

Sept. 7, 1943.

G. F. WALES

2,329,020

PUNCHING DEVICE

Filed April 17, 1942

3 Sheets-Sheet 1

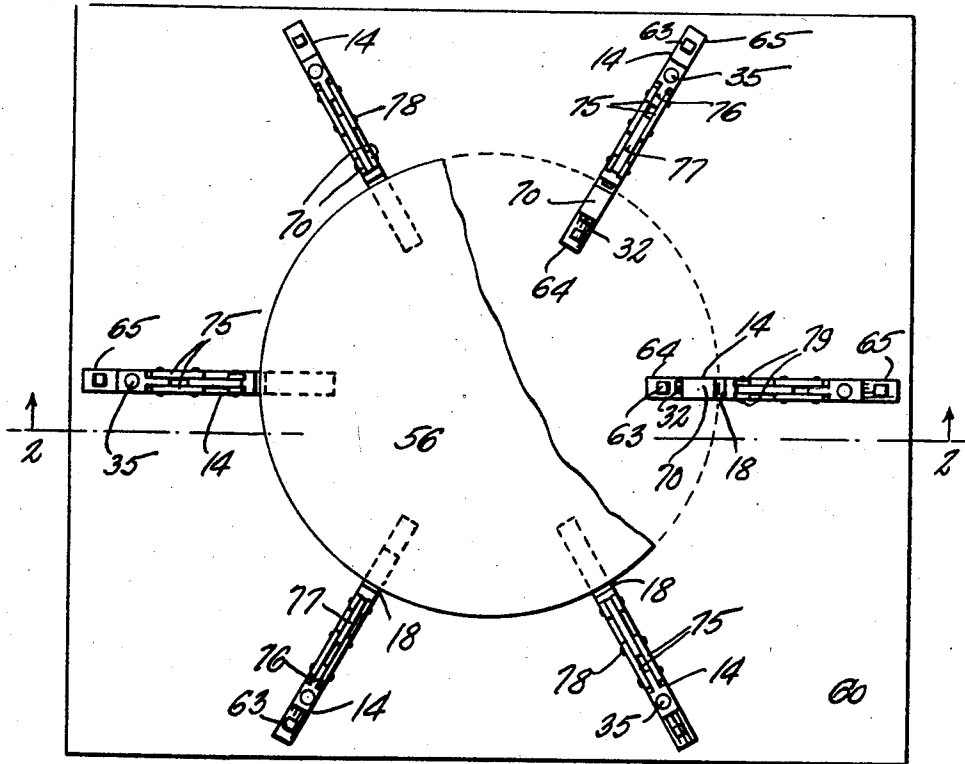


Fig. 1.

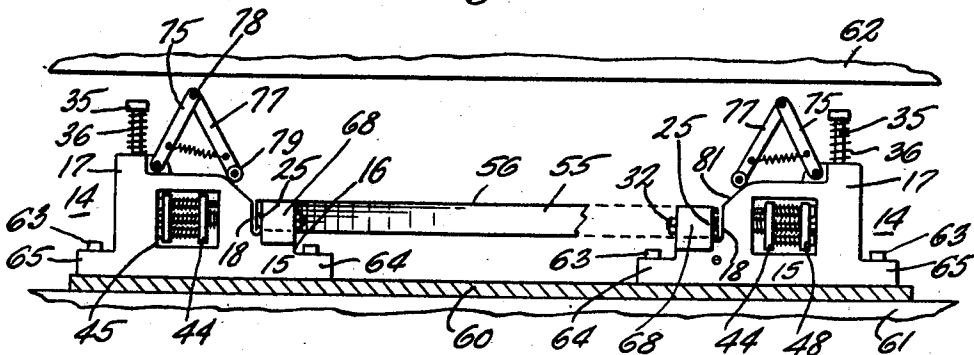


Fig. 2.

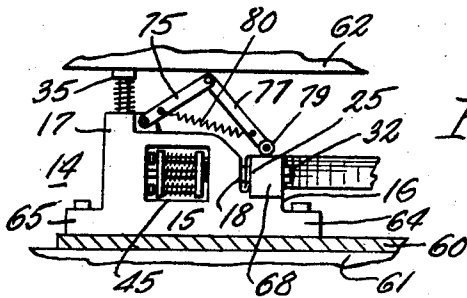


Fig. 3.

INVENTOR
George F. Wales
Parker, Rockwood & Farmer,
ATTORNEYS

Sept. 7, 1943.

