No. 658,082. Patented Sept. 18, 1900.

N. B. EVANS.

APPARATUS FOR PERFORATING DESIGNS IN SHEET METAL.

(Application filed Jan. 4, 1900.)

(No Model.) 3 Sheets—Sheet 1.

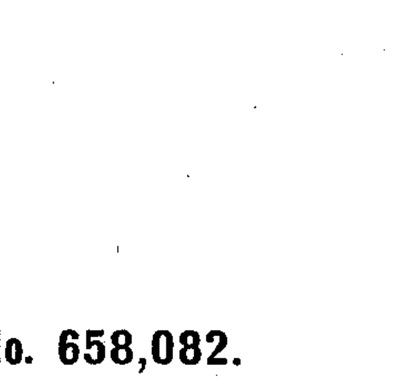

FIG. 3.

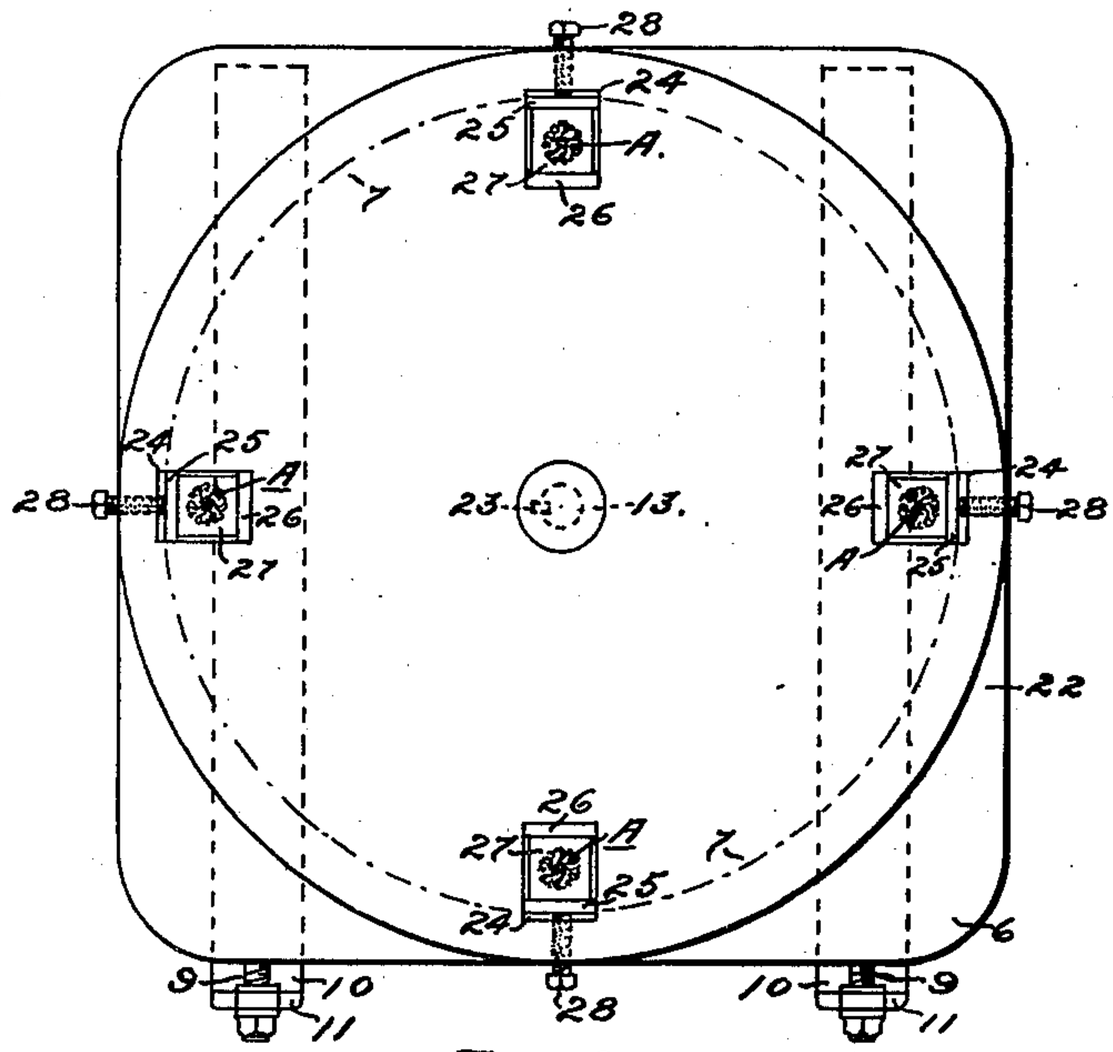

FIG. 2.

