(No Model.)

4 Sheets—Sheet 1.

J. M. CAYCE.

COMPENSATED PENDULUM MOTOR.

No. 513,878. Patented Jan. 30, 1894.

Fig. 1.

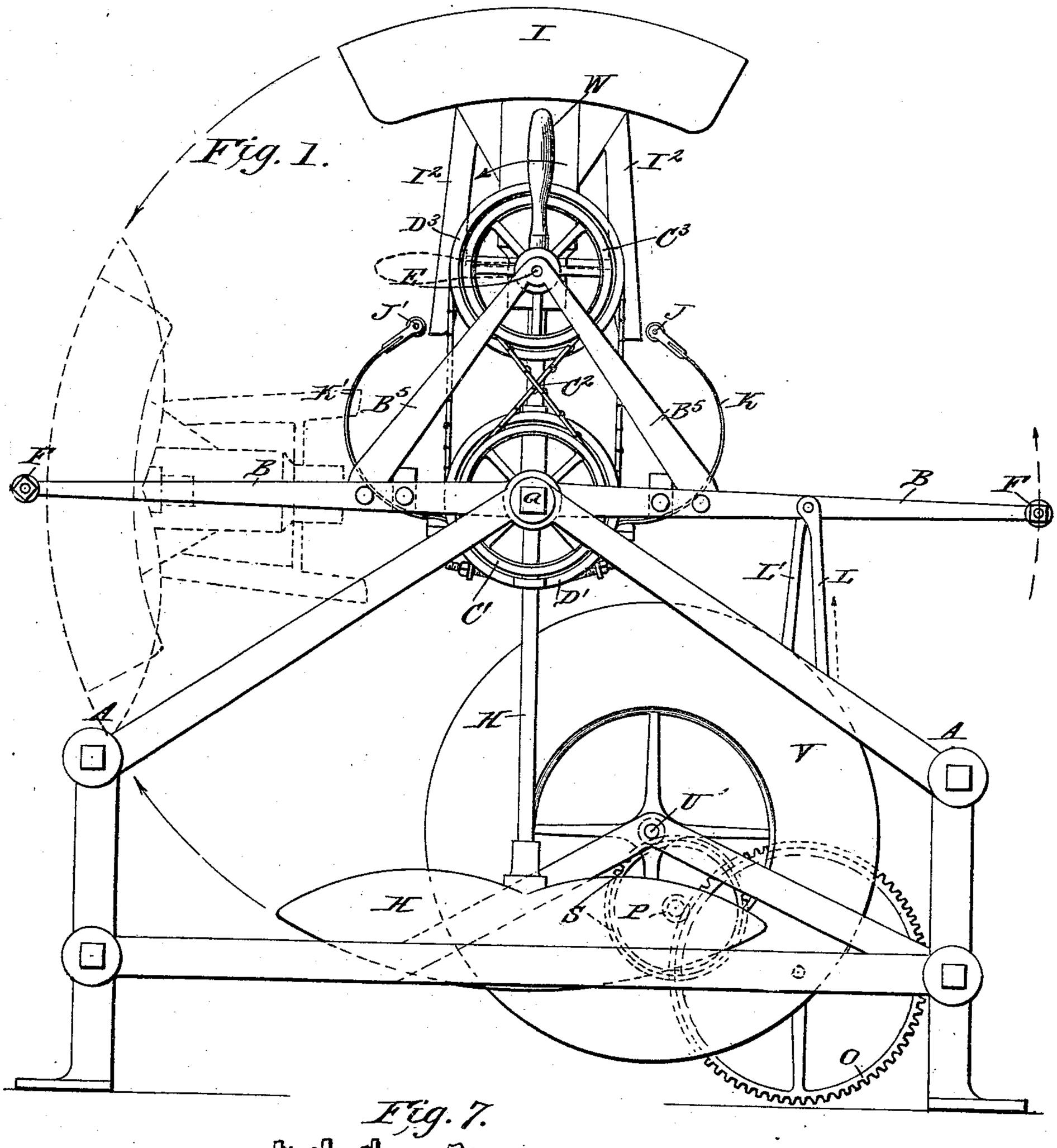
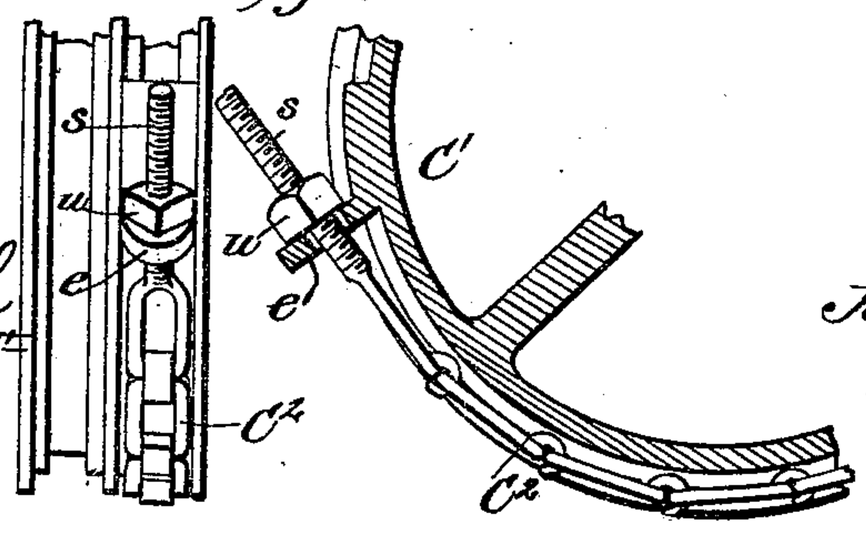


