(No Model.) 3 Sheets—Sheet 1.

S. S. BABBITT.

METHOD OF AND MACHINE FOR MAKING NUT BLANKS.

No. 376,224. Patented Jan. 10, 1888.

Fig. 1.

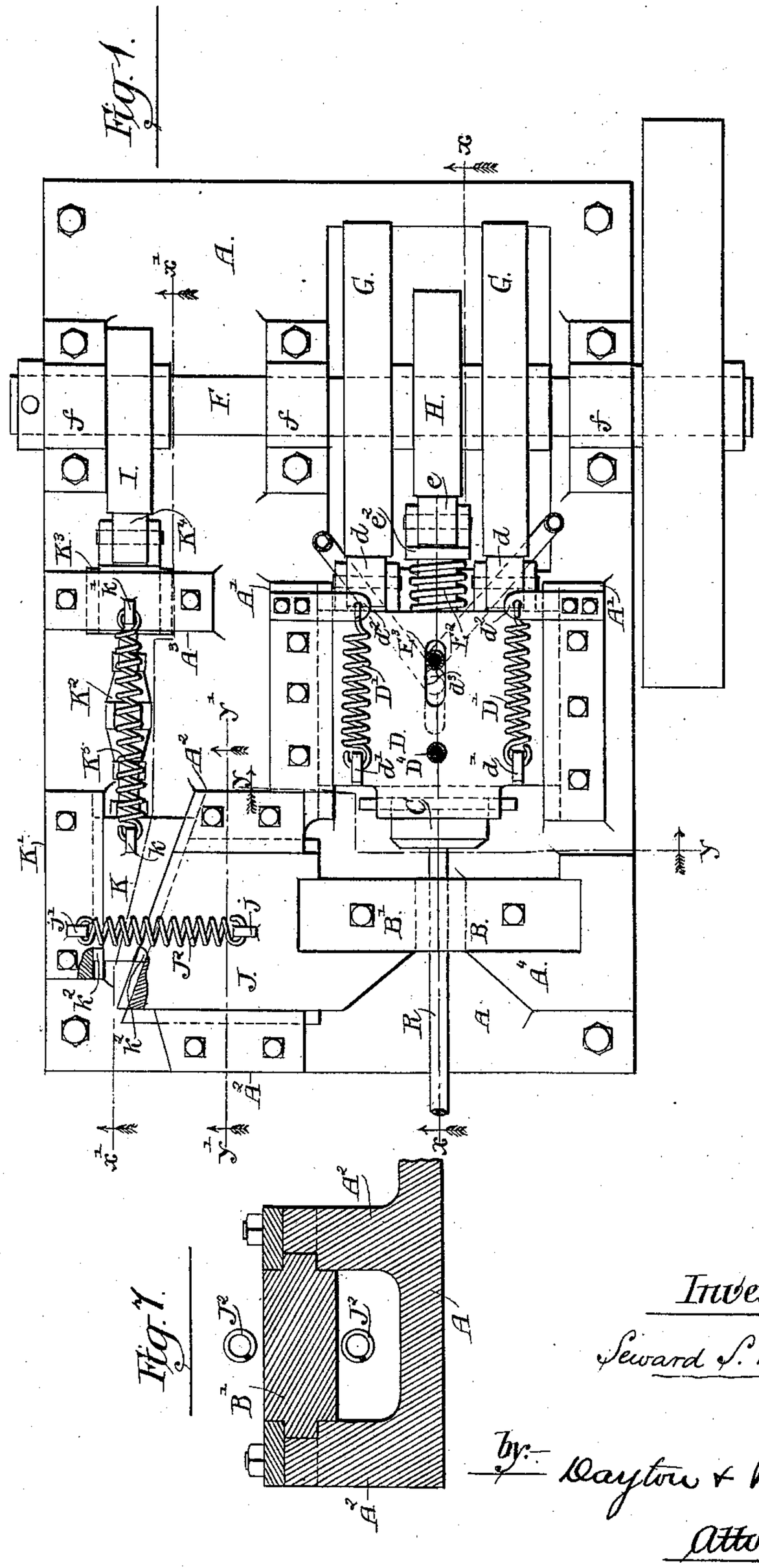

Fig. 10.

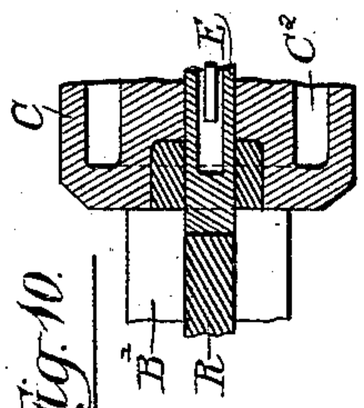

Fig. 9.

