Jan. 21, 1964 G. L. ADAMS ETAL 3,118,509

TRENCH DRILL

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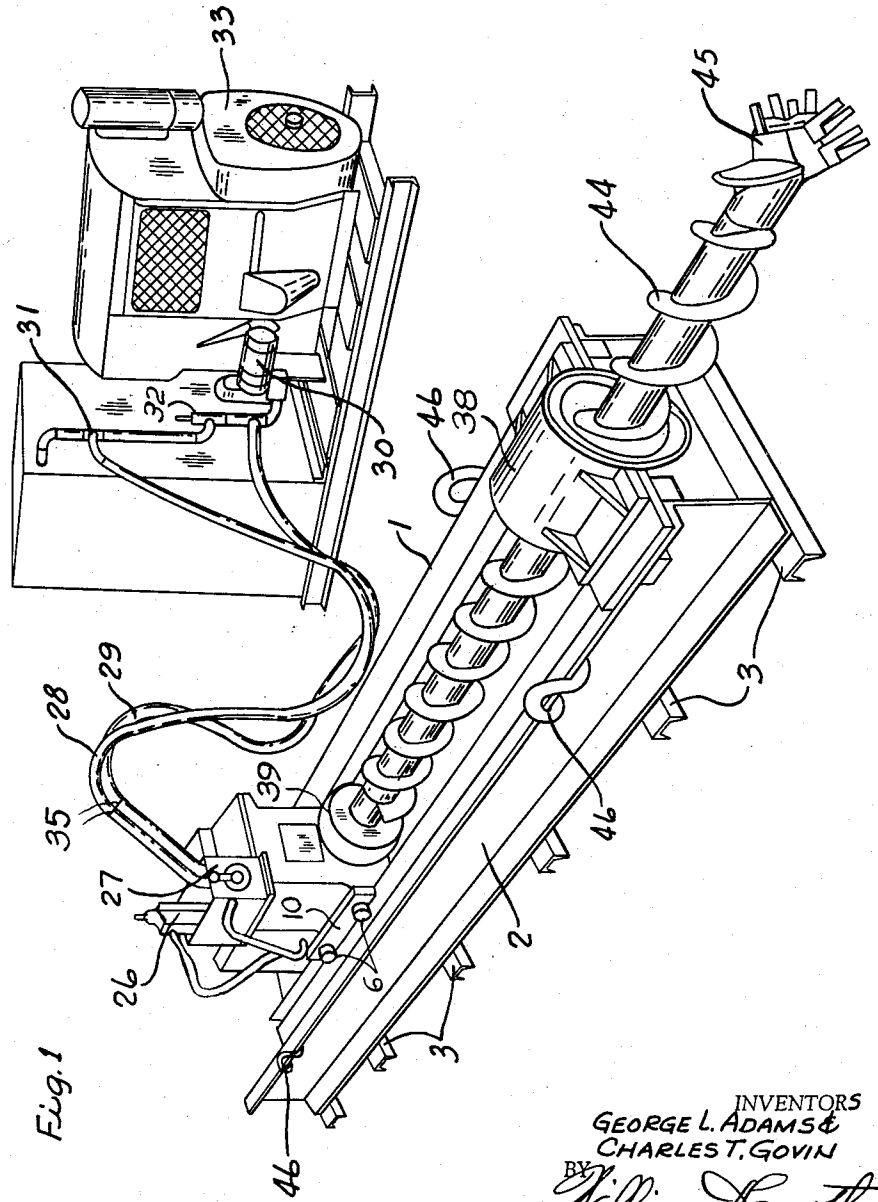


