Hubner & Hall,

Impt in Nut Machine,

No. 51316, Patented Dec. 5, 1865.

Fig. 1.

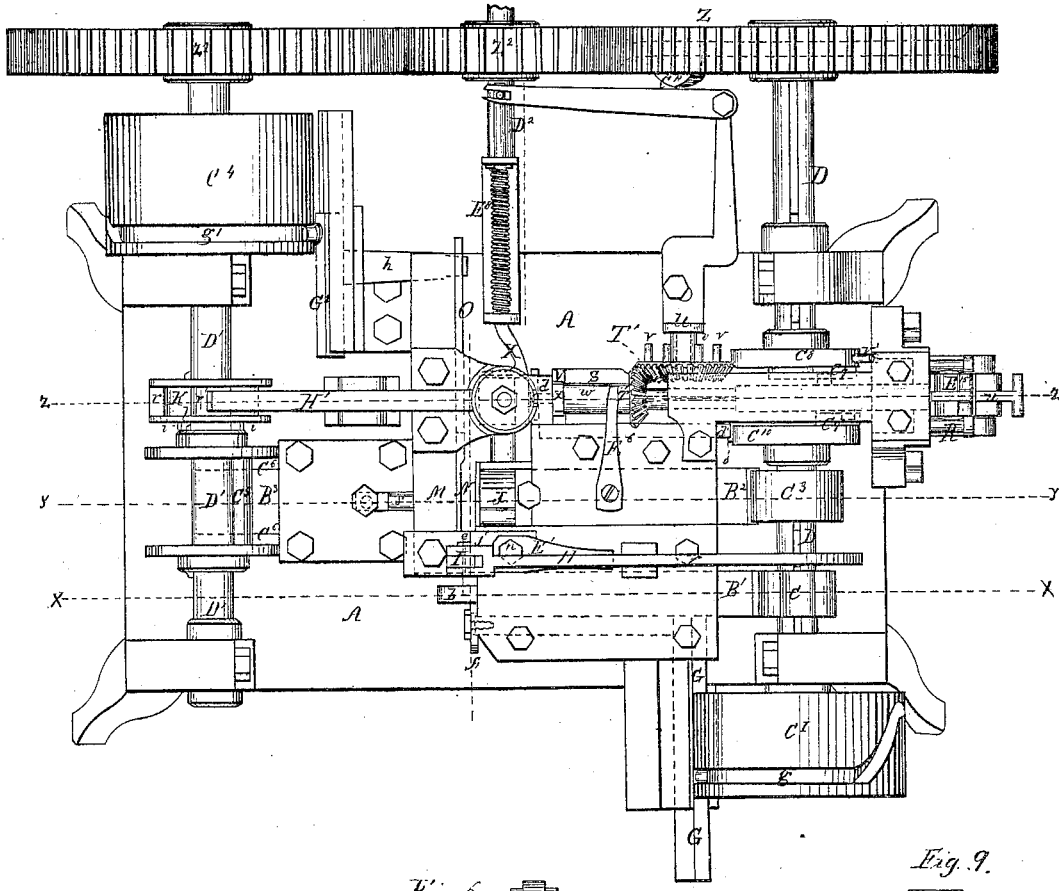

Fig. 6.

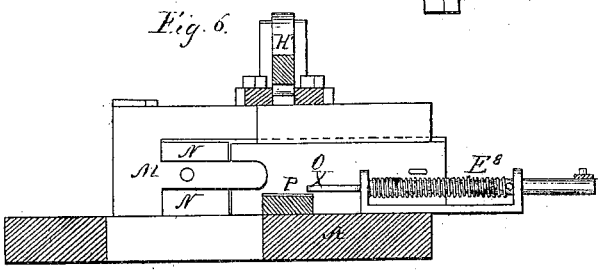

Fig. 8.

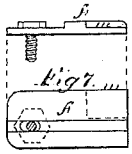

Fig. 9.

Fig. 10.

Witnesses.
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Per. E. L. Ronnick Atty.

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Fig. 2.

