Jan. 2, 1923.

1,440,789

E. C. MORGAN.
MACHINE FOR MINING.
FILED DEC. 3, 1915.

13 SHEETS-SHEET 1

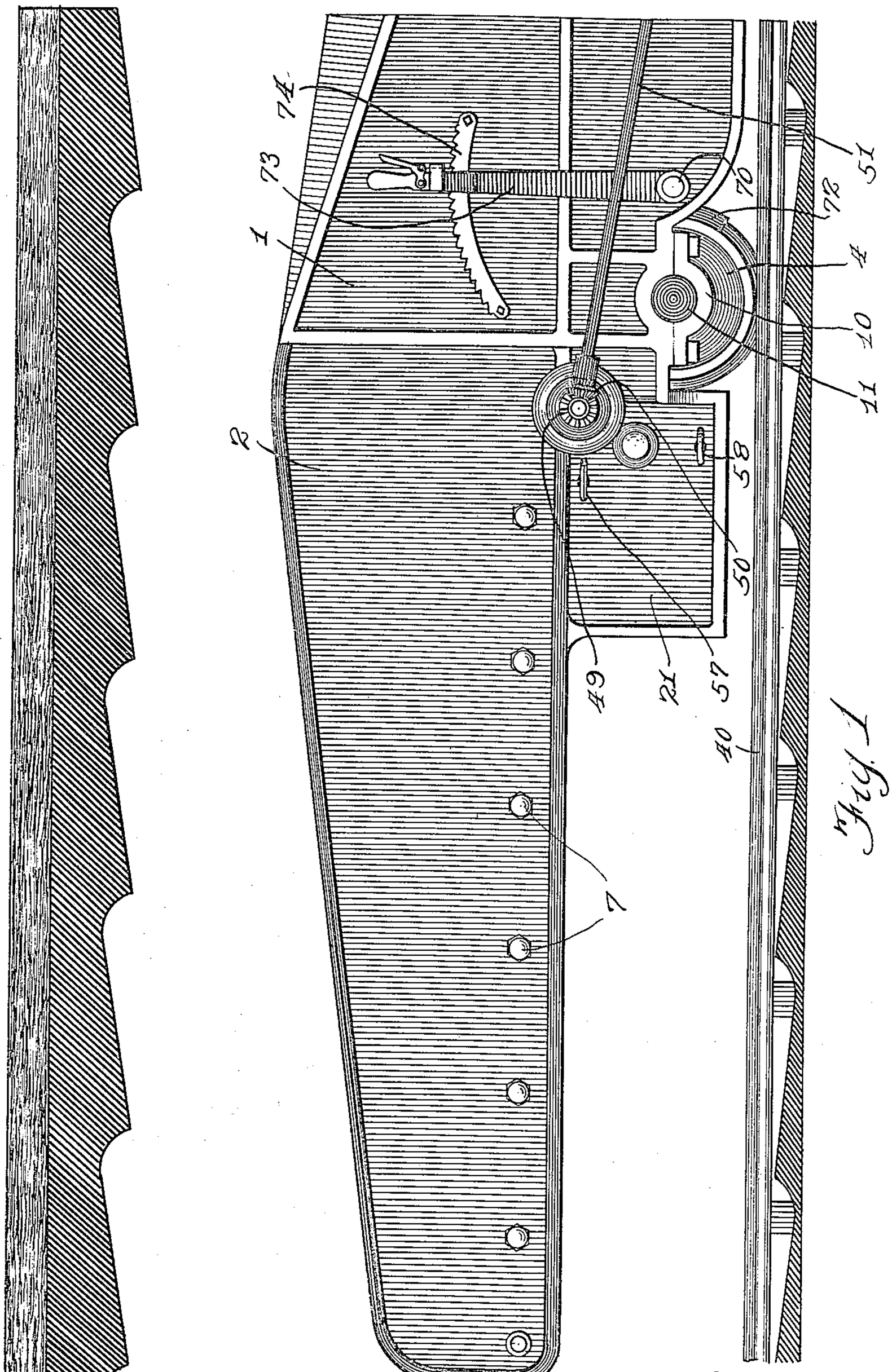

Fig. 1.

Witness.
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13 SHEETS-SHEET 2

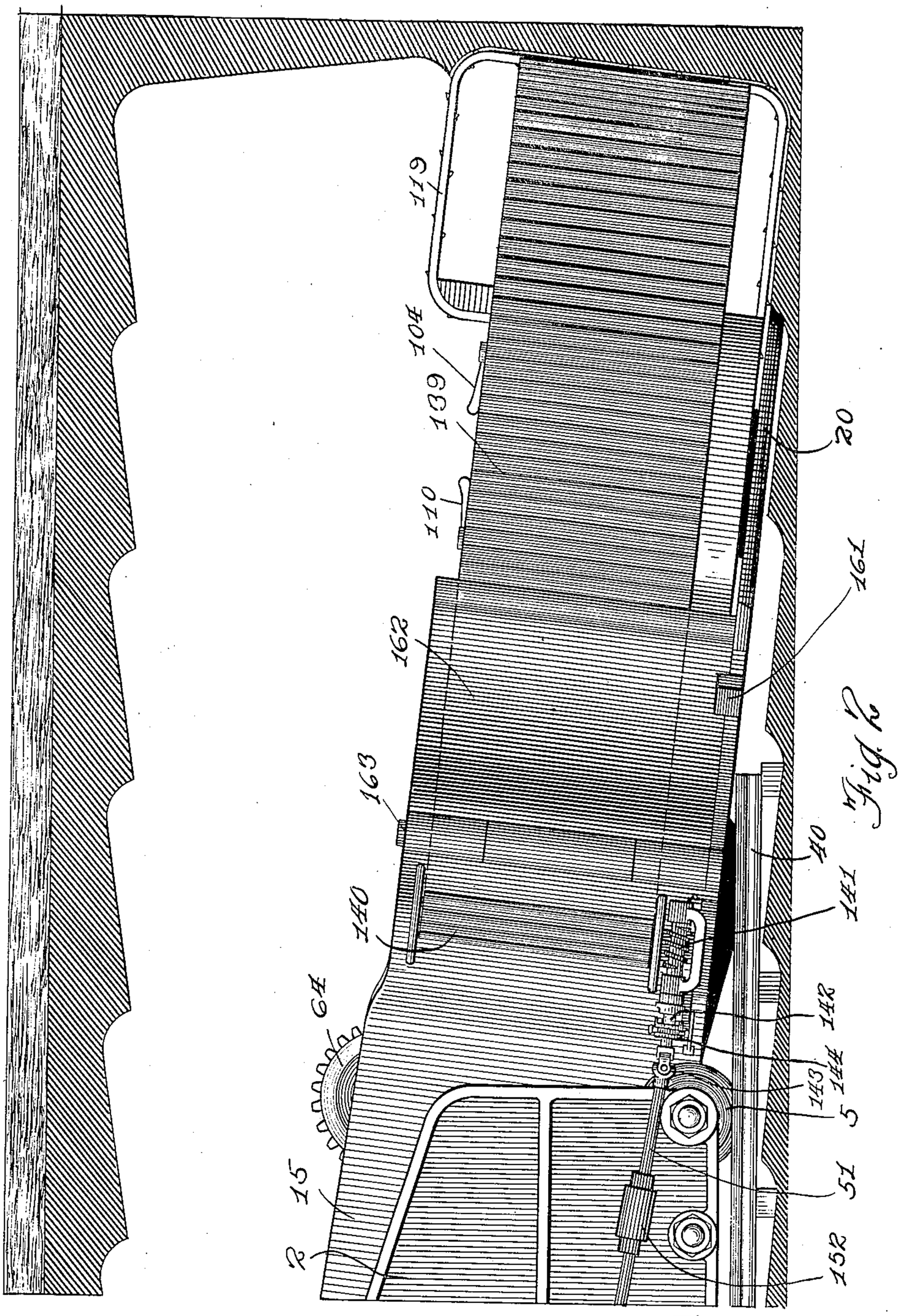

Fig. 2

Witness.
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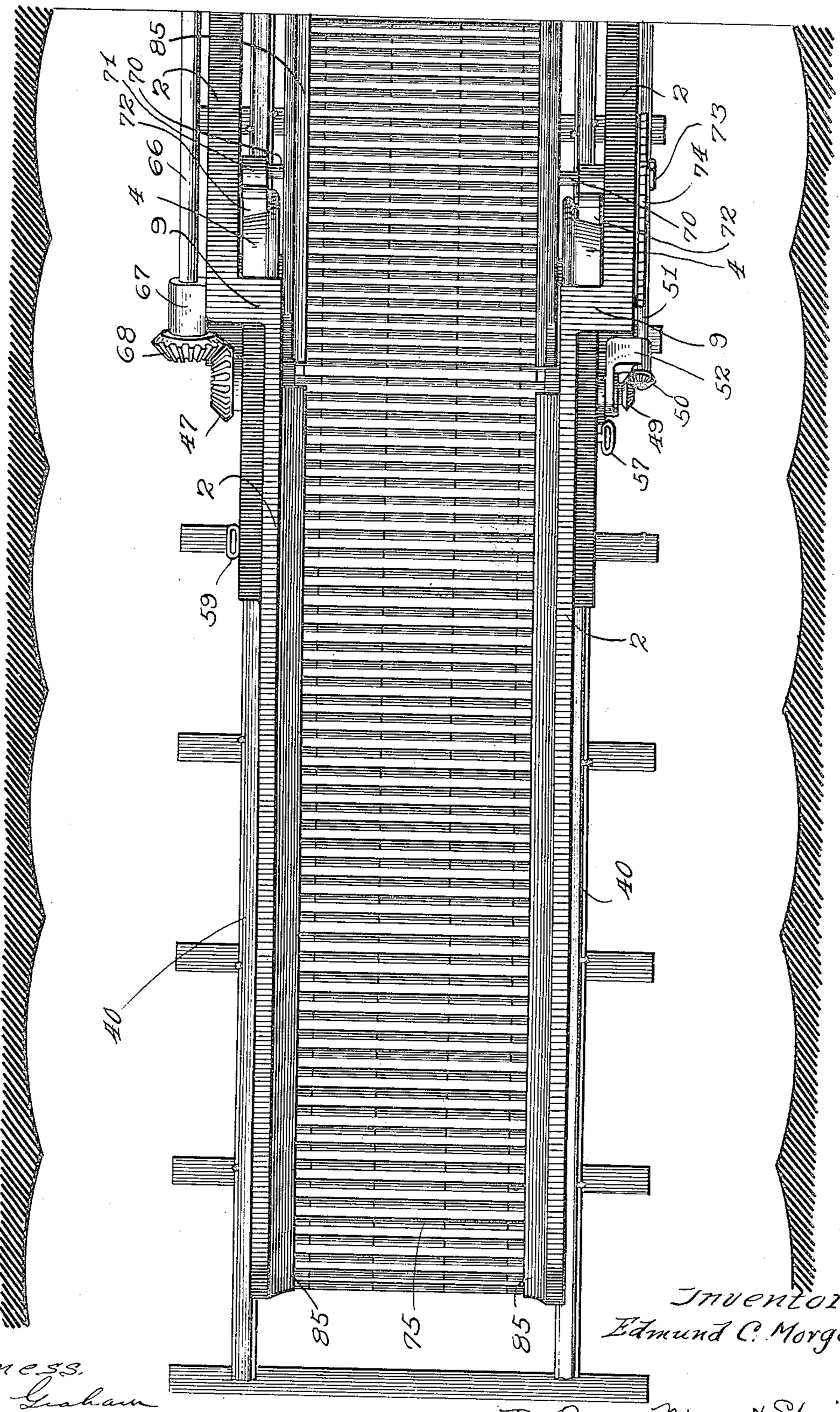

Fig. 3.

Witness.
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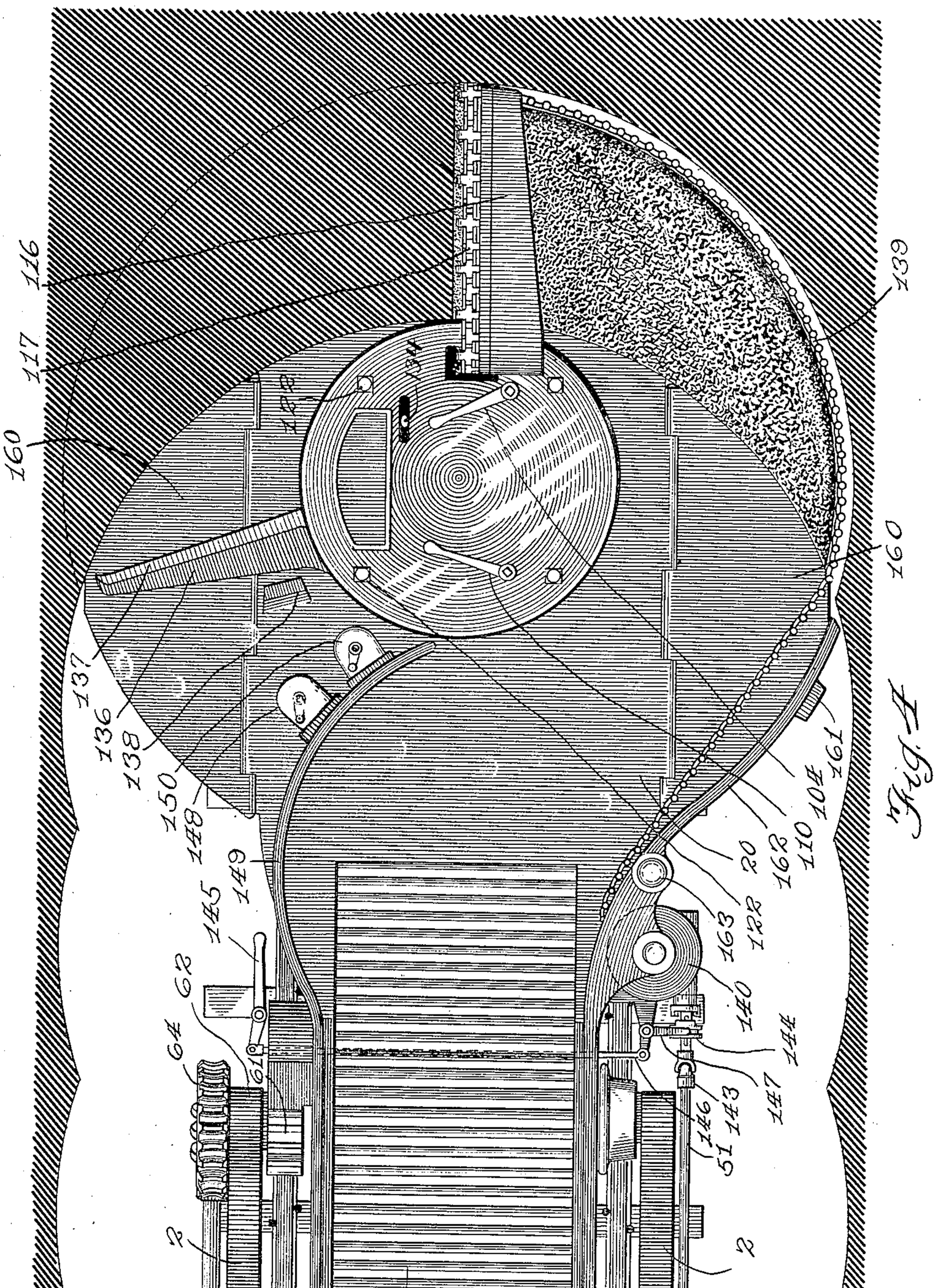

Fig. 4.

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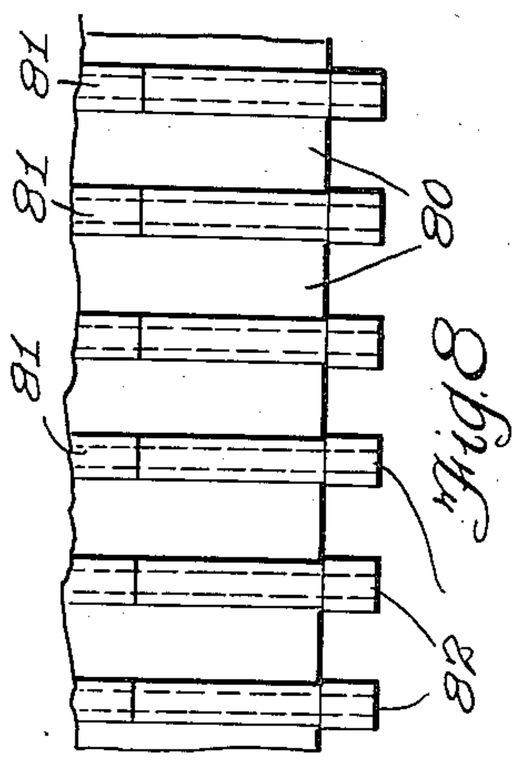