Fig. 7.



WITNESSES:

Fred J. Dretzsch

Edw. W. Byrn.

INVENTOR

John M. Cayce.

BY Munn & Co

ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

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J. M. CAYCE.

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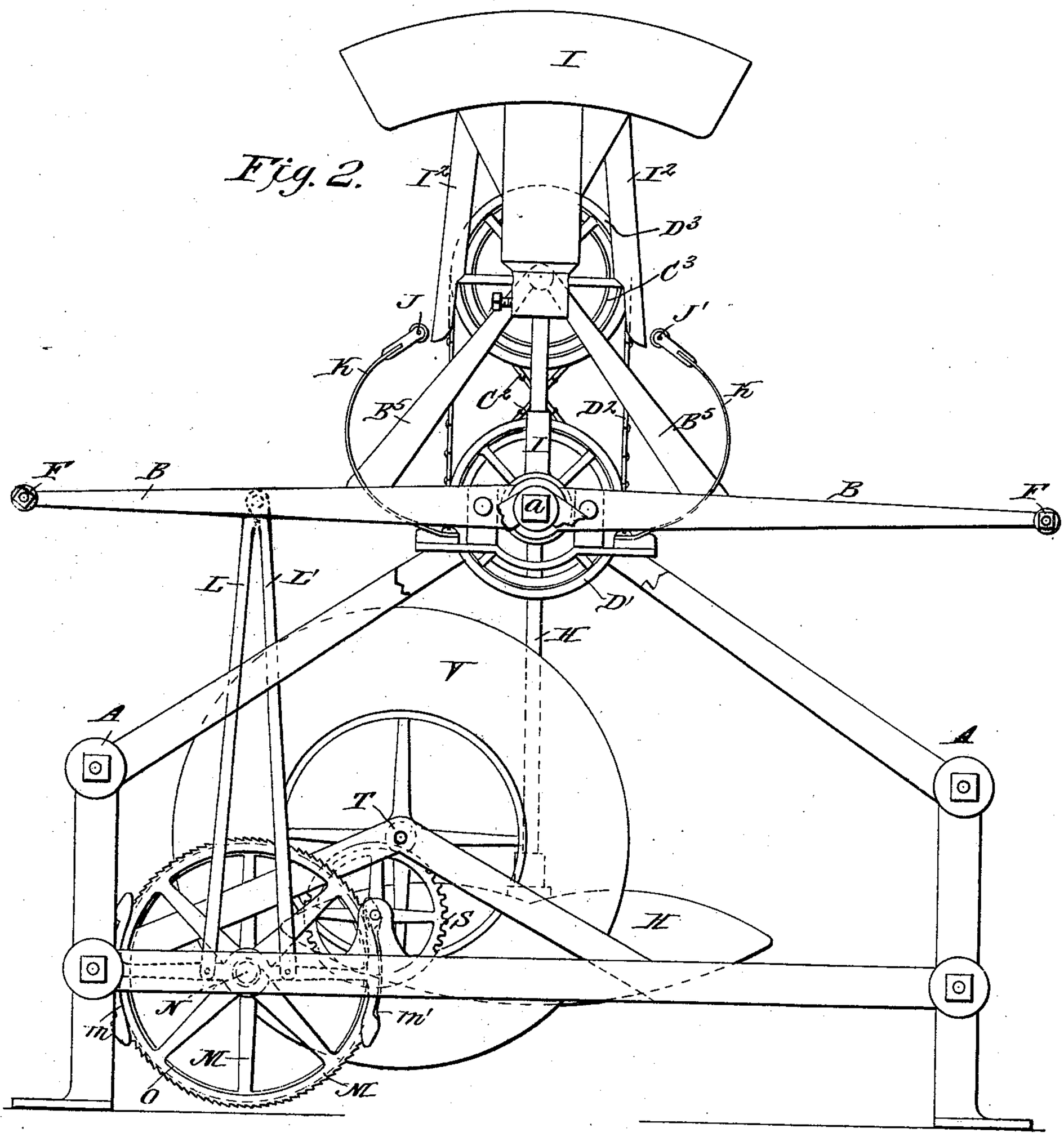
Fig. 2.



