Dec. 29, 1942. W. J. CROWELL, JR 2,306,595

BRAKE FOR BENDING SHEET MATERIAL

Filed Aug. 18, 1941 2 Sheets-Sheet 1

Fig. 1

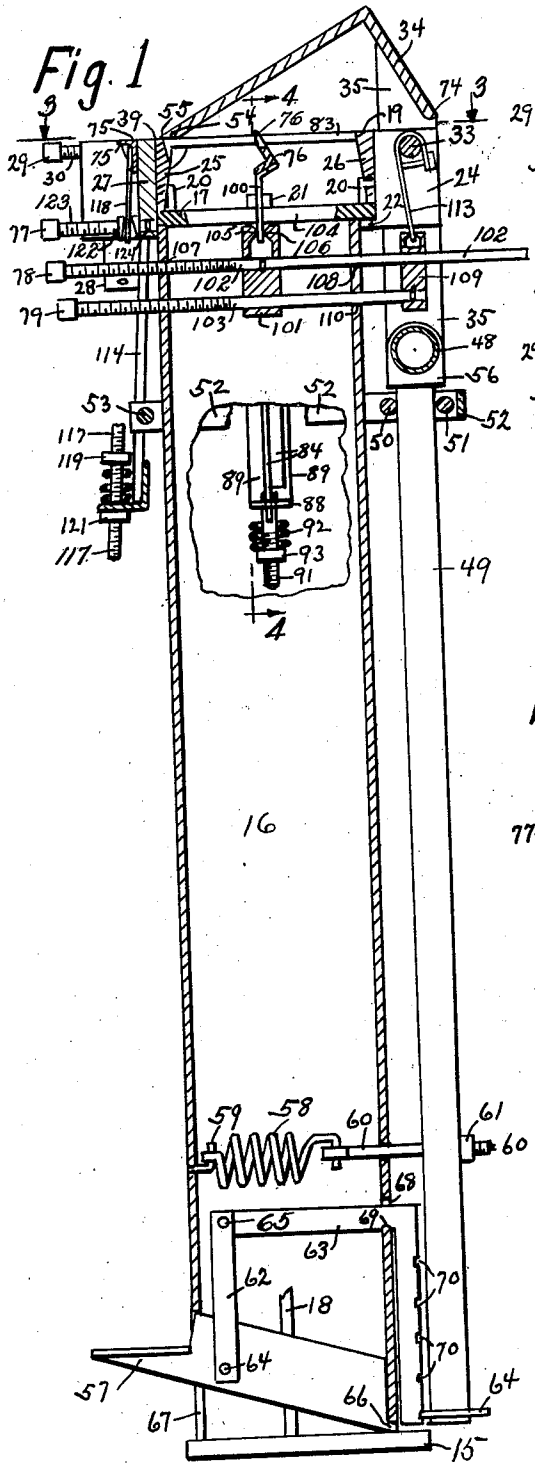


Fig 2

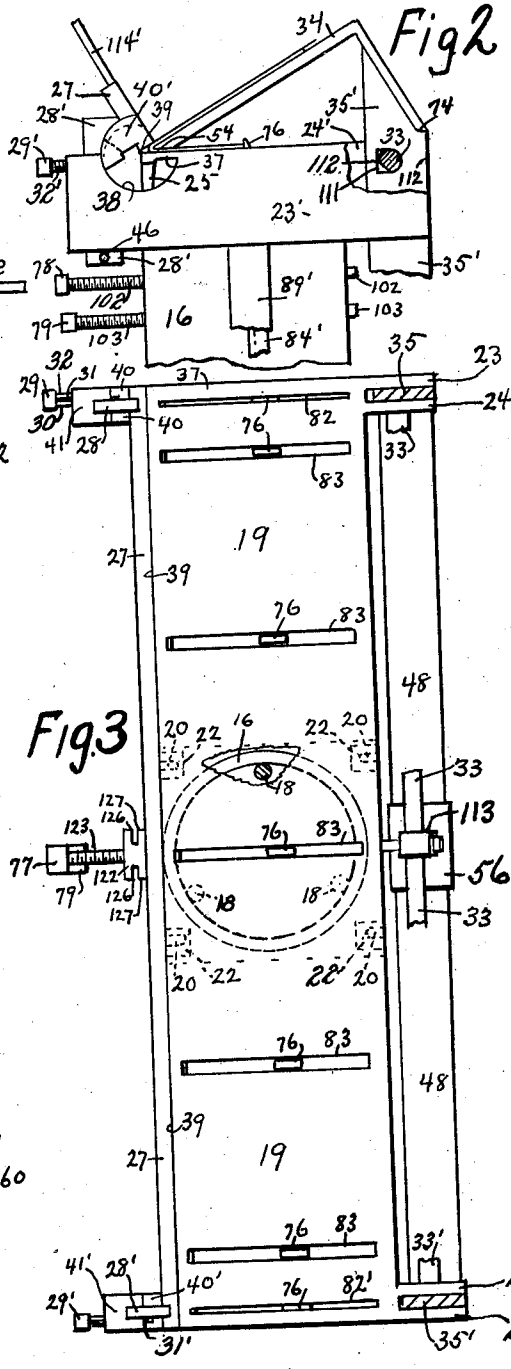


Fig 3

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BRAKE FOR BENDING SHEET MATERIAL

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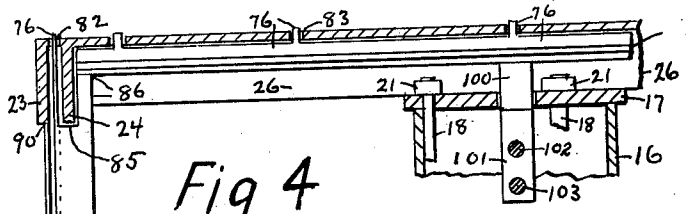


