No. 818,945. PATENTED APR. 24, 1906.

A. H. FETTERS.

SYNCHRONISM INDICATOR.

APPLICATION FILED MAY 22, 1905.

4 SHEETS—SHEET 1.

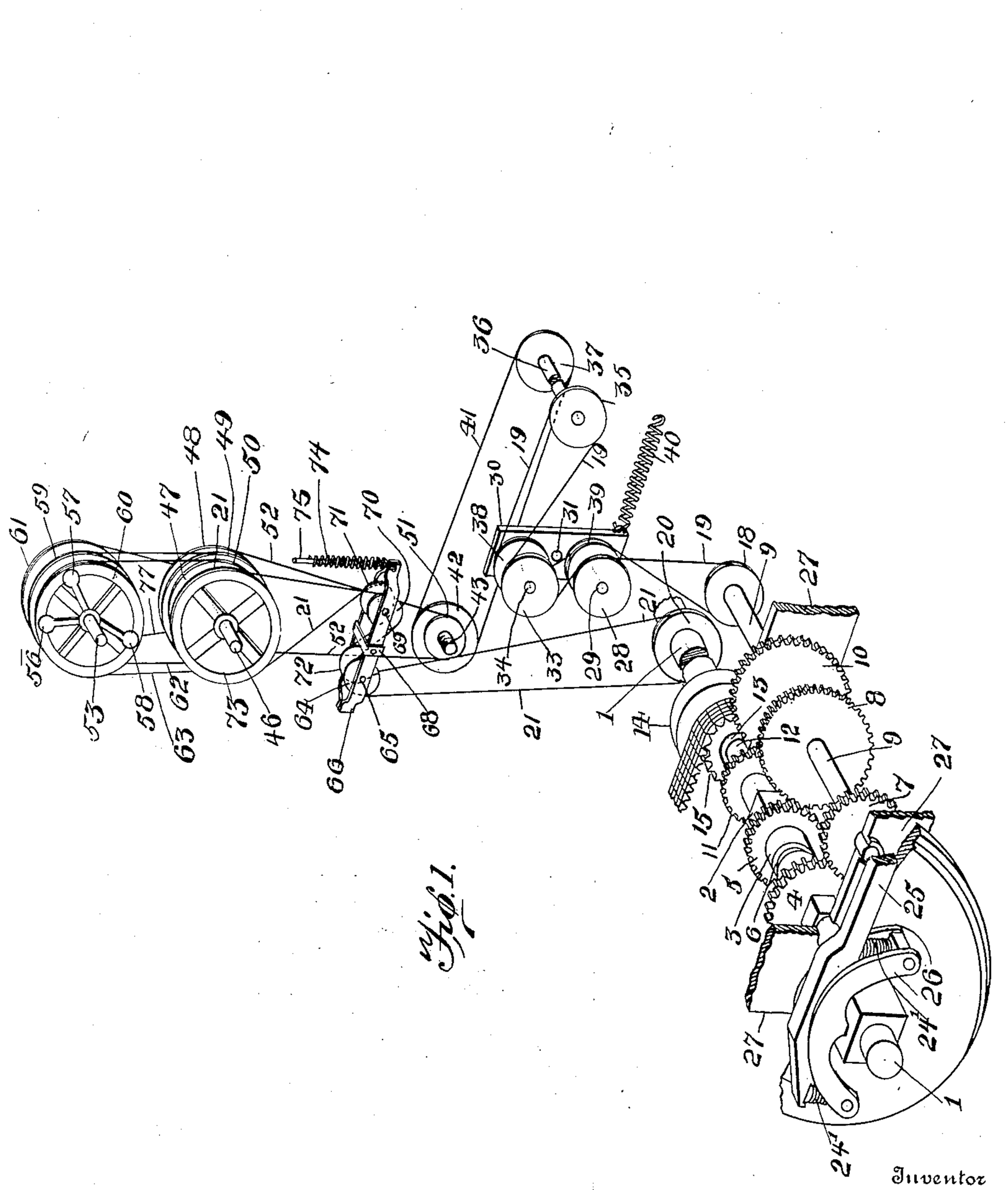

Fig. 1.

