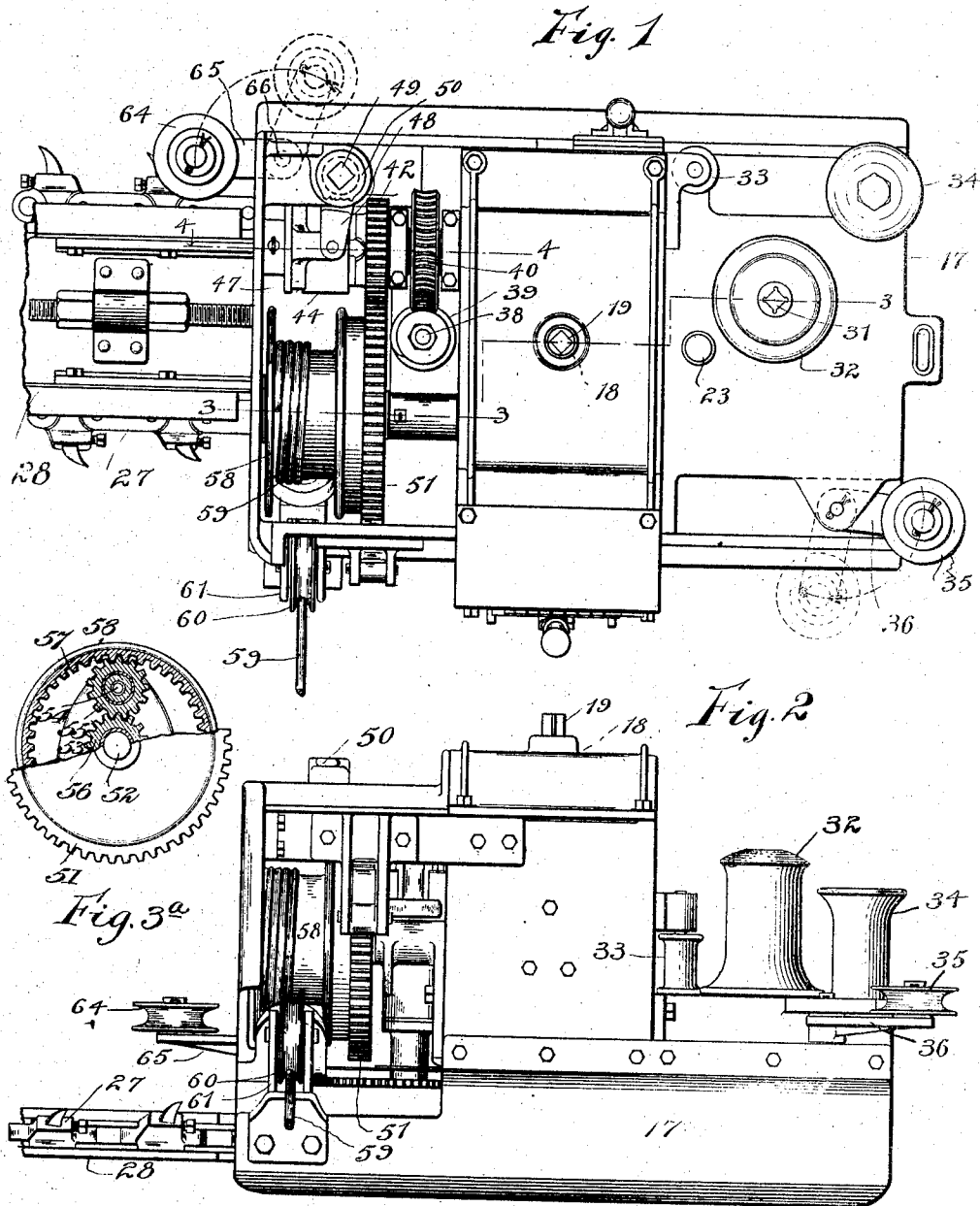


R. E. NOBLE.
MINING MACHINE.
APPLICATION FILED APR. 23, 1909.

1,019,722.

Patented Mar. 5, 1912.
3 SHEETS—SHEET 1.



