

No. 671,895.

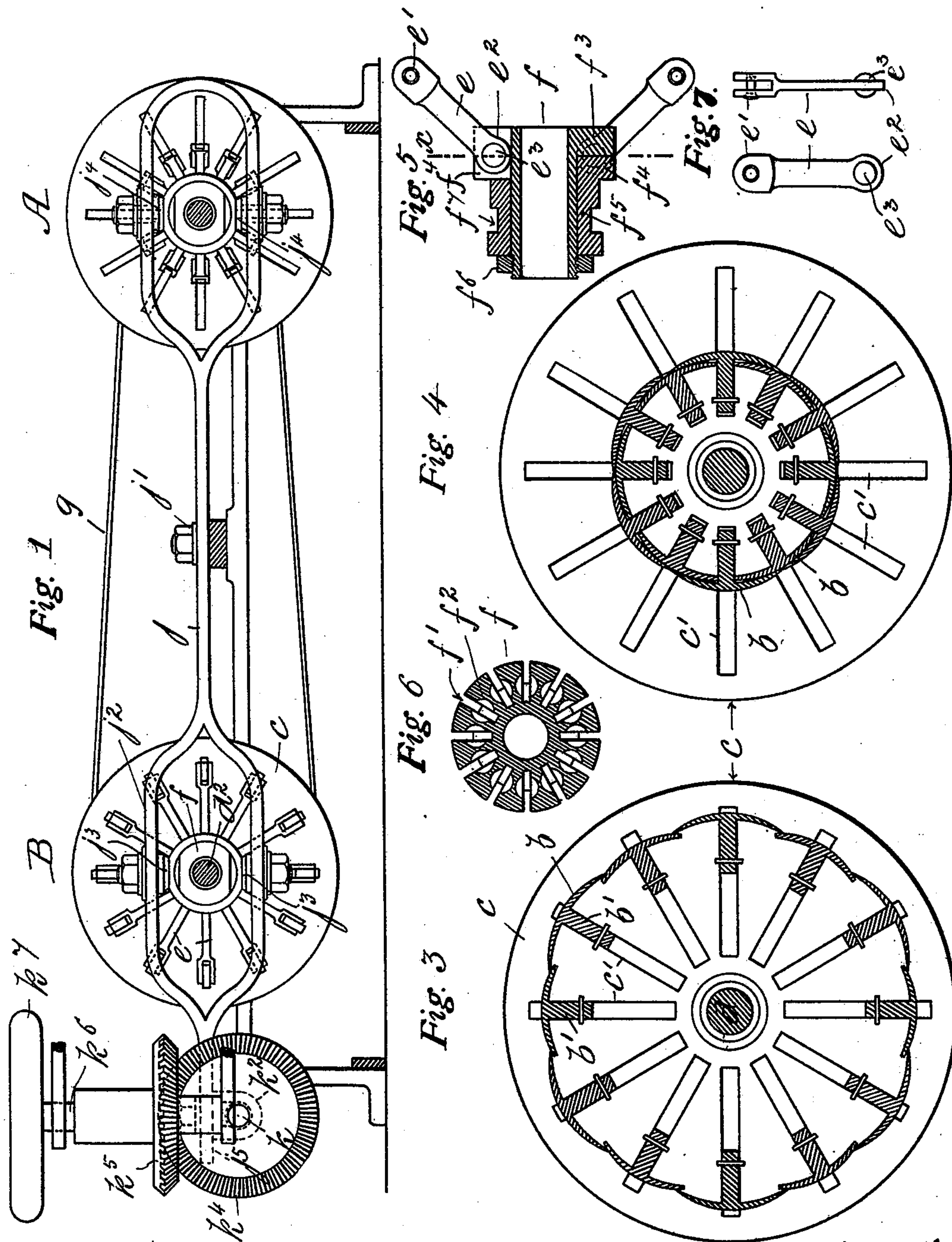
Patented Apr. 9, 1901.

