May 3, 1960 L. J. WILWERDING 2,935,298

POWER OPERATED PIPE PUSHING MACHINE

Filed Oct. 9, 1957

3 Sheets-Sheet 1

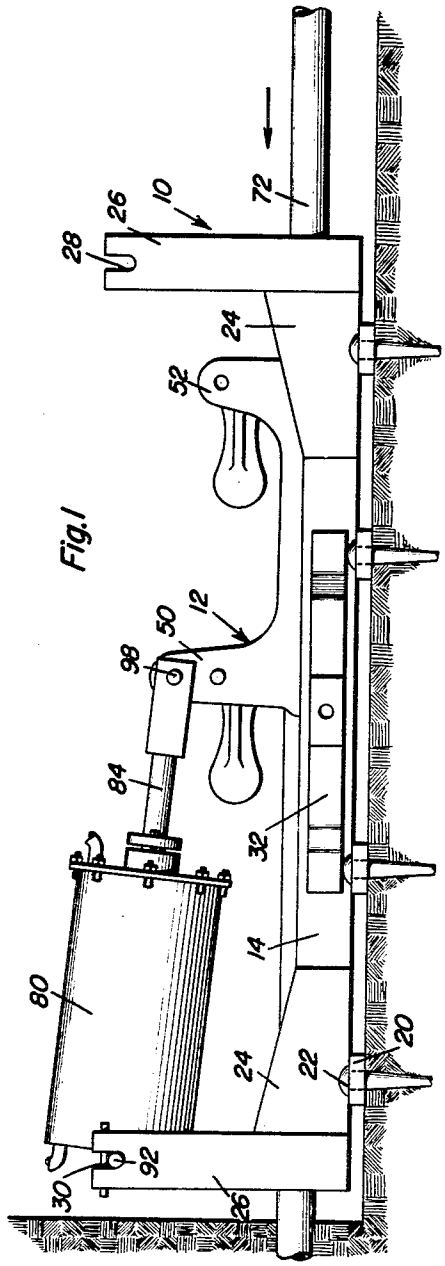


Fig. 1

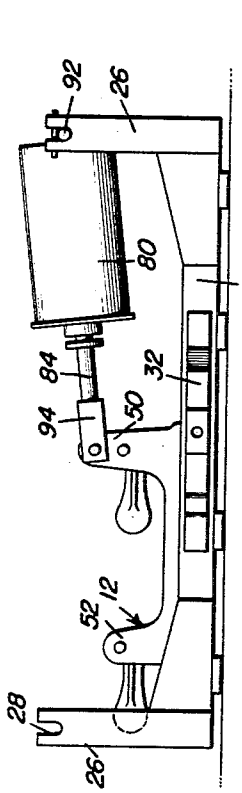


Fig. 3

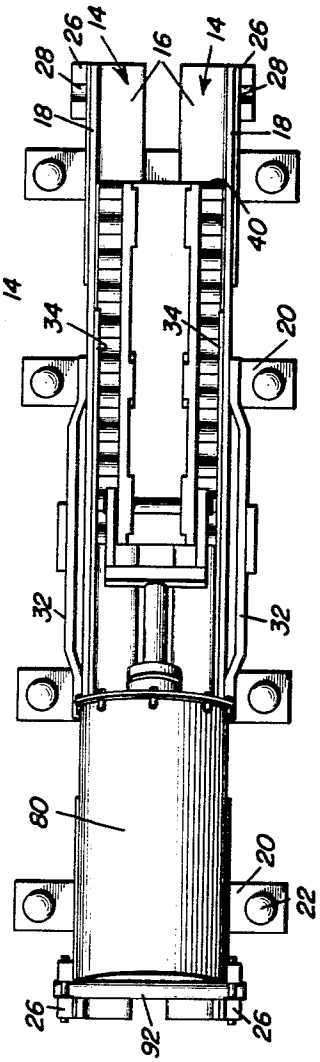


Fig. 2

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May 3, 1960 L. J. WILWERDING 2,935,298

