

Aug. 17, 1937.

G. D. MILLER

2,090,355

COAL MINING APPARATUS

Filed Dec. 4, 1933

3 Sheets-Sheet 1

Fig. 1.

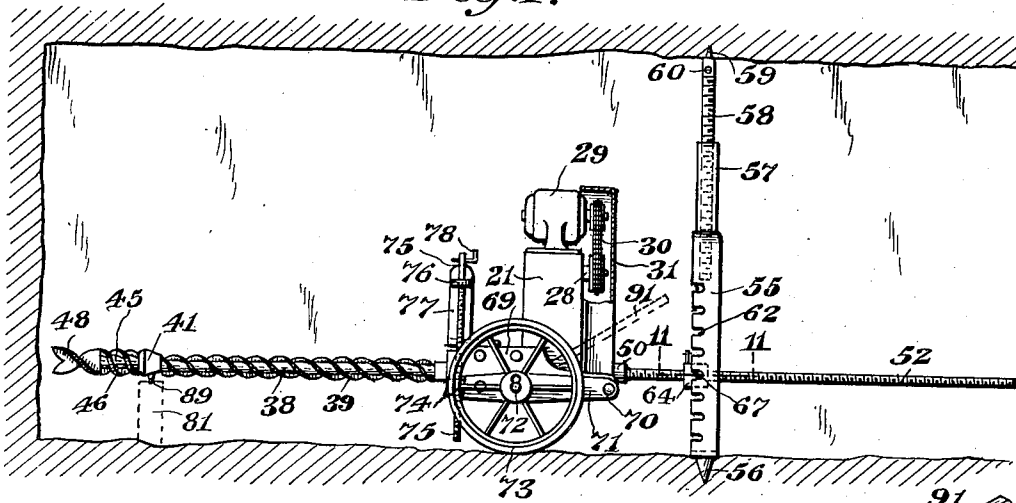


Fig. 2.

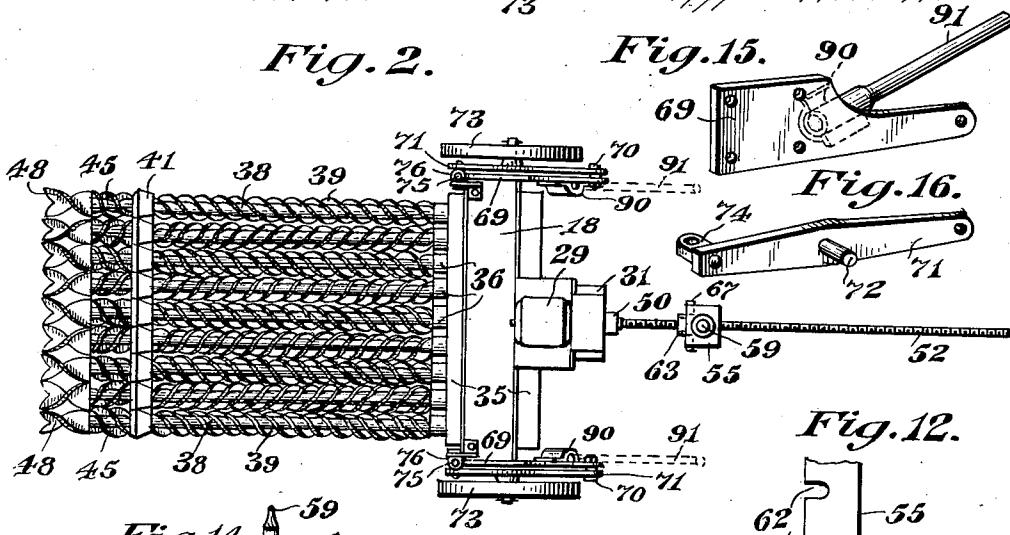


Fig. 15.

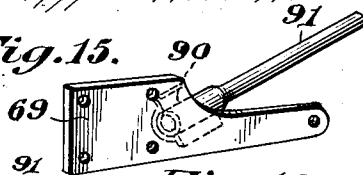


Fig. 16.

