No. 707,890. Patented Aug. 26, 1902.

W. A. WOOD.

VARIABLE SPEED CLUTCH.

(Application filed Nov. 22, 1901.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

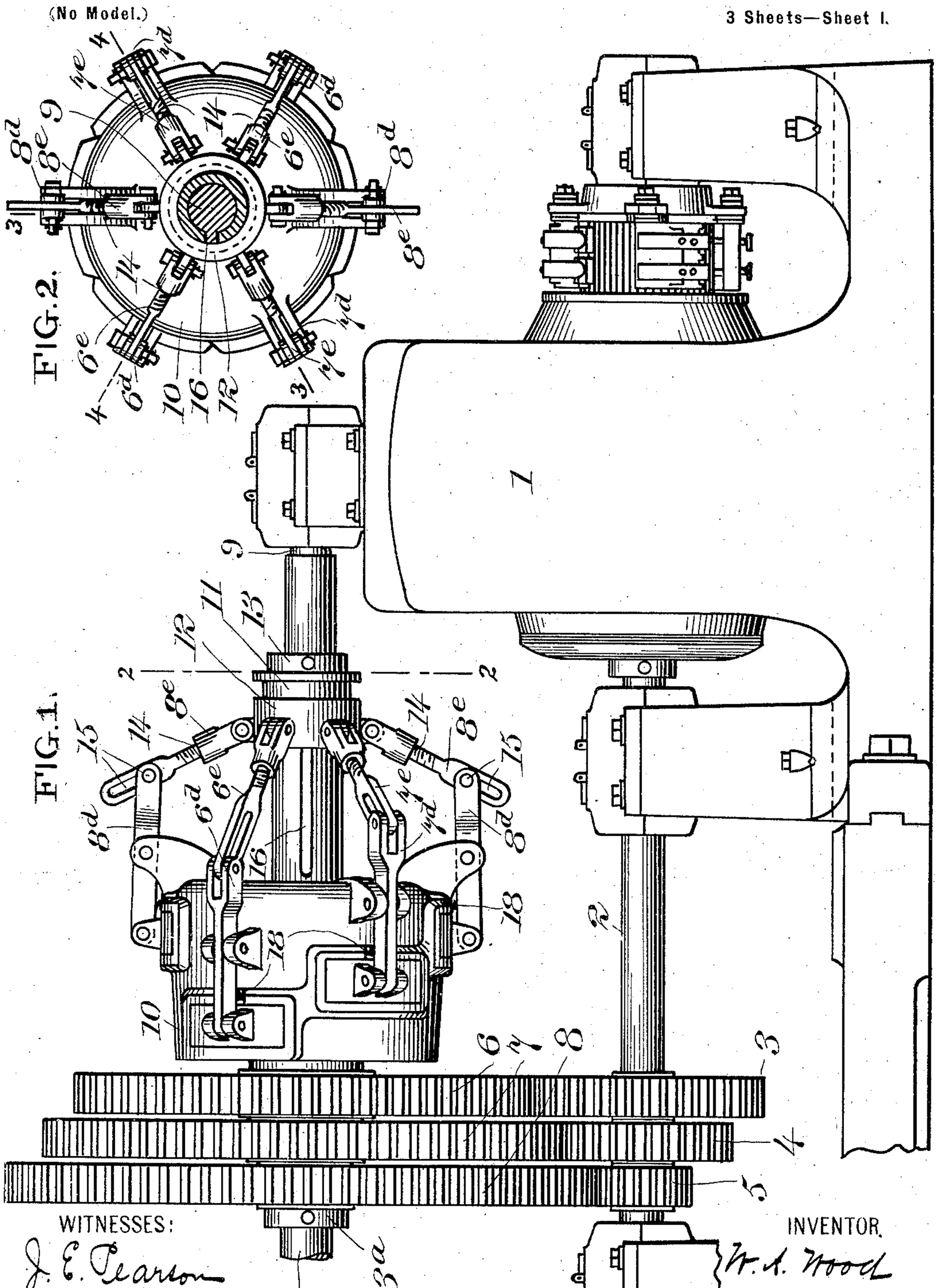

FIG. 2.

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C. E. Stecher

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(No Model.) 3 Sheets—Sheet 2.

FIG. 3.

