Sept. 9, 1924. 1,507,872

B. L. VAN ORMAN

METAL WORKING MACHINE

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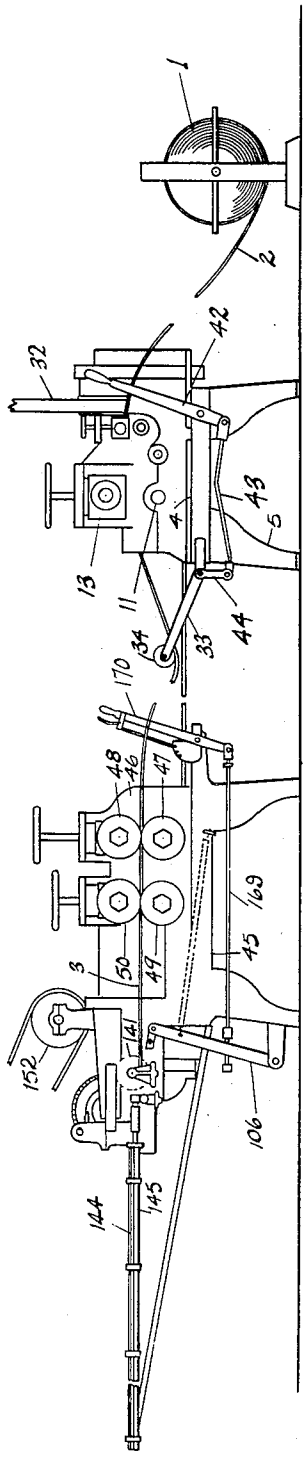


Fig. I.

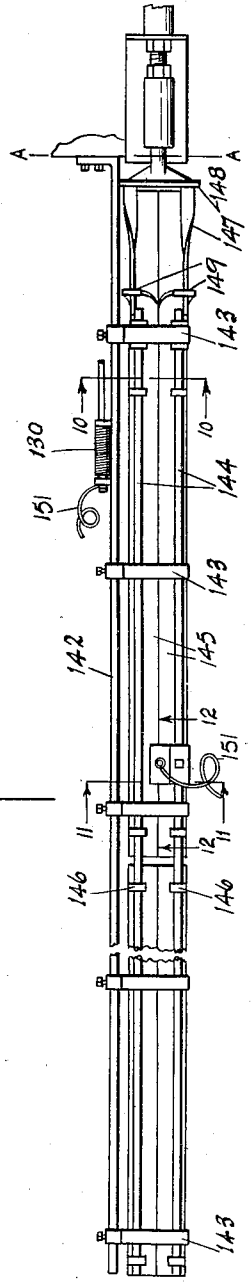


Fig. IX.

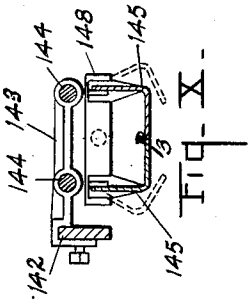


Fig. X.

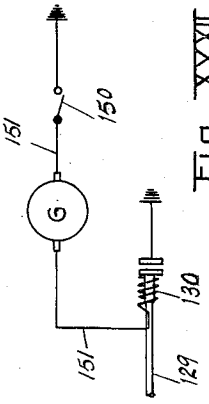


Fig. XXII

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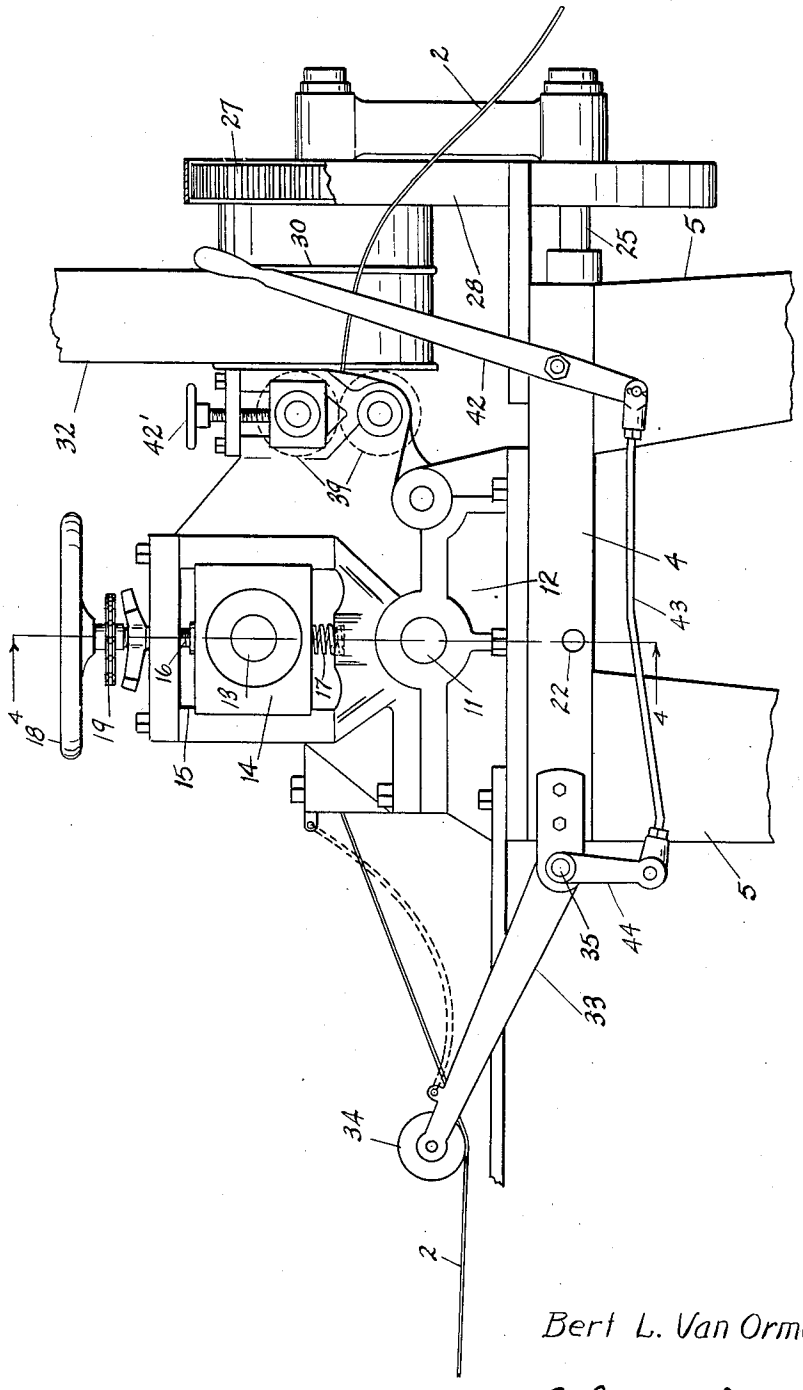


Fig. II.

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METAL WORKING MACHINE

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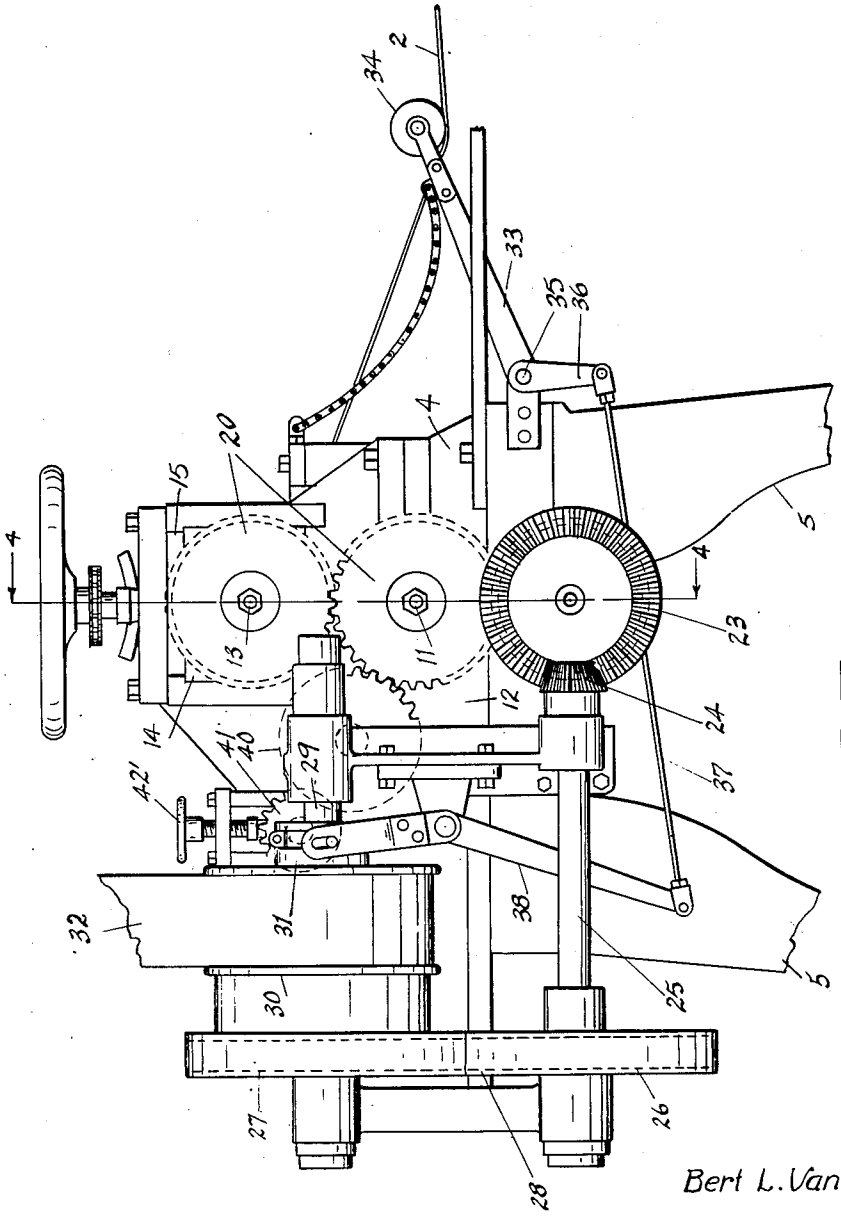


Fig. III.

