

Sept. 9, 1952

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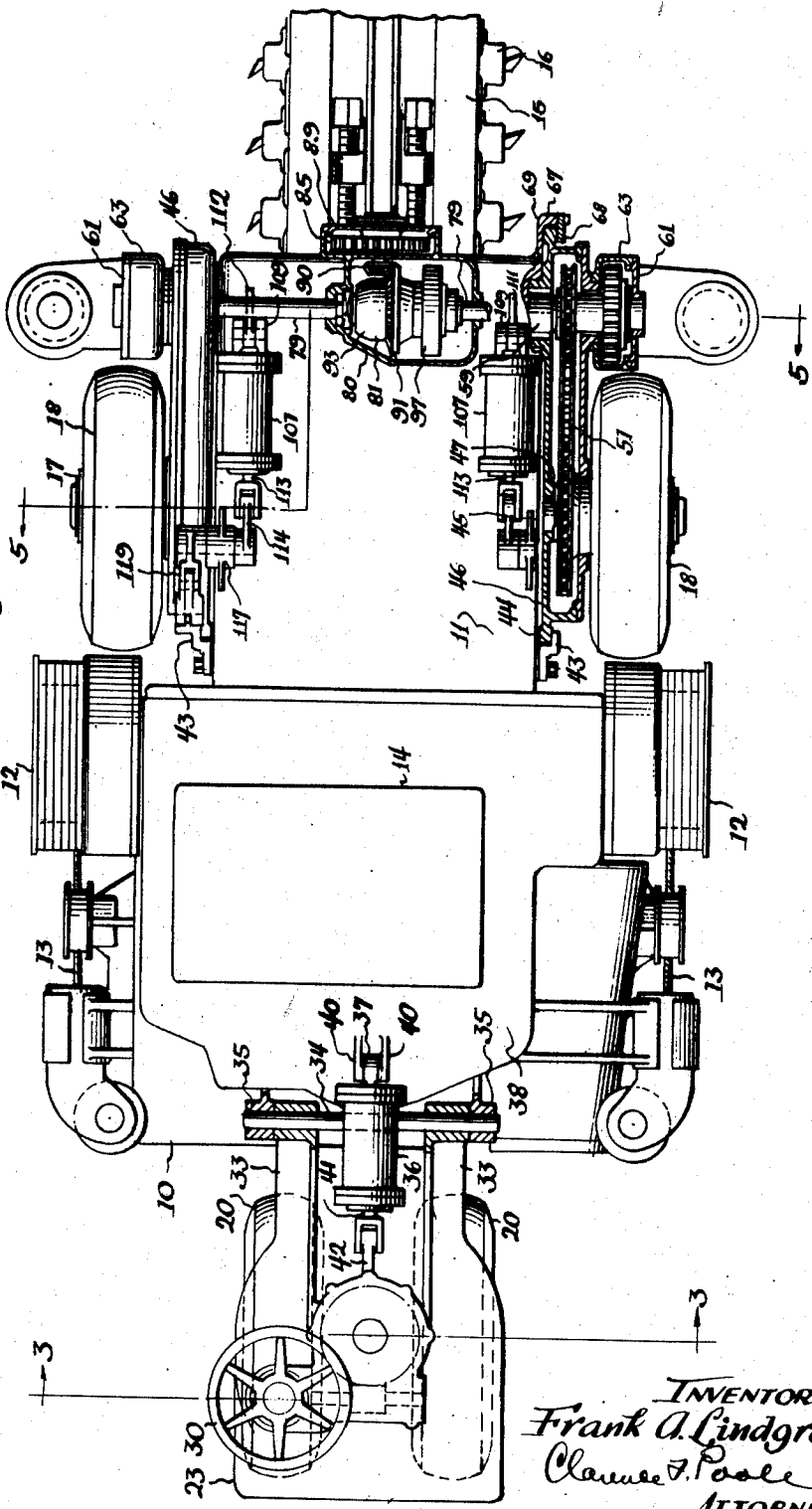
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KERF-CUTTING MACHINE

