

Sept. 27, 1938.

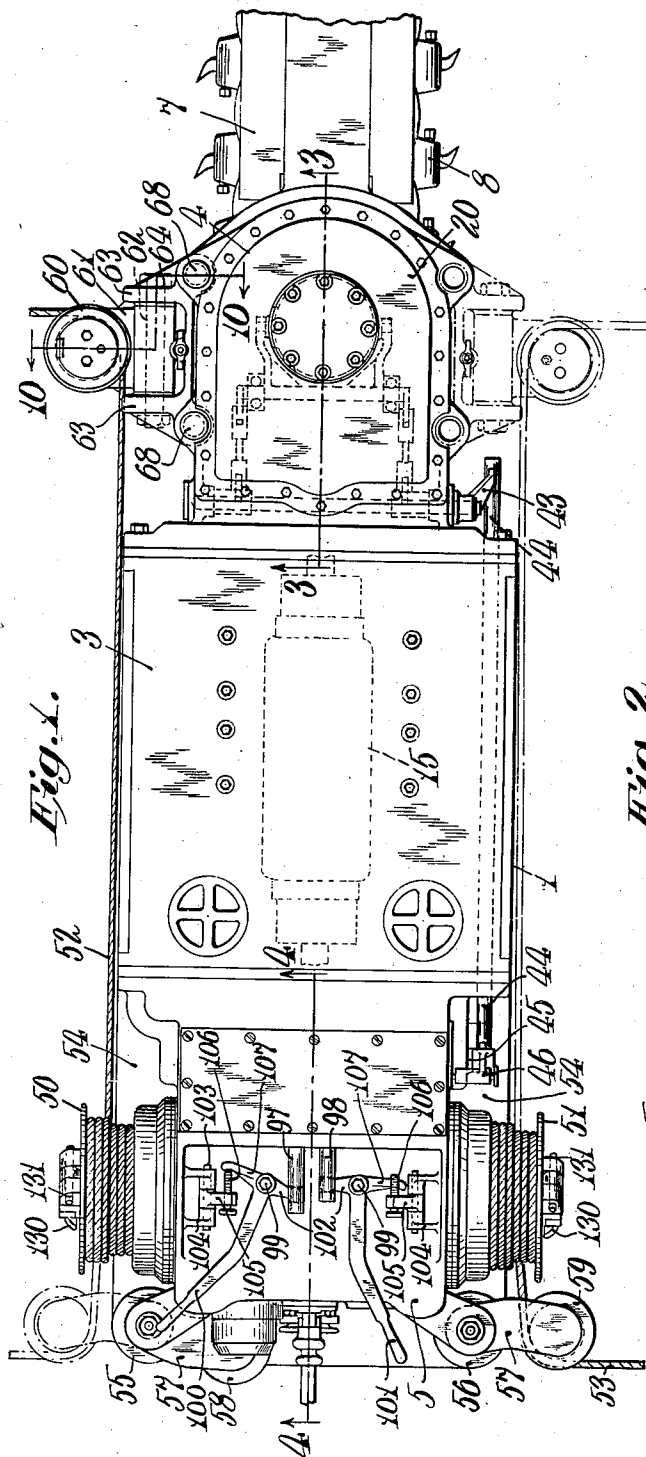
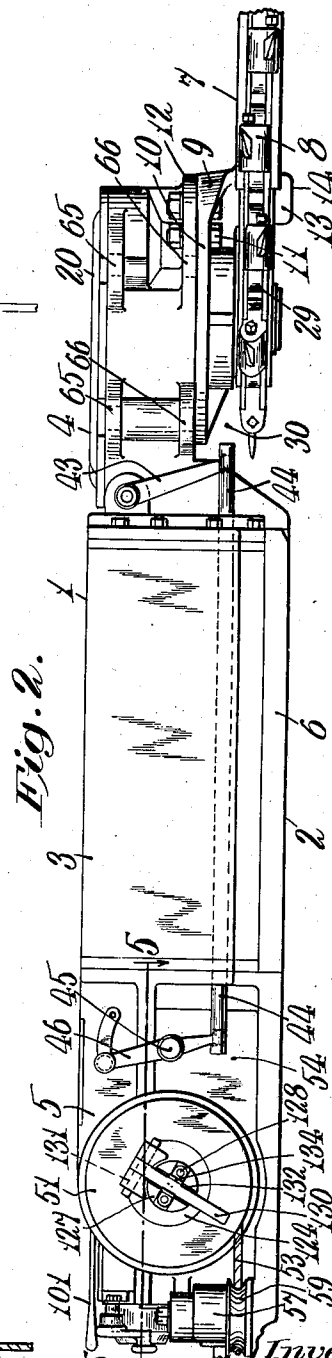
J. F. JOY ET AL

2,131,178

MINING MACHINE TRANSMISSION MECHANISM

Filed March 30, 1936

10 Sheets-Sheet 1



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MINING MACHINE TRANSMISSION MECHANISM

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Fig. 3.

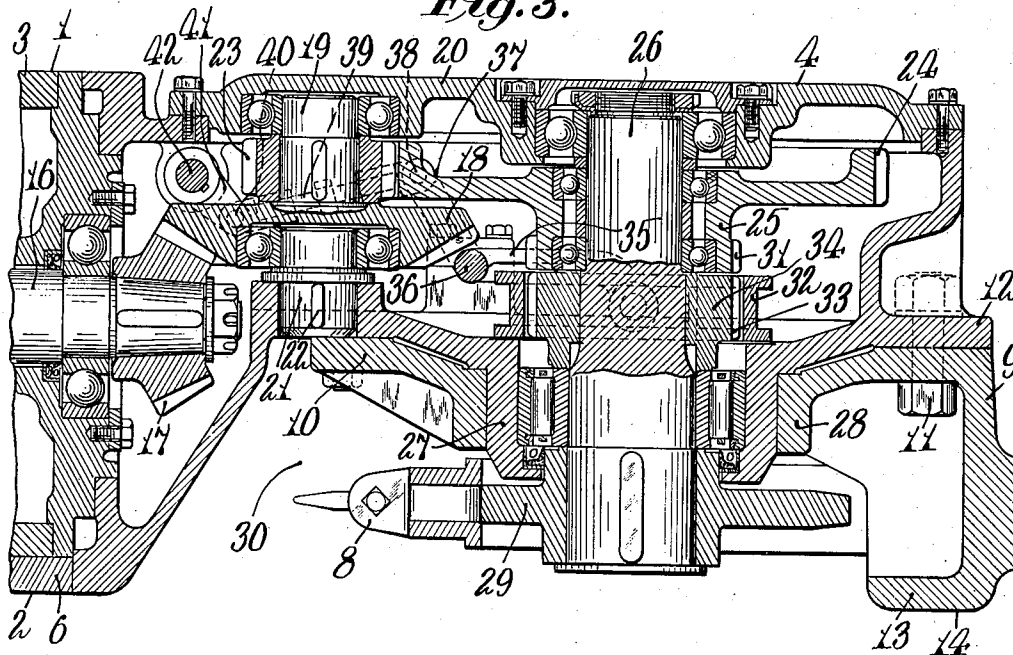
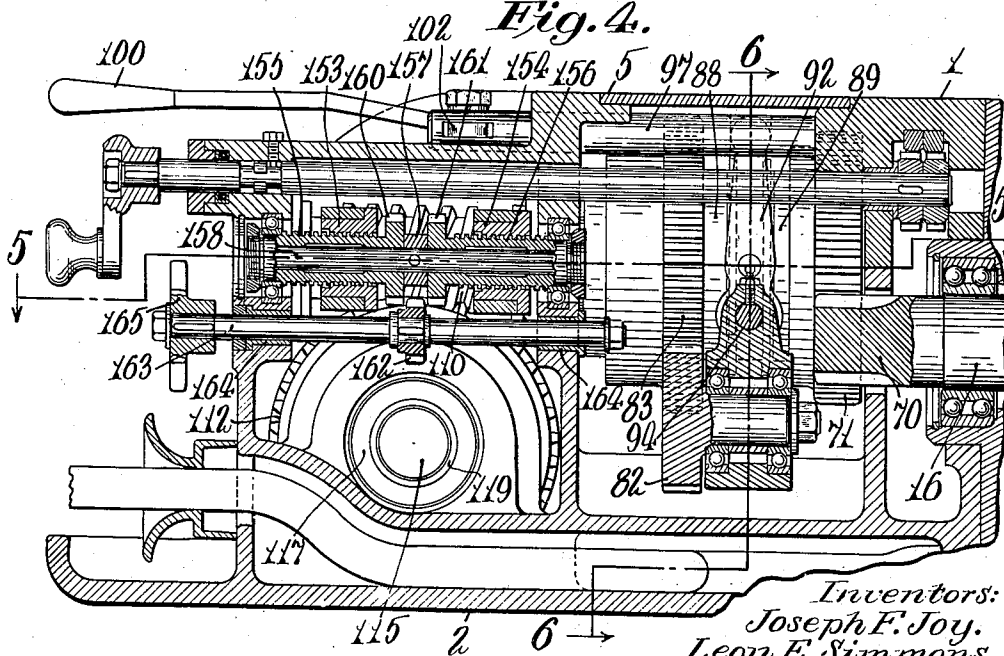


Fig. 4.