Fig. 1

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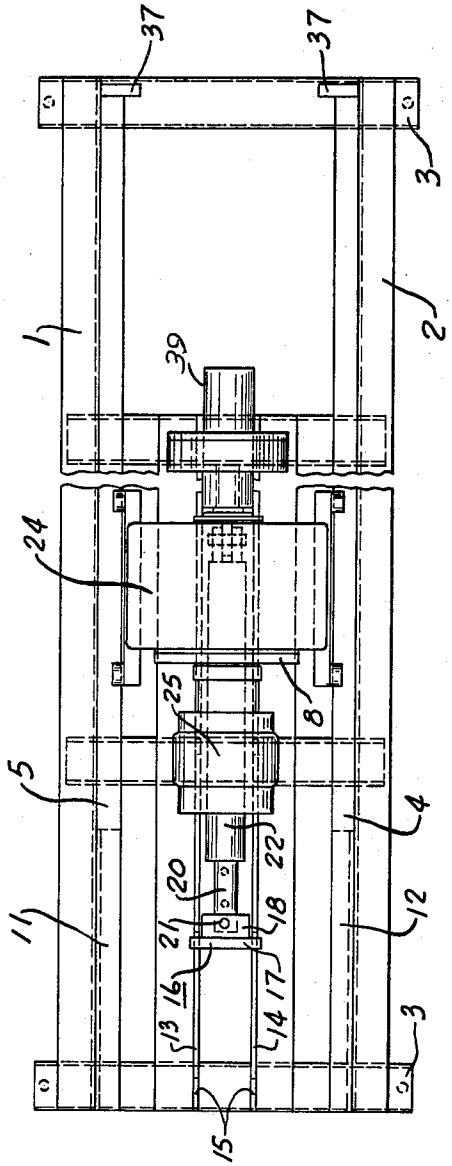


Fig. 3

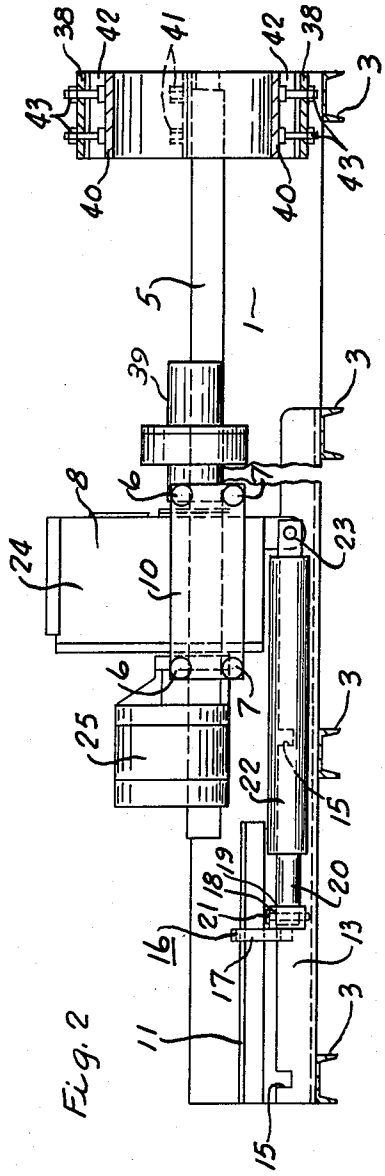


Fig. 2

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Fig. 4

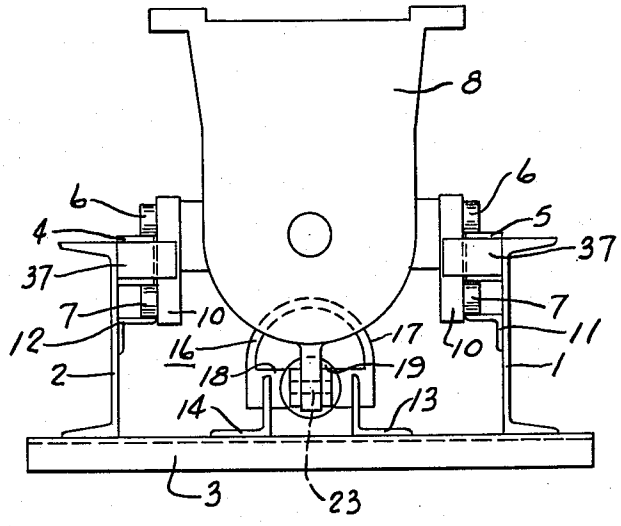
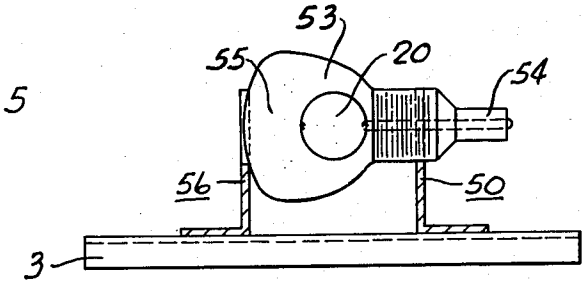


