

No. 725,812.

PATENTED APR. 21, 1903.

W. S. AUSTIN.  
VARIABLE SPEED GEARING.

APPLICATION FILED JUNE 23, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

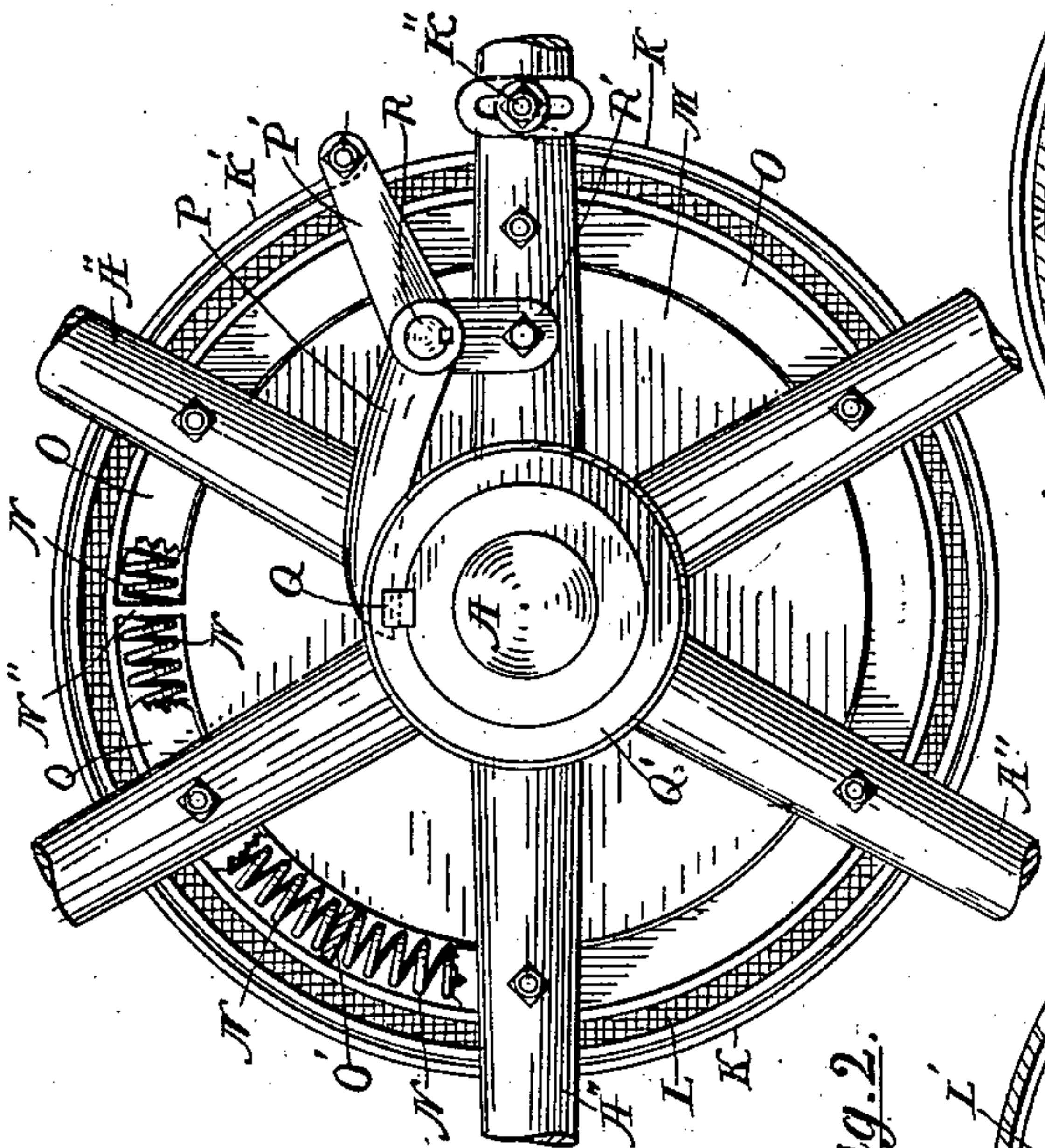


Fig. 2.

