

H. C. SPRENGLE.
METAL BENDING MACHINE.
APPLICATION FILED DEC. 29, 1910.

1,043,877.

Patented Nov. 12, 1912.

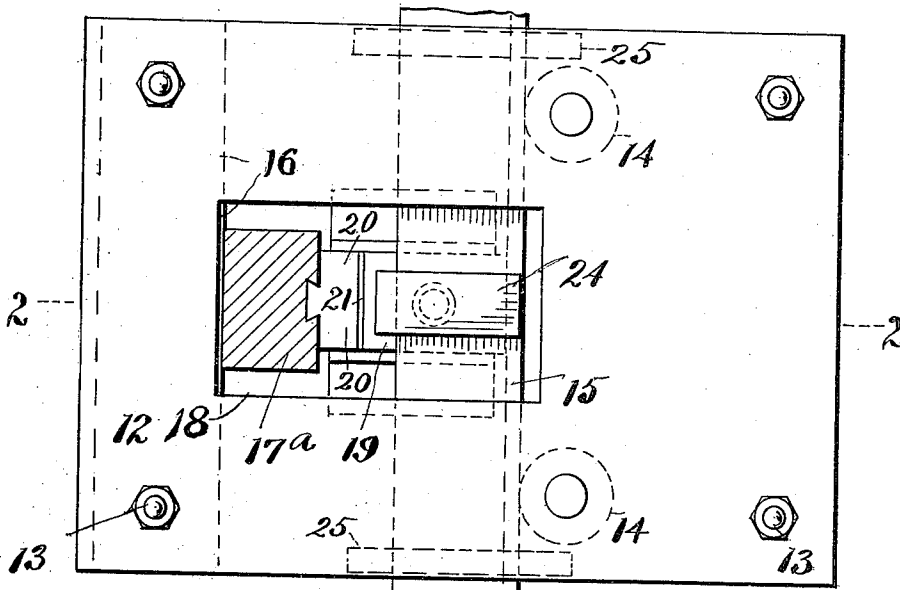


Fig. 1.

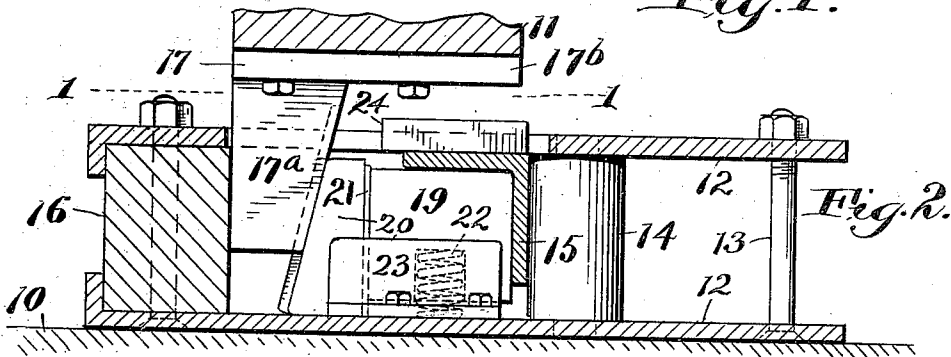


Fig. 2.

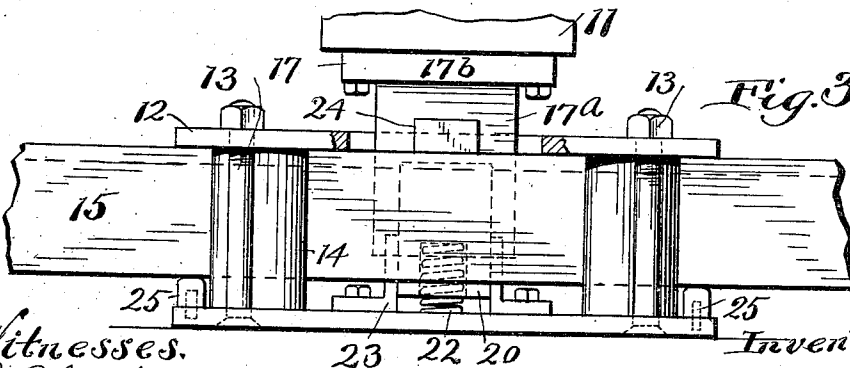


Fig. 3.