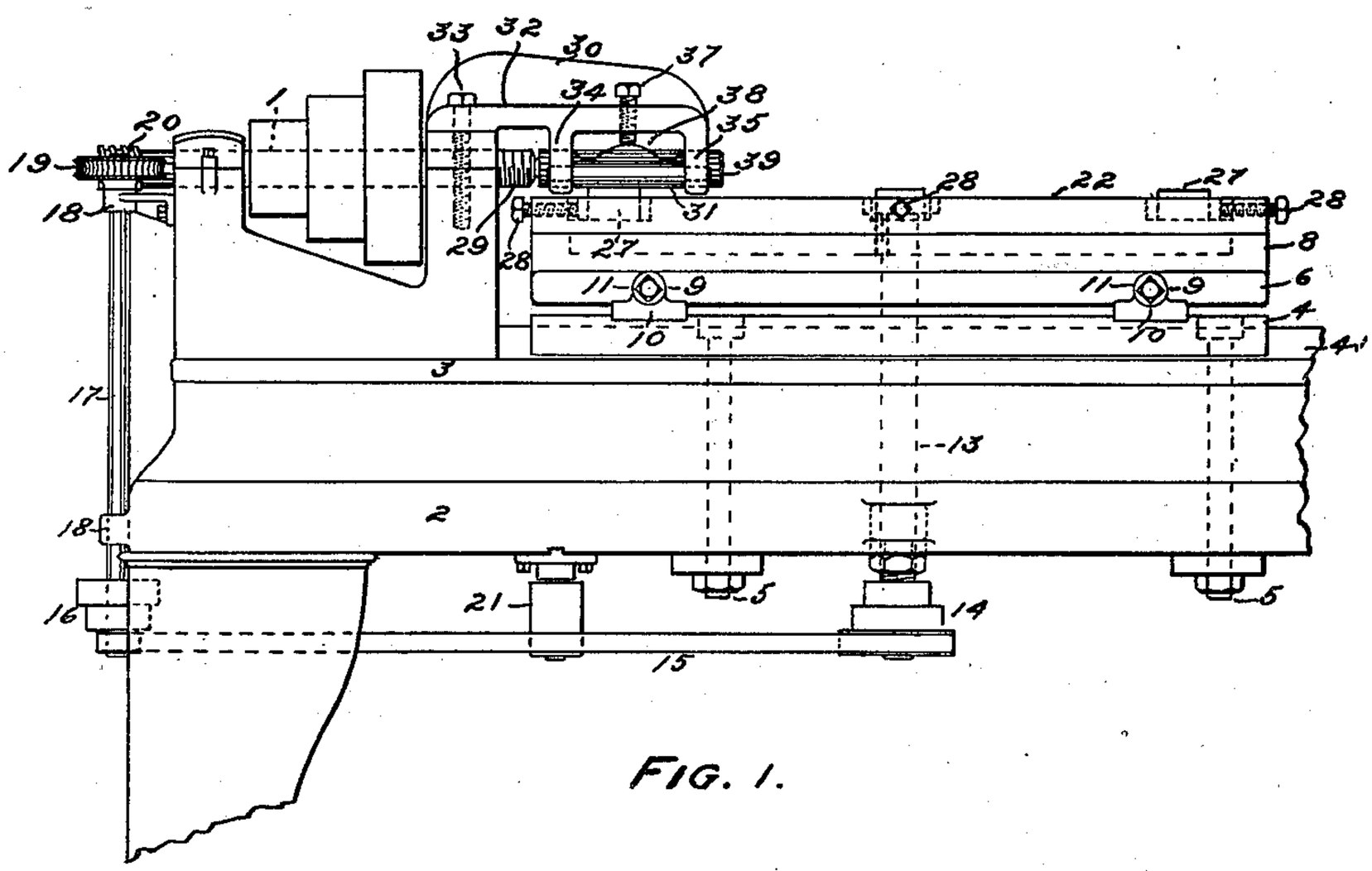

FIG. 1.

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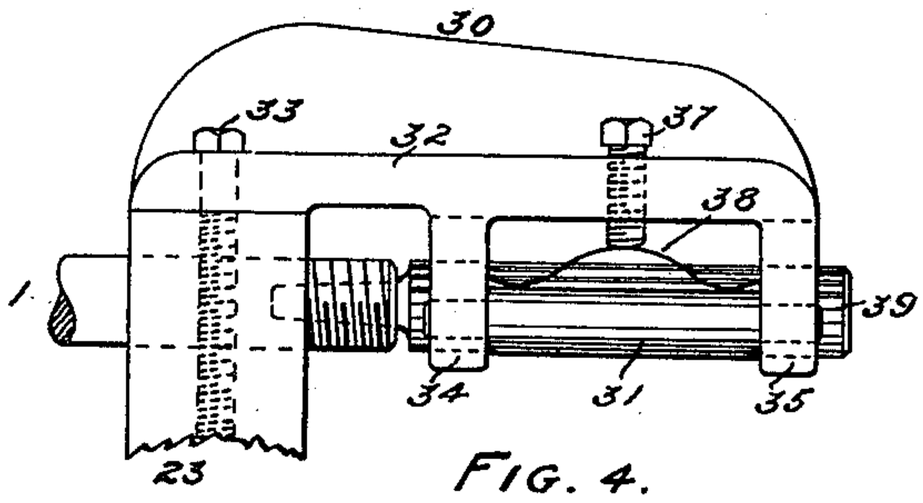

FIG. 4.

