No. 672,962. Patented Apr. 30, 1901.

D. S. SEYMOUR.

VARIABLE SPEED DEVICE.

(Application filed Sept. 1, 1900.)

(No Model.) 2 Sheets—Sheet 1.

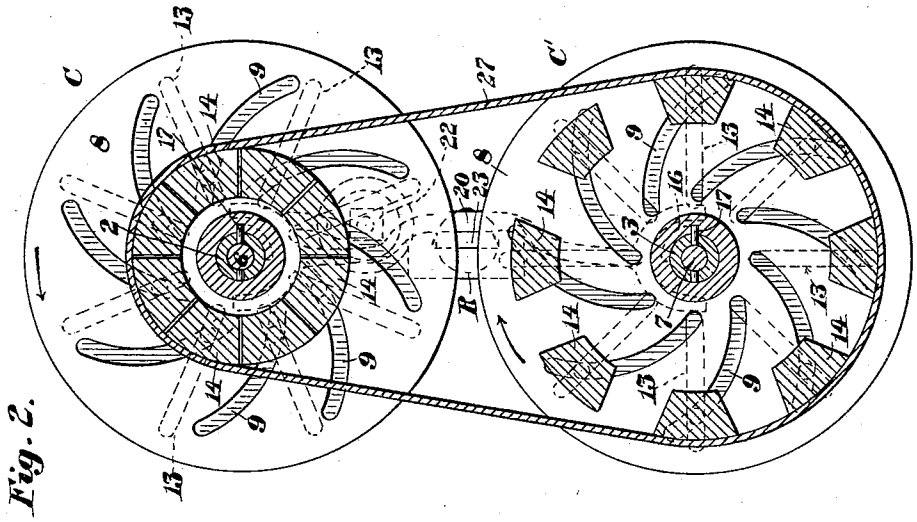


Fig. 2.

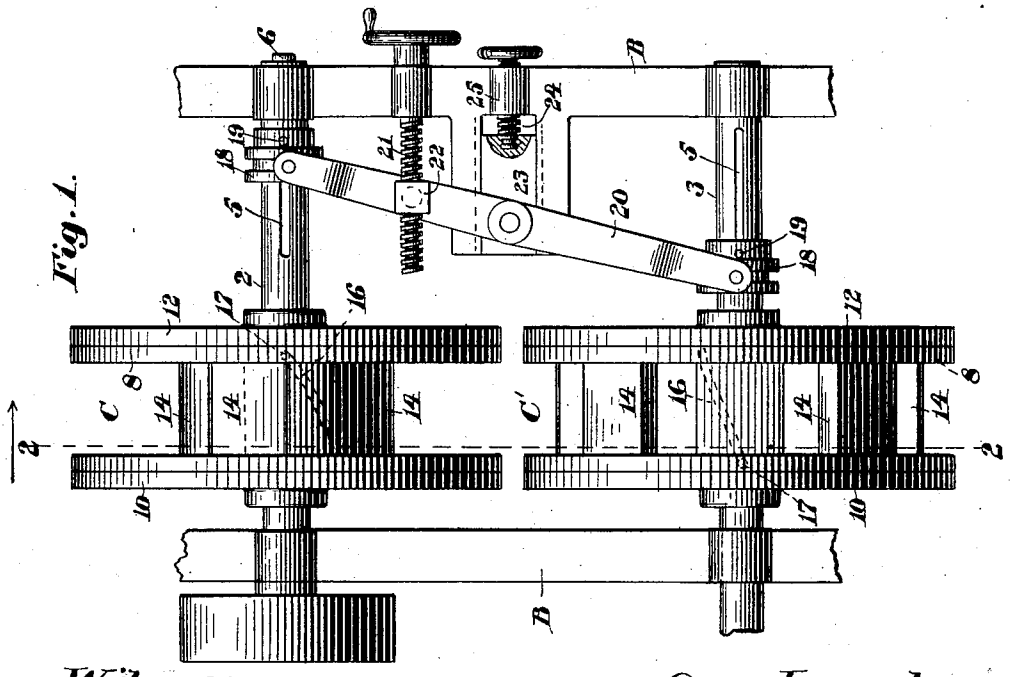


Fig. 1.

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Fig. 3.

