

Feb. 13, 1940.

H. G. KELLOGG

2,190,429

ROLLING MACHINE

Filed May 11, 1937

3 Sheets--Sheet 1

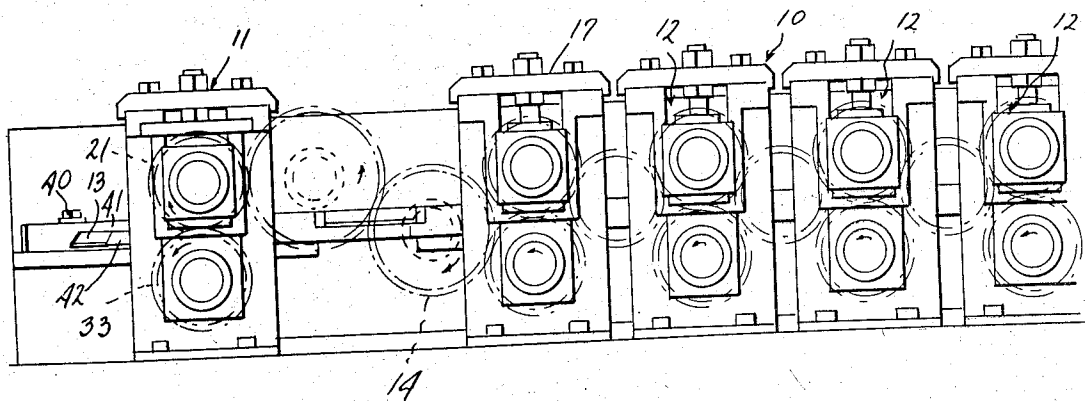


Fig. 1.

