Aug. 6, 1935. F. B. YINGLING 2,010,449

COAL MINING MACHINE

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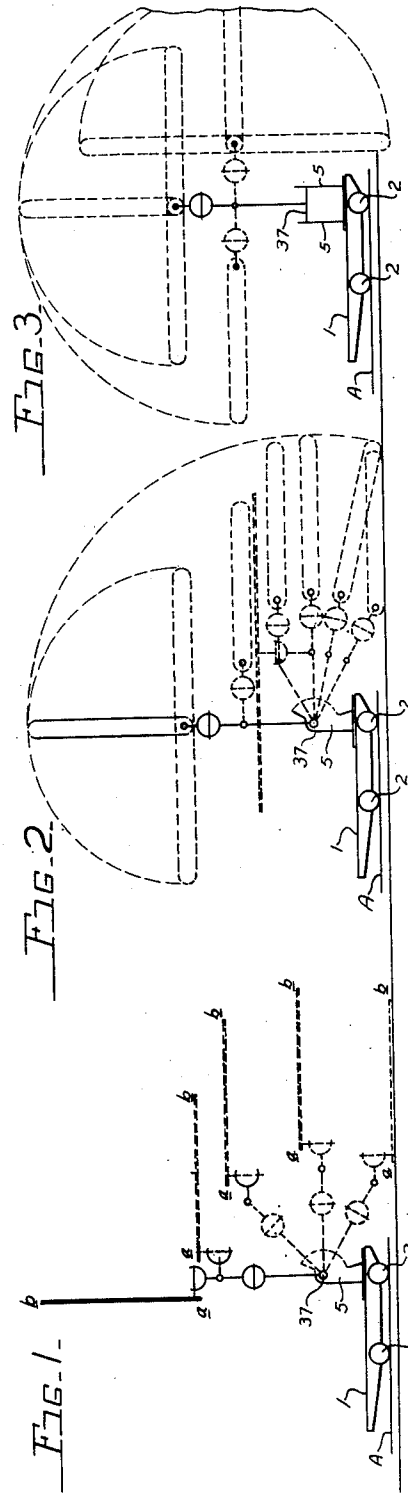


FIG. 3

FIG. 2

FIG. 1

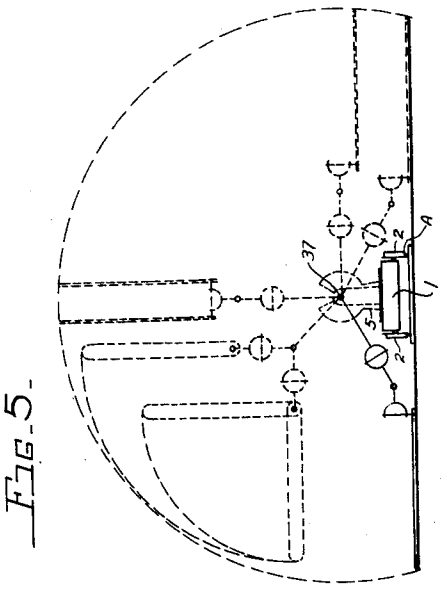


FIG. 5

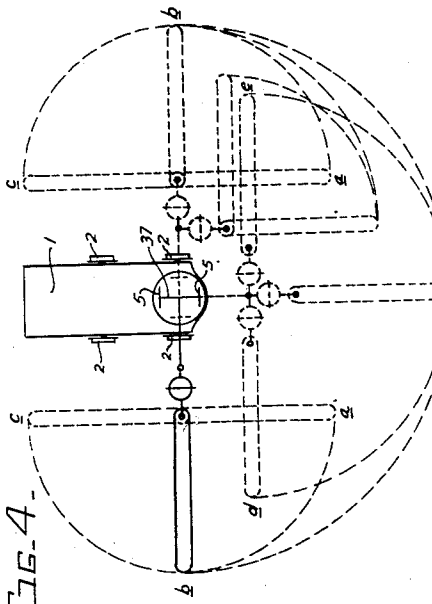


FIG. 4

INVENTOR
Frank B. Yingling.
BY Toulmin & Toulmin
ATTORNEYS

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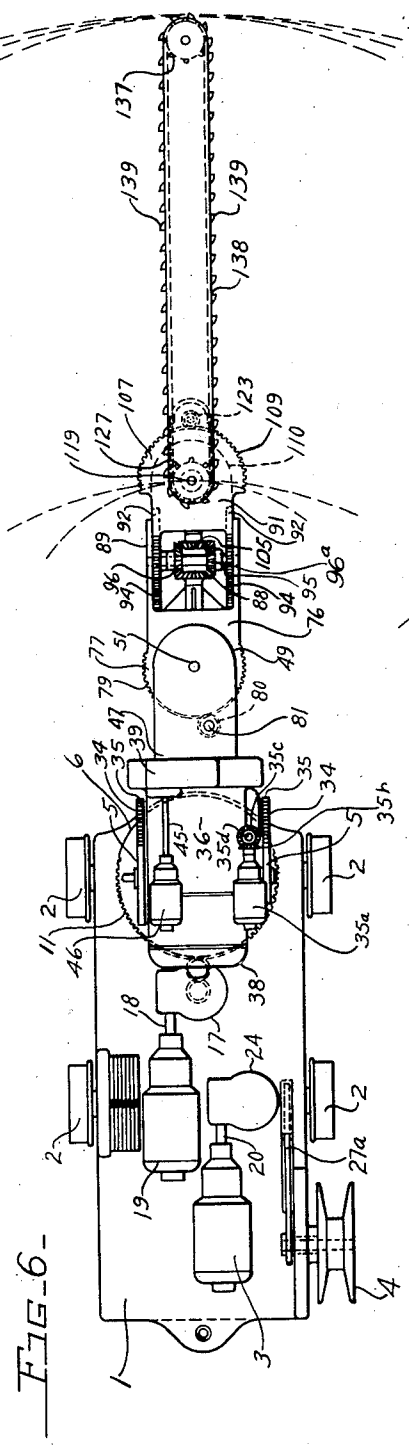


FIG. 6.

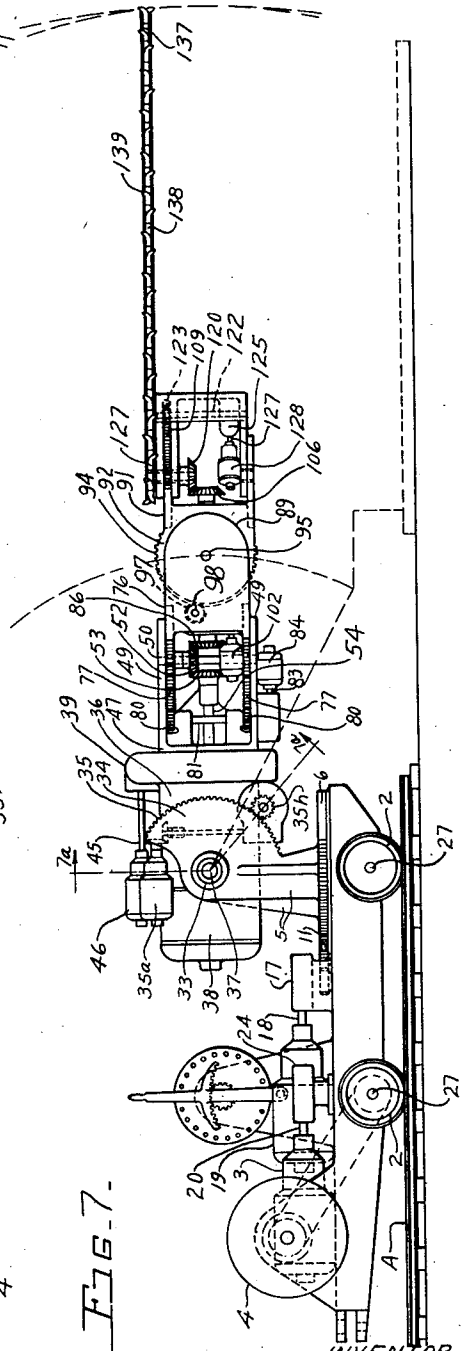


FIG. 7.

INVENTOR
Frank B. Yingling.
BY
Toulmin & Toulmin
ATTORNEYS

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FIG. 37.