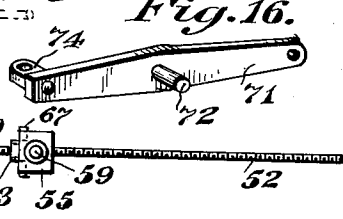


Fig. 12.

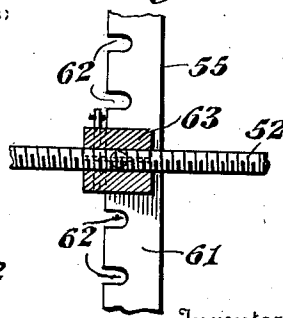


Fig. 14.

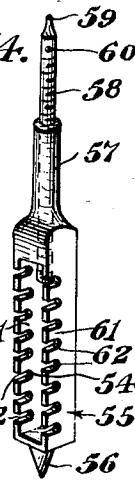


Fig. 17.

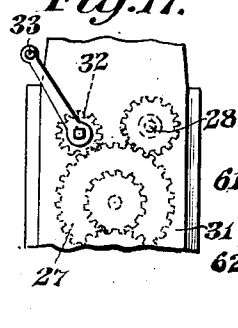


Fig. 11.

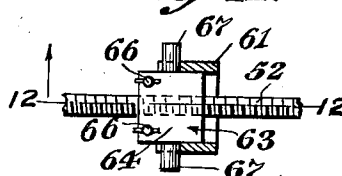