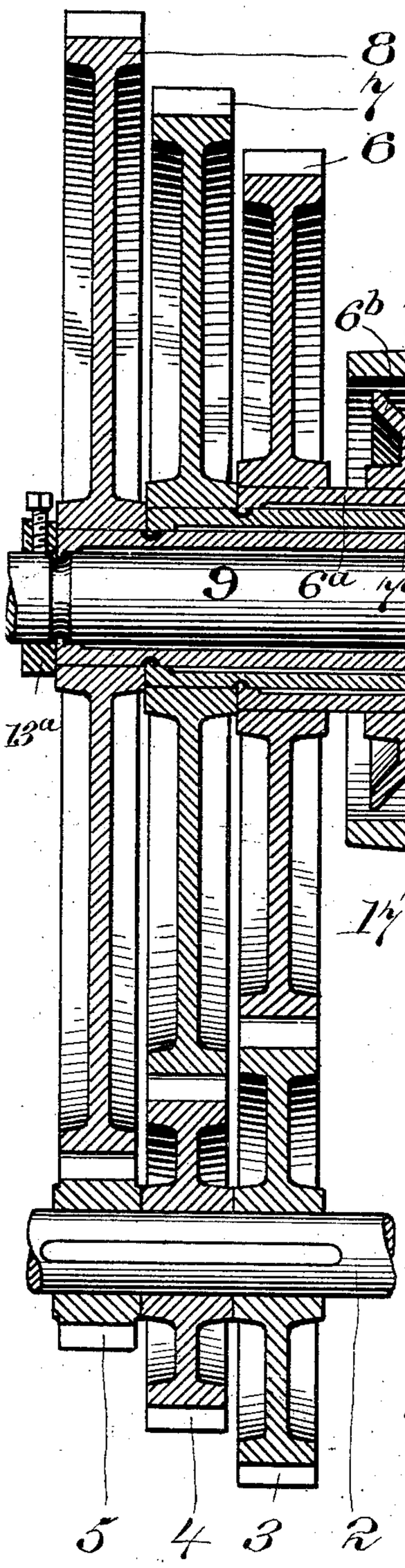

FIG. 4.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

