Nov. 17, 1925. 1,561,481

E. O'TOOLE

LONGWALL MINING MACHINE

Filed Feb. 14, 1924 7 Sheets-Sheet 1

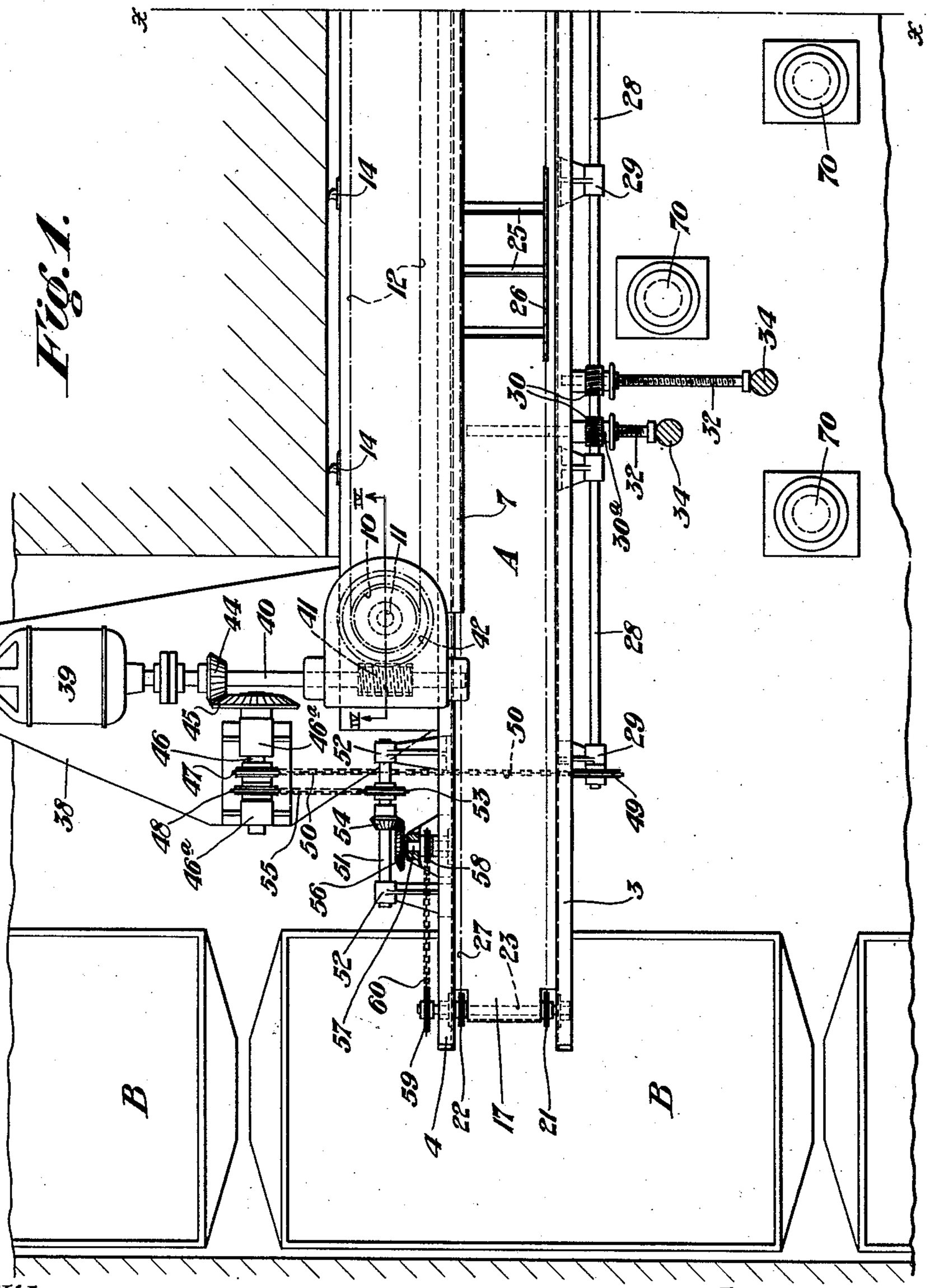

Fig. 1.

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Inventor:
EDWARD O'TOOLE,
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Nov. 17, 1925. **1,561,481**

