No. 630,407. Patented Aug. 8, 1899.

M. O. REEVES.

SPEED VARYING MECHANISM.

(Application filed Feb. 25, 1899.)

(No Model.) 3 Sheets—Sheet 1.

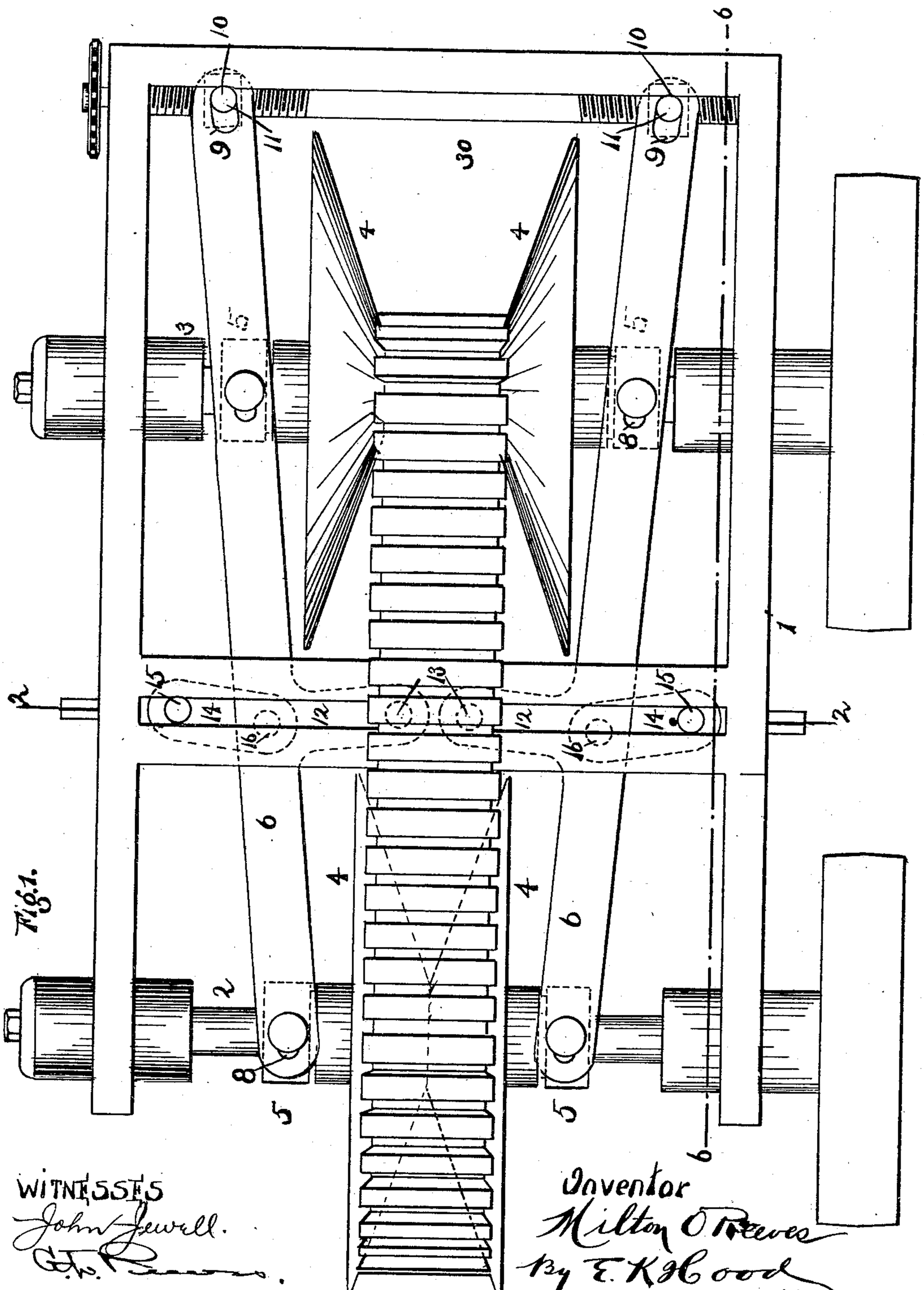

Fig. 1.