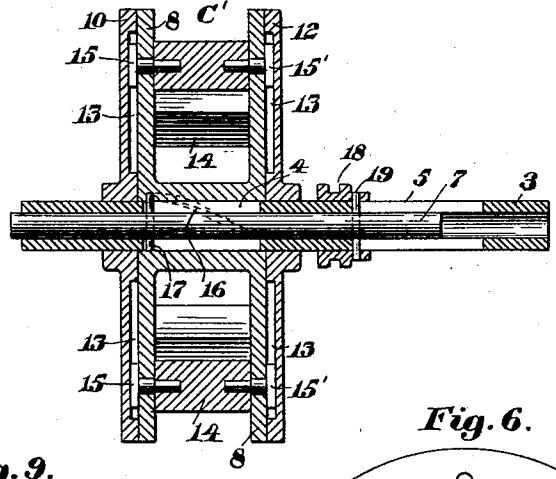


Fig. 9.

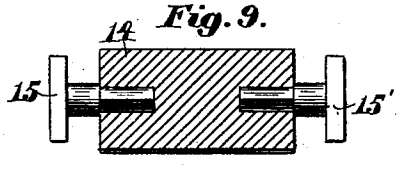


Fig. 8.

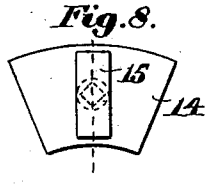


Fig. 6.

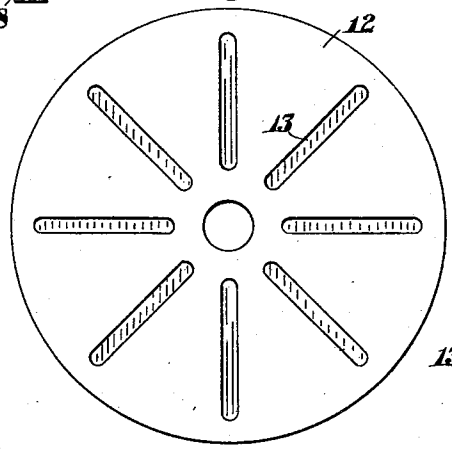


Fig. 7.

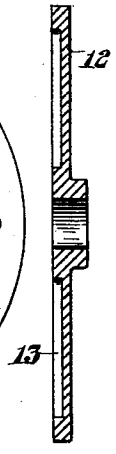


Fig. 4.

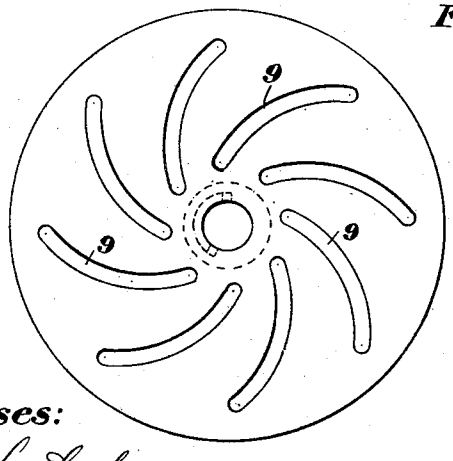
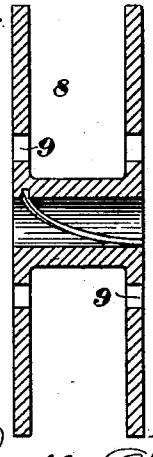


Fig. 5.



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UNITED STATES PATENT OFFICE.

DUDLEY S. SEYMOUR, OF HARTFORD, CONNECTICUT.

VARIABLE-SPEED DEVICE.

SPECIFICATION forming part of Letters Patent No. 672,962, dated April 30, 1901.

Application filed September 1, 1900. Serial No. 28,796. (No model.)

To all whom it may concern:

Be it known that I, DUDLEY S. SEYMOUR, a citizen of the United States of America, and a resident of the city and county of Hartford, in the State of Connecticut, have invented certain new and useful Improvements in Variable-Speed Devices, of which the following is a specification.

This invention relates to variable-speed devices, one object of the invention being to produce a simplified, durable, and efficient variable-speed device of compact construction and organization embodying a driving and a driven shaft and novel instrumentalities whereby the velocities of the two shafts may be simultaneously increased or decreased, as desired, and whereby the ratio of momenta thereof may be arbitrarily, gradually, and infinitesimally varied.

A further object of the invention is to provide a variable-speed device embodying a driving and a driven shaft, an expansion-pulley mounted upon each shaft and each having a plurality of radially-adjustable rim sectors or segments and a rotary carrier therefor, a reciprocatory actuator in connection with each shaft and effective on a movement thereof for imparting a rotative movement to the carrier independent of the rotary movement of the shaft, means operative on an independent movement of the carrier by the actuator for imparting radial movements to the rim-sector, and means, including a pivotally-supported lever connecting the two actuators, for imparting reciprocatory movements to the two actuators concurrently in opposite directions.

