F. GOELER.

SHEET METAL BENDING MACHINE.

APPLICATION FILED APR. 19, 1915.

1,162,050.

Patented Nov. 30, 1915.

4 SHEETS—SHEET 1.

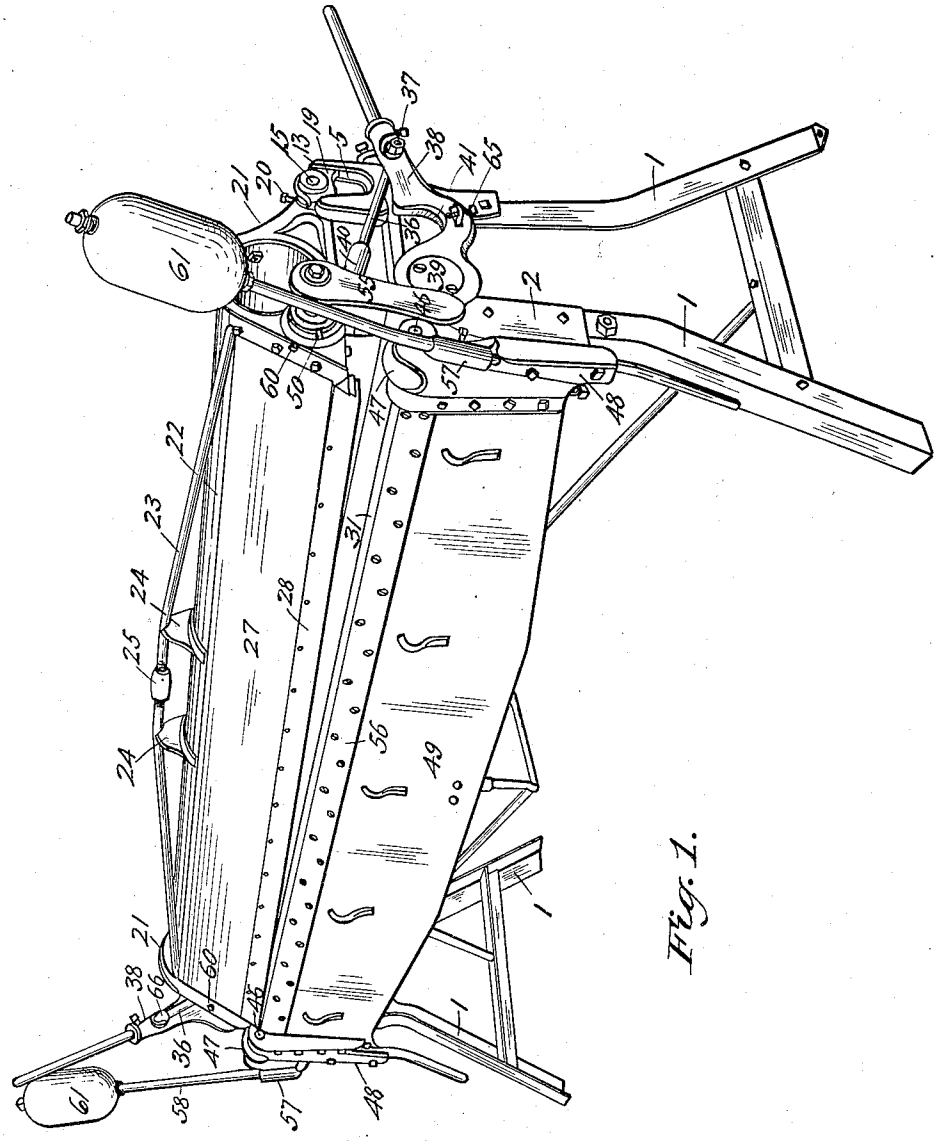


Fig. 1.

