

(No Model.)

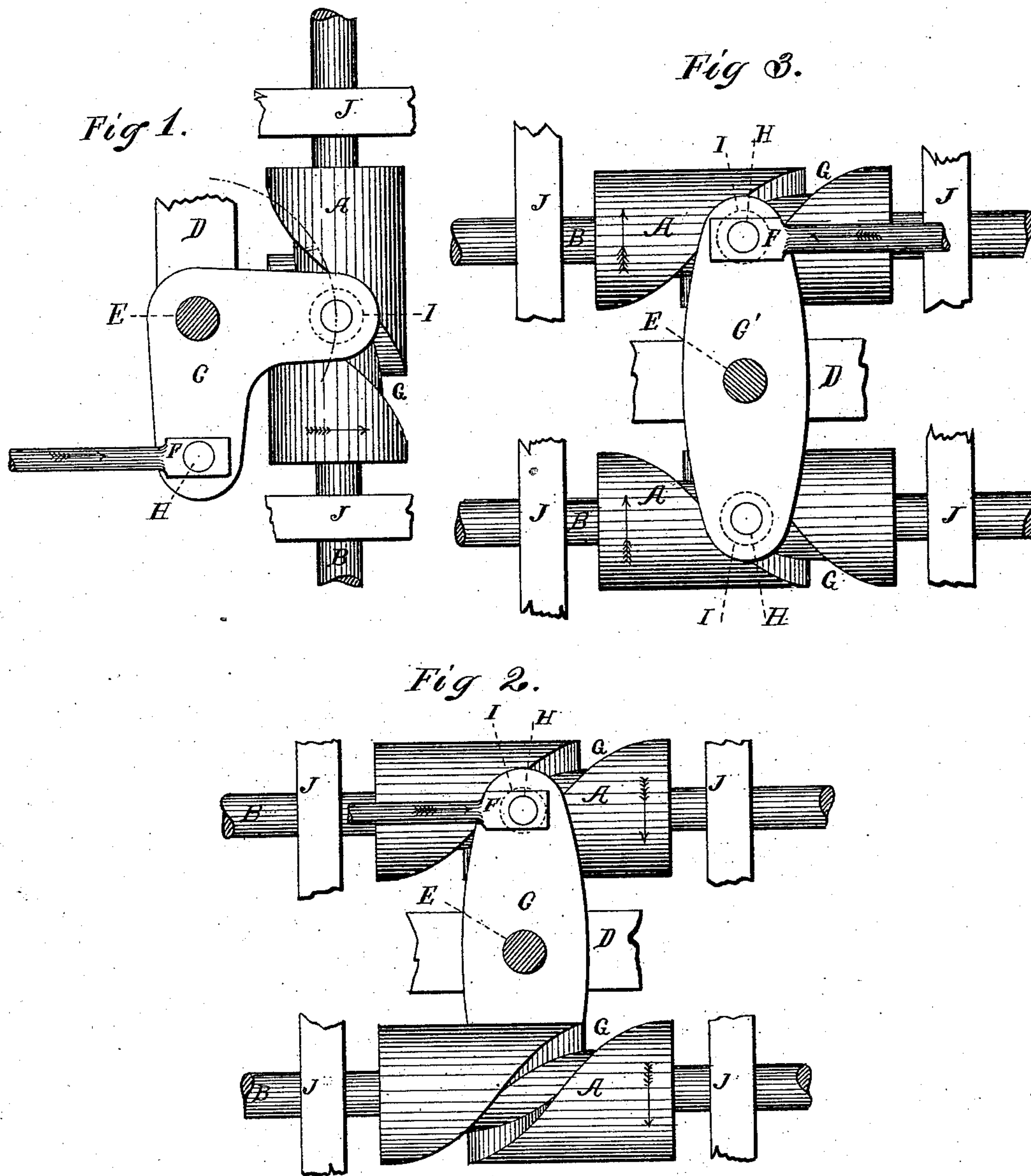
2 Sheets—Sheet 1.

R. CAMPBELL.

GEARING.

No. 290,855.

Patented Dec. 25, 1883.



Witnesses.  
J. W. Garner  
A. S. Patterson

Inventor.  
Robt. Campbell,  
per  
J. A. Lehmann,  
Attorney.

