

Jan. 3, 1939.

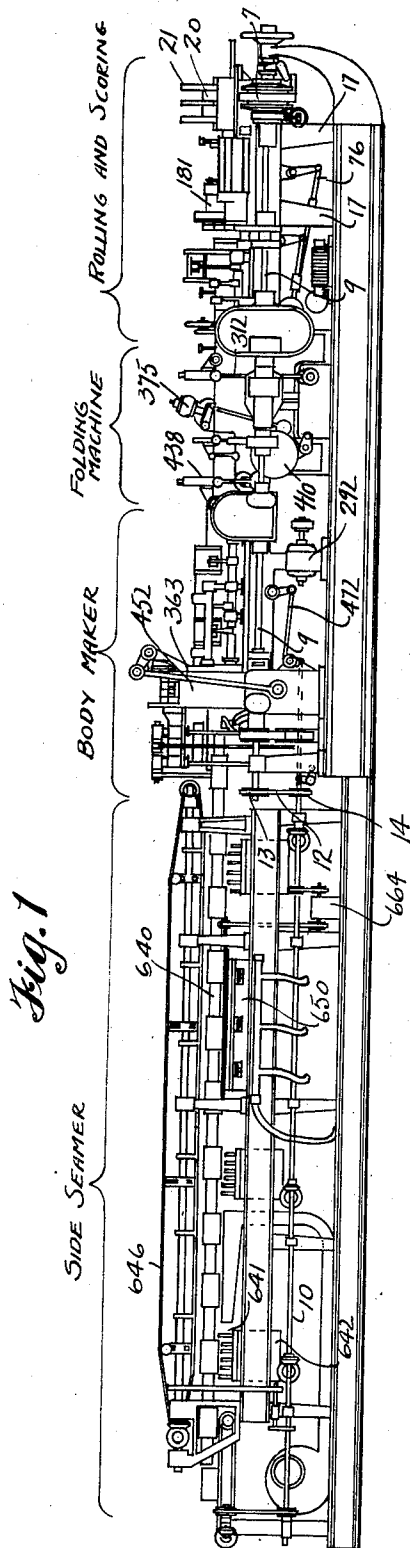
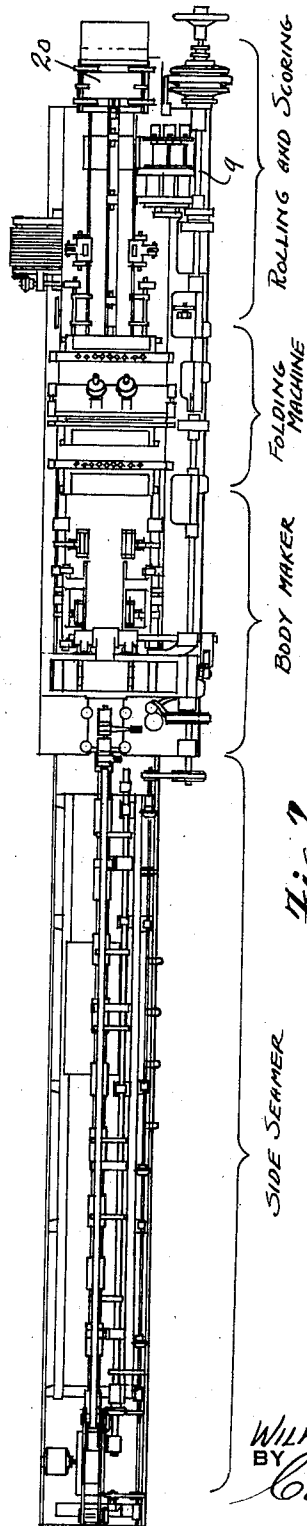
W. E. BURNS.

2,142,235

CAN BODY MAKING MACHINE

Filed Jan. 26, 1935

26 Sheets-Sheet 1



INVENTOR
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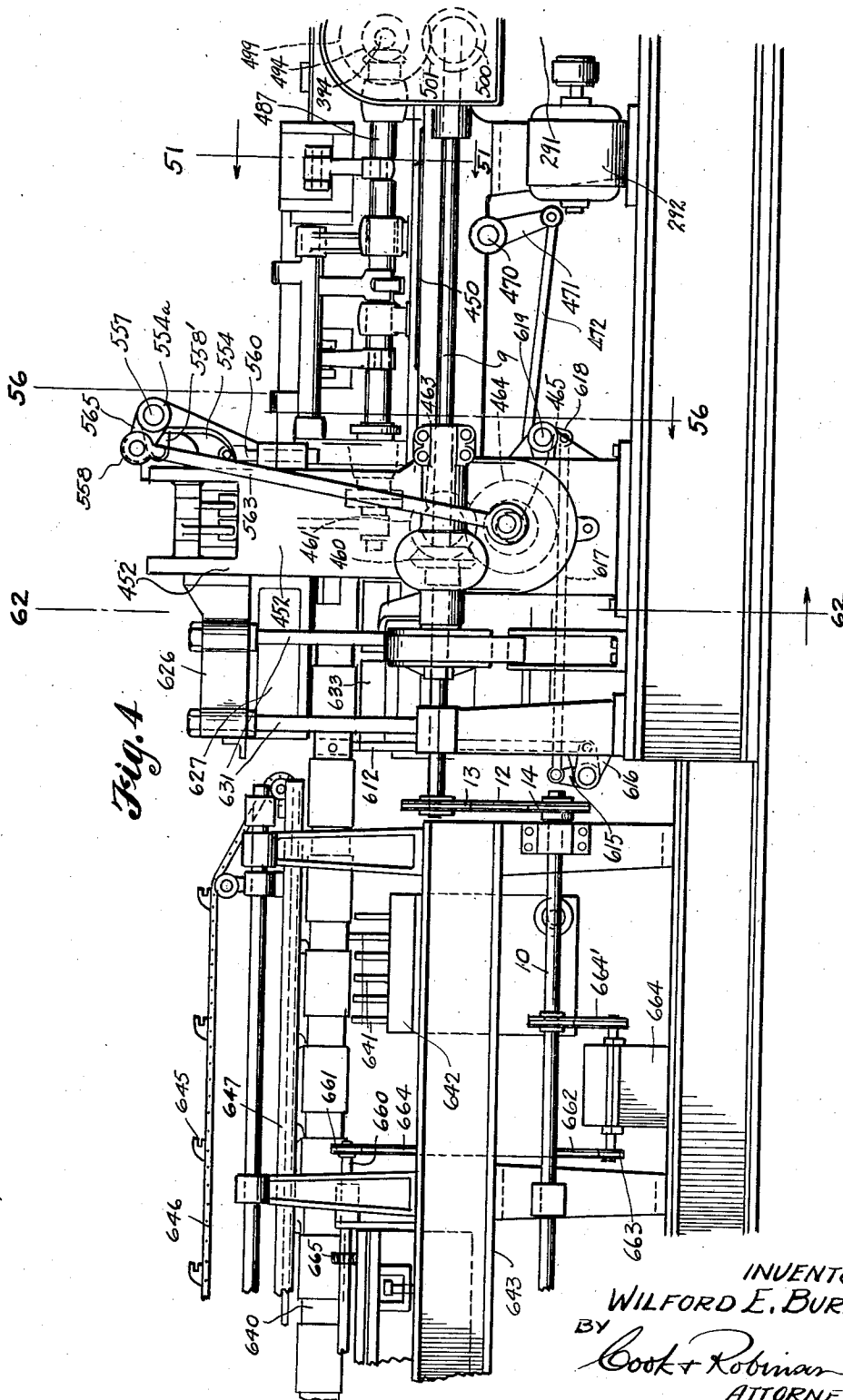
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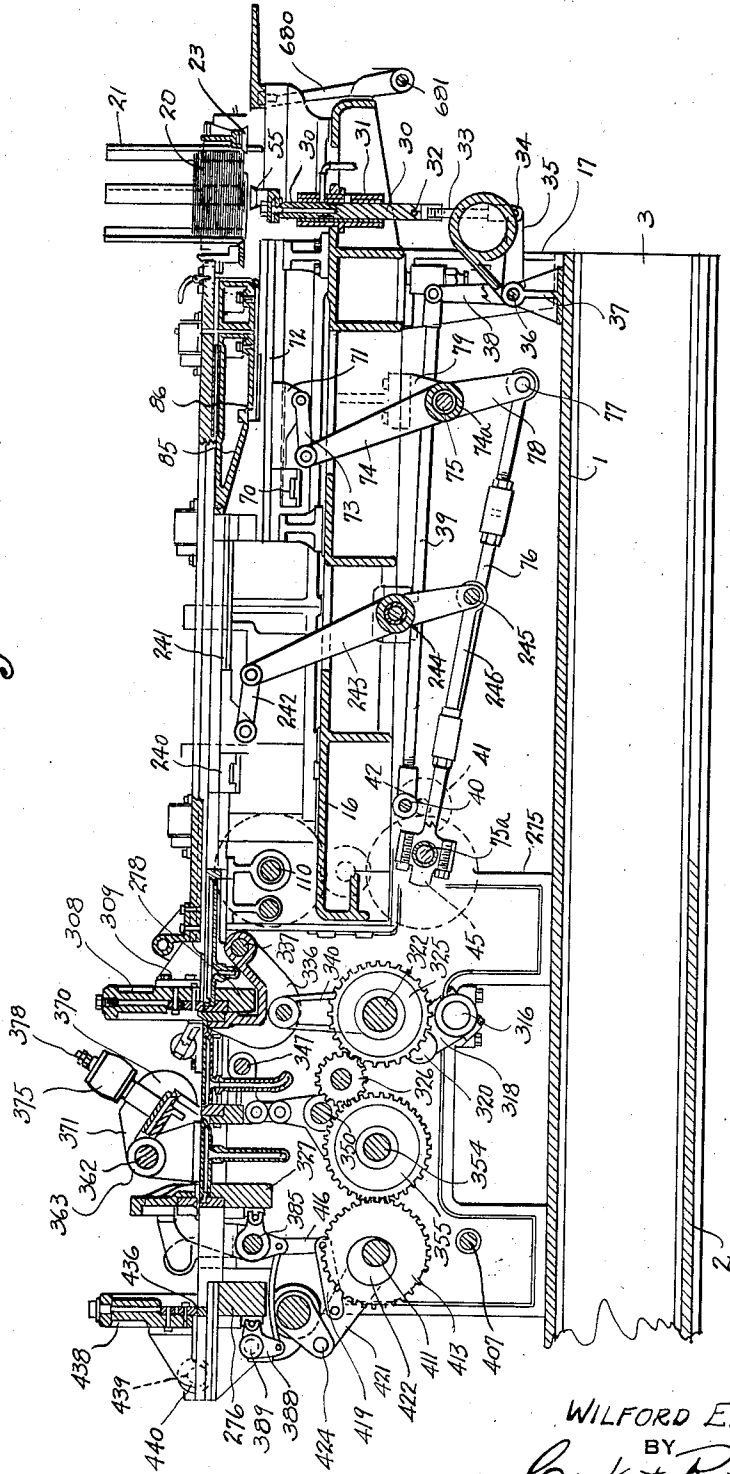
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26 Sheets-Sheet 4

Fig. 5



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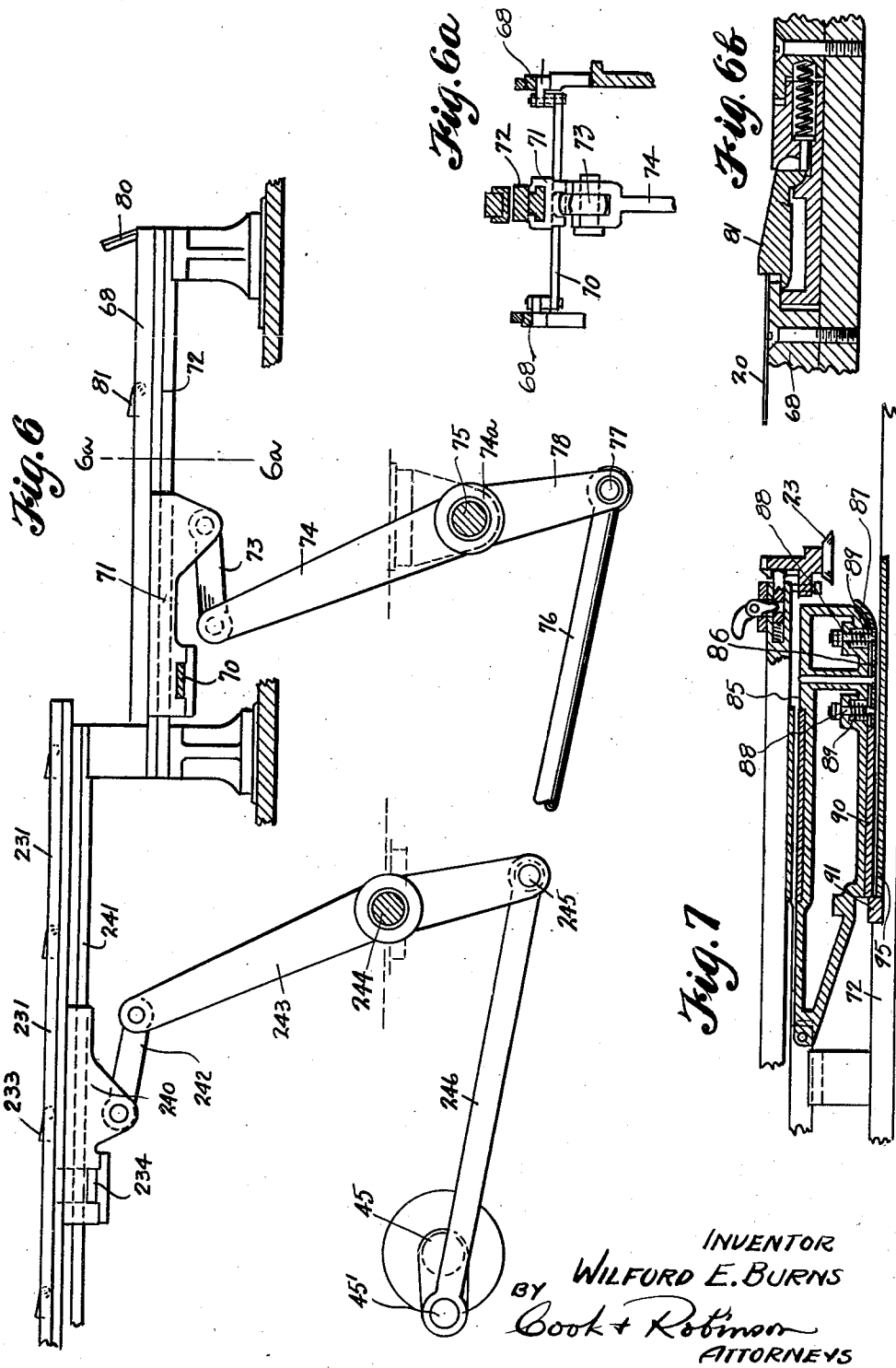
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CAN BODY MAKING MACHINE

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26 Sheets-Sheet 5



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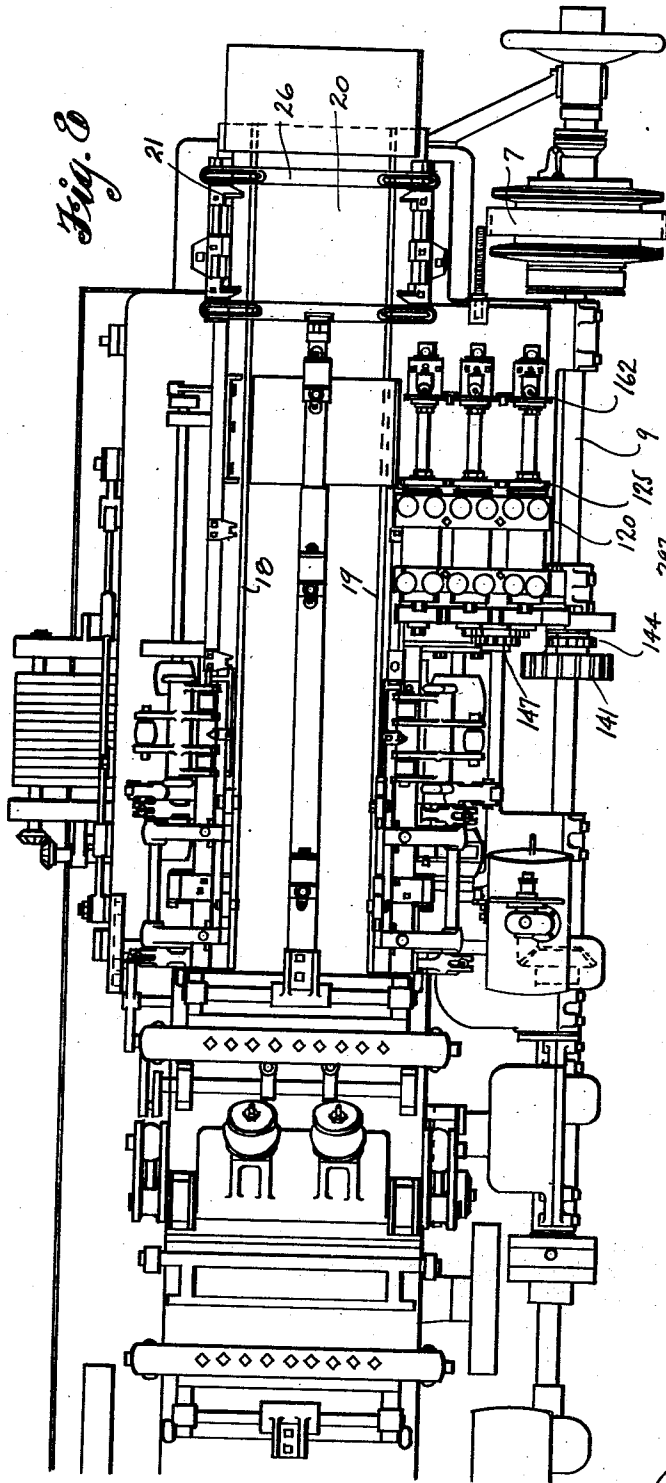
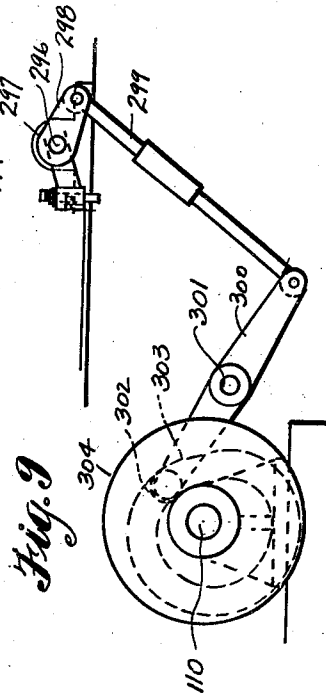
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26 Sheets-Sheet 6



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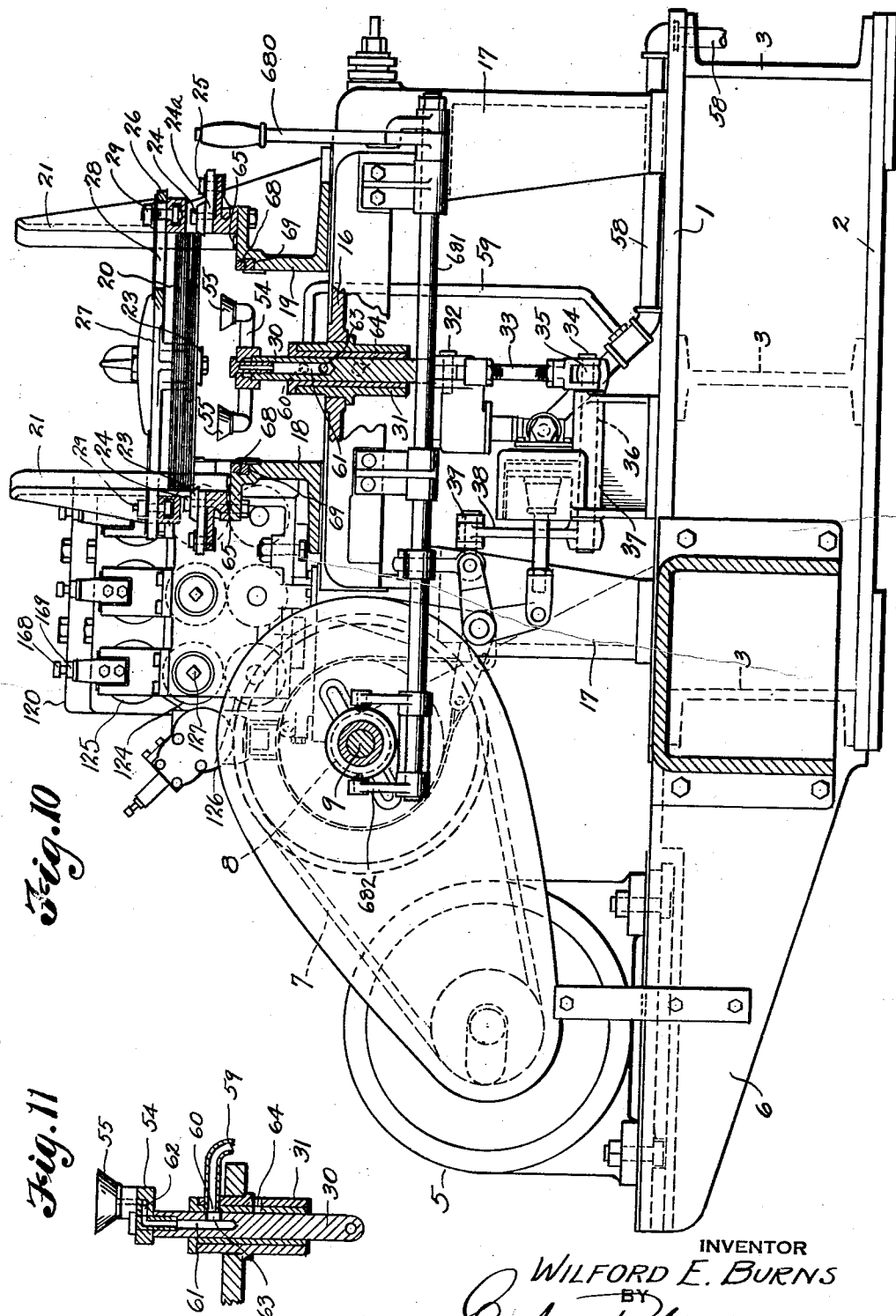