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4 Sheets-Sheet 1

Fig. 1



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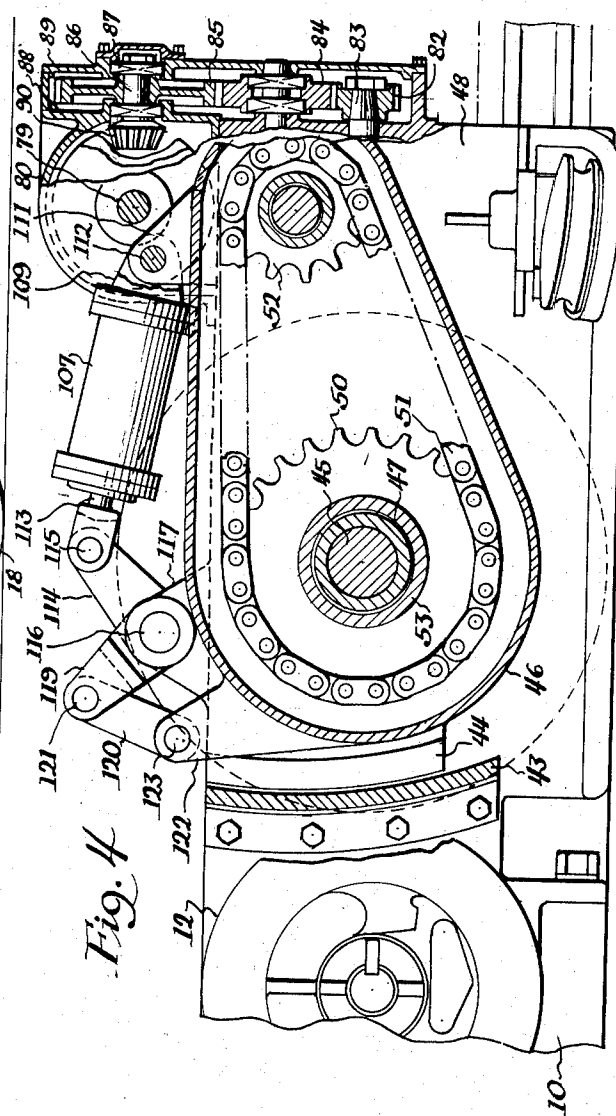
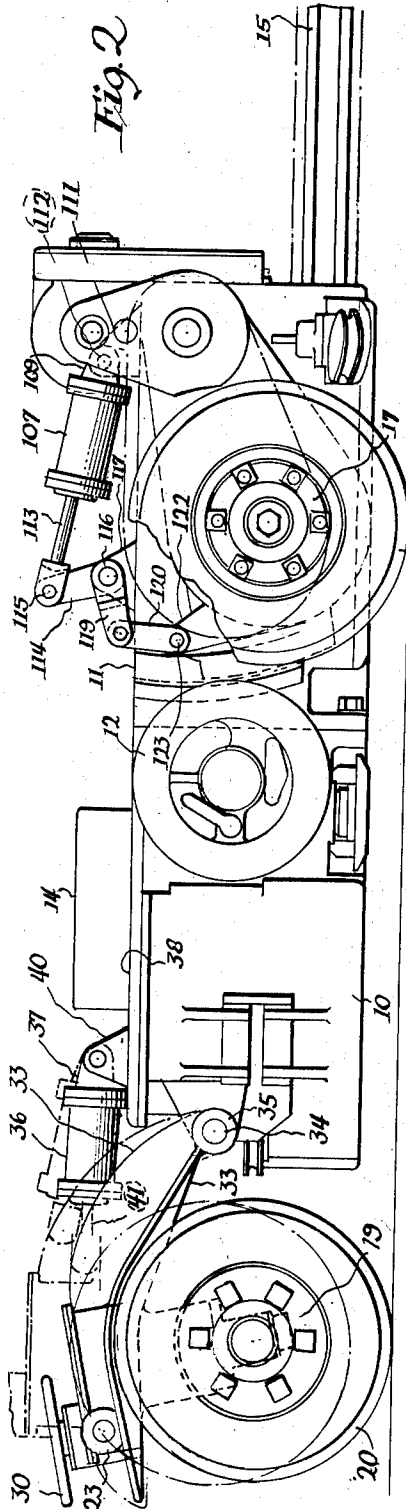
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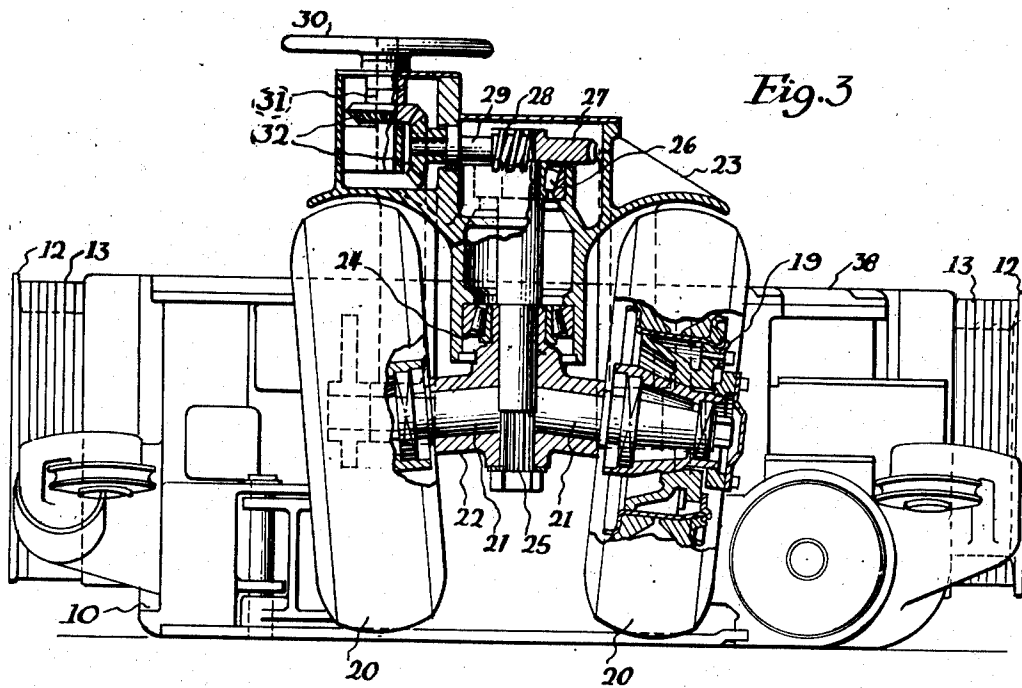
