(No Model.) 3 Sheets—Sheet 1.

J. F. McNUTT.

MACHINE FOR WORKING SHEET METAL.

No. 567,038. Patented Sept. 1, 1896.

Fig. 1.

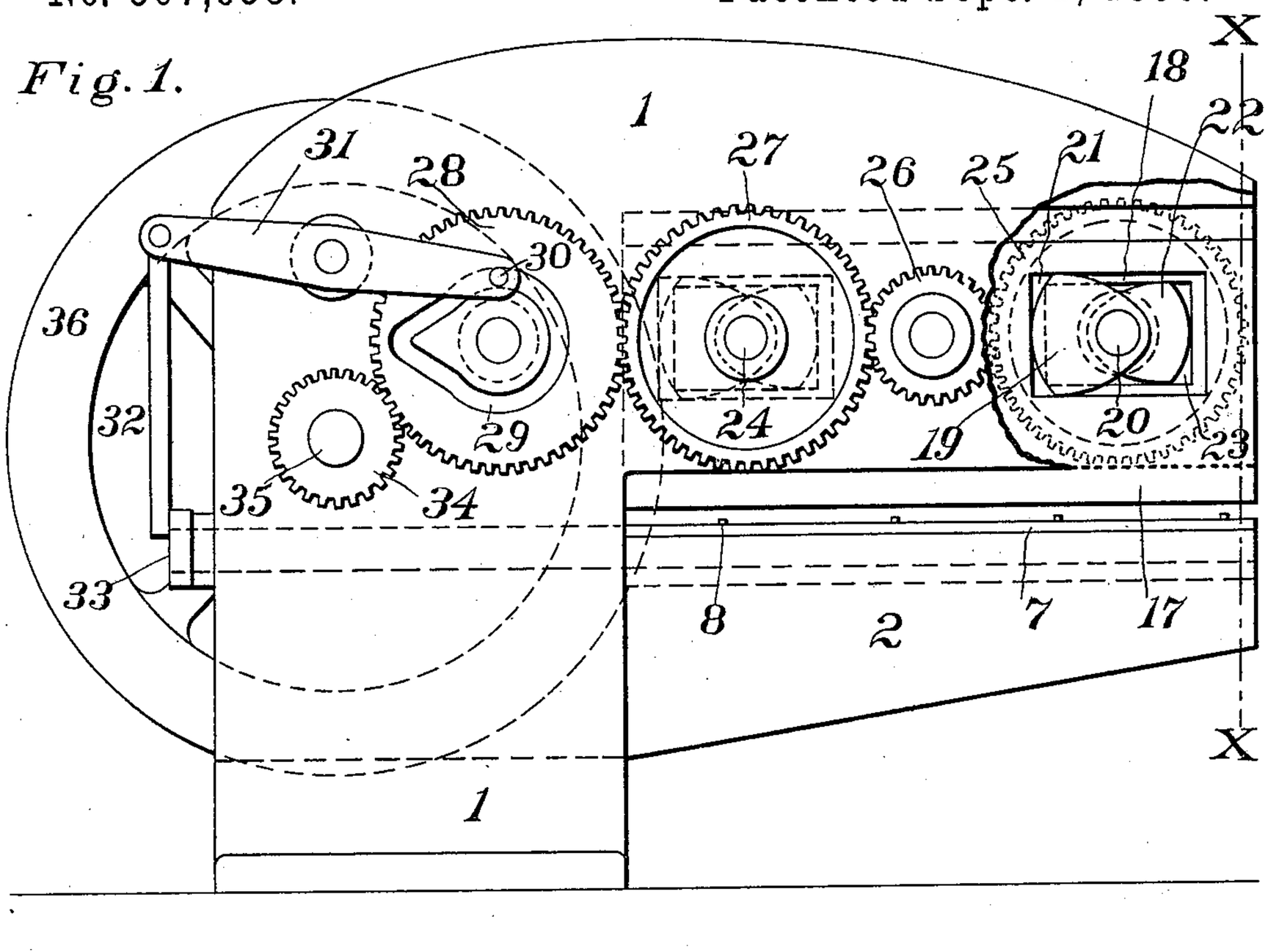
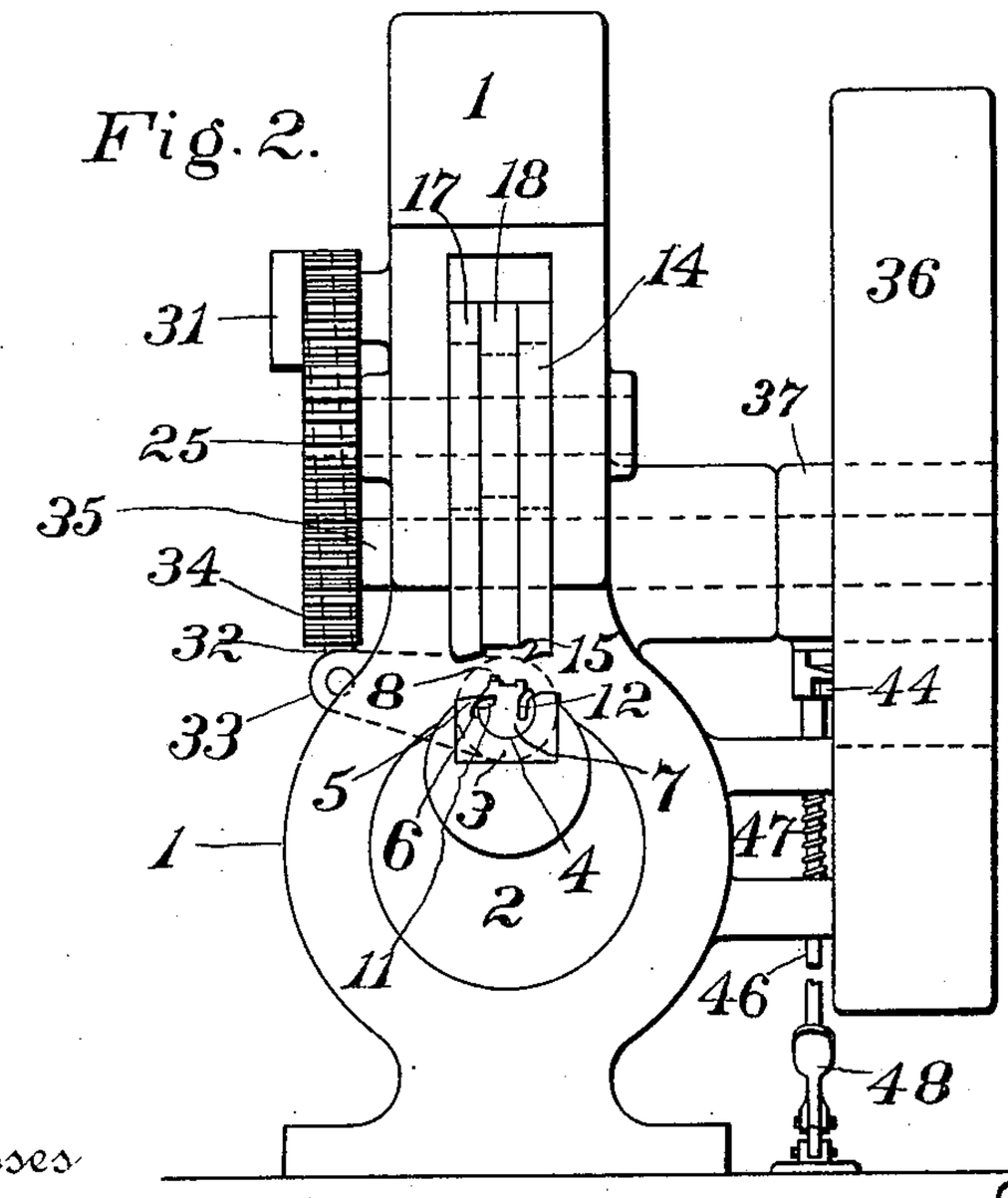


