

(No Model.)

2 Sheets—Sheet 1.

J. W. BOWERS.

# MACHINE FOR PUNCHING THE EYES OF AXES AND SIMILAR TOOLS.

No. 296,818.

Patented Apr. 15, 1884.

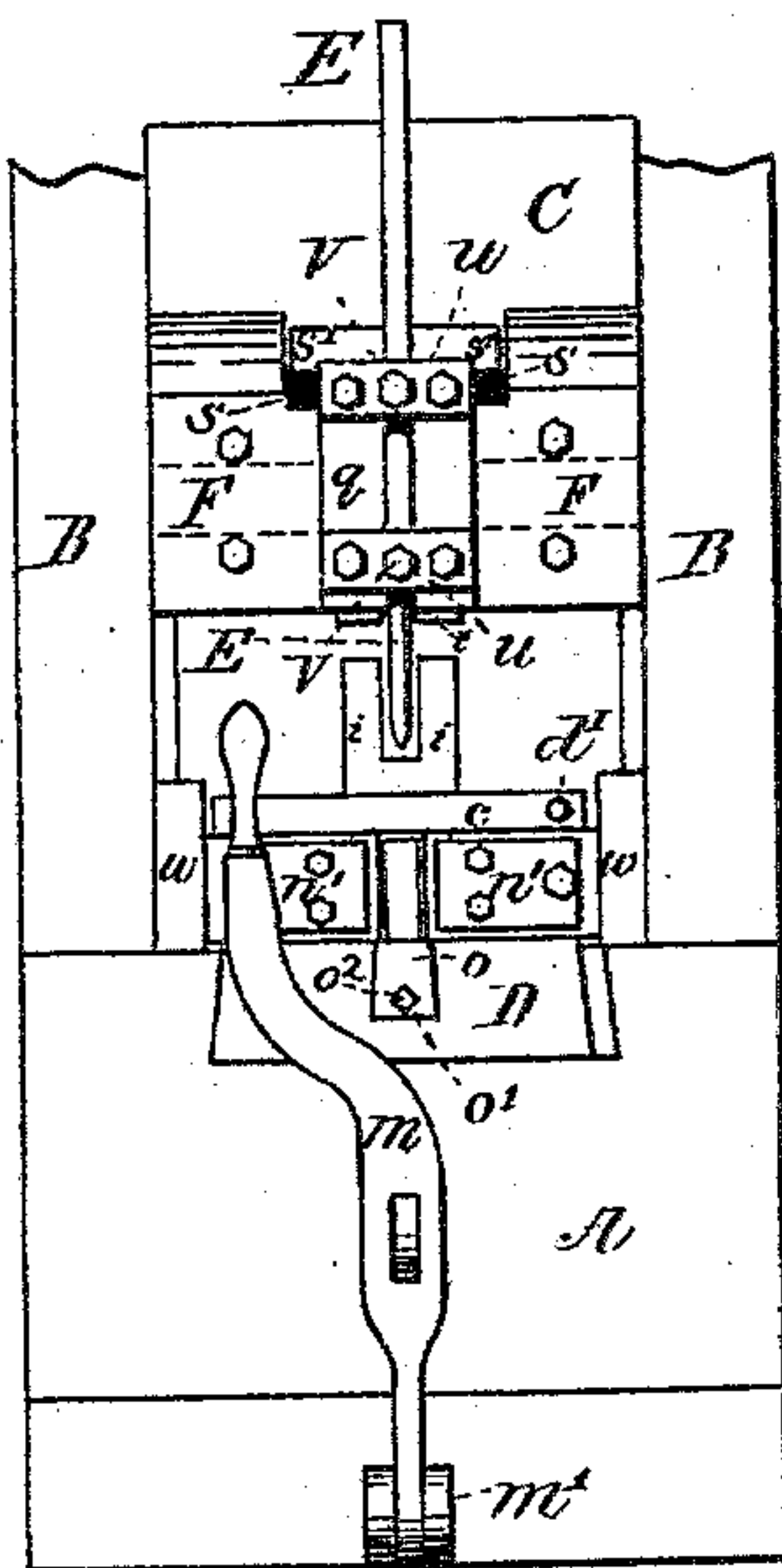


FIG-1.

