Nov. 11, 1930. F. J. JARECKI 1,781,180

SHEET METAL FOLDER

Filed Aug. 27, 1928 4 Sheets-Sheet 1

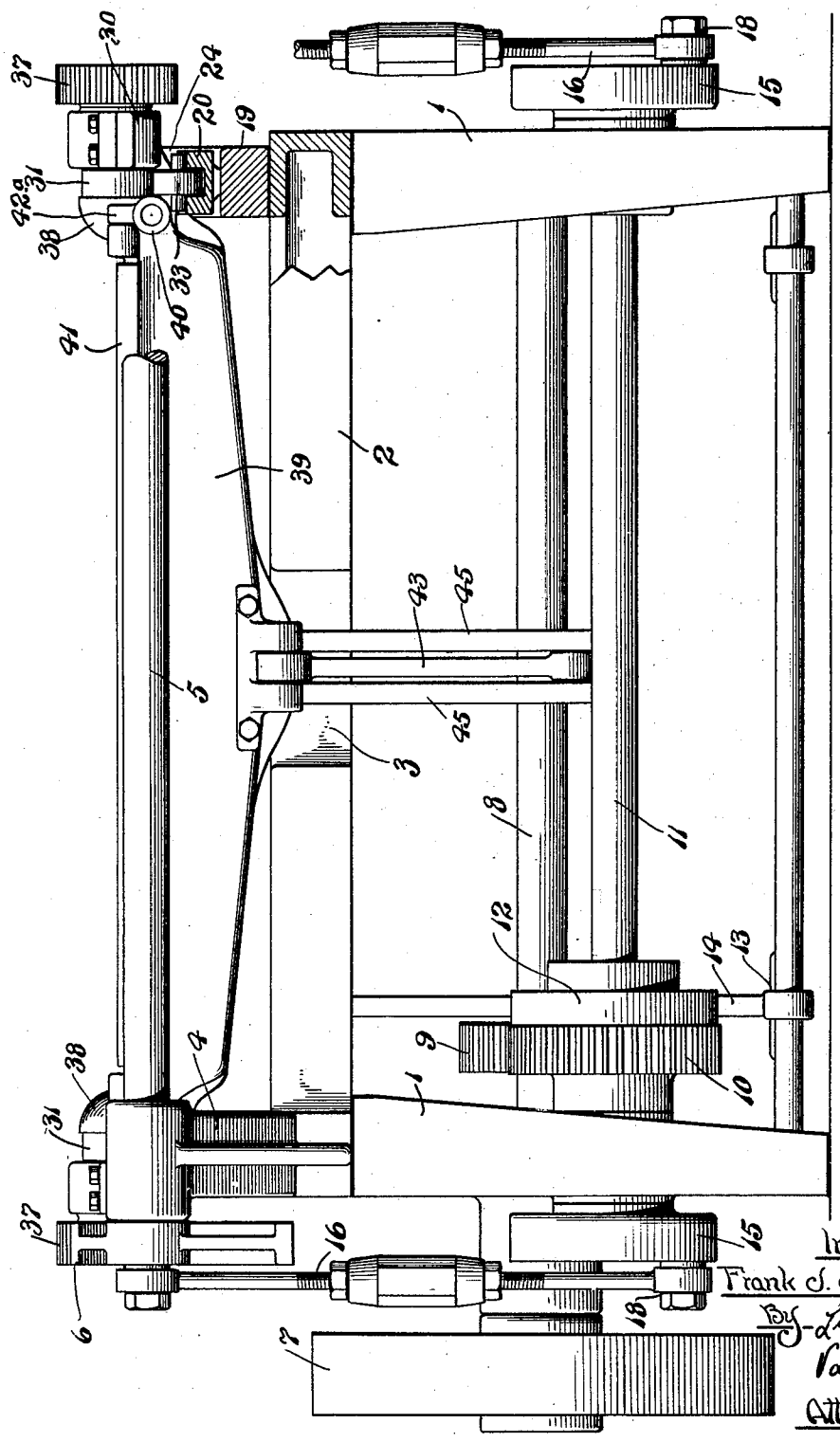

Fig. 1.

