

(No Model.)

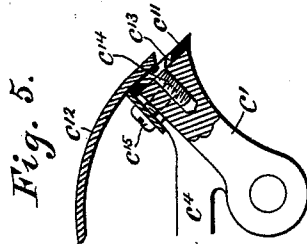
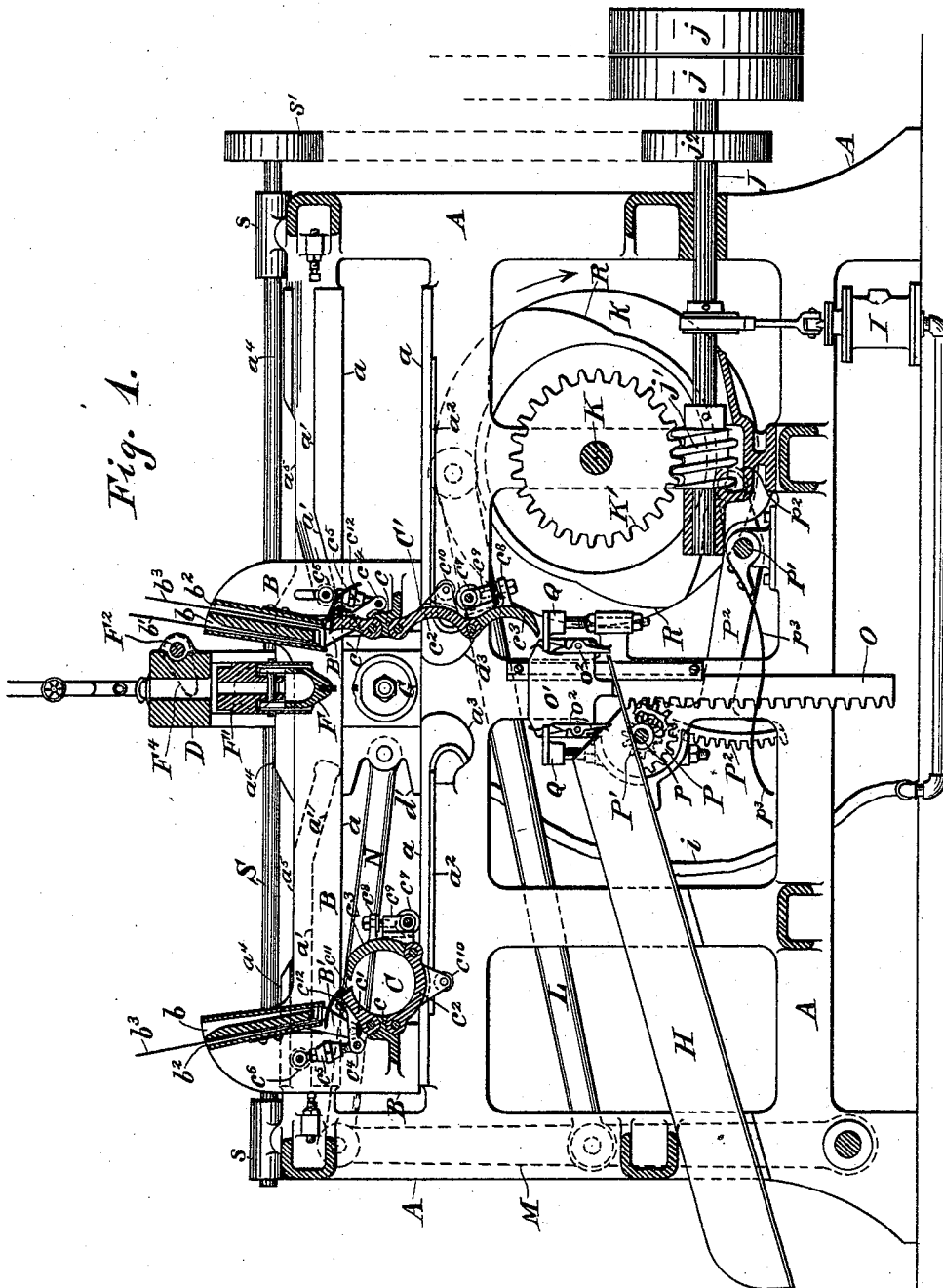
4 Sheets—Sheet 1.

W. H. SMYTH.

MACHINE FOR MAKING CAN BODIES, &c.

No. 529,815.

Patented Nov. 27, 1894.



Witnesses:

J. H. Nurse

H. F. Oscheck

Inventor.

W. H. Smyth

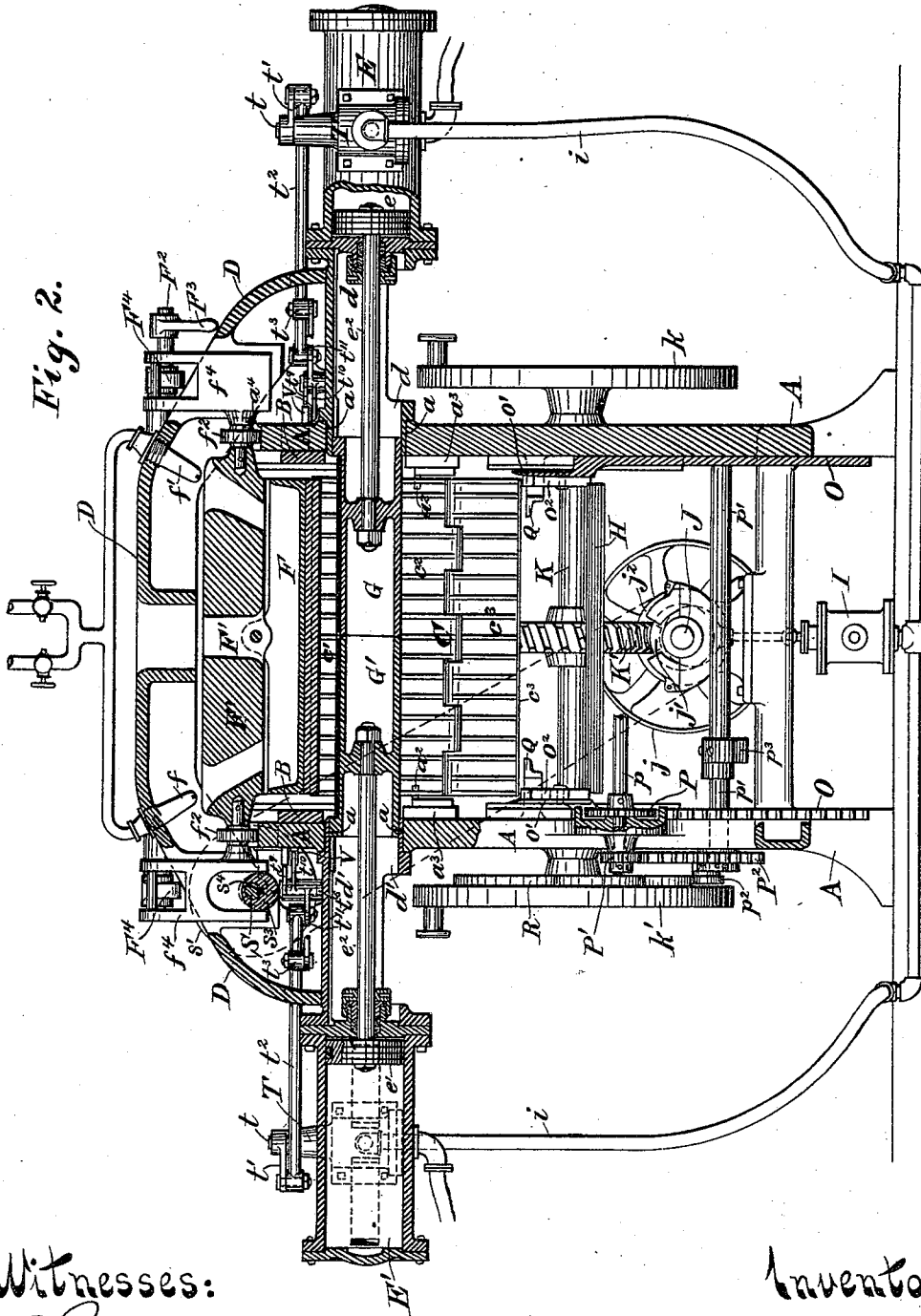
(No Model.)

