April 21, 1925.

1,534,463

E. O'TOOLE

LONGWALL MINING MACHINE

Filed Aug. 13, 1924

7 Sheets-Sheet 1

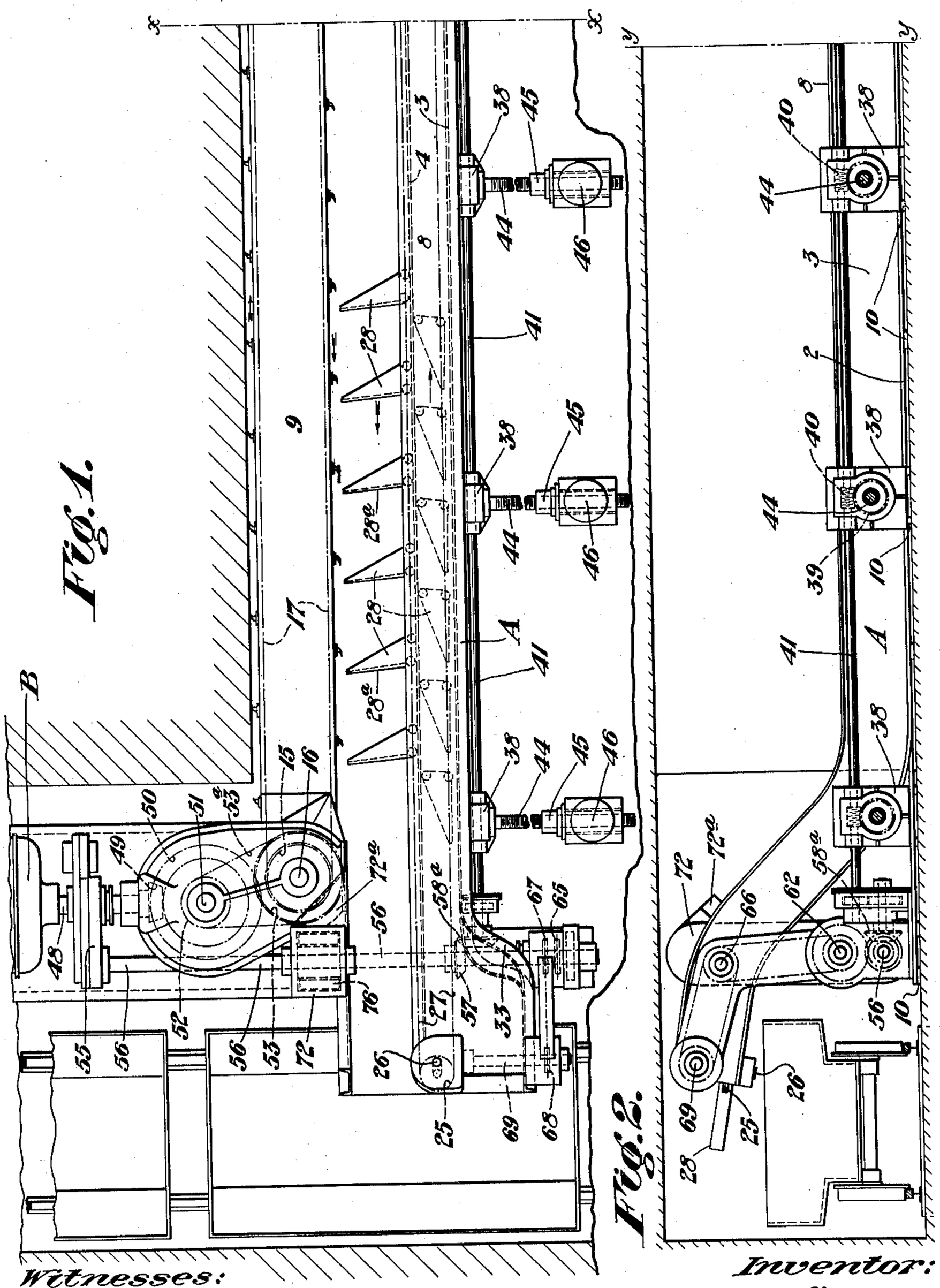

Fig. 1.

Fig. 2.

Witnesses:

Edwin Trueb

Inventor:

EDWARD O'TOOLE,

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his Attorney.

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LONGWALL MINING MACHINE

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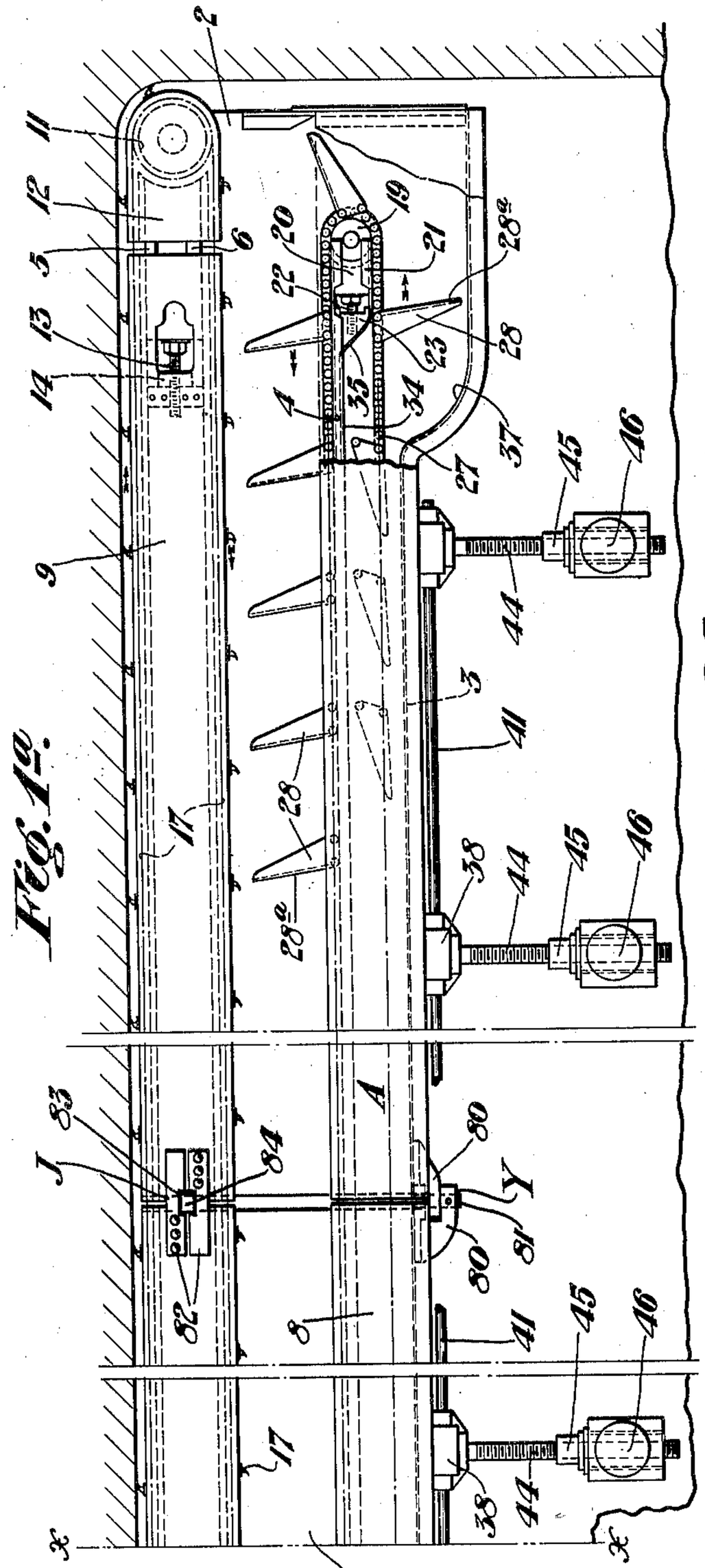