Fig 4

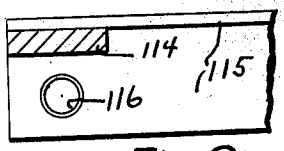


Fig. 8

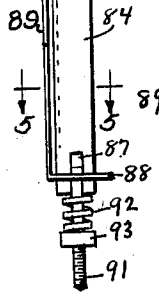


Fig. 5

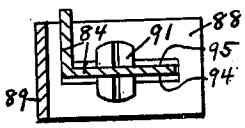


Fig. 6

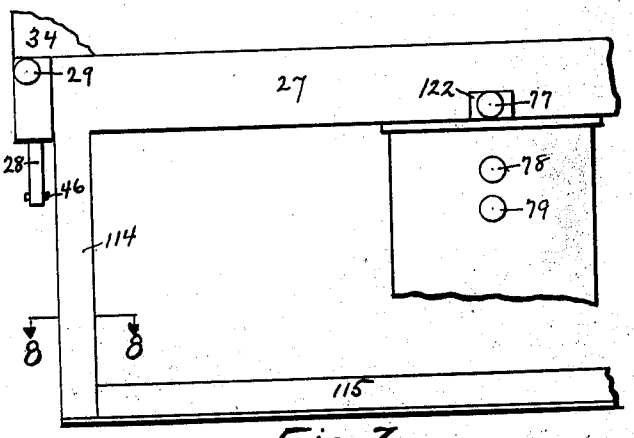


Fig. 7

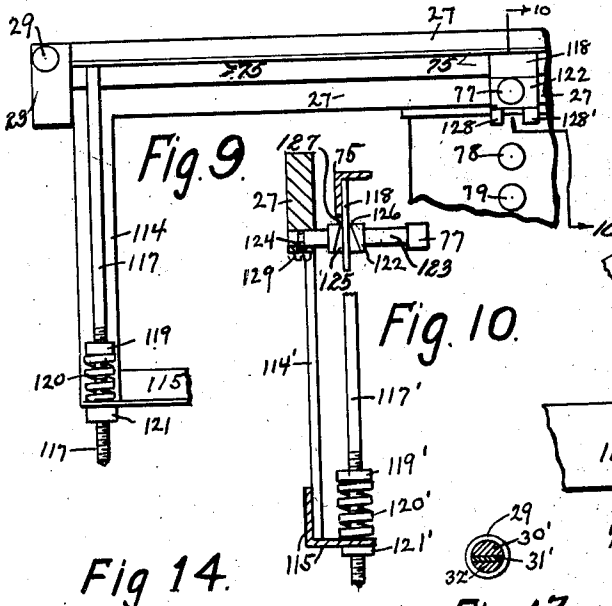


Fig. 9

Fig. 10

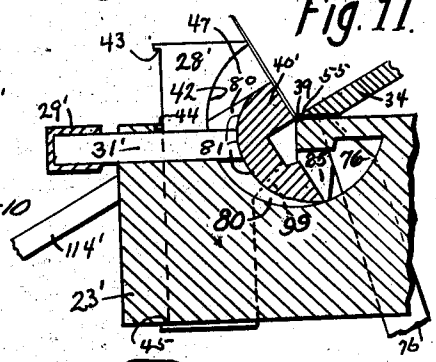


Fig. 11

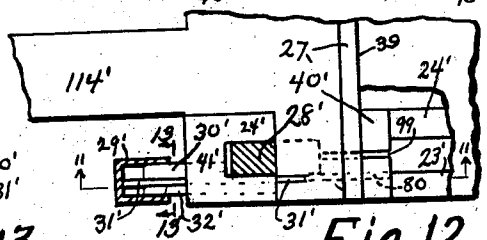


Fig. 12

Fig 13

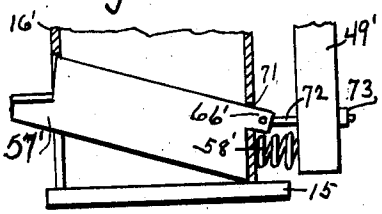


Fig 14

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UNITED STATES PATENT OFFICE

2,306,595

BRAKE FOR BENDING SHEET MATERIAL

William J. Crowell, Jr., Wyncote, Pa.

Application August 18, 1941, Serial No. 407,374

17 Claims. (Cl. 153—16)

The present invention relates to a "brake" for flap bending sheet material and will find particular application when making boxes, conduit fittings and the like of sheet material, its use, among other advantages, avoiding the need for hand crimping and permitting easy and exact gauging of flap widths and of the degrees of bending.

A purpose of the invention is to support a flap bar for flap service along the full length of the bar and in a manner permitting presentation of work material to any portion of the length of bar, from in front of the machine and from along either side of the machine, as well as permitting its presentation from the rear of the machine to any but small end portions of the bar length.

A further purpose is to make the ends of the flap bar flush with the ends of the gripping jaws of the machine and these flush with the sides of the machine.

A further purpose is to support a raised flap bar by raised bearings that retract downward when the bar is retracted angularly downward, the downward retraction of the bearings putting them out-of-the-way of work presented above the bearings to the bar.

A further purpose is to accommodate different thicknesses of work material by adjustably limiting rearward movement of a rearwardly pivoted gripper member. I provide the gripper with a forward and rearward play at its pivot and rearwardly limit the play, making the pivot an angularly adjustable cam.

A further purpose is to adjustably gauge flap width by angularly adjusting stop mechanism, pivoting rearward and forward stops respectively below and to the rear and below and to the fore of the flap line, supporting the rearward stop from the bed and the forward stop from the flap bar.

A further purpose is to upwardly present the rearward stop through slots in the bed of the machine, extending the slots from near the flap line rearwardly and locating them at intervals along the bed length.

