Oct. 13, 1953 R. LA LONE 2,655,192

BENDING AND SHEARING MACHINE

Filed June 16, 1951

4 Sheets-Sheet 1

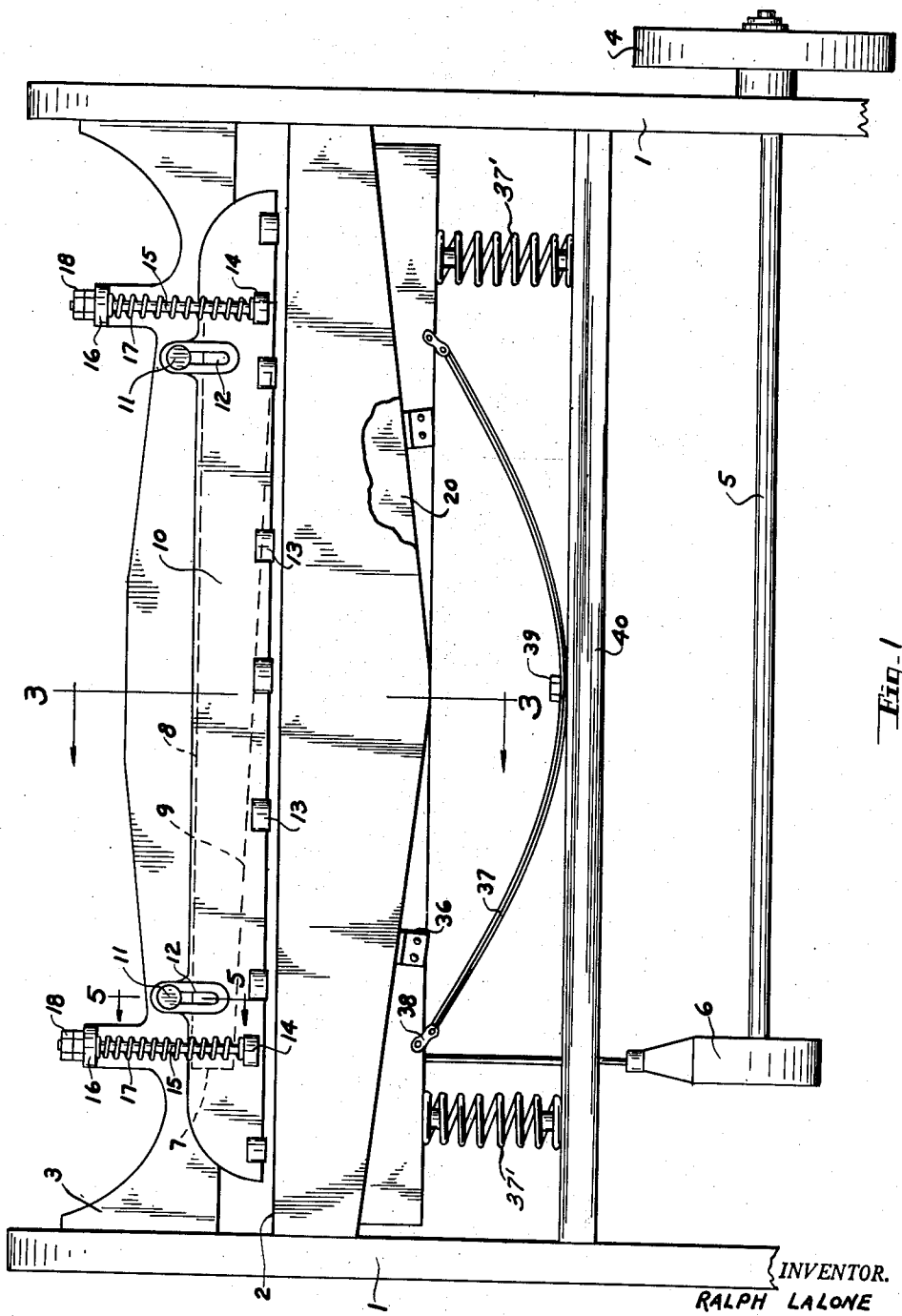

Fig. 1

INVENTOR.
RALPH LALONE

BY
Samuel Weinman
ATTORNEY.