Witnesses:

Alv. Fenstemaker
C. H. Crawford

Inventor

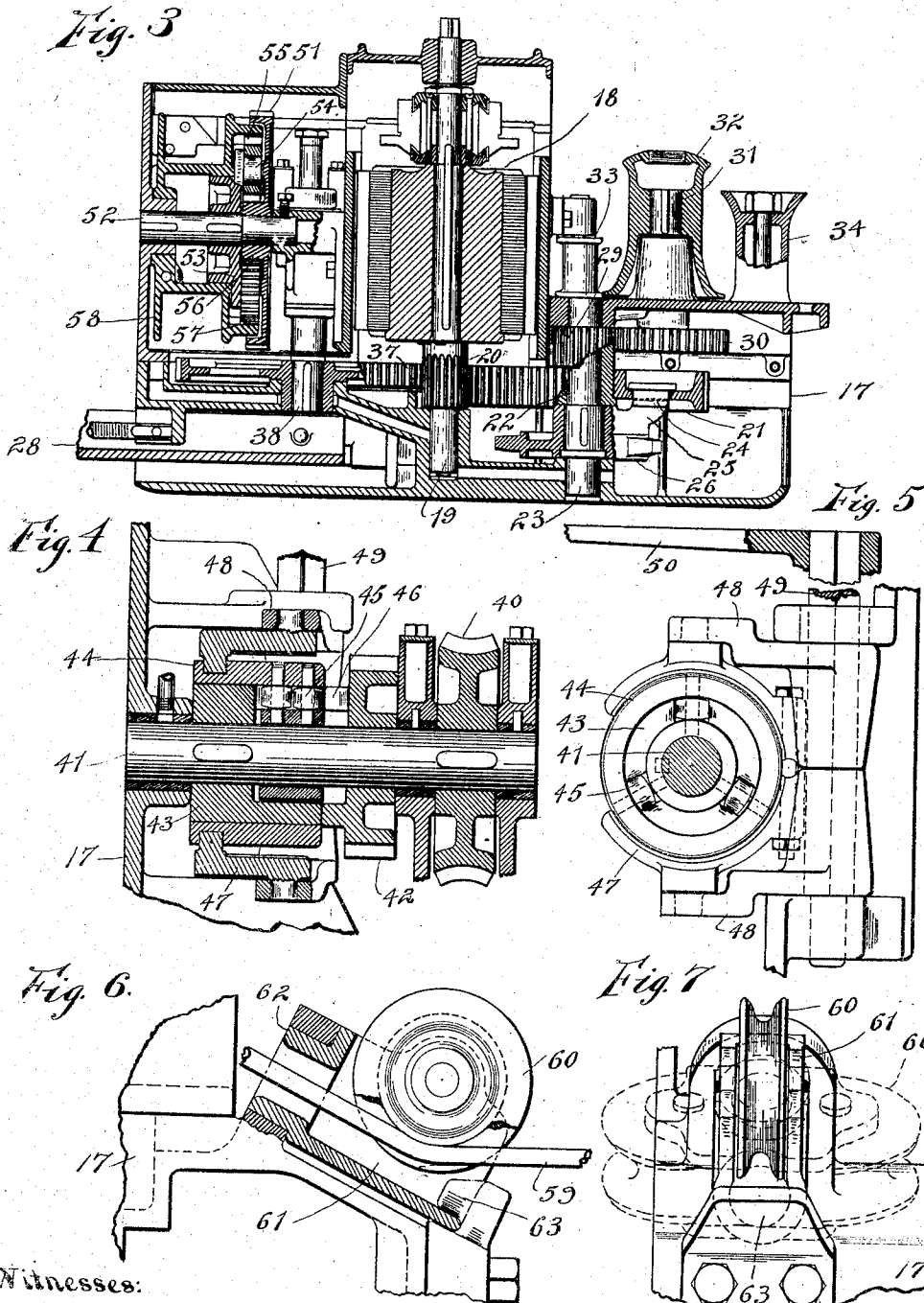
Ralph E. Noble
By *Glenn S. Noble*
Att'y.

R. E. NOBLE.
MINING MACHINE.
APPLICATION FILED APR. 23, 1909.

1,019,722.

Patented Mar. 5, 1912.

