Aug. 27, 1929. M. W. KNORR 1,726,438

PIPE LAYING MACHINE

Filed Nov. 8, 1927 2 Sheets-Sheet 1

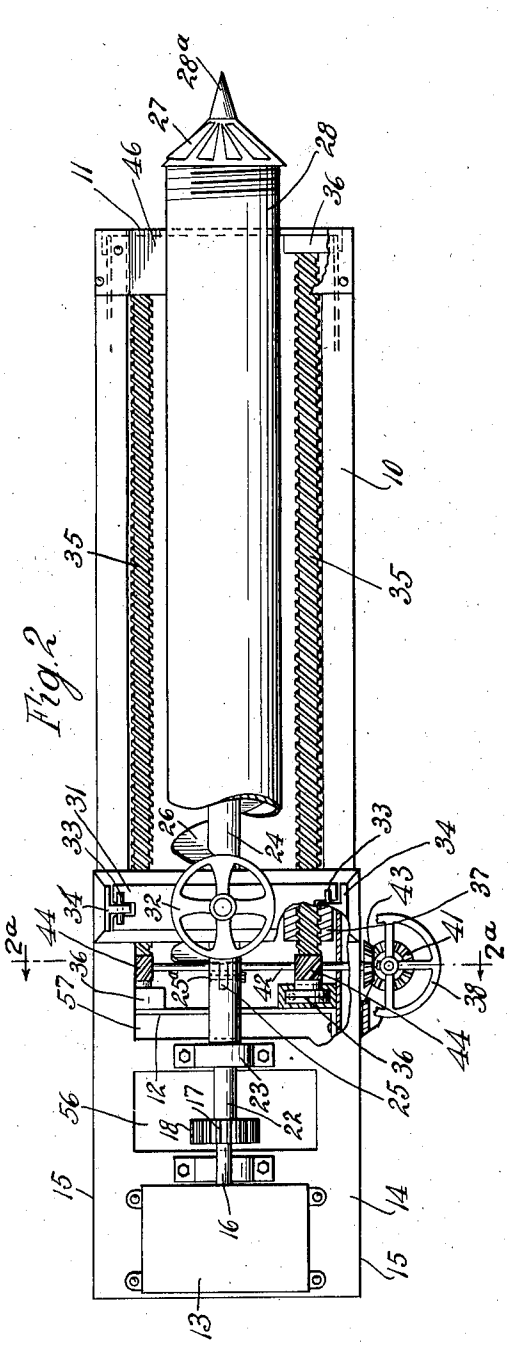


Fig. 2

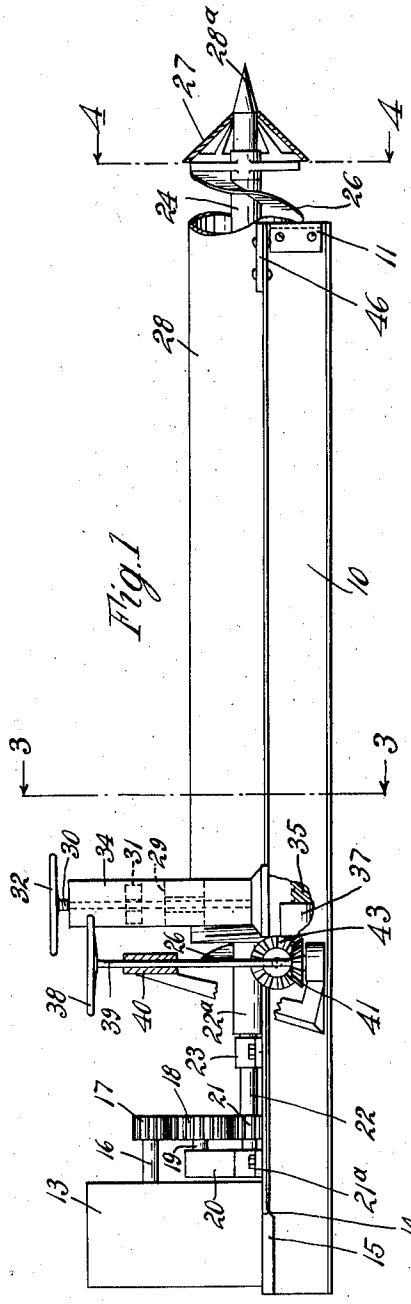


Fig. 1

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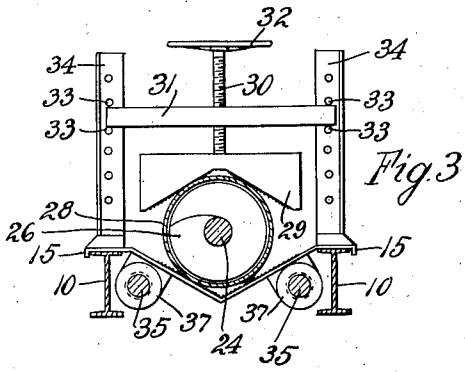


Fig. 3

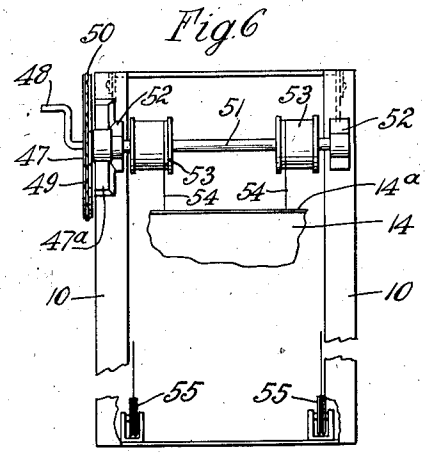