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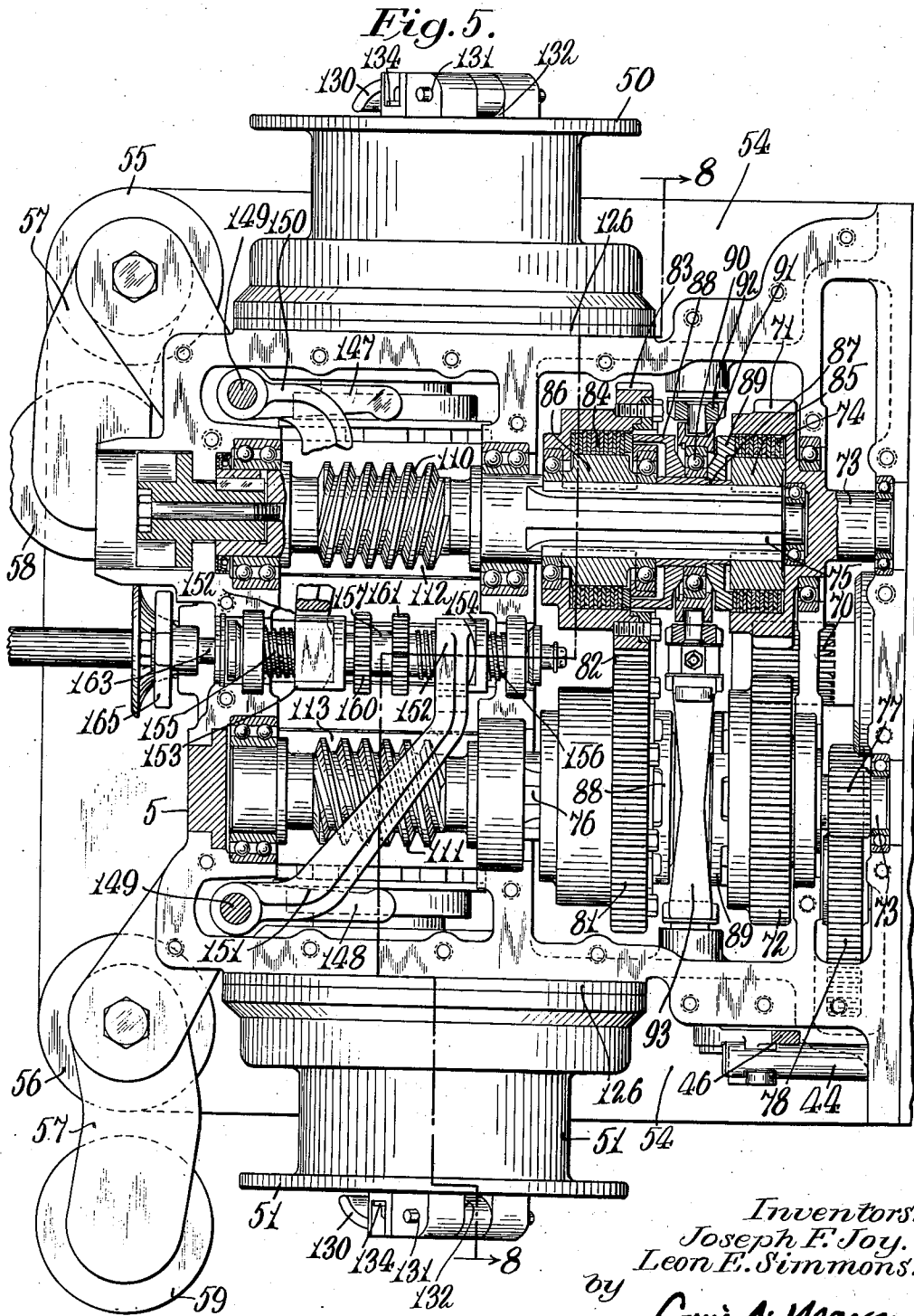
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MINING MACHINE TRANSMISSION MECHANISM

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10 Sheets-Sheet 3



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MINING MACHINE TRANSMISSION MECHANISM

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Fig. 6.

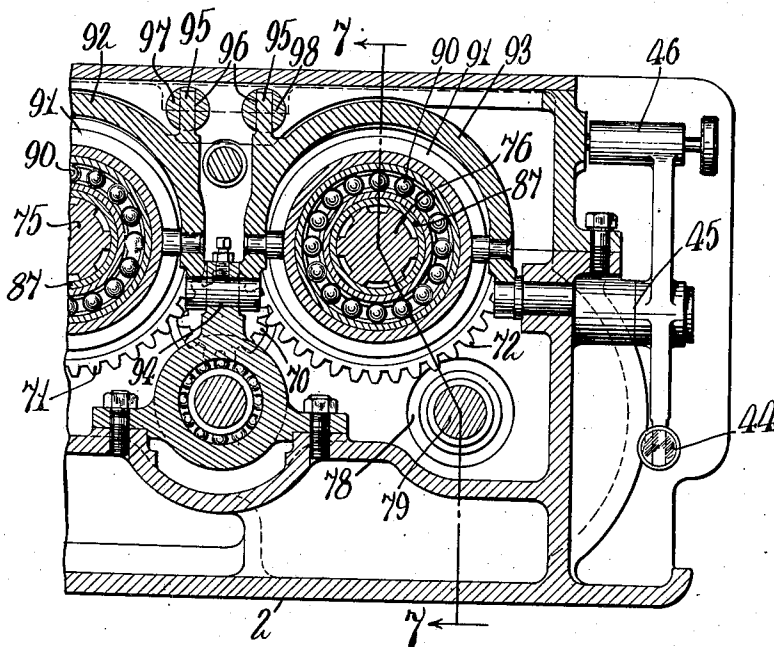
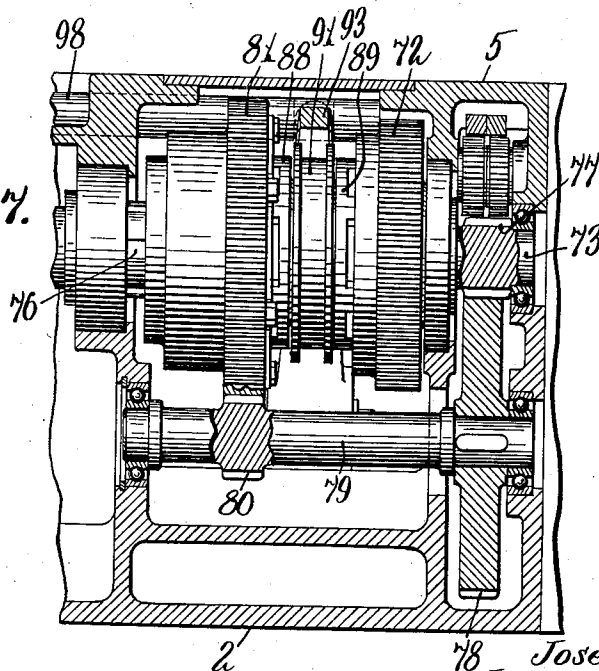


Fig. 7.



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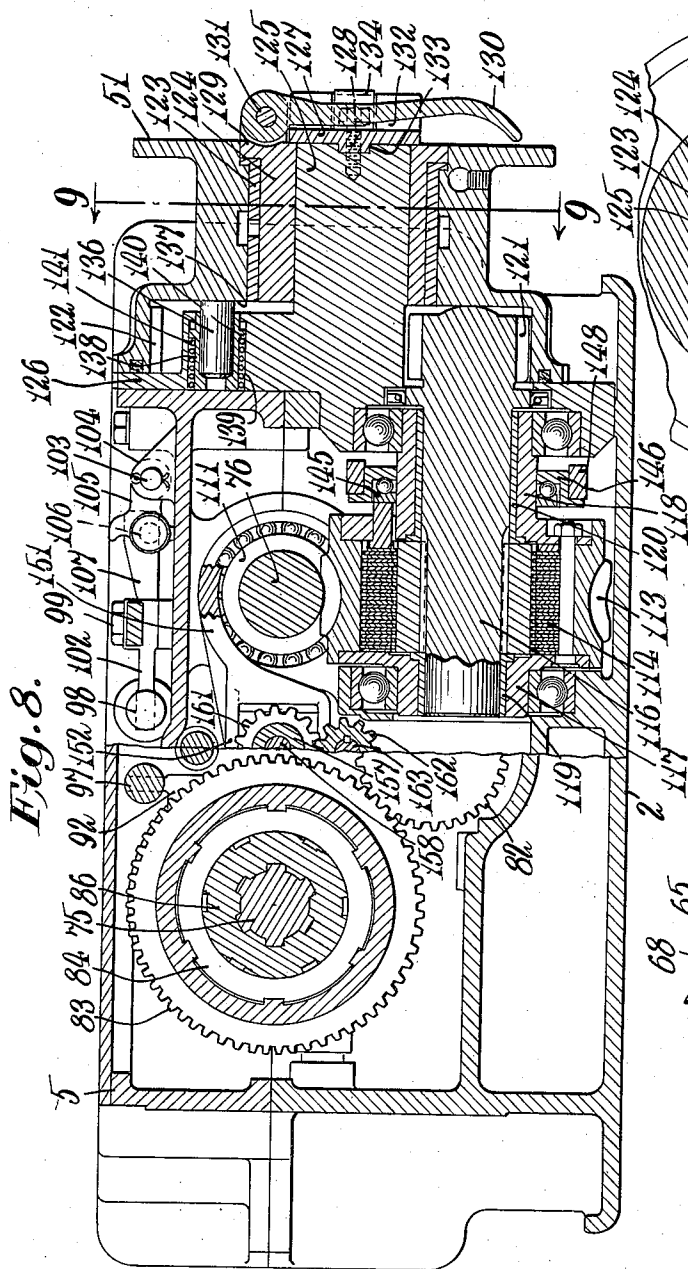


Fig. 8.

