(No Model.) 3 Sheets—Sheet 1.

W. S. LIBBEY.

WATER WHEEL GOVERNOR.

No. 545,599. Patented Sept. 3, 1895.

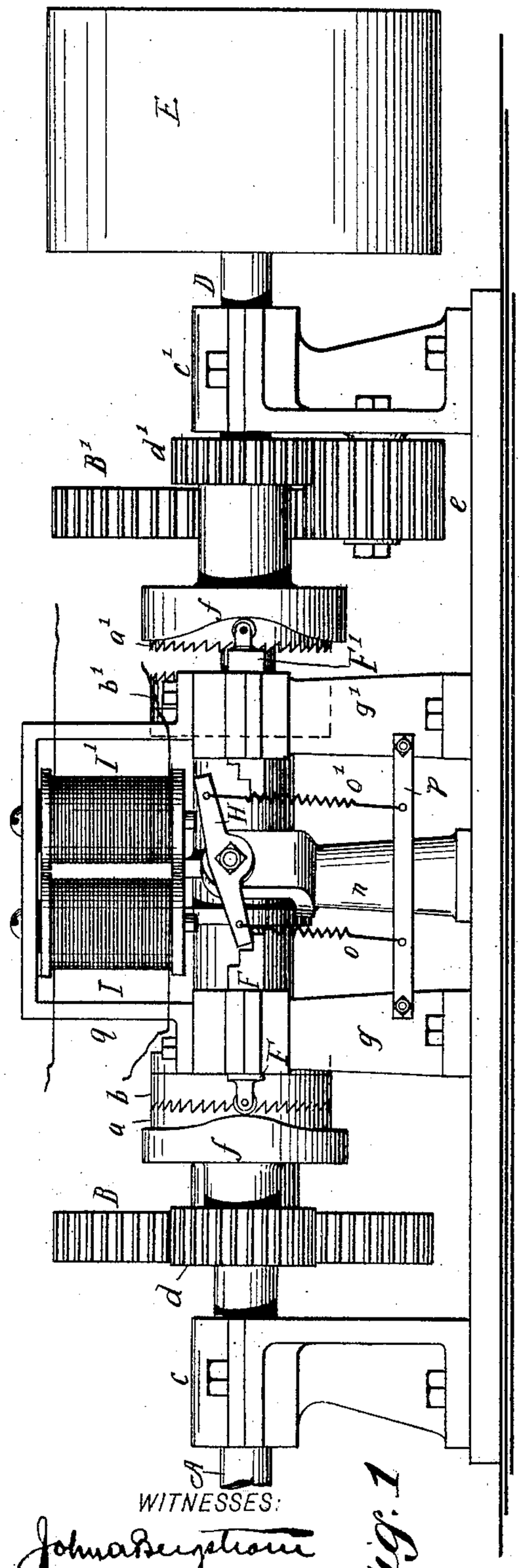

Fig. 1

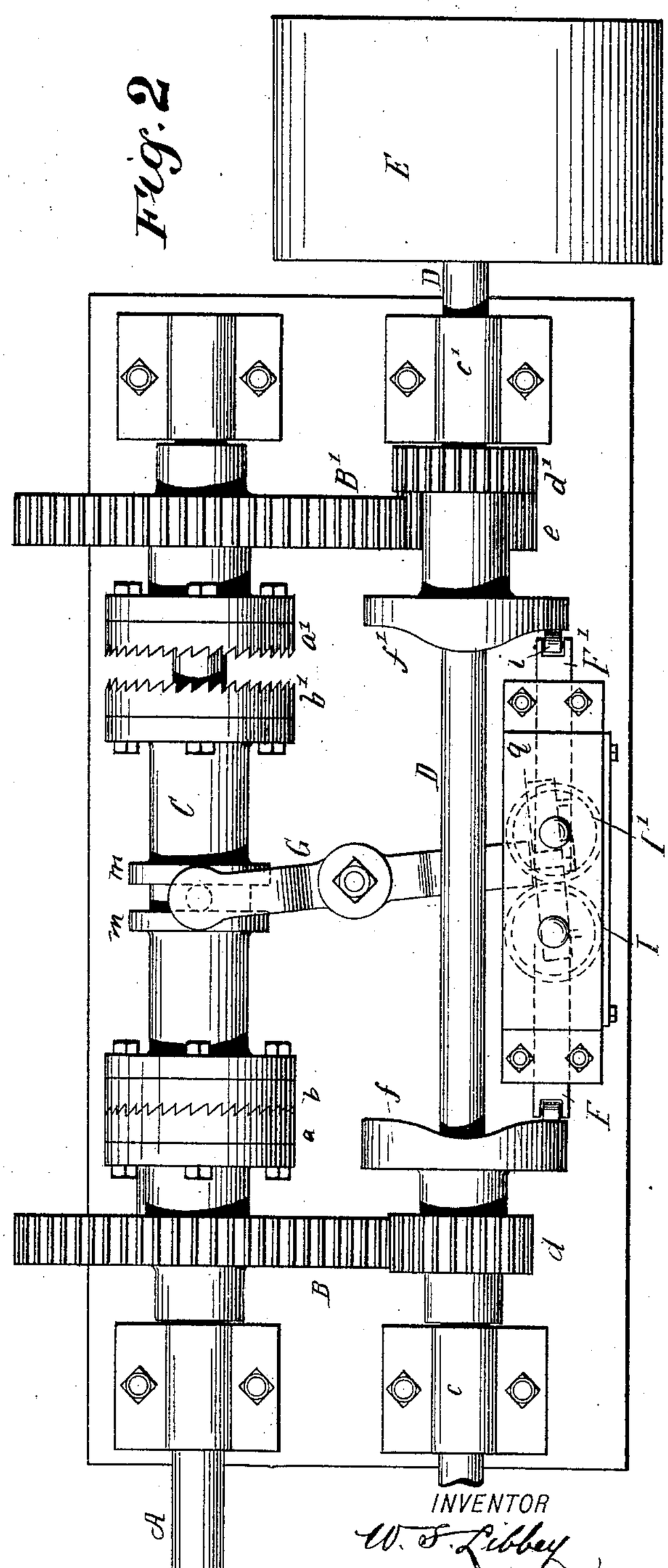

Fig. 2

WITNESSES:
John A. Bergstrom
C. M. Hopkins

INVENTOR
W. S. Libbey
BY
Munn & Co
ATTORNEYS.

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W. S. LIBBEY.

WATER WHEEL GOVERNOR.

