No. 861,082. PATENTED JULY 23, 1907.

W. BOWNE, Jr. & M. CRONKHITE.

VARIABLE SPEED MECHANISM.

APPLICATION FILED JAN. 14, 1907.

2 SHEETS—SHEET 1.

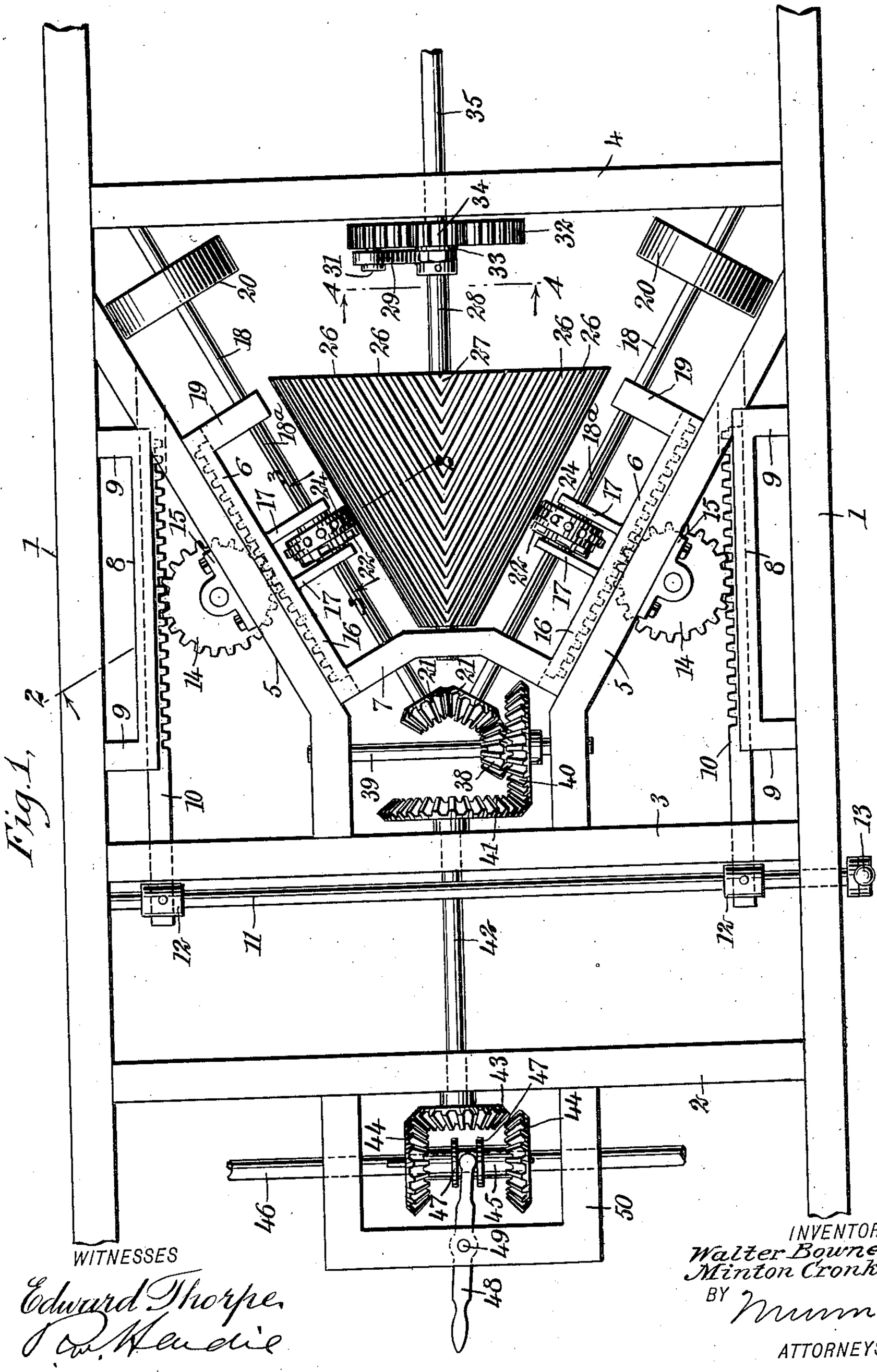


Fig. 1.

WITNESSES

Edward Thorpe.

[illegible] Kendrie

INVENTORS

Walter Bowne, Jr.

Minton Cronkhite

BY Munn & Co

ATTORNEYS

No. 861,082. PATENTED JULY 23, 1907.