3 SHEETS—SHEET 2.



Witnesses:

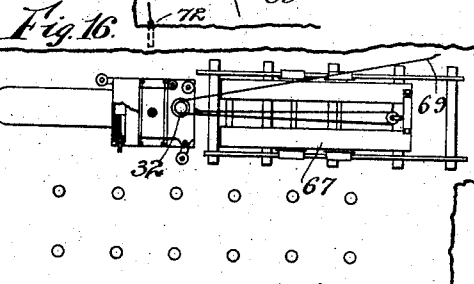
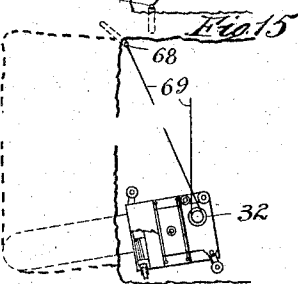
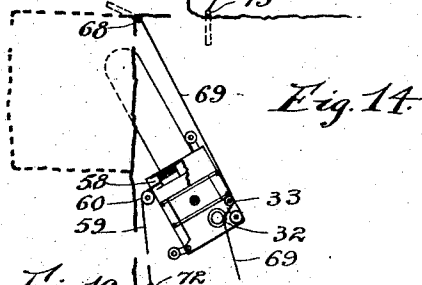
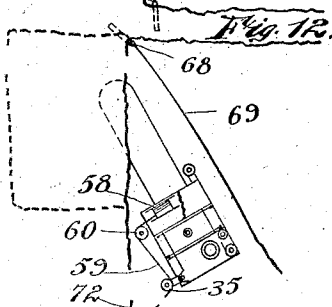
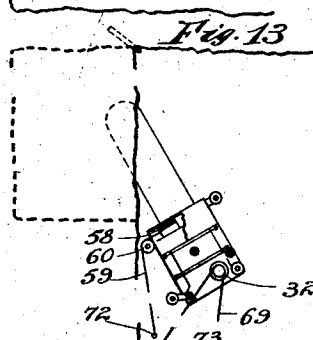
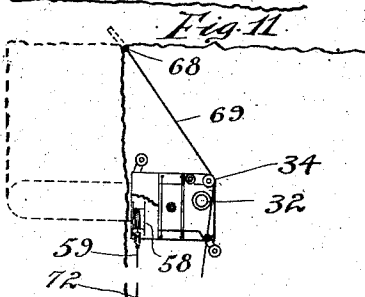
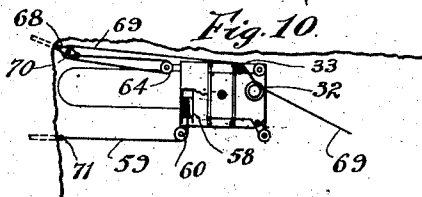
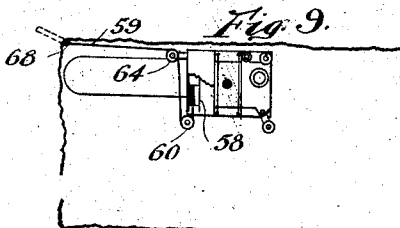
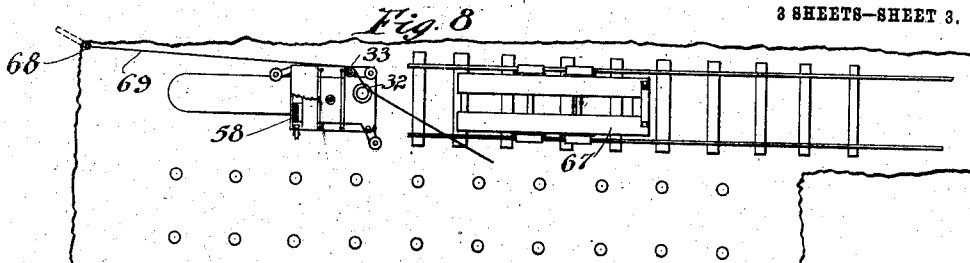
Al. J. Foster
C. M. Crawford

Inventor,
Ralph E. Noble
By *Glen D. Noble*
Att'y.

1,019,722.

Patented Mar. 5, 1912.