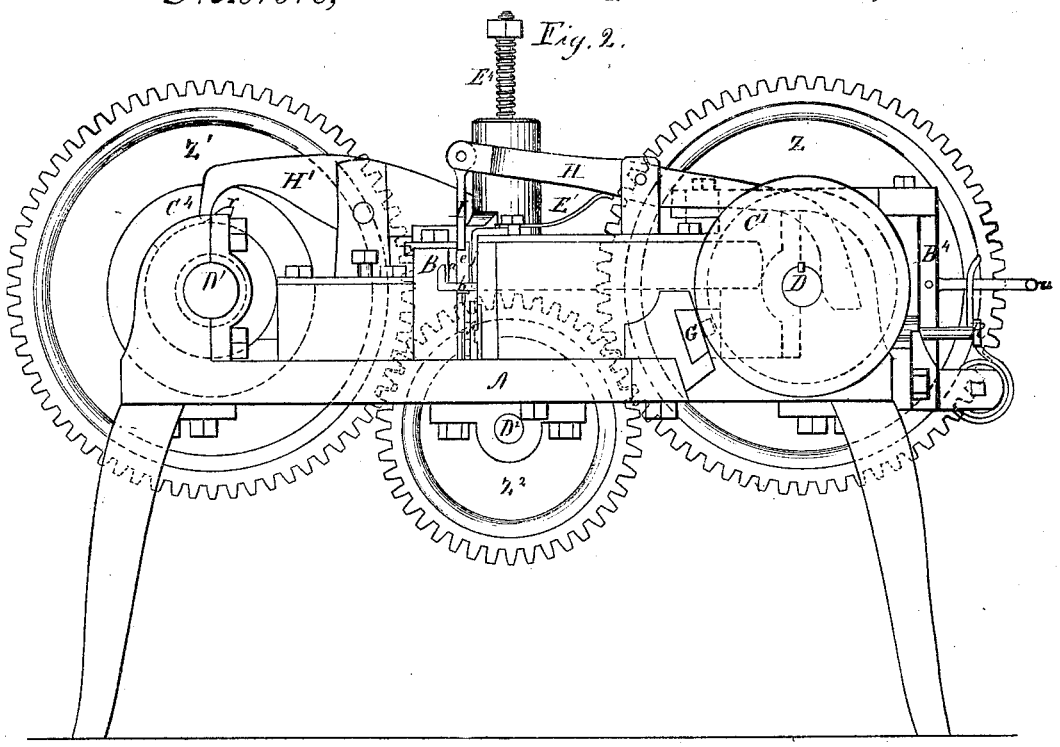

Fig. 13.

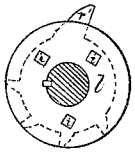

Fig. 12.

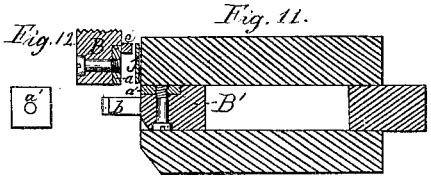

Fig. 11.

Fig. 3.

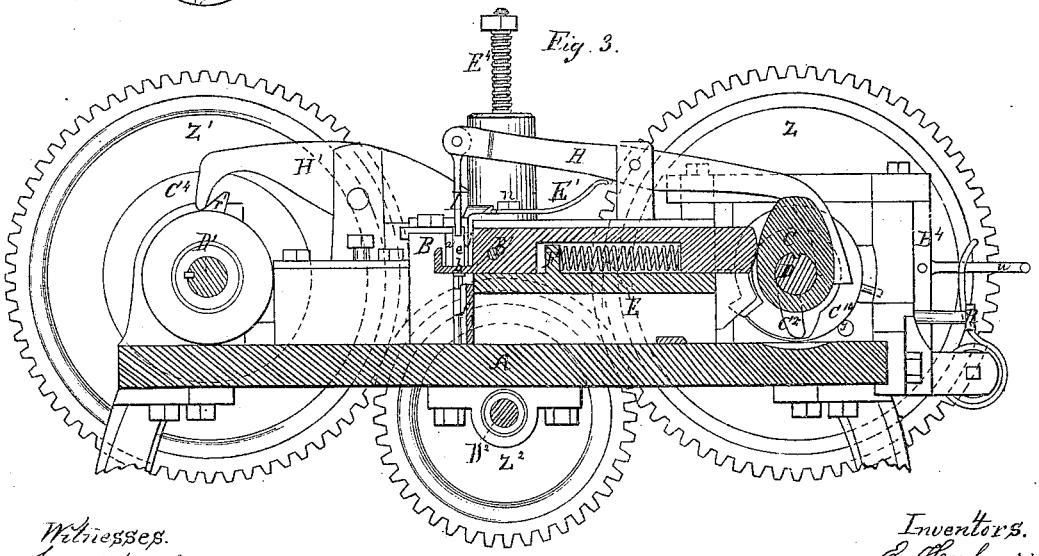

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Fig. 4.

