R. T. WITHERS.

MACHINE FOR FOLDING SHEET METAL.

APPLICATION FILED APR. 5, 1909.

954,556.

Patented Apr. 12, 1910.

3 SHEETS—SHEET 1.

FIG. 1.

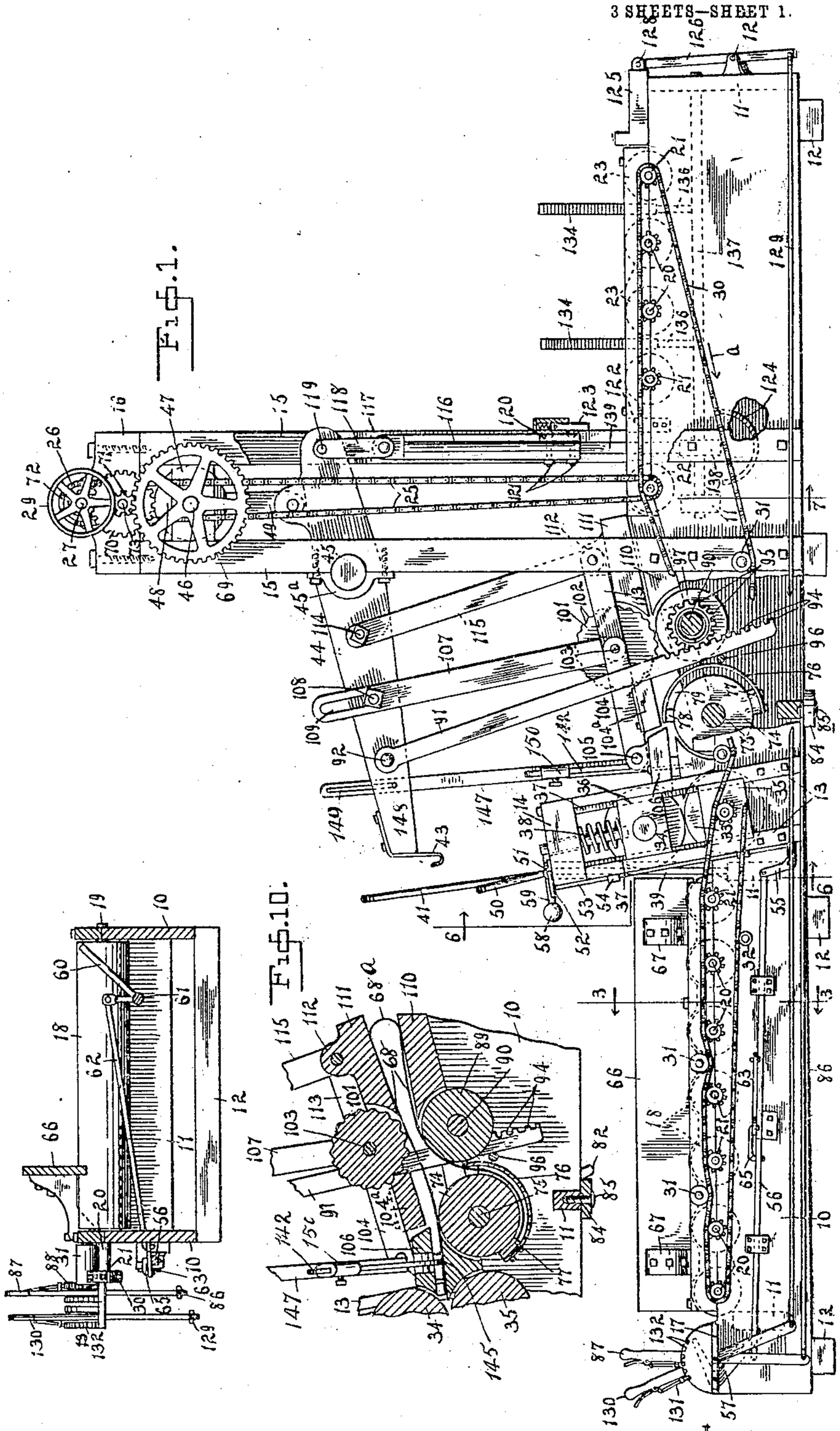

FIG. 3.

FIG. 10.

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3 SHEETS—SHEET 2.

FIG. 5.

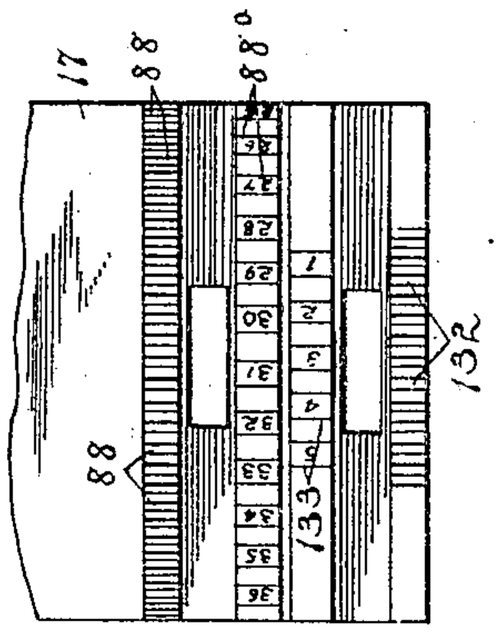


FIG. 2.

