

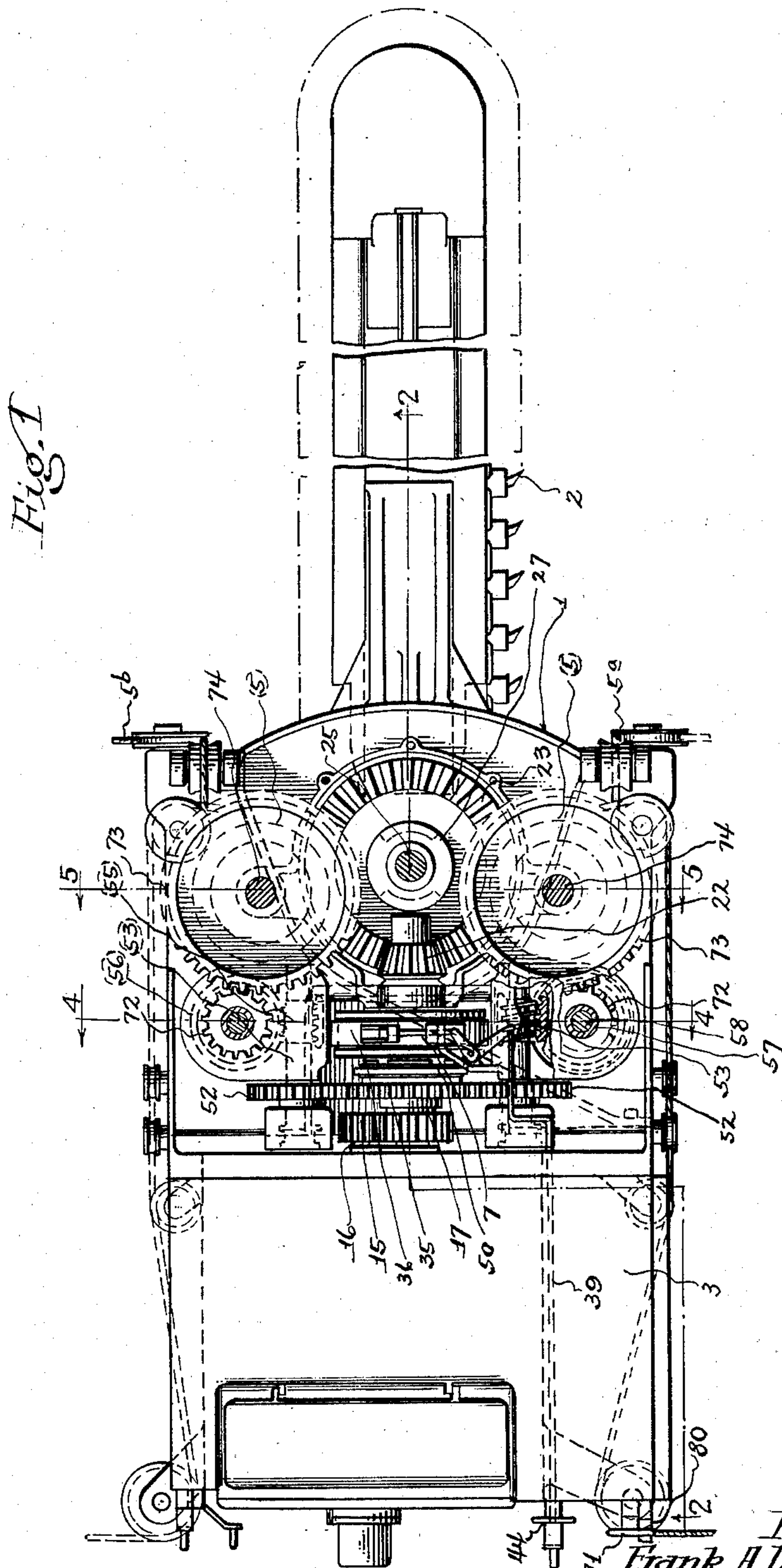
April 15, 1930.

F. A. LINDGREN

1,754,328

MINING MACHINE

Original Filed Dec. 25, 1926 4 Sheets-Sheet 1



Inventor
Frank A. Lindgren
Clarence F. Poole
Attorney.

