J. H. PALMER & E. W. SALMON, Jr.

MACHINE FOR JOINING SHEET METAL PLATES.

APPLICATION FILED JULY 20, 1911.

1,020,154.

Patented Mar. 12, 1912.

4 SHEETS—SHEET 1.

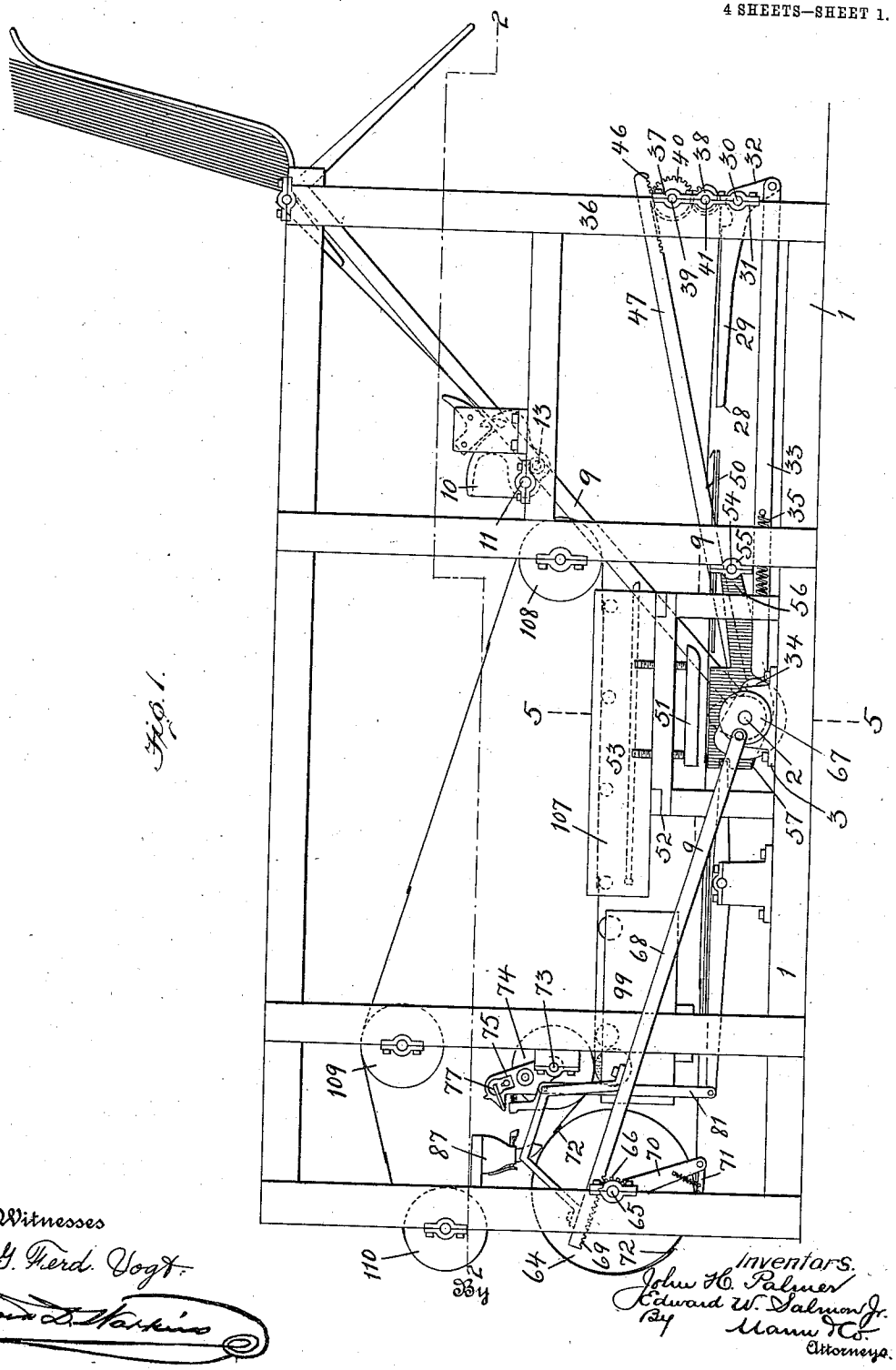

Fig. 1.

Witnesses

G. Ferd. Vogt.

Inventors.

John H. Palmer

Edward W. Salmon Jr.

By Munn & Co.

Attorneys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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4 SHEETS—SHEET 2.

