May 5, 1925.

1,536,327

F. CARTLIDGE

MINING MACHINE

Original Filed June 12, 1915 2 Sheets-Sheet 1

Fig. 1.

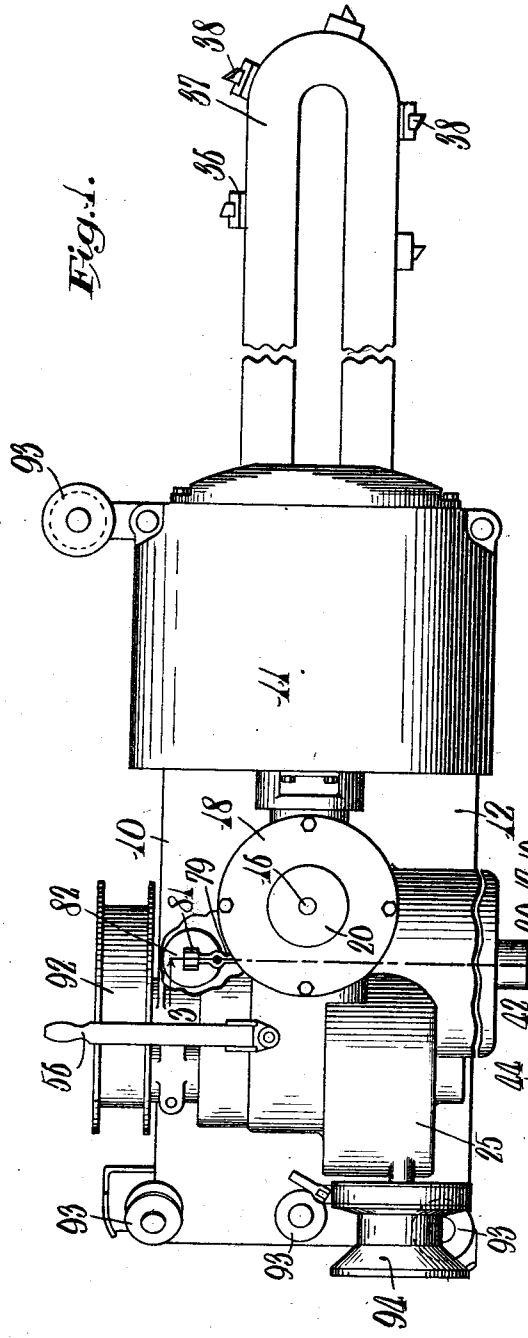
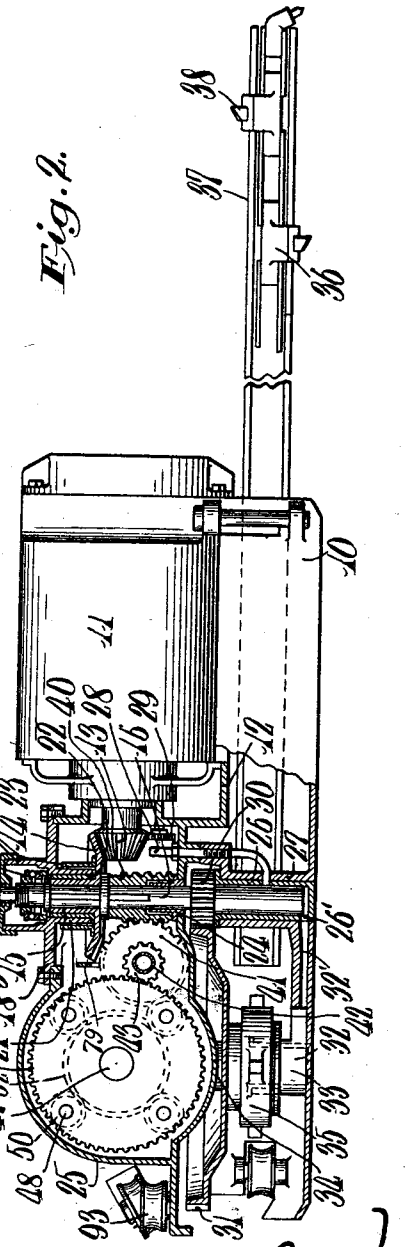


Fig. 2.



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MINING MACHINE

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Fig. 3.

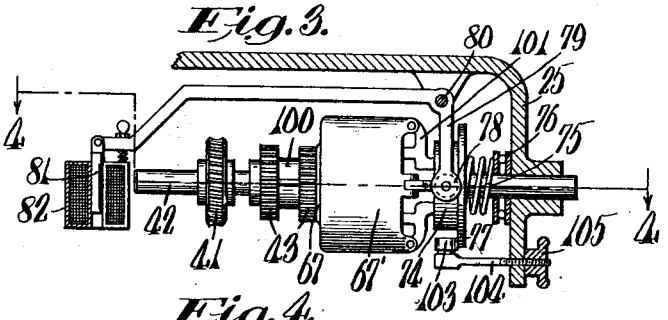


Fig. 4.

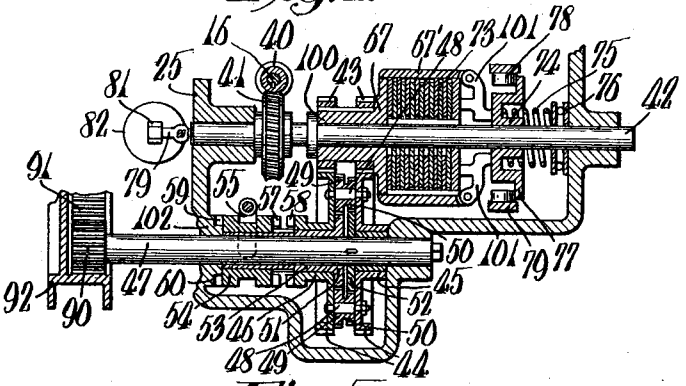


Fig. 5.

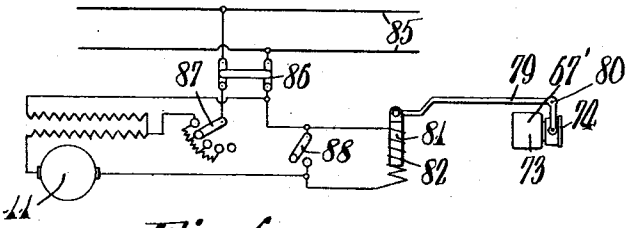
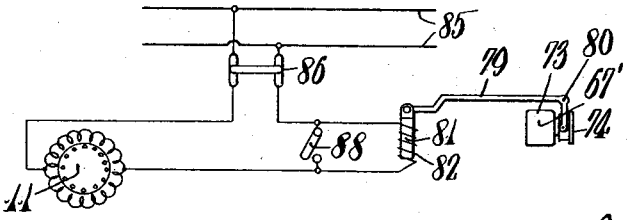


Fig. 6.



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Patented May 5, 1925. 1,536,327

UNITED STATES PATENT OFFICE.

FRANK CARTLIDGE, OF CINCINNATI, OHIO, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS.

MINING MACHINE.

Original application filed June 12, 1915, Serial No. 467,724. Divided and this application filed June 25, 25, 1924. Serial No. 722,373.

To all whom it may concern:

Be it known that I, FRANK CARTLIDGE, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Mining Machines, of which the following is a full, clear, and exact specification.

My invention relates to mining machines. It is an object of my invention to provide an improved mining machine. It is a further object of my invention to provide an improved mining machine having improved feeding mechanism. It is another object of my invention to provide an improved mining machine having improved feeding mechanism by which said machine may be fed at a plurality of predetermined speeds, one a cutting speed and the other a higher speed and under frictional control at each speed. It is a still further object of my invention to provide an improved automatic driving and feeding mechanism for a cutter of any sort and particularly for a mining machine wherein the feeding of the cutter into the material being cut is automatically controlled by the load on the cutter so that the speed of feeding is dependent upon and preferably varies in inverse sense to the load on the cutter. It is a still further object to do this electrically, and by mechanism which requires but a small amount of force for its feed controlling operation for controlling a heavy machine, which is arranged in such a compact manner that it can be used in the very narrow space which is usually available in mining operations, which is self-oiling and in which the driving motor when an electric motor can be either a direct or an alternating current motor, and which will prevent the motor when the latter is an alternating current motor being stalled.

In carrying out my invention I connect a driving motor, which is preferably an electric motor and which may be either a direct current motor or an alternating current motor, by suitable mechanism to the cutter and also connect it to a feed mechanism through a variable speed connection which in the illustrative form of my invention disclosed herein includes a clutch adjustable to permit different amounts of slippage and I control this clutch both automatically and in accordance with the load and manually and arrange the automatic control so that regardless of the manual control it is always in condition to act to reduce the rate of feeding when the load on the motor exceeds a predetermined value.

The present application is a division of my copending application renewal Serial No. 487,724, which was filed June 12, 1915.

In the accompanying drawings I have shown for purposes of illustration one form which my invention may assume in practice, the proportions varying slightly in different figures.

In these drawings—

Fig. 1 is a plan view of a mining machine embodying the illustrative form of my invention with the cutter mechanism partly broken away.

Fig. 2 is a side elevation of such a mining machine with some of the parts in section to show the driving mechanism.

Fig. 3 is a partial section on the line 3—3 of Fig. 1.

Fig. 4 is a view showing the gear connections for the feeding mechanism, the view being taken on the line 4—4 of Fig. 3.

