Feb. 11, 1964 E. BRYE 3,120,778

PERFORATING DEVICE

Filed May 23, 1960 2 Sheets-Sheet 1

Fig-1

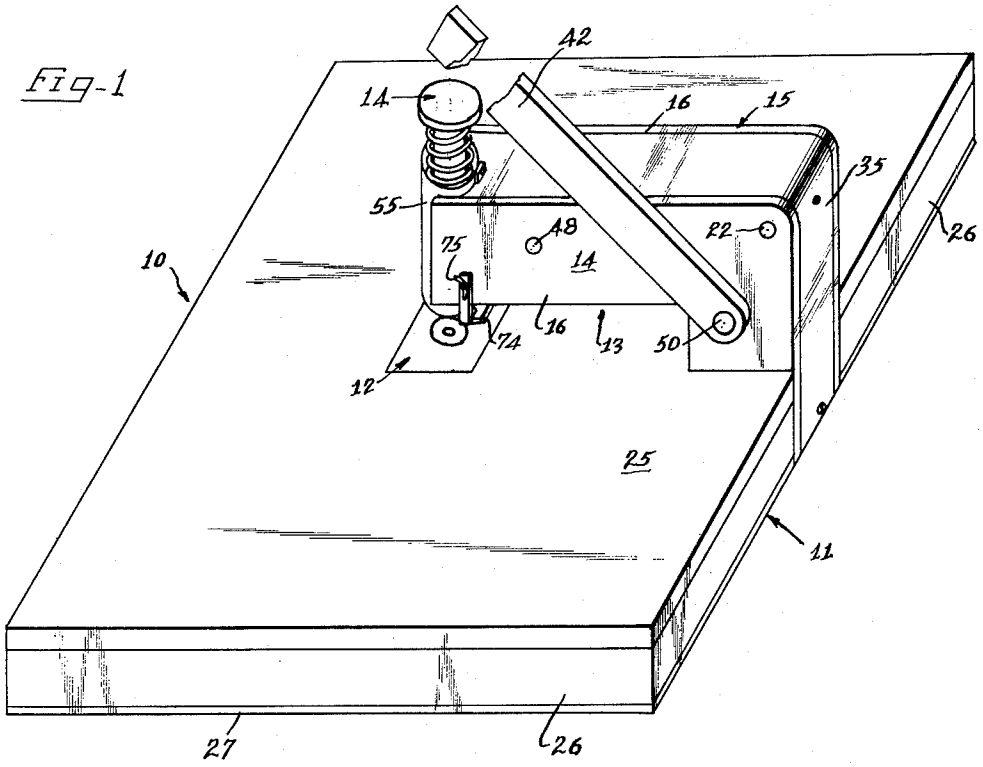
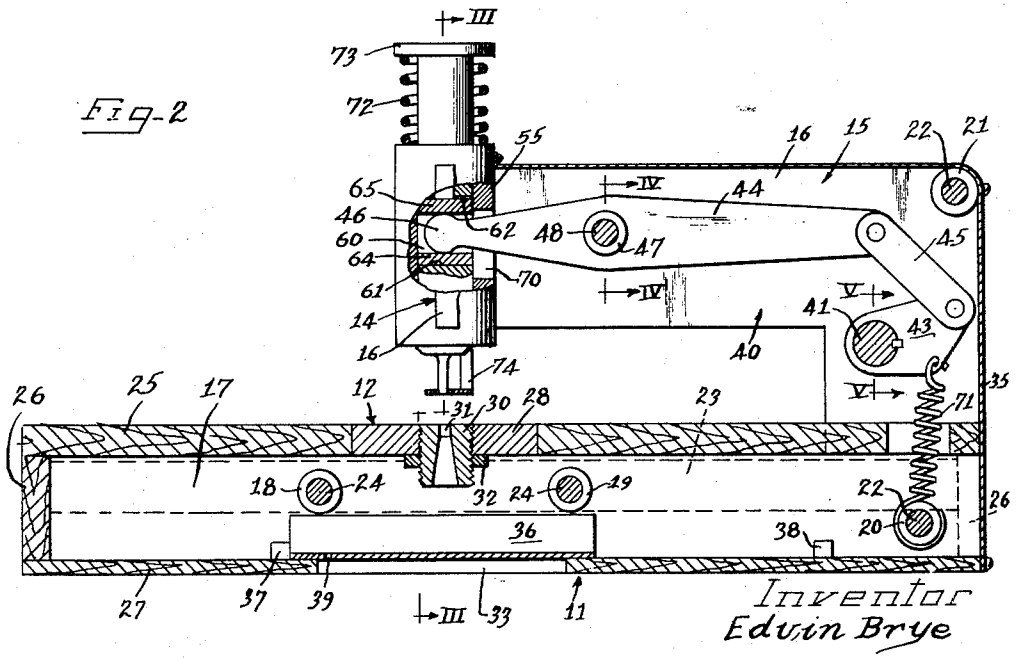


