Aug. 9, 1927. **1,638,507**

E. O'TOOLE

MINING AND LOADING MACHINE

Filed Oct. 10, 1925 9 Sheets-Sheet 1

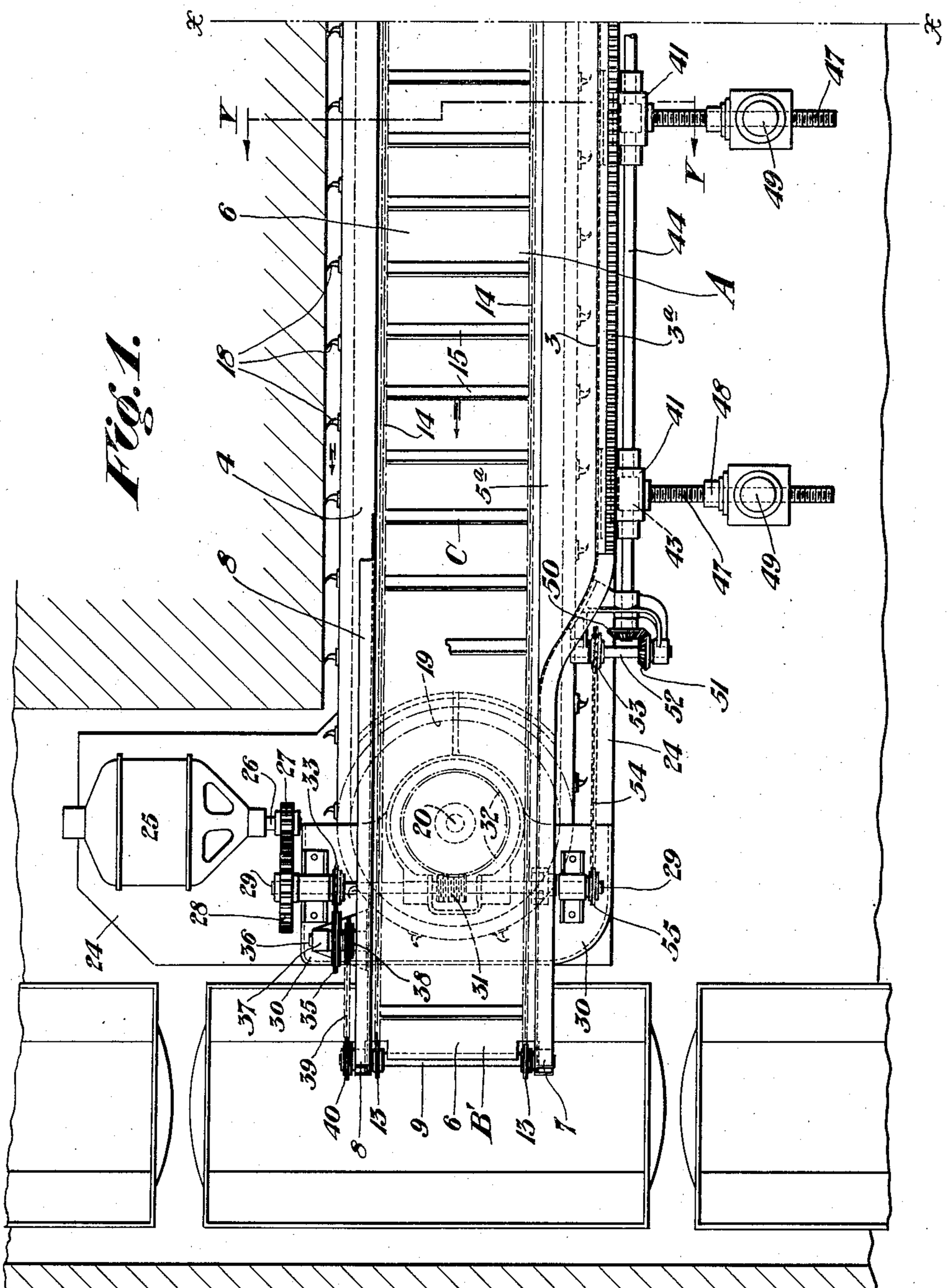

FIG. 1.

Witnesses:

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MINING AND LOADING MACHINE

Filed Oct. 10, 1925 9 Sheets-Sheet 2

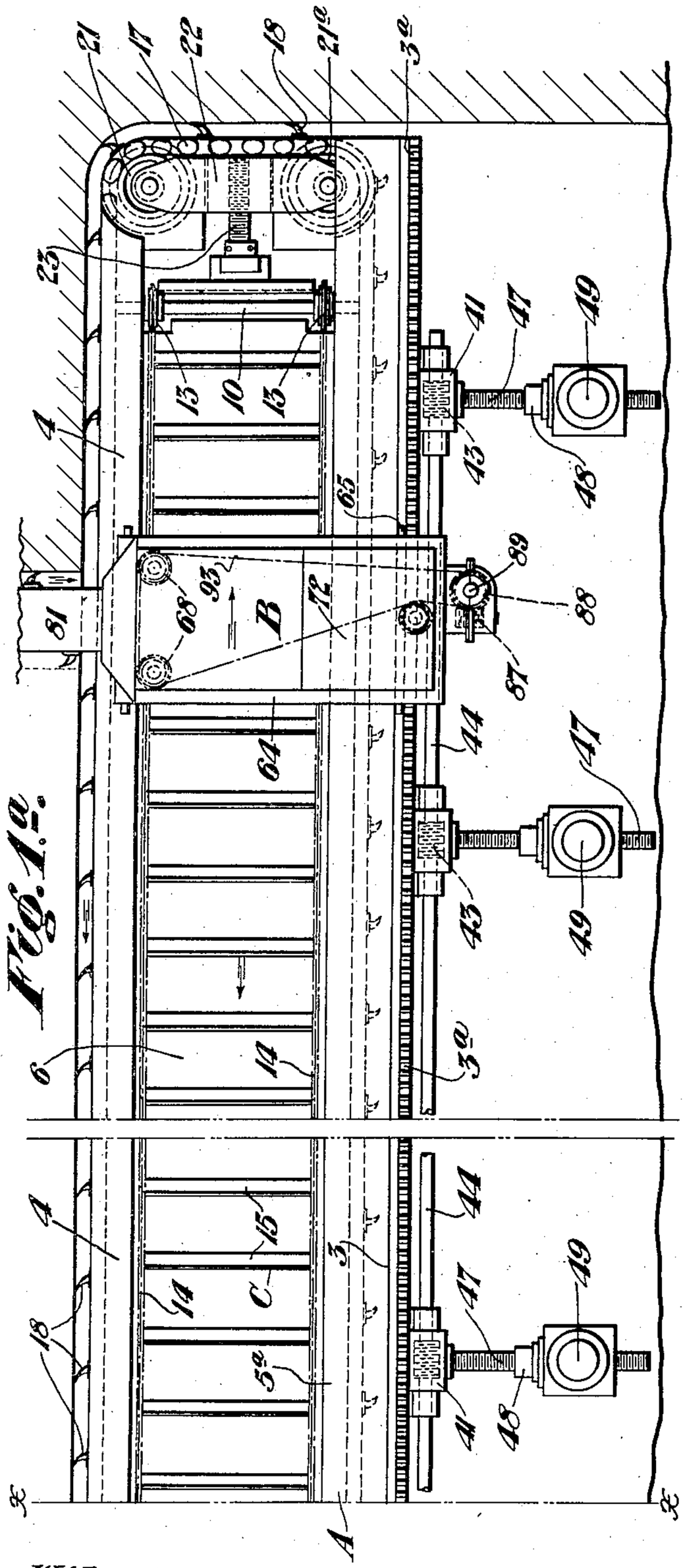

Fig. 1a.

