

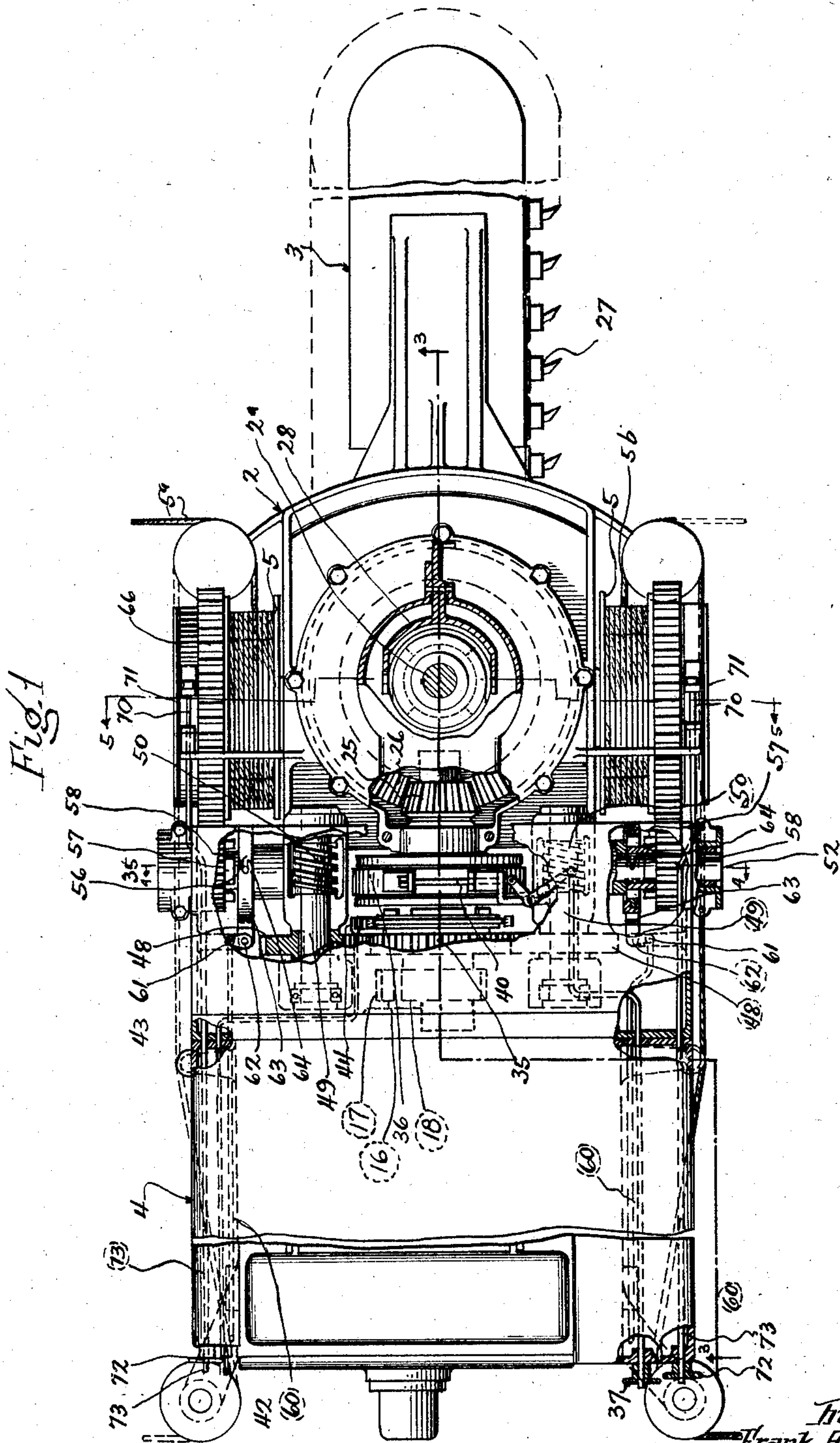
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1,754,329