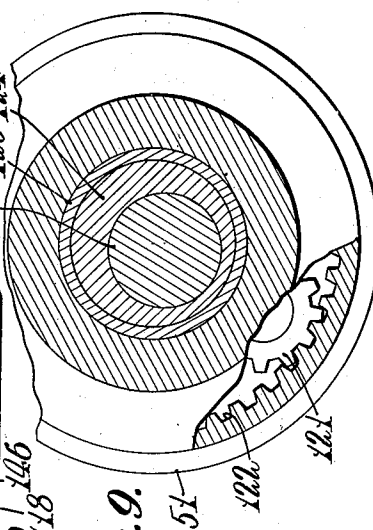


Fig. 9.

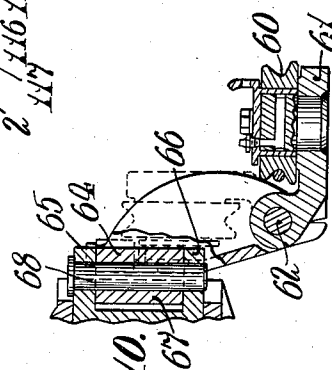


Fig. 10.

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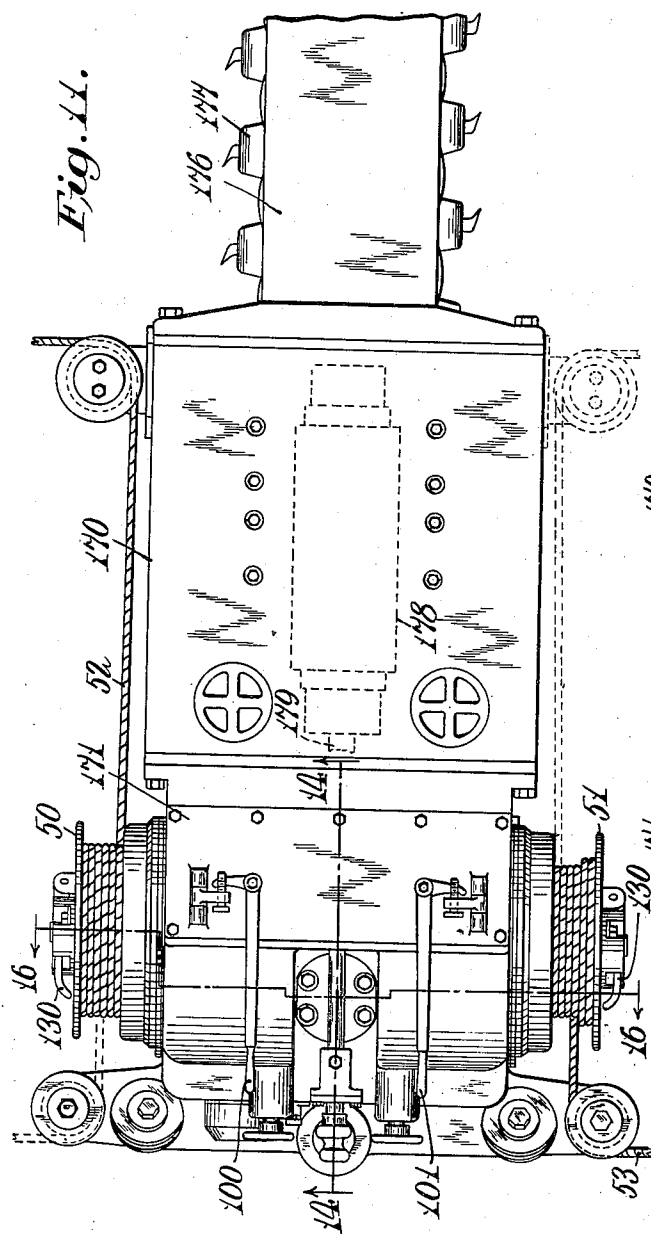
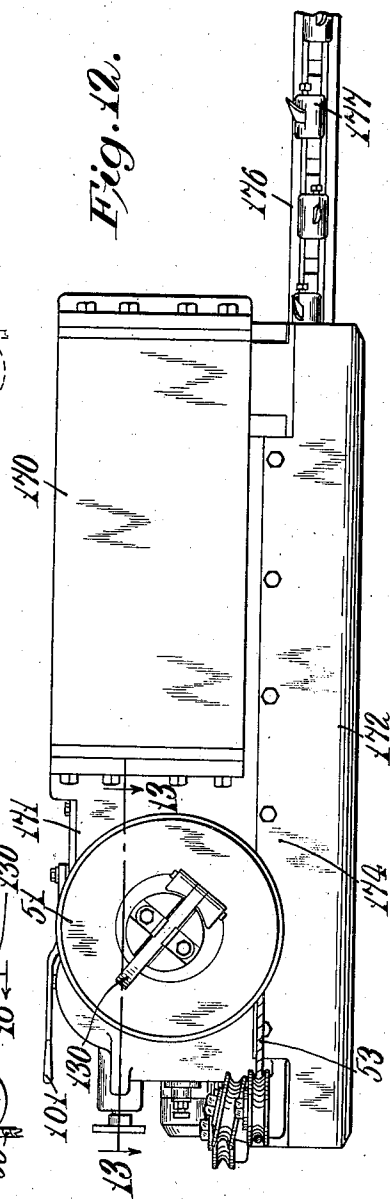
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MINING MACHINE TRANSMISSION MECHANISM

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10 Sheets-Sheet 6



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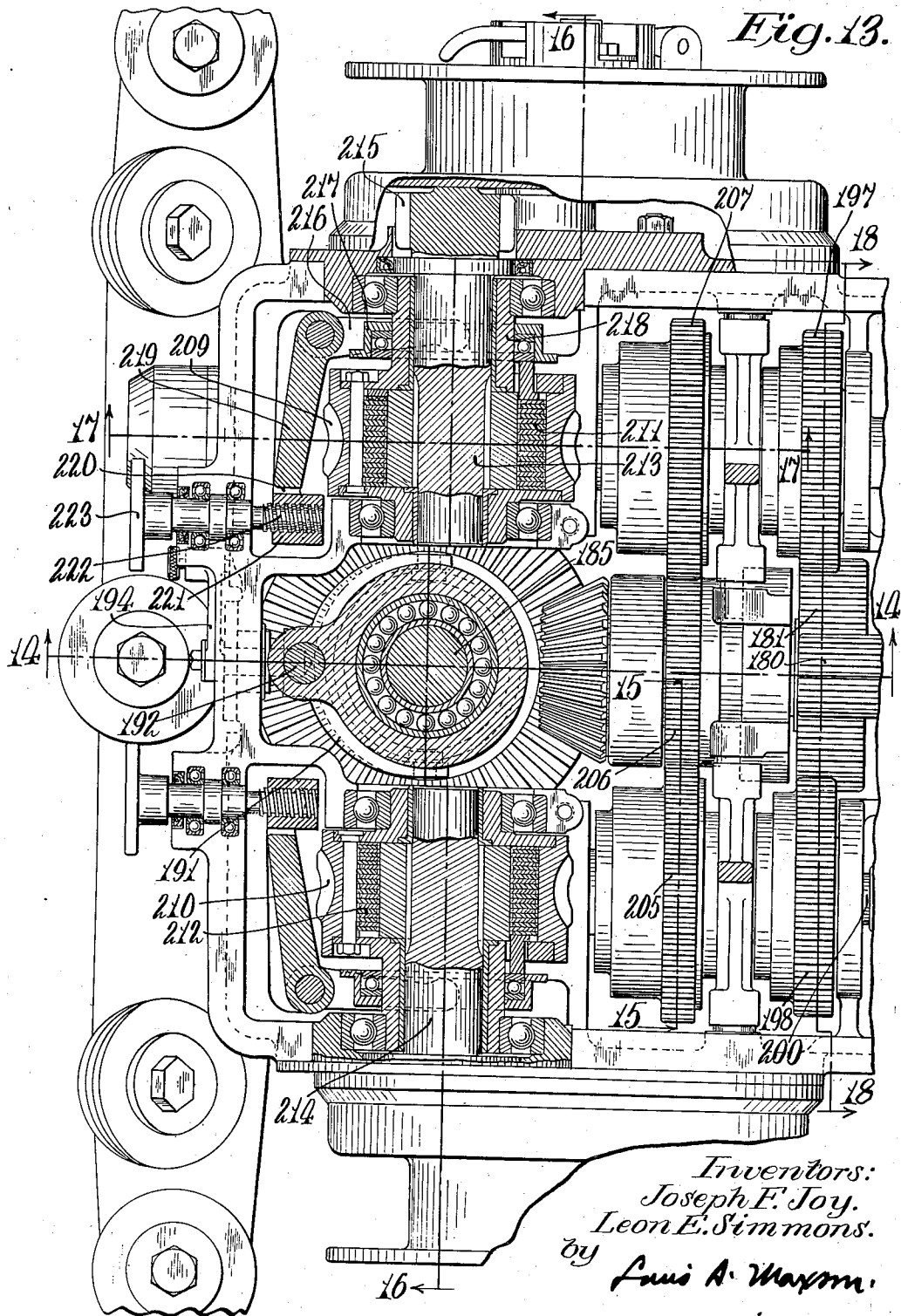
J. F. JOY ET AL

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MINING MACHINE TRANSMISSION MECHANISM

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Fig. 14.

