Nov. 28, 1944. G. F. WALES 2,363,630

NOTCHING APPARATUS

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Fig. 1.

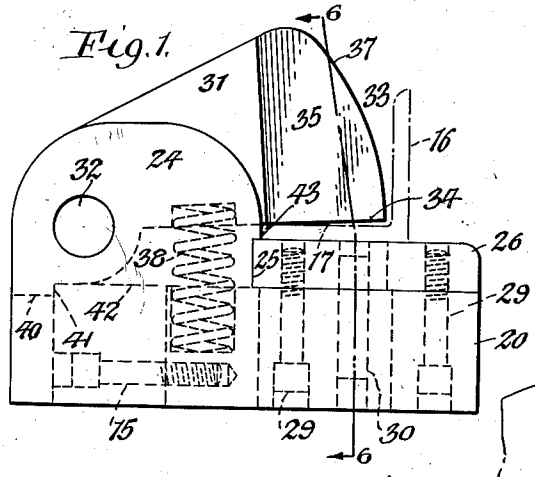

Fig. 2.

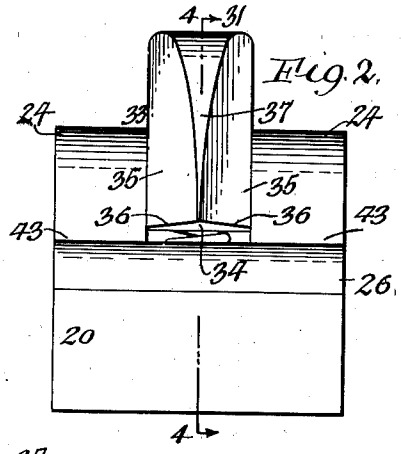

Fig. 3.

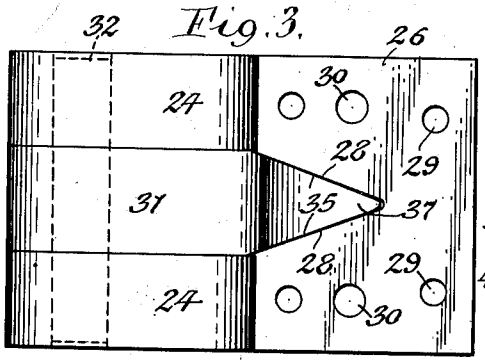

Fig. 4.

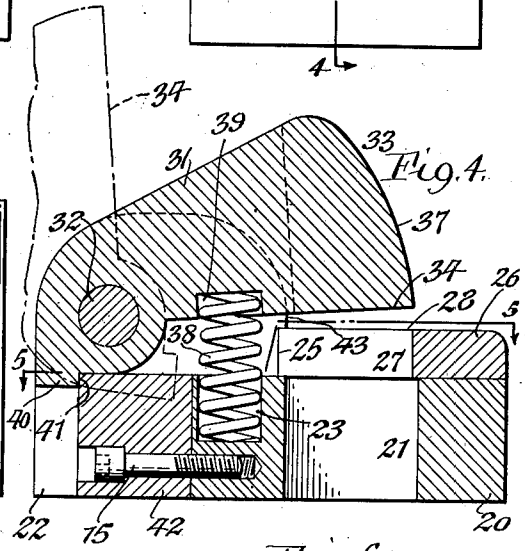

Fig. 5.

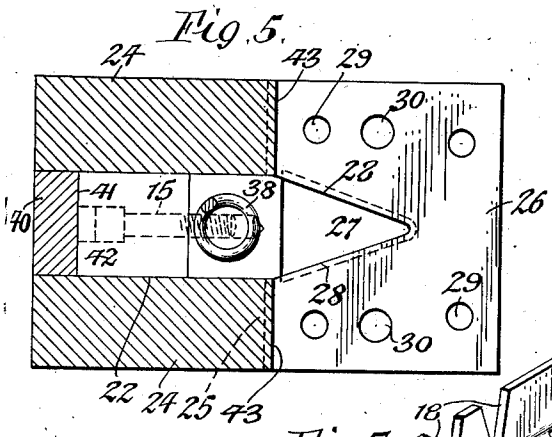

Fig. 6.