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LONGWALL MINING MACHINE

Filed Feb. 14, 1924 7 Sheets-Sheet 2

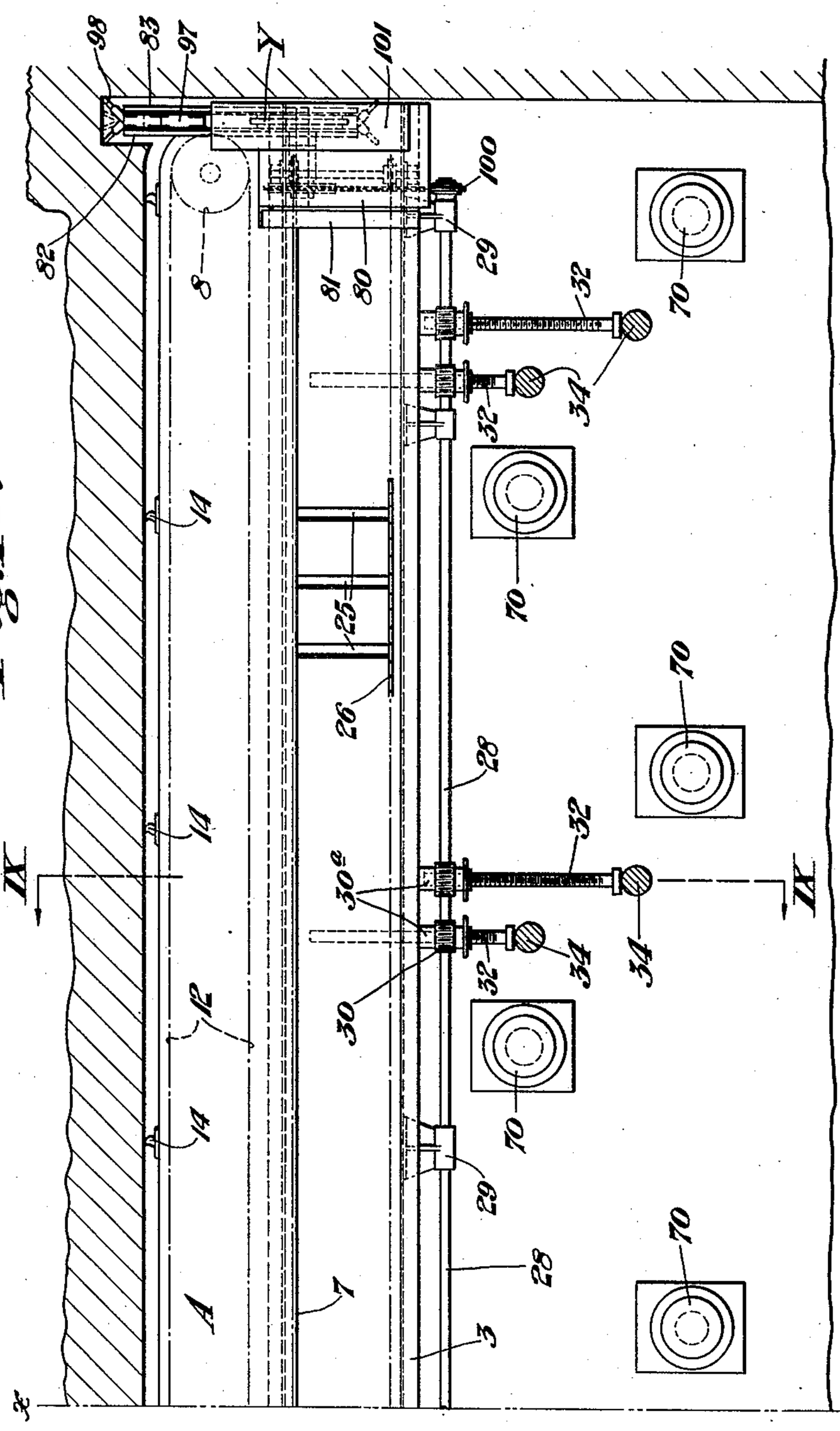

Fig. 1a.

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Nov. 17, 1925. 1,561,481

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LONGWALL MINING MACHINE

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Fig. 2.