Fig. 5 is a diagrammatic view showing the electrical connections when the driving motor is an electric motor of the commutator type.

Fig. 6 is a similar diagrammatic view showing the connections when the driving motor is an alternating current motor of the squirrel cage type.

In its illustrative form my invention is incorporated in a mining machine having a main frame 10 which has a substantially flat bottom and which carries all the working parts. Power for driving and feeding is furnished by a single electric motor 11 which rests on a horizontal shelf 12 on the main frame 10, such shelf being spaced some distance above the bottom of the frame to provide space for the cutter chain as hereinafter apparent. On the armature shaft of the motor 11 is a bevel pinion 13 which meshes with a bevel gear 14 having an elongated hub 15 which is keyed to a vertical shaft 16 which is hung from its upper end from an adjustable thrust bearing 17 supported in a removable cap plate 18 and located in a pocket formed by an upstanding flange 19 surrounded by a cap

20 which may be removed to fill such pocket with oil or other lubricant. The cap plate 18 also has a downwardly extending flange 21 which surrounds the hub 15 and between which and said hub 15 is a bushing 22 which is kept filled with oil by an upstanding flange 23 carried by the gear 14 and surrounding the space from the flange 21. The oil from the pocket formed by the flange 19 passes down along the bearing surfaces of the bushing 22 and in order to escape must overflow the flange 23. The shaft 16 is further supported by a bushing 24 in the floor of the gear casing 25, which bushing rises a considerable distance above such floor so as to maintain such gear casing partly full of oil and by a bushing 26 mounted in the upstanding flange 27 from the bottom of the main frame 10, the bushing 26 being closed at the bottom to enclose the lower end of the shaft 16. The bearing surfaces of the bushing 26 are lubricated by the oil which overflows from the gear casing 25 through the bushing 24 and also by an overflow pipe 28 which opens into such gear casing about the level of the top of the bushing 24 and leads downward through the floor of such gear casing to communicate with the bushing 26. For further lubrication the driving pinion 13 and oiling idler 29 may be mounted on the main frame 10 to mesh with such pinion and to dip into the oil in the gear casing 25.

Below the floor of the gear casing 25 but above the upper end of the bushing 26 a pinion 30 is fixed on the shaft 16. This pinion meshes with a gear 31 mounted on a shaft 32, which has bearings in bushings mounted in an upstanding circular flange 33 from the bottom of the main frame 10 and in an upstanding flange 34 from the floor of the gear casing 25, the flange 34 being located between some of the parts hereinafter described and overlapping therewith for economy in space. As shown the lower end of the shaft 32 is also lubricated from the casing 25, a suitable passage 32′ in the bottom of the main frame supplying lubricant thereto from the bushing 26 which, as shown, has a suitable port 26′ communicating with said passage. The gear 31 carries a driving sprocket 35, for a cutter chain 36, which is mounted on such sprocket 35 and travels around a suitable projecting frame 37 which extends into the vein of coal to be cut, the frame 37 being supported and the chain 36 being located in the space between the shell 12 and the bottom of the main frame 10. The cutter chain 36 has the usual cutters 38. Thus the motor 11 drives the cutter chain 36 through the pinion 13, gear 14, shaft 16, pinion 30, gear 31 and sprocket 35.

A worm 40 is fixed on the shaft 16 between the floor of the gear casing 25 and the gear 14. The lower end of this worm projects loosely over the upper end of the bushing 24. The worm 40 meshes with a worm gear 41 mounted on a horizontal stub or jack shaft 42. From this shaft 42 the feeding mechanism is driven. The shaft 42 carries coaxially therewith two duplicate pinions 43, which pinions are keyed to and rotate with a member 67 hereinafter described through which member said pinions are adapted to be connected by mechanism also to be later described to the shaft 42 for rotation therewith. The pinions 43 mesh respectively with two duplicate gears 44 mounted on sleeves 45 and 46 respectively, which sleeves are coaxial with and rotatable relative to a horizontal shaft 47, the sleeve 45 fitting directly on a bushing on the shaft 47. The gears 44 are spaced apart but are connected to rotate together by bolts 48 upon each of which bolts are mounted two planet gears 49 and 50 of slightly different size, but rigid with each other so as to rotate together. The gears 49 are shown as slightly larger than the gears 50. The planet gears 49 mesh with the sun gears 51 and planet gears 50 with the sun gear 52, the sun gear 52 being larger than the sun gear 51 to correspond to the difference in size of the planet gears 49 and 50. By reason of the duplication of the gears 43 and pinions 44 all tendency to twist in the planet gears 49 and 50 and in the sun gears 51 and 52 is eliminated. The sun gear 52 is fast on a shaft 47. The sun gear 51 forms part of a sleeve 53 rotatably mounted on the shaft and located between such shaft and the sleeve 46. A sliding sleeve 54 has a slidable toothed connection with the sleeve 53 and is slidable in either direction along such sleeve by a finger 55 which may be operated by a shift lever 56. The sleeve 54 is provided with teeth on both axial ends so that when slid in one direction from neutral position, in which it is free from any locking engagement, teeth 57 on one end thereof engage teeth 58 on the sleeve 46 to lock together the sleeves 46 and 53 and thus cause the sun and planet mechanism to revolve as a unit, and when slid in the other direction from neutral position, teeth 59 on the other end engage teeth 60 on a portion 102 constituting here a part of casing member 25. It will be observed that when the member 54 is slid to the right in Fig. 4 fast speed rotation is transmitted to the shaft 47 and when slid to the left slow speed of rotation of the shaft 47 is produced, the rotation at each speed being in the same direction, namely, in a direction to wind in a flexible feeding member, not shown, which cooperates with the feed operating member hereinafter described. It will be observed that the shaft 47 carries a pinion 90

which meshes with an internal gear 91 formed upon the internal periphery of a feed operating member, herein in the form of a drum member 92 rotatable upon a transverse axis disposed forwardly of the axis of rotation of the shaft 47 and rearwardly of the axis of rotation of the shaft 16. This winding drum may have mounted upon it a rope or cable which extends from it and over any desired ones of the pulleys 93 to move the whole mining machine in the desired direction as the rope or cable is wound upon the drum 92, a second rope or cable being provided on and controlled by a friction controlled take-up drum 94 so that after the cutter bar has been sumped into a mine face the machine may be moved bodily laterally along the face to undercut the same in a well-known manner.

For the purpose of providing a frictional control for the feed operating mechanism which will be effective at either feeding speed, the following construction is provided. It has been noted that the pinions 43 are mounted upon the member 67, being in fact mounted upon a sleeve portion 100 thereof which is loosely mounted on the shaft 42 and fixed to the member 67′ which constitutes a clutch casing between which and the shaft 42 is a multiple disc clutch 73. When the clutch 73 is set, the sleeve 100 and gears 43 rotate with the shaft 42, but when the clutch 73 is released there is more or less slippage between shaft 42 and the sleeve 100, the amount of such slippage depending upon the amount to which the clutch is released. The setting of the clutch 73 is controlled by a plurality of levers 101 pivoted on the clutch casing 67′ and bearing against the end disc of the multiple disc clutch 73, said levers being operated by a sliding sleeve 74 mounted on the shaft and spring pressed to a position to set the clutch 73 by a spring 75 which surrounds the hub of the disc 74 and acts between such disc and the thrust bearing 76 bearing against the gear casing 25. The disc 74 has a peripheral flange 77 which may be engaged by a pair of rollers 78 mounted on a forked lever 79 which straddles the disc 74 and is pivotally mounted on a fixed pivot pin 80 suitably supported on the frame of the casing 25. The lever 79 is connected to the movable core 81 of a solenoid 82 whose electrical connections will shortly be described. Manual means may be provided and are herein shown for releasing clutch 73 and for controlling the degree of loading thereof manually. As shown, one or more rollers 103 are carried by a slidable member 104 which is screw threaded and provided with a nut 105 which cooperates with the casing 25 to slide the member 104. The rollers cooperate with the flange 77 of the disc 74 to shift such disc against the spring 75 to release the clutch 73. Manipulation of the manually controlled nut 105, however, cannot cause an excessive load on the driving motor 11 because the rollers 78 are always in readiness for operation by the solenoid 82 to release the clutch 73 whenever the load on the motor requires it.

The solenoid 82 is connected in series with the motor 11 across any suitable supply circuit 85 through any suitable switch 86 and controlling device 87. The motor 11 is shown in Fig. 5 as a compound wound motor of the commutator type and in Fig. 6 as an induction motor of the squirrel cage type. Because of the series connection of the solenoid 82 the pull of such solenoid varies directly as the load on the motor 11, which load is in the main that due to the cutting mechanism. If desired, a switch 88 may be provided for short-circuiting the solenoid 82.

