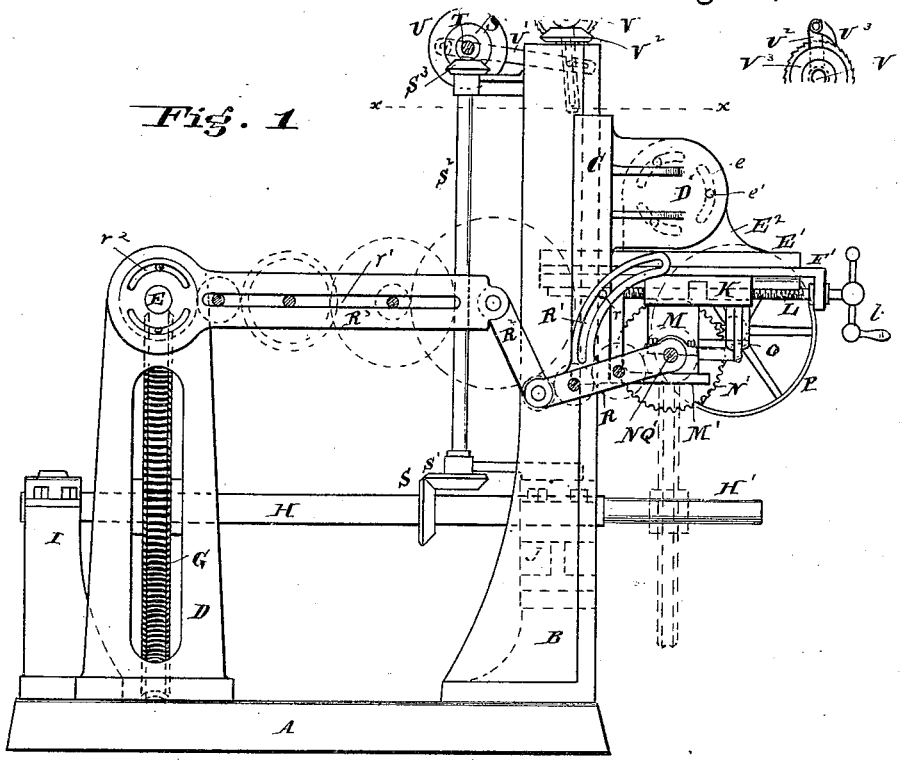
(No Model.) 2 Sheets—Sheet 1.

C. E. ALBRO.

GEAR CUTTING MACHINE.

No. 263,298. Patented Aug. 22, 1882.

Fig. 1



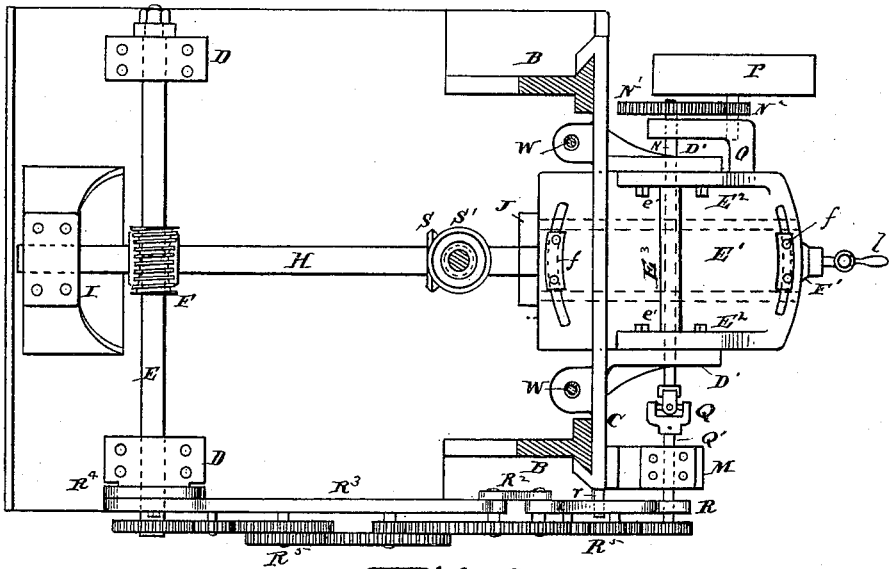


Fig. 2

Attests

Inventor

Charles E. Albro

By his atty

(No Model.) 2 Sheets—Sheet 2.

C. E. ALBRO.

GEAR CUTTING MACHINE.

No. 263,298. Patented Aug. 22, 1882.