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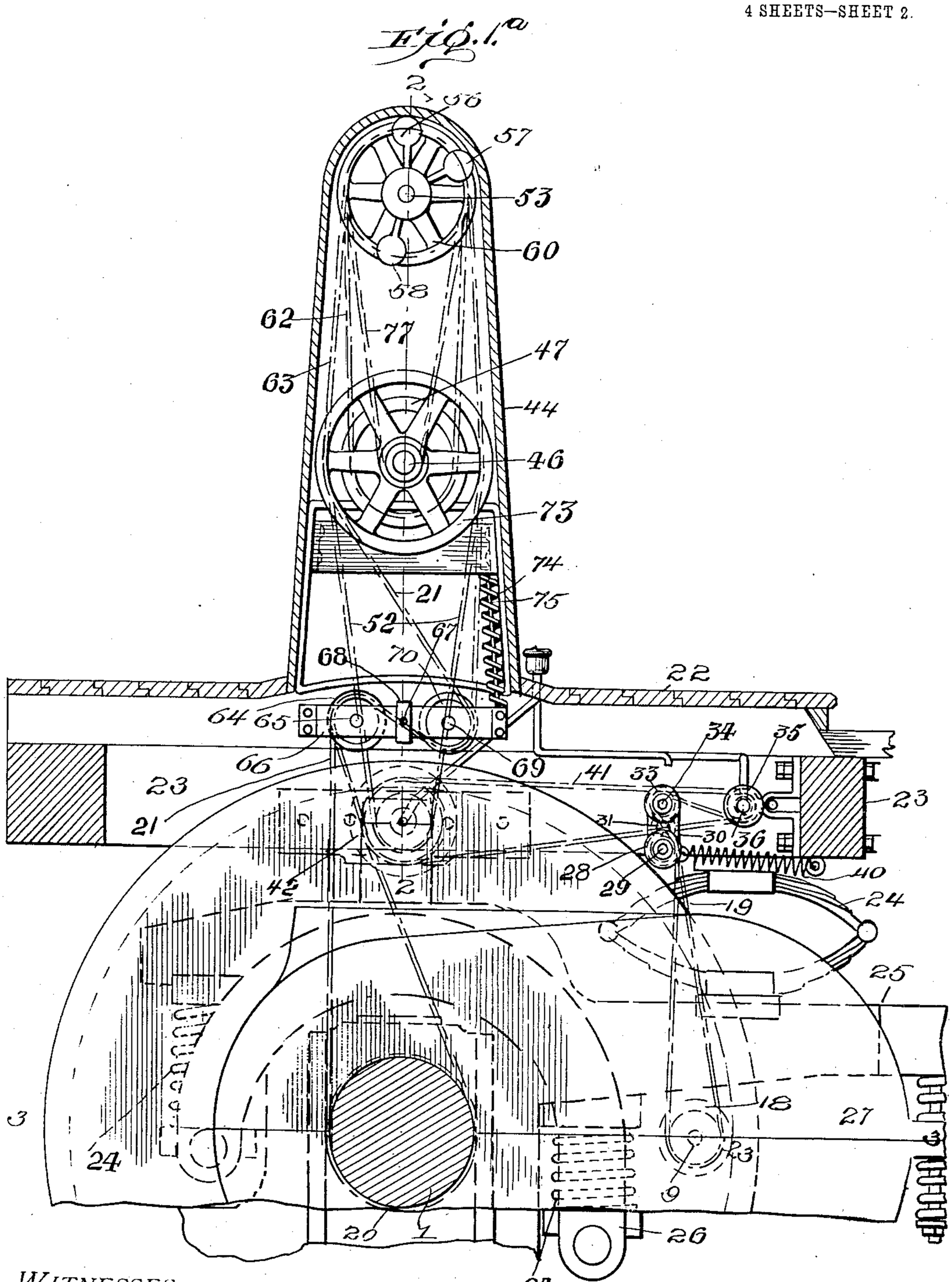
4 SHEETS—SHEET 2.

Fig. 1a



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4 SHEETS—SHEET 3.

Fig. 2.