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Fig. 3

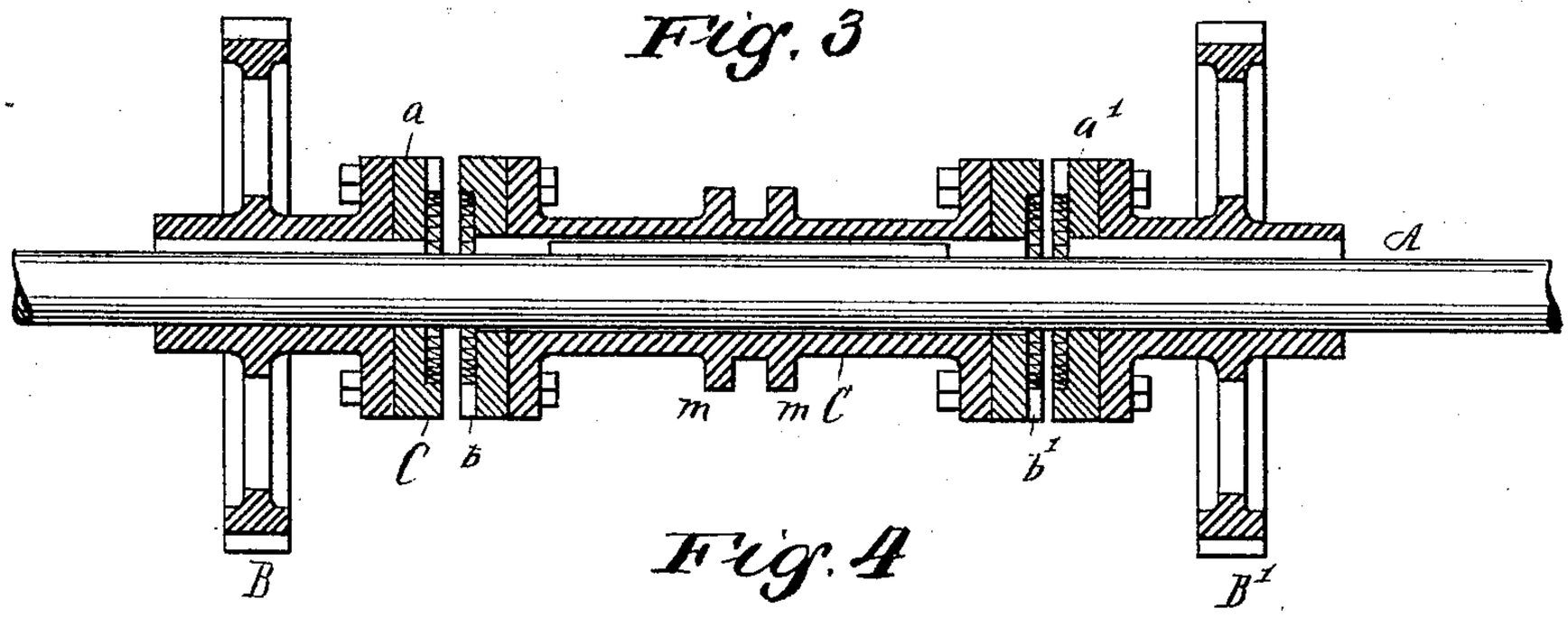
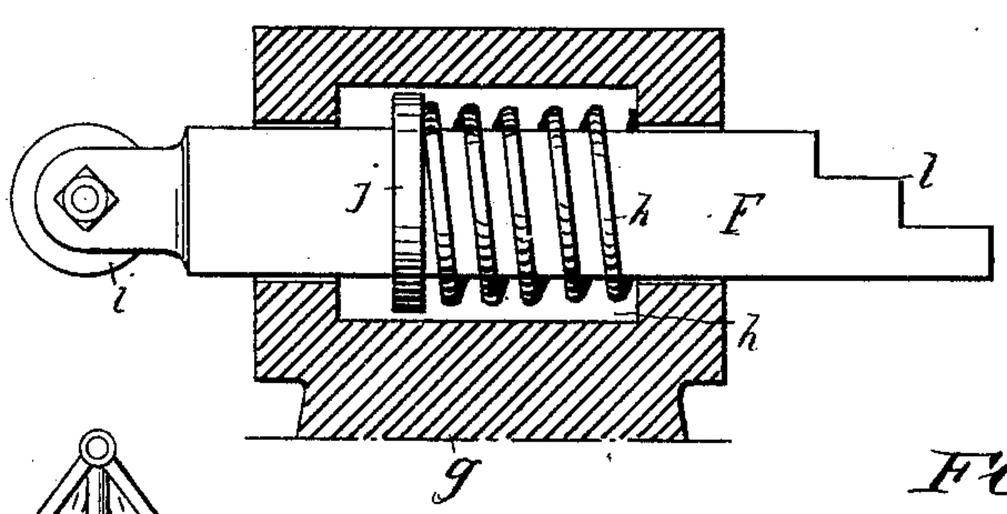


Fig. 4



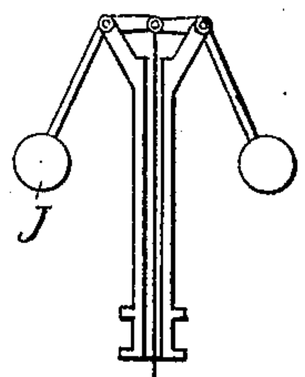


Fig. 6

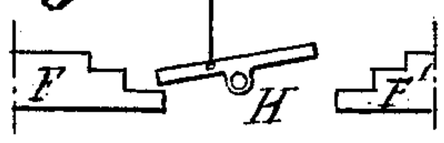


Fig. 5

WITNESSES:

John A. Berglund

G. M. Hopkins

INVENTOR

W. S. Libbey

BY

Munn & Co

ATTORNEYS.

(No Model.) 3 Sheets—Sheet 3.

W. S. LIBBEY.

WATER WHEEL GOVERNOR.

No. 545,599. Patented Sept. 3, 1895.

