(No Model.)

2 Sheets—Sheet 1.

E. D. SPEER.

GEARING.

No. 510,368. Patented Dec. 5, 1893.

Fig. 1.

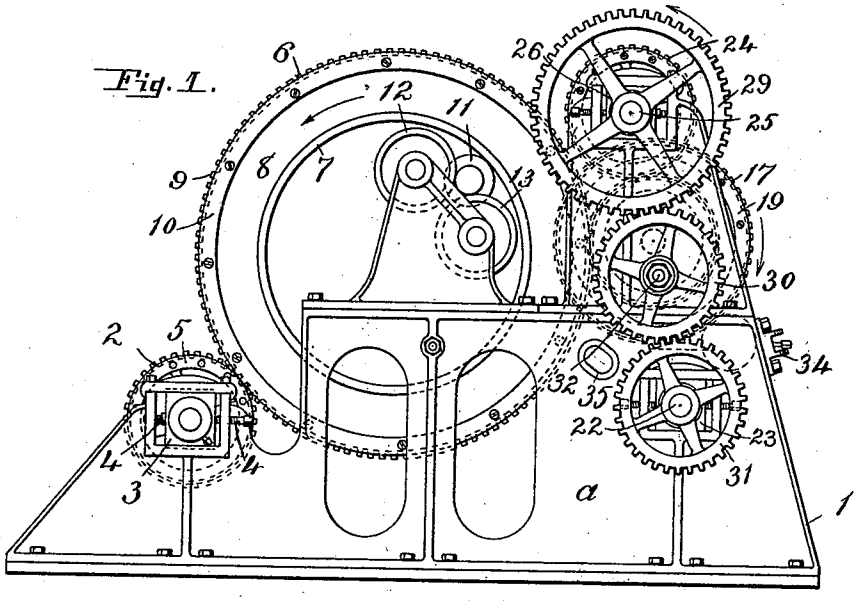
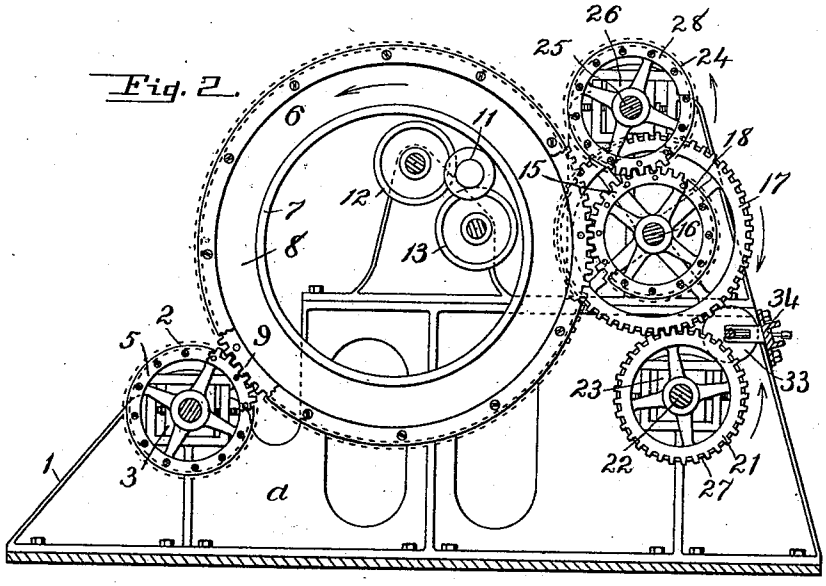


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

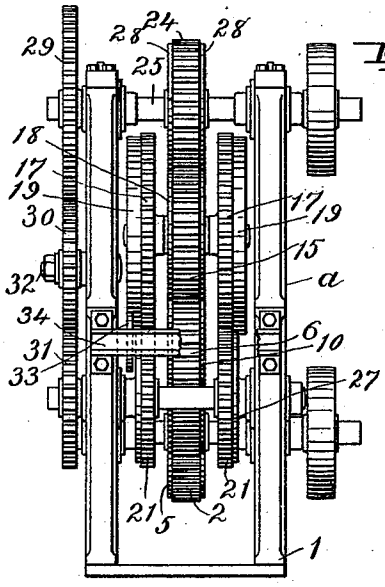


Fig. 5.

