W. F. BURDITT, JR.

APPARATUS FOR MAKING SQUARE TUBING.

APPLICATION FILED JULY 19, 1912.

1,173,168.

Patented Feb. 29, 1916.

4 SHEETS—SHEET 1.

Fig. 1.

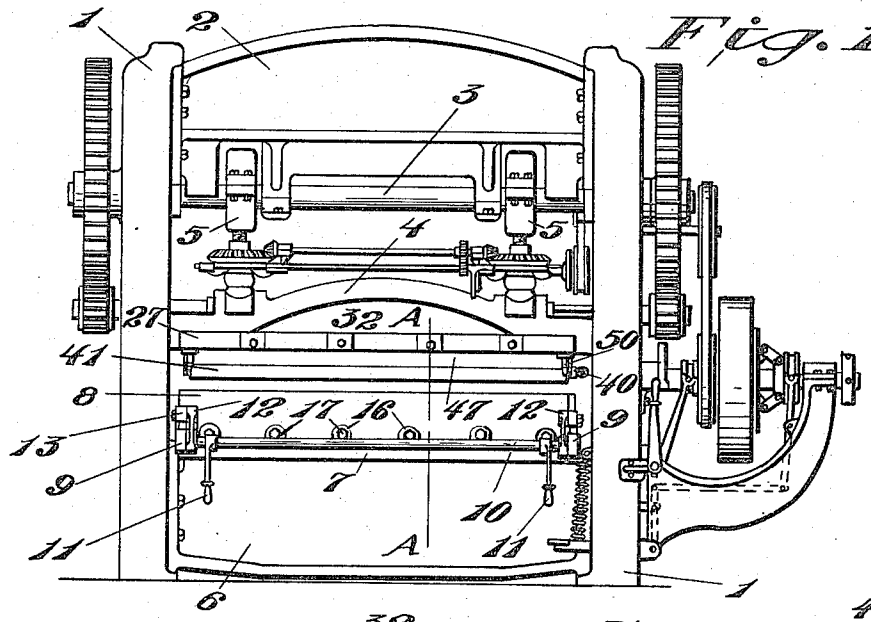
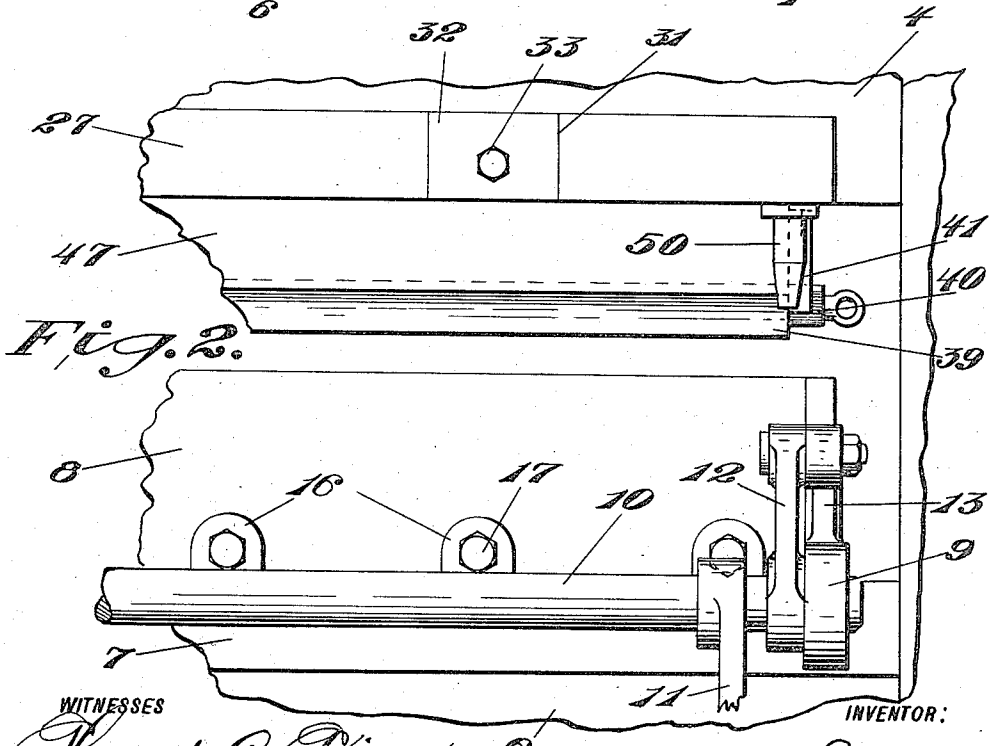


Fig. 2.



