No. 606,785. Patented July 5, 1898.

W. A. KEMP.

PIPE ELBOW BENDING MACHINE.

(Application filed Sept. 23, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

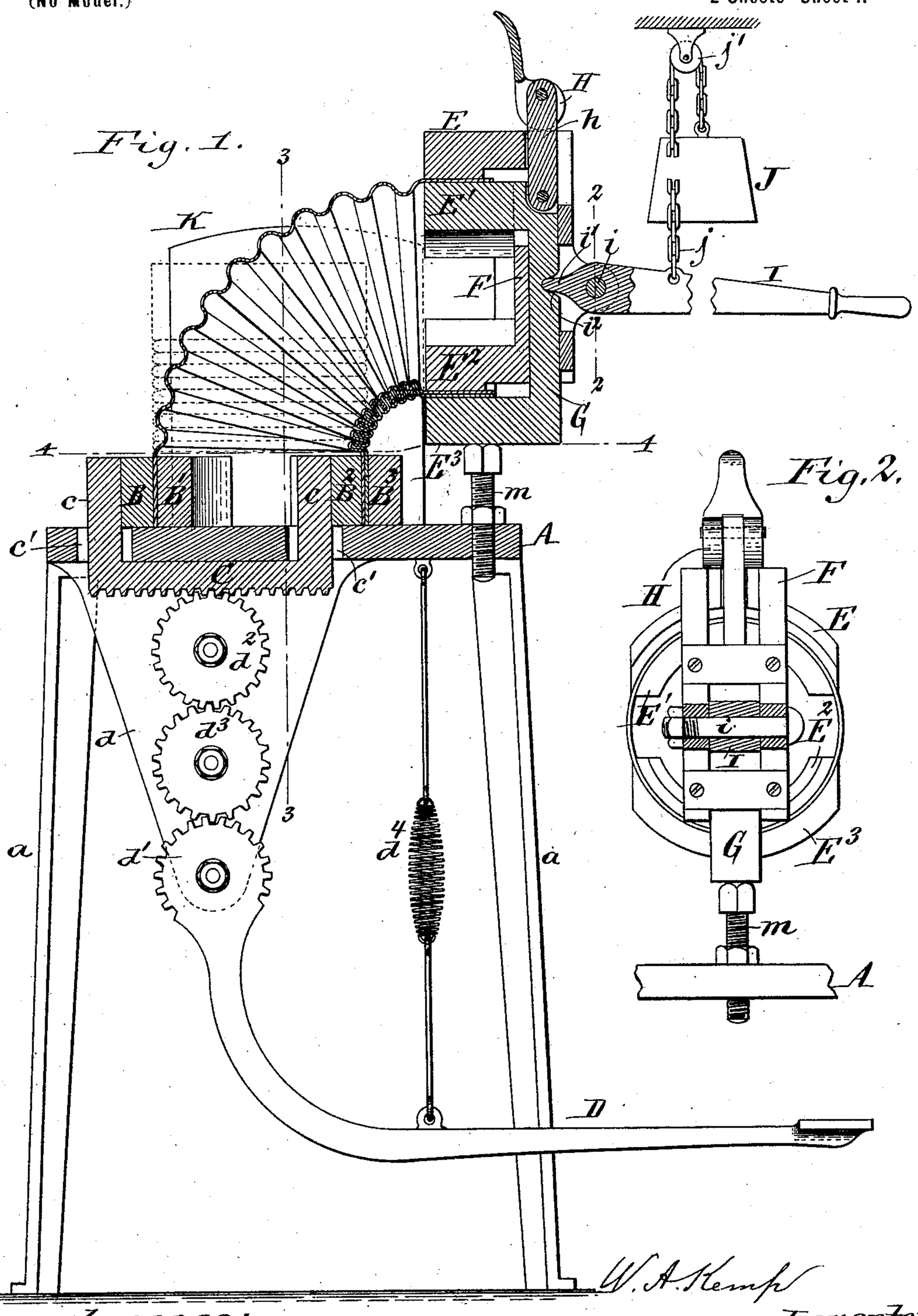

Fig. 2.

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Fig. 3.