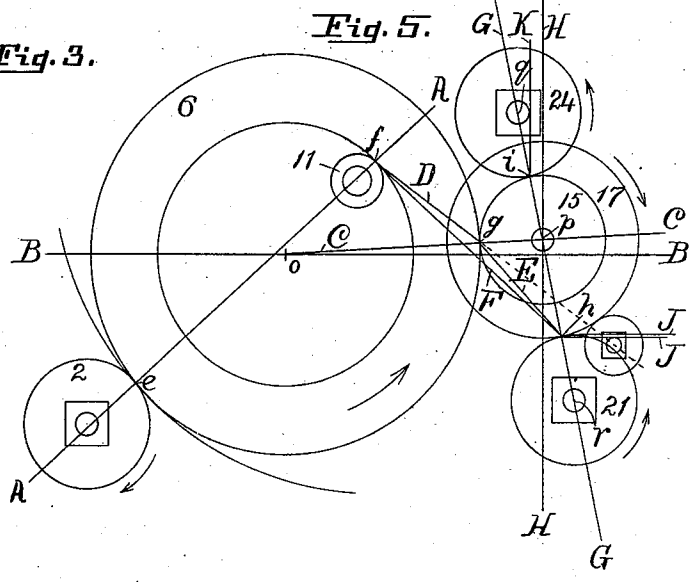


Fig. 4.

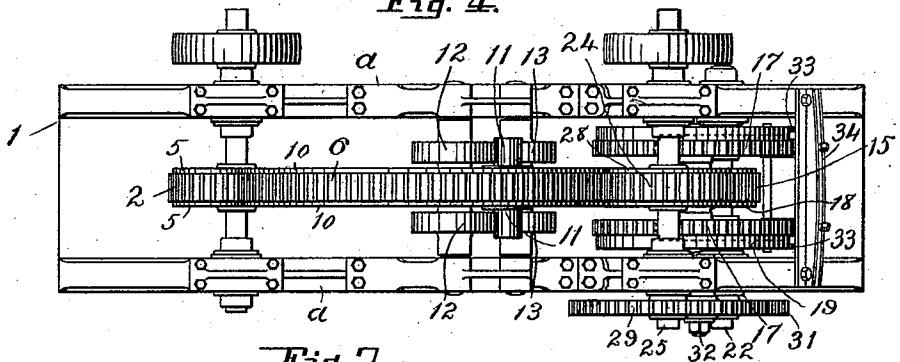


Fig. 7.

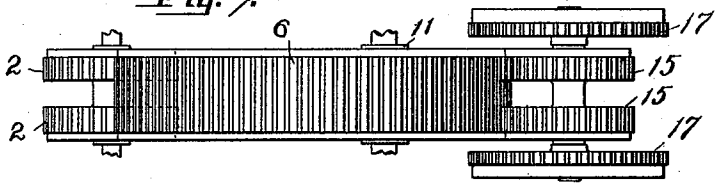
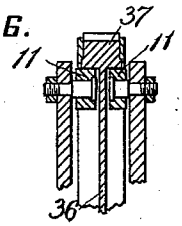


Fig. 6.



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EDWARD D. SPEER, OF NEW YORK, N. Y.

GEARING.

SPECIFICATION forming part of Letters Patent No. 510,368, dated December 5, 1893.

Application filed September 14, 1892. Serial No. 445,855. (No model.)

To all whom it may concern:

Be it known that I, EDWARD D. SPEER, a citizen of the United States, and a resident of New York, in the county of New York, State of New York, have invented a certain new and useful Improvement in Gearing for Transmitting Power, of which the following is a specification.

My invention relates to improvements in gearing for transmitting power, and it is the purpose especially of my improvement to construct and organize the machine with my peculiarly arranged and constructed annular eccentrically-supported gear wheel, in combination with my so called "free gear," which is to say, a gear supported solely on the pitch lines of the meshing gears, but itself without any axial support, and with ordinary axially supported gears, as hereinafter fully described and explained.

Referring to the drawings which accompany the specification to aid the description, Figure 1 is a side elevation of the machine and showing the train of timing gears. Fig. 2 is a sectional elevation of the machine, on the line X—X of Fig. 3. Fig. 3 is an end elevation of the machine looking toward the left of Fig. 1. This view shows the toothed faces of the free, the sustained and the timing gears. Fig. 4 is a view of the machine from above. Fig. 5 is a diagrammatic representation of the manner in which the moving parts are organized, to show the positions of the centers of the various gears and of the lines of forces. Figs. 6 and 7 are details of modifications in the annular gear and its bearing.

Now describing first the annular gear and the various trains of gears, 1 is the frame, set upon a strong rectangular bed plate and having the side plates *a*, ribbed and skeletonized and of substantially the shape shown in Fig. 1, so as to provide for the proper positioning of the various axle boxes, without undue waste of metal.