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4 SHEETS—SHEET 2.

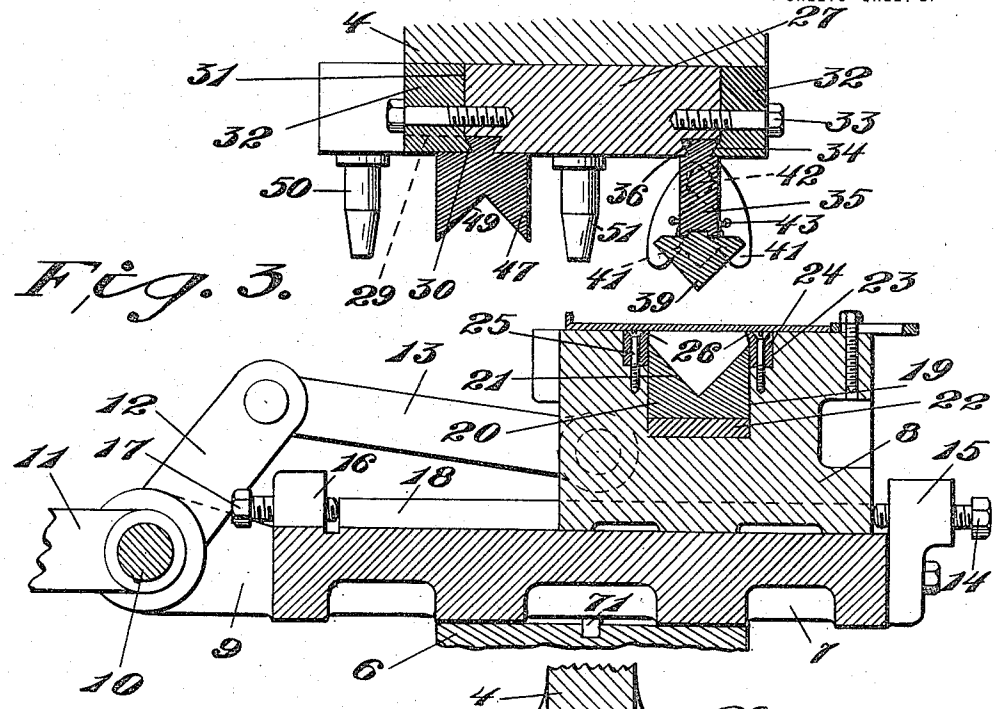


Fig. 3.