MINING MACHINE

Original Filed Dec. 25, 1926 3 Sheets-Sheet 1



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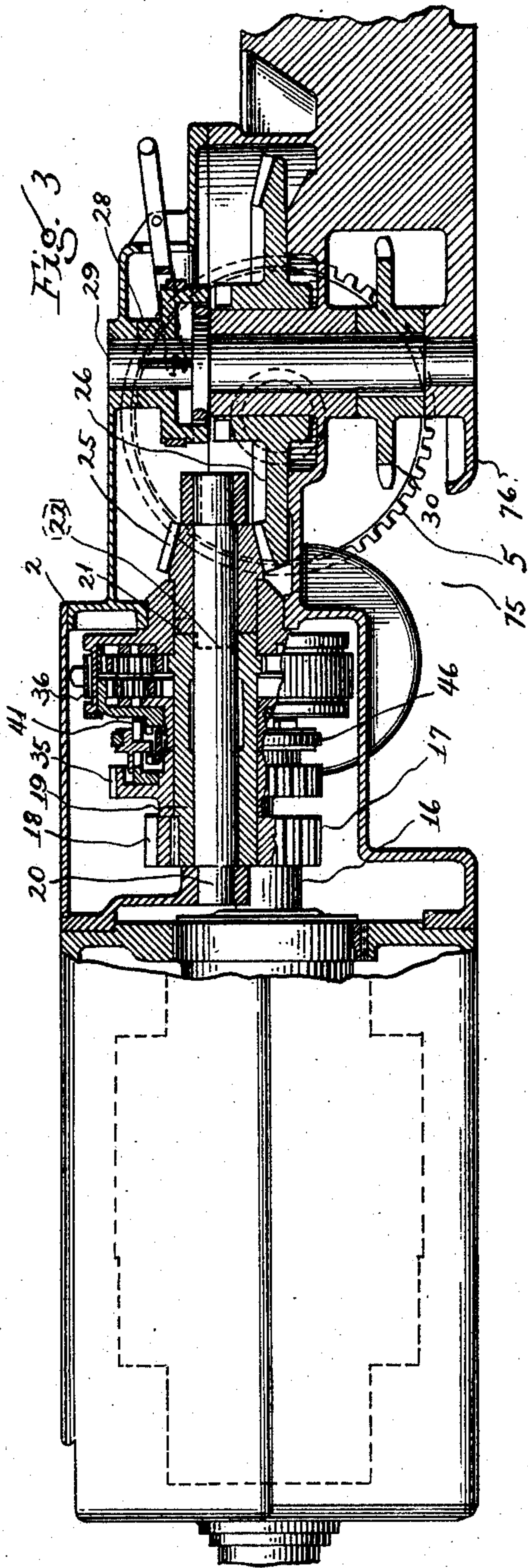
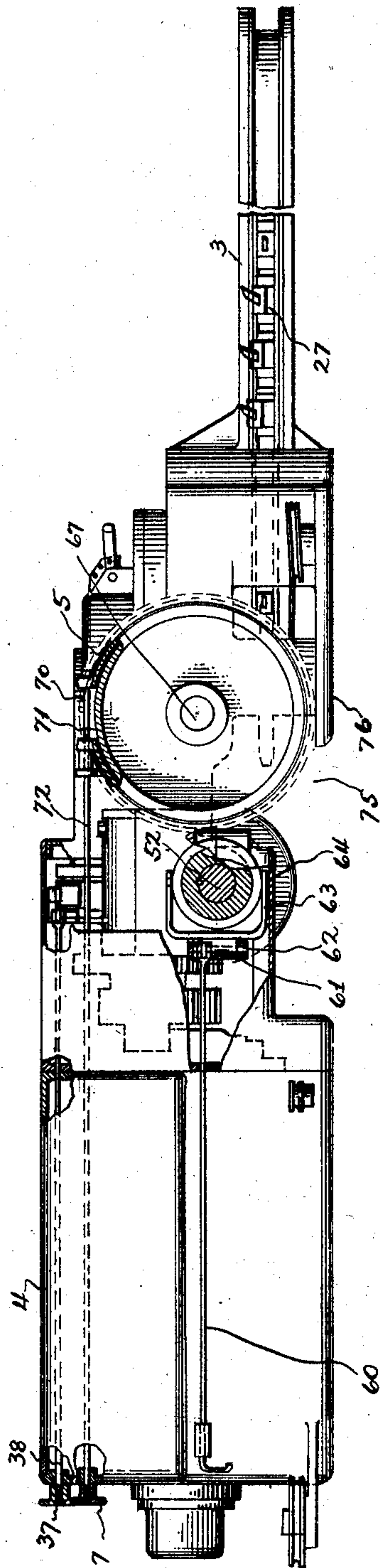
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Fig. 2



