No. 669,036. Patented Feb. 26, 1901.

J. H. PENDLETON.

MEANS FOR TRANSMITTING ROTARY MOTION.

(No Model.) (Application filed June 1, 1900.)

2 Sheets—Sheet 1.

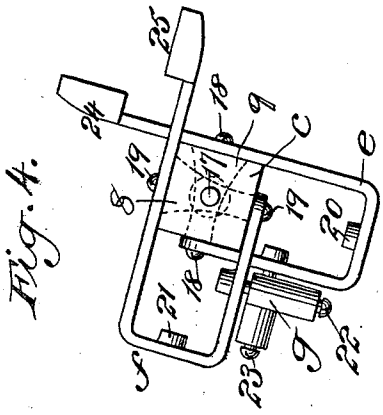

Fig. 4.

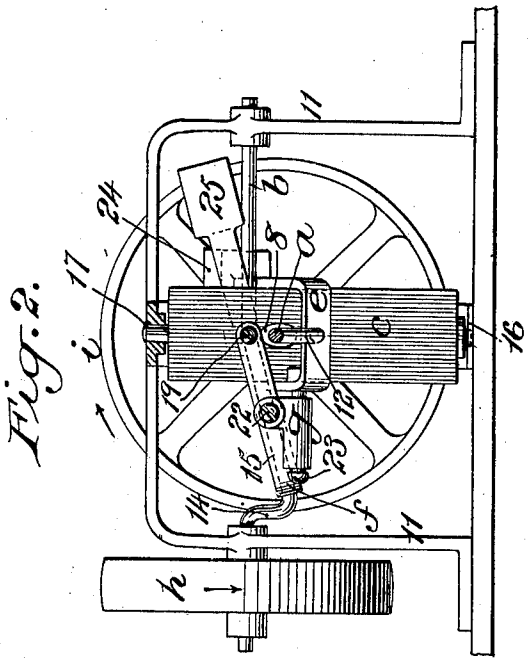

Fig. 2.

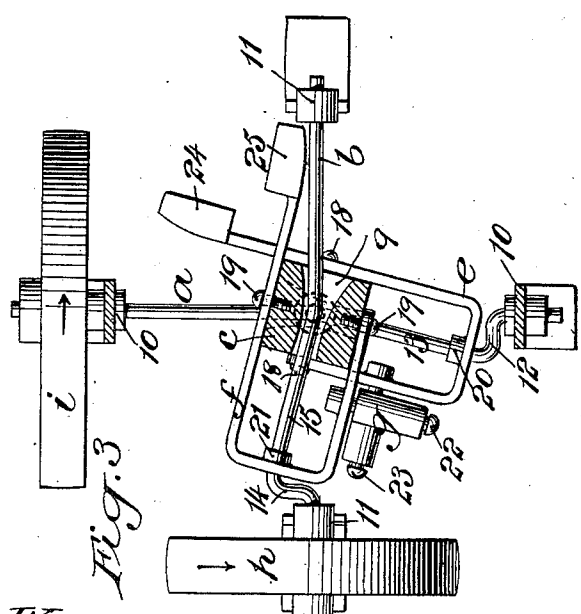

Fig. 3.

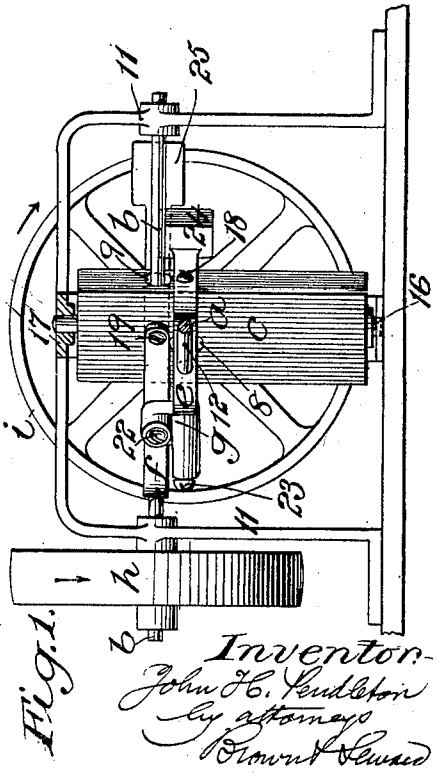

Fig. 1.

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Edward Vieser.

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J. H. PENDLETON.