Fig. 1a.

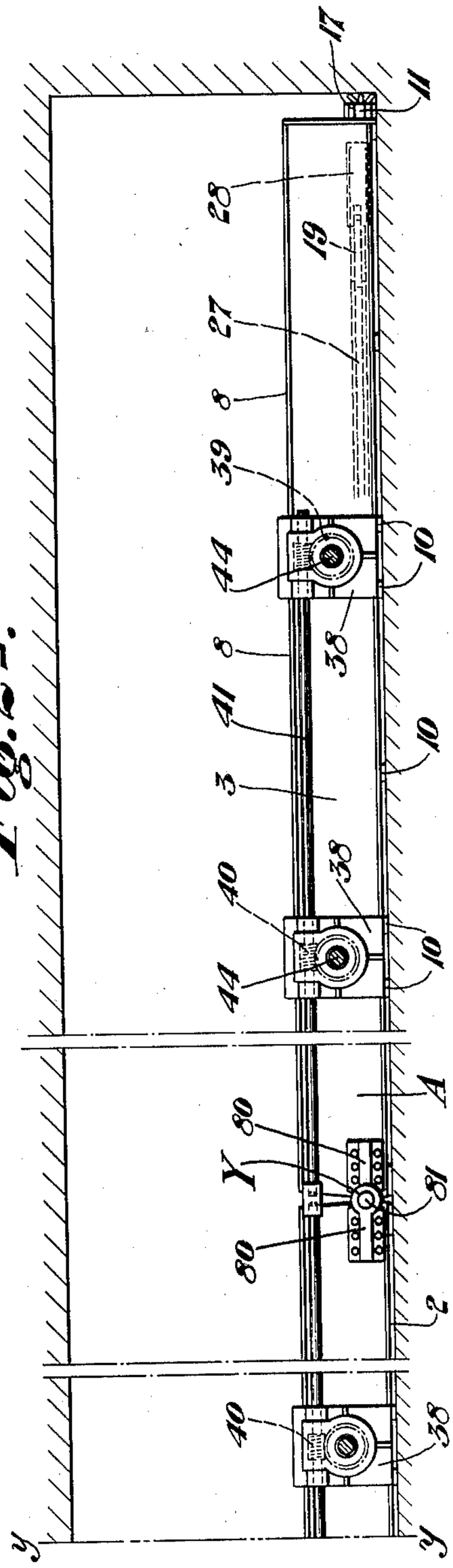

Fig. 2a.

