No. 703,359. Patented June 24, 1902.

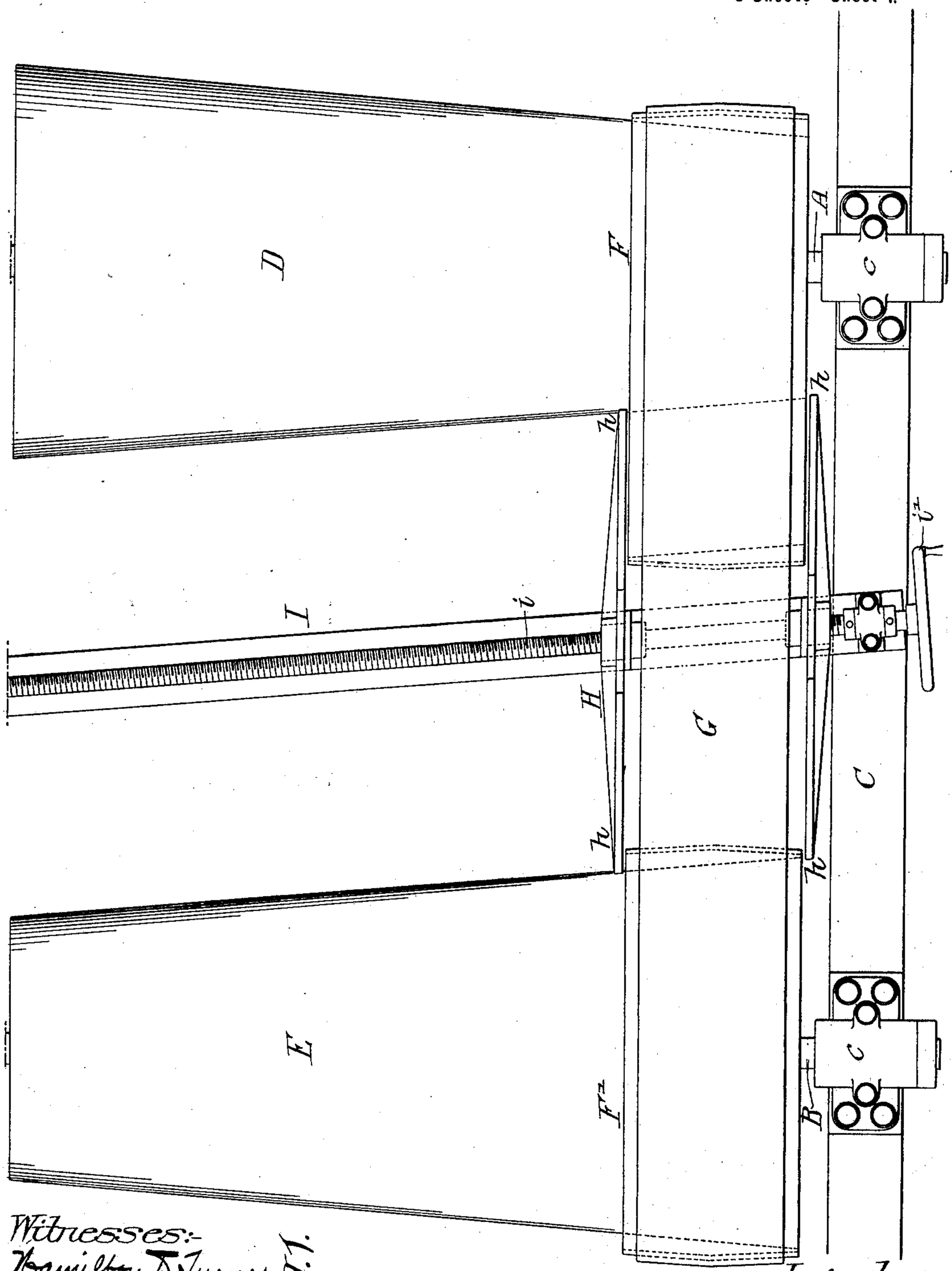
J. A. WHITE.

SPEED CHANGING DEVICE.

(Application filed Jan. 22, 1902

(No Model.)

3 Sheets—Sheet 1.



Witnesses:-
Hamilton D. Turner
Wm. A. Barr.

Fig. 1.

Inventor:-
Joseph A. White,
by his Attorneys; Hmm & Hmm

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 703,359. Patented June 24, 1902.

