Aug. 26, 1930. L. F. HESS 1,774,006

MINING MACHINE

Filed March 31, 1928 6 Sheets-Sheet 1

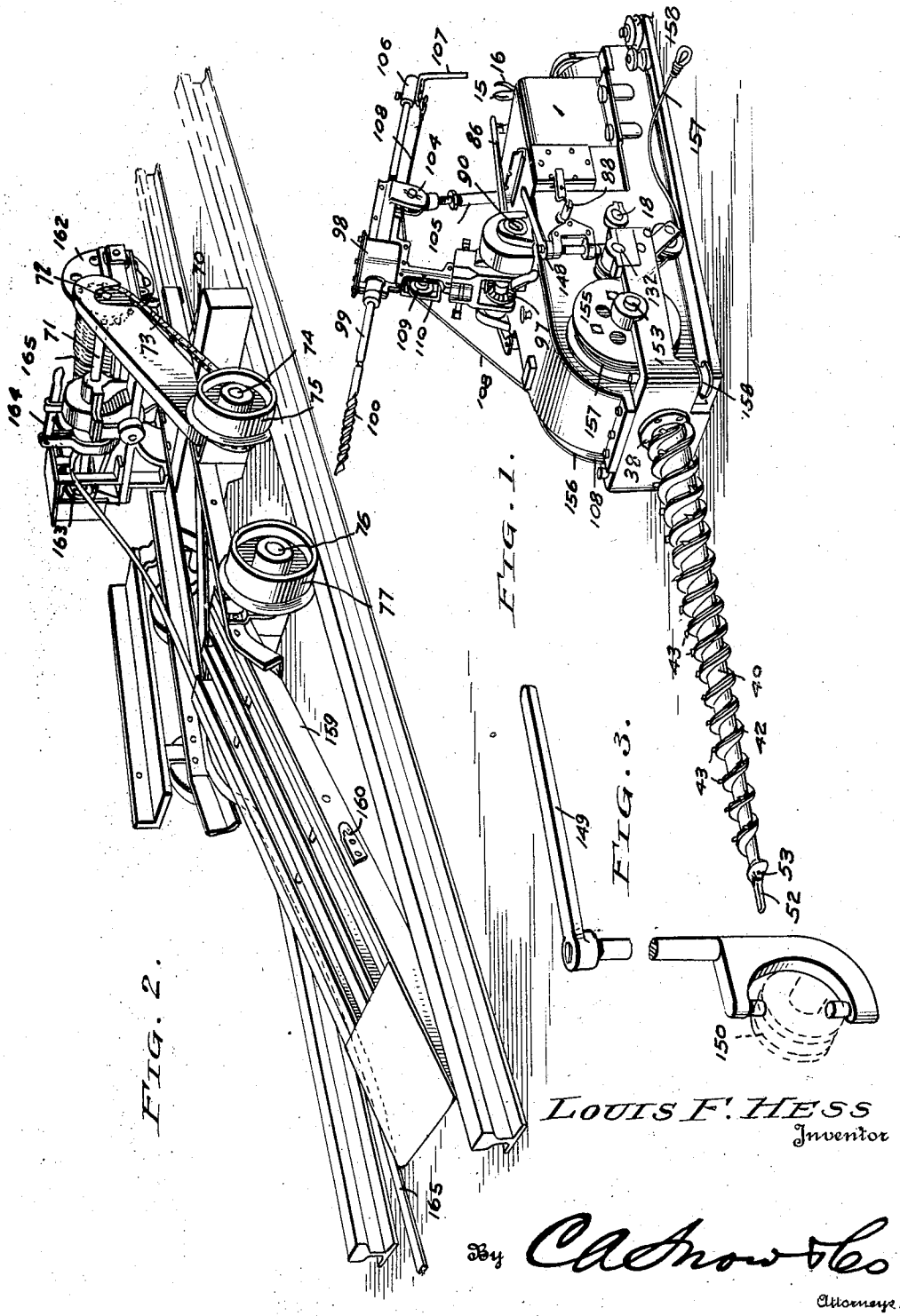


FIG. 1.

FIG. 2.

FIG. 3.

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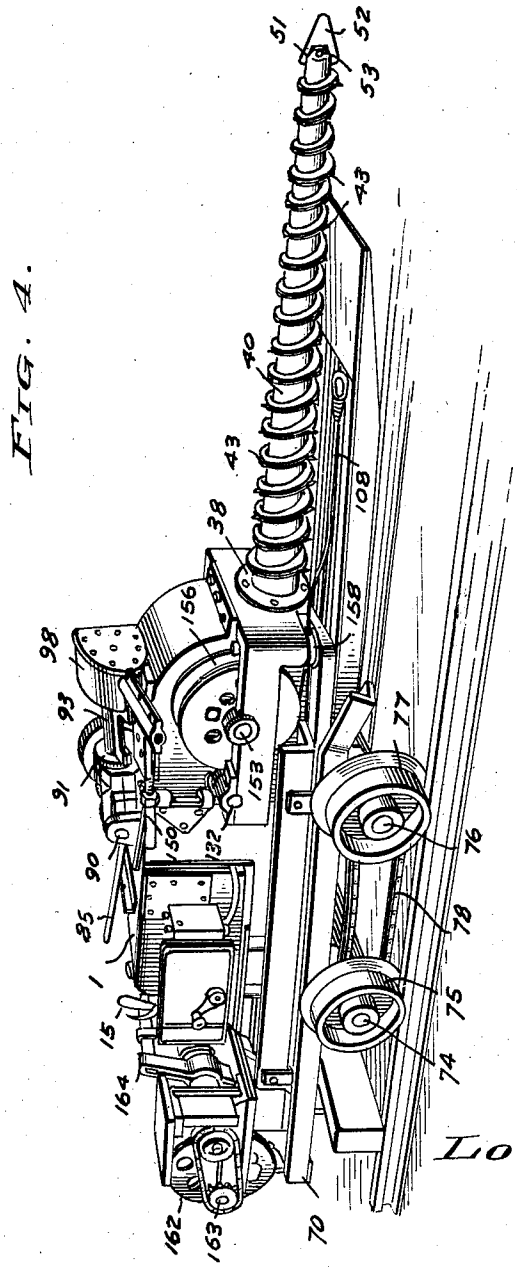


