May 4, 1943. E. H. TAYLOR 2,318,113

MEANS FOR PRODUCING PIPE BENDS

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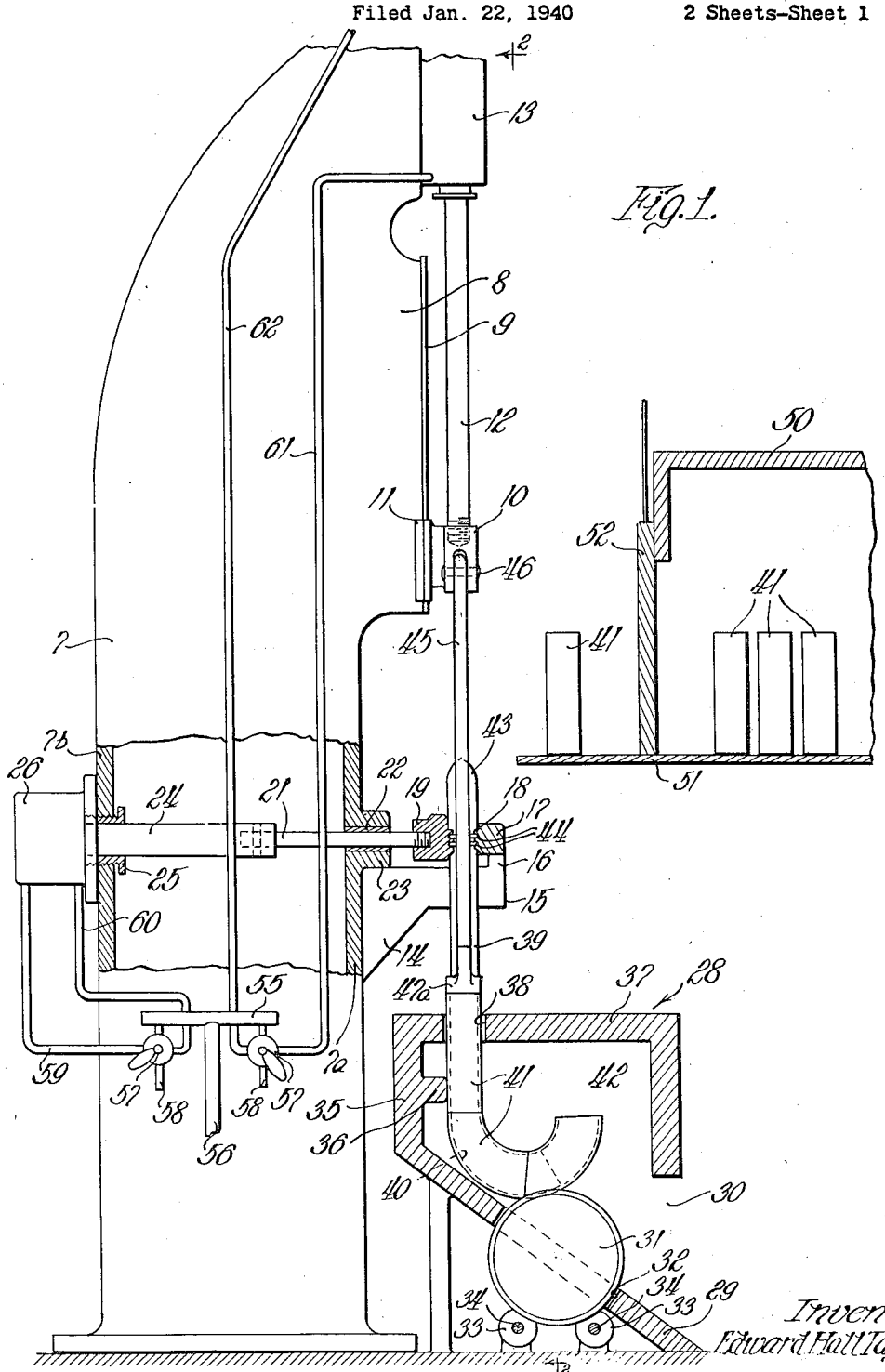


Fig. 1.

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Fig. 2.