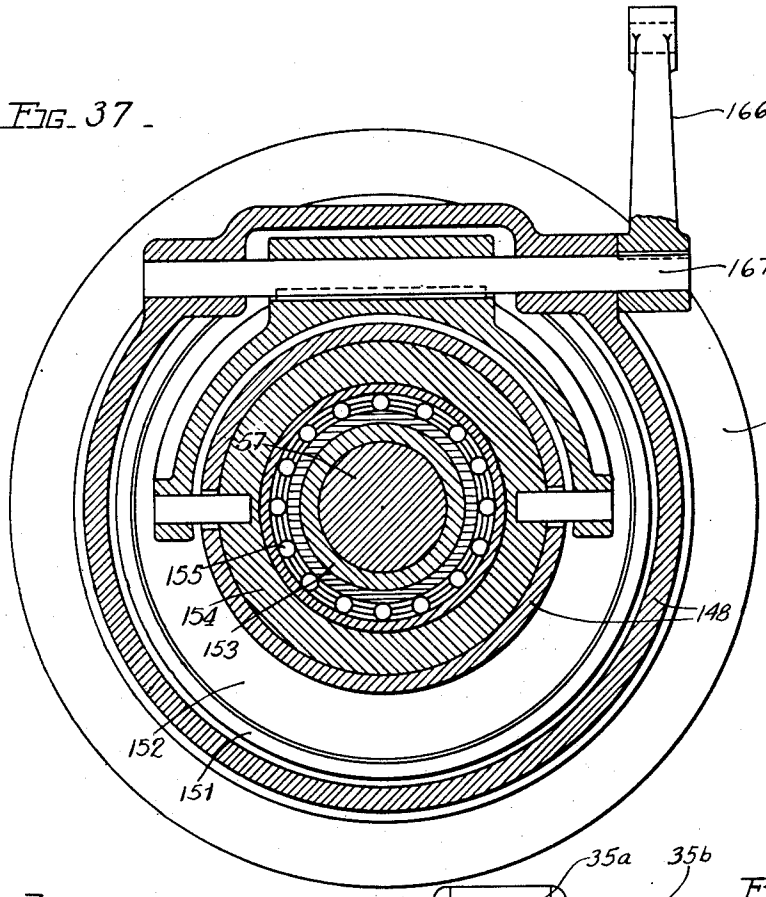


FIG. 7a.

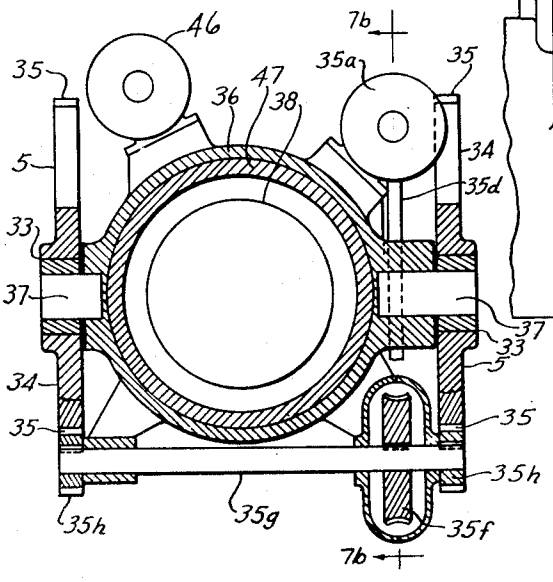
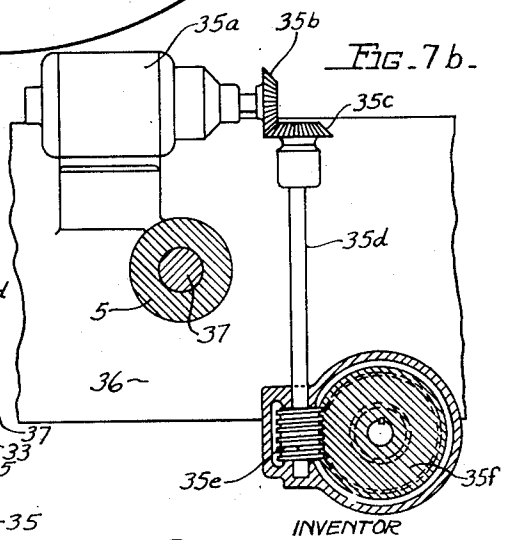


FIG. 7b.



INVENTOR

Frank B. Yingling.

BY

Toulmin & Toulmin

ATTORNEYS

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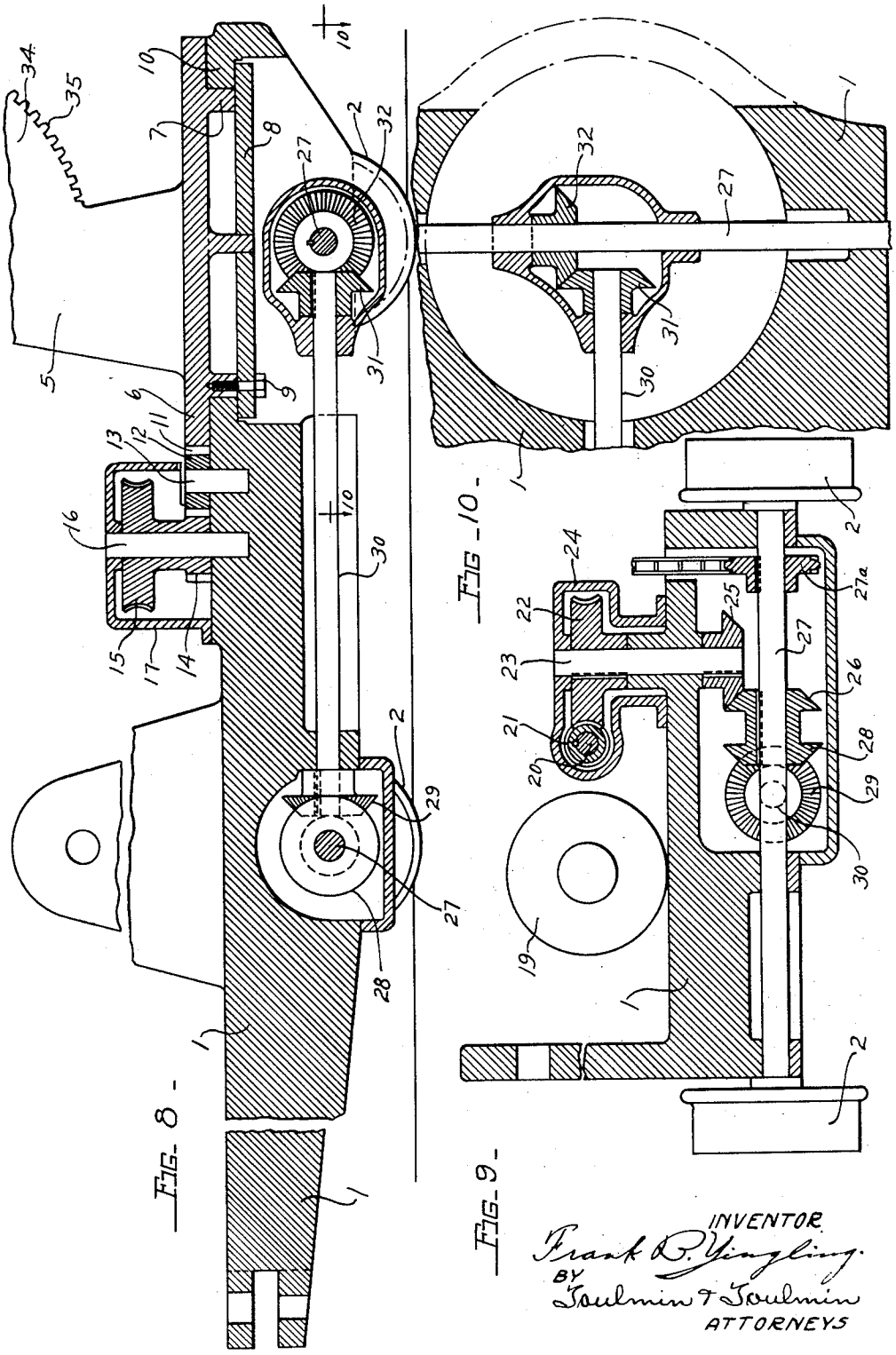


FIG. 8.

FIG. 10.

FIG. 9.

