

March 17, 1925.

1,530,261

J. H. HAWES

PIPE OR TUBE BENDING MACHINE

Filed March 7, 1923

FIG. 1.

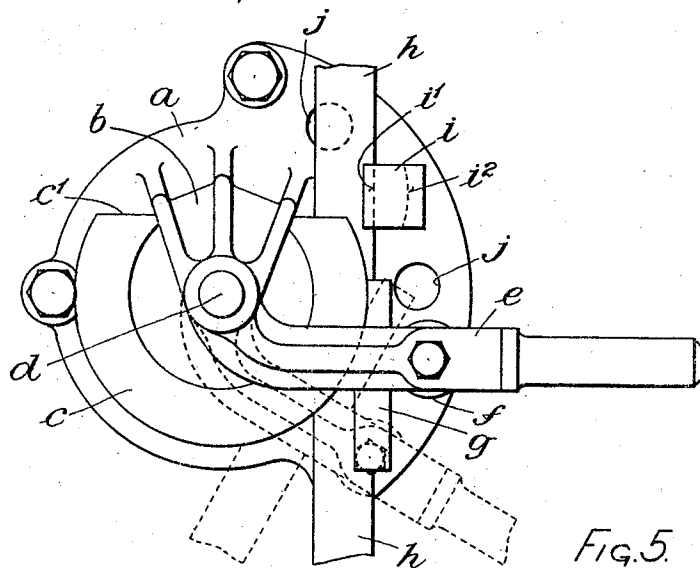


FIG. 5.

FIG. 2.

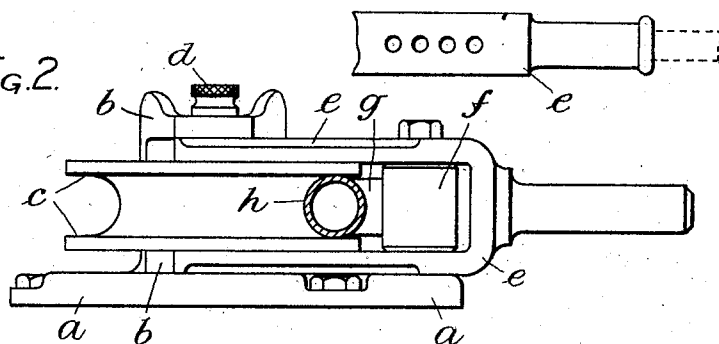


FIG. 3.

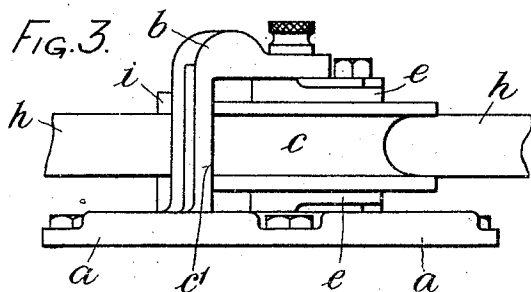
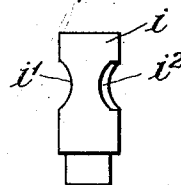


FIG. 4.



Inventor
John H. Hawes
by Wilkinson & Hirst
Attorneys

UNITED STATES PATENT OFFICE.

JOHN HENRY HAWES, OF LONDON, ENGLAND.

PIPE OR TUBE BENDING MACHINE.

Application filed March 7, 1923. Serial No. 623,470.

To all whom it may concern:

Be it known that I, JOHN HENRY HAWES, a subject of the King of Great Britain, of 14 to 19 Tottenham Mews, Tottenham Street, London, England, have invented a new and useful Improvement in or Relating to Pipe or Tube Bending Machines, of which the following is a specification.

This invention relates to tube or pipe bending machines of the kind wherein the tube to be bent is placed between the curved periphery of a former or radius wheel and a straight shield, and a roller carried by a radial lever is adapted to travel over the back of the shield to transmit the bending force therethrough to the tube and bend the same around the said former or radius wheel.

In apparatus of this kind the bending roller has always been carried upon a radial lever so as to engage the shield on a radial line passing through the bending point, or substantially so, and I find that with such an arrangement very thin tubes are distorted during bending if they are not filled.

