Feb. 20, 1940. J. JENSEN 2,190,839

BENDING BRAKE

Filed June 21, 1937 3 Sheets-Sheet 1

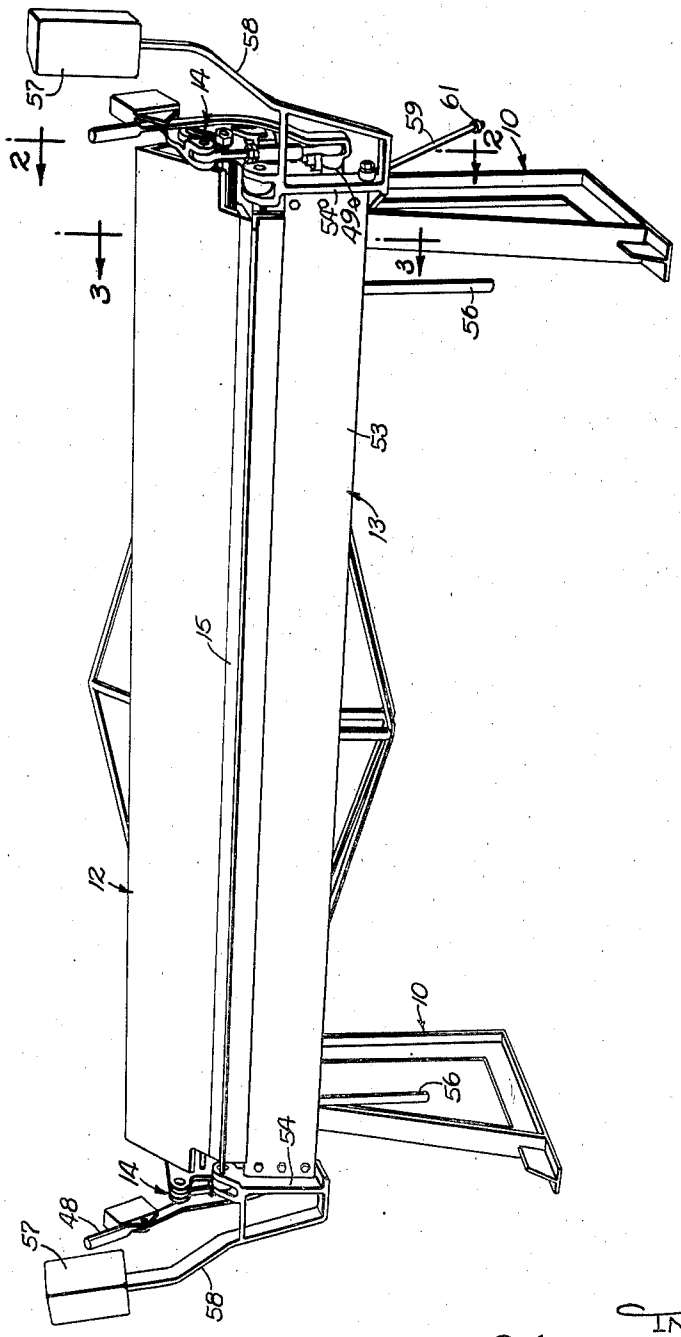


Fig. 1

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Filed June 21, 1937 3 Sheets-Sheet 2

