T. N. COFFELDER.

TUBE FLANGING MACHINE.

APPLICATION FILED NOV. 22, 1912.

1,104,166.

Patented July 21, 1914.

3 SHEETS—SHEET 1.

Fig. 1.

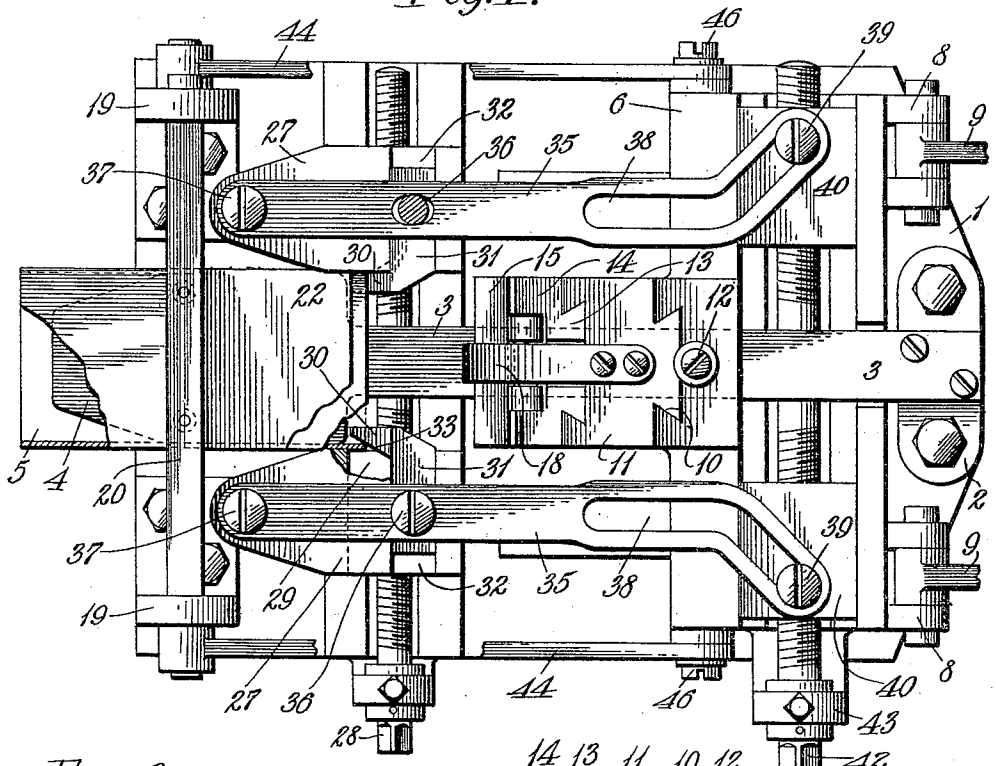
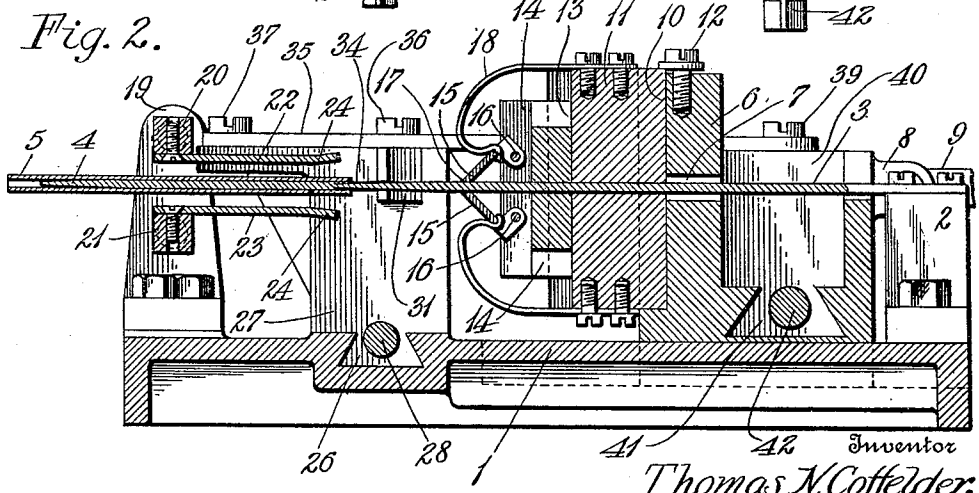


Fig. 2.