J. A. WHITE.

SPEED CHANGING DEVICE.

(Application filed Jan. 22, 1902.)

(No Model.) 3 Sheets—Sheet 2.

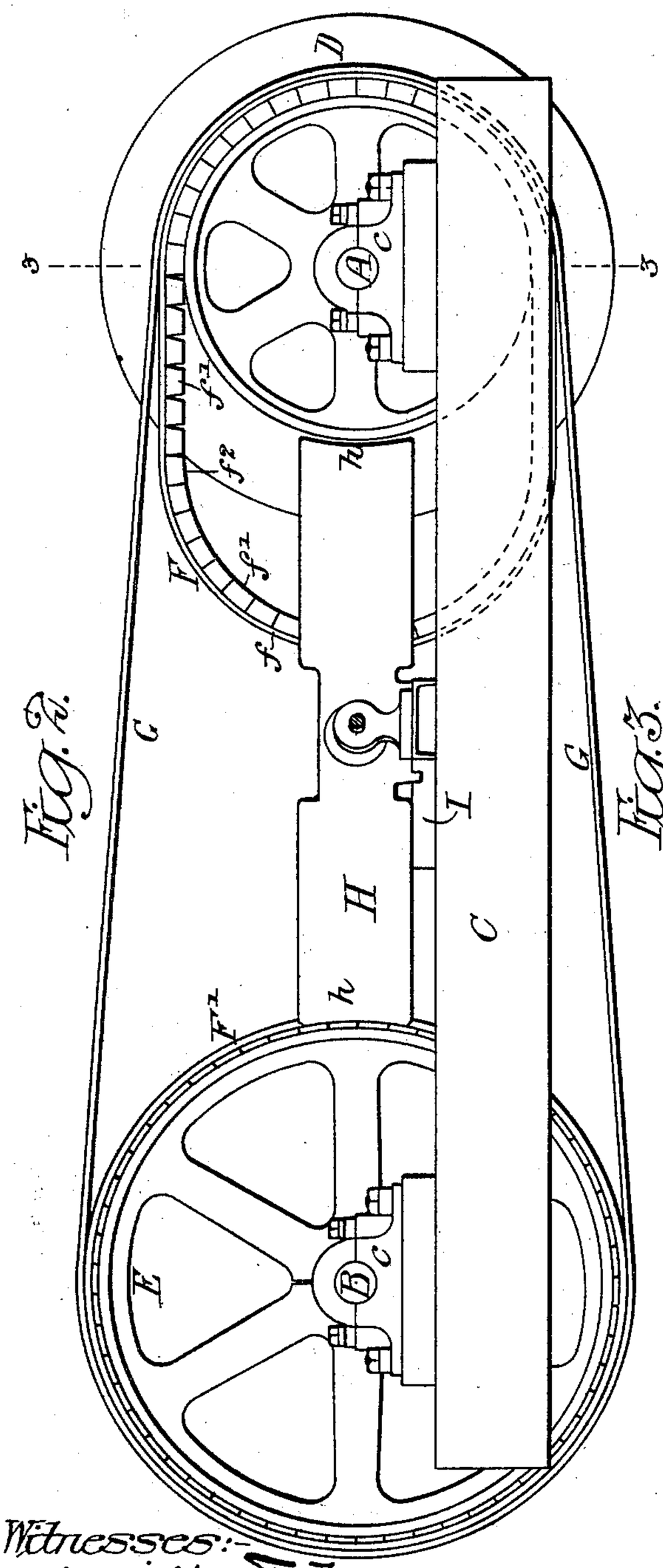


Fig. 2.

