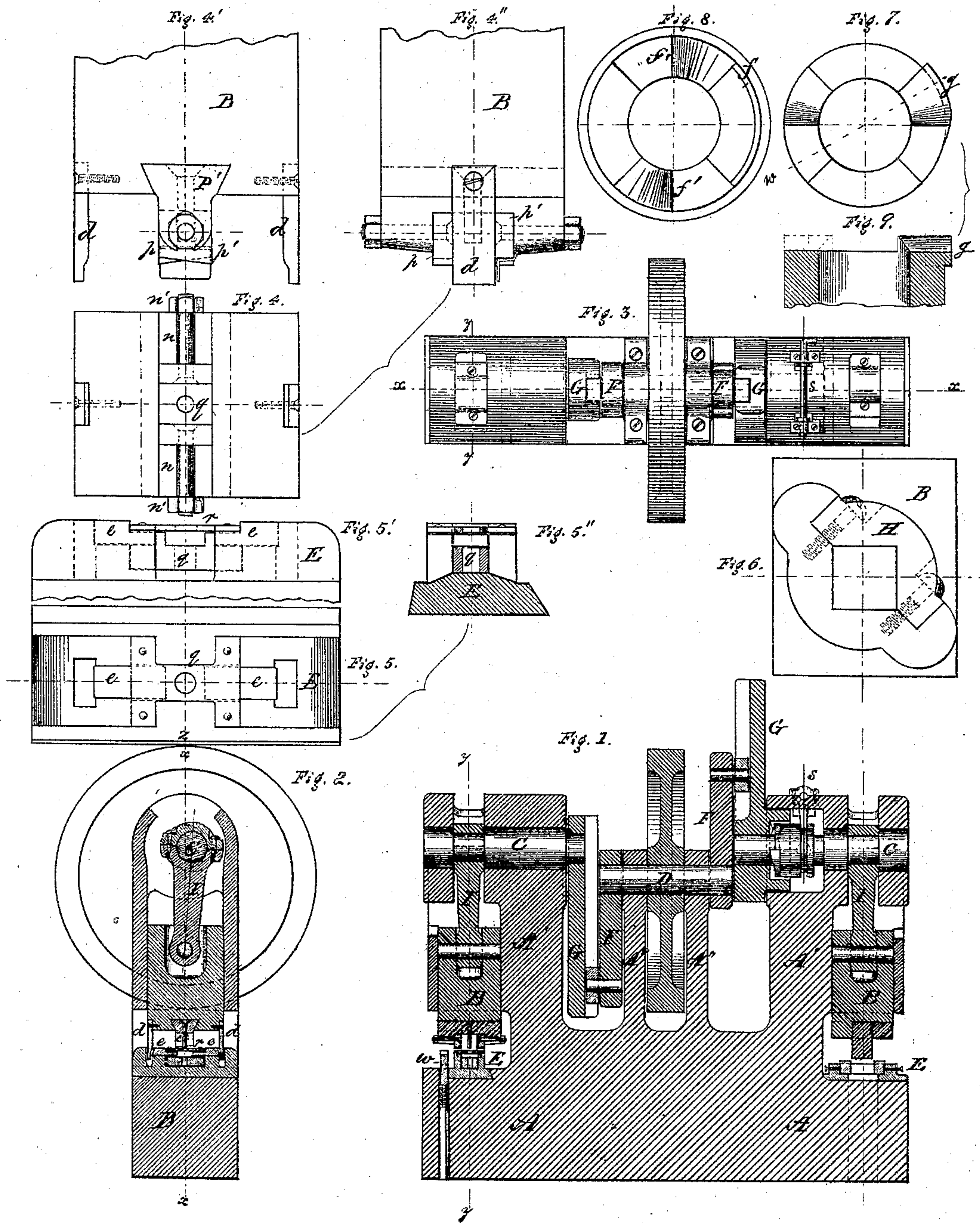


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No. 154,049.

Patented Aug. 11, 1874.



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Inventor.

