J. MORGAN.

SPEED GEARING.

APPLICATION FILED DEC. 9, 1908.

954,987.

Patented Apr. 12, 1910.

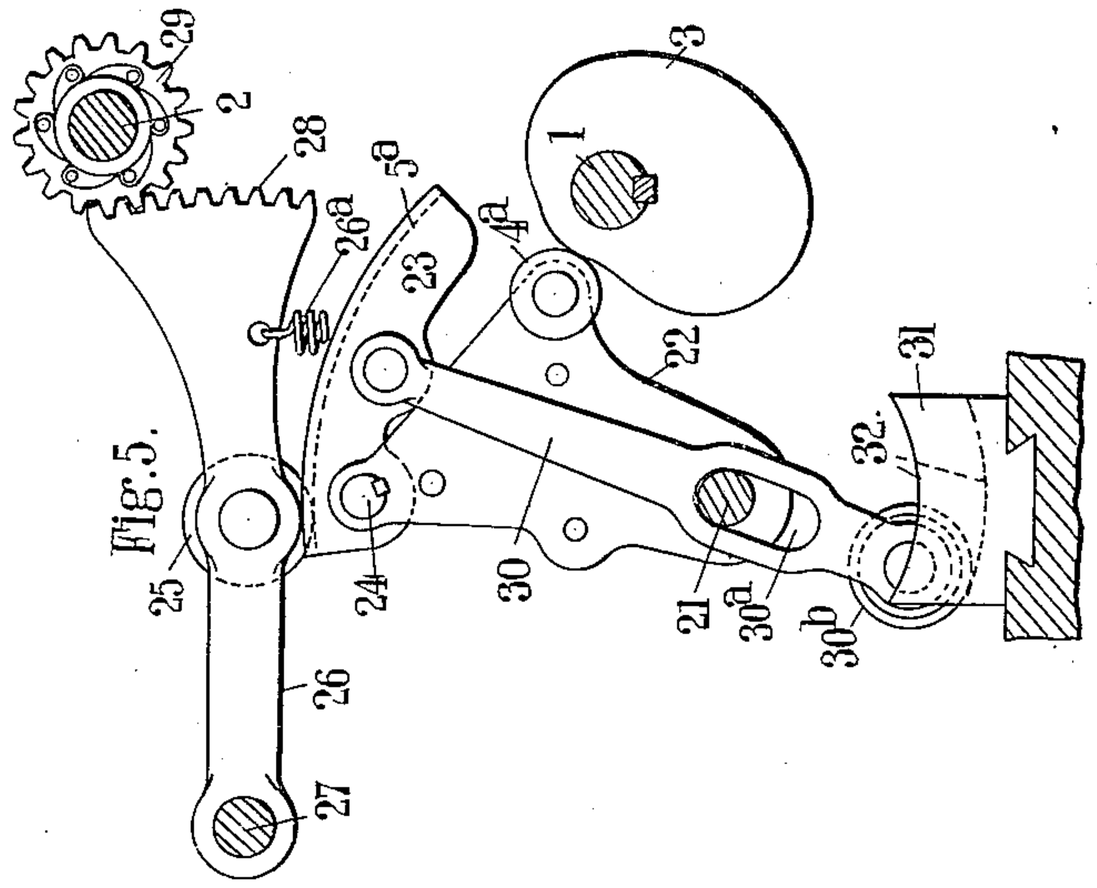

Fig. 5.