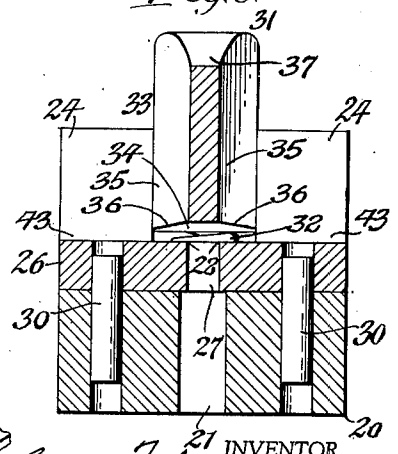

Fig. 7.

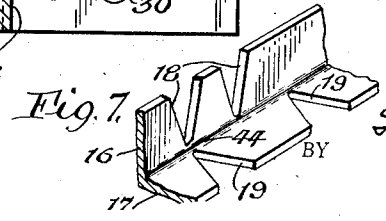

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Fig. 8.

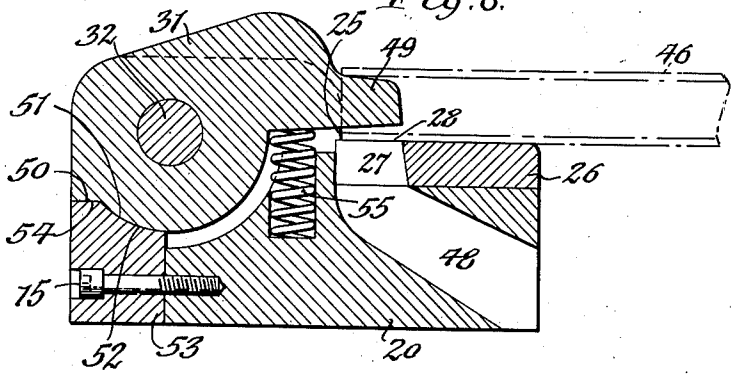


Fig. 9.

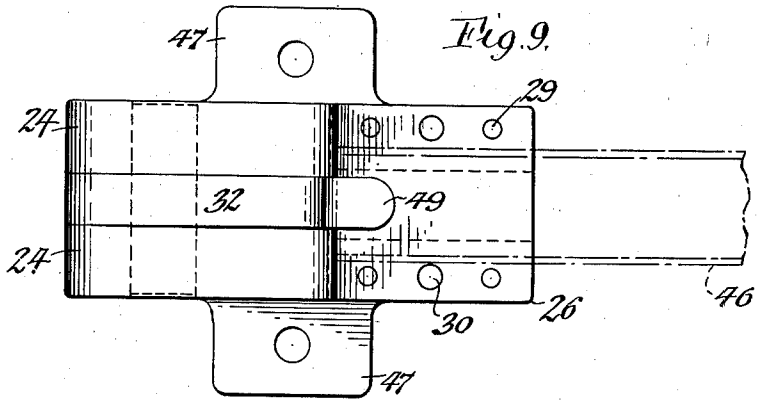


Fig. 10.

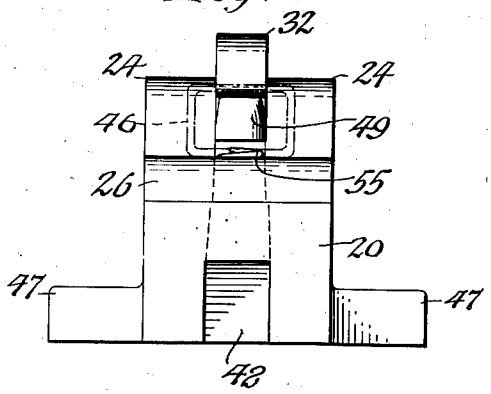
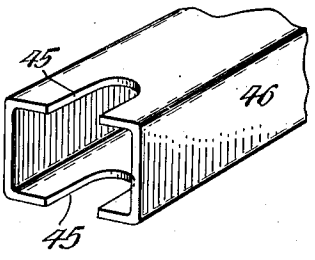


Fig. 11.



