C. D. CRARY.

METAL DRAWING FORGE.

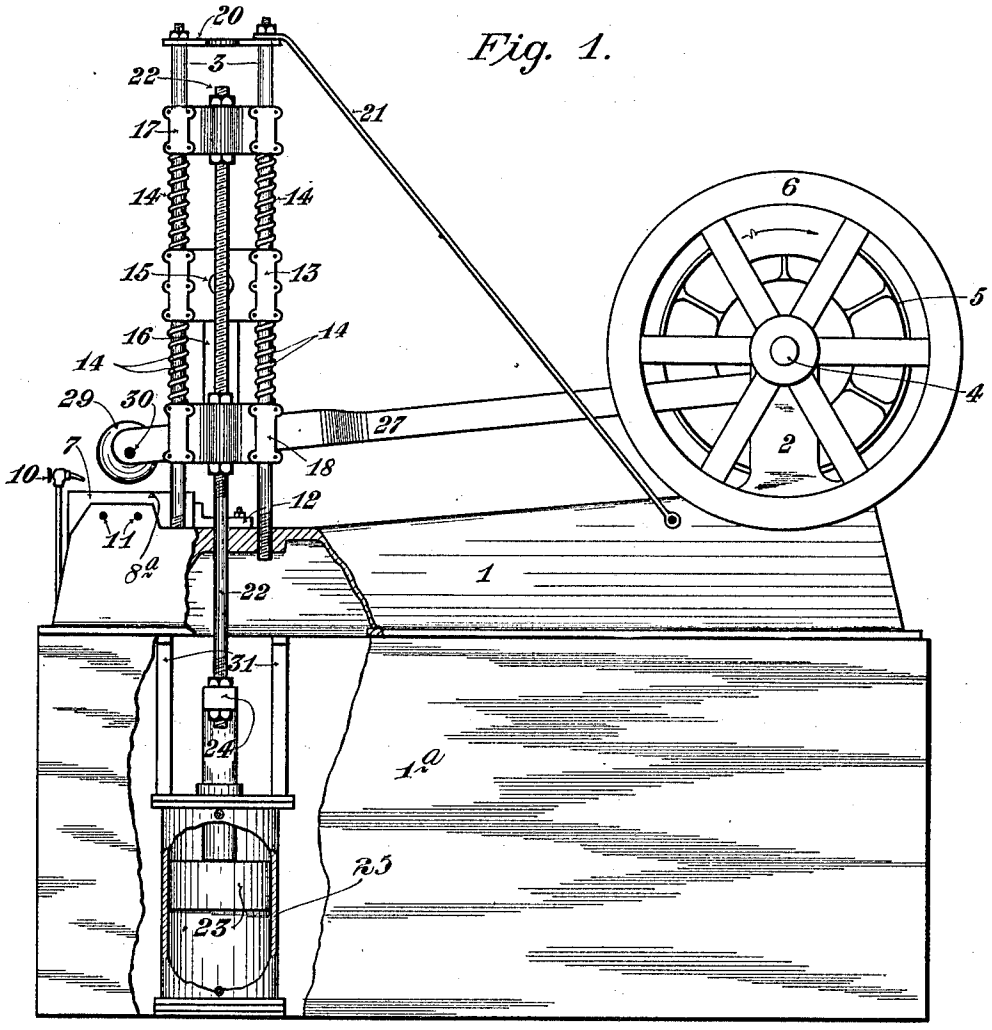
APPLICATION FILED JAN. 2, 1912.

1,040,282.