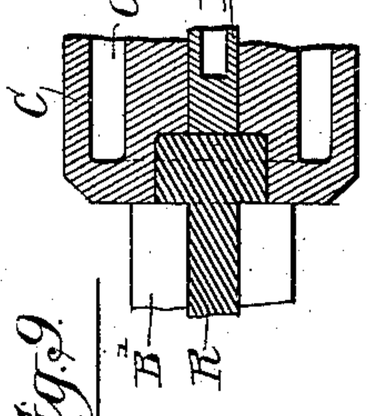

Fig. 8.

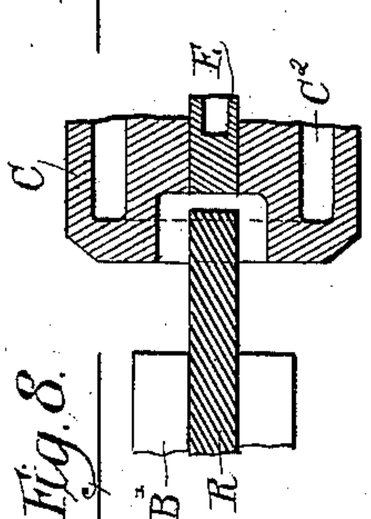

Fig. 7.

Witnesses:-

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Inventor:-

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(No Model.) 3 Sheets—Sheet 2.

S. S. BABBITT.

METHOD OF AND MACHINE FOR MAKING NUT BLANKS.

No. 376,224. Patented Jan. 10, 1888.

Fig. 12.

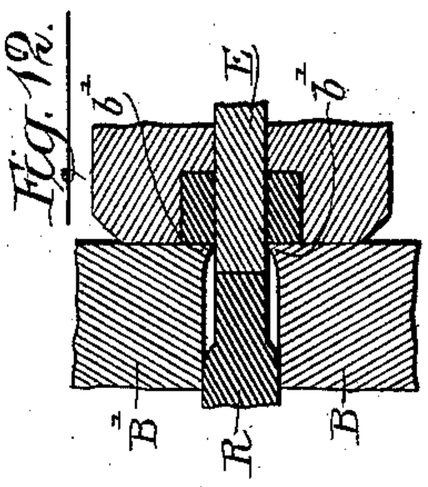


Fig. 11.

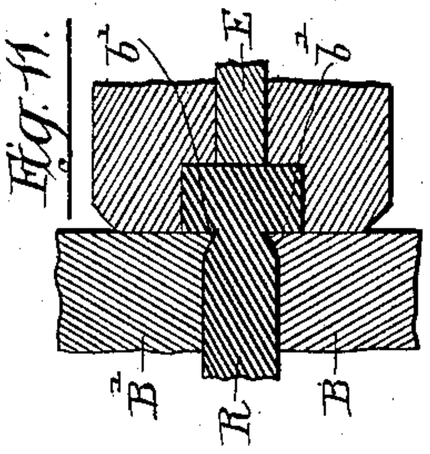


Fig. 3.