Oct. 13, 1953 R. LA LONE 2,655,192

BENDING AND SHEARING MACHINE

Filed June 16, 1951 4 Sheets-Sheet 2

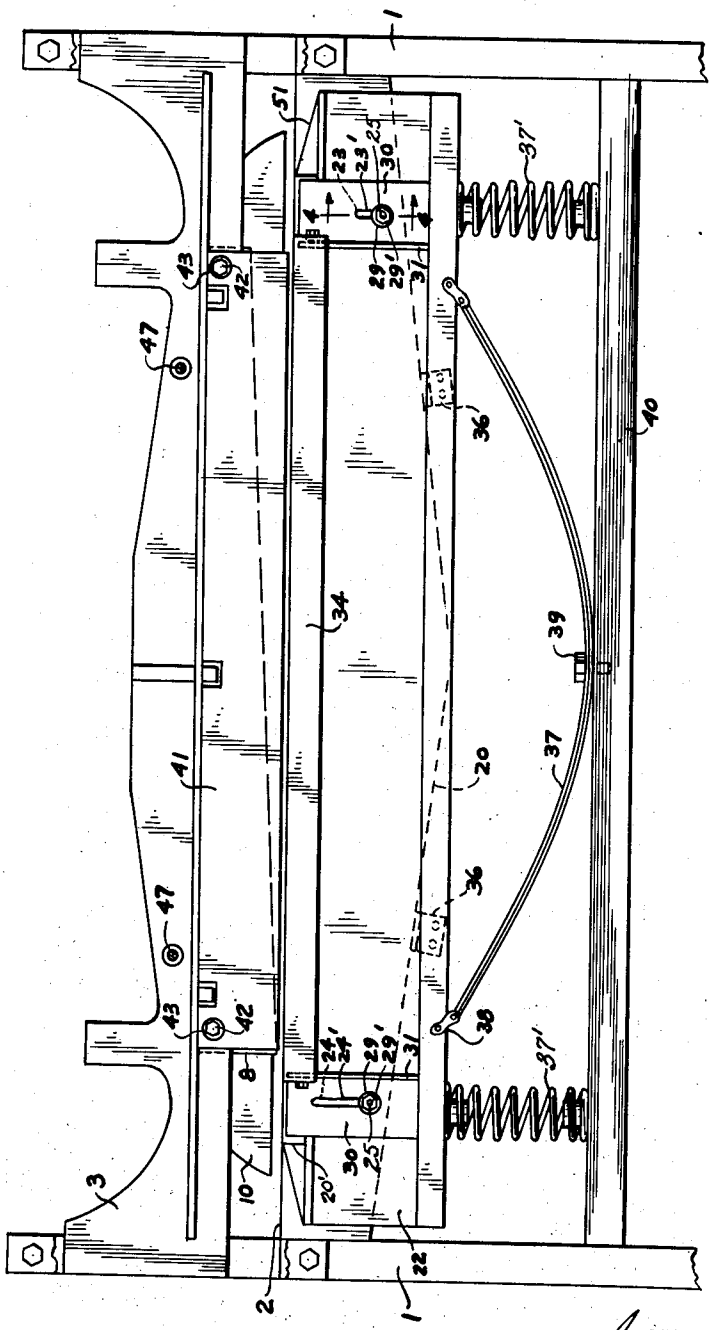

Fig. 2

INVENTOR.
RALPH LA LONE

BY Samuel Weissman

ATTORNEY.