3 SHEETS—SHEET 3.



Witnesses:

Att. Henshaw
C. M. Crawford

Inventor,

Ralph S. Noble
By Glenn S. Noble
Att'y.

UNITED STATES PATENT OFFICE.

RALPH E. NOBLE, OF CHICAGO, ILLINOIS, ASSIGNOR TO MORGAN-GARDNER ELECTRIC COMPANY, OF CHICAGO, ILLINOIS.

MINING-MACHINE.

1,019,722.

Specification of Letters Patent.

Patented Mar. 5, 1912.

Application filed April 23, 1909. Serial No. 491,807.

To all whom it may concern:

Be it known that I, RALPH E. NOBLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Mining-Machines, of which the following is a specification.

This invention relates to machines used in connection with mining, or the like, and it is particularly applicable to that type of machines used for coal mining and commonly known as chain machines on account of their being provided with chains carrying cutting bits for cutting channels or kerfs in the coal. When such machines are constructed so as to undercut the coal along a considerable distance, for instance, along the sides of a room, they are usually known as "long wall" machines, and it is this type of machine which I have illustrated as embodying the principal features of my invention.

The objects of this invention are to provide a simple, compact and efficient machine for cutting coal and to combine with such machine novel means for moving or handling the same, as for instance, when it is to be moved from its carrying car or truck to the face of the coal and again returned to the car, and also for feeding or moving the machine longitudinally toward the face of the coal to make an initial or sumping cut and laterally along the face of the coal when it is making the main cut, to withdraw the cutter bar from under the coal, or to perform such other movements of the machine as may be desirable.

Further advantages of my invention will appear from the following description and also from the accompanying drawings, in which—

Figure 1 is a plan view of the machine proper, parts being broken away for convenience in illustration; Fig. 2 is a side view of the same; Fig. 3 is a longitudinal section taken substantially on the line 3—3 of Fig. 1; Fig. 3* is a vertical sectional view showing the gears for driving the winding drum 58. Fig. 4 is a detail longitudinal section taken on the line 4—4 of Fig. 1; Fig. 5 is an end view of some of the parts shown in Fig. 4; Figs. 6 and 7 are details of one of the guide sheaves or pulleys; and Figs. 8 to 16, inclusive, are diagrammatical views showing the method of operation of my improved

machine in connection with the pulling and guiding ropes or cables.

As illustrated in these drawings, 17 represents a substantial frame or housing for the main operative parts of the mining machine, this frame being adapted to be slid along on the ground or floor of the mine in order to move it from its temporary carrying truck to the face of the coal and also when making the cut. At about the center of the frame or housing 17 is mounted a motor 18 which is provided, at the lower end of its driving shaft 19, with a pinion 20. This pinion engages with a gear 21 rigidly mounted on a sleeve 22 which in turn is loosely mounted on a stub-shaft 23 having suitable bearings in the frame 17. The gear 21 is provided with a removable plug or engaging piece 24 which is adapted to engage with an upwardly projecting arm 25 on a sprocket 26 which is rigidly mounted on the shaft 23, the arrangement being such that when the plug 24 is in position, it will drive the sprocket wheel 26 which in turn drives the shaft 23. This sprocket wheel also drives the cutter chain 27 which is mounted on a chain guide 28 in any ordinary or preferred manner, this guide being fastened securely to the frame 17.

The driving apparatus thus far described completes the means for operating the coal cutting mechanism, it being understood, of course, that a motor is provided with a suitable controller and connections for supplying it with an electric current.

In order to move the machine as a whole, I have provided certain cable or rope winding and guiding devices which will now be described. The sleeve 22 is provided at its upper end with a pinion 29, preferably made integral therewith, which meshes with a gear 30 mounted on the lower end of a shaft 31 which extends up through the frame or housing 17 and carries at its top a capstan or windlass 32. A guide roller 33 is also mounted on the top of the frame 17 adjacent to the windlass 32, and I have also provided a snubbing post 34 also securely mounted on this end of the frame. A second guide roller or sheave 35 is mounted on an arm 36 at one corner of the frame, as indicated in Figs. 1 and 2, so that it may be swung to different positions. The motor pinion 20 also engages with a gear 37 securely mounted on a shaft 38 in the inner or opposite end

of the frame, this shaft being provided with a worm 39 which engages with a worm gear 40 on a horizontal shaft 41 best seen in Figs. 4 and 5. A gear 42 is loosely mounted, on the shaft 41 and is adapted to be driven thereby through the medium of a clutch. The clutch illustrated comprises a collar 43 securely mounted on the shaft 41, this collar bearing a longitudinally movable sleeve 44 carrying one or more pairs of rollers 45 which engage with slots in the end of said sleeve, one of the rollers of each pair also being adapted to engage with slots 46 in the hub of the gear 42 when the clutch is in operative position.