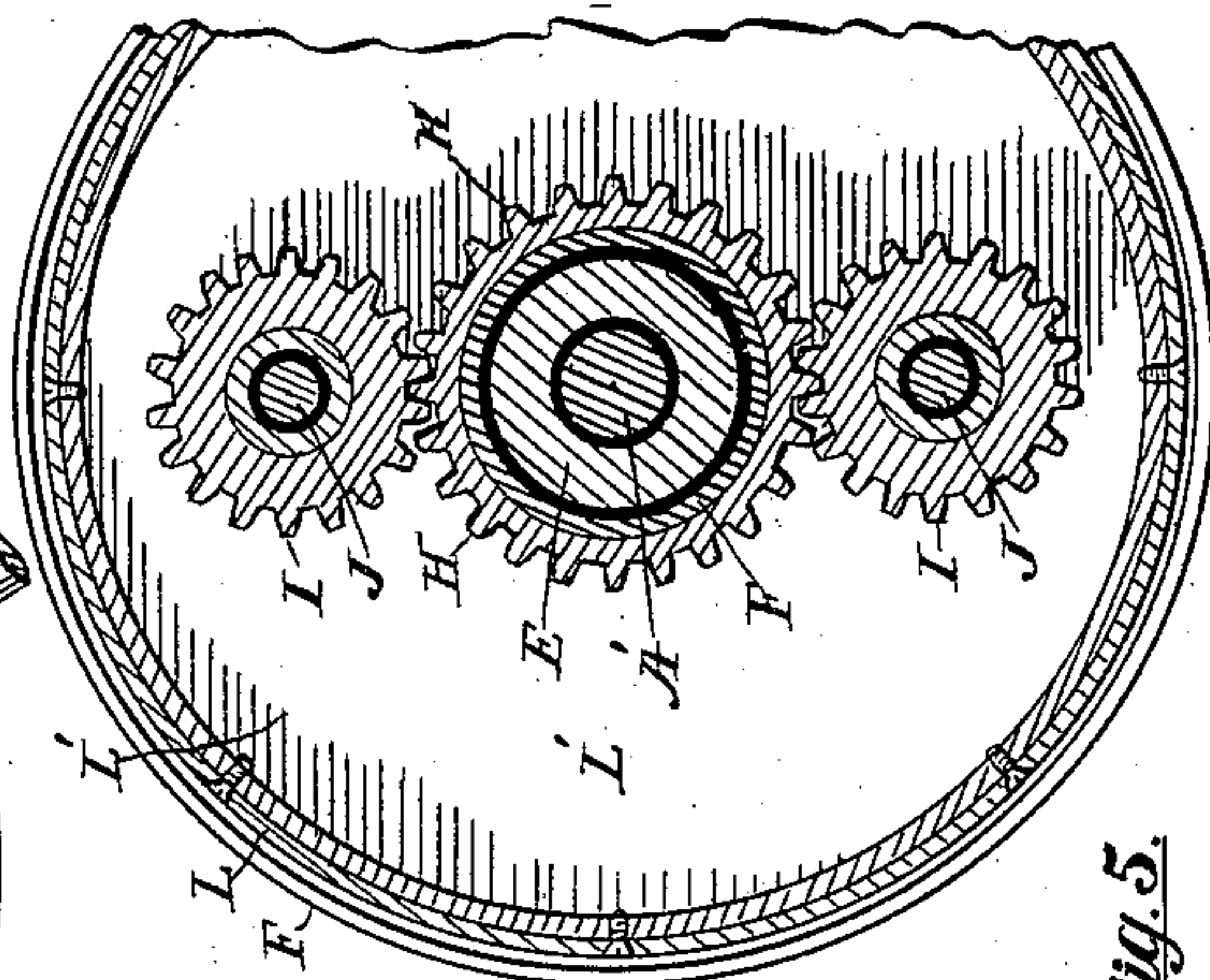


Fig. 5.

