

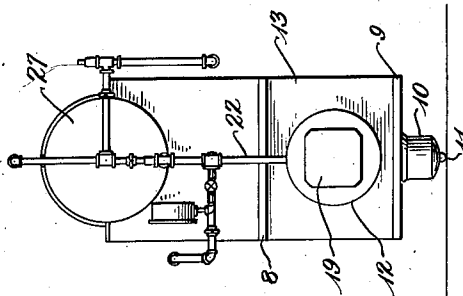
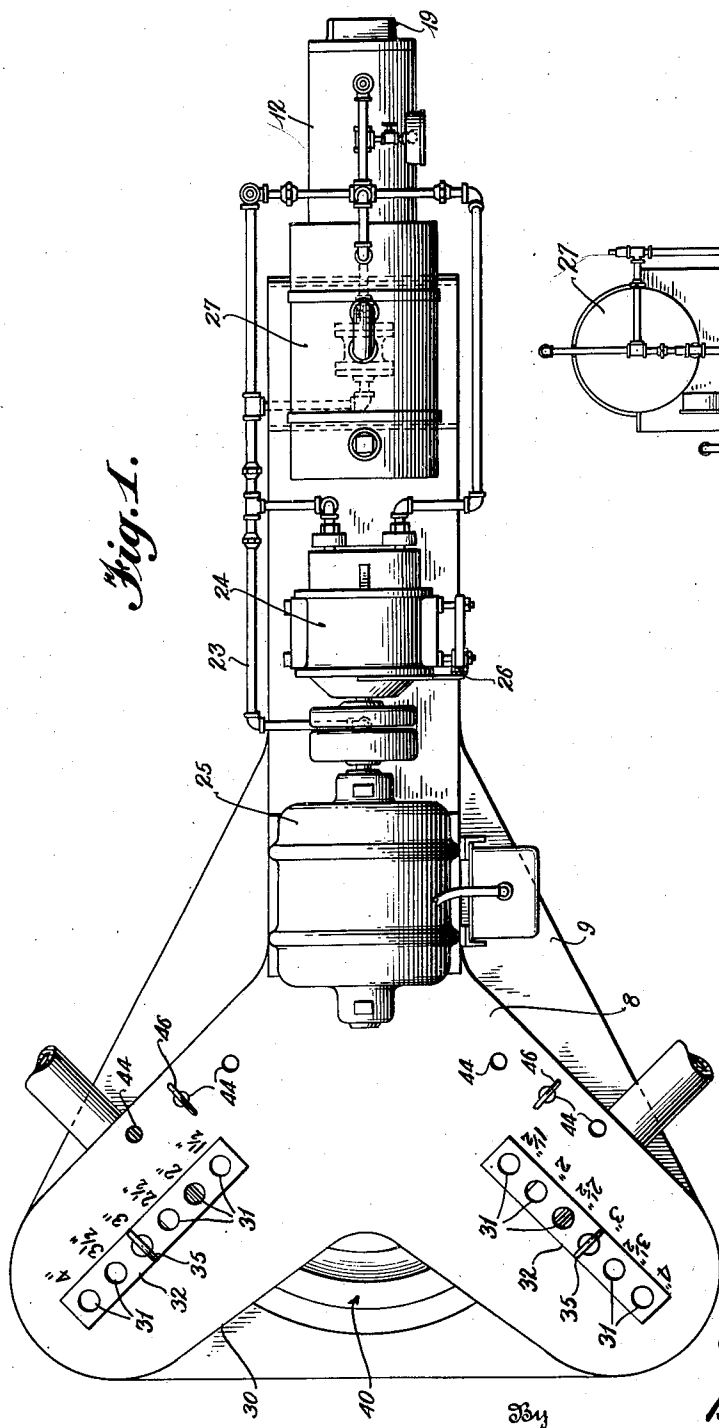
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G. R. NEWLON
PIPE BENDING MACHINE

