

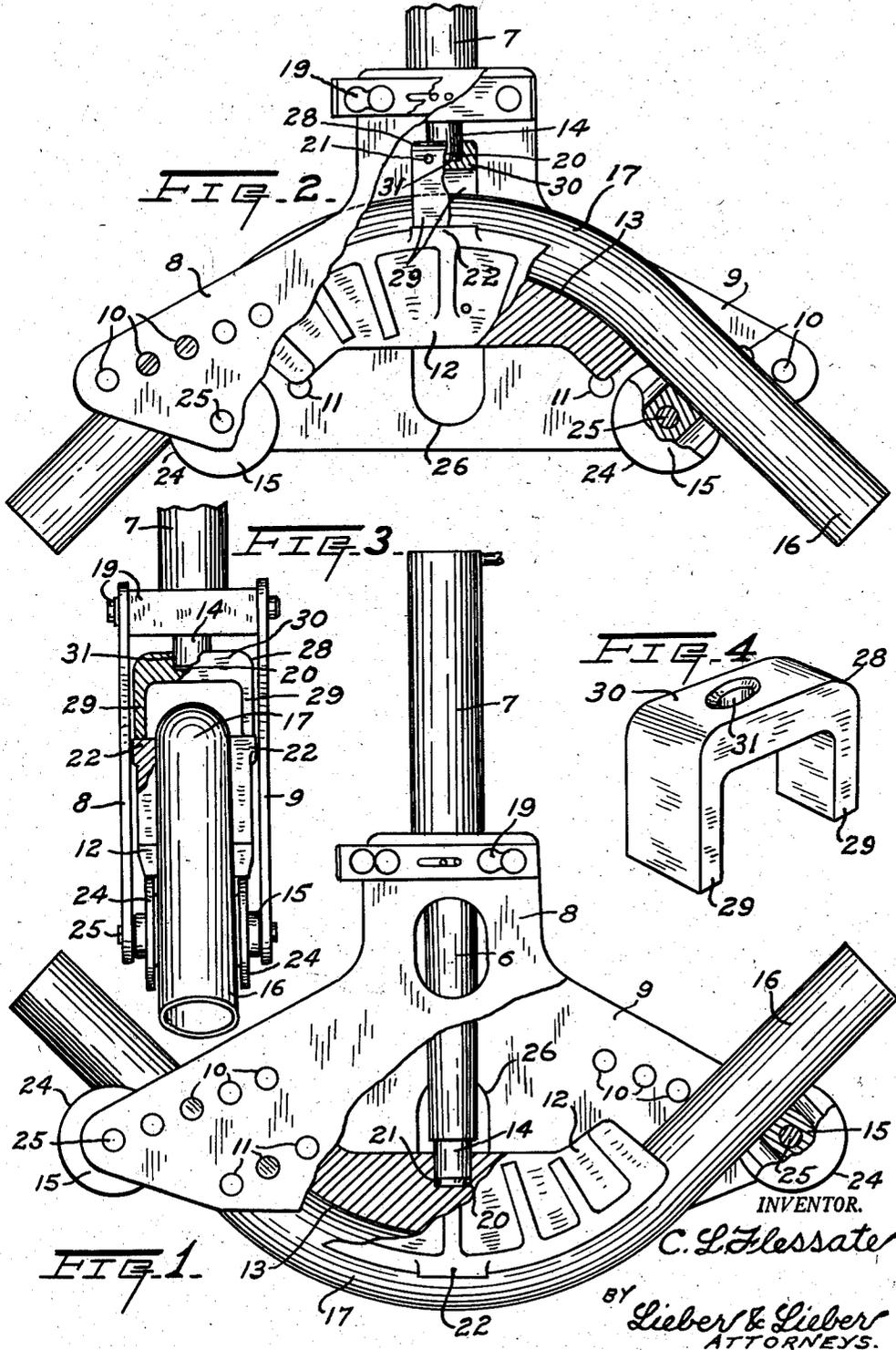
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ART OF BENDING AND EJECTING BENT PIPES

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ART OF BENDING AND EJECTING BENT PIPES

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The present invention relates in general to improvements in the art of bending elongated articles such as rods, tubes or pipes into desired shapes, and it relates more specifically to improvements in the construction and method of operating such article benders so as to effect accurate formation of the bends and most efficient ejection of the bent articles.

The primary object of this invention is to provide an improved method and apparatus for bending pipes or the like and for expediting removal of the bent pipes from the bender.

It has heretofore been commercial practice to bend rods and pipes with the aid of a bending unit having a plunger actuated shoe provided with a relatively deep arcuate groove adapted to coact with the portion of the article to be bent, and which shoe is caused to cooperate with a pair of reaction laterally spaced blocks coacting with the article outwardly beyond the shoe. While this equipment is capable of producing satisfactory bends in such elongated articles, it has been found that when a bend is produced in the deep groove of the forming shoe, the articles and especially pipes or tubes, spread laterally and become jammed within this groove thus making it very difficult to remove the bent product from the shoe without marring the bends.

