

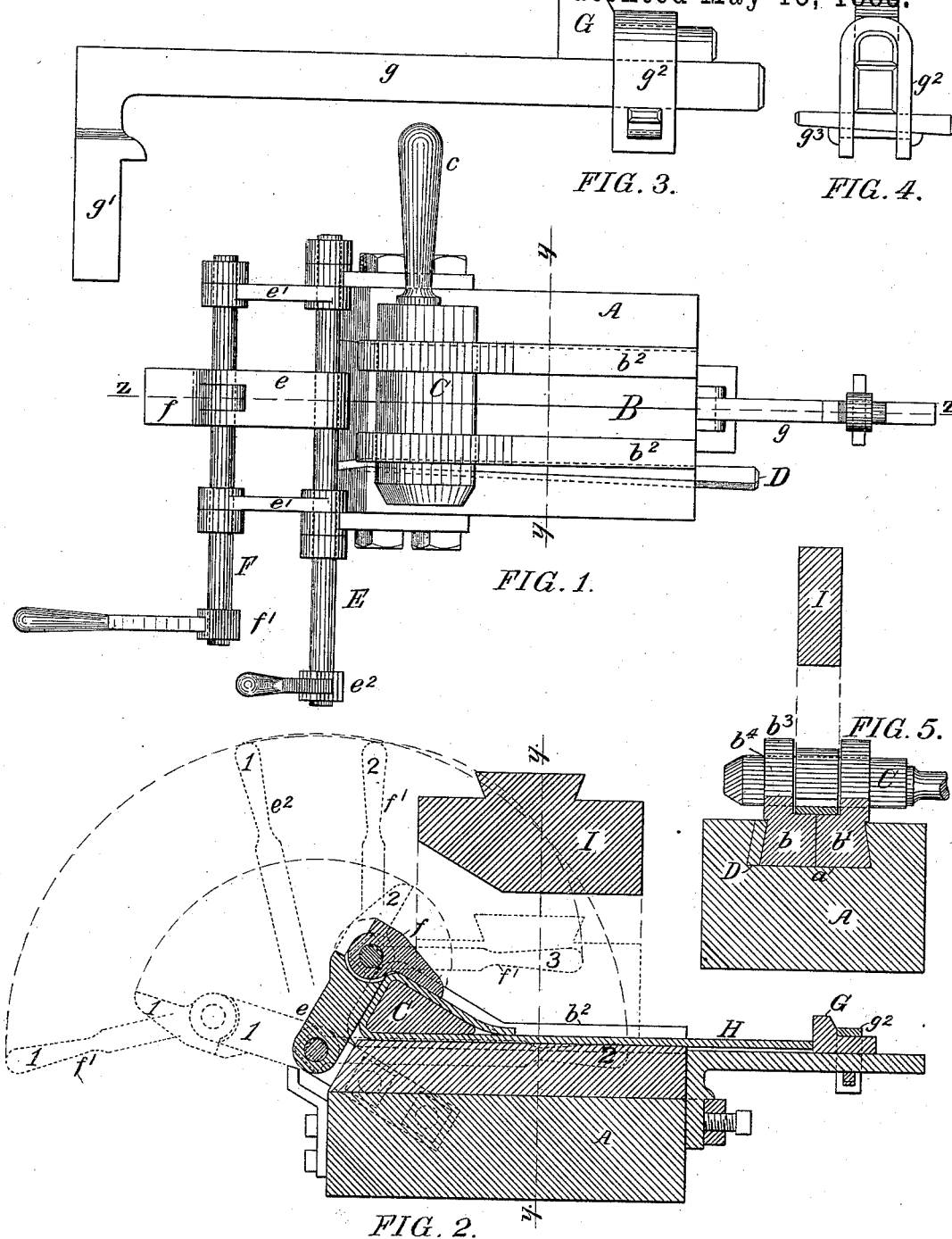
(No Model.)

2 Sheets—Sheet 1.

D. H. DOWNES.
FORGING MACHINE.

No. 383,047.

Patented May 15, 1888.



Witnesses.

Charles C. Setley.
B. M. Whitaker.

Inventor
David H. Downes.

By his Attorneys.

Coburn & Bachman.

(No Model.)

D. H. DOWNES.
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2 Sheets—Sheet 2.

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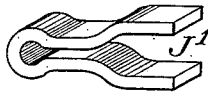


FIG. 11.

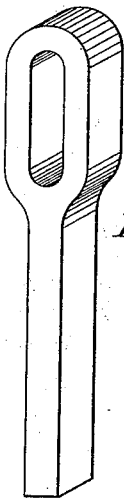


FIG. 12.

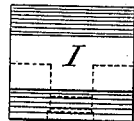


FIG. 9.

