

No. 807,854.

PATENTED DEC. 19, 1905.

J. NEUERT.  
PIPE BENDING MACHINE.

APPLICATION FILED JULY 6, 1905.

5 SHEETS—SHEET 1.

Fig. 1.

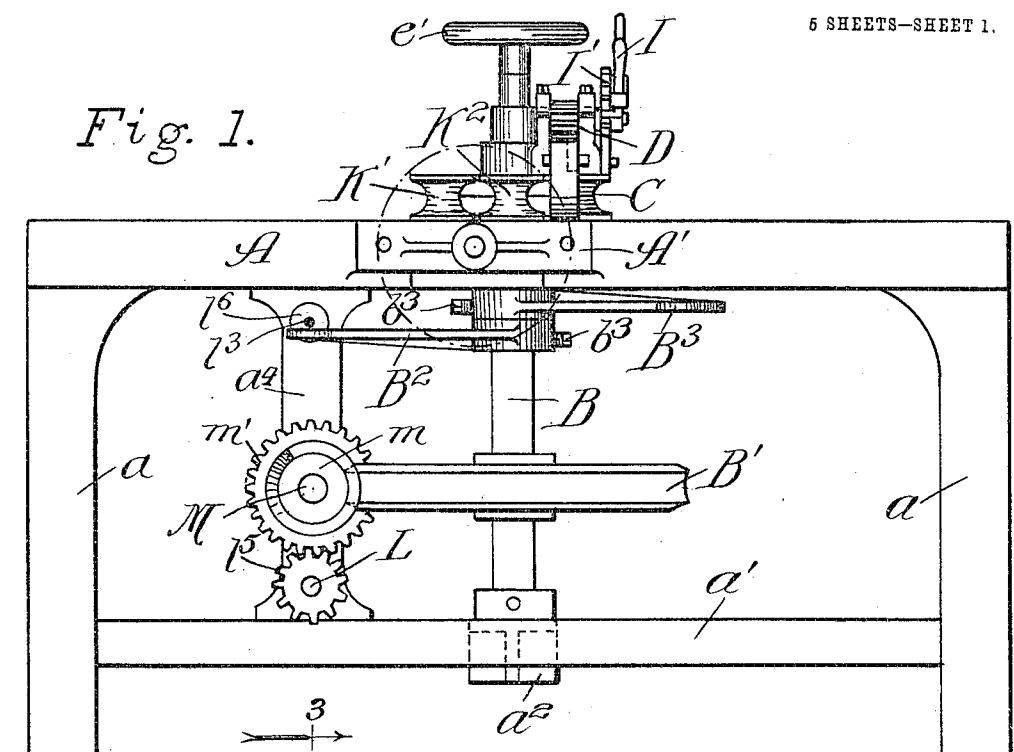
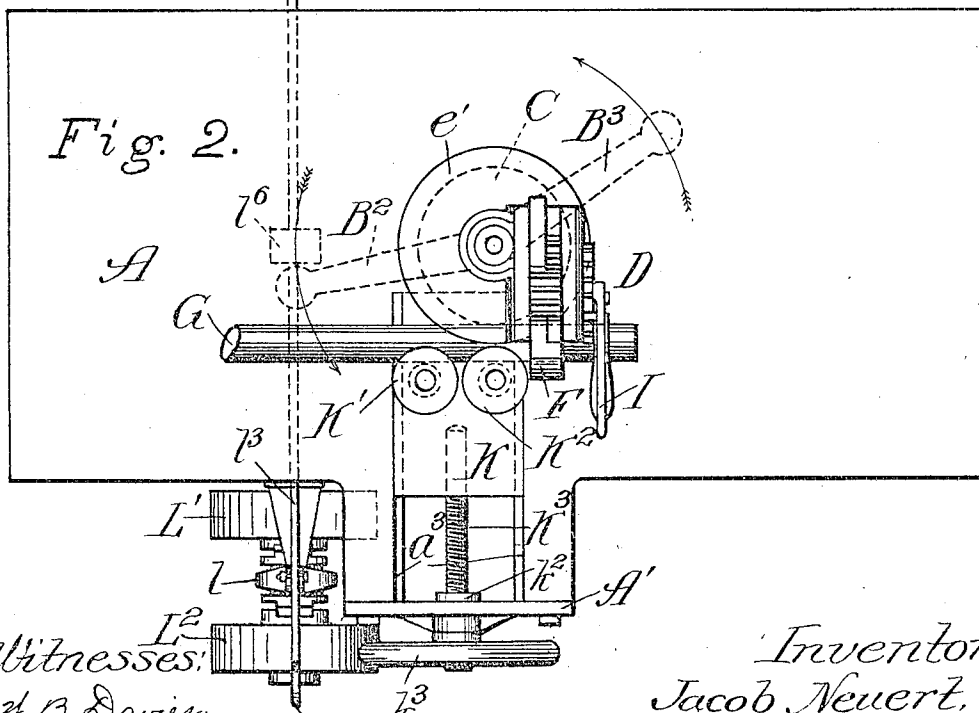