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Fig. 4

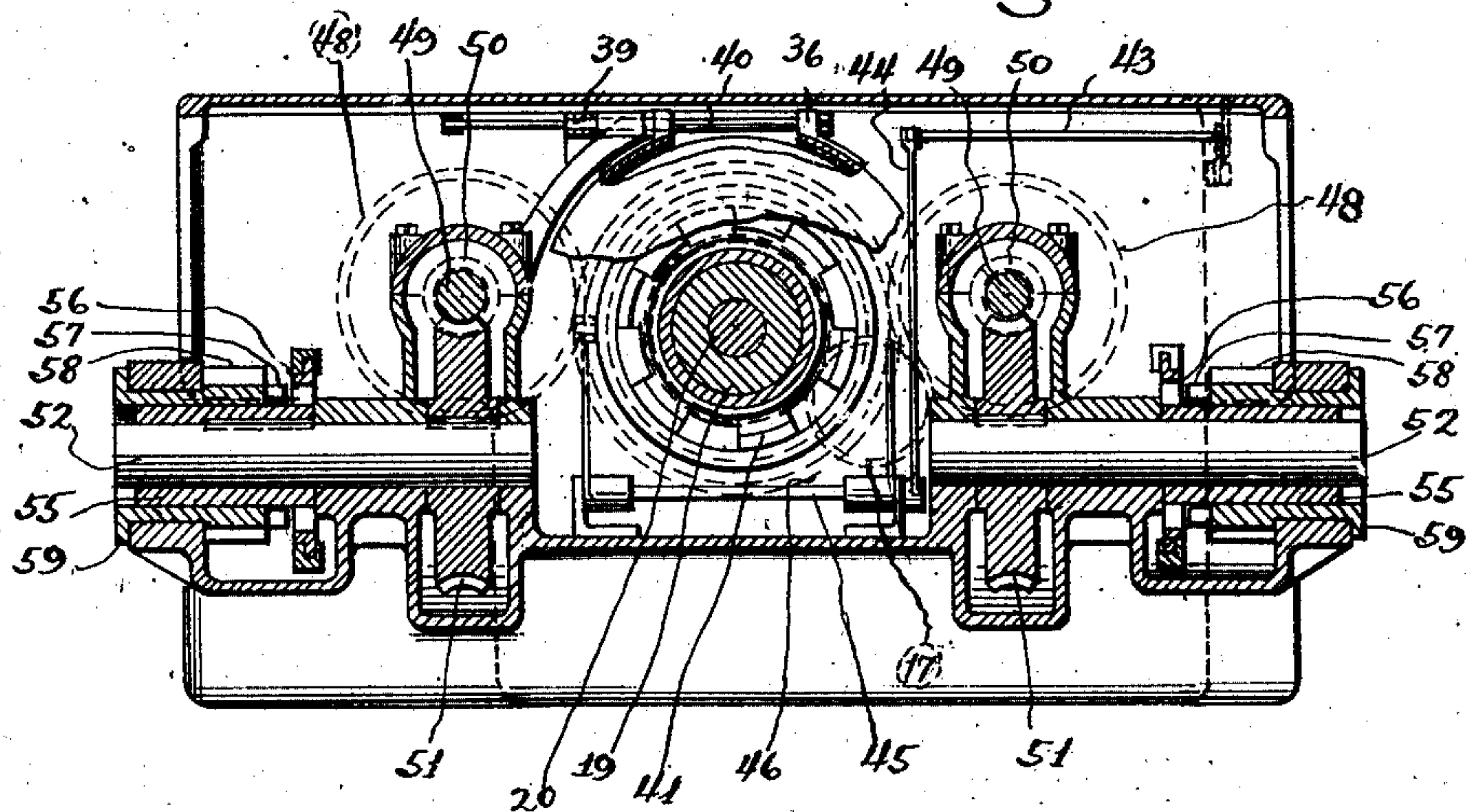
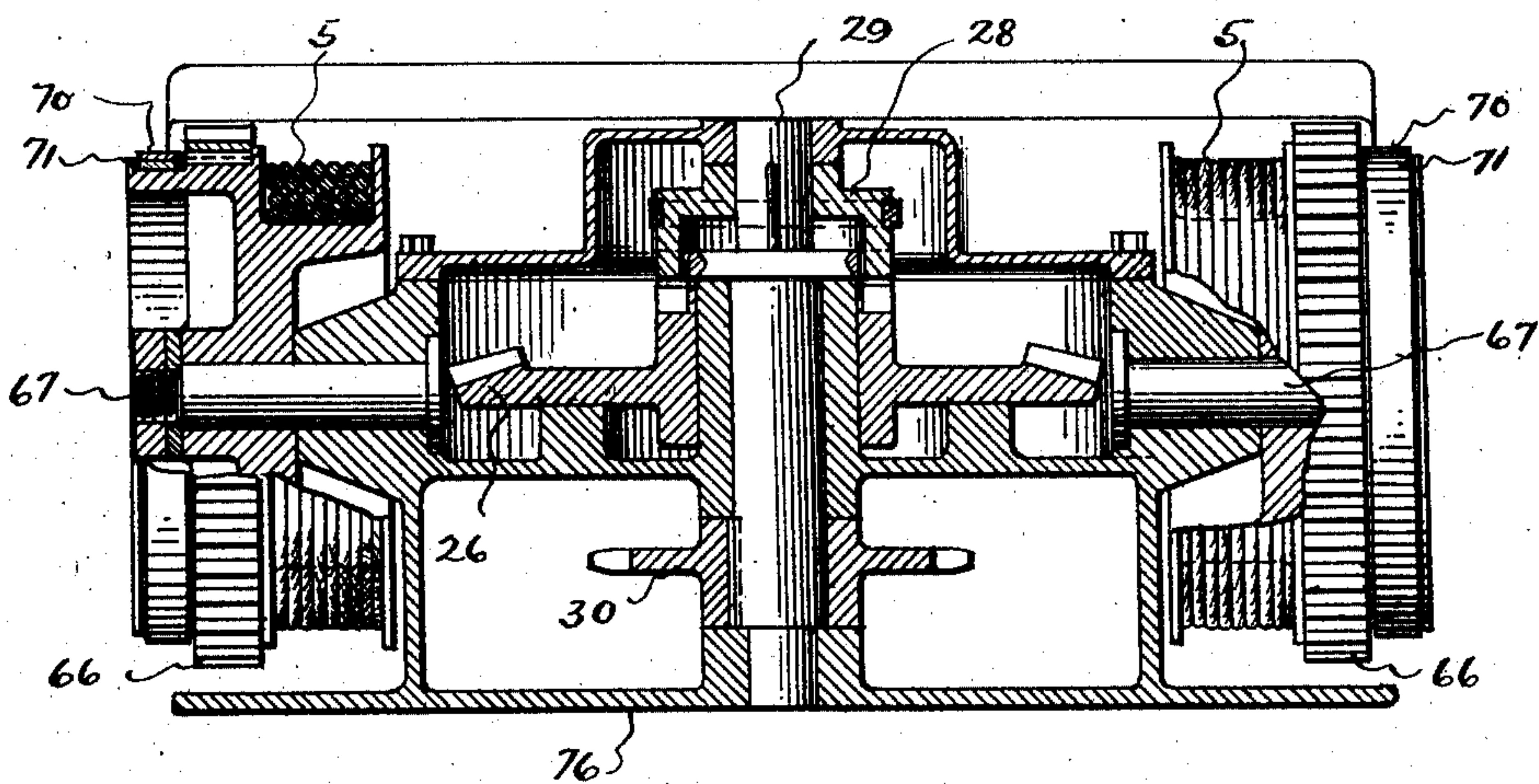