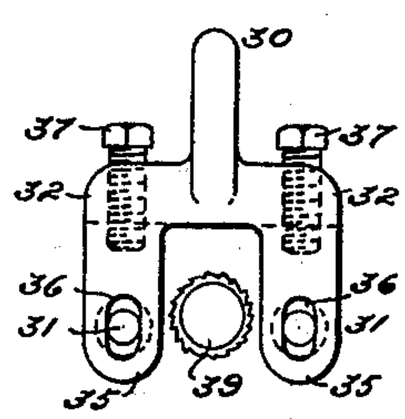

FIG. 8.

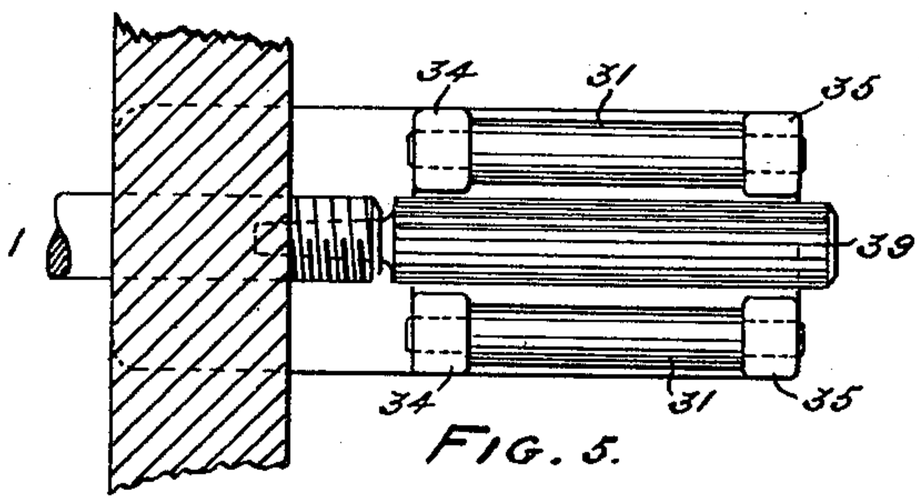

FIG. 5.

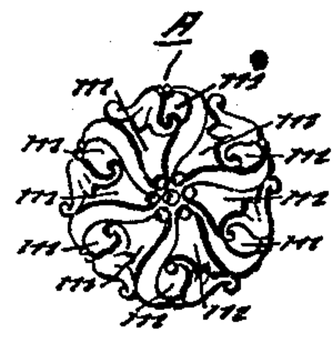

FIG. 9.

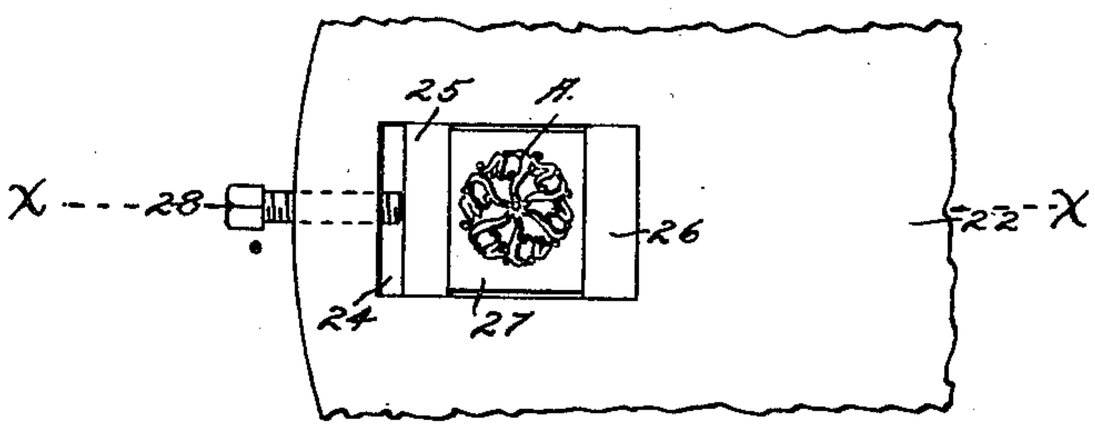

FIG. 6.