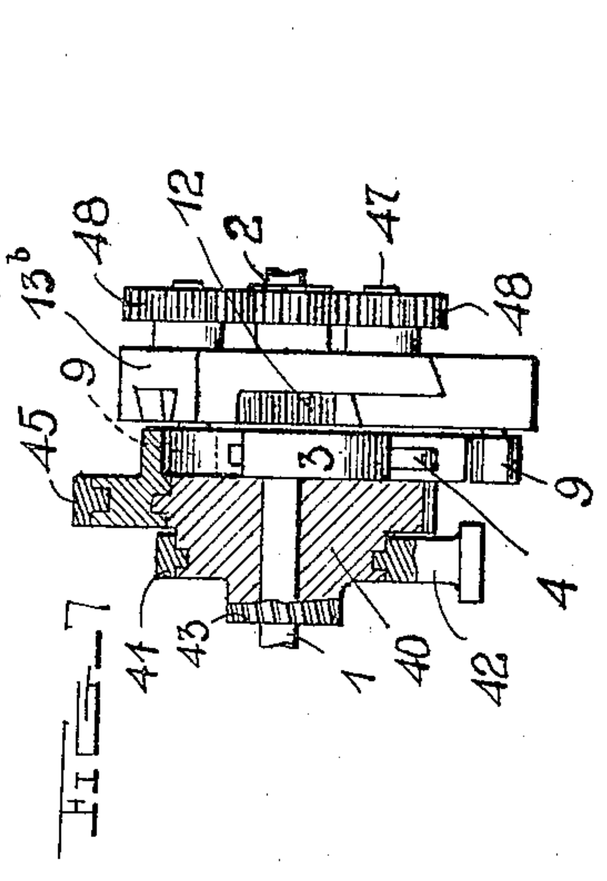

Fig. 6.

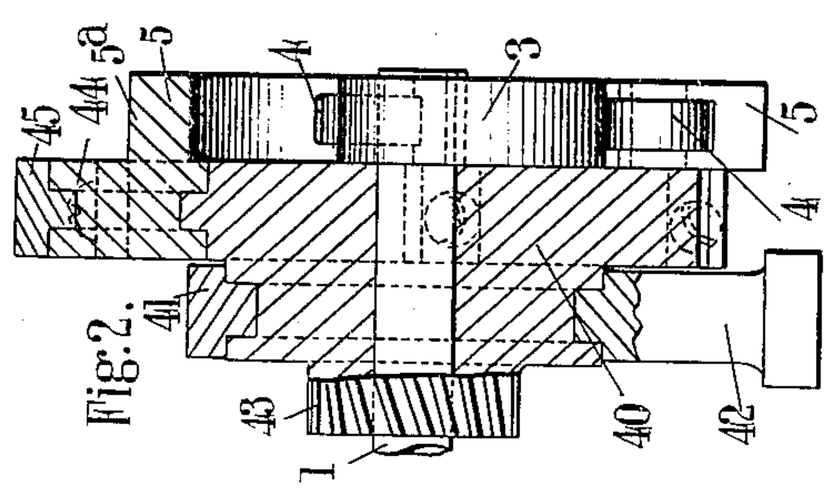

Fig. 2.

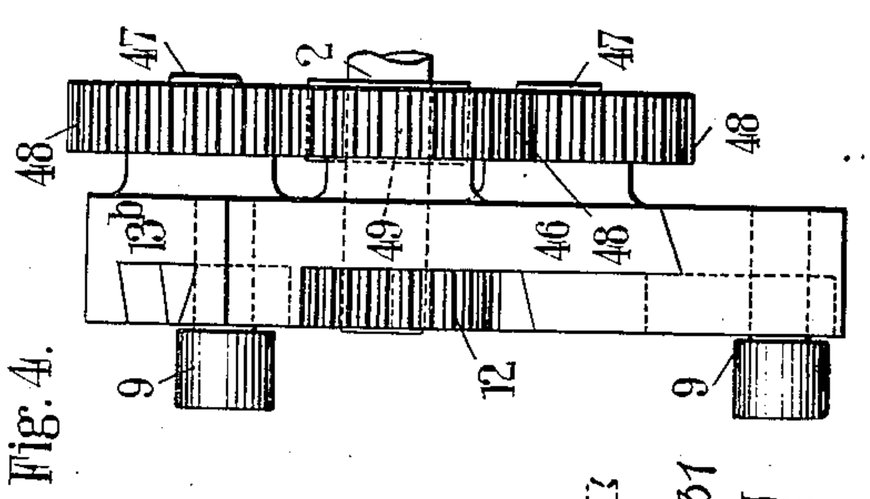

Fig. 4.