A. G. S. LYFORD.  
VARIABLE SPEED MECHANISM.

(Application filed Dec. 10, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES *Buttha E. Hart.*

INVENTOR *Arthur George Leason Lyford*

*Mary Curdell*

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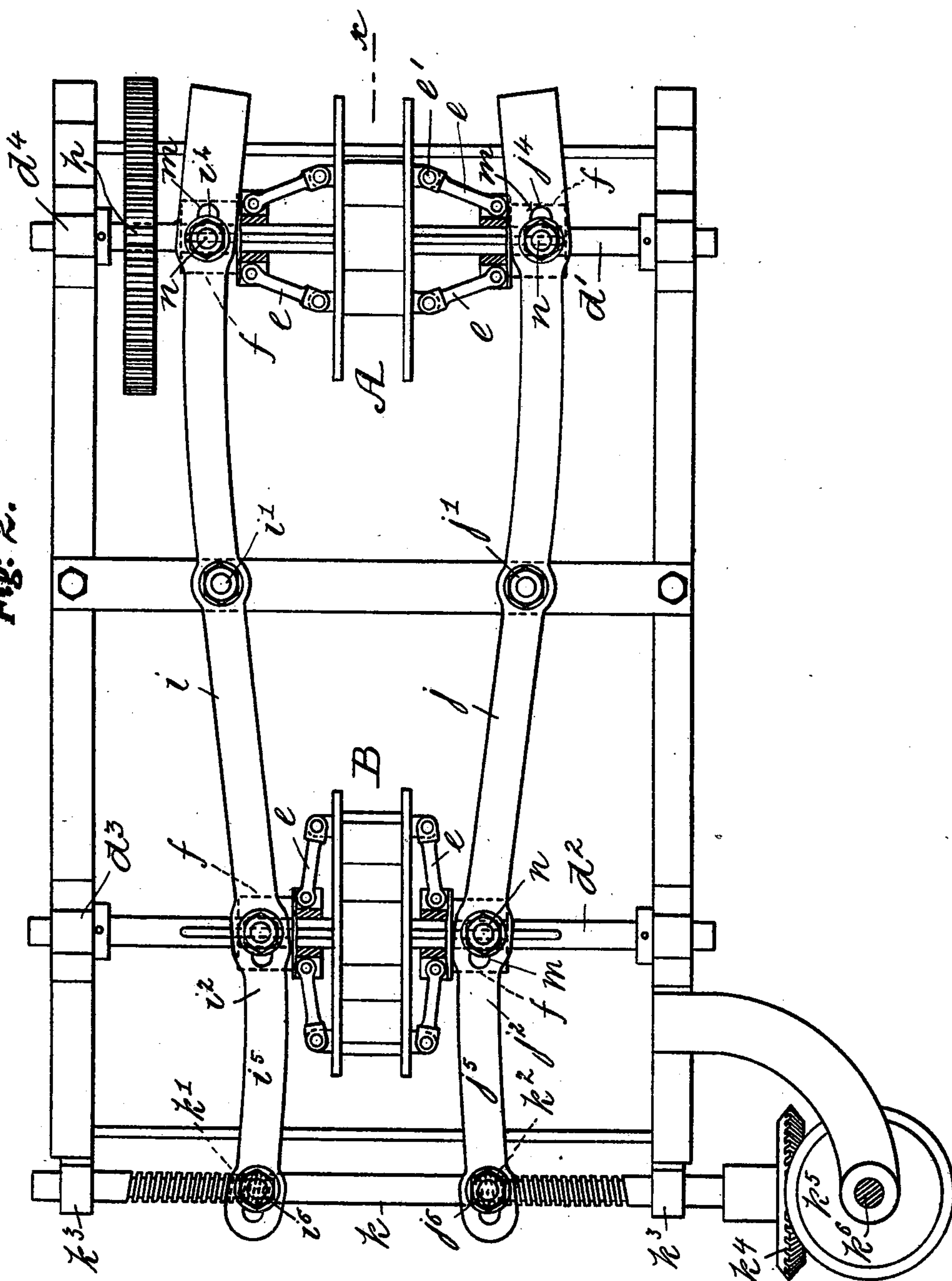
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2 Sheets—Sheet 2.

Fig. 2.



WITNESSES

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INVENTOR

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*Mary Lundell*



# UNITED STATES PATENT OFFICE.

ARTHUR GEORGE SEDDON LYFORD, OF LONDON, ENGLAND.

## VARIABLE-SPEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 671,895, dated April 9, 1901.

Application filed December 10, 1900. Serial No. 39,384. (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR GEORGE SEDDON LYFORD, builder, a subject of the Queen of Great Britain, residing at Loftus Works, Loftus road, Shepherds Bush, London, England, have invented certain new and useful Improvements in Mechanism for Transmitting Power at Variable Speeds, of which the following is a specification.

