(No Model.) 3 Sheets—Sheet 1.

M. MORTON.

COMBINED KEY SEAT AND GEAR CUTTING MACHINE.

No. 303,178. Patented Aug. 5, 1884.

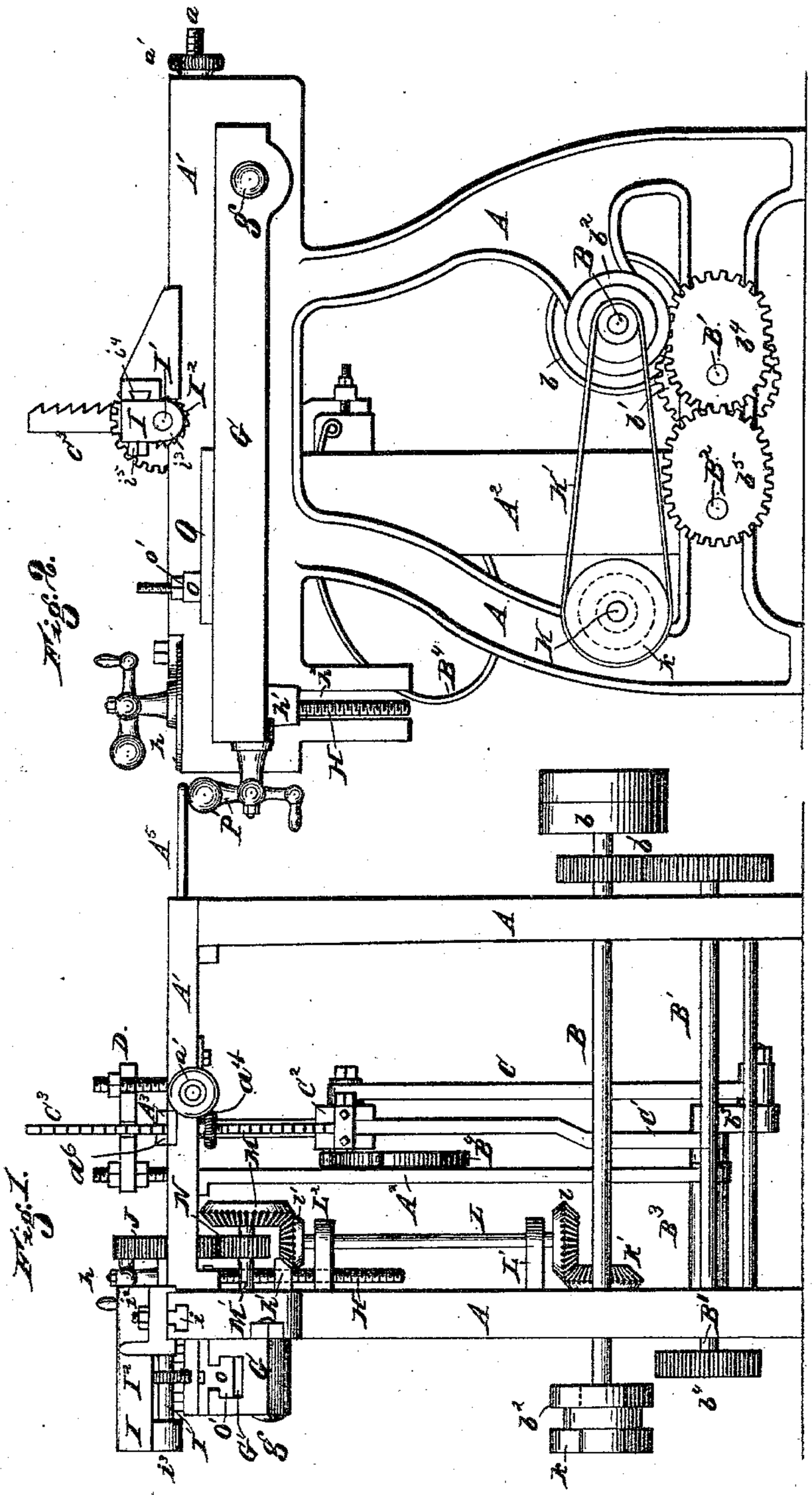

Fig. 2.

