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CONDUIT DRIVING MACHINE

Original Filed June 27, 1927

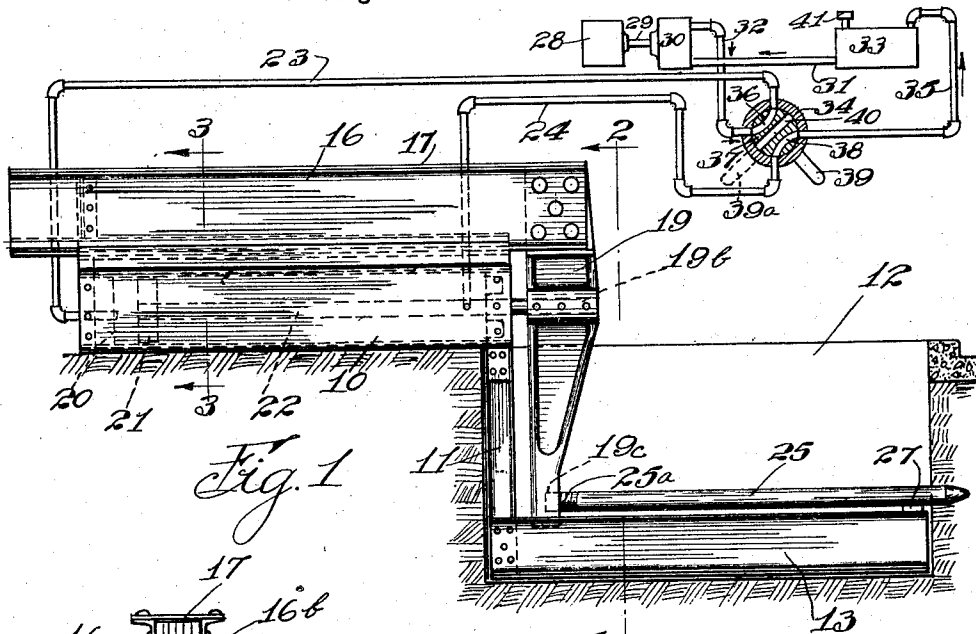


Fig. 1

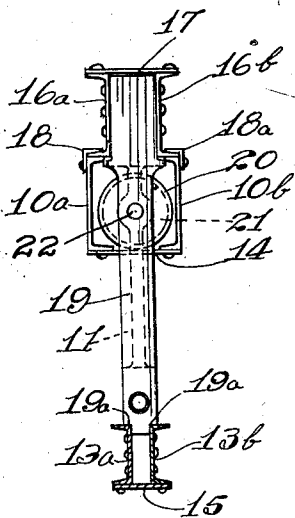


Fig. 2

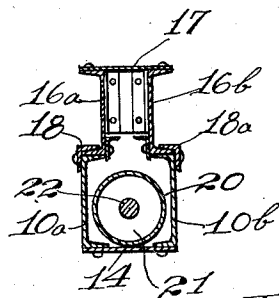


Fig. 3.

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CONDUIT-DRIVING MACHINE

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My invention relates to an improved construction of conduit driving machine for driving or pushing conduit under roadways and other locations where excavating to lay the conduit is impractical. Heretofore mechanisms of this kind have been hand operated in one way or another and the work has not only been arduous but also slow as a result. By my invention I provide power actuated mechanism for driving or pushing the conduit through the ground, this mechanism consisting preferably of a cylinder with its axis substantially parallel with the conduit, a piston in the cylinder adapted for operation by suitable fluid under pressure, and devices for communicating the pressure on the piston to a length of conduit to force it through the earth. More specifically, my invention provides a framework for location on the surface of the ground adjacent the trench provided to permit driving the conduit, a part of the framework preferably extending into the trench, and a movable structure carried by the framework to slide parallel with the cylinder and having an offset head extending into the trench to engage the length of conduit being driven, the head being connected with a piston rod extending into the cylinder and there connected with the piston. By my invention I also provide pressure producing and controlling mechanism so that the requisite pressure may be exerted on either side of the piston as desired, to either drive a length of conduit into the ground, or to withdraw it therefrom in the event it strikes an obstruction. I find it advisable to use as the driving fluid, liquid of some kind instead of gas, on account of the liquid being practically non-compressible and for this purpose I find that oil is quite satisfactory. To prevent waste of the liquid, I preferably arrange the system so that the liquid may flow in a closed path to and from a storage tank, which not only prevents loss of the liquid, but also provides a means for compensating for the unequal volumes of the two ends of the cylinder due to the space occupied by the piston rod. I also provide a convenient valve mechanism for applying pressure as desired to either side of the piston and for per-

mitting the pumping mechanism to idle as may be required when inserting a length of conduit to be driven.