Patented Oct. 8, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



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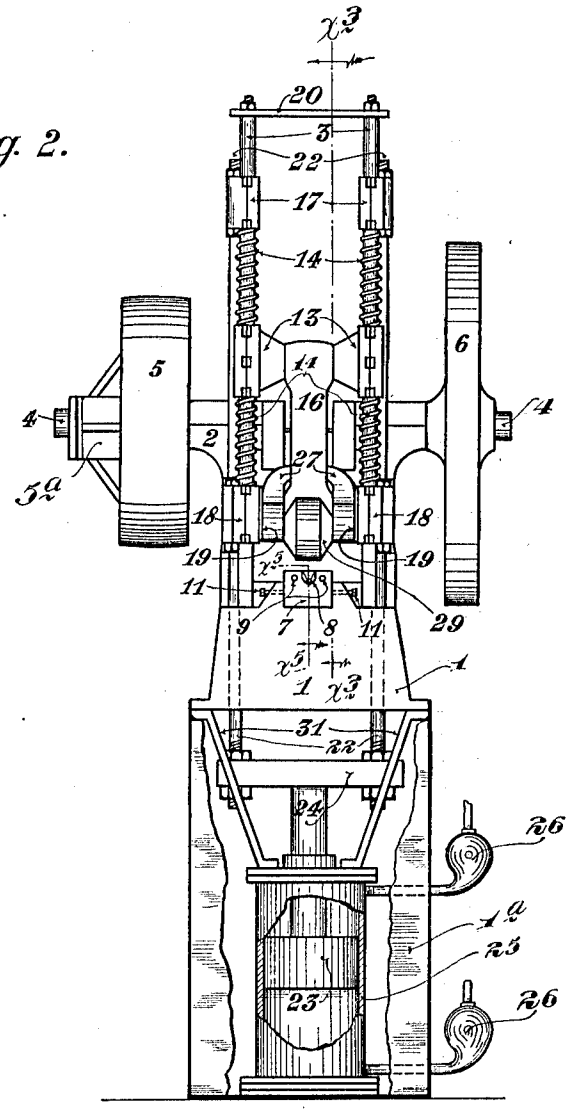
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3

