

June 9, 1931.

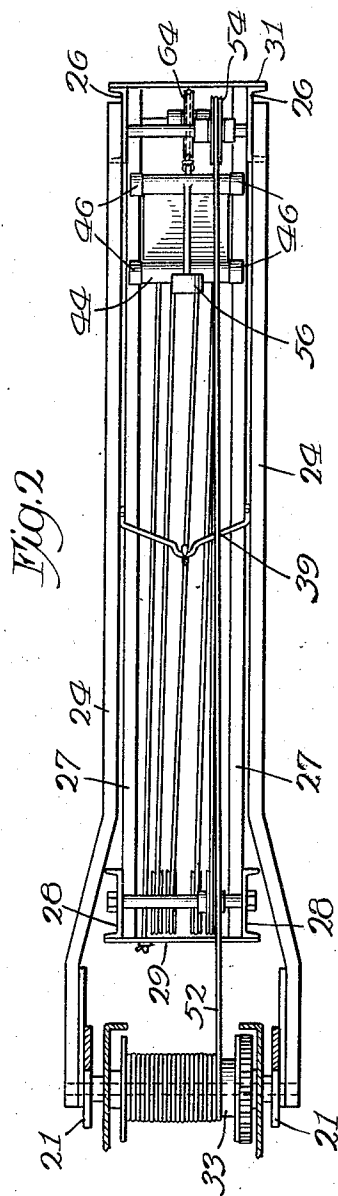
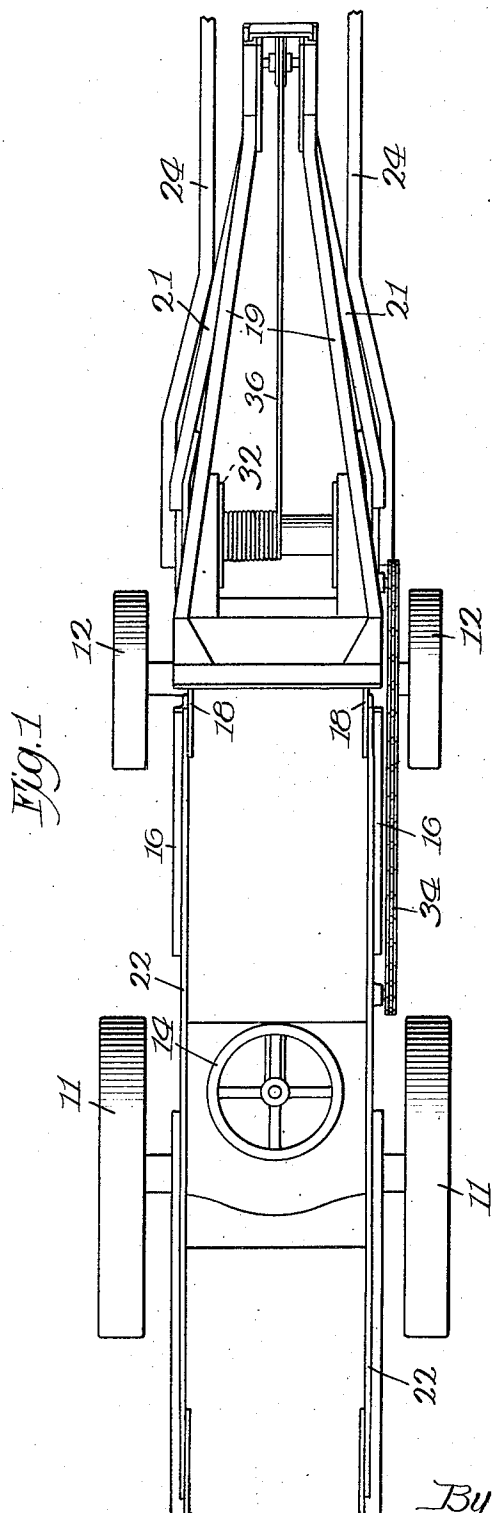
H. A. JOHNSON

1,809,342

PIPE PUSHING MACHINE

Filed Nov. 16, 1927

4 Sheets-Sheet 1



Inventor:
Harry A. Johnson
By George E. Mueller Atty.

