May 6, 1924.

1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

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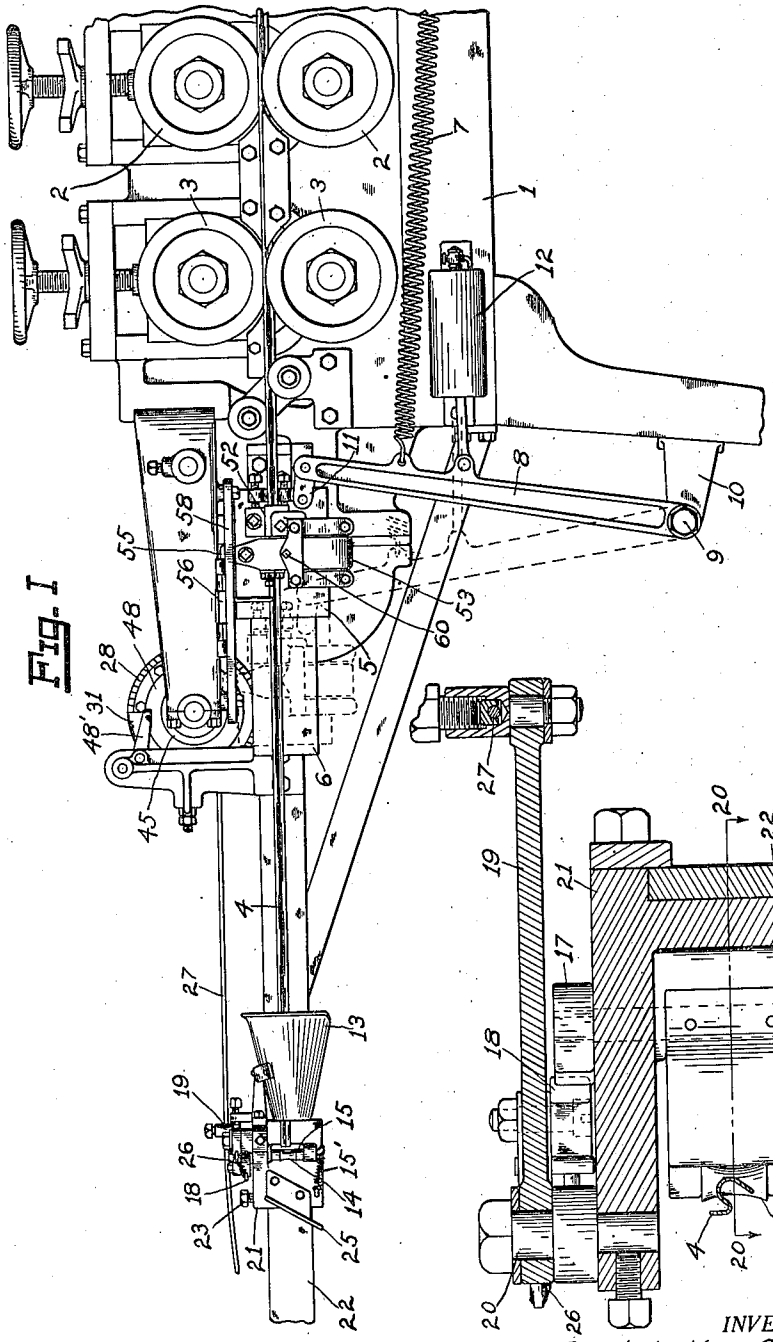


Fig. I

Fig. XIX

INVENTOR.
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BY
Chappell & Earl
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May 6, 1924.

1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

Filed May 15, 1922

10 Sheets-Sheet 2

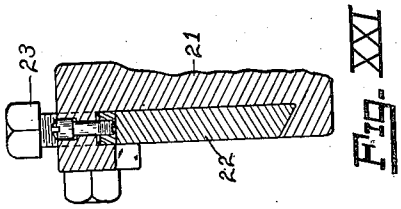


Fig. XXI

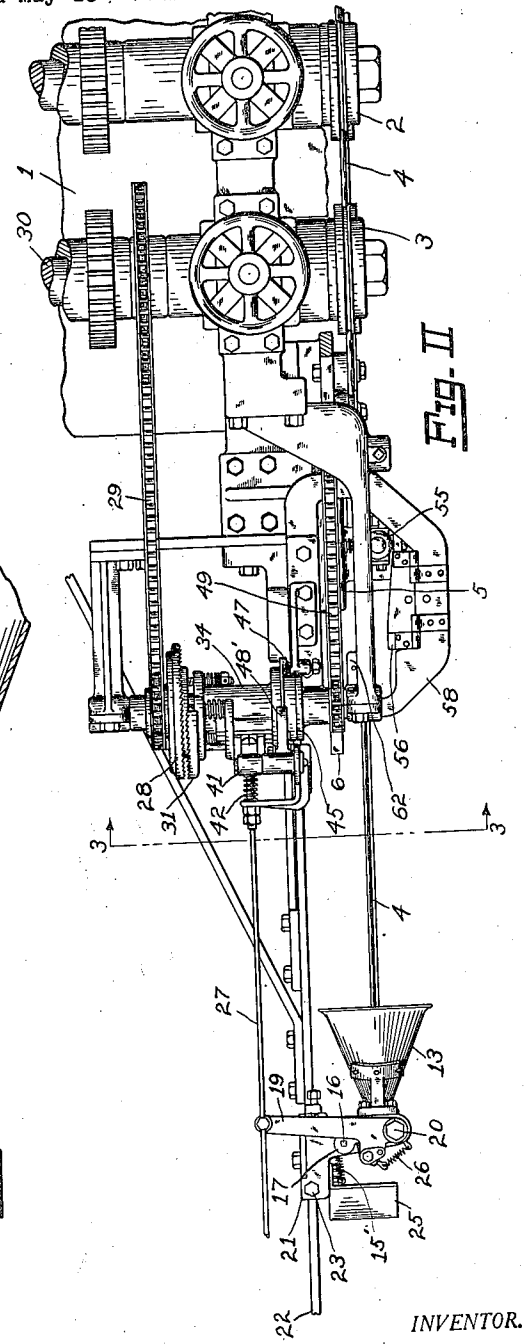


Fig. II

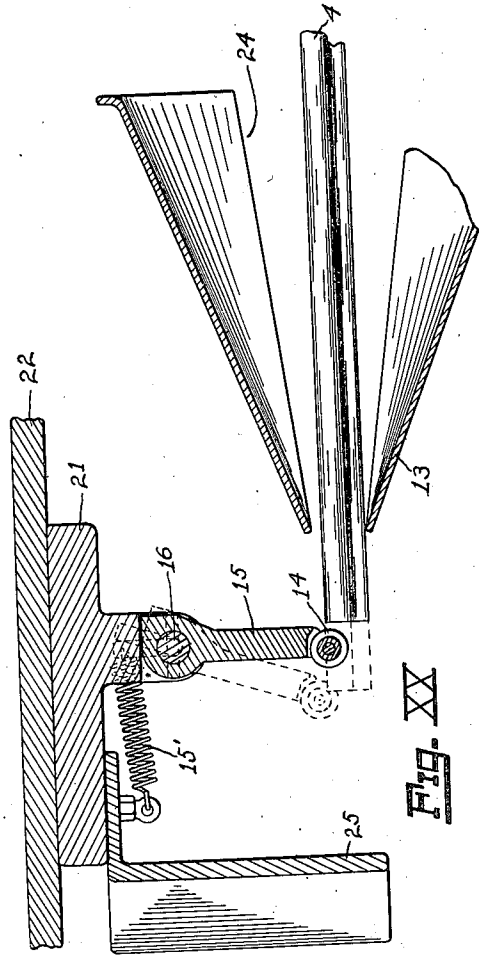


Fig. XX

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May 6, 1924. 1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