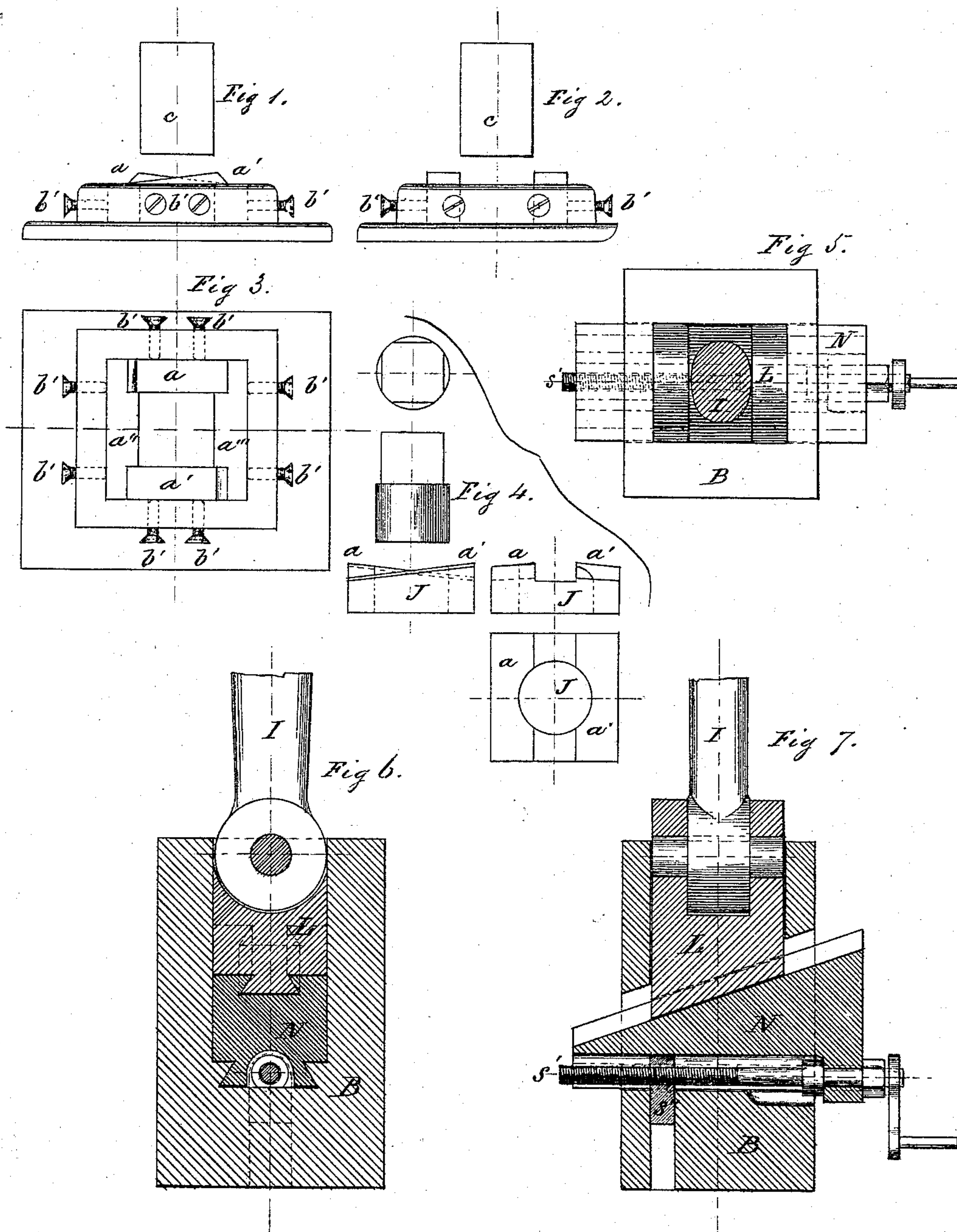
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