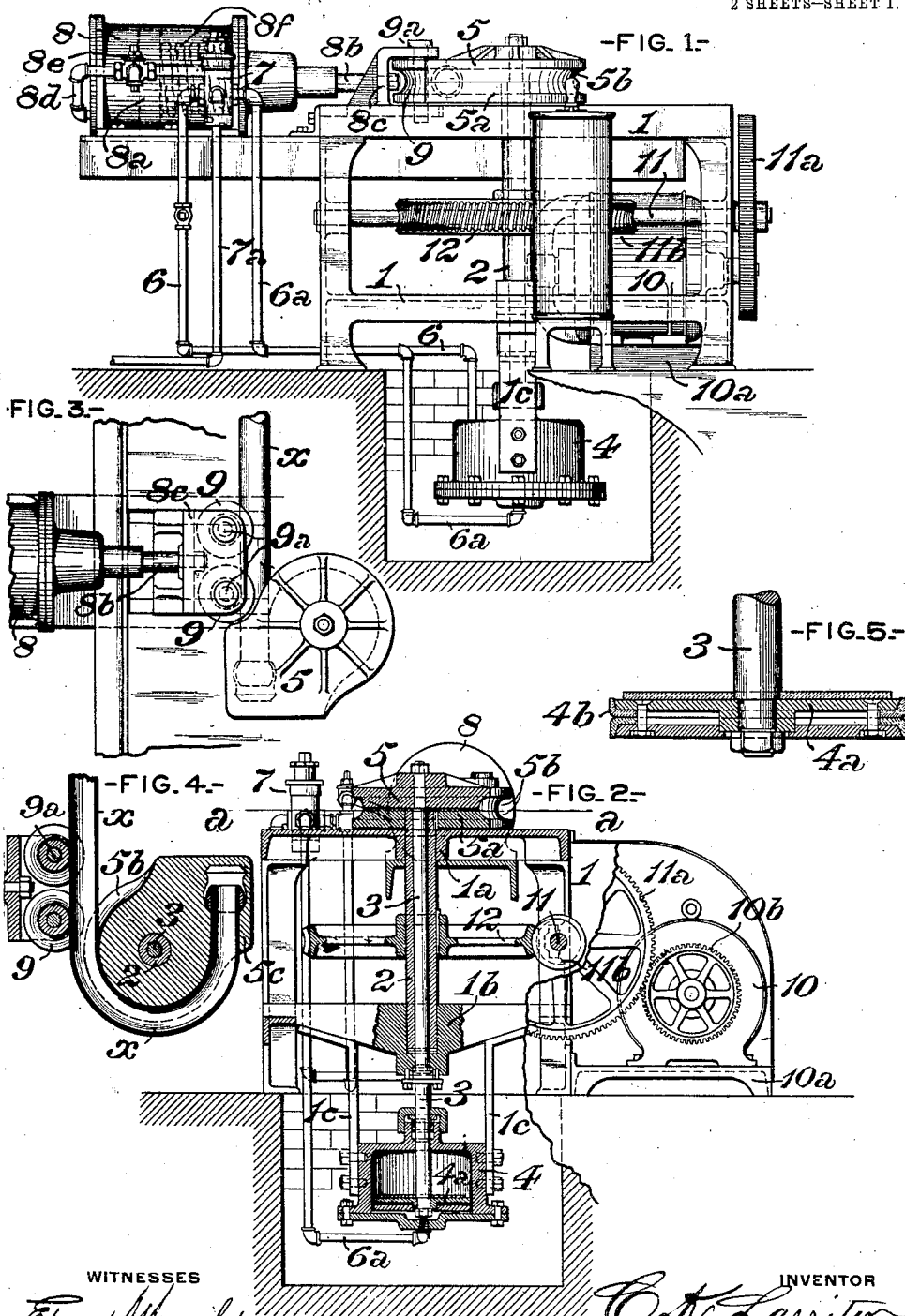


C. K. LASSITER.
 PIPE BENDING MACHINE.
 APPLICATION FILED SEPT. 9, 1912

1,052,069.

