(No Model.)

J. THOMSON.

SPEED CHANGING SPUR GEAR TRAIN.

No. 535,643. Patented Mar. 12, 1895.

Fig. 1.

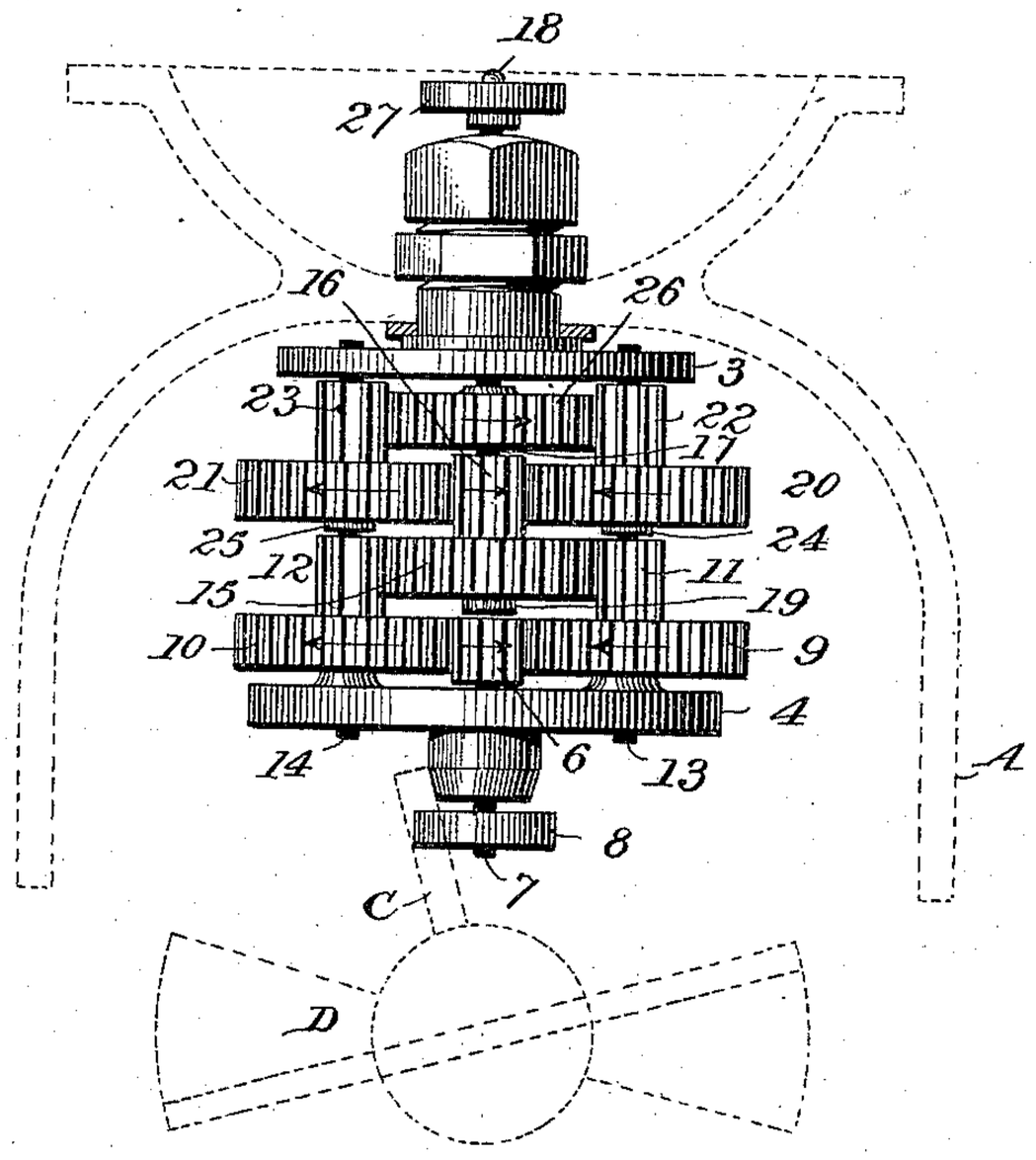

Fig. 2.

Fig. 3.