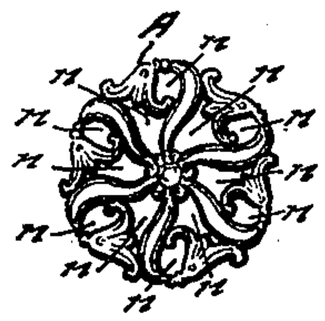

FIG. 10.

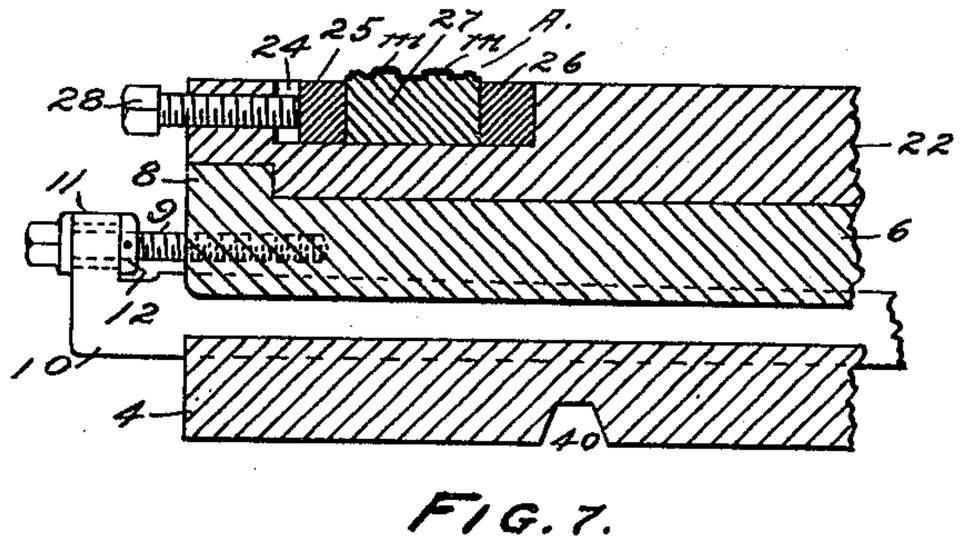

FIG. 7.

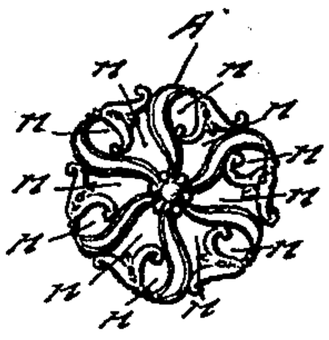

FIG. 11.

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(Application filed Jan. 4, 1900.)

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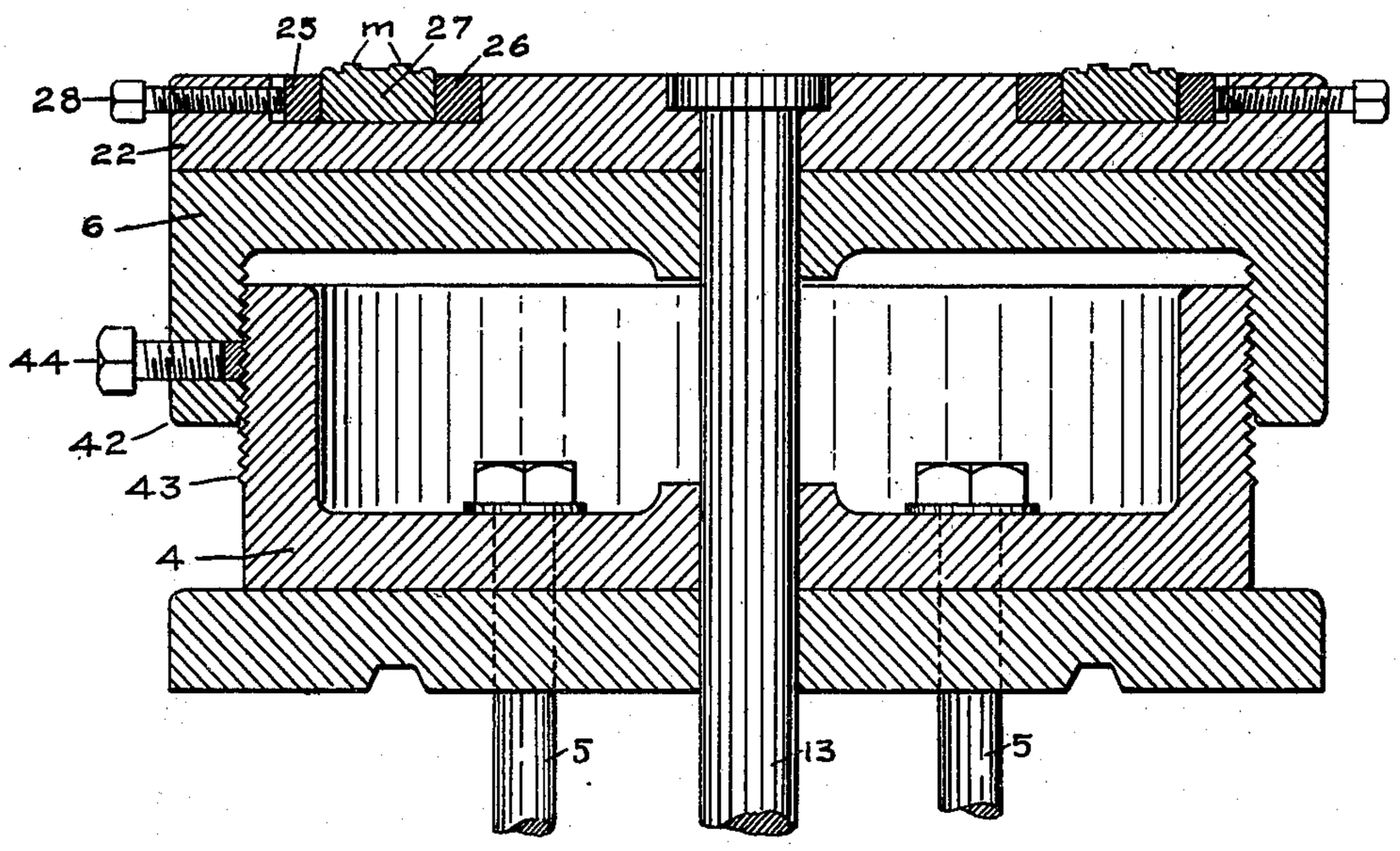