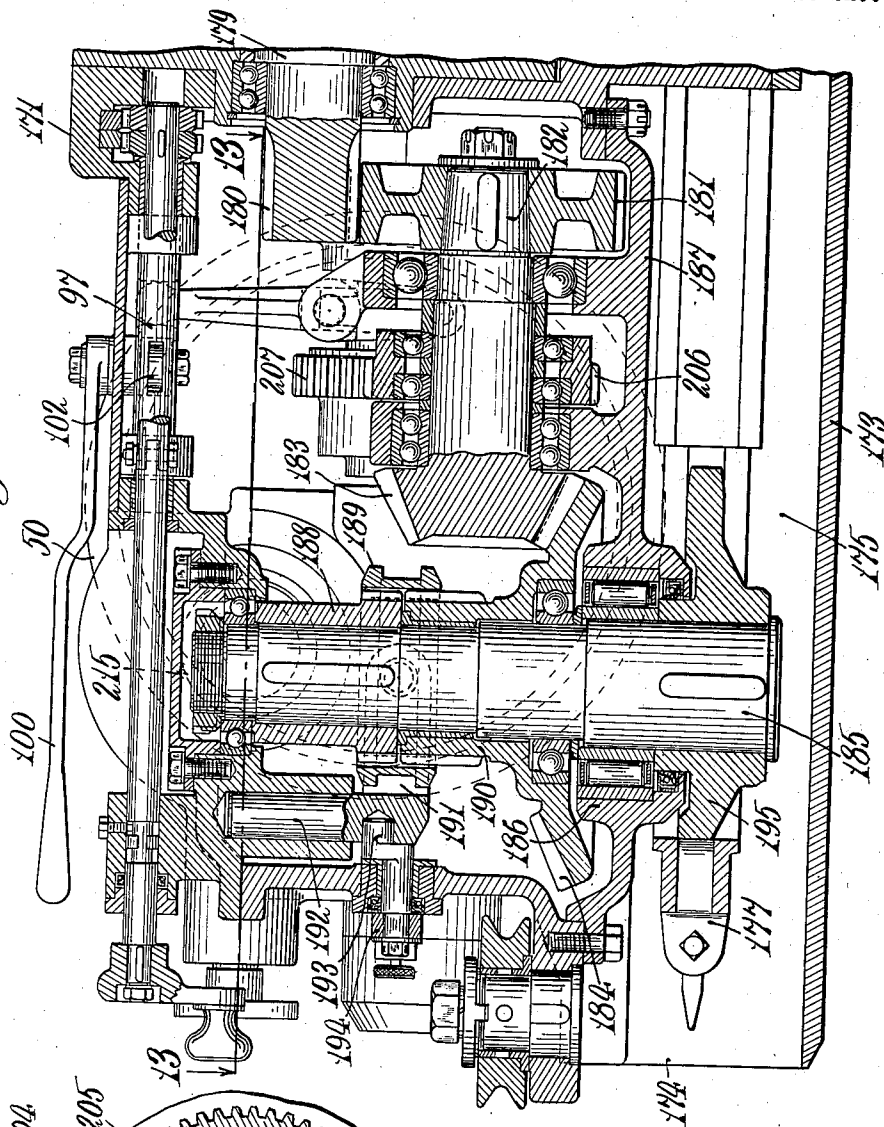
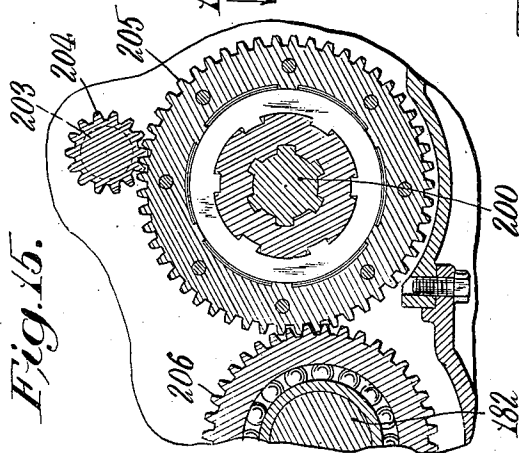


Fig. 15.



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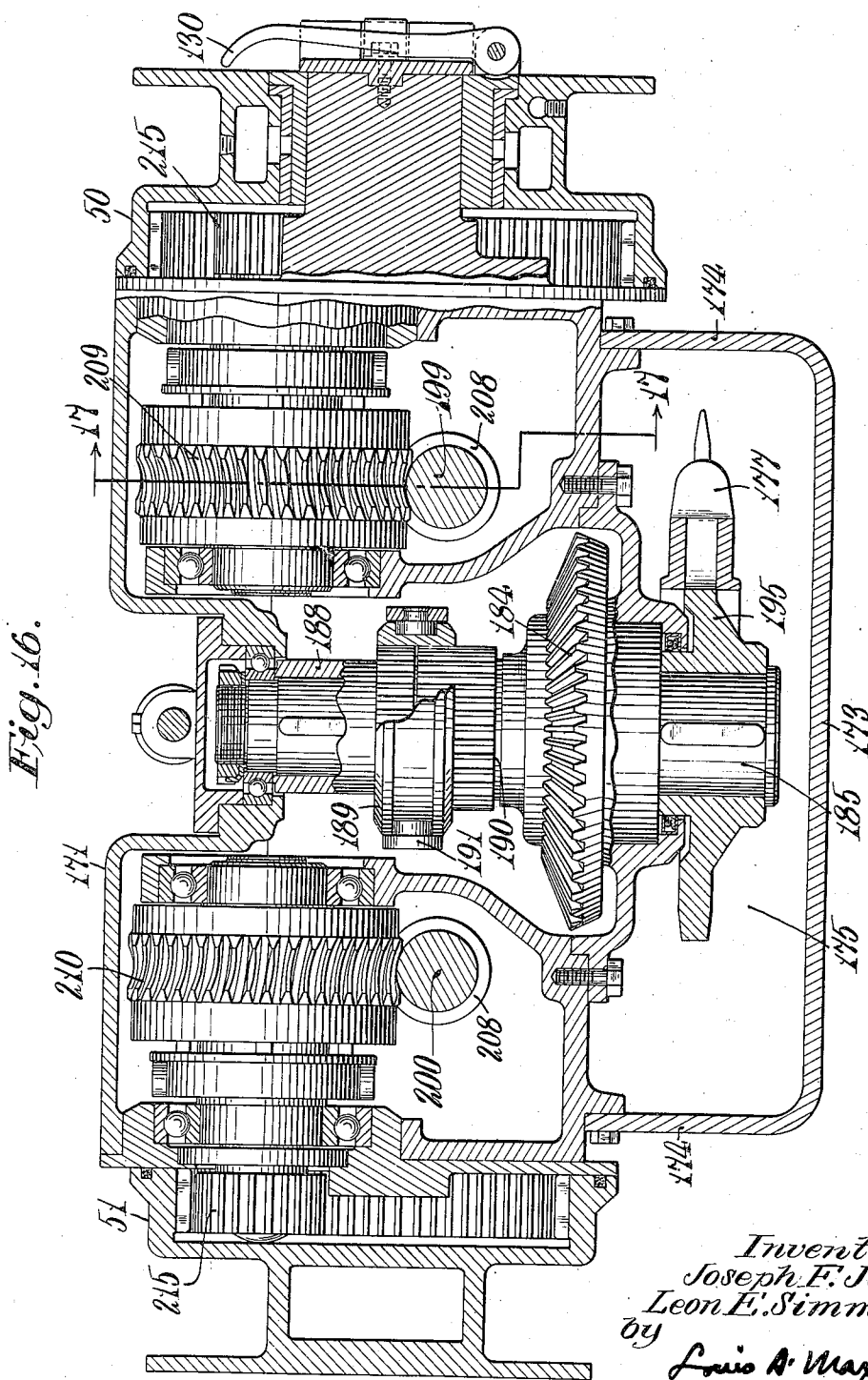
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MINING MACHINE TRANSMISSION MECHANISM

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10 Sheets-Sheet 9



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MINING MACHINE TRANSMISSION MECHANISM

Filed March 30, 1936

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Fig. 17.

