No. 856,847. PATENTED JUNE 11, 1907.

P. J. CONNORS.

PIPE BENDING MACHINE.

APPLICATION FILED MAR. 29, 1907.

5 SHEETS—SHEET 1.

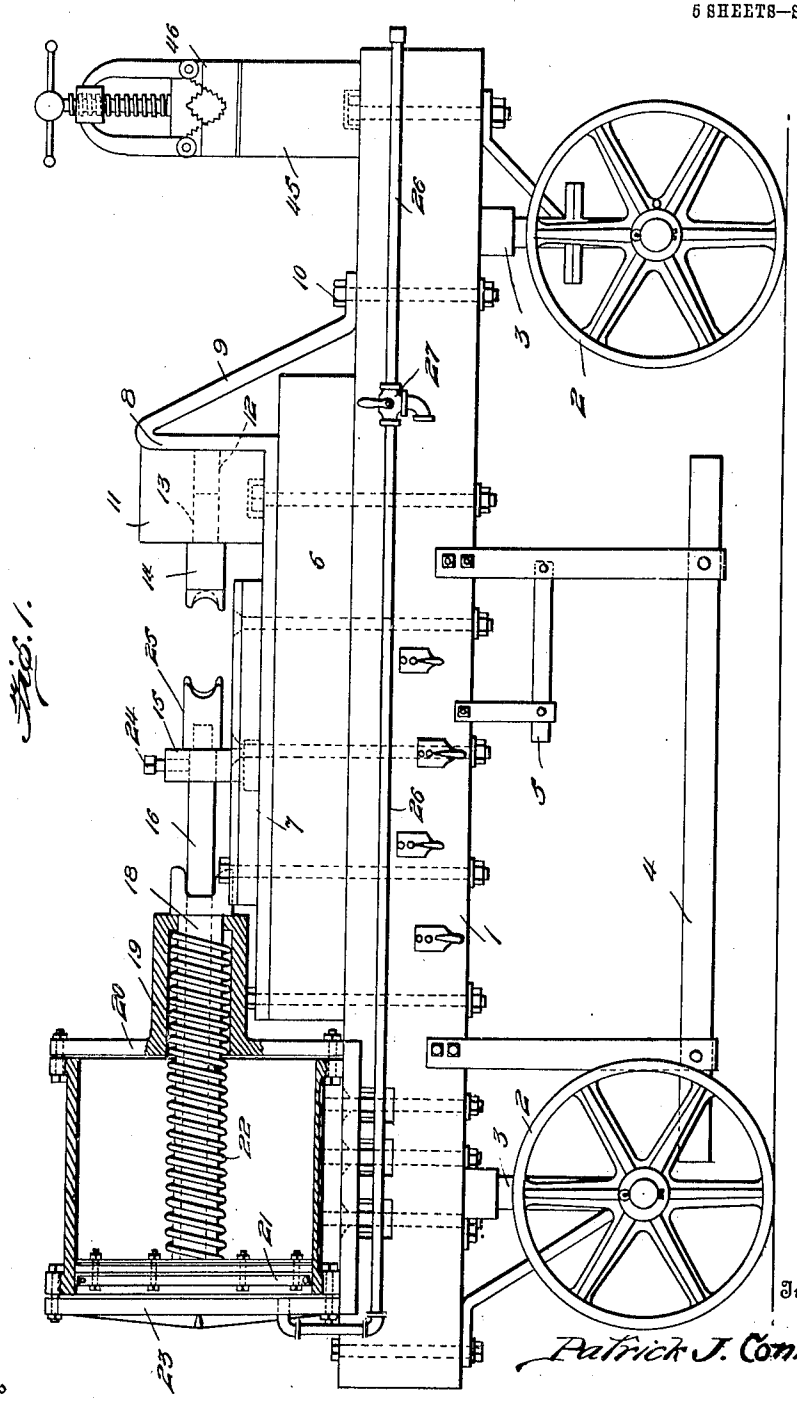


Fig. 1.

Witnesses

Inventor

Patrick J. Connors,

By David P. Moore,

Attorney

No. 856,847. PATENTED JUNE 11, 1907.

P. J. CONNORS.

PIPE BENDING MACHINE.

APPLICATION FILED MAR. 29, 1907.