FIG. 4.

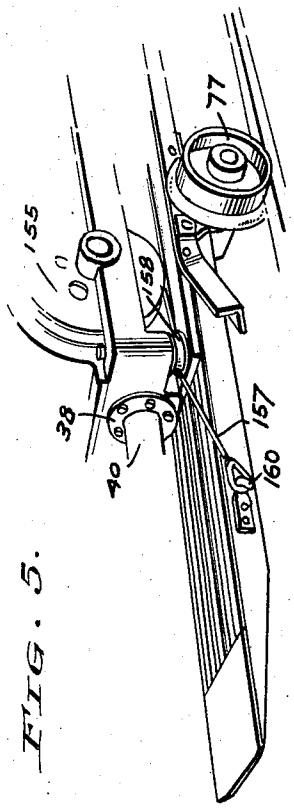


FIG. 5.

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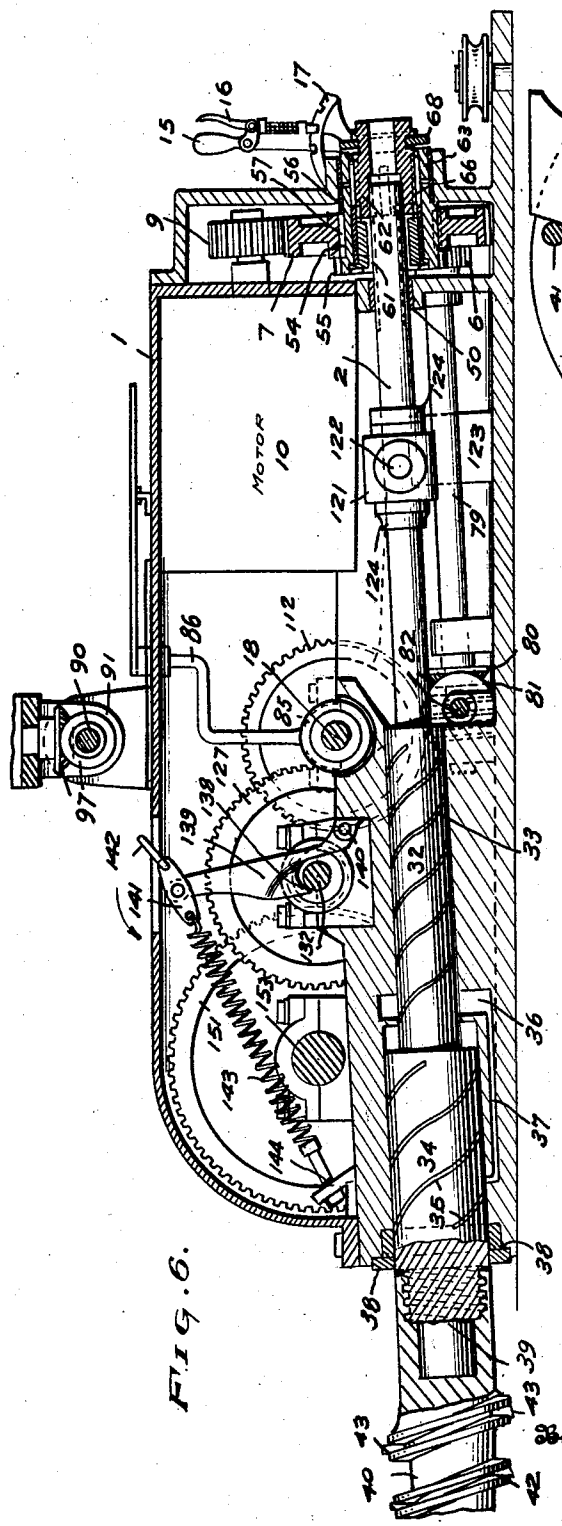


FIG. 6.

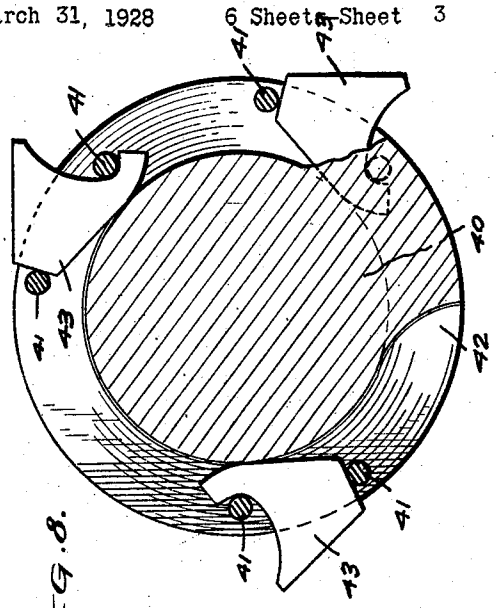


FIG. 8.

