Dec. 20, 1960 A. K. SCHOTT 2,964,984

APPARATUS FOR NOTCHING SHEET MATERIAL HAVING REVERSIBLE MULTIPLE CUTTING EDGE LEDGER BLADES

Filed Nov. 20, 1956 3 Sheets-Sheet 1

Fig. 1

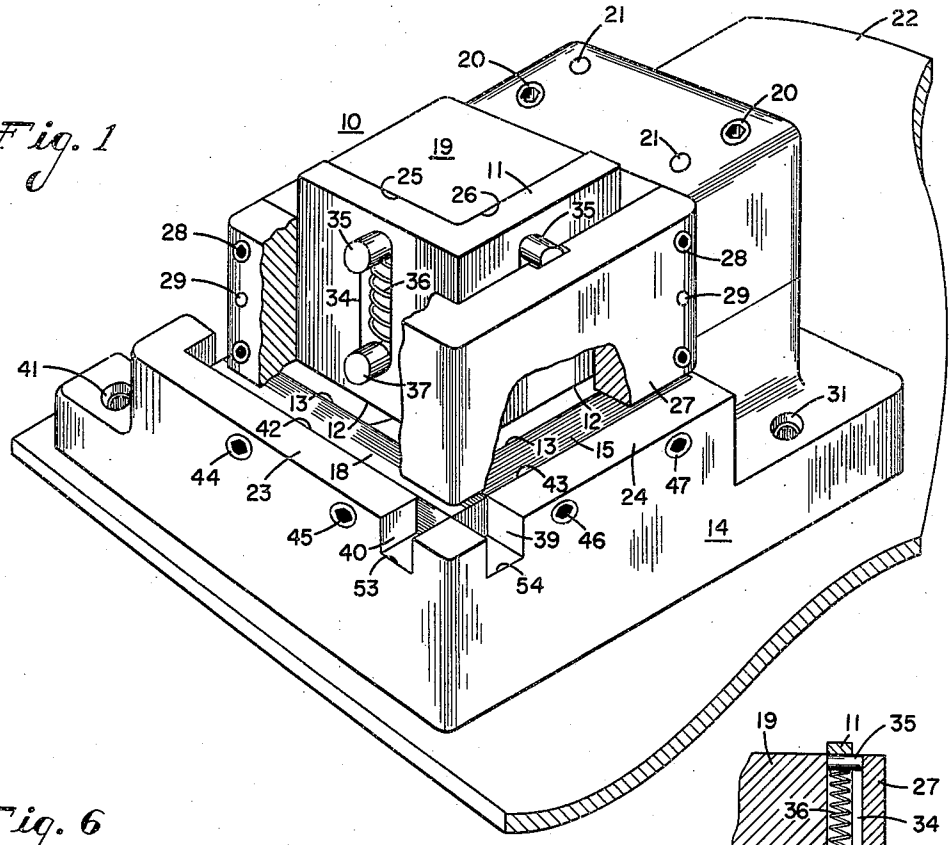
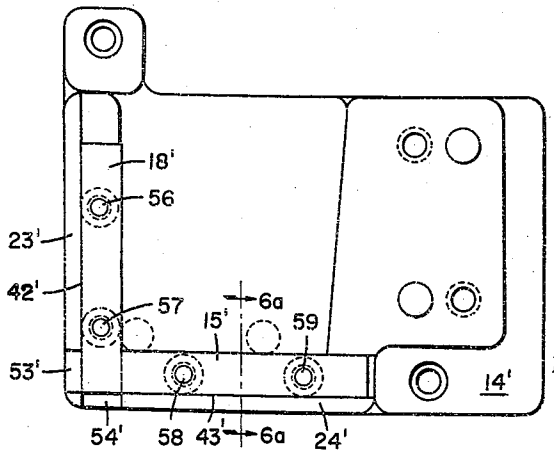