From what has preceded the mode of operation of this mechanism will be very clearly apparent. When the sleeve 54 is in its middle position, no feeding is obtained as the reaction gear 51 is free to rotate. When the sleeve 54 is thrown to the right to cause intermeshing of the teeth 57 and 58, quick feeding is prevented from causing overload on the motor by the action of the solenoid 82 on the clutch 73. When the sleeve 54 is thrown to the left to cause intermeshing of the teeth 59 and 60 the reaction gear is positively held stationary so that when the clutch 73 is set the shaft 47 is driven to operate the drum 92 at a slow winding speed and in the same direction as rotation occurred in the other operative position of the sleeve 54. Here also, if the feeding which results from this operation of the drum 92 causes the load on the motor to demand too great a current, the solenoid 82 draws in its core 81 and thereby operates the lever 79 to move the disc 74 to the right against the spring 75 to release the clutch 73 to a greater or less extent, thus allowing slipping between the reaction gear 51 and the shaft 42 and thereby diminishing or stopping the feeding action of the drum 92. As the load on the motor varies, the core 81 is moved in or out to cause a releasing or tightening of the clutch 73 and thus to control slippage of the shaft 42 in the sleeve 100 in accordance with the load so that the feeding operation always maintains the load on the motor at substantially a constant value. It will be understood that when the switch 88 is closed, the friction clutch 73 may be loaded to any extent within the capacity of the spring 75 by adjustment of the nut 105 so that the mechanism will produce not only two predetermined feeding speeds, namely, a fast and a slow feeding

speed, but also a plurality of fractional speeds obtained by allowing more or less slipping of the friction clutch. It will be understood that by properly reeving the flexible feeding member (not shown) which is wound upon the drum member 92 in such a direction as to be drawn in when the motor rotates in a direction to drive the cutter chain 36 counterclockwise in its orbit as viewed from above, it is possible to cause the machine to move in such a manner relative to the face as to sump the bar under the coal and to move the entire machine transversely of a working face to effect the cutting of a kerf. It is possible, moreover, to move the machine on to and off of a truck by properly reeving the flexible feeding member, the fast speed being the more frequently used for moving the machine about the entry or onto and off of the truck, while the slow speed is primarily the cutting speed. During the various cutting operations the brake controlled member 94, together with the flexible feeding member employed therewith may be used to control the movements of the machine as may be necessary.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in other forms without departing from its spirit or the scope of the appended claims.

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

1. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a feed operating member rotating on a transverse axis, a flexible feeding member cooperating therewith and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member concentric with and fixed during driving of said feed operating member as to angular movement with respect thereto, a pinion mounted on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, and means for driving said last mentioned shaft from said motor.

2. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member concentric with and fixed during drum driving as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, and means for driving said last mentioned shaft from said motor including a worm wheel on said shaft and a worm driven by said motor.

3. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member concentric with and fixed during drum driving as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, and means for driving said last mentioned shaft from said motor including a worm wheel on said shaft and a worm driven by said motor and rotating on a vertical axis to the rear of the latter.

4. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting

including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member coaxial with and fixed during drum driving as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, and means for driving said last mentioned shaft from said motor including a worm wheel on said shaft and a worm driven by said motor and rotating on a vertical axis to the rear of the latter, said motor having an armature shaft longitudinally disposed with respect to said frame and said last mentioned means also including a bevel pinion on said armature shaft and a bevel gear coaxial with and above said worm.

5. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member concentric with and fixed during drum driving as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, and means for driving said last mentioned shaft from said motor rotating on a vertical axis to the rear of the latter.

6. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member coaxial with and fixed during drum driving as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, and means for driving said last mentioned shaft from said motor including a worm wheel on said shaft and a worm driven by said motor, said motor having an armature shaft longitudinally disposed with respect to said frame and said means including a bevel pinion on said armature shaft and a bevel gear coaxial with and above said worm.

7. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member coaxial with and fixed during drum driving as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, means for driving said last mentioned shaft from said motor including a worm rotating on a vertical axis to the rear of the latter, and means arranged with reference to said worm at the other side of said friction controlled pinion for interrupting drive of said drum.

8. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope

wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member coaxial with and fixed during drum driving as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, and means for driving said last mentioned shaft from said motor including a worm wheel on said shaft and a worm driven by said motor, said motor having an armature shaft longitudinally disposed with respect to said frame and said last mentioned means including a bevel pinion on said armature shaft and a bevel gear coaxial with and above said worm, and means arranged with reference to said worm at the other side of said friction controlled pinion for interrupting drive of said drum.

9. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a feed operating member rotating on a transverse axis, a flexible feeding portion cooperating therewith and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a driving connection between one of said transverse shafts and said feed operating member, including a gear concentric with said feed operating member and a pinion on said shaft, a gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said pinion to said shaft, means for driving said last mentioned shaft from said motor, and means under frictional control for regulating the motion of the machine frame including a flexible portion extending during transverse cutting to a point behind the machine frame and a member cooperating therewith disposed further to the rear on said frame than said feed operating member and rotating on a horizontal axis.

10. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member concentric with and fixed during drum drive as to angular movement with respect to said drum, a pinion on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, means for driving said last mentioned shaft from said motor including a worm wheel on said shaft and a worm driven by said motor, and means under frictional control for regulating the motion of the machine frame including a second drum further to the rear of said frame than said first mentioned drum and rotating on a horizontal axis, and a flexible cable wound thereon and extending during transverse cutting to a point behind the machine frame.

11. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member concentric with and fixed during drum drive as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, means for driving said last mentioned shaft from said motor including a worm wheel on said shaft and a worm driven by said motor and rotating on a vertical axis to the rear of the latter, and means under frictional control for regulating the motion of the machine frame including a second drum further to the rear of said frame than said first mentioned drum and rotating on a horizontal axis and a flexible

cable wound thereon and extending during transverse cutting to a point behind the machine frame.

12. A room and pillar mining machine comprising a machine frame slidable on its bottom over a mine bottom, cutting mechanism including a cutter bar projecting longitudinally therefrom, a motor for actuating said cutting mechanism, and means for feeding said frame to sump said bar under the coal and thereafter to move said frame and bar laterally across a face during cutting including a pair of parallel transversely extending shafts, a rope winding drum rotating on a transverse axis, a rope wound thereon and adapted to extend during transverse cutting from a point adjacent the front end of said frame to a point in advance of said frame, a gear member coaxial with and fixed during drum drive as to angular movement with respect to said drum, a pinion journaled on one of said transverse shafts and meshing with said gear, a second gear on said shaft, a pinion on the other of said first mentioned shafts meshing with said last mentioned gear, friction mechanism for connecting said last mentioned pinion to said shaft, means for driving said last mentioned shaft from said motor including a worm wheel on said shaft and a worm driven by said motor and rotating on a vertical axis to the rear of the latter, said motor having an armature shaft longitudinally disposed with respect to said frame and means including a bevel pinion on said armature shaft and a bevel gear coaxial with and above said worm, and means under frictional control for regulating the motion of the machine frame including a second drum further to the rear of said frame than said first mentioned drum and rotating on a horizontal axis and a flexible cable wound thereon and extending during transverse cutting to a point behind the machine frame.

13. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating on a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said bevel gear and said driving sprocket, and feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm, and friction controlled driving connections between said shaft and said feed operating member including a friction clutch coaxial with said worm wheel.

14. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating on a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said bevel gear and said driving sprocket, and feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm, and friction controlled driving connections between said shaft and said feed operating member including a second shaft parallel to said transverse shaft and a friction clutch concentric with one of said shafts.

15. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating on a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said bevel gear and said driving sprocket and feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm, and friction controlled driving connections between said shaft and said feed operating member including a second shaft parallel to said transverse shaft and a friction clutch concentric with said worm wheel carrying shaft and controlling the driving of said second shaft by said first mentioned shaft.

16. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating upon a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said vertical shaft and said driving sprocket and feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm, and friction controlled driving connections between said bevel gear and said feed oper-

ating member including friction controlling mechanism coaxial with said worm wheel.

17. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating upon a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said vertical shaft and said driving sprocket and feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm, and friction controlled driving connections between said bevel gear and said feed operating member including a second shaft parallel to said transverse shaft and frictional controlling mechanism coaxial with one of said shafts and controlling all driving of the second mentioned transverse shaft by said first mentioned transverse shaft.

18. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating upon a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said bevel gear and said driving sprocket, and feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm, a driving element on said shaft, a friction clutch coaxial with said last mentioned shaft, said driving element being intermediate said worm wheel and friction clutch, and operative connections between said driving element and said feed operating member.

19. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating upon a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said bevel gear and said driving sprocket, and feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm, a driving element on said shaft, a friction clutch coaxial with said last mentioned shaft, said driving element being intermediate said worm wheel and friction clutch, operative connections between said driving element and said feed operating member, and means operative though said friction clutch is loaded and said motor running to interrupt the driving of said feed operating member by said motor.

20. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating upon a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said bevel gear and said driving sprocket, mechanism for feeding said machine bodily laterally along the mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm, and friction controlled driving connections between said shaft and said feed operating member including a friction clutch coaxial with said worm wheel, and means including a flexible member, a rotatable member cooperating therewith, and a friction device for varying the resistance to rotation thereof in a paying out direction for controlling the angular position of said machine during cutting.

21. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a bevel gear rotating on a vertical axis to the rear of said armature shaft and disposed above and meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said bevel gear and said driving sprocket, feeding mechanism for feeding said machine bodily laterally along the mine face including a feed operating member rotatable upon a transversely extending axis, a worm coaxial with and rotated by said bevel gear, a transverse shaft carrying a worm wheel driven by said worm and friction controlled driving connection between said shaft and said feed operating member including a second shaft parallel to said transverse shaft, a driven element on said second transverse shaft, a driving element on said first transverse shaft and a friction clutch at the opposite side of said driving element with respect to said worm wheel on said first mentioned transverse shaft, and

means including a flexible member, a rotatable member cooperating therewith and a friction device for varying the resistance to rotation thereof in a paying out direction for controlling the angular position of said machine during cutting.

