March 13, 1934. F. A. LINDGREN 1,950,737

MINING MACHINE

Original Filed Dec. 28, 1928 3 Sheets-Sheet 1

Fig. 1

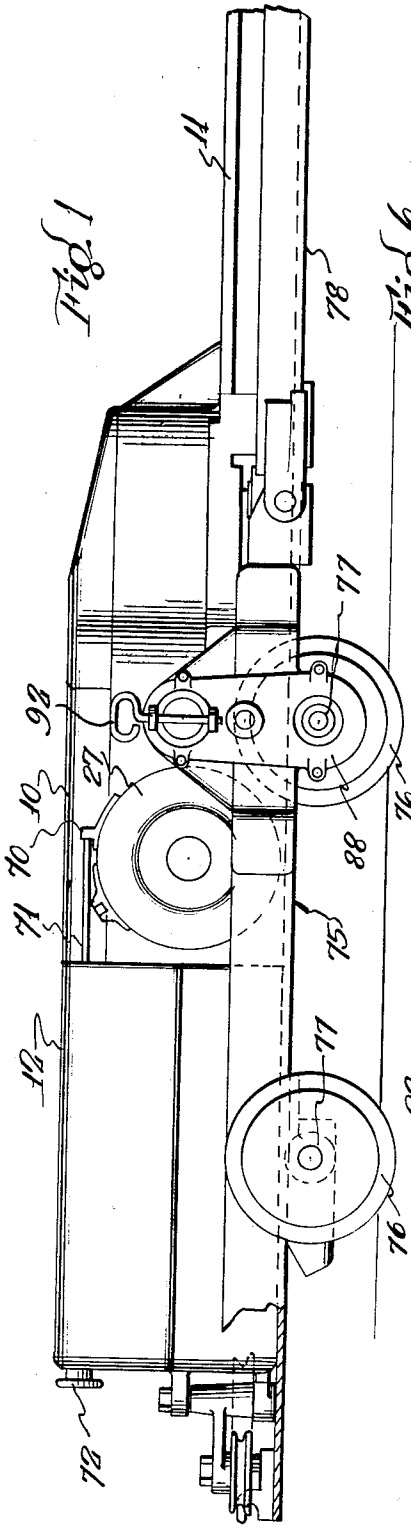


Fig. 6

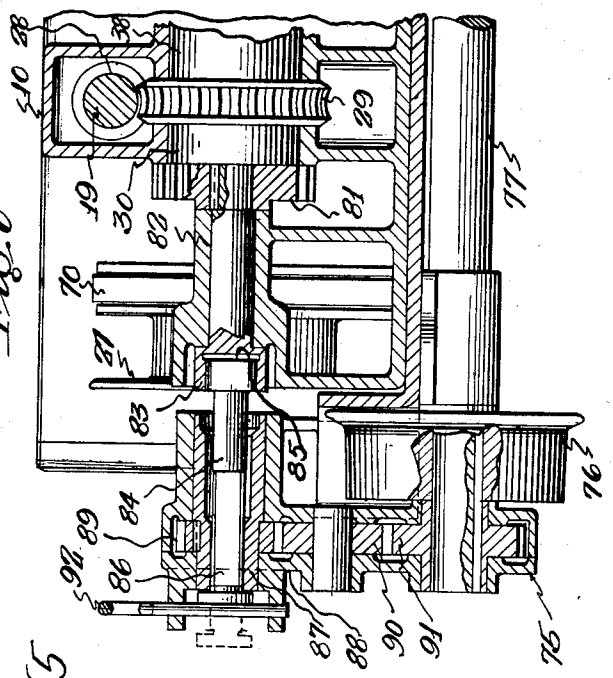
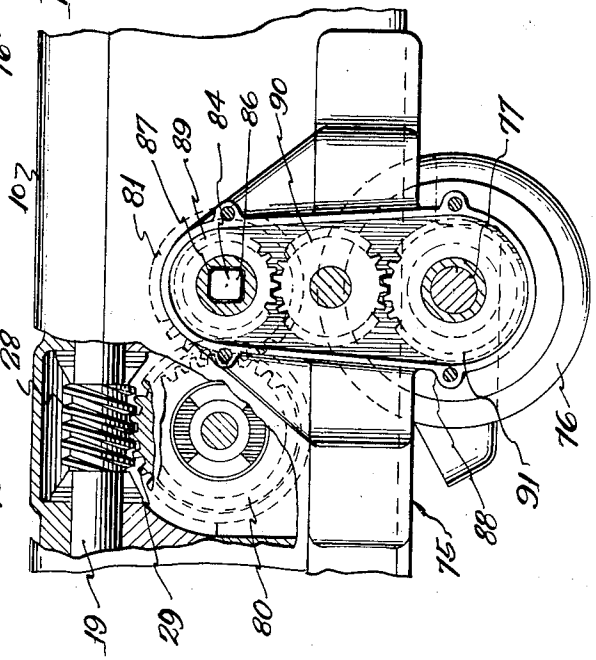