Fig. 10

Fig. 11

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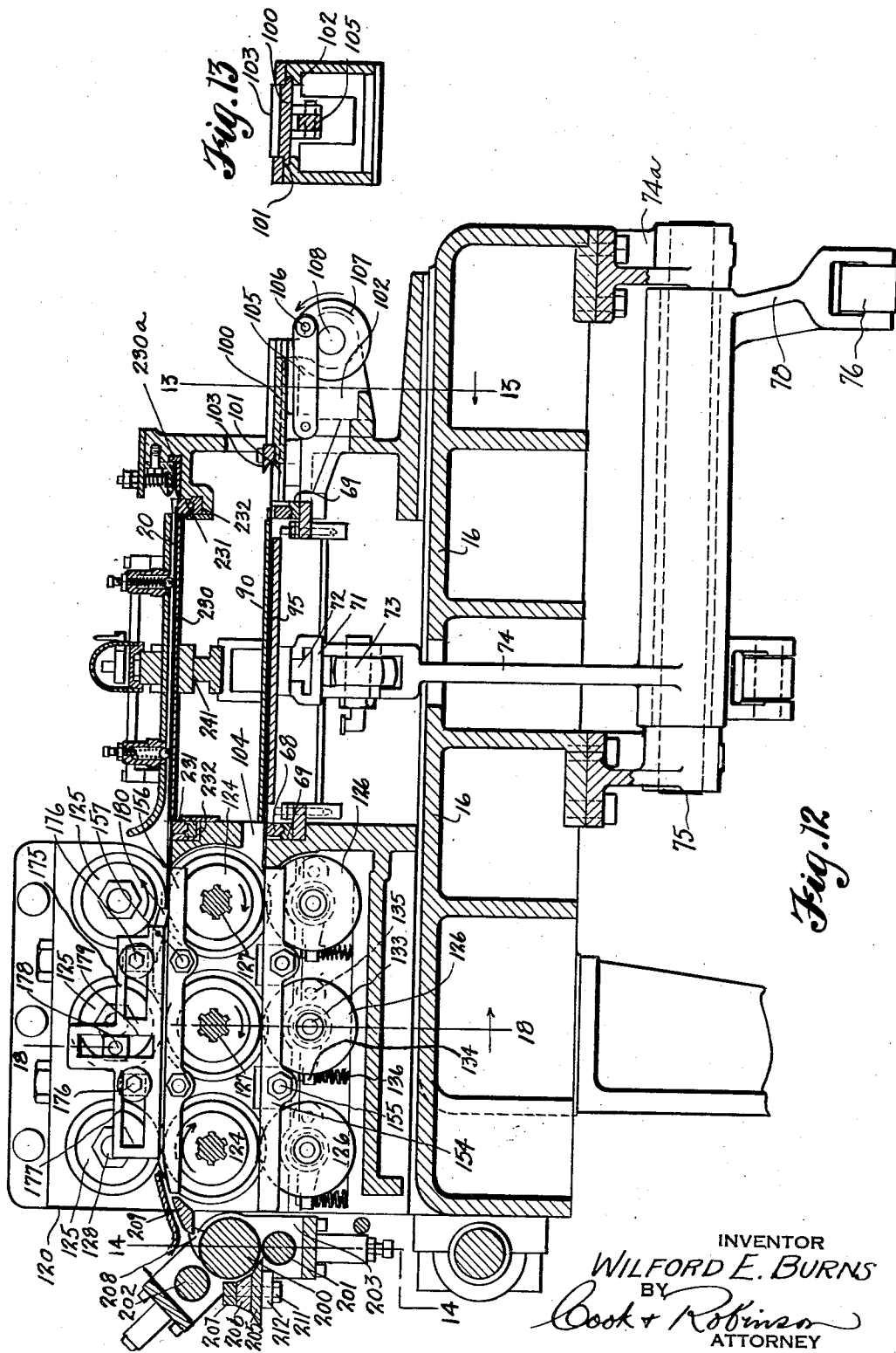
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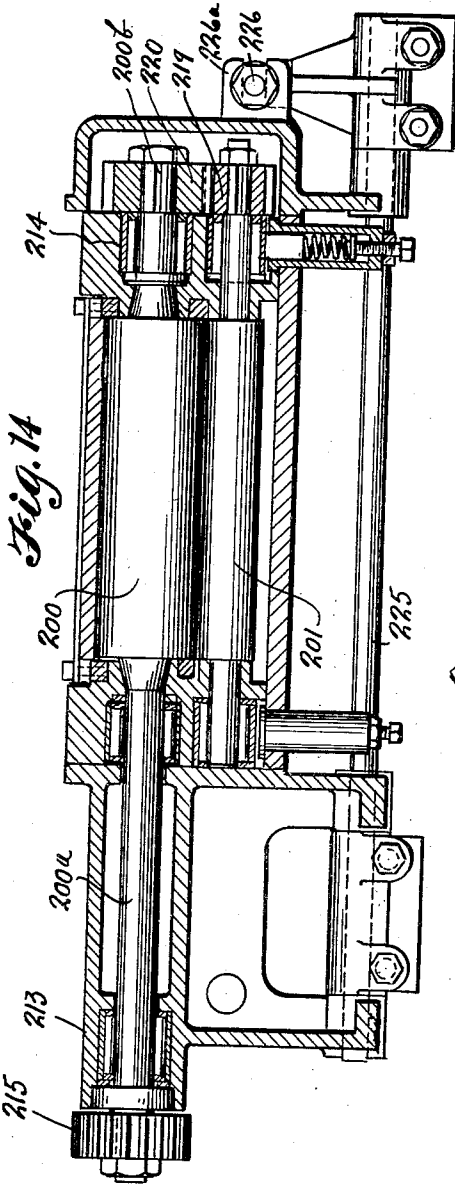


Fig. 14

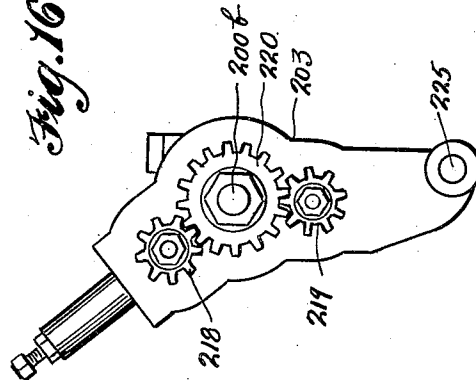


Fig. 16

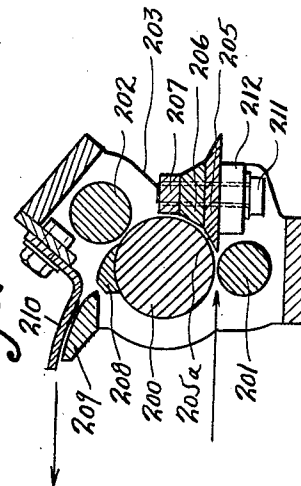


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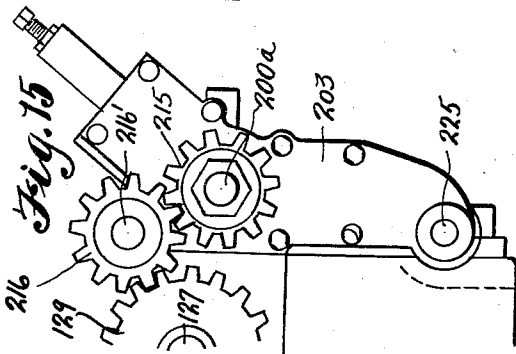


Fig. 15

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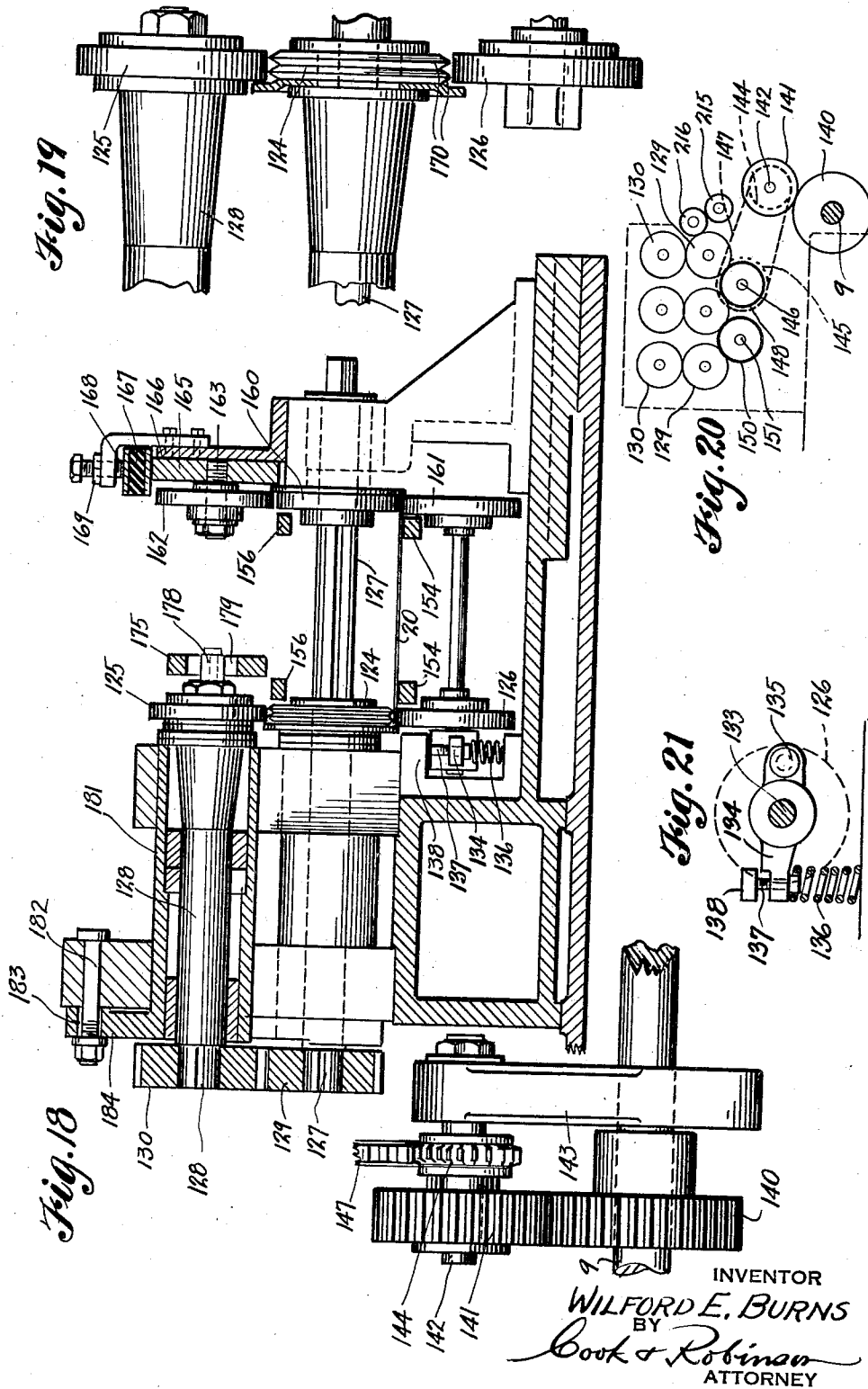
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26 Sheets-Sheet 10



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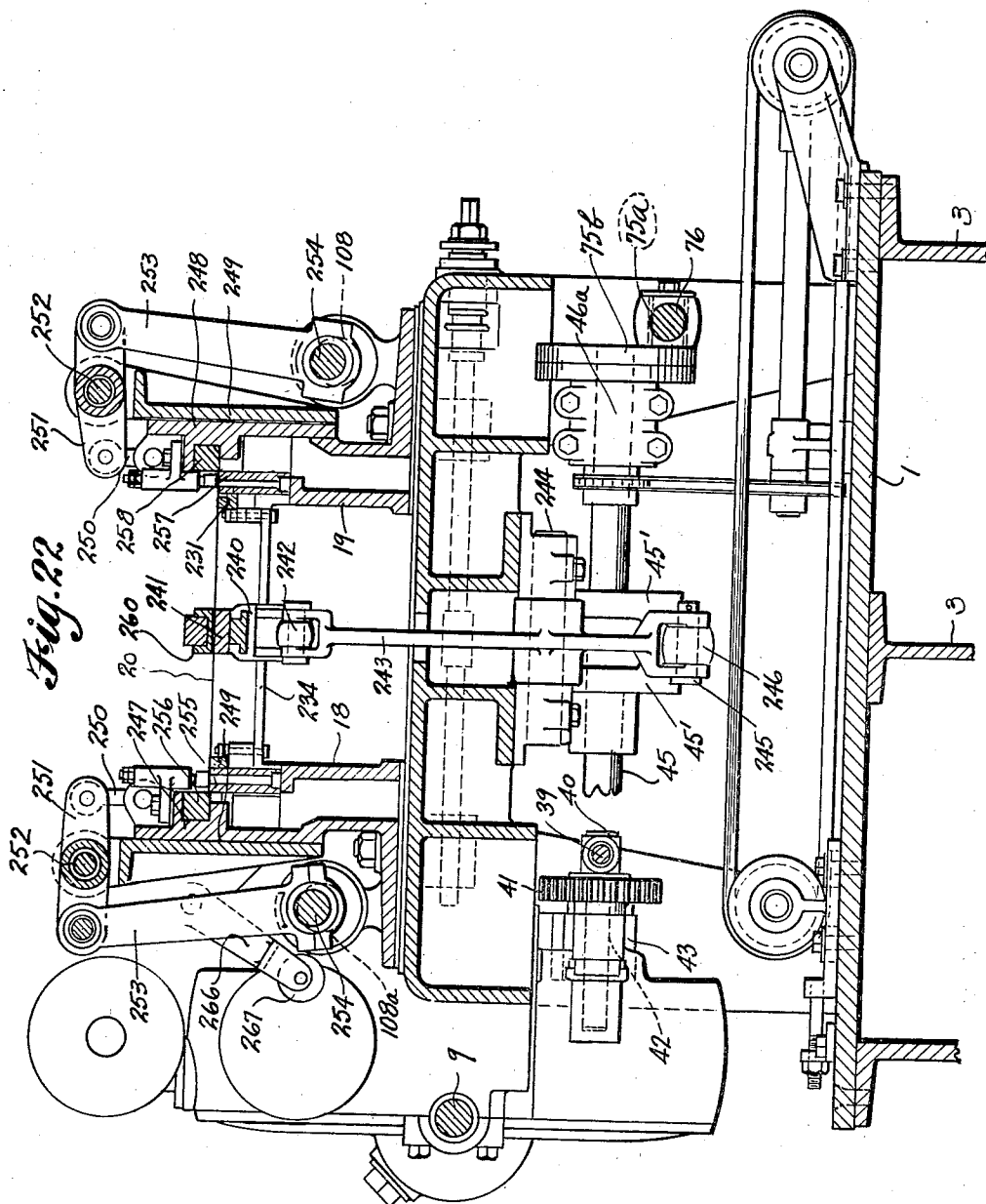
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26 Sheets-Sheet 11



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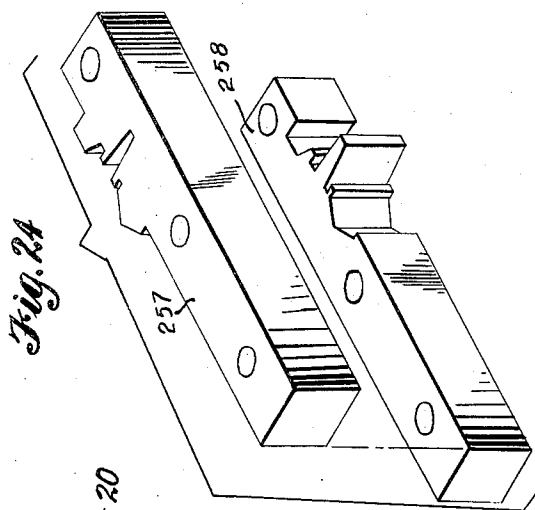


Fig. 25

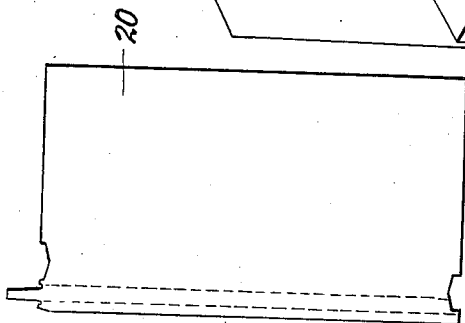
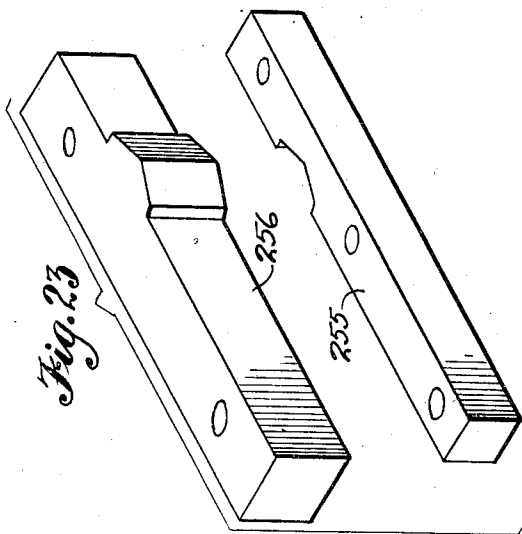
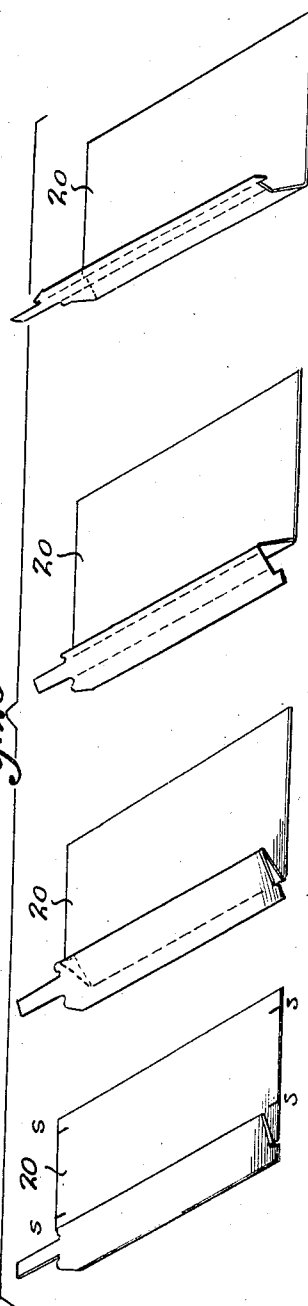


Fig. 26



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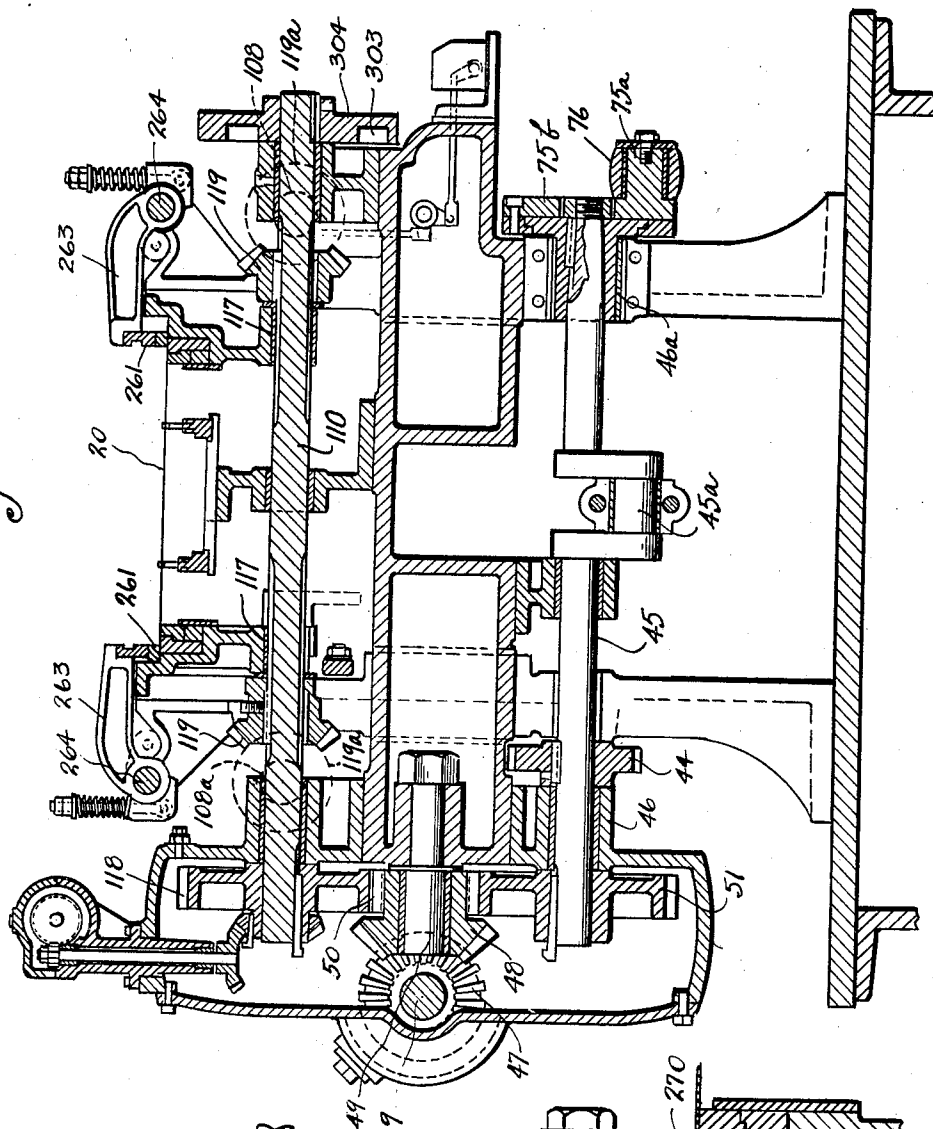
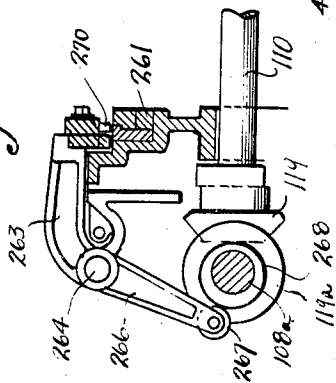
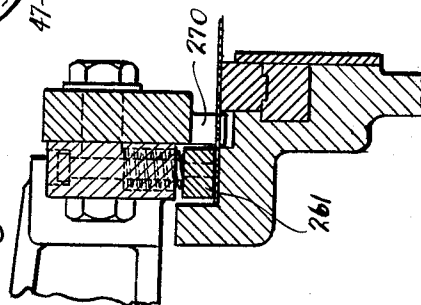
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CAN BODY MAKING MACHINE

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26 Sheets-Sheet 13.