My invention will best be understood by reference to the accompanying drawings showing a preferred embodiment thereof in which

Fig. 1 shows my conduit driving mechanism in side elevation in place for use, and also illustrates diagrammatically the pressure producing mechanism, the ground being shown in section in the view to illustrate the trench in which the work is being done,

Fig. 2 is a sectional view of the mechanism shown in Fig. 1 taken along the line 2—2, and

Fig. 3 is a sectional view of the mechanism shown in Fig. 1 taken along the line 3—3.

Similar numerals refer to similar parts throughout the several views.

As shown in the drawings, my mechanism consists of a framework 10 adapted to rest on the surface of the ground, from one end of which framework, a member 11 extends downwardly along one end of the trench in which the work is to be done. The lower end of the frame member 11 is preferably connected with bottom frame members 13 adjacent the bottom of the trench. As indicated in Figs. 2 and 3, the frame 10 may consist of vertically disposed channel bars 10^a and 10^b fastened together in separated relation by a bottom plate 14, the flanges of the channel bars extending towards each other. The frame member 11 may consist of any convenient structural shape, for example an I beam, or channel bars secured to the ends of the channel bars 10^a and 10^b in any convenient manner, and the frame members 13 are preferably channel bars 13^a and 13^b secured in convenient manner to the frame member 11 and connected together at their lower edges by a metal plate 15.

Above the main frame 10, a sliding member 16 is disposed resting on the upper surfaces of the upper flanges of the channel bars 10^a and 10^b, this member consisting preferably of channel bars 16^a and 16^b connected at their upper flanges by a plate 17 with their flanges extending away from each other and in separated relation so that their lower

flanges rest upon the upper flanges of the channel bars 10^a and 10^b. Angle bars 18, 18^a are secured to the channel bars 10^a and 10^b to form guideways for the lower flanges of the channel bars 16^a and 16^b, so that the member 16 may slide longitudinally on the main frame of the device. The right hand end of the member 16, as shown in Fig. 1, has rigidly secured to it, the upper end of a driving head 19, which is preferably a forging of iron or steel, of a size to occupy the space between the end portions of the webs of the channel bars 16^a and 16^b to which it is rigidly secured preferably by bolts. The driving head 19 extends vertically and is of a sufficient length to extend slightly below the upper edges of the channel bars 13^a and 13^b and the lower end of the head 19 may conveniently be recessed as indicated at 19^a to form bearing surfaces on the upper edges of the channel bars 13^a and 13^b to guide the lower end of the head.

Between the channel bars 10^a and 10^b, I dispose a metal cylinder 20 containing a piston 21 secured to one end of a piston rod 22 the other end of which extends through the right hand end of the cylinder 20 as indicated in Fig. 1, and into the head 19 at 19^b, where it is rigidly secured to the head 19.

In using the mechanism, fluid under pressure may be communicated to either the left hand end or the right hand end of the cylinder 20, for the relation shown in Fig. 1, by pipes 23 and 24 respectively, and when pressure is so communicated by the pipe 23, the piston 21, piston rod 22, head 19 and member 16 are moved to the right relatively to the frame 10. Similarly, communicating pressure to the cylinder 20 through the pipe 24 moves the parts last referred to, to the left. In using the mechanism, it will of course be understood that the frame 10 may, if found necessary, be anchored to the ground in any convenient way, although the relation of the member 11 and member 13, serves to hold the main frame 10 in place against thrusts exerted on the head for usual conditions of operation. The relation of the parts is such that the member 16 must move parallel with the axis of the cylinder, the size of the parts of the member 16 and of the head 19 being such as to withstand any driving thrusts exerted upon the lower end of the head, without deformation of the member 16 or of the head 19. In this way all bending stress is removed from the piston rod 22, which is required only to withstand the stress of compression or tension as the case may be, required to move the conduit.

In using the mechanism, the head 19 is moved to the left hand end of the trench, for the relation of the parts shown in Fig. 1, so that it is adjacent the frame member 11, in which position a length of conduit 25 is placed immediately above the frame mem-

bers 13, with one end of the conduit in a recess 19^a in the head 19, in which position the conduit 25 may be supported at its free end by a block 27 until the driving is begun. For this condition, when the head 19 is moved to the right, the conduit 25 is forced into the ground until the said driving head is adjacent the right hand end of the trench, when the head 19 is withdrawn and moved to the left as far as it will go; then a second length of conduit is screwed onto the conduit 25 by means of screw threads 25^a and the operation is repeated until the desired length of conduit is forced through the ground. In the event it is necessary to withdraw a length of conduit, the recess 19^a may be threaded to engage the threads 25^a so that motion of the head 19 to the left with the threads of the conduit in said engagement, will withdraw the length of conduit 25 from the ground so that it may be started in a different location.