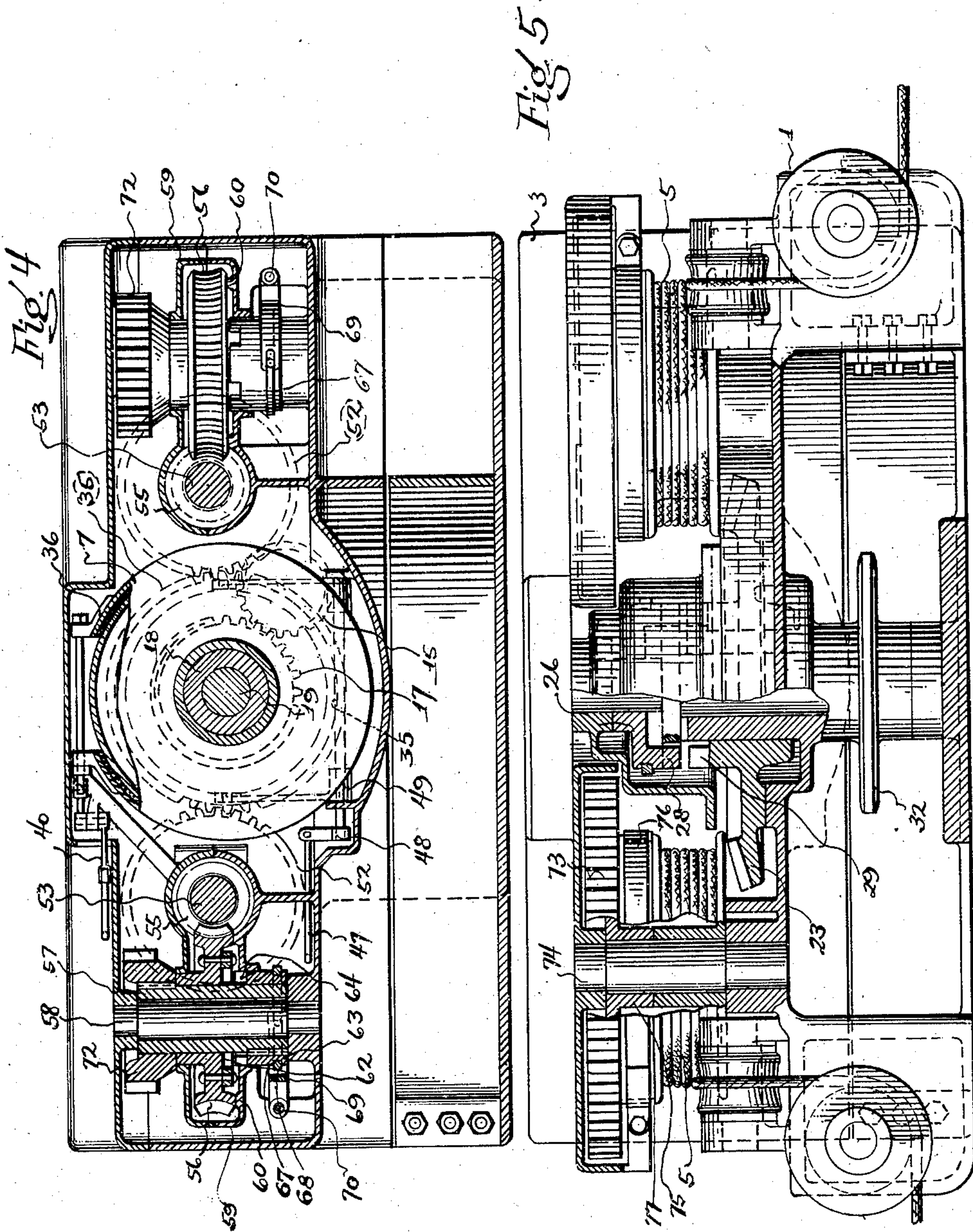
April 15, 1930.