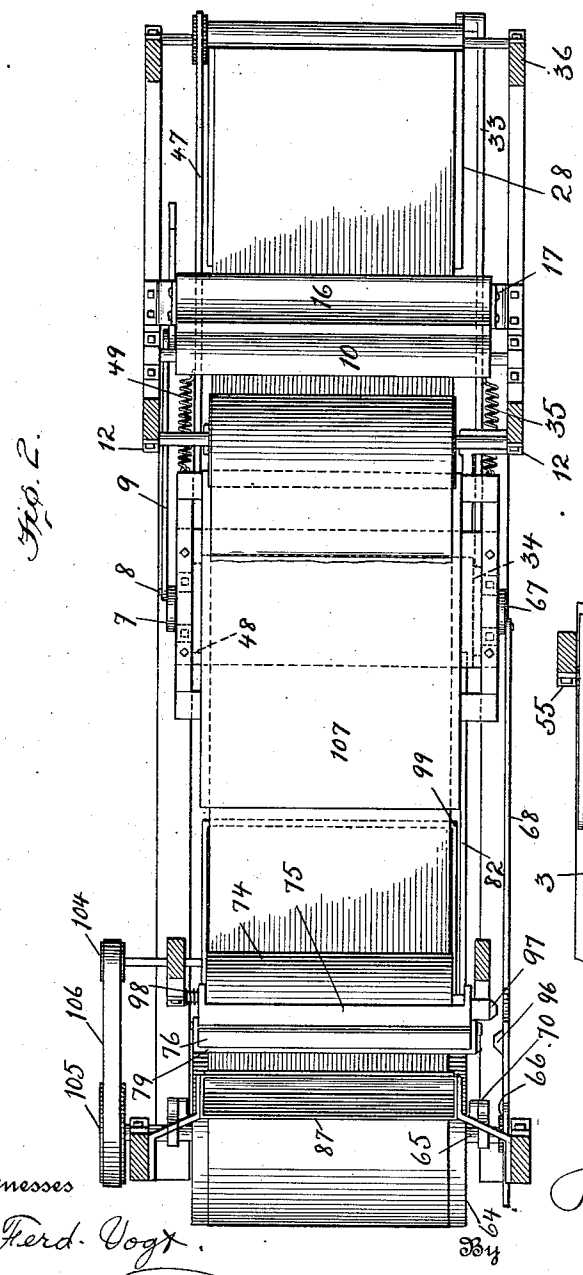

Fig. 2.

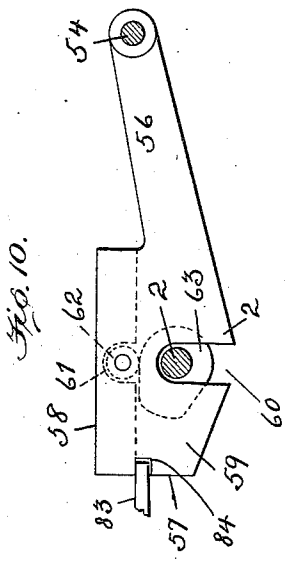

Fig. 10.

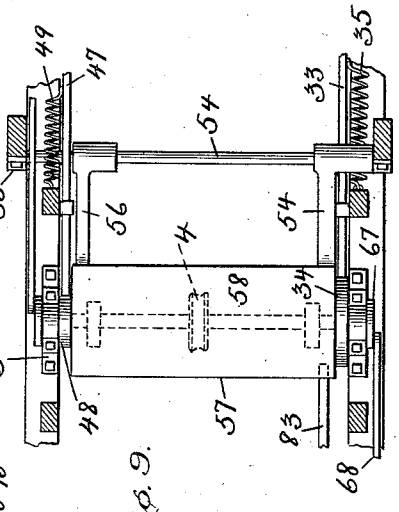

Fig. 9.

Witnesses

G. Ferd. Vogt.

Frank B. Harkins

Inventors

John H. Palmer

Edward W. Salmon Jr.

Munn & Co.

Attorneys.

J. H. PALMER & E. W. SALMON, Jr.

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4 SHEETS—SHEET 3.

