

C. H. TRUE.  
 PIPE BENDING DIE.  
 APPLICATION FILED AUG. 1, 1914.

1,167,538.

Patented Jan. 11, 1916.  
 2 SHEETS—SHEET 1.

Fig. 1.

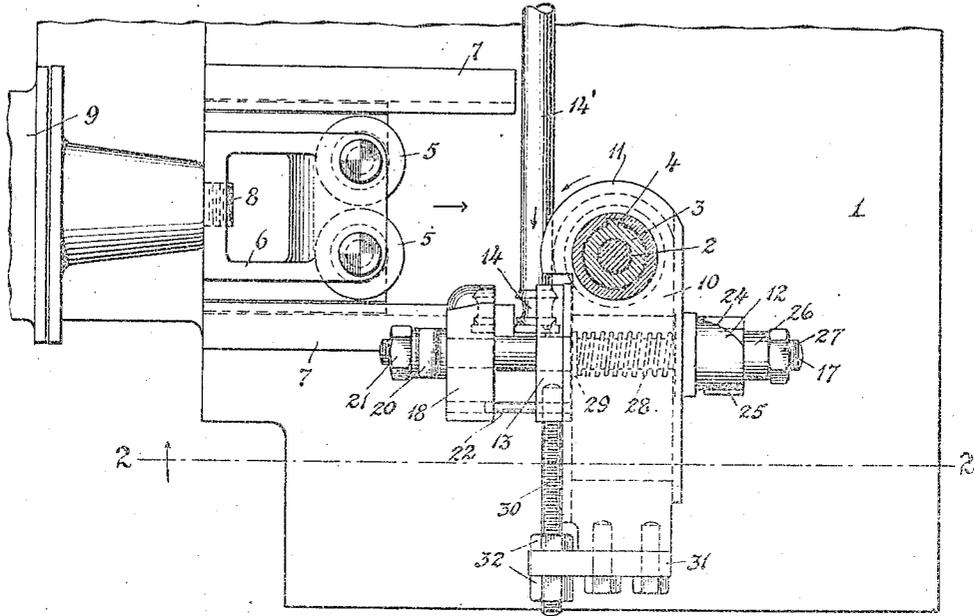
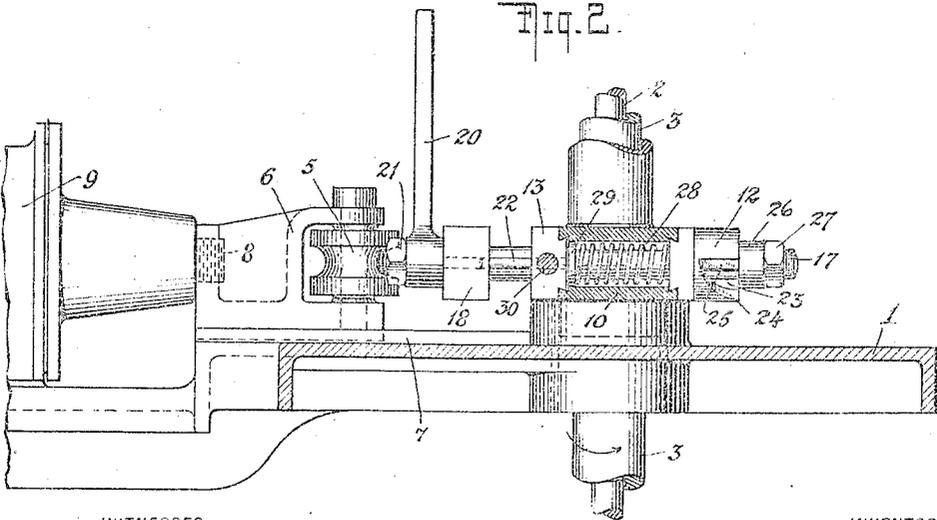


Fig. 2.



WITNESSES

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Fig. 3.