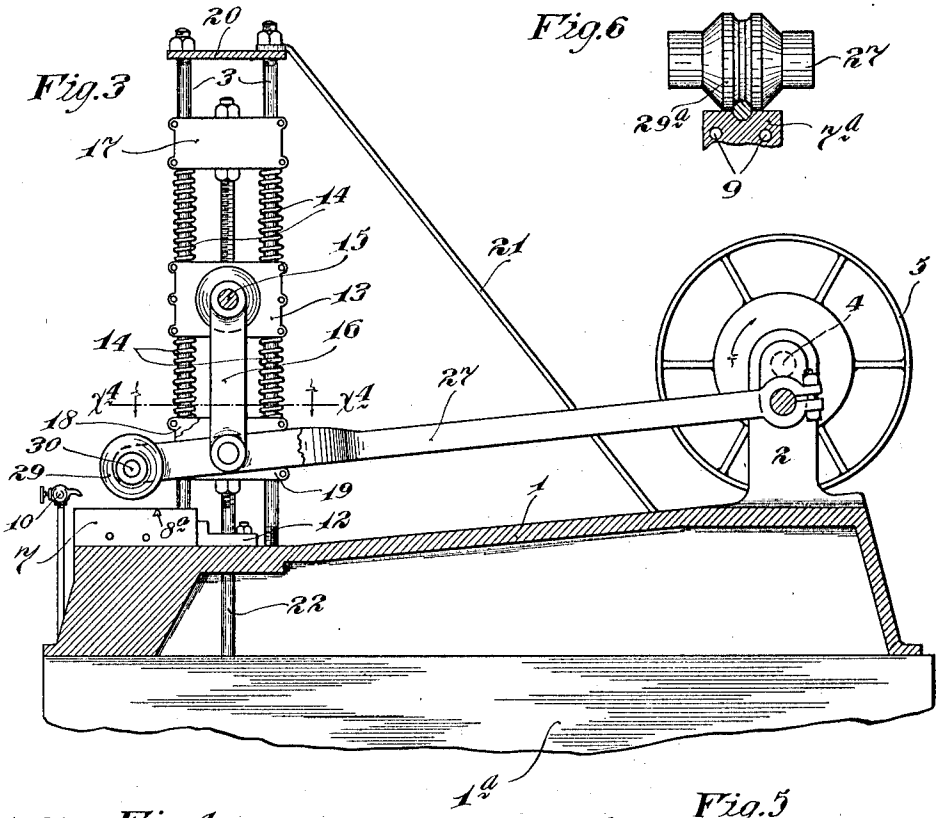


Fig. 6

Fig. 4

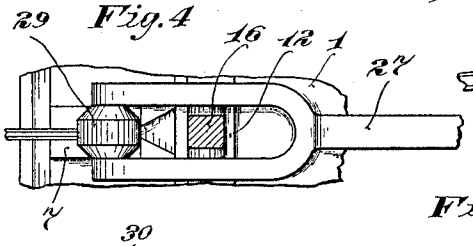


Fig. 5

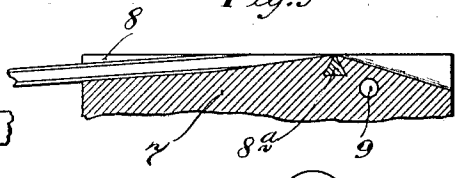
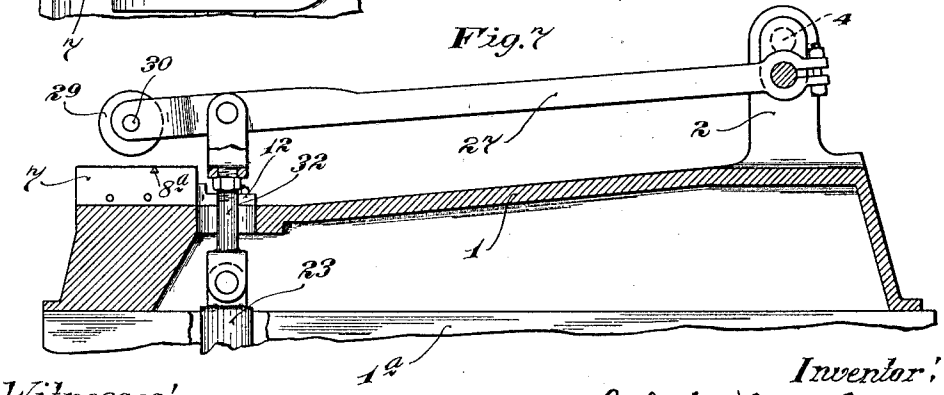


Fig. 7



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UNITED STATES PATENT OFFICE.

CALVIN DEAN CRARY, OF MINNEAPOLIS, MINNESOTA.

METAL-DRAWING FORGE.

1,040,282. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed January 2, 1912. Serial No. 668,878.

To all whom it may concern:

Be it known that I, CALVIN DEAN CRARY, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Metal-Drawing Forges; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide a simple and highly efficient metal drawing forge adapted to perform different kinds of work in the manufacturing of various different tools and other articles, all as will be hereinafter more fully set forth.

Generally stated, the invention consists of the novel devices and combination of devices hereinafter described and defined in the claims.

The present machine is herein designated as a metal drawing forge to distinguish the same from drop forges, and the like, where hot metal is given form by upsetting or by direct upsetting blows which distribute the grain of the metal in various different directions, whereas, my improved forge draws the metal in one direction and produces a grain extending approximately in the same direction.

The improved device, in its preferred form, and in one modified form is illustrated in the accompanying drawings wherein like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view in side elevation with some parts broken away showing the improved forge or machine; Fig. 2 is a front elevation of the forge, some parts being broken away; Fig. 3 is a vertical section taken approximately on the line x^3 x^3 on Fig. 2, some parts being broken away; Fig. 4 is a detail view in horizontal section taken approximately on the line x^4 x^4 on Fig. 3, some parts being broken away; Fig. 5 is a vertical section taken on the line x^5 x^5 on Fig. 2; Fig. 6 is a detail view partly in plan and partly in transverse vertical section illustrating the coöperating drawing roller and die block of different form from those shown in Figs. 1 to 5 inclusive; and Fig. 7 is a view corresponding to Fig. 3 but illustrating a modified arrangement of certain of the parts.

So far as the base or bed of the machine is concerned, it may take various forms, but as shown, it comprises a cast bed mounted on a sub-base 1^a. The bed 1 is shown as provided with heavy laterally spaced upwardly projecting shaft bearings 2.