Patented Feb. 4, 1913

2 SHEETS-SHEET 1.

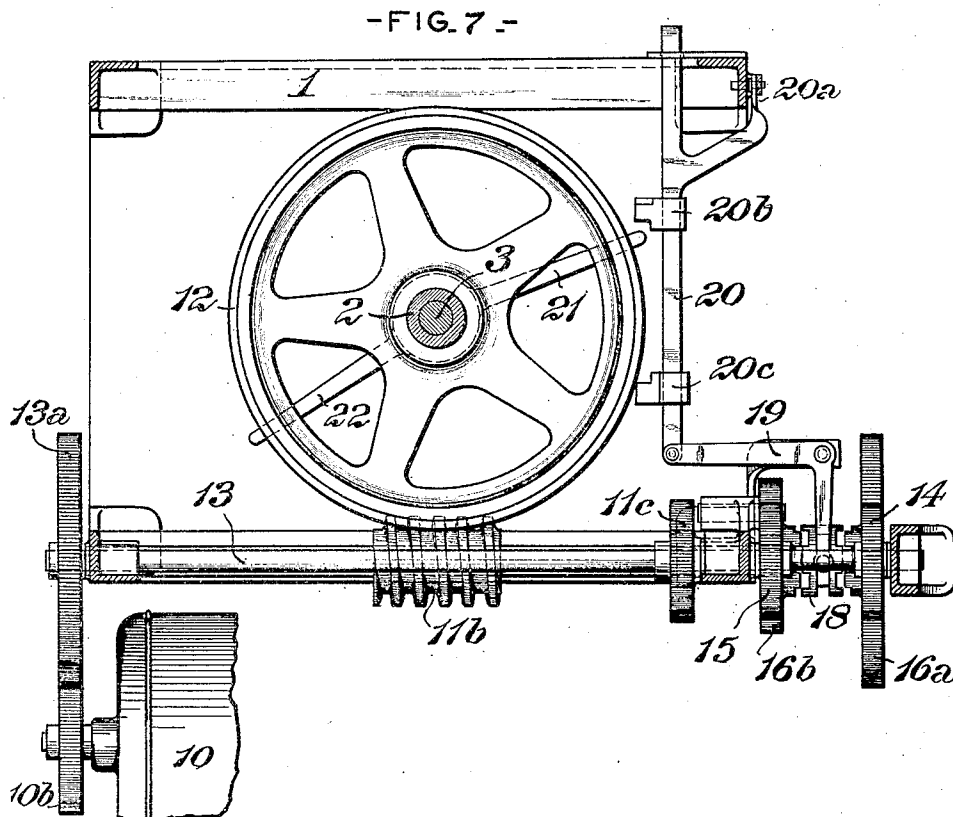
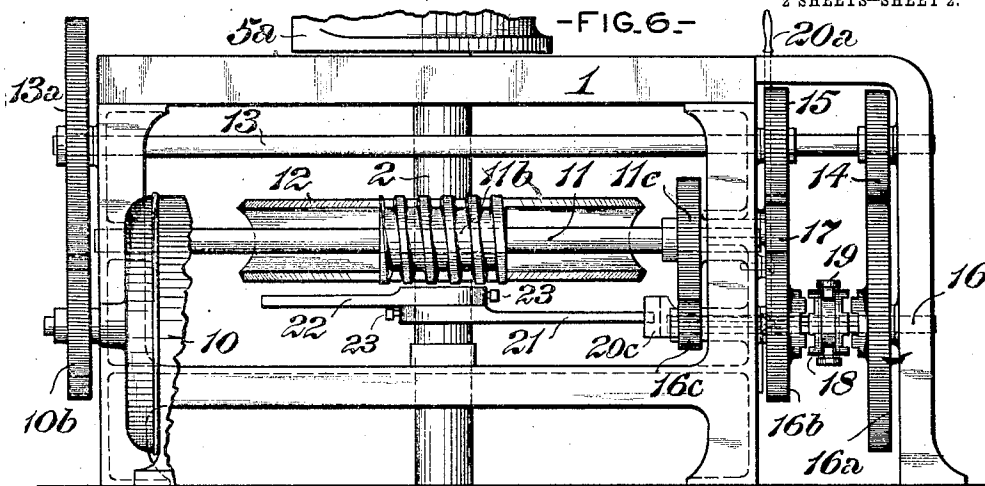


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WITNESSES

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UNITED STATES PATENT OFFICE.

COLUMBUS K. LASSETER, OF RICHMOND, VIRGINIA

PIPE-BENDING MACHINE.

1,052,069.

Specification of Letters Patent.

Patented Feb. 4, 1913.

Application filed September 9, 1912., Serial No. 719,308.

To all whom it may concern:

Be it known that I, COLUMBUS K. LASSETER, of Richmond, in the county of Henrico and State of Virginia, have invented a certain new and useful Improvement in Pipe-Bending Machines, of which improvement the following is a specification.