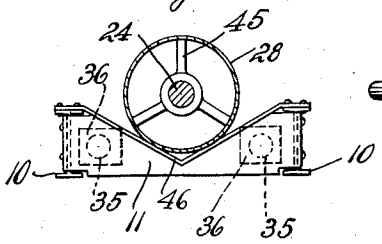


Fig. 6

Fig. 4



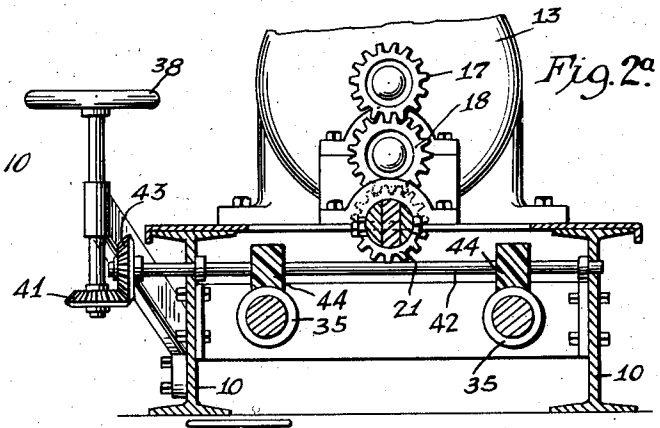


Fig. 2a

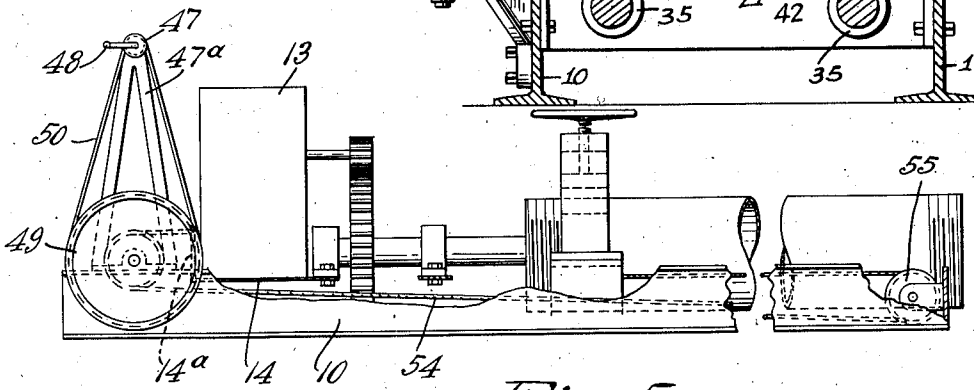


Fig. 5.

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Patented Aug. 27, 1929. 1,726,438

UNITED STATES PATENT OFFICE.

MAX WILLIAM KNORR, OF MAYWOOD, ILLINOIS.