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April 21, 1925. 1,534,463

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LONGWALL MINING MACHINE

Filed Aug. 13, 1924 7 Sheets-Sheet 3

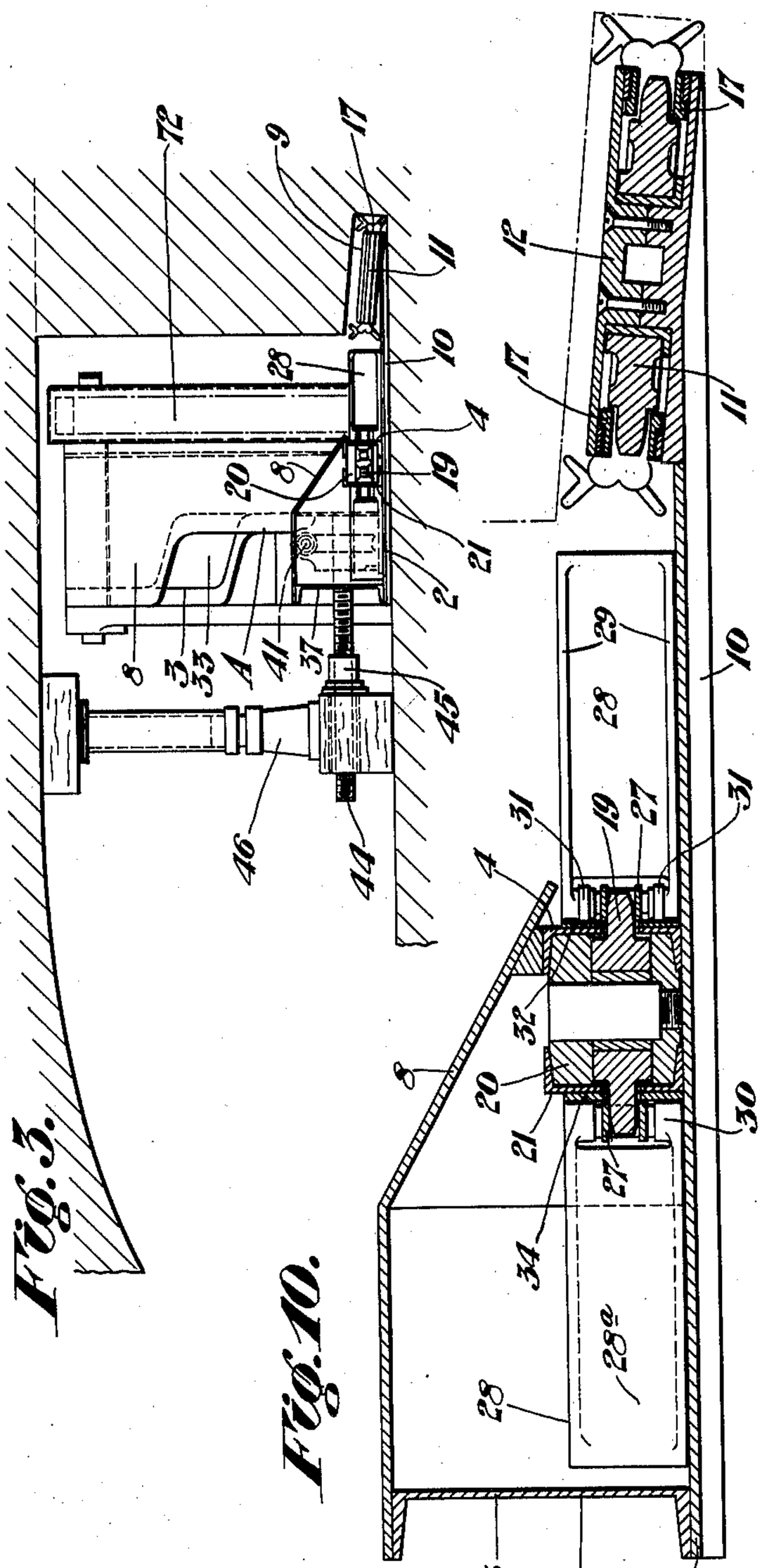

Fig. 3.

Fig. 10.

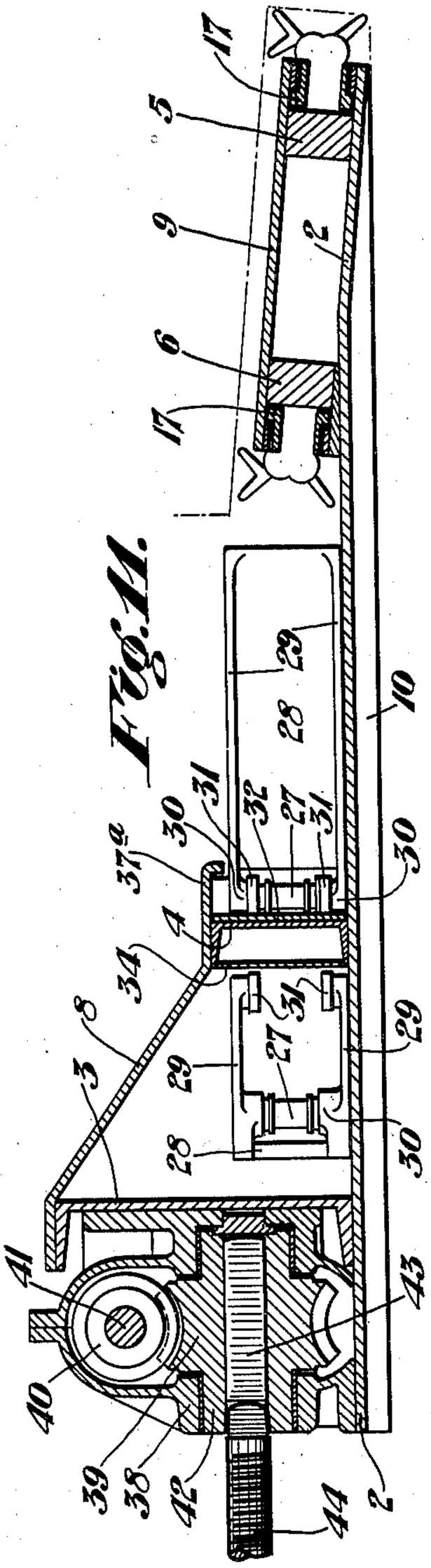

Fig. 4.

Witnesses:

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his Attorney.

April 21, 1925. 1,534,463

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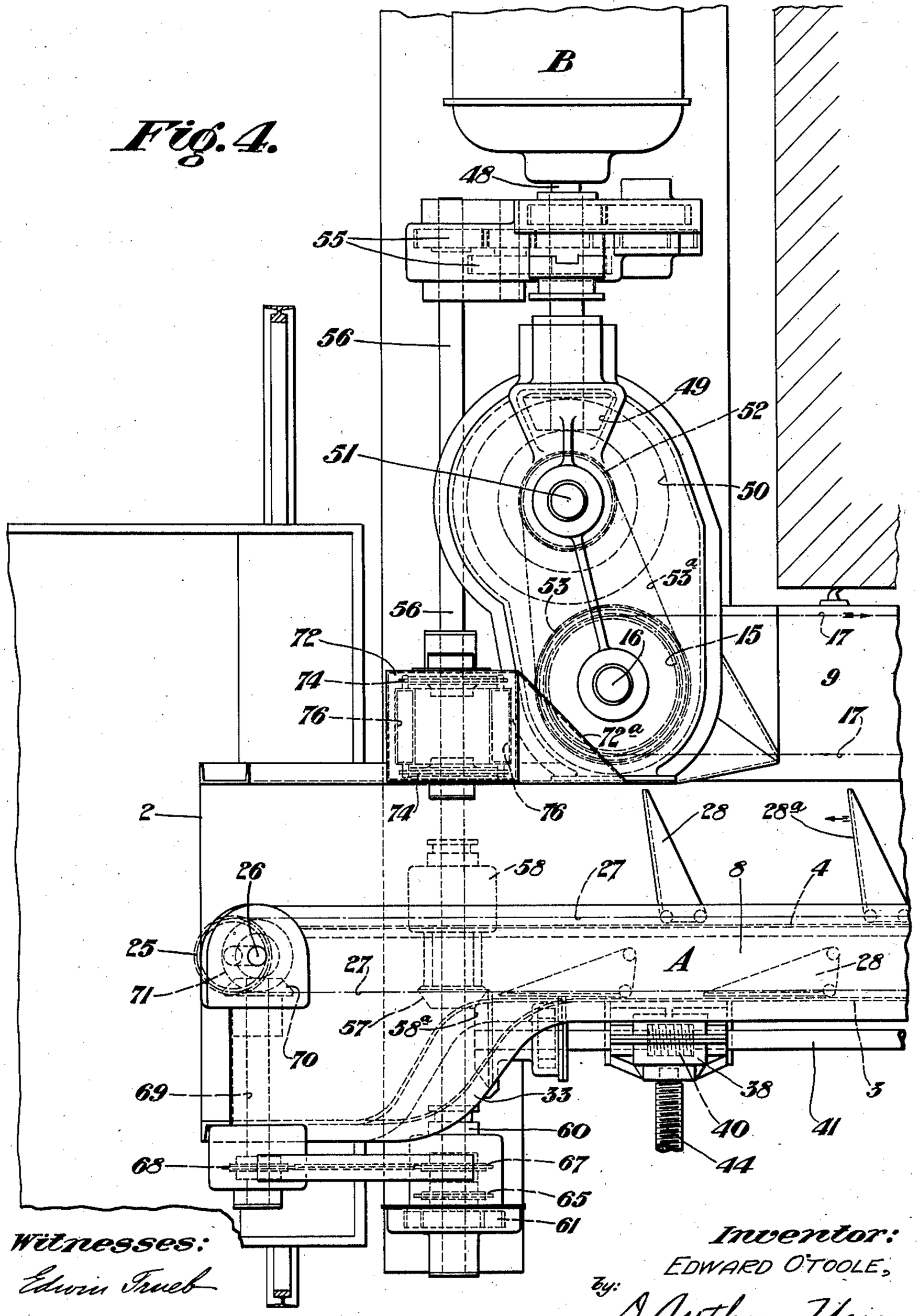
LONGWALL MINING MACHINE