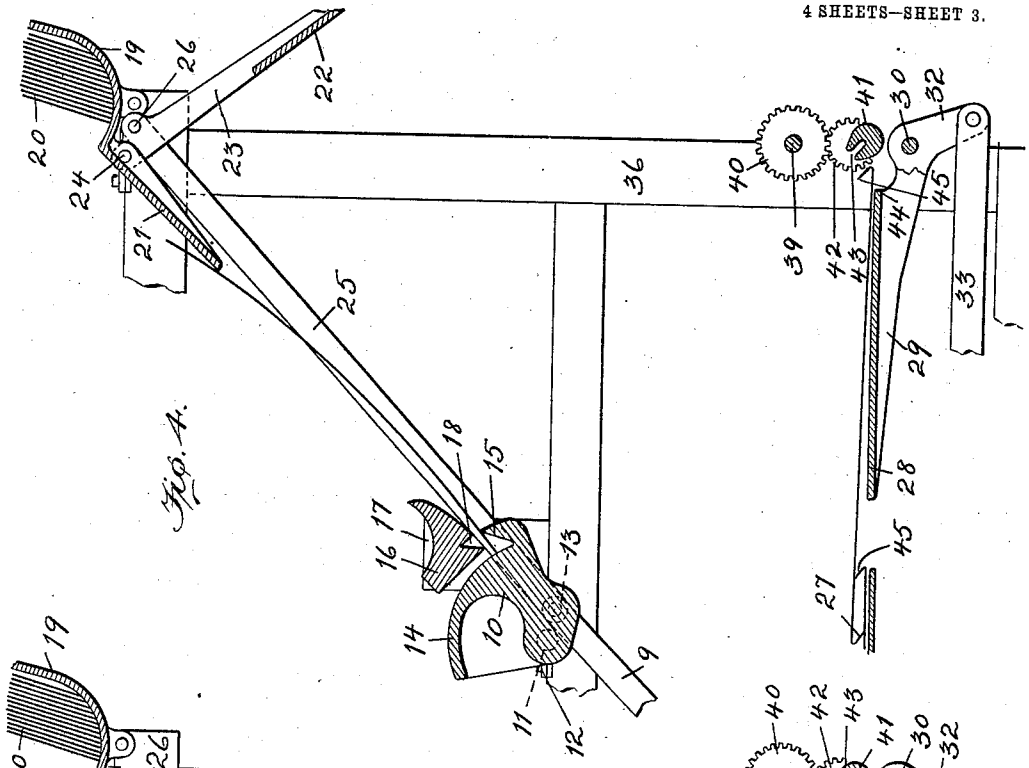

Fig. 4.

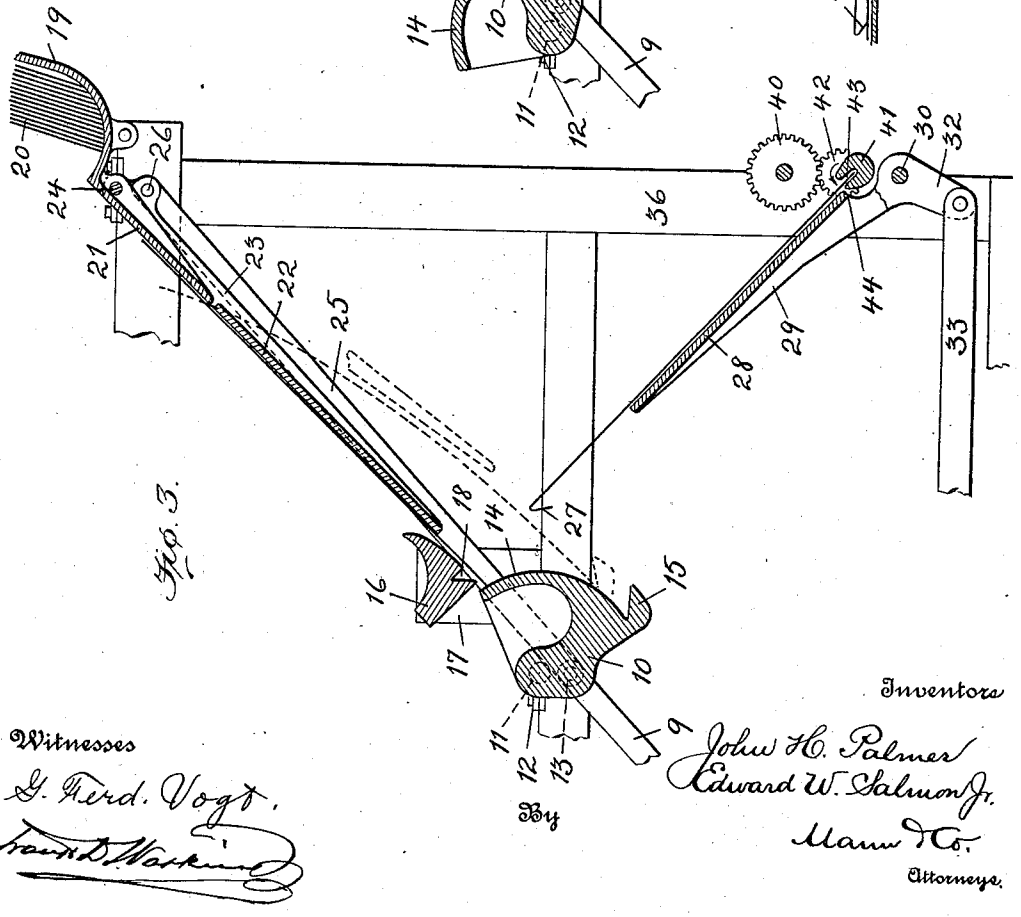

Fig. 3.

Witnesses

G. Ferd. Vogt.

Frank D. Watkins

Inventors

John H. Palmer

Edward W. Salmon Jr.

By Munn & Co.

Attorneys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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4 SHEETS—SHEET 4.

Fig. 5.