F. A. LINDGREN

1,754,328

MINING MACHINE

Original Filed Dec. 25, 1926 4 Sheets-Sheet 3



Inventor
Frank A. Lindgren
by Clarence F. Foote
Attorney

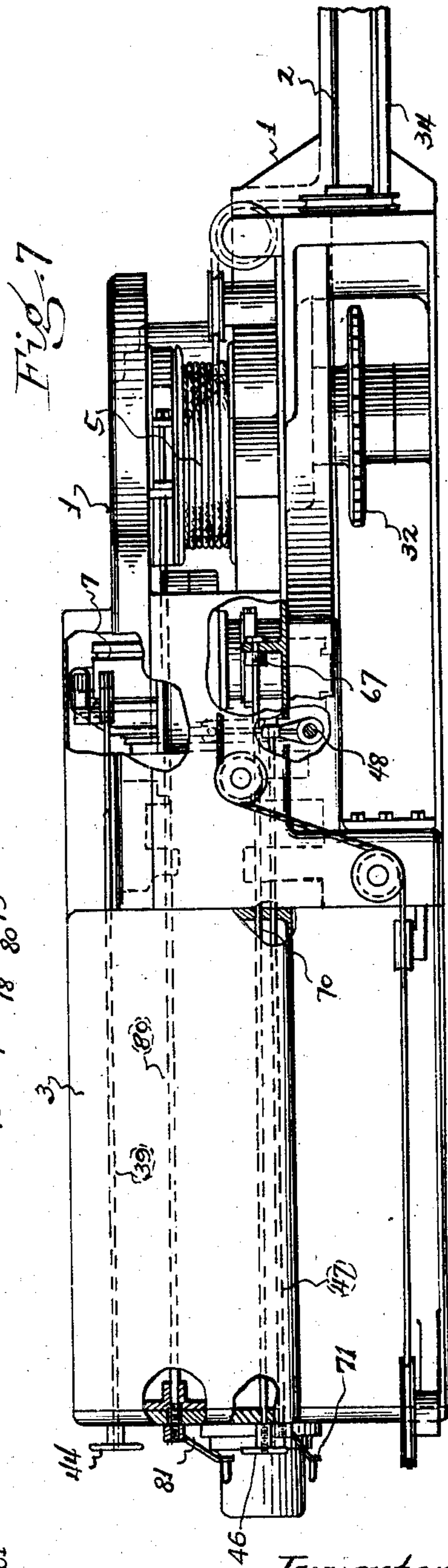
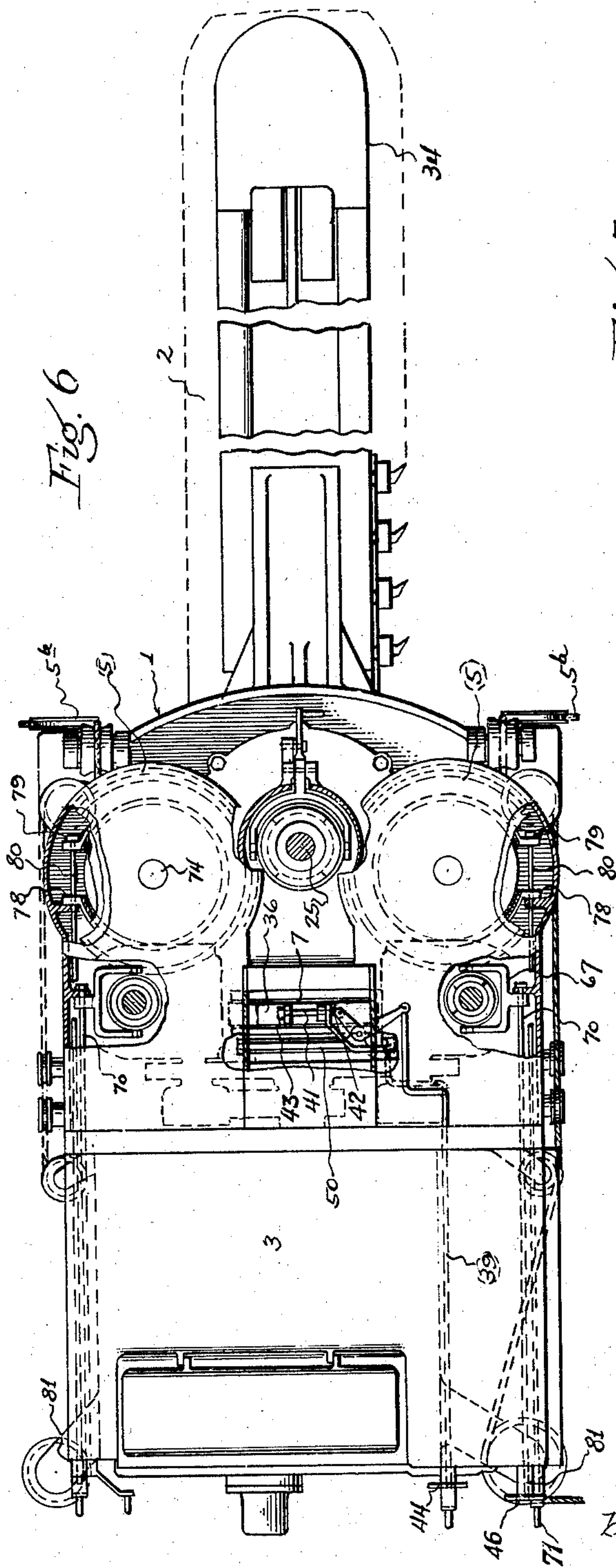
April 15, 1930.

