No. 611,851. Patented Oct. 4, 1898.

N. A. WHEELER.

GEAR CUTTING MACHINE.

(Application filed Sept. 3, 1897.)

(No Model.) 3 Sheets—Sheet 1.

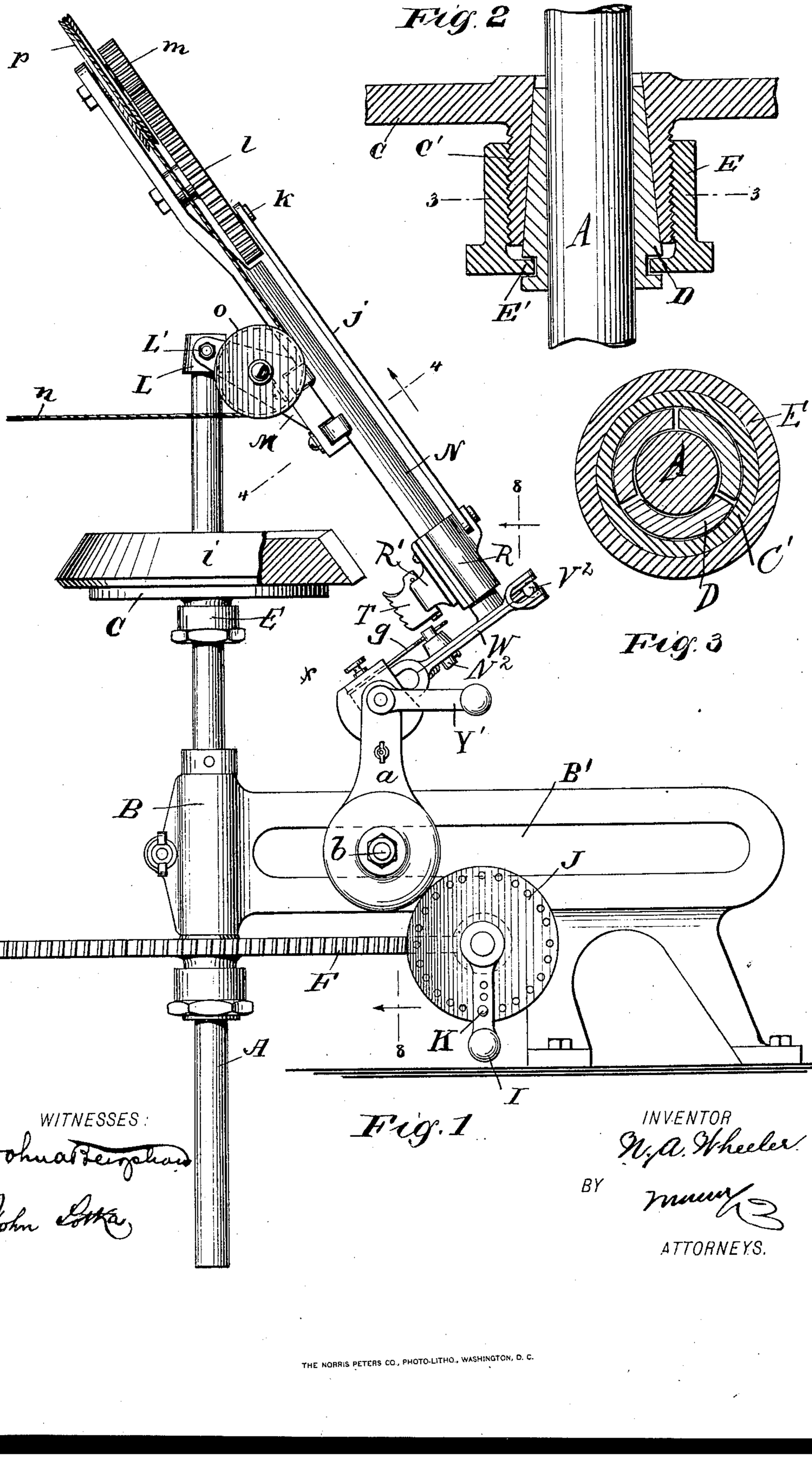

Fig. 1

Fig. 2

Fig. 3

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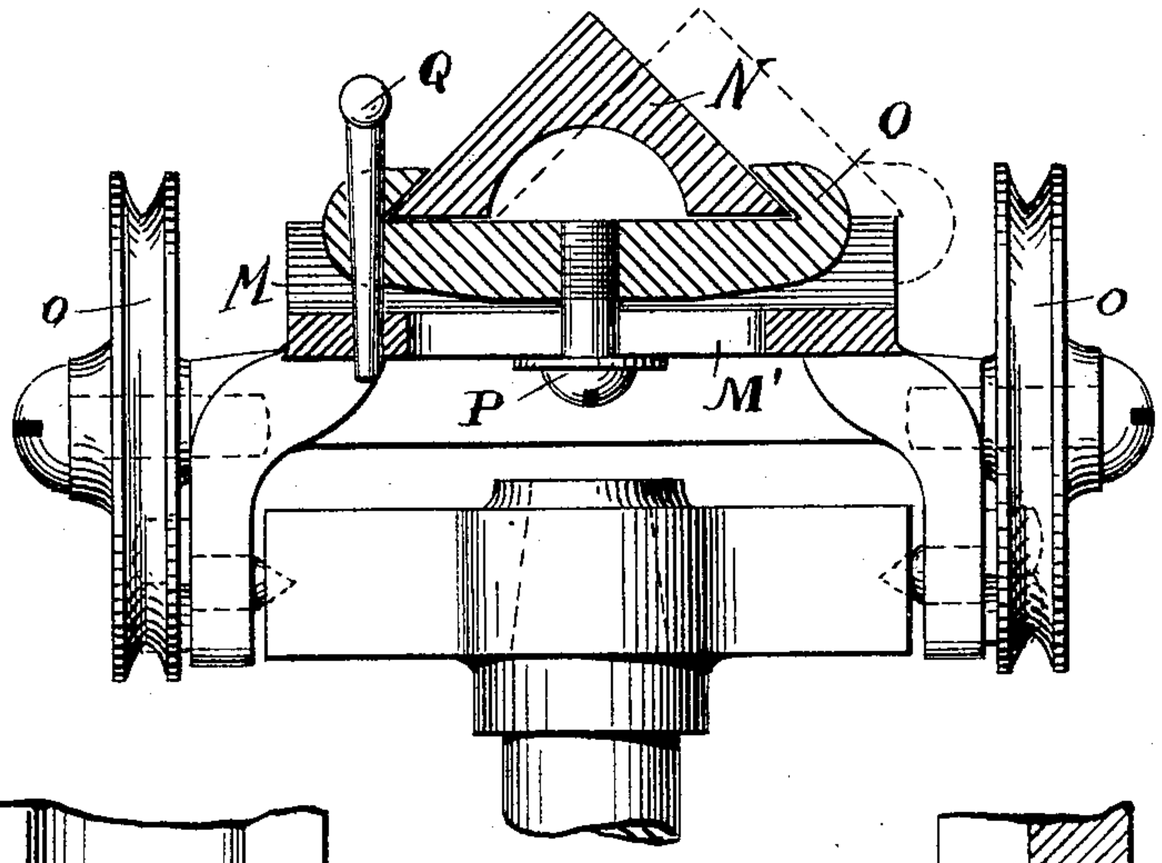