It has been proposed to employ with a radial lever such as mentioned a construction wherein the edges of the shield made contact with the edges of the former so that the opposing curved faces of the shield and former could not move towards one another when the edges were once in engagement and consequently the distribution of the pressure on the pipe was not satisfactory. It has also been proposed to employ with an inner former or radius wheel of slightly less depth than the tube an outer shield or former also of slightly less depth than the tube and divided longitudinally into two halves secured together by straps and in this arrangement the curved faces of the two halves which bear upon the tube were made in two different curves, a longitudinal gap being left alongside the tube where the curves meet, the arrangement being such that the pressure exerted tended to open out the divided former or shield and thus distribute the pressure.

It is the object of the present invention to provide an improved apparatus by which very thin tubes may be bent without distortion and without being filled, the improved machine, being, however, also useful for bending tubes of thick gauge when required.

To this end and according to the first and principal feature of the present invention the bending roller is so mounted on its lever as to always engage the shield and transmit the bending force therethrough to the tube at a point between 10° and 25° , but preferably approximately 15° beyond a radial line passing through the bending point.

Secondly, the lever carrying the bending roller is preferably cranked or offset forwardly so that when the parts are assembled for operation with the lever lying at substantially 90° with the tube to be bent, the roller will be so placed as to engage the shield at the beforementioned correct angular position as soon as the handle is pulled forward to exert the bending pressure.

Thirdly, the former or radius wheel is flanged outward sufficiently beyond its curved face to permit the curved face of the solid shield which is made with thin or knife like edges to slide to and from the tube between the said flanges which act as a guide, and thus form an effective support for holding the tube and properly distributing the pressure thereon without the view of the operation being obstructed during working, as is the case where a cover plate and interchangeable form wheel are employed, and thus the operation of bending tubes to templates or measurements is facilitated.

Fourthly, each machine is preferably provided with adjustable and interchangeable forms or radius wheels and bearing studs and means for adjusting the position of the roller to adjust the machine for dealing with tubes over a given range of sizes and also to enable partially bent tubes to be accommodated in the machine when S bends and so forth are being made.

The accompanying drawings show one construction of the improved pipe bending machine.

Figure 1 is a plan,
Fig. 2 is a front elevation of Fig. 1, and
Fig. 3 is a side elevation of Fig. 1 from the left.

Figs. 4 and 5 are details.

Referring to the drawings, *a* is a base plate provided with a bracket *b* in which is mounted a radius wheel *c* having a grooved and flanged periphery. The back of the said radius wheel is cut away so as to provide a flat part *c*¹ which takes support against the bracket *b*; a central removable through pin *d* serves to secure the radius

wheel in position and also forms the pivotal centre of an operating lever *e* which is preferably cranked or curved towards the pivot as shown, so that when the parts are assembled with the said lever *e* offset forwardly and lying at substantially 90° with the tube to be bent, the bending roller *f* carried by the lever will be in correct position to engage the shield. The grooved elongated shield *g* is formed with thin edges and is adapted to fit within the flanges of the radius wheel *c* whereby the grooved inner face of the shield embraces a suitable length of that portion of the tube *h* to be bent which lies in advance of the bending point, and thereby spreads the bending pressure and avoids the tube being damaged, during the operation, *i* is a stud adapted to be fitted in one of a number of holes *j* in the base plate and forming an abutment against which the length of pipe preceding the bending point may bear.

This said stud *i* is formed with one grooved side *i*¹ and one curved and grooved side *i*² as shown to form an efficient support for the tube as hereinafter set forth.

A machine of a given size and strength is preferably provided with a series of interchangeable radius wheels, tube shields, and bearing studs, and a series of holes in the lever (see Fig. 5) for adjusting the position of the roller so as to allow of the machine being used for tubes of different diameters within its range.

In operation, the tube *h* is passed into the machine so as to bear against the stud *i* and with the portion to be bent lying against the grooved periphery of the radius wheel *c*, the elongated grooved shield *g* is now slid over the tube between the same and the bending roller *f* and in such position as to lie between the flanges of the radius wheel so that the tube will be adequately supported around its circumference between the shield and the former or radius wheel as the bending proceeds.

