

No. 613,269.

Patented Nov. 1, 1898.

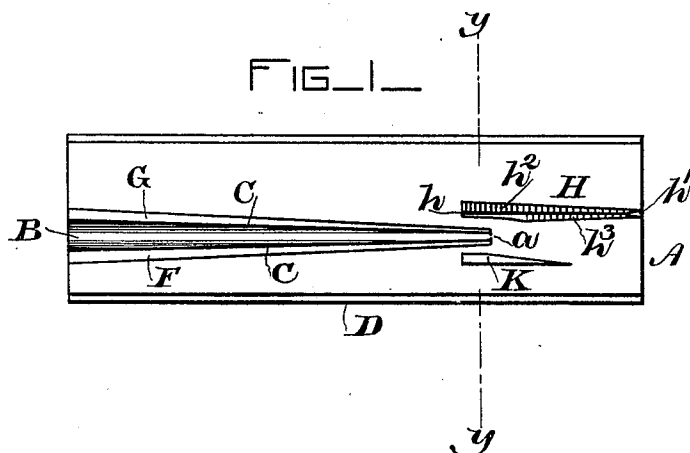
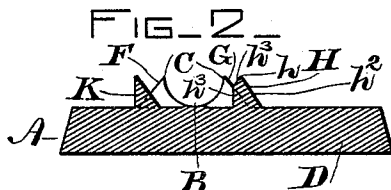
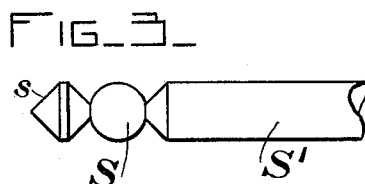
G. H. HATHORN.

DIE FOR FORGING ARTICLES CIRCULAR IN SECTION.

(Application filed Jan. 13, 1898.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES

C. Kitching.
A. Orme.

INVENTOR

George H. Stathorn,
By his attorneys,
Phillips & Anderson

No. 613,269.

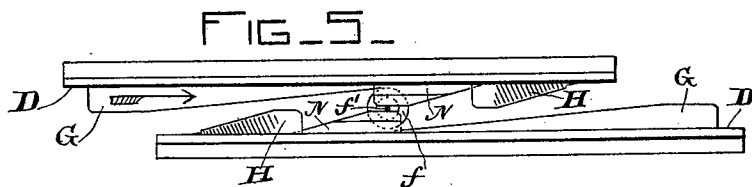
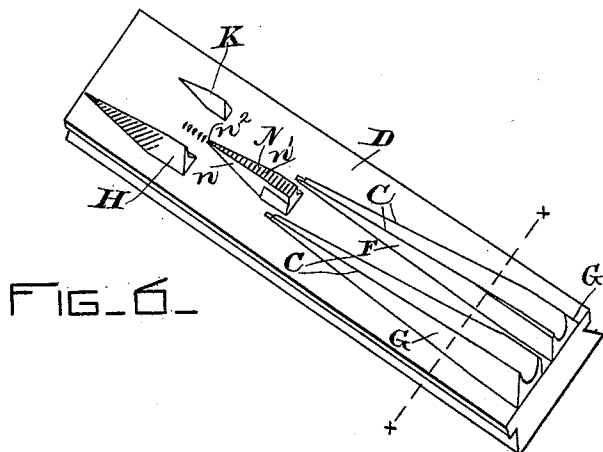
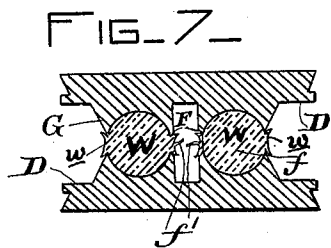
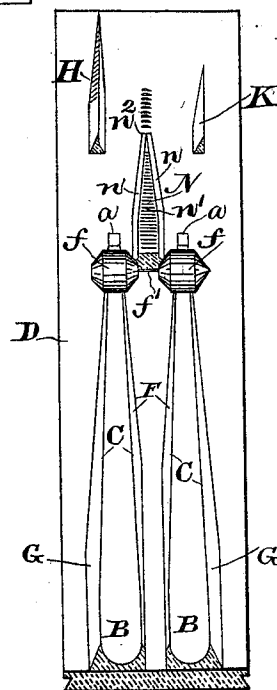
Patented Nov. 1, 1898.

G. H. HATHORN.
DIE FOR FORGING ARTICLES CIRCULAR IN SECTION.

(Application filed Jan. 13, 1898.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:

Flora L. Hathorn.
Gertrude M. Ellis.

