(No Model.) 2 Sheets—Sheet 1.

F. LECLÉRE.

TOOTHED GEAR WHEEL.

No. 263,791. Patented Sept. 5, 1882.

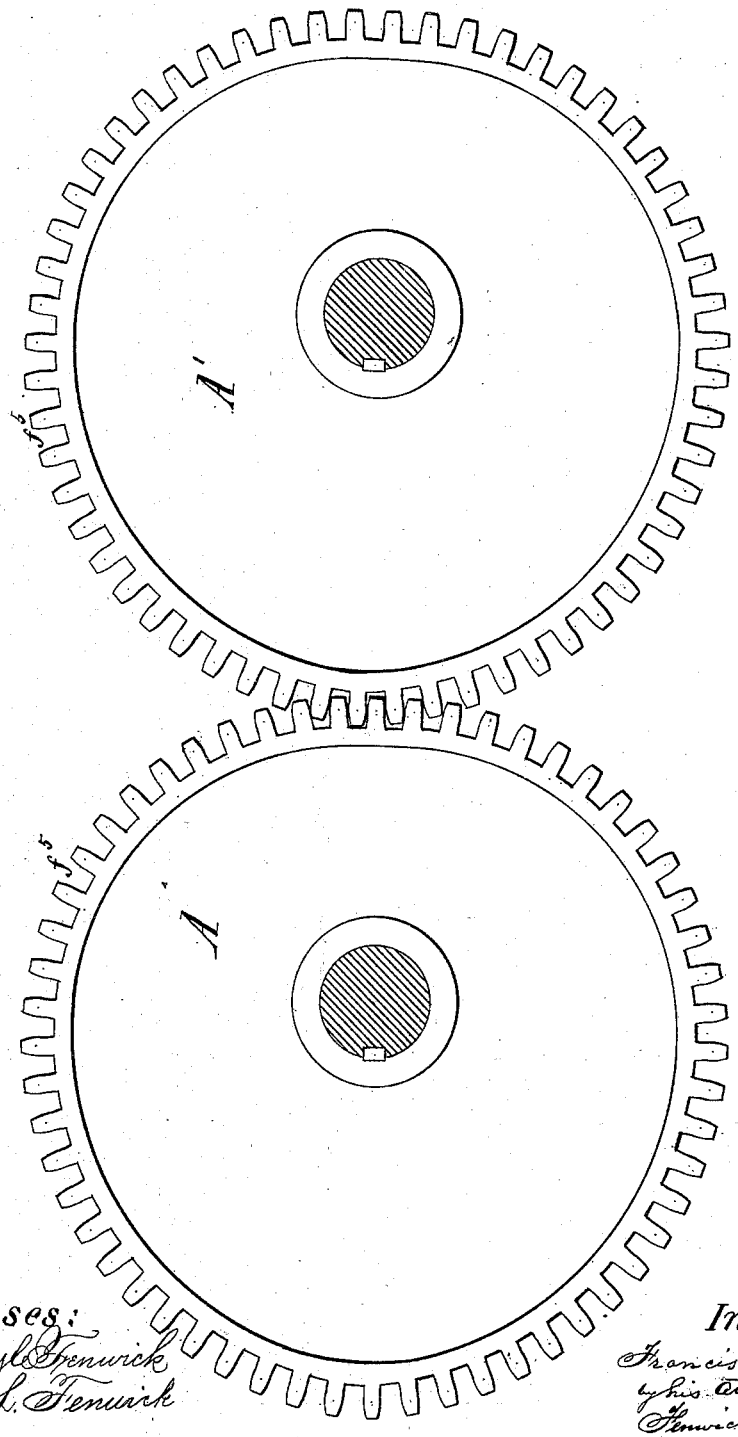

Fig 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

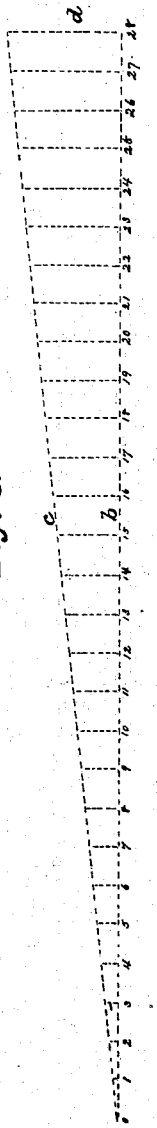
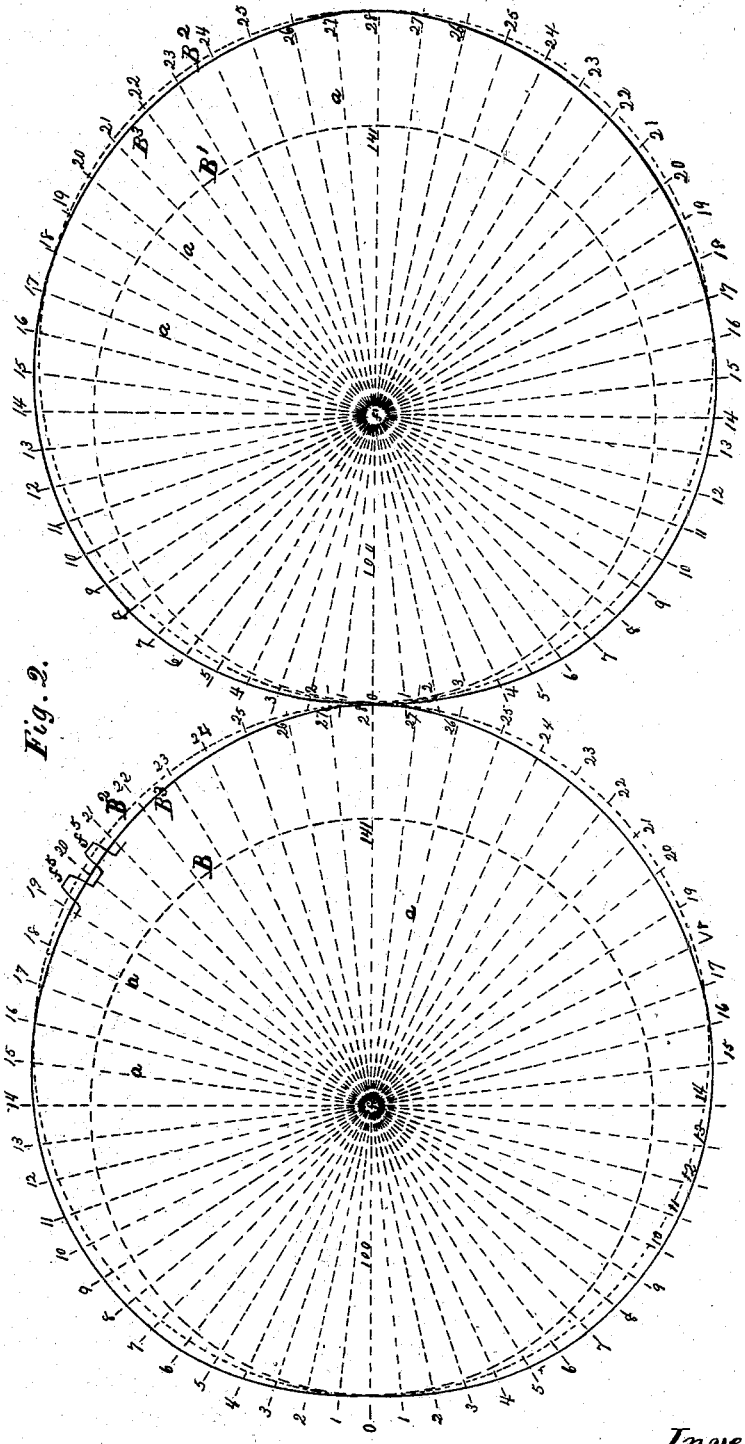


Fig. 2.



Witnesses:

R. Carlyle Fenwick

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UNITED STATES PATENT OFFICE.

FRANCIS LECLÈRE, OF PHILADELPHIA, PENNSYLVANIA.

TOOTHED GEAR-WHEEL.

SPECIFICATION forming part of Letters Patent No. 263,791, dated September 5, 1882.

Application filed August 2, 1882. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS LECLÈRE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Toothed Gear-Wheels, of which the following is a specification.

My invention relates to gear-wheels for determining the motion of mechanism employed in winding conical bobbins, and for other purposes; and the nature of my invention consists in toothed gear-wheels with their pitch-line formed on cam or variable curves having radii of the peculiar character hereinafter described.

With my improved wheels bobbins can be wound with a straight inclined surface, which is a form found very important in the use of the wound bobbins in the loom.

In the accompanying drawings, Figure 1 represents a side view of two of my improved toothed gear-wheels; Fig. 2, a diagram illustrating the mode of producing the wheels shown in Fig. 1; and Fig. 3 is a diagram which, in connection with Fig. 2, illustrates the manner of gradually increasing the length of the radii, and thereby determining the form of the cam-curve upon which the pitch-line for the teeth of the wheels is to be formed.