FIG. 12

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PERFORATING DESIGNS IN SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 658,082, dated September 18, 1900.

Application filed January 4, 1900. Serial No. 319. (No model.)

To all whom it may concern:

Be it known that I, NATHAN B. EVANS, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Apparatus for Perforating Designs in Sheet Metal, of which the following is a specification, reference being had therein to the accompanying drawings.

Like characters indicate like parts.

Figure 1 is a front elevation of my invention and of a speed-lathe to which it is attached. Fig. 2 is a top plan of the rotating table or dial upon the bed of said lathe and shows the die-holders adjustably positioned therein. Fig. 3 is a top plan view of details of the gearing. Fig. 4 is a front elevation of the milling and depression rolls of my invention and the means to support the same. Fig. 5 is a bottom plan view of said parts of my invention. Fig. 6 is a top plan view of a portion of the rotatable table or dial and the die-holder and adjusting-screw, together with the struck-up plate upon the die. Fig. 7 is a view, partly in side elevation and partly in section, on line *x x* of Fig. 6, showing in section the die, the struck-up plate thereon, the die-holder, and several parts of the dial, and showing in elevation one of the wedges for adjusting the height of the dial and also the adjusting-screws and means therefor. Fig. 8 is an end elevation of the milling-roll, depression-rolls, and means for mounting and connecting the same. Fig. 9 is a bottom plan view of the struck-up plate before the milling operation thereon. Fig. 10 is a bottom plan view of said plate after the milling operation. Fig. 11 is a front elevation of a finished brooch which is the product of my invention. Fig. 12 is a vertical diametrical section of the dial-bed, base, and connected parts, the two former being provided with screw-threaded adjusting means.

My invention relates to devices for perforating brooches, articles of jewelry, and other struck-up work; and it consists in the novel construction and combination of the several elements hereinafter particularly described and as specifically set forth in the claims.

It has heretofore been usual in the manufacture of brooches and other articles made from sheet-metal stock, which have an ornamental design or contour with various openings or apertures within the external lines or edges thereof, to strike up or form by means of a suitable die and plunger a piece of sheet metal, interposed between them in a drop-press or other suitable machine the desired pattern, shape, or configuration, and then to cut out such embossed or impressed portion of the sheet metal along and around the exterior lines of the pattern or design by means of suitable tools, and then in one or more separate operations by other dies and plungers to pierce, perforate, punch out, or remove such parts of the sheet metal as the pattern or design require to be open. These piercing and perforating operations are expensive and require a considerable degree of skill, especially in cases where the design is fine or intricate, and where the pattern is especially delicate it is practically impossible to make the dies strong enough to endure the work, and the metal is also liable to be torn, for which reason it is necessary to subject the stock to repeated operations, removing the superfluous metal a little at a time, thus greatly increasing the expense of the work and requiring much more time, and even with such fine small dies and skilful labor only the coarser lines and portions of a design can be produced by die action, and the most delicate designs in arabesque or filigree ornamentations cannot be produced by dies at all.