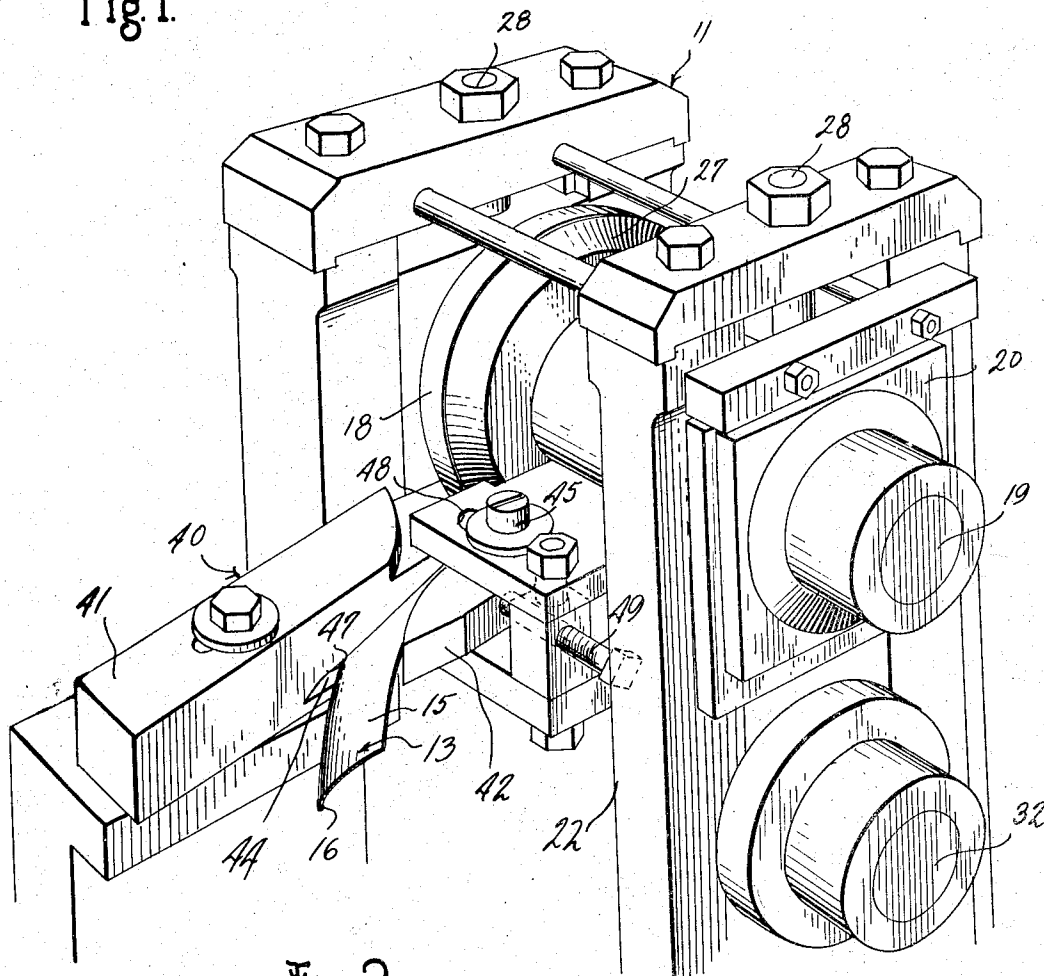


Fig. 2.

INVENTOR.

Homer G. Kellogg

BY

W. H. Hutton & Co. Attorneys

ATTORNEYS

Feb. 13, 1940.

H. G. KELLOGG

2,190,429

ROLLING MACHINE

Filed May 11, 1937

3 Sheets-Sheet 2

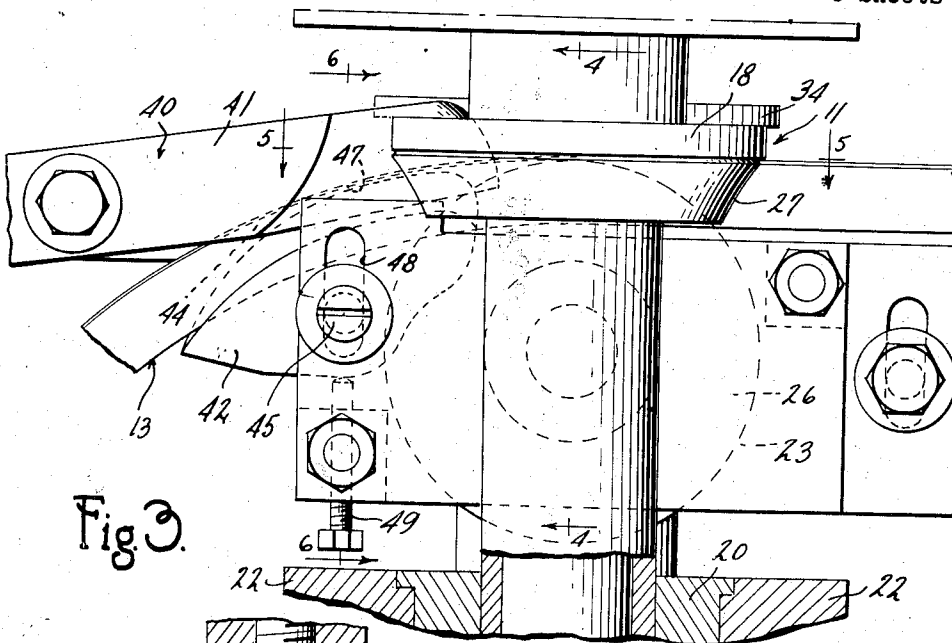


Fig. 3.