June 9, 1931.

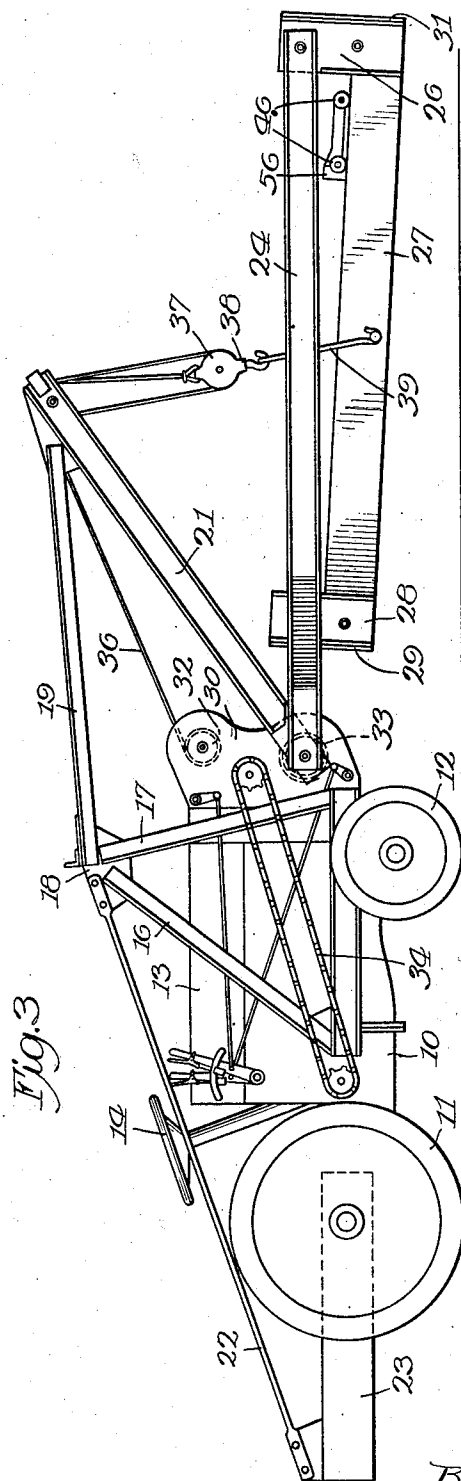
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