Fig. 1.

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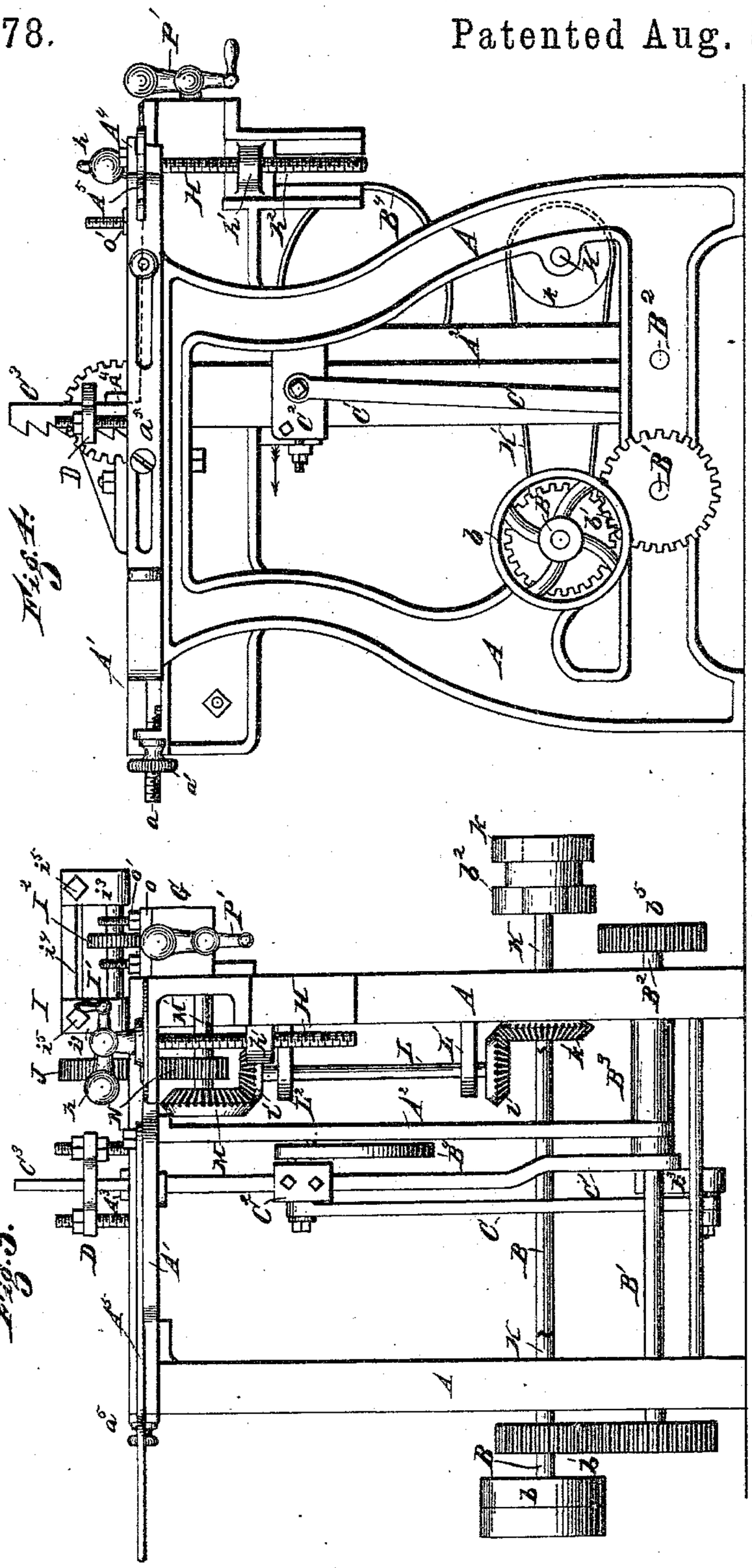

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 5.