4 Sheets—Sheet 2.

W. H. SMYTH.
MACHINE FOR MAKING CAN BODIES, &c.

No. 529,815.

Patented Nov. 27, 1894.



Witnesses:

J. H. Hourse
H. T. Aschbeck

Inventor.

W. H. Smyth

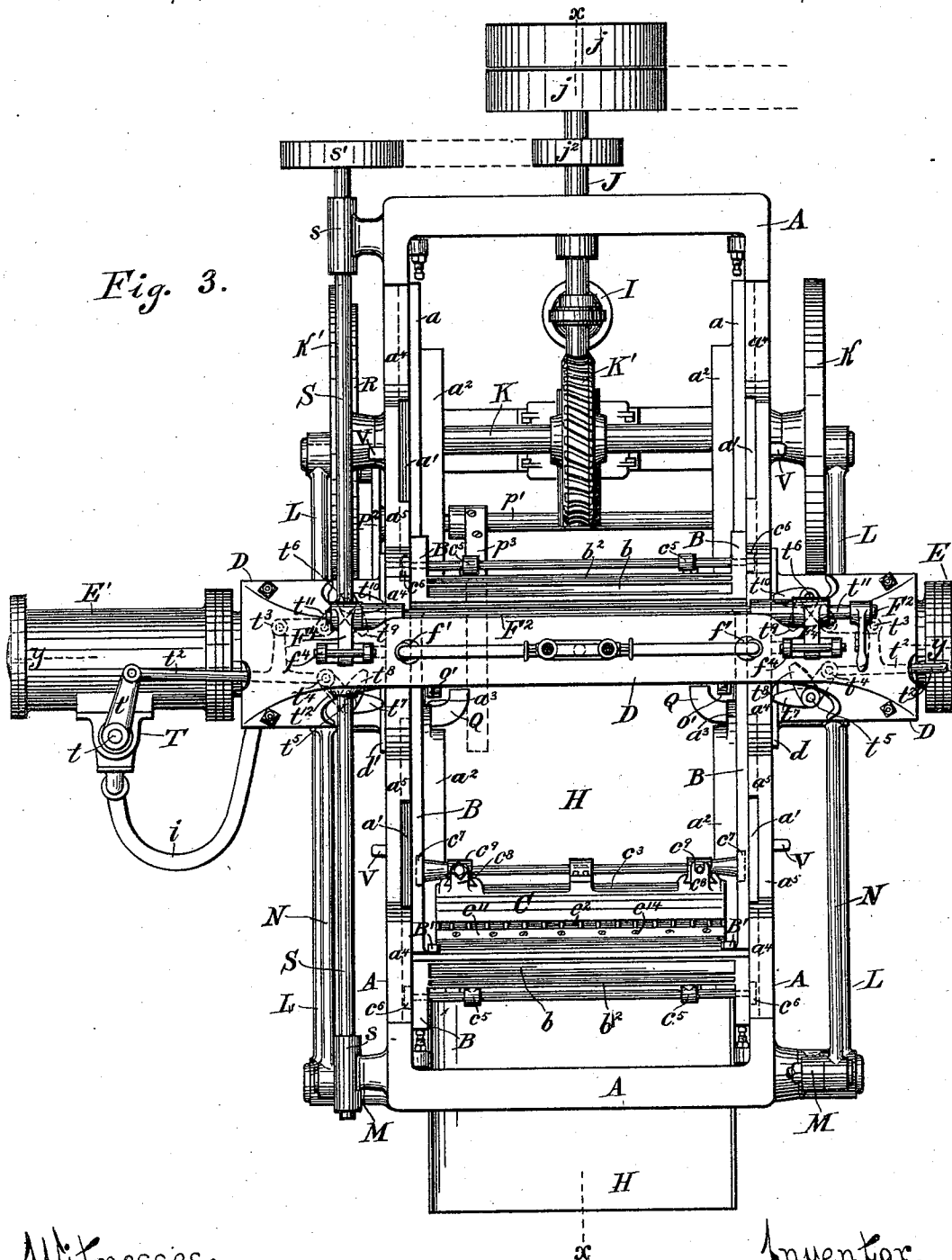
(No Model.)

4 Sheets—Sheet 3.

W. H. SMYTH.
MACHINE FOR MAKING CAN BODIES, &c.

No. 529,815.

Patented Nov. 27, 1894.



Witnesses:

J. H. Nurse

J. F. Aschbeck

Inventor.

W. H. Smyth.

(No Model.)

4 Sheets—Sheet 4.

W. H. SMYTH.

MACHINE FOR MAKING CAN BODIES, &c.

No. 529,815.

Patented Nov. 27, 1894.