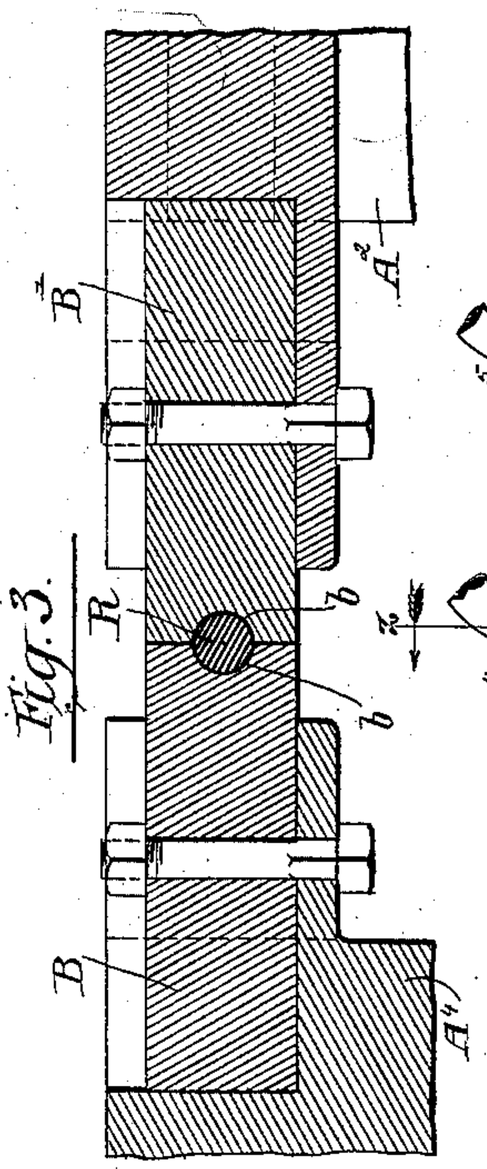
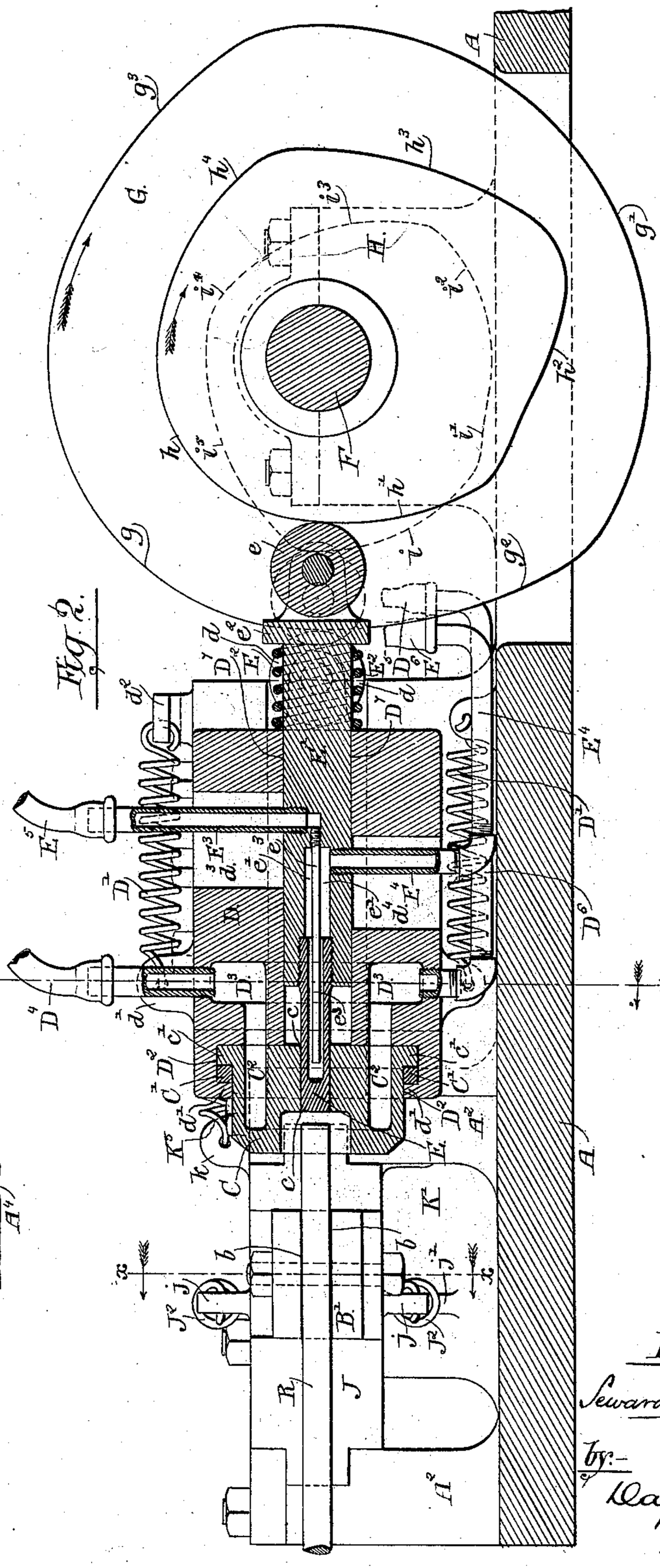


Fig. 2.



Witnesses:-

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(No Model.) 3 Sheets—Sheet 3.

S. S. BABBITT.

METHOD OF AND MACHINE FOR MAKING NUT BLANKS.

No. 376,224. Patented Jan. 10, 1888.

