(No Model.)

G. W. KIRKPATRICK & A. J. MARTIN.

CHANGEABLE SPEED GEARING.

No. 357,834. Patented Feb. 15, 1887.

Fig. 1.

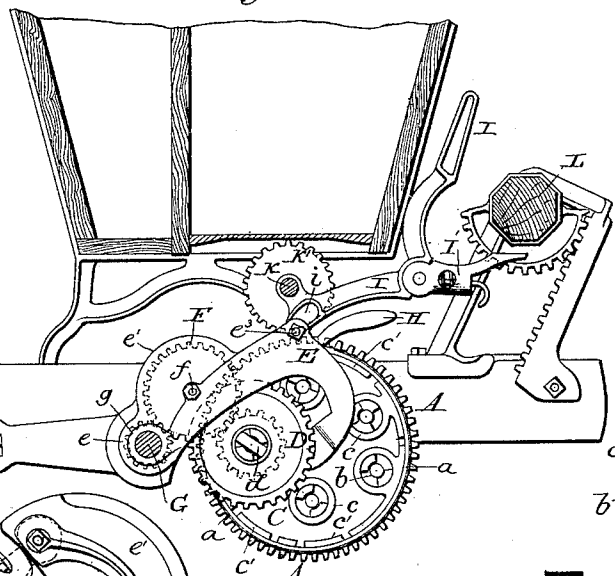


Fig. 7.

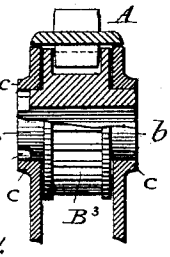


Fig. 3.

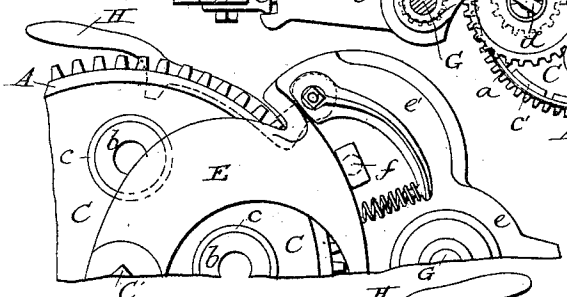


Fig. 2.

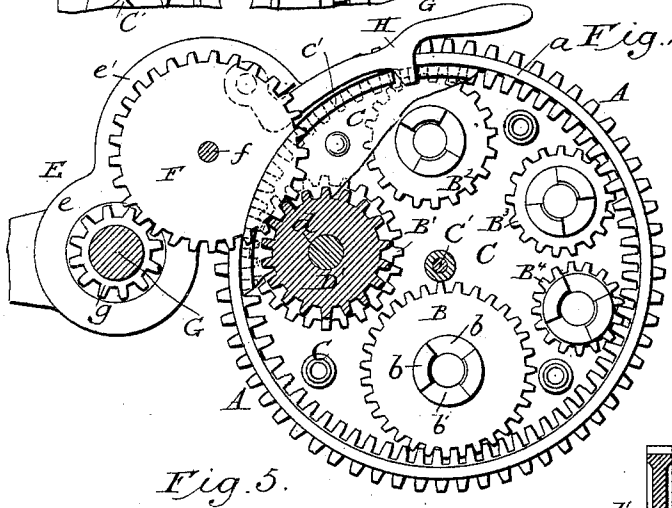


Fig. 4

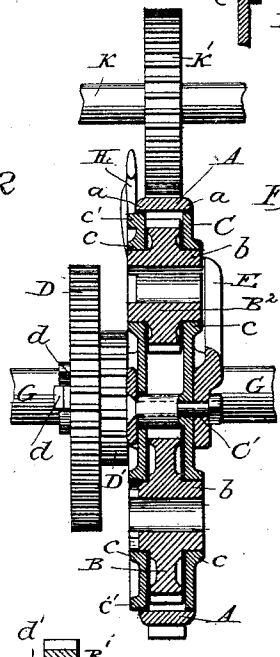


Fig. 5.

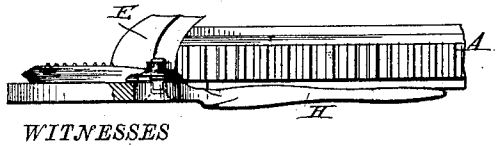
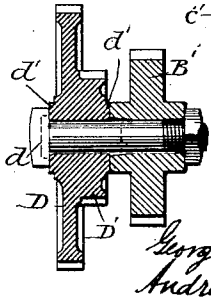


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE W. KIRKPATRICK AND ANDREW J. MARTIN, OF MACEDON, N. Y.; SAID MARTIN ASSIGNOR TO HELEN M. KIRKPATRICK, OF SAME PLACE.

CHANGEABLE-SPEED GEARING.

