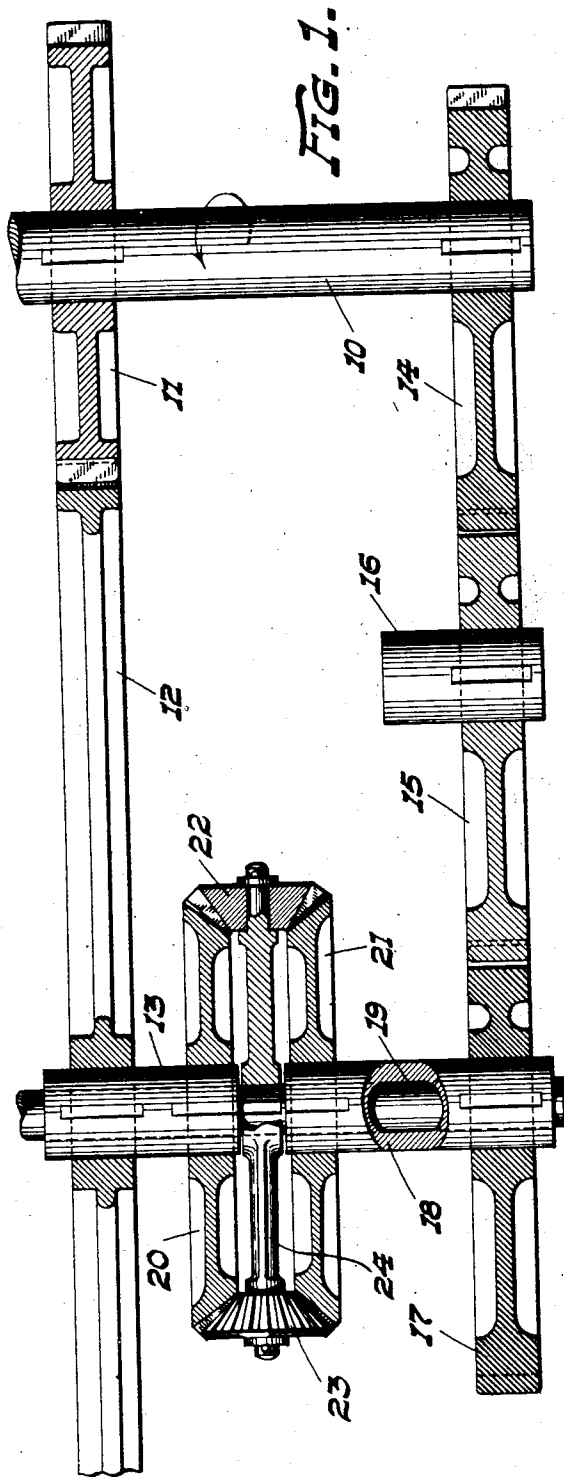


J. L. ADAMS, JR.
INTERMITTINGLY OPERATING GEAR SYSTEM.
APPLICATION FILED JULY 21, 1921.

1,409,900.

Patented Mar. 21, 1922.



WITNESS:

Paul J. Hawn
Del.

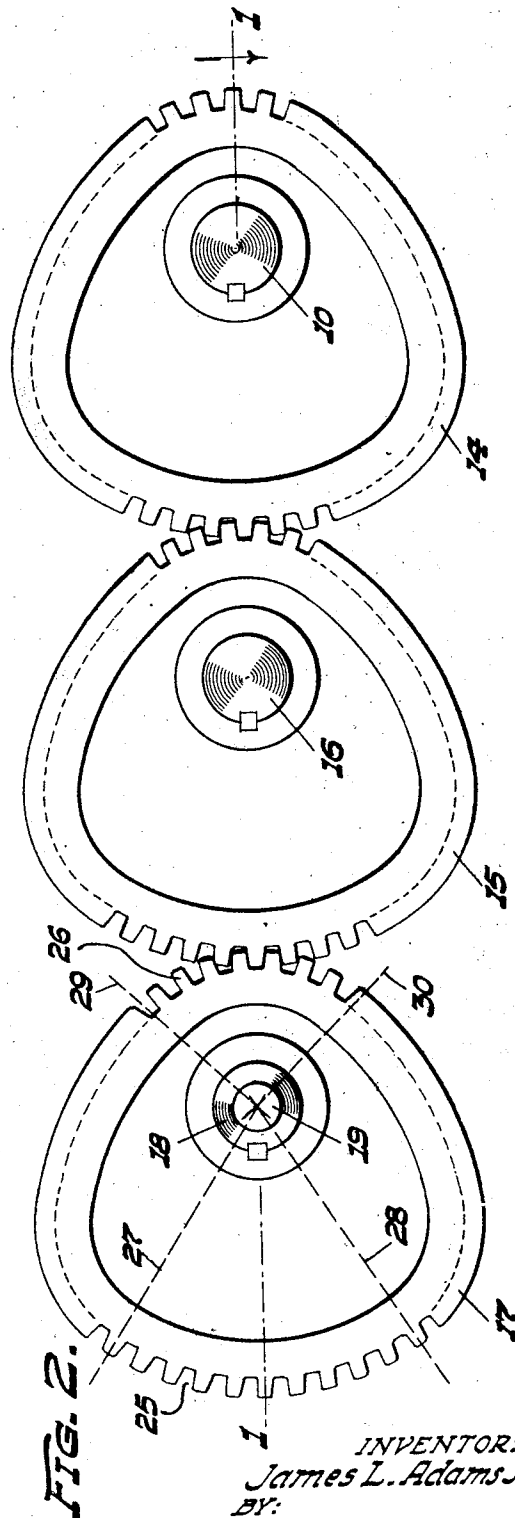


FIG. 2.