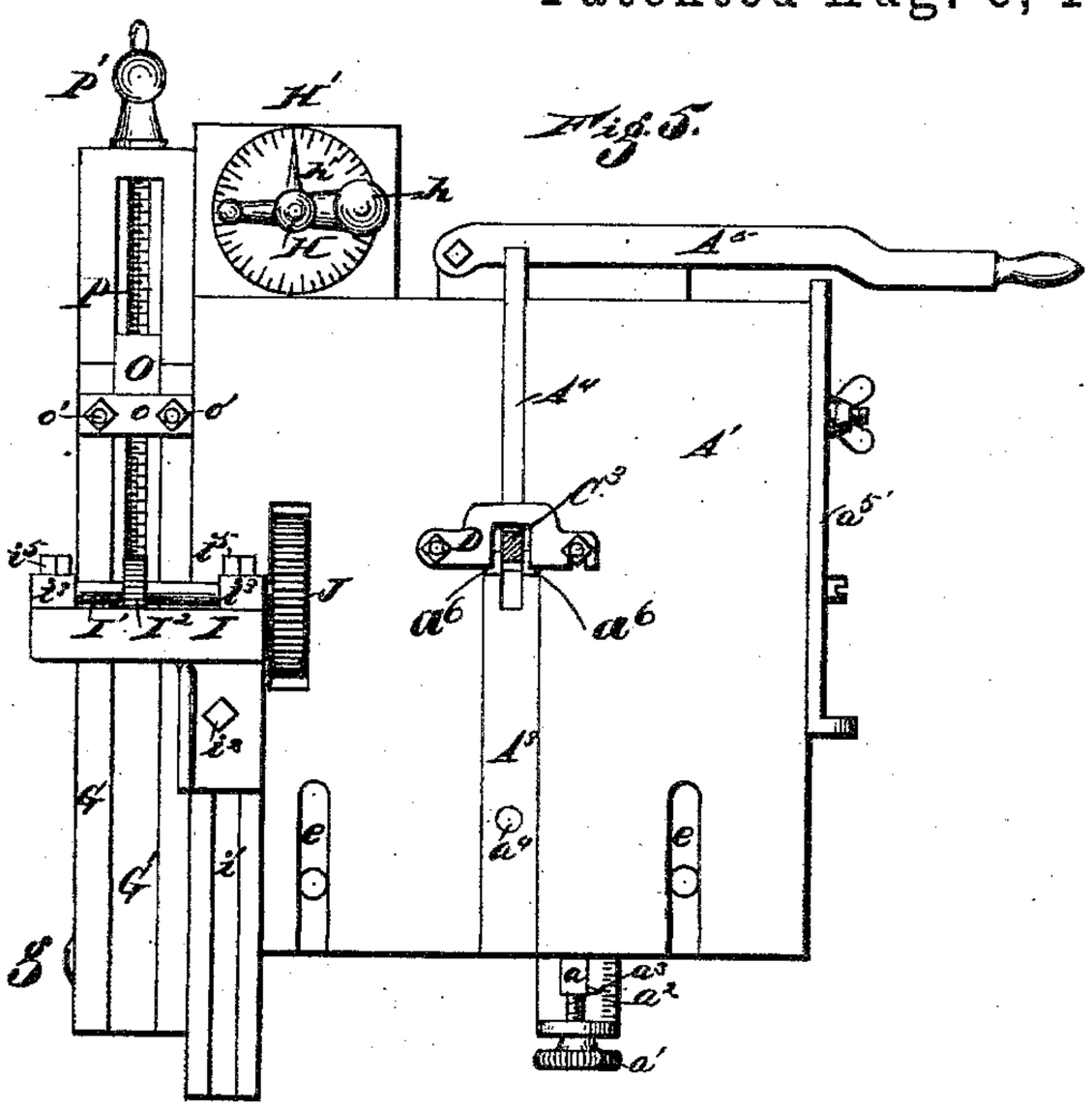

Fig. 6.