(No Model.)

2 Sheets—Sheet 2.

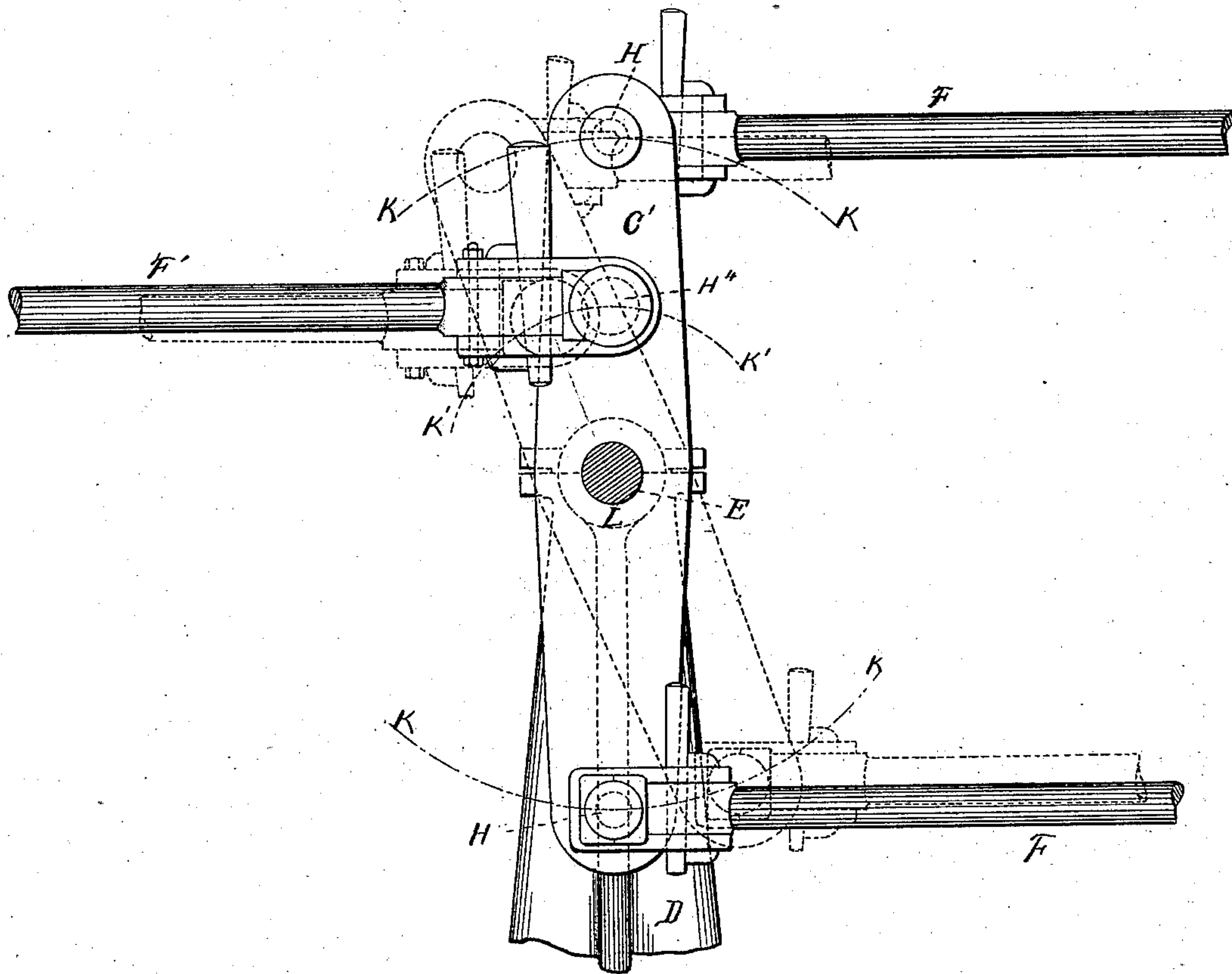
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*Fig 4.*



Witnesses.

J. W. Garner  
as Attorney

Inventor  
Robt. Campbell  
per  
J. A. Lehmann,  
att'y.



# UNITED STATES PATENT OFFICE.

ROBERT CAMPBELL, OF ALLEGHENY, PENNSYLVANIA.

