E. J. FLATHER.

ATTACHMENT FOR GEAR CUTTING MACHINES.

APPLICATION FILED JUNE 3, 1908.

936,879. Patented Oct. 12, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

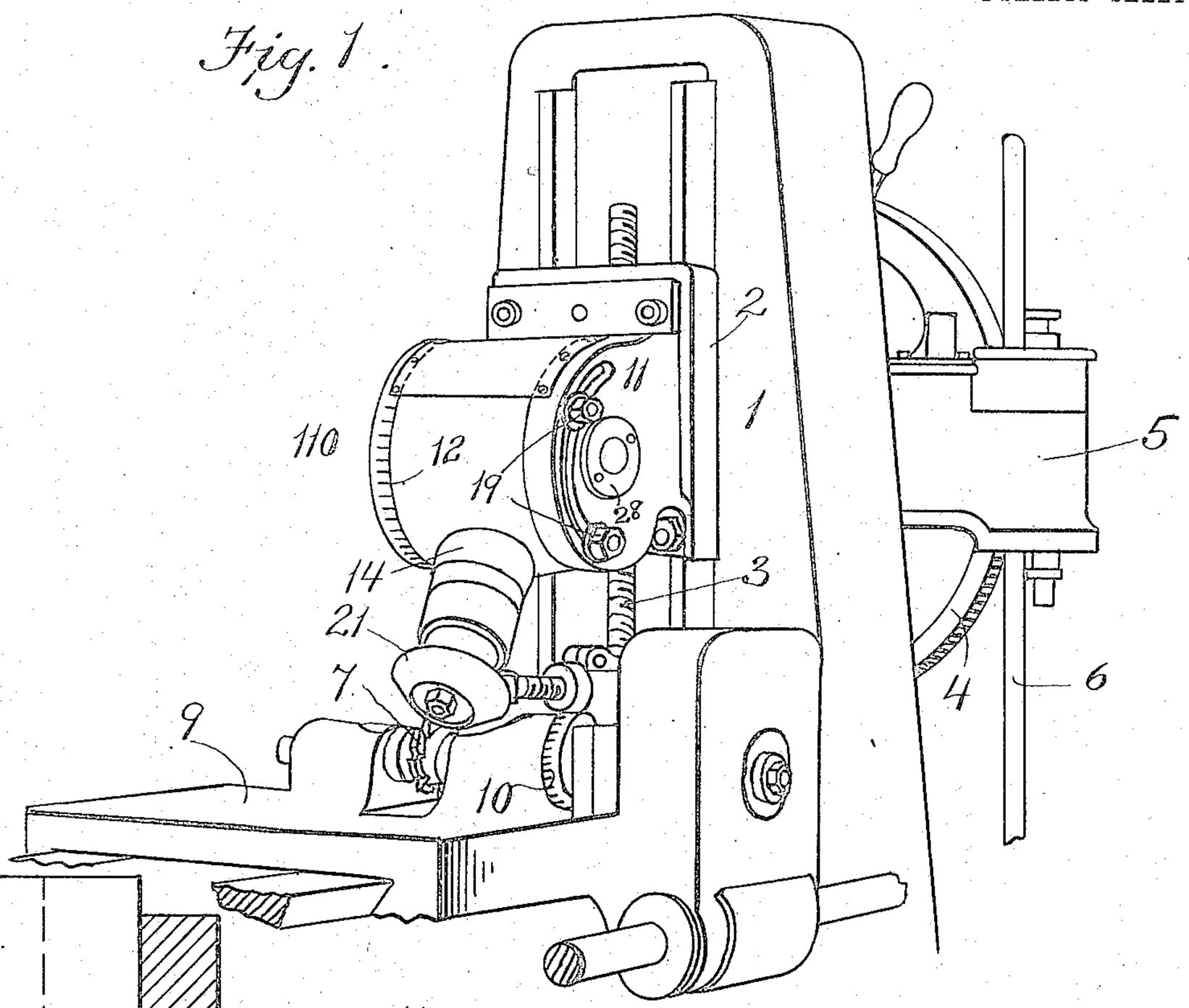


Fig. 2.




