E. J. BUTLER.

TUBE BENDING DEVICE.

APPLICATION FILED AUG. 8, 1908.

916,530.

Patented Mar. 30, 1909.

2 SHEETS—SHEET 1.

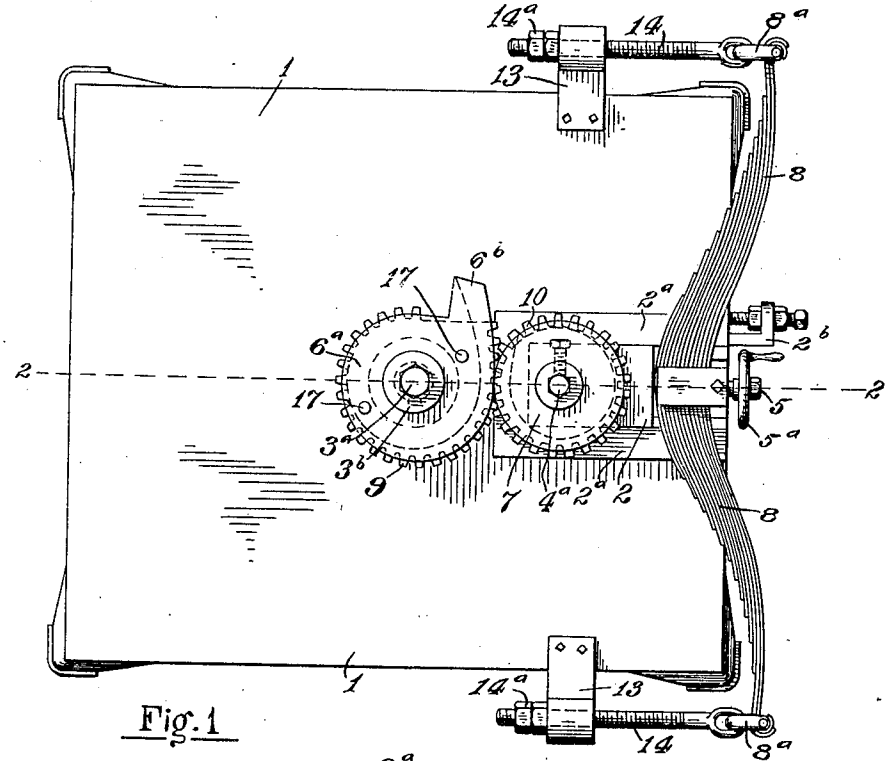

Fig. 1

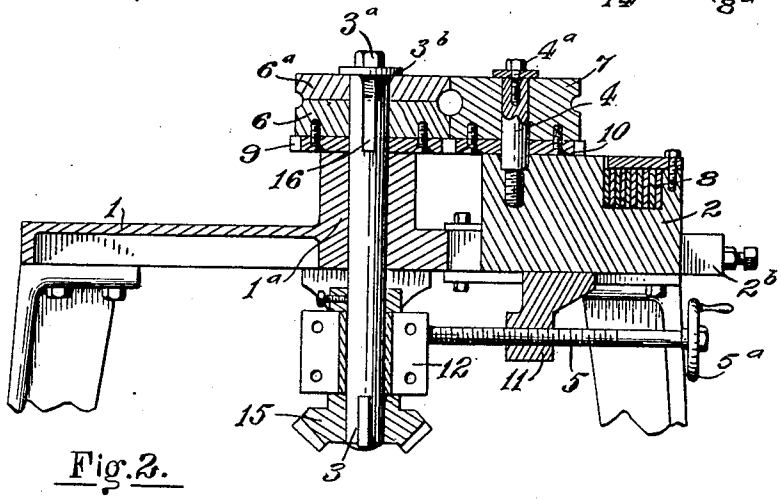

Fig. 2.

