

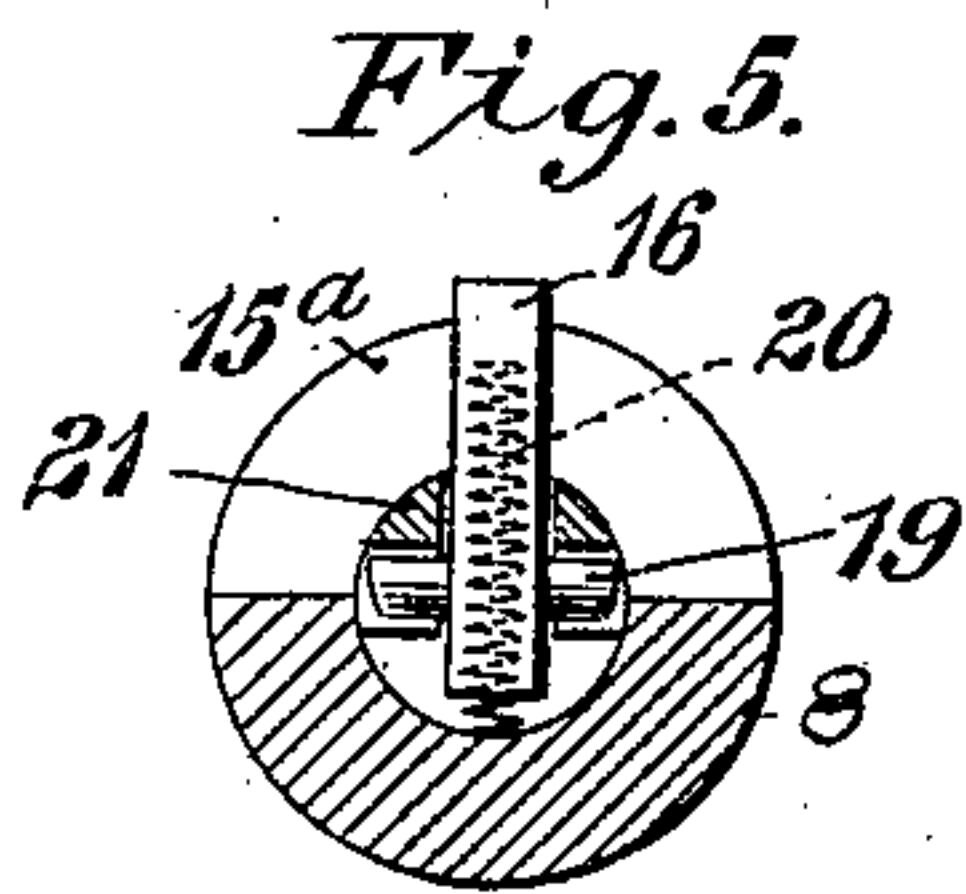