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

J. F. McNUTT.

MACHINE FOR WORKING SHEET METAL.

No. 567,038. Patented Sept. 1, 1896.

Fig. 3.

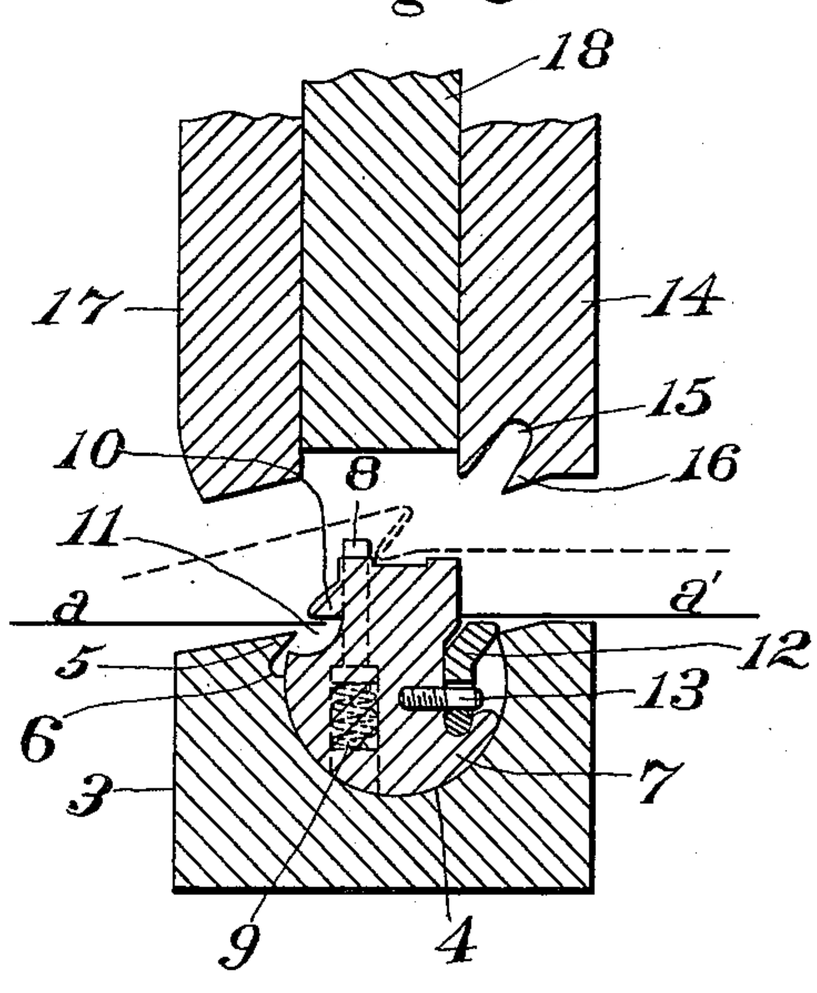


Fig. 4.