Fig. 2

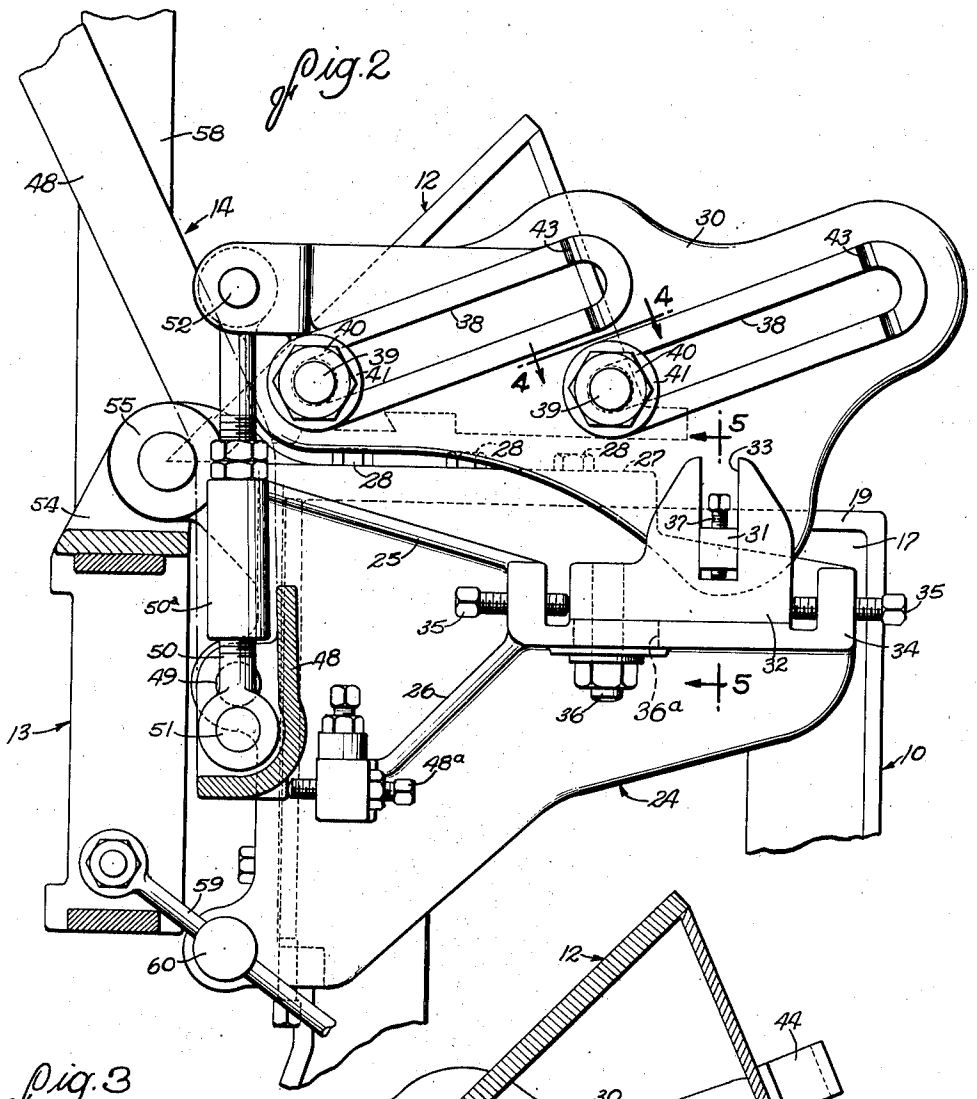
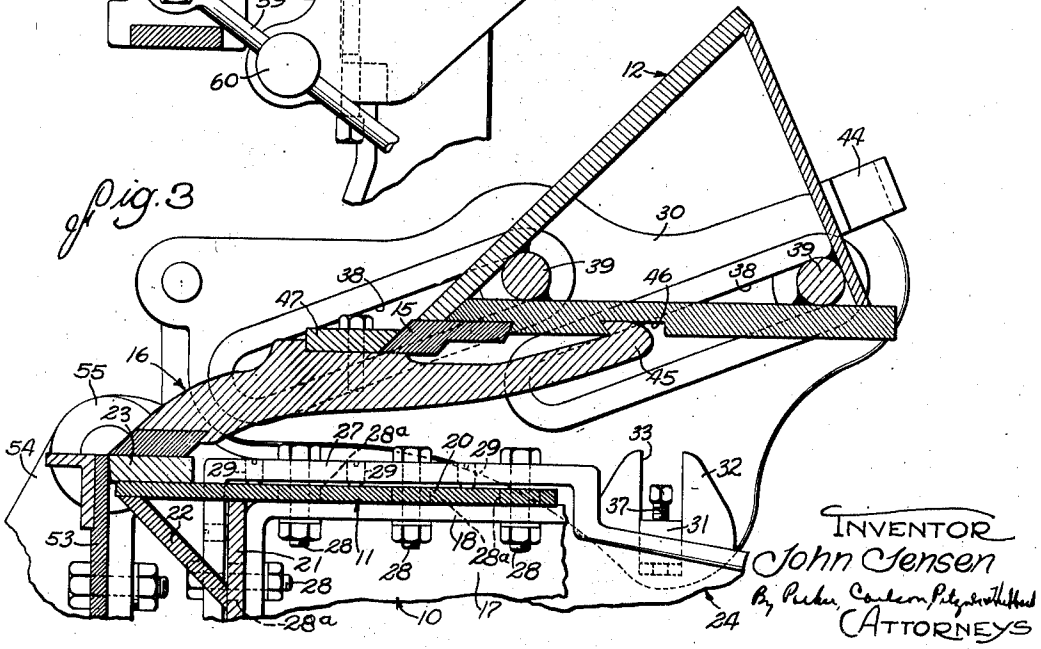