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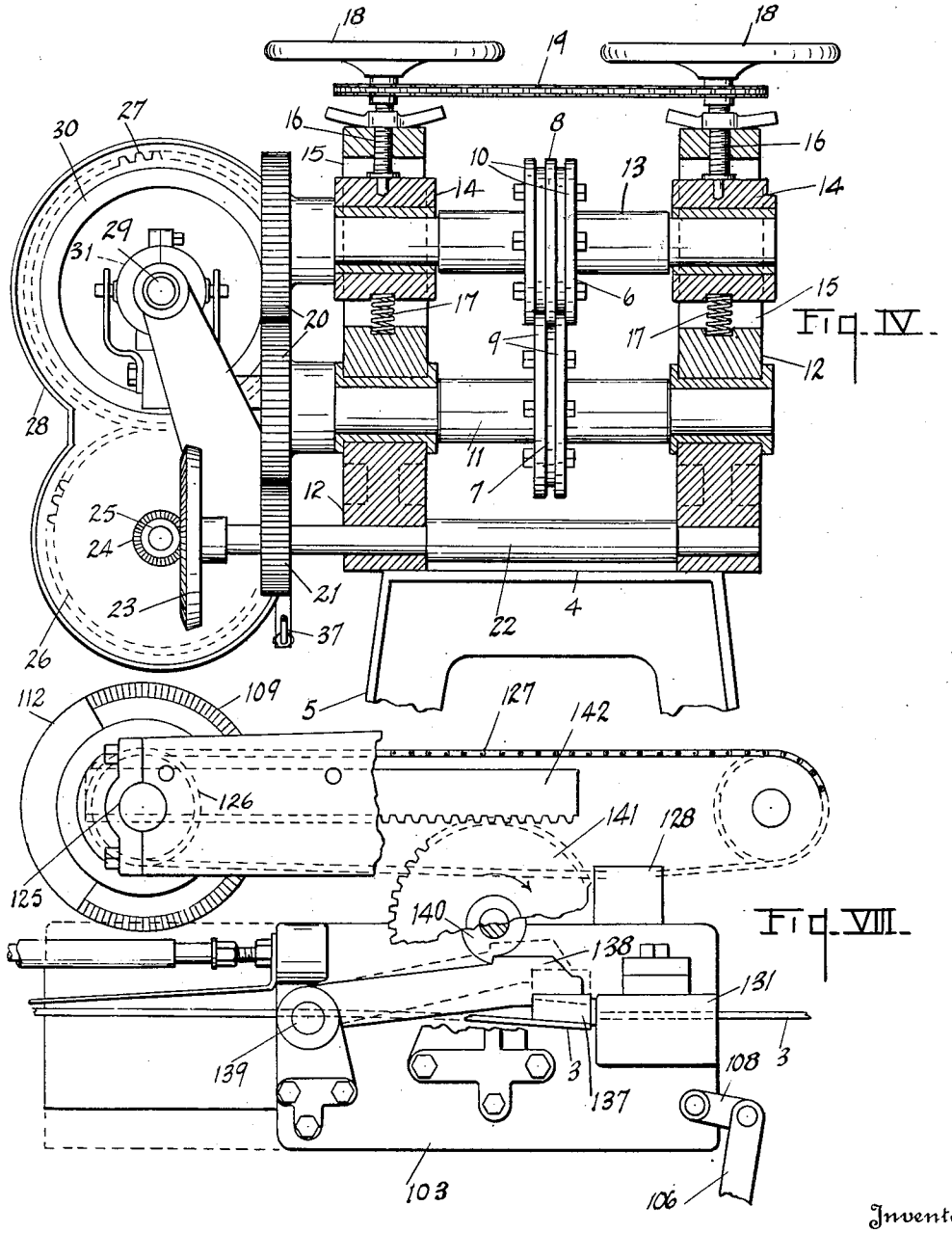


Fig. IV.

Fig. VIII.

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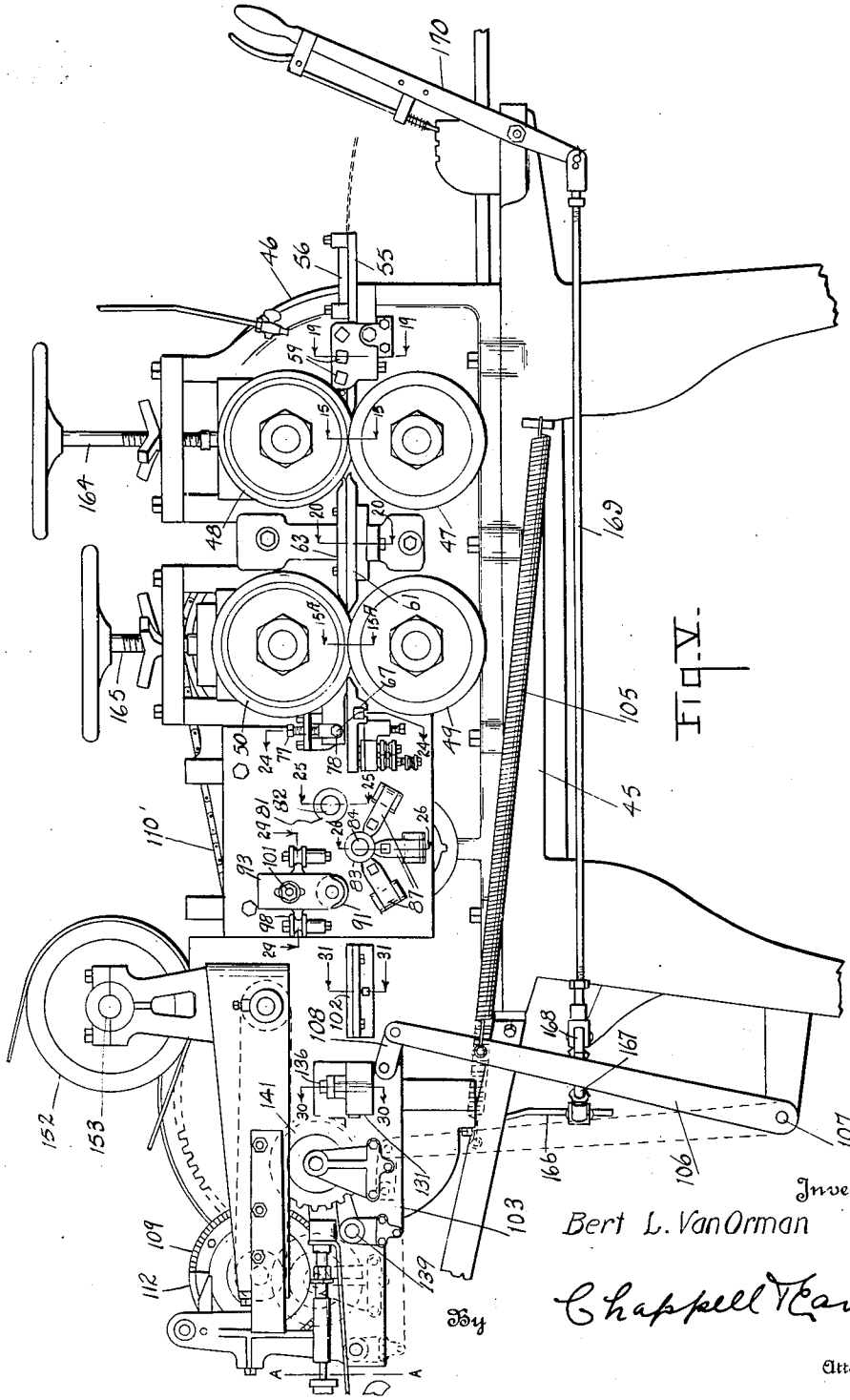


Fig. V.

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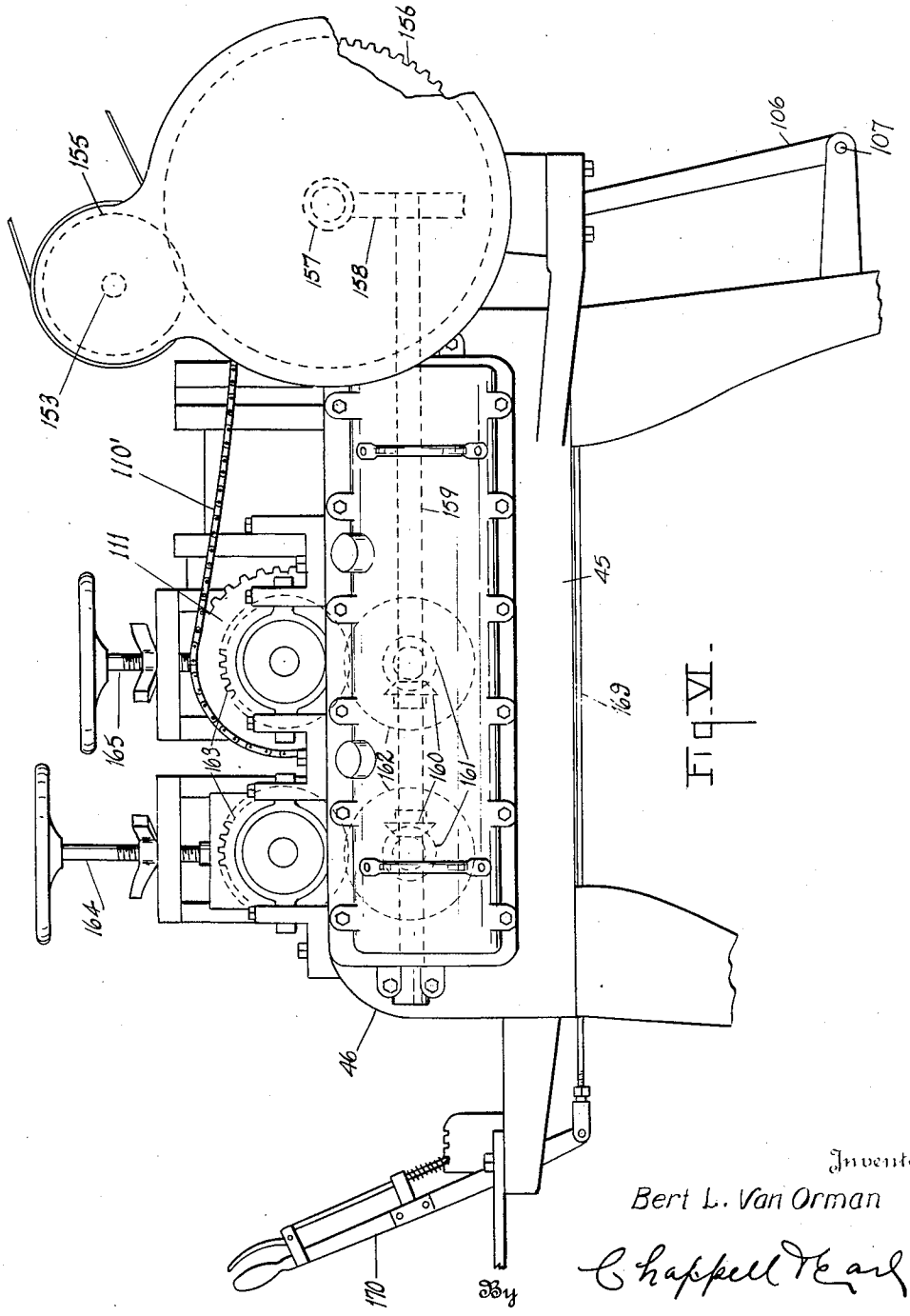


Fig. VI.

