April 3, 1928.

1,664,480

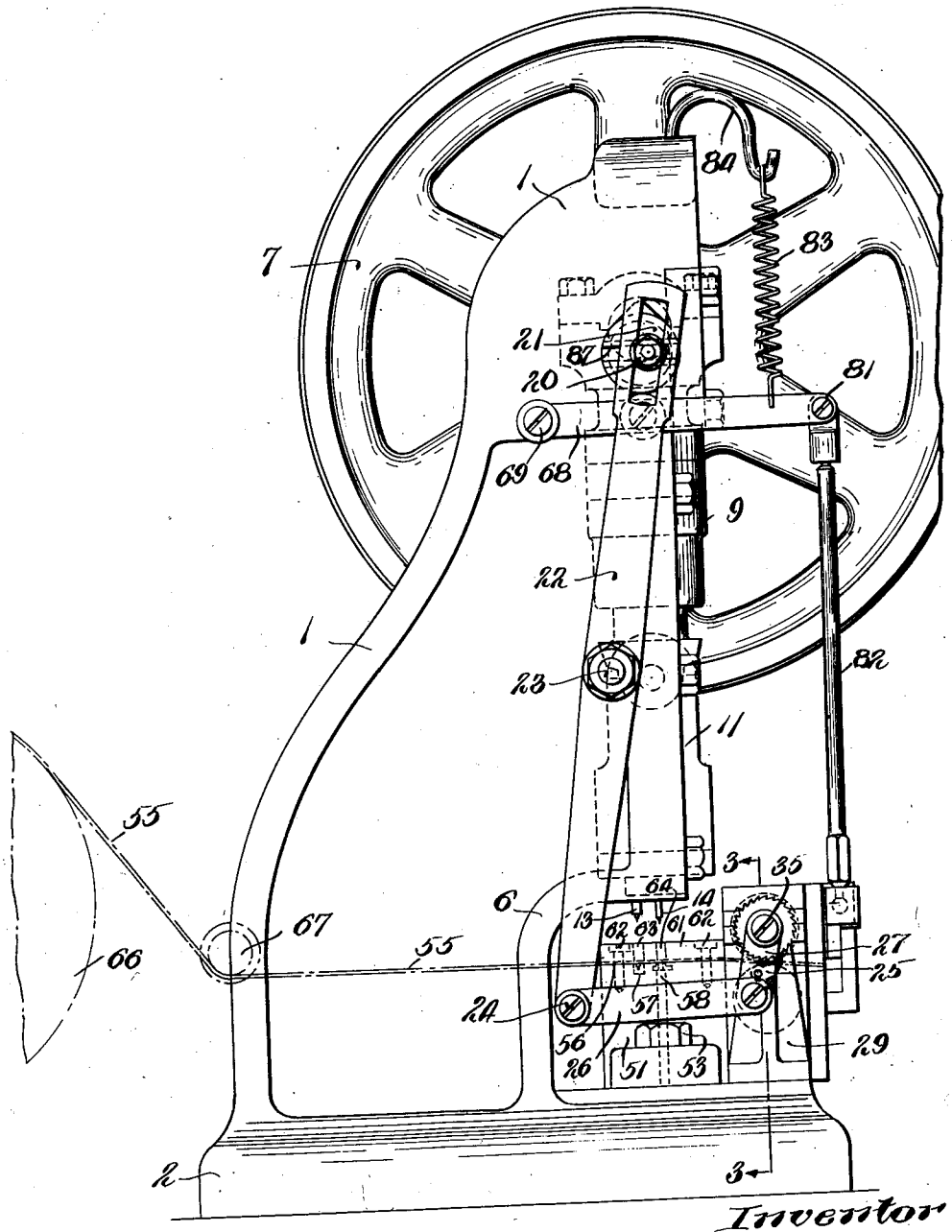
J. A. MURPHY

MANUFACTURE OF PRIMER ANVILS

Filed July 27, 1923

3 Sheets-Sheet 1

Fig. 1



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3 Sheets-Sheet 2

Fig. 2

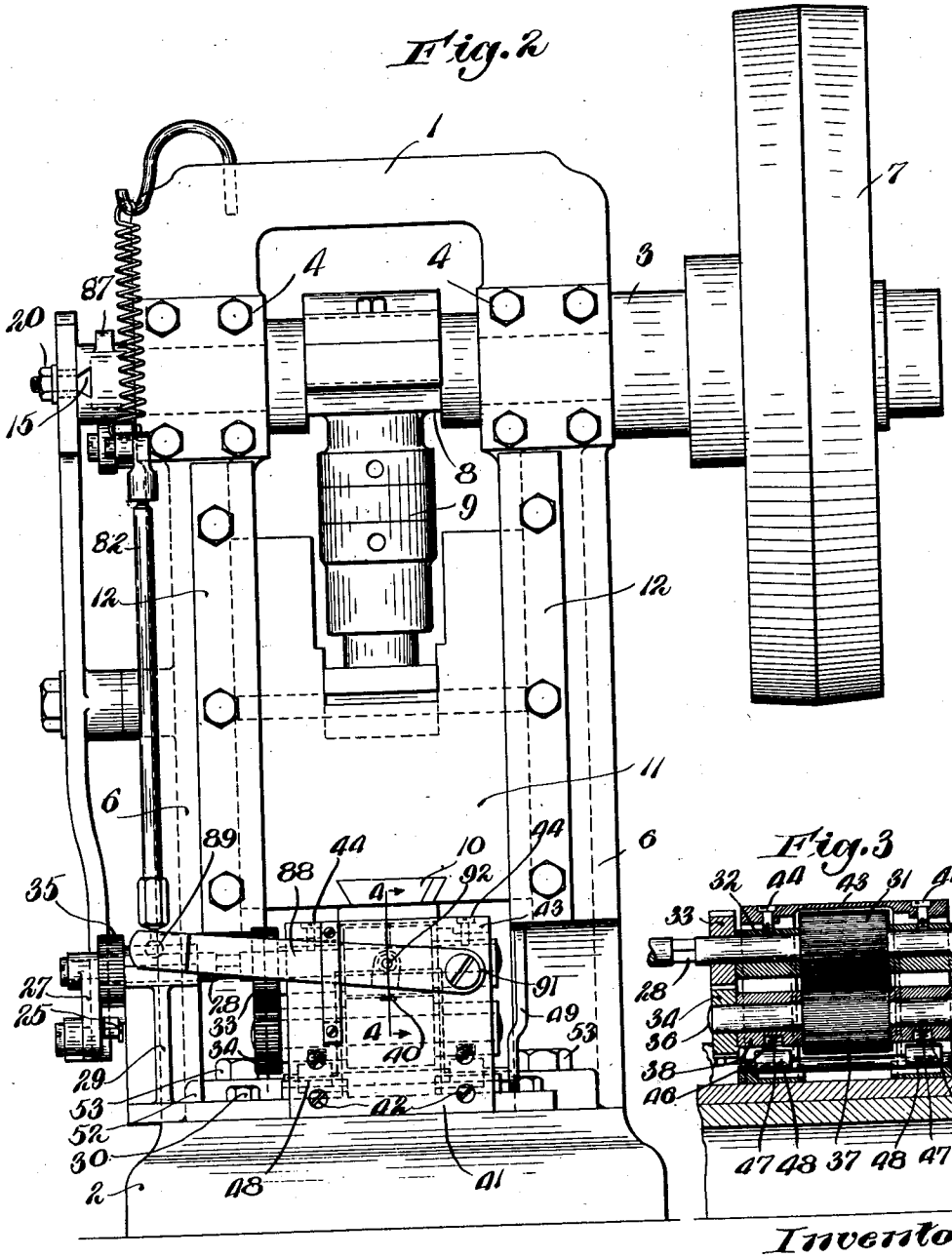

Fig. 3

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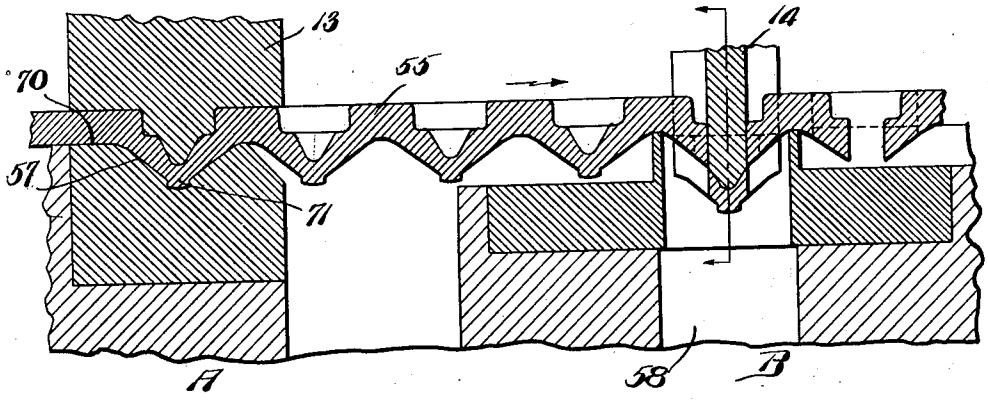
Fig. 4



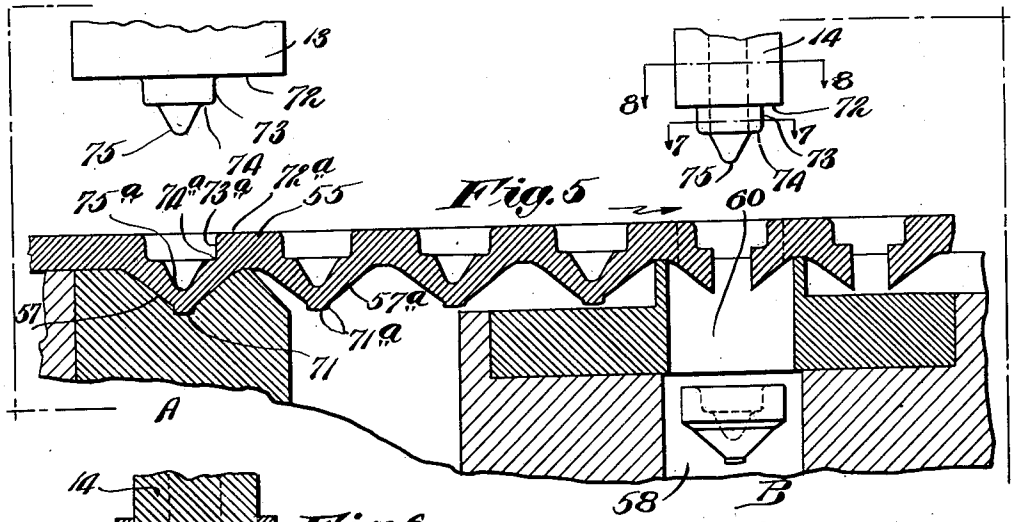


Fig. 5

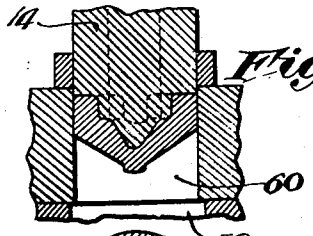


Fig. 6

Fig. 9

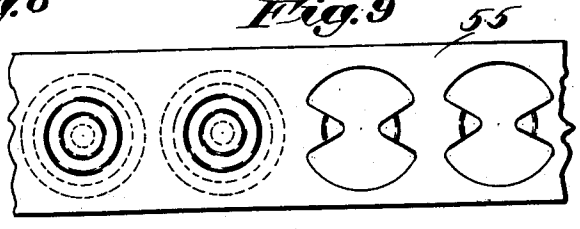


Fig. 8

Fig. 7.

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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF PRIMER ANVILS.

Application filed July 27, 1923. Serial No. 654,171.

In the manufacture of primer anvils, and more especially anvils having the shape and properties, such as described in my copending application, Sr. No. 654,170, filed on even date herewith, it is desirable that the operations involved shall be effected automatically, and it is accordingly an object of my invention to provide a machine for this purpose.

It is a feature of my invention that with my machine each individual anvil is made by a two stage operation upon a thin strip or sheet of malleable metal.

A preferred embodiment of my invention is described below, reference being made to the accompanying drawings, in which:

Fig. 1 represents a side elevation of the machine;

Fig. 2 represents a front elevation of the machine; and

Fig. 3 represents a detail cross-section on the plane indicated by the line 3—3 of Fig. 1.

