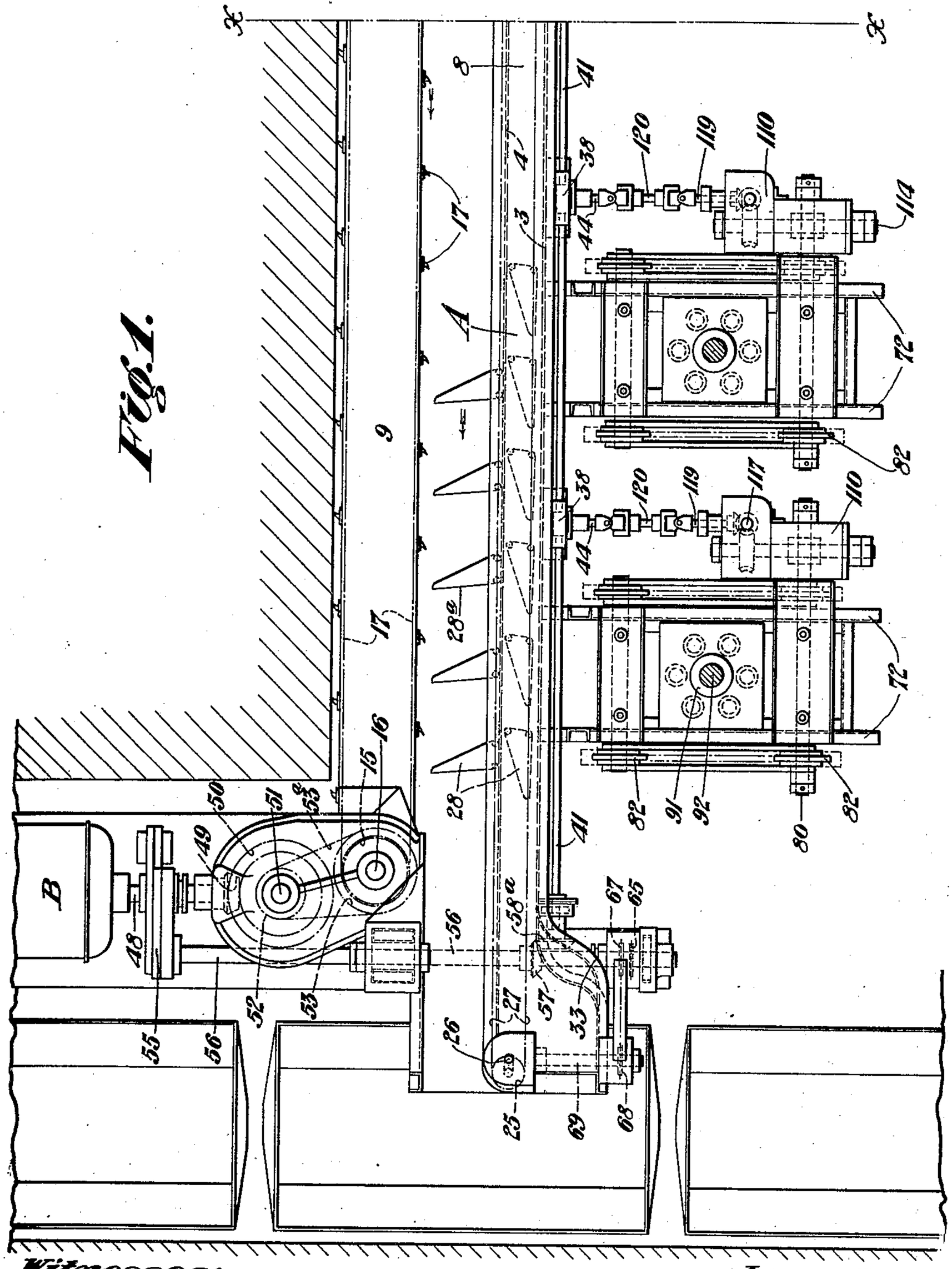
Nov. 26, 1929. E. O'TOOLE 1,737,327

MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 1

Fig. 1.



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MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 2