Witnesses.
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3 SHEETS—SHEET 2.

Fig. 3.

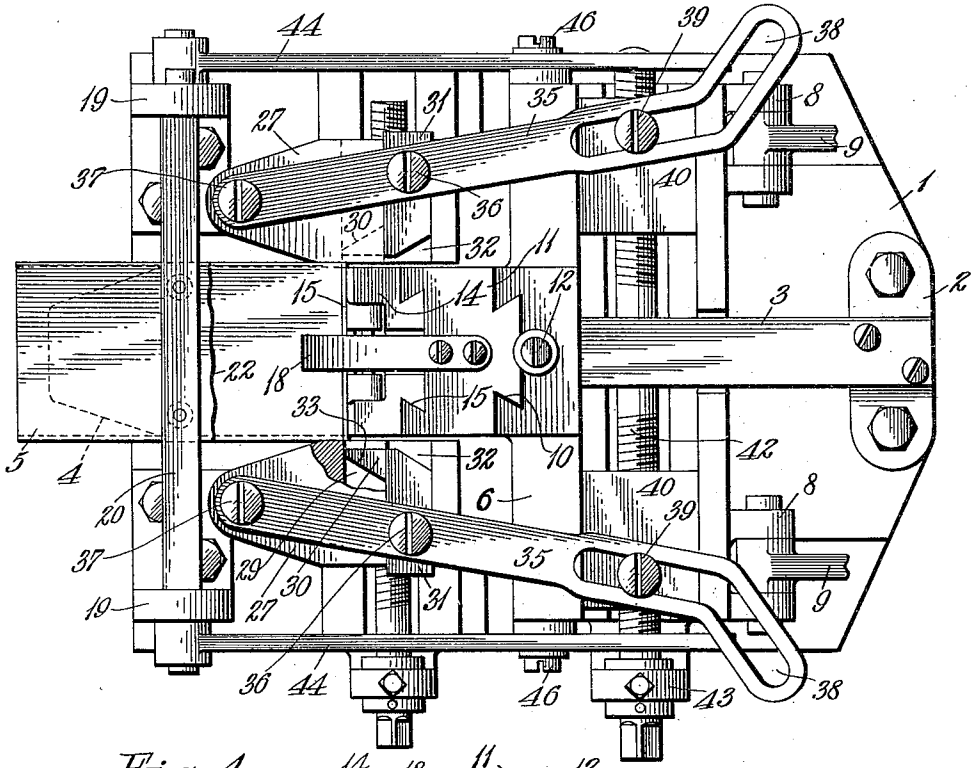
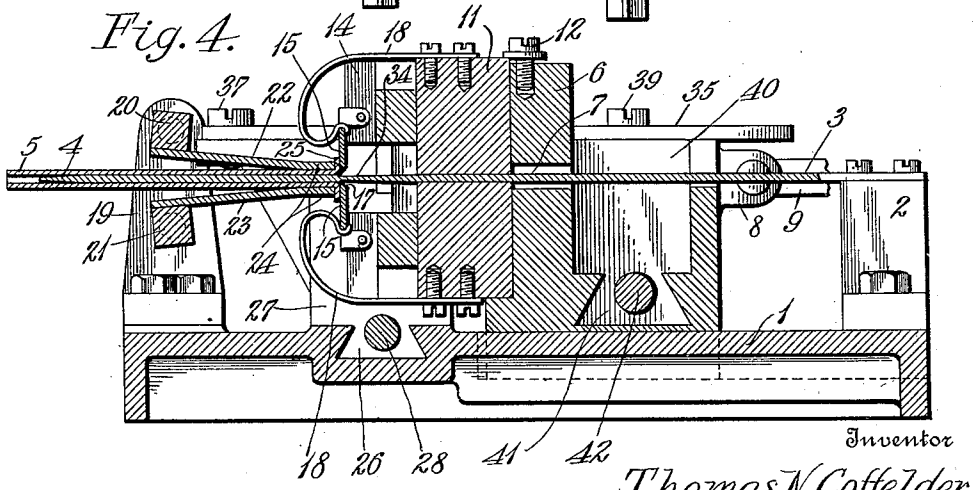