Filed Aug. 13, 1924 7 Sheets-Sheet 4

Fig. 4.



Witnesses:
Edwin Trueb

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April 21, 1925. 1,534,463

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LONGWALL MINING MACHINE

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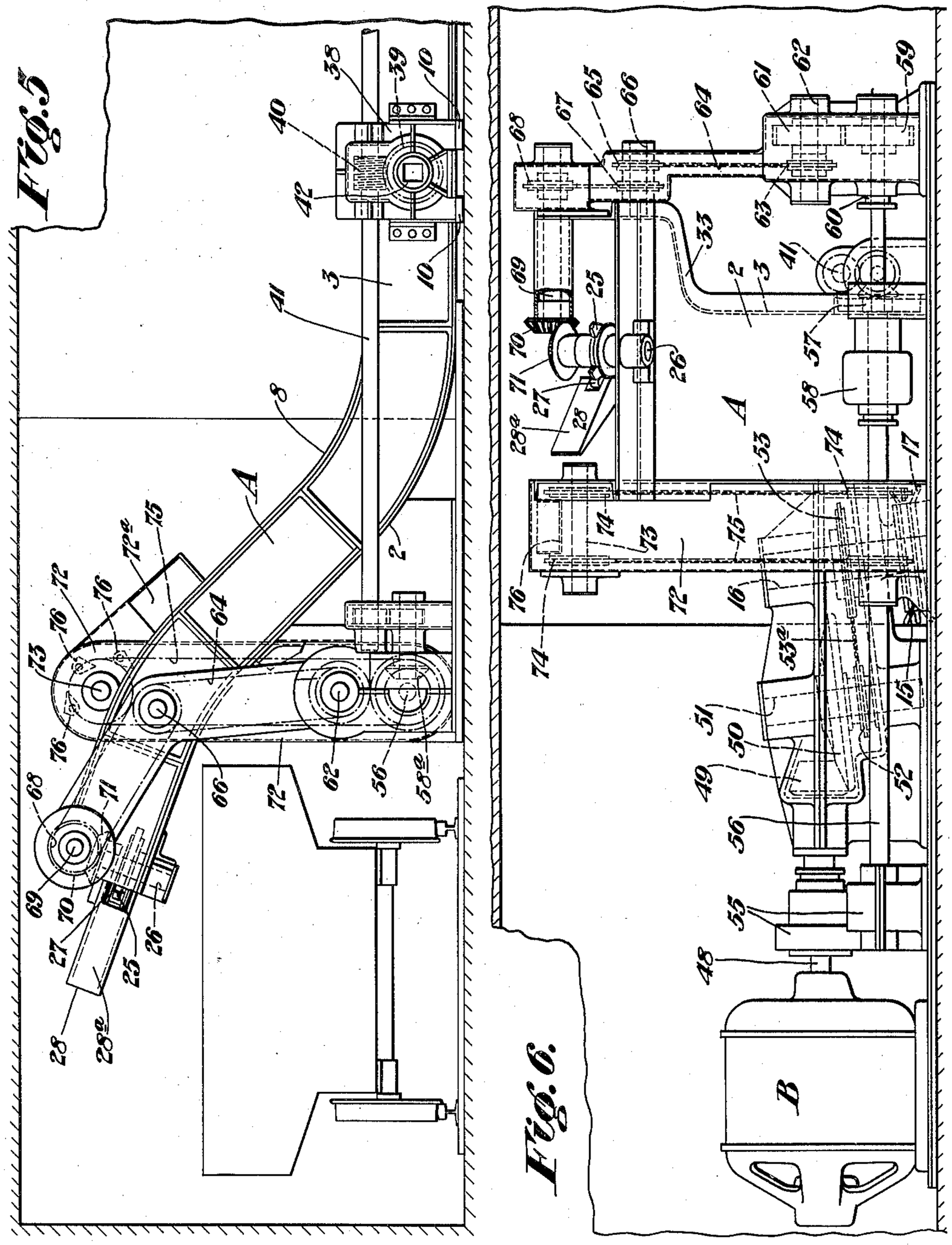

Witnesses:
Edwin Trieb

Inventor:
EDWARD O'TOOLE,
by:
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his Attorney.