Although it has previously been proposed to lock the shoe with a pipe thus jammed within its bending groove, against movement, and to cause the actuating plunger to press an insert pin or other element directly against the concave side of the bend of the jammed article within the groove while the reaction blocks were released, and to thereby eject the article, this method of ejection tends to mar and to destroy the accuracy of the bend by virtue of the fact that the ejecting pressure is applied locally and directly against the article within the bend.

It is therefore an important object of the present invention to provide an improved method of removing jammed articles from the shoe of such a bending unit conveniently and without marring or destroying the accuracy of the bend by applying the ejecting force directly against the shoe instead of the article.

Another important object of this invention is to provide simple but highly effective means for exploiting the improved jammed article ejecting method.

A further important object of the invention is to provide an improved mode of manipulating a pipe bending assemblage of the above described type, whereby simple reversal of the shoe with a bent pipe jammed therein will enable the use of the same pressure plunger which initially produced the bend, to be effectively utilized to eject the jammed article from the shoe.

Still another important object of my invention is to provide an improved pipe bending unit which is compact and powerful, as well as being flexible in its adaptation to quickly produce bends of various curvature with utmost precision.

These and other more specific objects and advantages

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of the invention will be apparent from the following detailed description.

A clear conception of the features constituting the present improvement, and of the construction and mode of manipulating a pipe bender while carrying on the steps of the improved ejecting method, may be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a part sectional plan view of a fluid pressure actuated pipe bender in action while producing a bend, portions of the unit having been broken away to more clearly reveal the functioning and the sections having been taken centrally through the bending shoe and one of the reaction blocks;

Fig. 2 is a similar part sectional view of the same pipe bender with the parts positioned preparatory to ejecting a bent pipe from the bending shoe, with some parts likewise broken away and like sections having been taken through others;

Fig. 3 is a part sectional side view of the same pipe bending assemblage with the parts in pipe ejecting condition as in Fig. 2, the section having been taken centrally through the ejector means and bending shoe, but at right angles to the plane of section of Figs. 1 and 2; and

Fig. 4 is an enlarged perspective view of the present improved bent pipe ejector.

While the invention has been shown and described herein as having been applied to a fluid pressure actuated portable rod and pipe bender of the type disclosed in the copending application of Raymond J. Traupmann, Serial No. 490,035, filed February 3, 1955, it is not intended to restrict the use of the improved features to such units or to the bending of pipes alone; and it is also contemplated that specific descriptive terms employed herein be given the broadest possible interpretation consistent with the actual disclosure.

With reference to the drawing, the portable pipe bender shown comprises in general, a fluid pressure actuated ram having a plunger 6 movable within a cylinder or guide member 7; a pair of parallel rigid plates 8, 9 each having its mid-portion detachably but firmly secured to the open end of the cylinder member 7 and also having therein two series of holes 10, 11 diverging away from the cylinder end, the corresponding holes 10, 11 of the two plates 8, 9 being axially aligned; a pipe bending shoe 12 provided with a relatively deep arcuate pipe engaging groove 13 and being detachably secured to the extreme outer end 14 of the plunger 6 for movement thereby between the spaced plates 8, 9 and intermediate the two series of holes 10, 11; and a pipe engaging reaction block 15 pivotally cooperable with selected aligned holes 10, 11 on opposite sides of the plunger 6 and being cooperable with the ram plunger 6 and shoe 12 to effect bending of a pipe 16 having a medial portion 17 confined within the groove 13.

As shown in the above identified application, the foregoing general assemblage of elements has heretofore been proposed, and the mid-portion of at least one of the plates 8, 9 may be detachably secured to the open end of the plunger guiding cylinder 7 as by means of a removable spacing and clamping bracket 19. The ram assembly may also be of any well known type, preferably operable by fluid pressure, and the outer end 14 of the plunger 6 is provided with an annular recess 20 with which a transverse pin 21 is cooperable to detachably secure the shoe 12 to the plunger, as shown in Fig. 1. The mid-portion of the shoe 12 on opposite sides of the groove 13 is provided with special pads 22; and depending upon the curvature required, any desired number of

shoes 12 having different groove curvatures but each having pads 22 formed thereon, may be provided.

Each of the reaction blocks 15 has opposite side flanges 24 and a polygonal hub bounded by curved surfaces generated with different radii for interchangeable cooperation with pipes 17 of diverse diameters, and these blocks 15 are rotatably mounted upon removable pivot pins 25 adapted to coact with any of the alined sets of holes 10, 11 in the plates 8, 9. These pivot pins 25 are removable from the plate holes 10, 11 in order to permit removal of the reaction blocks 15 and of the bending shoe 12 with a bent pipe 16 jammed within its groove 13, and when the bending shoe 12 is fully retracted by the plunger 6, a straight pipe 16 may be slipped longitudinally between the side plates 8, 9 and between the shoe 12 and blocks 15 so as to properly position the pipe for subsequent bending. The side plates 8, 9 are also provided with openings 26 for permitting removal of the shoe retaining pin 21.