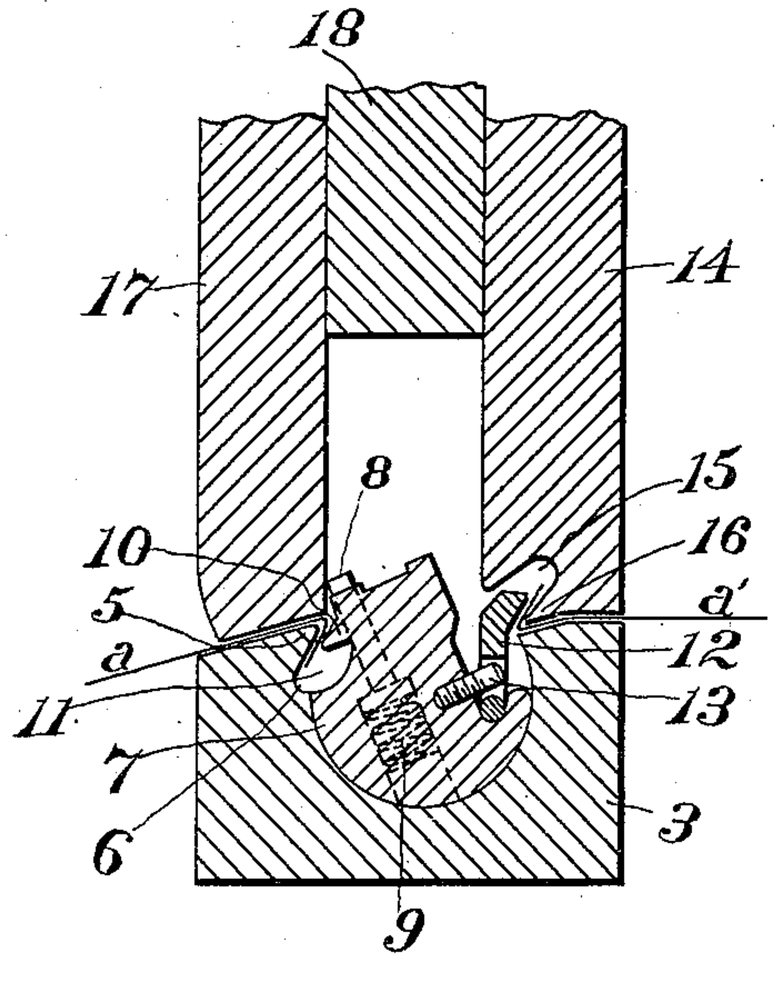


Fig. 5.

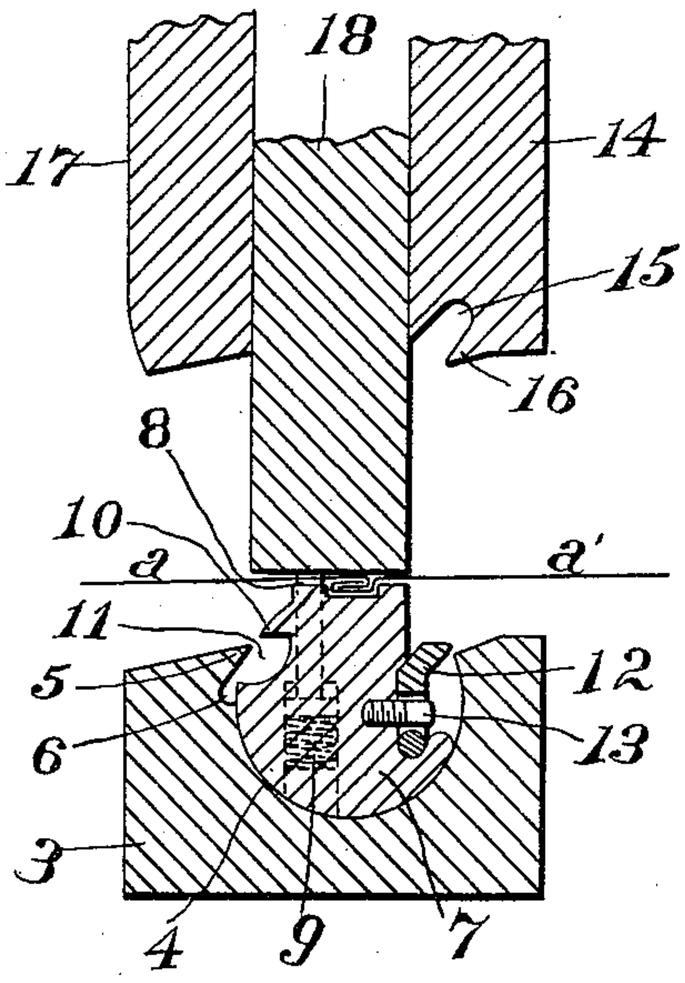


Fig. 6.

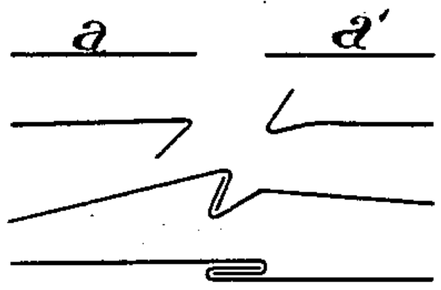
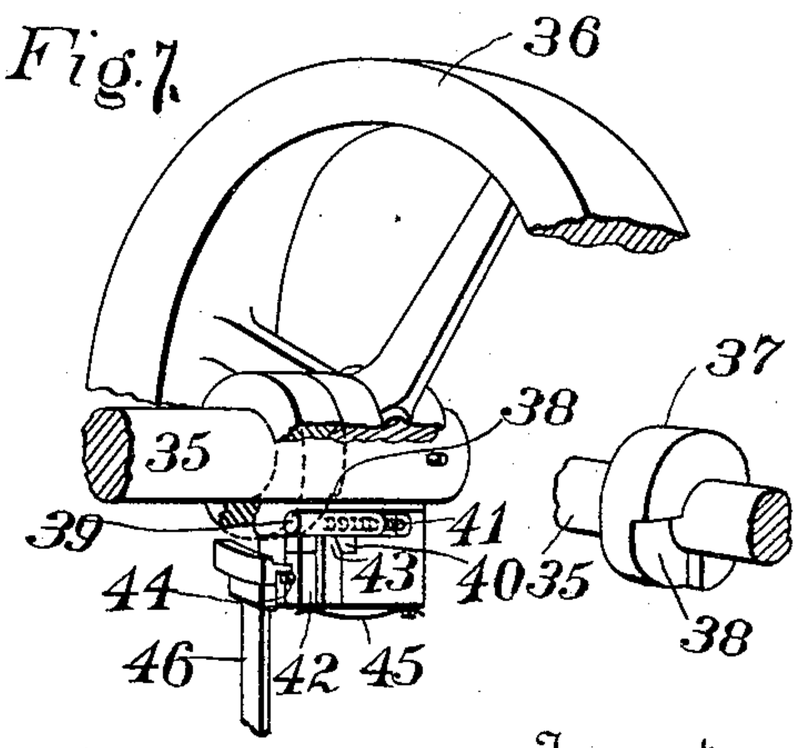


Fig. 7.



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(No Model.) 3 Sheets—Sheet 3.

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MACHINE FOR WORKING SHEET METAL.

No. 567,038. Patented Sept. 1, 1896.

Fig. 8.