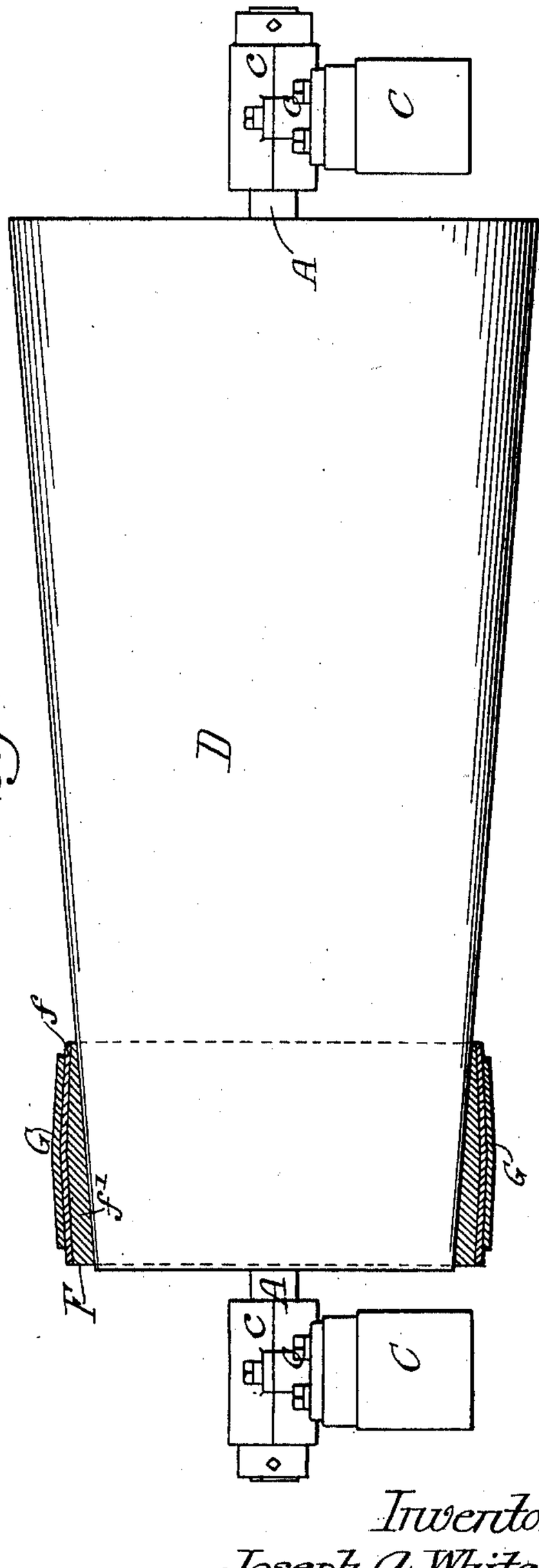


Fig. 3.

Witnesses:-
Hamilton D. Turner
Wm. A. Barr.

Inventor:
Joseph A. White,
by his Attorneys
Howson & Howson

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 703,359

Patented June 24, 1902.

J. A. WHITE.

SPEED CHANGING DEVICE.

(Application filed Jan. 22, 1902.)

(No Model.)

3 Sheets—Sheet 3.

Fig.10.

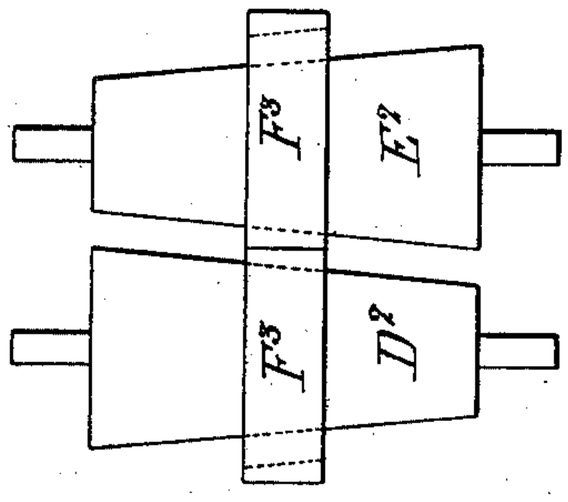


Fig.11.

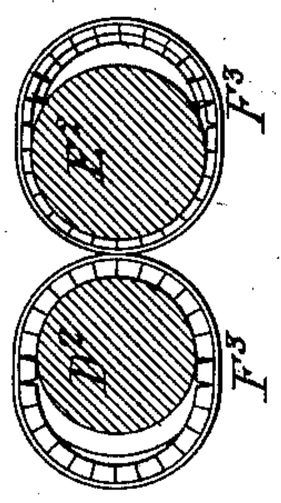


Fig.4.

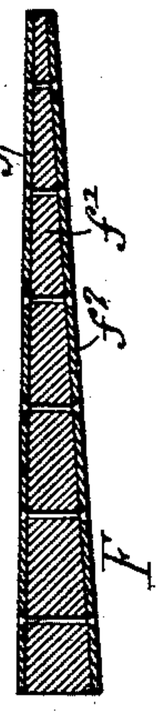


Fig.5.