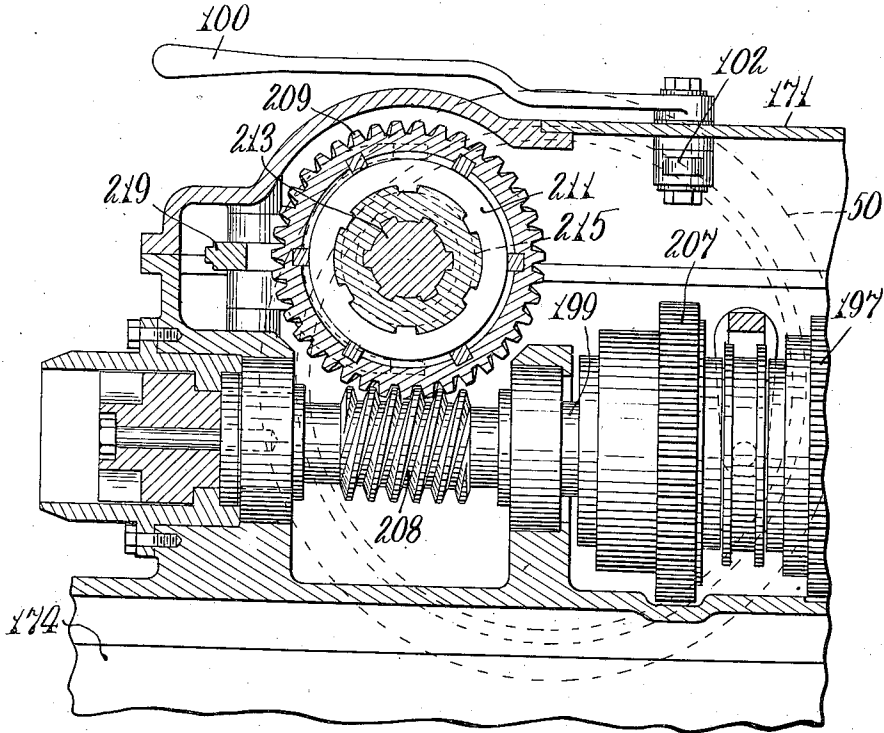
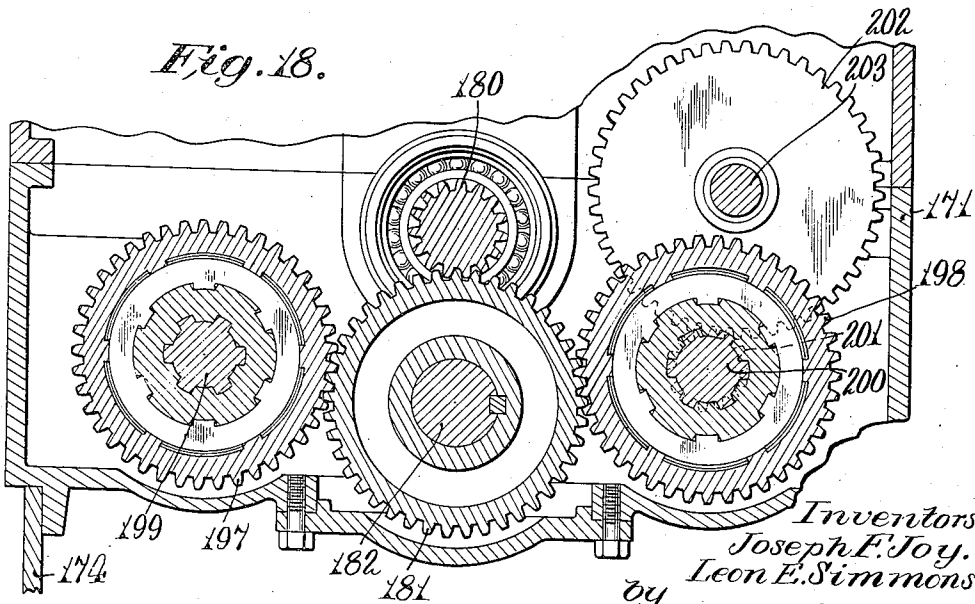


Fig. 18.



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UNITED STATES PATENT OFFICE

2,131,178

MINING MACHINE TRANSMISSION
MECHANISMJoseph F. Joy and Leon E. Simmons, Claremont,
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Application March 30, 1936, Serial No. 71,653

9 Claims. (Cl. 262—30)

This invention relates to mining machines, and more particularly, but not exclusively, to improvements in coal mining machines of the flexibly fed, room and pillar, floor cutter type.

5 An object of the present invention is to provide an improved coal mining machine of the flexibly fed, room and pillar, floor cutter type having improved flexible feeding means whereby the machine may be fed and guided in an improved
10 manner. Another object is to provide an improved flexible feeding means for a coal mining machine wherein relatively rotatable feeding and controlling members respectively cooperating with flexible feeding and controlling elements are em-
15 ployed for feeding and guiding the machine, such means embodying improved transmission means whereby the feeding and controlling members may be driven in an improved manner. A further object is to provide an improved plural speed trans-
20 mission means whereby the feeding and controlling members may be driven at either high or low speeds under frictional control at either speed. A still further object is to provide an improved plural speed transmission means embodying sepa-
25 rate high and low speed gear trains individual to the drive for each member whereby the feeding and controlling members may be independently driven in an improved manner. Still another object is to provide a novel compact arrangement
30 of the feeding and controlling members on the machine and an improved arrangement of the gearing of the transmission means whereby an extremely compact feeding mechanism is obtained. Other objects and advantages of the in-
35 vention will, however, hereinafter more fully appear.

In the accompanying drawings there are shown for purposes of illustration two forms which the invention may assume in practice.

40 In these drawings—

Fig. 1 is a plan view of a coal mining machine embodying one illustrative form of the improved feeding means.

45 Fig. 2 is a side elevational view of the mining machine shown in Fig. 1.

Fig. 3 is an enlarged view in longitudinal vertical section taken substantially on line 3—3 of Fig. 1.

50 Fig. 4 is an enlarged view in longitudinal vertical section taken substantially on line 4—4 of Fig. 1.

Fig. 5 is a horizontal sectional view, with parts shown in plan, taken substantially on line 5—5 of Figs. 2 and 4.

55 Fig. 6 is a cross sectional view taken substantially on line 6—6 of Fig. 4.

Fig. 7 is a detail vertical sectional view taken substantially on line 7—7 of Fig. 6.

60 Fig. 8 is a cross sectional view taken substantially on line 8—8 of Fig. 5.

Fig. 9 is a detail vertical sectional view taken on line 9—9 of Fig. 8.

Fig. 10 is an enlarged detail vertical sectional view taken substantially on line 10—10 of Fig. 1.

Fig. 11 is a plan view of a coal mining machine 5 embodying a modified form of the invention.

Fig. 12 is a side elevational view of the mining machine shown in Fig. 11.

Fig. 13 is an enlarged horizontal sectional view, with parts shown in plan, taken substantially on 10 line 13—13 of Figs. 12 and 14.

Fig. 14 is a view in longitudinal vertical section taken substantially on line 14—14 of Figs. 11 and 13.

Fig. 15 is a detail vertical sectional view taken 15 on line 15—15 of Fig. 13.

Fig. 16 is a cross sectional view taken substantially on line 16—16 of Figs. 11 and 13.

Fig. 17 is a view in longitudinal vertical section taken substantially on line 17—17 of Figs. 13 20 and 16.

Fig. 18 is a cross sectional view taken substantially on line 18—18 of Fig. 13.

In both embodiments of the invention the improved feeding mechanism is shown incorporated 25 in a coal mining machine of the flexibly fed, room and pillar, floor cutter type, although it will be evident that various features of the invention may be embodied in coal mining machines of various other types.