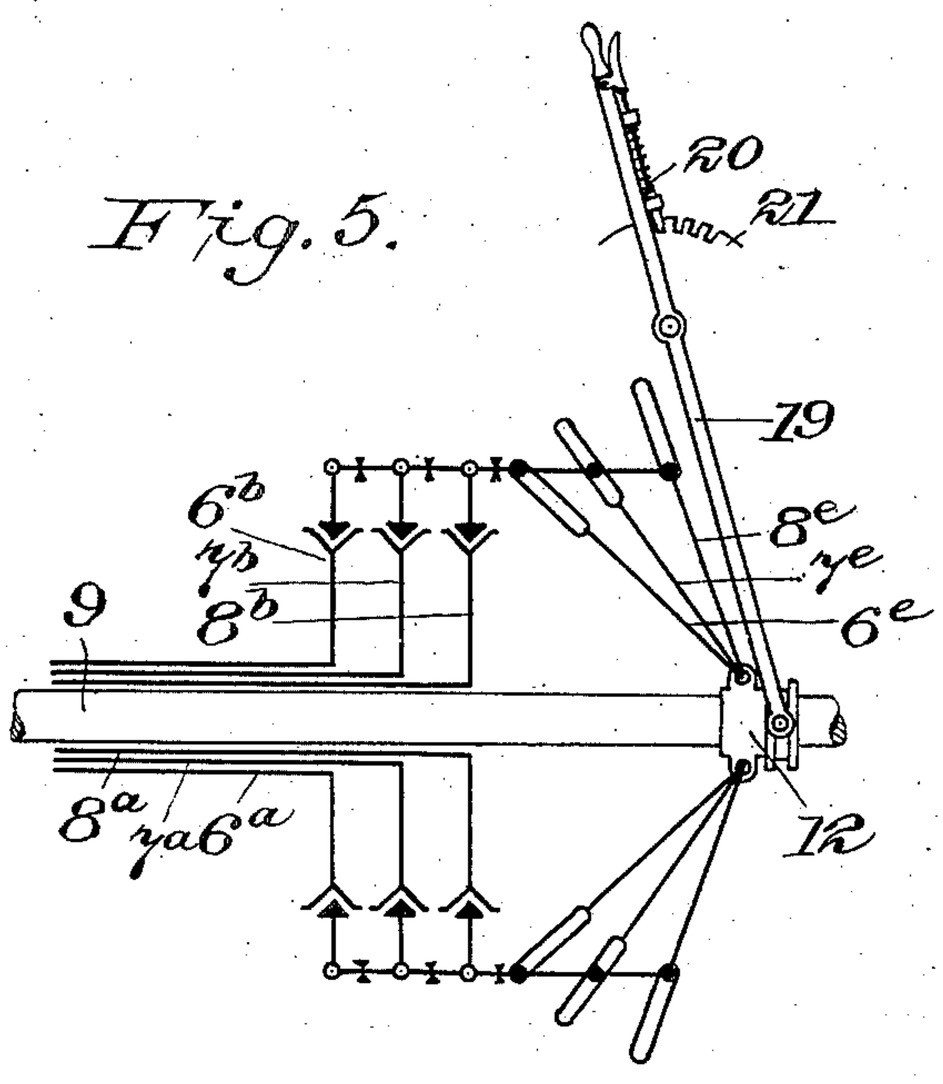


Fig. 6.

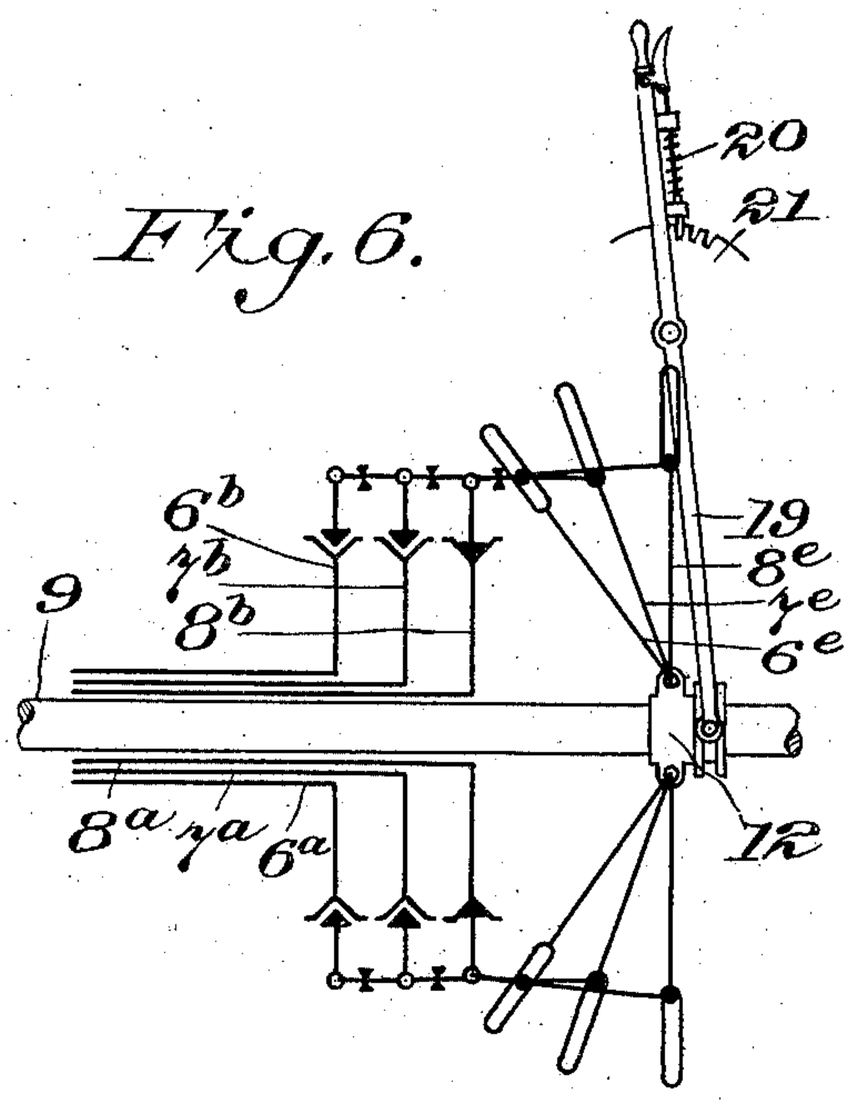


Fig. 7.

