March 27, 1928. 1,663,833

G. GENUNG

EARTH BORING MACHINE

Filed Feb. 27, 1925 2 Sheets-Sheet 1

Fig. 1.

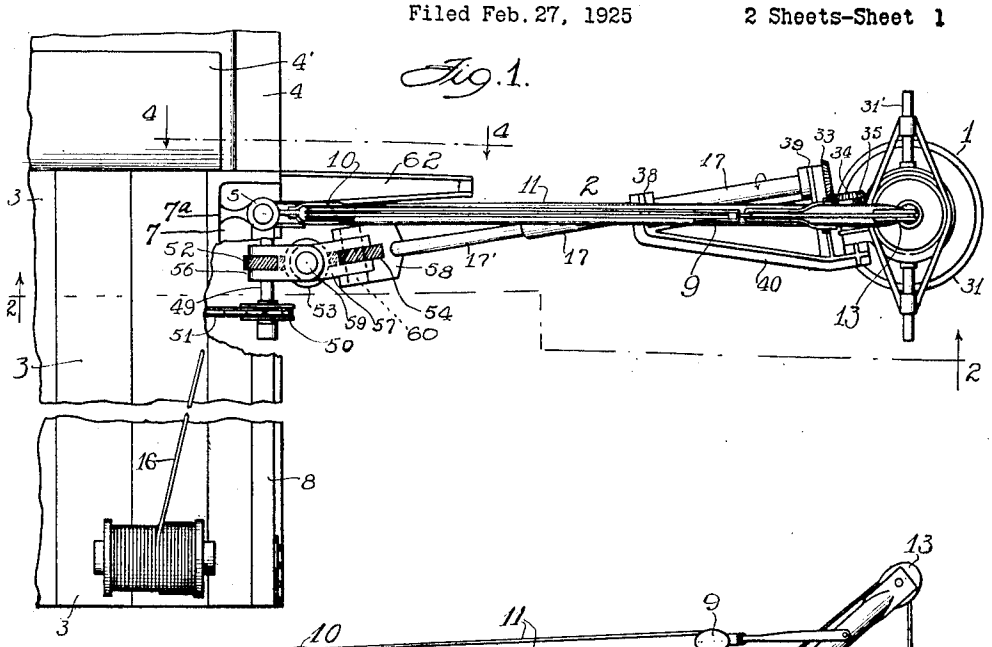
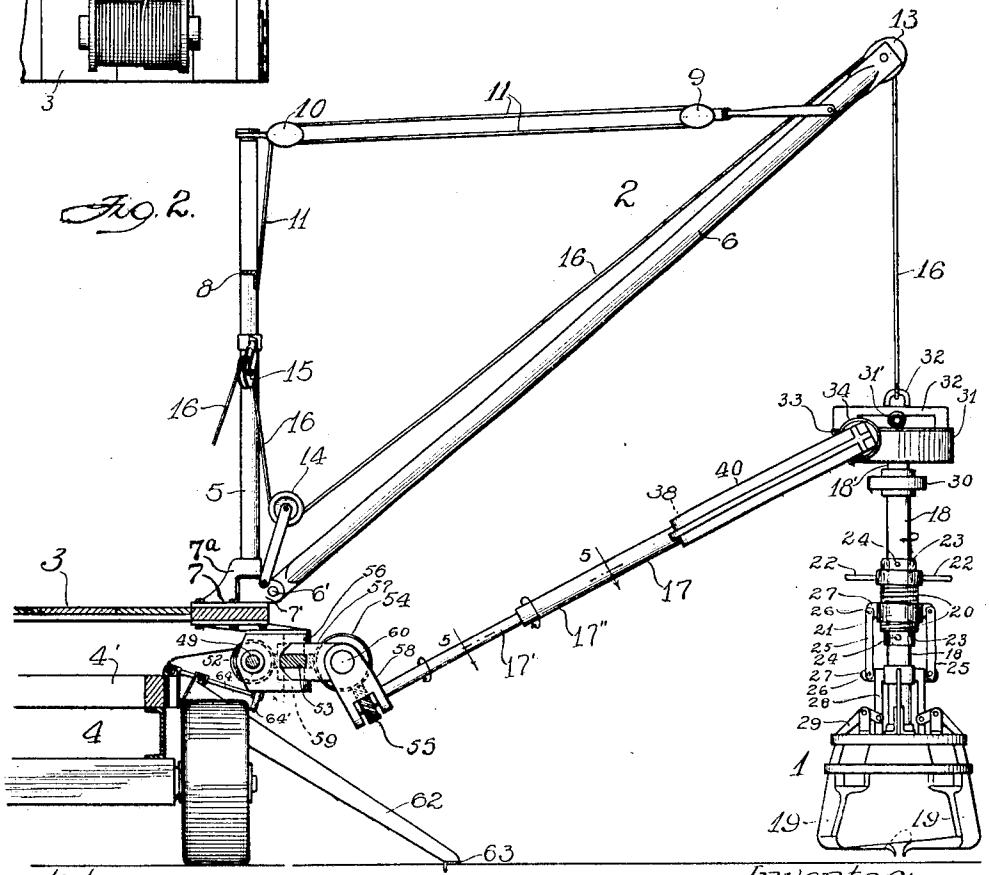