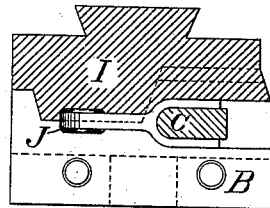


FIG. 8.

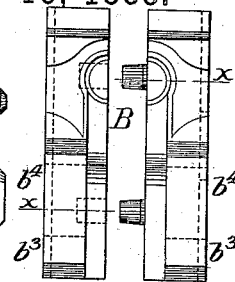


FIG. 6.

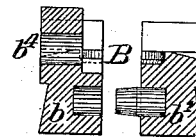


FIG. 7.

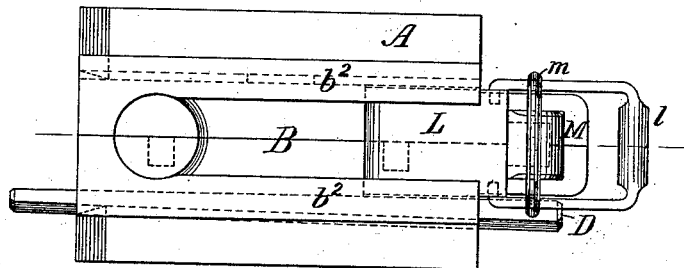


FIG. 13.

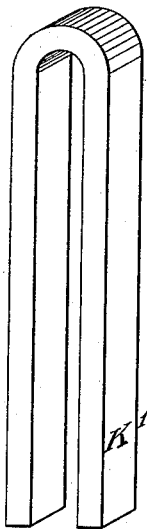


FIG. 16.

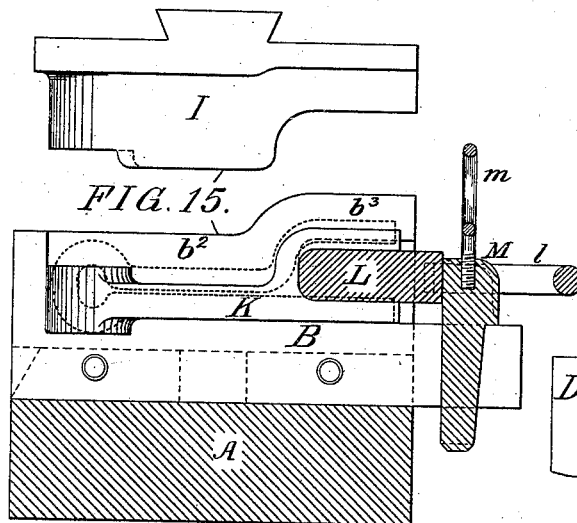


FIG. 15.

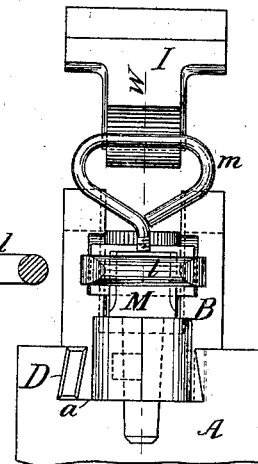


FIG. 14.

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UNITED STATES PATENT OFFICE.

DAVID H. DOWNES, OF PULLMAN, ILLINOIS.

FORGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 383,047, dated May 15, 1888.

Application filed March 24, 1888. Serial No. 268,403. (No model.)

To all whom it may concern:

Be it known that I, DAVID H. DOWNES, a citizen of the United States, residing at Pullman, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Forging-Machines, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a plan view of a die for a forging-machine embodying my invention; Fig. 2, a section of the same, taken on the line *z z* of Fig. 1, and with the upper die also shown on a similar section and the movable parts being illustrated in different positions by dotted lines; Fig. 3, a detail side elevation of the gage-bar detached; Fig. 4, an end elevation of the same; Fig. 5, a transverse section of the dies, taken on the line *y y* of Fig. 2; Fig. 6, a plan view of the lower die modified in form and the two parts of the die separated somewhat; Fig. 7, a section of the same, taken on the line *x x* of Fig. 6; Fig. 8, an elevation showing one-half of the said die and a section of the corresponding upper die; Fig. 9, an end elevation of the upper die; Fig. 10, side and edge elevations of the mandrel for this modification; Fig. 11, a perspective view of a blank bent in the rough ready for the dies; Fig. 12, a similar view of a hanger finished in my dies; Fig. 13, a plan view of a lower die, showing another modification; Fig. 14, an end elevation of the same, together with the corresponding upper die; Fig. 15, a vertical section of the same, taken on the line *w w* of Fig. 4, but with the upper die shown in elevation; and Fig. 16, a perspective view of a blank doubled and ready for the last-named dies.

