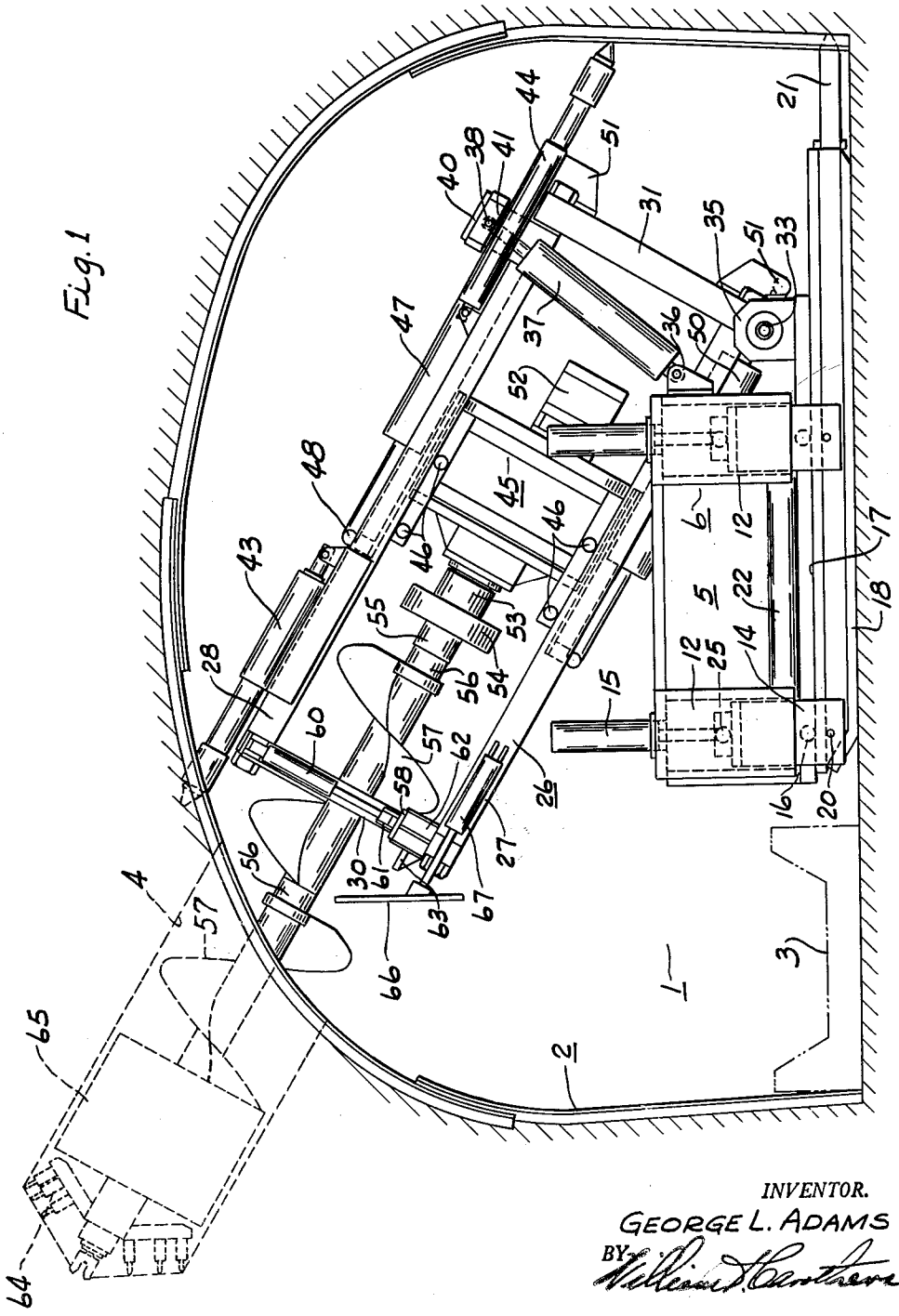
April 11, 1961 G. L. ADAMS 2,979,320

TILTABLE DEEP MINING AUGER MACHINE

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Fig. 1



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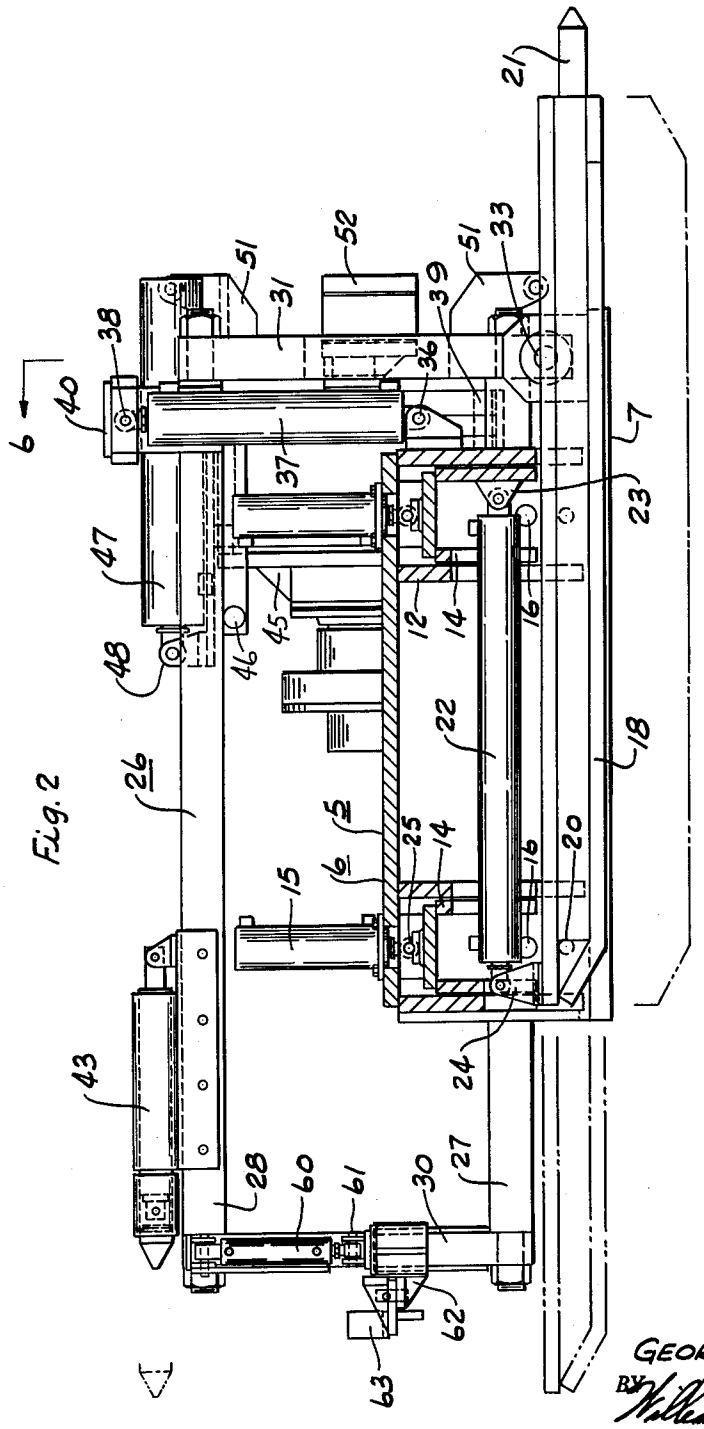


