Nov. 12, 1940. J. H. TAYLOR 2,221,417

MEANS FOR FINISHING BENDS

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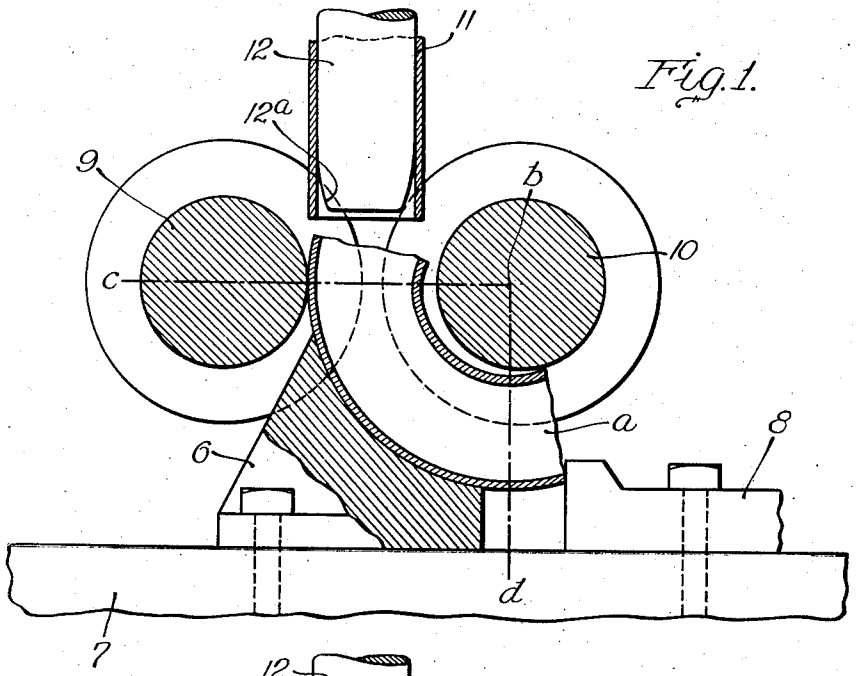

Fig. 1.

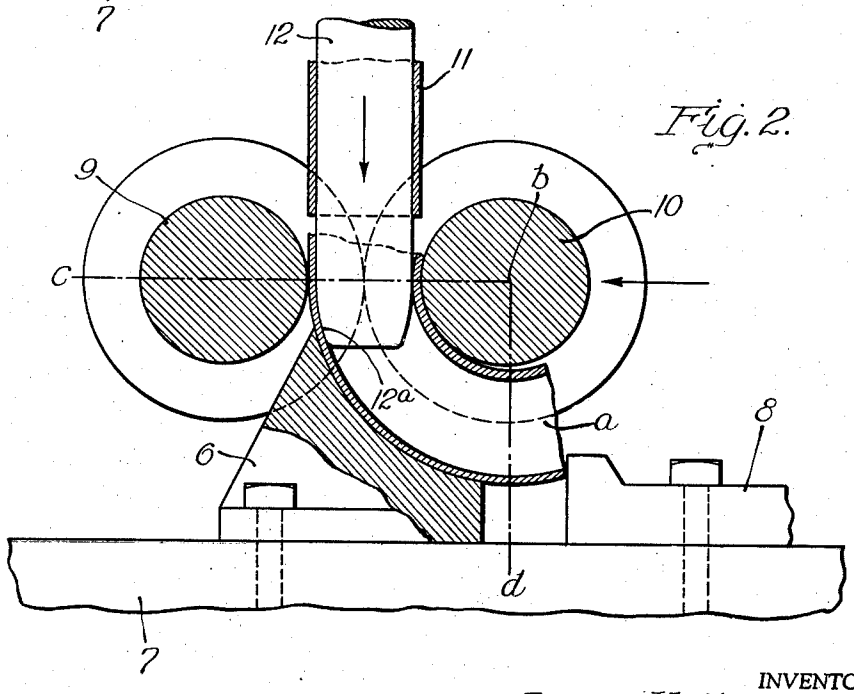

Fig. 2.

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Fig. 3.