Fig. 3



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Filed June 21, 1937 3 Sheets-Sheet 3

Fig. 5

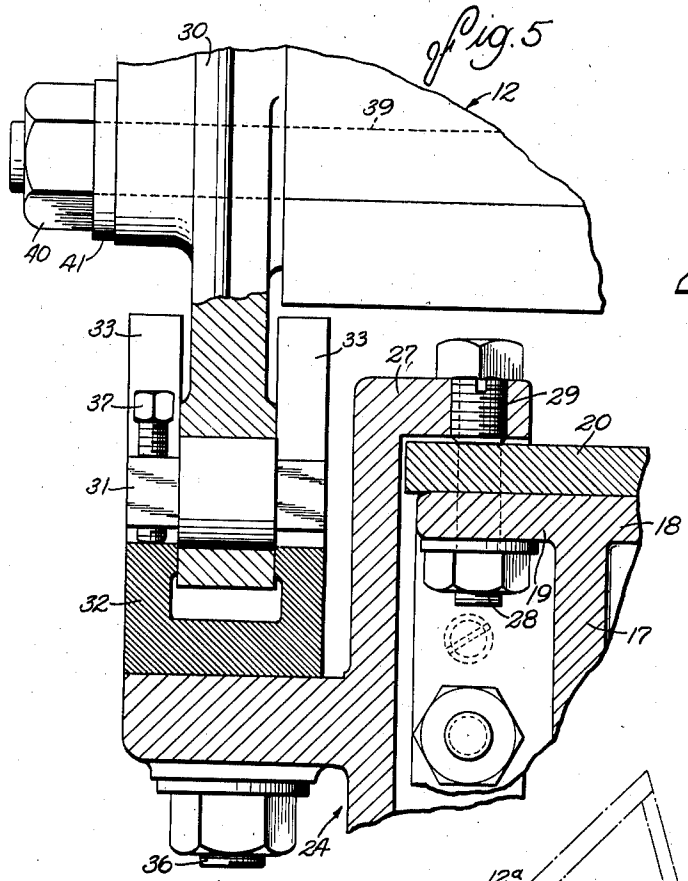


Fig. 4

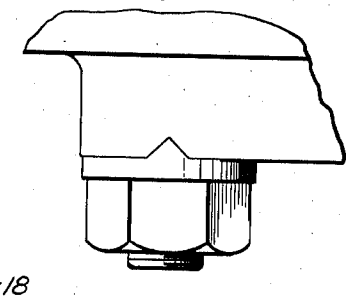
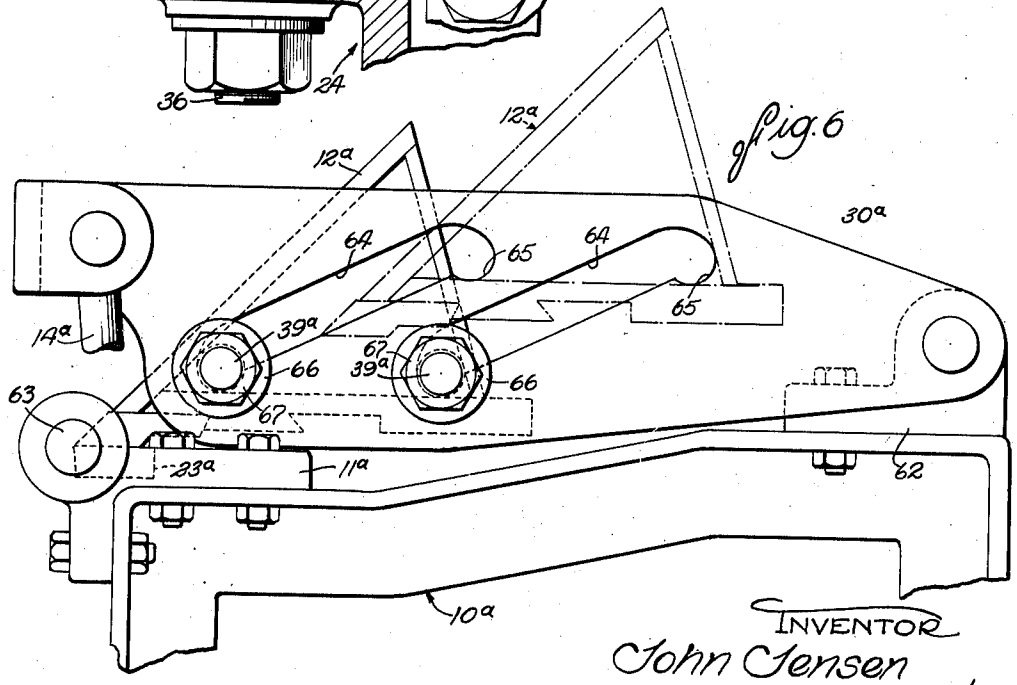


Fig. 6



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UNITED STATES PATENT OFFICE

2,190,839

BENDING BRAKE

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Application June 21, 1937, Serial No. 149,415

10 Claims. (Cl. 153—16)

The invention relates generally to brakes for bending sheet metal and more particularly to such brakes which are adapted to perform a variety of bending operations, such, for example, as plane sheet bending, box bending, and the like.

One object of the invention is to provide a bending brake of this character having an improved construction which simplifies the adjustment thereof to accommodate it for various types of bending operations.

Another object is to provide a brake of the character described which is rugged in construction and effective in operation although economical to manufacture.

Novelty also resides in the improved form of pivotal mounting connection for the platen of the brake.

Further objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the invention, reference may be had to the accompanying drawings in which

Figure 1 is a perspective view of a bending brake embodying the invention.

Fig. 2 is an enlarged partial end elevation of the brake shown in Fig. 1, said parts being sectioned along the line 2—2.

Fig. 3 is a fragmentary sectional view along the line 3—3 in Fig. 1, illustrating particularly the position of the platen with auxiliary bending fingers attached thereto.