Fig. 4 is a cross-section of a metal strip, and separate punching blocks in the plane of line 4—4, Fig. 2, showing the punches in lowered position;

Fig. 5 is a cross-section, the same as Fig. 4, the punches being in elevated position;

Fig. 6 is a detail cross-section of the extruding punch in direction of the arrows 6—6 in Fig. 4;

Fig. 7 is a cross-section of the extruding punch in the direction of arrows 7—7 of Fig. 5;

Fig. 8 is a cross-section of the extruding punch in the direction of the arrows 8—8 of Fig. 5; and

Fig. 9 is a plan view of a portion of the metal strip 55 shown in Fig. 5.

The yoke 1 is mounted upon the base 2 and supports the shaft 3 in the bearings 4. Said bearings are supported by the uprights 6 also mounted on the base 2. On the outer end of shaft 3 is the driving pulley 7 while between the bearings 4 is the eccentric bearing 8 to which one end of piston 9 is pivoted, the other end being pivoted to the vertically slidable head 11 mounted in the guides 12 on the uprights 6. Said head 11 is provided on its under face with a dovetail groove 10 in which may be mounted the embossing punch 13 and punch 14.

In a slot 15 on the end of shaft 3 opposite to the driving wheel is mounted the adjustable offset bolt 20 slidably engaging a slot 21 in a lever 22 which is pivoted to the upright 6 at 23 and at 24 to one end of arm 26, the other end of which is pivoted to an arm 27. Said arm 27 carries a pawl 25 and is pivoted to the end of a shaft 28, carrying a ratchet wheel 35 and bearing in the upright 29 fastened by nut 30 on base 2.

Said shaft 28, on the opposite side of upright 29, is provided with a corrugated roller 31 between bearings 32 mounted on either side of said roller, and with a gear 33. Said gear 33 meshes with a similar gear 34 on the shaft 36 of a similar roller 37, adjacent to said roller 31, and mounted on bearings 38.

The bearings 32 and 38 and their respective rollers 31 and 37 are resiliently urged toward each other by virtue of the arrangement to be described. Vertical plates 41 are fixed to the base 2 by means of screws 42 and joined together at the top by a horizontal plate 43. Passing through plate 43 are set screws 44 which press downward upon the bearings 32 while compression springs 46 set into recesses 47 in the under side of bearings 38, and operated by cams 48 and hand lever 49, tend to force bearing 38 upward. Thus the rollers 31 and 37 are yieldingly urged toward each other by a force depending upon the springs 46 and the positioning of the cams 48 thereagainst.

Said rollers are mounted forward of the block 51 which rests on base 2 clamped thereto by the boss 52, and bolts 53. Said block is provided with a horizontal slot 56 in the plane of contact of rollers 31 and 37, and adapted to receive a strip of metal 55 and to pass it between said rollers and to guide it beneath punch 13 and punch 14 in the head 11. In the bottom surface of said slot 56 is the depression 57 adapted to cooperate with the punch 13 in shaping said strip, and an aperture 58 adapted to register with and receive the punch 14 and to permit the piece of metal cut out by it to drop therethrough.

This part of the construction is more clearly illustrated by Figs. 4 and 5 in which the die block is represented in two units A and B, the metal strip 55 being adapted to move

intermittently in the direction of the arrow. Thus, a given portion of the strip will first come to rest over block A which has a flat top 70 with an inverted cone shaped depression 57 (the apex of which is enlarged into a cylindrical depression 71) in registry with embossing punch 13, and coacting therewith to shape said metallic strip as shown by Fig. 4. It is to be noted that said punch 13 has a flat surface 72, parallel with the flat top 70 of block A, a cylindrical surface 73, a flat surface 74, and an ovoido-conical point 75 opposite to the cylindrical depression 71 in depression 57, and shaping the corresponding surfaces 72^a, 73^a, 74^a, 75^a, 71^a, and 57^a respectively, on the metal strip 55. Adjacent block A, and at a given distance therefrom in the direction of the arrow is block B (block A and block B being represented by a single block 51 in Fig. 1) with a vertical aperture 58 therethrough, having the same cross section as the anvils to be made, and in registry with the extruding punch 14. The face of said punch 14 has surfaces identical in contour with those of punch 13 and which are numbered the same, but of a cross section as shown in Figs. 8 and 9, to correspond with the plan view of the anvils to be cut out. Likewise the entrance 60 to aperture 58 is of such a size and so shaped that said punch 14 will just fit it, producing a shearing action therewith to cut the strip 55 between them.