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INTERMITTINGLY-OPERATING GEAR SYSTEM.

1,409,900.

Specification of Letters Patent. Patented Mar. 21, 1922.

Application filed July 21, 1921. Serial No. 486,373.

To all whom it may concern:

Be it known that I, JAMES L. ADAMS, JR., a citizen of the United States, and resident of the city of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Intermittently-Operating Gear Systems; and I do declare the following to be a clear, exact, and complete description thereof, such as will enable persons skilled in the art to which the invention relates to make and use the same, reference being had to the accompanying drawings, for disclosure of one construction in which the invention has been embodied.

The present invention relates to a system of gearing, the purpose of which is to transmit motion intermittently.

The invention comprises an arrangement of two trains of gears, the common driving shaft for which is rotated at a constant speed. One of such trains is composed of circular gears to which the constant speed of the driving shaft is transmitted. The other train of gears is composed of irregular or eccentric gears which have a varying speed. The motions of the two trains of gears meet in a differential or planetary motion, by the use of which the machine or tool which is to be operated in the performance of its allotted functions, may be actuated through a fraction of a time cycle or working period, followed by a period of rest of substantially equal duration. The intermitting operation of the machine or tool in the definite timing referred to, permits the movement during the intervening periods of a conveyor or carrier mechanism which presents the work to the machine or tool for operation of the latter thereon.

Although the invention herein disclosed is capable of general use in connection with machines wherein it is desired that the operating elements or tools have the intermitting motion described, the embodiment of the invention hereinafter described is designed particularly for use in connection with devices such as are disclosed in the application of R. Stanley Smith, Serial No. 934,212, filed January 21, 1918. The application referred to discloses an assemblage of machines, which by their related and connected operations, are designed to produce motor and other vehicle frames au-

tomatically. In such assemblage the several machines have periods of synchronous operation, followed by like periods of rest, during which periods of rest, the frame elements are conveyed from machine to machine, or from station to station at which the machines are located, for the performance of the successive operations upon such frame elements in the progressive production of the vehicle frame.

The particular features of construction residing in my invention will be later described in detail, and the novelty thereof will be pointed out in the appended claims.

In the drawing which accompanies this specification, Figure 1 is a horizontal central sectional view through the gear system, on the line 1—1, Fig. 2, with the solid shafts shown in full lines.

Fig. 2 is a view in elevation showing the relation and arrangement of the irregular or eccentric gears.

Referring to the drawing, the numeral 10 indicates a shaft which may be driven at a constant rate of speed by any appropriate means or from any suitable source of power. A gear 11 is keyed upon the shaft 10. The gear 11 is in mesh with a larger gear 12, keyed upon a tubular shaft 13, which will be hereinafter described, the relation between the gears 11 and 12 being as 1:3, so that the constant speed of the driven shaft 10 is transmitted to the tubular shaft 13, in the reduced ratio of 3:1.

Also keyed upon the shaft 10 is an irregular or eccentric gear 14, which meshes with a like gear 15 fixed to a supporting shaft 16. The gear 15 meshes with a third like gear 17, keyed upon a tubular shaft 18, which latter is in alignment with the first mentioned tubular shaft 13. The shafts 10, 13, 16 and 18 will be journaled in suitable bearings properly located upon the frame.

A shaft 19 is supported in the bearings formed by the bores of the aligned tubular shafts 13 and 18. The said shaft 19 is projected beyond the outer end of the tubular shaft 13, in which it is partly journaled, and is connected to the special machine or tool which it is designed to operate.

The contiguous ends of the aligned tubular shafts 13 and 18 have keyed thereon opposed beveled gears 20 and 21, respectively, which last mentioned gears mesh with bev-

eled pinions 22 and 23, supported in diametral relation upon the opposite projecting ends of a spider 24, which latter is connected with the previously mentioned shaft 19, so as to transmit its translational movements to the latter during its periods of rotation, and impart to the pinions 22 and 23 a planetary motion at times during the operation of the gearing.

The irregular or eccentric gears 15 and 17, are each operated at varying speeds which are dependant upon the changing radii of the pitch circles upon which the teeth of such gears are formed. It will be observed from the indications upon the gear 17 in Fig. 2, that these irregular or eccentric gears, and the gear 14, have each two opposite segments of concentric formation, such segments being indicated 25 and 26, and being defined by radial dotted lines 27 and 28, and 29 and 30, respectively. The subtended arcs lying between the pairs of radial lines referred to, are of approximately equal length. Although the irregular or eccentric gear 14 has a constant speed of rotation, due to its being fixed upon the shaft 10, it imparts a varying speed to the like gear 15 with which it intermeshes, on account of the varying radii of the teeth of the said gear 14.