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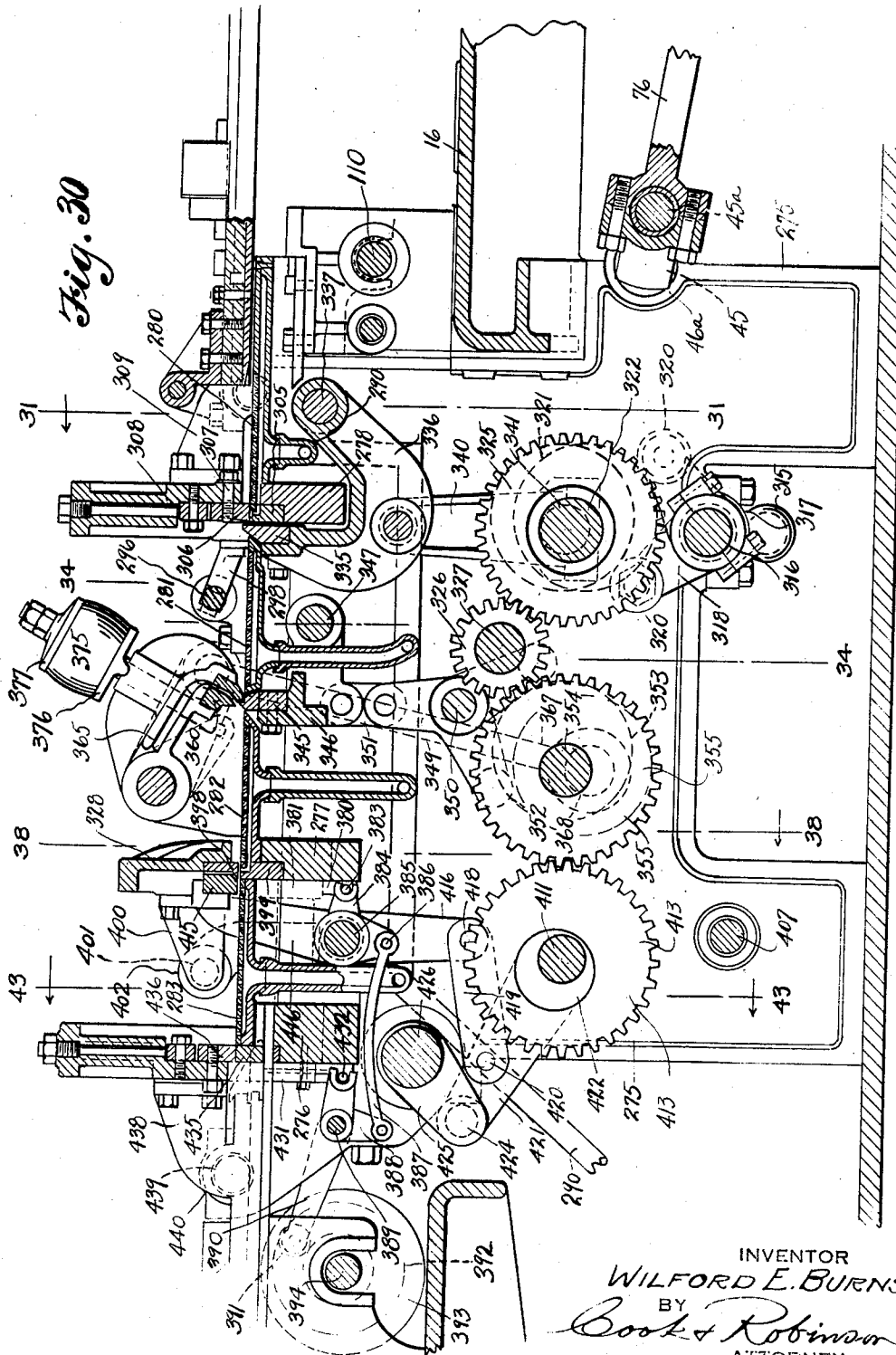
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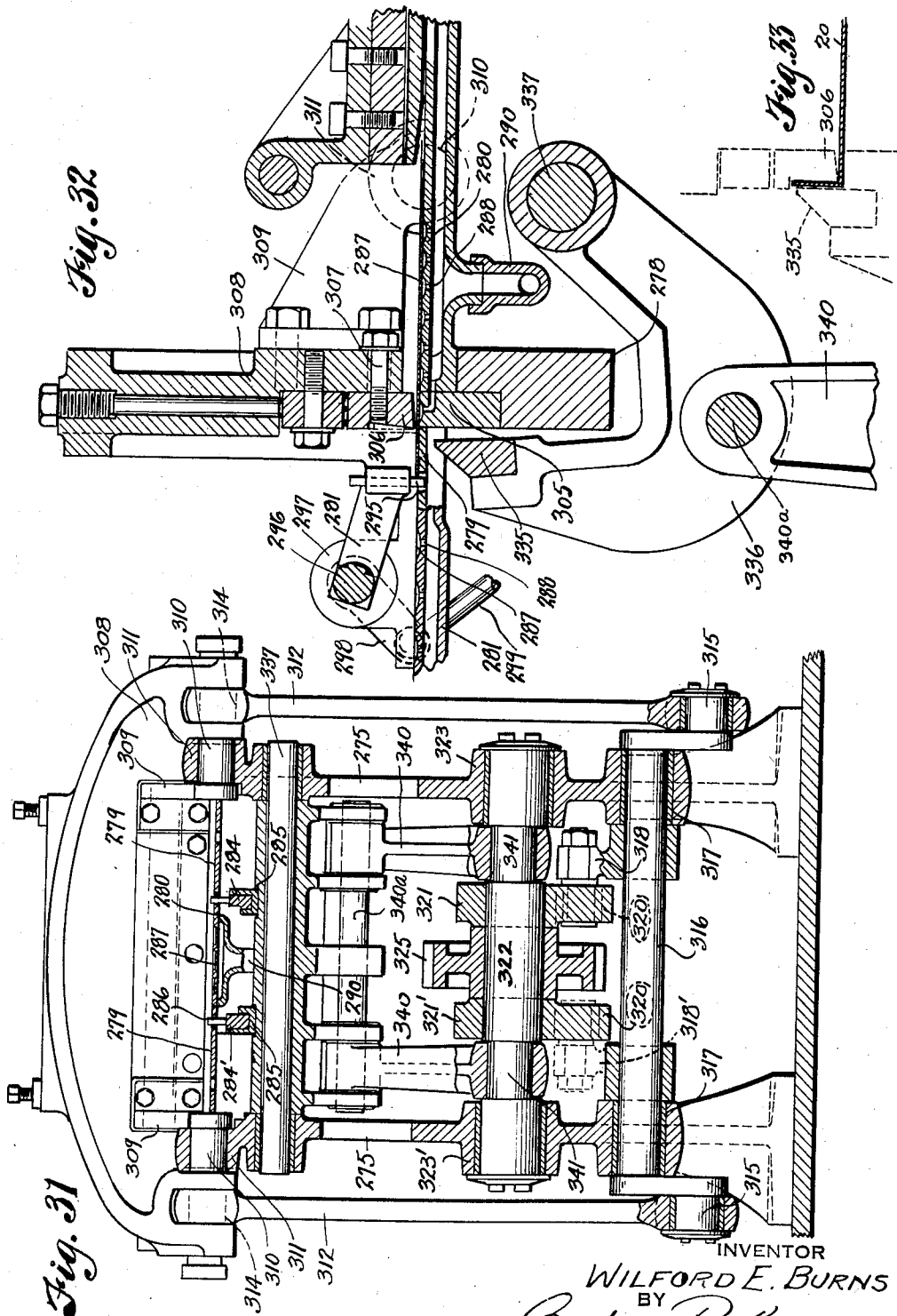
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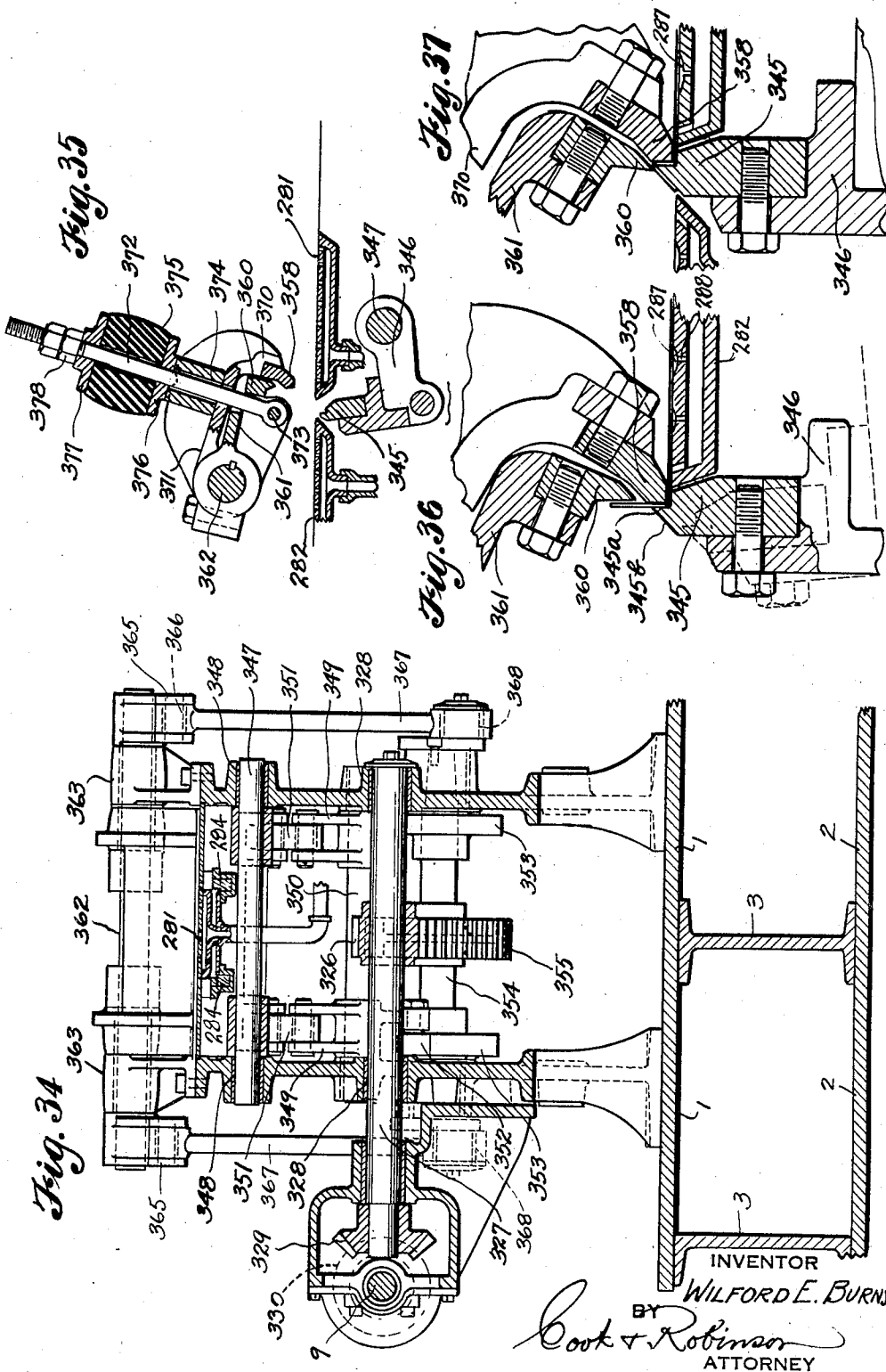
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Fig. 39

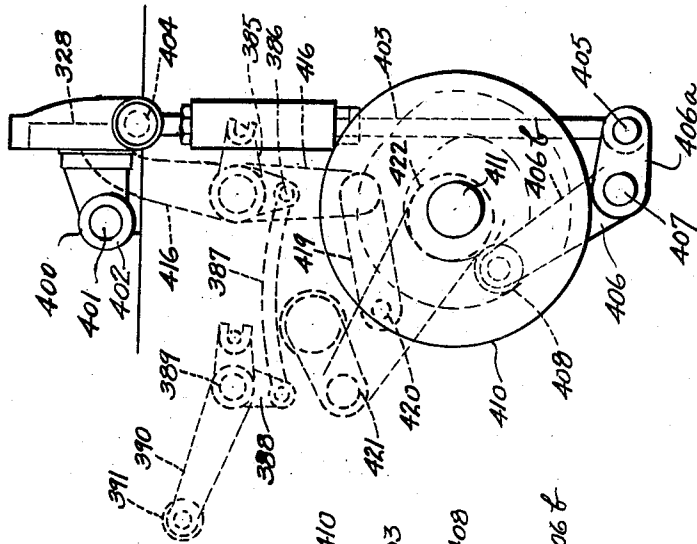
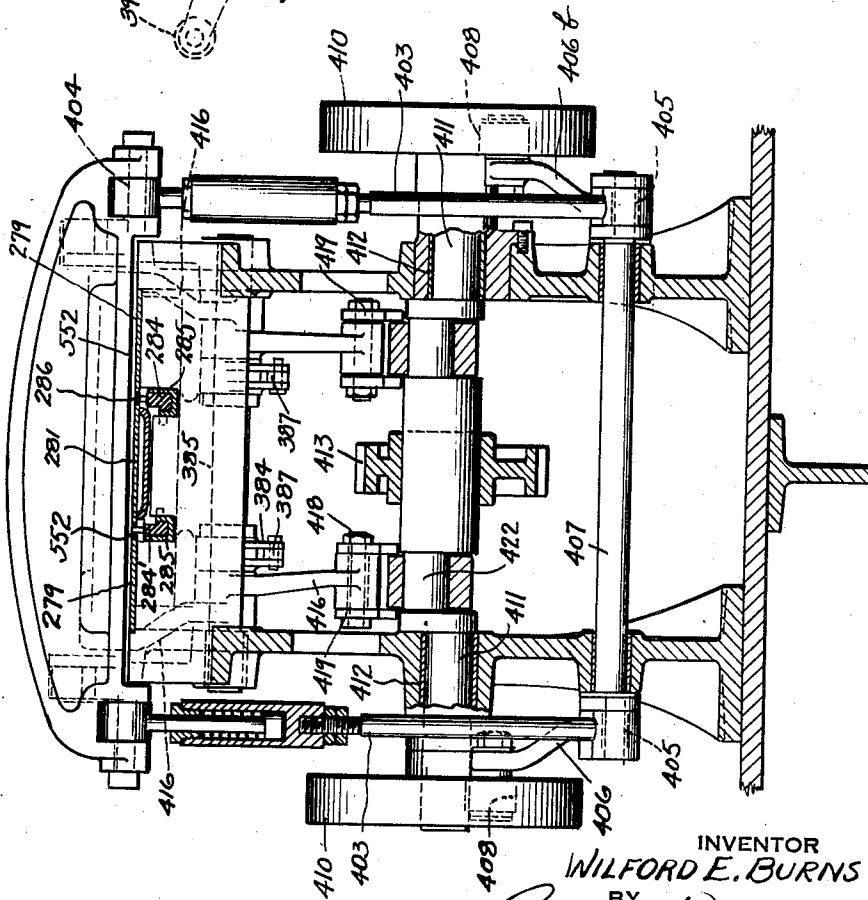


Fig. 38



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Fig. 41

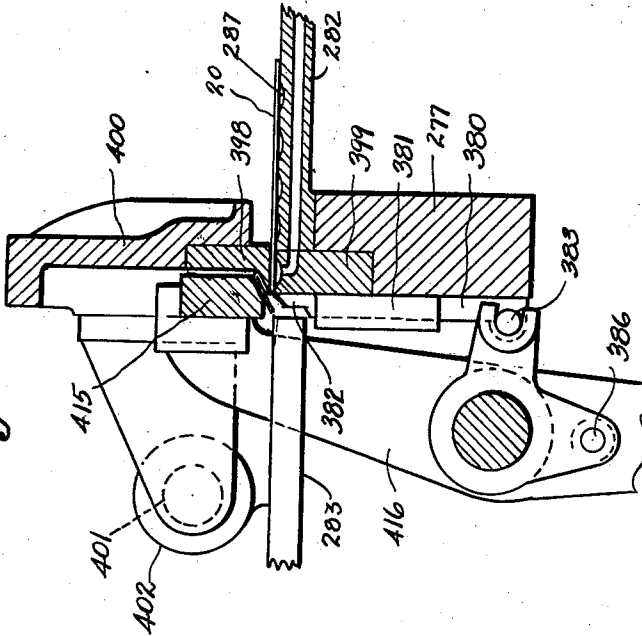
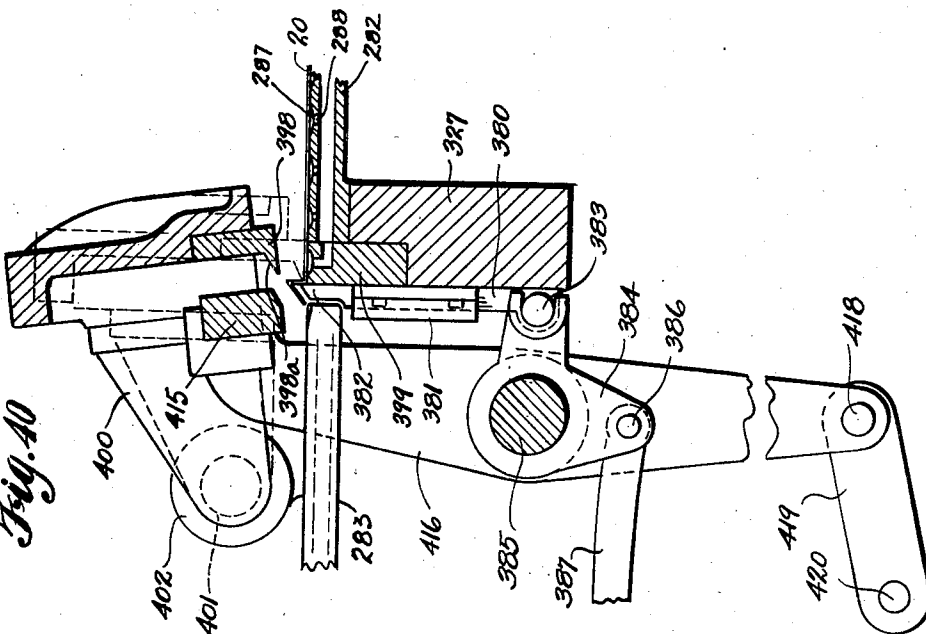