Fig. 5



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UNITED STATES PATENT OFFICE

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MINING MACHINE

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This invention relates to improvements in a continuous chain coal cutting mining machine adapted for use in 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 adapted for operation under very low head room, as in thin seams of coal.

10 The principal object of my invention is to provide an improved feeding mechanism including two rope drums disposed on horizontal axes on opposite sides but near the front or cutting end of said machine.

15 Other objects will appear from time to time as the description proceeds.

My invention may be more clearly understood by reference to the accompanying drawings, wherein—

20 Figure 1 is a plan view of the device embodying my invention with parts broken away to show the arrangement of the gearing;

Figure 2 is a side elevation of the device in Figure 1 with some parts broken away to show the arrangement of the operating levers;

25 Figure 3 is an enlarged fragmentary side elevation of the device shown in Figure 1, a portion of said elevation being a cross-section taken on line 3—3 of Figure 1;

30 Figure 4 is a sectional view taken through Figure 1 on line 4—4 thereof; and

Figure 5 is a sectional view taken through Figure 1 on line 5—5 thereof.

Referring now in detail to the drawings, 35 the embodiment of my invention comprises a mining machine 1 having a main frame 2 with a cutting element 3 projecting forwardly therefrom, and a driving motor 4 projecting from the rearward portion thereof. The cutting element 3 is preferably provided with an endless chain of the usual type and projects from the front end of the machine to cut a horizontal kerf in the mine wall, preferably adjacent the floor as the machine is 40 moved by draft devices in the well known manner. The driving motor 4 is attached to the rearward portion of the main frame 2 and rests on the mine bottom; the height of the motor shell determining the height of 45 the mining machine.

Referring now to the details of the driving mechanism for the feed and cutting elements, the motor 4 drives said mechanism through a motor shaft 16 having a pinion 17 at its forward end meshing with and driving a pin- 55 ion 18 keyed to a sleeve 19. Said sleeve is rotatable on a stud 20 fixed against rotation in suitable supports on the frame 2. Jaws 21 at the forward end of said sleeve mesh with jaws 22 on the hub of a bevel pinion 25 60 to rotate said pinion. Said bevel pinion has driving connection with a bevel gear 26 which drives a cutter chain 27 through a clutch 28, shaft 29, and sprocket 30.

Adjacent the rearward end of said bevel 65 pinion and coaxial therewith is the planetary reduction gearing 7 connectible with the rope drums 5, 5, for driving said rope drums at a plurality of frictionally controlled speeds. Said planetary gearing device is of the same 70 general type as used extensively in mining machine gearing, and as herein shown, imparts two frictionally controlled speeds to a gear 35 coaxial therewith. A suitable friction band 36 is provided for said planetary 75 reduction gearing device and is controlled by a hand wheel 37 at the rearward portion of the machine. Said hand wheel is threaded to a rod 38 which passes forward through the motor 4 to one arm of a bell crank lever 80 39. This bell crank lever is pivoted to the main frame of the machine and the other arm is pivoted to a rod 40 which is fastened to a movable end of the friction band 36. Tightening of the hand wheel 37 causes the friction band 36 to apply power to the gear 35 85 from the motor 4 at a reduced speed through the planetary reduction gearing device 7. A suitable clutch member which is herein shown as a jaw clutch 41 provides a means to drive 90 the gear 35 from the planetary reduction gearing device 7 at a plurality of frictionally controlled speeds. This clutch is operated by a hand lever 42 at the rear of the machine. This hand lever is fastened to the rear end 95 of a rod 43 which extends forwardly through the motor 4 to a crank lever 44 which in turn rocks a fork 45 attached to a shifting yoke 46 to shift the clutch 41. The spur gear 35 meshes with and drives gears 48, 48. These 100

gears are keyed to longitudinal shafts 49, 49, on opposite sides of the gear 35.

The rope drums 5, 5, on the forward portion of the main frame 2 on opposite sides of the cutting element 3 are of the same construction and are both driven from 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 2. The gear 35 connected with the planetary reduction gearing 7 drives said drums in opposite directions. The driving connection to both drums are substantially the same, so the driving connection to one drum only will be described.

A worm 50 is integral with the shaft 49 and is forward of the spur gear 48, said worm rotates a worm gear 51 keyed to a transverse shaft 52. The shaft 52 is journaled in the main frame 2 and an end portion of said journal box serves as a thrust bearing for the worm gear 51. A clutch sleeve 55 is feathered to the shaft 52 and has jaws 56 on its inner face engageable with jaws 57 on the inner face of a pinion 58 mounted on the clutch sleeve 55 and free to rotate thereon. The outer end of the pinion 58 has a hub integral therewith, which is journaled in the main frame 2. Suitable means are provided to move the clutch sleeve 55 transversely of the frame 2 along the shaft 52 to cause the jaws 56 to engage the jaws 57 on the pinion 58 and drive said pinion through the clutch sleeve 55 and vice versa. As shown herein, this shifting means is of a common lever construction operated by a rod 60 at the rear of the machine. The forward end of the rod 60 is pivoted to a crank lever 61 which is keyed to a shaft 62. A fork 63 is also keyed to the shaft 62. Said fork is pivoted to a yoke 64 to move the clutch sleeve 55 transversely along the shaft 52 upon movement of the rod 60 and thus engage or disengage the jaws 56 with the jaws 57. The pinion 58 meshes with a spur gear 66 connected to the rope drum 5 which is mounted on a transverse shaft 67. The other rope drum on the opposite side of the machine is also mounted on a similar transverse shaft 67 in the same relative position. Hence, when the pinions 58, 58 are operatively connected with the shafts 52, 52, one rope drum will wind in while the other pays off and vice versa upon reversal of the motor.