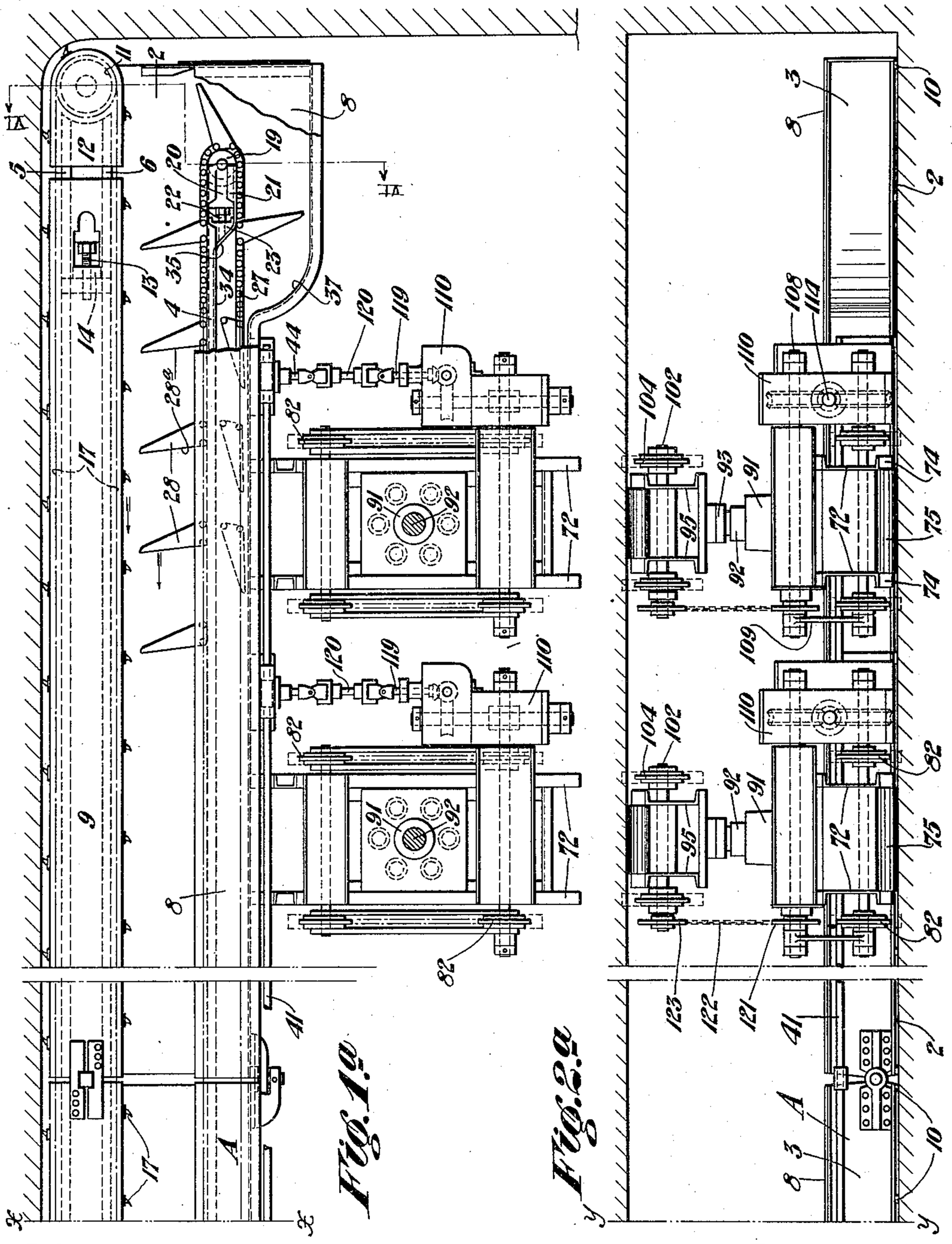

Fig. 2.

Fig. 2a.

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MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 3

Fig. 2.

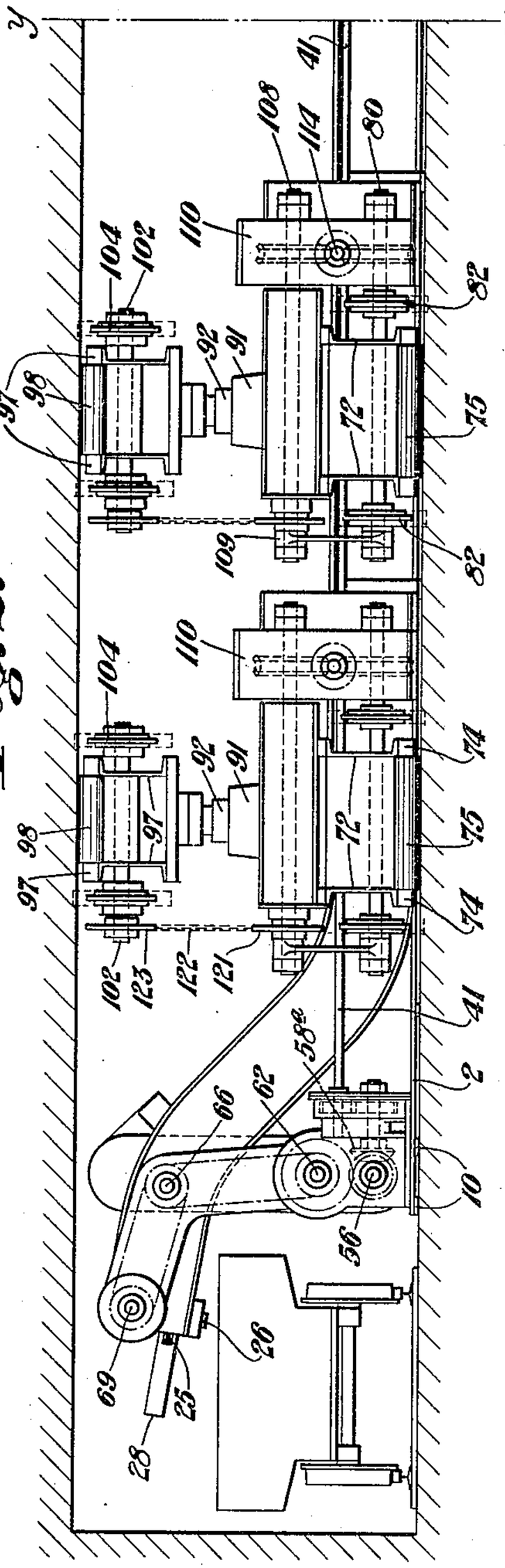
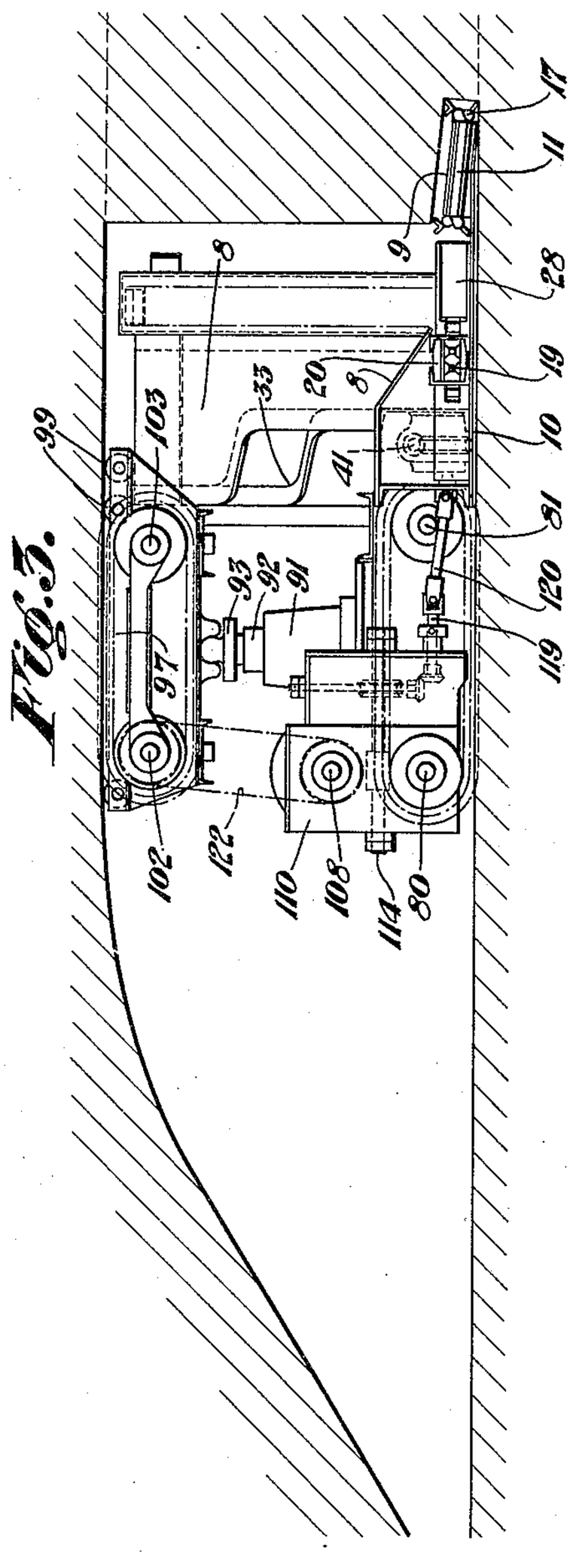


Fig. 3.