Fig. 42



Fig. 40



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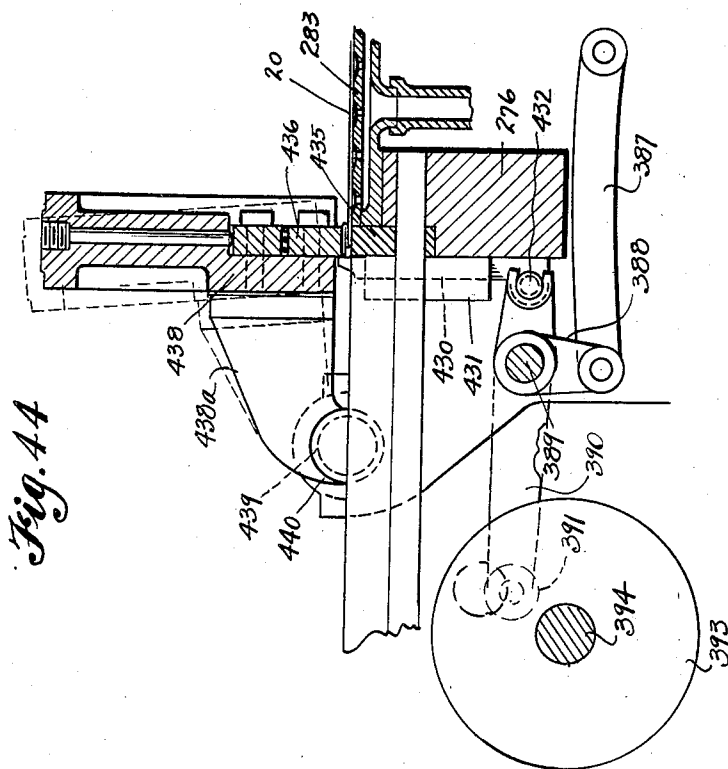
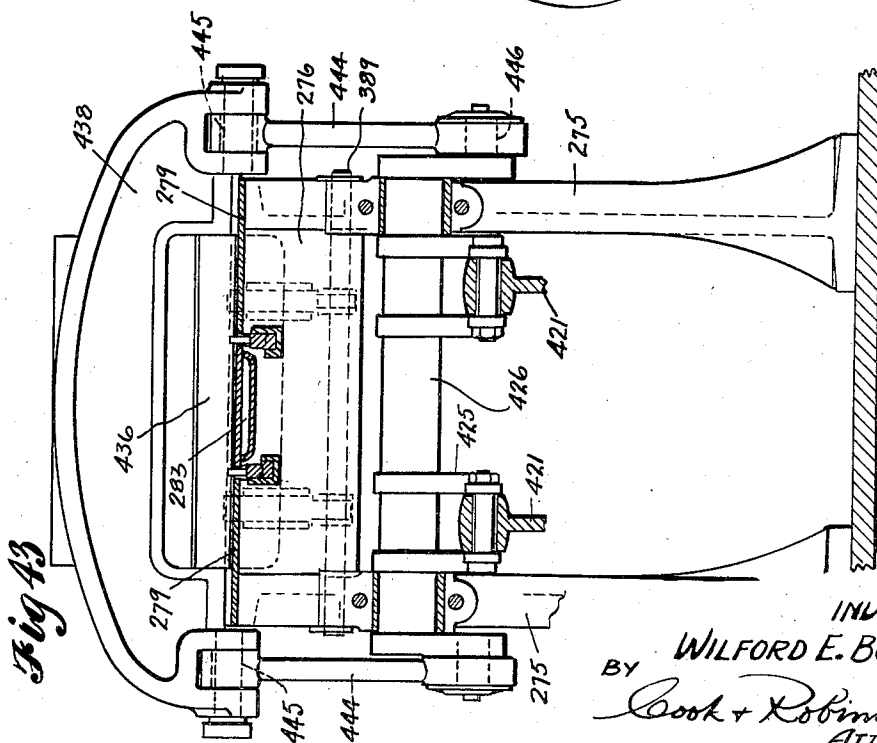
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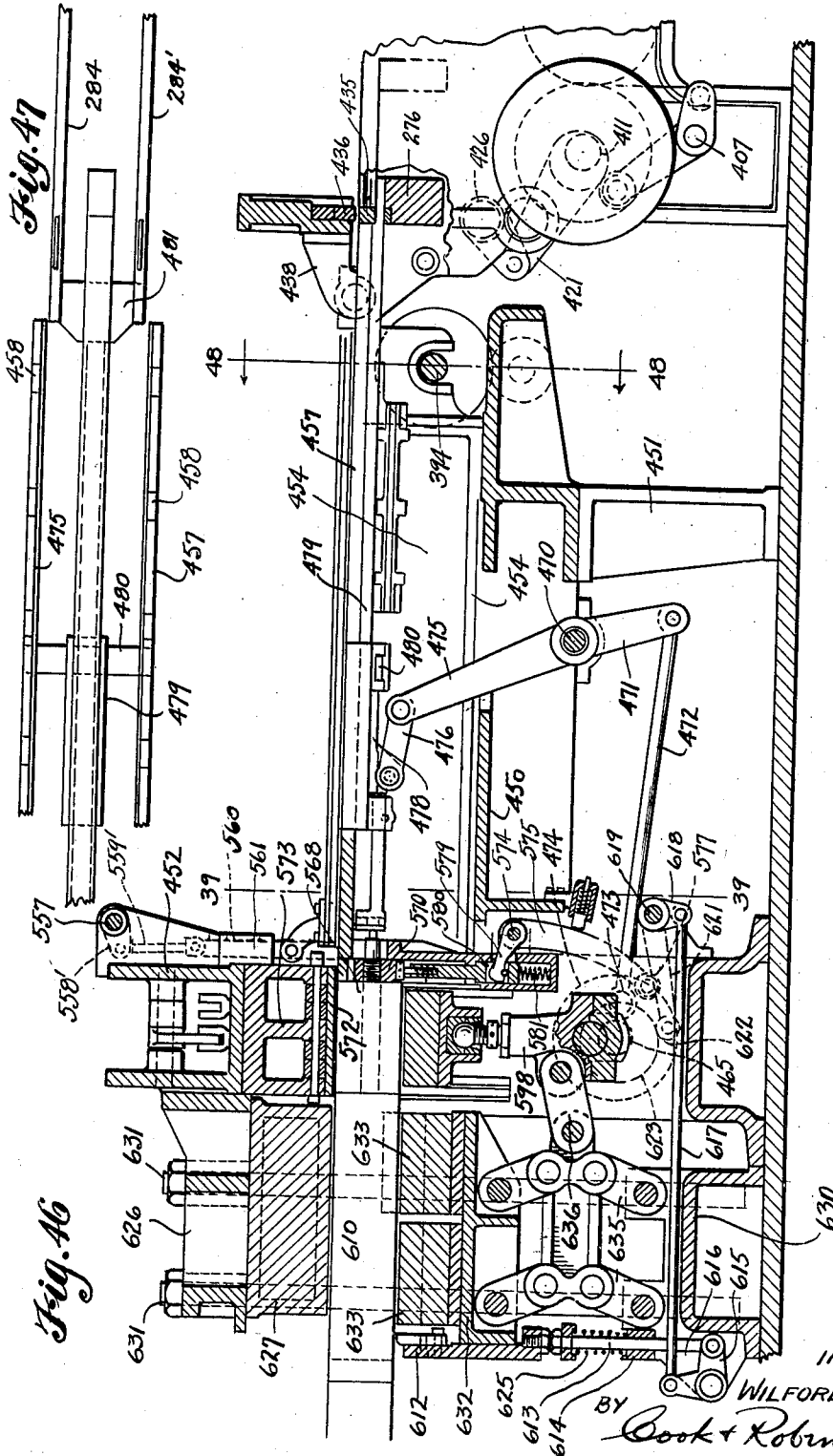
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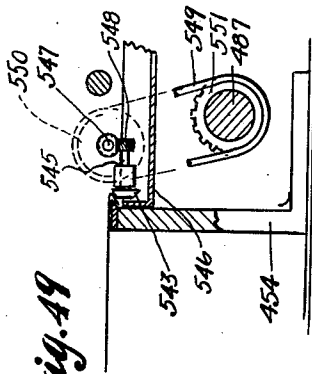


Fig. 49

Fig. 50

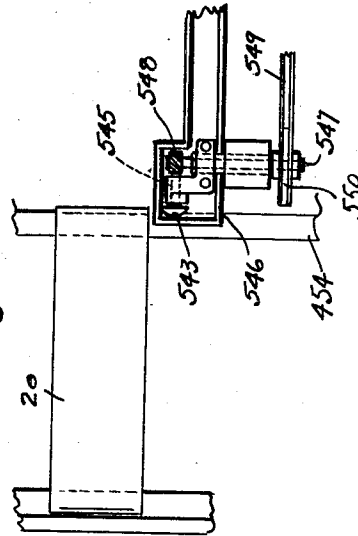
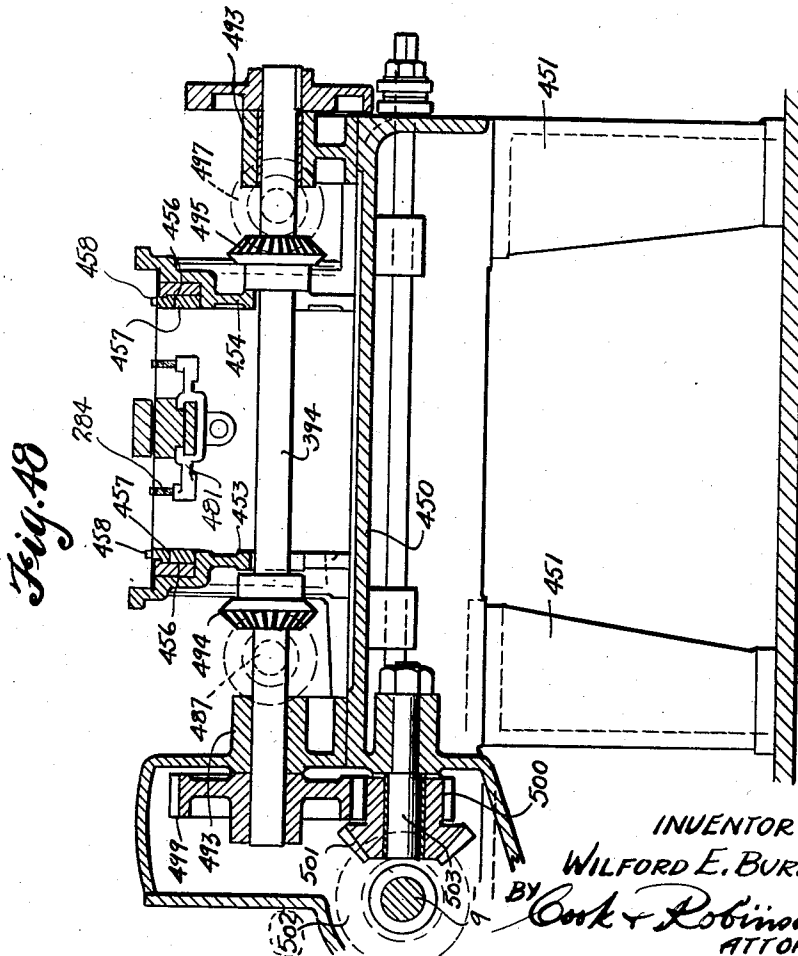


Fig. 48

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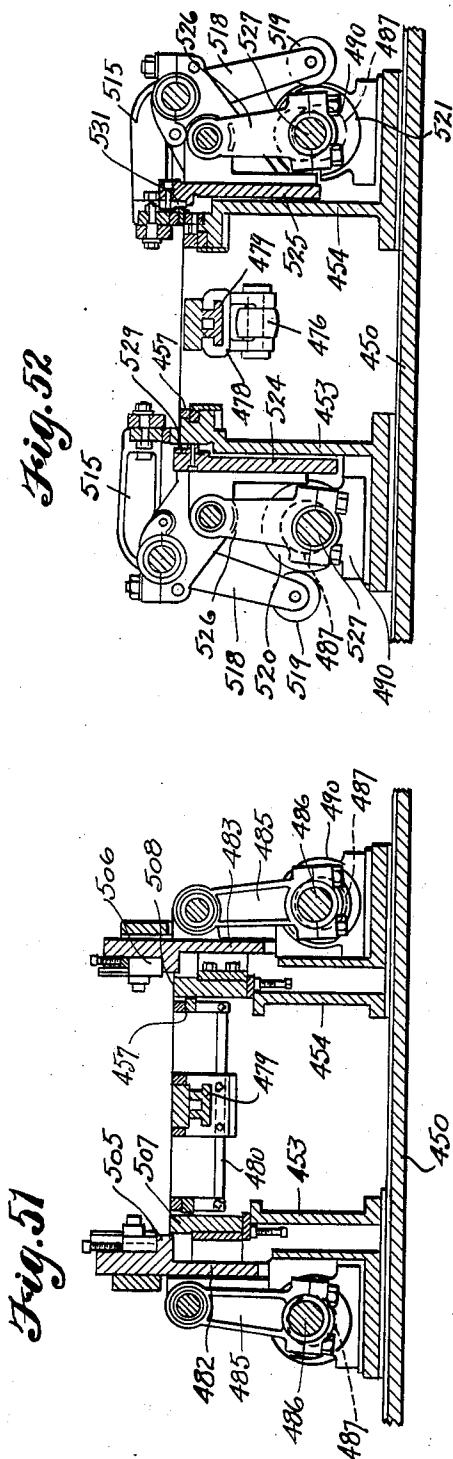
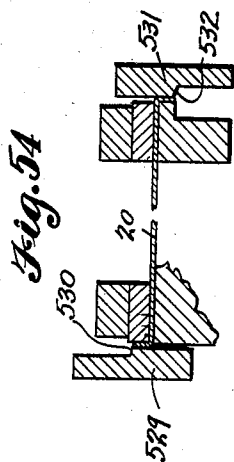
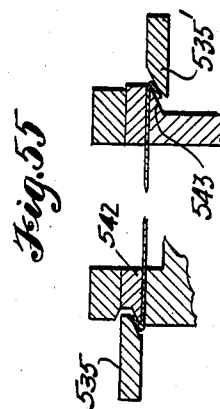
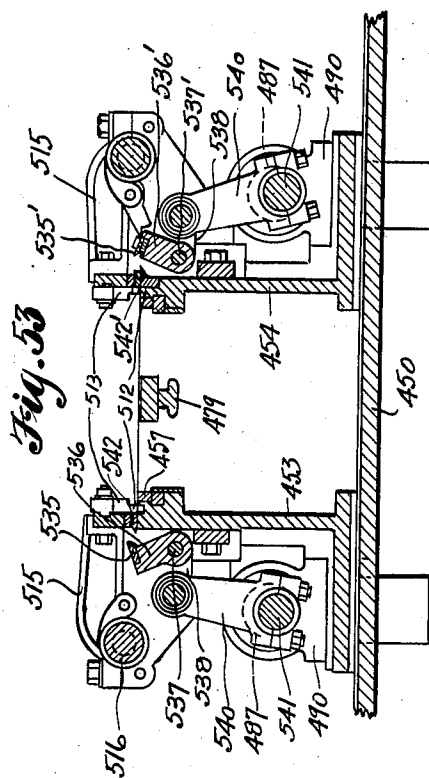
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CAN BODY MAKING MACHINE

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26 Sheets-Sheet 22



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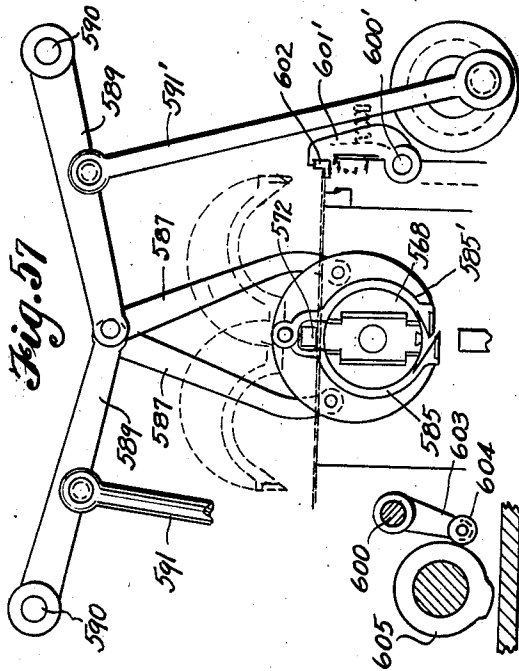
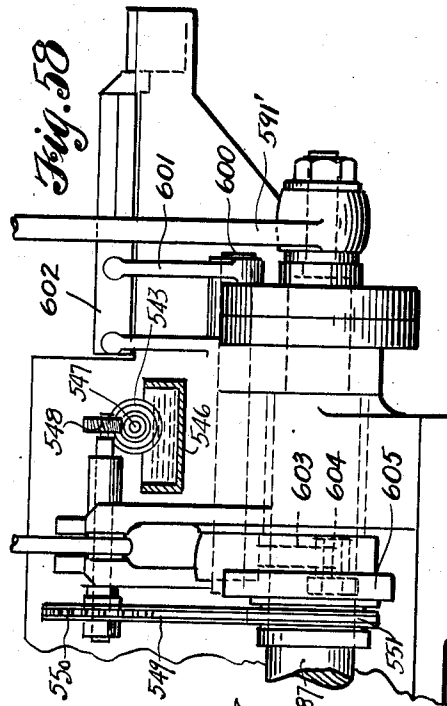
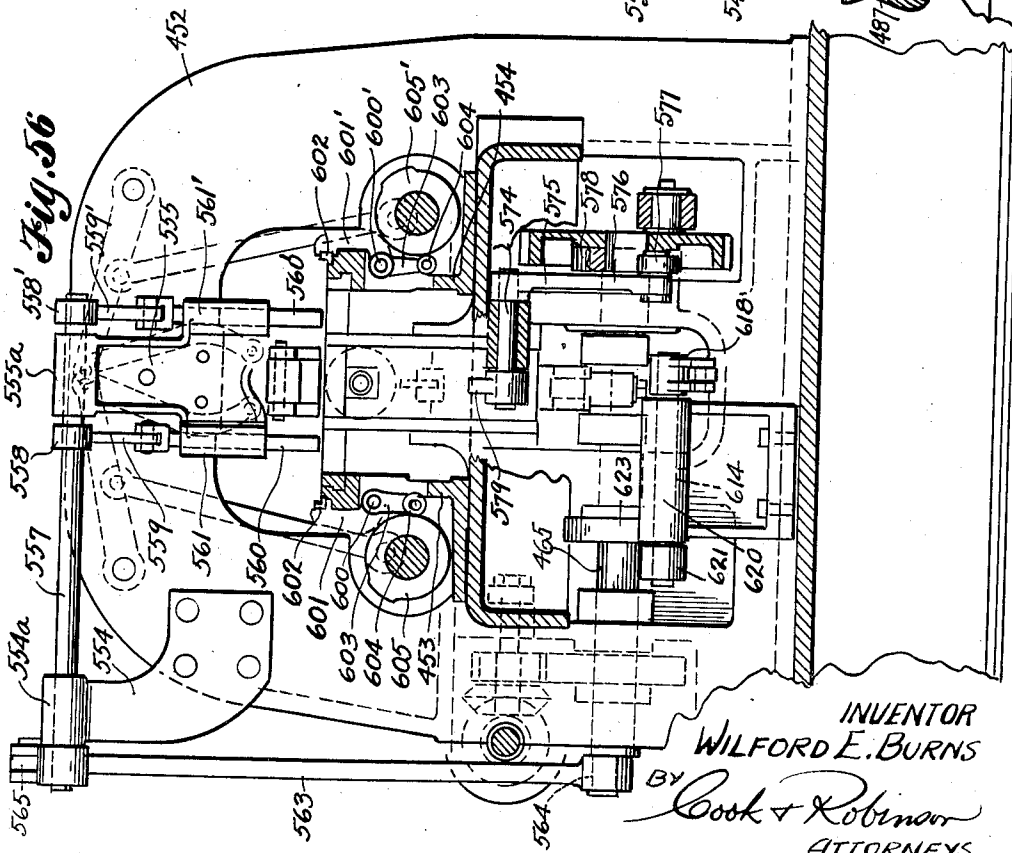
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26 Sheets-Sheet 23



