(No Model.) 8 Sheets—Sheet 1.

S. H. MARKHAM.

MACHINE FOR FORGING NUTS.

No. 520,067. Patented May 22, 1894.

- FIG. I -

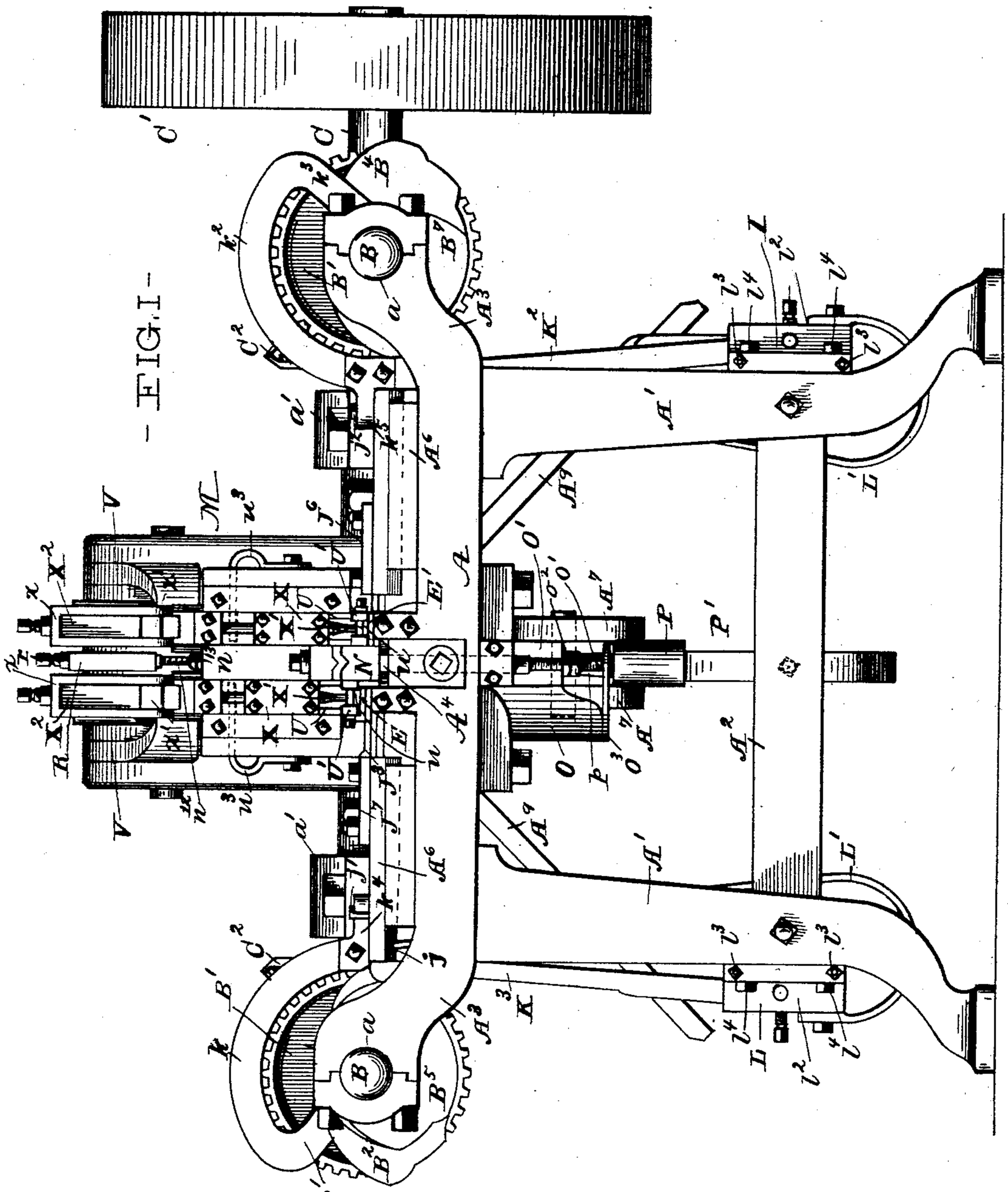

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FIG. II

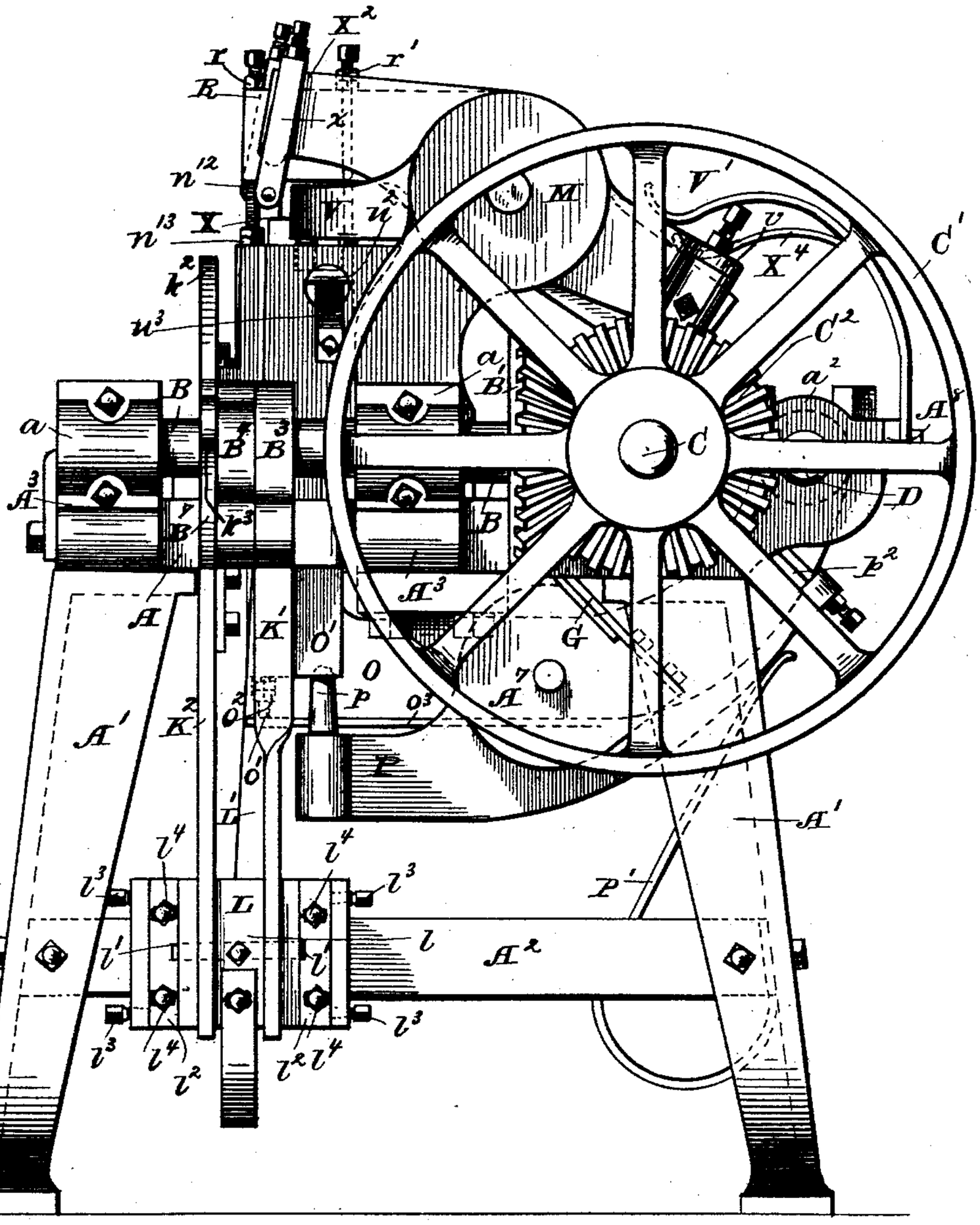

FIG. XIV