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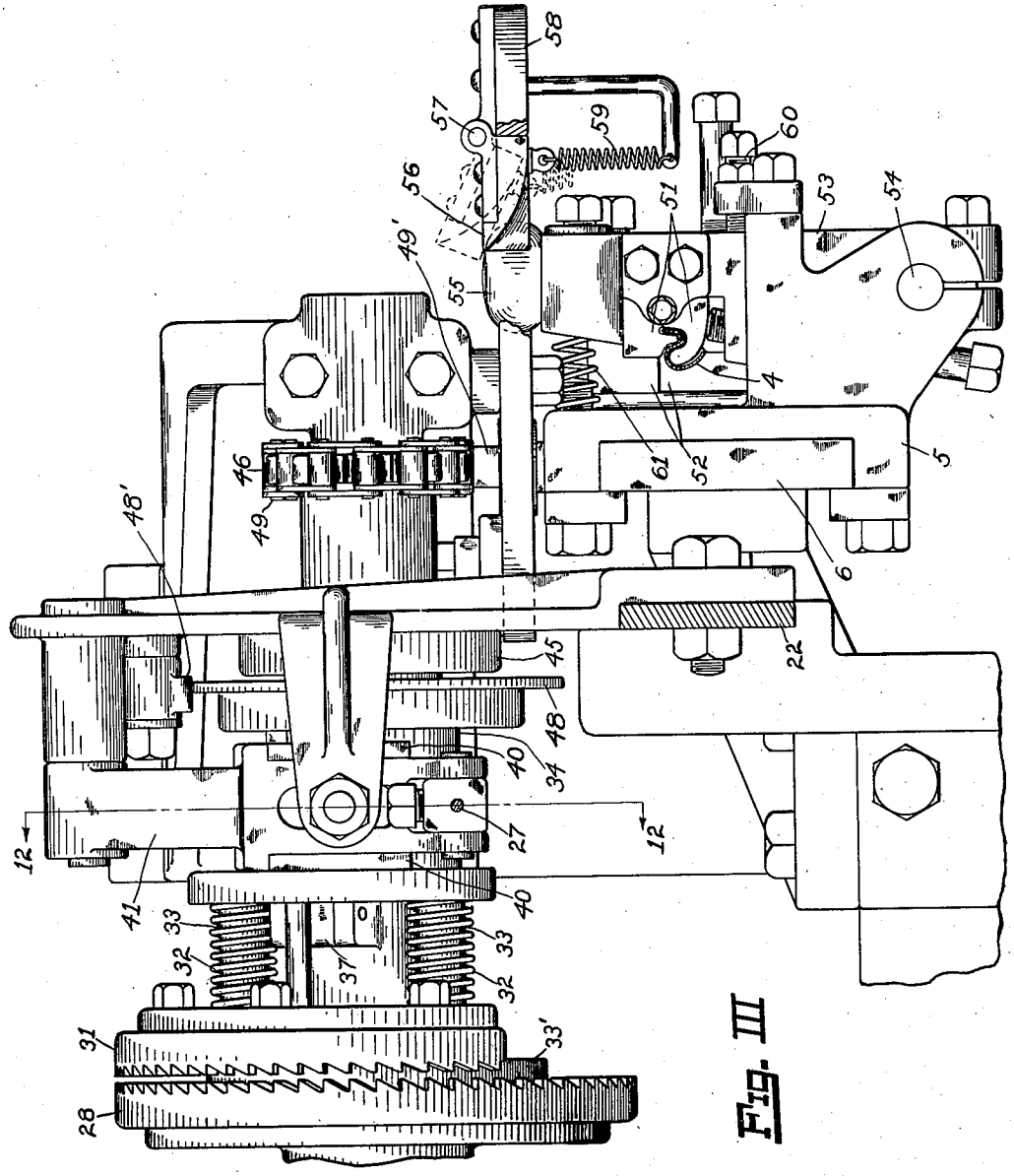


Fig. III

INVENTOR.
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May 6, 1924. 1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

Filed May 15, 1922 10 Sheets-Sheet 4

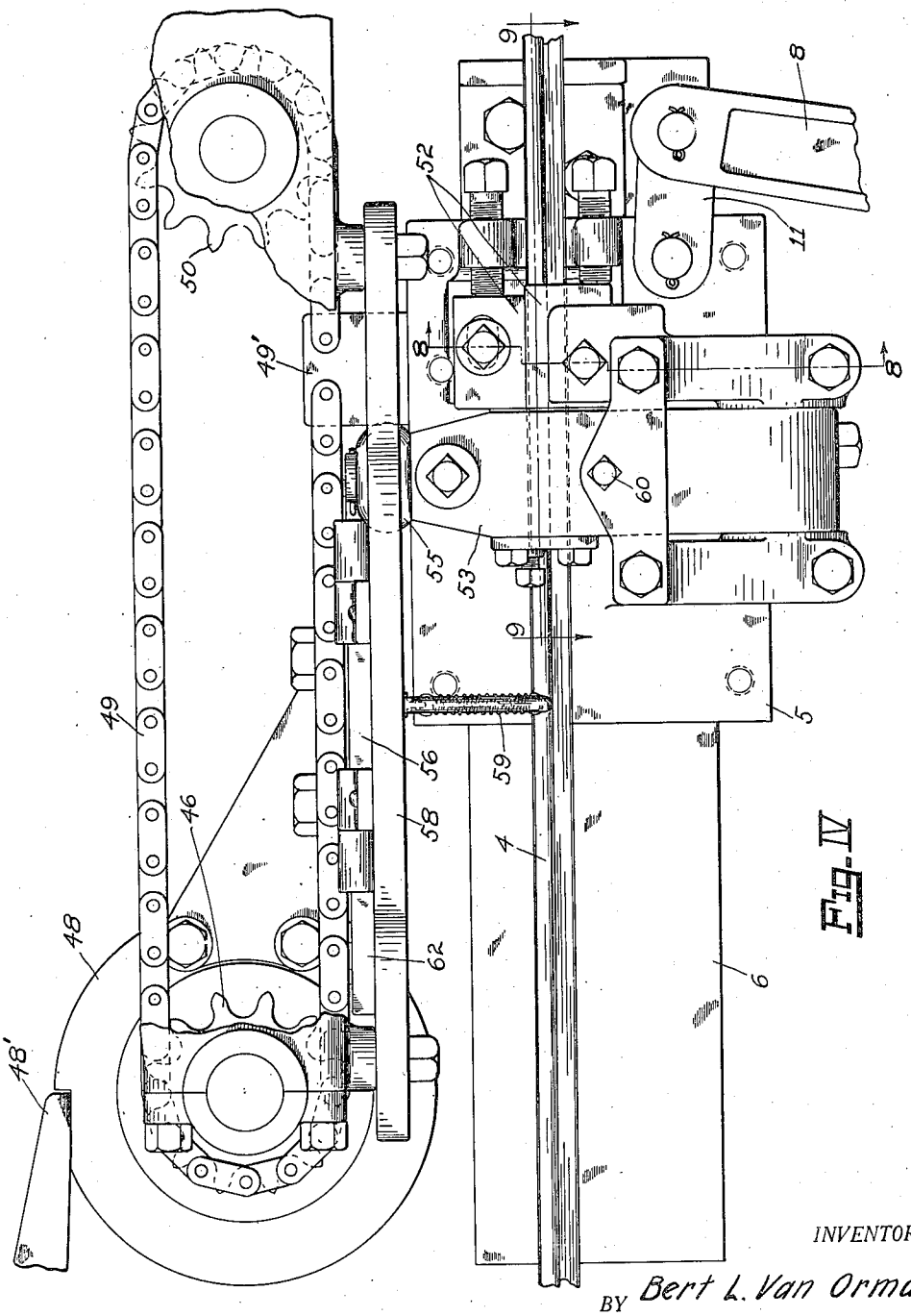


FIG. 4.