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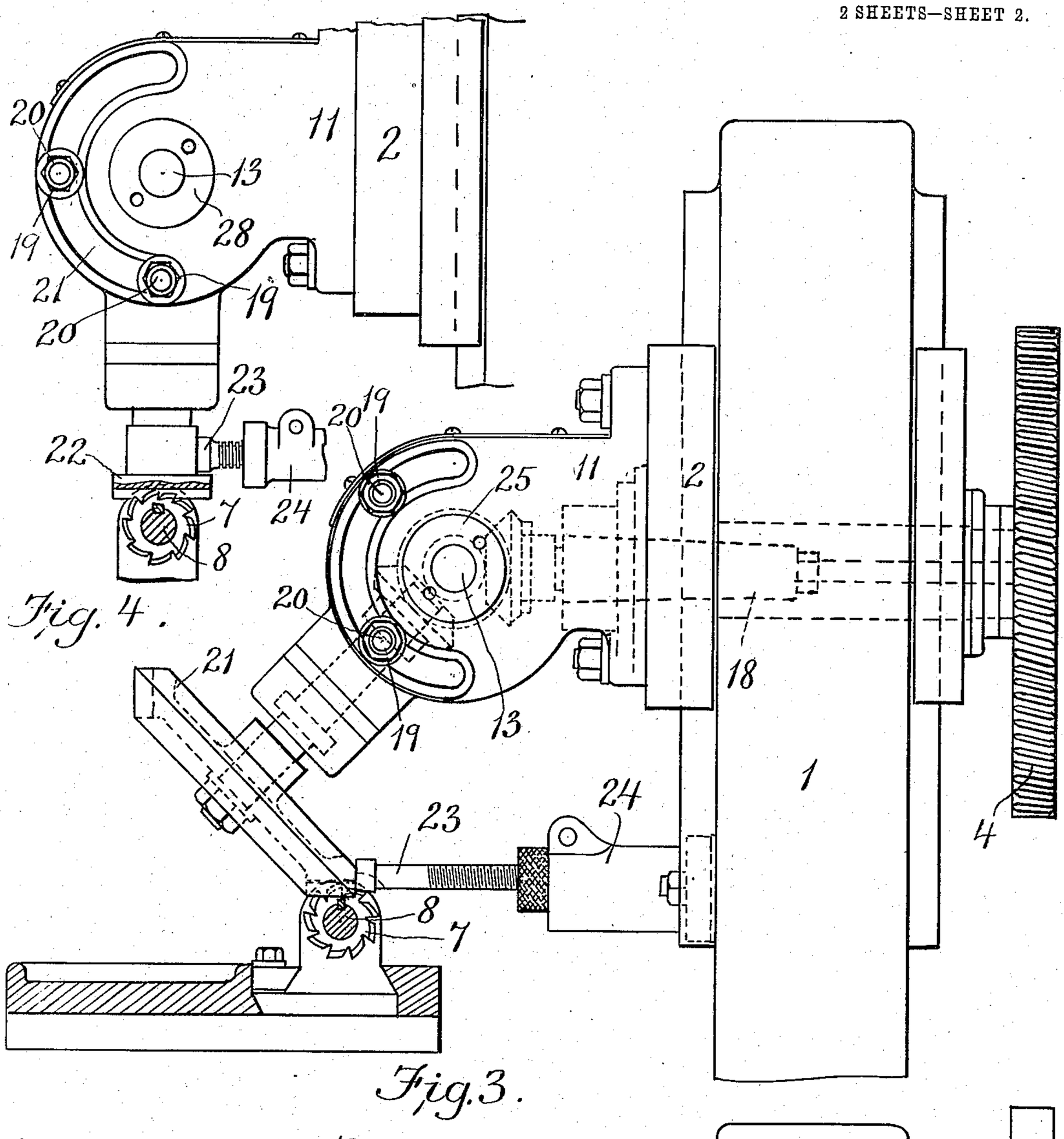


Fig. 4.

Fig. 3.

