

Jan. 12, 1926.

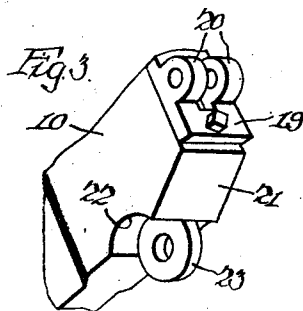
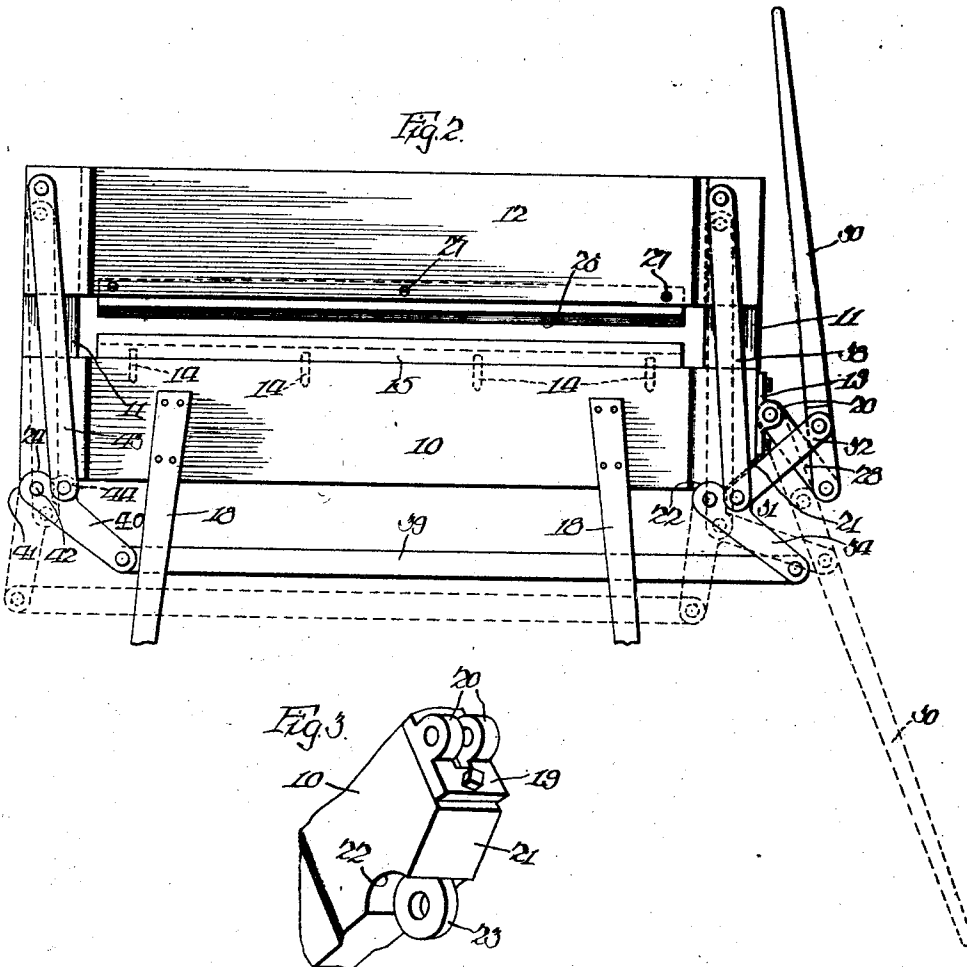
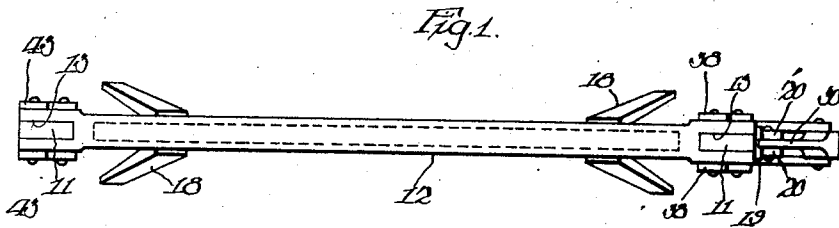
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1,569,461