It is the purpose of my invention to enable the formation of such patterns and designs in jewelry or other ornamental wares by means of striking up the same in sheet-metal stock by dies and removing in a single operation all the superfluous or interstitial metal, thus making possible the production of involved, difficult, and delicate designs from sheet metal by die action.

In the drawings I show a common speed-lathe having the usual shaft 1, rotatable by power, the frame 2, and the bed 3.

On the lathe-bed 3 is a base 4, secured in position by the bolts 5 and made with parallel grooves on its upper surface, as shown in Fig. 1 in solid lines and in Fig. 7 in dotted

lines. Above this base 4 and slightly separated therefrom a small distance, as seen in said Figs. 1 and 7, is a dial-bed 6, having on its under surface parallel grooves corresponding in position, direction, and dimensions with the grooves in the upper surface of the base 4, as indicated in Figs. 1 and 7. The dial-bed 6 has a central circular depression, the edge of which is represented by the dotted circle 7 in Fig. 2, thus leaving an external vertical flange 8, as seen in Figs. 1 and 7. The dial-bed is tapped on one side, just above the grooves therein, for the reception of adjusting-screws 9. Two wedges 10, having straight bottom edges and inclined or tapering top edges and parallel sides, (see Figs. 1, 2, and 7,) are provided, respectively, at the end with an earpiece 11, through which passes the adjusting-screw 9. The screw 9 has a square head by which it can be turned with a wrench, and it also has a fixed collar 12. By means of these screws 9, which move the wedges 10 in or out along said grooves, the dial-bed 6 can be elevated or lowered to any desired extent, the inclined top surface of the wedges 10 enabling such adjustment.

The base 4 and dial-bed 6 are each centrally perforated for the passage loosely therethrough of a vertical shaft 13, properly supported. The shaft 13 has the cone-pulleys 14, by which the speed of its rotation can be changed. This shaft is rotated by means of the belt 15, which passes around the pulley 14 of said shaft and also around the pulley 16 of a vertical shaft 17. The shaft 17 is supported in the lugs or brackets 18 and carries at its top a worm-gear 19, which meshes with the worm 20 of the main shaft 1 of the lathe. The belt 15 is tightened by the belt-tightener 21 in the well-known manner.

The dial 22 is a circular bed or table mounted on the upper end of the shaft 13 and rotatable therewith, being connected to it by a spline 23, as shown, or in any suitable manner. The dial 22 has an annular lip, as shown in Figs. 1 and 7, and fits rotatably in the circular depression in the surface of the dial-bed 6. The drawings show rectangular sockets 24 in the upper portion of the dial-plate 22, preferably four in number, whose central longitudinal lines are ninety degrees apart, (but any other number of sockets may be made, if desired, which, however, should be equidistant from each other,) and in these sockets 24 are placed the die-holders 25 26, which are blocks as long as the sockets are wide. Between the die-holders 25 26 is a die 27, whose upper surface has the pattern or design formed thereon, as usual. Adjusting-screws 28, mounted through the edges of the dial, have contact at their inner ends with the die-holders 25 and serve to place the dies accurately in position.

On the standard 29 of the lathe is mounted the support 30, which holds the depression-rolls 31. The support 30 has a base 32, through which bolts 33 pass into the standard 29 to secure said support in place. The base 32 has four lugs or downward projections 34 35. Said lugs 34 35 have elongated slots 36, and in these elongated slots of the lugs 34 35 are mounted the journals of the depression-rolls 31, as shown in Figs. 1, 4, 5, and 8. Through the base 32 of the support 30 are mounted two adjusting-screws 37, the end of each of which has a bearing on a bow-spring 38, whose ends rest on the top of the depression-roll 31, which is beneath it in recesses within said lugs. The milling-roll 39 has on its inner end a taper shank, by which it is connected with the end of the shaft 1 of the lathe in a socket therein, as shown in Figs. 1, 4, and 5.

The groove or channel 40 in the bottom of the base 4 (shown in Fig. 7) serves to hold said base in position by means of the ribs 41 of the bed or frame of the lathe.

Having thus described the parts of my improved mechanism, I will now proceed to explain its operation.