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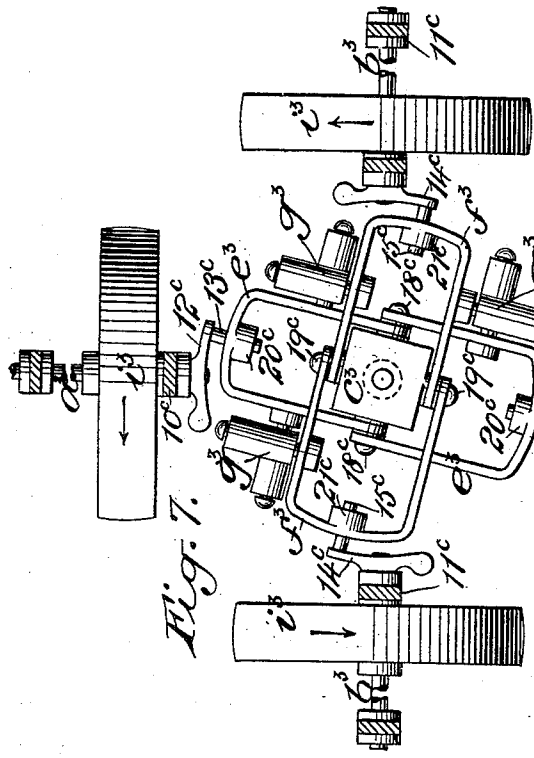

Fig. 7.

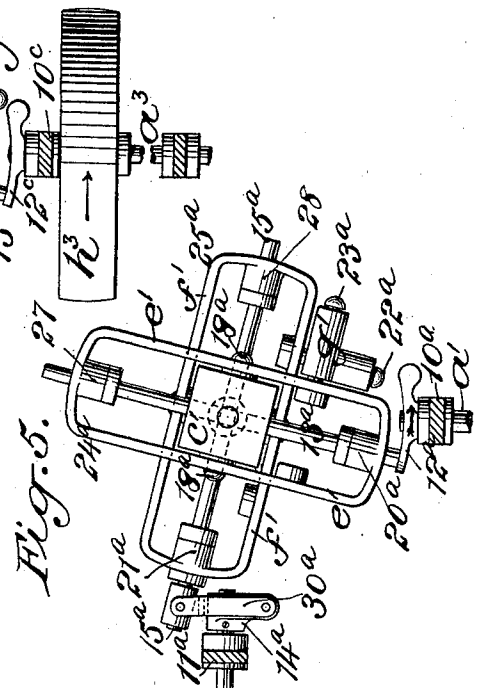

Fig. 5.

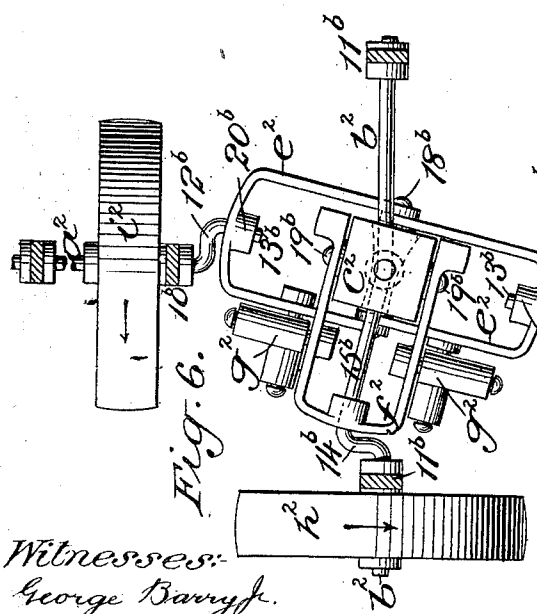

Fig. 6.

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MEANS FOR TRANSMITTING ROTARY MOTION.

SPECIFICATION forming part of Letters Patent No. 669,036, dated February 26, 1901.

Application filed June 1, 1900. Serial No. 18,706. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. PENDLETON, a citizen of the United States, and a resident of Ozone Park, in the borough of Queens, in the city and State of New York, have invented a new and useful Improvement in Means for Transmitting Rotary Motion, of which the following is a specification.

This invention relates to means for transmitting rotary motion from one to another of crossing shafts or of shafts or rotary bodies the axes of which have an angular relation to each other.

I will first describe my invention with reference to the accompanying drawings and afterward point out its novelty in the claims.

Figures 1 and 2 represent each a side elevation of a simple example of the invention, the front standard containing the bearing for the lower shaft being omitted and the shaft being shown in section, said figures showing the parts in different positions, but being otherwise alike. Fig. 3 is a plan view corresponding with Fig. 1, partly in section. Fig. 4 is a detail view which will be hereinafter explained. Figs. 5, 6, and 7 are plan views illustrating other examples of the invention.

Similar letters and numbers of reference designate corresponding parts in all the figures.