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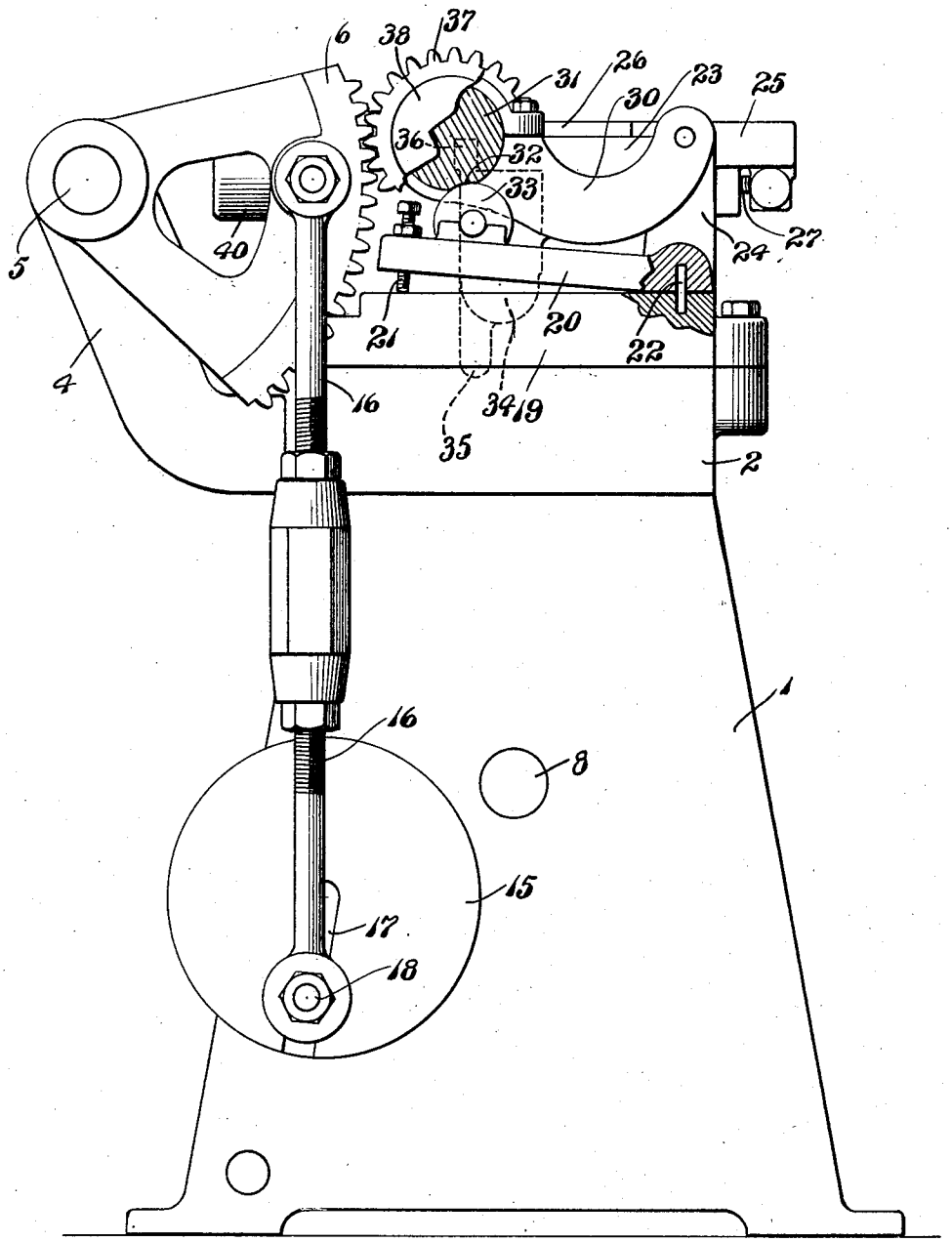

Fig. 2.