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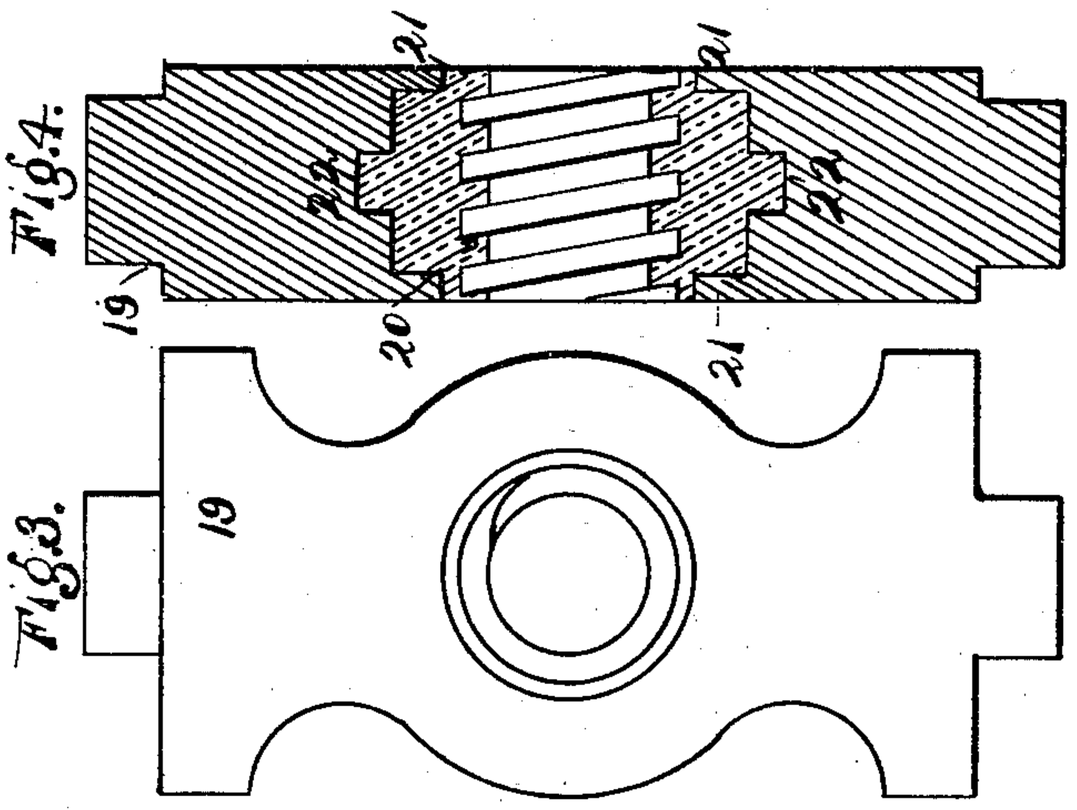