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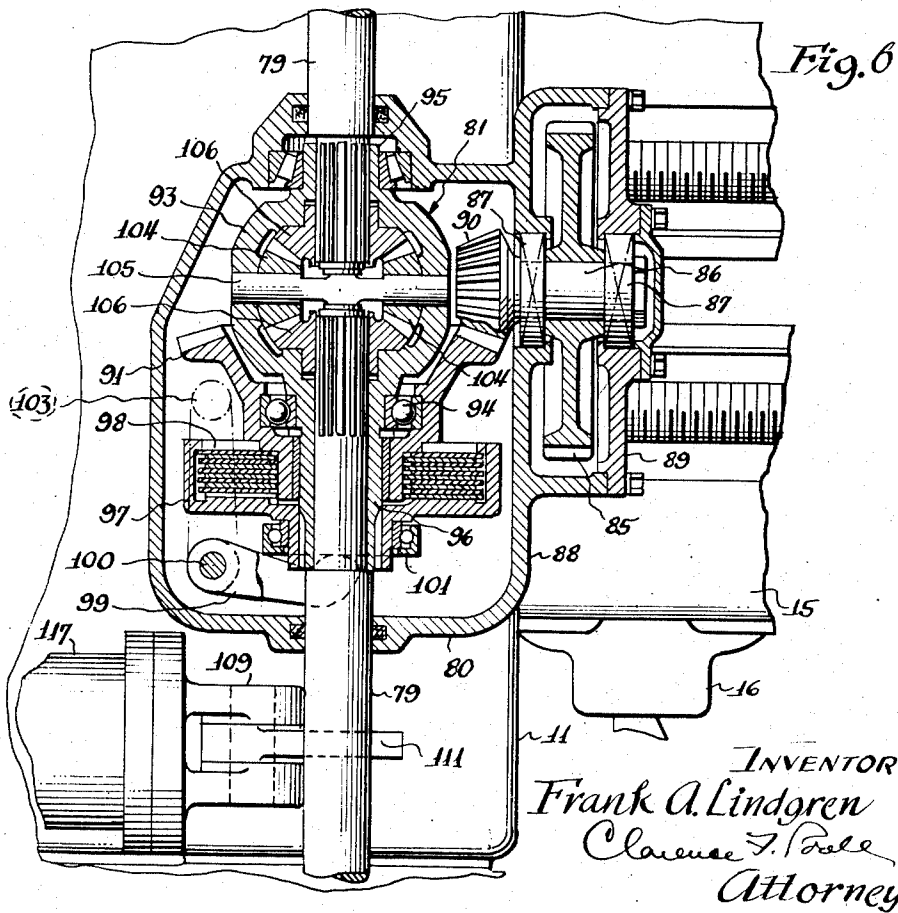
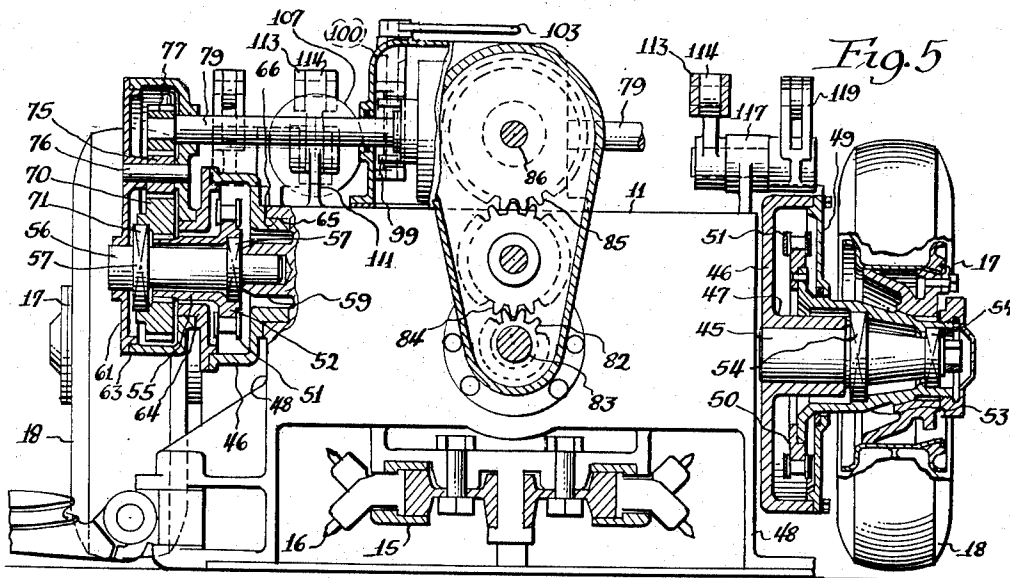
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KERF-CUTTING MACHINE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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KERF-CUTTING MACHINE