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Nov. 26, 1929. E. O'TOOLE 1,737,327

MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 4

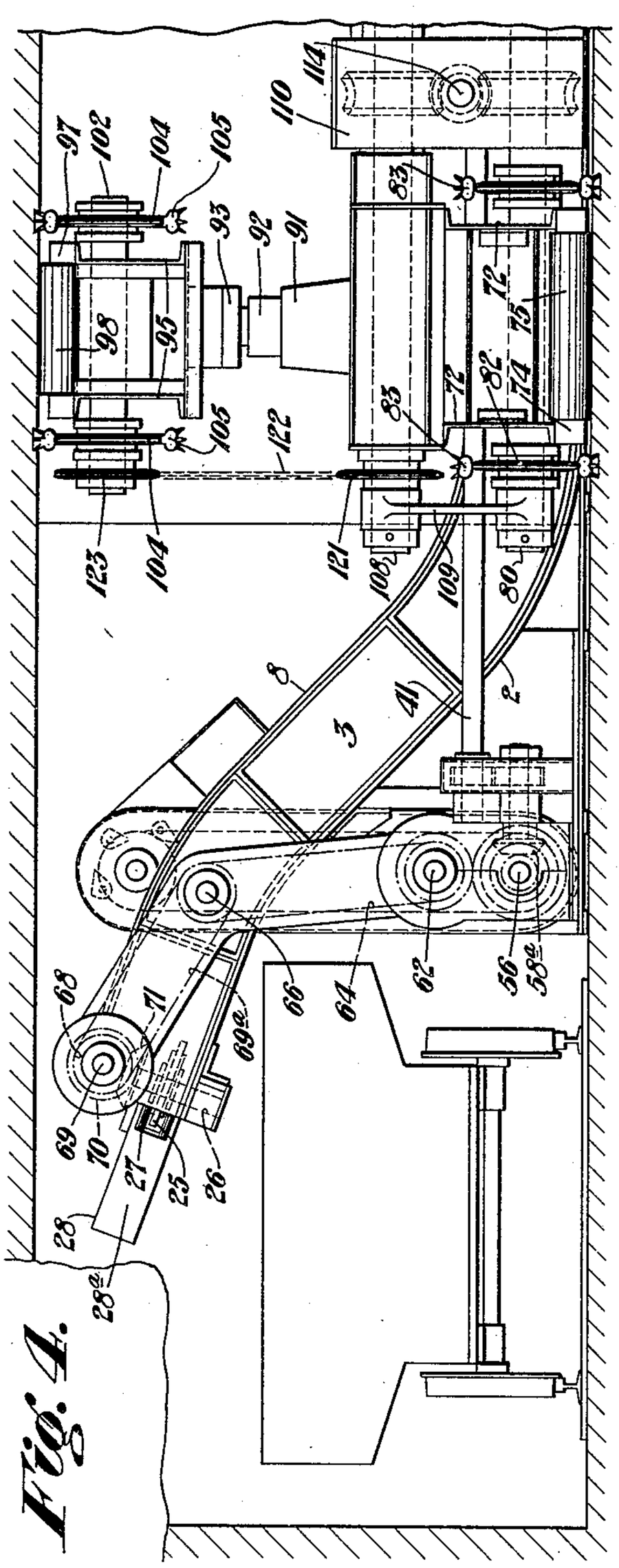

Fig. 4.

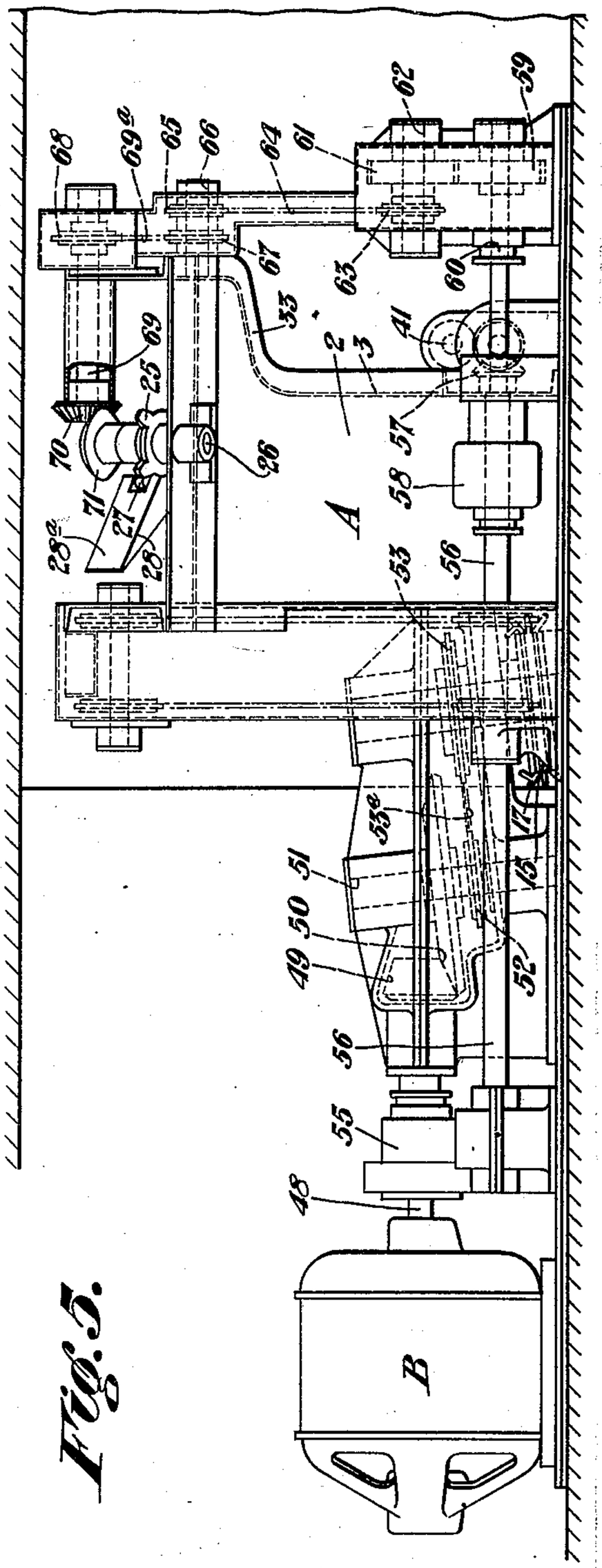

Fig. 5.