Fig. 2

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TILTABLE DEEP MINING AUGER MACHINE

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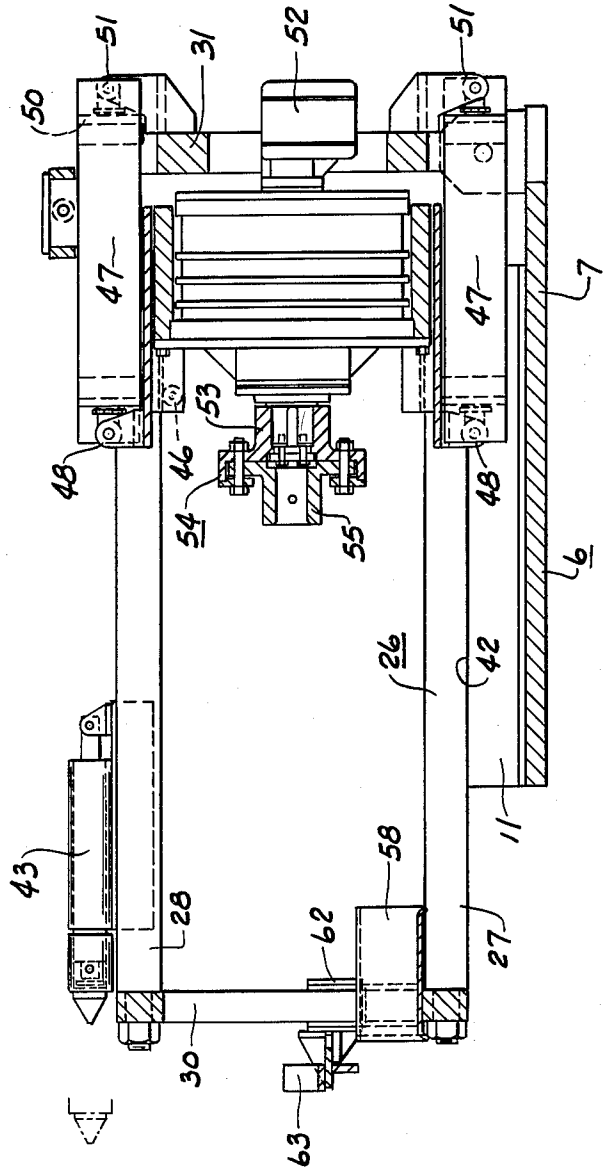


Fig. 3

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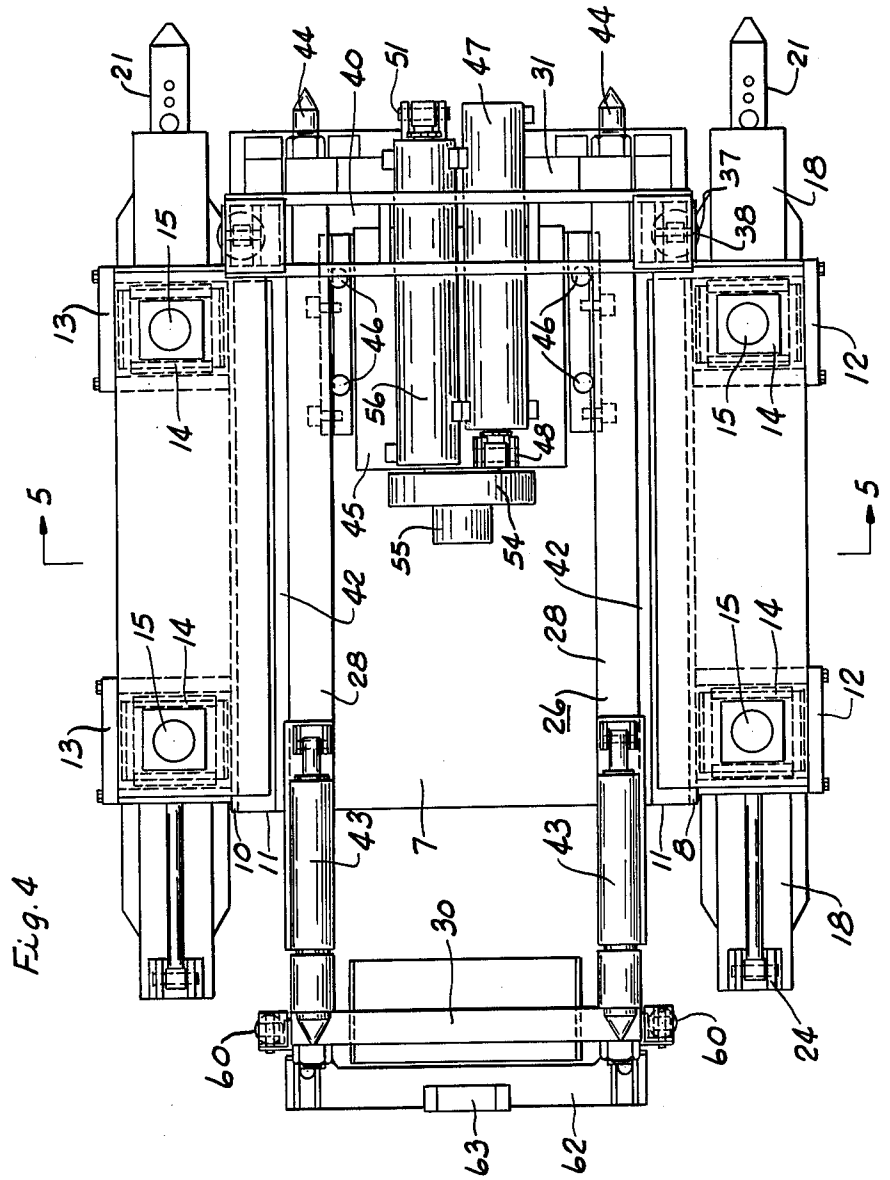