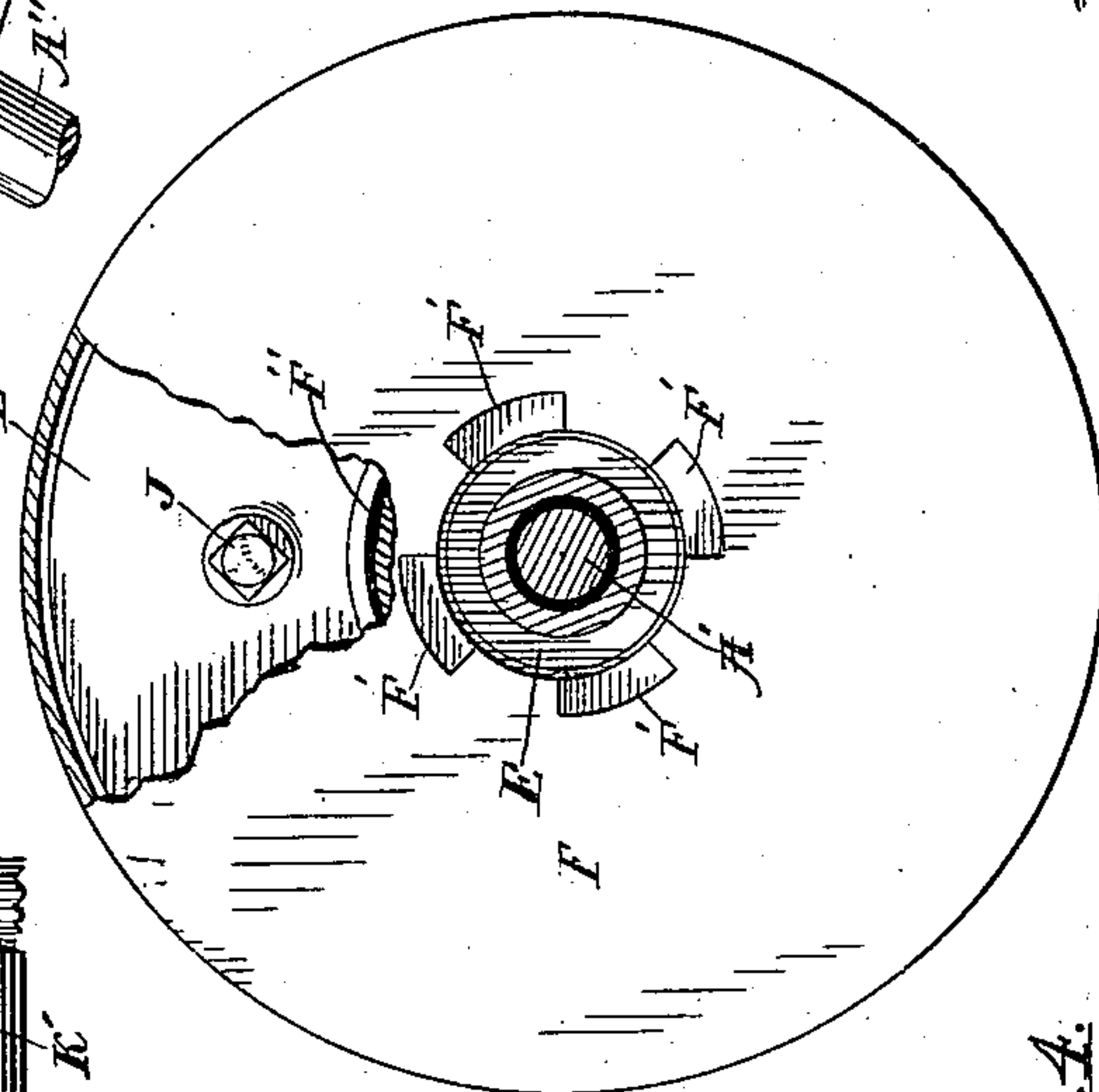


Fig. 4.