Witnesses.
E. B. Gilchrist
H. B. Sullivan.

Inventor.
Henry C. Sprengle
by Thurston & Davis
Attys.

UNITED STATES PATENT OFFICE.

HENRY C. SPRENGLE, OF CLEVELAND, OHIO.

METAL-BENDING MACHINE.

1,043,877.

Specification of Letters Patent.

Patented Nov. 12, 1912.

Application filed December 29, 1910. Serial No. 599,867.

To all whom it may concern:

Be it known that I, HENRY C. SPRENGLE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Metal-Bending Machines, of which the following is a full, clear, and exact description.

This invention relates to metal bending machines and is an improvement over the machine forming the subject-matter of my Patent Number 1,002,329, dated September 5th, 1911, for metal bending attachments for presses.

The machine or device forming the subject matter of my patent is designed particularly for bending irregular or flanged members, such as structural members, including angles, channels, T or I rails, and the like, and it includes a pair of stationary abutments which are supported on the bed of a suitable press and between which the stock is adapted to be bent, a bending block which is adapted to engage the stock between the abutments, and a wedge shaped device which is adapted to be attached to the plunger or ram of the press, and when reciprocated engages the bending block so as to force the same in a lateral direction and to bend the stock between the abutments in a direction at right angles to the direction of movement of the plunger and wedge. This machine is admirably adapted for the purpose intended, but it has been found that on some occasions or when structural members of a certain form, such as angles are bent, there is a tendency for the stock to bend upwardly as it is bent laterally or in the direction intended. This is due to the fact that as the stock is bent laterally, there is a stretching of the metal at the outer or far side of the horizontal flange, this stretching being greater at the far side than at the inner side and it is because of this unequal stretching at different parts of the stock that it bends upwardly or buckles, so to speak.

The object of the present invention is to eliminate this upward bending and to provide a bending machine which possesses all the advantages and operates in substantially the same way as my prior bending machine, but in addition prevents this upward bending so that when the stock is passed through the machine, it will be bent in only the desired plane.

The above object is attained in the present machine by causing the plunger or a device secured to the end of the plunger to engage, strike, or otherwise force the metal downward toward the bed as the wedge shaped member carried by the plunger bends the stock laterally outward between the abutments, or in a direction parallel to the bed. Preferably, this is accomplished by inserting between the stock and the plunger a shim which is engaged or hit by the plunger on its downward movement so as to maintain the stock straight as far as upward bending is concerned, the thickness of the shim being varied in accordance with the extent of the upward bending, which depends somewhat upon the shape and dimensions of the stock, and also upon the degree or extent that the stock is bent laterally.

In the accompanying sheet of drawings, Figure 1 is a horizontal sectional view through a bending machine embodying my invention, the section being taken substantially along the line 1—1 of Fig. 2, looking downward; Fig. 2 is a vertical sectional view substantially along the line 2—2 of Fig. 1; and Fig. 3 is an elevation looking toward the left of Fig. 2, certain portions being broken away for the sake of clearness.

The bending machine is preferably, (although not necessarily) in the form of an attachment which is designed to be applied to any suitable punch press, or other machine having a bed or base such as 10, and a plunger such as 11, which is designed to be reciprocated with respect to the base, and in this case being adapted to be reciprocated in a vertical direction, the base 10 being horizontal. The attachment comprises a stationary part which is designed to be attached to the bed, and a movable part which is designed to be attached to the plunger, the stationary part comprising a frame designed to be bolted or otherwise fastened to the bed and including a pair of plates 12, which are secured together by a suitable number of bolts or equivalent devices 13. Arranged between the plates are a pair of spaced abutments 14 in the form of rollers having at their ends reduced portions extending in suitably positioned openings in the plates. The stock which as here shown is in the form of an angle 15 is adapted to engage the abutments 14 and to be bent laterally outward between the same. Arranged between the plates of the frame near the rear end

thereof is a thrust or filler block 16, this thrust block being secured in position in the frame by two or more of the bolts 13, and being for the purpose of receiving the backward thrust of the bending device.