W. BOWNE, Jr. & M. CRONKHITE.

VARIABLE SPEED MECHANISM.

APPLICATION FILED JAN. 14, 1907.

2 SHEETS—SHEET 2.

Fig. 2,

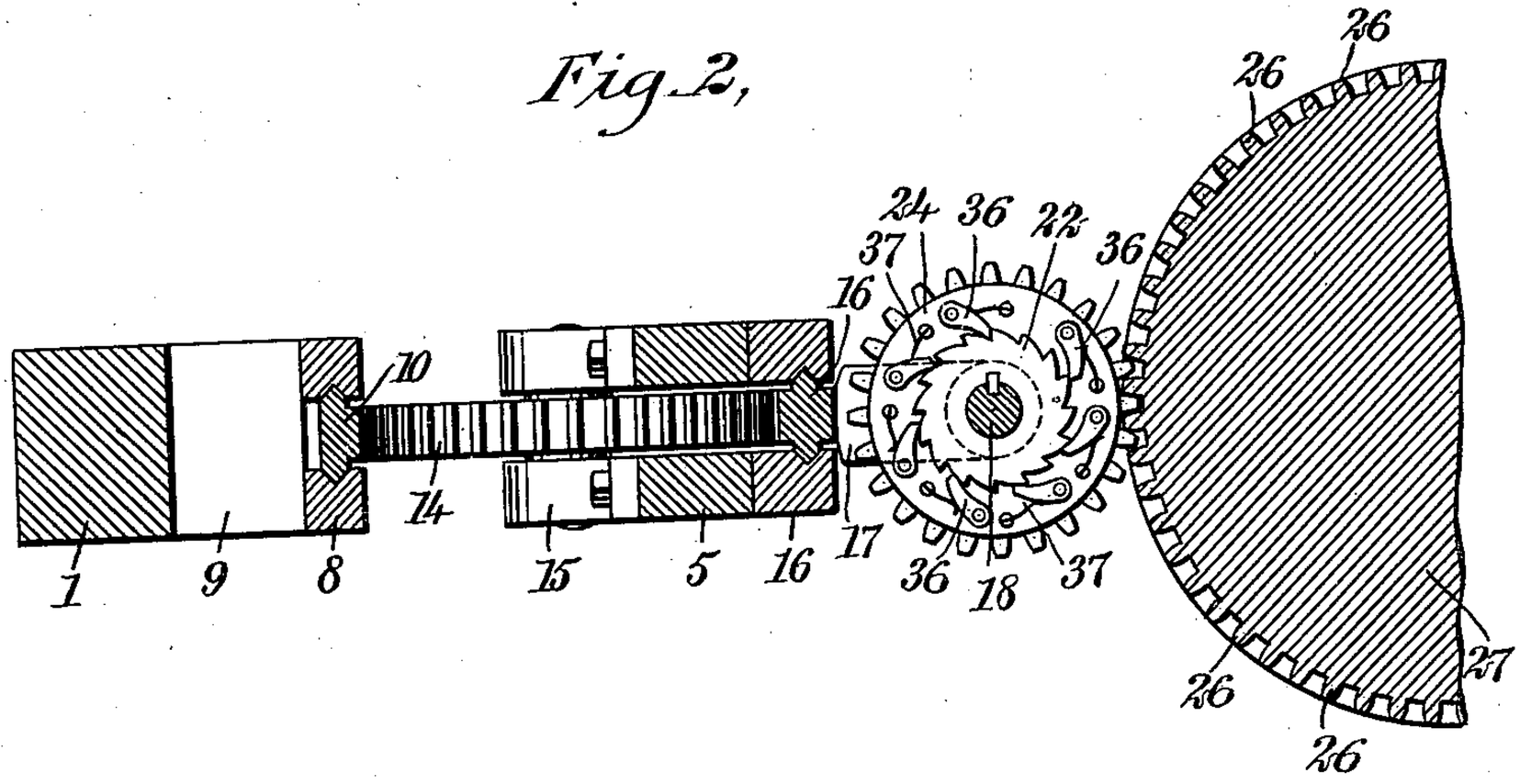