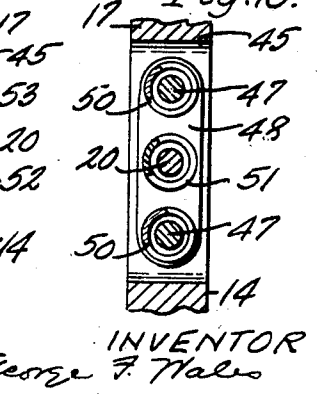
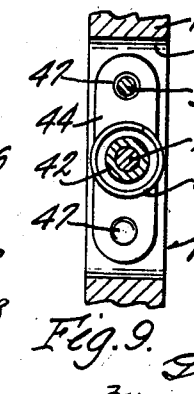
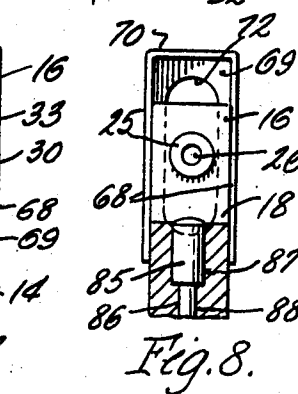
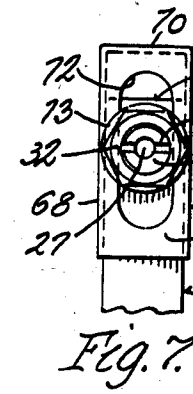
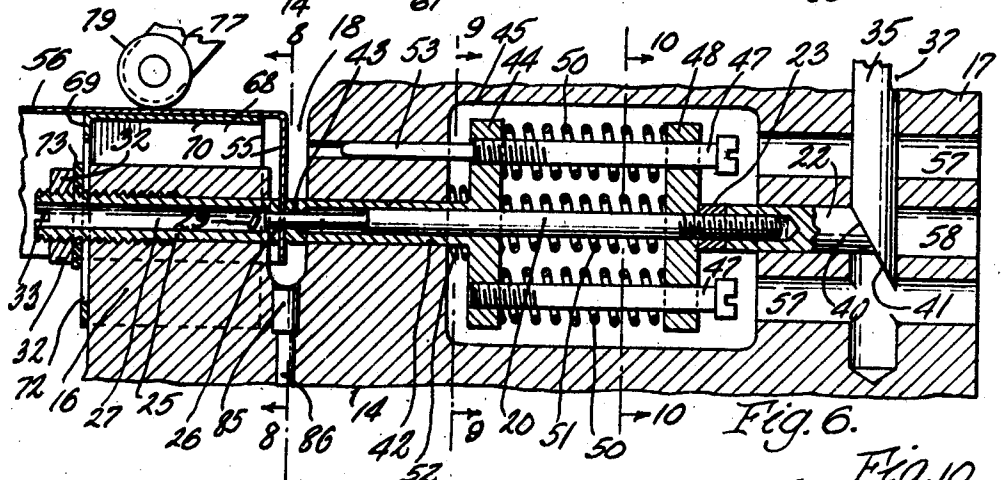
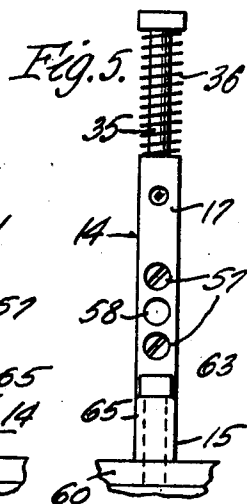
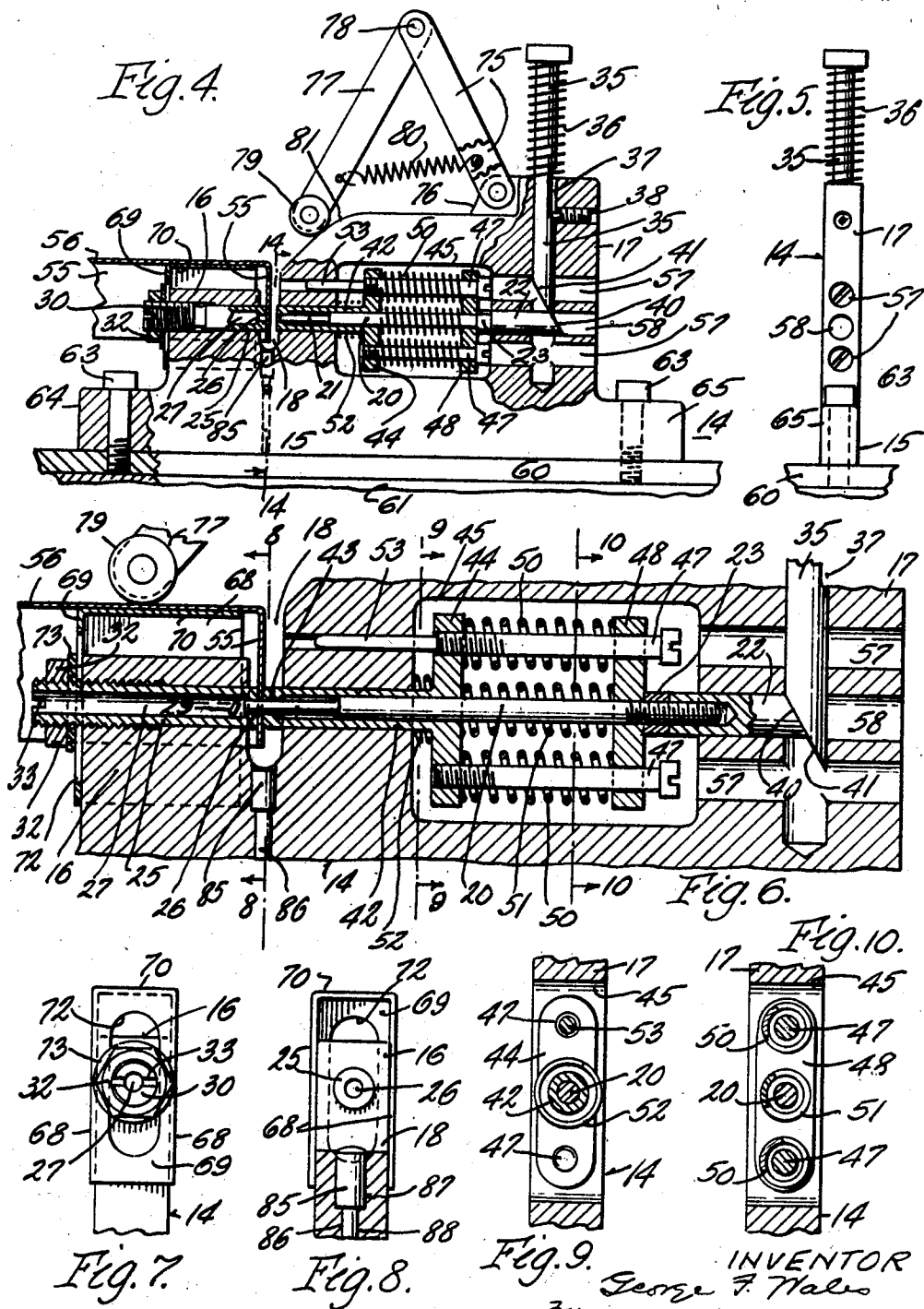
G. F. WALES

2,329,020

PUNCHING DEVICE

Filed April 17, 1942

3 Sheets-Sheet 2



INVENTOR
George F. Niles
Parker, Prochows & Larmer.
ATTORNEYS

Sept. 7, 1943.

