No. 770,286. PATENTED SEPT. 20, 1904.

W. E. HAMILTON.

MINING MACHINE.

APPLICATION FILED AUG. 14, 1903.

NO MODEL. 5 SHEETS—SHEET 1.

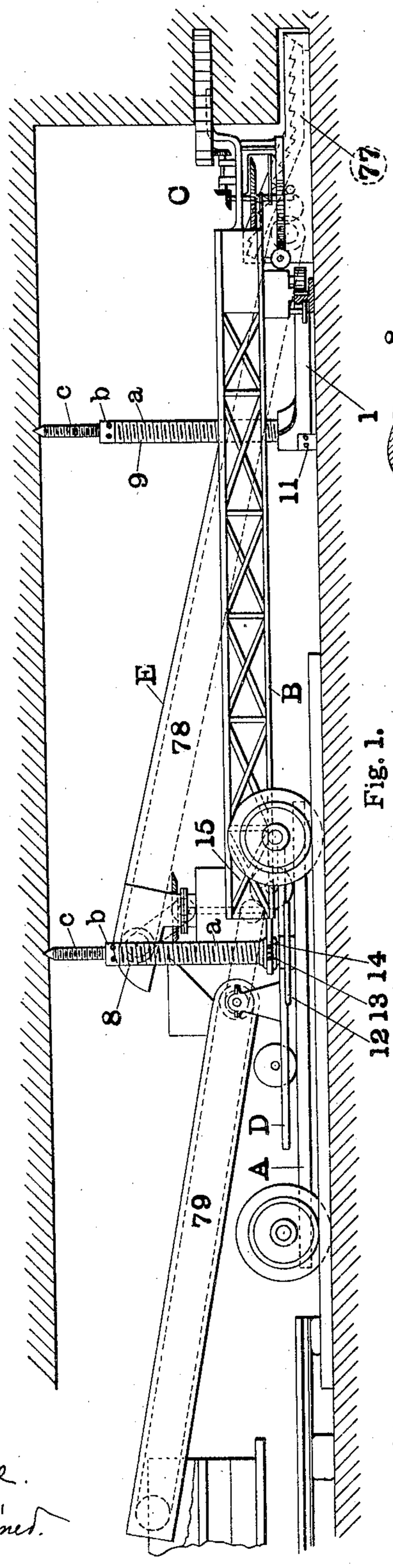

Fig. 1.

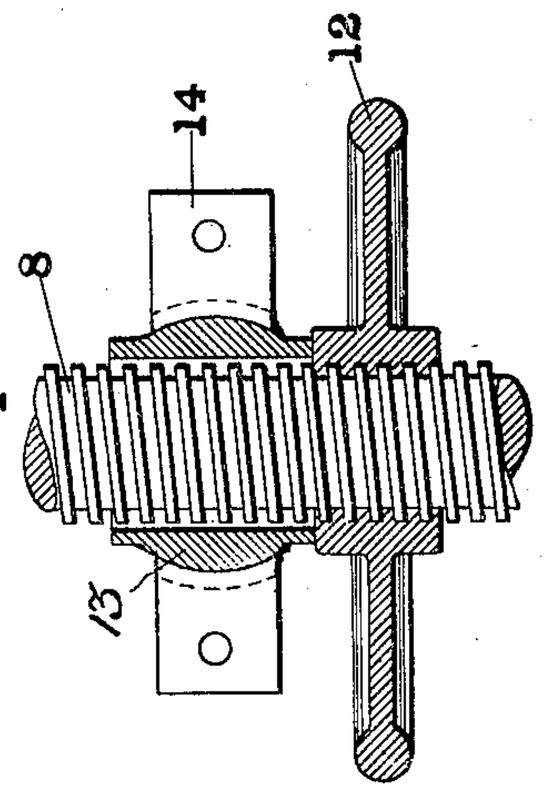

Fig. 14.

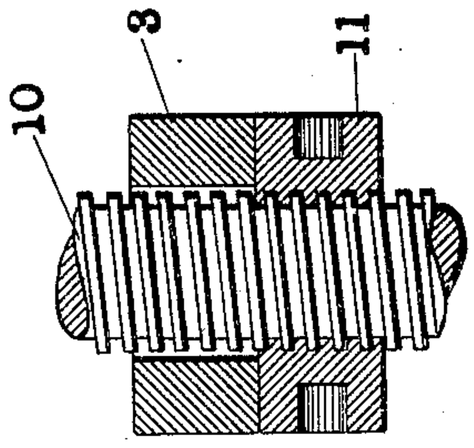

Fig. 15.

Witnesses:-
G. Braune.
Fred F. Reisner.

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Attorneys.

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NO MODEL. 5 SHEETS—SHEET 2.