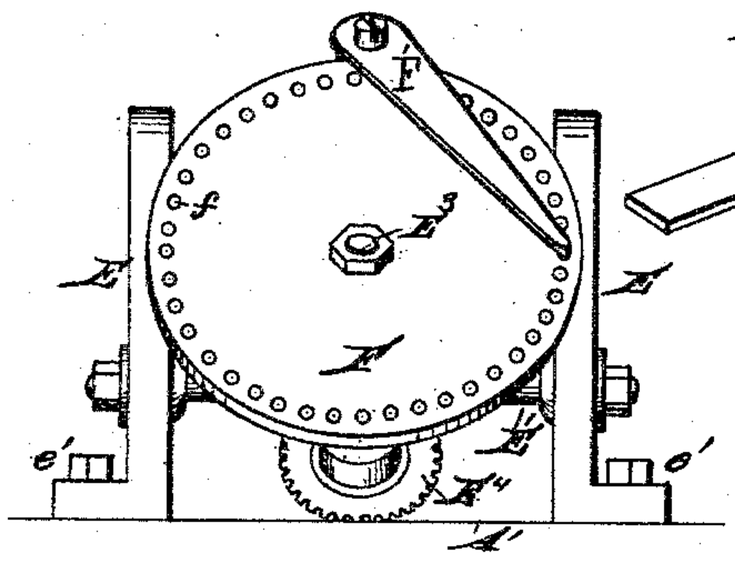

Fig. 8.

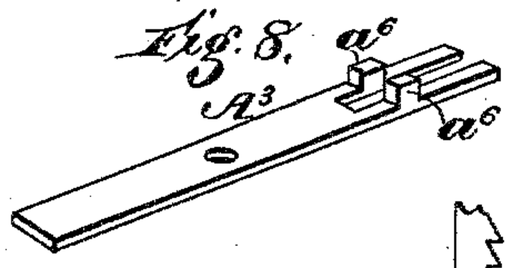

Fig. 7.

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UNITED STATES PATENT OFFICE.

MATTHEW MORTON, OF ROMEO, MICHIGAN.

COMBINED KEY-SEAT AND GEAR CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 303,178, dated August 5, 1884.

Application filed April 18, 1883. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW MORTON, of Romeo, county of Macomb, State of Michigan, have invented a new and useful Improvement in Combined Key-Seat and Gear Cutters; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention consists of the combination of devices and appliances hereinafter specified, and more particularly pointed out in the claims.

In the drawings, Figure 1 is a front elevation of a device embodying my invention. Fig. 2 is a side elevation. Fig. 3 is a rear elevation. Fig. 4 is an elevation of the side opposite Fig. 2. Fig. 5 is a plan view. Fig. 6 is a front elevation of some of the parts. Fig. 7 is a side view of the same, showing other parts in section and elevation. Fig. 8 is a perspective of the slide.

The object of my invention is, first, to provide a combined machine adapted to cut mitered, beveled, and other gearing of all kinds; and, second, which shall also be adapted for cutting keyways in pinions. It is the design of my invention to accomplish all these results by mechanism combined with one common table and driven by one common power. I accomplish these objects as follows:

In the drawings, A represents a suitable supporting-frame provided with a table, A′.

B is the driving-shaft provided with a suitable driving wheel or pulley, *b*, said shaft being geared with an additional shaft, B′, as shown at *b*′, and provided at its opposite end with a conical or stepped pulley, b^2.