Oct. 13, 1953 R. LA LONE 2,655,192

BENDING AND SHEARING MACHINE

Filed June 16, 1951 4 Sheets-Sheet 3

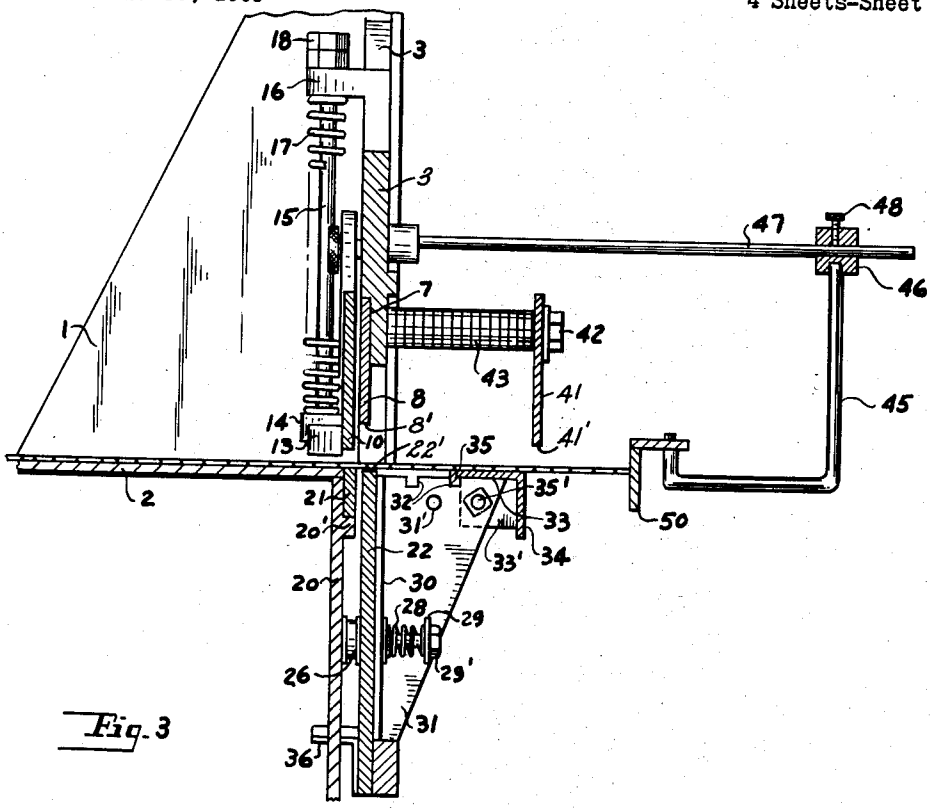

Fig. 3

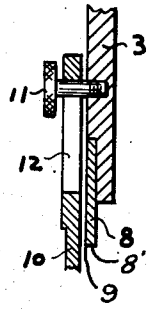

Fig. 5

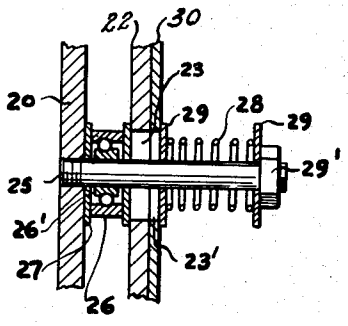

Fig. 4

INVENTOR.
RALPH LA LONE
BY
Samuel Wiseman
ATTORNEY

Oct. 13, 1953 R. LA LONE 2,655,192

BENDING AND SHEARING MACHINE

Filed June 16, 1951 4 Sheets-Sheet 4

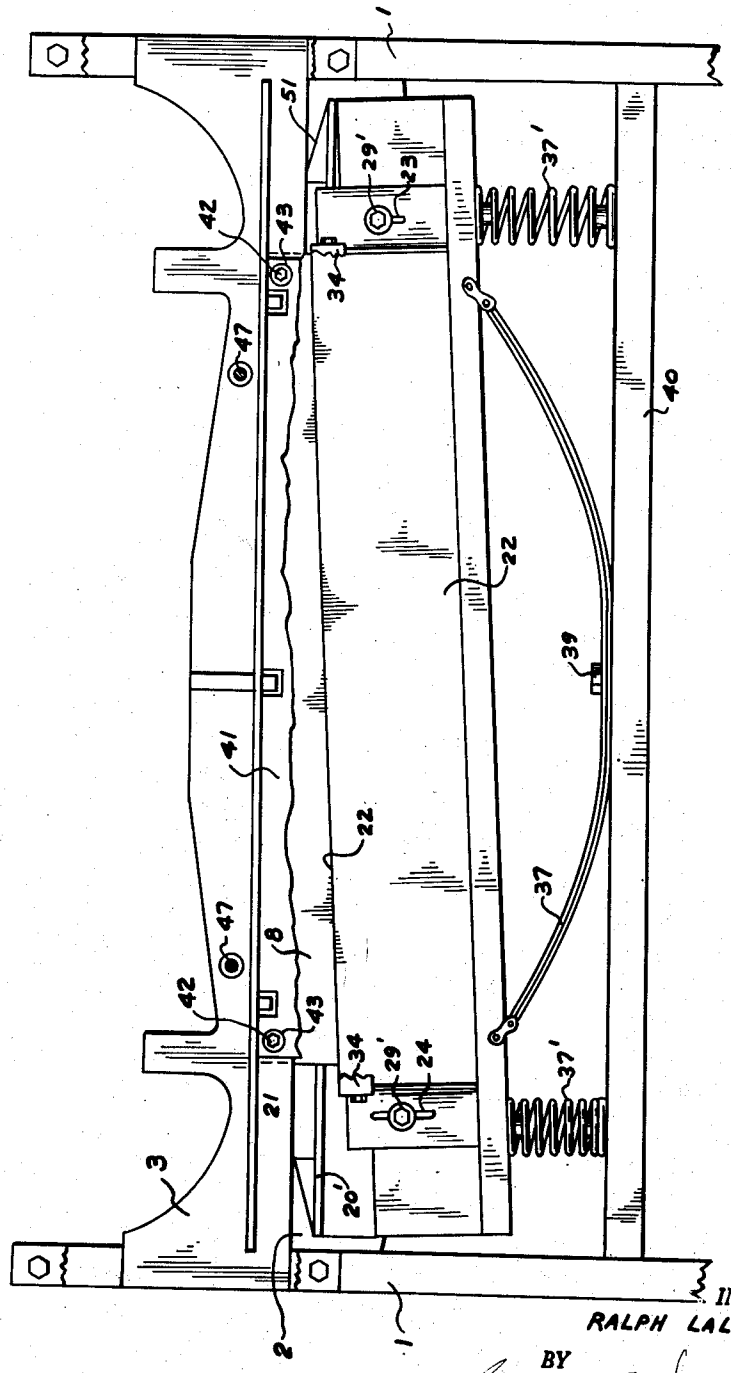

Fig. 6

INVENTOR.
RALPH LALONE.

BY
Kenneth Weinman
ATTORNEY.

Patented Oct. 13, 1953

2,655,192

UNITED STATES PATENT OFFICE

2,655,192

BENDING AND SHEARING MACHINE

Ralph La Lone, Detroit, Mich.

Application June 16, 1951, Serial No. 232,029

8 Claims. (Cl. 153—25)

1

The present invention pertains to a novel machine for shearing sheet material of various kinds although it is suitable particularly for working on metal lath of the mesh type. Such lath is used in rather long strips which are bent lengthwise at an angle somewhat greater than 90°. The bending may be done on a 90° form, and the lath will expand to a somewhat greater angle.

The strips are cut from a sheet in a conventional shearing machine in which the cutting edge of one of the blades is longitudinally inclined to the cutting edge of the other blade. The moving blade is carried by a head plate slidable in the frame of the machine, and the fixed blade is secured at an edge of the work table. It has been proposed to apply complementary bending members to the table and the head plate. It has been found that a strip bent in this manner takes a twist from end to end, probably as a result of the progressive cutting action between the shear blades. To remove the twist would require as much labor and expense as a separate bending operation, and the proposed idea has therefore remained an impracticality.

The principal object of this invention is to apply a bending mechanism to the shearing machine in such a manner that the aforementioned twist will not occur. Complementary bending members are applied respectively to the table and the slidable head plate. The member or form applied to the table or frame has a floating mounting in its plane and is given a rocking motion as it is engaged progressively by the movable shear blade. This movement of the bending form, resisted by a rather powerful but yielding spring system, results in a bent strip without the aforementioned twist. It appears that the peculiar movement of the bending form introduces forces opposing and balancing those that tend to twist the strip.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings in which:

Figure 1 is a front elevation of the machine;

Figure 2 is a rear elevation;

Figure 3 is a section on the line 3—3 of Figure 1;

Figure 4 is a section on the line 4—4 of Figure 2;

