E. J. LEES.

GEAR GENERATOR.

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1,081,971.

Patented Dec. 23, 1913.

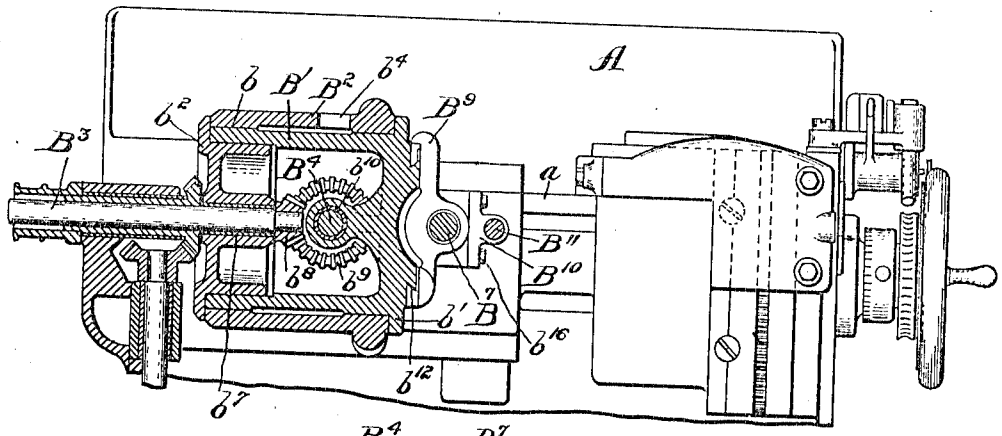


Fig. 1.

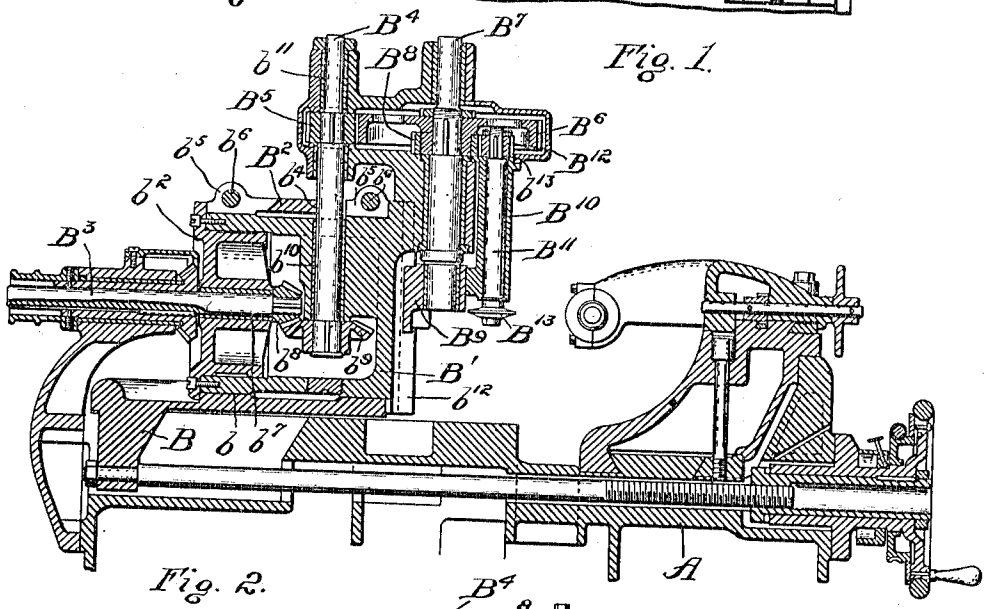


Fig. 2.

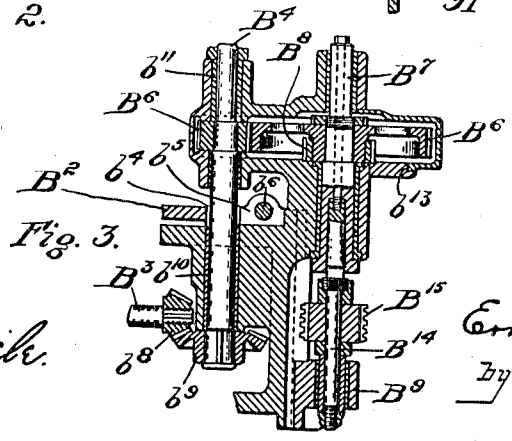


Fig. 3.

