the cover 92 has a peripheral flange 106 to which is secured a woven bag 108. This bag is of the ordinary vacuum cleaner type which permits the air to pass there-through but retains the dust particles.

A screen 110 carried by the cover 92 is so positioned over opening 104 as to intercept the major portion of the coal dust delivered to the car so that as the operation of grinding is continued, the car will be gradually filled with coal dust 112. A slight accumulation of dust may be encountered in bag 108; however, this may be removed when the quantity therein becomes objectionable.

The suction fan 100 will be of sufficient strength to normally deliver all of the coal dust to the car 86 and in many instances it may be possible to eliminate the fan wheel 62 in the grinding head by increasing the suction of fan 100. It is conceivable that the grinding operation within the power grinding unit may be eliminated when the exact size of the powdered coal is immaterial or when it is found more convenient to classify the powdered particles after they leave the mine. The cover 92 with its attached conduit may be removed from the car and fitted on another car for filling. Clamping means 114 and 116 may be utilized to insure a proper sealing of the cover member on the car. When a car is filled, it may be delivered from the mine so that the powdered coal may be sacked or otherwise disposed of for delivery.

It will be noted that with these forms of mining devices the air is drawn from the mine shaft 90 through the power grinding unit thence into the car where substantially all the foreign particles are filtered therefrom and the air is then again delivered to the shaft. When using the conduit type as shown in Fig. 1, the air delivered to the power grinding unit passes from the mine through the conduit 24, thus constantly causing a flow of fresh air to the face of the coal vein.

When it is desired to obtain a uniform grinding of the coal that is a coal dust that will all pass through a predetermined size screen, then it is found most convenient to use the secondary grinding means shown in Fig. 1 wherein no particle of coal can pass through the screen which is larger than the screen opening.

In the operation of this device, the operator simply moves the grinding wheel over the surface of the coal vein in such a manner as to maintain the face of the coal vein of substantially planar form. By properly mounting and counterbalancing the power grinding unit it is quite apparent that the unit may be manually operated without any great fatigue to the operator.

The use of this apparatus and method definitely eliminates several operations in the production of the powdered coal, eliminates much of the former cost and insures a much safer mining operation. Never at any time during the mining operation is there any large volume of dust laden air which might cause a major accident should it be exploded.

It is conceivable that many minor changes might be made in the structure of the apparatus without departing from the major purpose of this invention which contemplates the mining of coal or any other earth material by grinding it from its natural position within the earth.

I claim:

1. A mining device comprising a motor driven

grinding wheel adapted to be positioned against the earth structure to be mined, suction means including a screen to draw the ground earth material from said grinding wheel and force it against said screen, whereby it is screened and forced outwardly therefrom, and means whereby the particles of earth material too large to pass through said screen is ground sufficiently fine to pass through said screen.

2. In a mining apparatus of the character described a grinding wheel adapted to be positioned with its face against the earth structure to be mined, a motor operable to rotate said grinding wheel whereby to pulverize said earth structure, a suction means including a screen operable by said motor to draw said pulverized earth material from said wheel and force it against said screen located adjacent thereto and grinding means to reduce the larger particles of earth material whereby they will pass through said screen.

3. In a mining apparatus of the character described a grinding wheel adapted to be positioned with its face against the earth structure to be mined, a motor operable to rotate said grinding wheel whereby to pulverize said earth structure, a suction means including a screen operable by said motor to draw said pulverized earth material from said wheel and force it against said screen located adjacent thereto and grinding means to reduce the larger particles of earth material whereby they will pass through said screen, and suction means operable whereby the pulverized earth material passing through said screen is moved to a remote position.

4. In a mining apparatus of the class described an elongated casing open at its one end, a motor mounted in one end portion of said casing, a grinding wheel mounted for rotation on the motor shaft with its operating face extended beyond the open end of said casing and adapted to be positioned against the earth structure to be mined, a transverse screen partition mounted in said casing, a fan wheel mounted on said motor shaft between said grinding wheel and screen, whereby earth material ground from said earth structure will be drawn from said grinding wheel and forced against said screen, and grinding elements carried by said fan wheel disposed in operative relation with a grinding element carried by said casing whereby particles too large to pass through said screen will be reground to a size that will permit their passage through said screen.

5. In a mining apparatus of the class described an elongated casing open at its one end, a motor mounted in one end portion of said casing, a grinding wheel mounted for rotation on the mo-

tor shaft with its operating face extended beyond the open end of said casing and adapted to be positioned against the earth structure to be mined, a vertically disposed transverse screen partition mounted in said casing, a fan wheel mounted on said motor shaft between said grinding wheel and screen, whereby earth material ground from said earth structure will be drawn from said grinding wheel and forced against said screen, and grinding elements carried by said fan wheel disposed in operative relation with a grinding element carried by said casing whereby particles too large to pass through said screen will be reground to a size that will permit their passage through said screen, and a downwardly inclined wall integral with said casing to guide the large particles of ground material from said screen to said grinding elements.

6. In a mining apparatus of the class described an elongated casing open at its one end, a motor mounted in one end portion of said casing, a grinding wheel mounted for rotation on the motor shaft with its operating face extended beyond the open end of said casing and adapted to be positioned against the earth structure to be mined, a vertically disposed transverse screen partition mounted in said casing, a fan wheel mounted on said motor shaft between said grinding wheel and screen, whereby earth material ground from said earth structure will be drawn from said grinding wheel and forced against said screen, and grinding elements carried by said fan wheel disposed in operative relation with a grinding element carried by said casing whereby particles too large to pass through said screen will be reground to a size that will permit their passage through said screen, and a downwardly inclined wall integral with said casing to guide the large particles of ground material from said screen to said grinding elements, and suction means operable to move all the pulverized material passing through said screen to a container.

7. In a mining device a motor driven grinding wheel having spaced apart radially disposed arms adapted to be positioned against and to be moved transversely of the earth structure to be mined, a screen disposed in axial alignment with said wheel, suction means positioned intermediate said screen and wheel to draw the ground earth material from said grinding wheel and to force it against said screen to screen the ground earth structure, and means associated with said suction means operable to reduce the larger particles of earth structure so that they will pass through said screen.

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