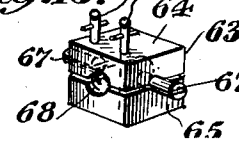


Fig. 13.



Gideon D. Miller;

By *R. Miller*

Attorney

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Fig. 3.

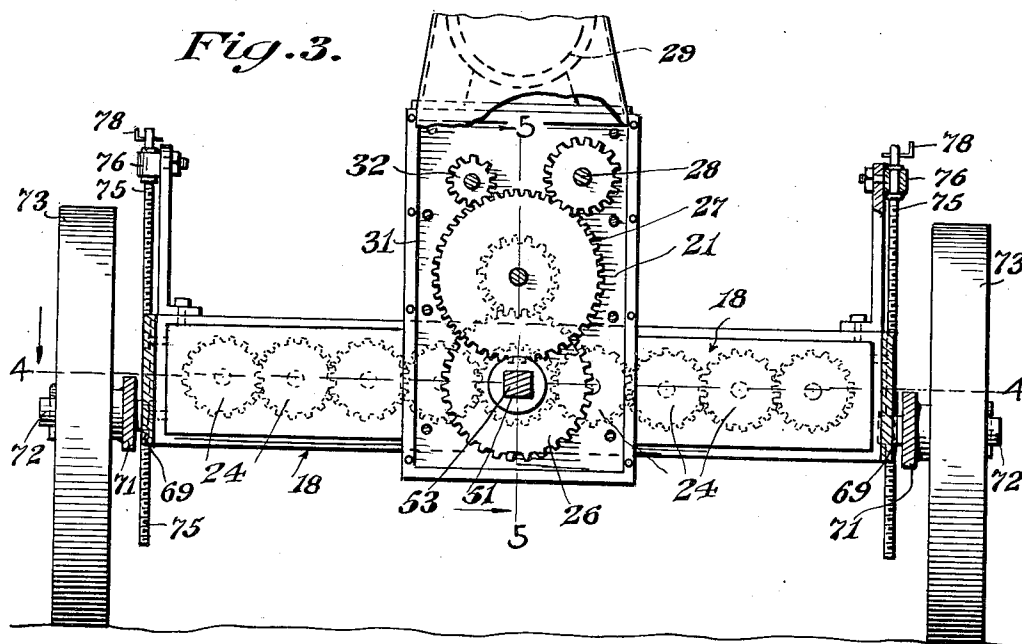
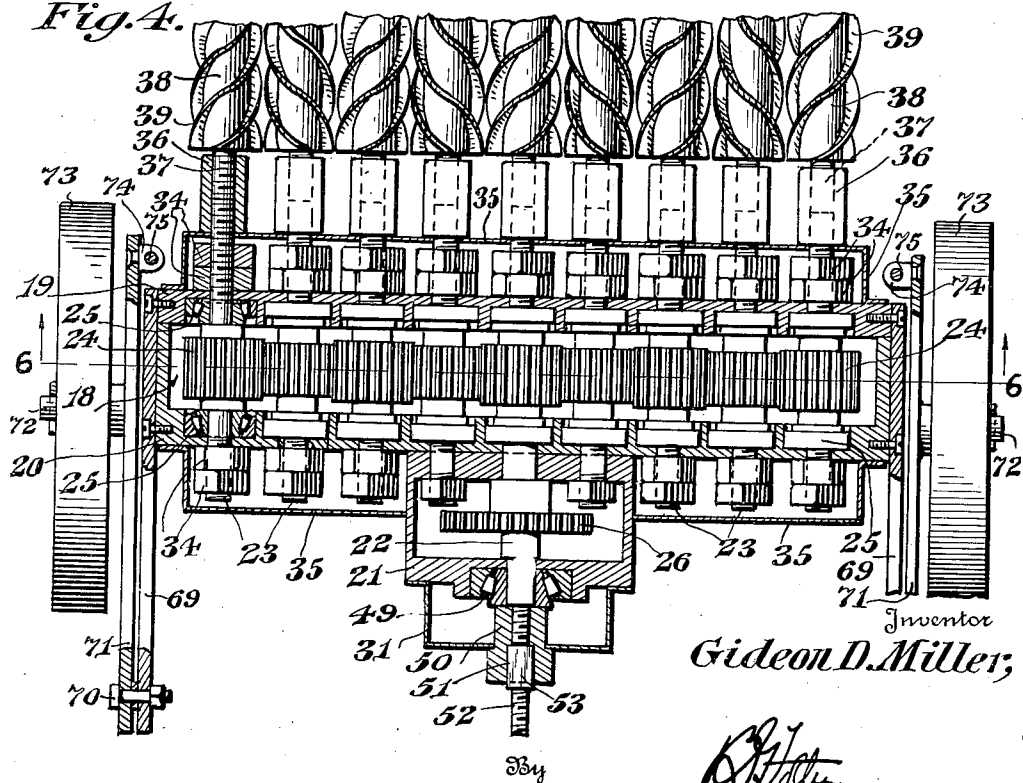