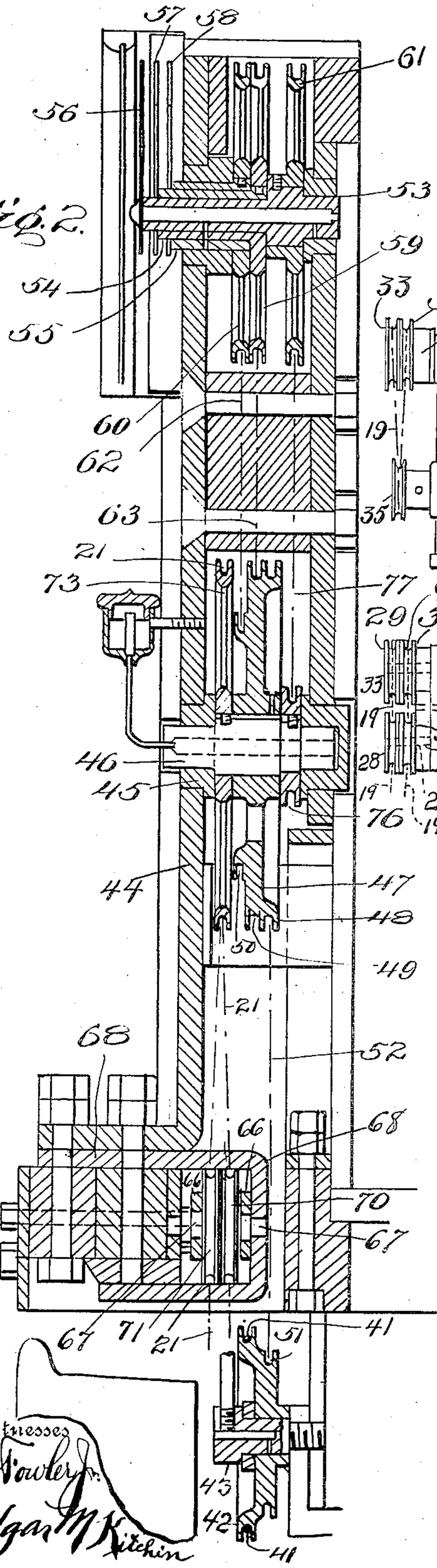


Fig. 4.

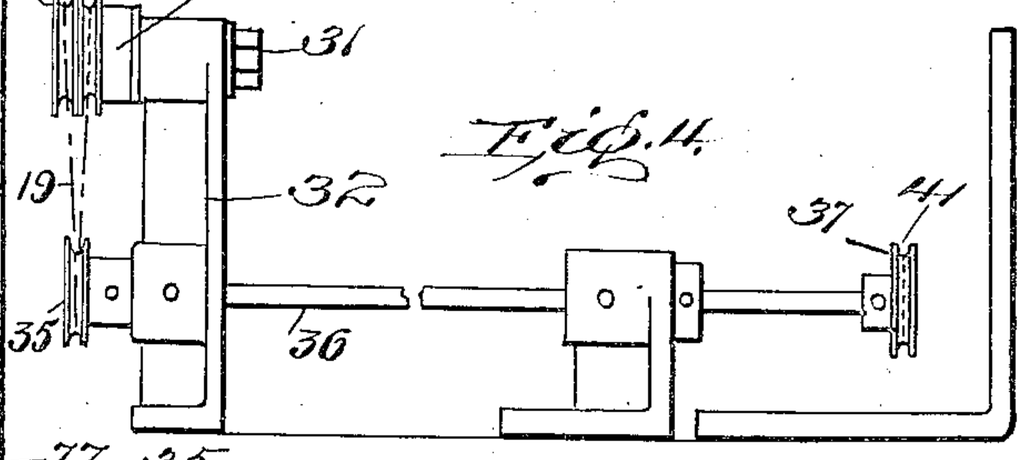


Fig. 5.

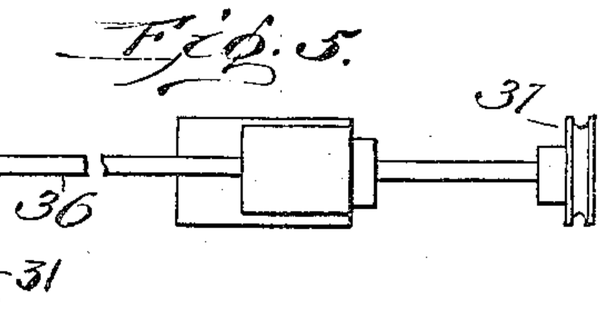
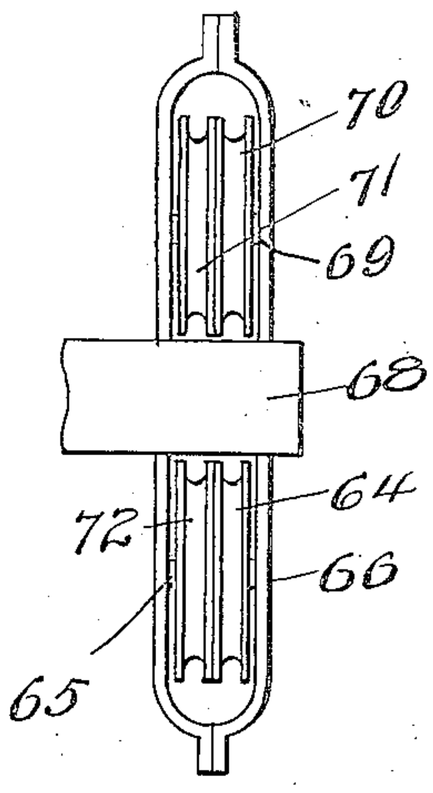