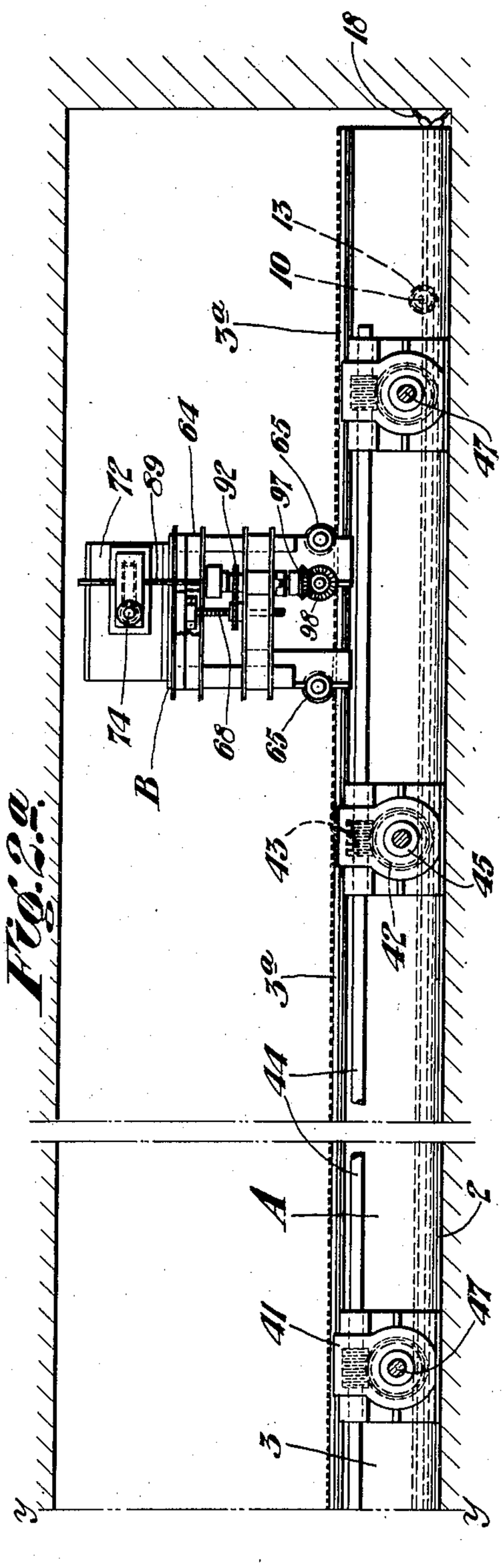

Fig. 2a.

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Aug. 9, 1927. 1,638,507

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MINING AND LOADING MACHINE

Filed Oct. 10, 1925 9 Sheets-Sheet 3

Fig. 2.

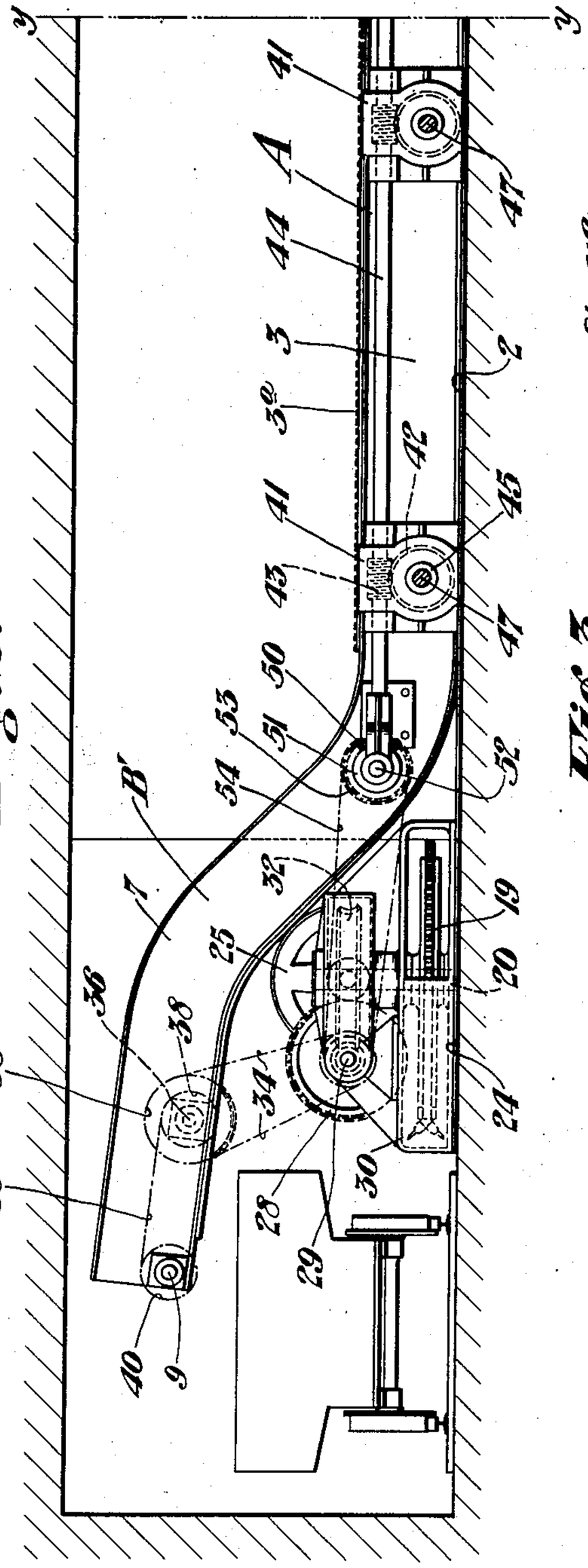
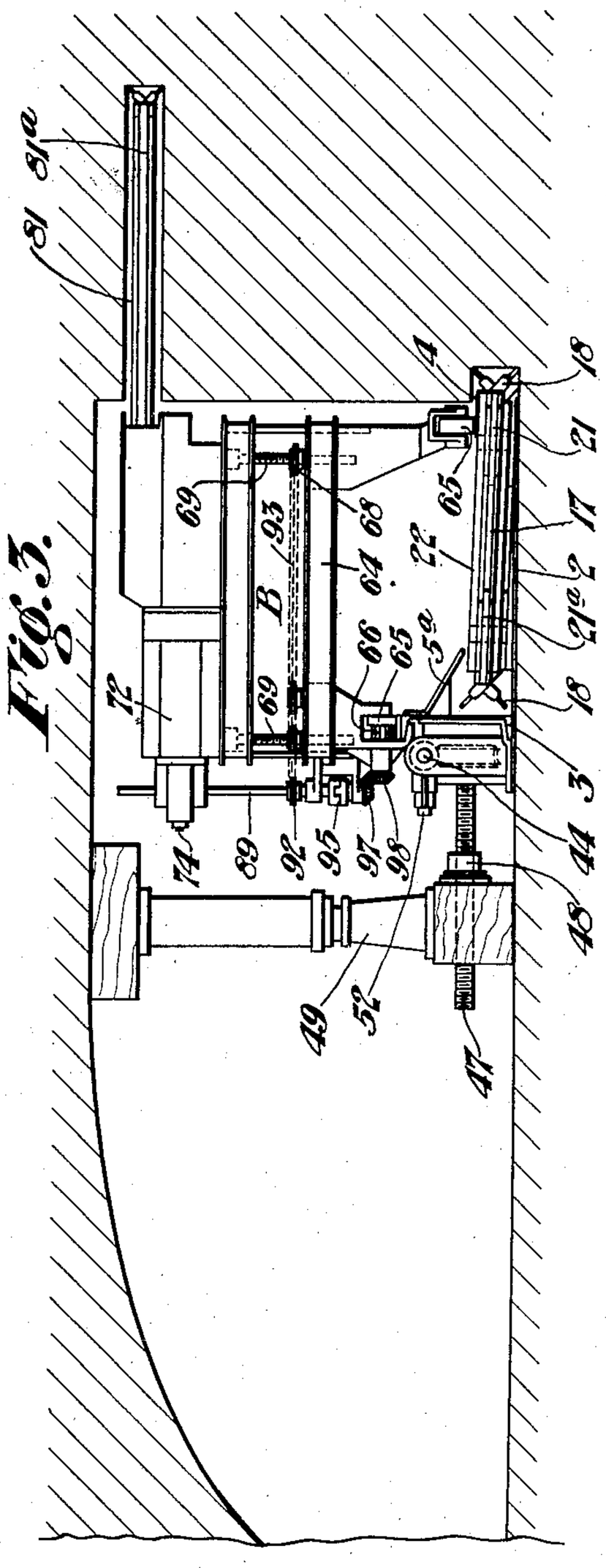


Fig. 3.