2,464,459

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3 Sheets-Sheet 1



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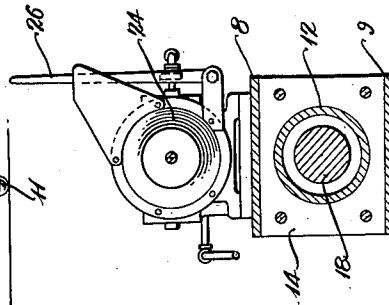
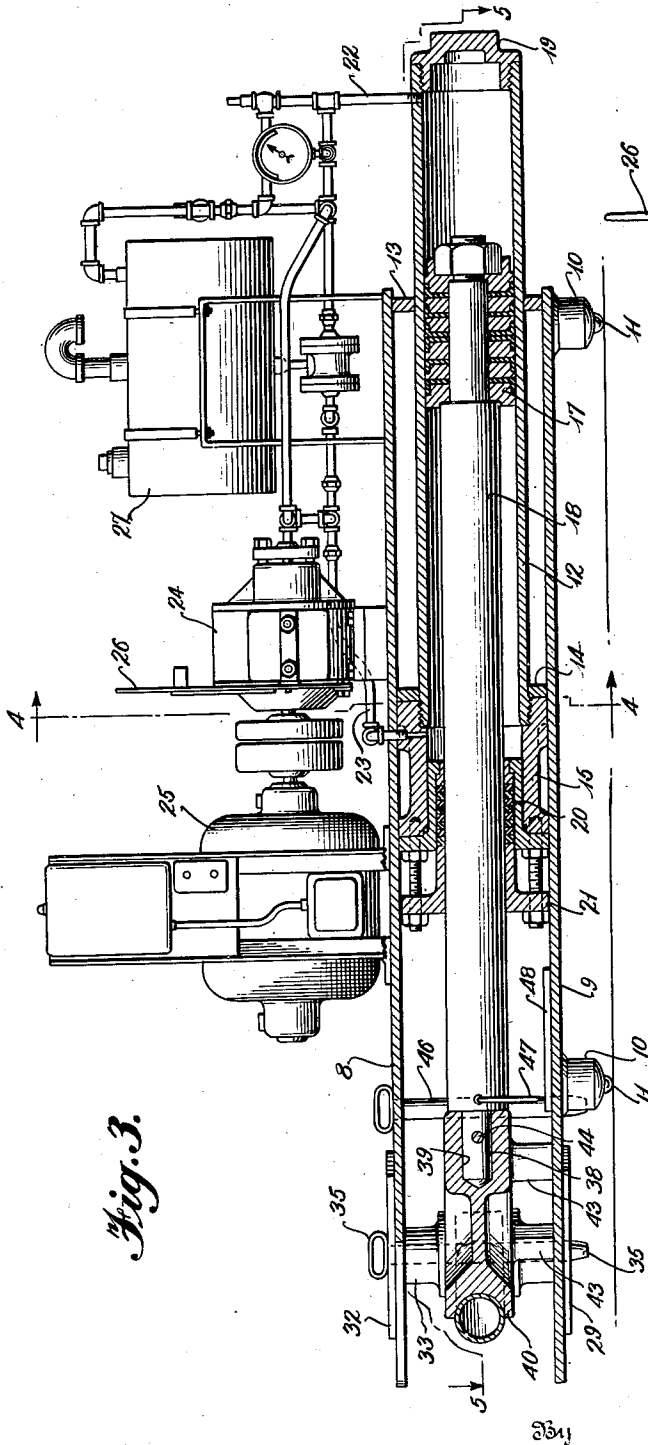
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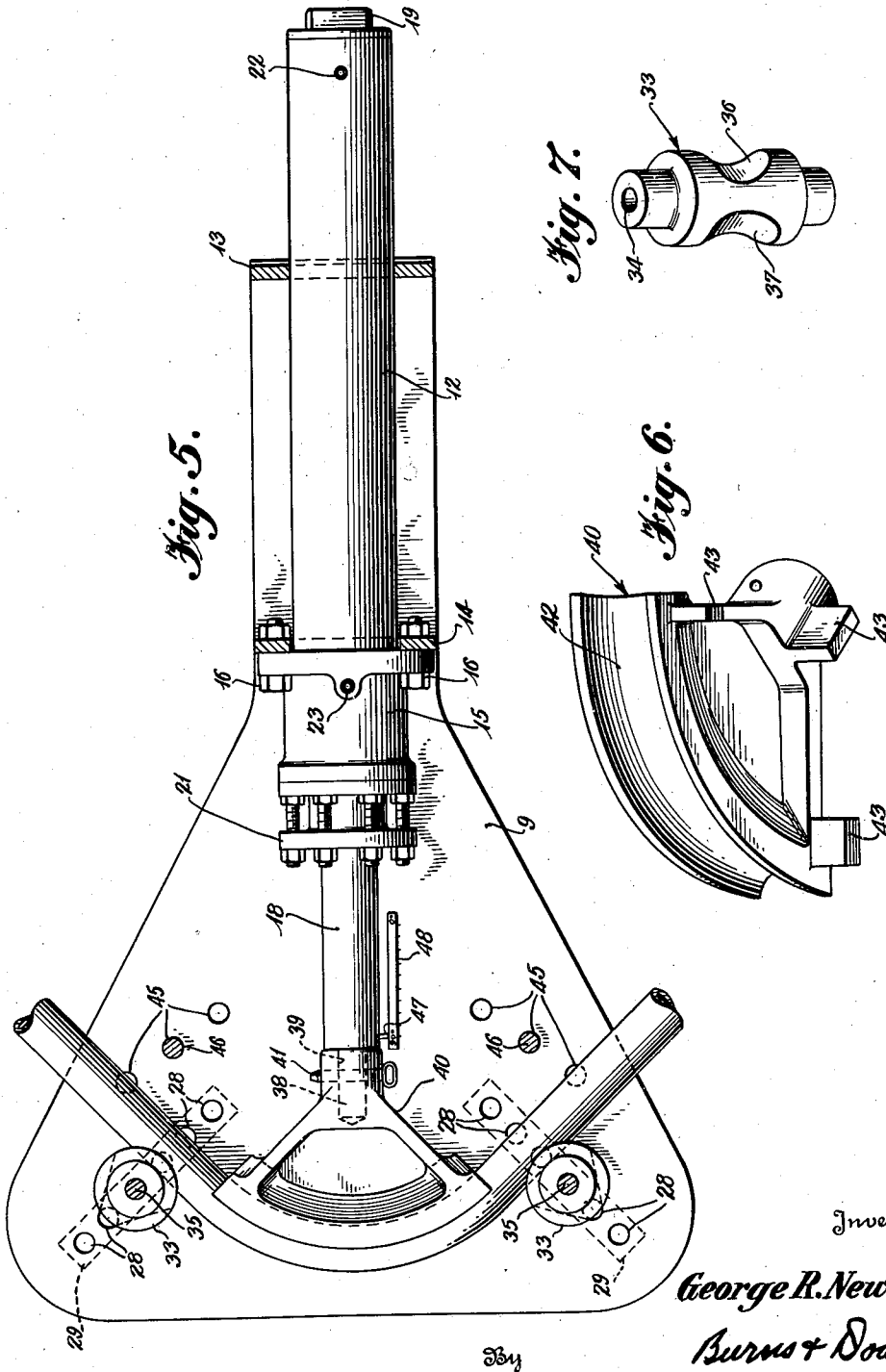
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PIPE-BENDING MACHINE