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

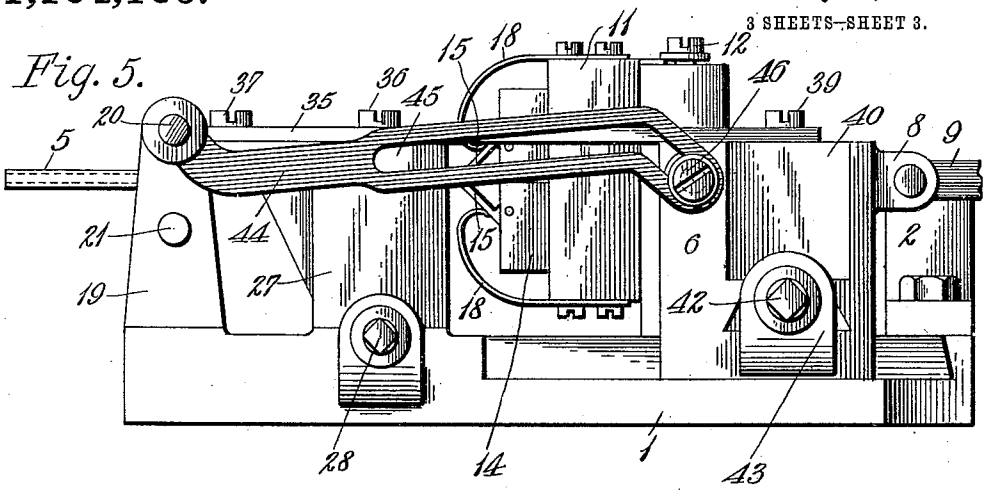


Fig. 6.

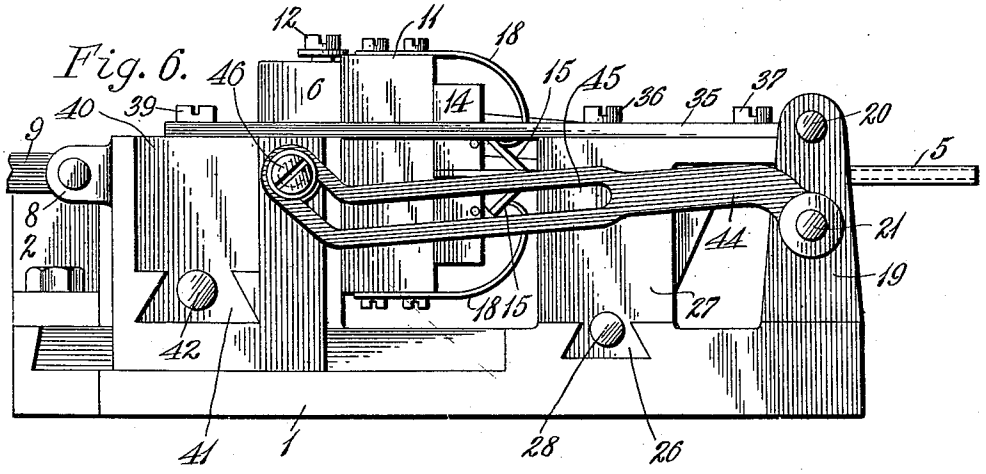


Fig. 7.

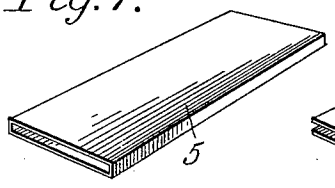


Fig. 8.

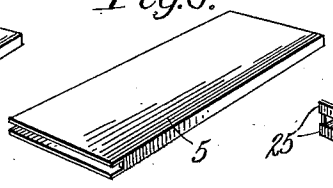
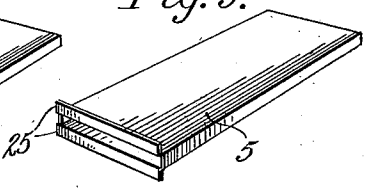


Fig. 9.



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UNITED STATES PATENT OFFICE.

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TUBE-FLANGING MACHINE.

1,104,166. Specification of Letters Patent. Patented July 21, 1914.

Application filed November 22, 1912. Serial No. 732,811.

To all whom it may concern:

Be it known that I, THOMAS N. COFFELDER, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Tube-Flanging Machines; of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a tube flanging machine and its object is to provide a simple and efficient machine especially adapted for forming laterally extending flanges upon the ends of flat tubes formed of thin sheet metal and especially adapted for use in the construction of motor vehicle radiators.