INVENTOR.

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May 6, 1924.

1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

Filed May 15 1922 10 Sheets-Sheet 5

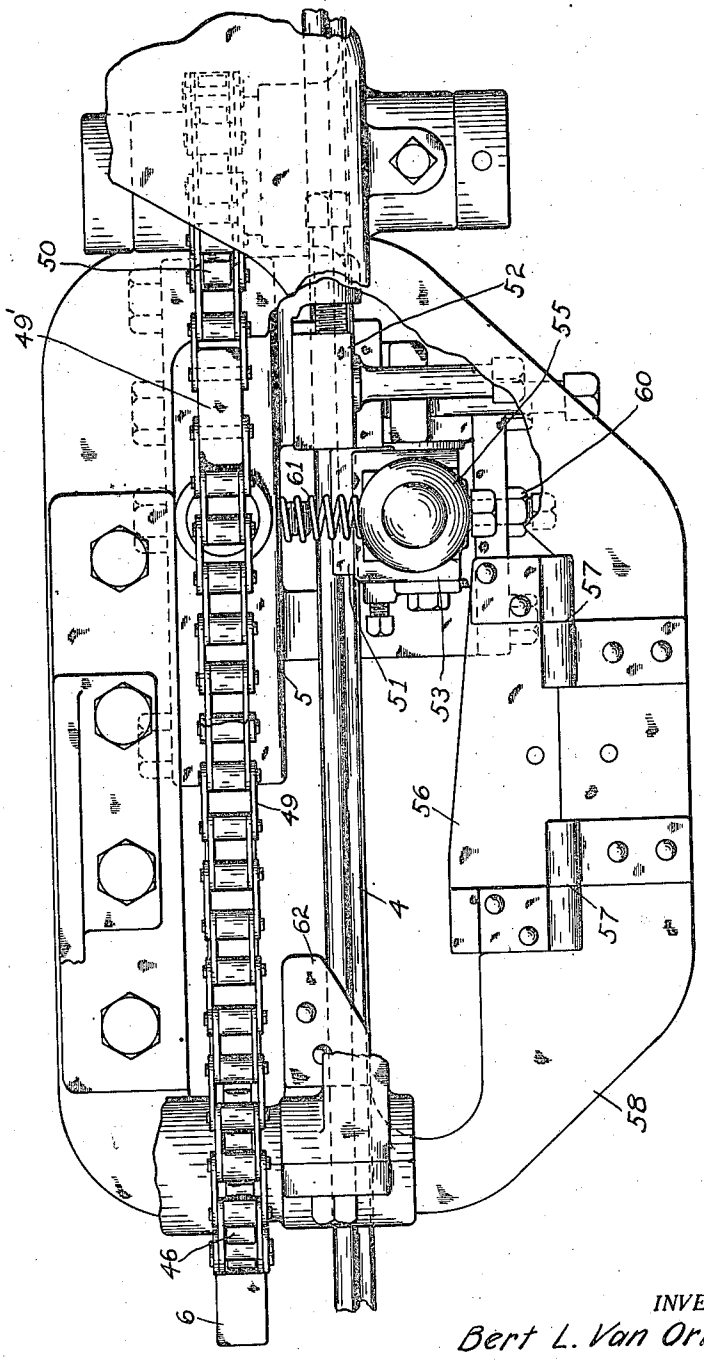


Fig. V

INVENTOR.
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May 6, 1924.

1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

Filed May 15, 1922

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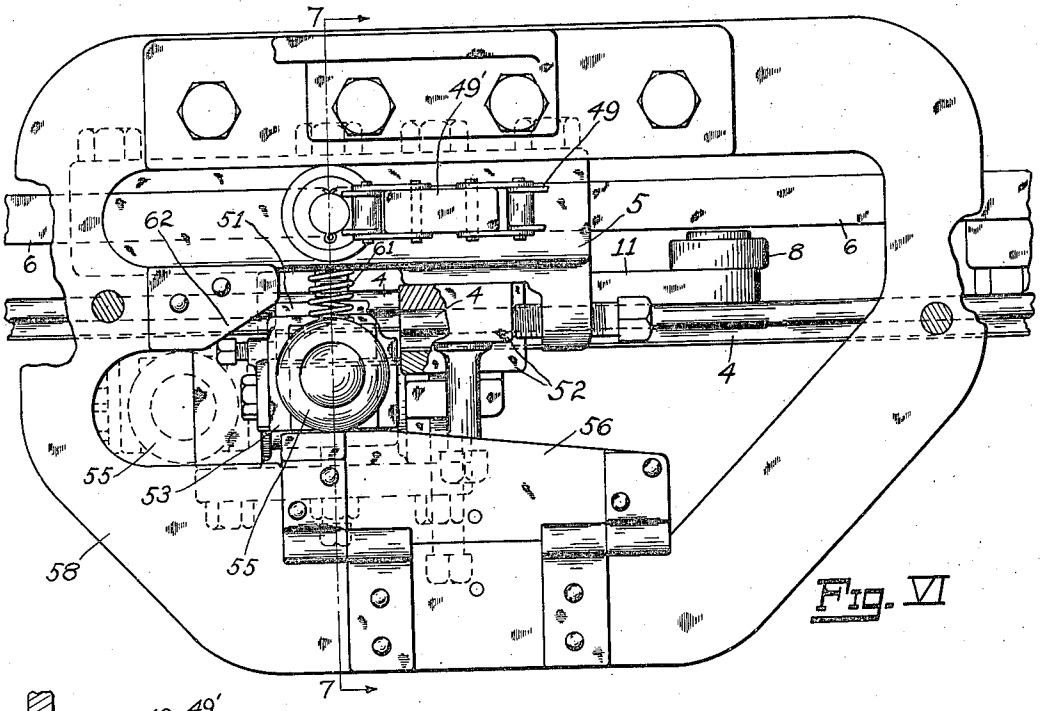


Fig. VI

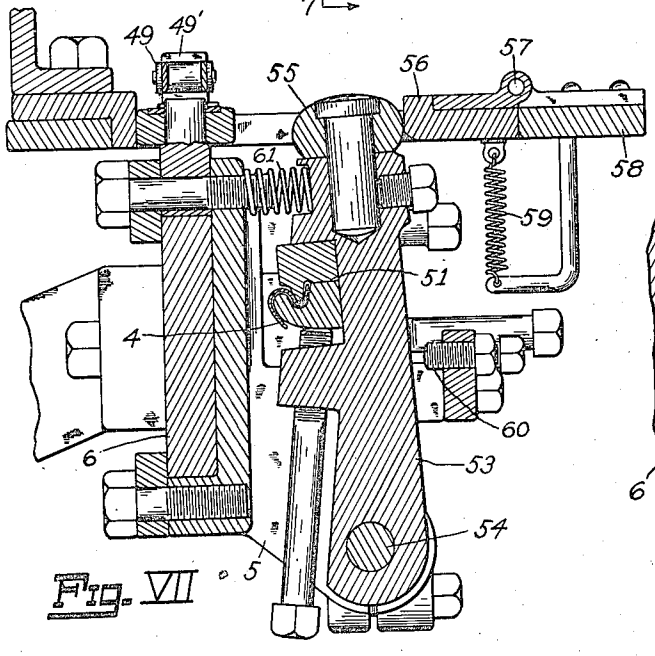


Fig. VII

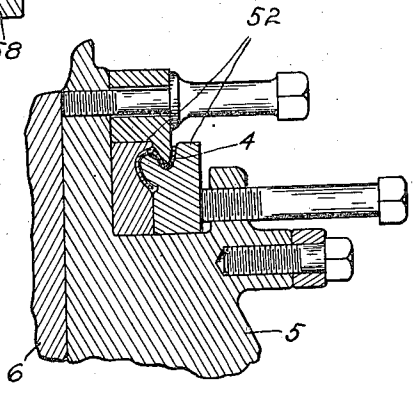


Fig. VIII

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1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

