June 1, 1937. J. E. RAWSON 2,082,653

METAL BENDING APPARATUS

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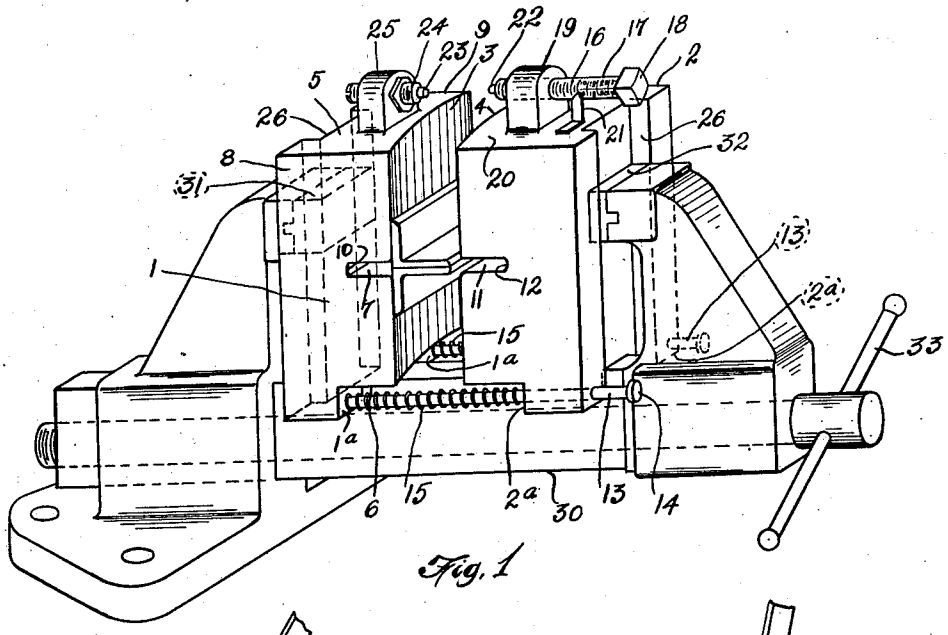



Fig. 1

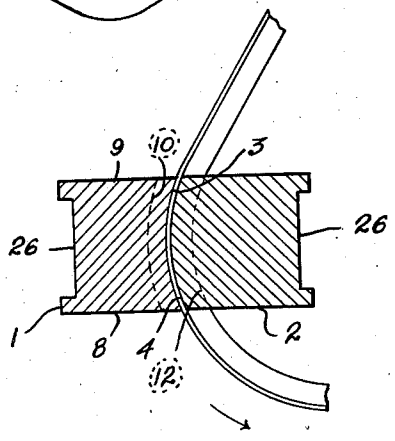



Fig. 2

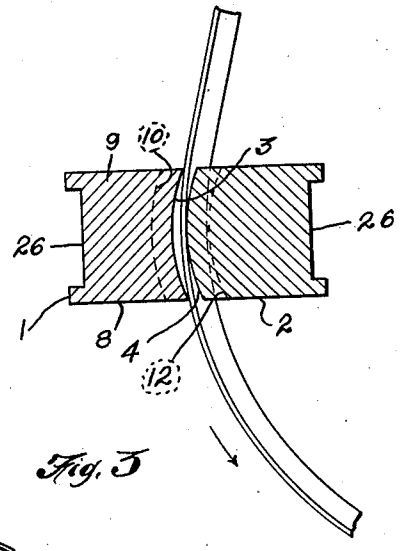



Fig. 3

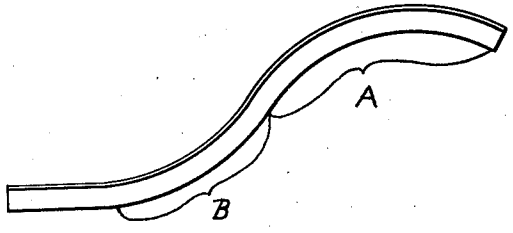



Fig. 4

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## METAL BENDING APPARATUS

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Application November 13, 1935, Serial No. 49,546

5 Claims. (Cl. 153—53)

This invention relates as indicated to metal bending devices, but has reference more particularly to a device of this character which is particularly adapted for the cold bending of various shapes of relatively small cross-section, such, for example, as angles and T's.