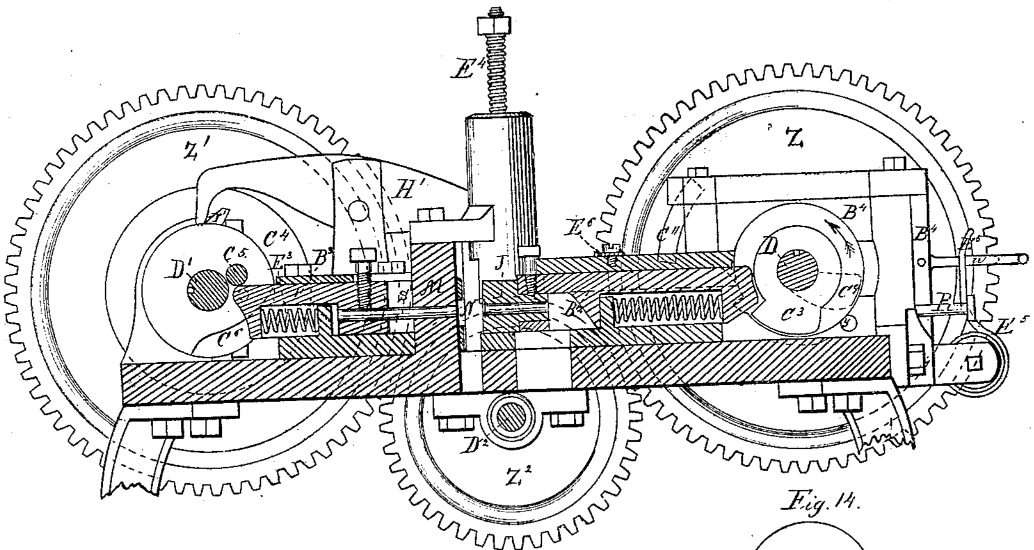


Fig. 14.

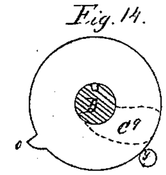


Fig. 5.

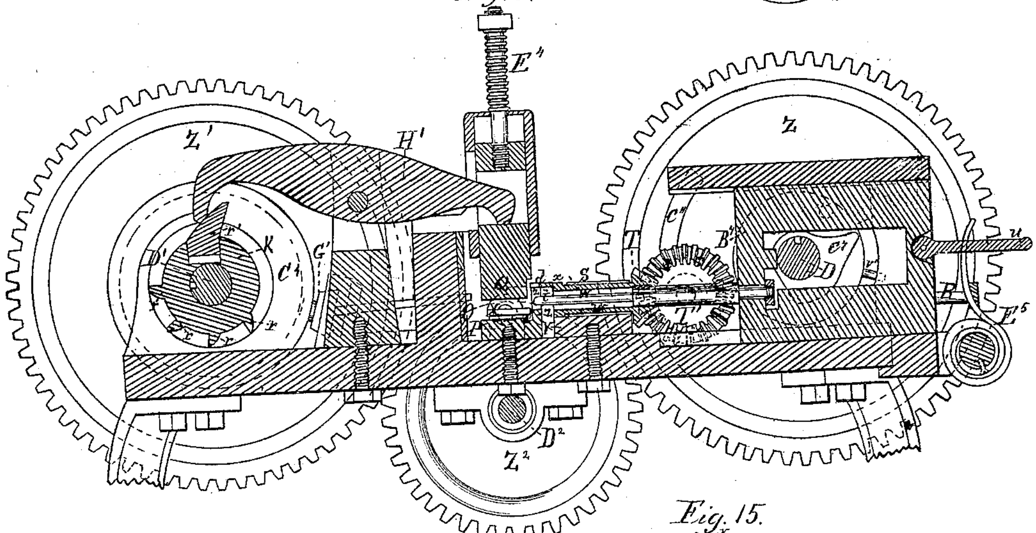
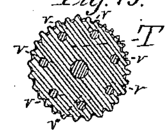


Fig. 15.



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UNITED STATES PATENT OFFICE.

EMIL HUBNER AND CHAS. HALL, OF NEW YORK, N. Y.

IMPROVEMENT IN NUT-MACHINES.

Specification forming part of Letters Patent No. **51,316**, dated December 5, 1865.