The invention consists in the matters hereinafter set forth and more particularly pointed out in the claims reference being had to the accompanying drawings in which—

Figure 1 is a plan view of the machine embodying the invention with portions broken away to show the construction; Fig. 2 is a longitudinal vertical section through the same; Fig. 3 is a view similar to Fig. 1 showing the parts in position at the end of the forming operation; Fig. 4 is a view similar to Fig. 2 showing the parts in position at the end of the forming operation; Fig. 5 is a side elevation of one side of the machine; Fig. 6 an elevation of the opposite side of the machine; Fig. 7 is a perspective view of a tube as it appears before being operated upon by the machine; Fig. 8 is a perspective view of the tube after the side edges have been cut away by the machine in the process of forming; and Fig. 9 is a perspective view of a finished tube after having been flanged by the machine.

As shown in the drawings 1 represents a suitable base which is provided with a fixed upwardly extending post 2 at its rear end to the upper end of which post is rigidly bolted a forwardly extending guide tongue 3 upon the forward free end 4 of which the thin sheet metal tube to be flanged, is sleeved, said end of the tongue being tapered for a short distance from its end so that it will readily enter the end of the tube. The end 4 of the tongue is of a width and thickness to fit closely within the particular size of tube to be flanged and its forward end preferably projects a short distance beyond the forward end of the machine so that the operator may readily slip the tubes thereon.

Reciprocable upon the base 1, forwardly of the post 2 and centrally of the bed, is a head block 6 having an opening 7 therein through which the tongue 3 passes. Pivotally connected to ears 8 at each end of the block at its rear side, are connecting rods 9 which may be actuated in any suitable manner, not shown, for reciprocating the head upon the base longitudinally of the tongue 3. The head block is formed at its forward side with a vertical undercut groove to receive a tongue 10 on a face block 11 which is also provided with an opening through which the tongue 3 slides, forming a support and guide for the tongue. The face block is detachably held upon the head block by means of a cap screw 12 in the head block engaging the upper end of the tongue on the face block.

The forward side of the face block is formed with an undercut groove to receive tongues 13 on two sides 14 which are free to move vertically toward and from the tongue 3 and guided in such movement by their dove-tail connection with the face block. These slides form carriers for two forming plates 15 which are pivoted at 16 to each slide with their beveled edges 17 resting upon the upper and lower sides of the tongue 3. Each plate is yieldingly held turned upon its pivot with its beveled edge in engagement with the tongue by means of a flat spring 18, which springs are secured at one end to the upper and lower ends of the face block 11 and are provided at their opposite ends with hooks to engage over the edges of the plates. The power of the springs 18 is thus applied to the plates between their pivots and their beveled ends to hold said ends in firm contact with the upper and lower sides of the tongue 3.

Rigidly secured to the base 1 adjacent to the forward corners thereof are brackets 19 which form bearings for two shafts 20 and 21, one extending across between said brackets 19 above the projecting end of the tongue 3 and the other below said end. Rigidly secured to the adjacent sides of said shafts directly above and below said tongue are two clamping plates 22 and 23 having free ends 24 which are bent slightly to lie flat against the sides of the tube 5 when said shafts 20 and 21 are turned to swing them toward each other. The end edges of said ends 24 on the clamping plates are formed true and square so that the metal of the tube

which is to form the flanges 25 on said tube may be bent laterally at right angles to the tube against said ends of the clamping plates and an even right angle bend will be formed thereby.

The bed 1 is formed with a transverse undercut groove to receive tongues 26 upon adjustable die blocks 27 which are positioned at each side of the guide tongue 3 adjacent to the ends 24 of the clamping plates. These blocks 27 may be adjusted to and from each other by means of a shaft 28 having a right and left hand screwthread engaging screwthreaded openings in the blocks 27. These blocks are positioned just far enough apart to permit the end of the tube 5 to be shoved in upon the end of the tongue 3 between them and each block is formed with a recess 29 extending horizontally therethrough for a cutting finger 30 which extends laterally from a slide 31 mounted in a way 32 in the top of the block. The guide tongue 3 is reduced in width at the transverse bending line of the flanges 25 or opposite the end edges of the clamping plates so that the slides 31 may be projected inward beyond the inner ends or faces of the blocks 27 with their cutting fingers 30 in the path of the tube 5 when the same is shoved inward upon the enlarged end 4 of the tongue 3. When the tube is so placed in the machine upon the tongue 3, its inner end will come into contact with the inclined edges 33 of the fingers 30 which in this position of the parts project into the end of the tube to the vertical plane of the bending line of the tube flanges. These fingers are of a thickness to fit within the end of the tube and thus when the tube is in place and the slides 31 are moved outwardly in their ways by means hereinafter described, the inclined cutting edges of the fingers 30 will engage the edges of the tube and sever a portion of the metal therefrom, separating the metal at the upper and lower sides of the tube for a distance from its ends, which metal is bent laterally to form the tube flanges 25, by the engagement therewith of the forming plates 15 when the head block 6 is moved forward. Beginning at the vertical plane of the bending line of said tube flanges, the tongue 3 is reduced in thickness, as at 34, for a short distance from said plane, and thus when the head block is moved forwardly with the forming plates 15 riding upon the upper and lower surfaces of said tongue, the sharp beveled edges of said plates will readily engage beneath the end of the metal of the tube 5 which projects beyond the vertical plane of its bending line and bend said side portions of the tube upwardly and downwardly against the ends of the clamping plates 22 and 23.