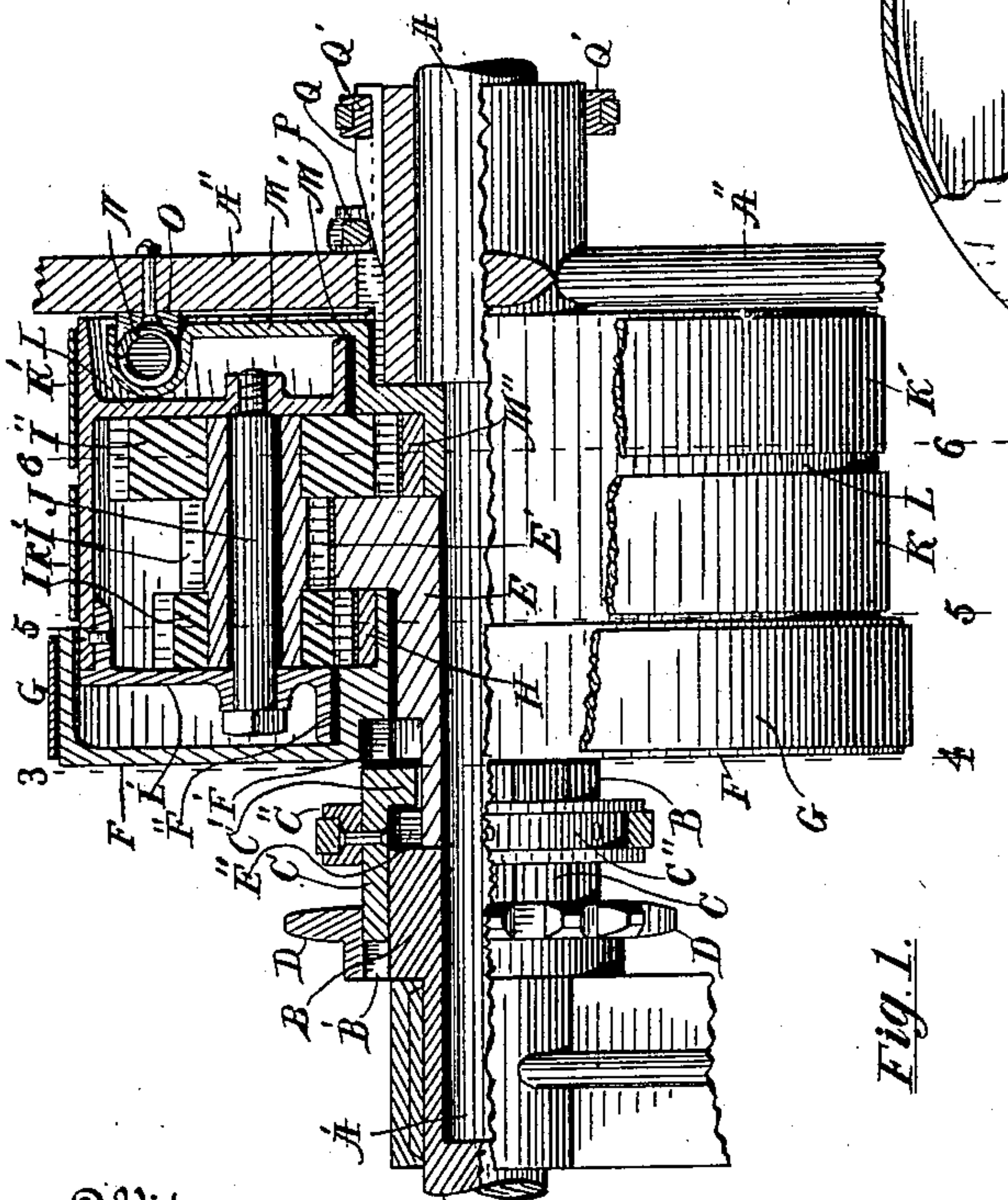


Fig. 1.

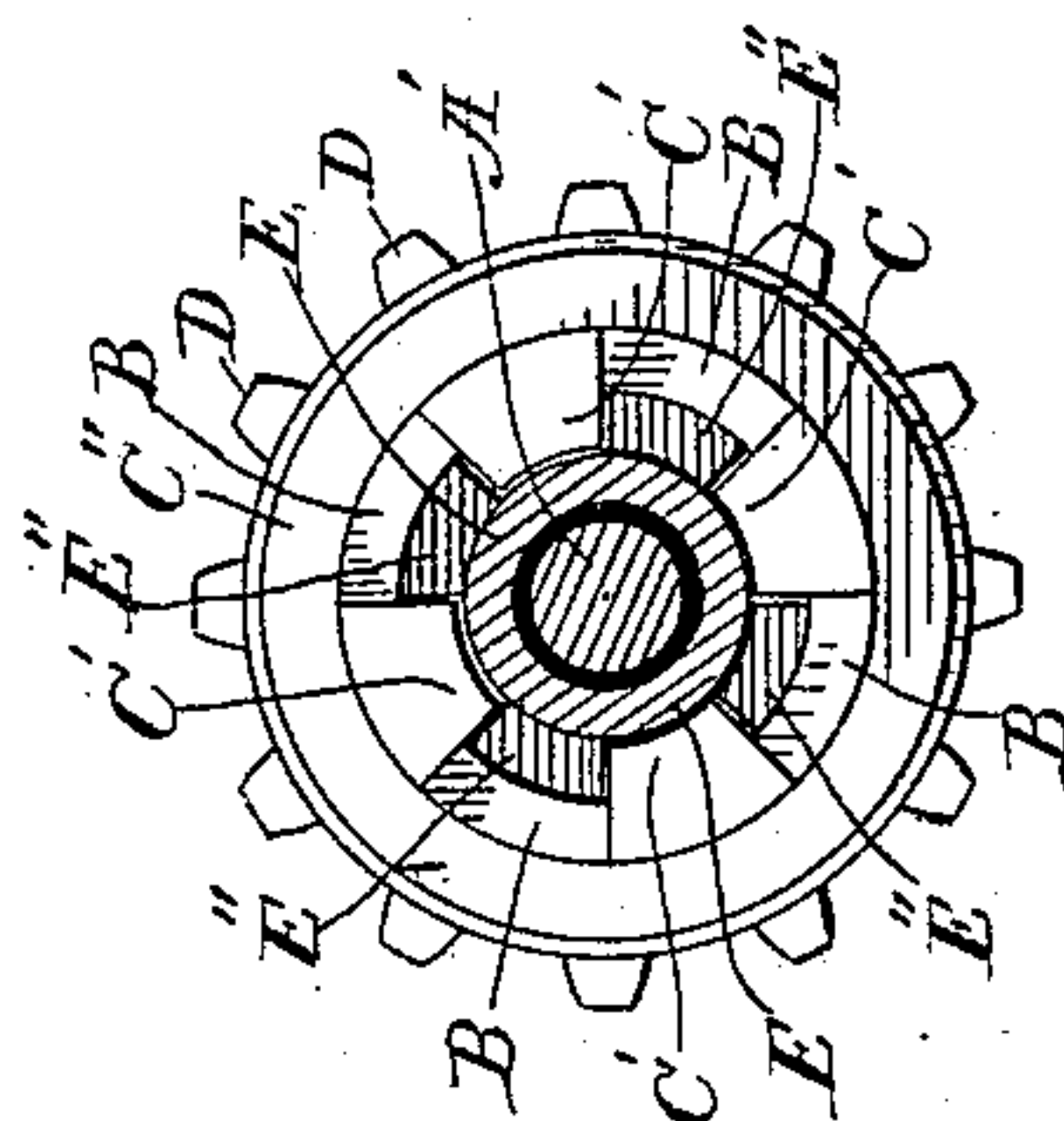


Fig. 3.