Fig. 4

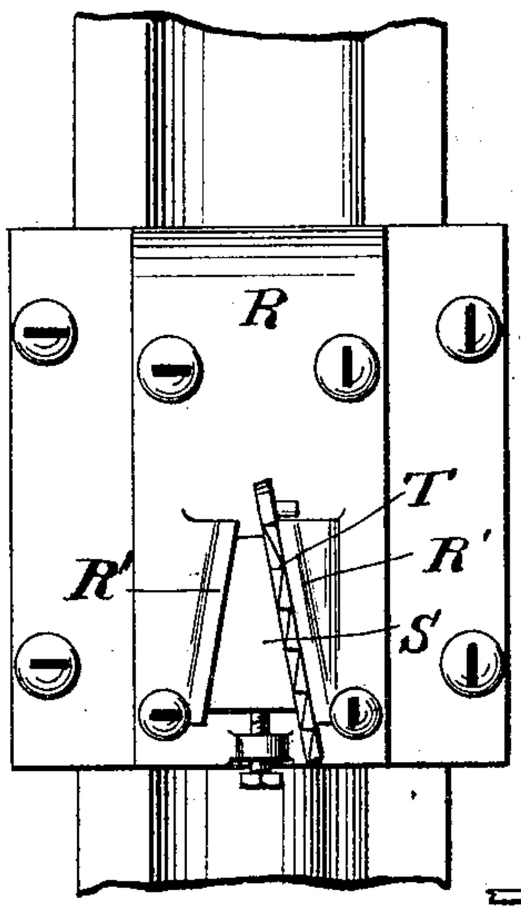

Fig. 6

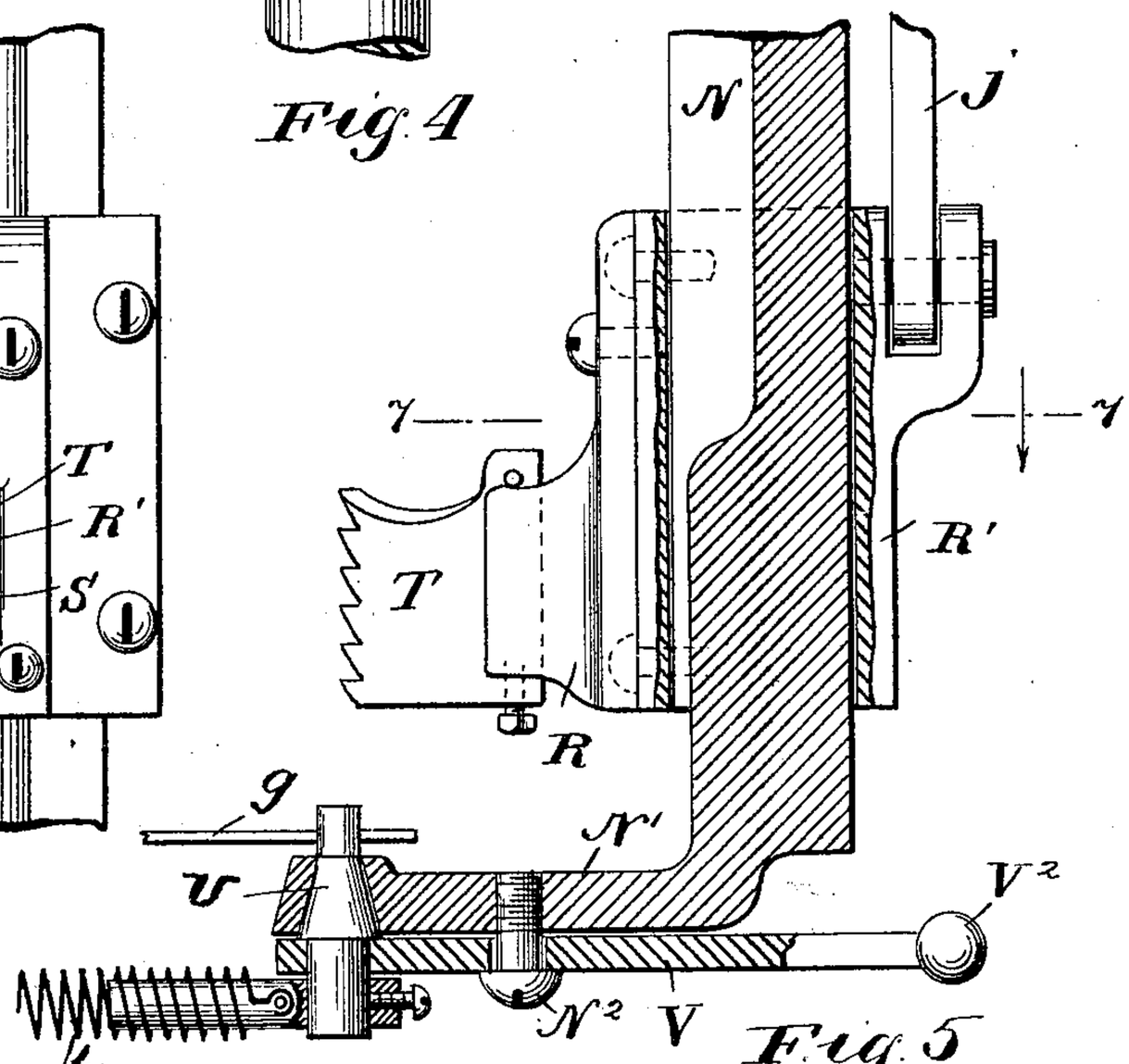

Fig. 5

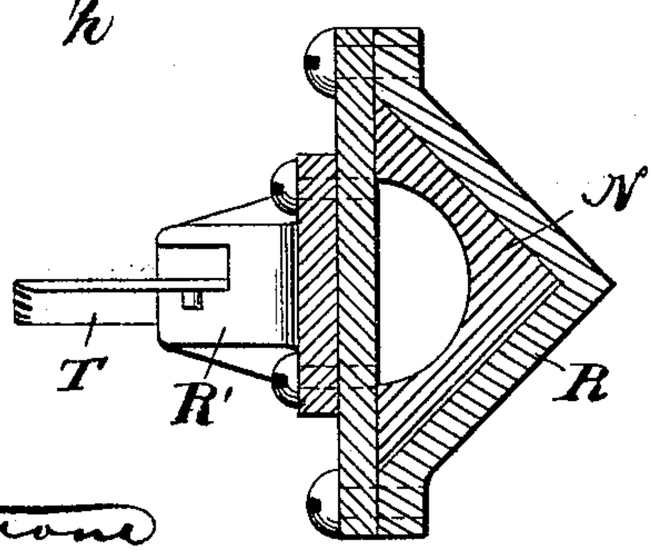

Fig. 7

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No. 611,851. Patented Oct. 4, 1898.

N. A. WHEELER.

GEAR CUTTING MACHINE.

(Application filed Sept. 3, 1897.)

(No Model.) 3 Sheets—Sheet 3.