Fig. 8

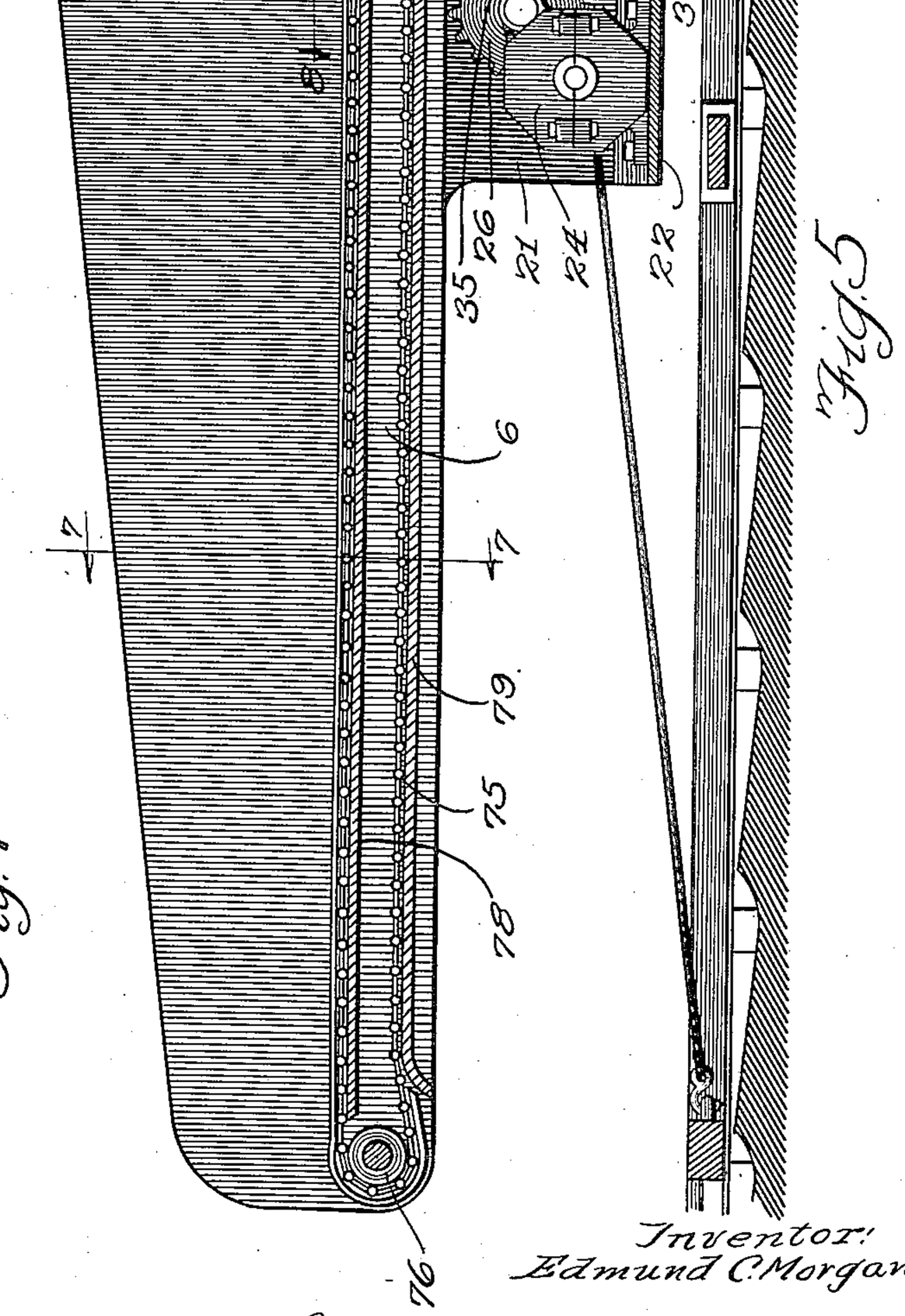

Fig. 5

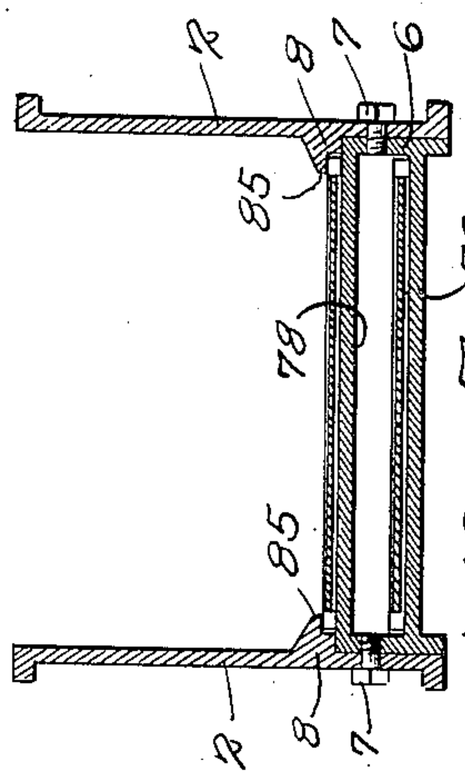

Fig. 7

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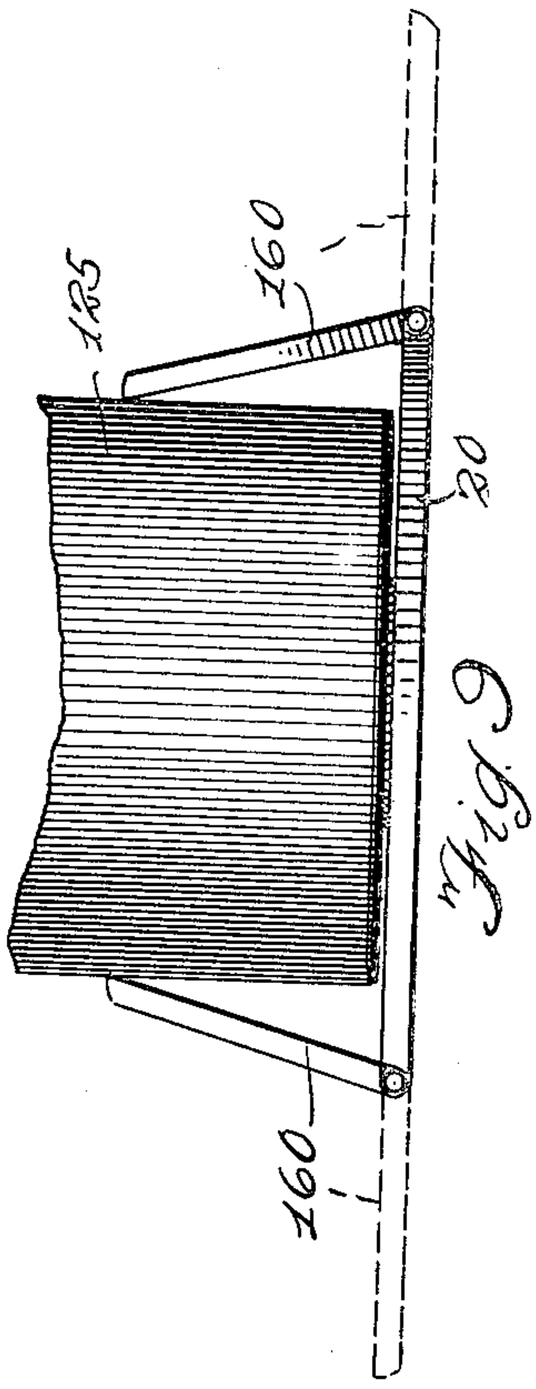

Fig. 9

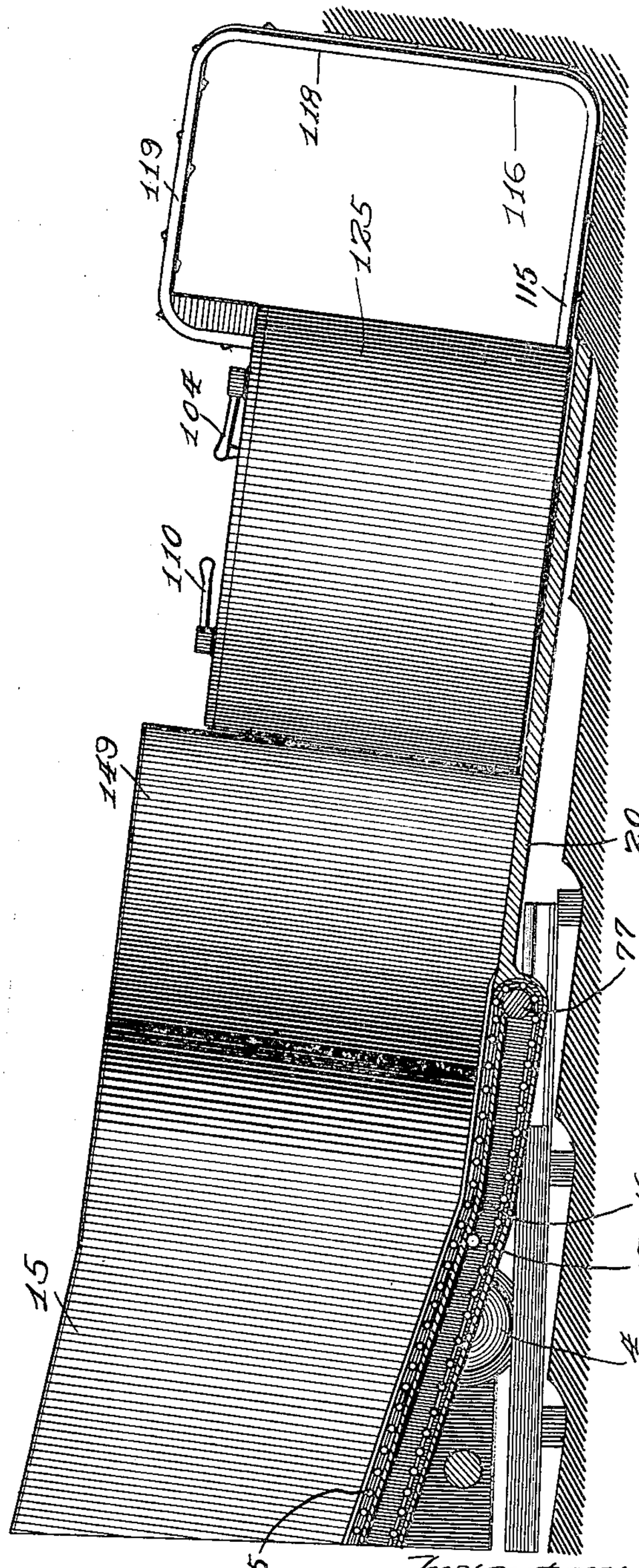

Fig. 4

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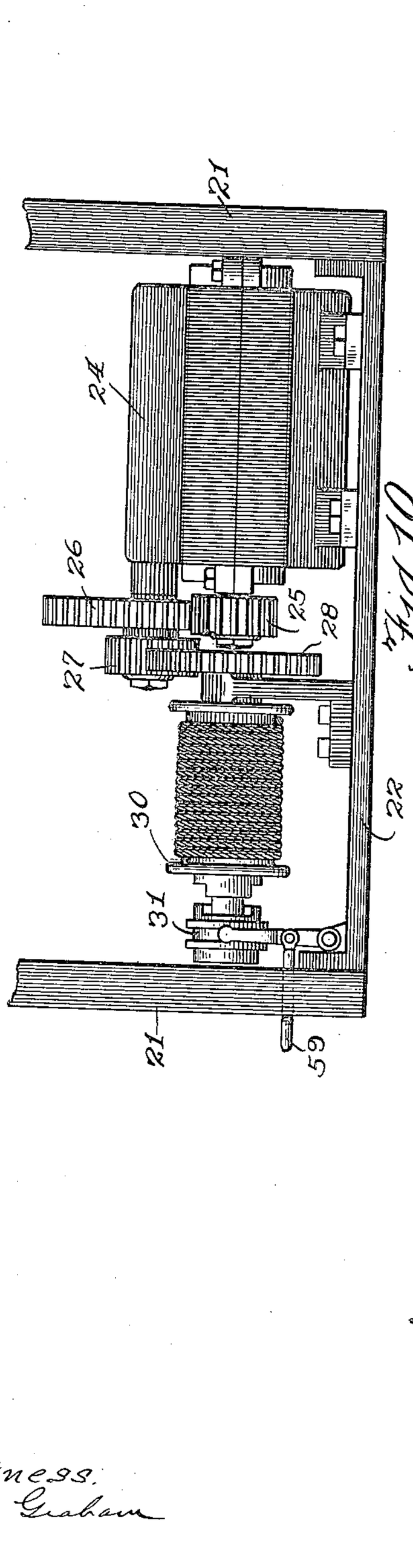

Fig. 10

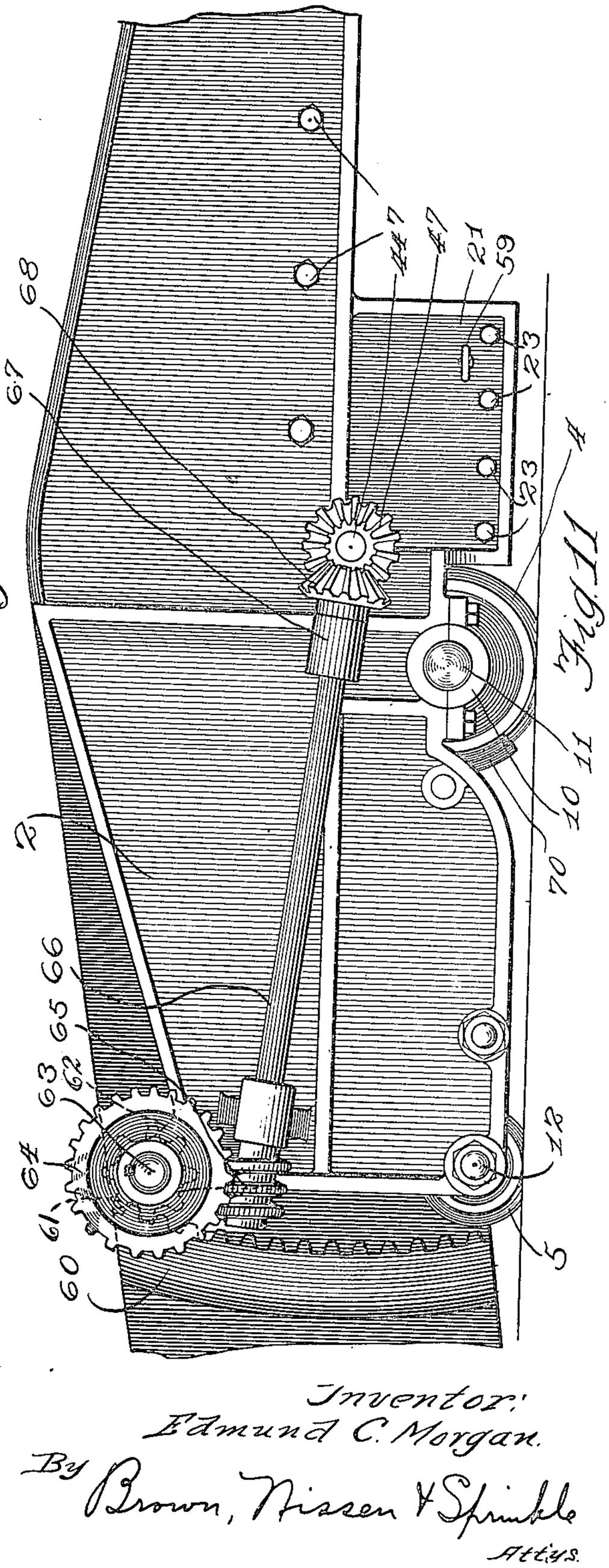

Fig. 11

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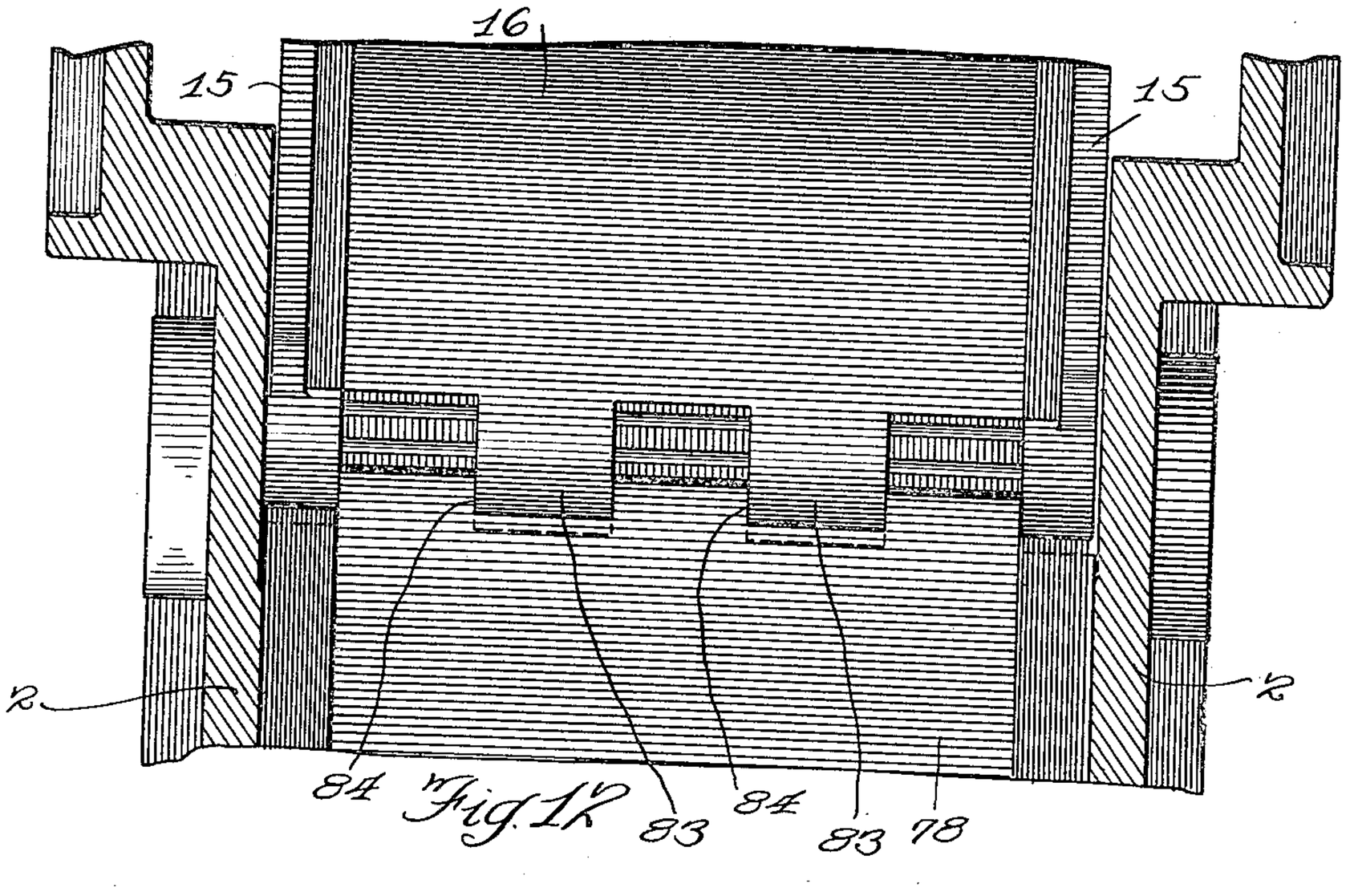