With these objects in view the invention consists in certain details of construction and in the combination and arrangement of the several parts of the variable-speed device, substantially as hereinafter described, and more particularly pointed out in the claims.

In the drawings accompanying and forming part of this specification, Figure 1 is a side elevation of one form of variable-speed device embodying the present invention, a portion only of the framework being shown and a part of the slide on which the shifting lever is mounted being broken away. Fig. 2 is a vertical cross-section taken on the dotted line 2 2 in Fig. 1 looking in the direction of the arrow. Fig. 3 is a central vertical section of a portion of one of the shafts, one expansion-pulley, and reciprocatory actuator. Fig. 4 is a face view of the spool-like rotative sector-carrier, which constitutes one element of the expansion-pulley. Fig. 5 is a central vertical section of the element shown in Fig. 4. Figs. 6 and 7 are face and sectional views, respectively, of one of the sector-guiding disks; and Figs. 8 and 9 are end and sectional views, respectively, of one of the rim-sectors, the sectional view being taken on the vertical dotted line in Fig. 8.

Similar characters designate like parts in all the figures of the drawings.

In the preferred construction and organization thereof (illustrated most clearly in Figs. 1, 2, and 3 of the drawings) the variable-speed device in its entirety comprises a frame B, (partly shown,) which may be of any suitable construction; two hollow shafts 2 and 3, journaled at opposite ends in the framework, and one of which may constitute a driving-shaft and the other a driven shaft, and both of which are shown having longitudinal slots or keyways 4 and 5 extending from the inner to the outer edge thereof; two expansion-pulleys (designated in a general way by C and C′) mounted upon the shafts 2 and 3; two reciprocatory actuators 6 and 7, supported for longitudinal movement within the shafts 2 and 3 and in coöperative relation with the adjusting elements of the expansion-pulleys and adapted for imparting relatively opposite rotative movements to said elements concurrently, and actuator-shifting means in operative connection with the two actuators and effective for imparting reciprocatory movements to said actuators simultaneously in opposite directions relatively.

In the drawings the expansion-pulleys are shown of substantially duplicate construction and organization, (like parts being designated by like characters,) and each consists, in one preferred form thereof shown, of a central spool-like rim-sector carrier or adjusting member 8, having two end disks or plates connected by an integral tubular hub and each disk having a plurality of radiating spirally-disposed sector-adjusting cams, (shown as cam-grooves 9;) sector-guiding

means (shown as two guiding disks or plates 10 and 12) disposed in coöperative relation with the two disks of the central member and each having a plurality of rectilinear radial guiding grooves or slots 13 formed, preferably, in the inner faces of and extending only part way through the same and in coöperative relation with spiral cam-grooves 9 of the two disks of the central member, each radial guiding-groove being disposed longitudinally in a plane intersecting the spiral plane of one cam-groove, and a plurality of rim sectors or segments 14, supported for radial adjustment between the inner faces of the two disks of the central member and having fixed projections 15 and 15′ at opposite ends thereof, extending through the spiral cam-grooves in the opposite disks of the central member into the radial grooves of the two guiding-disks 10 and 12, respectively, the outer ends of said projections having plane faces fitting between the side walls of the guiding-grooves and preventing rotative movements of the rim-sectors about the axes of their respective projections during radial adjustments thereof.

In practice the central member 8 will preferably constitute the adjusting member for the rim-sectors, the flanges or disks of said member having the spiral cam-grooves formed therein, as described; but it will be obvious that these disks might be constructed with rectilinear radial slots and the two outside disks with spiral grooves instead of straight radial grooves, as shown, and that these outside disks might constitute the adjusting members for the rim-sectors. Therefore it is distinctly to be understood that I do not desire to limit myself to the particular construction and organization of these parts as illustrated in the accompanying drawings, as they may be variously modified, within certain limits, without departure from this invention.

The spiral grooves 9 are so disposed with relation to the rectilinear radial grooves 13 of the adjacent disks that when the adjusting members of the two expansion-pulleys C and C′ are rotated in the opposite directions, as indicated by the arrows in Fig. 2, on their respective shafts 2 and 3 and with relation to the coöperative guiding-disks 10 and 12 the rim-sectors of the upper expansion-pulley C will be moved outward radially to increase the effective diameter of this pulley, and the segments of the other pulley C′ will be moved inward radially to decrease the effective diameter of this pulley, the sectors of one pulley being moved outward concurrently with the inward movement of the other sectors.