Fig. 6



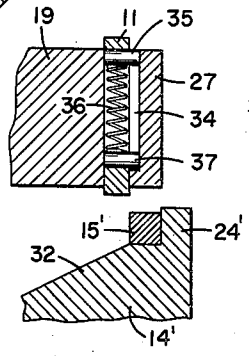


Fig. 6a

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Fig. 2

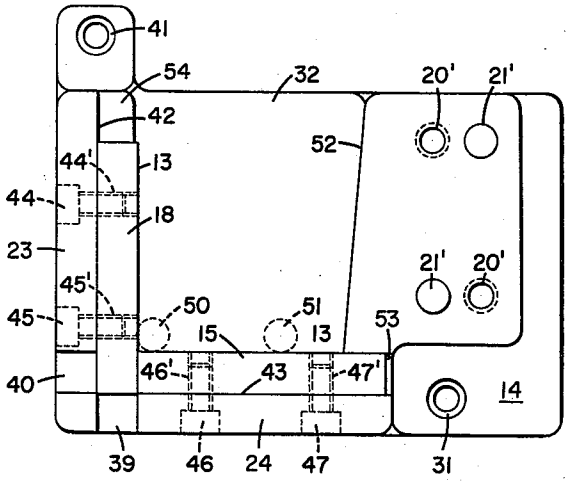


Fig. 3

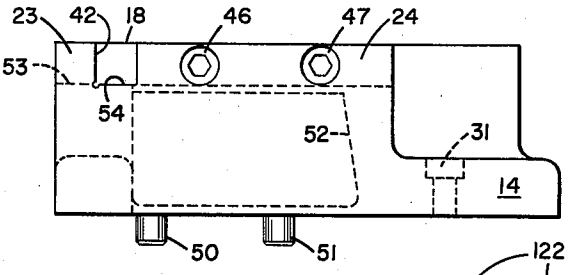


Fig. 4

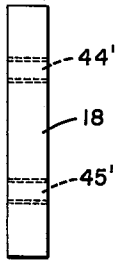
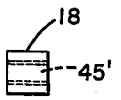


Fig. 5



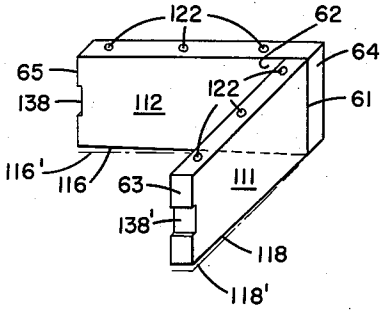


Fig. 9

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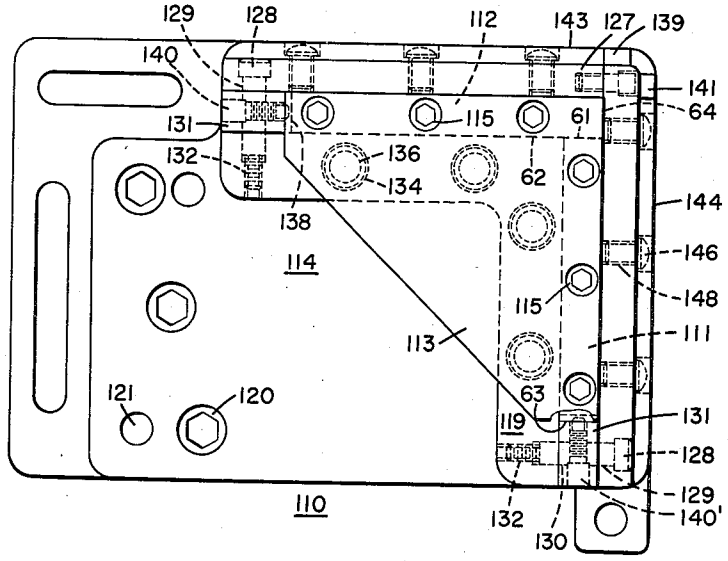


Fig. 7

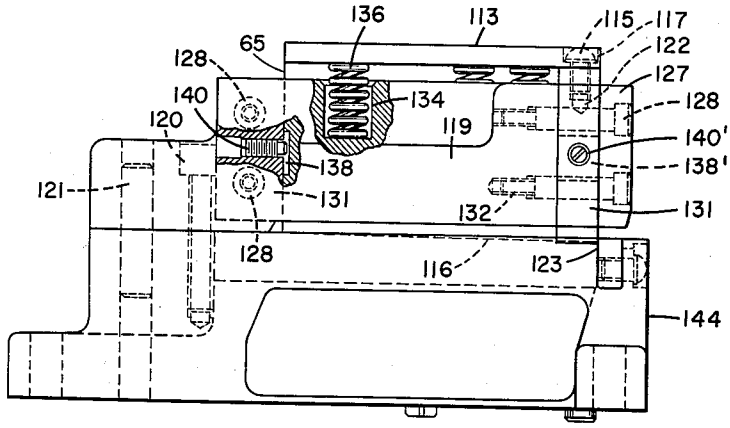


Fig. 8

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United States Patent Office 2,964,984 Patented Dec. 20, 1960

2,964,984

APPARATUS FOR NOTCHING SHEET MATERIAL HAVING REVERSIBLE MULTIPLE CUTTING EDGE LEDGER BLADES

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Filed Nov. 20, 1956, Ser. No. 623,483

3 Claims. (Cl. 83—694)

This invention relates to an improved device for punching notches in sheet metal and other sheet material.