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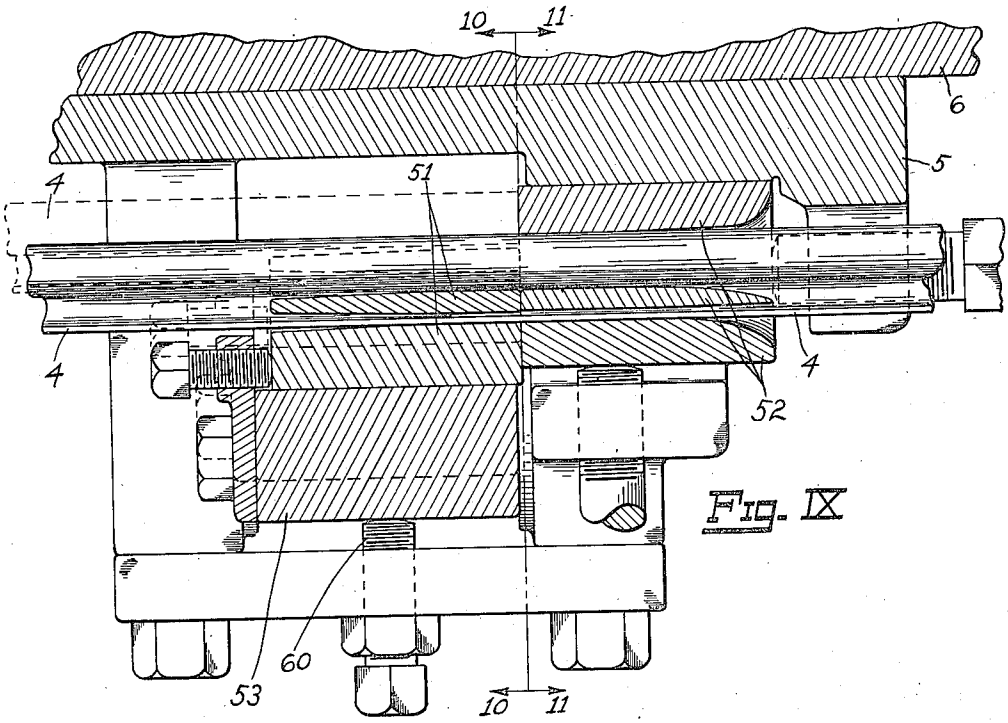


FIG. IX

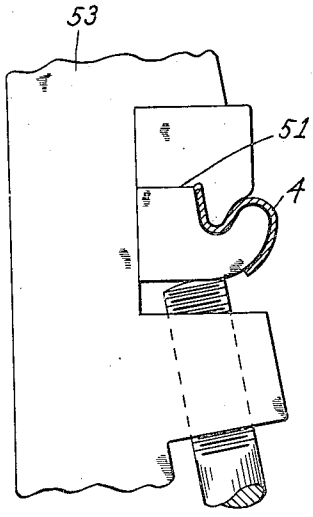


FIG. X

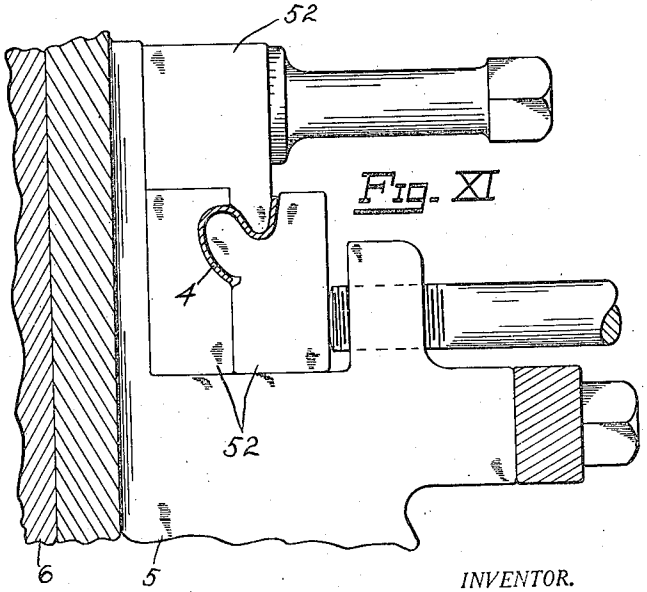


FIG. XI

INVENTOR.

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B. L. VAN ORMAN

METAL BENDING MACHINE

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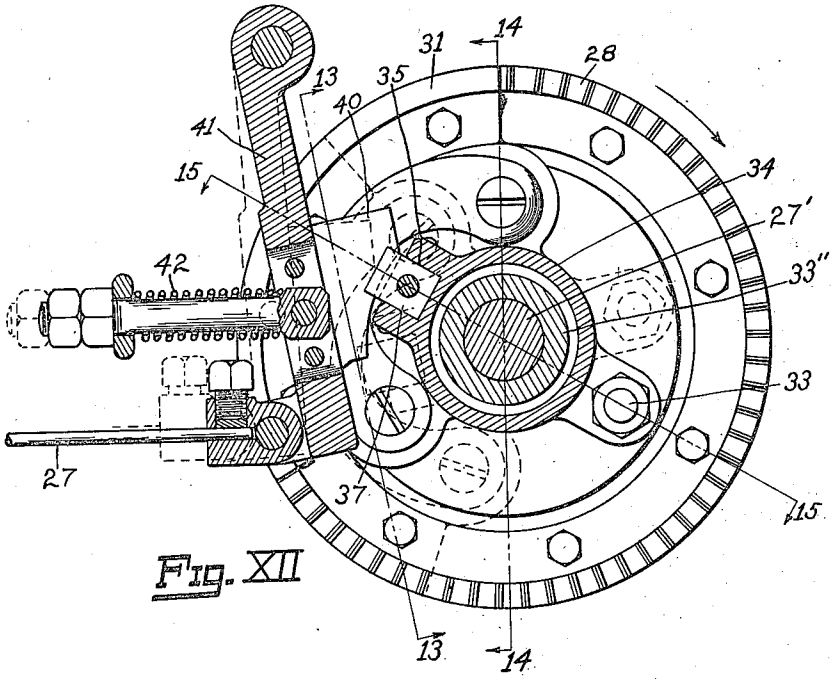


FIG. XII

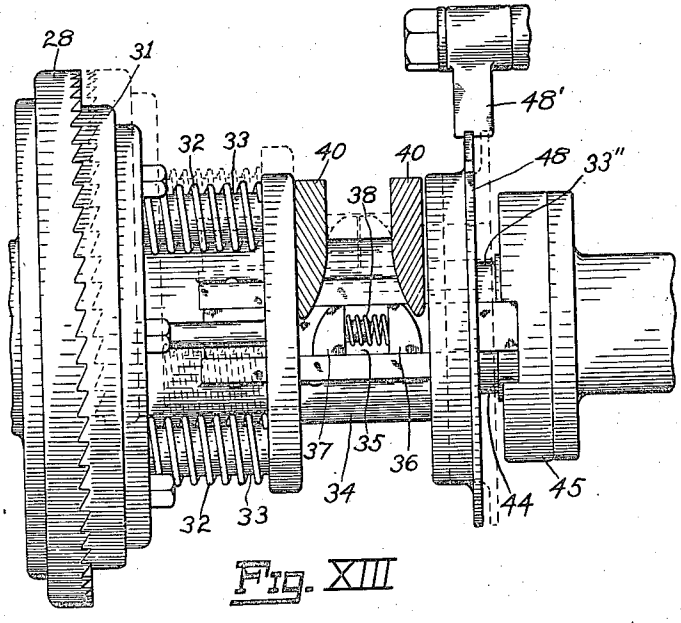


FIG. XIII

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1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