Figure 5 is a section on the line 5—5 of Figure 1; and

Figure 6 is a rear elevation showing the position of parts on completion of the bending and shearing action.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

2

As already indicated, this invention makes possible the provision of an operative and satisfactory bending attachment on a conventional shearing machine. The machine is of known construction and includes a pair of standards or uprights 1 between which is supported a horizontal table 2. The upper surface of the table 2 is a work supporting and guiding surface. A vertical head plate 3 is slidably mounted in the standards 1 and is reciprocated by means of a power driven pulley 4, a shaft 5 and an arm 6 mounted on the shaft and joined to the head plate. Since such mechanism is known in the art, further detailed description thereof is not considered necessary. The lower edge of the plate 3 is recessed at 7 to receive a shearing blade 8 suitably secured therein. The lower edge 9 of the blade is longitudinally inclined from one end to the other and moves progressively along the edge of the table 2 as the head plate is lowered, thereby shearing the piece that lies on the table. The blade 8 is formed with a flat surface 8' extending transversely and perpendicularly from the cutting edge.

A work holding plate 10 lies against the plate 3 and is slidably carried thereby. For this purpose the plate 3 carries a pair of bolts 11 slidably received in slots 12 in the plate 10. The lower edge of the holding plate 10 is formed with work holding lugs 13 that engage and hold the work piece before it is engaged by the blade 8.

A pair of lugs 14 on the plate 10 carries upwardly extending guide rods 15 passing through ears 16 on the head plate 3. The rods 15 are surrounded by coil springs 17, and the upper ends of the rods are held by nuts 18. The springs 17, therefore, permit relative movement of the head plate 3 beyond the holding plate 10 and become compressed in this movement. When the plate 3 has been raised as in Figure 3, the bolts 11 raise the plate 10 and the lugs from the work.

At the rear or inner end of the table 2 is suspended an apron 20 which is comprised in the fixed frame structure. The lower shear blade 21 is secured along the same edge of the table and the apron.

A floating pressure plate 22, extending also the whole width of the machine, lies adjacent to the blade 21 and is supported from the apron 20. For this purpose the pressure plate is formed near its ends with a short vertical slot 23 and a longer slot 24 through which are passed bolts 25 that screw into the apron 20. Between the apron 20 and the plate 22, each bolt carries a circular roller bearing 26, and a washer 27. The exposed end of the bolt carries a coil spring 28, a pair of washers 29 and a tightening nut 29'.

The outer race of the bearing 26 is somewhat longer than the inner race 26' and is clamped between the members 20, 22 while the inner race is free to rotate. The slots 23 and 24 are somewhat wider than the bolts 25 therein to permit a slight rocking movement of the plate 22 in the vertical plane in a manner presently to be described. In other words the pressure plate 22 has a floating mounting in two directions in a plane perpendicular to the upper or work supporting surface of table 2. The relative movement between the pressure plate and its supporting bolts is taken up by the bearings. Below the blade 21, the apron 20 has a longitudinal reinforcing rib 20', and the pressure plate 22 is spaced slightly from the members 21 and 20' to avoid surface friction. At its upper edge the plate 22 has a supporting surface 22' substantially co-planar with the surface of table 2 and in the path of the flat surface 8'.

To the rear surface of the pressure plate 22, near its ends, are welded a pair of angle brackets 30, 31 with their webs in vertical planes. The webs 30 against the pressure plate are slotted at 23' and 24' to coincide with the slots 23 and 24 respectively. The projecting webs 31 are formed with several notches 32 in the upper edge to receive a lower bender form, as will now be shown.

This bender form is a length of angle iron having one side 33 laid horizontally upon the brackets 30, 31. The vertical side 34 of the angle iron lies parallel to the direction of movement of the shear blade 8. The bender form is spaced rearard from the pressure plate 22 and is disposed entirely out of the path of blade 8. The free edge of the side 33 may be flanged downward at 35 to fit snugly in a pair of selected slots 32. The ends of the upper side 33 are formed with vertical webs 33' which overlap the webs 31. The webs 33' are bolted adjustably at 35' into selected holes 31' in the webs 31. Other means for adjustably securing the bender form to the bracket may be employed. The upper surface of the bender form is co-planar with the top of the table, thereby completing the supporting and guiding surface for the work.