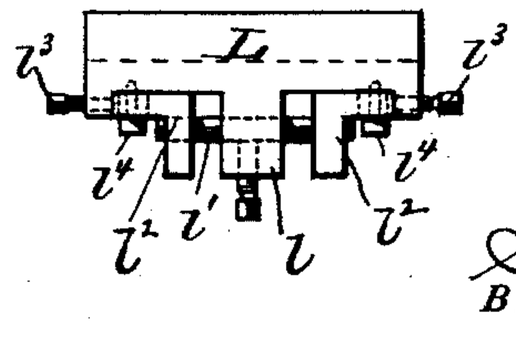

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FIG. III

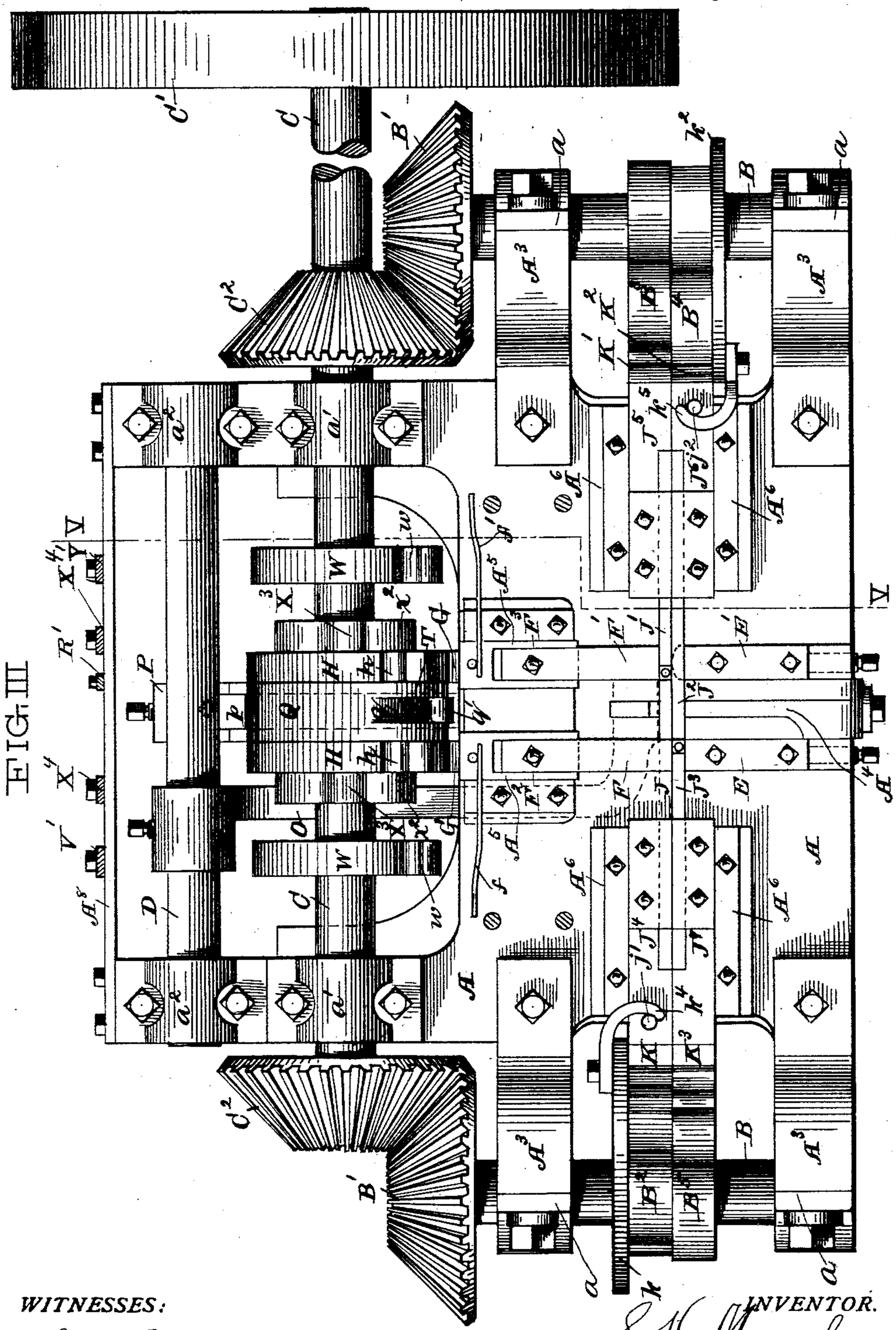

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FIG. IV.

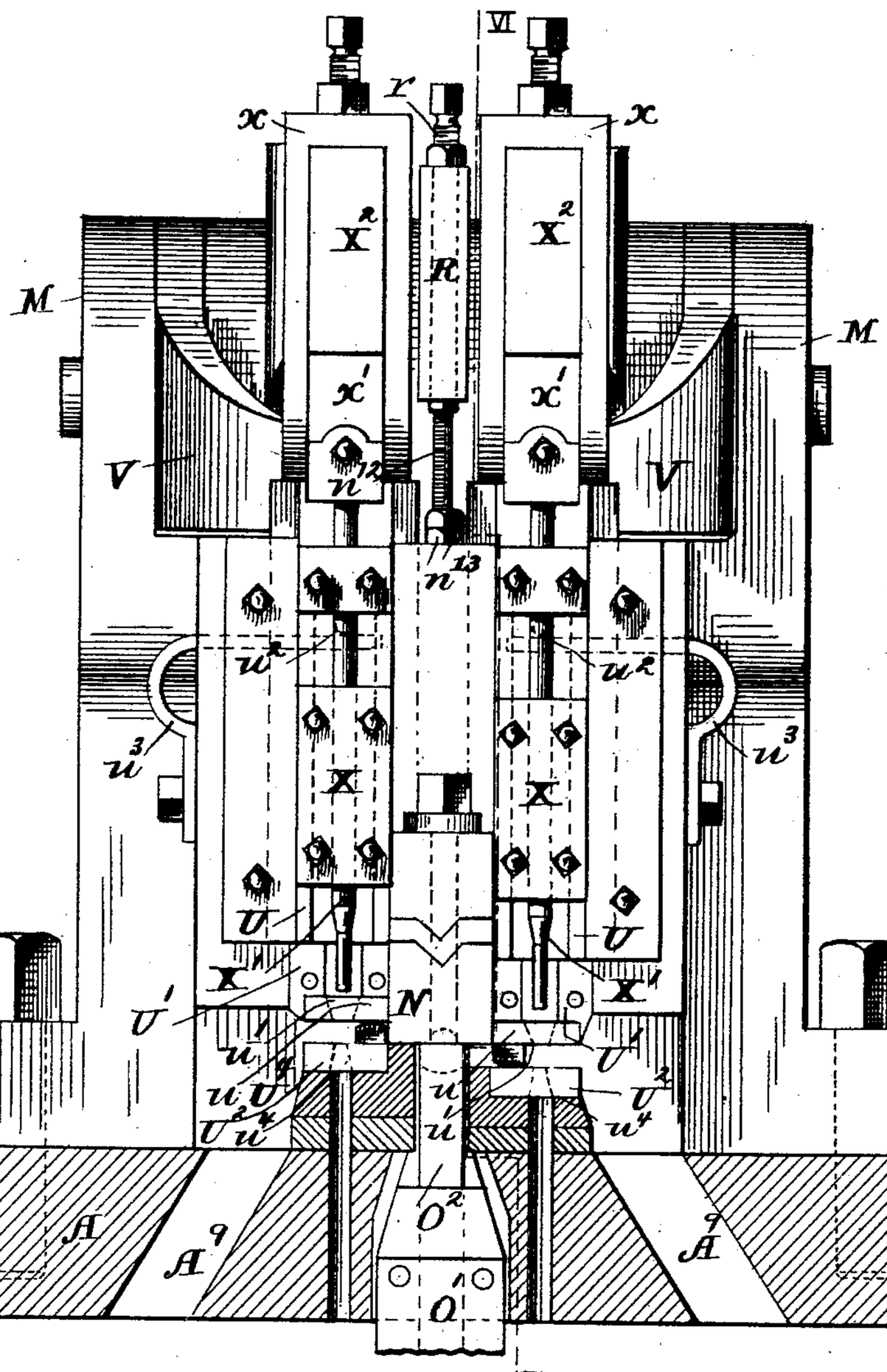

FIG. XV.

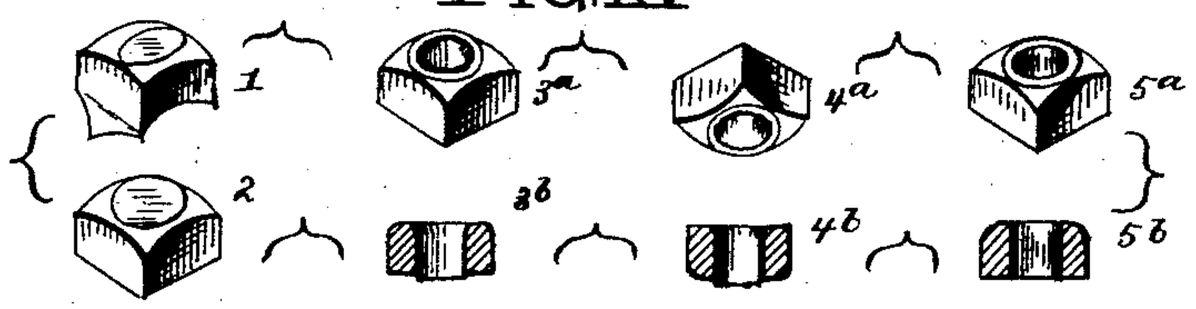

FIG. XVI.