When the parts are thus assembled with the handle of the cranked lever lying at substantially 90° with the tube the bending roller *f* will be conveniently brought to correct position in advance of the bending point to engage the shield at the before-mentioned point on a radial line approximately 15° beyond the bending point so as to exert the bending force in such advanced position during the bending operation that distortion of the tube both on the internal and external portion of the bend is avoided. I find the best results are obtained when the roller operates within an angle of 10° to 25° beyond the bending point.

As soon as the lever *e* is pulled forward the roller *f* travels over the back of the shield *g* and therethrough transmits the bending pressure to the tube and bends the

same around the radius wheel *c*. As the bending proceeds the shield *g* is gradually tilted as indicated in dotted lines in Fig. 1 until the roller *f* approaches the end of the shield when the lever *e* and roller are moved back slightly to release the shield which is then slid forward along the unbent portion of the tube and the operation is repeated until the tube is bent around the form to the required extent, the shield is now released by moving back the operating lever, and the bent tube may be removed. If it is inconvenient to draw out the bent tube from the front the pivotal pin *d* can be removed which allows both the operating lever together with the bent tube to be released.

In operating upon the end of a tube the other part of which has already been bent in a reverse curve the stud *i* is so placed that its curved and grooved face *i*² receives the bent part of the tube. The said stud may be placed in one or other of the holes *j* as may be necessary by the bend required and the position of the bending roller.

By dispensing with the use of a cover plate for the radius wheels or forms and by using flanged radius wheels such as *c* supported from the base by a bracket such as *b* together with a knife edged shield such as *g* and interchangeable stops such as *i* the position of which may be altered by the series of holes *j* the bending operation is sufficiently exposed to view to enable the operator to bend a tube to a template or desired measurements with great facility.

Further, it will be seen that in the process of bending, the tube is protected by the shield through which the bending force is transmitted by the roller operating beyond the bending point as described and thus the bending force is applied in such manner as to prevent damage to the tube and for this reason the use of filling is not required even with tubes of very small gauge.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A tube bending machine of the type referred to, comprising the combination of a radius wheel, and a shield with coacting faces grooved and proportioned to the tube to be bent, a lever mounted to turn on the axis of the radius wheel, and a bending roller mounted on said lever to contact with the back of the shield and transmit the bending force therethrough at a point lying on a radius of said wheel advanced from ten to twenty-five degrees from the radius of the wheel projecting through the bending point of the pipe.

2. A tube bending machine, comprising the combination of a radius wheel, and a shield with coacting faces grooved and proportioned to the tube to be bent, a lever mounted to turn on the axis of the radius wheel, a bending roller mounted on said

lever in position where the periphery of the bending roller will contact with the back of the shield at a point on a radius spaced substantially fifteen degrees in advance of the
5 radius passing through the bending point of the tube.

3. A tube bending machine of the kind described comprising a base plate, a bracket supporting the base plate, a flanged former
10 or radius wheel carried by the bracket, a grooved shield cooperating with the former or radius wheel to receive the pipe to be bent, a bending roller adapted to bear against
15 said shield, and a forwardly offset lever carrying and moving said bending roller, said lever supporting the bending roller initially at a point approximately 15° in advance of the bending point.

4. A tube bending machine of the kind
20 referred to comprising the combination of a radius wheel with curved periphery and flanges extending outwards beyond said curved periphery, a cranked lever carrying an adjustable bending roller, a base plate, a
25 bracket fixed to said base plate and overhanging said radius wheel and the pivotal

end of said cranked lever, a pivotal pin passing through said bracket, lever, and radius wheel and into said base plate, a solid elongated tube shield having its inner face
30 curved to fit the tube and formed with knifelike upper and lower edges so as to pass within the flanges of the radius wheel and embrace the tube to be bent; a stop for
35 engaging and supporting the tube and means for changing the position of the stop on the base plate.

5. A tube bending machine comprising a base plate, a former on the base plate having a tube receiving groove and confining
40 flanges, a grooved shield adapted to project between said flanges and having knife edges adapted to bear against the inner opposite faces of said flanges and cooperate therewith to uniformly support the tube, a lever
45 pivoted concentrically to the former and offset forwardly in the direction of swinging of the lever from ten to twenty-five degrees from the radius of the bending point of the tube, and a roller mounted on said
50 forwardly offset lever to engage said shield.

JOHN HENRY HAWES.