Fig-2



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Feb. 11, 1964 E. BRYE 3,120,778

PERFORATING DEVICE

Filed May 23, 1960 2 Sheets-Sheet 2

Fig. 3

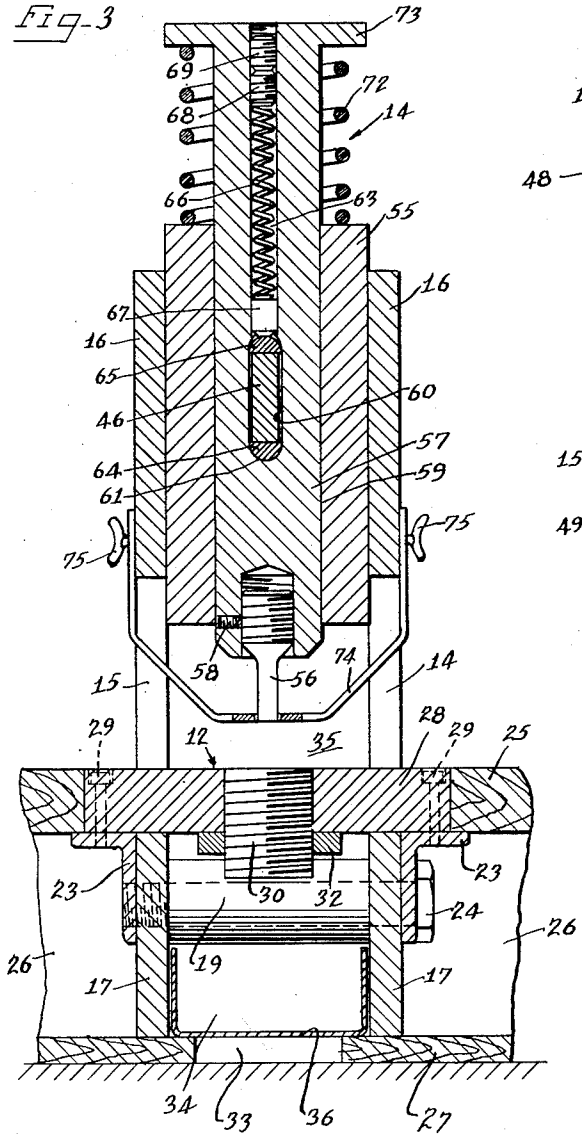


Fig. 4

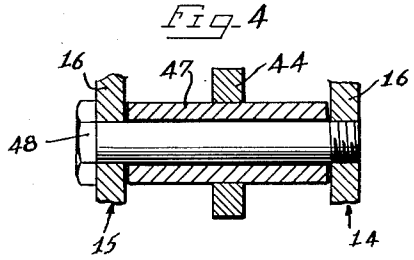


Fig. 5

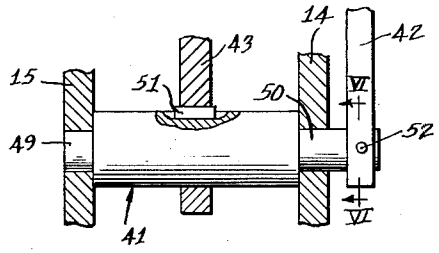
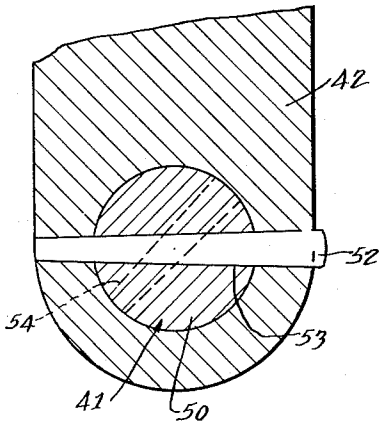


Fig. 6



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PERFORATING DEVICE

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3 Claims. (Cl. 83—633)

This invention relates generaly to perforating apparatus, and more specifically to an improved paper punch which is particularly adapted for perforating scoring sheets.

Although the principles of the present invention may be included in various paper punches, a particularly useful application is made in a hand-operated heavy-duty punch for perforating stacks of paper in a number of places disposed more or less at random all over the face of the sheets of paper.

In particular, I have devised a test answer and scoring sheet on which the testee places his answers by encircling an appropriate symbol. Thereafter, a number of identical scoring sheets are held in aligned superimposed position with respect to each other, and the number of sheets are perforated as a group at such symbols as should have been encircled. The score for each individual sheet is then determined by counting the number of encircled perforations. Conversely, if desired, the number of non-encircled perforations may be counted and subtracted from the highest possible score. This method has the further advantage that the testee, upon being given the perforated scoring sheet, is informed not only of his score, but also is informed as to what the correct answers were.

In the use of this method of administering and scoring tests, I have found that available perforating apparatus was not suited to the foregoing uses. For example, drill presses, paper drills, punch presses, and the like are all too large and too expensive. The structure of some of the devices obscures the view of the operator so that manual alignment of the proper symbol with the punch, even if a correctly perforated template is used, is difficult or impossible. Further, there has been no proper support for the stack of score sheets to be perforated, throat depth has been inadequate, the punch capacity has been inadequate, the punch has lacked an adequate degree of portability for classroom use, or the mechanism has been too expensive. In view of the fact that one or more of the foregoing or other objections has applied to available punching apparatus, I have invented a punch assembly which in a single device overcomes all of the problems, shortcomings, and deficiencies of prior art devices as to the above-described type of usage.