Fig. 4

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TILTABLE DEEP MINING AUGER MACHINE

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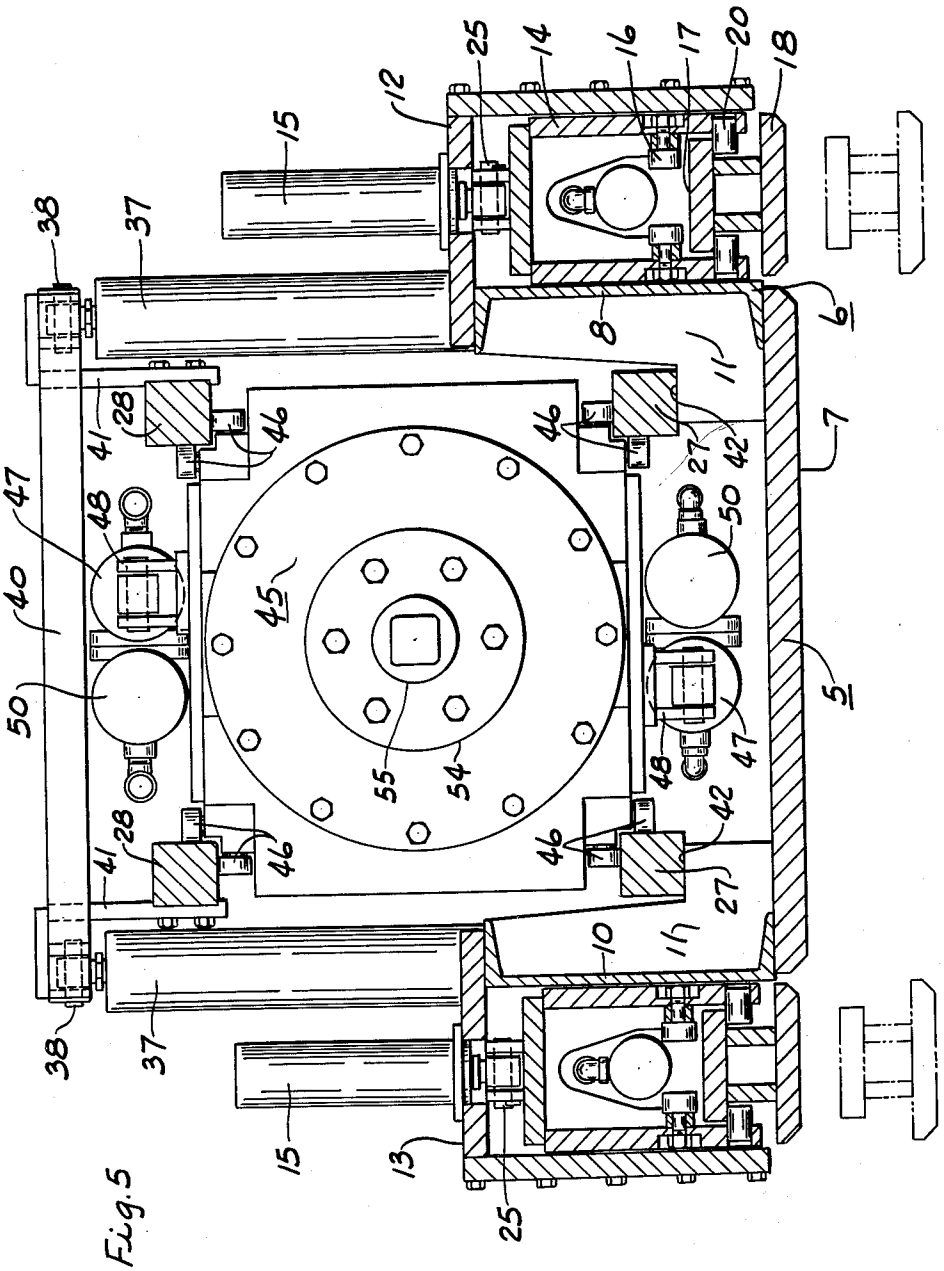