A piece of sheet metal has been struck up by a die and plunger in a drop-press in the usual manner and the design has been cut out of said plate along the contour of said design by means of a cutter, as heretofore. The piece thus cut out, we will suppose, is the brooch **A**. (Shown in Fig. 9.) It will be understood that said figure represents the back of said brooch and that it is one continuous piece of metal, embossed by said die action, but that the interstitial plane portions *m*, which it is the purpose of my invention to take out, have not yet been removed. The four dies 27 are placed in the sockets 24 of the dial 22 and are accurately adjusted in position therein by means of the screws 28. These dies 27 are all exactly alike and are like the die which gave the impression to the sheet-metal stock to form the pattern of the brooch thereon. The brooches A are placed face downward upon the dies 27, respectively. The wedges 10 are moved by the adjusting-screws 9 until the top surfaces of the several brooches A are in a plane in which to be accurately operated upon by the milling-roll 39. The dial 22 is then set in motion, being rotated by the shaft 13 thereof deriving motion from the shaft 1 of the lathe, communicated by the worm 20, worm-gear 19, shaft 17, pulleys 16 14, and belt 15, the latter being drawn tight by the belt-tightener 21. As each brooch A in turn comes to the depression-rolls 31 it is pressed thereby down into exact snug contact with the top surface of the die 27 beneath it, the action of the bow-springs 38 (which have been adjusted by the screws 37) insuring such contact, and the depressions *m* of the brooch A being then exactly filled by the corresponding raised portions of the die 27, as illustrated in Fig. 7. As the brooch A has its face downward, as stated, it is obvious that the depressions *m* of the face become upwardly-directed protuberances or projections, as seen

in Fig. 7. The milling-roll 39, which by the adjustments of the wedges 10 is in the proper operative position, rotates very rapidly by reason of its connection with the shaft 1 of the lathe and cuts off the upwardly-protruding portions *m* of the back of the brooch, thus making the holes or perforations *n* in the brooch A, as seen in Figs. 10 and 11. It is evident that instead of a milling-roll any suitable grinding or reducing mechanism of any description can be used for the same purpose. As the dial rotates the attendant, while the milling operation is in progress upon one of the articles, has free access to the others, removing those which have been operated upon and placing in position those which are to be operated upon, and all without stopping the machine. It is obvious, however, that equally-good results may be obtained if the die and its struck-up piece were held in a fixed position and a quickly-rotating milling-roll were moved over them, it being merely necessary that one part should be movable and the other part stationary.

Instead of using wedges to secure the parallelism of the base and dial-bed the dial-bed 6 may have a downwardly-extending annular flange 42, provided with an interior screw-thread, and the base 4 may have an upwardly-extending annular flange 43, provided with an exterior screw-thread engageable with screw-threads of the flange 42 of the dial-bed, and so the dial-bed can be raised or lowered, as required, and held in its adjustable position by means of a set-screw 44, which passes through the flange 42 and bears against the flange 43, as shown in Fig. 12.

I claim as a novel and useful invention and desire to secure by Letters Patent—

1. The combination of two systems of mechanism, one movable and the other stationary, one system consisting of a rotatable milling-roll, two spring-depressed, rotatable friction-rolls and proper supports for said rolls, and the other system consisting of a bed, a die-holder thereon, a die held by said die-holder and adapted to support an embossed plate of sheet metal corresponding with and fitting on said die and in such a plane as to expose the protuberances of said plate to the operation of the milling-roll, while said plate is in contact with said friction-rolls, substantially as shown and for the purpose specified.

2. The combination of a movable bed, a die held thereon and adapted to support an embossed struck-up plate of sheet metal corresponding with and fitting upon the surface of said die, a rotatable milling-roll properly supported and having its lower operative surface in a plane coincident with the plane of the surface of the protuberant portions of said die and spring-pressed friction-rolls adapted to contact with said plate and rotatable by said contact while said bed is moving and means of supporting said friction-rolls in position, substantially as described.

3. The combination of a movable bed, a die movably supported on said bed and adapted to support an embossed, struck-up plate of sheet metal corresponding with and fitting upon the surface of said die, means for adjusting and holding said die in position, a rotatable milling-roll properly supported and having its lower operative surface in a plane coincident with the plane of the surface of the protuberant portions of said die and spring-pressed friction-rolls adapted to contact with said plate and rotatable by said contact while said bed is moving and means of supporting said friction-rolls in position, substantially as specified.

4. The combination of a movable bed having a die-socket, a die in said socket adapted to support an embossed, struck-up plate of sheet metal corresponding with and fitting upon the surface of said die, a die-holder in said socket adapted to hold said die, means for adjusting and holding said die and die-holder in said socket, a rotatable milling-roll properly supported and having its lower operative surface in a plane coincident with the plane of the surface of the protuberant portions of said plate and spring-pressed friction-rolls adapted to contact with said plate and rotatable by said contact while the bed is moving and means of supporting said friction-rolls in position, substantially as set forth.