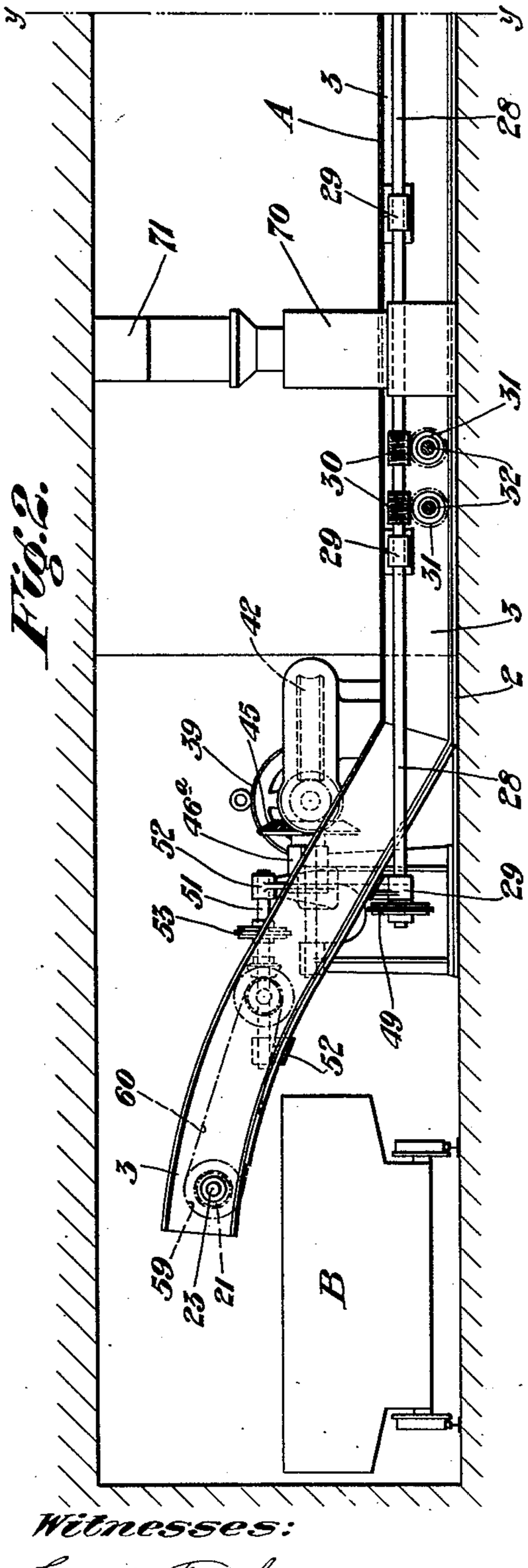
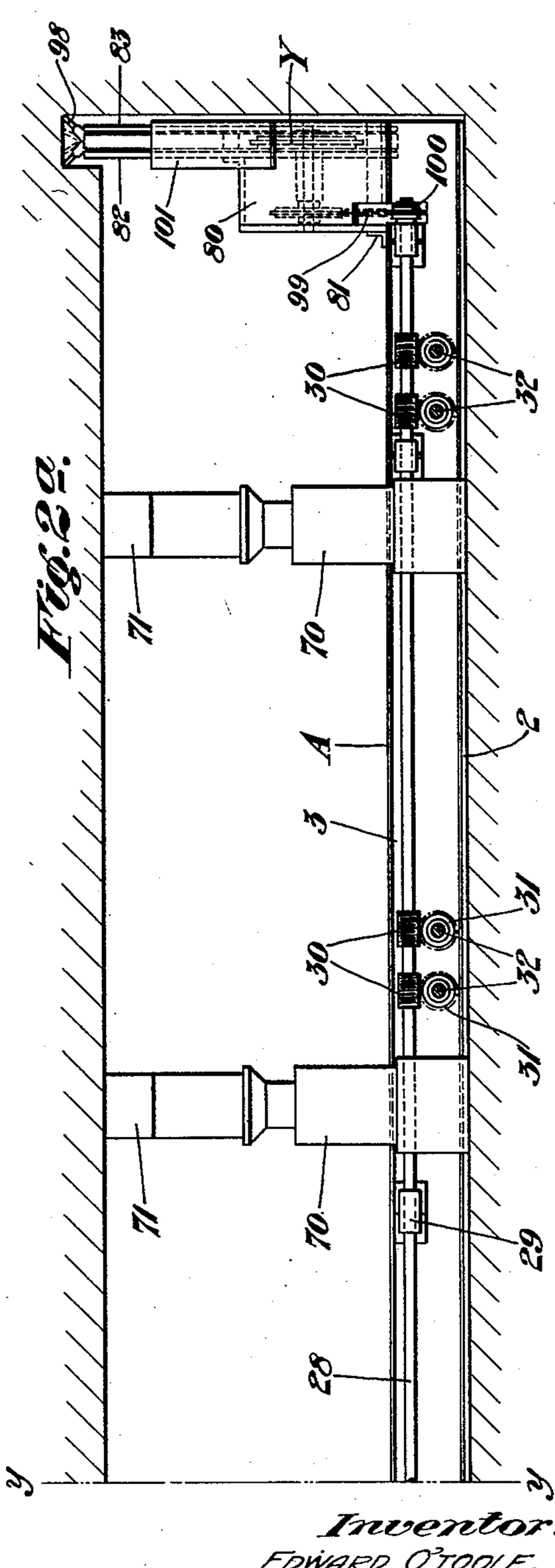


Fig. 2a.



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Nov. 17, 1925. 1,561,481

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LONGWALL MINING MACHINE

Filed Feb. 14, 1924 7 Sheets-Sheet 4

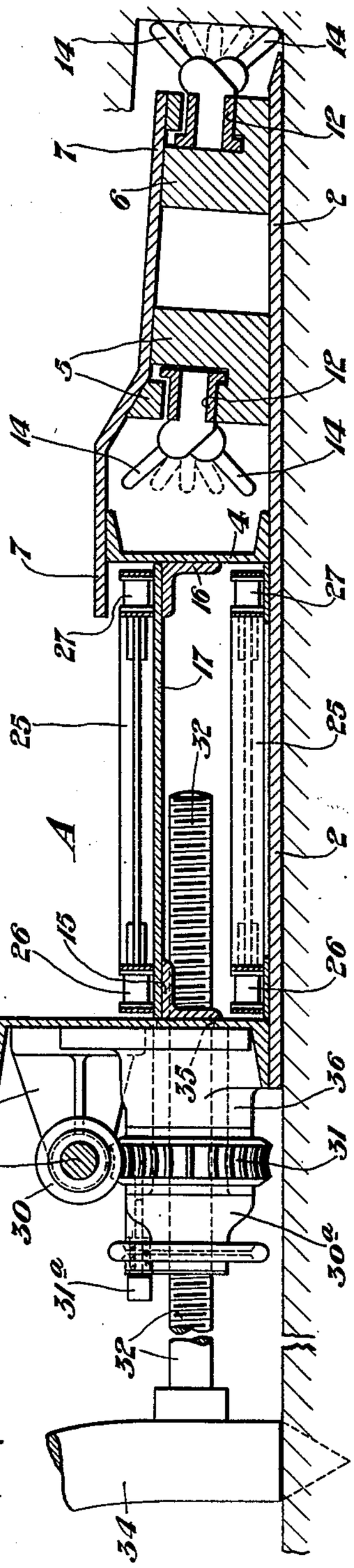

Fig. 9.

