Oct. 21, 1941. F. H. LESLIE 2,260,183

PUNCH PRESS AND PUNCH AND DIE SET HOLDER

Filed May 27, 1939 2 Sheets-Sheet 1

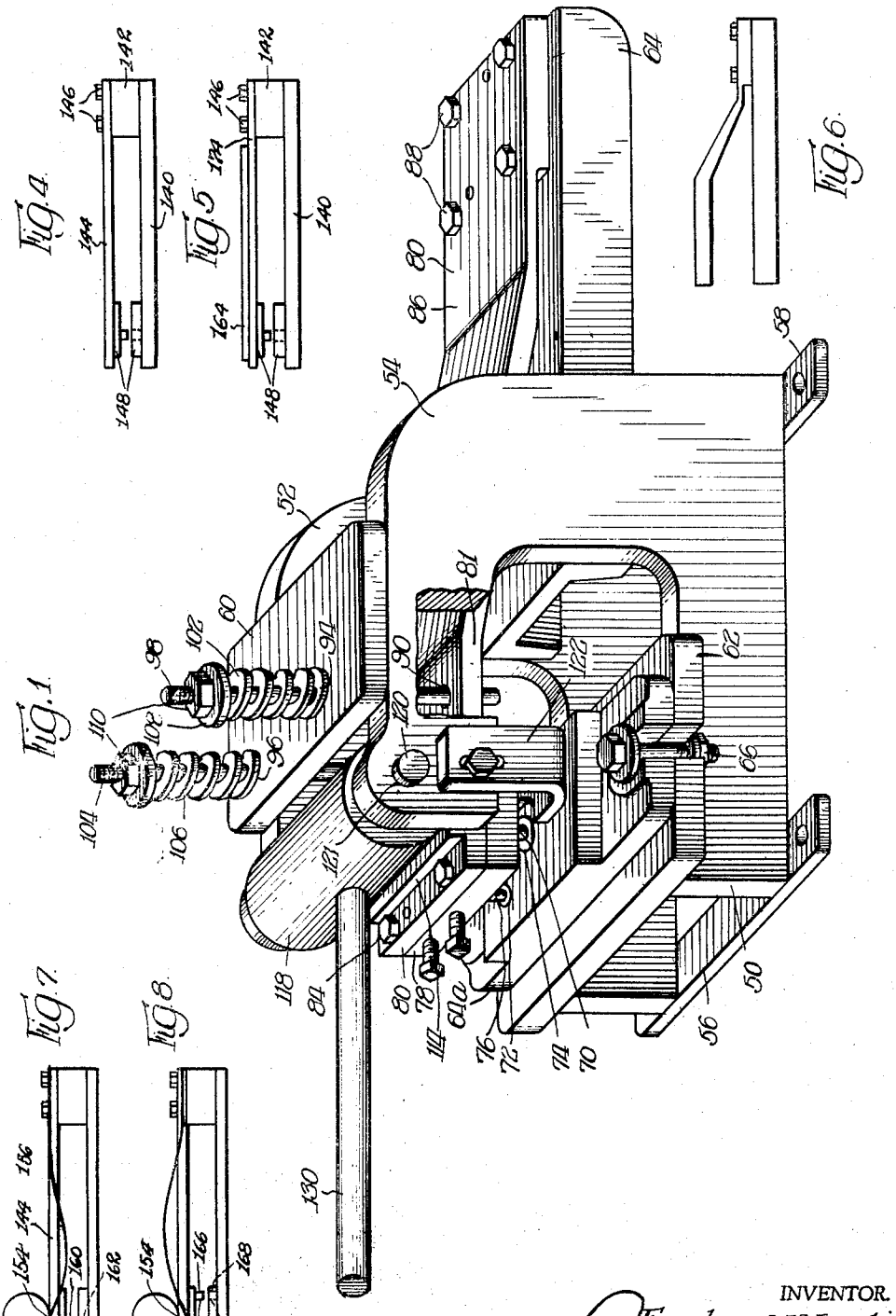

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Fig. 2.