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6 Claims. (Cl. 262—28)

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This invention relates to improvements in kerf-cutting machines of the room and pillar type.

The principal objects of my invention are to provide a novel form of wheel mounted self-propelled kerf-cutting machine of the room and pillar type arranged with a view towards utmost compactness, simplicity and efficiency in operation, and so constructed that the wheels and their supporting connections with the machine may support and propel the kerf-cutting machine about the mine from one working place to the other, and may lower the kerf-cutting machine into engagement with the ground and raise said wheels above the ground, to permit cutting by slidable movement of the machine along the ground on its bottom in the manner usual with machines of this type.

These and other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a top plan view of a kerf-cutting machine constructed in accordance with my invention, with certain parts broken away and certain other parts shown in horizontal section;

Figure 2 is a view in side elevation of the kerf-cutting machine shown in Figure 1;

Figure 3 is an enlarged fragmentary transverse sectional view taken substantially along line 3—3 of Figure 1;

Figure 4 is an enlarged fragmentary view in side elevation of the kerf-cutting machine shown in Figure 1, with certain parts thereof broken away and certain other parts shown in substantially longitudinal section in order to illustrate certain details of the drive to the rubber-tired driving wheels;

Figure 5 is an enlarged fragmentary transverse sectional view taken substantially along line 5—5 of Figure 1; and

Figure 6 is an enlarged detail horizontal sectional view taken through the drive to the rubber-tired wheels and showing certain other details of the differential drive to the driving wheels.

In the embodiment of my invention illustrated in the drawings, a kerf-cutting machine of a well known form of room and pillar type is shown as including a main frame 10 having a motor 11 secured to and projecting forwardly from its forward end. A flexible feeding means may be provided at opposite sides of said main frame rearwardly of said motor, which may comprise a pair of winding drums 12, 12 adapted to have flexible cables 13, 13 wound thereon and arranged to be anchored at their free ends at suitable points

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adjacent the working face, for feeding the kerf-cutting machine into and across the working face.

A cutter bar 15 having a cutter chain 16 guided for movement thereabout projects forwardly from the motor 11 and may be mounted on the underside of said motor (see Figures 1 and 5). Said cutter bar and cutter chain may extend beneath said motor and may be driven from the rear end thereof so as to propel the cuttings cut beneath said motor and main frame and discharge them from the rear end of said motor.

The machine is supported for transportation about the mine on two driving wheels 17, 17 having rubber tires 18, 18 mounted thereon and disposed at opposite sides of the motor 11 adjacent the forward end of the machine, and on two inwardly-toed, closely spaced steering wheels 19, 19 having rubber tires 20, 20 mounted thereon and disposed rearwardly of the main frame 10. Said driving wheels are recessed within the lateral boundaries of the machine to maintain the lateral dimensions of the machine and to facilitate the sumping and cutting operations of the machine, especially in close posting. Said drive wheels, as herein shown, are mounted in the spaces usually occupied by the starter and resistance for the motor, said starter and resistance being instead mounted on the top of the machine as indicated generally by reference character 14 in Figures 1 and 2.

The steering wheels 19, 19 are each journaled on a dead axle 21. Said axles project in opposite directions from a turning frame 22 and are inclined towards the ground so as to toe said wheels inwardly towards each other at the proper angle (see Figure 3). Said turning frame is journaled adjacent its upper end in a lower depending central cylindrical portion of a support frame 23 on a taper roller bearing 24. A vertical shaft 25 is splined in the lower end of said turning frame and projects upwardly therefrom. Said shaft is journaled adjacent its upper end on a taper roller bearing 26 mounted in the upper end of said cylindrical portion of said support frame. A worm gear 27 is keyed on the upper end of said vertical shaft and is meshed with a worm 28 on a transverse shaft 29. A steering wheel 30 on the upper end of a vertical shaft 31 is provided to turn said worm and worm gear and said wheels, for steering the machine, and is operatively connected therewith by means of a pair of meshing bevel gears 32, 32, one of which is on the vertical shaft 31 and the other of which is on the outer end of the transverse shaft 29.