Fig. 4 is a fragmentary detail view, in the direction of the arrows 4—4 in Fig. 2, of the adjustment locking means for the platen.

Fig. 5 is an enlarged detail view in section along the line 5—5 in Fig. 2, illustrating particularly the construction of the pivotal mounting arrangement for the platen.

Fig. 6 is an end elevation of a bending brake provided with a modified form of adjustable mounting for the platen embodying the invention.

The invention in the embodiment selected for purposes of illustration in Figs. 1 to 5, inclusive, includes as its principal elements a supporting framework formed of generally rectangular end frames 10, and carrying a horizontal bed 11 thereon, a platen 12 movable toward and away from the bed to clamp a sheet of metal therebetween and a pivotally mounted apron 13 adapted to be swung upwardly to bend the clamped sheet of metal about the forward edge of the platen. Movement of the platen 12 toward and away from the bed 11 is effected by lever mechanisms 14 located at opposite ends of the brake.

It will be noted that the platen 12 is provided with a continuous forward bending edge formed by a wear plate 15 which is utilized in bending plane sheets of metal. In order to condition the brake for bending box forms and the like, a plurality of detachable fingers 16 (Fig. 3) may be secured thereto at suitable intervals. The brakes illustrated herein embody an improved form of mounting for the platen by means of which it may be supported at the requisite height above the bed to accommodate the bending fingers.