Inventor.

George H. Hathorn
Phillips & Henderson
Attorneys.

UNITED STATES PATENT OFFICE.

GEORGE H. HATHORN, OF BANGOR, MAINE.

DIE FOR FORGING ARTICLES CIRCULAR IN SECTION.

SPECIFICATION forming part of Letters Patent No. 613,269, dated November 1, 1898.

Application filed January 13, 1898. Serial No. 666,541. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. HATHORN, a citizen of the United States, residing at Bangor, in the county of Penobscot and State of Maine, have invented certain new and useful Improvements in Dies for Forging Articles Circular in Section; 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.

The present invention relates generally to improvements in dies for forging articles circular in section either from a plastic metal or from other suitable metals—such, for example, as steel heated to a plastic condition.

The present invention more particularly relates to improvements in that class of dies for the purpose above noted which are adapted to operate upon a cylindrical bar, as shown in British patent to Bundy, No. 2,932, of 1806. In the operation of dies of this class as the cutting edges of the die enter the bar the inclined flanks, the intersection of which with the forming-channel forms the cutting edges, act to press or push away the surplus metal not required for the finished forging, such action occurring longitudinally of the bar—that is, in the direction of its axis. When the ball or other forging is formed directly from the bar, as heretofore practiced with this class of dies, this pushing or spreading action of the flanks of the die is resisted upon one side by the rod from which the forging is being formed and on the opposite side only by the waste, which is relatively small and light and yields more readily to the action of the flanks of the die. The resistance upon opposite sides of the die being unequal, there is a tendency to draw out the central portion of the bar as the dies enter it in the direction of the least resistance, and in this way either to make the finished forging hollow or “piped” or so badly strained along its polar axis as to materially weaken it. Several devices have been suggested in the prior art to remedy this objection—such, for example, as relieving that portion of the forming-channel which contacts with the equatorial zone of the forging; but in so far as I am advised of the art such devices have been ineffectual and the

best results have been secured with dies similar to Bundy dies, but run with a heavy waste—that is to say, caused to act on the bar at such a distance from the end that the waste produced was relatively long and heavy.

The object of the present invention is to obviate the difficulty above suggested and to produce a sound forging with a relatively light waste, and, further, to provide for the use of a plurality of forming-channels in each die, so that the balls or other forgings instead of being formed singly from the bar, as has heretofore been the practice with dies of this class, shall be formed simultaneously in groups of two or more, thus greatly increasing the capacity of the forging-machine.

To the above end the present invention consists of the improvements in form and arrangement of the working parts of dies for forging articles circular in section hereinafter more specifically set forth and claimed.

The present invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a ball-die having a single forming-channel embodying the present invention. Fig. 2 is a section on line *y y*, Fig. 1. Fig. 3 is an illustration of prior art, showing in side elevation a ball partially formed by the old method with its waste-piece and a portion of the rod attached. Fig. 4 is a plan view of a ball-die with two forming-channels also embodying the present invention. Fig. 5 is a side view of a pair of dies in operative position, each involving the structure illustrated in Fig. 4. Fig. 6 is a perspective view of the die structure illustrated in Fig. 4; and Fig. 7 is a section on line *x x*, Fig. 6.

Similar letters of reference indicate like parts in the several views.

Referring more particularly to Figs. 1 and 2 of the drawings, A represents a die which for the purposes hereinafter described and for ready adjustment in the forging-machine is conveniently mounted upon the base D. The die A is provided with the forming-channel B and the inclined flanks F and G, which intersect the forming-channel B to form the cutting edges C of the die, all of which parts are of the usual form and constitute no part of the present invention.

In accordance with the present invention I provide a cutter positioned in advance of the die, which cuts from the bar from which the forging is to be made a piece of metal of sufficient length to form the forging, said piece being severed or substantially severed from the bar before it is engaged by the die, so that during the operation of the inclined flanks of the die forcing away the surplus metal the resistance upon both sides of the die is equal and there is no tendency to draw the center of the forging, as before described.