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The support frame 23 has two laterally spaced arms 33, 33 which project from its upper end towards the rear end of the kerf-cutting machine in an angularly downwardly direction. Said arms are pivotally connected to the rear end of said kerf-cutting machine on a transverse shaft 34 mounted adjacent its opposite ends in bosses 35, 35, projecting rearwardly from the rear end of the main frame 10 and disposed beneath the top of said main frame. A cylinder 36 having an ear 37 projecting from its head end, is pivotally connected to a top cover 38 for said main frame by means of a pivotal pin 39. Said pivotal pin extends through said ear 37 and through two laterally spaced upright ears 40, 40 projecting upwardly from said top cover 38 and extending along opposite sides of said ear 37. A piston rod 41 extending from a piston (not shown) movable within said cylinder is extensible from said cylinder. Said piston rod is pivotally connected to a connecting ear 42 extending from the support frame 23 towards the main frame 10 and disposed between the arms 33, 33.

When fluid under pressure is admitted into the head end of the cylinder 36, the piston rod 41 will be extended from the piston rod end of said cylinder to depress the support frame 23 about the axis of the transverse shaft 34 and engage the steering wheels 19, 19 with the ground. Further extension of said piston rod from said cylinder will elevate the rear end of the main frame 10 above the ground, to permit said steering wheels to support the rear end of said main frame above the ground, so said wheels may steer the machine while it is traveling about the mine, as shown in Figure 2. It should here be understood that the rear end of the machine is supported above the ground during transportation, and that the wheels 19, 19 are also supported above the ground during the cutting operation by holding fluid pressure in either the head or piston rod ends of said cylinder 36.

Each front drive wheel 17 is mounted on a dead axle 45 projecting outwardly from a gear housing 46. Each of said gear housings is pivotally mounted adjacent its forward end to a side wall 48 of the casing for the motor 11, and is guided for vertical movement about its axis of pivotal connection to said motor by means of an arcuate gibbed retaining guide 43, secured to the side of said motor and slidably engaging the outer side of an arcuate flange 44 which extends rearwardly from said gear housing. The driving connection to each drive wheel 17 and the support therefor are substantially the same for each side of the machine, so said support and driving connection for one side of the machine only need herein be described in detail.

The dead axle 45 is mounted in and projects from an annular boss 47 which projects outwardly from an inner wall of said gear housing. A cover 49 serves to close the outer side of said housing. Said gear housing besides forming a vertically movable support for said front drive wheel, also forms a housing for a sprocket 50, a chain 51 meshing with and driving said sprocket, and a drive sprocket 52 for driving said chain (see Figures 1 and 4). Said sprocket 50 is herein shown as being secured to an outwardly extending substantially bell-shaped sleeve or hub 53, which is coaxial with and is journaled on the dead axle 45 on anti-friction bearings 54, 54. Said bell-shaped sleeve 53 forms a mounting for the drive wheel 17.

The drive sprocket 52 has an integrally formed sleeve 55 projecting outwardly therefrom, which

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is journaled on a transverse shaft 56 on anti-friction bearings 57, 57 (see Figure 5). Said shaft is mounted at its inner end in an annular support 59 formed integrally with and recessed within the side wall 48 of the casing for the motor 11, and is mounted at its outer end in an end cover 61 of a gear housing 63. Said last mentioned gear housing is pivotally mounted on an outwardly projecting annular shouldered portion 64 of the gear housing 46. The gear housing 46 is also provided with an inwardly extending annular bearing portion 65 coaxial with the shaft 56, which is journaled in an annular recess 66 of said motor, which encircles the annular shaft support 59. A retaining flange 67 projects forwardly from the forward end of said gear housing and is engaged by a gib 68, detachably secured to an arcuate rib 69, projecting forwardly and outwardly from the forward end of the casing for the motor 11, for retaining said gear housing within said annular recess, during vertical movement thereof about the axis of the sprocket 50, for raising the wheel 17 above the ground or for engaging said wheel with the ground and elevating the forward end of the kerf-cutting machine above the ground.

A spur gear 70 is splined on the outer end of the sleeve 55. Said spur gear is journaled on its hub on an anti-friction bearing 71 mounted on the shaft 56. The spur gear 70 is meshed with an idler gear 75 journaled on a transverse shaft 76, mounted in the gear housing 63 at one of its ends and in the cover 61 for said housing at its opposite end. A pinion 77 keyed on the outer end of a transverse shaft 79 meshes with and drives said idler gear. The transverse shaft 79 is journaled just inwardly of the pinion 77 in an inner wall of the gear housing 63 and projects inwardly therefrom within a housing 80 for a differential 81.