Fig. 12

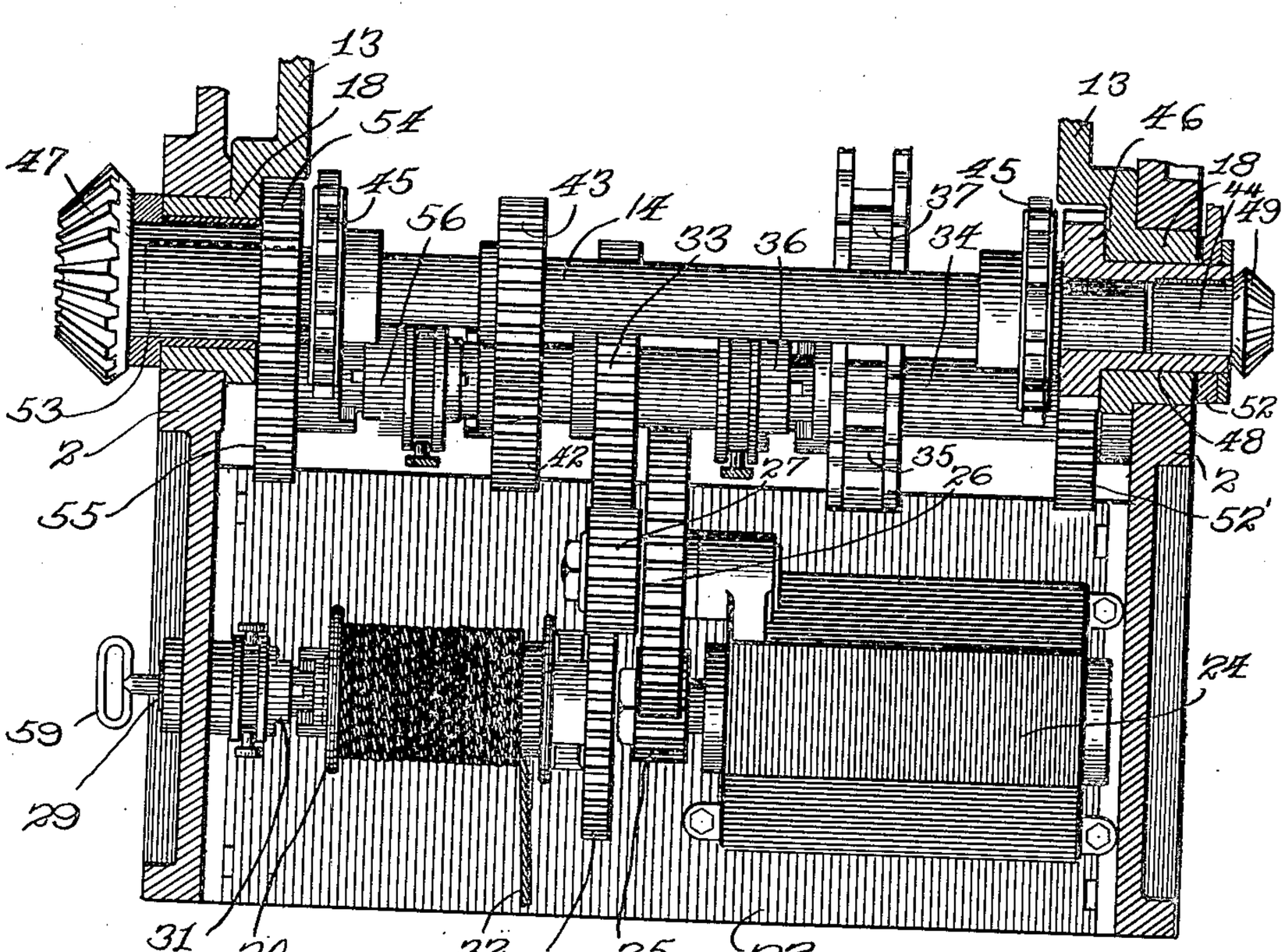

Fig. 13

Witness.
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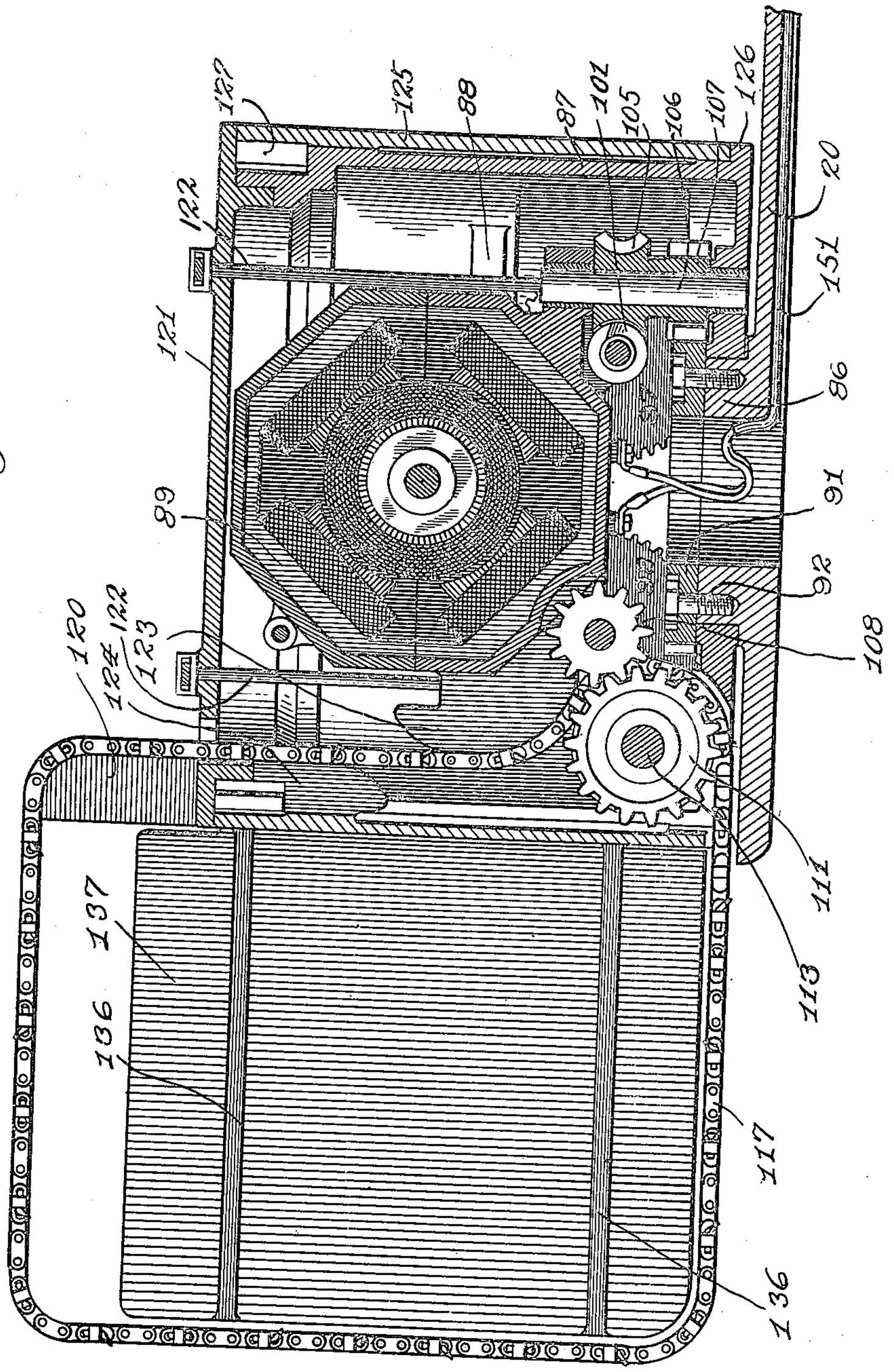
Fig. 14



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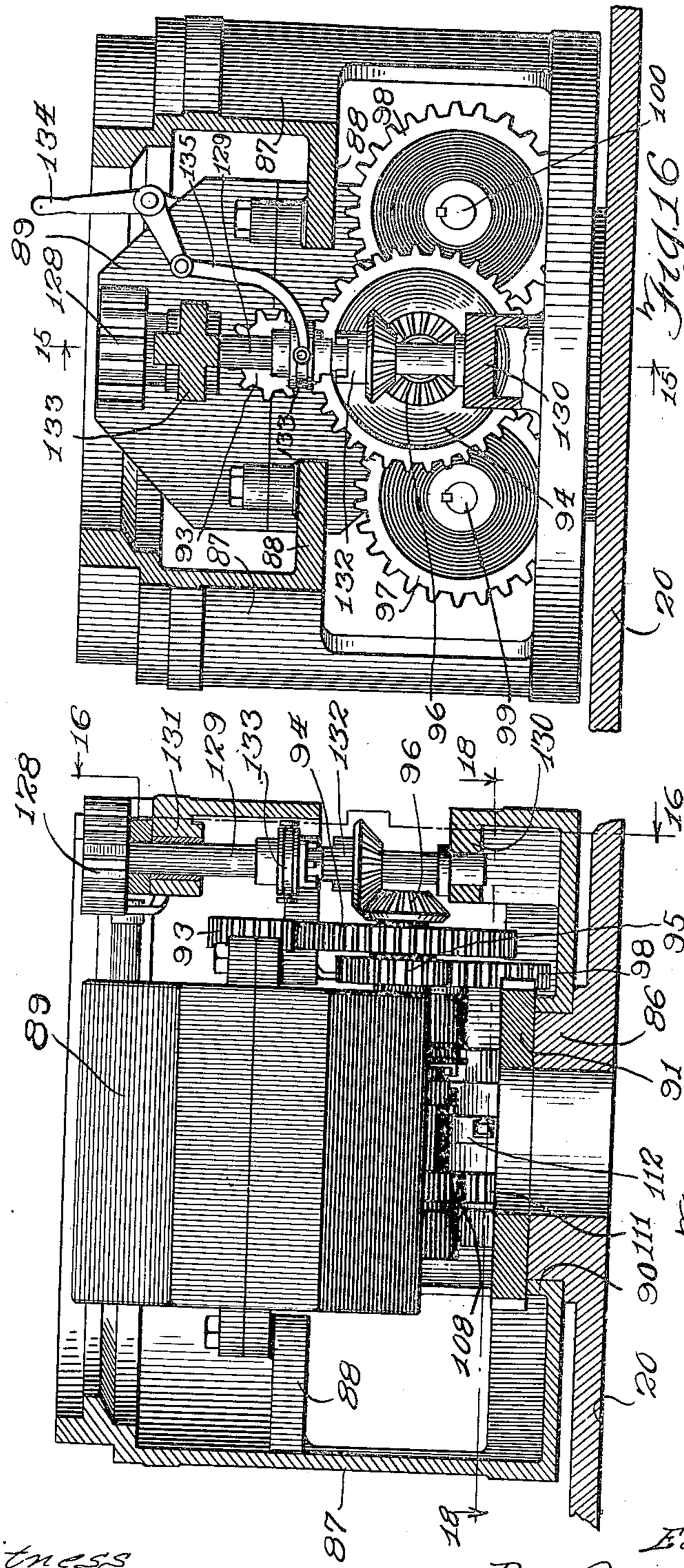

Fig. 16

Fig. 17

Fig. 15

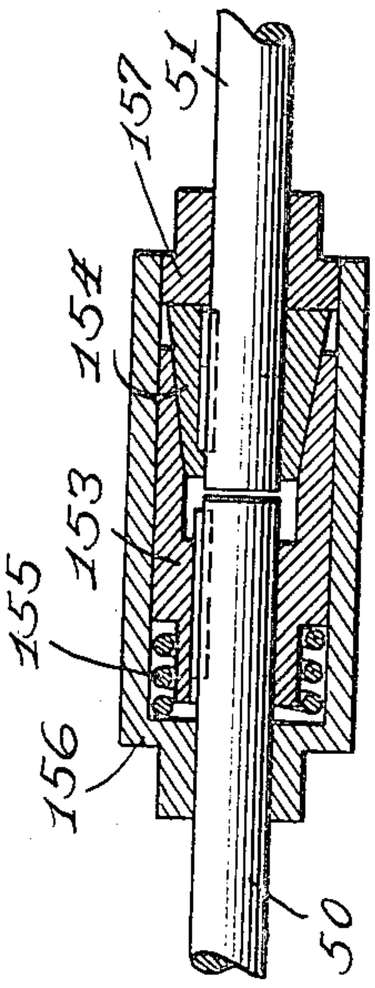

Fig. 20

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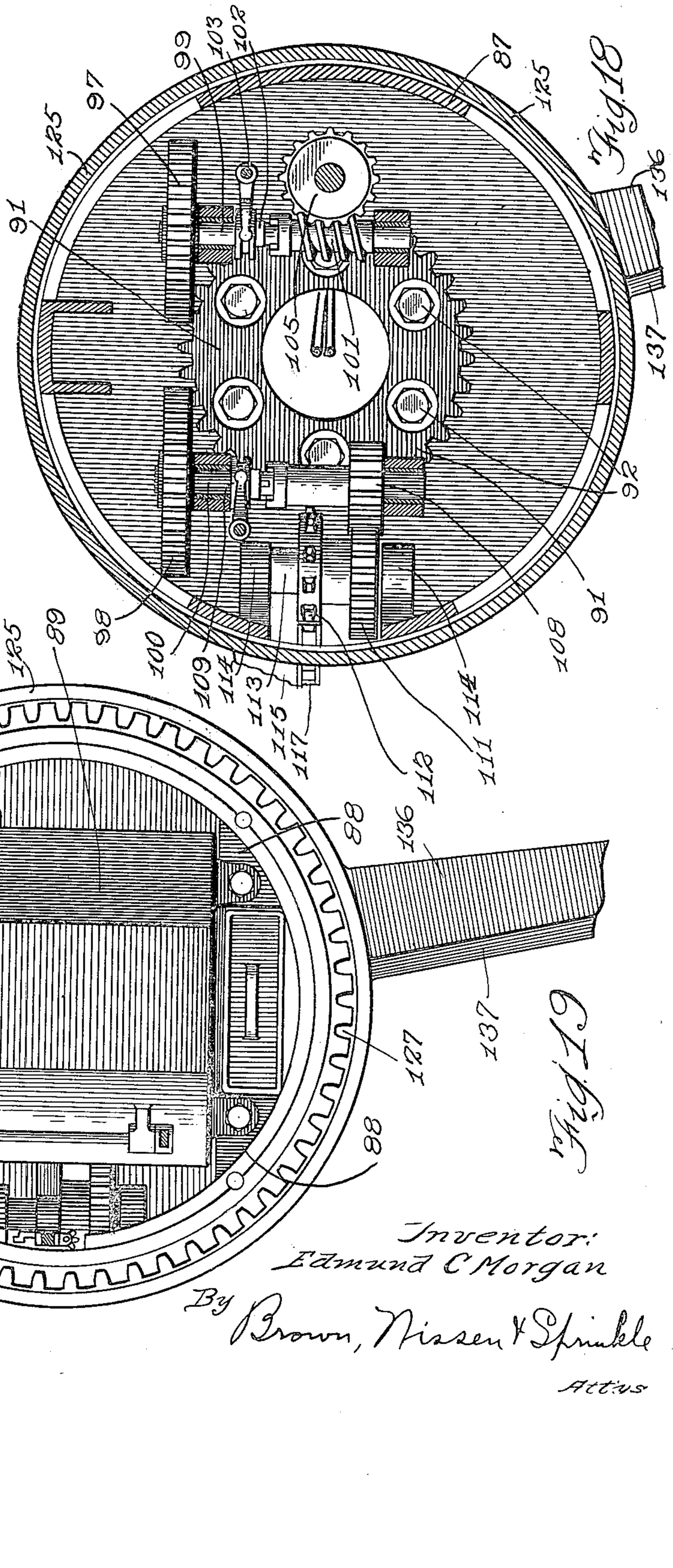

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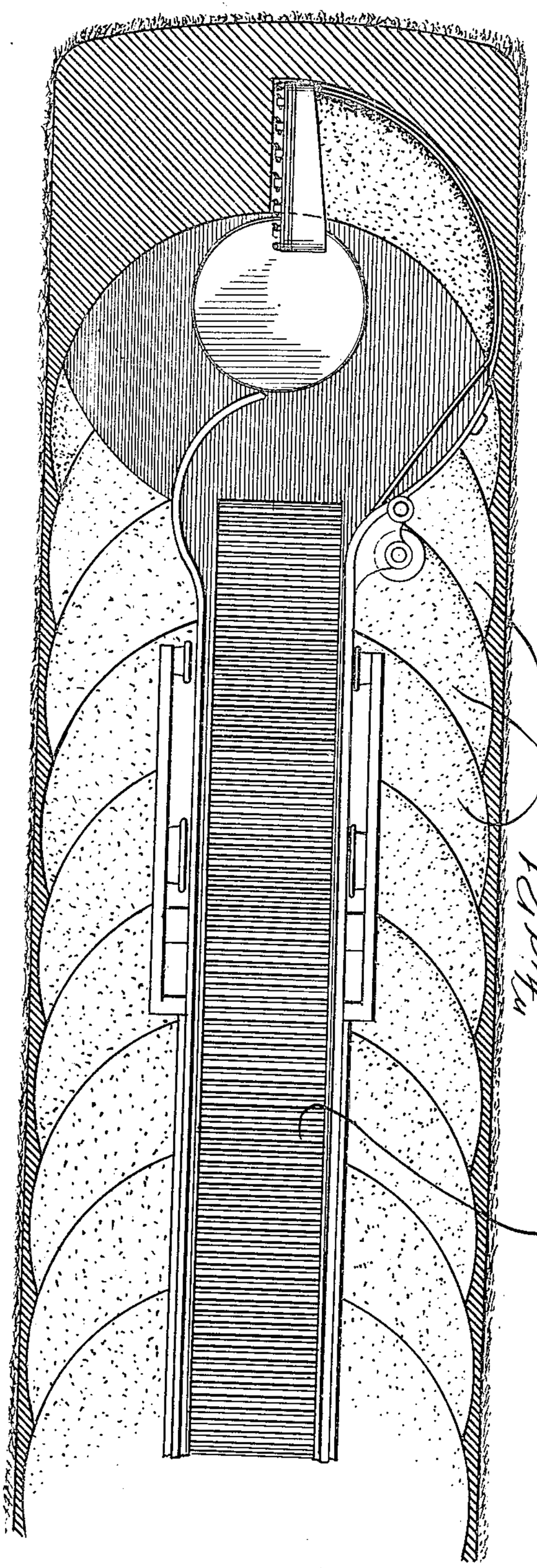

Fig. 12.

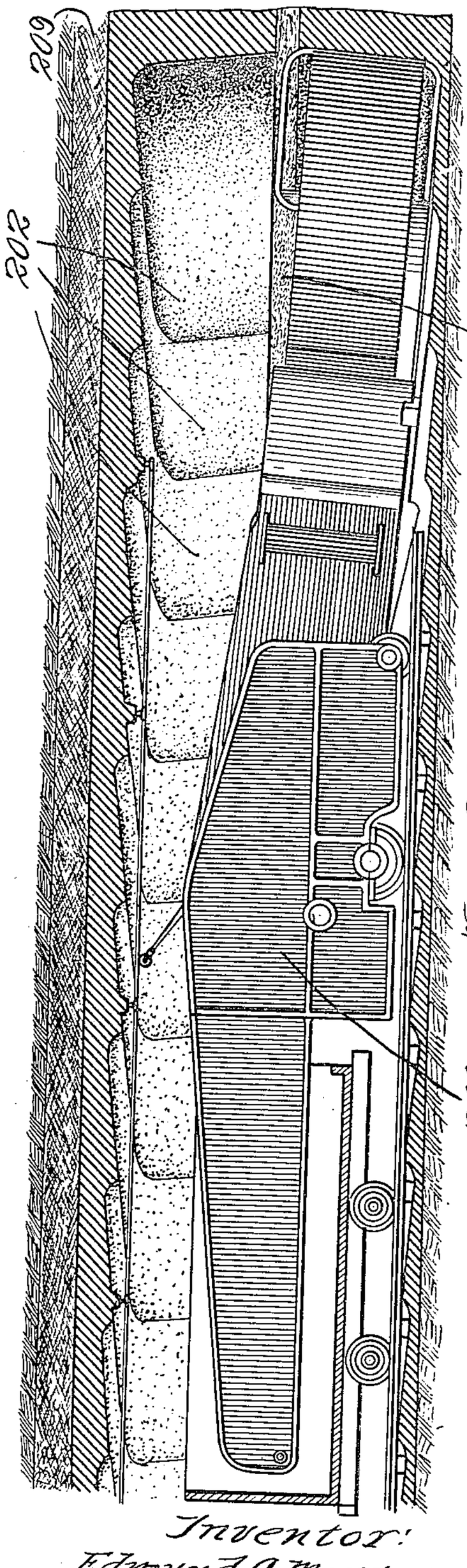

Fig. 13.