The numeral 3 indicates four vertical guide columns arranged in laterally spaced pairs and rigidly secured at their lower ends to the front portion of the bed 1. A crank shaft 4 is journaled in the shaft bearings 2 and provided at one end with a clutch pulley 5, and at its other end with a fly wheel 6. The clutch pulley 5 is adapted to be driven by a belt, not shown, and it is adapted to be coupled, at will, to the crank shaft 4 by a suitable clutch 5^a indicated in part in Fig. 2. A suitable die block of hardened steel is applied to the front portion of the base 1 and is preferably placed between suitable retaining flanges on the said base and rigidly but detachably held thereto, by suitable set screws 11. The forming die or cavity of the die block 7 will have different shapes according to the form of the article to be made, but in Figs. 1 to 5 inclusive, said die block is shown as formed with a channel 8 (see particularly Figs. 2 and 5) adapted to receive a cold chisel. In said views, it will be noted that the said channel 8 has a flat inclined surface extending to a hardened transverse cutting wedge 8^a that is set into the said die block 7. Preferably, the die block 7 (see Fig. 2) is formed with water circulating passages 9 so that the said block may be kept comparatively cool while hot metal is being worked thereon. The numeral 10 indicates an air delivery pipe having a discharge nipple arranged to blow air directly onto the die block 7 to thereby keep the same cleared of scale and dirt, and also to assist in keeping the die block and the coöperating die roller, hereinafter described, from becoming too hot.

The numeral 12 indicates a thrust block shown as bolted to the top of the base 1 and which positively holds the die block from rearward movement on the base.

The movable die which coöperates with the relatively fixed die or die block 7, is preferably in the form of a roller 29 journaled at 30 to one end of a heavy crank rod

27, the other end of which is journaled on the crank of the crank shaft 4. The free end of the crank rod 27 is pivotally connected at the rear of its roller to a supporting link 16, the upper end of which is journaled on the cross pin 15, of a cross head 13 that is mounted to move vertically on the four columns 3. Also, mounted to slide vertically on the said columns 3 are supplemental upper cross heads 17 and supplemental lower cross heads 18. The said upper and lower supplemental cross heads 17 and 18 are rigidly connected to the threaded ends of connecting rods 22, the lower ends of which are connected to the head 24 rigidly secured to the upper end of the stem of the piston 23. The piston 23 works in a fixed cylinder 25 which, as shown, is located within the sub-base 1^a and is connected to the base 1 by suitable brackets 31. The cylinder 25 and coöperating piston 23 and cooperating connections refer to an ordinary reciprocating engine and are adapted to operate as a hydraulic lift to raise and lower the cross heads, at will. Inasmuch as the construction of a hydraulic or water engine is well understood, further details thereof are not deemed necessary for the purposes of this case, it being, of course, understood that the piston may be moved vertically and held where set, at will. Where a limited elasticity is desired and no other means for affording the same is provided, this may be afforded by introducing a small amount of air into the cylinder or into the chambers connected therewith. Hence, for this purpose, I have, in Fig. 2, shown upper and lower air bulbs or chambers 26 which are connected, respectively, to the upper and lower ends of the said cylinders.

As shown, the upper ends of the columns 3 are rigidly tied together by a plate 20, and this plate is connected to the base 1 by an oblique base rod 21.

With the construction described, the so-called auxiliary cross heads 17 and 18 are moved positively with the piston 23. The main cross head 13 to which the upper end of the link 16 is pivoted, is given its movements through the connecting rods 22 and auxiliary cross heads 17 and 18, but the movement thereof may be yielding by opposing coiled springs 14 placed around the columns 3, with the upper members compressed between the cross heads 13 and 17 and with the lower springs compressed between said cross head 13 and the lower cross head 18. These opposing springs tend to hold the cross head 13 centered between the upper and lower cross heads 17 and 18, and with an action that approximates a counterpoised action. When the piston 23 is moved downward and the drawing roller 29 is forced onto the work held onto the die block 7, the downward pulling force is imparted from the upper cross head 17 to said cross head 13 through the upper springs 14, and the lower springs 14 will then serve to prevent violent recoil of the said upper springs.

It will be noted, particularly, by reference to Figs. 2 and 4, that the free end of the crank rod 27 is bifurcated, so that it embraces the link 16 and drawing roller 29, and works in close engagement with the faces 19 of the lower auxiliary cross heads 18, so that the latter serve to prevent lateral movements of the said crank rod and drawing roller.

The crank shaft 4 should be rotated in the direction of the arrow marked thereon in Fig. 3, and under such direction of rotation, the drawing die or roller 29, as it is drawn rearward or toward the said crank shaft, will be pressed lower and lower or into increasing pressure upon the chisel or other metallic article placed in the die block. The roller, therefore, has a pressing and drawing or pulling action on the hot metal which is being worked, and by repeated or successive pressing and drawing actions, turns the grain of metal into or toward a constant direction, to-wit, in a direction longitudinally of the channel of the said die block. This pressing and pulling or drawing action not only gives the desired form to the metal but refines and gives the same a grain tending in the same direction. The device is adapted for various different uses and a metallic article of most any form may be made by simply giving the right forms to the die block and coöperating so-called drawing roller or roller die.