To all whom it may concern:

Be it known that we, EMIL HUBNER and CHARLES HALL, both of the city, county, and State of New York, have invented certain new and useful Improvements in Machinery for Making Nuts for Screw-Bolts and Similar Articles; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 represents a plan of a machine embodying our improvements. Fig. 2 represents a side elevation of the same. Fig. 3 represents a vertical longitudinal section of the same at the line *x x* of Fig. 1. Fig. 4 represents a similar section at the line *y y* of Fig. 1. Fig. 5 represents a similar view at the line *z z* of Fig. 1. Figs. 6 and 7 represent transverse section of parts of the machine, showing the transferring mechanism; and Figs. 8 to 15, inclusive, represent views of different parts of the machine, having the same letters of reference applied to them as are applied to the same parts in the other figures.

The machine represented in the accompanying drawings is designed to form nuts from heated flat bars presented to it, and the general operation of the machine is as follows: A piece of the proper size to form a nut, and called a "nut-blank," is severed from the bar and pushed forward into the machine by an attendant. This nut-blank is pushed downward into the recess of a carriage, which transfers it to the place where it is snapped (or made convex upon one side) and punched while held in place by a pair of spring-nippers. After the blank has been snapped and punched the spring-nippers transfer it to a mechanism, which inserts a mandrel in the nut-blank, and presents it to a hammer, by which its edges are hammered, the nut-blank being turned between the strokes of the hammer, so that its edges are hammered in succession. Lastly, the blank is hammered upon its flat sides, and is then ejected from the machine.

The object of the first part of the invention is to remove the nut-blank, by a positive motion, from the place where it is severed from the bar, and deliver it to a carriage which transfers it horizontally to the punching mechanism.

This part of the invention consists of the combination of the cutting devices of the machine and the transferring-carriage with a plunger which removes the nut-blank from its position during cutting and delivers it to the transferring-carriage.

The object of the second part of the invention is to permit a nut-blank to be cut from a bar at one part of the machine and to be snapped and punched at another part of the machine.

This part of the invention consists of the combination of the cutting devices and snapping and punching devices, with a transferring-carriage, which receives the blank from the cutting devices in a recess and delivers it in the proper position to be snapped and punched.

The object of the third part of the invention is to transfer and hold the nut-blank in the machine; and it consists of the combination of a transferring-carriage and a traveling spring-nippers, the two operating in such manner that the former presents the nut-blank to the latter and is then withdrawn to receive a new nut-blank, while the latter holds the nut-blank and transfers it in the machine, in order that subsequent operations may be performed upon it.

In machines constructed previous to the present invention it has been customary to arrange the punch and the concave die that gives the convex form to one side of the nut in such manner that the punch entered the nut-blank through the said die; and as the effect of punching (particularly when the punch becomes dulled by use) is to depress the material in the immediate vicinity of the place where it enters, the result of the arrangement is that the orifice of the hole at the convex side of the nut has the appearance of having been slightly countersunk. Moreover, as in such preceding machines, the punch is caused to move through the concave die, it has been customary to construct them in such manner that the die remains stationary, and that the nut-blank is forced into it by a plunger or slide operating upon the side of the blank which is to form the flat side of the nut; hence the position of the nut-blank in the machine is changed in the direction of the line of travel of the punch.

The object of the fourth of the present invention is to cause the hole made by punching to extend squarely up to the convex side of the nut, so that the sides of the bore and the convex face of the nut form a sharp angle, also to permit the nut-blank to be held stationary in the machine during the action of the convex

die upon it, or "snapping," as it is technically called.

This part of the invention consists of the combination of a support for the flat side of the nut-blank, with a reciprocating concave snapping tool or die, and with a punch working through said support, so that the nut-blank is snapped while resting against said support, and is punched from the side opposite that at which the snapping-tool operates.

The object of the fifth part of the invention is to turn the mandrel on which the nut-blank is forged, and hold it in the proper position for the hammer to forge the blank properly.

This part of our invention consists of the combination of the mandrel with devices for turning it partly round at intervals, and with a former or forging-guide of the form of the nut to be forged, and a rest upon which said former is supported.

The object of the sixth part of the invention is to insure the descent of the forging-mandrel, so as to cause the nut-blank to rest upon the anvil before the hammer acts upon it.

This part of the invention consists of the combination of the mandrel and former with a spring which depresses the mandrel whenever the shape of the former permits such movement during the partial turning of the mandrel.

