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DIE FOR U-SHAPED PIPE BENDS.

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1,164,638. Patented Dec. 21, 1915.

Fig. 1.

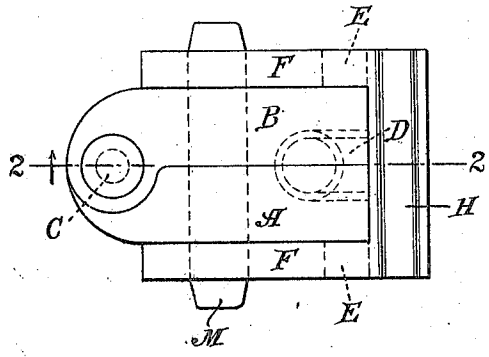


Fig. 3.

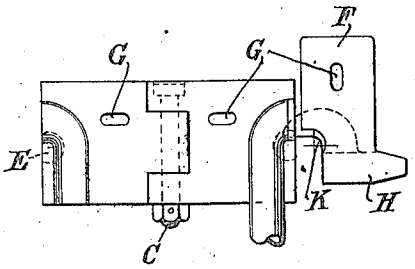


Fig. 2.

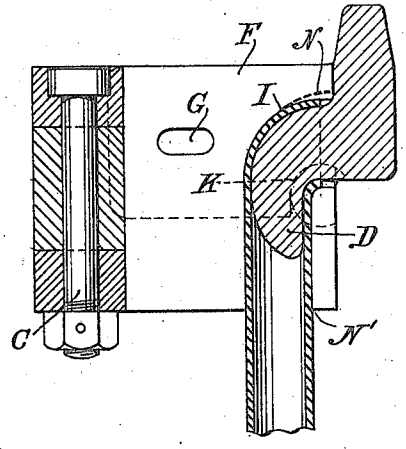


Fig. 4.

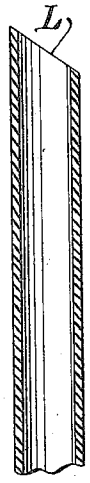


Fig. 5.

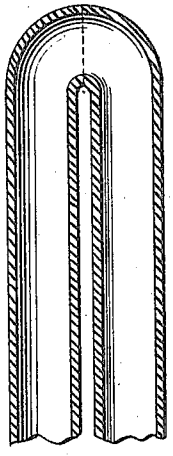
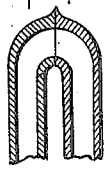


Fig. 6



WITNESSES

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DIE FOR U-SHAPED PIPE-BENDS.

1,164,638. Specification of Letters Patent. Patented Dec. 21, 1915.

Application filed April 5, 1912. Serial No. 688,649.

To all whom it may concern:

Be it known that I, NIELS CHRISTOPHER FRANDSEN, a subject of the King of Denmark, residing at Copenhagen, in the Kingdom of Denmark, have invented a new and useful Improvement in Dies for U-shaped Pipe-Bends, of which the following is a specification.

My invention relates to a die by means of which two pipe ends may be so shaped that they can at once be welded together to constitute a single pipe united by a U-shaped pipe bend.

My invention has especial utility in the manufacture of superheater pipes for smoke tube superheaters, such pipes generally having two or more adjacent legs united by U-shaped bends.

My invention will be better understood by referring to the drawings accompanying in which—

Figure 1 represents an end elevation of a preferred form of a die; Fig. 2 represents a section taken along the line 2—2 of Fig. 1, a pipe end being shown *in situ;* Fig. 3 represents the die opened as is required for the removal of a formed pipe end; Fig. 4 represents in central longitudinal section a pipe end ready to be formed; Fig. 5 represents in section two formed pipe ends as they appear when positioned for welding or after being welded, the section being taken in the plane of the pipes; and Fig. 6 represents in section a complete pipe bend having its point reinforced.

Essentially my die embodies a body portion comprising two, preferably, substantially similar hinged sections each of which is scooped out in the form which half of a pipe end is to have after it is bent. The two sections of the die being closed together, provision is made for an inner horn or mandrel attached to the die to be swung into that portion of the die which represents the bend of the completed pipe end in such a way as to constitute a core spaced away from the die walls (*i. e.* the walls of the scooped out portions) so that the pipe end when suitably heated and forced into the die will be bent into the required curve between the horn and said die-walls.

My invention will be better understood by referring to the drawing in which A designates the lower section of the die and B the upper section which is hinged to the lower section by a pintle C at the left of the die. At the right, each section of the die is scooped out so as to conform to the shape which a half pipe end should have after said pipe end has been bent ready for welding to the other pipe end. When the two halves of the die are closed together, therefore, these two scooped-out portions exactly conform in configuration to the shape of a finished pipe end.