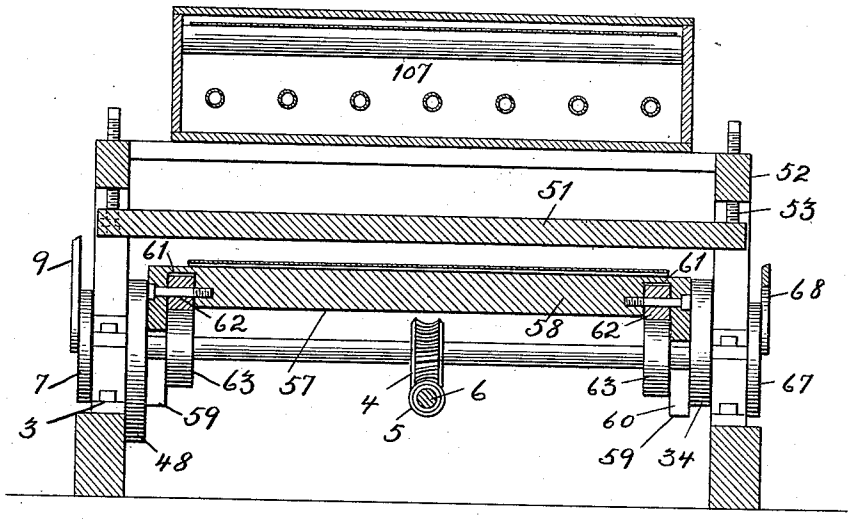


Fig. 6.

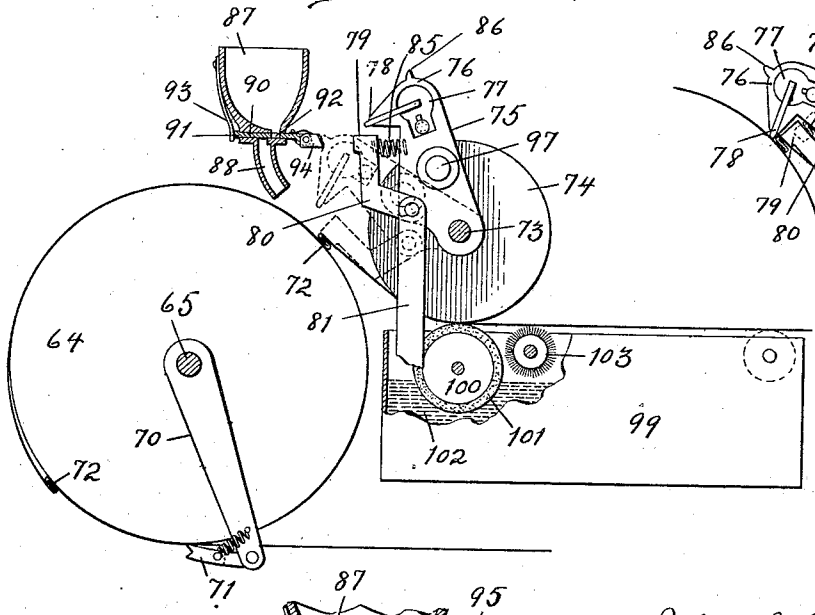
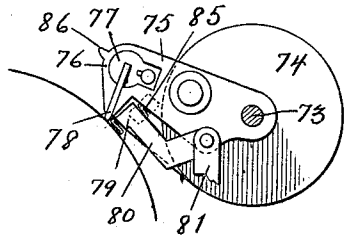


Fig. 7.



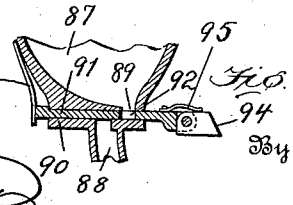


Fig. 8.

Witnesses

G. Ferd. Voigt.

Inventors.

John H. Palmer

Edward W. Salmon Jr.

By

Munn & Co.

Attorneys.

UNITED STATES PATENT OFFICE.

JOHN H. PALMER AND EDWARD W. SALMON, JR., OF BALTIMORE, MARYLAND.

MACHINE FOR JOINING SHEET-METAL PLATES.

1,020,154. Specification of Letters Patent. Patented Mar. 12, 1912.

Application filed July 20, 1911. Serial No. 639,491.

To all whom it may concern:

Be it known that we, JOHN H. PALMER and EDWARD W. SALMON, Jr., citizens of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Machines for Joining Sheet-Metal Plates, of which the following is a specification.

This invention relates to an improved machine for joining metallic sheets and has particular reference to a machine for securing together a plurality of sheets whereby to form a long and continuous strip.

One object of the invention is to provide an improved machine for forming hooks on opposite edges of sheet-metal plates interlocking the hooks on adjacent edges of two sheets, hammering the interlocked hooks to form a joint, soldering said joint, coating the surface of the strip of united sheets and drying the same.

Another object is to provide an improved machine for effecting the above-mentioned operations automatically.

A further object of the invention is to provide an improved machine for automatically joining and soldering together sheet-metal plates of the standard size which is usually 20 by 28 inches without regard as to whether they be united along the 20 inch width or the 28 inch width.

Another object is to provide a machine which will effect a joinder of the sheets even though there be variations in the length and without any adjustment or manipulation on the part of an operator.