The movable part of the attachment or of the bending machine includes a device or member 17 which is adapted to be bolted to the lower end of the plunger 11, and this member is provided with a wedge shaped portion 17^a adapted to be lowered through a suitable opening 18 in the upper plate 12 of the frame, and during its downward movement to bend the stock outwardly. This wedge or wedge shaped portion 17^a of the bending device 17 has a vertical or straight rear face which is adapted to engage or bear against the front or forward face of the thrust block, and a forward face which is inclined or on a taper.

The lateral or side thrust of the wedge as it is being lowered is transmitted to the stock so as to bend the latter laterally outward, by means of one or more bending blocks, including in this case a block 19 which is placed between the two plates 12 and engages the stock 15 midway between the abutments 14, and a second block 20 which is adapted to engage the block 19, and has its rear face inclined in conformity with the taper of the forward face of the wedge 17^a. Preferably, the wedge 17^a and block 20 have on their adjacent faces a dovetail sliding connection consisting in this case of an undercut slot in the tapered face of the wedge, and a dovetailed projection on the rear face of the block, said projection having a sliding fit in the slot. Consequently when the wedge is reciprocated, the block will remain in engagement therewith, and will move away from the block 19, on the upward movement of the wedge and toward the block 19 on the downward movement of the wedge. By reason of this arrangement, one or more shims 21 of suitable thickness can be placed very readily between the blocks 19 and 20, when it is desired to vary the degree of bending. The block 19 is preferably pressed upwardly against the horizontal flange of the angle or stock 15 by a coil spring 22 which is arranged between the lower plate 12 and the block 19, and extends into a suitable opening or socket in the bottom of the block 19. In this case, the angle 15 is arranged with its horizontal flange above and extending rearwardly, and the block 19 bears against the rear side of the vertical flange and against the lower side of the horizontal flange. The position of the angle 15 may be reversed, in which case the horizontal flange will be at the bottom and will project forwardly, and the block 19 will then bear against the vertical flange only. When the angle is so arranged, the spring 22 need not be employed. The blocks

19 and 20 may be held against sidewise movement by one or more sets of angles 23, which may be secured to the lower plate 12 and extend upwardly on opposite sides of the blocks so as to confine the latter to their proper positions.

It will be understood that when the stock is placed between the plates 12 in the proper manner, and when the plunger 11 provided with the bending member 17 is reciprocated, the wedge shaped portion of this member 17 by its engagement with the inclined end of the bending block 20 forces the blocks 19 and 20 laterally, bending the stock 15 outwardly between the abutments 14. In the use of this machine, particularly when the stock is to be bent in an arc of a circle, or is to be given a curvature of any other form, the stock is fed endwise through the frame so that different portions of it may be acted upon by the bending members, each portion or section of the stock being bent a proper amount to give the stock the desired degree of curvature. It will be understood, however, that this same machine is capable of bending the stock to a different shape or configuration than the one referred to, and that the machine is capable of being used for straightening bent or crooked members, instead of bending or curving straight members.

As before stated, in bending stock of certain forms, the stock assumes an upward bend or curvature in addition to the lateral bend or curvature for the reasons previously explained. To overcome this upward bending, the plunger is caused to strike or press the stock downwardly toward the bed or in the direction of movement of the plunger, at the same time that the stock is given a lateral bend by the lateral thrust of the wedge. This is accomplished in this case by employing a bending device 17 having a heel or flat forwardly projecting portion 17^b which projects over the stock, and by inserting between this portion 17^b and the stock, a shim or block 24 which is designed to be engaged by the former in its downward movement, so as to be depressed by it and to bend the stock downwardly the required amount. It will be understood that the amount or extent that the stock is bent downwardly is the same as the upward bend given to it by the wedge, and is sufficient to maintain the stock straight, as far as vertical bending or bending in a vertical plane or direction is concerned. The opening 18 through which the wedge enters at the top of the frame is prolonged so as to accommodate the shim or block 24.