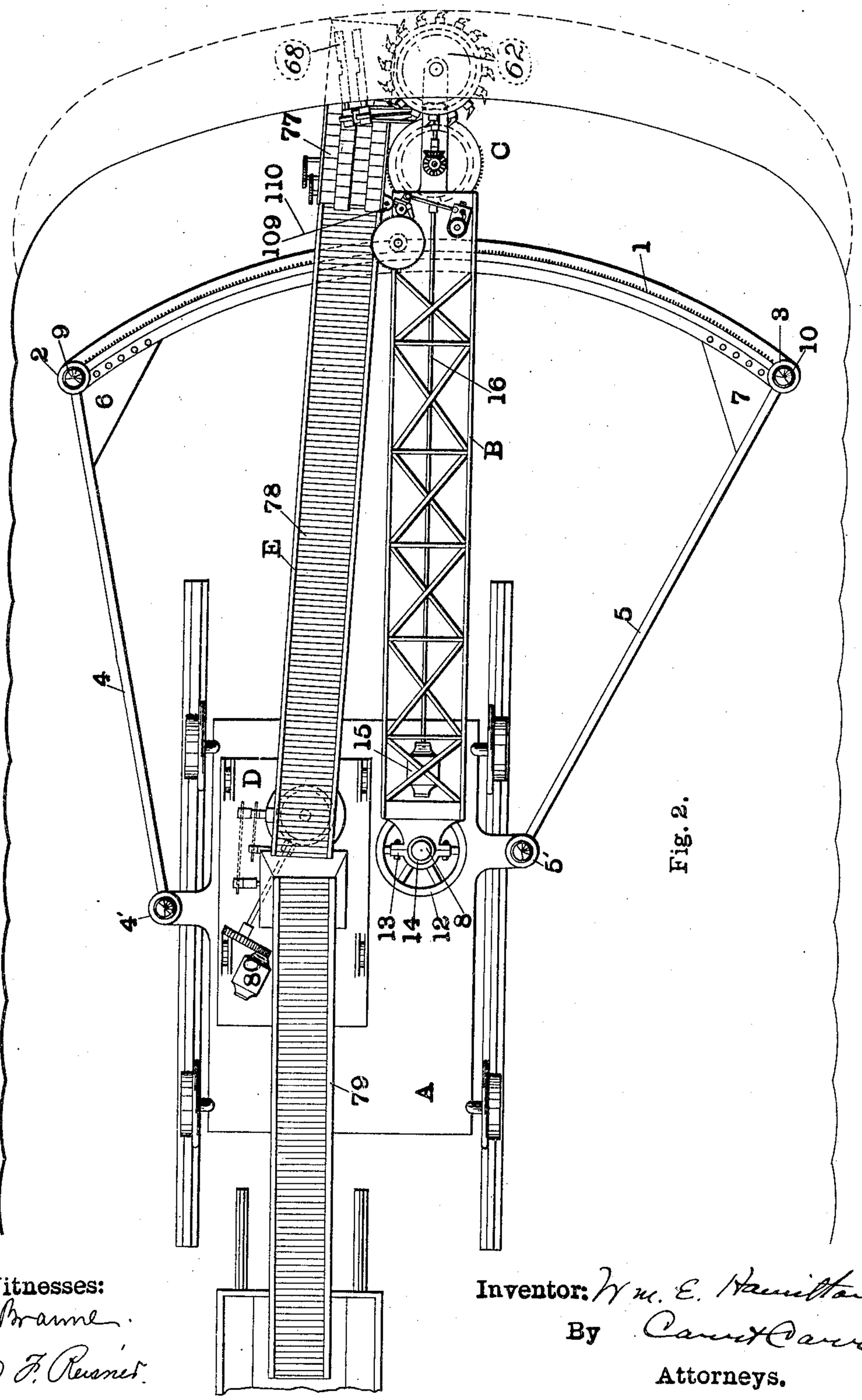

Fig. 2.

Witnesses:
G. Brame.
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NO MODEL. 5 SHEETS—SHEET 3.

Fig. 4.

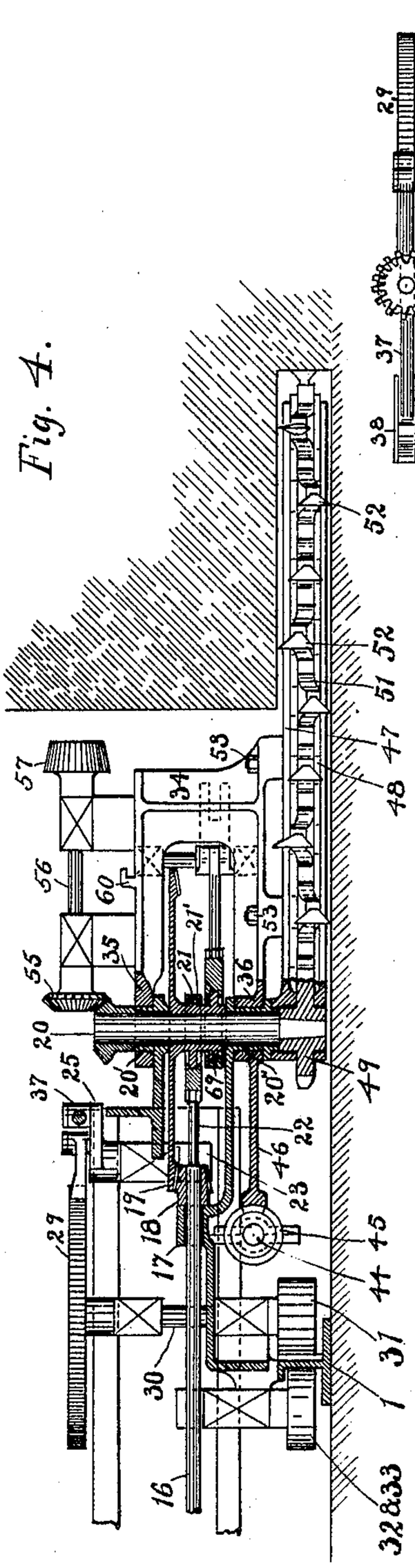


Fig. 5.

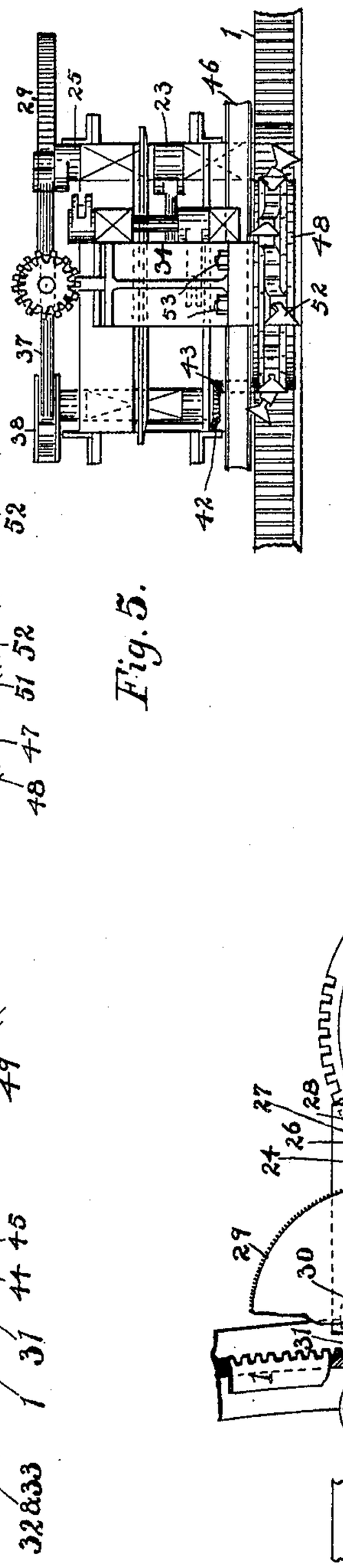
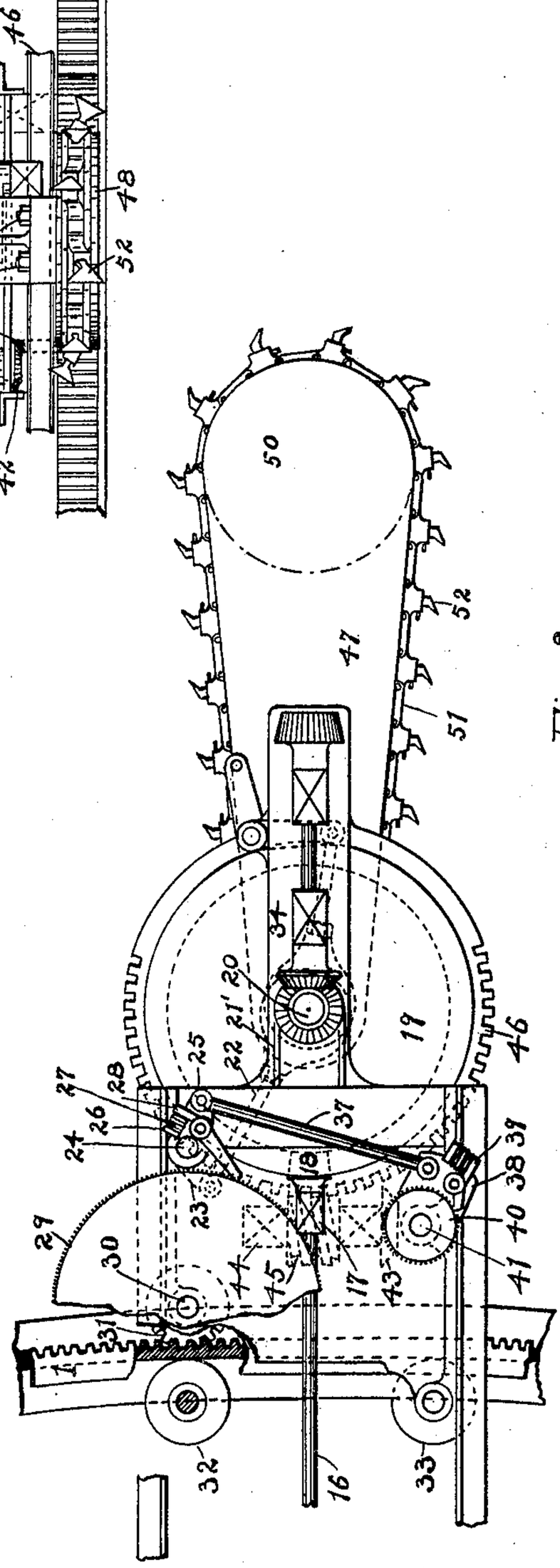