Fig. 5

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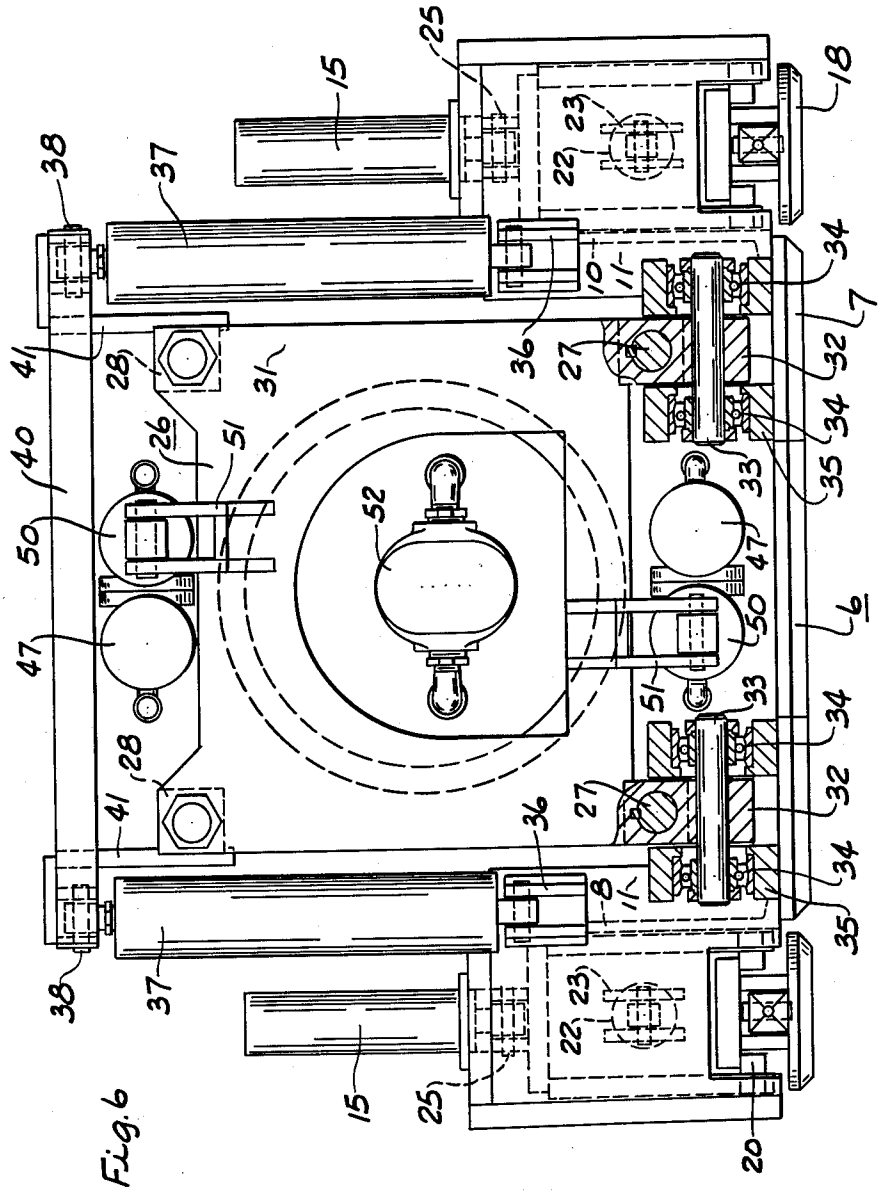


Fig. 6

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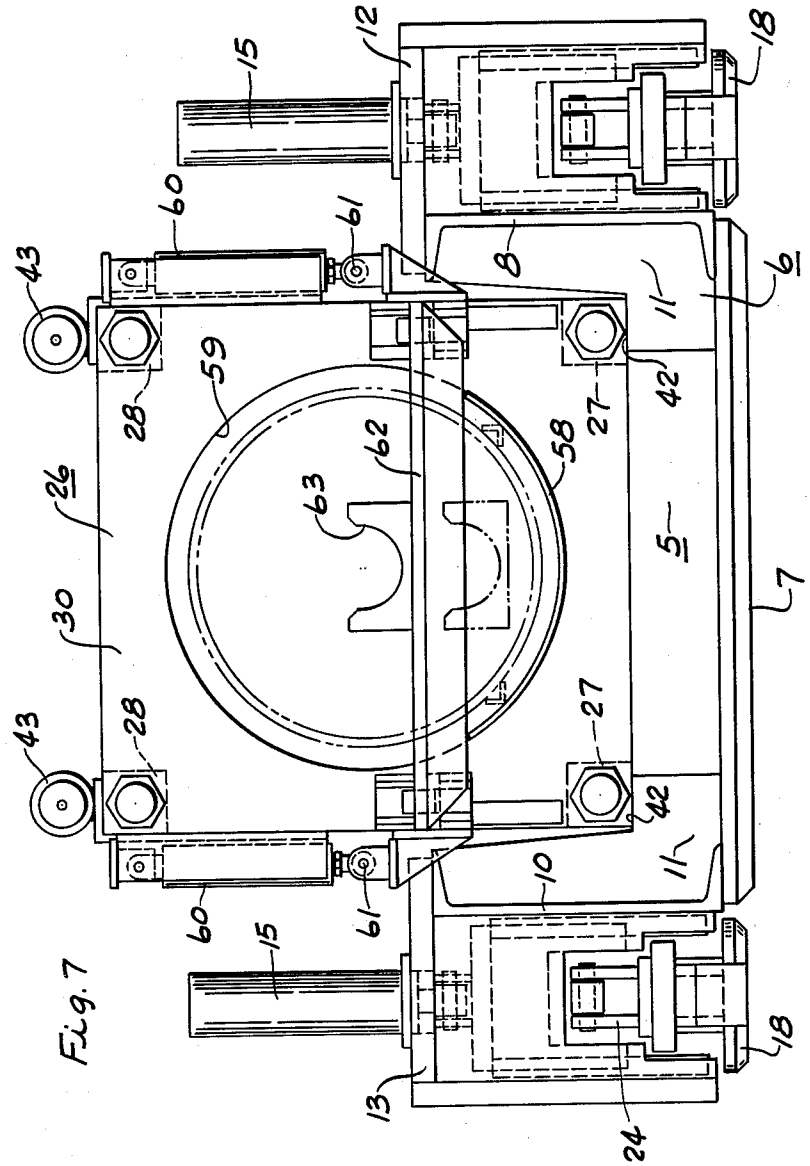