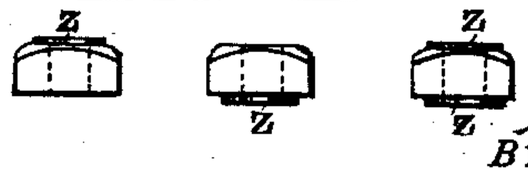

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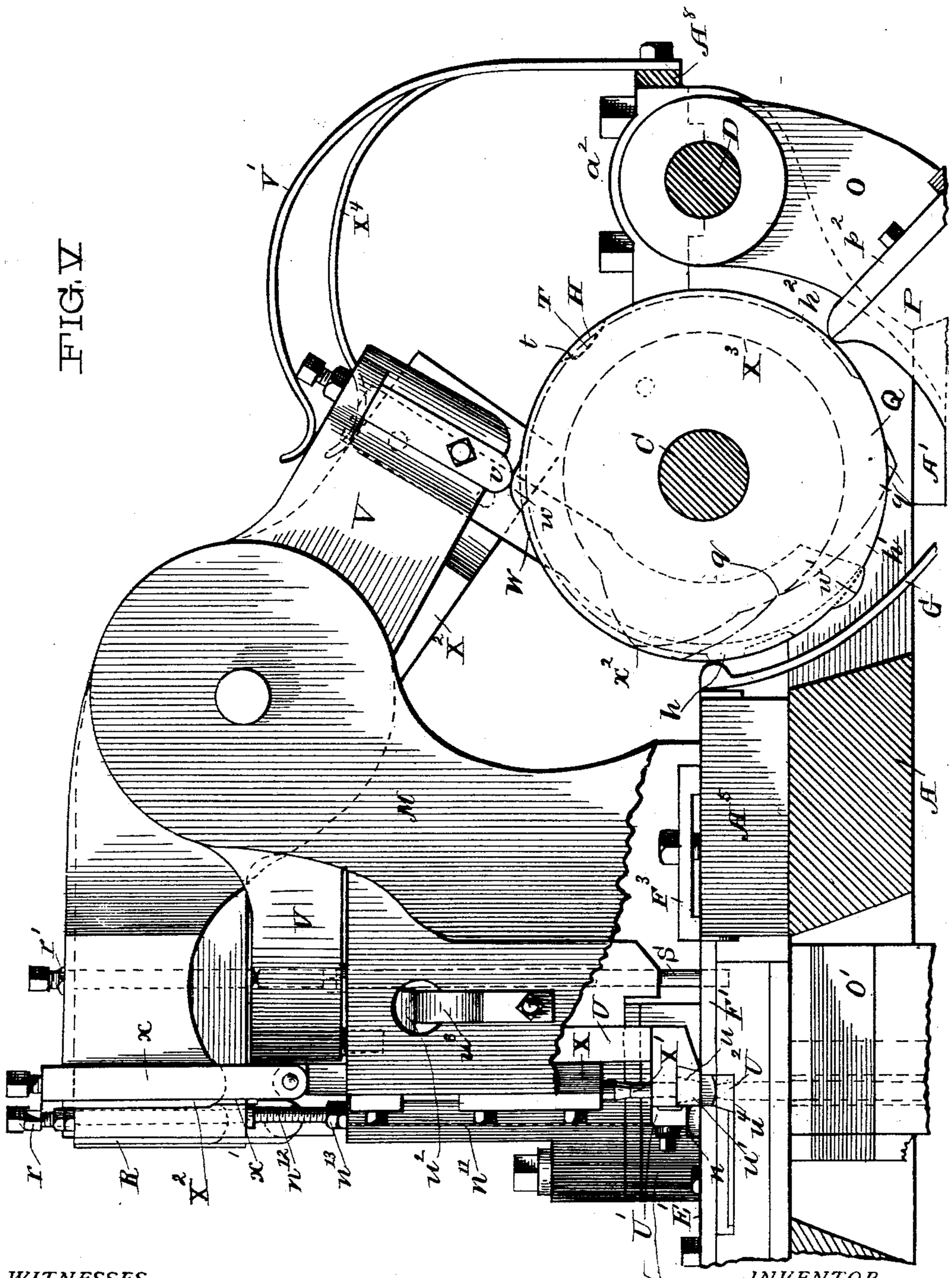
FIG. V.



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MACHINE FOR FORGING NUTS.