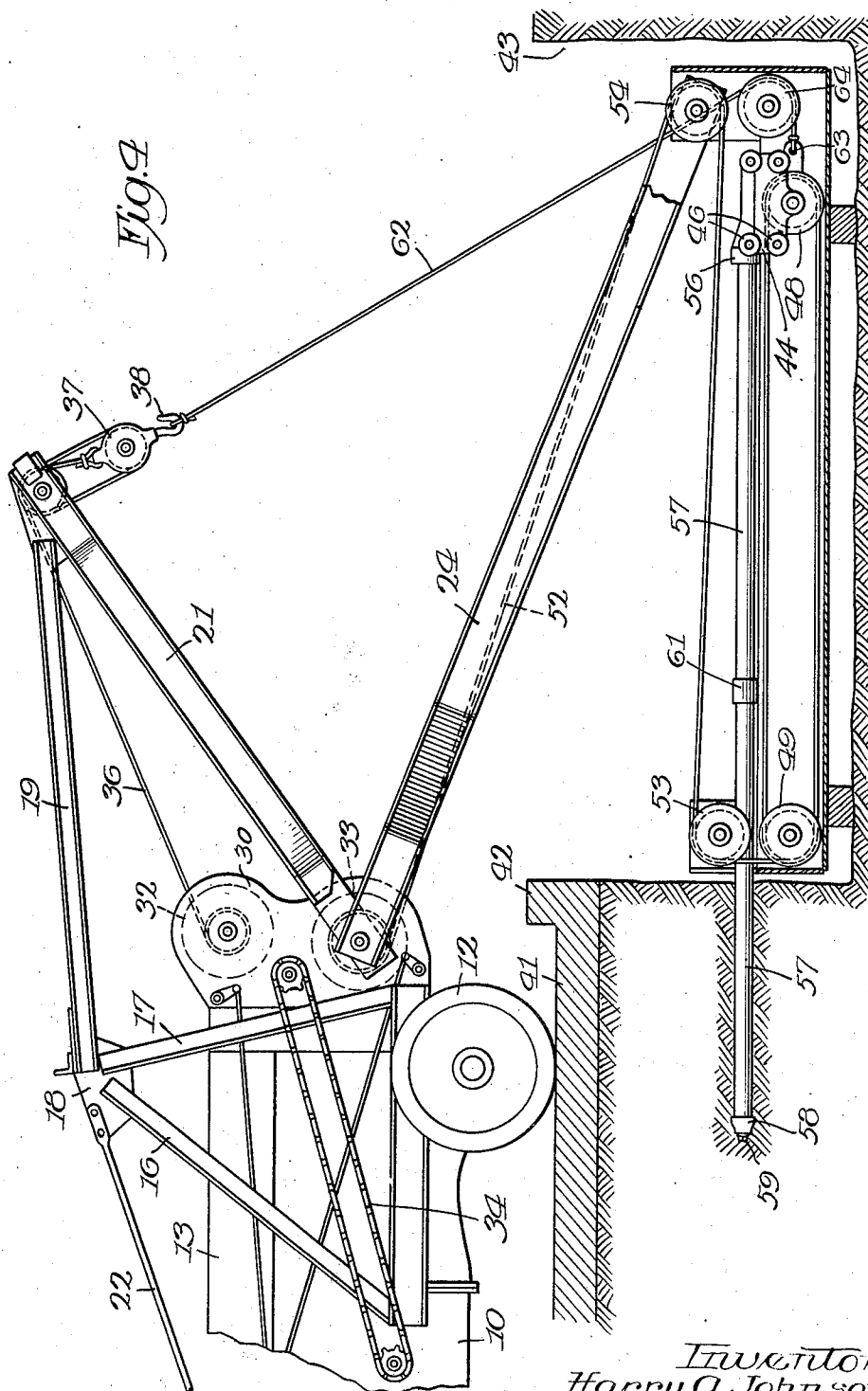
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PIPE PUSHING MACHINE

