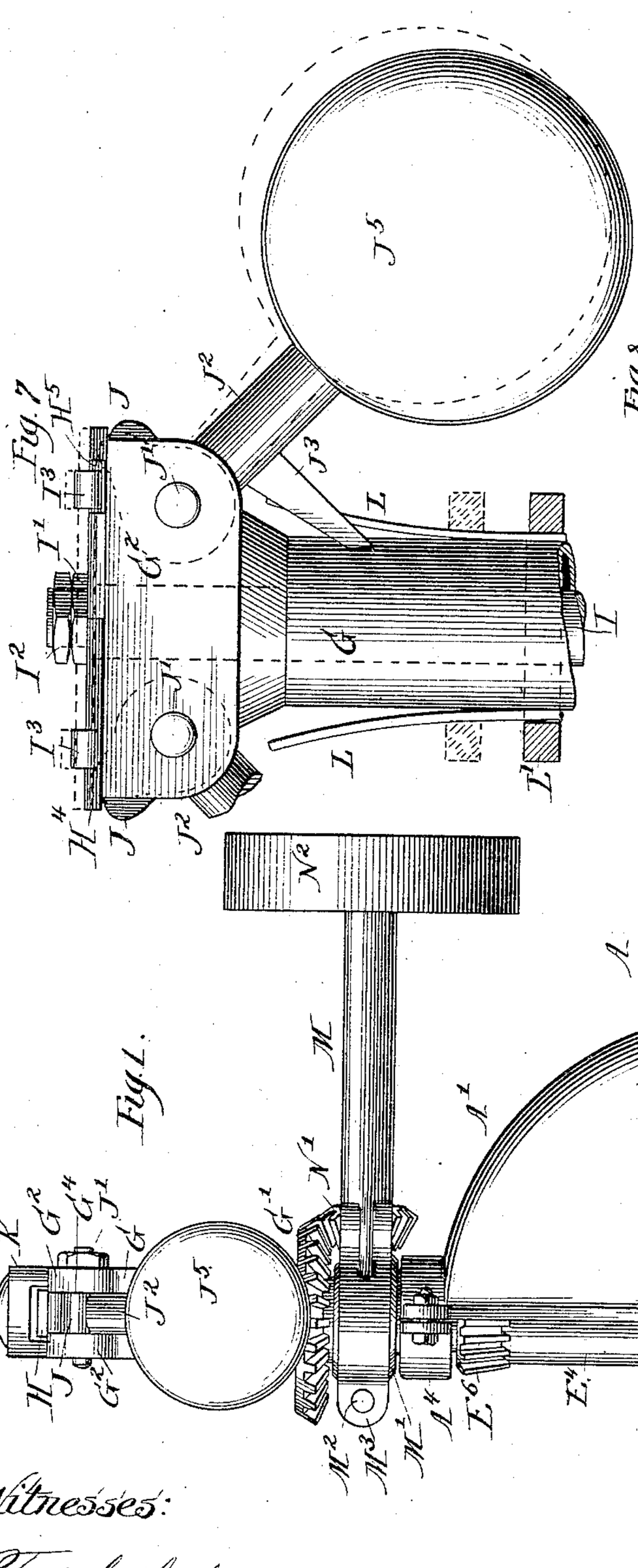
(Model.)

3 Sheets—Sheet 1.

A. W. & E. E. WOODWARD.

WATER WHEEL GOVERNOR.

No. 432,105. Patented July 15, 1890.



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(Model.) 3 Sheets—Sheet 2.