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Nov. 26, 1929. E. O'TOOLE 1,737,327

MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 5

Fig. 6.

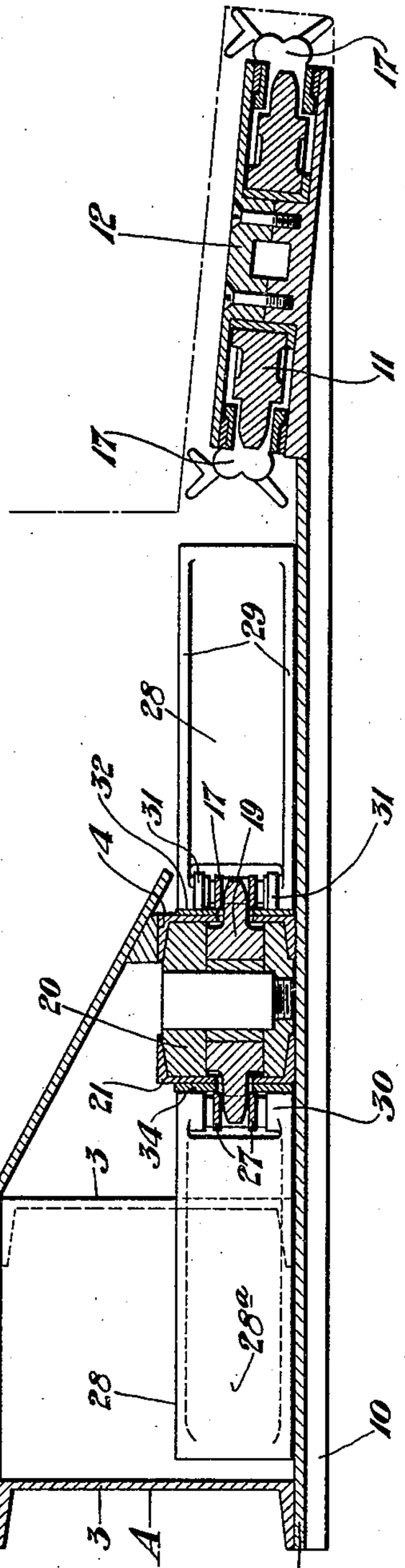
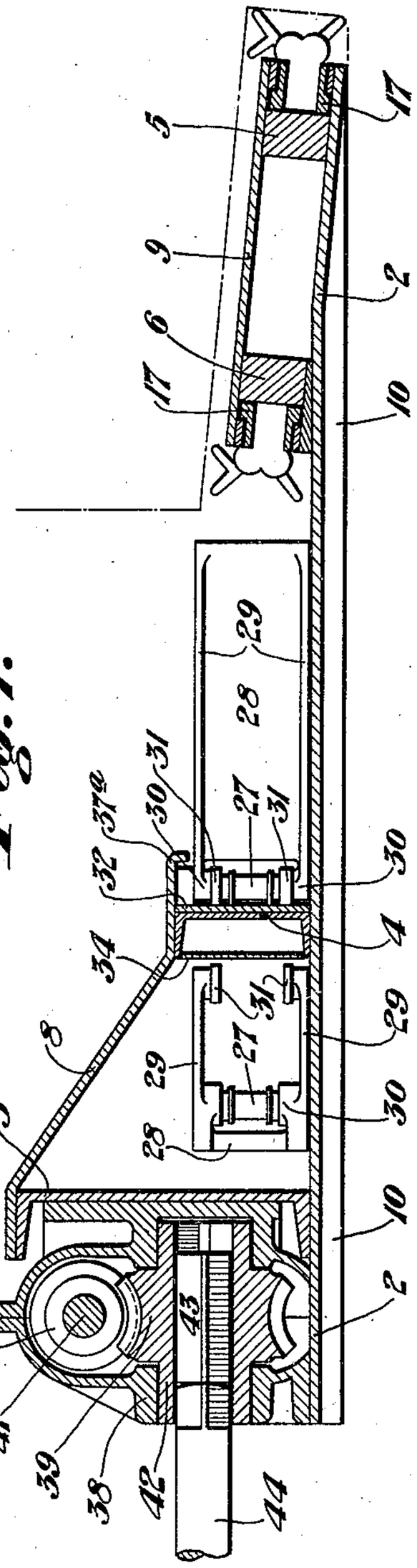


Fig. 7.



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Nov. 26, 1929. E. O'TOOLE 1,737,327

MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 6

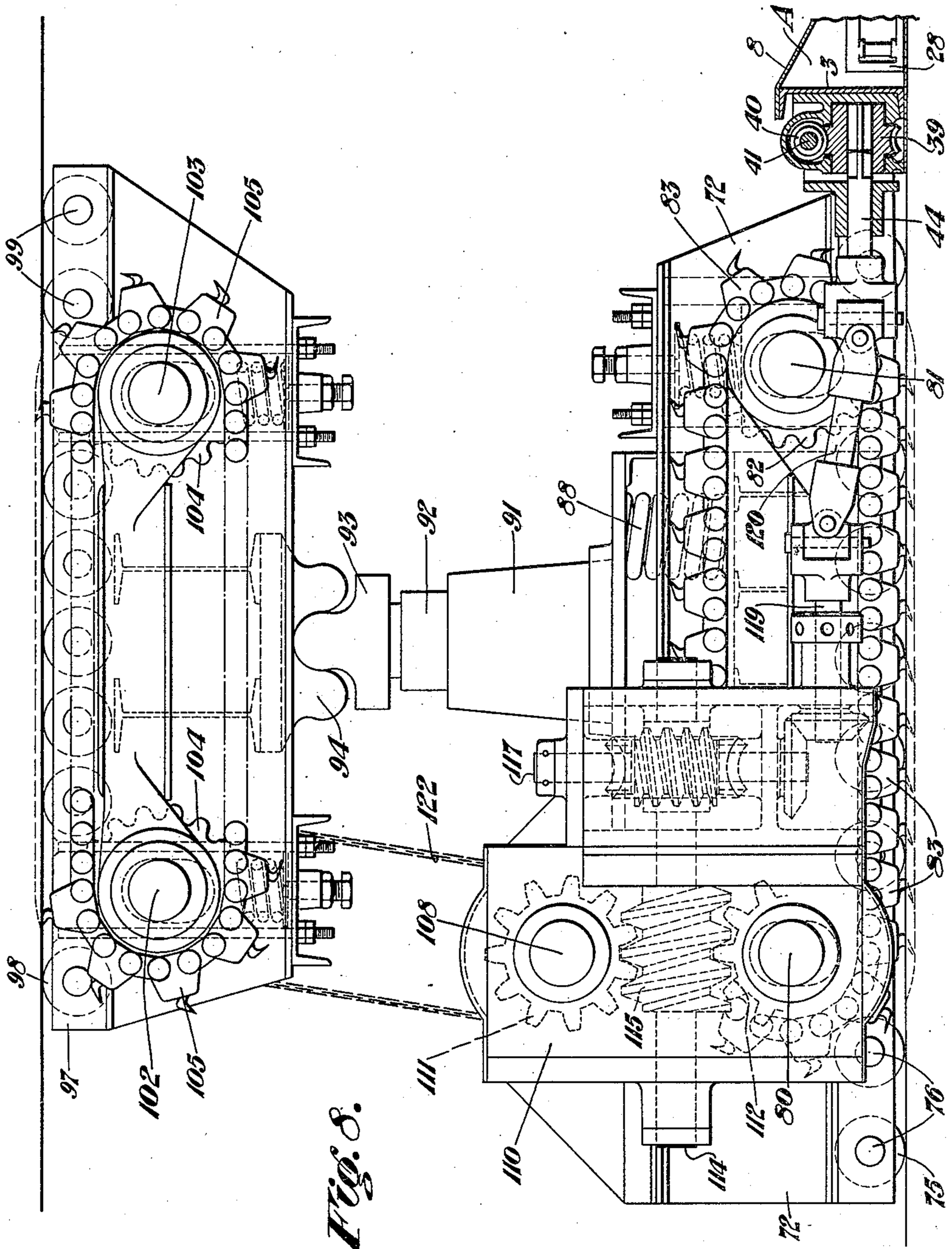

Fig. 8.

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Nov. 26, 1929. E. O'TOOLE 1,737,327

MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 7

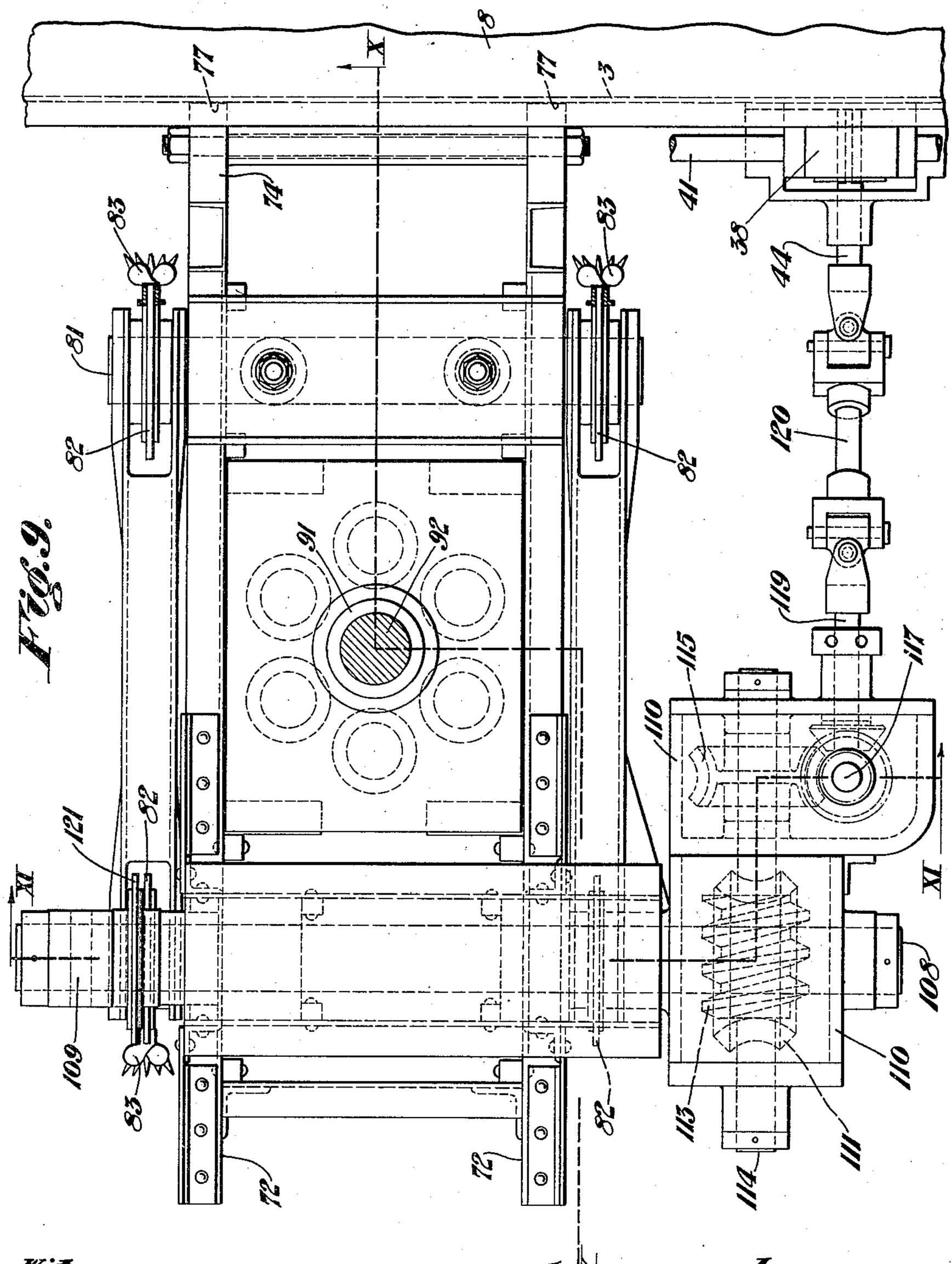

Fig. 9.