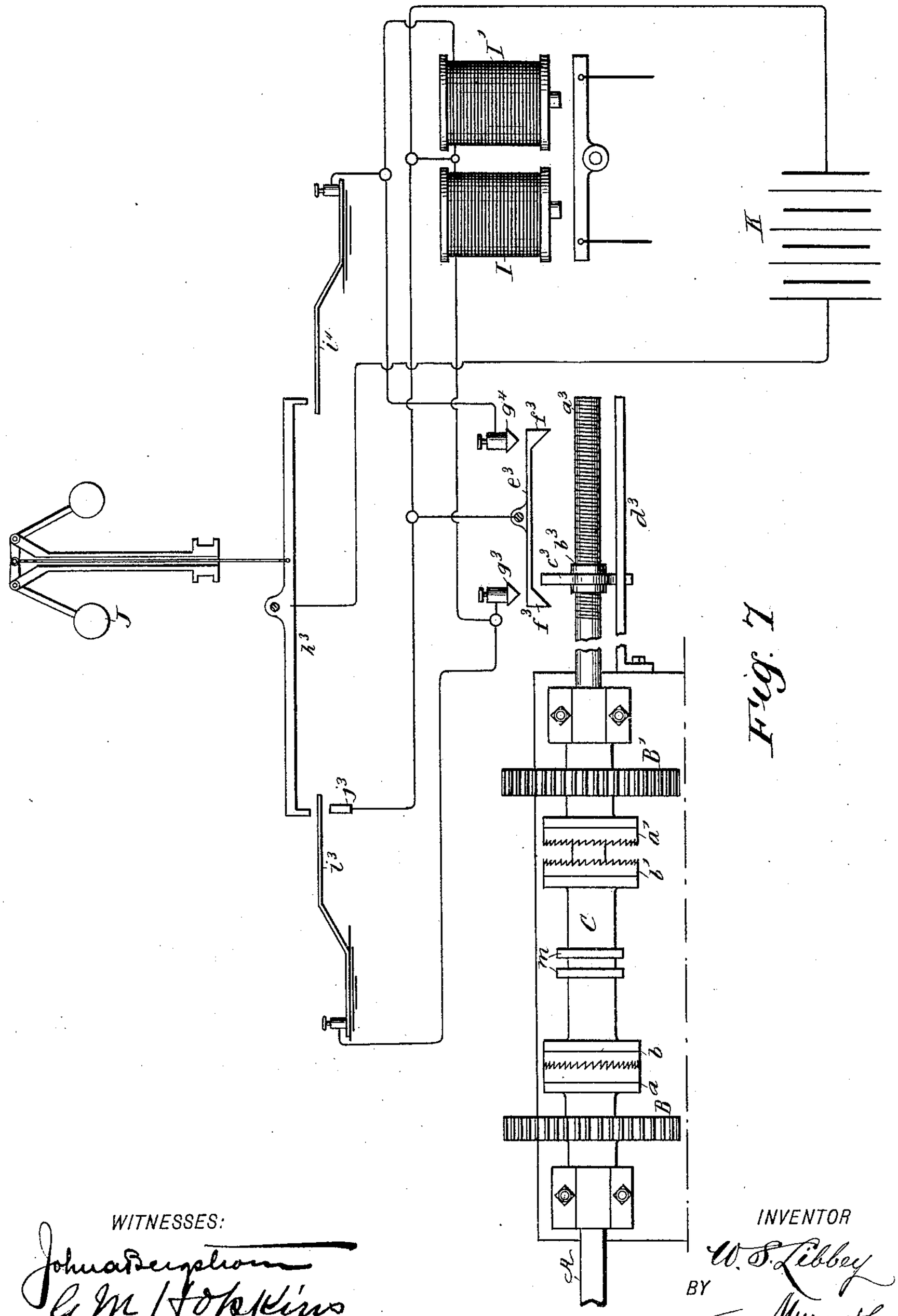


Fig. 1.

WITNESSES:

John A. Brayton

G. M. Hopkins

INVENTOR

W. S. Libbey

BY

Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

WINFIELD S. LIBBEY, OF LEWISTON, MAINE.

WATER-WHEEL GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 545,599, dated September 3, 1895.

Application filed August 21, 1894. Serial No. 520,889. (No model.)

To all whom it may concern:

Be it known that I, WINFIELD S. LIBBEY, of Lewiston, in the county of Androscoggin and State of Maine, have invented a new and Improved Water-Wheel Governor, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a front elevation of my improved water-wheel governor. Fig. 2 is a plan view. Fig. 3 is a longitudinal section of the clutch mechanism on the gate-operating shaft. Fig. 4 is an enlarged sectional side elevation of one of the reciprocating bars. Fig. 5 is a diagrammatic view of the centrifugal circuit-controller. Fig. 6 is a diagram of a modification wherein the centrifugal governor is applied directly to the tilting bar of the shifting lever, and Fig. 7 is a further modification showing a safety device.