Fig. 5



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MINING MACHINE

Original Filed Dec. 28, 1928 3 Sheets-Sheet 2

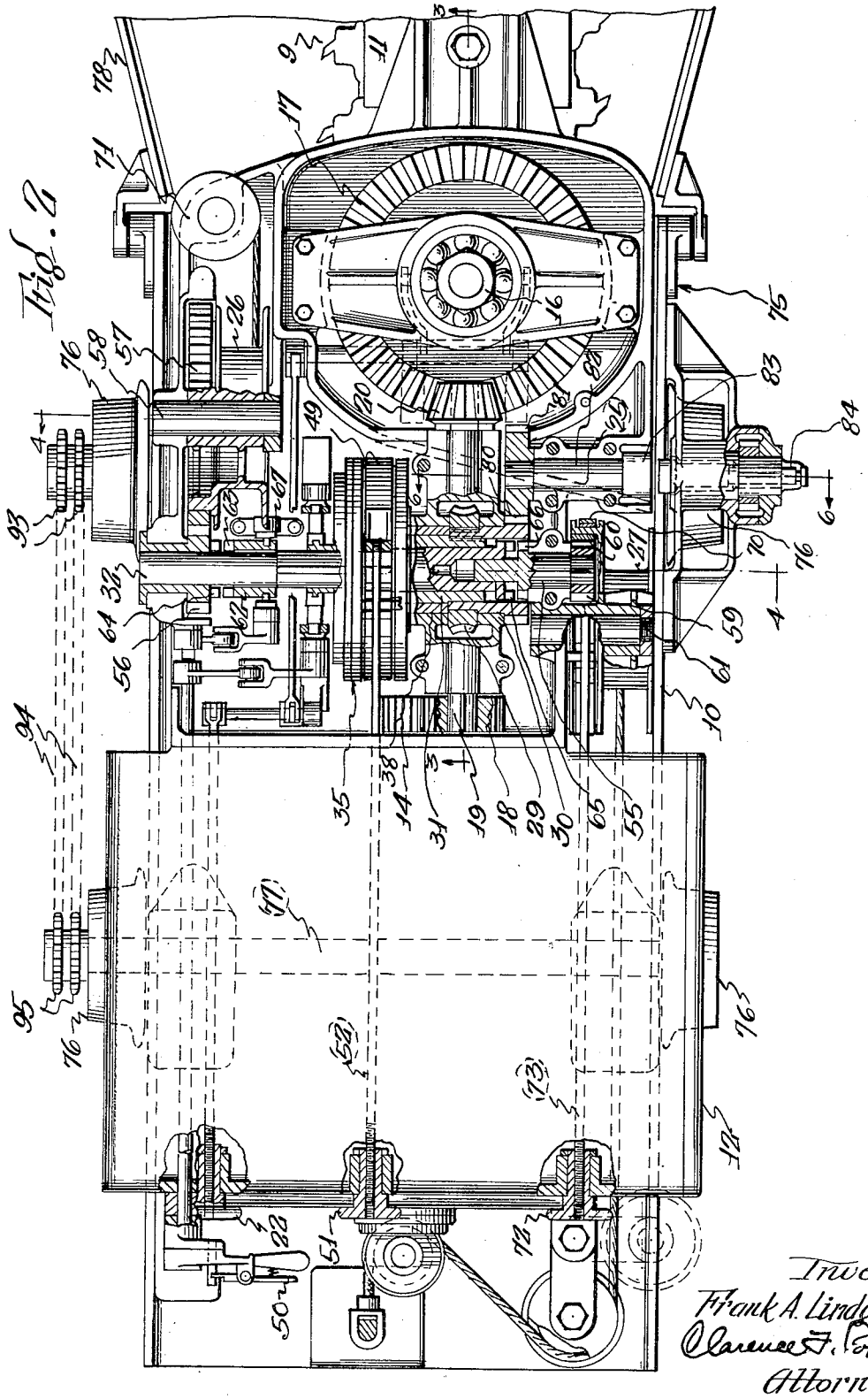

Fig. 2

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MINING MACHINE

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Fig. 3

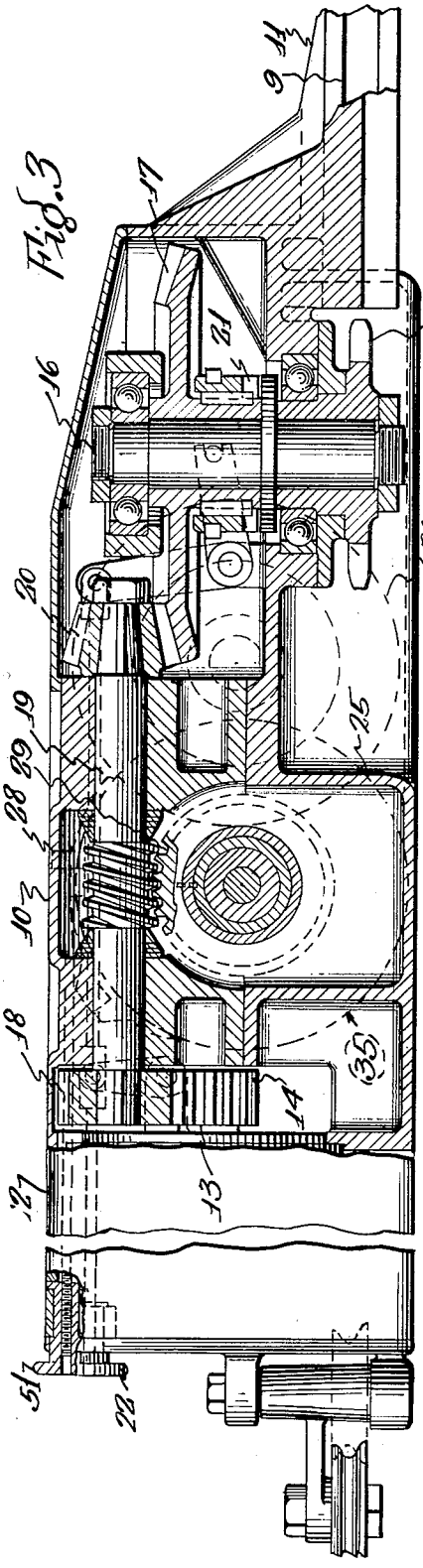
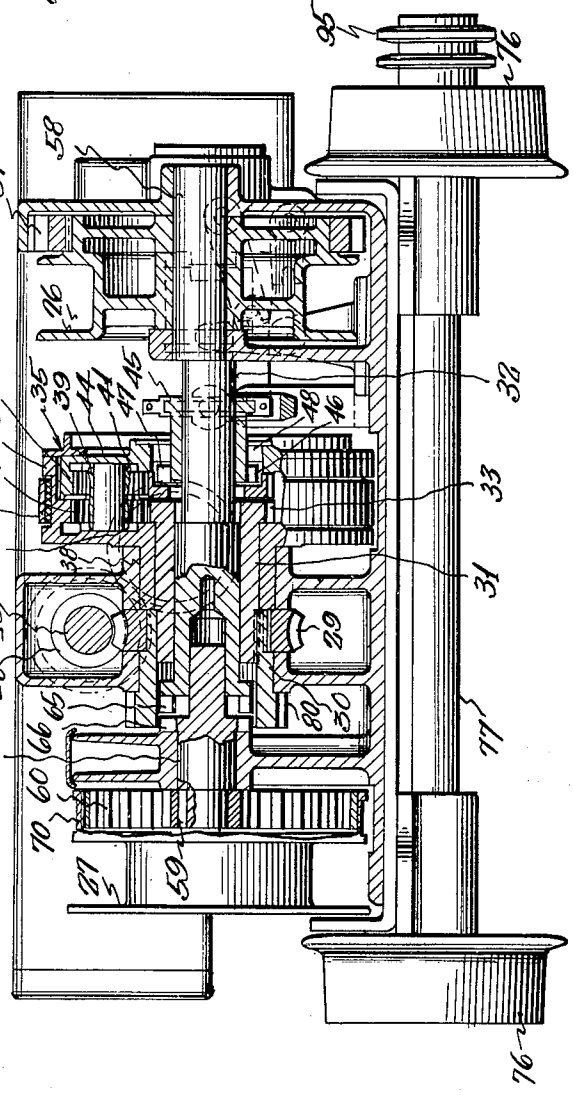


Fig. 4



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UNITED STATES PATENT OFFICE

1,950,737

MINING MACHINE

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Application December 28, 1928, Serial No. 328,912
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16 Claims. (Cl. 262—30)

This invention relates to improvements in mining machines and more particularly to coal cutting machines of the shortwall type slidable on their bottoms on the mine bottom while undercutting the coal.