POWER OPERATED PIPE PUSHING MACHINE

Filed Oct. 9, 1957 3 Sheets-Sheet 2

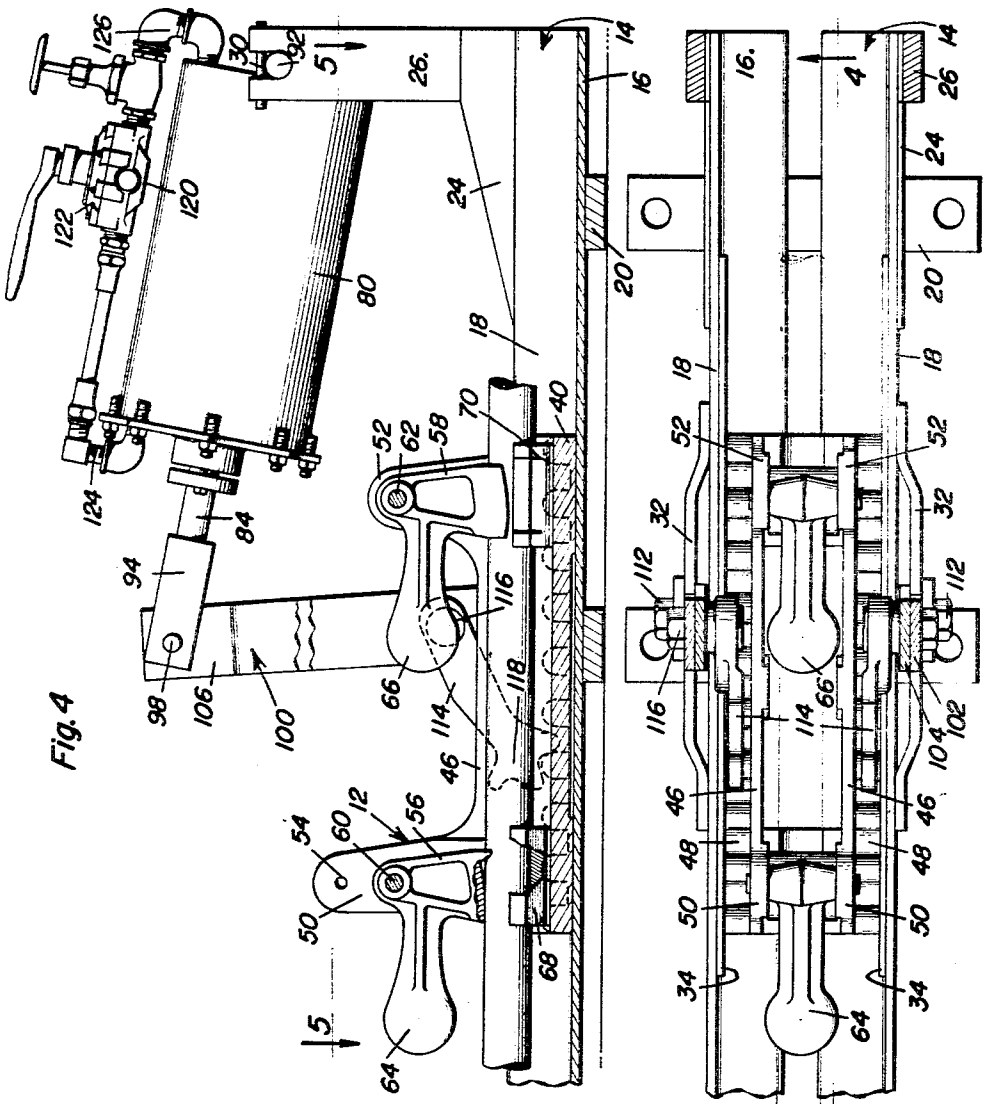


Fig. 4

Fig. 5

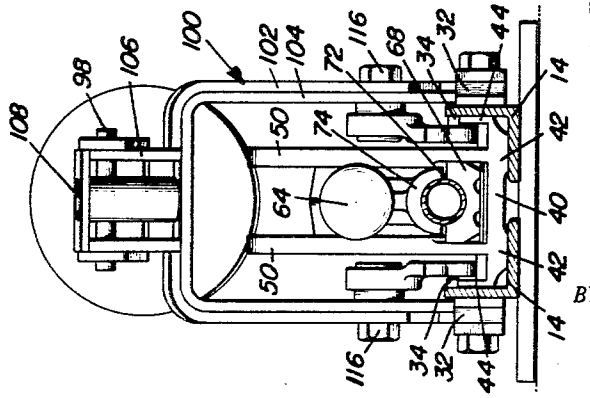


Fig. 6

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POWER OPERATED PIPE PUSHING MACHINE