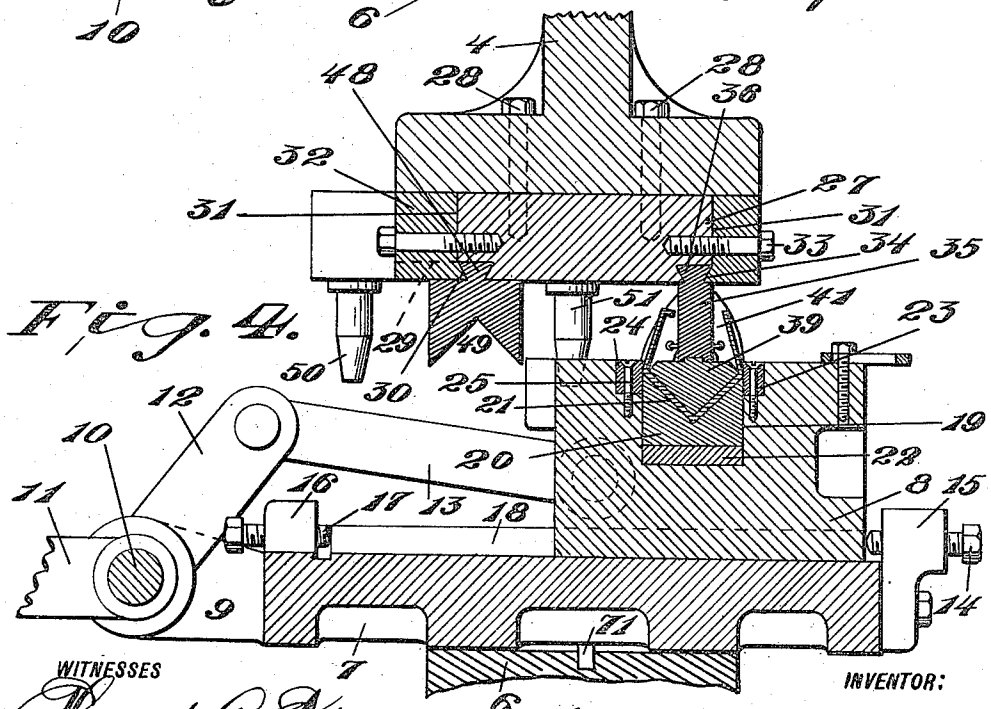


Fig. 4.

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4 SHEETS—SHEET 3.

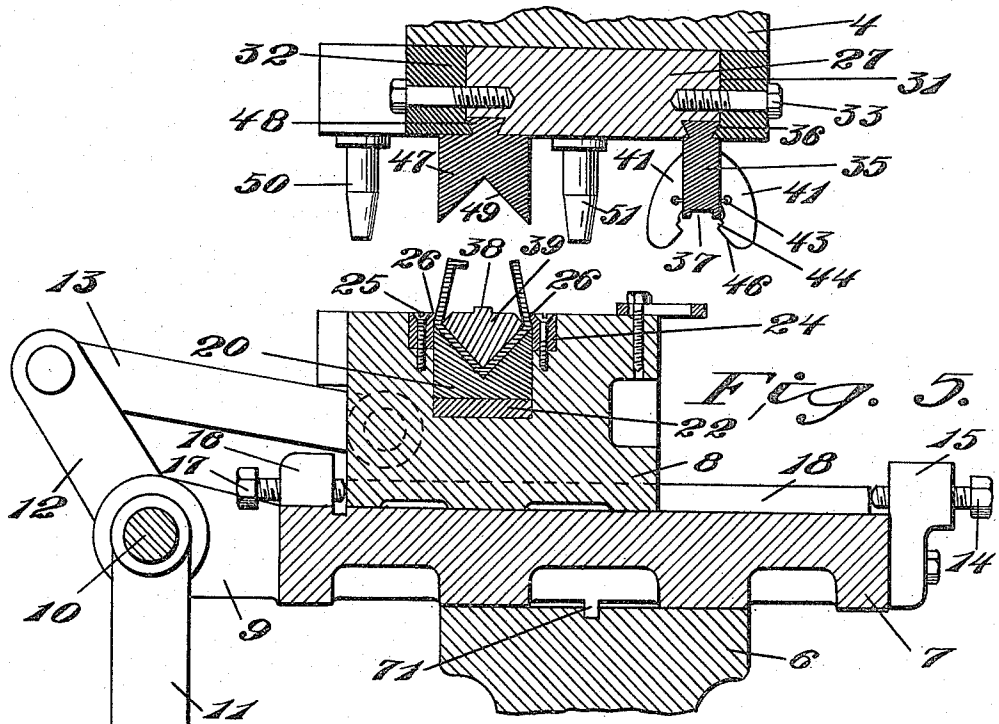


Fig. 5.