Fig. 3.



WITNESSES:

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NO MODEL. 5 SHEETS—SHEET 4.

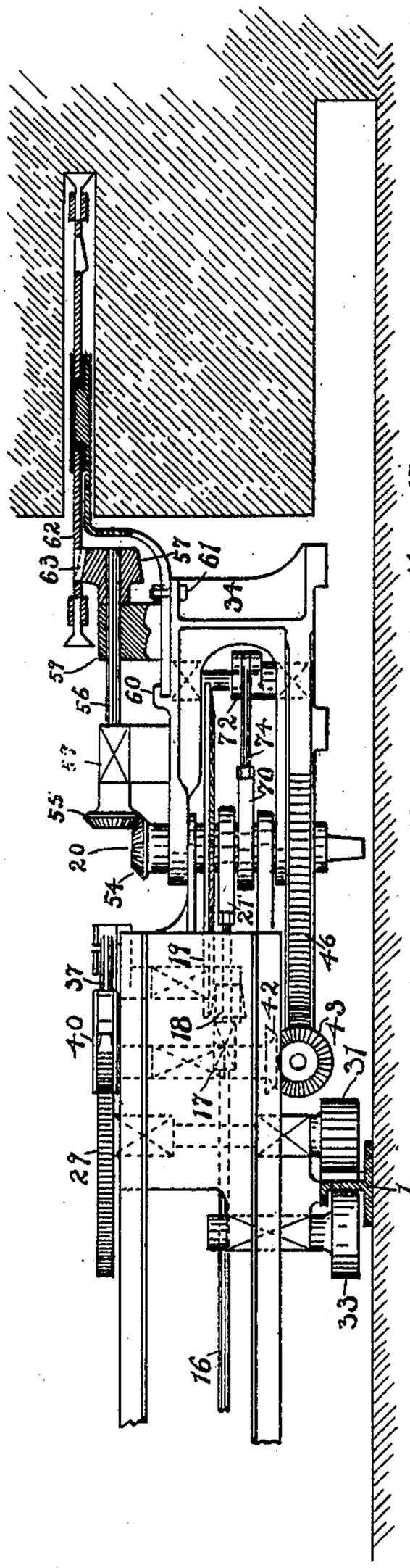

Fig. 7.

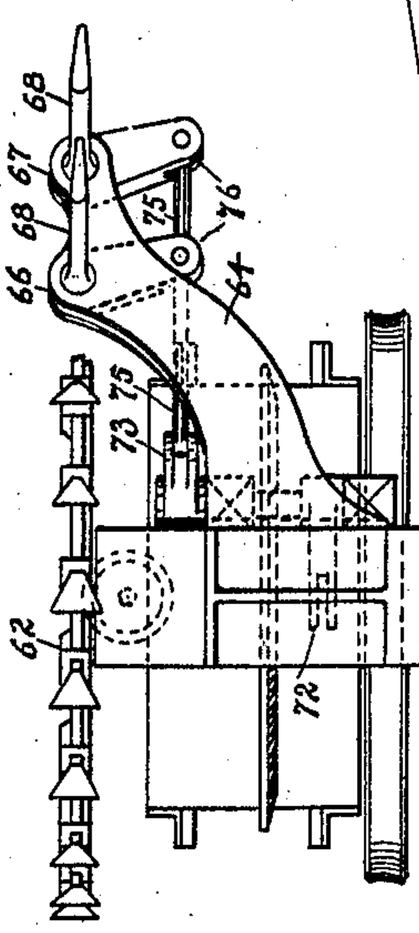

Fig. 8.