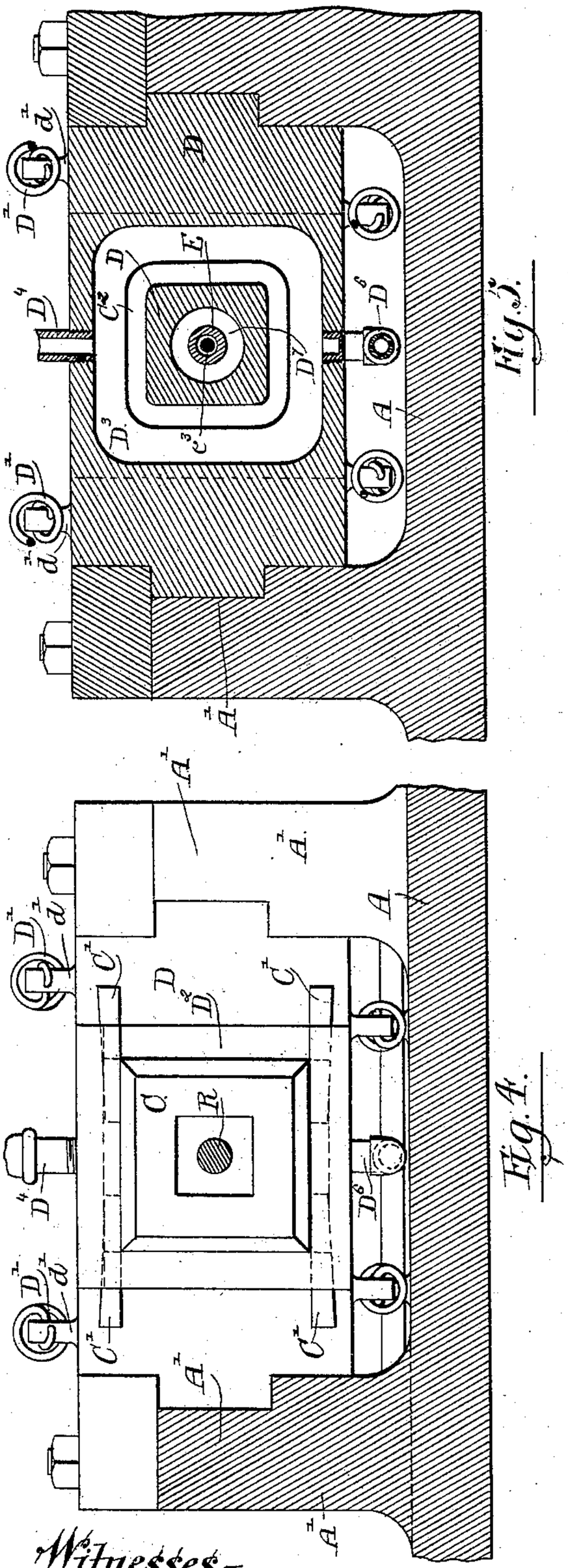

Fig. 4.

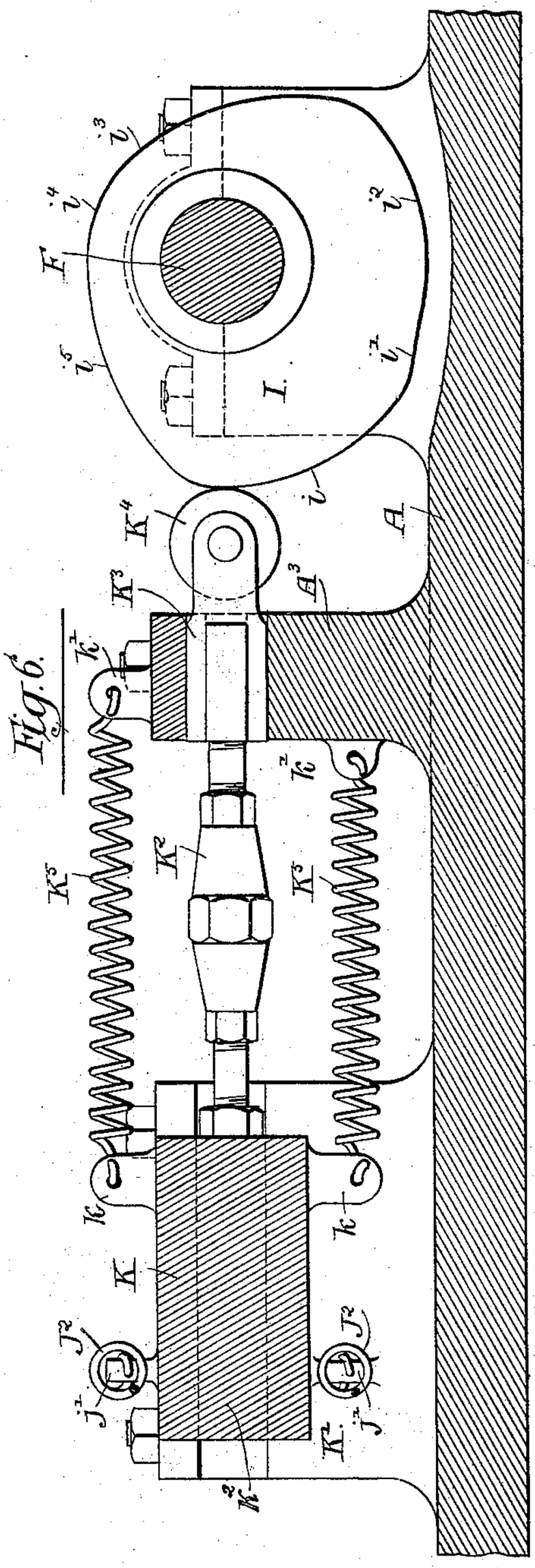

Fig. 6.

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by:— Dayton & Poole
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UNITED STATES PATENT OFFICE.

SEWARD S. BABBITT, OF UNIONTOWN, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO JOHN B. SKINNER, OF CHICAGO, ILLINOIS.

METHOD OF AND MACHINE FOR MAKING NUT-BLANKS.

SPECIFICATION forming part of Letters Patent No. 376,224, dated January 10, 1888.

Application filed February 28, 1887. Renewed December 12, 1887. Serial No. 257,681. (No model.)