SHEET METAL BENDING AND FORMING MACHINE

Filed March 7, 1925

2 Sheets-Sheet 1



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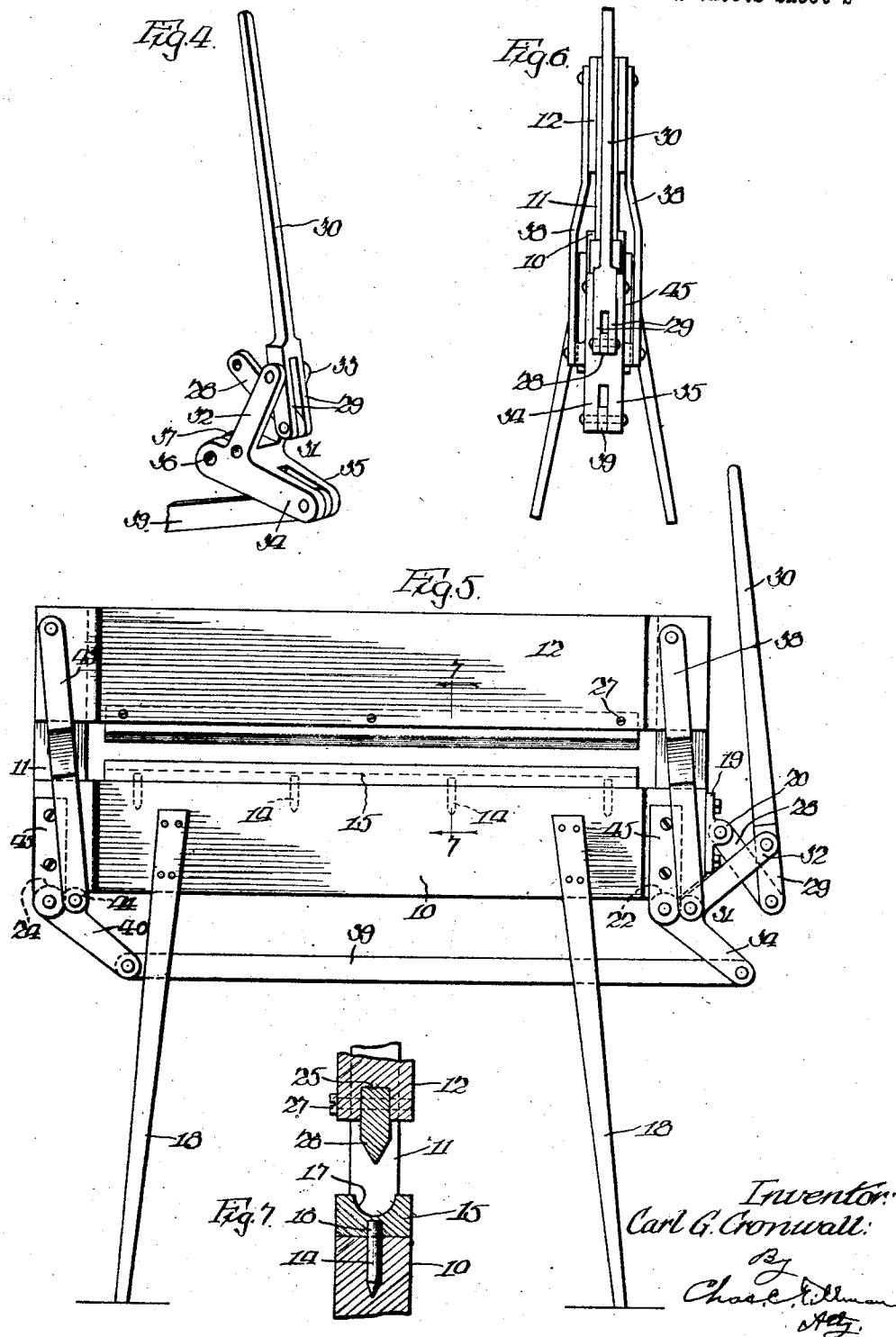
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE.