My invention relates to certain improvements in die-forging, whereby articles which are partly divided at one or more points are readily formed in the dies, and at the same time the general direction of the metal fiber is maintained.

The object of my improvements is to obtain a simple, speedy, and cheap way of making the kind of articles mentioned, and at the same time provide for superior strength and finish in the articles themselves. I accomplish these results by bending a metal bar of suitable size to form the desired article over upon itself,

and afterward forming the article from this doubled piece in forging dies of suitable shape and provided with a mandrel at the point of division, whereby the two parts of the doubled bar are securely welded together, and at the same time the proper shape given to the article.

My improvements therefore relate to the dies themselves, which may be used in any ordinary machine for die-forging; hence I have shown in the drawings only the dies and die-blocks, it being unnecessary to illustrate and describe the entire forging-machine, none of the other parts of which have any special relation to my invention.

I will proceed to describe the means by which I have carried out my invention in a practical way, and will then point out definitely in claims the special improvements which I believe to be new and wish to secure by Letters Patent.

In the drawings, A represents the die-block for the lower or female die, which is provided with a suitable seat, *a*, for the die, which in this instance is shown as a dovetailed recess.

In Figs. 1, 2, and 5 of the drawings dies are shown for the manufacture of hangers with a closed loop at one end, the rest of the hanger being straight. The lower or female die, B, is divided longitudinally, being composed of two parts, *b b'*, the lower portions of which are constructed to correspond with the seat in the die-block, but of not sufficient width to entirely fill the opening. These two parts may be joined by dowel-pins, or any other suitable means which will permit ready separation. The inside faces are cut down so as to provide a ledge, *b²*, on each half of the die, which together, when the two parts are united, make the bed of the die, as seen in Figs. 1 and 5 of the drawings. The cheeks of the die are considerably enlarged or extended upward to make projections *b³* at the rear end, and these projections are provided with openings *b⁴* a little above the bed of the die, and shaped substantially like the loop which is to be formed in the hanger. A mandrel, C, is provided, which is of the same shape and dimensions in cross-section as is desired for the loop in the hanger, and is fitted to be passed through the openings in the cheeks of the die from one

side to the other. The mandrel may be provided with a handle, *c*, for convenience of manipulation. A key, *D*, is formed of suitable shape and size to exactly fill the remaining space in the die-seat when the die is placed in position, so that when the two parts of the die are placed in the recess this key may be thrust in to fill the remaining space at one side, as shown in Fig. 5 of the drawings, and thus properly seat the die and secure it to the die-block. At the rear end of the die-block is a rock-shaft, *E*, upon which is rigidly fastened a cam, *e*, directly opposite the opening between the cheeks of the die. This shaft also has arms *e'* securely fastened to it near its respective ends, and at one end is provided with a crank or lever, *e''*, by means of which it may be oscillated. A second rock-shaft, *F*, is mounted in the outer ends of the cam *e* and the arms *e'*, and is provided with a second cam, *f*, secured to it at the point of bearing in the end of the cam *e*. This shaft is also provided at one end with a crank or lever, *f'*, by means of which it may be independently oscillated. A gage, *G*, is mounted upon an arm, *g*, secured to the die-block in any suitable way. In the drawings, Figs. 3 and 4 represent this gage and arm upon an enlarged scale, and the arm is provided with a shank, *g'*, depending from one end, which is adapted to fit in a suitable socket on the end of the die-block, as shown in Fig. 2 of the drawings. The gage is fastened to the arm at any desired point by means of a loop or staple, *g''*, passing over the shank of the gage and secured by a wedge-pin, *g'''*, passing through its ends underneath the gage-bar.

Now, in operation the die-block will of course be properly mounted in any suitable machine for die-forging, and the female die, described above, is properly seated in the block, as already described. The gage is fixed at the proper point to give the desired length to the finished hanger, and the jointed cams are thrown back in the position shown in dotted lines indicated by 1 in Fig. 2 of the drawings. A straight bar of iron, *H*, of the proper length is then laid in the die, one end resting against the gage and the other projecting out through the rear of the die and over the jointed cams. The mandrel *C* is then inserted through the cheeks of the die, as shown in Fig. 1 of the drawings, and will rest immediately upon the bar, as shown in Fig. 2. The lever *e''* is then thrown up into the position indicated by the dotted lines marked 2 in Fig. 2 of the drawings, which movement will of course turn the cam *e* up into the position shown in full lines in the same figure, and this bends the projecting end of the bar upward upon the first face of the mandrel, as seen in Fig. 1 of the drawings. The lever *f'* is at this time in the position also indicated by dotted lines marked 2 in the said figure. It is then thrown forward and downward into the position indicated by the dotted lines marked 3, thereby turning the cam *f* forward and downward into the position shown in full lines, and