Fig. 3,

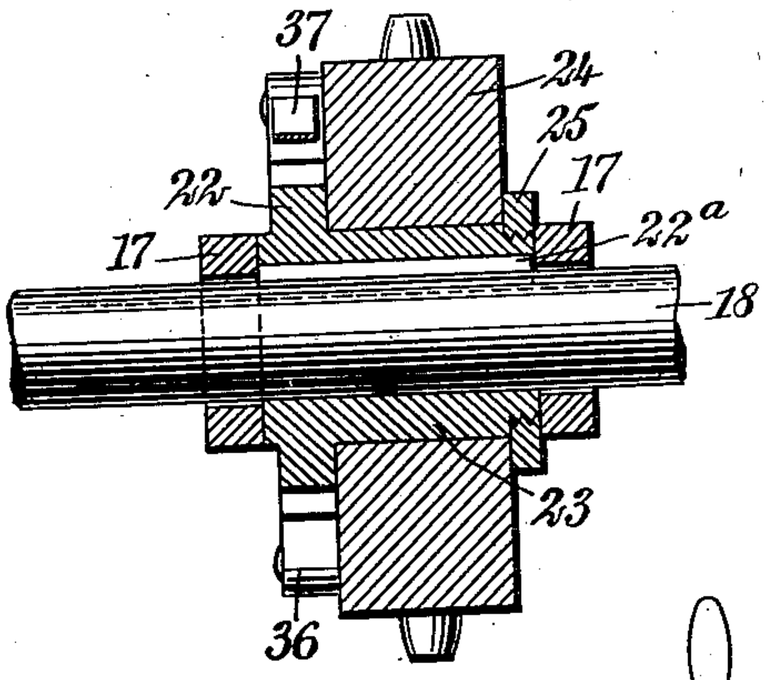


Fig. 4,

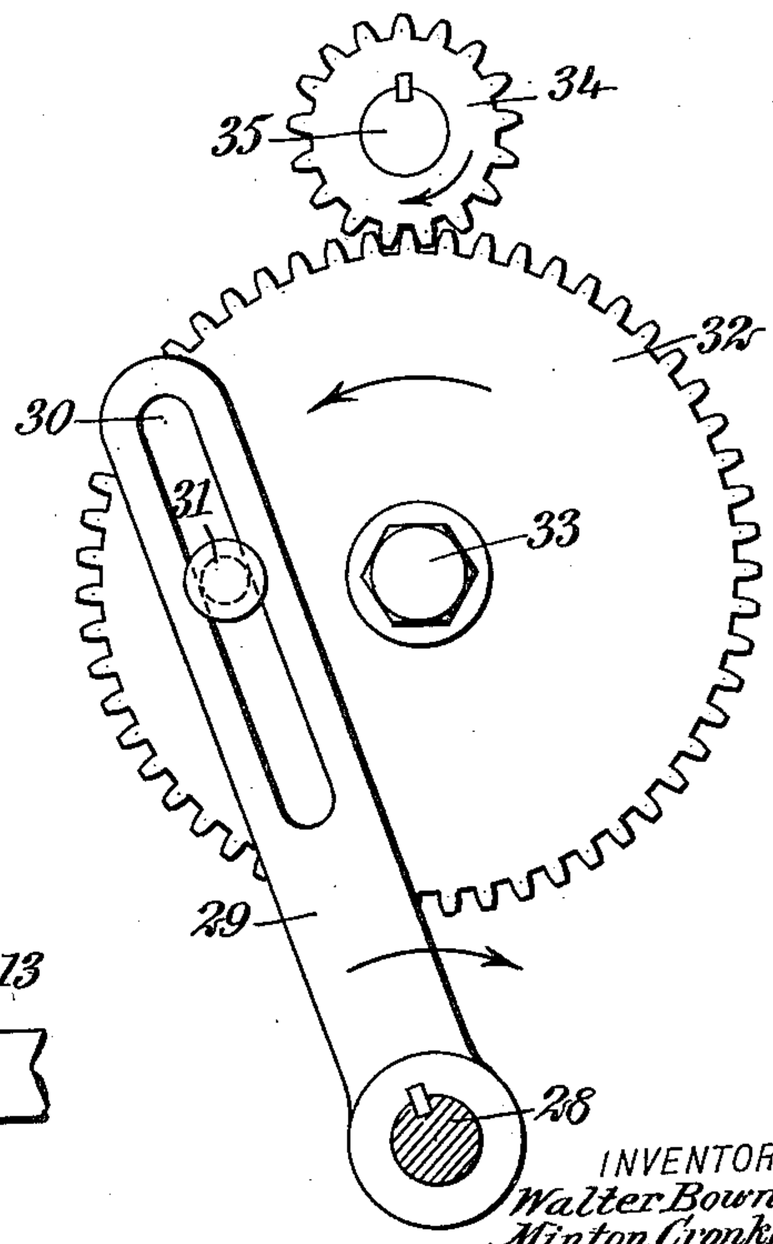
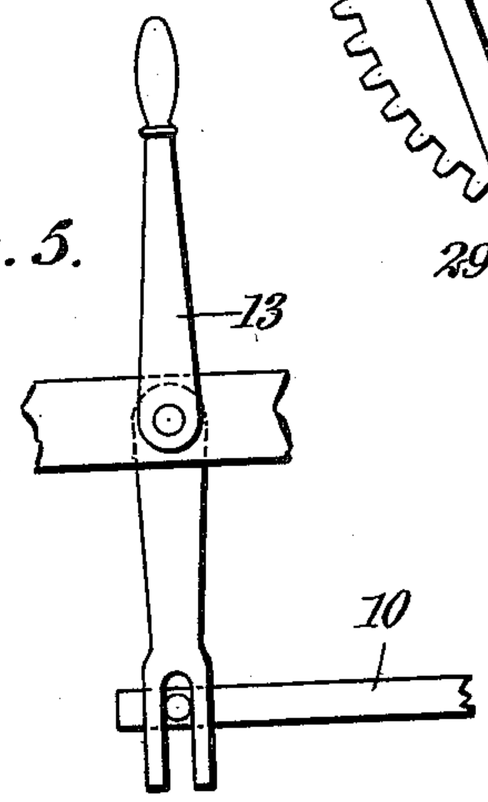