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SHEET METAL FOLDER

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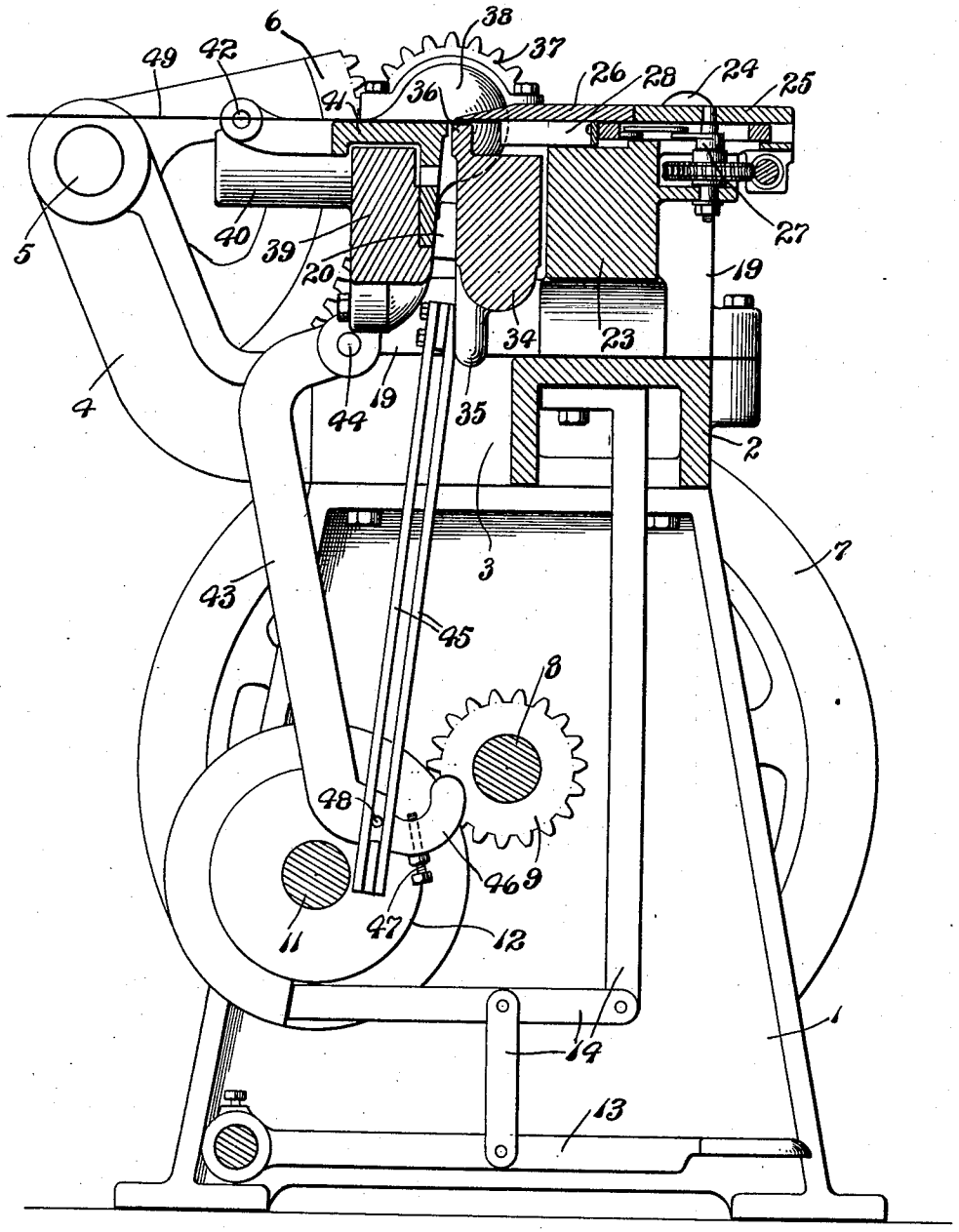

Fig. 3.

