2 Sheets—Sheet 1.

J. A. PEER.

Gear-Cutting Machine.

No. 204,756. Patented June 11, 1878.

Fig. 1.

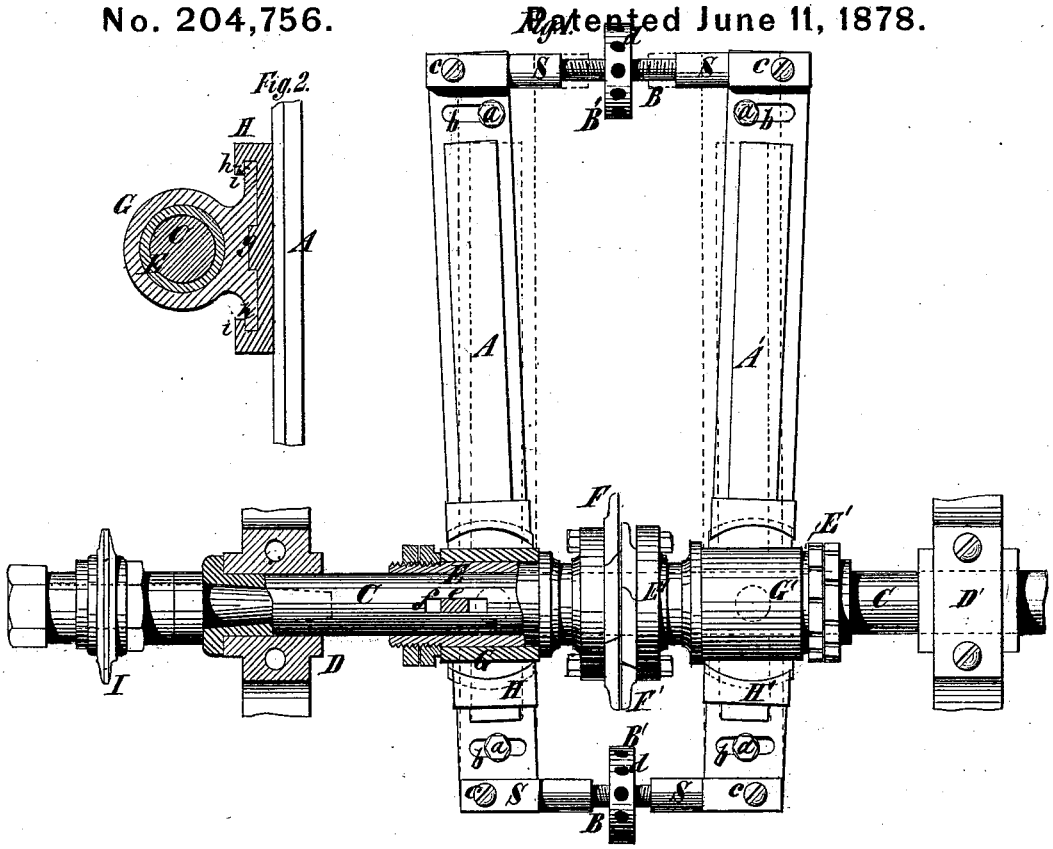


Fig. 2.

Fig. 3.

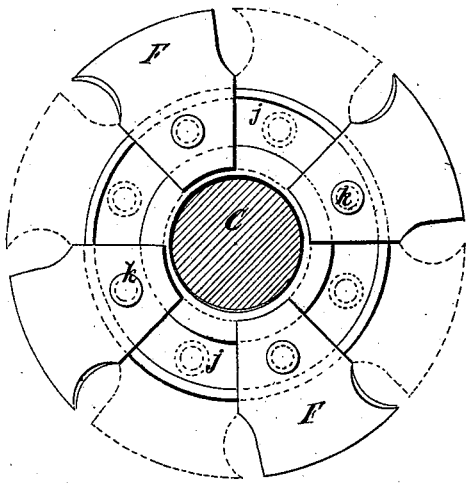
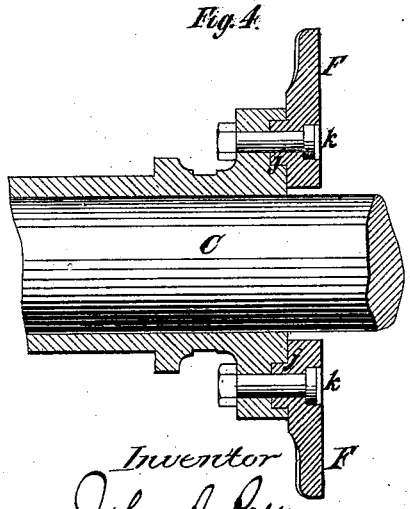


Fig. 4.