As shown in the drawings, I secure the above-noted result by providing an auxiliary cutter H, which is mounted upon the base D, and the cutting edge h of which is substantially parallel with the line of motion of the dies. The cutter H is preferably wedge-shaped in section, and its cutting edge h slopes in the direction of its entering end h' toward the base D, so that the cutter gradually enters the metal, its inclined sides h^2 and h^3 acting to spread the metal on each side of the point where the cut is being made. I find in practice that the inner inclined face h^3 of the cutter H has a tendency after the piece is severed or nearly severed from the rod to force it out from a proper position to be engaged by the dies, and for this reason I find it preferable to relieve the rear portion of the inner face h^3 of the cutter H, so that when the severing-point is reached it stands approximately vertical and its tendency to force the severed piece outward is greatly reduced. I also find it desirable to provide in practice what I have herein termed a "guard" K, which is located on the opposite side of the forming-channel B from the cutter H and is disposed substantially parallel therewith, its function being to engage the free end of the piece which is being cut from the bar, so that when severed it will be retained in proper position to be engaged by dies.

The guard K may be and conveniently is of the same general shape as the cutter H, except that I find no necessity for relieving its inner face, and the outer face may be substantially vertical, its shape or inclination being immaterial.

The rear end of the guard K is conveniently laterally in line with the rear end of the cutter H; but the guard K is preferably shorter than the cutter H, since there is no necessity that the outer end of the piece from which the ball is to be formed should come in contact with the guard K until it has been partially severed from the rod. The cutter H may, if found necessary, be jagged or corrugated to insure the rotation of the bar, as suggested in the patent to Bundy hereinbefore referred to. The entering end h' of the cutter H is preferably blunt or squared, for a purpose hereinafter described in connection with the die. It will be noted that the die A is formed with a blunt or squared entering end a , which, while not an essential feature of the present invention, I consider of great import-

ance and which is applicable to dies of this type not having the cutter or guard, its function being to center the rod to insure its presentation at a right angle to the path of motion of the dies.

Of course it will be understood that the form and arrangement of die and its cutter and guard, which coöperate with die A, are the same as heretofore described.

The operation of my invention as illustrated in Figs. 1 and 2 of the drawings is described as follows: A pair of dies similar to A being arranged in a forging-machine in the usual manner and set in motion to pass each other longitudinally with a parallel movement, as is usual in operating this class of dies, a rod of metal heated to the proper temperature is presented to the dies from the side on which the cutter H is located and projected beyond said cutter sufficiently to make the piece to be severed of sufficient length (slightly greater than the diameter of the ball) to form the forging. As the dies pass each other after the rod has been presented thereto, as above stated, the cutter H on each die enters the metal and as the rod is rotated by the action of the dies cuts into the same, and when the piece of which the forging is to be formed is partially cut off the guard K on each die engages its outer end and the piece is rolled along or rotated upon its own axis between the cutters and guards until the rear ends of the cutters H pass each other, (the cutters H then being approximately in contact,) when the piece is severed from the rod. Just before this severing occurs the piece is engaged by the entering ends of the dies and the forging is completed in the usual manner, the inclined flanks of the dies pushing away the surplus metal not taken into the forming-channel.

In Fig. 3, which, as before stated, illustrates the prior art, S represents an unfinished ball, s its waste, and S' the rod, and a comparison thereof with the unfinished balls W and their waste w as formed by dies involving the present invention, as shown in Fig. 7, would seem to be sufficient, in view of what has been heretofore said, to demonstrate the marked advantage of my improved dies.

In the modification of the present invention illustrated in Figs. 4, 5, 6, and 7 each die is provided with two forming-channels B, each having inclined flanks F and G and cutting edges C, and placed at sufficient distance apart to keep the waste from the two balls which are being simultaneously formed, as hereinafter described, from crowding against each other. The flanks of the forming channel or die proper are raised above the plane surface of the base D, which is provided for convenience in securing the dies in the machine and as a support for coöperating devices hereinafter described.

It has heretofore been found to be impractical to form with this class of dies more than one ball at a pass, although it is evident that

to form two balls simultaneously doubles the output of a machine and effects a great saving in the cost of the product.