Fig. 4.



Inventor
Gideon D. Miller,

R. G. Miller

Attorney

Aug. 17, 1937.

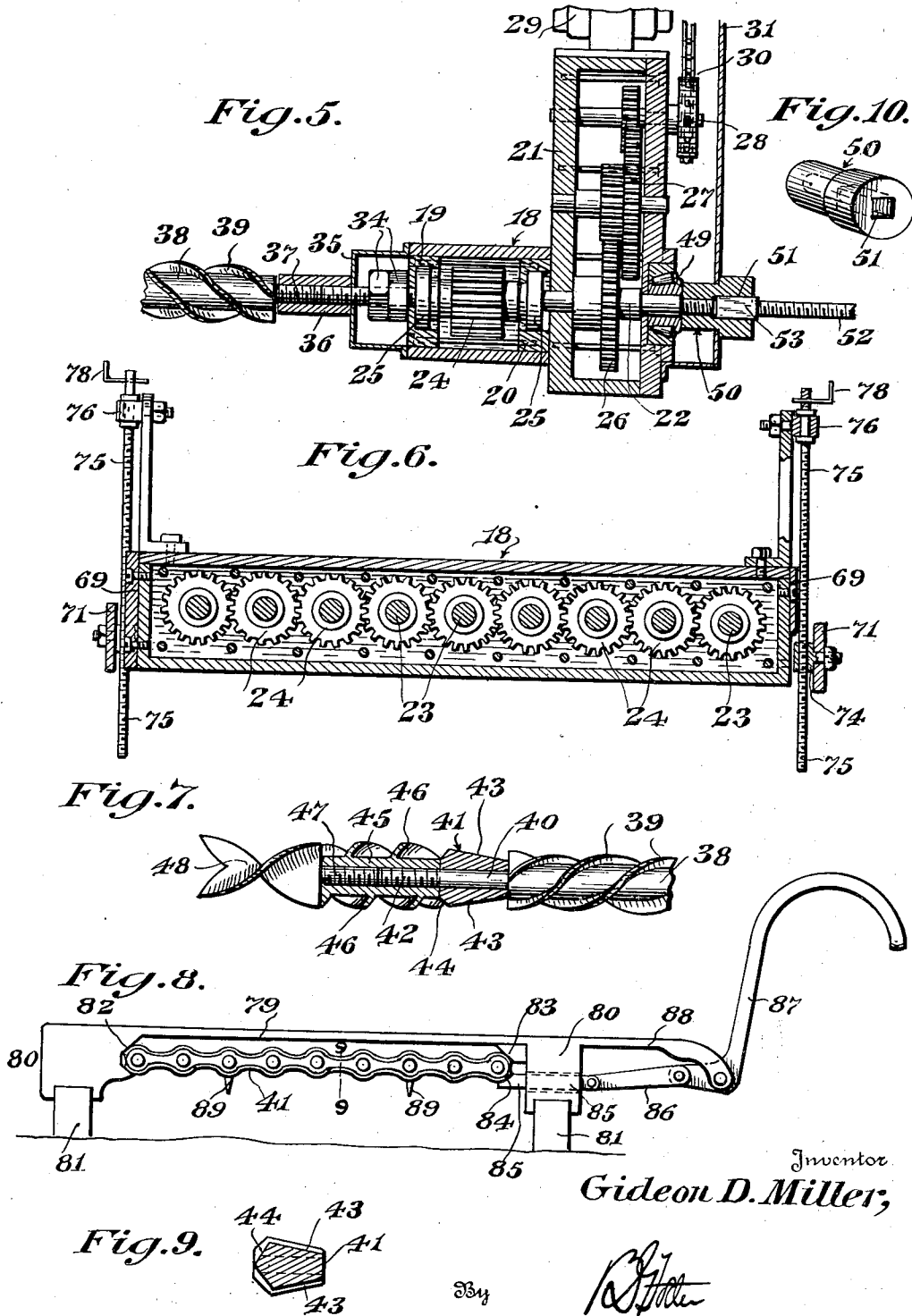
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UNITED STATES PATENT OFFICE

2,090,355

COAL MINING APPARATUS

Gideon D. Miller, Springs, Pa.

Application December 4, 1933, Serial No. 700,905

18 Claims. (Cl. 262—22)

The object of the present invention is to provide a light weight machine, particularly intended for undercutting coal, but useful for other analogous purposes, the same being relatively inexpensive to manufacture and yet having a high degree of efficiency in its cutting operations. Although useful in large mines where power is readily available, it is peculiarly adapted for smaller mines, even those not equipped with means for supplying electric current, as it is easily manipulated and can be driven manually.

A further and important object is to provide a structure in which a battery of drilling augers is employed and these augers are maintained at all times in operative relation with respect to each other, thus insuring their proper cutting relations, irrespective of conditions encountered during their cutting progress.

A still further and important object is to provide feeding means of a simple and highly effective character that can be easily set up and adjusted to the situation presented.

A still further object is to provide means of a simple character by which the height of the cutters can be easily varied so that the cut may be made at the most desirable height from the floor of the mine, thus making it possible to use the apparatus under varying conditions.

In the accompanying drawings:

Figure 1 is a side elevation of an embodiment of the invention which is at present considered the preferable one.

Figure 2 is a plan view of the same.

Figure 3 is a vertical transverse sectional view through the carriage portion and showing the gearing.

Figure 4 is a horizontal sectional view on the line 4—4 of Figure 3.

Figure 5 is a vertical sectional view on the line 5—5 of Figure 3.

Figure 6 is a vertical sectional view on the line 6—6 of Figure 4.

Figure 7 is a detail view partially in section through the front end portion of one of the augers.

Figure 8 is a view in elevation of a guiding means that may be employed in starting a cut.

Figure 9 is a detail sectional view through the yoke bar on the line 9—9 of Figure 8.

Figure 10 is a detail perspective view of the chuck or coupling member for the feed screw.