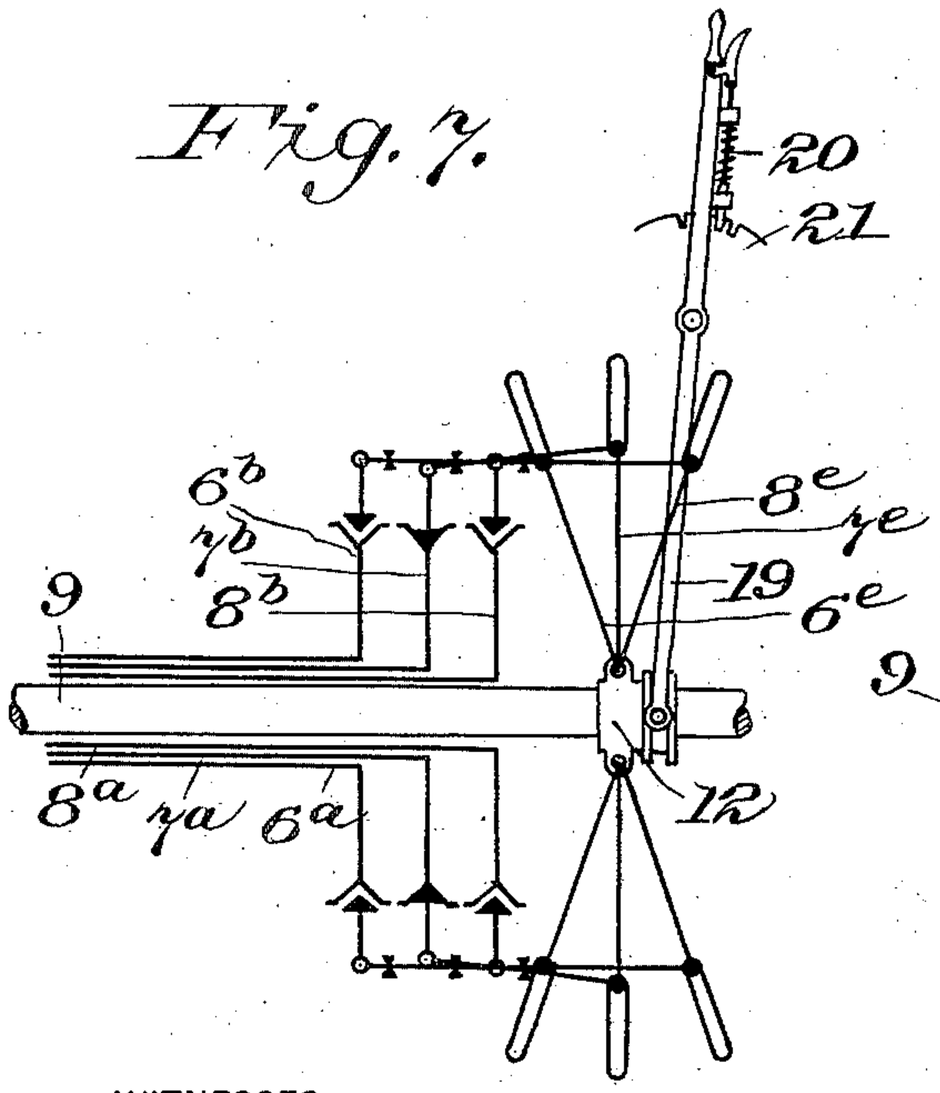
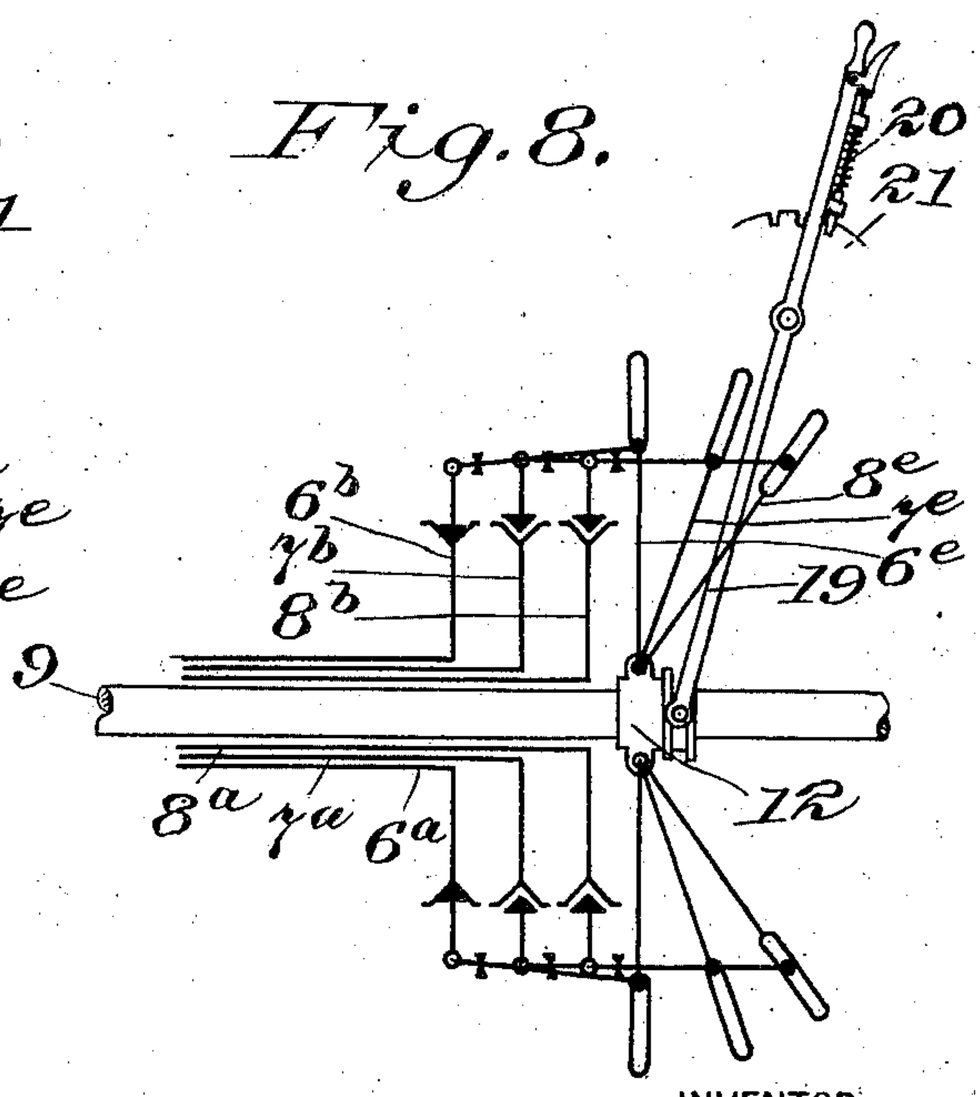