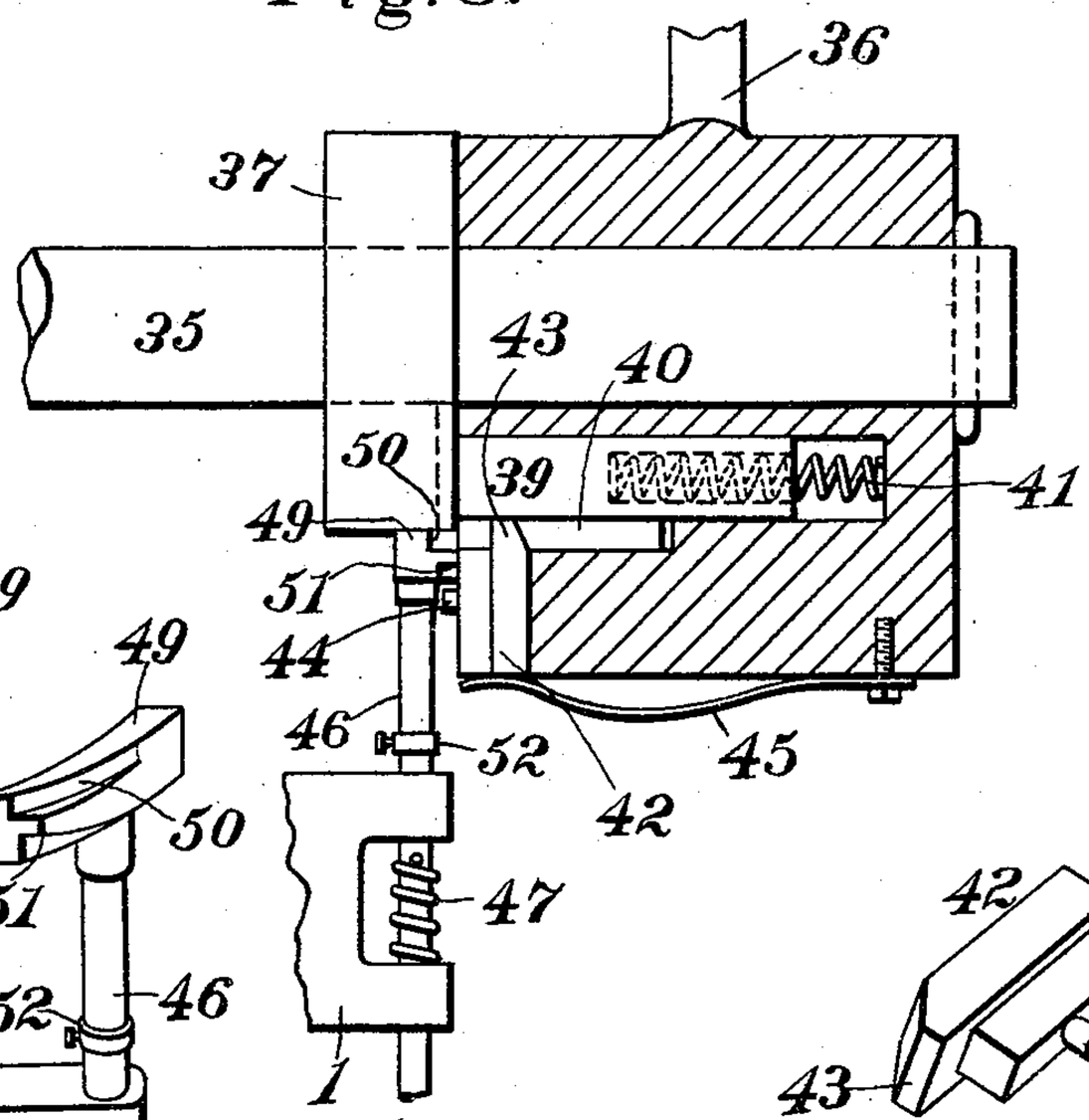
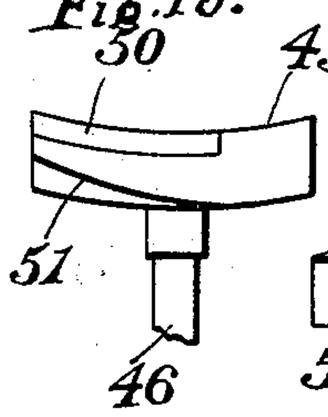


Fig. 13.



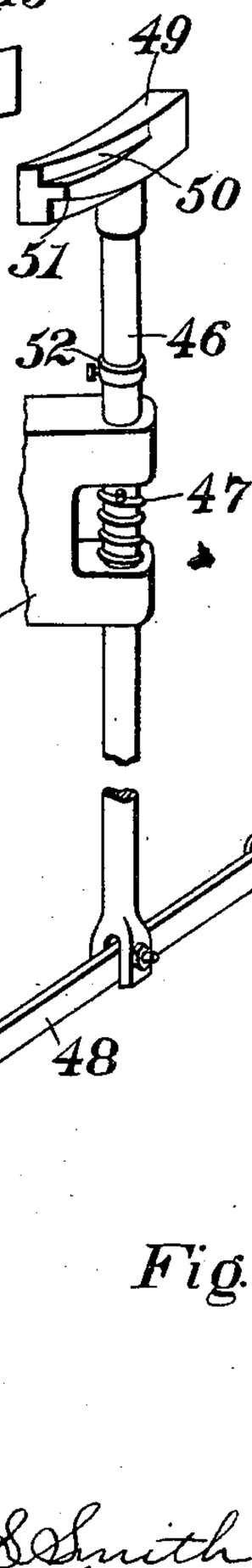


Fig. 9.

Fig. 10.

Fig. 11.