Witnesses

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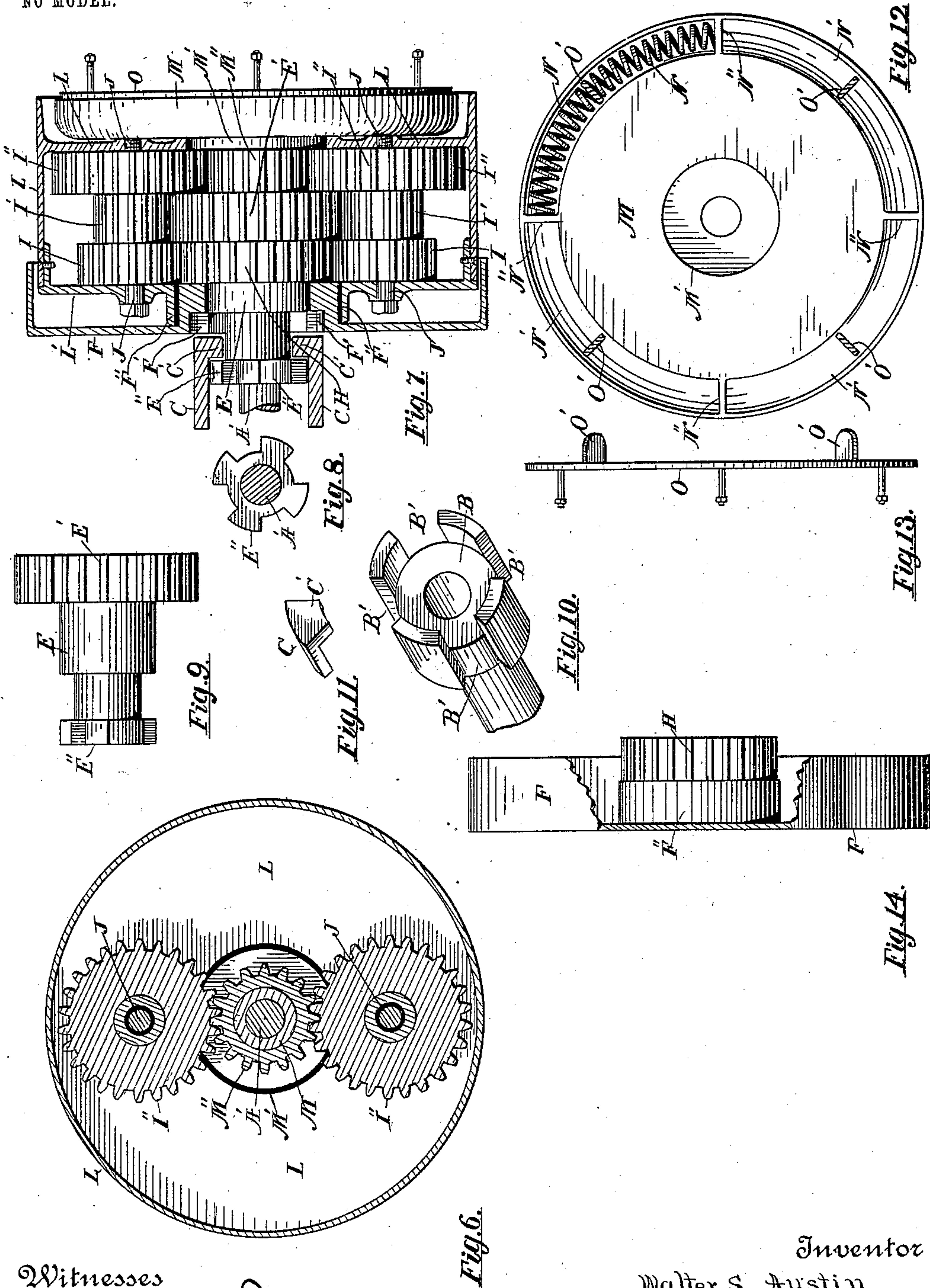
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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

WALTER S. AUSTIN, OF GRAND RAPIDS, MICHIGAN.

## VARIABLE-SPEED GEARING.

SPECIFICATION forming part of Letters Patent No. 725,812, dated April 21, 1903.

Application filed June 23, 1902. Serial No. 112,843. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER S. AUSTIN, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Variable-Speed Gearing; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in variable-speed gearing, and more particularly to such gearing when used in automobiles driven by combustible-vapor engines; and its object is to provide improved means for readily varying the relative speed of the engine and the driven member, to provide improved means for reversing the motion of the driven member without reversing the engine, to avoid strains and shocks, to provide an auxiliary brake, to avoid vibrations due to explosions in the engine, and to provide the device with certain new and useful features hereinafter more fully described, and particularly pointed out in the claims.