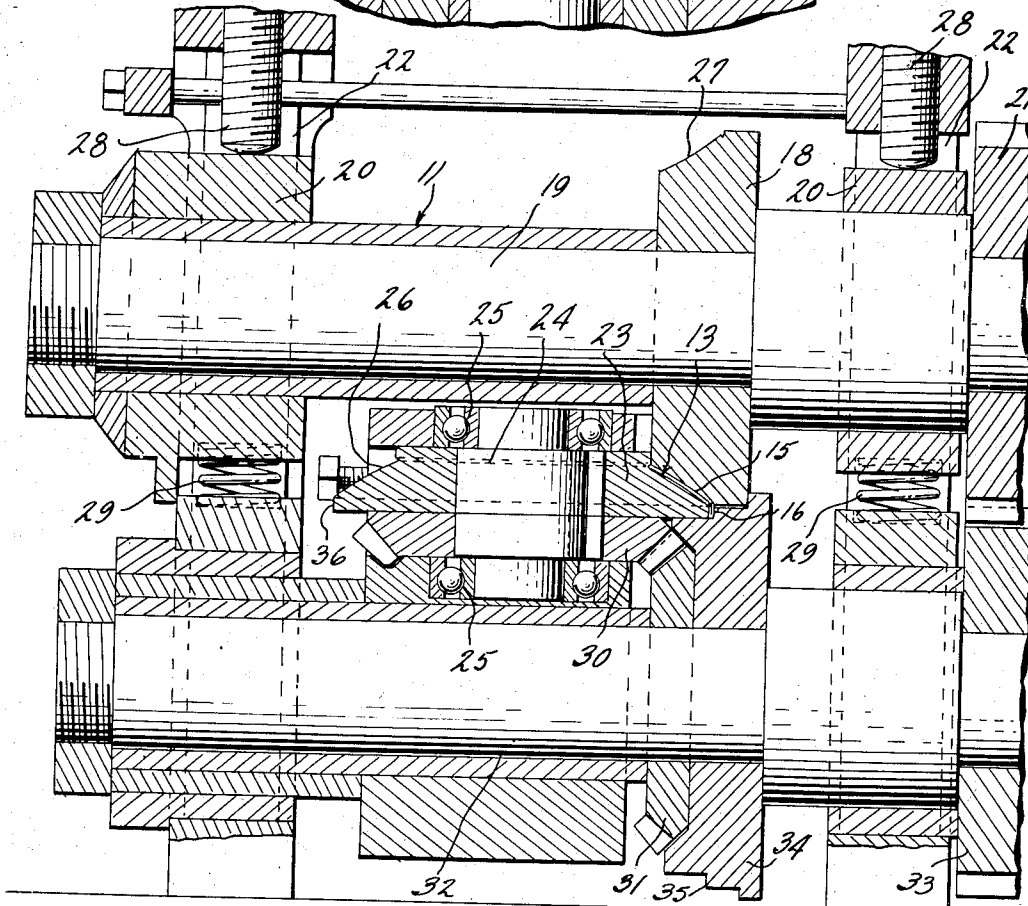


Fig. 4.

INVENTOR.

Homer G. Kellogg

BY

W. Arthur Hulbert & Bulfinch

ATTORNEYS

Feb. 13, 1940.