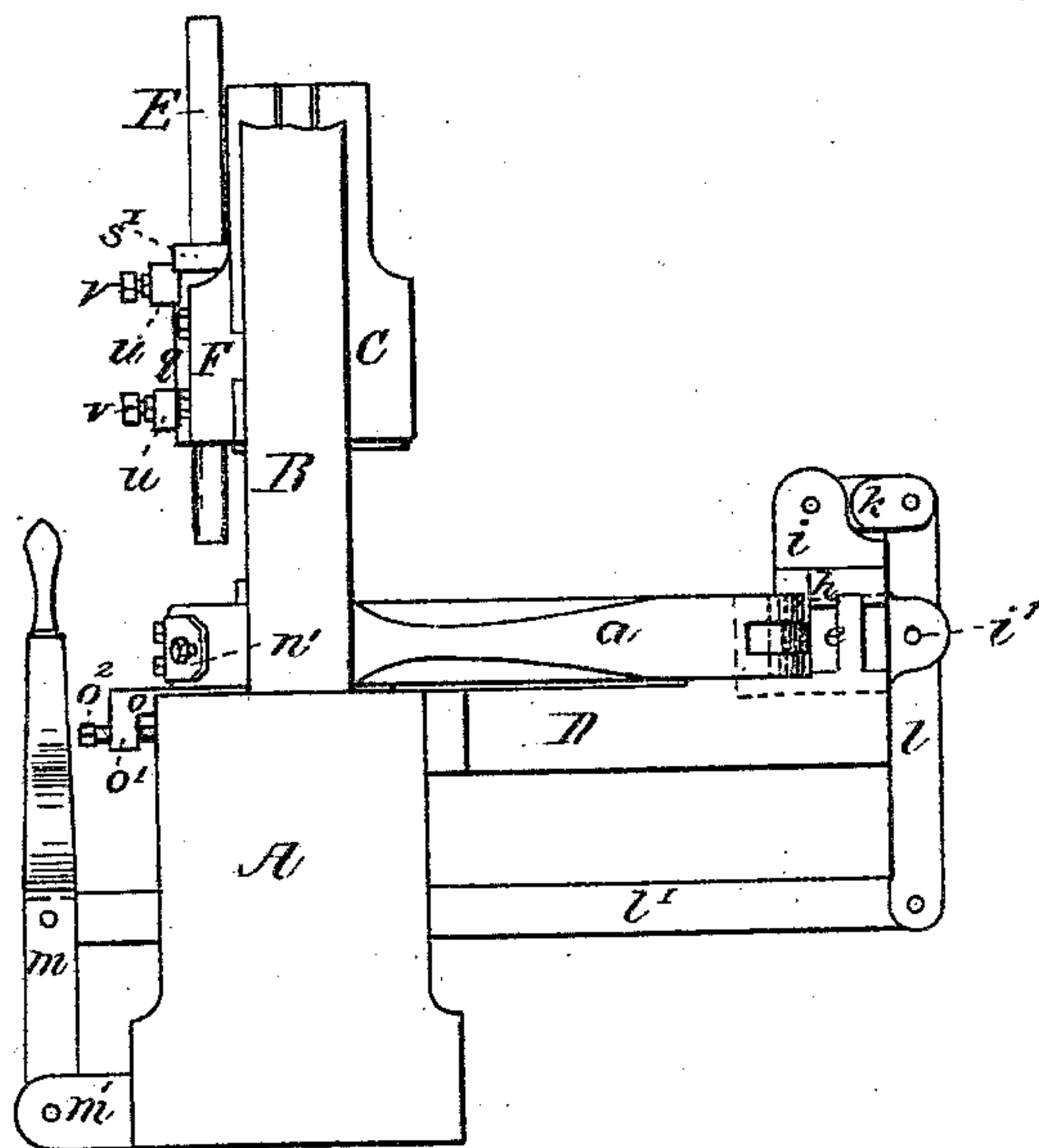


Fig-2-

WITNESSES

John T. Kemmerk.  
Frank Q. Melcher.

INVENTOR

John W. Bowen

(No Model.)

