

March 8, 1932.

W. GRAY

1,848,947

TOOL AND DIE

Filed April 5, 1929

2 Sheets-Sheet 1

Fig. 1

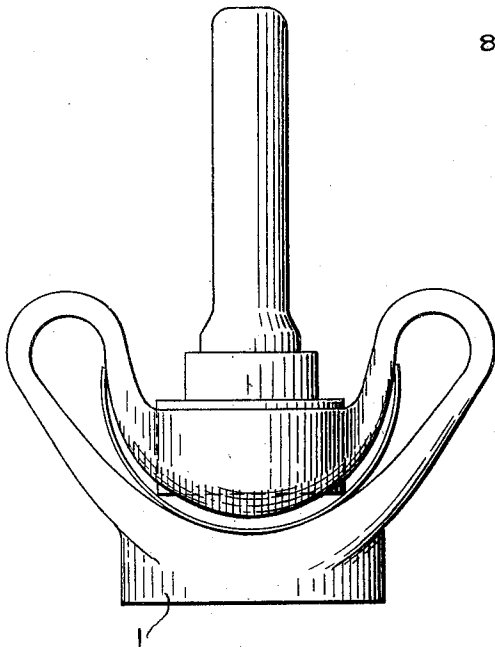


Fig. 2

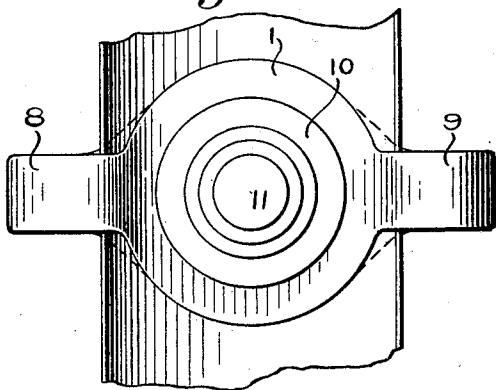


Fig. 3

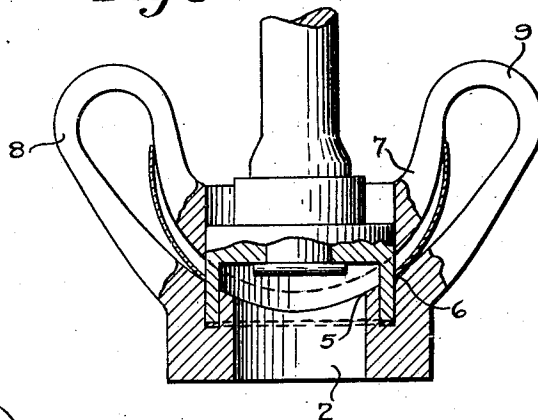


Fig. 4

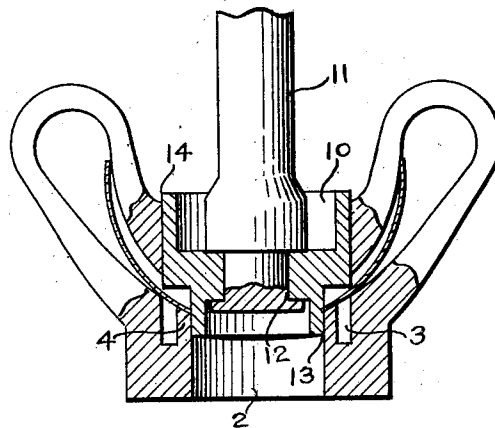
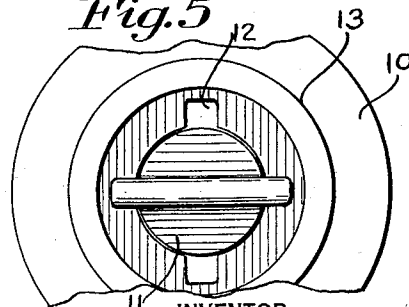