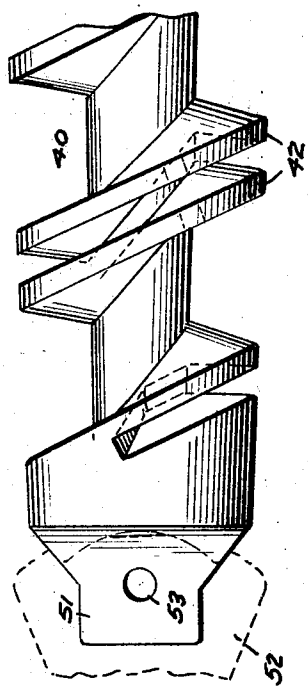


FIG. 7.

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MINING MACHINE

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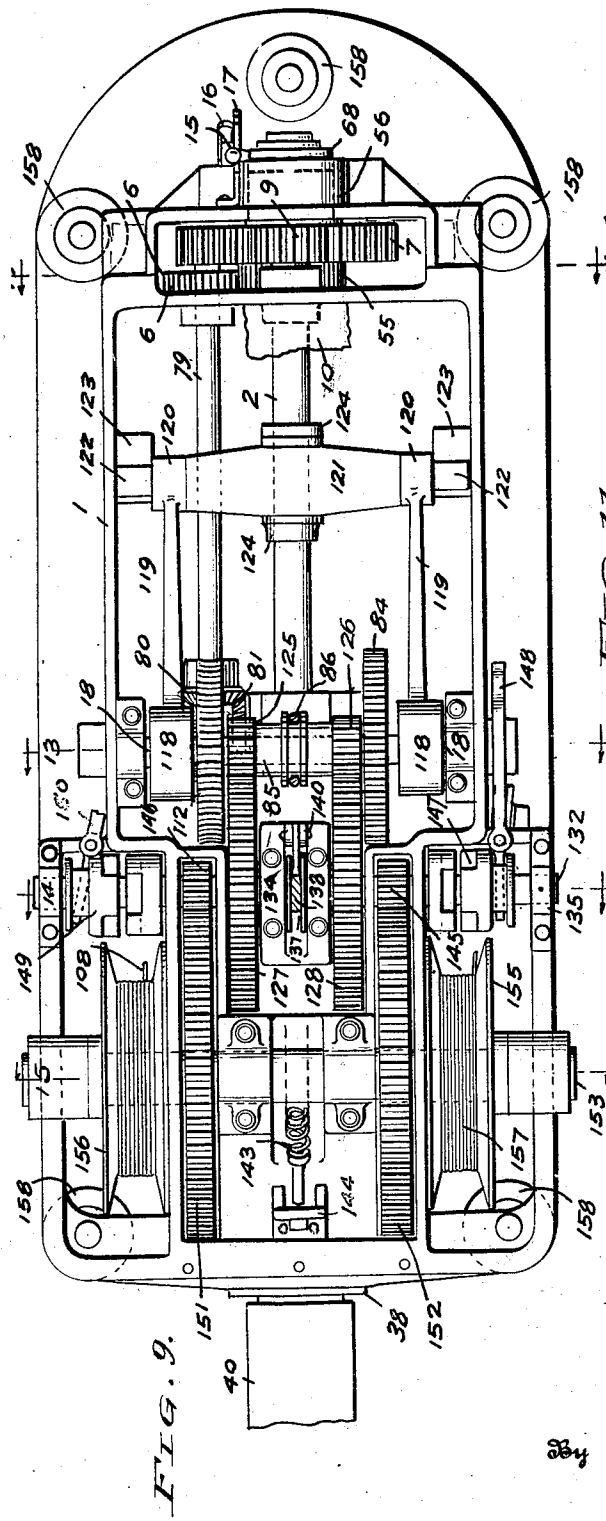


FIG. 9.

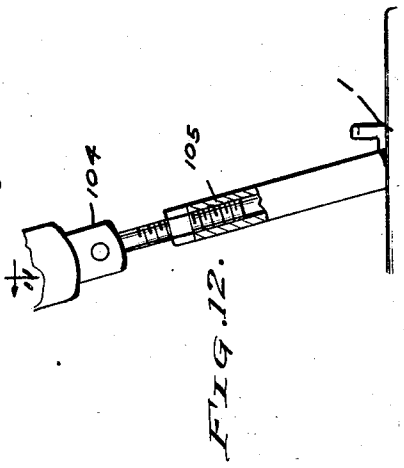


FIG. 12.