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UNITED STATES PATENT OFFICE.

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GEAR-GENERATOR.

1,081,971. Specification of Letters Patent. Patented Dec. 23, 1913.

Original application filed August 6, 1909, Serial No. 511,497. Divided and this application filed March 25, 1912. Serial No. 685,949.

To all whom it may concern:

Be it known that I, ERNEST J. LEES, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Gear-Generators, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates generally to gear generating machines, commonly referred to in the art as hobbing machines, whereby spur gears, worm gears, and spiral gears are cut by means of a continuously rotating cutter operating upon a continuously rotating blank.

Specifically, the hereinafter described invention relates to that part of the gear generating machine wherein the tool-driving spindle is mounted and whereby such spindle is driven, this application being a division of my prior application, Serial No. 511,497, filed Aug. 6, 1909.

The object of the invention is to provide means whereby the said tool spindle may be adjusted to assume required different angular positions with reference to the work, and whereby it may be driven at varying speeds, according to the character of such work.

The said invention consists of means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain means embodying my invention, the disclosed means, however, constituting but one of various mechanical forms in which the principle of the invention may be applied.

In said annexed drawing:—Figure 1 is a horizontal section of that portion of a hobbing machine embodying my present invention, certain parts illustrated and cut by this plane of section being shown in elevation. Fig. 2 is a vertical section taken upon a plane passing through the axis of the spindle, of a part of the gear generating machine shown in Fig. 1. Fig. 3 is a fragmentary vertical section taken upon the axis of the spindle, and showing a modified arrangement of parts in connection therewith.

Referring to the drawing, the frame A of the machine is provided upon its upper surface with a horizontal slide-way *a*, Figs. 1 and 2, which is placed at right angles with the longitudinal axis of the machine, and at the back thereof. Mounted upon this slide-way is a tool-head slide B, which is formed with a cylindrical seat *b* having its axis horizontal and parallel with the direction of sliding movement of the tool-head slide. Mounted in this horizontal seat is a tool-head B′, formed at one end with an integral flange *b*′, and at the other end with a removable flanged head b^2, which is suitably bolted to the tool-head B′, and, in conjunction with the flange *b*′, prevents endwise displacement of such tool-head in its seat.

The tool-head slide-frame member B^2 in which is formed the seat *b*, is provided with a transverse slot b^4, which intersects said seat throughout an arc of substantially 180°, beginning in a plane having a positive angle of 45° with reference to the horizontal plane, and terminating in a plane forming a negative angle of 45° with such first-mentioned plane. The said frame-member is split as at b^5, and suitable bolts b^6 are provided for drawing the split portion together, in order to bind the tool-head in its seat to assume various fixed angular positions, as will be readily understood. The flanged head b^2 is provided with a central horizontal bearing b^7, in which is mounted a horizontal tool-driving spindle B^3. The inner end of this spindle carries a bevel gear b^8, which meshes with a second bevel gear b^9 secured to the lower end of a secondary tool-driving spindle B^4. This latter spindle is mounted in a bearing b^{10} whose axis is perpendicular to the axis of spindle B^3, and projects through the slot b^4, as shown.

The tool-head slide B is formed with a gear housing, and in this housing is formed a bearing b^{11} in which the outer end of spindle B^4 is mounted. Within the housing, and secured to the said spindle, is a pinion B^5, which meshes with the gear B^6, secured to the main tool-driving spindle B^7. The said gear B^6 is of compound form, a second gear

B^8 being formed on or secured to the hub of same, and of smaller diameter than the main member of said gear B^6. A bearing support B^9 is mounted upon the outer main end of the head, so as to be adjustable in the direction of the axis of said spindle, and is provided with suitable binding screws, by means of which it may be fixedly secured in its slide-way b^{12}, as will also be readily understood.