PIPE-LAYING MACHINE.

Application filed November 8, 1927. Serial No. 231,972.

My invention relates to improvements in pipe laying machines.

The principal object of the invention is to provide improved mechanism of simple but rugged construction which can be economically manufactured, and which will be efficient in operation.

In the laying of pipes, such as water pipes and other conduits under ground, it frequently is necessary to place the same under paved streets which by municipal ordinance can not be opened up, and it thus becomes necessary to tunnel or bore an opening for the pipe to be laid. The present improvements are particularly adapted for such use, although not limited thereto as I contemplate the use of the improvements wherever desired and as a substitute for the trench method of laying pipes.

In the use of the present machine in laying a long stretch of pipe, an opening is made in the ground to receive the mechanism at the proper level and inclination, and preferably of such size as to provide sufficient room for the necessary work-men. When several sections of pipe have been laid, which may be just a few, or a larger number depending on the capacity of the particular machine being used, the machine is removed to another hole and a second stretch of pipe is laid, the two stretches being later connected to form a continuous pipe line.

The invention is broadly characterized by the provision of a supporting frame or base having thereon a sliding carriage provided with a suitable power unit, such as an electric motor, which operates a drill carried on the forward end of a screw conveyor shaft, the conveyor being arranged to operate in the pipe section being laid and adapted for conveying the earth through the pipe to the rear thereof whence it is removed by work-men or by suitable apparatus. A feeding mechanism is also employed which feeds the carrier, drill, conveyor and pipe forwardly in accordance with the capacity of the drill, and when the first section of the pipe has been laid, the conveyor shaft is disconnected from the power unit and the carriage then moved to retracted position. A second pipe section containing a second conveyor section is then positioned on the machine, the pipe sections are joined in the usual manner, the conveyor sections are connected together, and the second conveyor section is placed in driving engagement with the power unit, and after tightening the pipe clamping device the machine is operated again until the second section of pipe is nearly its entire length in the ground, after which the same steps are repeated up to the capacity of the power unit and feeding mechanism. The machine is then moved to a second hole as above described for laying additional lengths of pipe.

Additional objects of the invention relate to various features of construction and arrangement of parts which will be apparent from a consideration of the following specification and accompanying drawings, wherein:

Figure 1 is a side elevation of a machine embodying the improvements, parts being broken away for the purpose of clearness.

Fig. 2 is a top plan view thereof.

Fig. 2ª is a transverse section taken on the line 2ª—2ª of Fig. 2.

Fig. 3 is a vertical sectional view taken on the line 3—3 of Figure 1, illustrating the pipe clamping device, parts being omitted.

Fig. 4 is a fragmentary view taken on the line 4—4 of Fig. 1 showing the forward end of the device, and illustrating a bearing for centering the conveyor relatively to the pipe being laid.

Fig. 5 is a modified form of the invention, and

Fig. 6 is a broken plan view thereof illustrating certain details of the carriage actuating mechanism.

In the drawings 10, 10 are a pair of longitudinal base or supporting sill members consisting preferably of steel I beams. The sills are held in spaced relation by means of transverse plates 11, 12, at the forward and near the rear ends respectively. A power unit, such as motor 13 is secured to a sliding carriage member 14 which extends transversely of the sills 10 and has flanges 15, 15 which engage the top flanges of the sills to prevent displacement of the carriage. The motor shaft 16 carries a pinion 17 which meshes with a gear 18 on the short shaft 19 which is supported in the journal 20 secured to the carriage 14. The gear 18 drives the gear 21 on the shaft 22 which is supported in journals 21ª and 23. The forward end of the shaft 22 is enlarged to form a head 22ª which is adapted to be connected by any suitable means to the conveyor shaft 24, the means shown being a slot and tongue connection 25 and a pin 25ª for preventing disengagement of the members.

The conveyor shaft 24 has thereon a conveyor member 26, and at its forward end is a drill 27 of any suitable construction, the drill preferably being provided with a guiding or centering spur 28ª. The conveyor 26 rotates in the pipe section 28 which is held against rotation by a suitable pipe clamping or vise mechanism comprising a V shaped portion of the plate or carriage 14 (see Fig. 3) which as previously stated, has a sliding engagement with the sills 10. The pipe rests on the forward V shaped portion of the plate 14 and is held against rotation by the toothed jaws 29 carried on the threaded stem 30 which passes through a threaded opening in the cross bar 31, a hand wheel 32 being provided for operating the clamping device, as shown.