Witnesses:

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Aug. 9, 1927. 1,638,507

E. O'TOOLE

MINING AND LOADING MACHINE

Filed Oct. 10, 1925 9 Sheets-Sheet 4

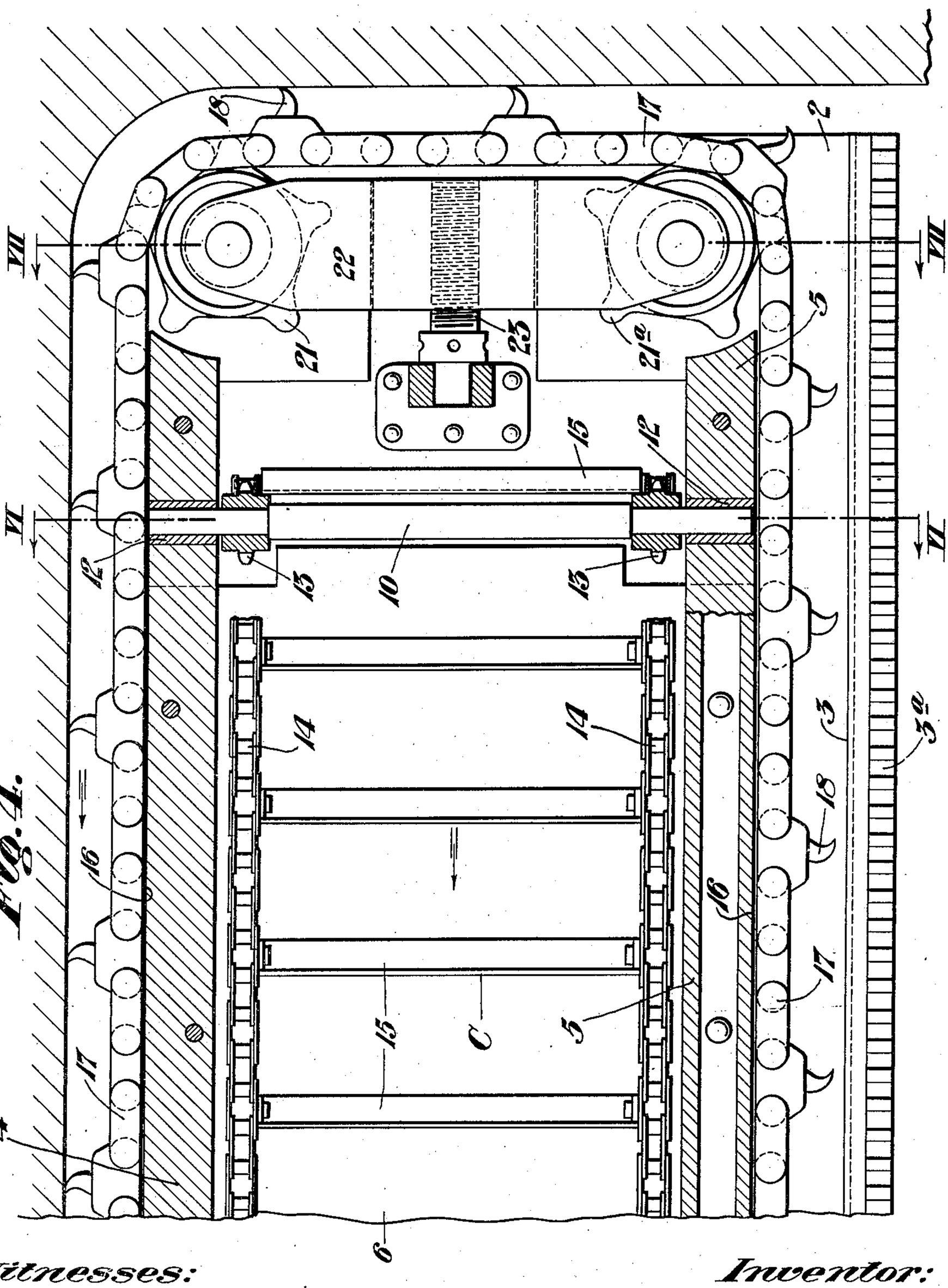

Fig. 4.

Witnesses:
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Aug. 9, 1927. 1,638,507