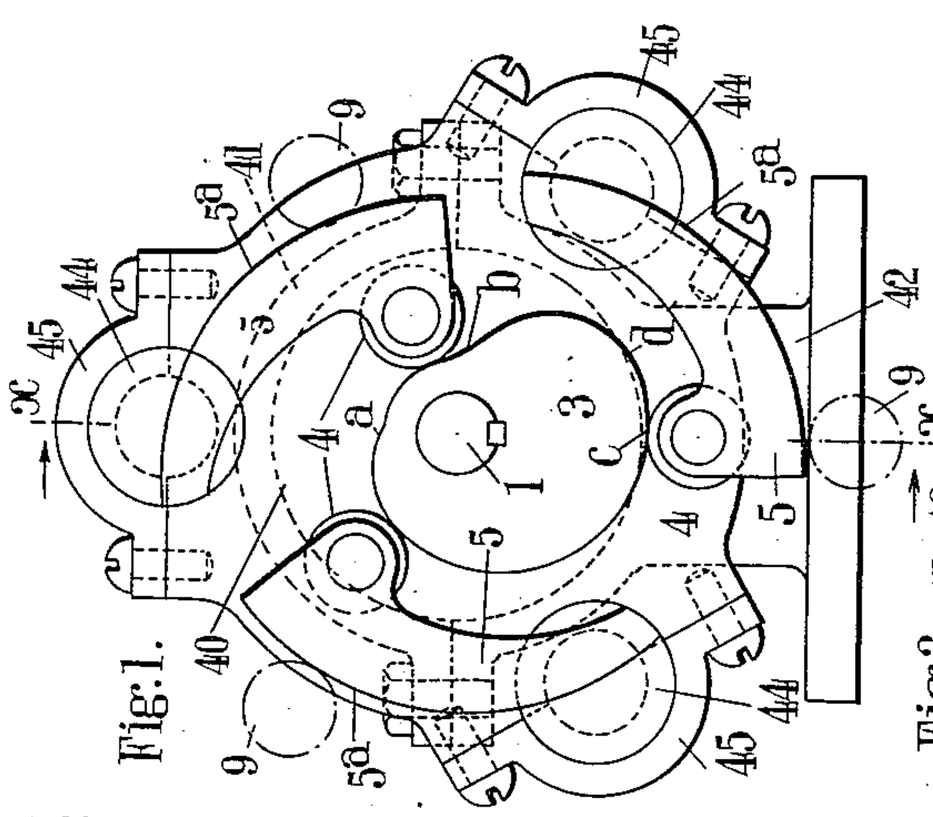

Fig. 1.

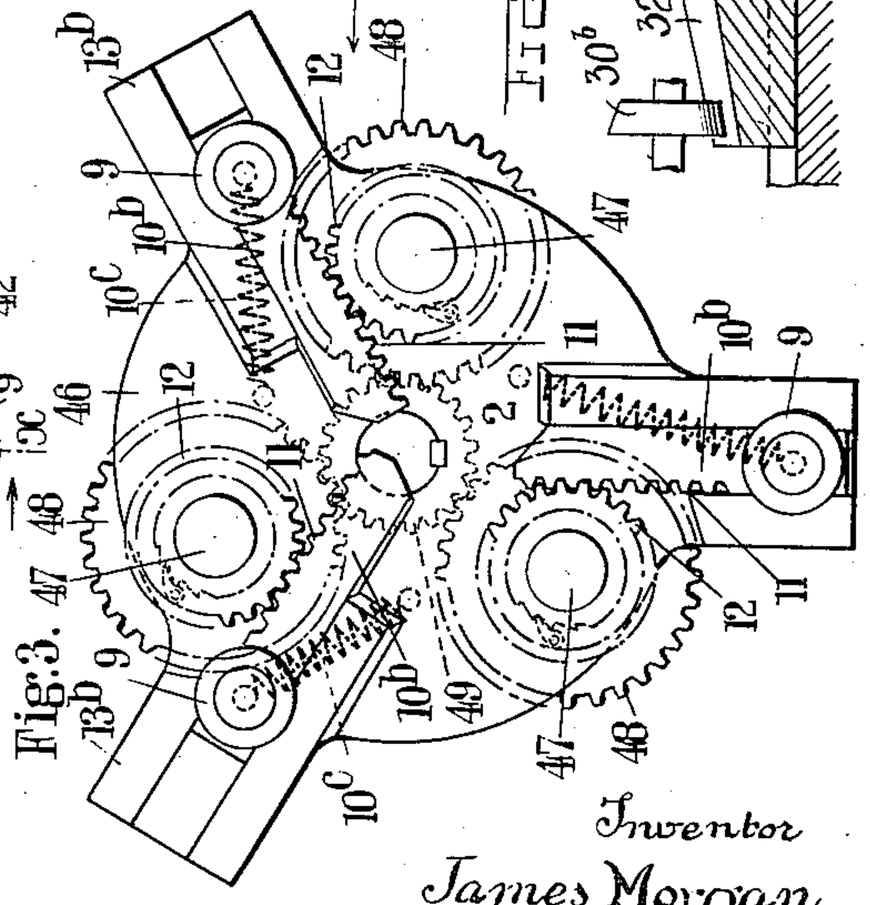

Fig. 3.