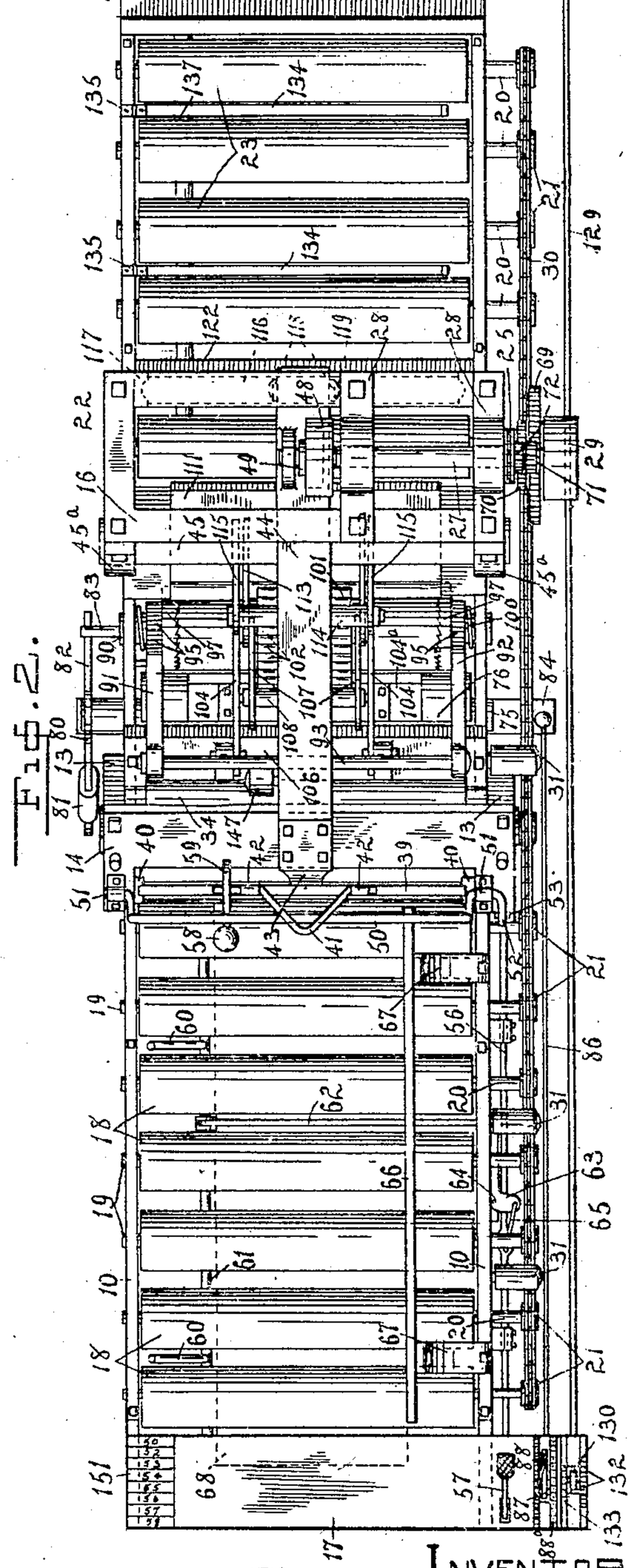
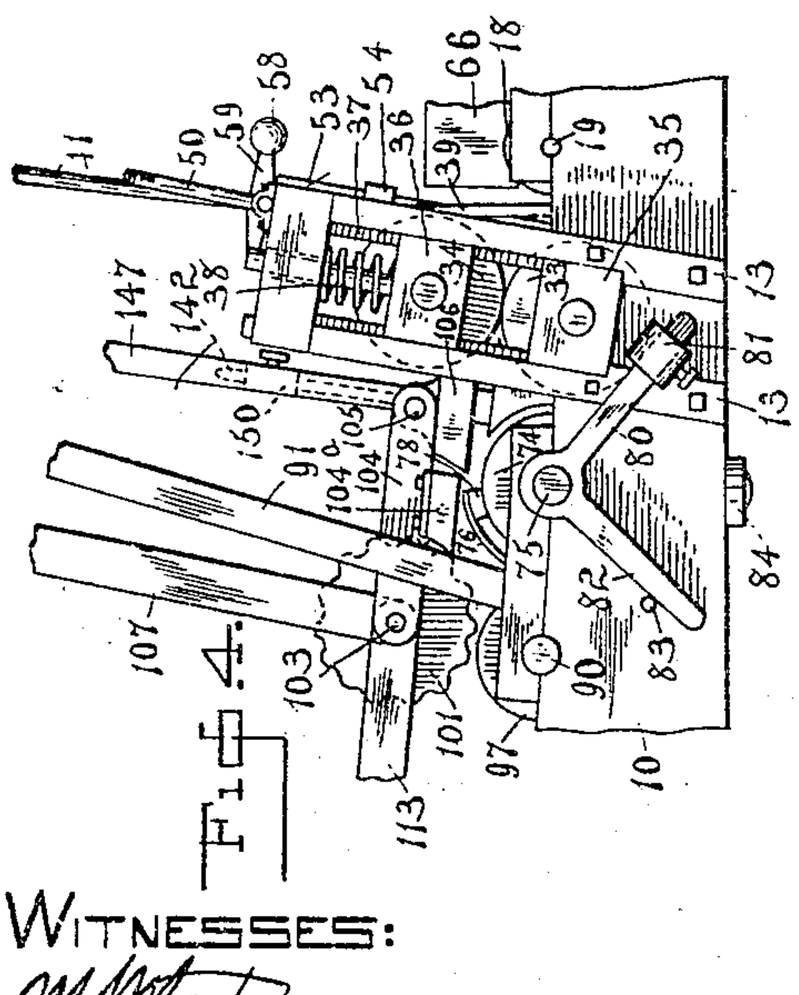


FIG. 4.



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3 SHEETS—SHEET 3.

Fig. 6.