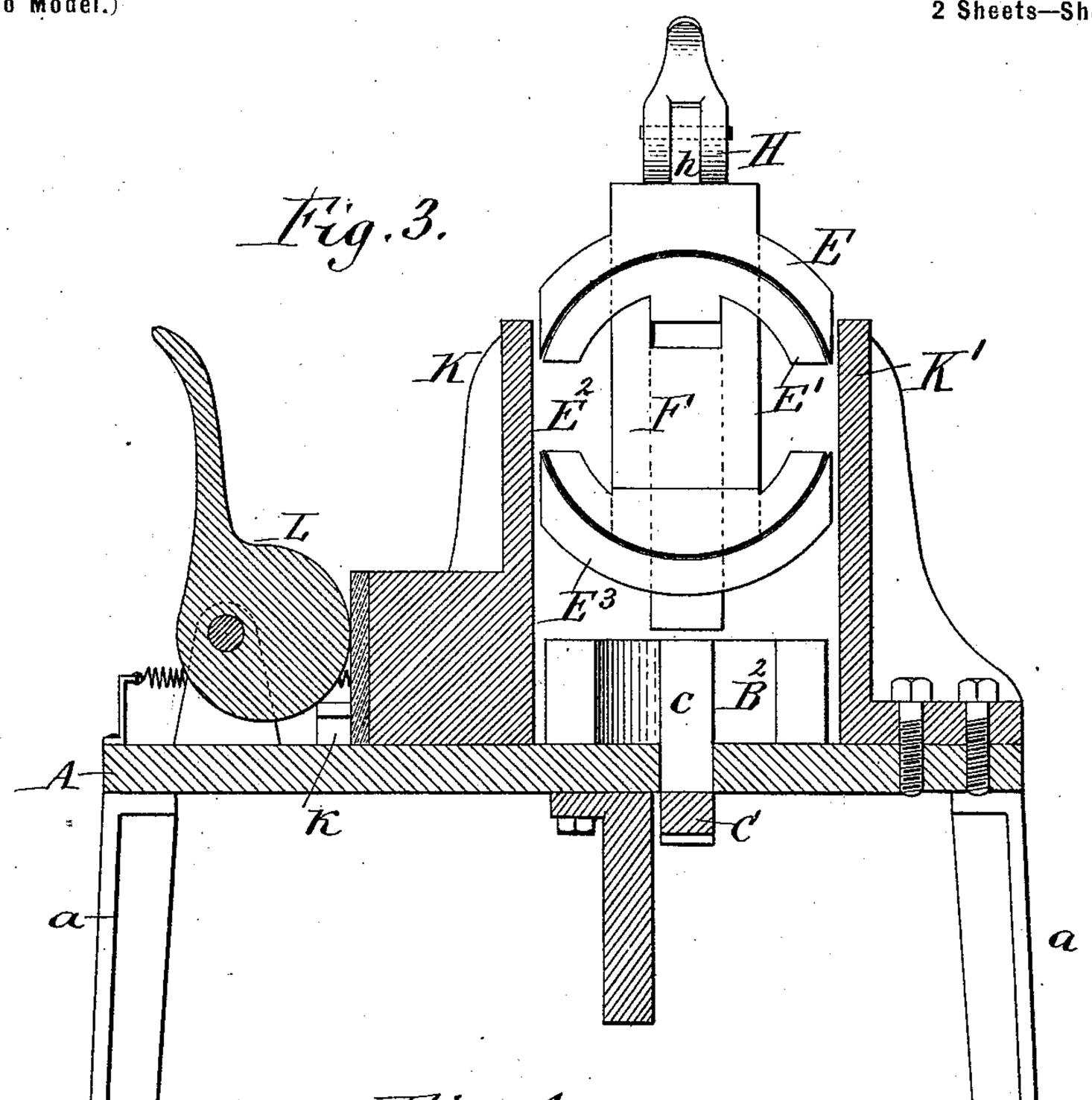