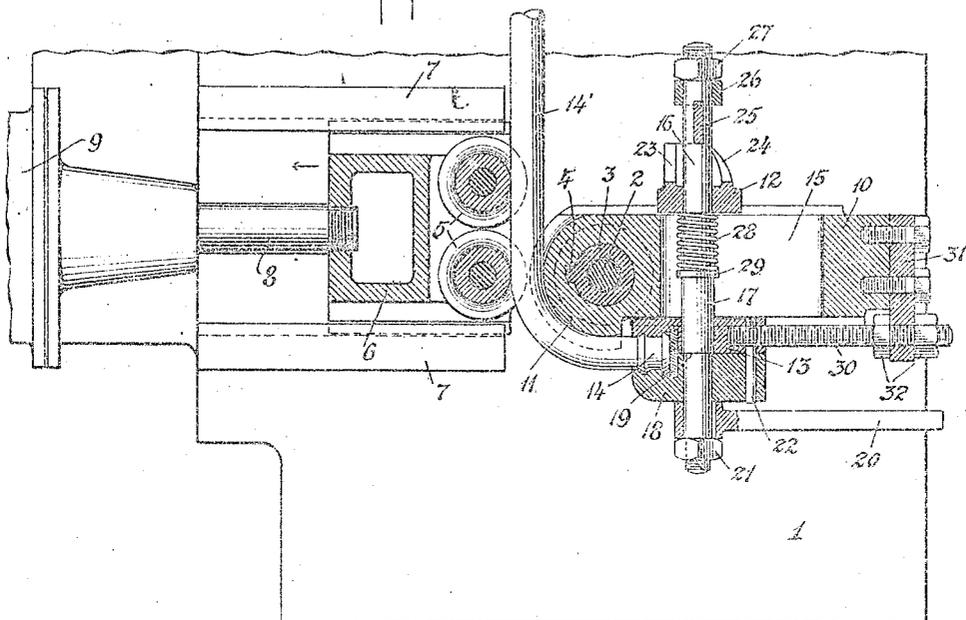
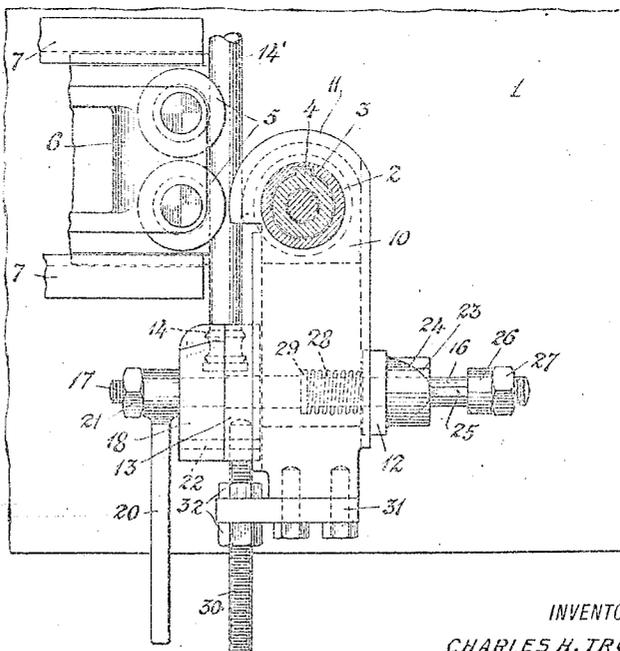


Fig. 4.



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# UNITED STATES PATENT OFFICE.

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## PIPE-BENDING DIE.

1,167,538.

Specification of Letters Patent.

Patented Jan. 11, 1916.

Application filed August 1, 1914. Serial No. 854,428.

To all whom it may concern:

Be it known that I, CHARLES H. TRUE, a citizen of the United States, residing at Hammond, county of Lake, State of Indiana, have invented certain new and useful Improvements in Pipe-Bending Dies, of which the following is a specification.

My invention relates to a pipe bending die and has for its object to provide an improved adjustable die by means of which bends of any desired angle and radius may be placed in a length of pipe.