INVENTOR
Frank B. Yingling.
BY
Toulmin & Toulmin
ATTORNEYS

Aug. 6, 1935. F. B. YINGLING 2,010,449

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FIG. 11.

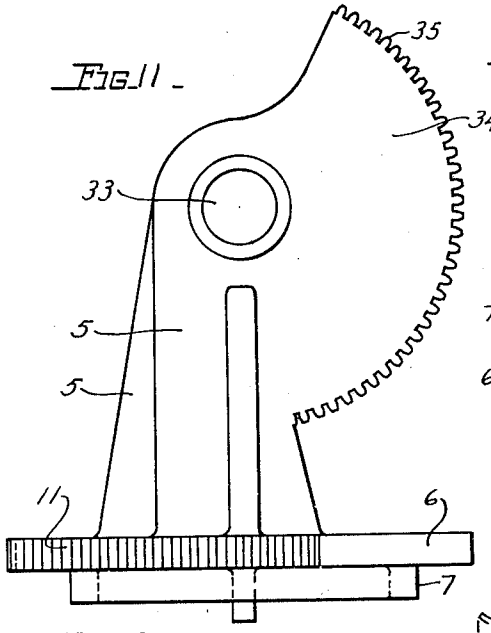


FIG. 12.

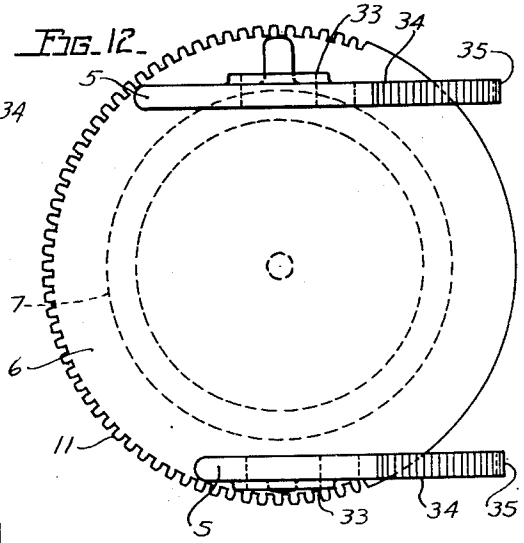


FIG. 13.

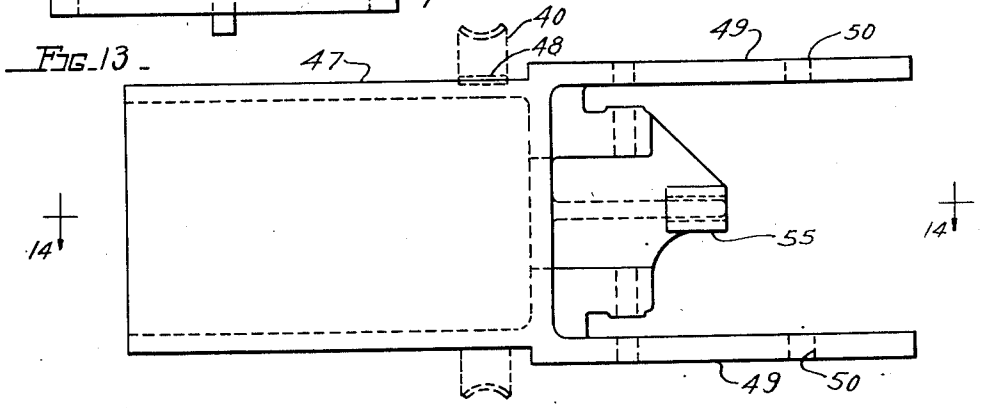
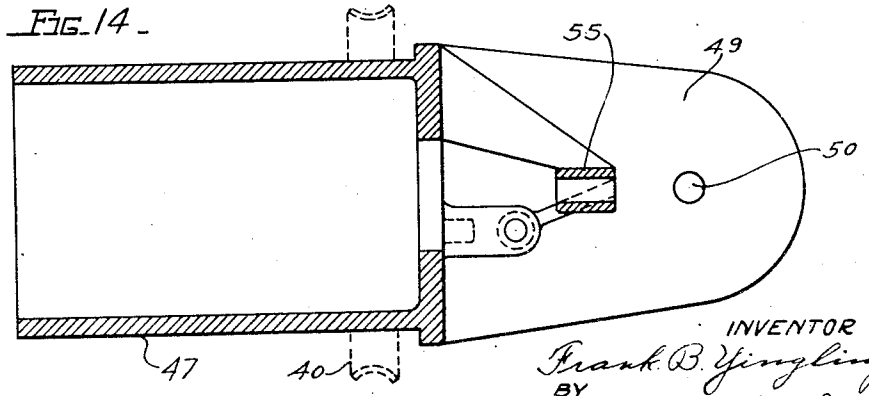


FIG. 14.



INVENTOR
Frank B. Yingling.
BY
Toulmin + Toulmin
ATTORNEYS

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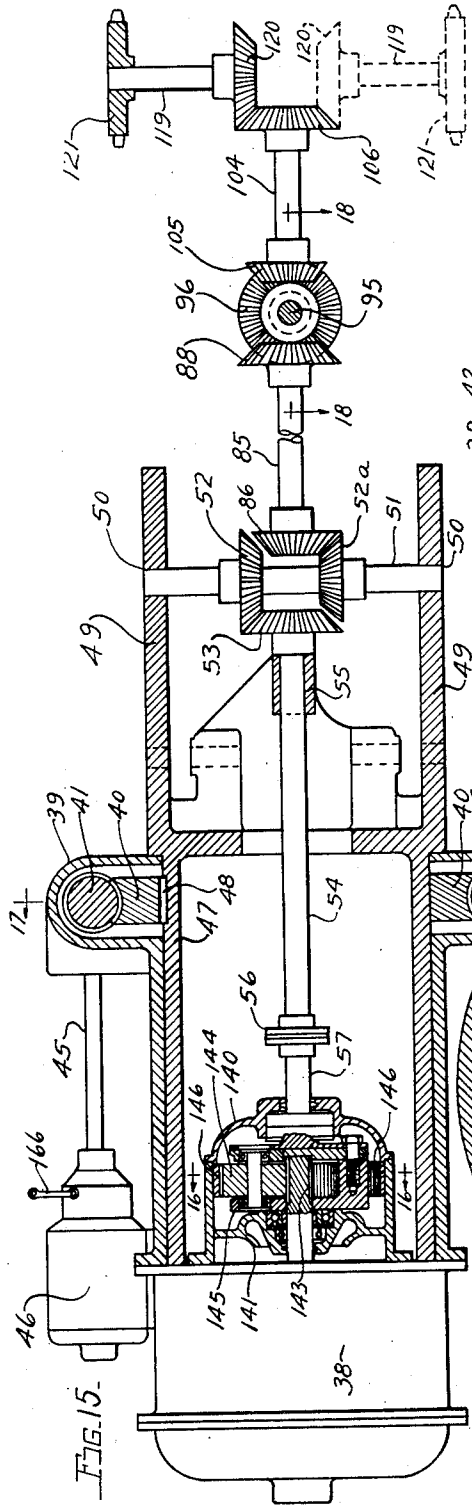


FIG. 15.

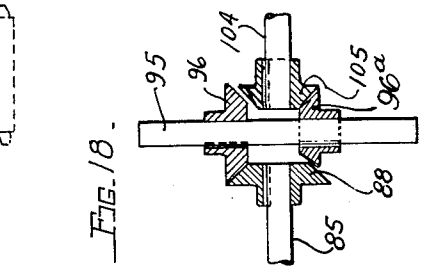


FIG. 18.

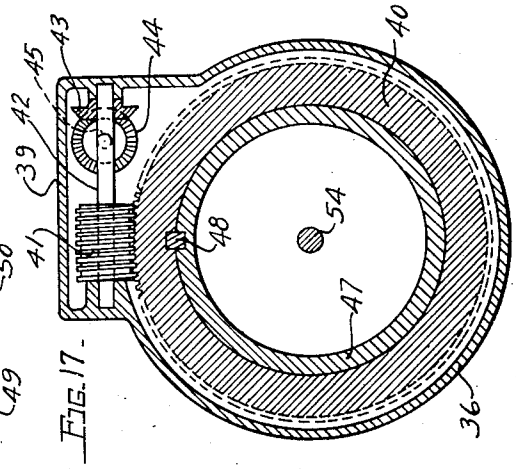


FIG. 17.