Another advantageous feature 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 for driving said drums simultaneously 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.

Means are provided for each rope drum to restrain rotation of said drums when either of said drums are disconnected from their driving means, as for instance when either of said drums are used for controlling retardation of the rear end of the machine. In the preferred form shown, I provide a common form of friction brake comprising a friction band 70 on a flange 71 which is integral with each respective brake drum on the outer end thereof. Said brake is operated by a hand wheel 72 threaded to a rod 73 at the rear of the machine. The rod 73 is fastened to a free end of the brake band 70 so turning of the hand wheel in one direction tightens the brake band and vice versa, to apply or release the brake.

The arrangement of the rope drums and ropes is such that in the normal cutting position, the rope drum 5 on the advancing or left hand 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. The left hand drum has a rope 5^b thereon which is preferably wound on said drum in a direction opposite to that of the rope 5^a on the right hand drum and thus unwinds from the top of said drum simultaneously with and at substantially 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 this retarding rope is unwound from its 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 required in maneuvering the machine during the sumping or dragging 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.

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 4. Additional sheaves 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 or discharge of the cuttings brought rearwardly by the cutter chain, it will be understood that the specific form of machine illustrated is of the reversible type, i. e., it is capable of being operated for cutting in either direction. Accordingly, the cuttings may be brought rearwardly to one side or the other by the cutter chain and will be discharged through an opening 75 provided for the discharge of said cuttings on either side of the machine. These openings are necessarily small since the rope drums, as shown, partially block these spaces, and the location of these drums cannot be changed on account of the limitations as to height, width and length imposed in a machine of this kind. Hence, in order to provide a means to effectively eliminate the cuttings, I omit the usual form of bottom pan beneath the gearing where these cuttings would be thrown. Referring to the drawings, it can be seen that my machine is supported on the mine floor on the bottom of the motor 4 at the rearward end, and on a shoe 76 at the forward end and that there is no bottom from this shoe backward to the main frame 2 near where said frame is joined to the motor 4. Thus, the cuttings expelled by the cutter chain will not be caught in a bottom pan and carried along with the machine but will be left on the mine bottom to be shoveled away by the machine operator as said machine progresses across the face of the coal. From this design it may be seen that I have effectively provided a means to eliminate the cuttings from the path of the cutter chain without the customarily large opening provided for the disposal of said cuttings.

Another advantageous feature of the machine above described, is the arrangement of the feed driving mechanism, wherein the two reduction worm and worm gears 48, 48, are interposed between the single centrally disposed planetary gear and the respective rope drum, on 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 in a mining machine of a main frame, a bearing shoe on the forward portion of said frame for supporting said frame for slidable movement on a mine bottom, a motor rearward of said main frame slidable on its bottom on a mine bottom and serving as the main supporting means for the rearward end of said main frame, said frame

having a bottomless cuttings passageway intermediate said motor and said shoe.

2. In combination with a mining machine, a frame, a motor rearward of said frame and connected thereto, slideable on its bottom on a mine bottom, a cutter arm projecting forwardly from said frame, flexible feed operating mechanism including a winding drum on either side of said cutter arm and operably connected with said motor to be driven therefrom at a plurality of predetermined speeds, through a single planetary gear device disposed on a horizontal axis extending longitudinally of said main frame intermediate said rope drums.

3. In combination with a mining machine, a frame, a motor rearward of said frame and connected thereto, slideable on its bottom on a mine bottom, a cutter arm projecting forwardly from said frame, feed operating mechanism comprising a winding drum on each side of said cutter arm on transverse axes at the forward portion of said main frame, driving means for driving said winding drums at a plurality of predetermined frictionally controlled speeds including a single planetary reduction gear device disposed on an axis perpendicular to the axes of said rope drums intermediate said rope drums.