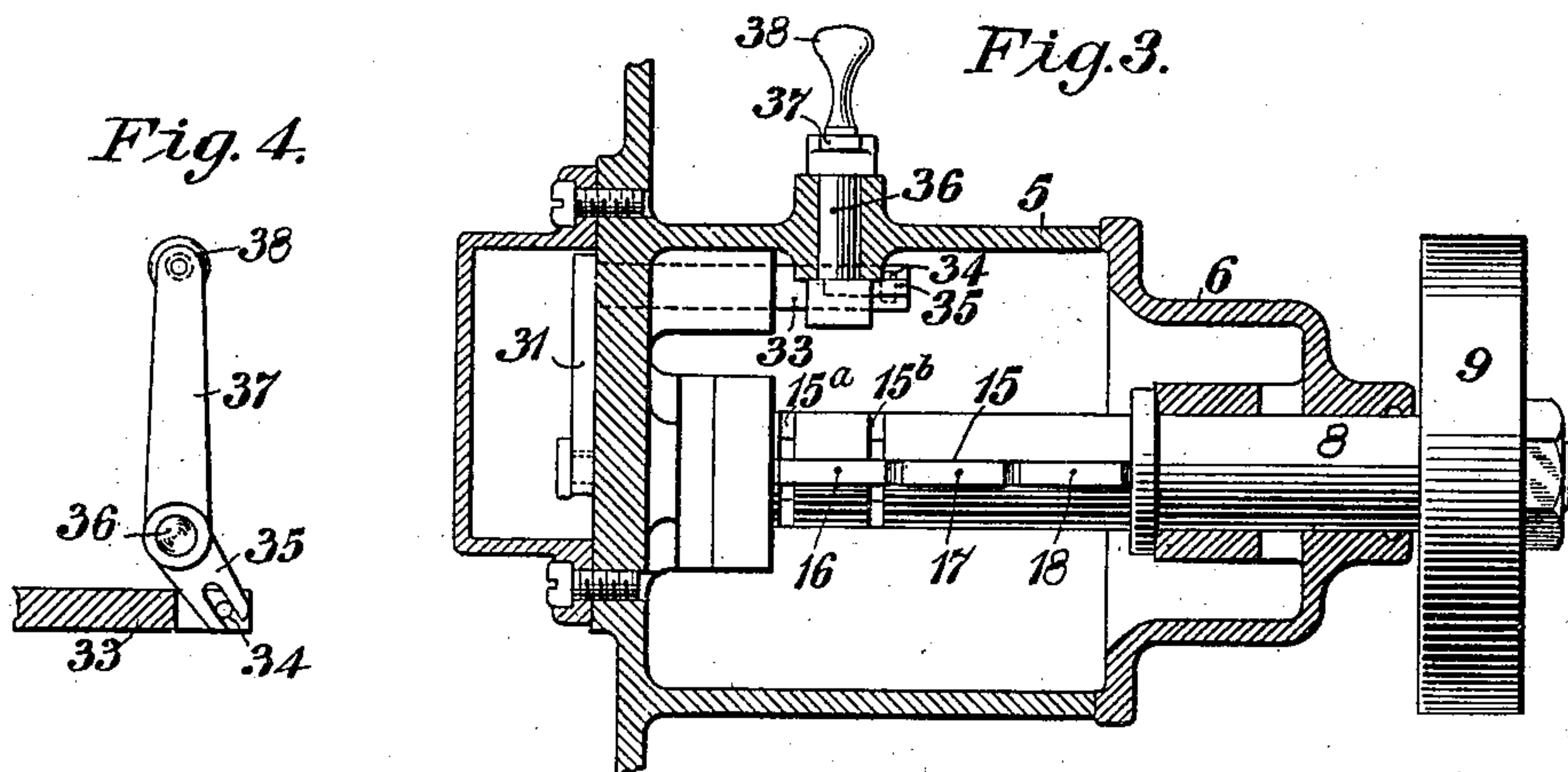