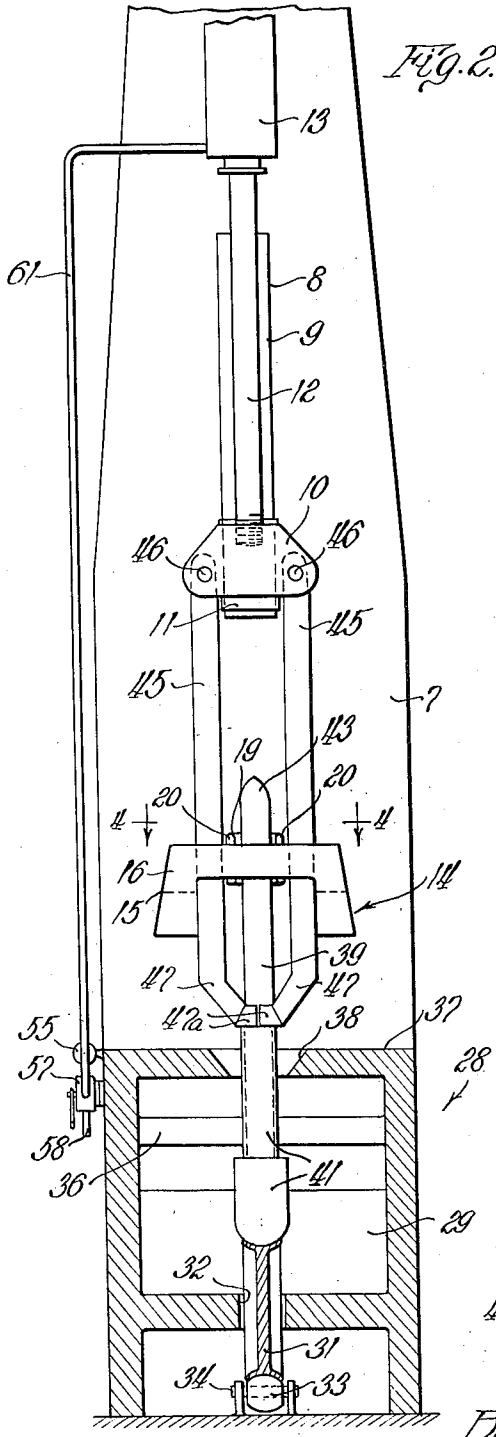


Fig. 3.

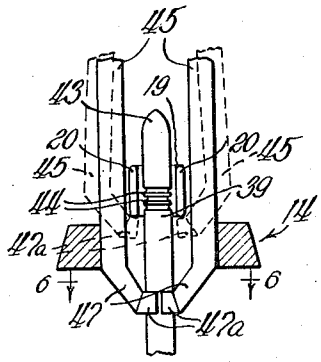


Fig. 4.

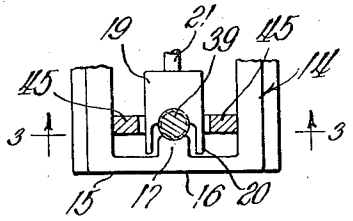
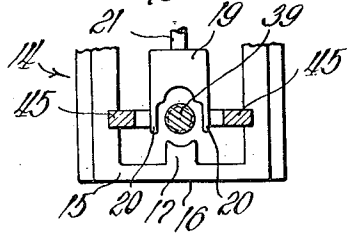


Fig. 5.



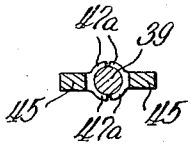


Fig. 6.

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Patented May 4, 1943

2,318,113

UNITED STATES PATENT OFFICE

2,318,113

MEANS FOR PRODUCING PIPE BENDS

Edward Hall Taylor, Oak Park, Ill.

Application January 22, 1940, Serial No. 314,958

4 Claims. (Cl. 153—48)

This invention relates to bends, and has to do with means for producing pipe bends and analogous articles from tubular blanks.

It is known to produce pipe bends by forcing tubular blanks along a mandrel rod and over a forming mandrel secured to one end of the rod. My invention is directed to means whereby the tubular blanks may be placed over the mandrel rod and forced along the same and over the mandrel, with expedition and facility, with a view to production of the bends at comparatively low cost. More specifically, I provide pusher means reciprocable lengthwise of the mandrel rod for forcing the blanks along the latter, and means for gripping the rod and restraining it against lengthwise movement during forcing of a blank therealong, the parts being so related that when the gripping means is released and the pusher means is in its retracted or inoperative position, a blank may be inserted over the mandrel rod with expedition and facility. Further objects and advantages will appear from the detail description.