Fig. 2.



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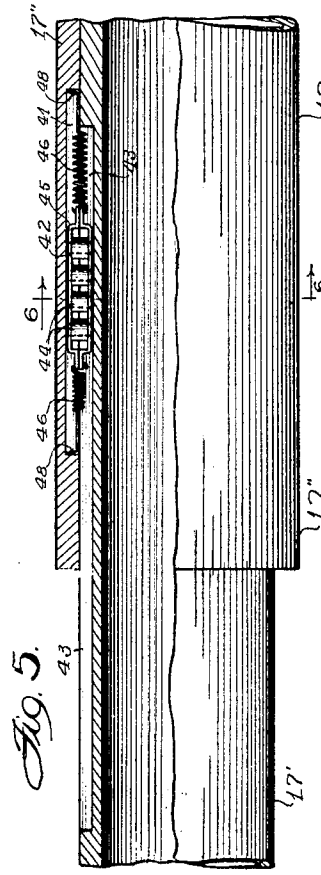


Fig. 5.

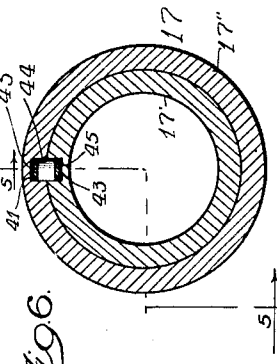


Fig. 6.

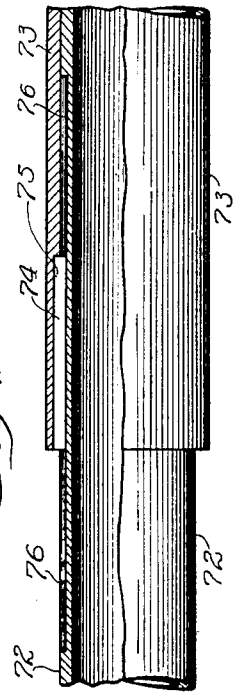


Fig. 7.

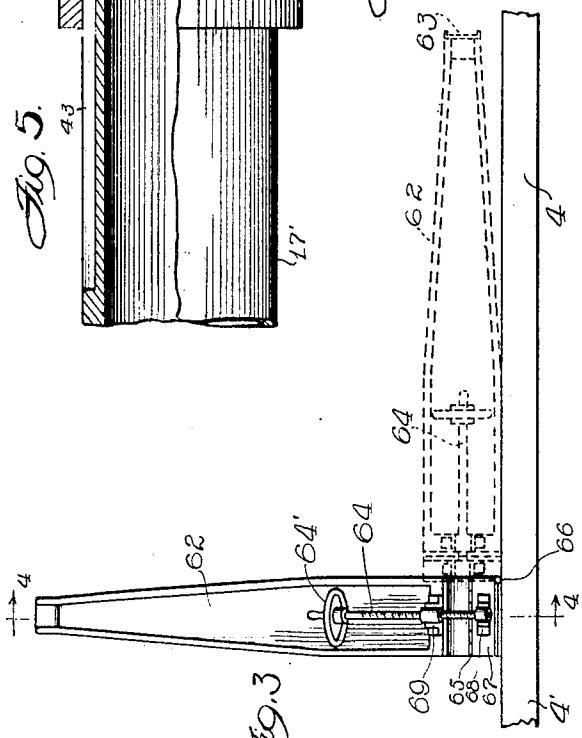


Fig. 3.