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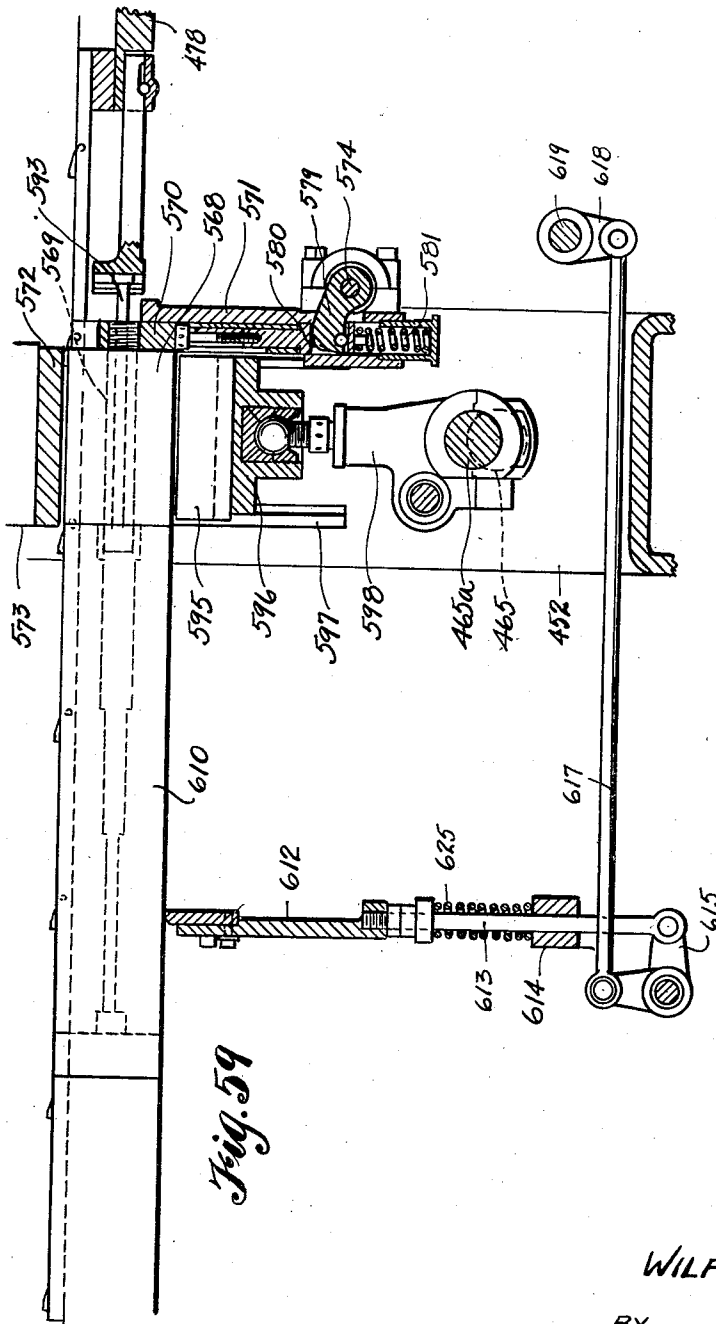


Fig. 59

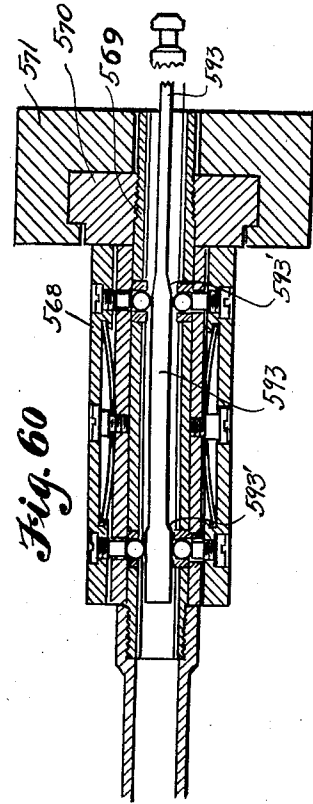
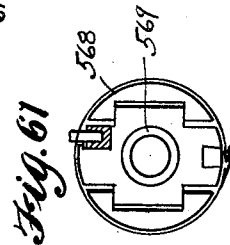


Fig. 60



Exd. 67

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CAN BODY MAKING MACHINE

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Fig. 63

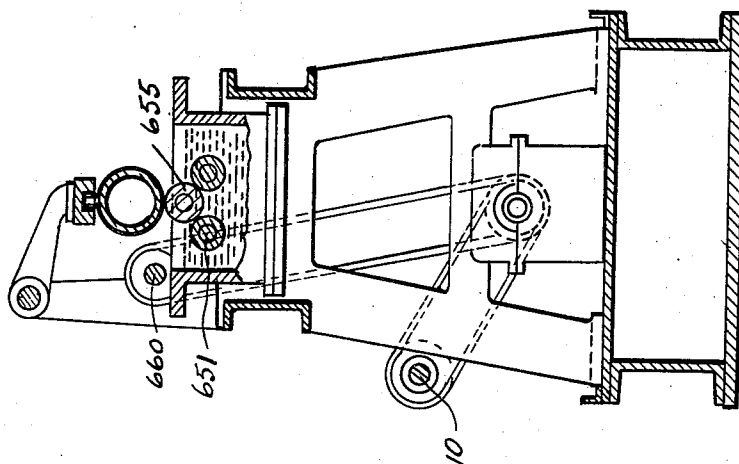
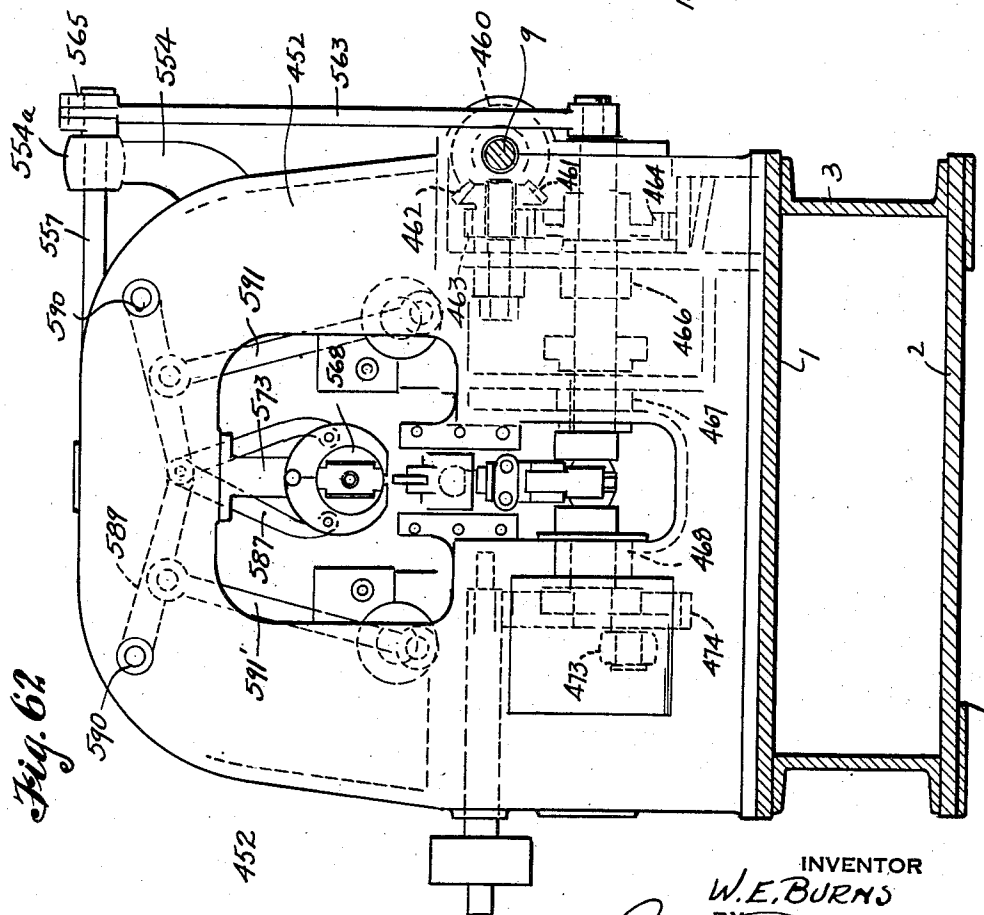


Fig. 62



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CAN BODY MAKING MACHINE

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Fig. 64

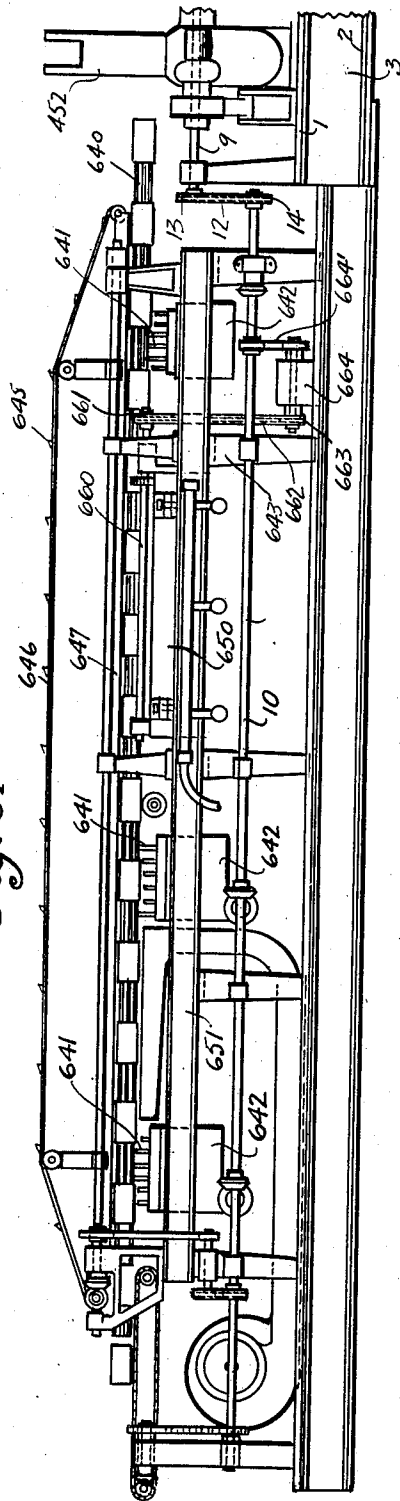


Fig. 65

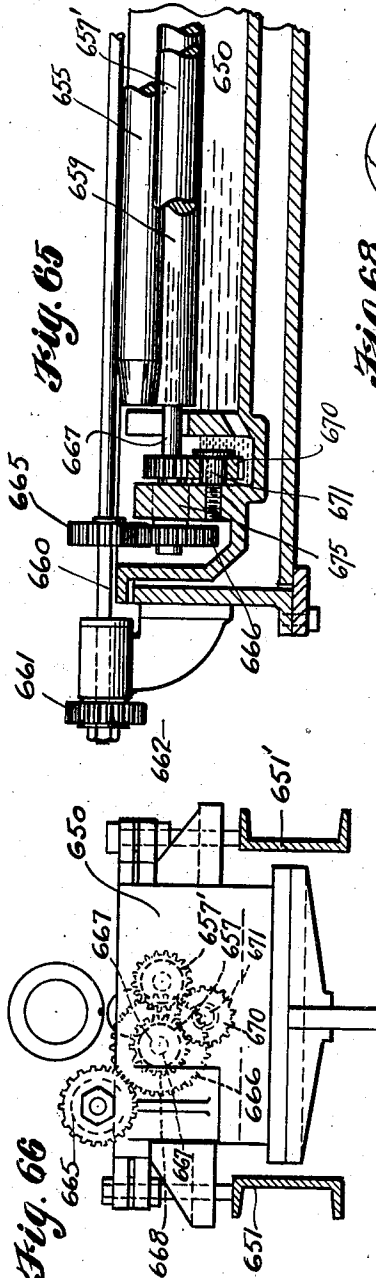


Fig. 66

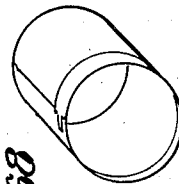
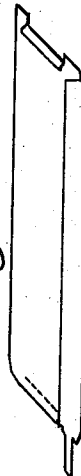


Fig. 67



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UNITED STATES PATENT OFFICE

2,142,235

CAN BODY MAKING MACHINE

Wilford E. Burns, Burlingame, Calif., assignor to
M. J. B. Co., a corporation of Delaware

Application January 26, 1935, Serial No. 3,604

21 Claims. (Cl. 113—7)

This invention relates to can body making machines, and it has reference more particularly to machines for making can bodies of that type known in the art as "collar cans", which type of can has an encircling, plural layer, folded collar about one end, with spaced parallel lines of scoring in the outer layer of the fold setting off a tearing strip which, in the finished can, may be torn out by means of a key thereby to detach the can end, or cover, for its removal from the body. The present machine is especially designed for the manufacture of the can described in United States Patent No. 1,615,930, issued to W. E. Burns on February 1, 1927, but, it is adapted also to the manufacture of standard cans, without the collar fold.

The principal object of the present invention is to provide a can body making machine of an improved type, which is fully automatic in its operations and whereby can bodies may be made at a high rate. Also, a machine in which parts are adjustable to adapt it for making cans in different sizes.

It is also an object of the invention to provide means whereby the blanks from which the bodies are formed may be folded while in the flat to form the collar portions without requiring change of position of the blanks in relation to the general, straight line delivery through the machine.

Another object of the invention resides in the combination with flexing rolls for breaking the stiffness of the body blanks of mechanism for scoring the blanks to define the tearing strips therein coincident with their passage through the flexing rolls.

Still other objects reside in the novel details of construction of the blank folding devices whereby, in a succession of operations, each blank is formed with a plural layer, folded collar with the tearing strip located in the outer layer of the fold.

Still other objects of the invention reside in the provision of means pneumatically retaining the body blanks against misalignment while being operated on at the various stations of the blank folding unit.

Other objects of the invention reside in the details of construction of parts, in their combination and in their mode of operation whereby the body blanks, on being received in the machine, will be automatically advanced in succession through the blank flexing and scoring devices, then to the various stations embodied in the folding unit, and finally delivered from the

body former to the side seamer horn for the application of solder thereto.

In accomplishing the above and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a side elevation of a can body forming machine embodying the present invention, with notations thereon to designate the various units.

Fig. 2 is a plan of the same.

Fig. 3 is an elevation of that part of the machine which includes the blank flexing rolls, the scoring rolls and the collar folding devices.

Fig. 4 is a side elevation of the body maker unit and a portion of the side seamer.

Fig. 5 is a central, vertical section, longitudinally of that part of the machine shown in Fig. 3.

Fig. 6 is a detail of the feed slides that initially advance the blanks into the machine and those which advance them, after being scored, to the folding unit.

Fig. 6a is a cross section on line 6a—6a in Fig. 6.

Fig. 6b is a sectional detail showing a feed finger of the feed slides.

Fig. 7 is a sectional view of the guideway shoe at the receiving end of the machine.

Fig. 8 is a plan of that part of the machine shown in Fig. 3.

Fig. 9 is a detail showing the actuating means for the blank locating stops at the initial station of the folding unit.

Fig. 10 is an elevation of the machine at the receiving end, some parts being in section for better illustration.

Fig. 11 is a cross sectional detail of the suction head of the blank feeding mechanism.

Fig. 12 is a vertical, cross section of the machine, on the line 12—12 in Fig. 3, at the blank flexing and scoring station.

Fig. 13 is a sectional view, on line 13—13 in Fig. 12.

Fig. 14 is an enlarged, sectional view, on line 14—14 in Fig. 12, along the vertical, axial plane of the central blank flexing roll.

Fig. 15 is an end view of the flexing roll unit, showing the driving gears.

Fig. 16 is an opposite end elevation of the unit.

Fig. 17 is a cross section through the rolling unit.

Fig. 18 is a cross section, axially through a set of scoring rolls, as on line 18—18 in Fig. 12 and showing also some of the driving gearing associated with the scoring rolls.

Fig. 19 is an enlarged, sectional detail axially of a set of scoring rolls.

Fig. 20 is a diagrammatic illustration of the scoring roll driving gear train.

5 Fig. 21 shows in elevation, the mounting and pressure applying means for one of the lower scoring rolls.

Fig. 22 is a cross section of the machine at the blank trimming and notching station, on line 10 22—22 in Fig. 3.

Fig. 23 and Fig. 24, respectively, are perspective views of the dies for trimming and notching the opposite edges of the body blanks prior to their being folded.

15 Fig. 25 is a perspective view of the blank, as trimmed and notched prior to folding.

Fig. 26 shows in perspective, the progressive steps of folding the blank to form the collar fold.

Fig. 27 is a cross section on the line 27—27 in 20 Fig. 3.

Fig. 28 is a cross sectional detail of a clamp bar and its actuating means.

Fig. 29 is an enlarged cross sectional detail of the clamp bar.

25 Fig. 30 is a central, longitudinal section of the blank folding unit of the machine.

Fig. 31 is a cross section of the machine at the first fold forming station, line 31—31 in Fig. 30.

30 Fig. 32 is an enlarged, cross sectional detail of the first operation folding devices.

Fig. 33 is a sectional detail, illustrating the angular bending of the body blank by the first operation devices.

35 Fig. 34 is a cross sectional view at the second fold forming station, line 34—34 in Fig. 30.

Fig. 35 is a sectional detail of the second operation folding devices, shown in retracted positions as for advancement of the blank.

40 Fig. 36 is a similar view with a blank clamped in position for the second fold forming operation thereon.

Fig. 37 is a view illustrating the formation of the second fold.

45 Fig. 38 is a cross section of the machine at the third operation station, line 38—38 in Fig. 30.

Fig. 39 is a side elevation of the actuating means for the third operation clamp.

50 Fig. 40 and Fig. 41, respectively, are cross sectional views of the third operation devices in different positions.

Fig. 42 is a view illustrating the fold as partly completed at the third operation station.

Fig. 43 is a cross section on the line 43—43 in 55 Fig. 30, at the fold bumping station.

Fig. 44 is an enlarged cross sectional view, illustrating the action of the fold bumping clamp.

Fig. 45 is an enlarged cross sectional view of the blank with completed fold.

60 Fig. 46 is a central, longitudinal section of the body former unit of the machine.

Fig. 47 is a plan showing the connection of the feed bars of the folding machine with those of the body former.

65 Fig. 48 is a cross section, on the line 48—48 in Fig. 46.

Fig. 49 is a cross sectional detail showing relation of the flux applying disk to the body blank hook.

70 Fig. 50 is a plan of the same parts.

Fig. 51 is a cross section through the folder housings at the notching station as on line 51—51 in Fig. 4.

Fig. 52 is a similar cross section at the first 75 hook forming station.

Fig. 53 is a similar cross section at the second hook forming station.

Fig. 54 and Fig. 55, respectively, show in enlarged detail, the first and second station hook forming devices.

Fig. 56 is a vertical, cross section on the line 56—56 in Fig. 4.

Fig. 57 is a cross sectional detail illustrating the wing clamps and the body blank supports at the body forming station.

Fig. 58 is a detail showing in side elevation, the fluxing roll and its driving means.

Fig. 59 is a detail, in elevation, of the horn clamps.

Fig. 60 is a horizontal cross section of the 15 forming horn, illustrating its expander mechanism.

Fig. 61 is an end view of the forming horn.

Fig. 62 is a vertical cross section on line 62—62 in Fig. 4.

Fig. 63 is a vertical cross section of the side seamer at the soldering station.

Fig. 64 is a side elevation of the side seamer.

Fig. 65 is a top view of the solder pot and solder applying rolls.

Fig. 66 is an end view of the pot showing the solder roll driving gears.

Fig. 67 is a perspective view of the can body blank just prior to being formed about the horn.

Fig. 68 is a perspective view of the finished 30 can body.

The present machine is what is known in the art as a "straight line" machine; that is, a machine wherein the body blanks are advanced in the same general line from the receiving to the delivery end. In this respect, the present machine differs from the machine of my application, filed on February 1, 1932 under Serial No. 590,369 published as Patent No. 1,978,740, in which the blanks progress endwise through a 40 folding unit and then are diverted at a right angle into the body former.

The present machine is made up of a plurality of connected units; the first of which embodies the blank feeding means, the blank flexing and scoring rolls and the blank trimming and notching dies. The second unit embodies the fold forming mechanisms whereby the blanks after being rolled, scored, trimmed and notched, are formed with the collar fold. The third unit comprises the hook forming devices and the body shaping and seaming means. The last unit is the side seamer whereby solder is applied to the side seams of the bodies.

The driven mechanisms of the several units 55 have a common source of power and are operatively connected for synchronous operation so that the body blanks will be moved successively from one unit to the other without interruption or loss of timing. For purposes of better understanding and more convenient reference, Fig. 1 has the various units thereof set off in brackets with the names of the units applied thereto.

Preparatory to making can bodies in the present machine, the tin body blanks are cut to accurate size and are stacked in a feed hopper from which they are delivered, in succession, through the machine. On entering the machine, the blanks are first advanced to the blank flexing 70 rolls and the scoring rolls; the former of which flexes the blanks to break their stiffness and the latter of which defines the tearing strips. The blanks, after being rolled and scored are advanced to dies whereby their ends are trimmed 75

and notched. Thence, they are advanced to the second unit of the machine comprising the various folding mechanisms whereby, in a plurality of operations, they are each formed with a plural layer, collar fold with the tearing strip located in the outer layer of the fold. The folded blanks progress then to the third or body maker unit of the machine comprising the hook forming devices, the wing clamps whereby the blanks are bent to body form about a shaping horn and their end hooks are interlocked in a permanent seam. The formed bodies then pass to the side seamer and solder is applied to their side seams.

All units of the machine are synchronized and all operations thereof are fully automatic and the various feed devices operate in timing to advance the blanks, one at a time, and in rapid succession by intermittent movements, through the machine.