Filed May 15, 1922

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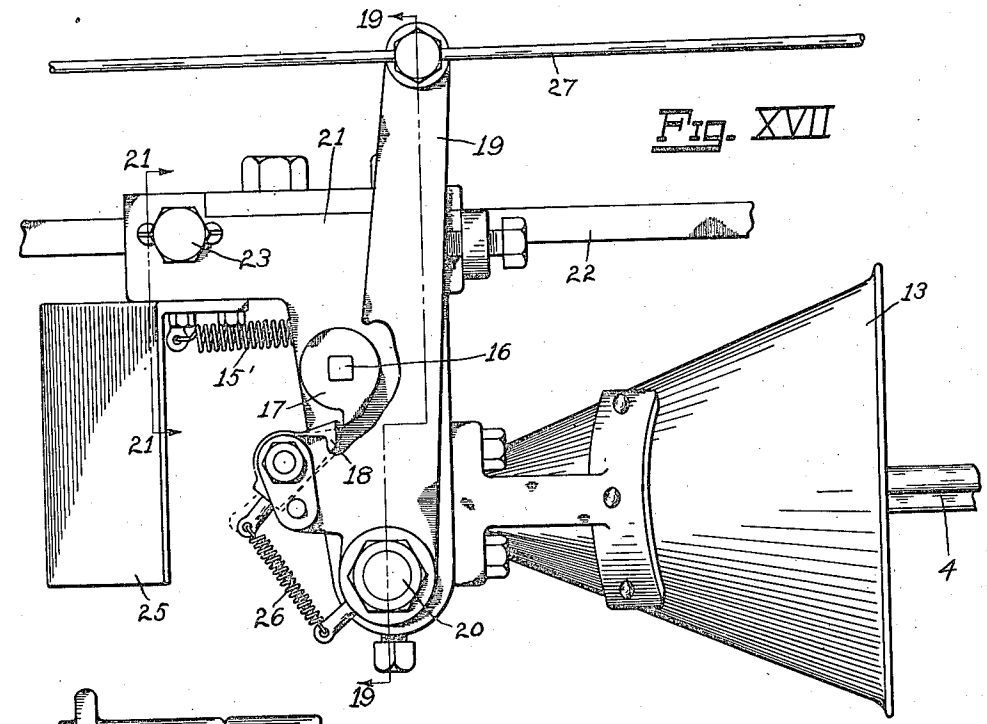


Fig. XVII

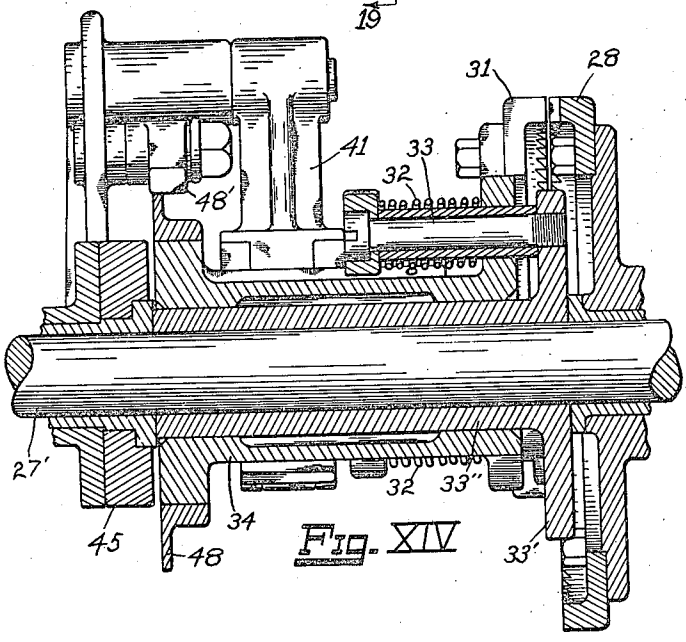


Fig. XIV

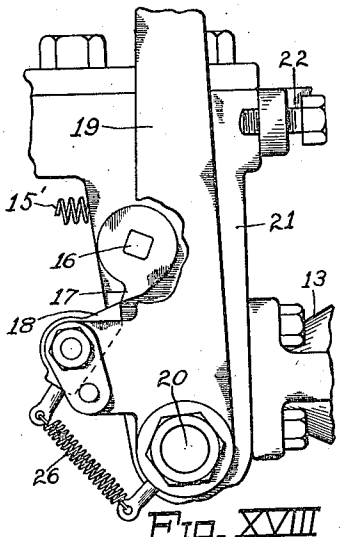


Fig. XVIII

INVENTOR.

Bert L. Van Orman

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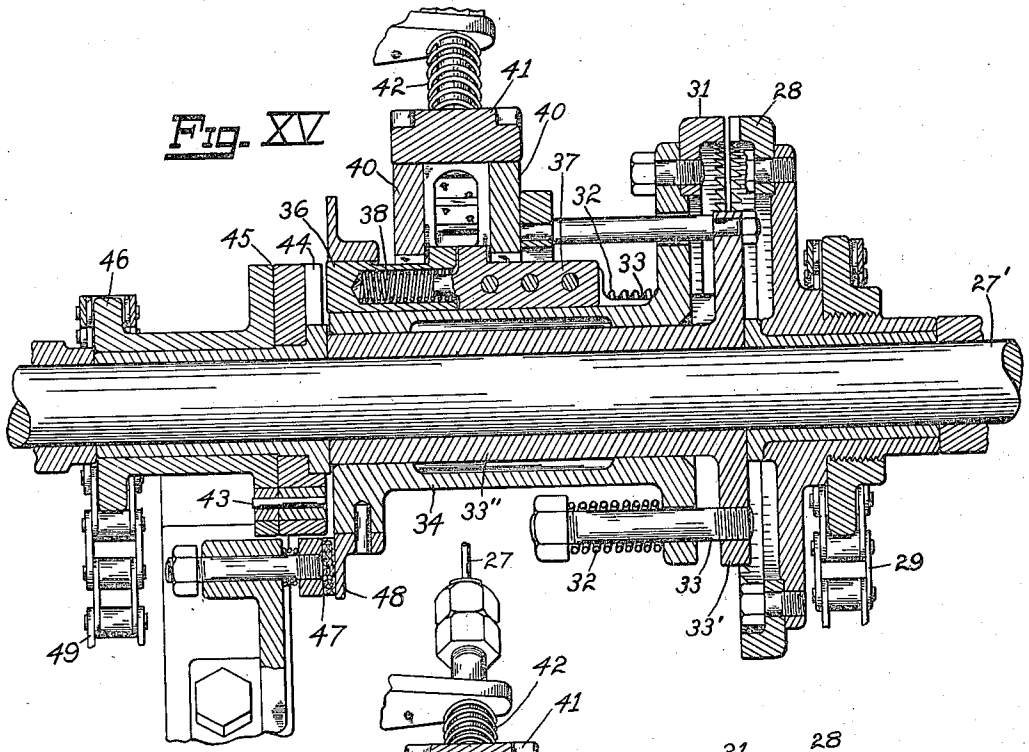
May 6, 1924. 1,493,169