The principal object of this invention is to provide a kerf cutting mining machine of the shortwall type suitable for use in thin seams of coal. Another object of the invention is to provide a machine which is simple and compact of construction, and still is of such rugged construction as to meet all reasonable requirements in cutting coal. Another object is to provide an improved construction including two power driven drums on said machine of substantially the same size and construction whereby the machine may be more easily manipulated about a mine, and to provide an improved truck driving means whereby the truck may be driven from the mining machine motor through a simplified geared reduction.

Other objects of the invention will appear from time to time in the following description of the machine embodying the several features of my invention.

The invention may be more clearly understood with reference to the accompanying drawings wherein:

Figure 1 is a side elevation of the device embodying my invention in position on a mining machine truck;

Figure 2 is an enlarged top plan view of the device embodying my invention with parts broken away and in section to more clearly show the details of my invention;

Figure 3 is an enlarged sectional view taken on line 3—3 of Figure 2;

Figure 4 is an enlarged sectional view taken on line 4—4 of Figure 2;

Figure 5 is an enlarged fragmentary side elevation of the mining machine shown in Figure 1 with parts broken away and in section to more clearly show the details of the truck driving means; and

Figure 6 is an enlarged fragmentary sectional view taken on line 6—6 of Figure 2.

Like numerals refer to like parts throughout the various figures.

Referring now to the details shown in the drawings, the machine comprises a main frame 10 having a cutter bar 11 projecting forwardly therefrom. The cutter bar 11 is preferably provided with an endless cutter chain 9 of the usual type and projects from the front end of the main frame 10 to cut a horizontal kerf in the mine wall preferably adjacent the mine floor as the machine is moved by draft devices across the mine face in the well known manner of machines of this type. A motor 12 projects rearwardly of the main frame 10 and its base slides on the mine bottom; all operating and driving mechanism being below the top portion of said motor so that the height of the mining machine is determined by the height of the motor 12. The motor 12 may be of any type but is herein shown as an electric motor having a longitudinally disposed armature shaft 13 having a spur pinion 14 on the forward end thereof.

The arrangement and construction of the cutter chain driving mechanism is shown in Figures 2 and 3 in detail. The cutter bar 11 is rigidly supported on the main frame 10 and is relatively close to the ground in order that the cutter chain 9 may cut a kerf at the mine bottom. The cutter chain 9 is driven by a sprocket 15 freely mounted on a vertical shaft 16. A bevel gear 17 is freely mounted on the top portion of said vertical shaft and is driven from the spur pinion 14 through a spur gear 18, longitudinal shaft 19 and bevel pinion 20. A clutch 21 herein shown as a jaw clutch is provided to operatively connect the bevel gear 17 with the sprocket 15 for driving said sprocket from the motor 12. The clutch 21 is operated by means of a hand wheel 22 at the rearward end of the motor 12 through a suitable system of levers of the usual type.

Figures 2 and 3 show a wall 25 of an arcuate shape which follows the path of the cutter chain and opens out to the retreating side of the machine to form a passageway for the cuttings whereby the cutter chain 9 may expel the cuttings beyond the mining machine as it is cutting a kerf in a mine wall to prevent said cuttings from being carried back into the mine kerf by the cutter chain. It may also be noted that the mining machine has no bottom beneath the cutter chain sprocket or cuttings passageway so that the cuttings not expelled by the cutter chain will rest on the mine bottom and be left behind as the mining machine advances across the coal face. The omission of a bottom plate beneath the cutter chain and cutter chain sprocket eliminates all possibility of the cuttings clogging up the cuttings passageway.

Referring now to the construction and arrangement of the feed operating mechanism it will be seen that I provide a novel construction and arrangement of parts disposed mainly to the forward portion of the motor 12 and within both the vertical and lateral limits of said

motor, thus requiring a minimum amount of both vertical and lateral space.

The feed operating mechanism includes a pair of winding drums 26 and 27 independently driven from the motor 12 through a frictionally controlled geared speed reduction device.

A worm 28 is integral with the longitudinal shaft 19 and rotates a worm gear 29 on a sleeve 30. The sleeve 30 is keyed on a sleeve 31 freely mounted on a transverse shaft 32. The sleeve 31 carries a pinion 33 thereon which constitutes the driving or sun gear of a planetary gear mechanism generally indicated at 35.