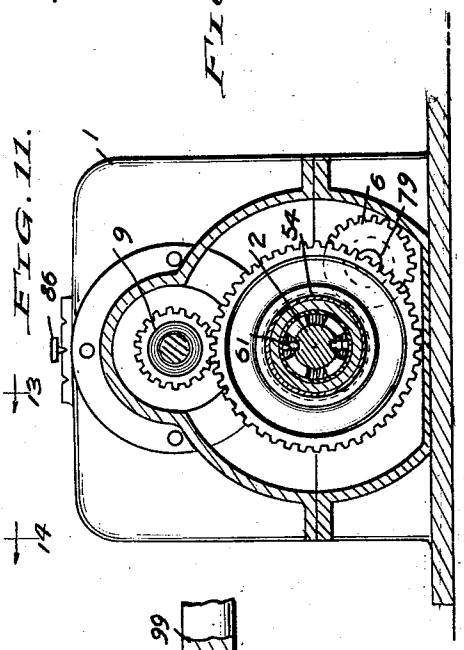


FIG. 11.



FIG. 10.

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MINING MACHINE

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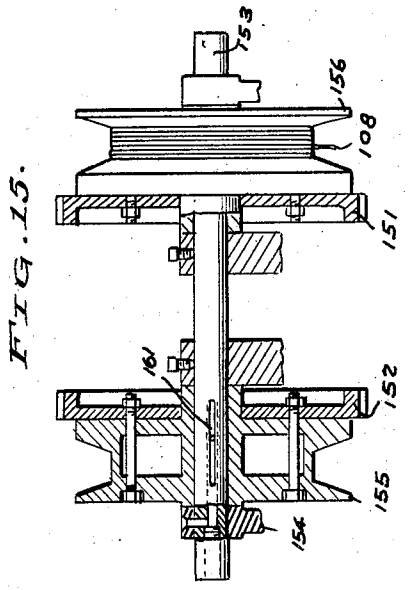


FIG. 15.

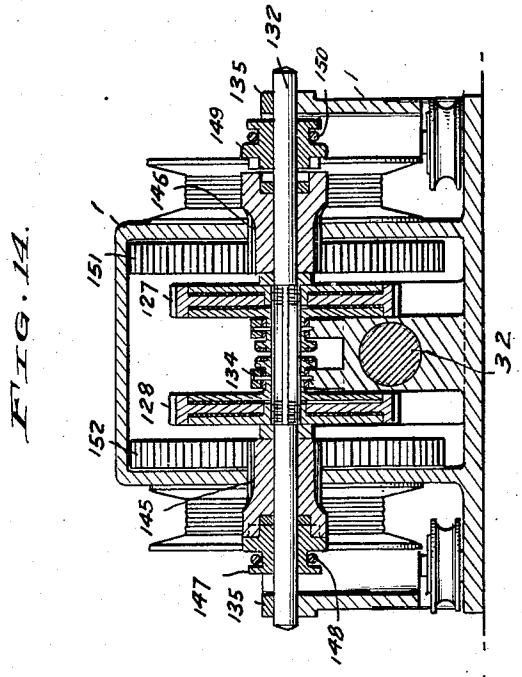


FIG. 14.

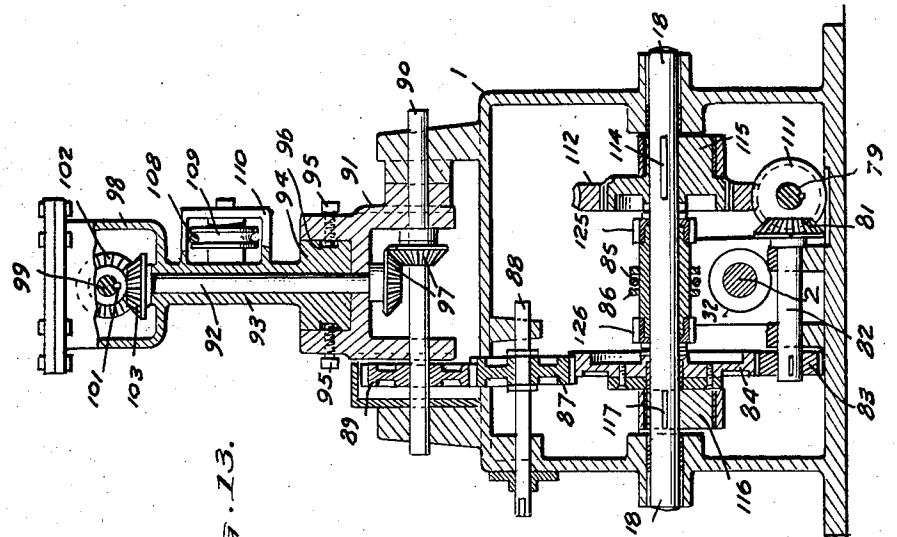


FIG. 13.