Fig. 2.



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5 SHEETS—SHEET 2.

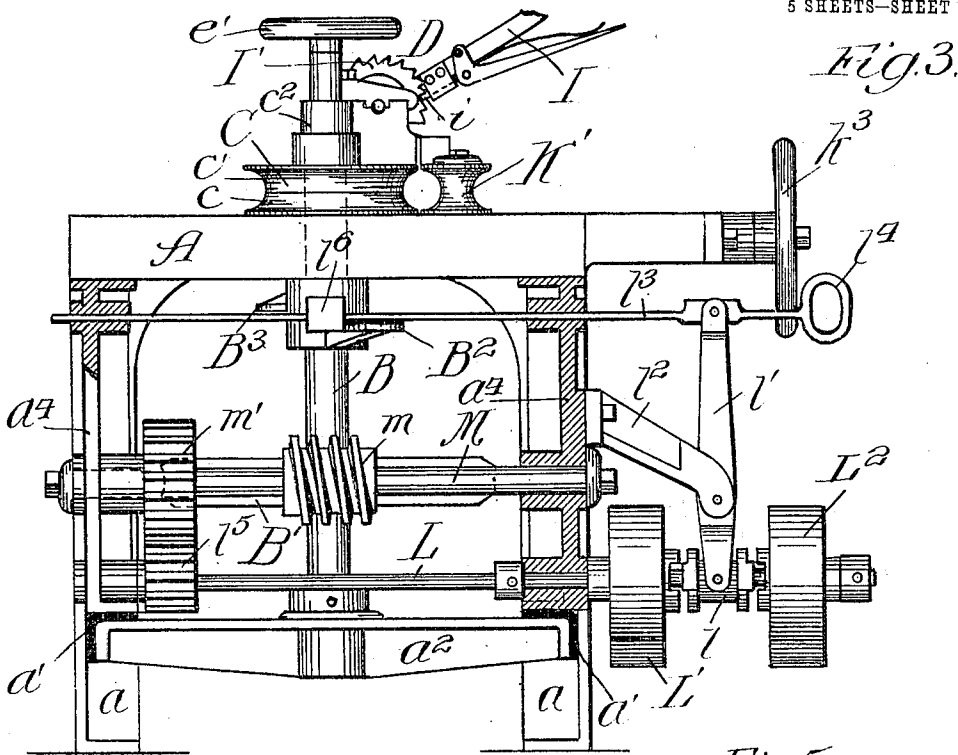


Fig. 4.

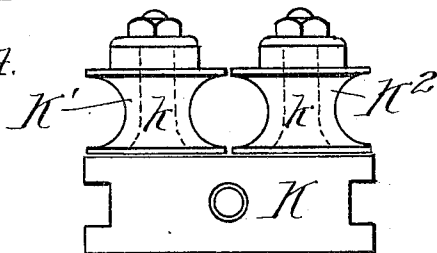


Fig. 5.

