

July 6, 1937.

J. SPATARO

2,086,141

MINING MACHINE

Filed March 3, 1937

3 Sheets-Sheet 1

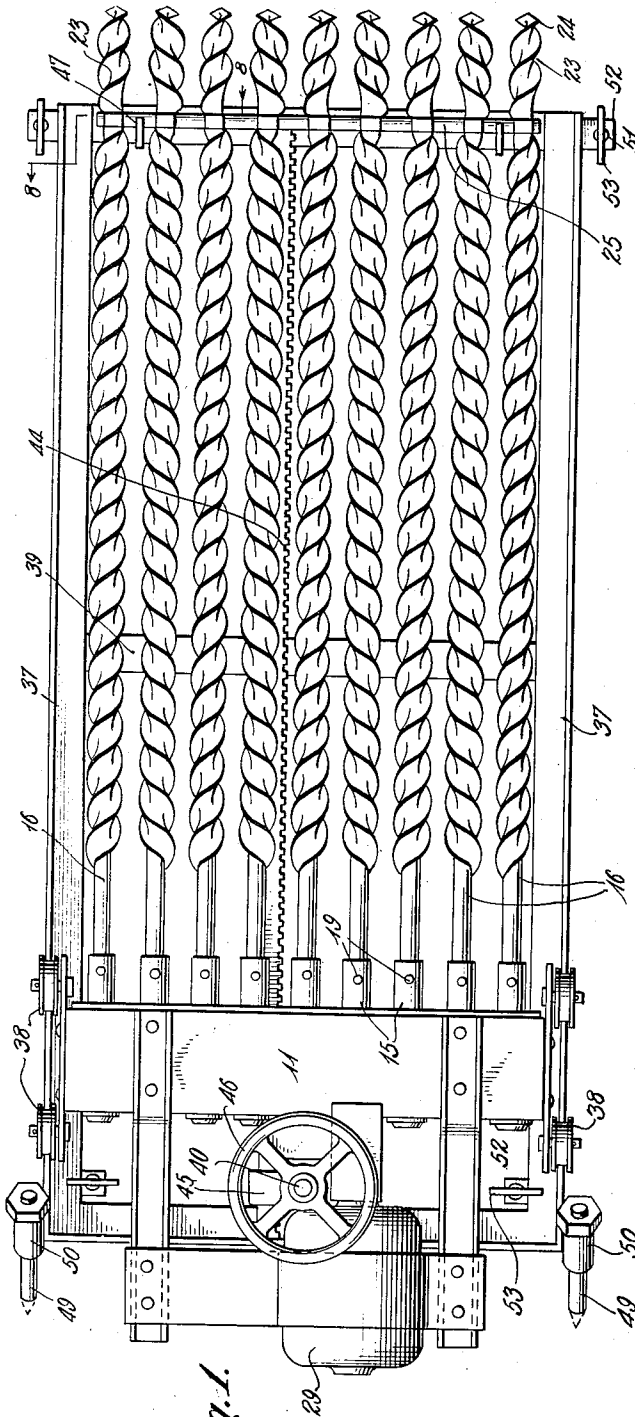


Fig. 1.

Fig. 10.

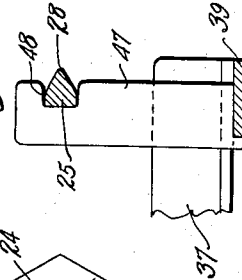


Fig. 9.

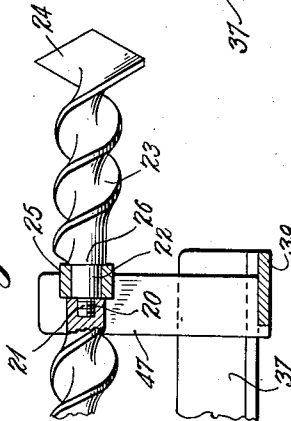
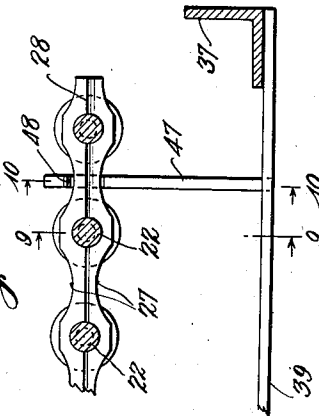


Fig. 8.