5 SHEETS—SHEET 2.

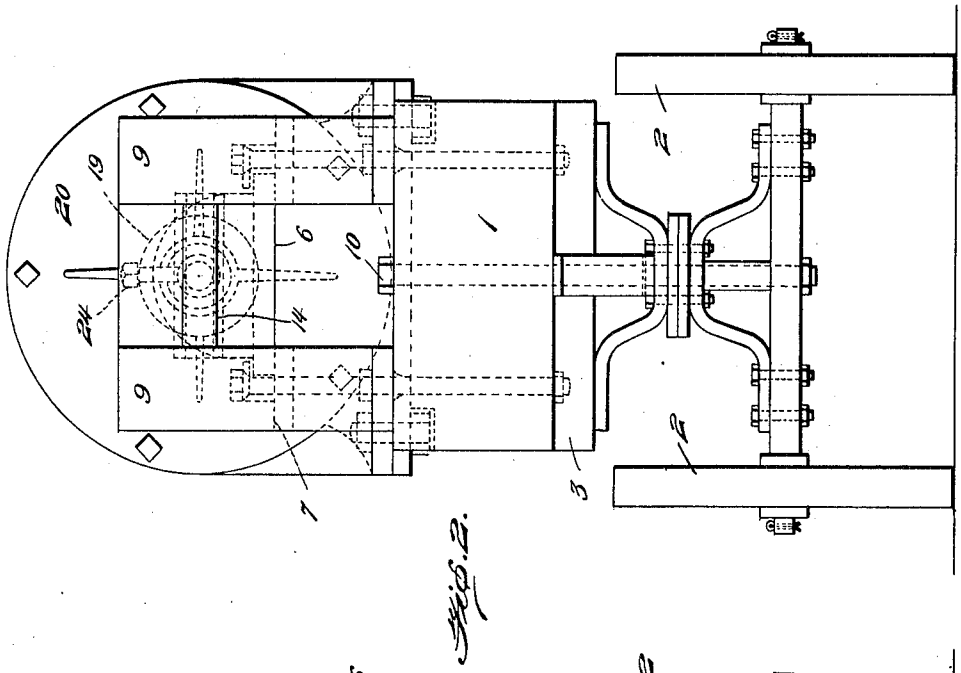


Fig. 2.

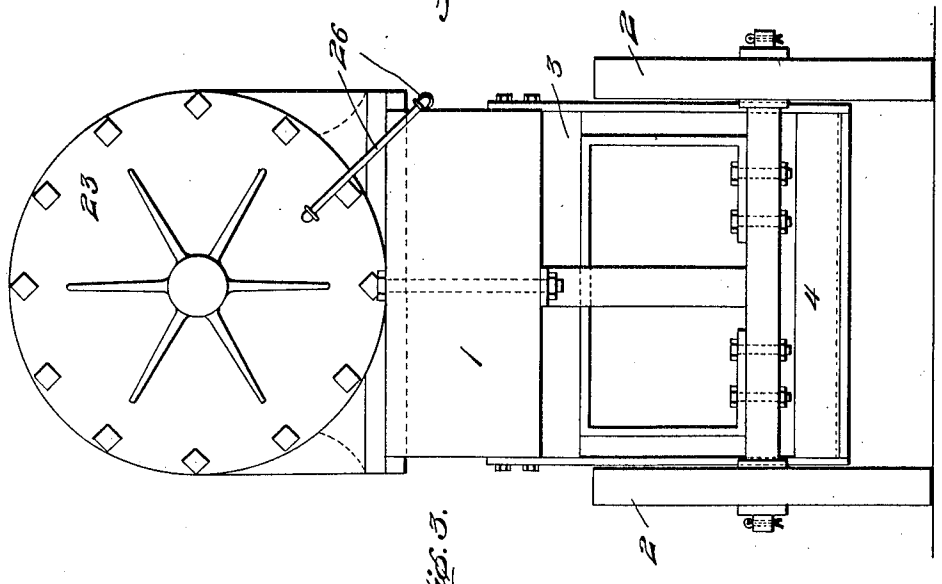


Fig. 3.

WITNESSES:

B. M. Offutt.

G. M. Spurney

INVENTOR

Patrick J. Connors.

BY

David R. Moore,

Attorney

No. 856,847. PATENTED JUNE 11, 1907.

P. J. CONNORS.

PIPE BENDING MACHINE.

APPLICATION FILED MAR. 29, 1907.

5 SHEETS—SHEET 3.

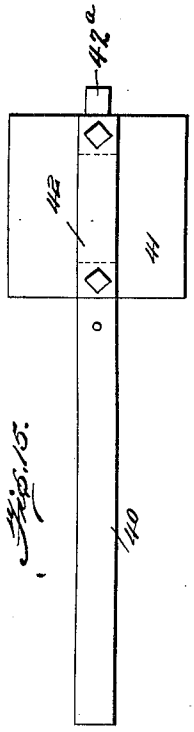


Fig. 15.