F. A. LINDGREN

1,754,328

MINING MACHINE

Original Filed Dec. 25, 1926 4 Sheets-Sheet 4



Inventor
Frank A Lindgren
by Clarence F. Pool
Attorney

UNITED STATES PATENT OFFICE

FRANK A. LINDGREN, OF WESTERN SPRINGS, ILLINOIS, ASSIGNOR TO GOODMAN MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

MINING MACHINE

Application filed December 25, 1926, Serial No. 157,006. Renewed September 12, 1929.

This invention relates to improvements in a continuous chain coal cutting machine for room and pillar work wherein the machine is moved on its own bottom laterally along a mine wall to cut a kerf thereunder, and more particularly relates to a machine of this class adaptable for use under very low head room, as in thin seams of coal.

Among the objects of my invention is to provide a mining machine of the class above described of compact form having an improved feeding mechanism including a novel arrangement of two rope drums cooperatively disposed on vertical axes at opposite sides, but near the front or cutting end of the machine.

Other objects of my invention will appear from time to time as the description proceeds.

My invention may be best understood by reference to the accompanying drawings, in which:

Figure 1 is a plan view of the device embodying my invention with certain gear covers removed to more clearly show the arrangement of the gearing;

Figure 2 is a fragmentary side elevation of the device shown in Figure 1, a portion of said elevation being a sectional view taken on line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary side elevation of Figure 1 with parts taken in section to more clearly show the driving means for the rope drums;

Figure 4 is a fragmentary sectional view taken on line 4—4 of Figure 1;

Figure 5 is a fragmentary sectional view taken on line 5—5 of Figure 1;

Figure 6 is a fragmentary plan view of the device in Figure 1 to show the location of the operating and control levers.

And Figure 7 is a fragmentary side view of the device in Figure 1 to show the location of the operating and control levers.

Like numerals refer to like parts throughout the various drawings.

Referring now in detail to the drawings, the embodiment of my invention comprises a mining machine having a main frame 1 with a cutting element 2 projecting forwardly therefrom. This cutting element is pref-

erably provided with an endless cutter chain of the usual type and projects from the front end of the main frame to cut a horizontal kerf in the mine wall preferably adjacent the floor as the machine is moved by draft devices in the well known manner of machines of this type. A motor 3 projects to the rear of the main frame 1 and the base of said motor slides on the mine bottom. All operating and driving mechanism is below the top portion of said motor. It will therefore be seen that the height of my device is determined by the height of the driving motor 3.

In the construction herein shown an extremely compact arrangement of feed and cutter chain drive gearing is obtained by providing draft devices 5, 5, on the forward end of the main frame 1 on vertical axes on each side of the cutter chain driving mechanism and by driving these draft devices from a planetary reduction gear mechanism 7 which is on a centrally disposed axis coaxial with and also forming part of the cutter chain driving means.

Referring now to the details of the driving mechanism for the feed and cutting elements, it may be seen that the motor 3 drives said mechanism through a spur pinion 15 keyed to the forward end of a motor shaft 16 which meshes with and drives a pinion 17 keyed to a sleeve 18 on the longitudinal center of the main frame 1. The sleeve 18 is rotatable on a horizontally disposed stud 19 which is fixed in suitable supports on the frame 1. Jaws 20 at the forward end of the sleeve 18 mesh with jaws 21 on the hub of a bevel pinion 22. The bevel pinion 22 has driving connection with a bevel gear 23 which is mounted for rotation on a vertical boss 24 integral with the main frame of the machine 1. A shaft 25 is rotatable in said boss, and is rotated by the bevel gear 23 through a clutch 26. The clutch 26 shown herein is of a common jaw type comprising a member 27 feathered to the shaft 25 and having jaws 28 thereon which mesh with jaws 29 in the hub of the bevel gear 23. Said clutch is actuated by a lever 30 at the forward portion of the machine. Rotation of the shaft 25 causes re-

tation of a sprocket 32 which in turn drives a cutter chain 33 about a cutter bar 34.