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FIG. VI

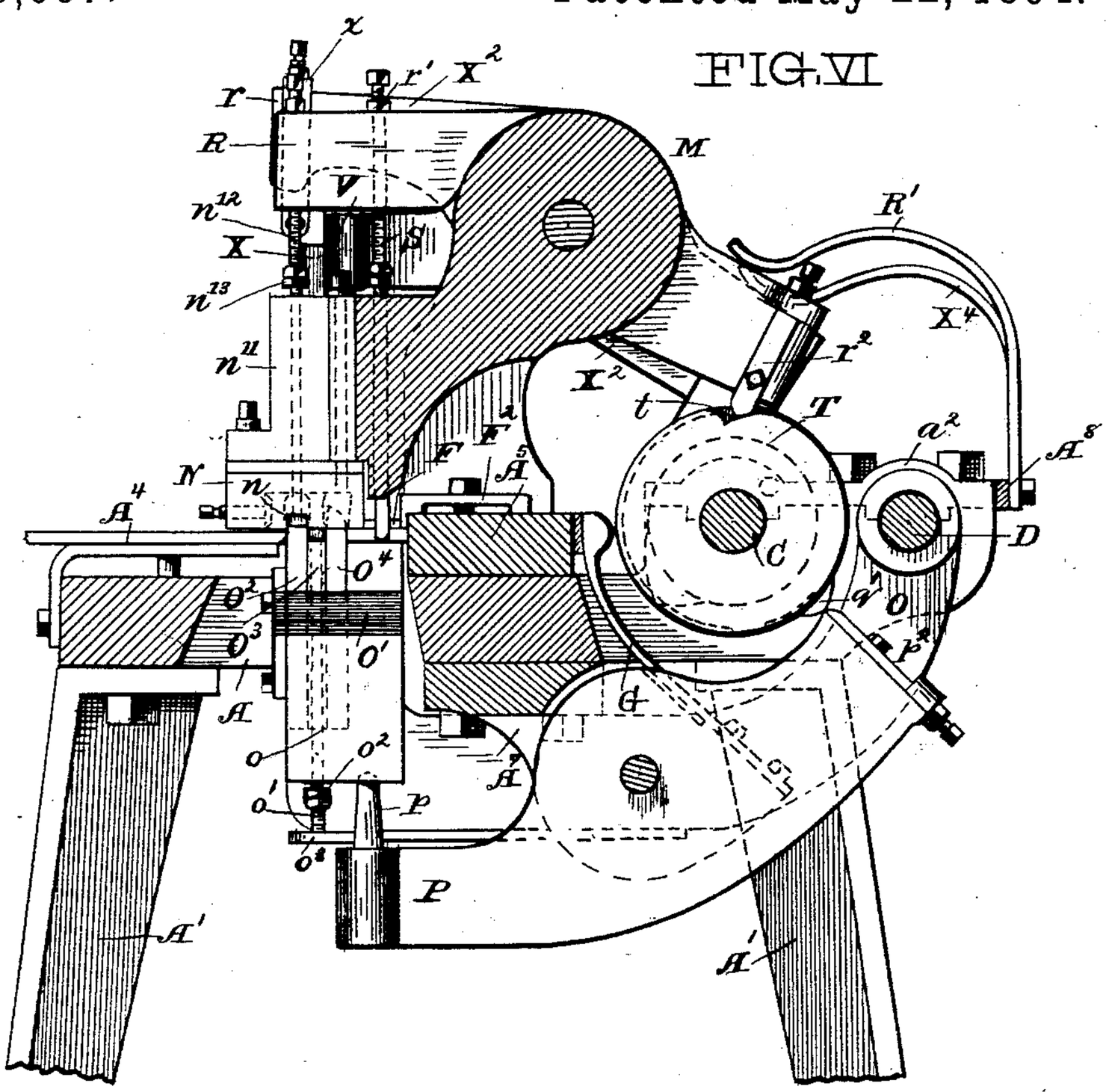


FIG. VII

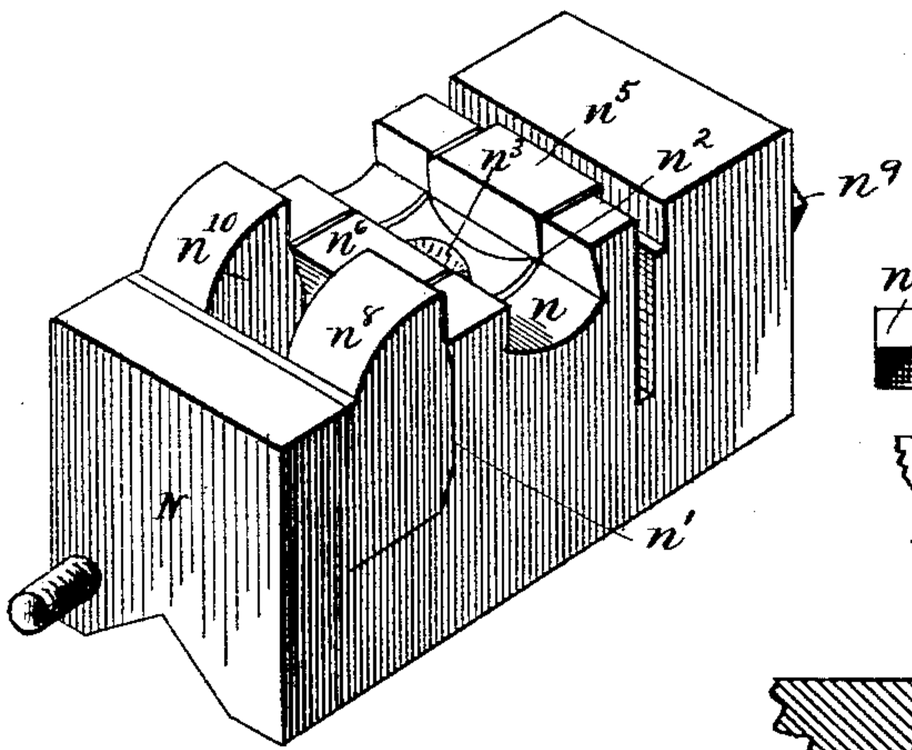
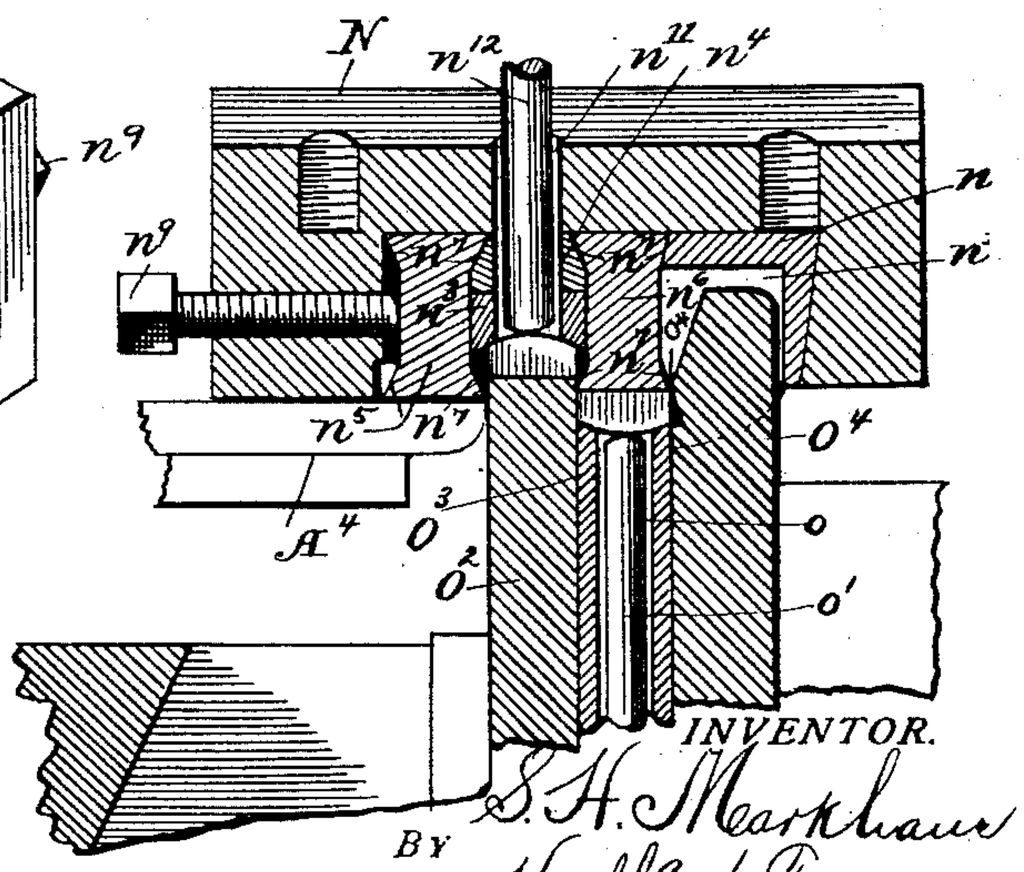


FIG. VIII



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(No Model.) 8 Sheets—Sheet 7.

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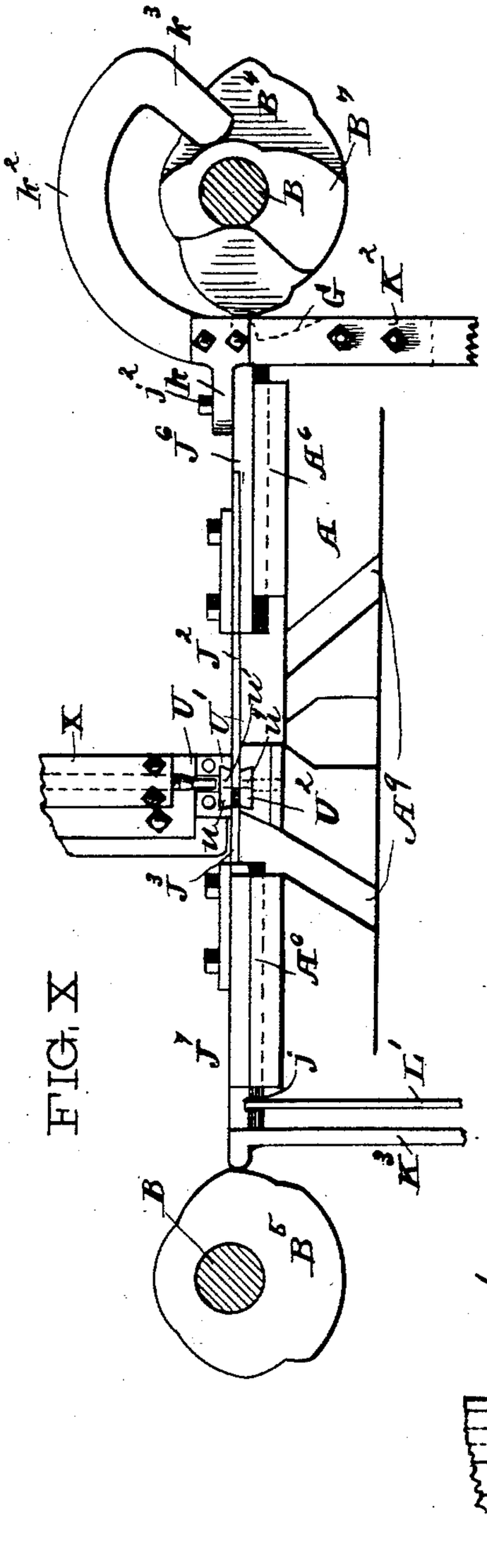