The block 51 may, as shown in Figs. 1 and 2, or may not as in Figs. 4 and 5, be covered by a cap plate 61, affixed to the die block by machine screws 62 and provided with openings 63 and 64 for the passage therethrough of the punch 13 and punch 14 respectively.

In operation, the strip of metal 55 is drawn from roller 66 passed under the guide roller 67, through slot 56 in the die block and thence between rollers 31 and 37 by which it is gripped under tension of the springs 46, and intermittently drawn forward a definite distance by each operation of the pawl 25 on the ratchet wheel 35.

After thus feeding in the end of the metal strip, power is applied, as by a belt to the pulley 7, and, upon consequent rotation of the shaft 3, the head 11 is lowered, forcing embossing punch 13 against the portion of the metal strip 55 immediately beneath it (imparting its contour to the upper surface and the contour of the depression 57 to its lower surface) and then lifting it clear of the strip entirely. Concurrently, the punch 14 is forced against a portion of the strip previously shaped by the punch 13 and by its shearing action against the edges of the aperture 60, cuts vertically through the strip, removing a corresponding section of the embossed portion therefrom.

It will be apparent that the metal strip when so acted upon by punch 14 will not only be bent but molded into the desired shape and contour between the surfaces 72, 73, 74, 75, 57 and 71 providing it with the corresponding surfaces 72^a, 73^a, 74^a and 75^a on the upper side and 57^a and 71^a on the lower side. Not only so, but these surfaces will meet in sharply defined edges, which is exceedingly important,—especially between 72^a and 73^a and between 71^a and 57^a for example. Moreover, as a result of the difference in conical angle between the ovoido-conical point 75 and the conical depression 57, the thickness of the strip will be modified and decreased toward the top providing the space enclosed by surface 75^a.

By suitable adjustment of the offset bolt 20, it will, upon rotation of the shaft 3, operate the levers 22, 26 and 27, and pawl 25, and thereby push the ratchet wheel 35 forward, driving the corrugated roller 31 a given amount and this, in turn, draws the strip 55 forward the same distance. This distance is such that the portion of the strip 55 embossed by the die 13 will be brought into registry with the punch 14 and aperture 58 by an integral number of operations substantially equal to the ratio of the distance between the two to the length of the embossed portion of the strip.

Moreover, this advancement of the metal strip is performed alternately with the strokes of the punch 13 and punch 14, and after it has become disengaged from them. This is determined by the relative angular position of the offset bolt 20 and of the eccentric bearing 8 upon shaft 3.

Thus after die 13 has embossed one portion of the strip, it is raised, the strip advanced and the portion embossed by 13 subsequently registers with the punch 14 and upon the descent of the die-head 11 punch 14 completes the operation by cutting out the embossed portion. As above pointed out, this registry may take place upon the next or after any integral number of progressions of the metal strip, depending upon the distance between die 13 and punch 14 and the amount by which it is advanced.

In this operation, the shape of the punch 14 is preferably such that it will exactly coincide with the surfaces 72^a, 73^a, 74^a, 75^a which have been formed upon the corresponding portion of the strip 55. This not only serves to bring the strip more accurately concentric with the punch, but assures a perpendicular cutting action by the punch as it forces this portion of the metal into the entrance to the aperture 58.

The cut out portion of the strip falls through the aperture 58 and the remainder of the strip continues between rollers 31 and 37 which continue to draw it through the die as already described. In view of the fact that primer anvils are of relatively

small dimensions, it is not necessary to lift the molded strip in order to permit its continued passage through the machine. The strip is sufficiently flexible to lift under the tension employed in drawing it through the guide slot and the tapered depression in its under surface of itself tends to raise it from its position in the die after the molding operation.