Adjacent the rearward end of the bevel pinion 22 and coaxial therewith is a frictionally controlled planetary reduction gearing 7 connectible with the rope drums 5, 5, for driving said rope drums at a plurality of frictionally controlled speeds. The planetary gearing device shown herein is of the same type as used extensively in mining machine gearing and provides two speeds to a gear 35 coaxial therewith, including a safety friction device affording slippage when undue stresses are encountered at either speed. In the form shown the friction device includes a friction band 36, carried on the planetary 7, which is tightened or loosened by controlling means actuated from the rear of the machine, which in this case comprises a tightening lever system comprising a rod 39 extending from the rear end of the machine forward through the motor 3 to one end of a bell crank lever 40 pivoted on the machine frame 1. The other arm of the bell crank lever is fastened to a rod 41 which passes through a fixed end 42 of the friction band 36 and is fastened to a loose end 43 of said friction band. A hand crank lever 44 is threaded to the rear of the rod 39. Rotation of said hand wheel in one direction tightens the friction band and vice-versa, and thereby affords a variable friction control at either driving speed, and also a safety slipping device, as described. A suitable clutch member which is herein shown as a jaw clutch 45 provides a means to selectively connect the gear 35 to either a high speed member 17 or a low speed member 36 of the planetary device 7. This clutch is operated by a hand lever 46 at the rear of the machine. This hand lever (see Figure 7) is fastened to the rear end of a rod 47 which extends forwardly through the motor 3 to a crank lever 48 which in turn rocks a fork 49 attached to a shifting yoke 50 for shifting the clutch 45. The spur gear 35 meshes with and drives gears 52, 52, in the same direction. These gears are keyed to longitudinal shafts 53, 53, on opposite sides of the gear 35.

The rope drums 5, 5, on the forward portion of the main frame 1 on opposite sides of the cutting element 2 are both driven from the planetary reduction gearing 7, which is rearward of said drums but on a horizontal axis perpendicular with the axes of said drums on the longitudinal center of the main frame 1. The gear 35 connected with the planetary reduction gearing 7 drives said drums in the same direction. The driving connections to both drums are substantially the same so the driving connection to one drum only will be described.

A worm 55 is mounted on the shaft 53 forward of the spur gear 52 and is rotated by said shaft through said gear. The worm

55 rotates a worm wheel 56 which is rotatable on a vertical sleeve 57. The sleeve 57 is mounted on a stud 58 and rotates thereon. A casing 59 surrounds said worm and worm gear. An annular ridge 60 is formed on the lower inner surface of the casing 59 to form a bearing and support for the worm gear 56. Clutch jaws 62 are fastened to the lower portion of said worm gear by suitable means. A clutch sleeve 63 is feathered to the sleeve 57 to rotate therewith, but to be free to move vertically thereon. Jaws 64 are provided on the upper portion of said clutch sleeve and are adapted to be engageable with the jaws 62 on the worm gear 56. A clutch yoke 67 fits in a groove 68 on the clutch sleeve 63. Movement of the yoke 67 in one direction or the other moves said sleeve and thus engages or disengages said clutch. Said yoke is actuated by a fork 69 (the prongs of which are pivoted thereon) through a rod 70 operated by a crank lever 71 from the rear of the machine. The jaws 64 and 65 being engaged, the worm gear 56 rotates the sleeve 57 which rotates a spur pinion 72 keyed to the upper end of said sleeve. The pinion 72 meshes with a spur gear 73 and rotates said gear on a vertical stud 74. A sleeve 75 is integral with said gear and has a rope drum keyed thereon. It may thus be seen that the rotation of the gear 35 in one direction rotates the gears 51, 52, simultaneously and thus the rope drums 5 may be rotated either simultaneously or independently in the same direction.

One of the advantageous features which may be seen from the above description is the arrangement of the feed driving mechanism wherein the two reduction worms and worm gears are interposed between the centrally disposed planetary gear mechanism 7 and the rope drums 5 on vertical axes 74 for driving said drums simultaneously or independently in the same direction. In this arrangement there is a considerable reduction in the speed of the worm over the speed of worms in other mining machine designs which materially reduces the friction and wear on said worm and worm gears.