B. L. VAN ORMAN

METAL BENDING MACHINE

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Fig. XV



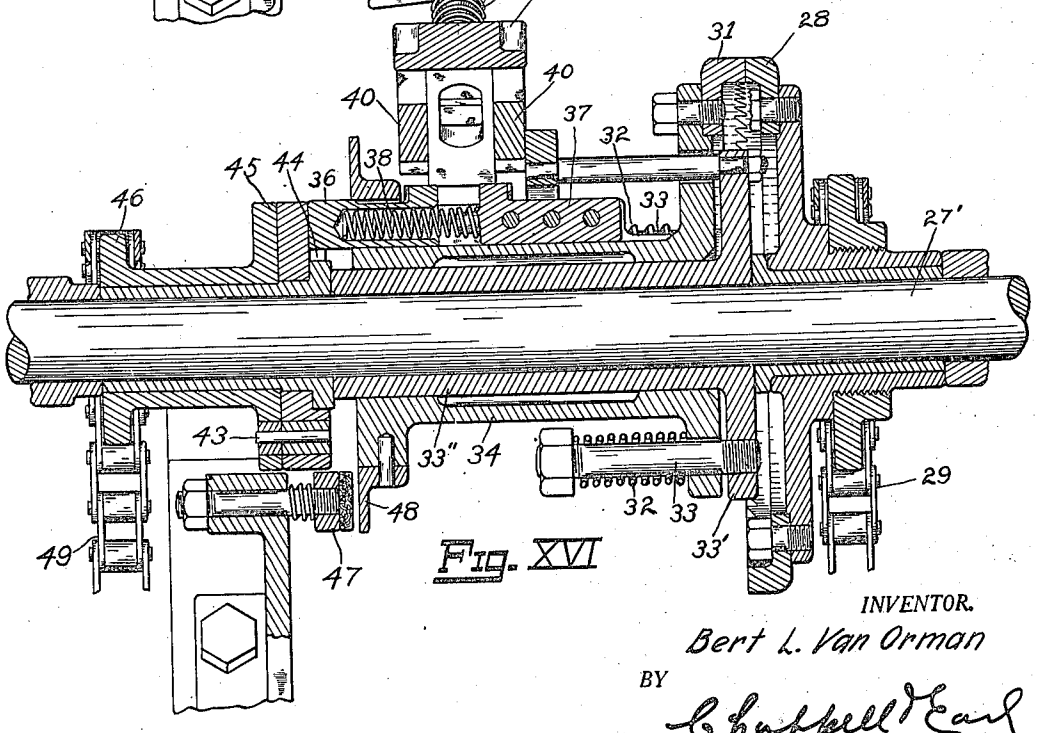


Fig. XVI

INVENTOR.

Bert L. Van Orman

BY

Chappell & Earl

ATTORNEYS

17-15

Patented May 6, 1924. 1,493,169

UNITED STATES PATENT OFFICE.

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

METAL-BENDING MACHINE.

Application filed May 15, 1922. Serial No. 561,085.

To all whom it may concern:

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

This invention relates to improvements in metal bending machines.

In the operations of metal bending machines for forming corrugated, grooved or flanged strips from spools of band iron or the like, it is desirable to feed the stock continuously through the forming rolls. It has heretofore been the practice to sever or partially sever the metal prior to its being formed up. This has not resulted in a product of uniform length, and to stop the machine on the forming of every strip not only subjects the machine to wear and tear and shock in starting and stopping, but also materially limits the output.

It is the main object of this invention to provide an improved metal bending machine in which the strips are cut off after forming and strips of uniform length are secured.

A further object is to provide an improved metal bending or forming machine of a large output. A still further object is to provide a machine having these advantages which is not likely to get out of repair in use and is automatic in its operation.

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 embodying the features of my invention is fully illustrated in the accompanying drawing forming a part of this specification, in which:

Figure I, Sheet 1, is a side elevation of my improved metal bending machine, the front portion including a part of the forming rolls being omitted.

Fig. II, Sheet 2, is a detail plan view of the rear portion of the machine.

Fig. III, Sheet 3, is a fragmentary rear elevation partially in section on a line corresponding to line 3—3 of Fig. II.

Fig. IV, Sheet 4, is a detail elevation looking from the right of Fig. III showing details of the cutter and of the mechanism directly associated therewith.

Fig. V, Sheet 5, is a fragmentary plan view of portions of the cut-off mechanism shown in Fig. IV with the parts in their initial position.

Fig. VI, Sheet 6, is a fragmentary view of the parts shown in Fig. V at the end of the work or severing stroke.

Fig. VII, Sheet 6, is a fragmentary section on a line corresponding to line 7—7 of Fig. VI.

Fig. VIII, Sheet 6, is a detail section on a line corresponding to line 8—8 of Fig. IV showing further details of the cut-off mechanism.

Fig. IX, Sheet 7, is an enlarged detail section on a line corresponding to line 9—9 of Fig. IV, showing details of the cut-off dies.

Fig. X, Sheet 7, is a view of the swinging cutter taken from a line corresponding to line 10—10 of Fig. IX.

Fig. XI, Sheet 7, is a view of the other cutter taken from a line corresponding to line 11—11 of Fig. IX.

Fig. XII, Sheet 8, is a detail section on a line corresponding to line 12—12 of Fig. III showing details of the cut-off driving clutch and its control means.

Fig. XIII, Sheet 8, is a detail view, partially in section, on a line corresponding to line 13—13 of Fig. XII showing further details of the cut-off driving means.

Fig. XIV, Sheet 9, is a detail section on a line corresponding to line 14—14 of Fig. XII.

Fig. XV, Sheet 10, is a detail view partially in section on a line corresponding to line 15—15 of Fig. XII showing details of the driving means with the clutch in disengaged position.

Fig. XVI, Sheet 10, is a detail section corresponding to that of Fig. XV with the clutch engaged and the parts in driving relation.

Fig. XVII, Sheet 9, is a fragmentary

view of the trip or control means for the cut-off driving mechanism.

Fig. XVIII, Sheet 9, is a detail view of the parts shown in Fig. XVII in actuated position.

Fig. XIX, Sheet 1, is a detail view, partially in vertical section, on a line corresponding to the broken line 19—19 of Fig. XVII.

Fig. XX, Sheet 2, is a detail view partially in vertical longitudinal section on a line corresponding to line 20—20 of Fig. XIX.

Fig. XXI, Sheet 2, is a detail transverse section on a line corresponding to line 21—21 of Fig. XVII.

In the drawing 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 refer to similar parts throughout the several views.

Referring to the drawing, 1 represents the main frame of the machine which is designed to support the various moving parts. As the structural details of the frame form no part of this invention they are not described herein.

The forming rolls 2, 2 and 3, 3 are arranged in coacting pairs. The driving means for these forming rolls is not illustrated nor have I illustrated the feed rolls and stock spool supporting means. The machine illustrated is especially designed for forming metal into strips 4 of S-cross section adapted for use in the manufacture of cushion springs. However, my improvements are desirable for use in machines for forming or bending various other shapes.

At the rear of the forming rolls a carriage 5 is reciprocatingly mounted upon the slideway 6. This carriage is returned to and held normally in its initial or forward position by means of the coiled spring 7 which is secured at one end to the frame and at its other end to a lever 8 pivoted at 9 on the bracket 10 of the frame and connected to the carriage 5 by the link 11. (See Fig. I.) A dashpot 12 checks the return of the carriage.