The object of the seventh part of the invention is to permit the nut-blank to be forged endwise and sidewise by the same hammer; and it consists of the combination of the hammer with tappets of different lengths to move it the requisite distances for forging the edges and side, and with a pusher to turn down the nut-blank upon the anvil, so as to present it flatwise to the hammer.

The object of the eighth part of the invention is to permit the movement of the hammer to be adjusted so as to adapt it to forging nut-blanks of different dimensions; and it consists of the combination of the cam-ring, that supports the tappets which actuate the hammer, with a movable tappet and with a movable cheek, by which the tappet is clamped in its position in the cam-ring.

The devices for cutting the nut-blank from the bar are situated at the front side of the machine, and consist of a stationary knife, *a*, and a movable knife, *a'*, between which the heated bar is shoved endwise by the attendant.

As it is desirable that the nut-blank should not be displaced from its position by the act of cutting it from the bar, the movable knife is arranged nearer the side of the machine at which the attendant presents the bar of iron than the stationary knife; hence the end of the bar which forms the nut-blank remains at rest against the stationary knife during the cutting operation, while the remainder of the bar is moved laterally by the movable knife pushing it before it. This arrangement of the movable knife is productive of great advantage as respects the appearance of the finished nut-blank, because the side of the nut-blank resting against the stationary knife is left flat up to the extreme edge formed by cutting it from the bar, and as the bar is turned half-round before each nut-blank is cut off, so as to place the squarely-cut edge of the bar against the stationary knife, each nut-blank cut from the bar is perfectly flat at one side. As will be hereafter seen, this flat side is not defaced by the subsequent operations performed by the machine, and consequently the finished nut-blank has one perfectly flat side.

The knives are formed of blocks of steel, the stationary one *a*, being secured by a screw to a stationary knife-stock, B, projecting upward from the bed-plate A of the machine, while the movable knife *a'* is secured to a sliding knife-stock, B', which is moved forward at proper intervals to sever the bar by means of a cam, C, secured to one, D, of the two revolving cam-shafts D D' of the machine. After the nut-blank is severed, the knife is moved backward, to permit the bar to be again pushed into the machine, by means of a spring, E, arranged within a recess of the sliding stock B', and bearing against a stationary projection, F.

In order to save material in making knives each is formed of a square block of steel, of suitable thickness, as shown at Figs. 11 and 12, with eight cutting-edges, four at each side, so that when one edge becomes dull by use it is only necessary to turn the knife one-quarter of a revolution to bring a new cutting-edge into place, and when the four cutting-edges at one side of the knife become dull the turning of it side for side presents four new cutting-edges, which can be used in turn; hence the material of one edge forms part of the backs of the other edges, and much less material is required than would be necessary to form eight separate knives each with sufficient back to enable it to be secured to the knife-stock.

As the knife becomes reduced in size by grinding, packing may be inserted between its edges and that of the recess of the knife-stock in which it is received, so as to keep the cutting-edge in the proper position.

In order that the bar may be held in a proper position for being entered between the knives it is supported upon a rest, *b*, which is connected with the slide B' of the movable knife, so as to travel with it; and in order that a nut-blank of the required size may be cut from the bar, a stop, *e*, is secured to a stationary knife-stock at a distance behind the edges of the cutters equal to the length of the piece to be severed from the bar. When the movable knife opens the bar is pushed forward until its end strikes this stop, and it is held there until the cutting is effected.

The carriage *f*, by which the severed nut-blank is transferred to the snapping and punching devices, is situated beneath the level of the knives, and is connected by an arm (shown in dotted lines in Fig. 1) with a slide, G, which is caused to move to and fro transversely to the length of the machine, and at proper intervals, by means of the cam C', whose pe-

riphery is provided with a groove, *g*, in which a pin projecting from the slide G is received. This groove is skewed at the proper part of its periphery, to move the carriage after it receives the nut-blank, and to return it after the nut-blank is griped by the spring-nippers, hereinafter described. The carriage is provided with a recess, *m*, Figs. 7 and 8, to receive the nut-blank after it is severed from the bar by the knives.

In order that the end of the bar cut off to form the nut-blank may not warp away from the stationary knife during cutting, an adjustable holder, *j*, is provided, to exert pressure upon the side of the bar; and as the effect of this pressure is to retain the nut-blank where it is cut, a movable plunger, I, is provided, to push the nut-blank squarely downwards into the recess of the carriage. The plunger is connected with a lever, H, the butt of which is held by a spring, E′, within the range of a cam, C^2, secured to the cam-shaft D. This plunger-cam is so formed and set relatively to the cams that operate the movable knife and the carriage, that it depresses the plunger after the nut-blank is cut off, and before the carriage moves to transfer it to the snapping mechanism.