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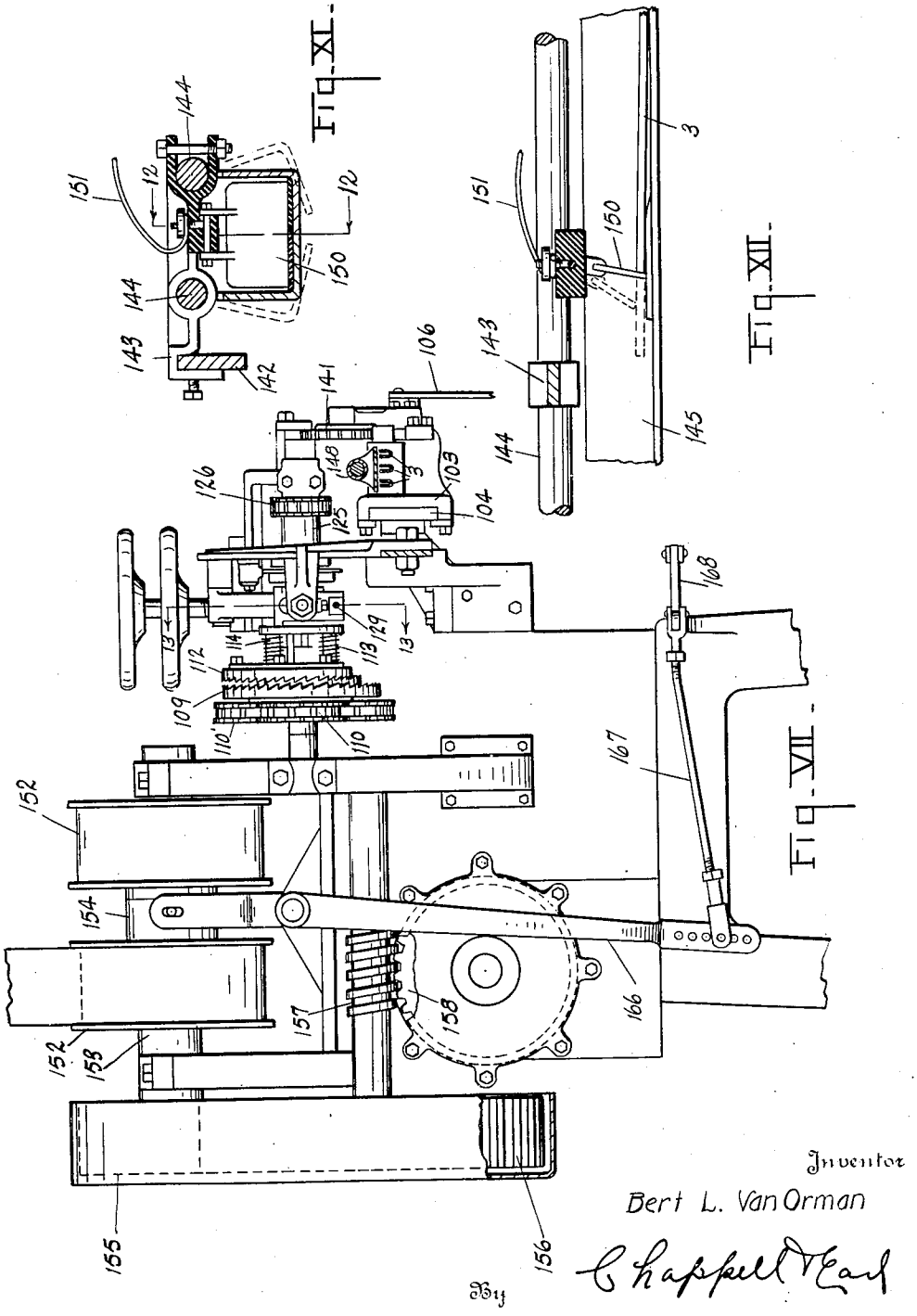
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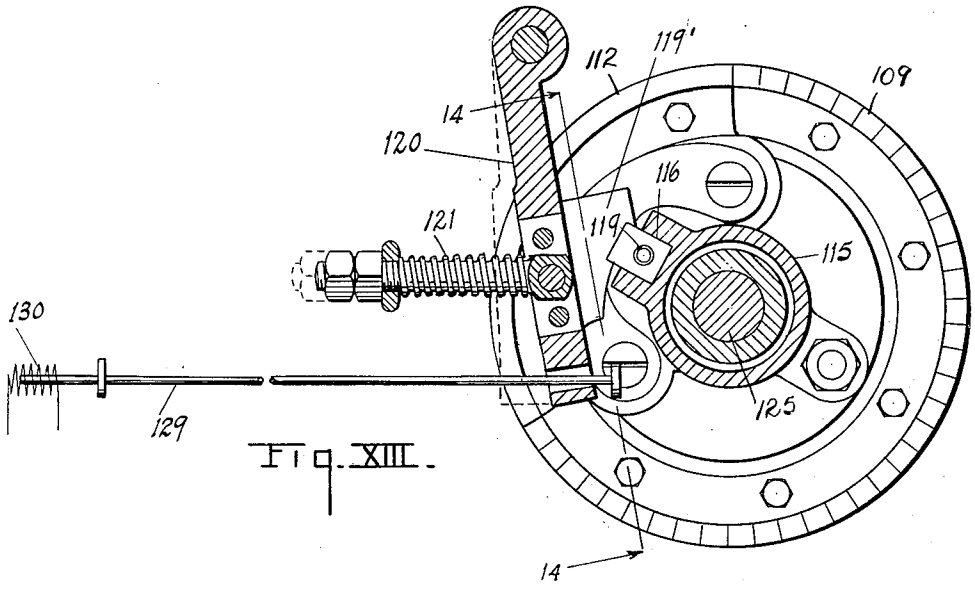


Fig. XIII.

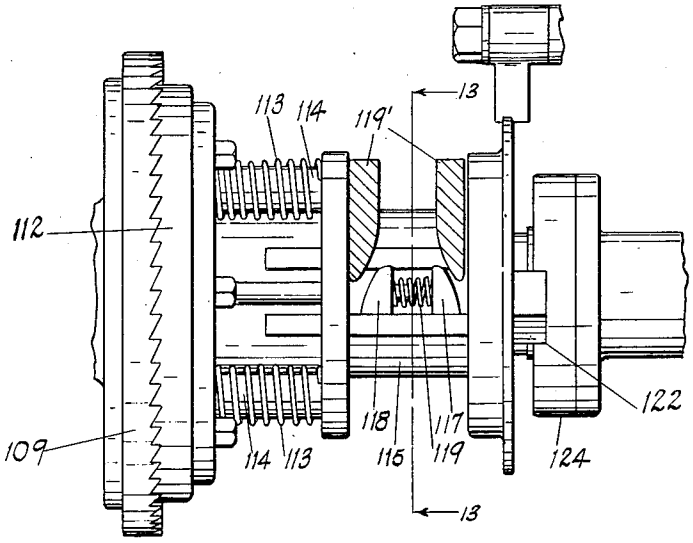


Fig. XIV.

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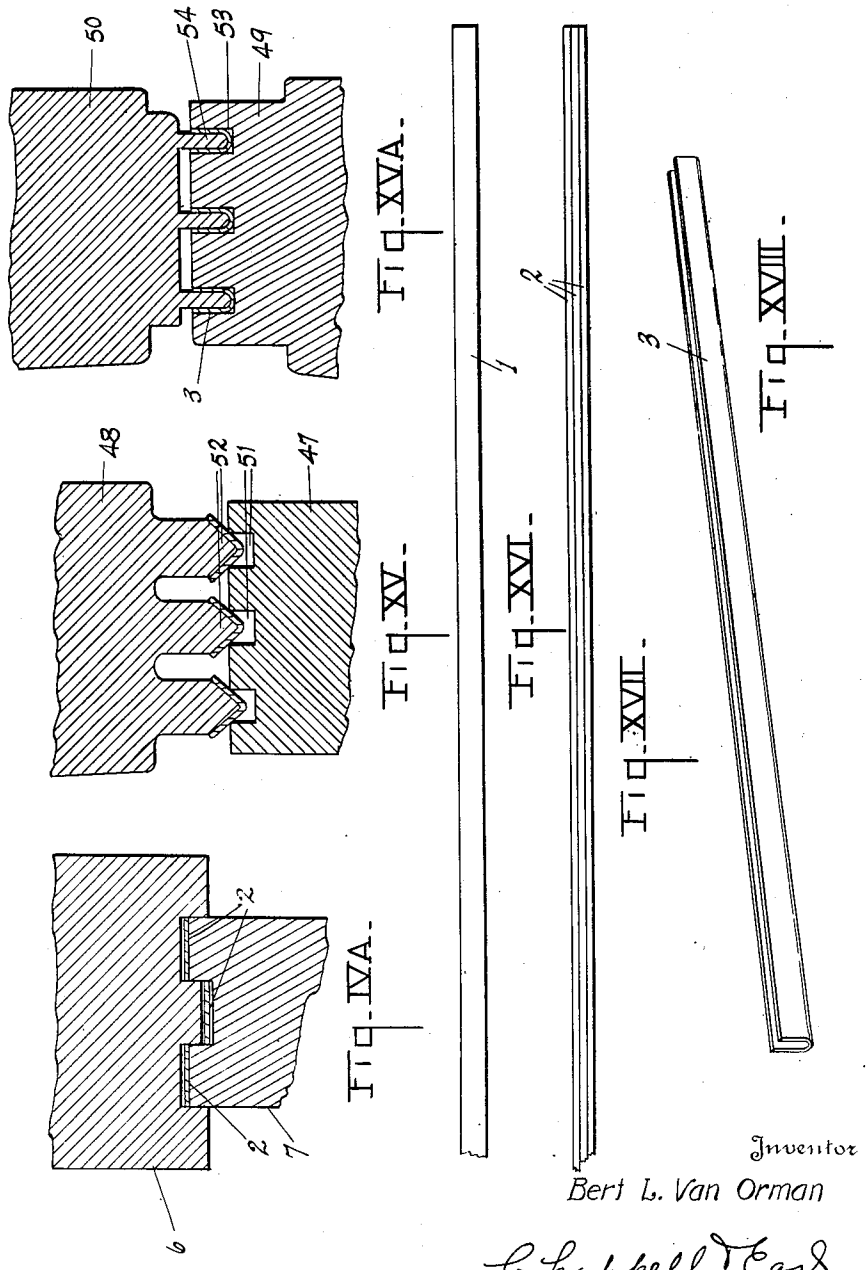
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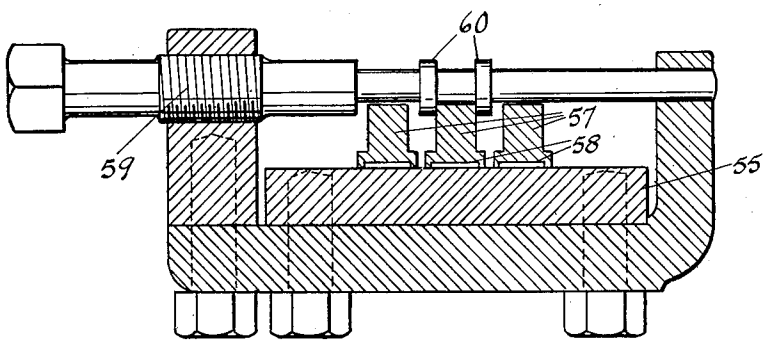


FIG. XIX.

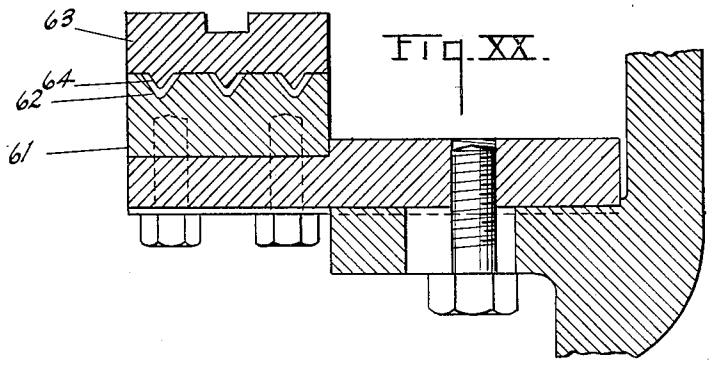


FIG. XX.