FIG. X

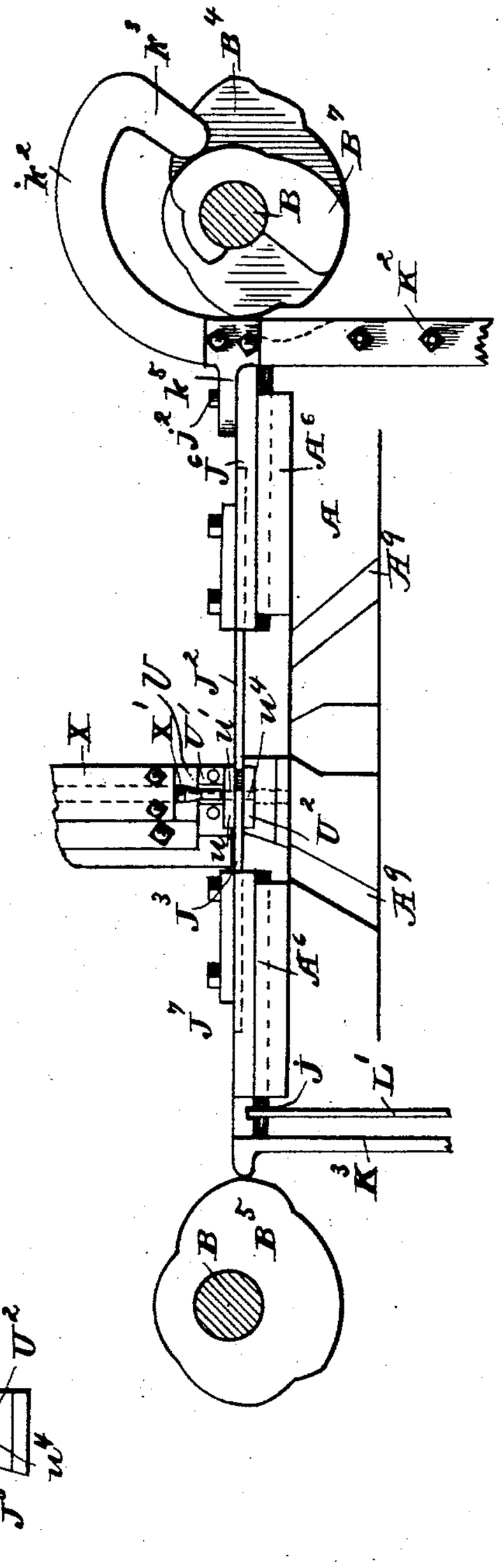

FIG. IX

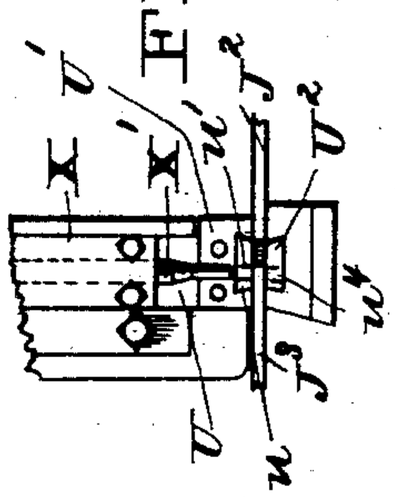

FIG. XI.

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(No Model.) 8 Sheets—Sheet 8.

S. H. MARKHAM.

MACHINE FOR FORGING NUTS.

No. 520,067. Patented May 22, 1894.

FIG. XII

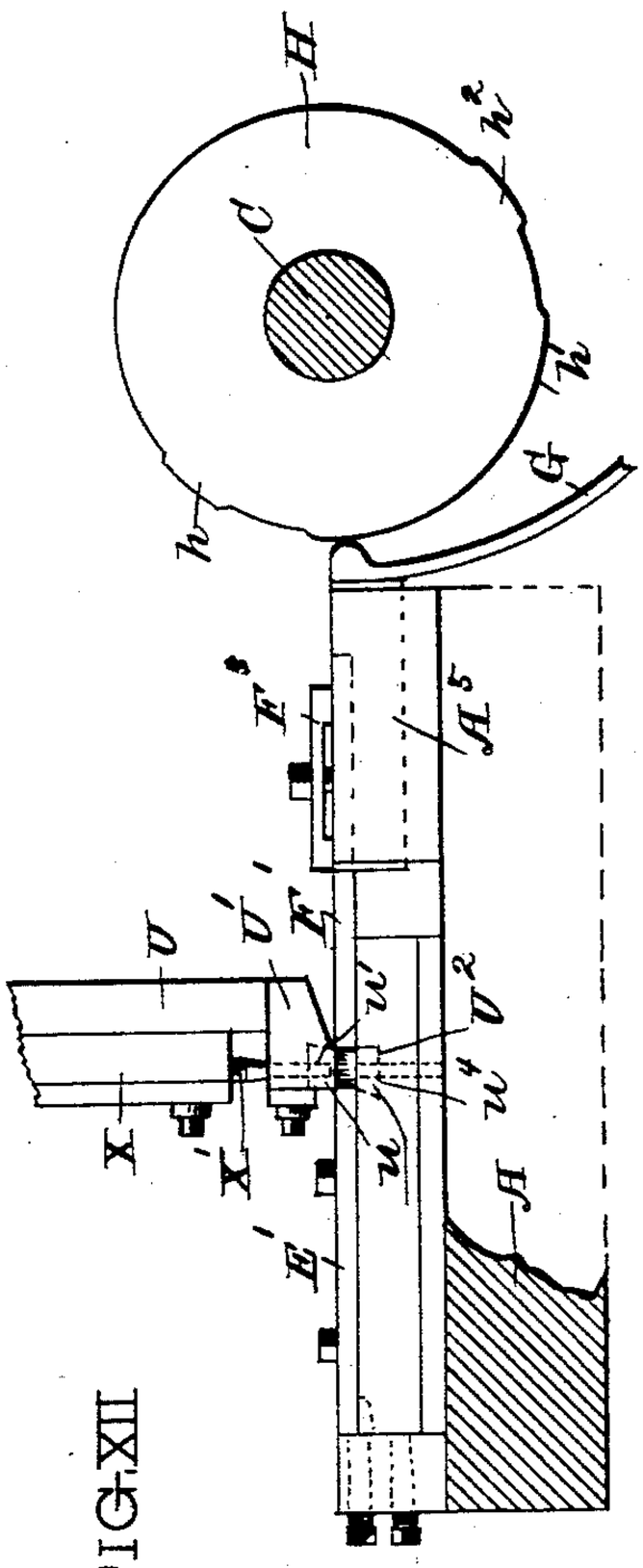
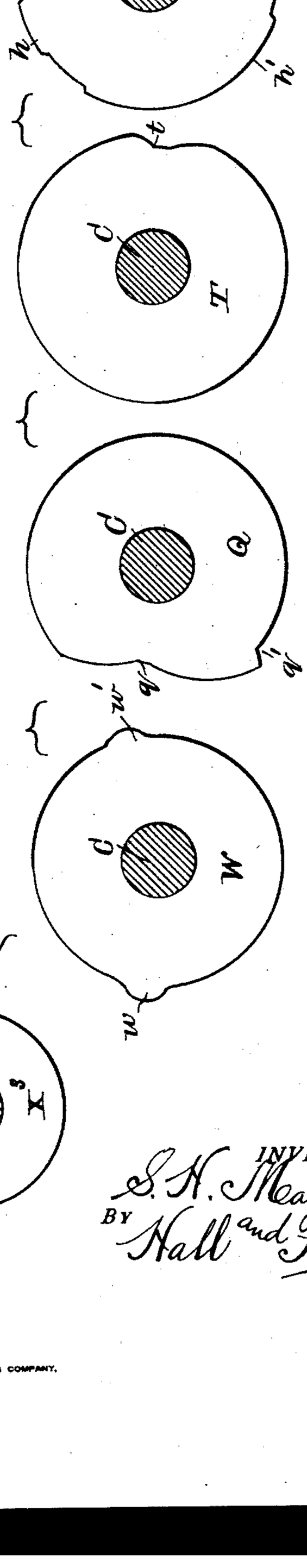


FIG. XIII



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UNITED STATES PATENT OFFICE.

SAMUEL H. MARKHAM, OF CLEVELAND, OHIO.

MACHINE FOR FORGING NUTS.

SPECIFICATION forming part of Letters Patent No. 520,067, dated May 22, 1894.