As a safety device to further insure the registry of the embossed portion of the strip with punch 14, there may be provided the lever arm 68 pivoted at 69 to the yoke 1 and at 81 to the vertical rod 82 and drawn upwardly by spring 83 suspended by hook 84 from yoke 1. Said lever arm is operated by contact with the cam 87 mounted upon shaft 3, forcing it downwardly against the tension of spring 83. At its lower end rod 82 is pivoted at 89 to arm 88, said arm 88 is also pivoted to plate 41 at its opposite end 91 and carries a knife edge 92 adapted to bear against plate 41 and when in lowered position to close the aperture 40 therein, cutting off the protruding end of the strip 55.

By this device it will be apparent that with proper adjustment of the cam 87, the tongue 92 will be lowered over the opening 40 at that period in the rotation of shaft 3 when the punch 13 and punch 14 are in registry with the proper portions of the strip 55 and are in the act of impressing and punching it. It will also prevent any forward movement of the strip which may be induced by the shaping operation or by excessive action of the rollers 31 and 37 in drawing the strip through the die. This device is, however, supplemental to my invention and not indispensable to it, for with the rollers properly adjusted, the advance of the strip will be exact and while at rest, they will hold it firmly. In this latter case, the metal strip is of course not cut off and is in the form of a continuous ribbon as it leaves the machine through the slot 56.

With each downward stroke of the head, a previously shaped anvil (or plurality of anvils) is removed from the strip of metal by a positively acting mechanism, and another anvil is shaped. Both results are effected by the same stroke, and simultaneously, but any given portion of the metal strip is shaped first and then cut from the strip. Preferably the shaping and cutting operations are conducted in this order and may be effected with an extreme degree of rapidity but concurrent action upon the same portion of the strip at the same time is to be avoided. If the metal were bent subsequent to cutting, the cut edge and surface would be deformed, thus rendering the anvils produced of irregular shape and defeating the purpose of this invention.

By completing the bending or shaping action upon the metal, while it is in sheet form, and then cutting to the desired shape, the contours of the anvil are not altered or affected by the cutting action, but are in fact reinforced during the cutting action which leaves the cut edges accurate both as to size and shape.

The advantages of my device rest not only in the simplicity of design and easy operation of the mechanism involved, but also in its adequate functioning to produce a primer anvil having the desirable properties set forth in my co-pending application above referred to, but may also be adaptable for other comparable products which are required to meet these or similar conditions of shape or use. It is to be noted that such other modifications or adaptations of my invention are comprehended by the above specification and included in the following claims.

I claim:

1. A machine for making primer anvils comprising means for advancing a sheet of metal therethrough, means for shaping a portion of said sheet into a hollow cone, the outer and inner surfaces of which having different conical angles, and means for cutting the portion so shaped from the metal sheet.

2. A machine for making primer anvils comprising means for advancing a sheet of malleable metal therethrough, means for shaping a portion of one side said sheet to an ovoido-conical contour and the corresponding portion of the opposite side of said sheet to the conical contour of the primer anvil, and means for subsequently cutting the shaped portion from the sheet.

3. A machine for making primer anvils comprising a punch having a conical point and a die block having a conical depression, in registry with and of a less acute conical angle than that of the conical point of said punch, and means for advancing a sheet of malleable metal intermittently past the punch and die block, said last named means operating when the punch is in raised position.

4. A punch for stamping out primer anvils having end surfaces adjacent its cutting edge which are approximately perpendicular to its axis, and a tapered projection inside said surfaces, the periphery of the base of said projection being more nearly parallel with the axis of the punch than the periphery of the tip of the projection.

5. A machine for making primer anvils comprising means for feeding a sheet of metal lengthwise along a predetermined path, punch and die members on opposite sides of said path for shaping succeeding portions of said sheet into hollow tapered contour, one of said members moving back and forth transversely of the plane of said sheet, and other punch and die members dis-

posed farther along said path for cutting the anvils from the sheet, the latter punch member having end surfaces extending transversely of the axis of the punch immediately inside its cutting periphery and a tapered protuberance inside said surfaces.