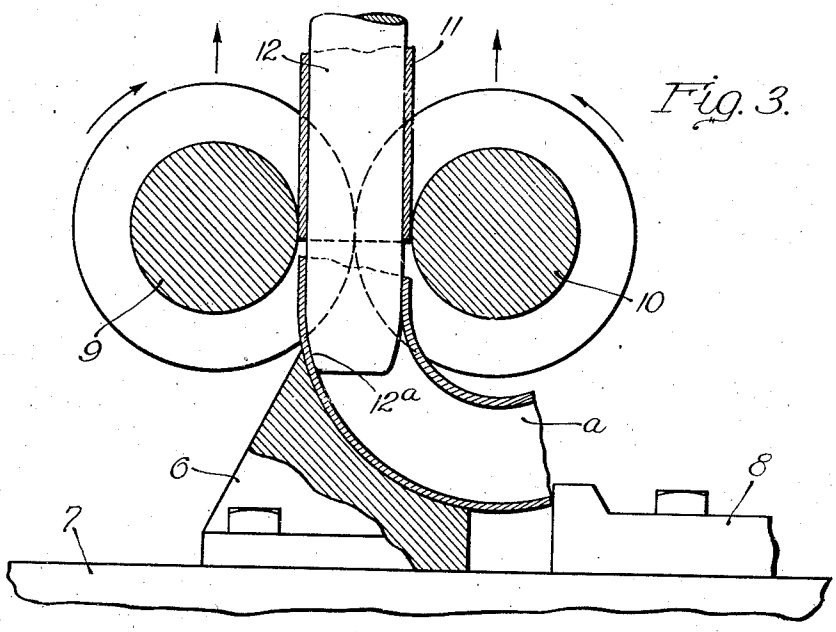


Fig. 4.

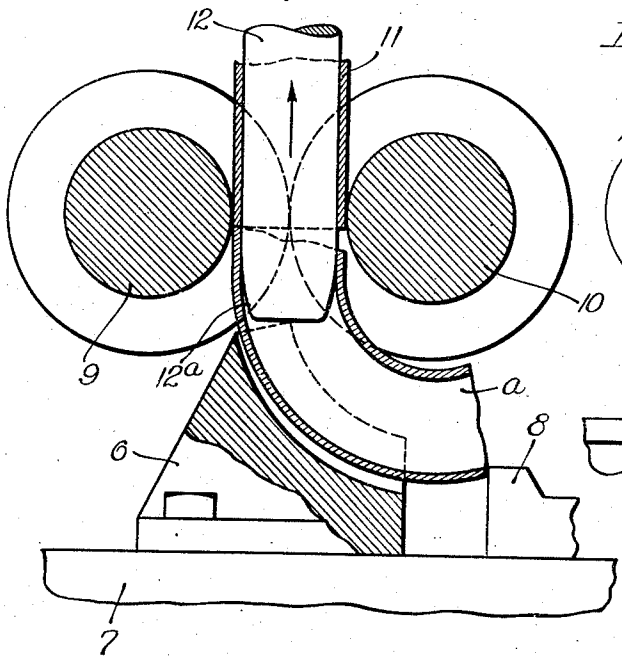
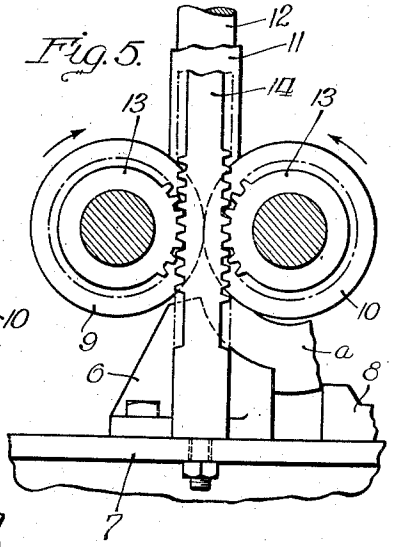


Fig. 5.



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2,221,417

MEANS FOR FINISHING BENDS

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7 Claims. (Cl. 80—1)

This invention relates to pipe fittings, and has to do with means for finishing the end portions of pipe bends.