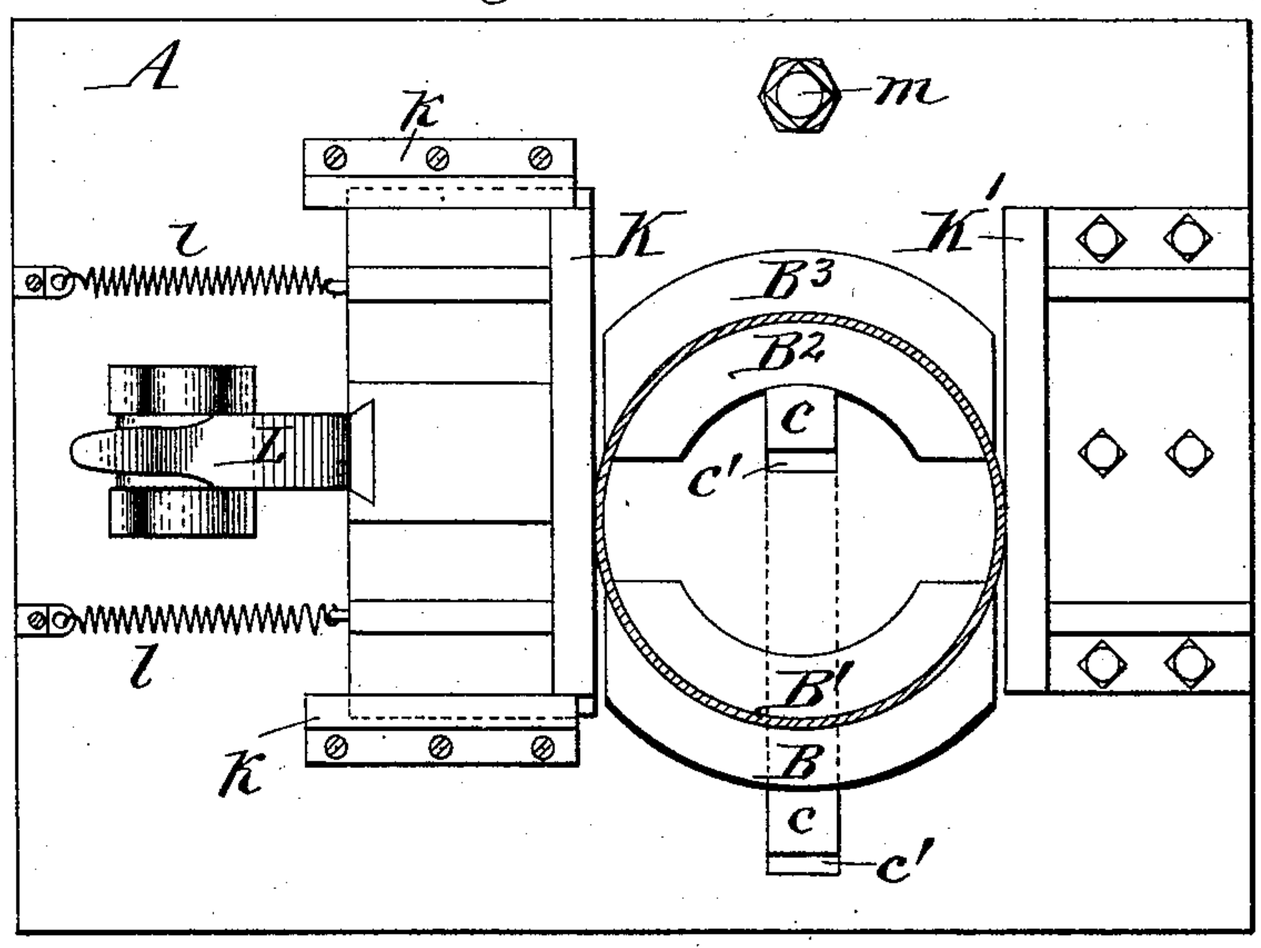