Fig. 7

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Fig. 8

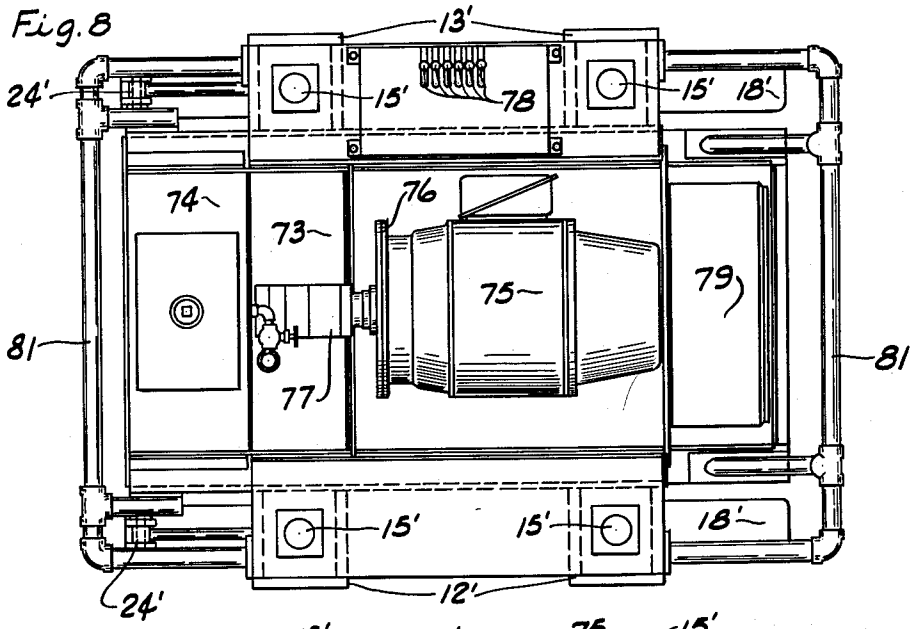
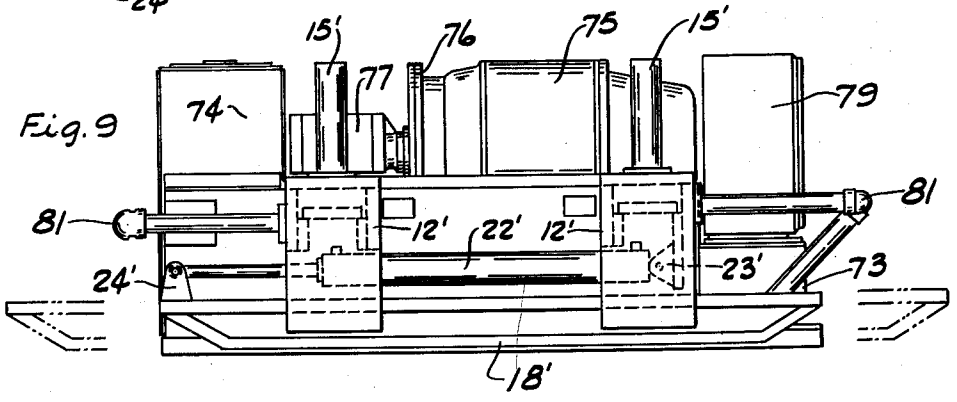


Fig. 9



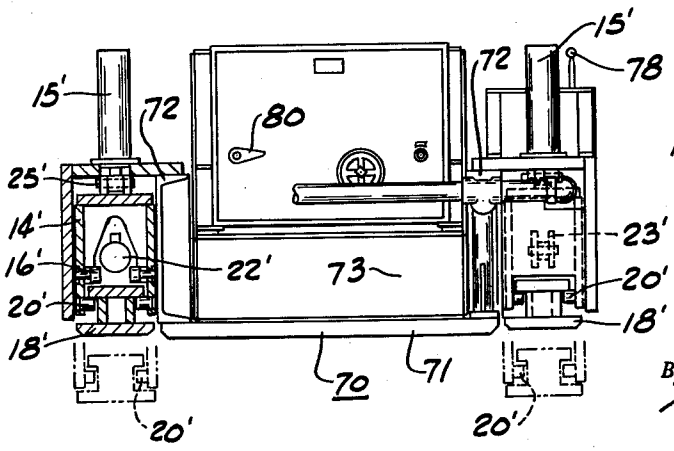


Fig. 10

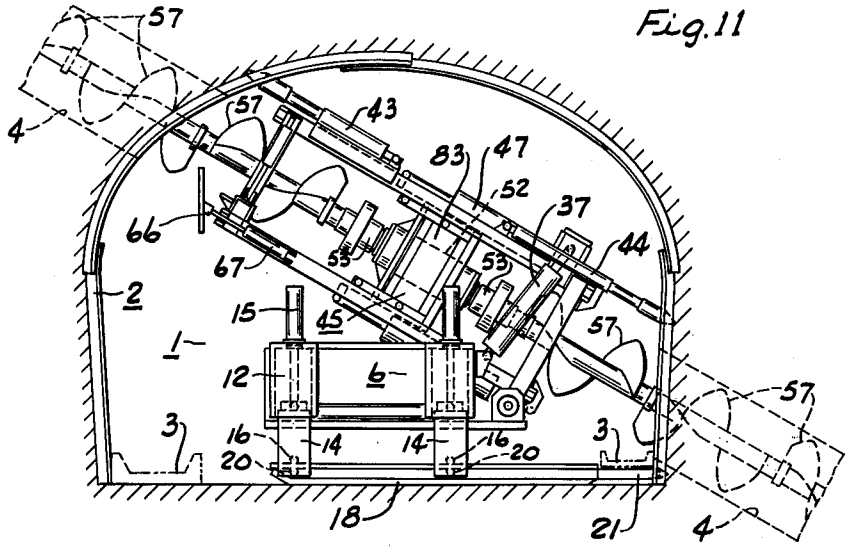
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TILTABLE DEEP MINING AUGER MACHINE

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Fig. 11



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United States Patent Office 2,979,320 Patented Apr. 11, 1961

2,979,320

TILTABLE DEEP MINING AUGER MACHINE

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Filed Mar. 12, 1958, Ser. No. 720,925

15 Claims. (Cl. 262—26)

This invention relates generally to auger mining machines and more particularly to a deep mining auger machine that can be tilted and swiveled along inclined angles.