In the drawings:

Figure 1 is a side view, partly broken away and with certain parts shown in section, of means embodying my invention for producing pipe bends;

Figure 2 is a sectional view taken substantially along the line 2—2 of Figure 1, certain parts being shown in elevation;

Figure 3 is a sectional view taken substantially on line 3—3 of Figure 4, certain parts being shown in elevation and the pusher members being shown in dotted lines in their retracted or inoperative position;

Figure 4 is a sectional view taken substantially on line 4—4 of Figure 2;

Figure 5 is a view similar to Figure 4 but showing the clamping means in releasing or open position; and

Figure 6 is a sectional view taken substantially on line 6—6 of Figure 3.

The preferred form of my invention includes a press comprising an upright main frame or standard 7, of suitable construction, provided, at the inner side of its upper portion, with an inward extension 8 carrying a guide rail or plate 9. A cross head 10 is slidably mounted on plate 8 for vertical reciprocation, by means of associated guides 11, in a known manner. This cross head is suitably secured to the lower end of a piston rod 12 extending through the lower end of a cylinder 13, suitably secured on frame 7 adjacent the upper end thereof, the upper end of rod 12 being suitably secured to a piston (not shown) operating in cylinder 13 in a known manner.

A yoke 14, of substantially U-shape in plan, projects from the inner side wall of main frame 7 and is formed integrally therewith or otherwise suitably secured thereto, this yoke being in vertical alignment with and below projection 8 and cross head 10 and the parts associated therewith. Bight portion 15 of yoke 14 is provided with an integral upward extension 16 carrying, at its upper end, an inwardly extending gripping jaw 17 the inner face of which is of arcuate shape, as shown in Figures 4 and 5, and is provided with inwardly projecting ribs or teeth 18. Gripping jaw 17 cooperates with an inner opposed movable gripping jaw 19 provided, at its inner end, with an arcuate recess, as shown in Figures 4 and 5, jaw 19 also being provided with two lateral extensions 20. An operating rod 21 is mounted for reciprocation through a bushing 22 disposed in a boss 23 integral with inner side wall 7a of frame 7. Jaw 19, like jaw 17, is provided with spaced ribs or teeth. The inner end of rod 21 is suitably secured to jaw 19, conveniently by screw means, and the outer end of this rod is suitably secured in the inner end of a piston rod 24 mounted for reciprocation through a stuffing box 25 associated with a cylinder 26 suitably mounted on the outer side wall 7b of frame 7. The jaws 17 and 19 cooperate to grip a mandrel rod and restrain it against endwise movement, while a blank is being forced along the rod, in a manner which will be described presently. The outer end of rod 24 is suitably secured to a piston (not shown) operating in cylinder 26 in a known manner.

A furnace 28, of suitable construction, is disposed below yoke 14, this furnace being provided with a downwardly and forwardly inclined bottom wall 29 and a front opening 30. A transversely concaved roller 31 extends through slot 32 in bottom wall 29 and is supported for rotation upon two transversely convexed rollers 33, mounted for rotation on shafts 34 disposed in back and in front of the vertical plane of the axis of roller 31. Back wall 35 of furnace 28 is provided with a forwardly projecting rib 36 spaced a short distance above the upper edge of bottom wall 29, and top wall 37 of the furnace is provided with an opening 38 disposed in front of rib 36. The interior of furnace 28 may be heated in any suitable known manner.

Opening 38 is disposed to receive a mandrel rod 39 clamped adjacent its upper end between the jaws 17 and 19 and extending downward therefrom into the furnace 28. A curved man-

drel 40 is suitably secured to the lower end of rod 39 and extends therefrom forwardly of furnace 28 above roller 31. The mandrel rod 39 is of cylindrical form and proper diameter for reception of tubular blanks 41 which are forced downward along rod 39 and over the mandrel 40, the latter being shaped in a known manner to form the blank forced thereover into a bend 42. The upper end of rod 39 is rounded at 43, to facilitate placing of blanks 41 over this rod, the latter being provided, a short distance from its upper end, with suitably disposed ribs or teeth 44 with which the teeth of the jaws 17 and 19 cooperate for clamping the mandrel rod and restraining it against downward movement. The teeth of the jaws and the teeth of the mandrel rod are of rounded cross section to facilitate engagement thereof and to exert a slight lifting effect on the mandrel rod when jaw 19 is moved into clamping or operative position. When rod 39 is clamped between the jaws it is supported thereby in vertical position, extending downward through opening 38 with a blank 41 on this rod in contact with rib 36 and the bend 42, on the mandrel 40, in light contact with the roller 31, sufficient to guide the bend 42 while not presenting appreciable resistance to movement thereof over the mandrel, since roller 32 is free to rotate.