The forward surface of the pressure plate carries a pair of angle stops 36 adapted to be brought up against the lower edge of the apron 20. A leaf spring 37 has its ends shackled at 38 to the lower edge of the pressure plate and its center fastened at 39 to a fixed frame member 40. In addition, a pair of booster coil springs 37' are inserted between the member 40 and the lower edge of the pressure plate 22, preferably near the ends of the latter, so that there is an upward pressure on the pressure plate, limited by the engagement of the stops 36 with the lower edge of the fixed member 20.

An upper complementary bender in the form of a strip 41 is secured in spaced relation to the rear surface of the head plate 3. The attachment is made by a number of bolts 42 with washers 43 inserted in an adequate space between the member 3 and the bender 41 to permit the latter to pass the form 33, 34. The bender 41 moves with the shear blade 8, with the bender moving into overlapping parallel surface relation to the form side 34. The leading edge 41' of the bender 41 and the end of inclined edge 9 nearer the work guiding surface are substantially equidistant from the work guiding surface.

In the upper position of the head plate 3, the lower edge of the upper bender 41 is spaced from the top 33 of the form somewhat more than the

holding lugs 13 which are spaced above table 2 only enough to permit passage of the work piece. The lower end of the upper blade 8 is spaced a greater distance from the top side 33 of the form than the lower edge of bender strip 41, and the higher end of this blade is spaced even more.

As the work is passed between the benders described, it engages a stop device. This device consists of a pair of guide rods 47 extending rearwardly and horizontally from the plate 3. On the rods are adjustably mounted a pair of L-shaped arms 45 which extend toward the lower bender. The upper ends of the arms are formed with bosses 46 riding on the rods 47 and adjustably secured thereto by screw 48. On the lower branch of each angle arm is secured a piece of angle iron 50 presenting a vertical surface spaced rearward from the lower bender and extending somewhat above and below the same in order to be engaged by the inserted material. The stops determine the width of the piece to be cut off by the shears and are obviously adjustable for different widths.

In the operation of the device, and with reference to Figure 2, on initial downward movement of the head plate 3, the lower end of the inclined cutting edge 9 of blade 8 will engage the fixed blade 21 at practically the same time that the bender 41 engages the form surface 34. As the cutting edge 9 moves toward the plane of the work guiding and supporting surface 2, 22', 33 and meets the edge of plate 21 to shear the work piece, it comes in contact with the work, thereby exerting pressure on surface 22' of pressure plate 22. It is to be noted, however, that only the lower end of surface 8' clamps the work surface 22' at this time. Consequently, the pressure plate 22 and the lower bender 33, 34 tend to rise at their other end with a rocking movement by the action of springs 37 and 37'. The work piece is initially clamped in the plane of the work guiding surface and thereafter is clamped progressively in an angularly displaced plane as the surface 8' rocks the pressure plate 22. This rocking movement is permitted by the looseness of the bolts 25 in their slots 23, 24 as previously stated.

The shearing progresses with the bending action and is not completed, at least, before the bending operation has been well started. Thus, the piece being cut off remains in contact with the stock and requires no additional clamping means while being bent.

As the inclined cutting edge of the blade 8 progressively crosses the cutting edge of the blade 21, it gradually increases the slope of the lower bender form, pushing the pressure plate down and tilting it a few degrees, until as shown in Figure 6 there is full contact with the work between the inclined lower edge of blade 8 and the pressure plate 22.

It has previously been proposed to apply a simple bending mechanism to a shearing machine of this kind, with benders fixed rigidly to the head plate and the table frame respectively. It has been found that the piece bent by this means takes a considerable twist from end to end. The cause of this twist has not been definitely determined but is believed to be the progressive cutting by the upper shear blade.

In the present invention, the lower bender has a somewhat floating relation to the frame, and the described rocking motion has been found to eliminate the aforementioned twist. In other

words, this motion introduces pressures that overcome the described tendency to twist.