Formed in the gear housing and adjacent to the gear B^8, is an opening b^{13} adjacent to which is secured a bearing support B^{10}. In this support is mounted an auxiliary tool-driving spindle B^{11}, Fig. 2, which projects through said opening and has secured to its outer end a pinion B^{12} meshing with the gear B^8. The lower end of this bearing support is secured to the bearing support B^9 by any suitable means, such as screws b^{16}, Fig. 1, whereby it may be readily detached therefrom. To the inner end of spindle B^{11} is secured the tool B^{13}, in this instance shown as a single cutter. The pinion b^{12} is made of considerably less diameter than that of gear B^8, so as to cause the spindle B^{11} to be rotated at a higher rate of speed than that imparted to spindle B^7. Where, however, it is desired to rotate the cutter at a lower rate of speed than that derived from the spindle B^{11}, as, for instance, when it is desired to generate gears by the hobbing method, the bearing support for said spindle is removed, together with such spindle and pinion B^{12}, the latter being withdrawn through the opening b^{13}. The support B^9 may be then moved downwardly upon its slide-way and used as a bearing for the lower end of the mandrel B^{14} upon which the hobbing tool B^{15} is mounted, the other end of the mandrel being driven into the spindle B^7, which is provided with a suitable tapered seat for such mandrel end, as shown in Fig. 3. This latter arrangement is generally adopted when a compound cutter or hob is used for generating spur, worm or spiral gears, a lower rate of speed being required in this class of operations on the part of the cutter, than is required, for instance, when it is desired to cut a worm by means of a single cutter.

By the above described arrangement, it will be observed that the main tool-driving arbor is adjustable about the horizontal axis of adjustment of the tool-head, and that different speeds of rotation may be imparted to tools, according to the work desired to be performed and the character of such tool.

Having fully described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a gear-generating machine, the combination of a main tool-driving spindle; a support forming the main bearing for such spindle; a supporting member mounted upon said support and adjustable thereon in the direction of the said spindle's axis; and an auxiliary tool-driving spindle and gears connecting same with said main driving spindle; said adjustable supporting member adapted to form a bearing-support for said auxiliary spindle.

2. In a gear-generating machine, a tool-holding and operating head comprising in its structure the combination of a main body-portion adjustable about an axis; a main driving-spindle mounted upon said main body-portion and having its axis transversely related to that of said first-named axis; gears for driving said spindle; a supporting member provided with a bearing having its axis coinciding with the axis of said main driving spindle and mounted upon said main body-portion and adjustable in the direction of said last-named axis; and an auxiliary tool-spindle and gears connecting same with said main driving spindle; said adjustable supporting member adapted to form a bearing-support for said auxiliary spindle.

3. In a gear-generating machine, the combination with a suitable frame, formed with a cylindrical seat, and with a segmental slot intersecting said seat; of a tool-holding and operating head mounted in said seat, adjustable about the axis of the latter, and comprising in its structure a driving spindle, a secondary driving spindle projecting through said slot, gears connecting said two spindles, and a main driving-spindle to which the tool may be attached, said latter spindle being mounted without said frame.

4. In a gear generating machine, the combination of a main tool-driving spindle; a support for forming the main bearing for such spindle; a compound gear secured to said spindle; means for driving one of the elements of said compound gear; a secondary spindle mounted adjacent to said main spindle and provided with a pinion; and a housing surrounding said compound gear and provided with an opening adjacent to the other element of the latter, whereby said secondary spindle pinion may be caused to mesh with said other element and be driven thereby.

5. In a gear-generating machine, the combination of a main tool-driving spindle; a support forming the main bearing for such spindle; a supporting member mounted upon said support and adjustable thereon in the direction of the spindle's axis; a compound gear secured to said spindle; a pinion meshing with one of the members of said compound gear; a housing surrounding the latter and provided with an opening adjacent to the other member of such compound gear;

an auxiliary spindle and bearing therefor, said bearing having one end secured to said adjustable supporting member, and the other end secured adjacent to the said opening; and a pinion fixed to said auxiliary spindle and engaging said other member of said compound gear.

Signed by me, this 20th day of March, 1912.

ERNEST J. LEES.

Attested by—
HERMAN EISELE,
B. M. HARRIS.