thus making a second bend in the end of the bar and bringing it down upon the second or upper face of the mandrel, as illustrated by Fig. 2 of the drawings. A loop is thus formed at one end of the bar, and the free end, which has been bent over around the mandrel, projects forward from the latter, lying upon the upper side of the bar in the die. The bending-cams are then thrown back out of the way and the upper or male die, *I*, which is properly mounted in the drop of the machine, is brought down upon the female die, as shown in dotted lines in Fig. 2. It will be understood, of course, that the bar is at a proper heat for forging—it must be at a welding heat. The action of the dies when thus brought together forges the loop around the mandrel, perfectly and completely filling up the space immediately in front of the die represented by the little triangular opening in Fig. 2 of the drawings, as the metal is crowded in toward the mandrel and forced around the front edge, so as to make a perfectly-formed loop. At the same time the two thicknesses of the bar are completely and perfectly welded together, thus making a complete hanger at one heat. It will be seen, also, that the natural direction of the fibers of the metal has not been materially disturbed, so that substantially its full strength will be found in all parts of the hanger. When the drop is raised, the mandrel can be readily pulled out from the die, and if there is any sticking the die key is removed, which permits the two parts of the die to be separated to obviate this difficulty. Fig. 12 shows a similar hanger, the shape of the loop being different. It may be made in like dies by suitably changing the shape of the mandrel.

The remaining figures of the drawings are simply for the purpose of illustrating the application of these improvements to dies of different forms for the purpose of making different articles.

Figs. 6 to 10 show a die for making a hanger with a forked end, instead of a loop, like that just described. The shape of the hanger *J* will be seen in Fig. 8 of the drawings, where it is shown in the dies after the drop. In this instance a blank, *J'*, is first formed by bending or doubling a suitable bar upon itself, as shown in Fig. 11. The ends of this blank are shown bent in this figure; but they may just as well be straight. The mandrel in this instance is of a form corresponding to the opening desired at the forked end of the hanger, and the point at which it is inserted in the die is near the front end, being passed through the cheeks, as before, and lying between the two free ends of the blank, as seen in Fig. 8 of the drawings. The operation of welding the two parts of the blank together and forming the forked hanger is practically the same as in the former case, and will be understood without any further description.

The dies shown in Figs. 13 to 15 are adapted to make a hanger, *K*, which also has a fork at

one end, but with one of its jaws straight and the other bent, as seen in Fig. 15 of the drawings. In this instance the mandrel L is introduced at the front of the die, the apertures or openings in the cheeks of the die for the reception of the mandrel being suitable recesses or notches cut in at their front ends. In this instance a bent blank, K', is prepared substantially as shown in Fig. 16 of the drawings. This is laid in the lower die, and the mandrel is introduced between the opened ends, as seen in Fig. 15 of the drawings, and is held in place by a key, M, passing down through a socket formed in the projecting ends of the lower portion of the die, as seen in Figs. 14 and 15 of the drawings. The mandrel L is provided with a handle, Z, and the key M with a handle, m, for convenience of manipulation. The operation of these dies will be readily understood without further explanation.

The bending devices are not attached to the two sets of dies last described; but they may be provided, if desired. In all cases the bending devices may be attached to the dies, so as to do the bending on the same device; or they may be entirely dispensed with, in which case the bending is done upon a separate machine.

In all instances it will be seen that the principle of operation is the same. The material of which the article is composed is bent or folded upon itself, and the two parts are then firmly welded together, while at the same time the divided or separate portions of the folds are properly formed around a removable mandrel. This principle of operation is applicable to a large variety of articles; hence I do not limit myself to the production of any particular article, such as any one of those shown and described.

I have herein illustrated my invention as applied to the production of certain articles; but I wish to be understood as claiming the invention in the manufacture of all articles to which it is applicable in its broad features.

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

1. A forging-die provided with transverse openings, in combination with a removable mandrel adapted to be inserted in the die and across the seat thereof by inserting it in said openings, substantially as and for the purposes specified.

2. The two-part die B, provided with transverse openings *b'*, in combination with the mandrel C, adapted to be inserted at will in said openings, and the male or drop die I, substantially as and for the purposes specified.

3. A die, B, in combination with a removable transverse mandrel, C, and a bending cam or cams attached to the die and arranged to bend the metal over the mandrel, substantially as and for the purposes specified.

4. The die B, in combination with the removable transverse mandrel C, and the jointed swinging bending-cams *e* and *f*, substantially as and for the purposes specified.

5. The die B, in combination with the rock-shafts EF, provided with suitable hand-levers, and the bending-cams *e* *f*, secured to the respective shafts, substantially as and for the purposes specified.

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Witnesses:

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