The movement of the carriage is controlled by the formed strips 4 which enter the conical guide 13 and are guided thereby against the roller 14 of the trip 15. This trip 15 is mounted on a pivot 16 having a finger 17 on its upper end adapted to engage the dog 18 on the actuating lever 19. This actuating lever 19 is pivoted at 20 on a bracket 21 carried by the bar 22 projecting rearwardly from the main frame. This bracket also carries the trip lever and parts connected thereto.

This bracket 21 is adjustably secured to the bar 22 by means of the set screw 23 (see Figs. XVII and XXI) so that the bracket is securely retained in its adjusted positions. The conical guide 13 is open at 24 on its under side and a stop plate 25 is provided with which the end of the strip 4 engages at about the time it is severed so that the severed strip drops through the hole 24 in the guide.

A spring 15′ (see Fig. XX) yieldingly holds the trip 15 in its initial position. When the trip is actuated by the work 4 engaging the trip its finger 17 is swung into engagement with the dog 18 of the actuating lever 19 swinging the lever rearwardly as is indicated in Fig. XVIII. As soon as the lever 19 has swung far enough to allow the finger 17 to pass the dog 18, the lever 19 is brought back to initial position by the pull from a spring 42 on a connecting rod 27. The dog 18 is held yieldingly in position by the coiled spring 26 which allows the dog to swing far enough to let the finger 17 pass on its return stroke (see dotted lines in Fig. XVII).

The actuating lever 19 is connected by the rod 27 to the driving clutch of the cut-off mechanism. This driving clutch comprises a toothed driving member 28 which is constantly driven by the sprocket chain 29 in the embodiment illustrated (see Fig. II), this sprocket chain being driven from the shaft 30 of one of the forming rolls. However, as the driving connections for the driving clutch member are not a part of this invention they are not further described herein. The driving clutch member is mounted on the shaft 27′.

The driven clutch member 31 is toothed to coact with the driving clutch member and is mounted for longitudinal movement relative thereto, being urged to engaging position (see Figs. III and XVI) by the coiled springs 32 carried by the pins 33. The pins 33 are carried by the flange 33′ of the sleeve 33″ on the shaft 27′. The driven clutch member 31 is provided with a barrel-like hub 34 slidable on the sleeve 33″ and having a longitudinal groove-like slideway 35 therein for the driving dog 36 (see Fig. XIII). The clutch releasing lug 37 is for convenience secured in this groove way (see Figs. XV and XVI). The coiled spring 38 urges the driving dog into engaging position, the spring being arranged between the dog 36 and the lug 37.

The dog 36 and the lug 37 project into the path of the fingers 40 of the clutch releasing lever 41 which is connected to be actuated by the rod 27. The lever 41 is held yieldingly in clutch releasing position by means of the coiled spring 42. When the lever 41 is retracted the fingers 40 are drawn out of engagement with the lug 37, allowing the driven clutch member to engage the driving clutch member and also allowing the dog 36 to engage the notch 44 in the disk 45 secured to the sprocket wheel 46 so that

the sprocket wheel is driven for one revolution of the clutch, the clutch being released and the driving dog retracted upon the completion of the revolution by fingers 40 of the releasing lever 41 (see Fig. XIII) so that the clutch is disengaged on the completion of each work stroke. As a protection against the breakage of parts the disk 45 is preferably composed of two sections held in proper relation to each other by a shearing pin 43 that is designed to yield to any undue strain that may be imposed upon the clutch.

A friction brake 47 is provided to engage with the flange 48 on the driven clutch member hub 34, when the clutch is released, thereby preventing the overthrow of the clutch. To prevent the retrograde movement of the carriage 5 and sprocket 46 from causing a reverse revolution of the clutch, a dog 48′ is arranged to drop into a notch in the flange 48, when the clutch has completed its revolution, thereby allowing the clutch to rotate only in one direction.

The sprocket wheel 46 is connected to the carriage 5 by means of the sprocket chain 49 so that when the clutch is engaged the carriage is moved on its forward stroke, it being returned by the spring 7 described. This sprocket chain 49 is connected to a stud 49′ on the carriage and is passed over a supporting sprocket 50 (see Figs. IV and V).

The carriage 5 carries a pair of cutters 51 and 52 that are provided with an opening or passage of substantially the same cross section as the stock 4, through which the latter passes while the carriage 5 is on its return stroke and at rest.

As shown in the drawings each cutter is composed of two or more parts, for convenience in manufacture, and provision is made for accurate adjustment of the shearing faces. The cutter 51 is carried by the cutter member 53 pivoted at 54 and normally held against an adjustable stop 60 by a spring 61, thereby holding the cutter 51 in line with cutter 52. The member 53 is provided with a roller 55 adapted to coact with the cam plate 56 which is pivoted at 57 on the yoke-like frame 58. The cam member 56 is held yieldingly in engaging position by means of the coiled spring 59. As the carriage 5 is moved rearwardly through the driving clutch described, the roller 55 coacting with the cam 56 swings the member 53 to the position shown in Fig. VI and by dotted lines in Fig. IX, thereby actuating the shear or cutter member 51 across the face of the cutter 52 to sever the stock. When the roll passes to the end of the cam 56 it encounters a second cam plate 62 which swings the member 53 back to initial position, thereby bringing the cutter 51 into position to receive the next length of stock (see dotted lines in Fig. VI). The rearward stroke of the carriage carries the roll 55 under the cam 56 which yields under the tension of the spring 59 to permit this (see Fig. III). The stock is thus severed by a moving cutter; that is, the cutter goes at the same speed as the stock through the machine so that the stock is not stopped at the severing position and the forming rolls are driven at a uniform and constant speed.

My improved metal bending machine is of large capacity, the machine is not subjected to the strains of stopping and starting and the product is of uniform length.

I have illustrated my improvements as I have embodied them in a machine for bending metal into an S-shape for use in the frames or rims of spring cushions. My improvements are, however, desirable for use in various other relations, but it is believed that the disclosure made will enable those skilled in the art to which my invention relates to embody or adapt them to the particular requirements.

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

1. The combination, in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of the forming means to reciprocate in the longitudinal path of the work, a shear block mounted on said carriage and conformed to the work so that the work is fed through the shear block, a coacting pivoted cutter conformed to the work, a carriage-driving means comprising a clutch, a clutch control mechanism including a trip actuated by the work whereby the clutch is actuated to intermittently drive the carriage, a return spring for said carriage, a pivoted actuating cam adapted to actuate said cutter on the forward movement of the carriage, said cutter being provided with a roller coacting with said cam and adapted to pass under said cam on the return stroke of the carriage, and a stop for said cutter whereby it is normally supported in alinement with the shear block to permit the projection of the work therethrough when in initial position and on the return stroke of the carriage.

2. The combination, in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of the forming means to reciprocate in the longitudinal path of the work, a shear block mounted on said carriage and conformed to the work so that the work is fed through the shear block, a coacting pivoted cutter conformed to the work, a carriage driving means comprising a clutch, a clutch control mechanism including a trip actuated by the work whereby the clutch is actuated to intermittently drive the carriage, a return spring for said carriage, an

actuating cam adapted to actuate said cutter on the forward movement of the carriage, and a stop for said cutter whereby it is normally supported in alinement with the shear block to permit the projection of the work therethrough when in initial position and on the return stroke of the carriage.

3. The combination, in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of the forming means to reciprocate in the longitudinal path of the work, a shear block mounted on said carriage and conformed to the work so that the work is fed through the shear block, a coacting pivoted cutter conformed to the work, a carriage-driving means comprising a clutch, a clutch control mechanism including a trip actuated by the work whereby the clutch is actuated to intermittently drive the carriage, and an actuating cam adapted to actuate said cutter on the forward movement of the carriage.