The object of my invention is to provide a simple and inexpensive mechanism whereby lengths of metal pipe may be bent, with accuracy and rapidity, on different desired radii, within a determined range.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a side view, in elevation, of a pipe bending machine embodying my invention; Fig. 2, an end view, as seen from the right, partly in vertical section in the axial plane of the forming die shaft; Fig. 3, a partial plan or top view; Fig. 4, a horizontal section, on the line *a a* of Fig. 2, showing the dies in position occupied after a pipe has been bent; Fig. 5, a transverse section, through the piston of the clamping cylinder; Fig. 6, a side view, illustrating the application of modified means for automatically stopping and reversing the forming dies; and, Fig. 7, a partial horizontal section illustrating the same.

In the practice of my invention, a substantial frame or table, 1, is provided for the support of the operative mechanism, and a vertical tubular forming die shaft, 2, is journaled in an upper bearing, 1^a, and a lower bearing, 1^b, in the frame. A clamping stem, 3, passes freely through the bore of the die shaft, 2, and is secured at its lower end, to a piston, 4^a, provided with packing rings, 4^b, preferably in the form of cup leathers, and fitting a clamping cylinder, 4, suspended upon the frame by hangers, 1^c. An upper forming die, 5, is secured upon the upper end of the stem, 3, and a similar lower forming die, 5^a, is secured upon the adjoining end of the tubular shaft, 2, in position to abut against the upper die, 5. As most clearly shown in Figs. 2 and 4, a peripheral groove, 5^b, is formed in each of the forming dies, the grooves being of quarter circle transverse section, so as to present a groove of semi-circular transverse section when the dies are brought into contact, and extending circularly around the major portion of the peripheries of the dies. The remaining portion of each of the

grooves is substantially tangential to its circular portion, and extends, in semi-circular section, into the metal of the die, forming an end stop, 5^c, which engages, and holds straight, the length of pipe, *x*, on which the machine operates, at and adjoining one of its ends.

It will be obvious to those skilled in the art, that the radii of the grooves, 5^b, in transverse section, must be in substantial correspondence with the half diameters of the pipes to be bent, and the radii of peripheral curvature of the grooves in correspondence with the curvature to which the pipes are desired to be bent. Separate removable and insertible pairs of forming dies must therefore be provided to suit correspondingly different diameters of pipes and different desired curvatures to be produced therein.

The upper forming die, 5, is moved upwardly, away from the lower forming die, 5^a, to admit of the insertion and removal of the lengths of pipe to be bent, in the grooves, 5^b, of the dies, and moved downwardly, to and against the lower die, to hold the pipe in the grooves and end stop, 5^c, by the admission of fluid under pressure, as steam or compressed air, to the lower or to the upper side, as the case may be, of the piston, 4^a, of the clamping cylinder, 4. The admission and exhaust of motive fluid to and from the upper and lower ends of the cylinder, 4, is effected through pipes, 6, 6^a, connecting said ends with a suitable four way controlling valve mechanism, 7, to which motive fluid is admitted by a supply pipe, 7^a.

A guide cylinder, 8, is secured upon the top of the frame, at substantially a right angle to the axis of the forming dies, and is fitted with a properly packed piston, 8^a, the rod, 8^b, of which, is connected to a cross head, 8^c, in which two guide rollers, 9, each having a peripheral groove of substantially semi-circular section, are journaled on vertical pivots, 9^a. The axis of the cylinder, 8, and the middle horizontal plane of the guide rollers, 9, are in a plane coincident with the plane of contact of the adjoining faces of the upper and lower forming dies, 5, 5^a. The rollers, 9, therefore, present curved bearings for one side of the length of pipe, *x*, desired to be bent, which are in the same horizontal plane as the bearing of the grooves of the forming dies on the op-

posite side of the pipe. Fluid under pressure is admitted to the left hand side of the piston, 8^a, through a pipe, 8^b, to move the guide rollers toward the forming dies, the admission and exhaust of fluid being controlled by an ordinary three way cock, 8^c, and upon the exhaust of motive fluid from the cylinder, the piston, cross head, and guide rollers, are retracted by a spring, 8^d.