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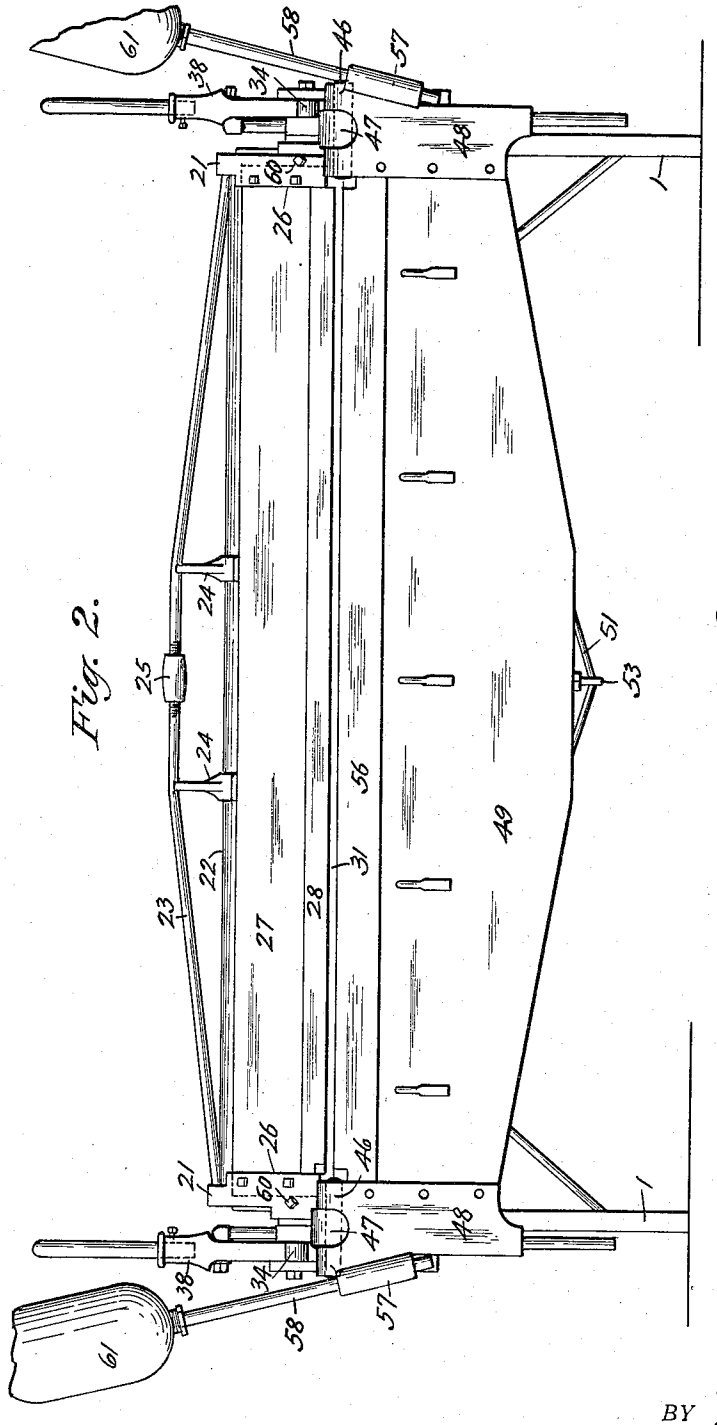


Fig. 2.

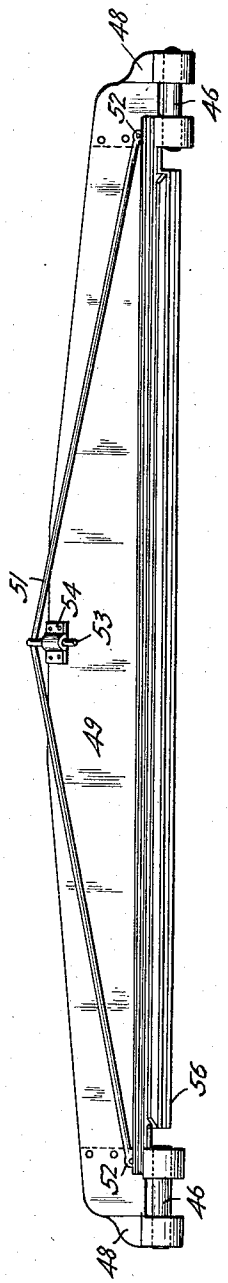


Fig. 3.

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4 SHEETS—SHEET 3.