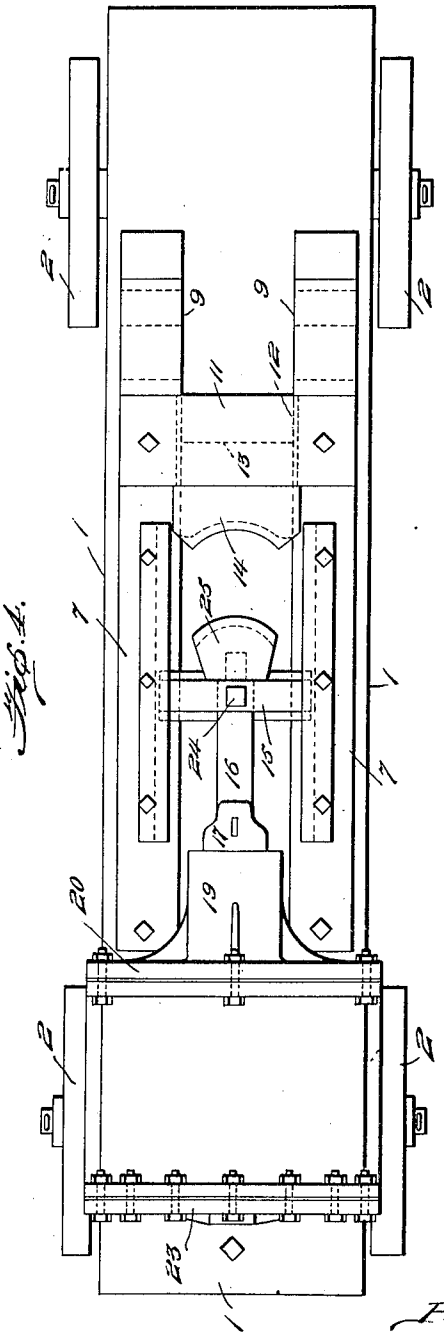


Fig. 4.

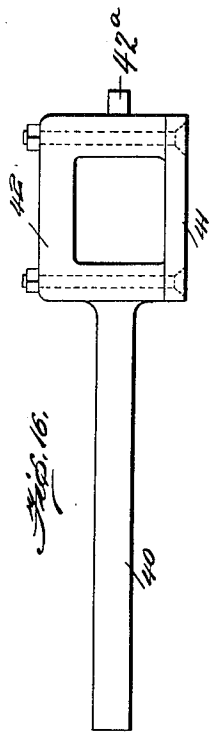


Fig. 16.

Witnesses

B. M. Offutt,

G. M. Spring

Inventor

Patrick J. Connors,

By

David B. Moore,

Attorney

No. 856,847. PATENTED JUNE 11, 1907.

P. J. CONNORS.

PIPE BENDING MACHINE.

APPLICATION FILED MAR. 29, 1907.

5 SHEETS—SHEET 4.

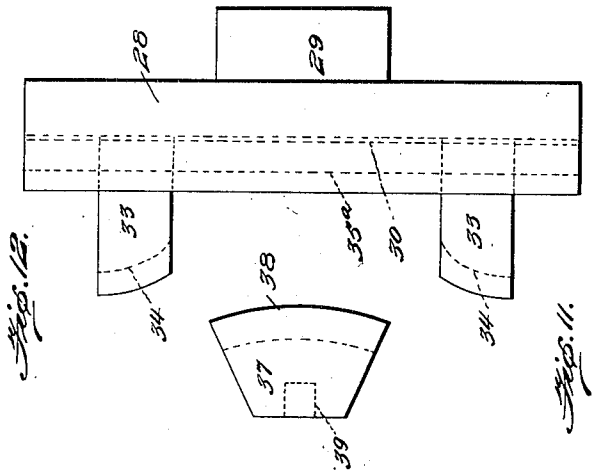


Fig. 12.

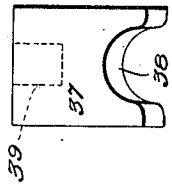


Fig. 11.

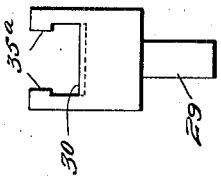


Fig. 7.