With these and other objects in view the accompanying drawings illustrate the invention, wherein—

Figure 1, shows a side elevation of the machine, Fig. 2, a sectional top plan view of the same,—the section being taken on the line 2—2 of Fig. 1, Figs. 3 and 4, enlarged sectional details through the edging devices, Fig. 5, is a vertical sectional view on an enlarged scale through the drying chamber and hammer, and shows the cam-shaft and cams for actuating the latter,—the section being taken on the line 5—5 of Fig. 1. Fig. 6 shows the feed drum and soldering devices in end elevation and on an enlarged scale and also shows a side elevation of the paint-applying device. Fig. 7, shows an end elevation of the soldering devices in the operated position. Fig. 8, is an enlarged sectional detail through the flux and solder-feed device. Fig. 9, is a horizontal sectional plan view directly over the hammer and through the supports or frame-work, and Fig. 10 is a detail side elevation of the hammer.

Referring to the drawings, the numeral, 1, designates the frame of the machine which may be of any suitable or desired construction that will afford bearing and support for the various elements employed. A horizontal shaft, 2, is supported in suitable side bearings, 3, and said shaft is provided with a gear, 4, that is driven by means of a worm, 5, on a driving shaft, 6, which may be seen in Fig. 5.

One end of the shaft, 2, is provided with a circular head, 7, which has a wrist pin, 8, on its outer face and a rod, 9, has its lower end pivotally engaging said wrist pin and extends upwardly and rearwardly therefrom, and the upper end of the rod is pivotally connected to one end of a horizontal edger or hook-former, 10. This edger or hook-former has two trunnions, 11, one at each end which enter suitable bearings, 12, on the frame and pivotally sustain it so that it may be oscillated by the reciprocating movement of the rod, 9, that is imparted by the head, 7, and wrist pin, 8. By reference to Figs. 3 and 4 it will be seen that the rod, 9, is connected to the edger or hook-former at, 13, which is to one side of the trunnion, 11, so that the rod will swing the edger through an arc of a circle each time it is reciprocated.

The edger or hook-former, 10, has a horizontal position between the side frames and is of such length as to accommodate sheets of any of the commercial widths or lengths. By reference to Figs. 3 and 4, it will be noted that the edger has a convex outer surface, 14, and a V-shaped flange or hook, 15, extending longitudinally along one edge thereof.

A horizontal bar, 16, extends crosswise of the machine and adjacent to the edger, 10, and is rigidly sustained by having its ends secured in suitable supports or brackets, 17, carried on the side frames. This bar has a longitudinal and horizontally-extending V-shaped notch, 18, in such relation with respect to the edger that the hook or flange, 15, of the latter may register therewith when the edger is swung up by the rod, 9, as indicated in Fig. 4,—the bar and edger together thus forming coacting dies to pro-

duce a hook on a sheet-metal plate, as will presently appear.

Above and to the rear of the edger and bar there is provided a sheet-metal plate holder, 19, which supports a plurality of sheet metal plates, 20, on their edges in such a manner as to enable them to be conveniently fed one at a time. The construction of this holder does not enter into the present invention and will form, together with certain feed mechanism the subject of a separate application. A short shelf constituting an inclined support, 21, depends from the holder and a swinging table, 22, has arms, 23, that are pivoted at 24, and beneath the inclined support.

A rod, 25, extends in an inclined direction between the hook former, 10, and arms, 23, and has its lower end pivotally connected with the pivot, 13, of the edger, 10, and the upper end of said rod is pivoted at, 26, to the table arm, 23. By means of this construction the reciprocating movement of bar, 9, is utilized to actuate or longitudinally reciprocate rod, 25, and thereby swing the arms, 23, and table, 22, from the position shown in Fig. 3, when the sheets are fed, to the position of those parts as shown in Fig. 4, so as to leave the sheet unsupported by the table at the time the hook, 15, enters the notch, 18, to bend or form a hook, 27: on one edge of the sheet metal plate. When a sheet is removed from the holder and dropped onto the table, 22, the lowermost edge thereof will rest upon the convex face, 14, of the edger which forms a stop for the lower edge of the sheet. At this time the edger will have the position shown in Fig. 3. The bars, 9, and, 25, will then be pushed upwardly by the wrist pin, 8, and this movement will swing the edger on its trunnions, 11, and cause the hook, 15, to approach notch, 18. At the same time bar, 25, will swing the table, 22, away from the sheet metal plate to the position shown in Fig. 4, leaving the plate unsupported by the table. The final upward portion of the movement of bar, 9, will cause the hook, 15, to press the lower edge of the metal plate into the notch, 18, and in so doing will bow the plate and cause its upper edge to spring below the lower edge of the inclined support, 21, and then swing or turn down as the hook, 27, on one edge of the sheet is completed.

By referring to Fig. 3, it will be noted that a table, 28, has an arm, 29, that is mounted on a horizontal rod, 30, which latter is sustained in bearings, 31, on the frame, and that said arm has a lateral extension, 32, which projects downwardly below the rod. A cam rod, 33, has one end pivotally connected to said extension, 32, and extends forwardly therefrom in substantially a horizontal direction and toward the shaft, 2, and the forward end of said rod terminates at the side or edge of a cam, 34, which latter is mounted on said shaft, 2.