Filed Oct. 9, 1957 3 Sheets-Sheet 3

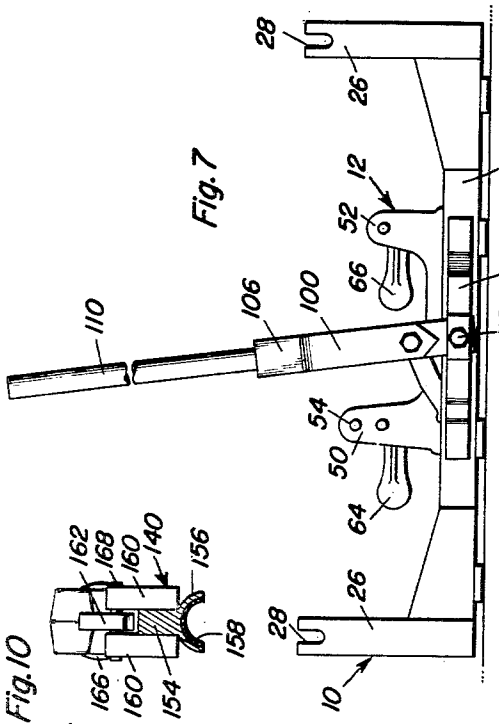


Fig. 7

Fig. 10

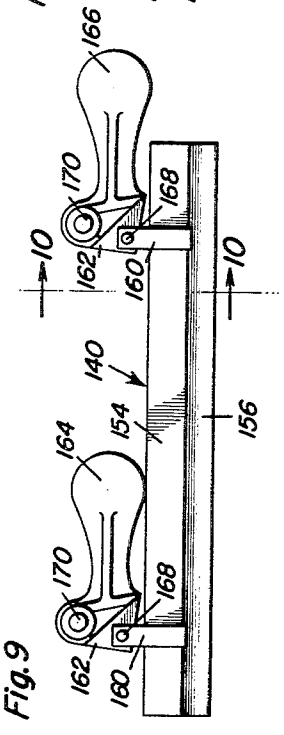


Fig. 9

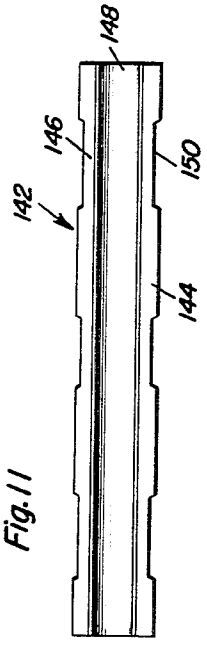


Fig. 11

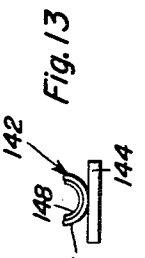


Fig. 13

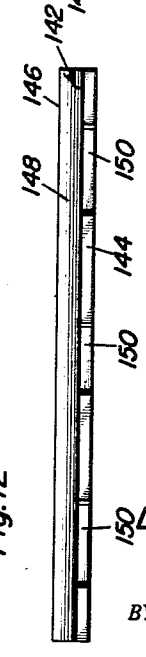


Fig. 12

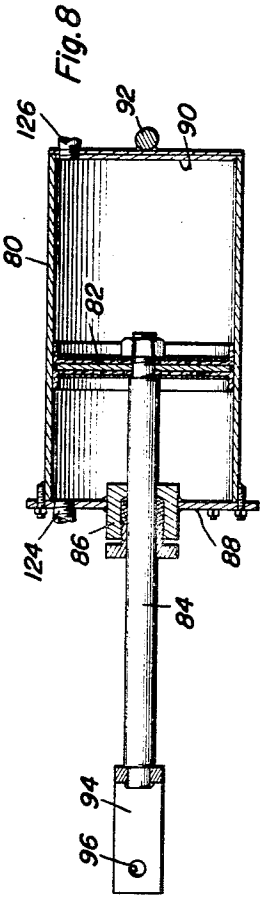


Fig. 8

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2,935,298

POWER OPERATED PIPE PUSHING MACHINE

Leo J. Wilwerding, Omaha, Nebr.

Application October 9, 1957, Serial No. 689,187

8 Claims. (Cl. 254—29)

This invention comprises a novel and useful power operated pipe pushing machine and more particularly relates to an implement especially adapted for the propelling of pipes under ground and operated with various mechanical advantages.

The primary purpose of this machine is to provide a pushing and pulling implement especially adapted for use in moving pipe under ground.

A further object of the invention is to provide an apparatus in accordance with the foregoing objects which may operate at various mechanical advantages and speeds of operation as desired.

A further object of the invention is to provide an apparatus in conformity with the preceding objects in which an improved engagement of the device with a pipe to be propelled is effected without danger of crushing or rupturing the pipe.

Yet another object of the invention is to provide an apparatus as set forth in the preceding objects which may be manually operated or selectively may be power operated and assisted by manual operation thereof.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a side elevational view showing a first embodiment of apparatus in accordance with this invention, in operative position for propelling a pipe under ground, and whereby the power operating means is directly applied to the pipe gripping slide for moving the latter by a pulling action thereon;

Figure 2 is a top plan view of the arrangement of Figure 1, the pipe gripping jaws being omitted therefrom;

Figure 3 is a view similar to Figure 1 but on a reduced scale and showing the power operating means applied directly to the pipe gripping slide for pushing the latter;