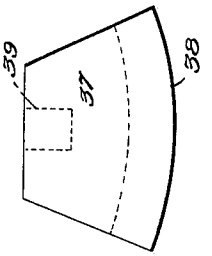


Fig. 10.

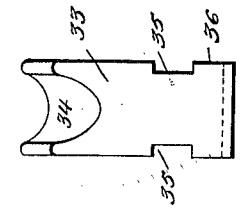


Fig. 9.

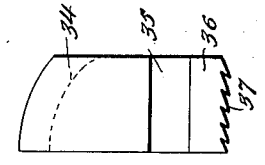


Fig. 8.

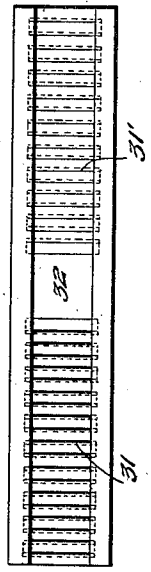


Fig. 5.

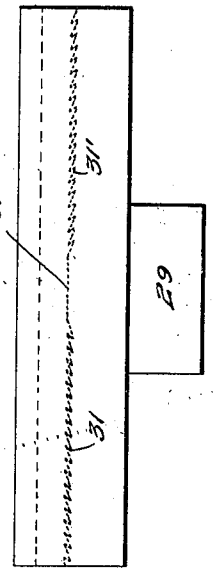


Fig. 6.

Witnesses

B. M. Offutt.

G. M. Spring

Inventor

Patrick J. Connors

By

David R. Moore

Attorney

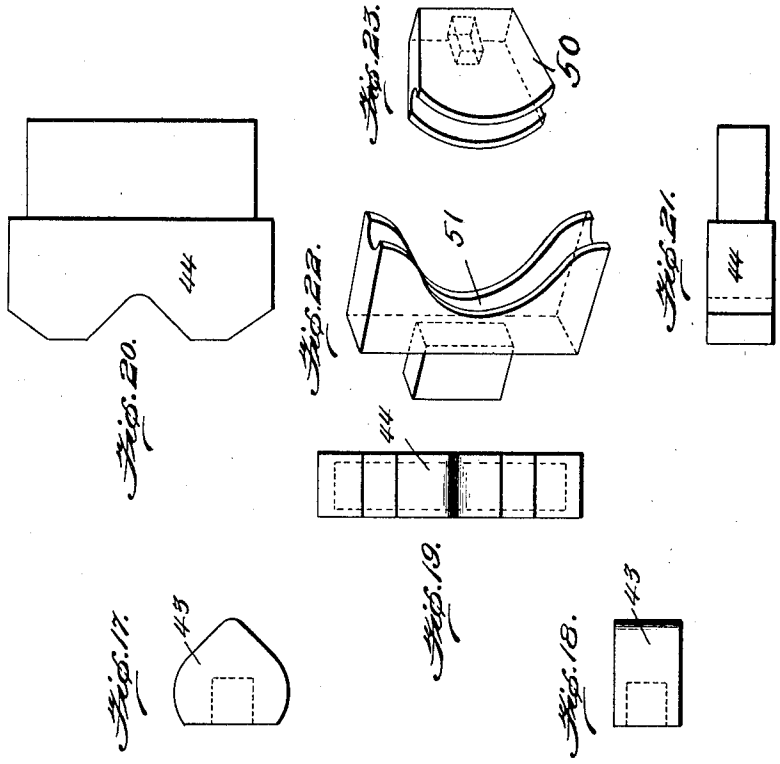
No. 856,847. PATENTED JUNE 11, 1907.

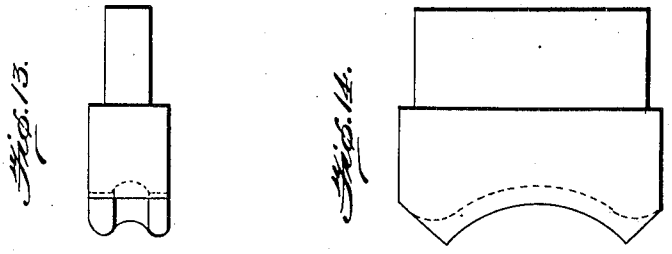
P. J. CONNORS.

PIPE BENDING MACHINE.

APPLICATION FILED MAR. 29, 1907.

5 SHEETS—SHEET 5.





WITNESSES:

B. M. Offutt.

G. M. Spring

INVENTOR

Patrick J. Connors.

BY David P. Moore

Attorney

UNITED STATES PATENT OFFICE.