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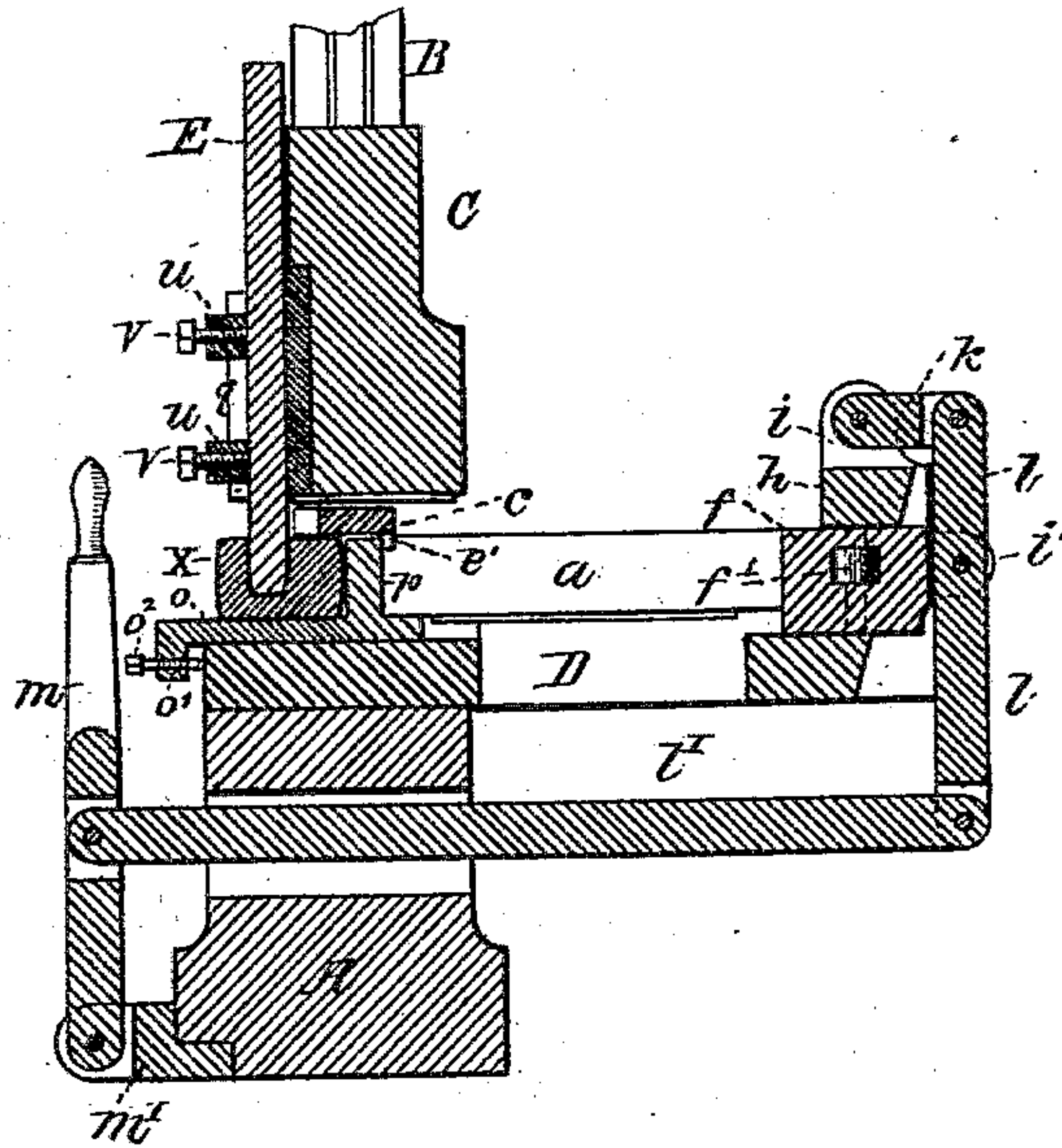