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SHEET METAL FOLDER

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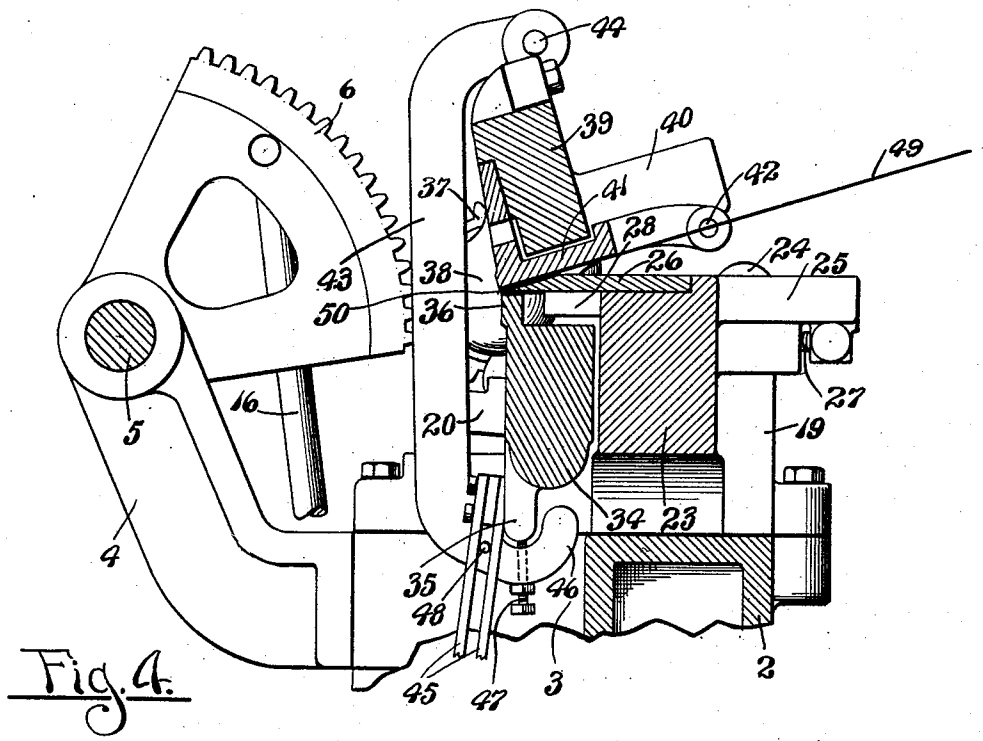

Fig. 4.

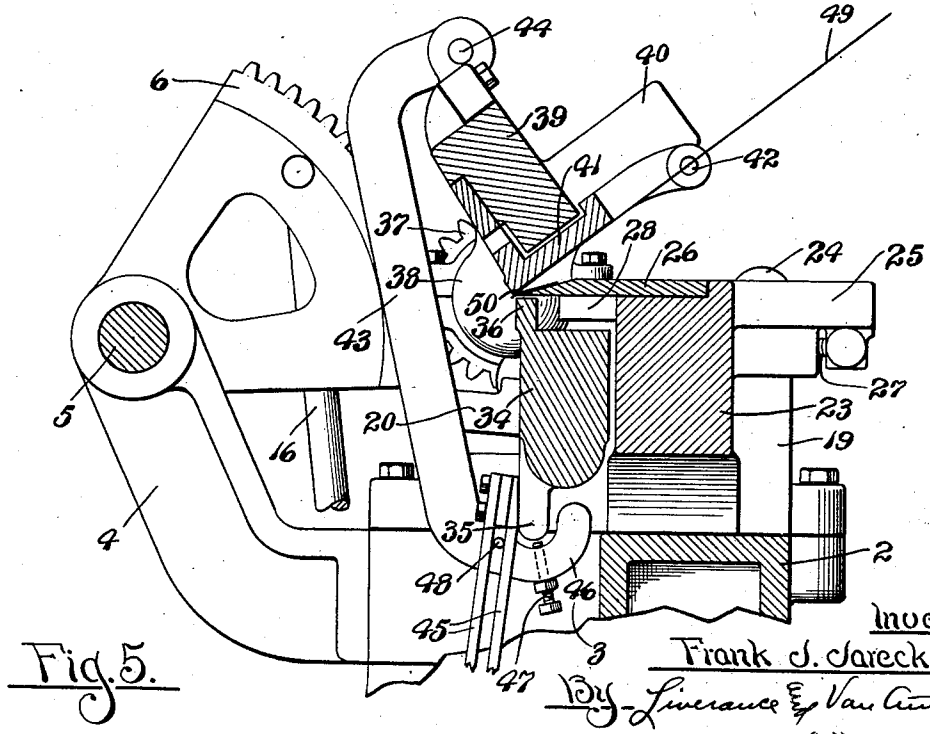

Fig. 5.

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UNITED STATES PATENT OFFICE

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SHEET-METAL FOLDER

Application filed August 27, 1928. Serial No. 302,196.

This invention relates to a sheet metal folding machine designed for folding sheet metal either upon itself to eliminate sharp or rough edges, or to fold one part or section of a plate of sheet metal at a desired angle with respect to the remaining portion thereof.

The plates of sheet metal folded in many cases are of considerable width and in order to obtain a proper fold of the metal the dies should be held rigid particularly at the extreme end of the folding operation and kept from springing downward which they are liable to do under the pressure applied thereto particularly at the intermediate portion of the under die which heretofore has been supported only at its ends. With my invention an automatic support for the middle portion of the under die is brought into play as the folding operation nears its completion thereby holding the intermediate or middle portion of the die rigid against any downward springing and causing the metal to be folded uniformly without discrepancies which otherwise occur between the ends of the fold.