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Nov. 26, 1929. E. O'TOOLE 1,737,327

MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 8

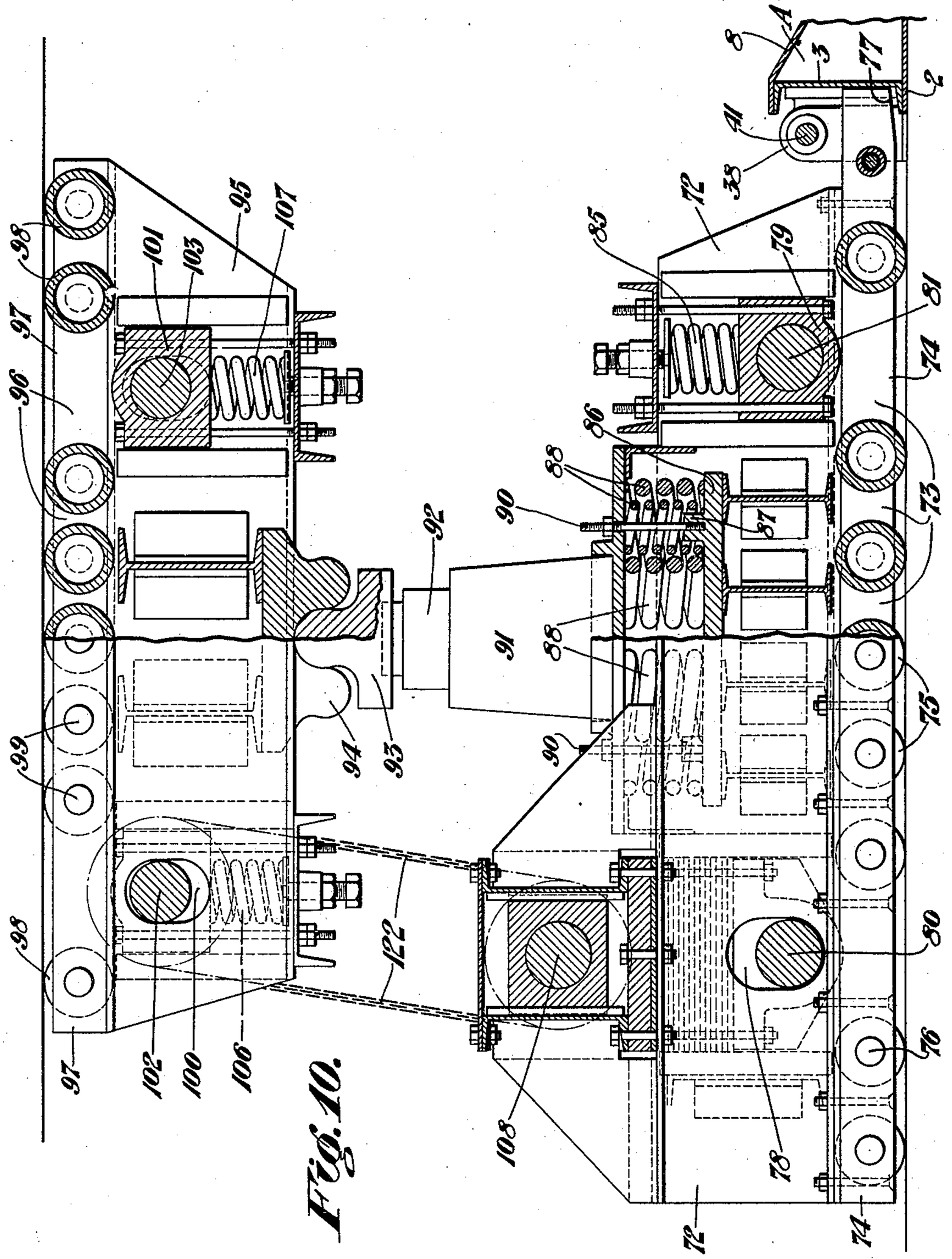

Fig. 10.

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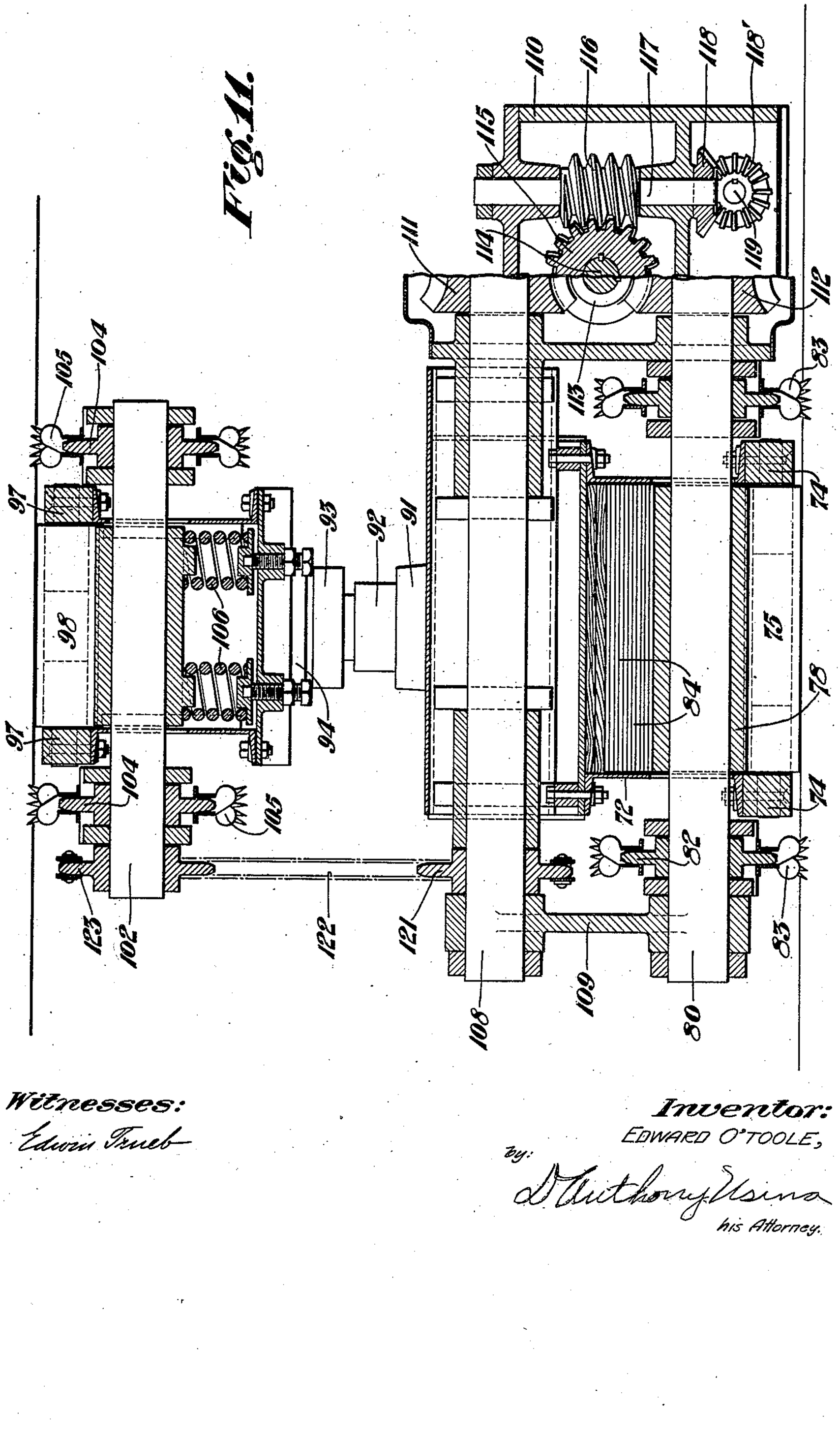
Nov. 26, 1929. E. O'TOOLE 1,737,327