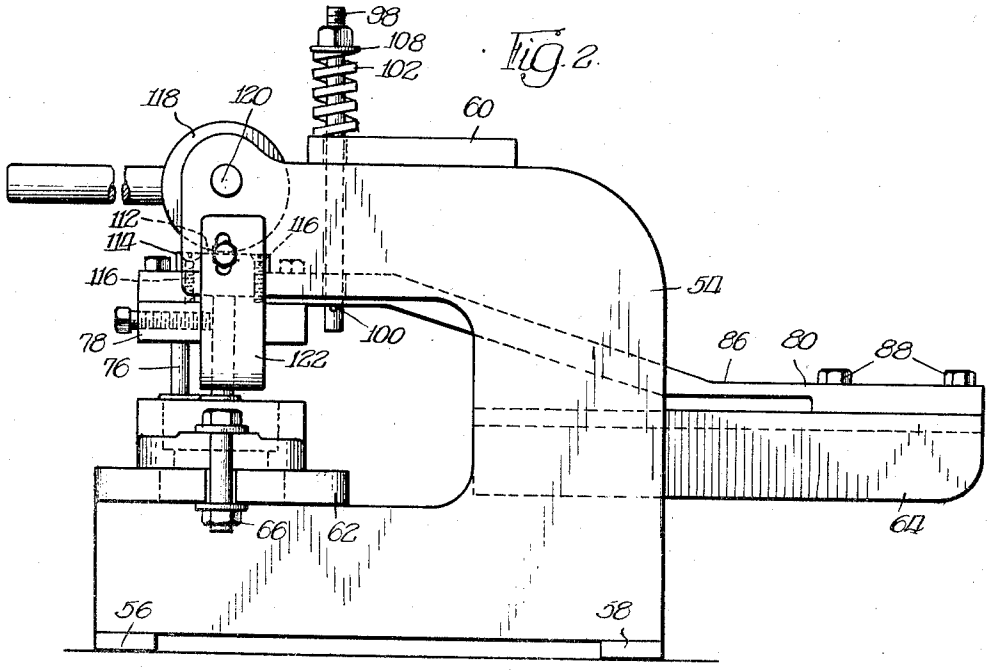
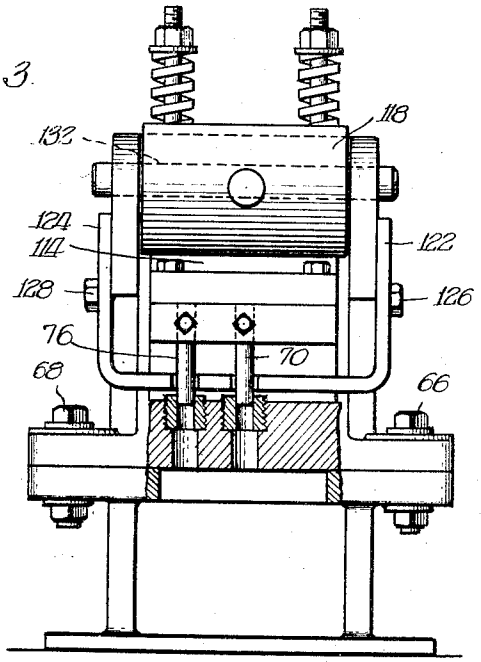


Fig. 3.



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UNITED STATES PATENT OFFICE

2,260,183

PUNCH PRESS AND PUNCH AND DIE SET HOLDER

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Application May 27, 1939, Serial No. 276,247

12 Claims. (Cl. 164—91)

This invention relates to improvements in punch presses and punch and die set holders, or sub-presses.

This invention constitutes a substantial departure from punch presses and punch and die set holders now in use in the field, and a fairly thorough understanding of current practice is desirable in order to perceive problems to be overcome. The punching and shaping of metal is an art which must meet an infinite number of variations. Presses vary from hand punches adapted to punch an eight-inch or less hole in metal having a thickness of one thirty-second inch, to giant presses used in the automobile industry for cutting and shaping automobile tops, While this invention in adaptable to large punch presses, its background in conception is in the machine shop requiring punch presses having beds of fifty square inches or less.