B^2 is a crank-shaft provided with a crank, b^3, and geared with the shaft B′ by means of the eccentric gearing b^4 and b^5, said gearing being somewhat elliptic in form, giving a fast or quick upward stroke and a slow downward stroke to the connecting-rod C, thus saving time in the upward stroke, while the gearing acts also as a back-gear. I prefer to make the connecting-rod adjustable upon the crank b^3, so that it may give the desired length of stroke to the cutter. This may be done in the ordinary way.

A^2 is a suitable support for the crank-shaft B^2.

C′ is a guide mounted upon the crank-shaft B^2, so as to turn thereon by the shaft passing loosely through its lower end in order that the upper end may have an oscillating motion forward in the direction of the arrow shown in Fig. 4, and backward, while at the same time it shall be perfectly rigid laterally.

C^2 is a sliding tool-holder or cross-head upon the oscillatory guide C′, and to which the upper end of the connecting-rod C is secured, said cross-head adapted to receive and to hold firmly a suitable cutting-tool, C^3, said cutting-tool projected up through the table and reciprocated by means of the connecting-rod C secured upon the cross-head C^2.

B^4 is a suitable spring secured at one end upon the support A^2, and at the other end connected with the cross-head, said spring being adapted to retract the cutting-tool and also to act as a counter-balance. I do not limit myself to this particular construction of the spring, as any suitable retracting-spring may be employed.

In order to adjust the upper end of the oscillatory guide C′ as may be required, I provide the table A′ with a slide, *a*, located beneath the table. It has one end engaged with the upper end of said oscillating guide, and provided at the outer end with an adjusting-nut, *a*′, said slide being screw-threaded upon its outer end for this purpose. The table is also provided with a scale-bar, a^2, the construction being such that a pointer, a^3, secured upon said slide may be moved backward and forward upon the scale-bar, and thereby adjust the position of the cutter secured upon the sliding cross-head mounted upon said oscillatory guide, the position of the pointer upon the scale-bar indicating the adjustment desired. It will be seen that when the pointer upon said slide is adjusted forward upon the scale-bar, the upper end of the oscillatory guide and the cutter connected therewith will be moved forward in the direction of the arrow, as shown in Fig. 4, and when said pointer is forced backward upon said scale-bar, said oscillatory guide and the cutter will be ad-

justed in the opposite direction. It will be evident that by this mechanism the cutter may be adjusted either so as to cut perpendicularly or at an angle, the cut being either deeper upon the upper portion of the work or deeper upon the lower portion of the work as may be desired, said angle being readily determined by adjusting the upper end of the oscillatory guide with the cutter connected therewith, either forward or backward of the perpendicular line, as may be desired.

A^3 is a guide located upon the face of the table, adapted to be set in any desired position by a thumb-screw, a^4, which screws into the guide so as to move therewith, the head of the thumb-screw being adapted to bind against the under side of the tube to clamp the guide in its adjusted position, said guide being designed for centering the work, and for this purpose is provided with suitable projections, a^6, adjacent to the cutter, as illustrated in the drawings.

A^4 is a sliding follower located upon the table in any proper manner in the rear of the cutter, adapted to be forced forward by a lever, A^5, for the purpose of forcing the cutter upon the work, so as to produce the desired cut. To determine and limit the depth of cut the stroke of the lever may be limited by any suitable mechanism—as, for instance, an adjustable slide, a^5, located upon the edge of the table.

D is a suitable chuck by which the work is held in position after being properly centered about the guide A^3. By the use of the guide A^3 for properly centering the work, I am enabled to cut keyways in pinions, inside gearing, &c. In order to cut miter and other gears, I provide the following described mechanism for presenting and holding the work to the cutter in a suitable manner.

E represents suitable supports adapted to be secured upon the table A′ in any suitable manner. These supports, however, should be made removable. The supports may be secured in any proper manner—as, for instance, they may be adapted to engage with suitable slides, e, upon the face of the table and to be held in the required position by means of the bolts e'.