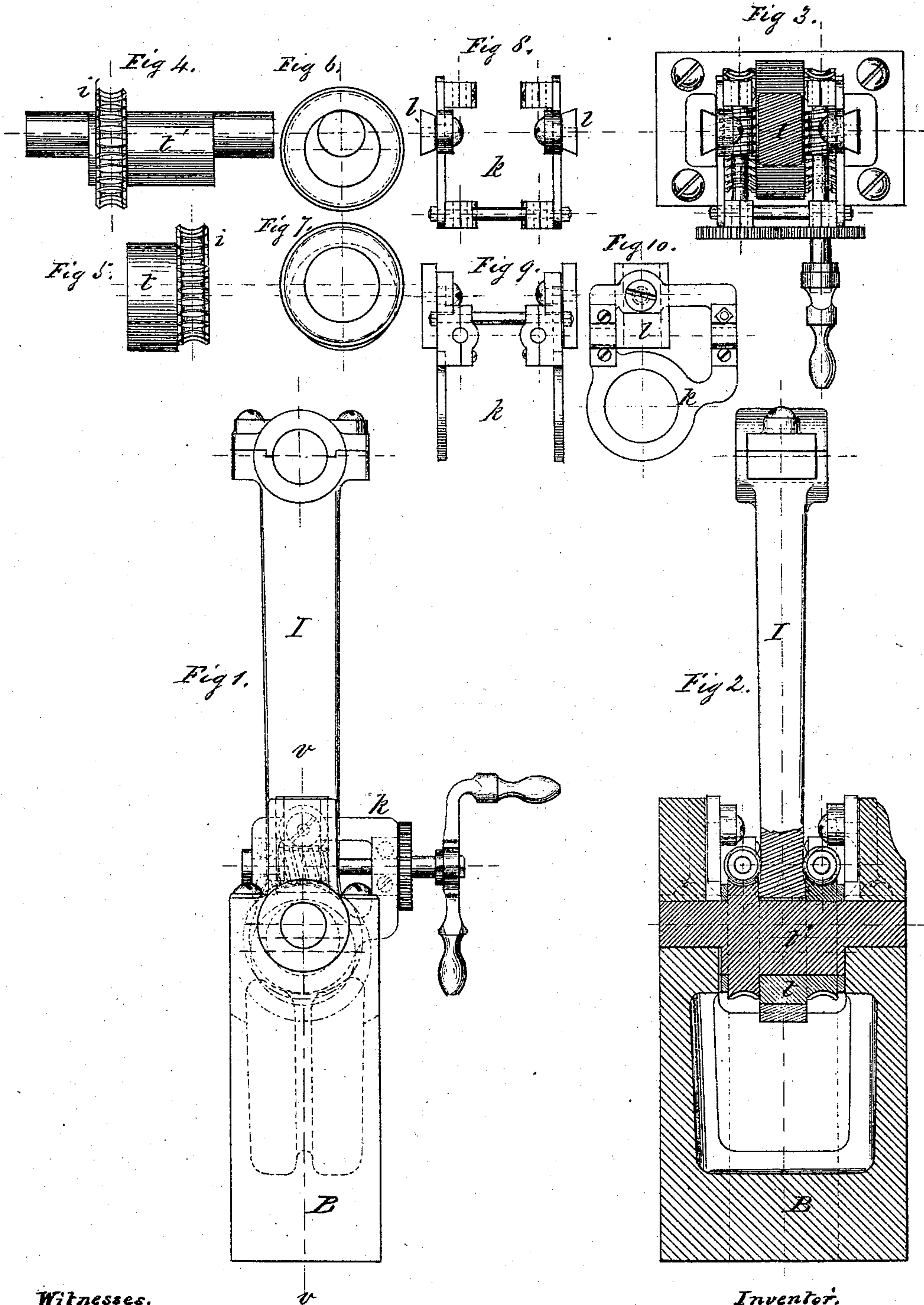
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