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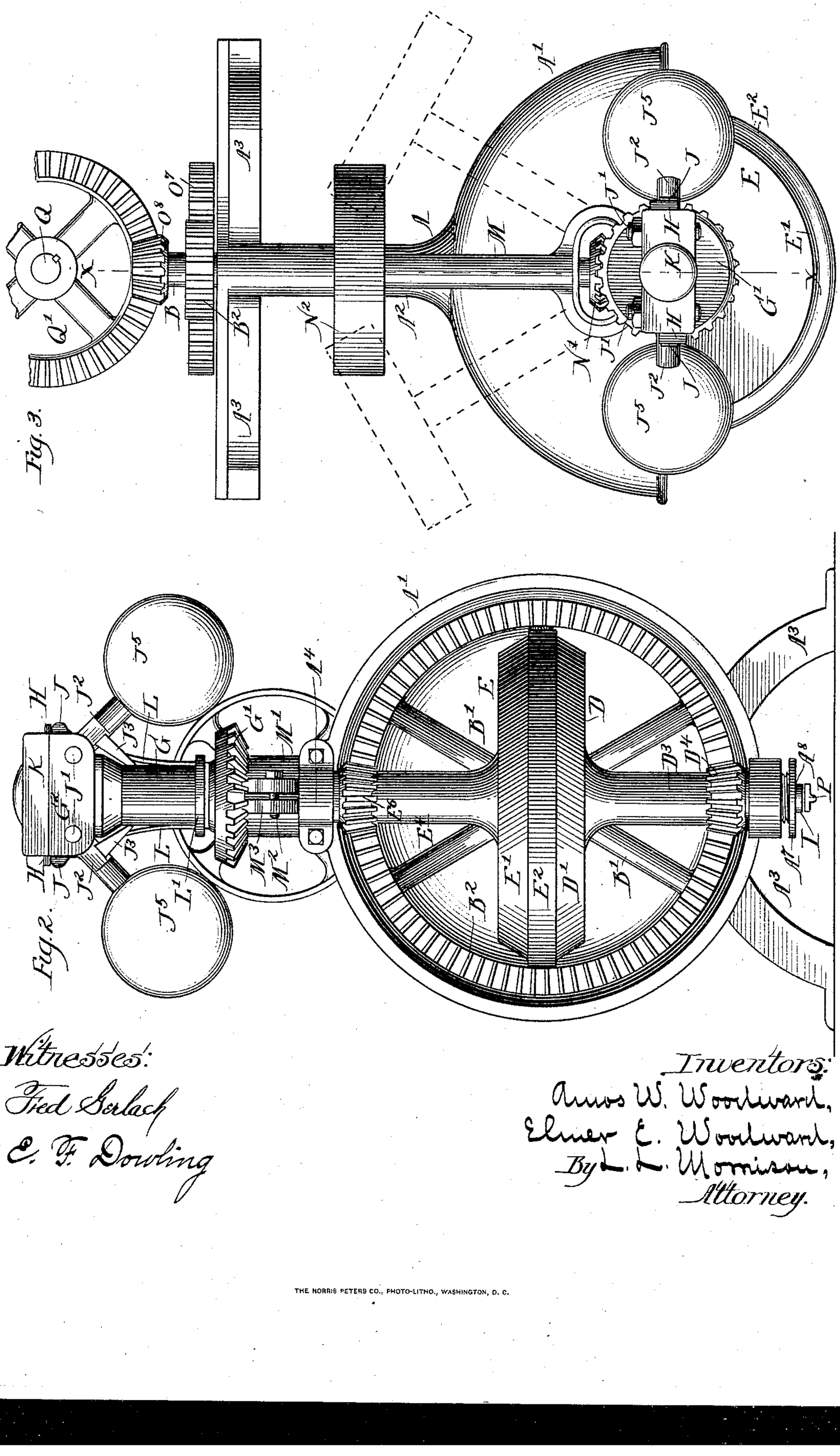

Fig. 3.

Fig. 2.

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(Model.)

3 Sheets—Sheet 3.

A. W. & E. E. WOODWARD.

WATER WHEEL GOVERNOR.