Accordingly, it is an object of the present invention to provide a heavy-duty paper punch capable of perforating simultaneously a number of sheets of paper superimposed upon each other, for example one hunderd fifty pages.

Another object of the present invention is to provide a heavy-duty paper punch which can be powered by one hand of the operator while the other hand of the operator is used to guide the stack of sheets into proper registration with the punch element at any one of a number of points disposed anywhere on the face of the sheets.

Yet another object of the present invention is to provide a low-cost heavy-duty paper punch which is rugged in construction, comparatively small in size, and which can be easily carried by hand from room to room.

A further object of the present invention is to provide a heavy-duty punch which may be easily maintained, serviced, and operated by people who lack mechanical skill.

Yet another object of the present invention is to provide a punch assembly of the type described wherein the punchings are selectively stored in the punch assembly.

A still further object of the present invention is to

provide a punch assembly which may be operated by a person who is either sitting or standing, and wherein the punch element is biased to a safe retracted position.

A still further object of the present invention is to provide a heavy-duty paper punch wherein the punch-actuating mechanism is provided with anti-backlash means.

Many other advantages, features and aditional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

On the drawings:

FIGURE 1 is a perspective view of a punch assembly constructed in accordance with the principles of the present invention;

FIGURE 2 is an enlarged cross-sectional view of the punch assembly shown in FIGURE 1;

FIGURE 3 is a further enlarged cross-sectional fragmentary view taken along line III—III of FIGURE 2;

FIGURE 4 is an enlarged cross-sectional fragmentary view taken along line IV—IV of FIGURE 2;

FIGURE 5 is an enlarged cross-sectional fragmentary view taken along line V—V of FIGURE 2; and

FIGURE 6 is a further enlarged cross-sectional fragmentary view taken along line VI—VI of FIGURE 5.