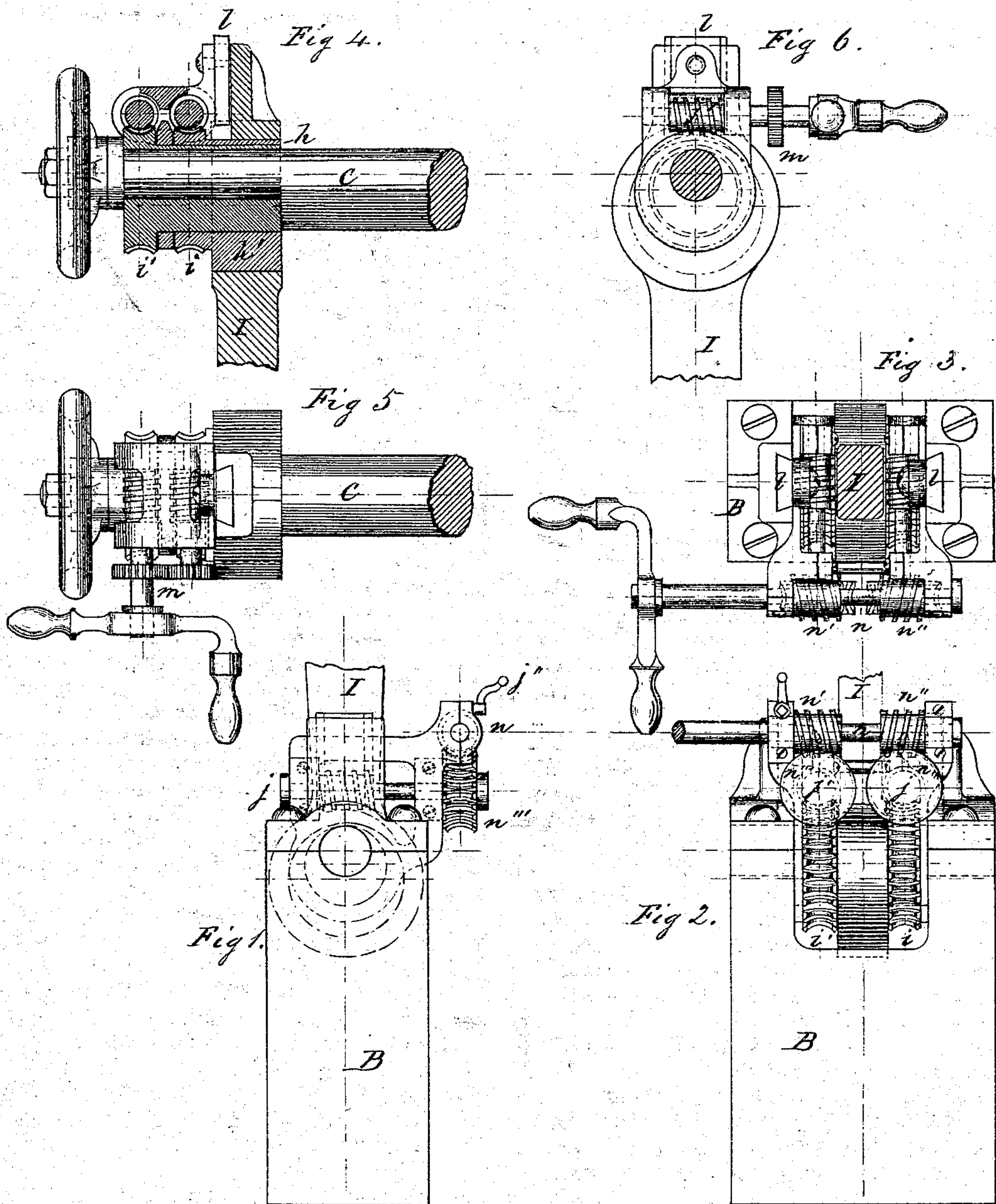
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UNITED STATES PATENT OFFICE.