H. G. KELLOGG

2,190,429

ROLLING MACHINE

Filed May 11, 1937

3 Sheets-Sheet 3

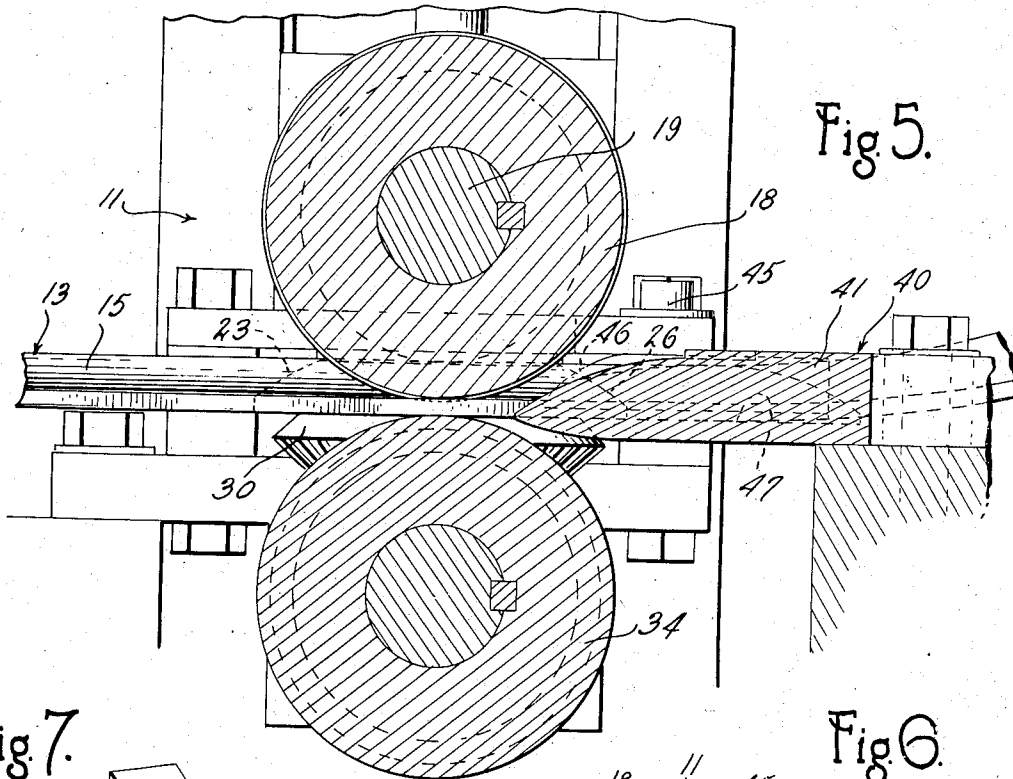


Fig. 5.

Fig. 7.

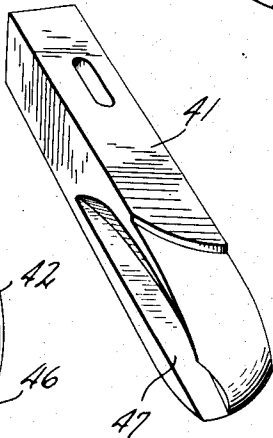


Fig. 6.

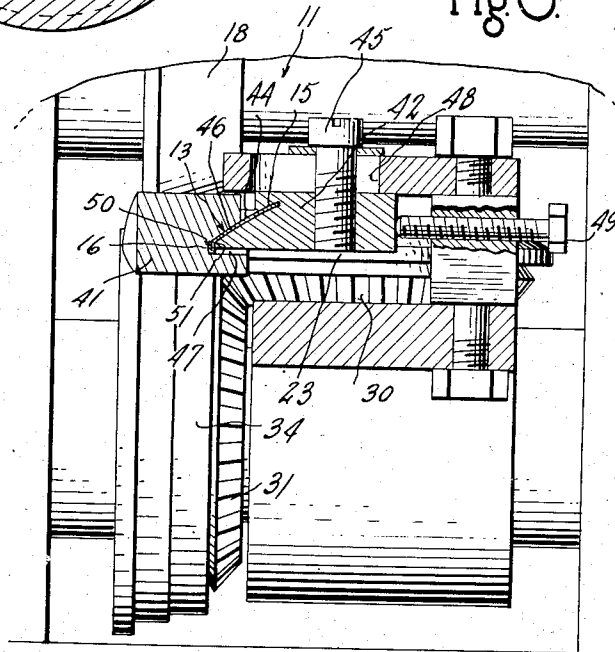


Fig. 8.

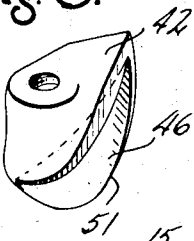
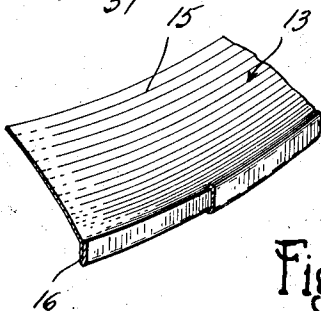


Fig. 9.

INVENTOR.