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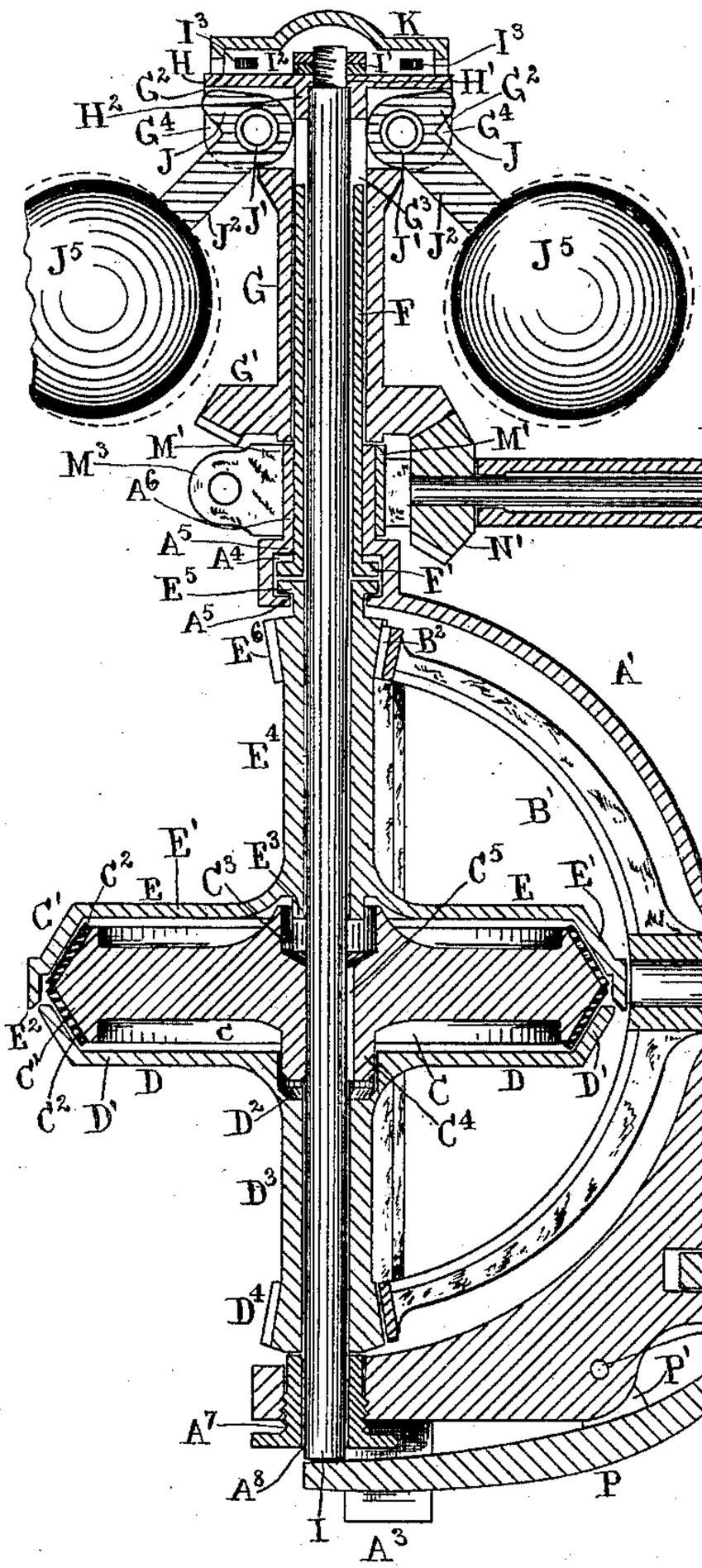

Fig. 5.

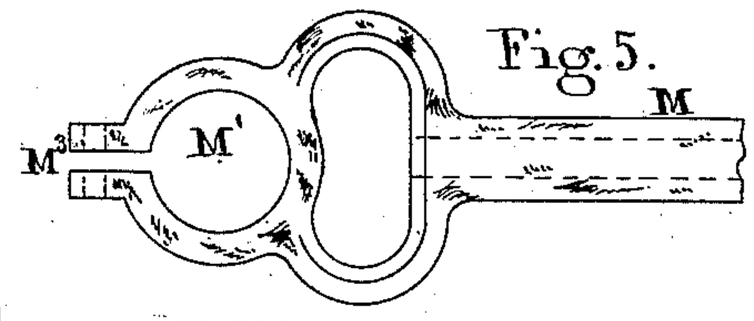

Fig. 6.

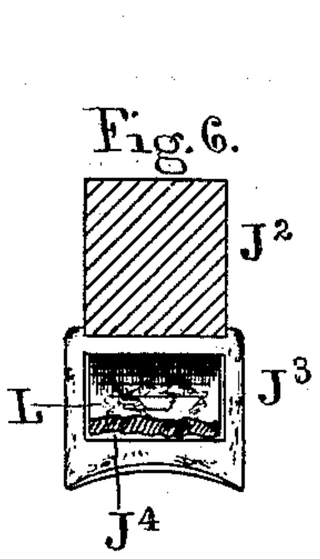

Fig. 4.