It is common practice to form pipe bends from straight wrought metal tubular blanks. Such bends are curved throughout their length and, it frequently happens, are of greater wall thickness at the inner or short side of the bend than at the outer side thereof, due to upsetting of the metal during the operation of forming the bend, it also frequently happening that the inner wall of the end portion of the bend is flared inwardly. My invention is directed to means whereby the end portions of a pipe bend may be straightened so as to be tangent to the body portion of the bend, this straightening of the end portion also serving to form the latter accurately to desired uniform diameter and to redistribute the metal of the end portion of the bend, where necessary, in a manner to assure that such end portion is of uniform wall thickness, this finishing of the end portion of the bend being accomplished with expedition and facility. More specifically, I provide means whereby the end portions of the bend are finished by a rolling operation, effective for accurately forming the end of the bend and for displacing and redistributing the metal thereof, to assure uniform wall thickness. Further objects and advantages of my invention will appear from the detail description.

In the drawings:

Figure 1 is a view, partly in section and partly in elevation, showing diagrammatically apparatus embodying my invention, this view illustrating the first step in the use of the apparatus;

Figure 2 is a view similar to Figure 1 illustrating the second step in the use of the apparatus;

Figure 3 is a view similar to Figure 1 illustrating the third step in the use of the apparatus;

Figure 4 is a view similar to Figure 1 illustrating the fourth step in the use of the apparatus; and

Figure 5 is a view, partly in section and partly in elevation, of the apparatus of Figures 1 to 4, inclusive, on a reduced scale, showing the means for rotating the finishing rollers.

In its broader aspects, my invention is applicable to any type of pipe bends or analogous articles, the end portions of which are to be finished straight and tangent to the curved body portion of the bend. I have shown, by way of example, and largely diagrammatically, a preferred form of apparatus embodying my invention, for use in finishing the end portions of a 90° elbow or bend.

In Figure 1 I have illustrated a 90° elbow *a* in unfinished condition, the end portions of this elbow being curved, with the body portion thereof, about a common center *b*. It will be noted that the inner side wall of the bend is of greater thickness than the outer side wall thereof, due to upsetting of metal in forming of the bend from the straight tubular blank, and the inner side of each end portion of the bend is flared slightly so that it is not strictly concentric with the center *b*. These conditions are commonly encountered in bends formed from straight wrought metal tubular blanks. In order that the bend may be in satisfactory condition for use, the end portions thereof, disposed outward beyond the planes indicated by the lines *b*—*c* and *b*—*d*, defining between them the 90° angle through which the body of the bend should be curved, should be straight, tangent to the curved body of the bend and of uniform wall thickness.

Referring to Figure 1, the bend *a* is placed with the lower or outer portion of the body of the bend seating in a corresponding recess in the upper face of a saddle 6 suitably secured, as by bolting, to a base 7. The lower end of bend *a* contacts a stop 8 suitably positioned and mounted upon base 7. With the bend disposed in the manner stated, the upper portion thereof extends above saddle 6 and fits into a grooved roller 9 mounted, in a suitable known manner, for rotation about a horizontal axis extending transversely of saddle 6, this roller being confined against horizontal movement but movable vertically in any appropriate manner. A grooved roller 10, similar to roller 9, is mounted at the opposite side of the bend for rotation about an axis parallel with the axis of roller 9, roller 10 being disposed in the same plane as roller 9, movable horizontally toward and away from the latter, in any suitable manner, and also movable vertically with roller 9. The groove in each of the rollers is of semi-circular cross section and conforms in size and shape to one-half of the exterior cross section of the desired end portion of the bend. When roller 10 is moved toward roller 9 into contact therewith, as in Figure 2, as will be explained more fully presently, the two rollers define between them a circular opening corresponding in diameter to the desired exterior diameter of the end of the bend.

Referring further to Figure 1, a cylindrical guide tube or sleeve 11 is fixedly mounted, in a suitable manner, above the rollers 9 and 10, the lower portion of sleeve 11 extending downward between the upper portions of the rollers, the exterior diameter and the wall thickness of sleeve

11 corresponding to the desired exterior diameter and wall thickness of the end of the bend. Sleeve 11 is disposed coaxially with the circular opening defined by the rollers 9 and 10, when the latter is in the position shown in Figure 2. A cylindrical mandrel 12, rounded at its lower end portion 12*a*, fits snugly within sleeve 11 for sliding movement therein, this mandrel being coaxial with sleeve 11 and also coaxial with the opening between the rollers, when roller 10 is in the position shown in Figure 2. Since the wall thickness of sleeve 11 is equal to the desired wall thickness of the end portion of the bend, the diameter of the body portion of mandrel 12 is equal to the desired interior diameter of the end portion of the bend, which corresponds to the interior diameter of the body portion of the bend.