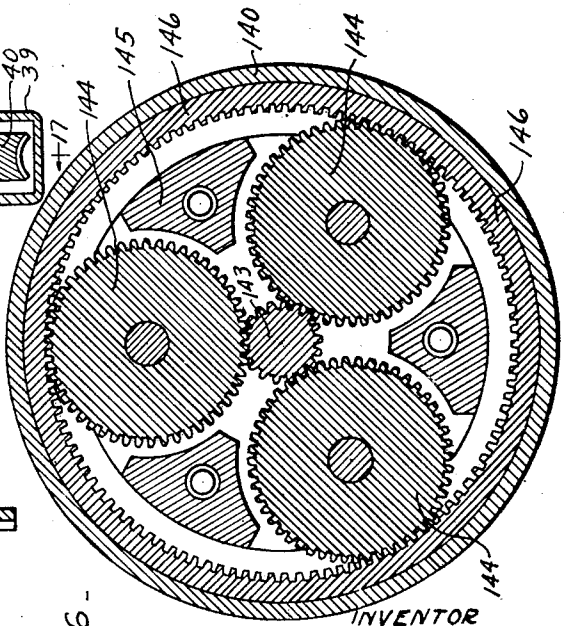


FIG. 16.

INVENTOR
Frank B. Yingling.
BY
Toulmin & Toulmin
ATTORNEYS

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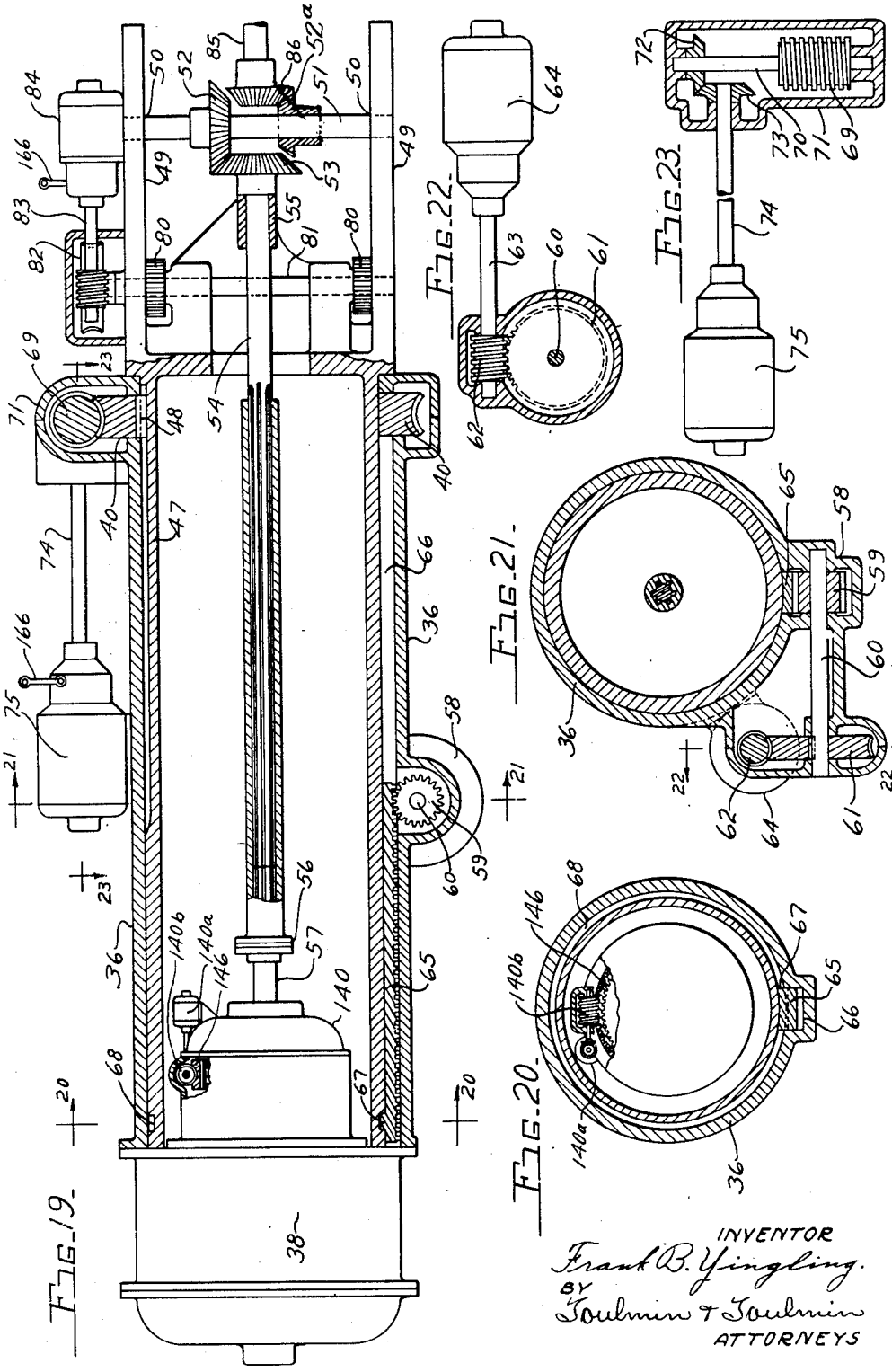


FIG. 19.

FIG. 22.

FIG. 23.

FIG. 21.

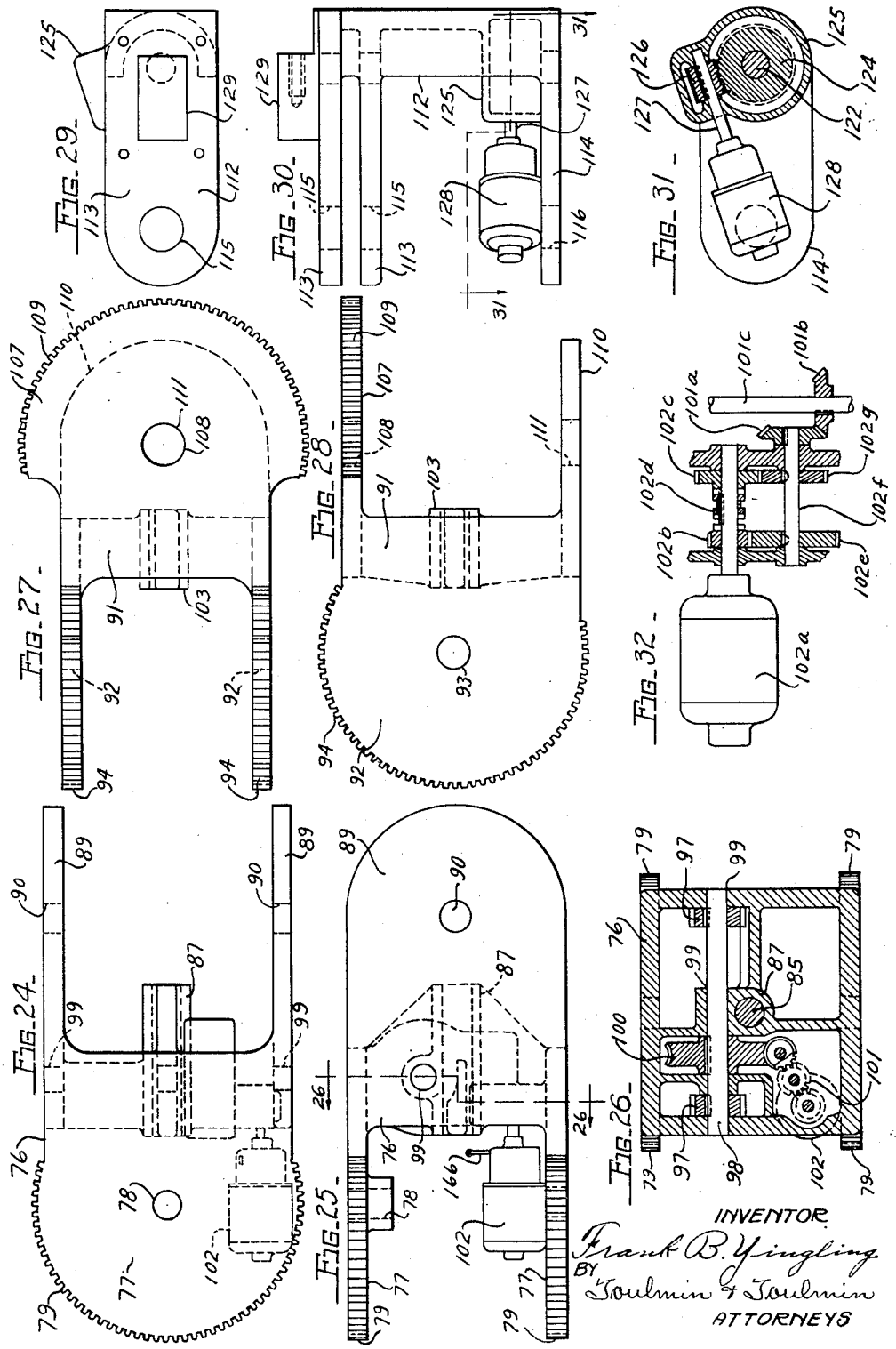
FIG. 20.