Two pusher bars 45 are pivoted at their upper ends, at 46, to cross head 10, at opposite sides of and equidistant from rod 12. Bars 45 extend downward through yoke 14, at opposite sides of the mandrel rod 39. Each of the bars 45 is provided, at its lower end, with a downwardly and inwardly inclined pusher element 47, the lower portion 47a of which is suitably formed so as to fit about rod 39 circumferentially thereof, the lower end of each element 47a preferably being flat and of appreciable width extending perpendicular to rod 39. Pusher bars 45 are guided in their vertical movement by the arms of yoke 14 and are confined thereby against movement away from rod 39, with elements 47 fitting snugly about the rod, so long as these latter elements are disposed below the upper edges of the yoke arms, as will be clear from Figures 2 and 3. When the pusher bars 45 are moved into their upper or inoperative position, indicated by dotted lines in Figure 3, the inner inclined surfaces of elements 47 contact the lower edges of elements 20 of jaw 19, thus swinging the arms 45 outward from rod 39 about pivots 46 and moving elements 47, including portions 47a thereof, into positions spaced from rod 39 providing clearance thereabout, as will be clear from Figure 3. During the first portion of the down stroke of bars 45, elements 47 contact the upper inner edges of the arms of yoke 14 and are moved thereby inward toward mandrel rod 39, into position with the lower portions 47a of elements 47 fitting snugly about this rod, as in Figure 3, in which latter position the pusher bars 45 are maintained during the remainder of the down stroke thereof and until they have been returned, in their up stroke, to position with the elements 47 disposed above the arms of the yoke.

A blank heating furnace 50, of known construction and heated in any suitable known manner, suitably located with respect to the mandrel rod and associated parts, is provided with an extension or shelf 51 projecting adjacent the upper end of rod 39. Furnace 50 receives a suitable number of blanks 41, which are heated to proper working temperature within the furnace and, as required, may be removed therefrom, one at a time, through a suitable opening controlled by a door 52, the removed blank being temporarily supported by shelf 51. When the pusher bars 45 have been moved upward into their inoperative position, and jaw 19 has been moved into its open or inoperative position shown in Figure 5, the blank 41 on shelf 51 may be removed therefrom and placed over the mandrel rod 39, down which the blank is moved into contact with the upper end of a preceding blank placed on this rod. When the jaw 19 is in open position the rod 39 may be tilted toward the back of the furnace 28, in placing the blank 41 on the mandrel rod, to provide clearance about this rod for movement of the blank therealong. That tilting of rod 39 may readily be accomplished, since, at that time, the mandrel and the rod are supported by the roller 31 which permits ready tilting of the rod in the manner stated. After a blank 41 has been inserted over the rod and moved downward there along into position with its upper end disposed below yoke 14, jaw 19 is moved into closed or clamping position, thus raising the rod 39 slightly, as above stated, and effectively clamping it in position, in cooperation with jaw 17. Thereafter the pusher bars 45 are moved downward along rod 39, with the lower portions 47a of elements 47 fitting snugly about this rod. Such downward movement of the pusher bars 45 brings the lower ends of elements 47a into contact with the upper end of the blank which, in the continued downward movement of bars 45 is forced downward along rod 39, forcing the preceding blank along this rod and over the mandrel 40. The bends 42 formed by passing the blanks over the mandrel 40 are delivered from the latter to the inclined bottom wall 29 of furnace 28, and pass through the opening 30. The length of the stroke of the pusher bars 45 preferably is such that a bend 42 is formed during each down stroke of the pusher bars, though the stroke of these bars may be of any suitable or preferred length as conditions may require or as desired. By having the blank heating furnace 50 adjacent the mandrel rod 39, with shelf 51 extending into proximity to the upper end of this rod, the heated blanks may be successively placed over the mandrel rod with expedition and facility, which is conducive to high speed operation.