In the particular construction illustrated in Figs. 1 to 5, inclusive, the end frames 10 are formed from portions of angle iron having a T-shaped cross section. Thus, the horizontal top member of each frame includes a vertically extending central web 17 and inwardly and outwardly extending horizontal flanges 18 and 19 (Fig. 5). The opposite ends of the bed 11 are supported on these end frames, the bed structure including a horizontal plate 20 (Fig. 3) with its opposite ends overlying the top flanges of the end frames and a vertical front plate 21 overlying the upper front portions of the end frames. The forward edge of the top bed plate 20 is reenforced by a web 22 and a replaceable wear plate 23 is preferably positioned at the forward edge of the top bed plate 20.

Brackets designated generally by the numeral 24 are positioned at the opposite ends of the brake and form a part of the supporting structure for the platen 12. These brackets are illustrated in the form of castings having forwardly extending angularly disposed arms 25 and 26 (Fig. 2) the upper arm 25 being fashioned with an inwardly projecting flange 27 which overlies the top and front end portions of the bed 11 (Figs. 3 and 5). A series of bolts 28 serve to maintain both the bed 11 and the end brackets 24 in position on the frames 10. Adjustment of both the positions of the vertical and horizontal brackets 24 with respect to the end frames is had by a plurality of set screws 29. In this adjustment operation the bolts 28 are slacked off and the set screws 29 adjusted for the desired shifting of the brackets 24. The bolts 28 are then tightened again to hold the brackets

in their adjusted positions. The resultant shifting of the slackened bolts 28, which takes place during the adjustment shifting of the brackets 24, is permitted by the enlarged slots 28a (Fig. 3) in the bed structure, which receive the bolts 28.

The platen 12 is formed by three heavy metal plates welded together to form a box-like structure of triangular cross section with the wear plate 15 secured to its forward edge. This platen structure is mounted for swinging movement toward and away from the bed 11 by a pivotal mounting arrangement including links 30 which are journaled on the brackets 24 by pins 31.

An improved arrangement has been provided for supporting the pivot pins in such manner as to facilitate the adjustment of the pivot points as well as to insure free movement of the platen irrespective of endwise tilting thereof. This arrangement includes in general the utilization of bifurcated supporting yokes 32 defining upwardly extending open-ended guideways 33. The squared ends of the pivot pins 31 are arranged for free vertical sliding movement in these guideways. Consequently, in view of the double guideway support at each end and free sliding movement of the pivots, there will be no binding in the pivotal connection even though the platen 12 may be tilted slightly in the course of its operation. The bracket yokes 32 are in turn mounted in laterally projecting U-shaped yokes 34 formed on the outer sides of the end brackets 24 and a pair of screws 35 (Fig. 2) serve to adjust the position of the yokes 32 transversely of the bed so that the forward edge of the platen may be brought into exact registry with the forward edge of the bed. Bolts 36 passing through slots 36a in the bottoms of the yokes 34 serve to hold the brackets 32 in their adjusted position. Furthermore, vertical adjustment of the pivot pins 31 may be had by adjusting screws 37 threaded in their outer ends and bearing against the bottoms of the guideways 33. It will thus be seen that the position of the pivotal axis for the platen 12 may be adjusted both horizontally and vertically with great nicety.

In addition, an arrangement has been provided for adjusting the height of the platen 12 above the bed 11. As was previously noted, this adjustment is particularly useful when auxiliary bending fingers such as the fingers 16 are attached to the platen for box bending operation. This arrangement includes in general an adjustable pin and slot connection between the ends of the platen and the links 30. Two parallel slots 38 (Fig. 2) are formed in each of the links 30, these slots being inclined with respect to the bottom of the platen. Laterally projecting pins 39 arranged at the forward and rear ends of the bottom of the platen are inserted in the slots 38. For simplicity and ruggedness of construction, these pins are preferably welded in position at the lower corners of the triangular box-like platen structure (Fig. 3). It will thus be seen that, as the pins 39 are slid along the slots 38, the platen 12 will be moved not only upwardly but also rearwardly. The platen is locked in its adjusted position on the brackets 30 by means of nuts 40 threaded on the pins 39 and bearing against lock washers 41 having transverse projections 42 (Fig. 4) on their inner faces which interfit with complementary recesses 43 formed in the guideways at the edges of the slots 38. It will thus be seen that the platen 12 may be pulled upwardly and the pins 39 locked in their uppermost position in which case the platen is properly positioned to receive the auxiliary bending fingers 16. A handle 44 (Fig. 3) secured to the rear face of a platen facilitates its adjustment.