A further purpose is to support the stops resiliently, the rearward stop that when set near the flap line under the clamping surface of the gripper it will rise and fall with the gripper, rising into its service position as the gripper is raised, and the forward stop that it may accommodate its position to that of the flap bar if the flap bar is thrown all the way to the gripper.

A further purpose is to adjustably limit the angle of bend or flapping of the flap bar. I locate a cam slot in a journal portion of the bar, a cooperating shoe in the adjacent supporting structure and adjustably limit outward movement of the shoe.

A further purpose is to locate easy screw adjustments at the front of the machine respectively for variant thickness of work material, for variant angle of flap bend, for variant width of rearwardly directed flap and for variant width of forwardly directed flap.

A further purpose is to spring clamp the brake to closure, lifting or opening it by treadle against the spring retraction, or optionally to spring retract the brake open, closing it by treadle against spring retraction.

A further purpose is to carry the bed, preferably in the form of a downward channel, across the top of a tubular post, to pivotally support the flap bar and gripper respectively at front and rear of the channel upon rails inset into the legs of the channel, a pair of rails at each end of the channel.

A further purpose is to present forwardly and upwardly mutilated journal ends of the flap bar to stationary and movable bearings concentric with the front edge of the bed, the stationary bearings, upward grooves in the rails, underlapping the bed and the movable bearings positioned by the journal ends of the flap bar retracting down out-of-the-way when the flap bar is retracted, operating between the rails.

A further purpose is to use the gripper to pivotally support the operating lever thereof.

Further purposes will appear in the specification and in the claims.

I have elected to illustrate one only of the many forms of my invention, showing however a detail modification and selecting a form that is practical and efficient in operation and that illustrates particularly well the principles involved.

Figure 1 is a vertical mid section, front to rear, of a desirable embodiment of the invention, central post structure being broken away to disclose gauge mechanism near one end of the machine.

Figure 2 is an end view of a portion of the structure of Figure 1 with an end rail broken away to show mechanism of the gripper, the view looking in the same direction as in Figure 1 but with parts in different position, Figure 1 showing the flap bar down in work receiving position and Figure 2 showing work in place with the flap bar all the way up at the end of flapping.

Figure 3 is a top plan of Figure 1, omitting the gripper, the view corresponding to a section of Figure 1 taken upon the line 3—3 thereof.

Figure 4 is a vertical section of Figure 3 taken upon the line 4—4 thereof and to show the rear lap-width gauge mechanism.

Figure 5 is a horizontal section of a detail, taken upon the line 5—5 of Figure 4 and to enlarged scale.

Figure 6 is a view corresponding to Figure 5 but with the addition of a part omitted in Figure 5.

Figure 7 is a broken front elevation to show the flap bar and flap bar handle and the different gauge setting knobs, with removable mechanism of the forward lap-width gauge lifted away.

Figure 8 is an enlarged sectional detail taken upon the line 8—8 of Figure 7.

Figure 9 is a broken view corresponding to a portion of Figure 7 but with the forward lap-width gauge mechanism in place and in its low out-of-the-way position.

Figure 10 is a broken vertical section of Figure 9 taken upon the line 10—10 thereof.

Figure 11 is a detail vertical section to enlarged scale showing flap bar bearing and stop mechanism, the view corresponding to a vertical section of Figure 12 taken upon the line 11—11 thereof, and showing the flap bar turned upward sixty degrees, stopped from further rise by the angle gauge, the view also showing the rear flap-width gauge set in its most forward position.

Figure 12 is a top plan of Figure 11 but omitting work material shown in Figure 11.

Figure 13 is a detail section of the angle gauge, taken upon the line 13—13 of Figure 12.

Figure 14 is a modified fragment of Figure 1, depression of the treadle opening the clamp or gripper in Figure 1 while in Figure 14 depression of the treadle closes the clamp or gripper.

Like numerals refer to like parts in all figures.

Describing in illustration and not in limitation and referring to the drawings:

In the illustration, central supporting structure of the bed includes a base plate 15, a hollow post 16 and a cap plate 17, with the three members 15, 16 and 17 bolted into a rigid unit by tie rods 18 and the bed 19, sectionally a horizontal inverted channel, is carried across the top of the central unit, hook bolts 20 bolting the bed to the cap plate 17.

As shown, the tie rods 18, three in number, inside the hollow post and uniformly spaced about the inner circumference thereof, thread into the base plate 15 and carry nuts 21 above the cap and between the down flanges of the bed. The hook bolts 20, four in number, are near the corners of the cap 17 some distance out from the post 16. At the top they hook outwardly into the down flanges of the channel and at the bottom carry nuts 22 below the cap 17.

Pairs of rails 23, 24 and 23', 24' at opposite ends of the bed are inset into the ends of the down flanges 25 and 26 of the bed and then welded to an integral structure with the bed. They extend forwardly of the bed for the support of a flap bar 27, movable flap bar bearings 28 and 28' and to carry counterpart mechanisms, 29, 30, 31, 32 and 29', 30', 31', 32' for adjustably limiting the angular throw of the flap bar.

The rails 23, 24 and 23', 24' extend rearwardly of the bed to carry a rod 33 pivotally supporting a gripper 34, 35, 35' with a provision for rearwardly supporting the gripper adjustably in order to accommodate the position of the gripper to different thicknesses of work material.

In the illustration the rails are intended to have been downwardly recessed to receive the web 37 of the bed, at the front of the machine along the flap bar the bed web being continuous from one end or side of the machine to the other.

The rails 23, 24 and 23', 24' suitably are all alike in contour. They are downwardly recessed arcuately with respect to the top front edge 39 of the bed and to provide stationary bearing surfaces 38 for the flap bar.