Fig. 5.



WITNESSES

Edward Thorpe.

[illegible]

INVENTORS

Walter Bowne, Jr.

Minton Cronkhite

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

WALTER BOWNE, JR., AND MINTON CRONKHITE, OF NEW YORK, N. Y.

VARIABLE-SPEED MECHANISM.

No. 861,082. Specification of Letters Patent. Patented July 23, 1907.

Application filed January 14, 1907. Serial No. 352,112.

To all whom it may concern:

Be it known that we, WALTER BOWNE, Jr., and MINTON CRONKHITE, both citizens of the United States, and residents of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Variable-Speed Mechanism, of which the following is a full, clear, and exact description.

This invention relates to means for varying the speed of a driving shaft, and is especially designed to be used in connection with motor vehicles, although adapted for various uses.

Other objects relating to the specific construction and special arrangement of the several parts of our invention, will be understood from the following description and accompanying drawings, in which drawings like characters of reference indicate like parts throughout the views, and in which

Figure 1 is a plan of a device embodying our invention; Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1; Fig. 3 is a vertical section taken on the line 3—3 of Fig. 1; Fig. 4 is a vertical section taken on the line 4—4 of Fig. 1; Fig. 5 is a side elevation of an operating lever for varying the speed of the driven shaft.

As illustrated in the drawings, the operating elements of our device are mounted upon a main frame, comprising longitudinal side bars 1 having transverse bars 2, 3 and 4 connected therewith. Diagonally extending bars 5 are attached at one end to the side bars 1 and at their opposite ends to the transverse bars 3. Guide-ways 6 are mounted upon the diagonal bars 5, and are preferably connected together by means of a bent cross bar 7. Auxiliary guide bars 8 are secured to the side bars 1 preferably by means of off-set ends 9, and are provided with guide-ways adapted to receive racks 10 which are connected with a transverse rock shaft 11 by means of crank arms 12 fixedly secured to said shaft. The shaft 11 is journaled at its ends on the side bars 1 of the main frame, and is provided with an operating lever 13 adapted to rock said shaft and to reciprocate the racks 10 in the guide bars 8, and thereby rotate idle pinions 14 which are journaled in bearing boxes 15 secured to the diagonal bars 5. These pinions in turn mesh with the teeth of racks 16, indicated by dotted lines in Fig. 1, and thereby reciprocate said racks longitudinally of the diagonal bars 5. The racks 16 are provided with laterally extending arms 17 which are provided with bearings for diagonally extending rotatable shafts 18 journaled in bearing boxes formed on laterally extending arms 19 and connecting bar 7 of the guide-ways. These shafts are provided on one end with fly wheels 20 and on their opposite ends with engaging beveled gears 21.