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2 Claims. (Cl. 153—38)

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The present invention relates to an improved machine for bending pipes. More particularly, it relates to a compact and portable machine capable of rapidly and accurately imparting the desired bend to pipes in the cold state without the necessity of packing the interior of the pipes. The machine is capable of accommodating pipes having diameters falling within a wide range.

An important object of the invention is to provide a pair of frame plates with the elements of the machine positioned with respect to these plates in a manner to provide a compact machine which is capable of bending pipes of large diameter without danger of harming the machine or injuring the operator.

Another object of the invention is to facilitate the making of those changes which are necessary to enable the machine to accommodate pipes of various diameters.

A further object of the invention is to provide means for stripping the pipe from the bending shoe after the bending operation has been completed.

Further objects of the invention will be referred to in the following description of a preferred embodiment of the invention. In this description, reference is had to the accompanying drawings in which:

Fig. 1 is a top plan view of a machine embodying the invention;

Fig. 2 is an end elevation view thereof;

Fig. 3 is a view, partly in side elevation and partly in longitudinal section, of the machine shown in Figure 1;

Fig. 4 is a transverse sectional view looking in the direction of the arrows along the line 4—4 of Fig. 3;

Fig. 5 is a view looking in the direction of the arrows along the line 5—5 in Fig. 3;

Fig. 6 is a perspective view of a pipe bending shoe; and

Fig. 7 is a perspective view of a pipe bending block.

Upper and lower frame plates 8 and 9, respectively, form the main frame of the machine. The lower frame plate 9 is provided with supporting legs 10, which are preferably three in number, with one located adjacent the cylinder end of the machine, and two located at the pipe bending end of the machine. These supporting legs are preferably provided with rollers or casters 11 to facilitate movement of the machine.

A cylinder 12 is positioned to lie at least partially between the frame plates 8 and 9. The cylinder 12 is secured in position by means of

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vertical plates 13 and 14 through which the cylinder passes. The plates 13 and 14 are welded or otherwise secured to the plates 8 and 9. As is best shown in Fig. 5, the cylinder 12 is provided with a flanged sleeve 15, which is bolted to the vertical plate 14 by means of bolts 16. A piston 17 is mounted on a piston rod 18 for reciprocation in the cylinder. A cylinder head 19 closes one end of the cylinder 12 and, at the other end, a packing 20 surrounds the piston rod 18. The packing 20 is provided with an adjustable packing gland 21.

Hydraulic pressure for forcing the piston and piston rod in a direction to bend pipe, as herein- after described, is supplied to the cylinder 12 through a conduit 22 and hydraulic pressure for retracting the piston and piston rod after bending of the pipe has been completed is supplied to the cylinder through a conduit 23 attached to the flanged sleeve 15 at the opposite end of the cylinder.

Hydraulic pressure is supplied by a pump 24, which is preferably a reversible flow pump of the multi-plunger type which provides an even and easily controlled rate of delivery. The pump 24 is driven by a suitable electric motor 25 and the direction and rate of delivery of the pump is controlled by a hand lever 26. A fluid reservoir 27 is provided. The pump 24, the motor 25, and the reservoir 27 are mounted on the upper frame plate 8. Except for the fact that the hydraulic pressure supplying elements are mounted on the upper frame plate, they may be varied in any appropriate manner, as will be apparent to those skilled in the art. For this reason, a more detailed description of the fluid pressure supplying means is not believed to be necessary.

The lower frame plate 9 is wider at the pipe bending end of the machine, as clearly illustrated in Fig. 5, and is provided with a plurality of complementary pairs of apertures, all of these apertures being designated by the reference numeral 28. The apertures 28 lie in a pair of lines extending at approximately 90° to each other, with each line lying at approximately 45° to the longitudinal center line of the machine. A reinforcing bar 29 is secured beneath the lower frame plate 9 adjacent each of the rows of apertures 28 and the bars 29 are provided with apertures which coincide with the apertures 28. These bars 29 serve to reinforce the plates and to provide greater bearing surface for the pins, presently to be described. The upper frame plate 8 also diverges at the pipe bending end of the machine, as illustrated in Figure 1. The extreme

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leftward end of the upper frame plate (as viewed in Figure 1) is provided with a notch 30, which enables an operator to see the pipe during the bending operation. The upper frame plate is also provided with a plurality of apertures 31, which occupy positions corresponding to those of the apertures 28 in the lower frame plate 9. A reinforcing bar 32 is secured to the upper frame plate adjacent each row of apertures 31 and serves the same function as reinforcing bar 29 on the lower frame plate.