The flap bar 27 turns about an axis herein called the flap line and that is intended to be substantially coincident with the top front edge 39 of the bed.

The flap bar presents fragment or mutilated journal portions 40 and 40' at opposite ends of the bar to the stationary bearings 38 which are arcuately concentric about the edge line 39 of the bed and underlap in-tact portions of the bed (Figures 2 and 11).

The flap bar and rail structures are intended to be both free from upward extension beyond the flap line while the flap bar is down in work receiving position, the top surfaces of the flap bar and of the rails being preferably then even with the top of the bed.

The movable or lift bearings 28 and 28' are housed laterally by the adjacent rails and forwardly are housed against the vertical edges of spacer strip connections 41 and 41' between the rails at their forward ends. They move vertically between low and high positions; from low positions when the flap bar is all the way down and at which their top ends preferably are even with the bed, Figures 1 and 3, to high positions, Figures 2 and 11, when the flap bar has been partially or wholly advanced and at which they present bearing surfaces 42 in arcuate alinement with the stationary bearing surfaces 38 and present these surfaces against the forwardly turned or turning mutilated journals 40 and 40', to support the flap bar from shifting axially forward from the flap line 39.

As the mutilated journals 40 and 40' and flap bar 27 retract downward from about a sixty degree advance (Figure 11) the lift bearings 28 and 28' descend by gravity to be downwardly out of the way and in positions considered sufficiently low to be out of the way are brought to rest by suitable engaging surfaces of the journal and bearing members 40, 29 and 40', 28' or by suitable opposing surfaces 43 and 44 of the lift bearing and rail structure, coming together at the low position of the lift bearing.

In Figure 11 corresponding upward and downward surfaces at 45 of the lift bearing and rail structure engage at the high position of the lift bearings while in Figure 2 a pin 46 is shown limiting the upward movement of the lift bearing.

The multilated journal portions of the flap bar obviously can be extended forward beyond the normally front face of the bar to wholly or partially fill the space at 47, Figure 11, without extending them above the normally top surface of the bar and when this is done, or if it is done, the need for stop surfaces at 43 and 44 is avoided. But such extension of the mutilated journal portions of the bar into the space at 47 is likely to be sometimes in the way, preventing bending operations otherwise readily performed on the machine so that more usually it is preferable to have the mutilated journal portions of the bar free both from upward extension beyond the normally top face of the bar and free from forward extension beyond the normally front face of the bar.

The gripper 34, 35, 35' includes a downwardly directed angle member 34 extending from one end of the machine to the other and carried on generally vertical arms 35 and 35' pivotally supported respectively between the rearward extensions of the rails 23 and 24 and between the rearward extensions of the rails 23' and 24'.

The vertical arms 35 and 35', pivotally supported on the rod 33, are united at their lower ends by a cross connector 48 to pivotally suspend an operating lever 49 between inner and out fulcrums 50 and 51. A mount 52 of the fulcrum pins 50 and 51 is shown as a clamp surrounding the hollow post 16, clamping to position at a bolt 53 and on loosening a nut (not shown) of the bolt 53 vertically adjustable on the post.

The lever 49 pivotally suspended from the gripper is located directly back of the hollow post and at the foot of the post spring treadle means are provided for the operation of the lever 49 and thereby of the clamping action of the gripper at the downwardly directed gripping surface 54 thereof.

The range of vertical movement of the gripper at its gripping face 54 and bending edge 55 is quite small, preferably from the bed upward being great enough merely for an easy sliding insertion of work sheets between the bed and gripping surface.

In the drawings the connector 48 uniting the down arms 35, 35' of the gripper and the suspended operating lever 49 are of pipe structure, a T head 56 of the lever 49 surrounding the cross connector 48 with freedom to turn with respect to the gripper, turning on the cross member or/and the cross member turning in the down arms of the gripper to accommodate rocking movement of the lever 49 with respect to the gripper. Suitably the cross member is welded to the gripper unit and the T head 56 of the lever 49 is made free to turn on the cross member when the lever 49 is rocked on either of its fulcrums 50 and 51.

Figures 1 and 14 show at the foot of the hollow post 16 or 16' respectively somewhat different spring and treadle mechanisms for operating the lever 49, thereby to operate the gripper.

The lever 49 fulcrums on its outer pivot 51 when moved in direction to raise the gripper member from the bed and fulcrums on the inner pivot 50 when moved in direction to press the gripper downward upon the bed or upon work between the bed and gripper.

The lever 49 positions the gripper and is spring retracted to maintain the gripper in a normal rest position, and either the open work-receiving position or the closed gripping position may be made the normal rest position, each having advantages over the other, and depression of a treadle 57 or 57' at the foot of the post 16 or 16' either shifts the lever 49 or 49' from its spring maintained position of normal rest, as in Figure 1, to raise the gripper for the insertion or removal of work, or, as in Figure 14, shifts it from its spring maintained position of normal rest to grip work for flap bending with the flap bar.

In Figure 1 the gripper normally is spring retracted strongly to its gripping position by means of a tension spring 58 inside the hollow post 16, forwardly anchored at a hook 59 to a front portion of the post and rearwardly adjustably stretched by a hook bolt 60, at its rear end in hook engagement with the spring and extending rearward loosely through the rear of the post, loosely through the body of the lever 49 with an adjustment nut 61 at the rear of the lever 49.

The treadle 57 operatively connects to the lever 49 through links 62, rocker 63 and cam washer 64, the links 62 being effectively a single link with one only visible and both pivoting on opposite ends of the same pivots 65 and 65' respectively in the treadle and rocker members. As shown, the treadle is a flat plate with a forward bend to provide the tread. Rearwardly, at 66, it presents a nose in a housing upward notch of the post wall and forwardly laterally houses in an upward slit 67 of the post wall.