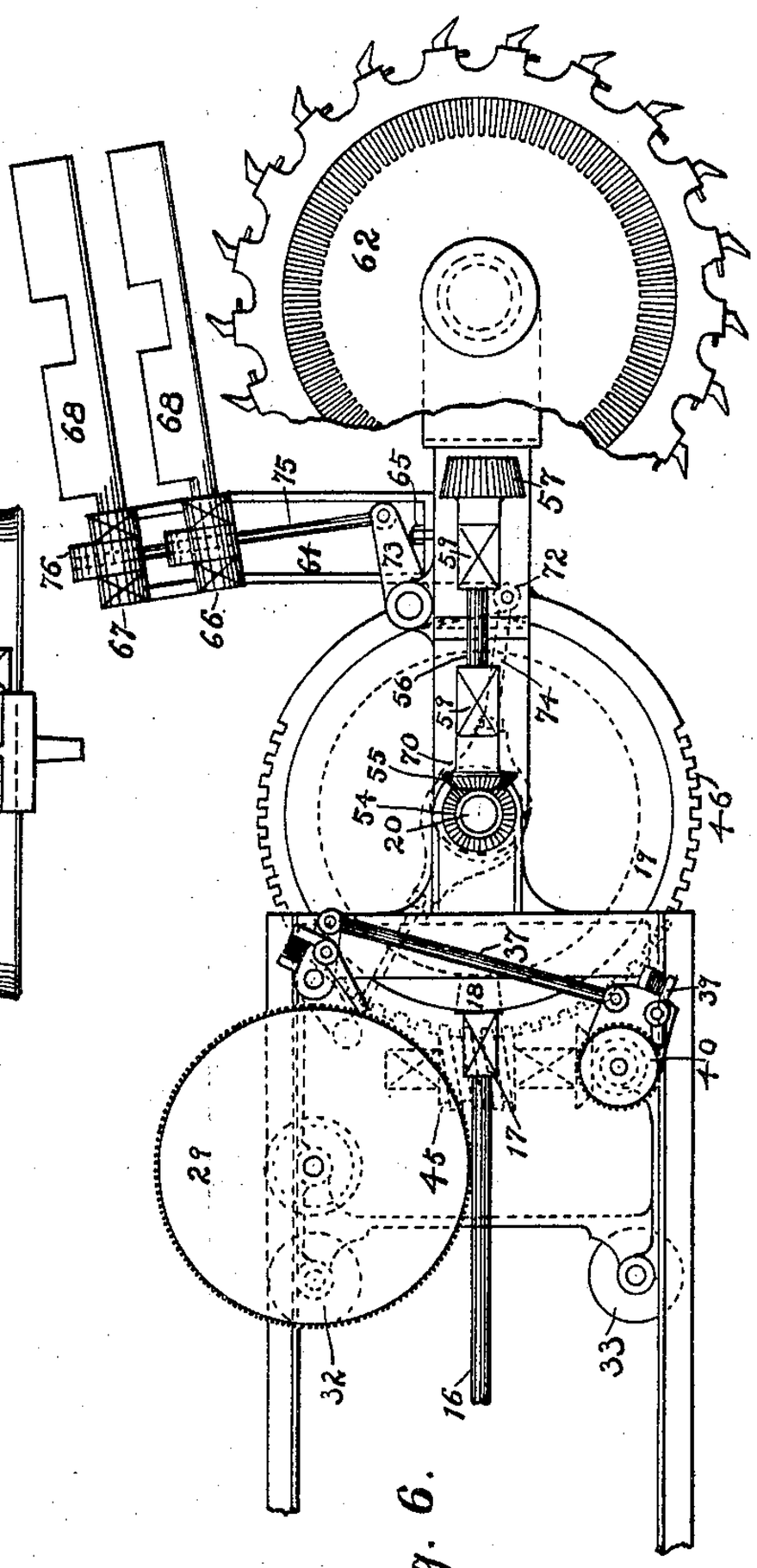

Fig. 6.

WITNESSES:

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MINING MACHINE.

APPLICATION FILED AUG. 14, 1903.

NO MODEL. 5 SHEETS—SHEET 5.

Fig. 9.

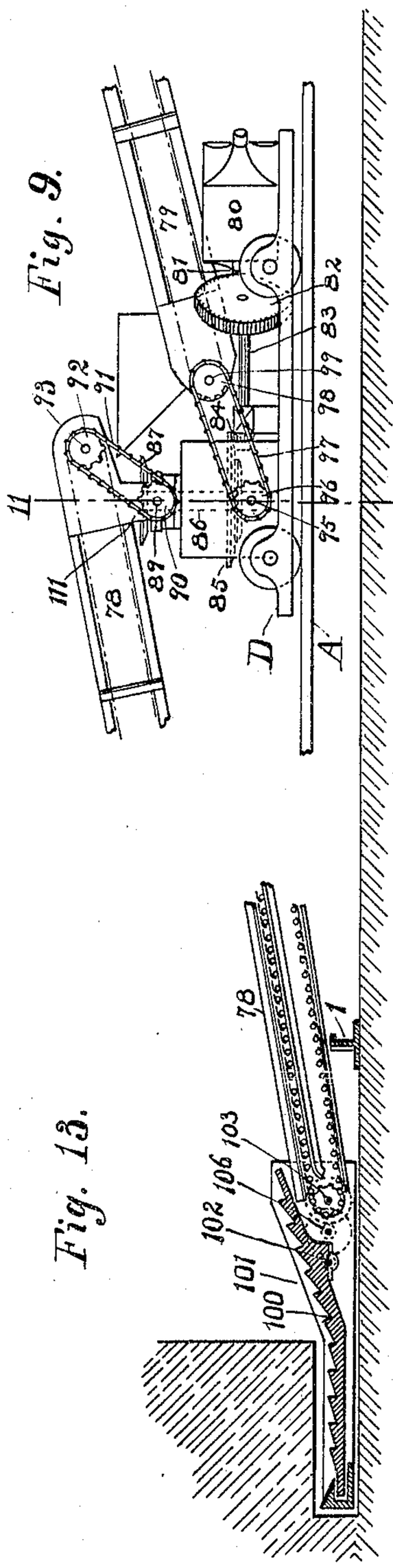

Fig. 10.

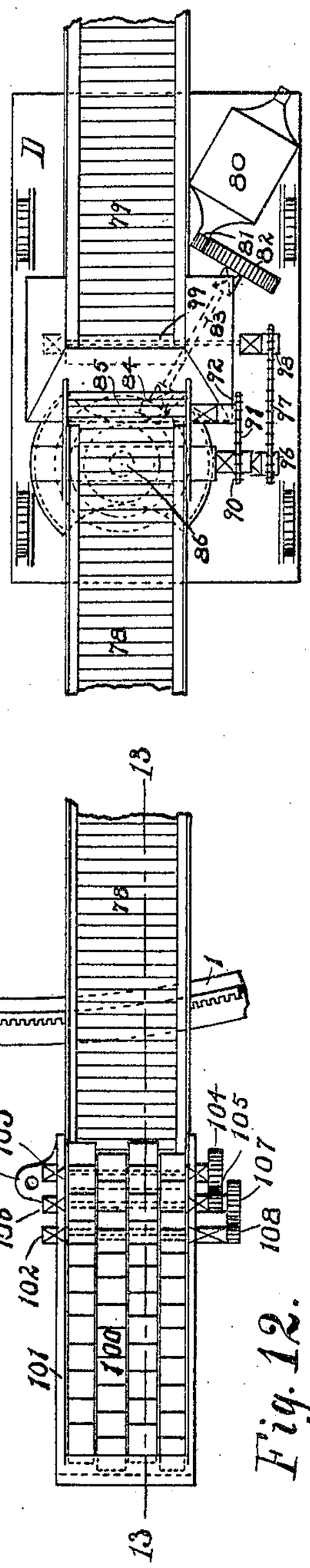

Fig. 11.

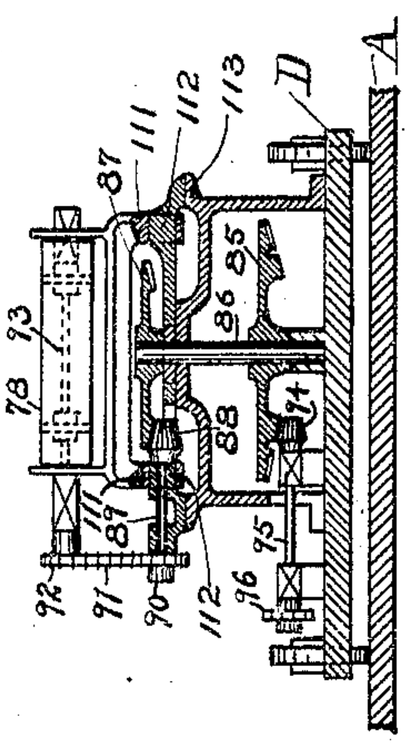

Fig. 13.

Fig. 12.

WITNESSES:

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Charles H. Potter.

INVENTOR.