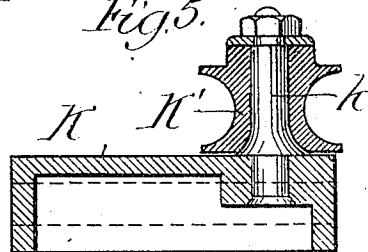
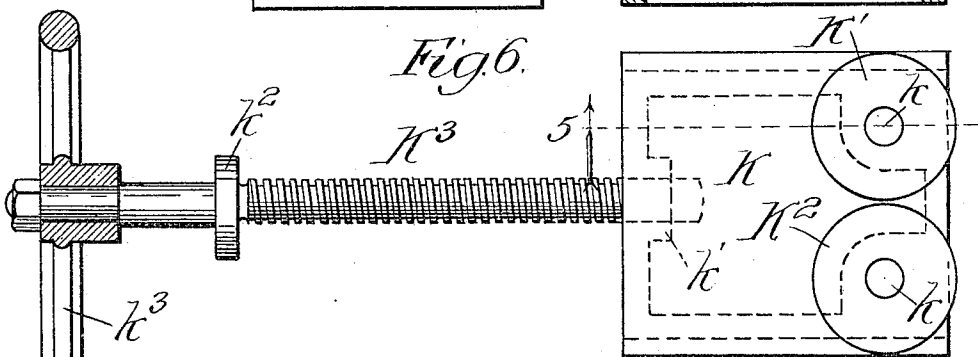


Fig. 6.



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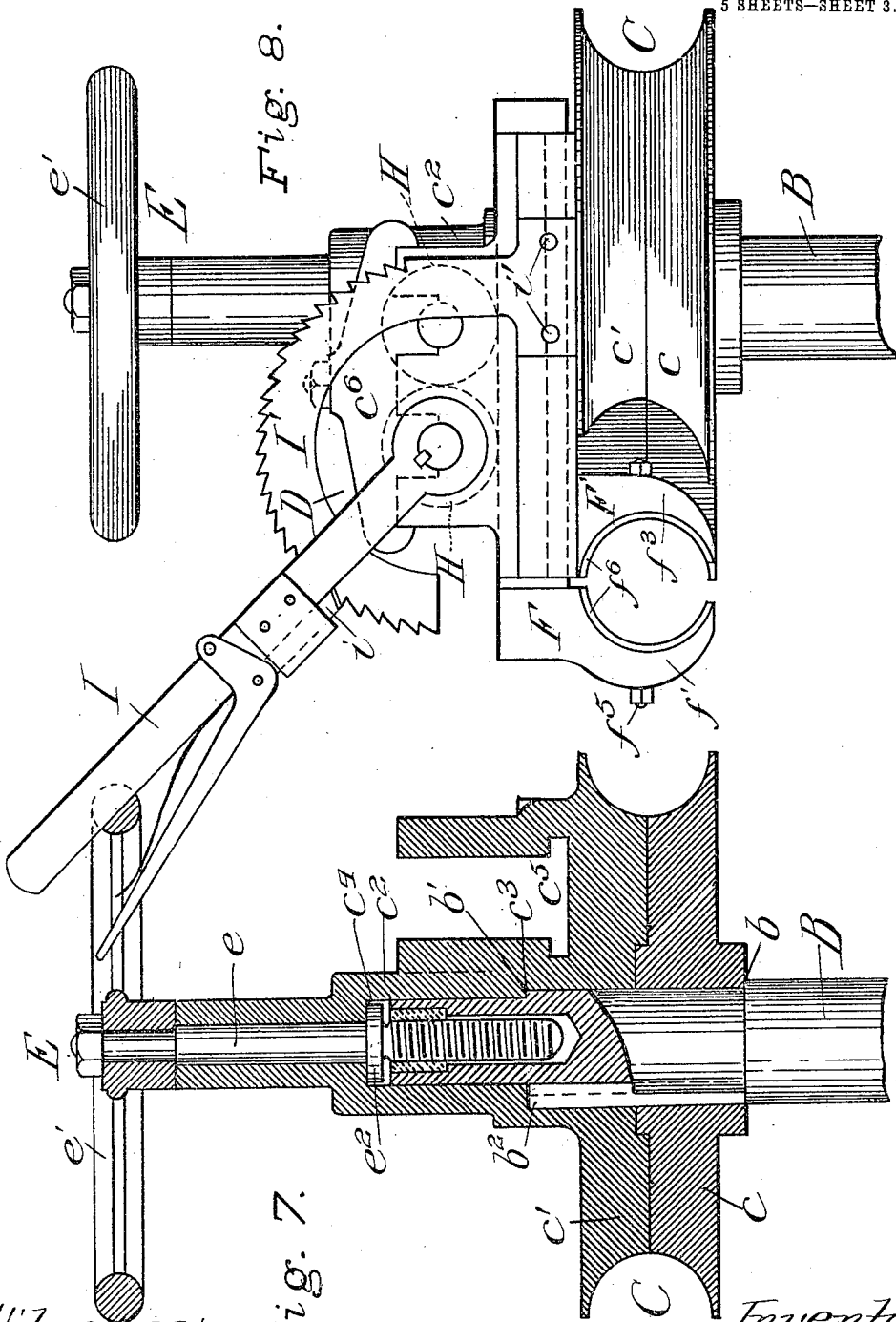
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5 SHEETS—SHEET 3.