10 This invention relates to mechanism for transmitting power at variable speeds through the medium of driving-belts and a new construction of expanding and contracting pulley, combined with special means for  
15 actuating the same.

Figure 1 of the accompanying drawings represents a side elevation of my improved mechanism, a portion of the framing being broken away, as adapted to and applied in connection with the driving-gear of a mechanically-propelled road-vehicle. Fig. 2 is a top side plan of the said mechanism. Fig. 3 represents, upon an enlarged scale, a longitudinal vertical section of one of the improved expanding  
20 and contracting pulleys employed in connection with the said mechanism upon the dotted line  $x$ . This view shows the pulley expanded to almost the greatest diameter. Fig. 4 is a similar sectional view to Fig. 3, but  
25 shows the same contracted to practically the smallest diameter obtainable. Fig. 5 represents a longitudinal vertical section of one of the sliding sleeves employed in connection with the said expanding and contracting pulleys. Fig. 6 is a transverse vertical section of Fig. 5 upon the dotted line  $x'$ . Fig. 7 represents in edge view and side elevation one of the series of jointed links employed as the connections between the adjustable parts of  
30 the pulleys and the sliding sleeves.

The same letters of reference indicate corresponding parts in the several figures of the drawings.

In my improved variable-speed mechanism  
45 I employ a pair of expanding and contracting pulleys A and B, each comprising an expanding and contracting periphery  $a$ , made up of a series of overlapping plate-sections  $b$ , each mounted upon a sliding carrier  $b'$ , whose  
50 ends are arranged to work, respectively, within pairs of radial guides or slots  $c'$ , cut within opposite cheeks or plates  $c$ , fixed to the axle

$d$  and constituting the sides of the pulley. The radially-sliding segments  $b$  of the periphery are operated by means of a series of arms  
55 or links  $e$ , radiating from the said axle and connected at the outer ends  $e'$  with the carriers  $b'$  of the said segments, while their other ends are jointed at  $e^2$  to a bush or sleeve  $f$ , sliding upon the axle toward or away from  
60 the pulley by suitable lever mechanism, such as is hereinafter described.

The peripheral plates or segments arranged between the fixed cheeks of the pulley are preferably curved to a radius corresponding  
65 to that of the smallest diameter to which the pulley can be contracted, and the edges of the intermediate sections are arranged to overlap the adjacent edges of the alternate sections more or less, as clearly shown in  
70 Figs. 3 and 4, the extent of such overlapping being varied according to the diameter to which the pulley is adjusted, so that when the sections are to be contracted to form a  
75 small periphery, as in Fig. 4, the carriers are run inward along the radial slots, and the edges of the plates or segments overlap considerably, and around the periphery made up by these curved plates the driving band or  
80 belt  $g$  or chains, ropes, or the like is or are passed.

The sliding sleeves  $f$ , by the movement of which the peripheral diameter of the pulleys are varied, may be formed with a series of  
85 longitudinal slots or gaps  $f'$  to form guides for the inner ends of the connecting links or arms  $e$ , before referred to, which have spherically-formed ends  $e^3$ , turning in spherical sockets  $f^2$  in the sleeve. These seatings  $f^2$ , in which the ball-joints work, are each formed  
90 in two halves, one half being made in a fixed collar  $f^3$  at the end of the sleeve and the other half in the corresponding collar  $f^4$  of a bush  $f^5$ , slipped onto or fitted to the sleeve and secured there by a lock-nut  $f^6$  or other means.  
95

The pulleys A and B are mounted, respectively, upon the motor or driving shaft  $d'$ , receiving its motion from the engine through a pinion  $h$  or otherwise, and the driven axle  
100  $d^2$ , which may either constitute in itself the road-wheel axle or is suitably connected therewith, the said axles running in suitable bearings  $d^3$   $d^4$ , mounted in the frame of the vehicle and having a pair of sliding sleeves  $f$ ,