Fig. 5.

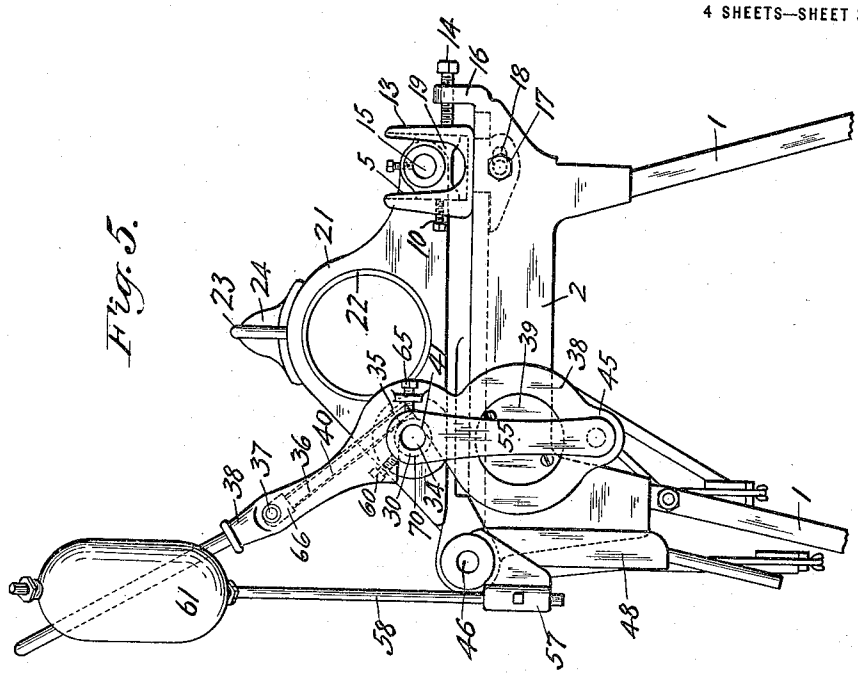
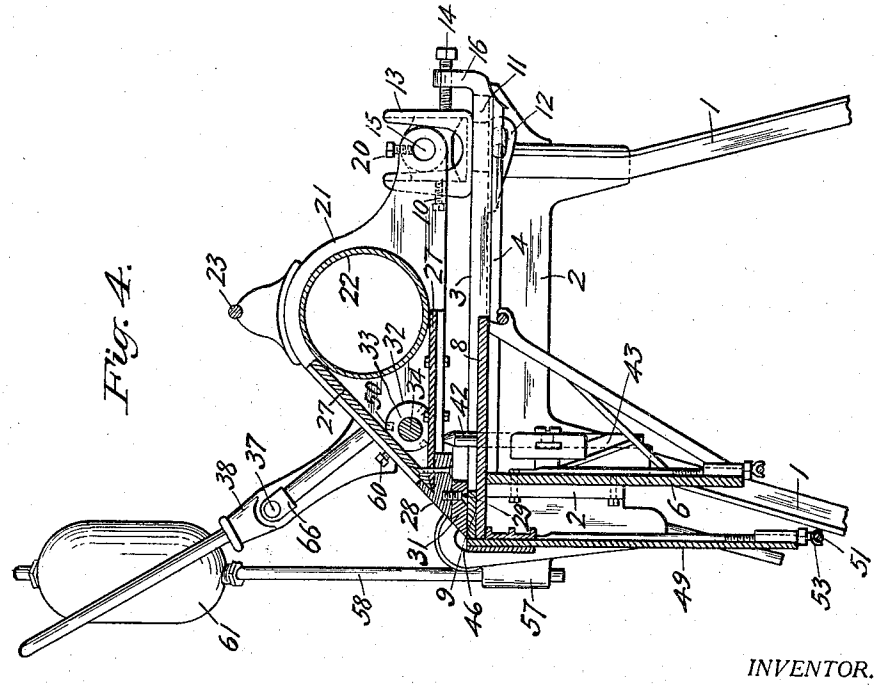


Fig. 4.



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4 SHEETS—SHEET 4.