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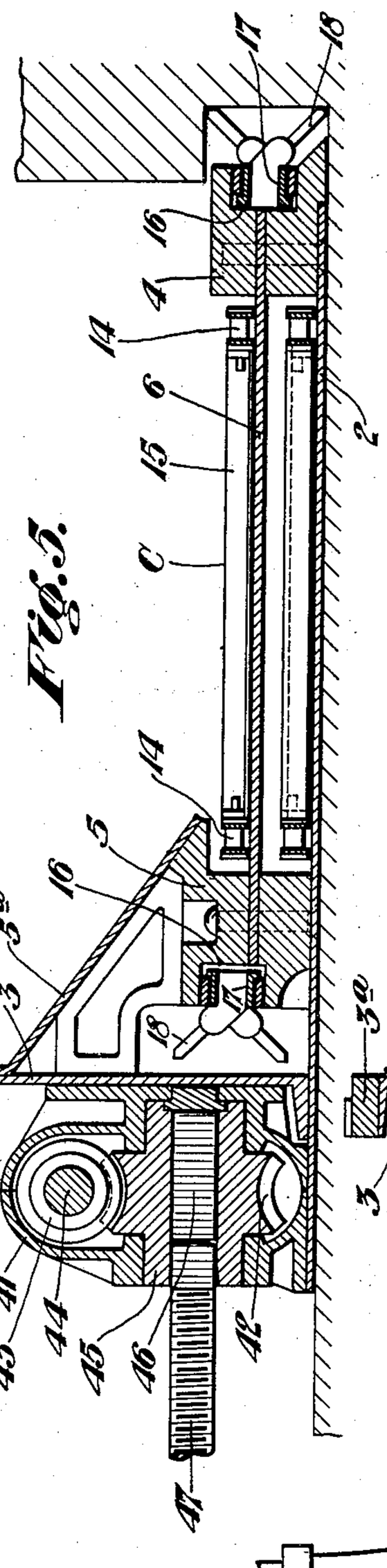
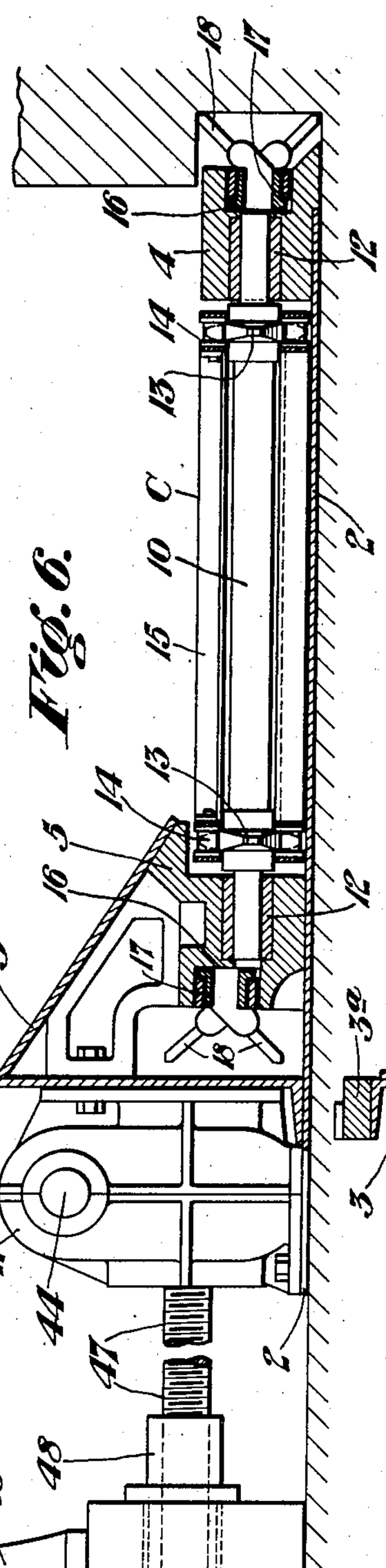
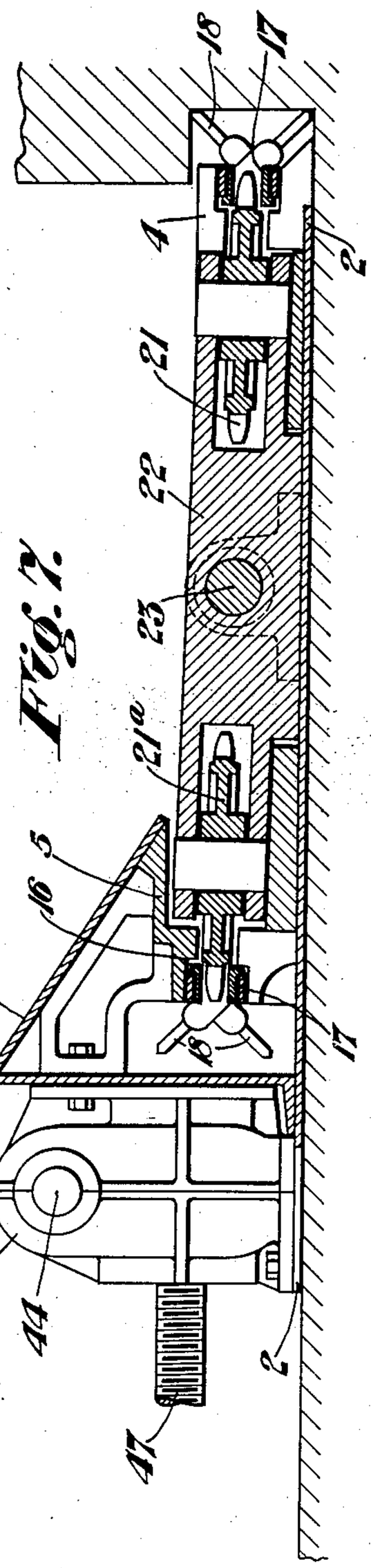
MINING AND LOADING MACHINE

Filed Oct. 10, 1925 9 Sheets-Sheet 5







Witnesses:

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Aug. 9, 1927. 1,638,507

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MINING AND LOADING MACHINE

Filed Oct. 10, 1925 9 Sheets-Sheet 6

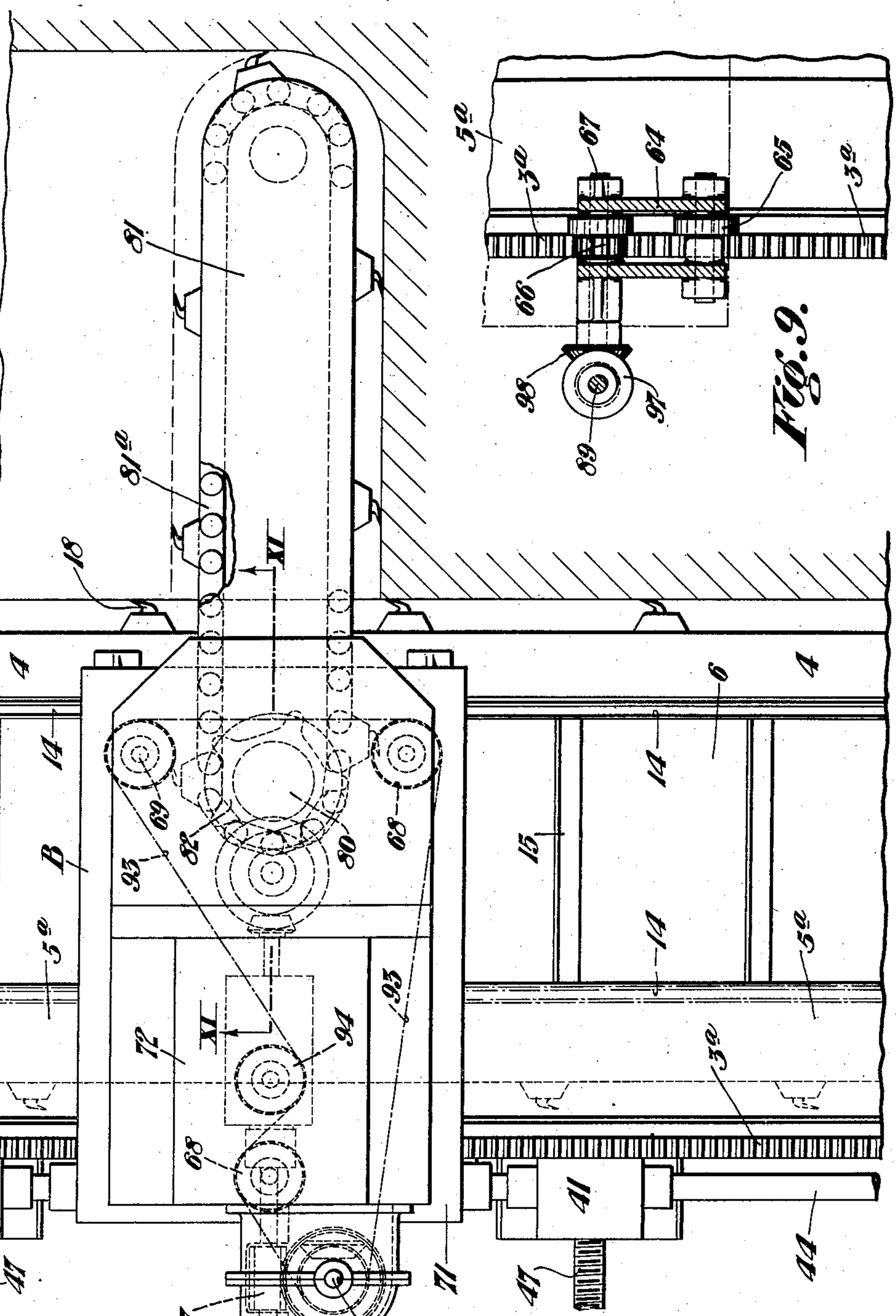

Fig. 8.

Fig. 9.

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Aug. 9, 1927. 1,638,507

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MINING AND LOADING MACHINE

Filed Oct. 10, 1925 9 Sheets-Sheet 7

Fig. 10.