The holder *j* is made adjustable by securing it to the machine by a screw-bolt, *n*, which passes through a slot in the shank of the adjustable holder, so that the face of the latter may be moved toward or from the face of the stationary knife, and secured in the required position to exert a slight pressure upon the bar when it is pushed in between the knives.

In the present machine the nut-blank is snapped by a concave-faced tool, J, which is connected with a slide, B^2, located farther inward in the machine than the movable knife-stock, and moved forward at proper intervals to snap the nut by means of a cam, C^3, secured to the cam-shaft D, the return movement from the snapped nut being effected by a spring arranged within the slide. The nut-blank is delivered in front of this snap-tool by the carriage *f*, and it is then directly in front of a stationary support, M, through which the punch that forms the opening through the nut is protruded.

As the side of the recess *m* in the carriage *f*, which presents the nut to the snap-tool would be in the way of that tool when it moved forward, the carriage must be withdrawn before the snap-tool operates upon the nut-blank. In order, therefore, that the nut-blank may be properly held while it is snapped, a traveling spring-nippers, N, is provided, and is moved forward from the hinder side of the machine at the proper time until its spring-jaws embrace and hold the nut-blank presented by the carriage, so that the carriage may then be withdrawn, leaving the nut-blank in the nippers directly in front of the snap-tool J, on one side, and the support M on the other.

In order that the spring-nippers may seize the nut-blank, the carriage *f* is made thinner than the nut-blank, so that the latter overhangs the recess in which it lies. The spring-nippers are also thinner than the nut-blank, so that they advance upon the portion of the latter which overhangs the recess of the carriage, and when the carriage is withdrawn, the side of the nut-blank toward the snap-tool overhangs the jaws and is the portion upon which the snap-tool acts. The spring-nippers project from a stock, O, which is moved to and fro at the proper times by means of a cam-groove, *g′*, formed in the periphery of a cam, C^4, secured to the cam-shaft D′, and this cam-groove acts upon a pin projecting from a slide, G′, with which the stock of the nippers is connected by an arm, *h*.

As soon as the carriage *f* is withdrawn from the nut-blank the snap-tool is forced against it by its cam C^3. This cam has a grade concentric with the cam-shaft D, to which it is secured, so that the snap-tool remains at rest in contact with the nut-blank for a short period after it has snapped it. During this period the punch *s* is caused to advance and punch a hole in the nut-blank, which is supported against the punch by the snap-tool. The punch *s* is arranged to protrude through a hole in the stationary support M of the nut-blank, and it is secured to a slide, B^3, which is pushed forward at the proper time to punch the nut-blank by means of a cam, C^5, secured to the cam-shaft D′. The slide is provided with a spring, E^3, which returns it, and thereby withdraws the punch from the nut after the cam C^5 has done its work; but as the punch might hang in the nut-blank if the spring alone was employed to withdraw it, a pair of cams, C^6 C^6, are provided to act upon pins secured to the sides of the punch-slide and pull it back by a positive movement in case the spring should fail to act.

The cams C^3 C^5, which operate the snap-slide and punch-slide, are so formed that they permit the snap-tool and punch to withdraw simultaneously from the nut-blank, leaving it in the spring-nippers.

The devices for forging the nut are situated nearer the back of the machine than the snap-tool, and consequently the nut-blank must be transferred to them after it is snapped and punched. In order to effect this transference, the spring-nippers are caused by the form of the cam-groove *g′*, which operates them, to move toward the back of the machine after the punch and snap-tool have been withdrawn from the nut-blank, so that the nut-blank is carried backward by the nippers. The forging is effected upon a stationary anvil-block, P, by a reciprocating hammer, Q, which is depressed by tappets *r r r r r′*, projecting from a cam-ring secured to the cam-shaft D′ and acting upon one end of a lever, H′, whose opposite end enters a slot in the piston of the hammer. The hammer is raised after each depression by a spring, E^4. Four of the tappets are used to forge the four sides of a square nut. The fifth tappet is used to forge the nut flatwise.