Application filed March 9, 1892. Serial No. 424,266. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL H. MARKHAM, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Machines for Forging Nuts, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

When operating my improved machine, I first cut two blanks from a bar, by upward pressure of a suitable tool against stationary resistance of a corresponding tool, said tools being so constructed that the blank next the end blank will be raised to a plane above the plane of the end-blank, whereby the end blank will receive a preliminary rounding upon its under side and the blank next to the end will receive a preliminary rounding upon the upper side. If desired, however, to carry out certain steps, only, of my method, I may have the blanks formed in any suitable or desired manner and by any suitable or desired tools or implements. When the blanks are cut, they are crowned, preferably by the same tools which severed them, and, when cut, in the above, first referred to manner, the end blank is crowned upon the under side and the blank next to the end blank upon its upper side. The crowning process forms the nut blanks completely convex upon one side, thereby insuring a perfect rounding of all their corners and a perfect crown or convexity of the blanks. After the nut blanks have been crowned they are squared either by simultaneous pressure from all sides or first from two opposite sides and then from the sides at right angles thereto. Immediately after the process of squaring, they are flattened upon both sides, the flat sides of the nut blanks receiving a true, flat surface, and the crowned sides of the blanks receiving the flat, circular surface which appears annular around the bores of the blanks after they have been pierced. After flattening the nut-blanks they are pierced, being in the meantime again squared and supported from the faces and from their flat and crowned sides, so that the process of piercing shall not affect the shape of the blanks. After piercing the blanks they are again flattened from their flat and crowned sides so as to correct any changes in the flattened portions which may have been caused by the piercing tools. The nut blanks are now finished ready for tapping.

The annexed drawings and the following description set forth, in detail, one mode of carrying out the invention; such specific mode being but one of various ways in which the principle of the invention may be used.

In said annexed drawings—Figure I represents a front view of my improved nut forging machine; Fig. II, a side view; Fig. III, a top plan view of the machine with the head removed; Fig. IV, a front view of the head; Fig. V, an enlarged section taken on the line V—V, Fig. III; Fig. VI, a vertical section taken on the line VI—VI, Fig. IV; Fig. VII, an inverted perspective view of the stationary shear block; Fig. VIII, a sectional detail view of the shear block and shear bits; Figs. IX and X, detached views of one set of side hammers, hammer slides, and cams, showing two modes of constructing the flatteners with comparatively slight changes in the means; Fig. XI, a detail view illustrating the flattener and side hammers for simply flattening the nut blank before piercing it; Fig. XII, a detached view illustrating one back hammer and the cam for operating it; Fig. XIII, views of the several cams upon the rear shaft; Fig. XIV, a view of one of the shoes for the side supporting arms; Fig. XV, perspective and sectional views of nut blanks at various stages of completion, and Fig. XVI, edge views of other forms of nuts capable of being made upon my machine.

In the drawings the letter A indicates the table or main frame of the machine which is mounted upon suitable legs, A′, connected by cross pieces, A^2, near their lower ends. Bearing brackets, A^3, project laterally from the sides of the main frame and are formed with bearings, *a*, in which are journaled shafts, B, parallel to said sides and slightly above the plane of the frame.

A drive shaft, C, having a suitable drive pulley, C′, or other means for receiving rotary motion, is journaled in bearings, *a*′, at the rear edge of the main frame, and has bevel cog wheels, C^2, which mesh with similar cog

wheels, B′, upon the side shafts. A shaft, D, is journaled to rock, parallel to the rear shaft, in bearings, a^2, projecting rearward from the rear bearings a'.

A horizontal guide, A^4, is formed at the middle of the forward edge of the main frame and is slightly wider than the bar from which the nut blanks are cut and which is fed to the shears through this guide.

Two stationary, forward hammers, E and E′, are adjustably secured upon the main frame at both sides of the bar-guide A^4, one, E, being secured in a plane above the other, E′, substantially as much higher as the thickness of the nut-blanks made in the machine, and being as much shorter than the other hammer as the width of the nut blank.

Two back hammers, F and F′, are adjustably secured in back hammer slides, F^2 and F^3, which slide in hammer guides, A^5, upon the rear portion of the main frame. The hammer F is as much longer than the hammer F′, as the width of the nut blank, and slides in a plane above the other hammer, corresponding to the forward hammer E; the other hammer F′ sliding in the same plane in which the forward hammer E′ is secured. Retracting springs, f and f', are secured at their ends and bear against pins or other projections upon the hammer slides, said springs serving to retract the back hammers after they have been thrown forward by their cams.

Spring bearing arms, G, are secured to the frame and are so shaped as to have their free, upper ends interposed between the rear ends of the rear hammer slides and two cams, H H, secured upon the rear or drive shaft; the tension of said spring bearing arms being against the cams. The periphery of each of said cams is formed with a short bulge, h, and a long bulge, h', both described with the same radius, and with a short bulge, h^2, described with a slightly shorter radius. The purpose of the cams is to reciprocate the back hammers, forcing the latter forward by the bulges upon their peripheries, as the shaft and cams revolve.

Two pairs of side hammers, J J′ and J^2 J^3, are adjustably secured in side hammer slides, J^4 J^5 and J^6 J^7, which slide in side hammer guides, A^6, upon the main frame; and the rear pair, J J′, are arranged in a plane below the forward pair, J^2 J^3, said two pairs sliding in the same planes as the back hammers and forward hammers.

Two pairs of cams, B^2 B^3 and B^4 B^5, are secured upon the two side shafts B B and bear with their peripheries against the upper ends of bearing arms, K K′ and K^2 K^3, which again bear against the outer ends of the side hammer slides. The lower ends of the bearing arms are pivoted in shoes, L, secured upon the cross-pieces A^2, each of said shoes having a central lip, l, in which a pivot bolt, l', is secured, upon which the arms are pivoted. Sliding, L-shaped lips, l^2, fit upon the ends of the pivot bolt and have adjusting screws, l^3, bearing against the ends of their feet to adjust them toward or from the bearing arms; and fastening screws, l^4, through their feet to secure them in their adjusted positions. By means of these adjustable lips all wear upon the bearing arms or upon parts of the shoes may be taken up and the arms may always swing in perfectly true, vertical planes. Springs, L′, are secured at their lower ends upon the central lips of the shoes and have their upper ends engaging notches, j, in the under sides of the outer ends of the hammer slides J^7 and J^5, serving to hold said slides against their bearing arms K^3 and K′ and to force the latter against the peripheries of their operating cams B^5 and B^3.

The cams B^2 and B^4 are of the same shape and the cams B^3 and B^5 are of the same shape, their corresponding bulges and depressions, however, being opposed, as the cams B^2 and B^3, and B^4 and B^5, respectively operate, in the same manner and at the same time, the long hammer J and short hammer J′ of the rear pair of side hammers, and the long hammer J^2 and short hammer J^3 of the forward pair of side hammers, but from opposite sides. The bulges and depressions of the cams will be described later when the construction of the other parts of the machine and the operation of all the parts becomes more apparent. The bearing arms K and K^2 have upwardly and outwardly curved hooks, k and k^2, upon their upper ends, and the ends, k' and k^3, of said hooks are bent inward to bear against cams, B^7, which serve to positively withdraw the bearing arms and the hammers with them; the bearing arms having curved fingers, k^4 and k^5, which engage studs, j' and j^2, upon the hammer slides J^4 and J^6.

A head, M, is secured upon the main frame, straddling the back hammers and overhanging the inner ends of the side hammers. An upper, stationary shear block, N, is secured upon the middle of the under side of the overhanging portion of the head, and is formed in its under side with a transverse recess, n, of substantially the width of the nut to be cut. The shear block has furthermore a deeper, transverse recess, n', a distance to the rear of the former recess, equal to the width of the nut; and an equally deep longitudinal recess, n^2, extends from the rear wall of said latter recess, through the recess n and beyond the same, being of the same width as the nut to be cut. A square crowner die, n^3, is secured in the longitudinal recess at its intersection with the forward, transverse recess n, and has a concavity in its face, of the curve desired for the crown of the nut. Said crowner die preferably rests against a supporting block, n^4, having beveled sides, although the die may be of a sufficient thickness to rest against the bottom of the recess. Two shear bits, n^5 and n^6, are secured in the longitudinal recess, one forward and one to the rear of the crowner die, and said bits are preferably of the shape illustrated in Figs. VII and

VIII, having outwardly flaring or beveled sides, n^7, at both ends so as to each have four overhanging shearing edges. A gage-block, n^8, fits and slides in the deep, transverse recess, so as to lock the shear bits and crowner die in position, a set-screw, n^9, passing through the forward end of the shear block and serving to securely lock said bits, die and block in place by bearing against the forward bit. It is obvious from the shape of the bits that, as one edge, only, of each bit is used at a time, each bit may be turned so as to present four sharp edges before requiring to be sharpened and, after all the edges have been dulled, the ends of the bits may be ground down to produce new shearing edges, whereupon they may again be secured in the shear block, pieces of sheet metal being placed between the bits and the bottom of the recess to make up for the metal ground away, and to bring the active shearing edges to their proper level. That portion of the under side of the shear block which is forward of the crowning recess, as well as the end face of the forward bit is in a plane slightly below the plane of the end face of the rear bit so that the iron bar, fed beneath the shear block will not be liable to strike the active shearing edge of the rear bit. The gage block n^8 has a recess, n^{10}, of about the same width as the crowner die, the purpose of which recess will hereinafter appear. The crowner die, shear block and head has a vertical bore, n^{11}, in which an ejector rod, n^{12}, slides, said rod having adjusting nuts, n^{13}, at its upper end by means of which its projection beneath the crowner may be adjusted. By means of this rod the nut blank may be forced out of the crowner recess and die after it has been sheared off from the bar and crowned.