To all whom it may concern:

Be it known that I, SEWARD S. BABBITT, of Uniontown, in the county of Fayette and State of Pennsylvania, have invented a certain new and useful Method of and Machine for Making Nut-Blanks and Similar Articles; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel process of and machine for making metal nut-blanks and similar articles.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

The process constituting my invention comprises as its main features the steps of first forming upon the end of a rod or bar an enlargement or head of the exterior size and shape of the nut-blank or similar article, and then punching or forcing out the metal from the middle part of the said enlargement or head, so as to form a hole or aperture therein. In making a nut-blank in this manner the metal punched out of or removed for forming the hole will be left upon the bar or rod from which the nut-blank is made, so that the metal thus punched out will remain integral with the rod and can be utilized in making another nut-blank in the same manner. The enlargement or head upon the bar will commonly, when working in iron or other metals of little ductility, be swaged or upset when the metal is heated to a degree common in metal forging. In the construction of nut-blanks in this manner it is entirely obvious that all of the metal of the rod is made into nut-blanks without waste, or, in other words, that after each nut-blank is formed from the metal at the end of the bar said bar will be in condition for use in making another and succeeding nut-blanks, and that no small pieces, scraps, or waste will be produced, but that all the metal of the bar will be utilized with the exception of the stub end, which in the use of a machine such as is herein shown will remain from each bar employed.

In the manufacture of nut-blanks as heretofore conducted the circular pieces or blocks punched out from square blanks in forming holes therein equals approximately twenty-five per cent. of the material used. In making hexagonal nut-blanks the portions punched out from the holes and the parts removed to give shape to the sides of the nut equal in all about forty per cent. of the material used. The small pieces or scrap thus made can only be utilized after being reworked, and are therefore much less valuable than merchantable iron, so that the waste by the making of this quantity of waste or scrap causes a great loss to the manufacturer. According to the usual market-rates at present the waste or scrap produced in nut-making is valued at about one-half the cost of merchantable iron. The novel process above described, therefore, has the great economic advantage of saving the reworking of a large proportion of the iron used and of thus avoiding an important item of loss to the manufacturer.

In carrying out the process or method above described any well-known or preferred tools or machines may be used—as, for instance, the enlargement or head may be formed upon a rod or bar by a machine similar to the well-known machines for forming bolt-heads, and containing gripping-jaws for holding the rod or bar and a reciprocating die moving toward and from the jaws and operating to upset the end of the metal rod held in the jaws to form a head thereon. Similarly the punching out of the central part of the head thus formed may be accomplished by any well-known form of punching-machine. It is entirely obvious, moreover, that the process or method described can be carried out by the use of hand tools or implements, as well as by machines driven by power.

The machine herein illustrated as constituting part of my invention is constructed for the purpose of rapidly and economically performing the heading and punching process, as above set forth. Such machine embraces as its main feature of novelty a clamp or clamping jaws for holding the metal rod from which the nut-blanks are to be formed, a reciprocating heading-die acting in connection with the clamping-jaws to form a head upon the rod, and a punch working through a central aperture in the die and operating to punch out the

central part of the head after the head has been formed upon the rod, the parts being so constructed that the rod may yield or move backwardly through the clamp-jaws as the metal is forced from the central part of the head in the advance of the punch.

The machine illustrated embraces devices for actuating the several parts described, means for cooling the die and punch, and other details of construction, as will hereinafter fully appear.

In the accompanying drawings, Figure 1 is a plan view of a machine illustrating my invention. Fig. 2 is a longitudinal vertical section of the same, taken through the parts immediately concerned in making the nut-blanks upon line *x x* of Fig. 1. Fig. 3 is a detail section of the clamp-jaws, taken upon line *x x* of Fig. 2. Fig. 4 is a sectional view taken upon line *y y* of Fig. 1, showing the heading-die in front elevation. Fig. 5 is a detail section through the sliding block carrying the heading-die, taken upon line *z z* of Fig. 2. Fig. 6 is a vertical section taken upon line *x' x'* of Fig. 1. Fig. 7 is a detail section taken upon line *y' y'* of Fig. 1. Figs. 8, 9, and 10 are detail sections of the die and punch, illustrating the operation of forming the nut-blanks. Figs. 11 and 12 illustrate a modified form of the clamp-jaws.

In the accompanying drawings, illustrating my invention, A is a horizontal bed-plate, upon which the several operative parts of the machine are mounted or sustained, and B B' are two gripping-dies or clamping-jaws located at one end of said bed, one of said jaws being stationary and the other movable.

C is a heading-die mounted in one end of a horizontally-sliding bed or carriage, D, having bearings at its side margins in guides A' A' upon the bed-plate.

E is a punch mounted to slide in a central aperture, *c*, of the die C and rigidly attached to a sliding bar, E, mounted within the carriage D and extending past the rear end of the said carriage.