Fig. 5



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Fig. 7

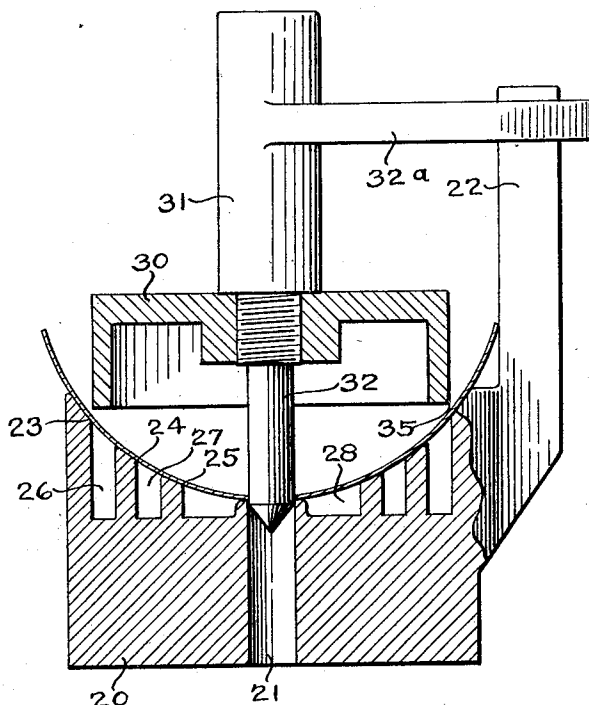


Fig. 6

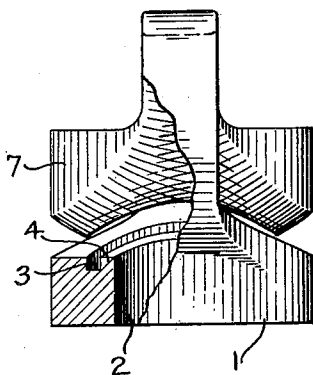


Fig. 8

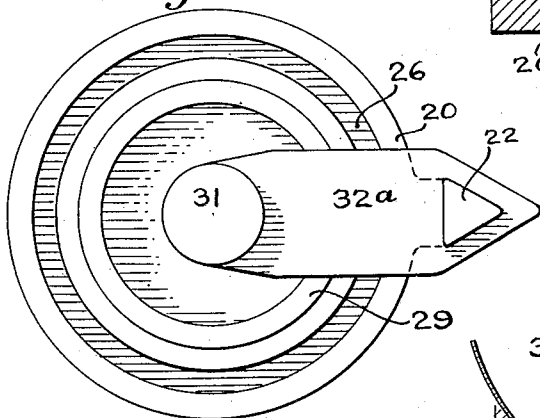
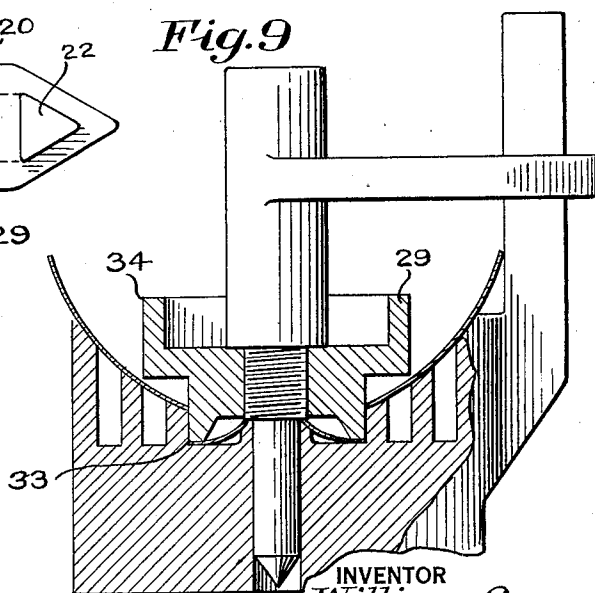


Fig.9



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TOOL AND DIE

Application filed April 5, 1929. Serial No. 352,782.

This invention relates to improvements in tools and dies, and especially to that class of tools and dies in which the die is mounted on a support and the tool on a plunger which moves it to and from the die in successive operations.

The object of the invention is to improve and simplify the construction of tools and dies employed in operating on sheet metal, and especially on curvilinear or bent sheet metal.

Another object of the invention is to provide tools and dies of this kind which are adapted to do several kinds of work.

To these and other ends the invention comprises the construction and arrangement of parts that will appear from the following description when read in conjunction with the accompanying drawings, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Figure 1 is a front elevation of a tool and die illustrating one embodiment of the invention;

Figure 2 is a plan view of the same;

Figure 3 is an elevation, parts being sectioned away to expose underlying parts;

Figure 4 is a similar view, other parts being exposed;

Figure 5 is an inverted plan view of the tool and its carrier;

Figure 6 is a side elevation of the die, parts being sectioned and broken away for clearness;

Figure 7 is a sectional view showing a slightly modified form of the invention;

Figure 8 is a plan view of the same but showing a modified form of tool, and

Figure 9 is a front elevation of the same, a part being sectioned away for clearness.

Referring particularly to Figures 1 to 6 of the drawings, in which there is illustrated a form of the invention particularly adapted for operating on curved sheet material such as gutters or eaves troughs, there is provided a die comprising a body 1 substantially cylindrical in form, and has its center bored to form an opening 2 therethrough. The upper cutting surface of the die is concave or

formed on a curvilinear plane to conform to the curvature of the work piece, and has a groove 3 formed therein concentric with the central opening 2, leaving a cylindrical portion 4 between the opening and the groove, and providing two circular cutting or shearing edges on the die, one at 5 at the upper end of the inner wall of the opening 2, and another at 6 at the upper end of the outer wall of the groove 3. It will be noted that these cutting edges are curved, conforming to the curvature of the upper surface of the die, so that the side portions lie in a higher plane than the middle portion, as seen in Figures 1, 3 and 4 of the drawings.