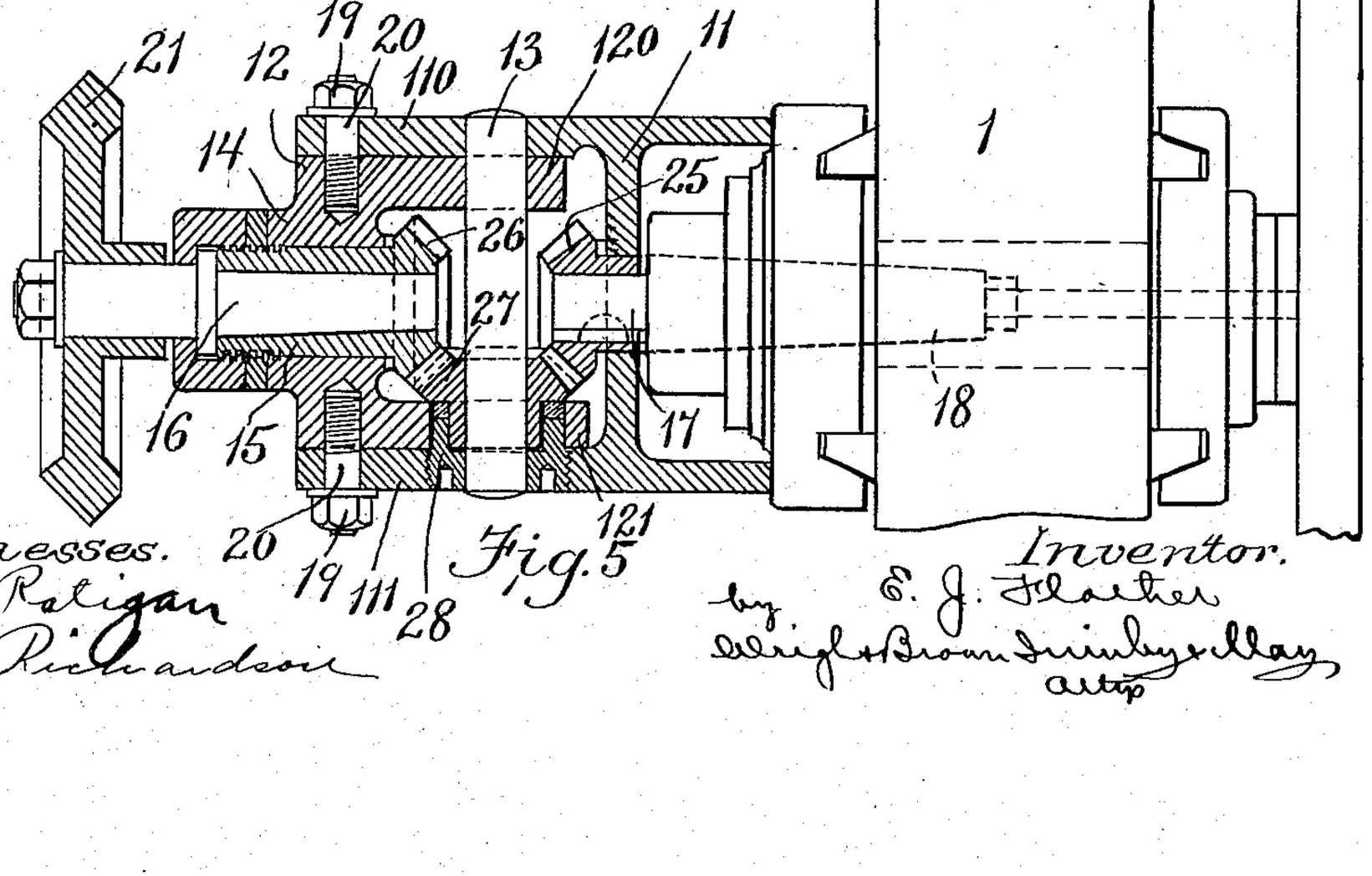


Fig. 5

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# UNITED STATES PATENT OFFICE.