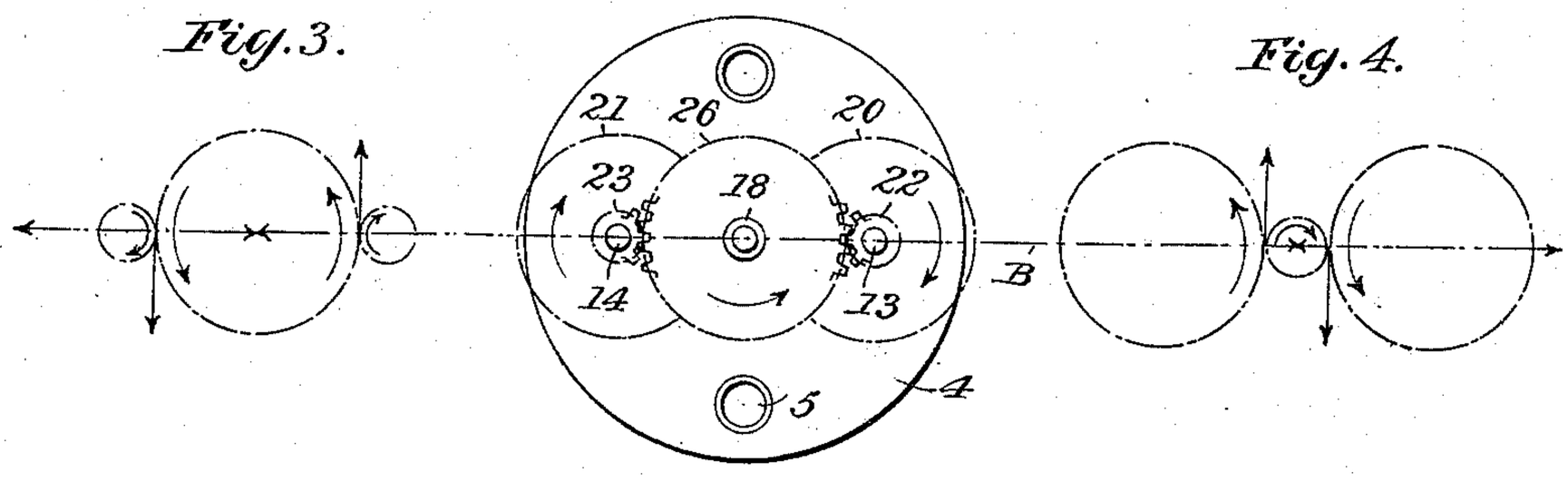

Fig. 4.

WITNESSES:

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JOHN THOMSON, OF BROOKLYN, NEW YORK.

SPEED-CHANGING SPUR-GEAR TRAIN.

SPECIFICATION forming part of Letters Patent No. 535,643, dated March 12, 1895.

Application filed August 24, 1894. Serial No. 521,228. (No model.)

To all whom it may concern:

Be it known that I, JOHN THOMSON, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Speed-Changing Spur-Gear Trains, of which the following is a specification.

My invention relates to speed-changing spur gear trains, and it has for its object to provide a construction which shall avoid the objections due to the side thrusts ordinarily inherent to such trains, to provide a structure in which the strains shall be balanced as far as practicable, to provide a device in which the errors due to the faulty development of the contour of the teeth are reduced to a minimum, and further to provide a gear train which shall be simple, cheap and effective in mode of operation, and shall avoid the objections to such trains as heretofore made, and to these ends, my invention consists in the various features of construction and arrangement of parts substantially as hereinafter more particularly pointed out.

In the accompanying drawings, I have shown one embodiment of my invention, sufficient to enable those skilled in the art to make use thereof, and while the form shown is the preferred form, it is to be understood that my invention is not limited to the construction and arrangement of parts therein set forth, but that the same principles of invention may be applied in various modified forms, producing substantially the same results. Furthermore, I have shown my invention in a form adapted for use in water meters, and the invention is especially useful in this connection, but it is to be understood that it can be used in many and various places where the object is to produce the minimum of frictional resistance, the maximum of durability, and the lowest cost of manufacture.

In the drawings: Figure 1, is an elevation of the train shown as applied to the casing of a water meter, which latter is indicated in the dotted line A. The front pillar 5, is omitted in this figure for clearness. Fig. 2, is a top plan view of the train, the upper plate 3, being removed. Figs. 3 and 4, are diagrams, illustrating the principle and mode of operation of the parts.

One of the principal features of my invention consists in providing three series of superimposed gears and pinions, all disposed in approximately the same plane, the central series, comprising the primary driving, and the final driven member of the train, and the two outer series of gears and pinions which mesh with the central series in the manner hereinafter more particularly set forth.

I have shown my device as employed for speed reduction in which the driving pinion is the high speed pinion, and the driven pinion is the low speed pinion, but it is to be understood, of course, that the parts may be reversed, and the low speed pinion may be the driving pinion, and the same advantageous results obtained.