The planetary gear mechanism 35 may be of any suitable type heretofore utilized in mining machine transmissions. In the form shown herein, said planetary includes an outer casing 36 which carries an internal gear 37 on its inner periphery, and has a hub 38 loosely mounted on the sleeve 31. (See Figure 4). A cage 39 is provided for rotation within the casing 36 and carries thereon one or more pairs of planetary pinions 40 and 41, each of said pinions being mounted side by side and rotating together on the same axis, but having a different number of teeth so as to produce a speed differential in the usual manner. One of the planetary pinions 40 is meshed with the sun gear 33 and the internal gear 37 carried in the outer casing 36. The other planetary pinion 41 is meshed with an internal gear 43 carried by a member 44 which is herein shown as a low speed member. A sliding clutch member 45 is slidable along the shaft 32 and has a plurality of clutch jaws 46 thereon adapted to engage jaws 47 on the cage 39 which herein serves as a high speed member, or engage jaws 48 on the low speed member 44 to drive the transverse shaft 32 at either a predetermined high or low speed by sliding the clutch member 45 in one direction or the other along the shaft 32, said shaft being disconnected from the planetary 35 when the jaws 46 are midway between the jaws 47 and 48. The sliding clutch member 45 is reciprocably moved on the transverse shaft 32 by means of a suitable system of levers of an ordinary type operated by a hand lever 50 at the rearward end of the motor 12 in a usual manner.

Under normal operating conditions, the casing 36 is restrained from rotation by means of a friction band 49. The arrangement is such that the casing 36 may be permitted to slip in the friction band 49 when the machine is put under excessive load at either high or low speed, thereby protecting the driving parts from damage or breakage when unusual cutting conditions are met with. Furthermore, the friction band 49 may also be utilized to afford variations in speed either through the high or low speed connections in the usual manner. Pressure of the friction band 49 on the casing 36 may be varied by means of a hand wheel 51 threaded on a rod 52 at the rearward end of the motor 12. The forward end of said rod has connection with the friction band 49 so as to apply or release pressure on said friction band, and thus vary the point at which said casing will slip in said band.

One end of the shaft 32 is hollow and is supported on one end of a shaft 55 journaled at its central portion in the main frame 10. The opposite end of the shaft 32 is journaled for transverse and rotatable movement in the hub of a spur pinion 56, which pinion is journaled in the main frame 10. The spur pinion 56 meshes with and drives a spur gear 57 integral with the winding drum 26 and journaled on a shaft 58. The outer end of the shaft 55 has a spur pinion 59 keyed thereon which meshes with and drives an internal gear 60 fixed to the winding drum 27 for driving said winding drum, said winding drum being journaled on a shaft 61. A clutch collar 62 is keyed on the transverse shaft 32 and has clutch jaws 63 on its outer face, which clutch jaws are engageable with clutch jaws 64 on the inner face of the spur pinion 56.

Clutch jaws 65 are provided on the opposite end of the transverse shaft 32 and are engageable with clutch jaws 66 integral with the shaft 55 for driving said shaft. The shaft 32 is moved transversely of the main frame 10 to engage either the clutch jaws 63 with the clutch jaws 64 to drive the winding drum 26 or disengage said clutch jaws from each other and engage the clutch jaws 65 with the clutch jaws 66 for driving the winding drum 27 by means of a clutch fork 67 journaled on the bottom portion of the main frame 10 and operated by a suitable system of levers in the usual manner by means of a hand lever at the rearward end of the motor 12 (not shown).

It may now be seen that either the winding drum 26 or the winding drum 27 may be driven from the motor 12 at a plurality of frictionally controlled speeds and that the driving arrangement is such that said drums may not both be driven from the motor 12 at the same time. This prevents the application of power on the head and tail ropes simultaneously and eliminates breakage of said feed ropes which may be caused when pull on said ropes is opposed to each other.

The winding drum 27 is used as a tail rope or retarding rope drum. A friction band 70 surrounds said drum to retard the unwinding speed of said drum when the mining machine is cutting a kerf along a mine face and thus control the position of the mining machine with respect to the mine face. Pressure of said friction band on the winding drum 27 will therefore retard the unwinding speed of said drum and therefore cause the machine to pivot about a forward sheave 71 on the advance side thereof about which the head rope is threaded and thus cause the cutter bar 11 to advance along the coal face ahead of the main body portion of the mining machine. Release of pressure against the winding drum 27 allows the speed of rotation of said winding drum to increase and allows the rearward end of the machine to advance ahead of the cutter bar 11. Pressure of the friction band 70 on the winding drum 27 is controlled by means of a hand wheel 72 on the rearward end of the motor 12 threaded on a rod 73 which has connection with said friction band.