WITNESSES:

Fred G. Dieterich

Edw. W. Byrn.

INVENTOR

John M. Cayce.

BY Munn & Co

ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

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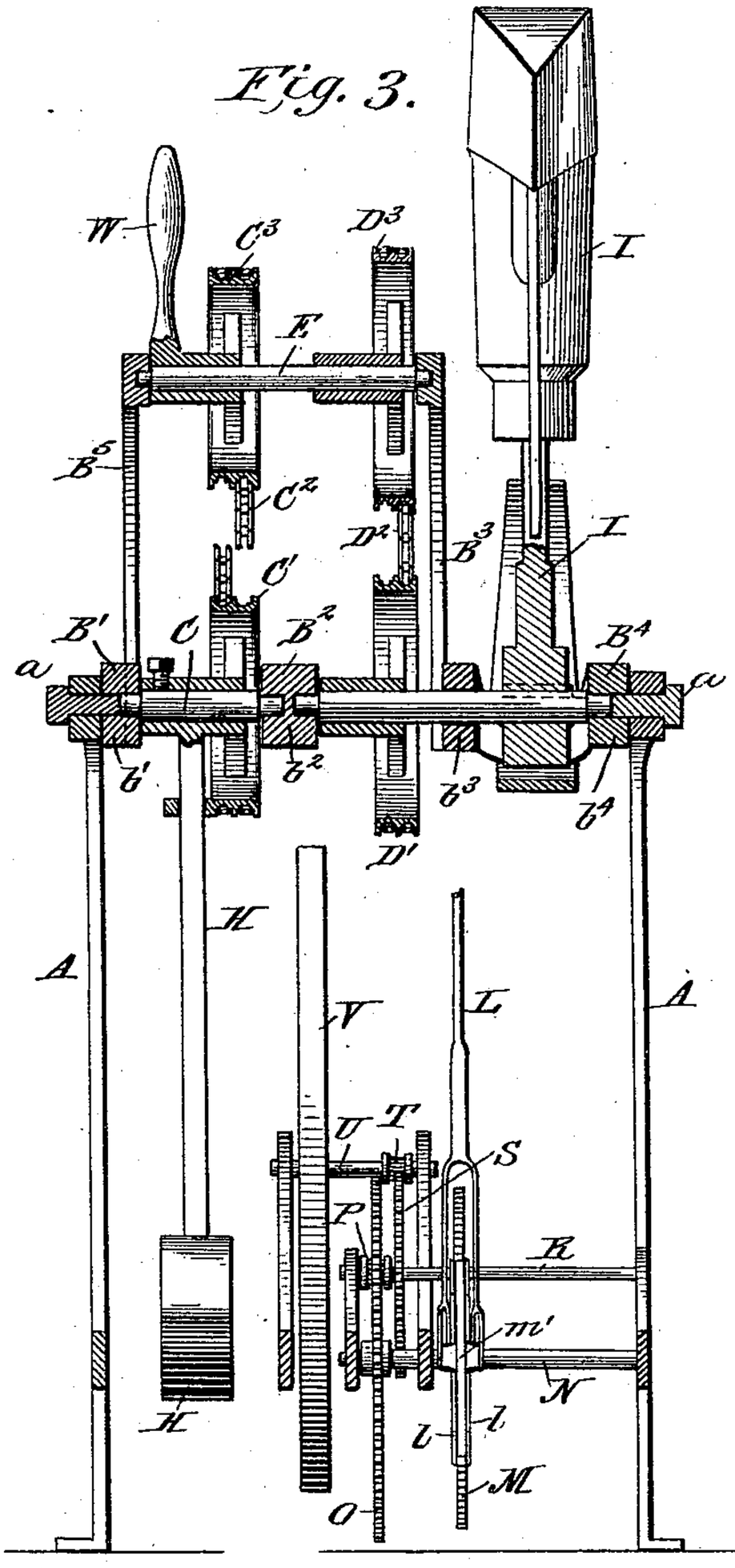
J. M. CAYCE.