In order to hold the forward end of the cam rod, 33, in operative connection with the cam, 34, there is provided in the present instance, a spring, 35, one end of which is attached to the frame and the other end is connected to said rod. This spring, 35, constantly draws the rod against the cam face and consequently as the cam turns the rod is reciprocated horizontally in proper time with the edger device so as to swing the table, 28, up or down in order to carry out the operation desired.

By means of the devices described the table, 28, is elevated or swung to the inclined position shown in Fig. 3, when the metal sheet swings down as the edger forms the hook, 27, consequently the edge of that sheet that was uppermost when the hook, 27, was formed will now become the lowermost edge and will slide down the inclined table, 28, and be directed to another edger or hook former which will now be described.

It will be noted that each of the rearmost vertical posts, 36, of the frame is provided with an upper bearing, 37, and an intermediate bearing, 38. A shaft, 39, extends horizontally between the bearings, 37, and carries a gear, 40, on one end thereof. An edger bar, 41, is sustained by the bearings, 38, and carries a pinion, 42, at one end which meshes with and is driven by the pinion, 40, on shaft, 39. This edger bar, 41, has a longitudinal slot, 43, therein which is of sufficient length to receive the entire lower edge of a sheet metal plate for a purpose now to be explained.

By again referring to Fig. 3, it will be seen that when the table, 28, is moved to the inclined position to receive a metal sheet that has had a hook, 27, formed on one edge, the slot, 43, in the edger bar, 41, will extend along and substantially flush with the lower edge, 44, of the table, so that the sheet will slide down the inclined table until its lower edge enters said slot, 43, which will serve as a stop, as seen in said Fig. 3.

The next step in the operation is to oscillate the edger bar, 41, and thereby cause the same to form a hook, 45, on the rear edge of the sheet. This is accomplished through the pinion, 42, and gear, 40,—the latter being actuated by means of a rack, 46, on the rear end of a bar, 47, which enters along the side of the frame and has its forward end operatively engaging the face of a cam, 48, on shaft, 2, as seen in Fig. 9. A spring, 49, serves to draw the bar, 47, toward the cam, 48, and keep it in engagement therewith. It is obvious that as cam, 48, moves the bar, 47, rearwardly the rack, 46, will cause gear, 40, to turn in a direction that will oscillate the edger bar, 41, so as to form the hook, 45,

and a reverse movement of the bar, 47, will reverse the same parts and return the edger bar, 41, to its normal position where the slot, 43, will be ready to receive another sheet. During this return movement of the edger bar the table, 28, will be lowered by means of cam, 34, pushing bar, 33, rearwardly and when the table, 28, assumes a horizontal position like that shown in Fig. 4, the hook, 27, on one edge of the sheet will point downwardly and be laid on the upper surface of the sheet next previously edged where it will interlock with the upturned hook, 45, on the rear edge of said previously-hooked sheet as the latter is drawn forward as will presently be described.

From the foregoing explanation it will be understood that each sheet has a down-turned hook formed on one edge and is then moved to a position where its opposite edge is formed into an upturned hook and that the sheet is then laid flat so that its down-turned hook may automatically engage an up-turned hook on the sheet previously engaged and thus be made ready for closing said interlocked or engaged hooks.

By reference to Fig. 1 it will be seen that a flat horizontal table or support, 50, is sustained between the side frames and serves to sustain the rear end of the sheet after it leaves the table, 28. In front of the said support, 50, we provide a seam-closing device which comprises a stationary horizontal anvil plate, 51, which extends horizontally between the two side frames of the machine and over the sheets which have been hooked together. The precise manner of sustaining this anvil plate is not material but in the present instance we provide a supplemental frame, 52, which carries a plurality of depending screw rods, 53, whose lower ends enter the anvil plate and adjustably sustain it in a pendant but rigid position.

A rod, 54, is sustained in suitable bearings, 55, on the frame and extends horizontally below the support, 50, and said rod forms a pivot for two arms, 56, that extend forwardly therefrom and carry the hammer, 57. This hammer comprises a horizontal plate, 58, from the opposite vertical ends, 59, of which the arms, 56, extend and said ends are each provided with a vertical central slot, 60, which bridges over the shaft, 2, and allows the hammer to move vertically over the said shaft. At opposite ends the under or bottom side of the hammer plate, 58, is provided with vertically-extending recesses, 61, and each recess is provided with an idler or roller, 62, against which the working faces of cams, 63, on shaft, 2, contact to effect a raising and lowering of the hammer as the shaft, 2, makes a revolution.

By means of the devices just described it will be seen that if the loosely engaged hooks, 27, and, 45, are drawn forward until they have position on the hammer plate, 58, the latter when raised by cams, 63, will compress the hooks between the hammer plate and the anvil plate, 51, thus locking the hooks and forming a lock seam. The locked together plates are next advanced intermittently until the locked seams are brought to a soldering mechanism which applies the solder and flux and then solders the same. The device for effecting this will now be described.