Fig. 5



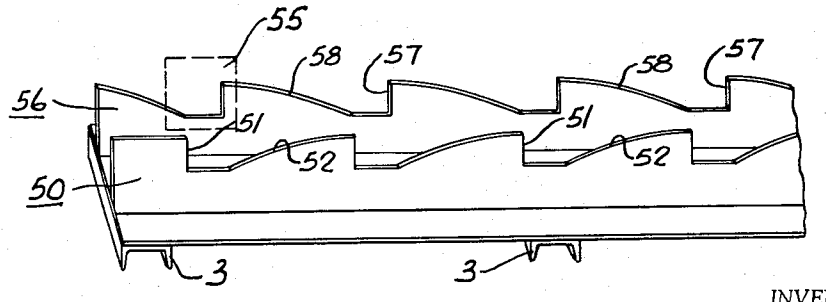


Fig. 6

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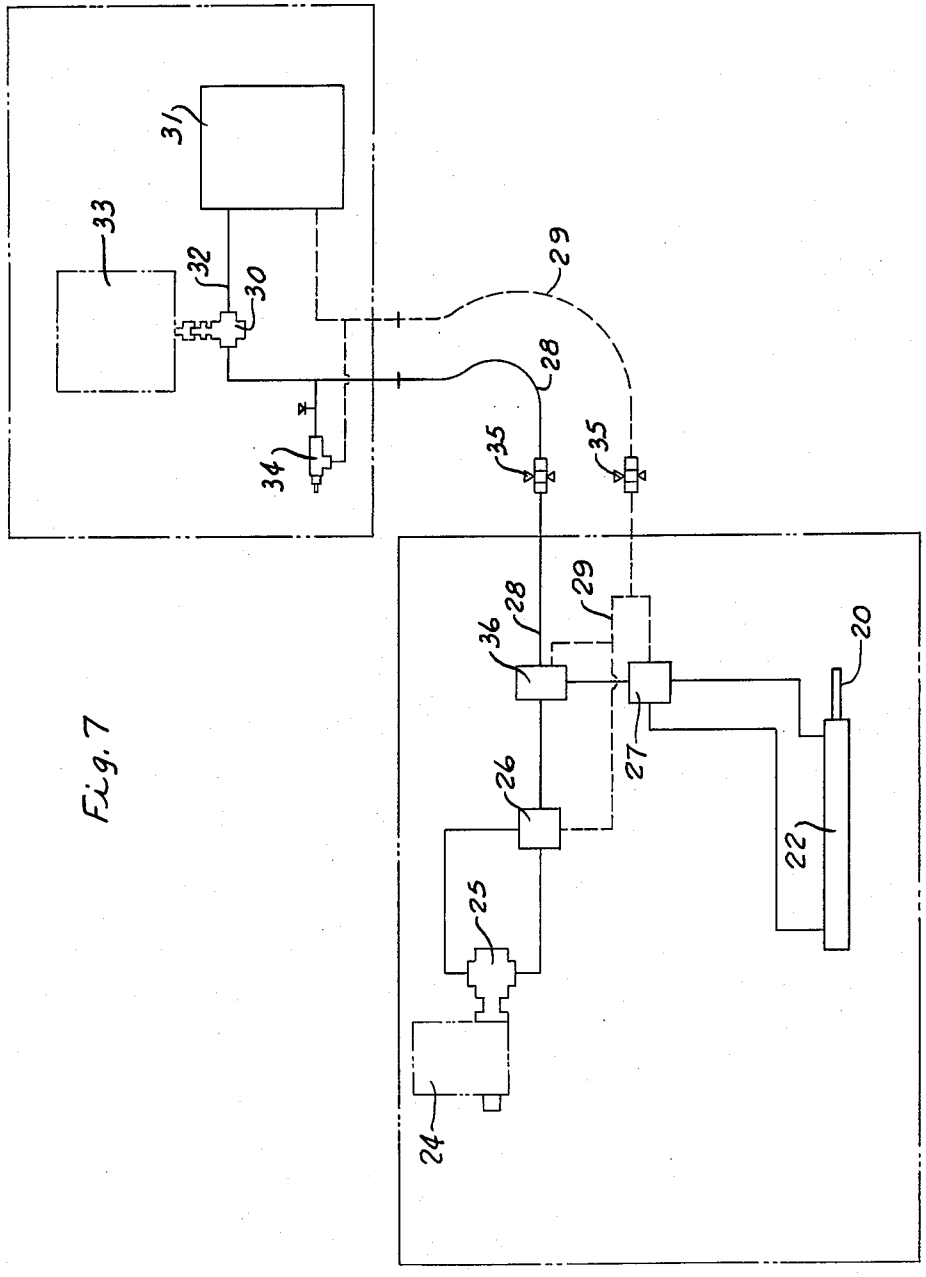