All punch presses are designed to perform two functions, namely, to cause the punch to enter the die and to maintain the punch and die in proper registry regardless of the number of times that the press is actuated. Specifically, the press must provide a die holding means and a punch holding means. There must be a means whereby the punch may be caused to enter the die. Finally, there must be means to prevent the punch or die from getting out of alignment either by a twisting of the punch in reference to the die, or by a tilting of the die or the punch out of the plane in which the two meet. Existing presses solve these problems in much the same way. The die and die shoe are rigidly affixed to a bolster on the press. The punch is affixed either directly or through the intermediary of a punch plate to a ram which is mounted to reciprocate along an axis passing through the die at right angles thereto. Generally speaking, the bolster and the die are faced upward and the punch and the ram are mounted above. Actuation of the ram is effected by a cam as in the so-called cam operated presses or by a rack and pinion as in the arbor presses, or by a system of levers and toggles controlled by hydraulic means as in the hydraulic presses. Existing presses prevent twisting of the punch in reference to the die or its tilting out of alignment with the die by means of slides or ways in which the ram reciprocates. These slides or ways frequently have a cross section of V or truncated V, and the ram carries guides for slidably moving within the slides.

It will be noted in the description above that in all of these presses, the means for applying pressure to the ram has nothing to do with the means for maintaining alignment of the ram, and the punch mounted thereon, with the die and the die shoe. It will further be noted that the independent means for maintaining alignment of the ram, that is the sildes, are obliged to keep the ram from rocking sideways or backwards and forwards and from twisting. The result of this is, firstly, that maintenance of alignment of the ram is dependent wholly upon the accuracy of machining and mounting of the guide on the ram and the slides on the frame of the press, and secondly, that there is constant wear between the guide and the slide which will gradually permit disalignment. The greater the number of slides and guides controlling the movement of the ram, the less likelihood there is of twisting or rocking of the ram, and it is apparent that the placing of four guides at the corners of the ram will best prevent either twisting or rocking of the ram.

The extent to which present presses incorporate these features may first be considered in examining the less expensive presses, for example, those retailing at one hundred dollars or less. Most of these presses are designed primarily to handle small and simple punches and the retail price of these presses does not warrant expensive slides and guides. The result is that the ram quite commonly is little more than a plunger having a circular cross section and moves up and down in a hole in the casting of the press. Where the punch to be used is nothing but an implement to cut a hole in a piece of metal or the like, mounting the punch in the exact center of the ram, which is called on-center as contrasted to eccentric loading, will minimize a tendency of the punch to rock in any direction. For this reason, the inexpensive punch presses are quite practical for on-center loading and inasmuch as a considerable percentage of sheet metal work requires only on-center loading, these presses have their practical value. The moment the shape of the punch becomes such that it cannot be loaded on-center with reference to the ram, however, it becomes necessary to provide a plurality of slides for the ram, which cannot be done without increasing the selling price of the press. It may, therefore, be said that the inexpensive press cannot be eccentrically loaded without causing excessive wear on the press and quickly wearing down the edges of the punch and die, so that they become useless. Its field is limited to on-center loading.

All sheet metal working shops must have one or more presses which permit eccentric loading and a few words on the more expensive punch presses are desirable. As mentioned above, the ram in these presses is guided by one or more slides and is actuated by a pitman rod journaled on an eccentric of a rotating shaft. Where only one pitman is employed, the pressure from the eccentric and the shaft is applied at some point of contact on the ram so that the slides are given no assistance in maintaining alignment of the ram and the punch either from the standpoint

of twisting or of rocking. As the punch plates and presses become larger, there may be provided a pair of pitman rods operating from eccentrics on the same shaft, and in this event, the rods assist the slides in preventing twisting or rocking sideways. In still larger presses, there may be provided eccentrics with or without pitman rods at each corner of the ram, in which case the bottom of the ram is maintained level both laterally and as regards to depth by means of the pressure mecchanism only, assuming that the cutting edges of the punch are distributed evenly over the surface of the punch plate. Where the cutting edges are not evenly disposed over the surface of the punch plate, it is apparent that the slides are essential. These presses become more and more expensive and even the small ones which permit eccentric loading and have a bed of fifty square inches or less run in the neighborhood of five hundred dollars or more new. Moreover, they have the distinct disadvantage of great wear on the slides.