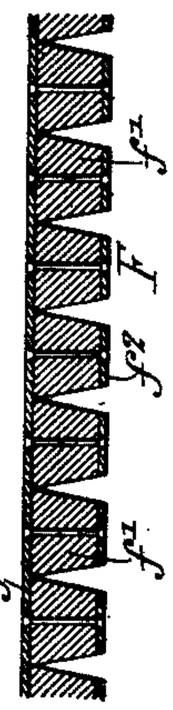


Fig.6.

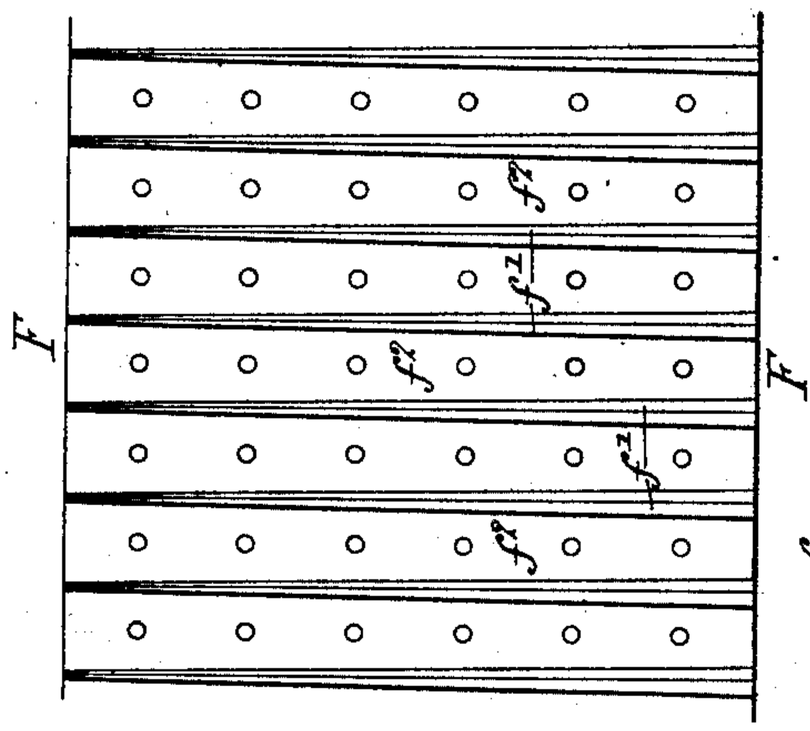


Fig.8.

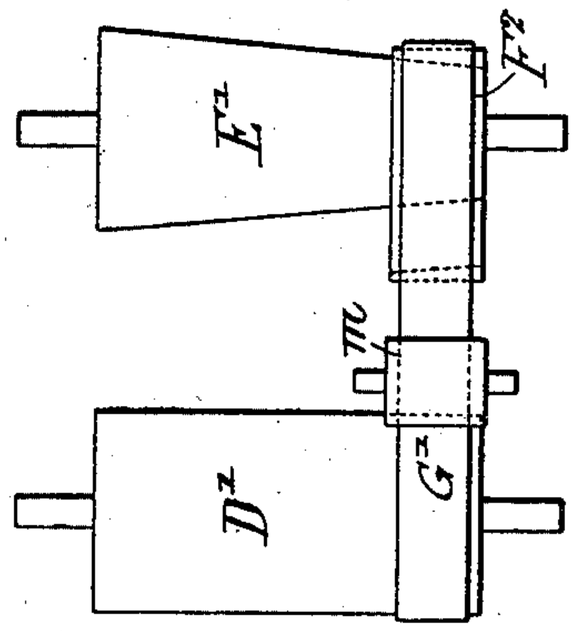


Fig.9.

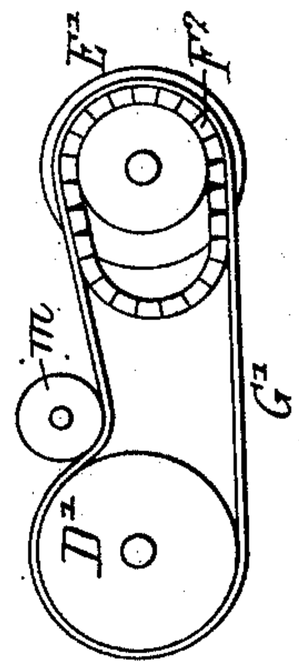


Fig.7.