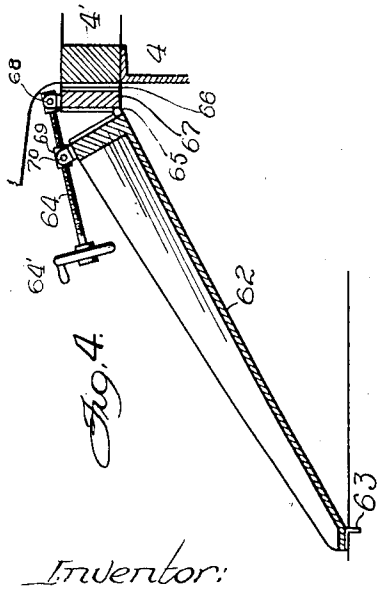


Fig. 4.

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UNITED STATES PATENT OFFICE.

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EARTH-BORING MACHINE.

Application filed February 27, 1925. Serial No. 12,094.

This invention relates to earth boring machines and especially to portable devices of this sort which are mounted on automotive power trucks or the like. The main objects of the invention are to provide an improved construction and arrangement of derrick and control members for vehicle mounted earth boring machines; to provide an improved form of adjustable means for bracing and stabilizing the truck body when the device is in use; to provide an improved form of flexible shaft power transmission for the derrick; and to provide an improved form of extensible drive shaft adapted for anti-friction telescopic operation.

An illustrative embodiment of this invention is shown by the accompanying drawings, in which:—

Figure 1 is mainly a plan of the derrick and boring means and also includes part of the truck, particularly the front end.

Fig. 2 is mainly a side elevation of the derrick and boring means, the truck being shown in vertical cross section on the line 2—2 of Fig. 1.

Fig. 3 is mainly a plan of the truck body brace, with only the immediately adjacent portion of the truck shown in connection therewith, the brace being shown in its lowered position in full lines and in its raised and folded position in dotted lines.

Fig. 4 is a vertical section through the device shown in Fig. 3 on the line 4—4 of said figure.

Fig. 5 is partly, the lower half, a side view of the telescopic joint portion of the drive shaft, which is carried by the boom, and the upper part of the view is in longitudinal section to show the anti-friction extension key bearings.

Fig. 6 is a cross section on the line 6—6 of Fig. 5.

Fig. 7 is similar to Fig. 5 except that a modified construction is shown for the joint member, a simple solid key being shown instead of rollers.

In the construction shown in the drawings, the auger 1 and derrick 2 are mounted on a platform 3, which platform is carried by a self-propelled vehicular member 4 here shown, with part broken away, in the form of a truck adapted for operation by an internal combustion engine, as will be understood, though the engine itself is not actually shown.

Referring first to Figs. 1 and 2, the derrick as here disclosed is mounted on the right hand side of the truck, relatively near the front end, adjacent to the seat canopy 4′, and is adapted to swing out from the side of the truck for operating purposes, as shown in both views, and back parallel with and toward the rear of the truck when not in use, as will be understood. Said derrick comprises mainly a stationary mast 5, boom 6, base plate or block 7, whereon the mast and boom are mounted, inclined rearward brace 8 for the mast, pulleys 9 and 10, together with cable 11 carried thereby for supporting and adjusting the boom, as will be understood, and pulleys 13, 14 and 15, together with cable 16 for raising and lowering the auger 1 and mechanism associated therewith. The boom is pivoted at 6′ to the eared sleeve or hub-like support 7′ which turns horizontally on the plate 7, with the mast 5 serving as a pivot. Said plate 7 has also therein an upstanding bracket 7^a to help support the mast upright.