April 21, 1925. 1,534,463

E. O'TOOLE

LONGWALL MINING MACHINE

Filed Aug. 13, 1924 7 Sheets-Sheet 6

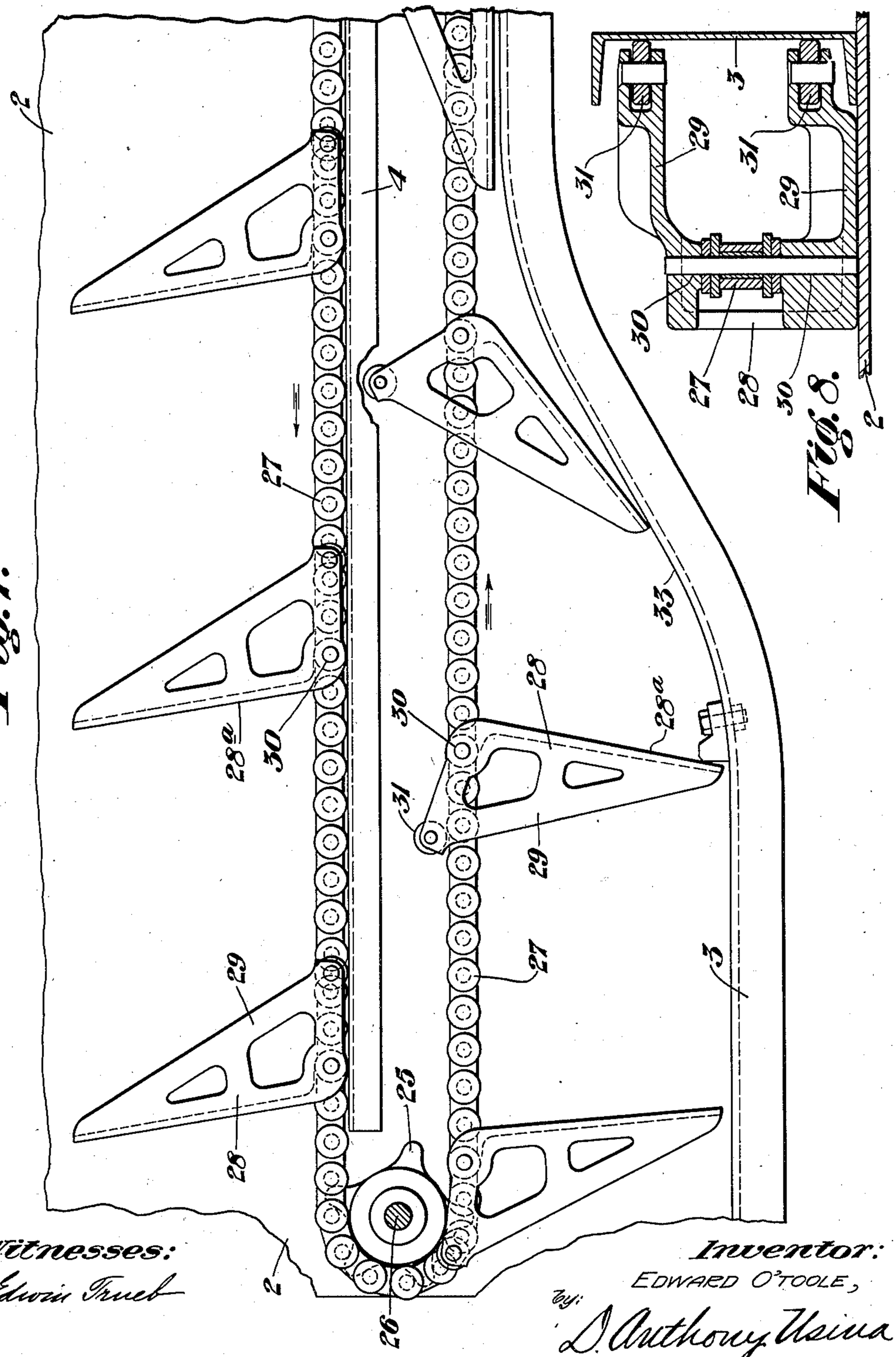

Fig. 7.

Fig. 8.

Witnesses:
Edwin Trueb

Inventor:
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April 21, 1925. 1,534,463

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LONGWALL MINING MACHINE

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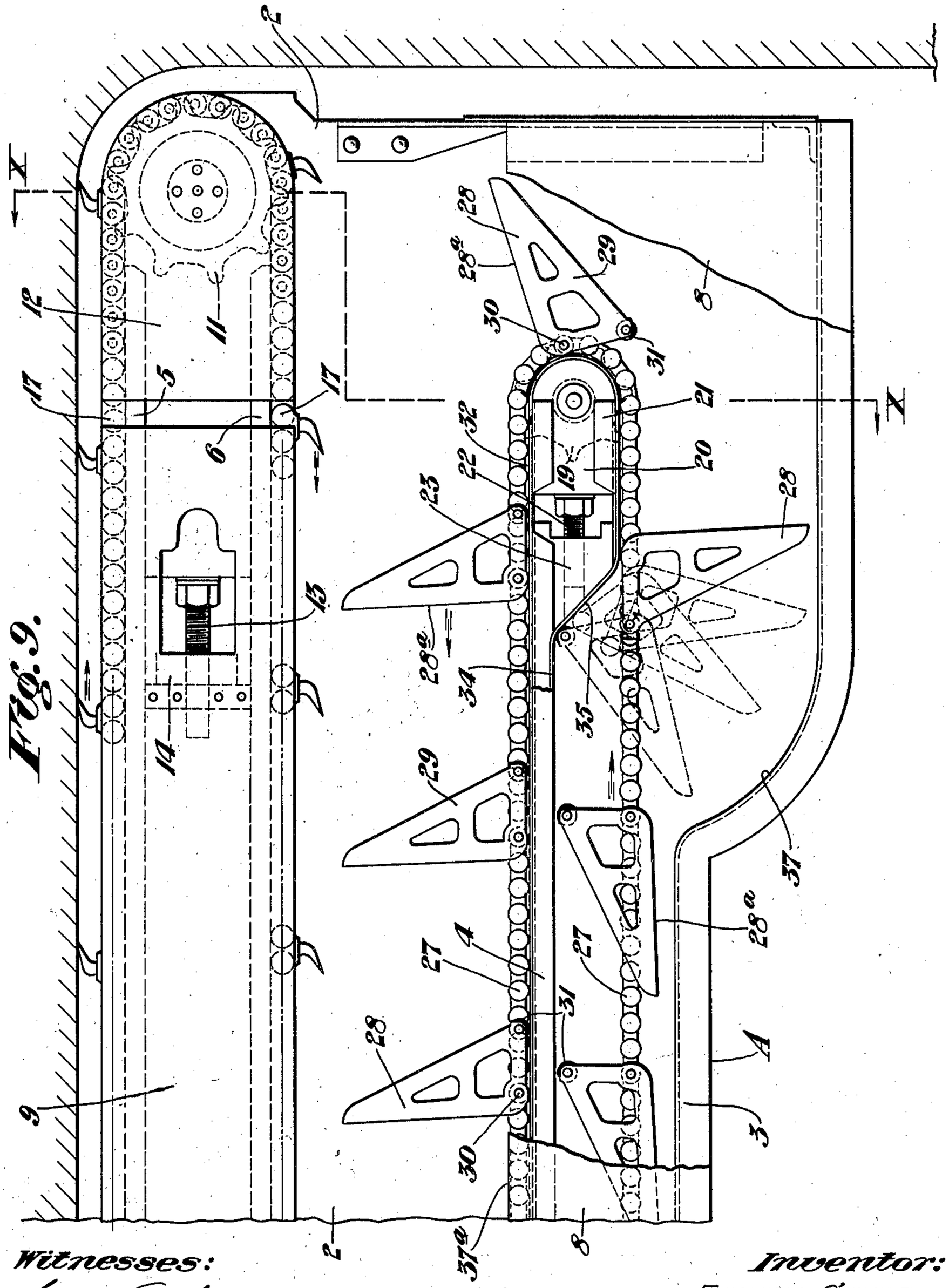