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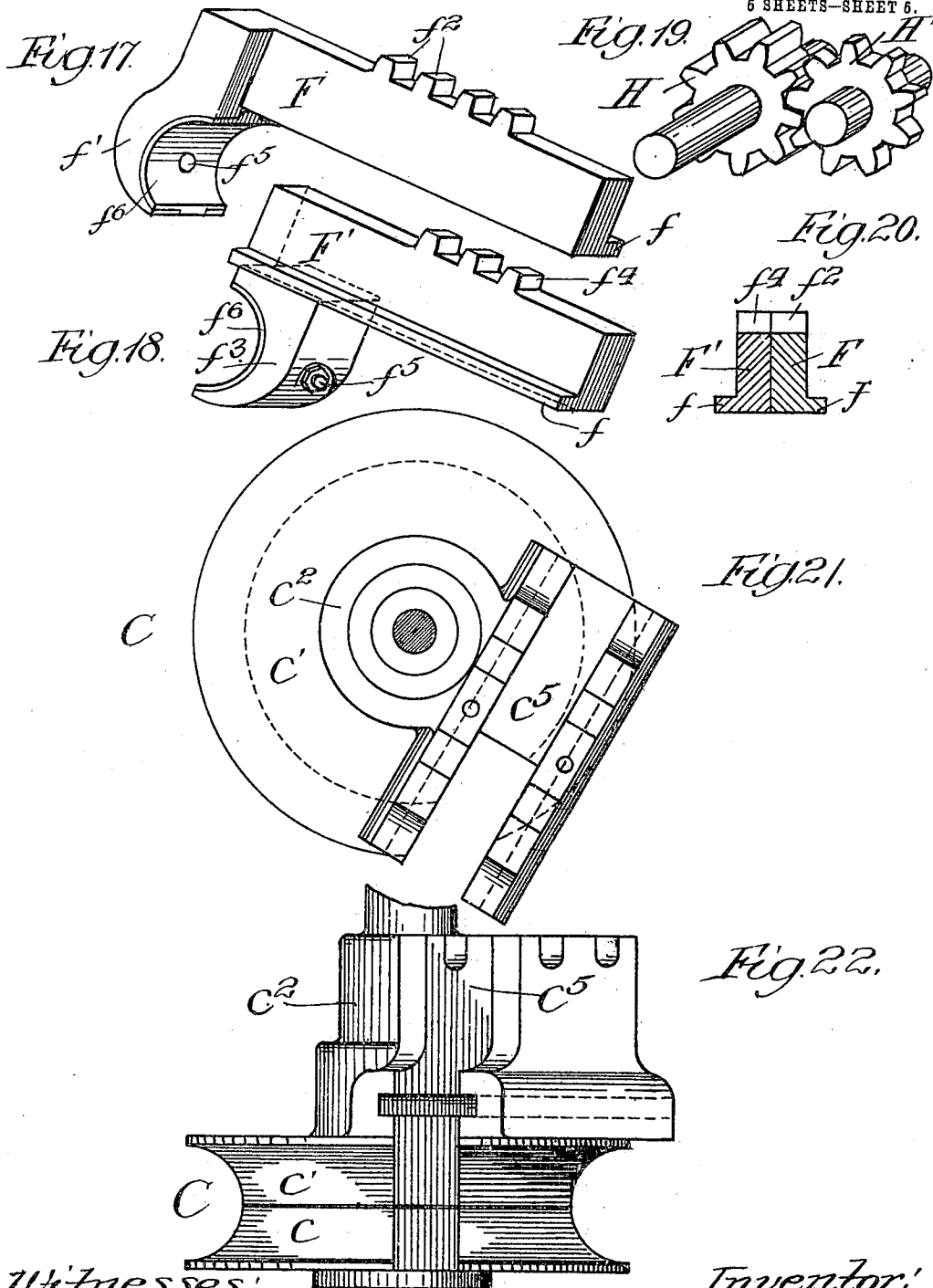