As a simple and convenient means for imparting sector-adjusting movements to the adjusting member of the expansion-pulley the inner face of the hub of each adjusting member has formed therein a spiral keyway or seat 16, (shown in dotted lines in Fig. 3,) in which is seated an actuating pin or key 17, fixed to the reciprocatory actuator (6 or 7) supported for longitudinal movements in the hollow or tubular shaft, upon which this adjusting member is loosely mounted for a limited amount of independent rotative movement, said pin or key extending through the longitudinal keyway or slot 4. Secured to the opposite end of each actuator 6 and 7 is a circumferentially-grooved shifting collar 18, which surrounds and is movable upon the hollow shaft, said collar being secured to the actuator preferably by a pin 19, extending through the longitudinal slot 5 in said shaft, as will be understood by reference to Fig. 3.

The spiral groove in the inner face of the hub of the adjusting member will preferably be so disposed as to impart a rotative movement in the proper direction to move the rim-sectors outward upon an inward movement of the actuator and to move the same in a reversed direction upon the outward movement of said actuator.

As a convenient means for operating the two actuators 6 and 7 to impart radial movements to the rim-sectors of the two expansion-pulleys, whereby to change the relative velocities of the driving and driven shafts, I have provided a shifting lever 20, pivotally supported intermediate its ends and having the usual forks and pins at opposite ends to engage in the grooves of the shifting sleeves 18 of the two actuators 6 and 7, and have provided, in connection with one end of said lever, a lever-shifting device, (designated by 21,) shown as an adjusting-screw journaled, as against longitudinal movement at one end, in a bearing on the frame and having a screw-threaded bearing in an internally-screw-threaded block 22, pivotally supported on the shifting lever, said screw being provided at the outer end thereof with a hand-wheel, whereby the same may be turned to operate the shifting lever, and as a means for adjusting the axis of the shifting lever to change the normal angle thereof, and consequently the relative throws of the two actuators 6 and 7, the supporting means for said lever is shown as a slide 23, mounted in a slideway on the frame for adjustment in parallelism with the two shafts 2 and 3, and an adjusting-screw 24 is provided in connection with said slide, (see Fig. 1,) which adjusting-screw is extended through a screw-threaded bearing 25′ in the frame.

I do not desire to limit myself to the particular construction and organization of means for imparting reciprocatory movement to the actuators shown in the drawings nor to the particular means illustrated for supporting and adjusting the shifter-lever thereof, as these may be variously modified without departure from this invention.

In Fig. 1 of the drawings the shaft 2 is represented as the driving-shaft, and is also shown provided at one end with a band-wheel, which may be driven from any suitable source of power. In this case the shaft 3 will constitute the driven shaft and will in practice

be connected with any suitable rotary member (not shown) of any mechanism or machine (not shown) it is desired to operate. In Fig. 2 the two expansion-pulleys C and C' are connected together by a belt 27.

The operation of this device will be readily understood by any one skilled in the art to which this invention pertains by a comparison of the several figures of the drawings, in connection with the foregoing description, and therefore need not herein be more fully explained.

I claim—

1. A variable-speed device including a shaft; two relatively rotative expansion-pulley members, one fixedly secured to and the other loosely mounted upon this shaft, and one of which has a series of radial guiding-grooves and the other a series of spiral adjusting-grooves; a plurality of rim-sectors each having a projection entering a radial and a spiral groove; and a reciprocatory actuator extending centrally through both pulley members and having a spiral connection with the hub of the loosely-mounted pulley member, whereby a reciprocatory movement of the actuator will effect a rotative movement of one pulley member with respect to the other to adjust the sectors radially.

2. A variable-speed device comprising a frame; a shaft journaled at opposite ends in bearings on the frame; two relatively rotative members one fixedly secured to said shaft and the other loosely mounted upon this same shaft and one of which has a plurality of rectilinear radial guide-grooves and the other of which has a plurality of spiral grooves therethrough in intersecting relations with the radial grooves; a plurality of rim-sectors each extending through a spiral groove and having a plane-faced portion seated in an intersecting radial groove; and a reciprocatory actuator having a spiral connection with one member, independent of the other member, and effective on a reciprocatory movement thereof for imparting a rotative movement to this member with respect to the other member.