In order to move the sleeve 44, I have provided a shifter yoke 47 which is moved by means of short crank arms 48 mounted on a shaft 49, which shaft is turned by means of a lever 50, the arrangement being such that when the lever 50 is moved in one direction, it will throw the rollers so that they will engage the gear 42 and turn the same with the shaft, and when thrown in the opposite direction, the rollers will be moved back into the slots in the sleeve 43, leaving the gear free. The gear 42 meshes with a gear 51 loosely mounted on a shaft 52 which has its supports in the frame 17, this shaft being securely keyed in its supports so that it does not turn. A combined disk and supporting member 53 is securely mounted on the shaft 52 and is provided with one or more studs 54 upon which are loosely mounted pinions 55 which engage with the teeth of a pinion 56 on the hub of the gear 51 and also with the teeth of an internal gear 57 in the projecting end of a winch or winding drum 58. This winding drum is mounted at one end on an inwardly projecting hub from the frame, and at the other end, on the supporting member 53, and is free to turn thereon. It will be noted from this arrangement that when the gear 51 is turned, the pinion 56 on the hub thereof will turn the small gears 55 which in turn will drive the drum 58 through the internal gear 57. A cable or rope 59 has one end secured to the drum 58, and its outer or free end is guided by means of a sheave or pulley 60. This sheave is mounted as shown in Figs. 6 and 7, so that it may be turned to stand in a vertical plane, or may be turned either to the right or left in a substantially horizontal plane, depending upon the direction in which the cable 59 is directed. For this purpose, the sheave or pulley 60 is supported in a block 61 having a hollow trunnion 62 at one end which engages with a bearing on the side of the frame 17 and is held at its opposite end by means of an inwardly projecting lug 63 which engages with the open end of the block 61, this open end being curved to allow for the turn of the block. The inner end of the frame 17 is also provided with a

guide sheave 64 carried by an arm 65 pivotally mounted at 66 on the opposite corner of the frame, the arm being free to swing to allow the sheave to move to different positions, as indicated.

When machines of this general character are to be moved for a considerable distance in a mine, they are usually placed on trucks, for instance, such as indicated at 67 in Figs. 8 and 16. When the truck, with the machine thereon, has been brought into the room, as indicated in Fig. 8, to approximately the end of the railway track, the truck is blocked or held in position, and the machine must then be moved from the truck to the face of the coal. These machines are comparatively heavy, and in order to thus move the machine from the truck to the face of the coal, a stake, or other means for attachment of a rope, is placed adjacent to the wall and preferably in the corner of the room, as indicated at 68. One end of a rope 69 is fastened to this stake and is then passed around the guide roller 33 and around the windlass 32, and its free end is then drawn tight by the operator, which causes the portion between the stake and the machine to be tightened and gradually moves the machine forward until the cutter frame is in position for operation. While this method of moving the machine forward might suffice to drive the cutting portion against the coal with sufficient force to enable the forward or initial cut to be made, I prefer to use a different method for feeding the machine forward for making this cut. One such method is indicated in Fig. 9, in which the cable 59, which is preferably made of steel rope, is rove around the sheave 60 and then around the sheave 64 and fastened to the stake 68. Then, as the drum 58 is turned, this will exert a powerful pull on the cable and thereby forcibly direct the cutting mechanism against the coal. I consider this particular arrangement for making the initial or sumping cut as one of the important features of this invention inasmuch as it provides means whereby such initial cut may usually be made without the use of any jacks, guide shoes, or other additional paraphernalia. It will be noted that, with the machine arranged in this manner, the tendency of the cutting bits, which are driven in the direction indicated by the pointing of the bits in Fig. 1, is to move the inwardly extending end of the cutter bar or chain guide toward the right of a person facing in the direction the machine is moved, as indicated in Fig. 9, or toward the jack 68. By having the drag or pulling cable 59 passing in along the right-hand side of the cutter bar or chain guide and fastened to the stake or jack at that side, this tendency of throwing the machine out of alignment is largely over-