In Fig. 6, the die block 7^a and the die roller 29^a are provided with coöperating channels that are adapted to draw out or form an octagonal bar such, for instance, as required for making chisels.

In the modified form of the device shown in Fig. 7, the same base 1, shaft bearings 2, crank shaft 4, die block 7, crank rod 27 and die roller 29 are employed that are illustrated in Figs. 1 to 5 inclusive. The free end of the crank rod 27, however, is shown as pivotally connected to the upper end of the oscillatory link 32, the lower end of which is pivoted to the stem of a piston 23. With this arrangement, there would be little, if any yielding action, unless, in fact, the air chambers 26 be employed as already stated; but, nevertheless, the die roller may be raised and lowered, at will, so as to regulate its action on the work and, as required, for instance, where a body of metal is to be reduced in thickness. Also it is desirable to move the die roller 29 upward at various times to permit the tool or other article to be inserted into or removed from the die block.

Not only is this improved so-called metal drawing forge adapted for general use in

shaping or forming metal and even for refining or changing the texture of metal where the same is not given any particular final form, the device may be made, as is obvious, in various different sizes designed to do different kinds of work. A large machine might be designed to draw out or form rails.

A few of the many other possible uses of the machine are as follows: for making plane blades, knife blades, chisels of different kinds, pliers, screw drivers, drills, beading tools, calking tools, cables, rods, and shafts.

What I claim is:

1. In a machine of the kind described, the combination with a suitable base, of a crank shaft journaled on said base, vertical columns on said base, a cross head movable on said columns and serving as a link support, a link pivoted to said cross head, a crank rod operated by said crank shaft and supported by said link, coöperating dies, one on said base and the other on the free end of said crank rod, and yielding means for moving said cross head.

2. In a machine of the kind described, the combination with a suitable relatively fixed die or block, of a spring-pressed link support mounted for straight line vertical movements, a vibratory link pivoted to said link support, a rod attached to said link near its free end, said rod having a die member for coöperation with said relatively fixed die, and means for reciprocating said rod to produce a coöperative action between the said two dies.

3. In a machine of the kind described, the combination with coöperating relatively fixed and movable dies, of a reciprocatory rod carrying said movable die, and a cylinder and piston with connections for adjusting said rod and holding said movable die for operative movements on different lines at varying distances from said fixed die.

4. In a machine of the kind described, the combination with a suitable base, of a crank shaft journaled on said base, vertical columns on said base, a cross head movable on said columns and serving as a link support, a link pivoted to said cross head, a crank rod operated by said crank shaft and supported by said link, and coöperating dies, one on said base and the other on the free end of said crank rod.

5. In a machine of the kind described, the combination with a suitable base, of a crank shaft journaled on said base, vertical columns on said base, a cross head movable on said columns and serving as a link support, a link pivoted to said cross head, a crank rod operated by said crank shaft and supported by said link, coöperating dies, one on said base and the other on the free end of said crank rod, and a coöperating cylinder and piston, said piston having a connection to said cross head for moving the same.

6. In a machine of the kind described, the combination with a suitable base, of a crank shaft journaled on said base, vertical columns on said base, a cross head movable on said columns and serving as a link support, a link pivoted to said cross head, a crank rod operated by said crank shaft and supported by said link, coöperating dies, one on said base and the other on the free end of said crank rod, and a cylinder and piston, said piston having a yielding connection to said cross head for adjusting and yieldingly holding the same.

7. In a machine of the kind described, the combination with a suitable base having upright columns, of main cross heads and upper and lower supplemental cross heads movable vertically on said columns, springs interposed between said main and supplemental cross heads, means for vertically adjusting said supplemental cross heads, a reciprocatory rod movably supported from said main cross heads, and coöperating dies, one on said base and the other on said reciprocatory rod, substantially as described.

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

CALVIN DEAN CRARY.

Witnesses:

MILDRED L. MUMMA,

HARRY D. KILGORE.