Witnesses:-
Hamilton D. Turner
Titus H. Irons.

Inventor:-
Joseph A. White,
by his Attorneys;
Howson & Howson

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOSEPH ATWOOD WHITE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO JOHN W. MOORE, OF PHILADELPHIA, PENNSYLVANIA.

SPEED-CHANGING DEVICE.

SPECIFICATION forming part of Letters Patent No. 703,359, dated June 24, 1902.

Application filed January 22, 1902. Serial No. 90,827. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH ATWOOD WHITE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Speed-Changing Devices, of which the following is a specification.

My invention relates to certain improvements in speed-changing devices used in the transmission of power, and particularly to certain improvements in speed-changing devices using cone-pulleys.

Heretofore the power which could be transmitted from a driving to a driven element through cone-pulleys was limited owing to the fact that a wide belt could not be used, the width of the belt being limited because of the taper of the pulley or pulleys.

The object of my invention is to provide a speed-changing gear of this type with means whereby any desired width of belt can be used and the power transmitted through the speed-changing gear materially increased without causing the belt to slip, to twist, or to travel laterally on the pulleys.

While my invention relates particularly to a double-cone-pulley change-gear, it will be understood that it may be used in connection with any gearing in which the diameter of the driving or driven elements can be increased or diminished.

In the accompanying drawings, Figure 1 is a plan view of a double-cone change-gear, illustrating my invention. Fig. 2 is a side view of the same. Fig. 3 is an end view with the belt in section on the line 3 3, Fig. 2. Figs. 4, 5, 6, and 7 are views of details of the flexible band. Figs. 8 and 9 are respectively a plan view and an end view illustrating a modification of the invention, and Figs. 10 and 11 are respectively a plan view and a transverse section illustrating another modification.

Referring in the first instance to Figs. 1, 2, and 3, A is a driving-shaft, and B is a driven shaft, these shafts being mounted in suitable boxes *c* on the supporting structure C. On the driving-shaft A is a cone-pulley D, and on the driven shaft B is a cone-pulley E, this pulley E being reversed in respect to the pulley D, so that the greatest diameter of the pulley E will be opposite to the least diameter of the pulley D. On the pulley D is a flexible endless band F, the length of which is at least equal to the greatest circumference of the cone-pulley D, so that when the band is moved from the greatest diameter of the cone toward the least diameter a certain portion of the band will be loose. The band F in the present instance is made of a belt *f*, of leather or other suitable material, having secured to its inner face a series of transverse blocks *f'*, these blocks being preferably faced on their inner sides with leather f^2, so that this leather facing will have a bearing against the cone-pulley. The facing-blocks are secured to the belt *f* by rivets, bolts, or other fastenings, as clearly shown in Figs. 4 and 5. On the cone-pulley E is a band F', similar to the band F of the pulley D. The blocks *f'* are tapered in three directions—that is to say, they are thicker at one end than at the other, they have beveled sides formed on lines which are radial to the axis of the pulley when the band is passing around the same, and their inner faces are wider at the thin end of the block than at the thick end of the same because of such beveling of the sides of the block, as will be understood on reference to Figs. 4, 5, 6, and 7. By this means I provide a band which is beveled on the inner face to accord with the bevel of the cone-pulley, but which also possesses an inner face susceptible of longitudinal expansion and contraction, as is necessary in the use of the band, for in the straight portion of the run the inner face of the band must be as long as the outer face, while when the band is passing around the pulley said inner face is shorter than the outer face to the extent of the difference in the length of the segments presented by said inner and outer faces, this difference being greater at the thick edge of the belt than at the thin edge of the same. The belt therefore readily accommodates itself to the different conditions existing at different points in its travel and runs true on the cone without any tendency to twist on the same or travel longitudinally thereon, such as would accompany the use of a solid belt of tapered cross-section. For this reason I term the band a "compensating" band. The outer

face of the band may be parallel with the shaft, as in Fig. 4; but it is preferably "crowned," as in Fig. 7—that is to say, rounded or reverse-angled for the reception of the driving-belt G, which passes around and bears upon the outer face of each band. By the use of interposed bands of the character described I am enabled to use a driving-belt of any desired width, as the belt is similar to and operates in substantially the same manner as a belt used for coupling two common pulleys. Heretofore the width of belts used in connection with cone-pulleys has necessarily been limited, owing to the fact that a wide belt would twist and creep upon the cone-pulleys, and it has been a difficult matter to hold the belt in position without undue friction.