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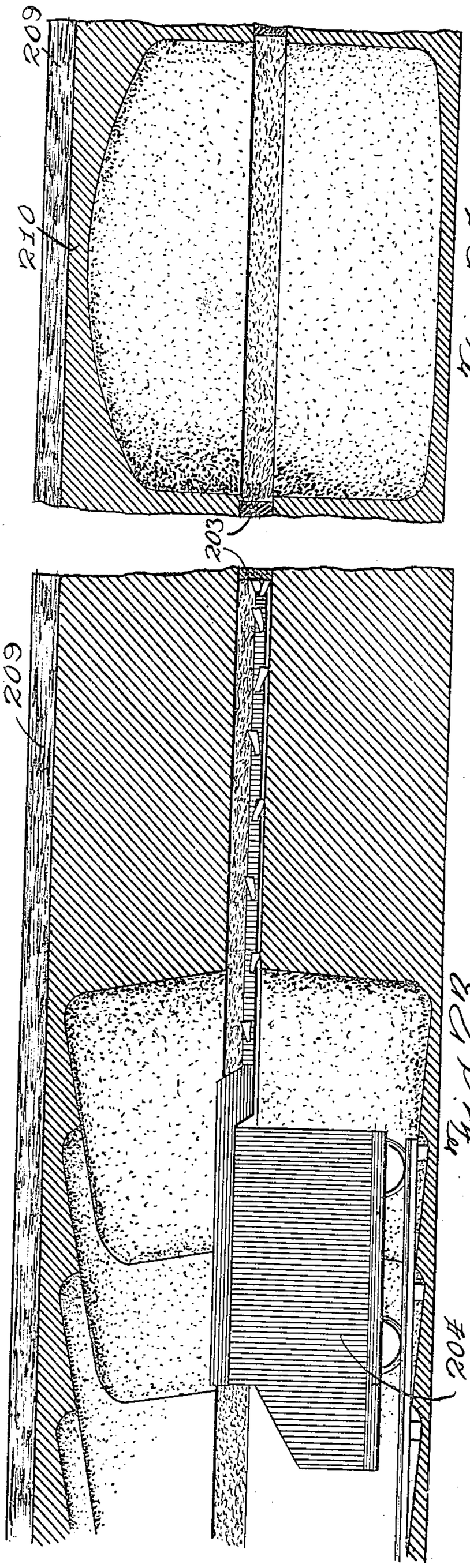

Fig. 24. Fig. 26. Fig. 23. Fig. 25.

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Patented Jan. 2, 1923. 1,440,789

UNITED STATES PATENT OFFICE.

EDMUND C. MORGAN, OF CHICAGO, ILLINOIS.

MACHINE FOR MINING.

Application filed December 3, 1915. Serial No. 64,905.

To all whom it may concern:

Be it known that I, EDMUND C. MORGAN, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented a certain new and useful Machine for Mining, of which the following is a specification.

The invention relates to mining machines of the core cutting type, and one of its objects is the provision of a simple and efficient core cutting mechanism combined with dislodging mechanism and conveyer apparatus in a mining and loading machine. Other objects of the invention will appear hereinafter, the novel features, and combinations of elements, being set forth in the appended claims.

In the drawings—Fig. 1 is a side elevation of the rear portion, and Fig. 2 of the front portion, of the machine forming a part of the present invention; Fig. 3 is a top plan view of the rear portion and Fig. 4 of the front portion of the machine shown in Figs. 1 and 2; Fig. 5 is a longitudinal section of the rear portion and Fig. 6 is a longitudinal section of the front portion of the machine shown in the figures described above; Fig. 7 is a cross section on line 7—7 of Fig. 5; Fig. 8 is a fragmentary plan view of a portion of a conveyer belt used in this invention; Fig. 9 is a fragmentary front elevation of the forward portion of the machine showing certain parts folded; Fig. 10 is a rear elevation of a fragmentary portion of the frame of the machine, showing one of the motors and associated parts; Fig. 11 is a fragmentary side elevation of a portion of the truck of the machine showing the mechanism for raising and lowering the operating head; Fig. 12 is a fragmentary sectional view looking down on a central portion of the machine and showing the joint between the relatively movable parts of the frame; Fig. 13 is a fragmentary horizontal sectional view showing one of the motors and associated gearing for driving various parts of the machine; Fig. 14 is a central vertical sectional view of the operating head used on the mining machine; Fig. 15 is a transverse vertical sectional view of the head shown in Fig. 14; Fig. 16 is a vertical sectional view substantially on line 16—16 of Fig. 15; Fig. 17 is a detail view showing the arrangement of certain of the gears used in the operating head; Fig. 18 is a horizontal sectional view on line 18—18 of Fig. 15; Fig. 19 is a top plan view of the operating head of the machine with the top cover removed; Fig. 20 is a sectional detail of a shaft coupling used in one of the drive shafts of the machine; Fig. 21 is a diagrammatic plan view of a portion of a mine chamber, illustrating a method of mining which can be carried out by the use of the present invention; Fig. 22 is a vertical longitudinal sectional view of the mine chamber shown in Fig. 21; Fig. 23 is a longitudinal vertical sectional view of a mine chamber illustrating one of the steps in the process of mining comprising part of the present invention; Fig. 24 is a transverse sectional view of a mine chamber formed during the process of mining comprised in this invention; Fig. 25 is a diagrammatic top plan view; and Fig. 26 is a diagrammatic vertical longitudinal section of a mine chamber illustrating steps in the process of this invention.

In order that this invention may be best understood, the machine by which the process is carried out, will first be described, and the method will then be more clearly understood. Referring first more particularly to Figs. 1 to 7, inclusive, and Figs. 10 and 11, the numeral 1 designates generally the elongated machine frame having longitudinally extending side plates 2 mounted on wheels 4 and 5 of a truck on which the machine is carried. The side plates 2 of the frame 1 are secured together at their lower edges by a box-shaped casting 6, (Figs. 5 and 7), which extends transversely of the machine from one side to the other and longitudinally of the machine forwardly from the rear end to a point .. short distance back of the rear wheels 4. The side plates 2 are secured to the member 6 by means of cap screws or other suitable fastenings 7, and the plates 2 are provided with inwardly extending ribs 8 to cooperate with the upper edges of the member 6 to assist in forming a rigid frame structure. As best shown in Fig. 3 of the drawings, the side plates 2 of the frame 1 are offset at 9 at a point near the rear wheels of the truck to provide a wider space between the forward portions of said side plates than that between the rear portions thereof. As shown in Figs. 1 and 11, the side plates 2 are provided at their lower edges near the offset portion 9 with journal bearings 10 in which the axle 11 which carries the forward wheels 4 is

mounted. The wheels 5 are carried by a transverse rod 12 connecting the extreme forward portions of the side plates 2. The side plates 2, with the transversely extending connecting member 6 and the wheels 4 and 5, cooperate to form a wheel mounted main frame upon which the other parts of the machine are carried.

An auxiliary or supplemental frame 13 on which the cutting apparatus is carried, is pivotally mounted on the axis of the transverse shaft 14 which extends between the side plates 2 of the main frame at a point slightly above and in the rear of the wheels 4, as best shown in Figs. 5 and 13. The auxiliary frame 13 comprises side plates 15 connected at their bottom by a pair of webs or plates 16 and 17. Both plates 15, as shown in Figs. 5 and 13, have rearwardly and downwardly extending bearing lugs 18 journalled for pivotal movement on the shaft 14, and in openings in the side plates 2 of the main frame concentric with the shaft 14. The connecting webs 16 and 17 of the auxiliary frame 13 extend forwardly to a point slightly in the rear of the operating head. From this point the bottom portion of the auxiliary frame is continued forwardly by a heavier plate or floor member 20, as best shown in Fig. 6, on which member the operating portions of the mining machine head are mounted in a way to be described.

As will be seen from Figs. 1, 5 and 13, the side members 2 of the main frame 1 have downwardly extending portions 21 located in the rear of the truck wheels 4 and arranged to carry operating mechanism for various parts of the machine. A supporting plate 22 connects the lower portions of these members and is secured to them by means of bolts 23 as shown in Fig. 11. Mounted on and supported by the plate 22 is a motor 24 as shown in Fig. 10. The motor 24 is arranged to drive the pinion 25 (Fig. 13), meshing with the gear 26, which is coaxial with and drives the pinion 27. The pinion 27 meshes with the gear 28 secured to the shaft 29 on which the drum 30 is loosely mounted and to which it may be clutched by means of the clutch 31. A cable 32 may be wound on the drum 30 for positioning the machine in the mine chamber or for moving sections of the track when occasion requires. A second gear 33 meshes with the pinion 27 and is rigid with and drives the shaft 34. A sprocket wheel 35 is loosely mounted on the shaft 34 and may be secured thereto by the clutch 36. A sprocket chain 37 (Fig. 5) operatively connects the sprocket 34 with a second sprocket wheel 38 rigidly secured to the axle 11 on which the wheels 4 are mounted. By this construction the mining machine may be moved along the track 40 to properly position it in the mine chamber. The direction of motion is controlled by reversing the motor 24.

Loosely mounted on the shaft 34 and arranged to be clutched thereto, is a gear 42, (Fig. 13) which meshes with a gear 43 rigidly secured to the shaft 14 which has also rigidly secured thereto the sprocket wheels 45. At opposite ends of the shaft 14 and rotatively mounted thereon are two gears 46 and 47 respectively. The gear 46 is carried by a hub 48 journalled for rotation in the lug 18 of the pivoted frame 13. The hub 48 forms a bearing in which the shaft 14 is journalled. A bevelled pinion 49 is keyed to the hub 48 for rotation therewith and meshes with a second bevelled pinion 50 (Figs. 1 and 3). The bevelled pinion 50 is carried by a shaft 51 which is journalled in a bracket 52 which bracket in turn is journalled on the end of the hub 48. This arrangement permits a pivotal movement of the shaft 51 about the axis of the shaft 14 without disturbing the driving engagement of the pinions 49 and 50. The gear 46 meshes with a gear 52′ rigidly mounted on the shaft 34. By this connection the bevelled pinions 49 and 50 and the shaft 51 are rotated whenever the motor 24 is driven.

The gear 47 at the end of the shaft 14 opposite the pinion 49, is rigidly carried on a hollow hub or sleeve 53 in which the end of the shaft 14 is journalled, and which has rigidly secured thereto the gear 54. The sleeve or hub 53 is journalled for rotation in the pivotal lug 18 of the frame 13. The gear 54 meshes with a gear 55 loosely mounted on the shaft 34 to which it may be secured by a double clutch 56. The clutch 56 is also used for clutching the gear 42 to the shaft 34 and is operated by a handle 57 carried on a rod extending to the outer side of the machine, as shown in Fig. 1. Similar handles 58 and 59 are provided for operating the clutches 36 and 31 respectively.

In order to make two cuts for each position of the machine, one cut above the other, the auxiliary frame 13 is arranged to be tilted about the shaft 14 as an axis. To accomplish this tilting, the rack 60, (Fig. 11) is secured to one of the side plates 15 of the frame 13 at a point adjacent the forward end of the side member 2 of the main frame 1. A pinion 61 is mounted on an upstanding lug 62, secured to the forward end of the side plate 2. The pinion 61 is carried by one end of a shaft 63, the other end of which carries a worm gear 64. The gear 64 meshes with a worm 65 carried by the forward end of the shaft 66. The rear end of the shaft 66 (Figs. 3 and 11) is journalled in a bracket 67 secured to the side plate 2. A bevel gear 68 is carried on the end of the shaft 66 in position to mesh with the gear 47 carried as shown in Fig. 13 on the axis of the shaft 14. By this arrangement, when the clutch 56 is

operated to secure the gear 55 to the shaft 34, the gear 47 will drive the shaft 66 and thus rotate the pinion 61 to raise or lower the rack 60 and the supplemental frame 13, the direction of movement depending upon the direction of rotation of the motor 24. By this arrangement the operating head of the machine may be raised or lowered into position to make the different cuts illustrated in Fig. 2.

A shaft 70 (Figs. 1, 3 and 5) extends from one side of the main frame 1 to the other at a point adjacent the truck wheels 4, and carries a pair of cams 71 arranged to cooperate with brake shoes 72 pivotally suspended from the sides 2 of the frame 1 in position to bear against the wheels 4. A brake lever 73 is carried at one end of the shaft 70 and is arranged to cooperate with the ratchet bar 74 to hold the brake in position when set to lock the wheels 4.

Referring to Figs. 3 to 8 inclusive, it will be seen that a conveyer belt 75 extends longitudinally of the machine throughout the greater portion of the length thereof along the chutes formed by the main and supplemental elongated frames. This belt passes over a roller 76 at the rear end of the main frame and over a roller 77, near the forward end of the auxiliary frame. The upper run of the belt is supported by the upper web or platform 78 of the base member 6 of the main frame 1, and by the upper web or inclined platform 16 of the auxiliary frame 13. The lower run of the belt is supported by the lower web or horizontal platform 79 of the main frame 1 and by the lower web or inclined platform 17 of the auxiliary frame 13. The belt itself, as shown in Fig. 8 is made up of narrow strips 80 of sheet metal secured together at their edges by hinged connections 81. Each of the hinged connections 81 carries at the edge of the belt a lug 82, and these lugs are arranged to cooperate with the sprocket wheels 45 carried by the shaft 14, by means of which the belt is driven. As shown in Fig. 5, the lower supporting plates 79 and 17 terminate a short distance from one another near the pivotal support of the frame 13 in order to provide space for the cooperation of the sprocket wheels 45 with the chain 75. In order that there may be no break in the support for the upper run of the belt, the web 16 of the pivoted frame 13 is provided with tongues 83 which project rearwardly and cooperate with registering slots 84 cut in the forward end of the web 78. This construction is best shown in Fig. 12. When the auxiliary frame 13 is moved on its pivot, the tongues 83 and slots 84 will move relative to one another, but the space between the webs 16 and 78 will always be bridged by the tongues 83, thus forming a continuous support for the conveyer chain. The movement of the conveyer chain, as previously explained, is controlled by means of the clutch 56. Overhanging guide flanges 85 extending toward each other from the plates 2 as shown in Fig. 7 are provided throughout the entire length of the conveyer and extend over the edges thereof to guide the conveyer and hold it in proper position.

It should be noted that the elongated main frame comprising the spaced-apart side plates 2 and the connecting platform 78 in reality constitutes an open-ended chute for guiding the coal carried rearwardly by the endless conveyer mechanism. It should also be noted that the supplemental frame comprising the upright spaced-apart plates 15 and the connecting inclined platform 16 constitutes a chute which may be inclined downwardly or upwardly or held in a substantially horizontal position while being in alinement with the rear chute which is adapted to overhang a mine car, as shown in Figs. 1, 5 and 22. The forward elongated chute is also open-ended and its rear end telescopes into the forward end of the main frame or rear chute. As shown in Fig. 13 the supplemental frame 13 which carries the spaced-apart upright plates 15, is journaled in bearings in the spaced-apart plates 2 for tilting up and down movement on the axis of the shaft 14. The supplemental frame is therefore confined against lateral movement relatively to the main frame which enables the use of the single endless conveyer extending from its forward receiving position, as shown in Fig. 6, to its rear delivery position, as shown in Fig. 5. By having the supplemental frame pivoted on the axis of the shaft 14, the mechanism for driving the endless conveyer is not interfered with by the tilting of the supplemental frame relatively to the main frame. By locating the driving mechanism for the conveyer on the axis of the pivot for the forward supplemental frame, such driving mechanism, as shown in Fig. 5, will maintain the conveyer taut along that portion which extends below the platform 78. The lower platform 79 may therefore in some instances be omitted but I prefer to use it in such instances where the loading of mine cars, as shown in Fig. 22, might cause the tilting of the forward end of the car up against the conveyer. The lower inclined platform 17 is preferably employed to protect the conveyer when it tends to become slack and to hang down too low. The tubular guide-ways below the platforms 78 and 16 are arranged in alinement with each other, as shown in Fig. 5, with their connecting ends registering where the driving mechanism is located. It will thus be seen

that I have provided a single endless belt conveyer mounted on sectional platforms in alinement with each other and positively held in contact with the sectional platforms, while beneath the platforms the tubular guiding mechanism completely encloses the conveyer and protects it from injury. Such guiding and protecting mechanism for the endless conveyer is arranged to be flexible adjacent the conveyer driving mechanism and therefore the operation of the latter is not interfered with when the supplemental frame, together with the core-cutting mechanism carried thereby, is adjusted to various elevations while the said chutes are maintained in alinement with each other so as not to interfere with the free travel of the endless conveyer.

The coal is severed from the inner upright wall of the mine chamber by core-cutting apparatus carried on the base plate or platform 20 secured to the forward end of the tilting or auxiliary frame 13. Referring to Figs. 14 and 15, it will be seen that the platform 20 is provided with a centrally located bearing lug 86. Mounted on the bearing 86 for rotation about a vertical axis, is a circular shell or skeleton frame 87 which is provided with four inwardly projecting lugs 88 which support an electric motor 89 within the frame. The shell 87 is provided with a circular journal 90 which surrounds the bearing portion of the lug 86 and which is held in place by a stationary gear 91 which is rigidly secured to the upper surface of the bearing lug 86 by a number of cap screws 92. The armature shaft of the motor 89 is provided with a pinion 93 which meshes with a gear 94 rotatably mounted on a stud shaft secured to the lower portion of the casing of the motor 89. Rigidly secured to the gear 94 for rotation therewith are a spur pinion 95 and a bevelled pinion 96, shown best in Fig. 15. The spur pinion 95 meshes with two gears 97 and 98 (Fig. 17), rigidly mounted on shafts 99 and 100 respectively. Referring to Fig. 18 it will be seen that the shaft 99 which carries the gear 97 has a worm 101 journalled for free rotation thereon. This worm 101 may be secured to the shaft 99 for rotation therewith by means of the clutch 102. The clutch 102 is operated by a rod 103 which extends upwardly to the top of the casing and is provided with a handle 104 (Fig. 4) by means of which it is operated. The worm 101 meshes with a worm wheel 105 (Figs. 14 and 18) rigidly secured to an upright shaft 106 which carries a spur pinion 107 in position to mesh with the stationary gear 91 secured to the platform 20 by the screws 92. By this arrangement the motor 89 may be clutched to the train of gearing described, and the pinion 107 be thus caused to travel around the gear 91 and carry the entire skeleton frame 87 with it, thus rotating the frame about the center of the bearing lug 86 as a vertical axis. The wheel 98 and the shaft 100 may be clutched to the pinion 108 by means of the clutch 109 operated by the handle 110 (Fig. 4) carried at the top of the casing 87. The pinion 108 meshes with a gear 111 rigidly secured to the sprocket wheel 112, both of which are mounted for free rotation on the shaft 113. The shaft 113 is carried by lugs 114 which project inwardly from the walls of the casing 87. Extending horizontally from the lower portion of the frame 87 at a point adjacent the sprocket wheel 112, is the lower bar 115 of a loop chain core cutter 116. A chain 117 of this cutter is guided along the front portion of the bar 115 and passes over the sprocket wheel 112 by means of which it is driven. The frame of the core cutter 116 in addition to the lower horizontal bar 115 has an upwardly extending portion 118 and an upper horizontal bar 119 (Fig. 6) which extends inwardly and is secured to the upper portion of the frame 87 (Fig. 14) and held thereon by an upwardly extending arm 120. The arm 120 is rigidly mounted on a cover plate 121 which fits over the top of the frame 87 and is secured thereto by bolts 122 (Fig. 4). Guides 123 and 124 are provided for directing the chain 117 over the sprocket wheel 112 in the cutter head frame.