When the head block is moved forwardly to such a position that further forward movement is resisted by the forming plates 15 coming into contact with the end of the tube and its flanges which are turned outwardly thereby against the ends of the clamping plates, further movement of said head block will cause the forming plates to turn on their pivots 16 toward each other, sliding their carriers in their guides away from the tongue 3, which sliding movement of the carriers permits said plates to turn to a position at right angles to the tongue and thus bend the tube flanges at right angles to the sides of the tubes, upwardly and downwardly against the forming ends of the clamping plates. The springs 18 are of such a form and strength that they operate to hold the forming plates 15 with their beveled ends firmly against the sides of the guide tongue and at the same time operate to yieldingly hold the slides 14 moved toward each other into engagement with the upper and lower sides of said tongue.

To move the slides 31 and their cutting fingers 30 in timed relation to the movement of the head block 6, and sever the metal from the sides of the tube before the forming plates 15 are brought into engagement with the tube, a bar 35 is pivotally attached intermediate its ends by means of a pivot screw 36 to each slide 31 and this bar is pivoted at its forward end to the block 27 by a pivot screw 37. The rear end of each bar 35 is bent laterally and formed with a longitudinal slot 38 through which a bolt 39 extends, said bolt engaging a screwthreaded opening in an adjustable slide 40 which is provided at its lower side with a tongue 41 engaging an undercut groove in the head block 6, said slides 40 being thus attached to the head block to be adjusted thereon transversely thereof by said dove-tail connection. A shaft 42 having a right and left hand screwthread engages screwthreaded openings in the slides 40 and this shaft is held at one end against longitudinal movement in a bearing 43 on the head block. The slides 40 may thus be adjusted simultaneously toward and from each other by the turning of the shaft 42.

The slots 38 in the bars 35 have an outwardly extending portion in the laterally bent ends of the bars and a straight portion at their forward ends so that when the head 6 is moved forwardly said bars are at once swung outwardly and thus move the slides 31 laterally, causing the fingers to sever the sides of the tube and move into the recesses 29 in the blocks 27 out of the path of the advancing forming plates 15.

To turn the shafts 20 and 21 and bring the clamping plates 22 and 23 into engagement with the sides of the tube to clamp the same upon the guide tongue 3 in timed relation to the movement of the head block, each

shaft has secured to its outer end a bar 44, which bars extend rearwardly at each side of the machine and are formed with laterally bent rear ends. The rear end of each bar is formed with a longitudinal slot 45 having an inclined portion extending in the laterally bent end of the bar and carried by the head block 6 are studs or bolts 46 engaging said slots 45 so that when the head is reciprocated the bars 44 will be raised and lowered by the engagement of the studs with the inclined portions of the slots in the bars and thus turn the shafts 20 and 21 in opposite directions to bring the rear ends of the clamping plates into clamping engagement with the tube 5.

Tubes of any desired width may be flanged in the machine by detaching the guide tongue 3 and replacing it with one which is of the width at its forward end to fit within the tube to be flanged, and then adjusting the die blocks 27 and slides 40 toward or from each other to bring the cutting fingers 30 into proper relation with the tube. The face block 11 is also made detachable as previously described so that it may be readily taken out and another put in its place which is provided with forming plates of a width to correspond with the width of the tube to be operated upon.

The tubes 5 may be formed from a single piece of sheet metal which is previously folded into the desired shape and size or they may be drawn or otherwise formed in any desired manner, the construction and form of the tube being immaterial as any tube which will fit over the end of the guide tongue may be flanged in the machine. Obviously, changes may also be made in the construction and arrangement of parts of the machine without departing from the spirit of my invention and I do not limit myself to the particular form or arrangement shown.