Fig. 6.



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4 SHEETS—SHEET 4.

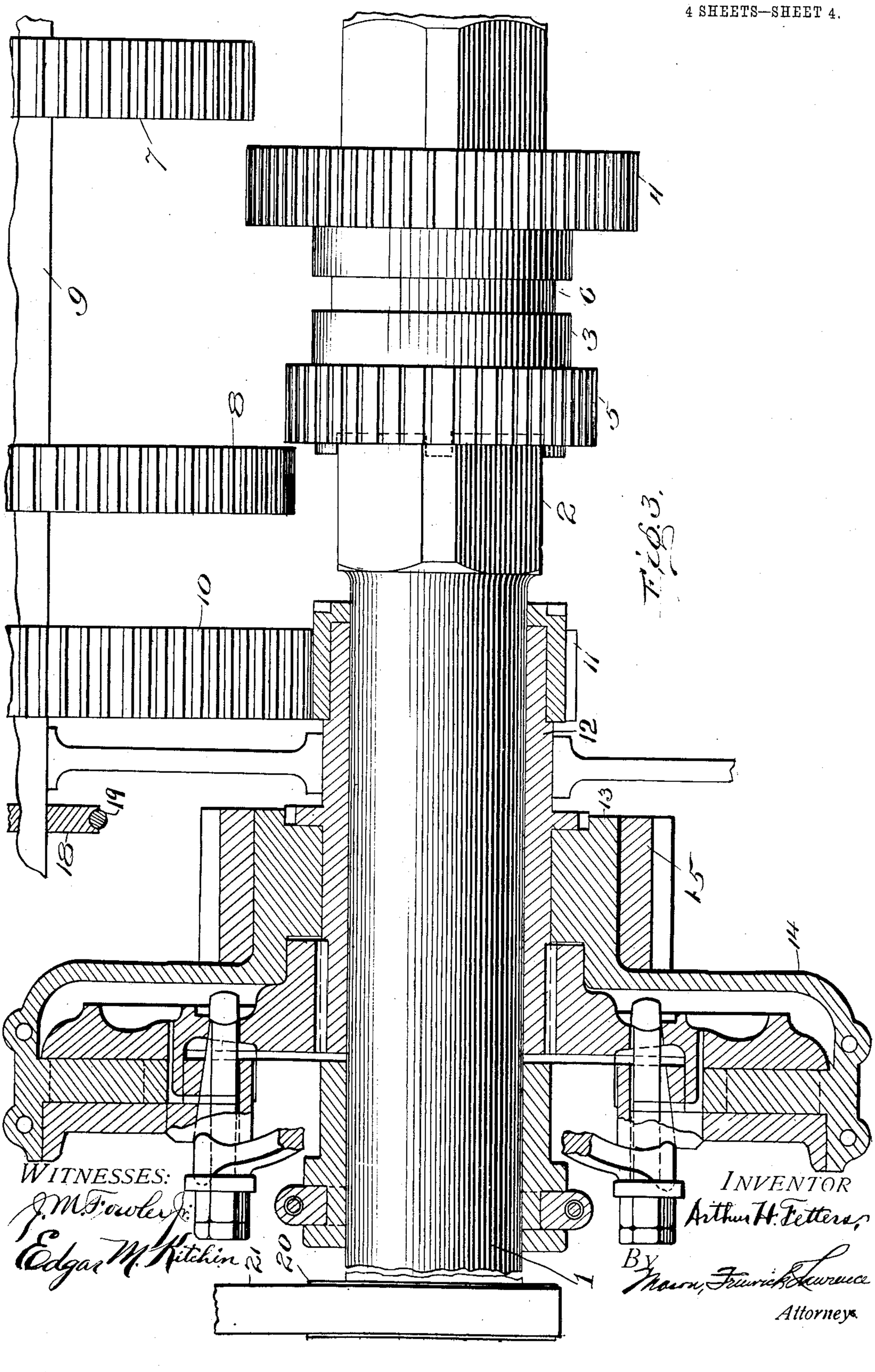

Fig. 3.