The difficulty heretofore encountered when it has been attempted to make more than one ball at a pass with dies of this class has been that the metal which is being crowded away from one forming-channel reacts against the metal being crowded away from the other forming-channel, and such reaction is sufficient to prevent the successful operation of the die. By my present invention I have obviated this difficulty by spreading the metal axially and separating the portions of metal to be forged in the respective forming-channel, so that the waste pieces cannot react upon each other. As illustrated in the drawings, I secure this result as follows: Located between the entering ends of the forming-channels B is what I have termed a "spreader" N, which is mounted upon the base D, the rear end thereof being slightly to the rear of the entering ends of the channels B, (which are laterally in line with each other,) and which extends forward to a point slightly in advance of the rear ends of the cutter and guard. The spreader N is provided with inclined flanks n , but as distinguished from the cutter H is preferably flattened on top to facilitate its spreading action, the flattened portion being preferably substantially parallel with the upper surface of the base D from the rear end of the spreader to a point n' toward its entering end, from which it gradually slopes off toward the base D, terminating in a blunt point n^2 , preferably raised very slightly above the base D. The flattened surface of the spreader N may be, if found necessary, provided with corrugations to insure the rotation of the portion of the rod which is acted upon by the same. Of course it is understood that the spreader N on each die is of the same form and similarly arranged, and the elevation of each spreader N is such that as their rear ends pass the portions of metal on opposite sides thereof will be severed or preferably the portion of the bar from which the respective forgings are to be made will be brought to what may be aptly termed a "dumb-bell" shape, substantially as illustrated in Fig. 4 of the drawings, in which f represent the blanks from which the forgings are to be made, and f' represents a relatively narrow neck or stem, whereby the same are connected similar to the handle of a dumb-bell.

While I do not wish to limit the present invention to a form and arrangement of the spreader which will secure the specific result last above described, I find the same in practice to be preferable to any other construction known to me, for the reason that while it in no way impedes the operation of the inclined flanks in pushing away the metal not required in the finished forging the relatively small neck or stem above referred to keeps the respective portions of the blank in their

proper relative position and insure their proper entering to the forming-channels.

The cutter H and guard K may be and conveniently are in this modification of my invention substantially the same in form and arrangement as the cutter and guard heretofore described, except that they are set at sufficient distance apart to permit the cutters to sever from the bar a portion of sufficient length to form both forgings, as hereinafter described, and that in the present modification the cutter and guard stand in the same relative position to the spreader that they did in the first-described construction to the forming-channel of the die. I desire to say in this connection that I do not consider the present invention as limited to its application to a ball-die, as the same is equally applicable to dies for making boot-calks or other articles circular in section, and I desire to say, further, that with slight variations in construction requiring mere mechanical skill three or more forming-channels may be used.

The operation of my improved dies, as illustrated in Figs. 4, 5, 6, and 7, requires but little explanation in view of the foregoing description of the form and arrangement thereof. The cutters H operate upon the rod to cut off a portion thereof, the outer end of which is engaged by the guards K to keep it in position just as hereinbefore described. Just before the portion above referred to is severed from the rod it is engaged at or near its center by the spreaders N, so that it is held by the spreaders before it leaves the guards and cutters, no opportunity being given for the severed portion to become displaced, and thus prevent the proper operation of the dies. The spreaders N, entering the metal of the severed portion of the rod, as above stated, bring it into the dumb-bell shape before referred to, forming upon opposite sides of the spreaders a blank to be forged to the proper shape in each forming-channel, said blanks being spread apart far enough to properly enter said channels, which are parallel and so placed with reference to each other that the operation of the inclined flanks of one in pushing off the surplus metal from the blank will not interfere with the operation of the flanks of the other.

Having thus described my invention and its mode of operation, I claim as novel and desire to secure by Letters Patent of the United States—

1. In a die for forging articles circular in section, the combination with a forming-channel for forming the finished forging, of inclined flanks acting to spread the surplus metal axially away from the forming-channel, and an auxiliary cutter in advance of the entering end of the die, arranged to sever the rod or blank, at or near the time of its engagement by the forming-channel, to equalize the resistance to the spreading action of the flanks, substantially as described.

2. In a die for forging articles circular in

section, the combination with a forming-channel for forming the finished forging of inclined flanks acting to spread the surplus metal axially away from the forming-channel,

5 an auxiliary cutter in advance of the entering end of the die arranged to sever the rod or blank, at or near the time of its engagement by the forming-channel, to equalize the resistance to the spreading action of the flanks, and a guard arranged to engage the end of the rod and to cooperate with the cutter to maintain the severed portion in position to be properly engaged by the forming-channel, substantially as described.

15 3. In a die for forging articles circular in section, the combination with a plurality of forming-channels having independent entering ends, of a spreader located between such channels and extended in front thereof,

whereby the portions of the rod or blank to be formed in each channel are spread apart before entering the same, substantially as described.

4. In a die for forging articles circular in section, the combination with a plurality of forming-channels having independent entering ends, of a cutter and spreader arranged to sever a portion from the rod or blank and elongate said severed portion before it is engaged by the forming-channels, substantially as described.

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

GEORGE H. HATHORN.

Witnesses:

A. E. WHYTE,
A. O. ORNE.