Figure 4 is a view taken in vertical longitudinal sections substantially upon the plane indicated by section line 4—4 of Figure 5 and showing a modified manner in which the power operating means is connected by a ratchet mechanism with a mechanical advantage to the pipe moving element, parts being broken away;

Figure 5 is a horizontal sectional view taken substantially upon a plane indicated by the section line 5—5 of Figure 4, parts being broken away;

Figure 6 is a view in end elevation from the left side of Figure 4;

Figure 7 is a view in side elevation of the apparatus of Figure 4 but showing the power operated means replaced by a manual operating means;

Figure 8 is a view in vertical longitudinal section through the power operating means;

Figure 9 is a view in side elevation of a modified movable upper pipe clamping jaw constituting the pipe engaging element of the device;

Figure 10 is a vertical sectional view taken substantially upon a plane indicated by section line 10—10 of Figure 9;

Figure 11 is a top plan view of the slide clamp;

Figure 12 is a side elevational view of the same, the modified, stationary lower pipe clamping jaw for use with the upper jaw of Figures 9 and 10; and

Figure 13 is an end elevational view of the same.

Embodiments of Figures 1–3

The pushing and pulling implement forming the subject matter of the present invention in the form of Figures 1–3 comprises a base designated generally by the numeral 10, a slide 12 mounted for sliding movement thereon, together with a power operating mechanism for the slide of a character to be subsequently set forth.

The base 10 comprises a pair of tracks each designated by the numeral 14 and preferably comprising angle iron or L-shaped members having each a flat horizontal flange 16 together with a vertical side flange 18. The two rails are secured in fixed position by being rigidly secured in any desired manner to a plurality of underlying laterally or transversely extending base plates 20, these being suitably apertured to receive spikes 22 extending therethrough by which the base plates and the tracks are rigidly secured in position for operation as shown in Figure 1.