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UNITED STATES PATENT OFFICE.

AMOS W. WOODWARD AND ELMER E. WOODWARD, OF ROCKFORD, ILLINOIS.

WATER-WHEEL GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 432,105, dated July 15, 1890.

Application filed April 12, 1889. Serial No. 307,050. (Model.)

To all whom it may concern:

Be it known that we, AMOS W. WOODWARD and ELMER E. WOODWARD, citizens of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented a new and useful Improvement in Water-Wheel Governors, of which the following is a specification.

This invention has for its object the production of a water-wheel governor capable of quickly changing the position of a water-gate as greater or less power is used; and it consists in certain new and useful features of construction and combinations of parts, hereinafter described, and pointed out in the claims.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation of our improved governor. Figs. 2 and 3 are, respectively, an end elevation and a plan view of the same. Fig. 4 is a view of a vertical section thereof through the dotted line *x x* of Fig. 3. Figs. 5, 6, 7, 8, and 9 are views in detail of detached portions of the governor.

Like letters of reference indicate corresponding parts throughout the several views.

A is the main frame of the governor, and consists, essentially, of a hemispherical shell A′, a form of construction peculiarly adapted to admit of a consolidation of the parts composing our machine, and a horizontal portion A^2, preferably integral therewith and projecting from the outer curved portion thereof, to form bearings for parts to be described hereinafter.

A^3 are legs for supporting the main frame A.

B is a horizontal shaft mounted in the portion A^2 of the main frame A and projecting through the shell A′ thereof.

B′ is a hemispherical wheel rigidly connected with the shaft B, having teeth B^2 on the periphery of the same and being included in the shell A′.

A^4 is a cylindrical chamber, partially closed at both ends by means of horizontal annular flanges A^5, which serve as bearings to support parts to be described hereinafter.

A^6 is a bushing integral with and extending upward from the upper flange A^5 of the chamber A^4.

A^7 is a bushing tapped into the shell A′ and having a vertical cylindrical opening A^8 therethrough to form a bearing.

C is a horizontal friction-disk of any suitable form and construction, but having the periphery thereof preferably provided with double bevels C′ inclining toward the axis of the disk. The double bevels C′ should be faced with leather C^2 or other suitable material in order to produce the most satisfactory results. The central portion of the upper side of the friction-disk C has a basin C^3 sunk therein, and the central portion of the lower side of the same has a vertical annular boss C^4 depending therefrom and preferably integral therewith.

C^5 is an oil-passage extending from the bottom of the basin C^3 through the friction-disk C and boss C^4.

D is a lower horizontal disk-shaped friction-pulley, the dish-shaped portion D′ thereof being on the upper side of the pulley and a counterpart of the lower half of the friction-disk C in order that it may admit and engage with the same.

D^2 is a basin in the central portion of the upper side of the friction-pulley D, of proper dimensions to readily admit the boss C^4 of the friction-disk C.

D^3 is a vertical sleeve-shaft continuous with the pulley D and resting on the bushing A^7, for a bearing whereon to turn.

D^4 is a horizontal pinion rigidly secured to the shaft B^3 and meshing with the wheel B′.

E is an upper horizontal dish-shaped friction-pulley, the dish-shaped portion E′ thereof being on the under side of the pulley and a counterpart of the upper half of the friction-disk C, in order that it may admit and engage with the same, and the lower edge of said dish-shaped portion being provided with a substantially vertical annular flange E^2, projecting below and including the upper edge of the dish-shaped portion D′ of the friction-pulley D, for a purpose to be fully explained hereinafter. The central portion of the under side of the friction-pulley E has a vertical annular, preferably integral, boss E^3 depending therefrom into the basin C^3 in the disk C.

E^4 is a vertical sleeve-shaft continuous with the pulley E and suspended therewith from the chamber A^4 by means of the horizontal

annular flange E^5, which serves as a bearing therefor.

E^6 is a horizontal pinion rigidly connected with the shaft E^4 and meshing with the wheel B′.

F is a perpendicular non-revoluble sleeve seated in the upper end of the chamber A^4 and prevented from working thereout by means of the horizontal annular flange F′ projecting therefrom.

G is a perpendicular sleeve including and freely revoluble about the upper portion of the sleeve F.