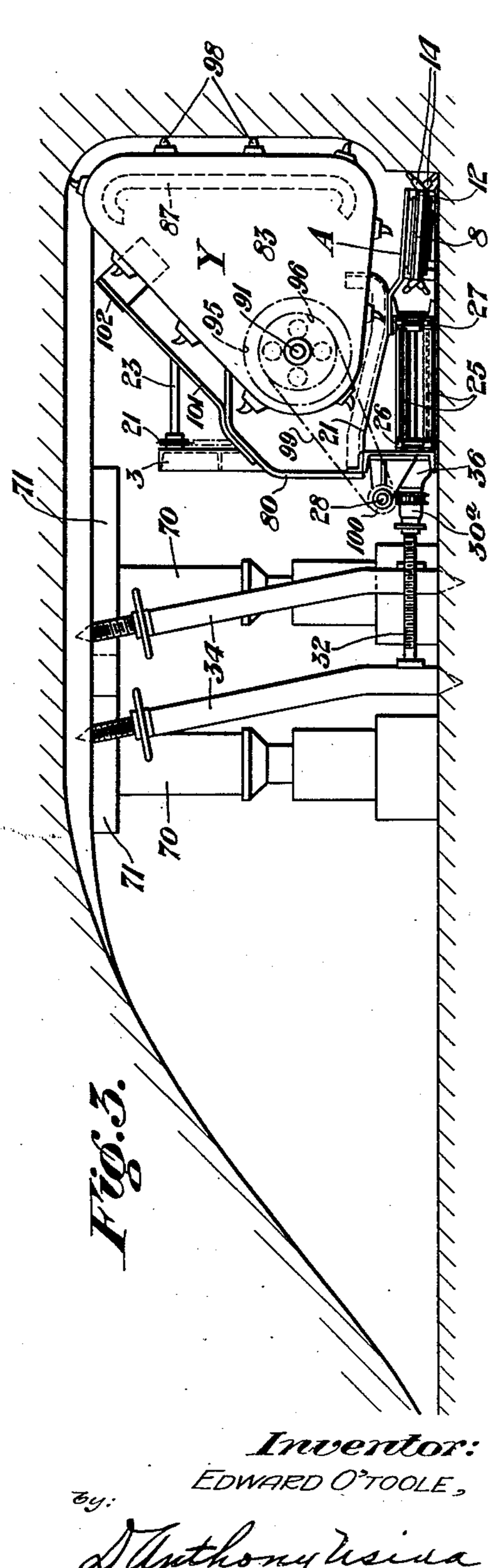

Fig. 3.

Witnesses:
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Nov. 17, 1925. 1,561,481

E. O'TOOLE

LONGWALL MINING MACHINE

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Fig. 8.

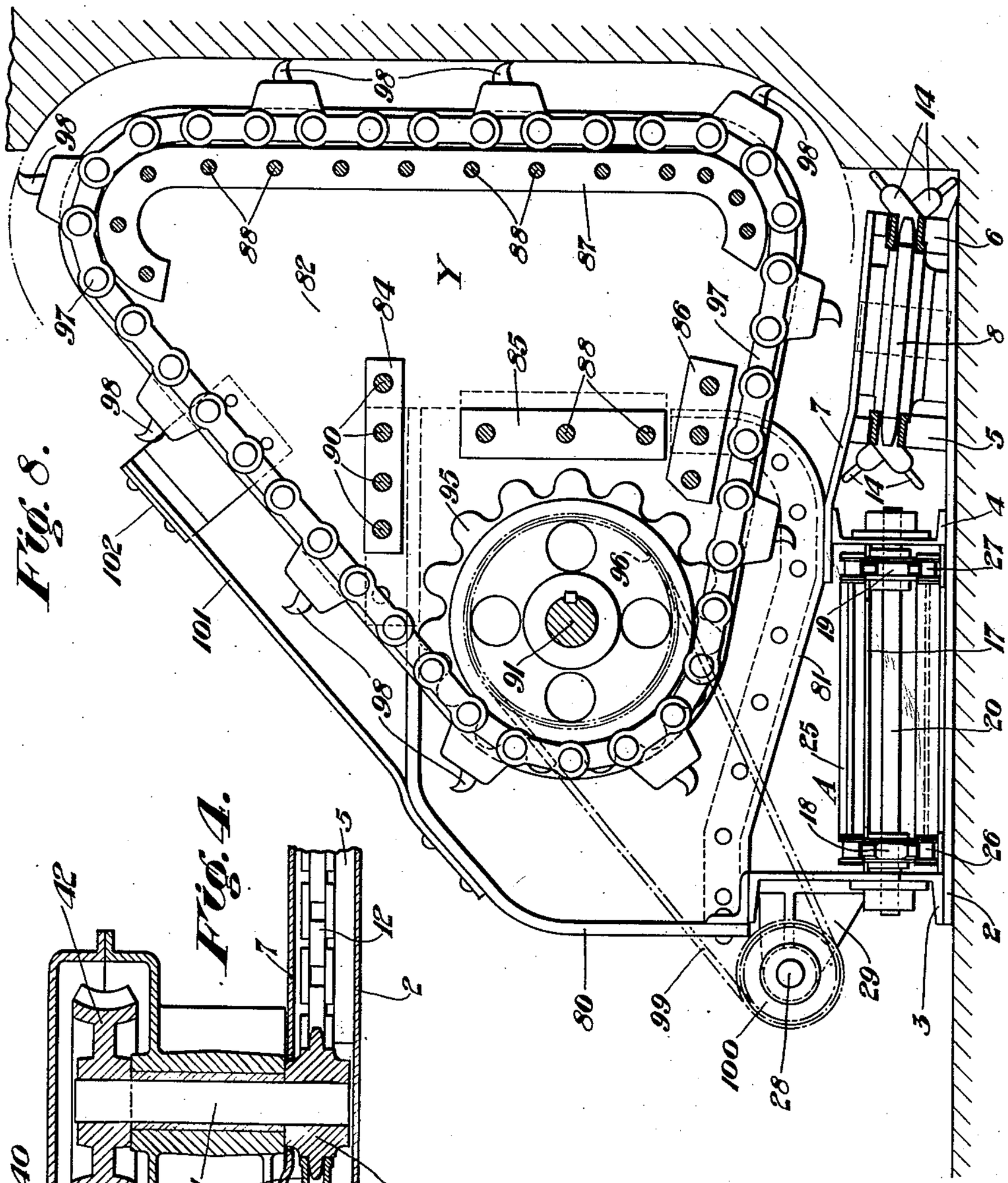

Fig. 4.