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UNITED STATES PATENT OFFICE.

ARTHUR H. FETTERS, OF OMAHA, NEBRASKA.

SYNCHRONISM-INDICATOR.

No. 818,945. Specification of Letters Patent. Patented April 24, 1906.

Application filed May 22, 1905. Serial No. 261,721.

To all whom it may concern:

Be it known that I, ARTHUR H. FETTERS, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Synchronism-Indicators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to indicators, and is particularly directed to mechanism designed to indicate a synchronous condition of gears running at variable speeds.

It has for one of its objects to provide mechanism adapted to indicate the speed at which several gears are rotating, and, further, to indicate when certain of said gears are running in synchronism, so as to facilitate the throwing of said gears into mesh.

Another object is the provision of indicating mechanism of the above type of such construction as to be adapted for use in vehicles—such as, for instance, cars—the bodies of which are resiliently and movably supported from the truck-frame.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the mechanism hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, wherein is illustrated one of the various possible embodiments of my invention, Figure 1 represents a diagrammatical perspective view of an embodiment of the present invention. Fig. 1ª represents a longitudinal vertical central section through a portion of a car provided with an embodiment of the present invention. Fig. 2 represents a vertical section taken on the plane of line 2 2 of Fig. 1ª and looking in the direction indicated by the arrow. Fig. 3 represents a horizontal section taken on the line 3 3 of Fig. 1ª and looking downwardly. Fig. 4 represents a detail view of part of the transmitting-gear. Fig. 5 represents a front view of the detail seen in Fig. 4. Fig. 6 represents a detail plan view of the axle-belt tightener detached.

Before entering upon a detailed description of the several features of my invention and in order to render clearer of understanding certain of the objects thereof it may here be noted that in variable-speed gearing serious damage often results upon attempts being made to throw gears into mesh by reason of variations in the speed thereof. It is therefore desirable that mechanism be provided to indicate when the gears to be meshed are running in synchronism, so that the throwing into mesh may be safely accomplished without putting an undue strain upon the operative parts of the mechanism. The provision of such indicating mechanism is particularly desirable in vehicles, such as cars, designed to be driven at various speeds; but accurate results are rendered difficult of attainment by reason of the relative movement between the car-bodies carrying the indicating devices and the truck-frame upon which the propelling mechanism is mounted. I have therefore provided mechanism designed to indicate accurately a synchronous condition of gears which is particularly adapted for motor-car propulsion, although capable of use in a variety of other relations. The above and other advantages are secured in structures of the nature of that hereinafter pointed out.

In accomplishing the objects of my invention I propose to employ mechanisms such as is illustrated in detail in the accompanying drawings, in which 1 represents a shaft to be driven and in the present instance indicates an axle of a car, such axle being provided with a squared portion 2, upon which is slidingly mounted a sleeve 3, snugly fitting said squared portion so as to rotate with the shaft. The sleeve 3 is provided with gears 4 and 5 of different diameters and with an annular groove 6, adapted to be engaged by any suitable throwing device for causing said gears 4 and 5 to be moved into mesh with gears 7 and 8, respectively fixed to a counter-shaft 9. A gear 10 is fixed to the shaft 9 and meshes with the gear 11, fixed to a sleeve 12, rotatably mounted on the shaft 1. Rotatably mounted on the sleeve 12 is a hub 13 of a carrier 14 of a clutch. Mounted upon and fixed to the hub 13 is a power-receiving gear 15.