SPECIFICATION forming part of Letters Patent No. 357,834, dated February 15, 1887.

Application filed August 26, 1886. Serial No. 211,926. (No model.)

To all whom it may concern:

Be it known that we, GEORGE W. KIRKPATRICK and ANDREW J. MARTIN, of Macedon, in the county of Wayne and State of New York, have invented certain Improvements in Changeable-Speed Gearing, of which the following is a specification.

This invention relates to multiple speed devices for machinery, the object being to enable a driving-shaft constantly rotating at a uniform speed to transmit a faster or slower motion to drive mechanism, as may be desired.

To this end the invention consists in combining with a fixed gear or pinion upon the driving-shaft a ring provided with internal-gear teeth constantly meshing with and supported by a number of actuating-pinions varying in size, any one of which may be adjusted to be driven by the driving-pinion or intermediate gears.

It consists, further, in a locking device whereby said actuating-pinions may be maintained in a fixed relation to the intermediate gears, it being understood that the pinions herein mentioned are journaled upon a supporting plate or casing, with which we prefer to cause the locking device to coact.

It consists, also, in minor details of construction and combinations, to be hereinafter described, and claimed in the clauses at the close of the specification.

For convenience of illustration we have shown our improved gearing arranged to control the feed of a fertilizer-distributer for a grain-drill or seeding-machine, and the internally-geared ring, when used in that connection, should be provided with external cogs, as shown. It will however be understood that the devices herein shown may be applied to many classes of machinery with immaterial variation—as, for instance, sprocket-teeth might be used in place of the cog-teeth upon the exterior of the geared ring, or teeth may be dispensed with and said ring used as a band-pulley, or the intermediate gearing connecting the pinion of the driving-shaft with the actuating-pinions of the speed devices may be dispensed with, said driving-shaft pinion meshing directly with the pinion which is clutched to the hub of the actuating-pinions.

In the accompanying drawings, Figure 1 represents a side elevation of our system of gearing and its relation to the fertilizer-box of a grain-drill. Fig. 2 is a vertical section of the speed-changing device. Fig. 3 is a detail illustrating the locking mechanism. Fig. 4 is an axial section through the cogged ring and its actuating-pinions. Fig. 5 is a plan view showing the locking mechanism and a part of the cogged drive-ring. Fig. 6 is a sectional detail of one of the actuating-pinions coupled with the removable pinion. Fig. 7 is a sectional view, partly in section, showing a modified form of one of the actuating-pinions.

A represents a revolving ring, provided both externally and internally with gear-teeth, and B B′, &c., are driving-pinions of different diameters, each of which engages constantly with the internal teeth of the ring. The pinions are formed with hubs seated in supporting-plates C, applied within opposite sides of the ring, and acting to give support thereto. These plates, which are normally fixed in position, which may be revolved to bring the different pinions into an operative position, as hereinafter more fully explained, are supported by a central bolt or pivot, C′, which is in turn supported at its ends in arms E, journaled loosely around the main driving-axle G.

Each of the internal pinions, B B′, &c., has one hub extended through the side plate and toothed or notched on the exterior, as shown at *b′*, to interlock with an external gear-wheel, D, which may be applied to any one of the pinions at will, and from which they receive motion. The pinions and the gear are provided with axial holes, as shown, so that the gear may be held in connection with the particular pinion to which it is for the time being applied by means of a bolt, *d*, passed through the two, as shown in Fig. 6.

For imparting motion to the gear D we fix on the axle G a pinion, *g*, which engages constantly a gear, F, carried by the arms E, and engaging in its turn the gear D, motion being thus communicated from the shaft G, through the pinion *g*, to gear F, and thence through the gearing D to one of the internal pinions, which in its turn rotates the external ring, A. The speed of this ring with relation to the

speed of the prime mover G depends upon the diameter of the particular internal pinion which may be called into action.

The rotation of the plate C, in which the pinions are supported, admits of any one of the pinions B B', &c., being brought in such position that when the external gear, D, is applied thereto the gear will engage with and receive motion from the driving-gear F. As the entire series of internal pinions engage constantly with the ring, it follows that they are all revolved when the mechanism is in action, but the power is applied through a single pinion at a time, the others turning idly upon their pivots.

The gear D may be constructed with a single line of teeth, or it may be made, as shown in Figs. 1, 4, and 6, of double width on the face, and its two sides made of different diameters and each provided with teeth and adapted to be reversed or turned side by side, so as to bring its larger or its smaller side into engagement with the driving-gear F, as required. This construction permits an additional change in the rate of speed, the parts being driven at a much higher speed when the gear has its smaller portion brought into action than when the other side is used.