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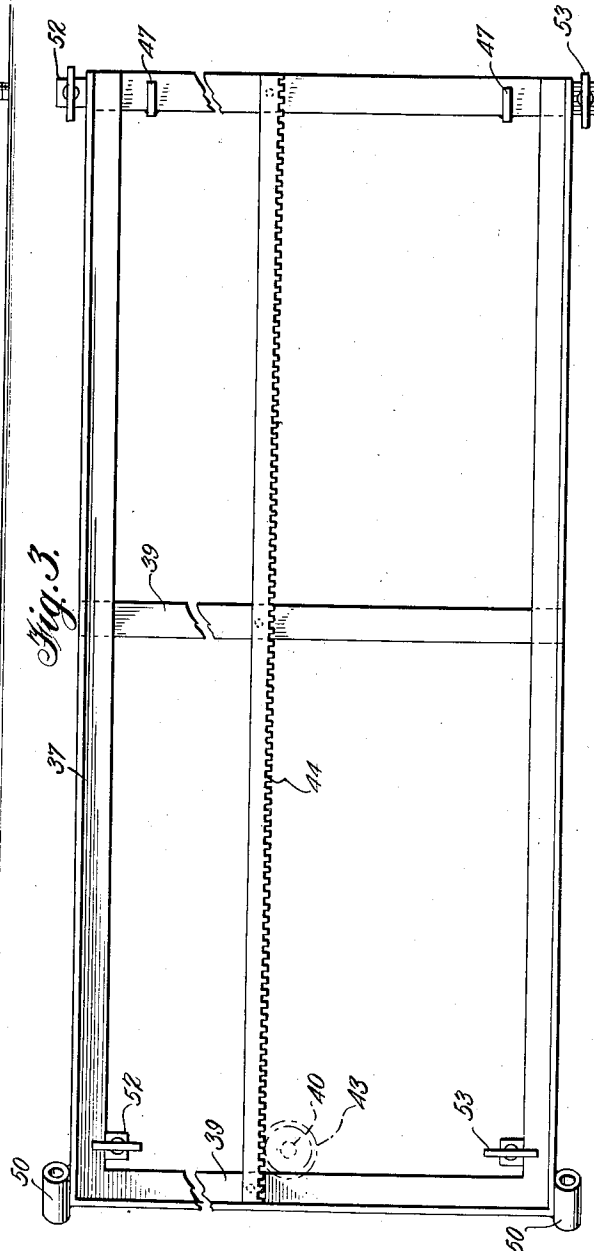
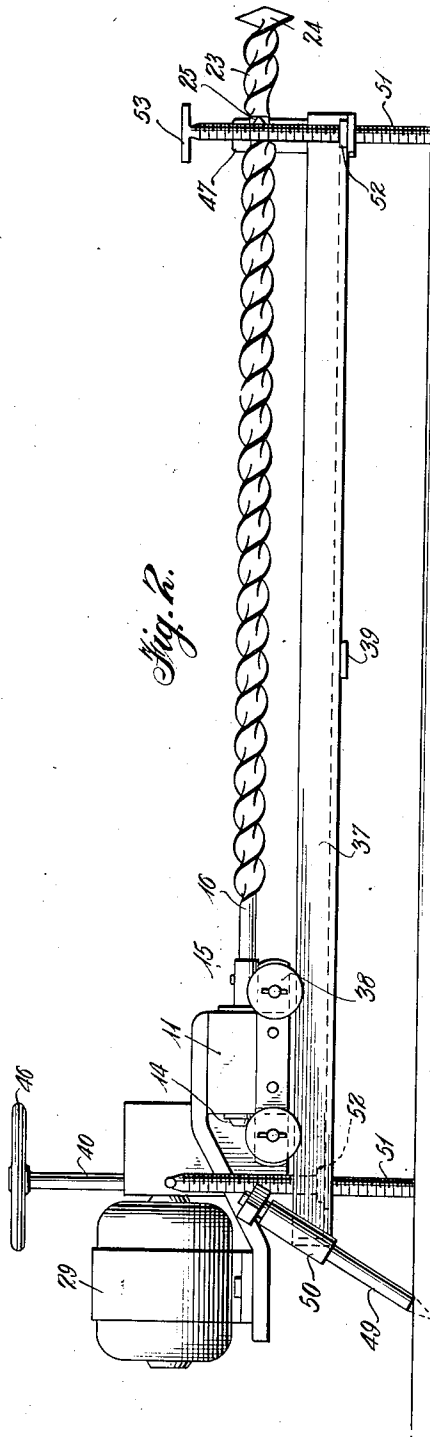
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MINING MACHINE