Witnesses

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UNITED STATES PATENT OFFICE.

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SPEED-GEARING.

954,987. Specification of Letters Patent. Patented Apr. 12, 1910.

Application filed December 9, 1908. Serial No. 466,664.

To all whom it may concern:

Be it known that I, JAMES MORGAN, a subject of the King of Great Britain and Ireland, residing at 42 Upper Clapton road, London, England, have invented certain new and useful Improvements in Speed-Gearing, of which the following is a specification.

This invention relates to speed gearing or like devices for transmission of a reduced or increased speed to secondary shafts from a driven main shaft, the invention being of that type of gearing or speed varying devices in which the motion is transmitted to the last shaft or that to be driven by a free wheel, or ball, or like clutch or ratchet mechanism the motion for this purpose, being obtained from a cam adapted to give a uniform angular movement through a curved lever or levers, and a movable part, the length of effective action of which lever or levers can be varied to vary the amount of motion transmitted to the clutch or the like through the movable part. According to the present invention a more compact and a simpler form of device of this type is obtained than heretofore. Such device is described together with a variation thereof in the accompanying drawings in which:—

Figure 1 is a front elevation of one half of the device. Fig. 2 is a section on line *x*—*x* of Fig. 1 looking in the direction of the arrow. Fig. 3 is a front elevation of the other half of this form. Fig. 4 is a side elevation of Fig. 3 looking in the direction of the arrow. Fig. 5 is a front elevation of another form of the device. Fig. 6 is a side sectional elevation of a part of Fig. 5, and Fig. 7, is a sectional elevation of the complete device. In Figs. 1 to 4 the device is shown in halves or parts, Fig. 1 representing one face and Fig. 3 the other face of the two parts which are arranged face to face when in use.

The shaft 1 driving the cam 3 is in line with the shaft 2 it is intended to drive, as has been before proposed and is centrally located in a block 40 movably held by a strap 41 of a plumber block or frame 42 the block having a worm 43 for moving it. The block 40 carries three short bosses 44 rotatable in straps 45, such bosses 44 carrying levers 5 having curved faces 5^a, and with rollers 4 at their extreme outward ends which are adapted to bear on the cam 3. The other part may consist of a plate or frame 46 surrounding the shaft 2 to be driven and carries guide blocks 13^b, in which reciprocate rods 10^b carrying rollers 9 and racks 11 which engage with pinions 12 attached to or forming the loose or driving parts of a ratchet clutch as shown, the studs 47 carrying the other or driven part of the clutch, passing through the frame 46 and having affixed to them pinions 48 which drive a common pinion 49 secured to the shaft 2. The return movement of the reciprocating rods 10^b and of the curved levers 5 which operate them outwardly may be obtained or insured by springs such as 10^c indicated by dotted lines in Fig. 3, or in other suitable ways.

The operative part of the cam 3 is represented by *a c* and the return half by *c d b a* the shape of *a c* being such that there is a regular increase in the distance from the center of shaft 1 in direct ratio to the angular distance from *a*, *i*, *e*, assume a straight line *a c* passing through the center of 1 and the distance from the center of 1 to *a* to be x. Now draw a straight line from the center of 1 upward and to the left of *a* at an angle of 10° to line *a c*. Then the length of this line to the point of intersection with curve *a c* will be x+y, y, being the increase in diameter at an angle of 10°. Now draw another line at an angle of 20°. This line will then equal x+2 y and so on until at the point *c* which represents an angle of 180° the distance from the center of 1 will be x+18, y. The small arc *c d* is concentric with shaft 1 as is also the small arc *a b* and form "dwells" for the purpose of easing the movements of the rollers 4. This arrangement would give each roller 4 a uniform motion forward if it moved in a straight line, but as its movement is on an arc with its center on boss 44 this variation can if desired be compensated for by a slight adjustment of the curvature of the cam from *a* to *c* which may be obtainable by a graduation of the chord of its arc. A cam so formed or modified may be made to give a practically uniform motion to the lever 5 during its outward stroke.