5. The combination of a rotatable dial-plate properly supported, means to rotate the same, dies held on said dial-plate, each of which is adapted to support an embossed struck-up plate of sheet metal corresponding with and fitting upon the surface of said dies, respectively, a rotatable milling-roll properly mounted in a fixed support and having its lower operative surface in a plane coincident with the plane of the surface of the protuberant portions of said embossed plates and spring-pressed friction-rolls adapted to contact with said embossed plates and rotatable by said contact when said dial-plate is rotating and means of supporting said friction-rolls in position, substantially as described.

6 The combination of a rotatable dial-plate properly supported and provided with die-sockets, a die in each socket and adapted to support an embossed, struck-up plate of sheet metal upon each die and corresponding with and fitting upon the surface thereof, a die-holder for each die and adapted to hold the same, means for adjusting and holding said die and die-holder in the corresponding socket, a rotatable milling-roll properly mounted in a fixed support and having its lower operative surface in a plane coincident with the plane of the surface of the protuberant portions of said embossed plates and spring-pressed friction-rolls adapted to contact with said embossed plates and rotatable by said contact when said dial-plate is rotating and means of supporting said friction-rolls, substantially as specified.

7. The combination of a base-plate having parallel grooves on its upper surface, a dial-

bed having parallel grooves on its under surface, wedges adjustably movable in said grooves between said plate and bed and a dial-plate rotatable on and supported by said dial-bed, means to rotate said dial-plate, dies held on said dial-plate, each of which is adapted to support an embossed struck-up plate of sheet metal corresponding with and fitting upon the surface of said dies, respectively, a rotatable milling-roll properly mounted on a fixed support and having its lower operative surface in a plane coincident with the plane of the surface of the protuberant portions of said embossed plates and spring-pressed friction-rolls adapted to contact with said embossed plates and rotatable by said contact when said dial-plate is rotating and means of supporting said friction-rolls in position, substantially as shown.

8. The combination of a base-plate having parallel grooves on its upper surface, a dial-bed having parallel grooves on its under surface, wedges adjustably movable in said grooves between said plate and bed, a dial-plate rotatable on and supported by said dial-bed, and provided with die-sockets, means to rotate said dial-plate, a die in each socket and adapted to support an embossed, struck-up plate of sheet metal upon each die and corresponding with and fitting upon the surface thereof, a die-holder for each die and adapted to hold the same, means for adjusting and holding said die and die-holder in the corresponding socket, a rotatable milling-roll properly mounted upon a fixed support and having its lower operative surface in a plane coincident with the plane of the surface of the protuberant portions of said embossed plates and spring-pressed friction-rolls adapted to contact with said embossed plates and rotatable by said contact when said dial-plate is rotating and means of supporting said friction-rolls in position, substantially as described.

9. The combination of a base-plate and a dial-bed with means of vertically adjusting the latter upon the former, a dial-plate rotatable on and supported by said dial-bed, means to rotate said dial-plate, dies held on said dial-plate, each of which is adapted to support an embossed struck-up plate of sheet metal corresponding with and fitting upon the surface of said dies, respectively, a rotatable milling-roll properly mounted on a fixed support and having its lower operative surface in a plane coincident with the plane of the surface of the protuberant portions of said embossed plates and spring-pressed friction-rolls adapted to contact with said embossed plates and rotatable by said contact while said dial-plate is rotating and means of supporting said friction-rolls in position, substantially as specified.

10. The improved apparatus for perforating embossed metal plates herein described, consisting of the combination of a lathe having a bed, standard and a shaft rotatable by power, a worm on the end of said shaft, a vertical shaft supported on one end of the lathe and having at its top a worm-gear engaged with said worm, a pulley on the bottom of said vertical shaft, a second vertical shaft mounted upon proper supports and having a pulley at the bottom, a belt from the pulley first named to the pulley last named, a belt-tightener in contact with said belt between said pulleys, a base upon the lathe-bed, a dial-bed above and parallel with said base, wedges adjustably mounted and movable between the dial-bed and base in grooves thereof, a dial-plate rotatable with the second-named vertical shaft and fitting in a circular recess in the top of the dial-bed and provided with die-sockets, a die in each socket, adapted to support an embossed plate of sheet metal upon the surface of such die and corresponding with and fitting upon the surface of the same, a die-holder in each socket, an adjusting-screw extending through the edge of the dial-plate into each socket and adapted to hold the die and die-holder therein, a bracket upon the standard of the lathe and having a base, four lugs extending down from said base, each lug having an elongated slot therein, two depression-rollers mounted in said slots, two adjusting-screws through said base, two bow-springs attached to the ends of said screws and placed with their ends in contact with the depression-rolls, respectively, and adapted to press said rolls into contact with said embossed plates, a milling-roll attached to the end of the lathe-shaft and rotatable therewith, the lower operative surface of which milling-roll is in a plane coincident with the plane of the surface of the protuberant portions of said embossed plate, all operating substantially as shown and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

NATHAN B. EVANS.

Witnesses:
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