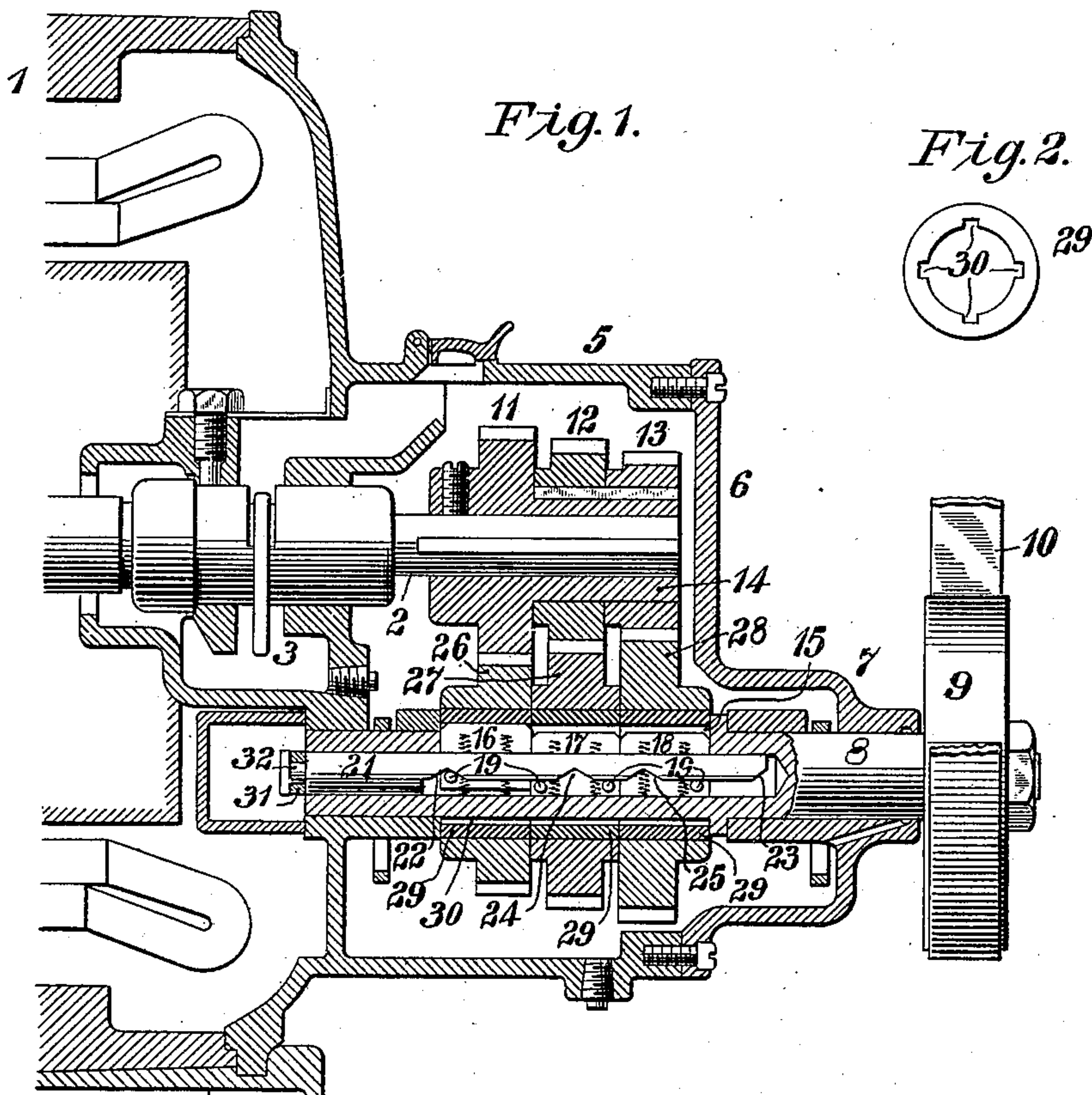
No. 710,225.