Fig. 7 illustrates one of the pipe bending blocks. This bending block is designated generally by the reference numeral 33. It has the general shape of a roller and is provided with a longitudinal bore 34 for receiving block pins 35 which extend through the upper frame plate 8, the bore 34, and the lower frame plate 9 to secure the pipe bending blocks in appropriate position. Each bending block 33 is provided with three pipe engaging faces, only two of which are visible in Fig. 7. Each pipe engaging face is designed to accommodate a pipe of a particular diameter. For example, the pipe engaging face 36 may be dimensioned to accommodate a pipe of two inch outside diameter, while the pipe engaging face 37 may be designed to accommodate a pipe having an outside diameter of two and one-half inches. The third pipe engaging face, which is not visible in Fig. 7, could, for example, be designed to accommodate pipes having one and one-half inch outside diameter. The pipe bending blocks 33 are provided in identical pairs and the machine is ordinarily furnished with sufficient pairs of bending blocks of varying sizes to accommodate any diameter of pipe which is likely to be bent by the machine. By limiting each bending block to three pipe engaging faces, it is possible to make these faces long enough to provide adequate contact area with the pipe to prevent deformation of the pipe and to assure that the pipe bending blocks will turn on the pins 35 as the pipe is bent.

The outer end of the piston rod 18 is reduced in diameter as indicated at 38 and engages a socket 39 in a pipe bending shoe 40. A pin 41 is used to retain the pipe bending shoe on the end of the piston rod. This pin 41 is readily removable to permit substitution of a different bending shoe. The pipe bending shoe 40 is best illustrated in Figs. 5 and 6. The pipe engaging face of the bending shoe, designated by the reference numeral 42, is shaped to engage approximately half of the circumference of the pipe being bent. This insures against flattening of the pipe during the bending operation and eliminates the necessity for packing the interior of the pipe. The length of the pipe engaging face 42 lies on an arc which constitutes approximately one-fourth part of a circle. Each bending shoe is designed to accommodate pipes of a particular outside diameter, and a separate shoe is provided for each diameter of pipe which is likely to be operated upon by the machine.

The bending shoes 40 are provided with three supporting lugs 43 which rest and slide upon the lower frame plate 9 during operation of the machine. These supporting lugs are so proportioned that the bending shoe can be placed on the lower frame plate 9 and the bending shoe will be at the proper height for ready engagement of the socket 39 with the end 38 of the piston rod 18. This greatly facilitates interchange of the bending shoes, since such shoes are rather heavy, particularly when designed for use with pipes of large diameter.

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The upper frame plate 8 is also provided with two rows of aligned apertures 44, and the lower frame plate 9 is provided with similarly disposed apertures 45. The apertures 44 and 45 are arranged to receive pipe stripping pins 46, which are effective to strip bent pipe from the pipe engaging face 42 of a bending shoe 40 upon retraction of the piston rod 18.

The outer end of the piston rod 18 is provided with a pointer 47, which cooperates with a scale 48 mounted on the lower frame plate 9. By means of this pointer and scale, the operator can obtain a direct reading of the angle which has been imparted to the pipe at any instant during the operation of the machine.

The operation of the machine will now be described. At the beginning of the operation, the piston 17 and the piston rod 18 will be retracted into the cylinder 12. The operator may, for example, desire to bend a pipe having a three-inch outside diameter. He selects a pair of bending blocks 33, each of which has one pipe engaging face adapted for use with a three-inch pipe. The bending blocks are positioned between the upper and lower frame plates. A bending block pin 35 is passed through one of the holes 31 in the upper frame plate 8. It will be seen from Fig. 1 that each of the apertures 31 has indicia associated therewith to indicate the diameter of pipe for which each particular hole is appropriate. In the assumed instance, the operator passes a pin 35 through an aperture 31, which is appropriate for use with a three-inch pipe and the pin is extended through the bore 34 of the bending block and through the corresponding aperture 28 in the lower frame plate. Each bending block is thus appropriately positioned. A bending shoe, having a pipe engaging face 42 appropriate for use with a pipe having a three-inch diameter, is placed on the lower frame plate 9 and is supported by the supporting legs 43. By sliding the pipe bending shoe 40 along the lower frame plate, it is a simple matter to position the socket 39 on the reduced end 38 of the piston rod 18. The pin 41 is then inserted to secure the bending shoe on the piston rod.