Surrounding the skeleton frame 87 and arranged to rotate relative thereto is a hollow cylindrical casing 125. The shell 125 is supported by a flange 126 extending outwardly around the bottom edge of the frame 87. The upper edge of this shell is provided with inwardly projecting gear teeth 127 (Figs. 13 and 19) by means of which the shell is rotated relative to the skeleton frame. The teeth 127 mesh with a pinion 128 carried on a vertical shaft 129 journalled in lugs 130 and 131 carried by the frame 87, as best shown in Figs. 15 and 16. Mounted for free rotation on the shaft 129, is a pinion 132 meshing with the pinion 96 driven by the motor 89, as previously described. The pinion 132 may be secured to the shaft 129 for rotation therewith by the clutch 133, which is slidable on the shaft 129 by means of a lever 134 and a connecting link 135. By this mechanism the pinion 128 may be driven by the motor 89 and thus cause the shell or sleeve 125 to rotate about the skeleton frame 87. Rigidly secured to the hollow cylinder 125 and extending laterally therefrom, are a pair of superposed arms 136 (Fig. 14) which carry a vertical wing or plate 137 which is of a size to pass freely through the unobstructed core-opening of the loop chain core-cutter 116 but large enough to substantially fill the space surrounded by the cutter loop. A stop 138 (Fig. 4) is provided in the path of the movement of the plate 137

to limit the rotation of this plate in one direction. It will be seen from the drawings and description of the motor 89 and its associated parts, that the cutter frame and the chain 117 may be simultaneously driven by the motor to form a kerf in the material to be mined, for the purpose of severing the material from the mine wall. It will also be seen that the frame 87 which carries the cutter frame 116 will be rigidly held in whatever position it is moved into by the worm drive by means of which it is operated. Because of this fact, the plate 137 carried by the hollow cylinder 125 may be rotated about the frame 87 to remove the severed material in a manner to be described.

For the purpose of reducing the friction between the severed material and the wall of the mine, and for properly guiding this material into position from which it may be transported, a flexible apron 139 is provided one end of which is, as shown in Fig. 4, secured to the rear portion of the upright cutter bar 118 of the cutter frame. This apron is somewhat similar in construction to the conveyer belt 75, being made up of metal strips hinged together at their edges; but the apron differs from the conveyer belt in that the inner surface of the apron is made as smooth as possible in order to permit the mined material to slide freely against the inner surface thereof. The rear end of the apron is secured to a reel 140 (Figs. 2 and 4) on which the apron may be wound. The reel 140 is driven by a screw 141 carried by a shaft 142 which is operatively connected with the shaft 51 by a universal coupling 143. The worm 141 may be clutched to the shaft 142 for rotation therewith by means of a clutch 144 operated by a lever 145 mounted on the opposite side of the machine and connected with the clutch by means of a rod 146 and bell crank 147 (Fig. 4). By means of this worm drive the reel 140 is rigidly held from rotation except when positively driven by the motor 89 through the shaft 51. The direction of rotation of the reel 140 depends on the direction of rotation of the driving motor. The motor 89 is operated through a controller 148 mounted on a guard wall 149 projecting upwardly from the base plate 20. A second controller 150 is also carried by the guard wall 149 and is connected to the motor 89 in the casing 87 of the machine by cables 151 (Fig. 14). Current is supplied to the motors by means of a trolley line in a manner well known in the art.

The shaft 51 is provided with a friction or slip coupling 152 (Fig. 2) the construction of which is best shown in Fig. 20. The two ends of the shaft 51 are disconnected from one another and are provided with friction members 153 and 154 respectively which are keyed to the two sections of the shaft. The friction member 153 is free to slide longitudinally on the shaft and is forced toward the member 154 by means of a coil spring 155, thus providing constant frictional contact between the two members 153 and 154. So long as the torsion between the two sections of the shaft 51 does not exceed a certain limit, the sections will continue to rotate in unison. When, however, the torsion becomes great enough to overcome the friction between the members 153 and 154, the sections will rotate relative to one another. The two sections are provided with surrounding casing members 156 and 157 respectively for enclosing the operating parts of the friction coupling.

In order that the platform 20 may extend the full width of the mine chamber and yet be folded to a width corresponding to that of the machine when the machine is being transported from one chamber to another, the plate 20 is provided at each side with hinged extensions 160 (Fig. 4). These extensions, as shown in Fig. 9, may be folded up against the cutter head when the machine is being transported, and may be extended, as shown in broken lines in Fig. 9, when the machine is in operation. One of the extensions 160 is provided with a stop 161 against which a pivoted guard 162 (Fig. 4) is swung and by means of which the outward movement of the guard is limited (Fig. 2). The guard 162 is pivoted at 163 and may be swung inwardly to a position over the main portion of the platform 20 in front of the conveyor 75 when the extensions 160 are folded for transportation. Before the parts of the platform are folded as described, the cutter frame 116 and the arms 136 and plate 137 are swung about their pivot until they occupy a position in the rear of the cutter head. In this way all of the parts of the cutting and loading apparatus may be brought into compact relation to one another when the machine is being transported.

The operation of the disclosed embodiment of the invention is as follows:

The machine is located in a mine chamber, as shown in Figs. 1 to 6 inclusive, and the auxiliary frame is tilted to its uppermost position, that is into the position for making a cut at the upper portion of an upright wall in the mine chamber. The operator will then start the motor 89 in the cutter head and connect the sprocket wheel 112 by means of the clutch lever 110 (Figs. 2, 4 and 18) to cause the cutter chain 117 to travel on the cutter frame. The motor 89 is then operatively connected with the pinion 107 which begins its travel about the gear 91 carrying the cutter frame with it about the bearing lug 86 as an axis. In this way a U-shaped kerf is formed in the material to be mined, which severs a portion of the material crescent-shaped in horizontal section,

as shown in Fig. 4. During the forward movement of the cutter 116, the motor 24 may be operated to drive the reel 140 to permit the apron 139 to be paid out and drawn into the kerf formed by the vertical portion of the cutter 116. If at any time it is found desirable to break away the portion of the material severed, this may be done by throwing out the clutch 144 and stopping the movement of the reel 140, thus holding the end of the apron stationary. If this is done while the cutter continues to rotate, the apron will be drawn tighter and will bring pressure to bear on the severed surface of the material, thus causing portions of it to be broken off. The same effect may be produced by stopping the feed of the cutter 116 and driving the reel 140 in the direction to wind up a portion of the apron 139. Whether such breaking operation will be necessary or not, will depend upon the nature of the material being mined. In many places in coal mining the coal will break up sufficiently of its own accord without any positive breaking operations. After the cutter frame 116 has rotated a sufficient amount to completely sever the section of material, the movement of the cutter will be stopped and the frame will then be rigidly held from rotation by the worm gear by means of which it is driven. When the material has thus been completely severed, the lever 134 (Fig. 16) is moved by the operator to cause rotation of the pinion 138 to drive the hollow cylindrical casing 125 (Fig. 19) rotating it about the axis of the cutter head in a direction opposite to the cutting direction of the cutting frame. This movement of the hollow cylinder 125 carries with it the arms 136 and the plate 137 which thus form a mover or follower for the severed material which forces the material before it in the reverse direction of the movement of the cutter and carries the dislodged material before it backwardly onto the supporting base plate or platform 20. During this movement the apron 139 prevents frictional contact of the severed material with the mine wall and thus permits the material to be slid freely before the plate 137 and onto the receiving platform 20. As the material moves backwardly, it is guided by the guards 149 and 162 or along a chute comprising such guards into a position adjacent the forward end of the conveyer 75. In the meantime the conveyer is being driven by the motor 24 and connected mechanism (Fig. 5), and as fast as the material is forced upon the end of the conveyer, it is taken up and carried rearwardly along the body of the machine to the rear end thereof where it is discharged into a car or other conveying mechanism from the rearwardly extending main frame which is adapted to overhang a mine car. After the completion of each cut and the removal of the severed material, the loop core cutter is returned to its initial position and the apron 139 simultaneously rewound upon its reel. The slip or friction drive 152 is provided in the shaft 51 to compensate for any inequality in the rate of motion of the drives for the two ends of the apron. After the upper cut has thus been completed, the tilting frame is swung downwardly and a second cut is made just below that made by the machine while in its upper position (Fig. 2). When both these cuts have been made, the chamber will then extend into the walls of the mine a distance equal to the depth of the cuts made. The machine is now moved forwardly in the chamber and the operation is repeated.

The novel features of the method of mining employed in connection with the machine thus described will be best understood by reference to Figs. 21 to 26 inclusive. In Figs. 21 and 22 the machine forming part of this invention is designated by the numeral 200 and is diagrammatically shown in position in a mine chamber. In Fig. 21 the shape of the various cuts made by the machine as viewed from above is illustrated by the crescent-shaped figures 201. These figures are formed by successively removing sections of the material from its native bed by the rotation of a loop core cutter in a horizontal direction about an upright axis, and by forcing the material thus removed from the position it occupied in its native bed by a follower which swings about the same axis as the loop core cutter and which moves the material rearwardly onto a conveyer which carries it to a position where it may be transported from the mine. The chamber formed by the machine is, however, of a greater height than can be produced by a single cut, and in order to form a chamber of a sufficient height, two cuts are made one above the other for each position of advance of the machine into the chamber. The portion of the machine which carries the mechanism for forming these cuts is movable about a horizontal pivot to position the cutter in its upper and lower positions. The outline of the different cuts formed by the machine as viewed in vertical section, is designated by the numeral 202, Fig. 22. It frequently happens in coal mines that a stratum of undesirable material is found in a mine bed. Such a stratum is shown in the figures referred to and is designated by the numeral 203. In the present process of mining, this stratum 203 is first removed by a machine arranged to form a horizontal kerf in the material to be mined. Such machines are well known in the art and one such machine is diagrammatically shown in Fig. 23 and designated by the numeral 204. In carrying out the present method, the stratum of undesirable material is first removed

by the machine 204 for a sufficient distance in the mine wall to permit a plurality of cuts to be made by the mining machine proper before the entire material from which the undesirable stratum has been removed is completely mined. Fig. 25 shows in plan view a portion of a mine chamber from which the stratum of undesirable material has been removed for a sufficient distance to permit several cuts to be made by the mining machine. In this figure the numeral 201 designates two cuts already made by the machine, and the numeral 205 designates the portion from which the stratum of undesirable material has been removed. Fig. 26 designates in vertical section the lines of cleavage shown at 206, and the sections of detached material shown at 207 formed during the mining process. The opening 208 indicates a portion from which the stratum of undesirable material has been removed. Fig. 24 is a transverse sectional view of the mine chamber formed in carrying out the present process. It should be noted that the upper part of the chamber is arched transversely thereof. This is due to the fact that while the uppermost cut is being made the portion of the frame carrying the loop core cutter is tilted upwardly to such a position that the axis of rotation of the cutter is inclined backwardly from the vertical. This causes the forward portion of the cutter to reach its highest position when it is at the center of its travel while making a cut transversely of the mine chamber. The floor of the mine chamber is also curved but to a much less degree than the roof of the chamber, due to the fact that the pivot about which the supporting frame for the operating head is tilted, is much nearer the floor of the mine than it is the roof. This arching of the mine roof is very important, as it forms a support for the roof, and enables the chamber to be cut without the use of props. It will be noted by referring to Figs. 22, 23 and 24, that a stratum of material 209 is shown above the layer of coal being mined. This is the usual condition in which coal is found, material 209 often being slate. It has been found that if all of the coal is removed from beneath a layer of slate, the action of the air upon the slate will soon cause it to break and fall into the mine chamber. In the present method of mining, a thin layer of unmined coal is left below the stratum of slate, as shown at 210 in Fig. 24. This layer of coal at the center of the arch formed by the machine, is only of sufficient thickness to prevent the deteriorating action of the atmosphere upon the slate located above the coal. The layer of coal, of course, is thicker at the sides of the chamber in order to form the supporting arch. In this way, a self-supporting chamber having an arch-shaped roof which remains intact for a long period of time, is produced. The two machines used to perform the different steps in the mining process are mounted on their trucks for the purpose of facilitating the interchange of the machines in the mine chamber after the completion of the steps performed by each machine and also to provide easy transportation of the machines from one chamber to another.

I claim:

1. In a mining machine, the combination with a truck frame having a rearward extension adapted to overhang a mine car on a mine track on which said truck frame is mounted, of a supporting frame pivotally mounted on said truck frame on a transverse axis for up and down swinging movements from positions at the floor of the mine chamber to positions at the roof thereof along an upright mine wall, kerf cutting mechanism mounted on the forward end of said supporting frame for swinging feeding movements on an upright axis, means for operating said kerf cutting mechanism including swinging feeding movements thereof on such upright axis, and self-acting power mechanism connected between said truck frame and said supporting frame for tilting the latter on its pivotal connection to said truck frame to effect adjustment in elevation of said kerf cutting mechanism.

2. In a mining machine, the combination with a truck, of a supporting frame pivotally mounted on said truck to extend forwardly in advance thereof, kerf cutting mechanism mounted on the forward end of said supporting frame for swinging feeding movement relatively thereto on an upright axis in position for operation on an upright mine wall in advance of said frame, an upright arcuate rack on said supporting frame intermediate its forward end and its pivotal connection to said truck, and self-acting power mechanism connected to said upright arcuate rack for tilting said supporting frame up down on said truck to adjust the elevation of said kerf cutting mechanism.

3. In a mining machine, the combination with a truck having a main frame, of an auxiliary frame pivotally connected to said main frame for up and down movement relatively thereto on a substantially horizontal transverse axis, cutting mechanism mounted at the forward end of said auxiliary frame, means for operating said cutting mechanism, an upright arcuate rack mounted on said auxiliary frame intermediate said transverse axis and said cutting mechanism, and self-acting power mechanism comprising self-locking worm gearing connected between said main frame and said upright arcuate rack for swinging said auxiliary frame vertically about its pivotal connection to said

main frame to adjust the elevation of said cutting mechanism.

4. In a mining and loading machine, the combination with a main frame comprising spaced-apart side walls and a connecting bottom to form an open ended chute, of a supplemental frame pivotally mounted on said main frame and confined against lateral movement relatively to said main frame, said supplemental frame being also provided with spaced-apart side walls in position to overlap adjacent portions of the side walls of said main frame, said supplemental frame being also provided with a bottom in position to form a continuation of the bottom of said first-named chute, mechanism mounted on the free end of said supplemental frame for dislodging material from an upright mine wall, and means for transferring the dislodged material longitudinally of said main and supplemental frames over the bottoms thereof to loading position.

5. In a mining machine, the combination with a main frame comprising an open ended chute, of an auxiliary frame comprising an open ended chute with the rear ends of the side walls of the latter overlapping the forward ends of the side walls of the first-named chute, means for pivotally connecting said auxiliary frame to said main frame and confining said second-named chute to positions extending in alinement with said first-named chute while such overlapping is maintained, cutting mechanism carried by said auxiliary frame at the free end thereof, means for operating said cutting mechanism to cut material in an upright mine wall in advance of said auxiliary frame, loading machanism for transferring dislodged material along said chutes, and self-acting power mechanism mounted on said main frame and connected to said auxiliary frame for swinging the latter to adjust the elevation of said cutting mechanism while said chutes are maintained in alinement with each other and in overlapping relation at their adjacent end portions.

6. In a mining and loading machine, the combination with a main frame having spaced-apart upright side members and a connecting bottom extending in a general horizontal direction to form an open ended chute the rear end of which is adapted to overhang a mine car, of an auxiliary frame carried by said main frame for up and down movement relatively thereto but confined against lateral movement relatively thereto, an open ended chute on said auxiliary frame with the rear ends of the side walls thereof in overlapping relation to the forward end portions of the side walls of said first-named chute, the bottom of the chute on said auxiliary frame being arranged to form a continuation of the bottom of the chute on said main frame, dislodging mechanism mounted on the free end of said auxiliary frame for arcuate feeding movement relatively thereto on an upright axis, and loading mechanism for transferring the dislodged material from said dislodging mechanism along the forward chute and the rear chute out of the rear end of the latter.

7. In a mining machine, the combination with a truck comprising a main frame having spaced-apart upright side walls and a connecting bottom to form an open ended chute, of an auxiliary frame pivotally connected to said main frame for up and down movement on a transverse horizontal axis, an open ended chute on said auxiliary frame and comprising upright side walls overlapping the inner forward end portions of the side walls of said first-named chute, the chute on said auxiliary frame comprising also a bottom in position to form a continuation of the bottom of said first-named chute in the various positions of said auxiliary frame relative to said main frame, mining mechanism mounted on the forward end of said auxiliary frame, and loading mechanism for transferring mined material along said chutes to loading position.

8. In a mining machine, the combination with a truck adapted to travel on a mine track, of a supplemental frame pivotally mounted on said main frame for up and down adjustments relatively thereto, said supplemental frame being elongated to have a long reach beyond the forward end of the mine track for a plurality of mining positions on the track, core-cutting mechanism mounted at the forward end of said supplemental frame for swinging feeding movements in a general horizontal direction and relatively to said supplemental frame, means for operating said cutting mechanism, and means for swinging said supplemental frame vertically relatively to said main frame to adjust the elevation of said core-cutting mechanism.

9. In a mining machine, the combination with a truck having a pair of supporting wheels located intermediate the ends thereof and a second pair of supporting wheels located near the front end thereof, said supporting wheels being in a position to be adapted to roll over the surfaces on which said mining machine is supported, of an auxiliary frame pivotally mounted on said truck for movement relatively thereto in upright planes, the pivotal connection between said auxiliary frame and said truck being located adjacent a plane extending vertically through the axis of said first-mentioned pair of wheels, and means connected to said auxiliary frame near the second pair of wheels for swinging said auxiliary frame vertically relatively to said truck.

10. In a mining machine, the combination

with a main frame having a bottom portion and spaced-apart side walls, of an auxiliary frame pivotally carried by said main frame and having spaced-apart side walls arranged adjacent the side walls of said main frame and having a bottom portion forming a continuation of the bottom portion of said main frame, said auxiliary frame being confined against lateral movement relatively to said main frame by said pivotal connection, cutting mechanism carried by said auxiliary frame, and a single endless conveyer extending longitudinally of both of said main and auxiliary frames to transfer material from said cutting mechanism along the chutes out of the rear end of the chute on the main frame along the bottoms of the chutes at the various elevations of said cutting mechanism and said auxiliary frame.

11. In a mining machine, the combination with a main frame having spaced-apart longitudinally extending upright side walls and a bottom extending a portion of the way along said side walls by terminating in a position spaced back from the forward ends of said side walls, of an auxiliary frame pivotally carried by said main frame on a transverse horizontal axis adjacent the forward end of said bottom, said auxiliary frame having a bottom portion in position to form a continuation of the bottom portion of said main frame, and spaced-apart side walls adjacent the side walls of said main frame extending forwardly beyond said transverse axis, cutting mechanism mounted on said auxiliary frame, and means for swinging said auxiliary frame on said transverse axis to vary the elevation of said cutting mechanism while the bottom of said auxiliary frame remains in position to form a continuation of the bottom of said main frame and the rear end portions of the side walls of said auxiliary frame remain in overlapping relation with the forwardly extending side walls of said main frame.

12. In a mining machine, a main frame having side walls extending longitudinally thereof and having a bottom plate connecting said side walls and extending longitudinally thereof for a portion of their length, an auxiliary frame pivotally mounted between said side walls and having a bottom portion arranged to form a continuation of the bottom plate of said main frame, and a movable connection between the bottom portions of said main and auxiliary frames arranged to permit pivotal movement of said auxiliary frame relative to said main frame without destroying the continuity of said bottom portions.

13. In a mining machine, a main frame having longitudinally extending side members and a bottom plate extending longitudinally of said side members a portion of the length thereof, an auxiliary frame pivotally mounted on said main frame between said side members and having a bottom plate arranged to form a continuation of the bottom plate of said main frame, means for moving said auxiliary frame vertically relative to said main frame, a mining machine head carried by said auxiliary frame, a conveyer arranged to travel longitudinally of the bottom members of said frames to transfer material severed by said head, and a movable connection between the bottom members of said main and auxiliary frames arranged to maintain the continuity thereof during the movement of said auxiliary frame.