Ratchet wheels 22 are splined on the shafts 18 by means of keys 22^a adapted to engage longitudinal seats 18^b formed on the shafts 18. These ratchet wheels are preferably provided with sleeves 23 upon which are freely mounted pinions 24, held in place on said sleeves by means of nuts 25, shown in Fig. 3. The pinions 24 engage the teeth 26 of a cone 27 arranged in two opposite series, the teeth of each series extending parallel with each other and converging with the corresponding teeth of the opposite series on opposite sides of said cone. The cone 27 is mounted on a rock shaft 28 having its ends journaled in suitable bearing boxes on the cross bar 4 of the main frame and the bent connecting bar 7 of the main guide frame. A rock arm 29 is fixedly secured to the shaft 28 and provided with a slot 30 adapted to receive a pin 31 attached to a gear 32 which is mounted to rotate idly on a stud 33 attached to the cross bar 4 in any suitable manner. A gear 34 meshes with the gear 32 and is fixedly attached to a driving shaft 35 which is also journaled on the cross bar 4, and connected with driving mechanism of any suitable construction. Pawls 36 are pivotally attached to the side of the pinion 24, and are arranged at unequal distances from each other so that one of the pawls will be in engagement with one of the notches of the ratchet wheel, while each of the remaining pawls occupy different positions relatively to the adjacent teeth of the ratchet, as shown in Fig. 2, thereby avoiding any lost motion as the shafts 18 are rocked in their bearings. Springs 37 bear against the pawls 36 and hold their ends against the teeth of the ratchet wheel. The meshing gears 21 attached to the rock shafts 18 are connected with a beveled gear 38 fixedly attached to a rotating shaft 39, which is also provided with a beveled gear 40 meshing with a corresponding beveled gear 41 attached to one end of a rotating shaft 42 which is journaled in suitable bearings in boxes mounted on the cross bars 2 and 3 of the main frame. The shaft 42 is provided on its opposite end with a gear wheel 43 adapted to engage correspondingly beveled gears 44 attached to a sleeve 45 which is splined on a driven shaft 46, and preferably provided with collars 47 adapted to be operated by a hand lever 48 that is pivotally secured by means of a pivot pin 49 to an auxiliary frame 50 attached to or connected with the main frame.

When the device is in operation, the shaft 35 is rotated by the motive power operating the device, and the gear 34 on said shaft rotates the gear 32 which is mounted upon the stud 33. The rotary motion of the gear 32 is transformed into a rocking movement by means of the pin 31 attached to said gear which engages the slot 30 of the rock arm 29 fixedly attached to the

shaft 28, thereby giving a rocking movement to said shaft and to the cone 27 mounted thereon. As the cone 27 is rocked the teeth of one of the series rotate the pinions 24 mounted on the shafts 18. These sprocket wheels being freely mounted on the shafts 18 and provided with pawls 36, rotate freely in one direction on the shafts 18, and in the opposite direction they rotate with the shafts 18 because of the pawls 36 engaging the teeth of the sprocket wheels 22. A positive driving movement is thereby communicated alternately from the cone 27 to each of the oppositely disposed shafts 18. The rotation of said shafts is communicated through the gear wheels 38 and 40 and the rotating shaft 39 to the gears 41 and 43, and the shaft 42 upon which they are mounted, thereby producing a continuous rotary motion of said shaft. The driven shaft 46 is rotated in either direction by bringing one or the other of the gear wheels 44 in contact with the gear 43. The speed at which the driven shaft 46 is rotated is determined by the position of the pinions 24 on the longitudinal lines of the cone. When the pinions are arranged in the position shown in Fig. 1, the driven shaft will be rotated at about its medium speed, or slightly faster. By rocking the shaft 11, however, by means of the operating lever 13, the racks 10 are moved in the guide-ways on which they are mounted, thereby rotating the gears 14, which in turn slide the racks 16 along the guide-ways of the bars 6, which carry with them the pinions 24 and ratchet wheels 22 mounted on the shafts 18, thereby increasing the speed of the driven shaft as the pinions are moved toward the larger end of the cone, and decreasing the speed as said wheels are brought toward the smaller end of said cone. Locking mechanism of ordinary construction, such as a notched segment and engaging latch, may be connected with the lever 13 to hold the racks 10 against longitudinal movement, thereby keeping the pinions 24 in any desired position relatively to the surface of the cone 27.