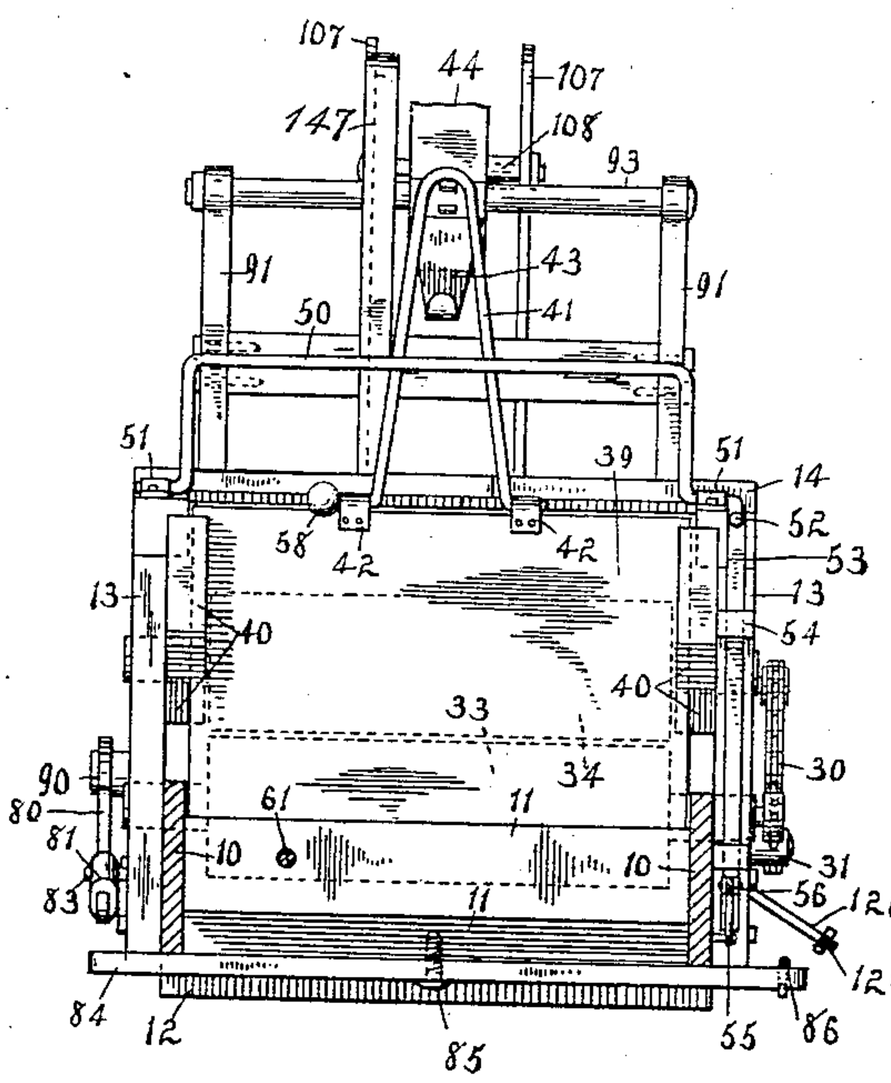


Fig. 7.

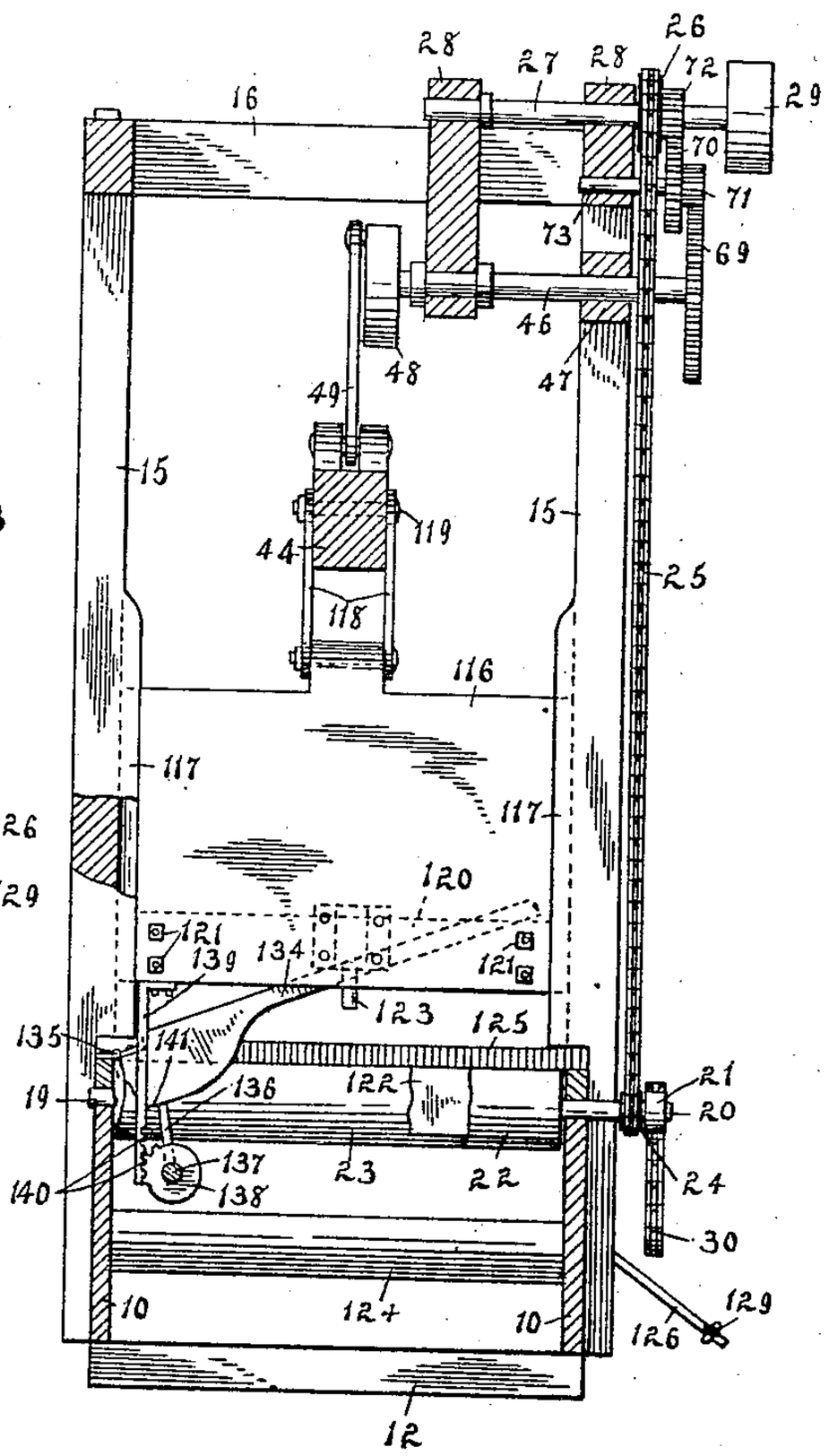


Fig. 8.