The cross head 10 and the clamping jaw 19 may be operated in any suitable manner, conveniently by reciprocating the pistons in the cylinders 13 and 26. For that purpose, I provide a manifold or header 55 to which is connected a supply pipe 56 leading from a suitable source of supply of pressure fluid, either liquid or gaseous. Assuming that the parts are pneumatically operated, air under suitable pressure is supplied to the header 55. This header is connected to two control valves 57 of known type, each provided with an exhaust tube 58. One of the valves 57 is connected by two tubes 59 and 60 to cylinder 26 adjacent the ends thereof. The other valve 57 is connected by a tube 61 to cylinder 13, adjacent the lower end thereof, and by a tube 62 to cylinder 13 adjacent the upper end thereof in an obvious manner, not shown. By properly manipulating the valves 57, the push bars 45 and clamping jaw 19 may be moved in desired directions as required. If preferred, hydraulic operation of the cross head 10 and jaw 19 may be utilized, in which case the exhaust tubes 58 of the valves 57 may be suitably connected to tubes appropriately connected to the hydraulic system.

Changes in details may be resorted to without departing from the field and scope of my invention, and I intend to include all such variations, as fall within the scope of the appended claims, in this application in which the preferred form only of my invention has been disclosed.

I claim:

1. In means for producing pipe bends from tubular blanks, a main frame, a substantially vertical mandrel rod and a mandrel at the lower end thereof, a yoke extending from said frame about the upper portion of said rod and provided with a fixed clamping jaw, a movable clamping jaw cooperating with said fixed jaw for clamping therebetween the upper portion of said rod, a cross-head mounted for reciprocation on said frame above said rod, and pusher bars pivoted to and depending from said cross-head at opposite sides of said rod and provided at their lower ends with elements adapted and disposed to fit about said rod between said mandrel and said clamping jaws, said yoke and said elements and one of said jaws having cooperating surfaces effective for swinging said bars away from said rod, as they approach the limit of their up stroke, and for swinging said bars toward said rod into position with said elements fitting about said rod, as said bars start their down stroke, and maintaining said bars in their latter position during their down stroke.

2. In means for producing pipe bends from tubular blanks, a main frame, a substantially vertical mandrel rod and a mandrel at the lower end thereof, a yoke extending from said frame about the upper portion of said rod and provided with a fixed clamping jaw, a movable clamping jaw cooperating with said fixed jaw for clamping therebetween the upper portion of said rod, means for supporting said mandrel and rod at the lower end thereof for tilting movement, when said movable jaw is in non-clamping position, a cross-head mounted for reciprocation on said frame above said rod, pusher bars pivoted to and depending from said cross-head at opposite sides of said rod and provided at their lower ends with elements adapted and disposed to fit about said rod between said mandrel and said clamping jaws, and means for moving said bars away from said rod, as they approach the limit of their up stroke, and toward said rod with said elements fitting thereabout, as said bars start on their down stroke, and maintaining said bars in their latter position during their down stroke.

3. In means for producing pipe bends from tubular blanks, a mandrel rod and a mandrel at one end thereof, releasable holding means engageable with said rod for restraining it against endwise movement in the direction of said mandrel, pusher means reciprocable lengthwise of said rod and adapted and disposed to fit about said rod between said holding means and said mandrel, said pusher means being movable toward and away from said rod substantially radially thereof, and means for moving said pusher means toward and away from said rod in accordance with and controlled by movement of said pusher means lengthwise of said rod toward and away from said mandrel, and for confining said pusher means against movement away from said rod during movement of said pusher means lengthwise of said rod toward said mandrel.

4. In means for producing pipe bends from tubular blanks, a substantially vertical mandrel rod and a mandrel at the lower end thereof, clamping means engageable with and disengageable from said rod adjacent the upper end thereof, means at the lower end of said rod for tiltably supporting said mandrel and rod and confining said rod against downward movement when said clamping means is disengaged from said rod, a reciprocating cross-head above said rod, pusher bars pivoted to and depending from said cross-head at opposite sides of said rod and provided at their lower ends with elements adapted and disposed to fit about said rod between said mandrel and said clamping means, means for moving said bars away from said rod into inoperative position with said elements spaced from said rod, as said bars approach the limit of their up stroke, and means for moving said bars toward said rod into operative position with said elements fitting about said rod and maintaining them in the latter position, during the down stroke of said bars.

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