My invention is particularly directed to this novel feature as will be understood from the following description taken in connection with the accompanying drawings, in which,

Fig. 1 is a front elevation of the machine, certain parts being broken away and shown in section for a better disclosure of the construction.

Fig. 2 is an end elevation thereof with parts broken away and in section.

Fig. 3 is a transverse vertical section between the ends of the machine showing the machine in the position it occupies when the sheet metal is inserted therein, and

Figs. 4 and 5 are fragmentary sections similar to those shown in Fig. 3 but illustrating other positions of the machine during the metal folding operations performed thereby.

Like reference characters refer to like parts in the different figures of the drawings.

In the construction of the machine, end supports 1 of the proper form are provided, above and attached to which is a heavy horizontal table 2 which, at a point between its ends, at its front side has a recess 3 as shown for a purpose which will later appear. A bracket 4 is secured at the front side and at each end of the table 2 extending forwardly and upwardly, each bracket having a bearing at its upper free end for the rotatable mounting of a shaft 5 which extends therethrough. At each end of the shaft a gear segment 6 is permanently secured and extends to the rear.

The machine is belt driven preferably, a belt from any suitable source of power passing around a driving pulley 7 fixed at one end of a horizontal shaft 8 mounted in bearings on the end members 1 of the machine frame. The shaft 8 carries a gear 9 which meshes with a second gear 10 fixed to the end of another horizontal shaft 11 mounted in bearings on the ends 1 and extending at each end beyond said ends of the machine. An automatic clutch 12 of the type in common use on punch presses is associated with the shaft 11 and gear 10 and is adapted to be operated by foot lever 13 which is operatively connected with the clutch by means of various links and bars 14 one of which is a trip for the clutch. The specific construction of the clutch and tripping mechanism therefor is not described in detail as it is old and well known and is not an essential feature specifically of the present invention. It is enough to say that on stepping on the lever 13 the shaft 11 is rotated through a single revolution and automatically stopped at the completion of the revolution. At each end of the shaft 11 a wheel 15 is secured which is connected by a connecting rod 16 with the gear segment 6. The connection of the rods 16 to the wheels 15 is by means of a radial T-slot 17 in each wheel 15 in which a T-bolt 18 is adjustably mounted whereby the throw of the rod 16 may be controlled as it may be adjusted inward or outward with respect to the center of the wheel 15 to which it is secured. The rod 16 is divided and equipped with a turn buckle take up as shown whereby this adjustment may be readily effected.

It is evident from the foregoing that on rotation of the shaft 11 the gear segments 6 are simultaneously reciprocated first in an up-

ward direction and then returning in a downward direction to the position occupied at the beginning of the operation.

Located above the table 2, at the rear thereof, is a casting 19 reduced in thickness adjacent its ends. Above each reduced end of the casting 19 a bar 20 is located, its front end being free and having an adjusting screw 21 passing therethrough the lower end of which bears against the upper surface of the adjacent end of the casting 19, while the opposite rear end is connected by a pin 22 to said member 19. The upper sides of the bars 20 are located at an angle to the horizontal, as shown in Fig. 2.

The casting 19 includes a heavy horizontal connecting bar 23 of metal (shown in Figs. 3, 4 and 5) and further includes upwardly extending posts 24 near each end and at the rear side. There is also provided at the upper side and extending rearwardly from the connecting bar 23 a housing 25, in front of which a horizontal die 26 is secured, the front end of which tapers to an edge as shown and which extends forward a distance beyond the front side of the bar 23. Adjusting means 27 for a stop 28 slidably mounted beneath the die 26 is mounted in the housing 25. This adjusting mechanism is not specifically any feature of the present invention and is not described in detail. It is designed that the stop 28 may be moved backward or forward to different positions so as to regulate the distance that a plate of sheet metal may be inserted under the free edge of the die 26.

An arm 30 is pivotally connected at its rear end to the upper end of each of the posts 24 and at its free end is provided with a bearing for a short stud shaft 31. Each of the shafts 31 has a shallow recess 32 in a side thereof (see Fig. 2) and each of the shafts rides upon a roller 33 carried at the upper side of the adjacent bar 20, previously described. When the rollers 33 are seated in the shallow recess 32 of the shafts 31 said shafts are lowered slightly but when the shafts turn so as to move the recesses away from the rollers 33 said shafts are elevated a distance equal to the depth of the recesses 32.