WILLIAM H. IVENS, OF TRENTON, NEW JERSEY.

IMPROVEMENT IN MACHINES FOR SHEARING NUT-BLANKS FROM BARS.

Specification forming part of Letters Patent No. 154,049, dated August 11, 1874; application filed April 14, 1874.

To all whom it may concern:

Be it known that I, WILLIAM H. IVENS, of Trenton, in Mercer county and State of New Jersey, have invented Improvements in a Combined Punching and Shearing Machine, of which the following is a specification:

In the accompanying drawings, forming part of this specification, (on Sheet 1,) Figure 1 represents a central longitudinal vertical section of the machine. Fig. 2 is a transverse vertical section taken on the line *y y* on Fig. 1. Fig. 3 is a top view of the machine. Figs. 4, 4', 4'' are, respectively, an inverted face view and a front and side elevation of the lower portion of the plunger and its attachments. Figs. 5, 5', 5'' are, respectively, a plan, front elevation, and section, on the line *z z* on Figs. 5 and 5', of the die-block. Fig. 6 is an inverted face view of the plunger used for cutting blanks, showing the diagonal arrangement of the clamp for holding the punch. Figs. 7 and 8 are face views of the fixed and movable parts of the clutch. Fig. 9 is a cross-section on the line *w w* of Fig. 7. On Sheet 2, Figs. 1 and 2 represent a front and side elevation, respectively, of the punch and die. Fig. 3 is a plan of the sectional die. Fig. 4 shows detached views of a solid shearing-die and punch. Figs. 5, 6, and 7 represent, respectively, a plan and two vertical sections (at right angles to each other) of a wedge device for adjusting the elevation of the plunger, and to compensate for the wear of the die and the punch. On Sheets 3 and 4 is represented a balanced eccentric adjustment for regulating the elevation of the plunger. Fig. 1 (on Sheet 3) is a front elevation of the eccentric or compensating means of adjustment. Fig. 2 is a vertical section of the same, taken on the line *v* on Fig. 1. Fig. 3 is a plan of the same. Figs. 4 to 10, inclusive, are detached views of the several operating parts thereof. Figs. 1, 2, and 3 (on Sheet 4) show, respectively, a front and side elevation and plan of the eccentric adjustment, with a modified means of operating the same. Figs. 4, 5, and 6 represent, respectively, a vertical section, a plan, and a side elevation, showing the application of the same adjustment to the upper end of the pitman at its connection with the eccentric neck of the main shaft D.

This invention embraces an improved combination, in which a differential movement of any desired degree may be communicated from the driving-shaft to the rams, through the eccentric or cam shaft or shafts, by simpler, more powerful, and less expensive means than those heretofore used for that purpose; also, a diagonal arrangement of the clamp for holding the punch in the plunger or ram, whereby a straight tool of square steel may be used, and the necessity of forging and fitting, as heretofore, is avoided. Furthermore, the application of shearing-knives, in combination with a rest and clamping-toes, for cutting and holding the blank while being punched, and a novel construction of clutch in combination with the differential levers, to insure their engagement in proper position to dispense power when needed, and speed, when power is not required. The invention also consists in a novel combination of gearing with a slotted lever and eccentrically-arranged axes, and vertically or horizontally reciprocating cutter-heads; and in a die constructed in sections, for the convenience of adjustment or removal for repair, the several sections of which supporting each other when clamped in the die-bed. Furthermore, in a simple and convenient means of adjusting the distance between the operating-crank and the cutting-edge of the punch or shears by a wedge and screw having dovetailed connection above and below with the pitman-stub and with the ram, whereby the relative distance of said two points may be extended or shortened, as desired; and in the combination of eccentrics encircling each other within the eye of the pitman, and geared so as to be rotated simultaneously in reverse directions, whereby, in raising or lowering the ram, its connection with the pitman shall be at all times vertically central.

I will now describe the machine in detail by referring to the drawings, in which the same letters occurring on several figures indicate like parts.

A represents the body of the machine, which consists of a heavy solid block of metal, with upward extensions A', which constitute guides and bearings for the punch-holders or rams B, and the eccentric operating-

shafts C; also, other upward extensions, A'', which constitute supports for the driving-shaft D. On the upper face or anvil portion of the body A is seated a die, E, of suitable form and construction for the character of work to be performed, and on the under face of the ram B are attached suitable knives, punches, or shears, *p p*, to co-operate with the die-block *q*, to produce the desired article or result, which cutting and shaping devices will be hereinafter more fully described.

In the first place I provide for a differential movement of the plunger B by arranging the driving-shaft D in a plane, preferably below the operating eccentric shaft or shafts C, and communicating motion from the former to the latter by means of the crank-lever F, having a sliding or rolling connection with the slotted lever G, by which eccentricity of the shafts D and C greater leverage is obtained while the punch or knives are performing their work, and by shortening the leverage on the eccentric shaft C in the return motion, when there is no resistance, a quicker travel is obtained, and consequently much time saved.