COMPENSATED PENDULUM MOTOR.

No. 513,878. Patented Jan. 30, 1894.

Fig. 3.



WITNESSES:

Fred G. Dieterich

Edw. W. Byrn.

INVENTOR

John M. Cayce.

BY Munn & Co

ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 4.

J. M. CAYCE.

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Fig. 4

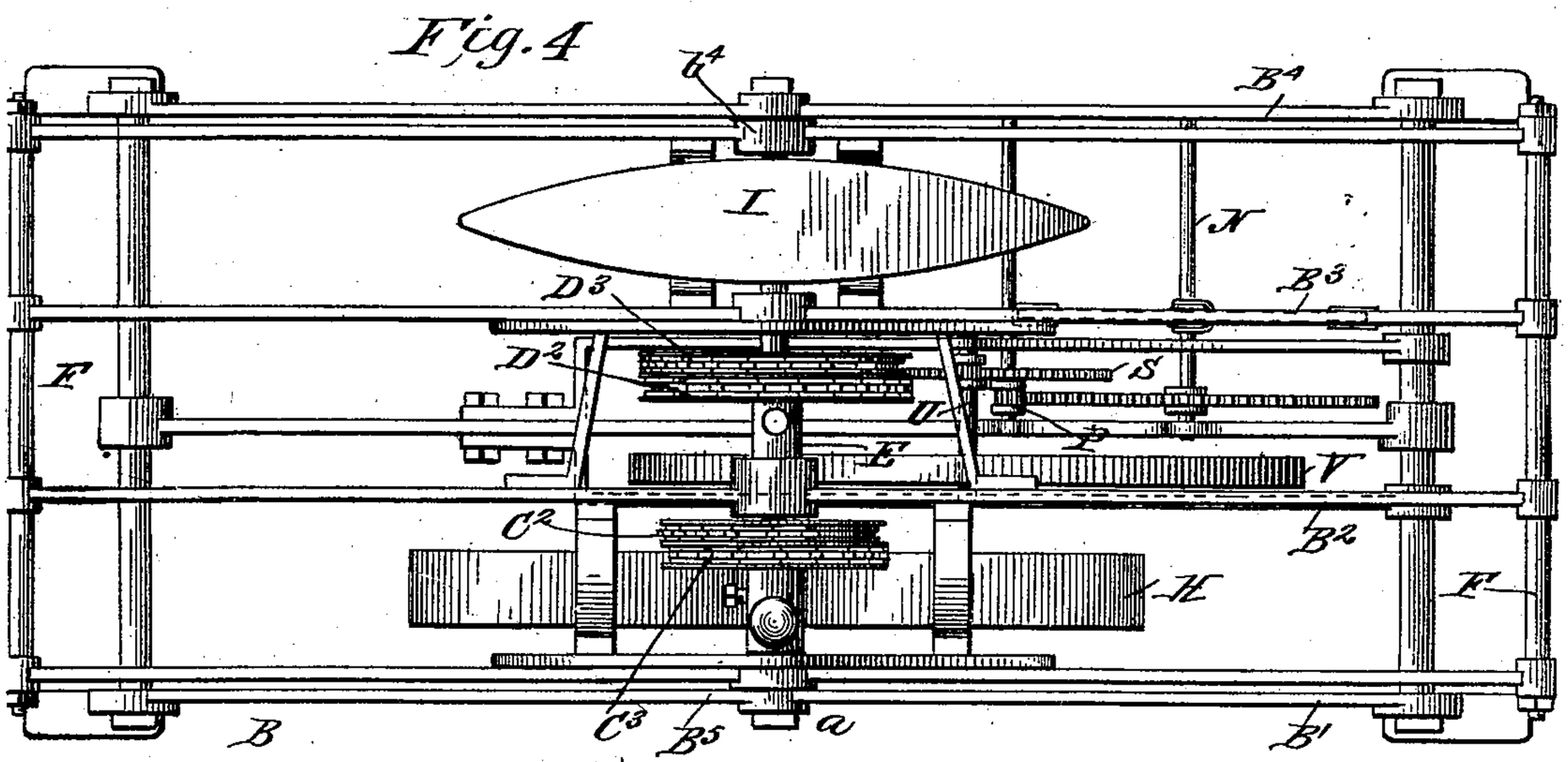


Fig. 5.