Self-contained notching implements have come into widespread use because they permit of cutting a plurality of notches in sheet material simultaneously, and because they also permit punching the notches simultaneously with perforation of the sheet and in practically any desired relationship.

These self-contained notching implements comprise a manually transportable support, a punch mounted reciprocably on the support, a die mounted on the support in aligned relation to the punch, and resilient means for stripping the punch from the work on completion of the punching stroke.

In the self-contained notching implements hitherto available, the die was usually of simple construction; but the punch was complex in shape. For making a right-angular notch in sheet metal or other sheet material, for instance, the die consisted merely of two rectangular shaped die members made of tool steel and disposed at right angles to one another; the punch, however, was a right-angular shaped strip of tool steel, and was costly to make. When the cutting edge of the die member became dulled through usage, it was necessary to replace the worn die members with new die members. On the other hand, when the punch became dull it could be inverted and turned end for end, and reused until the new cutting edge became dull; then it was necessary for the punch to be discarded.

In manufacturing conventional punches and die members, careful control over the positions of the cutting edges with relation to the apertures, through which the fastening means are passed to secure the punch and die members to the support, is necessary to provide proper clearance between the cutting edges of the punch and the cutting edges of the die members.

An object of the present invention is to provide a notching implement in which both the punch and die members are of simpler design, and less expensive to make and to replace than in conventional notching implements.

Another object of the invention is to provide a notching implement in which the die members, at least, have a longer useful life than in conventional notching implements.

Another object of the invention is to provide improved die members for a notching implement, each of which has a plurality of available cutting edges that may be used successively without sharpening by simply repositioning the die member on the base of the notching implement.

Still another object of the invention is to provide a notching implement in which the punch is made of a plurality of cutting steels, each of which has a plurality of cutting edges that may be brought successively into operative position by repositioning the cutting steels in the punch holder.

Other objects of the invention will be apparent hereinafter from the description when taken in conjunction with the accompanying drawings and the recital of the appended claims.

There are three embodiments of the invention illustrated in the drawings. In all of the illustrated embodiments, the notching implement comprises a base, a punch reciprocable relative to the base, a die assembly mounted on the base in cutting relation with the punch, and spring means for stripping the punch from the work on completion of the punching stroke.

In all the illustrated embodiments of the invention, the die assembly comprises a pair of cutting steels or die members of square cross-section, each having an end face adapted to be abutted against a side face of the other to form an angular die for cooperation with the punch. For cutting a notch having an angle of 90°, the ends of these cutting steels are squared, so that when an end of one cutting steel is abutted against a side face of the other, the two die steels form a 90° angle. The base is provided with two supporting seats, each having two surfaces disposed at right angles to one another, on which the cutting steels or die members are adapted to be supported in operative position with respect to the punch working face.

Each die seel has four cutting edges extending, respectively, along its four longitudinal edges. A pair of parallel threaded apertures pass completely through each die steel, so that the die steel may be secured in place on its seat by a pair of bolts or screws that pass through the base and thread into the apertures. The apertures are symmetrically placed longitudinally and vertically in the cutting steels, so that the several cutting edges of each die steel may be disposed successively in operative position by inversion of the die steel and rotation of the die steel end for end, and each die steel may be secured in its seat regardless of which cutting edge is used.

In one embodiment of the invention, the fastening bolts or screws are disposed horizontally in the base.

In the second illustrated embodiment of the invention assembly, the two die steels are secured to the base by bolts or screws that extend vertically upward through the base into the steels.