disposed, respectively, on the opposite sides of the pulley and connected with the sliding carriers of the peripheral segment through the medium of the connecting-links *e*. A pair of long controlling or regulating levers *i, j* are pivoted at *i', j'*, respectively, to the frame or to a suitable support at a point equidistant between the two axes and pulleys, with the outer forked or looped ends *i<sup>2</sup>, j<sup>2</sup>* of these levers having opposite pairs of studs *i<sup>3</sup>, j<sup>3</sup>* or equivalents engaging with annular grooves *f<sup>7</sup>* of the bushes for expanding or contracting the one pulley B, while the other end parts of the said levers have similar studs at *i<sup>4</sup>, j<sup>4</sup>*, engaging with like grooves or races in the sleeves which govern the expansion and contraction of the other pulley A. The levers are extended or are provided with supplementary arms *i<sup>5</sup>, j<sup>5</sup>*, which are respectively jointed at *i<sup>6</sup>, j<sup>6</sup>* to a pair of screw-boxes *k', k<sup>2</sup>*, one of which is right-hand screwed and the other left-hand screwed, in connection with which is a right and left hand threaded shaft *k*, working in suitable bearings *k<sup>3</sup>*, with one end fitted to a bevel-wheel *k<sup>4</sup>*, gearing with a second bevel-wheel *k<sup>5</sup>*, made fast to a hand-wheel shaft or pillar *k<sup>6</sup>*, provided with a hand-lever *k<sup>7</sup>*, arranged convenient to the driver of the vehicle and by the turning of which the screw-shaft is rotated, the screw-boxes are moved along it, and the levers are turned upon their fulcrum in one direction or the other, whereby the diameter of one pulley is increased and that of the other pulley proportionately decreased, and as the driving belt, ropes, or the like pass over the two pulleys for communicating motion from the one to the other the ratio of the speeds of the driving and driven shafts is varied accordingly. The levers are connected to the studs by slots *m* on the one part and pins *n* on the other part to admit of the angular movement of the said levers.

I wish it to be understood that I do not limit myself to the particular arrangement of the lever mechanism herein described for transmitting the motion to the slides or means which govern the expansion and contraction of the pair of pulleys, and also that the said governing means may be varied in various ways without departing from the nature of my invention.

If necessary, only one sliding sleeve may be employed in connection with each expanding and contracting pulley, although I prefer to employ them in pairs, arranged one each side the pulley, as herein described, with the sets of radial arms or connecting-links jointed, respectively, to the opposite ends of the adjustable carriers of the peripheral segments.

Expanding and contracting pulleys constructed as hereinbefore described are applicable for all purposes in which power is transmitted at variable speeds and may either be used singly or in pairs. When used singly

for receiving motion from or transmitting motion to an ordinary fixed pulley, I may employ any ordinary belt-tightening device for taking up the slack which occurs in the belt when the pulley is contracted.

Having fully described my invention, what I desire to claim and secure by Letters Patent is—

1. An expanding and contracting pulley for use in connection with mechanism for the transmission of power at variable speeds consisting of an expanding and contracting periphery formed of a series of overlapping sections, slides for the said sections, and cheeks provided with radial guides within which operate the said slides, the said cheeks forming the sides of the pulley.

2. In mechanism for transmitting power at variable speeds, the combination of a pulley having an expanding and contracting periphery formed of a series of overlapping sections, slides for the said sections, and means for operating the said slides, consisting of a series of arms or links jointly connected at their outer ends to the said slides, and a sliding sleeve connected to the other end of said links for operating the same.

3. In mechanism for transmitting power at variable speeds, the combination of a pulley having an expanding and contracting periphery formed of a series of overlapping sections, slides for the said sections, means for operating the said slides, consisting of a series of arms or links jointly connected at their outer ends, respectively, to the said slides and having their opposite ends formed in a spherical manner, a sliding sleeve, a collar, said sleeve and collar provided with spherical sockets to receive the spherical ends of the said links, and means for connecting the said collar and sleeve together.

4. In a mechanism for transmitting power from a driving-shaft to a driven shaft at variable speeds, an expanding and contracting pulley mounted on the driving-shaft, an expanding and contracting pulley mounted on the driven shaft, each of said pulleys formed of a series of overlapping sections, a belt connecting the two pulleys, a pair of sliding sleeves connected to the said sections for operating the same, a pair of levers connected to the said sleeves for operating the same, sliding screw-boxes for operating the said levers, and a rotatable right and left hand screw-shaft for operating the said boxes, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ARTHUR GEORGE SEDDON LYFORD.

Witnesses:

H. D. JAMESON,  
F. L. RAND.