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM ALEXANDER WOOD, OF ANSONIA, CONNECTICUT.

VARIABLE-SPEED CLUTCH.

SPECIFICATION forming part of Letters Patent No. 707,890, dated August 26, 1902.

Application filed November 22, 1901. Serial No. 83,280. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ALEXANDER WOOD, a citizen of the United States, residing at Ansonia, county of New Haven, State of Connecticut, have invented certain new and useful Improvements in Variable-Speed Clutches, of which the following is a specification.

My invention relates to power-transmission gear in general; and it consists of the variable-speed clutch mechanism hereinafter more specifically described and claimed.

I have here illustrated the gear as applied to an electric motor; but of course it may be driven from any other source of energy and would have a wide field of application also in driving that class of automobiles in which gas-engines are employed.

A mechanism which as at present advised I believe to be the best form of embodiment of my invention is illustrated in the accompanying sheet of three drawings, in which—

Figure 1 is a side elevation of an electric motor and counter-shaft with my invention applied thereto, all the clutches being out of operation. Fig. 2 is a cross-section on line 2 2 of Fig. 1. Fig. 3 is a section through the centers of the gear-wheels, the section through the clutch being taken on two planes indicated by the bent line 3 3 of Fig. 2, the middle clutch being in operation. Fig. 4 is a similar section through the clutch, taken on two planes represented by line 4 4 of Fig. 2 after the counter-shaft has revolved through one hundred and twenty degrees. Fig. 5 is a diagrammatic view showing all the clutches out of operation and the position of the links forming the toggle-joints, all of said links being turned up into the same plane. Fig. 6 is a similar view showing the first clutch in operation. Fig. 7 is a similar view showing the second clutch in operation. Fig. 8 is a similar view showing the last or third clutch in operation.