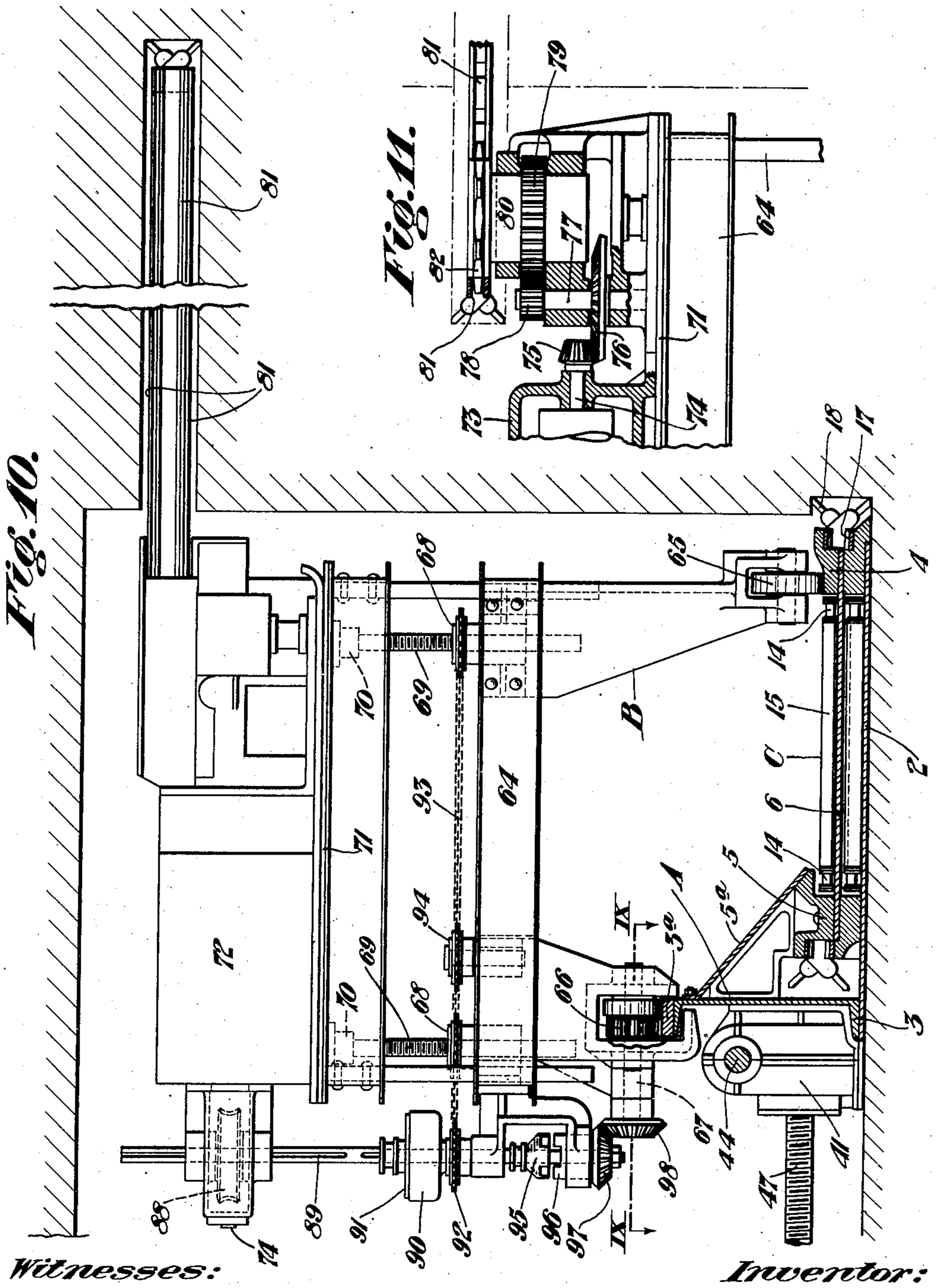

Fig. 11.

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1,638,507

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MINING AND LOADING MACHINE

Filed Oct. 10, 1925

9 Sheets-Sheet 8

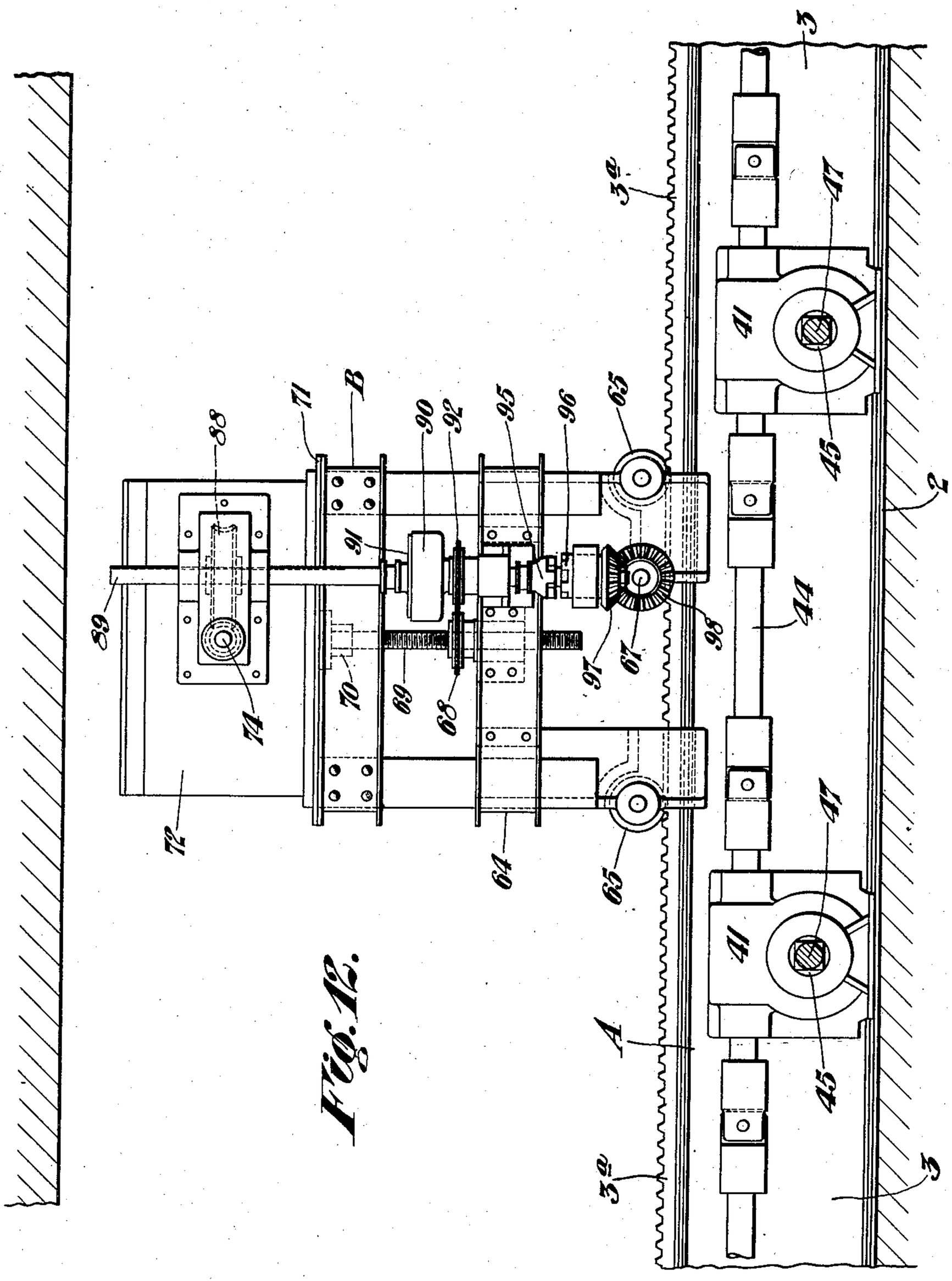

Fig. 12.