A suitable braking means is provided for each rope drum to be used when either drum is disconnected from the motor and it is desired to use said rope drum as a retarding device. Said braking means comprises a suitable friction band 76 on a flange 77 integral with said rope drum. One end of this band is fixed to a lug 78 on the frame 1. A head 79 on a rod 80 bears against the other end of said band. The rod 80 extends rearwardly to the rear end of the machine where it is actuated by a screw device and hand crank 81. Turning of the crank 81 in one direction pulls the ends of the friction band 76 together and tightens the band on the flange 77 and vice-versa.

The arrangement of the rope drums and ropes is such that in the normal cutting position, the rope drum 5 on the advance or left side of the machine is connected to the motor 3 to wind in a rope 5^a while the opposite drum 5 is connected to the motor 3 to rotate in the same direction as the drum on the left side of the machine. A rope 5^b is wound on the drum 5 on the retreating or right hand side of the machine preferably in an opposite direction to the rope 5^a so the rope 5^b will unwind at the same rate of speed as the rate of takeup on the rope 5^a. The purpose of the rope 5^b during this part of the cutting movement is to restrain the movement of the rear end of the machine and maintain the proper angular relation of the cutter bar to the working face. Power may be released from the retarding rope to allow said rope to be unwound by the pull of the machine. The braking means varies the rate of speed at which the retarding rope is unwound from the drum to keep the machine in alignment with the face of the coal. The retarding rope drum however may be disconnected from the motor when maneuvering the machine during the sumping or drawing out operations, or when the cutting is exceptionally hard and the cutting element cannot be kept in proper alignment to the face of the coal without the use of the additional retarding means provided by the braking means.

Means are provided for reversing the normal functions of the two drums above described whereby the drum 5 on the retreating side of the machine may wind in the rope 5^b and the drum 5 on the opposite side of the machine may unwind the rope 5^a. In order to do this it is only necessary to reverse the direction of rotation of the motor 3. Additional rope sheaves and rollers are also provided on both sides of the machine to allow the ropes to wind in or pay off in the correct position in regards to the machine frame.

Referring now to the disposition of the cuttings brought rearwardly by the cutter chain, the specific form of machine illustrated is provided with a motor of the reversible type so as to permit the cutter chain to be driven in either direction. Accordingly, the cuttings may be brought rearwardly to one side or the other of the cutter chain and be discharged through an opening provided for said cuttings, on either side of said machine. A reversible cuttings deflector 82 is provided to deflect the cuttings discharged from the cutter chain through the opening on the retreating side of the machine. This reversible cuttings deflector is fully disclosed and claimed in a co-pending application of Herbert A. Buehler, filed December 25, 1926, Serial Number 157,008. In event the direction of cutting is changed it is necessary to also reverse the deflector to turn the cuttings to the opposite side of said machine. The cuttings passageway

is greatly restricted on account of the motor 3 being directly rearward of the cutter chain but with the horizontal arrangement of rope drums shown herein, it may be seen that there is ample provision of space for the cuttings to be discharged to either side of the machine.

Although I have shown and described one form in which my invention may be embodied, it will be understood that the construction thereof and the arrangement of the various parts may be altered without departing from the spirit and scope thereof. Furthermore, I do not wish to be construed as limiting myself to the specific embodiment illustrated in the drawings, excepting as it may be limited by the appended claims.

I claim as my invention:

1. The combination with a kerf cutting mining machine, feed operating mechanism therefor comprising a driving motor slideable on its bottom on the mine bottom, two rope drums rotatable on vertical axes at opposite sides of said machine forward and beneath the uppermost extremities of said driving motor, a frictionally controlled planetary reduction gearing mechanism interposed between said motor and rope drums, the upper extremities of said mechanism being below the uppermost extremities of said motor, means interposed between said planetary gearing mechanism and each of said rope drums for selectively connecting said drums with said planetary gearing mechanism whereby said drums may be driven simultaneously or independently, and braking means for each of said drums.

2. In a mining machine, a frame, a cutter bar extending forwardly of said frame and having a cutter chain thereon, a motor rearward of said frame and resting on the mine bottom, a longitudinally disposed driving member forward of said motor and driven by said motor, a vertical shaft on the forward portion of said frame, a driving sprocket thereon for driving said cutter chain about said cutter bar, drive gearing and clutch means to operatively connect said sprocket with said motor interposed between said driving member and said vertical shaft, a pair of feed operating mechanisms arranged on vertical axes at opposite sides of said frame forwardly of said motor, a planetary geared reduction device mounted concentrically with said driving member and operatively connected with said feed operating mechanisms for driving said feed operating mechanisms at a plurality of predetermined speeds.