H is the belt-shifter, which can be of the ordinary type, having two arms *h h* at each side, which engage the driving-bands F F′ and not the belt G, said bands being somewhat wider than the belt. The shifter slides on a suitable beam I and is operated by means of screw *i*, provided with a handle *i′*, so that on turning this screw the shifter can be moved on the beam and will carry with it the two bands F F′. By causing the shifter to act upon the bands F F′ rather than upon the belt the shifting operation can be readily effected, as the bands are not under tension.

In Figs. 8 and 9 I have shown a plain pulley D′ on one shaft and a cone-pulley E′ on the other shaft, and in this case there is only one band F^2, which is mounted on the cone-pulley E′, the driving-belt G′ being in contact with the pulley D′ and with the band F^2, an idler *m* being used to take up the slack of the driving-belt G′.

In Figs. 10 and 11 I have shown two cone-pulleys D^2 and E^2, placed close together, and on each cone-pulley is a band F^3, tapered in cross-section, so that each will fit the face of its pulley; but the outer face of each band is parallel with the line of the pulley-shafts, the outer faces of the bands coming into contact, so that one shaft is frictionally driven from the other through the medium of these bands.

The operation of the device shown in Figs. 1, 2, and 3 is as follows: If the shifting device is in the position shown in Fig. 1, then the belt is in position to drive the shaft H from the shaft A at the lowest speed and the flexible band F runs upon the smallest diameter of the cone D, while the flexible band F′ runs upon the largest diameter of the cone E, and consequently there is a slack portion of said band F extending out from the cone D and between the two runs of the driving-belt. The arms of the shifter H rest on each side of the bands F F′, so that when the shifting screw is turned the bands will be moved on the cones, and as the bands are moved a portion of the band F′ becomes slack, owing to the decreasing diameter of the cone-pulley E, while a portion of the band F is taken up by the increasing diameter of the cone D, the space between the blocks *f′* permitting the bands to adjust themselves perfectly at all points on the cones. The loose portions of the flexible bands will not contract to much less than the size of the small end of the cone, this being prevented by the blocks forming part of the band.

I claim as my invention—

1. A band having an inner face transversely tapered from one edge to the other, whereby it is adapted to a cone-pulley, said inner face being susceptible of longitudinal expansion and contraction, substantially as described.

2. A band having an inner face transversely tapered from one edge to the other, whereby it is adapted for application to a cone-pulley, said inner face being susceptible of longitudinal expansion and contraction in varying degree from the thinner to the thicker edge of the same, substantially as described.

3. The combination of a cone-pulley, a band applied thereto, said band being tapered in cross-section and susceptible of longitudinal expansion and contraction on its inner face, and a power-transmitting belt bearing externally upon said band, substantially as described.

4. The combination of a pair of cone-pulleys, a band applied to each of said pulleys, said band being tapered in cross-section and susceptible of longitudinal expansion and contraction on its inner face, and a power-transmitting belt bearing externally upon each of said bands, substantially as described.

5. A band for application to a cone-pulley, said band having on its inner face transverse blocks forming the bearing-surface of the band on the pulley, said blocks being tapered in thickness from one edge of the belt to the other, and also tapered in width at their bearing-faces, from the thin end of the block to the thick end of the same, substantially as described.

6. A band for application to a cone-pulley, said band having on its inner face transverse blocks forming the bearing-surface of the band on the pulley, said blocks being tapered in thickness from one edge of the belt to the other, and also beveled on the edges, and tapered in width at their bearing-faces from the thin end of the block to the thick end of the same, substantially as described.

7. A band for application to a cone-pulley, said band having on its inner face transverse blocks forming the bearing-surface of the band on the pulley, said blocks being tapered in thickness from one edge of the belt to the other, and also tapering in width at their bearing-faces from the thin end of the block to the thick end of the same, and having said bearing-faces covered with leather, substantially as described.

8. The combination of a cone-pulley, a band adapted thereto and tapered in cross-section to conform therewith, a driving-belt applied to the outer face of said band but narrower than the same, and a shifting device acting

only upon the band to shift the band and belt on the pulley, substantially as described.

9. The combination of two pulleys, one of which is conical, a driving-belt passing around both pulleys, and a loose intermediate compensating band on the conical pulley, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH ATWOOD WHITE.

Witnesses:

WILL. A. BARR,

JOS. H. KLEIN.