In the third illustrated embodiment of the invention, a two-piece punch is employed. Each part of this punch comprises a tool steel of rectangular cross section. Each part has two side cutting edges. These extend longitudinally along the opposite side edges of one face. Each punch steel can, therefore, be removed and repositioned, when one cutting edge is dull, to bring the other cutting edge into cutting position. The two punch steels are positioned relative to one another at an angle corresponding to the angle of the notch which is to be punched in the work, and are detachably fastened to a plate that is mounted parallel to the base of the implement. Springs are interposed between this plate and the base of the implement to strip the punch from the work upon completion of the working stroke. For smoother cutting, the punch steels are made with shear cutting edges, that is, with cutting edges inclined to the plane of cut. With this construction, in order to use the second cutting edge of each punch steel, it is necessary to put one steel in place of the other when using the second cutting edge of each. The two punch steels are of different length, but readily fit in abutting relation in either of their cutting positions. The shear cut achieved with the punch steels used in this third embodiment of the invention reduces very materially the punching force required to effect the notching operation, since with this construction the notching cut proceeds progressively from one end to the other of each punching steel.

In the drawings:

Fig. 1 is a perspective view, partially broken away, of

a notching unit constructed according to one embodiment of this invention;

Fig. 2 is a top plan view of the base portion thereof, showing in detail the novel die steel assembly;

Fig. 3 is a side elevation of the base;

Fig. 4 is a top plan view of a die steel made according to this embodiment of the invention;

Fig. 5 is an end elevation thereof;

Fig. 6 is a top plan view of the base portion of a notching unit having die steels constructed according to a modified form of the invention;

Fig. 6*a* is a fragmentary section through the notching unit taken on a line such as the line 6*a*—6*a* of Fig. 6 but showing the punch and its guide head as well as the base and the die;

Fig. 7 is a top plan view of a notching unit made according to a further modification of the invention;

Fig. 8 is a side elevation thereof, partly broken away, showing the punch in depressed position; and

Fig. 9 is a perspective view of the punch of this notching unit.

The notching unit of the present invention is capable of use in stamping presses of the kind commonly employed for blanking, piercing, trimming, punching and notching sheet metal, and in other suitable installations.

In the following description, similar numerals of reference indicate like parts in the several figures of the drawings.

Fig. 1 shows a notching implement **10** comprising a base **14** and a head, head portion, or holder **19**. A punch **11** is reciprocably mounted on the holder **19**.

The punch **11** shown is right angular in transverse shape; and the holder or column **19** has two vertically-disposed, lateral faces **25**, **26**, that are disposed at right angles to each other, on which the punch **11** reciprocates. The punch **11** is held in place on the holder **19** by a right-angular shaped cap **27** which is detachably secured to the holder by a plurality of screws **28** and dowels **29**.

The punch **11** is reciprocable in the space between the cap **27** and the holder **19**. To maintain the punch at the desired elevation, to permit insertion of the work between the punch and the die, and to strip the punch from the work on completion of each punching stroke, the stripping springs **36** are provided. There is a vertical slot **34** through each leg of the punch. In each slot there is mounted a spring **36**, an upper pin **35** and a lower pin **37**. The spring **36** in each slot is interposed between the upper pin **35** and the lower pin **37**. Each upper pin **35** is held against the upper end of the associated slot **34** by the associated spring **36**. Each lower pin **37** engages a shoulder (Fig. 6*a*) on the inner surface of the cap **27**, so that as the punch **11** is depressed by the ram of the press, in which the unit is mounted, the spring **36** is compressed. Upon release of the punch **11**, the expansive force of the compressed spring **36**, acting on the upper pin **35**, will cause the punch **11** to be stripped from the work and to resume its normal elevation.

The holder **19** is rigidly secured to the base **14** by screw fasteners **20** and dowels **21**, which engage in apertures **20'** and **21'**, respectively (Fig. 2), in the base **14**, and insure proper alignment of the base and holder.

The opposite ends of the slot **34** are preferably made equidistant from the opposite upper and lower end faces of the punch **11** so that the punch can be used with either face down. Thus, after one end of the punch has dulled, it may be inverted and the other end may be used. The punch, therefore, has in effect two cutting edges.

The die comprises a pair of cutting steels, **15** and **18** (Figs. 1, 2, 4 and 5), which are disposed at a right angle to each other to provide a right-angular die cutting edge for cooperation with the right-angular cutting edge of the punch **11**. The die steels are square in cross-section and each is positioned and supported in a right-angular seat formed on the base **14**. The base has wall portions **23**, **24** projecting upwardly above the main portion **32** of the base; and these wall portions have plane, inside, accurately disposed vertical faces **42**, **43**. The die steels seat against these plane, vertical surfaces, **42** and **43**, respectively, and on plane, horizontal supporting surfaces, **54** and **53**, respectively, formed on the base. Each die steel seats flush against its horizontal support surface **54** or **53**, and against the associated vertical locating surface **42** or **43**, and is positioned thereby in operative relation to the punch **11**.