4. The combination, in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of the forming means to reciprocate in the longitudinal path of the work, a shear block mounted on said carriage, a coacting pivoted cutter, a carriage driving means comprising a clutch, a clutch control mechanism including a trip actuated by the work whereby the clutch is actuated to intermittently drive the carriage, a return spring for said carriage, a pivoted actuating cam adapted to actuate said cutter on the forward movement of the carriage, said cutter being provided with a roller coacting with said cam and adapted to pass under said cam on the return stroke of the carriage, and a stop for said cutter whereby it is normally supported in alinement with the shear block to permit the projection of the work therethrough when in initial position and on the return stroke of the carriage.

5. The combination, in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of the forming means to reciprocate in the longitudinal path of the work, a shear block mounted on said carriage, a coacting pivoted cutter, a carriage driving means comprising a clutch, a clutch control mechanism including a trip actuated by the work whereby the clutch is actuated to intermittently drive the carriage, a return spring for said carriage, an actuating cam adapted to actuate said cutter on the forward movement of the carriage, and a stop for said cutter whereby it is normally supported in alinement with the shear block to permit the projection of the work therethrough when in initial position and on the return stroke of the carriage.

6. The combination, in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of the forming means to reciprocate in the longitudinal path of the work, a shear block mounted on said carriage, a coacting pivoted cutter, a carriage driving means comprising a clutch, a clutch control mechanism including a trip actuated by the work whereby the clutch is actuated to intermittently drive the carriage, and an actuating cam adapted to actuate said cutter on the forward movement of the carriage.

7. The combination, in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of the forming means to reciprocate in the longitudinal path of the work, a shear block on said carriage and conformed to the work so that the work is fed through the shear block, a coacting pivoted cutter conformed to the work, a pivoted actuating cam adapted to actuate said cutter on the forward movement of the carriage, said cutter being adapted to pass under said cam on the return stroke of the carriage, and a stop for said cutter whereby it is normally supported in alinement with the shear block to permit the projection of the work therethrough when in initial position and on the return stroke of the carriage.

8. The combination, in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of the forming means to reciprocate in the longitudinal path of the work, a shear block on said carriage, a coacting pivoted cutter, and a pivoted actuating cam adapted to actuate said cutter on the forward movement of the carriage, said cutter being adapted to pass under said cam on the return stroke of the carriage.

9. In a structure of the class described, including work forming rolls, the combination of a carriage mounted to reciprocate in the path of the work, means independent of the work for driving said carriage on its forward stroke at the speed of the work discharged from the rolls, a return means for said carriage permitting the continuous feed of the work, a cutter mounted on said carriage, and means independent of the work for actuating said cutter on the work stroke of the carriage.

10. In a structure of the class described, including work forming means, the combination of a reciprocating cutter carriage, means for driving said carriage including a clutch, a trip lever disposed in the path of

the work, a conical guide disposed in advance of said trip lever and having a slot in the bottom thereof through which the severed work may fall, a stop plate disposed at the rear of said trip lever, a return spring for said trip lever, a clutch control means including an actuating lever, a return spring for said actuating lever, a dog on said trip lever, and a pivoted detent on said actuating lever with which said dog coacts thereby permitting the independent return of said levers to their initial positions.

11. In a structure of the class described, including work forming means, the combination of a reciprocating cutter carriage, means for driving said carriage including a clutch, a trip lever disposed in the path of the work, a return spring for said trip lever, a clutch control means including an actuating lever, a return spring for said actuating lever, a dog on said trip lever, and a pivoted detent on said actuating lever with which said dog coacts thereby permitting the independent return of said levers to their initial positions.

12. In a structure of the class described, including work forming means, the combination of a reciprocating cutter carriage, a clutch means for said carriage, a clutch control means including a trip lever disposed in the path of the work, a conical guide disposed in advance of said trip lever and having a slot in the bottom thereof through which the severed work may fall, a stop plate disposed at the rear of said trip lever, and a return spring for said trip lever.

13. The combination in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage reciprocating in the longitudinal path of the work, means independent of the work for driving said carriage on its forward stroke at a speed corresponding to the speed of the work discharged by the work forming means, a shear block mounted on said carriage in the path of the work so that the work is fed through and supported by the shear block, the shear block being conformed to the work, a coacting cutter mounted on said carriage and conformed to the work, a spring for holding said cutter normally in retracted position permitting the projection of the work when the carriage is in initial position and on the return stroke of the carriage, and a cam for actuating the cutter and with which the cutter is brought into operative relation on the work stroke of the carriage.

14. The combination in a structure of the class described including work forming means discharging the work in a longitudinal path, of a carriage reciprocating in the longitudinal path of the work, means independent of the work for actuating said carriage on its forward stroke at a speed corresponding to the speed of the work discharged by the work forming means, a shear block mounted on said carriage in the path of the work so that the work is fed through and supported by the shear block, the shear block being conformed to the work, a coacting cutter mounted on said carriage and conformed to the work, and means independent of the work for actuating the cutter on the work stroke of the carriage.

15. The combination in a structure of the class described including work forming rolls, of a carriage mounted to reciprocate in the path of the work, means independent of the work for driving said carriage on its feed stroke at a speed corresponding to the speed of the work discharged from the forming rolls, a control means for said carriage driving means including a driving clutch controlled by a trip actuated by the work whereby the carriage driving means is actuated to intermittently drive the carriage, a cutter on said carriage to which the work is fed by the forming rolls, and a cam for actuating said cutter on the forward stroke of the carriage.

16. The combination in a structure of the class described including work forming rolls, of a carriage mounted to reciprocate in the path of the work, means independent of the work for driving said carriage on its feed stroke at a speed corresponding to the speed of the work discharged from the forming rolls, a cutter on said carriage to which the work is fed by the forming rolls, and a cam for actuating said cutter on the forward stroke of the carriage.

17. The combination in a structure of the class described including a work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of said forming means to reciprocate longitudinally in the path of the work, means independent of the work for actuating said carriage on its forward stroke at a speed corresponding to the speed of the work discharged by said work forming means, a cutter mounted on said carriage, and means for actuating said cutter and with which the cutter is brought into operative relation on the forward stroke of the carriage.

18. The combination in a structure of the class described including a work forming means discharging the work in a longitudinal path, of a carriage mounted at the rear of said forming means to reciprocate longitudinally in the path of the work, means independent of the work for actuating said carriage on its forward stroke at a speed corresponding to the speed of the work discharged by said work forming means, a cutter mounted on said carriage, and means independent of the work for ac-

tuating said cutter on the forward stroke of the carriage.

19. The combination in a structure of the class described including work forming means, of a carriage to which the work is delivered by said work forming means reciprocating in the path of the work, means independent of the work for driving said carriage on its forward stroke at a speed corresponding to the speed of the work discharged by said work forming means, a cut-off means on said carriage actuated independently of the work and during the work stroke of the carriage, and means for controlling said carriage driving means including a trip actuated by the work discharged from the work forming means.

20. The combination in a structure of the class described including work forming means, of a carriage to which the work is delivered by said work forming means reciprocating in the path of the work, means independent of the work for driving said carriage on its forward stroke at a speed corresponding to the speed of the work discharged by said work forming means, and a cut-off means on said carriage actuated independently of the work and during the work stroke of the carriage.

21. In a structure of the class described including work forming means, of a cutter carriage to which the work is delivered by said work forming means, means independent of the work for driving said carriage on its forward stroke at a speed corresponding to the speed of the work discharged from the work forming means, said work driving means including a normally disengaged clutch, and means for engaging said clutch including a trip actuated by the work to be severed, said trip being adjustably mounted for determining the length of the severed strips.

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

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