The drive from the motor 11 to the differential 81 includes a pinion 82 keyed on the forward end of a shaft 83 of the motor 11 (see Figure 5). Said pinion meshes with and drives an intermediate gear 84 disposed thereabove, which meshes with and drives a spur gear 85 mounted on a longitudinal shaft 86. Said longitudinal shaft is journaled on opposite sides of the spur gear 85 in anti-friction bearings 87, 87, one of which is mounted in an end wall 88 of the housing 80 and the other of which is mounted in a cover 89 for the gear train just described. A bevel pinion 90 is keyed on the inner end of the longitudinal shaft 86 and meshes with and drives a bevel gear 91 mounted coaxially of the transverse shaft 79 and journaled on the hub of a cage 93 for said differential, on a ball bearing 94. Said cage has a hub 95 which is journaled in one end wall of the housing 80 and is mounted for free rotation with respect to the left-hand drive shaft 79. A sleeve 96 projects from the opposite end of said cage and is freely mounted on the opposite drive shaft 79. Said sleeve has the bearing 94 mounted thereon and has the hub of a bevel gear 91 extending therealong within a housing 97 of a friction disk clutch 98. Said clutch housing is keyed on said sleeve and said clutch may be of any well known form of friction disk type, so need not herein be shown or described in detail. Said clutch is engaged by means of a forked lever 99 pivotally mounted in the differential housing 80 on a vertical pivotal pin 100. The free ends of the furcations of said lever have bearing engagement with opposite sides of a thrust bearing 101, for moving said thrust bearing and clutch housing along said sleeve to engage the clutch.

A hand lever 103 is keyed to the outer end of said shaft outside of the housing 80 for operating said clutch to selectively drive the differential cage 93 from the bevel gear 91.

The cage 93 of the differential has two differential pinions 104, 104 journaled on a shaft 105, which is mounted at its ends in opposite sides of said cage. Said pinions mesh with bevel gears 106, 106 splined on the inner ends of the transverse shafts 79, 79 for differentially driving said shafts in a well known manner.

The means for vertically moving each gear housing 46 about the axis of the drive sprocket 52 and raising or lowering the drive wheels 17, 17 with respect to the ground, and for elevating the kerf-cutting machine above the ground, includes a fluid cylinder 107. Said cylinder has a bifurcated ear 109 projecting from the head end thereof, the furcations of which extend along opposite sides of an ear 111 extending upwardly from the top of the casing of the motor 11, and which are pivotally connected to said ear by means of a pivotal pin 112. A piston rod 113 extending from a piston (not shown), movable with said cylinder, is pivotally connected at its outer end to a rocking arm 114, by means of a pivotal pin 115. Said rocking arm is mounted on and secured to a transverse shaft 116 which is pivotally mounted intermediate its ends on a bearing support 117 projecting upwardly from the top of the casing for the motor 11. A rocking arm 119 is mounted on the outer end of said shaft and projects angularly upwardly therefrom in a rearward direction, and has a link 120 pivotally connected to its outer end on a pivotal pin 121. Said link depends from the free end of said rocking arm and is connected at its lower end to an ear 122 projecting upwardly from the rear end of the gear housing 46, by means of a pivotal pin 123.

When fluid under pressure is admitted to the head ends of the cylinders 107, 107 and the cylinder 36, the piston rods 113, 113 and 41 will be extended from the piston rod ends of said cylinders to pivot the frame 23 and gear housings 46, 46 downwardly in a counterclockwise direction, to engage the wheels 17, 17 and 19, 19 with the ground and bodily lift the kerf-cutting machine above the ground, for transportation on said driving and steering wheels and to hold said kerf-cutting machine in said elevated position by holding fluid pressure in said cylinders.

When fluid under pressure is released from the head ends of the cylinders 107, 107 and 36, the gear housings 46, 46 and support frame 23 will pivot upwardly in a clockwise direction about the axis of the shaft 34 and the axes of the sprockets 52, 52 until the kerf-cutting machine engages the ground. The admission of fluid under pressure to the piston rod ends of said cylinders will then raise said driving wheels 17, 17 and 19, 19 above the ground, to permit the cutting of a kerf along a mine bottom by slidable movement of the machine along its bottom, effected by the feed drums 12, 12 and flexible cables 13, 13 in the well known manner.

A suitable fluid pressure system may be provided to admit fluid under pressure to or to release pressure from the head and piston rod ends of the cylinders 36 and 107, 107 and to hold pressure therein, to elevate or lower the kerf-cutting machine with respect to the ground and to raise the wheels 17, 17 and 19, 19 out of engagement with the ground, and to hold said wheels out of engagement with the ground or hold the kerf-cutting machine in an elevated position above the

ground. Said system may be so arranged as to admit fluid under pressure to the rear cylinder 36 independently of the front cylinders 107, 107, to tilt the kerf-cutting machine about one end or the other, and is no part of my present invention so will not herein be shown or described in detail.