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6 SHEETS—SHEET 6.



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# UNITED STATES PATENT OFFICE.

JACOB NEUERT, OF CHICAGO, ILLINOIS.

## PIPE-BENDING MACHINE.

No. 807,854.

Specification of Letters Patent.

Patented Dec. 19, 1905.

Application filed July 6, 1905. Serial No. 268,553.

*To all whom it may concern:*

Be it known that I, JACOB NEUERT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pipe-Bending Machines, of which the following is a specification.

My invention relates to an improvement in machines for bending piping to form elbows, return-bends, coils, and the like without requiring the use of a mandrel in the piping to avoid kinking the same.

The invention is illustrated in the accompanying drawings, in which—

15 Figure 1 is a view in side elevation of my improved machine; Fig. 2, a top plan view of the same, showing hidden parts by dotted lines and a piece of piping in position in the machine preparatory to bending; Fig. 3, a section taken at the line 3 on Fig. 2 and viewed in the direction of the arrow; Fig. 4, an enlarged view, in end elevation, of the carriage cooperating with the former for holding the free end of the pipe during the bending operation; Fig. 5, a vertical section of the device shown in Fig. 4, taken at the line 5 on Fig. 6 and viewed in the direction of the arrow; Fig. 6, an enlarged top plan view, partly sectional, of the device for holding the piping during the bending operation and the means for adjusting the device relative to the former; Fig. 7, an enlarged broken vertical section of the divided former with the means for raising and lowering the upper section; Fig. 8, an enlarged partly-broken view in elevation, showing the former and the means secured thereto for clamping to the former the portion of the piping to be bent; Fig. 9, an enlarged view, in side elevation, of the clamping means shown in Fig. 8; Fig. 10, a top plan view of the device shown in Fig. 9; Fig. 11, a similar view of one of the cooperating jaw-equipped clamping members shown in Fig. 10; Fig. 12, a similar broken view of the other of the two cooperating members of the clamping device shown in Fig. 10; Fig. 13, a plan view of the pinion for actuating the member of the clamping device shown in Fig. 11; Fig. 14, a similar view of the pinion for actuating the clamping member shown in Fig. 12; Fig. 15, a sectional face view of one of the jaw-linings; Fig. 16, an end view of the same; Fig. 17, a perspective view of the jaw-equipped clamping member shown in Fig. 11; Fig. 18, a similar view of the jaw-equipped clamping member

shown in Fig. 12; Fig. 19, a similar view of the meshing pinions for actuating the clamping-bars to open and close the jaws; Fig. 20, a transverse section taken through the clamping members when in position for insertion into the slot on the former; Fig. 21, a top plan view of the former with its shaft in section and showing the guide-slot for the clamping device, and Fig. 22 a broken view showing the divided former in side elevation and the guide-slot for the clamping mechanism in perspective.