E′ is a tilting shaft secured in said supports, preferably having its bearing in vertical slots e^2 in said supports, the construction being such that said shaft may be raised or lowered for heavier or lighter work, as the case may be, said shaft being secured in said supports in such a manner that it may be readily tilted backward and forward as may be desired.

E^2 is a sleeve rigidly connected with the tilting shaft, through which passes a shaft, E^3, said shaft adapted and designed to hold the work E^4 at its lower end, as illustrated more particularly in Figs. 6 and 7. Said shaft E^3 is preferably provided at its upper end with a dial-plate, F.

F′ is an index-point properly supported and adapted to engage with orifices f upon said dial-plate, by which mechanism the work may be rotated so as to cut the gears at regular intervals, as may be desired. By the use of this mechanism just described, should it be desired to cut a miter-gear, the shaft E^3 with the work secured thereon is tilted as desired, by means of its location in the sleeve E^2, connected with the shaft E′, and firmly secured in said position. Then by rotating the shaft E^3 as desired, the gearing may be cut by the operation of the cutter C^3. By securing the shaft E^3 either in a perpendicular line or at any desired angle, any kind of gearing may be cut.

The operation of the device is as follows: It is evident, since the oscillatory guide C′ oscillates from the center of the crank-shaft, and the cutter is fastened firmly in the cross-head C^2 upon said guide, the cutter will have a perfectly straight cut in line with the guide, so that the kerf will be perfectly true and straight. By means of the slide a engaged with said guide, the guide with the cutter is adjusted so as to cut perpendicularly or in a tapering manner, as may be desired, in the method already described. By setting the index-finger at the proper point—say at the center of the scale—the cutter will be adjusted to cut a perfectly upright kerf to a uniform depth. The index-finger being moved backward and forward upon the scale by means of the adjusting-nut a', the cutter will be correspondingly adjusted to produce a tapering cut, which may be deeper at the top or at the bottom, as may be required. When the pointer has been set in the proper position upon the scale for any desired cut, the guide A^3 by which the work is set is then adjusted by means of the thumb-screw a^4 for the depth of cut demanded, the position of said guide being determined by measuring the required distance from the edge of the cutter to the face of the upwardly-projecting portions of said guide. The slide a^5 should also be properly adjusted by means of its thumb-screw to limit the stroke of the lever A^5, by means of which the cutter is forced upon the work. When the cutter has once been adjusted it is ready to cut any number of kerfs of the desired kind. If it is desired to cut keyways in pinions, inside gearing, &c., the work is centered about the upwardly-projecting portions a^6 of the guide A^3 on each side of the cutter and brought firmly against the projecting portions. The work thus being centered, the kerf will be always perfectly straight with the center. The work can thus be more accurately centered than when centered from the outside, as in any other devices. Moreover keyways may be caused to taper alternately, if desired, by a suitable adjustment of the oscillatory guide, by means of the slide a, as described, the work remaining the same side down upon the table.

It will be seen that by locating the push-bar or follower A^4 below the face of the table, or so that its upper face is even with the face

of the table, as shown in Figs. 3 and 5, the force of the lever A^5 is applied to the cutter below the work, a point of considerable importance to which I call special attention, as thereby I am enabled to use the entire length of the cutter, while at the same time the operation of the lever upon the follower is such as to apply the pressure near the cutting-center of the cutter.

In other machines of this class the power has heretofore been applied to the cutter by a push-bar above the work. In cutting gears in heavy work, however, should it be desired, said follower A^4 may be constructed with an upright arm of suitable length to engage against the saw, as more particularly illustrated in Fig. 4. By my device, the cutter getting dull at any point, can readily be lowered or raised in the cross-head, and thus be made to cut its entire length.