The means illustrated for producing and controlling the supplying of fluid under pressure to the cylinder 20, consists preferably of a motor 28 having a driving shaft 29 connected with a pump 30, which pump has supply and discharge pipes 31 and 32 respectively. The pipe 31 connects with a storage tank 33 and the pipe 32 connects with the housing of a valve mechanism 34. The housing 34 is also provided with a pipe connection 35 for delivering fluid to the tank 33. The pipes 23 and 24 are also connected with the housing 34 as indicated. The connections of the several pipes to the valve housing 34 are made so that the passageway 36 of the valve member 37 may connect the pipes 23 and 32, and that the passageway 38 in said valve member may connect the pipes 24 and 35 for the position of the valve member indicated in Fig. 1. For this condition, the fluid delivered to the pipe 32 from the pump 30 is communicated through the passageway 36 to the pipe 23 to produce pressure on the left hand side of the piston 21 and the fluid contained in the cylinder on the right hand side of the piston 21 may flow freely through pipe 24, passageway 38, and pipe 35 to the tank 33, the flow to the pump 30 being in any case from the tank 33 through the pipe 31. The valve member 37 is connected with an operating handle 39 which when moved to its alternate position indicated by dotted lines at 39^a, moves the passageway 36 to connect the pipes 23 and 35, and also moves the passageway 38 to connect the pipes 24 and 32. For this condition, fluid is supplied under pressure from the pipe 32, through the passageway 38 to the pipe 24 and thus produces pressure on the right hand side of the piston 21, and fluid contained on the left hand side of the piston in the cylinder 20 flows freely through pipe 23, passageway 36 and pipe 35 to the tank 33. In the event it is desired to leave the

piston 21 in any particular position in the cylinder 20, with the motor 28 in operation, the handle 39 may be moved to a position mid-way between the two positions described, for which mid-position a passageway 40 in the valve member 37 establishes direct communication between the pipe 32 and the pipe 35, thus permitting the fluid to circulate freely through said pipes, the connections of the pipes 23 and 24 at this time being cut off from communication with any of the valve passageways. The tank 33 may be provided with a suitable vent 41 to equalize pressures in it for varying volumes of fluid contained in it. The motor 28 may be of any convenient type, for example an internal combustion motor, and the pump 30 may be of any type desired, for example a rotary pump, and as stated, I find that oil answers admirably as an operating fluid for the system.

From the above it will appear that conduit may be rapidly driven, regardless of resisting pressures, as long as it can be driven at all, and that the labor heretofore required in doing this work is eliminated by the use of my mechanism.

While I have shown my invention in the particular embodiment above described, it will be understood that I do not limit myself to this exact construction as I may employ equivalents known to the art at the time of the filing of this application without departing from the scope of the appended claims.

What I claim is:

1. In a conduit driving machine, the combination of a framework carrying a guideway, a member movable longitudinally on said guideway, a cylinder carried by said framework with its axis substantially parallel with said guideway, an offset head carried by said member to extend into a trench to drive a conduit, a piston in said cylinder, and a piston rod for communicating pressure on said piston to said driving head.

2. In a conduit driving machine, the combination of a framework carrying a guideway, a member movable longitudinally on said guideway, a cylinder carried by said framework with its axis substantially parallel with said guideway, an offset head carried by said member to extend into a trench to drive a conduit, a piston in said cylinder, a piston rod for communicating pressure on said piston to said driving head, and frame members extending from said framework into and along the lower part of the trench to guide the lower end of said driving head.

3. In a conduit driving machine, the combination of a longitudinally movable conduit driving member, a cylinder and piston, and operating connections between said piston and said member, said member having a laterally offset portion permitting said member to be above the surface of the ground and the driven conduit to be in a trench.

4. In a conduit driving machine, the combination of a longitudinally movable conduit driving member, a cylinder and piston, and operating connections between said piston and said member, said member having a laterally offset portion permitting said member to be above the surface of the ground and the driven conduit to be in a trench, and guideways for said member.

5. In a conduit driving machine, the combination of a framework carrying a guideway, a member movable longitudinally on said guideway, an offset head carried by said member to extend into a trench to drive a conduit, and means for exerting driving pressure upon said head.

6. In a conduit driving machine, the combination of a framework carrying a guideway, a member movable longitudinally on said guideway, an offset head carried by said member to extend into a trench to drive a conduit, frame members extending from said framework into and along the lower part of the trench to guide the lower end of said driving head, and means for exerting driving pressure upon said head.

7. In a conduit driving machine, the combination of a longitudinally movable conduit driving member, and means for exerting driving pressure upon said member, said member having a laterally offset portion permitting said member to be above the surface of the ground and the driven conduit to be in a trench.

8. In a conduit driving machine, the combination of a longitudinally movable conduit driving member, means for exerting driving pressure upon said member, said member having a laterally offset portion permitting said member to be above the surface of the ground and the driven conduit to be in a trench, and guideways for said member.

In witness whereof, I hereunto subscribe my name this 20th day of June, A. D. 1927.

ARTHUR H. SLOAN.