The auxiliary bending fingers 16 have been illustrated in Fig. 3 as being provided with hooked rear end portions 45 adapted to fit within a complementary undercut groove 46 in the bottom of the platen. A clamping plate 47 detachably connected to the fingers overlies the front face of the wear plate 15 and holds the fingers firmly in position.

In the operation of the brake, the platen 12 is manipulated by the linkage mechanisms 14 which include counterweighted upwardly extending operating levers 48 (Fig. 2) pivoted on the end brackets 24 at 49. The lower ends of the operating arms 48 are U-shaped and receive the lower ends of links 50 which are pivoted thereto at 51, pivots 49 and 51 being eccentrically disposed, thereby constituting a toggle linkage. The upper ends of the links 50 are pivotally connected at 52 to the forward ends of the links 30. It will be noted that the links 50 are composed of alined pins threaded in a central sleeve 50a which serves to adjust their effective length. As the operating levers 48 are swung in a clockwise direction (as viewed in Fig. 2) the platen 12 is also moved in a clockwise direction about its pivots 31. Counterclockwise or forward movement of the arms 48 is limited by adjustable stop screws 48a (Fig. 2) threaded in suitable bosses on the brackets 24 and contacting the lower ends of the linkage arms 48.

The apron 13, hingedly connected to the bed and operable to bend the sheet of metal secured between the bed and platen, consists in general of a normally depending leaf 53 supported with its upper rear edge substantially coincident with the upper front edge of the bed wear plate 23. At each end of the leaf 53 is bolted a hinge strap 54 enlarged and forked at its upper end to receive a stud 55 projecting from the bracket 24. The strap 54 is attached to the stud by a pin projecting through the stud and forked end of the strap. As best shown in Fig. 3, the hinge axis of the apron coincides with the front corner of the bed wear plate 23 so that the upper edge of the leaf 53, which affects the bending, will remain the same distance from the corner of the wear plate 23 as the apron is swung about its axis. Swinging movement is imparted to the apron by depending bars or manual operating handles 56 (Fig. 1) and suitable counterweights 57 carried by upwardly projecting arms 58 are preferably provided therein.

In performing some bending operations it is desirable that the apron be swung only a part of the way toward the platen 12 so as to bend the sheet at some predetermined angle. In order to facilitate this type of bending, rods 59 (Fig. 2) are pivoted to the lower ends of the apron straps 54; these rods being freely slidable in apertured rotatable pins 60 on the brackets 24. Adjustable stops 61 threaded on the rods 59 contact the pins 60 to limit upward movement of the apron at any selected point.

In the operation of the bending brake described above, the initial adjustment of the upper apron edge with respect to the bed is had by adjusting the set screws 29 to shift the end brackets 24 either transversely or vertically after having slacked off the bolts 28. When the set screws 29 have been set for the desired clearance between the bracket 24 and the end frame, the bracket is secured firmly in such position by the bolts 28.

Similarly, the initial adjustment of the bending edge of the platen with respect to the forward edge of the bed is effected by changing the points of pivotal mounting of the platen through the medium of adjusting screws 35 and 37. The platen 12 is then raised by the operating levers 48 and a sheet of metal clamped between the platen and bed, whereupon the apron is swung upwardly to bend the clamped sheet to any selected angle. In the event that a box bending operation is to be performed, the nuts 40 on the supporting pins 39 of the platen are loosened and the platen pulled upwardly so as to position the pins 39 at the upper ends of the slots 38 at which point the platen is again clamped in position and the auxiliary fingers 16 are attached. If necessary, the axis of pivotal movement of the platen may again be adjusted by the screws 35 and 37. The bending operations are then performed in the usual manner.