FIG-3-



Fig-6-



Fig-7-

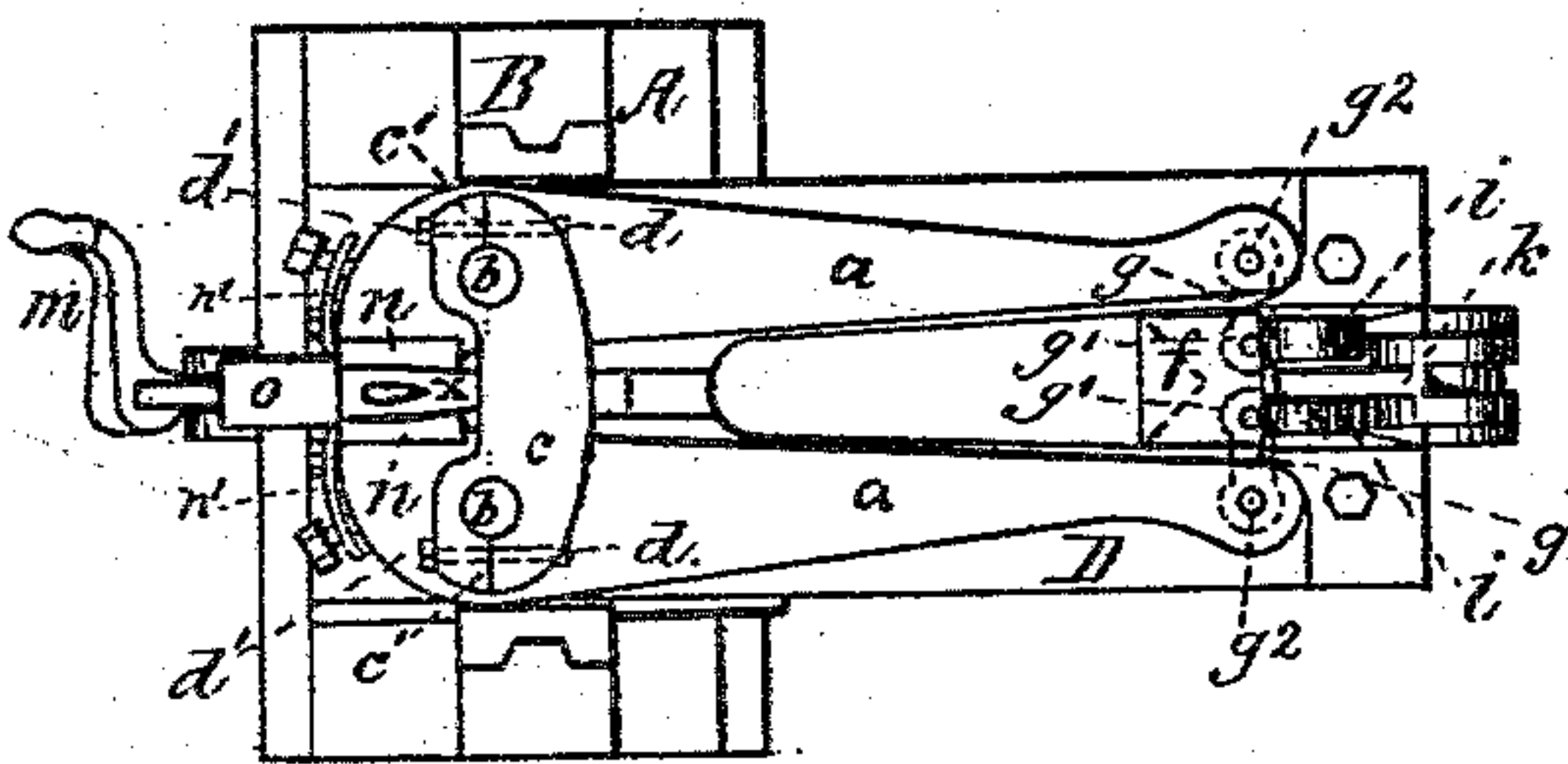


Fig-4-

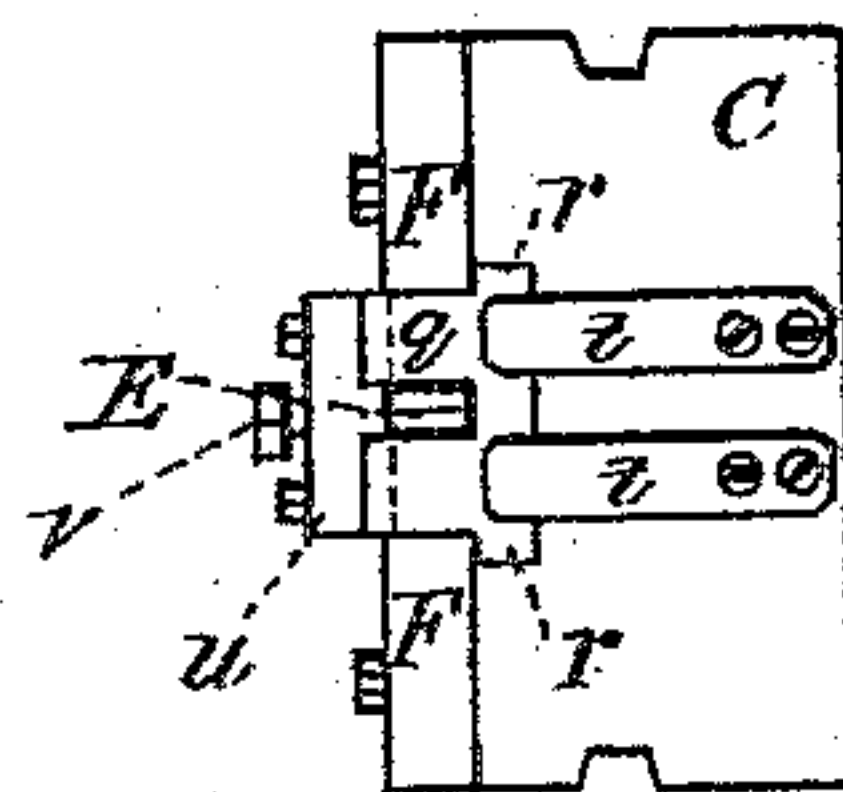


Fig-5-

WITNESSES

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Frank Q. Melcher.