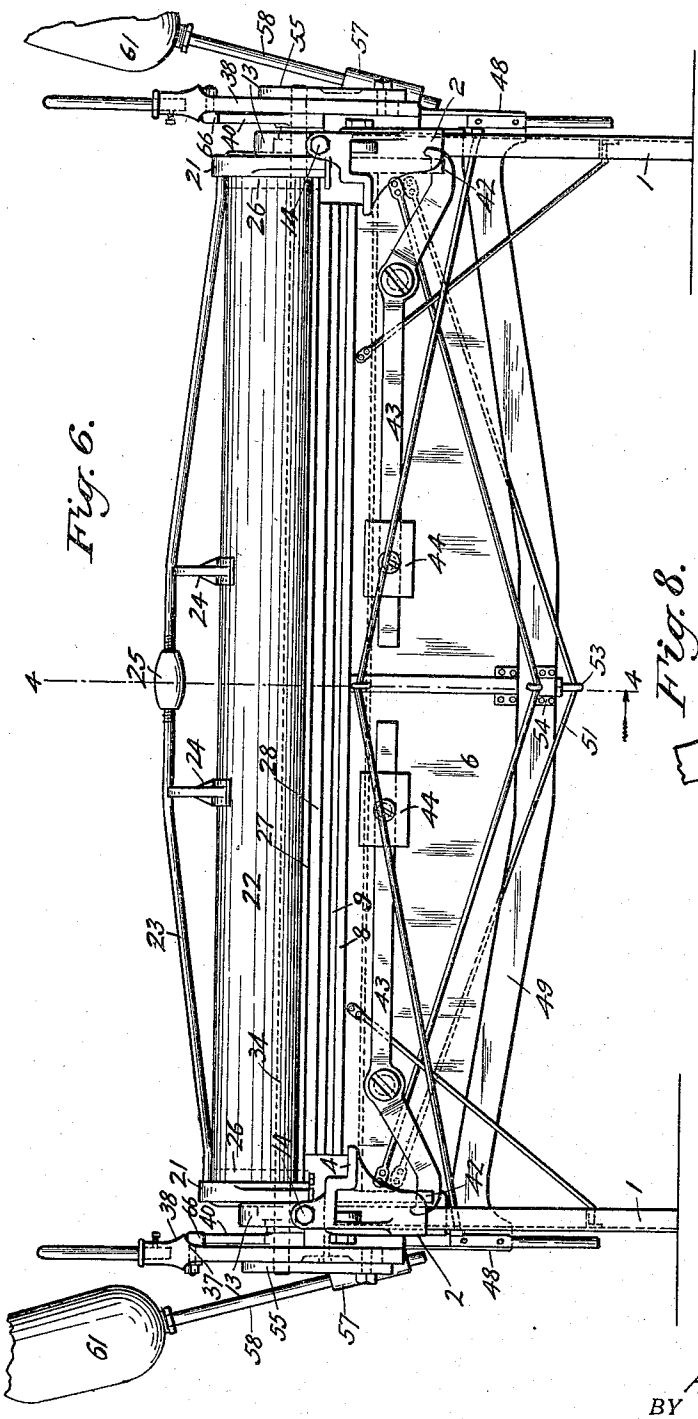


Fig. 6.

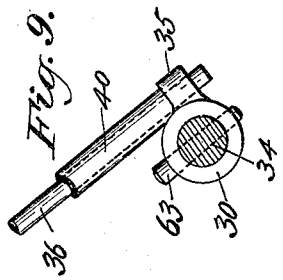


Fig. 9.

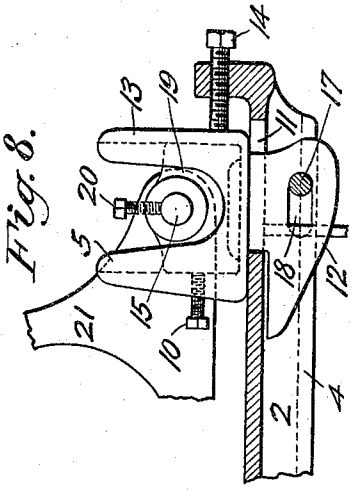


Fig. 8.