Any suitable clutch mechanism may be arranged to engage the carrier 14 for transmitting movement from the same to the sleeve 12, the mechanism herein shown and described representing my preferred form. Of

course it will be understood that the power-transmitting devices illustrated and described are illustrative of one type to which the present improved synchronism-indicator may be applied. In operation the sleeve 3 is designed to be thrown longitudinally of the shaft 1 for causing the gear 4 to mesh with gear 7, or said sleeve may be moved to a position for causing the gear 5 to mesh with gear 8, and it will be understood that the hereinafter-described synchronism-indicator is employed for showing the movement of the gear 4 with respect to gear 7 and gear 5 with respect to gear 8. As the shaft 9 must always travel at a rate bearing a fixed ratio to the rate of travel of the gears 7 or 8 and as gear 5 and gear 4 must always travel at a rate having a fixed ratio with respect to each other, it is only necessary to provide devices actuated by the shaft 9 and shaft 1 (the latter shaft rotating at the same speed as sleeve 3) and indicating devices actuated thereby for indicating the relation of travel of the gears connected to said parts. Therefore, as seen in Fig. 1, I provide a suitable pulley 18, fixed to the shaft 9, and pass a belt 19 about the same and extend the same upwardly to a mechanism hereinafter described. Near the end of the axle 1 opposite that carrying the sleeve 3 I arrange a pulley 20, about which is passed a suitable belt 21, extending upwardly to a mechanism hereinafter described. The synchronism-indicator hereinafter described is mounted upon and carried by a flooring 22, Fig. 1[a], of a suitable car of any ordinary construction, said flooring being supported by the usual sills 23, sustained by springs 24, mounted upon side frames 25 of ordinary construction, said side frames being in turn carried by springs 24′ 24′, mounted upon any ordinary equalizer-levers 26, such equalizer-levers resting upon the journal-boxes carried by the axles of the car. It is to be noted that the shaft 9 and gearing carried thereby are journaled in the supports 27, supported at one end on the axle 1 and at the other end by suitable springs, so that said supports are free to move vertically with said axle, and said axle is free to move vertically with respect to and independently of the platform 22.

As seen best in Figs. 1, 4, and 5, the belt 19 extends upwardly to a pulley 28, said pulley being journaled on a stub-shaft 29, fixed to a pivotally-mounted bar or plate 30, said bar being pivotally mounted upon a suitable bolt 31, carried by a support 32, suitably connected to the car. The belt 19 extends past the pulley 28 upwardly and about a pulley 33, journaled on a stub-shaft 34, fixed to the opposite end of the bar 30 from that carrying shaft 29. From the pulley 33 the belt 9 extends to and passes about a pulley 35, fixed to a shaft 36, journaled in the cross-piece 32 and extending transversely of the bar and carrying at its opposite end a pulley 37, arranged in the same vertical plane longitudinally of the car as the pulley 20 on the axle 1, the pulley 37 being of course in a different horizontal plane. The belt 19 on its return lap extends about a pulley 38, journaled on the shaft 34, and said belt extends downwardly past the pulley 39, journaled on the shaft 29, and thence downwardly and about the pulley 18. The outgoing lap and the return lap of the belt 19 pass forwardly of the pulleys 28 and 39 and rearwardly of the pulleys 33 and 38, said belt being thus interlaced about such pulleys in such a manner that forward pressure upon the lower end of the bar 30, tending to cause pivotal movement of said bar upon its pivot 31, will tend to maintain said belt in a taut condition, and in order to retain the taut condition of said belt a spring 40 is fixed at one end to one of the sills 23 and at the other end to the lower end of the bar 30 in position for drawing said lower end forwardly. It is here to be noted that as the flooring 2 and parts connected therewith, which constitute the initial support for the pulley 35, are moved with respect to the shaft 9 and in practice are being continually moved independently thereof it is desirable to provide means for preventing slack in the belt 19, and such means is provided in the interlaced pulleys carried by the bar 30. Passed about the pulley 37 is a belt 41, which extends to and is passed about a pulley 42, journaled on a stub-shaft 43, fixed to one of the sills 23. A superstructure or housing 44 is mounted upon the platform 22 and is provided with bearings 45 45 for the journals of a shaft 46. Rotatably mounted upon the shaft 46 is a multiple pulley 47, such pulley being provided with belt-receiving grooves 48, 49, and 50. The pulley 42 is of the multiple type, and in addition to the groove for the belt 41 said pulley is provided with a groove 51, about which passes a belt 52, said belt being in turn turned upwardly and passed about the groove 48 of the pulley 47. At the upper end of the housing 44 is arranged a shaft 53, which is journaled in said housing at one end and at its other end carries a rotatably-mounted sleeve 54, Fig. 2, said sleeve in turn carrying an inclosing rotatably-mounted sleeve 55, the sleeve 55 constituting a journal for the end of the shaft 53 opposite that journaled in the housing 44. The nested shafts 53, 54, and 55 at their outer ends carry pointers or targets 56, 57, and 58, respectively. Fixed to the sleeve 54 is a pulley 59, and fixed to the sleeve 55 is a pulley 60. Fixed to the shaft 53 is a pulley 61. The diameter of the pulley 47 at the point of the grooves 48 and 49 bears the same relation to the diameter of said pulley 47 at the point of the groove 50 as the diameter of the gear 8 bears to gear 7; wherefore when the pulley 47 is driven by the belt 52 at a rate