The rocker 63, a flat angle member, presents a generally horizontal arm forwardly into the hollow of the post through a rearward perforation 68 of the post wall, is pivotally supported on the wall at the bottom of the perforation 68 in an upward notch 69 of the rocker and presents a downward rear arm between the lever 49 and the post 16, the rear arm presenting a succession of vertically spaced notches 70 toward the lever 49 to selectively house the inner edge of the cam washer 64.

The cam washer 64 has its inner and outer diameters relatively eccentric and is movable along the lever 49 to be received selectively in any one of the rearward notches 70 of the rocker 63.

In the structure of Figure 1 the normal angular position of the lever 49 without depression of the treadle 57 is determined by the closure position of the gripper upon the bed or upon work between the bed and gripper and the position of the treadle undepressed may be regulated by angularly shifting the eccentric washer 64 which changes the position of the rocker 63 with respect to the lever 49.

It will be seen also that the degree of opening of the gripper when the treadle is depressed and the force required to depress the lever may be widely varied and relatively in opposite directions by shifting the cam washer 64 to a selectively different notch 70.

In the structure of Figure 14, the lever 49' is in its normal rearwardly retracted position at which it holds the gripper open in work-receiving position, a compression spring 58' without depression of the treadle 57' holding the lever 49' resiliently in its normal rearwardly retracted position.

The treadle 57' presents an upward rearwardly extending nose 66' through a housing rearward perforation 71 of the wall of the post 16' and a hook bolt 72 adjustably links the upward nose 66' of the treadle to the lower end of the lever 49', forwardly hooking pivotally into the nose 66', rearwardly loosely passing through the lever 49' and at the back of the lever provided with an adjustment nut 73.

Important features of the invention accommodate the device to service needs that may be widely variant: with respect to the thickness of the work to be bent, to the degree of angular bending, to the width of flap and to interfering dimensional characteristics of the work, as with respect to the location and magnitude of different bends and of different portions of the work.

Particularly if there are to be two or more parallel bends in the same direction and on the same sheet, this sheet will best progress through the machine from the rear, slid forward between the gripper arms 35, 35', over the cam rod 33 and under the suitably high rear edge 74 of the gripper, forward under the raised gripping edge 54, 55, to the rearwardly presented upwardly projecting face of a suitably raised and set lap-width gauge 75, shown in low position, Figures 1, 9 and 10.

Perhaps more frequently the work will be presented from the front or from the front and one or other of the sides, with the flap presented rear-

wardly over the flap bar, between the bed and raised gripping edge to a suitably set lap-width gauge 76, Figures 1 to 6 and in raised position Figures 1 to 4 and 11, Figure 11 showing a fragment of the gauge 76 in its most forward position, while in Figures 1 to 4 it is in mid position.

The degree of bending may need to vary widely. Sometimes the flap bar 27 needs to be thrown all the way until it presses the bending flap of the work against the sloping face of the gripper and at other times the flap bar will need to be thrown to any of a number of specific angular positions along its range of throw, positions exactly determinable by one or both of the counterpart mechanisms 29, 30, 31, 32 and 29', 30', 31', 32' for adjustably limiting the angular throw of the flap bar.

Different setting heads of the device are shown at 29, 29', 77, 78 and 79. These adjustment heads, located at the front of the machine permit the device to be set quickly and easily to the variant needs of specific work.

The angular throw of the flap bar is adjustably limited at one or both of the heads 29 and 29'; the width of a forward flap, one above the flap bar, is determined at the head 77; the width of a rearward flap, one under the gripper during bending, is determined at the head 78; and the head 79 permits an easy accommodation of the machine to different thicknesses of the bending material.

The mechanisms 29, 30, 31, 32 and 29', 30', 31', 32' for adjustably limiting the throw of the flap bar are counterpart, a description of either applying to both and optionally one only being provided in that either may be used without the other, although for heavy duty service it is believed preferable to have two, one at each end of the machine in front of the mutilated journal 40 or 40'.

The mutilated journal 40', Figures 11 and 12, is provided adjacent the lift bearing 28' with a cam slot 80, the bottom 81 of the slot spiralling with respect to the flap line 39 outwardly and rearwardly from the front of the flap bar and the members 29', 30', 31', 32' include a screw cap 29', threaded rod segments 30' and 32' and a shoe or slide 31'.

The shoe or slide 31' presents its inner end in the slot 80 to or toward the cam surface 81, presents its outer end across the end wall of the cap 29' and is laterally housed on one side by the lift bearing 28' and the threaded rod segment 30' and on the other side by the threaded rod segment 32'.

The rod segments 30' and 32' are of different lengths in that one of the segments, 30', is directly in front of the lift bearing 28'. The segments 30' and 32', presenting their flat faces to opposite sides of the shoe or slide 31' have their arcuate surfaces threading, optionally loosely, into the adjacent rail structure and the cap or head 29' adjustably threading the outer ends of the segments to adjustably limit outward movement of the shoe or slide 31'. The presentation of the flat of the shoe to one side of the lift bearing prevents any turning of the members 31', 32' and 30' in obvious manner.

Upward turning of the flap bar 27 is stopped when the cam surfaces 81 compresses the shoe or slide 31' longitudinally against the cap 29', and stopped adjustably at different angular positions of the bar at correspondingly different portions of the cam 81 according to the screw adjustment of the cap or head 29'.

The forward and rearward lap-width gauges or stops 75 and 76, presented selectively in front of and behind the braking edge 55 of the gripper according to the manner of work presentation are at any desired distances from the gripping edge 55 within ranges of adjustment at the heads 77 and 78. They are carried on legs near the sides of the machine, pivotally and downwardly yieldably supported at axes well below the bed level, are vertically adjustable at their pivotal supports and are angularly adjustable at the heads 77 and 78 to adjustably shift the lap-width.