G′ is a horizontal miter-pinion integral or rigidly connected with the sleeve G.

G^2 is a head integral with the sleeve G, having a central opening G^3 extending vertically therethrough and slots G^4 in the ends thereof to admit parts to be described hereinafter.

H is a horizontal yoke having a circular opening H′ therein and an annular flange H^2, integral with the former and concentric with the latter, extending perpendicularly downward into the opening G^3. The opposite sides of the yoke H are provided with downwardly and inwardly projecting bevels H^3 H^4, for a purpose to be described hereinafter.

I is a vertical shaft passed through the parts A^7, D^4, D^3, D, C^4, C, E, E^3, E^4, E^6, E^5, F′, F, G′, G, G^2, and H, to the latter of which it is secured by means of the nut I′ and set-nut I^2. The shaft I is freely revoluble independently of all the parts through which it passes, excepting the friction-disk C, which is rigidly connected therewith, and the parts G′, G, and G^2, which are preferably integral and connected with the yoke H by means of the dovetail lugs H^5, secured to the head G^2, and the double hooks I^3.

J represents cams mounted by means of the horizontal bolts J′ in the slots G^4 in the head G^2.

J^2 represents ball-arms of the ordinary form and integral with the cams J.

J^3 represents rests, free at their lower ends, but securely connected by their upper ends to the arms J^2.

J^4 represents transverse retangular openings in the rests J^3 to admit parts to be described hereinafter.

J^5 represents governor-balls attached to the free ends of the arms J^2.

K is a cap covering the top of the head G^2 and the parts attached thereto.

L represents regulating-springs secured by their lower ends to the sleeve-shaft G and having their upper ends inserted into the openings J^4 in the rests J^3.

L′ is a collar embracing the sleeve-shaft G and springs L and adapted to be slid up and down, the former to regulate the tension of the latter.

M is a horizontal tubular shaft-arm, which is swivel-jointed to the bushing A^6 by means of the cleft collar M′. After the arm M has been turned to the position desired it may be rigidly secured to the bushing A^6 by means of the set-screw M^2, which is passed through the lugs M^3, which are integral with their collar.

N is a horizontal shaft mounted inside the arm M.

N′ is a vertical bevel-pinion mounted on the shaft N and meshing with the bevel-pinion G′.

N^2 is a vertical pulley, also mounted on the shaft N.

O is a horizontal shaft mounted in the main frame A and having the middle portion O′ thereof enlarged in diameter and provided with an external screw.

O^2 is a wheel threaded internally and mounted on the portion O′ of the shaft O.

O^3 represents radial slots in the periphery of the wheel O^2.

O^4 is a boss or hub integral with the wheel O^2 and provided with a bevel O^5, which inclines toward the axis thereof.

O^6 is a latch pivoted to the main frame A and adapted to enter the slots O^3 in the wheel O^2, to prevent the same from revolving with the shaft O.

O^7 is a vertical gear-wheel mounted on the shaft O and meshing with the gear-wheel B^2.

P is a lever pivoted at the middle portion thereof by means of the lugs P′ to the main frame A.

Q is a vertical shaft connecting with any gate suitably constructed to be gradually opened and closed by means of a water-wheel governor.

Q′ is a horizontal bevel gear-wheel mounted on the shaft Q and meshing with the bevel-pinion O^8.

Our purpose in devising and constructing the herein-described machine has been to produce a governor the proper parts of which should be and continue, though constantly used and too freely and carelessly oiled, sufficiently sensitive to properly perform their functions. Specifically, we have, first, simplified the construction of and greatly consolidated the various parts composing the governor. Secondly, we have provided the friction-disk C with the sink C^3 and the boss C^4, the lower friction-pulley D with the sink D^2, the upper friction-pulley E with the flange E^2 and boss E^3, which constructions and combinations render it impossible for oil or dirt to find their way into the friction-surfaces of the friction-disk and pulleys, two substances which are the most prolific source of trouble in this class of governors. Thirdly, we have contrived the yoke H and hooks I^3, which connect the former through the dovetail lugs H^5 with the head G^2. The parts H, I^3, and G^2, when constructed and connected as shown, almost completely overcome the centrifugal force of the shaft I when the same is revolving, thereby relieving it from most of its frictional contact with the parts through which it passes and in which it revolves, thus rendering the same very sensitive to any force acting vertically thereon.