of speed relative to the speed of the shaft 9 belts 62 and 63, passed about the grooves 50 and 49, respectively, will be driven at a rate which will cause the pulleys 60 and 59, to which said belts are passed, to travel in a ratio proportionate to the speed of rotation of the gears 7 and 8. Therefore the targets or pointers 57 and 58 will indicate the proportionate travel of the gears 7 and 8.

The belt 21 extends from pulley 20 upwardly about a pulley 64, Fig. 2, journaled on the shaft 65, fixed to a frame 66, said frame in turn being pivotally mounted on stub-shafts 67 67, projecting from casing 68, surrounding said frame 66, the stub-shafts 67 engaging said frame intermediate the length thereof. At the opposite end of the frame 66 from that to which the shaft 65 is fixed is arranged a shaft 69, upon which are journaled pulleys 70 and 71, a pulley 72 being journaled on the shaft 65. Belt 21 after passing about the pulley 64 passes beneath and about the pulley 70 and extends upwardly from said pulley and passes about a pulley 73, fixed to the shaft 46. The return lap of the belt 21 extends downwardly from the pulley 73 and passes beneath and about the pulley 71 and passes upwardly and about the pulley 72 and thence downwardly and about the pulley 20. The front end of the frame 66 is engaged and depressed by a spring 74, said spring being guided by an ordinary thrust-rod 75. The depressing action of the spring 74 tends to swing the front end of the frame 66 downwardly upon the pivot of the frame, and thereby causes the pulleys 70 and 71 to depress the laps of the belt 21 and the pulleys 65 and 72 to elevate such laps, the interlacing of the belt in said pulleys thus facilitating maintaining the belt in a taut condition regardless of independent movement of the flooring 22 and sills 23 with respect to the shaft 1. The shaft 46 carries a relatively small pulley 76, about which is passed a belt 77, which belt extends upwardly and passes about the pulley 61. The relation of the pulley 73 to the shaft 1 and to the pulley 76 and the relation of pulley 76 to pulley 61 are such that the rotation of the pulley 61 will bear the same proportionate relation to the rotation of pulleys 60 and 59 as exists between the rotation of the shafts 1 and the gears 7 and 8.

It will be observed that as the pulleys 59, 60, and 61 rotate in that relation which exists between the rotation of the shaft 1 and gears 7 and 8 the pointers or target 56, which is actuated by shaft 53, driven by pulley 61, will travel in the same relation to the pointers 57 and 58 as the relation of travel of the shaft 1 has to the gears 7 and 8, and therefore as the sleeve 3 must travel at the same rate as the shaft 1 when the target 56 is traveling with one of the targets 57 or 58 it is evident that either of the gears 4 or 5 is traveling at the same time with either the gear 7 or the gear 8. Thus if when the gears 4 and 7 are in mesh it is desired to increase the speed of the shaft 1 the sleeve 3 is shifted for releasing mesh of the gears 4 and 7, and as the gears "drift" or rotate freely the rotation of the sleeve 3 will gradually become the same as the rotation of gear 8, which condition will be indicated by the fact that the target 56 begins to move with the target 57, and as soon as such targets travel together the gear 5 may be thrown into mesh with gear 8 without danger of breaking.

It will accordingly be apparent that I have provided mechanism well adapted to achieve the objects of my invention characterized by increased simplicity and efficiency. The relative movement between the car-truck and the car-body carrying the indicating devices does not in any way affect the accuracy of operation.

As many changes could be made in the above construction and many apparently widely different embodiments of my invention could be made without departing from the scope thereof, I intend that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. I desire it also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which as a matter of language might be said to fall therebetween.

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

1. The combination with a pair of gears of different diameters and susceptible of variable speed and designed to be thrown into and out of mesh, means for actuating said gears, mechanically-actuated indicators for showing the peripheral speed of each of said gears, and means driven by said actuating means for actuating said indicators.