While I have herein 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 my invention to the specific embodiment illustrated, excepting as it may be limited in the appended claims.

I claim as my invention:

1. In a room and pillar kerf-cutting machine, a main frame, a motor mounted at the forward end of said main frame, a cutter chain carrying cutter bar projecting forwardly of said motor, feeding mechanism disposed rearwardly of said motor, and means for elevating said machine above the mine floor and supporting it for transportation and for lowering said machine to rest upon the ground including rear steering wheel means and front drive wheels, said rear steering wheel means including a steering wheel supporting frame having mine floor engaging supporting wheels mounted thereon and bodily turnable about an upright axis for steering said machine, a transverse pivotal connection between the forward end of said frame and the rear end of said main frame, and extensible means mounted on top of said main frame and connected between said main frame and said supporting frame for moving said frame about said transverse axis or holding said frame in fixed relation with respect to said main frame, to elevate or lower the rear end of said main frame with respect to the mine floor and hold the rear end of said main frame in fixed relation with respect to the mine floor, a separate wheel supporting frame transversely pivoted adjacent one of its ends to each side of said motor, said frames having said front drive wheels journaled therein and disposed within the lateral limits of the machine, drive connections from said motor to said front drive wheels, and extensible means connected between said motor and said wheel supporting frames for pivotally moving said frames about said transverse axes or for holding said frames in fixed relation with respect to said motor to elevate or lower the forward end of said machine with respect to the mine floor and to hold the forward end of said machine in fixed relation with respect to the mine floor.

2. In a room and pillar kerf-cutting machine, a main frame, a motor mounted at the forward end of said main frame, a cutter chain carrying cutter bar projecting forwardly of said motor, feeding mechanism disposed rearwardly of said motor, and means for elevating said machine above the ground and supporting it for transportation and for lowering said machine to rest upon the mine floor including rear steering wheel means and front drive wheels, said rear steering wheel means including a steering wheel supporting frame having ground engaging supporting wheels mounted thereon for bodily turning movement about an upright axis, for steering said machine, a transverse pivotal connection between the forward end of said frame and the rear end of said main frame, a fluid pressure cylinder having a piston rod extensible

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therefrom mounted on top of said main frame and connected between said main frame and said supporting frame at points spaced from the pivotal axis thereof for moving said support frame about said transverse axis or for holding said frame in fixed relation with respect to said main frame, to elevate or lower the rear end of said main frame with respect to the mine floor, a separate wheel supporting frame transversely pivoted adjacent one of its ends to each side of said motor, said frames having said front drive wheels journaled therein and disposed within the lateral limits of the machine, drive connections from said motor to said front drive wheels, and a separate fluid pressure cylinder having a piston rod extensible therefrom connected between said motor and each of said supporting frames for pivotally moving said frames, or for holding said frames in fixed relation with respect to each other, to elevate or lower the forward end of said machine with respect to the mine floor and to hold the forward end of said machine in fixed relation with respect to the mine floor.

3. In a room and pillar kerf-cutting machine, a main frame, a motor mounted at the forward end of said main frame, a cutter chain carrying cutter bar projecting forwardly of said motor, feeding mechanism disposed rearwardly of said motor, and means for elevating said machine above the mine floor and supporting it for transportation about the mine and for lowering said machine to rest upon the mine floor including rear steering wheel means and front drive wheels, said rear steering wheel means including a steering wheel supporting frame having floor engaging wheels mounted thereon for bodily turning movement about an upright axis, for steering said machine, a transverse pivotal connection between the forward end of said frame and the rear end of said main frame, a fluid pressure cylinder having a piston rod extensible therefrom mounted on top of said main frame and connected between said main frame and said supporting frame at points spaced from the pivotal axis thereof for moving said support frame about said transverse axis or for holding said frame in fixed relation with respect to said main frame, to elevate or lower the rear end of said main frame with respect to the mine floor, a separate supporting frame extending along each side of said motor, each of said frames having pivotal connection with said motor adjacent one of its ends and being guided for vertical slidable movement with respect to said motor adjacent its opposite end and having one of said front drive wheels journaled thereon for movement therewith, drive connections from said motor to said front drive wheels including gearing co-axial with the axis of pivotal movement of said frame, and a separate fluid pressure cylinder having a piston rod extensible therefrom, connected between said motor and each of said supporting frames, for pivotally moving said frames or for holding said frames in fixed relation with respect to said motor, to elevate or lower the forward end of said machine or to hold it in fixed relation with respect to the mine floor.