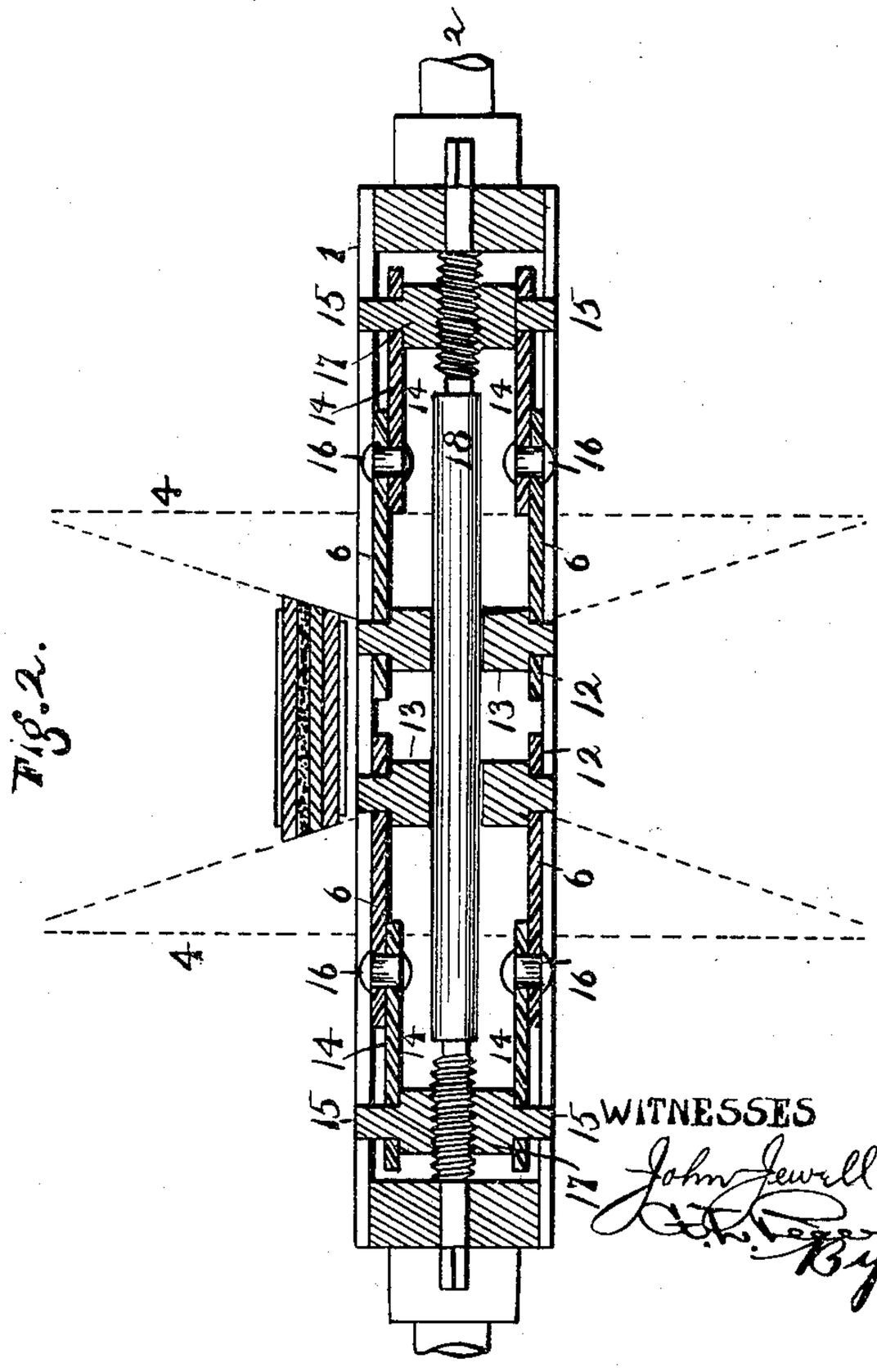

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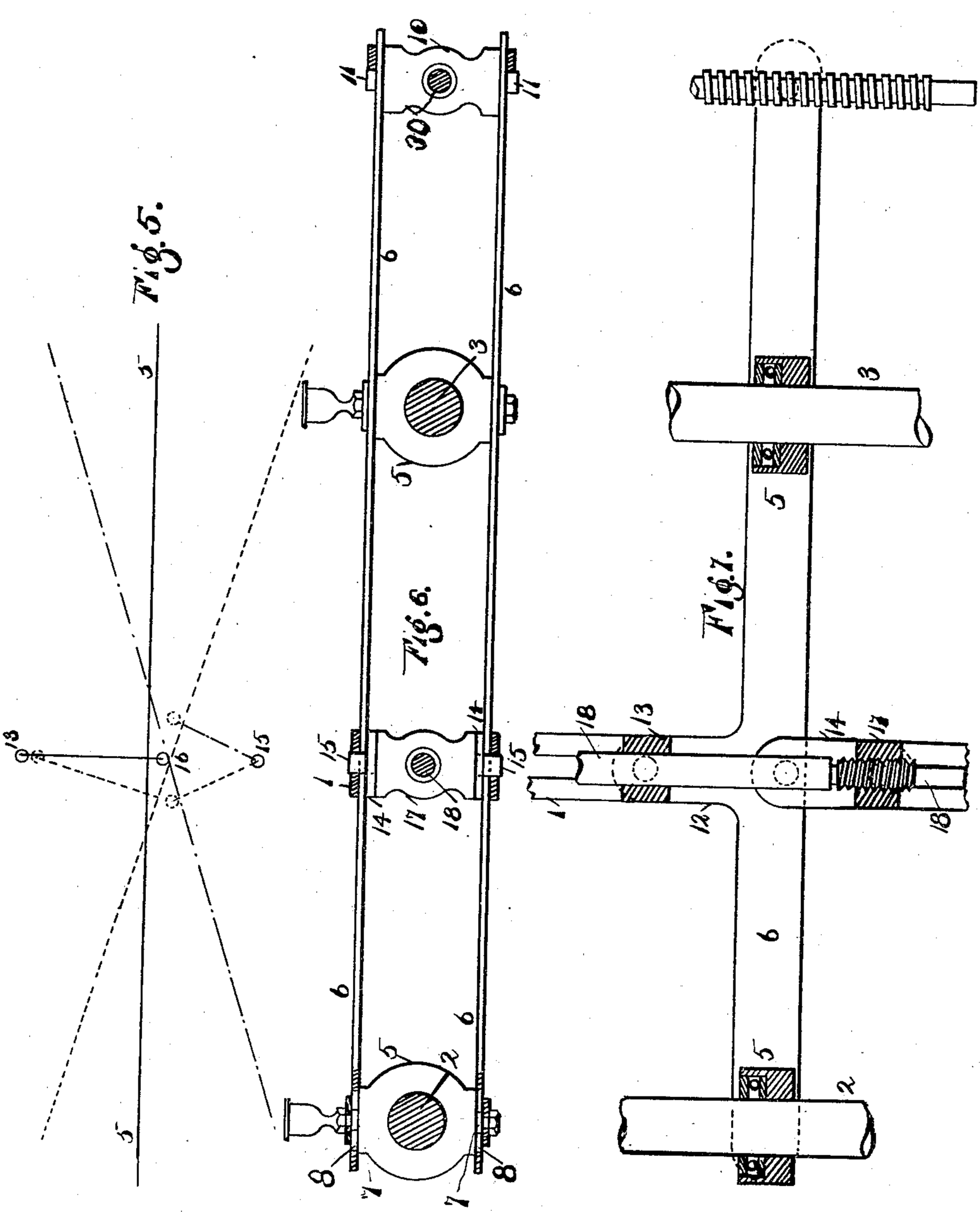

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UNITED STATES PATENT OFFICE.

MILTON O. REEVES, OF COLUMBUS, INDIANA, ASSIGNOR TO THE REEVES PULLEY COMPANY, OF SAME PLACE.

SPEED-VARYING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 630,407, dated August 8, 1899.

Application filed February 25, 1899. Serial No. 706,900. (No model.)

To all whom it may concern:

Be it known that I, MILTON O. REEVES, a citizen of the United States of America, residing at Columbus, in the county of Bartholomew and State of Indiana, have invented certain new and useful Improvements in Speed-Varying Mechanism, of which the following is a specification.

The object of my invention is to provide a mechanism wherein a variation of speeds from maximum to minimum can be obtained without varying the initial driving speed, and more especially to provide means for maintaining a uniform tension upon the belt in the machine hereinafter described and claimed and also to provide a compact and efficient device.

My invention consists in the combination and arrangement of parts hereinafter described and claimed.