A feature common to all of the cam operated presses, and to some other types, is that of driving the ram by means of power transmitted through a shaft. The shaft carrying the eccentric is journaled in two bearings of the press frame. The shaft is rotated in a conventional manner and the eccentric actuates a pitman. The result of this is that there is great wear in the bearings and at the point of contact between the pitman and the ram which is comparatively small and is frequently a wrist pin. The result of this wear in the main bearings and in the wrist pin is excessive repair cost.

Mention should be made here that the mounting of a punch off center on a punch press which has too much play causes the punch and the die to meet unevenly under circumstances that require a very exact clearance, for if the clearance is not exact, the metal tears or fails to shear evenly. It is quite evident that the clearance between the edge of the punch and the edge of the die depends upon the thickness of the metal to be cut and the physical characteristics of the metal itself. When one is punching sixteen gauge copper, one may utilize a different clearance than when one is punching sixteen gauge steel.

Another aspect of punch press operation is the leader pin die set, which is referred to by some machinists as a sub-press. The leader pin die set comprises a pair of complementary plates, around the periphery of one of which are rigidly mounted bolts or pins which project toward the complementary plate. The latter plate carries holes to pass these leader pins. The punch and the die are fastened to the inner faces of the two plates. It is apparent that the leader pins of one plate penetrate the holes of the opposite plate and tend to maintain the two plates in exact alignment. In substance, the leader pin die set is a positioning means auxiliary to the slides on the press itself. Viewed even more broadly, it is really a sub-press which lies within the main press. One can safely say that all fine punch press work and tool making turns upon the employment of leader pin die sets. The higher grade tool makers make all of their tools for leader pin die sets, being unwilling to prepare tools which are to be used on any less accurate method of punching.

With the above as a background, the principal object of this invention is to provide a large bed press which will permit of eccentric loading and which does not rely upon slides for maintaining the punch and die in registry. Toward the attainment of this objective, one of the major features of my invention is the provision of a cam for actuating the ram, said cam having a width exceeding that of one dimension, ordinarily the width, of the punch plate. In order to prevent twisting of the punch plate, a feature of my invention is the mounting of the punch plate upon a heavy, generally horizontal flexible leaf which will have such rigidity and resistance to forces acting in any line lying within the plane of its surface, that twisting or backward and forward rocking of the punch plate will be impossible. It is a further feature of the invention that this leaf be provided with a flexible point which will permit movement at right angles to the plane of the leaf and thereby permit the punch to be seated in the die.

A second object of this invention is to provide an inexpensive punch press which will permit eccentric loading. The features of my invention mentioned above which assure registry of the punch and the die, are simply made and require no careful and accurate machining. They completely displace the slides of the ordinary punch press and in so doing, eliminate from punch presses, the principal element of cost in the manufacture of a punch press which permits of eccentric loading.

A further object of this invention is to establish a flexing point in the punch plate carrying member at some predetermined and limited point whereby the punch plate in approaching the die will move along an arc of definite and invariable radius.

One object of this invention is to greatly increase the bearing surface which bears the brunt of wear during the punching operation and to center that bearing surface as much as possible directly above the punch plate. One of the features of my invention is the provision of a long bearing within the cam whereby the cam will rotate upon a shaft mounted in fixed supports upon the punch press. By this construction, the bearing surface is more centrally disposed and greatly increased, while at the same time, the overall limits of the punch press are reduced.

Another object of this invention is to apply the force which will actuate the cam directly to the surface of the cam as contrasted to applying it through a shaft to which the cam is affixed. The drilling of a hole in the cam surface to receive an actuating lever is a feature of this invention. This lever may be either manually or power operated. It may be replaced by a rack operating upon teeth cut in the face of the cam. In either instance, the power is applied at a point which is at a distance from the axis of the cam almost equal to the distance of the point of the cam which is applying the force to the punch plate from the same axis.

A further object of this invention is to provide an inexpensive sub-press which will be the equivalent of a leader pin die set and which may be so inexpensively made that it will be possible for metal working shops to invest in a comparatively large number of these sub-presses in which may be permanently mounted those punches and dies for which there is constant and repeated use. One feature of this invention is the incorporating of the flexible leaf which holds the punch plate into a spaced relationship with a separate heavy metal base which may be laid upon the bolster of a punch press beneath the means for actuating the press, regardless of what those

means may be. My sub-press will be useful in existing presses, regardless of the type of ram or the means for actuating it providing the proper size sub-press is adopted.