Fig. 9.

Witnesses:
Edwin Trueb

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Patented Apr. 21, 1925. 1,534,463

UNITED STATES PATENT OFFICE.

EDWARD O'TOOLE, OF GARY, WEST VIRGINIA.

LONGWALL MINING MACHINE.

Application filed August 13, 1924. Serial No. 731,810.

To all whom it may concern:

Be it known that I, EDWARD O'TOOLE, a citizen of the United States, and resident of Gary, in the county of McDowell and State of West Virginia, have invented certain new and useful Improvements in Longwall Mining Machines, of which the following is a specification.

This invention relates to mining machines and while not limited thereto, relates more particularly to a combined mining and loading machine of the longwall type.

One object of this invention is to provide a machine of the class described in which the cutting chain cooperates with the conveyer transporting the mined material away from the face of the material to be mined.

Another object is to provide a novel form of folding flight conveyer particularly adapted for use with mining machines of the class described.

A further object is to provide a machine of the class described having the novel construction, design and combination of parts hereinafter described and illustrated in the accompanying drawings—

Figures 1 and 1ª show a top plan of a machine embodying my invention.

Figures 2 and 2ª show a rear elevation of the same.

Figure 3 is an elevation of the butt end of the machine.

Figure 4 is an enlarged plan view of the head end of the machine showing the drive mechanism.

Figure 5 is an enlarged rear elevation of the head end of the machine, showing the drive mechanism.

Figure 6 is an elevation of the head end of the machine.

Figure 7 is an enlarged fragmentary plan of the head end of the machine, showing the way the conveyer flights are folded.

Figure 8 is a detail sectional view through the return passageway, showing folded conveyer flights.

Figure 9 is an enlarged plan view of the butt end of the machine, with the cover plate removed to show the means for extending the conveyer flights into material engaging position.

Figure 10 is a sectional elevation on the line X—X of Figure 9.

Figure 11 is a sectional elevation on the line II—II of Figure 1ª.

Referring more particularly to the drawings, the letter A designates the elongated main frame of the machine as a whole, which is composed of a bottom plate 2, a main channel beam 3 extending longitudinally along the rear edge of the plate 2, a second channel 4 secured on the bottom plate intermediate the rear and forward edges of the plate 2, and a pair of spaced cutter chain guides 5 and 6 extend longitudinally adjacent the forward edge of and are secured to the bottom plate 2. A cover plate 8 is secured to and extends between the channel beams 3 and 4, and a second cover plate 9 is secured to and extends between the cutter chain guides 5 and 6. A plurality of skid bars 10 are secured to and extend transversely across the bottom face of the bottom plate 2 and serve as both skids and stiffening members.

A cutter chain idler sprocket 11 is journaled to rotate about a substantially vertical axis in a bearing block 12 which is adjustable longitudinally of the frame A by means of the screw threaded adjusting bar 13 mounted in the rigid cross bar 14 secured between the cutter chain guides 5 and 6.

A cutter chain head or power sprocket 15 is mounted on a substantially vertical shaft 16 journaled at the head end of the machine. A cutter chain 17 of standard design is trained over the sprockets 11 and 15 and passes through the guides 5 and 6.

A conveyer idler sprocket 19 is journaled to rotate about a substantially vertical axis in an adjustable bearing block 20 slidably mounted between a short length of channel 21 and the channel 4. The bearing block 20 is adapted to be adjusted by means of a screw threaded adjusting rod 22 threaded into a fixed block 23.

The head or loading end of the frame A is inclined upwardly sufficiently to permit the conveyer to discharge the mined material directly into cars. A conveyer head or power sprocket 25 is mounted on a substantially vertical shaft 26 at the head end of the frame A.

A conveyer chain 27 is trained around the sprockets 19 and 25 and carries conveyer flights 28. The flights 28 are substantially

triangular shaped in plan and comprise a vertically disposed material engaging face or wall 28[a] and a pair of rearwardly extending flanges 29. The flights 28 are pivotal at their heels, as at 30, to the conveyer chain 27, and are adapted to be folded back along the conveyer chain during their return passage so that the flanges 29 extend over and under the chain 27. The flanges 29 are provided with rollers 31 for a purpose to be described.

The forward face of the channel 4 is provided with a hardened wear plate 32 and the conveyer chain 27 and flights 28 are adapted to ride along this plate when conveying material, so that the rollers 31 will contact with the plate and prevent the flights from moving about their pivotal connections 30. Therefore, the flights will be held in extended position to convey the mined material.