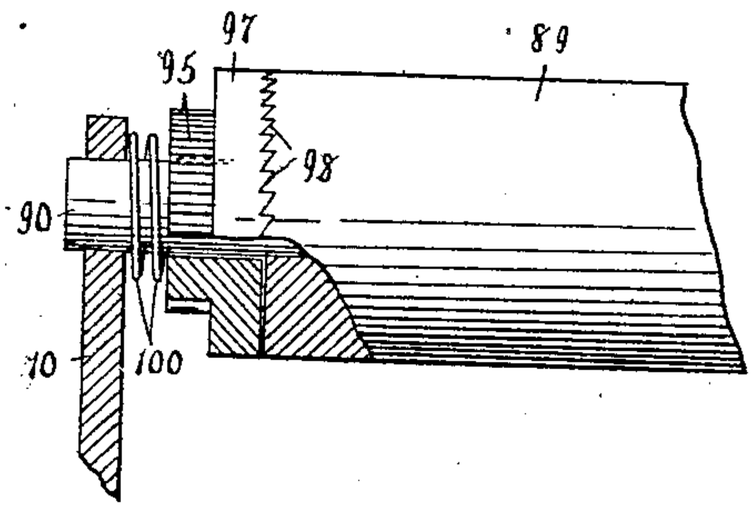
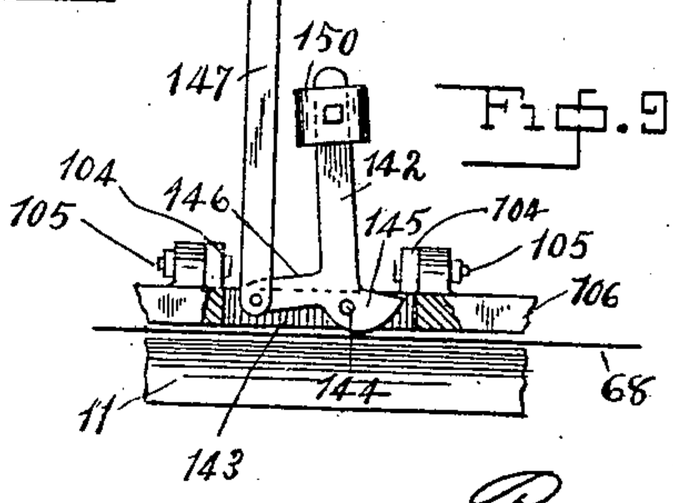


Fig. 9.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR FOLDING SHEET METAL.

954,556. Specification of Letters Patent. **Patented Apr. 12, 1910.**

Application filed April 5, 1909. Serial No. 488,066.

To all whom it may concern:

Be it known that I, ROBERT T. WITHERS, citizen of the United States, residing at New Castle, in the county of Lawrence and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Folding Sheet Metal, of which the following is a specification.

My invention relates to appliances used in the manufacture of sheet iron, and refers particularly to machines designed for folding or doubling the sheets during the rolling process.

It is necessary, in the production of iron in the form of sheets or thin plates, when designed for special purposes, such, for instance as those used in the manufacture of tin plate, to reduce the thickness of the sheets to such a degree that the required gage cannot be obtained by the ordinary methods of rolling, and in order to bring the plates to the required dimensions, recourse is had to the well known expedient of superposing two or more plates and then passing them through the forming rolls under pressure and while properly heated, thus obtaining sheets much thinner than can be made by rolling a single layer or plate of the material.

It is a matter of common knowledge that tin plate is produced by dipping iron sheets or plates into molten tin. To make this material, which is technically termed black plate, pieces of iron or steel of a standard size are heated and passed between rolls that are placed as close together as it is practicable to work them. The sheets thus former are yet much too thick for the purpose intended and in order to make them sufficiently thin the sheets are folded or doubled and after being brought to the proper temperature are again rolled. The plates are in this way reduced to approximately one-half their former thickness. These superposed sheets are again doubled by folding, heated as before, and given a final rolling, thus producing four plates from the original single sheet of approximately the same superficial dimensions but of one-fourth the thickness presented by the single sheet.

The folding of the rolled sheets has heretofore been accomplished by hand work and so far as I am aware, machines adapted to successfully accomplish the desired results have not come into general use.

The chief objects of the improvements which form the subject matter of this application are:—to produce a machine that will automatically fold or double sheets of iron fed thereto; to furnish means for flattening the sheets so doubled; to supply a shearing mechanism whereby the folded sheets will be automatically trimmed to a predetermined length; and to provide a simple, efficient and durable apparatus, that will accomplish the desired results with rapidity.

Other objects of the invention, stated in detail, are:—to provide a machine for the purpose stated that will adjust the plates so as to be properly presented to the feed rolls, to furnish a clamping device for holding the sheet while being folded, and to supply means for determining the position of the fold in the plate to be doubled.

Further objects of the invention are, to furnish means for indicating the length of the sheet previous to being folded, to provide an adjustable gage for the shearing mechanism, and to arrange automatic means for removing the finished sheets from the machine.

I accomplish the desired results above stated, and others of importance, by means of the apparatus illustrated in the accompanying drawings, which form a part of this application, the mechanism generally described comprising horizontal parallel rollers, upon which the plate to be doubled is laid, and which form a conveyer therefor, feed rolls, a movable stop or gate arranged to be placed in the path of the advancing sheet, clamping folding and compressing mechanism, an automatic shearing device for trimming the sheet margins, operating levers conveniently arranged at one end of the machine, and suitable driving mechanism arranged to move the conveyer and feed rolls continuously, and the sheet folding, compressing and cutting devices intermittently.

In the drawing the various details of the construction are disclosed in the following views:—

Figure 1 is a side elevation of the complete apparatus, some portions of the frame being broken away to disclose the mechanism beneath; Fig. 2 is a top plan view of the machine; Fig. 3 is a sectional view on the line 3—3 of Fig. 1; Fig. 4 is an enlarged fragmentary view showing the adjusting means for the pocket roll; Fig. 5 is a frag-

mentary view, also enlarged, showing the segment ratchets; Figs. 6 and 7 are sectional views on the lines 6—6 and 7—7, respectively, of Fig. 1; Fig. 8 is a fragmentary view, enlarged, of one end of the ratchet roll; Fig. 9 is a fragmentary view, showing the sheet clamp, and Fig. 10 is a fragmentary sectional view showing a folded sheet clamped in position for the operation of flattening.

Referring to the details of the drawings, the numeral 10 indicates the side members of a rectangular main frame, suitably connected by cross pieces 11, and supported on transverse sills 12. Intermediate its ends the main frame is supplied with auxiliary frames, one of which is slightly inclined and comprises corner posts or standards 13, bolted to the main frame, and connected by cross pieces and end plates 14. At a suitable distance to the rear of the frame 13 is a vertical frame having upright standards 15 connected by tie beams 16. At the front end of the machine is located a platform or foot board 17, upon which the operator stands and from which he controls the entire machine by means of governing levers and accessories hereinafter described. Between this foot board and the auxiliary frame 13 are arranged horizontal tables or conveying rollers 18, extending transversely between the side frame members 10. These rollers are furnished with suitable journals 19, 20, having their bearings in the said members 10. The journals 20 extend through the supporting frame member and upon their ends are mounted sprocket wheels 21. Immediately beneath the frame 15 is located a transverse table or conveying roller 22 and located in the rear of this roller and in the same horizontal plane is a series of similar conveying rollers 23, which are duplicates of the said conveying rollers 18, and are journaled in the frame members 10 in like manner, their journal ends also carrying sprockets 21. Upon the shaft of the roller 22 is mounted a sprocket 24, driven by a vertical chain 25, which extends upward to the top of the auxiliary frame 15 and there engages a sprocket 26, keyed on a driving shaft 27, the latter being supported in suitable bearings or boxes 28. This shaft 27 carries a driving pulley 29, which receives motion from any convenient source of power. The front series of table rollers 18, and the rear series 23 are driven from the roller 22 by means of a chain 30, which engages the sprockets 21. In order to insure proper engagement between the chain and sprockets idlers 31 are arranged at suitable points, other supporting idlers 32 preventing the chain from sagging to an undesirable extent.