More particularly, the object of my invention is to provide a die of the character described by means of which the location of the bend, with respect to its distance from the end of the pipe, may be definitely predetermined by a suitable preadjustment of the die and so that thereafter, for a given number of pipe lengths, this determined location of the bend may be the same for each.

A still further object of my invention is to provide a die of the character described so arranged that, once adjusted for a given location of the bend, a pipe may be easily and quickly gripped, bent and released without the possibility of error in the position of the bend.

Another object of my invention is to provide a die of the character described so that the position of the bend with reference to the end of the pipe may be quickly and positively changed by a definite amount.

My invention will be found particularly useful in connection with superheater elements for the flue tube type of superheater, in most known forms of which said elements must be bent as they emerge from the flue tubes and proceed to the smoke box.

Generally speaking, the total number of elements for the superheater of a given locomotive may be separated into four or five groups according to the distance from the end of the elements at which the bend is located. The improved die of my invention enables all of these bends for the several groups to be accurately and quickly made.

In the accompanying drawings, which form a part of my specification, I have shown my invention as applied to a pipe bending machine of the character shown in

the patent to Lassiter No. 1,052,069 dated Feb. 4, 1913.

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

Figure 1 represents a plan view, part section, of my improved pipe bending die; Fig. 2 represents a section, part elevation, along the line 2—2 of Fig. 1; Fig. 3 represents a plan view, partly in horizontal section through the die and guide rollers, showing the position of the parts after the pipe has been bent through 90°; and Fig. 4 is a plan view, part section, similar to Fig. 1 showing the pipe in position for bending at a different distance from its end.

In the drawings, the bed or frame 1 of the bending machine, the spindle 2 (having no function when my improved die is used), the revolubly mounted hollow shaft 3 keyed to the die at 4, the bending rollers 5 revolubly attached to frame 6 which itself is slidably engaged with guide rails 7 so as to be reciprocated toward and from the die by piston rod 8 of air cylinder 9, are all parts of the Lassiter machine as shown in the above referred to patent.

The die or former 10 which, as stated above, is keyed to shaft 3, at 4, has the form of an elongated plate with the end, 11, adjacent to the shaft, curved to such radius as it is desired to bend the pipe upon and peripherally grooved in conformity with the diameter of the pipe. Opposite sides of the die are parallel to one another and provided with dovetailed grooves in which are slidably fitted a cam member 12 and a jaw member 13. This jaw member 13 is recessed to conform to the head 14 (the end as shaped to be attached to the steam collector) of the pipe and the side of the die into which the jaw member dovetails is located at such distance from the center line of the die that when the pipe 14' is tangent to and in contact with the peripheral groove of the die, the head will fit accurately into the recess of said jaw member.

The body of die 10 has a horizontal slot extending from a point near the hollow shaft 3 to a point near the end of the die and in this slot lies a transverse clamp operating shaft 16 one end of which has an easy rotating and sliding fit in a hole bored

through cam member 12 while an enlarged portion 17 of the other end of the shaft has a similar fit in a hole bored through jaw member 13. A clamp member 18, recessed similarly to jaw member 13, is also fitted upon shaft 16 and held between the shoulder 19 of said shaft and a clamping lever 20 which is keyed upon said shaft and held in position by nut 21. A pin 22, fixed in jaw member 13, has sliding engagement with a corresponding hole through clamp member 18.

The sleeve like outer end of cam member 12 is provided with a pair of oppositely arranged and similarly disposed notches 23 each of which has one straight face and one concave face 24 which constitutes a cam surface. A transverse riding bar 25 having projecting ends, passes diametrically through shaft 16 adjacent to cam member 12 and is held in position by the collar 26, itself held from slipping off by the nut 27. A spring 28 surrounds shaft 16 and is held between the inner side of cam member 12 and collar 29 fixed to said shaft.