A truck 75 is provided to move the mining machine about the mine from cutting place to cutting place. The truck 75 is of an ordinary type supported on wheels 76 and axles 77 and having a hinged or drop front 78 so that the mining machine may be moved on or off of said truck by means of its draft ropes in the usual manner.

A suitable geared reduction means is provided for driving the truck 75 from the motor 12 which herein includes a spur gear 80 integral with the sleeve 30, a spur gear 81 driven thereby, and a shaft 82 journaled in the main frame 10 having a driving socket 83 in its outer end and driven by the spur gear 81. A coupling shaft 84 having an irregular upturned inner end 85 fits in the

driving socket 83, and has a squared shank 86 for rotating a sleeve 87 journaled in a frame portion 88 attached to the truck 75. The sleeve 87 has a spur gear 89 keyed thereon which meshes with and drives an idler gear 90, which idler gear drives a gear 91 keyed to the forward truck axle 77. A pin 92 abuts the outer end of the coupling shaft 84 to hold the upturned end 85 of said shaft in the driving socket 83 when the truck 75 is being propelled by the mining machine motor 12. Said pin is removable to allow the coupling shaft 84 to be disconnected from the shaft 82 when it is desired to remove the mining machine from the truck 75. The forward and rearward truck axles 77 are operatively connected together by means of driving sprockets 93, drive chains 94, and driven sprockets 95.

It may now be seen that I have provided a mining machine of the shortwall type having a new and novel arrangement of feed operating and cutting mechanism so that said machine will be of a minimum height and still be of such a length as to be readily transportable about a mine without interfering with props or roof supports while cutting.

I have also provided two power driven rope drums to manipulate my machine and move it about the mine, which drums are both independently driven from the motor 12 at a plurality of predetermined frictionally controlled speeds. While my machine is of a low height, the mechanical and electrical parts of my machine are of such size and strength that said machine may safely and efficiently meet all requirements of cutting coal due to the compact and novel arrangement of said parts whereby said parts may be readily accessible for repair or adjustment. It may also be seen that I have provided a new and improved truck drive whereby the truck is driven from the forward portion of the motor through a simple direct geared reduction instead of the usual chain drive from the mining machine to the truck, which provides a more positive drive for the truck than has formerly been used and which eliminates the possibility of breakage of drive chains from the mining machine to the truck.

The arrangement of the feed gearing and controlling clutches 63 and 65 selectively connecting the gearing to either the feed drum 26 or 27 is such as to permit either of the drums to be driven independently of the other. The machine may then be sumped with either rope and a cross cut may be made with one of the ropes while the other rope may be utilized for retarding movement of the rear end of the machine. Retardation of the winding drum 27 is controlled by the brake band 70, it not being necessary to control retardation of the winding drum 26 since my machine is only adapted to cut in one direction.

It will be further understood that the drums may be selectively driven at variable speeds through the planetary gear mechanism 35, and that the direction of rotation of the gearing and drums may be reversed by reversing the motor in the usual manner.

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

I claim as my invention:

1. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, feeding mechanism for said mining machine comprising two rope drums one on each side of said mining machine, and a transverse shaft driven from the forward end of said motor at a plurality of frictionally controlled speeds and disposed rearwardly of the axis of rotation of one of said rope drums, said shaft being slidable transversely of said mining machine and operatively connectible with either of said rope drums at opposite ends thereof.

2. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, feeding mechanism for said mining machine comprising two rope drums one on each side of said mining machine and disposed forwardly of said motor, a planetary reduction gearing mechanism disposed on a transverse axis forwardly of one of said drums, and a transverse shaft coaxial with said planetary reduction gearing mechanism, and driven thereby, said shaft being movable transversely of said mining machine for connecting either of said rope drums with said mining machine motor.

3. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, feeding mechanism for said mining machine disposed forwardly of said motor comprising a head rope drum on one side of said mining machine, and a tail rope drum on the opposite side of said mining machine, a planetary reduction gearing mechanism driven by said motor and disposed on a transverse axis forwardly of the axis of rotation of said tail rope drum and rearwardly of the axis of rotation of said head rope drum, a transverse shaft coaxial with said planetary reduction gearing mechanism and driven thereby, and clutch mechanism on opposite ends of said transverse shaft for independently driving either said head rope drum or said tail rope drum from said motor at a plurality of predetermined speeds.

4. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, feeding mechanism for said mining machine disposed forwardly of said motor comprising a head rope drum on one side of said mining machine, and a tail rope drum on the opposite side of said mining machine, a planetary reduction gearing mechanism driven by said motor and disposed on a transverse axis forwardly of said tail rope drum, a transverse shaft movable transversely of said main frame, said transverse shaft being coaxial with said planetary reduction gearing mechanism

and driven thereby, and clutch mechanism on opposite ends of said transverse shaft for connecting said head rope drum and disconnecting said tail rope drum from said motor and vice versa so that either said head rope drum or said tail rope drum may be independently driven from said motor at a plurality of predetermined speeds.

5. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, feeding mechanism for said mining machine disposed forwardly of said motor comprising a head rope drum on one side of said mining machine and a tail rope drum on the opposite side of said mining machine, a planetary reduction gearing mechanism disposed on a transverse axis forwardly of the axis of rotation of said tail rope drum, and rearwardly of said head rope drum, and a transverse drive shaft coaxial with said planetary reduction gearing mechanism and driven thereby, said shaft being movable transversely of said mining machine for connecting either of said rope drums with said mining machine motor.

6. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, feeding mechanism for said mining machine forwardly of said motor comprising a head rope drum on one side of said mining machine and a tail rope drum on the opposite side of said mining machine, a planetary reduction gearing mechanism disposed on a transverse axis forwardly of the axis of rotation of said tail rope drum, and rearwardly of said head rope drum, a transverse shaft movable transversely of said main frame, said transverse shaft being coaxial with said planetary reduction gearing mechanism and driven thereby, and clutch mechanism on opposite ends of said transverse shaft for connecting said head rope drum and disconnecting said tail rope drum from said motor upon transverse movement of said shaft and vice versa so that either said head rope drum or said tail rope drum may be independently driven from said motor at a plurality of predetermined speeds.

7. In an apparatus of the class described, a wheeled truck, a mining machine slidable thereon including a main frame, a motor rearwardly of said main frame, a longitudinally extending cutter bar projecting forwardly of said main frame, feeding mechanism for said mining machine comprising a head rope drum and a tail rope drum, driving means for said rope drums comprising a single transverse shaft driven by said motor selectively connectible with said rope drums at opposite ends thereof, a spur gear coaxial with said shaft and driven by said motor, a shaft parallel to said transverse shaft and driven by said gear, and a socket on the outer end of said shaft, said socket being connectible with a geared driving connection for driving said truck.

8. In an apparatus of the class described, a truck having wheels and axles thereon, a mining machine detachably mounted on said truck including a main frame, a motor rearwardly of said main frame, a longitudinally extending cutter bar projecting forwardly of said main frame, feeding mechanism for said mining machine comprising a head rope drum and a tail rope drum, driving means for said feeding mechanism comprising a single transverse shaft connectible with said rope drums at opposite ends thereof and driving means for said truck comprising a spur gear coaxial with said shaft and driven by said motor, a shaft parallel to said transverse shaft driven by said spur gear, a socket on the outer end of said shaft, a power bracket on said truck having a geared driving connection with said truck wheels and axles, and a coupling shaft connectible with said socket for driving said truck wheels through said power bracket.

9. In an apparatus of the class described, a truck having wheels and axles thereon, a mining machine detachably mounted on said truck including a main frame, a motor rearwardly of said main frame, a longitudinally extending cutter bar projecting forwardly of said main frame, feeding mechanism for said mining machine comprising a head rope drum and a tail rope drum, driving means for said feeding mechanism comprising a single transverse shaft connectible with said rope drums at opposite ends thereof and driving means for said truck comprising a gear coaxial with said shaft, and driven by said motor, a shaft parallel to said transverse shaft driven by said gear, a socket on the outer end of said shaft, a power bracket on said truck having a plurality of gears having driving connection with said truck wheels and axles and a coupling shaft for driving said last named gears from said socket on said parallel shaft.

10. In an apparatus of the class described, a truck having wheels and axles thereon, a mining machine detachably mounted on said truck including a main frame, a motor rearwardly of said main frame, a longitudinally extending cutter bar projecting forwardly of said main frame, feeding mechanism for said mining machine comprising a head rope drum and a tail rope drum, driving means for said feeding mechanism comprising a motor shaft, a longitudinal shaft driven thereby, a worm gear driven by said longitudinal shaft, and driving means for said truck comprising a shaft parallel to the axis of said worm gear, a power bracket on said truck having a plurality of spur gears journaled therein, one of said spur gears having driving connection with one of said truck wheels and axles, and a coupling shaft movable transversely of another of said spur gears and operatively connecting said spur gear with said last mentioned shaft.