Referring more in detail to the drawings—

The various mechanisms which are embodied in the first three units of the machine are mounted upon a sub-base of heavy, rigid and substantial construction, preferably consisting of heavy metal plates 1 and 2 riveted, or otherwise attached, to the flanges of interposed channel and I-beams, 3, that extend longitudinally of the base. The side seamer mechanism is supported on a base that continues from and in alignment with the sub-base that mounts the other units of the machine.

The operating parts of the machine are driven by an electric motor 5 that is mounted upon a laterally extending support 6 attached to the sub-base at the receiving end of the machine. This motor has a driving belt connection 7, operating through the mediacy of a clutch 8, with a horizontal line shaft 9 extending along one side of the machine and mounted in suitable supporting bearings, as seen in Figs. 1 and 2. As will presently be described, all moving devices and those mechanisms acting on the body blanks are operatively connected to receive their driving power from the shaft 9.

The side seamer mechanism is operated by a longitudinal line shaft 10, see Figs. 1, 2 and 4, which has a driving connection with the line shaft 9; the connection comprises a sprocket chain belt 12 operating about sprocket wheels 13 and 14 that are fixed on the shafts 9 and 10, respectively, as seen in Fig. 4.

The hopper for supporting the supply stack of body blanks, the blank feeding means, the blank flexing rolls, the scoring rolls, the notching dies and the actuating means for these parts are mounted upon a horizontal bed, or base, 16 which, as seen in Fig. 3, is supported at its outer end by legs 17 and at its inner end has supporting connection with the frame structure of the blank folding unit, later described. Mounted upon the bed 16 and extending longitudinally thereof in parallel relation, are folder housings 18 and 19 which together form a guideway within which the body blanks are moved in their passage through the machine. These housings serve also as mountings for the various devices that forward, trim and notch the blanks.

As seen best in Figs. 5 and 10, the body blanks 20 are stacked in a hopper at the receiving end of the machine. This hopper is composed of standards 21 that form its four corner members and which are attached by bolts 22 to parts of the folder housings and are adjustable from and toward each other to adjust the hopper to accommodate blanks of different widths. The stack

of body blanks, 20, confined in the hopper, moves downwardly by gravity and it is supported by contact with the downwardly and inwardly beveled edges of horizontally disposed disks 23 located at the lower end of the hopper between its corners; there being disks to support the opposite ends of the blanks, attached by bolts 24 to plates 24a which in turn are attached by bolts 25 to the folder housings; and disks that support the side edges of the blanks mounted by cross bars 26, as seen in Fig. 10, have opposite end slots 28, through which bolts 29 extend to attach the bars to the folder housings and thereby provide for an adjustment to accommodate blanks of different lengths.

Blank feeding mechanism

The body blanks 20 are fed into the machine from the lower end of the hopper stack by the action of a vertically reciprocating suction head, illustrated best in Figs. 5 and 10. This latter mechanism comprises a short shaft 30 that is disposed vertically and is reciprocally movable in a bushed guide bearing 31 mounted in the base 16 directly below the stack of blanks. At its lower end, the shaft 30 is pivotally attached by a bolt 32 to a link 33 which, in turn, is pivotally connected at its lower end by a bolt 34 to the swinging end of a horizontally extending lever 35 fixed on one end of a rock shaft 36 revoluble in a bracket bearing 37 attached to the base 16. A vertically extending rocker arm 38 is fixed to the other end of shaft 36 and this is operatively connected by a rod 39 with a stud 40 extending eccentrically from the inner face of a gear wheel 41 which revolves on a short stub shaft 42, fixed in a frame bearing 43. The gear wheel 41 is revolubly driven by an intermeshing gear wheel 44 which latter is fixed on a driven cross shaft 45, as seen in Fig. 27. Cross shaft 45, is a crank shaft whereby the various blank feeding and advancing devices are operated, and it is supported at its ends in bearings 46 and 46a attached to base 16 and is revolubly driven by geared connection with the line shaft 9; the driving connection being best shown in Figs. 3 and 27 and comprises a bevel gear 47 fixed on the shaft 9 and driving a bevel gear 48 revolubly on a supporting stud 49 fixed in the bed 16. The hub portion of gear 48 is formed with a pinion gear 50 and this drives a gear 51 keyed on the crank shaft 45. The gears 41 and 44 are of the same diameter and thus with each revolution of the crank shaft 45, the gear 44 will rotate once and, through the connecting rod and lever mechanism described, will cause a definite reciprocal action of the suction head shaft 30.

At the upper end of the vertical shaft 30 is a cross head 54, see Figs. 10 and 11, which mounts a pair of upwardly facing, rubber suction cups 55 adapted, when the shaft 30 is actuated to its upper limit, to be brought into contact with the lowermost blank of the stack in the hopper, then when the shaft moves downwardly, the blank is held to the cups by suction applied thereto, and is pulled downwardly from the stack to the position at which its opposite ends will be released from the supporting disks 23 and will drop to rest within the guideway provided therefore by the accurately spaced folder housings 18 and 19. Prior to the next upward movement of the suction device, the blank will be released from the suction cups and will be advanced to a position for delivery to the flexing and scoring rolls.

Suction is applied to the cups, in proper timing,

from a source of vacuum, not shown, through a pipe 58 shown in Fig. 10. This pipe 58 has a branch pipe 59 leading therefrom to a port 60, in the guide bearing 31, as seen in Fig. 11. The shaft 30 also has a longitudinal channel 61 with branch channels 62 in the cross head communicating with the suction cups 55 and there is a port 63 in the shaft 30 opening laterally from channel 61 for registration with the supply port 60. Thus, when the suction cups move up against the stack, suction is automatically applied to the cups incident to the ports 60 and 63 coming into registration. When the shaft 30 moves down to its lower limit, the source of suction is cut off by passage of the ports out of registration and finally that in the cups is automatically released by port 63 being brought into registration with a port 64 in the bearing 31 that opens to atmosphere.

When the body blank 20 is fed from the hopper and is released by the suction cups, its opposite ends are then confined within guideways provided by horizontal shoulders 65 longitudinally of the opposite folder housings. Prior to upward travel of the suction cups, the blank is advanced toward the rolling and scoring station by the action of a pair of feed bars 68—68 reciprocally movable in guideways 69—69 provided therefor in the opposite folder housings and underlying opposite ends of the blanks. These feed bars are rigidly connected across their forward ends by a cross bar 70, see Fig. 6a, which, in turn, is centrally connected with a slide 71, operable along a guide rail 72 that is parallel with and supported on the bed 16 medially of the housings and underlying the body blanks. The slide 71 is connected by a link 73 with the upper end of an oscillating lever 74 integral with a sleeve 74a revoluble on a cross shaft 75. The sleeve is oscillated by connection with the crank shaft 45; the connection, as seen in Figs. 5 and 27, comprises a connecting rod 76 operatively attached at one end to an eccentric stud 75a on a wheel 75b keyed on one end of crank shaft 45 and at its other end is pivotally attached, as at 77, to the lower end of a downwardly extending lever arm 78 integral with the sleeve 74a. The shaft 75 which supports the levers 74 and 78 is fixed at its ends in bearings 79 fixed to the underside of base 16, as seen in Fig. 3.

The advancement to the scoring station of the blanks, received into the guideway from the hopper, is by two intermittent movements, which are effected by successive forwarding movements of the feed bars 68—68. To effect the advancement of the blanks, the bars 68 are equipped with feed fingers 80 at their rearward ends and with other fingers 81 at a definite interval forwardly of the first. These forward feed fingers 81 are pivotally mounted in the bars and are spring pressed upwardly to engage the blanks delivered to the guideway. The springs, see Fig. 6b, are arranged in the bars to hold the fingers in an upwardly extended position but permit the fingers to be pressed downwardly on retractive movements of the bars, to pass beneath the next advancing blank. The feed finger arrangement is such that, on each advance movement of the bars 68, the fingers 80 will first engage and advance a blank just previously extracted from the hopper by the suction cups. On the next advance movement of the bars, this blank will be advanced another interval by the feed fingers 81, and a second blank will be advanced by the fingers 80 to the position just vacated by the first blank. When the first blank is advanced to the second station, it will

then be disposed flatly upon a horizontal base plate 95 which extends between the folder housings and across the guide bar 72, as shown in Figs. 7 and 12.

In order that the blanks, as advanced, will be properly held in their advanced positions during retractive movements of the feed bars 68, a friction shoe 85 is provided to overlie the guideway and rail 72 and plate 95. This shoe, as seen best in Figs. 5 and 7, is pivotally suspended at one end as at 85' so that its receiving end portion floats, and at this end, the shoe has a flat bottom plate 86 beneath which the blanks are pushed by the feed bars on their first advance movement from the hopper and this plate has its receiving, transverse edge upturned, as at 87, to serve as a deflector whereby the blanks are guided beneath the shoe. This plate 86 is supported from the shoe by a plurality of bolts 88 which have their lower ends fixed in the plate and their upper ends headed and slidable in the shoe, and coiled springs 89 are arranged about the bolts between the plate and shoe to yieldingly urge the plate downwardly to thereby frictionally hold the blanks against retractive movement in the guideway.

The second advance movement of each blank disposes it beneath a horizontal plate 90, fixed in the shoe 85, with its forward edge abutted against a stop bar 91, fixed in the rail 72. The blank is thereby accurately aligned with the rolling and scoring means, which will presently be described. When the blanks are returned from the scoring rolls, they are passed across a horizontal plate 230 that is fixed across the top of the shoe beneath a flattening plate 130' as will presently be more fully explained; these plates being best shown in Figs. 7 and 12.

Blank rolling and scoring

Briefly explained, the purpose of the flexing rolls is to break the grain of the metal of the body blanks. This is effected by passing them against breaker bars which bend the blanks in one direction about a roller of small diameter, then flattening them out in the guideway. This provides that when they are finally bent into cylindrical body form, they will bend evenly and without flats, irregularities or ridges, thus to insure truly cylindrical bodies. In the present machine the blank scoring operation which provides the tearing strip is incident to passing the blank over the flexing rolls and in this respect the present practise is differentiated from the usual practise of scoring the body blanks prior to their delivery to the body maker.

The rolling and scoring means is best illustrated in Figs. 12 to 18. By reference to Fig. 12 it will be observed that the body blanks, on reaching the second position of advancement in the folder housing guideway against bar 91, will be disposed between the fixed bottom plate 90 of the shoe 85 and the supporting plate 95 fixed on rail 72.

Each blank, after coming to rest against the stop bar 91, is then ejected laterally into the scoring rolls. The means for effecting this endwise movement is best shown in Figs. 12 and 13, wherein 100 designates a horizontally disposed slide, reciprocally contained in a guideway 101 formed in a bracket 102 attached to the folder housing at the side of the machine opposite the scoring rolls. This slide is reciprocally actuated in timing with the feeding of blanks to this station of the machine and at its end has a bar 103 that is adapted, on inward movements of the

slide, to engage the adjacent end edge of a forward blank to move the blank endwise and through a passage 104 in the folder housing to the scoring rolls.

5 The slide 100 is reciprocally actuated by a link 105 with one end pivotally attached thereto and its opposite end connected eccentrically, by a pivot stud 106, to a wheel 107 fixed on the end of a cam shaft 108 extended along side of the folder housing and revolvably supported by the bracket 102 attached to the housing; the use of this cam shaft later being explained.

10 The cam shaft 108 and a similar shaft 108a which actuate the blank trimming dies presently described are located at opposite sides of the guideway; the shaft 108a being similarly supported in bearings 109a. These two cam shafts are revolvably driven in timing with each other and with the feeding of blanks into the machine, 15 by geared connections, as seen in Figs. 8 and 27, with a cross shaft 110 that is revolvably supported above the bed 16 and extended through the folder housings in bearings as at 117, and is driven by a gear 118 keyed thereon in mesh with driven gear 50. Gear wheel 118 is of the same size as the gear 51 on shaft 45 and therefore the shafts 45 and 110 will rotate at the same rate. Bevel gears 119 are keyed on shaft 110 and these drive bevel gears 119a of like size keyed on shafts 20 108—108a.

By reference to Figs. 10 and 12, it will be observed that at that side of the machine to which the blanks are laterally pushed for scoring, is a frame structure 120 in which a plurality of sets 25 of scoring rolls are mounted; there being, in this instance, three sets of scoring rolls between which the forward, longitudinal edge of each blank is passed both in its delivery to and return from the blank flexing rolls presently described, which are located at the outside of the scoring rolls. The arrangement of the scoring rolls is such that they operate also as feed rolls in the delivery of the blanks to the flexing rolls and their delivery back into the guideway.

30 First describing the scoring rolls: As seen in Fig. 12, all the rolls are axially parallel and those of each set are in vertical alinement. Each set comprises a central roll 124, an upper roll 125 and a lower roll 126. Each set of rolls has a driving shaft 127 mounted revolvably in suitable bearings in the opposite end members of the frame structure 120. The central rolls 124 are keyed on their respective driving shafts 127 and the upper rolls are fixed on supporting and driving shafts 128 revolvable in bearings in the frame structure and driven from the shafts 127 by intermeshing gears 129 and 130 fixed, respectively on the outer ends of shafts 127 and 128, as seen in Fig. 18. The lower rolls 126 are frictionally 35 driven by contact with the body blanks passed between them and the central rolls. As seen in Figs. 18 and 21, each of the lower rolls 126 is mounted by a stud 133 on a vertically swinging lever arm 134. These arms have ends pivotally attached by studs 135 to the frame structure and springs 136 are arranged to bear upwardly against the other ends of the arms to urge the rollers upwardly against the body blanks. Set screws 137 are adjustable in the arms to engage stops 138 on the frame structure in a manner to prevent actual contact of the lower and central rolls when no blanks are passing between them.

40 All the scoring rolls are driven in unison by connection with the main shaft 9. By reference to Figs. 18 and 20, it will be seen that there is a

gear 140 fixed on shaft 9 in driving mesh with a gear 141 revolvable on a stud 142 that is fixed in a bracket 143 attached to the bed plate 16. Formed coaxial with gear 141 to revolve therewith is a sprocket wheel 144 and this is alined with a sprocket wheel 145 revolvable on a stud 146 fixed in the frame 120. A sprocket chain 147 operates about the two sprocket wheels 144 and 145 to drive the latter. A gear wheel 148 is formed coaxial of the sprocket 145 and is in driving mesh with the gears 129 keyed on the adjacent ends of the driving shafts 127 of the two outer sets of rolls; the inner set of rolls being driven, as seen in Fig. 20, by an idler gear 150 mounted on a stud 151 fixed in the frame 120, and meshing with the driving gears 129 on the driving shafts 127 of the central and inner sets of rolls.

When a blank is advanced endwise from the folder housing guideway, its forward longitudinal edge passes successively between the central and lower rolls of the several sets. On its return and after passing about the body flexing rolls, it passes between the upper and central rolls of the several sets. In its outward travel, the blank is supported by bars 154, see Figs. 12 and 18, that are fixed by studs 155 in the frame 120. On its return, it is likewise supported by horizontal bars 156 attached to the frame by studs 157.

To aid the rolls just described in feeding the blanks, there are also driving rolls 160 mounted on the shafts 127, as seen in Fig. 18, to engage the lower longitudinal edges of the blanks. Also, rolls 161 are mounted in the frame in the same manner as are rolls 126 to bear upwardly against the blanks in opposed relation to the rolls 160 and, likewise, rolls 162 are arranged above the rolls 160 to bear downwardly against the blanks. These latter rolls are revolvable on studs 163 fixed in slides 165 vertically movable in guideways 166 in the frame 120 and urged downwardly by expandable rubber cushions 167 that are disposed between the upper ends of the slides and pressure screws 168 adjustably mounted in an overhanging bracket 169 fixed to the frame. Adjustment of the screws varies the pressure applied by the rubber cushions.

Since only one edge of each blank is to be scored, only the rolls 124 are designed for scoring and for this purpose one or more is provided with encircling, score cutting beads 170, as seen in Fig. 19. In the present instance, two of the rolls 124 have parallel scoring beads which define the opposite boundaries of the tearing strip in the blank and one roll has provision for forming "herringbone" scoring in the tearing strip.

In order to insure a positive and complete return of the scored blanks into the guideway, there is provided, as seen in Fig. 12, a horizontally reciprocating pusher 175 slidably supported by studs 176 that are fixed in the frame 120 and extended through longitudinal slots 177 in the pusher. A stud 178, fixed eccentrically to the upper roll 125 of the central set, operates in a vertical slot 179 in the pusher bar to cause the latter to reciprocate in accordance with rotation of the roll. On the inner end of the pusher bar is a spring pressed feed finger 180 which, on inward movement of the bar will move downwardly to engage with the outer edge of the returning blank to push it completely into the guideway. On return of the bar, the finger yields upwardly and slides over the oncoming blank.

To insure accuracy and control in the depth of the scoring in the body blanks, the upper and central rolls are relatively adjustable toward and

from each other. To provide for this adjustment, the shafts 128 which mount the upper rolls 125 are revoluble in cylindrical quills 181, as seen in Fig. 18, which are rotatably fitted in the frame bearings. The shafts 128 are eccentric of the quills, therefore, rotary adjustment of the quills in their bearings will cause adjustment of the upper rolls either toward or from the central rolls. This adjustment is retained by means of bolts 182 which extend through arcuate slots 183 in flanges 184 at the outer ends of the quills, and have nuts threaded thereon for tightening against the flanges.

As was previously stated, the flexing of the body blanks to break the grain of the metal is incident to their delivery through the scoring rolls; the flexing rolls, as seen in Fig. 12, being located at the outside of the several sets of scoring rolls. The flexing rolls comprise a central roller 200, a lower roller 201 of smaller diameter, and an upper roller 202; all of which rollers are axially parallel and revolubly mounted in a frame 203 which, in turn, is supported from the frame 120. The central and lower rollers are arranged so as to receive the body blanks between them as delivered outwardly, see Fig. 17, from the scoring rolls. On passing between these rolls 200 and 201, which are driven and operate as feed rolls, the outer end of a blank is brought into contact with a breaker bar 205 having an upwardly beveled surface 205a slightly spaced from but substantially tangential to the surface of the roll 200, whereby the blank is deflected upwardly. Thence the blank edge comes successively into contact with the beveled edges of other bars 206 and 207 superimposed on bar 205, whereby the blank is farther bent to follow the curvature of roll 200 and finally to pass between the central roll and the upper roll 202 and across a stripper 208 and then between guides 209 and 210 and thereby delivered to the upper rolls of the scoring device and returned to the upper guideway of the folder housing.

In their passage about the roller 200, the body blanks are bent to a cylindrical curvature of small radius and when they are subsequently straightened out by return to the guideway, the grain of the metal is broken thereby providing that when finally bent to body form, the blanks will bend evenly and without formation of flats or ridges. The breaker bars 205, 206 and 207 are removably mounted in frame 203 by bolts 211, extended through their ends and through lugs 212 on the opposite end members of the frame.

The rolls 200, 201 and 202 are all driven, as shown in Figs. 14, 15, 16 and 20. The central roll has opposite end spindles 200a and 200b, revoluble in bearings 213 and 214 in the supporting frame structure. A driving gear 215 is keyed on the spindle 200a in driving mesh with an idler gear 216 mounted by a stud 216' in driving mesh with the driving gear 129 of the shaft 127 of the adjacent scoring roll. The upper and lower rolls 201 and 202 are driven by gears 218 and 219 fixed on their end spindles, as seen in Fig. 16, in driving mesh with a gear 220 on the spindle 200b of the central roll 200.

The frame 203 in which the flexing devices are mounted, is pivotally supported at its lower edge to swing outwardly on a hinge shaft 225 fixed to the frame 120 and it is adapted to be secured in functional position by bolts 226 mounted in frame 120 and extended through slotted ears 226a on frame 203, as in Fig. 14. Release of the bolts permits their displacement from the slots and the

entire frame 203 to swing downwardly away from the scoring unit to give access to the latter in the event of clearing a jam.

The scored body blanks are returned into the folder housings and into a guideway at a higher level than that into which the blanks are originally fed, as will be observed by reference to Fig. 12. On their return into the guideway they pass onto a supporting plate 230 and against a stop bar 230a. They are then advanced in succession along the guideway by the reciprocal action of a pair of feed bars 231—231' operating in guides 232 in the folder housings. These feed bars have feed fingers 233 therein for engaging the rear edges of the blanks on forward movements of the bars and the fingers are downwardly yieldable on retractive movements of the bars to pass beneath the oncoming blanks.

The feed bars 231—231', as seen in Fig. 6, are connected by a bar 234 with a slide 240 slidably on a guide rail 241 fixed between the housings, and the slide 240 is connected by a link 242 with the upper end of a lever 243 supported on a pivot shaft 244 and having its lower end connected pivotally, as at 245, with a link 246 which, in turn, is connected with a throw 45' of the crank shaft 45, as seen in Fig. 5.

The blanks, in their advancement along the guideway by the feed bars 231, are successively brought to the station at which devices operate thereon to trim and notch their ends, thus to prepare them for the fold and to form the tearing strip tongue. This mechanism is shown in Figs. 22, 23 and 24, wherein 247 and 248 designate slides that are mounted in suitable guideways 249 in the folder housings for vertical reciprocation. The slides are reciprocated through connections with the cam shafts 108 and 108a; each slide being connected by a link 250 with a rock lever 251 and the levers are pivotally supported intermediate their ends by pivots 252 on the folder housings and have their outer ends connected by links 253 with eccentrics 254, respectively, on the cam shafts 108 and 108a.