Fig. 7

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United States Patent Office 3,118,509 Patented Jan. 21, 1964

3,118,509

TRENCH DRILL

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5 Claims. (Cl. 173—160)

This invention relates generally to augers and more particularly to what is known as a trench auger for drilling horizontal holes under streets, roadways and the like.

The principal object of this invention is the provision of a trench auger having separable motor and track members which simplifies the assembly and disassembly of the structure in the field without the necessity of heavy crane equipment and the like.

Another object is the provision of a simplified trench drill that has a limited hydraulic feed which is materially shorter than the length of the auger requiring consecutive steps in feeding the auger forward or backward which steps are controlled manually.

Another object is the provision of a trench drill having a rack that operates in conjunction with a piston automatically feeding the auger section in each direction in steps shorter than the length of the auger.

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

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

FIG. 1 is a perspective view of the trench drill and power unit therefor.

FIG. 2 is an enlarged view in side elevation of the trench drill with parts broken away.

FIG. 3 is a plan view of the trench drill with parts broken away.

FIG. 4 is an end view of the structure illustrated in FIGS. 2 and 3.

FIG. 5 is a detailed sectional view of the automatic feed.

FIG. 6 is an isometric view of the rack employed with the automatic feed of FIG. 5.

FIG. 7 is a schematic diagram of the hydraulic system of the trench drill comprising this invention.

Referring to the drawings the trench drill comprises the channel frame members 1 and 2 which are mounted on the crosstie members 3 which are inverted channels. The frame members are provided with the inner track members 4 and 5 which are welded adjacent the top of each frame member 1 and 2 and comprise a rod which is substantially square in cross section for receiving the top and bottom rollers 6 and 7 of the carriage 8. The top rollers 6 engage and ride on the top surface of the rails 4 and 5 and there are four in number being supported by the plates 10 which function as gauge slides between the inner faces of the rails 4 and 5. The bottom rollers 7 are provided with a slight clearance with the under side of the rails 4 and 5 when the weight of the carriage 8 is supported by the rollers 6 on top of the rails but during operation when the carriage lifts due to a torque load on the auger the rollers 7 traverse the slight clearance and engage the under side of the rails 4 and 5.

As shown in FIGS. 2 and 3, the rails 4 and 5 terminate some distance from the last tie 3 shown at the left of the drawing but are replaced by the free or clear track members 11 and 12 which are constructed of angle irons and the upper surface of which functions as a top rail surface for the bottom rollers 7 when the carriage 8 is drawn to the rear of the track so as to be out of engagement with the rails 4 and 5. When the carriage 8 is drawn to the rear of the track so as to be supported wholly

upon the free or clear track members 11 and 12, then the carriage 8 may be lifted from the track which permits one to separate the carriage from the track for the purpose of turning the carriage around on the track and at the same time swivelling the cylinder 22 in the opposite direction so that the cylinder shall appear as shown in FIG. 2, for the purpose of drilling in the opposite direction, or for handling and transporting the same. By dismantling the structure in this manner, one can manually assemble and disassemble the trench drill without the aid of heavy crane equipment which is an important feature of this invention.