Witnesses:
Edwin Trueb

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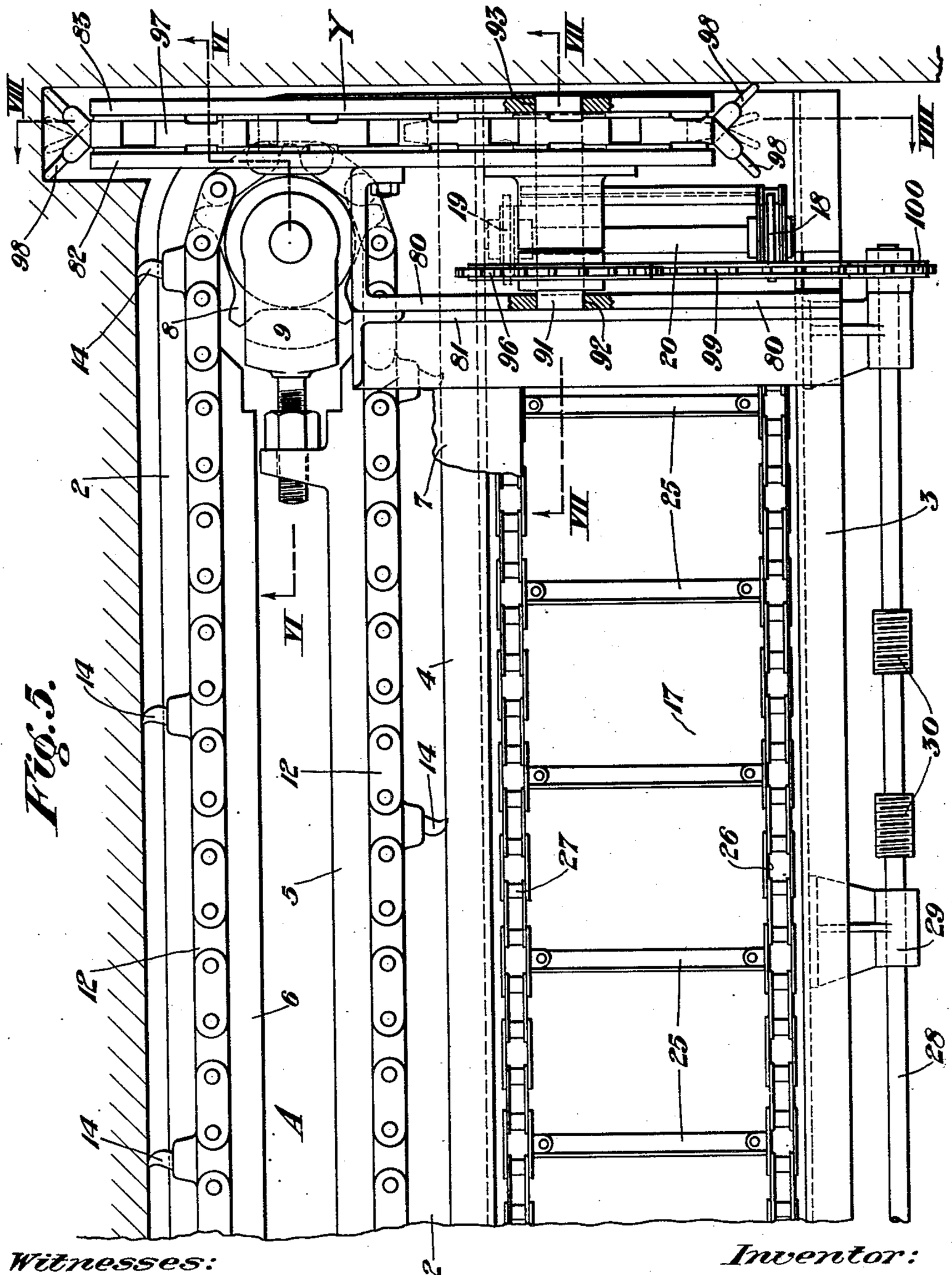
Nov. 17, 1925. 1,561,481