Figure 11 is a horizontal sectional view on the line 11—11 of Figure 1.

Figure 12 is a detail sectional view on the line 12—12 of Figure 11.

Figure 13 is a perspective view of the feed block.

Figure 14 is a detail perspective view of the post.

Figure 15 is a view of one of the carriage brackets, indicating an arrangement that may be employed for an operating handle.

Figure 16 is a perspective view of the carrier arm for one of the wheels.

Figure 17 is a detail view illustrating the arrangement when the device is manually operated.

In the embodiment disclosed, a carriage is employed, the body of which is in the form of an elongated horizontal gear case 18 having front and rear side walls 19 and 20. On the rear side of this body or gear case 18 and centrally disposed with respect thereto, is a vertical gear case 21 that is of less width than the length of the gear case 18 and projects above the same.

Extending centrally through the lower portion of the gear case 21 and through the central portion of the gear case 18 is a horizontal shaft 22 that may be termed the main drive shaft. Extending through the horizontal gear case 18 on opposite sides of the main drive shaft 22 are other shorter shafts 23. The various shafts are geared together by intermeshing spur gears 24. Consequently it will be evident that if the main shaft 22 is rotated, the alternate shafts 23 will be rotated in opposite directions. The various shafts 22 and 23 are preferably provided with suitable roller bearings 25 that are disposed at inclinations so as to also act as thrust bearings.

On the main shaft 22 and located in the vertical gear case 21 is a master drive gear 26 which, through a train of speed reducing gears 27, is connected to a prime mover shaft 28 in the upper portion of the case 21. A motor 29 may be located on the top of the said gear case 21 and its shaft is connected by chain and sprocket gearing 30 with the prime mover shaft 28. The chain and sprocket gearing is preferably arranged at the rear side of the case 21 and may be enclosed and protected by a housing 31. It will be evident therefore that this provides a power driven mechanism. If electric current is not available, however, the mechanism may be operated by hand, and to this end, there may be provided in the upper portion of the gear case 21, a smaller drive gear 32, to the shaft of which a hand crank 33 may be attached as shown in Figure 17.

Now referring particularly to Figures 4 and 5, it will be noted that the projecting ends of the shafts 23 are threaded, and that on these threaded ends are screwed sets of nuts 34. This provides means for adjusting the shafts longitudinally, and also holding them against longitudinal play. The portions of the shafts carrying the nuts 34 are preferably enclosed in sheet metal housings 35 that serve to protect them and the bearings from dirt and dust, and also receive any oil escaping from the gear case 18, it being understood that the gears 24 are preferably run in a suitable lubricating bath.

The front ends of the shafts 22 and 23 project beyond the front housing 35 and threaded on these projecting ends are chucks in the form of sleeves 36. The sleeves project beyond the said shafts, thus providing sockets, into which are threaded the reduced spindle ends 37 of auger shanks 38. These shanks are provided with spiral flutes 39 arranged alternately in opposite directions, so that their action when rotated is to carry back the cuttings as hereinafter explained. By referring particularly to Figure 7, it will be noted that the front ends of said shanks 38 also have reduced spindles 40 that are journaled in a yoke bar 41 and have threaded ends 42 extending beyond the front end of said yoke bar. It will be noted that this yoke bar tapers rearwardly, or in other words, its upper and lower faces 43 converge toward the rear side of the same, and that its front side is also bluntly tapered, as indicated at 44. Preferably also, as will be clear by reference to Figure 8, the bar is enlarged at the bearings for the spindles 40 or reduced between said bearing portions, and furthermore being of less vertical width than the augers, considerable unobstructed space is provided that will permit the passage rearwardly of cuttings.

Screwed on to the horizontally projecting threaded ends 42 of the auger shanks 38 are chuck sleeves 45 preferably provided with worm flanges 46, these sleeves extending beyond the ends 42 and providing sockets. Into these sockets are threaded the shanks 47 of suitable bits 48. It will be understood that these bits may take any desirable form, and those shown are merely for exemplification.