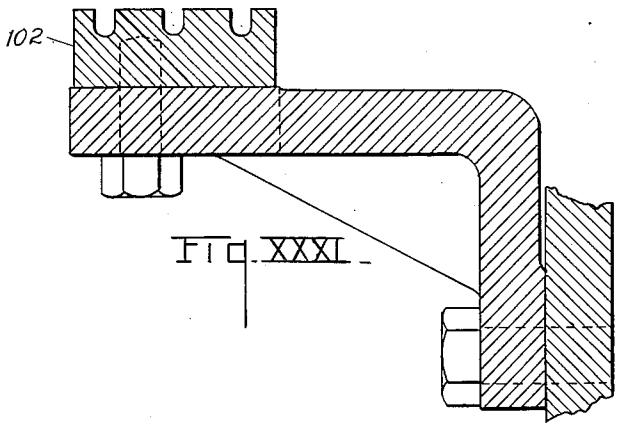


FIG. XXXI.

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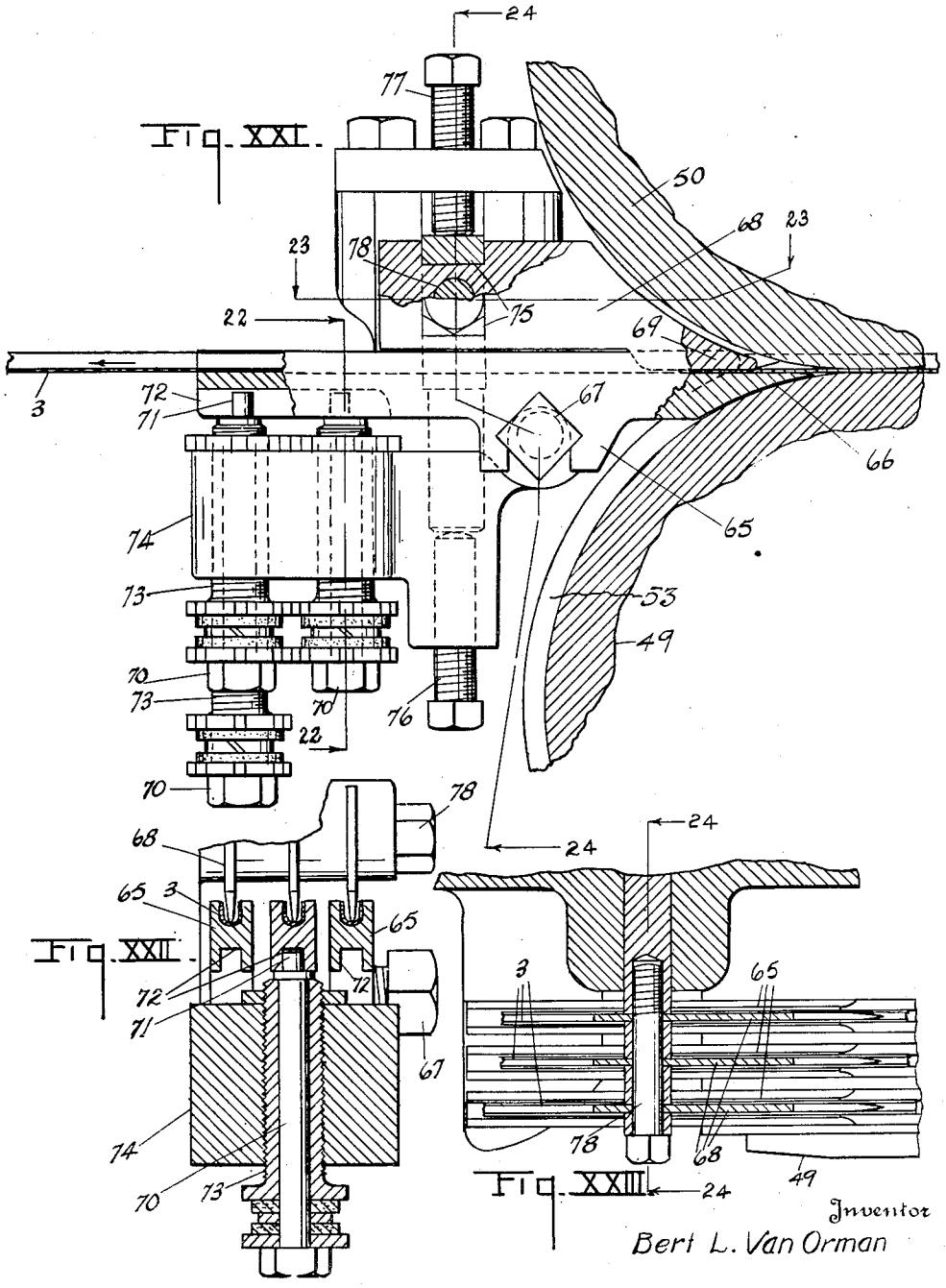


Fig. XXI.

Fig. XXII.

Fig. XXIII.

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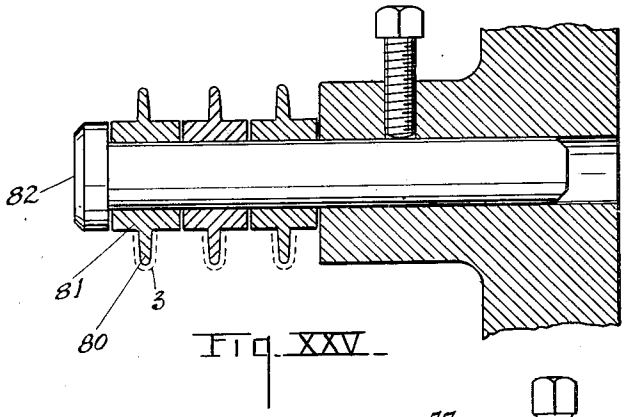


Fig. XXV.

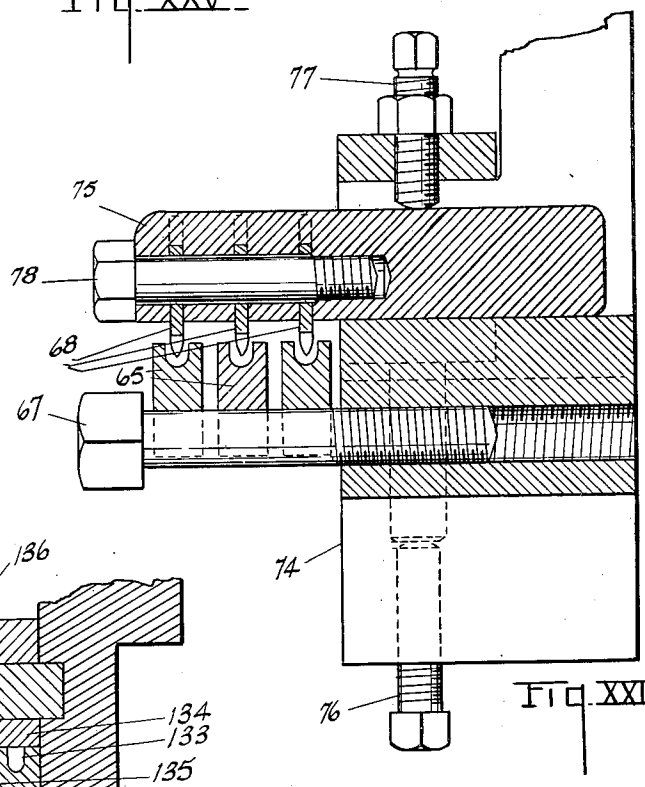


Fig. XXIV.

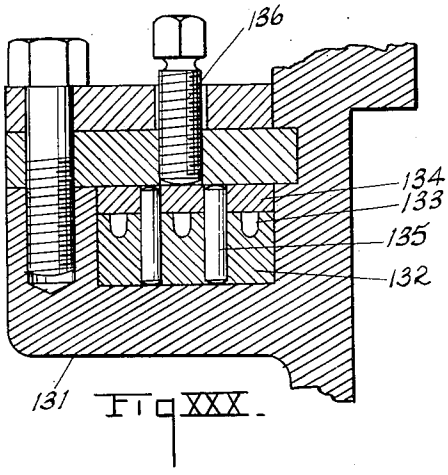


Fig. XXX.

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METAL WORKING MACHINE

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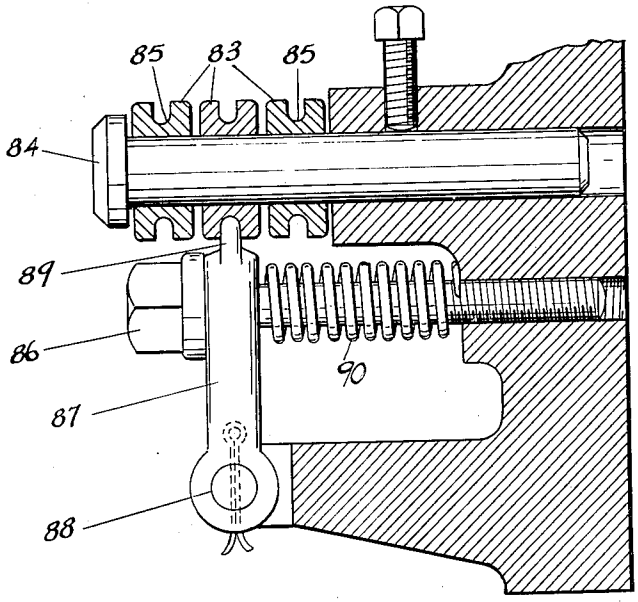


Fig. XXVI.

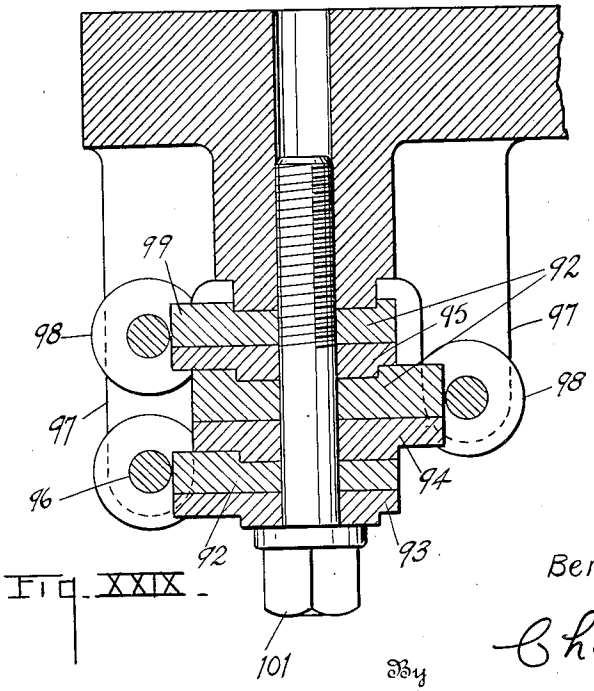


Fig. XXIX.