3. A variable-speed device comprising a hollow shaft; a spool-like rim-sector carrier loosely mounted on said shaft and having a spiral way in the hub thereof, and also having a plurality of spiral cam-grooves in the end disks thereof; two rotative members fixed to said shaft adjacent the end disks of the spool-like member and having rectilinear guiding-grooves in intersecting relation with the cam-grooves; a plurality of rim-sectors having projections at opposite ends thereof extending into both the cam-grooves and guiding-grooves; and a reciprocatory actuator supported in the hollow shaft and having a projection entering the spiral way, whereby on a reciprocatory movement of the actuator a rotative movement will be imparted to the carrier.

4. In a variable-speed device, an expansion-pulley comprising a spool-like central member having a spiral groove in the inner face of the hub and having a series of spiral cam-grooves formed through the end disks; two concentrically-disposed guiding-disks supported in coöperative relation with the end faces of the central member and having rectilinear radial grooves in coöperative relation with the cam-grooves of said central member; and a plurality of rim-sectors having fixed projections at opposite ends extending through the cam-grooves and having plane bearing-faces engaging in the radial grooves; in combination with a reciprocatory actuator engaging in the spiral groove in the hub of the central member.

5. A variable-speed device including a shaft; two concentrically-disposed disks fixed to said shaft and having radial guiding-grooves therein; a spool-like carrying member loosely mounted upon the shaft between the two guiding-disks and having spiral cam-grooves formed through the end disks thereof in intersecting relation with the radial grooves; rim-sectors having projections extending into the spiral and radial grooves; and means including a reciprocatory actuator movable longitudinally of the shaft and having a spiral connection with the hub of the spool-like member, whereby on a movement of the actuator a rotative movement will be imparted to the spool-like member with respect to the disks to adjust the sectors radially.

6. A variable-speed device including a frame; a shaft journaled in bearings on said frame; two concentrically-disposed disks fixedly secured to said shaft and having radial guiding-grooves therein; a spool-like carrying member loosely mounted upon this shaft between the two guiding-disks and having a series of spiral cam-grooves formed through the end plates thereof in coöperative relation with said guiding-grooves; rim-sectors having projections extending into the grooves of the plates and disks; means including a reciprocatory actuator having a spiral connection with the hub of the carrying member, independent of said disks, and adapted on reciprocations thereof for imparting rotative movements to said member with respect to said disks to move the sectors radially; and shifting means including a collar mounted upon the shaft and operatively connected with said actuator.

7. A variable-speed device comprising two hollow shafts having longitudinal slots extending therethrough; two spool-like sector-carriers loosely mounted upon said shafts and having spiral grooves in the hubs thereof and also having spiral cam-slots formed through the end plates or disks thereof; two guiding-disks secured to each shaft in coöperative relation with the end faces of the carrier and having straight radial grooves in coöperative relation with the cam-grooves of said carrier; a plurality of rim-sectors having

projections at opposite ends thereof extending through the cam-grooves and having plane bearing-faces fitting the straight radial grooves; a reciprocatory actuator mounted in each shaft and having a pin or projection entering the spiral groove in the hub of the carrier on this shaft; shifting means in connection with the two actuators and adapted for moving them simultaneously in opposite directions whereby to rotate the two carriers in relatively opposite directions and effect inward and outward radial movements of the sectors of the two carriers, respectively.

8. A variable-speed device embodying a suitable frame, two parallel shafts journaled at opposite ends in bearings on said frame; a spool-like member loosely mounted upon each shaft and having a plurality of grooves through the end disks or plates thereof; two disks fixedly secured to each shaft adjacent opposite ends of said spool-like member and having grooves in intersecting relation with those of said member; a reciprocatory actuator having a direct spiral connection with the hub of each spool-like member; two collars mounted one upon each shaft and connected, respectively, with said actuators; and a pivoted lever in connection with said collars and operative for shifting the actuators simultaneously in the opposite directions.

9. A variable-speed device including a shaft; two relatively rotative members, one of which is fixed to, and the other of which is rotatably mounted upon, this shaft, and one of which members has a series of radial grooves and the other a series of spiral grooves; a series of rim-sectors having projections extending through one series of grooves into the other series of grooves; a reciprocatory actuator in operative connection with one member and adapted for rotating this member with respect to the other member to adjust the sectors radially; a pivotally-supported shifting lever in operative connection with the actuator; a movable support for the lever; means for adjusting said support to change the position of the pivotal point of the lever; and means for rocking said lever on its pivot to impart reciprocatory movements to the actuator.

Signed by me at Hartford, Connecticut, this 22d day of August, A. D. 1900.

DUDLEY S. SEYMOUR.

Witnesses:
E. C. WHITNEY,
L. C. WOOD.