My invention consists, essentially, in the combination and arrangement of parts hereinafter more fully described, and which will be more fully understood by reference to the accompanying drawings, in which—

Figure 1 is a side view, partly in section and partly in elevation, of a device embodying my invention; Fig. 2, an end elevation of the same; Fig. 3, a transverse section on the line 3 4 of Fig. 1, showing parts to the left of the line; Fig. 4, the same, showing parts to the right of the line; Fig. 5, a transverse section on the line 5 5 of Fig. 1, showing parts to the left of the line; Fig. 6, the same on the line 6 6 of Fig. 1, showing parts to the right of the line; Fig. 7, a side elevation of the gearing with the case and the wheel F in section; Fig. 8, an end view of the clutch member on the sleeve; Fig. 9, a detail of the sleeve and parts attached; Fig. 10, a perspective detail of the driven member; Fig. 11, a perspective detail of one of the sliding keys; Fig. 12, a detail of the wheel M and the springs therein; Fig. 13, a detail of the driving-ring, and Fig. 14 a detail of the wheel F with a part of the rim broken away.

Like letters refer to like parts in all of the figures.

A represents the driving-shaft, provided with a reduced extension A', extending within the axis of the device, which shaft in practice is given a constant rotary motion by some suitable motor.

A' is a shaft on which the gearing is mounted. It is shown as an extension of the shaft A; but it may be an extension of the driven member or an independently-rotative section of shaft, as most convenient.

B represents the driven member, which is preferably journaled on the shaft A' and provided with a sprocket-wheel D or other convenient means for transmitting motion to the vehicle or other mechanism to which variable and reversible motion is to be imparted. I prefer to mount this member in a suitable bearing, as shown, and extend it in line with the driving-shaft. This driven member B is provided with means for alternately connecting it with the gear H or the gear E', forming parts of two different trains of gears, or disconnecting it from the same altogether at pleasure. For this purpose I provide the said driven member with a cupped end, as shown, to receive a clutch member E'' on the outer end of a sleeve E, journaled on the shaft A', and also with longitudinal grooves or channels B', in which channels are sliding keys C, having inwardly-projecting lugs C' to engage the clutch member E'' and to freely rotate around the sleeve E when disengaged from said clutch member. These sliding keys are simultaneously operated and held by a ring C'', attached thereto, slidable longitudinally on the driven member, and operated by any convenient means. I have shown four; but obviously a greater or less number may be used.

On the inner end of the sleeve E is a gear E', engaged and driven as hereinafter described.

Journaled on the sleeve E and close to the inner end of the driven member B is a wheel F, provided with recesses F' in its hub to receive the ends of the sliding keys C to connect said wheel to the driven member. Surrounding this wheel is a non-rotating brake or band G, provided with any suitable means for tightening the same upon the wheel, whereby the latter is held from rotating when



running the driven member backward or retarded when operating as a brake.

On the inner end of the hub F'' of the wheel F is fixed a gear H, also engaged and  
5 driven as hereinafter described.

Journalled on the shaft A' and near the wheel A'' is a driving-disk L, which is yieldingly connected to the wheel A'' to prevent vibrations due to explosions in a combustible-  
10 vapor engine or motor, when one is used, or to take up the shock due to change of speed or to starting. For this purpose I prefer to provide a channel N' near the periphery of the disk, in which channel is placed a series of  
15 springs N, arranged in pairs in separate compartments formed by transverse abutments N'' in the channel, against which abutment the springs act to drive the disk in either direction. To connect these springs to  
20 the driving-wheel, I prefer to provide a ring O, attached to the driving-wheel opposite the channel and springs and provided with abutments O', extending into the channel N', Fig. 12, and between the respective springs in  
25 each compartment. Fixed on the hub M' of this disk is a driving-pinion M'' to engage and drive the back gears, which transmit motion to the gears E' and H. These back gears consist of two or more series of three gears—viz.,  
30 two pinions I I', of different sizes, engaging the gears H and E', and a gear I'', engaging the pinion M''—each series being rigidly attached to each other and journaled on a bolt J, mounted in a gear-case L, having a detachable head  
35 L'. Said gear-case is journaled on the outside of the hubs F'' and M' and engaged by a non-rotating brake or band K to hold it from turning and also engaged by a rotating band K' to operate as a friction-clutch to connect the case to the wheel A''. The band K  
40 is operated in any convenient manner to hold the case from turning, and the band K' is operated by being adjustably attached to the wheel A'' at one end, as at K'', and attached  
45 at the other end to an arm P', fixed on one end of a rock-shaft R, journaled in a bearing R', attached to said wheel. A lever P, fixed on the other end of the rock-shaft, extends to near the hub of the wheel and is moved out-  
50 ward to tighten the band by a sliding wedge Q, longitudinally movable in a groove in the hub of the wheel and operated by a ring Q', slidable longitudinally on the hub and surrounding the same and operated by any suitable means.  
55