The main or rear channel member 3 is bent rearwardly at the head end of the frame, as at 33, to provide clearance for the extended conveyer flights 28 as they travel around the head sprocket 25. As the flights pass around the sprocket 25 they will engage the back of the channel 3 and be moved about their pivotal connections 30 so as to fold back along the chain 27. The space between the channels 3 and 4 being considerably less than the length of the conveyer flights 28, the flights will be held in their folded position as they return to the butt end of the machine.

A wear and guide plate 34 is secured between the flanges of the channel 4 and the rollers 31 of the conveyer flights 28 engage and run on this plate during their return passage.

A guide or cam plate 35 is secured between the flanges of the channel 4 adjacent the butt end of the frame and is curved rearwardly so as to pass along the rear side of the channel 21 and around the idler sprocket 19 and join with the butt end of the plate 32. The plate 35 is slotted to permit the chain 27 to engage the teeth of the sprocket 19 and join with the butt end of the plate 32. The plate 35 is slotted to permit the chain 27 to engage the teeth of the sprocket 19 and also serve as a guide against which the rollers 31 of the flights 28 will engage and thus force the flights outwardly into extended or material engaging position. The rear or main channel member 3 is also bent rearwardly at the butt end of the frame, as at 37, to provide clearance for the flights as they are forced into extended position.

The cover plate 8 is extended over the forward edge of the channel 4, as at 37[a], and serves to maintain the conveyer chain 27 in position.

A plurality of worm and worm-wheel castings 38 are secured at spaced intervals along the rear face of the main channel member 3 and suitable worm-wheels 39 are journaled therein which are meshed with worms 40 on a power shaft 41 extending along the rear of the machine and journaled in suitable bearings at each end of each of the plurality of boxes or casings 38.

The spindles 42 of the worm-wheels 39 are provided with centrally arranged squared openings adapted to receive a filler bar 43 and the squared forward end of a screw threaded feed bar 44. The bars 44 have screw threaded connections with nuts 45 carried by the bases of a series of hydraulic jacks 46 arranged to the rear of the machine for supporting the roof of the mine. It will be readily seen that the rotation of the worm-wheels 39 by the shaft 41 and worms 40 will rotate the bars 44 and thus cause them to rotate in the nuts 45 and be fed forward. The force of the forward feeding bars 44 will be delivered directly through the filler bars 43 to the channel 3 of the frame A of the machine and thus force the machine forwardly into the material being mined.

The main frame A has its head end widened out and extended forwardly to provide a support for the driving motor B and its associated gearing, shafting, etc., necessary to drive the machine.

The motor B is mounted on the extreme forward portion of the main frame and has its armature shaft coupled directly to a shaft 48 which has a bevel gear 49 on its rear end in mesh with a bevel gear 50 on a substantially vertical stub shaft 51. The shaft 51 also carries a sprocket 52 which is operatively connected by a chain 53[a] with a sprocket 53 on the shaft 16 on which the cutter chain head or power sprocket 15 is mounted. From the foregoing it will be readily understood that the cutter chain is driven by the motor B through the above mechanism, and it is to be noted that the above drive connections are so arranged that the cutter chain will be driven in a clockwise direction.

The shaft 48 is connected through suitable reducing gearing 55 to a shaft 56 which carries a bevel gear 57 intermediate its ends and a clutch 58 for operatively connecting the gear 57 with the shaft. The gear 57 is in mesh with a bevel gear 58[a] on a spur shaft 58[b] which is connected through gears 58[d] to the power shaft 41 which extends lengthwise along the rear side of the machine.

The shaft 56 extends beyond the gear 57 to the rear of the main frame and has a gear 59 thereon adapted to be connected to or disconnected from the shaft by means of a clutch 60. The gear 59 is in mesh with a gear 61 on a stub shaft 62 which also is provided with a sprocket 63. The sprocket

63 is connected by a chain 64 with a sprocket 65 on a stub shaft 66, which also carries a sprocket 67 which is connected to a sprocket 68 on a head shaft 69 by a chain 69a. The shaft 69 carries a bevel gear 70 which meshes with a bevel gear 71 on the conveyer head sprocket shaft 26.

The driving gearing and shafts for driving the conveyer chain 27 are so arranged and connected that the conveyer chain will be driven in a counter-clockwise direction, that is, in the opposite direction to the direction of travel of the cutter chain 17, so that the return strand of the cutter chain moves parallel with and in the same direction as the working or conveying strand of the conveying chain, and thus the cutting bits of the cutter chain and the flights of the conveyer will cooperate to move the mined material lengthwise of the machine.

A vertical bucket conveyer is located at the head end of the machine to pick up any small pieces or dust-like particles of the mined material carried out by the return strand of the cutter chain 17. This conveyer consists of a vertically disposed casing 72 having its side wall facing the cutter chain open at its lower end to receive the material carried out by the chain, and having an inclined outlet chute 72a at its upper end extending over and discharging into the path of the conveyer flights 28. A shaft 73 is journaled adjacent the upper end of the casing and the shaft 56 passes through the lower end of the casing. Suitable sprockets 74 are mounted on the shafts 73 and 56, and conveyer chains 75 are trained over the sprockets 74 and carry buckets 76 adapted to pick up the material carried out by the cutter chain 17 and convey it up to the upper end of the casing 72 and automatically discharge it into the chute 72a.

The frame A may be and preferably is made in short length sections detachably secured together to permit disassembling for facilitating transportation from place to place. The several sections, when the frame A is made in sections, are secured together at their rear edge by a flexible joint Y and at their forward edge by a flexible joint J. The joint Y consists of a pair of overlapping finger-like members 80 secured on the channel members 3 of the opposite sections and secured together by a pivot pin 81. The forward joint J consists of a pair of parallel bars 82, one being secured to the bottom plate 2 of each section between the cutter chain guides 5 and 6 and being co-extensive with each other. The bars 82 have their abutting side faces recessed to provide a socket 83 in which is mounted a locking block 84.

The making of the frame A in sections, as above described, has an additional advantage in that it permits a limited vertical flexing movement of the sections to compensate for the unevenness of the floor of the mine or other obstructions over which the machine might pass.

The machine described in detail above has several novel features, such as the novel form of folding conveyer which permits the machine to be made of less width than would be possible if the conveyer flights were extended during their return passage. Also the opposite movements of the cutter chain and conveyer chain permits a cooperation between these two parts which results in a materially better handling of the mined material, and the particular form of conveyer serves to increase the capacity of the conveyer materially beyond that heretofore thought possible for flight conveyers of its class.