Means are provided for effecting the feed or advance of the augers as they cut their way into the coal. The preferred means is detailed as follows: As has already been explained the main drive shaft 22 extends across the upright gear case 31 and has a roller bearing 49 therein. Beyond this bearing it is threaded into a chuck in the form of a sleeve 50, provided in its exposed end with an angular socket 51. A feed screw rod 52 has a correspondingly angular head 53 that is detachably engaged in the socket 51 and extends rearwardly of the carriage in parallel relation, however to the axes of the augers. This screw passes through a slot 54 formed by the bifurcation of a post 55 that is set behind the carriage. To this end the post has a spur 56 at its lower end adapted to embed in the floor of the mine, while its upper end is in the form of a sleeve 57 in which is threaded an extension rod 58 terminating in a spur 59 that is embedded in the roof of the mine. The rod has a suitable opening 60 therein to receive a turning bar or other suitable operating device. It will thus be evident that the post can be fixed at any point desired. The bifurcation 54 creates a pair of spaced legs 61, and the front margins

of these legs are rearwardly notched to form recessed seats 62. The feed screw 52 passes through a feed block 63 shown in detail in Figure 13. The block preferably consists of upper and lower separable sections 64 and 65 connected by pins 66 or other suitable devices which will permit such separation and yet prevent the parts being completely detached from each other. The block has oppositely outstanding pintles 67, parts of each being formed or carried by the respective sections 64 and 65. Through the block is a threaded bore 68, also formed partly in each section. The pintles when assembled are adapted to snugly engage in the seats 62 and thus hold the block sections together and in threaded engagement with the feed screw 52. When, however, the pintles are disengaged from the seats, it will be obvious that the sections can be separated and the block thus slid along the feed screw.

In order to support and permit the free movement of the carriage, the following mechanism is provided. Secured to the ends of the gear case 18 are bracket plates 69 which extend beyond the rear side of said gear case, and pivoted to their rear ends, as indicated at 70, are forwardly extending vertically swinging carrier arms 71. These arms have outstanding spindles 72 on which are journaled wheels 73. The front and free ends of the arms 71 have pivoted thereto boxes 74 in which are threaded vertical adjusting screws 75. These screws 75 are rotatably mounted in other boxes 76 carried by the upper ends of upstanding brackets 77. Suitable handle devices 78 are provided for turning the screws. It will thus be evident that by turning the screws 75 the carriage can be elevated or lowered as desired.

In starting in the face of the wall that is to be undercut, it may be desirable to have a temporary support for the advance ends of the augers and the structure illustrated in Figures 1 and 8 may be employed. This consists of an arch bar 79 that extends across and over the augers above the yoke bar 41 and has depending heads 80 at their ends recessed to receive suitable spacing blocks 81. These blocks may be interchangeable in order to vary the height of the device. One of the heads 80 is provided at its inner side with an inwardly tapered socket 82 that receives one end of the yoke bar 41 that is tapered to fit the same. The other head has an inclined upper portion 83, an opposing socket wall 84, being created by the tapered end of a bolt 85, slidable in the head and having a link connection 86 with an operating lever 87 pivoted on an extension 88 of the head. It will be evident that when this device is in position as shown in Figures 1 and 8 the bits will be effectively supported until they have made their entrance into the face of the wall, after which the support may be removed. It will be noted, however, that the yoke bar 41 has depending lugs 89 which will enter the cutting and thus support the structure as it advances into the coal or other material being cut.

The operation of the apparatus is as follows: The machine is brought to the face of the wall to be undercut, as indicated in Figure 1, and the gearing is then set in motion either by the motor 29 or by the hand crank 33 of Figure 17. As a consequence the augers as complete units are rotated in opposite directions and the bits will cut into the material. Because of the rotation of the main shaft 22, the feed screw 52 will also

be rotated and as the feed block has been set at the proper position and is held by the post, obviously the machine will advance and continue the cutting operations to the depth desired. The cuttings will be moved rearwardly by the bits and the flutes 46 of the bit chucks 45 to the yoke bar 41. This yoke bar will allow the free passage of the cuttings and prevent choking. The cuttings after passing the yoke bar are engaged by the flutes 39 of the auger shanks, which act as screw conveyors to continue the rearward movement of the cuttings and deposit them outside the hole or slot being cut. If the character of the material is such that a slower or faster feed is found desirable, it is only necessary to have a set of feed screws and feed blocks with threads of various pitches, so that the feeding action can be readily increased or decreased by substituting one for another.