4. In a room and pillar kerf-cutting machine, a main frame, a motor mounted at the forward end of said main frame, a cutter chain carrying cutter bar projecting forwardly of said motor, feeding mechanism disposed rearwardly of said motor, and means for elevating said kerf-cutting machine above the mine floor and support-

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ing it for transportation about the mine and for lowering said machine to rest upon the ground including rear steering wheel means and front drive wheels, said rear steering wheel means including a steering wheel supporting frame having floor engaging wheels mounted therein for bodily turning movement about an upright axis for steering said machine, a transverse pivotal connection between the forward end of said frame and the rear end of said main frame, a fluid pressure cylinder having a piston rod extensible therefrom mounted on top of said main frame and connected between said main frame and said supporting frame at points spaced from the pivotal axis thereof for moving said supporting frame about said transverse axis or for holding said frame in fixed relation with respect to said main frame, to elevate or lower the rear end of said machine with respect to the mine floor, a supporting frame extending along each side of said motor, each of said frames having pivotal connection with said motor adjacent one of its ends and being guided for vertical slidable movement with respect to said motor adjacent its opposite end and having one of said front drive wheels journaled thereon for movement therewith, a fluid pressure cylinder having a piston rod extensible therefrom connected between the casing for said motor and each of said supporting frames, for pivotally moving said frames or for holding said frames in fixed relation with respect to said motor, to elevate or lower the forward end of said machine or hold it in fixed relation with respect to the mine floor, and drive connections from the forward end of said motor to said front drive wheels including differential gearing, a gear at each side of said motor and journaled coaxial with the pivotal axes of said frames, drive connections from said differential gearing to said gears, and drive connections from said gears to said wheels.

5. In a room and pillar kerf-cutting machine, a main frame, a motor mounted at the forward end of said main frame, a cutter chain carrying cutter bar projecting forwardly of said motor, feeding mechanism disposed rearwardly of said motor, and means for elevating said kerf-cutting machine above the mine floor and supporting it for transportation about the mine and for lowering said machine to rest upon the mine floor including rear steering wheel means and front drive wheels, said rear steering wheel means including a steering wheel supporting frame having floor engaging wheels mounted therein for bodily turning movement about an upright axis for steering said machine, a transverse pivotal connection between the forward end of said frame and the rear end of said main frame, a fluid pressure cylinder having a piston rod extensible therefrom mounted on top of said main frame and connected between said main frame and said supporting frame at points spaced from the pivotal axis thereof for moving said supporting frame about said transverse axis or for holding said frame in fixed relation with respect to said main frame, to elevate or lower the rear end of said machine with respect to the mine floor, a separate supporting frame extending along each side of said motor, each of said frames having pivotal connection with said motor adjacent one of its ends and being guided for vertical slidable movement with respect to said motor adjacent its opposite end and having one of said front drive wheels journaled thereon for movement therewith, a separate fluid

pressure cylinder having a piston rod extensible therefrom connected between the casing for said motor and each of said supporting frames, for pivotally moving said frames or for holding said frames in fixed relation with respect to said motor, to elevate or lower the forward end of said machine or hold it in fixed relation with respect to the mine floor, and drive connections from the forward end of said motor to said front drive wheels including differential gearing, a gear at each side of said motor and journaled coaxial with the pivotal axes of said frames, drive connections from said differential gearing to said gears, and drive connections from said gears to said wheels, including chain and sprocket drives carried by said frames and extending therealong.

6. In a room and pillar kerf-cutting machine, a main frame, a motor mounted at the forward end of said main frame, a cutter chain carrying cutter bar projecting forwardly of said motor, feeding mechanism disposed rearwardly of said motor, and means for elevating said machine above the mine floor and supporting it for transportation about the mine and for lowering said machine to rest upon the mine floor including rear steering wheel means and front drive wheels, said rear steering wheel means including a steering wheel supporting frame having floor engaging wheels mounted thereon for bodily turning movement about an upright axis, for steering said machine, a transverse pivotal connection between the forward end of said frame and the rear end of said main frame, a fluid pressure cylinder having a piston rod extensible therefrom mounted on top of said main frame and connected between said main frame and said supporting frame at points spaced from the pivotal axis thereof for moving said supporting frame about said transverse axis or for hold-

ing said frame in fixed relation with respect to said main frame, to elevate or lower the rear end of said machine with respect to the mine floor, a separate supporting frame extending along each side of said motor, each of said frames having pivotal connection with said motor adjacent one of its ends and being guided for vertical slidable movement with respect to said motor adjacent its opposite end and having one of said front drive wheels journaled thereon for movement therewith, drive connections from said motor to said front drive wheels including gearing coaxial with the axes of pivotal movement of said frames, a separate fluid pressure cylinder for each of said wheel supporting frames, pivotal mountings for said cylinders on the top of said motor, a piston rod extensible from each of said cylinders, a separate rocking arm for each of said frames mounted on the top of said motor adjacent opposite sides thereof and rocked by an associated piston rod, and a link connecting each of said rocking arms with an associated wheel supporting frame for pivotally moving said frames or holding said frames in fixed relation with respect to said motor, to elevate or lower the forward end of said machine with respect to the mine floor or to hold it in an elevated position for transportation about the mine.

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