PATRICK J. CONNORS, OF GREENVILLE, PENNSYLVANIA.

PIPE-BENDING MACHINE.

No. 856,847. Specification of Letters Patent. Patented June 11, 1907.

Application filed March 29, 1907. Serial No. 365,306.

To all whom it may concern:

Be it known that I, PATRICK J. CONNORS, a citizen of the United States, residing at Greenville, in the county of Mercer and State of Pennsylvania, have invented certain new and useful Improvements in Pipe-Bending Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

My present invention relates to improvements in pipe bending machines, and the main object of my invention is the provision of a machine of this character provided with a stationary die and a reciprocating die operated under pressure to compress the pipe between the dies and form the desired curvature or bend in the pipe, the said curvature or bent pipe being formed without bulging or breaking the pipe.

To this end, my machine consists of a suitable frame or support, which is portably mounted so as to be moved where desired, the said frame having mounted thereon a bed which contains the stationary die support, in which the stationary die removably fits. The said bed is further provided with a piston to which is adaptably connected the other die and said piston is mounted in an air brake cylinder similar to the Westinghouse air brake. The cylinder is connected with an air supply means, whereby the piston is moved so as to compress the die and bend the pipe the spring returning the piston upon the release of the air.

To more clearly illustrate my invention, attention is invited to the accompanying drawings, in which:—

Figure 1 is the side elevation of the complete machine with the cylinder in section. Fig. 2 is a front elevation of the same. Fig. 3 is a rear elevation thereof. Fig. 4 is a top plan view. Figs. 5, 6, and 7 are detailed views of an adjustable die holder. Figs. 8 and 9 are detailed views of one of the adjustable female dies. Figs. 10 and 11 are detailed views of the male die used in connection therewith. Fig. 12 illustrates the relative positions of the adjustable dies and the holder, and the male die. Figs. 13 and 14 are detailed views of its respective female die. Figs. 15 and 16 are detailed views of my combination piston and cross-head for returned bends, and Figs. 17, 18, 19, 20 and 21, are detailed views of the male and female right angle dies for clamps. Figs. 22 and 23 are details of my male dies.

Referring to the drawings:—The numeral 1 designates a bed, which is mounted upon the wheels 2, through the medium of the frames or bolsters 3, the said bed having depending therefrom a shelf 4, to retain the dies and the small shelf 5 to retain small pipe dies. Bolted upon the upper surface of the bed 1, is the auxiliary bed 6, and secured to said bed by said bolts are the two strips or rails 7, each having the upwardly projecting right-angle 8, which terminates in the brace 9, and is secured to the fore portion of the bed, as at 10. Resting against the end 8, and upon the upper face of the strips or rails 7, is the stationary die holder or block 11, provided with the channel or receptacle 12, for the reception of the lug 13, of the stationary die 14, the said stationary die being removably mounted within said holder by means of said lug and the receptacle.

Slidably mounted in the rails 7 is the yoke or frame 15 for carrying the outer end of the link or joint 16, which is detachably connected at its other end 17, to the piston rod 18, which projects through the sleeve 19, of the cylinder 20 and is connected to the piston head 21. This piston rod is surrounded within the cylinder and the sleeve by a coiled spring 22, by means of which the head 21 is normally held toward the rear end 23, of the cylinder. By this means, the rod or link 16 with the yoke 15 is allowed to reciprocate within the rails 7, a set screw 24, being employed to connect the rod 16 to the yoke 15, so that the die 25 carried removably upon the end of the link 16 will properly aline with the die 14, and all will slide in unison.

In order to properly operate my machine, the pipe to be bent is placed in the die 14, and air under pressure is supplied through the pipe 26, through the end 23 of the cylinder 20, thus causing the piston head 21 to move and compress the spring slowly and thus bring the die 25, toward the die 14, and under this slow steady pressure to operate upon the pipe and bend the same according to the desired shape. The supply of the air is controlled by the means of a three way valve 27.