William E. Hamilton

No. 770,286. Patented September 20, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM E. HAMILTON, OF ZANESVILLE, OHIO.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 770,286, dated September 20, 1904.

Application filed August 14, 1903. Serial No. 169,445. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. HAMILTON, a citizen of the United States, and a resident of the city of Zanesville, county of Muskingum, and State of Ohio, have invented certain new and useful Improvements in Mining-Machines, of which the following is a specification.

My invention relates to mining machinery, and especially coal-mining machinery; and its principal objects are to dislodge the material being mined by mechanical means and without the use of explosives, to dislodge and load the material, and other objects hereinafter more fully appearing.

My invention consists principally in means for making parallel cuts across the face of the chamber, in means following the cutting means to break down the section severed, and in loading means in position to receive the material broken down and to convey it away; and it further consists in the parts and in the arrangements and combinations of parts hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, and wherein like symbols refer to like parts wherever they occur, Figure 1 is a sectional view of a chamber of a coal-mine, showing an elevation of my improved mining-machine in position, the undercutting mechanism being removed and the feed-rack being shown in section. Fig. 2 is a plan view of the machine shown in Fig. 1. Fig. 3 is a plan view of the head of the frame with the undercutting mechanism in position and the overcutting mechanism and parts cooperating therewith removed. Fig. 4 is a view of the parts shown in Fig. 3, partly in longitudinal section. Fig. 5 is an end view of the parts shown in Figs. 3 and 4. Fig. 6 is a plan view of the head of the frame with the overcutting mechanism and the breaking mechanism in position, the undercutting mechanism being removed. Fig. 7 is a side elevation of the parts shown in Fig. 6, except the cutter-head and a portion of the gearing therefor, which are shown in section. Fig. 8 is an end view of the parts shown in Figs. 6 and 7. Fig. 9 is a side elevation of the conveyer-truck and the parts mounted thereon. Fig. 10 is a plan view of the parts shown in Fig. 9. Fig. 11 is a transverse sectional view on the line 11 11 of Fig. 9. Fig. 12 is a plan view of the initial conveyer of the loading mechanism, and Fig. 13 is a longitudinal sectional view on the line 13 13 of Fig. 12. Fig. 14 is a sectional view through the bearing of the radial frame upon its anchor-column. Fig. 15 is a sectional view through the eye of the arcuate feed-rack.

In the arrangement shown in Figs. 1 and 2 a truck A carries the radial frame B of the dislodging mechanism C. A second truck D is mounted on the first truck A and carries the loading mechanism E. The forward end of the loading mechanism is connected to the radial frame B in position to coöperate with the dislodging mechanism.

Upon the floor of the chamber is placed an arcuate feed-rack 1, having its center of curvature at the pivot-point of the radial frame B on the truck. The feed-rack 1 terminates at either end in eyes 2 3, vertically offset from the main portion of the feed-rack. It is connected to the truck A by ties 4 5, which are rigidly connected to the said feed-rack by means of stay-plates 6 and 7 and are secured to the truck A by means of screw-columns 4′ 5′, with which eyes on the ties loosely engage and are supported by nuts. This feed-rack supports and guides the forward end of the frame B.

The machine is rigidly fixed in position by means of extensible anchor-columns 8, 9, and 10, passing through the truck A and the eyes at the ends of the feed-rack, respectively, and which are jammed between the roof and floor of the chamber. Each column consists of a lower section *a*, which is externally screw-threaded, at least for a portion of its length, and rests upon the floor. This section is hollow, at least at its upper portion, and carries a nut *b*, which engages with an upper screw-threaded section *c*. By rotation of the nut *b* the upper section *c* may be raised and the columns jammed between the floor and roof of the chamber, thus firmly anchoring the machine in position. The screw-threaded exterior of the lower section *a* of each of the anchor-columns for the feed-rack is engaged

by a screw-block 11, which engages the lower side of the eyes 2 3. By rotation of the screw-blocks 11 and the nuts on the screw-columns 4′ 5′, described above, the feed-rack and its ties may be vertically adjusted. The screw-threaded exterior of the lower section *a* of the anchor-column for the truck is engaged by a hand-wheel 12. Resting upon the hand-wheel is a loose sleeve 13, upon which the rear end of the radial frame is pivoted. By the rotation of the hand-wheel the rear end of the radial frame may be vertically adjusted. It will thus be seen that means are provided for vertically adjusting the entire dislodging mechanism carried by the radial frame, the rear end of the latter being carried up with the sleeve 13, and the forward end being carried up with the feed-rack 1. The rear end of the radial frame terminates, preferably, in a separable bearing 14, which is spherically concave. The sleeve 13, on the anchor-column 8, is spherically convex. The radial frame is thus preferably mounted upon a universal joint.

Upon the rear end of the radial frame B a motor 15 of any desired form is mounted. Extending longitudinally of the radial frame is a main shaft 16, suitably connected at its rear end to the motor and journaled at its forward end in a horizontal bearing 17. A bevel-gear 18 is fixed upon the outer end of the main shaft beyond the bearing 17. The bevel-gear 18 engages with and drives a bevel-gear 19, fixed upon and intermediate of the bearings of a vertical shaft 20, journaled in bearings 20′ 20″ in the radial frame. The shaft 20 is hereinafter called the "head-shaft." Through these parts the power from the motor 15 is transmitted to the mechanism for propelling the radial frame, for oscillating the rotatable frame, for driving the undercutting mechanism and the dislodging mechanism, all hereinafter described.

The means for propelling the radial frame will now be described. The hub of the bevel-gear 19 has fixed thereon eccentrics 21 69, preferably integral. An eccentric-strap 21′ engages the eccentric 21 and is connected by a connecting-rod 22 to the lower arm 23 of a bell-crank lever. This bell-crank lever has arms 23 and 25 in different horizontal planes connected by a long pivot 24, journaled in the radial frame. The upper arm 25 bears a pawl 28, pivotally mounted thereon and which is held to its work by a spring 27, bearing upon one arm of the pawl and a lug 26 on the arm 25. The pawl 28 operates upon a ratchet-wheel 29, fixed upon a vertical shaft 30, journaled in vertical bearings in the radial frame. Upon the lower end of the vertical shaft 30 is fixed a feed-gear 31, which meshes with the feed-rack 1. Rollers 32 33, also journaled on the radial frame, engage the rear side of the feed-rack and hold the feed-pinion in engagement therewith. By this mechanism a step-by-step movement is given to the forward end of the radial frame, so that it rotates on its bearing at its rear end and describes the sector of a circle subtended by the arcuate feed-rack. The mechanism mounted on the forward end of the frame is thus carried from one side of the room to the other. In the present machine no means for returning the mechanism to the initial position are shown, and it is to be manually returned to the initial position for the beginning of the next sweep across the room. Obviously, however, many feed mechanisms are capable of being applied to propel the mechanism in both directions across the room. For example, feed mechanisms described in my copending application filed on October 20, 1903, Serial No. 177,750, may be applied for this purpose.