Shapes of the aforesaid character, particularly angles, are at the present time used to a considerable extent in the construction of guards for machines of various types. In the construction of a belt guard for a punch press, for example, where the guard must cover the wheel and belt to a height of about six feet above the floor level, two angles are usually employed for the frame of the guard and both must be formed to exactly the same predetermined curvature as required by State Codes governing the construction of this type of safety guard.

It has heretofore been the practice in bending angles for the aforesaid purpose to use a hammer and a hollow block of steel, forming the angle to approximately the desired contour by repeatedly striking one leg of the angle against the block. The vertical leg of the angle which is thus repeatedly struck by the hammer, is compressed or shortened and the other leg is stretched or elongated. Consequently, when the angle is finally bent to the approximate desired contour, the legs present a warped appearance, and it is necessary to flatten them and remove the hammer marks, as by placing one of the legs at a time on a flat block and striking it with light hammer blows. Not only does the aforesaid method of bending the angles involve a considerable amount of labor and effort, but the resulting product is not usually characterized by uniformity or workmanlike appearance.

It is a primary object of the present invention to provide a device which is of simple and rugged construction, which is admirably adapted for rapidly and uniformly bending angles and other shapes to any desired curvature within predetermined limits, and which can be operated and adjusted with a minimum of effort.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain structure embodying the invention, such disclosed means constituting, however, but one of various structural forms in which the principle of the invention may be used.

In said annexed drawing:—

Fig. 1 is a perspective view of the bending device; Fig. 2 is a view showing the closed position of the bending dies when bending angles to a maximum degree of curvature; Fig. 3 is a view showing the closed position of the bending dies when bending angles to a minimum degree of curvature; and Fig. 4 is a view showing an angle having reverse curvatures which may be imparted thereto by means of the device.

Referring more particularly to the drawing, the device is shown as consisting of a pair of dies 1 and 2, disposed in alignment with each other. The die 1 is provided with a transversely curved concave surface 3 and the die 2 with a transversely curved convex surface 4, which has substantially the same degree of curvature as the surface 3 of the die 1.

Intermediately of the upper and lower surfaces 5 and 6 respectively thereof, the die 1 is provided with a horizontally disposed recess 7 which extends the full width of the die, that is from the side 8 to the side 9, and rearwardly or inwardly from the surface 3 to a distance approximately the width of the leg of the largest angle which the device is adapted to bend. In practice, this distance will be about one and one-half inches. The rear wall 10 of this recess, it will be noted, is substantially parallel with the surface 3 of the die. The depth or height of the recess 7 will, in practice, be slightly more than twice the thickness of the legs of the largest angle which the device is adapted to bend. In practice, this depth will be about 3/8 of an inch.

The die 2 is similarly provided with a recess 11 disposed opposite the recess 7 and having a rear wall 12 which is substantially parallel with the surface 4 of the die.

The dies 1 and 2 are maintained in alignment with each other and in assembled relation by means of parallel slide rods 13 which are removably secured to the die 1, and extend through the die 2. These rods are provided with heads 14 which limit the extent of separation of the dies and maintain them in assembled relation at all times. A coiled spring 15 is mounted on each rod, the ends of these springs abutting the dies so as to automatically cause the die 2 to recede from the die 1 when the pressure of the movable vise jaw on the die 2 is released, as will be presently described.

For the purpose of regulating the degree of curvature which may be imparted to an angle or other shape by the device, means are provided

as shown in Fig. 1, consisting of a screw bolt 16 having a shank 17 provided with graduations indicating radius of curvature in inches and a head 18. This screw bolt is threadedly mounted in a lug 19 extending from the upper surface 20 of the die 2.

A pointer or index finger 21 is mounted on the surface 20 of the die, and the bolt may be set at any desired point with reference to this pointer. The bolt is reduced in diameter at one end to provide a contact point 22, which is adapted to abut a similar point 23 of a screw 24 mounted in a lug 25 extending from the upper surface 5 of the die 1.

Each of the dies 1 and 2 is provided in its rear surface with a vertically extending recess 26 which is of a width sufficient to receive the jaw of a vise, whereby the device is restrained from lateral movement when in use.

The device, as above described, is adapted to be mounted on the movable screw housing member 30 of a vise, the downwardly extending elements 1a and 2a of the dies engaging the sides of this housing member so as to assist in preventing lateral displacement of the device during movement of the die 2 towards or away from the die 1. With the device thus mounted, the stationary and movable jaws 31 and 32 respectively of the vise extend into the recesses 26 in the rear surfaces of the dies and in conjunction with the screw housing member 30, effectively prevent lateral movement of the device at all times.