Coal mining augering machines have been used principally for punch mining around mountains and similar heavy overburden strip mines to remove as much coal as possible close to the exterior of the hill. Punch mining permits less than seventy percent recovery and may penetrate at a depth of two hundred feet or more depending upon the conditions.

One difficulty in using an augering or punch mining machine underground is in the storage of the augering sections in such cramped quarters and the necessity of using relatively short auger sections because the machine is usually transverse of the entry, drift or slope which requires the use of short auger sections. Short auger sections require frequent stopping of the machine for the insertion of additional auger sections. However, the auger has many advantages in deep mining and particularly in anthracite coal where the coal seams extend at an angle upwardly from a slope. The diameter of the auger can be chosen to be equal to or smaller than the thickness of the sloping seam. If substantially the same size as the seam, the recovery is determined upon how close the holes can be punched.

Other objects and advantages appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification without limiting the claims thereto certain practical embodiments illustrating the principles of this invention wherein:

Fig. 1 is a view in side elevation of the deep augering mining machine comprising this invention.

Fig. 2 is a side elevation of the mining machines shown in Fig. 1 in a horizontal position.

Fig. 3 is a vertical sectional view of the mining machine shown in Fig. 2.

Fig. 4 is a top plan view of the mining machine shown in Figs. 1 and 2.

Fig. 5 is a transverse section taken on the line 5—5 of Fig. 4.

Fig. 6 is a transverse sectional view taken on the line 6—6 of Fig. 2.

Fig. 7 is a view in front elevation of the machine as shown in Fig. 2.

Fig. 8 is a plan view of the power unit for the deep mine augering machine.

Fig. 9 is a view in side elevation of the structure shown in Fig. 8.

Fig. 10 is an end elevation partly in section of the structure shown in Figs. 8 and 9.

Fig. 11 is a view illustrating an auger mining machine having a chuck on either end.

Referring to Fig. 1 the mining machine is shown disposed in the main hole, drift or tunnel as indicated at

1, the roof and walls of which are braced by the iron frame 2 made up of end and arcuate roof sections secured together and braced against the earth. The tunnel 1 is provided with the conveyor member 3 which is disposed under the augering machine to gather the material mined as it falls or otherwise descends from the bored hole indicated at 4, the axis of which is at an angle to the longitudinal axis of the tunnel. The boring machine 5 as illustrated in Figs. 1 to 7 comprises the machine base frame 6 having a bottom plate member 7 that rests against the floor of the mine when the machine is in operation. This bottom is illustrated more clearly in Figs. 5, 6 and 7. Machine base frame 6 comprises the bottom 7 with oppositely disposed heavy channel members 8 and 10 having a series of parallel plate members 11 providing an upwardly open base with ample space therebetween. The exterior of both channel members is provided with the connected bracket hoods 12 and 13 that support the lifting brackets 14 hoisted by the cylinder jacks 15. The depending flanges of the brackets 14 are provided with the inturned rollers 16 that rest on the top track surface 17 of the skid members 18 when the latter are lowered by the jacks 15 to raise the machine and its bed 7 from the surface of the ground and permit the machine to traverse on the rollers 16 along the top track surface 17 of the skids 18. The top track of the skids is a flange under which the opposed inturned support pins 20 extend. A support 20 is below each roller 14. When the lifting brackets 14 are withdrawn upwardly inside of the enclosed connected bracket hoods 12 and 13 as shown in Fig. 5, the skids 18 may be slid back and forth on the supports 20. As shown in Fig. 1 the machine and the skids are both on the ground and the skids are extended to the rear of the machine so that the expansible jack members 21 may extend rearwardly from the machine so as to engage the earth and prevent the machine from sliding rearwardly as pressure is applied to force the auger and its cutting head upwardly into the hole being bored. Relative movement between the skids 18 and the machine 5 is obtained by means of the jack member 22 which is illustrated in Fig. 2 and is connected to the machine through a pivotal connection 23 in the lifting bracket 14 at the rear of the machine and a second pivotal connection 24 to the skid 18 at the front of this jack 22. Thus by expanding or contracting the jacks 22, the skids 18 may be moved independently of the machine or permit the machine to move thereunder. However, when each of the skids 18 are dependently operated, the machine may be maneuvered so as to turn its axis parallel with the longitudinal axis of the tunnel or in any angular position necessary for the transportation or positioning of the machine. As shown in Fig. 4, the piston from the jacks 22 is shown in their extended position from the jacks. Each foot or bottom of the skids 18 is wide as shown in Fig. 7 so as to provide ample support for the machine which is considerably heavy. Each lifting bracket 14 is provided with a swivel connection 25 between its bracket and the piston rod of the jacks 15 as shown in Fig. 5.

The machine base frame is upwardly open as illustrated in Fig. 7 to receive the tiltable frame 26. The tiltable frame is made up of the lower and upper bar members 27 and 28 which are connected at the front end by the plate member 30 and at their rear end by the plate member 31. The lower end of the rear plate 31 has the spaced extensions 32 depending therefrom and which as shown in Fig. 6 are provided with aligned transverse openings for receiving the journaled pins 33 which are carried in the antifriction bearings 34 mounted in the

bearing housings 35 at the rear of the base frame 6. Thus the whole of the movable frame 26 may be pivoted about the axis of the aligned journaled pins 33.