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3 Sheets-Sheet 2



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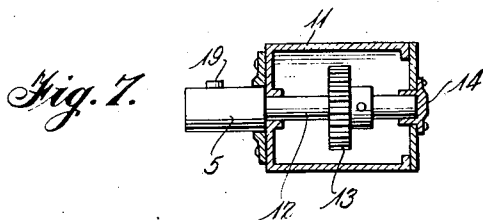
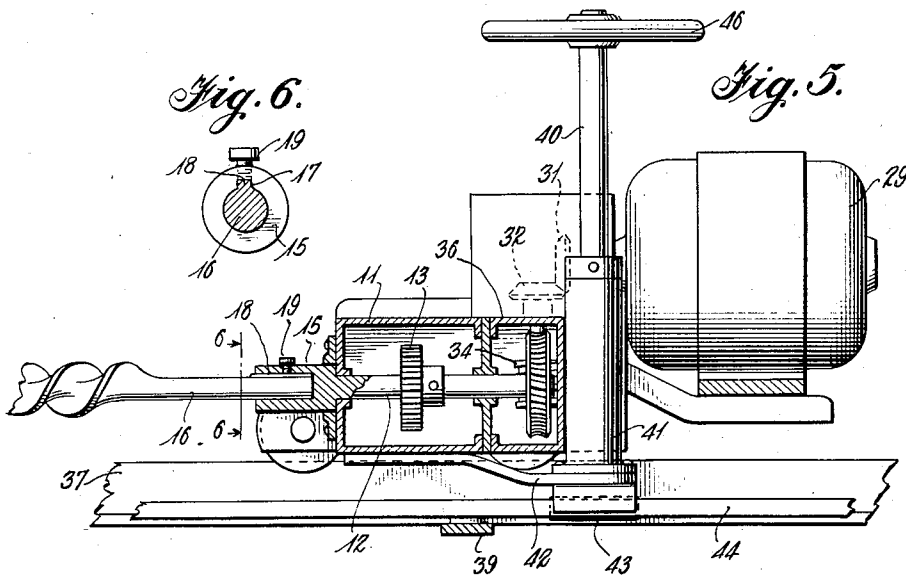
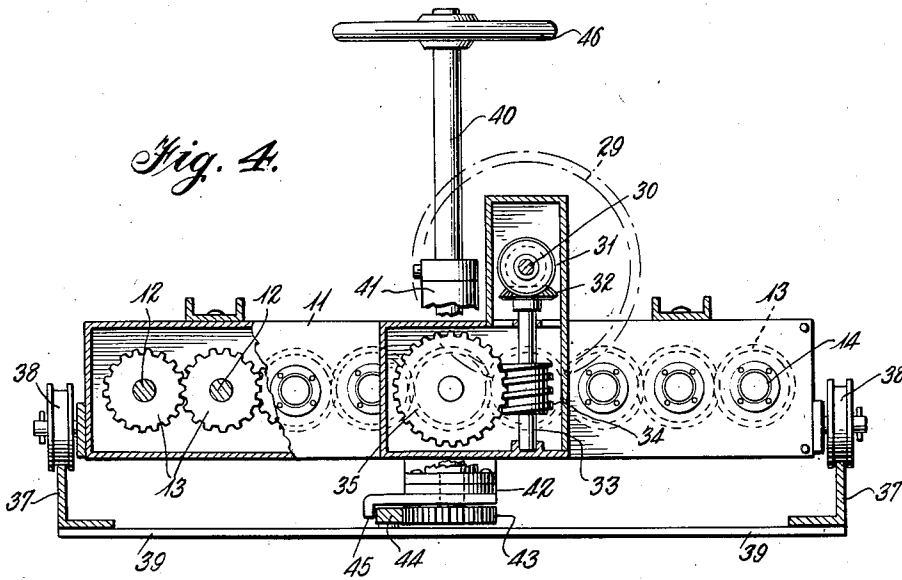
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MINING MACHINE