To produce the wheels A A′ shown in Fig. 1, two circles, B B′, of equal diameter, are struck, as shown in Fig. 2, and these circles are divided into equal parts by radial lines *a*, say fifty-six—that is, from 0 to 28 on one half of the circle and from 0 to 28 on the other half. Having determined what the desired gradual increase of the length of the radii should be, the ordinates for the same are drawn at distances apart which correspond in number with the divisions of the circles B B′ in the following manner: A horizontal line, *b*, is first drawn and divided into equal parts, numbered from 0 to 28, then an inclined line, *c*, starting from 0 and ending at 28, and then a vertical line, *d*, uniting the inclined and horizontal lines at 28. The equal divisions from 0 to 28 are now made and drawn vertically between the horizontal and inclined lines, as shown in Fig. 3. The ordinates for gradually increasing the lengths of the radii of the wheels being thus marked out, as illustrated in the diagram Fig. 3, they are added in regular order, according to their numbers, 1, 2, 3, and so on, to the radii of the circles B B′—that is, from 0 to 28 on one half and from 0 to 28 on the other half of the respective circles—and their outer ends are united by a continuous cam-curve, B^3, which is the correct pitch-line for the teeth of the cam gear-wheels. Upon this pitch-line the teeth f^5 are constructed in accordance with well-known rules. The gear-wheels thus constructed by aid of ordinates, as illustrated in Fig. 3, will produce, if used in connection with known bobbin-winding machinery, wound conical bobbins having straight-line surfaces, and as such wound bobbins, when used in looms, are found to produce superior work, the utility of my improved wheels will be seen.