4. In combination with a mining machine, a frame, a motor rearward of said frame and connected thereto, slideable on its bottom on a mine bottom, a cutter arm projecting forwardly of said frame having a cutter chain movable thereon, and a driving means for said cutter chain, feed operating mechanism for said mining machine comprising two rope drums on the forward portion of the machine frame, one on each side of the cutter chain driving mechanism, and each having operative connection with said motor through a frictionally controlled planetary reduction gear mechanism disposed coaxially with a portion of said cutter chain driving mechanism.

5. In combination with a mining machine, a frame, a motor rearward of said frame and connected thereto, slideable on its bottom on a mine bottom, a cutter arm projecting forwardly of said frame having a cutter chain movable thereon, a driving means for said cutter chain, feed operating mechanism for said mining machine comprising two rope drums on the forward portion of the machine frame, one on each side of the cutter chain driving mechanism and driven by said motor through a planetary reduction gear device disposed coaxially with a portion of said cutter chain driving mechanism.

6. In combination with a mining machine, a frame, a motor rearward of said frame and connected thereto, slideable on its bottom on a mine bottom, a cutter arm projecting forwardly of said frame having a cutter chain

movable thereon, a driving means for said cutter chain, feed operating mechanism for said mining machine comprising two rope drums on the forward portion of the machine frame, one on each side of the cutter chain driving mechanism and driven by said motor from a common spur gear coaxial and operatively connectible with a frictionally controlled planetary reduction gear mechanism coaxial with a portion of said cutter chain driving mechanism rearward of said cutter chain.

7. In combination with a mining machine, a frame, a motor rearward of said frame and connected thereto slideable on its bottom on a mine bottom, a cutter arm projecting forwardly of said frame having a cutter chain movable thereon, and a driving means for said cutter chain, feed operating mechanism for said mining machine comprising two rope drums on the forward portion of the machine frame, one on each side of the cutter chain driving mechanism, and driven by said motor from a common spur gear coaxial and operatively connectible with a frictionally controlled planetary reduction gear mechanism coaxial with a portion of said cutter chain driving mechanism rearward of said cutter chain, and a worm and worm gear reduction interposed between said planetary gear mechanism and each of said rope drums.

8. In combination with a mining machine, a frame, a motor rearward of said frame and connected thereto, a cutter arm projecting forwardly from said frame, and flexible feed operating mechanism including a winding drum on both sides of said cutter arm, a separate worm and worm-gear reduction disposed between said motor and each drum to operatively connect said motor with said drums, and a single planetary gear device interposed between said motor and said worm and worm-gear reductions disposed on a horizontal axis extending longitudinally of said main frame intermediate said rope drums for driving said rope drums at a plurality of predetermined frictionally controlled speeds.

9. In combination with a mining machine, a frame, a motor rearward of said frame and connected thereto, a cutter arm projecting forwardly of said frame having a cutter chain movable therein and a driving means for said cutter chain, feed operating mechanism for said mining machine comprising two rope drums on the forward portion of the machine frame, one on each side of the cutter chain driving mechanism and driven simultaneously or independently by said motor from a common spur gear coaxial and operatively connectible with a frictionally controlled planetary reduction gear mechanism coaxial with a portion of said cutter chain driving mechanism rearwardly of said cutter chain, and a separate worm and worm gear reduction on each side of said planetary

interposed between said planetary gear mechanism and each of said rope drums.

10. In a mining machine, a frame, a chain carrying cutter arm projecting forwardly of said frame, a motor to the rear of said frame, said motor being slideable on its bottom on a mine bottom, a cutter chain driving sprocket adjacent the forward end of said frame operatively connected with said motor, feed operating mechanism comprising two rope drums on transverse axes on opposite sides of the forward end of said main frame and having an outer periphery extending below the upper portion of said motor, driving connections including a single planetary reduction device on a longitudinal axis between said motor and said drums and beneath the uppermost portion of said motor for driving said drums simultaneously or independently from said motor at a plurality of speeds, said frame being supported for slideable movement on a mine bottom by said motor on its rearward end and a bearing shoe at its forward end, said motor, bearing shoe, frame and rope drums forming a bottomless cuttings passageway between said bearing shoe and said motor rearwardly of said rope drums, beneath said gearing and opening on each side of said frame.

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

FRANK A. LINDGREN.

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