INVENTOR

John W. Bowers



# UNITED STATES PATENT OFFICE.

JOHN W. BOWERS, OF FRANKLIN, ASSIGNOR TO THE DOUGLAS AXE  
MANUFACTURING COMPANY, OF BOSTON, MASSACHUSETTS.

MACHINE FOR PUNCHING THE EYES OF AXES AND SIMILAR TOOLS.

SPECIFICATION forming part of Letters Patent No. 296,818, dated April 15, 1884.

Application filed May 3, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN W. BOWERS, of Franklin, in the county of Norfolk and Commonwealth of Massachusetts, have invented a new and useful Improvement in Machines for Making the Eyes of Axes and Similar Articles, of which the following is a specification.

My invention relates to machines for making axes and similar articles; and it consists in improvements in what are known as "drop-hammer" machines to be used for forming the eyes of axes, pickaxes, &c.

Prior to my invention the eyes of ax-polls and similar articles have been made by forcing a punch through the blank by various contrivances—for instance by placing the end of a bar of metal between jaws, which as they descend squeeze the metal into the desired form for the ax-poll, and immediately thereafter, as the said jaws descend farther, force the poll down upon a pin rigidly fixed below, thereby punching the eye nearly through from that side, and then by raising the jaws release the blank, which is then reversed and the operation repeated, whereby the eye is punched, as set forth in the patent of Dodge, No. 31,660, dated March 12, 1861. The eye is then more perfectly formed by the operation of a third pin. Also, by placing the blank between two punches, arranged one above and the other below in the same line, in a vertically-sliding frame which is caused to reciprocate by means of projecting teeth on a pair of rollers acting upon lugs on the sides of said frame, and by this means partially form the eye and afterward finish it by repeated thrusts of another punch, substantially as set forth in the Donald Patent No. 133,360, dated November 26, 1872. In the manufacture of some tools also a punch is driven through the blank and the metal drawn down to the proper thickness around this punch, or an eye-pin under a trip-hammer. So far as I am aware, however, the eyes of axes, pickaxes, and similar articles have never been made in a drop-hammer machine, and my invention consists in the combination with such machines of the devices hereinafter described.

This machine is intended for use in connec-

tion with that embodying my improved dies described and claimed in the specification accompanying my application, sworn to on the 19th day of February, 1883, and filed in the Patent Office on the 23d day of said February. After the pattern has been operated upon by my said improved dies, producing a poll of the form shown at Fig. 6 of the drawings, it is placed upon one edge with the head toward the front between the clamps of the machine herein described, there gripped firmly and the eye punched, which operation forces the metal at the thin part of the poll out against the gripping-faces of the clamps, and thereby gives it a substantially perfect shape.

My improved punching-machine consists of a pair of levers, which are pivoted near their front or gripping ends to a bed-piece, which are keyed to the anvil of a drop-hammer machine, and which serve as clamps to firmly hold the poll while it is being punched. I have found that in order to get the desirable amount of gripping power between the front ends of these levers, the length which they project in front and in the rear of their pivots should be in the proportion of about one to five. By a system of levers controlled by a handle pivoted to a lug on the front of the anvil-block I operate a pair of toggles, which are pivoted to the rear ends of the said clamping-levers. The gripping-faces of these clamps are removable dies, having a form which is the counterpart of that desired for the side of a finished ax-poll or other article. They may be adjusted by placing shims of metal behind them, and are held in place by means of clamps on the front of the gripping ends of said levers, made adjustable so as to accommodate dies of varying dimensions. In the front side of the hammer of the machine I make a slot or mortise, into which is fitted a tool-stock for holding the punch used for forming the eye. This tool-stock is held in place in the said mortise by means of two adjustable gibs, which serve as stops, one on each side of the said stock, secured to the front of the hammer by bolts, which bear against a tongue projecting from either side of the said stock. These tongues do not extend entirely to the top of the stock,