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Patented Nov. 28, 1944

2,363,630

UNITED STATES PATENT OFFICE

2,363,630

NOTCHING APPARATUS

George F. Wales, Kenmore, N. Y.

Application March 4, 1942, Serial No. 433,279

13 Claims. (Cl. 164—50)

This invention relates to an apparatus for cutting notches in workpieces and more particularly to apparatus whereby notches may be cut in the flanges of angle irons immediately adjacent to the inner corner between the flanges of such irons and also to apparatus whereby notches may be cut in the end portions of tubes.

One of the objects of this invention is to provide an apparatus for this purpose which is simple and compact in construction, strong and durable in operation and capable of having its cutting members quickly and easily sharpened without requiring extensive disassembling of the parts for this purpose.

Another object of this invention is to so construct the notching apparatus that it can be readily operated in association with the bed and ram of an ordinary press without requiring any mechanical connection therewith and thus may be quickly placed in a press for use and likewise removed therefrom when not required.

A further object of this invention is to provide simple and efficient means whereby the punch arm and the die plate of the apparatus may be conveniently and reliably mounted on the base of the apparatus and permit of easily using different pairs of die plates and punch arms for producing notches of different shapes on the workpieces.

In the accompanying drawings:

Fig. 1 is a side elevation of one form of notching apparatus embodying this invention.

Fig. 2 is a front elevation of the same.

Fig. 3 is a top plan view thereof.

Fig. 4 is a vertical longitudinal section taken on line 4—4, Fig. 2.

Fig. 5 is a horizontal section taken on line 5—5, Fig. 4.

Fig. 6 is a vertical transverse section taken on line 6—6, Fig. 1.

Fig. 7 is a fragmentary perspective view of an angle iron having its flanges notched by the use of the apparatus shown in Figs. 1–6.

Fig. 8 is a vertical longitudinal section of a notching apparatus embodying the present improvements but adapted more particularly for notching the ends of tubular workpieces.

Fig. 9 is a top plan view of the same.

Fig. 10 is a front elevation thereof.

Fig. 11 is a perspective view of a tube having its end notched by the apparatus shown in Figs. 8, 9 and 10.

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

Although the apparatus shown in Figures 1–6 is more particularly designed for producing V-notches 18, 19 in the flanges 16, 17 of an angle iron, as shown in Fig. 7, the same may also be employed for producing various forms of notches in the edges of sheet material or the like by making the cutting edges of the die and punch members of the apparatus of the desired form.

Referring to the construction shown in Figs. 1–6, the numeral 20 represents the base of the notching apparatus which may be made of any suitable metal, but preferably cast iron. This base may also be of any desired contour although the rectangular form shown in the drawings is preferred. In its front part this base is provided with a vertical discharge opening or chute 21 through which the slugs cut from the workpiece, during operation of notching the same, are discharged from the apparatus, this opening in the present case extending from the upper to the under side of the base, as shown in Fig. 4.

In its rear side the base is provided with a rearwardly opening recess 22 and on the central part of its upper side the same is provided with an upwardly opening spring socket 23. On its rear part the base is provided with two bearing lugs 24 which project upwardly along opposite sides of the recess 22 and each of which is provided on its front side with a retaining recess, groove or notch 25, the lower side of which is flush with the top of the base, as best shown in Figs. 1–4.

The numeral 26 represents a die plate of steel or the like which rests on the front part of the base and provided in its rear part with a die notch 27 which extends to the rear edge of this plate and registers with the upper end of the slug chute in the base. The corners between the top of the die plate and the upper end of the die notch 27 form the cutting edges 28 of the die and these edges may be sharpened when they become dull or worn by grinding the upper side of the die plate sufficiently to restore these cutting edges.