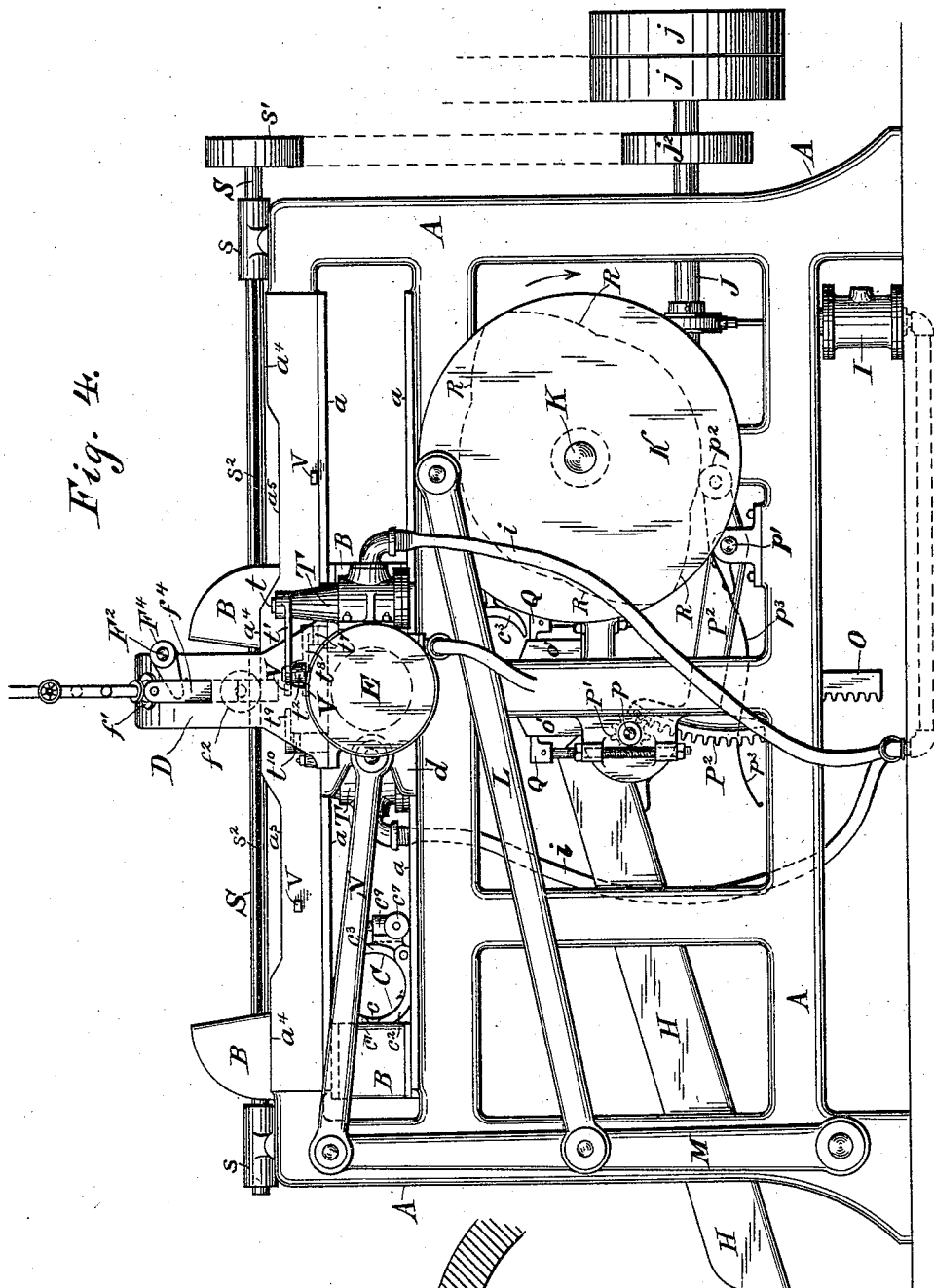


Fig. 4.

Witnesses:

J. H. Hourse

H. F. Ascherb

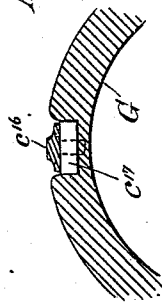


Fig. 6.

Inventor.

W. H. Smyth.

UNITED STATES PATENT OFFICE

WILLIAM H. SMYTH, OF BERKELEY, CALIFORNIA.

MACHINE FOR MAKING CAN-BODIES, &c.

SPECIFICATION forming part of Letters Patent No. 529,815, dated November 27, 1894.

Application filed June 1, 1893. Serial No. 476,275. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. SMYTH, a citizen of the United States, residing at Berkeley, Alameda county, State of California, have invented an Improvement in Machines for Making the Bodies of Cans and other Packing-Vessels; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of machines for folding and fastening sheets of material into bodies, for use as cans, and other vessels for packing purposes.

My invention consists in the novel construction, arrangement, and combination of the several parts which I shall hereinafter fully describe, and specifically claim.

The object of my invention is to provide a machine for this purpose which shall be effective and rapid in its operation, whereby its capacity and general usefulness are materially increased, resulting in a marked economy in the manufacture of such bodies.

Referring to the accompanying drawings,—
Figure 1 is a longitudinal vertical section on the line $x-x$ of Fig. 3. Fig. 2 is a transverse vertical section on the line $y-y$ of Fig. 3. Fig. 3 is a plan. Fig. 4 is a side elevation. Fig. 5 (Sheet 1) is a detail of the upper section c' of the folder C. Fig. 6 is a cross section of the mandrel showing the insulated soldering strip.

A is the frame having at its top the parallel side slides a , upon which is mounted a carriage B. This carriage as seen in Fig. 1, is of an open character having connected cross ends. To these ends are connected the folders represented by C and C'. These folders are made in sections, whereby they are enabled to be extended vertically to an open position as shown by C' in Fig. 1, and turned into a folded or annular form as shown by C in Fig. 1. The folders may each be formed of any suitable number of sections, though the preferable form and number are those here shown and consisting of a fixed central section c secured to the carriage ends, an upper section c' hinged to the top of the central section, a lower section c^2 hinged to the bottom of the central section, and an end section c^3 hinged to the lower end of the lower section. These folders have a length equal

to the width of the open center of the carriage B as shown in Fig. 2.

In each end of the carriage B is formed an approximately vertical chute or channel b , (Fig. 1) which is adapted to receive a sheet of material, represented by b' , from which the body of the can or other vessel is to be formed, and also with a chute or channel b^2 to receive a sheet of solder represented by b^3 , the lower ends of both chutes being just in front of the vertical plane of the extended or open folder, as shown in Fig. 1.

D is a cross-head (Figs. 2 and 3). It is a rigid arch spanning the main frame and supported upon it by blocks $d d'$ which slide upon the top of the main frame. To these blocks are secured the engine cylinders E and E', one on each side, and having pistons $e e'$, the rods e^2 of which are connected with the aligned mandrels G G', which are seated in the blocks $d d'$, and are adapted to be withdrawn into and to be projected from them. The mandrels move crosswise of the machine, and meet in the middle as shown in Fig. 2. The location of the cross-head D is in a vertical plane intermediate of the ends of carriage B, and the mandrels lie in the horizontal plane of the central or fixed section of folders C C' as shown in Figs. 1 and 2.