14. In a mining and loading machine, the combination with a main frame comprising spaced-apart side members and a connecting bottom plate to form a chute, of an auxiliary frame pivotally mounted between said side members adjacent one end of said bottom plate and itself provided with a bottom plate arranged to form a continuation of the bottom plate of said main frame, a tongue carried by one of said plates and arranged to bridge the space between said plates when said auxiliary frame is adjusted about its pivotal connection with said main frame, dislodging mechanism mounted on said auxiliary frame, and means for transferring dislodged material along said bottom plates out of the rear end of said chute to loading position.

15. In a mining and loading machine, the combination with a main frame having spaced-apart side members and a connecting bottom plate, of an auxiliary frame pivotally mounted between said side members near one end of said bottom plate, cutting mechanism mounted on said auxiliary frame to move therewith to various elevations, a bottom plate carried by said auxiliary frame, a movable connection between the bottom plates of said main and auxiliary frames comprising tongues and slots arranged to slide relatively to one another to maintain the continuity of said bottom plates when said auxiliary frame is moved on its pivotal connection with said main frame, means for operating said cutting mechanism, and means for effecting transfer of cut material from said cutting mechanism along said auxiliary and main frames.

16. In a mining machine, the combination with a truck adapted to travel on a mine track, said truck comprising a main frame extending longitudinally of said track, of an auxiliary frame pivotally carried by said main frame for up and down movement on a transverse horizontal axis, said auxiliary frame also extending longitudinally of said track and in advance of said main frame in a general horizontal direction, cutting mechanism mounted on the forward end of

said auxiliary frame in position for operation on an upright mine wall in advance of the forward end of the mine track, an upright arcuate rack mounted on said auxiliary frame intermediate said cutting mechanism and the pivotal connection between said auxiliary frame and said main frame, a motor carried by said truck, and power transmission mechanism connected between said motor and said upright arcuate rack for swinging said auxiliary frame on said horizontal transverse axis to adjust the elevation of said cutting mechanism on a comparatively long radius while said auxiliary frame occupies positions extending longitudinally of said track between the floor and roof of the mine chamber.

17. In a mining machine, the combination with a truck adapted to travel on a mine track and comprising a main frame having spaced-apart side members extending longitudinally of the track, of an auxiliary frame pivotally mounted on said main frame between the said side members and arranged to swing vertically relatively thereto, a motor carried by said main frame, cutting mechanism mounted on said auxilary frame for swinging feeding movement on a comparatively short radius, means for operating said cutting mechanism, a rack on said auxiliary frame between said cutting mechanism and the pivotal connection between said auxiliary frame and said main frame, and power transmission gearing between said motor and said rack, said power transmission gearing comprising worm gearing in position to automatically lock said auxiliary frame in adjusted position relative to said main frame when the source of power to said transmission gearing is disconnected.

18. In a mining and loading machine, the combination with a main frame, of an auxiliary frame pivotally mounted on said main frame for movement up and down relatively thereto, a single endless travelling conveyer mounted on said main and supplemental frames and extending from the forward portion of said supplemental frame to the rear end of said main frame, and mechanism mounted on said auxiliary frame for dislodging material and delivering it to said endless conveyer for transportation along said auxiliary frame and said main frame irrespective of the adjustment of the elevation of said auxiliary frame on its pivotal connection with said main frame.

19. In a mining and loading machine, the combination with an elongated main frame, of a truck for carrying said main frame in fixed position to overhang a mine car, a supplemental elongated frame movably mounted on said main frame for adjustment relatively thereto, an endless conveyer having superposed portions traveling in opposite directions and extending continuously along said elongated frames from the forward portion of said supplemental frame to the rear end of said fixed frame, and mechanism mounted on said supplemental frame for dislodging material from a mine wall and delivering it to said conveyer.

20. In a mining and loading machine, the combination with a truck, of conveyer mechanism carried by said truck and comprising a movable section, cutting mechanism connected to move bodily with said movable section, means for moving said movable section and said cutting mechanism in up and down directions into various operating positions, means for dislodging material from a mine wall by feeding movements in a general horizontal direction and delivering such dislodged material to said conveyer mechanism, a motor carried by said truck, and gearing connecting said motor with said conveyer mechanism to effect the operation of said conveyer mechanism in any of the positions to which said movable section is adjusted, said gearing being also connected with said moving means.

21. In a mining machine, the combination with a trough provided with a fixed conveyer frame section and a pivoted conveyer frame section forming a continuation of said fixed section, kerf cutting mechanism mounted on the forward end of the pivoted section for swinging movement relatively thereto on an upright axis and on a comparatively short radius, means for operating said cutting mechanism, a motor mounted on said truck, and power transmission gearing between said motor and said pivoted section for moving said pivoted section relatively to said fixed section to adjust the elevation of said cutting mechanism bodily on a comparatively long radius, said power transmission gearing comprising a worm and worm wheel for automatically locking said pivoted section in adjusted position relative to said fixed section when the power of said motor to said power transmission gearing is disconnected.

22. In a mining and loading machine, the combination with a main frame adapted to extend rearwardly to overhang a mine car on a track at the rear end of said frame, of a supplemental frame pivoted on a substantially horizontal axis to said main frame and extending forwardly therefrom, dislodging mechanism mounted at the forward end of said pivoted frame, a single endless conveyer extending from the forward portion of said supplemental frame to the rear end of said main frame, and means for swinging said supplemental frame to adjust the elevation of said dislodging mechanism while the forward section of said conveyer remains in alinement with the rear section thereof to secure delivery of dislodged material by said conveyer to the mine car for various ele-

vations of said dislodging mechanism and while said mine car remains on the track at the rear end of said frame.

23. In a mining machine, the combination with a truck mounted main frame, of an elongated supplemental frame pivotally connected at its rear portion to said main frame for up and down adjustment relatively thereto, core-cutting mechanism comprising an upright run adapted to cut a kerf spaced back from the face of the mine wall, means for swinging said supplemental frame to adjust the elevation of said core-cutting mechanism on a long radius to cause said core-cutting mechanism to leave an approximately upright wall, and means for operating said kerf-cutting mechanism including arcuate feeding movement on an upright axis at adjusted elevation and in adjusted positions at varying distances from the forward end of the mine track.

24. In a mining machine, the combination with a wheel-supported main frame adapted to travel on a mine track, of a supplemental frame pivotally connected to said main frame rearwardly of the wheels thereof, a substantially horizontal platform at the outer forward end of said supplemental frame for location adjacent an upright mine wall, means for moving said supplemental frame about its pivotal connection to said main frame to adjust the elevation of said platform on a comparatively long radius, core-cutting mechanism mounted on said platform for arcuate movement about an upright axis, and means for operating said core-cutting mechanism including arcuate feeding movement thereof relatively to said platform while the latter occupies a position adjacent said mine wall.

25. In a mining machine, the combination with a main frame, of an elongated chute U-shaped in cross section and pivotally mounted on said main frame for up and down movements relatively thereto, an endless conveyer having superposed portions traveling in opposite directions with the upper receiving portion extending along the bottom of said elongated chute, core-cutting mechanism mounted at the outer end of said chute opposite the pivotal connection of said chute with said main frame and means for operating said core-cutting mechanism including swinging feeding movement thereof relatively to said chute on an upright axis.

26. In a mining machine, the combination with a supporting frame comprising a platform, of core-cutting mechanism having an unobstructed core-opening therethrough and mounted on said supporting frame for arcuate feeding movement on an upright axis, and side plates pivotally carried by said platform as extensions thereof and having forward edges in position to form continuations of the forward edges of said platform, such forward edges conforming to the contour of the face of the mine wall formed by the next previous arcuate core-cut.

27. In a mining machine, the combination with a supporting frame comprising a platform, of kerf-cutting mechanism mounted on said frame for arcuate movement on an upright axis, means for operating said kerf-cutting mechanism, extensions pivotally mounted at the lateral edges of said platform and arranged to swing into folding position and sustained in the latter position during transportation of the mining machine, and means for moving said supporting frame together with said kerf-cutting mechanism for positioning the latter to operate on an upright mine wall while said platform together with its extensions is located adjacent the mine wall.

28. In a mining machine, the combination with a main frame, of a supplemental frame pivotally connected to said main frame for up and down movement relatively thereto on a substantially horizontal axis, core-cutting mechanism mounted on the forward end of said supplemental frame for swinging feeding movement on an upright axis, means for operating said core-cutting mechanism to cut a core in a general horizontal direction in advance of said supplemental frame, and self-acting power-actuated mechanism for adjusting the elevation of said supplemental frame together with the core-cutting mechanism mounted thereon.

29. In a mining machine, the combination with a substantially horizontal platform, of a supplemental frame cylindrical in form and mounted on said platform to rotate on an upright axis substantially perpendicular to said platform, core cutting mechanism having an unobstructed core opening therethrough and connected to said supplemental frame to rotate about such upright axis, and means within said cylindrical supplemental frame for operating said core cutting mechanism including arcuate feeding movement thereof by rotation of said supplemental frame relatively to said platform.

30. In a mining machine, the combination with a supporting frame, of a supplemental frame comprising a drum and mounted on said supporting frame for movement about an upright axis, core cutting mechanism having an unobstructed core opening therethrough and connected to said drum to rotate therewith, and means comprising a motor within said drum for operating said core cutting mechanism including feeding movement thereof by rotating said drum on said upright axis relatively to said supporting frame.

31. In a mining machine, the combination with a supporting frame, of a cylindrical supplemental frame mounted on said supporting frame for rotary movement rela-

tively thereto on an upright axis, core cutting mechanism having an unobstructed core opening therethrough and connected to said cylindrical frame to rotate therewith, a motor within said cylindrical frame, and means driven by said motor for operating said core cutting mechanism including feeding movement thereof by rotating said cylindrical frame on said upright axis relatively to said supporting frame.

32. In a mining machine, the combination with a supporting frame comprising a platform of a bearing on said platform, an upright cylindrical frame journalled on said bearing, core cutting mechanism having an unobstructed core opening therethrough and carried by said cylindrical frame, and means comprising a motor within said cylindrical frame for operating said core cutting mechanism including feeding thereof by rotating said cylindrical frame on said bearing relatively to said supporting frame.

33. In a mining machine, the combination with a supporting frame, of an upright hollow cylindrical frame mounted on said supporting frame for rotary movement relatively thereto on an upright axis, loop chain core cutting mechanism having an unobstructed core opening therethrough and mounted on said cylindrical frame for rotary movement therewith, and means comprising a motor mounted within said cylindrical frame for operating said loop chain core cutting mechanism including arcuate feeding movement thereof by rotating said cylindrical frame relatively to said supporting frame.

34. In a mining machine, the combination with a platform, of a fixed gear secured to said platform, an upright hollow frame mounted on said platform for arcuate movement relatively thereto on an upright axis. a pinion meshing with said fixed gear and connected to said motor to be driven thereby to cause said frame to move in an arc on said upright axis relatively to said platform, a loop chain core-cutter mounted on said frame to be moved in an arc therewith, and means connected to said motor for driving said chain during the arcuate feed thereof, the forward edge of said platform being shaped to fit closely against the mine wall by following the arcuate contour thereof and so that the upper surface of said platform shall form a continuation of the natural shelf produced by the cutting of the core by said loop chain core-cutter.

35. In a mining machine, the combination with a main supporting frame, of an elongated supplemental frame pivotally connected at its rear end to said main frame, said supplemental frame being supported entirely by said main frame, kerf-cutting mechanism mounted on the forward end of said elongated supplemental frame for feeding movement arcuately on an upright axis relatively to said supplemental frame while supported entirely by the latter, means on said main frame for adjusting the elevation of the forward end of said supplemental frame to adjust the elevation of said kerf-cutting mechanism on a comparatively long radius, an apron conveyer on said elongated supplemental frame, and means for operating said kerf-cutting mechanism.

36. In a mining machine, the combination with a supporting frame, of a hollow cylindrical supplemental frame mounted on said supporting frame for rotary movement about an upright axis, a motor mounted within said cylindrical frame, cutting mechanism carried by said frame to move bodily therewith, means within said hollow frame and connected to said motor for operating said cutting mechanism including arcuate feed thereof about such upright axis, ejector mechanism mounted for movement about said cylinder frame concentric with the upright axis thereof, and mechanism connected to said motor for operating said ejector mechanism by moving the same about said cylindrical frame on said upright axis to engage and move material cut by said cutting mechanism.

37. In a mining machine, the combination with a main frame, of a hollow supplemental frame mounted for arcuate movement on an upright axis on said main frame, a motor enclosed by said hollow supplemental frame, a loop chain core-cutter carried by said supplemental frame and movable bodily therewith in an arc, gearing between said motor and said loop chain core-cutter and located within said hollow supplemental frame, and additional gearing also located within said hollow supplemental frame and connected between said motor and said main frame for rotating said supplemental frame on such upright axis to effect arcuate feeding of said loop chain core-cutter relatively to said main frame.

38. In a mining and loading machine the combination with a receiver having spaced-apart upright rigid walls with an intervening platform in fixed relation to such walls, said receiver having an inlet opening adapted to be located at the mine wall for receiving material directly therefrom, of an endless core cutter having an unobstructed core opening therethrough and mounted in position to swing on an upright axis to cut material from a mine wall for passage directly from the latter into the inlet opening of said receiver, and means for operating said core cutter to cut material for passage therethrough into said receiver.

39. In a mining machine, the combination with cutting mechanism, of means for operating the same, a separate material moving device having an upright engaging face and

operable independently of the operation of said cutting mechanism, and power transmission mechanism for operating said material moving device at will to cause said upright face to engage cut material and move it from the mine wall.

40. In a mining machine, cutting apparatus comprising a hollow cylindrical frame, severing mechanism carried by said frame, a second hollow cylindrical member, a material moving device carried by said second member, and means for rotating said hollow members about a common upright axis.

41. In a mining machine, cutting apparatus comprising a cylindrical skeleton frame mounted for rotation about an upright axis, a hollow cylindrical sleeve mounted for rotation about said skeleton frame, operating devices carried by said sleeve and frame, a material moving frame carried by said sleeve and means for rotating said sleeve and frame independently of one another.

42. In a mining machine, a cutter head comprising a hollow frame, severing mechanism carried by said frame, a shell surrounding said frame and rotatable relative thereto, a material moving device carried by said shell, and a motor mounted within said frame and shell for rotating said frame and shell about an upright axis independently of one another.

43. In a mining machine, the combination with a supporting frame, of a supplemental hollow frame mounted on said supporting frame for arcuate movement about an upright axis, a motor mounted within said supplemental frame, cutting mechanism carried by said supplemental frame and movable bodily therewith for arcuate feeding movement, and means for operating said actuating mechanism comprising gearing driven by said motor and including a worm and worm wheel for moving said supplemental frame and said cutting mechanism about said upright axis in an arc and for locking said supplemental frame against arcuate movement relatively to said supporting frame when said motor stops by the cutting off of power therefrom.

44. A cutter head for mining machines, comprising a frame mounted for rotation about an upright axis, a motor carried by said frame for rotating said frame about said axis, mechanism for preventing rotation of said frame by means other than said motor, and a material moving device carried by said frame and rotatable relative thereto for moving material severed by said head.

45. A cutter head for a mining machine, comprising a hollow cylindrical skeleton frame, a bearing on which said frame is mounted for rotation about an upright axis, a motor mounted within said frame, a worm drive connected with said motor for rotating said frame upon said bearing and for holding said frame from rotation when said worm drive is not operated by said motor, a shell rotatably mounted on said frame, means for connecting said shell with said motor for rotation about said frame, severing mechanism carried by said frame, and means carried by said shell for moving the material operated upon by said severing mechanism.

46. A cutter head for mining machines comprising a hollow cylindrical frame, a bearing on which said frame is mounted for rotation about an upright axis, a fixed gear concentric with said axis and having upright gear teeth, a pinion mounted in said frame eccentrically of said axis and arranged to mesh with said gear, a motor mounted within said frame, and a worm drive also within said frame and connecting said motor with said pinion to drive said pinion to cause said frame to rotate about said axis and to prevent rotation of said frame about said axis when not driven by said motor.

47. In a mining machine, the combination with an upright cylindrical frame, of cutting mechanism mounted on said frame to move bodily therewith, a motor mounted within said frame, connections between said cutting mechanism and said motor and located within said frame for actuating said cutting mechanism, and additional mechanism connected to said motor and located wholly within said frame for moving the latter in an arc together with said cutting mechanism to effect arcuate feeding of the latter while being actuated.

48. In a mining machine, the combination with an upright hollow cylindrical frame, of a supporting frame, a bottom for said cylindrical frame, said bottom being pivotally connected to said supporting frame, a gear fixed to said supporting frame and located within said cylindrical frame with its center substantially coinciding with the axis of arcuate movement of said cylindrical frame relatively to said supporting frame, a top for said cylindrical frame to form a hollow enclosure, a motor within such hollow enclosure, connections between said motor and said fixed gear within such hollow enclosure to move said cylindrical frame and the parts carried thereby in an arc on said upright axis, a loop chain core-cutter having an unobstructed core opening therethrough and mounted on said cylindrical frame in a plane extending approximately radially therefrom relatively to said upright axis of arcuate movement of said cylindrical frame, and connections between said loop chain core-cutter and said motor, such connections being located in said enclosure.

49. In a mining machine, the combination with cutting mechanism, gearing for driving said cutting mechanism, a motor connected to said gearing, means comprising

additional gearing for arcuately feeding said cutting mechanism about an upright axis, a motor, means for connecting said motor with said first-named gearing at the will of the operator, additional means for connecting said additional gearing to said motor at the will of the operator and independently of said first-named connecting means, and a drum for enclosing said motor, said first-named gearing and said additional gearing, said connecting means extending to positions exterior of said drum and said cutting mechanism extending from the exterior of said drum.

50. In a mining machine, the combination with an upright cylindrical cutter head, of a loop chain cutter frame having an unobstructed core-opening therethrough and carried by said cutter head to move bodily therewith, a chain cutter mounted on said cutter frame to travel along the same, a motor carried within said cutter head, chain driving means within said cutter head, means for connecting said motor at the will of the operator with said chain driving means, means for moving said cutter head arcuately to effect arcuate feeding movement of said chain cutter while the latter travels transversely of the direction of feeding movement, and means for connecting the motor at the will of the operator with said feeding mechanism.

51. In a mining machine, an upright hollow cylindrical cutter head, a motor mounted within said cutter head, a pair of shafts mounted within said cutter head and driven by said motor, a worm drive connected with one of said shafts and arranged to be clutched thereto for rotation with said motor, gearing connected with the other of said shafts and arranged to be clutched thereto for rotation with said motor, a sprocket wheel driven by said gearing, a chain cutter driven by said sprocket wheel, a frame for guiding said cutter chain carried for rotation with said cutter head, and means driven by said worm drive for rotating said frame and cutter head to feed said chain cutter into the material to be mined.

52. In a mining machine, a hollow cylindrical cutter head, a motor mounted within said cutter head for rotating said head about an upright axis, means for preventing rotation of said cutter head when not driven by said motor, a shell surrounding said cutter head and rotatable relative thereto, a shaft carried by said cutter head, gearing connecting said shaft and shell to drive said shell relative to said cutter head, and a material moving device carried by said shell for moving material severed by said cutter head.

53. In a mining machine, a hollow cylindrical skeleton frame, a cutter carried by said frame, a motor mounted within said frame for rotating said frame and cutter, a hollow shell surrounding said frame and rotatable relative thereto, a material moving device connected to said shell, means carried by said frame for rotating said shell, means under the control of the operator for independently connecting said motor for causing said motor to rotate said frame about its axis and said shell about said frame independently of one another.