A forwardly curved arm, O, is supported at its upwardly-projecting, rear end to rock upon the rock shaft D, and has a shear holder, O′, at its forward end. A shear or cutter, O^2, and a crowning blank rest, O^3, are secured in the shear holder, the rest to the rear of the cutter; and a gage, O^4, is secured to the rear of the blank rest and may project into the recess in the gage block of the shear block. The cutter is of such a width that it may enter the crowning recess of the shear block making a shear cut with its edges opposed to the active shearing edges of the shear bits in said block. The blank rest is concave so as to form a crowning die for the nut blank resting upon it, and is formed with a vertical bore, o, extending through the shear holder and in which slides an ejector rod, o', having adjusting nuts, o^2, upon its lower end and bearing with its lower end against a flat spring, o^3, secured to the under side of the shear holding arm, O, and serving to raise the rod and the nut blank when the arm is released from upward pressure against the shear block. The forward face of the gage is inclined, and has a slight overhang over the crowing blank rest, as indicated at o^4, so that the bar,—as the end of the latter is forced against the gage,—may be moved back to have the exact lengths of nut blanks cut off; the bar being carried with and sliding down upon the incline, as the movable shear holder rises. The overhang provides a space upon the crowning blank rest, slightly wider than the nut blank, so that the blank, which is cut off at a less width than the blank rest, may have a sufficiently large surface to rest upon to receive a perfect crowning upon its under side. This will clearly appear by referring to Fig. VIII of the drawings.

A lever, P, is fulcrumed at about its middle between two lips, A^7, upon the under side of the main frame, and has a conical arm, p, pivotally supported upon its forward end, said arm bearing with its rounded apex in a suitable seat in the under side of the shear holder. The rear end of the lever has a steel nose piece, p^2, adjustably secured in it, and said nose-piece bears against the periphery of a shear operating cam, Q, secured upon the rear or drive shaft C. Said cam has a mainly circular periphery and has a depression, q, into which the nose piece drops when the shear and rest are depressed as the iron bar from which the blanks are cut is fed into the machine; and a bulge, q', upon which the nose piece rides when the rear arm of the shear lever is depressed and the forward arm with the shear and rest is raised to cut off the blanks. When the nose piece rides upon the circular periphery of the cam, the upper faces of the shear and rest are flush with the surfaces upon which the hammers slide and upon which the nut blanks slide or rest while being flattened or pierced. A lever, R, is pivoted in the middle of the head and has a vertical screw bolt, r, adjustably secured through its forward end, the lower end of said bolt bearing against the upper end of the ejector rod n^{12} in such a manner that it may depress said rod when the forward end of the lever is depressed. Another vertical screw bolt, r', is adjustably secured in the forward arm of the lever and bears with its lower end against the upper end of a rod, S, which slides in a suitable vertical bore in the head and bears with its lower end against the lower shear holder so as to positively depress the latter when the forward arm of the lever is depressed. The rear arm of the lever R has a suitable nose piece, r^2, which bears against the periphery of a cam, T, upon the rear shaft, said cam having a principally circular periphery with a small depression, t, into which the nose piece r^2 may drop at the same time the shear operating lever is actuated to raise the lower shear holder by the bulge q' upon the shear operating cam Q. Two flattener slides, U, slide in vertical guide ways in the forward face of the head and have forwardly projecting clamps, U′, at their lower ends, in which clamps flattener tools, u, are secured said tools having vertical perforations, u', for the passage of the piercers, and flatten-

ing surfaces at the sides of said perforations. The flattener slides have rearwardly projecting pins, u^2, upon their rear or inner faces, and springs, u^3, bear against said pins and serve to raise the slides when they have been depressed. Two levers, V, having inwardly curved forward arms, bear with the ends of said forward arms against the upper ends of the flattener slides; and the ends of the rear arms of said levers have steel nose pieces, v, which ride upon the peripheries of two cams, W, having two bulges, w and w', upon their peripheries, and secured upon the rear shaft. The flatteners will thus be twice depressed during one revolution of the rear shaft by means of said cams and the levers. Two piercer slides, X, slide in vertical guide ways in the forward face of the head and in front of the flattener slides, and said slides have the piercers, X′, secured in them in such a manner that the piercers may pass through the vertical perforations in the upper, movable flattener tools and through corresponding perforations, u^4, in lower, stationary flattener tools, U^2, suitably secured upon the machine frame beneath the upper flattener tools and having flattening surfaces at the sides of said perforations. The piercer slides are movably connected, by means of straps, x, and short knuckle arms, x', to the forward ends of two levers, X^3, fulcrumed in the head and having the ends of their rear arms bearing against two cams, X^3, secured upon the rear shaft, said cams having each a steep bulge, x^2, which will rock the levers and depress the piercers, once during each revolution of the rear shaft.

A bar, A^8, is secured to the bearings a^2 for the rock-shaft D, and curved springs, R′, V′ V′, and X^4 X^4, are secured upon said bar and respectively bear with their forwardly-curved ends against the rear arms of the levers R, V V and X^2 X^2, keeping the ends of said levers in contact with their respective cams.

A spring, P′, is secured upon the rear cross-piece A^2 of the machine frame and bears against the rear arm of the shear-operating lever P, holding it in contact with its cam H.

In Fig. XV, are shown, in perspective and sectional views, nut-blanks at the several stages of making nuts; 1, illustrating in perspective a nut-blank after it has been severed from the bar and crowned. The convex top of the nut has an oval configuration caused by the fact that the blank receives a preliminary curve as it is cut by the shears, so that the crowner tool or die acts with more effect upon the side portions of the top than upon the end-portions of the same. The flat side of the nut has fins at its ends caused by metal being drawn between the shearing edges. 2 illustrates in perspective the flattened nut-blank prior to piercing, showing the circular flat portion upon the top and the fins upon the under side as flattened into the nut blank. 3^a and 3^b illustrate in perspective and section, the upper nut-blank, or the blank crowned in the stationary shear-block, after said blank has been pierced from the convex side. The hole in the nut-blank has a rounded upper edge and a fin around its lower edge, caused by metal carried along with the piercer. 4^a and 4^b illustrate, in perspective and section, the lower nut-blank, or the blank crowned in the lower blank-rest and crowner, after said blank has been pierced from its flat side, showing how the metal is carried along with the piercer and forms a rounded upper edge and a fin around the lower edge. 5^a and 5^b illustrate, in perspective and section, the finished nut-blank as it leaves the machine after the final flattening, ready for tapping, showing the crowned and the perfectly flattened surfaces of the nut.

Fig. XVI illustrates three forms of nuts which may be made upon my improved machine. The nuts are shown as having raised washer-portions, z, upon their upper or under faces or upon both upper and under faces. When making these forms of nuts, the flattener tools are formed with circular recesses for forming the washer-portions during the process of flattening the blanks.