Witnesses
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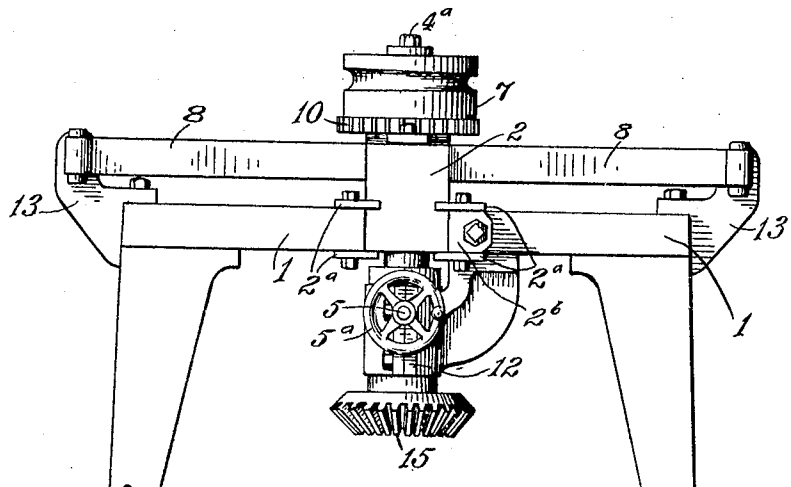

Fig. 3.

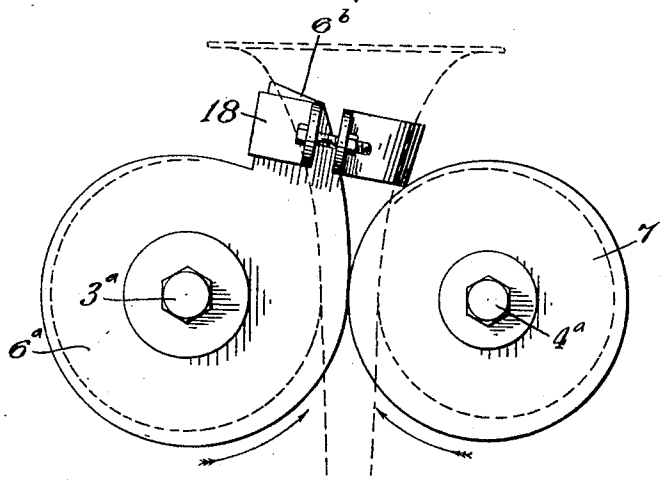

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

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TUBE-BENDING DEVICE.

No. 916,530. Specification of Letters Patent. Patented March 30, 1909.

Application filed August 8, 1908. Serial No. 447,586.

To all whom it may concern:

Be it known that I, EDWARD J. BUTLER, a citizen of the United States of America, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Tube-Bending Devices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in tube bending devices, and more particularly to such devices as are adapted for bending the tubing used in the manufacture of brass musical wind instruments; and its object is to provide a device in which such tubes may be bent rapidly, uniformly and true; that will avoid buckling or wrinkling the tubes on the compressed or concave side of the curve; that will permit the bending of such tubes in either true or irregular curves, and in various other new and useful features hereinafter more fully described and particularly pointed out in the claims.

My device consists essentially of two rotatable forming dies one of which is provided with means for clamping one end of the tube to be bent to the same, providing means for holding the two dies in yielding engagement with the tube to be bent, and providing means when a tube is bent in more than a half circle for removing the bended tube without springing or unbending the same, as will more fully appear by reference to the accompanying drawings, in which:

Figure 1 is a plan view of my improved bending device; Fig. 2 a vertical section taken on the line 2—2 of Fig. 1; Fig. 3 an end elevation of the same; and Fig. 4 an enlarged detail in plan view of the two forming dies illustrating the manner in which the tube as made ready to commence the operation of bending is held in the machine (the arrows indicating the direction of rotation of the forming dies).

Like characters refer to like parts in all of the figures.

1 is a table integral with which is a bearing 1^a in which is journaled a shaft 3, which shaft is also journaled at its lower end in an auxiliary bearing 12 and provided with a gear 15 through which motion is imparted to said shaft 3. A horizontally adjustable head 2 is gibbed in ways 2^a on the table 1 and is yieldingly moved toward the shaft 3 by a spring 8, the tension of which is maintained through the links 8^a, the eye-bolts 14, which are provided with adjusting nuts 14^a, and the brackets 13 which are fixed on the table 1. On the head is fixed a screw threaded bracket 11 to receive the screw 5, the end of which screw engages the bearing 12, and is adapted to move the head 2 backward against the tension of the spring 8, a hand wheel 5^a being provided for rotating said screw. Splined to the upper end of the shaft 3 is one of the forming dies which consists of the lower half 6 and the upper half 6^a. These halves are caused to register in their proper relation by the spline 16 and the pins 17. A gear 9 is fixed on the lower half 6 of the die and is also engaged by the spline 16. A flange cap screw 3^a is threaded in the upper end of the shaft 3 to hold the two halves 6 and 6^a of this forming die together when the device is in operation.