In accordance with the present invention, besides providing the pads 22 on each bending shoe 12, a special U-shaped pipe ejector 28 is also provided, see Figs. 2, 3 and 4. This ejector 28 has a pair of depending opposite side plates 29 adapted to coact with the pads 22 of the bending shoe, and which are integrally united by a bridge piece 30 having therein a socket 31 adapted to receive the plunger end 14 and to be secured thereto by a transverse pin 21. Whenever the shoe 12 has been removed from the plunger end the ejector 28 may be secured to the plunger 6 while the latter is in the position shown in Fig. 1, and the attached ejector is thereafter movable by this plunger 6 into the position shown in Figs. 2 and 3, and the side plates 29 should be disposed far enough apart so they will not touch a jammed pipe bend 17 when they contact the pads 22, and these plates should also be of sufficient length to prevent the bridge piece 30 from contacting the pipe 16 during ejection.

When the improved pipe bending and bent pipe ejector have been properly constructed as above described, and a bending shoe 12 of proper bend and transverse groove curvature has been selected, the pipe 16 may be bent as follows: With the ram plunger 6 and shoe 12 fully retracted as in Fig. 1, and while the shoe 12 is attached to the plunger end 14 by means of the pin 21, the reaction blocks 15 should be applied to the alined sets of holes 10, 11 which correspond to the pipe curvature required and rotated about their pivot pins 25 to present the faces of the polygonal hubs which will properly engage the pipe periphery and face toward the retracted shoe 12.

The straight piece of pipe 16 may then be longitudinally inserted without obstruction between the side plates 8, 9 and intermediate the retracted bending shoe 12 and the pre-positioned reaction blocks 15, until the medial pipe portion is positioned so as to receive the bend 17. The ram may then be actuated to move the plunger 6 and the shoe 12 outwardly, thereby causing the groove 13 to engage the adjacent pipe periphery while also bringing the pipe portions on opposite sides of and beyond the shoe 12 into engagement with the reaction blocks 15. Continued outward movement of the plunger 6 and shoe 12 until these elements are positioned as in Fig. 1, will cause the bend to be fully formed, but as the pipes 16 are bent the portions 17 invariably spread laterally and jam within the groove 13 thus making it difficult to release the finally bent pipes without marring or destroying the accuracy of the bends.

In order to avoid such action, it is only necessary with the present improved method, to remove the reaction blocks 15 and to detach the shoe 12 with the bent pipe 16 confined therein from the plunger end 14, and to there-

after attach the ejector 28 to this plunger end 14, and retract the plunger 6 and the ejector 28 as in Figs. 2 and 3. The shoe and bent pipe assemblage should then be reversed and positioned between the side plates 8, 9 so that the ejector side plates 29 engage the shoe pads 22, whereupon the reaction blocks 15 may be attached to the plates 8, 9 in the manner illustrated in Fig. 2 so as to contact the pipe 16 on the opposite sides of the shoe 12 beyond the bend 17. By subsequently moving the plunger 6 outwardly the ejector 29 will directly engage and gradually push the shoe 12 away from the jammed portion of the pipe 16 while the latter coacts with the blocks 15, thus releasing the shoe 12 without marring the pipe 16 or destroying the accuracy or curvature of the bent portion 17.

This ejection of the bent pipes 16 can obviously be effected quickly, and after a pipe has been removed the bending unit may be just as conveniently restored to proper condition for subsequent bending operation by merely removing the ejector 28 and returning the shoe 12 and blocks 15 to the positions shown in Fig. 1. The provisions of the pads 22 and of the ejector 28 thus makes it possible to rapidly eject the jammed pipes 16 with the aid of the same power plunger 6 which produces the bends 17, without in any manner damaging the pipes or affecting the accuracy of the bends, due to the fact that the ejecting force is applied directly to the shoe 12 along the entire length of the groove 13, and not locally against a small area of the bend 17 as in prior pipe ejecting equipment. The improved assemblage is simple, compact and flexible in its adaptations, and the invention has proven highly satisfactory and successful in actual use.

It should be understood that it is not desired to limit this invention to the exact details of construction and operation of the fluid pressure actuated pipe bending unit herein specifically shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art.

I claim:

1. Apparatus for bending a pipe about a grooved shoe in which it has a tendency to stick and for thereafter releasing the pipe from within the groove, comprising, a frame, motor means mounted on said frame, a ram reciprocable by said motor means, power means to move said ram in one direction only, reaction blocks equally spaced on each side of said ram and mounted on said frame, a removable shoe having a face curved in longitudinal and transverse planes and adapted to bend a cylindrical workpiece supported on said reaction blocks, said transverse curvature of said shoe having approximately the same radius as the workpiece whereby said shoe has a tendency to adhere to said workpiece upon completion of the bending thereof, means on said shoe to receive one end of said ram, said shoe with said bent workpiece stock therein being reversible with respect to said reaction blocks and said ram, and ejector means engageable between said ram and the longitudinally curved edges of said shoe to force said shoe off of said workpiece upon movement of said shoe in said one direction.

2. Apparatus as set forth in claim 1 in which the ejector means is of U-shape.

3. Apparatus as set forth in claim 1 in which the ejector means is of U-shape with its bridge formed with a socket for receiving said ram while its legs are directly engageable with the medial portion of said shoe.

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