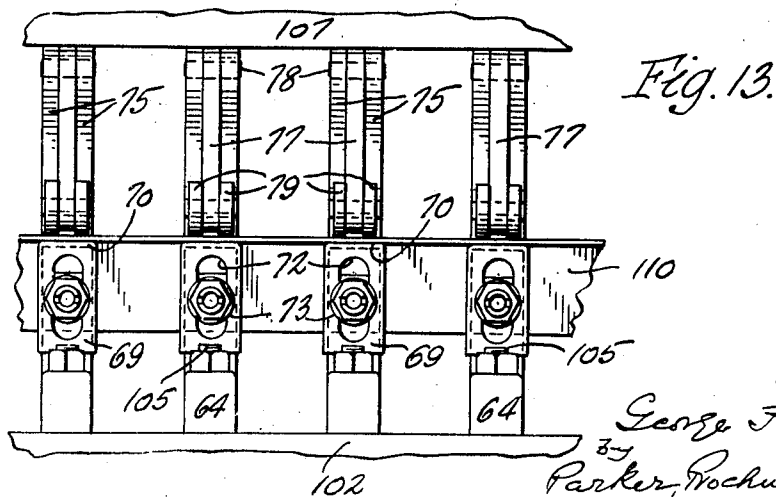
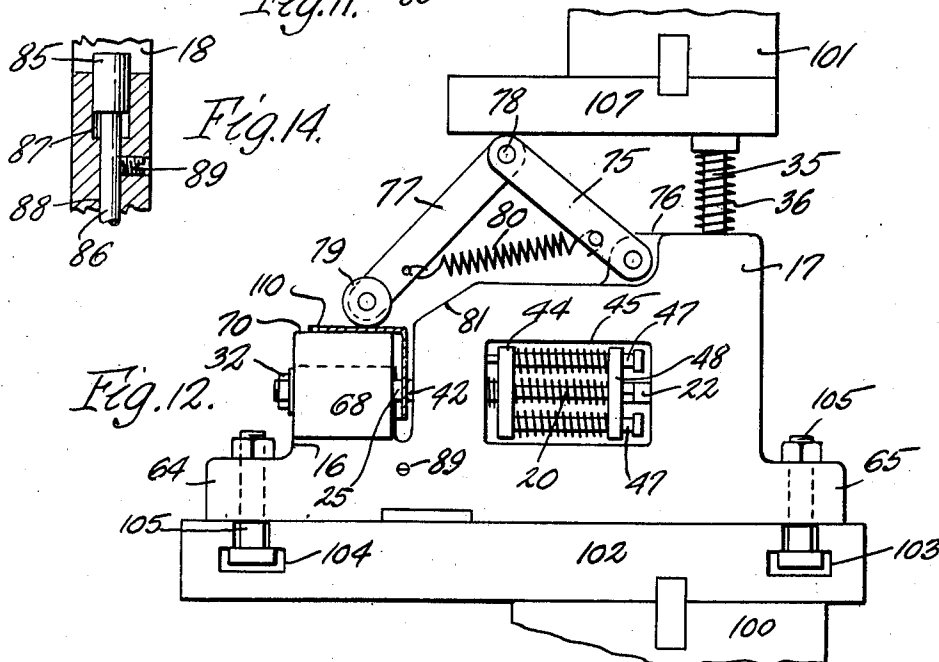
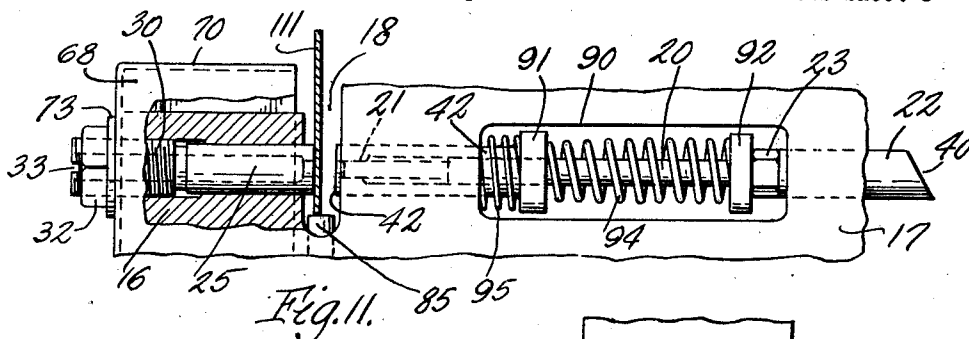
G. F. WALES

2,329,020

PUNCHING DEVICE

Filed April 17, 1942

3 Sheets-Sheet 3



INVENTOR
George F. Wales
Parker, Rochwood & Farmer
ATTORNEYS

UNITED STATES PATENT OFFICE

2,329,020

PUNCHING DEVICE

George F. Wales, Kenmore, N. Y.

Application April 17, 1942; Serial No. 439,383

32 Claims. (Cl. 164-94)

This invention relates to apparatus for punching sheet metal and other materials, and more particularly to apparatus or devices of this type which are actuated by an ordinary press or other machine having a vertically movable member or ram.

One of the objects of this invention is to provide a punching device which is constructed to punch holes in a direction at an angle to the direction of movement of the member which actuates the punching device. Another object of this invention is to provide a punching device which may be removably mounted on a press or other actuating machine in position to be actuated by the ram or other movable actuating member, and which has a punch mounted to move at an angle to the movement of the actuating member.

A further object of the invention is to provide a punching device capable of punching holes in a substantially horizontal direction and which is actuated by a vertically moving member of a press or other machine.

It is also an object of this invention to provide a punching device which is constructed to punch holes in a vertical flange of a cover or pan-like article or in other flanged members. Another object is to provide punching devices which may be arranged in rows or groups for simultaneous actuation by a single ram or actuating device, for punching a plurality of holes in vertical flanges or angular extensions of articles.

It is a further object of this invention to provide a punching device of this type in which the movable work engaging member recedes, after the completion of the punching operation, into a position to facilitate the positioning of the work into and out of operative relation to the punching device.

It is also an object of this invention to provide a punching device with a punch of improved construction.

Another object is to provide a die of improved construction which may be adjusted toward and from the punch and easily removed from the punching device.

Another object of this invention is to provide a punching device of this type with gaging means of improved construction for correctly positioning the work with reference to the device.

A further object of this invention is to provide a device of this kind with means for holding the work in correct relation to the device during the punching thereof.

A further object of this invention is to provide a punching device of this type which is simple in construction, efficient in its operation and economical to manufacture.

Other objects and advantages of this invention will appear from the following description and claims.