It will be seen from the foregoing description that, assuming a sheet of material to be fed down in front of the open folder C' in Fig. 1, and between it and the projected mandrel, and tangential thereto, the movement of cross-head D to the right will carry said mandrel into contact with the sheet, and press and hold it against the fixed central section c of the folder. Continued movement of the cross-head and of the mandrel it carries, will, thereupon, by contact, move the carriage B along with it to the right; and it is during and by reason of this movement that the closing of the folder, to form the sheet of material around the mandrel is effected. The means for operating the folders are as follows: Referring to Fig. 1, it will be seen that to the back of the upper section c' of the folder is secured a crank arm c^4 , to which is connected an adjustable link c^5 , the end of which is fitted with a roller stud c^6 , which travels in a cam groove a' of the main frame. This groove is horizontal throughout the greater portion of

its length, but at its inner end it inclines downwardly, as shown in Fig. 1, the effect being, when the roller stud c^6 is in the inclined portion, as shown in the right hand folder C', to raise the upper section c' to a vertical plane, and when in the horizontal portion to throw said section over into its place in the circle of the closed folder, as shown in the folder on the left.

To the back of the lower section c^2 is fitted a roller stud c^{10} , which is adapted to travel under a horizontal track a^2 on the main frame. This track bears at its inner end against the back of section c^2 , and when the folder moves outwardly, this contact serves to start said section upwardly on its folding movement, and thereafter the roller stud c^{10} holds it. To the back of the end section c^3 is secured a lever arm c^8 to which is connected an adjustable link c^9 , having in its outer end a roller stud c^7 which travels upon a curved cam track a^3 , the upper end of which joins the slides a of the main frame. The effect of the curved cam track a^3 is to lower the end section c^3 as shown on the right, and to raise it again, and the effect of the horizontal slide a is to hold said section to its curve in the closed folder, as shown on the left. The adjustable links c^5 and c^9 permit the accurate adjustment of the interior diameter of each folder to suit the different sizes of cans and to insure their equal diameters. The mandrels G and G' are retractible through the timely movements of the pistons e and e' , the cylinders being supplied with the expansible or power medium through the flexible connections i from a pump I, shown in Fig. 2, as connected with and operated from the main power shaft J.

H is the discharge way at the central portion of the frame A, Fig. 1, and adapted to receive the bodies from the middle of the machine.

The operation of the parts thus far described may be set forth at this point with advantage. Referring to Fig. 1, let it be assumed that a sheet of material be fed and held just in front of the holder C', and that the cross-head and projected mandrels are moving to the right. By contact with the sheet and pressure of the mandrels against the folder, the carriage B is moved to the right. At once the upper section c' of the folder closes inwardly against the top of the sheet, and the lower section c^2 and end section c^3 also close in against the lower portion of the sheet, these movements being due to the movement of the carriage, and thus they fold said sheet around the mandrels and hold it there. Now when the parts have arrived nearly at the end of the stroke to the right, the mandrels are retracted from within the formed body, leaving the latter in the still closed folder, and the actuating devices of the folder sections at the left hand side of the carriage have come to the inner portions of their cam tracks and grooves, whereby they are opened out and lie vertically extended, and this completes

the stroke. Now the cross-head returns, and with its mandrels still withdrawn, it leaves the carriage which now remains at rest, and moves toward and just past the center of the machine. Before it reaches this point, however, its mandrels are once more projected, and thereupon, coming in contact with the sheet of material fed to the left-hand folder, the carriage is moved over to the left, the sectional folder closing in about the sheet and forming it about the mandrels. During this movement to the left, the closed folder on the right, with its contained body or tube is brought to the central portion of the machine, and there the sections of the folder opening, drop the body or tube out into the discharge way H, and assume the position shown in Fig. 1, ready to receive another sheet of material. Then upon the return of the cross-head and mandrels, the operation is repeated, and the carriage, moving to the right, brings and discharges centrally the body or tube formed on the left. The valve motion for distributing the steam, air, water, or other fluid properly to the cylinders E and E', in order to operate their pistons and to project and retract the mandrels is shown in Figs. 2, 3, and 4, and particularly in Fig. 3.

T is a suitable distributing valve, connected properly with the cylinders. The stem t of the valve has a lever t' , to the free end of which is connected a rod t^2 , the other end of the rod being provided with two points of connection, t^3 and t^4 , at right angles to each other. Upon the upper surface of the sliding blocks d and d' of the cross-head D, are secured vertical pins t^5 and t^6 , upon which are journaled tappets t^7 , t^8 , t^9 , and t^{10} , each set at a different level, and connected in pairs, the tappets t^7 and t^8 being connected and adapted to operate in unison, and t^9 and t^{10} being similarly connected. Upon the pins t^6 and t^5 are also journaled the levers t^{11} and t^{12} respectively, the former being connected with rod t^2 at the connection t^3 , and the latter at the connection t^4 , and said tappets are also connected rigidly respectively with tappets t^9 , t^{10} , and tappets t^7 , t^8 . Upon the sides of carriage B are the several fixed tappet pins V located in planes to receive the several contacts of the tappets, whereby the valves T are operated at proper times. When the edges of the sheet are overlapped by the folder sections, they must be fastened in some way. In the case of metallic sheets, I provide for soldering them.

F is a soldering iron extending across the length of the cross-head frame D, in which it is carried. This iron is attached to a weight-block F', the ends of which have rollers f^2 (Fig. 2) which are adapted to roll upon the elevated tracks a^4 of the main frame, and thus to carry and support the block and soldering iron. The tracks a^4 are not continuous, but as shown in Fig. 1, are separated by depressions a^5 which provide for the removal of support from under the rollers f^2 , to permit the soldering iron to drop down to its

work. The weight-block and soldering iron are mounted in the cross-head frame D in such a manner that they may have free vertical movement, in which they are guided and maintained by flat guide pieces f^4 (Fig. 2). The weight-block F' also serves as a hood for the soldering iron, directing and confining the flames supplied thereto, and forming a combustion chamber. Burners $f f'$ attached to the cross-head D (Fig. 2) are adapted to project flames down through openings in the weight-block into the channel of the soldering iron, and within the combustion chamber formed by said block serving as a hood. Now, regarding simply the vertical movement of the soldering iron, its time in the operation is as follows: When, in the outward stroke of the cross-head and mandrels from the center, the latter have reached a point at which the folder has bent the sheet of material around the mandrels, then the rollers f^2 of the weight-block F' leave the end of the middle section of track a^4 , and lie over the depressions a^5 , whereby the soldering iron comes down upon the overlapped edges of the formed sheet. It remains in this contact until the mandrels have advanced sufficiently to enable the iron to complete its work, whereupon its rollers f^2 reaching the outer section of track a^4 , the soldering iron is raised from the body or tube, and the solder is thus given time to cool.

A reciprocating transverse movement is given to the soldering iron in order to iron out and complete the soldering of the joint of the body or tube, by means of the following devices:

S is a horizontal shaft (Fig. 1) running parallel to the length of the machine and mounted thereon in suitable bearings s , and having at one end a pulley s' connected with a pulley j^2 on the main shaft J below, whereby shaft S is rotated. The shaft S is formed with a longitudinal feather way s^2 (Fig. 4) and upon the shaft is an eccentric s^3 (Fig. 2) fitted by a key s^4 to the feather way s^2 of the shaft, whereby the eccentric can slide longitudinally on the shaft, but will still be turned thereby. The eccentric operates between the yoke-shaped pieces f^4 on the ends of the weight-block F' , and thus imparts to said block and the soldering iron the necessary transverse movement.