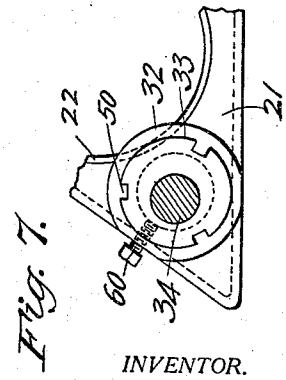


Fig. 7.

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UNITED STATES PATENT OFFICE.

FREDERICK GOELER, OF SAN FRANCISCO, CALIFORNIA.

SHEET-METAL-BENDING MACHINE.

1,162,050. Specification of Letters Patent. Patented Nov. 30, 1915.

Application filed April 19, 1915. Serial No. 22,336.

To all whom it may concern:

Be it known that I, FREDERICK GOELER, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Sheet-Metal-Bending Machines, of which the following is a specification.

The present invention relates to sheet metal bending machines and is an improvement upon the machine for which a patent was granted to me March 9th, 1915, No. 1,131,055.

The objects of the invention are to provide a bending machine of this character in which the movable jaw can be raised at either end independently of the other end when desired; in which no lost motion develops in the movement of the top plate corresponding with the movement of the levers; in which there is a large opening of the jaws; in which it is impossible for the sheet bending plate or levers to spring back or unlock; which contains means of adjustment for varying the pressure of the movable jaw for different thicknesses of metal; and of which the operation is easy and simple.

In the accompanying drawings, Figure 1 is a perspective view of the machine showing only one side of the movable jaw slightly raised; Fig. 2 is a front view thereof; Fig. 3 is a rear perspective view of a front plate detached; Fig. 4 is a transverse vertical section on the line 4—4 of Fig. 6; Fig. 5 is an end view of the machine; Fig. 6 is a rear view thereof; Fig. 7 is an enlarged detail sectional view showing an eccentric shaft; Fig. 8 is a similar view showing a bearing for a movable jaw; Fig. 9 is a similar view of a sleeve.

Referring to the drawings, the stationary frame of my improved sheet metal bending machine is supported at each end upon a two-legged frame 1, there being secured to the legs at each end an angle plate 2 having a top member, or inwardly extending flange 3, formed with a transversely extending depressed shelf 4. To said angle plate is secured a front plate 6. Supported by said top members is a top plate 8 upon which is secured a wearing strip 9 the front edge of which registers with the front edge of the top plate 8.

In the rear portions of the top members of the angle plates are formed slots 11, through which hangers 12 depend from U-shaped blocks 13, said blocks being adjusted by screws 14 secured through apertured lugs 16 rising from said top sections, screws 17 passing through longitudinal slots 18 in said angle plates, and screwed into said hangers 12, serving to clamp the bearing blocks 13 in the position to which they have been adjusted.

Slidable vertically in grooves 5 in said blocks 13 are the edges of bearings 19, normally secured in said blocks 13 by set screws 10, in which bearings are contained short shafts 15, secured by set screws 20 and extending laterally or outwardly from the rear ends of broad arms or plates 21, which have large circular apertures to receive the ends of a cylinder 22 extending longitudinally of the machine and connecting said arms together so that they move in unison.

A sectional tie rod 23, the parts of which are connected at the center by a turn-buckle 25, is secured at its ends to said arms, and its mediate portion is supported by struts 24 resting upon the cylinder. Said arms 21 are formed with inwardly extending flanges 26, the flanges from each arm meeting at an acute angle, and to said flanges are secured backing plates 27 extending longitudinally of the machine. To said plates is pinned, near their meeting edges, a clamping plate 28, to which is detachably secured, by screws 29, a wearing strip 31, having a sharp or beveled front edge adapted to register with the front edge of the wearing strip 9.

In each arm 21 is a bearing 32, in which is rotatably mounted a circular disk 33, through both of which disks extends an eccentric shaft 34, which passes through sleeves 30 having lateral extensions 35 forming the lower ends of sleeves 40 into which telescope rods 36, said rods and sleeves thus constituting extensible bars, the upper ends of which are pivotally connected, as shown at 37, to levers 38, fulcrumed at 23 upon the end angle plates 2.