INVENTOR
Frank B. Yingling.
BY
Toulmin & Toulmin
ATTORNEYS

Aug. 6, 1935. F. B. YINGLING 2,010,449

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INVENTOR
Frank B. Yingling
BY Toulmin & Toulmin
ATTORNEYS

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FIG. 33

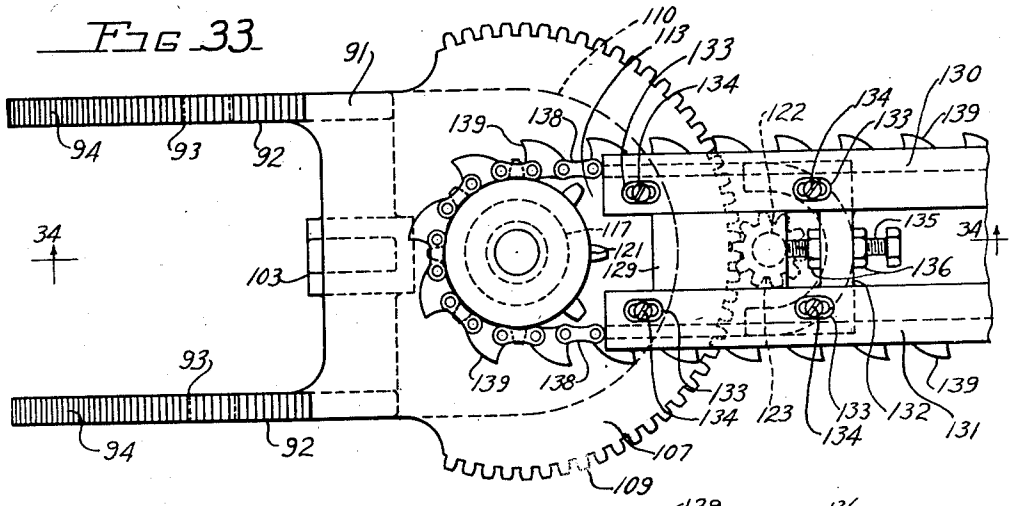


FIG. 34

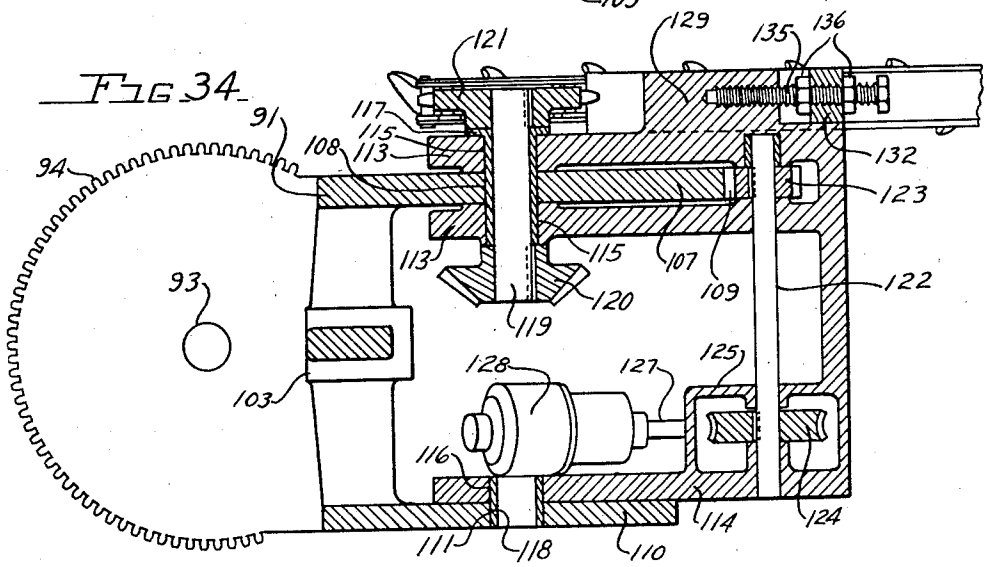
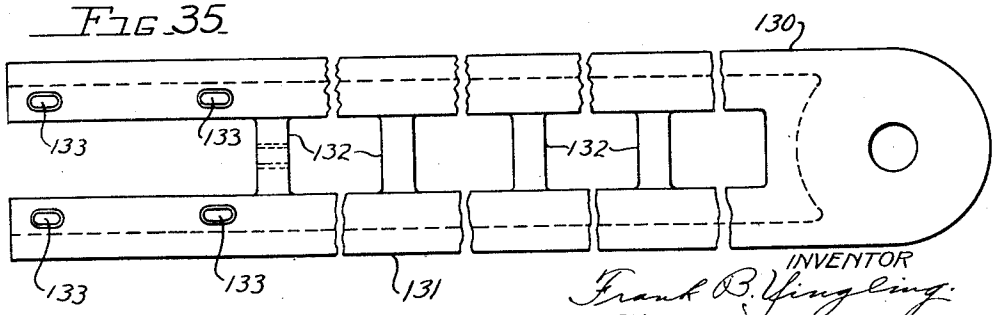


FIG. 35



INVENTOR
Frank B. Yingling.
BY
Toulmin & Toulmin
ATTORNEYS

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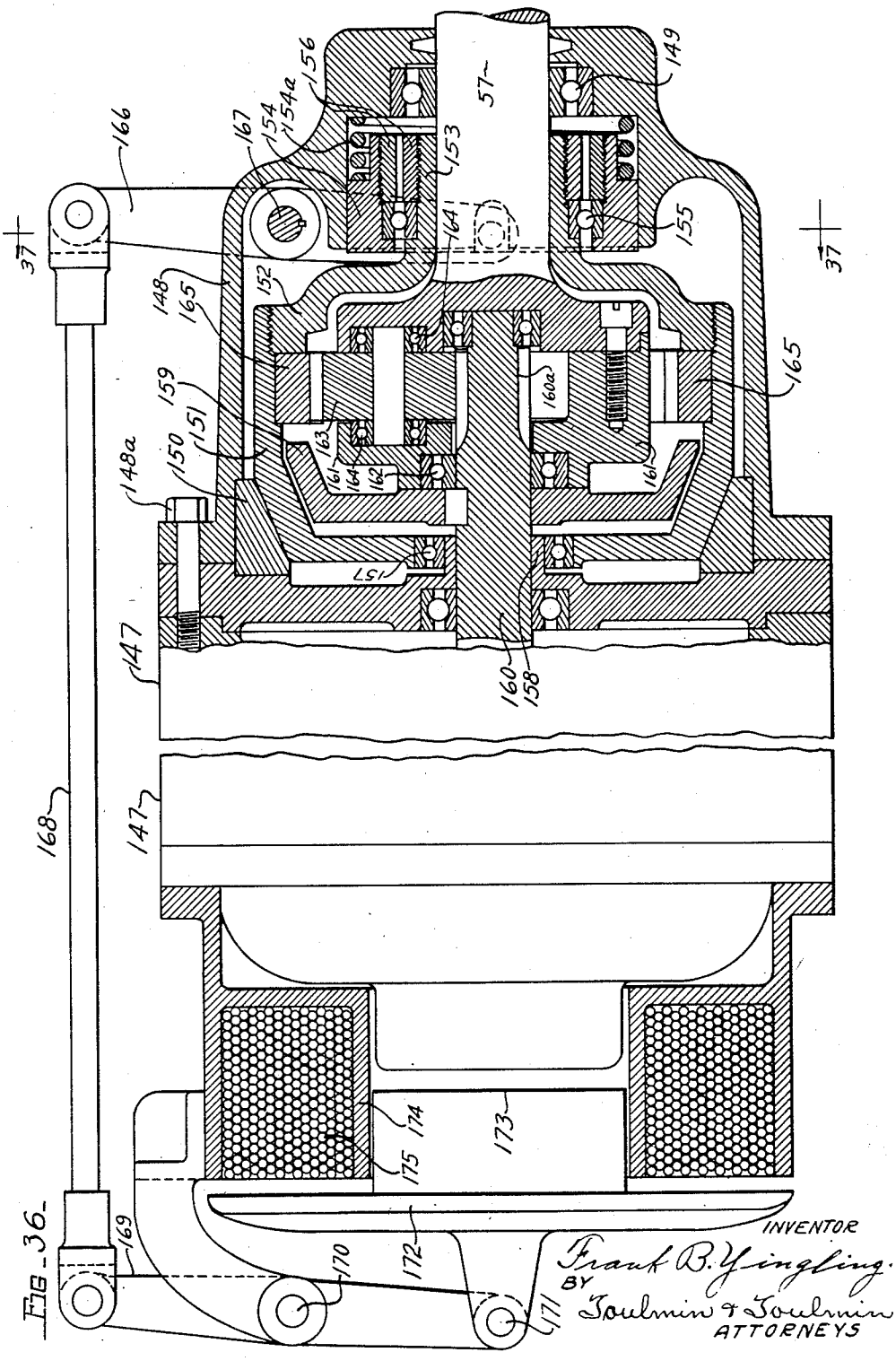