CARL GUSTAV CRONWALL, OF CHICAGO, ILLINOIS.

SHEET-METAL BENDING AND FORMING MACHINE.

Application filed March 7, 1925. Serial No. 13,720.

To all whom it may concern:

Be it known that I, CARL GUSTAV CRONWALL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Sheet-Metal Bending and Forming Machines, of which the following is a specification.

This invention relates, generally, to metal working, but has particular relation to improvements in sheet metal bending and forming machines, and it consists in certain peculiarities of the construction, novel features, arrangement and combination of the various parts thereof as will be hereinafter more fully set forth and specifically claimed.

The principal object of the invention is the provision of a machine for bending and forming pieces of sheet metal into various shapes for different uses or purposes, which shall be simple and inexpensive in construction, strong, durable and efficient in operation.

Another, and an important object, is the provision in such a machine, of means preferably manually operated for actuating a movable die or forming element-carrying member thereof with great force and effect, as well as with accuracy and uniformity throughout its length or dimensions, yet in such a way as to require but little exertion on the part of the operator.

Still another object is to provide the die or forming element-carrying members of the machine with means whereby dies or matrices of different shapes can be interchangeably used, and can be quickly and readily removed and replaced for this purpose.

Other objects and advantages of the invention will be disclosed in the following description and explanation, which will be more readily understood when read in conjunction with the accompanying drawings, in which embodiments of the invention are illustrated, it being understood that changes and modifications may be resorted to without a departure from the spirit of the invention, so long as they fall within the scope of the appended claims forming a part hereof.

In the drawings,—

Fig. 1 is a plan view of a machine embodying one form of the invention.

Fig. 2 is a side view in elevation thereof showing the parts by continuous lines in their normal positions, or in the positions they will occupy when ready to receive a piece of sheet metal between the forming members or dies thereof and by dotted lines about the positions the parts will occupy when moved to their forming or operative positions.

Fig. 3 is an enlarged fragmental perspective view of a portion of the base or fixed die carrying member of the machine, showing the construction of one end and a part of the lower surface thereof.

Fig. 4 is a detached perspective view of a portion of the means for actuating the movable die carrying member.

Fig. 5 is a view in side elevation illustrating a modification in the construction of the lower portion of the base or fixed die carrying member.

Fig. 6 is an end view in elevation thereof, and

Fig. 7 is an enlarged vertical sectional view taken on line 7—7 of Fig. 5 looking in the direction indicated by the arrows.

Like numerals of reference refer to corresponding parts throughout the different views of the drawing.

Referring now more particularly to Figs. 1 to 4 inclusive of the drawings, the reference numeral 10 designates as a whole the base of the machine, which base may be made of any suitable size, form and material, but by preference of an elongated rectangular shape as shown. At each of its ends the base 10 is provided with an upright 11 each of which is by preference of less thickness than that of the base 10 and are employed to act as guides for the movable die or forming element-carrying member 12 which is also of an elongated substantially rectangular shape and has at each of its ends a slot or guide-way 13 for the reception of the guides 11 or uprights. The base 10 has a flat upper surface and is provided in its upper portion with a series of spaced pins 14 arranged in a row at the medial line between the side surfaces of said base and so as to project

a slight distance above its upper surface, as is clearly shown in Figs. 2, 5 and 7 of the drawings. These upwardly projecting pins 14 are employed as keepers for a matrix or die 15 which is provided in its lower surface with a number of openings 16 corresponding in position and size with the pins 14 which fit into said openings. The upper portion of the die or matrix 15 may be provided with a cavity 17 of any desired shape. The base 10 may be supported in any suitable or well known way but by preference by means of a pair of legs 18 located near each end thereof, one member of each pair of said legs being located on opposite sides of the base and secured thereto at their upper portions in any suitable way. One end of the base 10 has mounted thereon a plate 19 which is provided with a pair of spaced and transversely apertured bearing lugs or bosses 20, see Figs. 1 to 3 inclusive of the drawings. Just below the lower end of the plate 19 the base 10 is downwardly beveled as at 21, see Fig. 3, and adjacent the lower end of the beveled portion 21 the bottom of the base 10 is provided with a transversely disposed upwardly curved recess 22 at about the middle of which is mounted and secured in any well known way to the base an apertured bearing member 23, which member and curved recess are employed for the purpose to be presently explained. Near its opposite end the base 10 is provided in its bottom with another transversely disposed upwardly curved recess or bearing surface 24 which is also equipped with a transversely apertured bearing member, which, like the bearing member 23 above mentioned, is secured in any well known way to the base 10 at about the middle of the recess 24.