Filed March 3, 1937

3 Sheets-Sheet 3



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2,086,141

MINING MACHINE

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Application March 3, 1937, Serial No. 128,847

8 Claims. (Cl. 262—22)

This invention is a drilling machine for use particularly in the mining of coal.

An object of the invention is to provide a machine of comparatively simple construction for operating upon the coal vein to drill or cut a kerf or opening therein to facilitate breaking down of the vein, the device being so constructed as to be readily applicable to the vein, operated and maintained at a minimum of cost and which will prove highly efficient and practical for the intended purposes.

A further object of the invention is to provide a mining machine of that type involving a gang of rotary cutters, and wherein improved means is employed for the assemblage of the cutters to permit of the same being easily and quickly detached when breakage or derangement of a cutter occurs without disturbing the entire cutter assembly.

A further object of the invention is to provide in a machine of the character generally stated, improved means for feeding the cutter gang to the face of the coal, and wherein the cutter feed may be carefully and accurately manipulated to avoid breakage or strain upon the mechanism when strata of sulphur, slate or other hard substances are encountered.

A still further object of the invention is to provide improved means for accurately positioning the cutters prior to the starting of the cutting operation.

With these objects in view, together with others which will appear as the description proceeds, the invention consists in the novel construction, combination and arrangement of parts all as will be described more fully hereinafter, illustrated in the drawings, and particularly pointed out in the claims.

In the drawings:

Figure 1 is a top plan view of a mining machine embodying my present invention,

Figure 2 is a side elevation of the improved machine,

Figure 3 is a top plan view of the trackway upon which the machine travels,

Figure 4 is an enlarged fragmentary sectional view taken transversely of the machine and through the gear box and power mechanism,

Figure 5 is a similar view illustrating the connection of the power shafts with the augers as well as the feed mechanism,

Figure 6 is a sectional view on line 6—6 of Figure 5,

Figure 7 is a detailed view illustrating a thrust bearing for the power shafts,

Figure 8 is an enlarged sectional view illustrating the association of the bits with the tie bar,

Figure 9 is a view taken substantially on line 9—9 of Figure 8, and

Figure 10 is a similar view taken on line 10—10 of Figure 8.

Referring now more particularly to the drawings the carriage or gear box of the machine is represented at 11. This gear box is preferably made of light but durable metal and is closed in such manner as to preclude the entrance of dust or grit to its interior where the various power gears are housed. This carriage or gear box has arranged therein a plurality of power or drive shafts 12, all spaced equal distances apart, and each shaft has affixed thereto a spur gear indicated at 13; the various gears being in mesh with each other as shown. It is obvious, therefore, that rotation of any one of the shafts 12 will impart similar movement to the remainder of the shafts, and that adjacent shafts will rotate in directions opposite to each other. These shafts will be mounted in proper bearings in the front and rear walls of the carriage or gear housing, and an approved and dust proof thrust bearing for the said shafts is illustrated at 14 in Figure 7.