As shown on the drawings:

The principles of this invention are particularly useful when embodied in a heavy-duty punch assembly such as illustrated in FIGURE 1, generally indicated by the numeral 10. The punch assembly 10 includes a base 11 supporting a die assembly 12, a rigid arm 13 secured to the base 11, and a punch or punch assembly 14 guided in the rigid arm 13 for reciprocation and for cooperation with the die assembly 12.

The structure as a whole includes a pair of C-shaped plates 14, 15 which are disposed in side-by-side fixed spaced relation to each other, each of the plates 14, 15 having an upper arm 16 and a lower arm 17, as best seen in FIGURE 2. In this embodiment, the base 11 includes the lower arms 17.

Between the plates 14, 15 there is disposed a number of plate spacers 18, 19, 20, and 21. A bolt 22 passes through the plate 15 and is threaded into the plate 14 through each of spacers 20 and 21. On the outside surface of each of the lower arms 17, there is disposed a bracket 23 illustrated in this embodiment as comprising angle iron having a downwardly directed portion flatwisely engaging the lower arm 17, and having a horizontal upwardly directed portion coplanar with the upper surface of the lower arms 17. A pair of screws 24, 24 passes through one bracket 23, through one lower arm 17, through one of spacers 18 and 19, through the other lower arm 17, and into the other bracket 23 as best seen in FIGURE 3. The base 11 further includes a table member 25, for example of plywood, which is supported by the upper surface of the lower arms 17 and also by the brackets 23. The table 25 preferably has a length and a width approximately twice that of the sheets to be perforated. Thus support for the stack of sheets to be perforated will be provided by the upper paper-supporting surface of the table member 25 no matter where the hole is to be perforated. Of course, larger sheets may be accommodated, but this may in certain instances require turning these sheets end for end. If desired, side strips, each indicated by the numeral 26, may be provided about the periphery of the table member 25 to provide peripheral support. The base 11 preferably further includes a bottom plate or cover 27.

The die assembly 12 is disposed centrally of the paper-supporting surface of the table member 25 and includes

a die-supporting plate 28 of the same thickness as the table member 25 and, as best shown in FIGURE 3, supported by and secured to the upper surface of the arms 17 by a plurality of screws 29. As best seen in FIGURE 2, the die assembly 12 further includes a die element 30 which is externally threaded and received in a threaded aperture in the die-supporting plate 28. The die element 30 has a die aperture 31, the upper portion of which is of uniform diameter which represents the sharpening length of the die element. The lower portion of the die aperture 31 tapers to permit release of paper punchings. The die element 30 is normally adjusted to be coplanar with the paper-supporting surface of the table member 25 and is locked into position by a jam nut 32 accessible through an opening 33 in the bottom cover 27.

The die aperture 31 thus is seen to communicate with the space between the lower arms 17 of the C-shaped plates 14, 15 so that paper punchings are discharged into the relatively large cavity or chamber 34 therebetween. The chamber 34 is thus defined by the bottom cover 27, the forward strip 26, the lower arms 17, 17, the table member 25, and the die assembly 12. Also, a metal closure strip 35 extends laterally between the plates 14, 15, beginning at the bottom cover member 27, extending upwardly along the bight of the C-shape, about the spacer 21 to which it is secured, and across the length of the upper arm of the C-shaped plates 14, 15. If desired, punchings may fall directly through the opening 33 to an external receiving means. Preferably, however, a closure member 36, best seen in FIGURES 2 and 3, normally closes the opening 33 so that paper punchings are retained in the chamber 34. The closure member 36 is of generally U-shaped cross-section which is vertically guided by the spacers 18, 19, is laterally guided by the lower arms 17, 17, and is movable therebetween lengthwise in a fore and aft direction between stops 37, 38. Friction is utilized to retain the closure member 36 in position, and an aperture 39 is provided therein into which a pencil point or the like may be inserted for sliding the closure member 36. It is thus apparent that various parts jointly comprise enclosing means for the space between the lower arms 17, 17 to define the chamber 34, and that the opening 33 also serves as a discharge opening for paper punchings.