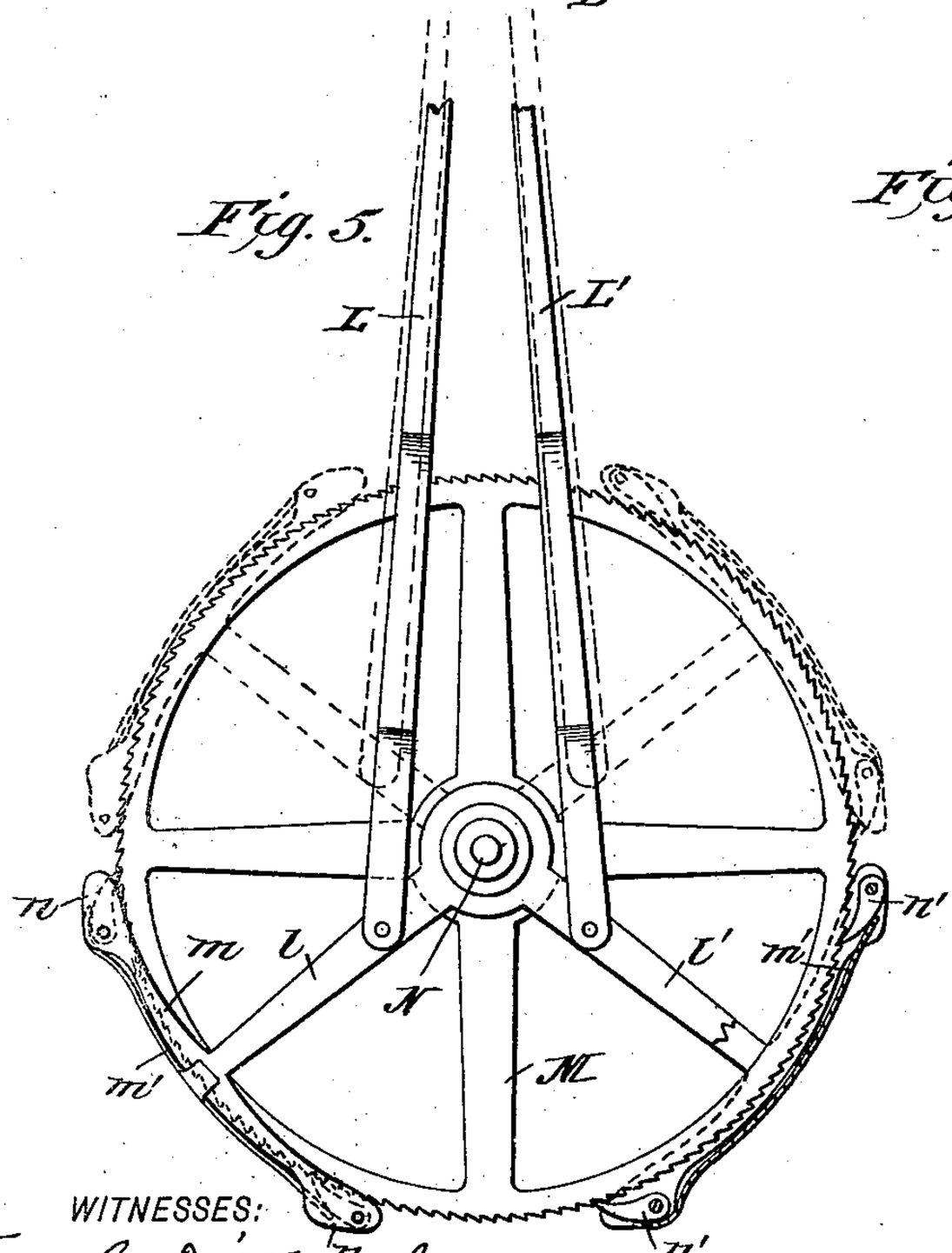
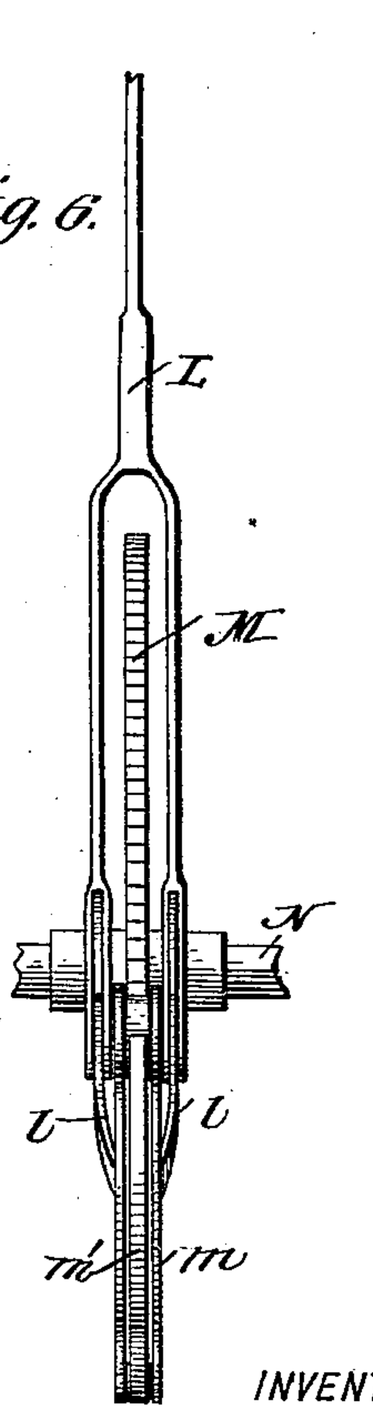


Fig. 6.



WITNESSES:

Fred G. Dieterich

Edw. W. Byrn.

INVENTOR

John M. Cayce.

BY Munn & Co

ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN M. CAYCE, OF NASHVILLE, TENNESSEE.

COMPENSATED-PENDULUM MOTOR.

SPECIFICATION forming part of Letters Patent No. 513,878, dated January 30, 1894.

Application filed February 11, 1893. Serial No. 461,856. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. CAYCE, of Nashville, in the county of Davidson and State of Tennessee, have invented a new and useful Improvement in Compensated-Pendulum Motors, of which the following is a specification

My invention is in the nature of a novel pendulum motor, in which weights operating from gravity serve to supply motive power for utilization in the arts for all the uses for which power may be employed.

I term my invention a compensated pendulum motor, for the reason that the weight of the pendulum is balanced or compensated by a counterweight, both acting in unison while furnishing motive power, but balancing or neutralizing each other in the shifting movement necessary to readjust their positions and continue their effectiveness.

My invention consists in the peculiar construction and arrangement of the various parts of the device, which I will now proceed to describe with reference to the drawings in which—

Figure 1 is a side elevation from one side. Fig. 2 is a side elevation from the opposite side. Fig. 3 is a vertical transverse section. Fig 4 is a plan view, and Figs. 5, 6 and 7 are details.