The forming dies are, in each bending operation, rotated through such portion of a revolution as may be requisite to impart the desired curvature to the pipe, by the application of power, from any suitable and conveniently located prime mover, to the die shaft, 2. As herein exemplified, the prime mover employed is an electric motor, 10, supported on a bed plate, 10^a, connected to one side of the frame, and having a spur pinion, 10^b, fixed on its armature shaft and engaging a similar pinion, 11^a, on a horizontal countershaft, 11, journaled in the frame, 1, below the forming dies. The countershaft, 11, carries a worm, 11^b, which engages a worm wheel, 12, fixed on the tubular die shaft, 2.

Figs. 6 and 7 illustrate the application of mechanism whereby the rotation of the forming dies may be automatically stopped when the pipe has been bent to the curvature desired and the dies returned to position for commencing another bending operation. To this end, the spur pinion, 10^b, of the motor armature shaft, engages a corresponding gear, 13^a, fixed on a horizontal shaft, 13, which is journaled in bearings in the upper portion of the frame, and has secured upon it, near its opposite end, two spur pinions, 14 and 15. The pinion, 14, engages a corresponding gear, 16^a, fitted to turn freely on a lower horizontal shaft, 16, and the pinion, 15, engages an idle pinion, 17, fixed on a short shaft which is journaled in the frame between the shafts, 13 and 16. The idle pinion, 17, engages a gear, 16^b, which is fitted to turn freely on the shaft, 16, and a spur pinion, 16^c, fixed on said shaft, engages a corresponding gear, 11^a, on the shaft, 11, of the worm wheel, 12, through which rotation is imparted to the forming dies.

A clutch, 18, having the usual means, as an internal key fitting a spline, for enabling it to be moved longitudinally, on the shaft, 16, while relatively engaged therewith, and end projections for engaging corresponding projections on the gears, 16^a and 16^b, is mounted on said shaft, between said gears, and is movable into and out of engagement with either of them, or out of engagement with both of them, as the case may be, by a clutch lever, 19, of bell crank form, which is journaled on the frame and coupled to a shipping lever, 20, having a handle, 20^a, by the appropriate movements

of which lever, the engagement and disengagement of the clutch lever, with and from the gears, 16^a and 16^b, may be effected. Stops, 20^b and 20^c, are fixed adjustably on the shipping lever, 20, in position to receive the contact of arms, 21 and 22, which are fixed adjustably on the shaft, 2, by which the shipping lever and coupled clutch lever are moved in one or the other direction, as the case may be.

In starting the machine for bending a length of pipe which has been inserted between the forming dies and guide rolls, the clutch, 18, is first moved by the handle, 20^a, into engagement with the gear, 16^a, which, through the gears, 15, 16^c, and 11^a, above described, imparts the proper forward movement to the forming dies. When the traverse of the latter proper to bend the pipe as desired has been made, the arm, 21, strikes the stop, 20^b, of the shipping lever, and moves the clutch into the middle position shown in Figs. 6 and 7, thereby stopping the movement of the dies thereat. The operator then moves the handle, 20^a, in the opposite direction, and engages the clutch, 18, with the gear, 16^b, which, through the gears, 17, and 15, reverses the movement of the dies. When the dies have been returned to normal starting position, the arm, 22, strikes the stop, 20^c, and moves the clutch into the middle position, thereby stopping the operation of the machine. The arms, 21 and 22, are fixed on the die shaft, 2, by set screws, 23, so as to be adjustable to suit the different extent of the bends desired to be made.

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

1. In a pipe bending machine, the combination of two peripherally grooved forming dies, each having an end stop for a length of pipe, concentric shafts on which said dies are secured, means for longitudinally moving one of said shafts relatively to the other, means for coincidently rotating said shafts, and means for guiding a length of pipe in a direction tangential to the forming dies.

2. In a pipe bending machine, the combination of two peripherally grooved forming dies, each having an end stop for a length of pipe, concentric shafts on which said dies are secured, a fluid pressure cylinder, a piston fitting therein and connected to one of said shafts, means for effecting the supply and exhaust of fluid under pressure to and from opposite sides of said piston, means for coincidently rotating said shafts, and means for guiding a length of pipe in a direction tangential to the forming dies.

3. In a pipe-bending machine, the combination of two peripherally grooved forming dies, each having an end stop for a length of pipe, a tubular shaft on which one of

said dies is secured, means for rotating said shaft, a stem within said tubular shaft and to which the other of said dies is secured, fluid-operated means to move said stem
5 longitudinally to open and close said dies, a pair of guide-rollers movable laterally toward and away from said dies, fluid-op-

erated means for moving said guide-rollers, and valve mechanism for controlling said fluid-operated means.

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Witnesses:

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