The die E, used in this machine for cutting nut-blanks from the bar, is formed with its transverse cutting-edges *a a'* inclined in opposite directions, so as to effect a shearing cut by their operation in connection with a flat-faced die or punch, which is performed with much less expenditure of power than when a direct cut is made by parallel cutting-edges of the ram and die, and the blank being formed is kept flat by the face of the punch while the shearing is performed. Preferably I construct the die in sections, as represented in Fig. 3, Sheet 3, the cutting edges or sides *a a'* being of rectangular form, with the exception of their upper surfaces, which are inclined in opposite directions, as before stated. These sections are supported by side pieces *a'' a'''*, which are formed with shoulders for the cutting-sides *a a'* to rest against, and which determine their distance apart. These four sections, being seated in the die-holder, are clamped together and adjusted into position for co-operation with the punch *c* by means of the screws *b'*, so that by slackening said screws the sections *a a'* may be readily removed for grinding when their edges become worn. The punch for cutting the bar into nut-blanks is a straight rectangular piece of steel, secured to the ram by a diagonally-arranged clamp, H, by which arrangement of the clamp or holding device the usual forging of the punch, so as to set its face-angles diagonally to those of its shank, is avoided, and a more perfect-fitting punch is obtained by cutting the proper length from a bar of rolled steel than can be after several hours' labor in forging and fitting, as required by the common arrangement of the holding-clamp. Thus the cost of making a punch of rectangular form is reduced to a minimum, and much time saved in the running of the machine. To the lower portion of the ram B, on opposite sides, transversely to the length of

the bar being operated on, are attached vertical pendants *d*, which, by the inclined or wedge formation of their lower ends, in the descent of the ram B, operate on the toe or sliding pieces *e* to force them inward, while the cutters *p p'* on the other two sides co-operate to secure the blank all around, and prevent it from splitting while being punched.

The machine may also be used for forming hexagonal or polygonal nuts, for which purpose I first take a circular die with opposite sides or surfaces inclined as represented in Fig. 4, Sheet 3, the diameter of such circular die being equal to, or slightly greater than, the circumscribing circle of the polygon to be formed. The blank formed by this first operation is then submitted to the action of another punch or shear and die, by which segments of the circle first formed are severed or shaved off, leaving the desired polygon, by which process but very little metal has to be removed in the second operation, and a more perfect article is produced in two operations than by three when the blank is first cut rectangular, leaving large corners to be severed by the second die, after which a rough blank is the result, requiring to be shaved by a third operation to obtain a merchantable article.

The female portion of the clutch used in this machine is formed with a shoulder, *f*, around about one-fourth of its periphery, and between the two jaws *f'*, Fig. 8, on one side only, and the other or male portion, Figs. 7 and 9, is formed with a projection, *g*, on the periphery of one of its interlocking sides, which projection rides the shoulder *f* and jaws *f'*, until it is in proper position relatively to the levers F G to engage with the female portion, Fig. 8, of the clutch, to effect the purpose before described. This clutch may be applied to one or both sides of the combined machine, and is operated to throw it into or out of gear by the ordinary forked lever *s*, or any other suitable device.

In place of the ordinary dies I prefer to use knives *p*, Fig. 4, Sheet 1, shaped with inclined cutting-edges, as they are less expensive and more easily detached for sharpening or repair. These knives co-operate with a rest or block, *q*, to shear off the blank from the bar, and to remove the necessary amount of waste from its end, by which double cut the blank is held flat on the rest or block *q* while being severed from said bar, which operation is performed with much less expenditure of power than when the cutting-edges are parallel. The knives *p p'* are attached by bolts *n* to downward extensions of the holder P, which is connected with the ram B by dovetail, the bolts *n* resting in grooves on the under side of the said downward extensions, so that by loosening the nuts *n'* the bolts, with the knives they secure, are freed from the holder P for repair or renewal.