The gear I'' is engaged and driven by the pinion M''. The pinion I' engages and drives the gear E' and sleeve E, and the pinion I engages and drives the gear H and wheel F.  
60 When the sliding keys are in mid-position, as shown in the drawings, the driven member is wholly disconnected from the mechanism. When the driven member is connected to the sleeve E and the case held from turning by the band K, a slow forward speed is the result, the train being through the pinion M'', gear I'', pinion I', and gear E'. When

connected with the wheel F and the case held as before, an intermediate forward speed results, the train being through the pinion M'',  
70 gear I'', pinion I, and gear H. When the case is released by the band K and attached to the driving-wheel by the band K' and the driven member connected to either of the gears H E', the highest forward speed is the  
75 result. The driven member rotates with the same speed as the driving-shaft, being driven by the revolving case connected to the gear E' by the pinions I', which are yieldingly held from rotating about the bolts J by engage-  
80 ment of the gear I'' with the pinion M''. This holding is, however, not rigid, because of the yielding connections between the said pinion and the driving-wheel through the springs N. It will also be observed that the rotation of  
85 the parts on the internal bearings of the device is wholly eliminated at the high speed, which is of great advantage on account of wear, friction, and power saved thereby. To run the driven member backward, it is con-  
90 nected with the sleeve E, as before, the case is wholly released and allowed to rotate, and the wheel F is held from rotating by tightening the band G. The driven member is then driven forward relative to the case at the  
95 slowest speed; but the case is in the meantime driven backward at a greater speed by engagement of the pinion I with the now stationary gear H. The difference in size of the pinions I and I' determines the rate of this  
100 backward movement of the driven member B. By wholly releasing the case and connecting the driven member with the wheel F and tightening the band G the motive power is wholly disconnected from the driven mem-  
105 ber, and the wheel and band will operate as a brake to retard the rotation of the driven member. It will also be observed that by gradually tightening the various bands G, K, and K' the motion may be "picked up"  
110 without any sudden shocks and strains on the mechanism; also, that at all times the springs N operate to ease the strain and shock due to starting the parts in motion, as well as those due to the explosions in the engine.  
115

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of a driving-shaft, a driving-pinion connected to the shaft, a rota-  
120 tive sleeve, a gear fixed on the sleeve, a gear rotative on the sleeve, a driven member, means for alternately connecting the driven member with the sleeve and with said gear, a case rotative about the axis of the sleeve, a  
125 gear and two pinions rigidly attached to each other and journaled in the case and engaging the driving-pinion and the gears on the sleeve, means for holding the case from turning, and means for connecting the case with the driv-  
130 ing-shaft.

2. The combination of a driving-shaft, a driving-pinion connected to the shaft, a rota-  
tive sleeve, a wheel journaled on the sleeve,



a gear attached to the wheel, a driven member, means for alternately connecting the driven member with the wheel, and with the sleeve, a case rotative about the axis of the sleeve, a gear and two pinions rigidly attached to each other and journaled in the case and also engaging the pinion on the shaft and the gears on the sleeve and wheel, and separate means for holding the wheel and the case from turning.

3. The combination of a driving-shaft, a driving-pinion connected to the shaft, a rotative sleeve, a wheel journaled on the sleeve, a gear fixed on the wheel, a driven member, means for alternately connecting the driven member with the sleeve and with the wheel, a case rotative about the axis of the sleeve, a gear and two pinions rigidly attached to each other and journaled in the case and also engaging the driving pinion and the gears on the sleeve and wheel, separate means for holding the wheel and case from turning, and means for connecting the case with the driving-shaft.

4. The combination of a driving-shaft, a driving-pinion connected to the shaft, a rotative sleeve, a gear and clutch member on the respective ends of the sleeve, a hub journaled on the sleeve, and having recesses, a gear attached to the hub, a driven member having longitudinal grooves, sliding keys in said grooves and adapted to alternately engage the clutch member and the said recesses, means for operating the keys, and a gear and two pinions rigidly attached to each other, and engaging the driving-pinion and the gears on the sleeve and hub.

5. The combination of a driving-shaft, a driving-pinion connected to the shaft, a rotative sleeve, a clutch member and a gear on the sleeve, a wheel journaled on the sleeve and provided with recesses, a gear fixed on the wheel, a driven member having longitudinal grooves, sliding keys in said grooves and engaging the recesses and having inwardly-projecting lugs to engage the clutch, means for operating the keys, a case rotative about the axis of the sleeve, a gear and two pinions rigidly attached to each other and journaled in the case and engaging the driving-pinion and the gears on the sleeve and wheel, separate means for holding the wheel and case from turning, and means for connecting the case and shaft.

6. The combination of a driving-shaft, a hub journaled on an extension of the shaft, means for yieldingly connecting the hub and shaft, a driving-pinion fixed on the hub, a rotative sleeve, a gear fixed on the sleeve, a hub journaled on the sleeve, a gear fixed on the hub, a driven member, means for alternately connecting the driven member with the sleeve and with the last-named hub, a case journaled on the hubs, a gear and two pinions journaled in the case and engaging the pinion and gears on the hubs and sleeve, means

for holding the case from turning, and means for connecting the case to the driving-shaft.

7. The combination of a driving-shaft, a hub journaled on an extension of the shaft, means for yieldingly connecting the hub and shaft, a driving-pinion fixed on the hub, a rotative sleeve, a gear fixed on the sleeve, a wheel having a hub journaled on the sleeve, a gear fixed on said hub, a driven member, means for alternately connecting the driven member to the sleeve and to the wheel-hub, a case journaled on the hubs, a gear and two pinions journaled in the case and engaging the pinion and gears on the hubs and sleeve, separate means for holding the wheel and case from turning, and means for connecting the case to the shaft.