The dislodging mechanism is mounted upon a rotatable frame, which will now be described, together with the means for rotating it. The rotatable frame 34 is substantially U-shaped in side elevation, as shown in Figs. 4 and 7, and has two bearings 35 36, which engage and turn upon the exterior of the bearings 20′ 20″ on the forward end of the radial frame. The lower branch of the rotatable frame carries a worm-wheel 46, which is preferably integral therewith and which is driven by the following means: A link 37 is pivotally connected at one end to the upper arm 25 of the bell-crank lever described above and at the other end to an arm 38, which is journaled on a vertical shaft 41, journaled in the radial frame. The arm 38 carries a spring-pressed pawl 39, which actuates a ratchet-wheel 40, fixed upon the upper end of a vertical shaft 41. At the lower end of the vertical shaft 41 there is fixed a bevel-gear 42, which meshes with the bevel-gear 43, fixed upon one end of a horizontal shaft 44, journaled on the radial frame. Fixed upon the opposite end of the horizontal shaft 44 is a worm 45, which meshes with the worm-wheel 46 upon the rotatable frame. By means of this mechanism step-by-step movement is given to the rotatable frame, so that it rotates on its bearings. This movement is desirable at the beginning and end of the sweep of the radial frame—at the beginning so that the cutter can gradually cut its way into the face of the wall to the desired depth after the machine has been positioned for the cut; at the end, so that the cutter can cut its way out without having to run the machine back. It also enables the machine to make a wider cut than would otherwise be possible.

The feeding of the radial frame and the rotatable frame occurs alternately, the pawls 28 and 39 being arranged to be manually thrown out of operation. When the radial frame is at its extreme left position, the pawl 28 is thrown out of engagement with its ratchet-wheel until the rotatable frame has been turned into position substantially in line with the radial

frame. Then the pawl 39 is thrown out of engagement with its ratchet-wheel and the pawl 28 is thrown into engagement with its ratchet-wheel until the radial frame has been driven to its extreme right position. Then the pawls are again changed until the rotatable frame has been swung around so as to bring the cutter out of the wall.

The rotatable frame is adapted to carry alternately a removable undercutting mechanism and dislodging mechanism comprising a removable overcutting mechanism and breaking mechanism. The removable undercutting mechanism shown in Figs. 3, 4, and 5 will now be described. The undercutting mechanism comprises a casing having walls 47 48, between which and in which sprockets 49 and 50 are journaled. A sprocket-chain 51 is carried on the sprockets and bears staggered cutters 52, some of which cutters project above and below the casing, so that the slot cut thereby will be wide enough to receive the mechanism. The driving-sprocket 49 has an opening to receive the squared lower end of the head-shaft 20. Bolts 53 pass through the casing and flanges on the rotatable frame. The undercutting mechanism is thus removably mounted upon the rotatable frame.

In beginning work upon a vertical section of the wall of a mine-chamber the undercutting mechanism is attached and an undercut made at the floor-level across the entire width of the chamber. This undercut is made vertically wide enough to receive the initial conveyer of the loading mechanism hereinafter described. The undercut having been made, the undercutting mechanism is removed and the dislodging mechanism, (shown in Figs. 6, 7, and 8,) now about to be described, is attached to the rotatable head.

Upon the upper end of the head-shaft 20 there is fixed a bevel-gear 54. A horizontal shaft 56, journaled in bearings 59 on the rotatable frame, has bevel-gears 55 57 fixed upon it, the former of which meshes with the gear 54. An L-shaped projection 60 extends across the entire width of the upper surface of the rotatable frame. A substantially Z-shaped bracket is mounted upon the frame, its rear edge engaging beneath the flange of the L-shaped projection and is further secured by bolts 61, passing through the bracket and a forwardly-extending flange of the frame. On the forward end of the bracket a rotatable cutter-head 62 is pivoted. The cutter-head is provided on its lower face with gear-teeth 63, the cutter being slotted between the teeth, and these teeth are engaged by the bevel-gear 57 on the horizontal shaft. The overcutting mechanism is thus driven from the head-shaft 20.

A bifurcated bracket 64 is fastened to the side of the rotatable frame by bolts 65. The branches of the bracket terminate in bearings 66 67, in which are journaled the breaking-levers 68 in such position as to follow immediately in the path of the cutter-head. The breaking-levers are broad and thin and operate by being oscillated in the slot cut by the overcutting mechanism. When oscillated out of the position shown in Fig. 8, one edge bears upon the upper surface of the slot and the other upon the lower surface, and thus leverage is exerted to break down the severed section of the wall. The breaking-levers are operated by the following mechanism: Upon the eccentric 69 on the hub of the bevel-gear 19 there is an eccentric-strap 70. A bell-crank lever is journaled in the rotatable frame and has one arm, 72, in the plane of the eccentric 69 and the other, 73, in a higher horizontal plane. A connecting-rod 74 connects the eccentric-strap 70 and the lower arm 72 of the bell-crank. Pivoted at the end of the upper arm 73 is a link 75, connecting to arms 76, rigidly fixed to the shafts of the breaking-levers 68 intermediate of their bearings. By means of these elements an oscillating movement is transmitted to the breaking-levers from the head-shaft 20.

By means of the sweep of the radial frame and the rotatable frame the dislodging mechanism is carried across the wall of the chamber in the same manner as described in connection with the undercutting mechanism. A horizontal section of the wall is thus severed by the overcutting mechanism and broken down by the breaking-levers. Then the radial frame and the parts carried by it are elevated by means of the vertical adjusting means on the anchor-columns 8 9 10 and screw-columns 4′ 5′ described above, and second horizontal section is severed and broken down. This operation is repeated until the top of the chamber is reached. In order, however, that no time need be lost in removing the material broken down and to avoid the necessity for removing the machine to permit the removal of the material, it is desirable to incorporate as a part of the machine means for loading the material as it is broken down.

The loading mechanism E will now be described. The loading mechanism E is mounted upon a truck D, which is mounted upon a truck A in such manner as to have longitudinal movement thereon. This arrangement is to permit relative movement of the loading mechanism and dislodging mechanism, as it is not desirable to have the loading mechanism in position when the undercut is being made. The loading mechanism comprises an initial conveyer 77, an intermediate conveyer 78, and a final conveyer 79. A motor 80 drives the conveyer through suitable gearing. The motor-axle carries a gear 81, which meshes with a gear 82, fixed to a horizontal shaft 83, which carries a bevel-gear 84. A bevel-gear 85 is fixed upon a vertical shaft 86 and meshes with the bevel-gear 84. The rotation of the