The steel **18** is secured in position by a pair of screws **44** and **45**, that extend through the vertical wall **23** and that thread into holes **44'** and **45'**, respectively, that are equidistant from opposite ends, respectively, of this cutting steel **18**. The steel **15** is similarly secured in position by a corresponding pair of screw fasteners **46** and **47**, extending through the wall **24** and threading into apertures **46'** and **47'**, respectively, which are equidistant from opposite ends, respectively, of this steel **15**. The screw heads are accessible from the exterior surface of the base and are counter-sunk in the walls **23**, **24**. Symmetrical disposition of the securing means in each cutting steel permits the inversion and rotation end for end of each cutting steel so as to allow each of the four longitudinal edges thereof to be employed as a cutting edge. Thus, a single cutting steel has four usable cutting edges, which may be used successively simply by removal of the screw fasteners and an appropriate relative repositioning of the cutting steel.

For convenience in manufacture and more readily to assemble the die steels in abutting relation, the die steel **18** may be made longer than the die steel **15**. Slots **39** and **40** (Fig. 1) are milled at right angles in the side walls **23** and **24** of the base to permit ready access to the die steels. These slots also provide clearance for the milling cutters during milling of the seats for these die steels.

To facilitate initial positioning of the base or die holder **14** on the template **22**, a pair of pilot pin **50** and **51**, shown in Fig. 3, are provided on the undersurface of the die holder **14**. The notching implement may also be secured in position on the bed rail of a press or the like by a pair of fasteners passed through the apertures **31** and **41** (Fig. 1) in the base **14**.

In operation, the notching implement may be placed between the bed and the ram of a press. Upon downward movement of the ram, pressure is applied by the ram against the punch **11**, which is thereby forced downwardly to cause its lower cutting edges **12** (Fig. 1) to cooperate with the cutting edges **13** of the cutting steels **15** and **18** to cut a notch in the work. Upon upward movement of the ram, this pressure is relieved; the springs **36** then return the punch to its normal elevation.

The slug, which is cut from a sheet of work material during notching, drops downwardly on the inclined surface **32** of the base **14**, and so is discharged from the device. In order to assist ejection of the slug and prevent it from becoming obstructed in its descent, the lateral surface **52** (Fig. 3) of the base **14** is relieved, or made wider at the bottom than the size of the largest slug which may be cut.

To use the marginal cutting edges of a cutting steel successively, its securing screws **44**, **45**, or **46**, **47**, are withdrawn into the wall **23** or **24**; and the steel is then inverted to expose a fresh marginal cutting edge. Alternatively or successively, the steel may be rotated through an angle of 180°, or rotated and inverted, to expose other marginal edges of the steel for use.

A modified form of the invention is illustrated in Figs. 6 and 6*a*. Here the die steels are secured in position by screws that extend vertically upwardly through the base instead of by screws that extend horizontally through the base as in the first-described embodiment of the invention. Here, the cutting steel **18'** is positioned on

the base 14' in support seats provided by the flat vertical surface 42' of wall 23' and by the flat horizontal surface 54' of the base. It is held in position by screws 56 and 57 which extend upwardly from the base 14 into the steel and which thread into holes that extend vertically through the steel. The other cutting steel 15' is similarly abutted against the flat vertical surface 43' of wall 24' of the base and the flat horizontal surface 53' of the base. It is held in position by screws 58 and 59 which extend upwardly from the base 14 into the steel and which thread into holes that extend vertically through the steel.

A primary advantage of this modified form of the invention is that the sidewalls 23' and 24' of the base 14 may be of reduced thickness. This permits a decrease in the size of the base 14. In the embodiment of the invention shown in Figs. 1 to 5, the sidewalls 23 and 24 were required to be of sufficient thickness to accommodate the apertures 44', 45', 46' and 47' for the cutting steel fasteners. In the embodiment shown in Fig. 6, the corresponding apertures extend vertically upward in the base 14' and impose no requirement on the sidewalls. Hence, the sidewalls 23' and 24' can be of a minimum thickness for supporting the cutting steels in position during notching.