Throughout the drawings like reference-figures indicate like parts.

An electric motor 1 is shown rotating its armature-shaft 2, on which are keyed fast the three pinions 3, 4, and 5 of different diameters. Meshing with these pinions are the gear-wheels 6, 7, and 8, which rotate about the counter-shaft 9, being loosely mounted thereon by means of the sleeves 6^a, 7^a, and 8^a, which are nested one within the other. These sleeves carry each a friction-pulley 6^b, 7^b, and 8^b, having the grooved rims shown. An inclosing hood 10 is fastened to the shaft 9, as by a key in the keyway 16, so as to revolve with said shaft and overhang or inclose the three clutch-pulleys 6^b, 7^b, and 8^b. This hood has suitable openings, within which are movably mounted the V-shaped friction-blocks 6^c, 7^c, and 8^c, which coöperate with the grooved pulley-wheels 6^b, 7^b, and 8^b. These clutch-blocks are respectively mounted on levers 6^d, 7^d, and 8^d, which are pivoted to lugs on the hood 10 in the manner clearly shown in the drawings. Coöperating with these levers are a series of links 6^e, 7^e, and 8^e, which are pivoted at their inner ends to a sliding clutch-operating ring 12, having a circumferential groove 11, by means of which it may be grasped by any operating means, such as the lever 19. (Shown in Figs. 5 to 8, inclusive.) The collar 13 limits the movement of the hood 10 and its supporting-sleeve on the shaft in one direction, and the collar 13^a limits the movement of the sleeves in the other direction.

The links 6^e, 7^e, and 8^e may be made adjustable by means of the screw telescoping connection shown at 14 and are preferably provided at their outer ends with pin-and-slot connections 15 with the levers, all as shown in the drawings.

Set-screws 17 17 may be employed to prevent the clutch-blocks 6^c, 7^c, and 8^c from being withdrawn too far from their sockets in the hood 10, as shown in Fig. 1, and said blocks may be normally held out of engagement with the clutch-pulleys by means of spiral springs 18 18, pressing their supporting-levers upward, as shown in Figs. 3 and 4.

The operating-lever 19 may be provided with a notched quadrant 21 and spring-latch 20 for holding it in various positions shown in the diagrammatic figures.

The method of operation of my invention is the following: The parts being in position shown in Figs. 1, 2, and 5, none of the clutch-blocks 6^c, 7^c, and 8^c are in contact with their corresponding pulleys 6^b, 7^b, and 8^b, and as a result the gear-wheels and sleeves supporting them revolve idly on the shaft 9, which re-

mains stationary. If, however, the lever 19 is thrown into position shown in Fig. 6, so that the latch 20 falls into the second notch, the toggle-links 8^e will be brought into a position at right angles to the shaft 9, thereby forcing out the free end of the levers 8^d and forcing the clutch-blocks 8^c toward the shaft and into engagement with the clutch-pulley 8^b. This locks the hood 10, and consequently the shaft 9, to said clutch-pulley and its supporting-sleeve 8^a. The whole apparatus so locked, including the shaft 9, is therefore caused to revolve with the gear-wheel 8, and the shaft 9 is given its slowest speed of rotation. If the latch 20 is lifted and the lever 19 shifted so that the latch will fall into the third notch, the position illustrated in diagram Fig. 7, results, in which the clutch-blocks 8^c are released from engagement and the clutch-blocks 7^c are thrown into engagement with the pulley 7^b. This position of the parts locks the driven shaft 9 to the gear-wheel 7, and the driving-shaft 2 revolving at the same rate the second speed of rotation is given to the driven shaft. If, again, the lever 19 is shifted into such a position that the latch falls into the last notch, as indicated in Fig. 8, the clutch-blocks 8^c 7^c are both released and the clutch-blocks 6^c are forced into engagement with the friction-pulley 6^b, locking the driven shaft to the smallest gear-wheel 6 and giving the driven shaft its highest speed of rotation.