The machine has demonstrated its adaptability to work smoothly, quickly and effectively, and being light in weight and relatively inexpensive, it is peculiarly adapted to small machines, not only because of its ability to be driven either by current or by hand, but being light in weight, is easily moved from place to place, set up and operated by a single workman.

In order that this may be most conveniently done, the bracket plate 69 may be provided with handles by which the machine can be moved. To this end, said plates can be provided with rearwardly and upwardly inclined sockets 90 adapted to receive correspondingly inclined handle bars 91 which project sufficiently far in rear of the carriage to be grasped by a workman.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:

1. In a coal mining apparatus, the combination with a support, of a battery of augers projecting therefrom, means for effecting the rotation of the augers, and a yoke connecting the augers adjacent their cutting ends, said augers being rotatably mounted in the yoke and being tied together thereby, and said yoke having the portions thereof between the bearings reduced in vertical thickness to permit ready passage of the cuttings.

2. In a coal mining apparatus, the combination with a support, of a battery of augers projecting therefrom, means for effecting the rotation of the augers, and a yoke bar having bearings in which the advance portions of the augers are journaled, said bar being of less transverse section than the diameter of the cuts made by the augers and having its front face bluntly tapered, said bar also tapering transversely rearwardly to permit the passage of the cuttings thereby, and said augers having spiral ejecting blades behind the yoke bar.

3. In a coal mining apparatus, the combination with a support, of a battery of augers projecting therefrom, means for effecting the rotation of the augers, and a yoke bar having bearings in which the advance portions of the augers are journaled, said bar being of less transverse section than the diameter of the cuts made by the augers and being transversely and rearwardly tapered from substantially its front side to permit the passage of the cuttings thereby and said

augers having spiral ejecting blades behind the yoke bar.

4. In a coal mining apparatus, the combination with a movable support, of a battery of auger shanks mounted on the support and projecting in advance of the same, said shanks having gudgeons at their advance ends, a yoke bar extending transversely of the front ends of the shanks and having bearings for the gudgeons, chucks on the gudgeons in advance of the yoke bar, and cutting bits detachably mounted in the chucks.

5. In a coal mining apparatus, the combination with a movable support including a gear case, of a plurality of shafts journaled in the gear case and having projecting portions provided with chucks, spirally fluted auger shanks having their rear ends engaged in the chucks and projecting in advance of the same, said shanks having gudgeons at their advance ends, a yoke bar extending transversely of the front ends of the shanks and having bearings for the gudgeons, chucks on the gudgeons in advance of the yoke bar, cutting bits detachably mounted in the last mentioned chucks, and means geared to the shafts for rotating them.

6. In a coal mining apparatus, the combination with a movable support including a gear case, of a second gear case upstanding above the first gear case, a plurality of shafts in the first gear case projecting therefrom, a motor on the upstanding gear case, gearing between the motor and one of the shafts, gearing interposed between the shafts for causing their rotation from the motor, sleeves on the projecting portions of the shafts, spirally fluted auger shanks engaged in the sleeves and having gudgeons in their advance ends, a yoke bar transversely of the shanks and rotatably receiving the gudgeons, sleeves on the gudgeons in advance of the yoke bar, and bits detachably mounted on the last mentioned sleeves.

7. In a coal mining apparatus, the combination with a carriage, of cutting mechanism mounted thereon, means on the carriage by which the cutting mechanism is operated, said means including a driving shaft having a coupling member, a feed screw having a head that detachably engages the coupling member, an anchor post having means for setting the same, and a feed block mounted on the post and comprising separable threaded sections that embrace the screw, said block having a mounting on the post and being held against separation and in threaded engagement with the screw by said mounting.