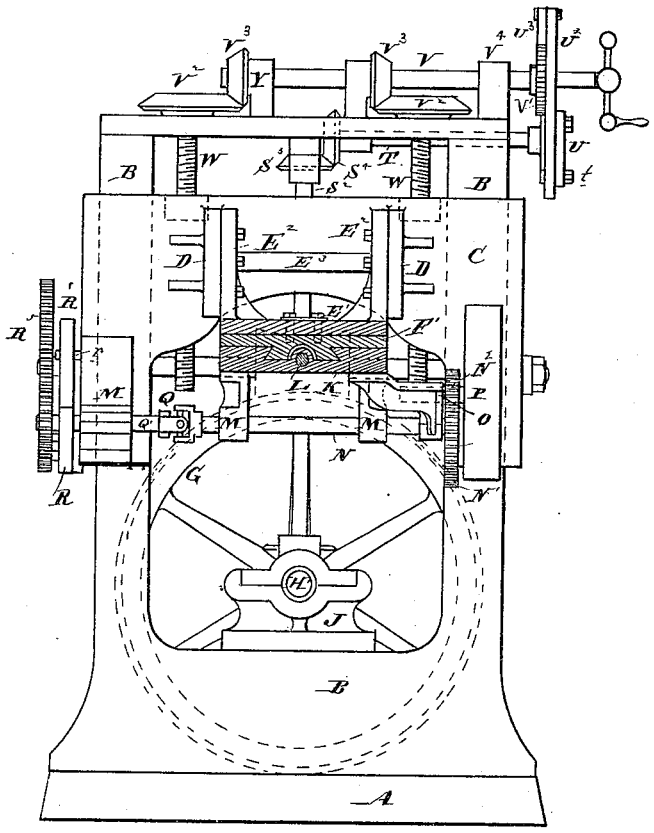


Fig. 3

Attest:

Inventor

Charles E. Albro

By his atty

UNITED STATES PATENT OFFICE.

CHARLES E. ALBRO, OF PHILADELPHIA, PENNSYLVANIA.

GEAR-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 263,298, dated August 22, 1882.

Application filed March 27, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. ALBRO, of the city and county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Gear-Cutters, of which the following is a specification.

My invention has reference to gear-cutters in general, but more particularly to those machines adapted to cut endless screw-gearing; and it consists in certain mechanism hereinafter specified, and which constitutes an improvement upon patent granted to me September 23, 1879, and numbered 219,892.

The object of this invention is to arrange the cutter-shaft, or that which carries the worm-cutter, in a frame adapted to slide vertically to feed the said cutter down upon the worm-wheel disk; or, if the worm is to be cut, to feed the worm cylinder or blank down upon the cutters carried by the master-wheel shaft; further, to provide automatic mechanism to automatically feed said frame; further, to provide means to drive the master-wheel worm from the cutter-shaft, and at the same time to allow said shaft to change its position; further, to provide means by which the cutter and its shaft may be set at any desired angle to cut oblique teeth, as on bevel-wheels, or oblique teeth on spur-wheels, all of which is more fully set out in the following specification, and the construction clearly shown in the accompanying drawings, which form part thereof.

In the drawings, Figure 1 is a side elevation of my improved gear-cutting machine. Fig. 2 is a sectional plan of same on line *x x;* and Fig. 3 is a front elevation of same, with a small portion cut away.

A is the bed-plate, and to it at the front end is secured the upright housing or standard B, upon which the frame C slides in a vertical line, or in a line at right angles to the shaft which carries the master-wheel.

Secured to or forming part of frame C are the bearings D′, to which are pivoted the lugs E^2, which are secured to plate E′. These lugs E^2 are held in position on the bearings D′ by slots *e* and bolts *e′*, or, if desired, a shaft may be used. The slots *e* are curved, and when working on bolts *e′* constitute a pivot or hinge-joint, and by tightening the bolts after setting the plate E′ it may be securely held in such position.

To the plate E′ is secured the plate F′, which carries a guide and a feed-screw, L, having a handle, *l*, to move the slide-plate K, which carries the cutter-shaft N in bearings M and O. The plate F′ is pivoted to plate E′ by means of curved slots and bolts *f*, and by means of which it may be set at any desired angle thereon.

To one end of the cutter-shaft N is secured the spur-wheel N′, which meshes with a pinion, N^2, secured upon the driving-shaft carried in bearing O, and carrying the driving-pulley P. The other end of said cutter-shaft N is provided with a universal joint, Q, which is also secured to shaft Q′, carried in bearing M′, secured to or forming part of frame C. The arm R is loosely pivoted to the shaft Q′, and is guided by a slot, R′, curved about said shaft as a center, and in which a pin, *r*, secured to frame C works.

To the free end of the arm R is pivoted a rod or link, R^2, whose other end is pivoted to an arm, R^3, loosely pivoted to the shaft E, supported in bearings on standards D, and carrying worm F, which works the master-wheel G, secured upon shaft H, supported in bearings I and J. The arm or frame R^3 is guided by curved slots r^2, in which rigid pins or bolts work, as shown, the said arm R^3 working against a face-plate, R^4. The arms R, R^2, and R^3 form a toggle-joint, and the arms R and R^3 carry the speed-gearing R^5, by which the master-wheel is rotated, and allow the shaft N to be raised or lowered without interrupting the movement of the master-wheel. The end H′ of the shaft H is slightly tapered to form the mandrel upon which the worm-wheel-blank disk is secured, as shown in dotted lines.