As is already apparent, the rigid arm 13 is fixedly secured to the base 11 near one edge of the paper-supporting surface of the table member 25. Further, the rigid arm 13 extends over the paper-supporting surface and defines therewith a paper-receiving throat.

To reciprocate the punch 14, there is provided a manually operated linkage, generally indicated by the numeral 40 in FIGURE 2, which linkage is disposed largely in the rigid arm 13 between the upper arms 16 of the plates 14, 15. The linkage 40 includes a shaft 41 rockably supported by the plates 14, 15 and to which a pair of levers is drivingly secured. One of the levers comprises a handle 42, and the other lever is a drive lever 43. An additional lever 44 is pivoted intermediate its end by the plates 14, 15 between the upper arms 16, 16 thereof. One end of the lever 44 is connected by a pair of links 45 to drive lever 43. The other end of the lever 44 is rounded as at 46 and comprises a generally vertically movable drive element which has a driving connection with the punch 14, explained in detail hereafter.

Referring to FIGURE 4, there is illustrated the structure by which the lever 44 is pivoted intermediate its ends. The lever 44 is carried by a hub, bushing, or sleeve 47 which has an axial length slightly less than the spacing between the upper arms 16, 16, and a screw 48 extends through the upper arm 16 of the plate 15, through the spacer-sleeve 47 and is threaded into the upper arm 16 of the plate 14, thereby providing a pivotal support for the upper arm 44.

Referring now to FIGURE 5, there is illustrated the structure by which the handle lever 42 and the drive lever 43 are supported by the shaft 41. The shaft 41 has reduced diameter end portions 49, 50, which are respectively journaled in the plates 15, 14. Thus an enlarged portion intermediate the ends of the shaft serves as a spacer to keep the drive lever 43 centered. The drive lever 43 is keyed as at 51 to the shaft 41 for corotation therewith. The reduced diameter portion 50 extends through the plate 14 and receives the handle lever 42. As best seen in FIGURE 6, a taper pin 52 extends through the handle lever 42 and through an opening 53 in the reduced diameter portion 50. The opening 53 is so directed that the handle, when retracted, will normally take the position shown in FIGURE 1 so that the operator may reach up, grasp the handle, and pull it downwardly while the operator is seated. The reduced diameter portion 50 has an alternate opening 54 which may selectively receive the taper pin 52. When the handle is so held, it is nearly horizontal when the punch is retracted so that an operator who is standing may grasp the handle and press downwardly to actuate the punch.

At the forward end of the upper arms 16, 16 there is disposed and secured, in any convenient manner such as welding, a punch guide means 55 in the nature of a sleeve or cylinder which is concentric with the die aperture 31. The punch or punch assembly 14 is slidably received within the opening in the guide cylinder 55 as best shown in FIGURE 3. In this embodiment, the punch 14 includes a punch element 56 and a punch support 57 threaded at its lower end to engage with external threads on the punch element 56. Means such as a set screw 58 are provided to lock the punch element 56 in a selected adjusted position.

The punch support 57 has a cylindrical portion 59 which directly engages the interior of the tubular guide member 55. Further, there is a horizontal opening 60 extending through the punch support 57 of elongated cross-sectional shape as shown in FIGURE 3. The upper and lower limits of the opening 60 are defined by confronting shoulders 61, 62. The punch support 57 is also provided with an upwardly directed opening 63 which communicates with the horizontal opening 60. The driving end 46 of the linkage 40 extends into the horizontal opening 60, and preferably, a pair of bearing inserts 64, 65 are also disposed in the opening 60, one on each side of the driving end 46 of the linkage 40, and respectively engageable with the shoulders 61, 62.