Between the arms 30 a heavy horizontal bar 34 is located directly in front of the heavy connecting bar 23. Said bar 34 at its lower edge and midway between its ends is formed with a downwardly extending lug 35 and at its upper front corner with an upwardly projecting ledge 36 which normally lies directly below and spaced a short distance from the tapered forward edge of the die 26. That is, when the rollers 33 are seated in the recess 32, bar 34 and the ledge 36 are dropped below the lower side of the die 26 a distance such that a plate of sheet metal may be readily inserted between the die and said ledge.

At the outer end of each of the shafts 31 a gear 37 is secured which meshes with the adjacent gear segment 6 and is rotated on the reciprocatory movement of said segment. At the inner end of each shaft 31 is an off-set member 38 which normally extends downward and forward for a short distance, said members being integral with the ends of a third heavy horizontal bar 39 which extends parallel to and in front of the bar 34. The bar 39 at each end has a forwardly extending socket 40 integral therewith. A die plate, or, as it is more commonly known, a flapper plate 41 lies above and over the bar 39 having its upper side in the same plane as the lower side of the die 26, and from the ends of the plate 41 arms extend which are pivotally connected at 42 to lugs 42ª projecting upward from the outer ends of the socket members 40 (see Figs. 1 and 3).

An irregularly shaped bar member 43 has pivotal connection at its upper end 44 to the bar 39 near its middle and at its lower edge, said member 43 extending downwardly through the recess 3 and to the rear, passing between the spaced apart pairs of bars 45 which in turn are permanently connected at their upper ends to the downwardly extending lug 35 described. After the bar 43 passes between the pairs of bars 45 the same terminates in a hook 46 through which an adjusting screw 47 passes upwardly. Guide pins 48 extend laterally from the lower end portion of the member 43 between the bars of each pair of bars 45 to guide the lower end of the member 43 in its upward and downward movements.

With the mechanism in the position shown in Fig. 3 a plate of sheet metal, indicated at 49, is inserted from the front of the machine over the plate 41 and the ledge 36 and under the forward edge of the die 26 until the stop 28 is reached. By stepping on the lever 13 the mechanism is started in operation. The gear segments 6 are oscillated rotating the gears 37 and turning the bar 39 and attached plate 41 to the position shown in Fig. 4. At the beginning of the rotating movement of the gears 37 the shafts 31 are turned so as to disengage the recess 32 from the rollers 33, whereupon there is a slight elevation of the bar 34 and the upper side of the ledge 36 clamps against the under side of the plate 49 below the forward tapered edge of the die 26 and securely holds the plate in place. The plate 41 with the continued rotative movement of the bar 39 in a clockwise direction bends the plate around the edge of the die 26 making the bend indicated at 50. Of course by adjusting the throw of the machine a bend having a greater angle may be made.

It will be noted that with the movement of the bar 39 from the position shown in Fig. 3 to that shown in Fig. 4 the member 43 is elevated and as the plate 41 presses the

sheet metal against the upper inclined side of the die 26 the set screw 47 comes against the lower end of the lug 35 and thereby exerts an upward pressure on the bar 34 holding the same against any downward spring or flexure at its previously unsupported middle portion, so that the fold or bend in the sheet metal is uniform throughout its entire length. This occurs in each bending operation and the bar 34 is thus held against any tendency for even a slight downward bend or vibration at its intermediate portion as the bending operation approaches its end, at which time the pressure exerted is the greatest. This feature of construction is one of great value in devices of this character and insures uniformity of finished product.

Should it be desired to fold the edge portion of the metal flat against the main body of the plate after the bend has been completed, as shown in Fig. 4, it is withdrawn from the machine on the return movement of the bar 39 and attached parts to initial position and it is then placed in the machine above the inclined free edge portion of the die 26 and the operation repeated. This is illustrated in Fig. 5 where the die or flapper plate 41 is about to complete the final operation, which, when completed, will cause the mechanism to occupy the same position as shown in Fig. 4, whereupon the edge portion of the sheet metal plate 49 will be pressed flat against the main body of said plate.