Referring particularly to Figs. 1, 2 and 6 it will be noted that a comparatively large roll, 64, is loosely mounted at one end of the machine on a horizontal shaft, 65, and that said shaft carries a toothed gear, 66, at one end. It will also be noted that the end of shaft, 2, carries a circular head, 67, which has the function of a crank in that it pivotally sustains one end of a rack bar, 68, which it reciprocates as the head turns with the shaft, 2. The other end of the rack bar, 68, has a rack, 69, at its under side which engages the toothed gear, 66, consequently the movement of the bar in one direction will impart a partial rotation to the gear, 66, and shaft, 65, in one direction and the return movement of said bar will return the shaft but without operating said roll. An arm, 70, depends at one end of the roll, 64, and carries a pawl or dog, 71, on its lower end which projects over the face of the roll, 64, and engages the hammered seam, 72. This arm, 70, is connected with the rack and pinion so as to swing as the said gear is moved in one direction or the other consequently the dog or pawl will take behind a seam, 72, when it is desired to advance the sheets and carry the sheets froward by turning the roll thereby intermittently advancing the sheets and leaving a seam in position to be soldered. A greater swing is preferably given the arm, 70, than the distance between the adjacent seams, for the purpose of accommodating and working sheets of varying lengths. The arm and pawl, 71, always carry the seam to a given point where the same may be clamped against the roll and the sheets and roll thus held rigidly while the pawl, 71, is returned. The clamp and soldering iron are closely associated and are best shown in Figs. 6 and 7 of the drawings to which reference will now be made. A horizontal shaft, 73, is sustained in suitable bearings on the frame and said shaft carries a roll, 74. A soldering iron frame, 75, is mounted on the shaft, 73, at opposite ends of the roll and has slight movement longitudinally on said shaft ends. This frame, 75, straddles the roll, 74, and has a cross bar, 76, that extends parallel with the circumference of the roll and which contains a heating chamber, 77, for a gas flame. A copper bar, 78, is carried by

the bar, 76, and extends outwardly from the heating chamber and the outer end of this bar, 78, is the so-called soldering iron. A clamping bar, 79, has an arm, 80, at each end which is pivotally connected to the soldering iron frame, 75, and a link bar, 81, has its upper end pivotally engaging the arm, 80, and frame, 75, and its lower end is pivotally connected to the forward end of a rock bar, 82, so that when the rock bar is operated the soldering iron and clamp will also be actuated. The rock bar, 82, gets in motion by having its rear end, 83, entered in a slot, 84, in the edge of the hammer, 57. It will thus be seen that when the hammer is raised the rock bar, 82, will be rocked and link, 81, will be drawn down thereby swinging the clamping bar, 79, and soldering iron down to the seam. A spring, 85, is interposed between the clamping bar, 79, and the soldering iron frame so that the clamping bar will first seat on the seam and the soldering iron in following will compress the spring and crowd the clamp against the seam. The clamping bar will thus seat on the seam before the soldering iron has completed its movement and this timing in the movement enables two things to be effected. First, the clamping bar will form a dam on top of the seam and flux and solder may be deposited in front of that dam and held there while the iron is completing its movement. Second, the clamp being seated, the iron then has a lug, 86, which is utilized in its descent to discharge a charge of flux and solder on the seam before the iron seats on the latter. The feeding of the flux and solder is effected as follows:—A receptacle, 87, is sustained over the roll, 64, and has a discharge trough, 88, that extends the width of the sheet. This trough terminates near the circumference of the large roll, 64, so that material discharged therefrom will be deposited onto the seam behind the clamping bar. In practice we preferably mix the flux with a granulated solder and deposit the two in the receptacle. By reference to Figs. 6 and 8 it will be noted that the receptacle has a long narrow vertical slot, 89, therein and a horizontal slot, 90, extending crosswise thereof. A slide valve, 91, is located in the slot, 90, and has a vertical slot, 92, therein which normally registers with the slot, 89, of the receptacle so that the materials on the receptacle will fall by gravity into the valve slot, 92, and fill the same,—said latter slot thus serving to measure the quantity of solder and flux that is to be discharged onto a seam. A spring plate, 93, at the rear of the valve serves to keep it normally pressed forward. The front end or edge of the valve carries a spring-pressed pawl, 94, the spring, 95, being on top thereof to normally press the same down but allowing it to be raised. As the iron descends the lug, 86, engages the pawl, 94, on the valve, 91, as shown in broken lines in Fig. 6, and pushes said valve laterally until the slot, 92, of the valve is brought into register with the passage in the chute, 88, into which the measured flux and solder drops and by which it is directed onto the seam before the iron is brought into contact therewith. The iron then seats on the edge of the seam and fuses the solder so that it will sweat into the seam and solder the latter. To aid in this soldering operation we impart a reciprocating movement to the iron by placing a cam block, 96, on the side of the rack bar, 68, and by providing a beveled lug, 97, on the side of the iron-carrying frame, 75, so that when the bar, 68, returns to its normal starting point the lug, 97, will be pushed laterally carrying the frame, 75, and iron, 78, with it and cause a lengthwise rub of the iron over the seam. These parts are then returned by means of a spring, 98, at the far side of the iron-frame. After the soldering operation we provide means for coating one surface of the joined sheets which are now in a web form and the devices employed to do this will now be described, reference being made to Figs. 1, 2 and 6 of the drawings. It will be seen that a receptacle, 99, is sustained by the frame beneath the roll, 74, and that directly beneath the said roll we mount a roller, 100, in the receptacle. This roller preferably has a covering of soft pliable material, 101, and its lower circumference is submerged in liquid, 102, that is to be transferred to the surface of the web or sheets which are directed between the material, 101, and the roll, 74, so as to drive the roller, 100, by frictional engagement of the web. As the web is drawn between the two rollers the lower one will take up and apply the liquid thereto and to effect a distribution and a removal of excess liquid we provide a shaft at one side of the roller, 100, and mount a revolving brush, 103, thereon. The shaft, 102, and brush, 103, get their motion through pulleys, 104, 105, and a belt, 106,—the pulley, 105, being mounted on the end of shaft, 65, that carries the large roll, 64. After the coating operation we pass the web through a drying chamber, 107, where it halts long enough to dry the coating sufficiently to enable the web to be rolled. Rollers, 108, 109, and 110, merely serve to guide the web after it leaves the drying chamber and upon leaving roller, 110, the web is drawn by suitable winding mechanism and wound into a bundle in any suitable manner.

