G. M. HOLMES.

Gear-Cutting Machines.

No. 155,026. Patented Sept. 15, 1874.

Fig. 3.

Fig. 2.

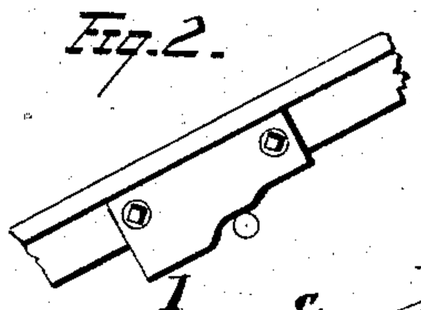

Fig. 1.

WITNESSES.

W. T. Newman.

Wells W. Leggett.

INVENTOR.

George M. Holmes.

By Leggett & Leggett.

Attorneys

UNITED STATES PATENT OFFICE.

GEORGE M. HOLMES, OF GARDINER, MAINE, ASSIGNOR OF ONE-HALF HIS RIGHT TO PHILIP C. HOLMES, OF SAME PLACE.

IMPROVEMENT IN GEAR-CUTTING MACHINES.

Specification forming part of Letters Patent No. **155,026**, dated September 15, 1874; application filed April 27, 1874.

To all whom it may concern:

Be it known that I, GEORGE M. HOLMES, of Gardiner, county of Kennebec, State of Maine, have invented an Improved Mechanism for Planing the Cogs of Bevel-Gear Wheels; and declare the following to be a full, clear, and exact description thereof, such as will enable others skilled in the art to make and use it, reference being had to the accompanying drawings.

My invention relates to mechanism for planing the surfaces of the cogs in bevel-gearing; and consists in the devices and combinations, as hereinafter fully set forth and claimed.

In the drawings, Figure 1 is a view in plan of my improved mechanism. Fig. 2 is a separate view of the form or templet that gives the required motion to the bevel-gear wheel that is being planed. Fig. 3 is a separate view of the removable or adjustable index-wheels.

A is the bed of the planer, upon which the platen B slides in suitable guides, and is actuated by suitable mechanism. C is a shaft, upon which the rough casting (the cogs of which are to be planed) is secured. It is pivoted at D by passing through a collar that has a swivel motion about a bearing in the elevated standard E. F is a frame, tubular along the portion *f*, for the passage of the shaft C. At one end it is attached rigidly to the swivel-collar D by a set-screw. At the other end it terminates in a frame-work that supports the index mechanism. G is the tool-holder, attached to the platen, provided with suitable mechanism for adjusting the tool *g* to its work. H is a guide, and forms a support for the end *c* of the shaft C. At a suitable point upon this guide H is a form or templet, I, of a shape corresponding to the radial contour of the sides of the cogs to be planed, its dimensions being larger than the said radial contour proportionate to its distance from the center of motion D. K is a link, connected with the shaft C at one end, and to the traveling nut L at the other end, which nut L is upon the feed-screw M.

By operating the crank *m*, the shaft C may be set at any angle suitable to any size of bevel-gear wheel to be planed, and when the wheel and the tool are properly adjusted, the movement of the platen B will cause an arm, N, to turn the feed-screw M one or more notches in each travel of same.

One of the important features of my invention consists in the adjustment of the tool *g*, and its motion relatively to the adjustment of the cog-wheel to be planed. The bevel-gear wheel to be planed is adjusted upon the shaft C, so that the apex of its beveled or conical surface shall be at the center of motion D, and the tool *g* is so adjusted that the point or cutting-edge of the same shall travel in a line passing through the same point or apex D.

The index mechanism consists of drive or crank wheel O, wheel P, and intermediate wheel Q. The latter wheel, Q, is set in a slotted frame, R, which swings on the shaft of the wheel P. The other end of the slotted frame R is adjustable by means of a set-screw, *s*, in a slotted arc, S, the object being to admit of wheels Q of different size being employed, and to adjust any such wheel to the wheels O and P, the said wheel Q being of such a size corresponding to any given size of cog that a single turn or a given number of complete turns of the crank-wheel O will move the bevel-gear wheel through the space of one cog, a suitable latch, T, indicating when a single turn has been completed. The bevel-gear wheel is turned by means of the worm *p* upon the shaft of the wheel P, operating in a worm-wheel on the periphery of the wheel U.

Instead of a single wheel, Q, as shown in Fig. 1, I propose, generally, to employ either two wheels, Q Q′, as shown in Fig. 3, or else a single wheel having two sets of cog-gearing, Q Q′, whereby the motion given to the gearing Q by the crank-wheel O will be multiplied in the wheel P.

In order to make a true wheel the tool *g* should travel on a line passing exactly through the center of motion D; but a slight variation from that line will produce a wheel sufficiently accurate for ordinary work, but varying from accuracy in proportion as the tool varies from the said line of travel.

It will be seen that there are two set-screws, *d d*, upon opposite sides of the center of mo-

tion D. The shaft C has a slight vertical motion upon these set-screws to enable it to follow the contour of the templet I.

It is obvious that the shaft C may be rigid as regards motion about its own axis, and the bevel-gear be adjusted upon it to be turned around it; and it is also obvious that various forms of index mechanism may be employed to turn the shaft C, or turn the bevel-gear around the axis of the shaft, without departing from the principle of my invention.

What I claim is—

1. A shaft, C, for holding the bevel-gear wheel, the cogs of which are to be planed, adjusted by mechanism substantially as described, to turn laterally and vertically about a point, D, which is upon its axis, also on the line of travel of the planing-tool *g*, and at the apex of the conical or beveled surface to be planed, substantially as and for the purpose set forth.

2. A shaft, C, for holding the bevel-wheel, the cogs of which are to be planed, adjusted by mechanism substantially as described, to revolve on its own axis, and to turn laterally and vertically about a point, D, which is upon its axis, also on the line of travel of the planing-tool *g*, and at the apex of the conical or beveled surface to be planed.

3. In combination with a shaft, C, for holding the bevel-gear wheel to be planed, constructed and adjusted to turn about the point D, as described, a form or templet, I, or its equivalent, to guide the gear-wheel to the tool and enable the latter to form the proper radial contour of the sides of the cog, substantially as described.

4. In combination with the shaft C, the link K and nut L, the latter attached to the feed-screw M, substantially as and for the purposes set forth.

5. The combination, in a machine for planing bevel-gears, of a planing-tool, *g*, adjusted to have a movement always along the same right line, the said line passing through the apex D of the conical surface to be planed, a shaft, C, for holding the gear to be planed, adjusted to have a universal motion about the point D, and mechanism for bringing the gear to, and holding it in contact with, the tool *g* substantially as described.

6. In a machine for cutting the teeth of bevel-gear wheels, the combination of a pivoted shaft for supporting the wheel to be cut, a reciprocating cutter moving constantly in one only right line, and that line directed toward or passing through the point in which the shaft is pivoted, mechanism to gradually draw or otherwise move the free extremity of the shaft more and more nearly to a parallelism with the line of movement of the cutter, and a device for guiding said movement of the shaft in a curved path, with the view of gradually changing the position of the wheel being cut in relation to the cutter, to permit the cutter to impart to the teeth the proper contour, the combination being and operating substantially as specified.

Witness my hand this 27th day of April, 1874.

GEORGE M. HOLMES.

Witnesses:

WELLS W. LEGGETT,

ROBT. M. BARR.