11. In an apparatus of the class described, a truck having wheels and axles thereon, a mining machine detachably mounted on said truck including a main frame, a motor rearwardly of said main frame, a longitudinally extending cutter bar projecting forwardly of said main frame, feeding mechanism for said mining machine comprising a head rope drum and a tail rope drum, driving means for said feeding mechanism comprising a motor shaft, a longitudinal shaft driven thereby, a worm gear driven by said longitudinal shaft, and driving means for said truck comprising a gear coaxial with said worm and driven thereby, a shaft driven by said gear having a driving socket on its outer end, a power bracket on said truck having a plurality of gears journaled therein, one of said last named gears having driving connection with one of said truck wheels and axles, a coupling shaft operatively connectible with another of said last named gears, and means whereby said coupling shaft

may be slidably moved transversely of said last named gear and have driving connection with said driving sprocket.

12. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom, the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, and feeding mechanism for said mining machine comprising a transverse shaft disposed forwardly of said motor and driven from said motor at a plurality of frictionally controlled speeds, and a plurality of feeding drums operatively connectible with said transverse shaft, one of said drums being rotatable about an axis disposed forwardly of said transverse shaft, the other of said drums being rotatable about an axis disposed rearwardly of said transverse shaft, and both of said drums being substantially within the lateral and vertical limits of said motor.

13. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom, the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, and feeding mechanism for said mining machine comprising a transverse shaft disposed forwardly of said motor and driven from said motor at a plurality of frictionally controlled speeds, a feeding drum rotatable about an axis forwardly of said transverse shaft and disposed within both the lateral and vertical limits of said motor, another feeding drum rotatable about an axis disposed rearwardly of said transverse shaft at the opposite end thereof and disposed within both the lateral and vertical limits of said motor, and means for operatively connecting said drums to said transverse shaft.

14. In a mining machine, a main frame, a motor rearwardly of said main frame and slidable on its bottom on a mine bottom, the height of said motor substantially determining the height of the machine, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, and feeding mechanism for said mining machine comprising a transverse shaft disposed forwardly of said motor and driven from said motor at a plurality of frictionally controlled speeds, a feeding drum rotatable about an axis forwardly of said transverse shaft and disposed within both the lateral and vertical limits of said motor, another feeding drum rotatable about an axis disposed rearwardly of said transverse shaft at the opposite end thereof and disposed within both the lateral and vertical limits of said motor, and clutch mechanism on opposite ends of said transverse shaft for independently driving either of said feed drums from said motor at a plurality of predetermined speeds.

15. In a mining machine, a motor slidable on its bottom on a mine bottom, the height of said motor substantially determining the height of the machine, a main frame forwardly of said motor of narrower lateral dimensions than said motor, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, an arcuate cuttings passageway closed to the advance side of said machine and open to the receding side of said machine, a transverse shaft disposed rearwardly of said cuttings passageway and driven from said motor at a plurality of predetermined speeds, and a plurality of feed drums operatively connectible with opposite ends of said transverse shaft, said feed drums being within the lateral and vertical limits of said main frame, said feed drum on the advance side of said machine being rotatable about an axis disposed forwardly of said transverse shaft and said feed drum on the receding side of said main frame being rearwardly of said cuttings passageway.

16. In a mining machine, a motor slidable on its bottom on a mine bottom, the height of said motor substantially determining the height of the machine, a main frame forwardly of said motor of narrower lateral dimensions than said motor, a longitudinally extending cutter bar projecting forwardly of said main frame having a cutter chain movable thereabout, an arcuate cuttings passageway closed to the advance side of said machine and open to the receding side of said machine, a transverse shaft disposed rearwardly of said cuttings passageway and driven from said motor at a plurality of predetermined speeds, a feed drum connectible with one end of said transverse shaft and rotatable about an axis disposed forwardly of said transverse shaft and disposed within both the lateral and vertical limits of said main frame, a feeding and retarding drum connectible with the opposite end of said transverse shaft and rotatable about an axis disposed rearwardly of said transverse shaft and disposed within both the lateral and vertical limits of said main frame and rearwardly of the cuttings passageway opening on the receding side of the machine.

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