As shown in FIGS. 2 and 3, a pair of rack rails 13 and 14 in the form of angle irons are secured in spaced relation to the top of the tie members 3 and which extend from the rear of the track to within the next to the last tie member 3, there being as many as six or more tie members for each frame. Each of the rack rails 13 and 14 have notches 15 cut therein as indicated in FIGS. 2 and 3 which are shown to be square in these views for receiving the cylinder latch 16 which is in the form of a handle member 17 secured to a pawl bar 18 that has a central opening 19 to receive the end of the piston 20 which is held in place by the pin 21. Thus the cylinder latch 16 is locked to the piston 20 which is a double acting piston operable within the cylinder 22, the other end of which is pivoted as indicated at 23 to the under side of the carriage 8. Thus when the cylinder and piston 20 and 22 are expanded or retracted as the case may be to the full extent of its stroke the cylinder latch 16 is withdrawn from the socket 15 and the cylinder is then energized until it is received in the next consecutive socket.

If the augers are being fed into the ground, the cylinder latch as shown in FIG. 2 is in the second socket 15 and when the cylinder 22 is fully expanded the cylinder latch is lifted manually from the second socket and the cylinder 22 is energized to contract the piston therein until it is free of the second socket and is then dragged along the top of the rack rails until it falls into the next succeeding socket 15 and thereafter the procedure is repeated to feed the carriage to the right.

When the carriage 8 is lifted from the track for turning it around and replacing the same on the track the cylinder 22 may be swivelled about the pivot 23 to lie in the opposite direction relative to the carriage, but when replaced on the track the cylinder will have the same relative position to the track as that shown in FIG. 2.

The carriage 8 comprises the gear reduction structure 24 which is driven by the hydraulic motor 25 and as shown in FIG. 1 the hydraulic motor is actuated by the controls 26 and 27 mounted on top of the gear reduction box and which are in turn connected by the flexible lines 28 and 29 to the output of the pump 30 and the return tank as indicated at 31.

This hydraulic system is shown more in detail in the diagrammatic figure of FIG. 7 wherein the gear reduction 24 is shown coupled to the motor 25 and the pressure line 28 is connected to the output of the pump 30, the inlet of which is connected by the pipe 32 to the hydraulic tank 31. The pump 30 is operated by the internal combustion engine 33 and a relief valve 34 connects the line 28 to the return line 29 thence to the tank 31.

As illustrated in FIGS. 1 and 7 both the pressure line 28 and the return line 29 are provided with the self-sealing couplings 35 flush with the lines. The pressure line 28 proceeds to the flow divider 36 which divides the pressure between the two control valves 26 and 27, each of which is a four-way valve. Each of the control valves 26 and 27 together with the flow divider 36 have their respective housings connected directly to the return line 29.

The flow divider 36 functions to deliver a constant

volume of oil to valve **27** and the remainder of oil from pump **30** is delivered to valve **26**. The control valve **27** functions to expand and contract the double-acting piston and cylinder **20** and **22** for feeding the carriage in either direction, whereas the control valve **26** functions to operate the hydraulic motor **25** in either direction and at different speeds.

As shown in FIG. 3 the stops **37** are provided at the front end of the track. However, in FIG. 2, a large auger guide is illustrated at **38** which contains therein a smaller auger guide **40**. The larger auger guide is secured to the frame members **1** and **2** by the bolts **41**, whereas the smaller auger guide is provided with the space bars **42** which seat the smaller auger guide within the larger auger guide and the same is held in position by the bolts **43**. This structure is also illustrated in FIG. 1 as well as FIG. 2. However, the FIG. 1 shows the auger **44** in position with an auger bit **45** on the forward end.

The rear of the auger **44** is seated in and supported by the rotary auger chuck **39** on the end of the output shaft of the gear reduction **24** and the rotary center of the chuck **39** is in line with the rotary center of the auger.