Arranged above the body and supported adjacent thereto but out of contact therewith is a tool guiding and centering member 7, having a circular central opening concentric with and of substantially the same diameter as the groove 3. The lower or bottom face of the member 7 is curved downwardly or convexed to conform to the curvature of the upper face of the cutting member and is supported thereon by means of lateral recurved arms 8 and 9 formed integral therewith. It will be noted that a die is thus formed of a single piece of material which provides a guideway for the work piece between the cutting portion and the tool guide.

A complementary member or tool 10 is carried on a reciprocating member 11 of a common or well known form of die press or a hand punch to be driven with a mallet, and operates in the tool guide, which also serves to eject the work from the tool to which it sometimes clings after the cutting operation.

The tool is detachably secured to the reciprocating member or plunger 11 by means of a bayonet joint 12. It is substantially cylindrical in form and provided with two cutting edges 13 and 14 corresponding to the cooperating cutting edges 5 and 6 of the body, the cutting edge 14 being of larger diameter and adapted to cooperate with the cutting edge 6, and the cutting edge 13 being of smaller diameter and adapted to cooperate with the cutting edge 5 of the die. These cutting edges are arranged on oppo-

site faces of the tool, which may be detached from the plunger and inverted when it is desired to cut a larger or smaller opening in the work piece. The cutting edges of the tool lie in substantially plane surfaces, so that the work piece is first engaged at the lateral elevated portions of the die, gradually shearing it out as it approaches the lower central portion. This arrangement requires less power for the work and results in a clean even cut in the work. The tool is slightly smaller in diameter than the die, such as $\frac{1}{32}$ of an inch, so that it may move into and out of the die freely without sticking or binding.

The die 20, illustrated in Figures 7 to 9 of the drawings, comprises a body of cylindrical form and has a central circular opening 21 in which the tool or complementary member is guided and centered in its movements to and from the die. Cooperating guiding means for the tool are provided on the die. Said means comprises an arm 22 angular in cross-section and extending vertically upward at one side of the die.

The upper or cutting face of the die is curved or concaved to correspond to the form of the work piece to be operated on, and is provided with three cutting edges 23, 24 and 25, in the present instance of circular form, and formed by cutting concentric grooves 26 and 27 and counter-boring the center of the die at 28. It will be noted that by this construction a die is provided adapted to cooperate with three cutting tools of different diameters to cut openings of different sizes.

Two tools 29 and 30 are provided for cooperation with this die. These tools are mounted on a plunger 31 of usual or preferred construction by means of screw threads or other preferred means. The plunger 31 has a cylindrical extension 32 of smaller diameter than the threaded portion which engages the opening 21 in the die, and serves to center and guide the tool in its movements to and from the die. Cooperating therewith to center and guide the tool is an arm 32^a extending laterally from the plunger and having an angular opening corresponding to the form of the arm 22 which it slidably engages.

The tool 29 has a circular cutting edge 33 on one of its faces of comparatively small diameter and adapted to cooperate with the smallest cutting edge 25 of the die. The opposite face of the tool is also provided with a cutting edge 34 formed by counter-boring the tool to form an opening of the same diameter as the slot 27 with which the tool cooperates. It will be understood that when it is desired to cut a smaller or larger opening, the tool is detached from the plunger, inverted, and again secured thereto.

The tool 30 is shown as provided with a

single circular cutting edge 35 and is otherwise of similar construction and interchangeable with the tool 29. This tool is also substantially cylindrical in form, and the cutting edge is formed thereon by counter-boring to form an opening therein of substantially the same diameter as the slot 26 with which it cooperates.

It will be noted that a tool and die have been provided which are simple in construction, easy to operate, and adapted to operate on curved sheet metal such as eaves troughs or gutters, and cut more accurate geometric openings therein than is possible when the openings are cut before the metal is bent.

It will be understood that this invention is not to be limited to the exact form shown and described herein, and this application is intended to cover any modifications or departures coming within the intent of the improvement or the scope of the following claims.

I claim:

1. A die comprising a body having a plurality of concentric cutting edges and a guide member integral therewith and adapted to guide a complementary member into cooperation therewith, said cutting edges and guide member being spaced from each other and provided with curved surfaces to receive a curved work piece between them.

2. A die comprising a body having a plurality of concentric cutting edges, a guide member integral therewith and adapted to guide a complementary member into cooperation with its cutting edges, said guide serving to strip stock from engagement with the complementary die member.

In witness whereof, I have hereunto signed my name.

WILLIAM GRAY.