come, and the operator can, in most instances, by properly placing the jack and positioning the machine at the commencement of the cut, make this initial cut without the use of any auxiliary guiding means whatever, such as guide ropes, jacks, or the like. On account of this he is enabled to operate the machine with great rapidity and with little or no loss of time in making the initial cut preparatory for the main cutting operation along the wall. In some instances, as where the coal or material to be cut is usually hard, I may combine the use of both the cable and the rope, for instance as indicated in Fig. 10. In this instance, there is also a further slight modification in that a sheave 70 is secured to the stake or holder 68, or otherwise held adjacent to the face of the coal, and the rope 69 has one end attached to the block of this sheave. The rope is then rove around the sheave 64, then around the sheave 70 and back around the guide roller 33 to the capstan or windlass 32. The cable 59 passes directly from the sheave 60 to a second stake or fastening device 71. By means of this arrangement, when the drum 58 is turned and the rope 69 is tightened so that it will be drawn in by the capstan or windlass, they will both act to move the machine forward so that its cutting mechanism will be forced into and under the coal to make the initial cut.

When the frame carrying the cutter chain has moved in its full length under the coal, the machine is then moved laterally to make the cut along the face of the room. When this cut is to be made, a stake or fastening device 72 is placed at some distance ahead of the machine, adjacent to the face which is being cut and preferably at the opposite corner of the room. The end of the cable 59 is then secured to this stake and the drum 58 turned, which winds up the cable, thereby drawing the machine forward to make the desired cut.

In order to guide the machine as it moves forward, the rope 69 is wound around the snubbing post 34 and the free end held by the operator, so that by drawing on the same it will be tightened around the post, thereby tending to hinder or stop the forward movement of the outer end of the frame, and by the proper manipulation of this rope, together with the control of the winding drum 58, the operator is enabled to carefully guide the machine along the face of the room and to keep the cutting portion at its full depth under the coal which is being undercut. The operator by holding the free end of the rope and paying it to the snubbing post has the machine under constant control at all times and is readily apprised of any undue obstruction to the cutting devices and any consequent undue strain placed upon the machine, and may instantly relieve

the machine by loosening the tension on the free end of the rope. By means of this arrangement it will be seen that the snubbing post slides along the rope and is in frictional engagement therewith. While such a post forms a preferred means for producing a sliding friction on the rope yet it will be apparent that some other form of device might be used in place thereof. The result which is desired being to put a sufficient friction directly on the rope so that it will retard the outer end of the machine. In some instances it may become necessary or desirable to withdraw the cutter bar from under the coal after the machine has proceeded for some distance along the face of the room. In order to do this, the cable 59 may be slightly loosened and then passed around the guide sheave 35, as indicated in Fig. 12, the rope 69 being free from the snubbing post, and the drum 58 then turned. This will cause the frame to be swung around as indicated, thereby exposing the principal portion of the cutter chain and its supporting frame. Another method of doing this is indicated in Fig. 13, in which the rope 69 is removed from the stake 68 and its end brought forward and secured to a stake or support 73 in front of the machine and its free end then wound around the capstan 32 so that by tightening the free end it will cause the outer part of the frame to be swung around as indicated, the drum 58 in the meantime remaining stationary. When the machine is to be swung back into cutting position, this may be accomplished as indicated in Fig. 14 by means of the rope 69 which in this case is wound around the capstan so that the outer end of the frame may be drawn back as indicated. After the cut has been completed, the machine may be swung around and drawn back onto the truck 67 by means of the rope 69, for instance as indicated in Fig. 16.