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Gear-Cutting Machine.

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Fig. 5.

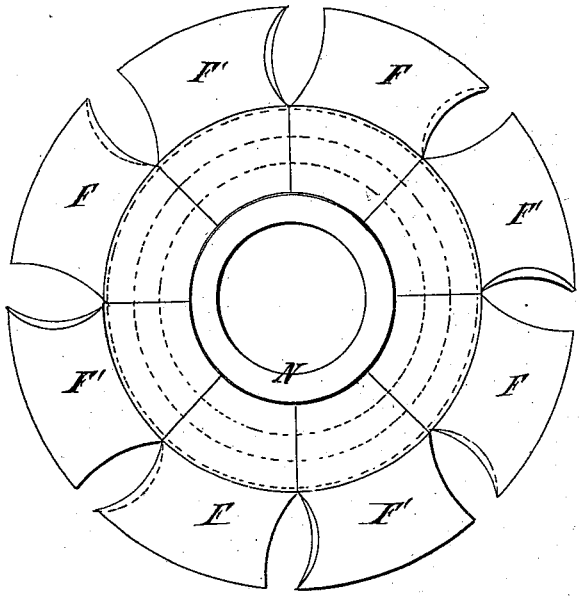


Fig. 6.

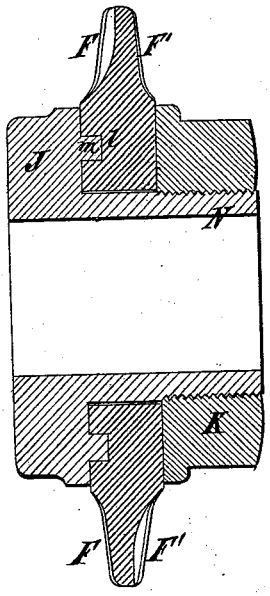


Fig. 7.

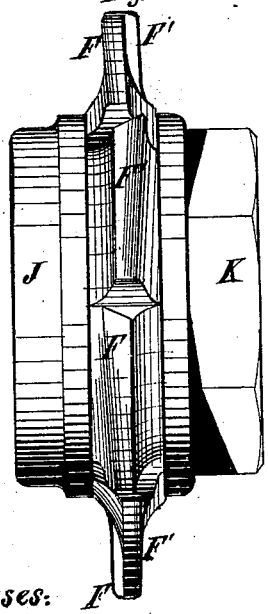
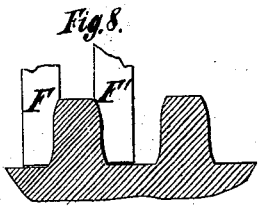


Fig. 8.



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UNITED STATES PATENT OFFICE

JOHN A. PEER, OF SAN FRANCISCO, ASSIGNOR OF ONE-HALF HIS RIGHT TO RUFUS SMITH, OF OAKLAND, CALIFORNIA.

IMPROVEMENT IN GEAR-CUTTING MACHINES.

Specification forming part of Letters Patent No. **204,756**, dated June 11, 1878; application filed August 23, 1877.

To all whom it may concern:

Be it known that I, JOHN A. PEER, of the city and county of San Francisco, and State of California, have invented certain new and useful Improvements in Gear-Cutting, of which the following is a description:

One of my improvements relates particularly to the invention which is the subject of United States Letters Patent No. 153,370, bearing date the 21st day of July, 1874, and has special reference to the means whereby, in cutting teeth for a bevel-gear wheel, the two opposite series of cutters are caused to approach each other to form the taper of the teeth and the spaces between them.