The advantages of my invention comprise the compactness of the structure and the ease with which a number of varying speeds may be obtained by one continuous motion of the lever. Also it may be noted that in passing from the highest to the lowest speed the intermediate-speed clutch must be temporarily thrown in, and thereby acting as a brake to gradually reduce the speed the shock which would otherwise result from immediate transfer from the highest to the lowest speed is avoided. The parts are all readily adjustable, so as to insure the firm gripping of the clutches, and great pressure between the parts is secured with little effort of the operator by reason of the toggle-joint action. By providing separate clutching means for locking each of the sleeves to the driven shaft I reduce the wear on the clutches by distributing it and, furthermore, obtain the advantage that if any one of the clutches becomes worn or broken, so as to be temporarily disabled, the use of the gear at the other speeds is not interfered with.

It is evident that various changes could be made in the construction illustrated without departing from the spirit and scope of my invention. Other forms of operative connections between the sliding ring 12 and the clutch-blocks might be substituted for the lever and toggle-link shown. The direction of the gripping action between the clutch-pulleys and the clutch-blocks might be changed and other gripping means substituted for those shown. The relative positions of the clutch-pulleys and clutch-blocks might be changed and other forms of gearing substituted for the toothed gears and pinions shown; but all of these modifications I should still consider within the scope of my invention so long as the principle of operation herein described is preserved.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a variable-speed-transmission gear, the combination of a driving-shaft, a driven shaft, a plurality of sleeves loosely mounted on the driven shaft, gearing connecting said sleeves to the driving-shaft and so proportioned as to rotate said sleeves at different rates of speed, separate clutching means for locking each of said sleeves to the driven shaft, and interconnecting means whereby when any one of said means is locked to its corresponding sleeve the remaining sleeves are free, said locking means consisting of a pulley with a V-shaped rim carried by the sleeve and a V-shaped clutch-block supported from the driven shaft.

2. In a variable-speed-transmission gear, the combination of a rotating shaft, a plurality of sleeves nested one within another and loosely mounted on said shaft, a plurality of clutch-pulleys mounted one on each of said sleeves, a hood fastened to the shaft, surrounding said clutch-pulleys and provided with radial openings opposite the said pulleys, clutch-blocks carried in said openings in said hood, and means for forcing the clutch-blocks opposite any one pulley into and out of engagement therewith.

3. In a variable-speed-transmission gear, the combination of a rotating shaft, a plurality of sleeves nested one within another and loosely mounted on said shaft, a plurality of clutch-pulleys mounted one on each of said sleeves, a hood fastened to the shaft, surrounding said clutch-pulleys and provided with radial openings opposite the said pulleys, clutch-blocks carried in said openings in said hood, and means for forcing the clutch-blocks opposite any one pulley into and out of engagement therewith, together with a single lever and connections therefrom to all of said clutch-blocks, so that only those blocks opposite any one pulley can be thrown into engagement at any one time.

4. In a multiple-clutch mechanism, the combination of a rotating shaft, a series of clutch-blocks mounted on and rotating with said shaft, a series of levers carrying said blocks and mounted on pivots carried by said shaft, a ring adapted to slide longitudinally of said shaft, and a series of links connecting said ring with each of said levers, whereby the sliding of said ring longitudinally of the shaft will cause the clutch-blocks to consecutively approach toward or recede from the shaft, to-

gether with suitable clutch members adapted to coöperate with said clutch-blocks whenever the same approach the shaft.

5. In a multiple-clutch device the combination of a rotating shaft, a plurality of sleeves loosely mounted on said shaft, a clutch member carried by each sleeve, a series of movable clutch-blocks rotating with the shaft and adapted to grasp or release the respective clutch members, a ring adapted to slide longitudinally of the shaft and toggle-joint connections from said ring to said movable blocks, whereby said blocks are consecutively forced into and released from engagement with their respective coöperating clutch members, as the ring is slid along the shaft.

6. In a multiple-clutch mechanism, the combination of a rotating shaft, a series of clutch-blocks mounted on and rotating with said shaft, a series of levers carrying said blocks and mounted on pivots carried by said shaft, a ring adapted to slide longitudinally of said shaft, and a series of adjustable links connecting said ring with each of said levers, whereby the sliding of said ring longitudinally of the shaft will cause the clutch-blocks to consecutively approach toward or recede from the shaft, together with suitable clutch members adapted to coöperate with said clutch-blocks whenever the same approach the shaft.

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

WILLIAM ALEXANDER WOOD.

Witnesses:
H. E. P. TAYLOR,
H. A. HIGGINS.