E. O'TOOLE

LONGWALL MINING MACHINE

Filed Feb. 14, 1924 7 Sheets-Sheet 6



Witnesses:
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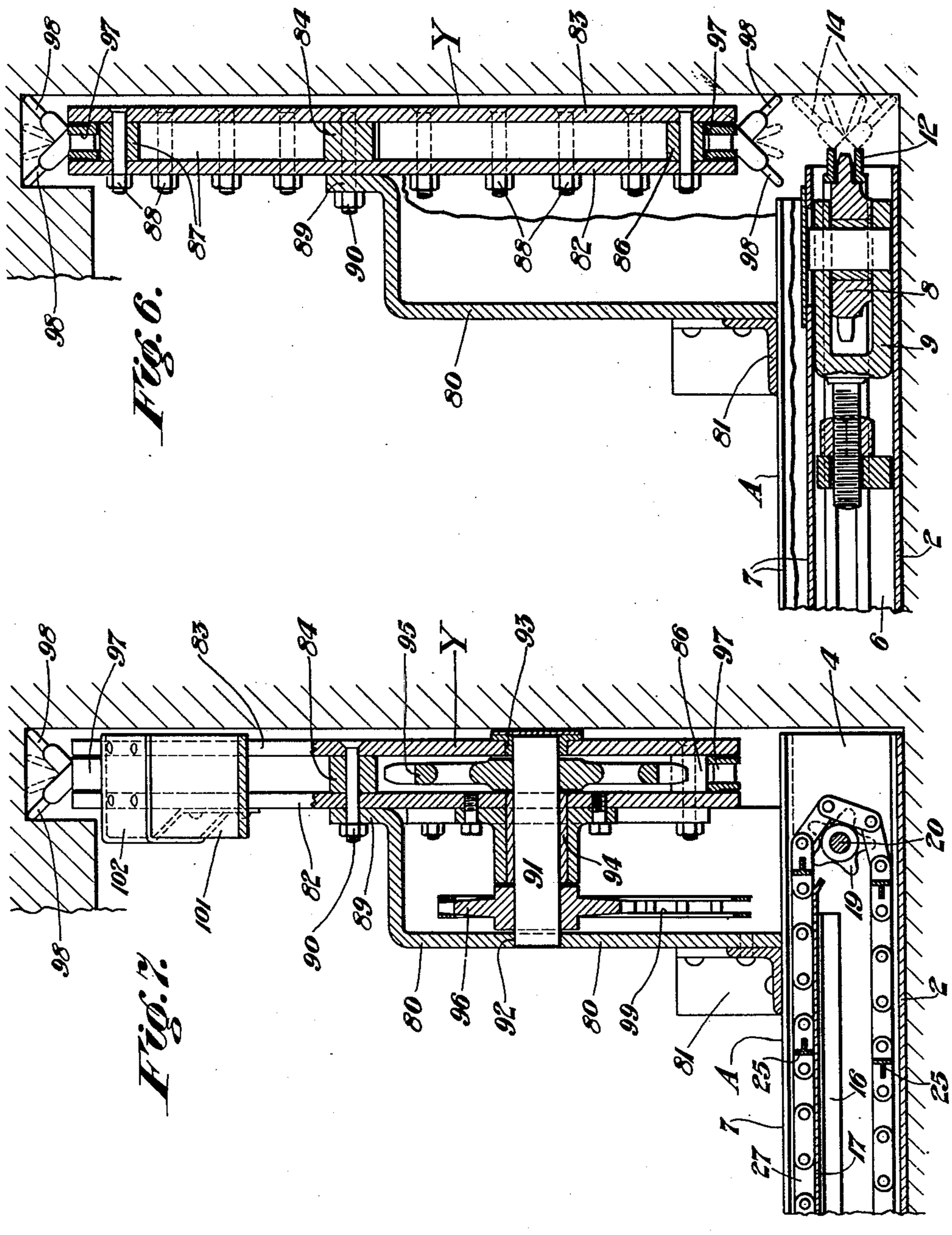
Nov. 17, 1925. 1,561,481

E. O'TOOLE

LONGWALL MINING MACHINE

Filed Feb. 14, 1924 7 Sheets-Sheet 7



Witnesses:
Edwin Trueb

Inventor:
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Patented Nov. 17, 1925. 1,561,481

UNITED STATES PATENT OFFICE.

EDWARD O'TOOLE, OF GARY, WEST VIRGINIA.

LONGWALL MINING MACHINE.

Application filed February 14, 1924. Serial No. 692,694.

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 mining machines of the longwall type of the construction shown and described in my co-pending application, Serial No. 620,246, filed February 20, 1923.

This invention has for its object the provision of a machine of the class described that will both mine and load the mined material, with a minimum of labor.

Another object is to provide a machine of the class described that will cut a vertical kerf at the butt end of the machine, thus eliminating the necessity of a heading at this end of the machine and permitting the use of the machine in cutting solid coal, or in driving a room.

A further object of this invention is to provide a machine of the type described, having the novel construction, design and combination of parts described in the following specification and illustrated in the accompanying drawings.

In the drawings, Figure 1 is a partial top plan of the machine in working position.

Figure 1ª is a continuation of the plan of Figure 1 from the line X—X.

Figure 2 is a partial rear elevation of the machine.

Figure 2ª is a continuation of the elevation of Figure 2 from the line Y—Y.

Figure 3 is an end elevation of the machine.

Figure 4 is an enlarged detail sectional elevation on the line IV—IV of Figure 1, showing the cutting chain drive gears.

Figure 5 is an enlarged plan of the butt end of the machine, with housing and other enclosing parts removed for clearness.

Figure 6 is a sectional elevation on the line VI—VI of Figure 5.

Figure 7 is a sectional elevation on the line VII—VII of Figure 5.

Figure 8 is an enlarged sectional elevation on the line VIII—VIII of Figure 5.

Figure 9 is an enlarged sectional elevation on the line IX—IX of Figure 1ª.

Referring more particularly to the drawings, the letter A designates the frame of the machine as a whole, which is composed of a base or bottom plate 2, rear and front channel members 3 and 4, respectively, cutter chain guides 5 and 6, and housing or cover plate 7.

A cutter chain idler sprocket 8 is mounted between the base plate 2 and cover plate 7 at the butt end of the machine. A cutter chain drive sprocket 10 is mounted on a drive shaft 11 adjacent the delivery end of the machine.

A cutter chain 12 having the usual cutting bits 14 is trained over the sprockets 8 and 10 and serves to cut a kerf in the material being mined.

Angle brackets 15 and 16 are secured to the rear and front channel members 3 and 4, respectively, and serve as a support for a conveyer plate 17.