The pipe which it is desired to bend is then inserted horizontally between the upper and lower frame plates and between the outer end of the bending shoe 40 and the bending block 33. The stripping pins 46 are inserted in apertures 44 and 45 so as not to interfere with the bending of the pipe.

The motor 25 is started and the operator manipulates the lever 26 in a manner to cause the pump 24 to supply hydraulic pressure to the cylinder 12 through the pipe 22, to cause the piston 17, the piston rod 18, and the bending shoe 40 to move to the left (as viewed in Figs. 1, 3 and 5). The operator watches the pointer 47 and the scale 48 and as soon as the desired bend has been imparted to the pipe, the leftward movement of the bending shoe is halted. The lever 26 is next manipulated to supply hydraulic pressure through the conduit 23 to the leftward end of the cylinder 12 for the purpose of retracting the piston, the piston rod and the bending shoe. The fluid pressure supplying means is preferably designed so that this return stroke of the piston rod and bending shoe is more rapid than the power stroke. As the bending shoe is retracted, the pipe will engage the pipe stripping pins 46 and will be disengaged from the pipe engaging face 42 of the bending shoe 40. The bent pipe is then withdrawn from the machine.

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I have illustrated and described what I now consider to be the preferred embodiment of my machine. However, it will be obvious that various modifications may be resorted to without departing from the invention as defined by the following claims.

Having thus described my invention, I claim:

1. A pipe bending machine comprising upper and lower horizontally extending and vertically spaced frame plates, a cylinder, piston and piston rod assembly mounted between said frame plates for horizontal reciprocation of the piston rod between said frame plates, fluid pressure supplying means, a pipe bending shoe horizontally slidable on said lower frame plate and provided with attaching means positioned and arranged for attachment to and detachment from the outer end of said piston rod while said shoe is supported by said lower frame plate, pipe bending blocks positioned between said frame plates on opposite sides of the path of movement of said shoe, said blocks being secured in position by pins extending through said upper and lower frame plates and through the blocks, each of said blocks having three pipe engaging faces arranged to accommodate pipes of different diameters and the blocks being rotatable on said pins to selectively position the appropriate pipe engaging faces for contact with the pipe to be bent, stripping pins for stripping bent pipe from said bending shoe positioned between said frame plates on opposite sides of the path of travel of said bending shoe and between said bending blocks and said cylinder, and control means for supplying fluid pressure from said supplying means to said cylinder to move said bending shoe between said bending blocks to bend pipe and for supplying fluid pressure to said cylinder to retract said bending shoe between said stripping pins to strip bent pipe from said bending shoe.

2. A pipe bending machine comprising upper and lower horizontally extending and vertically

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spaced frame plates, a cylinder, piston and piston rod assembly mounted between said frame plates for horizontal reciprocation of the piston rod between said frame plates, fluid pressure supplying means, a pipe bending shoe slidably supported on said lower frame plate, said shoe being provided with attaching means positioned for attachment to and detachment from the outer end of said piston rod while said shoe is supported by said lower frame plate, pipe bending blocks positioned between said frame plates on opposite sides of the path of movement of said shoe, said blocks being secured in position by pins extending through said upper and lower frame plates and through the blocks, control means for supplying fluid pressure from said supplying means to said cylinder to move said bending shoe between said bending blocks to bend pipe and for supplying fluid pressure to said cylinder to retract said bending shoe, a scale on said lower frame plate and a pointer carried by said piston rod for indicating on said scale the degree of bend imparted to a pipe.

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