The elementary construction of the device is described in Letters Patent No. 583,402, issued to the Reeves Pulley Company May 25, 1897, and further exemplified in Letters Patent No. 588,354, issued to the Reeves Pulley Company August 17, 1897.

The device primarily consists of two parallel shafts mounted in a suitable frame and each carrying a pair of cone-shaped driving elements splined to its shaft. The members of each pair have their cone-surfaces facing each other. Each driving element is provided with a projecting hub bearing against a ball thrust-bearing. The corresponding bearings of each pair are connected by means of levers pivoted half-way between the shafts, which when oscillated move one pair of driving elements together and move the other pair apart simultaneously therewith. A bevel-edged driving-belt of suitable construction is stretched between the pairs of driving elements, and as one pair move apart the belt assumes a small driving diameter, and simultaneously therewith the other pair move together and the belt assumes a large driving diameter, thus varying the speed of one shaft relatively to the other.

As is well known among mechanics, more belt is required to pass around and connect a large and small pulley than is required to pass around and connect two pulleys of the same diameter—the mean between the large and the small one—the pulleys of course being spaced the same distance between centers. It will be noticed that this fundamental principle is met in a speed-varying mechanism of the class described, and to construct a successful machine for transmitting power this variation in belt must be taken care of. If the driving elements are actuated along their respective shafts by levers pivoted half-way between the shafts, it will be noted that the approaching and receding elements slide exactly the same distance, but in opposite directions, thus increasing the driving diameter upon the approaching pair exactly the same amount as the driving diameter upon the receding pair is decreased; but, as heretofore stated, more belt is required for this latter position of the driving elements than is required in the intermediate position. A part of my present invention consists in making the belt long enough to assume a driving diameter upon each pair slightly greater than the mean diameter when the levers are parallel and then providing means for moving the pairs of driving elements in a differential ratio, whereby the belt is kept at uniform tension upon all driving diameters.

In the drawings, Figure 1 is a plan of the device embodying my invention; Fig. 2, a cross-section on line 2 2 of Fig. 1; Fig. 3, a plan of one of the lever-operating nuts; Fig. 4, a section of the same; Fig. 5, a diagrammatic sketch, showing the principle of operation of the device; Fig. 6, a section on line 6 6, Fig. 1; and Fig. 7, a detached plan of one of the levers.

1 represents the frame, having mounted therein two parallel shafts 2 3, each carrying a pair of driving elements 4, splined to their respective shafts to rotate therewith, but free to slide longitudinally thereon. Each driving element bears against a ball thrust-bearing 5, supported between pairs of levers 6. These thrust-bearings are provided with diametrically opposite trunnions 7, which are adapted to work in slots 8, the purpose of which will be hereinafter described.

The corresponding members of each pair of driving elements are connected by a separate pair of levers, which are prolonged at one end and provided with slotted openings 9.

Mounted adjacent to these extended ends is a screw-shaft provided with a left-hand-threaded part and a right-hand-threaded part, each carrying a nut 10, engaging with its corresponding pair of levers by means of trunnions 11, working in slots 9.