The slot **24** below the lower end of the blade **8** is longer than the slot **23**, since the pressure plate is obviously given a longer downward movement at this end. Although the bolts **25** have lateral play in the slots, the amount of play is limited, and the swinging or tilting of the pressure plate and lower bender is therefore restricted. At an upper corner of the pressure plate, the sway appears to be not more than 15°.

When downward pressure on the plate **3** is released, the springs **37** and **37'** raise the pressure plate until the stops engage the lower edge of the fixed member **20**. The upper corners of the pressure plate are sloped off at **51** in order to clear certain parts of a standard or conventional shear on the upward movement.

To adjust the vertical dimension of the bent strip of material, interchangeable forms of various vertical widths may be provided for bolting or otherwise fastening on the brackets **30**, **31**, and the stops **50** are also adjusted. For the thickness of the work, adjustment of the upper bending member **41** is made by altering the number of washers **43**.

The machine is adapted especially for bending and cutting strips of metal lath in the well known mesh form, but may also be applied to other sheet materials within the scope of the invention.

Although a specific embodiment of the invention has been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention as indicated by the appended claims.

What I claim is:

1. A bending and shearing machine comprising a frame structure including a work guiding surface, a blade along one edge of said surface, a shear blade slidably movable in said structure toward the plane of said surface, and having a cutting edge cooperating with and longitudinally inclined relatively to the cutting edge of the first blade, said shear blade presenting a flat surface extending transversely and perpendicularly from its cutting edge, a pressure plate yieldingly supported on said structure and having a floating mounting thereon in two directions in a plane perpendicular to said guiding surface, said pressure plate having a supporting surface initially substantially co-planar with said guiding surface and lying in the path of said flat surface, whereby a work piece on said guiding surface becomes clamped between said flat and supporting surface initially in substantially the plane of said guiding surface and progressively in an angularly disposed plane on the working stroke of said shear blade, a bending form carried by said pressure plate, out of the path of said shear blade, and having a surface parallel to the direction of movement of said shear blade, a complementary bending member movable with said shear blade and positioned to move into overlapping parallel surface relation to said bending form.

2. A bending and shearing machine as set forth in claim 1, said bending member having a leading edge parallel to said guiding surface, said leading edge and end of said inclined cutting edge nearer said guiding surface being substantially equidistant from said guiding surface, whereby said bending member progressively overlaps said bending form surface while said inclined cutting edge traverses the first blade.

3. A bending and shearing machine as set forth in claim 1, said bending form and bending member being spaced from the first blade and said shearing blade in the direction in which the work is fed, said bending member having a leading edge parallel to said guiding surface, said leading edge and end of said inclined cutting edge nearer said guiding surface being substantially equidistant from said guiding surface, whereby said bending member progressively overlaps said bending form surface while said inclined cutting edge traverses the first blade.

4. A bending and shearing machine as set forth in claim 1, said bending form having another surface co-planar with said guiding surface for supporting engagement by the work.

5. A bending and shearing machine as set forth in claim 1, said bending form having another surface co-planar with said guiding surface for supporting engagement by the work, said bending form and bending member being spaced from said blade in the direction in which the work is fed.

6. A bending and shearing machine as set forth in claim 1, said bending form having another surface co-planar with said guiding surface for supporting engagement by the work, said bending form and bending member being spaced from said blades in the direction in which the work is fed, said bending member having a leading edge parallel to said guiding surface, said leading edge and end of said inclined cutting edge nearer said guiding surface being substantially equidistant from said guiding surface, whereby said bending member progressively overlaps said bending form surface while said inclined cutting edge traverses the first blade.

7. A bending and shearing machine as set forth in claim 1, said structure including an apron on which said pressure plate is mounted, said apron extending in a plane perpendicular to said work guiding surface.

8. A bending and shearing machine as set forth in claim 1, said structure including an apron on which said pressure plate is mounted, said apron extending in a plane perpendicular to said work guiding surface, said bending member having a leading edge parallel to said guiding surface, said leading edge and end of said inclined cutting edge nearer said guiding surface being substantially equidistant from said guiding surface, whereby said bending member progressively overlaps said bending form surface while said inclined cutting edge traverses the first blade.

RALPH LA LONE.

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