As best seen in FIGURE 3, a spring 66 is disposed in the upwardly directed opening 63 and acts at its lower end against a plug 67 which bears against the upper bearing insert 65 to urge the driving element 46 against the lower bearing insert 64, which thereby is urged against the lower shoulder 61. A reactive force for the spring 66 is provided by an adjustment screw 68 which is locked into position by a jam screw 69, both of which are accessible from the top of the punch 14. Thus the spring 66 acts between the punch and the drive element 46 to bias the drive element 46 into engagement with the lower shoulder 61. Normally, the force applied by the spring 66 is sufficiently great so that when the punch 14 is being retracted from a stack of punched sheets, the spring will continue to maintain the engagement between the drive element 46 and the lower shoulder 61, thereby eliminating any backlash even as wear occurs during usage. The upper shoulder 62 will ordinarily be engaged by the upper bearing insert 65 only if the force from the spring 66 is low enough to permit such occurrence. Any imperfection in roundness of the end of the lever 44 or drive element 46 is thus automatically compensated for by the resiliently biased means that are disposed in the punch support openings.

Where the guide means 55 is associated with the other elements in the manner shown herein, an opening 70 is provided therein within which one end of the lever 44 may reciprocate or rock.

It is preferred that the punch 14 be retracted when not in use. To this end, there is provided a spring 71 acting

between a stationary portion of the assembly, such portion in this instance being the spacer 20 in the base. The other end of the spring 71 is operatively connected to the drive linkage 40, in this instance specifically to the drive lever 43 as shown in FIGURE 2. Actuation of the handle and hence of the linkage in a punch-advancing movement stores energy in the spring 71 which, upon release of the handle, acts through the linkage 40 to urge the punch 14 upwardly. This embodiment shows a second spring 72 also acting to this same end. The spring 72 surrounds the punch support 57 and acts between an enlarged head 73 thereon and a stationary portion of the device, in this instance the upper surface of the guide member 55. Upon manual operation of the linkage in a punch-advancing or paper-punching movement, energy is stored in the spring 72, so that upon release of the handle, the energy in the spring acts to bias the punch in a punch-retracting direction.

The punch element 56 is made adjustable in the punch support 57 not only to compensate for punch sharpening, but also so that the operator may select the retracted position of the punch element so that the gap between the cutting edge hereof and the die element 30 is substantially the same as the stack of papers to be punched. This feature thus facilitates accurate manual alignment of the stack of paper with the cutting edge of the punch.

When the punch has penetrated the stack of paper, friction will act to hold the paper on the punch element 56. To remove the paper therefrom, there is provided a stripper member 74 secured to a stationary part of the upper arm 13 and extending closely about the lower end of the punch element 56. To insure stripping, the stripper member 74 must not allow any portion of the punch element 56 to project below the stripper member 74 when the punch support 57 has been fully retracted. In view of the fact that the punch element is adjustable, it therefore is preferable that the stripper member 74 is also adjustable, and to this end it is adjustably supported by thumb screws 75 which extend through slots (not shown) in the stripper member and into the respective upper arms 16, 16. Preferably, the stripper member is so shaped as shown so as to guide or compress any loose stack of paper into position beneath the punch element. Further, the portion of the stripper which surrounds the punch element, consistent with sufficient rigidity to perform its primary function, is made of a minimum size to minimize its interference with the operator's view.

From the foregoing description, it is believed that the operation and adjustment of the punching device is now apparent and that it embodies such features in combination as overcome the various objections to the use of prior art devices in the punching of standardized test score sheets.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A perforating punch and die assembly, comprising in combination: a pair of C-shaped sheet metal plates disposed in spaced side-by-side fixed relation to each other, and each having an integral upper arm and an integral lower arm; a separate flat table member supported at its lower surface by the upper edges of the lower arms, and having an upwardly directed workpiece-supporting surface; a separate die-supporting plate having a lower surface coplanar with the lower surface of said table member and rigidly secured to and supported at its lower surface by the upper edges of the lower arms centrally of said supporting surface, and having an upper surface substantially coplanar with said supporting surface; a die element adjustably threaded into said separate die-supporting plate and having a lower end extending between and below the upper edges of the lower arms; means coacting between the threads of said die and said lower surface of said die-supporting plate and locking the angular and axial position of said die element therein; the upper arms of said C-shaped plates each extending over said supporting surface to a point above said die-supporting plate; a punch; means fixedly carried by said upper arms and defining a bore for slidably guiding said punch in a position to cooperate with said die element; and a manually operated linkage carried by said upper arms and having driving connection with said punch for reciprocating the same.