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4 Sheets-Sheet 3



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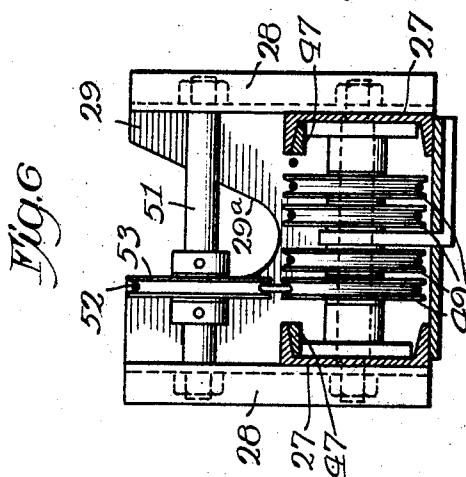
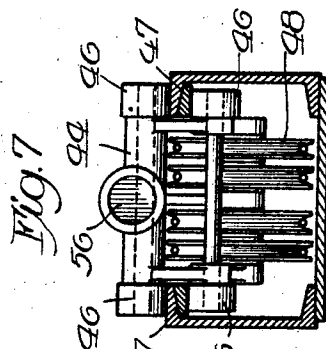
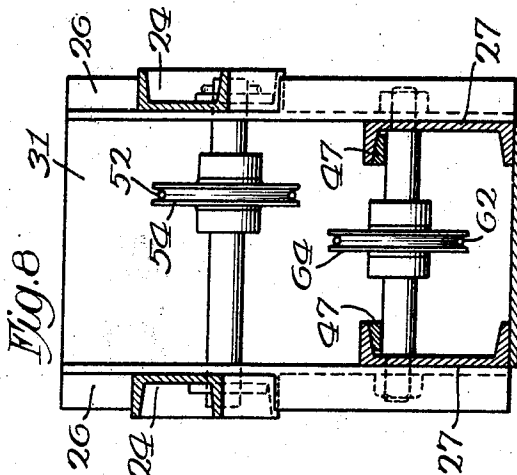
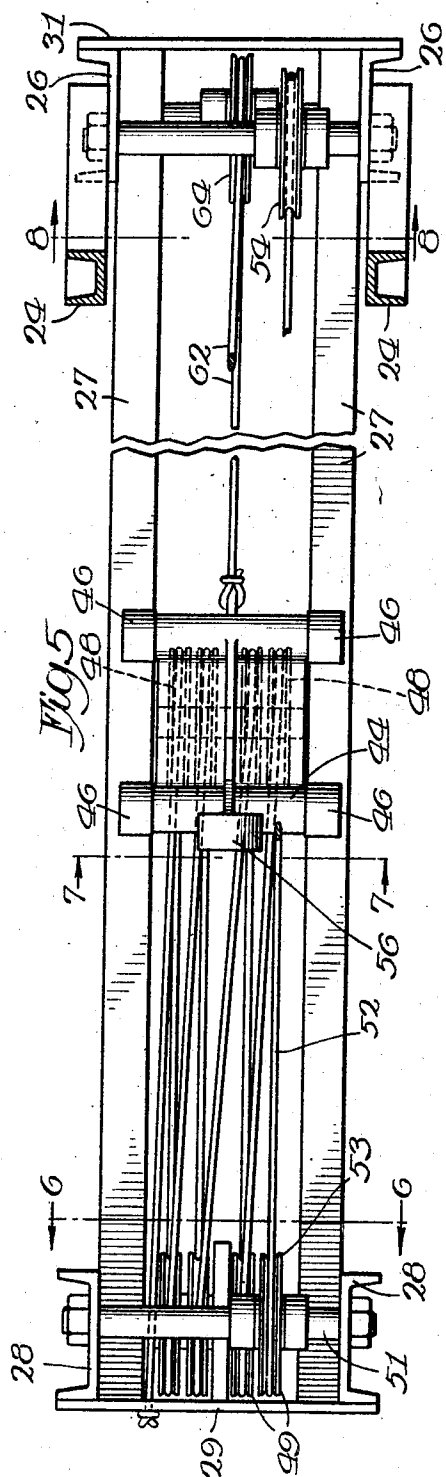
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PIPE PUSHING MACHINE

Filed Nov. 16, 1927

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

HARRY A. JOHNSON, OF CHICAGO, ILLINOIS

PIPE PUSHING MACHINE

Application filed November 16, 1927. Serial No. 233,536.

My invention relates to a machine for laying pipe by a method known as "pipe pushing".

It relates more particularly to a mechanism for pushing house service pipes and the like to be connected from the main line to the interior of a building, or for the placing of any species of pipe where there are obstructions to be encountered when digging an ordinary trench. The usual difficulty in installing service pipes is that the pavement in the street must be torn up and this is an expensive and unsatisfactory operation.

The principal object of my invention is to provide an improved means for installing such pipes.

Another object is to provide a mechanism quickly movable from one place to another for installing service pipes.

Another object is to provide a mechanism of this class which can be quickly put in readiness for performing a pipe pushing operation at one location, and very quickly removed and transported to another location when the pushing operation is completed.

Another object is to utilize ordinary tractor power for pushing pipes in the manner described.

Another object is to provide a simple mechanical structure adapted to be combined with a tractor to push pipes without the necessity of digging a pipe trench.

Another object is to provide an improved mechanically operated pipe pusher.