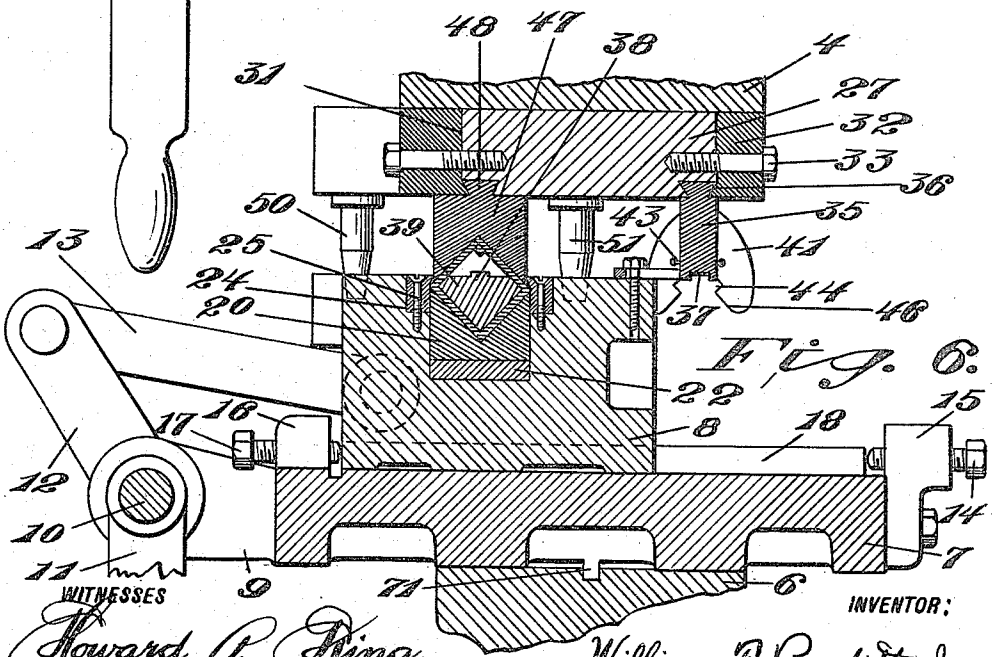


Fig. 6.

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4 SHEETS—SHEET 4.

Fig. 7.

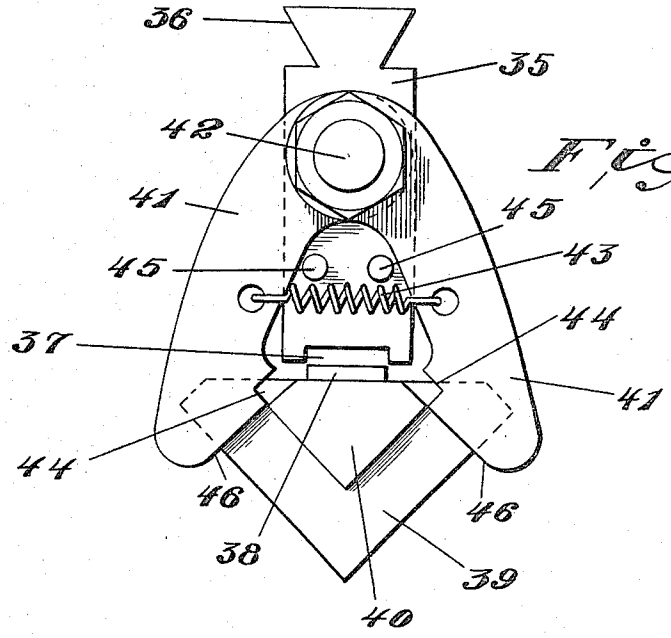


Fig. 8.

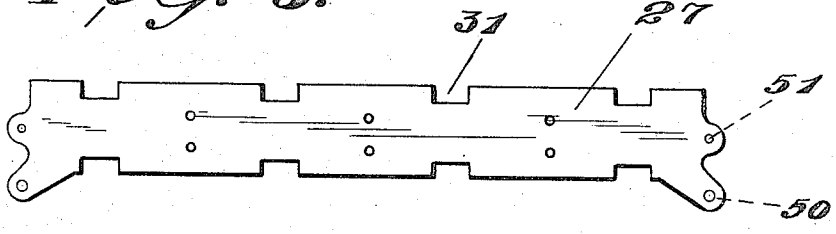


Fig. 10

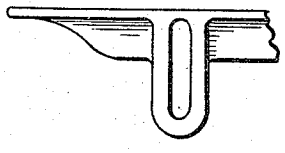
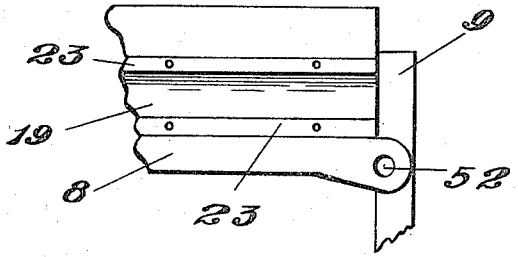


Fig. 9.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MAKING SQUARE TUBING.