2. A perforating punch and die assembly, comprising in combination: a pair of C-shaped sheet metal plates disposed in spaced side-by-side fixed relation to each other, and each having an integral upper and an integral lower arm; a separate flat table member supported at its lower surface by the upper edges of the lower arms, and having an upwardly directed workpiece-supporting surface; a separate die-supporting plate having a lower surface coplanar with the lower surface of said table member and rigidly secured to and supported at its lower surface by the upper edges of the lower arms centrally of said supporting surface, and having an upper surface substantially coplanar with said supporting surface; a die element adjustably threaded into said separate die-supporting plate and having a lower end extending between and below the upper edges of the lower arms; means coacting between the threads of said die and said lower surface of said die-supporting plate and locking the angular and axial position of said die element therein; means having a fixed relation to said plates and enclosing the space intermediate the lower arms to define a chamber communicating with said die element for receiving and storing punchings, said means having a discharge opening; a closure member disposed in said chamber normally in a closing relation to said discharge opening and being selectably movable from said opening while remaining entirely disposed within said chamber; the upper arms of said C-shaped plates each extending over said supporting surface to a point above said die-supporting plate; a punch; means fixedly carried by said upper arms and defining a bore for slidably guiding said punch in a position to cooperate with said die element; and a manually operated linkage carried by said upper arms and having driving connection with said punch for reciprocating the same.

3. A perforating punch and die assembly, comprising in combination: a pair of C-shaped flat sheet metal plates disposed in spaced side-by-side fixed relation to each other and each having an integral upper arm and an integral lower arm; a separate flat table member supported at its lower surface directly against the upper edges of the lower arms, and having an upwardly directed workpiece-supporting surface; a separate die-supporting plate having a lower surface coplanar with the lower surface of said table member and rigidly secured to and supported at its lower surface by the upper edges of the lower arms centrally of said supporting surface, and having an upper surface substantially coplanar with said supporting surface; a die supported by said separate die-supporting plate and having an upper surface substantially coplanar with said supporting surface; the upper arms of said C-shaped plates each extending over said supporting surface to a point above said die-supporting plate; a punch; means fixedly carried by said upper arms and defining a bore slidably guiding said punch in a position to cooperate with said die element; and a manually operated linkage carried by said upper arms and having driving connection with said punch for reciprocating the same.

References Cited in the file of this patent

UNITED STATES PATENTS

220,129 Cowhig ---------- Sept. 30, 1879

(Other references on following page)

7

UNITED STATES PATENTS

264,487	Stevenson	Sept. 19, 1882
290,433	Jordan	Dec. 18, 1883
490,007	Williams	Jan. 17, 1893
863,346	Berry	Aug. 13, 1907
871,739	Southworth	Nov. 19, 1907
939,633	Reynolds	Nov. 9, 1909
1,076,772	Lilleberg	Oct. 28, 1913
1,447,247	Hilsdorf	Mar. 6, 1923
1,488,562	Spaulding	Apr. 1, 1924
2,227,081	Gray	Dec. 31, 1940

8

2,260,183	Leslie	Oct. 21, 1941
2,329,020	Wales	Sept. 7, 1943
2,355,344	Wales	Aug. 8, 1944
2,359,682	Ruder	Oct. 3, 1944
2,375,445	Sines	May 8, 1945
2,387,027	Jackson	Oct. 16, 1945
2,518,545	Hazelton	Aug. 15, 1950

FOREIGN PATENTS

172,746	Germany	July 9, 1906