Referring first to Figs. 1, 2, and 3, *a* and *b* designate two horizontal shafts crossing each other at right angles in parallel planes. The said shafts may be supported and run in any fixed bearings. The lower shaft *a* is represented as supported in bearings in fixed standards 10 10 and the upper one, *b*, in bearings in fixed standards 11 11. The said shafts are both cranked alike, as shown in Fig. 3, the crank of *a* being designated by 12 13 and that of *b* by 14 15.

c is what may be called a "yoke-carrier," consisting of an upright shaft having its journals 16 17 working in fixed bearings, of which the lower one is represented as in a step and the upper one as in a bridge supported on the standards 11. The axis of the journals or pivots of this yoke-carrier intersects the axes of the shafts *a* and *b* at the crossing of said shafts, as may be understood by reference to Fig. 3, openings 8 9 being provided in the said carrier large enough for the free passage through it of the shafts and their crank-pins.

To the yoke-carrier *c* are pivoted one above the other, crossing each other at right angles, by pivots 18 19 two vertically-oscillating yokes *e* and *f*. The yoke *e* contains the bearing 20 for the crank-pin 13 of the shaft *a* and the yoke *f* contains the bearing 21 for the crank-pin 15 of the shaft *b*. The crank-pins 13 15 are represented at such oblique angles to their respective shafts that they are always parallel with the planes of oscillation of their respective yokes upon their pivots 18 or 19, as may be understood by reference to Fig. 3, and at the same time each yoke is always in a plane passing through its pivot 18 or 19 and the center of its bearing 20 or 21, as may be understood by reference to Fig. 2, wherein the crank-pin 15 is shown through the yoke in dotted outline. The two yokes are connected together by a link *g*, said link being connected with the yoke *e* by a pivot 22 and with the yoke *f* by a pivot 23. This is shown in Fig. 4, which represents a plan view with the shafts omitted. The yokes *e f* are provided, respectively, with counterbalances 24 25 to counterbalance the portions which contain the crank-pin bearings 20 21.

Rotary motion being given by any suitable means to either of the shafts *a b*, a corresponding rotary motion will be transmitted from it to the other. I will suppose, for example, that the upper shaft *b* is the driver, receiving motion through its pulley *h*, and that the shaft *a* is furnished with a pulley *i* for transmitting the motion received from *b*. The crank 14 15 of the shaft *b* gives to its yoke *f* both an upward and downward oscillation and a horizontal movement about the pivots 16 17 of the yoke-carrier *c*, which turns back and forth with it. This pivotal movement of the yoke-carrier gives a corresponding horizontal movement to the yoke *e*, and the link *g* transmits from the yoke *f* a corresponding vertical movement to the yoke *e*, and the horizontal and vertical movements of the latter yoke are resolved into a circular movement of the bearing provided in said yoke for

the crank-pin 13, and a rotary movement of the crank 12 13 and its shaft a is thereby produced.

In the example shown in Fig. 5, which is especially adapted for the transmission of motion between two shafts meeting at right angles in the corner of a building or room, the two shafts a' and b', or at least the crank-pins 13^a 15^a thereof, pass through the yoke-carrier c', as in the first-described example; but the fixed bearings 10^a 11^a for each of the said shafts are only on one side of the yoke-carrier. The yokes e' f' in this example are prolonged, as shown at 24^a 25^a, beyond the carrier c', and the crank-pins 13^a 15^a have, in addition to their bearings 20^a 21^a, like those in the first-described example, bearings 27 28 in the prolonged parts 24^a 25^a of the yokes. These prolonged parts 24^a 25^a of the yokes constitute counterbalances, in which respect they are the equivalents of the counterbalances 24 25 of the first-described examples. Either shaft may be the driver; but I will suppose, for example, that it is the shaft b' which transmits motion to and through the connection g' between their yokes. The relative directions of the two shafts will depend on which side of the driving-yoke f' the connection is made. By changing the position of the connection from one side to the other of said yoke the direction of the driven shaft is reversed, while the direction of the driver remains the same. The arm 14^a of the crank 14^a 15^a of shaft b' is shown as connected with its crank-pin by a pivoted drag-link 30^a to compensate for variations in the length of the shaft.

In the example shown in Fig. 6, one driving-shaft b^2 gives rotary motion in opposite directions to two shafts a^2 a^2, arranged in line with each other at right angles to the said shaft b^2. The shaft b^2 is supported in bearings 11^b 11^b, one on each side of the yoke-carrier c^2, and it passes through the yoke-carrier as in the first-described example, the yoke f^2, which receives its crank-pin 15^b, being similarly pivoted to the carrier c^2 by pivots 19^b. There is a separate yoke e^2 for each shaft a^2, and both of these yokes are pivoted to the carrier c^2 by the same pivots 18^b. The said shafts a^2 do not pass through the carrier c^2, but their crank-pins 13^b terminate just inside of their bearings 20^b in their respective yokes. The two yokes e^2 e^2 are connected with the yoke f^2 by separate links g^2, one on one side and the other on the other side of said yoke f^2, and by this arrangement of connections the two shafts a^2 a^2 are caused to rotate in opposite directions.