The support for the operative parts of the machine is shown as a table-top A on legs a, with braces a' extending between them. Journaled in a bridge-tree a<sup>2</sup>, supported by the braces a', is a vertical shaft or spindle B, which extends through an opening in the table-top, forming a bearing, and carries at its upper end a horizontally-divided former C, a clamping device D on the former for the portion of the pipe to be bent, and means for raising and lowering the upper section of the former. The upper end of the spindle B is internally screw-threaded and is of reduced diameter, affording the shoulders b b', Fig. 7. The former comprises a horizontal section c and a superposed section c'. The member c is provided with a central bore corresponding with the diameter of the portion of the spindle B above the shoulder c, to adapt it to rest upon the shoulder b, in which position it is secured to the spindle to rotate therewith by a key b<sup>2</sup>. The member c' likewise fits about the reduced part of the spindle and is slidably secured by the key b<sup>2</sup> to the spindle B to cause it to rotate therewith. The member c' is provided with a vertical extension c<sup>2</sup>, having its bore reduced to form shoulders c<sup>3</sup> c<sup>4</sup>. The periphery of the former is grooved to adapt it to conform to the curved surface of the pipe to be bent about it.

I provide as means for separating and drawing together the sections of the former a hand-screw E, comprising a stem e, threaded at one end for engaging the threaded end of the spindle B and carrying at its opposite end a hand-wheel e'. The stem e is provided above its threaded portion with a collar e<sup>2</sup>, which engages the shoulder c<sup>4</sup> of the section c' to adapt the section c' to be raised and lowered by operating the hand-wheel.

The means for drawing the pipe to be bent about the former to cause it to conform thereto comprises a pair of cooperating rack-bar members F F', reciprocally confined in a

guide-slot  $c^5$ , having a widened bottom, in the upper face of the former-section  $c'$ , lateral flanges  $f$  provided on the bars fitting into the widened bottom of the slot  $c^5$  to retain the device against vertical movement. The member F is provided at one end with a depending inturned jaw  $f'$ , having a concave inner surface, and on its top side with the rack  $f^2$ . The cooperating member F' is provided with a depending outturned jaw  $f^3$ , having a concave inner surface cooperating with the jaw  $f'$  for clamping therein a pipe G to be bent and with the rack  $f^4$  on its top side. The inner surfaces of the jaws are preferably provided with a face-roughened wear-taking lining of hard metal, insuring a firmer grip on the piping, by securing to the inner face of each of the jaws, as by bolts  $f^5$ , curved plates  $f^6$ . Mounted in bearings on the walls of the guide-slots  $c^5$  and held in place by a cap  $c^6$  are pinions H H', meshing with each other and engaging, respectively, the racks  $f^2$   $f^4$  of the members F and F', the pinion H extending across the member F', but not engaging the rack  $f^4$  thereon, to cause it to mesh with the pinion H'. Secured to the pinion H is lever mechanism for turning the pinions in opposite directions for sliding the bars in the guide-slot  $c^5$  to spread and draw together the jaws of the clamping device, comprising a lever I, keyed to the pinion H and having near its face end a spring-held pawl  $i$ , which travels upon a toothed quadrant I', secured to the outside wall of the slot, as by bolts  $i'$ . Slidably confined in guides  $a^3$  on the table-top and having its top flush with the table-top is a carriage K, provided at its forward end with a pair of peripherally-grooved rollers K' K<sup>2</sup>, journaled on studs  $k$   $k'$ , rising from the carriage, adapted to cooperate with the former in preventing the pipe during the bending operation from becoming buckled or collapsed and to serve as an abutment for the free end of the pipe for holding it steady during the bending operation and at the same time permit the pipe to be advanced to the former.