Secured to the shaft H is a bevel-wheel, S, which meshes with another bevel-wheel, S′, secured upon a shaft, S^2, carrying at the top another bevel-wheel, S^3, which meshes with bevel-wheel S^4, secured upon shaft T, carrying on its end a crank-wheel, U, to which is pivoted the rod U′, provided on its end with a slot.

Supported in bearings Y on top of standards B is a shaft, V, which carries the bevel-wheels V^3 and ratchet-wheel V′. The bevel-wheels V^3 mesh with bevel-wheels V^2, secured

to shafts W, which are screw-threaded and work in lugs on the frame C.

Pivoted to shaft V is a rocker, U^2, carrying at the top a pawl, U^3, which works the ratchet-wheel V', and at the bottom an adjusting-slot, in which a bolt, *t*, works. The rod U' and rocker U^2 are secured together by bolt *t*, which, when secured in different positions in the slot on rocker U^2, cause the frame C to be fed down faster or slower, as the case may be.

The operation is as follows: The pulley P being rotated, the cutter-shaft N revolves and puts the train of wheels R^5 in motion, rotating the worm F and the master-wheel G, with its shaft H. By this means the cutter on the shaft N and the disk to be cut on shaft H, or vice versa, are rotated in the proper relative velocities. The train of wheels R^5 is varied to correspond with the pitch of the worm-cutter. During the operation of the cutter the feed mechanism gradually lowers the frame C, and the toggle-joint carrying the wheels R^5 moves correspondingly. If a bevel-wheel is to have its teeth cut, the train of wheels R^5 is dispensed with and the worm F rotated by hand-power an interval corresponding with the pitch of a tooth, and the plate E' is set at the desired angle in bearings D, and by means of the screw L the cutter-shaft N is reciprocated, having been disconnected from the universal joint Q. If an oblique tooth on spur-wheels is to be cut, the plate F' is set at the desired angle on plate E'. This is done by rotating the screw L while setting the plate F'.

Various forms of cutters may be used upon this machine, and in all cases, except in cutting worms, the cutter is placed upon the shaft N and is rotated, while the master-wheel shaft H carries the worm-wheel blank, spur-wheel blank, or bevel-wheel blank, as the case may be. In the case of cutting worm-wheel teeth or worms, the train of wheels R is used to automatically rotate the master-wheel shaft. In all other cases the shaft N alone rotates. The driving-belt is to be arranged so that the driving-pulley may be moved up or down or set at an angle, but always remaining in a vertical plane, or, in other words, having its axle horizontal. When a worm is to be cut the blank is placed upon the shaft N, and the master-wheel shaft H carries the cutters, which may be made in various ways, those commonly used radiating from the center of shaft H, and when the worm is being cut it and the cutters rotate relatively to one another, that they have the same movement as if the worm was driving the worm-wheel.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a gear-cutting machine, a master-wheel and its shaft supported in immovable bearings, in combination with a cutter-shaft supported in bearings carried by a frame arranged to slide vertically, and mechanism to rotate said master-wheel through the agency of the cutter-shaft, substantially as and for the purpose specified.

2. In a gear-cutting machine, a master-wheel and its shaft, supported in stationary bearings, in combination with a cutter-shaft supported in bearings carried by a frame arranged to slide vertically, mechanism to automatically feed said frame, a worm-wheel to rotate the master-wheel, and mechanism connecting the cutter-shaft with said worm-wheel or its shaft, said mechanism controlling the relative revolutions of the cutter-shaft and master-wheel shaft, and allowing vertical movement to said cutter-shaft, substantially as and for the purpose specified.

3. In a gear-cutting machine, a master-wheel and its shaft, supported in stationary bearings, in combination with a cutter-shaft supported in bearings carried by a frame arranged to slide vertically, mechanism to feed said frame vertically, means to adjust said cutter-shaft horizontally and angularly, substantially as and for the purpose specified.

4. In a gear-cutting machine, a master-wheel and its shaft, supported in stationary bearings, in combination with a cutter-shaft supported in bearings carried by a frame arranged to slide vertically, mechanism to feed said frame vertically, means to adjust said cutter-shaft horizontally and angularly, a worm-wheel to rotate said master-wheel, and mechanism connecting the cutter-shaft with said worm-wheel or its shaft, said mechanism controlling the relative revolutions of the cutter-shaft and master-wheel shaft, substantially as and for the purpose specified.

5. In a gear-cutting machine, the combination of the master-wheel G, shaft H, worm F, shaft E, toggle-joint R^3 R^2 R, gears R^5, cutter-shaft N, carried by a frame, E', slide C, and standards B, substantially as and for the purpose specified.

6. In a gear-cutting machine, the combination of master-wheel G, shaft H, worm F, shaft E, toggle-joint R^3 R^2 R, gears R^5, cutter-shaft N, slide K, screw-feed L, plate F', adjusting device *f*, plate E', having lugs E^2, bearings D', secured to slide C, universal joint Q, shaft Q', standards B, and means to feed said slide C, substantially as described.

In testimony of which invention I hereunto set my hand.

CHARLES E. ALBRO.

Witnesses:
R. S. CHILD, Jr.,
R. M. HUNTER.