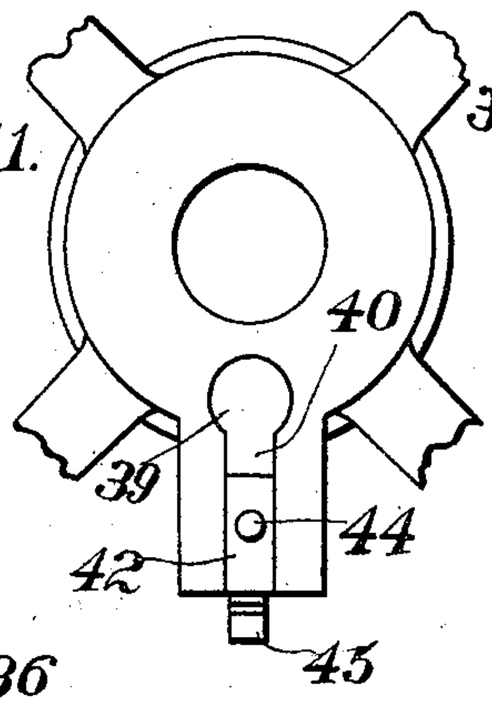
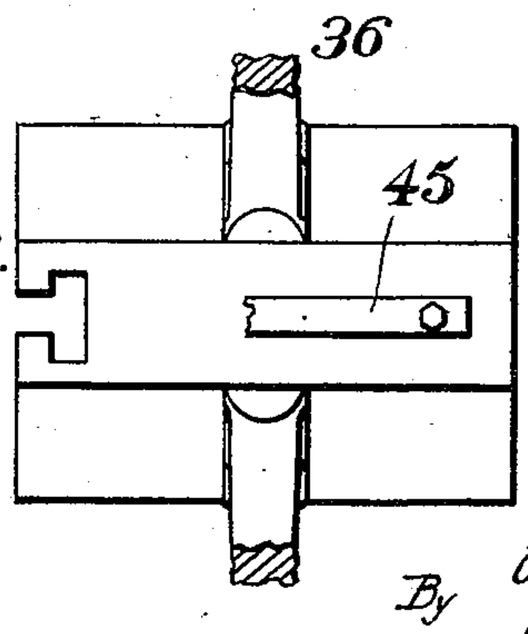


Fig. 12.



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UNITED STATES PATENT OFFICE.

JOHN FRANKLIN McNUTT, OF WARREN, OHIO, ASSIGNOR OF ONE-HALF TO RICHARD HUGH SCOTT, OF TRUMBULL COUNTY, OHIO.

MACHINE FOR WORKING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 567,038, dated September 1, 1896.

Application filed September 13, 1895. Renewed July 30, 1896. Serial No. 601,111. (No model.)

To all whom it may concern:

Be it known that I, JOHN FRANKLIN McNUTT, a citizen of the United States, residing at Warren, in the county of Trumbull and State of Ohio, have invented certain new and useful Improvements in Machines for Working Sheet Metal; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures and letters of reference marked thereon, which form a part of this specification.

My invention relates to machines for working sheet metal, and has for its object the improvement of devices for folding and seaming.

A further object of my invention is the production of a machine designed to clamp the sheets operated upon at a certain distance from the edges before the fold is effected, thus insuring the contact of surfaces equal in breadth throughout the length of the seam.

My invention consists, essentially, of reciprocating die-plates suitably actuated with relation to each other, stationary surfaces presented to the die-plates, a rocking cylindrical piece possessing a folding edge, a movable folding-bar, and an anvil or surface capable of being so held as to coöperate with one of the reciprocating plates in the perfecting of a so-called "lock-seam," together with various details hereinafter particularized.

In the accompanying drawings, wherein like figures and letters represent like parts throughout the several views, Figure 1 shows a side view with a portion of the main frame broken away to exhibit the mechanism employed to serve motion to the various working parts. Fig. 2 shows an end view taken from a point to the right of Fig. 1. Fig. 3 shows a vertical section of stationary die-block, movable die-plates, and rocking cylinder upon line *x x* of Fig. 1, with the edges of a sheet in position to begin the fold. Fig. 4 shows a sectional view, as in Fig. 3, with the sheet clamped between block and die-plates and the edges folded by a partial rotation of the rocking cylinder. Fig. 5 shows a sectional view, as in Fig. 3, when the parts are engaged in perfecting the seam to join the edges of the sheet. Fig. 6 indicates the form of the edges of the sheet at the close of the different steps taken to complete the seaming process, and Fig. 7 represents one form of a single-revolution stop-motion device for engaging and releasing the fly-wheel. Fig. 8 represents a side view, partly in section, showing the positions of the parts constituting the stop-motion clutch; Fig. 9, a perspective view of the recessed block fixed upon the upper extremity of the trip-rod; Fig. 10, a perspective view of the sliding spring-governed block designed to be moved within the T-groove in the hub of the fly-wheel; Fig. 11, an inner end view of the hub of the fly-wheel; Fig. 12, a view of the hub from below, the sliding block having been removed, showing the T-groove; and Fig. 13, a side view of the recessed block fixed upon the upper extremity of the trip-rod. The parts appearing in Figs. 8 to 13, inclusively, are drawn upon a somewhat larger scale than that chosen for the preceding figures.

Referring to Figs. 1 and 2, numeral 1 marks the main frame of the machine, of any desirable form and weight, provided with an overhanging portion longitudinally recessed to accommodate the reciprocating die-plates hereinafter described. Beneath the overhanging portion and equaling it in length a horn or bracket 2 is attached to or integral with the main frame. Occupying a rectangular channel which extends throughout the length and along the upper surface of horn 2 is the anvil or die-block 3. The die-block is bored lengthwise, the axis of the bore being situated somewhat above a line joining the middle points of the ends of the block, but in the same vertical plane. The diameter of the bore is such that the block is provided with a longitudinal groove 4 of more than semi-cylindrical extent, the segment completing the circular cross-section of the groove lying above the block. (See Figs. 3, 4, and 5.) An inspection of the same figures will show that part of the upper surface of the block upon one side of the groove and the whole of such surface on the other side is inclined from the horizontal, as usually constructed. The latter surface, mentioned as wholly inclined, forms