In order that the hole in the nut-blank may

not be defaced by the forging, the nut-blank is forged upon a mandrel, *t*, and this mandrel is so moved that it takes the nut-blank from the spring-nippers, places it over the anvil-block to be struck by the hammer, turns it at intervals to present its edges in succession to the hammer, and then withdraws from the nut-blank. In order that it may take the blank from the spring-forceps and present it to the hammer over the anvil-block, it is caused to advance endwise into the hole of the nut-blank, and its body is made of slightly-larger diameter than the hole and its point slightly tapering, so that it may be entered into the nut-blank and that the latter clings to it; consequently when the mandrel is drawn back it withdraws the nut-blank from the nippers, leaving them free to move forward and operate upon a succeeding nut-blank.

The mandrel is connected loosely with a slide, B^4, which is moved to advance the mandrel into the nut-blank by a cam, C^7, secured to the cam-shaft D, and acting upon a pin secured to the slide B^4. This slide is connected by a link, *u*, with a spring, E^5, which, acting antagonistically to the cam C^7, draws back the mandrel, as soon as the form of the cam will permit such motion, until the nut-blank is placed directly over the anvil-block P and under the hammer Q. The spring E^5 is then prevented from mov- the mandrel farther by a bridle, R, which limits its range of motion.

The hammer is caused, by the four tappets *r r r r*, to strike four times upon the edges of the nut-blank, which is turned one-quarter round between each two blows, so as to present a new face to be forged, this turning of the blank being effected by turning the mandrel. For this purpose it is fitted with a sleeve, *w*, through which it can slide freely endwise, but with which it is compelled to turn, the connection between the mandrel and the sleeve being a spline or feather upon one and a longitudinal groove in the other. The sleeve lies in a deep groove in a bearing, S, which permits it to turn and to rise and fall, but prevents it from moving materially endwise with the mandrel. It is fitted with a beveled pinion, T, whose teeth engage with those of a beveled wheel, T′, which is fitted upon an arm projecting from a bracket, U, secured to the bed-plate of the machine. The hinder side of this wheel is furnished with pins, *v*, which are within the range of motion of three pins, *v′*, that project radially from a hub, C^8, secured to the cam-shaft D. These radial pins are so arranged relatively to the tappets *r r r r*, which operate the hammer, that they act upon the pins of the beveled wheel T′ and turn it, the mandrel *t*, and the nut-blank upon the mandrel between each two blows of the hammer, and the angular distances and lengths of the pins are such that the amount of turning effected by each is a quarter of a revolution of the mandrel when a four-sided nut is to be formed.

As the nut is square or four-sided, and as the anvil P is stationary, it is necessary to raise the nut as it is partly turned and then to let it descend, so as to bear squarely on the anvil. These operations are effected by causing the mandrel *t* to tilt the nut-blank as it turns it, the tilting motion being imparted by the former *x*, or forging-guide, which is a square block, with the corners removed, secured to the sleeve *w* above a rest or flat block, V. As the distance from each corner of this former to the center of the mandrel is greater than the distance from one of its sides to the center of the mandrel, and as the former is compelled to turn with the sleeve and mandrel, the effect of it is to raise the sleeve and mandrel as they turn, as represented at Fig. 10, and then lower them again; and as the sides of the former are square with each other they bring the mandrel at the end of each movement to the exact position which it should occupy to cause the hammer to make a square nut. As the weight of the parts is not sufficient to cause them to descend with the requisite speed when the former permits their descent, a spring, E^6, is arranged to bear upon the sleeve *w* and insure their rapid descent.

After the nut has been forged upon its edges it is forged flatwise. For this purpose the mandrel is withdrawn from it and it is presented flatwise to the hammer. The withdrawal of the mandrel is effected by a cam, C^9, secured to the cam-shaft D, acting upon a pin, *y*, projecting from the mandrel slide B^4, and the nut is prevented from moving with the mandrel by a stop, *z*, through which the mandrel slides and against which the nut abuts after the mandrel has carried it with it a short distance. When the mandrel withdraws from the nut-blank, the lower edge of the latter is received in a shallow recess, *c′*, in front of the stop *z*, and immediately afterward a pusher, *d*, is moved against its upper side by a tappet, *o*, (represented in dotted lines in Figs. 3 and 4,) projecting in the proper position from the cam-hub C^{10} to act at the proper time upon the slide *d′* with which the pusher is connected. As this pusher moves the upper side of the nut-blank from the stop *z*, while the side of the recess prevents the lower side of the nut-blank from moving in the same manner, the effect is to turn the nut-blank upon its flat side, thus placing it flatwise upon the anvil beneath the hammer, which is then depressed by the long tappet *r′* of the cam-ring K to forge the nut-blank flatwise, thus finishing it. As soon as the pusher has operated upon the blank it is withdrawn by a spring acting upon its slide *d′*, the form of the pusher-cam C^{10} being such as to permit such withdrawal.