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM A. KEMP, OF TORONTO, CANADA.

PIPE-ELBOW-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 606,785, dated July 5, 1898.

Application filed September 23, 1897. Serial No. 652,735. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. KEMP, a subject of the Queen of Great Britain, residing at Toronto, in the county of York, in the Province of Ontario, Dominion of Canada, have invented a new and useful Improvement in Pipe-Elbow-Bending Machines, of which the following is a specification.

In the manufacture of a pipe-elbow in accordance with my improved method, for which I have filed a separate application for patent September 23, 1897, Serial No. 652,737, a blank of sheet metal is first corrugated transversely and then bent into a pipe, so that the corrugations extend circumferentially around the pipe. The corrugations are then compressed uniformly, and the pipe is finally bent into an elbow, whereby those portions of the corrugations which lie on the outer side of the elbow are stretched or distended, while the portions of the corrugations on the inner side of the elbow remain compressed.

The object of this invention is to provide a simple and efficient machine whereby the operation of bending a pipe into an elbow may be effected easily and quickly.

In the accompanying drawings, consisting of two sheets, Figure 1 is a vertical longitudinal section of my improved pipe-bending machine. Figs. 2 and 3 are vertical transverse sections in lines 2 2 and 3 3, Fig. 1, respectively. Fig. 4 is a horizontal section in line 4 4, Fig. 1.

Like letters of reference refer to like parts in the several figures.

A represents the horizontal bed or table of the machine, which is provided with supporting-legs *a*.

B B′ and B^2 B^3 represent two pairs of segmental clamping-jaws whereby the lower end of the corrugated pipe is held during the operation of bending the same into an elbow. These two pairs of jaws grasp diametrically opposite sides of the pipe, and each pair consists of a stationary jaw which is secured to the top of the table and a movable jaw which is movable horizontally toward and from the stationary jaw. One of the jaws of each pair has a convex face which bears against the inner side of the pipe, and the other jaw of the same pair has a concave face which bears against the outer side of the pipe. The stationary jaw B′ of one pair and the movable jaw B^2 of the other pair bear against the inner diametrically opposite sides of the pipe, and the movable jaw B and stationary jaw B^3 of the corresponding pairs bear against the outer diametrically opposite sides of the pipe. The movable jaws are operated simultaneously by a horizontally-reciprocating gear-rack C, arranged below the table and provided with two lugs *c c*, which project upwardly through openings *c′ c′* in the table and connect with the movable jaws. The gear-rack is reciprocated for opening and closing the jaws by a treadle D, pivoted to a hanger *d* on the table and provided with a gear-segment *d′* and intermediate gear-wheels d^2 d^3, also pivoted on the hanger and meshing with each other and with the gear-rack and the segment of the treadle, respectively. Upon depressing the treadle the jaws are closed and upon raising the treadle the jaws are opened, the jaws being normally held in the latter position by a spring d^4, connecting the treadle with the bed or other stationary part of the machine.

E E′ and E^2 E^3 represent two pairs of segmental clamping-jaws, whereby the upper end of the corrugated pipe is grasped and bent to one side, so as to form the same into an elbow. The two pairs of jaws grasp the pipe on diametrically opposite sides, and each pair consists of an inner jaw, having a convex face, which bears against the inner side of the pipe, and an outer jaw, having a concave face, which bears against the outer side of the pipe. The outer jaw E of one pair is connected by cross-bar F with the inner jaw E^2 of the other pair, and the inner jaw E′, coöperating with the outer jaw E, is connected by a cross-bar G with the outer jaw E^3, coöperating with the inner jaw E^2. The cross-bars are arranged to slide lengthwise, one upon the other, for opening or closing the two pairs of jaws. Preparatory to beginning the bending of the pipe the jaws are closed on the upper end of the pipe by means of a rotary cam H, which bears against the outer side of one of the cross-bars, and is pivotally connected by a link *h* with the other cross-bar.

I represents a hand-lever whereby the cross-bars and their clamping-jaws are carried and manipulated in bending the pipe. This lever

is pivoted to one of the cross-bars by a transverse pin *i* and provided with a tooth or lug *j'*, which engages with a notch or recess i^2 in the other cross-bar, whereby upon depressing this lever for bending the pipe the cross-bars are slid one upon the other in the direction for closing the jaw and increasing the pressure of the same upon the pipe, thereby preventing the same from becoming detached from the pipe during the bending operation. The weight of the hand-lever and the upper clamping devices mounted thereon is balanced by a counterweight J, which is connected with the hand-lever by a chain *j*, passing around an overhead roller *j'*.

While bending the pipe into an elbow its central portion tends to flatten into an oval shape by spreading outwardly at right angles to the plane in which the pipe is bent. In order to avoid this, two vertical retaining-plates K K' are arranged on opposite sides of the pipe parallel with the line of movement of the upper clamping devices. The retaining-plates bear against opposite sides of the pipe and confine the latter against spreading while the same is being bent into an elbow, and thereby prevent flattening of the central portion of the pipe. One of these plates is preferably secured rigidly to the table, while the other plate slides in transverse guideways *k* on the table toward and from the other fixed plate, thereby permitting of conveniently inserting a pipe between the plates and removing the same therefrom. The movable retaining-plate is moved inwardly toward the fixed retaining-plate by a cam L, pivoted on the table and engaging with the movable plate, and is moved outwardly by springs *l*, connecting the movable plate with the table.