8. In a coal mining apparatus, the combination with a carriage, of cutting mechanism thereon, means on the carriage by which the cutting mechanism is operated, said means including a driving shaft having a coupling member, a feed screw having a head that detachably engages the coupling member, an anchor post having means for setting the same, said post having spaced legs between which the screw passes and said legs having recessed seats, and a feed block having a threaded bore that receives the screw with outstanding spindles removably engaged in the seat, said block comprising separable sections which include the spindles and said sectional spindles being held against separation when engaged in the seats and thereby holding the blocks against separation.

9. In a coal mining apparatus, the combination with a carriage and cutting mechanism carried thereby, of a feed screw for the carriage, a feed block comprising separable sections that embrace the screw and have threaded engagement there-

with when together, and common means for detachably holding the block during the feeding operation and preventing the separation of the sections thereof.

5 10. In a coal mining machine, the combination with a movable support, of a battery of auger shanks journaled on the support and projecting in advance of the same, a yoke bar in which the advance portions of the shanks are journaled and
10 by which they are tied together, spirally fluted couplings on the shanks in advance of the yoke bar, and bits secured to said couplings.

11. In a coal mining machine, the combination with a movable support, of a battery of auger
15 shanks journaled on the support and projecting in advance of the same, the front ends of said shanks having gudgeons, a yoke bar in which the gudgeons are journaled, spirally fluted couplings mounted on the gudgeons in advance of the yoke
20 bar and having sockets in their front ends, and bits having shanks engaged in the sockets.

12. In coal mining apparatus, the combination with a movable carriage, of a battery of augers mounted on the carriage and projecting in ad-
25 vance of the same, a yoke bar extending transversely of the front end portions of the augers and having bearings in which they are mounted, and supports for the yoke bar movable therewith.

13. In coal mining apparatus, the combination
30 with a movable carriage, of a battery of augers mounted on the carriage and projecting in advance of the same, a yoke bar extending transversely of the front end portions of the augers and having bearings in which they are mounted,
35 and supporting lugs depending from the yoke bar and of a size to move into and out of the cuts made by the augers.

14. A mining machine of the character described, comprising a carriage provided with front
40 and rear walls, drill shafts rotatably supported by said walls, gears on the respective shafts and in mesh with each other in such manner that alternate shafts rotate in a direction opposite to the direction of rotation of the others, conveyor
45 shafts in axial alinement with the respective drill shafts and removably engaging the outer ends of said shafts, a spacer bar, said conveyor shafts having reduced portions extended through and rotatively engaging said spacer bar, sockets

carried by said reduced portions and located forwardly of said bar, drill bits removably engaging said sockets, means for imparting rotative movement to one of said drill shafts, and means co-
operating with the last mentioned shaft for causing said carriage to travel in a forward direction.

15. In a mining machine, a carriage, drill shafts rotatably supported by said carriage and projecting forwardly therefrom, a threaded shank projecting beyond the forward ends of each shaft and of a diameter less than said shafts, a bar having openings corresponding to the diameter of said shanks, said openings spaced apart a distance equal to the distance between said shafts and through which said shanks project, a socket for each shaft threadably receiving said shanks, and a drill bit detachably secured to each socket.

16. In combination with a mining machine having a rearwardly extending threaded feed shaft, of an abutment post anchored rearwardly of said machine, said post having a series of vertically disposed notches, a pair of feed box members each having complemental threaded portions engageable with said feed shaft, lugs projecting laterally from said members, and said lugs engageable within the notches in said post.

17. In a mining machine, a carriage having a front wall, a plurality of power shafts rotatably mounted in said carriage and having their forward ends projecting beyond said wall, drill shafts detachably secured at their rear ends to the forward ends of said power shafts, drill bits detachably secured to the outer ends of said drill shafts, a bar having openings therein spaced apart a distance equal to the distance between said drill shafts and receiving the ends of said shafts, and means for rotating said power shafts.

18. In an abutment post for mining machines, a pair of spaced parallel legs having laterally aligned recesses in their forward edges, a pair of feed box members of identical construction each having complemental threaded portions adapted to receive and engage with the threads of a feed shaft, means for securing said feed box members together, and lugs projecting from the ends of said feed box members and engageable in said notches.

GIDEON D. MILLER.