F is a horizontal driving-shaft mounted in bearings *f f* upon the bed A, and provided with two cams, G, for actuating the sliding bed or carriage D, a cam, H, for actuating the punch, and a cam, I, for actuating the movable jaw B' of the clamping device. The said jaw B' is attached to a sliding block, J, mounted to slide in stationary guides A^2 A^2, arranged transversely upon the bed. The devices connecting said block J with the cam I for actuating said block comprise a wedge, K, constructed to bear against a stationary projection, K', upon the bed-plate, the wedge being, as shown, provided with lateral ribs k^2 k^2, entering guide-grooves in the block J and projection K'. The wedge K is connected by means of a rod, K^2, with a sliding block, K^3, which carries an anti-friction roller, K^4, upon which the cam I operates. The said block is constructed to slide in a guide-aperture formed in a standard, A^3, upon the bed A. The carriage D is preferably provided with anti-friction rollers *d d*, acting against the cam surface of the cam G G, and said rollers are held in contact with the cams by means of springs D' D', attached, as shown, to projections *d' d'* upon the block D and to arms d^2, bolted to the guides A' A' of the frame.

The sliding bar E, carrying the punch, is preferably provided with an anti-friction roller, *e*, bearing against the cam H, said bar being thrown toward the cam by means of a heavy spiral spring, E^2, placed about said bar between a shoulder, e^2, at the end of the bar and the adjacent end surface of the block D.

The sliding block J, carrying the clamp jaw B', is moved in a direction to open the jaw and to retain it in contact with the sliding wedge K by means of springs J^2, attached to lugs or projections *j j'* upon the said plate J and projection K', respectively, and the roller K^4, through the medium of which motion is transmitted to the wedge K, is held in engagement with the cam I by means of spiral springs K^5 K^5, attached to lugs *k k'* upon the said wedge K and the part A^3 of the machine-frame.

The clamp-jaws B B' are provided each with a separate recess, *b*, Fig. 3, of the proper size and form to fit the rod or bar from which the nuts are to be made—in the instance illustrated of semicircular form. Said rod or bar is indicated in the drawings by the letter R.

In the particular construction of the clamping-jaws shown the stationary jaw B is made separate from the machine-frame and is secured in an opening or recess formed in an elevated part, A^1, of the bed-plate A. The movable jaw B' is similarly made separate from and fitted to a recess in the sliding block J, said jaws B B' being made removable, to enable them to be replaced when worn out, or to allow other jaws to be inserted in working upon rods of different sizes.

In the particular construction illustrated the die C is attached to the sliding block or carriage D by being inserted in a recess, D^2, formed at the forward end of said block, the die being held immovably in place by means of wedges C' C', inserted at the top and bottom of the die between outwardly-extending flanges *c' c'* upon the die and inwardly-projecting lips or flanges *d' d'* of the block, as more clearly shown in Fig. 2.

For the purpose of keeping the said die C cool, the latter is preferably chambered and means provided for maintaining a constant flow of water therethrough. As shown in the drawings, a recess, D^3, is cast in the body of the block D, extending to the flat face of the recess D^2 of said block, and a recess, C^2, is made in the die C, extending around the recess of the die and opening at the rear or inner face of the latter, the recesses D^3 and C^2 being so arranged that when the die is secured in place in the block D the openings of said recesses will come together and said recesses will form a continuous space or chamber, through

which water may be circulated. Water may be supplied to the water-chamber described in any suitable manner, flexible pipes D^4 D^5 being herein shown as connected with the top and bottom of the block communicating with the chamber D^3 for this purpose. The flexible pipe D^5 is, in the particular construction shown, attached to a rigid horizontal pipe, D^6, extending to a point at the rear and at one side of the block D through the space between said block and the bed-plate A; but these pipes may be otherwise arranged in practice, as may be found convenient or desirable.

In the particular construction herein shown the sliding bar E′, carrying the punch E, is made cylindric and adapted to slide in a cylindric aperture, D^7, of the block D, and said punch E is made separate from said bar E′ and attached to the latter by a screw-threaded connection, as clearly shown in Fig. 2. To provide means for cooling the said punch by a circulation of water, said punch is made tubular or hollow to a point near its forward or working end, and the sliding bar E′ is provided with a recess, e', communicating with the hollow interior of the punch. At the inner end of the said recess e' is secured a small tube, e^3, which extends through the hollow interior of the punch to a point near the forward end of the recess therein. Said tube e^3 is connected at its inner or rear end with a vertical pipe, E^3, which is tapped into the slide-bar E′ and extends outwardly through a longitudinal slot, d^3, in the block D. A second pipe, E^4, is also tapped into the sliding bar E′, so as to communicate with the recess e', said pipe passing through a second slot, d^4, in the block D.

To the outer ends of the pipes E^3 E^4 are attached flexible inlet and exit water-tubes E^5 E^6, by means of which a continuous circulation of water through the central recess of the punch may be maintained.