In connection with the foregoing description it may be well to demonstrate in the following manner the fact that two wheels corresponding exactly in their construction will work together without unusual friction and produce the effect stated. We will suppose that the diametrical proportion of a given full and an empty bobbin has been ascertained, and the necessary cam form of the respective wheels can therefrom be determined. Now, by referring to Fig. 2, it will be seen that two circles, B B′, of equal diameter are shown, by the aid of which and ordinates shown in Fig. 3, I construct the dividing-curve or pitch-line of the wheels A A′ shown in Fig. 1 of the drawings. The radii of the said circles represent the shortest radii of the cam-wheels A A′. The shape of the pitch-line is such that the toothed surfaces of the two wheels A A′ constructed by the aid of it produce a variable revolving speed of the bobbins of the proportion of 1 : 2. I have in the illustration shown adopted this proportion for the reason that it is the diametrical proportion between the base and apex of the frustum of the cone formed upon the bobbin by the winding of the thread thereon, or of either an empty or filled bobbin in nearly all cases. In accordance with this variation of speed the radii of the wheels must be gradually increased and decreased in length, and for this purpose the length of the greatest radii is first determined. I therefore divide the shortest radius (of each wheel) f' 0 into a suitable number of equal parts—say 100. Now,

giving the longest radius the unknown value x, I have $\frac{2.100}{x}=\frac{x}{100}$, or $200=\frac{x^2}{100}$, or $x=\sqrt{20{,}000}$ =141 of the above-mentioned units, approximately, which is the length of the long radius; or, otherwise expressed, the angular speed of the wheel A′ is the quickest when its shortest radius is in line with the longest radius of the wheel A, and it is the slowest when its longest radius is in line with the shortest radius of said wheel A. The ratio of the two radii in the former case $(\frac{f'\,28}{f'\,0})$ and the ratio of the two radii in the latter case $(\frac{f'\,0}{f'\,28})$ must be as 2 : 1, or ratio $(\frac{f'\,28}{f'\,0})$ must be equal to ratio $\frac{f\,10}{f'\,28}\times 2$. In order, now, to construct the pitch-line for the wheels A A′, a circle, B^2, of the diameter 100×141 or 241 is drawn so as to touch the circles B B′ at 0, and is divided into a suitable number of equal parts—say fifty-six, or twenty-eight on each half of the circle. The difference between the shortest and longest radius, which is forty-one, is measured and transferred upon an upright line, *d*, Fig. 3, at the end of a horizontal line, *b*, in said figure, which horizontal line is divided into twenty-eight equal parts, corresponding with the divisions of either of the above-mentioned half-circles. From the end 0 of the horizontal line *b* to the upper end of the vertical line *d* an inclined line, *c*, is drawn, and from the divisions 1, 2, 3, up to 28 of the horizontal line *b* lines are drawn up toward and terminated on line *c*, said lines being parallel with line *d*, as shown in Fig. 3. The lines obtained are the true ordinates for the graduation of the radii between the shortest and longest radius of the dividing-line of the cam gear-wheels, and these ordinates are added in regular order, according to their numbers, 1, 2, 3, up to 28, to the lengths of the radii drawn through the divisions of the circles B B′, and their ends are united by a continuous cam-curve, B^3, which is the correct pitch or dividing line for the teeth of the cam gear-wheels. Upon this dividing-line the teeth f^5 are constructed, as illustrated.

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

1. Toothed gear-wheels A A′, having the pitch-line for their teeth formed on extended radii of circles, which extended portions of radii are formed from ordinates of gradually-increasing length, and which are terminated on a straight inclined line, *c*, which starts from 0 and ends at the vertical line *d*, which gives the longest radius to the circle upon which the pitch-line of the teeth of the wheels is formed, substantially as described.

2. The mode of producing the wheels A A′, consisting in striking two circles, B B′, of equal diameter, and circles B^2, and dividing each semicircle into twenty-eight (more or less) equal parts by radii, beginning at 0 and terminating at 28, then marking ordinates for giving the desired gradually-increasing length of radii upon a diagram, consisting of a horizontal line, *b*, inclined line *c*, and a vertical line, *d*, and adding these ordinates in regular succession, according to their numbers, to the radii of the circles, and then forming the pitch-line for the teeth at the termini of these ordinates, substantially as and for the purpose described.

FRANCIS LECLÈRE.

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