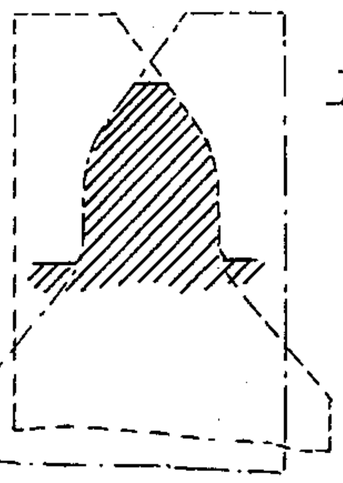

Fig. 13

Fig. 14

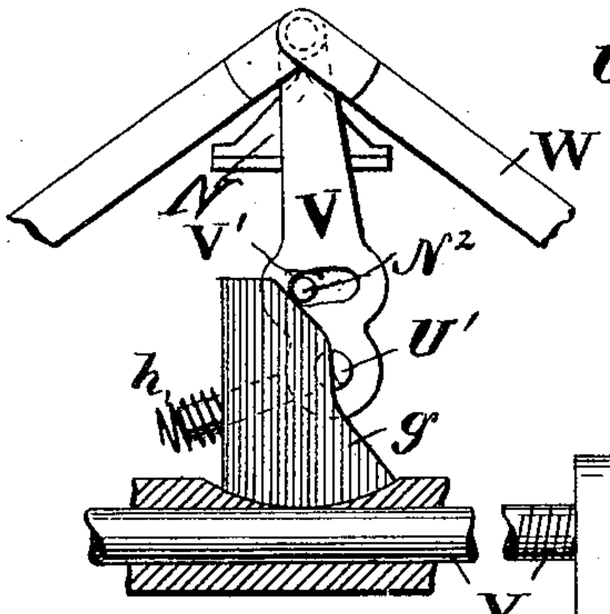

Fig. 11

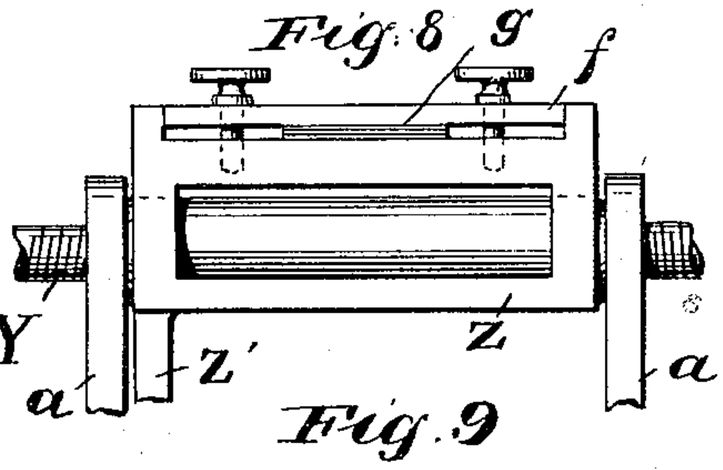

Fig. 9

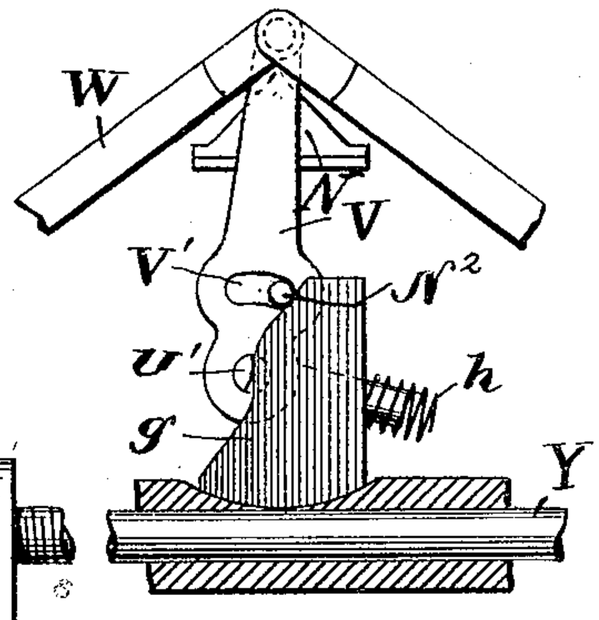

Fig. 12

Fig. 8

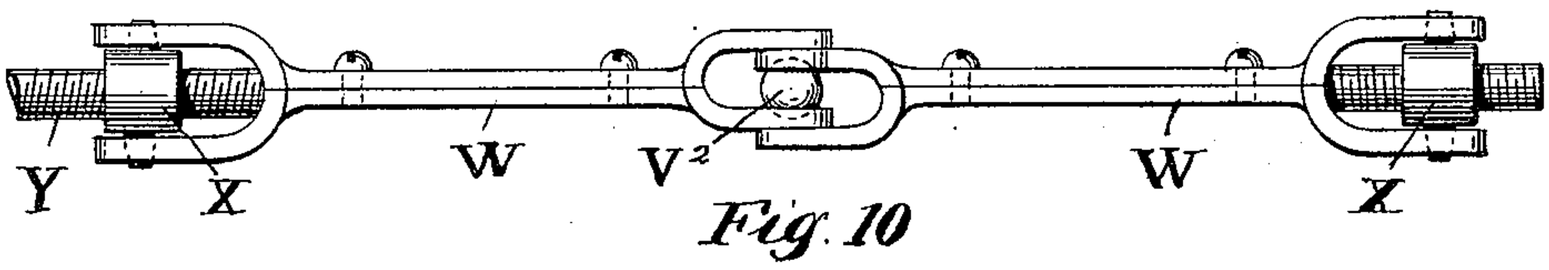

Fig. 10

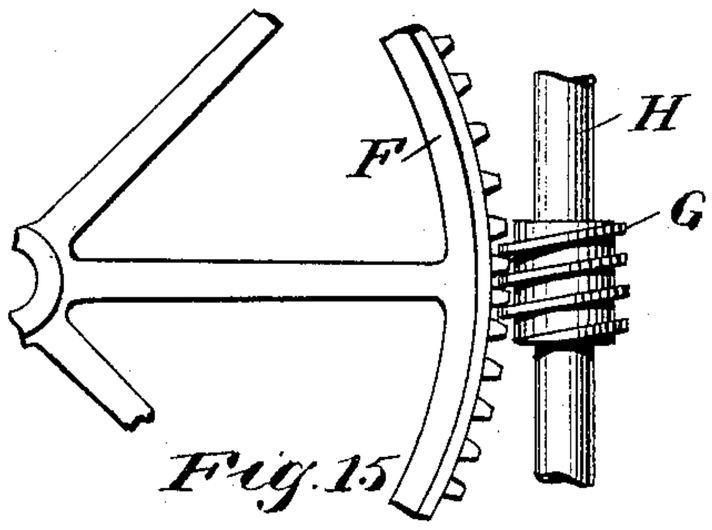

Fig. 15

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UNITED STATES PATENT OFFICE.

NELSON A. WHEELER, OF STOCKTON, CALIFORNIA, ASSIGNOR OF ONE-HALF TO WARREN P. WHEELER, OF SAME PLACE.

GEAR-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 611,851, dated October 4, 1898.

Application filed September 3, 1897. Serial No. 650,480. (No model.)

To all whom it may concern:

Be it known that I, NELSON A. WHEELER, of Stockton, in the county of San Joaquin and State of California, have invented a new and Improved Gear-Cutting Machine, of which the following is a full, clear, and exact description.

My invention relates to gear-cutting machines, and has for its object to provide a machine which will be capable of a great variety of adjustments, so that gear-teeth of various types can be cut therewith.

The invention will be fully described hereinafter and the features of novelty pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the machine with part of the gear-wheel pattern in section. Fig. 2 is a longitudinal section of the holder or support for said pattern. Fig. 3 is a cross-section of the same on line 3 3 of Fig. 2. Fig. 4 is a cross-section of the cutter-guide on line 4 4 of Fig. 1. Fig. 5 is a longitudinal section of the lower end of the cutter-guide, showing the cutter thereon. Fig. 6 is