The bending brake illustrated in Fig. 6 is, in general, similar in construction to that heretofore described but is somewhat lighter in construction and is particularly adapted for use with lighter gauge sheets of metal. This brake includes end members 10ª formed of angle iron and supporting the opposite ends of a bed plate 11ª having a generally L-shaped cross section with a wear plate 23ª inset in its forward edge. A platen 12ª identical in construction with the platen 12, described above, is supported for swinging movement toward and away from the bed and links 30ª pivoted at their rear ends in brackets 62. A suitable toggle linkage 14ª, substantially identical with that described above, is utilized for moving the platen into and out of clamping position. An apron (not shown) is hinged on the forward ends of the brackets 11ª by pins 63 and may be swung toward and away from the platen to bend a clamped sheet of metal in the usual manner.

The brake shown in Fig. 6 differs from that illustrated in Figs. 1 to 5, inclusive, principally in that a simplified adjustable connection has been provided for securing the platen 12ª to its associated supporting links 30ª. In this construction, parallel inclined slots 64 are formed in the links 30ª. The upper ends of these slots are undercut or recessed, as indicated at 65, so that laterally projecting pins 39ª secured to the ends of a platen and inserted in the slots 64 will drop into the recesses when moved to the upper ends of the slots. Consequently, ordinary washers 66 and nuts 67 threaded on the pins 39ª may be utilized to clamp the platen 12ª either in its lowered position shown in full lines in Fig. 6 or in its raised position shown in dot-dash lines. When in the raised position indicated, auxiliary bending fingers may be attached to the platen in the same manner as described above.

Although certain particular embodiments of the invention have been shown and described in some detail for purposes of illustration, there is no intention to thereby limit the invention to such preferred embodiments but, on the other hand, the appended claims are intended to cover all modifications within the spirit and scope of the invention.

I claim as my invention:

1. A bending brake comprising, in combination, a supporting framework, a bed carried by said framework, a platen arranged above said bed for swinging movement toward and away from the same, said platen presenting a continuous bending edge for the bending of plain sheets, auxiliary bending fingers adapted to be detachably connected to said platen and to extend downwardly and forwardly from said continuous bending edge, links pivotally mounted on said framework adjacent the opposite ends of said platen, each of said links having two parallel slots therein inclined with respect to the plane of the lower side of said platen, means supporting said links with the slotted portions thereof above said bed, and means including laterally projecting pins extending from the front and rear portions of each end of said platen and inserted in said slots for adjustably supporting said platen on said links at a selected height above said bed and displaced a corresponding distance rearwardly thereof, whereby said platen may be readily positioned with either said continuous bending edge or said auxiliary fingers in operative relation with said bed.

2. A bending brake comprising, in combination, a supporting framework, a bed carried by said framework, a platen arranged above said bed for swinging movement toward and away from the same, links pivotally mounted on said framework, adjacent the opposite ends of said platen, each of said links having a slot therein inclined with respect to the plane of the lower side of said platen, means supporting said links with the slotted portions thereof above said bed, and means including projections on said platen inserted in said slots for adjustably supporting said platen on said links at a selected height above said bed.

3. A bending brake comprising, in combination, a supporting framework, a bed carried by said framework, a platen disposed above said bed for swinging movement toward and away from the same, said platen being of box-like construction and generally triangular in cross section, links pivotally mounted on said framework adjacent the opposite ends of said platen, each of said links having a pair of parallel slots formed therein inclined with respect to the plane of the lower side of said platen, means supporting said links with the slotted portions thereof above said bed, and means including laterally projecting pins secured in the lower corners of each triangular end of said platen and inserted in said slots for adjustably supporting said platen on said links at a selected height above said bed.

4. A bending brake comprising, in combination, a supporting framework, a bed carried by said framework, a platen disposed above said bed and arranged for swinging movement toward and away from the same, links pivotally mounted on said framework adjacent the opposite ends of said platen, each of said links having a slot therein inclined with respect to the plane of the lower side of said platen, means supporting said links with the slotted portions thereof above said bed, projections on opposite ends of said platen inserted in said slots and adapted to support said platen closely adjacent said bed when disposed in the lower ends of said slots, and means including lock washers on said projections having teeth thereon adapted to coact with complementary recesses adjacent the upper ends of said slots for detachably maintaining said platen in an elevated position with respect to said bed.