FIG. 36.

INVENTOR
Frank B. Yingling.
BY
Toulmin & Toulmin
ATTORNEYS

Patented Aug. 6, 1935 2,010,449

UNITED STATES PATENT OFFICE

2,010,449

COAL MINING MACHINE

Frank B. Yingling, Hamilton, Ohio, assignor to Cyrus J. Fitton, Hamilton, Ohio

Application December 3, 1932, Serial No. 645,567

5 Claims. (Cl. 262—28)

This invention relates to improvements in coal mining machines, and has for its object to produce a machine for use in mines to cut kerfs in an upright wall in front of or on either side of the machine, from the bottom or floor line to the top of the seam, or between the top and the bottom on opposite sides of the machine. The kerfs may be made in any line from a horizontal line adjacent the bottom of the machine to a vertical line above the machine.

It is an object of this invention to provide, in connection with a frame or chassis supported on two pairs of wheels, means rotatably mounted on the frame or chassis above one of said pairs of wheels, so that the cutting mechanism may be rotated in a horizontal plane from a position on one side, at substantially right angles to the chassis, to a position on the other side of the chassis, at substantially right angles thereto.

It is also an object of this invention to provide a coal mining machine consisting of a chassis having mounted thereon a rotating pedestal which pivotally supports a cylindrical frame carrying a motor for operating the cutting blade and the mechanism for supporting the blade in various angular positions.

It is also an object of this invention to provide, in connection with a cylindrical frame, means mounted in the cylindrical frame for rotation therein so that a blade supported by said means may be positioned at any angle to the vertical.

It is a further object of this invention to provide, in connection with a motor and a cutter blade, means for varying the speed relationship between the blade and the motor, and means for varying the distance between the operating motor and the blade operated thereby.

It is a further object of this invention to provide, in connection with the motor for operating the cutter blade, a clutch mechanism for varying the speed relationship between the motor and the cutter blade, and also electrical means for operating the clutch.

These and other advantages will appear from the following description taken in connection with the drawings.

Referring to the drawings:

Figure 1 shows diagrammatically a variety of horizontal positions in which the cutter blade may be operated. It also shows the cutter blade being operated in a vertical position.

Figure 2 shows a variety of horizontal positions in which the cutter blade may be operated, and also shows vertical positions in which it may be operated.

Figure 3 shows a variety of horizontal and vertical positions in which the blade may be operated.

Figure 4 shows the positions in which the cutter blade may be operated in a horizontal plane, from one side of the truck to the other.

Figure 5 shows the various vertical positions in which the blade may operate.

Figure 6 is a top plan view of the machine.

Figure 7 is a side elevation.

Figure 7*a* is a section on the line *a*—*a* of Figure 7.

Figure 7*b* is a section on the line *b*—*b* of Figure 7*a*.

Figure 8 is a vertical, longitudinal section through the center of the chassis or frame.

Figure 9 is a transverse section on the line 9—9 of Figure 8.

Figure 10 is a section showing the connection between the longitudinal shaft and one of the wheel shafts and the housing therefor.

Figure 11 is a side elevation of the rotating pedestal.

Figure 12 is a top plan view of the rotating pedestal.

Figure 13 is a view showing the cylindrical rotating frame.

Figure 14 is a section on the line 14—14 of Figure 13.

Figure 15 is a vertical section through the cylindrical elevating frame, with the motor attached to one end and the operating structure supported by the cylindrical frame.

Figure 16 is a section on the line 16—16 of Figure 15.

Figure 17 is a section on the line 17—17 of Figure 15.

Figure 18 shows a top plan view of the gears shown in Figure 15, to the right of the cylindrical elevating frame.

Figure 19 is a view similar to Figure 15 but showing a slightly modified form of cylindrical elevating frame and a cylindrical rotating frame mounted therein.

Figure 20 is a section on the line 20—20 of Figure 19.

Figure 21 is a section on the line 21—21 of Figure 19.

Figure 22 is a section on the line 22—22 of Figure 21.

Figure 23 is a section on the line 23—23 of Figure 19.

Figure 24 is a side elevation of the rear double forked frame.

Figure 25 is a top plan view of the frame shown in Figure 24.

Figure 26 is a section on the line 26—26 of Figure 25.

Figure 27 is a top plan view of the second or front double forked frame.

Figure 28 is a side elevation of the frame shown in Figure 27.

Figure 29 is a top plan view of the cutter bar head.

Figure 30 is a side elevation of the cutter bar head.

Figure 31 is a section on the line 31—31 of Figure 30.

Figure 32 shows a modified form of the motor drive used in connection with the rear double forked frame.

Figure 33 is a top plan view showing the rear end of the cutter bar and the supporting structure therefor.

Figure 34 is a section on the line 34—34 of Figure 33.

Figure 35 is a top plan view of the cutter bar with parts thereof broken away.

Figure 36 is a section through a planetary gear and clutch mechanism forming the connection between the blade motor and the shaft for operating the blade through the various chains of gears. This figure also shows in section the electrical means for shifting the clutch.

Figure 37 is a section on the line 37—37 of Figure 36.

The mining machine is supported on a truck or frame 1, adapted to travel along a track A. This truck in the present instance has a pair of axles, with wheels 2 located thereon for supporting the truck on the track. The truck is driven by means of a motor 3. Suitably connected to one of the axles is a cable drum 4 upon which the electric cable for supplying current to the various motors may be wound. As the truck moves forwardly this drum will let off the cable, and as it moves backwardly this drum will take up the cable.

Located at the front end of the truck frame and immediately above the front axle are pedestals 5, which have a circular base 6 supported upon some suitable part of the frame. Extending downwardly from the base is an annular projection 7, which fits in a suitable hole or opening therefor in the frame, provided in flanges 10. This base is held upon the flanges, with the annular projection extending through the hole, by means of a plate 8 attached to the annular projection beneath the flanges by means of screws 9. The axis of rotation of the base and the pedestals passes through the axis of a cylindrical elevating frame pivotally supported between the pedestals.

On the periphery of the circular base are teeth 11 engaged by a pinion 12 located on a shaft 13, suitably supported in the frame. This pinion 12 is engaged by a pinion 14, which has integral therewith a worm gear 15. The worm gear 15 and the pinion 14 are rotatably mounted upon an axle 16 supported by the frame, and a housing 17 which incloses the worm gear 15 and the pinion 14. The worm gear 15 is engaged by a worm located on a shaft 18 of a motor 19.

The motor 3 for propelling the truck is provided with a shaft 20, which has thereon a worm 21 engaging a worm gear 22 mounted upon a vertical shaft 23, journalled in the frame, and a housing 24 supported on the frame. This housing not only serves as a means for supporting one end of the shaft 23 but also incloses the worm gear 22 and the worm 21.