In the inclined frame 13 are supported a pair of coöperating feed rolls 33, 34, the lower roll 33 being journaled in a fixed bearing 35, while the upper roll 34 is mounted in a box 36 adapted to move in slideways 37, formed on the frame 13, and the roll 34 is constantly urged toward its companion roll by compression springs 38, thus accommodating the rolls to receive sheets of different gage.

Upon the front of the feed roll frame 13 is mounted a movable stop or gate in the form of a plate 39, arranged to slide vertically in ways 40. This plate or stop extends below the plane of the upper sides of the conveying rollers 18, on which the sheets to be folded are laid, and when in its lowest position the said gate or plate will form a stop for the advancing sheet and hold it back until said stop is removed from the path of the sheet, which is done by raising it by means to be described, whereupon the sheet will be immediately driven to the feed rolls by the action of the table or conveying rollers 18. Upon the top of the said stop or gate 39 is a vertically projecting loop 41 formed by a bent rod, hinged at 42 to the upper edge of the gate so that it normally leans from the perpendicular, as shown in Fig. 1. The loop can be rocked on its hinges to a vertical position where it will be in the path of and may be engaged by a hook 43, pendent from the front end of a walking beam 44. This beam is mounted on a rock shaft 45, journaled in boxes 45ª secured to the frame 15, and is driven from a counter-shaft 46 carried on a cross piece 47 attached to the said frame 15, and is connected to a crank disk 48 on said counter-shaft, by a link 49. In Fig. 1 the loop 41 is seen in its inclined or inoperative position, and if the walking beam 44 is now rocked on its axis, the hook 43 will clear the said loop 41. To throw the loop to its vertical or operative position, so that it will be engaged by the said hook in its upward movement, the following mechanism is employed. Secured to the frame 13 above the stop or gate 39 is a rod 50 bent into the form of a bail and turned at the ends to form bearings which engage eyes or boxes 51. This bail passes in front of the loop 41 and rests normally in the position shown in Figs. 1 and 2. One extremity of this rod or bail is bent horizontally forward to form a lifting arm 52, which is operated by the engagement therewith of the upper end of a rod 53, slidable in eyes 54 attached to the frame 13. This rod is lifted in said eyes by means of a bell-crank lever 55, connected by a rod 56 to a foot lever 57, in the form of a bell-crank lever, pivoted in the foot board 17. A weight 58 is suspended to an arm 59, attached to the said loop 41, to insure the restoration of the loop to its inoperative position when released. The foot lever 57 has another function in addition to that of rocking the loop 41 to its engaging position, and that is

to operate means for adjusting the sheets when laid upon the conveying rollers 18, so that they will be properly presented to the feed rolls. This is accomplished by means of a pair of adjusting arms 60 (Figs. 2 and 3) attached to a horizontal rock shaft 61, mounted longitudinally to the main frame below the table rollers 18, and operatively connected with the rod 56 by a link 62, the proper direction of the movement being obtained by means of a suitable bell-crank lever 63, pivoted to the frame at 64, and connected to the said rod 56 by a rod 65. When a sheet of the material to be folded is laid upon the table rollers 18, the operator will depress the foot lever 57 and thus rock the shaft 61, bringing the arms 60 up between the adjacent rollers and in contact with the lateral edge of the plate or sheet, thus forcing it against a guide plate 66, supported upon brackets 67 above the rollers 18, the position of the sheet thus adjusted or straightened, being shown in dotted outlines 68 in Fig. 2.

The counter-shaft 46 projects through the supporting frame and upon its end carries a comparatively large gear wheel 69, which is rotated from the main shaft 27 by a train of gears 70, 71, 72, the latter gear being keyed to the said driving shaft, and the gears 70 and 71 journaled on a stud shaft 73, fixed in the auxiliary frame. Thus geared down the movement of the shaft 46 is comparatively slow, so that the table rollers 18, 22, and 23, will travel at a greater speed than the counter-shaft and the mechanism moved thereby, and convey the sheets quickly to and from the intermediate and more slowly operated devices.

Immediately behind the lower feed roller 33 is an important element of the sheet folding mechanism, consisting of a roll 74, mounted on a shaft 75, journaled in the frame members 10. The function of this roll is to deviate one end of the sheet after it passes the feed rolls and then hold that end stationary while the other portion of the sheet is being advanced by the action of the said feed rolls with the result that the sheet is bent in the middle taking the form shown in Fig. 10. The said roll 74 is furnished with a cylindrical segment shell 76, extending about half way around the circumference and having its lower margin secured to a longitudinal spacing member 77 and its upper edge supported at each end of the roll by a block 78, thus leaving an interval or pocket 79 between said shell and the body 74 of the roll. This pocket-roll has a limited rocking movement on its shaft, and is operated by the advance end of the sheet to be folded which enters the said pocket as soon as it passes beyond the feed rolls. The shaft 75 is provided at one end with an arm 80, upon which is adjustably mounted a suitable weight 81. Another arm 82 is engaged by a stop 83 to maintain the roll in its initial position with the mouth of the pocket 79 in the path of the sheet, as shown in Fig. 1. The roll is limited in the opposite direction by an adjustable stop, consisting of a lever 84 extending across the machine beneath the frame and pivoted about its middle to one of the frame pieces 11 by a suitable bolt 85. This lever extends at one end into the path of the said arm 82, and at the other is connected by a rod 86 to an operating lever 87 arranged at the front of the machine. This lever is provided with a spring held locking dog adapted to engage suitable notches in a segment rack 88 arranged adjacent to said lever, an indicating scale 88[a] facilitating the placing of the lever at the desired position.