The rear end of the bracket hoods 12 and 13 are provided with the bracket members 36 which pivotally support the lifting cylinder jacks 37 that extend upwardly and are pivotally connected as at 38 to the crosshead 40 which has the depending plates 41 connected to the spaced upper bars 28 of the frame 26. By expanding or contracting the jacks 37, the whole of the frame 26 may be pivoted around the axis of the journaled pins 33. The jacks 37 are fully retracted as shown in Fig. 2. However, they are expanded as shown in Fig. 1 to tilt the frame 26 and permit the auger to operate upwardly along an inclined plane relative to the base 6 of the machine 5. When the frame member 26 is lowered the bars 27 rest on the step 42 in the longitudinal plate members 11.

When the frame 26 has been raised to the desired position by means of the jack 37 the fluid is locked into the jack to hold the frame there. The front jacks 43 and rear jacks 44 are expanded so as to force their points into the earth and thereby aid in locking the frame 26 relative to the tunnel for the purpose of holding the machine steady as the augering continues. Both sets, the front jacks 43 and the rear jacks 44, are mounted on top of the frame 26 as illustrated in Figs. 1 and 4. Thus the point jacks 21, 43 and 44 all aid in holding the machine steady while the auger mines.

The frame 26 slidably supports the mining machine carriage 45 as best illustrated in Figs. 1, 4 and 5 and particularly in the latter wherein the machine 45 is supported by the rollers 46 mounted on each of the four corners of the machine carriage 45 for engaging the opposite faces of the bars 27 and 28. There are two sets of the rollers 46 fore and aft of the machine carriage 45 which permit the machine to be moved longitudinally of the frame 26 for the purpose of feeding the auger into the bored hole 4. The reciprocal machine carriage 45 is fed by means of the two pairs of oppositely faced longitudinally disposed jack members 47 having their cylinders tied together, one pair on top and one pair on the bottom of the carriage 45. Cylinders 47 have their piston members connected by means of the brackets 48 to the motor carriage 45 and the pistons from the cylinders 50 are connected by the brackets 51 to the frame 26. As shown in Fig. 5 the cylinders 50 have their piston rods extending from the rear; whereas in Fig. 5 the cylinder jacks 47 have their piston rods extending to the front of the machine. Both the cylinder jacks 47 and 50 are double acting and since they are connected between the frame 26 and the reciprocal machine mounting carriage 45 the four cylinders are effective in expanding and contracting the reciprocal machine mounting carriage 45 causing the same to ride longitudinally of the bars 27 and 28 being supported by the rollers 46.

The motor member 52 is mounted on the rear of the reciprocal motor carriage 45 and when energized will rotate the shaft 53 through the intermediate gear reduction. The shaft 53 carries the chuck 54 and has bolted thereto the flange coupling member 55.

The coupling 55 is arranged to detachably engage the nonround ends 56 of the auger sections 57. Each auger section is made so that when the motor carriage 45 is fully retracted the auger section will fit within the space between the bars forming the frame 26. The auger is positioned as shown in Fig. 3 on the upwardly open tray 58. When supported by the tray 58, the rear nonround driving joint of the auger section such as indicated at 56 is inserted in the flange coupling member 55 and the front end is substantially aligned with the rear end of the auger string 57 which is supported by an adjustable yoke vertically adjustable by the jacks 60.

The upwardly open tray 58 as shown in Fig. 7 is secured to the large opening 59 in the front plate 30. The jacks 60 are mounted on each side of the front plate 30 and have their pistons connected through the brackets 61 to the cross member 62 which supports the centrally disposed yoke member 63 that may be raised and lowered. This yoke member is employed to be raised to hold the rear end of the auger sections in the hole by its shaft so that it may be coupled to the newly added auger shaft member. When drilling up, the auger sections may be alternated with connecting bar members representing only the shaft of the auger section. Auger section 57 extends upwardly in the bore hole 4. A rotary cutting head 64 is mounted on the end of the auger string 57 and immediately behind the same is a nonrotary barrel member 65. The material mined is cut out by the rotary head and passes backward through the barrel 65 that supports the head and is drawn by the auger sections 57 to the opening of the bored hole 4 where it drops to the conveyor 3 and is removed from the vicinity of the mining machine.

As shown only in Fig. 1 and Fig. 11, a shield member 66 is movable relative to the frame 26 by the jack 67 to support and aid in deflecting coal descending from the end of the auger string 57.

Referring now to Figs. 8, 9 and 10, which disclose the power plant for the mining machine illustrated in Figs. 1 to 7, comprises a similar upwardly open base member 70 made up of a base plate 71 with upwardly extending side channel members 72, each of which is provided with the boxes 12' and 13' on opposite sides thereof for enclosing the hoist brackets 14' which are connected at their upper ends by the pivotal joint 25' to the jacks 15'. The hoist brackets 14' are also provided with the inwardly extending oppositely disposed rollers 16' which ride on the top flange of the skid members 18'. The brackets 14' also carry the inturned pin supports 20' that engage under the top flange of the skids 18' in the same manner previously described in regard to the mining machine. Each skid is provided with its jack member 22' having its piston connected through the bracket 24' to the skid 18' and its cylinder connected by means of the bracket 23' to the inside of the bracket member 14'. Thus the base 70 of the power plant can be maneuvered, turned, or otherwise manipulated in the same manner as that of the base of the machine. Its base can be elevated with the skids 18' on the ground at a slope in two directions relative to the axis of the base and still maintain the machine in a level position owing to the contacts of the roller 16' with the top of the skids and to the pivoting relation of the jacks 22' in the same manner as that of the mining machine.