vertical shaft is communicated to a horizontal shaft 89 through a bevel-gear 87 on the shaft 86 and a coöperating bevel-gear 88. The shaft 89 carries a sprocket-wheel 90, connected by a sprocket-chain 91 to a sprocket-wheel 92 upon the driving-shaft 93 of the intermediate conveyer 78. A bevel-gear 94 upon the horizontal shaft 95 also meshes with the bevel-gear 85 upon the vertical shaft. The horizontal shaft 95 carries a sprocket-wheel 96, connected by a sprocket-chain 97 with a sprocket-wheel 98 upon the driving-shaft of the final conveyer 79. The initial conveyer consists of a number of toothed plates 100, mounted in a frame 101 and arranged for alternate reciprocation. Near their upper ends the plates are pivoted upon the crank-shaft 102, having a crank for each plate. The crank-shaft is driven from the forward shaft 103 of the intermediate conveyer by means of the intermediate gearing. A gear 104 is fixed upon the shaft 103 and meshes with a small gear 105, fixed upon the shaft 106, which also carries a larger gear 107. The last-mentioned gear meshes with a small gear 108, fixed upon the crank-shaft. The frame 101 of the initial conveyer has an ear 109 upon the side toward the radial frame. The latter has a corresponding ear 110. By means of a bolt passing through these ears the loading mechanism is connected to the radial frame, so that the initial conveyer will be immediately below the breaking-levers and will move therewith as the radial frame sweeps across the chamber. In order to permit the elevation of the forward end of the loading mechanism the intermediate conveyer is pivotally mounted on its truck on both horizontal and vertical axes. The upper end of the intermediate conveyer 78 has downwardly-extending bearings 111, which engage a horizontal bearing 112, the latter being concentric with the sprocket 90 and its shaft 89. The horizontal bearing 112 bears upon a horizontal circular track 113 concentric with the bevel-gear 87 and is adjustable thereon. The loading mechanism may turn about both horizontal and vertical axes without throwing the transmission mechanism out of gear.

When the overcutting mechanism and the breaking-levers are removed and the undercutting mechanism is attached, the loading mechanism is detached and drawn back out of the way; but when the undercut has been made and the machine is ready to make the overcuts the loading mechanism is moved forward and attached to the radial frame, the initial conveyer extending into the undercut. The breaking-levers then break the material being mined down into the initial conveyer which carries it up to the intermediate conveyer, and this in turn discharges it onto the final conveyer which discharges into the car. As the loading mechanism is connected to the radial frame, the forward end will be raised with the latter when elevated to make the overcuts above the first and will operate in the same manner.

Briefly describing the operation of the machine, an undercut is made at the level of the floor of the mine-chamber by the undercutting mechanism. The undercut being made, the undercutting mechanism is removed and the dislodging mechanism is mounted on and the loading mechanism is connected to the radial frame. An overcut is made, the breaking-levers at the same time breaking down the section between the undercut and the overcut, and the material broken down is caught by the loading mechanism and conveyed to the car. This horizontal section of the wall being removed, the mechanisms are elevated into position to make a second overcut, and this second section is removed in the same manner as the first. This operation is repeated until the wall of the chamber is entirely removed up to the top. Then the machine is moved forward, a second undercut is made, and a second vertical section of the wall or vein is removed in the same manner as the first. Thus the use of explosives is entirely avoided, and by combining the dislodging means and the loading means in coöperative relationship there is avoided the delays incident to the removal of the dislodging mechanism and the positioning of the loading mechanism, and then the removal of the loading mechanism and the repositioning of the dislodging mechanism. Not only is the time thus consumed saved, but time is further saved by simultaneously dislodging and loading the material being mined.

Obviously the construction hereinbefore described is capable of modification without departing from the spirit of my invention, and I do not wish to be limited to such specific construction.

What I claim is—

1. A mining-machine comprising a movable platform, a radial frame pivotally mounted on said platform, cutting mechanism and breaking mechanism mounted on the forward end of said frame and loading mechanism movably mounted on said movable platform and detachably connected at its forward end with the forward end of said frame in such manner that the said loading mechanism projects beneath and moves with said breaking mechanism.

2. A mining-machine comprising a movable platform, a radial frame pivotally mounted on said platform, cutting mechanism and breaking mechanism mounted on the forward end of said frame, and loading mechanism, comprising an initial conveyer, mounted on said movable platform and so connected at its forward end with said frame that said initial conveyer lies beneath and moves with said breaking mechanism.

3. A mining-machine comprising a movable platform, a radial frame pivotally mounted on

said platform, means for causing said frame to describe a sector of a circle, simultaneously-operating cutting mechanism and breaking mechanism mounted on the forward end of said frame, a movable platform on said first-mentioned platform, a simultaneously-operating loading mechanism mounted on said last-mentioned platform and so connected at its forward end with the forward end of said radial frame that the forward end of said loading mechanism shall project beneath the said breaking mechanism and move therewith.

4. A mining-machine comprising a movable platform, a radial frame pivotally mounted on said platform, means for causing said frame to describe a sector of a circle, means for elevating said radial frame, dislodging mechanism mounted upon said radial frame, and loading mechanism mounted upon said platform and so connected with the forward end of said frame that the forward end of said loading mechanism projects beneath said dislodging mechanism and moves therewith.

5. A mining-machine comprising a movable platform, a radial frame pivotally mounted on said platform, dislodging mechanism comprising simultaneously-operating cutting mechanism and breaking mechanism mounted upon said radial frame, means for elevating said radial frame, and simultaneously-operating loading mechanism movably mounted on said platform and so connected at its forward end with said radial frame that the forward end of said loading mechanism shall project beneath and move with said breaking mechanism.

6. A mining-machine comprising a base, an arcuate feed-rack, a radial frame pivotally mounted at one end on said base and supported on said feed-rack on the other end, and means for elevating said radial frame and said feed-rack with respect to said base.

7. A mining-machine comprising a base, an arcuate feed-rack, a radial frame having one end pivotally mounted on said base and the other end supported on said feed-rack, cutting means and breaking means mounted on said radial frame, and means for elevating said feed-rack and said radial frame.

8. A mining-machine comprising a base, an arcuate feed-rack, a radial frame having one end pivotally mounted on said base and the other end supported on said feed-rack, cutting means and breaking means mounted to swing about the forward end of said radial frame, and means for elevating said feed-rack and said radial frame.

9. A mining-machine comprising a base, an arcuate feed-rack, a radial frame having one end pivotally mounted on said base and the other end supported on said feed-rack, cutting means and breaking means removably mounted on said radial frame, and means for elevating said feed-rack and said radial frame.

10. A mining-machine comprising a base, an arcuate feed-rack, extensible columns for anchoring said base and said feed-rack, a radial frame pivotally mounted at one end on the extensible column anchoring said base and supported at the other end on said feed-rack, and means on said extensible columns for elevating said radial frame and said feed-rack with respect to said base.

11. A mining-machine comprising a base, an arcuate feed-rack, extensible columns for anchoring said base and said feed-rack, and having an externally-screw-threaded section, a radial frame pivotally mounted at one end on the extensible column anchoring said base and supported at the other end on said feed-rack, and means engaging said screw-threaded sections of said extensible columns for elevating said radial frame and said feed-rack.