30 In the illustrative embodiment of the invention shown in Figs. 1 to 10, inclusive, the improved feeding mechanism is shown embodied in a coal mining machine of the room and pillar "lowvein" type comprising a low compact machine frame 1 35 having a smooth bottom surface 2 and adapted to rest upon and slide in any direction over the mine floor, the machine frame being composed of a plurality of frame sections united together to form a compact rigid unit including a motor frame section 3, a front cutter frame section 4 and a rear feed frame section 5. The motor frame section is supported on a bottom skid plate 6 and the motor section arranged intermediate the cut-
40 ter frame and feed frame sections, thereby to provide an extremely low, compact construction. Supported on and projecting forwardly from the cutter frame section 4 is an elongated horizontal plane cutter bar 7 having mounted on its margin for circulation thereabout an endless cutter chain 8, the cutter bar supported by a hanger frame 9
50 formed with a circular flange 10 rigidly secured, as by bolts 11, to a flange 12 integral with the cutter frame. Formed on the lower surface of the hanger frame 9 is a narrow skid plate or shoe 13 having a smooth bottom surface 14 slidably engageable with the mine floor. The motor frame section 3 contains a motor 15, herein preferably of the reversible electric type, having its
55 power shaft 16 horizontally disposed and extend- 60

ing longitudinally of the machine. Keyed to the forward end of the motor power shaft is a bevel gear 17 meshing with a horizontal bevel gear 18 integrally formed with a vertical shaft 19. The shaft 19 is journaled at its upper end within a ball bearing supported within a detachable cover plate 20 of the cutter frame and at its lower end within a ball bearing seated within the recessed lower face of the bevel gear 18 and supported on a stub shaft 21 fixed at 22 within the cutter frame. Keyed to the shaft 19 above the bevel gear 18 is a spur gear 23 meshing with a large spur gear 24 journaled for rotation about a vertical axis arranged in advance of the shaft 19. The hub 25 of the gear 24 is journaled on ball bearings supported by a vertical shaft 26. The shaft 26 is journaled at its upper end within a ball bearing supported within the cover plate 20 and near its lower end within a roller bearing supported within a cylindrical bearing support 27 formed integral with the lower portion of the cutter frame. As illustrated, the cutter bar hanger 9 has a cylindrical bearing support 28 surrounding and supported on the cylindrical bearing support 27. Keyed to the lower end of the shaft 26 is a chain sprocket 29 arranged in a transverse chamber 30 extending across the lower portion of the cutter frame, and engaging and driving the endless cutter chain 8. Formed on the hub 25 of the gear 24 are clutch teeth 31 connectible by a sliding clutch 32 to clutch teeth 33 formed on a clutch member 34 keyed to the shaft 26. Engaging the slidable clutch member 32 is a shipper yoke 35 mounted on a transverse shaft 36. Fixed to the shaft 36 are levers 37 pivotally connected at 38 to links 39, the latter in turn pivotally connected at 40 to levers 41 fixed to a transverse operating shaft 42. Fixed to the outer end of this operating shaft is a lever 43 engaging a reciprocable operating rod 44 extending longitudinally of and guided within the machine frame. Pivotally mounted at 45 on the side of the feed frame 5 at the rear end of the machine is an operating lever 46 engaging the slidable operating rod 44. It will thus be seen that the cutter chain clutch operating lever is conveniently located at the rear end of the machine frame, and when the clutch 32 is connected to the clutch teeth 31, the cutter chain may be driven from the motor through the bevel gearing 17, 18, spur gearing 23, 24, shaft 26 and chain sprocket 29.

Now referring to the improved flexible feeding means, it will be noted that arranged in coaxial relation on the opposite sides of the feed frame 5 are feeding and controlling members 50 and 51, herein in the form of cable winding or haulage drums respectively having wound thereupon feeding and controlling cables 52 and 53. The opposite sides of the feed frame section are recessed at 54 and the feeding and controlling drums 50 and 51 are arranged within these recesses so that the lateral limits of the machine are maintained extremely compact. As illustrated, the operating lever 46 for the cutter chain control clutch is located in one of these recesses 54 in advance of the winding drum 51 in the manner shown in Figs. 1 and 2. Arranged at the rear end of the feed frame are horizontal guide sheaves 55 and 56, while pivotally mounted about axes coincident with the guide sheave axes are swinging brackets 57 respectively supporting horizontal guide sheaves 58 and 59. Mounted at the advancing side of the machine frame on the cutter frame section 4 is a front guide sheave 60.

Improved mounting structure is provided for

the guide sheave 60, whereby the latter may be transposably supported at either side of the cutter frame section, herein comprising a hanger 61 pivotally supported for vertical swinging movement on a horizontal bolt 62 supported within spaced perforated lugs 63, 63 integral with a bracket 64. The opposite sides of the cutter frame are provided with sets of upper and lower perforated lugs 65 and 66, and the bracket 64 is provided with spaced perforated lugs 67 adapted to be inserted between the sets of upper and lower lugs 65, 66 and held in position thereon by means of holding pins 68, 68. It will be evident that when the pins 68, 68 are released, the sheave hanger bracket 64 may be readily detached from one side of the cutter frame and re-attached to the opposite side of the cutter frame, as indicated constructively in dot and dash lines in Fig. 1.

It is accordingly evident that the feeding and controlling cables 52, 53 may be extended in opposite directions from the bottoms of the feeding and controlling drums 50 and 51 in various directions about the guide sheaves 55, 56, 58, 59 and 60 in the manner well understood by those skilled in the art.

The improved transmission means between the motor and the feeding and controlling drums herein comprises a spur pinion 70 formed on the rearward extremity of the motor power shaft 16 and meshing, as shown most clearly in Fig. 6, with spur gears 71 and 72 arranged on parallel horizontal axes extending longitudinally of the machine and spaced equi-distantly from a central longitudinally extending vertical plane including the motor power shaft axis, the motor pinion driving the spur gears 71, 72 in the same direction. Each of the spur gears 71 and 72 is formed integral with a shaft 73 journaled in ball bearings suitably supported within the feed frame (see Fig. 5), and these spur gears are connectible by multiple disc clutches 74 to coaxial shafts 75 and 76. Formed on the supporting shaft 73 for the spur gear 72 is a spur gear 77 meshing with a large spur gear 78 keyed to a horizontal shaft 79, herein arranged parallel with the shaft 76 beneath the latter (see Fig. 7). The shaft 79 is journaled within ball bearings suitably supported within the feed frame, and formed integrally with the shaft is a spur gear 80 meshing with a spur gear 81 coaxial with the spur gear 72. Meshing with and driven by the spur gear 81 is an intermediate spur gear 82 meshing with a spur gear 83 arranged coaxially with the spur gear 71. The spur gears 71 and 72 constitute the high speed terminal gears of the high speed gear trains, while the spur gears 81 and 83 constitute the low speed terminal gears of the low speed gear trains. The gears 81 and 83 are connectible by multiple disc clutches 84 to the shafts 75 and 76 respectively. The slow speed terminal gears 81, 83 have their hubs journaled on ball bearings supported by the shafts 75 and 76, while the rear ends of these shafts are journaled in ball bearings supported within the hubs of the fast speed terminal gears 71 and 72 in the manner shown in Fig. 5.

Now referring to the operating means for the multiple disc clutches 74, 74 and 84, 84 for the high and low speed terminal gears, it will be noted that supported on each of the shafts 75, 76 intermediate the inner clutch elements 85 and 86 of the disc clutches are sleeves 87 having slidably mounted thereon clutch applying rings 88 and 89. Surrounding these sleeves and arranged intermediate the clutch applying rings is a ball thrust bearing 90 having engaging its outer race

a clutch shifter ring 91. Engaging these clutch shifter rings are clutch shippers 92 and 93 respectively pivotally mounted at 94 within the feed frame and each having a projection 95 extending within slots 96 arranged in parallel operating rods 97 and 98 respectively. Pivotally mounted at 99 on the top surface of the feed frame are levers 100 and 101 having arms 102 projecting within slots formed in the rods 97 and 98, respectively. It will thus be seen that when the levers 100, 101 are swung about their pivots the operating rods 97 and 98 are moved axially to swing the shipper yokes 92, 93 about their pivots, thereby to move the clutch shipper rings 91 axially relative to the sleeves 87 surrounding the shafts to move either the clutch applying ring 88 or 89 into a position to apply either the high speed clutch 74 or the low speed clutch 84. In Fig. 1 the lever 100 is shown in low speed clutch applying position. Pivotally mounted on horizontal pivot pins 103 supported in upstanding lugs 104 formed on the upper surface of the feed frame are brackets 105 having projecting arms carrying adjusting screws 106 engageable with projecting arms 107 formed on the levers 100 and 101. When the lever 100 is in its low speed clutch applying position as shown in Fig. 1, the bracket 105 may be swung about its pivot pin to bring the adjusting screw 106 into engagement with the projecting arm 107, thereby to lock the lever 100 in such position. By adjusting the screw 106 any desired clutch loading pressure may be attained. When the levers 100, 101 are swung into their high speed clutch loading position, the brackets 105 are swung up out of the way.

Again referring to the improved transmission means, it will be noted that fixed to the parallel longitudinal shafts 75 and 76 are worms 110 and 111 respectively, these worms having teeth of the same pitch but of opposite inclination and meshing with the teeth of worm wheels 112 and 113 at the tops of the latter. Since the worms 110, 111 rotate in the same direction, the worm wheels 112, 113, due to the opposite inclination of the worm teeth, are driven in relatively opposite directions. As shown most clearly in Fig. 8, the worm wheels are connectible by multiple disc clutches 114 to coaxial shafts 115 and 116. The hubs 117 and 118 of each worm wheel are journaled within ball bearings supported within the feed frame, and the shafts 115, 116 journaled within bearing sleeves 119 and 120 supported within the worm wheel hubs 117. Fixed to each of the shafts is a spur gear 121 meshing with the teeth of an internal gear 122 formed on the flanges of the cable winding drums 50 and 51. As shown in Fig. 8, each of the cable winding drums is journaled on a bearing sleeve 123 supported on an eccentric sleeve 124 in turn rotatably mounted on a cylindrical bearing projection 125 formed integral with a bracket 126 attached to the feed frame and forming a part of the latter. A washer 127 secured, as by screws 128, to the cylindrical bearing projection 125 engages the outer surface of the eccentric sleeve 124 to maintain the latter on the bearing projection, and the eccentric sleeve is provided with a flange 129 for retaining the bearing sleeve 123 and the drum in position on the eccentric sleeve.