A stud 4 is fixed in the head 2, said stud being parallel with the shaft 3 and spaced apart therefrom. Upon this stud is mounted the second forming die 7, on the under side of which is fixed a gear 10, which when the dies are in operative position meshes with the gear 9 of the other forming die and synchronizes the peripheral relation of these dies when in the operation of bending a tube. A flanged cap screw 4^a is threaded in the upper end of the stud 4 to hold the forming die 7 in horizontal operative position.

The operation of my device is as follows: After the tube to be bent is prepared in the usual manner, it is secured to the extension 6^b of the divided forming die by the clamp 18. The forming dies are brought into engagement with the tube and the gears 9 and 10 in mesh by the tension of the spring 8 which is set sufficient to overcome the resistance developed by the bending of the tube. The forming dies are then rotated in the direction indicated by the arrows (Fig. 4) until the required amount of curvature is obtained.

In many of these bending operations the tube is required to be bent more than a half circle, which would make it impossible to remove the bended work from the die around which it is bent without springing or unbending it sufficient to pass it over the largest diameter of the groove of the die. To avoid

this necessity, I have divided the forming die around which the tube is bent in the plane of the axis of its groove, and after the tube is bent to the required degree, I draw the head which carries the forming die 7 away form the work by means of the screw 5, remove the clamp 18, then the flanged cap screw 3[a], and then the upper half 6[a] of the forming die is removed and the work fully released. The peripheral conformation of these forming dies, and the cross section conformation of their grooves may be varied to meet the requirements of any particular shape of tube to be bent, thus developing any required form of curve or angle desired.

By my improved device I am able to bend tubing from the lightest to the heaviest into any required form without buckling the concave side and at a great saving of time and expense. I am able to bend a tube complete from the time of putting the work into the device to removing it and preparing the device for the reception of another tube in two to three minutes, while to bend a like tube by hand as now done, would require from three to four hours. Another advantage that I gain is a perfect uniformity of work.

What I claim is:

1. In a device of the class described, the combination of two rotatable forming dies having grooves in their edges, means for synchronizing the peripheral relation of the dies, means for detachably securing one end of the tube to be bent to one of said dies, a spring for yieldingly holding the dies in contact with the tube, means for imparting a rotary motion to said dies, and means for overcoming the tension of the spring to separate the dies.

2. In a device of the class described, the combination of two rotatable forming dies having grooves in their edges one of said dies being divided in the plane of the axis of its groove the peripheral relation of which dies is maintained by gears, means for detachably securing one end of the tube to be bent to one of said dies, a spring for yieldingly holding said dies in contact with said tube and the gears in mesh, means for imparting a rotary motion to said dies, and a screw to overcome the tension of the spring and separate the dies.

3. In a device of the class described, the combination of two rotatable forming dies having grooves in their edges, one of said dies being mounted on a driving shaft, a head adapted to be moved toward and from the first named die, on which head the other die is mounted, gears to synchronize the peripheral relation of said dies, a spring engaging the head to hold said dies in peripheral contact and said gears to mesh, a screw to move the head away from the shaft, a clamp to detachably secure one end of the tube to be bent to one of said dies, and means for rotating the said dies.

4. In a device of the class described, a table on which a rotatable die having a groove in its edge is journaled, a head adapted to traverse in the table in ways therein, a second rotatable die having a groove in its edge and journaled on said head, a spring attached to the head to move said second die into engagement with the tube to be bent, gears on said dies which mesh to synchronize the peripheral relation of the same, an extension on one of said dies, a clamp to secure the tube to be bent to said extension, means for imparting a rotary motion to said dies, and a screw to move said head against the tension of the spring.

5. In a tube bending machine, a driving shaft, a rotary die fixed on the shaft, a head movable toward and away from the shaft, a second rotary die journaled on the head, an oppositely projecting spring carried by the head, tensioning bolts attached to the respective ends of the spring and slidable in fixed brackets, nuts on the bolts, and a screw connected to the head to move the same to separate the dies.

6. In a binding machine, a table, a driving shaft journaled in the table, a head movable toward and from the shaft, rotary dies respectively on the shaft and head, gears connecting the dies, a spring carried by the head, and oppositely projecting therefrom, tensioning bolts attached to the spring, brackets attached to the table in which the bolts are inserted, and a screw mounted in the head to move the same away from the shaft.

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

EDWARD J. BUTLER.

Witnesses:

GEORGIANA CHACE,
MINNIE JOHNSON.