In the drawings A represents a strong stationary frame work of any suitable character, in the upper part of which is fulcrumed upon trunnions a the rocking frame B. This frame has four parallel bars B′ B^2 B^3 B^4 connected at their outer ends by cross bars F F and having in the center, in line with the trunnions a four hubs or enlargements b' b^2 b^3 b^4 provided with journal bearings. In these bearings are journaled, see Fig. 3, two longitudinally aligned horizontal shafts C and D, of which C extends from bearing b' to b^2 and is journaled in the same, while D is somewhat longer and is journaled in bearings b^2 b^3 b^4, these two shafts being arranged in line with each other, and also in line with the trunnions or fulcrum of the frame B.

Above the parallel bars of the frame B there are erected triangular standards B^5, in the upper ends of which is journaled horizontal rock shaft E immediately above the shafts C and D. These standards B^5 are rigidly bolted to and form a part of the rocking frame B.

Upon the shaft C is rigidly fastened a double grooved pulley C′ which, as shown, is a plain pulley with two peripheral grooves to receive a chain belt C^2 which extends upwardly to and around a corresponding double grooved pulley C^3 rigidly fixed on the shaft E. This chain belt is crossed between the pulleys C′ and C^3.

Upon the other shaft D there is rigidly fixed another double grooved pulley D′ which by a chain belt D^2 is connected to another corresponding double grooved pulley D^3 fixed on shaft E above. This chain belt D^2 is not crossed but proceeds straight and parallel between the pulleys. This connection causes a given rotary motion of the shaft E and the upper pulleys to transmit a reversed rotary motion to the shafts C and D below with their respective pulleys.

To take up slack in the chain belts the ends of the latter are connected to one of the pulleys by tension screw s Fig. 7 which passes through an eye e in the pulley and is provided with a nut u behind the eye to tighten the chain as may be required.

To the lower side of the shaft C is rigidly attached a pendulum H consisting of a rod with a heavy weight attached to its lower end. To the other shaft D and projecting upwardly there is a corresponding rod and weight I forming a counterbalance for the pendulum through the pulley and chains as hereinafter described. These two weights may be made as heavy as desired, their effectiveness for furnishing power depending upon their weight. It is necessary, however, that they should balance each other, and for this purpose it is not essential that they should both weigh the same, but one may be lighter than the other and be mounted on a correspondingly longer rod or arm.

J J′ are grooved rollers mounted to turn in the ends of upwardly curved springs K K′, which latter are fixed rigidly to the tilting frame B with the rollers arranged in the plane of the guides I^2 of the counterbalance weight I, so that the latter in moving from side to side will fall upon the rollers alternately and find an elastic support thereon.

The adjustment of the weights from side to side of the fulcrum of frame B is made to tilt the latter alternately in opposite directions, and the tilting motion of the frame B is transmitted to driving gears below through the following mechanism.

L L′ are two connecting rods which at their upper ends are pivoted to the tilting frame B by the same bolt. At their lower ends these connecting rods are forked and their forks or branches are made to embrace or straddle a ratchet wheel M fixed rigidly upon a shaft N journaled in the frame work A. The lower ends of the forks of the rods L L′ are pivoted respectively, the one to a pair of radial arms *l* hung upon shaft N and the other to a pair of radial arms *l′* also hung upon the shaft N. These pairs of radial arms are arranged upon opposite sides of the shaft N and they each bear a curved frame *m* and *m′*, which embrace a portion of the periphery of ratchet wheel, and each has at each end a spring pawl *n* and *n′* engaging with the ratchet teeth on the periphery of the wheel. With this construction the oscillating motion of the frame B is converted into a continuous rotary motion of the shaft N, for as the rods L L′ descend, one of them, through its radial arm and pawl, engages the ratchet wheel and turns it, while the other rod is forcing its radial arm and pawl back for a new hold. Then when the frame B tilts in the opposite direction, the pawl which was at work moves back to a new position as in dotted lines Fig. 5, and the other pawl transmits the power. In this way both the up and down stroke of the rods L L′ serve to rotate shaft N, giving it a continuous motion.