In the accompanying drawings:

Fig. 1 is a top plan view of a plurality of punching devices embodying this invention mounted in position to simultaneously operate on the work.

Fig. 2 is a fragmentary elevation thereof, partly in section, on line 2-2, Fig. 1.

Fig. 3 is an elevation of one of the punching devices, showing the parts thereof in the position which they occupy at the completion of a punching operation.

Fig. 4 is a sectional elevation, on an enlarged scale, of a punching device embodying this invention.

Fig. 5 is an end elevation thereof.

Fig. 6 is a fragmentary sectional elevation thereof, on a larger scale, showing the parts in the positions which they occupy at the completion of a punching operation.

Fig. 7 is a fragmentary end view of the portion of the apparatus shown in Fig. 6.

Figs. 8, 9 and 10 are transverse sections thereof, on lines 8-8, 9-9 and 10-10, Fig. 6.

Fig. 11 is a fragmentary side elevation of a punching device of modified construction.

Fig. 12 is a side elevation of a punching device applied to a press brake.

Fig. 13 is an end view of a plurality of punching devices mounted on a press brake.

Fig. 14 is a fragmentary section on line 14-14, Fig. 4.

The punching of holes in sheet metal and other materials is generally accomplished by means of a vertically movable punch actuated in any suitable manner, such, for example, as by the ram of a press. There are times when the work to be operated on is of such shape or form that it is either impossible or difficult to operate on the same by means of a vertically operable punch. By means of the construction herein described, this difficulty is overcome by having the punch and die of the punching device arranged to punch holes horizontally or at another angle to the vertical.

Referring to Figs. 4 to 10, 14 represents a holder or frame of my improved punching device, which includes a base 15 having a pair of upwardly extending horns or supporting parts 16 and 17 in which the perforating elements of the punching device are mounted, these parts in the particular construction illustrated being formed integral with the base. These supporting parts are separated by an upwardly opening gap or slot 18 into which the portion of the work to be operated on is inserted.

The holders of my improved punching devices support the punch and die, either one of which may be movable relatively to the other. In the particular construction illustrated, the part 16 of the holder supports the stationary member of the punch and die implements, which in the construction illustrated, is the die, and the part

17 supports the movable member, which is a punch 20 having a punch bit 21. This punch is arranged substantially horizontally in the construction illustrated by way of example, but it will be obvious that the punch and die may be arranged to operate in any other desired angular relation to the vertical. The punch 20 also has a head 22 which is preferably adjustably secured to the punch, for example, by a screw threaded connection, as shown in Fig. 6, a lock nut 23 securing the parts in their desired relation to each other. This makes it possible to regulate the length of the punch as may be desired.

The die located in the part 16 of the holder may be of any suitable or desired form. I prefer, however, to employ a die of improved construction which is adjustable toward and from the punch and which can readily be removed from the holder. The die shown in the drawings by way of example has a substantially cylindrical portion 25 provided with an opening or hole 26 in the end thereof adjacent to the punch, this opening being of such diameter as to properly cooperate with the bit 21 of the punch. This opening 26 terminates at its inner end in an enlarged passage 27 into which the slugs 29 punched out of the work are received. This passage 27 extends to the left end of the die element shown in Figs. 4 and 5, from which these slugs 29 are discharged.

In order to secure the die element in the part 16 of the holder, this die element is provided with a screw threaded portion 30 which is of larger diameter than the cylindrical part 25 and which is adapted to cooperate with a corresponding internally threaded portion in the holder part 16. The cylindrical portion 25 of the die which fits snugly in an accurately formed hole in the holder part 16 serves to correctly locate the axis of the die on the holder, and by means of the threads 30, the die can be adjusted to extend into the gap or slot 18 to the desired extent. The die may be secured in its adjusted position in any desired manner, for example, by means of a lock nut 32 exerting pressure against the outer face of the part 16 of the holder. To facilitate the adjusting of the die in the direction of its length, the outer end of the die which projects beyond the part 16 of the holder is preferably provided with a slot 33 to receive a screwdriver. When it is desired to remove the die element from the holder, it is merely necessary to release the lock nut 32 and then turn the die in a direction to move it out of its hole in the part 16 of the holder.

Since presses and other means for actuating punching devices usually have a vertically movable ram or actuating part, means are provided for converting such vertical movement into movement in the direction of the length of the punch. Any suitable or desired means may be provided for this purpose, and in the construction shown by way of example, a vertically movable actuating pin 35 is provided, which is guided in a hole or aperture in the upwardly extending part 17 of the holder, and which is suitably connected with the punch for actuating the same. This actuating pin is preferably normally held in elevated position by means of a spring or other resilient member 36, and the actuating pin is limited in its movement and held against turning in any suitable manner, for example, by means of a keyway or groove 37 in the pin, which cooperates with a stationary part, such for example as the end of a dog point screw 38. The head 22

of the punch is provided with a tapering or inclined surface 40 with which a correspondingly tapered surface 41 of the actuating pin 35 cooperates in such a manner that downward movement of the actuating pin 35 will result in movement of the punch toward the die, which in the particular example illustrated, is horizontal movement. Any other connection between the actuating pin and the punch may be provided.

The punch may be guided in its movement to and from the die in any suitable or desired manner, for example, by means of a guide sleeve 42, the bore of which is such as to guide the body portion 20 of the punch. If the bit or working end 21 of the punch is of smaller diameter than the body portion, the guide sleeve is provided at the end thereof with a contracted bore 43 in which the bit 21 of the punch may reciprocate. The guide sleeve 42 fits slidably in an accurately bored hole in the part 17 of the holder, which hole is in axial alignment with the bore of the part 16 of the holder in which the die is secured. The guide sleeve 42 also acts to strip the work from the bit of the punch and in the construction illustrated in Figs. 1 to 10, the guide sleeve is provided at its inner end with a flange 44 which is preferably of elongated form as shown in Fig. 9, so as to be contained and arranged in one end of a relatively large opening 45 in the part 17 of the holder. This flange is between the opposite side faces of the holder 14.