Similar letters of reference indicate corresponding parts in all the views.

The object of my invention is to provide mechanism for promptly and positively operating water-wheel gates, thus permitting of governing the motion of the wheel with a minimum of variation.

My invention consists in the combination, with the gate of a water-wheel, of a shaft for opening and closing the gate, wheels placed on the shaft and arranged to revolve continuously in opposite directions, clutch mechanism carried by the shaft and constructed to engage either of the wheels, a clutch-lever engaging the clutch and carrying a tilting bar, continuous reciprocating bars adapted to engage the tilting bar of the clutch-lever, and means for swinging the tilting bar, all as will be hereinafter more fully described.

The shaft A is connected with the gates of the water-wheel to be governed, and upon the said shaft are loosely placed spur-wheels B B′ and toothed clutch-disks *a a′*, carried by the said spur-wheels. A sleeve C, placed on the shaft A between the spur-wheels B B′, carries toothed clutch-disks *b b′*, which are capable of engaging the clutch-disks *a a′* when the sleeve is moved longitudinally on the shaft A. On the same base supporting the shaft A are placed journal-boxes *c c′*, in which is journaled a shaft D, which is provided at one end with a pulley E, and upon the shaft adjoining and between the boxes *c c′* are secured pinions *d d′*. The pinion *d* engages the spur-wheel B on the shaft A, and the pinion *d′* engages an intermediate pinion *e*, which meshes into the spur-wheel B′ on the shaft A. By means of this arrangement of gearing the wheels B B′ are made to revolve in opposite direction.

Upon the shaft D between the pinions *d d′* are placed cams *f f′*, which face each other and are therefore oppositely arranged with respect to each other, and upon the base which supports the other portions of the mechanism are placed standards *g g′*, the upper ends of which are provided with chambered mortises *h*, as shown in Fig. 4. In the mortises are placed sliding bars F F′. The bar F is provided at one end with a roller *i*, which rolls upon the face of the cam *f*, and on the said bar within the chamber on the standard *g* is secured a collar *j*, between which and the wall of the chamber *h* is placed a spiral spring *k*, which presses the bar F toward the cam *f*, keeping the roller *i* in contact with the said cam, so that as the cam revolves the bar F is made to reciprocate in the mortises in the standard. The inner end of the bar F is provided with two notches or offsets forming a shoulder *l*. The bar F′ is constructed like the bar F, but it is oppositely arranged with respect to the said bar, so that its roller *i′* may engage the cam *f′*.

The sleeve C is provided with a groove which receives a spline on the shaft A, so that while the said sleeve can move longitudinally on the shaft it cannot turn thereon. The center of the sleeve C is provided with a pair of collars *m*, between which are inserted pins projecting from the forked end of the lever G. The said lever is fulcrumed on the standard *n*, and is provided at its free end with a tilting bar H, which is made of magnetic material. Springs *o o′* are connected with the tilting bar H upon opposite sides of its fulcrum and attached to a bar *p*, fastened to the standards *g g′*. The said springs tend to hold the tilting bar H in a horizontal position and out of engagement with the reciprocating bars F F′.

Above the tilting bar H are supported electromagnets I I′ by a yoke *q*, secured to the standards *g g′*. When the water-wheel is running normally, the tilting bar H occupies a horizontal position and the sleeve C remains in a central position on the shaft A, with the clutches out of engagement; but

when one of the magnets I I′ is energized, in the manner presently to be described, one end of the tilting bar H is attracted, causing it to turn on its pivot and bring the opposite end into the path of one of the reciprocating bars F F′. As shown in the drawings, the magnet I′ is energized and the bar H is tilted so as to bring one end into the path of the reciprocating bar F, which by engagement with the tilting bar H causes the lever G to swing and throw the clutch-disk *b* into engagement with the clutch-disk *a*, thereby permitting the spur-wheel B to turn the sleeve C and the shaft A, causing a quick movement of the gate of the water-wheel. When the water-wheel regains its normal speed, the current is withdrawn from the magnet I′, and the springs *o o′* cause the tilting bar H to return to a horizontal position, thus disengaging it from the reciprocating bar F. A change in the speed in the opposite sense causes the magnet I to be energized when the bar H is tilted in the opposite direction, bringing it into engagement with the shoulder on the reciprocating bar F′, which results in moving the clutches in the opposite direction and reversing the motion of the shaft A.