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MINING MACHINE

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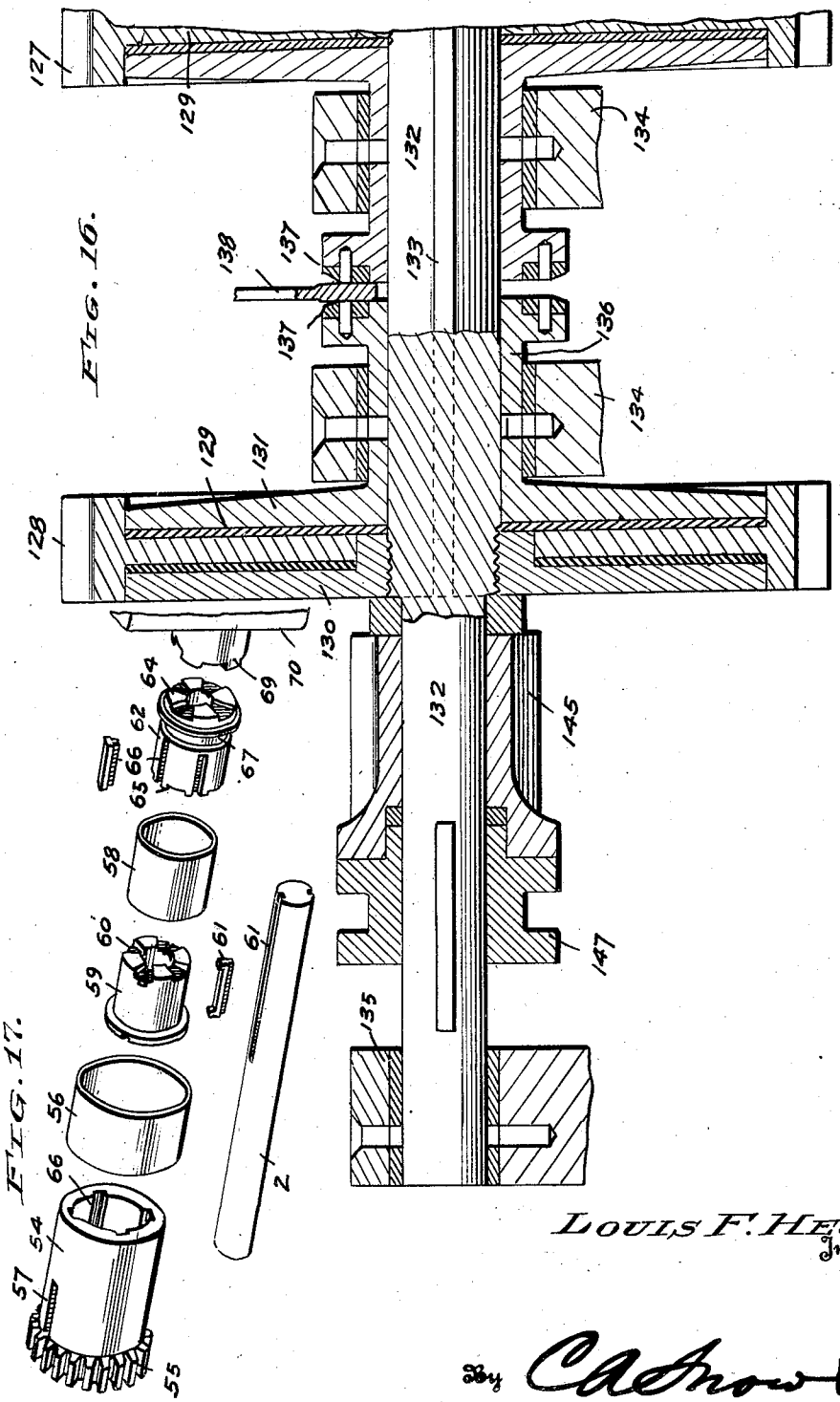


FIG. 16.

FIG. 17.

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Patented Aug. 26, 1930 1,774,006

UNITED STATES PATENT OFFICE

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MINING MACHINE

Application filed March 31, 1928. Serial No. 266,306.

This invention aims to provide a mining machine in which novel means is supplied for reciprocating and rotating the main auger, it being possible to couple the machine to a truck which carries the machine, to the end that the truck may be driven.

Another object of the invention is to provide novel means whereby the mining machine may be shifted about on the floor of the mine, as occasion may demand.

A further object of the invention is to provide novel means for operating and adjusting a supplemental auger which is mounted on the main mining machine.

It is within the province of the disclosure to improve generally and to enhance the utility of devices of that type to which the invention appertains.

With the above and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed, may be made within the scope of what is claimed, without departing from the spirit of the invention.

In the drawings:—

Figure 1 shows in perspective, a mining machine constructed in accordance with the invention, removed from the carrying truck, and in operative position; Figure 2 is a perspective view showing the carrying truck ready to receive the mining machine for transportation; Figure 3 is a fragmental perspective showing one of the clutch-throwing levers, parts being broken away; Figure 4 is a perspective view showing the machine mounted on the truck and ready for transportation; Figure 5 is a perspective view disclosing a portion of the truck and a part of the mining machine; Figure 6 is a longitudinal section taken through the main part of the mining machine; Figure 7 is a fragmental elevation wherein the main auger is shown in part; Figure 8 is a cross sectional view of the main auger; Figure 9 is a plan view of the frame of the machine with parts removed and broken away; Figure 10 is a sectional detail showing the connection for the main auger tip; Figure 11 is a cross section on the line 11—11 of Figure 9; Figure 12 is a sectional view showing the adjustable props for the supplemental auger; Figures 13, 14, and 15, are sections taken, respectively, on the line 13—13, 14—14, and 15—15, of Figure 9; Figure 16 is a fragmental transverse section showing a portion of one of the cross shafts and attendant parts; Figure 17 is a composite perspective view showing divers of the clutch and gear elements which are displayed in assembled position at the extreme right hand end of Figure 6 of the drawings.