Having thus fully described my invention what I claim is:—

1. In a tube flanging machine, the combination of a member to be inserted in a tube to be flanged, tiltable members adapted to be brought into engagement with the top and bottom of said tube when in place upon said member to form abutments, and yieldable means adapted to engage within the end of the tube and bend the sides thereof outwardly against said abutments.

2. In a tube flanging machine, the combination of laterally movable members adapted to enter the end of a tube to be flanged, means for moving said members to cut portions from the tube, tiltable abutments to engage opposite sides of the tube, and means adapted to enter the end of the tube and fold the sides thereof outwardly against said abutments, said means being disposed in planes above and below the planes of said members.

3. In a tube flanging machine, the combination of tiltable members between which the end of a tube to be flanged is adapted to be placed, adjustable fingers positioned to limit the movement of the tube in the machine, means for moving the fingers to sever portions from the end of the tube, and means for folding the portions of the tube between said cut away portions at right angles to the sides of the tube.

4. In a tube flanging machine, the combination of members adapted to receive the end of a tube to be flanged between them and having recesses, cutting fingers adapted to limit the movement of the tube between said members, means for moving the fingers laterally into the recesses to sever portions from the end of the tube, abutments adapted to engage the sides of the tube and having faces in alinement with the ends of the fingers, and means adapted to enter the end of the tube and fold the sides thereof outwardly against said faces of the abutments.

5. In a tube flanging machine, the combination of a member adapted to fit within a tube to be flanged, means for limiting the movement of the tube above said member and severing by an outward movement portions from said tube, tiltable clamping members movable into engagement with the sides of the tube on said member and adapted to form abutments, pivoted members adapted to enter the end of the tube beyond the ends of the clamping members and to turn upon their pivots and fold the sides of the tube outwardly against said abutments.

6. In a tube flanging machine, the combination of a supporting tongue adapted to enter the end of a tube to be flanged, tiltable members movable into engagement with the sides of the tube upon the tongue, and means reciprocable longitudinally of the tongue into engagement with the end of the tube to form the same outwardly against the ends of said members, said means being yieldable in planes at an angle to said tongue.

7. In a tube flanging machine, the combination of a supporting member adapted to fit within the end of a tube to be flanged, means for limiting the movement of the tube upon said member and severing portions from the end of the tube, clamping members to engage the sides of the tube upon the supporting member, means for folding portions of the end of the tube outwardly, and means for actuating the severing means, clamping members and folding means in timed relation to each other.

8. In a tube flanging machine, the combination of a member adapted to fit within a tube to be flanged, clamping members adapted to engage the tube at a distance from one end, pivoted forming members yield-

ingly held at an angle to each other to enter the end of the tube and adapted to turn upon their pivots and fold portions of the end of the tube outwardly against the ends of the clamping members.

9. In a tube flanging machine, the combination of a supporting tongue adapted to fit within the end of a tube to be flanged, means for clamping the tube upon the tongue, pivoted forming plates having beveled edges, means for yieldingly holding said plates with their beveled edges in contact with the sides of the tongue, and means for moving the tongue and forming members relatively to bring said members into engagement with the end of the tube on the tongue and fold portions of the said end outwardly against the ends of the clamping members.

10. In a tube flanging machine, the combination of a tongue adapted to fit within the end of a tube to be flanged, a head through which the tongue extends, clamping members to engage the tube upon the tongue, forming members carried by the head to engage within the end of the tube and form portions of the same outwardly against the ends of the clamping members, and means for reciprocating the head.

11. In a tube flanging machine, the combination of die blocks having recesses, a tongue adapted to fit within the end of a tube to be flanged and support the end of the tube between the die blocks with its end portion opposite the recesses in the blocks, cutting fingers carried by the die blocks to enter the end of the tube and adapted to be moved into the recesses to sever portions from the end of the tube, clamping members to engage the sides of the tube, a reciprocable head through which the tongue extends, and means carried by the head for engaging the end of the tube and outwardly bending the side portions of the tube between its cut away portions.

12. In a tube flanging machine, the combination of a member adapted to enter the end of a tube, pivoted forming plates adapted to rest upon said member at their free ends to enter the end of the tube and to turn upon their pivots when brought into engagement therewith and to bend portions of the tube outwardly, means for yieldingly holding the forming plates in contact with said member, and means engaging the sides of the tube to form an abutment against which the end portions of the tube are folded outwardly by the forming plates.