The forward ends of the parallel power shafts 12 project beyond the housing 11, and each is provided with an enlargement or socket member 15 for the reception of the rear or inner end of an auger or conveyor 16. It is important to the invention that the connection between the auger and power shafts be such that they may be quickly and easily connected together or disjoined, while at the same time it is necessary that a positive drive connection be established between the said shafts. To this end, the socket 15, which snugly receives the rear end of auger 16, is equipped with a key-way 17 to receive a key 18 forming a part of the said shaft 16. A set screw 19 threaded in the socket assists in effecting the union between the shafts.

The augers 16 are relatively long, and adjacent augers are pitched oppositely, as shown, so that their operation in withdrawing dust and particles of coal as the drilling proceeds will be accomplished notwithstanding that they rotate in opposite directions. The outer or forward ends of the shafts or augers 16 are provided with axial internally threaded sockets 20, for the reception of threaded stems 21 projecting rearwardly from the bearing portion 22 of a bit indicated at 23. The forward ends of the bits 23 are equipped with cutters represented at 24, while between the cutters

and bearing portions are twists or augers as shown corresponding to the pitch of their respective auger shafts.

Maintenance of the several auger or conveyor shafts and the bits carried thereby in proper parallel relation is accomplished by the provision of a tie or yoke bar 25. This bar is formed of light and durable metal and is provided with a series of openings corresponding in number to the number of auger shafts of the machine. These openings are spaced apart a distance equal to the distance between the several augers, and are of a diameter such as to snugly and rotatably receive the bearing portions 22 of the bit shafts 23. The pitch of the cooperating threads on the stem 21 and the sockets therefor correspond to the direction of rotation of the shaft and bit. It is obvious from the construction so far outlined that rotation of the power shafts in the carriage will cause the several augers and bit shafts to rotate and that coal dust cut by the bits as the machine advances to the vein will be drawn rearwardly from the cut or kerf by the convolutions of the various augers. It will be understood, of course, that the several bits and augers will be placed sufficiently close together that the various bits will cut a continuous kerf in the face of the coal as the machine is advanced. It is also apparent that should a bit become broken, dulled or in any other manner rendered inoperative, it is but necessary to unscrew the same from connection with its cooperating auger and replace the same with a new bit. Similarly, should an auger 16 become broken or deranged, it is but necessary to remove the bit and to pull the defective auger forwardly from engagement in its socket 15 after having first loosened the set screw 19. In this manner, defective bits or augers may be easily and quickly replaced without great expenditure of time and without disturbing or dismantling other parts of the mechanism. The particular manner of associating the bits with the augers at their point of meeting in the rear of the tie or yoke bar 25, tends to transmit stresses or strains such as may result from encountering veins of slate or sulphur to the tie bar instead of the bits and augers. To assist in this function, the bits are shouldered as at 26 for bearing against the forward face of the tie bar 25. This tie bar may be recessed in its upper and lower edges, as at 27, between bearing openings in order that coal dust may escape as the cutting proceeds, and the forward edge of this bar may be wedge shaped as at 28 to assist in passing the coal dust rearwardly of the cut as the bits advance.

The shafts 12 which operate the various augers are driven through the instrumentality of a motor of suitable horse power represented at 29 and mounted in any convenient position either upon the gear housing or in the rear thereof. It will be understood, of course, that this motor may be plugged into a suitable power line. The shaft 30 of the motor is provided with a beveled gear 31 in mesh with a similar gear 32 carried by a jack shaft 33 mounted either within or in the rear of the housing 11 in suitable bearings. The jack shaft is equipped with a worm 34 in mesh with a worm gear 35 affixed preferably to the central shaft 12 of the gang of cutter members. The worm, worm gear and jack shaft, in the present instance, are contained within a dust and grit proof housing 36 in the rear of the main housing 11. It is obvious that when the motor 29 is energized, the power developed in its shaft 30 will be transmitted to the beveled gears 31, 32 and worm

and worm gear 34 and 35 respectively to the central of the drive or power shafts, whereupon such power will be distributed to the various other shafts by means of the intermeshing gears thereon as heretofore described. The various bits and augers will therefore be rotated simultaneously and at uniform speed.