On the shaft N is arranged a gear wheel O which meshes with a pinion P on a second shaft R and a gear wheel S on this shaft R in turn engages with a pinion T on the shaft U of a fly wheel V. I have merely shown this gearing to illustrate the operation of my motor, and it is obvious that such gearing forms no necessary part of the device, and may be replaced by any of the special mechanisms in the arts which is designed to be operated by motive power.

I will now proceed to describe the principle and mode of operation of my pendulum motor. To start the device it is necessary to throw both the pendulum and its counterbalance out to a horizontal position with both upon the same side of the pendulum of the tilting frame B. This position is indicated in dotted lines in Fig. 1, and the parts are adjusted thereto by hand through a crank arm W on the shaft E, or it may be done by a direct pressure upon the pendulum or counterbalance, for as these two weights act through the chain belts and pulleys in antagonism to each other, they exactly balance, and but very little power is required to throw these two weights to the horizontal position as shown in Fig. 1. When in this position, it will be seen that the counterbalance weight is caught and held in an elastic manner by one of the grooved rollers of the springs and the jar is thus broken, and as both weights exactly balance each other they stay in this position, and as they are both on the same side of the fulcrum of frame B, the latter tilts with a power equal to the combined gravity of the two weights, which causes an upward strain upon the connecting rods L L′. As soon as the frame B has reached the limit of its tilting movement, then the two weights are thrown over to the other side of frame by the crank W, and the frame tilts in the opposite direction, and causes a downward strain upon the connecting rods L L′. In this way by intermittently shifting the weights by hand, or otherwise, a continuous application of power to the gearing below is obtained, which may be utilized for any purpose, and which in extent is only limited by the gravity of the weights and the strength of the parts of the machinery. By tightening the chain belts through the tension adjusting devices all slack or looseness in the belt is taken up whenever it exists, and a sensitive and accurate balance is thus secured between the pendulum and its counterweights, the crossing of the belts and the projection of the pendulum and counterweight in opposite directions serving to give the same result as though the counterweight were on the pendulum rod itself on the opposite side of its fulcrum, while the independent aligned shafts permit an independent swinging movement to the pendulum and counterweight in accordance with the principles of my invention.

By using the connecting rods L L′ and the double acting pawls for converting the oscillating motion of the tilting frame into a continuous rotary motion no definite crank throw is required, and the weights and the tilting frame may be shifted at the ends of their complete stroke or at any portion of their stroke without interfering with the operation of the motor, and furthermore there is no dead center. The double pawls *n n* at opposite ends of frames *m* secure instant engagement of the ratchet wheel so that there is no slack or jar.

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

1. The combination of the tilting frame, the two aligned shafts C and D arranged coincidently with the fulcrum of the tilting frame and provided respectively the one with a weighted pendulum and the other with a weighted arm projecting in an opposite direction from the pendulum, two pulleys mounted rigidly upon these shafts, a superposed rock shaft with two corresponding pulleys, and two belts connecting the pulleys of the shafts C D with the pulleys of the rock shaft above, one of these belts being crossed and the other straight to cause a given motion of the rock

shaft to impart a reversed motion to the pendulum and counterweight substantially as and for the purpose described.

2. The combination of frame work A, tilting frame B connected thereto by trunnions *a a* and consisting of parallel bars with cross bars and central bearings *b' b²* *b³* *b⁴*, the aligned shafts C and D journaled therein, and provided respectively with a pendulum and oppositely projecting counterweight, and pulleys C' and D', the triangular frame B^5 with rock shaft E having pulleys C^3 D^3, the two belts C^2 and D^2 one being crossed and the other straight, the springs K K' with supporting rollers at their free ends, and mechanism for converting the rocking motion of the frame into a continuous rotary motion substantially as shown and for the purpose described.

3. The combination with the two aligned shafts C and D having respectively a pendulum and a counterbalance, and also pulleys C' and D'; of a rock shaft E with two corresponding rigid pulleys C^3 D^3, the two belts C^2 D^2, and tension adjusting mechanism for these belts for taking up slack and securing a sensitive and accurate balance between the pendulum and its counterweight substantially as shown and described.

JOHN M. CAYCE.

Witnesses:
SOLON C. KEMON,
EDWD. W. BYRNE.