but a shoulder is left at the top on each side, which strikes upon the top of the said gibs or stops when the stock is at its lowest position, they being made short enough to allow the said tool-stock to slide vertically up and down within a short range of movement. In order to keep the said stock at its highest position—that is, so that the top thereof shall bear against the upper face of the said mortise in the hammer—it is supported by one or more springs, which, for the sake of convenience, I attach to the lower face of the hammer, and have them bear against the lower side of the tool-stock, by which means it is held firmly against the hammer when it is dropped in the operation of punching the eye of the ax or other article. The object of giving the said tool-stock the capability of a vertical sliding movement in the hammer is to relieve the strain upon the devices which raise the hammer, for when the punch by the drop of the hammer has been forced into and nearly through the metal of the ax or other article held firmly between the said clamp-levers, it will require a great amount of power to withdraw the punch therefrom if applied with a steady continuous pull; but by percussion the punch can be readily removed. Therefore the spring beneath the tool-stock should have a strength only a little more than sufficient to raise the stock and keep it in close contact with the hammer, so that when the hammer begins to rise, after driving the punch into the metal of the ax or other article where it is tightly wedged, the resiliency of the spring will allow the stock to slide in the mortise in the hammer until the shoulders on the top of the stock strike upon the stops or top of the gibs which hold it in place. The hammer will then have acquired sufficient momentum to bring the said gibs into contact with the shoulders on the tool-stock with a sharp blow, which will readily knock the punch out of the metal of the ax-poll, and the spring will then carry the stock up to its normal position in contact with the hammer again.

My improved machine is intended for punching the eyes of axes and other articles which require to be spread laterally at the portion where the eye is to be formed, in order to completely fill the dies of the clamping-levers and bring the sides of such article to the proper shape; for if the ax-poll or other article completely filled the space between the faces of the dies in the gripping end of the clamps before the punching operation, it would require so great an amount of power and increase the cost of construction of the machines so much that it would not be an economical and practical method, all of which will readily appear from the drawings annexed to this specification and forming a part thereof, wherein—

Figure 1 represents a front elevation of my improved punching-machine; Fig. 2, a right-hand-side elevation; Fig. 3, a vertical section through the center of the machine; Fig. 4, a plan view of the machine with the hammer

and punch removed; Fig. 5, a view of the bottom of the hammer, showing the bottom of the tool-stock, and two springs, which hold it in place. Figs. 6 and 7, respectively, show the form of my improved ax-poll before and after it has been operated upon by the punching-machine.

Like parts of the machine in the different figures are designated by the same letters.

A is the base-piece or anvil of the machine; B, the upright standards, between which the drop-hammer is held and guided, represented in the drawings as broken off at the top.

C is the hammer.

D is the bed-piece keyed to the anvil A, and projects back therefrom a sufficient distance to support the rear ends of the clamp-levers *a*, which are pivoted to the bed-piece D at *b*, these pivots extending up through a yoke *c*, resting on top of the clamp-levers *a*. The pivots *b b* are held tightly by the top in the yoke *c* by slotting the yoke from the ends in to the pivot-holes, as indicated at *c'*, and then closing these slots by a bolt, *d*, running horizontally through the yoke at either end, and a nut, *d'*, screwed onto the end of each.

Back of the rear line of the anvil A, in order to lighten the bed-piece D and facilitate the escape of scale, it is cast with an oblong opening, which extends back nearly to the rear end thereof, where two upright projections, *e*, are cast upon it, one on each side, and extending through between these upright projections is a centrally-located slot or mortise, into which a block, *f*, is nicely fitted, which should be capable of sliding readily therein. Through this block *f* a mortise, *f'*, is cut horizontally through the block at right angles to its sides at the rear end of the mortise, and at an angle of about forty-five degrees with the sides of the block from the forward corners thereof to a perpendicular plane dividing the said block longitudinally in the center, thus making a mortise V-shaped at the forward end, as shown in dotted lines, Fig. 4, and straight across the rear end. In this mortise *f'* the ends of two short toggle-levers, *g g*, are pivoted at *g' g'*, the other ends of which are pivoted at *g" g"*, one to the rear end of each of the clamp-levers *a*.

On the top of the upright projections *e*, and extending across and overlapping the same, is a cap-piece, *h*, grooved out on its under side to shut over the outer edges thereof. On the top of this cap-piece *h* two ears, *i i*, project, in which is pivoted a short link, *k*, forked at its outer end. In the forked end of the link *k* a lever, *l*, is pivoted. This lever *l* extends down below the bed-piece D, so that its lower end is in line with about the middle of the anvil A. On the rear end of the block *f* two ears, *i'*, project, in which the lever *l* is also pivoted. The lower end of the lever *l* is forked to receive the end of an extensible connecting-rod, *l'*, which is pivoted therein. This connecting-rod *l'* extends forward through a



hole made in the anvil-block A, and is pivoted to an upright hand-lever, *m*, which is also pivoted at its lower end to a forked lug, *m'*, attached near the bottom of the anvil-block; and it will be seen that as the pivots in the lug *m'* and the ears *i* are the fixed points or unchangeable fulcrums of this series of levers, a movement of the hand-lever *m* toward and from the anvil will cause the lever *l* to vibrate back and forth on its pivot in the forked link *k*, and the block *f*, being pivoted to the lever *l* through the ears *i'*, will be caused to slide backward and forward in the mortise in the upright pieces *e*, and thus by means of the two toggle-levers *g g*, pivoted to the sliding block *f*, and to the rear end of each of the clamp-levers *a*, those ends of the levers will be vibrated toward and from each other as the block *f* slides backward and forward, which movement of the rear ends of the clamp-levers *a* will open and close the forward or gripping ends thereof.