22. In a room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket, driving means therefor actuated by said motor including an element rotating on a vertical axis, said element on rotation carrying therewith a worm, and means for feeding said machine including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, and means for driving the same at a plurality of predetermined speeds in one direction with said motor running in one direction including plural speed planetary gearing frictionally controlled at either speed and driven by said worm.

23. In a room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket, driving means therefor actuated by said motor including an element rotating on a vertical axis and carrying therewith a worm, and means for feeding said machine including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, and means for driving the same at a plurality of predetermined speeds in one direction with said motor running in one direction including plural speed planetary gearing frictionally controlled at either speed and driven by said worm, and controlling means for said gearing including an element reciprocable in a direction perpendicular to the plane of orbital movement of the planetary gearing to change the speed produced thereby.

24. In a room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket, driving means therefor actuated by said motor including an element rotating on a vertical axis and carrying therewith a worm, and means for feeding said machine including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, and means for driving the same at a plurality of predetermined speeds in one direction with said motor running in one direction including plural speed planetary gearing frictionally controlled at either speed and driven by said worm, and controlling means for said planetary gearing including an element reciprocable along the line perpendicular to the orbit and coincident with the axis of orbital movement of said planetary gearing to effect a change in the speed produced.

25. In a room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket, and driving means therefor including a bevel pinion on said armature shaft, a bevel gear rotatable on a vertical axis and driven by said bevel pinion, a spur pinion coaxial with said bevel gear, a second spur gear rotating on a vertical axis, and operative connections between said last mentioned spur gear and said cutter chain driving sprocket, and feeding means for said mining machine including a flexible feeding member, a feed operating member rotatable on a transverse axis and cooperating with said flexible feeding member, a worm rotatable with one of said elements rotating on a vertical axis, and means driven by said worm for driving said feed operating member at a plurality of predetermined speeds in one direction with said motor running in one direction including a plural predetermined speed planetary gearing frictionally controlled at either speed and driven by said worm.

26. In a room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket and driving means therefor including a bevel pinion on said armature shaft, a bevel gear rotatable on a vertical axis and driven by said bevel pinion, a spur gear coaxial with said bevel gear, a second spur gear rotating on a vertical axis, and operative connections between said last mentioned spur gear and said cutter chain driving sprocket, and feeding means for said mining machine including a flexible feeding member, a feed operating member rotatable on a transverse axis and cooperating with said flexible feeding member, a worm rotatable with one of said elements rotating on a vertical axis, and means driven by said worm for driving said feed operating member at a plurality of predetermined speeds in one direction with said motor running in one direction including plural predetermined speed planetary gearing frictionally controlled at either speed, and controlling means for said gearing including an element reciprocable in a direction perpendicular to the plane of orbital movement of the planetary gearing to change the speed produced thereby.

27. In a room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket and driving means therefor including a bevel pinion on said armature shaft, a bevel gear rotatable on a vertical axis and

driven by said bevel pinion, a spur gear coaxial with said bevel gear, a second spur gear rotating on a vertical axis, and operative connections between said last mentioned spur gear and said cutter chain driving sprocket, feeding means for said mining machine including a flexible feeding member, a feed operating member rotatable on a transverse axis and cooperating with said flexible feeding member, a worm rotatable with one of said elements rotating on a vertical axis, and means driven by said worm for driving said feed operating member at a plurality of predetermined speeds in one direction with said motor running in one direction including plural speed planetary gearing frictionally controlled at speeds, and controlling means for said planetary gearing including an element reciprocable along the line perpendicular to the orbit and coincident with the axis of orbital movement of said planetary gearing to effect a change in the speed produced.

28. In a room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a cutter-chain driving sprocket and driving means therefor including a bevel pinion on said armature shaft, a bevel gear rotatable on a vertical axis and driven by said bevel pinion, a spur gear coaxial with said bevel gear, a second spur gear rotating on a vertical axis, and operative connections between said last mentioned spur gear and said cutter chain driving sprocket, and feeding means for said mining machine including a flexible feeding member, a feed operating member rotatable on a transverse axis and cooperating with said flexible feeding member, a worm rotatable with one of said elements rotating on a vertical axis, means driven by said worm and frictionally controlled at all speeds for driving said feed operating member at a plurality of predetermined speeds in one direction with said motor running in one direction including, a worm wheel driven by said worm and rotating on a transversely extending axis, and mechanism for transmitting power from said worm wheel to said feed operating member including planetary gearing including orbitally moving elements the axis of whose orbital movement extends transversely and is disposed further from said armature shaft than the axis of rotation of said worm wheel and said feed operating member.

29. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, and feeding mechanism operated by the other including a flexible feeding member, a winding member cooperating therewith and rotatable on a horizontal transverse axis, and means actuated by said last mentioned driving element for rotating said winding member at a plurality of predetermined speeds to cause the same to draw in said flexible feeding member at a plurality of speeds and under frictional control at each speed while said motor runs in one direction, said last mentioned means including friction mechanism having a horizontal axis.

30. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, and feeding mechanism operated by the other including a flexible feeding member, a winding member cooperating therewith, and means actuated by said last mentioned driving element for rotating said winding member at a plurality of predetermined speeds to cause the same to draw in said flexible feeding member at a plurality of speeds and under friction control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame.

31. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, and feeding mechanism operated by the other including a flexible feeding member, a winding member cooperating therewith, and means actuated by said last mentioned driving element for causing said winding member to draw in said flexible feeding member at a plurality of predetermined speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed platentary gear reduction all of whose elements rotate on axes extending transversely of said frame and driving means therefor including an element actuated by said last mentioned driving element and rotating on an axis parallel to a line perpendicular to the axis of said shaft.

32. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, and feeding mechanism operated by the other including a flexible feeding member, a winding member cooperating therewith, and means actuated by said last mentioned driving element for causing said winding member to draw in said flexible feeding member at a plurality of predetermined speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame and driving means therefor including an element actuated by said last mentioned driving element and rotating on an axis parallel to a line perpendicular to the axis of said shaft, and means for controlling the speed of drive of said planetary gear reduction including an element reciprocable in a direction parallel to the axes of rotation of the elements of said planetary gearing and operative in different positions to effect different cooperation between the elements of said gearing.

33. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, and feeding mechanism operated by the other including a flexible feeding member, a winding member cooperating therewith, and means actuated by said last mentioned driving element for causing said winding member to rotate at a plurality of predetermined speeds in the same direction to draw in said flexible feeding member at a plurality of speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame, and means for controlling the speed of drive of said planetary gear reduction including an element reciprocable in a direction parallel to the axes of rotation of the elements of said planetary gearing and operative in different positions to effect different cooperation between the elements of said gearing.

34. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted which is rotatable with said gear, a worm and a driving pinion on said shaft each rigidly connected thereto, cutting mechanism driven by said last mentioned driving pinion, and feeding mechanism operated by said worm including a flexible feeding member, a winding member cooperating therewith, and means actuated by said worm for causing said winding member to draw in said flexible feeding member at a plurality of predetermined speeds and under frictional control at each speed while said motor runs in one direction.

35. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted which is rotatable with said gear, a worm and a driving pinion on said shaft, cutting mechanism driven by said last mentioned driving pinion, and feeding mechanism operated by said worm including a flexible feeding member, a winding member cooperating therewith, and means actuated by said worm for causing said winding member to rotate at a plurality of predetermined speeds in the same direction to draw in said flexible feeding member at a plurality of speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame.

36. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted which is rotatable with said gear, a worm and a driving pinion on said shaft, cutting mechanism driven by said last mentioned driving pinion, and feeding mechanism operated by said worm including a flexible feeding member, a winding member cooperating therewith and means actuated by said worm for causing said winding member to rotate at a plurality of predetermined speeds in the same direction to draw in said flexible feeding member at a plurality of speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending

transversely of said frame, and driving means therefor including a worm wheel actuated by said worm and rotating an element of said planetary gearing.

37. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted which is rotatable with said gear, a worm and a driving pinion on said shaft, cutting mechanism driven by said last mentioned driving pinion, and feeding mechanism operated by said worm including a flexible feeding member, a winding member cooperating therewith and means actuated by said worm for causing said winding member to rotate at a plurality of predetermined speeds in the same direction to draw in said flexible feeding member at a plurality of speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame, driving means therefor including a worm wheel actuated by said worm and rotating an element of said planetary gearing, and means for controlling the cooperation of the elements of said planetary gearing to effect a different speed of drive therethrough including a member reciprocable in a direction transverse of said machine frame.

38. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism including a bar rigidly projecting longitudinally from said frame during cutting and a circulating cutter chain and driven by one of said elements and feeding mechanism operated by the other of said elements including a flexible feeding member, a feed operating member cooperating therewith and rotating on a transverse axis, and means actuated by said last mentioned driving element for causing said winding member to draw in said flexible feeding member at a plurality of predetermined speeds and under frictional control at each speed while said motor runs in one direction.

39. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism including a bar rigidly projecting longitudinally from said frame during cutting and a circulating cutter chain and driven by one of said elements and feeding mechanism operated by the other of said elements including a flexible feeding member, a feed operating member cooperating therewith and rotating on a tranversely extending axis, multi-predetermined-speed driving means therefor frictionally controlled at each speed including a planetary gear reduction, and means for causing the elements thereof to cooperate differently to produce different predetermined driving speeds.

40. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism including a bar rigidly projecting longitudinally from said frame during cutting and a circulating cutter chain and driven by one of said elements and feeding mechanism operated by the other of said elements including a flexible feeding member, a feed operating member cooperating therewith and rotating on a transversely extending axis, multi-predetermined-speed driving means therefor frictionally controlled at each speed including a planetary gear reduction, and means for causing the elements thereof to cooperate differently to produce different predetermined driving speeds, said planetary gear reduction being so constructed and arranged that all of the elements thereof rotate on transversely extending axes.

41. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements fixed to said shaft, cutting mechanism driven by one of said elements, and machine feeding and guiding mechanism including a plurality of flexible feeding portions extending in opposite directions from opposite ends of said machine frame during cutting across a face, means operated by the other of said driving elements including a feed operating member rotatable on a transverse axis and cooperating with one of said portions to effect movement of the machine toward the end of said

portion remote from said machine, and means frictionally controlled at each speed for effecting rotation of said feed operating member at a plurality of predetermined speeds and means for controlling the length of said other portion.

42. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements fixed to said shaft, cutting mechanism driven by one of said elements, and machine feeding and guiding mechanism including a plurality of flexible feeding portions extending in opposite directions from opposite ends of said machine frame during cutting across a face, means operated by the other of said driving elements including a feed operating member cooperating with one of said portions to effect movement of the machine toward the end of said portion remote from said machine, and means frictionally controlled at each speed for effecting rotation of said feed operating member at a plurality of predetermined speeds and means for controlling the length of said other portion including a member rotatable on a horizontal axis and cooperating with said last mentioned portion and frictional controlling means controlling the rate of rotation of said member.

43. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements rigid on said shaft, cutting mechanism driven by one of said elements, feeding mechanism operated by the other including a flexible feeding portion, a winding member cooperating therewith, and means actuated by said last mentioned driving element for causing said winding member to draw in said flexible feeding member at a plurality of predetermined speeds and under frictional control at each speed while said motor runs in one direction, and frictionally controlled means for controlling the angle of said machine relative to a working face including a second flexible feeding portion and a frictionally controlled rotatable element cooperating therewith.

44. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, feeding mechanism operated by the other including a flexible feeding portion, a winding member cooperating therewith, and means actuated by said last mentioned driving element for causing said winding member to draw in said flexible feeding member at a plurality of predetermined speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame, frictionally controlled means for controlling the angle of said machine relative to a working face including a second flexible feeding portion and a frictionally controlled rotatable element cooperating therewith.

45. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, feeding mechanism operated by the other including a flexible feeding portion, a winding member cooperating therewith, and means actuated by said last mentioned driving element for causing said winding member to rotate at a plurality of predetermined speeds to draw in said flexible feeding member at a plurality of speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame, and driving means therefor including an element actuated by said last mentioned driving element and rotating on an axis parallel to a line perpendicular to the axis of said shaft, and frictionally controlled means for controlling the angle of said machine relative to a working face including a second flexible feeding portion and a frictionally controlled rotatable element cooperating therewith.

46. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, feeding mechanism operated by the other

including a flexible feeding portion, a winding member cooperating therewith, and means actuated by said last mentioned driving element for causing said winding member to rotate at a plurality of predetermined speeds in one direction to draw in said flexible feeding member at a plurality of speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame and driving means therefor including an element actuated by said last mentioned driving element and rotating on an axis parallel to a line perpendicular to the axis of said shaft, and means for controlling the speed of drive of said planetary gear reduction including an element reciprocable in a direction parallel to the axes of rotation of the elements of said planetary gearing and operative in different positions to effect different cooperation between the elements of said gearing, and frictionally controlled means for controlling the angle of said machine relative to a working face including a second flexible feeding portion and a frictionally controlled rotatable element cooperating therewith.

47. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable with said gear, a plurality of driving elements on said shaft, cutting mechanism driven by one of said elements, feeding mechanism operated by the other including a flexible feeding portion, a winding member cooperating therewith, and means actuated by said last mentioned driving element for causing said winding member to rotate at a plurality of predetermined speeds in one direction to draw in said flexible feeding member at a plurality of speeds and under frictional control at each speed while said motor runs in one direction including a multi-speed planetary gear reduction all of whose elements rotate on axes extending transversely of said frame, and means for controlling the speed of drive of said planetary gear reduction including an element reciprocable in a direction parallel to the axes of rotation of the elements of said planetary gearing and operative in different positions to effect different cooperation between the elements of said gearing, and frictionally controlled means for controlling the angle of said machine relative to a working face including a second flexible feeding portion and a frictionally controlled rotatable element cooperating therewith.

48. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm rigidly mounted on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and mechanism for feeding said machine laterally during cutting including a flexible feeding member, a feed operating member cooperating therewith, and driving mechanism for said feed operating member including driving gear operative to effect rotation thereof at a plurality of predetermined speeds and including at each of such speeds frictional means for limiting the power transmissible.

49. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a shaft disposed in a common plane with said first mentioned shaft, a gear on said second mentioned shaft driven by said pinion and effecting rotation of said second mentioned shaft, a worm rigidly fixed on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and mechanism for feeding said machine laterally during cutting including a flexible feeding member, a feed operating member cooperating therewith, and plural speed driving mechanism therefor driven by said worm and providing a plurality of predetermined speeds at each of which it is frictionally controlled.

50. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and mech-

anism for feeding said machine laterally during cutting including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, and driving mechanism for said feed operating member including driving gearing operative to effect rotation thereof at a plurality of predetermined speeds and including at each of such speeds frictional means for limiting the power transmissible.

51. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and mechanism for feeding said machine laterally during cutting including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, and driving mechanism for said feed operating member including driving gearing operative to effect rotation thereof at a plurality of predetermined speeds and including at each of such speeds frictional means for limiting the power transmissible.

52. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and mechanism for feeding said machine laterally during cutting including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, and driving mechanism for said feed operating member including driving gearing including planetary gearing and operative to effect rotation thereof at a plurality of predetermined speeds and including at each of such speeds frictional means for limiting the power transmissible, said feed operating member rotating on a transversely extending axis disposed in front of and parallel to the axis about which the orbital movement of said planetary gearing takes place.

53. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and mechanism for feeding said machine laterally during cutting including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, and driving mechanism for said feed operating member including driving gearing including planetary gearing and operative to effect rotation thereof at a plurality of predetermined speeds and including at each of such speeds frictional means for limiting the power transmissible, said feed operating member rotating on a transversely extending axis disposed intermediate the axis of orbital rotation of said planetary gearing and said armature pinion.

54. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm rigidly mounted on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and means for effecting feeding of said mining machine and controlling the angle thereof to the face during cutting across a face including a plurality of flexible feeding portions extending in opposite directions from the opposite ends to said frame during cutting across a face, a feed operating member cooperating with the forwardly extending portion, driving mechanism for said feed operating member including a driving gearing operative to effect rotation thereof at a plurality of predetermined speeds and including at each of said speeds frictional means for limiting the power transmissible and a rotatable member rotating on a hori-

zontal axis and arranged adjacent the rear end of said machine and cooperating with the rearwardly extending flexible portion and provided with frictional controlling means.

55. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and means for effecting feeding of said mining machine and controlling the angle thereof to the face during cutting across a face including a plurality of flexible feeding portions extending in opposite directions from the opposite ends of said frame during cutting across a face, a feed operating member cooperating with the forwardly extending portion, driving mechanism for said feed operating member including driving gearing including planetary gearing and operative to effect rotation thereof at a plurality of predetermined speeds and including at each of said speeds frictional means for limiting the power transmissible, and a rotatable member rotating on a horizontal axis and arranged adjacent the rear end of said machine and cooperating with the rearwardly extending flexible portion and provided with frictional controlling means, said feed operating member rotating on a transversely extending axis disposed in front of and parallel to the axis about which the orbital movement of said planetary gearing takes place.

56. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and means for effecting feeding of said mining machine and controlling the angle thereof to the face during cutting across a face including a plurality of flexible feeding portions extending in opposite directions from the opposite ends of said frame during cutting across a face, a feed operating member cooperating with the forwardly extending portion, driving mechanism for said feed operating member including driving gearing including planetary gearing and operative to effect rotation thereof at a plurality of predetermined speeds and including at each of said speeds frictional means for limiting the power transmissible, and a rotatable member rotating on a horizontal axis and arranged adjacent the rear end of said machine and cooperating with the rearwardly extending flexible portion and provided with frictional controlling means, said feed operating member rotating on a transversely extending axis disposed intermediate the axis of orbital rotation of said planetary gearing and said armature shaft.

57. In a room and pillar mining machine, a machine frame having a cutter bar projecting therefrom longitudinally, a cutter chain on said bar, a motor on said frame, driving means for said chain actuated by said motor, and means for feeding said machine to sump said bar into a working face including a flexible feeding member adapted to be placed under tension during sumping, a feed operating member cooperating therewith, and actuating means for said feed operating member effective to rotate the same at either of two predetermined speeds and frictionally controlled at either speed, said means including epicyclic gearing comprising elements cooperating differently during drive at said two predetermined speeds.

58. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of the shaft, a vertical shaft arranged to the rear of said armature shaft and carrying a bevel gear adjacent the upper end thereof meshing with said driving pinion, a cutter chain driving sprocket, driving connections between said vertical shaft and said cutter chain driving sprocket and mechanism driven by said motor for feeding said machine bodily laterally along a mine face during cutting including a feed operating member rotatable upon a horizontal axis, and actuating means therefor including a worm rotatable upon a vertical axis, a worm wheel driven thereby and a friction clutch between said worm wheel and said feed operating member.

59. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a vertical shaft arranged at the rear of said armature shaft and carrying a bevel gear adjacent the upper end thereof meshing with said driv-

ing pinion, a cutter chain driving sprocket, driving connections between said vertical shaft and said driving sprocket, and feeding mechanism for feeding said machine bodily laterally along a mine face during cutting including a feed operating member rotatable upon a transverse axis and actuating means therefor operative to effect drive thereof at a plurality of speeds including worm gearing including driving and driven elements and friction clutch means coaxial with the latter.

60. A room and pillar mining machine including a motor having an armature shaft rotatable upon an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a vertical shaft arranged to the rear of said armature shaft and carrying a bevel gear adjacent the upper end thereof and meshing with said driving pinion, a cutter chain driving sprocket and driving connections between said vertical shaft and said driving sprocket, and feeding mechanism for feeding said machine bodily laterally along a mine face during cutting including a feed operating member rotatable upon a transversely extending axis and actuating means therefor including a worm rotatable upon a vertical axis, a worm wheel rotatable upon a transversely extending axis and friction clutch means coaxial with said worm wheel.

61. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a vertical shaft arranged to the rear of said armature shaft and carrying a bevel gear adjacent the upper end thereof meshing with said driving pinion, a cutter chain driving sprocket, a driving gear therefor coaxial therewith, a driving connection between said vertical shaft and said driving gear, and feeding mechanism for feeding said machine bodily laterally along a mine face during cutting including a feed operating member rotatable upon a horizontal axis lying in a line whose projection vertically cuts said driving gear and actuating means therefor including a worm rotatable upon a vertical axis, a worm wheel rotatable upon a horizontal transverse axis whose projection vertically also cuts said driving gear, and friction clutch mechanism coaxial with said worm wheel.

62. A room and pillar mining machine including a motor having its armature shaft rotating on an axis extending longitudinally of the machine, cutting mechanism including a cutter chain driving sprocket, a driving gear therefor coaxial therewith, feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member and driving mechanism therefor including a worm rotating upon a vertical axis and in a direction opposite to the direction of rotation of said driving gear, a worm wheel driven by said worm and a friction clutch coaxial with said worm wheel.

63. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion on the rear end of said shaft, a vertical shaft arranged to the rear of said armature shaft and carrying a bevel gear adjacent the upper end meshing with said winding pinion, a cutter chain driving sprocket, a driving connection between said vertical shaft and said driving sprocket, and feeding mechanism for feeding said machine bodily laterally along the mine face during cutting including a feed operating member and actuating means therefor operative to actuate the same at a plurality of predetermined speeds and frictionally controlled at each of said predetermined speeds including a worm rotatable upon a vertical axis.

64. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion on the rear end of said shaft, a vertical shaft arranged to the rear of said armature shaft and carrying a bevel gear adjacent the upper end meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said vertical shaft and said driving sprocket, and mechanism for feeding said machine bodily laterally along the mine face during cutting including a feed operating member rotatable upon a horizontal axis and actuating means therefor including a worm rotatable upon a vertical axis, a worm wheel driven thereby, and friction clutch means coaxial with said worm wheel.

65. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, a bevel driving pinion on the rear end of said shaft, a vertical shaft arranged to the rear of said armature shaft and carrying a bevel gear adjacent the upper end meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said vertical shaft and said driving sprocket, and feeding mechanism for feeding said machine bodily laterally along the mine face during cutting including a feed operating member rotatable upon a transverse axis and actuating means therefor including a worm rotatable upon a vertical axis, a worm wheel rotatable upon an axis parallel to said transverse axis, and friction clutch mechanism coaxial with said worm wheel.

66. A room and pillar mining machine including a motor having its armature shaft

rotatable on an axis extending longitudinally of the machine, a bevel driving pinion upon the rear end of said shaft, a vertical shaft arranged to the rear of said armature shaft and carrying a bevel gear adjacent the upper end thereof meshing with said driving pinion, a cutter chain driving sprocket, a driving connection between said vertical shaft and said driving sprocket, and mechanism driven by said motor for feeding said machine bodily laterally along the mine face during cutting including a feed operating member and actuating means therefor including a worm rotatable upon a vertical axis, a worm wheel driven thereby and rotatable upon an axis parallel to the axis of rotation of said feed operating member, and friction clutch mechanism coaxial with said worm wheel.

67. A room and pillar mining machine including a motor having its armature shaft rotating on an axis extending longitudinally of the machine, cutting mechanism including a cutter chain driving sprocket, a driving gear therefor coaxial therewith, and mechanism driven by said motor for feeding said machine bodily laterally along the mine face including a feed operating member and driving mechanism therefor including a worm rotatable upon a vertical axis and in a direction opposite to the direction of rotation of said driving gear, a worm wheel driven by said worm, and friction clutch mechanism coaxial with said worm wheel.

68. A room and pillar mining machine including a motor having its armature shaft rotating on an axis extending longitudinally of the machine, cutting mechanism including a cutter chain driving sprocket, a driving gear therefor coaxial therewith, and mechanism driven by said motor for feeding said machine bodily laterally along the mine face including a feed operating member rotating on a transverse axis and driving mechanism therefor including a worm rotatable upon a vertical axis and in a direction opposite to the direction of rotation of said driving gear, a worm wheel rotating on a parallel transverse axis driven by said worm, and friction clutch mechanism coaxial with said worm wheel.

69. A room and pillar mining machine slidable upon its bottom including a motor having a longitudinally extending armature shaft, a driving pinion carried thereby, a shaft carrying a gear driven by said driving pinion and also carrying and rotating therewith in fixed angular relation thereto, a worm and a driving pinion, cutting mechanism including a cutter chain driving sprocket driven by said last mentioned driving pinion, and feeding mechanism including a worm wheel driven by said worm, a feed operating member, and means for effecting rotation thereof at a plurality of predetermined speeds frictionally controlled at each of said speeds.

70. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, cutting mechanism including a cutter chain driving sprocket, a driving gear therefor coaxial therewith, feeding mechanism for feeding said machine bodily laterally along the mine face at a plurality of friction controlled predetermined speeds including a feed operating member, a worm wheel, planetary driving connections coaxial with said worm wheel between said worm wheel and said operating member, and clutch mechanism including a member reciprocable axially of said worm wheel and planetary driving connections and means for actuating said cutter chain sprocket driving gear and said worm wheel by power from said motor including a driving pinion on said armature shaft, a gear meshing therewith and driven thereby, a shaft on which said last mentioned gear is fixed, a worm on said shaft engaging said worm wheel, and a pinion on said shaft engaging said cutter chain driving sprocket driving gear, said worm being between the gear and pinion on said shaft.

71. A room and pillar mining machine including a motor having its armature shaft rotatable on an axis extending longitudinally of the machine, cutting mechanism including a cutter chain driving sprocket, a driving gear therefor coaxial therewith, feeding mechanism for feeding said machine bodily laterally along a mine face including a feed operating member, a worm wheel and planetary driving connections between said worm wheel and said operating member including a plurality of orbitally moving gears, and a plurality of mutually coaxial gears with which said orbitally moving gears mesh, frictional controlling means operative irrespective of the mode of cooperation of said planetary driving connections to interrupt the drive on overload, and means for rotating said cutter chain driving sprocket driving gear and said worm wheel by power from said motor including a driving pinion on said armature shaft, a gear meshing therewith and driven thereby, a shaft on which said last mentioned gear is fixed, a worm on said shaft engaging said worm wheel and a pinion on said shaft engaging said cutter chain driving sprocket driving gear.

72. In a mining mechanism, a frame carrying in rigid relation thereto during cutting a longitudinally projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving

means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed frictionally controlled at either speed and including flexible feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connection between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter and planetary gearing coaxial therewith.

73. In a mining mechanism, a frame carrying in rigid relation thereto a longitudinally projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed frictionally controlled at either speed and including flexible feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter and planetary gearing coaxial therewith and comprising a plurality of sun gears and a plurality of planet gears.

74. In a mining mechanism, a frame carrying in rigid relation thereto a longitudinally projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed frictionally controlled at either speed and including flexible feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter and planetary gearing coaxial therewith and comprising a plurality of orbitally moving gears and a plurality of mutually coaxial gears with which said orbitally moving gears cooperate.

75. In a mining machine, a frame carrying in rigid relation thereto during cutting movement of said machine in a direction parallel to a working face a longitudinally projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed and under frictional control at each speed including a flexible feeding means, guiding means therefor, winding means cooperating with said flexible feeding means and rotatable on a transversely extending horizontal axis, and friction controlled driving connections between the same and said motor.

76. In a mining machine, a frame carrying in rigid relation thereto during movement of said machine in a direction parallel to a working face a projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed under frictional control at each speed including a flexible feeding member, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter.

77. In a mining machine, a frame carrying in rigid relation thereto during movement of said machine in a direction parallel to a working face a projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed under frictional control at each speed including a flexible feeding means, guiding means therefor, winding means cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including an orbitally moving gear, means for determining the movement of said gear and a gear meshing therewith and operatively connected to said winding means.

78. In a mining machine, a frame carrying in rigid relation thereto during movement of said machine in a direction parallel to a working face a projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed under frictional control at each speed including a flexible

feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter, and driving means for said transverse shaft including a gear whose axis traverses an orbit about the axis of said shaft, means for determining the movement of said gear and a gear coaxial with said shaft and rotating the same during feeding at the cutting speed.