2 is the driving gear, to which motion is imparted by any motor, as by a steam engine, and said gear, 2, being fixed on a shaft that is journaled in boxes, 3, on the frame, 1, the said boxes being made adjustable by means of screws, 4, 4, as will be readily understood by inspecting Fig. 1. Said gear, 2, also has on either side flanges, 5, 5, turned true to the pitch line, and said flanges may either be cast with the gear, or may be screwed or bolted on as shown.

Meshing with gear, 2, is my gear, 6, which is in effect a geared ring, with large, central, circular orifice, and I prefer to form said gear, 6, with a truly turned annular flange, 7, web, 8, and geared rim or flange, 9, the latter being provided with the circular side flanges, 10, 10, around the pitch line, so as to prevent the teeth of the gears, 2, and 6 from crowding into each other. Said gear, 6, is eccentrically supported on the shaft or bearing, 11, that is in turn preferably supported on anti-friction rolls, 12, 13, whose axles are set in bearings on the frame, *a*, *a*, as shown.

Meshing with the annular gear, 6, and on the side thereof opposite to the gear, 2, is the gear, 15, rigid with its axle, which is the same diameter as said gear, 2, has the flanges, 18, on each side around the pitch line, as hereinbefore explained, and carries rigidly on its axle, 16, two larger gears, 17, 17. The axle of said gear, 15, is not held in boxes, but said gear, 15, which with its axle 16 and gears 17, constitute what is termed the free gear, is supported by the engagement of said gears 17 with the gears 21 herein after described. I prefer to use the two gears, 17, 17, in order to prevent the gear, 15, from tipping sidewise, and said gears, 17, 17, have broad flanges, 19, 19, around the pitch line, on one side as shown in order to bear both on the flanges of the gears, 21, 21, and on the rolls, 33, 33. Beneath said free gear, 15, and meshing with gears, 17, 17, are the said gears, 21, 21, fixed on the axle, 22, which is journaled on the well known anti-friction rolls, in adjustable boxes, 23, 23, on said frames, *a*, *a*, and over said gear, 15, and meshing therewith is the gear, 24, fixed on an axle, 25, supported as shown on anti-friction rolls, in adjustable boxes, 26, 26, on said frames, *a*, *a*. Said gears, 21, 21, and 24, all have the side flanges around the pitch line, respectively indicated by 27, 27 and 28, and said gears are all of the same diameter as the driving gear, 2, while the load is also to be applied to the gear, 24, or to some device as a winch connected thereto. The ends of the said axles, 22 and 25 are also connected by a train of timing gears, 29, 30, 31, whereof gears 29 and

31 are respectively on the axles, 25 and 22, and the gear, 30, revolves on a stud, 32, set in the frame, *a*. Said gear, 29, is of the same diameter as said gears, 17, 17, and said gears, 30, 31, are each of the same diameter as gears 24 and 21. Consequently the said train of timing gears will keep gears, 24 and 21 revolving in exactly the same time as if the gears, 15, 17, 17, were journaled in boxes to form a train of connecting gears, 24 and 21.

The position of the various centers and points of contact: Assuming that the gear, 6, is to revolve in the direction of the arrow, so that at its contact with the gear, 15, it moves upwardly, then the gears, 2 and 6, and bearing, 11 are so positioned that the right line, A, A, which joins the contact points of the gear, 6, with the gear 2 and bearing 11 respectively, passes to the left and above the center, *o*, of the said gear, 6, that is on the side of said center remote from the gear, 15, and so that the larger part of the gear, 6, is on the lower and right side of the line, A, A. This position of the points, *e*, *f*, prevents jamming the gear 6 on the bearing 11. Second, the center, *p*, of the gears, 15, 17, 17, is above the horizontal line, B, B, through the center *o*, of gear, 6, so that the line, C, C, joining *o* and *p* inclines upwardly above said horizontal, and therefore the lines, D, E, F, joining the contact points *f*, *g*, *h*, make a triangle whose apex *g*, where the pitch line of gear 6 touches the pitch line of gear 15 is to the right and above the base line F, that joins the contact point *f*, with the contact point *h* between the pitch lines of gears 17, 17, and 21, 21, and consequently if we suppose the gear 6 to be tending to oscillate toward the right, its tooth engaging under a tooth on the gear 15 will tend to lift gears 17, 17, from gears 21, 21, and not to crush the same thereon, and this is a very important feature of my invention. In the third place the centers, *q*, *r*, of the gears 24, 21, 21 respectively are in the same straight line G, G, through the center *p* of gears 15, 17, 17, so that if we suppose the gear 15 to tend to oscillate over toward the right around the point, *h*, that motion will be tangential to the pitch line of gear 24, and consequently will not tend to jam gear 15 against gear 24. Also the line G, G, inclines downwardly and to the right of the vertical line H, H, drawn through the center *p*, and from this it follows that the point, *h*, is below the extreme top point of the pitch line of gears 21, 21, as indicated by the distance between the horizontal lines J, J. Therefore the gears, 15, 17, 17, cannot be forced to the right without lifting the gears, 17, 17, over the rising arcs of gears 21, 21; and in practice I find that the machine has no such tendency, but the gears, 15, 17, 17 remain in place and mesh as described, simply by their own weight and there is no apparent tendency to force them out of position. It also follows from the position of the line, G, G, that the center, *q*, of the gear 24 is between the vertical line K, through the point, *i*, and the point, *f*, and is of course to the left of the line H, H. Evidently, if motion be imparted to the gear, 2, said gear will have a momentary tendency to oscillate gear 6 around the bearing, 11, but this tendency will be momentarily resisted by the teeth of the gear, 15, and consequently the gear 6 and also the gear 15 will revolve about their respective centers, thereby imparting rotation to the gears, 21 and 24, the train of timing gears, 29, 30, 31 meantime keeping gears 21 and 24 in exact time, as hereinbefore explained. Thus from the gear 24 motion can be conveyed to any desired point or imparted to any desired contrivance. Evidently I may place a roll, 33, 33, so as bear against the flange of each of the gears, 17, 17, and with its center in the line D, prolonged so as to support the weight of the gear 6, and the said rolls, 33, 33, may turn on axles set adjustably in a yoke, 34, that is bolted to the frame. I may also place a boss, 35 on the frame, *a*, to support an axle for a fly wheel, not shown, to be driven from the gear, 30, of the train of timing gears.