While these diagrammatic views illustrate various ways of operating the machine by means of one or both of the ropes, it is obvious that the ropes may be arranged in other ways, if desired, in order to move or control the machine, and such illustrations are merely intended to indicate in a general way the method of operation of my invention. It is also obvious that changes may be made in the arrangement of the parts and in the general construction without departing from the spirit of this invention, and therefore I do not wish to be limited to the exact arrangements or details shown and described; but

What I claim and desire to secure by Letters Patent is:

1. In a mining machine, the combination of a frame, a cutter bar projecting from one end of said frame, a winding drum mounted in said frame adjacent to said cutter bar,

a cable engaging with said drum and adapted to be used for pulling said machine when the drum is turned, a capstan mounted at the opposite end of said frame, a rope adapted to be engaged by said capstan for pulling said machine, means for turning said drum and means for turning said capstan.

2. In a mining machine, the combination of a frame, a cutting device at one end of said frame, a winding drum mounted on said frame adjacent to the end carrying the cutting device, a cable engaging with said drum and adapted to be used for drawing the machine when the drum is turned, guide sheaves mounted on said frame for guiding said cable, a capstan mounted on the outer end of said frame, a rope for engagement with said capstan and adapted to move said machine when one end thereof is fixed and the other end drawn so that it will engage closely with the capstan, guide sheaves for said rope mounted on said frame, means for turning said winding drum and means for turning said capstan.

3. In a machine of the character described, the combination with the frame thereof, of means for applying power to the end of the frame adjacent to the cutting apparatus for feeding the machine forward, a guide rope having one end anchored behind the machine, and a snubbing post on the outer end of the frame, adapted to be engaged by said rope for controlling the movement of the machine.

4. A coal mining machine having a feeding mechanism for feeding the machine forward along the face of the wall, consisting in a forwardly projecting feeding cable and means on said machine for winding up said cable, and a controlling device comprising a guide rope having one end fixed at a point behind the machine and a snubbing post on the outer end of said machine, with which said rope is adapted to engage, the arrangement being such that the operator may hold the free end of the rope after it has been passed around the snubbing post while keeping adjacent to the machine.

5. In a mining machine, the combination of a frame, a chain support extending from one end of said frame, a motor mounted in said frame, a cutter chain engaging with said support and driven by said motor, a winding drum mounted between said motor and the end of the frame carrying said chain support, gears for driving said drum from said motor, a clutch connected with said gears for controlling the movement of said drum, a cable engaging with said drum, means for holding the outer end of said cable so

that the machine will move when the drum is turned, a capstan mounted on the opposite end of said frame from said drum, gears for driving said capstan from said motor, a rope, means for securing one end of said rope, whereby, when it is passed around the capstan and the free end drawn tight, the machine will be moved, and guide sheaves or rollers for said cable and rope.

6. In a mining machine, the combination of a slidable frame or housing, an electric motor having a vertical shaft mounted centrally in said housing, a pinion on said shaft, a gear engaging with said pinion, a vertical shaft driven by said gear, a worm on said shaft, a worm gear engaging with said worm, a horizontal shaft driven by said worm gear, a second gear loosely mounted on said last-named shaft, a clutch for driving said gear from said shaft, a gear loosely mounted on a horizontal shaft and engaging with said last-named gear, a pinion on the hub of said last-named gear, a support from said shaft carrying one or more idler gears engaging with said pinion, and a winding drum having an internal gear engaging with said idler gears.

7. The combination of a frame, a cutting apparatus carried thereby, a winding reel on the inner end of the frame, a cable on said reel for propelling the machine when it is in operation, adapted to be fastened to a stationary holder in advance thereof, a guide rope secured at one end to a stationary holder in the rear of the machine and means on the machine to be frictionally and slidably engaged by the rope for retarding the outer end of the machine.

8. In a mining machine, the combination of means adapted to exert a pull on the machine adjacent to the wall for moving the machine forward, a support in the rear of the machine, a rope engaging with said support, and means on the machine to be frictionally and slidably engaged by the rope for retarding the outer end of the machine the amount of such friction being under control of the operator.

9. In a mining machine, the combination of means adapted to exert a pull on the machine adjacent to the wall for moving the machine forward, a rope having one end anchored for retarding the outer end of the machine and stationary means on the machine adapted to be frictionally and slidably engaged by the rope.

RALPH E. NOBLE.

Witnesses:

M. W. MINTZ,
R. WISMAN.