The means illustrated for adjusting the rollers relative to the former consist of a hand-screw K<sup>3</sup>, working at its threaded end in a correspondingly-threaded head  $k'$  on the carriage and held near its opposite end against any movement other than rotary by a collar  $k^2$  thereon, engaging the inner side of a plate A' at the end of the guides  $a^3$ , through which the hand-screw extends, a hand-wheel  $k^3$  on the outer end of the hand-screw enabling the operator to move the carriage back and forth to properly position the rollers relative to the former to embrace or release a pipe operated upon.

The mechanism for operating the spindle B comprises a shaft L, mounted in bearings in vertical supports  $a^4$  on opposite sides of the machine and secured to the table-top A,

and braces  $a'$  to extend at one end beyond the vertical support, where it carries two oppositely rotatable belt-pulleys L' L<sup>2</sup> to be suitably connected with the driving power. (Not shown.) The pulley L' operates to the right and the pulley L<sup>2</sup> to the left, regarded from the right-hand side of Fig. 3. On the shaft L between the pulleys L' L<sup>2</sup> is mounted clutch mechanism comprising an ordinary form of clutch device  $l$ , secured to one end of a lever  $l'$ , fulcrumed on a bracket  $l^2$ , secured to the frame of the machine and connected with a horizontal shifting rod  $l^3$ , extending through guide-openings in the frame of the machine and provided at its outer extremity with an operating-handle  $l^4$ . A shaft M, journaled in bearings in the vertical supports  $a^4$  above the shaft L, is provided near its center with a worm  $m$ , meshing with a worm-wheel B' on the spindle B, and near one end with a gear  $m'$ , meshing with a similar gear-wheel  $l^5$  on the drive-shaft L.

As it is desirable in the operation of the machine to arrest the movement of the former at predetermined positions, I provide means for automatically disconnecting the driving power, said means consisting of a stop  $l^6$  on the shifting rod  $l^3$ , represented in the form of a collar, to be engaged to move the rod in either direction by independent tapping-arms B<sup>2</sup> B<sup>3</sup>, secured on the spindle B to be separately adjustable thereon by set-screws  $b^3$ .

The operation of the machine is as follows: The carriage K, carrying the rollers K' K<sup>2</sup>, is withdrawn from the position illustrated in Fig. 2 by turning the hand-screw K<sup>3</sup>, and the lever I is then thrown to an upright position to separate the jaws  $f'$   $f^3$  of the clamping mechanism. The end of the pipe to be bent is inserted between the rollers K' K<sup>2</sup> and the former C and through the jaws of the clamping mechanism, in which position it is clamped between the jaws by drawing down the lever to the position shown in Figs. 3 and 8. The carriage is then advanced in its guides by turning the hand-wheel  $k^3$  until the rollers K' K<sup>2</sup> press firmly against the pipe G, the roller K<sup>2</sup> cooperating with the former C to embrace the pipe and the roller K' bearing against the surface of the pipe behind the roller K<sup>2</sup>. The pipe being in position for bending, the former and clamping mechanism are turned with the spindle B away from the rollers K' K<sup>2</sup> by drawing out the shifting rod, which connects the pulley L' to the shaft, thereby operating the gears  $l^5$   $m'$ , the worm  $m$ , and the worm-wheel B'. As the clamping mechanism turns away from the rollers K' K<sup>2</sup> it draws the pipe G with it, causing the pipe to be advanced between the rollers and the former and curving it about the grooved periphery of the former. When the former C has turned to the position at which it was predetermined it should stop by

the previous adjustment of the tapping-arm B<sup>3</sup>, that arm moving in the direction of the collar l<sup>6</sup> strikes the latter and automatically throws the clutch mechanism by shifting the rod l<sup>7</sup>, thus disconnecting the pulley L<sup>1</sup> from the shaft L and stopping the machine. After the bend has been formed the pipe is released from the machine by throwing the lever I to an upright position to open the jaws and release the pipe, the carriage carrying the rollers is drawn away from the former, and the hand-wheel e' turned to raise the top section c' of the former C, thereby completely freeing the pipe and permitting it to be easily removed from the machine. The former C is returned to its original position by pushing inwardly the shifting rod, and thereby connecting the clutch mechanism with the pulley L<sup>2</sup> to cause the spindle B to turn in the opposite direction until the tapping-arm B<sup>2</sup> strikes the collar l<sup>6</sup> and shifts the rod l<sup>7</sup>, with the result of disconnecting the clutch from the pulley L<sup>2</sup> and stopping the machine, the parts of the machine being then in the relative positions represented in Figs. 1 and 2.