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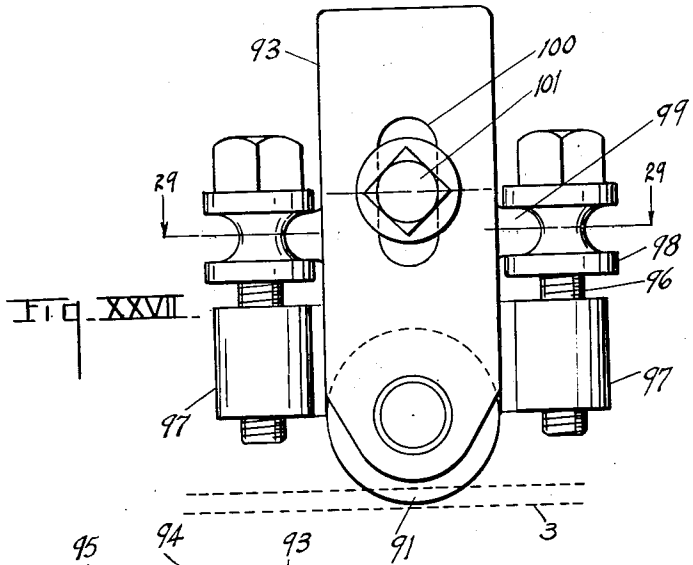


Fig. XXVII.

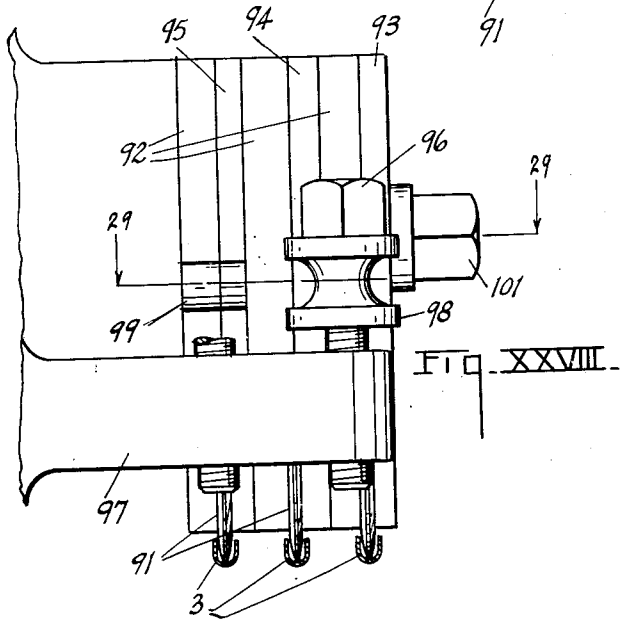


Fig. XXVIII.

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1,507,872

UNITED STATES PATENT OFFICE.

BERT L. VAN ORMAN, OF HIGHLAND PARK, MICHIGAN, ASSIGNOR TO L. A. YOUNG INDUSTRIES, INCORPORATED, OF DETROIT, MICHIGAN.

METAL-WORKING MACHINE.

Application filed March 12, 1923. Serial No. 624,599.

To all whom it may concern:

Be it known that I, BERT L. VAN ORMAN, a citizen of the United States, residing at Highland Park, county of Wayne, State of Michigan, have invented certain new and useful Improvements in Metal-Working Machines, of which the following is a specification.

This invention relates to improvements in metal working machines.

The main objects of this invention are:

First, to provide a machine for slitting and bending, or conforming, straps of metal into U-shaped strips.

Second, to provide a machine for this purpose in which the stock is automatically slitted and fed to the forming machine.

Third, to provide an improved metal bending machine adapted for simultaneously forming a plurality of strips.

Fourth, to provide an improved metal bending machine which is of large capacity.

Fifth, to provide an improved metal forming machine which requires little attention on the part of the operator.

Sixth, to provide an improved metal forming machine having these advantages which is not likely to get out of repair.

Further objects, and objects pertaining to details and economies of construction and operation will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification. The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of the invention is clearly illustrated in the accompanying drawing forming a part of this application, in which:

Figure I, Sheet 1, is a side elevation of my improved metal forming and slitting machine, the parts being shown conventionally for convenience in illustration.

Fig. II, Sheet 2, is an enlarged side elevation of the slitting portion of the machine, parts being shown conventionally for convenience in illustration.

Fig. III, Sheet 3, is a side elevation of the right-hand side of the parts shown in Fig. II.

Fig. IV, Sheet 4, is a vertical section on a line corresponding to line 4—4 of Figs. II and III showing details of the slitting mechanism, parts being shown in full lines for convenience in illustration.

Fig. IV^A, Sheet 9, is a detail vertical sectional view through the slitting rolls with stock shown or indicated therein.

Fig. V, Sheet 5, is a left-hand side elevation of the metal bending portion of the machine.

Fig. VI, Sheet 6, is a right hand elevation of the metal bending portion of the machine.

Fig. VII, Sheet 7, is a rear end elevation of the metal forming portion of the machine, parts being sectioned and parts being partially broken away for convenience in illustration.

Fig. VIII, Sheet 4, is an enlarged left-hand elevation showing details of the cut-off and delivery mechanism.

Fig. IX, Sheet 1, is a plan view of the delivery end of the machine, the lines A—A of this figure and Fig. V indicating the relation of this delivery mechanism to the main portion of the machine.

Fig. X, Sheet 1, is a detail section on a line corresponding to line 10—10 of Fig. IX showing details of the delivery mechanism.

Fig. XI, Sheet 7, is a detail section on a line corresponding to line 11—11 of Fig. IX showing further details of the delivery mechanism.

Fig. XII, Sheet 7, is a detail longitudinal section of the delivery mechanism on a line corresponding to line 12—12 of Figs. IX and XI.

Figs. XIII, Sheet 8, is a detail section on a line corresponding to line 13—13 of Figs. VII and XIV showing details of the clutch for controlling the delivery mechanism.

Fig. XIV, Sheet 8, is a detail view, partially in section, on a line corresponding to line 14—14 of Fig. XIII.

Fig. XV, Sheet 9, is a detail vertical section through the first pair of forming rolls on a line corresponding to line 15—15 of Fig. V, work being indicated in the rolls.

Fig. XV^A, Sheet 9, is a detail section through the second pair of forming rolls on a line corresponding to line 15^A—15^A of Fig. V.

Fig. XVI, Sheet 9, is a plan view of a section of stock.

Fig. XVII, Sheet 9, is a plan view of a section of the stock after it has been cut or slitted into strips.

Fig. XVIII, Sheet 9, is a perspective view of one of the completed strips of U-cross-section.

Fig. XIX, Sheet 10, is a detail vertical section on a line corresponding to line 19—19 of Fig. V showing details of the stock guide means for the first pair of forming rolls.

Fig. XX, Sheet 10, is a detail vertical section on a line corresponding to line 20—20 of Fig. V showing details of the work supporting and guiding means between the first and second pairs of forming rolls.

Fig. XXI, Sheet 11, is a detail side elevation of parts shown in Fig. V, certain parts being vertically sectioned.

Fig. XXII, Sheet 11, is a detail vertical section on a line 22—22 of Fig. XXI.

Fig. XXIII, Sheet 11, is a detail horizontal section on a line corresponding to line 23—23 of Fig. XXI.

Fig. XXIV, Sheet 12, is a detail vertical section on a line corresponding to line 24—24 of Figs. V, XXI and XXIII showing details of the work supporting and guiding means immediately at the rear of the second pair of forming rolls.

Fig. XXV, Sheet 12, is a detail vertical section through certain guiding rollers on a line corresponding to line 25—25 of Fig. V.

Fig. XXVI, Sheet 13, is a detail section on a line corresponding to line 26—26 of Fig. V showing details of the work supporting or guiding means.

Fig. XXVII, Sheet 14, is an enlarged side elevation of parts shown in Fig. V.

Fig. XXVIII, Sheet 14, is a detail elevation looking from the left of Fig. XXVII.

Fig. XXIX, Sheet 13, is a detail section on a line corresponding to line 29—29 of Figs. XXVII and XXVIII.

Fig. XXX, Sheet 12, is a detail vertical section on a line corresponding to line 30—30 of Fig. V.

Fig. XXXI, Sheet 10, is a detail section on a line corresponding to line 31—31 of Fig. V showing still further details of the supporting and guiding means for the formed stock.

Fig. XXXII, Sheet 1, is a wiring diagram showing wiring connections, for operating the driving clutch from the cut-off mechanism.

In the drawings the sectional views are taken looking in the direction of the little arrows at the ends of the section lines and similar numerals of reference indicate similar parts throughout the several views.

In Fig. I of the drawings the parts are illustrated in their general relation, the machine consisting, in general, of a slitting mechanism, a forming mechanism and cut-off and delivery mechanisms.

The stock designated at 1 in Fig. I, see also Fig. XVI, is a roll or spool of band steel of such width that it may be cut or slit into a plurality of strips designated by the numeral 2, see Figs. IV^A and XVII, Sheet 9, the strips 2 being of such width that they may be bent into U-cross-section to form the completed strip 3, see Fig. XVIII, Sheet 9. This particular strip is designed for use in the manufacture of spring cushion structures for automobile cushions and upholstering generally.

I have illustrated my improvements in detail as I have embodied them in practice in a machine for forming these strips, although it will be understood that my improvements are adapted for use in forming metal for other purposes, and, while the forming mechanism illustrated is designed for forming three strips simultaneously, certain features of the mechanism are readily adapted and desirable for use or embodiment in machines designed to operate on single strips.

Slitting mechanism.—I will first describe the slitting mechanism. This slitting mechanism comprises a bed 4 supported on suitable legs or pedestals 5, see Figs. I–IV^A inclusive. The slitting mechanism proper comprises a pair of coacting slitting rolls 6 and 7, the roll 6 having a central peripheral cutter 8 and the roll 7 having a pair of peripheral cutters 9 spaced to coact with the cutter 8 securing therewith a shearing action.

The roll 6 has a pair of peripheral flanges 10 which are spaced from the cutter 8 so as to embrace the cutters 9, the flanges 10 serving to support the outer strips 2 as they are severed, whereas, the intermediate strip 2 is supported between the cutters 9, see Fig. IV^A, the distance between the inner ends of the flanges 10 being equal to the width of the stock 1. By thus forming the cutters a uniform slitting of the stock is insured.

The shaft 11 for the cutter 7 is carried in relatively fixed bearings in the side members 12 of the frame. The shaft 13 of the cutter 6 is carried in bearings 14 supported in slots 15 in the side members of the frame and adjusted by means of the screws 16 against the tension of the springs 17, see Fig. IV. Each of the screws 16 is for convenience in adjustment provided with a hand-wheel 18, the screws being provided with sprockets connected by the sprocket chain 19 so that a uniform adjustment is secured.

The cutter shafts are provided with a pair of meshing gears 20, a gear 21 on the shaft 22 meshing with one of the gears 20. This shaft 22 has a bevelled gear 23 at one end thereof, the gear 23 being driven from the bevelled pinion 24 on the shaft 25. This shaft 25 has a gear 26 thereon meshing with a gear 27, these gears 26 and 27 being engaged within the gear-box 28.

The gear 27 is mounted on the shaft 29 carrying the pulley 30, the pulley being connected to this shaft by the clutch 31 shown conventionally in Fig. III. The pulley 30

is driven from the power belt 32. The clutch 31 is controlled from the control lever 33 having a pulley 34 adapted to rest on the slitted strips of stock 2. The lever 33 is pivoted at 35 and has an arm 36 connected by the link 37 to the shifting lever 38 for the clutch 31 so that when the slack in the stock exceeds a predetermined point, the clutch 31 is released or disengaged to stop the slitting mechanism.