2. In combination with a pair of spur-gears of different diameters and capable of having variable speed and adapted to be thrown into and out of mesh, of means for actuating said gears, indicators adapted to be driven at different rates of speed by said actuating means to indicate the relative peripheral speed of two of said gears, a third indicator and means for actuating the same to indicate the peripheral speed of a third spur-gear relative to two of the first-mentioned gears.

3. In a mechanism of the class described, in combination a pair of gears adapted to be thrown into mesh, means adapted to drive said gears, and mechanically-actuated means connected with said last-mentioned means adapted to be rotated at speeds proportion-

ate to the peripheral speeds of each of the same, and upon said peripheral speeds becoming equal to be rotated in unison.

4. In a mechanism of the class described, in combination, a pair of gears mounted upon a car and adapted to be thrown into mesh one with the other, movable means adapted to indicate the peripheral speeds of each of said gears, said means being mounted upon a portion of said car movable with respect to said gears, belting connecting said indicating means and said gears, and means adapted to maintain said belting in taut condition.

5. In a mechanism of the class described, in combination, a pair of gears mounted upon a car and adapted to be thrown into mesh one with the other, rotary indicating means mounted upon a portion of said car, movable relative to the gears, each of said indicating means being adapted to be driven at a speed proportionate to the peripheral speed of one of said gears, means adapted to drive said gears, belting connecting said last-mentioned means with said indicating means, and means adapted to maintain said belting in taut condition.

6. In a mechanism of the class described, in combination, a pair of gears mounted upon a car, a third gear mounted upon said car adjacent said first-mentioned gears and adapted to be thrown into mesh with either of the same, means mounted upon a portion of said car movable with respect to said gears and adapted to indicate the peripheral speed of each of said gears, means adapted to drive said gears, belting connecting said last-mentioned means with said indicating means, and means adapted to maintain said belting in taut condition.

7. In a mechanism of the class described, in combination, driving means, driven means, a pair of gears rotatable at different peripheral speeds with respect to each other and connected to one of said means, a gear connected with the other of said means and adapted to be thrown into mesh with either of said first-mentioned gears, and means adapted to indicate the peripheral speed of said last-mentioned gear with reference to the peripheral speed of either of said first-mentioned gears.

8. In a mechanism of the class described, in combination, a car, driving means mounted upon said car, means driven from said driving means adapted to propel said car, a pair of gears, rotatable or of different peripheral speeds connected with one of said means, a gear connected with the other of said means and adapted to be thrown into mesh with either of said first-mentioned gears and vary the speed at which the car is propelled, and means mounted upon said car adapted to indicate the peripheral speed of said last-mentioned gear with reference to the peripheral speed of either of the others of said gears.

9. In a mechanism of the class described, in combination, a car, driving means mounted upon said car, means driven from said driving means adapted to propel said car, a pair of gears rotatable at different peripheral speeds connected with one of said means, a gear connected with the other of said means and adapted to be thrown into mesh with either of said first-mentioned gears and vary the speed at which the car is propelled, and means mounted upon said car having parts adapted to rotate at speeds proportional to the peripheral speeds of each of said gears and upon the peripheral speeds of two of said gears becoming equal to rotate in unison.

10. In a mechanism of the class described, in combination, a car, driving means mounted upon said car, means driven from said driving means adapted to propel said car, a pair of gears of different peripheral speeds connected with one of said means, a gear connected with the other of said means and adapted to be thrown into mesh with either of said first-mentioned gears and vary the speed at which the car is propelled, means upon a portion of said car movable relatively to said gears adapted to indicate the peripheral speeds of each of the same, means connecting said indicating means with said driving means and said driven means, and means adapted to render said connecting means unaffected by relative movement of said indicating means and said gears.

11. In a mechanism of the class described, in combination, a car, driving means mounted thereon, means driven from said driving means and adapted to propel said car, a pair of gears connected with one of said means, a gear connected with the other of said means, mechanically-actuated indicating means mounted upon a portion of said car movable relatively to said gears and adapted to indicate the relative peripheral speeds of each of the same, belting connecting said indicating means with said gears, and means adapted to maintain said belting in taut condition.

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

ARTHUR H. FETTERS.

Witnesses:
CHAS. A. COONS,
HARRY R. STRINGER.