a front elevation of the cutter and its guide. Fig. 7 is a transverse section on line 7 7 of Fig. 5. Fig. 8 is a sectional elevation on line 8 8 of Fig. 1. Fig. 9 is an end view showing the means for securing the templet. Fig. 10 is a plan of the screw-rod and toggle-levers shown in Fig. 8. Figs. 11 and 12 show the templet and the parts controlled thereby in two different positions. Figs. 13 and 14 show specimens of the work my improved machine is capable of doing, and Fig. 15 is a detail view of the index or divider.

The machine comprises a support, which may be in the nature of a shaft A, journaled in bearings B and as a rule disposed vertically. On said shaft is secured an adjustable work-holder C, which, as shown in Fig. 2, has a conical bore, into which fits a wedge-shaped sleeve D, the said sleeve having a circular groove, into which projects a lip E′ on a nut E, arranged to screw on a thread provided on a downward extension C′ of the work-holder C. It will be obvious that by unscrewing the nut E the holder is loosened, so that it may be adjusted vertically on the shaft, and by then again tightening the nut the wedge D is forced into clamping engagement with the shaft.

The shaft A is adapted to be turned periodically by any suitable mechanism such as, for instance, a worm-wheel F, secured on the shaft and engaged by a worm G (see Fig. 10) on an actuating-shaft H, having a crank I. Adjacent to the crank is arranged a stationary indicating-disk J, provided with a series of holes for engagement with a peg K to be inserted in holes in the crank, this arrangement being well known in gear-cutting machinery.