ERNEST J. FLATHER, OF NASHUA, NEW HAMPSHIRE.

## ATTACHMENT FOR GEAR-CUTTING MACHINES.

936,879. Specification of Letters Patent. Patented Oct. 12, 1909.

Application filed June 3, 1908. Serial No. 436,381.

*To all whom it may concern:*

Be it known that I, ERNEST J. FLATHER, of Nashua, in the county of Hillsboro and State of New Hampshire, have invented certain new and useful Improvements in Attachments for Gear-Cutting Machines, of which the following is a specification.

This invention relates to attachments adapted to be applied to machines which cut spur teeth on the peripheries of circular blanks, in order to enable such machines to cut teeth on bevel gear blanks, face clutches, and do a variety of other work in which cuts are made at various angles with respect to the axis of the work.

The object of the invention is to provide a simple attachment which can be secured to any gear-cutting machine, and is adapted to hold work at any desired angle with respect to the line in which the cutting tool operates, for the purpose of making all kinds of bevel-gear and clutch teeth, radial slots, polygons, etc., and to complete such gears and clutches automatically when attached to an automatic machine.

In the drawings I have illustrated the attachment as mounted upon a gear-cutting machine of the character shown in my Patent No. 825,311, for gear-cutting machines, granted July 10, 1906, but it is to be understood that it is not limited in its use to connection with a machine of this particular type, but may be used with a variety of other gear-cutting machines.

Of the accompanying drawings,—Figure 1 represents a perspective view of the column of such a machine with my attachment applied thereto, there being shown also the cutting tool and part of the mechanism for indexing and adjusting the blank. Fig. 2 represents a vertical longitudinal section of the attachment. Fig. 3 represents an elevation of the attachment shown as being adjusted for cutting miter gears. Fig. 4 represents an elevation of the attachment adjusted for cutting face clutches. Fig. 5 represents a horizontal longitudinal section of the attachment.

The same reference characters indicate the same parts in all the figures.

In the drawings, 1 represents the column of a machine, such as illustrated in the patent above referred to, on which is mounted so that it can slide vertically, a slide 2 which serves as a bearing for the work-spindle of the machine, this slide being adjusted by the screw 3, and the work-spindle being turned for indexing the work by the index-wheel 4 rotated by a worm in the housing 5 and mounted on a vertical shaft 6. The construction and relative arrangement of these parts are shown in the patent above referred to, and need no particular description here, inasmuch as they form no part of the present invention, but are referred to merely as illustrative of the manner in which the present invention is applied and operated.

The cutter is represented by 7 and is on a horizontal shaft 8 so that it rotates in a vertical plane and is carried in a horizontal line from front to rear while it cuts, by the sliding bed 9. A lateral adjustment is given the cutter by means of the nut 10, in the manner described in the patent aforesaid.

The attachment consists of a main body or casing 11 adapted to be affixed rigidly to the slide 2 and a swinging part or head 12 which is pivoted to the fixed part. The construction of these parts is best shown in Figs. 2 and 5, from which it will be seen that the body 11 has sides 110 111 between which the head 12 is contained, and that a pivot pin 13 passes through these sides and through lugs 120 121 on the head. The body 11 is open at the front between the side wings, and the head 12 is flush with the peripheries thereof. It has a bearing 14 of which the axis intersects the axis of the pivot 13, and in which there is held rotarily a bushing 15 carrying a work arbor 16. In the head 11 there is also a bearing holding a supplementary spindle 17 which has a tapered shank 18 adapted to be set into a socket in the main work-spindle, and to be held frictionally thereby so that it will be turned whenever the main spindle is rotated. The axis of the supplementary spindle also intersects the axis of the pivot-pin 13 and is in the same plane as that of the work-arbor. The latter may be adjusted with the head 12 about the pivot 13 so as to extend at any angle relatively to the supplementary spindle 17, the adjustment in this case being in a vertical plane. It is retained in any adjusted position by clamping nuts 19 on studs 20 which are carried by the head and project through slots 21 in the sides of the head. The extent of these slots and the position of the studs 20 limit the latitude of adjustment of the head, it being adjustable in the embodiment of the invention here illustrated through about 90°, that is, from a position

in which the arbor 16 is in line with the spindle 17, to one in which it is at right angles thereto, this being sufficient for all ordinary purposes.