Another object is to provide in combination with such improved pusher, improved means for handling and operating the same.

In accomplishing my invention, I provide a frame mounted on a tractor of conventional design and having a pipe pushing unit forming a part of the same and pivoted thereto, the pushing unit being adapted to be supported above the street to facilitate movement of the tractor, but mounted to be lowered into a trench to receive a pipe and force it through the earth in a direction determined by the position thereof. The tractor is provided with a pair of drums driven by the tractor engine for controlling the movement of a pipe engaging carriage forming a

part of the unit, the connection from the drums to the carriage being by means of a pair of cables one wound on each drum and connected to opposite ends of the carriage whereby reciprocatory movement is possible.

Other objects and features of the invention will be apparent from a consideration of the following detailed description taken with the accompanying drawings, wherein

Fig. 1 is a fragmentary plan view of a machine embodying the main features of my invention;

Fig. 2 is a plan section showing some of the details of the pipe pushing unit;

Fig. 3 is a side elevational view;

Fig. 4 is an enlarged fragmentary portion of Fig. 3, with the apparatus in pipe laying position, a portion thereof being shown in section to bring out the arrangement of parts;

Fig. 5 is a plan section showing the mounting in operation of the pipe engaging carriage;

Fig. 6 is a sectional view taken along the line 6-6 of Fig. 5;

Fig. 7 is a sectional view along the line 7-7 of Fig. 5;

Fig. 8 is an end view looking at the right hand end of Fig. 5;

Fig. 9 is a fragmentary sectional view showing a bail for lifting the pipe laying unit and,

Fig. 10 is a detail of a pipe follower adapted to be used when the last section of pipe is being laid.

The embodiment shown in the drawings includes any usual form of tractor provided with rear wheels 11, front wheels 12, a usual form of internal combustion engine protected under the hood 13 and a steering mechanism including a steering column 14. The usual tractor chassis is provided to which is secured uprights 16-16 and 17-17 secured to an assembly frame 18, to which is also secured brace rods 19-19 for supporting a boom 21. The boom comprises two members with aligned pivots, and operating together as a single member. A pair of tie rods 22-22 extend from the assembly frame 18 and connect with a counterweight 23 extend-

ing from the rear of the tractor and compensating for the load suspended from the boom 21.

At the base of the boom, a pair of channels 24 are pivoted and have their other ends pivotally connected with a pair of channel uprights 26 integrally secured at one end to a pair of horizontal channels 27 forming the main frame of the pipe laying unit proper, and having a second pair of upright channels 28 at the other end, end plates 29 and 31 being secured to the ends of the channels 27 and to the side edges of the upright channels.

At the front of the tractor, a power driven drum mechanism is provided including a drum housing 30 forming a part of the main frame and drums 32 and 33 driven by a suitable gear mechanism through a chain 34 which receives its power from the tractor engine. The drum 32 is provided with a cable 36 which forms a part of a block and tackle mechanism 37 suspended from the top of the boom and provided with a hook 38 for engaging a bail 39, the bail 39 being adapted to form a connection with the pipe laying unit so that this entire unit including the connecting channels 24 may be raised upwardly in the manner shown in Fig. 1 so that the entire mechanism may be transported from place to place by driving the tractor in the usual manner.

Fig. 4 shows the position which the mechanism assumes when a pipe is being laid. The tractor rests upon the paving 41 adjacent the curbing 42 and immediately in front of a narrow and relatively small trench 43 which has previously been dug in a suitable location as for example, in the parkway between the street and sidewalk. The cable 36 is payed out to permit the pipe laying unit proper to descend to the bottom of the trench where it assumes a strictly horizontal position as shown. The bail 39 is then disconnected and the block and tackle 37 employed to return to pipe laying carriage to starting position in a manner which will be made clear.