The forward and rearward lap-width gauges are normally used selectively, the forward gauge when the work is presented from the rear of the machine and the rearward gauge when the work is presented from the front of the machine. The forward lap-width gauge is carried from the flap bar 27 and the rearward lap-width gauge is carried from the outer rails 23 and 23'.

The bed is vertically slotted at 82 and 82' between the rails near each side of the machine and at 83 at suitable intervals of the bed length, the slots being transverse to the length of the machine from points somewhat inward from the flap-line to points somewhat inward from the rear edge of the bed.

The flap width gauge 76 is presented to the work upwardly from beneath the bed through the bed slots 82, 83 and 82' by tine portions of the gauge.

The member 76 is shown as a horizontal angle extending longitudinally of the machine beneath the bed, with an upwardly directed wider flange recessed intermediate the tines and to form the tines, upwardly presented through the slots, relatively alined at the same distance from the flap line, one in each of the slots 83.

The legs 84 and 84' of the gauge 76 are suitably opposite counterparts welded to the horizontal tined angle at the ends thereof and a description of one will apply to both.

Referring to Figures 4 to 6, the leg 84 is of angle section with one flange presented up between the rails 23 and 24 through the slot 82 to provide an end tine of the gauge 76 with a forward edge in the alinement of the forward edges of the other tines. The other and wider flange is downwardly recessed at 85 to avoid the rail 24 and at 86 rigidly connects with the horizontal portion of the gauge 76.

At the bottom of the leg 84 the wider flange is upwardly slotted at 87, the adjacent portion of the narrower flange removed and the leg is supported from a low horizontal plate or shelf 88, shown as a right bend at the lower end of a flat 89 rigidly connected at its upper end at 90 to the rail 23.

The leg 84, at the lower end of its slotted wide flange, straddles the head and body of a supporting screw 91 and presents its end to a spring 92 surrounding the body of the screw 91 above an adjustment nut 93 and below the supporting plate or shelf 88. The forward and rearward faces 94 and 95 of the leg are presented to horizontal forward and rearward edges 96 and 97 of a slot in the plate 88, centrally enlarged at 98 to downwardly pass the body of the screw 91. The forward and rearward edges 96 and 97 of the supporting plate 88 are pivot bearings presented to opposite sides of the leg and preferably these edges are downwardly chamfered as indicated in Figure 4.

The chief function of the spring 92 is to per-

mit more easy use of the lap-width gauge on very narrow widths of flap at which the tine portions of the gauge may often need to be set directly under the downwardly directed gripping surface 54 of the gripper, for example, as seen in Figure 11. When in this setting, the gauge member 76 comprises an upward resilient follower of the gripper surface 54, rising and falling with the gripper, immediately in its work receiving position when the gripper is lifted without in any wise interfering with the downward gripping action of the gripper. A suitable slot 99 in the rear of the mutilated journal 40' permits entry of the gauge member 76 to its forwardmost positions.

The head of the screw 91 is upwardly supported by the plate 88 and is cut away at opposite sides even with the body of the screw for its entry into the upward slot 87 of the leg 84.

The lap-width gauge 76 may be set with its alined tines anywhere along the slots 82, 83, 82', at any of these positions being raised and lowered at the nuts 93. The setting mechanism of the lap-width gauge 76 includes the members 100, 101, 102, 78 and 103 (Figures 1 and 4), the member 100 comprising a flat arm downward from the gauge member 76 through a slot 104 in the cap 17 and between upward forward and rearward arms of a shifter, the member 101. The shifter 101 presents opposing shift edges 105 and 106 to the forward and rearward faces of the arm 100 and is itself shifted forwardly and rearwardly by the member 102, shown as a rod rotatable in the shifter 101 without freedom of longitudinal movement in the shifter, the rod forwardly threading at 107 through the front of the post 16 to carry the head 78 rigidly connected thereto and rearwardly having a slide support at 108 in the back of the post 16 and extended back of the post where it provides guiding slide support for a shifter 109 of the thickness-adjustment mechanism.

The member 103 is the operating rod of the thickness adjustment shifter 109, carries the adjustment head 79 at its forward end, threads through the front of the post 16, gives slide guiding support to the shifter 101, has a slide support at 110 in the back of the post 16 and at its rear end gives a swiveling support to the shifter 109, to shift the shifter 109 forwardly and rearwardly by turning the head 79 to longitudinally shift the rod by reason of its threading through the front of the post.

As may be best seen in Figure 2, the proper position of the gripper at its forwardly presented braking edge and upper face is different somewhat according to the thickness of work material in that the plane of the initially under side of the work sheet both before and throughout bending should pass through the flap line 39, the pivotal axis of the flap bar, and I provide easy means for slightly shifting the operating position of the gripper forwardly and rearwardly to accommodate lesser and greater thicknesses of work material.

The down arms 35, 35' of the gripper pivot respectively between the rails 23, 24 and between the rails 23', 24' at opposite ends of the machine on horizontal stationary pivots 33 and 33', supported in the rails at the sides of the respective arms.

I provide the gripper with a small freedom of forward and rearward movement on the cam-and-pivot rod 33, suitably by forwardly or rearwardly relieving opposing forward portions of the arm and pivot members, for example, as indicated at 111, Figure 2, and I adjustably support the gripper from rearward movement by moving the cam rod 33, shifting its angular position.

The cam rod 33 journals in the rails on each side of each of the gripper arms 35, 35', presents forwardly supporting edges 112 to the gripper arms and extending for the length of the machine presents a shift arm 113 to the opposing shift edges of the shifter 109 already described. It will be seen that angular movement of the shift arm 113, effected by turning the adjustment head 79, arcuately changes the forward and rearward position of the edges 112 forwardly supporting the gripper. Operating the flap bar exerts heavy rearward pressure upon the gripper, maintaining it against the arcuately forwardly and rearwardly adjustable edges 112 of the cam rod 33.