The length of shaft 16 is such that, when clamp member 18 is drawn against jaw member 13, the riding bar 25 will just clear the end of cam member 12 and when the riding bar is at the bottom of notches 23 clamp member 18 will be sufficiently distant from the jaw member 13 to permit the end 14 of pipe 14' to be inserted into the recess of said jaw member.

An adjusting screw 30 has one end fixed in the outer end of jaw member 13 and passes loosely through a hole bored in a plate 31 screwed or otherwise fixed to the outer end of die 10. Nuts 32 are threaded upon screw 30 upon each side of said plate. By suitably turning said nuts 32 upon the screw the jaw member 13, together with shaft 16, cam member 12, clamp member 18 and clamping lever 20, all fixed thereupon, may be adjusted to and fro in the length of the die so as to vary the position of the end or head 14 of pipe 14'; when nuts 32 are tightened upon plate 31 the position of the pipe end will be fixed until the described adjustment is changed.

The operation of my invention is as follows: The several parts of the mechanism being in the position shown in Figs. 1 and 2, the pipe 14' is placed in the peripheral groove of die 10 with its previously shaped end or head 14 in the recess of clamp member 13. Clamping lever 20 is then drawn outward and downward, thereby rotating shaft 16 and causing the riding bar 25 to rise on the concave cam face 24 of cam member 12, thereby compressing spring 28 and drawing clamp member 18 toward the jaw member 13. As the clamping lever reaches its lowest position the riding bar 25 will slip out of the notches 23 and lie upon the flat

outer face of cam member 12 and the clamp member 18 will be drawn against the jaw member 13 and hold the pipe end 14 firmly in position. The bending rollers 5 are then moved inwardly by the admission of air to air cylinder 9 and the die 10 is revolved, counter clock-wise, to the position shown in Fig. 3 thereby producing a right angle bend in the pipe. By revolving the die through a lesser or greater angle the angle of bend will be correspondingly changed.

The bending operation, as above described, is that of the Lassiter patent previously referred to and I claim no part of the same as my invention other than that which has to do with the clamping of the pipe end. Should it be desirable to produce a bend in pipe 14' at a greater or less distance from the end of the pipe, the nuts 32 are loosened and the screw 30 rotated in one direction or the other, thereby sliding the adjustable portion of the die in or out as the case may be. The nuts 32 are tightened on the plate 31 when the desired position for the pipe end has been obtained. The operations as just above described are then performed. Fig. 4 shows the adjustable part of the die set for a distance between pipe end and bend greater than that shown in Figs. 1, 2 and 3. When the bend has been completed the bending rollers are withdrawn, the clamping lever 20 thrown upwardly and inwardly, thereby permitting the riding bar 25 to drop into the bottom of the notches 23 and spring 28 to move clamp member 18 away from the jaw member. The pipe is then removed.

While I have shown the die of my invention as applied to a Lassiter bending machine as disclosed in the previously referred to patent, I do not limit myself to such use as obviously my die may be adapted to various mechanisms within the spirit of the invention. Essentially all that is required to use said die is that there be bending rollers or the equivalent adapted to be placed against the pipe and that thereupon said bending rollers and die be arranged to move relatively to the axis of the peripheral groove. Furthermore, while I have shown my die as applied to a pipe it is obvious that strips, channel bars, and other linear structures may be usefully bent therein.

Having described my invention I claim:

In a pipe bending die of the class described and adapted to be revolved about an axis, means for holding the end of the pipe said means comprising a jaw member and a notched cam member slidably engaged with the die, a clamp operating shaft passing slidably and rotatably through said jaw and cam members, a clamp member and a riding bar fixed to said shaft and the length of said shaft being such that when the riding bar is free of the notches the clamp and jaw members are drawn together while when the

riding bar is at the bottom of the notches  
the clamp member and jaw member are separated so as to admit the end of the pipe, means for rotating said shaft, and means  
5 engaging both the die and the pipe end holding means whereby the latter may be moved along the die with respect to the axis thereof.

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

CHARLES H. TRUE.

Witnesses:

E. C. PATTERSON,  
M. S. ROUSMANIERE.