The device forming the subject matter of this application includes two principal cooperating mechanisms, to wit, a mining machine that is shown by itself in Figure 1, and a truck that appears alone in Figure 2. Taking up, first, the mining machine, such views as Figures 6 and 9 make it evident that the mining machine includes a frame which, for the present, is designated as a whole by the numeral 1, the frame carrying a prime mover, such as an electric motor 10, the shaft of the motor carrying and operating a pinion 9.

A main auger shaft extends lengthwise of the machine. The auger shaft 2 rotates, and it has, also, a slight longitudinal reciprocatory movement. As seen in Figure 6 at 50, the rear end of the auger shaft 2 is mounted to slide and to rotate in the frame 1. The auger shaft includes an enlarged intermediate part 32 mounted in the frame of the machine and provided with an oil groove 33 of spiral form, the construction being such that the groove receives oil from a reservoir 36 in the frame, to lubricate the part 32 of the auger shaft, as the auger shaft slides and rotates. The main auger shaft comprises another enlarged part 34, of greater diameter than the part 32, and mounted to slide and to rotate in the frame work of the machine. For the lubrication of the part 34, the same is provided with a spiral groove 35 distributing oil which is delivered upon the part 34 of the auger shaft through an oil duct 37 that extends back to the oil reservoir 36. The forward portion of the part 34 of the auger

shaft cooperates with a bearing 38 in the front end of the frame 1. The forward end of the auger shaft is connected at 39, by threading or otherwise, to an auger 40.

The main auger 40 has a two-part spiral flange 42 (Figure 7), the constituent members of the flange 42 being connected by pairs of cross pins 41. Cutters 43 project outwardly beyond the flange 42, the cutters abutting against the body of the auger 40 and against one of the pins of each pair, the cutters being hooked under the other pin 41 of each pair, a secure but releasable mounting for the cutters being provided, as any one can see readily when Figure 8 of the drawings is noted. It appears from Figure 4 that the forward end of the auger shaft has bifurcations 51 receiving the rear end of an auger tip 52, the parts 51 and 52 being connected at 53, to hold the auger tip in place.

Referring to Figures 6 and 17, it may be stated that the pinion 9 on the shaft of the motor 10 meshes with a gear wheel 7. Through the gear wheel 7 extends the tubular hub 54 of a pinion 55 located in front of the gear wheel 7, the rear end of the hub 54 being journaled in a bearing 56 mounted in the frame 1. The hub 54 has a tight press-fit in the gear wheel 7 and also is keyed at 57 to the gear wheel 7. A bushing 58 is located inside of the hub 54. Within the bushing 58 is a tubular clutch member 59, the end clutch elements of which are shown at 60. The clutch member 59 can turn with respect to the hub 54 and the pinion 55, but the clutch member 59 is splined at 61 to the main auger shaft 2, so that although the auger shaft can move endwise in the clutch member 59, the shaft 2 and the clutch member 59 must participate in a common rotation. A clutch member 62 is journaled in a cuff 63 located within the bearing 56. In one end of the clutch member 62 there is a clutch 64, and in the opposite end of the member 62 there is a clutch 65. The clutch member 62 is splined at 66 into the hub 54 of the pinion 55 for relative sliding movement. The clutch member 62 has a circumferential groove 67 for the rotatable reception of a shift ring 68 that is under the governance of a hand lever 15 fulcrumed on a segment 17 carried by the frame 1, the hand lever 17 having a latch mechanism 16 adapted to cooperate with the segment.

When the clutch member 62 is shifted to the left in Figure 6 by means of the ring 68 and the lever 15, the clutch elements 65 of the member 62 cooperate with the clutch elements 60 of the clutch member 59. Then there is established a driving train for the main auger shaft 2, including the motor 10, the pinion 9, the gear wheel 7, the tubular hub 54 of the pinion 55 (because the hub 54 is keyed at 57 to the gear wheel 7), the spline 66, the clutch member 62, the clutch element 65, the clutch element 60, the clutch member 59, the spline 61, and the main auger shaft 2. As a result of this connection rotation is imparted to the auger shaft 2. The pinion 55 is rotated also, and the function of the pinion 55 will be explained hereinafter. By shifting the lever 15 into a neutral position, the clutch member 62 may be moved into such a position that the clutch elements 65 will be disengaged from the clutch elements 60, and, then, rotation will not be imparted to the clutch member 59 and to the auger shaft 2. It may be stated profitably at this place that by shifting the lever 15, the clutch member 62 may be moved far enough to the right in Figure 6 so that the clutch 64 of the member 62 will be engaged with a clutch 69 on the truck 70, when the mining machine is mounted on the truck 70, as shown in Figure 4 of the drawings. The driving train for the truck 70 includes the motor 10 of the mining machine, the pinion 9 of the motor, the gear wheel 7 the key 57, the hub 54, the spline 66, the clutch member 62, the clutch member 64, the clutch 69, a shaft 71 on the truck 70, a sprocket wheel 72 (Figure 2) on the shaft, a sprocket chain 73 engaged with the sprocket wheel 72 and connected operatively with the axle 74 which carries one set of truck wheels 75, motion being transmitted from the axle 74 to the other axle 76 and the corresponding wheels 77 by a sprocket chain 78 which is shown in Figure 4.

On the rear end of the truck 70 there is journaled a reel 162 which is driven by a chain and sprocket connection 163 from the shaft 71, suitable clutch mechanism 164 being supplied, so that the shaft 71 will either operate the chain 73 and propel the truck, or rotate the reel 162. The reel 162 carries the cable 165 which contains the conductors for the motor 10.