54. A coal cutting machine comprising a swinging enclosure having conveying means movable therewith and comprising an inlet opening having a platform and spaced-apart upright rigid walls terminating at the mine wall, of a core cutter mounted in position to cut a core in advance of the forward open end of said enclosure, and means for operating said core cutter to cut material for passage onto said platform between said spaced-apart side walls.

55. In a mining and loading machine, the combination with an arcuate chute comprising spaced-apart upright rigid walls mounted in position for receiving dislodged material directly from their positions in the mine wall, and means for cutting an arcuate core of material in the mine wall in arcuate alinement with said chute.

56. In a mining machine, a platform, a loop cutter carried by said platform and rotatable about an upright axis, a material moving device rotatable about the axis of said cutter and movable through the loop thereof, and means for rotating said loop cutter and material moving device independently of one another.

57. In a mining machine, the combination with a supporting frame, of core cutting mechanism having an unobstructed core opening therethrough and mounted on said supporting frame for rotation on an upright axis in position for cutting a core of material from an upright mine wall, and means comprising a separate device rotatable about said axis independently of the rotation of said core cutting mechanism and in position for moving the severed material from such mine wall.

58. In a mining machine, a loop cutter, means for rotating said cutter about an upright axis, to sever a section of material from its native bed, a material moving device independently rotatable about said axis to move said material from its severed position, and mechanism for directing the material so moved onto a transporting device.

59. In a mining machine, the combination with a supporting frame having a platform, of a conveyer having its forward receiving end at the rear portion of said platform, severing mechanism mounted on said platform for movement about an upright axis relatively thereto in position to sever material from its native bed, and independently

operable mechanism for moving the severed material from its severed position over said platform rearwardly to the forward receiving portion of said conveyer.

60. In a mining machine, the combination with cutting mechanism comprising mechanism for cutting an upright kerf spaced back from the face of an upright mine wall, an anti-friction device movable into the kerf thus formed, and means for moving the cut material along said anti-friction device away from its severed position.

61. In a mining machine, the combination with cutting mechanism comprising means for cutting a kerf in a mine wall, of an anti-friction device adapted to be interposed between the cut material and the unmined mass, and means for moving the cut material from the mine wall along said anti-friction device and along the cut surface of the unmined mass.

62. In a mining machine, a loop cutter movable about an upright axis, an apron secured to said cutter and movable into the kerf formed thereby, and a device movable independent of said cutter for forcing the material severed by said cutter along the surface of said apron away from its severed position.

63. In a mining machine, a platform, a cutter head mounted on said platform for rotation about an upright axis, a loop cutter carried by said cutter head, an apron secured to said cutter and movable therewith into the kerf formed thereby, means for moving the material severed by said cutter away from its severed position while in contact with said apron and onto said platform.

64. In a mining machine, a loop cutter, means for moving said cutter about an upright axis to form a kerf in the material to be mined, an apron having one end secured to said cutter and movable into the upright portion of the kerf formed thereby, a reel to which the other end of said apron is secured, means for driving said reel in either direction, and means for controlling said reel driving means independently of the movement of said cutter.

65. In a mining machine, a loop cutter movable about an upright axis to form a kerf in the material to be mined, an apron having one end thereof secured to said cutter for movement into said kerf, a reel to which the other end of said apron is secured, and a friction drive for operating said reel.

66. In a mining machine, a platform, a conveyer for transporting material from one side of said platform a cutter for severing material located at the other side of said platform, and mechanism operable independently of said cutter for forcing the material severed thereby over said platform onto said conveyer.

67. In a mining machine, the combination with a supporting frame comprising a platform having an arcuate forward edge adapted to be located adjacent an upright mine wall and abut against the same, of cutting mechanism mounted on said frame for arcuate movement on an upright axis, means for operating said cutting mechanism including arcuate feed thereof bodily relatively to said platform and along such arcuate edge thereof, a conveyer having its receiving end at the rear portion of said platform, and means for moving severed material directly from the mine wall over the forward arcuate edge of said platform and along the latter to the receiving end of said conveyer.

68. In a mining machine, a platform, an upright cylindrical cutter head secured to said platform, a loop cutter movable about the axis of said cutter head for severing material to be mined, a separate device movable about the axis of said cutter head independently of said loop cutter for moving the severed material onto and over said platform, a conveyer for receiving the severed material, and guides mounted on said platform for directing the severed material onto said conveyer.

69. In a mining machine, a platform, an upright cylindrical cutter head mounted on said platform, a cutter frame secured to said cutter head and rotatable therewith about an upright axis, a material moving device carried by said cutter head and rotatable thereon about said upright axis, said cutter frame and material moving device arranged to be swung into a position near the central longitudinal axis of said platform, plates hinged to the sides of said platform and foldable inwardly into inoperative position to decrease the width of said platform, and a guide pivoted on said platform and movable toward the central portion thereof into inoperative position.

70. In a mining machine, the combination with an enlongated main frame mounted on wheels adapted to run on a track and extending in a general horizontal direction to overhang a mine car on said track, of a supplemental elongated frame pivotally mounted on said main frame and confined to positions extending longitudinally of said main frame in alinement therewith in a general horizontal direction and along the track for transportation in low roof mine chambers, cutting mechanism carried by the forward end of said supplemental frame in position for operation on an upright mine wall, means for operating said cutting mechanism to cut material in such upright mine wall in advance of said sup-

plemental frame, and self-acting power actuated mechanism connected between said main and supplemental frames for tilting the supplemental frame to adjust the elevation of said cutting mechanism.

71. In a mining machine, the combination with a truck adapted to travel on a mine track, of a main frame mounted on said truck and extending rearwardly therefrom in position to overhang a mine car on the track, a supplemental frame mounted on said truck and extending forwardly therefrom along said mine track, a pivotal connection between said supplemental frame and said main frame in a relatively low position at the lower portion of said main frame, horizontally swinging cutting mechanism carried at the outer end of said supplemental frame for swinging feeding movement on a comparatively short radius, means for operating said cutting mechanism including such swinging movement, and self-acting power mechanism for swinging said supplemental frame on its pivotal connection with the main frame to adjust the elevation of said cutting mechanism while said supplemental frame extends in a general horizontal direction along said track longitudinally of said main frame.

72. In a mining machine, the combination with a truck, of a frame pivotally mounted thereon, horizontally rotatable cutting mechanism carried by the forward end of said frame, means connected between the truck and said frame for moving the latter on its pivoted connection to said truck to adjust the elevation of said cutting mechanism and to hold the latter at adjusted elevation, means for operating said cutting mechanism at its adjusted elevation, and brake mechanism on the truck to prevent movement thereof during the operation of said cutting mechanism.

73. In a mining machine, the combination with a truck having wheels adapted to run on a mine track, propelling mechanism connected to said wheels to move the truck along the track, an elongated main frame mounted on said truck to extend longitudinally of said track in position to overhang a mine car on said track, an elongated supplemental frame supported by said truck in alinement with said main frame longitudinally of said track and movable relatively to said main frame, travelling chain kerf cutting mechanism adapted for cutting kerfs in a coal face, said kerf cutting mechanism being mounted on the free end of said supplemental frame, means for operating said kerf cutting mechanism to cut coal in an upright mine wall in advance of said supplemental frame, a pivotal connection between said supplemental frame and said main frame in a relatively low position, and self-acting power actuated mechanism for moving said supplemental frame on its pivotal connection to said main frame to adjust the elevation of said kerf cutting mechanism while said supplemental frame is maintained in alinement with said main frame and while both of said frames remain extended in a general horizontal direction longitudinally of said mine track.

74. In a mining and loading machine, the combination with a main frame having a rearward extension adapted to overhang a mine car, of a supplemental frame having a platform, dislodging mechanism mounted at the free end of said supplemental frame, means for operating said dislodging mechanism to dislodge material from an upright mine wall in advance of said supplemental frame, endless conveyer mechanism extending rearwardly from a receiving position at the rear portion of said platform, means for moving said supplemental frame to adjust the elevation of said dislodging mechanism and of said platform without disturbing the continuity of said conveyer mechanism, and means mounted on the forward portion of said supplemental frame in position to move transversely of said platform and arcuately to transfer the dislodged material to the receiving end of said conveyer mechanism.

75. In a mining and loading machine, the combination with a wheel mounted elongated frame having a rearward extension adapted to overhang a mine car, of an elongated supplemental frame pivotally connected at its rear end to said main frame and confined to positions in alinement with said main frame, core-cutting mechanism mounted on the forward end of said supplemental frame, means for operating said core-cutting mechanism to cut material in an upright mine wall in advance of said supplemental frame, an endless conveyer extending from the forward portion of said supplemental frame rearwardly along the said main frame to the rear end of the latter, and means for tilting the supplemental frame relatively to said main frame to adjust the elevation of said core-cutting mechanism without interfering with the operation of said endless conveyer.

76. In a mining and loading machine, the combination with a supporting frame, of a narrow elongated supplemental frame pivotally connected to said supporting frame for up and down movement relatively thereto on a horizontal axis, core-cutting mechanism mounted on the outer end of said narrow elongated supplemental frame, means for operating said core-cutting mechanism including arcuate feeding movement thereof on an upright axis and in a general horizontal direction, an endless conveyer having

superposed portions traveling in opposite directions along said elongated supplemental frame, and means for effecting the transfer of cut material from an upright mine wall to the forward receiving end of said conveyer.

77. In a mining and loading machine, the combination with core cutting mechanism, a frame for supporting said core cutting mechanism in an upright plane, an apron conveyer having a carrying plane of operation transverse to the plane in which said core cutting mechanism is supported, and means for operating said core cutting mechanism and said conveyer.

78. In a mining and loading machine, the combination with a main frame, of a supplemental frame pivoted to said main frame for vertical adjustment, a loop chain core cutter mounted on said supplemental frame, means for moving said loop chain core cutter in an arc along the arcuate peripheral portion of said supplemental frame, a vertical sectional belt drawn into the back-kerf produced by said core cutter, means for exerting a pull on said belt to retract said core cutter to initial position, means independent of said core cutter but mounted on said supplemental frame for pushing the severed core of material while said pull is being exerted on said belt, a conveyer for receiving the material dislodged from the mine wall and moved back therefrom over said supplemental frame, means for guiding the material onto said conveyer, and means for moving said supplemental conveyer to adjust the vertical position of said core cutter and enable the latter to make a plurality of cuts across the mine wall, one above the other.

79. In a mining and loading machine, the combination with a truck frame having a rearward extension adapted to overhang a mine car on a track, of wheels for mounting said truck frame on said track, a forwardly extending supporting frame pivotally mounted on said truck frame intermediate its ends, core-cutting mechanism mounted on the forward end of said supporting frame, means for operating said core-cutting mechanism including the feed thereof in a general horizontal direction relatively to said supporting frame to cut a crescent-shaped core of material from an upright mine wall at the forward end of said supporting frame, and self-acting power mechanism connected between said truck frame and said supporting frame for tilting the latter on its pivotal connection to said truck frame to effect adjustment of the elevation of said core-cutting mechanism on a comparatively long radius.

80. In a mining and loading machine, the combination with a truck frame having a rearward extension at a fixed elevation and adapted to overhang a mine car, of wheels for mounting said frame on a mine track, a supporting frame pivotally connected at its rear end to said truck frame, said pivotal connection being in a relatively low position, means mounted on the forward end of said supporting frame for dislodging material from an upright mine wall, means carried wholly by said frames and located intermediate said pivotal connection and the outer end of said supporting frame for adjusting the elevation of said dislodging mechanism by tilting said supporting frame, and means for transferring the dislodged material from the mine wall to the rear end of said rearward extension.

81. In a mining and loading machine, the combination with a main frame having a rearward extension at a fixed elevation and adapted to overhang a mine car, of an auxiliary frame pivotally connected at its rear end to said main frame intermediate the ends of the latter, said pivotal connection being in a relatively low position on said main frame, dislodging mechanism mounted at the forward end of said auxiliary frame, means for operating said dislodging mechanism on an upright mine wall, means between said main frame and said auxiliary frame intermediate the ends of the latter to adjust the elevation of said dislodging mechanism while said main and auxiliary frames are maintained in substantial alinement with each other and both in a general horizontal direction, and means for transferring dislodged material from the mine wall in a general horizontal direction along said auxiliary frame and said main frame to such mine car.

82. In a mining and loading machine, the combination with an elongated main frame comprising a longitudinal chute, of a supplemental elongated frame pivotally connected at its rear end to said main frame and also comprising a longitudinal chute confined to positions extending longitudinally of said main frame with said chutes in alinement with each other and in overlapping relation with each other, dislodging mechanism mounted at the forward end of said supplemental frame for operation relatively to said supplemental frame, means applied to said supplemental frame intermediate the ends thereof to swing said supplemental frame vertically relatively to said main frame to adjust the elevation of said dislodging mechanism and the forward end of the chute of said supplemental frame, means for operating said dislodging mechanism, and mechanism for transferring the dislodged material along said chutes to the rear end of said main frame.

83. In a mining and loading machine, the combination with a main frame, of a pair of wheels at the forward portion of said

main frame and an additional pair of wheels intermediate the ends of said frame for mounting the latter on a mine track, an auxiliary frame pivotally mounted on said main frame adjacent a plane extending vertically through the axis of said intermediate wheels and confined to positions longitudinally in alinement with said main frame, mechanism located at the forward portion of said main frame and connected to said auxiliary frame intermediate the ends thereof for swinging said auxiliary frame up or down to adjust the elevation of the forward end thereof, dislodging mechanism mounted on the forward end of said auxiliary frame for operation relatively thereto, means for operating said dislodging mechanism to dislodge material from a mine wall onto the forward end of said auxiliary frame, and means for transferring the dislodged material longitudinally along said auxiliary frame to and along said main frame longitudinally of the track to a mine car on said track.

84. In a mining and loading machine, the combination with a supporting frame having a rearward extension adapted to overhang a mine car, of an endless conveyer mounted on said frame to travel longitudinally thereof, a tubular guideway on said frame for the under-run of said conveyer to hold the latter away from said mine car, and mechanism mounted forwardly of said frame in position for dislodging material from the mine wall onto the forward receiving end of said conveyer.

85. In a mining and loading machine, the combination with supporting framework comprising a rearward extension adapted to overhang a mine car, an endless conveyer extending longitudinally of said framework to the rear end of said extension, a cross plate for said rearward extension in position to guide and protect the underrun of said conveyer extending along said extension, and mechanism mounted on the forward end of said framework for dislodging material from an upright mine wall onto the forward end of said conveyer.

86. In a mining and loading machine, the combination with a main frame, of a supplemental frame pivoted to said main frame for up and down movement relatively thereto, an endless conveyer extending longitudinally of said main and supplemental frames, dislodging mechanism mounted on the forward end of said supplemental frame, and a spaced cross plate for guiding and protecting the lower run of said conveyer extending along said supplemental frame.

87. In a mining and loading machine, the combination with a main frame having a bottom portion, of an auxiliary frame pivotally mounted on said main frame for up and down movement relatively thereto and also having a bottom portion in position to form a continuation of the bottom portion of said main frame, an endless conveyer extending along said bottom portions of said main and auxiliary frames, a cross plate mounted on said main frame in spaced-apart relation to the bottom portion of said main frame to form a guideway and protector for the underrun of said conveyer extending along said main frame, a cross plate on said auxiliary frame mounted in spaced-apart relation to the bottom portion of said auxiliary frame to form a guideway and protector for the underrun of said conveyer extending along said auxiliary frame, mechanism for dislodging material from a mine wall onto the forward receiving end of said conveyer, means for tilting said auxiliary frame to adjust the elevation of said dislodging mechanism, and means associated with the axis of tilting movement of said auxiliary frame for operating said conveyer irrespective of the adjustment of elevation of said dislodging mechanism.

88. In a mining machine, the combination with a main frame comprising an elongated bottom plate extending longitudinally of said frame, of an auxiliary frame pivotally connected to said main frame and having an elongated bottom portion extending longitudinally thereof to form a continuation of the bottom plate of said main frame, a movable connection between the bottom portions of said main and auxiliary frames arranged to permit pivotal movement of said auxiliary frame relatively to said main frame without disturbing the continuity of said bottom portions, a single endless conveyer extending along said frames, means for mining material and transferring it to said conveyer, and means for adjusting the elevation of said mining means without disturbing the operativeness of said conveyer.

89. In a mining and loading machine, the combination with an elongated main frame having a guideway extending longitudinally thereof, of an auxiliary elongated frame pivotally connected to said main frame and having a guideway extending longitudinally thereof, dislodging mechanism mounted on the forward end of said auxiliary frame, conveyer mechanism mounted on said main and auxiliary frames to travel longitudinally thereof along said guideways, means for operating said dislodging mechanism to dislodge material from an upright mine wall onto the forward receiving end of said conveyer mechanism, means for moving said auxiliary frame to adjust the elevation of said dislodging mechanism, and a movable connection between said main and auxiliary frames to maintain the continuity of said guideways for said conveyer mechanism for the various adjustments in elevation of said dislodging mechanism.

90. In a mining machine, the combination with a supporting frame, of a narrow elongated supplemental frame pivotally mounted on said supporting frame for up and down adjustment relatively thereto, core-cutting mechanism having an unobstructed core-opening therethrough and mounted on said elongated supplemental frame for arcuate feeding movement on an upright axis, such core-cutting mechanism comprising a traveling cutter-chain, means for operating said core-cutting mechanism including arcuate feeding movement thereof on such upright axis in a general horizontal direction across the mine wall to cut a core of material in such mine wall, an endless conveyer having superposed portions traveling in opposite directions along said narrow elongated supplemental frame, and means for engaging the core material and moving the same onto the forward receiving end of said conveyer.

91. In a mining machine, the combination with a substantially horizontal platform, of a supplemental frame having an exterior cylindrical surface and mounted on said platform for arcuate movement relatively thereto about an upright axis, core cutting mechanism carried by said supplemental frame for movement therewith, said core cutting mechanism having an unobstructed core opening therethrough in position to permit said cylindrical surface to form an arcuate abutment as to the core cut by said cutting mechanism, and means for operating said core cutting mechanism including arcuate feeding movement thereof relatively to said platform to cut a core extending through said unobstructed core opening and with its lower surface approximately in the plane of the lower surface of said platform.

92. In a mining machine, the combination with core-cutting mechanism having an unobstructed core-opening therethrough, of a frame for supporting said core-cutting mechanism for arcuate feeding movement, a flexible anti-friction belt connected to the outer end of said core-cutting mechanism and movable therewith back of the core produced by said core-cutting mechanism, means for exerting a pull on said flexible belt to break off portions of said core before completely cut from the mine wall, means for operating said core-cutting mechanism to cut a core in its entirety from the mine wall, and core-moving mechanism mounted on said supporting frame in position to engage the completely cut core and move the same along said anti-friction device while the latter remains back of said core.

93. In a mining machine, the combination with a supporting frame, of core-cutting mechanism mounted thereon, of means for operating said core-cutting mechanism, a flexible belt connected to said core-cutting mechanism and movable therewith to extend back of the core cut thereby, and means mounted on said frame in position to engage the core and move the same along said belt while the latter occupies a position back of said core.