The operation of the clamp-jaws, the die, and the punch in making a nut is more clearly illustrated in the sectional detail views, Figs. 7, 8, and 9. The rod, which is commonly operated on when heated sufficiently hot for forging, is thrust between the gripping-jaws B B′ until its end comes in contact with the inner face of the die C, which die is moved backwardly a sufficient distance at each reciprocation to enable the rod to be thrust through the clamp-jaws a distance necessary to afford sufficient metal in the projecting part to fill the die. When the rod has been placed in the position described, the clamp-jaw B′ is actuated to grip the rod and the die then advanced into contact with the gripping-jaws, the parts at this time being in the position shown in Fig. 8. In this advance movement of the die the plunger is moved at the same rate of speed therewith, so that the end of the punch forms a part of the inner wall of the die at such time. After the head has been formed upon the rod in the manner described, the punch is advanced until it has passsed through the head, thereby punching out the central part of the head and forcing back the rod with the piece of metal punched out thereon, the gripping dies being separated or opened slightly at this time to allow the rod to move backwardly as the punch is advanced. I have herein shown the punch as made with a square or flat end face; but other forms of punches may be used as may be desired or preferred.

The rod or bar used for making the nut-blanks will commonly be round and of approximately the same diameter as the punch by which the hole is formed in the nut-blank. I prefer, however, to make the recesses *b b* of the clamping dies of such size as to form, when closed, an aperture slightly larger in diameter (say one thirty-second of an inch) than the punch, so that the punch will pass freely into the opening of the clamping-jaws, which latter serve as a die block for the punch in the punching operation. When the said opening of the clamping-jaws is made larger than the punch, moreover, a blank-rod larger than the punch is used, in order that the rod may be firmly clamped by the clamp-jaws. The use of a blank-rod larger than the punch is of advantage, inasmuch as the larger the bar the more easily may the head be upset thereon.

It is not necessary to the operation of the forming devices described, however, that the rod or bar from which the nut-blank is formed should be approximately of the same diameter as the punch—as, for instance, said bar may be materially larger than the punch and the clamp-jaws made of proper size to grip such bar, provided the opening of the clamp in its part adjacent to the heading-die be contracted to form an opening only slightly larger than the punch. A construction of this kind is shown in Figs. 11 and 12, in which the clamp-jaws B and B′ are provided with lips or projections *b′ b′*, which operate to cut into or compress the metal of the bar at the faces of the clamp-jaws against which the heading-die acts, and which form, when the clamp-jaws are brought together, an opening of proper size to admit the end of the punch. When this construction is used, the part or plug punched out of the head will be of less diameter than the blank-rod, so that the said rod will, after each nut-blank is formed, have a small cylindric projection at its end, and will present the appearance shown in Fig. 12. Such projection will, however, be compressed or upset into the larger part of the rod in making the next succeeding nut-blank therefrom.

For the purpose of producing the several motions in the clamping-jaws, the heading-die, and the punch in the manner described, the cams G, H, and I, by which motion is given to the said parts, are, in the particular machine illustrated, made as follows:

To describe, first, the cams G G, (of which two are used to give equal pressure on both sides of the block D,) each of said cams, as more clearly shown in Fig. 2, is made as follows:

g is a concentric part of the cam upon which the roller d acts during the time that the clamp-jaws are being opened and closed. g' is an outer concentric part upon which the said rollers travel during the time the die is advanced and while the punch is being operated.

g^2 is an inclined surface connecting the part g with the part g' and acting to throw the heading-die forward to form the head upon the rod, and g^3 is an inclined part acting to allow the retraction of the die after the head has been formed and punched.

The cam H has an inner concentric part, h, corresponding in angular position with the part g of the cam G and with an outwardly-directed inclined part, h', parallel with the part g^2 of the cam G, and acting to advance the punch at the same time that and at the same speed as the die is advanced by the said surface g^2.

h^2 is an outwardly-deflected surface forming an extension of the surface h' and acting to advance the punch during the time that the die is held forward by the surface g.

h^3 h^3 is a similarly-inclined surface allowing the backward movement of the punch, said surface being preferably arranged to terminate in radial alignment with the end of the surface g', so that the punch will be fully retracted before the die begins to move backwardly.

h^4 is a surface connecting the part h^3 with the part h and arranged parallel with the surface g^3 of the cam G, so that after the punch is returned to its normal position with relation to the die both the die and punch will move backward together.

The cam I (shown in dotted lines in Fig. 2 and in Fig. 5) is provided with an outer concentric part, i, coinciding in angular position with the parts h' and g^2 of the cams H and G, and operating to hold the gripping-jaws closed at the time the die and punch are being advanced together.

i' is a short inwardly-deflected surface for relaxing the gripping-jaws before the punch begins its advance movement, said surface terminating in a second concentric part, i^2, by which the jaws are held stationary, but slightly apart, during the time the punch is being advanced.