To supply the solder, I have herein shown the following devices: The solder sheet b^3 in channel b^2 rests with its lower edge upon the top plate c^{11} of the upper section c' of the folder and immediately in front of the sharpened edge of a plate c^{12} secured to said folder section, (Figs. 5 and 1.) Now, when the folder will cut off a strip of solder which will be deposited upon the joint ready for the soldering iron. Referring to Fig. 5, it will be seen that the top plate c^{11} of the upper folder section c' has its lip projecting from the section and intersecting the line of curvature thereof. The object of this is to insure the pressing

down and in of the edge of the sheet upon the mandrel. This top plate is adjustable forward and back to regulate the position of its pressing lip, its adjustability being effected by means of an elongated slot c^{13} in said plate fitting over a screw c^{14} and a set screw c^{15} operating from the back.

The means for feeding the sheets of material to position between the open folders and the approaching mandrels are as follows: The sheet b' in channel b rests with its lower edge upon a hinged support B' , attached to the carriage B (Fig. 1). O is a vertically sliding rack bar, having a head o' to which are attached, one on each side, the nippers o^2 , each consisting of a fixed jaw and a spring controlled movable jaw. These nippers are in a vertical line below the sheet receptacles of the carriage when said carriage is moved into position to part with the sheets. Q are fixed stops to receive and to support the sheets when drawn down, and to relieve them of the nippers. When the rack bar O moves upwardly, the fixed jaw of the nippers comes in contact with the hinged support B' and forces it backwardly, thereby allowing the sheet b' to drop into the nippers, the movable jaw being opened by contact with the front edge of the channel b . Then, when the nippers move down, they carry the sheet with them, until the lower edge of the sheet comes upon the fixed stops Q and being arrested the sheet will be withdrawn from the nippers which continue their descent.

The several power transmitting connections are as follows:—J is the main driving shaft with fast and loose pulleys $j j$. This shaft (Fig. 1) has a worm j' which engages a worm gear K' on the counter shaft K, which is provided with crank wheels $k k'$ (Figs. 2 and 3). To these are connected rods L, the outer ends of which are connected to rock arms M, the upper ends of said rock arms being connected by rods N (Fig. 1) with the cross-head frame D. Thus the cross-head is reciprocated. Engaging with the rack bar O, of the feed nippers, is a pinion P on a horizontal shaft p mounted in the main frame. Upon the outer end of shaft p is another pinion P' which engages with a segmental rack P^2 , the shank of which is journaled at p' in the main frame. The shank carries a roller stud p^2 which is operated upon by a cam R upon the crank wheel k . Upon the pivotal shaft at p' of the segmental rack P^2 is also secured a flat spring p^3 , which toward the upper extremity of its motion comes in contact with the lower portion of the discharge way H, whereby the beginning of the downward movement of the rack bar O is rendered quick and immediate. Thus the nippers are moved up and down to feed the sheets of material. In connection with the cross-head frame D, is a shaft F^2 having a crank handle F^3 , and provided with lifting arms F^4 which play up under the yoke pieces f^4 of the weight-block of the soldering iron whereby said iron may be raised up com-

pletely out of the way when not in use. In order to prevent the rapid radiation of heat from the joint undergoing the soldering process, I have, as shown in Fig. 6, seated in a groove in the mandrels, a metallic strip c^{16} upon which the joint lies and receives the pressure of the soldering iron, and below this strip I have placed a strip c^{17} of some non-conducting material such as wood, so that the receiving strip is separated from the metallic body of the mandrel.

The full operation of the machine is as follows:—The sheet b' being placed in the receptacle b is supported by the hinged support B' , till in the course of the revolution of the crank wheel k , the attached cam R engages with the roller p^2 , thereby depressing the rear end of the shank of the segmental rack P^2 , and correspondingly raising the toothed end, which in its turn through its engagement with the pinion P' rotates the shaft p and the pinion P . This pinion being engaged with the rack bar O , the latter is thereby elevated, so bringing the stationary side of the feed nippers o^2 in contact with the hinged support B' , forcing it from under the sheet, and permitting the sheet to drop into the nippers. At the same time the loose side of the nipper comes in contact with the front edge of the receptacle b , thereby opening it and permitting the sheet to fall between the jaws of the nippers. The continued motion of the cam R having raised the segmental rack P^2 to its highest point, the further motion of the cam permits of its downward course by the weight of the feeding device, assisted by the pressure of the spring p^3 against the lower side of the runway H , carrying down with it the sheet until it reaches the rest or stop Q , which prevents its further motion, and withdraws it from the nippers. It now rests loosely upon the stops Q and in front of the open folder. By this time the mandrels G and G' have been projected toward each other, till they have met in the center of the machine, forming a continual cylindrical bar, across the machine and in front of the sheet, which is tangential thereto and is between the mandrels and the open folder. The cross-head during this time that the feeding device has been operating to carry the sheet down, has been advancing from the end of the machine, at which is located the closed folder. The continued advance of the mandrels causes the latter to grasp the sheet between itself and the stationary portion of the open folder, carrying the sheet along with it; at the same time causing the folder to wrap around said mandrels whereby through the action of the several rollers connected to the sections of the folder and their engagements with the various cam tracks and grooves, the sheet is now, by the sufficient advancement of the mandrels, wrapped around them; but during this operation, the upper section of the folder carrying the sharp plate c^{12} has severed from the sheet of solder b^3 a thin sliver the whole length of the sheet, and

by the closing of the upper section c' has deposited this sliver upon the joint of the folded body or tube. These combined actions of folding the sheet, cutting the solder and depositing it upon the joint have been accomplished while the mandrels have moved a certain distance, during which the soldering iron F has now arrived at that portion of the frame where the tracks which support it cease. The soldering iron immediately descends upon the joint, melting the solder and forming the joint. The iron remains upon the joint until the cross-head and carriage have arrived at nearly the extremity of their journey, when the rollers f^2 come to the track once more and are thereby elevated, raising the soldering iron from off the joint. In order to facilitate the soldering and sweating, besides the motion already described in the soldering iron, it has a continuous horizontal reciprocation. The mandrels and the accompanying carriage continue some little distance beyond the point to which the soldering iron has been raised, to permit the molten solder to set, and then by the engagement of one of the tappets with the tappet stop, the valve T is operated and the mandrels withdrawn. The cross-head and mandrels continue their journey in the reverse direction, leaving the carriage stationary with its completed tube. When it arrives near the center of the machine, the tappets again engage with another tappet stop which causes the mandrels to be again forced out to the center of the machine; the other nippers in the meanwhile having raised and secured another sheet, and the operation above described is repeated on the other end of the machine. During the accomplishment of this second operation, the carriage with its formed tube is moved backward to its former position, carrying with it its complete tube, which by the opening of its inclosing sectional folder deposits it in the discharge way H . In this it is temporarily held by the nippers, but as these rise it is permitted to roll down the inclined way H and be thereby discharged.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for making the bodies of cans and other packing vessels, the combination of a folder, a mandrel around which the folder bends the sheet, means for effecting the movement of the mandrel in the line of its axis, and means for effecting its travel in a line at an angle to its axis, substantially as described.