The support or shaft A at its upper end has loosely mounted thereon a horizontally-rotatable collar L, carrying horizontal pivots L′, on which is adapted to swing a bracket M, carrying the cutter-guide N. It will be seen that the upper end of the shaft A forms a support for the collar L and the parts connected therewith. Preferably the guide is adjustable longitudinally of the bracket, such adjustment being made possible by clamping the cutter-guide to the bracket by means of clamps O. These clamps are also transversely adjustable for a purpose hereinafter stated, the bracket M having to this end a transverse slot M′ for each clamp O, screws P being used to secure the clamps on the brackets, and in order to hold the clamp in the central position a pin Q may be inserted through holes in the clamp and in the bracket, as shown in Fig. 4. The clamps O and screws P form means for locking the cutter-guide N to the bracket M. When the screws P are tightened, they draw the clamps O toward the lower face of the bracket M, the cutter-guide N of course being carried in the same direction. This movement will cease when that portion of the cutter-guide which is between and exteriorly of the clamps O engages the upper surface of the bracket, against which it will be pressed tightly. On the cutter-guide is adapted to reciprocate a cutter-carrier R, having on its front face two ears or projections R′. (See Figs. 5 and 6.) These ears converge to receive between them an adjustable wedge S, which forms a clamp to hold the cutter T in position. It will be observed that the cutter

may be placed at either side of the wedge. The front or working edge of the cutter is serrated, as shown.

The lower end of the cutter-guide N has an extension N′, receiving a pin U, which, as shown best in Figs. 8, 11, and 12, has a flat side or shoulder U′. This pin is also engaged by an arm V, capable of a pivotal movement on said pin and limited in such pivotal movement by having a slot V′, adapted for engagement with a pin N^2, projected from the extension N′ of the cutter-guide N. The free end of the arm V has a ball V^2, jointed to the ends of the toggle-arms W, said arms having pivotal connection to nuts X, capable of longitudinal movement on a screw-rod Y, provided with a crank Y′. The rod Y is journaled in a sleeve Z, supported in a yoke *a*, said yoke being capable of longitudinal sliding movement on the frame of the machine, and for this purpose the yoke consists of two sections adapted to be clamped against the frame by a screw *b* and nut *c*, the frame having a longitudinal slot B′, in which the said screw may move. The sleeve Z is adapted to be held in position by a hook *d*, engaging an extension or segment Z′ on said sleeve, said hook being secured in place by a wing-nut *e*.

On the sleeve Z is secured a clamp *f* for holding in place the pattern or templet *g*, said templet having an outline corresponding to that of the tooth to be cut. (See Figs. 8, 11, and 12.) The flat face U′ of the pin U is held against the curved face of the templet *g* by a coiled spring *h*, secured to the arm V, the other end of the said spring being hooked on the yoke *a*. (See Fig. 8.)

The cutter-guide N may be given any suitable shape, and, as shown in Fig. 7, the cutter-guide is substantially triangular in cross-section, the slide or cutter-carrier R being shaped accordingly.

In operation the wood plate or block *i*, which is to form the pattern of the gear-wheel, is first turned to a true cylindrical or conical shape and is placed upon the work-holder C. The yoke *a* and the holder C are so adjusted that a line extending from the pivot L′ to the working edge of the cutter and to the guiding edge of the templet *g* will coincide with the periphery of said block or blank *i*. A reciprocating motion is then imparted to the cutter in the direction toward and from the pivot L′ by any suitable mechanism—for instance, as shown by means of a connecting-rod *j*, secured to a crank-pin *k* on the gear-wheel *l*, engaging a pinion *m*, which is driven by means of a transmission-rope *n*, passing over pulleys *o* and *p*. During such movement the cutter-guide N remains stationary, and thus the cutter moves in the same path at each stroke. In order to cause the cutter to deviate laterally and at the same time to go deeper into the material, the operator turns the crank Y′. This causes the nuts X on the screw-rod Y to move away from each other, thereby drawing the connected ends of the toggle-arms W toward the shaft A, and at the same time causing the guide N, with the cutter T, to take part in such movement, since the guide is pivoted upon the shaft A at L′. It will be obvious that in this manner the cutter will be caused to penetrate deeper into the material. At the same time since the spring *h* keeps the pin U against the guiding edge of the templet *g* the arm V, and with it the guide N, will be moved sidewise, the shaft A acting as a pivot for such movement, it being understood, however, that the shaft and the blank *i* remain stationary. Thus the operator by gradually feeding the cutter inward will also move said cutter laterally, so as to reproduce on the blank the exact shape of the tooth which is produced on the templet *g*. When one side of the tooth has thus been cut, the templet *g* is reversed for the purpose of cutting the other side of the tooth, the spring *h* is unhooked and then fastened upon the hook on the other side of the yoke *a*, and the arm V is thrown over until the pin N^2 engages the opposite end of the slot V′. Figs. 11 and 12 illustrate these two different positions. At the same time the cutter T (see Fig. 6) is removed and a similar cutter is inserted with the opposite inclination on the other side of the wedge S. In this manner both sides of the tooth will be cut. (See diagram, Fig. 13.) When one tooth has been completed, the block *i* is given a partial rotation by turning the crank I to the desired extent.