On the outer end of the arbor 16 is fastened the blank to be cut. In Figs. 3 and 5, the blank 21 is to be made into a miter gear, and in being operated upon the arbor is adjusted at an angle of 45° with respect to the line in which the cutter travels. In Fig. 4, the blank 22 is to be made into a clutch having radial teeth on its flat face, and in this case the arbor is set at an angle of 90° to the work-support. The work is held steady against the thrust of the cutter by means of a rim support 23, which extends from the column 1 over the cutter and bears against the rim of the blank 21 or the hub of the blank 22. It is adjustable so that it may be made to bear properly against any sort of a blank, and for that purpose is provided with screw threads meshing with internal threads in the sleeve 24 by which it is held.

After each tooth is cut, the blank is indexed by the indexing mechanism illustrated in the patent previously referred to, which turns the index-wheel 4 and main work-spindle through the required distance. This motion also turns the supplementary spindle 17, the motion of which is transmitted to the arbor 16 through a train of bevel gears. One of the gears 25 of the train is affixed to the spindle 17, another 26 to the sleeve 15. while the intermediate member 27 is journaled upon the pivot pin 13 and meshes with both of the previously-named gears. This gear being coaxial with the axis of adjustment of the work arbor, enables the latter to be turned and the work indexed, whatever may be its angular position. Adjustment of the intermediate gear to take up back-lash so that accurate results may be obtained, is afforded by a nut 28 threaded into the side 111 of the head and bearing against the back of the gear. Adjustment of the blank aside from the automatic indexing is permitted by disconnecting the positive fine clutch, which is graduated and mounted in the housing 5, in the manner illustrated in the patent referred to, whereupon it may be turned by hand to adjust the work by slight amounts.

In cutting radiating or diverging teeth by means of this attachment, the work arbor and cutter are set in the same plane and the radial cuts are made. Then, in order to remove stock from the teeth so that the teeth and intermediate spaces will be equally tapered, the cutter is set to one side or other of the center of the arbor and the blank is adjusted by the manual adjustment previously described, so that the radial slot previously cut is also slightly out of the central plane, and the sides of the teeth are then slabbed off while the parts are in this adjustment.

The lateral adjustment of the cutter is indicated and measured by graduation marks on the periphery of the nut 10, while the angular position of the work arbor is indicated by a scale on the periphery of the side 110 of the attachment body.

Instead of making the body or casing 11 as a separate part to be detachably connected to the spindle-carrying slide of a gear-cutting machine, the said body may be made as an integral part of the slide, the machine being then permanently adapted for cutting bevel gears or face clutches, and also being capable of cutting spur gears by swinging the head forward until the work arbor is in line with the main spindle.

I claim:—

1. An independent attachment for gear-cutting machines for enabling gears and similar elements having inclined or radiating teeth or grooves to be cut by such machines, comprising a head having provisions by which it may be detachably secured to an otherwise complete gear-cutting machine, a rotary work-holder mounted in said head with provision for swinging transversely of its axis of rotation, and a spindle journaled in said head adapted to be connected detachably with the work spindle of the machine, and having rotation-transmitting connection with said work-holder.

2. An independent attachment for gear-cutting machines for enabling gears and similar elements having inclined or radiating teeth or grooves to be cut by such machines, comprising a head having provisions by which it may be detachably secured to an otherwise complete gear-cutting machine, a rotary work-holder mounted in said head with provision for swinging transversely of its axis of rotation, a spindle journaled in said head adapted to be connected detachably with the work spindle of the machine, and rotation-transmitting connections between said spindle and work-holder, constructed and arranged to actuate said holder in all positions of the latter.

In testimony whereof, I have affixed my signature, in presence of two witnesses.

ERNEST J. FLATHER.

Witnesses:
HERBERT J. ALEXANDER,
WILLIAM F. DUVAL.