8. The combination of a driving-shaft, a driving-wheel on the shaft, a hub and a sleeve journaled on an extension of the shaft a disk provided with chambers and fixed on the hub, a driving-pinion fixed on the hub, springs in the chambers, a ring attached to the driving-wheel and having abutments extending into the chambers and engaging the springs, a rotative sleeve, a gear and clutch member on the sleeve, a wheel having a hub provided with recesses and journaled on the sleeve, a gear fixed on the hub, a driven member journaled on the extension of the shaft and having longitudinal grooves, sliding keys in said grooves and engaging the clutch member and the recesses, a case journaled on the hubs, a gear and two pinions journaled in the case and engaging the pinion and gears on the hubs and sleeve, separate means for holding the wheel and the case from turning and means for connecting the case with the driving-wheel.

9. The combination of a driving-shaft having an extension, a sleeve journaled on said extension, a gear on the inner end of the sleeve, an outwardly-projecting clutch member on the other end of the sleeve, a hub journaled on the sleeve, and having recesses in its outer end, a gear fixed on the inner end of the hub, a driven member journaled on the extension of the shaft and having a cupped end surrounding the clutch member, and longitudinal grooves in its outer surface, sliding keys in the grooves to engage the recesses and inwardly-projecting lugs on the keys to engage the clutch member, and means for holding and sliding the keys.

10. The combination of a driving-shaft, a driving-wheel fixed thereon and having a groove on its hub, a driving-pinion connected to the wheel, a rotative sleeve, a gear fixed on the sleeve, a hub journaled on the sleeve, a gear fixed on the hub, a driven member, means for alternately connecting the same with the sleeve and with the hub, a case rotative about the sleeve, a gear and two pinions journaled in the case, and engaging the driving-pinion and the gears on the sleeve and hub, means for holding the case from ro-



tating, a band surrounding the case and adjustably attached to the driving-wheel, a rock-shaft journaled in a bearing attached to said wheel, a lever on the rock-shaft, a sliding wedge in the groove of the driving-wheel hub and engaging the lever, a ring engaging the wedge and slidable on the hub, and an arm fixed on the rock-shaft and attached to the other end of the band.

11. The combination of a driving-shaft, a driving-wheel fixed on the shaft, a hub journaled on an extension of the shaft, a disk and a pinion fixed on the hub, abutments on the disk and driving-wheel, springs engaging the abutments a sleeve journaled on the shaft, a clutch member and a gear on the sleeve, a hub journaled on the sleeve, and having recesses, a gear fixed on the hub, a driven member, sliding keys in the driven member to engage the clutch member and the recesses, a case journaled on the hubs, a gear and two pinions journaled in the case and engaging the pinion and gears on the hubs and sleeve, bands severally engaging the wheel and the case to hold each from turning, a band surrounding the case and attached to the driving-wheel at one end, a lever connected to the other end of the band, a sliding wedge engaging the lever, and means for sliding and holding the wedge.

12. The combination of a driving-shaft, a sleeve rotative on an extension of the shaft, a hub rotative on the sleeve and having recesses, gearing adapted to drive the sleeve and hub at different speeds, outwardly-projecting clutch members on the sleeve, a driven member near the sleeve, longitudinal grooves in the driven member, sliding keys in the grooves, and engaging the recesses when moved outward, inwardly-projecting lugs on the keys engaging the clutch members when the keys are moved inward and revolving freely around the sleeve when the keys are in mid-position, and a ring slidable on the

driven member and connected to the keys to operate the same.

13. The combination of two gears of different diameters and revolving independently around a common axis, a driven member, means for alternately connecting the driven member to the respective gears, two pinions of different diameters rigidly connected to each other and respectively engaging the said gears, and also journaled on a common bearing adapted to revolve about the axis of the first-named gears, means for rotating the said pinions on said bearings and also about the axis of the gears, means for preventing the rotation of the smaller gear about its axis, and means for preventing the revolution of the bearing of the pinions around the axis of the gears.

14. The combination of a driving-pinion, and two driven gears of unequal diameter all independently revoluble about a common axis, a corresponding series of a gear and two pinions respectively engaging the driving-pinion and driven gears and rigidly connected to each other and also journaled on a common axis adapted to revolve around the axis of the driving-pinion and driven gears, a driven member, means for alternately connecting the driven member with the respective driven gears, means for preventing the revolution of the smaller driven gear, means for preventing the revolution of the attached gear and pinions about the axis of the driving-pinion and driven gears, means for rotating the driving-pinion about its own axis, and means for driving the attached gear and pinions about the axis of the driving-pinion and driven gears.

In testimony whereof I affix my signature in presence of two witnesses.

WALTER S. AUSTIN.

Witnesses:

LUTHER V. MOULTON,  
JENNIE M. SLOANE.