2. In a machine for making the bodies of cans and other packing vessels, the combination of a folder and a mandrel around which the sheets are bent by the folder, said mandrel being divided into two independent parts across its length substantially as described.

3. In a machine for making the bodies of cans and other packing vessels, the combination of a folder and a mandrel around which

the folder bends the sheet, said mandrel being divided into two parts across its length and means for withdrawing each part of the mandrel from the encircling sheet and folder, substantially as described.

4. In a machine for making the bodies of cans and other packing vessels, the combination of oppositely located folders, aligned mandrels about which the sheet is bent by the folders, means for moving the mandrels to and from the folders successively, and means for projecting and retracting said mandrels to and from each other, to permit the folders to bend the sheets around them and to withdraw them from the encircling sheets and folders, substantially as described.

5. In a machine for making the bodies of cans and other packing vessels, the combination of a plurality of folders, with a mandrel common to all and about which a sheet is bent by each folder successively, substantially as described.

6. In a machine for making the bodies of cans and other packing vessels, the combination of oppositely located folders, with a mandrel about which a sheet is bent by the folders, said mandrel being adapted to approach to and recede from each folder successively, substantially as described.

7. In a machine for making the bodies of cans and other packing vessels, the combination of a plurality of folders, a mandrel common to all and about which a sheet is bent by each folder successively and means for retracting the mandrel from each encircling sheet, substantially as described.

8. In a machine for making the bodies of cans and other packing vessels, the combination of oppositely located folders, a mandrel about which a sheet is bent by the folders, means for moving the mandrel to and from the folders successively, and means for retracting the mandrel from the encircling sheet and folder, substantially as described.

9. In a machine for making the bodies of cans and other packing vessels, the combination of oppositely located folders, aligned mandrels about which a sheet is bent by the folders, means for moving the mandrels to and from the folders successively, and means for projecting and retracting said mandrels to and from each other, to permit the folders to bend the sheets around them and to withdraw them from the encircling sheets and folders, substantially as described.

10. In a machine for making the bodies of cans and other packing vessels, the combination of a folder, a frame movable to and from the folder, a mandrel carried by the frame and adapted to receive the sheet bent around by the folder, and a power device carried by the frame for withdrawing the mandrel from the encircling sheet and folder and projecting it again, substantially as described.

11. In a machine for making the bodies of cans and other packing vessels, the combination of a folder, a frame movable to and from

the folder, a mandrel carried by the frame and adapted to receive the sheet bent around it by the folder and an engine with power connections carried by the frame for withdrawing the mandrel from the encircling sheet and folders and projecting it again, substantially as described.

12. In a machine for making the bodies of cans and other packing vessels, the combination of oppositely located folders, a frame movable to and from said folders successively, a mandrel carried by the frame and adapted to receive the sheets bent around it by each folder successively and a power device on the frame for withdrawing said mandrel from the encircling sheets and folders and projecting it again, substantially as described.

13. In a machine for making the bodies of cans and other packing vessels, the combination of a folder, a frame movable to and from the folder, aligned mandrels carried by the frame and adapted to receive the sheet bent around them by the folder, and power devices on the frame for simultaneously moving the mandrels to and from each other to permit them to receive the sheet and folder and to withdraw them therefrom, substantially as described.

14. In a machine for making the bodies of cans and other packing vessels, the combination of oppositely located folders, a frame movable to and from said folders successively, aligned mandrels carried by the frame and adapted to receive the sheet bent around them by each folder successively, and power devices on the frame for simultaneously moving the mandrels to and from each other, to permit them to receive the sheet and folder and to withdraw them therefrom, substantially as described.

15. In a machine for making the bodies of cans and other packing vessels, the combination of a forming mandrel, a folding device, means for horizontally reciprocating both mandrel and folding device, and means for effecting the functional operations of both during their reciprocation, substantially as herein described.

16. A machine for making the bodies of cans and other packing vessels, having forming and folding devices so arranged that the forming device is adapted to withdraw from the surrounding body while the latter is in traveling motion, substantially as described.

17. A machine for making the bodies of cans and other packing vessels, having a folding device and a mandrel adapted to withdraw from the encircling folder while the latter is in traveling motion, substantially as described.

18. In a machine for making the bodies of cans and other packing vessels, the combination of a movable carriage, a folder carried thereby, means operated by the movement of the carriage to open and close the folder and a traveling mandrel adapted to approach said folder and to receive the sheet of material bent around it, substantially as described.

19. In a machine for making the bodies of cans and other packing vessels, the combination of a folder, a mandrel about which the sheets are bent by the folder and a feeding device adapted to feed sheets alternately upon each side of the mandrel, substantially as described.

20. In a machine for making the bodies of cans and other packing vessels, the combination of a movable carriage, a folder carried thereby, means operated by the movement of the carriage to open and close the folder, means for feeding a sheet of material to the open folder and a traveling mandrel adapted to press the sheet against the folder, and to receive said sheet bent around it by the closing folder, substantially as described.

21. In a machine for making the bodies of cans and other packing vessels, the combination with suitable forming and folding devices of duplicate feeding devices adapted to feed sheets alternately to the forming device, substantially as described.

22. In a machine for making the bodies of cans and other packing vessels, the combination of a movable carriage a folder carried thereby, means operated by the movement of the carriage to open and close the folder, a traveling mandrel adapted to approach the folder to receive the sheet of material around it by the closing of the folder, and means for retracting said mandrel from the encircling body and folder, substantially as described.

23. In a machine for making the bodies of cans and other packing vessels, the combination of a folding device, a mandrel about which the sheets are bent by the folder, and a suitable feeding device adapted to feed sheets between the mandrel and folder, in a direction tangential to the periphery and in a direction parallel to a diameter of the mandrel, substantially as described.

24. In a machine for making the bodies of cans and other packing vessels, the combination of a movable carriage, a folder carried thereby, means operated by the movement of the carriage to open and close the folder, means for feeding a sheet of material to the open folder, a traveling mandrel adapted to approach the sheet and folder, and to receive said sheet around it by the closing of the folder and means for retracting said mandrel from the encircling body and folder, substantially as described.

25. A machine for making the bodies of cans and other packing vessels, having a folder and a mandrel around which the sheets are bent by the folder, said mandrel being adapted to withdraw from the surrounding sheet when the latter is formed into a body, and the folder being adapted to retain the formed body after the mandrel has withdrawn, substantially as described.

26. A machine for making the bodies of cans and other packing vessels, having a mandrel around which sheets are bent by a folder and

adapted to withdraw therefrom, and a moving folder which folds the sheets around said mandrel, and carries the formed bodies after the mandrel has withdrawn, substantially as described.