After the nut is completed it is ejected from the anvil by the discharger X, which is pushed forward at the proper moment by a cam, C^{11}, secured to the face of the wheel Z, and is withdrawn by a spring, E^8, after the cam has pushed it forward. The finished nut drops through a hole in the bed-plate of the machine.

Instead of forging the nut flatwise by the same hammer which forges it edgewise, we sometimes permit the nut to drop down through a slot in front of the stop *z* after the mandrel is withdrawn, and receive it upon a support be-

neath. Upon one side of the support we arrange a vertical anvil, and upon the opposite side we arrange a horizontal-acting hammer, which is operated by a tappet at the proper time to compress the nut-blank flatwise and complete the nut. The discharger in this case is employed to dislodge the nut from its support after the horizontal hammer has acted, and the pusher X and the long tappet r' are omitted.

As nuts vary in thickness the movement of the hammer which forges them flatwise must correspond with the thickness of the finished nut. In order that this movement may be adjusted to suit nuts of different thicknesses, the tappet r' is constructed to move radially in a socket in the cam-ring K, so that it may be set to project more or less. It is prevented from receding into the socket by the interposition of packing of pieces of plate-iron inserted in the socket beneath its butt; and it is held securely in place by constructing the cam-ring with a movable cheek, *l*, which is caused to press firmly against the side of the tappet by screws *i*, Fig. 13.

The two cam-shafts D D′ are connected by cog-wheels $z\ z'\ z^2$, so as to revolve in unison, the intermediate cog-wheel, z^2, being secured to a shaft, D^2, which is prolonged to receive a fly-wheel and a belt-pulley, to which the power may be imparted by means of a belt.

From the drawings and above description it will be seen that the cutting devices are arranged in one group near the front side of the machine, the snapping and punching devices constitute a second group near the center of the machine and parallel with the group of cutting-devices, while the forging devices constitute a third group at the rear of the machine and parallel with the other two.

It will also be perceived that the three groups are combined by the transferring-carriage and traveling spring-nippers which transfer the nut-blank transversely to the mean lines of the above-mentioned three groups in the direction of the red lines ⅌ ⅌, Fig. 1. This arrangement and combination permits the devices to be arranged substantially in the same horizontal plane and at sufficient distances apart to prevent them from interfering with each other. It also affords free access to all the parts for adjustment and repair; and, as the different groups act in succession and the devices of one group act upon one nut-blank while those of another are acting upon another nut-blank, the machine is capable of turning out finished nuts with great rapidity.

Having thus described a machine embodying our invention, we deem it proper to state that parts of our invention may be used without others whenever circumstances will permit such use—as, for example, our forging instrumentalities may be used in machines employing other combinations than those we have described for the purpose of snapping and punching the nut. The construction of parts of our invention may also be modified without changing their mode of operation—as, for example, the former or forging guide may be made six sided, in order to adapt it to tilting a nut-blank for a six-sided nut.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination of the cutting devices of the nut-machine, and a transferring-carriage to move the nut-blank, with a plunger which moves the blank from the cutters and delivers it to the transferring-carriage, constructed and arranged as set forth.

2. The combination of the cutters and snapping and punching devices with a recessed transferring-carriage to carry the nut-blank from the cutters and deliver it to the snapping and punching devices, constructed and arranged as set forth.

3. The combination of the transferring-carriage with the transferring spring-nippers, the two operating substantially as set forth.

4. The combination of the movable concave snapping-tool, support for the flat side of the nut-blank, and punch moving through said support, so that it will punch from the side opposite that at which the snapping-tool operates, substantially as set forth.

5. The combination of the forging-mandrel with the devices for turning it, and with the former and rest therefor, substantially as set forth.

6. The combination of the forging-mandrel, former, and spring, substantially as set forth.

7. The combination of the hammer with tappets of different lengths, and with an instrument to turn the nut-blank upon its flat side, substantially as set forth.

8. The combination of a cam-ring with a movable tappet, and with a movable cheek to clamp the tappet in its place, substantially as set forth.

In witness whereof we have hereunto set our hands this 16th day of January, A. D. 1865.

EMIL HUBNER.
CHARLES HALL.

Witnesses:
ANDW. ANDERSON, Jr.,
W. L. BENNEM.