

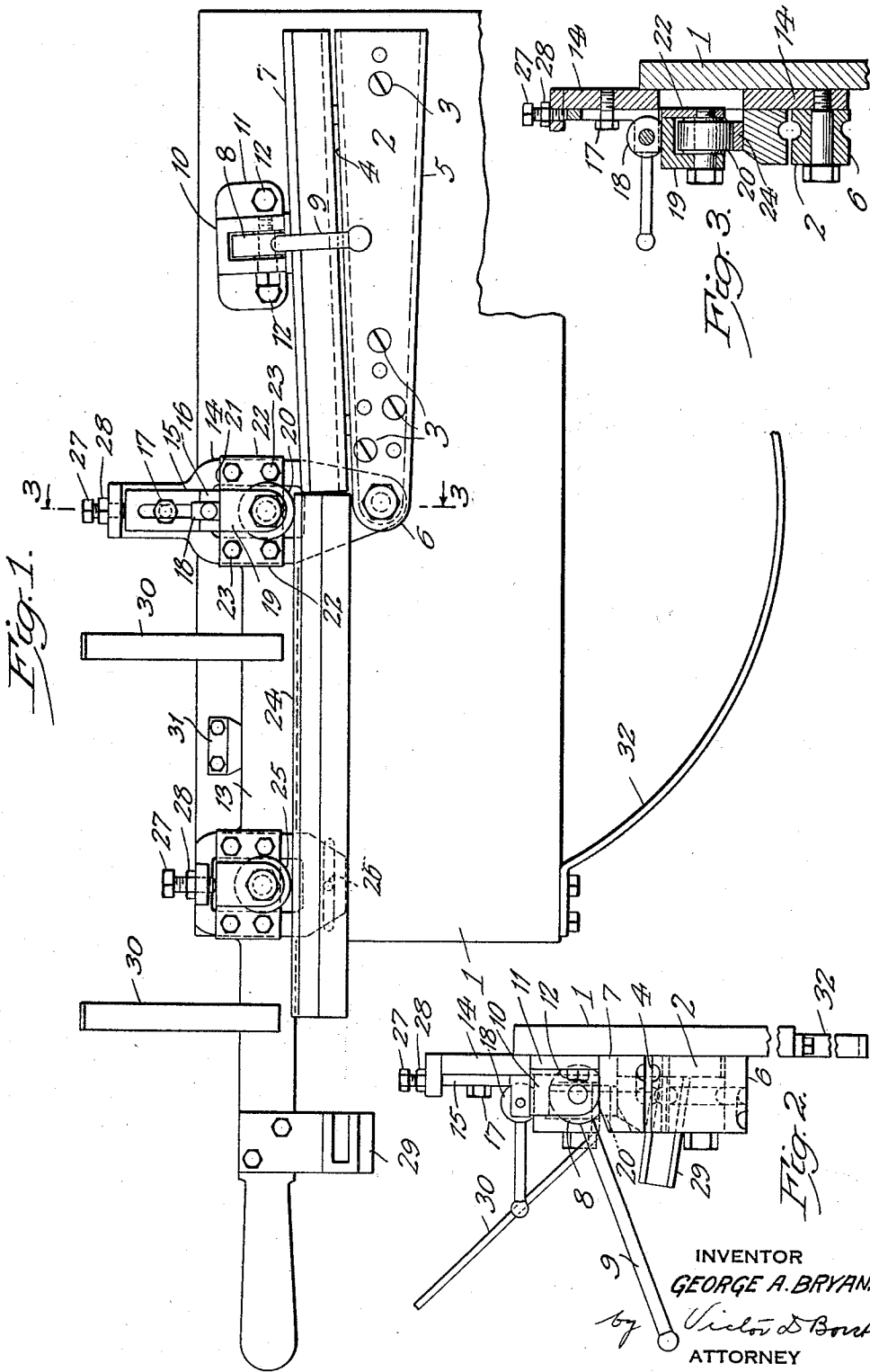
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G. A. BRYAN

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DEVICE FOR BENDING TUBES

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GEORGE A. BRYAN, OF PERU, INDIANA, ASSIGNOR TO BRYAN STEAM CORPORATION,
A CORPORATION OF NEW MEXICO

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By my invention, I contemplate a device for bending tubes as, for example, the water tubes of a water tube boiler such as that disclosed in Letters Patent No. 1,672,480, granted to me June 5, 1928.

In forming tubes by bending, as is done in water tube boilers and water heaters such as those used in domestic or home heating systems, great care must be taken to bend the tube without constricting the cross-sectional area thereof. One object of my invention is to produce a device by means of which such tubes may be quickly and accurately bent into shape and thereby decrease the time required, and consequently the expense of producing these coils.