Having thus described our invention what we claim and desire to secure by Letters Patent is,—

1. In a machine of the character described the combination with means for bending one edge of each sheet to form a hook at said

edge, of means for shifting the sheet; means for forming a hook on the opposite edge of the sheet after it has been shifted; means for engaging a hook of one sheet with a hook of another sheet; means for clamping the engaged hooks; means for applying solder to the engaged hooks while they are clamped and means for soldering the engaged and clamped hooks.

2. In a machine of the character described the combination with means for sustaining a sheet in an inclined position, of means for forming a hook on the lower edge of the inclined sheet; means for reversing the sheet to turn the opposite edge thereof down; means for forming a hook on said latter edge; means for engaging a hook of one sheet with a hook of another sheet and means for soldering the engaged hooks.

3. The combination with a swinging table to hold a sheet-metal plate in an inclined position, of means adjacent the lower edge of the table for forming a hook on one edge of a sheet; another swinging table to receive the sheet; means for forming a hook on the opposite edge of the sheet; means for operating the latter table to lay the hook-edge of one sheet in an overlapped position with the hook-edge of another sheet; means for closing the hooks together, and means for soldering the closed-together hooks.

4. The combination with means for sustaining a sheet-metal plate in an inclined position, of means for forming a hook on the lower edge of the inclined sheet; a swinging table to receive the sheet after the hook has been formed on one edge and to hold said sheet in an inclined position with the hook-edge uppermost; means for forming a hook on the opposite edge of the sheet; means for moving the table to overlap the hook-edges of two sheets; means for pressing the hooks on the overlapped sheets together and means for soldering the closed hooks.

5. The combination with an upper swinging table, of a lower swinging table; means in a horizontal plane between the two tables for forming a hook on one edge of a sheet metal plate; means adjacent the lower table for forming a hook on the opposite edge of the sheet-metal plate; means for engaging a hook of one sheet with the hook of another sheet and means for soldering the engaged hooks.

6. The combination with an upper swinging table, of a lower swinging table; an oscillating hook-forming device to form a hook on one edge of a sheet metal plate while the latter is held by the upper table; an oscillating hook-forming device to form a hook on the opposite edge of the sheet while the latter is held by the lower table; means for operating the lower table to overlap the hook-edge of one sheet with the hook-edge of another sheet; means for locking the engaged hooks together and means for soldering the engaged hooks.

7. In a machine for uniting metal sheets the combination with means for forming a hook on one edge of each sheet, of means for forming a hook on the opposite edge of each sheet,—means for interlocking the hook of one sheet with the hook of another sheet; means for advancing the locked sheets intermittently; a soldering iron extending crosswise of the locked-together sheets and means for moving the iron lengthwise of the interlocked hooks.

8. In a machine for uniting metal sheets the combination with means for forming a hook on one edge of each sheet, of means for forming a hook on the opposite edge of each sheeet,—means for interlocking the hook of one sheet with the hook of another sheet; means for advancing the locked sheets intermittently; a swinging soldering iron; means for swinging the iron to and from the interlocked hooks and means for reciprocating the iron lengthwise of the engaged hooks.

9. In a machine for uniting metal sheets the combination with means for forming a hook on one edge of each sheet, of means for forming a hook on the opposite edge of each sheet,—means for interlocking the hook of one sheet with the hook of another sheet; means for advancing the locked sheets intermittently; a clamp to press against the engaged hooks; means for feeding solder to the hooks at the side of the clamp, a soldering iron, and means for moving the iron to and from a point at the side of the clamp.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN H. PALMER.
EDWARD W. SALMON, Jr.

Witnesses:
Chas. B. Mann,
G. Ferd. Vogt.