one side of a folding edge 5, the complemental side being formed by a cut tangential to the groove and into the body of the block, forming the offset or secondary groove 6. Fitting in the groove 4 is the rocking cylinder 7, which passes through the main frame and is journaled and connected at the rear of the machine, as more fully described later herein. That portion of the length of cylinder 7 lying in the grooved block is flattened upon one side and provided with rectangular elevations bounding the flat area lengthwise. The construction results in a shallow depression, wherein the seam connecting the sheets is pressed into its final shape. At intervals along one of the elevations gage-pins 8 project. The pins are let into the body of the cylinder 7 at right angles to the flattened area, and springs 9, encircling or placed beneath the pins within the cylinder, restore them to their original projecting position after the operation of seaming is concluded in each instance. The gage-pins 8 are employed, in number as required, to enable the operator to quickly place the folded sheet into position for seaming. They are of common construction and operation and need no further description. Along the cylinder, at one side of the pins 8, is a folding edge 10, formed by routing the body of the piece, as shown at the point 11. (See Figs. 3, 4, and 5.) Immediately beyond the rectangular elevation opposite to the pins 8 the metal of the rocking cylinder is cut away at right angles to the flattened area, as my invention is ordinarily constructed. The cut extends throughout the length of the portion of the cylinder 7 lying within block 3, but does not again reach the surface in a direct line. The metal thus divided is removed from the main body in such a manner as to leave a ledge remaining. An angular depression is formed into the face of the cylinder thus exposed and a semicircular groove is fashioned in the remaining ledge. A folding-bar 12 rests upon the grooved ledge and is loosely shackled in place by the set-screws 13, which enter the cylinder through suitably-shaped orifices in the folding-bar. It will be understood that the bar equals the groove 4 in length. From the cross-section shown in Figs. 3, 4, and 5 the bent upper portion of the bar 12 and its folding edge can be seen, and that edge is usually rounded for the sake of increased efficiency and to avoid liability of a sharp edge catching in the metal sheet operated upon.

Located upon the same side of the machine and partly over the folding-bar 12, with which it is adapted to coact, is the die-plate 14, capable of being raised and lowered by mechanism explained hereinafter. The lower surface of plate 14 corresponds to that of block 3 presented to it, and a depression 15 along the lower inner angle of the plate completes the folding edge 16 upon one side and affords a guide for the folding-bar upon the other side of the depression. Number 17 represents the second outer die-plate and possesses a lower surface corresponding to that of block 3, which it is designed to meet, and 18 represents the middle plate having a plain flat face as customarily made, although the rectangular groove described in connection with cylinder 3 may be given to the lower face of this plate. The plates 14 and 17 rise and fall simultaneously within suitable guides in the main frame. The actuating elements are precisely alike for each and consist of the cams 19, rigidly held on the cross-shaft 20, which is journaled in the frame 1. The cams revolve in the rectangles 21, with which the plates are provided. The middle plate 18 reciprocates oppositely to the side plates, but like means are employed to guide and to serve it motion, the cam 22, fixed upon the shaft 20 and revolving in the rectangle 23 in the plate, performing the latter office. Two sets of equivalent cams and rectangles are supplied to insure even action of the plates, the cross-shaft 24, similar in all respects to the shaft 20, bearing the duplicate parts.

Fixed upon the shaft 20, at one end, is the spur-wheel 25, which meshes with the pinion 26, revolubly supported upon a spindle projecting from the side of frame 1. Pinion 26 also engages the spur-wheel 27, which is made fast upon the shaft 24 at one end, and this spur-wheel is operated by the cog-wheel 28, which is revoluble upon a suitable pivot projecting from the side of frame 1. A cam-groove 29, one portion of which follows part of a circle, the remainder being V-shaped, is formed in one side of the cog-wheel 28. It will be observed that the system of gearing just described, when in operation, turns the spur-wheels 25 and 27, which are identical, in the same direction and at the same speed.

Within and adapted to be engaged by the cam-groove 29 is the pin 30, attached to the lever 31, pivoted to the main frame and pivotally connected by the rod 32 to the crank 33, which is keyed to the extension of the cylinder 7 at the rear of the machine. The gear 28 is directly driven by the pinion 34 upon the cross-shaft 35, which carries at its other extremity the band fly-wheel 36, for receiving power from the source. The movable elements and their relations to each other as explained in this paragraph are best shown in Fig. 1.

Referring to Fig. 7, 35 represents the shaft, and 36 the fly-wheel revolubly placed thereupon. In the extended hub of the wheel 36 is contained part of the single-revolution stop-motion clutch for applying the driving force intermittingly to the machine.

Number 37 marks a collar fixed upon the shaft and provided with a recess 38 in the side lying against the hub of the fly-wheel. Fitting within an additional bore in the hub of wheel 36 is the bolt 39, having the notched lug 40 and being forced to project beyond the hub by the spring 41. Adapted to slide within a slot in the hub of wheel 36 is the

piece 42, provided with the angular projection 43, fitting the notch in the lug 40. A pin 44 extends at right angles to the projection 43 from piece 42, and a spring 45, attached to the hub, maintains the position of the piece.

A trip-staff 46, movable up and down within guides attached to the frame of the machine, Figs. 2, 8, and 9, has fixed upon its topmost extremity a curved block 49 possessing an upper triangular recess having a vertical bearing-surface 50, and a lower triangular recess having a horizontal bearing-surface 51. (See Fig. 9.) The bearing-surfaces of both recesses are usually curved, although each may be simply an inclined plane. Number 47 marks a spring coiled about the staff 46 and so compressed between a projection of the main frame and a pin or collar attached to the staff that the curved block 49 is normally held in contact with the collar 37. By means of the treadle 48, Figs. 2 and 9, the staff can be drawn downward against the force of the spring. Assuming the block 49 to be resting in its regular place against the collar 37 and the bolt 39 to have been forced into the hub of the fly-wheel until caught and held by the projection 43 of the piece 42, then wheel 36 can rotate idly upon shaft 35. If, however, the staff 46 should be lowered a short distance until stopped by an adjustable collar 52, the revolution of the hub will bring the pin 44 into contact with the highest point of the bearing-surface 51 of block 49, and further motion will withdraw the projection 43 from the notch in the lug 40 and permit the spring-operated bolt 39 to be advanced into engagement with the recess 38 in the collar 37, thereby connecting shaft 35 with the source of power. Pressure upon the treadle being now removed, the spring 47 raises the staff and reëstablishes contact between block 49 and collar 37. As a single revolution of the fly-wheel nears completion, supposing the rotation to be toward the observer of Fig. 8, the lug 40 enters the widest part of the upper triangular recess of the block 49 and, meeting the bearing-surface 50, is pressed back into the hub until the projection 43 reëngages the notch, whereupon the shaft 35, no longer power-driven, is brought promptly to rest through the ordinary friction of the machine.

Stop-motion clutches mechanically equivalent to that described are frequently used in connection with machines of this general nature.