The operation of bending a corrugated pipe into an elbow is as follows: The straight pipe is first placed in a vertical position, as shown in dotted lines, Fig. 1, between the retaining-plates and the open jaws of the lower clamping device. The jaws of the latter are then closed upon the pipe, whereby the lower end of the pipe is firmly secured in position. The movable retaining-plate is then adjusted inwardly, so that the pipe is confined snugly at its sides between the retaining-plates. The upper clamping device is now applied to the upper end of the pipe, so as to seize the same firmly and then swung laterally and downwardly together with the upper portion of the pipe in a plane parallel with the retaining-plates, whereby the pipe is bent into an elbow. Upon opening the clamps at both ends of the elbow and withdrawing the movable retaining-plate the finished elbow may be easily removed. The downward movement of the upper clamping device is preferably limited by a stop consisting of a vertical screw-bolt *m*, engaging with the table. By screwing this bolt up or down the angle of the elbow may be varied.

I claim as my invention—

1. In a machine for bending a pipe into an elbow, the combination with a stationary clamping device adapted to securely grasp one end of the pipe, and a movable clamping device adapted to grasp the opposite end of the pipe and to swing laterally with reference to the other clamping device, of retaining-plates adapted to bear against the sides of the pipe and arranged parallel with the plane in which the movable clamping device swings, substantially as set forth.

2. In a machine for bending a pipe into an elbow, the combination with a laterally-swinging clamp adapted to grasp the free end of the pipe, of a stationary clamping device composed of two pairs of jaws, two of said jaws being stationary and engaging one against the outer and the other against the inner side of the pipe, and two of said jaws being movable and engaging respectively against the inner side and the outer side of the pipe, substantially as set forth.

3. In a machine for bending a pipe into an elbow, the combination with a laterally-swinging clamp adapted to grasp the free end of the pipe, of a stationary clamping device composed of two pairs of jaws, two of said jaws being stationary and engaging one against the outer and the other against the inner side of the pipe, and the other two of said jaws being movable and connected to move simultaneously in the same direction, substantially as set forth.

4. In a machine for bending a pipe into an elbow, the combination with a laterally-swinging clamping device adapted to grasp the upper end of the pipe, of a stationary clamping device composed of two pairs of jaws adapted to engage against opposite sides of the lower end of the pipe, each pair consisting of a fixed and a movable jaw, a gear-rack connecting the movable jaws, and a gear-wheel meshing with the gear-rack, substantially as set forth.

5. In a machine for bending a pipe into an elbow, the combination with a stationary clamping device adapted to grasp one end of the pipe, of a laterally-swinging clamping device consisting of two pairs of jaws adapted to grasp opposite sides of the opposite end of the pipe, and bars connecting the inner jaw of each pair with the outer jaw of the other pair, substantially as set forth.

6. In a machine for bending a pipe into an elbow, the combination with a stationary clamping device adapted to grasp one end of the pipe, of a laterally-swinging clamp consisting of two pairs of jaws adapted to grasp opposite sides of the opposite end of the pipe, bars connecting the inner jaw of each pair with the outer jaw of the other pair, and a tightening-cam bearing against one bar and connected with the other bar, substantially as set forth.

7. In a machine for bending a pipe into an elbow, the combination with a stationary clamping device adapted to grasp one end of the pipe, of a laterally-swinging clamping device consisting of two pairs of jaws adapted

to grasp opposite sides of the opposite end of the pipe, bars connecting the inner jaw of each pair with the outer jaw of the other pair, and a lever pivoted on one of said bars and provided with a tooth engaging with a notch in the other bar, substantially as set forth.

8. In a machine for bending a pipe into an elbow, the combination with a stationary clamping device adapted to grasp one end of the pipe and a laterally-swinging clamping device adapted to grasp the opposite end of the pipe, of a stop which limits the lateral movement of the swinging clamping device, substantially as set forth.

9. In a machine for bending a pipe into an elbow, the combination with a stationary clamping device adapted to grasp one end of the pipe and a laterally-swinging clamping device adapted to grasp the opposite end of the pipe, of a fixed retaining-plate and a laterally-movable retaining-plate adapted to bear against opposite sides of the pipe, substantially as set forth.

Witness my hand this 20th day of September, 1897.

WILLIAM A. KEMP.

Witnesses:
W. FRANCIS,
F. MCCARTHY.