The die plate may be detachably secured to the base by various means but preferably by screws 29 passing upwardly through openings in the base and engaging threaded openings in the die plate. For the purpose of maintaining the die plate in an accurate position relative to the punch member with which the die plate cooperates two dowels or alining pins 30 are employed, each of which is arranged in corresponding alining openings formed in the base and die plate.

For the purpose of assisting the screws 29 in holding the die plate on the base this plate engages its rear edge, on opposite sides of its notch

27, with the retaining recesses or grooves 25 of the lugs 24, as shown in Figs. 1 and 4.

The numeral 31 represents a vertically swinging punch arm the rear part of which is arranged between the bearing lugs 24 and pivoted thereto by a horizontal pivot pin 32 passing transversely through the rear parts of said lugs and the punch arm, as shown in Figs. 1, 3 and 4. At its front end the punch arm is provided with a cutter blade or punch 33 which has a flat under side 34 and forwardly converging sides 35 so as to provide cutting edges 36 of V-form at the corners between the flat underside of the cutter blade and the V-shaped vertical sides of the same. The V-shaped cutting edges 36 of the cutter blade are adapted to cooperate with the correspondingly shaped cutting edges 28 of the die plate for producing a correspondingly shaped notch in a workpiece by removing the respective slug therefrom.

When the cutting edges 36 of the punch blade become dull through wear the same can be resharpened by grinding the lower flat side 34 of the punch blade. In order to maintain the proper V-shape of the cutting edges 36 of the punch blade notwithstanding that some of the material is removed from its underside 36 during the sharpening operation the front end or edge 37 of the punch blade is curved concentrically with the axis of the punch arm, as shown in Figs. 1 and 4, thereby maintaining the proper V-formation of the cutting edge 36 on the punch blade regardless of the grinding for sharpening the same.

Depression of the punch arm for effecting a notching operation may be produced in any suitable manner, but preferably by placing the base of the notching apparatus on the bed of a press and engaging the top of the punch arm by the descending ram of the press.

Raising of the punch arm is preferably effected by a lifting spring 38 seated with its lower end in the spring socket 23 of the base while its upper end is seated in a socket or recess 39 on the underside of the punch arm in front of its axis.

Upward movement of the punch arm is limited by a stop 40 projecting downwardly from the punch arm in rear of its axis and adapted to engage a rearwardly facing stop 41 on the rear part of the base. For the purpose of enabling the punch arm to be turned upwardly an abnormal extent to facilitate sharpening of the die plate and the punch arm without requiring undue disassembling of the parts of the notching apparatus for this purpose, means are provided for conveniently detaching the stop 41 from the base. The preferred form of the means for accomplishing this purpose shown in Figs. 1, 4 and 5 comprise a stop block 42 arranged in the recess 22 of the base and having the stop 41 on its rear side while its front side engages with the inner end of the recess 22. This stop block is detachably connected with the base by means of a screw 15 arranged below the path of the stop lug 40 on the punch arm.

When the notching apparatus is not in use the punch arm is elevated by the spring 38 and the punch stop 40 engages with the base stop 40 and arrests the upward movement of the punch arm into a position in which a gap is formed between the die plate and punch blade for the reception of the workpiece which is to be notched. As shown by dotted lines in Fig. 1, this workpiece is represented as an angle iron which has one flange 17 resting horizontally on the die plate and engaging its outer edge with a gage surface 43 formed by the front side of the bearing lugs 24 immediately above the recesses 25 thereon while the other flange 16 is arranged vertically immediately in front of the punch blade. Upon depressing the punch arm by means of a press ram or otherwise the blade of the punch will press downwardly on the respective flange of the angle iron and, by cooperation with the cutting edges of the notch on the die plate, will cause a slug to be cut or sheared out of the workpiece and a V-notch formed in the same.