1,173,168. Specification of Letters Patent. Patented Feb. 29, 1916.

Application filed July 19, 1912. Serial No. 710,331.

To all whom it may concern:

Be it known that I, WILLIAM F. BURDITT, Jr., a citizen of the United States, residing at Lyons Farms, in the county of Union and State of New Jersey, have invented certain Improvements in Apparatus for Making Square Tubing, &c., of which the following is a specification.

The objects of this invention are to provide means for bending sheet-metal into tubes of rectangular cross-section with a minimum number of movements or operations; to provide a male die member which becomes also a mandrel, and improved means for handling said die member; to enable the partially formed tubing to be quickly and accurately closed into its completed form; to secure simplicity of construction and operation; to reduce the cost of manufacture of tubing, and to obtain other advantages and results as may be brought out in the following description.

Referring to the accompanying drawings, in which like numerals of reference indicate the same parts throughout the several figures, Figure 1 is a front elevation of a power press embodying my invention; Fig. 2 is an elevation similar to Fig. 1, but showing only a portion of the hammer and anvil, on larger scale; Fig. 3 is a section on line A—A of Fig. 1, showing the hammer about to form the initial bend in the metal; Fig. 4 is a similar section showing said initial bend completed; Fig. 5 is also a similar section showing the female die shifted for the final and closing bend; Fig. 6 shows said final bend completed; Fig. 7 is an end view of the mandrel and carrier therefor, detached from the press and showing certain fingers just disengaging the mandrel; Fig. 8 is a plan of the upper die holder, detached, the dies and blocks for clamping them in place being removed; Fig. 9 shows an end portion of the lower die carriage, in plan, the female die, side pieces and metal gage all being removed; and Fig. 10 is a plan of an end portion of the metal gage.

In said drawings, and particularly in Fig. 1, I have shown a sheet-metal bending press of ordinary form with housings 1, 1, upper connecting leaf 2 supporting the power driven shaft 3 which actuates the hammer 4 through eccentrics or cranks 5, 5, and having between the lower ends of said housings the anvil 6. A lower die holder is mounted upon said anvil, in carrying out my invention, said die holder comprising a base portion 7 held centrally by a bottom rib 71 and being of sufficient width to allow the required travel of a laterally sliding carriage 8 thereon for the female die. Brackets 9, 9 project horizontally forward from said base portion 7 and provide bearings for a rock shaft 10 upon which operating handles 11, 11 are secured near the housings 1, 1, although they might be at other points of the length of said rock shaft if desired. Arms 12, 12, also fast on said rock shaft 10, preferably near its ends, are connected by links 13, 13 to the said sliding carriage 8, and thus movement of the handles 11, or one of them, transmits a sliding movement to said carriage from side to side of the base portion 7. Preparatory to the initial bend of the metal, the said handles 11 are raised, thereby bringing the carriage to its rearward position, as shown in Figs. 3 and 4, such rearward movement being limited by stop bolts 14, 14 screwed into upwardly projecting ears 15 suitably bolted to the base portion 7. Said ears, however, might be cast integral with the base portion, as shown by the ears 16 at the front of the base portion, which receive stop screws 17 to limit forward movement of the carriage 8. It may here be noted that transverse ribs or guides 18 on the floor of the base portion 7 prevent longitudinal displacement of the transversely sliding carriage 8.

The carriage 8 has a longitudinal channel 19 in its top, preferably of rectangular cross section and adapted to receive the female die member 20, said die member having itself a V-shaped groove 21 of suitable shape to fit one corner of the tube to be made, and being adapted to be brought to any desired height in the channel of the carrier by the insertion of liners or filling pieces 22 beneath said die member. The side walls of said die channel 19 in the carriage are recessed, as at 23, 23, at their upper or outer longitudinal edges, and in said recesses are mounted hardened side pieces 24, 24, said side pieces being secured in place by suitable means, such as the screws 25. Longitudinal lips 26, 26 project slightly into

the channel 19 from the exposed longitudinal corner edges of the side pieces 24, and these lips narrow slightly the upper opening or top of the channel 19, the function of which will be hereinafter explained.