Hoist loops **46** are shown in FIG. 1 for raising and lowering the frame from a trench.

In the modification as shown in FIGS. 2 and 3 the cylinder latch must be manually raised from each of the notches **15**. However, in the structure illustrated in the modification shown in FIGS. 5 and 6 the latch is thrown either to the right or to the left depending upon which way it is desired to automatically feed the carriage **8**. As shown in FIG. 6 one-half of the rack rail member **50** is shown with a cylinder latch seat **51** which is vertical, the opposite end being a cam shape as illustrated at **52**. The cylinder latch **53** which is enabled to swing through 180° on the piston rod **20** has a handle member **54** and a convexly shaped cam member **55** and when the handle member engages the seat **51** the cam member rides on the opposite face of the rack rail **56** which has the force reacting face **57** and the cam face **58** which are both faced in the direction opposite to that of the reaction face **51** and the cam face **52** of the rack rail **50**. Thus when the cylinder latch is thrown to the right as illustrated in FIG. 5, it is not necessary to raise the latch manually for each position. It is merely necessary to fully expand the cylinder and then contract it which permits the latch to drag itself over the cam face **52** to release the top of the convexly shaped cam **55** from the opposite pocket and pass to the next succeeding notch. In this manner the carriage may be automatically stepped in one direction and by throwing the handle **54** 180° from that shown in FIG. 5 the cylinder latch may be made to function automatically in withdrawing the auger sections from the hole.

It will be noted that the auger section illustrated in FIG. 1 is materially longer than the stroke of the piston which is an advantage in a structure of this character.

We claim:

1. A trench auger having a fabricated base with a pair of longitudinally disposed parallel frame members each carrying a rail and forming a track, spaced transverse ties secured to said frame members to form an open lattice, a carriage having upper and lower rollers to engage the top or bottom surface of said rails, a motor coupled with a speed reducer and driving a rotary auger chuck supported by said carriage, a pair of spaced parallel rack rails secured to said ties between said frame members, characterized by a series of pairs of upwardly open sockets in said rack rails forming a rack over which said carriage rides, a double-acting fluid actuated piston member and cylinder member with one member pivotally attached at one end to the forward end of said carriage, a latch on the opposite end of said other member to engage in said sockets, and a handle on said latch for manipulating and withdrawing the latter from said pairs of sockets and from which said rotary auger chuck may be fed in a step-by-step movement forward or backward along said rails to feed an auger in or out of a hole.

2. The trench auger of claim 1 characterized in that said pivotal attachment of said one member to said carriage is positioned on the forward under part of said carriage and extends into the plane of said sockets to position said double-acting piston and cylinder member under said carriage and between said parallel rack rails to protect the same.

3. The trench auger of claim 1 characterized in that the center line of the rotary axis of said chuck is positioned substantially in line with the horizontal plane intersecting the tops of said rails.

4. The trench auger of claim 1 characterized in that said rails stop short of the rear of said beams for the approximate distance of the wheel base of said rollers, and a second short pair of rails carried by said beams below the first pair of rails to receive on their top surface said lower rollers in supporting said carriage free to be lifted from said base.

5. A trench auger, consisting of a track having upper and under surfaces and supported from cross ties for placement in a trench, a carriage with upper rollers to engage said upper track surface and support the carriage for movement along said track, lower rollers on said carriage to engage said under track surface and prevent the carriage from jumping the track, a rotatably supported auger chuck on one end of said carriage to support and feed auger sections in drilling holes, motor means on the other end of said carriage connected to rotate said auger chuck, rack means carried by said track and having a series of spaced upwardly open sockets, a double acting fluid cylinder and piston, a pivotal connection between said cylinder and said carriage, a latch on said piston for detachable engagement in said sockets for operating said carriage in a step-by-step movement in opposite directions along said track, said under track surface stopping short for a selected section of said track to permit said carriage and said double-acting fluid cylinder and piston to be lifted, turned, and repositioned on said track with said double-acting fluid cylinder and piston turned in the opposite direction on said pivotal connection to feed said carriage in the opposite direction from the same track setting and drill an aligned hole at opposite ends of the trench.

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