5. A bending brake comprising, in combination, a supporting framework, a bed carried by said framework, a platen disposed above said bed and arranged for swinging movement toward and away from the same, links pivotally mounted on said framework adjacent the opposite ends of said platen, each of said links having a slot there-

in inclined with respect to the plane of the lower side of said platen, means supporting said links with the slotted portions thereof above said bed, and projections on opposite ends of said platen inserted in said slots and adapted to support said platen closely adjacent said bed when disposed in the lower ends of said slots, said slots having downwardly curved upper end portions adapted to engage said pins to maintain said platen in elevated position with respect to said bed.

6. A bending brake comprising, in combination, a supporting framework, a bed carried by said framework, a platen disposed above said bed and adapted to cooperate therewith to clamp a sheet of metal therebetween, bifurcated open ended upwardly facing yokes on said framework adjacent the ends of said platen, pivot pins disposed in said yokes, and means for journaling said platen on the intermediate portions of said pins between the sides of said bifurcated yokes.

7. In a bending brake the combination of a bed, a platen located above said bed, means including a continuous bending edge disposed along the forward portion of said platen for conditioning the same to bend plain sheets, means including a plurality of removable fingers fashioned to extend downwardly and forwardly from said platen when secured thereto for conditioning said platen for the bending of box forms, means supporting said platen for swinging movement toward and away from said bed, said last named means including slotted plates disposed at opposite ends of said platen and means pivotally supporting said plates for swinging movement, means including cooperating pins adjustably disposed in said slots for alternatively supporting said platen either in a position to aline said continuous bending edge in operative relation with said bed or alternatively at a substantial distance above said bed and with said fingers in operative relation with said bed, means for adjusting the position of said platen both horizontally and vertically with respect to said bed to bring either said continuous bending edge or said fingers exactly into the position desired, and a cooperating bending apron swingably mounted on said bed.

8. A bending brake comprising, in combination, a bed and platen adapted to clamp a sheet of metal therebetween, means forming a continuous bending edge on said platen for the bending of plain sheets, fingers adapted to be carried by said platen to provide a discontinuous bending edge for the bending of boxes, a platen supporting member, means pivotally supporting said member for swinging movement of said platen toward and away from said bed for the clamping of a metal sheet therebetween, and means forming an adjustable connection between said member and said platen independent of said pivotal means for adjusting the position of said platen above said bed both horizontally and vertically to accommodate said fingers.

9. A bending brake comprising, in combination, a bed and platen adapted to clamp a sheet of metal therebetween, means forming a continuous bending edge on said platen for the bending of plain sheets, fingers adapted to be carried by said platen to provide a discontinuous bending edge for the bending of boxes, a pivot located adjacent the rear of the bed, an arm projecting a substantial distance generally forwardly from said pivot and swingable about the same toward and away from said bed, and means forming a vertically adjustable connection between said arm and platen and at a point displaced a substantial distance forwardly of said pivot toward the front of the bed for alternatively supporting said platen on said arm either in a position to aline said continuous bending edge in operative relation with said bed or alternatively at a substantial distance above said bed and with said fingers in operative relation with said bed.

10. A bending brake comprising, in combination, a bed and platen adapted to clamp a sheet of metal therebetween, means forming a continuous bending edge on said platen for the bending of plain sheets, fingers adapted to be carried by said platen to provide a discontinuous bending edge for the bending of boxes, a pivot located adjacent the rear of the bed, an arm projecting a substantial distance generally forwardly from said pivot and swingable about the same toward and away from said bed, means forming a vertically adjustable connection between said arm and platen and at a point displaced a substantial distance forwardly from said pivot toward the front of the bed for alternatively supporting said platen either in a position to aline said continuous bending edge in operative relation with said bed or alternatively at a substantial distance above said bed and with said fingers in operative relation with said bed, and means for adjusting said pivot toward and away from the front of the bed to accomplish an accurate alinement between the bed and the fingers or continuous bending edge.

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CERTIFICATE OF CORRECTION.

Patent No. 2,190,839. February 20, 1940.

JOHN JENSEN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 49, strike out the words "positions of the" and insert the same before "brackets" in line 50; page 2, second column, line 48, for "affects" read effects; line 55, for "therein" read thereon; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of April, A. D. 1940.

(Seal)

Leslie Frazer
Acting Commissioner of Patents.