The shaft 23 also has thereon a bevel gear 25 which engages a bevel gear 26 mounted upon the rear axle 27 of the truck frame. Integral with the gear 26 is a gear 28, which engages a gear 29 located on one end of a longitudinally extending shaft 30, which has on its other end a gear 31 meshing with a gear 32 upon the forward axle 27. Between the rear axle 27 and the drum 4 is a sprocket connection 27a for operating the drum.

In the upper end of each pedestal is a hole or bearing 33 concentric with teeth 35 arranged on the outer peripheries of flanges 34, one flange for each pedestal. Between the two pedestals there is pivotally supported a cylindrical elevating frame 36 by means of trunnions 37, one trunnion in each hole 33. To the rear end of this cylindrical elevating frame is attached a motor 38. These trunnions are in alignment with and directly above the front axle 27.

Around the front end of the cylindrical elevating frame is an annular housing 39, which has located therein a worm ring 40 engaged by a worm 41 upon a shaft 42 suitably journalled in the housing. On this shaft is also a bevel gear 43 which engages a bevel gear 44 located on one end of a shaft 45 of a motor 46. Located within the cylindrical elevating frame and within the worm ring is a cylindrical rotating frame 47. The worm ring is splined to the cylindrical rotating frame by means of a spline 48. This spline permits the longitudinal movement of the rotating frame in regard to the worm ring.

Extending forwardly from the rotating frame are two brackets 49, each of which has therein a hole 50 for receiving a shaft 51. On this shaft is a bevel gear 52 in mesh with a gear 53 on the front end of a shaft 54 journalled in a bearing 55 formed as part of the rotating frame. The rear end of the shaft 54 is connected to a shaft 57 by means of a coupling 56. These shafts 54 and 57 are driven by the motor 38, through a planetary gear mechanism later to be described.

Located on the under side of the elevating frame is a housing 58, which has therein a pinion 59 located on a transversely extending shaft 60. This shaft also has thereon a worm gear 61 engaged by a worm 62 located on a shaft 63 of a motor 64. The rotation of the motor will cause the pinion 59 to rotate. This pinion 59 engages a rackbar 65 located in a suitable groove 66 in the elevating frame, between this frame and the rotating frame.

On the rear end of the rackbar is a lug 67, which fits in an annular groove 68 formed in the periphery of the rotating frame, adjacent its rear end. By means of this lug and bar the rotating frame may be moved longitudinally within the elevating frame and at the same time the rotating frame may be rotated through the worm ring 40. In the present instance the worm ring is operated by means of a worm 69 located upon a shaft 70 journalled in a suitable housing.

This shaft 70 also has thereon a bevel gear 72 meshing with a bevel gear 73 on one end of a shaft 74 of the motor 75. The worms 69, shaft 70 and gears 72 and 73 are located within a casing 71. The operation of the motor 75 will cause the rotation of the rotating frame by means of the rotation of the worm ring 40.

On the front end of the rotating frame and supported thereon by means of the shaft 51, is a double forked frame 76, shown in Figures 24 and 25. On the rearward part of this frame are

two brackets 77, which have holes 78 therein to receive the shaft 51. Concentric with these holes and on the peripheries of the brackets 77 are teeth 79 engaged by pinions 80 located on a shaft 81 journalled in the brackets 49.

On one end of the shaft 81 is a worm gear 82, which is engaged by a worm on the shaft 83 of a motor 84. The operation of the motor 84 causes the pinions 80 to rotate. These pinions, in engagement with the teeth 79 of the brackets 77, cause the double forked frame 76 to rock on the shaft 51, thereby elevating or lowering the front end of the double forked frame. This double forked frame is the rear frame of this same construction.

In this rear double forked frame there is supported a shaft 85 in bearings 87. On the rear end of this shaft 85 is a bevel gear 86 engaged by a bevel gear 52*a* located upon the shaft 51. On the forward end of the shaft 85 is a bevel gear 88.

On the double forked frame are forward brackets 89, which have therein holes 90 adapted to align with holes 93 formed in rearwardly extending brackets 92 of a second double forked frame 91. The rearwardly extending brackets 92 have thereon teeth 94 concentric with the holes 93. Through the holes 90 and 93 extends a shaft 95, which has thereon a bevel gear 96 engaging the gear 88 on the front end of the shaft 85.

The teeth 94 on the brackets 92 are engaged by pinions 97 located on a shaft 98 journalled in bearings 99 in the frame 76. On this shaft is a worm gear 100 operated by means of a motor 102 through a connecting gear mechanism 101. The rotation of the motor 102 operates the shaft 98 so that the frame is rotated on its pivot 95. Instead of having the motor 102 a motor 102*a* as shown in Figure 32 may be used.

On the motor shaft are two loosely mounted gears 102*b* and 102*c* adapted to be connected to the motor shaft by means of a clutch mechanism 102*d*. The gear 102*b* meshes with a gear 102*e* located on a shaft 102*f*. There is also fixed to this shaft a pinion 102*g*, which is smaller than the gear 102*e*. There is also on this shaft 102*f* a bevel gear 101*a* which meshes with a bevel gear 101*b* on a shaft 101*c* for operating a worm for driving the worm gear 100.

103 is a bearing located in the frame 91, and it supports a shaft 104, which has on its rear end a gear 105 meshing with a gear 96*a* located on the shaft 95. On the front end of shaft 104 is a gear 106 for driving the shaft with its sprocket wheel thereon. The frame 91 has thereon a forwardly extending bracket 107, which has therein a hole 108 and teeth 109 arranged concentrically around the hole 108. Spaced from the bracket 107 is a second bracket 110, which has therein a hole 111 in alignment with the hole 108.

These brackets 107 and 110 support the cutter head 112, which has extending rearwardly therefrom a pair of spaced arms 113 which receive between them the bracket 107. These arms 113 have aligned holes 115. This head also has a rearwardly extending arm 114 with a hole 116 therein in alignment with the holes 115.

When the parts are assembled as shown in Figure 34 a sleeve 117 extends through the holes 108 and 115, and the sleeve 118 passes through the holes 111 and 116. By means of these two sleeves the cutter head is journalled upon the rear frame 91. Extending through the sleeve 117 is a shaft 119, which has on its lower end a bevel gear 120 which meshes with the gear 106 on the front end of the shaft 104. On the upper end of the shaft 119 is a sprocket 121.

In the front end of the cutter head is a shaft 122 which has on the upper end thereof a pinion 123 adapted to engage with the teeth 109 on the bracket 107. On the lower end of this shaft 122 is a worm gear 124 located within a housing 125. This worm gear is engaged by a worm 126 located on a shaft 127 of a motor 128.

Located upon the cutter head is a lug 129 adapted to receive on opposite sides parallel members 130 and 131, connected by cross arms 132 to form the cutter bar. These cutter bar members have elongated holes 133 for receiving bolts 134, by which they may be attached adjustably to the cutter head. For the purpose of adjusting the cutter bar longitudinally with regard to the cutter head there is located in the lug a bolt 135 which passes through one of the cross arms 132 and has on each side of the cross arm an adjusting nut 136. One the front end of the cutter bar is a sprocket 137, which cooperates with the sprocket 121 for supporting the cutter chain 138, which has thereon a plurality of cutter teeth 139.

It will be noticed that the connection between each adjacent pivotally connected part has thereon a gear connected to a shaft for operating by a chain of gear and shaft mechanism, the sprocket chain by means of the motor located on the pedestals.

In Figure 15 there is shown a planetary gear connection between the motor 38 and the shaft 57. This gear mechanism is inclosed within a housing 140 attached to the front part of the motor and located within the rotating frame 47. Within the housing 140 adjacent the motor is a partition 141, which supports a bearing 142 for the shaft of the motor 38. The end of the shaft is formed into a gear pinion 143, which meshes with a plurality of intermediate gears 144. In the present instance there are three of these gears, as shown in Figure 16, supported by means of a frame 145 which has suitable bearings for the intermeidate gears. Fixed within the housing 140 and around the intermediate gears is an internal gear 146 engaged by the intermediate gears.

The rotation of the motor shaft and the pinion 143 located thereon causes the intermediate gears to rotate. Since these gears engage the stationary internal gear 146 they will cause the frame in which they are journalled to rotate. Since this frame is directly connected to the shaft 57 it will rotate the shaft 57, and through it the shaft 54 and all of the gears operatively connected with the shaft 54, for operating the cutter chain located on the cutter bar. By this means there is provided a speed reduction between the motor shaft and the shaft 54.