Mounted by the folder housing at one side of the guideway, as seen in Fig. 22, is a die 255 and on the slide 247 is a punching die 256. Likewise, at the opposite side of the guideway is a fixed die 257 and the slide 248 mounts a punching die 258. At their periods of rest at this station, the blanks are disposed with their opposite ends overlying the dies 255 and 257, and on downward action of the slides are trimmed off by the punching dies, thus to trim the opposite ends of the blank to the shape shown in Fig. 25. After thus being trimmed, the blanks are advanced along the guideway to the mechanisms for forming the collar folds.

In their travel along the guideway leading to the folding unit, the blanks are supported medially of their ends upon the longitudinal rail 241 and are held from buckling upward by an overlying bar 260, as seen in Fig. 22. To hold the blanks against retraction from advanced positions incident to retractive movements of the feed bars, clamp bars 261 are provided at opposite sides of the guideway to overlie the ends of the blanks. These clamp bars are supported as in Figs. 27, 28 and 29 by rocker arms 263 mounted by shafts 264 held in bearings 265 at opposite sides of the folder housings. The rockers have actuating levers 266 fixed thereto with rollers 267 at their ends in contact with cams 268 on the shafts 108 and 108a, whereby the clamp bars are actuated from and against

the blank ends. The clamp bars are provided also with stops 270 against which the blanks are advanced by the feed bars to accurately position them with respect to the devices which are to act thereon. These stops move up with the clamp bars to clear the blanks for advancement by the feed bars. In their general construction, these feed bars, the clamp bars and stops are like those described and illustrated in U. S. patent to Troyer, No. 1,543,460.

Folding unit

The blank folding unit is the central or second unit of the machine. It is shown in longitudinal section in Fig. 30. This part of the machine comprises a supporting frame structure including opposite side frames 275—275 mounted on the sub-base and joined rigidly by a plurality of horizontal cross beams designated individually by reference numerals 276, 277 and 278. This frame, at one end supports the forward end of the bed 16 and, at its other end, is connected with the body former unit to which the blanks are advanced after being formed with the collar fold.

Supported by the several cross beams of the folding unit frame in the longitudinal central line of the unit, are suction manifolds 280, 281, 282 and 283. Along the opposite sides of these are flat plates 279. The manifolds and plates together form a flat topped, horizontal bed across which the body plates are advanced by successive and definite advance movements. The means for advancing the blanks comprises a pair of reciprocally movable feed bars 284 and 284' contained in guideways 285 and reciprocally actuated, by means presently described, in timing with the feed bars 231. The feed bars 284 have spring actuated feed fingers 286 pivotally mounted therein and extended into positions for engaging with the rear edges of the blanks on forward movements of the bars, thereby to push the blanks forwardly. These fingers yield downwardly as the bars are retracted, thereby to pass beneath the oncoming blanks.

The suction manifolds are disposed between the feed bars, and the feed fingers of the bars operate in longitudinal slots in the bed at the sides of the manifolds. Each manifold consists of a hollow housing having its flat top surface formed with closely placed pockets 287 connected by perforations 288 with the hollow interior. Each manifold has a suction pipe connection 290 with a source of suction which may be any suitable form of device such as the suction fan 291 operated by belt connection with a motor 292, as shown in Fig. 4. Thus, as the body blanks which have a tendency, due to their previously being rolled, to bow upwardly are advanced onto the bed of the folder unit, they will be drawn flatly against the bed and held against free movement by reason of the suction applied to the pockets 287 which the blank overlies.

The suction is sufficient to hold the blanks flatly against the bed plate but not sufficient to overcome the blanks being moved forwardly by the feed devices.

As each blank is advanced onto the manifold 280 by the reciprocal action of the feed bars 231 of the first unit, it is positively and accurately positioned for the first fold forming operation by its forward edge being brought up against a pair of spaced stop fingers 295, as shown in Fig. 32. These fingers are fixed on a cross shaft 296 that is rotatably supported at its ends in bearings 297

mounted at opposite sides of the frame structure. The shaft 296 is oscillated in timing with the actions of the feed bars to move the fingers downwardly into position to stop the blank, then to raise them out of the way for advancement of the blank after the fold forming operations at that station. The means for actuating the rock shaft is shown in Figs. 9 and 30 wherein 298 designates an arm that is fixed on one end of the shaft 296 and connected by a link 299 with one end of the rocker lever 300 that is pivotally mounted on a side frame of the machine by a stud 301 and has a cam roller 302 at its end operating in a cam groove 303 in a wheel 304 fixed on the end of cross shaft 110 as shown in Fig. 27.

When a blank is stopped by contact with the fingers 295, it is disposed with its forward edge overlapping a clamping bar 305 set in the cross beam 278, as shown in Fig. 32. It is then immediately clamped securely in this position by a bar 306 disposed across the upper surface of the blank to co-act with the bar 305, and fixed by bolts 307 to a clamp 308 having supporting arms 309 formed with end trunnions 310 that are pivotally mounted in bearings 311 on the opposite side frames. The clamp is pivotally movable to actuate the bar 306 against and from the blank and this movement is effected by a pair of links 312—312, see Fig. 31, connecting with opposite ends of the clamp 308 by pivots 314 and pivotally mounted at their lower ends on eccentrics 315 at opposite ends of a transverse rock shaft 316 which is mounted in bearings 317—317' in the frame members. The shaft 316 is oscillated by a pair of rocker arms 318—318' which are fixed thereto in spaced relation, and in angular relationship. At the ends of these arms are cam rollers 320 engaging cam wheels 321—321' on a revolubly driven cam shaft 322 extended between the opposite side frames of the unit and supported at its ends in bearings 323 and 323'. The two levers co-act with the two cam wheels to rock the shaft 316 back and forth through a definite arc. The cam shaft has a central driving gear 325, that is driven, as seen in Fig. 30, by a gear 326 fixed on a driven shaft 327 mounted transversely of the frame in bearings 328—328 and having a beveled gear 329 at its outer end in mesh with a gear 330 of the same size keyed on shaft 9. After the forward edge of the blank has been securely clamped between the bars 305 and 306, the first fold forming operation takes place. This consists of bending the longitudinal forward edge of the blank upwardly at a right angle, as shown in Fig. 33. For this operation a breaker bar 335 is supported below the blank and just forward of bar 305, by a pair of arms 336—336 pivotally mounted by a cross shaft 337 fixed at its ends in the frames 275. The arms of the bar are connected, by a cross shaft 340a as in Fig. 31, with links 340 with eccentrics 341 on the cross shaft 322. Thus, as the shaft 322 rotates, it actuates the arms 336 upwardly and moves the bar 335 against the forward edge of the clamped blank and bends it upwardly, as in Fig. 33, against the forward face of clamp bar 306 which face is beveled slightly inward for clearance. The action of this bar 335 coacting with clamp bars 305 and 306 is to make a sharp right angular bend. After the formation of the bend, the clamp bar 306 is lifted and the bar 335 is lowered to the positions of Fig. 32. The blank is then advanced to the next station for the second fold forming operation, which is illustrated in Figs. 34 to 37.

As the blank is advanced to this station by

the action of the feed bars 284 it is brought accurately to position against a stop bar 345, as in Fig. 36; this bar being provided with a vertical shoulder 345a of a definite height and a top surface 345b that is beveled forwardly and downwardly from the shoulder. The upturned flange of the blank extends considerably above the shoulder and this second operation is to bend it down against the beveled surface 345b.

10 The bar 345 is supported by a clamp 346 fixed on a cross shaft 347, see Fig. 30, rotatably mounted at its ends in bearings 348 in the opposite side frames 275. The clamp is actuated upwardly and downwardly in timing with the advancement of blanks, to locate the bar 345 in functional position, as seen in Fig. 36, then after the folding operation, to pull it down to the position of Fig. 35 to permit further advancement of the blank. This action of the clamp is effected by a pair of bell cranks 349—349 mounted on a cross shaft 350, with ends connected by links 351 with the clamp. The other ends of the cranks mount cam rollers 352 which travel on cams 353 on a cross shaft 354 driven by a gear keyed thereon in mesh with the gear 326 on cross shaft 327.

When the clamp bar 345 is in raised position, and the upward fold of the blank is seated against shoulder 345a, a clamp bar 358 is then actuated downwardly from a raised position to a position against the blank at the inside of the bend to hold it firmly against the seat. When the blank has thus been clamped, as seen in Fig. 36, the vertical flange provided by the first operation is then folded downwardly against the beveled surface 345b of bar 345, as shown in Fig. 37, by the action thereagainst of a breaker bar 360 supported by an arm 361 keyed on a cross shaft 362 revolvable in bearings 363 mounted on the opposite sides of the frame. At the opposite ends of the shaft 362 are short arms 365 connected pivotally as at 366 to the upper ends of links 367 which are pivotally fixed at their lower ends on eccentrics 368 at the outer ends of cross shaft 354. Thus, as shaft 354 rotates, the arm 361 is actuated upwardly and downwardly accordingly. The clamp bar 358 is mounted by a clamp 370 having arms 371 pivoted on shaft 362. This clamp 370 is actuated by the arm 361 by means best seen in Fig. 35, comprising a pair of links 372 with ends pivotally attached by bolts 373 to the arm 361 and extended upwardly therefrom through openings 374 in the clamp 370. Expandable rubber cushions 375 are mounted on the links between washers 376 and 377 and nuts 378 are threaded onto the outer ends of the links to yieldingly hold the clamp 370 against the arm 361. The arrangement is such that the clamp bar 358 is yieldingly held in advance of the bar 360, as shown in Fig. 35, and as they are actuated downwardly together, the clamp bar 358 first engages within the bend of the blank, as in Fig. 35, then, through the yielding of the rubber cushions, the clamp bar 360 is permitted a further movement whereby it is caused to engage the blank edge to bend it downwardly against the beveled forming bar 345, as seen in Fig. 37. Following this bending operation, the clamp 358 and breaker bar 360 move back to the positions of Fig. 35 and the blank is then advanced by the feed bars to the third station of the folding machine.

When the blank is advanced to the third station, it is accurately positioned by being brought up against a pair of stop slides 380, see Figs. 30 and 40, which are held in guide housings 381 fixed to the forward face of cross beam 327. The up-

per portions of these slides have beveled ends 382 adapted to be projected up above the surface across which the blanks are advanced to engage within the vertical and downturned portions of the fold as formed at the preceding station. These slides are actuated upwardly and downwardly through pivoted connections, as at 383, with bell crank levers 384 pivoted on a cross shaft 385 located below the bed; said levers 384 having downwardly extending arms pivotally attached as at 386 with links 387 connected with bell crank levers 388 fixed on a rock shaft 389 rotatably mounted at its ends in bearings in the opposite side frames 275. The rock shaft is oscillated in timing with the feed bars by a lever 390, see Fig. 30, fixed to its outer end and having a cam roller 391 thereon following in a cam slot 392 in a cam wheel 393 on a cross shaft 394 rotatably driven, as presently described. The slides 380 are thus actuated upwardly in exact timing with forwarding of the blanks to stop in the position of Fig. 40. A forming shoe 398 is then clamped against the blank just back of the fold, thereby to clamp it tightly against an underlying bar 399 inset in cross beam 277. The forming shoe is mounted by a clamp 400 with trunnions 401 at its ends pivoted in supporting bearings 402 at opposite sides of the frame to permit an oscillating action of the clamp. This action is effected by means of connecting links 403 having their upper ends pivotally attached, as at 404, to the clamp and their lower ends pivotally attached as at 405 to the lateral arms 406a of the bell crank levers 406 pivoted on the ends of a cross shaft 407 carried in the frame, as seen in Fig. 38. The upwardly directed arms 406b of the bell crank levers 406 mount cam rollers 408 at their upper ends that follow in cam slots 409 in cam wheels 410 fixed on the outer ends of a cross shaft 411 revolvably supported, as shown in Fig. 38, in bearings 412 in the side frames 275. This shaft has a driving gear 413 keyed thereon in mesh with the driven gear 355 on shaft 354, as seen in Fig. 30.

After the forming shoe 398 has been clamped against the blank, as shown in dotted lines in Fig. 40, the open fold of the collar portion of the blank, forwardly of the shoe, is then flattened toward the blank body and down against the beveled top surface 398a of a forwardly extended toe of the shoe, as shown in Fig. 41. This flattening is effected by the action of a breaker bar 415 carried by the upper end portions of levers 416 pivoted on the cross shaft 385 and having their lower ends connected pivotally, as at 418, with links 419 which in turn are pivotally connected as at 420, with connecting rods 421. These latter rods have ends mounted on eccentric journals 422 on cross shaft 411, and their opposite ends pivotally attached, as at 424, with rocker levers 425 fixed on the end of a cross shaft 426; this latter shaft being revolvably supported in bearings 427 in the opposite side frames 275, as shown in Fig. 43. The connections above described are such that, as shaft 411 revolves, it causes an oscillating action of levers 416 to swing the breaker bar 415 against shoe 398, thus to flatten the fold against the beveled surface of the shoe, then to swing the bar 415 upwardly to clear the way for further advancement of the blank. The clamp 400 swings upwardly and away from the blank to the position of Fig. 41 just as fingers of the feed bars engage the blank to advance it.

Following this flattening operation and the advancing movement of the blank by the feed bars

to the final station of the folding machine, the partial fold is then completely flattened down against the blank, as shown in Fig. 45. As each blank is advanced to this final station by the forward reciprocal action of the feed bars, its forward edge is disposed against a pair of stops 430, as seen in Fig. 44. The stops are vertically movable in guides 431 fixed to the forward face of the cross beam 276 and are actuated through pivotal connections 432 at their lower ends with the horizontal arms of bell cranks 388 on the cross shaft 389 which, in turn, is actuated, as was previously described, by lever 390 and cam 393. The timing is such that the stops 430 come into functional position as the blanks are advanced thereto to accurately position the blanks for the final operation thereon.

As the blanks are thus stopped with the folded portions thereof directly overlying a heavy bar 435 inset in cross beam 276, a bumper bar 436 is actuated downwardly against the fold and it is flattened. The bar 436 is mounted in a clamp 438 and this is swingingly supported at its ends by arms 438a having end trunnions 439 pivoted in bearings 440 at opposite sides of the frame. The clamp is raised and lowered by means of links 444 with their upper ends pivotally attached to the clamp, as at 445, and their lower ends pivotally mounted on eccentric cranks 446 at the opposite ends of the cross shaft 426, actuated, as previously described, by connection with cross shaft 411.

Following this bumping operation and after retraction of the stops 430, the blank is advanced by the feed bars to the next unit of the machine for the blank edging and body shaping and seaming operations.

Body maker

The body maker unit of the machine comprises a horizontal bedplate 450 supported at one end by legs 451 and at its opposite end by an arch frame 452; said legs and frame being mounted on the sub-base which mounts the two units first described. Fixed longitudinally on the bed are parallel folder housings 453 and 454 together forming a guideway continuing from the folder unit and into which guideway the folded blanks are delivered for continued advancement. The folder housings, as shown in Fig. 48, are provided with guideways 456 in which feed bars 457—457 are reciprocally contained for advancement of the blanks and these bars have feed fingers 458, like those of the previously described bars, whereby the blanks are pushed forwardly with each reciprocal action of the bars.

The feed bars 457 are reciprocated by indirect connection with the line shaft 9; the connection, as seen in Figs. 46 and 62 comprising a beveled gear 460 on shaft 9 driving a beveled gear 461 revolvably mounted on a stud 462 mounted in the arch frame. The hub of the gear 461 is formed with a gear 463 that drives a gear 464 keyed on a crank shaft 465 that is revolvably mounted transversely of the machine within the arch frame in bearings 466, 467 and 468. Mounted transversely of the bed 450, see Fig. 46, is a shaft 470 and mounted thereon is a rocker having a downwardly extended lever arm 471 connected by a link 472 with an eccentric stud 473 fixed in a gear wheel 474 that is keyed on the inner end of the crank shaft 465. The rocker also has an upwardly extending arm 475 connected by a link 476 with a slide 478 reciprocally mounted on a supporting rail 479 fixed longitudinally between the folder

housings. The slide mounts a cross bar 480 and this is fixed at its opposite ends to the feed bars 457—457. Thus, with each rotation of the crank shaft 465, there will be an advance movement of the blanks effected by the feed bars.

It will be mentioned that the feed bars 284 and 284' of the folding machine are reciprocally actuated by direct connection with the slide 478; the connecting means comprising the cross head 481 as shown in Fig. 47 and the latter bars take up the blanks as delivered thereto by the feed bars of the folding machine.

As the folded blanks are delivered into the guideway of the body former unit, they are first brought to the notching station at which devices act thereon to slit notch the ends to define the limits of the body hooks later to be made at the ends of the blanks. These slits are designated at s-s in Fig. 26. The notching mechanism comprises slides 482—483, see Fig. 51, that are reciprocally movable in vertical guideways in the opposite folder housings. The reciprocal action of the slides is effected by their connection through links 485 with eccentrics 486 on cam shafts 487 that extend horizontally along opposite sides of the machine in supporting bearings 490. These shafts are revolvably driven by geared connections with the cross shaft 394, previously mentioned, which in turn is driven by connection with the line shaft 9. The cross shaft 394, see Fig. 48, revolves in bearings 493 and has beveled gears 494 and 495 keyed thereon in mesh with gears 496 and 497, respectively, on the cam shafts 487 and it has a driving gear 499 at its outer end in mesh with a gear 500 formed on the hub portion of a beveled gear 501 which is driven by a beveled gear 502 fixed on line shaft 9. The gears 500 and 501 are revolvable on a stud 503 that is fixed in the side wall of the bed, and the gear arrangement just described is such that the cam shafts rotate in unison with the reciprocal actions of the feed slides, thus to keep the action of the notching dies in timing with the feeding of blanks thereto.

Mounted by the slides 482 and 483, respectively, are punching dies 505 and 506 which coact with dies 507 and 508 fixed in the folder housings. On downward action of the punching dies the opposite ends of the blank are properly slit, as shown in Fig. 26. For this operation, and also for the various operations which are subsequently performed on the blanks at the various stations, the blanks are accurately positioned by their being brought up against depending stops 512 on clamp bars 513 that extend along the opposite side edges of the guideway to overlie the opposite end portions of the blanks and which clamp the blanks positively against movement while being operated on. The clamp bars are like those of the first unit described and are mounted by arms 515 of rockers 516 pivoted on supporting shafts 517 at opposite sides of the guideway. The rockers have actuating levers 518 with cam rollers 519 at their ends rolling on cams 520—521 on the cam shafts 487. These clamp bars are shown in Fig. 52.

The next two advance movements of the blanks following the notching operation thereon, bring them to the stations for the hook forming operations whereby opposite edges are bent to form the end hooks which later are interlocked. At the first hook forming station, the end edges of the blanks between the end notches s-s are bent, one upwardly and the other downwardly. This is accomplished as follows: Supported at

the outside of the folder housings are slides 524 and 525 vertically reciprocated by means of connecting rods 526 fixed thereto and pivoted on eccentrics 527 on the cam shafts 487. On the slide 524 is a plate 529 provided with an upwardly facing shoulder 530 which, upon upward movement of the slide will engage the blank edge to bend it upwardly. Likewise, on the slide 525 is a plate 531 with a downwardly facing shoulder 532 which will be brought against the other edge of the blank upon downward movement of the slide and will bend that edge downwardly, as shown in Fig. 54. The blank is then advanced to the second hook forming station.

At the second station the laterally bent end edges of the blank are bent inwardly to complete the hooks. After the blank has been clamped at this station, its laterally turned edges are engaged by the beveled end portions of shoes 535—535' on levers 536 and 536' that are pivotally mounted on supporting shafts 537 and 537' at opposite sides of the housings. These levers have rocker arms 538, see Fig. 53, extending therefrom and connected by rods 540 with eccentrics 541 on the cam shafts 487 in such manner that the shoes will be actuated inwardly against the blank ends to bend the hooks inwardly. Beveled edge bars 542 and 542' are arranged to cooperate with the shoes as seen in Fig. 55.

On completion of the hooks, the blanks are advanced to an idle station and then to the forming station at which they are bent into body form about a shaping horn. In passing to the latter station, a flux is applied to the end hooks as an aid to soldering. The flux is applied by means shown in Figs. 49 and 50 comprising a beveled edged disk 543 revolvably supported on a shaft 545 to revolve in a flux bath in a container 546 supported adjacent the guideway. The down turned flange of the blank at that side wipes against the disk in passing and the flux is thereby transferred thereto. The disk is revolved by a driving connection comprising a shaft 547 having a geared connection, as at 548, with shaft 545 and a sprocket chain belt 559 connecting sprocket wheels 550 and 551 on the shafts 547 and cam shaft 487, as seen in Fig. 49.

It will here be explained that, by reason of the fact that the bed of the folding machine across which the blanks are advanced for folding must necessarily be slotted longitudinally for the passage of the feed fingers of the feed bars, as seen in Fig. 38 at 552, the completed fold in each blank will have slight downward bulges at those places where it overlapped the slots when the fold was finally bumped and compressed. These bulges, in a finished can, would be detrimental, for various reasons, and therefore provision has been made to flatten them down even with the remaining part of the fold.