Homer G. Kellogg

BY

William H. Hulbert & Bulfinch

ATTORNEYS

UNITED STATES PATENT OFFICE

2,190,429

ROLLING MACHINE

Homer G. Kellogg, Detroit, Mich., assignor to
Motor Products Corporation, Detroit, Mich., a
corporation of New York

Application May 11, 1937, Serial No. 142,024

6 Claims. (Cl. 153-64)

This invention relates generally to rolling machines and refers more particularly to apparatus for forming a strip of stock into an arcuate section of predetermined cross sectional contour.

One of the principal objects of this invention resides in the provision of a rolling machine having means for receiving the stock as it is delivered from between the cooperating forming rolls and for bending the stock in a plane substantially parallel to the plane of advancement of the stock by the forming rolls.

Another advantageous feature of the present invention resides in the provision of means predeterminedly positioned with respect to the bending mechanism to receive the bent strip and to control the degree of curvature of the strip.

The foregoing, as well as other objects, will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a semi-diagrammatic side elevational view of a rolling machine embodying my improved bending fixture;

Figure 2 is a perspective view of the bending fixture;

Figure 3 is a plan view, partly in section, of the bending fixture shown in Figure 2;

Figures 4, 5, and 6 are sectional views taken respectively on the planes indicated by the lines 4-4, 5-5, and 6-6 of Figure 3;

Figure 7 is a fragmentary perspective view of one of the guide members;

Figure 8 is a similar view of a cooperating guide member; and

Figure 9 is a fragmentary perspective view of the completed strip.

The coiled strip produced by the machine forming the subject matter of this invention may be advantageously used to form louver blades for radiator grills of the type wherein the blades are bowed or curved longitudinally thereof, although the machine is by no means limited to the manufacture of this product. In general, the machine comprises a rolling unit 10 and a bending unit 11 situated at the delivery end of the rolling unit to receive the strip as it is discharged from the latter. The rolling unit comprises a plurality of sets of forming rolls 12 cooperating with each other to progressively fashion the strip 13 to the desired cross sectional contour shown in Figure 9 of the drawings. The lower rolls of each set are driven in a counter-clockwise direction from a driving gear 14 located between the units and the upper rolls are yieldably urged toward the lower rolls to fric-

tionally clamp the strip between the rolls. As a result, the cooperating rolls of each set serve to advance the strip through the machine as well as to form the strip to the desired cross sectional contour. Upon reference to Figure 9, it will be noted that the strip fashioned in the rolling unit comprises a transversely bowed body portion 15 and a depending return bent flange 16 at one longitudinal edge of the body portion. The body portion is of substantial width as compared to the flange 16 and is inclined upwardly from the flange.

As the strip 13 leaves the last set of forming rolls 17, it is introduced to the bending unit 11 and is coiled by this unit without disturbing the cross sectional contour thereof. The bending unit 11 is shown in Figure 4 as having a top roll 18 secured to a shaft 19 having the opposite ends journaled in bearing blocks 20 and having a gear 21 at one end meshing with the drive gear 22 for rotation by the latter in a clockwise direction, or in the direction of advancement of the strip through the machine. It will be observed from Figure 4 that the bearing blocks 20 are vertically slidably supported between upright guides 23 to permit movement of the top roll 18 toward and away from the bottom roll 24. The roll 23 is secured to a vertical shaft 25 having the opposite ends thereof suitably journaled in bearings 26 and having its axis of rotation lying in a common plane with the axis of rotation of the roll 18. Upon reference to Figure 4, it will be noted that the roll 23 has a peripheral surface 27 cooperating with the peripheral surface 28 of the roll 18 to receive the body portion 15 of the strip 13 therebetween and the clearance between the two peripheral surfaces is varied to a limited extent by adjusting screws 29 acting on the top surfaces of the bearing blocks to urge the same in a downward direction against the action of springs 30 fixedly supported beneath the blocks in engagement with the bottom surfaces thereof.