The construction described has proved very practical and efficient in handling sheet metal for making any bends of any desired angle therein or for bending the edge portion of a plate of sheet metal over so as to eliminate sharp and rough edges. Supporting the bar 34 from underneath at its middle point automatically when the pressure thereon is at its greatest has obviated defects in the product produced and made the same uniform throughout the full width of the sheet metal plate operated upon. The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In a machine of the class described, a support, a relatively fixed die mounted on said support, a movable die, means for moving the same to bend a plate of sheet metal about the edge of the fixed die, a supporting bar located underneath the edge of the said fixed die, and means actuated by movement of the movable die for exerting pressure at the under side of and at a point between the ends of said supporting bar at the time that the movable die is brought against the sheet metal and the same pressed against the fixed die.

2. In a machine of the class described, a support, a relatively fixed horizontally located die carried by said support having a free edge underneath which the edge portion of a plate of sheet metal is adapted to be passed, a movably mounted die adapted to be located horizontally in one position and over which the plate of sheet metal is located when the same is inserted underneath the fixed die, means for turning the movable die about a horizontal axis to bend the sheet metal about the free edge of the fixed die, a supporting bar located underneath said edge of the fixed die over which the sheet metal passes, means for elevating the supporting bar a short distance upon initiation of the turning movement of the movable die, and means automatically engaging against the under side of said supporting bar at a point between its ends to press upwardly thereagainst when the movable die has been turned to press the metal against the upper side of the fixed die.

3. In a machine of the class described, a supporting frame, a relatively fixed horizontal die carried thereby having a free edge portion underneath which the edge of a plate of sheet metal is adapted to be passed, a movable die mounted to turn about a horizontal axis located to one side of the first die and adapted to be positioned horizontally in one position over which said plate of sheet metal passes, means for turning the movable die about said horizontal axis, a supporting bar located underneath the free edge portion of the fixed die over which the sheet metal passes, means for automatically raising the supporting bar at the beginning of the turning movement of the movable die to clamp the sheet metal between it and the fixed die, and means connected with the movable die and elevated thereby as the same is turned about said horizontal axis into engagement against said supporting bar at a point between its ends to thereby hold the supporting bar against downward flexure when the movable die has pressed the metal against the upper side of the fixed die.

4. In a machine of the class described, a supporting frame, a relatively fixed horizontal die having a free edge portion carried on said frame, a movable die adapted in one position to be located horizontally whereby a plate of sheet metal may be passed thereover and underneath the free edge of the fixed die, means for mounting the movable die to turn about a horizontal axis to a position over the free edge portion of the fixed die, a supporting bar located underneath the free edge portion of the fixed die and normally slightly spaced therefrom whereby the sheet metal plate may pass thereover, means for automatically elevating the supporting bar to clamp the sheet metal between it and the fixed die at the beginning of the turning movement of the movable die, means for turning said movable die about said horizontal axis, guide bars attached to the support-

ing bar and extending downwardly therefrom, a member connected with the movable die and extending downwardly between said guide bars, means on said member engaging with the guide bars to guide the lower end of said member in its movements whereby on completion of the turning movement of said movable die to a position over the fixed die the lower end of said member presses against the under side of the supporting bar at a point intermediate its ends, for the purposes described.

5. In a machine of the class described, a relatively fixed die and a movable die, said movable die normally occupying a position wherein a plate of sheet metal may be passed thereover and underneath the edge of the fixed die, a supporting bar under said fixed die over which the sheet metal passes, means for automatically clamping the metal between said fixed die and supporting bar at the beginning of the movement of the movable die, means for moving said movable die to bend the sheet metal about the free edge of the fixed die, and means connected with the movable die and movable therewith adapted to bear against the lower side of the supporting bar at a point between its ends on the completion of the movement of the movable die.

6. In a machine of the class described, a relatively fixed die, a movable die, means for moving the same to bend a plate of sheet metal about the edge of the fixed die, and means actuated by movement of the movable die for exerting pressure at the under side of and at a point between the ends of said fixed die at the time the movable die is brought against the sheet metal and the same pressed against the fixed die.

7. A sheet metal bending machine having two relatively movable dies, each having upper sheet metal receiving surfaces when in normal position, means for moving one die relative to the other to change the position of its sheet metal receiving surface, and a member connected to one of said dies and located beneath said dies when in normal position, said member engageable with the other of said dies when the movable die is moved for clamping the said dies together at the completion of the bending movement.

In testimony whereof I affix my signature.

FRANK J. JARECKI.