27. In a machine for making the bodies of cans and other packing vessels, the combination of a reciprocating retractible mandrel and a folder adapted to fold sheets around the mandrel and to carry and return the formed body after the withdrawal of the mandrel, to the feeding point of the sheet, substantially as described.

28. In a machine for making the bodies of cans and other packing vessels, the combination of body forming and joint securing mechanisms, means for effecting their bodily travel and means for effecting their functional operation while traveling, substantially as herein described.

29. In a machine for making the bodies of cans and other packing vessels, the combination of forming and folding devices and a device for securing the joint of the body formed thereby, means for effecting the bodily travel of said forming and folding devices, and said joint securing device, and means for effecting their functional operation while traveling, substantially as herein described.

30. In a machine for making the bodies of cans and other packing vessels, the combination of a forming mandrel, a folding device and a soldering iron, means for effecting the bodily travel of said mandrel, folding device and soldering iron and means for effecting their functional operation while traveling, substantially as herein described.

31. In a machine for making the bodies of cans and other packing vessels having folding devices, a former and a soldering iron contained in the same moving frame, substantially as herein described.

32. In a machine for making the bodies of cans and other packing vessels, the combination of folding devices, a traveling mandrel around which the sheets are bent by the folding devices and a soldering iron adapted to travel with and be carried by the mandrel, substantially as herein described.

33. In a machine for making the bodies of cans and other packing vessels, the combination of a continuously traveling soldering device and an intermittently traveling device for folding the bodies, substantially as described.

34. In a machine for making the bodies of cans and other packing vessels, the combination of a soldering device and a former, traveling together continuously, with an intermittently traveling folding device with which the soldering device and former act in conjunction to make the bodies, substantially as herein described.

35. In a machine for making the bodies of cans and other packing vessels, the combination of a traveling soldering device and du-

plicate folding devices with which the soldering device acts to secure the joint of the folded bodies, substantially as herein described.

36. In a machine for making the bodies of cans and other packing vessels, the combination of a traveling soldering device and a series of folding devices with which the soldering device acts successively to secure the joint of the folded bodies, substantially as described.

37. In a machine for making the bodies of cans and other packing vessels, the combination of a traveling soldering device and traveling duplicate folding devices with which the soldering device acts while the parts are traveling to secure the joint of the folded bodies, substantially as herein described.

38. In a machine for making the bodies of cans and other packing vessels, the combination of a traveling soldering device and a series of traveling folding devices with which the soldering device acts successively and while the parts are traveling to secure the joint of the folded bodies, substantially as herein described.

39. In a machine for making the bodies of cans and other packing vessels, the combination of a traveling soldering device and a traveling retractible mandrel, with duplicate folding devices with which the soldering device and the mandrel act in conjunction to form the bodies, substantially as herein described.

40. In a machine for making the bodies of cans and other packing vessels, having a frame with tracks, a traveling soldering iron having a hood supported by said tracks during a portion of the travel of the iron, substantially as herein described.

41. In a machine for making the bodies of cans and other packing vessels, having a frame with cam tracks, a traveling soldering iron having a hood supported by said tracks during a portion of the travel of the iron and adapted to be directed and relieved thereby to allow the iron to press upon the joint of the body during the other portion of its travel, substantially as herein described.

42. In a machine for making the bodies of cans and other packing vessels, the combination of a movable carriage a folder carried thereby, means operated by the movement of the carriage to open and close the folder, a traveling mandrel adapted to approach the folder to receive the sheet of material formed around it by the folder, and a traveling device adapted to descend upon the folded body and to secure its joint while held upon the mandrel by the folder, substantially as described.

43. In a machine for making the bodies of cans and other packing vessels, the combination of a movable carriage, a folder carried thereby, means operated by the movement of the carriage to open and close the folder, a traveling mandrel adapted to approach the folder to receive the sheet of material formed around it by the folder, a traveling device

adapted to descend upon the folded body to secure its joint while held upon the mandrel by the folder, and means for retracting said mandrel from the encircling body and folder, substantially as described.

44. In a machine for making the bodies of cans and other packing vessels, the combination of a reciprocating carriage having a folder at each end, and means for opening and closing them, a reciprocating cross-head with a mandrel adapted to approach and recede from the folders successively whereby said mandrel receives the sheets successively bent around it by the folders, and means for retracting the mandrel from the encircling sheets and folders, substantially as described.

45. In a machine for making the bodies of cans and other packing vessels, the combination of a freely movable carriage having a folder at each end with means for operating them, a reciprocating cross-head with a mandrel lying between the folders and adapted by successive contact therewith to reciprocate the carriage, and means for projecting the mandrel to receive the sheets successively bent around it by the folders, and to withdraw it from the encircling sheets and folders, substantially as described.

46. In a machine for making the bodies of cans and other packing vessels, the combination of a freely movable carriage having a folder at each end with means for opening and closing them, means for feeding the sheets in front of the open folders successively, a reciprocating cross-head with a mandrel lying between the folders and adapted by successive contact with the sheets of material pressed thereby against the folders, to reciprocate the carriage and means for projecting the mandrel to receive the sheets successively bent around it by the folders and to withdraw it from the encircling sheet and folders, substantially as described.

47. In a machine for making the bodies of cans and other packing vessels, the combination of a main frame, a freely movable carriage mounted thereon, a folder at each end of the carriage, devices on the folders engaging others on the main frame whereby the folders are opened and closed by the movement of the carriage, means for feeding the sheets in front of the open folders successively, a reciprocating cross-head with a mandrel lying between the folders and adapted by successive contact with the sheets of material pressed thereby against the folders to reciprocate the carriage, and means for projecting the mandrel to receive the sheets successively bent around it by the folders, and to withdraw it from the encircling sheet and folders, substantially as described.

48. In a machine for making the bodies of cans and other packing vessels, the combination of a freely movable carriage having a folder at each end, means operated by the movement of the carriage to open the folders at the inner limits of their carriage move-

ment, and to close them while moving to and from said inner limits, means for feeding sheets of material in front of the open folders successively, a reciprocating cross-head with
 5 a mandrel lying between the folders and adapted by successive contact with the sheets of material pressed thereby against the folders to reciprocate the carriage, and means for projecting the mandrel to receive the sheets
 10 successively bent around it by the folders and to withdraw it from the encircling sheet and folders substantially as described.

49. In a machine for making the bodies of cans and other packing vessels, the combination of a freely movable carriage having a
 15 folder at each end, adapted to be opened and closed by the movement of the carriage, means for feeding sheets of material in front of the open folders, a reciprocating cross-head carrying aligned mandrels which when projected
 20 lie between the folders and are adapted by contact therewith through the intervening sheet of material to reciprocate the carriage, and a power device carried by the cross-head
 25 for projecting said mandrels toward each other to receive the sheets of material successively bent around them by the folders, and to withdraw them from the encircling sheets and folders, substantially as described.