The flattening means is shown in Figs. 4, 46, and 56, wherein 554 and 555 designate brackets that are fixed to the upper portion of the arch frame 452 and provided with bearing portions 554a and 555a in which a horizontal shaft 557 is revolvably contained. The bracket 555 is located centrally above the folder housing guideway. Fixed to the shaft 557 adjacent opposite sides of the bearing 555a, are arms 558 and 558' connected by links 559 and 559', respectively, with the upper ends of a pair of bumper slides 560 and 560' that are mounted in vertical guides 561 and 561' at the lower portion of the bracket.

The lower ends of these slides closely overlie the fold of the blank when the latter stops at that idle station just ahead of the forming horn, and are actuated downwardly against the blank to iron out the bulges in the fold. To actuate the bumpers, the shaft 557 is slightly rotated by a connection with the crank shaft 465; the connection, as best seen in Fig. 56 comprising a link 563 that is mounted on an eccentric journal 564 on an end of the crank shaft and is pivotally attached, at its upper end, to a short lever arm 565 fixed on the shaft 557. The timing is such that the bumping takes place during a period of rest of the blank.

After the bumping of the body blanks, they are advanced to the forming station at which they closely overlie a forming horn 568 located centrally of the path of travel of blanks and supported by a tubular stud 569 fixed in a vertical slide plate 570. This plate is contained for slight reciprocal movement in a guide block 571 that is fixed in the arch frame, as seen in Figs. 46, 59 and 60. A slight downward and upward shifting movement is provided for the forming horn in order that the body blanks, as advanced, may be easily positioned between the upper edge thereof and a clamping bar 572 that is fixed in a bracket 573 mounted centrally within the arch, and directly above the horn. The movement of the horn is timed with the feeding of the blanks thereto, and it is effected by means like that described and illustrated in U. S. patent to Troyer, et al., under No. 1,750,550; comprising a rock shaft 574 with a lever arm 575 fixed thereto and provided at its end with a roller 577 engaging a cam wheel 578 on the crank shaft 465. On the inner end of the shaft 574 is a short arm 579 extended into a slot 580 in the slide 570. The cam wheel in proper timing actuates the lever 579 to pull the slide 570 downwardly thereby to provide space for admittance of a body blank between the top edge of horn 568 and clamp bar 572. Then a coiled spring 581 contained in a recess in the lower end of the plate 571 pushes up on the slide to lift the horn and clamp it against the blank.

After the blank is thus clamped, its opposite ends are bent downwardly and brought into overlapped relation for engaging their end hooks, by the action of a pair of pivoted wing clamps 585 and 585' that are mounted by a hinge pin 586 in the bracket 573. These wing clamps are actuated by connections with the cam shafts 487 of the body former. The wing clamps are pivotally connected with the lower end of links 587 which, in turn, are connected at their upper ends with lever 589 mounted in the arch frame by pivot pins 590. The levers 589 are connected at their upper ends with levers 589 mounted in the arch frame by pivot pins 590. The levers 589 are connected, respectively, by links 591 and 591' with eccentric studs 592 at the ends of the cam shafts 487. Thus, in accordance with the synchronous rotation of the shafts and the feeding of blanks to the horn, the wing clamps are actuated from the dotted line position of Fig. 57 to the closed position, thereby to bend the body blanks about the horn and cause their hooked ends to overlap in a manner whereby on expansion of the horn, the hooks will be engaged for seaming. The forming horn 568 is of the expandable type now generally in use, and as illustrated is like that of the Troyer, et al., patent above mentioned. It is actuated between retracted and expanded positions by connection

with the feed slide 478, as shown in Figs. 46 and 59. The connection includes an expander bar 593 which is reciprocally contained within the tubular horn mounting stud 569 and which has cam surfaces 593', as seen in Fig. 60, which act indirectly on the opposite side plates of the horn to expand them outwardly after the ends of a body blank have been overlapped, thereby to cause the hooks to interlock. Then, the seam is bumped and closed by the action of a bumper bar 595 carried in a slide 596 reciprocally contained in guides 597 below the horn. The slide is connected by a pitman 598 with a throw 465a of the crank shaft 465. Thus, with each rotation of the crank shaft 465, a blank is advanced to the horn, the horn is then slightly raised to clamp the blank against the abutment bar 572, then the wing clamps 585 are actuated against the opposite end portions of the blank to bend it about the horn and to engage its end hooks, then the horn is expanded to interlock the hooks and the seam is bumped and closed by the bumper slide 595.

As the body blanks are advanced toward the forming horn, their opposite edges are supported in the folder housing guideways but as they are advanced to the forming station across the horn, these edges pass into pivoted supports, that are continuations of the folder housing guideways but are outwardly movable to free the ends of the blanks when actuated downwardly by the wing clamps. These pivoted supports are shown in Figs. 56, 57 and 58 wherein 600 and 600' designate pivotally supported shafts on which upwardly extending arms 601 and 601' are fixed. At the upper ends of these arms are angular guides 602 in which the edges of the blanks are received. Fixed to the shafts 600 and 600' are levers 603 mounting rollers 604 at their lower ends. These rollers engage with cam wheels 605 and 605' mounted on the cam shafts 487 and are actuated thereby in timing with the feeding of blanks and the action of the wing clamps to move the supports outwardly just as the wing clamps swing downwardly, thereby to be in the clear of the wings and of the blank ends. Springs 606, see Fig. 57, acting against the arms 601 push the supports back to normal position as the cams rotate. The particular function of these supports is to hold the body blanks in proper alignment and at the proper position relative to the horn and bumper, preparatory to being clamped.

After a blank has been wrapped into body form about the horn 568, the hooks engaged and the body seam bumped, the body is then pushed out along the horn, successively passing through two auxiliary bumping stations at which certain form is given to the overlap of the fold and the body flange adjacent the fold to prepare it for the soldering operation. Then, the body is advanced to the side seamer horn for soldering.

The provision of the two auxiliary bumping stations requires an extension member 610 be applied to horn 568, as seen in Fig. 59. This extension, for security and rigidity, requires an additional supporting clamp at its outer end to supplement the mounting at its inner end. The additional clamp is shown best in Fig. 46 wherein 612 designates a vertical bar slidably mounted for vertical movement and connected at its lower end with a rod 613 mounted in a guide bearing 614. The rod 613, in turn, is attached to the horizontal arm of a bell crank lever 615 mounted in a bracket 616 and having its vertical arm

connected by a link 617 with a lever 618 on a rock shaft 619. The rock shaft is mounted in a bearing 620 and has a lever arm 621 with a cam roller 622 in contact with a cam 623 fixed on shaft 465, as seen in Fig. 56. Thus, with each rotation of the crank shaft, and in timing with the advancement of can bodies along the horn extension, the slide 612 is pulled down to disengage the horn for passage of the body, when it is pushed up, by a coiled spring 625 encircling the rod 613, and is held thereby in supporting contact with the horn extension.

The auxiliary bumping mechanism is best seen in Fig. 46 wherein 626 designates a bracket that is fixed to the arch frame above the line of the horn. This bracket mounts an abutment block 627 that closely overlies the horn. Fixed in this bracket, and in a base bracket 630 below the horn are parallel, vertically disposed guide rods 631 on which a cross head 632 is slidable. This head mounts the desired bumpers 633 and 633' for acting against the can bodies at the two auxiliary stations. The cross head is reciprocally actuated in proper timing with the delivery of cans by connection with the crank shaft 465; the connection comprising a set of toggles 635 connected by a link 636 with the pitman 598 so that with each rotation of the crank shaft, the head 632 is actuated to cause the bumpers to act on the cans at rest and in position on the horn extension.

Side seamer

The side seamer horn 640 is a continuation of the forming horn and its extension, and it is supported, as shown in Figs. 4 and 64 by a plurality of horn supporting contacts 641 in housings 642 fixed in a frame structure 643. Without going into detail, it will be stated that this side seamer horn, its supports and the mechanisms associated therewith for conveyance of cans along the horn are well known in the art. The can bodies, on their delivery into the horn, are engaged by lugs 645 of a conveyor chain belt 646 operating in a guide 647 along the top of the horn, and are thereby conveyed, in succession, through the soldering station, then along the horn for cooling and are finally discharged. The various supporting contacts are actuated by connection with the shaft 10 as is also the conveyor chain belt.

The solder rolls are contained in a pot 650 supported below the horn between the longitudinal beams 651 and 651' of the frame structure, as seen in Fig. 66. The pot may be electrically heated or gas heated in the usual manner, or by any suitable means.

The main solder applying roll 655, is supported parallel with the horn, closely beneath it for application of solder to the body seams. This roll is floating and rests upon a pair of parallel, driven rolls 657 and 657', as shown in Figs. 63 and 65.

A feature of the solder pot construction resides in the roll driving gearing, as shown in Figs. 65 and 66, wherein 660 designates a drive shaft extended above the solder pot. At one end of the shaft is driving sprocket 661 over which a chain belt 662 operates; this belt being driven by a sprocket 663 on the shaft of a gear reduction device 664 driven by a sprocket chain connection 664' from shaft 10. On the shaft 660 is a gear 665 meshing with a gear 666 fixed on the supporting spindle 667 of the rolls 657. Gears 668 and 669, out of mesh are fixed respectively

on the supporting spindles of the two lower rolls and these are driven in unison by an idler gear 670 revolvably mounted on a stud 671 in the end wall of the pot.

5 By reference to Fig. 65, it will be observed that the spindles of the two driven rolls are mounted in a support 675 within the pot and that there are no packing boxes required in the solder pot walls since the main drive shaft is located above the pot and drives the rolls through a gear train that is within the pot. This differs from the usual procedure of extending the driving spindles of the lower rolls through an end wall of the solder pot.

10 The present machine is fully automatic, and under automatic stop control, not shown. It is thrown in gear or out of gear manually by a control lever 680 located at the receiving end of the machine, and having operative connection through a shaft 681 and shaft yoke 682 with the main clutch.

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

25 1. In a can body making machine having a guideway, feed devices for advancing folded can body blanks therealong to a primary fold bumping station and subsequently to an auxiliary bumping station, a fold bumping means at the primary station comprising an abutment bar positioned to underlie the fold of the blanks as they are delivered to that station, said bar being slotted across its abutment face for passage of the feed devices, a bumper bar, and means for actuating it against the blank fold when so positioned to flatten the fold against said abutment bar; and an auxiliary bumping means at the auxiliary station, comprising abutments disposed to underlie those portions of the blank folds that registered with the slots of the abutment bar during the first bumping action, and bumping devices coacting with said abutments against the opposite face of the fold.

45 2. In a machine of the character described, a guideway having an opening thereacross, a stop movable periodically into the guideway and feed devices synchronized in movement with the said stop for forwarding body blanks successively against said stop to overlie said opening; a clamp bar fixed in a position transversely of the guideway to underlie the forward edge portion of a blank when advanced against the stop, an upper clamp bar operable against the top of the blank in direct opposition to the first bar, and a breaker bar movable upwardly through the guideway opening to coact with the upper clamp bar to bend the forward portion of the blank upwardly and to definitely locate the line of the bend.

60 3. In a machine of the character described, a guideway having an opening thereacross, means whereby body blanks having their forward edges flanged upwardly along a definite line are advanced intermittently along the guideway, a breaker bar movable upwardly through the guideway opening to act as an abutment for seating the upturned edge of an advanced blank thereagainst, a clamp bar movable into the angle of the flanged blank to hold the same against the breaker bar, and a movable breaker bar above the blank operable to bend the upper portion of the flange back along a definite line defined by the top edge of the first mentioned bar.

75 4. In a can body forming machine, a guideway having an opening thereacross, means for intermittently advancing along the guideway body

blanks, having forward edge flanges bent upwardly and the upper portions of said flanges bent forwardly and downwardly; a stop member movable through the guideway opening for abutment by the upturned flange, a clamp bar movable into the angle of the upturned flange and blank to clamp the blank against movement, and a breaker bar operable against the downturned portion of the flange to bend the flange back toward the body portion.

5. In a body maker, a guideway, means for feeding can body blanks into the guideway, means for advancing the blanks in succession along the guideway, a blank flexing mechanism disposed at one side of the guideway, means for moving the blanks laterally from the guideway, transfer rolls positioned to receive, and operable to advance the laterally moved blanks through the flexing mechanism, and means for returning the blanks from the flexing mechanism into the guideway; said transfer rolls having means thereon whereby each blank will be scored to set off a tearing strip therein.

6. In a body maker, the combination with a guideway, means for feeding body blanks into the guideway, means for advancing the blanks in succession along the guideway and body forming devices arranged for operation on the blanks, of a blank flexing and scoring mechanism disposed at one side of the guideway in advance of the body forming devices, and including a breaker bar, a flexing roll, means for laterally displacing the blanks from the guideway, transfer rolls operable to deliver the laterally displaced blanks against the breaker bar and about the flexing roll and means coacting therewith to return the flexed blanks into the guideway; said transfer rolls being equipped with means for scoring each blank to set off a tearing strip therein.

7. In a body making machine, the combination with folder housings forming guideways, feed devices for feeding body blanks into the machine and for advancing them in succession along the guideways, of a blank scoring and flexing mechanism disposed laterally of the guideways, and including a driven roll and breaker devices, means operating in synchronism with the first mentioned feed devices for displacing the blanks laterally from one guideway, a plurality of transfer rolls operable to deliver the blanks as displaced from the guideway to the said driven roll and breaker devices, means coacting with the transfer rolls and to cooperate with the latter to return said blanks to the other guideway; said transfer rolls being cooperatively arranged for rolling contact with the blanks and having means for scoring each of said blanks during its transfer, to set off a tearing strip therein.

8. In a body making machine, a receiving guideway and a second guideway, feed devices for advancing body blanks in succession therealong, blank flexing and scoring means at one side of the receiving guideway, means operating in synchronism with the feed devices for laterally displacing the blanks from the receiving guideway into said blank flexing and scoring means, means to return said blanks into the second guideway; said blank flexing and scoring means comprising a driven flexing roll of relatively small diameter, a breaker bar and driven feed rolls adjacent thereto, a plurality of sets of driven transfer rolls, each set comprising a central roll, an upper and a lower roll; the central and lower rolls cooperating to feed the blanks from the receiving guideway to the flexing roll and break-

er bar, which latter operates to bend them to the curvature of the roll; the central and upper transfer rolls coacting to return the blanks to the second guideway and to score each blank to set off a tearing strip therein.

9. In a machine of the character described, a bed comprising a plurality of plates, spaced in the lengthwise direction of the bed and formed with suction openings, means for forwarding body blanks successively and by intermittent movements along the bed to stations intermediate the plates, devices for acting on the blanks through the spaces between plates at the various stations to progressively form each with a fold, a source of suction and means connecting said source of suction with the bed plate openings to hold the blanks against the bed and against movement except that provided for by the blank forwarding means.

10. In a can body making machine, a receiving guideway and a second guideway, feed devices for advancing body blanks in succession therealong, blank flexing and scoring means at one side of the receiving guideway, means operating in timing with the said feed devices for displacing the blanks from the receiving guideway into the said blank flexing and scoring means, a plurality of sets of driven transfer rolls cooperating to advance the received blanks to the flexing and scoring means, and coacting to advance said blanks from the scoring and flexing means into the second guideway, and a reciprocating feed device actuated by one of said transfer rolls to engage the returning blanks to insure their disposition in the second guideway for engagement by the feed devices.

11. In a can body making machine, the combination with means for feeding body blanks in succession through the machine by intermittent movements, a series of devices at stations spaced apart along the machine for operating on said blanks during their periods of rest, a bed upon which the said blanks are advanced by the feeding means from station to station and having suction openings therein, and means for creating suction through said openings whereby to hold the blanks against movement while not being advanced by said feeding means.

12. In a can body machine, a bed plate formed with suction openings, and, at regular intervals, with open spaces, suction manifolds connected with said openings, means for feeding body blanks intermittently along the bed plate across said suction openings, and causing said blanks to have their periods of rest while overlying the said open spaces, means operating on the blanks through said open spaces and, while the blanks are at rest, to form each with a plural layer fold, and clamping means for positively holding the blanks against movement while being operated on by the said devices.

13. In a machine of the character described, a guideway including a perforated bed with open spaces at intervals therealong along which body blanks may be advanced through a plurality of stations, a source of suction connected with the perforations, reciprocally acting feed bars for intermittently advancing the body blanks upon the bed plate successively to the various stations for their periods of rest, means at the various stations for registering and temporarily clamping each blank against movement, and breaker bars at the several stations operating through and transversely of the guideway and in timing with the

feed bars for bending the blanks to progressively form each with a plural layer fold.

14. In a can body machine, a longitudinal guideway including a perforated bed across which body blanks are advanced through a plurality of stations, reciprocally acting feed bars for intermittently advancing the blanks progressively from station to station for their periods of rest, means at the several stations for registering and temporarily clamping each blank against movement, a source of suction connected with the perforations of the bed plate, thereby to cause the blanks to lie closely against the bed and to be held against free movement, and devices movable upwardly through the open spaces of the bed at the various stations to cooperate with means above the guideway to form each blank with a plural layer fold and operating during the retractive action of the feed bars.

15. A can body machine comprising a flat bed, means for advancing body blanks progressively by intermittent movements successively to a series of stations therein, means for holding the blanks flatly against the bed while being advanced, means timed with the advance movements for registering and clamping the blanks to the different stations during their periods of rest, and devices acting on each blank at successive stations, first to bend its forward edge portion upwardly, then to fold a part of the upwardly bent portion, then to press the upwardly bent and back-folded parts down toward the body, and finally to bump and close the fold against the blank; each of said folding and bending devices being operable through the bed and extending transversely thereof and to the direction of travel of the blank.

16. In a can body forming machine, a guideway having an opening thereacross, means for intermittently advancing along the guideway body blanks having forward edge flanges bent upwardly and the upper portions of said flanges bent forwardly and downwardly, a stop member movable through the guideway opening for abutment by the upturned flange, a clamp bar movable into the angle of the upturned flange and blank to clamp the latter against movement, a breaker bar operable against the downturned portion of the flange to bend the flange back toward the body portion; said guideway having a second opening thereacross, a stop movable into the guideway to receive the blanks thereagainst as advanced from the first mentioned stop and clamp bars respectively overlying and underlying the blank when positioned against the second mentioned stop and adapted to be actuated to flatten the folded portion of the blank therebetween.

17. In a body making machine, a succession of spaced operating stations, means for intermittently advancing body blanks successively to the stations, a perforated bed upon which said blanks are advanced from station to station, and a source of suction connected with the perforations of the bed to cause the blank to be drawn by suction against the bed and held against movement except as caused by said intermittent advancing means.

18. In a machine of the character described, a longitudinal guideway including a perforated bed with open spaces at intervals therealong, across which body blanks are advanced through a plurality of stations, reciprocally acting feed bars for intermittently advancing the blanks progressively from station to station for periods of

rest, means at the several stations for registering and temporarily clamping each blank against movement, a source of suction connected with the perforations of the bed plate, thereby to cause the blanks to lie closely against the bed and to be held against free movement, and devices movable upwardly through the open spaces of the guideway at the various stations to cooperate with means above the guideway to form each blank with a plural layer fold and operating during the retractive action of the feed bars; the fold forming devices including a breaker bar that moves upwardly through the guideway in cooperation with the clamping means at the first station to bend the forward portion of the registered blank at a right angle to the body portion.

19. In a machine of the character described, a longitudinal guideway including a perforated bed with open spaces at intervals therealong, across which body blanks are advanced through a plurality of stations, reciprocally acting feed bars for intermittently advancing the blanks progressively from station to station for periods of rest, means at the several stations for registering and temporarily clamping each blank against movement, a source of suction connected with the perforations of the bed plate, thereby to cause the blanks to lie closely against the bed and to be held against free movement, and devices movable upwardly through the open spaces of the guideway at the various stations to cooperate with means above the guideway to form each blank with a plural layer fold and operating during the retractive action of the feed bars; the fold forming devices including a breaker bar that moves upwardly through the guideway in cooperation with the clamping means at the first station to bend the forward portion of the registered blank at a right angle to the body portion, another

breaker bar that moves upwardly through the guideway, at the second station, a clamp above the bed that coacts therewith to hold the upturned portion of the blank against the last mentioned breaker bar and a third breaker bar that operates to bend the upturned portion back upon itself.

20. In a body making machine, in combination, a guideway, devices for advancing body blanks in succession along the guideway and progressively through a succession of stations, a blank rolling and flexing means adjacent one side of the guideway, feed devices and transfer rolls operable to deliver the body blanks into said rolling means and to return them into the guideway, means for holding the blanks flat in the guideway after the flexing operation; said transfer rolls having score forming ribs thereon adapted to act on the blanks to form each with a tearing strip along one edge thereof, and devices at following stations of the machine to form the blanks with a plural layer fold wherein the tearing strip is contained in the outer layer, and means for joining the ends of the folded blank in body form.

21. In a can body machine, in combination, a continuous straight line guideway, means for feeding can body blanks into the guideway at one end with the edges thereof which are to form the top and bottom end edges of the can extending transversely of the guideway, means for advancing the blanks in succession and by intermittent movements along the guideway, and devices arranged to act on the blanks to edge and fold them, and to form each into a body with a plural layer fold at one end while the top and bottom edges of the blank are at all times held perpendicularly to the longitudinal axis of the guideway.

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