Another modification of the invention is shown in Figs. 7, 8 and 9. In this form of the invention, the notching implement 110 is equipped with a punch and a die that are mounted, respectively, on a punch holder or head 119 and a base 114 of the implement.

The punch includes a short punch steel 111 and a long punch steel 112. The end face 61 of the short punch steel 111 is abutted against the lateral inner face 62 of the long steel 112, at one end thereof, at a right angle. The two punch steels are both secured at their tops to a punch plate 113 by a plurality of screws 115 that pass through apertures 117 in the punch plate 113 and engage in threaded apertures 122 in the punch steels. The punch assembly thus formed is reciprocably mounted on the head 119.

The head 119 has two right-angularly disposed, vertical, lateral faces on which the punch reciprocates. The punch steels are guided between these lateral faces and a pair of caps 127, that are detachably secured to the punch holder 119 by screws 128 that pass through preformed apertures 129 in the caps, through preformed apertures 130 in filler blocks 131, and that thread into tapped holes 132 in the punch holder. There are two filler blocks 131 disposed, respectively, at the outside ends of the right-angular shaped space in which the punch reciprocates. They fill the space between the outer ends of the caps 127 and the punch holder or head 119.

To maintain the punch assembly at a desired elevation, and to strip the punch from the work upon completion of a punching stroke, a plurality of stripping springs 136 are interposed between plate 113 and head 119. The head 119 is formed with a plurality of recesses 134 on the upper face thereof, and a stripping spring 136 is engaged in each recess 134. Thus, as the punch assembly is depressed, the springs 136 are compressed, and upon release of the punching force, the compressed springs expand, acting against the punch plate 113, to strip the punch from the work and cause the punch assembly to resume its normal elevation.

The outer end face 65 of the long punch member 112 is formed with a vertically-extending slot 138, and the end of a set screw 140 (Fig. 8), that is mounted in the filler block 131, engages in this slot to retain the punch steel 112 in the head and prevent it from jumping or falling out of the head. Similarly, a set screw 140' is mounted in the other filler block 131 and engages in a vertical slot 138' in the outer end face 63 of the short punch member 111 to limit movement of that punch steel.

The embodiment of the invention illustrated in Figs. 7, 8 and 9 is adapted to produce a 90° notch in the sheet of work material, and thus, the short and long punch members 111 and 112 respectively are abutted together at right angles, and the die steels 123 are mounted correspondingly in the base, to provide the desired 90° cutting angle.

The punch steels 111 and 112 are preferably made with shear cutting edges 116 and 118, that is, with their cutting faces inclined upwardly from one end to the other. Preferably they are positioned so that the cutting edges incline upwardly from the abutting faces of the punching steels to their remote end faces, as shown in Figs. 8 and 9. Thus the notching cuts will be taken progressively from one end to the other of the punching bits. This will mean smoother cuts on the work and require application of a smaller punching force than where the punch cuts at one time along the whole of its cutting edge. Here 116' and 118' denote lines lying in a plane containing the tips of the cutting edges of the two punch steels. These lines would designate the cutting edges of the punch steels if the punch steels had no relief for shear cutting, that is, if the punch steels had cutting edges, as in the embodiment of the invention illustrated in Fig. 1, lying in a plane perpendicular to the direction of cut.

Because of the shearcutting edges, the punching steels 111 and 112 cannot be inverted when one edge dulls, but since both steels are rectangular in cross-section, they can be transposed, the steel 111 taking the place of the steel 112 and vice-versa. For this purpose, each steel has a double cutting edge, the two cutting edges extending, respectively, along opposite longitudinal edges of the lower face of the steel. The two end holes 122 in the short steel 111 for the securing screws 115 are equispaced from the ends 61, 63, respectively, of that steel; and are also equispaced from the center hole 122 of this steel. The two end holes 122 in the long steel 112 are equispaced from the center hole 122 in this steel and are spaced at the same distance from the center hole 122 in this steel as the end holes 122 in the short steel 111 are from the center hole 122 in the steel 111. The two end holes in the long steel 112 are at different distances from the respective adjacent ends of this steel, but the outer end hole 122 is at the same distance from the adjacent outer end face 65 of the steel as are the end holes 122 in steel 111 from the respective adjacent ends 61 and 63 of steel 111. The inner end hole 122 in the long steel 112 is spaced from the adjacent end 64 of that steel by a distance equal to the thickness of steel 112 plus the spacing of the inner end holes 122 in the short steel 111 from the adjacent end 61 of the short steel 111. This construction of the two steels enables their transposition.