The pinion 55 meshes with a gear 6 on a shaft 79 extended lengthwise of the frame 1 and journaled thereon. The shaft 79 carries a beveled gear 80 meshing with a beveled gear 81 (Fig. 13) on a countershaft 82 disposed transversely of the frame of the machine and supported for rotation thereon. A pinion 83 is fixed to the countershaft 82 and meshes with a gear wheel 84 mounted to turn on a shaft 18 journaled on the frame 1.

The gear wheel 84 meshes with a pinion 87 carried by a shaft 88 which is mounted to slide endwise and to rotate on the frame 1, the construction being such that the pinion 87 may be shifted out of mesh with the gear wheel 84 when desired. The pinion 87 meshes with a gear 89 on a shaft 90 journaled in the frame 1. On the shaft 90, a support 91 is mounted to swing, and in the support 91 a shaft 92 is journaled, the shaft being journaled also in a tubular bearing 93 having a foot 94 mounted to rotate in the support 91 and held on the support for rotation by set screws 95 extended into a circumferential groove 96 in the foot 94. It is possible to

advance the set screws 95 and hold the foot 94 and the bearing 93 against rotation. The lower end of the shaft 92 is operatively connected with the shaft 90 by beveled gears 97. On the upper end of the bearing 93 there is a guide casing 98 (Figs. 13 and 1) in which an auger shaft 99 is mounted to slide longitudinally and to rotate, the auger shaft carrying an auger 100 which is used for boring blast holes. The auger shaft 99 is splined at 101 (Fig. 13) into a beveled pinion 102 located within the casing 98, the pinion 102 meshing with a beveled pinion 103 on the shaft 92. The casing 98 has a depending bracket 104, as shown in Figure 1, and to this bracket is pivoted a longitudinally extensible prop 105 (Fig. 12) adapted to cooperate with the frame work 1 of the machine to hold the auger 100 at any desired angle, as shown in Figure 1. The rear end of the auger shaft 99 is journaled in a shoe 106 provided with a handle 107, the handle serving as an anchor for a flexible element 108 which is passed across a sheave 109 journaled in a bracket 110 on the side of the bearing 93. The flexible element 108 is operated by means which will be described hereinafter, but it will be obvious that the flexible element 108 serves as a means for advancing the auger shaft 99 and the auger 100. The auger shaft 99 is rotated by a train of elements comprising the beveled pinion 102, the beveled pinion 103, the shaft 92, the beveled pinions 97, the shaft 90, the gear 89, the pinion 87, the gear wheel 84, the pinion 83, the countershaft 82, the beveled gear 81, the beveled gear 80, the shaft 79, the gear 6, the pinion 55, and the gear wheel 7, the pinion 9, and the motor 10. The operation of the supplemental auger shaft 99 may be stopped by shifting the pinion 87 sidewise (Fig. 13). The auger shaft 99 can be adjusted in a vertical plane because the guide casing 98, the shaft 92, and the support 91 have swinging movement about a horizontal axis represented by the shaft 90. The auger shaft 99, moreover, can be swung with respect to an axis represented by the shaft 92 of figure 13, because the foot 94 of the bearing member 93 is adjustably held for rotation, at 95—96, in the upper part of the support 91.

The shaft 79 carries a worm 111 meshing with a worm wheel 112 which is connected at 114 to the shaft 18. The worm wheel 112 has an eccentric 115, and an eccentric 116 is secured at 117 to the shaft 18, as indicated in Figure 13. The eccentrics 115 and 116 cooperate with straps 18 on arms 119 that are pivoted at 120 to a cross head 121 the ends 122 of which slide on supports 123 at the sides of the casing of the machine. The main auger shaft 2 is journaled in the cross head 121 but is held against longitudinal movement therein by collars 124 on the shaft 2.

Longitudinal reciprocation is imparted to the shaft 2 by a train of parts including the motor 10, the pinion 9, the gear wheel 7, the pinion 55, the gear 6, the shaft 79, the worm 111, the worm wheel 112, the shaft 18, the eccentrics 115 and 116, the straps 118, the arms 119, the cross head 121, and the collars 124. It is evident that the main auger shaft 2 and the auger 40 have a compound movement in that they rotate and slide longitudinally.

A clutch member 85 is slidable on the shaft 18, and the shaft 18 is rotatable in the clutch member. The clutch member 85 is slid by a shifting mechanism 86 which is accessible from without the frame 1, as shown in Fig. 6. The clutch 85 is supplied at one end with a pinion 125, and at the other end with a pinion 126. The pinion 125 meshes with a gear 127 (Figures 9 and 16) and the pinion 126 meshes with a gear 128. The gears 127 and 128 each have a web 129 located between a fixed abutment 130 and a movable clamp 131, the abutment and the clamp being carried by a shaft 132. The abutment 130 is secured to the shaft 132 against movement longitudinally thereof and against rotation thereon, but the clamp 131 is splined at 133 to the shaft 132, to slide toward and away from the abutment 130. The shaft 132 is journaled in bearings 135 on the frame 1, and the clamps 131 have hubs 136 that are journaled in bearings 134 on the frame 1. The hubs 136 of the clamps 131 have flanges 137 between which extends the tapered part 138 (Figure 6) of a lever 139 which is fulcrumed at 140 on the framework of the machine. A link 141 is pivoted to the upper end of the lever 139 and carries a handle 142 which is accessible from the outside of the framework of the machine. The link 141 is connected to a retractile spring 143 that is anchored at 144 upon the machine frame.