These and such other objects as may be attained by my invention are disclosed below and shown in the drawings, comprising two sheets, in which:

Figure 1 is a perspective view of my punch press with my sub-press permanently mounted therein;

Figure 2 is a side elevation of the device shown in Figure 1;

Figure 3 is a front elevation partly cut away to show the punches and dies;

Figure 4 is a side view in elevation of a demountable sub-press;

Figure 5 is a view of a demountable sub-press having the upper arm reinforced;

Figure 6 is a view of a sub-press of the type shown in Figure 1, but modified so as to be demountable;

Figure 7 is a view of the sub-press shown in Figure 4 beneath the cam and shows buckling operation of the upper arm of the sub-press when the eccentric loading is in advance or in front of the cam; and

Figure 8 is a diagrammatical view similar to Figure 7 showing the buckling of the upper arm when the punch and die are mounted to the rear of or behind the cam.

In the drawings, a perspective view of the punch press may be seen in Figure 1. The frame referred to as **50** comprises two U-shaped jaw members **52** and **54** held in spaced relationship by strips **56**, **58** and **60** and by bolster **62** and channel bar **64**. The joints are welded. Mounted on the bolster **62** is die shoe **64***a*, which may be adjusted laterally by nut and bolt locking assemblies **66** and **68**. The dies **72** and **74** are positioned in the die shoe **64***a* in registry with the punches **76** and **70**. The punches **76** and **70** are mounted in the punch plate **78**, which is fastened to the leaf **80** by screws such as **84**.

The leaf **80** is a heavy strip of steel having a thin portion or flexing point at **86** and is fastened by screws such as **88** to the channel bar **64**. The leaf **80** is perforated by holes such as **90**, which are in alignment with holes **94** and **96** in the strip **60**. Through holes **90** and **94** is rod **98** held against vertical movement by pin **100** and spring **102**. Similarly mounted in holes **92** and **96** is rod **104** with spring **106**. The upper ends of the rods **98** and **104** are threaded, and washers **108**, which press against springs **102** and **106**, may be adjusted by nuts **110**. The bearing surface **112** on shim **114** which is held to leaf **80** by screws **116**, is engaged by the broad surface of the cam **118**, which rotates on the shaft **120**, supported by members **52** and **54**. In Figures 1, 2 and 3, the cam is shown in its lowermost position with the punches and the dies.

Mounted on the side members **52** and **54** are the strippers **122** and **124** held in adjustable relationship by screws **126** and **128**.

The operation of the punch press is this: in the normal position, the cam handle **130** is in the upward position, which permits the springs **102** and **106** to hold upward the leaf **80** and shim **114** against the face of the cam **118**. The vertical space between the punch and the die may be about an eighth of an inch. Adjustment of this space and adjustments to accommodate a different length of punch are made by substitution of other shims **114** that are either thinner or thicker than shim **114** being used. When the sheet of metal is in the press, the handle **130** is brought down either with or without the assistance of a weight on the end to increase the inertia. The cam **118** engaging the bearing surface **112**, depresses the punch plate end of the leaf **80**, causing the punches **70** and **76** to penetrate the metal and seat themselves in the dies **74** and **72**. The leaf **80** flexes at the point **86**. Upon raising the cam handle **130**, springs **102** and **106** raise the leaf **80**, and the strippers **122** and **124** clear the metal sheet from the punches.

Several features of this punch press should be noted. The punch **76** is off-center. This constitutes eccentric loading. Looking at Figure 3, it will be observed that no rocking effect will be communicated to the bearing surface **132** within cam **118**, for the reason that the baring surface is in all instances directly above the punch and there is bearing surface on both sides of either punch. Considerable forward and backward rocking, as may be seen in Figure 2, the punch **76** is mounted in advance of a vertical line drawn through the shaft **120**. In order to avoid backward and forward rocking, the leaf **80** is a thick plate except at its flexing point **86**. Between the flexing point **86** and the punch plate **78**, the leaf **80** is rigid and acts as a column and for any punch which might be used in this press cannot be distorted. Regardless of the direction of the disaligning tendency, one can see that the heavy leaf **80** plus the long distance of contact between the cam **118** and the bearing surface **112**, will completely prevent disalignment.