To facilitate placing of the bend *a* in the saddle 6, roller 10 is moved away from roller 9 into its position shown in Figure 1, or into any other suitable position, and the stop 8 may be moved out of its position shown in Figure 1. The bend *a* is then inserted in the saddle and stop 8 is secured in its position shown in Figure 1, the bend then being accurately positioned with its upper portion projecting above saddle 6 into the groove of roller 9 and, in part, into the groove of roller 10, when the latter roller is positioned as shown in Figure 1. The mandrel 12 is then moved downward so as to enter into the upper end of the bend, and the roller 10 is moved toward roller 9 so as to contact the wall of the upper end portion of the bend under suitable pressure, as shown in Figure 2. In performing this step of the operation, the mandrel 12 and roller 10 may be moved simultaneously, or the mandrel may first be inserted into the bend and roller 10 then moved into its position shown in Figure 2, such movement of the roller being indicated by the arrow. It will be seen that the rollers 9 and 10 contact the fitting *a* in the plane *b*—*c*, which is the plane of juncture between the curved body portion of the fitting or elbow *a* and the end portion thereof which is to be finished. This subjects the fitting, in the plane *b*—*c*, to a squeezing action between the rollers, which tends to displace metal from the thicker inner side wall of the fitting end. Thereafter, the rollers 9 and 10, with the latter roller remaining in its innermost position, are moved upward, in a suitable manner, as indicated by the arrows in Figure 3, into the position shown in the latter figure, mandrel 12 remaining in its position shown in Figure 2. Referring now to Figure 5, each roller has a gear 13 secured thereon, adjacent one end thereof, these gears meshing with the racks of a double rack bar 14, bolted or otherwise suitably secured to base 7 and projecting upward therefrom. The gears 13 and rack bar 14 cooperate to rotate the rollers 9 and 10 simultaneously and in opposite direction, as they are moved upward, as indicated by the arrows in Figures 3 and 5. In this manner, the end portion of the bend is subjected to a rolling action, as the rollers 9 and 10 move upward, which action is highly efficient for accurately forming the end portion of the bend about the body of mandrel 12, and for displacing metal from the thicker portion of the wall of the bend and redistributing this metal in such manner as to assure uniform wall thickness of the end portion of the bend. In that manner the end portion of the bend is finished straight and tangent to the curved body portion thereof, is formed accurately to desired diameter both interiorly and exteriorly, and is finished to desired uniform wall thickness.

In the continued upward travel of the rollers 9 and 10, the rollers pass above the upper end of the bend into contact with guide sleeve 11, adjacent the lower end thereof, as in Figure 3, that being permitted by having sleeve 11 of the same exterior diameter as the desired exterior diameter of the end portion of the bend. The rollers remain in their latter position while the mandrel 12 is moved upward as indicated by the arrow in Figure 4, in any suitable manner. During the first portion of the upward movement of the mandrel, the bend *a* is raised from saddle 6 and moves upward with the mandrel, until the upper end of the bend contacts the lower end of sleeve 11. Thereafter, the bend is held against upward movement and the mandrel 12, in its continued upward movement, is withdrawn from the bend, which is thus stripped from the mandrel and drops back into the saddle 6, as will be obvious. That completes the finishing of the end portion of the bend, the other end portion of which may be finished in the manner above described.

While I have described the apparatus of my invention as used for finishing the end portions of a 90° bend or elbow, by way of example, it is applicable to various other bends and analogous articles, as will be understood by those skilled in the art.

I claim:

1. In means for finishing the end portions of pipe bends, a pair of rollers having relative movement one toward and away from the other and adapted to receive and confine between them under forming pressure the end portion of a pipe bend when said rollers are spaced their minimum distance apart, means for supporting a pipe bend with its end portion disposed between said rollers, a tubular guide member disposed to be in substantial alignment with the end of a bend supported between said rollers, and a straight mandrel mounted for movement through said guide member for projection therefrom into the end of a bend, said rollers being movable along said mandrel toward said guide member in rolling pressure contact with the end portion of the bend effective for shaping said end portion to substantially uniform diameter and wall thickness about said mandrel, the latter and said guide member having relative lengthwise movement effective for bringing the shaped end of the bend into contact with the adjacent end of the guide member and thereafter stripping said bend from said mandrel.