MINING MACHINE

Filed Sept. 16, 1924 9 Sheets-Sheet 9

Fig. 11.



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Patented Nov. 26, 1929 1,737,327

UNITED STATES PATENT OFFICE

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MINING MACHINE

Application filed September 16, 1924. Serial No. 738,034.

This invention relates to mining machines and more particularly to a combined roof support and advancing rig for use with the longwall type of mining machines adapted to be moved bodily forward into the material being mined.

The object of the present invention is to provide a combined roof support and advancing rig adapted to support the roof and advance with the machine.

Another object is to provide a device of this class having a tractor form of propelling mechanism at both the upper and lower ends adapted to engage both the roof and floor of the mine.

A further object is to provide a device of the class described having the novel construction, combination, and arrangement of parts hereinafter described and illustrated in the accompanying drawings.

In the drawings—

Figures 1 and 1ª combine to illustrate a plan view of a mining machine with which the combined roof supporting and advancing rigs of this invention are primarily adapted for use.

Figures 2 and 2ª combine to show a rear elevation of the machine of Figures 1 and 1ª.

Figure 3 is an end view of the butt end of the machine of Figures 1 and 1ª, showing the roof supporting and advancing rigs in position.

Figure 4 is an enlarged rear elevation of the delivery end of the mining machine.

Figure 5 is an enlarged end elevation of the delivery end of the mining machine.

Figure 6 is a transverse sectional elevation through the mining machine on the line VI—VI of Figure 1ª.

Figure 7 is a transverse sectional elevation through one of the drive connections of the mining machine which drive the roof supporting and advancing rigs.

Figure 8 is an enlarged side elevation of one of the combined roof supporting and advancing rigs.

Figure 9 is a top plan thereof.

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

Figure 11 is a similar elevation of the line XI—XI of Figure 9.

Referring more particularly to the drawings, the letter A designates the elongated main frame of the mining 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 conveyor 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 casings 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 power shaft 44 adapted to be connected to the drive mechanism of the combined roof support and advancing rigs to be described.

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 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 69[a]. 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 co-operate to move the mined material lengthwise of the machine.

The mining machine shown and described is made the subject of my co-pending application, Serial No. 731,810, filed August 13, 1924. It will be understood that while the combined roof supporting and advancing rigs, to which this application is primarily directed, are particularly adapted for use with a mining machine such as shown and described, their use is not limited to such machines, but they may be used with any other mining machine where it is desired to have combined roof supports and advancing rigs.

The combined roof support and advancing rig of this invention comprises a base 72 which is built up of structural shapes and plates and is provided along its bottom face with a centrally arranged recess 73 and side flanges 74. A plurality of anti-friction rollers 75 are mounted in the recess 73 and project below the lower or bottom face of the base 72, and have their axles 76 journaled in suitable bearing openings in the flanges 74. The forward end of the base 72 is shaped as at 77 to fit against the rear face of the beam 3 of the mining machine.

The base 72 is provided at its opposite ends with bearings 78 and 79, respectively, for transverse tractor shafts 80 and 81 having sprockets 82 against each end, over which are trained tractor chains 83 adapted to engage the floor of the mine when in operation to feed the lower portion of the device or rig forwardly.

The bearings 78 and 79 are provided with cushioned mountings so as to permit a limited vertical movement of the shafts 80 and 81, respectively. The rear bearing 78 is cushioned by a rubber cushion member 84 mounted in the base 72 above said bearing and adapted to be compressed thereby. The forward bearing 79 is cushioned by springs 85 so as to permit vertical movement thereof.

The base 72 is provided with a centrally arranged jack supporting plate 86 having a plurality of upwardly projecting spring guides 87 thereon. A plurality of heavy coil springs 88 are mounted on said jack supporting plate, and a jack base 89 is mounted on the springs 88 and adjustably held in position by tie bolts 90 passing through suitable apertures in the jack base and screw threaded into the plate 86.

A jack 91 of any ordinary and well known construction, but preferably of the hydraulic type, is mounted on the jack base 89. The jack plunger or lifting element 92 is provided with a head member 93 having a pivotal connection with a cooperating member 94 on the bottom face of the roof supporting beam 95.

The beam or roof member 95 is built up of structural shapes and plates and is provided along its upper face with a centrally arranged roller recess 96 and side flanges 97. A plurality of anti-friction rollers 98 are mounted in the recess 96 and have their axles 99 journaled in suitable bearing apertures in the flanges 97.

The room member 95 is provided at its opposite ends with bearings 100 and 101, respectively, in which are journaled transverse tractor shafts 102 and 103 having sprockets 104, over which are trained tractor chains 105 adapted to engage the roof of the mine when in operation to feed the upper portion of the rig forwardly.

The bearings 100 and 101 are cushioned for vertical movement by means of spring mountings 106 and 107, respectively.