This form of notching apparatus is particularly desirable for cutting notches in the flanges of angle irons close to the inner corners of the same and thus permit using such notched angle iron advantageously for certain installations. An example of thus advantageously notching an angle iron would be to provide the respective flanges of the same with a pair of notches which are transversely in line, as shown at the left of Fig. 7. An angle iron thus notched would leave a small web 44 on the respective flanges between the inner ends of the corresponding notches which web can be easily bent for bringing adjacent sections of the angle iron into an angular position relative to each other and thus form a frame binding or the like in which the several sections are integrally connected. This is of importance to hold the two mitered edges together for welding.

When it is desired to sharpen the cutting edges of the die plate and punch arm the stop block 42 is detached from the base after removing the screw 15. The punch arm can now be swung from its normally horizontal position, shown by full lines in Fig. 4, to a retracted vertical position, shown by dotted lines in the same figure, thereby fully exposing the upper side of the die plate and the underside of the punch blade and permitting of conveniently grinding these sides or surfaces by means of the usual grinding apparatus employed for this purpose without requiring disassembling of other parts of this notching apparatus.

The form of notching apparatus shown in Figs. 8, 9 and 10 is more particularly designed for cutting U-shaped notches 45 in the ends of tubes 46 which may be either of rectangular form in cross section, as shown in Fig. 11, or of other desired forms but this apparatus may also be used for cutting other shapes of notches in tubes and in other articles.

The construction of this notching apparatus is substantially the same as that shown in Figs. 1–6, the chief differences consisting in providing the base 20 with perforated ears 47 on its laterally opposite sides for the reception of bolts or screws whereby the same may be attached to the bed of a press or other support, also extending the slug discharge chute 48 from the underside of the die plate to the front of the base, and also constructing the punch blade 49 in the form of a narrow nose which is adapted to receive the end of a tube and cut one or more U-shaped notches 48 into the same. The stop 50 on the punch arm is also made in the form of a shoulder which faces downwardly from the punch arm in rear of its axis, and the hub of the punch arm has a concentric lower face 51 which engages with a correspondingly curved face 52 on a stop block 53 which has an upwardly facing stop face 54 which is engaged by the stop 50 of the punch arm to limit the upward movement of the punch arm under the expansion of the spring 55. In other respects the two forms of this invention are alike

and the description of the construction shown in Figs. 1–6 is therefore applicable to the construction shown in Figs. 8, 9 and 10.

I claim as my invention:

1. A notching apparatus comprising a base provided on its rear part with upwardly projecting lugs, a die plate mounted on the front part of said base and provided in its rear edge with a cutting notch, a punch arm arranged between said lugs and pivoted thereto and provided in front of its axis with a cutter blade adapted to cooperate with the cutting notch of said die plate and also provided in rear of its axis with a stop, and a stop block arranged between said lugs and detachably connected with said base and provided with a stop adapted to be engaged by the stop of said punch arm for limiting the separation of said arm and plate, said stop block when removed from said base providing the required clearance for the stop of the punch arm which permits the latter to be raised above the die plate a sufficient extent to permit of sharpening the cutter blade without removing the cutter arm and its blade from said lugs.

2. A notching apparatus comprising a base provided on its rear part with upwardly projecting lugs, a die plate mounted on the front part of said base and provided in its rear edge with a cutting notch, a punch arm arranged between said lugs and pivoted thereto and provided in front of its axis with a cutter blade adapted to cooperate with the cutting notch of said die plate and also provided in rear of its axis with a stop, a stop block arranged between said lugs and detachably connected with said base and provided with a stop adapted to be engaged by the stop of said punch arm for limiting the separation of said arm and plate, and a lifting spring engaging its upper end with the underside of said punch arm in front of its axis and resting at its lower end on said base between said die plate and said stop block.

3. A notching apparatus comprising a base, a die plate mounted on said base and provided on its rear side with a notch having a cutting edge, and a vertically swinging punch arm pivoted at its rear end on the rear part of said base and provided on its front end with a cutter blade having cutting edges on its opposite sides adapted to cooperate with the cutting edges of said notch for producing notches in a workpiece, and also having its front end curved concentrically with the axis of said punch arm.