12. A mining-machine comprising a base, an arcuate feed-rack, anchor-columns each having an externally-screw-threaded section, one anchoring said base and one passing through and anchoring each end of said feed-rack, a radial frame supported on said feed-rack at one end and having a spherically-concave bearing at the other end, a spherically-convex sleeve on said anchor-column anchoring said base and engaged by said bearing, a screw-threaded hand-wheel on said anchor-column supporting said sleeve and screw-blocks on said anchor-columns anchoring said feed-rack beneath and supporting the ends of said feed-rack.

13. A mining-machine comprising means for making a cut across the wall of a mine-chamber, means arranged to operate in the cut to break down the section severed and means arranged below said breaking means in position to receive the material as it is broken down and convey it away.

14. A mining-machine comprising a cutting mechanism for making a cut across the wall of a mine-chamber, breaking means arranged to follow immediately in the path of the cutting mechanism to break down the section severed and loading means connected with said cutting mechanism and breaking means and arranged to move therewith.

15. A mining-machine comprising cutting means arranged to make a cut across the wall of a mine-chamber, breaking means arranged to follow immediately in the path of said cutting means, and loading means arranged to extend beneath said breaking means and into a kerf at the base of the wall and thereby receive the material as it is broken down.

16. A mining-machine comprising cutting means for making a cut across the wall of a mine-chamber, simultaneously-operating breaking means following immediately in the path of the cutting means to break down the section severed, and simultaneously-operating loading means connected with said cutting means and breaking means to move therewith.

17. A mining-machine comprising cutting means for making a cut across the wall of a

mine - chamber, simultaneously - operating breaking means following immediately in the path of the cutting means to break down the section severed, and simultaneously-operating loading means detachably connected with said cutting means and breaking means and mounted to have movement relative thereto.

18. A mining-machine comprising cutting means for making a cut across the wall of a mine - chamber, simultaneously - operating breaking means following immediately in the path of the cutting means to break down the section severed, and simultaneously-operating loading means connected with said cutting means and breaking means and comprising an initial conveyer in position to receive the material broken down by the breaking means.

19. A mining-machine comprising a truck, a frame pivotally mounted thereon, cutting means mounted on the said frame for making a cut across the wall of a mine-chamber, simultaneously-operating breaking means mounted on said frame to break down the section severed, and simultaneously-operating loading means detachably connected to the said frame and mounted to have movement relative thereto.

20. A mining-machine comprising a truck, a frame pivotally mounted thereon, cutting means mounted on said frame for making a cut across the wall of a mine-chamber, simultaneously - operating breaking mechanism mounted on said frame to break down the section severed, a second truck movably mounted on said truck, and simultaneously-operating loading means mounted on said second truck and detachably connected to said frame.

21. A mining-machine comprising a truck, a frame pivotally mounted thereon, cutting means mounted on said frame for making a cut across the wall of a mine-chamber, simultaneously - operating breaking mechanism mounted on said frame to follow immediately in the path of said cutting means and break down the section severed, a second truck movably mounted on said truck and simultaneously-operating loading means mounted on said second truck and detachably connected to said frame, comprising an initial conveyer in position to receive the material broken down by the breaking means.

22. A mining-machine comprising cutting means for making a cut across the wall of a mine - chamber, simultaneously - operating breaking means following immediately in the path of the cutting means to break down the section severed, simultaneously - operating loading means connected with said cutting means and breaking means and comprising an initial conveyer in position to receive the material broken down by the breaking means, and means for elevating said cutting means and breaking means and the forward end of said loading means.

23. A mining-machine comprising a platform, a radial frame pivotally mounted on said platform, a cutter mounted upon said radial frame, and a breaking-lever projecting from the machine to extend into the kerf made by said cutter.

24. A mining-machine comprising a platform, a radial frame pivotally mounted on said platform, a rotatable frame mounted upon the forward end of said radial frame, a cutter and a breaking-lever mounted upon said rotatable frame, said breaking-lever being mounted to extend into the kerf made by said cutter.

25. A mining-machine comprising a frame, a cutter mounted thereon, and an oscillating lever mounted on said frame to extend into the kerf made by said cutter.

26. A mining-machine comprising a frame, a cutter mounted thereon, an oscillating lever mounted on said frame to extend into the kerf made by said cutter, and means on said frame to drive said cutter and oscillate said lever.

27. A mining-machine comprising a platform, a radial frame pivotally mounted thereon, actuating means on said frame, a head-shaft operatively connected to said actuating means, a cutter and an oscillating breaking-lever mounted on said frame, and means connecting said head-shaft to said cutter and breaking-lever.

28. A mining-machine comprising a radial frame, a head-shaft mounted therein, means to actuate said head-shaft, and means for detachably connecting undercutting mechanism, an overcutting mechanism, or a breaking mechanism to said frame.

29. A mining-machine comprising a radial frame, a rotatable frame pivotally mounted on the forward end of said radial frame, said rotatable frame being arranged for the detachable connection thereto of an undercutting mechanism, an overcutting mechanism, or a breaking mechanism.

30. A mining-machine comprising a radial frame, a motor mounted on said frame and driving a main shaft extending longitudinally of said frame, a head-shaft mounted at the forward end of said frame, gears connecting said shafts, a rotatable frame pivoted on said radial frame to swing concentrically with said head-shaft, said rotatable frame being arranged for the detachable connection thereto of an undercutting, an overcutting, or a breaking mechanism.

31. A mining-machine comprising a frame, dislodging mechanism detachably connected thereto and comprising oscillating levers, and actuating mechanism for said dislodging mechanism mounted on said frame.

32. A mining-machine comprising a frame, overcutting mechanism and breaking mechanism detachably connected thereto and comprising oscillating levers, and actuating mechanism for said overcutting mechanism and breaking mechanism mounted on said frame.

33. A mining-machine comprising an elon-

gated radial frame pivoted at one end, a rotatable frame pivotally mounted on said radial frame, and cutting mechanism detachably connected to said rotatable frame.

34. A mining-machine comprising a radial frame, a rotatable frame pivotally mounted on said radial frame, cutting mechanism detachably connected to said rotatable frame, and actuating mechanism mounted on said radial frame.

35. A mining-machine comprising a radial frame, a rotatable frame pivotally mounted on said radial frame, dislodging mechanism detachably connected to said rotatable frame, and actuating mechanism mounted on said radial frame.

36. A mining-machine comprising a radial frame, a rotatable frame pivotally mounted on said radial frame, overcutting mechanism and breaking mechanism detachably connected to said rotatable frame.

37. A mining-machine comprising a radial frame, a head-shaft mounted at the forward end thereof, actuating mechanism operatively connected to said head-shaft, a rotatable frame pivoted on said radial frame to swing concentrically with said head-shaft, and cutting mechanism detachably mounted on said frame and operatively connected to said head-shaft.

38. A mining-machine comprising a radial frame, actuating mechanism mounted thereon, a head-shaft in said radial frame operatively connected to said actuating mechanism, a rotatable frame pivotally mounted on said radial frame, and dislodging mechanism detachably connected to said rotatable frame in operative relation to said head-shaft.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM E. HAMILTON.

Witnesses:

J. F. LINTON,

C. A. MCALLISTER.