*n n* are the removable and adjustable dies forming the gripping-faces of the clamp-levers *a*, and are held in place by adjusting-clamps, *n' n'*, on the front end of said levers. In the upper face of the bed-piece D a dovetailed groove is made in line with the space between the two gripping-faces of the clamp-levers *a*, extending from the front edge of the bed-piece back to the oblong opening beyond the anvil, its width being somewhat greater than the thickest ax-poll or other article which is ordinarily made. In this dovetailed groove a strip of steel, *o*, is accurately fitted, so as not to be liable to move merely by the jar of the machine, and is made long enough to extend back of the rear edge of the yoke *c*, and on its front end has a shoulder, *o'*, projecting down on the under side of it, through which is an adjusting-screw, *o''*, the end of which bears against the front of the anvil. An upright projection, *p*, is forged upon this steel strip *o* at a point far enough back of the gripping-faces of the clamps *a* to allow an ax, ax-poll, or other article, as the case may be, to be placed in the proper position between the said gripping-faces, and have the bit-end of the ax or poll rest against the said projection *p*. Small variations in the length of the article to be punched can be accommodated by the adjusting-screw, *o''*, and, to assist in holding the projecting stop *p* more firmly, its upper end extends into a slot, *p'*, in the yoke *c*. The strip *o* is made of steel, the better to resist wear.

*q* is the tool-stock, fitted in a mortise in the front of the hammer C, for holding the punch E. By means of tongues *r r*, Fig. 5, projecting laterally from each side of the stock *q*, at its rear edges, the said stock is held in place in the hammer by gibs F, bolted to the front side of the hammer on either side of the stock. Notches *s s* are cut in the top of these gibs on their inner edges, next the stock *q*, to allow space for the shoulders *s' s'* to move up and

down a short distance. Fastened to the bottom of the hammer C are one or more springs, *t*, Fig. 5, the ends of which project forward under the bottom of the stock *q*, and hold it up in close contact with the upper face of the mortise in the hammer. In the front of the stock *q* a central vertical groove is made to receive the punch E, and in order to hold the punch rigidly and securely in this groove, two or more cross-bars, *u*, are bolted to the front of the stock *q*, and by means of steel set-screws *v*, projecting through these cross-bars, the punch E is firmly held in place.

In order to break the shock of the blow of the hammer whenever its momentum is more than sufficient to force the punch into the metal-blank the proper distance, I place a block of hard wood, *w*, beneath the hammer on each side, between the standards B and the clamp-levers *a*, making these blocks high enough to project a little above the upper surface of the yoke *c*; but in place of these blocks of wood, an air-cushion or equivalent means may be used for this purpose. Such air-cushions or other equivalent means might also be used to assist in withdrawing the punch from the metal, in which case the punch might be rigidly held in the hammer; but I have found in practice that the sliding tool-stock is much more efficient and generally desirable, for the reason that if air-cushions or equivalent means are used to assist in withdrawing the punch from the metal after it has been driven into the blank, the blow of the hammer will have to be sufficiently in excess of the force needed to drive the punch, to also compress such air-cushions or other means.

*x* is an ax or ax-poll gripped between the clamp-levers *a* after it has been operated upon by the punch E. In Fig. 3 the ax-poll is shown with the punch in the position which it will occupy after the first blow, and the levers *m* and *l* are in the position which partially releases the pressure of the gripping-faces of the clamps *a* at the time when the punch is to be withdrawn. In Fig. 4 it is represented as it appears in the clamps *a* after both blows of the punch have been made and the metal has been forced out so as to completely fill the dies *n*.