## GEARING.

SPECIFICATION forming part of Letters Patent No. 290,855, dated December 25, 1883.

Application filed May 24, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT CAMPBELL, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Gearing, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to an improvement in gearing in which a lever receiving its motion through the medium of a piston-rod, connecting-rod, or other device engages and operates a cylindrical spindle or a connecting-rod engaging a crank.

The object of my invention is to obtain greater leverage, power, speed, economy, and general adaptability of construction in the conversion of right-line, right-line reciprocating, and oscillating motion into rotary motion. I attain these objects by mechanism of which the accompanying drawings are an illustration.

Figure 1 represents a lever, C, fulcrumed on a pin, E, which is firmly affixed to the standard or support D. The lever C engages a groove, G, in the surface of the cylindrical spindle A. B represents a shaft; H, the attachment of the connecting-rod F.

Fig. 2 shows a double lever, C', engaging two spindles at opposite sides.

Fig. 3 also represents a double lever engaging two grooves, G G, having their respective pitches reversed to each other.

Fig. 4 shows a lever intended to operate one or more connecting-rods, or to be operated by one or more connecting-rods or pistons.

Similar letters refer to similar parts throughout the several views.

To set forth the distinctive character and operation of the device, it is necessary to state that it is believed that the direct conversion of right-line or right-line reciprocating motion into rotary motion is attended with loss of power and speed, and is less economical and adaptable than where oscillating motion adapted to the production of resultant arcs is employed as an intermediate operation. To exemplify this feature, reference being had to Fig. 1, it will be seen that the effective end of the lever C describes an arc, which, from the position of the fulcrum E, is convex to the side of the groove G farthest from the fulcrum,

and concave to the side nearest the fulcrum, the convex arc producing epicycloidal and the concave hypocycloidal action, the first being shown in Fig. 1, the second in Fig. 2, and both in Fig. 3. These actions have an increase or decrease of speed or power, according to their respective distances from the fulcrum. The rise and fall of tangential bearing upon the anti-friction roller I consequent to the convexity of the surface of the cylinder, while offering little impediment to the action, produces a more uniform wear upon the roller, its pin or stud. The curve of the arc also serves to aid in crossing the centers or the reverting curves of the groove G at the end of the stroke of the lever. It will be seen in Fig. 1 that the motive force passes over the fulcrum, which is placed between the connecting-rod F and the engaged or effective end of the lever C. In Figs. 2 and 3 the motive force acts directly upon one of each pair of cylindrical spindles, and through the medium of the lever on the other spindles. It is evident that the connecting-rod may be connected with the lever at any available point. For example, in Fig. 4, let either of the connecting-rods F be connected with a crank, (not shown,) the operative piston or connecting rod F' being connected with the lever C' at one-half the distance of the connecting-points of either of the other rods F from the fulcrum E, the resultant arcs K' and K will measure the piston-stroke or the stroke of a motive connecting-rod and the crank-stroke or effective stroke, respectively. The piston-stroke may thus be made greater or less than the crank-stroke, and this provision may afford the choice of speed, power, economy, or other accruing advantage attendant upon this mode of construction and operation.

Having given the plainest statement of what I claim as my invention, I disclaim any method of directly converting right-line motion or right-line reciprocating motion into rotary motion.

I do not claim a regular spiral groove or a uniform cylindrical spindle as essential to the effects or objects sought by this contrivance. It can be easily shown that uniform motion can be secured without a spiral groove and without a regular cylinder.

I also disclaim the application of a slotted

or grooved driving head or wheel as an operative or effective attachment to the lever herein referred to or described; but

What I claim, and desire to be protected by  
5 Letters Patent, is—

1. In gearing, a lever engaged and operated to produce a resultant arc or limited stroke, substantially as and for the purposes set forth.

2. In gearing, a cylinder having tangential  
10 bearings at a greater or less distance from the axis, and conforming to the action of an engaged lever, in combination with it, substan-

tially as described, and for the purposes set forth.

3. In gearing, one or more connecting-rods, 15 in combination with a lever, substantially as shown and described, and for the purpose set forth.

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

ROBERT CAMPBELL.

Witnesses:

JAMES H. PORTE,

JOS. H. JACOBS.