The shift arm 113, rigidly connected to the cam rod 33 in any suitable way, for example, by welding, has been shown as clamping thereto in obvious manner.

It will be seen that the gripper should be positioned further rearward when the work material is thicker and the adjustment is made quickly and easily at the front of the machine by turning the head 79.

The flap bar 27 is provided with operating handle and forward lap-width gauge supporting structure comprising outward arms 114 and 114' and a cross bar 115 between the outer ends of the arms. The cross bar 115 is shown of angle section with one flange of the angle at right angles to the arms provided with chamfered bores 116 in front of the suitably flat arms 114, 114'.

The forward lap-width gauge 75 is located adjustably in front of the flap bar with a flat face presentable above the flap bar toward the gripper, having legs 117 and 117' pivotally and resiliently supported in the chamfered bores 116 of the cross bar 115, and having an adjustment arm 118 operatively presented to an arm shifter 122 operable at the head 77.

The horizontal body of the lap-width gauge 75 is shown a bar of angle section, the angle flanges in direction of width from the corner edge extending respectively downward and forward; the legs 117 and 117' rigidly connecting at the top to the horizontal body of the gauge are suitably rods threaded toward their lower ends and carrying nuts 119 and 119' and springs 120 and 120' above the cross bar 115 and nuts 121 and 121' below the cross bar 115. The springs 120 and 120', compressed against the cross bar 115 of the flap bar handle, press the gauge member 75 upward to extents limited positively by the nuts 121 and 121' and the gauge projecting or not projecting above the flap bar according to whether the nuts 121, 121' are nearer or less near to the ends of the legs.

The shifter 122 effectively is a nut on a threaded rod 123, the rod 123 carrying the adjustment head at its outer end non-rotatable with respect to the rod and at its inner end at 124 receiving rotatable support in a low portion of the flap bar 27 without freedom to move longitudinally in the flap bar.

The shifter 122, a laterally elongated nut, is slotted inwardly from its lateral ends, with the slots vertical at their lateral bottoms 125 downwardly forwardly and rearwardly flaring from their top forward and rearward edges 126 and 127.

The adjustment arm 118 from the lap-width gauge 75 is downwardly forked and presents its fork arms 128 and 128' in the alined opposite slots of the shifter 122, preventing the shifter from turning on its supporting rod 123 by laterally engaging the vertical lateral bottoms 125 of the slots, and in front and rear the fork arms are operatively engaged by the forward and rearward top edges 126 and 127 of the slots.

The shifter 122, non-rotatable and a nut on the threaded rod 123 carrying the adjustment head 77, operatively engaging forward and rearward faces of the adjustment arm 118, positions the lap-width gauge 75 for flap width and changes flap-width settings when the adjustment head 77 is turned.

Vertical shiftings of the lap-width gauge 75, to and from its operative positions at which normally it will project somewhat above the flap bar 27 are effected at the nuts 121 and 121'.

Sometimes particular work operations may need the gauge 75 and its positioning mechanism 77, 123, 122 out of the way and both are removable and put back quickly and easily, the gauge 75 lifting out on removal of the leg nuts 121 and 121' and the mechanism 77, 123, 122 sliding out of the flap bar on loosening its holding screw 129.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of the invention.

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

1. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface, a stationary bearing for the journal, in retracted position of the bar free from upward projection upwardly beyond the flap surface, a vertically movable bearing operative in advanced positions of the flap bar and inoperative in retracted positions thereof, a stationary vertical abutment in front of the movable bearing vertically guiding the movable bearing, and flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement.

2. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement and in which the bed, the gripper, the flap bar and the flap surface of the flap bar have relatively even ends at one side of the machine, permitting presentation of work from the front of the machine and from the side of the machine and to operate on work located during bending at the side of the machine, part way in and part way laterally beyond the machine, with the line of bending ending at the said even ends at the side of the machine.

3. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement and in which the bed, the gripper, the flap bar and the flap surface of the flap bar are substantially of equal length and relatively even at the sides of the machine, permitting the presentation of work material from either side of the machine and from the front of the machine along any portion of the length of the flap bar and to operate on work located during bending at the side of the machine, part way in and part way laterally beyond the machine, with the line of bending ending at the said even ends at the side of the machine.

4. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement with a cam groove in the mutilated journal presenting a cam bottom of rearwardly increasing radius with respect to the journal axis, a shoe presenting a rearward end in the groove, a housing laterally supporting the shoe and means adjustably limiting the shoe in forward movement by the cam to adjustably limit the advance of the flap bar.

5. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap sur-

face, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement with a cam groove in the mutilated journal presenting a cam bottom of rearwardly increasing radius with respect to the journal axis and the groove being located laterally adjacent the movable bearing, a shoe presenting a rearward end in the groove with a rearward portion of one side of the shoe laterally against the movable bearing, longitudinally split screw segments housing opposite sides of the shoe forwardly of the movable bearing, threaded support of the segments and a cap adjustably threading the forward ends of the segments to adjustably limit forward movement of the shoe between the segments to adjustably limit advance of the flap bar.

6. In a brake machine, a bed, a flap bar pivoting axially substantially in the forward edge of the bed, a gripper above the bed having a gripping bending edge along and somewhat back of the forward edge of the bed, a cam providing pivot support for the gripper at an axis rearwardly distant from the front of the bed, axially close to the plane of the bed, supporting the gripper upwardly, supporting it downwardly and supporting it adjustably rearwardly at somewhat different distances from the flap axis of the flap bar to accommodate different thicknesses of work material, a bearing for the cam and means for adjusting the angular position of the cam in the bearing.