3. In a mining machine, a frame, a cutter bar extending forwardly of said frame and having a cutter chain thereon, a motor rearward of said frame and resting on the mine bottom, a longitudinally disposed driving member forward of said motor and driven by said motor, a vertical shaft on the forward portion of said frame, a driving

sprocket thereon for driving said cutter chain about said cutter bar, drive gearing and clutch means to operatively connect said sprocket with said motor interposed between said driving member and said vertical shaft, a pair of feed operating mechanisms arranged on vertical axes at opposite sides of said frame forwardly of said motor, a frictionally controlled planetary geared reduction device mounted concentrically with said driving member, and clutch means to operatively connect said feed operating mechanisms with said frictionally controlled planetary geared reduction device for selectively driving said feed operating mechanisms at a plurality of predetermined frictionally controlled speeds simultaneously or independently.

4. In a mining machine, a frame, a cutter bar extending forwardly of said frame and having a cutter chain thereon, a motor rearward of said frame and resting on the mine bottom, a longitudinally disposed driving member forward of said motor and driven by said motor, a vertical shaft on the forward portion of said frame, a driving sprocket thereon for driving said cutter chain about said cutter bar, drive gearing and clutch means to operatively connect said sprocket with said motor interposed between said driving member and said vertical shaft, a pair of feed operating mechanisms arranged on vertical axes at opposite sides of said frame forwardly of said motor, a frictionally controlled planetary geared reduction device mounted concentrically with said driving member, and clutch means to operatively connect said feed operating mechanisms with said frictionally controlled planetary geared reduction device for selectively driving said feed operating mechanisms at a plurality of predetermined frictionally controlled speeds simultaneously or independently, said feed operating mechanisms and said drive and feed gearing being beneath the uppermost extremities of said motor.

5. In a mining machine, a frame, a cutter bar extending forwardly of said frame and having a cutter chain thereon, a motor rearward of said frame and resting on the mine bottom, a longitudinally disposed driving member forward and said motor and driven by said motor, a vertical shaft on the forward portion of said frame, a driving sprocket thereon for driving said cutter chain about said cutter bar, drive gearing and clutch means to operatively connect said sprocket with said motor interposed between said driving member and said vertical shaft, a pair of feed operating mechanisms arranged on vertical axes at opposite sides of said frame forwardly of said motor, a planetary geared reduction device mounted concentrically with said driving member and operatively connected with said feed operating mechanisms

through a common spur gear for driving said feed operating mechanisms at a plurality of predetermined speeds.

6. The combination with a kerf cutting mining machine, of feed operating mechanism therefor comprising a driving motor slideable on its bottom on a mine bottom, two rope drums arranged on vertical axes at opposite sides of said machine forward and beneath the uppermost extremities of said driving motor, and a single frictionally controlled variable speed reduction gearing interposed between said motor and said drums for driving each of said drums at the same speed in the same direction.

7. The combination with a kerf cutting mining machine, of feed operating mechanism therefor comprising a driving motor slideable on its bottom on a mine bottom, two feed operating mechanisms arranged on vertical axes at opposite sides of said machine forward and beneath the uppermost extremities of said driving motor, a frictionally controlled planetary reduction gearing mechanism interposed between said motor and rope drums, the upper portion of said mechanism being below the uppermost extremities of said motor, and means interposed between said planetary gearing mechanism and each of said rope drums for selectively connecting said drums with said planetary gearing mechanism whereby each of said drums may be simultaneously driven at a plurality of predetermined speeds.

8. A kerf cutting mining machine including a motor slideable on its bottom on a mine bottom, winding drums arranged on vertical axes at opposite sides of said motor, a driving member extending longitudinally of said machine intermediate said rope drums, planetary gear mechanism concentric with and driven by said longitudinally extending driving member, the upper portion of said planetary gearing mechanism being substantially beneath the upper portion of said motor, a gear concentric with and driven by said planetary gear mechanism, parallel gears on opposite sides of said first mentioned gear operatively connected with said gear, a worm rotated by each of said gears, and a worm gear driven by each of said worms, said worm gears each being rotatable on a vertical axis and each having operative connection with one of said winding devices.

Signed at Chicago, in the county of Cook and State of Illinois, this 23rd day of December, A. D. 1926.

FRANK A. LINDGREN.