When the irregular or eccentric gears are moving through the position shown in Fig. 2, they produce a 3:1 increase in speed between the shaft 10 and the tubular shaft 18. But when the said gears are rotated 180° a corresponding decrease in the ratio of their movement takes place. It follows from the construction described, that the rate of rotation of the beveled gear 20 on the tubular shaft 13 is therefore constant, and that the rate of rotation of the beveled gear 21 on the tubular shaft 18 is variable, but in synchronism with the rotation of the irregular or eccentric gear 17, which as before stated, is also fixed on the tubular shaft 18.

During certain portions of the cycle of movement of the gear trains, as when the shaft 18 is operating at its lowest speed, the beveled gears 20 and 21 rotate at the same speed in opposite directions. During such movement the differential pinions 22 and 23, in mesh with the beveled gears 20 and 21, rotate idly upon the spider 24, without imparting translational movement to the latter and to the shaft 19. Consequently, the shaft 19 is not rotated, and the special machine or tool, or other device connected therewith is inoperative and remains at rest.

When an increase above the minimum speed of the irregular or eccentric gears as described occurs, the beveled gear 21 on the tubular shaft 18 correspondingly increases its speed, with a consequent gradual increase in the speed of the shaft 19. This increase continues until the irregular or eccentric gears have reached their maximum speed.

The differential in the ratio of movement of the beveled gears 20 and 21 thus established, causes the pinions 22 and 23 to swing through their planetary path and move the spider 24. Consequently, the shaft 19 will be rotated during this period, and correspondingly the special machine or tool which is operated by the said shaft 14, will be actuated for the performance of its work.

In the intervals of the alternating working periods described, the conveyor mechanism will be actuated to carry or move the elements from one position to the next. Such conveyor mechanism will be actuated by a second gear system of the type herein disclosed, as will be understood.

The drawing shows a typical but not necessarily invariable construction. Equivalent structures will suggest themselves to those skilled in the art to which the invention pertains. The ratios given are not absolute, but may be varied. Such changes will be within the scope of my invention. The purposes of the invention may also be achieved by changing the form of the gears 11 and 12, so as to provide for the varying speed of such gears, and correspondingly changing the form of the irregular or eccentric gears, so that the two trains of varying speed gears will operate in synchronism at the desired times in the cycle of their movements, and at varying speeds with relation to each other at other times in the cycle, to effect the desired operations.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. In a motion transmitting mechanism, a gear train operating at constant speed and a gear train operating at variable speed, a differential connecting the said trains, and an element actuated by the differential with intervening periods of inaction.

2. In a motion transmitting mechanism, a shaft driven at constant speed, a train of circular gears actuated thereby, a train of irregular or eccentric gears actuated by the said shaft at varying speed, a differential connecting the trains at their other ends, and an element rotated intermittently by the differential.

3. In a motion transmitting mechanism, a shaft for transmitting motion, and means for actuating the said shaft intermittently, the said means comprising two trains of gears, one actuated at constant speed and the other at variable speed, a differential connecting the said trains of gears, and connections with the transmitting shaft, whereby the latter is rotated intermittently.

4. In a motion transmitting mechanism, a shaft driven at constant speed, two trains of gears actuated from the said shaft, the first train at constant speed and the second at varying speed, a transmitting shaft, and

a differential connected to the other ends of the trains and to the transmitting shaft, whereby the latter is rotated intermittingly.

is rotated intermittingly with alternating periods of rest, the periods of rotation and the periods of rest being of substantially equal duration.

5 In a motion transmitting mechanism, a gear train comprising circular gears actuated at constant speed, a second gear train comprising irregular or eccentric gears actuated at variable speed, aligned tubular shafts upon which the last gear of each train is mounted, a differential connecting the
10 contiguous ends of the said tubular shafts, and a shaft journaled in the said tubular shafts and connected to the differential, whereby the said journaled shaft is rotated
15 intermittingly.

6. In a motion transmitting mechanism, a shaft, reduction gears driven therefrom, and a tubular shaft rotated by such gears at constant speed, irregular or eccentric gears
20 driven at variable speed from the said shaft, and a second tubular shaft rotated by said variable speed gears, a differential connecting the tubular shafts, a power transmitting shaft journaled in the tubular shafts, and
25 connections between the differential and the power transmitting shaft, whereby the latter

7. In a mechanism for transmitting intermitting motion, a shaft driven at a constant rate of speed, a circular gear fixed thereon, a second circular gear in mesh therewith, and a tubular shaft on which said second
30 gear is fixed, in combination with a train of irregular or eccentric gears the first of which is fixed upon the said driven shaft, an aligned tubular shaft upon which the end gear of the train is mounted, a differential
40 connecting the contiguous ends of the tubular shafts, and a power transmitting shaft journaled in the aligned tubular shafts and connected with the differential and rotated intermittingly thereby.

In testimony whereof, I have signed my name at Milwaukee, this 30th day of June, 1921.

JAS. L. ADAMS, JR.

Witnesses:

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GLADYS M. MCGHEE.