The stock is fed to the slitting rolls by means of feed rolls 39 shown by dotted lines in Fig. II. These feed rolls are driven by the gears 40 and 41, see Fig. III. The upper feed roll is provided with an adjusting screw 42'. As the structural details of these feed rolls form no part of this invention I do not further illustrate or describe the same herein.

To provide means for stopping the slitting mechanism, I provide a hand lever 42 which is connected by the link 43 to an arm 44 on the clutch control lever 33, see Fig. II.

Forming mechanism.—The stock is taken directly from the slitting machine by the forming machine which comprises a suitable bed 45, see Fig. V, and a frame member 46 mounted thereon, the forming parts being mainly mounted on the side of this frame as shown in Fig. V.

The forming mechanism comprises two pairs of coacting forming rolls 47 and 48, and 49 and 50, see Figs. XV and XV^A, Sheet 9. The forming roll 47 has peripheral grooves 51 of rectangular cross section while the roll 48 has annular peripheral ribs 52 of A-cross-section. The forming roll 49 has peripheral grooves 53 of rectangular cross section, these grooves being relatively narrower and deeper than the grooves 51. The forming roll 50 has peripheral flange-like ribs 54 adapted to coact with the grooves 53, the coacting relation of the ribs and grooves of the forming rolls being clearly illustrated in Figs. XV and XV^A.

The stock is guided to the first pair of forming rolls across a feed table 55 which has a retaining plate 56 under which the strips are guided. At the rear end of this feed table is a guide block 57 having a groove 58 in its face adapted to receive the strips and support them laterally upon the feed table 55, see Fig. XIX. Each of these guide blocks is provided with an adjusting screw 59, one of these being detailed in Fig. XIX, Sheet 10. These screws are provided with a pair of spaced collars 60 which embrace the guide blocks so that, as the screw is adjusted, the guide block is shifted laterally thereby making it possible to adjust the same to properly guide the stock to the first forming rolls, 47, 48, by which the stock is bent into a V-cross-section as shown in Fig. XV.

Between the first and second pairs of forming rolls I provide a supporting table, a cross-section of which is shown in Fig. XX, Sheet 10, comprising the base or bed member 61 having spaced V-shaped grooves 62 in the face or top surface thereof of such dimensions as to receive the partially conformed stock. A retaining plate 63 having longitudinal V-shaped ribs 64 is mounted on the table or bedpiece 61, thereby not only guiding the stock, but preventing any distortion thereof as it is delivered from the first pair of forming rolls to the second pair.

The stock is conformed by the second pair of forming rolls into a U-cross-section as shown in Figs. XV^A and XVIII, Sheet 9, the stock being thus gradually conformed to the desired shape.

The metal being placed under considerable stress during this forming operation, there is a tendency for it to distort or twist. To prevent this and remove the torsion or twisting stresses, I provide supports 65 at the rear of the second pair of forming rolls, these supports having tongues 66 which project into the grooves 53, see Fig. XXI, Sheet 11, there being three of these supporting members 65 which are mounted on the bolt 67 and adjustably supported thereon by means hereinafter described.

The retaining members 68 mounted above the members 65 have forwardly projecting tips 69 which engage within the channel of the conformed stock 3 as it leaves the rolls. Each of the guiding and supporting members 65 is adjusted laterally by means of the adjusting rods 70 having eccentric pins 71 engaging the grooves 72 in the under side of the members 65, see Figs. XXI and XXII. These adjusting rods 70 are carried by the sleeves 73 threaded into the supporting bracket 74 which also carries the bolt 67. The retaining members 68 are adjustably supported on the vertically adjustable blocks 75, the lower ends of which are supported by the screws 76. Set screws 77 through the top of the bracket clamp these parts in their adjusted position. These retaining members 68 are carried by a bolt 78, being spaced thereon by the sleeves 79, see Figs. XXI and XXIII.

With the parts thus arranged they may be very accurately adjusted to receive, support and guide the stock as it comes from the last forming rolls. As the stock leaves this supporting means just described, it is engaged by the peripheral flanges 80 of the rollers 81, see Figs. V and XXV. These rollers are loosely mounted on the stub-shaft 82. The function of these rollers is to further guide the conformed stock or strips.

From these rollers 81 the conformed stock passes to the supporting and guide rollers 83 which are arranged on a stub-shaft 84. these rollers having peripheral grooves 85 of such dimensions as to receive the stock.

These rollers are laterally adjustable upon the shaft 84, the adjusting means comprising the screws 86, which engage the adjusting members 87 pivoted at 88 and having tongues 89 engaging the grooves of the rollers, one of these being shown in detail in Fig. XXVI. Coiled springs 90 on the screws hold the adjusting members 87 against the head of the screws.

At the rear of and to engage within the stock is a set of guide rollers 91, see Figs. V, XXVII and XXVIII. These guide rollers 91 are carried by the vertically adjustable members 92, there being plates 93, 94 and 95 interposed between these members 92 as shown in Figs. XXVIII and XXIX, Sheets 13 and 14.

The adjusting screws 96 carried by the lugs 97 and having grooved collars 98 are provided for the roller carrying members, the members having tongues or lugs 99 engaging the grooves as shown in Figs. XXVII and XXVIII. The plates are vertically slotted at 100 to receive the clamping bolt 101 so that after adjustment they may be clamped in adjusted position.

The stock, as it leaves the supporting and guiding members 65, passes under the rollers 81, which, as stated, have flanges engaging with the channels of the conformed stock, over the rollers 83, being supported within the grooves 85 thereof, under the rollers 91, which have V-shaped peripheries as shown in Fig. XXVIII. From these rollers 91 the stock passes to the supporting plate 102, see Figs. V and XXXI, from whence it passes to the delivery and cut-off mechanism.

Cut-off and delivery mechanism.—This cut-off mechanism comprises a reciprocating carriage 103 which is supported by the way 104 to reciprocate longitudinally of the machine, see Figs. V and VII. The carriage is returned and held normally in a forward position by means of the spring 105 which is connected to a lever 106 pivoted at 107 and connected to the carriage by a link 108. The driving means for this carriage is substantially that shown in my application for Letters Patent filed May 15, 1922, Serial No. 561,085, and, in general, comprises a clutch mechanism detailed in Figs. XIII and XIV of the present application. The driving clutch member 109 of this clutch mechanism is constantly driven through a sprocket wheel 110 connected thereto and the sprocket chain 110′, this sprocket chain being driven from a sprocket 111 on one of the forming roll shafts, see Fig. VI.

The driven clutch member 112 is toothed to coact with the driving member 109 and is mounted for longitudinal movement relative thereto, being urged to engaging position by the coiled springs 113 carried by the pins 114. The driven clutch member is provided with a barrel-like hub 115 supported for longitudinal movement and having a longitudinal groove-like slideway 116 therein for the driving dog 117. The clutch releasing lug 118 is for convenience secured in this groove. The coiled spring 119 urges the driving dog 117 into engaging position, the spring being arranged between the dog 117 and the lug 118.

The dog 117 and the lug 118 project into the path of the fingers 119′ of the clutch releasing lever 120, which is held yieldingly in clutch releasing position by the coiled spring 121. When the lever 120 is retracted the fingers 119′ are drawn out of engagement with the lug 118 allowing the driven clutch member to engage the driving clutch member, and also allowing the dog 117 to engage the notch 122 in the disk 124. This disk is carried by a shaft 125 having a sprocket 126 thereon coacting with the sprocket chain 127 connected to the carriage 103 at 128, see Fig. VIII, so that when the clutch is engaged the carriage is reciprocated.

The clutch is controlled by the rod 129 which is actuated by an electromagnet shown conventionally at 130. The means for controlling this electromagnet will be later described.

The conformed strips are delivered to the carriage which is provided with a shear block designated generally by the numeral 131, see Fig. XXX, and consisting of the longitudinally grooved shear block 132 having grooves 133 to receive the conformed strips. A retaining or cover plate 134 is held in position by the pins 135 and the screw 136.

The coacting cutter 137 is carried by the lever 138 pivoted at 139 and actuated by the cam 140, the cam being actuated by the gear 141 meshing with a fixed rack 142 so that as the carriage is reciprocated the cam is actuated to actuate the cutter, severing the stock as indicated in Fig. VIII. The movement of the carriage is timed, that is, the speed of the carriage corresponds to that of the work as it is discharged from the forming mechanism. The stock is severed on the rearward stroke of the carriage and delivered to or guided to the carriage shear block on the return stroke, and is fed thereto until the predetermined length has been delivered, the conformed material itself serving to control the cut-off mechanism.

A plan view of this cut-off mechanism is shown in Fig. IX and consists of a bar 142 carrying arms 143 carrying the rods 144. The work is delivered to a trough comprising a pair of members 145 hinged at 146 on the rods 144. The trough is actuated by cams 147 mounted on the plunger 148 carried by the carriage. These cams engage the slotted arms or parts 149 on the trough members 145 so that as the cams are recip-

rocated the trough members are opened and closed, the same being shown in closed position by full lines in Fig. X and in open position in dotted lines, in which position they discharge the work, see Figs. X and XI.

As the work is delivered along the trough it engages the gate-like tappet 150 which is electrically connected by the wire 151 to the electromagnet 130. This tappet constitutes a contact member, it being insulated from the other metal parts, the electrical connection being completed, however, through the stock itself which grounds in the machine, thus completing the circuit so that the electromagnet is actuated to actuate the clutch when the carriage is actuated, cutting off the stock and, through the mechanism described, opening the trough to discharge the stock, thereby breaking the electrical connections and disengaging the clutch.

The tappet or contact is mounted for adjustment so that the length of the stock may be controlled as desired, this adjustable mounting being illustrated in Fig. XI.

The driving means for the forming rolls is illustrated in Figs. VI and VII, various parts being shown conventionally. The pulleys 152 which are both mounted on the shaft 153 are connected to a suitable source of power by means of belts to secure a forward or reverse drive. The clutch indicated conventionally at 154 is adapted to connect either of these pulleys to the shaft 153. The shaft 153 is provided with a gear, shown by dotted lines at 155, meshing with a gear 156 which drives the worm 157, which, in turn, drives the gear 158 on the shaft 159 disposed longitudinally of the machine. This shaft is provided with bevelled gears 160 meshing with gears 161 on the shafts of the lower forming rolls, see dotted lines in Fig. VI. These shafts have gears 162, indicated by dotted lines, meshing with the gears 163 on the upper shafts of the forming rolls.

The upper forming rolls are provided with adjusting screws 164 and 165. The clutch 154 is provided with a clutch lever 166 connected by the link 167 to an arm of the bell crank lever 168 which is, in turn, connected by the link 169 to the control lever 170 positioned at a convenient point for the operator at the front of the forming mechanism.

My improved slitting and forming machine is of large capacity and requires comparatively little attention on the part of the operator. The cost of the stock in the relatively wide strips is very materially less than the cost of the narrower stock, that is, of stock of the proper width for forming the U-shaped strips. The strips produced are of uniform shape and are uniformly straight.

I have illustrated and described my improvements in an embodiment which I have found very practical and efficient. I have not attempted to illustrate or describe certain modifications or adaptations which I contemplate as I believe the disclosure made will enable those skilled in the art to which my invention relates to embody or adopt the same as may be desired.