Witnesses:
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1,638,507

E. O'TOOLE

MINING AND LOADING MACHINE

Filed Oct. 10, 1925

9 Sheets-Sheet 9

Fig. 13.

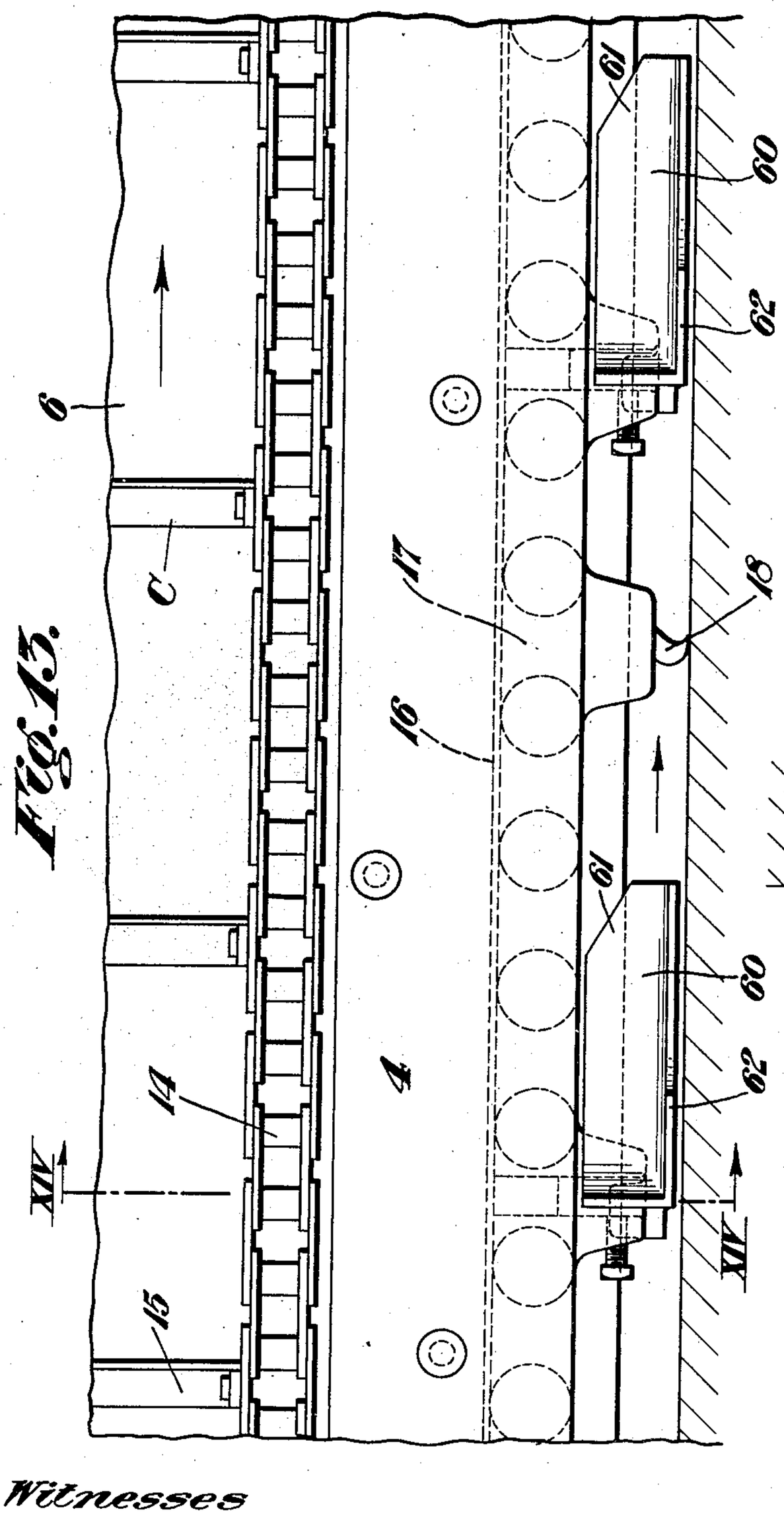


Fig. 15.

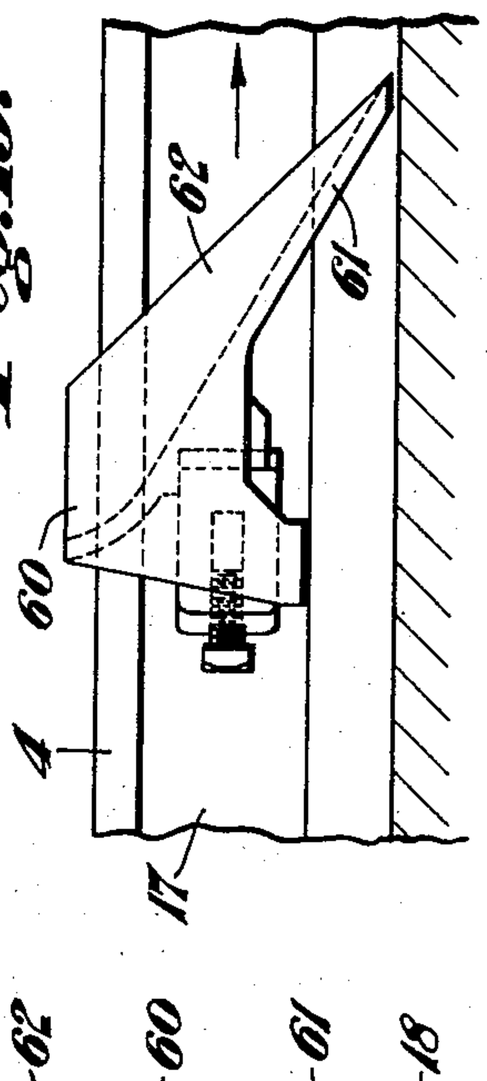
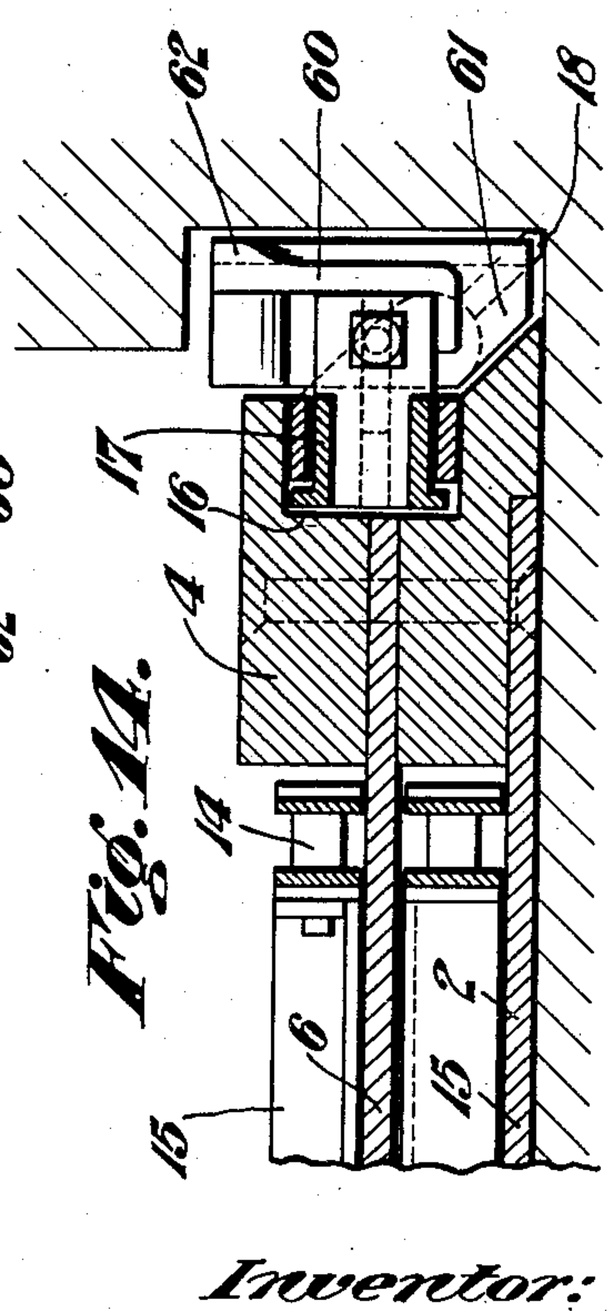


Fig. 14.