The roll 23 is rotated in the direction of advancement of the strip by means of a beveled gear 31 secured to the shaft 24 and meshing with a beveled gear 32 secured to a third shaft 33 which in turn is driven by a gear 34 meshing with the gear 21 on the shaft 19. The axis of the shaft 32 is disposed in the same plane as the axes of the other two shafts and a third roll 35 is secured to this shaft in cooperation with the rolls 18 and 23. The periphery of the roll 35 is provided with a radially extending annular portion 36 cooperating with an axially extending annu-

lar portion 36 on the periphery of the roll 23 to maintain the return bent flange 16 on the strip 13 in its proper relation to the body portion 15 of the strip during the bending operation.

The strip 13 is coiled or bent about the axis of the roll 23 by reason of the fact that the peripheral speed of the portions of the cooperating rolls 18 and 23, engaging the lower edge portion of strip 13, is greater than the peripheral speed of the portions of these rolls which engage opposite sides of the strip at the upper longitudinal edge thereof. In other words, the portions of the rolls engageable with opposite sides of the strip 13 at the lower edge thereof are spaced a greater distance from the axes of the respective rolls than the portions of the latter engaging the upper edge of the strip. As a result, the metal of the strip is progressively drawn to a greater extent from the upper edge of the strip to the bottom edge of the latter in a direction longitudinally of the strip, and this working of the metal causes the strip to assume a constant degree of curvature about the axis of the horizontal roll 23. In order to insure or assist in bending the strip as it passes between the rolls 18 and 23, the screw 28 adjacent the roll 18 may be adjusted to move the associated bearing block 20 in a direction toward the roll 23 relative to the bearing block 20 at the opposite end of the roll shaft 19. In other words, the axis of the shaft 19 is tilted slightly in a direction to cause the portions of the rolls having the greatest peripheral speed to exert more pressure on the strip than the other portions of the rolls and, as a consequence, bending of the strip to the proper degree of curvature is facilitated. It will, of course, be understood that sufficient clearance exists between the registering peripheral portions of the rolls 18 and 34, and between the intermeshing gears 21 and 33 to permit the limited adjustment referred to above. This differential pressure may also be employed to control the degree of curvature since by reversing the above procedure, or in other words applying more pressure on the strip at the edge opposite the flange 16, the degree of curvature about the axis of the roll 23 may be reduced.

In many classes of work, it is highly important that the degree of curvature be very accurately controlled and this is accomplished herein by providing a guide 40 adjacent the bending unit 11 to receive the coiled strip as it is discharged from between the rolls 18 and 23. The guide 40 comprises cooperating relatively adjustable members 41 and 42 shown in Figure 6 as cooperating with each other in forming a passage 44 corresponding in cross section to the cross sectional contour of the strip 13 and curved longitudinally of the strip to correspond to the predetermined degree of curvature desired. In detail, the member 42 is pivoted, as at 45, to the frame of the machine for swinging movement in a plane parallel to the plane of rotation of the roll 23 and is provided with a top surface 46 over which the strip 13 is adapted to pass. The surface 46 conforms in cross section to the cross sectional contour of the portion 15 of the strip and is curved in the path of travel of the strip to the proper radius. The guide member 41 is also supported on the machine frame for pivotal adjustment in a plane parallel to the plane of pivotal movement of the member 42 and the swinging end of the member 41 is formed with a recess 47 therein receiving the lower edge portion of the member 42 in the manner shown in

Figure 6. It will be observed from this latter figure that the top wall of the recess 47 engages the top wall of the strip 13 and that both members are adjusted to frictionally clamp the portion 15 of the strip therebetween. In this connection, attention may be called to the fact that the pivot 45 extends through a slot 48 in the frame elongated in a direction to permit the member 42 to be moved toward or away from the member 41 by an adjusting screw 49. With this additional adjustment, frictional engagement of the members with the strip is insured, irrespective of the pivotal adjustment of the members. Referring again to Figure 6 of the drawings, it will be noted that the depending return bent flange 16 on the strip 13 is also frictionally engaged by cooperating arcuate surfaces 50 and 51 on the members 41 and 42, respectively, in order to prevent deforming of this flange by the bending operation. It will, of course, be understood that the coiled strip produced by the machine is cut to the desired lengths, but the means for accomplishing this result forms no part of this invention and is accordingly not shown herein.