Moreover, alignment is not dependent upon wear in the slides or the ways of a ram, which by wearing can cause disalignment, as in the ordinary punch press. The only wearing surfaces in this punch press are in the bearing **132** where cam **118** rotates on shaft **120** and between the cam **118** and the bearing surface **112**, both of which can be lubricated readily. In both bearings, the lengths of the wearing surfaces are a maximum, that is, they are at least equal to the width of the punch plate or to the width of the effective working area of the press.

The friction of cam **118** on bearing surface **112**, causes a force to push backwards against leaf **80**. This force is resisted by the strength of leaf **80** which acts as a column and by the strength of channel **64** so no backwards motion of leaf **80** is permitted.

It is to be noted that cam **118** is large in diameter as well as long. This means that the bending of shaft **120** when pressure is applied is prevented by the exceptionally strong cam **118**. This feature is unique and very important as it permits pressure to be applied to the leaf **80** with a performance equivalent to that of a double crank press. There need be only two bearings **121** to support shaft **120** in side members **52** and **54**, which do not have to be anti-friction bearings instead of four anti-friction bearings to support the shaft as must be used in a double crank press.

The width of the punch plate is dependent upon the length of the cam, and the depth from front to back of the punch plate is dependent upon the strength of the leaf **80**. It is apparent that the size of my punch press can be readily varied so that certain press operations can be accomplished with a small punch plate, and others, by a large one.

Another feature of this invention is the ease with which the punches and the dies may be

positioned in the punch plate and the die shoe. In order to obtain exact registry of the two complementary parts, the punch is rigidly fastened in the punch plate. The cam handle 130 is then slowly brought down, so that the punch engages the die and the bolts 66 and 68 are then pulled up tight. When this exact registry has been obtained, the handle 130 is returned to open or normal position and the machine is ready for use.

In Figure 4 is seen a sub-press comprising a base 140, a spacer member 142, a leaf 144 fastened together by screws as 146. The conventional punch and die set is identified by the number 148. For on-center loading, this is a very useful sub-press. It consists of two plates, a spacer member, four fastening screws to which are affixed a punch plate and a die. These can be turned out at comparatively little cost, and a machine shop can afford to mount a certain type of punch in such a sub-press and never take down the sub-press until the punch and die set wears out.

However, the sub-press shown in Figure 4 cannot be used for eccentric loading in front of or behind the pressure application point with any degree of success. In Figure 7, there is shown diagrammatically the position of such a sub-press under a cam 150 with the punch 152 mounted in advance of the pressure point 154 between the cam and the upper surface of the leaf 144. It has been found that the leaf 144, when made of a thickness which will flex, will wave in the manner shown by the curved line 156. Of course, the wave is greatly exaggerated here, but even a slight wave will cause the forward edge 158 of the die to be overlapped by the forward edge of the punch 152 and, conversely, the rear edge 160 of the punch 152 will overclear the rear edge of the die 162. This causes tearing of the metal and rapid wear of the die. It is, therefore, necessary that the flexing point of the leaf 144 be reduced and this is accomplished, as shown in Figure 5, by the addition of a strengthening plate 164.

Similarly, as may be seen in Figure 8, where the punch and die set is mounted eccentrically, but to the rear of the point 154, the wave in the leaf 144 is the converse of the wave shown in Figure 7, with the result that the rear edge 166 of the punch overlaps the rear edge 168 of the die and the front edge of the punch 170 overclears the front edge of the die 172.

It is, of course, apparent that the reinforcing plate 164 performs equally well to prevent this waving effect and confines the flexing action of the leaf 144 to some point such as 174 shown in Figure 5. The commercial punch press shown in Figure 1, employing the thickened portion 81 having a reduced thickness at 86, performs the same function as the sub-press shown in Figure 5.