A pair of idler sprockets 18 and 19 are mounted on a shaft 20 journaled in the channel members 3 and 4 adjacent the butt end of the machine, and a pair of drive sprockets 21 and 22 are mounted on a shaft 23 journaled in the channel members 3 and 4 at the delivery end of the machines. The channel frame members 3 and 4 are inclined upwardly on an angle and extend beyond the main body of the machine for a short distance at the delivery end of the machine to provide for delivery of the material into the cars B or other conveying devices.

A flight conveyer composed of T-shaped flight members 25 secured to conveyer chain members 26 and 27 is trained over the sprockets 18—19 and 21—22 so that it rides on the upper side of the conveyer plate 17 and serves to pull or convey the mined material along said plate.

A drive shaft 28 is journaled in bearings 29 mounted on the base 2 along the rear side of the machine, and carries a plurality of worm gears 30 adapted to mesh with worm wheels 31 freely movable on feed-in or advancing bars 32. The worm gears 30 and feed-in bars 32 are arranged in pairs so that one bar may be advancing while the other bar is being moved in a forward position. The bars 32 are screw threaded and are provided with nuts 30ª adapted to be locked to the worm wheels 31 by locking pins 31ª. The bars 32 are adapted to have their rear ends engaged against suitable removable jacks or posts 34 mounted between the roof and bottom of the mine and their

forward ends projected through suitable openings or apertures 35 in the rear channel member 3.

The main frame of the machine is provided with a motor base 38 on which is mounted the drive motor 39 for the cutter and conveyer. The motor 39 is coupled to a counter-shaft 40 which carries a worm gear 41 meshed with a worm wheel 42 secured on the upper end of and adapted to drive the sprocket shaft 11 of the cutter chain drive.

The shaft 40 is provided intermediate its ends with a beveled gear 44 in mesh with a beveled gear 45 on a stub shaft 46 journaled in bearings 46a on the base 38. The shaft 46 is provided with drive sprockets 47 and 48. The sprocket 47 is in line with a sprocket 49 on the drive shaft 28 and a sprocket drive chain 50 is trained over the sprockets 47 and 49 to drive the shaft 28. A stub shaft 51 is journaled in bearing 52 on the base 38 and is provided on one end with a sprocket 53 and the other end with a beveled gear 54. A sprocket chain 55 is trained over the sprocket 48 on the shaft 46 and sprocket 53 on shaft 51 so as to drive the shaft 51 and gear 54.

The gear 54 is in mesh with a second beveled gear 56 on a stub shaft 57 journaled in the forward channel member of the frame. The shaft 57 carries a sprocket 58 which is in line with a drive sprocket 59 on the conveyer drive shaft 23 and a sprocket chain 60 is trained over the sprockets 58 and 59 so that the conveyer is also driven from the motor 39.

In order to permit this machine to be used in cutting solid coal, that is, permitting the machine to advance into a solid block of coal or other material to be mined at the butt end, as when driving a room, I provide a vertical cutter Y adapted to cut a vertical kerf into the material to be mined in advance of the machine, thus removing the end support from the under cut material and permitting it to readily break down onto the machine.

The cutter Y is supported on the main frame A of the machine by a combined housing and supporting member 80 formed from a single plate so as to give it maximum strength. The member 80 is riveted or otherwise secured along its lower and forward edge to a suitable angle iron support 81, which in turn is secured to the rear and front channel members 3 and 4 of the main frame A. The member 80 is bent to form the one side, top, front and back walls of a housing adapted to enclose the drive sprocket of the butt end or vertical cutter Y.

A pair of cutter chain guard and guide plates 82 and 83 are mounted or carried by the member 80. The plates 82 and 83 are held in spaced relation by suitable filler blocks or bars 84, 85, 86 and 87, the filler block 87 extending along substantially the entire forward edge of the plates and serving as a support of the cutter chain during its cutting operation.

The plates 82 and 83 are secured together by suitable bolts 88 which pass through the plates and the filler blocks, and the assembled plates are secured to an upright flange 89 by bolts 90.

A suitable cutter drive shaft 91 is journaled in bearings 92 and 93 in member 80 and plate 83 and in a bearing sleeve 94 secured to the plate 82.

A cutter chain drive sprocket 95 is secured to the shaft 91 between the plates 82 and 83, and drive chain sprocket 96 is secured to the shaft 91 adjacent the end of the shaft within the housing and supporting member 80.

A cutter chain 97 of standard construction having cutter teeth 98 is trained over the sprocket 95 and over the filler bar 87 and is adapted to travel downwardly along the filler block 87 when the shaft 91 and sprocket 95 are rotated.

The drive sprocket 96 is connected by a suitable drive chain 99 to a sprocket 100 on the shaft 28, so that as the shaft 28 is rotated the cutter chain 97 will be operated to cut a vertical kerf into the material to be mined.

A guard plate 101 extends from the rear of the member 80 upwardly in spaced relation with the plates 82 and 83 so as to clear the cutter teeth 98 of the chain 97, and has its forward end secured to a bracket 102 secured to the plate 82.

The forward edge of the plates 82 and 83 and cutting portion of the cutter chain 97 are materially in advance of the cutting portion of the cutter chain 12, so as to cut the vertical or end kerf in advance of the horizontal or bottom kerf.

The bottom edges of the plates 82 and 83 and the bottom stretch of the cutter chain 97 are spaced above the face of the conveyer and uppermost portion of the cutter chain 12, so that the chain 97 will clear the chain 12.

The cutter Y is arranged so as to partly overhang the cutter chain 12 and conveyer, whereby part of the cuttings from the cutter chain 97 will be carried back onto the conveyer and the remainder will be deposited against the cutter chain 12, which will carry them out to the delivery end of the machine.