Witnesses

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Patented Aug. 9, 1927. 1,638,507

UNITED STATES PATENT OFFICE.

EDWARD O'TOOLE, OF GARY, WEST VIRGINIA.

MINING AND LOADING MACHINE.

Application filed October 10, 1925. Serial No. 61,796.

This invention relates to mining machines and more particularly to a combined mining and loading machine of the longwall type, and has for its object the provision of a novel machine of this type which may be used as an undercutting and loading machine or as an overcutting and loading machine as desired.

Another object is to provide a novel mining machine having a cutting mechanism adapted to travel along the machine frame and to be adjustable vertically over a wide range so as to permit the formation of horizontal kerfs in the material to be mined at various levels.

Mining machines constructed in accordance with this invention are particularly adapted for use in coal mines where the roof is so tender that the blasts or shots, when placed against the roof, to bring down the coal will shatter the roof and bring down the roof slate, or where the upper portion of seam carries a high percentage of sulfur, which renders this top coal valueless for metallurgical purposes, and it is preferred to leave it up to help support the roof, and in many other instances where it is not desired to disturb the roof or where it is not practical to undercut the coal.

The present invention provides a novel form of longwall machine having a cutting mechanism adapted to overcut the coal over a longwall face and to load the coal over the same face after it has been broken down by bottom shots.

In the drawings:

Figures 1 and 1ª show a plan of a machine constructed in accordance with this invention, the figures being divided on the line X—X.

Figures 2 and 2ª show a rear elevation of the machine of Figures 1 and 1ª divided on the line Y—Y.

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

Figure 4 is an enlarged plan of the tail end of the machine.

Figure 5 is a transverse sectional elevation on the line V—V of Figure 1.

Figure 6 is a transverse sectional elevation on the line VI—VI of Figure 4.

Figure 7 is a transverse sectional elevation on the line VII—VII of Figure 4.

Figure 8 is an enlarged top plan of the overcutting mechanism.

Figure 9 is a sectional plan on the line IX—IX of Figure 10.

Figure 10 is a side elevation of the overcutting mechanism.

Figure 11 is a sectional elevation on the line XI—XI of Figure 8.

Figure 12 is a rear elevation showing the operating mechanism of the overcutting device.

Figure 13 is a fragmentary plan of the forward edge of the machine showing the cutting chain equipped with plows for elevating mined material onto the machine.

Figure 14 is a transverse sectional elevation on the line XIV—XIV of Figure 13.

Figure 15 is a fragmentary front elevation showing one of the plow members.

Referring more particularly to the drawings, the letter A designates the main frame or base 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, and a pair of spaced cutter or plow chain guide-bars 4 and 5. The cutter or plow chain guide-bar 4 is mounted along the forward edge of the bottom plate 2, while the bar 5 is spaced materially to the rear of the bar 4, so that its rear face is spaced only a short distance from the forward face of the beam 3. A suitable cover plate 5ª extends from the top of the beam 3 to the top of the guide-bar 5, so as to form a closed housing for the return strand of the cutter or plow chain.

The top face of the beam 3 is provided with a combined rack and track bar 3ª and the top face of the bar 4 is shaped to form a second track member. A wheeled platform B is mounted on the base A and adapted to travel longitudinally of the base on the track composed of the bar 3ª and top face of the bar 4.

The guide-bars 4 and 5 are divided longitudinally along a horizontal axis and a conveyer plate 6 is secured therebetween.

The main frame A is provided at its head or loading end with an upwardly inclined extension B′ composed of side channel beam members 7 and 8, which support the head end of the conveyer plate 6 and the head conveyer shaft 9, which is journaled in suitable bearings in said side beam members.

A conveyer tail shaft 10 is journaled in suitable bearings 12 adjacent the forward end of the guide-bars 4 and 5. The shafts

9 and 10 are provided with suitable sprockets 13, and a flight conveyer C, composed of side chains 14 and flights 15, is trained over the sprockets 13 so that the conveying portion or strand thereof, passes along the upper face of the plate 6 and the return portion or strand passes under the plate 6.

The forward face of the guide-bar 4 and rear face of the guide-bar 5 are provided with guide slots 16 in which a tool chain 17, of any well known construction, is adapted to ride. The chain 17 is provided with a series of downwardly projecting or bottom cutter bits 18 of standard design, and also with a series of plow members 18[a], the cutter bits serving to cut a level floor, and the plows lifting and directing the mined material onto the conveyer.

The chain 17 is trained over a head sprocket 19 mounted on a vertical shaft 20 and over a pair of tail or idler sprockets 21 and 21[a], mounted in an adjustable take-up block 22, which is adapted to be adjusted by the screw 23 to take up slack in the cutter chain.

The base plate 2 is provided with an extension 24 at the head end of the machine which serves as a base for the power and drive unit of the machine. A motor 25 is mounted on the base plate 24 and has its armature shaft 26 provided with a pinion 27 which is in mesh with a gear 28 on a transverse shaft 29 journaled in a housing 30. A worm 31 is mounted on the shaft 29 and meshed with a worm-wheel 32 on the shaft 20, which shaft carries the cutter chain head sprocket 19.

The shaft 29 also is provided with a sprocket 33 which is connected by a chain 34 to a sprocket 35 on a stub shaft 36 mounted on a suitable bearing bracket 37. The shaft 36 is also provided with a sprocket 38 which is connected by a chain 39 to a power sprocket 40 on the conveyer head shaft 9.

From the above it will be seen that a single motor operates both the tool chain 17 and the conveyer C, and also that due to the novel arrangement of parts, the conveyer is located between the working and return strands of the tool chain, so that the material being mined may be readily directed onto the conveyer.

A plurality of worm and worm-wheel casings 41 are secured at spaced intervals along the rear face of the channel member 3, and suitable worm-wheels 42 are journaled therein which are meshed with worms 43 on a power shaft 44 extending along the rear of the machine and journaled in suitable bearings at each end of each of the plurality of boxes or casings 41.

The spindles 45 of the worm-wheels 42 are provided with centrally arranged squared openings adapted to receive a filler bar 46 and the squared forward end of a screw-threaded advancing or feed bar 47. The bars 47 have screw-threaded connections with nuts 48 carried by the bases of a series of hydraulic jacks 49, 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 42 by the shaft 44 and worms 43 will rotate the bars 47 and thus cause said bars to rotate in the nuts 48 and be fed forward. The force of the forward feeding bars 47 will be delivered through the filler bars 46 to the channel 3 of the frame A of the machine and thus force the machine forwardly into the material being mined.

The power shaft 44 is provided at its head end with a beveled gear 50 which meshes with a beveled gear 51 on a stub shaft 52. The shaft 52 is also provided with a sprocket 53, which is connected by a chain 54 with a sprocket 55 on the shaft 29, so that the single motor 25 also drives the shaft 44 to advance the machine.

While I have shown and described the use of the roof supporting jacks 49, the bars 47 and nuts 48 for supporting the roof and advancing the machine, it will be understood that any other form of roof supporting and advancing mechanism may be used.

It will also be understood that while I have shown and described a single motor for operating the tool chain, conveyer and advancing mechanism, I do not wish to be limited to this specific detail since these parts may be operated by separate motors if desired.