Means is afforded for releasing the cable winding drums for free rotation with respect to their driving gears, and this release means comprises a lever 130 pivotally mounted at 131 on the eccentric sleeve 124. The lever is swingable within a transverse notch 132 formed in the member 127,

and since the latter is interlocked at 133 to the cylindrical projection 125 the eccentric sleeve is at that time rigidly locked by the lever 130 to the cylindrical projection 125. Spring clips 134 engageable with the lever are provided for frictionally maintaining the lever within the slot. When the lever 130 is swung outwardly from the slot the eccentric sleeve may be rotated relative to the cylindrical projection 125 to move the internal gear 122 out of mesh with the teeth of the spur gear 121 and at that time the cable winding drum may rotate freely on its bearing sleeve 123. The drum may be locked in its freed position by again swinging the lever 130 within the slot in the member 127, thereby to again lock the eccentric sleeve to the cylindrical projection 125. Means is also provided for braking rotation of the cable winding drums so that when the latter are released from their drives, undue spinning of the drums is prevented, and these spinning brakes each comprise a braking plunger 136 frictionally engaging the inner surface 137 of the drum and mounted in a sleeve 138 guided in a horizontal bore 139 formed in the bracket 126. Engaging a flange 140 on the sleeve and encircling the sleeve is a coil spring 141 for constantly urging the sleeve and plunger 136 toward braking position.

Now referring to the operating means for the disc clutches 114, it will be observed that slidably mounted on the hubs 118 on each of the worm wheels is a clutch applying ring 145 engaged by an operating ring 146. Engaging these operating rings are shipper yokes 147 and 148 pivotally mounted on vertical shafts 149 (see Fig. 5). Fixed to the shafts 149 are levers 150 and 151 each having a bifurcated end 152 engaging the flattened sides of nuts 153 and 154 threadedly engaging operating screws 155 and 156 respectively (see also Fig. 4). The operating screws are journaled within ball bearings supported within the feed frame and are held in proper spaced relation by a spacing washer 157 fixed to a shaft 158 extending centrally within bores formed axially through the screw shafts. Formed on the screw shafts are gears 160 and 161 with which a spur gear 162 is selectively engageable. The gear 162 is keyed to a reciprocable operating shaft 163 guided within bearing bushings 164 supported within the feed frame. Keyed to the outer end of the shaft 163 is an operating handle 165. It will thus be seen that the shaft 163 may be slid axially to bring the teeth of the gear 162 into engagement with the teeth of either of the gears 160 and 161, and upon rotation of the gear 162 one of the adjusting screws is rotated to move its cooperating nut axially relative thereto, thereby to swing one or the other of the levers 150, 151 and the cooperating shipper yoke about their pivot to apply one or the other of the disc clutches. It is accordingly evident that the cable winding drums may be driven in winding direction at either high or low speeds, one of the cable winding drums rotating in the direction opposite from the other so that both of the cables may be wound in from the bottoms of the drums during drive at either speed, in the manner shown in Figs. 1 and 2.

In the modified form of the invention disclosed in Figs. 11 to 18, inclusive, the improved feeding mechanism is embodied in a coal mining machine of the standard room and pillar type wherein both the feeding mechanism and the cutting mechanism are driven from the rear end of a forwardly located motor arranged above the

cutter bar. The mining machine comprises a motor frame section 170, a feed and cutter frame section 171 and a bed frame section 172, the frame sections 170 and 171 being supported on the bed frame section with the motor frame section located at the forward end of the machine. As shown in Fig. 16, the bed frame 172 is in the form of a skid plate 173 having upturned sides 174, 174 secured, as by screws, to longitudinal flanges depending from the bottom surfaces of the frame sections 170, 171, and this bed frame provides a chamber 175 extending longitudinally throughout the length of the machine frame beneath the frame sections 170, 171. Secured within the machine frame and projecting within the chamber in the lower bed frame 172 is an elongated horizontal plane cutter bar 176 having mounted on its margin for circulation thereabout an endless cutter chain 177, the cutter bar projecting from the chamber 175 forwardly from the forward end of the machine frame in the manner shown in Figs. 11 and 12.

The motor frame section 170 houses a motor 178, herein preferably of the reversible electric type, having its power shaft 179 horizontally disposed and extending longitudinally of the machine. As shown in Fig. 14, integrally formed with the rearward extremity of the motor power shaft 179 is a spur motor pinion 180 meshing with a spur gear 181 keyed to a horizontal shaft 182, herein arranged parallel with the motor power shaft and suitably journaled within the frame section 171. Integrally formed with the rearward portion of the shaft 182 is a bevel gear 183 meshing with a horizontal bevel gear 184 journaled on suitable bearings supported by a vertical shaft 185. This shaft is journaled at its upper end within a ball bearing supported within the top portion of the frame section 171 and near its lower end within a roller bearing supported within a cylindrical bearing support 186 formed on a detachable bottom plate 187 secured to the frame section 171. Keyed to the shaft 185 is a clutch member 188 having clutch teeth connectible by a sliding clutch member 189 to clutch teeth formed on the hub 190 of the bevel gear 184. The clutch member 189 is operated by a shipper yoke 191 formed on a vertically slidable shaft 192 guided within a bore formed in the frame section 171 and having an operating eccentric 193 provided with an operating lever 194. Keyed to the lower end of the shaft 185 is a chain sprocket 195 arranged in the chamber 175 and engaging and driving the endless cutter chain 177. It will thus be seen that when the clutch element 188 is connected by the clutch member 189 to the bevel gear hub 190 the cutter chain may be driven from the motor through the spur gearing 180, 181, bevel gearing 183, 184 and the vertical shaft 185.

Now referring to the improved feeding mechanism for the machine, it will be noted that meshing with the spur gear 181 are spur gears 197 and 198 arranged on parallel axes arranged parallel with and spaced equidistantly from the shaft 182 at the opposite sides of the machine frame. The spur gears 197, 198 are connectible by multiple disc clutches, similar to the clutches of the form of the invention above described, to shafts 199 and 200 respectively, the shafts arranged coaxially with the spur gears and suitably journaled within the frame section 171. Rotatable with and driven by the spur gear 198 is a spur gear 201 meshing with a spur gear 202 keyed to a shaft 203 herein arranged parallel

with and above the shaft 200 and likewise suitably journaled within the frame section 171. Fixed to the shaft 203 is a spur gear 204 meshing with a spur gear 205 herein arranged coaxially with the spur gear 198. The gear 205 meshes with a spur gear 206 herein arranged coaxially with the spur gear 181 and, as shown in Fig. 14, journaled on ball bearings supported by the shaft 182. The gear 206 meshes with a spur gear 207 arranged coaxially with the spur gear 197. The spur gears 197, 198 constitute the high speed terminal driving elements of the high speed transmissions, while the spur gears 205, 207 constitute the low speed driving elements of the low speed transmissions, and the gears 205 and 207 are connectible by multiple disc clutches similar to those disclosed in the form of the invention above described, to the coaxial shafts 200 and 199 respectively. Fixed to the shafts 199 and 200 are worms 208 similar to the worms 110 and 111 of the form of the invention above described, herein meshing with the bottoms of and driving in relatively opposite directions worm wheels 209 and 210 respectively (see Fig. 13). These worm wheels are connectible by multiple disc clutches 211 and 212 respectively to coaxial shafts 213 and 214 herein arranged with their axes horizontally disposed and extending transversely of the machine. Fixed to these shafts are spur pinions 215 engaging the internal gears on the drums likewise in the manner above described and as is clearly disclosed in Fig. 8. The operating means for the high and low speed disc clutches are the same as those disclosed in Fig. 6, while the operating means for the disc clutches 211 and 212 each comprise a shipper yoke 216 engaging a clutch applying ring 217 slidably guided on and surrounding the hub 218 of the worm wheel. The shipper yoke has a lever 219 having a bifurcated end 220 engaging a nut 221 in turn threadedly engaging an adjusting screw 222. This adjusting screw is suitably journaled within the rear wall of the frame section 171 and has an operating handle 223. Otherwise this form of the invention is generally similar to the embodiment disclosed in Figs. 1 to 10, inclusive.