Next to the pocket roll 74 is arranged a ratchet roll 89, mounted on a shaft 90, journaled in the frame members 10. This roll is driven intermittently in one direction by means of rack-rods 91, pivoted at 92 upon the ends of a fixed shaft 93, which transfixes the said walking beam 44. The lower ends of the rack-rods are furnished with racks 94 which are in mesh at each side of the machine with pinions 95 loosely mounted on the roll shaft 90. The racks are held in engagement with the said pinions by a retaining rod 96. Each pinion is attached to a crown ratchet disk or wheel 97, having teeth 98 engaging similar teeth on the body of the roll 89. These ratchets 97 are yieldingly held in mesh by coiled springs 100 embracing the shaft 90 upon the outer side of each pinion 95. It will be readily understood that when the forward end of the walking beam ascends the racks will rotate the roll 89, and when the beam descends the ratchets will yield, the roll remaining at rest until the walking beam is again on the upward stroke. Above the ratchet roll 89 and coöperating therewith when the latter is rotated, is a binding roll 101, having a roughened or corrugated surface 102. This roll is shorter than the roll 89 and is arranged midway between the main frame sides, its shaft 103 being journaled in the ends of parallel side members 104 of an auxiliary frame, connected by a flattening plate 104[a]. The other ends of these auxiliary frame members are pivoted at 105 to a fixed frame member 106. This frame is swung vertically upon the centers 105 by links 107 pivoted at their lower ends to the shaft 103 and connected at their upper ends to a cross bar 108, extending upon both sides of the said walking beam 44. The upper ends of said links 107 are furnished with longitudinal slots 109 which permit of considerable lost motion, so that the roll 102 will remain in contact with the coöperating roll 89, or an interposed metal sheet 68, except when the walking beam is at the upper

end of the stroke, and when the beam is at the end of the down stroke the adjustment is such that the required amount of pressure will be exerted by the binding roll upon the folded sheet, when the latter has reached this locality in its rearward movement.

Immediately to the rear of the ratchet roll 89 is a bed plate 110 which has a slightly inclined upper face arranged about on a level with the top of the said ratchet roll. Above the said bed plate, and corresponding in superficial dimensions therewith, is a compression plate, or press 111, having its lower surface substantially parallel with the upper surface of the bed plate 110. The upper face of this press is provided with ears 112, to which are pivoted link arms 113, having their forward ends pivoted on the shaft 103 of the corrugated roller 101. The said press is supported from a transverse arm 114, projecting on both sides of the walking beam 44 by connecting rods 115.

After the sheets have been doubled in the manner hereinafter described, it will be necessary to trim the ends of the sheet, and for this purpose a shearing or cutting apparatus is installed at the rear of the press 111 and operatively connected with the walking beam. This shearing mechanism consists of a vertical frame plate 116, moving in slideways 117, on the upright members 15 of the vertical auxiliary frame. This plate is reciprocated by links 118 pivoted to the rear end of the walking beam 44, at 119. A cutter bar 120 is secured to the lower margin of said frame plate 116 by suitable bolts 121, and is adapted to cooperate with a fixed cutting member 122, in the ordinary manner of such devices. In order to clamp the plate firmly while being sheared, a springheld piston or plunger 123 is fixed to the rear face of the cutter frame and this projects below the cutter bar 120, thus engaging the sheet or plate to be cut before the shearing members are brought into contact. Immediately below the shears is arranged a suitable receptacle 124 to catch the scraps sheared from the plate margins. During the cutting process the sheet operated upon will lie on the rear table rollers 23, and in order that the operator, who stands at the opposite end of the machine, may be able to control the position of the sheet relatively to the shearer, an adjusting stop or gage is provided. This comprises a plate 125, adapted to be slidden horizontally by means of a lever 126, pivoted at 127 to the frame, and having its upper end 128 attached to the rear edge of said gage plate 125. A rod 129 connects the lower end of the lever 126 to an operating lever 130 mounted upon the foot board 17. The said lever 130 has the usual springheld dog 131, adapted to engage a suitable ratchet 132. An indicating scale 133 having graduations corresponding to the teeth of the ratchet, enables the operator to readily set the gage 125 at the opposite end of the machine at any predetermined distance from the shearing line, so that the sheet may be properly sheared. The trimmed sheet is removed from the table rolls 23 by means of an automatic dumping device, comprising arms 134, arranged to rise and fall in the spaces between adjacent rolls. These arms are hinged at 135 to the main frame member 10, and are operated by rock-arms 136, fixed on a rock-shaft 137, arranged transversely to the levers 134. The forward end of the rock-shaft extends beneath the cutter plate 116, and carries a segment gear 138, which is operated by a rack 139 on the lower end of an arm 140, secured to the plate 116. The upper ends of the arms 136 are adapted to engage inclined faces 141 on the dumping arms 134. When the plate 116 is in its highest position, shown in Fig. 7, the arms 134 will be raised and inclined at an angle that will cause the plate if there is one thereon to slide clear of the machine and fall upon the floor. As the cutter frame descends the arms 134 will resume their horizontal position to permit the next plate to be carried upon the rollers 23, where it will be stopped as before by the gage 125 in proper position for trimming.

During the operation of compressing the bent plate to flatten it by the descent of the press 111 and the binding roll 101, the rear end of the sheet or plate 68, which is now free from the feed rollers, will be liable to slip and to prevent this I provide a clamping device for holding this end firmly. Said device comprises a lever 142 (Fig. 9) arranged in a slot 143 in the frame piece 106, and rockable on a pivot 144. The lower end of said lever terminates in a projection or jaw 145, having an eccentric cam face adapted to engage the sheet 68, the construction being clearly shown in Figs. 9 and 10. Projecting in an opposite direction is an arm 146, to which is pivotally connected a rod 147, which extends upward and is connected to the walking beam 44 by a pin 148 which plays in a longitudinal slot 149 in said rod, thus allowing the proper amount of lost motion. The lever 142 is furnished with an adjustable weight 150, sufficiently heavy to hold the eccentric cam or jaw 145 in engagement with the sheet 68 until released by the downward movement of the walking beam 44.