For varying the relative difference between the speed of the motor shaft and the shaft 54 a motor 140*a* may be provided, which has on its shaft a worm 140*b* for engaging a cooperating worm gear formed on the periphery of the internal gear. This motor may be operated or not. The variation in the speed produced by the operation of this motor depends upon the direction in which it rotates. If the motor shaft rotates in one direction the speed may be increased, or if rotated in another direction the speed may be decreased. This motor is shown in Figures 19 and 20.

In Figures 36 and 37 a modified form of speed

reduction is shown. In this form the motor is indicated by the numeral 147, and has attached thereto a forwardly extending casing 148 which provides in its front end a bearing 149 for the shaft 57. The casing is attached to the motor frame by means of bolts 148a. At the point where the housing is attached to the motor there is provided a fixed clutch element 150, adapted to be engaged by a cap member 151 which surrounds the motor shaft.

In the forward end of this cap member a disc-like member 152 is threaded. This disc-like member has a forwardly extending sleeve 153 which closely fits around the shaft 57 but may be moved longitudinally of the shaft. Around the shaft and within the casing 148 is a ring member 154, which has between it and the sleeve 153 a bearing 155. This bearing is held in place by means of rings 156, one threaded into the ring member 154 and the other threaded on the sleeve 153 so that the bearings 155 are held fixed with relation to the sleeve 153. The sleeve and the ring 154 may move longitudinally of the shaft 57 and are urged in a lefthand direction by means of a spring 154a.

The cap member is rotatably mounted by means of bearings 157 on a projection 158 formed in the front part of the motor casing, and around the motor shaft 160. Fixed to the shaft 160, within the cap member 151, is a clutch member 159. The clutch member 159 and the clutch member 150 are fixed, one on the casing and the other on the motor shaft. The cap 151 cooperates with these clutch members and may be shifted on the projection 158 and on the shaft 57.

Rotatably supported on the front end of the motor shaft 160 by means of bearings 162 is a frame 161, which rotatably supports a plurality of pinions 163 supported in bearings 164 in the frame. These pinions, three in number in the present instance, engage internally a ring gear 165 fixed to the cap 151. The intermediate pinions 163 not only engage the teeth on the ring gear but also engage a pinion 160a formed on the end of the motor shaft 160.

The rotation of the motor shaft will cause the pinions 163 to rotate. If the ring gear is stationary the frame 161 will rotate and carry with it the shaft 57, which is integrally formed therewith. Whenever the cap member 151 engages the clutch element 150 the ring gear is held stationary, and any rotation of the motor shaft will cause a less rapid rotation of the shaft 57, but if the cap 151 were shifted so that it does not engage the clutch element 150 but does engage the clutch element 159, the cap will rotate with the motor shaft and cause the ring gear to rotate also with the motor shaft. There will be no rotation of the intermediate gears and the shaft 57 will rotate with the same speed as the motor shaft.

The cap 151 may be shifted by means of a lever 166, pivoted at the point 167. The lower end of this lever has thereon a yoke which engages the ring 154 for shifting the cap 151 longitudinally with respect to the motor shaft. To the upper end of the lever 166 one end of a link 168 is attached the other end of which link is attached to the upper end of a lever 169, pivoted at the point 170.

The lower end of the lever 169 is pivoted at the point 171 to a disc-like member 172, which has extending therefrom a core 173 projecting into the solenoid cylinder 174, around which there is wound a plurality of coils of wire 175, adapted to conduct an electric current for causing the core 173 to move in or out of the cylinder 174.

In Figures 7a and 7b are shown the structures for tilting the elevating frame, consisting of a motor 35a, suitably located on the frame. This motor has a bevel gear 35b on the end of the motor shaft, which meshes with a bevel gear 35c on one end of a vertically extending shaft 35d, suitably supported on one side of the elevating frame. On the other end of the shaft 35d is a worm 35e which meshes with a worm gear 35f, adjacent one end of a shaft 35g, which has on each end a pinion 35h engaging the teeth 35 on the flanges 34. By properly operating the motor 35a the elevating frame may be tilted in one direction or another.

In Figure 1 the lines a—b indicate positions in which the cutter blade may operate for cutting various kerfs, either in a horizontal plane or in a vertical plane. Figure 2 shows various horizontal positions of the blade for cutting horizontal kerfs. This figure also shows the manner in which a semi-circular kerf may be cut above the truck or frame which supports the operating mechanism.

Figure 3 shows various kerfs that may be cut in a vertical plane. Figure 4 shows the various kerfs that may be cut in a horizontal plane. In this figure the letters a—b—c show semi-circular kerfs on each side of the frame. The letters b—b—b show a semi-circular kerf that may be cut from one side of the frame, extending around and in front of the frame to the other side of the frame. A semi-circular line d—b—e shows the kerf that may be cut in a horizontal plane in front of the truck by rotating the cutter blade. Figure 5 shows various positions of the cutter operating in a plane transverse of the frame and extending in an arc across the frame, or to one side of the frame.

In the various motors the speed may be controlled by the lever 166, similar to that shown in connection with Figure 36.

The extensible and articulate parts of the machine consist, first, of an elevating frame in which is located a cylindrical extensible frame, the latter rotating within the former and extensible therein by means of a suitable motor. To the front end of the rotating frame is attached the rear end of a frame structure which has attached to its front end a similar frame structure.

These frame structures articulate with relation to each other and also with relation to the rotating frame. To the front frame member is attached the cutter head so that it may rotate on an axis suitably provided therefor, either in a horizontal or any other plane, depending upon the position of the rotating frame within the elevating frame.

The pivotal connection between each of these elements, which consists of a shaft, has thereon gearing through which the cutting mechanism is operated by suitable shafts driven from the main motor and connected to these pivotal shafts by suitable gearing. By this means the cutting mechanism can be operated from the main motor regardless of its angular position with relation to the main motor.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of my claims and my invention.

Having thus fully described my invention, what

I claim as new and desire to secure by Letters Patent, is:

1. In combination, a chassis, a bracket, a driving motor pivoted on said bracket for tilting thereon, a cutter mounted on the extension of said motor driven thereby, means for adjusting the angular position of the cutter with respect to the driving motor irrespective of the tilt of the motor and the angular adjustment thereto of the cutter, means to adjust the cutter rotatably about the axis of the driving motor, means to adjust the cutter at an angle to the rotary axis of the adjustment, and means to extend the cutter at different distances from the driving motor.

2. In combination, a chassis, a bracket pivoted thereon vertically, a driving motor pivoted on said bracket horizontally adapted to counterbalance a cutter, a cutter mounted on said motor adapted to be driven thereby, means to swing the bracket, means to tiltably adjust the driving motor on the bracket, means to rotate the cutter bodily with respect to the driving motor axis, means to adjust the distance between the cutter and the driving motor without disturbing the driving relationship therebetween, and means to angularly adjust the cutter with respect to the drivng axis of the motor so driving it.

3. In combination, a chassis, a bracket pivoted thereon vertically, a driving motor pivoted on said bracket horizontally adapted to counterbalance a cutter, a cutter mounted on said motor adapted to be driven thereby, means to swing the bracket, means to tiltably adjust the driving motor on the bracket, means to rotate the cutter bodily with respect to the driving motor axis, means to adjust the distance between the cutter and the driving motor without disturbing the driving relationship therebetween, means to angularly adjust the cutter with respect to the driving axis of the motor so driving it, and means to swing said cutter in a given plane irrespective of said angular adjustment.

4. In a coal mining machine, a frame, a support comprising a pair of pedestals mounted on the frame for rotation on a vertical axis, a cylindrical elevating frame pivoted between the pedestals, a motor on one end of the frame, a rotating frame in the elevating frame, means to rotate the rotating frame in the elevating frame, means to move the frames longitudinally of each other, and a coal cutting means supported on the rotating frame and operatively connected to the motor.

5. In a coal mining machine, a truck, a cylindrical elevating frame, a support for the elevating frame pivoted to the truck and to the elevating frame, a cylindrical rotating frame in the elevating frame, a cutter supported by the rotating frame, means to rotate the rotating frame in the elevating frame, and a motor on the elevating frame for moving the frames longitudinally of each other.

FRANK B. YINGLING.