Supposing the governor to be in position

for use, and the pulley N^2 to be in connection with the main shaft of a water-wheel by means of a belt, shafting, and gearing, its adjustment and operation are then as follows: Open the gate to its fullest extent, letting the governor run, turn the boss O^4 of the wheel O^2 against the lever P, thereby raising the shaft I endwise until the revolving friction-disk C is suspended between the friction-pulleys D E, then drop the latch O^6 into a slot O^3 in the wheel O^2, and the adjustment is complete. If more power is required, the balls J^5, the yoke H, the shaft I, and revolving friction-disk C will descend and the latter engage with the friction-pulley D, which is thereby caused to revolve, and, through the medium of the wheel B′, shaft B, gear-wheels B^2 O^7, shaft O, pinion O^8, gear-wheel Q′, and shaft Q, raise the gate (not shown) connected with the latter. If less power is required, the balls J^5, the yoke H, the shaft I, and revolving friction-disk C will rise and the latter engage with the upper friction-pulley E, and thereby cause it to revolve, and, through the medium of the parts B′, B, B^2, O^7, O, O^8, Q′, and Q, lower the gate, all the parts from B′ to Q, inclusive, obviously revolving in directions the reverse of those mentioned to raise the gate.

As long as the governor is in operation the shaft I, the disk C, pinion G′, and all the parts located above said pinion, revolve rapidly and continuously in one direction. The shaft I, disk C, and yoke H also have a slow, nearly constant, very slight vertically-reciprocating motion, simultaneous with the revolving motion to which reference has just been made. The movements of the wheel B′, shaft B, gear-wheels B^2 O^7, shaft O, wheel and boss O^2 O^4, pinion O^8, gear-wheel Q′, and shaft Q are oscillatory.

We claim—

1. In a speed-governor, in combination, the shaft I, the friction-disk C rigidly connected therewith and provided with the basin C^3 in the upper side thereof, and the depending boss C^4, the lower dish-shaped friction-pulley D, provided with the basin D^2 to admit said boss, and the upper dish-shaped friction-pulley E, provided with the boss E^3, depending into the basin C^3 of the friction-disk, substantially as and for the purpose set forth.

2. In a speed-governor, in combination, a vertical shaft capable of endwise motion, a horizontal friction-disk mounted thereon, the peripheral portion whereof is provided with double bevels, as shown, the upper central portion thereof having a basin sunk therein and the lower central portion of the same having a vertical boss depending therefrom, a lower horizontal dish-shaped friction-pulley, a counterpart of and adapted to engage with the lower half of the friction-disk, having a basin in the central portion of the upper side thereof to admit the boss depending from said disk, and an upper horizontal dish-shaped friction-pulley, a counterpart of and adapted to engage with the upper half of the friction-disk, having a boss depending from the central portion of the lower side thereof into the basin in said disk and being provided with the vertical annular flange projecting downward therefrom, extending below and including the upper edge of the dish-shaped portion of the lower friction-pulley, substantially as described, and for the purpose specified.

3. In a speed-governor, in combination, the vertical shaft capable of endwise motion, the yoke supporting said shaft, the revoluble head wherewith said yoke is connected, and the double hooks connecting said yoke and revolving head together.

4. In a water-wheel governor, as a compact construction and combination of parts, the hemispherical shell A, the hemispherical wheel B included therein, the vertical shaft I, the friction-disk C mounted thereon, the lower friction-pulley D complete, and attachments necessary to connect it with the wheel B′, and the upper friction-pulley E complete, and attachments necessary to connect the same to the shaft I and with the wheel B′, the parts C D E being partially included in the hemispherical wheel B′, substantially as described, and for the purpose set forth.

5. The herein-described water-wheel governor, consisting, essentially, of the main frame A, the horizontal shaft B, and vertical shaft I mounted therein, the hemispherical wheel B′, the friction-disk C, and friction-pulleys D E, and all attachments for connecting the same with the shaft I and main frame A, the vertical sleeve F, the horizontal shaft N, and bearing, the revolving head G^2, the yoke H, and hooks I^3 for connecting the shaft I with the head G^2, the ball-arms, balls, and attachments necessary to connect the same with said head G^2, substantially as described, and for the purpose set forth.

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