The process of doubling, flattening, compressing, and finally of trimming thin iron sheets, is accomplished by operating the machine hereinbefore described in the following manner. The operator takes his stand at the front of the machine upon the foot board 17, so as to be convenient to the gate

controlling lever 57, the pocket roll stop lever 87 and the gage lever 130. The shaft 27 is driven at a uniform rate of speed and the conveying rolls 18 and 23 will be in constant rotation, the direction in which this driving chain moves being indicated by the arrow *a*. A single or more sheets 68 of the material to be operated upon is then thrown upon the rollers 18 and will be carried by them against the gate 39, which will be in its down position, and the sheet will be thus kept from advancing so long as the gate blocks the way. The sheets which are to be doubled will be of various lengths and will sometimes have one edge uneven while the other is sufficiently true, and for these reasons the line of the fold where the sheet is doubled will require to be correspondingly adjusted relatively to the said sheet. In order to enable the operator to determine the exact length of the sheet, a scale 151 is marked upon the foot board 17 and the graduations thereon are measured from the face of the gate as a base, so that the near edge of the sheet will coincide with the division corresponding with its length. Having inspected the condition of the sheet margins and noted its length the operator then moves the lever 87 so as to correspond with the required adjustment of the pocket roll movement, which, it will be understood, determines the relative position of the line of the bend upon each sheet. For instance if it is desired to fold the sheet, say, two inches from the center line, the lever 87 will be shifted to the corresponding notch of the indicating scale 132. As provision is made for trimming the edges of the sheet after each bending process in order to keep the edges true, the gage 125 must then be set to give the proper cut. As the sheet will have been folded to approximately half its original length before it impinges against the said gage the operator will take this fact into consideration in setting the gage lever 130. For instance, if the sheet, as indicated by the scale 151, is 61 inches and the sheet is to be folded in the middle, the lever will be set at 30, and in this case approximately one half inch will be sheared from each layer of the doubled sheet when the cutter descends. These preliminary adjustments having thus been made, while the sheet 68 is urged against the obstructing gate, the next step will be to raise the latter and allow the sheet to pass to the feed rollers 33, 34. Waiting until the walking beam 44 has finished its down stroke and is commencing to ascend, the operator then places his foot upon the lever 57, which will throw the loop 41 into the path of the ascending hook 43 and at the same time operate the rock shaft 44 the arm 60 at the same time engaging the margin of the sheet and thrusting it against the guide 66, so that it will lie straight with the feed rolls. As the hook 43 rises it will engage the said loop and as soon as the gate or stop 39 is raised to a sufficient height to clear the plate sheet 68 the latter will be thrust between the feed rollers and be forced on by them until it enters the pocket 79. The pocket roll 74 being free to move on its centers, the sheet, which has not yet left the feed rolls, will rotate the said pocket roll until the arm 82 is engaged by the stop lever 84 which has been previously adjusted as stated above. The advance end of the sheet 68 will thus be held stationary while the rolls continue to feed the rear end which will cause the sheet to be thrown into a loop or bight 68^a beneath the press 111 as shown in Fig. 10. The movement of the walking beam at this stage will be downward, bringing the binding roll 101 and the press 111 down upon the bight or bend 68^a and thus flatten the sheet out upon the bed-plate 110. During this compression of the sheet there is more or less tendency to draw the upper end of the doubled sheet more than the lower, which is still wedged in the pocket 79, and this is prevented by the clamp jaw 145 which engages the sheet just as it leaves the feed rollers and before the press has had time to act. As soon as released by the upward movement of the press, the folded sheet will be carried by the coöperative movement of the ratchet and binding rolls upon the conveying rollers 22, 23, and it will travel backward until stopped by the gage 125, where it will remain until the action of the cutter has trimmed the determined amount from the sheet edges, and as the cutter frame ascends it will operate the rock shaft to raise the dumping arms 134 to their inclined position, and the trimmed sheet will slide by gravity from the table rolls to the floor.

Having thus described my invention, what I claim as new, is:—

1. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet-feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for checking or delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for adjusting the sheet relative to the feeding rolls, means for doubling the sheet, means for gaging the location of the bend in the sheet, and means for compressing the doubled sheet.

2. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for adjusting the sheet relative to the feeding rolls, means for bending

the sheet, means for gaging the location of the bend in the sheet, means for compressing the doubled sheet, and means for shearing the margins of the compressed sheet.

3. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for adjusting the sheet upon the conveying rolls relative to the feeding rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for doubling the sheet, means for gaging the location of the bend in the sheet, means for compressing the doubled sheet, means for shearing the margins of the compressed sheet and a gage for positioning the sheet relative to the shearing means.

4. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for adjusting the sheet while upon the conveying rolls relative to the feeding rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for doubling the sheet, means for gaging the location of the bend in the sheet, means for compressing the doubled sheet, means for clamping one end of the sheet while being compressed, means for shearing the margins of the sheet subsequent to compression, a gage for positioning the sheet relatively to the shearing means and means for automatically removing the sheet from the shearing table.

5. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for adjusting the sheet while upon the conveying rolls relative to the feeding rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for doubling the sheet, means for gaging the location of the bend in the sheet, means for compressing the doubled sheet, means for clamping one end of the sheet while being compressed, means for shearing the margins of the sheet subsequent to compression, a gage for positioning the sheet relatively to the shearing means and means for automatically removing the sheet from the shearing table.

6. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for adjusting the sheet while upon the conveying rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for doubling the sheet, said doubling means comprising a pocket roll arranged in the path of the advancing sheet and adapted to be engaged by the end of the sheet, means for compressing the doubled sheet, means for shearing the margins of the compressed sheet and a gage for positioning the sheet relatively to the shearing means.

7. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for adjusting the sheet relative to the feeding rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for doubling the sheet, said doubling means comprising a pocket roll arranged in the path of the advancing sheet and adapted to deviate the end of the sheet to form a bend, means for gaging the location of the bend in the sheet, means for compressing the doubled sheet, shears for trimming the compressed sheet, devices for conveying the sheet from the compressing means to the shears, and a gage for positioning the sheet relative to the shears.

8. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for adjusting the sheet relative to the feeding rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for doubling the sheet, said doubling means comprising a pocket roll adapted to deviate the advancing end of the sheet to form a bend in said sheet, means for gaging the location of the bend in the sheet, a press for flattening the doubled sheet, means for clamping one end of the sheet while being flattened, means for shearing the doubled sheet, means for conveying the sheet from the said press to the shearing means, said conveying means comprising a ratchet roll adapted to be intermittently operated, and a binding roll coöperating with said ratchet roll, an adjustable stop for positioning the sheet relatively to the shearing means, and means for automatically removing the sheet from the shearing table.

9. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame and arranged to receive the sheet from the conveying rolls, means for adjusting the sheet relative to the feeding rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, means for doubling the sheet, said doubling means comprising a pocket roll journaled in said frame adjacent

to the feeding rolls, a pocket in said roll arranged in the path of the advancing sheet, and adapted to be engaged thereby to operate the pocket roll, and form a bend in the sheet, a stop limiting the movement of the pocket roll to gage the location of the bend in the sheet, a press for flattening the doubled sheet, means for clamping the sheet while being flattened, shears for trimming the flattened sheet, means for conveying the sheet from the press to the shears, said conveying means comprising a roll adapted to be intermittently operated and a binding roll cooperating with said ratchet roll, an adjustable stop for positioning the sheet relatively to the shears, and means for removing the trimmed sheet from the machine.

10. In a machine of the class described, including a supporting frame and sheet conveying, adjusting, and feeding means arranged on said frame, sheet doubling means comprising a pocket roll journaled on said frame, a pocket on said roll adapted to be engaged by the advancing sheet for the purpose of deviating the end of the sheet to form a bend therein, adjustable means for limiting the movement of said roll, to determine the location of the bend, means for flattening the sheet after being bent, and means for trimming the margins of the flattened sheet.

11. In a machine of the class described, including a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame, means for adjusting the sheet relative to the feeding rolls, sheet doubling means comprising a sheet deviating roll journaled on said frame, a pocket on said deviating roll adapted to be engaged by the sheet for the purpose of forming a bend in said sheet, means for gaging the location of the bend in the sheet, means for flattening the sheet after being doubled, shears for trimming the margins of the flattened sheet, means for conveying the flattened sheet to the shears, said conveying means comprising a ratchet roll, adapted to be operated intermittently, and a binding roll provided with a corrugated surface, and a gage for adjusting the sheet relative to the shears.

12. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame, means for adjusting the sheet relative to the feeding rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, sheet doubling means arranged on the frame adjacent to said feeding rolls, means for gaging the position of the bend in the sheet, means for compressing the bent sheet, said compressing means comprising a fixed plate mounted on said frame, an auxiliary frame pivoted on said supporting frame, a compression plate carried by said auxiliary frame, and means for trimming the margins of the compressed plate.

13. In a machine of the class described, including a supporting frame, sheet conveying rolls, and sheet feeding rolls mounted on said frame, the combination with the said frame of sheet-doubling means comprising a sheet deviating roll arranged adjacent to the sheet feeding rolls, said deviating roll adapted to be engaged and operated by the sheet for the purpose of bending the sheet, means for compressing the bent sheet including an auxiliary frame pivoted upon the said supporting frame, a compression plate mounted on said auxiliary frame, a fixed plate mounted on said supporting frame and coöperating with said compression plate, means for trimming the edges of the compressed sheet, means for conveying the compressed sheet to the trimming means, said conveying means comprising a ratchet roll arranged below the path of the sheet and adapted to have an intermittent movement, and a binding roll journaled on said auxiliary frame and adapted to coöperate with said ratchet roll, means for gaging the position of the sheet relative to the trimming means, and means for removing the finished plate from the machine.

14. In a machine of the class described, the combination with a supporting frame, sheet conveying rolls mounted on said frame, and sheet feeding rolls mounted on said frame, of sheet doubling means comprising a sheet deviating roll arranged parallel with said feeding rolls and adjacent thereto, means on said roll adapted to be engaged by the advancing sheet to operate said roll, an adjustable stop limiting the movement of the deviating roll in one direction, sheet compressing means comprising a fixed plate mounted on said supporting frame below the path of the sheet, an auxiliary frame pivoted on said supporting frame above the path of the sheet, a compression plate mounted on said auxiliary frame and cooperating with said fixed plate to form a press, means for shearing the margins of the compressed sheet, and a gage for positioning the sheet relative to the shearing means.

15. In a machine of the class described, the combination with a supporting frame, sheet conveying rolls mounted on the frame, and sheet feeding rolls mounted on said frame, of sheet doubling means comprising a pocket roll arranged in the path of the sheet after it leaves the feeding rolls and adapted to be operated by the sheet, means for compressing the sheet comprising an auxiliary frame pivoted on said supporting frame, a compression plate on said auxiliary frame above the path of the sheet, a fixed

plate mounted on said supporting frame and coöperating with the compression plate to form a press, shearing means on the supporting frame, means for conveying the sheet from the press to the shearing means, and means for removing the sheet from the machine.

16. In a machine of the class described, the combination with a supporting frame, sheet conveying rolls mounted on the frame, and sheet feeding rolls mounted on said frame, of sheet doubling means arranged adjacent to said sheet feeding rolls, sheet compressing means comprising an auxiliary frame pivoted upon said supporting frame, a compression plate mounted upon said auxiliary frame above the path of the sheet, a fixed plate mounted upon the said supporting frame below the path of the sheet, means for shearing the margins of the compressed sheet, and means for conveying the sheet from the compression plates to the shearing means, said conveying means including a roll arranged below the path of the sheet and adapted to be intermittently operated, and a binding roll journaled in said auxiliary frame above the path of the sheet.

17. In a machine of the class described, the combination with a supporting frame, of sheet conveying rolls mounted on the frame, sheet feeding rolls mounted on said frame, means for adjusting the sheet relative to the feeding rolls, sheet doubling means arranged adjacent to said sheet feeding rolls, sheet compressing means comprising a fixed and a movable plate arranged upon opposite sides of the path of the sheet and coöperating to form a press, shearing means adapted to trim the margins of the compressed sheet and an adjustable stop to position the sheet relative to the shearing means.

18. In a machine of the class described, the combination with a supporting frame, of sheet conveying rolls mounted on the frame, sheet feeding rolls mounted on said frame, sheet doubling means arranged adjacent to said feeding rolls, means for compressing the doubled sheet, means for shearing the compressed sheet, and operative means comprising a main shaft journaled in said supporting frame, a counter-shaft operatively connected to the main shaft and a walking beam connected to said counter shaft.

19. In a machine of the class described, a supporting frame, sheet conveying rolls mounted on said frame, sheet feeding rolls mounted on said frame, means for adjusting the sheet relative to the feeding rolls, means for delaying the movement of the sheet from the conveying rolls to the feeding rolls, a scale for indicating the length of the sheet, means for doubling the sheet after it has left the feeding rolls, means for compressing the doubled sheet, means for shearing the compressed sheet, and operative means comprising a main shaft, a counter-shaft, gearing connecting the counter-shaft with the main shaft, and a walking-beam operatively connected with the counter shaft.

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

ROBERT T. WITHERS.

Witnesses:
JOHN DONNELLAN,
WALTER DONNELLAN.