The cutting machine thus described is mounted for travel upon a trackway which is of such character and construction as to be capable of being easily and quickly carried into and adjusted in the main shaft, however small or restricted the latter may be. This trackway comprises side rails represented at 37 formed preferably of angle iron as shown for lightness and strength. These irons or tracks correspond approximately to the overall length of the mining machine and are engaged by wheels 38 forming trucks mounted at the ends of housing 11. These tracks are maintained in spaced parallel relation by cross tie 39 welded or in any other convenient manner secured thereto.

It is intended that the machine be caused to travel upon the tracks and to be positively and properly fed to the coal face. The feed mechanism for this purpose includes a feed post 40 disposed in upright position at the rear of the housing and preferably midway the ends thereof. This post is mounted in a suitable socket bearing 41 carried by a strap or other support 42 affixed to the underpart of the carriage. The lower end of the shaft 40 has affixed thereto a gear 43 engaged with the teeth of a rack bar 44 secured to the cross ties 39 and disposed parallel to the rails 37. A keeper 45 is secured to the bracket 42 and extends over the rack bar in such manner as to maintain the gear 43 in mesh with the teeth thereof.

It is apparent that rotation of the shaft 40 by means of hand wheel 46 at the upper end thereof will cause the mining machine in its entirety to be moved upon the track depending upon direction of rotation of the shaft. An operator of the machine by means of the hand wheel is enabled to feed the bits properly to the face of the coal, and the speed with which the machine is fed will depend upon the nature or density of the coal and the foreign matter encountered. Should undue resistance be offered, the operator may slow down the feed in order that damage to the bits or other parts of the mechanism may be avoided. When it is desired to discontinue the cut and to withdraw the machine it is but necessary to reverse the direction of rotation of hand wheel 46, whereupon the machine in its entirety will be caused to travel rearwardly upon the tracks 37.

The forward end of the track is provided with supporting arms or posts 47. These posts are of such width as will permit them to pass between adjacent augers 16, and the forward faces of these posts are recessed as at 48 to receive the tie bar 28 when the machine is retracted. These posts, therefore, serve as stops to limit the rearward movement of the machine upon the track and also relieve the elongated shafts or augers of weight when the machine is inactive or is being moved from the mine.

The trackway is provided with anchoring means in order to resist any tendency on the part of the track to move rearwardly as the cutting machine advances into the body of coal. This anchoring means includes thrust struts or pins 49 adjustably mounted in sockets 50 secured to the side rails 37 of the track at the rear end thereof. These sockets are disposed angularly

downwardly and rearwardly as indicated, in order that the pointed ends of the struts may be engaged with the floor of the mine.

The track is also provided with means whereby it may be elevated or lowered in order that the cutting bits may be accurately positioned with relation to the coal vein. This raising and lowering means includes posts 51 threaded in members 52 either forming a part of or permanently connected to the track rails 37. The upper ends of the posts are equipped with heads 53 by means of which they may be conveniently operated. From this construction it is apparent that the elevation of the trackway and the mining machine carried thereby may be accurately governed. It is also apparent that the construction described affords simple and convenient means whereby the angularity of the cutting elements may be accurately governed.

The machine constructed in accordance with the foregoing description is of comparatively light construction and may be easily delivered within the narrow confines of the ordinary mine shaft. The track, while affording a strong and rigid support for the machine, is of extremely light weight and may be positioned with facility. Once the track and its associated machine are positioned and the motor energized, the kerf may be easily and quickly cut to the desired depth with a minimum of opportunity for danger to any of the mechanism should hard substances be encountered by the bits.