A pipe driving carriage 44 is provided with two double pair of rollers 46, the top set of rollers riding along the top of the upper channel flange and the bottom set riding along a liner 47 which is secured to the flange to provide a better track for the rollers. The carriage has a plurality of sheaves adapted to cooperate with sheaves 49 carried on a transverse shaft 51 supported between the channels 27 at the end thereof and over which sheaves, a cable 52 is trained, extending therefrom over an upper sheave 53 disposed between the channels thence over a second sheave 54 at the opposite end of the pipe laying unit whence it is taken up on the drum 33. The pipe engaging end of the carriage 44 has a circular recess 56 which is adapted to receive a pipe section 57 to force it through

the earth as shown in Fig. 4. The first pipe to be pushed into the ground is provided with a suitable head to facilitate its entering the ground and to prevent the plugging of the pipe with earth. I find that the use of a reducing coupling 58 and a small plug 59 answers the purpose satisfactorily. As one pipe is pushed in, the second pipe is joined thereto by a standard pipe coupling 61. The cable 62 is secured to the pipe engaging carriage at 63, and extends over a sheave 64 with its opposite end connected to a hook 38.

In the operation of the mechanism, the trenches 43 are previously dug in a position in which a pipe is to be laid and the proper number of lengths of pipe 57 are placed at the trench to be laid by the machine. The operators of the machine are given a route to follow and drive along the street 41 at a normal rate of speed until they reach an open trench where they stop long enough to lay the pipe. They then proceed to the next trench and continue the operation, with ordinary speed of operation and conditions, laying a good many hundred feet of pipe in one day.

When reaching a trench, the tractor is driven up to it and the pipe laying unit lowered in the manner described. The bail 39 is then removed from connection with the pipe laying unit and also removed from the hook 38. This hook is then connected to the cable 62 and the drum 32 driven until the carriage 44 is in approximately the position shown in Fig. 4. The length of pipe 57 is then placed against the ground and the drum 33 actuated to draw the carriage toward the end of the pipe until it engages in the circular aperture 56. The pipe is then lined up in all directions so as to point directly to the spot where it is to emerge. The drum 33 is again turned to force the pipe 57 inwardly as far as the carriage will drive it. The carriage is then withdrawn again by operating the drum 32, the second length of pipe 57 connected to the first by the coupling 61 and the operation repeated. When the last length of pipe is reached, a follower 66 (Fig. 10) is inserted in the free end of the pipe, the other extending end of the follower being engaged by the carriage to drive the pipe as much farther as desired.

If desired, guides may be provided for the pipe to insure its movement in the proper direction. In this connection, I show the end plate 29 cut away at 29a to form such a guide. I have found, however, in actual practice that it is advisable to level by hand, no matter how accurately the guides are placed because irregularities in the street on which the tractor is resting and other contributing causes, may throw the pipe laying unit slightly out of line. For this reason, practically a guide is of not very great consequence because the pipe must be lined up

anyway to begin with, and after it has penetrated the earth some distance, the earth itself acts as a guide.

Although I have described the details of one embodiment of my invention, it is obvious that the invention is not restricted to this particular form and no limitation is made except as defined in the appended claims.

What I claim as new and desire to secure by United States Letters Patent is:

1. In a pipe pushing machine for forcing a service pipe from a trench through a section of earth, a motor driven vehicle having power take off means, a pushing unit secured to the vehicle and adapted to be extended into the trench, a reciprocable pipe engaging carriage on said unit, a pair of drums carried by the vehicle, means for driving the drums from the power take off means and cables connected to said drums and to opposite ends of said carriage for operating the same.

2. A pipe pushing machine for forcing a service pipe from a trench through a section of earth, said machine comprising a tractor, a super-structure carried at one end of the tractor, a boom supported by said super-structure and forming a part thereof, an auxiliary boom having one end pivoted at the base of the boom, a pipe pushing unit having one end pivoted to the opposite end of said auxiliary boom, and means for suspending said unit and auxiliary boom from the outer end of said boom to raise the unit for transportation by said tractor or to lower the same into operating position in a trench.

3. The combination defined in claim 2 with a counterweight on said tractor and a tie rod forming a part of said super-structure, and connected from said superstructure to said counterweight.