While I have shown the cutter chain drive shaft 91 as receiving its power from shaft 28 through sprockets 96 and 100 and chain 99, it will be understood that if deemed advisable or necessary a separate source of power may be provided for driving the shaft 91.

In operation, the motor 39 is started and the cutter chain 12 is driven through its drive sprocket 10 by the shaft 40, worm 41, worm wheel 42 and shaft 11. Simultaneous with the operation of the cutter chain the shaft 28 will be rotated by motor 39 through shaft 40, gears 44, 45, shaft 46, sprockets 47 and 49, and chain 50, so as to operate the end or vertical cutter Y and the feeding bars 32. Also simultaneous with the above operations, the conveyer is operated from the motor 39 through shaft 40, gears 44, 45, sprocket 48, chain 55, sprocket 53, shaft 51, gears 54, 56, shaft 57, sprocket 58, chain 60 and sprocket 59.

As the machine cuts under the coal, the machine is fed forward into the kerf formed by the cutting chains, and the coal breaks down onto the housing plate 7 and is pushed onto the conveyer portion of the machine.

In Figures 1, 1[a] and 3 I have shown a plurality of hydraulic jack members 70 arranged in two rows to the rear of the machine, the jacks of one row being in staggered relation to the jacks of the other row. The jacks 70 serve to support cap pieces 71 against the roof to support the same. As the machine advances the jacks in the rearmost row are loosened and advanced to a position forward of the front row, and so on as the machine progresses. As the jacks 70 and cap pieces 71 are advanced a gob forms immediately behind the supports. By forming the gob immediately behind the supports and in such close proximity to the machine the shearing forces on the undercut coal are sufficient to break down the coal on the machine as it is undercut.

It will be understood that various changes in design and construction of details may be made without departing from the scope of my invention as defined in the appended claims.

I claim—

1. A mining machine comprising in combination a frame, a cutter chain having cutter bits thereon mounted on said frame and movable longitudinally thereof adapted to form a substantially horizontal kerf in the material to be mined, a conveyer mounted to the rear of said cutter chain and extending parallel therewith, a second cutter chain arranged at the butt end of said machine and movable in a direction at right angles to said first named cutter chain adapted to form a substantially vertical kerf in the material to be mined, and means for operating said cutter chains and said conveyer.

2. A mining machine comprising in combination a frame, a cutter chain having cutter bits thereon mounted on said frame and movable longitudinally thereof adapted to form a substantially horizontal kerf in the material to be mined, a conveyer mounted to the rear of said cutter chain and extending parallel therewith, a suitable upright supporting structure secured to said frame adjacent the butt end of said machine, said supporting structure extending an appreciable distance beyond the forward face of said horizontal kerf, a second cutter chain arranged on and adapted to travel around said supporting structure to form a substantially vertical kerf in the material to be mined in advance of said frame, and means for operating said cutter chains and said conveyer.

3. A mining machine comprising in combination a frame, a cutter chain having cutter bits thereon mounted on said frame and movable longitudinally thereof adapted to form a substantially horizontal kerf in the material to be mined, a conveyer mounted to the rear of said cutter chain and extending parallel therewith, a second cutter chain at the butt end of said machine and extending into said material an appreciable distance beyond said first mentioned cutter chain, said second cutter chain being arranged to travel about a horizontal axis and being adapted to cut a vertical kerf in the material to be mined.

4. A mining machine comprising in combination a frame, a cutter chain having cutter bits thereon mounted on said frame and movable longitudinally thereof adapted to form a substantially horizontal kerf in the material to be mined, a conveyer mounted to the rear of said cutter chain and extending parallel therewith, and means at the butt end of said machine for forming a substantially vertical kerf in the material to be mined in advance of the vertical kerf formed by said first named cutter chain.

5. A mining machine comprising in combination a frame, a cutter chain having a plurality of cutter bits thereon mounted on said frame and arranged to travel about a vertical axis in a direction longitudinally of said frame so as to form a horizontal kerf in the material to be mined, a housing over said cutter chain, said housing having the forward edge of its upper face below the upper ends of the uppermost cutter bits so as to be movable into the kerf formed by said bits, a conveyer mounted to the rear of and extending parallel with said cutter chain adapted to receive the mined material and convey it longitudinally of said machine, a combined housing and supporting member supported on said main frame adjacent the butt end thereof, a second cutter chain carried by said member, said last named cutter chain being arranged to travel about a horizontal axis and to form a substantially vertical kerf in the material to be mined, means for advancing said machine into the material to be mined, and power means for driving said cutter chains and conveyer.

6. A mining machine comprising in com-

bination a frame, a cutter chain having a plurality of cutter bits thereon mounted on said frame and arranged to travel about a vertical axis in a direction longitudinally of said frame so as to form a horizontal kerf in the material to be mined, a housing over said cutter chain, said housing having the forward edge of its upper face below the upper ends of the uppermost cutter bits so as to be movable into the kerf formed by said bits, a conveyer mounted to the rear of and extending parallel with said cutter chain adapted to receive the mined material and convey it longitudinally of said machine, a combined housing and supporting member supported on said main frame adjacent the butt end thereof, a second cutter chain carried by said member and adapted to form a substantially vertical kerf in the material to be mined, said last named cutter chain being spaced slightly above said first named cutter chain and conveyer and projecting an appreciable distance forward of said first named cutter chain, power means for advancing said machine into the material to be mined, and means for driving said cutter chains and conveyer.

In testimony whereof I have hereunto set my hand.

EDWARD O'TOOLE.