A drive shaft 108 is mounted on the rear end of the base member 72 directly above the sprocket shaft 80 and is supported at one end on the shaft 80 by a connecting bearing member 109, and at its other end by the drive gearing housing 110. It will thus be seen that any vertical movement of the sprocket shaft 80 will be communicated direct to the drive shaft 108 and, therefore, these shafts will remain constantly spaced, irrespective of the vertical movement of the shaft 80 due to its cushioned bearing.

The shafts 108 and 80 are provided with worm wheels 111 and 112, respectively, within the housing 110, which mesh with the opposite sides of a worm 113 on a longitudinally extending shaft 114 journaled in the housing 110. The shaft 114 is provided with a worm wheel 115 in mesh with a worm 116 on a vertical shaft 117 journaled in the housing 110, and provided with a bevel gear 118 on its lower end, which is in mesh with a bevel gear 118′ on the rear end of a horizontal power shaft 119, which extends through the forward end of the housing 110 and is connected to the power shaft 44 by a universal coupling member 120.

The shaft 108 is provided with a sprocket 121 at its end opposite the worm wheel 111, which is connected by a chain 122 to a sprocket 123 on the tractor shaft 102.

From the above description of the drive mechanism it will be readily seen that as the shaft 41 is operated by the motor of the machine, each of the several roof supporting and advancing rigs will be steadily and constantly driven so as to slowly advance and push the mining machine into the material being mined.

This steady advance of the roof supporting rigs at a rate equal to the advance of the mining machine eliminates the danger of a roof fall between the machine and the roof supports, and also eliminates the labor and delays necessary to move up other forms of stationary supports.

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

I claim:—

1. The combination with a mining machine, of means separate from and located at the rear of said machine for supporting the roof of the mine and for advancing said machine into the material being mined, said means including a power jack member and power advancing means for simultaneously advancing the machine and jack in a horizontal direction.

2. The combination with a mining machine, of means separate from and located at the rear of said machine for supporting the roof of the mine and for advancing said machine into the material being mined, said means comprising a base having its forward end in engagement with said machine, a jack on said base, a roof support carried by said jack, tractor members on said base and roof support, and means for driving said tractor members.

3. The combination with a mining machine, of means separate from and located at the rear of said machine for supporting the roof of the mine and for advancing said machine into the material being mined, said means comprising a base member having a plurality of anti-friction rollers along its bottom face, and having its forward end in engagement with said machine, a jack on said base, a roof support carried by said jack, said roof support having a plurality of anti-friction rollers along its upper face, tractor members on said base and roof support, and means for driving said tractor members.

4. The combination with a combined longwall mining and loading machine, of a combined roof support and advancing rig separate from said machine comprising an elongated base member having its forward end in engagement with the rear side wall of said machine, a jack member mounted on said base member, an elongated roof support carried by said jack, tractor members on said base and said roof support, and means for driving said tractors.

5. A combined roof support and mining machine advancing rig comprising a base member having a plurality of rollers journaled along its bottom face, tractor chains mounted along each side of said base and adapted to engage the floor of the mine, a plurality of coil springs mounted on said base, a hydraulic jack mounted on said coil springs so as to permit a limited vertical movement of said jack, a roof support mounted on said jack, said roof support having a plurality of rollers journaled along its upper face, and tractor chains along each side of said roof support adapted to engage the roof of the mine, the tractor chains on said base and said roof support being adapted to be driven simultaneously to advance said device.

6. A combined roof support and mining machine advancing rig comprising a base member having a plurality of rollers journaled along its bottom face, tractor chains mounted along each side of said base and adapted to engage the floor of the mine, a jack mounted on said base, a roof support mounted on said jack, said roof support having a plurality of rollers journaled along its upper face and tractor chains along each side of said roof support adapted to engage the roof of the mine, the tractor chains on said base and said roof support being adapted to be driven simultaneously to advance said device.

7. The combination with a combined longwall mining and loading machine comprising a substantially rectangular frame, said machine being adapted to be moved bodily into the coal being mined, of a plurality of combined roof supports and advancing rigs located to the rear of said machine, said roof supports and advancing rigs each comprising a base member adapted to engage the rear face of the machine frame and having a plurality of rollers journaled along its bottom face, transversely arranged shafts adjacent each end of said base, sprockets on each end of said shafts, tractor chain trained over said sprockets adapted to engage the floor of the mine, a jack mounted on said base, a roof support mounted on the upper end of said jack, said roof support having a plurality of rollers journaled along its upper face, transversely arranged shafts adjacent each end of said roof support, sprockets on each end of said shafts, tractor chains trained over said sprockets and adapted to engage the roof of the mine, a drive shaft journaled along the rear of said machine frame, and means operatively connecting each of said combined roof supports and advancing rigs with said drive shaft to drive said tractor chains, whereby said combined roof supports and advancing rigs and mining machine will be simultaneously moved forward into the coal being mined.

8. The combination with a mining machine of the longwall type, of a plurality of combined roof supports and advancing rigs located to the rear of said machine, said roof supports and advancing rigs each comprising a base member adapted to engage the rear face of the machine, a plurality of rollers journaled along the bottom face of said base, tractor chains mounted along each side of said base and adapted to engage the floor of the mine, a jack mounted on said base, a roof support mounted on said jack, said roof support having a plurality of rollers jour-

naled along its upper face, tractor chains arranged along each side of said roof support, power driving means carried by said machine, and means for operatively connecting said tractor chains with said power driving means, whereby said combined roof supports and advancing rigs and said mining machine will be simultaneously moved forward into the coal being mined.

9. A roof supporting machine for supporting the roof of a mine comprising a base member having a plurality of anti-friction rollers along its bottom face, a jack on said base, a roof support carried by said jack, said roof support having a plurality of anti-friction rollers along its upper face, tractor members on said base and roof supports, and means for driving said tractor members.

10. A roof supporting mechanism for supporting the roof of a mine comprising a base member having a plurality of anti-friction rollers along its bottom face, tractor chains mounted along each side of said base and adapted to engage the floor of the mine, resilient means mounted on said base, a jack mounted on said resilient means so as to permit a limited vertical movement of said jack, a roof support mounted on said jack, said roof support having a plurality of rollers journaled along its upper face, and tractor chains along each side of said roof support adapted to engage the roof of the mine, the tractor chains on said base and said roof support being adapted to be driven simultaneously to advance said device.

In testimony whereof I have hereunto set my hand.

EDWARD O'TOOLE.