2. In means for finishing the end portions of pipe bends, a pair of rollers having relative movement one toward and away from the other and adapted to receive and confine between them under forming pressure the end portion of a pipe bend when said rollers are spaced their minimum distance apart, means for supporting a pipe bend with its end portion disposed between said rollers, a fixed tubular guide member disposed to be in substantial alignment with the end of a bend supported between said rollers, and a straight mandrel mounted for reciprocation through said guide member for projection therefrom into the end of a bend and retraction into said guide member, said rollers being movable along said mandrel toward said guide member in rolling pressure contact with the end portion of the bend effective for shaping said end portion to substantially uniform diameter and wall thickness about said mandrel.

3. In means for finishing the end portions of pipe bends, a pair of rollers having relative movement one toward and away from the other and adapted to receive and confine between them under forming pressure the end portion of a pipe bend when said rollers are spaced their minimum distance apart, means for supporting a pipe bend with its end portion disposed between said rollers, a fixed tubular guide member disposed to be in substantial alignment with the end of a bend supported between said rollers, and a straight mandrel mounted for reciprocation through said guide member for projection therefrom into the end of a bend and retraction into said guide member, the axes of said rollers being in a common plane perpendicular to said mandrel and said rollers being movable simultaneously along said mandrel toward said guide member in rolling pressure contact with the end portion of the bend effective for shaping said end portion to substantially uniform diameter and wall thickness about said mandrel.

4. In means for finishing the end portions of pipe bends, a pair of rollers having relative movement one toward and away from the other and adapted to receive and confine between them under forming pressure the end portion of a pipe bend when said rollers are spaced their minimum distance apart, means for supporting a pipe bend with its end portion disposed between said rollers, a fixed tubular guide member disposed to be in substantial alignment with the end of a bend supported between said rollers, a straight mandrel mounted for reciprocation through said guide member for projection therefrom into the end of a bend and retraction into said guide member, said rollers being movable along said mandrel toward said guide member in rolling pressure contact with the end portion of the bend effective for shaping said end portion to substantially uniform diameter and wall thickness about said mandrel, and means for rotating said rollers simultaneously at the same rate and in opposite directions corresponding to their movement along said mandrel toward said guide member.

5. In means for finishing the end portions of pipe bends, a pair of rollers adapted to receive and confine between them under forming pressure the end portion of a pipe bend, means for supporting a pipe bend with its end portion disposed between said rollers, and a straight mandrel disposed in substantial alignment with the end of a bend supported between said rollers and insertible by lengthwise movement into the end of the bend disposed between said rollers, the latter being movable along said mandrel in rolling pressure contact with the end portion of the bend effective for forming said end portion to substantially uniform diameter and wall thickness about said mandrel.

6. In means for finishing the end portions of pipe bends, a pair of rollers adapted to receive and confine between them under forming pressure the end portion of a pipe bend, means for supporting a pipe bend with its end portion disposed between said rollers, and a straight mandrel disposed in substantial alignment with the end of a bend supported between said rollers, the latter and said mandrel having relative movement lengthwise of said mandrel effective for causing insertion thereof into the end of the bend disposed between said rollers, the latter being movable along said mandrel in rolling pressure contact with the end portion of the bend effective for forming said end portion to substantially uniform diameter and wall thickness about said mandrel.

7. In means for finishing the end portions of pipe bends, a pair of rollers adapted to receive and confine between them under forming pressure the end portion of a pipe bend, means for supporting a pipe bend with its end portion disposed between said rollers, and a straight mandrel confined against lateral movement and disposed in substantial alignment with the end of a bend supported between said rollers, the latter and said mandrel having relative movement lengthwise of said mandrel effective for causing insertion thereof into the end of the bend disposed between said rollers, the latter being movable along said mandrel in rolling pressure contact with the end portion of the bend effective for forming said end portion to substantially uniform diameter and wall thickness about said mandrel.

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