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

1. In a structure of the class described, the combination with a forming means comprising forming rolls adapted to simultaneously act upon a plurality of strips delivered thereto side by side, of a stock slitting means comprising feed rolls, slitting rolls, a driving means for said feed and slitting rolls comprising a clutch, and a clutch control lever adapted to rest upon the slitted stock between the slitting rolls and the forming rolls whereby the clutch is controlled by the slitted stock.

2. In a structure of the class described, the combination with a forming means comprising forming rolls adapted to simultaneously act upon a plurality of strips of stock, a stock slitting means comprising feed rolls, slitting rolls, a driving means for said feed and slitting rolls comprising a clutch, and means whereby the clutch is controlled by the slitted stock between the slitting rolls and the forming rolls.

3. In a structure of the class described, the combination with a forming means comprising forming rolls adapted to simultaneously act upon a plurality of strips of stock, of a stock slitting means comprising a driving means for said slitting means comprising a clutch, and a clutch control lever adapted to engage the slitted stock between the slitting means and the forming rolls.

4. In a structure of the class described, the combination with a forming means adapted to simultaneously act upon a plurality of strips of stock, a stock slitting means comprising feed rolls, slitting rolls, a driving means for said feed and slitting rolls comprising a clutch, and a clutch control means comprising a member engaging the stock between the slitting rolls and the forming means.

5. In a structure of the class described, the combination with a forming means adapted to simultaneously act upon a plurality of strips of stock, a stock slitting means, a driving means for said slitting means comprising a clutch, and a clutch control means comprising a member engaging the stock between the slitting means and the forming means.

6. In a structure of the class described, the combination of a pair of initial coacting forming rolls, one of which has periph-

eral grooves of rectangular cross section and the other coacting peripheral ribs having A-shaped peripheries, a second pair of coacting forming rolls, one of which has peripheral grooves of a dimension adapted to receive the conformed stock, and the other peripheral flanges coacting with said grooves to form the stock, a stock feeding table disposed in advance of the first pair of forming rolls, guide blocks adjustable on said feed table having grooves in their under sides adapted to engage the strips for guiding them upon said feeding table, screws provided with spaced collars engaging said blocks whereby they may be individually adjusted laterally to guide the stock to the forming rolls, a support disposed between the pairs of forming rolls in alignment with the bites thereof and having V-shaped grooves therein conformed to the material as discharged from the first forming rolls, a retaining plate having V-shaped ribs on its under side coacting with said grooves to support the stock therein as it is guided to the second pair of forming rolls, supporting and guiding members disposed at the rear of the second pair of forming rolls and projecting into the grooves of the grooved roll, said members having work channels and being supported for vertical and lateral adjustment, coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the second pair of forming rolls, channeled supporting rollers disposed at the rear of said supporting and guiding members in spaced relation thereto, means for laterally and independently adjusting said supporting rollers, laterally floating retaining rollers disposed in advance of said supporting rollers and having peripheral flanges adapted to engage within the channels of the work, retaining and guiding rollers disposed above and at the rear of said supporting rollers and adapted to engage within the conformed work supported by such rollers, means for vertically adjusting said retaining and guiding rollers, a channeled guide member disposed at the rear of said rollers, and a reciprocating carriage provided with cut-off means disposed at the rear thereof.

7. In a structure of the class described, the combination of a pair of initial coacting forming rolls, one of which has peripheral grooves of rectangular cross section and the other coacting peripheral ribs having A-shaped peripheries, a second pair of coacting forming rolls, one of which has peripheral grooves of a dimension adapted to receive the conformed stock and the other peripheral flanges coacting with said grooves to form the stock, a support disposed between the pairs of forming rolls in alignment with the bites thereof and having V-shaped grooves therein conformed to the material as discharged from the first forming rolls, a retaining plate having V-shaped ribs on its under side coacting with said grooves to support the stock therein as it is guided to the second pair of forming rolls, supporting and guiding members disposed at the rear of the second pair of forming rolls and projecting into the grooves of the grooved roll, said members having work channels and being supported for vertical and lateral adjustment, coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the second pair of forming rolls, channeled supporting rollers disposed at the rear of said supporting and guiding members in spaced relation thereto, means for laterally and independently adjusting such supporting rollers, laterally floating retaining rollers disposed in advance of said supporting rollers and having peripheral flanges adapted to engage within the channels of the work, retaining and guiding rollers disposed above and at the rear of said supporting rollers and adapted to engage within the conformed work supported by such rollers, means for vertically adjusting said retaining and guiding rollers, a channeled guide member disposed at the rear of said rollers, and a reciprocating carriage provided with cut-off means disposed at the rear thereof.

8. In a structure of the class described, the combination of a pair of initial coacting forming rolls, one of which has peripheral grooves of rectangular cross section and the other coacting peripheral ribs having A-shaped peripheries, a second pair of coacting forming rolls, one of which has peripheral grooves of a dimension adapted to receive the conformed stock and the other peripheral flanges coacting with said grooves to form the stock, a stock feeding table disposed in advance of the first pair of forming rolls, guide blocks adjustable on said feed table having grooves in their under sides adapted to engage the strips for guiding them upon said feeding table, screws provided with spaced collars engaging with said blocks whereby they may be individually adjusted laterally to guide the stock to the forming rolls, supporting and guiding members disposed at the rear of the second pair of forming rolls and projecting into the grooves of the grooved roll, said members having work channels and being supported for vertical and lateral adjustment, coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the second pair of forming rolls, channeled supporting rollers disposed at the rear of said supporting and guiding members in spaced relation thereto, means for laterally and independently ad-

justing such supporting rollers, laterally floating retaining rollers disposed in advance of said supporting rollers and having peripheral flanges adapted to engage within the channels of the work, retaining and guiding rollers disposed above and at the rear of said supporting rollers and adapted to engage within the conformed work supported by such rollers, means for vertically adjusting said retaining and guiding rollers, a channeled guide member disposed at the rear of said rollers, and a reciprocating carriage provided with cut-off means disposed at the rear thereof.

9. In a structure of the class described, the combination of a pair of initial coacting forming rolls, one of which has peripheral grooves of rectangular cross section and the other coacting peripheral ribs having A-shaped peripheries, a second pair of coacting forming rolls, one of which has peripheral grooves of a dimension adapted to receive the conformed stock and the other peripheral flanges coacting with said grooves to form the stock, supporting and guiding members disposed at the rear of the second pair of forming rolls and projecting into the grooves of the grooved roll, said members having work channels and being supported for vertical and lateral adjustment, coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the second pair of forming rolls, channeled supporting rollers disposed at the rear of said supporting and guiding members in spaced relation thereto, means for laterally and independently adjusting such supporting rollers, laterally floating retaining rollers disposed in advance of said supporting rollers and having peripheral flanges adapted to engage within the channels of the work, retaining and guiding rollers disposed above and at the rear of said supporting rollers and adapted to engage within the conformed work supported by such rollers, means for vertically adjusting said retaining and guiding rollers, a channeled guide member disposed at the rear of said rollers, and a reciprocating carriage provided with cut-off means disposed at the rear thereof.

10. In a structure of the class described, the combination of a pair of initial coacting forming rolls, one of which has peripheral grooves of rectangular cross section and the other coacting peripheral ribs having A-shaped peripheries, a second pair of coacting forming rolls, one of which has peripheral grooves of a dimension adapted to receive the conformed stock and the other peripheral flanges coacting with said grooves to form the stock, a stock feeding table disposed in advance of the first pair of forming rolls, guide blocks adjustable on said feed table having grooves in their under sides adapted to engage the strips for guiding them upon said feeding table, screws provided with spaced collars engaging said blocks whereby they may be individually adjusted laterally to guide the stock to the forming rolls, a support disposed between the pairs of forming rolls in alignment with the bites thereof and having V-shaped grooves therein conformed to the material as discharged from the first forming rolls, a retaining plate having V-shaped ribs on its under side coacting with said grooves to support the stock therein as it is guided to the second pair of forming rolls, supporting and guiding members disposed at the rear of the second pair of forming rolls and projecting into the grooves of the grooved roll, said members having work channels and being supported for vertical and lateral adjustment, and coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the second pair of forming rolls.

11. In a structure of the class described, the combination of a pair of initial coacting forming rolls, one of which has peripheral grooves of rectangular cross section and the other coacting peripheral ribs having A-shaped peripheries, a second pair of coacting forming rolls one of which has peripheral grooves of a dimension adapted to receive the conformed stock and the other peripheral flanges coacting with said grooves to form the stock, a stock feeding table disposed in advance of the first pair of forming rolls, guide blocks adjustable on said feed table having grooves in their under sides adapted to engage the strips for guiding them upon said feeding table, screws provided with spaced collars engaging said blocks whereby they may be individually adjusted laterally to guide the stock to the forming rolls, a support disposed between the pairs of forming rolls in alignment with the bites thereof and having V-shaped grooves therein conformed to the material as discharged from the first forming rolls, and a retaining plate having V-shaped ribs on its under side coacting with said grooves to support the stock therein as it is guided to the second pair of forming rolls.

12. In a structure of the class described, the combination of coacting pairs of forming rolls, said forming rolls being adapted to act on a plurality of strips, a stock feeding table disposed in advance of the first pair of forming rolls, guide members individually adjustable on said feed table for guiding the stock to the forming rollers, a support disposed between the pairs of forming rolls in alignment with the bites thereof and having closed guides for the work, work supporting members disposed at the rear of the second pair of forming rolls to receive the work therefrom, said members having

channels conformed to the work and being supported for aligning adjustment, coacting retaining members having tongues projecting into the channels to engage the work as it is delivered from the second pair of forming rolls, channeled work supporting rollers disposed at the rear of said supporting members, means for laterally adjusting such supporting rollers, laterally floating retaining rollers disposed between said work supporting members and rollers to engage the work carried thereby, and work retaining and guiding rollers adjustably mounted above and at the rear of said supporting rollers to engage within the conformed work.

13. In a structure of the class described, the combination of coacting pairs of forming rolls, said forming rolls being adapted to act on a plurality of strips, a support disposed between the pairs of forming rolls in alignment with the bites thereof and having closed guides for the work, work supporting members disposed at the rear of the second pair of forming rolls to receive the work therefrom, said members having channels conformed to the work and being supported for aligning adjustment, coacting retaining members having tongues projecting into the channels to engage the work as it is delivered from the second pair of forming rolls, channeled work supporting rollers disposed at the rear of said supporting members, means for laterally adjusting such supporting rollers, laterally floating retaining rollers disposed between said work supporting members and rollers to engage the work carried thereby, and work retaining and guiding rollers adjustably mounted above and at the rear of said supporting rollers to engage within the conformed work.

14. In a structure of the class described, the combination of coacting pairs of forming rolls, said forming rolls being adapted to act on a plurality of strips, a stock feeding table disposed in advance of the first pair of forming rolls, guide members individually adjustable on said feed table for guiding the stock to the forming rollers, work supporting members disposed at the rear of the second pair of forming rolls to receive the work therefrom, said members having channels conformed to the work and being supported for aligning adjustment, coacting retaining members having tongues projecting into the channels to engage the work as it is delivered from the second pair of forming rolls, channeled work supporting rollers disposed at the rear of said supporting members, means for laterally adjusting such supporting rollers, laterally floating retaining rollers disposed between said work supporting members and rollers to engage the work carried thereby, and work retaining and guiding rollers adjustably mounted above and at the rear of said supporting rollers to engage within the conformed work.

