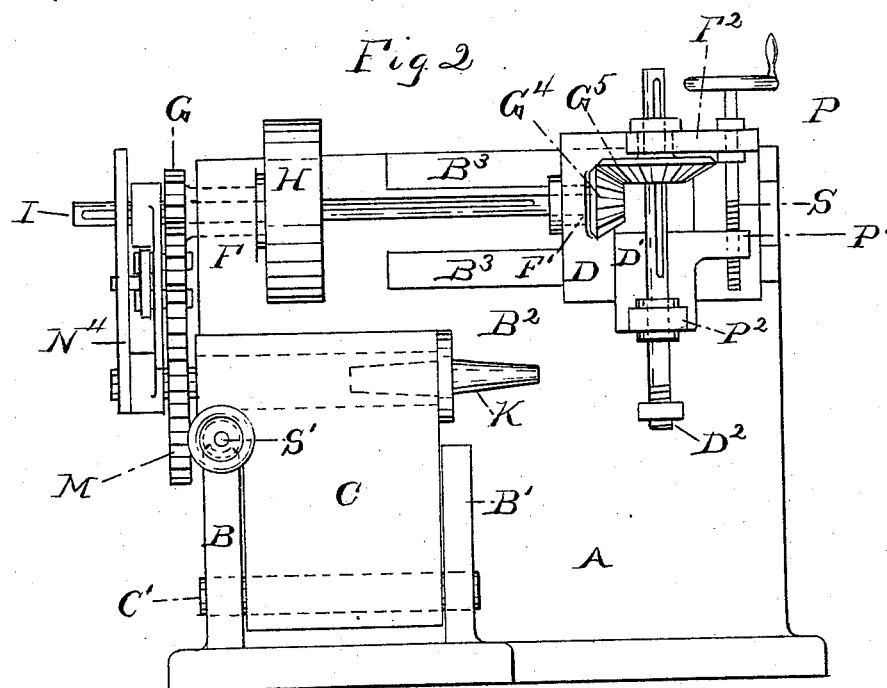
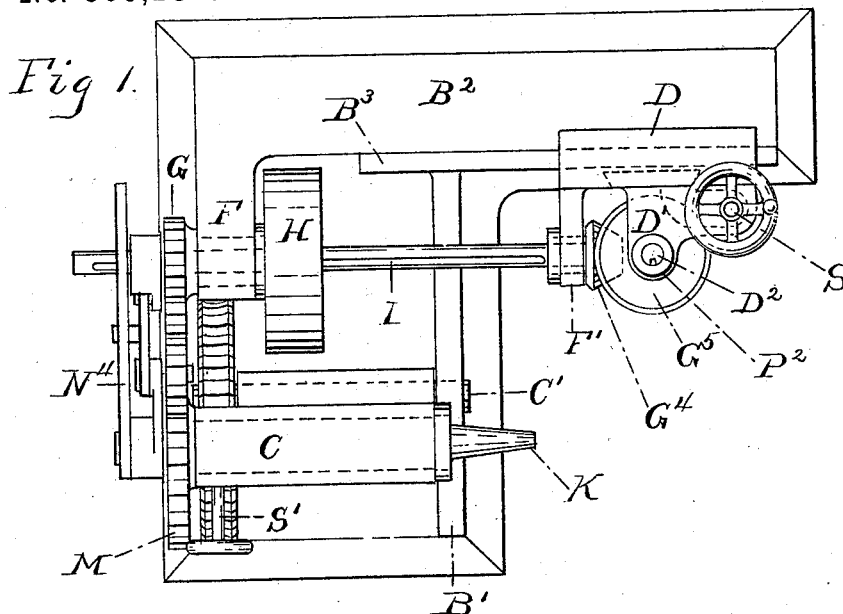


F. H. RICHARDS.  
GEAR CUTTING MACHINE.

No. 305,235.

Patented Sept. 16, 1884.



Witnesses;  
H. W. Faulkner  
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# UNITED STATES PATENT OFFICE.

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## GEAR-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 305,235, dated September 16, 1884.

Application filed December 31, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Gear-Cutting Machines, of which the following is a specification, reference being had to the accompanying two sheets of drawings.

This invention relates to that class of gear-cutting machines adapted for the cutting of worm-wheels by means of a hob, in which the blanks are revolved positively harmoniously with that hob by means of gearing between the blank-arbor and the cutter-arbor.

It has for its object to provide a machine of the class described of simple construction, in which the blank and the cutter shall be revolved, as described, by independent means, through the agency of a driving-shaft, and having improved devices for carrying the blank and the cutter.

It consists of a rigid frame-work, a blank-arbor mounted upon a swinging frame, suitable cutter-carrying mechanism, a driving-shaft, and gearing, whereby rotary motion is communicated from that driving-shaft to the blank-arbor and to the cutter-arbor.

Referring to the drawings, Figure 1 is a plan view. Fig. 2 is a front elevation. Fig. 3 is a rear side elevation. Fig. 4 is an enlarged view of certain details of the preceding figures.

Similar letters refer to similar parts throughout the several views.