Patented Sept. 30, 1902.

C. C. TYLER.  
SPEED CHANGING DEVICE.

(Application filed May 8, 1901.)

(No Model.)



WITNESSES:

C. L. Belcher  
Birney Hines

INVENTOR

Charles C. Tyler

BY

Wesley E. Carr  
ATTORNEY.



# UNITED STATES PATENT OFFICE.

CHARLES C. TYLER, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

## SPEED-CHANGING DEVICE.

SPECIFICATION forming part of Letters Patent No. 710,225, dated September 30, 1902.

Application filed May 8, 1901. Serial No. 59,332. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES C. TYLER, a citizen of the United States, residing in Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Speed-Changing Devices, of which the following is a specification.

My improvement relates to speed-changing mechanism, and particularly to means employed for securing a plurality of different speeds from a shaft or axle that operates at a single uniform speed.

The object of my invention is to provide mechanism of simple and inexpensive construction that may be readily manipulated to obtain the pulley speed desired and that is not liable to become broken or disarranged in use.

My invention is susceptible of embodiment in apparatus having a variety of forms and arrangements of parts and of application to shafts or axles driven by any suitable means and at any rate of speed.

As illustrative of one use of my invention I have shown it applied to the shaft of a poly-phase alternating-current electric motor, Figure 1 of the accompanying drawings being a longitudinal sectional view of my device and one end of the motor to which it is applied, parts of the apparatus being broken away. Fig. 2 is a detail view of one of the parts of the mechanism. Fig. 3 is a longitudinal sectional view of the apparatus illustrated in Fig. 1, the section being taken in a horizontal plane and the gearing being removed. Fig. 4 is a detail view of an adjusting-crank, and Fig. 5 is a sectional detail view of one portion of the speed-adjusting apparatus.

The electric motor 1, which, as has already been stated, is merely indicative of my means for driving a shaft or axle at approximately uniform speed, has a shaft 2, mounted in suitable bearings in the casing or frame of the motor. One of these bearings 3 is located in an integral lateral extension 5, provided with an end plate 6, the latter being provided with a bearing 7 for the auxiliary shaft 8, which is suitably geared to the machine which it is desired to drive at different rates of speed. The gearing here indicated consists of a pulley 9 and a belt 10, other types of gearing being obviously susceptible of use, if

desired. The motor-shaft 2 is shown as provided with three gear-wheels 11, 12, and 13, of different diameters and different numbers of teeth, corresponding to the different speeds desired. As indicated, the gear-wheels 12 and 13 are mounted upon and keyed to the hub 14 of the gear-wheel 11; but all of these gears obviously might be keyed directly to the shaft 2, if desired. The auxiliary shaft 8 is hollow and is provided at one side with a longitudinal slot 15 of sufficient length and width to receive three removable and adjustable keys 16, 17, and 18, and with two transverse slots 15<sup>a</sup> and 15<sup>b</sup> near one end. Each of the keys 16 and 18 is provided with a pin 19, that projects laterally from both sides of the key, and the middle key 17 is provided with two pins 19, which, respectively, have the same relative location in the key as the pins in the keys 16 and 18. Each of the keys is also provided with two cylindrical sockets in which are located coiled springs 20, that project beyond the lower edge of the key in order to force the key out of its slot, when it is free to move in the outward direction.

Coöperating with the keys 16, 17, and 18 is an adjustable cam-plunger 21, the diameter of the cylindrical portion of which is substantially the same as that of the bore of the shaft 8, the fit being such that the bar may slide easily back and forth in its socket. The cam-plunger is provided with a notch 22 near one end and is cut away, as indicated at 23, at the other end. At two intervening points notches 24 and 25 are provided. These notches and the cut-away end portion are so spaced apart that as the bar is moved longitudinally the pins 19 are successively forced into the corresponding notches by the springs in the corresponding keys 16, 17, and 18.

Three gear-wheels 26, 27, and 28 are loosely mounted upon the shaft 8, respectively in the planes of the gear-wheels 11, 12, and 13, so as to mesh with the latter, each pair of intermeshing wheels being reversely proportioned as to diameters and number of teeth. Each of the gear-wheels 26, 27, and 28 has a bushing 29, which is provided with four keyways or grooves 30, equally spaced apart and of such size and shape as to receive the edge of the corresponding adjustable key when the latter is moved outward under the action of



its springs 20 to lock the corresponding wheel to the shaft 8.