The general mode of operation of both forms of the improved mining machine will be clearly apparent from the description given. The feeding and controlling cables are extended from the feeding and controlling drums around certain of the guide sheaves and are connected at their free ends to suitable anchor jacks located at the rib and face, and as the cables are wound in by the drums, the cutter bar is sumped beneath the coal, the controlling drum guiding the machine during the sumping operation. Upon completion of the sumping cut, the feed cable is detached from the anchor jack at the face and extended from the front guide sheave laterally from the advancing side of the machine to an anchor jack located at the left hand rib. The machine is then fed by the feed drum transversely across the coal face, while the controlling drum controls the angular position of the machine with respect to the face. During the transverse cutting operation the controlling cable guides the machine, it being understood that at that time the controlling drum is disconnected from its drive and merely pays out the cable as the machine is fed laterally under the control of its friction clutch, the latter at that time acting as a brake against the then stationary worm wheel or so-called "dead gear". The controlling drum may, of course, be connected to its drive to wind

in the cable if it is desired to swing the machine to vary the angular position of the cutter bar with respect to the coal face, for instance, when it is necessary to cut around obstructions encountered by the cutter bar. Upon completion of the transverse cutting operation the machine is angled, and by suitable rearrangement of the anchor jacks and cables the machine is moved rearwardly to withdraw the cutter bar from beneath the coal. The machine may be fed rapidly over the mine floor by winding in the cables at a relatively high machine-moving speed, and in both embodiments of the invention the machine may be mounted on a transport truck during transport of the machine from one working place to another, and the truck wheels of the truck may be driven from the mining machine motor through the truck driving means on the machine. The machine may be operated to cut from left to right simply by reversing the cutter bits in the cutter chain, rearranging the feed cables on the drums and reversing the motor. Other uses and advantages of the improved mining machine will be clearly apparent to those skilled in the art.

While there are in this application specifically described two forms which the invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What we claim as new and desire to secure by

Letters Patent is:

1. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and motor driven means for independently rotating said members at either high or low speeds including a separate plural speed transmission mechanism for each member through which it, but not the other member, is driven, each transmission mechanism including high and low speed terminal gears arranged in coaxial relation, a horizontal shaft extending longitudinally of the machine, clutches for selectively connecting said terminal gears in driving relation with said shaft, said shaft extending rearwardly relative to said high and low speed gears, and self-locking worm gearing including a worm fixed to the rearwardly extended portion of said shaft and a worm wheel meshing with said worm, and friction clutches for connecting said worm wheels in driving relation with said members respectively, said friction clutch for one member operative to act as a friction drag brake for variably controlling rotation of said member while the clutches of its transmission mechanism are released and while said other member is being rotated through a terminal gear of its transmission mechanism without releasing the gear-connecting clutch of the latter, said drag brake acting to brake rotation of said member whose rotation is controlled thereby and said worm gearing associated with said member acting as a stationary reaction means for said drag brake.

2. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and motor driven means for independently rotating said members at either high or low speeds including a separate plural speed transmission mechanism for each member through which it, but not the other member, is driven, each transmission mechanism including high and low speed terminal gears arranged in

coaxial relation, a horizontal shaft extending longitudinally of the machine, clutches for selectively connecting said terminal gears in driving relation with said shaft, said shaft extending rearwardly relative to said high and low speed gears, and self-locking worm gearing including a worm fixed to the rearwardly extended portion of said shaft and a worm wheel meshing with said worm and arranged on a horizontal axis, and friction clutches for connecting said worm wheels in driving relation with said members respectively, said friction clutch for one member operative to act as a friction drag brake for variably controlling rotation of said member while the clutches of its transmission mechanism are released and while said other member is being rotated through a terminal gear of its transmission mechanism without releasing the gear-connecting clutch of the latter, said drag brake acting to brake rotation of said member whose rotation is controlled thereby and said worm gearing associated with said member acting as a stationary reaction means for said drag brake.

3. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and motor driven means for independently rotating said members at either high or low speeds including a separate plural speed transmission mechanism for each member through which it, but not the other member, is driven, each transmission mechanism including high and low speed terminal gears arranged in coaxial relation, a horizontal shaft extending longitudinally of the machine, clutches for selectively connecting said terminal gears in driving relation with said shaft, said shaft extending rearwardly relative to said high and low speed gears, and self-locking worm gearing including a worm fixed to the rearwardly extended portion of said shaft and a worm wheel meshing with said worm and arranged on a horizontal axis extending transversely of the machine, and friction clutches for connecting said worm wheels in driving relation with said members respectively, said friction clutch for one member operative to act as a friction drag brake for variably controlling rotation of said member while the clutches of its transmission mechanism are released and while said other member is being rotated through a terminal gear of its transmission mechanism without releasing the gear-connecting clutch of the latter, said drag brake acting to brake rotation of said member whose rotation is controlled thereby and said worm gearing associated with said member acting as a stationary reaction means for said drag brake.

4. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and motor driven means for independently rotating said members at either high or low speeds including a separate plural speed transmission mechanism for each member through which it, but not the other member, is driven, each transmission mechanism including high and low speed terminal gears arranged in coaxial relation, a horizontal shaft extending longitudinally of the machine, clutches for selectively connecting said terminal gears in driving relation with said shaft, said shaft extending rearwardly relative to said high and low speed gears, and self-locking worm gearing including a worm fixed to the rearwardly extended portion of said shaft and a worm wheel meshing with said worm and arranged on an axis parallel with the axis of the member driven thereby, and friction

clutches for connecting said worm wheels in driving relation with said members respectively, said friction clutch for one member operative to act as a friction drag brake for variably controlling rotation of said member while the clutches of its transmission mechanism are released and while said other member is being rotated through a terminal gear of its transmission mechanism without releasing the gear-connecting clutch of the latter, said drag brake acting to brake rotation of said member whose rotation is controlled thereby and said worm gearing associated with said member acting as a stationary reaction means for said drag brake.

5. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and motor driven means for independently rotating said members at either high or low speeds including a separate plural speed transmission mechanism for each member, each transmission mechanism including high and low speed gear trains and clutches for rendering said gear trains alternately effective, and driving connections between said transmission mechanisms and said members respectively each including a self-locking worm gearing, said worm gearings arranged at the same side of said gear trains, and a friction clutch for connecting said worm gearing in driving relation with one of said members, said friction clutch for one member operative to act as a friction drag brake for variably controlling rotation of said member while the clutches of its transmission mechanism are released and while said other member is being rotated through a gear train of its transmission mechanism without releasing the gear train controlling clutch, said drag brake acting to brake rotation of said member whose rotation is controlled thereby and said worm gearing associated with said member acting as a stationary reaction means for said drag brake.

6. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and operating and controlling means for said members for effecting rotation of the latter in one direction comprising transmission mechanisms including self-locking worm gearings individual to each of said members, each transmission mechanism including high and low speed terminal gears arranged in coaxial relation, a horizontal shaft extending longitudinally of the machine, and clutches for selectively connecting said terminal gears in driving relation with said shaft, said shafts extending rearwardly relative to said high and low speed terminal gears and said self-locking worm gearings including worms fixed to the rearwardly extended portions of said shafts respectively, and friction devices for connecting said members for drive by their respective worm gearings when the latter are driven through either terminal gears and for brakingly connecting said members to said worm gearings when the latter are not driven and said terminal gear controlling clutches are released, to provide a controlled reverse rotation of said members.

7. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and operating and controlling means for said members for effecting rotation of

the latter in one direction including a transmission mechanism for each member through which it, but not the other member, is driven, one transmission mechanism including an element driven through the other transmission mechanism, said transmission mechanisms each including high and low speed terminal gears arranged in coaxial relation, a horizontal shaft extending longitudinally of the machine, and clutches for selectively connecting said terminal gears in driving relation with said shaft, said shafts extending rearwardly relative to said high and low speed gears, self-locking worm gearings individual to each of said members including worms fixed to the rearwardly extended portions of said shafts respectively, and friction devices for connecting said members for drive by their respective worm gearings when the latter are driven by either of said terminal elements and for brakingly connecting said members to said worm gearings when the latter are not driven and said transmission clutches are released to provide a controlled reverse rotation of said members.

8. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and motor driven means for independently rotating said members at either high or low speeds including a separate plural speed transmission mechanism for each member, each transmission mechanism including high and low speed terminal gears arranged in coaxial relation, a coaxial driven element, and clutches for selectively connecting said terminal gears in driving relation with said driven element to effect drive of the latter, a driving gear meshing with said high speed terminal gears of both transmission mechanisms, a gear coaxial with one transmission mechanism and driven by the high speed terminal gear thereof, gearing driven by said last recited gear and including a gear meshing with the low speed terminal gear of one transmission mechanism, and a gear meshing with the low speed terminal gears of both transmission mechanisms for connecting said low speed terminal gears in driving relation.

9. In a mining machine transmission mechanism, in combination, relatively rotatable members to be driven, and motor driven means for independently rotating said members at either high or low speeds including a separate plural speed transmission mechanism for each member, each transmission mechanism including high and low speed terminal gears arranged in coaxial relation, a coaxial driven element, and clutches for selectively connecting said terminal gears in driving relation with said driven element to effect drive of the latter, a driving gear meshing with said high speed terminal gears of both transmission mechanisms, a gear coaxial with one transmission mechanism and driven by the high speed terminal gear thereof, gearing driven by said last recited gear and including a gear meshing with the low speed terminal gear of the transmission mechanism with which said coaxial gear is coaxial, and a gear meshing with the low speed terminal gears of both transmission mechanisms for connecting said low speed terminal gears in driving relation.

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