The hammer 4 has an upper die holder 27 secured flatwise against its under face, as by means of the bolts 28, and said die holder has recesses 29 along the lateral edges of its lower face, said recesses having undercut inner walls 30. Vertical slots 31 are cut in the edges of the said die holder, as shown in Fig. 8 with especial clearness, said slots extending inward to a point between the edge of the die holder and the adjacent undercut wall 30 of the recess 29. Clamping blocks 32 fit slidably in said slots, each block being held by a bolt 33 and extending at its lower part into the recess 29 with an undercut face or wall 34 at the side of said projection next the undercut wall 30 of said recess.

At the rear of the machine, as I have shown it in the drawings, a mandrel carrier 35 is held by its upper dovetailed edge 36 in the recess 29 by the clamping blocks 32, said mandrel carrier having at its lower edge a groove 37 to receive the tongue 38 on the mandrel 39, said mandrel being triangular in cross section and adapted to fit in the groove 21 of the female die member to shape one corner of the tubing to be made. Said mandrel has at its ends extensions 40, which are adapted to be engaged by latches 41, 41, one pair at each end of the mandrel carrier 35, said latches serving to hold the mandrel to the carrier until it is forced into the female die 21 with a piece of sheet metal between, when the friction is sufficient to retain said mandrel therein and cause the latches to pull off as the hammer ascends again. These latches, or one pair of them, are shown in detail in Fig. 7, where 42 indicates the bolt or pin upon which they are pivoted and 43 indicates a spring which draws the latches together into engagement at their notches 44 with the end extension 40 of the mandrel. 45, 45 indicate stops to prevent the latches being drawn so close together by spring 43 that they will not automatically pick up the mandrel when the mandrel carrier is lowered for that purpose, it being understood that at such a time the beveled faces 46 of the latches slide upon the opposite sides of the mandrel extension 40 to guide the latches into engagement.

When the mandrel 39, as a die member, is forced into the lower die member 20, as shown in Fig. 4, it will be seen that two sides and the intermediate angle of the tubing are completely formed, and the other two adjacent angles are partially formed by the overhanging lips 26, 26 of the side pieces 24, 24. These lips are close enough to the lateral edges of the mandrel as it is lowered so that the metal blank is engaged at the opposite corner edges of the mandrel and slightly pinched; this causes the upwardly projecting portions of the blank to bend toward each other over the said lateral edges of the mandrel, as the mandrel is forced past the lips, so that when the mandrel is seated said portions of the sheet metal projecting above said lips converge, as shown in Fig. 4. Upward movement of the hammer then draws the mandrel carrier away from the mandrel, which is left as shown in Fig. 5, and the sliding carriage is slid to the front of the machine.

At the front of the machine, also, an upper closing die 47 is held by its dovetailed tongue 48 in the recess 29 of the die holder, by the clamping blocks 32, said closing die being positioned to coöperate with the lower die 20 in the forward position of the same, as shown in Fig. 5. This closing die 47 has a V-shaped groove 49 corresponding to the groove 21 in the lower die 20 and adapted to form the diagonally opposite corner of the tubing. When the said closing die is brought down by the hammer, as shown in Fig. 6 the two sides of its groove 49 engage the already converging free sides of the tubing and bend the same toward each other into final position, completing the angles of the tubing at the side edges of the mandrel 39, as will be understood upon an inspection of Fig. 6. The hammer is then raised, the mandrel 39 slid longitudinally out of the formed tube and said tube removed from the machine.

In order to insure exact registration of the upper dies or each of them, with the lower die, when the hammer is lowered, the upper die holder 27 is provided with front and rear pairs of downwardly projecting dowels 50, 50 and 51, 51, respectively, one pair of said dowels being adapted to enter sockets 52, 52 on the sliding carriage 8 when in one position and the other pair adapted to enter said sockets when the sliding carriage is in its other position. Preferably said dowels are tapered at their ends, as shown, to guide the upper and lower parts into the exact registration necessary for accurate work.