In accordance with my invention, I provide a bed-plate to which a stationary arcuate swaging block is secured, and a movable swaging block which acts in all positions of its movement at a tangent to the curved edge of the stationary block. The moving tangential swaging block presses the tube against the stationary block and forces the tube to conform to the curvature thereof.

A detail description of one embodiment of my invention will be given in connection with the accompanying drawings in which:

Fig. 1 is a plan of a device embodying my invention;

Fig. 2 is an end elevation of the device shown in Fig. 1, and

Fig. 3 is a section on the line 3—3 of Fig. 1.

In the illustrated embodiment, which is the type used for shaping copper tubing to be used in a water tube boiler such as that which is used in domestic heating systems, there is a bed-plate 1 to which a stationary swaging block or anvil 2 is secured by means of machine screws 3. The stationary swaging block has converging edges 4 and 5 and an arcuate inner end 6, the center of which is coaxial with the center of the bed-plate 1. A continuous semi-circular groove is formed in the edges 4 and 5 and the arcuate end 6 of the swaging block or anvil 2. The groove is inclined to and crosses a longitudinal central plane parallel to the sides of the swaging block and containing the cen-

tral axis thereof. The groove starts in the converging edge 4 adjacent the face or side of the swaging block in contact with the bed-plate 1, runs at an angle to the longitudinal central plane of the block, crosses the plane at the arcuate end 6 and terminates adjacent the outer side of the swaging block at the end of the converging edge 5. The purpose of the inclination of the groove in the edge of the swaging block will appear as the description proceeds.

Secured to and in sliding contact with the base plate 1, a clamping block 7 having a complementary semicircular groove in one edge thereof, is positioned to cooperate with the edge 4 of the swaging block 2. The clamping block 7 is pressed into engagement with the edge 4 of the stationary swaging block 2 by a cam 8 having a handle 9 secured thereto and pivoted within a bifurcated casting 10 having flanges 11 through which it is secured to the bed plate 1 by means of bolts 12.

A hand lever 13 substantially T-shape in plan is pivoted at one end of the flange 14 coaxial with the center of the arcuate end of the stationary swaging block 2. Thus, the hand lever 13 rotates about the central axis of the arcuate end of the stationary swaging block as a tangent to a circle having a radius equal to the length of the arm 14. On the surface of the flange 14, a block 15 having a bifurcated flange 16 is adjustably secured by means of a bolt 17 engaging the sides of a longitudinal groove in the block 15. Within the bifurcated flange 16, a cam 18 is pivoted and is adapted to press upon a U-shape block 19 which carries a roller 20 journaled between the sides of the U. The U-shape block 19 has on the side adjacent the surface of the flange 14, extensions 21 which are slidably engaged by side plates 22 secured to the flange 14 by means of bolts 23. The roller 20 bears on one edge of a movable swaging block 24 near one end thereof. A similar roller 25, secured to the hand lever 13 in a similar manner to the roller 20, with the exception that the cam clamping member 18 and its associated parts are omitted, bears on the other end of the movable swaging block 24. Below the roller 25, the swaging block 24 is secured to the

stem of the hand lever 13 by a pin 26 slidably and pivotally engaging a groove in the side of the swaging block 24. In the edge opposite that on which the rollers 20 and 25 bear, there is a semicircular groove which is complementary to the groove in the edge 5 of the stationary swaging block 2; and in the position shown in Fig. 1, it forms a continuation of the inclined groove in the edge 4 of the stationary swaging block 2. When the cam 18 is rotated into operative position, there is a slight pivotal movement of the swaging block 24 around the pin 26 and the end of the swaging block 24 under the roller 20 engages the edge of the stationary swaging block 2 near the arcuate end thereof, and as the hand lever 13 is rotated about its pivot the edge of the movable swaging block 24 moves as a tangent to the arcuate end of the stationary swaging block 2. The position of the rollers 20 and 25 is adjustable by means of the set screws 27 and the lock-nuts 28. A stop member 29 having a slot opened at one edge and an end inclined to the surface thereof, is secured to the hand lever 13 near the hand grip portion thereof, and determines the length to which a tube may be inserted in the device. Angle members 30 secured to the side of the hand lever determine the angular relation of the planes containing successive bends formed in a tube. In the construction shown, by turning the tube into contact with the members 30 after each bend the successive bends in the tube will lie in parallel planes.

Secured to the bed-plate 1, a stop member 31 prevents a backward rotation of the hand lever 13. An arcuate strip 32 which is secured to the edge of the bed-plate 1, acts as a bearing for the hand lever 13 in its rotation about its pivot.