The sleeves 30 are detachably secured to the shafts 34 by taper pins 63, so that when the lever 38 is operated at either end, it results that, because the upper portions 36 of the bars fit within the lower portions 40 and said lower portions are offset from the shaft 34, said shaft 34 is turned at that end, and therefore also at the other end, so that the movable jaw is raised at both ends. However, if the taper pin 63 be removed and the set screw 10 at one end be unscrewed, so that

the block 13 can be raised, said jaw can be raised at one end only, as in that case the shaft 34 will not be turned by the operation of the lever 38. In such case the jaw will be raised slightly at one end only as shown in Fig. 1, suitable for certain classes of work. For other kinds of work it is desirable that both ends should be raised to said position, and in that case the lever 38 at the other end is also operated. Each lever 38 is formed in its front edge with a recess 41, the projecting end of the shaft 34 engaging the side of said recess remote from the pivot of the lever, when the lever is swung into a vertical position. Each lever 38 is extended, as shown at 45, beyond its fulcrum and to said extension is pivoted at one end an outer link 55, which is formed at the other end with a hub or sleeve 70 surrounding the adjacent end of the shaft 34 extending beyond the recess 41, so that said side serves to take part of the stress upon the end of the shaft 34, instead of the whole of said stress being transmitted to the pivot 37. When said lever is so swung into a vertical position it depresses the jaw, formed by the wearing strip 31, and clamping and backing plates 28, 27 firmly upon the stationary wearing strip 9. Furthermore, when the shaft 34 has passed the dead center, that is, the plane between the axes of the pivots 37 and 39, it is self-locking, as any upward pressure on the clamping jaw tends to press said shaft 34 still farther away from said plane. However, the forward motion of the lever 38 can be adjustably limited by means of a screw 65 screwed through a lug on the lever, and which abuts against the hub or sleeve 70, so that said lever is arrested at the point in which it is exactly in alinement with its pivotal center and the center of the shaft 34. In this position, no power less than that required to break the machine can force the jaws apart, if directly applied thereto, and yet, if force be applied to the lever 38 to open the jaws, they begin to open immediately and without any lost motion.

By reason of the shaft 34 extending the length of the machine, the clamping jaw can be operated from either side.

In order to counter-balance the weight of the movable jaw, there are provided pins 42, which extend through the angle plates 2, and the upper pointed ends of which engage the under sides of the arms of the jaw. The lower ends of said pins are supported by short arms of levers 43 pivoted upon the rear side of the front plate, the long arms of said levers carrying adjustable weights 44.

Pivoted upon pivot pins 46 which extend through bearings 47 formed on the angle plates 2 are end plates 48 which are riveted to a bending plate 49, which is strengthened by a tie bar 51 of which the ends are secured, as shown at 52, to the bending plate, and the middle passes through a forked end of a screw 53 screwed in a socket 54 secured upon the bending plate. Upon the outer side of the bending plate and adjacent to the edge extending between its pivots is a wearing strip 56. Extending obliquely outward from each end plate 48 is a bearing 57 of a counter-balance arm 58, carrying at the end remote from the bending plate a counter-balance weight 61, said weights counterbalancing the weight of the bending plate, so that to swing the plate on its pivots requires a force only sufficient to overcome inertia, and no weight is required to be lifted.

The shelves 4 in the angle plates 2 are depressed for the purpose of permitting the machine to be used for bending a sheet of metal which has flanged edges, said flanges being received in said depressions, while the remainder of the sheet metal is pressed between the two wearing strips 31 and 9.

An important feature of my invention is that by this construction I am enabled to raise the clamping jaw to such a height that a large piece of sheet metal can be inserted between the clamping jaw and the stationary clamping plate in order to bend said sheet metal along any line thereof.

After said sheet metal has been placed upon the stationary clamping plate and the movable clamping jaw has been moved down nearly into contact with the upper surface of said sheet metal, the sheet metal can readily be shifted to any position in which it will be bent along the exact line desired, because said clamping jaw, although very heavy, exerts no pressure upon the upper surface of said sheet metal, and moreover said clamping jaw will remain in any elevated position, by reason of the counterbalancing means provided.