What I claim as new, and desire to secure by Letters Patent, is—

1. A pipe-bending machine comprising, in combination, a rotatable former, means for actuating said former, an abutment device for the free end of a pipe to be bent, and pipe-clamping mechanism on said former comprising a pair of cooperating jaw-equipped rack-bars and lever-operated pinions engaging the racks for opening and closing the jaws.

2. A pipe-bending machine comprising, in combination, a rotatable former provided with a guide-slot, means for actuating said former, an abutment device for the free end of the pipe to be bent, and pipe-clamping mechanism comprising a pair of cooperating rack-bars reciprocally confined in said slot to move in relatively contrary directions, each provided with a jaw, a pair of pinions meshing with each other and with the racks on said bars, and a lever connected with one of said pinions for actuating them to open and close the jaws.

3. In a pipe-bending machine, the combination with a vertical rotary shaft containing an internally-threaded opening in its upper end, of a former consisting of a peripherally-grooved pulley composed of a lower section secured to said shaft and an upper section seating on said lower section about the shaft to rotate therewith but vertically movable thereon and provided with a hollow vertical extension into which the shaft extends, and a hand-screw device on said extension and working in said opening, for the purpose set forth.

4. In a pipe-bending machine, the combination with a vertical rotary shaft, of a peripherally-grooved pulley on said shaft forming the former, and pipe-clamping means

comprising jaw-equipped rack-bars reciprocally confined on said former and intermeshing pinions engaging the racks to actuate said bars in relatively contrary directions.

5. In a pipe-bending machine, the combination with a vertical rotary shaft, of a peripherally-grooved pulley on said shaft forming the former provided with a guide-slot in its upper portion, and pipe-clamping means comprising a pair of jaw-equipped rack-bars reciprocally confined in said slot and intermeshing pinions engaging the racks to actuate the bars in relatively contrary directions, with a lever for turning said pinions carrying a spring-pawl and a toothed quadrant to be engaged by said pawl.

6. A pipe-bending machine comprising, in combination, a vertical rotary shaft threaded internally at its outer end, a peripherally-grooved former on said shaft comprising a lower section and an upper vertically-movable section provided with a shoulder, means for raising and lowering said upper section comprising a stem rotatably supported on said upper section provided at one end with a handle and having its opposite end screw-threaded and engaging the threaded end of said shaft and provided with a collar engaging said shoulder, means for actuating said shaft, clamping mechanism on said former for gripping the portion of the pipe to be bent, and an abutment device for the free end of the pipe cooperating with said former.

7. In a pipe-bending machine, the combination with a frame having journaled therein a shaft carrying a former, and pipe-clamping and abutment mechanism cooperating with said former, of clutch-controlled driving means for said shaft, a shifting rod connected with the clutch for shifting it and carrying a stop, tapping-arms to engage said stop provided with sleeves surrounding said shaft and horizontally adjustable thereon, for the purpose set forth.

8. In a pipe-bending machine, the combination with a frame, of a vertical shaft journaled therein and carrying a worm-wheel, tapping-arms adjustably supported on the shaft, a former secured on said shaft, pipe-clamping and abutment mechanisms cooperating with said former, a horizontal shaft journaled in said frame and carrying a worm meshing with the worm-wheel on said vertical shaft, a drive-shaft geared to said worm-shaft and carrying a pair of belt-pulleys, a clutch on said drive-shaft between said pulleys, a lever engaging said clutch at one end, and a shifting-rod supported on the frame and connected with the opposite end of said lever, and carrying a collar in the path of said tapping-arms to be engaged thereby.

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In presence of—

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J. H. LANDES.