In the example represented in Fig. 7 there are four separate shafts, from one of which rotary motion is transmitted to the other three. Two of said shafts a^3 a^3 are in line with each other, and the other two, b^3 b^3, which are at right angles to a^3 a^3, are also in line with each other. A separate yoke e^3 or f^3 is provided for each of said shafts. The two yokes e^3 e^3 of the shafts a^3 a^3 are pivoted to the carrier c^3 by the same pivots 18^c, and the two yokes f^3 f^3 are pivoted to the said carrier by the same pivots 19^c. None of these shafts pass through the yoke-carrier c^3; but their crank-pins 13^c 15^c terminate in the yokes just within their respective bearings 20^c 21^c, and the stationary bearings 10^c 11^c for each of said shafts are on one side of the carrier c^3. Either of the said shafts may be the driver; but I will suppose the shaft a^3 in the lower part of the figure to be the driver and furnished with a pulley h^3 for the reception of a driving-belt. The driving-shaft yoke e^3 is connected with the yoke f^3 of the right-hand shaft b^3 by means of a link g^3, connecting the said yoke e^3 with one side of said yoke f^3. The said yoke f^3 is connected by a second link g^3 on its opposite side with the yoke e^3 of the shaft a^3 in the upper part of the figure, which yoke e^3 is connected by means of a third link on its other side with the yoke f^3 of the left-hand shaft b^3. By means of the third link connections motion is transmitted from the yoke of the driving-shaft to the yokes of the other shafts in succession and of the second, third, and fourth yokes each transmits motion to its respective shaft. With the link connections shown between the four yokes the relative directions of the shafts are as indicated by the arrows on their respective pulleys; but by changing the connections from one side to another of the yokes the relative directions may be varied in many ways, as will be obvious to the engineer or skilled mechanic.

What I claim as my invention is—

1. The combination of two crank-shafts located at an angle to each other, a yoke-carrier consisting of a shaft having its axis perpendicular to and intersecting the axial lines of said crank-shafts, stationary bearings for said crank-shafts and yoke-carrier, yokes one for each crank-shaft pivoted to the yoke-carrier at an angle to each other and transversely to the axis of said carrier and containing bearings for the cranks of said crank-shafts, and a link connection between said yokes, substantially as herein described.

2. The combination of two crank-shafts located at an angle to each other, a yoke-carrier consisting of a shaft having its axis perpendicular to and intersecting the axial lines of said crank-shafts, stationary bearings for said crank-shafts and yoke-carrier, yokes one for each crank-shaft pivoted to the yoke-carrier at an angle to each other and transversely to the axis of said carrier and containing bearings for the cranks of said crank-shafts, counterbalances for said yokes, and a link connection between said yokes, substantially as herein described.

3. The combination of a plurality of crank-shafts arranged at angles to each other in parallel planes, a yoke-carrier consisting of a shaft having its axis perpendicular to and intersecting the axial lines of said crank-shafts

and having in it an opening for the passage through it of one of said crank-shafts, stationary bearings for said crank-shafts and yoke-carrier, yokes one for each crank-shaft crossing each other and pivoted to the yoke-carrier transversely to the axis thereof and containing bearings for the cranks of said crank-shafts, and a link connection between any two of said crossing yokes, substantially as herein described.

4. The combination of two crank-shafts crossing each other in parallel planes, a yoke-carrier consisting of a shaft having its axis perpendicular to and intersecting the axial lines of said crank-shafts and having in it transverse openings for the free passage through it of both of said crank-shafts, stationary bearings for said crank-shafts and yoke-carrier, yokes one for each crank-shaft pivoted to the yoke-carrier at an angle to each other and transversely to the axis of said carrier and containing bearings for the cranks of said crank-shafts, and a link connection between said yokes, substantially as herein described.

5. The combination of two crank-shafts located at an angle to each other, a yoke-carrier consisting of a shaft having its axis perpendicular to and intersecting the axial lines of said crank-shafts, stationary bearings for said crank-shafts and yoke-carrier, yokes one for each crank-shaft pivoted to the yoke-carrier at an angle to each other and transversely to the axis of said carrier and containing bearings for the cranks of said crank-shafts, and a link pivoted to the two yokes respectively by pivots arranged transversely to each other, substantially as herein described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 22d day of May, 1900.

JOHN H. PENDLETON.

Witnesses:
FREDK. HAYNES,
EDWARD VIESER.