13. In a tube flanging machine, the combination of a supporting tongue adapted to fit within the end of a tube to be flanged, clamping members adapted to engage the sides of a tube upon the tongue, a reciprocable head through which the tongue extends, slides carried by the head, forming plates pivotally attached to the slides and having edges engaging and sliding upon the tongue to enter the end of the tube and flange the same outwardly, and yielding means for holding the forming members with their ends against the tongue and in an inclined position which means is adapted to yield when the movement of said forming members along the tongue is resisted by the clamping members, to permit the forming members to turn upon their pivots to a position at right angles to the sides of the tube.

14. In a tube flanging machine, the combination of a supporting tongue supported at one end and adapted to fit within the end of a tube to be flanged at its opposite end, a reciprocable head through which the tongue extends, forming members carried by the head to engage the end of the tube and form portions thereof outwardly thereon, means adapted to enter the end of the tube and to be moved laterally to cut edge portions from the end of the tube, clamping members movable into and out of engagement with the sides of the tube to clamp the tube in place upon the tongue and to form abutments against which the end portions are formed outwardly by the forming members, means for reciprocating the head, and means actuated by the movement of the head for moving the clamping members and the members for severing the edge portions from the tube.

15. In a tube flanging machine, the combination of die blocks having recesses therein, slides carried by said blocks, and having fingers formed with inclined cutting edges, a supporting tongue having an end portion to fit within a tube to be flanged and support the tube between the die blocks with its edges in contact therewith and its end extending beyond the recesses in the blocks, means for moving the slides to bring the inclined cutting edges of the fingers into engagement with the edges of the tube and sever portions therefrom when said fingers are moved by the slides into the recesses, and means movable longitudinally of the tongue to engage within the end of the tube and fold the side portions thereof outwardly.

16. In a tube flanging machine, the combination of a tongue supported at one end and formed at its opposite end to fit within a tube to be flanged, die blocks adjustable toward and from the edges of the tongue opposite the inner end of the tube thereon, cutting fingers carried by the die blocks and adapted to enter the inner end of the tube and sever edge portions therefrom, clamping members above and below the tube on the tongue, a reciprocable head through which the tongue extends, a detachable face block on the head through which the tongue extends, slides carried by the face block and movable toward and from the sides of

the tongue, forming plates pivoted at one edge to the slides and beveled at their opposite edges to engage the sides of the tongue, means for yieldingly holding the plates and slides in engagement with the tongue, and means for reciprocating the head and actuating the clamping members.

17. In a tube flanging machine, the combination of a tongue formed at one end to fit within a tube to be flanged and rigidly supported at its opposite end, die blocks adjacent to the sides of the tongue, rock shafts extending in parallelism above and below the tongue adjacent to the formed end of the same, clamping members carried by said rock shafts and adapted to swing into clamping engagement with the upper and lower sides of the tube on the tongue when the shafts are turned, slides carried by the die blocks, cutting fingers on the slides adapted to enter the inner end of the tube on the tongue and sever edge portions from the end of the tube when the slides are moved, a reciprocable head through which the tongue extends, forming plates carried by the head to engage the inner end of the tube on the tongue and form side portions of the tube outwardly against the ends of the clamping members, means for reciprocating the head, bars connected to the head for reciprocating the slides on the die blocks, and bars actuated by the movement of the head for rocking the rock shafts and moving the clamping members into clamping engagement with the tube.

18. In a tube flanging machine, a member adapted to have a tube placed thereon, means at the sides of said member for simultaneously limiting the movement of said tube upon said member and severing side portions from said tube, and means above and below said member and movable between the first mentioned means for flanging the end of said tube.

19. In a tube flanging machine, tiltable members adapted to clamp and hold a tube, laterally movable means adapted to extend into the end of the tube and sever opposed portions therefrom, and means movable to and from the end of this tube between the first mentioned means and coöperating with said member in flanging the end of said tube.

20. In a tube flanging machine, a stationary member adapted to have a tube seated thereon, means movable laterally at an angle to said member and adapted to remove opposed edge portions from the end of the tube, and means movable longitudinally of said member and adapted to flange the remaining edge portions of the tube.

In testimony whereof I affix my signature in presence of two witnesses.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."