It will be observed that while the link 55 only is used to draw down the movable jaw, said jaw is locked in its closed position not only by the link 55, which is at that time on the line of centers of the pivots of said link and the lever 38, but by the upper surface of the recess 41 and by the sleeve 40 and rod 36, for said rod 36 has an enlargement or shoulder 66 which abuts against the end of the sleeve 40 in the closed position of the jaws.

An important feature of my invention resides in the provision which is herein made for varying, for different thicknesses of metal to be bent by the machine, the height of the movable clamping jaw above the stationary plate. This is due to the fact that the shaft 34, the ends of which are connected to the lower ends of the link sections 40, passes eccentrically through the disks or bushings 33, which are revoluble in the arms or heads 21. Each of these bushings is pro-

vided with slots 50, by which it may be turned with a wrench, and there is also provided for each bushing a set screw 60 screwed through the edge of the head 21, and which can secure the bushing in any position to which it has been turned. Thus if it is desired to change the distance between the stationary and movable jaws for a different thickness of sheet metal, all that is necessary is to unscrew the set screws 60, turn the bushings in the proper direction through the angular distance required, and screw the set screws in again, securing the bushings in place. In order to insure that the bushings are turned through equal angular distances there may be provided thereon marks indicating the distance through which they are turned.

A very valuable feature of my invention resides in the fact that the movable jaw will remain in any position in which it has been placed. In that respect it differs from prior machines of this general character in which the movable jaw is required to be thrown back the full distance whenever a readjustment is made of the position of the sheet metal. With my machine such is not the case, but it is only necessary to raise the movable jaw from the sheet metal a sufficient distance to permit the sheet metal to be moved, and the movable jaw will remain in this position until the sheet metal has been readjusted, and then the movable jaw can be clamped against the sheet metal plate.

In prior machines of this character, when the sheet metal was too thick to be bent by the bending plate, the effect would be that the strain on the sheet metal would cause the clamping jaw to be moved backward by turning about the shafts 15. In my invention such is not the case. The reason for this is that the shaft 34 has been moved beyond the center lines of the pivots 37 and 39. In other words, the pressure on the movable jaw only tends to move it downward, or more firmly upon the sheet metal, on account of the points to which pressure is applied being past the center of resistance.

Another important feature of my construction is that it affords a large opening at the back through which to pass sheet metal having a flange. The magnitude of this opening will evidently depend upon the length of the pins 42.

I claim:—

1. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, members extending transversely to the ends of said shaft, bars operatively connected with said members, and levers fulcrumed upon the ends of the machine and to which are pivotally connected ends of the bars, the parts being arranged so that the other ends of the bars swing in their closing position past the center lines between the pivots of the levers on the machine and the pivots of the bars on the levers.

2. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, members extending transversely to the ends of said shaft, extensible bars connected at one end with said members, and levers fulcrumed upon the ends of the machine and to which are pivotally connected the other ends of the bars, the parts being arranged so that the lower ends of the bars swing in their closing position past the center lines between the pivots of the levers on the machine and the pivots of the bars on the levers.

3. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, sleeves detachably secured to the ends of said shaft and having transverse extensions, bars operatively connected with said extensions, and levers fulcrumed upon ends of the machine and to which are pivotally connected the other ends of the bars, the parts being arranged so that the lower ends of the bars swing in their closing position past the center lines between the pivots of the levers on the machine and the pivots of the bars on the levers.

4. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, members extending transversely to the ends of said shaft, bars operatively connected with said members and levers fulcrumed upon the ends of the machine and to which are pivotally connected the upper ends of the bars, each lever being formed with a recess the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft.

5. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, members extending transversely to the ends of said shaft, extensible bars connected at one end with said members and levers fulcrumed upon ends of the machine and to which are pivotally connected the other ends of the bars, each lever being formed with a recess the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft.

6. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, sleeves detachably secured to the ends of said shaft and having transverse extensions, bars operatively connected with said extensions and levers fulcrumed upon ends of the machine and to which are pivotally connected the other ends of the bars, each lever being formed with a recess the upper side of which can engage the corresponding end of

the shaft to receive part of the upward stress on the shaft.

7. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, members extending transversely to the ends of said shaft, bars operatively connected with said members, and levers fulcrumed upon the ends of the machine and to which are pivotally connected the upper ends of the bars, each lever being formed with a recess the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft, the parts being arranged so that the lower ends of the bars swing in their closing position past the center lines between the pivots of the levers on the machine and the pivots of the bars on the levers.

8. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, members extending transversely to the ends of said shaft and extensible bars connected at one end with said members, and levers fulcrumed upon ends of the machine and to which are pivotally connected the other ends of the bars, each lever being formed with a recess the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft, the parts being arranged so that the lower ends of the bars swing in their closing position past the center lines between the pivots of the levers on the machine and the pivots of the bars on the levers.

9. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft rotatable in bearings in said plates, sleeves detachably secured to the ends of said shaft and having transverse extensions, bars operatively connected with said extensions, and levers fulcrumed upon ends of the machine and to which are pivotally connected the other ends of the bars, each lever being formed with a recess the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft, the parts being arranged so that the lower ends of the bars swing in their closing position past the center lines between the pivots of the levers on the machine and the pivots of the bars on the levers.

10. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft in bearings in said plates, sleeves detachably secured to the ends of said shaft and having transverse extensions, extensible bars connected with said extensions, and levers fulcrumed upon the ends of the machine and to which are pivotally connected the upper ends of the bars, each lever being formed with a recess, the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft.

11. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft in bearings in said plates, sleeves detachably secured to the ends of said shaft and having transverse extensions, extensible bars connected with said extensions, and having shoulders adapted to impart pressure to said sleeves in the closed position of the jaw, and levers fulcrumed upon the ends of the machine and to which are pivotally connected the upper ends of the bars, each lever being formed with a recess, the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft.

12. In a sheet metal bending machine, a pivoted jaw having end arms or plates, bearings for the pivots of said jaw, means for movably supporting said bearings, a shaft in bearings in said plates, members extending transversely therefrom, bars operatively connected with said members, and levers fulcrumed upon the ends of the machine and to which are pivotally connected the upper ends of the bars.

13. In a sheet metal bending machine, a pivoted jaw having end arms or plates, bearings for the pivots of said jaw, means for movably supporting said bearings, a shaft in bearings in said plates, sleeves detachably secured to the ends of said shaft and having transverse extensions, extensible bars connected with said extensions, and levers fulcrumed upon the ends of the frame of the machine and to which are pivotally connected the upper ends of the bars.

14. In a sheet metal bending machine, a pivoted jaw having end arms or plates, bearings for the pivots of said jaw, means for movably supporting said bearings, a shaft in bearings in said plates, sleeves detachably secured to the ends of said shaft and having transverse extensions, extensible bars connected with said extensions, and levers fulcrumed upon the ends of the machine and to which are pivotally connected the upper ends of the bars, each lever being formed in its front edge with a recess, the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft.

15. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft in bearings in said plates, levers fulcrumed upon the ends of the machine and having extensions below their fulcrums, and links pivotally connected to said extensions and the ends of said shaft.

16. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft in bearings in said plates, levers fulcrumed upon the ends of the machine and having extensions below their fulcrums,

links pivotally connected to said extensions and the ends of said shaft, and adjustable stops for limiting the movement of said links.

17. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft in bearings in said plates, levers fulcrumed upon the ends of the machine, each formed in its front edge with a recess the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft and extended below its fulcrum, and links pivotally secured to said extensions and the ends of said shaft.

18. In a sheet metal bending machine, a pivoted jaw having end arms or plates, a shaft in bearings in said plates, levers fulcrumed upon the ends of the machine, each formed in the front edge with a recess the upper side of which can engage the corresponding end of the shaft to receive part of the upward stress on the shaft and extended below its fulcrum, links pivotally secured to said extensions and the ends of said shaft, and adjustable stops for limiting the movement of said links.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FREDERICK GOELER.

Witnesses:
FRANCIS M. WRIGHT,
D. B. RICHARDS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."