The operation and use of the device will be generally understood from the foregoing description, but may be briefly described as follows:

It will be assumed that it is desired to simultaneously bend a pair of angles to the shape shown in Fig. 2, that is, so as to produce the maximum degree of curvature of the angles. In such case, the bolt 16 will be retracted as far as possible, as indicated in Fig. 1. The jaw 32 of the device will also be retracted by the handle 33 of the vise, so as to provide sufficient space between the dies to permit endwise insertion of the angles, as indicated in Fig. 1, it being apparent that upon such retraction of the jaw 32, the springs 15 will force the die 2 to follow the jaw 32 as the latter recedes. The angles arranged as shown in Fig. 1, are then inserted between the dies and in such manner that the horizontally extending legs enter the recess 11 in the die 2. The vise handle 33 is then rotated, thereby moving the die 2 towards die 1 and causing the surface 4 of the die 2 to engage the vertical legs of the angles, bending the angles to the desired curvature in the manner shown in Fig. 2. By providing the recess 11 in the die 2 to receive the horizontal legs of the angles, both the horizontal and vertical legs of the angles may be simultaneously bent to the desired curvature, and the difficulties, as previously described, of bending one leg of the angle independently of the other, thereby avoided.

Where portions of the angles of a length greater than the width of the dies are to be bent, it will be understood that the die 2 will be released, and the angles moved along in the direction indicated by the arrow in Fig. 2, so as to present to the curved surfaces of the dies such additional straight portions of the angles as may be desired.

Where, as in the manufacture of guard frames, it is desired to provide angles having reversely curved portions, as shown in Fig. 4, the portion of the angle indicated by the reference character A, will be curved in the manner just described. For bending that portion of the angle designated B, however, the angle will be reversed and the leg which was previously disposed in the recess 11, will now be disposed in the recess 7 of the die 1.

Where it is desired to simultaneously bend a pair of angles to the shape shown in Fig. 3, that is, so as to produce a smaller degree of curvature than in Fig. 2, the bolt 16 is adjusted by screwing it forwardly until the index finger 21 indicates on the shank 17 of the bolt the desired radius of curvature of the angle. The bending operations are then conducted as previously described, with the exception that the dies will not approach each other to the extent shown in Fig. 2, but will remain spaced apart as indicated in Fig. 3 and to an extent determined by the engagement with each other of the contact points 22 and 23. In order to compensate for wear of the point 22 which would in such case necessitate resetting of the bolt 16, the screw 24 is adjustably mounted in the lug 25.

In bending T's, the vertical member of the T will be disposed in the recess 11 or 7, as may be desired.

It will be noted that the device is portable and may be quickly and easily removed from the vise when not in use, that it is compact and may therefore be easily transported and stored in a small space, and that its ready detachability from the vise permits the vise to be used for its ordinary functions when the present device is not required to be used.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In combination with a vise having a stationary jaw, a movable jaw and a screw housing, a device for bending angles comprising a pair of dies movable relatively to each other, each of said dies having downwardly extending elements engaging the sides of said screw housing, slide rods secured to the elements of one of said dies and extending through the elements of the other die, and coiled springs mounted on said rods, said springs resisting the movement of said dies towards each other.

2. In combination with a vise having a stationary jaw, a movable jaw and a screw housing; a device for bending angles comprising a pair of dies movable relatively to each other, each of said dies having downwardly extending elements engaging the sides of said screw housing.

3. In combination with a vise having a stationary jaw, a movable jaw and a screw housing; a device for bending angles comprising a pair of dies, each of said dies having elements engaging the sides of said screw housing and vertically-extending recesses in the rear surfaces of said dies, said recesses being open at each end and said jaws extending into said recesses.

4. In a device of the character described, a pair of relatively movable dies having opposed curved surfaces, and means for limiting the extent to which said curved surfaces may be caused to approach each other, said means comprising

a contact member on one of said dies and an adjustable screw bolt on the other die, said bolt being in axial alignment with said contact member.

5. In a device of the character described, a pair of relatively movable dies having opposed curved surfaces, and means for limiting the extent to which said curved surfaces may be caused to approach each other, said means comprising a longitudinally adjustable contact member on one of said dies and an adjustable screw bolt on the other die, said bolt being in axial alignment with said contact member.

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