As a means for adjusting the cam-plunger 21 I provide an arm 31, having a bifurcated end that engages a reduced portion 32 at one end of the cam-plunger, as indicated in Figs. 1 and 3. The other end of the arm 31 is fastened to one end of a bar 33, that is mounted so as to reciprocate longitudinally and is provided at its other end with a pin 34, with which engages the bifurcated end of a lever-arm 35. The lever-arm 35 is rigidly mounted upon one end of a short shaft 36, that is mounted in suitable bearings in the framework or casing 5 and at its outer end is provided with a lever-arm 37, having an operating-handle 38. It will be seen that by moving the handle 38 forward or backward the cam-plunger will be correspondingly reciprocated, and if suitable marks are provided on the casing 5 or on an indicator-plate fastened thereto the handle may be moved to exactly the position desired for any given speed of the shaft 8. With the cam-plunger in the position indicated in Fig. 1 the gear-wheel 26 is locked to the shaft 8, and consequently a maximum speed of the shaft 8 is secured. If the handle 38 be now actuated to move the cam-plunger toward the motor, the key 16 will be withdrawn from the keyway 30 in the corresponding bushing 29 and the springs of the key 17 will force it outward into one of the keyways of the corresponding bushing 29. The gear-wheel 27 will be thus locked to the shaft 8, and the latter will be rotated at the intermediate speed. A still further movement of the cam-plunger in the same direction by means of the handle 38 and the intermediate mechanism will serve to withdraw the key 17 from the bushing-keyway and will permit the pin 19 of the key 18 to drop into the notch or cut-away portion 23 at the end of the plunger as the key is forced outward by its springs. The gear-wheel 28 being thus locked to the shaft 8 and the other gear-wheels released, the shaft will be rotated at its lowest speed.

The middle key 17 is provided with two pins 19, in order to insure a straight-line movement of the key; but a single pin might be employed, the same as with the keys 16 and 18, or the keys 16 and 18 might each be provided with two pins if a proper construction of operating means should be employed, so that when any one of the keys might be projected by its springs to lock the corresponding gear-wheel to the shaft the other keys would be held in their inward position to permit free rotation of the corresponding wheel. The slots 15<sup>a</sup> and 15<sup>b</sup> are so spaced and located as to receive the pins 19, and thus permit of the insertion of the keys 18, 17, and 16 in the order named and the removal of the same in the reverse order.

It will be understood that other means for locking and releasing the gear-wheels may be employed and that where gear-wheels of greater dimensions are employed a plurality

of plungers having cams and notches so arranged as to provide a permutation locking arrangement may be employed, if desired. It will be also understood that a different number of gear-wheels may be utilized in order to obtain a different number of speed variations, if desired, and that the mechanism is susceptible of other variations without departing from the spirit and scope of my invention.

I claim as my invention—

1. The combination with a rotatable shaft having a plurality of gear-wheels keyed thereon, of a supplemental shaft having a plurality of gear-wheels loosely mounted thereon in position to mesh with the wheels mounted on the first-named shaft, a plurality of keys mounted in the second shaft, springs tending to force said keys outward to lock the gear-wheels to the shaft and a cam-plunger for withdrawing all or all but one of said keys from locking position.

2. The combination with a shaft having a plurality of gear-wheels of different diameters keyed thereto, of a supplemental shaft having gear-wheels of different diameters loosely mounted thereon in position to mesh with the gear-wheels on the first-named shaft, a plurality of keys provided with lateral projections and movably mounted in the supplemental shaft, springs for moving said keys into engagement with the corresponding gear-wheels and a cam-plunger for engaging said projections to withdraw the keys from the corresponding gear-wheels.

3. The combination with a driving-shaft having a plurality of gear-wheels of different diameters keyed thereon, a second shaft having a corresponding number of gear-wheels of different diameters arranged to mesh with the first-named gear-wheels, keys corresponding in number and position to the gear-wheels on the second shaft and provided with lateral projections, springs tending to force said keys outward and means for engaging the projections on all but one of said keys to hold said keys out of engagement with the corresponding gear-wheels.

4. The combination with a driving-shaft having a plurality of gear-wheels of different diameters keyed thereon, of a second shaft having a corresponding number of gear-wheels of different diameters loosely mounted on the shaft in position to mesh with the first-named wheels, spring-actuated keys mounted in the second shaft and provided with lateral projections, a cam-plunger located in said shaft and means for shifting said plunger longitudinally to engage the projections on the keys and move them inwardly in opposition to their springs.

In testimony whereof I have hereunto subscribed my name this 6th day of May, 1901.

CHARLES C. TYLER.

Witnesses:

JAMES B. YOUNG,  
WESLEY G. CARR.