The end portions of the flange 44 are formed to receive bolts 47 which also extend through a pressure pad 48 which is somewhat similar in shape to the flange 44, as shown in Fig. 10. Springs of any suitable form are provided between the pressure pad 48 and the flange 44, such for example as coil springs 50 through which the bolts 47 extend, and preferably a similar spring 51 is arranged about the part 20 of the punch. These springs are under initial compression sufficient to strip the punch from the work after the hole has been punched, by withdrawing the bit of the punch into its guide sleeve 42. A smaller spring 52 is preferably interposed between the flange 44 and an end wall of the opening 45 in the part 17 of the holder, to retract the guide sleeve 42 and the punch into the position shown in Fig. 4, which facilitates the insertion of the work between the punch and die.

Suitable means may also be provided for preventing the flange 44 and the stripper assembly from turning out of its normal position within the opening 45 in the holder, such for example as a pin 53 slidable in a hole in the part 17 of the holder.

In the operation of this part of the mechanism, it will be obvious that as the punch head 22 is moved to the left from the position shown in Fig. 4, by downward movement of the actuating pin 35, the lock nut 23 at the head of the punch will engage the pressure pad 48 and move the same to the left, thus also moving the guide sleeve 42 to the left, for the reason that the springs 50 and 51 overcome the resistance of the spring 52. When the end of the guide sleeve engages the work, such as a flange 55 of a cover or lid 56, or any other piece of work that may be inserted into the groove or gap 18, movement of the guide sleeve and flange 44 ceases, and further movement of the punch causes the same to penetrate the work and enter into the end of the die. During this punching movement, the springs 50 and 51 are further compressed. The parts will then be in the positions shown in Fig. 6. Upon re-

turn of the actuating rod 35 into its upper position, the die will be moved to the right in Figs. 4 and 6 by means of the stripper springs 50 and 51, thus withdrawing the bit of the punch from the work. When this movement of the punch relatively to its guide sleeve 44 is completed, the punch, guide sleeve and the stripper springs and pressure pad will be moved bodily or as a unit to the right into a position such as illustrated in Fig. 4, by the smaller spring 52.

Holes 57 in the part 17 of the holder afford access to the ends of the bolts 47 for removing the bolts and for varying the initial compression of the springs 50 and 51 to the extent necessary for stripping the punch from the work. A hole 58 is provided through which the punch may be removed. It will be noted that the punch may be removed independently of the stripper mechanism at any time for sharpening the end thereof.

The punching devices herein described may be used singly or they may be arranged in groups and may be mounted on the bed of a press or other machine in any other suitable or desired manner. In Figs. 1 to 3, I have shown a group of these punching devices mounted on a template 60 which may then in turn be suitably mounted on the bed 61 of a press or other machine in such a manner that all of the actuating pins 35 are below the movable element or ram 62 of the press so that when the ram descends, it will press down the actuating pins 35 to a sufficient extent to force the punch through the work. The template 60 may be secured to the bed of the press by any suitable means (not shown) and the template is provided with suitably located threaded holes in which bolts 63, extending through projections 64 and 65 at opposite ends of the base 15 of the holder, may be secured; see also Fig. 4.

In Figs. 1 to 3, I have shown the punching devices arranged to operate upon a vertical flange 55 of a pan-shaped body or cover 56, and the punching devices are so located on the template 60 that when the work 56 is placed in position for punching of the flange 55 thereof, this flange will enter into the gap or slot 18 of each punching device. The punching devices are so located on the template as to punch the holes in the desired circumferential spaced relation to each other, one of these punching devices being provided for each hole required in the flange 55. It will be obvious that when the ram 62 descends all of the punching devices will be actuated simultaneously to punch holes in the flange 55 of the work, the ram being shown in its lower position in Fig. 3. It will be obvious that my improved punching devices may be used to operate on many different types of work, the pan-shaped member 56 being merely illustrative of one type of article to be operated upon.

Gage means of any suitable or desired type may be provided for correctly locating the work with reference to the punch and die. In the construction shown for this purpose, I have provided an adjustable gage upon which the horizontal portion of the work may rest. The gage illustrated for this purpose by way of example is adjustable vertically on the upwardly extending part 16 of the body portion 14 of the punching device and includes a pair of parallel sides 68 connected by an end portion 69, these portions of the gage being mounted to bear against two sides and the end of the upwardly extending part 16 of the holder. Preferably the upper edges of the two side members 68 are connected by a top

member 70 on which the horizontal portion of the work may rest. This gage member is vertically adjustable on the part 16 of the holder and may be secured in the desired position in any suitable or desired manner. In the construction shown, I have provided the end panel 69 of the gage with an upwardly extending slot 72 through which the threaded portion 30 of the die may extend. The lock nut 32 which secured the die in correct position also clamps the gage member at the elevation desired, and if desired, a washer 73 may be interposed between the nut 32 and the slotted end wall 69 of the gage. Consequently, if the horizontal portion of the work, such as the part 56 of the pan-like member shown in Figs. 1 to 6 rests on the upper face 70 of the gage, the location of the hole made by the punch will be determined by the adjustment of the gage.

I preferably also provide means for holding the work on the gage. Any suitable means may be employed for this purpose, and I have illustrated by way of example a hold down member including a pair of links 75 pivotally mounted at one end on a lug or projection 76 of the upwardly extending part 17 of the holder. Another link 77 is pivotally connected at 78 to the links 75 and this link 77 may be provided at its lower end with one or more rollers 79. A spring 80 connects the link 77 with the links 75 and the holder is preferably provided with an inclined face 81 on which the rollers 79 may roll into a withdrawn or inoperative position. It will be noted that the upper ends of the links 75 and 77 extend above the upper end of the actuating pin 35 when this pin is in its upper position. Consequently, when the ram 62 descends to actuate the punching device, it will first engage the upper ends of the links 75 and 77, thus causing the rollers 79 to ride down the inclined face 81 into engagement with the horizontal portion 56 of the work. The spring 80 is preferably of sufficient strength so that when the rollers 79 engage the work, the horizontal part of the work will be pressed into engagement with the upper part 70 of the gage. These hold down members are particularly desirable when a plurality of punching devices operate on a single piece of work, such as the pan-like member 56 which may be slightly warped, or may have a camber, so that normally not all portions thereof will lie on the gages of the several punching units. The hold down members of these units, however, will rectify any warpage or cambers in the work, and thus assure correct positioning of the holes. When the punching of the work has been completed and the ram moves into its upper position, the springs 80 of the hold down members will retract the links into the positions shown in Figs. 2 and 4, so that the work may be easily removed from the punching devices and replaced by another piece of work to be operated upon.