This improvement consists in the combination, in a gear-cutting machine with a rotary shaft, of two rotary sleeves capable ot longitudinal movement on said shaft, carrying separate and independent series of cutters, and fitting in boxes pivoted to slide-pieces traveling along adjustable guides or ways which are connected at or near their ends by right and left hand screws, whereby said guides or ways may be accurately adjusted and secured at any desired inclination to each other, and the traveling slide-pieces will, in passing along them, cause the said two separate series of cutters to approach each other, as is necessary for the proper formation of the teeth.

Another improvement consists in a novel gear-cutting instrument composed of two series of cutters, which have oblique cutting-edges, which alternate one with another, so that the cutters in one series intervene between those of the other series and afford clearance for chips produced thereby, which are all formed and arranged on one pitch-line, and which are all made separate from and independent of each other, whereby I am enabled to avail myself of superior metal for the cutters, and am enabled to grind them very easily and accurately at all points and on opposite sides. With the same tool I produce a very superior instrument.

In the accompanying drawings, Figure 1 is a face view, partly in section, of a portion of a gear-cutting machine embodying my improvements. Fig. 2 is a transverse section of one of the aforesaid sleeves, its box, and slide-piece. Fig. 3 is a transverse section of the cutter-shaft and side view of one series of cutters in a cutting-instrument embodying certain of my improvements. Fig. 4 is a transverse section of said cutters and their sleeve. Fig. 5 is a side view of a cutting-instrument of modified form. Fig. 6 is a transverse section thereof. Fig. 7 is an edge view thereof, and Fig. 8 is a diagram illustrative of a modification of the said instrument.

Similar letters of reference designate corresponding parts in all the figures.

A A′ designate two guides or ways, which are to be secured to the frame of a gear-cutting machine—say by bolts *a*, fitting in slots *b*—so that they can be adjusted at different inclinations relatively to each other. B designates connections between these guides or ways, consisting of screws having right-hand threads on one part of their length and left-hand screws on the other part of their length. The reversely-threaded portions of these screws B engage with correspondingly screw-threaded sockets S extending from and preferably pivoted to said guides or ways, as by bolts or screws *c*, so that they may always remain in line with the said screws B, irrespective of the adjustment of the said guides or ways. Hubs B′, arranged midway between the ends of the screws B, and provided with sockets *d* for the reception of a rod or hand-piece, may serve as the means for operating said screws and drawing the said guides or ways together at either or both ends. This means for adjusting the guides or ways is much simpler and more reliable than the means included in my said patent for this purpose.

C designates a rotary shaft carrying the cutters for forming the gear-teeth. This shaft is supported in bearings D D′, which may be secured in any suitable manner to a sliding frame, so as to provide for carrying the cutters on said shaft over the gear-blank, whereon the teeth are to be formed. E E′ designate two sleeves surrounding said shaft C, capable of movement longitudinally thereon, but secured by splines or tongues *e* fitting in mortises *f*, so as to rotate therewith. F F′ designate two separate and independent series of cutters, (the peculiarities of whose construction I

will hereinafter describe,) which are respectively secured to and carried by the sleeves E E′, and serve to form reverse sides of gear-teeth on the gear-wheel blanks subjected to them. The sleeves E E′ respectively fit within boxes G G′, pivoted to slide-pieces H H′, adapted to travel on the guides or ways A A′ as the cutter-shaft carries the cutters F F′ over the gear-blank. The boxes G G′ fit on pivots *g* extending from the slide-pieces H H′, and are provided with flanges having arc-shaped ends *h* fitting behind flanges *i* extending from the slide-pieces and securing the said boxes thereto. The object of thus pivoting the boxes to the slide-pieces is to enable the former to remain parallel with the cutter-shaft C and the latter to adapt themselves to the inclination of the guides or ways A A′. This method of connecting the cutter-carrying sleeves E E′ to the slide-pieces H H′ is much simpler and more reliable than the means shown in my aforesaid patent for the same purpose.

If the cutters are desired to cut straight parallel-sided gear-teeth, the guides or ways A A′ are adjusted so as to be parallel with each other; but if the cutters are desired to cut bevel-wheel gear, tapering from end to end, the said guides or ways are inclined to each other to correspond to the desired taper of the bevel-gear teeth, and then, as the shaft C carries the cutters F F′ over the bevel-gear blank, the slide-pieces H H′, acting on the sleeves E E′, cause the two series of cutters to approach or recede from each, so as to produce the desired taper.