94. In a mining machine, the combination with a supporting frame comprising a platform, of core-cutting mechanism having an unobstructed core-opening therethrough and mounted on said frame for arcuate feeding movement on an upright axis, means for operating said core-cutting mechanism including arcuate feeding movement thereof relatively to said frame, a wide flexible anti-friction belt connected to the outer end of said core-cutting mechanism and movable into the mine wall back of the core, means for exerting a pull on the other end of said flexible belt to break off portions of said core, a radial plate mounted in upright position for arcuate movement on the said upright axis and through said unobstructed core-opening, and means for operating said upright plate to engage the core and move the same along said belt onto said platform away from the mine wall.

95. In a mining machine, the combination with a supporting frame comprising a platform, of a turntable gear fixed thereto, of a hollow drum frame pivoted to said supporting frame between the same and said fixed gear, an electric motor mounted within said hollow drum, core-cutting mechanism mounted on said drum and having an unobstructed core-opening therethrough, means comprising locking worm gearing between said motor and said fixed gear for rotating said drum on the upright axis of said fixed gear to effect arcuate feeding movement of said core-cutting mechanism, means connected between said motor and said core-cutting mechanism for actuating the latter, a sleeve journaled on said drum, a vertical plate connected to said sleeve to extend approximately radially therefrom for a path of movement along an arc and through said unobstructed core-opening, and means connected between said motor and said sleeve for rotating the latter and said plate on said drum while the latter is held stationary by said locking worm gearing.

96. In a mining and loading machine, the combination with a supporting frame comprising a platform, of conveyer mechanism extending rearwardly from said platform, core-cutting mechanism mounted for arcuate movement relatively to said platform on an upright axis, means for operating said core-cutting mechanism, means for moving the core from a mine wall along said platform to said conveyer mechanism, and guiding mechanism for directing the core onto said conveyer mechanism.

97. In a mining and loading machine, the

combination with a supporting frame, of a platform connected to the forward end of said frame, an endless conveyer mounted on said supporting frame and having superposed portions travelling in opposite directions to and from a receiving position at the rear portion of said platform, cutting apparatus mounted on said platform in advance of the receiving end of said conveyer for operation relatively to said platform, means for operating said cutting apparatus, and means for effecting the transfer of cut material from the mine wall over said platform onto the receiving end of said conveyer.

98. In a mining and loading machine, the combination with an elongated supporting frame, of a laterally spreading platform connected to the forward end of said frame and having an arcuate forward edge adapted to occupy a position closely adjacent the upright face of a mine wall, core-cutting mechanism mounted on said platform for arcuate feeding movement on an upright axis relatively to said platform, means for operating said core-cutting mechanism to cut a crescent-shaped core of material in the mine wall in a general horizontal direction adjacent said platform, and means for moving the core of material from its native position in the mine wall arcuately over said platform, and an endless conveyer having superposed portions traveling in opposite directions to and from a receiving position at the rear portion of said platform.

99. In a mining and loading machine, the combination with a main frame having a rearward extension adapted to overhang a mine car, of wheels for mounting said frame on a track, an elongated supplemental frame pivoted to said main frame intermediate the ends thereof for up and down movement relatively to said main frame, said main and supplemental frames each comprising elongated chutes confined to positions in alinement with each other, a laterally spreading platform connected to the forward end of said supplemental frame and having a forward arcuate edge adapted to occupy a position closely adjacent the upright face of a mine wall, an endless conveyer having superposed portions traveling in opposite directions and extending along the chutes of said main and supplemental frames, mechanism mounted on the forward portion of said main frame and connected to said supplemental frame intermediate its ends to tilt said supplemental frame up and down, mechanism for operating said endless conveyer comprising a driving sprocket on the axis of the pivot between said supplemental and main frames, loop chain core-cutting mechanism mounted on said platform for swinging feeding movement on an upright axis in a general horizontal direction across the mine wall in front of said platform, means for operating said core-cutting mechanism to cut a crescent-shaped core in a general horizontal direction with its lower surface approximately in the plane of the upper surface of said platform, a swinging arm in position to move through the unobstructed core-opening of said core-cutting mechanism, means for operating said arm to engage the core and move the same arcuately over said platform onto said conveyer, spaced-apart arcuate guides for directing the material onto said conveyer, an upright flexible belt connected to the outer end of said core-cutting mechanism and entering the mine wall back of the core, and means for exerting a pull on said belt while said core-cutting mechanism is held from retrograde movement by part of its operating mechanism.

100. In a mining and loading machine, the combination with supporting framework having a platform on the forward end thereof, of a conveyer extending longitudinally of said framework, a complete mining machine mounted on said platform for arcuate feeding movement relatively thereto, means for operating said mining machine including arcuate feeding thereof to dislodge material from a mine wall adjacent the forward end of said platform, and means for effecting transfer of the dislodged material over said platform onto said conveyer.

101. In a mining and loading machine, the combination with a rearward extending main frame, of a forward extending supplemental frame, a platform connected to the forward end of said supplemental frame, a complete mining machine mounted on said platform for arcuate movement relatively thereto on an upright axis, means for operating said mining machine to dislodge material from a mine wall adjacent said platform, means for adjusting the elevation of said platform together with said mining machine, conveyer mechanism extending from said platform longitudinally of said supplemental and main frames, and means for effecting the sliding of the dislodged material over said platform onto said conveyer.

102. In a mining and loading machine, the combination with supporting framework, of conveyer mechanism extending longitudinally thereof, a platform connected to the forward portion of said framework, core-cutting mechanism mounted on said framework for arcuate swinging movement on an upright axis and comprising a cylindrical frame, spaced-apart arcuate upright guides on said platform adjacent the receiving end of said conveyer mechanism, and means for moving the core over said platform along a portion of said cylindrical frame and between said guides onto said conveyer mechanism.

103. In mining and loading apparatus,

the combination with a supporting frame, of dislodging mechanism mounted on said frame, a platform connected to said frame in position to receive dislodged material, a lateral extension pivoted to said platform on a longitudinal axis, an upright guide plate pivoted to said frame for movement over said platform including said extension thereof, and an abutment for limiting the movement of said guide plate to approximately the lateral edge of said extension.

104. In a mining and loading machine, the combination with a receiver comprising spaced-apart upright walls adapted to fit closely to an upright arcuate mine wall, of core-cutting mechanism having an unobstructed core opening therethrough and mounted in position to cut coal in columns from the face of the vein for passage into said receiver directly from the mine wall, and an endless conveyer having superposed portions traveling in opposite directions for transferring dislodged material from said receiver toward loading position.

105. In a mining machine, the combination with a truck having a pair of supporting wheels located at the rear portion thereof, a second pair of supporting wheels located at the front portion thereof, said supporting wheels being in a position to be adapted to roll over the surfaces on which said mining machine is supported, of an auxiliary frame pivotally connected to said truck adjacent the axle of the rear pair of wheels for movement relatively to said truck in upright planes, and means connected between said truck and said auxiliary frame near the forward pair of wheels for swinging the auxiliary frame vertically relatively to said truck and on its pivotal connection thereto.

106. In a mining machine, the combination with a truck having a forward pair of wheels and a rear pair of wheels for travel on a mine track, of a truck frame on said truck, an auxiliary frame pivotally connected to said truck frame in a relatively low position adjacent the axle of the rear pair of wheels, and means connected between said truck frame and said auxiliary frame adjacent the forward pair of wheels to swing said auxiliary frame relatively to said truck frame in upright planes.

107. In a mining machine, the combination with a frame having a platform, of an upright plate mounted on said frame to extend out beyond the forward end of said platform for movement in an arc about an upright axis in position to engage dislodged material in advance of said platform, and mechanism for operating said arcuately movable means to engage dislodged material in advance of said platform and move such material arcuately onto said platform.

108. In a mining machine, the combination with a supporting frame, of an antifriction device adapted to be inserted into a kerf in a mine wall between cut material and the unmined mass, means for exerting a pull on said device to dislodge the cut material, and means for moving the cut material from the mine wall along said antifriction device and along the cut surface of the unmined mass.

109. In a mining machine, the combination with a supporting frame having a curved forward edge adapted to engage the curved face of a mine wall adjacent a previously cut crescent-shaped core of material, an upright plate mounted on said frame for arcuate movement on an upright axis beyond said forward curved edge along the space occupied by such crescent-shaped core of material, and means for operating said plate by moving the same on such upright axis to dislodge the cut material from the mine wall and transfer the same rearwardly along such frame.

110. In a mining machine, the combination with a supporting frame having a platform with its forward edge corresponding in contour to the upright curved face of a mine wall, said forward curved edge of said platform being adapted to be located adjacent a previously cut crescent-shaped core of material, of an upright pushing plate mounted on said platform for arcuate movement on an upright axis in advance of the forward edge of said platform and along the space occupied by said core, and means for swinging said pushing plate on such upright axis and along such space to move the core material from the mine wall onto said platform and along the same toward the rear portion of said frame.

111. In a mining machine, the combination with a supporting frame, of a platform on the forward end thereof, an upright pushing plate mounted on said platform for arcuate movement relatively thereto on an upright axis, a chute extending from said platform toward the rear portion of said frame, and means for operating said push plate by swinging the same on said upright axis along the space occupied by a previously cut core of material to dislodge the said material from the mine wall onto said platform and transfer such material along said chute toward the rear portion of said frame.

112. In a mining machine, the combination with an elongated main frame, of a supplemental elongated frame pivotally connected to said main frame on a transverse axis, a platform at the forward end of said supplemental frame, a swinging push plate mounted on said platform, a chute extending from said platform along said supplemental and main frames to loading position, means for operating said push plate

by swinging the same along a space occupied by a crescent-shaped core of material to dislodge such material from the mine wall onto said platform and move the same along said platform into said chute, and conveyer mechanism for transferring such material along said supplemental and main frames to loading position at the rear end of said main frame.

113. In a mining machine, the combination with supporting framework, of an upright push plate mounted on the forward portion of said framework for arcuate movement on an upright axis, means for adjusting the elevation of said push plate, means for operating said push plate by moving the same arcuately along the space occupied by a previously cut crescent-shaped core of material to dislodge such material from the mine wall and move the same along said framework toward the rear portion therof.

114. In a mining machine, the combination with an elongated main frame, of a supplemental elongated frame pivotally connected at its rear portion to said main frame to permit adjustment in elevation of the forward portion of said supplemental frame, means for swinging said supplemental frame on its pivotal connection with said main frame to adjust the elevation of the forward portion of said supplemental frame, a platform on the forward end of said supplemental frame, an upright push plate mounted on said platform for arcuate movement on an upright axis, means for operating said push plate at its adjusted elevation to move along the space occupied by a previously cut core of material to dislodge such material from the mine wall onto said platform and transfer such material toward the rear portion of said platform, and a single endless conveyer having superposed portions travelling in opposite directions from a receiving position at the rear portion of said platform and at the forward end of said supplemental frame to loading position at the rear end of said main frame.

115. In a mining machine, the combination with a supporting frame, of cutting apparatus having a predetermined path of travel in a general horizontal direction across the mine wall relatively to said supporting frame, means for operating said cutting apparatus to completely cut out from the mine wall a body of rigid material from a predetermined space, a material-moving device mounted on said supporting frame in radial position to have an arcuate path of travel in a general horizontal direction along substantially the entire space occupied by the completely cut-out material, and means for operating said material-moving device to engage the cut material by movement along such space to move the cut material from the mine wall.

116. In a mining machine, the combination with a supporting frame, of core-cutting mechanism having an unobstructed core-opening therethrough and mounted on said frame for arcuate feeding movement relatively thereto on an upright axis, means for operating said core-cutting mechanism including feeding movement thereof on such upright axis to cut a core in a mine wall, a material-moving device mounted on said frame in position to extend transversely of the path of said core-cutting mechanism to abut against one end of said core, and means for operating said material-moving device to engage one end of said core and push the latter to slide the same from its native position in the mine wall.

117. In a mining machine, the combination with a wheel-supported main frame adapted to travel on a mine track, of cutting apparatus having a predetermined path of travel in a general horizontal direction across the mine wall in advance of the track, means for operating said cutting apparatus to completely cut out from the mine wall a body of material from a predetermined space, an upright pushing plate mounted on said main frame in position to have a path of travel in a generally horizontal direction along substantially the entire space occupied by the completely cut out material, and means for operating said upright plate to engage the cut material by movement along such space to move the cut material from the mine wall.

118. In a mining machine, the combination with a wheel-supported main frame adapted to travel on a mine track, of a supplemental frame pivoted to said main frame for movement up and down relatively thereto, core cutting mechanism having an unobstructed core opening therethrough and mounted on the forward end of said supplemental frame for arcuate feeding movement relatively thereto on an upright axis, means for operating said core cutting mechanism including feeding movement thereof on such upright axis to cut a core in a mine wall in advance of said mine track, a material-moving device mounted on said supplemental frame to swing on an upright axis in position to abut against one end of said core, means for operating said material-moving device to engage one end of said core and push the latter to slide the same from its native position in the mine wall on to said supplemental frame, and loading apparatus extending rearwardly from the front portion of said supplemental frame to the rear end of said main frame for transferring the core material to a mine car on the mine track at the rear of said main frame.

119. In a mining and loading machine, the combination with a main supporting

frame mounted on a truck adapted to travel on a mine track, of an elongated supplemental frame pivotally connected at its rear end to said main frame for entire support thereby, dislodging mechanism mounted on the forward end of said elongated supplemental frame for entire support thereby, means on said main frame for adjusting the elevation of the forward end of said supplemental frame to effect adjustment in elevation of said dislodging mechanism, loading apparatus mounted on said main and supplemental frames for receiving material from said dislodging mechanism and transferring such dislodged material toward loading position at the rear end of said main frame, and means for propelling said main frame along said track to move the entire machine including the elongated supplemental frame and said dislodging mechanism to new locations with the dislodging mechanism adapted to occupy many operating positions beyond the forward end of said mine track.

120. In a mining and loading machine, the combination with a truck frame having wheels adapted to travel on a mine track, said frame having a rearward extension adapted to overhang a mine car, of a supplemental frame pivotally connected at its rear end to said truck frame, means mounted on the forward end of said supplemental frame for dislodging material from an upright mine wall, means carried wholly by said truck frame and said supplemental frame and located intermediate said pivotal connection and the outer end of said supplemental frame for adjusting the elevation of said dislodging means by tilting said supplemental frame while the mining and loading machine including the said supplemental frame and the dislodging means carried thereby remains free for movement along said mine track, and means for transferring dislodged material from the mine wall to the rear end of said rearward extension.

121. In a mining and loading machine, the combination with a supporting frame having a rearward extension adapted to overhang a mine car, of an endless conveyer mounted on said frame to travel longitudinally thereof, a guideway on said frame for the under run of said conveyer to hold the latter away from said mine car, and core-cutting mechanism mounted forwardly of said frame in position for dislodging material from the mine wall onto the forward receiving end of said conveyer for transfer to the mine car.

122. In a mining and loading machine, the combination with supporting framework comprising a rearward extension adapted to overhang a mine car, of an endless conveyer extending longitudinally of said framework to the rear end of said extension, means on said rearward extension in position to guide and protect the under run of said conveyer extending along said extension, and automatic mechanism mounted on the forward end of said framework for dislodging material from an upright mine wall onto the forward end of said conveyer for automatic transfer by the latter to the mine car.

123. In a mining and loading machine, the combination with a main frame, of a supplemental frame pivoted thereto for up and down movement relatively thereto, an endless conveyer extending longitudinally of said main and supplemental frames, dislodging mechanism mounted on the forward end of said supplemental frame in position to automatically dislodge material from the mine wall for automatic and direct transfer to said supplemental frame and to said endless conveyer for transfer toward loading position, and means for guiding and protecting the lower run of the conveyer extending along the supplemental frame.

124. In a mining machine, the combination with a main frame, of a supplemental frame movable relatively thereto and adapted to engage one end of a block of material, a chute separate from said supplemental frame and mounted with its receiving end approximately midway between the floor and roof of a mine chamber, means for moving said supplemental frame to force said block of material into the receiving end of said chute, and means for adjusting the position of said supplemental frame in an arc to enable blocks of material to be moved into said chute from various elevations.

125. In combination, a mining machine bodily rotatable about an upright axis, a loop cutter secured to said mining machine and extending radially therefrom, and a table extending radially from said mining machine in the plane of the lower portion of said loop cutter for receiving material severed by said cutter.

126. In a mining machine, the combination with a supporting frame, of means for pivotally supporting said frame at the rear end thereof on a substantially horizontal axis for enabling the forward end of said frame to be tilted up and down, core-cutting mechanism having an unobstructed core-opening therethrough and mounted on the forward end of said frame to swing relatively thereto on an upright axis, means for operating said core-cutting mechanism including arcuate feed thereof relatively to said supporting frame and about said upright axis, and self-acting power apparatus for tilting the supporting frame on its rear horizontal axis to adjust the elevation of said core-cutting mechanism.

127. In a mining machine, the combination with a frame, of a loop chain core-cut-

ter mounted on said frame and having an unobstructed core-opening therethrough, a receiving platform, means for operating said core-cutter, a flight movable along said platform, and means for operating said flight to eject material from said platform.

128. In a mining machine, a cutter, a flexible member, means for moving said member into the kerf formed by said cutter, a follower for forcing the material severed by said cutter away from its native position, and means for moving said follower and flexible member together while in contact with the severed material.

129. In a mining machine, a cutter, means for moving said cutter to sever a section of material from a mine vein, a flexible apron, means for moving said apron into the kerf formed by said cutter, a follower for moving the material severed by said cutter away from its native position, and means for moving said apron and follower together to remove said material.

130. In a mining machine, the combination with a supporting frame, of kerf-cutting mechanism, means for operating said kerf-cutting mechanism, a supplemental frame comprising an enclosure for said operating means having a cylindrical exterior, means for moving said supplemental frame together with said kerf-cutting mechanism in an arc on a pivot on said supporting frame, and means associated with said exterior cylindrical surface of said supplemental frame for acting on the cut material to move it from its cut position.

131. In a mining machine, the combination with a supporting frame, of core-cutting mechanism having an unobstructed core-opening therethrough, means for operating said core-cutting mechanism, a supplemental frame comprising a cylindrical enclosure for said operating means, said supplemental frame being mounted for arcuate movement with said core-cutting mechanism on an upright axis on said supporting frame, and means for moving said supplemental frame together with said core-cutting mechanism and said operating means on said upright axis to effect arcuate feed of said core-cutting mechanism.

132. In a mining machine, the combination with a supporting frame, of cutting mechanism mounted thereon, means for operating said cutting mechanism, a cylindrical abutment for the cut material, said abutment being mounted on said frame adjacent said cutting mechanism, and means for rotating said abutment relatively to said frame and independently of said operating means.

133. In a mining machine, the combination with a loop chain core-cutter, of means for operating the same, a cylindrical abutment interlooping said core-cutter and mounted for movement independently of said core-cutter, and means for positively moving said abutment.

134. In a mining machine, the combination with cutting mechanism, of means for operating the same, a guard for said operating means, a contact cylinder rotatably mounted on said guard for movement independently thereof, and means for actuating said contact cylinder to engage cut material and move the same out of its native position.

135. In a mining machine, the combination with core-cutting mechanism comprising a cutterhead mounted to swing on an upright axis, of means for operating said core-cutting mechanism, a cylinder rotatably mounted on said cutterhead, a radial contact member mounted on said cylinder in position to engage one end of the core cut by said cutting mechanism, and means for rotating said cylinder to cause said contact member to force said core out of its native position.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this first day of December, A. D. 1915.

EDMUND C. MORGAN.

Witnesses:
A. J. CRANE.
CHARLES H. SEEM.