A separate piece H extending beyond the top and bottom of the combined and closed die sections, is provided with tongues F which closely embrace the die when the two halves are thus closed together. These tongues are suitably cut away so as to engage journals E fixed to the two halves of the die. The piece H has attached to it, midway between the tongues F, a curved horn or mandrel D so positioned that when the piece H with its tongues F is rotated upon the aforesaid journals E, this horn will register with the curved portion of the die in the region corresponding to the tube end so as to be substantially concentric with but spaced from the curved walls of the die. When the horn is thus positioned, a flat bolt M is slipped through suitably located bolt holes G which have been formed both in the tongues F and in the two die halves A and B so that said two halves and the horn D are rigidly locked together.

The operation of the die is as follows: A pipe end of diameter corresponding to the scooped out portion of the die is sawed off at an angle L (Fig. 4). This pipe end is then heated to a red heat and forced into the straight portion of the die opening at N′ (Fig. 2), so that the point L of the tube

end will strike the curved portion of the die at I; this will cause the pipe end, if sufficient pressure be applied, to be bent around the curved portion of the die opening between the wall thereof and the horn D.

If it is desired that the pipe end shall be thickened or reinforced at and near its point at the outer side thereof, this may be readily accomplished by having the scooped out portion of the die in this region enlarged to any desired extent, as shown for example by the dotted line N, Fig. 2. By suitably defining this region of enlargement, the wall thickness of the finished pipe end may be made to lessen gradually from a maximum at the point of the pipe end to a normal thickness at any chosen distance from said point. Fig. 6 shows a finished pipe bend thus reinforced. This reinforcing is very desirable in superheater pipes in order that they may withstand the heat of the furnace gases which is most intense at the points of the U bends lying adjacent to the fire box.

A single pipe end having been formed as above described, the bolt M is knocked out and the piece H with its tongues F rotated upon the journals E so as to withdraw the horn D from the die opening. A suitable number of pipe ends having been formed, they may then be joined together in pairs as indicated in Fig. 5, and the ends welded in any convenient manner.

I have described my invention as applied to a die for forming one pipe end at a time, but dies embodying my inventive idea and providing for bending a number of pipe ends simultaneously may easily be arranged.

As described my die is operated by hand but it may, if preferred, be operated by power within the scope of my invention.

Having described my invention, I claim:

1. A die for bending pipe ends comprising a body portion provided with a suitable die opening, having the form of a completely inclosed bore, part of which is curved, and an integral horn held rigidly within said curved part but spaced from the walls thereof during the bending process the cross section of said horn becoming less as its end is approached.

2. A die for bending pipe ends comprising a body portion provided with a suitable die opening, having the form of a completely inclosed bore, one end of which is curved while the remainder is straight, an integral horn held rigidly within said curved part but spaced from the walls thereof during the bending process the cross section of said horn becoming less as its end is approached, and means for instantly releasing and removing said horn when the bending process is completed.

3. A die for bending pipe ends comprising a body portion having separable sections and provided with a suitable die opening part of which is curved, a horn movably attached to said body portion and adapted to be inserted into and removed from said curved part, and means for simultaneously locking said sections together and for holding said horn within said curved part during the bending process.

4. A die for bending pipe ends comprising a body portion having separable sections and provided with a suitable die opening part of which is curved, a horn adapted to be inserted within the curved part said horn being provided with tongues which closely embrace the die when its sections are closed, and means for locking said tongues to said body portion so as to hold them closed and the horn immovable.

5. A die for bending pipe ends comprising a body portion provided with a suitable die opening part of which is curved while the remaining part is straight, an integral horn rigidly attached to the die but spaced therefrom and extending through the curved part into the straight part, the inner contour of the horn conforming to the inner contour of the curved part of the die opening and then having a straight part conforming to a straight part of the die opening and the outer contour of the curved part of the horn being continuously curved so as to join the inner contour of the horn, and means for disattaching said horn when the bending process is completed.

6. A die for bending pipe ends comprising a body portion provided with a suitable die opening part of which is curved while the remaining part is straight, the cross-section of said curved part being enlarged in the region of its outer end, and an integral horn attached to the die but spaced therefrom and extending into said curved part, the space between horn and die being greatest in the region of the outer end of said curved part.

7. A die for bending pipe ends comprising a body portion provided with a suitable die opening part of which is curved while the remaining part is straight, the cross-section of said curved part being enlarged in the region of its end, and an integral horn attached to the die but spaced therefrom and extending into said curved part, the cross-section of said horn in the region of its base being also enlarged and the space between horn and die being greatest in the region of the outer end of said curved part.

8. A die for bending pipe ends comprising a body portion provided with a suitable die opening part of which is curved while the remaining part is straight, the cross-section of said curved part being enlarged at its outer end, an integral horn rigidly at-

tached to the die but spaced therefrom and extending through the curved part into the straight part, the space between horn and die being greatest in the region of the outer end of said curved part, the inner contour of the horn conforming to the inner contour of the curved part of the die opening and then having a straight part conforming to a straight part of the die opening and the outer contour of the curved part of the horn being continuously curved so as to join the inner contour of the horn, and means for instantly disattaching said horn when the bending process is completed.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

NIELS CHRISTOPHER FRANDSEN.

Witnesses:
P. HOFMAN BANG,
VALDEMAR CHRISTENSEN.