30 50. In a machine for making the bodies of cans and other packing vessels, the combination of a freely movable carriage having at each end a folder, and means for opening and closing the folders by the movement of the
 35 carriage, means for feeding a sheet of material to each folder successively, a reciprocating cross-head having a projectible and retractible mandrel lying and operating between the folders and adapted by contact
 40 therewith through the intervening sheets of material to reciprocate the carriage and an overlying iron carried by the cross-head and having means for lowering it upon and raising it from the joint of the folded body within
 45 the folder, substantially as described.

51. In a machine for making the bodies of cans and other packing vessels, the combination of a freely movable carriage having at
 50 each end a folder and means for opening and closing the folders by the movement of the carriage, means for feeding a sheet of material to each folder successively, a reciprocating cross-head having a projectible and retractible mandrel lying and operating between the folders and adapted by contact
 55 therewith through the intervening sheets of material to reciprocate the carriage, and an overlying iron carried by the cross-head and having means for lowering it upon and raising it from the joint of the folded body within
 60 the folder, and means for reciprocating said iron longitudinally over the joint, substantially as described.

52. In a machine for making the bodies of
 65 cans and other packing vessels, the combination of a main frame, a freely movable carriage thereon having a folder at each end,

with means engaging the frame whereby by the movement of the carriage the folders are opened and closed, means for feeding sheets
 70 of material in front of the open folder, a reciprocating cross-head having a projectible and retractible mandrel adapted to impart movement to the carriage and to receive and withdraw from the bent sheets of material,
 75 an overlying fastening iron carried by the cross head, and means connected therewith and engaging the main frame for vertically moving said iron to and from the joint of the folded sheet, substantially as described. 80

53. In a machine for making the bodies of cans and other packing vessels, the combination of a main frame, a freely movable carriage thereon having a folder at each end,
 85 with means engaging the frame whereby by the movement of the carriage the folders are opened and closed, means for feeding sheets of material in front of the open folder, a reciprocating cross-head having a projectible and retractible mandrel adapted to impart
 90 movement to the carriage and to receive and withdraw from the bent sheets of material, an overlying fastening iron carried by the cross-head, and means connected therewith and engaging the main frame for vertically
 95 moving said iron to and from the joint of the folded sheet, and means for reciprocating said iron longitudinally over the joint, substantially as described.

54. In a machine for making the bodies of
 100 cans and other packing vessels, the combination of a main frame, a freely movable carriage thereon having a folder at each end, with means engaging the frame whereby by the movement of the carriage the folders are
 105 opened and closed, means for feeding sheets of material in front of the open folder, a reciprocating cross-head having a projectible and retractible mandrel adapted to impart movement to the carriage and to receive and
 110 withdraw from the bent sheets of material, an overlying fastening soldering iron carried by the cross-head, and means connected therewith and engaging the main frame for vertically moving said soldering iron to and from
 115 the joint of the folded sheet, means for reciprocating said soldering iron longitudinally over the joint, and a burner carried by the cross-head for heating the soldering iron, substantially as described. 120

55. A machine for making the bodies of cans and other packing vessels, consisting of a main frame having a central discharge way, a freely movable carriage thereon having a
 125 folder at each end with means operated by the movement of the carriage for opening the folders at the inner limit of their carriage movement whereby they alternately receive a sheet of material and discharge a finished body into the discharge way, and for closing them while
 130 moving to and from the inner limits, means for feeding a sheet of material to each open folder successively, a reciprocating cross-head carrying a projectible and retractible mandrel

adapted when projected to move the carriage by contact with the sheets of material pressed against the folders and to withdraw from the encircling sheets and folders, and a vertically movable longitudinally reciprocating fastening iron carried by the cross-head and operating upon the joint of the folded sheet while on the mandrel, substantially as described.

56. In a machine for making the bodies of cans and other packing vessels, a sectional folder, the upper section of which has a front lip projecting within the circle of the closed folder, substantially as described.

57. In a machine for making the bodies of cans and other packing vessels, a sectional folder having an adjustable plate on one section with a front lip projecting within the circle of the closed folder, substantially as described.

58. In a machine for making the bodies of cans and other packing vessels, and in combination with a folder, a channel for the sheet of material, means for temporarily supporting the sheet, and a vertically movable nippers adapted to seize the sheet and to feed it down in front of the folder, substantially as described.

59. In a machine for making the bodies of cans and other packing vessels, and in combination with a folder, a channel for the sheet above, and a fixed stop below, a hinged supporting arm under the lower edge of the sheet to temporarily support it in the channel, and a vertically movable nippers, adapted on its upward movement to press back the supporting arm and to receive and grasp the falling sheet, and to carry said sheet down in front of the open folder and rest it upon the stop below, substantially as described.

60. A machine for making the bodies of cans and other packing vessels, consisting of a main frame with central discharge way, the freely movable carriage with its end folders, a reciprocating cross-head with its projectible and retractible mandrels adapted to impart movement to the carriage, the soldering iron on the cross-head adapted to operate upon the joint of the folded body, the channels in the carriage ends for the sheets of material, the temporary hinged supports for said sheets, the stops below and the vertically reciprocating nippers adapted to successively feed a sheet of material in front of each folder, substantially as described.

61. In a machine for making the bodies of

cans and other packing vessels, the combination of a reciprocating cross-head frame, the mandrel therein, and the engine carried by the cross-head frame and adapted to project and retract the mandrel, substantially as described.

62. In a machine for making the bodies of cans and other packing vessels, the combination of a reciprocating cross-head frame, the mandrel therein, the engine carried by the cross-head frame, for projecting and withdrawing the mandrel, a source of power fluid operated by the driving mechanism of the machine and connections for supplying said fluid to the engine, substantially as described.

63. In a machine for making the bodies of cans and other packing vessels, the combination of a sectional folder adapted to bend the sheet into a body, said folder having a cutting plate, and a channel for a sheet of solder arranged to direct said sheet to rest upon the folder in front of its cutting plate whereby the folder in closing will cause its plate to cut off a piece of solder and deliver it upon the joint of the body, substantially as described.

64. In a machine for making the bodies of cans and other packing vessels, the sectional folders having the adjustable closing and opening connections whereby the diameter of said folders when closed may be regulated, substantially as described.

65. In a machine for soldering the seams of the bodies of cans and other packing vessels, the combination of a soldering iron adapted to press upon the joint or seam, a metallic soldering strip under said joint or seam, and a strip of non-conducting material separating said strip from the part in which it is seated, substantially as described.

66. In a machine for making the bodies of cans and other packing vessels, the combination of traveling folding and forming devices, a traveling soldering iron, a hood over said iron forming a combustion chamber and flexible connections between said chamber and a suitable combustible fluid supply whereby flames are projected into said chamber, substantially as herein described.

In witness whereof I have hereunto set my hand.

WILLIAM H. SMYTH.

Witnesses:

LINCOLN SONNTAG,
S. H. NOURSE.