The operation of my invention may be summarized as follows: The sheet is bent about the horn 2, and edges *a a'* without fold are placed upon block 3, as shown in Figs. 3 and 6, until they meet the cylinder above the folding-bar 12 and within the depression 11. The clutch is operated and the power applied, causing the ascent of plate 18 and the descent of plates 14 and 17, which firmly clamp the edges of the sheet. It will be observed that the width of the folds is accurately gaged and cannot vary along the seam, such variation being a prominent fault in many machines of this character. The angle in the cam-groove 29 now operates the lever 31, connection 32, and crank 33, giving a partial rotation to cylinder 7. Folding edge 10 of the cylinder bends one edge of the sheet downward, and upon the other side the bar 12 turns the opposite edge upward into the groove 15 of the clamping-plate 14. The combined action of bar 12 and plate 14 bends the sheet in two directions. (See Figs. 4 and 6.) The completion of one revolution by shaft 35 restores the rocking cylinder and plates to their first positions and releases the collar 37 from its engagement with bolt 39 of the stop-motion device. Gear 34 upon shaft 35 is so proportioned to gears 25, 27, and 28 that one revolution of shaft 35 produces but one half-revolution in shafts 20 and 24. The assumed movement of the parts just described has turned gear 28 so that the bend in cam-groove 29 points exactly opposite to the direction shown in Fig. 1, and the pin 30 now enters upon the circular portion of the groove and will not be displaced during the next one-half revolution of gear 28. The edges of the sheet are now hooked together (see Fig. 6) and placed upon cylinder 7 in the position shown by the dotted lines *a a'* in Fig. 3. The clutch is again employed, this time causing the ascent of plates 14 and 17 and the descent of plate 18, perfecting the lock-seam joining the edges of the sheet, restoring the working parts of the machine to their original positions, Figs. 1, 2, and 3, and permitting the removal of the seamed sheet to make way for another.

I do not limit myself to the precise form and arrangement shown herein, but may conclude to vary the construction within the scope of my invention.

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

1. In a machine for working sheet metal, a frame, in combination with a suitably-supported block provided with folding edges, reciprocative clamping-plates, a driving-shaft, attachments for transmitting power to and for operating said plates within the frame, said block and the said plates adapted to cooperate as clamping devices, a partly-revoluble cylinder having folding edges and an anvil portion, said cylinder capable of being arranged and actuated to fold in opposite directions the edges of a metal sheet held between said block and clamping-plates, substantially as set forth.

2. In a machine for working sheet metal, a frame, in combination with a suitably-supported block provided with folding edges, reciprocative clamping-plates, said block and plates adapted to coöperate as clamping devices and having corresponding surfaces, a driving-shaft, attachments for transmitting power to and for operating said plates within the frame, a reciprocative seam-closing plate, mechanism for raising and lowering said plate

conversely to the movement of said clamping-plates, a partly-revoluble cylinder having folding edges and an anvil portion, said cylinder capable of being arranged and actuated to fold in opposite directions the edges of a metal sheet held between said block and said clamping-plates, substantially as set forth.

3. In a machine for working sheet metal, a frame, in combination with a suitably-supported block having a longitudinal groove and an offset at one side of said groove, the upper surface of the block and the face of the offset joining in a folding edge, reciprocative clamping-plates, one of said plates being provided with a folding edge, said block and plates adapted to coöperate as clamping devices and having corresponding surfaces, a driving-shaft, attachments for transmitting power to and for operating said plates within the frame, a reciprocative seam-closing plate constructed to be placed between the clamping-plates, mechanism for raising and lowering said seam-closing plate conversely to the movement of said clamping-plates, a partly-revoluble cylinder having folding edges and an anvil portion, said cylinder fitting movably within said groove in the block and capable of being arranged and actuated to fold in opposite directions the edges of a metal sheet held between said block and clamping-plates, substantially as set forth.

4. In a machine for working sheet metal, a cylinder having its surface flattened for a portion of its length, longitudinal elevations bounding said flattened portion, spring-operated gage-pins situated at intervals along one of said elevations, a folding edge upon one side formed by the juncture of the cylindrical surface with a longitudinal recess in the body of the cylinder, a rocking folder-bar pivotally attached within a recess in said cylinder, said folder-bar capable of being turned to project sidewise beyond the surface of the cylinder, substantially as described.

5. In a machine for working sheet metal, a suitably-supported block grooved longitudinally, in combination with a cylinder fitting movably within said groove and having a folding edge, rocking folder-bar and recesses adapted to gage the width of a fold, reciprocating plates, a driving-shaft, attachments for transmitting power to and for operating said plates, said cylinder so arranged and capable of being so actuated as to fold in opposite directions the edges of a metal sheet held between the said block and said plates, substantially as and for the purposes herein shown and described.

6. In a machine for working sheet metal, a suitably-supported block having a folding edge and a longitudinal groove, in combination with a cylinder fitting movably within said groove and having a folding edge, a longitudinal flattened portion, a rocking folder-bar and gaging devices, an outer reciprocating plate provided with a folding edge, a groove adjacent to said edge and a clamping-surface, an outer reciprocating plate provided with a clamping-surface, the clamping-surfaces of the said plates arranged to be brought into contact with corresponding surfaces of said block, an inner or middle plate reciprocating oppositely to said outer plates and capable of being brought into contact with said cylinder, a driving-shaft, attachments for transmitting power to and for operating said plates, said cylinder so arranged and capable of being so actuated as to fold in opposite directions the edges of a metal sheet held between said plates and said block, substantially as and for the purposes herein shown and described.

7. In a machine for working sheet metal, the combination of a suitable main frame having a projecting horn, a block supported by said horn in a fixed position, said block having a longitudinal groove and a folding edge toward the groove, a cylinder fitting movably within said groove and provided with a folding edge, a rocking folder-bar and gaging devices, a portion of said cylinder extending through and journaled in said frame, reciprocating plates working between guides attached to said frame and having surfaces adapted to be brought into contact with corresponding surfaces of said block, one of said plates having a folding edge and an adjoining groove, attachments for partly rotating said cylinder and for restoring it to its original position, a driving-shaft borne by said frame, gearing for transmitting power to and mechanism for operating said plates, substantially as and for the purposes herein shown and described.