From the foregoing, it will be observed that I have provided relatively simple mechanism for bending strip stock to a predetermined degree of curvature. More particularly, it will be noted that I have incorporated the bending mechanism in combination with a rolling machine for receiving the strip formed by the latter and bending this strip in a plane substantially parallel to the plane of advancement of the strip through the machine without interfering with the contour of the strip. In addition, attention is called to the fact that the bending operation is effected by cooperating driven rolls in such a manner that these rolls cooperate to actually advance the continuous strip at the same time it is being bent to the proper degree of curvature.

What I claim as my invention is:

1. In a metal working machine, a bending unit having cooperating revoluble rolls provided with bearing surfaces both inclined with respect to the axes of the rolls and arranged so that the corresponding oppositely disposed portions of the bearing surfaces have the same peripheral speed, means for introducing a strip between the inclined surfaces of the rolls, means for rotating the rolls to effect a bending of the strip in accordance with the difference in peripheral speed of the axially spaced portions of the bearing surfaces of the rolls, and means for relatively angularly adjusting the rolls to exert a differential pressure on portions of the strip spaced transversely of the latter.

2. In a metal working machine, a bending unit having cooperating rolls supported for rotation about axes extending at an angle to each other and having cooperating surfaces both inclined with respect to the axes whereby the corresponding outer portions of the surfaces have a peripheral speed greater than the corresponding inner portions of said surfaces, means for introducing a strip of metal between said surfaces, and means for relatively adjusting the rolls to exert a differential pressure on portions of the strip spaced transversely thereof.

3. In a metal working machine, a bending unit having cooperating rolls supported for rotation about axes extending at an angle to each other in a common plane and having cooperating surfaces both inclined with respect to the axes.

means for introducing a strip of metal between said surfaces, and means for relatively adjusting the rolls to apply a greater pressure on the strip adjacent the outer longitudinal edge portion of the strip.

5 4. In a metal working machine, means for bending a strip of stock having a transversely inclined body portion and having a flange extending at an angle from one longitudinal edge
10 of the body portion, said means including cooperating rolls supported for rotation about axes extending at an angle to each other and having cooperating surfaces both inclined with respect
15 to the axes at an angle corresponding to the angle of inclination of the body portion of the strip, means for introducing the body portion of the strip between the inclined surfaces of the rolls, means for rotating the rolls to effect a bending
20 of the strip in accordance with the difference in peripheral speeds of the inner and outer corresponding portions of the inclined surfaces of the rolls, and means for receiving the strip passing between the rolls to control the degree of curvature of the strip and having cooperating surfaces
25 engageable with opposite sides of the flange on the strip to maintain the latter in its predetermined angular relationship to the body portion of the strip during the bending operation.

5. In a metal working machine, a bending unit having cooperating revoluble rolls provided with bearing surfaces both inclined with respect to the axes of the rolls and supported with the bearing surfaces adjacent each other to receive a
5 strip of stock therebetween, and means for relatively adjusting the rolls to exert a differential pressure on different portions of the strip of stock as the latter passes between the bearing surfaces on the rolls. 10

6. In a metal working machine, a bending unit having cooperating bending rolls provided with bearing surfaces both inclined with respect to the axes of the rolls and arranged so that the corresponding disposed portions of the bearing
15 surfaces of the rolls have the same peripheral speed, means for introducing a strip of stock between the inclined surfaces of the rolls, means for relatively adjusting the rolls to exert a differential pressure on different portions of the
20 strip of stock as it passes between the bearing surfaces to longitudinally bend said strip, and guide means predeterminedly positioned with respect to the cooperating rolls to engage the strip as it passes from between the bearing surfaces of
25 said rolls and adjustable to control the degree of curvature.

HOMER G. KELLOGG.