Having thus described the invention, what I claim is—

1. In an apparatus of the character described, a laterally slidable carriage having a channel therein, a die with a V-shaped groove movably mounted in said channel, a mandrel fitting said V-shaped groove and having V-shaped lateral edges, a mandrel carrier adapted to be separably connected to said mandrel, a closing die for closing the sheet metal over the upper part of the mandrel, an upper die holder carrying said closing die and mandrel carrier, means for raising and lowering the said upper die holder, and means for shifting said carriage.

2. In an apparatus of the character described, a laterally slidable carriage having a channel therein, a die with a V-shaped groove movably mounted in said channel, a mandrel fitting said V-shaped groove and having V-shaped lateral edges, a mandrel carrier adapted to be separably connected to said mandrel, a V-shaped closing die adapted to fit the upper sides of said V-shaped edges, an upper die holder carrying said closing die and mandrel carrier, means for raising and lowering the said upper die holder, and means for shifting said carriage.

3. In an apparatus of the character described, a laterally slidable carriage, a grooved die on said carriage, a mandrel for said groove of the die, a mandrel carrier, means for connecting said mandrel carrier and mandrel when the latter is idle and automatically disconnecting them when the mandrel is seated in the grooved die upon a piece of sheet metal, a closing die, an upper die holder carrying said closing die and mandrel carrier, means for raising and lowering said upper die holder, and means for shifting said carriage.

4. In an apparatus of the character described, the combination with a grooved die, a mandrel for said groove of said die, a mandrel carrier adapted to engage said mandrel to force the same into the grooved die, latches on said mandrel carrier adapted to hold the mandrel when idle and automatically release the mandrel when it is seated in the grooved die holder upon a piece of sheet metal, an upper die holder carrying said mandrel carrier, and means for raising and lowering said upper die holder.

5. In an apparatus of the character described, the combination with a lower die, of a mandrel adapted to coöperate with said die and having end extensions, a mandrel carrier adapted to engage the top of said mandrel, latches arranged in pairs one at each end of said carrier adapted to engage the said end extensions of the mandrel, and an upper die holder carrying said mandrel carrier.

6. In an apparatus of the character described, the combination with a lower die comprising a middle section with a V-shaped groove, side pieces at the opposite sides of said groove, and a mandrel fitting said middle portion and having lateral V-shaped edges adapted to pinch the metal against said side pieces as it passes them and thus bend it inward.

7. In an apparatus of the character described, the combination with a lower die comprising a middle section with a V-shaped groove and side pieces at opposite sides of said groove overhanging the same, of a mandrel fitting said middle section and having lateral V-shaped edges adapted to pinch the metal against said side pieces as it passes them and thus bend it inward.

8. In an apparatus of the character described, a lower die holder having a channel with its side walls recessed at their upper edges, a die removably mounted in said channel, side pieces mounted one in each of said recesses and overhanging said die, and a mandrel fitting said die and having lateral V-shaped edges adapted to pinch the metal against said side pieces as it passes them and thus bend it inward.

9. In an apparatus of the character described, the combination with a lower die having a groove with overhanging lips at its opposite lateral edges, a mandrel fitting said groove and having lateral V-shaped edges adapted to pinch the metal against said lips as it passes them and thus bend it inward and partially close it over the mandrel, and a closing die having a groove with converging sides adapted to further close the sheet metal above said mandrel.

10. In an apparatus of the character described, the combination with a lower die of a mandrel adapted to enter said die, a mandrel carrier, latches with diverging ends adapted to be spread by engagement with said mandrel and grasp the same, springs drawing said latches together, and means for raising and lowering said mandrel.

11. In an apparatus of the character described, the combination with a lower die, of a mandrel adapted to enter said die, a mandrel carrier, latches with diverging ends adapted to be spread by engagement with said mandrel and grasp the same, springs adapted to hold said latches in frictional engagement with the mandrel, stops limiting movement of the latches by said springs, and means for raising and lowering said mandrel.

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