4. A notching apparatus comprising a base provided with a slug discharge chute and two bearing lugs rising from the rear part of the base on opposite sides of said chute and provided with recesses on their front sides, a die plate mounted on said base and provided on its rear side with a notch having a cutting edge and engaging its rear side with the recesses in said lugs, screws connecting said plate with said base, a vertically swinging punch arm having its rear part arranged between said bearing lugs and pivoted thereto and provided on its front part with a cutter blade, the opposite cutting edges of which are adapted to cooperate with the cutting edge of said notch for producing notches in a workpiece, a spring for yieldingly holding said arm in an elevated position, a stop projecting downwardly from the punch arm in rear of its axis, and a rearwardly facing stop arranged on the rear side of said base and adapted to be engaged by the downwardly projecting stop on said arm.

5. A notching apparatus comprising a base provided on its rear part with a rearwardly opening recess and two upwardly projecting bearing lugs on opposite sides of said recess, a die plate secured to the upper side of the front part of said base and provided with a cutting notch, a vertically swinging punch arm having its rear part arranged between said lugs and pivoted thereto and provided on its front part with a cutting blade adapted to cooperate with said cutting notch, a stop projecting downwardly from the punch arm in rear of its axis, a stop block arranged in said rear recess and having a rearwardly facing stop adapted to be engaged by the stop on the punch arm, and a screw detachably connecting said stop block with said base.

6. A notching apparatus comprising a base, a die plate mounted on the front part of said base and provided on its rear edge with a notch having cutting edges, and a punch arm pivoted at its rear end on the base and provided on the underside of its front part with cutting edges adapted to engage with the cutting edges of said notch and the front end of said arm being curved concentrically with the axis of the same.

7. In a notching apparatus having a base, a die member supported by said base and having a pattern cutting edge extending from the rear edge forward into said die member, a reciprocating punch member having a cutting edge of corresponding pattern fulcrumed on said base, a stop to limit the movement of the punch member away from said die member, said stop being removable to enable said punch cutting edge to be swung to a position for increasing the spacing between said punch and the cutting edge of said die.

8. A notching unit comprising a base, a die mounted on the base, a punch mounted directly on the base and movable toward and from the die, and means whereby the stroke of the punch is controlled so as to render the same relatively short during normal operation of the punch and to increase the extent of movement of the punch away from the die to facilitate sharpening of the punch without dismounting the same from the base.

9. In a notching apparatus having a base, a die member supported by said base, a cooperating punch member fulcrumed on said base, a resilient device for retaining said punch member yieldingly in elevated inoperative position above said die member, means to enable said punch to be further spaced from said die cutting edge to provide increased space for grinding the top face of said die member and the cooperating face of said punch member without detaching the punch from the base.

10. In a notching apparatus having a base, a die member supported by said base, a punch member fulcrumed on said base, means for guiding said punch member so as to engage and disengage its cutting edge with the cutting edge of said die member including upwardly projecting lugs on said base spaced apart to accommodate said punch member and a fulcrum pin extending through said punch member and lugs, said lugs extending forwardly and engaging said die member.

11. In a notching apparatus having a base, a die member supported by said base, and a cooperating punch member fulcrumed directly on said base, means for opening the gap between said punch and die members to permit grinding of either member without removal of the same from said base.

12. In a notching apparatus having a base, a die member supported by said base, a cooperating punch member fulcrumed directly on said base, and control means for controlling the extent of the gap between said punch and die members to permit grinding of either member without removal of the same from said base including the release of said gap control means.

13. In a notching apparatus having a base, a die member supported by said base, a cooperating punch member fulcrumed directly on said base, and control means for controlling the extent of the gap between said punch and die members to permit grinding of either member without removal of the same from said base including the removal of said gap control means which is normally in the space under said fulcrum.

GEORGE F. WALES.