The auger 1 is adapted and arranged for mechanical drive through a telescopically extensible shaft 17 and connections therefor, as will be more fully described. The auger itself comprises substantially a rotatably supported shank 18 and an earth engaging bit part including a plurality of pivotally mounted digging members or scoops 19 mounted on the lower end of said shank, together with manually operable dumping means for opening and closing the scoops 19.

The said dumping means for the scoops 19 comprises mainly an exteriorly threaded sleeve 20 of elongated shape mounted rotatably on the middle part of shank 18 in combination with a short interiorly threaded sleeve 21 arranged to travel up and down on said sleeve 20, when the latter is rotated by means of handles 22 thereon. Said sleeve 20 is secured against longitudinal movement by means of a pair of end collars 23 fixed on said shank 18 by pins 24. The sleeve 21 is connected to the dump mechanism of the digging members 19 by means of a pair of links 25 which are secured by pivots 26 to the outstanding

shoulders 27 on said sleeve and on the sliding member 28 which operates the scoop actuating mechanism, including levers 29 as will be understood. The bit proper and scoop members are not claimed as part of my invention and need not be further described herein.

The upper end of the shank 18 is connected through a short shaft 18′ and a spring cushion coupling 30, such as shown in my copending application, Serial No. 27,260, to the gearing in housing 31, to which gearing the shaft 17 is operably connected. Said housing is provided with a bracket 32 and lug 32′ on its upper side, to which the cable 16 is connected. The handles 31′ facilitate adjustment of the auger for boring.

Said shaft 17 at its outer end is provided with a bevel gear 33 fixed thereon in operative relation to another bevel gear 34 which is rigidly connected to a worm gear 35, the latter being arranged to mesh with a corresponding gear, not shown, fixed on the upper end of the short shaft member 18′, which leads down to the said coupling 30.

The driving shaft 17 serves also as a torque reactor for the auger and is of sufficiently rigid construction to effect this service without objectionable bending. The outer end of shaft 17 is journaled at two points 38 and 39 spaced apart on the bracket 40 which is pivoted to housing 31 coaxially with the worm gear 35, substantially as shown in my copending application.

In order to accommodate extension of shaft 17, as required for raising the auger, and shortening when the auger is lowered, the shaft is made in two sections 17′ and 17″, the latter being tubular to receive the former. Relative turning of sections 17′ and 17″ is prevented by a groove and key construction, as shown by Figs. 5 and 6. In order to avoid friction and to permit ready change in effective length of the shaft, especially when under load, the groove 41 in section 17″ is provided with a key 42 of special construction for riding in the groove 43 of section 17′. Said key 42 comprises a plurality of cylindrical bearing rollers 44 carried by a frame 45 held in tension between two springs 46 secured to the ends as at 47. The outer end of each spring 46 is fastened to the outer shaft member 17″, as by screws 48, at the ends of the groove 41 in which said key slides.

With a view to further minimizing friction losses, and in order to provide for great mechanical strength in the universal joint at the inner end of the extensible shaft 17, forming part of the transmission mechanism which drives the auger 1, a spiral gear joint is used, as shown by Figs. 1 and 2, for communicating with the power shaft 49 on the side of the truck. This shaft 49 receives its power from the engine through a sprocket wheel 50 and chain 51, and delivers power to a spiral gear 52 fixed on the front end of said shaft 49. This gear 52 delivers its power directly to a second spiral gear 53, which turns on a vertical axis. This second gear 53 meshes with a third spiral gear 54 which turns on a horizontal axis in a plane perpendicular to the shaft 17. This third gear 54 in turn delivers its power to said shaft 17 through the medium of a fourth spiral gear 55 keyed to the inner end of said shaft. The mounting for this gear mechanism includes a series of link like members hinged together at their ends coaxially with the corresponding gears respectively, as will be apparent.

For simplicity of design, both as to the gears and the mountings therefor, these spiral gears are all substantially alike. The said gear mounting comprises three link members 56, 57 and 58. The middle link 57 has two forked ends with the fork planes at right angles, to receive the pivots 59 and 60 respectively. These pivots serve both as hinge pintles to connect the end links 56 and 58 and as supports for the gears 53 and 54 respectively. The other two links 56 and 58 are substantially like link 57, but at their outer forks receive the shafts 49 and 17′ respectively instead of short pivots such as 59 and 60, and said pivots fit in the apposite forks of said outer links. Horizontal swinging of shaft 17 is about pivot 59 and vertical swinging is about pivot 60. Link 56 is rigid with the frame 4.