The bar 31 is removably secured by pins 33 to the vertical standards 34, a number of holes being provided in the members 34 for rendering the bar adjustable to accommodate pipe of different sizes. The standards 34 are shown as being made of T irons and the cross-bar 31 as being slotted for sliding vertically thereon. (See Fig. 2.) The standards 34 are secured to the carriage plate 14 by any suitable means, and as will be seen a pipe held by the clamping device will be carried forward, or to the right as viewed in Figs. 1 and 2, when the plate or carriage 14 is moved longitudinally of the sills 10. The cross-bar 31 may be removed for convenience in positioning the pipe and conveyor sections in the machine.

For feeding the mechanism forwardly on the sills during the operation of the drill, a pair of worm shafts 35, 35 may be provided as shown in Figures 1 to 4. The shafts are supported at both ends in suitable thrust bearings 36, 36 which are secured to the end or transverse plates 11, 12. The shafts 35 pass through threaded lugs 37 (see Fig. 3) secured to the lower side of the carriage 14. It will thus be seen that as the shafts 35 are rotated in one direction, the carriage 14 will move to the right as viewed in Figures 1 and 2; and to the left when they are operated in the opposite direction.

The feeding shafts 35 may be operated if desired by power derived from the motor 13 by suitable power take-off mechanism, but in the modifications of the invention herein disclosed, manually operable means are employed and may consist of a hand wheel 38 on the shaft 39 which is journalled in a standard 40 secured to the sills 10 or other stationary portion of the machine. A beveled drive pinion 41 is secured to the shaft 39 and drives the shaft 42 through the gear 43. Worms 44 are secured to the shaft 42 and mesh with worm gears 35ª secured on shafts 35 as shown in Fig. 2ª. From the foregoing it will be understood that the carriage 14 can be moved forwardly of the base by operating the wheel 38, thus feeding the drill to the work.

The drill head 27 cuts an opening of a diameter sufficient to admit the pipe 28, and delivers the earth into the pipe through which it is conveyed by the conveyor 26.

If desired a spider bearing 45 may be provided at the forward end of the pipe on the conveyor shaft 24, but preferably unattached to the pipe. The bearing serves to keep the conveyor concentric with the pipe and overcomes the gravitational tendency of the drill to cut in a downwardly inclined path. A transverse plate 46, secured to the sills 10, supports the pipe at the forward end of the machine.

From the above description it will be apparent that as the motor operates, the screw conveyor and drill will be rotated, and the earth removed by the drill delivered to the pipe through which it will be carried by the conveyor. The earth will be removed from adjacent the rear end of the pipe as above mentioned. As the device operates the hand wheel 38 is rotated slowly by a work-man. Rotation of the hand wheel causes the shaft 42 to turn which by means of the worms 44 cause the feeding shafts 35 to rotate. These shafts 35, which pass through the lugs 37 cause the carriage 14, the motor 13, the clamping mechanism, pipe 28, conveyor 26, and drill 27 to be fed forwardly, as will be clear. When the pipe section has been embedded nearly its entire length, the motor is stopped, the shafts 21 and 24 uncoupled, and the hand wheel rotated in a direction to move the carriage to the left hand position shown in the drawings, Figs. 1 and 2. The cross bar 31 of the clamping device is then removed and a new pipe section and corresponding length of conveyor are inserted in the machine, the pipes and conveyor sections being, respectively, connected together. The rear end of the new conveyor section is then connected to the counter shaft 22 and the clamping device is tightened on the pipe, the motor started, and the feeding mechanism operated as before.

In Figures 5 and 6 of the drawings the drill driving mechanism is substantially the same as above described, but the feeding shafts 35 are omitted and the feeding of the machine is effected by means of suitable cables. In this modification of the invention a sprocket wheel 46 is supported at the rear of the base 10 by means of a standard 47ª, a crank 48 being employed for operating the sprocket which drives the wheel 49 by means of the chain 50. A transverse shaft 51 is rotated by the wheel 49, the shaft being journaled in bearings 52 secured to the sill or base members 10.