Levers 6 are provided with an inwardly-projecting teat or part 12, having the pivot for the lever formed therein. Each pair of levers pivot upon corresponding pivots 13, which are free to slide laterally relatively to the frame. Links 14 are pivoted to suitable supports 15 and have their free ends pivotally secured to their corresponding lever at 16. Now the movement of these levers may be noted. Starting from the position shown in Fig. 1, if the screw-shaft is actuated the extended ends of the levers are caused to approach each other. This, as will be readily seen, causes the pair of driving elements closest the screw-shaft to approach each other and simultaneously therewith causes the other pair to recede; but as this is taking place it will be noticed that levers 6 are swinging about their pivots 13; but since points 16 must swing about pivots 15 on account of link 14 the pivots 13 are forced longitudinally toward each other. This movement continues until points 16 come in line with pivots 13 and 15. Now by further movement of the screw-shaft 30 the pivots 13 begin to recede from each other on account of links 14 having passed to the other side of the line through the pivots. The slots in levers 6 allow of the necessary sliding movement upon the thrust-collars 5. The result of this action is as follows: Now as the levers move from the position shown in Fig. 1 the approaching pair move together more rapidly than the receding pair move apart, because the pivots 13 are being forced toward each other at the same time that the levers are swinging on their pivots and moving the driving elements, and the belt is caused to ride on the approaching driving elements upon a slightly-larger diameter than it would occupy if the approaching elements were moved exactly the same distance as the receding elements. This relative movement of the driving elements continues until the pairs of levers are parallel. Now upon investigation it will be found that the belt is upon equal diameters of each pair; but these diameters are slightly above the mean. If movement in the same direction is continued, the links 14 swing to the other side of the center line drawn through the pivots and the pivots 13 recede, thereby causing the approaching pair to move gradually slower and the receding pair gradually faster. It will thus be seen that the driving elements are moved in a differential ratio, the approaching faster than the receding, until the levers are parallel, and from thence on vice versa. The same action takes place no matter in what direction the driving elements are moved.

For adjusting the driving elements so as to produce any desired initial tension upon the belt I provide means for moving pivots 15 simultaneously in opposite directions. The arrangement consists of a right and left hand threaded screw-shaft 18, carrying nuts 17, which carry the pivots 15. By simply turning shaft 18 the pivots are forced a little closer together, thereby forcing both pairs of elements together, and any looseness caused by stretching is taken up. This action is fully described in Letters Patent No. 584,402, issued to the Reeves Pulley Company June 15, 1897.

Figs. 3 and 4 show one of the nuts used on the screw-shaft 30, which consists of an iron portion 19, provided with a receptacle 20, said receptacle having flanges 21 and indentations 22. In forming the nut the iron portion or shell 19 is placed over a threaded mandrel and a molten metal poured therearound. After the same is cooled the mandrel is withdrawn and the nut is perfectly formed. The flanges 21 keep the metal from working out, while lugs 22 keep the same from turning within the receptacle.

I claim as my invention—

1. In a speed-varying mechanism, the combination of a frame, two parallel shafts mounted therein, a pair of cone-shaped driving elements carried by each shaft; a belt connecting the pairs; levers pivoted between the shafts and adapted to oscillate and simultaneously move one pair of driving elements together and the other pair apart, and means for concurrently advancing or receding the lever-pivots toward or from each other, said means controlled by the levers substantially as and for the purpose set forth.

2. In a speed-varying mechanism the combination of a frame, two parallel shafts mounted therein, a pair of cone-shaped driving elements carried by each shaft, a belt connecting the pairs, levers pivoted between the shafts and adapted to oscillate and simultaneously move one pair of driving elements together and the other pair apart; and means, controlled by the levers for advancing the pivots toward each other through a part of the oscillating of the levers and recede the pivots from each other through the remainder of their movement, substantially as and for the purpose set forth.

3. In a speed-varying mechanism, the combination of a frame and two parallel shafts mounted therein, a pair of cone-shaped driving elements carried by each shaft; a belt connecting the pairs; thrust-bearings taking against the driving elements; levers connecting the corresponding thrust-bearings; an inwardly-projecting teat formed on each lever, pivots formed in said teats, free to move laterally relatively to the frame, links pivotally secured to a suitable support in rear of levers, and pivotally secured to the levers, and means for oscillating said levers, substantially as and for the purpose set forth.

4. In a speed-varying mechanism, the combination of a frame, two parallel shafts mounted therein; a pair of cone-shaped driving ele-

ments carried by each shaft, a belt connecting the pairs; thrust-bearings taking against the driving elements; levers connecting the corresponding thrust-bearings; an inwardly-projecting teat formed on each lever, pivots formed in said teats, free to move laterally relatively to the frame, links pivotally secured to adjustable supports in the rear of the levers and pivotally secured to the levers and means for oscillating the levers, substantially as and for the purpose set forth.

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