It will be understood that while I have described and shown only one specific embodiment of my invention, I do not wish to be limited thereto since various modifications may be made without departing from the scope of the invention as defined in the appended claims.

I claim:—

1. A combined mining and loading machine comprising an elongated main frame, a cutter chain adapted to travel lengthwise of said machine around a vertical axis in a clockwise direction, the forward or cutting strand of said cutting chain having its cutting bars extending beyond the forward edge of said frame so as to undercut and form a kerf in the material to be mined and permit the material to break down on said machine, an endless conveyer mounted to the rear of said cutter chain and extending parallel with said cutter chain, said conveyer traveling around a vertical axis in a counterclockwise direction, and being provided with overhanging horizontal extending flights, so that said conveyer flights co-operate with said cutter chain to convey the material broken down on said machine lengthwise thereof.

2. A combined mining and loading machine comprising an elongated main frame, a cutter chain adapted to travel lengthwise of said machine around a vertical axis in a clockwise direction, the forward or cutting strand of cutter chain having its cutting bars extending beyond the forward edge of said frame so as to undercut and form a kerf in the material to be mined, and permit the material to break down on said machine, and an endless conveyer mounted immediately to the rear of the return strand of said cutter chain and extending parallel with said cutter chain, said conveyer traveling around a vertical axis in a counterclockwise direction, and being provided with overhanging horizontally extending conveyer flights, so that the forward or conveying strand of said

conveyer co-operates with the return or rear strand of said cutter chain to convey the material broken down on said machine lengthwise thereof.

3. A combined mining and loading machine comprising an elongated main frame, a cutter chain adapted to travel lengthwise of said machine around a vertical axis in a clockwise direction, the forward or cutting strand of said cutting chain having its cutting bars extending beyond the forward edge of said frame so as to undercut and form a kerf in the material to be mined and permit the material to break down on said machine, and an endless conveyer mounted immediately to the rear of the return strand of said cutter chain and extending parallel with said cutter chain, said conveyer traveling around a vertical axis in a counterclockwise direction, and being provided with overhanging horizontally extending conveyer flights, so that the forward or conveying strand of said conveyer co-operates with the return or rear strand of said cutting chain to convey the material broken down on said machine lengthwise thereof, and power means for operating said cutter chain and said conveyer.

4. A combined mining and loading machine, comprising an elongated main frame, a cutter chain adapted to travel lengthwise of said machine around a vertical axis in a clockwise direction, the forward or cutting strand of said cutting chain having its cutting bars extending beyond the forward edge of said frame so as to undercut and form a kerf in the material to be mined and permit the material to break down on said machine, and an endless conveyer mounted immediately to the rear of the return strand of said cutter chain and extending parallel with said cutter chain, said conveyer traveling around a vertical axis in a counterclockwise direction and being provided with overhanging horizontally extending conveyer flights, so that the forward or conveying strand of said conveyer co-operates with the return or rear strand of said cutter chain to convey the material broken down on said machine lengthwise thereof, power means for operating said cutter chain and said conveyer, and means for feeding said machine bodily into the material being mined.

5. In a mining machine of the longwall type having an elongated frame extending parallel with the face of the material to be mined, and having means for undercutting and forming a kerf in the material to be mined, a conveyer located to the rear of said undercutting means, said conveyer comprising an endless chain trained over sprockets rotating about a vertical axis, conveyer flights having one end pivotally mounted on said chain so as to extend horizontally outward therefrom, and means for folding said flights back along said conveyer chain as said chain moves around to return position.

6. In a mining machine of the longwall type having an elongated frame extending parallel with the face of the material to be mined, and having means for undercutting and forming a kerf in the material to be mined, a conveyer located to the rear of said undercutting means, said conveyer comprising an endless chain trained over sprockets rotating about a vertical axis, conveyer flights having one end pivotally mounted on said chain so as to extend horizontally outwardly therefrom, means for folding said flights back along said conveyer chain as said chain moves around to return position, and means for maintaining said conveyer flights folded during the return passage of said conveyer chain.

7. In a mining machine of the longwall type having an elongated frame extending parallel with the face of the material to be mined, and having means for undercutting and forming a kerf in the material mined, a conveyer located to the rear of said undercutting means, said conveyer comprising an endless chain trained over sprockets rotating about a vertical axis, conveyer flights having one end pivotally mounted on said chain so as to extend horizontally outward therefrom, and means for automatically folding said flights back along said conveyer chain as said chain moves around to return position.

8. In a mining machine of the longwall type having an elongated frame extending parallel with the face of the material to be mined, and having means for undercutting and forming a kerf in the material to be mined, a conveyer located to the rear of said undercutting means, said conveyer comprising an endless chain trained over sprockets rotating about a vertical axis, conveyer flights having one end pivotally mounted on said chain so as to extend horizontally outward therefrom, means for automatically folding said flights back along said chain as said chain moves around to return position, means for returning said flights to extended position as said conveyer chain moves into conveying position, and means for maintaining said flights in extended position during the conveying passage of said conveyer.

9. A combined mining and loading machine comprising an elongated main frame, a cutter chain adapted to travel lengthwise of said machine around a substantially vertical axis, the forward or cutting strand of said cutting chain having its cutting bars extending beyond the forward edge of said frame so as to undercut and form a kerf in the material to be mined and permit the material to break down on said machine,

an endless conveyer mounted to the rear of said cutter chain and extending parallel with said cutter chain, said conveyer traveling around a substantially vertical axis in a direction opposite to the direction of said cutter chain, so that said conveyer and the return strand of said cutting chain cooperate to convey the material broken down on said machine lengthwise thereof.

10. A combined mining and loading machine comprising an elongated main frame, a cutter chain adapted to travel lengthwise of said machine around a substantially vertical axis, the forward or cutting strand of said cutting chain having its cutting bars extending beyond the forward edge of said frame so as to undercut and form a kerf in the material to be mined and permit the material to break down on said machine, an endless conveyer mounted immediately to the rear of the return strand of said cutting chain and having its conveying strand traveling in the same direction as the return strand of said cutting chain, so that said conveyor and return strand of said cutting chain cooperate to convey the material broken down on said machine lengthwise thereof.

In testimony whereof I have hereunto set my hand.

EDWARD O'TOOLE.