I would call special attention also to the feature of my invention described for setting the work for cutting keyways in pinions, &c., so as to cut straight from the center with the utmost accuracy, which may be readily accomplished by means of the upwardly-projecting portions of the guide A^3, which, in connection with the chuck D, will hold the work firmly against said projecting portions of the cutter, and thus insure a straight cut of the saw from the center of the work. Should it now be desired to cut miter or other gears upon the outside of the work, the oscillatory guide, with the cutter connected therewith, is adjusted so that the cutter will cut perpendicularly. The depth of cut desired is regulated in the manner above described, as also the stroke of the lever A^5 by means of the slot a^5. The slide a is then loosened, so that the saw can operate freely. The only difference in the mechanism employed in cutting miter and other gearing over keyways in pinions, &c., consists in the method of presenting the work to the cutter, which is done by securing the supports E upon the table A′, with its tilting shaft and other mechanism described in connection therewith, the work being secured upon the end of the rotating shaft E^3. By this mechanism the work may be moved forward to the saw at any desired angle, so as to cut gears of any description desired. This mechanism for presenting the work to the cutter may be removed from the table whenever it is desired.

It will be seen that whether the guide A^3 be used alone for centering the work, or whether the supports E, with the mechanism connected therewith be employed in addition, there is a perfect co-operation of the various elements with each other.

What I claim is—

1. The combination, with the oscillatory guide, of the sliding tool-holder connected to the upper end of said guide, and a crank-shaft to which the said guide is connected for operating the guide from the center of the shaft, substantially as described.

2. The combination of the bed or table, the oscillatory guide, the slide located beneath the table and connected with the upper end of said guide, and means for moving said slide to adjust said guide for making tapering cuts from either side, substantially as described.

3. The combination of the bed or table, the oscillatory guide, the slide located beneath the table and connected with the upper end of said guide, a scale-bar, and an adjusting nut and pointer connected with said slide, substantially as described.

4. The combination of the table, the adjustable guide for centering the work, the cutter, the sliding follower upon the table to the rear of the cutter to force the cutter upon the work, and means for controlling the movement of said follower to control the depth of the cut, substantially as described.

5. The combination, with the table, of a slide adapted to set the cutting-tool to make tapering cuts from either side of the work, a push-bar, a lever adapted to force said bar upon the cutting-tool, and means for limiting the stroke of the lever, substantially as described.

6. The combination of the table, a slide adapted to set the cutting-tool to make tapering cuts from either side of the work, a guide for centering the work with the cutting-instrument, a push-bar, a lever adapted to force said bar upon the cutting-instrument, and means for limiting the stroke of the lever, substantially as described.

7. The combination of the table, the work-supporting frame, the shaft connected with said frame so as to be tilted and elevated or lowered thereon, and a shaft, E^3, connected with said tilting shaft, having the work connected therewith, and provided at one end with the dial-plate and pointer, substantially as described.

8. The combination, with a suitable frame, of a driving-shaft, B, geared with the shaft B′, a crank-shaft, B^2, geared with the shaft B′ by means of eccentric gearing b^4 b^5, an oscillating guide adapted to oscillate from the center of the crank-shaft, provided with a sliding tool-holder, and a connecting-rod secured to said sliding holder and to the crank-shaft, substantially as described.

9. In a gear-cutting machine, an adjustable guide, A^3, provided with upward-projecting portions on either side of the cutting-instrument, the construction being such that the work may be centered about the cutter in such a manner as to secure a straight cut from the center of the work, substantially as described.

10. In a gear-cutting machine, the combination of the bed, the follower A^4, applied as set forth, the lever A^5, bearing against the same, and means for limiting the throw of the lever, the construction being such that the force of the lever is applied to the cutter below the work and its pressure near the center of the cutter, substantially as described.

11. The combination, with an oscillatory

guide provided with a sliding head and a cutting-instrument secured thereto, of an adjustable frame provided with a tilting shaft adjustably secured therein, and means for holding the work, the construction being such that the work may be tilted in any desired position for the operation of the cutter, substantially as described.

In testimony whereof I sign this specification in presence of two witnesses.

MATTHEW MORTON.

Witnesses:
N. S. WRIGHT,
A. E. INGLIS.