Carried on the shaft 51 are winding drums 53, 53, around which are cables 54, 54. One end of each cable is connected to the rear of the carriage 14, a suitable bracket 14ª being

provided for making such attachment, if desired. The other ends of the cables pass around sheaves 55, 55 at the forward end of the base and thence to a suitable portion of the carriage. By means of this arrangement the carriage can be moved along the sills to the work as in the previously described form of the invention.

As shown in Figure 2, the plate or carriage member 14 may be provided with openings 56 and 57 for accommodating portions of the moving mechanism and to permit the removal of loose earth, if desired.

Although I have shown certain features of my improvements for the purpose of illustration, it will be apparent that various changes and alterations may be made therein without departing from the spirit of the invention, and I do not wish to be restricted to the specific forms shown and described except where limitations thereto appear in the following claims.

What I claim is:

1. Apparatus of the class described comprising a pair of sill members, cross plates thereon, a slidable carriage on said sills, a power unit on said carriage movable therewith for operating a drill, a pipe holding device associated with said carriage, and means for feeding said carriage and device longitudinally of said sill comprising a threaded shaft journaled on said cross plates.

2. A pipe laying device comprising a base, a carriage slidable thereon, a drill, a conveyor associated therewith for removing the earth displaced by the drill, a pipe to be laid in which said conveyor operates, a carriage slidable on said base, a power unit and pipe holding means on said carriage for respectively operating said drill and holding said pipe against rotation, and means for moving said carriage forwardly to feed the drill to the work and force the pipe into the opening made by the drill.

3. Apparatus of the class described comprising a drill, a conveyor for removing the earth displaced by the drill, a pipe to be laid in which said conveyor operates, a slidable power unit for actuating said drill and conveyor, a pipe clamping device for holding said pipe against rotation, said device being slidable with said unit, and feeding means for feeding said drill to the work and forcing said pipe into the opening made by the drill.

4. Apparatus of the class described comprising a base having a pair of spaced sills provided with outwardly turned flanges at the top thereof, a carriage comprising a plate spanning said sills and having sliding engagement with said flanges, a pipe clamping device movable with said carriage for engaging a pipe to be laid and to prevent rotation thereof, a transverse plate between the forward ends of said sills and constituting a support and guide for said pipe as the latter is moved with said carriage, and means for actuating said carriage longitudinally of said sills.

5. Apparatus of the class described comprising a base having a pair of spaced sills provided with outwardly turned flanges at the top thereof, a carriage comprising a plate spanning said sills and having sliding engagement with said flanges, a pipe clamping device movable with said carriage, said device having a base shaped to receive a pipe to be laid and having a toothed member for engaging the upper side of said pipe, a transverse plate between the forward ends of said sills and constituting a guide and support for said pipe as the latter is moved with said carriage, and means for actuating said carriage longitudinally of said sills, said means comprising a pair of members extending longitudinally of said sills in operative engagement with said carriage and operating mechanism for actuating said members.

6. Apparatus for laying pipe comprising a supporting base having a pair of longitudinally flanged members, a carriage slidably engaging said flanges, a power unit and pipe clamping means movable with said carriage, a conveyor extending longitudinally of said base and having detachable engagement with said power unit, a drill head carried by the forward end of said conveyor, a pipe to be laid within which said conveyor operates, said pipe being held against rotation by said clamping means, a removable bearing in the forward end of said pipe for holding said conveyor and drill in concentric alinement with said pipe, and means for advancing said drill, conveyor, and pipe simultaneously.

7. A machine for laying pipes under ground comprising a pair of flanged sill members, cross plates secured thereto, a threaded shaft journalled in said plates, a carriage having sliding engagement with said flanges, a member secured to the carriage and depending therefrom into cooperating relation with the threads of said shaft whereby when said shaft is rotated said carriage will be moved longitudinally of said sills, means for rotating said shaft, power actuated drill means carried by said carriage in parallel relation with said sills, and a clamping device movable with said carriage and being adapted to carry a pipe to be laid and to feed the same forwardly into the hole made by the drill means.

In witness whereof I have subscribed my name.

MAX WILLIAM KNORR.