My invention may also be employed for the purpose of cutting skew-teeth, such as represented in Fig. 14. In Fig. 1 the cutter T moves in a line which passes through the axis of the shaft A, thereby producing the ordinary character of bevel-gear. If, however, the clamps O, with the cutter-guide N, are shifted laterally, as indicated by dotted lines in Fig. 4, the cutter will reciprocate in a line which will not pass through the center of the shaft A, and thus skew-teeth, as shown in Fig. 14, may be cut.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of the work-holder, the cutter-guide whose axis is arranged at an angle to that of the work-holder, the cutter mounted to reciprocate on said guide, and the bracket on which said guide is adjustable transversely of the direction in which the cutter reciprocates, said bracket being pivotally mounted to permit of changing its angle relatively to the work-holder.

2. The combination of the work-holder, a stationary support, a bracket having a universal joint connecting it with said support, a cutter-guide adjustable transversely of said bracket, and the cutter mounted to reciprocate longitudinally of the guide, substantially as described.

3. The combination of the supporting-shaft,

the work-holder thereon, the bracket connected to said shaft by a universal joint, the cutter-guide longitudinally slidable upon said bracket, means for locking the cutter-guide on the bracket a yoke or slide movable toward and from said shaft and having a loose connection with the said cutter-guide, so that the guide, when loose on the bracket will slide and automatically adjust itself upon the bracket when said yoke is adjusted relatively to the shaft and a cutter mounted to reciprocate longitudinally of the guide, substantially as described.

4. The combination of the work-holder, the support, the cutter-guide pivotally connected therewith, the cutter mounted to reciprocate on said guide, a normally stationary shaft having screw-threaded portions, and toggle-arms connected with the said shaft and with opposite sides of the cutter-guide, as and for the purpose set forth.

5. The combination of the work-holder, the support, the cutter-guide connected thereto by a universal joint, the cutter mounted to reciprocate on said guide, a spring-pressed arm connected with said guide, a templet engaged by said arm, a shaft normally stationary and having screw-threaded portions, and toggle-arms connected with said shaft and with opposite sides of the cutter-guide, substantially as described.

6. The combination of the stationary work-holder, the support, the cutter-guide connected therewith by a universal joint, the cutter mounted to reciprocate on said guide, an arm pivotally connected to said guide and having a limited motion, a detachable spring for pulling said arm in either direction, a reversible templet engaged by said arm, fastening devices located on each side of said templet and adapted to hold the detachable end of the spring and means for moving said arm to engage the different portions of the templet successively, substantially as described.

7. The combination of the work-holder, the cutter, the guide on which the cutter is mounted to reciprocate, and the bracket or support on which said guide is adjustable transversely of the direction in which the cutter reciprocates, substantially as described.

8. The combination of the work-holder, the support, the bracket pivotally jointed thereto so that it can assume positions at various angles to the support, the cutter-guide slidable longitudinally on said bracket, the slide adjustable toward and from said support, an articulated connection between the slide and the cutter-guide so that the movement of the slide will cause a sliding adjustment of the cutter-guide on the bracket, and a cutter arranged to reciprocate on the cutter-guide, substantially as described.

9. The combination of the shaft forming a work-holder, the cutter-guide disposed at an angle to said shaft and connected thereto by a universal joint, the cutter held to reciprocate on that portion of the guide which is farthest away from the said shaft and means for adjusting the inclination of the guide, substantially as described.

NELSON A. WHEELER.

Witnesses:
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M. H. PRATER.