To compensate for the wear, by use and grinding, of the dies and cutters, I provide a means of adjustment of the elevation of the

plunger, consisting of an eccentric sleeve, *t*, Sheet 4, Fig. 4, encircling a rotating eccentric boss, *t'*, in the plunger B, and passing through the eye of the pitman I, whereby, by the rotation of these two eccentrics in opposite directions simultaneously, by means of the worms *j j'* and worm-wheels *i i'*, the elevation of the plunger B may be adjusted without destroying the central position of its connection with the pitman I. This mode of adjustment may consist of two eccentric sleeves, *h h'*, Sheet 5, Fig. 4, fitting one over the other, at the connection with the operating-shaft C, or, as before described, of one eccentric sleeve, *t*, over an eccentric boss or shaft, *t'*, and both passing through the eye of the pitman I at its connection with the ram B. The worm-wheels *i i'* on the eccentric sleeves *h h'*, or sleeve and boss, necessarily have a motion vertically and laterally in their rotation, and in order to retain the worms *j j'* in proper gear with them, the worms are hung in a frame, *k*, which has a vibrating motion around the common axes of the two eccentrics, and a rising and falling motion by its connection with the dove-tailed slides *l*.

On Sheet 4, Figs. 4, 5, and 6, the worms *j j'* are represented as geared together by spur-wheels *m*; and in Figs. 1, 2, and 3, by a transverse shaft, *n*, carrying right and left worms *n' n''*, gearing with worm-wheels *n''' n''''* on the axles of the worms *j j'*, which latter, although somewhat slower in its operation, is preferable, for the reason that it is not as liable to be deranged by the jarring movement of the plunger; and when the desired elevation is attained said worm-shaft *n* may be rigidly clamped by the crank-lever *j''*.

Another mode of adjustment is shown in Figs. 5, 6, and 7 on Sheet 2, which, for a lower grade of machines, may be used, as being less expensive than that above described, and than the double-wedge adjustment heretofore used. This means of adjustment consists of an inclined formation of the lower end of the stub L, through which the pitman I is connected with the ram or plunger B, and a wedge, N, of corresponding inclination, having an inclined sliding dovetailed connection with the former, and a horizontal dovetailed connection with the latter or plunger B; which wedge is operated to adjust the elevation of the plunger by the screw *s'* gearing with the nut *s''* in the plunger and with said wedge, by which dovetailed connection of the wedge with both stub and ram the parts may be either extended or contracted by the operation of the screw *s'* alone.

The bar of iron, which is of suitable width and thickness for the blank desired, is caused to rest on the guide or support *w*, which is sustained by a spring, so that, when the blank is severed from said bar, the guide *w* is de-

pressed until the ram B ascends, when the spring will force the bar to the proper level to be again pushed forward for a repetition of the operation, and in which motion the blank previously formed is pushed from under the ram into its proper receptacle.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The driving-shaft D and band or gear wheel, arranged eccentrically between the operating-shafts C, in combination with the levers F G, shafts C, pitmen I, and rams B, substantially as shown and described.

2. The arrangement of the clamping device H diagonally to the angles of the ram, for securing the punch thereto, as and for the purpose set forth.

3. The combination of the wedge-formed side pieces *d d* and sliding toe-pieces *e e*, with the rest *q*, and diagonal shears *p p'*, for cutting and clamping the nut-blank while being punched, and the stripper *r*, for freeing it from the punch in the return motion of the latter, as described.

4. The clutch, Figs. 7 and 8, constructed with a rim, *f*, on the inner periphery of the female half, and an outward extension, *g*, on the male half, in combination with the shafts C and D, differential levers F G, and ram B, for operation as specified.

5. The sectional die, represented on Sheet 3, having its shearing sides *a a'* supported by shoulders formed on the side pieces *a'' a'''*, and these side pieces supported on the ends of the cutting sides, as shown and described.

6. The wedge N, having dovetails or dovetailed grooves on its upper and lower sides, in combination with the inclined under face of the stub L, and with the ram B, each having dovetails or grooves to match with those of the wedge, substantially as and for the purpose set forth.

7. The combination of the eccentric shaft *t*, and eccentric sleeve *t*, or of two eccentric sleeves, with the worm-wheels *i i'* and worms *j j'*, geared together for operating said eccentrics simultaneously in reverse directions, for the purpose specified.

8. The combination of the hanging frame *k* and dovetailed slides *l*, with the worm-wheels *i i'*, worms *j j'*, and eccentric sleeves *h h'*, or sleeve and boss, all arranged for operation substantially as shown and described.

9. The holder P', in dovetailed connection with the ram B, provided with downward extensions grooved on their under faces to receive the bolts *n*, to secure the knives *p p'* and the punch *p''* to the ram, as shown and described.

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Witnesses:

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