Secured to the side flanges 18 of the tracks at the opposite ends of the same and upon the outside surfaces of the side flanges are a pair of plates comprising braces 24 and to the outer sides of these at the ends of the rails are secured vertically disposed standards 26 having notches 28 in their upper ends. The standards and braces may be welded to each other and to the rails 14 in order to provide a rigid, and reinforced construction.

The standards 26 are provided with transverse bores above the lower ends of their notches 28 for the reception of retaining pins 30, see Figure 1, for a purpose to be subsequently apparent.

The base structure is completed by the rigid attachment to the outside of the vertical flanges 18 of a pair of straps 32 constituting support brackets as set forth hereinafter. To the inside surfaces of the vertical flanges 18 and adjacent their upper edges there are fixedly secured as by welding or the like a pair of slide retainer bars 34, see Figures 2, 5 and 6.

The slide 12 is the same for all embodiments of this invention, and consists of a flat plate-like base 40, see in particular Figures 2, 4 and 6, having a pair of longitudinally extending ribs 42 upon its bottom surface which are slidably engaged upon the horizontal flanges of the rails 14. This slide base is provided with upstanding longitudinally extending side walls 44 which slidably engage the inside surfaces of the vertical flanges 18 of the rails 14 and are retained thereon by the overlying disposition of the slide retainer bars 34 as will be apparent from Figures 5 and 6.

Extending longitudinally of the slide and in parallel relation to but within the side walls 44 thereof is a pair of walls 46. Between the inner and outer walls the top surface of the base plate 40 is provided with longitudinally extending toothed surfaces or racks 48 by means of which motion is imparted to the slide as set forth hereinafter. Rising from the inner walls adjacent the opposite ends thereof are upstanding brackets or lugs, there being a relatively higher pair of brackets or lugs 50 at one end, and a relatively shorter pair of brackets or lugs 52 at the other end. At their uppermost portions, the lugs 50 are provided with apertures 54.

A pair of eccentric wedging or clamping dogs 56 and 58 comprising movable pipe clamping jaws, are journaled as by pivot pins 60 and 62 respectively to the standards 50 and 52, these dogs being provided with weighted handles 64 and 66 respectively.

Beneath the dogs **56** and **58**, the base plate **40** of the slide is provided with removable clamping blocks **68** and **70**, comprising stationary pipe clamping jaws, which are secured in any desired manner. As will be more readily apparent from Figures 4 and 6, the upper surface of the clamping blocks has a semi-cylindrical recess adapted to conform to and receive therein the exterior surface of a pipe **72** which is to be pushed or pulled by the implement. Referring now to Figure 6 it will be seen that the dogs **56** and **58** have their bottom surface provided with a further semi-cylindrical jaw **74** which likewise corresponds to the contour of the pipe **72** as will be best apparent from Figure 6. Thus, when the dogs are urged downwardly by their weighted handle **64** and **66**, their movable and fixed jaws **74** and **68**, **70** respectively will grip therebetween the pipe **72** over substantially the entire circumference of the pipe and thus establish a secure gripping action thereon without danger of crushing or rupturing the pipe.

Operating means, actuated either by a source of power, manually or both are provided for imparting sliding movement to the slide upon its supporting tracks and thus to advance or retract the pipe **72** gripped in the slide. The power actuated portion of the operating means, as shown best in Figures 1–4 and 8 consists of a fluid pressure actuated cylinder **80** having a suitable piston **82** slidable therein, the latter being provided with a piston rod **84** extending through a packing gland assembly **86** provided in one end wall **88** of the cylinder **80**. The other end of the cylinder is closed as by an end wall **90** to which is secured a transversely disposed pivotal mounting pin **92** which is removably receivable in the notches **28** of a set of standards **26** at either end of the base of the machine. When the mounting pin **92** is so received, it is retained and locked in its corresponding notch by the locking pin **30** previously mentioned.