To prevent the punch being moved forward before the jaws are relaxed by the action of the inclined surface i, the cam H is provided with a short concentric part, h^4, arranged to coincide in angular position with the said inclined part i', as clearly shown in Fig. 2, said concentric part h^4 being arranged between the inclined cam-faces h' h^2, before described. At the end of the cam surface i^2, and in position to retract the movable clamp-jaw after the punch has begun its rearward movement, is a cam-surface, i^3, which extends inwardly to a short concentric part, i^4, which allows the clamping-jaws to remain fully open while the heated rod is being inserted between them. Between the surface i^4 and the concentric part i first above described is an outwardly-inclined surface, i^5, by which the clamp-jaw is quickly advanced to grip the rod in time for the operation of the die and punch thereon in the manner before described.

In square and other nut-blanks as heretofore made the sides of the blanks are commonly distorted and roughened in shearing, and the nut bent more or less out of shape in punching. Nut-blanks and other articles made by the machine above described have the advantage of being alike and equally smooth on all sides and of being undistorted by punching, inasmuch as the punching is done when the blank is surrounded on all sides by the forming-dies, so that the metal is not drawn out of shape in the punching operation.

The main feature of novelty embraced in the machine above described consists in gripping or clamping dies or jaws for holding the rod, a reciprocating heading-die, and a punch constructed to slide in or through the heading-die, so that the head may be formed and the hole punched therein in what is practically one operation. It is obviously immaterial as far as the general operation of these parts is concerned as to which of said parts are made movable and which stationary, as to whether both clamp-jaws are movable or one only, and as to what particular form of the many well-known kinds of driving or actuating devices are employed for moving the clamping jaws, die, and punch. I desire, therefore, to claim, broadly, a machine embracing the parts referred to without restriction to the particular means shown for actuating said parts. I do, however, herein claim as new certain novel details of construction present in the machine shown, but which are not necessary for the carrying out of the invention herein broadly claimed.

It will of course be understood that in carrying out the process above set forth and in the use of the machine described, the recess of the die for u- setting the rod may be square, hexagonal, circular, or other form which it is desired to give the exterior surface of the article produced.

The punch used, also, may be square, hexagonal, or other shape, to give an aperture of desired form in the article made, and the rod or bar from which the article is made may be cylindric, square, or of other cross-sectional shape. In the use of a round punch with a square rod in a machine of the character shown, however, the opening of the clamp-jaws adjacent to the forming devices will desirably be made to correspond with the shape of the punch, and this is also desirable whenever the rod differs from the punch in cross-sectional form. The said opening of the clamp-jaws may be given the desired shape for the purpose above stated by contracting its size at the inner faces of the clamp-jaws in the manner illustrated in Figs. 11 and 12.

I do not wish to restrict myself to a process

and machine for making metal articles having flat exterior faces and commonly called "nut-blanks," inasmuch as other metal articles having central apertures or perforations—such as washers and rings—may also be rapidly and expeditiously formed by the same process or by the use of the same machine. It is to be understood, furthermore, that the heading-die may give the final form to the exterior of the nut-blank, or that the nut-blank or other object may be first shaped in the rough by the forming-dies and afterward given final form and finish. For use in making ordinary nut-blanks requiring no after finishing, however, the use of this process is of great advantage, inasmuch as the surface of the nut is thereby accurately formed with a smooth surface without waste.

I claim as my invention—

1. The method of making nut-blanks or similar articles, which consists in compressing or upsetting the end of a rod or bar to form an enlargement or head thereon and then punching out the metal from the central part of the enlargement or head thus made.

2. A machine for making nut-blanks and similar articles, comprising clamping-jaws or dies for holding a rod or bar, an apertured heading-die, and a punch working through the said heading-die, substantially as described.

3. The combination of clamping jaws, an apertured heading-die, a sliding carriage or block carrying said die, a reciprocating punch having sliding support in said carriages and passing through the aperture of said die, and means for actuating said clamping-jaws, carriage, and punch, substantially as described.

4. A machine for making nut-blanks or similar metal articles, comprising clamping-jaws, an apertured heading-die, a sliding block or carriage carrying the heading-die, a punch working through the aperture of the die, a sliding support for the punch mounted in said block or carriage, a driving-shaft provided with cams acting upon said carriage and upon the punch-support, and means actuating the clamping-jaws, substantially as described.

5. A machine for the purpose described, comprising stationary and movable clamp-jaws, an apertured heading-die, a sliding block or carriage carrying said heading-die, a punch working through the aperture of the heading-die, a support for the punch sliding in said carriage, a sliding plate supporting the movable clamp-jaw, a wedge acting upon said sliding plate, and a shaft carrying cams for actuating said wedge, heading-die, and punch, substantially as described.

6. The combination, with the die C and carriage D, of recesses D^3 and C^2 in said carriage and die, forming a water-chamber, and water supply and exit pipes connected to said chamber, substantially as described.

7. The combination, with the die C, carriage D, punch E, and bar E', supporting said punch, said punch being recessed, of water inlet and exit pipes connected with the recess of the punch, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

SEWARD S. BABBITT.

Witnesses:
M. H. BOWMAN,
C. H. SEATON.