The lower surface of the movable die carrying member 12 is provided with a longitudinally disposed channel 25 in which is located a die or forming member 26 of any desired formation, for co-operation with the adjacent surface of the die or forming member 15, and said member 26 may be detachably held in position within said channel by means of a number of screws 27 seated in suitable transverse openings in the member 12 and extended through registering openings provided in the upper portion of said die member.

Pivotally mounted at one of its ends between the apertured bosses or lugs 20 on the plate 19 at the operator's end of the machine, is a link 28 the other end of which is pivotally mounted between the lower portions of the prongs 29 with which the operating lever 30 is provided, at its lower end. A bell crank lever, designated as a whole by the reference numeral 31 and comprising a pair of upwardly extended and spaced parallel arms 32 and 33, and a pair of downwardly extended and spaced parallel arms 34 and

35 (see Fig. 4) and having a transverse opening 36 and a vertical slot 37 in its front end, is fulcrumed at said end on the bearing member 23 located near the operating end of the base 10 in such a way that the rounded portions of the front or upper end of the bell crank lever 31 will contact with the surface of the curved recess 22 on each side of the bearing member 23, thus providing a very efficient and stable bearing connection between the said bell crank lever and the base of the machine.

The upper ends of the arms 32 and 33 are pivotally connected to the sides of the lever 30 at the upper portion of the prongs 29 thereof, as will be readily understood by reference to Figs. 2 and 4 of the drawings, in such a way as to straddle the link 28 so as to permit free movements of the parts. At about their juncture with the arms 34 and 35 of the bell crank lever 31, the arms 32 and 33 each has pivotally connected thereto the lower end of a link 38 which is pivotally secured to the upper portion of the movable die carrying member 12 near the operator's end of the machine and on each side thereof. Pivotally secured at one of its ends between the free ends of the arms 34 and 35 of the bell crank lever 31 is a tie bar or link 39 which extends longitudinally with respect to the base 10 and under the same between the members of each pair of its legs 18, and is pivotally connected at its other end to the lower end of a pair of parallel spaced arms 40 connected together for unitary movement and by preference of the same construction as the arms 34 and 35 of the bell crank lever 31 above described. The upper ends of the arms 40 are rounded as at 41 to co-act with the upwardly curved bearing surface 24 and are pivotally mounted on a shaft 42 journaled in the bearing member 23 located on the bottom of the base 10 near its end opposite that on which the operating lever 30 is mounted.

It will be understood that the upper ends of the arms 40 are provided with a space or slot 37 for the reception of the said bearing member 23 in a similar manner to that shown in Fig. 4 with respect to the arms 34 and 35 of the bell crank lever. However, it will be observed that the arms 32 and 33 of the bell crank lever are omitted from the structure of the arms 40, and it will be clearly seen in Figs. 2 and 5 of the drawings that a link 43, located on each side of the machine at the end thereof adjacent the pivot or fulcrum 42 for the arms 40, is pivotally secured at its lower end to an upwardly extended boss 44 on the arms 40, and at its upper end pivotally connected to the upper portion of the movable die carrying member 12 near its end opposite the operating lever.

In Fig. 5 of the drawings the modifica-

tion consists in dispensing with the bearing members 23 employed in the construction illustrated in Figs. 1 to 4 inclusive and above described and in lieu thereof in supporting the upper ends of the arms 34 and 35 of the bell crank lever 31 and the upper ends of the arms 40 by means of brackets 45 one of which is vertically mounted on each side of the base 10 near each of its ends directly above the curved bearing portions 22 and 24 and in such a way that the lower ends of each pair of said brackets will depend slightly below the lower surface of the base, as is clearly shown in Fig. 5 of the drawings.