6. A machine for making primer anvils comprising means for feeding a sheet of metal lengthwise along a predetermined path, punch and die members on opposite sides of said path for shaping succeeding portions of said sheet into hollow cone shaped contour, one of said members moving back and forth transversely of the plane of said sheet, and other punch and die members disposed farther along said path for cutting the partially formed anvils from the sheet, the latter punch member having a conical central portion and outer end surfaces approximately perpendicular to the axis of the punch, said surfaces terminating at the peripheral cutting edge of the punch.

7. A machine for making primer anvils comprising a cone-shaped punch, a die block having a conical depression in registry therewith, said punch and die block being adapted to shape between them a metal sheet, and means for cutting the portion so shaped from said sheet.

8. A machine for making primer anvils comprising a conical punch, a die block in registry therewith having a conical depression, adapted to press and shape between them a sheet of metal and an extruding punch adapted to cut a section of the metal so shaped from said sheet perpendicularly thereto.

9. A machine for making primer anvils comprising a conical punch and a die block having in registry therewith a conical depression, adapted to press and shape between them a portion of a sheet of metal and an extruding punch having a point of the same contour as said conical punch and adapted to cut a section of said shaped portion from the sheet perpendicularly thereto.

10. A machine for making primer anvils comprising a punch with an ovoido-conical point and an annular shoulder at its base, a die block having in registry with said punch a conical depression with a cylindrical surface at its base and apex, said punch and die block being adapted to press and shape between them a sheet of metal, and an extruding punch having an ovoido-conical point and an annular shoulder at its base, and adapted to register with a corresponding aperture in the die block and with a shaped portion of said metal sheet and to cut from the latter a right-cylindrical section with longitudinal grooves therein.

11. A machine for making primer anvils from sheet metal comprising means to shape a portion of said metal to the desired cone-shaped contour and a punch having a point of such size and shape as to exactly fit said cone-shaped portion of the sheet and to cut a section therefrom perpendicularly to said sheet.

12. A machine for making primer anvils comprising a die block, a pair of rollers engaging between them a strip of malleable metal and adapted to intermittently advance said strip a given distance through a slot in the die block and an edge, movable over the exit end of said slot, operated alternately with the advancing period of said rollers to provide a definite period during which said strip shall be held stationary.

13. A machine for making primer anvils comprising a die block, a feeding device for intermittently advancing a malleable metal strip longitudinally for a given distance through a slot in the die block, a knife edge movable over the exit end of said slot alternately with the period of advance of the metal strip, to cut off and arrest its progress, and an embossing and punching die adapted to operate upon different portions of said strip while it is stationary.

14. The process of making primer anvils for explosive shells comprising shaping two sides of a thin sheet of metal to different conical contours and cutting from said sheet a substantially cylindrical section containing said shaped portion.

15. The process of manufacturing anvils for cartridge primers comprising the steps of indenting a sheet of malleable metal to a desired truncated-conical contour and cutting from said sheet the section containing the portion so shaped.

16. The process of making primer anvils for explosive shells, comprising pressing one side of a thin malleable metal sheet into a truncated-conical depression and the other side over a cone, and cutting the portion so shaped from the sheet by a concentric cylindrical punch.

17. A process for the manufacture of a primer anvil for explosive shells comprising the steps of pressing a sheet of malleable metal into the shape of a hollow cone, with a boss at its exterior apex, a cylindrical surface adjacent the base of said cone, a flat surface substantially at right angles to the axis of said cylindrical surface, and cutting the portion so shaped from the metal sheet.

18. The process of making primer anvils for explosive shells comprising simultaneously indenting one side of a metal sheet to form a cone-shaped point provided with an annular shoulder at its base, and forcing the corresponding opposite side of said sheet into a conical shape having an enlargement at its apex and at its base and subsequently cutting from said sheet a substantially right-cylindrical section including the portion so shaped.

19. A process for the manufacture of a

primer anvil for explosive shells, comprising the steps of first indenting one side of a sheet of malleable metal to form a cone shaped point provided with an annular shoulder, simultaneously compressing the opposite side of said sheet into a concentric conical form having at the apex and base of said form cylindrical enlargements, and secondly cutting from said metal sheet the portion so shaped and diametrically opposite notches from the margin thereof.

Signed by me at Lowell, Massachusetts, this 20th day of June, 1923.

JAMES A. MURPHY.