The plows 18[a] have an inclined bottom wall 61 which is inclined downwardly and forwardly in the direction of travel of the tool chain, and a retaining flange 62 which prevents the material being lifted from falling from the plows.

A carriage 64 is mounted on the base A and is provided with wheels 65 which travel on the track portion of the bar 3[a] and the top of the bar 4. A combined wheel and pinion 66 is mounted on a shaft 67 journaled on the carriage 64 and the pinion portion thereof is in mesh with the rack portion of the bar 3[a] while the wheel portion engages and travels along the track portion of said bar.

The top face of the carriage 64 is provided with a plurality of sprocket nuts 68, which nuts are in threaded engagement with platform elevating screws or posts 69 which have their upper ends journaled in cap pieces 70 on the bottom face of a platform member 71.

The platform 71 carries a standard form of overcutter comprising a casing 72 enclosing a motor 73 having its armature shaft 74 connected at one end by gears 75 and 76 with a shaft 77 carrying a gear 78 which meshes with a gear 79 on a cutter chain drive member 80. A cutter bar 81 extends for-

wardly from the casing 72 and a cutter chain 81ª is mounted on said bar and trained around a sprocket 82 on the member 80. The other end of the armature shaft 74 is connected by a worm 87 which is in mesh with a worm-wheel 88 having a sliding key mounting on a vertical drive shaft 89 journaled in suitable bearings on the carriage 64.

A friction clutch composed of idler and driving portions 90 and 91, respectively, is mounted on the shaft 89, and the idler portion 90 carries a sprocket 92. A drive chain 93 is trained around the sprocket 92 and the sprocket nuts 68 so that when the clutch parts 90 and 91 are engaged the chain will be operated to rotate the sprocket nuts 68 and raise or lower the platform 71. A chain tightening sprocket 94 is adjustably mounted on the carriage 64 and engages with the chain 93 to tighten it as it stretches in use.

A jaw clutch composed of driving and idler portions 95 and 96, respectively, is mounted on the shaft 89 adjacent the lower end thereof, and the idler portion 95 thereof carries a beveled gear 97 which is in mesh with a beveled gear 98 on the shaft 67, so that when the clutch parts 95 and 96 are engaged the beveled gears will transmit power from the shaft 89 to the shaft 67 and rotate the shaft 67 and the combined pinion and wheel member 66 to cause the carriage and platform to move longitudinally of the base A.

It will be understood that I do not wish to be limited to the construction of overcutter described above, since various forms of standard overcutters at present well known and in common use may be used in my novel combination by simply connecting the armature shaft to the drive shaft 89 by suitable gearing.

In operation the coal will be overcut by the cutter-bar 81 as the carriage and platform is moved longitudinally of the base in a direction transverse of the mine face, and after the material is overcut the material will be broken down by upshooting. After the material is broken down the tool chain 17 and conveyor C will be operated to load the broken material. The cutting tools 18 in the chain 17 serve to cut a level floor as the apparatus advances into the mined material.

It will be especially noted that the operation of the overcutter is independent of the loading apparatus and, therefore, they may be operated independent of each other and when the overcutter has cut a kerf over a short distance the overcut material may be broken or shot down and loaded while the overcutter continues to cut more kerf.

It will also be noted that when desired the carriage and platform may be removed from the base A and the plows may be removed from the tool chain 17 and cutting tools substituted therefor, so that the base A may be used independently as a mining and loading machine. When the base A is operated independent as a mining and loading machine the material is undercut by the chain 17 and broken down directly on the machine and loaded by the conveyer C.

I claim:

1. A mining machine comprising an elongated base member, a conveyer extending longitudinally of said base, a cutter chain extending longitudinally of said base and adapted to cut on a horizontal plane, means for directing mined material onto said conveyer, a track on said base, a carriage mounted on said track, a platform mounted on said carriage and vertically movable relative thereto, cutting mechanism carried by said platform and adapted to cut a horizontal kerf in the material to be mined, and means for moving said carriage and platform longitudinally of said base.

2. A mining machine comprising an elongated base member, a conveyer extending longitudinally of said base, a cutter chain extending longitudinally of said base and adapted to cut on a horizontal plane, means for directing mined material onto said conveyer, a track on said base, a carriage mounted on said track, a platform mounted on said carriage and vertically movable relative thereto, a cutting mechanism carried by said platform including a horizontal overhanging forwardly projecting cutter bar, a cutter chain operable on said bar, and means for operating said cutter chain.

3. A mining machine comprising an elongated base member, a conveyer extending longitudinally of said base, a cutter chain extending longitudinally of said base and adapted to cut on a horizontal plane, means for directing mined material onto said conveyer, a track on said base, a carriage mounted on said track, a platform mounted on said carriage and vertically movable relative thereto, cutting mechanism carried by said platform and adapted to cut a horizontal kerf in the material to be mined, means for moving said platform vertically, means for moving said carriage and platform longitudinally of said track, and a single motor for operating said last two mentioned means and said cutting mechanism.

4. A mining machine comprising an elongated base member, a conveyer extending longitudinally of said base, a cutter chain extending longitudinally of said base and adapted to cut on a horizontal plane, means carried by said cutter chain for directing mined material onto said conveyer, a track on said base, a carriage mounted on said track, a platform mounted on said carriage and vertically movable relative thereto, cutting mechanism carried by said platform and adapted to cut a horizontal kerf in the

material to be mined, and means for moving said carriage and platform longitudinally of said base.

5. A mining machine comprising an elongated base member, a conveyer extending longitudinally of said base, a cutter chain extending longitudinally of said base and adapted to cut on a horizontal plane, means carried by said cutter chain for directing mined material onto said conveyer, a track on said base, a carriage mounted on said track, a platform mounted on said carriage and vertically movable relative thereto, a cutting mechanism carried by said platform including a horizontal overhanging forwardly projecting cutter bar, a cutter chain operable on said bar, and means for operating said cutter chain.

6. A mining machine comprising an elongated base member, a conveyer extending longitudinally of said base, a cutter chain extending longitudinally of said base and adapted to cut on a horizontal plane, means carried by said cutter chain for directing mined material onto said conveyer, a track on said base, a carriage mounted on said track, a platform mounted on said carriage and vertically movable relative thereto, a cutting mechanism carried by said platform including a horizontal overhanging forwardly projecting cutter bar, a cutter chain operable on said bar, means for moving said platform vertically, means for moving said carriage and platform longitudinally of said track, and a single motor for operating said last two mentioned means and said cutting mechanism.

7. A mining machine, comprising an elongated base member having its longitudinal axis extending parallel with the face to be mined and movable toward said face, a conveyer extending longitudinally of said base, a chain extending longitudinally of said base, means carried by said chain for directing mined material onto said conveyer, a track on said base, a carriage mounted on said track, a platform mounted on said carriage and vertically movable relative thereto, a cutting mechanism carried by said platform including a horizontal overhanging forwardly projecting cutter bar, a cutter chain operable on said bar, and means for operating said cutter chain.

8. A mining machine, comprising an elongated base member having its longitudinal axis extending parallel with the face to be mined and movable toward said face, a conveyer extending longitudinally of said base, a chain extending longitudinally of said base, means carried by said chain for directing mined material onto said conveyer, a track on said base, a carriage mounted on said track, a platform mounted on said carriage and vertically movable relative thereto, a cutting mechanism carried by said platform including a horizontal overhanging forwardly projecting cutter bar, a cutter chain operable on said bar, screw means for moving said platform vertically, means for moving said carriage and platform longitudinally of said track, and a single motor for operating said last two mentioned means and said cutting mechanism.

In testimony whereof, I have hereunto set my hand.

EDWARD O'TOOLE.