In this modification the upper ends of the arms 34 and 40 are journaled between the depending ends of the brackets 45 and the rounded portions of said upper ends will co-operate with the curved bearing surfaces 22 and 24 in a manner so as to provide very stable and efficient bearings.

From the foregoing, and by reference to the drawings, it will be readily understood and clearly seen that by the construction and arrangement of the above named lever and links employed for the actuation of the movable die or forming element carrying member, great pressure or force will be imparted to said movable member by the downward movement of the operating lever 30 and with a minimum expenditure of power or energy applied thereto. It is also manifest that, assuming the parts are in the positions shown in Figs. 2 and 5 of the drawings and it is desired to give formation to a piece of material such as a piece of sheet metal, all that is necessary is to place the same between the dies or forming members 15 and 26 which may be of any construction to give the desired formation to the material, when by turning the operating lever downwardly to about the position shown by dotted lines in Fig. 2, the dies or forming members will be caused to co-operate with one another so as to clamp and give form to the piece of material being operated on. In this operation of the downward movement of the operating lever 30, it is obvious that the links 28 and 39 will co-operate with the lever, the arms of the bell crank lever 31, the arms 40 and links 38 and 43 in the manner of toggles and that thereby great force or pressure will be imparted to the movable die carrying member.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a machine of the class described, the combination with a suitably mounted base, of a forming element mounted thereon, another forming element and a carrying member therefor movably mounted with respect to said base for the co-operation of their forming elements, means for the move-

ment of said movable member toward and from said base, said means including a link pivoted at one of its ends to an end of the base, an operating lever pivoted at one of its ends to the other end of said link, and leverage compounding means having pivotal connection with said operating lever above its pivot and with the ends of the base and the ends of the said movable member.

2. In a machine of the class described, the combination with a suitably mounted base having upwardly extended guiding means at its ends, of a forming element longitudinally and detachably mounted on the upper portion of said base, a member movably mounted above the base and having means co-acting with said guiding means thereof, a forming element detachably and longitudinally mounted on the lower surface of the last named member for co-operation with the forming element of the base, means for the movement of said movable member toward and from said base, said means including a link pivoted at one of its ends to an end of the base, an operating lever pivoted at one of its ends to the other end of said link, and leverage compounding means having pivotal connection with said operating lever above its pivot and with the ends of the base and the ends of said movable member.

3. In a machine of the class described, the combination with a suitably mounted base having in its lower surface near each of its ends an upwardly curved bearing recess, a forming element detachably mounted on the upper surface of the base, a member mounted for vertical movement and guidance above said base, a forming element mounted on the lower surface of the last named member for co-operation with the forming element of the base, a pair of arms pivotally mounted near each end of the base and below the same, said arms having their ends rounded and arranged for co-action with said recesses, connections pivotally uniting the upper portions of said arms to said movable member near its ends, a link connecting the lower ends of said arms, a link pivotally mounted at one of its ends on an end of the base, an operating lever pivoted at its lower end on the other end of said link, and a connection uniting said lever above its pivot to the upper portion of one pair of said arms.

4. In a machine of the class described, the combination with a suitably mounted base having in its lower surface near each of its ends an upwardly curved transverse bearing recess, of an apertured bearing member mounted in each of said recesses, a forming element mounted on the upper surface of the base, a member mounted for vertical movement and guidance above said base, a forming element mounted on the lower surface of the last named member

for co-operation with the forming element of the base, a pair of arms pivotally mounted on each of said apertured bearing members below the base, said arms having their upper ends rounded and arranged for co-
5 action with said recesses, connections pivotally uniting the upper portions of said arms to said movable member near its ends, a link connecting the lower ends of said arms, a link pivotally mounted at one of its ends 10 on an end of the base, an operating lever pivoted at its lower end on the other end of the last named link, and a connection uniting said lever above its pivot to the upper portion of one pair of said arms.

CARL GUSTAV CRONWALL.