Secured to the outer end of the piston rod **84** is a yoke **94** having aligned apertures **96** therein whereby the yoke may be secured as by a pivot pin **98** to the aperture **54** of the taller brackets or lugs **50**. As will now be apparent upon application of fluid pressure into the cylinder **80**, the silde will be moved in one direction or the other upon the rails or tracks **14**, depending upon the direction in which the piston and piston rod are moved. Thus, a mechanical advantage by means of the power source is provided for effecting movement of the slide **12** and therefore for forcing the pipe **72** into the earth or drawing it therefrom as desired. As seen by comparing Figures 1 and 3, by securing the cylinder **80** to either standard **26** and by reversing the slide or the slide and the pipe **72** gripped by the jaws thereof may be either pushed or pulled.

Embodiment of Figures 4–6

Where a relatively slower action but a greater mechanical advantage and power for driving the slide is required, a ratchet mechanism shown in Figures 4–6 may be operatively interposed between the piston rod **84** and the slide for effecting operation of the latter. This ratchet mechanism consists of a U-shaped ratchet lever **100** consisting of a pair of U-shaped bars **102** and **104** disposed in side-by-side or nested relation. Secured to the upper end or web portion of the U-shaped ratchet lever **100** is an upstanding neck **106** having therein diametrically disposed bores adapted to receive the previously mentioned yoke pin **98** as will be apparent from Figures 4 and 6.

Extending vertically through the neck **106** is a socket or bore **108** in which may be removably received a handle **110**, see Figure 7, whereby force may be manually applied to the ratchet lever **100** either alone as suggested in Figure 7, or in conjunction with the power-actuated yoke **94**.

At its lower end, the ratchet lever **100** is pivoted as by pivot members **112** to the side brackets **32**, the inner bar **104** of the ratchet lever **100** being disposed between the side brackets and the vertical flanges **18** of the tracks as will be readily apparent from Figure 5. Thus, the U-shaped ratchet lever is mounted for oscillatory motion upon the base member of the device.

A pair of ratchet arms **114**, as shown in Figures 4, 5 and 6, especially, is pivoted to each side arm of the U-shaped ratchet lever **100**, as by means of bolts **116**. At their outer ends, each ratchet arm is provided with a toothed extremity **118** adapted to cooperate with the racks **48** as will be best apparent from Figure 4.

The arrangement is such that upon oscillation of the ratchet lever **100**, the ratchet arms **114** will impart a step-by-step unidirectional travel to the slide and move the same over the tracks **14**. During this travel, it will be observed that the previously mentioned slide retainer bars **34** will prevent any upward movement of the slide relative to the tracks.

The power operating means is the same for both embodiments previously described. Referring now especially to Figure 4 it will be seen that any suitable fluid under pressure, supplied by any suitable source not shown, by means of a conduit **120** is delivered by the manual control valve **122** to conduits **124** and **126** extending through the opposite end walls **88** and **90** of the cylinder **80** to thereby selectively supply the fluid pressure to either side of the piston. Thus, the piston is urged by fluid pressure, as desired, in either direction, the valve arrangement being such that when fluid pressure is applied to one side of the piston, to one of the conduits **124**, the fluid pressure on the other side of the piston is vented by the conduit **166** and the valve **122** to the atmosphere.

As so far described it will be seen that the apparatus is operable in a variety of manners to obtain different speeds and mechanical advantages of operation, as follows:

(1) The power means **80** may be directly connected to the standard **26** at either end of the slide **12** for pulling the slide as shown in Figures 1 and 2 or for pushing it as shown in Figure 3.

(2) The power means **80** may be connected to the slide through the ratchet mechanism as shown in Figures 4–6 in order to operate the slide at an even greater mechanical advantage.