4. A pipe pushing machine for forcing a service pipe from a trench through a section of earth, said machine comprising a vehicle, a superstructure carried by the vehicle, a boom forming a part of the super-structure, an auxiliary boom pivoted at one end to the base of the boom, a pipe pushing unit connected to the opposite end of said auxiliary boom, and means adjustably connecting the auxiliary boom and pipe pushing unit to said boom.

5. In a pipe pushing machine, a tractor having power take-off means, a driving drum mounted on the tractor, driving means from the power take-off means to the drum, a pipe pushing unit with a pivoted connection to the tractor, and cable means connected to the pipe pushing unit and actuated by the drum for operating the pipe pushing unit.

6. In a pushing machine, a power driven vehicle adapted for relatively rapid movement from one position to another and having power take-off means thereon, a pushing unit carried by the vehicle, means forming a piv-

otal connection from the vehicle to the unit for raising or lowering said unit to pushing position and assisting in supporting the same during transportation, said means including cable operated means for operating said pushing unit, and means for driving said cable from said power take-off means.

7. In a pushing machine, a framework including a super-structure, a boom pivoted at one end to the framework, a pushing unit pivoted to the opposite end of the boom, a carriage slidably mounted on the pushing unit, a pair of drums rotatably mounted on the framework, cables on the drums and having connections to opposite ends of the carriage for operating the same, a source of power positioned on the framework and driving connections from said source of power to said drums and said boom.

8. In a pipe pushing machine, a power operated vehicle provided with power take-off means, a pipe pushing unit having a pivoted connection to said vehicle, a drum frame secured to the vehicle, a pair of drums carried by said frame, cables on the drums connected to operate said pushing unit and driving connections from the power take-off means to said drum.

9. In a pipe pushing machine, a pushing unit including horizontally disposed frame members, pipe supporting and guiding means thereon, a carriage movable on the frame members, a plurality of sheaves disposed at the ends of the frame members, cables trained around the sheaves and connected at two points to the carriage for advancing or withdrawing the same.

10. The combination with a pipe pushing unit as defined in claim 9 of a transporting power operated vehicle with power take-off means, a frame on the vehicle and including a housing for a pair of drums, a boom having one end pivoted to the frame and the other end pivotally secured to the pushing unit, one of said cables being connected to one of the drums and the pivoted boom and extending along the same for direct connection to the carriage to operate the carriage in one direction, the other cable extending from the other drum and over the framework to support, raise or lower the pushing unit and pivoted boom and also adapted for making a connection to the carriage for movement of the carriage in a reverse direction, and driving connection between the drums and said power take-off means.

11. Apparatus of the class described comprising a bed adapted to be placed in a trench, said bed having guide flanges, a pipe pushing member guided by said flanges and slidable longitudinally of said bed, sheaves at one end of said bed, additional sheaves carried by said slidable member, a cable passing over said sheaves and a power actuated means for winding said cable to move said slidable

member along said bed for forcing a pipe or the like into the earth at one end of the trench.

12. Apparatus of the class described comprising a bed member formed of a pair of spaced longitudinal members having upper inwardly directed flanges, sheaves adjacent each end of said bed member, a pipe pushing member disposed in said bed and having rollers coacting with said flanges for guiding said pushing member, sheaves carried by said pushing member, and a power actuated cable passing around all of said sheaves for driving said pushing member.

13. Pipe pushing mechanism comprising a bed formed of spaced longitudinal flanged members, end plates secured to said members, a power actuated pushing member movable longitudinally of said bed, said pushing member having rollers coacting with said flanges for guiding said member, the forward end plate having a recess the bottom wall of which serves as a guide for the pipe being placed and a socket device on said pushing member for engaging the rear end of said pipe, said other end plate serving to abut the rear wall of a trench to prevent counter movement of the bed during the pushing operation.

In witness whereof, I hereunto subscribe my name this 14th day of October, 1927.

HARRY A. JOHNSON.

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