Having thus described my invention, what I claim as new and useful is:

1. In a mining machine, a track, a carriage movable on said track, cutter mechanisms projecting from said carriage, a spacer bar connected to and movable with said mechanisms, and an arm extending upwardly from said track and supporting said spacer bar when the carriage has moved to its limit in one direction.

2. In a mining machine, a carriage, power shafts on said carriage, means for rotating said shafts, a conveyor shaft for each power shaft, said conveyor shafts detachably connected at their rear ends to their respective power shafts, a spacer bar having openings therein corresponding to the number of conveyor shafts and spaced apart a distance equal to the distance between said conveyor shafts, a drill bit shaft for each conveyor, each drill bit shaft having a cutting point, reduced bearing portions on said bit shafts to engage in said openings, and means for detachably connecting the rear ends of said bits with the forward ends of their respective conveyor shafts.

3. In a mining machine, a plurality of parallel rotatable conveyor shafts, a spacer bar for the outer ends of said conveyor shafts having openings aligned therewith, a bit shaft for each conveyor shaft, each bit shaft having a cutting point, reduced bearings on said bit shafts to engage in said openings, and means for detachably connecting the rear ends of said bit shafts with the forward ends of said conveyor shafts.

4. In a mining machine, a plurality of ro-

tatably conveyor shafts, a spacer bar for the outer ends of said shafts having openings therein in alinement with said conveyor shafts, a bit shaft for each conveyor shaft, a conveyor portion for each bit shaft, a reduced bearing projecting rearwardly from each bit shaft engaged in the corresponding bar opening, and a stem projecting rearwardly from said bearing to detachably engage the adjacent end of the adjacent conveyor shaft.

5. In a coal mining machine, the combination with a movable support, of a battery of auger shanks mounted on the support and projecting in advance of the latter, said shanks having internally threaded sockets at their forward ends, a yoke bar extending transversely and in advance of said forward ends, bit shafts rotatably mounted in said yoke bar and supporting the latter, and a threaded stem on each bit shaft projecting rearwardly from said yoke bar to engage in the sockets of said shanks.

6. In a mining machine, a carriage, a plurality of power shafts rotatably mounted on said carriage, drill shafts detachably secured at their rear ends to said power shafts, bit shafts detachably secured to the opposite ends of said drill shafts, a bar having openings therein spaced apart a distance equal to the distance between said drill shafts, bearing portions on said bit shafts rotatably engaged in said openings, and means for rotating said power shafts.

7. In a mining machine, a track including parallel rails, a rack bar secured to said track parallel with said rails, a carriage, wheels on said carriage resting on said rails, a feed shaft on said carriage, a gear on said shaft engaged with the teeth of said bar, a hand wheel for operating said feed shaft, a plurality of drive shafts rotatably mounted in parallel relation in said carriage, intermeshing gears on said shafts, a motor for driving one of said drive shafts, a socket member on the forward end of each of said drive shafts, an auger member for each drive shaft, keys on the rear ends of said auger members to engage and lock in said sockets, the forward end of each auger member having an internally threaded axial recess, a tie bar having openings corresponding to the number of auger members, a drill bit for each auger shaft, a spiral member on each bit, a bearing on each bit to engage in an opening in said tie bar, a threaded stem projecting rearwardly from each bearing member to engage in the axial recesses, and means for raising or lowering said track.

8. In a mining machine, a plurality of conveyor shafts, a spacer bar for the outer ends of said shafts having openings therein in alinement with said shafts, a bit shaft for each conveyor shaft, a conveyor portion on each bit, a reduced bearing on each bit shaft rearwardly of said portion and engaged in the adjacent opening, a threaded stem projecting rearwardly from said bearing, and the forward end of each conveyor shaft having a threaded socket to receive the stem of the adjacent bit shaft.

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