Figure 6 shows a separate sub-press modeled along lines of the leaf 80 and channel bar 64 of the press shown in Figure 1. This is a commercial form of sub-press comparable to the sub-presses shown in Figures 5 and 4. It should be borne in mind that one cannot hope to displace the sub-presses now in use, but it is quite possible that the sub-presses such as those shown in Figures 4, 5 and 6 may come into general use in conjunction with arbor and cam presses now in use by adaptation of the beds of such presses to receive these sub-presses.

Attention is called to the means for applying power to the cam 118. It will be seen that the handle 130 is seated in the cam and the power is applied to the surface of the cam. In order to convert this into a power press, one could apply reciprocating power to the handle 130, or could notch the face of the cam at right angles to its axis to receive a rack capable of reciprocation. In either event, the power is transmitted to the cam directly. It does not come through a shaft, that is, through shaft 120, as in conventional practice, and its power is not transmitted through a connecting rod and ram. The fact is that the shaft 120 may be free to rotate in bearing 121, or not, this being immaterial, for the cam 118 is free to rotate on the shaft 120 and most of the rotation occurs in the bearing indicated by the numeral 132 in Figure 3. On a power stroke of the cam 118, most of the sliding occurs in the bearing 132, while there may be a small amount in the bearing 121. As for the ram and slides of the conventional punch press, in my press the end of the leaf 80 is the ram and, because the leaf 80 is rigidly fastened to the channel bars 64, slides are unnecessary. The elimination of slides removes one of the principal cost factors in a punch press, because slides must be made with great care and accuracy, and the surfaces of the ram which ride on the ways must be made with equal care and accuracy. Moreover, there is wear between the ram surfaces and the ways and to compensate for this wear, the ram surfaces are pressed against the ways by adjustable pressure means, as set screws and gibs. Contrast my press which requires no part needing exact machining, nor of wearing surfaces other than those of the cam with existing presses.

In the above, I have described the preferred embodiments of my invention of my slideless punch press and U-shaped sub-press. It is possible to meet the problems overcome by this press by making variations thereof, as by substituting other means of applying power to close the jaws of the sub-press or by varying the manner of holding the jaws of the sub-press in spaced relationship, but the broad aspects of the invention as set forth in the objects and disclosure determine the scope and the means which fall therein.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. A punch press of the character described comprising, in combination, a punch plate capable of holding a plurality of punches off center, a die shoe, a means for moving the punch plate relative to the die shoe consisting of a force directed against all points in a line extending across approximately the entire width of the punch plate whereby lateral rocking of the punch plate is prevented, and means acting as a column on the punch plate and the die shoe whereby forward and backward rocking between the two is prevented.

2. A punch press of the character described comprising, in combination, a punch plate capable of holding a plurality of punches off center, a die shoe, a means for moving the punch plate relative to the die shoe consisting of a force directed against all points in a line extending across approximately the entire width of the punch plate whereby lateral rocking of the punch plate is prevented, and means acting as a column on the punch plate and the die shoe whereby forward and backward rocking between the

two is prevented, said means comprising an elongated inflexible base having the die shoe disposed at one end and rigidly affixed to its other end a flexible leaf carrying the punch plate.

3. A punch press of the character described comprising, in combination, a punch plate capable of holding a plurality of punches off center, a die shoe, a means for moving the punch plate relative to the die shoe consisting of a force directed against all points in a line extending across approximately the entire width of the punch plate whereby lateral rocking of the punch plate is prevented, and means acting as a column on the punch plate and the die shoe whereby forward and backward rocking between the two is prevented, said means comprising an elongated inflexible base having the die shoe mounted at one end and rigidly affixed to its other end an offset inflexible elongated member carrying the punch plate, said second elongated member having a weakened portion close of the place of joinder with the first elongated member for the purpose of permitting flexing whereby the punch plate and the die shoe may be brought into operable relationship.

4. A punch press of the character described comprising, in combination, a framework, one end of a flexible elongated member rigidly fastened to said framework, an actuating cam having approximately the same width as the flexible elongated member and disposed at right angles thereto at a point adjacent the latter's end, spring means for holding the flexible member in engagement with the cam, a punch plate capable of holding a plurality of punches off center mounted on the free end of said flexible elongated member, and a die shoe positioned in operable relationship with respect to said punch plate.