The circuit of the magnets I I′ is shown in Fig. 5. A centrifugal governor J is provided with a sliding contact-disk *r*, which is connected electrically with one pole of the battery K. The other pole of the said battery is connected with one terminal of each magnet I I′, and the other terminals of the magnets are connected with springs *s s′*, which extend over the edge of the contact-disk *r*. The governor being driven by the water-wheel, as the speed diminishes the contact-disk *r* is moved by the falling of the governor-balls and forms an electrical connection with the spring *s′*, thus causing the magnet I′ to be energized. When the speed increases, the contact-disk *r* is raised and an electrical contact is formed with the spring *s*, thereby causing the magnet I to be energized.

Instead of interposing a battery and electromagnet between the governor and the tilting bar H, I may connect the governor with the tilting bar in the manner shown in Fig. 6. In this case the bar H is tilted by a mechanical connection with the levers of the governor, a diminishing of the speed of the governor tilting the bar in one direction and an increase of speed tilting it in the opposite direction, thereby accomplishing results that are accomplished by means of the battery and the electromagnet.

In the modification shown in Fig. 7 the shaft A is prolonged beyond its bearings and provided with a screw-thread a^3, upon which is placed a traveling nut b^3, carrying an arm c^3. The said arm c^3 extends above and below the nut, its lower end being guided in a slot in the fixed bar d^3, which prevents the arm and nut from turning, while allowing it to move longitudinally on the screw-thread a^3. Above the screw is supported a contact-spring e^3, having two equal arms provided at their ends with beveled cams f^3, which are oppositely arranged with reference to each other. The beveled cams f^3 are in the path of the arm c^3, carried by the nut b^3. Above the ends of the spring e^3 are supported contact-points g^3 g^4. The magnets I I′ and the gate-operating mechanism connected therewith are the same as already described. The governor J is connected with the lever h^3, which is pivoted at its center. Under the ends of the lever h^3 are supported contact-springs i^3 i^4, and under the contact-spring i^3 is located a fixed contact J^3. One pole of the battery K is connected electrically with the lever h^3. The other pole of the battery is connected with one terminal of each magnet I I′, with the spring e^3, and contact j^3. The remaining terminal of the magnet I is connected with the contact-point g^3 and with the spring i^3. The remaining terminal of the magnet I′ is connected electrically with the spring i^4 and contact-point g^4.

In the regular working of the apparatus the governor J causes the lever h^3 to tilt and make contact with the spring i^3 or i^4, according to requirements; but if the governor should stop by the running off of the belt or from some other cause, the lever h^3 would be tilted on its fulcrum, bringing one end thereof into contact with the spring i^3 and carrying the said spring into contact with the point j^3, thereby cutting out of the circuit the magnet I, which controls the opening of the gate. To avoid moving the gate beyond a prescribed limit, the magnet I or I′ is cut out by the closing of the circuit between the spring e^3 and one or the other of the contact-points g^3 g^4, according to the movement of the nut b^3 and arm c^3.

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

1. The combination with a gate operating shaft, gear wheels loose on the shaft, and a clutch carried by the said shaft, of a drive shaft parallel with the gate operating shaft, gearing between the drive shaft and the gear wheels of the gate operating shaft to revolve the said gear wheels in opposite directions, a pivoted clutch operating lever having one end extending adjacent to the drive shaft, means operated by the drive shaft for swinging the clutch operating lever on its pivot to shift the clutch, a governor, and means for controlling the movement of the clutch operating lever from the governor, substantially as described.

2. The combination with a gate operating shaft, gear wheels loose on the shaft, and a clutch carried by the said shaft, of a drive shaft parallel with the gate operating shaft, gearing between the drive shaft and the gate operating shaft to revolve the said gear wheels in opposite directions, a pivoted clutch operating lever having one end extending adjacent to the drive shaft, cams on the drive shaft, intermediate mechanism between the cams and the clutch operating lever for swinging the said lever on its pivot to shift the

clutch, a governor, and means for controlling the movement of the clutch lever from the governor, substantially as described.