(3) As shown in Figure 7, the ratchet mechanism of Figures 4–6 may be actuated manually by inserting the handle **110** in the socket **106** of the ratchet mechanism.

(4) The manual operation by the handle **110** may be combined with the attachment of the power means **80** to either the slide, as in Figures 1 and 3 or to the ratchet mechanism as in Figures 4–6.

Modified clamping means of Figures 9–13

In all of the preceding embodiments the pipe clamping means comprised sets of spaced jaws carried by the slide and engaging spaced portions of the pipe **72**. However, where it is desired to grip a pipe without marring its surface, as for example, various forms of coated, covered or wrapped pipes, a modified jaw construction is preferred.

For this purpose, the modified clamping means of Figures 9–13 are provided which may be applied to the slide **12** in any of the preceding arrangements, and this form of clamping means provides a movable upper clamping member **140** cooperating with a stationary lower clamping member **142**, each extending substantially the full length of the slide **12** and being interchangeable in said slide with the clamping means previously described and illustrated in connection therewith.

As seen from Figures 11–13, the lower clamping member **142** comprises a flat, plate-like base **144** upon which is carried a semi-cylindrical jaw **146** having a lining **148** of any suitable soft or resilient material which will not mar the finish of a pipe gripped therein. Figures 11

and 12 indicate lateral recesses **150** in the sides of the base **144** which constitute anchor means and receive therein the laterally inwardly projecting standards **50** and **52** and an intermediate laterally inwardly projecting rib **152** on the slide side walls **46**, as shown in Figure 5, whereby to removably secure the lower clamping member to the slide against relative longitudinal movement.

The movable upper clamping member **140** comprises a plate-like member **154** from which depends the inverted semi-cylindrical jaw **156**, complementary to the lower jaw **146**, and likewise having a lining **158** similar to the lining **148**. Rising from opposite sides of the member **154** are pairs of rigid brackets or lugs **160** between which are journaled the plate-like ribs **162** of weighted levers **164** and **166**, by the pivot pins **168**. The levers **164**, **166** have pivot apertures **170** therein which are adapted to receive the pivot pins **60** and **62** of the slide **12**. It will thus be apparent that when the clamping recess **56**, **58**, **64**, **66**, **68** and **70** are removed, the members **140** and **142** may be substituted therefor, the former being secured to the slide and supported thereon by the pins **60**, **62** while the latter is retained by the anchor recess **150**.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A pushing and pulling implement for pipes comprising a base, tracks on said base, a slide mounted on said tracks for sliding movement, said slide comprising a flat base sliding upon said tracks, outer walls rising from the side edges of said flat base, hold down means on said first mentioned base retaining said slide on said tracks, said outer walls slidably engaging said tracks and hold down means, a pair of inner walls on said flat base lying between said outer walls, clamping means for grasping a pipe disposed between and pivotally mounted upon said inner walls, racks on said slide, a ratchet lever mounted on said first mentioned base for oscillatory movement, ratchet arms pivoted to said ratchet lever and each engaging one of said racks, and means for actuating said ratchet lever.

2. The combination of claim 1 wherein said clamping means comprises a clamping block on said slide and a dog pivoted on said slide above said block, said block and dog having complementary semi-cylindrical surfaces for substantially entirely embracing a pipe therebetween.

3. The combination of claim 2 wherein the surface on said dog is eccentric whereby to wedge against said pipe upon pivoting of said dog.

4. The combination of claim 1 wherein said actuating means includes a neck having in said lever a socket, a handle receivable in said socket.

5. The combination of claim 1 wherein said actuating means includes a neck in said lever, a fluid pressure actuated cylinder and piston carried by said base, said piston having a piston rod connected to said neck.

6. The combination of claim 5 wherein said neck has a socket, a handle receivable in said socket.

7. The combination of claim 1 wherein said base includes side brackets secured to the sides of said tracks, said lever being pivoted to said side brackets and being disposed between the latter and said tracks.

8. The combination of claim 1 wherein said racks lie between said inner and outer walls.

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