In Figs. 5, 6, 7, 8, 9, 10, 11 and 12 is illustrated my adjustable die with its proper holder. This combination consists of a holding block 28, having a lug 29, whereby

the same is properly attached to my machine and upon the opposite face of this block 28, I provide the substantially dovetailed longitudinal slot 30, having the two sets of inwardly projecting ratchet teeth 31 and 31′, the said teeth terminating in the central raised portion 32. This block is what I term the female die carrying block and carries dies which consist of the body 33, carrying the die 34 and being further provided with the grooves or channels 35 upon opposite sides, the said channels and the head 36 being adapted to fit within the groove 30, of the block 28, and have the teeth 37, engage the respective teeth 31 or 31′ of the block. The grooves 35 are of greater width than the shoulders 35ª, of the block, so as to allow the ratchet teeth to be dis-engaged, when it is desired to adjust the female dies. The male die which is shown in Figs. 11 and 12, consists substantially of the body 37, carrying the die 38, and the socket 39, by means of which the said die is connected to the end of the link 16. In Fig. 12, I have shown the relative position of these dies. In Figs. 13 and 14, I illustrate the female dies which are what I term 90 degrees radius. The male die which is used in connection therewith is similar to the male dies, shown in the Figs. 10 and 11. In Figs. 15 and 16, I have illustrated my combination piston and cross head for return bends. In Fig. 15, is shown the top view, and it consists of the piston 40, the plate 41 and the cross head 42, Fig. 16 being a side elevation of the same.

The cross-head shown in Figs. 15 and 16, is used in lieu of the rod 16, and yoke 15, only when a greater length of pipe is to be bent; and when this is the case, a bar or other frame carrying extreme end dies is mounted in the opening of the yoke or cross-head 42, while a small central die, as 25, is connected to the lug 42ª.

The plate 41 is adapted to have its edges engage and slide in the rails 7, while in the yoke or cross-head 42 is carried the portion of the die that bends the extreme ends of the return bend, while upon the lug 42ª, I secure the die for forming the center of the bend.

The male dies 43, as shown in Figs. 17 and 18, are used to form clamps and are what I term right angle dies and the female die 44, shown in Figs. 19, 20, and 21 is the die to be used in connection with that shown in Figs. 17 and 18.

In Figs. 22 and 23 50 is the male die and 51 the female, these dies being especially for bending 90° pipes.

All the dies shown in Figs. 5, 6, 7, 8, 9, 10, 11 and 12 are modifications of the dies 25 and 14.

In order to complete my machine, I mount upon the forward end of the bed 1, a support 45, for the pipe vise 46.

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

1. In a bending machine, the combination of a support, a stationary block mounted thereon, a die member removably carried thereby, a cylinder, a piston and piston head mounted therein and adapted to be moved outwardly by pressure, a spring for returning the same, a link connected to the piston-rod, a pair of tracks or rails upon the support, a frame slidably mounted therein, and removably connected to the other end of the link, and a die carried by said link and frame and adapted to coact with the die carried by the block.

2. In a bending machine, the combination of a support, a die stationarily mounted thereon, a cylinder mounted upon the support, a piston head and rod mounted therein and adapted to be projected by pressure, a spring for returning the same, a link connected to the outer end of the piston rod, a die adapted to coact with said die carried by the link, and means carrying the free end of the link to guide the same and slidably mounted on the support.

3. In a bending machine, the combination of a support, a die stationarily mounted thereon, a cylinder mounted upon the support, a piston head and rod mounted therein and adapted to be projected by pressure, a spring for returning the same, a link connected to the outer end of the piston rod, a die adapted to coact with said die carried by the link, a pair of rails mounted upon the support, and means slidably mounted in the rails for guiding the free end of the link and its die.

4. In a bending machine, the combination of a support, a die stationarily mounted thereon, a cylinder mounted upon the support, a piston head and rod mounted therein and adapted to be projected by pressure, a spring for returning the same, a link connected to the outer end of the piston rod, a die adapted to coact with said die carried by the link, a pair of rails mounted upon the support, and a frame slidably mounted therein for guiding the free end of the link and its die.

5. In a bending machine, the combination of a female die, consisting of a block having a substantially dove tailed shape channel therein two series of oppositely inclined ratchet teeth in the base of said channel, and a pair of dies slidably mounted within said channel and provided with teeth for engaging the teeth of the block.

6. In a bending machine the combination of a bed, an auxiliary bed carried thereby, a pair of angle-irons carried by the auxiliary bed, a die block connected to the angle of said irons, a die member removably carried by said block, a yoke slidably connected to the auxiliary bed intermediate of its length,

a cylinder mounted upon the bed, a piston head mounted in said cylinder, a piston connected to the head and extending toward the yoke, a link connected to said piston and yoke and adapted to reciprocate with the yoke, a die member removably carried by said link, a spring surrounding the piston within the cylinder and normally holding the die members apart, and an air supply for operating the piston head to move the reciprocating die member toward the stationary die member.

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

PATRICK J. CONNORS.

Witnesses:
GEORGE KITCH,
CHAS. M. BARRETT.