I designates a cutting-instrument arranged upon one end of the cutter-shaft C, and so that it may be readily removed therefrom or applied thereto, and may be used for work to which the cutters F F′ are not so well adapted.

Turning, now, to the cutters F F′, (see particularly Figs. 3, 4, 5, 6, and 7,) it will be seen that each is made separate from and independent of all the others. When thus made they can be rendered far superior to those made together, as they will be less difficult to shape, and better metal can be obtained for them, besides which they can be ground and backed and faced more easily and more accurately when detached from one another. The general shape of such cutters is segmental. Each, however, has a laterally-oblique cutting-face, curved to produce a shear cut, and preferably has, in addition thereto, a peripherical taper, to afford clearance for the chips produced by it. They are all on the same pitch-line, have flat backs, and the two series alternate with one another, and afford clearance for the chips cut.

In the style of cutting-instrument first described, the cutters are preferably provided with arc-shaped ribs *j*, entering recesses in the ends of the sleeves E E′, and they are secured to the said sleeves by bolts *k*; but in the style of cutting-instrument shown in Figs. 5, 6, and 7, where the cutters have no independent movement, they are represented as provided with arc-shaped grooves *l*, fitting upon a circular rib, *m*, on a stock, J, and are represented as secured in place by a nut, K, screwed on a hub, N, extending from said stock and bearing against the cutters. The cutting-instrument I, Fig. 1, may be of the kind last described.

A very important advantage of this cutting-instrument, whose teeth severally have cutting-faces on one side only, is that the cutters designed for use on different sides of the instrument may be arranged both with their cutting-faces in the same direction—for instance, both uppermost—and may be dressed or finished with the same tool at the same operation, and hence may be rendered so precisely alike that the gear-teeth cut by them will be exactly alike on both sides, and, when engaging with the teeth of another wheel or a rack cut by the same cutters, will work with facility, and without any obstruction due to irregularities or differences in the teeth.

The cutters in the cutting-instruments described may cut opposite sides of the same tooth, instead of opposite sides of adjacent teeth, if arranged as illustrated in Fig. 8.

It will be seen that by my invention I have produced superior machinery for cutting bevel-gear teeth and a very superior cutting-instrument for forming gear-teeth.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in a gear-cutting machine with a rotary shaft, of two rotary sleeves capable of longitudinal movement on said shaft, carrying separate and independent series of cutters, connected to boxes pivoted to slide-pieces traveling along guides connected by right and left hand screw-threads, substantially as and for the purposes set forth.

2. The combination, in a gear-cutting machine with guides causing the two separate series of cutters to approach one another for the purpose of tapering a bevel-gear-wheel tooth, of right and left hand screw-threads for adjusting the said guides relatively to each other, substantially as and for the purpose set forth.

3. The combination, in a gear-cutting machine with a rotary shaft and two separate and independent cutter-carrying sleeves mounted thereon, so as to be susceptible of longitudinal movement, of boxes surrounding said sleeves and pivoted to slide-pieces traveling on adjustable inclined guides, substantially as and for the purpose set forth.

4. A gear-cutting instrument composed of a series of detachable cutters, severally having a cutting-face on one side only, and arranged so that the cutting-faces of alternate cutters are on one side of the instrument, and the cutting-faces of intervening cutters are on the other side, substantially as specified, whereby the opposite or reverse cutters may be detached and dressed together, so as to be perfectly uniform.

5. A gear-cutting instrument composed of a

series of cutters severally having a cutting-face on one side only, arranged one with its cutting-face on one side and the next with its cutting-face on the other side of the said instrument, and severally having the reverse side or back inward of the plane of the cutting-face of the next cutter, substantially as specified, whereby each cutter affords clearance to the chips produced by the preceding cutter.

6. A gear-cutting instrument composed of a series of cutters severally having a cutting-face on one side only, the reverse side or back inward of the plane of the cutting-face of the preceding cutter, and having a laterally-oblique cutting edge or end, substantially as and for the purpose specified.

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Witnesses:
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