7. In a brake machine, a bed, a flap bar having its flap axis substantially in the forward edge of the bed, a gripper above the bed having a gripping bending edge along the forward edge of the bed somewhat back thereof, operating arms for the gripper, generally vertical at opposite sides of the machine rearward of the bed, operable at their lower ends and mounting the forwardly extending gripper on their upper ends, an angularly adjustable cam rod pivotally supporting the arms and presenting upward and downward pivot surfaces to downward and upward surfaces of the arms and having a forward edge against generally vertical rearward surface of the arms differently distant from the rod axis at different angular settings of the rod, a bearing for the rod and means for adjustably varying the angular setting of the rod to support the gripper with its gripping bending edge at somewhat different distances from the flap axis of the flap bar to accommodate different thicknesses of work material.

8. The structure of claim 7 and the said means for varying the rod setting including a downward arm from the rod, a shifter forwardly and rearwardly engaging the arm and means for forwardly and rearwardly moving the shifter.

9. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement, a lap stop facing the flap line of the flap bar at selectively variant distances, upwardly extending legs carrying the stop, low abutments at front and rear of the legs cooperatively pivoting the stop on a low axis parallel to the flap line, adjustable resilient upward supports for the legs from the abutments and adjustable means for forwardly and rearwardly setting the stop, the stop being adapted to engage the gripper resiliently to accommodate its position to that of the gripper by compression of the resilient supports for the legs.

10. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement, characterized by the bed having slots at intervals of its length and extending from near its forward edge rearward, a lap stop having upward tines in the slots, legs upwardly carrying the stop, stationary low abutments at front and rear of the legs cooperatively pivoting the stop on a low axis parallel to the flap line of the flap bar, adjustable upward supports for the legs from the abutments and adjustable means for forwardly and rearwardly setting the stop.

11. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement, a lap stop in front of the flap bar at selectively variant distances from the flap line thereof, downward arms on the flap bar, legs threaded upwardly from their lower ends upwardly carrying the stop, low abutments from the arms at front and rear of the legs cooperatively pivoting the stop on a low axis parallel to the flap line, nuts on the legs at portions thereof above the abutments, springs compressed between the nuts and the abutments to resiliently upwardly support the stop, other nuts below the abutments adjustably limiting upward movement of the stop and adjustable means carried on the flap bar for forwardly and rearwardly setting the stop.

12. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for

gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement characterized by a post supporting the bed, the bed having a channel with its flanges downward across the top of the post and with rail projections at each end of the bed, forward to carry the flap bar and rearward to carry the gripper, with the flap bar free from longitudinal projection at the side of the machine beyond the flap surface of the bar and with the bed, the gripper and the bending surface of the flap bar relatively even at their ends, to operate on work located during bending at the side of the machine, partway in and partway laterally beyond the machine, with the line of bending ending at the said even ends at the side of the machine.

13. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement characterized by a lap stop, legs upwardly carrying the stop, low abutments at front and rear of the legs cooperatively pivoting the support on a low axis parallel to the flap line of the flap bar, adjustable upward supports for the legs from the abutments, a downward arm from the stop, a shifter forwardly and rearwardly engaging the arm and means operable at the front of the machine for forwardly and rearwardly moving the shifter.

14. In a brake machine, a bed, a flap bar located along the front of the bed with its axis at the front edge of the bed, generally vertical arms, a rod rearward of the bed pivoting the arms intermediate their length and coaxially parallel to the front edge of the bed, rearward extensions from the bed supporting the rod, a gripper rearwardly supported on the upper ends of the arms and forwardly presenting a bending gripping edge above the bed along the forward edge thereof, a post supporting the bed, a gripper-operating lever rearward of the post, operating pivot connection between the upper end of the lever and the lower ends of the vertical arms, rearwardly and forwardly directed fulcrums presented respectively to generally vertical forward and rearward sides of the lever and spring and treadle means for operating the lever, in one direction by depression of the treadle and in the other direction by spring retraction of the lever and treadle.

15. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement characterized by the bed having slots at intervals of its length extending from near its forward edge rearward with forward portions of the slots under the gripping surface of the gripper, a lap stop having upward tines in the slots, legs upwardly carrying the stop, low abutments at front and rear of the legs cooperatively pivoting the stop on a low axis parallel to the flap line of the flap bar, upward springs supports for the legs, adjustable upward supports for the spring supports from the abutments and adjustable means for forwardly and rearwardly setting the stop.

16. The structure of claim 14, the treadle mounted in and forwardly projecting from a hollow of the post, a rocker having a downward generally vertical arm between the post and lever arm, having a forward arm into the hollow post, upward fulcrum support at the rear of the post, downward link connections between forward portions of the forward arm and treadle and an operating connection between low portions of the vertical arm and lever arm.

17. In a brake machine, a bed having a forward edge, a gripper above the bed having a bending edge along the forward edge of the bed, means for relatively moving the gripper and the bed for gripping sheet material between the bed and gripper, a flap bar having a flap surface inwardly adjacent the forward edge of the bed, a mutilated journal on the flap bar free from projection upwardly beyond the flap surface and stationary and movable bearings for the journal, in retracted position of the bar both free from upward projection upwardly beyond the flap surface, flap bar operated means for lifting the movable bearing as the flap bar advances during an early portion of its advance, the movable bearing in raised position rearwardly supporting the journal from forward movement, three stops, one rearwardly supporting the gripper substantially at the pivotal axis thereof, a second engaging the flap bar to limit the angular throw of the bar and a third engaging the work to limit the width of lap and screw adjustments of the stops located at the front of the machine and respectively for thickness of work, for angle of flap bend and for width of flap, operative respectively to adjust the stop rearwardly supporting the gripper, to adjust the stop presented to the flap bar and to adjust the stop presented to the work when registering it for bending.

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