It will be observed that both the driving member and the driven member of the gear train are contained in the central series of gears. Thus, in the arrangement shown, the primary driving pinion 6, is fixed to a spindle 7, mounted on the lower plate 4, and in the present instance this spindle has an arm or other means 8, by which it is driven, as by the spindle C of the disk meter action D. The said pinion 6, meshes right and left with driven gears 9 and 10, having pinions 11 and 12, respectively fixed thereto. These gears and pinions are free to revolve, being mounted upon the upright axles or spindles 13, 14, confined in the upper and lower plates 3 and 4. The next transmission is from the driving pinions 11 and 12 to the single lower central driven gear wheel 15, to which gear is fixed a pinion 16, and both the gear and pinion are free to rotate on the lower extension 17 of the spindle 18 of the driven gear, the collar or head 19 supporting the gear and pinion in proper position on the spindle. Of course, instead of mounting this gear and pinion on an extension of the driven spindle, it may be mounted on an extension of the driving spindle, or even independently mounted, the main feature being that it is supported between the driven and driving gears in a line with their axes. The next transmission is from the single central driving pinion 16, right and left to the two upper driven gear wheels 20, 21, to which wheels are respectively fixed the driving pinions 22 and 23, but both of these gear wheels and pinions are freely mounted

upon the upright axles 13, 14, and in the present instance their weight is borne by the collars 24, 25, fast to the axles. The final transmission is from the two driving pinions 22, 23, acting right and left upon the single upper center driven gear 26, which is fixed to the driven spindle 18 in the present instance, and thus becomes the final driven member of the train, it being shown as passing through the stuffing-box of the water meter casing. It is evident that this same arrangement may be extended to a greater or less extent by adding more pinions and gears, arranged in substantially the manner set forth, so that any amount of reduction or increase of speed may be attained.

From this arrangement of the parts, it will be seen that no side thrusts are borne by either the spindles or the bearings of the central series of the train, while the side thrusts transmitted therefrom right and left to the two outer series are not only materially reduced in intensity, but are borne and resisted by twice the projected area that would be afforded by a single series.

Among the practical advantages arising from this construction and arrangement are that whatever wear may take place both upon the high speed spindle, as 7, and also in its bearing in the plate, it will be uniformly distributed, that is, it will be cylindrical, in contradistinction to the oblong wear or bearing produced by simple single spur trains, which cause the wear to take place chiefly in the direction of the side thrusts. So also the same advantages apply with equal, if not greater, force to the final driven member, as the spindle 18, which is required to be revolved against the greater frictional resistance of the stuffing-box, for instance, besides having to drive the exterior gearing of a register in the case of a water meter or other apparatus in other cases, and is shown as provided with the gear 27 for this purpose. Furthermore, by thus compounding the train and thereby balancing the strains upon the central series of gears, as will be seen more particularly by reference to the diagrams, Figs. 3 and 4, and doubling the working contacts, it becomes feasible to considerably reduce the diameters of the axles supporting the gears and pinions, and to use teeth of finer pitch and less breadth of face than would be practical with a single train system. Furthermore, it is desirable in a construction like that described that the radial location of the leaves of each pinion with respect to the teeth of the gear to which it is fixed and with which it rotates shall be exactly similar to that of every other gear and pinion. In other words, if a line drawn through the leaves of one pinion should pass through spaces of its gear, while the leaves of another pinion should point toward the teeth of its gear, then the driving stresses would not be in balance, and the teeth of the train, if accurately cut and located, would jam sidewise. The construction and disposal here contemplated are clearly indicated in Fig. 2, showing what may be said to be the initial setting up of the train, a leaf in each pinion and two spaces in the gear all lying in the same right line, B. In this wise, the stresses and resistances, as indicated in the diagram, Figs. 3 and 4, will be fully realized in practice.

Having thus pointed out the general principles of my invention and the results and advantages of the construction, as well as the preferred form of embodying it, what I claim is—

1. A spur gear train, comprising a central series of superimposed gears and pinions containing the primary driving member and the final driven member of the train, and two outer series of superimposed gears and pinions meshing with the central series, the axes of the several series being disposed in approximately the same plane, substantially as described.

2. A spur gear train, comprising a central series of gears and pinions, and two outer series of gears and pinions disposed to the right and left and meshing with the central series, and fixed spindle on which the said outer series are mounted, substantially as described.

3. The combination with the upper and lower gear plates, of the axles supported in said plates, collars fixed to said axles the two outer series of gears and pinions mounted thereon, and separated by said collars, a central series of gears and pinions the driven spindle of which is mounted in one plate, and the driving spindle of which is mounted in the other plate, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN THOMSON.

Witnesses:
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