It will be understood, however, that the punching steels, instead of being formed as hexahedrons with two non-parallel sides, might be made with each pair of opposed faces parallel, to cut along the whole of their cutting edges at once. In this case they can have four cutting edges like the die steels.

The die steels used may be like those described in the previously described embodiments of the invention and may be similarly secured to the base. The die steels 123 are positioned and supported on the horizontal plane surfaces 139 and 141 respectively, formed on the base 114 of the unit, and against the plane, vertical, inside face of each of the sidewalls 143 and 144 of the base. Each said support seat provides a plane vertical surface and a right-angularly disposed horizontal, flat supporting surface against which the respective die steel is seated in flush engagement in correct position relative to the corresponding punch steel. The die steels are secured to their respective seats by a plurality of screws 146 that are horizontally directed through the walls 143, 144 of the base and that thread into recesses 148 in the die members. Except for structural modification to accommodate the base 114 for use on a particular type of bed, the base 114 and the die assembly are structurally identical with the base and die assembly illustrated in Figs. 1 through 5.

The base **114** and the head **119** are detachably secured together by screws **120** and dowels **121**, which insure proper alignment.

In operation of this modified form of the invention, the notching implement may be placed between the bed and the ram of a press, and pressure is applied by the ram against the punch plate **113**. The plate **113** and the punch steels are thereby forced down to cause the cutting edges of the punch steels to cut progressively along the lengths in cutting a notch in the work material. As the ram is raised, the springs **136** return the punch assembly to its normal elevation.

The set screws **140** and **140'** are adjusted to retain the punch assembly in the implement without binding. To remove a punching steel for repositioning or to remove the punch assembly from the implement for replacement of the punch steels, these set screws are eased out of engagement with their respective slots. Each punch steel may then be removed from the plate **113** simply by removing the screws **115**.

Since each of the punch steels **111** and **112** is simply a piece of rectangular metal stock that is cut to size and sharpened on its lower face to provide the requisite cutting edges, the punch steels are inexpensive to produce and occupy a minimum of storage space. Consequently, carrying an inventory of the required punch steels for rapid replacement of a dulled or damaged steel is not expensive and will expedite production.

It is obvious that the type of notching unit described in the specification and shown in the drawings may be used to cut all shapes of notches, being varied in detail to suit conditions. Thus, while the foregoing description relates to the details of particular embodiments of the invention, it will be understood that both the notching and die steels may be made according to the invention to any desired shape, and may be positioned at any desired angle relative to one another to cut notches of various desired shapes and sizes and with various included angles between their sides.

While the invention has been described in connection with specific embodiments thereof, then, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. In a notching device adapted to be removably placed as a unit between the bed and ram of a press, said device including a base, a die assembly having convergent simultaneously acting cutting edges rigidly supported on said base, and means removably rigidly secured to a head portion of said base and defining a guideway aligned with said die-cutting edges, the improvement comprising: a punch assembly reciprocably carried in said guideway for cooperation with said die-cutting edges, said punch assembly including a pair of separate elongated punch bits, each having a rectangular cross-section, one of said bits being longer than the other, said bits being disposed with an end of each in convergent relation to the other, each of said punch bits having a dimension at the convergent end in the direction of punch assembly reciprocation which is longer than the corresponding dimension at the opposite end, each of said punch bits having a cutting edge along a marginal edge remote from a surface thereon, said surface slidably engaging said head portion of the base during reciprocation of the punch assembly, a punch plate for being directly engaged by the ram and removably secured to and disposed against a side of said punch bits remote from their cutting edges, said longer and said shorter punch bits also being adapted to be secured to said punch plate when said punch bits have been interchanged to each present an alternate cutting edge and an alternate surface in sliding engagement with said head portion, all of said cutting edges being coplanar; a plurality of compression springs each having one end supported by said head portion of the base in a recess and an opposite end in engagement with said plate coplanarly with said punch bits, said springs being operative to urge said punch assembly in a direction away from the die assembly; and retainer screw means removably and rigidly secured with respect to said head portion of the base and operative on said punch assembly for positively limiting the distance which said punch assembly can be returned in said direction.