This tube bending machine is especially applicable to forming the water tubes of a water tube boiler, such as that disclosed in my patent above referred to. Such tubes are bent upon themselves to extend across the combustion chamber. The plane of the successive reverse bends in the tubes are offset, the reverse bends in the tube on one side of the boiler being in one plane and the reverse bends in the tube on the other side of the boiler being contained in a plane parallel to the first but offset therefrom. The operation of the device is as follows:

A tube is inserted along the inclined grooves in the clamping block 7 and the movable swaging block 24, the end of the tube being received in the slot in the stop member 29 when the parts are in the position shown in Fig. 1. The cams 8 and 18 are rotated by means of the handles secured thereto and clamp the tube in the complementary grooves in the stationary swaging block 2. In this clamping action, the cam 8 moves the clamping

block 7 perpendicular to the side edge 4 of the stationary swaging block 2 to clamp the tube therebetween, and the cam 18 moves the movable swaging block 24 about its pivotal connection 26 to the lever 13 into clamping engagement with the arcuate end 6 of the stationary swaging block 2 and clamps the tube in frictional engagement therewith. The hand lever is then rotated about its pivot, the movable swaging block 24 moving as a tangent to the arcuate end of the stationary swaging block, until the edge of the movable swaging block 24 engages the edge 5 of the stationary swaging block 2. The frictional engagement of the edge of the movable swaging block 24 and the arcuate end of the stationary swaging block 2 causes an inwardly longitudinal movement of the movable swaging block 24 which is permitted by the rollers 20 and 25, together with the slotted connection of this swaging block 24 with the pin 26. The hand lever is then returned to the inoperative position, the clamping cams 8 and 18 are released, the tube pushed into the device and rotated to engage the angle members 30, the bent end being received within the slot in the stop member and the above operations repeated.

The inclination of the groove in the edge of the swaging block gives to the tube, bent in the device, an offset which is required for certain types of water tube boilers. It is, however, obvious that the groove may be straight as well as inclined, depending upon the shape to which it is desired that the tube conform.

It is obvious that various changes may be made in the illustrated embodiment above particularly described within the principle and scope of my invention as expressed in the appended claims.

I claim:

1. A machine for bending tubes comprising a bed-plate, a stationary arcuate swaging block secured to said bed-plate, a lever arm pivoted coaxial with said arcuate stationary swaging block, a movable swaging block carried by said lever arm and having a longitudinally slidable connection therewith, and means for moving said movable swaging block laterally to the lever arm and clamping said movable swaging block into frictional engagement with the surface of said arcuate stationary swaging block.

2. A tube bending machine comprising a bed plate, a stationary swaging block secured to the bed plate, the swaging block having an arcuate end portion, a clamping block co-operating with one edge of the stationary swaging block, means for moving the clamping block perpendicular to the edge of the stationary swaging block to clamp a tube therebetween, a lever pivoted coaxially with the arcuate end of the swaging block, a movable swaging block carried by the lever arm

and having a longitudinally slidable connection therewith, and means for moving one end of the movable swaging block into contact with the arcuate end portion of the stationary swaging block and clamping it into frictional engagement therewith.

3. A tube bending machine comprising a bed plate, a stationary swaging block secured to the bed plate, the swaging block having converging side edges and an arcuate end portion, a clamping block cooperating with one of the side edges of the stationary swaging block, means for moving the clamping block perpendicular to the side edge of the swaging block to clamp a tube therebetween, a lever pivoted coaxially with the arcuate end of the swaging block, a movable swaging block pivotally connected to said lever and being movable longitudinally thereof, and means for moving the movable swaging block about its pivotal connection to the lever into engagement with the arcuate end of the stationary swaging block and clamping it in frictional engagement therewith.

4. A tube bending machine comprising a bed plate, a stationary swaging block secured to the bed plate, the swaging block having converging side edges and an arcuate end portion, a clamping block cooperating with one of the side edges of the stationary swaging block, means for moving the clamping block perpendicular to the side edge of the swaging block to clamp a tube therebetween, a lever pivoted coaxially with the arcuate end of the swaging block, a movable swaging block pivotally connected to said lever and being movable longitudinally thereof, means for moving the movable swaging block about its pivotal connection to the lever into engagement with the arcuate end of the stationary swaging block and clamping it in frictional engagement therewith, and a stop member secured to said lever for determining the length of the tube extending beyond the arcuate end of the stationary swaging block.

In witness whereof, I hereunto subscribe my signature.

GEORGE A. BRYAN.