The upwardly open base 70 of the power plant is provided with a fluid receptacle or tank as indicated at 73. This tank fills the space between the channels 72 which are provided with ribs as indicated in Fig. 10. The tank 73 extends along the bottom for the full length of the base 70 and extends upwardly as shown at 74 in Fig. 9 which is the opposite end from that shown in Fig. 10. This tank has mounted thereon the electric motor 75 which operates through the drive mechanism 76, the dual pump 77. This pump has two pumping chambers, each of which is connected through a line to the tank 73. The separate output of these pumps may be employed in many different ways to operate the system. For example, one pump may be employed to rotate the machine by operating the motor 52 while the other pump functions to supply fluid under pressure for operating all of the jack structures disclosed, both on the mining machine and on the power plant 70. As shown in Figs. 8 and 9, a series of valve levers 78 are provided to control operations of the jack members for manipulating the power plant base member 70. A similar set of levers is provided on the mining machine between the spaced housings 13, although not shown.

The right end of the tank 73 has mounted thereon the electrical control box 79 which receives the cable and has the protective instruments therein to properly

control the operation of the motor 75. This box has an exterior circuit breaker handle as illustrated in Fig. 10 at 80 and it is also provided with start and stop push-buttons. A suitable piping is connected to the output of the pump 77 together with pressure control devices and is piped through a flexible hose to the machine as illustrated in Figs. 1 to 7 where it is redistributed through control arms to actuate the machine. A heavy pipe bumper 81 is placed around the ends of the power plant base 70 to protect the equipment.

Referring to Fig. 11 the machine illustrated is the same as that illustrated in Figs. 1 to 7 with the provision of a different character of hydraulic motor 52 mounted within the gear reduction unit 83 which permits the use of a rotary shaft 53 extending from either end of the carriage 45. This structure permits the machine to auger coal downwardly or from the rear of the machine and at any angle from the horizontal to the vertical in the same manner that the forwardly projecting auger may drill. The angle of drilling may be extended beyond the 90° swing by manipulating the jacks 15 so as to slope the base 1 in the direction in favor of the extended angle. Thus the skids may be employed to support the mining machine so as to dig downwardly below the horizontal from the forward end when the machine is not equipped with a coupling at either end of the carriage permitting it to drill in opposite directions.

I claim:

1. An auger mining machine comprising a base, an open frame having spaced parallel front and rear plates connected by upper and lower bar members, pivot means connecting the lower rear end of said base with the lower rear end of said frame below said rear plate, elevator motor means in the form of jacks pivotally connected between the base and frame in a transverse plane adjacent to said rear plate to raise and lower said frame on said pivot means to different angles relative to said base, a carriage within said frame having rollers engaging each of said bar members for movement longitudinally on said frame, rotary motor drive means on said carriage, a sectional auger with a mining head connected to said motor drive for rotation, said auger sections replaceable through said frame, and power means to move said carriage along said frame to feed and retract the rotating auger and mining head into the material to be mined.

2. The mining machine of claim 1 characterized in that said power means to move said carriage includes a pair of fluid piston cylinders on each side of said carriage, each pair of said cylinders secured together with their pistons extending in opposite directions and having one piston connected to the carriage and the other connected to said rear plate of said frame to support their cylinders in suspension and beside said carriage regardless of its extended position or inclination.

3. The mining machine of claim 1 characterized in that said motor drive means on said carriage includes a motor coupled with a gear reduction means the output having a coupling to receive within said frame the end of said auger with its mining head extending therebeyond.

4. The mining machine of claim 1 characterized in that said frame has an arcuate guide on said front plate to support said sectional augers while being assembled in said frame, and a crosshead having a seat beyond the outer face of said front plate to receive and hold the last of said sectional augers while said arcuate guide supports said section augers for assembly or disassembly with the auger string.

5. The mining machine of claim 1 characterized in that expandible anchor jacks are mounted on the fore and aft portions of said frame to engage opposite sides of the mining tunnel and aid in anchoring said frame while operating said machine regardless of the angle of said frame.

6. The mining machine of claim 1 characterized in that expandible anchor jacks are mounted on the fore part of said frame and the aft part of said base to engage opposite sides of the mining tunnel and aid in anchoring said machine while in operation regardless of the angle of said frame.

7. The mining machine of claim 1 characterized in that expandible anchoring jacks are mounted fore and aft on the top of said frame to engage opposite sides of the mining tunnel and aid in anchoring said frame in a plane at an angle to said base.

8. The mining machine of claim 7 characterized in that a third set of expandible anchoring jacks are mounted on said base to engage the tunnel wall to aid in anchoring said frame through said pivot.

9. The mining machine of claim 1 characterized in that said base is upwardly open with connected solid bottom plate with upwardly extending side walls, and spaced parallel seats on the inside of said walls just above said bottom plate to receive said frame when lowered to a horizontal position.

10. The mining machine of claim 1 characterized in that said base includes a solid bottom plate with upwardly extending side walls, two pairs of spaced upwardly extending ears on said bottom plate at the rear of said side walls, said ears having aligned openings to receive pivot pin members, spaced depending ears on said rear frame plate, each depending ear extending between said pairs of ears on said bottom plate and journaled on said pivot pin members.

11. The mining machine of claim 1 characterized in that parallel skids are mounted along each side of said base, piston cylinder means to independently move said skids longitudinally to tram and turn said base and guide and direct the auger and mining head, when said cylinders are retracted said skids extending rearwardly to balance said base relative to said pivot means.

12. The mining machine of claim 11 characterized by an extensible jack in the rear end of each skid to engage the wall in back of said machine when drilling forwardly to aid in supporting the force on said auger and mining head.

13. The mining machine of claim 1 characterized in that said motor drive means on said carriage is hydraulic, and valve means to control the speed of said motor drive means from one to thirty revolutions per minute.

14. The mining machine of claim 1 characterized in that said rotary motor drive means has a chuck on each end to drive said auger and mining head in either direction in said frame regardless of its angle.

15. The mining machine of claim 1 characterized in that said base is upwardly open and includes a flat bottom plate with spaced upwardly projecting side walls, seats on the inside of said side walls to support said frame, and said pivot means being mounted to position its axis on said flat bottom of the base and below said seats materially below the position of the center of gravity of said frame with the carriage therein.

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