5. A punch press of the character described comprising, in combination, a frame, an elongated member weakened at one end for flexing and affixed at that end to the frame, a rotatable cam having a width approximately that of the elongated member mounted on the frame immediately above the free end of said elongated member, spring means disposed above the elongated member for urging the same against the cam, a punch plate fastened beneath the free end of the elongated member, means for removably mounting the punch plate on the punch press, means for holding the punch plate in locked position, and a die shoe disposed in operable relationship to said punch plate.

6. A punch press of the character described comprising a punch plate carried by a flexible leaf and capable of holding a plurality of punches off center, a die shoe, means for establishing relative movement between the punch plate and the die shoe and means acting laterally as a column on the punch plate and the die shoe whereby forward and backward rocking of the two with respect to each other is prevented.

7. A punch press of the character described comprising, in combination, a punch plate capable of holding a plurality of punches off center, a die shoe, means for moving the punch plate relative to the die shoe consisting of a force directed against all points in a line extending across approximately the entire width of the punch plate whereby lateral rocking of the punch plate is prevented, and means acting as a column on the punch plate and the die shoe at a pivotal point whereby forward and backward rocking between the two is prevented, said pivotal point being in approximately the plane in which a punch mounted in the punch plate will enter a die mounted in the die shoe.

8. A punch press of the character described comprising, in combination, a throat having an upper and a lower faced jaw, a die bed disposed on the lower jaw, a leaf anchored at one end to a portion of the frame and having its free end extending substantially parallel to a point above said bed, means on the upper jaw of said throat for causing the free end of the leaf to move toward or away from the bed, and a weakened portion transversely of the leaf close to the point where the leaf is fastened to the frame, which weakened portion acts as a line of flexion when the free end of the leaf is moved toward or away from the bed, said flexion portion being approximately in the plane where a punch suspended from the leaf will enter a die mounted on the bed, whereby misalignment of the punch and die due to an arcuate movement of the two with respect to each other is minimized.

9. A punch press comprising a frame, a punching zone, a substantially inflexible elongated leaf rigidly fastened at one end to said frame in such a manner that its free end is disposed within the punching zone, a punch plate capable of holding a plurality of punches off center fastened on the free end of said leaf within the punching zone, said elongated leaf having a weakened portion adjacent to the point of affixation to the frame whereby the leaf may be flexed with respect to the frame at said weakened portion, and means directed against the free end of the leaf for moving it with respect to the frame.

10. A punch press comprising a frame having a base, a punching zone above said base, a flexible leaf having a free end in the punching zone reinforced and carrying punch elements and fastened at its other end to said frame, a support mounted on the base above the punching zone, and means on said support for moving the flexible leaf toward said base, whereby forces tending to misalign the support above the punching zone with respect to the base will have no effect upon the relationship of the leaf to the base.

11. A punch press comprising upper and lower arms connected at one end to form a frame having a throat, a die shoe bed mounted on the lower arm, a flexible leaf fastened at one end on the walls of the throat, a punch plate holder mounted on the free end of the flexible leaf, and means for moving the die shoe bed and punch plate holder relatively to each other, said means being disposed on the upper arm, whereby forces set up by a punch entering a workpiece will be dissipated upon the second named arm without causing misalignment of punch and die elements disposed on the punch plate holder and the die shoe respectively.

12. A punch press comprising a base, a punching zone above one portion of said base, an elongated leaf offset so as to have an upper end portion and a lower end portion, means for mounting the lower end portion on said base so that the upper end portion extends into the punching zone, flexing means in the lower end portion for permitting vertical movement of the upper end portion in the punching zone, a supporting member mounted on the base adjacent said flexing means, and means on said supporting member for moving the free end of said offset leaf in the punching zone.

FREELAND H. LESLIE.

CERTIFICATE OF CORRECTION.

Patent No. 2,260,183. October 21, 1941.

FREELAND H. LESLIE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 12, for "eight" read --eighth--; line 50, after "of" insert --a--; line 60, for "sildes" read --slides--; page 2, first column, line 11, for "mecchanism" read --mechanism--; and second column, line 15, for "flexible" read --flexing--; page 3, second column, line 18, for "baring" read --bearing--; page 3, second column, line 21, for "Considerable" read --Considering--; 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 3rd day of March, A. D. 1942.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)