My improved punching devices may, of course, operate upon work which has no horizontally extending part to cooperate with the gage which has been described. When this type of work is operated on by the punching device, gage means of any suitable construction may be provided for engaging the lower edge of the work to limit the extent to which the work may be inserted into the gap or slot 18. For example, I have illustrated in the drawings, a gage pin, the upper end of which has an enlarged head 85 which extends substantially across the slot or gap 18, and a lower stem portion 86. The holder below the gap is provided with a hole having an upper portion

87 of a diameter and depth sufficient to receive the entire head of the gage pin, and a lower portion 88 of reduced diameter to receive the stem of the pin. The gage pin may be secured in the desired position in any suitable manner, for example, by means of a set screw 89, see Fig. 14. Any other means for limiting the extent to which the work to be punched may enter the gap 18 may be provided.

In Fig. 11, I have illustrated a modified construction of my punching device in which only a single stripper spring is provided in place of the three springs shown in Figs. 1 to 10. In this case, the holder is provided with an opening 93 of smaller size than the opening 45 heretofore described. The guide sleeve 42 in this case is provided with a smaller flange 91 and a pressure pad 92 in the form of an annular disk is provided which bears against the lock nut 23 of the punch. A stripper spring 94 is placed between the flange 91 and the pressure pad 92, and a smaller return spring 95 is positioned between the flange 91 and the adjacent end of the opening 93 in the holder. The operation of this construction is similar to that described in connection with the other figures.

Figs. 12 and 13 illustrate a manner of using my improved punching devices in connection with a press brake or a similar machine having an elongated bed 100 and ram 101. The bed 100 may be provided with an elongated rail or adapter 102 rigidly secured to the ram and on which the punching devices may be mounted in any suitable manner. By way of example, the rail or adapter 102 shown is provided with a pair of longitudinally extending T-slots 103 and 104 and bolts 105 extending into the slots and through the holes in the end extensions 64 and 65 of the holder may be employed for securing the punching devices to the rail or adapter in any desired spaced relation to each other.

The ram 101 of the press brake may, if the same is not of sufficient width to engage both the actuating pins and also the hold down links of the punching units, be provided with an adapter in the form of a bar 107 of sufficient length to engage the several punching units. Any other means for mounting the punching units on the press brake may, of course, be employed, if desired.

My improved punching devices may, of course, be employed in connection with any kind of work in which the parts to be punched can be inserted into the gaps or slots 18 thereof. In Figs. 12 and 13, I have illustrated the punching devices as operating on an angle bar 110 and in Fig. 11, the device is shown operating on a strip 111.

While my improved punching device is herein shown and described as used on a press having a bed and a movable ram, it will be understood that the use of the improvements herein described is not limited to power presses, since they may be used with any machine or device which may apply the required power to the punching device. The terms "bed" and "ram" are herein employed to designate respectively the stationary and movable parts of such machine or apparatus, and the term "press" is used to designate any such machine or apparatus.

It will be obvious that punching devices herein described may be used for punching holes horizontally in many different varieties of work by mounting the punches on a template 60 which is shown in Figs. 1 to 3 or on a base plate 102 as shown in Figs. 12 and 13, the units being mounted

on these plates in accordance with the pattern of holes desired in the work. The setting up of the punch units on the template or base plate may be done outside of the press and the template or base plate with the parts mounted thereon may then be placed on the bed of a press. After the desired number of work-pieces have been punched, the plate having the punch units mounted thereon may be removed from the press and another plate having punch units already set up for operating on another type of work can be positioned on the bed of a press, so that the time during which the press is idle is materially reduced. As soon as one type of job has been completed, the punch units may be removed from the template or base plate for use on another template or base plate.

I claim as my invention:

1. In a punching device, the combination of a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, said parts having axially aligned holes extending completely through said parts and terminating at said gap, a die in the hole of one of said parts and a punch in the hole in said other part in operative relation to said die, said other housing part having an opening extending transversely through the same and across the hole therein, and through which the punch extends, and a stripper spring arranged in said opening and acting on said punch for stripping the punch from the work.

2. In a punching device, the combination of a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die in one of said parts and a punch in said other part in operative relation to said die, said other housing part having a longitudinal hole in which said punch is slidably arranged and an opening extending transversely through the other housing part and across which the punch extends, a stripper member having a part extending into said opening, yielding means acting on said part of said stripper member and said punch for stripping the punch from the work, and yielding means in said opening for moving said punch away from the work after the punch has been stripped from the work.

3. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die mounted in one of said parts and terminating at said gap, a punch in the other of said parts in operative relation to said die, said holder having a longitudinal hole in which the punch is arranged and a transverse opening intersecting said longitudinal hole through which said punch extends, a guide sleeve for said punch extending from said opening to said gap and slidable toward and from said die and having a flange arranged in said opening, a pressure pad also arranged in said opening, and a stripper spring arranged between said flange and said pad, said punch having a part engaging said pad to move said pad with said punch during movement of said punch toward the work and to compress said spring when the punch is penetrating the work, whereby the spring strips the punch from the work after completing the punching operation.

4. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work and having aligned holes extending completely through said parts and terminating at said gap,

a die mounted in the hole of one of said parts and terminating at said gap, a punch in the hole of the other of said parts in operative relation to said die, said holder having a transverse opening therethrough through which said punch extends, a guide sleeve for said punch extending from said opening to said gap and having a flange arranged in said opening, a pressure pad also arranged in said opening, a stripper spring arranged between said flange and said pad, said punch having a part engaging said pad to move said pad with said punch during movement of said punch toward the work and to compress said spring when the punch is penetrating the work, whereby the spring strips the punch from the work after completing the punching operation, and adjustable means connecting said flange and said pressure pad for placing said stripper spring under variable initial compression.

5. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die mounted in one of said parts and terminating at said gap, a punch in the other of said parts in operative relation to said die, said holder having a transverse opening therethrough through which said punch extends, a guide sleeve for said punch extending from said opening to said gap and having a flange arranged in said opening and movable toward and from said die, a pressure pad also arranged in said opening, a stripper spring arranged between said flange and said pad, said punch having a part engaging said pad to move said pad with said punch during movement of said punch toward the work and to compress said spring when the punch is penetrating the work, whereby the spring strips the punch from the work after completing the punching operation, and a yielding member acting on said flange to withdraw said punch and sleeve from engagement with the work after completion of the stripping operation.

6. A punching device including a holder, a punch movably mounted on said holder, a die mounted on said holder in operative relation to said punch, said die including a cylindrical portion guided in said holder for adjustment toward and from said punch, and a threaded portion engaging a correspondingly threaded portion of said holder for turning said die for adjusting the same in the direction of its length, and means for locking said die against movement when in adjusted position.

7. A punching device including a holder, a punch movably mounted on said holder, a die mounted on said holder in operative relation to said punch, said die including a cylindrical portion guided in said holder for adjustment toward and from said punch, and a threaded portion engaging a correspondingly threaded portion of said holder for turning said die for adjusting the same in the direction of its length, and means for locking said die against movement when in adjusted position, said die having a passage extending lengthwise through the same through which punchings removed from the work may be discharged.

8. A punching device including a holder having a pair of outwardly extending parts spaced apart to form a gap into which the work may be inserted, a punch arranged in one of said parts, and a die arranged in the other part in operative relation to said punch, said die having a cylindrical portion and said other part of said holder having an aperture into which said cylin-

drical portion fits for holding said die in correct axial relation to said punch, another portion of said die and said other part of said holder having cooperating means for adjusting said die toward and from said punch.

9. A punching device including a holder having a pair of outwardly extending parts spaced apart to form a gap into which the work may be inserted, a punch arranged in one of said parts, and a die arranged in the other part in operative relation to said punch, said die having a cylindrical portion and said other part of said holder having an aperture into which said cylindrical portion fits for holding said die in correct axial relation to said punch, said die also having a threaded portion formed to cooperate with a correspondingly threaded portion of said other part of the holder for adjusting said die in the direction of its length toward and from said punch, said threaded part extending beyond said other part of said housing, and a lock nut on the threaded part of said die and exerting pressure against said other part of said housing to lock said die against movement.

10. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a punch member carried on one of said parts and a die member carried by the other of said parts, gage means on said holder for limiting the extent to which work may be inserted into said gap, means for adjusting said gage means to position the same for different kinds of work, and pressure means mounted on said holder for yieldingly urging the work into engagement with said gage means.

11. A punching device including punch and die members, one of which is movable relatively to the other, a holder on which said members are mounted and which is constructed for mounting on the bed of a press in a position in which the ram of the press may operate said movable member, and work positioning means mounted on said holder and including a part which is yieldingly held in a withdrawn position laterally out of the path of movement of the work into and out of operative position in the punching device and which is positioned to be engaged by the ram after its initial movement to actuate the punching device and moved into engagement with the work before the ram engages said movable member.

12. A punching device including punch and die members, one of which is movable relatively to the other, a holder on which said members are mounted and which is constructed for mounting on the bed of a press in a position in which the ram of the press may engage and operate said movable member, and work positioning means including pivotally connected links, one end of one link being pivoted on said holder, a spring connecting a pair of links, the end of another link being movable against the action of said spring into position to engage the work and yieldingly urge it into correct relation to said punch and die members.

13. A punching device including punch and die members, one of which is movable relatively to the other, a holder on which said members are mounted and which is constructed for mounting on the bed of a press in a position in which the ram of the press may engage and operate said movable member, and work positioning means including a pair of pivotally connected links, one end of one link being pivoted on said holder and

the free end of the other link being movable along said holder into and out of position to engage the work; a spring connecting said links, said links having their pivotally connected portions extending into position to be actuated by the ram before the ram actuates said movable member, for moving said free end of said other link against the action of said spring, into engagement with the work.

14. A punching device including punch and die members, one of which is movable relatively to the other, a holder on which said members are mounted and which is constructed for mounting on the bed of a press in a position in which the ram of the press may engage and operate said movable member, and work positioning means including a pair of pivotally connected links, one end of one link being pivoted on said holder and the free end of the other link being movable along said holder into and out of position to engage the work, a spring connecting said links, said links having their pivotally connected portions extending into position to be actuated by the ram before the ram actuates said movable member, for moving said free end of said other link against the action of said spring, into engagement with the work, and a roller on the free end of said other link for rolling on said holder and on the work.

15. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die member mounted in one of said parts and a punch member mounted in the other of said parts in operative relation to said die member, one of said members being movable relatively to the other to operate on the work, and a gage mounted on one of said parts adjacent to said gap and adjustable in the direction of the length of said gap and extending beyond the open end of said gap to engage a portion of the work which extends at an angle to the portion of the work in said gap.

16. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die member mounted in one of said parts and a punch member mounted in the other of said parts in operative relation to said die member, one of said members being movable relatively to the other to operate on the work, a gage mounted on one of said parts of the holder and having sides engaging the sides of said part, and a part connecting said sides of said gage and upon which a laterally extending part of the work in said gap may rest, and means for adjustably securing said sides of said gage to said holder part to limit the extent to which the work may extend into said gap.

17. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die member mounted in one of said parts and a punch member mounted in the other of said parts in operative relation to said die member, one of said members being movable relatively to the other to operate on the work, and a gage member extending about and slidable on one of said housing parts in a direction lengthwise of said gap and with which a laterally extending portion of the part of the work in said gap may engage, and means for adjustably securing said gage member on said housing part.

18. A punching device including a holder having a die and a punch mounted thereon, said punch being movable toward and from said die,

a guide sleeve arranged about a part of said punch and movable into engagement with the work, a spring acting on said punch and said guide sleeve for yieldingly urging said punch into a position within said sleeve, said spring being movable toward and from the work with said punch and sleeve and being compressed when said punch penetrates the work, and means for yieldingly urging said punch, said sleeve and said first mentioned spring away from the work.

19. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die mounted in one of said parts and terminating at said gap, a punch in the other of said parts in operative relation to said die, a guide sleeve for said punch extending into said gap to engage the work for stripping said punch from the work and having a flange, a pressure pad connected with said punch and spaced from said flange, a stripper spring arranged between said flange and said pad, adjustable means for spacing said pad from said flange for placing said spring under initial compression, whereby the spring strips the punch from the work after completing the punching operation, and a yielding member for withdrawing said punch and sleeve from engagement with the work after completion of the stripping operation.

20. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die mounted in one of said parts and terminating at said gap, the other part of said holder having a hole extending completely therethrough in alignment with said die and a second hole extending at an angle to said first hole and intersecting the same, a punch slidably arranged in said first hole, and an actuating member slidable in said second hole and connected with said punch for moving the same into operative relation to said die and movable partly out of its hole to permit said punch to be moved out of its hole past said actuating member.

21. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die mounted in one of said parts and terminating at said gap, the other part of said holder having a hole extending therethrough in alignment with said die and a second hole extending at an angle to said first hole and intersecting the same, a punch slidably arranged in said first hole for movement toward and from said die, said punch having a head which has an inclined end face, and an actuating member slidable in said second hole and having an inclined end adapted to engage said inclined face of said head to impart movement to said punch and to hold said punch against movement out of said first hole, and which is movable in its hole out of engagement with said head to permit such punch to be moved out of its hole past said actuating member.

22. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die mounted in one of said parts and terminating at said gap, a punch in the other of said parts in operative relation to said die, said holder having a transverse opening therethrough through which said punch extends, a plurality of springs arranged side by side in a row and acting on said punch to strip the same from the work,

and means for confining said row of springs within said opening in said holder.

23. A unitary punching unit for punching holes horizontally and for vertical actuation, said unit comprising a one-piece holder having a pair of upwardly extending parts spaced to form between them a gap to receive the work, a die mounted on one of said parts, the other of said parts having a horizontal hole extending lengthwise completely through the same in axial alinement with said die, a punch movable in said hole toward and from said die, said other part having an upright hole intersecting said horizontal hole, and an actuating member slidable in said upright hole and connected with said punch for moving the same into operative relation to said die, and out of operative relation to said punch to enable said punch to be removed from said horizontal hole by sliding said punch past said upright hole.

24. A punching unit according to claim 23, and having stripping means arranged about said punch.

25. A punching device including a holder having a pair of outwardly extending parts spaced apart to form between them a gap to receive the work, a die member mounted in one of said parts and terminating at said gap, a punch member in the other of said parts in operative relation to said die and movable toward and from said die member to operate on the work, a stripping member mounted on said holder for movement toward and from the work, and having an opening through which the work engaging end of said punch may pass, a spring reacting against said stripping member and said punch for withdrawing the work engaging end of said punch into said hole in said stripping member, and a spring weaker than said first mentioned spring and reacting against said holder and said stripping member for yieldingly urging said punch and stripping member into a position in which said punch is out of engagement with the work.

26. A unitary hole punching unit comprising a one-piece housing having an upwardly extending part having a substantially horizontal hole extending completely through said part, a die mounted on said unit in spaced relation to said part and in axial alinement with said hole in said part, a punch in said hole and movable toward and from said die, a stripper spring about said punch, the width of said housing being not substantially greater than the width of said stripper spring, and a vertically movable actuating member in said part, connected with said punch for moving said punch through the work and normally extending across said hole and movable into an inoperative position clear of said hole to permit said punch to be moved in a direction away from said die out of said hole for sharpening and replacing.

27. A method of punching a plurality of holes horizontally in vertical portions of work by means of a plurality of punching units each having a horizontally movable punch actuated by a vertically movable member and spaced by a gap from its cooperating die, which includes arranging said units on a base plate in spaced relation according to the pattern of holes required in the work, and so that the work may enter the gaps of all of the units, securing the units to said base plate while thus arranged, punching the desired number of work-pieces, and then removing the units from said base plate for use on another plate to operate on work of another type.

28. A hole punching apparatus for use on a

press brake having an elongated bed and ram, including a rail mounted on the bed of the press brake and having longitudinally extending T-slots, a plurality of punch units each including a holder having a base formed to extend crosswise of said rail and having holes in registration with said T-slots, bolts having their heads arranged in said T-slots and extending through said holes in said holders for securing said units to said rail and for adjusting said units lengthwise of said rail, each of said units having a substantially horizontally movable punch and a stationary die spaced apart to form a gap to receive the work, said gap being positioned forwardly of the bed and ram to facilitate placing work into the gaps of said units, each unit also having an upwardly extending actuating member located near the rear of the unit for actuating the punch and positioned to be actuated by the ram of the press brake.

29. Hole punching apparatus according to claim 28, and including an adapter plate secured to the ram of the press and extending horizontally beyond said ram for actuating said units.

30. A method of punching a plurality of holes horizontally in work of different types, by means of a plurality of punching units, each having a horizontally movable punch actuated by a vertically movable member and spaced by a gap from its cooperating die, which includes mounting such units on a template formed to receive the units in such spaced relation as is required by the pattern of holes desired in work of one type, mounting another series of units on another template for perforating the work in accordance with another pattern of holes, placing the first template on the bed of a press, punching the desired number of workpieces, then removing the first template from the press and positioning said other template therein, and removing said units from the first template for use on other work.

31. A punching apparatus including a base plate, a plurality of punching units mounted on said base plate in correct relation to each other, each punching unit having a horizontally movable punch, a vertically movable member for actuating said punch, a die with which said punch cooperates and spaced from said punch by a gap into which the work may enter, adjustable gage means on said units for limiting the extent to which the work may be inserted into said gap, and individual pressure means mounted on each holder for yieldingly urging the work into engagement with the gage means before the work is perforated, whereby camber in the work will be taken out by said pressure means.

32. A punching apparatus including a base plate, a plurality of punching units mounted on said base plate in correct relation to each other, each punching unit having a horizontally movable punch, a vertically movable member for actuating said punch, a die with which said punch cooperates and spaced from said punch by a gap into which the work may enter, adjustable gage means on said units for limiting the extent to which the work may be inserted into said gap, and individual pressure means mounted on each holder and including an inclined link which when in its inoperative position, terminates at its lower portion adjacent to said gap, to guide the work into said gap, said link when depressed engaging the work in the gap to press the work against the gage means prior to and while the work is being perforated.

GEORGE F. WALES.