The operation of my improved punching-machine is as follows: An ax, ax-poll, or other similar article, of the form substantially as shown in Fig. 6, after it has been heated to the proper temperature is taken by the operator and placed upon one edge, between the dies *n n*, constituting the gripping-faces of the clamp-levers *a*. The hand-lever *m* is then drawn forward into the position shown in Fig. 4, by which movement the lower end of the lever *l* is also drawn forward by means of the connecting-rod *l'*. The forward movement of the lever *l* pushes the block *f* forward in the mortise between the projections *e*, and at the same time the ends of the two toggle-levers *g g*, which are pivoted in the block *f* at *g' g'*, are carried forward until the toggle-levers are at



right angles, or nearly so, with the sides of the block *f*. This will force the rear ends of the clamp-levers *a* apart, and consequently press their forward or gripping ends together, and tightly squeeze the ax or other article which has been placed between them, resting on the steel strip *o*. As soon as the heated ax or other article has been firmly clamped, the hammer *C* is released, and it drops, forcing the punch *E* into the metal of the ax, splitting it centrally in the thin portion, and about two-thirds through, as shown in Fig. 3. Immediately the hand-lever *m* is pushed partly back toward the anvil, which relieves to some extent the pressure of the gripping-jaws upon the ax, and thereby renders the withdrawal of the punch more easy. At that moment the operator throws the lifting devices of the machine into operation, and as the hammer begins to rise the punch is held so tightly in the metal of the ax that the springs *t* are not sufficiently strong to pull it out. The tool-stock *q* will therefore slide in the mortise in the front of the hammer until the hammer has risen enough to bring the top of the gibs *F* against the shoulders *s' s'* at the top of the stock. The hammer will then have acquired considerable momentum, and will strike the shoulders *s'* with a sharp blow, which will easily knock the punch out of the metal of the ax, and as soon as that is done the springs *t* should be sufficiently strong to raise the stock until the top of it is brought into close contact with the top of the mortise again. The lever *m* is then pushed entirely in against the anvil, thereby entirely releasing the ax or other article, which is turned over, so as to present the other edge upward. The hammer is then dropped and the operation above described is repeated, which completes the formation of the eye in a very perfect manner. The operation of the punch in forming the eye in an ax, ax-poll, or other article having the form at the eye portion substantially like that shown in Fig. 6, will divide the metal into two parts of equal thickness, and force these out against the faces of the dies *n n*, held in the gripping ends of the clamp-levers *a*, thus giving the article a substantially perfect shape upon the sides conforming to the face of the dies used in the clamp-levers.

Much less power is required to operate my machine than any in use prior to my invention. There is no waste of material in scrap-iron, and the punching is done so quickly

that it can be accomplished at the same heat at which the ax or poll like that shown in Fig. 6 is formed in my improved dies, described and claimed in my application above referred to. The product of my improved punching-machine, as also this step in the method of making axes and similar articles, I have made the subject of another application for Letters Patent.

What I claim is—

1. In a drop-punching machine, the combination of a drop and a tool-stock normally abutting endwise against the drop, with springs for holding the drop and tool-stock in such position, but permitting them to slide vertically upon one another, substantially as shown and described.

2. In a drop-punching machine, the combination of a drop and a tool-stock carried thereby, arranged to slide vertically one upon the other, and having their relative movement limited in one direction by abutting endwise against each other, so as to act as one mass when they descend in the operation of punching, and stops for limiting such movement in the other direction, so that after the tool has been forced into the metal and the drop begins to ascend it will at first move independently of the tool-stock, and then after acquiring momentum will suddenly act upon the tool-stock to withdraw the tool from the metal, all substantially as shown and described.

3. In a drop-punching machine, a drop, in combination with a punch held in a tool-stock capable of separate vertical movement in the drop, and clamping-levers *a a*, pivoted upon the bed of the machine for firmly holding the article to be punched in proper position to receive the thrust of the punch when the drop descends, substantially as described.

4. In a drop-punching machine for punching the eyes of axes, ax-polls, and similar articles, the combination of a drop and punch with a pair of clamping-levers having removable adjustable dies *n n* in their gripping ends, the faces of which are the counterpart in shape of that which it is desired to produce upon the sides of the finished article, and adjustable clamps *n' n'*, for holding said dies therein, all constructed and operated substantially as described.

JOHN W. BOWERS.

Witnesses:

JOHN T. KENNERK,  
FRANK O. MELCHER.

It is hereby certified that in Letters Patent No. 296,818, granted April 15, 1884, upon the application of John W. Bowers, of Franklin, Massachusetts, for an improvement in "Machines for Punching the Eyes of Axes and Similar Tools," an error appears in the printed specification requiring the following correction, viz: In line 73, page 1, the word "of" should be omitted; and that the Letters Patent should be read with this correction therein to make it conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 6th day of May, A. D. 1884.

[SEAL.]

M. L. JOSLYN,  
*Acting Secretary of the Interior.*

Countersigned:

BENJ. BUTTERWORTH,  
*Commissioner of Patents.*