In the construction herein shown and described, we have embodied our invention in its preferred form. We do not desire to be limited to the special arrangement of the several elements shown herein, as other means having similar capabilities may be used without departing from our invention.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. The combination with a rotatable driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with opposite series of parallel teeth, rotatable shafts arranged on opposite sides of the cone, wheels adjustable longitudinally of and operatively connected to said shafts, engaging said cone, and a driven shaft connected with said last named shafts, substantially as shown and described.

2. The combination with a rotatable driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with oppositely disposed series of parallel teeth, and a rotatable driven shaft connected with said cone, substantially as shown and described.

3. The combination with a rotatable driving shaft, of a rock shaft connected therewith, a cone fixedly secured to said rock shaft and provided with opposite series of teeth inclined to the axial line of said cone, rotatable shafts arranged on opposite sides of said cone, pinions loosely mounted on said shaft, ratchet wheels splined on said shafts and operatively connected with said pinions, and a driven shaft connected with said last named shafts, substantially as shown and described.

4. The combination with a driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with oppositely disposed series of teeth arranged at an inclination to the axial line of said cone, shafts arranged on opposite sides of said cone, pinions adapted to engage the teeth of said cone, freely mounted on said shafts and provided with a series of pawls arranged at unequal distances from each other, and ratchet wheels splined on said shafts, and a driven shaft connected with said last named shafts, substantially as shown and described.

5. The combination with a rotatable driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with opposite series of parallel teeth arranged at an inclination to the axial line of said cone, rotatable shaft mounted on opposite sides of said cone and connected with a driven shaft, pinions freely mounted on said shafts, ratchet wheels splined on said shafts and operatively connected with said pinions, a driven shaft, and means for moving said pinion and ratchet wheels longitudinally of said shafts, substantially as shown and described.

6. The combination with a rotatable driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with opposite series of parallel teeth arranged at an inclination to the axial line of said shaft, shafts mounted on opposite sides of said cone and connected with a driven shaft, pinions mounted freely on said shafts, ratchet wheels splined on said shafts and operatively connected with said pinions, racks connected with said pinion and ratchet wheels, pinions engaging said racks, a driven shaft, and means for rotating said pinions and moving said racks longitudinally, substantially as shown and described.

7. The combination with a driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with opposite series of parallel teeth arranged at an inclination to the axial line of said cone, rotating shafts arranged on opposite sides of said cone and connected with a driven shaft, ratchet wheels splined to said rotating shafts and provided with sleeves, pinions journaled on said sleeves, pawls engaging said ratchet wheels, a driven shaft, and means for moving said pinions longitudinally of said shafts, substantially as shown and described.

8. The combination with a rotatable driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with oppositely disposed series of parallel teeth, a driven shaft, means for operatively connecting said cone with the driven shaft, and mechanism for reversing the driven shaft, substantially as shown and described.

9. The combination with a rotatable driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with opposite series of parallel teeth arranged at an inclination to the axial line of said cone, shafts arranged on opposite sides of said cone and parallel therewith, ratchet wheels splined to said shafts, pinions freely mounted on said ratchet wheels and adapted to engage the teeth of said cone, beveled gears mounted on the ends of said shafts, a reversible driven shaft, and connecting mechanism between said driven shaft and the shafts arranged opposite said cone, substantially as shown and described.

10. The combination with a rotatable driving shaft, of a rock shaft connected therewith, a cone mounted on said rock shaft and provided with opposite series of parallel teeth arranged at an inclination to the axial line of said cone, shafts arranged opposite to the sides of said cone and parallel therewith, ratchet wheels splined on said shafts and provided with sleeves, pawls engaging said ratchet wheels, pinions journaled on the sleeves of the ratchet wheels, racks mounted to slide parallel with the sides of said cone and provided with arms connected with said ratchet wheels, pinions engaging said racks, operative mechanism engaging said pinions, comprising reciprocating

racks, a rock shaft connected therewith, and a lever mounted on said rock shaft, substantially as shown and described.

11. In a variable speed mechanism, a rock shaft, a cone mounted on said rock shaft and provided with oppositely disposed series of parallel teeth arranged at an inclination to the axial line of said cone, rotatable shafts arranged on opposite sides of and parallel with the sides of said cone, mechanism mounted to slide on said shafts and adapted to have a sliding engagement with the teeth of said cone and operate said rotatable shafts, and a driven shaft connected to the rotatable shafts, substantially as shown and described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WALTER BOWNE, JR.
MINTON CRONKHITE.

Witnesses:
JNO. M. RITTER,
R. W. HARDIE.