In Fig. 6 I show a manifest and equivalent modification of the annular gear. In this figure said gear consists of a web, 36, with a toothed flange, 37, and two fulcrums one under either side of the flange, 37, but in the same straight line. In Fig. 7 I show that the toothed face of the annular gear may be quite wide so as to mesh with two free gears, 15, 15, and with two driven gears 24, 24, and with two driving gears 2, 2; these being evidently equivalents of the constructions hereinbefore described.

I claim as my invention—

1. In a gearing, the combination of an annular gear, an eccentrically arranged bearing for the same, a free gear meshing with said annular gear, supporting gears and a driven gear meshing with said free gear, whereby the free gear is sustained and motion transmitted to the driven gear, substantially as and for the purpose described.

2. In a gearing, the combination of an annular gear, an eccentrically arranged bearing for the same, an axially supported driving gear meshing with said annular gear, a free gear meshing with said annular gear and axially supported gears 21, 24 meshing with said free gears.

3. In a gearing, the combination with the annular gear, 6, and eccentric bearing therefor, of the axle 16 having the gears 15, 17, 17 secured thereto, the gear 24, supporting gears 21, 21, and the train of timing gears connecting the axles of said gears, 24 and 21, 21, substantially as and for the purpose described.

4. In a gearing, an annular gear, an eccentrically arranged bearing for the same, a gear, 15 without any axial support meshing with said annular gear, gears, 17, 17, fixed on the axle of gear 15, an axially supported gear

meshing with said gear, 15, and other axially supported gears meshing with said gears, 17, 17.

5. In a gearing, the combination of the annular gear, 6, and eccentrically arranged bearing therefor, gear, 15, meshing therewith and having no axial support, gears, 17, 17, secured on the axle of said gear 15, gear 24 meshing with gear 15, and gears, 21, 21, meshing with gears, 17, 17, and the whole so organized that the lines extending from the point of support of the gear 6 to the point of contact of gears 6 and 15, thence to the point of contact of gears 17 and 21, and thence back to the point of support of gear 6 form a triangle whose apex is outward from the center of said gear 6, substantially as and for the purpose described.

6. In a gearing meshing with an annular gear, a gear, 15, having no axial support, and carrying gears, 17, 17, that mesh with axially supported gears, 21, 21, at points which are beyond the vertical line through the center of the gear, 15, and below the highest points on the pitch line of said gears, 21, 21, and a gear 24, meshing with the gear 15, substantially as and for the purpose described.

7. In a gearing, the annular gear, 6, and eccentrically arranged bearing therefor, the gear, 15 without axial support, carrying the gears, 17, 17, and meshing with the gear, 6, the gear, 24, meshing with said gear, 15, gears 21, 21, meshing with said gears 17, 17, and the whole so organized that the plane through the points of contact between the gears 15 and 24, and the gears 17 and 21 passes through the center of the gear 15 and inclines downwardly and beyond the vertical through said center, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 8th day of September, 1892.

EDWARD D. SPEER.

Witnesses:
WILLIAM G. FINLEY,
ARTHUR L. KENT.