2. In a notching device adapted to be removably placed as a unit between the bed and ram of a press, said device including a base, a die assembly having convergent simultaneously acting cutting edges rigidly supported on said base, and means removably rigidly secured to a head portion of said base and defining a guideway aligned with said die-cutting edges, the improvement comprising: a punch assembly reciprocably carried in said guideway for cooperation with said die-cutting edges, said punch assembly including a pair of separate elongated punch bits, each having a rectangular cross-section, one of said bits being longer than the other, said bits being disposed with an end of each in convergent relation to the other, each of said punch bits having a dimension at the convergent end in the direction of punch assembly reciprocation which is longer than the corresponding dimension at the opposite end, each of said punch bits having a cutting edge along a marginal edge remote from a surface thereon, said surface slidably engaging said head portion of the base during reciprocation of the punch assembly, a punch plate for being directly engaged by the ram and removably secured to and disposed against a side of said punch bits remote from their cutting edges, said longer and said shorter punch bits also being adapted to be secured to said punch plate when said punch bits have been interchanged to each present an alternate cutting edge and an alternate surface in sliding engagement with said head portion, all of said cutting edges being coplanar; and a plurality of compression springs each having one end supported by said head portion of the base in a recess and an opposite end in engagement with said plate coplanarly with said punch bits, said springs being operative to urge said punch assembly in a direction away from the die assembly.

3. In a notching device adapted to be removably placed as a unit between the bed and ram of a press, said device including a stationary base, a pair of polyhedral die-members of rectangular cross-section jointly having convergent simultaneously acting cutting edges on at least one marginal edge thereof, and means removably rigidly secured to a head portion of said base and defining a guideway aligned with said die-cutting edges, the improvement comprising: a punch assembly reciprocably carried in said guideway for cooperation with said die-cutting edges, said punch assembly including a pair of separate elongated punch bits, each having a rectangular cross-section, one of said bits being longer than the other, said bits being disposed with an end of each in convergent relation to the other, each of said punch bits having a dimension at the convergent end in the direction of punch assembly reciprocation which is longer than the corresponding dimension at the opposite end, each of said punch bits having a cutting edge along a marginal edge remote from a surface thereon, said surface slidably engaging said head portion of the base during reciprocation of the punch assembly, a punch plate for being directly engaged by the ram and removably secured to and disposed against a side of said punch bits remote from their cutting edges, said longer and said shorter punch bits also being adapted to be secured to said punch plate when said punch bits have been interchanged to each present an alternate cutting edge and an alternate surface in sliding engagement with

said head portion, all of said cutting edges being coplanar; a plurality of compression springs each having one end supported by said head portion of the base in a recess and an opposite end in engagement with said plate coplanarly with said punch bits, said springs being operative to urge said punch assembly in a direction away from said die-members; retainer screw means removably and rigidly secured with respect to said head portion of the base and operative on said punch assembly for positively limiting the distance which said punch assembly can be returned in said direction; a first die-member-supporting surface on said stationary base, said surface being disposed perpendicularly to the direction in which said punch assembly is reciprocable; a pair of wall portions each forming an integral part of said base, and each including a second die-member-supporting surface disposed parallel to said direction in parallel spaced relation to the cutting edge of one of the die-members; adjacent sides of the die-members being in engagement with said first-supporting surface and one of the second supporting surfaces for being supported and located thereby in cutting relation to said punch assembly; means supported by each of said wall portions and acting transversely to said second supporting surfaces and detachably securing said die-members

against said second supporting surfaces; said base having means spaced from said wall portions which jointly with said wall portions defines a workpiece-receiving mouth of lesser extent in the direction of punch reciprocation than is the dimension of the die-members in the same direction; and said base being recessed at an end of each of the die-members to permit removal of each of the die-members respectively in a direction parallel to both of said surfaces engaged thereby upon detachment of said securing means.

References Cited in the file of this patent

UNITED STATES PATENTS

629,532	Thomas	July 25, 1899
856,719	Nagle	June 11, 1907
1,140,897	Frank	May 15, 1915
1,203,342	Howard	Oct. 31, 1916
1,519,983	Robbins	Dec. 16, 1924
1,663,092	Parys	Mar. 20, 1928
2,146,780	Wales	Feb. 14, 1939
2,222,095	Van Dusen	Nov. 19, 1940
2,255,846	Grammer	Sept. 16, 1941