A pinion 145 and a pinion 146 are loose on the shaft 132, the pinion 145 being adapted to be connected to the shaft 132 by a clutch 147 under the control of a lever 148, and the pinion 146 being adapted to be connected to the shaft 132 by a clutch 149 under the control of a lever 150 which, like the lever 148, is fulcrumed on any accessible part of the framework of the machine.

The pinion 146 meshes with a gear wheel 151, and the pinion 145 meshes with a gear wheel 152, the gear wheels 151 and 152 being mounted on a shaft 153 that is journaled in bearings 154 on the frame of the machine. The gear wheel 152 is secured to a drum 155, and the gear wheel 151 is secured to a drum 156. It may here be noted that the flexible element 108 which controls the longitudinal advancement of the auger shaft 99 of Figure 1 is wound about the drum 156. About the drum 155 is wound a flexible element 157 which may be engaged about any desired number of a group of pulleys 158 on the ma-

chine. The flexible element 157 is used for shifting the machine about, when the machine is in working position as shown in Figure 1, and the flexible element 157 may be used, also, to draw up the mining machine upon the truck 70 as shown in Figure 4, the truck including a pivotally mounted skid 159, along which mining machine may be slid when the skid is lowered as in Figure 2. The flexible element 157 may be connected to a hook 160 on the side of the skid, to raise the skid out of the way, after the mining machine has been mounted on the truck 70 as depicted in Figures 4 and 5. Reverting to Figure 15, the drum 155 and the gear wheel 152 may be connected at 161 to the shaft 153, but the gear wheel 151 and the drum 156 turn on the shaft 153.

The clutch 85 may be shifted endwise by the mechanism shown at 86, to connect the clutch either with the worm wheel 112 or with the gear wheel 84. Rotation, thus, can be imparted to the clutch 85 either from the train that operates the supplemental auger 99 in Figure 13, or by the train (including the worm wheel 112), that imparts longitudinal reciprocation to the main auger shaft 2. When the clutch 85 is rotated, the pinion 125 on the clutch 85, drives the gear wheel 127, or the pinion 126 on the clutch 85 drives the gear wheel 128, rotation, in either event, being imparted to the shaft 132. The operator, then, by means of the lever 150, the clutch 149, the pinion 146 the gear wheel 151, and the drum 156, can operate the flexible element 108, to feed the supplemental auger shaft 99 of Figure 1: or, by means of the lever 148, the clutch 147, the pinion 145, the gear wheel 152, and the flexible element 157, the operator can move the machine about, it being recalled that the flexible element 157 can be anchored and arranged around any of the pulleys 158. The lever 139 may be tilted more or less, to vary the amount that the part 138 of the lever extends between the flanges 137 of Figure 16, thus varying the grip of the clamps 131 on the webs 129 of the gears 128 and adjusting the speed with which the flexible elements 108 or 157 are taken in or paid out.

The operation of the machine has been dealt with hereinbefore step by step, and a brief résumé at this point will suffice. The auger shaft 2 can rotate and move longitudinally, the supplemental auger shaft 99 of Figure 1 may be tilted vertically, rotated on its axis, swung with respect to a transverse axis, and be fed longitudinally, and the machine can be loaded on the truck and be caused to propel the truck it being possible, through the instrumentality of the drum 155 and the cable 157 to haul the machine around as desired, with respect to the work, when the machine is in the position shown in Figure 1.

What is claimed is:—

1. In a mining machine, a frame, a main auger mounted on the frame for rotation and for longitudinal reciprocation, mechanism for operating the main auger, a supplemental auger mounted on the frame for longitudinal adjustment, a shaft supported on the frame for rotation, means for connecting the shaft with said mechanism, drums on the shaft, and flexible elements connected to the drums, one flexible element being connected to the supplemental auger to secure a longitudinal adjustment of the supplemental auger, and the other flexible element constituting means for shifting the frame and both augers with respect to the work.

2. In a device of the class described, a carrying truck, a skid pivoted to the carrying truck, a mining machine adapted to be moved along the skid and upon the truck, the mining machine including a member supported for rotation, means for driving said member, and a flexible connection mounted on said member and connected to the skid to raise the skid into an inoperative position.

3. A mining machine comprising a frame, a motor on the frame and including a pinion, an auger shaft mounted to rotate and to move longitudinally in the frame, a gear wheel meshing with the pinion, a second pinion located in front of the gear wheel and having a tubular hub extended through the gear wheel and secured to the gear wheel, the rear end of the hub being journaled in the frame, a tubular clutch member mounted to turn in the hub, the auger shaft extending through the clutch member and being splined to the clutch member to slide therein and to rotate therewith, a second clutch member journaled in the frame and splined to the hub for rotation therewith and for relative longitudinal sliding movement with respect thereto, the second clutch member having inner clutch elements at one end for cooperation with the tubular clutch member, and having outer clutch elements at its opposite end for cooperation with a part to be driven, means for shifting the second clutch member longitudinally of the hub to render the aforesaid clutch elements operative one at a time, and means operated by the second pinion for imparting longitudinal reciprocation to the auger shaft.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

LOUIS F. HESS.