The three levers 5 are arranged at equal intervals around the cam 3 and take up its motion one after the other and communicate it to the rollers 9, the rods racks and pinions which in turn convey it to the pinion 49. By turning the worm or other gear 43 by hand mechanism the block 40 may be partly rotated in the bearing straps 41 and thus the

point of contact of the rollers 9 on the curved faces 5^a of the levers may be varied. Thus the outward movement of the rollers 9 is comparatively small when the points of contact of the rollers with the curved surfaces 5^a of the levers 5 is near the inner ends of the latter, but when the rollers are in the position indicated by the dotted lines of Fig. 1 or near the outer ends of the levers 5, the maximum amount of movement will be obtained and consequently the greatest angular movement of the clutches.

It will be noted that the movable parts carrying the racks 11 have a motion radially to and from the center line of the driving and driven shafts and that this enables the apparatus to be made more compact in form than has been heretofore possible with apparatus of this class.

In the form shown in Figs. 5 and 6 the cam 3 which is of the same construction as in Fig. 1 operates the roller 4^a of a lever 22 pivoted on a stud 21 and carrying a plate 23 angularly pivoted to it at 24 and having the curved face 5^a which face works with a sliding action upon a lever 26 which it reciprocates or through a roller 25 of same. The plate 23 it will be seen thus forms a part of the lever 22. The lever 26 is pivoted at one end at 27 and has a segmental rack 28 at the other which engages a pinion 29 carried on or forming the exterior ring or casing of a free wheel or clutch on the driven shaft 2. The lever 26 may have a spring 26^a for pulling same in one direction. The plate 23 has a rod 30 pivoted to it and guided by a slot 30^a which encircles the stud 21 while its lower end carries a conical roller 30^b supported by an adjustable block 31 guided and slidable in a suitable part. This block is of a curvature on its face 32 adapted to the radius of the end of the rod 30 at its varying points, and is tapered longitudinally so as to raise or lower said lever.

In the position shown in Fig. 5 the lever 22, rod 30 and the plate 23 will be reciprocated by the cam, but no motion will be imparted to the lever 26. When however the block 31 is moved by hand to raise the rod 30 the curved surface 5^a will act as a cam and will raise the lever 26 and so operate the clutch and drive the shaft 2 in one direction the spring 26^a acting to pull down the lever.

It will be obvious that the devices described and illustrated may be modified in their details without departing from the invention.

What I claim and desire to secure by Letters Patent is:—

1. In a speed gear of the gradual variation type, a driving shaft, a cam fixedly mounted thereon, a lever of variable effective length actuated by the cam and provided with a cam surface, a guided bearing piece acted on by the lever cam surface, a rack connected to the guided bearing piece, a free wheel pinion geared to the rack, a driven shaft, and a gearing connecting the pinion to the driven shaft.

2. A speed gear of the gradual variation type comprising radial racks, means for reciprocating the racks, free wheel devices gearing into the racks, a driven shaft, and gearing connecting the free wheel devices with the driven shaft.

3. In a speed gear of the gradual variation type, a driving shaft, a cam thereon, a lever actuated by the cam and provided with a cam surface, a movable bearing piece acted on by the lever cam surface, a means for varying the relative positions of the lever cam surface and the bearing piece, a rack connected to the movable bearing piece, a free wheel pinion geared to the rack, a driven shaft, and a pinion on the driven shaft.

4. In a speed gear of the gradual variation type, a driving shaft, a cam mounted thereon, a lever actuated by the cam, a guided rack having a projection bearing on the back of the lever, a frame carrying the lever, a means for adjusting the frame to vary the position of the point of bearing of the projection on the lever, a free wheel device gearing with the rack, a driven shaft, and a pinion on the driven shaft.

In testimony whereof I have affixed my signature, in presence of two witnesses.

JAMES MORGAN.

Witnesses:
J. W. MacKenzie,
Albert Jones.