The operation of the machine is as follows:—The bar from which the blanks are cut, is heated to forging heat and introduced at the guide A^4 until it strikes the gage in the lower shear-holder. The shear-holder is raised by means of its lever and cam, and the shear, in conjunction with the upper, stationary shear-bits, cuts off two nut blanks, the blanks receiving a preliminary rounding at their ends by the action of the shear and bits. As the blanks are compressed by the upward movement of the shear-holder, the inner, lower blank is crowned by the crowner-die in the shear holder, and the outer upper blank is crowned by the crowner die in the stationary shear-block. When the shear-holder is again lowered, the long side-hammers strike the nut-blanks and convey them to the flattening tools, where the front and rear hammers and the side-hammers bear against the four sides of the blank and square them, either successively or simultaneously. After the banks have been squared, the flatteners descend and flatten the blanks, whereupon the flatteners ascend and allow the blanks to be conveyed beneath the piercers. The hammers will first square and then hold the blanks firmly while they are pierced and the flatteners will strip the blanks from the piercers while the latter ascend. The side hammers convey the blanks from beneath the piercers to the final flattening surface of the flattening tools, where the flatteners will again descend and give the final flattening to the blanks, the back hammers being at this stage barely in contact with the blanks, the short radius bulges upon their cams forcing the hammers but slightly forward. The side hammers will now push the finished blanks off from the flattener tools into suitable discharge chutes, A^9, through which the nuts are discharged out of the machine. The bulges

and depressions upon the opposite cams for the side-hammers correspond with each other so that the side-hammers bear constantly more or less tightly against the blanks while the latter are flattened and pierced. As it is very important to have the blanks brought accurately to the proper positions upon the lower flattener tools, so as to have the blanks perfectly and evenly flattened and pierced, the bearing arms K and K^2 and the hammers are prevented from flying too far inward when acted upon by the bulges of the cams by the hooked ends k k' and k^2 k^3 and the cams B^7, which positively retract the bearing arms and hammers and positively keep them from moving farther than the size of the bulges upon the cams require them to move.

In the form illustrated in Fig. IX, the nut blank is flattened at one side of the piercer, then conveyed beneath the piercer, then conveyed to the other side of the piercer and again flattened, and finally ejected from the machine.

In the form illustrated in Fig. X, the nut blank is illustrated at one side of the piercer, then conveyed beneath the piercer, then conveyed back to the same side of the piercer and again flattened, and finally ejected, being carried beneath the piercer and to the side of the same for the first flattening. The side hammer cams are formed with slightly different bulges and depressions in said two forms, on account of the different functions required of the side-hammers, but the method of treating the nut is the same in both forms.

In Fig. XI is illustrated a form of flattener tools which may be employed when it is desired to give the nut blank one flattening only, before piercing, the blank being conveyed to the flattener tool at one side of the piercer, then conveyed to beneath the piercer, and then ejected. I prefer, however, to again flatten the blank after it has been pierced, as the final flattening gives the nut a finished appearance and corrects all inequalities and fins which may have been formed upon the blank by piercing it.

By first crowning the blank, then flattening it, then piercing it and then again flattening it, I am enabled to cut and finish a greater number of nuts with the same set of tools, without sharpening or renewing them, than can be done where the blanks are not subjected to the flattening process after crowning and after piercing, as irregularities in the form of the nuts caused by wear of the shear bits or piercers are corrected by the subsequent flattenings, and the tools may therefore, be allowed to wear to a greater extent than would be admissible where the flattening and crowning processes are performed, at one operation and the piercing either prior or subsequent to the same.

The nuts will practically undergo a double process of forging, as the blanks are first squared and then flattened, then again squared and then pierced, whereby the perfect squaring of the nut is insured.

By having the gage upon the movable shear-holder instead of upon the stationary shear-block the tendency of the end-blank to break off from lack of support at the end is avoided. This cannot otherwise be avoided excepting by holding the end of the bar very firmly against the gage when the latter is in the stationary shear-holder, and this again is impracticable when the machine runs fast. The gage upon the end of the movable shear-holder carries the end of the bar with it, and the inclined or overhanging face of the gage furthermore insures this action.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism herein set forth, provided the principles of construction respectively recited in the following claims are employed.

I therefore particularly point out and distinctly claim as my invention—

1. In a machine for forging nuts, the combination of flattening tools having flattening surfaces and registering perforations through them, a piercer passing through said registering perforations, side, back, and forward hammers for squaring the nut-blanks, and cams for the side-hammers provided with bulges to act upon the latter to push the nut blank from the flattening surfaces to beneath the piercer and thence again to the flattening surfaces of the tools, substantially as set forth.

2. In a machine for forging nuts, the combination of shears having a concave crowning tool, flattening tools having flattening surfaces and registering perforations through them, a piercer passing through said registering perforations, side, back, and forward hammers for squaring the nut-blank, cams for the side hammers provided with bulges to act upon the latter to push the blank from the flattening surfaces to beneath the piercer and thence again to the flattening surface, and cams having their bulges so arranged, one in relation to the other, so as to first operate the shear and crowner, then the squaring hammers and flattener, then the piercer, and finally again the flattener, substantially as set forth.

3. In a machine for forging nuts, the combination of flattener tools having registering perforations and flattening surfaces at the sides of said perforations, a piercer passing through said perforations, two side-hammers and hammer-slides, and bearing arms bearing against the ends of said hammer-slides, one of said bearing arms having an outwardly-curved hook formed with an inwardly-bent end, cams bearing against the bearing-arms and having bulges arranged to actuate the hammers to move the nut blank in relation to the flattener tool, and a cam upon the face

of one of said cams and having the bent end of the hook bearing against it to positively check and withdraw the bearing arms, substantially as set forth.

4. In a machine for forging nuts, the combination of a lower shear-holder, a lever supporting and operating the same, a revolving cam bearing against one arm of said lever, a vertical rod bearing against said shear-holder, a lever having an adjustable screw-bolt bearing against the upper end of said rod, and a revolving cam bearing against one arm of said lever, substantially as set forth.

5. In a machine for forging nuts, the combination of a shear-block formed with a forward transverse recess, a rear, deep, transverse recess, and a deep longitudinal recess in its under side; a crowner-die in the longitudinal recess at its intersection with the forward transverse recess; shear-bits having outwardly flaring sides at both ends and secured in the longitudinal recess forward and to the rear of the crowner-die; a recessed gage block fitting into the rear deep, transverse recess, and a screw bearing against the forward bit and locking the bits, block and die in the recess, substantially as set forth.

6. In a machine for forging nuts, the combination with a stationary shear block formed with a transverse recess having shear-bits in its edges, of a movable shear-holder having a shear entering the transverse recess, a blank rest to the rear of said shear, and a gage to the rear of said blank rest, substantially as set forth.

7. In a machine for forging nuts, the combination of a stationary, upper shear-block having a transverse recess with shear-bits in the edges of said recess and a gage block to the rear of said recess formed with a recess in its middle, and a movable, lower shear-block having a shear and a blank rest and a gage to the rear of said blank rest registering with and entering into the recess in the gage block, substantially as set forth.

8. In a machine for forging nuts, the combination with a stationary shear block formed with a transverse recess having shear bits in its edges, of a movable shear-holder having a shear entering the transverse recess, a blank rest to the rear of said shear, and a gage in the rear of said blank rest and formed with an inclined forward side, substantially as set forth.

9. In a machine for forging nuts, the following instrumentalities, in combination, viz.—a crowner, squaring hammers, a flattener, a piercer, and means for actuating the crowner, the flattener and the piercer, and for operating the squaring hammers subsequent to the crowner and while the flattener is operated, and again after said flattener has been operated and while the piercer is operated, substantially as set forth.

10. In a machine for forging nuts, the following instrumentalities, in combination, viz.—a crowner, a flattener, a piercer, and squaring hammers, and means for operating the crowner, the flattener and the piercer, and for operating the squaring hammers first subsequent to the crowner, then to confine the blank while the flattener is operating, then again to actuate said squaring hammers, and then to confine the blank while piercing the same, substantially as set forth.

11. In a machine for forging nuts, the following instrumentalities, in combination, viz.—a crowner, a flattener, and a piercer, and means for operating the crowner, then the flattener, then the piercer, and finally again the flattener, substantially as set forth.

12. In a machine for forging nuts, the following instrumentalities, in combination, viz.—a double cutter constructed to cut the end blank in a plane below the blank next to the same, crowners arranged to crown the end blank upon the under side and the blank next to it upon the upper side, flatteners for flattening both blanks upon both faces, piercers, and means for moving the blanks from the crowners to between the flatteners, then to the piercers, and then back to between the flatteners, substantially as set forth.

13. In a machine for forging nuts, the following instrumentalities, in combination, viz.—cutters constructed to cut the end blank into a plane below the blank next to the same, crowners arranged to act upon the under side of the end blank and the upper side of the adjoining blank, piercers, flatteners, and squaring hammers; and means for actuating said squaring hammers so as to square the blank subsequent to the crowning while the flatteners are actuated and to confine the blank while the piercer is actuated, and to actuate the flattener subsequent to the crowner and subsequent to the piercer, substantially as set forth.

In testimony that I claim the foregoing to be my invention I have hereunto set my hand this 5th day of March, A. D. 1892.

SAMUEL H. MARKHAM.

Witnesses:
WM. SECHER,
GEO. A. SNOW.