8. In a machine for working sheet metal, the combination of a suitable main frame having a projecting horn, a block supported by said horn in a fixed position, said block having a longitudinal groove and a folding edge toward the groove, a cylinder fitting movably within said groove and provided with a longitudinal flattened portion, a folding edge, a rocking folder-bar and gaging devices, a portion of said cylinder extending through and journaled in said frame, outer reciprocating plates working within guides attached to said frame and having clamping-surfaces adapted to be brought into contact with corresponding surfaces upon said block, one of said plates having a folding edge and an adjoining groove, an inner plate guided between and arranged to reciprocate oppositely to said outer plate, said inner plate capable of being brought into contact with the said cylinder, attachments for partly rotating said cylinder and for restoring the same to and maintaining its original position during a predetermined portion of a single cycle of operation, a driving-shaft, mechanism for transmitting power to and for operating said plates, substantially as and for the purposes herein shown and described.

9. In a machine for working sheet metal, the combination of a suitable main frame

having a projecting horn, a block supported by said horn in a fixed position, said block having a longitudinal groove and a folding edge toward the groove, a cylinder fitting movably within said groove and provided with a longitudinal flattened portion, a folding edge, a rocking folder-bar and gaging devices, a portion of said cylinder extending through and journaled in said frame, outer reciprocative plates arranged to be moved within guides attached to said frame, one of said plates having a folding edge and an adjoining groove, said block and plates adapted to coöperate as clamping devices, an inner or seam-closing plate constructed to be placed between said outer plates, said seam-closing plate capable of being brought into contact with the cylinder, mechanism for partly rotating said cylinder and for restoring the same to and maintaining its original position during a predetermined portion of a single cycle of operation, attachments for transmitting power to and for operating said plates, a driving-shaft, a stop-motion clutch whereby the driving-shaft may be intermittingly connected with the source of power and automatically disconnected therefrom, substantially as set forth.

10. In a machine for working sheet metal, the combination of a suitable frame, a driving-shaft, a pinion fixed upon said shaft, a cog-wheel adapted to mesh with said pinion and revoluble upon a spindle projecting from the frame, an auxiliary shaft journaled in said frame, a spur-wheel fixed upon the auxiliary shaft and adapted to mesh with said cog-wheel, a pinion revoluble upon a pivot projecting from the frame and adapted to mesh with said spur-wheel, a second auxiliary shaft journaled in said frame, a spur-wheel fixed upon the second auxiliary shaft and adapted to mesh with the pinion upon said pivot, clamping-plates reciprocative within guides attached to said frame and provided with rectangular openings, a seam-closing plate capable of being placed between and reciprocated oppositely to the motion of said clamping-plates, said seam-closing plate provided with rectangular openings, cams rigidly held upon the auxiliary shafts and adapted to operate within the rectangular openings of said clamping and seam-closing plates, a horn projecting from said frame, a block supported by said horn in a fixed position and provided with a longitudinal groove, clamping-surfaces and folding edges, a partly-revoluble cylinder having a folding edge, a movable folder-bar and an anvil portion, said cylinder movably fitting the groove in said block, and means for operating said cylinder, substantially as set forth.

11. In a machine for working sheet metal, the combination of a suitable frame, a driving-shaft, a pinion fixed upon said shaft, a cog-wheel adapted to mesh with said pinion and revoluble upon a spindle projecting from said frame, said cog-wheel having in one side a cam-groove consisting of a circular portion and an angular portion, an auxiliary shaft journaled in the frame, a spur-wheel fixed upon said auxiliary shaft and adapted to mesh with said cog-wheel, a pinion revoluble upon a pivot projecting from the frame and adapted to mesh with said spur-wheel, a second auxiliary shaft journaled in the frame, a spur-wheel fixed upon the second auxiliary shaft and adapted to mesh with the pinion upon said pivot, clamping-plates reciprocative within guides attached to the frame and provided with rectangular openings, a seam-closing plate capable of being placed between and reciprocated oppositely to the motion of said clamping-plates, said seam-closing plate provided with rectangular openings, cams rigidly held upon the auxiliary shafts and adapted to operate within the rectangular openings of said clamping and seam-closing plates, a horn projecting from said frame, a block supported by said horn in a fixed position and provided with a longitudinal groove, clamping-surfaces and folding edges, a partly-revoluble cylinder having a folding edge, a movable folder-bar and an anvil portion, said cylinder constructed to fit movably the groove in said block and to extend through the frame and to be suitably journaled therein, an arm attached to said cylinder, a lever pivoted to said frame and having a pin adapted to engage the cam-groove in said cog-wheel, a rod pivotally connecting said arm and lever, substantially as set forth.

12. In a machine for working sheet metal, the combination of a suitable frame, a driving-shaft, a pinion fixed upon said shaft, a cog-wheel adapted to mesh with said pinion and revoluble upon a spindle projecting from said frame, said cog-wheel having in one side a cam-groove consisting of a circular portion and an angular portion, an auxiliary shaft journaled in the frame, a spur-wheel fixed upon said auxiliary shaft and adapted to mesh with said cog-wheel, a pinion revoluble upon a pivot projecting from the frame and adapted to mesh with said spur-wheel, a second auxiliary shaft journaled in the frame, a spur-wheel fixed upon the second auxiliary shaft and adapted to mesh with the pinion upon said pivot, clamping-plates reciprocative within guides attached to said frame and provided with rectangular openings, a seam-closing plate capable of being placed between and reciprocated oppositely to the motion of said clamping-plates, said seam-closing plate provided with rectangular openings, cams rigidly held upon the auxiliary shafts and adapted to operate within the rectangular openings of said clamping and seam-closing plates, a horn projecting from the frame, a block supported by said horn in a fixed position and provided with a longitudinal groove, clamping-surfaces and folding edges, a partly-revoluble cylinder having a folding edge, a movable folder-bar and an anvil portion, said cylinder constructed to fit movably the groove

in said block and to extend through the frame and to be suitably journaled therein, an arm attached to said cylinder, a lever pivoted to said frame and having a pin adapted to engage the cam-groove in said cog-wheel, a rod pivotally connecting said arm and lever, a stop-motion clutch whereby said driving-shaft may be intermittingly connected with the source of power and automatically disconnected therefrom, substantially as set forth.

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

JOHN FRANKLIN McNUTT.

Witnesses:

ALFRED F. HARRIS,

THOMAS H. WILSON, Jr.