In order to prevent tilting of the platform 3 and frame 4, an adjustable lateral brace or anchor is provided on the truck. This brace comprises mainly a rigid bar 62 having a ground gripping tip or shoe 63 on its free outer end and manually operable means 64 for raising and lowering at its opposite end where it is hinged to the truck frame for double movement. This connection includes a pair of hinge members, one of which 65 accommodates vertical movement and the other 66 accommodates horizontal movement. The hinge members 65 and 66 are connected by a common block 67 which is interposed, as shown.

The raising and lowering means 64 comprises a screw having a handle 64′ on its outer end. The inner end is pivotally connected at 68 to the upper edge of hinge block 67. An internally threaded carrier 69 on said screw is secured pivotally at 70 to the upper edge of the brace 62 at its inner end. Turning the handle 64′ in one direction serves to lower the brace 64 and in the opposite direction to raise the same. When the brace is raised, it may be swung horizontally to fit snugly against the side of the vehicle frame 4′, as indicated by dotted lines on Fig. 3. When it is to be swung

downwardly for use, it may be lowered by means of the screw 64. Reverse turning of the screw raises the brace to its horizontal position ready for swinging horizontally against the truck.

Referring to Fig. 7, a modified form of joint is here shown for the torque reactor and driving shaft. Here the telescopic joint is substantially similar to that shown in Fig. 5, except that in this modification the shaft sections 72 and 73 are provided with a simple slot and key connection instead of being provided with an anti-friction key, such as shown in Fig. 5. In Fig. 7 the key 74 is secured in a slot 75 of section 73 and rides in the slot 76 of section 72.

The relatively light auger adapted for manual dumping is especially suitable for use on trucks where speed is required and where extremely heavy work is not demanded. The equipment as a whole being of light construction, it is capable of quick and ready manipulation, and the power connections for driving the auger enable it to accomplish power boring most efficiently.

Although but two embodiments of this invention have been herein shown and described, it is to be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. An earth boring machine comprising a mobile support, a derrick mounted thereon, an auger carried by said derrick and a combination power drive and torque reactor shaft operably connecting said auger and support, said shaft being telescopically extensible and provided with anti-friction bearings for the extension joint.

2. An earth boring machine comprising a mobile support, a derrick mounted thereon, an auger carried by said derrick and a power shaft operably connecting said auger and support, said shaft comprising a pair of sections telescopically connected, the overlapping ends being oppositely grooved lengthwise, and an anti-friction key disposed coactively in the grooves.

3. An earth boring machine comprising a mobile support, a derrick mounted thereon, an auger carried by said derrick and a power shaft operably connecting said auger and support, said shaft comprising a pair of sections telescopically connected, the overlapping ends being oppositely grooved lengthwise, and an anti-friction key disposed coactively in the grooves, said key comprising a carrier frame and a plurality of cylindrical rollers held thereby with their axes disposed radially of said shaft, and springs urging said frame to a medial position.

4. An earth boring machine comprising a mobile support, a derrick mounted thereon, an earth auger carried by said derrick, a source of power on said derrick and a mechanical train connecting said auger to said source, said train including both a telescopically extensible shaft and a universal joint having spiral gears to transmit the power therethrough, said joint including three pivotally connected forked links and three spiral gears coactively related and carried thereby.

5. In combination a mobile support, a derrick thereon, an earth auger carried by said derrick, means to transmit power from said support to said auger, said means including a telescopically extensible shaft suspended under said derrick and gearing at the ends of said shaft respectively, that at the outer end being arranged to transmit power from said shaft to said auger and that at the inner end comprising four spiral gears including one which is mounted on the said support on an axis disposed lengthwise of said support, one keyed to the said shaft and two others intermediately disposed, and three pivotally related fork members to hold said spiral gears in cooperative relation.

Signed at Chicago this 6th day of February, 1925.

GILBERT GENUNG.