I prefer to arrange beneath the stock so as to support the same while being bent, a pair of strips 25 which are supported on the lower plate 12 at a suitable distance apart, and equidistant from the vertically recipro-

cating bending device, these strips serving as abutments between which the stock is bent downwardly. The distance between the strips or abutments 25 and the thickness of the shim 24 may be varied to suit the requirements of each particular case. I prefer to use this shim or block 24, and to have the shim struck or engaged by the heel 17^b of the bending device, but it will be understood, of course, that the downward pressure of the plunger may be transmitted to the top of the stock in a different manner, if so desired. When the position of the stock is reversed so that the horizontal flange is below and extends forwardly, and the vertical flange projects upwardly, this shim or block 24 will engage and bend downwardly the vertical flange.

Having thus described my invention, what I claim is:

1. The combination in a bending machine of a base or bed, a pair of spaced abutments against which stock may rest supported by the base, a bending device adapted to engage and bend the stock outwardly between the abutments, said device having a portion which moves toward the stock lying between the abutments and prevents it bending in a direction at right angles to its direction of movement between the abutments.

2. In a bending machine, a bed having a pair of spaced abutments, a vertically reciprocating bending device having a wedge shaped portion which engages a member which bends the stock laterally outward between the abutments and at right angles to the direction of movement of the bending device, and another portion which bends the stock downward toward the base so as to overcome the upward bending tendency by the wedge shaped portion.

3. In combination with a press having a reciprocating plunger and a stationary bed, a metal bending attachment comprising a pair of abutments which are supported by the bed and between which the stock is adapted to be bent, a bending block adapted to engage the stock between the abutments, and a bending device adapted to force the bending block laterally with respect to the direction of movement of the plunger so as to bend the stock outwardly between the abutments, and a portion which bends the stock in the direction of movement of the plunger.

4. In combination with a press having a reciprocating plunger and a stationary bed, a metal bending attachment comprising a pair of abutments which are supported by the bed and between which the stock is

adapted to be bent, a bending block arranged at the side of the stock between the abutments, a bending block above the stock between the abutments, and a bending device carried by the plunger and comprising a wedge shaped portion adapted to engage the first named bending block so as to bend the stock laterally outward between the abutments, and a portion which engages the second named block so as to bend the stock toward the bed or in the direction of movement of the plunger.

5. In combination with a press having a reciprocating plunger and a stationary bed, a metal bending attachment comprising a pair of abutments secured to the bed, and adapted to have the stock bent laterally outward between the same in a direction at right angles to the movement of the plunger, a second pair of abutments on which the stock is adapted to be bent in the direction of movement to the plunger, and a bending device carried by the plunger and comprising a wedge shaped portion adapted to bend the stock laterally between the first named pair of abutments, and a portion which is adapted to bend the stock downwardly between said second pair of abutments so as to prevent the stock being bent upwardly by the wedge shaped portion.

6. In combination with a press having a bed and a reciprocating plunger, a metal bending attachment comprising a frame adapted to be secured to the bed and including a pair of plates, a pair of spaced abutments supported between said plates and between which stock is adapted to be bent laterally, a thrust block supported between the plates, the upper plate of the frame having an opening therein, a bending device carried by the plunger and comprising a wedge shaped portion adapted to enter said opening, said wedge shaped portion having a straight rear face adapted to engage the thrust block, and a tapered forward face, a bending block arranged between the plates substantially midway between the abutments and adapted to be moved laterally by said wedge shaped portion, and said bending device carried by the plunger having a portion adapted to bend the stock toward the bed or in the direction of movement of the plunger.

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

HENRY C. SPRENGLE.

Witnesses:

H. R. SULLIVAN,
A. F. KWIS.