In order to lock the pinion carrying plates C against accidental rotation and to hold them in position to maintain a proper connection between the gears D and F, we propose to employ a locking device of any suitable character, preferably a latch, H, such as shown in the drawings, pivoted to one of the arms E and arranged to engage notches formed in one of the plates. We also prefer to connect the two plates C C by means of other bolts, as shown in the drawings, in order to keep them from separating laterally and to compel their uniform rotation, that they may not bind or cramp upon the journals of the pinions.

K represents the shaft to which it is required to impart motion by our gearing. As shown in the drawings, it is mounted in fixed bearings and provided with a pinion, K', which engages with and receives motion from the external teeth of the ring A. The vertical swinging motion of the arms E permits the ring to be dropped out of engagement with the gear when required.

When the gear is applied to grain-drills and similar machines, we mount on the shaft K an arm, I, containing an eccentric slot, *i'*, which engages a stud or pin on the arms E, so that the vibration of the arm I will throw the ring A into and out of gear. We commonly divide or fork the rear end of the arm I, in order that it may be actuated by the customary rising-and-falling bar L, through which the hoes or drill-teeth are raised and lowered. The lower arm, I', of the lever is jointed to the remaining portion and provided with a spring-latch for locking it in operative position. This permits it to be unlocked and dropped downward, so that the bar L may descend to lower the drill-teeth without throwing the gear into action.

If desired, the internal pinions, B B', &c., may be formed with concentric side flanges, as shown in Fig. 7, to bear against the interior of the ring A, and assist in supporting the same. The pinions thus constructed and arranged will reduce the friction between the ring and the plates C C.

The essence of my invention resides in combining with the internal-toothed ring A a series of internal driving-pinions of different diameters and means for supporting these pinions and establishing at will connection between any one of them and the gear from which it receives motion, and it is manifest that the details of construction may be modified in various respects, which will suggest themselves to the skilled mechanic after a reading of this specification.

In order to prevent the internal teeth of the ring A and the actuating-pinions from "bottoming" in action, we usually construct the teeth of the ring a little longer than those of the pinions, as shown in Fig. 2, though the same result may be attained by means of the annular flanges on the sides of the pinions, as shown in Fig. 7.

While we have shown our gearing applied to a grain-drill for the purpose of illustrating one of its applications and its mode of action, it is to be understood that it may be applied to a variety of machines in which it is necessary to change the speed of a shaft driven from a prime mover having a constant speed.

Having thus described our invention, what we claim is—

1. In a changeable speed gearing, the combination of an internally-cogged ring, a series of internal driving-pinions of different diameters, each engaging directly with said ring, and a revoluble support for said pinions.

2. In a changeable-speed gear, the combination of a casing or support adapted to be rotated, a series of actuating-pinions of different diameters journaled therein, and an internally-cogged ring meshing with said pinions and provided with flanges overhanging the periphery of the casing.

3. In a changeable-speed gear, the combination of a revolving ring toothed both internally and externally, a series of internal driving-pinions of different diameters, each engaging directly with said ring, a revoluble case or support in which said pinions are mounted, an external gear, D, constructed for connection with either of said pinions at will, and a driving-gear, F, with which gear D may be engaged by revolving the case or support regardless of the particular pinion to which said gear D may be connected.

4. In a changeable-speed gearing, the combination, with the revoluble casing or support, the internally-cogged ring, and the actuating-pinions of different diameters journaled in said casing in engagement with the ring and having

clutch members upon their hubs, of a removable external pinion provided with a clutch member, the internal driving-gear, F, and means, substantially as described, for locking the revoluble casing in different positions.

5. In combination with the revoluble casing fitted with actuating-pinions and the internally-cogged ring, the removable pinion, the swinging frame or support for the casing, the gear F, mounted in said frame, and the driving-pinion *g*, having its axis coincident with the pivot of the swinging frame.

6. The combination of the driving-pinion *g*, the frame or arms E, carrying the intermediate gear constantly meshing with the driving-pinion, the revoluble casing, the internally-cogged ring, the internal pinions of different diameters, the removable gear D, adapted for application to the different pinions, and the driven pinion K′, having its shaft mounted in fixed bearings.

7. In combination with the driving-shaft G and its pinion, the frame E, the ring A, supported from said frame and connected by intermediate gear with the driving-pinion, the driven pinion K′, and the lever I.

8. In combination with the revoluble casing, the actuating-pinions journaled therein and provided with peripheral flanges, and the internally-geared ring engaging the pinions and bearing upon their flanges, as described.

9. The combination of the driving-shaft and its pinion, the arm or bracket carrying the changeable-speed gear, and the gear-wheel K′ on a driven shaft, the lifter bar or roller L, and a lever, I, provided with the horizontal arm or latch lying in the path of the lifter-roller.

In testimony whereof we hereunto set our hands, this 20th day of August, 1886, in the presence of two attesting witnesses.

GEORGE W. KIRKPATRICK.
A. J. MARTIN.

Witnesses:
ISAAC DEAN,
W. L. ACKER.