79. In a mining machine, a frame carrying in rigid relation thereto during movement of said machine in a direction parallel to a working face a projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed, and at a predetermined higher speed under frictional control at each speed including a flexible feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter, and driving means for said transverse shaft including a gear whose axis traverses an orbit about the axis of said shaft, means for determining the movement of said gear and a gear coaxial with said shaft and rotating therewith during feeding, and a clutch slidable longitudinally of said shaft operative in its different positions to effect rotation of said shaft at different speeds.

80. In a mining machine, a frame carrying in rigid relation thereto during movement of said machine in a direction parallel to a working face a projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed under frictional control at each speed including a flexible feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter, and driving means for said transverse shaft including a gear whose axis traverses an orbit about the axis of said shaft, means for determining the movement of said gear and a gear coaxial with said shaft and rotating the same during feeding at the cutting speed, and a clutch slidable longitudinally of said shaft operative in its different positions to effect rotation of said shaft at different speeds.

81. In a mining machine, a frame carrying in rigid relation thereto during movement of said machine in a direction parallel to a working face a projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed under frictional control at each speed including a flexible feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter, and driving means for said transverse shaft including a gear whose axis traverses an orbit about the axis of said shaft, means for determining the movement of said gear and a gear coaxial with said shaft and rotating the same during feeding at the cutting speed, and a clutch slidable longitudinally of said shaft operative in its different positions to effect rotation of said shaft at different speeds.

82. In a mining machine, a frame carrying in rigid relation thereto during movement of said machine in a direction parallel to a working face a projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed under frictional control at each speed including a flexible feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, and friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter, and driving means for said transverse shaft including a gear whose axis traverses an orbit about the axis of said shaft, means for determining the movement of said gear and a gear coaxial with said shaft and rotating the same during feeding at the cutting speed, and a clutch slidable longitudinally of said shaft operative in its different positions to effect rotation of said shaft at different speeds, said clutch operating in one position to vary the relation of parts of said planetary

gearing to each other to effect the higher speed of drive.

83. In a mining machine, a frame carrying a rigid relation thereto during movement of said machine in a direction parallel to a working face a projecting cutter bar, a motor on said frame, a cutter chain carried by said cutter bar, chain driving means operatively connected with said motor, and means for effecting movement of said frame at a predetermined cutting speed and at a predetermined higher speed under frictional control at each speed including a flexible feeding means, guiding means therefor, winding means rotating on a transverse axis on said frame and cooperating with said flexible feeding means, friction controlled driving connections between the same and said motor including a transversely extending shaft operatively connected with said winding means during operation of the latter, and driving means for said transverse shaft including a gear whose axis traverses an orbit about the axis of said shaft, means for determining the movement of said gear and a gear coaxial with said shaft and rotating therewith during feeding, and a clutch slidable longitudinally of said shaft operative in its different positions to effect rotation of said shaft at different speeds, said clutch operating in one position to vary the relation of parts of said planetary gearing to each other to effect the higher speed of drive.

84. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, cutting mechanism thereon including a cutter chain driving sprocket, means for driving said sprocket from one end of said motor, feeding mechanism for feeding said frame bodily laterally along a mine face including a feed operating member, and operative connections between said driving means and said feed operating member including a pair of transverse members, one constituting the sole driving member and connected to said driving means and the other constituting the sole driven member and connected to said feed operating member, frictional controlling means coaxial with said driving member, and speed reduction mechanism between said transverse members carried by said members.

85. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, cutting mechanism thereon including a cutter chain driving sprocket, means for driving said sprocket from the rear end of said motor including a bevel gear rotatable on an upright axis in a position above the axis of rotation of the motor, mechanism for feeding said frame bodily laterally along a mine face including a feed operating member, and operative connections between said bevel gear and said feed operating member including a plurality of transverse members, one connected to said bevel gear and the other connected to said feed operating member and one of said members extending only part way across said frame, frictional controlling means coaxial with that one of said transverse members which is connected to said bevel gear, and speed reducing mechanism between said members.

86. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, cutting mechanism thereon including a cutter chain driving sprocket, means for driving said sprocket from the rear end of said motor, mechanism for feeding said frame bodily laterally along a mine face including a feed operating member, and operative connections between said driving means and said feed operating member including a pair of transverse members, one constituting the main driving member and connected to said driving means and the other constituting the main driven member and connected to said feed operating member, said feed operating member and said last mentioned member both being cut by a plane to which the axis of rotation of said feed operating member is perpendicular, frictional controlling means coaxial with the former of said transverse members, and speed reduction mechanism between said transverse members having intermeshing elements thereof concentric with each of said members.

87. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis and extending longitudinally of said frame, cutting mechanism thereon including a cutter chain driving sprocket, means for driving said sprocket from the rear end of said motor including a bevel gear, feeding mechanism including a feed operating member rotatable on a transverse axis, operative connections between said driving means and said feed operating member including an upright rotatable worm below said bevel gear, a worm gear meshing with said worm, a transverse member carrying said worm gear, a friction clutch coaxial with said worm gear, a second transverse member operatively connected to said feed operating member, and reduction mechanism between said transverse members.

88. A room and pillar mining machine slidable over a mine bottom during cutting and comprising a motor, a projecting cutter bar, a cutter chain thereon, a cutter chain driving sprocket for actuating said chain, driving connections between said motor and said sprocket, and means for feeding said mining machine over the mine bottom including a flexible feeding member, a feed operating element cooperating therewith and

means driven by said motor and operative to effect rotation of said feed operating member at a plurality of predetermined speeds in the same direction without reversal of said motor and including friction mechanism operative to prevent overloading of said mechanism at either of said predetermined speeds and disposed with its axis horizontal and transversely extending.

89. In a mining machine, the combination of a feeding member, a motor and gearing through which said motor and feeding member are connected including a driving element for said feeding member, and means for effecting rotation of said driving element including a member driven by said motor, a member orbitally movable on driving of said last mentioned member and a member coaxial with said element and rotatable during operation thereof in the same direction and at the same angular speed therewith, clutch means coaxial with said element oppositely reciprocable to effect driving of said fourth mentioned member respectively at the same speed as said second mentioned member and at a reduced speed, and frictional controlling means included in said mechanism at each speed.

90. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, an upstanding driving member carried on said frame and disposed in rear of said motor, driving connections between the rear end of said motor and the upper end of said member, cutting mechanism including a cutter chain driving sprocket, driving connections between said sprocket and the lower end of said member, a flexible feeding member for feeding said frame bodily laterally along the mine face including a feed operating member on said frame, and driving connections therefor operatively connected to said upstanding member at a point below the connection of one of said driving connections thereto and including a worm and worm wheel and a friction clutch coaxial with said worm wheel.

91. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, an upstanding driving member carried on said frame and disposed in rear of said motor, driving connections between the rear end of said motor and the upper end of said member, cutting mechanism including a cutter chain driving sprocket, driving connections between said sprocket and the lower end of said member, a flexible feeding member for feeding said frame bodily laterally along the mine face including a feed operating member on said frame rotating on a transverse axis, and driving connections therefor operatively connected to said upstanding member at a point below the connection of one of said driving connections thereto and including a worm and worm wheel and a friction clutch coaxial with said worm wheel, said worm wheel also rotating on a transverse axis.

92. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, an upstanding driving member carried on said frame and disposed in rear of said motor, driving connections between the rear end of said motor and the upper end of said member including a bevel pinion rotating with said motor and a bevel gear rotating with said upstanding driving member, cutting mechanism including a cutter chain driving sprocket, driving connections between said sprocket and the lower end of said member, a flexible feeding member for feeding said frame bodily laterally along the mine face including a feed operating member on said frame and driving connections therefor operatively connected to said upstanding member at a point below the connection of one of said driving connections thereto and including a worm and worm wheel and a friction clutch coaxial with said worm wheel.

93. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, an upstanding driving member carried on said frame and disposed in rear of said motor, driving connections between the rear end of said motor and the upper end of said member including a bevel pinion rotating with said motor and a bevel gear rotating with said upstanding driving member, cutting mechanism including a cutter chain driving sprocket, driving connections between said spocket and the lower end of said member, a flexible feeding member for feeding said frame bodily laterally along the mine face including a feed operating member on said frame rotating on a transverse axis and driving connections therefor operatively connected to said upstanding member at a point below the connection of one of said driving connections thereto and including a worm and worm wheel, and a friction clutch coaxial with said worm wheel; said worm wheel also rotating on a transverse axis.

94. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, an upstanding driving member carried on said frame and disposed in rear of said motor, driving connections between the rear end of said motor and the upper end of said member including a bevel pinion rotating with said motor and a bevel gear rotating with said upstanding driving member, cutting mechanism including a cutter chain driving sprocket, driving connections

between said sprocket and the lower end of said member, a flexible feeding member for feeding said frame bodily laterally along the mine face including a feed operating member on said frame rotating on a transverse axis and driving connections therefor operatively connected with said upstanding member at a point below the connection of one of said driving connections thereto and including a worm and worm wheel, and a friction clutch coaxial with said worm wheel, said worm wheel also rotating on a transverse axis and said axes of rotation of said transverse shaft and said worm wheel both being cut by the vertical projection of the periphery of said bevel gear.

95. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable by said gear, a plurality of driving elements on said shaft driven by the latter, cutting mechanism driven by one of said elements, and feeding mechanism operated by the other including flexible feeding means, winding means cooperating therewith, and means frictionally controlled at each speed for driving said winding means at a plurality of predetermined speeds and including a plurality of coaxial gears arranged on a transversely extending axis and one adapted to constitute a reaction member and the other a winding means driving member, coaxially arranged gears rotating at equal angular rates and meshing with said first mentioned coaxial gears, and means driven by said motor for causing said second mentioned gears to roll around said coaxial gears to produce a reaction between the latter.

96. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable by said gear, a worm and a pinion on said shaft driven by the latter, cutting mechanism driven by said pinion, and feeding mechanism operated by the worm including flexible feeding means, winding means cooperating therewith, and means frictionally controlled at each speed for driving said winding means at a plurality of predetermined speeds and including a plurality of coaxial gears arranged on a transversely extending axis and one adapted to constitute a reaction member and the other a winding means driving member, coaxially arranged gears rotating at equal angular rates and meshing with said first mentioned coaxial gears, and means driven by said worm for causing said second mentioned gears to roll around said coaxial gears to produce a reaction between the latter.

97. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable by said gear, a plurality of driving elements on said shaft driven by the latter, cutting mechanism driven by one of said elements, and feeding mechanism operated by the other including flexible feeding means, winding means cooperating therewith, and means frictionally controlled at each speed for driving said winding means at a plurality of predetermined speeds and including a plurality of coaxial gears arranged on a transversely extending axis and one adapted to constitute a reaction member and the other a winding means driving member, coaxially arranged gears rotating at equal angular rates and meshing with said first mentioned coaxial gears, means driven by said motor for causing said second mentioned gears to roll around said coaxial gears to produce a reaction between the latter, and means for causing different cooperations between said gears to produce different predetermined speeds of rotation of said winding means.

98. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion on said armature shaft, a gear meshing with said driving pinion and driven thereby, a shaft on which said gear is mounted and which is rotatable by said gear, a worm and a pinion on said shaft driven by the latter, cutting mechanism driven by said pinion, and feeding mechanism operated by the worm including flexible feeding means, winding means cooperating therewith, and means frictionally controlled at each speed for driving said winding means at a plurality of predetermined speeds and including a plurality of coaxial gears arranged on a transversely extending axis and one adapted to constitute a reaction member and the other a winding means driving member, coaxially arranged gears rotating at equal angular rates and meshing with said first mentioned coaxial gears, means driven by said worm for causing said second mentioned gears to roll around said coaxial gears to produce a reaction between the latter, and means for causing different cooperations between said gears to produce different predetermined speeds of rotation of said winding means.

99. In a mining machine, a machine frame, a horizontal motor thereon rotatable on an axis extending longitudinally of said frame, cutting mechanism thereon including a cutter chain driving sprocket, means for driving said sprocket from the rear end of said motor, mechanism for feeding said frame bodily laterally along a mine face including a feed operating member, and operative connections between said driving means and said feed operating member including a plurality of transverse members, one connected to said driving means and the other connected to said member, and variable speed transmission mechanism between said members including a friction clutch and providing a plurality of frictionally releasable trains for rotating said feed operating member at different predetermined speeds.

100. In a room and pillar mining machine, a machine frame having a cutter bar projecting therefrom longitudinally, a cutter chain on said bar, a motor on said frame, driving means for said chain actuated by said motor, and means operated by said motor for feeding said machine to sump said bar into a working face including a flexible feeding member adapted to be placed under tension during sumping, a feed operating member cooperating therewith and actuating means for said feed operating member including plural predetermined speed gearing therefor frictionally controlled at each speed and including a gear operative on rotation to effect rotation of said feed operating member, a coaxial gear adapted to be held against rotation to effect drive at one of said speeds, and orbitally moving gears meshing respectively with said first and second mentioned gears and mutually coaxially disposed and rotating at equiangular speeds.

101. In a room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket, driving means therefor actuated by said motor including an element rotated on a vertical axis and carrying therewith a worm, a worm wheel driven by said worm and rotating on a transversely extending axis, a flexible feeding member, a winding element therefor rotating on a transverse axis, and mechanism for transmitting power from said worm wheel to said winding member including planetary gearing including orbitally moving elements the axis of whose orbital movement extends transversely and is disposed further from said armature shaft than the axes of rotation of said worm wheel and said feed operating member, and frictional controlling means including elements having cooperating frictional surfaces coaxial with respect to a line parallel to the axis of rotation of said feed operating member.

102. In a room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket, driving means therefor actuated by said motor including an element rotating on a vertical axis and carrying therewith a worm, and means for feeding said machine including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, a worm wheel rotatable on a transverse axis disposed at the opposite side of said worm from said armature shaft, planetary gearing including a sun gear rotatable on an axis more remote from said worm than the axis of rotation of said worm wheel and operative connections between an element of said planetary gearing and said feed operating member, and frictional controlling means including elements having frictional surfaces coaxial with respect to a line parallel to the axis of rotation of said feed operating member.

103. In a room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a cutter chain driving sprocket, driving means therefor actuated by said motor including an element rotating on a vertical axis and carrying therewith a worm, and means for feeding said machine including a flexible feeding member, a feed operating member cooperating therewith and rotatable on a transverse axis, a worm wheel rotatable on a transverse axis disposed at the opposite side of said worm from said armature shaft, planetary gearing including a sun gear rotatable on an axis more remote from said worm than the axis of rotation of said worm wheel and operative connections between an element of said planetary gearing and said feed operating member, and frictional controlling means including elements having cooperating frictional surfaces coaxial with respect to a line parallel to the axis of rotation of said feed operating member, the axis of rotation of said feed operating member being disposed nearer said armature shaft than the axis of rotation of said sun gear.

104. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm fixed on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a

cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and mechanism for feeding said machine laterally during cutting including a flexible feeding member, a feed operating member cooperating therewith, a plural-speed driving mechanism therefor driven by said worm and providing a plurality of predetermined speeds, said plural-speed driving mechanism including a worm wheel driven by said worm and coaxially arranged frictional controlling mechanism.

105. A room and pillar mining machine including a motor having an armature shaft rotatable on an axis extending longitudinally of the machine, a driving pinion thereon, a gear driven thereby, a shaft supporting and driven by said gear, a worm fixed on said shaft adjacent said gear, a driving pinion on said shaft at the opposite side of said worm from said gear, cutting mechanism including a cutter bar extending during cutting longitudinally of said frame and carrying a circulating cutter chain, a cutter chain driving sprocket and operative connections between said sprocket and said second mentioned driving pinion, and mechanism for feeding said machine laterally during cutting including a flexible feeding member, a feed operating member cooperating therewith, plural-speed driving mechanism therefor driven by said worm and providing a plurality of predetermined speeds said plural-speed driving mechanism including a worm wheel driven by said worm and coaxially arranged frictional controlling mechanism, and clutch means slidable transversely of said machine frame and operative when slid in opposite directions to effect said different predetermined speeds.

106. In a room and pillar mining machine, a machine frame having a cutter bar projecting therefrom longitudinally, a cutter chain on said bar, a motor on said frame. driving means for said chain actuated by said motor, and means operated by said motor for feeding said machine to sump said bar into a working face including a flexible feeding member adapted to be placed under tension during sumping, a feed operating member cooperating therewith, and actuating means for said feed operating member including plural predetermined speed gearing therefor frictionally controlled at each speed and including a gear element operative on rotation to effect rotation of said feed operating member, a coaxial gear adapted to be held against rotation to effect drive at one of said speeds, and orbitally moving gears meshing respectively with said first and second mentioned gears and mutually coaxially disposed and rotating at equiangular speeds.

107. A mining machine slidable over a mine bottom during cutting and comprising a motor, a projecting cutter bar, a cutter chain thereon, a cutter chain driving sprocket for actuating said chain, driving connections between said motor and said sprocket, and means for feeding said mining machine over the mine bottom including a flexible feeding member, a feed operating member cooperating therewith and means driven by said motor and operative to effect rotation of said feed operating member at a plurality of predetermined speeds in the same direction without reversal of said motor including a plurality of elements constituting plural speed planetary gearing and differently cooperating to transmit rotation at different speeds, a shaft coaxial with certain of said elements and constituting a driving element for said feed operating member, and friction mechanism operative to prevent overloading of said mechanism at either of said predetermined speeds and releasable to interrupt power transmission through said elements to said shaft, said friction mechanism being arranged at the end of said motor remote from the cutter bar.

108. A mining machine slidable over a mine bottom during cutting and comprising a motor, a projecting cutter bar, a cutter chain thereon, a cutter chain driving sprocket for actuating said chain, driving connections between said motor and said sprocket, and means for feeding said mining machine over the mine bottom including a flexible feeding member, a feed operating member cooperating therewith and means driven by said motor and operative to effect rotation of said feed operating member at a plurality of predetermined speeds in the same direction without reversal of said motor including a plurality of cooperating elements constituting plural speed gearing, a shaft coaxial with certain of said last mentioned elements and constituting a driving element for said feed operating element, and friction mechanism operative to prevent overloading of said mechanism at either of said predetermined speeds and releasable to interrupt power transmission through said elements to said shaft, said friction mechanism being arranged with its axis horizontal and being disposed at the end of said motor remote from the cutter bar.

In testimony whereof I affix my signature.

FRANK CARTLIDGE.