15. In a structure of the class described, the combination of coacting pairs of forming rolls, said forming rolls being adapted to act on a plurality of strips, work supporting members disposed at the rear of the second pair of forming rolls to receive the work therefrom, said members having channels conformed to the work and being supported for aligning adjustment, coacting retaining members having tongues projecting into the channels to engage the work as it is delivered from the second pair of forming rolls, channeled work supporting rollers disposed at the rear of said supporting members, means for laterally adjusting such supporting rollers, laterally floating retaining rollers disposed between said work supporting members and rollers to engage the work carried thereby, and work retaining and guiding rollers adjustably mounted above and at the rear of said supporting rollers to engage within the conformed work.

16. In a structure of the class described, the combination of coacting pairs of forming rolls, said forming rolls being adapted to act on a plurality of strips, a stock feeding table disposed in advance of the first pair of forming rolls, guide members individually adjustable on said feed table for guiding the stock to the forming rollers, a support disposed between the pairs of forming rolls in alignment with the bites thereof and having closed guides for the work, work supporting members disposed at the rear of the second pair of forming rolls to receive the work therefrom, said members having channels conformed to the work and being supported for aligning adjustment, and coacting retaining members having tongues projecting into the channels to engage the work as it is delivered from the second pair of forming rolls.

17. In a structure of the class described, the combination of a plurality of coacting pairs of forming rolls, said forming rolls being disposed side by side and adapted to act on a plurality of strips, a stock feeding table disposed in advance of the forming rolls, guide members individually adjustable on said feed table for guiding the stock to the forming rollers, and a support disposed at the rear of said forming rolls in alignment with the bites thereof and having closed guides for the work.

18. In a structure of the class described, the combination of a pair of initial coacting forming rolls, one of which has peripherial grooves of rectangular cross section and the other coacting peripheral ribs having A-shaped peripheries, a second pair of coacting forming rolls, one of which has peripheral grooves of a dimension adapted to receive the conformed stock and the other peripheral

flanges coacting with said grooves to form the stock, a support disposed between the pairs of forming rolls in alignment with the bites thereof and having V-shaped grooves therein conformed to the material as discharged from the first forming rolls, and a retaining plate having V-shaped ribs on its under side coacting with said grooves to support the stock therein as it is guided to the second pair of forming rolls.

19. In a structure of the class described, the combination of a pair of coacting forming rolls adapted to simultaneously act upon a plurality of strips of stock, a stock feeding table disposed in advance of said forming rolls, guide blocks having grooves on their under sides adapted to engage the strips for guiding them to the forming rolls, and screws provided with spaced collars engaging said blocks whereby they may be individually adjusted to guide the stock to the forming rolls.

20. In a structure of the class described, the combination of a pair of coacting forming rolls adapted to simultaneously act upon a plurality of strips of stock, a stock feeding table disposed in advance of said forming rolls, guide blocks having grooves on their under sides adapted to engage the strips for guiding them to the forming rolls, and screws for individually adjusting said guide blocks.

21. In a structure of the class described, the combination of a plurality of pairs of coacting forming rolls disposed side by side and adapted to simultaneously act upon a plurality of strips of stock, a stock feeding table disposed in advance of said forming rolls, guide members for guiding the strips on said table to the forming rolls, and means for individually adjusting said guide members.

22. In a structure of the class described, the combination of a pair of coacting forming rolls, a stock feeding table disposed in advance of said forming rolls, a guide block having a groove on its under side adapted to engage the strip for guiding it to the forming rolls, and a screw provided with spaced collars engaging said block whereby it may be adjusted to guide the stock to the forming rolls.

23. In a structure of the class described, the combination of a pair of coacting forming rolls, a stock feeding table having a flat face across which the stock is fed disposed in advance of said forming rolls, a guide block having a groove on its under side adapted to engage the strip for guiding it to the forming rolls, and means for adjusting said guide block and supporting it in its adjusted position.

24. In a structure of the class described, the combination of a pair of coacting forming rolls, one of which has peripheral grooves and the other coacting peripheral ribs whereby a plurality of strips may be simultaneously acted upon, supporting and guiding members disposed at the rear of the forming rolls and projecting into the grooves of the grooved roll, said members having U-shaped channels and being supported for vertical and lateral adjustment, coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the forming rolls, channeled supporting rollers disposed at the rear of said supporting and guiding members and in spaced relation thereto, means for laterally adjusting such supporting rollers, laterally floating retaining rollers disposed in advance of said supporting rollers and having peripheral flanges adapted to engage within the channels of the work, retaining and guiding rollers disposed above and at the rear of said supporting rollers and adapted to engage within the conformed work supported by such rollers, and means for adjusting such rollers.

25. In a structure of the class described, the combination of a pair of coacting forming rolls, one of which has peripheral grooves and the other coacting peripheral ribs whereby a plurality of strips may be simultaneously acted upon, supporting and guiding members disposed at the rear of the forming rolls and projecting into the grooves of the grooved roll, said members having U-shaped channels and being supported for vertical and lateral adjustment, coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the forming rolls, channeled supporting rollers disposed at the rear of said supporting and guiding members and in spaced relation thereto, means for laterally adjusting such supporting rollers, retaining and guiding rollers disposed above and at the rear of said supporting rollers and adapted to engage within the conformed work supported by such rollers, and means for adjusting such rollers.

26. In a structure of the class described, the combination of a pair of coacting forming rolls, one of which has peripheral grooves and the other coacting peripheral ribs whereby a plurality of strips may be simultaneously acted upon, supporting and guiding members disposed at the rear of the forming rolls and projecting into the grooves of the grooved roll, said members having U-shaped channels and being supported for vertical and lateral adjustment, coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the forming rolls, channeled supporting rollers disposed at the rear of said supporting and

guiding members and in spaced relation thereto, and means for laterally adjusting such supporting rollers.

27. In a structure of the class described, the combination of a pair of coacting forming rolls, one of which has peripheral grooves and the other coacting peripheral ribs whereby a plurality of strips may be simultaneously acted upon, supporting and guiding members disposed at the rear of the forming rolls and projecting into the grooves of the grooved roll, said members having U-shaped channels and being supported for vertical and lateral adjustment, and coacting retaining members having tongues projecting forwardly into the channels to engage the work as it is delivered from the forming rolls.

28. In a structure of the class described, the combination of a pair of coacting forming rolls, a work supporting member disposed at the rear of the forming rolls to receive the work therefrom, said member having a channel conformed to the work and being supported for aligning adjustment, a coacting retaining member projecting into the channel to engage the work as it is delivered from the forming rolls, a channeled work supporting roller disposed at the rear of said supporting member, means for laterally adjusting such supporting roller, a laterally floating retaining roller disposed between said work supporting member and roller to engage the work carried thereby, and a work retaining and guiding roller adjustably mounted above and at the rear of said supporting roller to engage within the conformed work.

29. In a structure of the class described, the combination of a pair of coacting forming rolls, a work supporting member disposed at the rear of the forming rolls to receive the work therefrom, said member having a channel conformed to the work and being supported for aligning adjustment, a coacting retaining member projecting into the channel to engage the work as it is delivered from the forming rolls, a channeled work supporting roller disposed at the rear of said supporting members, means for laterally adjusting such supporting roller, and a work retaining and guiding roller adjustably mounted above and at the rear of said supporting roller to engage within the conformed work.

30. In a structure of the class described, the combination of a pair of coacting forming rolls, a work supporting member disposed at the rear of the forming rolls to receive the work therefrom, said member having a channel conformed to the work and being supported for aligning adjustment, and a coacting retaining member projecting into the channel to engage the work as it is delivered from the forming rolls.

31. In a structure of the class described, the combination of a pair of coacting forming rolls adapted to simultaneously act on a plurality of strips, channeled work supporting rollers, means for laterally adusting such supporting rollers, laterally floating retaining rollers disposed in front of said work supporting rollers to engage the work carried thereby, and work retaining and guiding rollers adjustably mounted above and at the rear of said supporting rollers to engage within the work.

32. In a structure of the class described, the combination with coacting forming rolls, of work supporting and guiding means disposed at the rear of said forming rolls and comprising channeled supporting rollers, means for laterally adjusting such supporting rollers, a laterally floating retaining roller disposed in advance of said supporting rollers adapted to engage within the work, retaining and guiding rollers disposed above and at the rear of said supporting rollers and adapted to engage within the conformed work by such rollers, means for vertically adjusting such rollers, and a channeled guide member disposed at the rear of said rollers.

33. In a structure of the class described, the combination with coacting forming rolls, of work supporting and guiding means disposed at the rear of said forming rolls and comprising channeled supporting rollers, means for laterally adjusting such supporting rollers, and a laterally floating retaining roller disposed in advance of said supporting rollers adapted to engage within the work.

34. In a structure of the class described, the combination with coacting forming rolls, of work supporting and guiding means disposed at the rear of said forming rolls and comprising channeled supporting rollers, means for laterally adjusting such supporting rollers, retaining and guiding rollers disposed to engage the work supported by such rollers, means for adjusting such rollers, and a channeled guide member disposed at the rear of said rollers.

35. In a structure of the class described, the combination with coacting forming rolls, of work supporting and guiding means disposed at the rear of said forming rolls and comprising channeled supporting rollers, means for laterally adjusting such supporting rollers, retaining and guiding rollers disposed to engage the work supported by such rollers, and means for adjusting such rollers.

36. In a structure of the class described, the combination with a work forming means, of a carriage mounted at the rear of said work forming means to reciprocate in the longitudinal path of the work, a shear block carried by said carriage, a coacting pivotally mounted cutter, a cam for actuating said

cutter, means for actuating said cam comprising a rack, and a gear connected to said cam and coacting with said rack whereby the cam is actuated upon the reciprocation of the carriage.

37. In a structure of the class described, the combination of a supporting bar, arms carried by said bar, supporting rods mounted on said arms, a pair of trough members pivotally mounted on said rods to close with their edges together to receive the work or to swing apart to discharge the same, a reciprocating carriage, cams carried thereby for actuating said trough members, a driving clutch for said carriage, a control means therefor comprising an electromagnet, and a contact member for said electromagnet positioned to be engaged by the work delivered to the trough which constitutes a circuit closing means whereby the electromagnet is actuated.

38. In a structure of the class described, the combination of a pair of trough members pivotally mounted to close to receive the work or to swing apart to discharge the same, a reciprocating cutter carriage, means carried thereby for actuating said trough members, a driving clutch for said carriage, a control means therefor comprising an electromagnet, and a contact member for said electromagnet positioned in the trough to be engaged by the work which constitutes circuit closing means whereby the electromagnet is actuated.

39. In a structure of the class described, the combination of a forming means comprising forming rolls whereby the stock is conformed and advanced, a stock slitting means comprising feed rolls and slitting rolls, a driving means for said feed and slitting rolls comprising a clutch, and a clutch control means comprising a member engaging the stock between the slitting rolls and forming means.

40. In a structure of the class described, the combination with a forming means, a stock slitting means comprising feed rolls, driving means for said feed rolls comprising a clutch, and a clutch control means comprising a member engaging the stock between the slitting rolls and the forming means.

41. In a structure of the class described, the combination with a forming means, a stock preparing means, driving means for said stock preparing means, and a control means for said stock preparing means comprising a member engaging the stock between the stock preparing means and the forming means.

In witness whereof, I have hereunto set my hand and seal.

BERT L. VAN ORMAN, [L. S.]