The frame of the machine, A, is preferably made integral, as here shown, and consists of a base portion, an upright portion, B<sup>2</sup>, and two flange-like portions, B and B'. Upon the part B<sup>2</sup> of the frame are formed any suitable ways, as B<sup>3</sup>, whereon a carriage, as D, is adapted to be traveled by means of any suitable appliance, such as a screw and nut or its equivalent. A bearing, F, formed or secured on B<sup>2</sup>, and another one F', fixed on D, serve to carry the driving-pulley H and gear G<sup>4</sup>, respectively. The driving-shaft I is fixed to one of these and splined to the other, it being in the present instance so fixed to the latter and splined to the former. A bearing, F<sup>2</sup>, is formed or fixed on carriage D, (see Fig. 2,) for carrying a gear, G<sup>3</sup>,

that meshes with and is driven by gear G<sup>4</sup>. Below bearing F<sup>2</sup>, on carriage D, suitable ways or gibs are provided for the slide D', that has a bearing, P<sup>2</sup>, for the cutter-arbor D<sup>2</sup>, that is splined to slide through and be driven by gear G<sup>3</sup>. Upon carriage D, near bearing F<sup>2</sup>, is formed bearing P, that carries screw S, that works in a nut, P', formed on slide D', whereby the cutter is adjusted to its proper working position in the machine.

I do not limit myself to bevel-gearing between shaft I and arbor D<sup>2</sup>, as worm-gearing may be used in place thereof by a slight change in the construction of the parts carrying and driven by them; neither do I limit myself to the particular construction of the parts D D' D<sup>2</sup> S and the bearings described.

The blank-arbor, which is of any suitable construction, as K, is carried upon a swinging frame, also of any suitable construction, as C. That frame is arranged to oscillate upon a pivot, as C', and is preferably, but not necessarily, further supported laterally by the parts B and B' of the frame. That frame is also formed to receive a shaft, S', carrying a worm, (shown best in Fig. 3,) which meshes with teeth formed on part B, whereby the said frame may be swung upon its pivot by the turning of that worm. The blank-arbor carries a suitable master-wheel, as M, preferably a spur-wheel, that is driven from a gear, G, carried upon the hub of pulley H, by means of intermediate gearing, as G' and G<sup>2</sup>. That intermediate gearing may have any suitable arrangement; but I prefer to have it carried by a system of links jointly connected, as shown best in Figs. 3 and 4. One end of link N' is fitted upon arbor K, and one end of link N<sup>3</sup> to shaft I, the other end of each of those links being pivoted to intermediate links, N<sup>2</sup>, by means of studs S<sup>4</sup> and S<sup>5</sup>, respectively, which carry the train of intermediate gears, G G'. It is obvious that by this arrangement of gearing (shown best in Fig. 3) the distance between shaft I and arbor K may be increased or diminished without throwing them out of gear.

In order to keep the system of gearing in positions between the extremes shown by the solid and dotted lines of the side view in Fig. 4, the link N<sup>2</sup> is provided with a central stud,

S<sup>3</sup>, that is kept in a line between said shaft and arbor by means of a slot in bar N<sup>4</sup>, that is carried, preferably, upon them.

It is not necessary to always use the same number of gears in the train as shown in this application. They may also be formed into a compound instead of a simple train. Various arrangements of bevel-gearing and worm-gearing may obviously be substituted for the system hereinbefore last described, and I consider it immaterial to the general character of my machine whether one or another of such forms of gearing is so used.

The operation of cutting worm-wheels in this machine is performed in substantially the same manner as in others of the same class. The blank is suitably fixed to blank-arbor K, a suitable hob, as L, fixed to cutter-arbor D<sup>2</sup> and adjusted to proper working position, a suitably proportioned train of intermediate gears, selected with due regard to the other gearing of the machine as well as to the cutter and to the blank to be cut, fixed in place to drive arbor K, and the machine started by a belt on pulley H, or by other equivalent means. By turning the worm S' the frame C and the blank carried thereby are then fed toward the cutter until the blank is sufficiently cut, when the completed worm-wheel is removed in the usual manner.

By providing suitable blank-spacing mechanism for blank-arbor K and omitting the train of gearing from shaft I to arbor K, this machine may be adapted for the cutting of spur-wheels in substantially the usual manner.

Having thus described my invention, I claim—

1. A frame having ways B<sup>3</sup> and bearing F, carriage D, pulley H, splined shaft I, gears G<sup>4</sup> and G<sup>5</sup>, splined arbor D<sup>2</sup>, slide D', having bearing P<sup>2</sup>, combined and operating substantially as described. 40

2. In a gear-cutting machine, a suitable frame-work, a swinging frame carrying a blank-arbor, a cutter-arbor, and a carriage, substantially as described, for carrying the same, a driving-shaft, gearing, substantially as described, between said driving-shaft and said cutter-arbor, and gearing, substantially as described, between said driving-shaft and said blank-arbor, combined and operating substantially as described. 50

3. In a gear-cutting machine, in combination, carriage D, slide D', splined arbor D<sup>2</sup>, and gears G<sup>4</sup> and G<sup>5</sup>, substantially as and for the purpose described. 55

4. In a gear-cutting machine, in combination, a part, as D, slide D', splined arbor D<sup>2</sup>, a driving-wheel, as G<sup>5</sup>, and screw S, substantially as and for the purpose described.

5. In a gear-cutting machine, in combination, a driving-shaft, as I, a blank-arbor, as K, adapted to be moved toward and from that shaft, a suitable train of gearing between that shaft and that arbor, carried upon a system of links, as N', N<sup>2</sup>, and N<sup>3</sup>, and a bar, as N<sup>4</sup>, for controlling the position of said links, substantially as and for the purpose described. 60 65

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