3. In a water wheel governor, the combination with a gate operating shaft, gear-wheels loosely mounted on the shaft and a clutch carried by said shaft, of a drive shaft, gear wheels meshing with the gear wheels of the gate operating shaft to revolve them in opposite directions, cams on the drive shaft, a pivoted lever for operating the clutch sliding bars for operating the said lever, said bars being operated by the cams, a governor, and means for controlling the movement of the said pivoted lever from the governor, substantially as described.

4. In a water wheel governor, the combination with a gate, operating shaft, gear wheels loose on the shaft, and a clutch carried by said shaft, of a drive shaft, gear wheels meshing with the gear wheels of the gate operating shaft for revolving them in opposite directions, cams on the drive shaft, a pivoted lever for operating the clutch, a tilting and spring actuated bar on one end of the said lever, sliding and spring pressed bars operated by the cams and adapted to engage the tilting bar, and means for tilting the said bar to bring it into engagement with the said sliding bars, substantially as described.

5. In a water wheel governor, the combination with a gate operating shaft, gear wheels loose on the shaft, and a clutch carried by said shaft, of a drive shaft, gear wheels meshing with the gear wheels of the gate operating shaft for revolving them in opposite directions, cams on the drive shaft, a clutch operating lever, a tilting and spring actuated bar on one end of the clutch lever, sliding and spring pressed bars operated by the cams and adapted to engage the tilting bar, a governor, and means operated by the governor for tilting the said bar, substantially as described.

6. In a water wheel governor, the combination with a gate operating shaft, gear wheels loose thereon, clutch disks carried by said wheels, a sleeve fitted to slide but not to turn on the said shaft and clutch disks carried by the sleeve, of a drive shaft, pinions on the shaft, one of the pinions meshing with one of the gear wheels, an intermediate pinion meshing with the other gear wheel and the pinion of the drive shaft, a pivoted lever engaging the sleeve, a tilting and spring actuated bar on one end of the pivoted lever, cams on the drive shaft, sliding and spring pressed bars operated by the cams and provided with shoulders adapted to be engaged by the tilting bar, and means for tilting the said bar to bring its ends in line of travel of the sliding bars, substantially as herein shown and described.

7. In a water wheel governor, the combination of a gate operating shaft, spur wheels placed loosely on the shaft and furnished with clutch disks, a sleeve movable lengthwise of the shaft but not revoluble thereon, clutch disks secured to the sleeve, a lever engaging the sleeve and carrying a tilting lever of magnetic material, reciprocating bars arranged below the ends of the tilting lever, means for reciprocating the bars and revolving the spur wheels in opposite directions, and electromagnets arranged to act on the tilting lever, substantially as specified.

8. In a water wheel governor, the combination with a gate operating shaft, gear wheels loose on the shafts, and a clutch carried by the said shaft, of a drive shaft, gear wheels for revolving the gear wheels of the gate operating shaft in opposite directions, a clutch operating lever, a tilting and spring actuated bar of magnetic material on one end of the clutch lever, cams on the drive shaft, sliding and spring pressed bars operated by the cams and adapted to engage the tilting bar, electro magnets adjacent to said tilting bar, a governor, and electrical connections between the governor and magnets for alternately energizing the magnets, substantially as and for the purpose set forth.

9. In a water wheel governor, the combination with a gate operating shaft, and a reversing mechanism for said shaft, of electro magnets for controlling the reversing mechanism, a governor, a centrally pivoted lever with which the governor is connected, spring contacts under the ends of the lever, a fixed contact beneath one of the spring contacts, and the electrical connections between the contacts and the magnets, substantially as and for the purpose set forth.

10. In a water wheel governor, the combination with a gate operating shaft, a reversing mechanism for said shaft, electro magnets for controlling the reversing mechanism, a governor, and electrical connections between the governor and magnets, of a traveling arm operated by the gate operating shaft, a spring above the arm and having two contact points with which the arm is adapted to engage, contact points above the spring and electrical connections between the contacts and magnets, substantially as and for the purpose set forth.

11. In a water wheel governor, the combination with a gate operating shaft having one end prolonged and screw threaded, a reversing mechanism for said shaft, electro-magnets for controlling the reversing mechanism, a governor, and the electrical connection between the governor and magnets, of a nut traveling on the screw threaded end of the said shaft, and provided with an arm, a contact spring above the said arm and having downwardly extending projections contact points above the spring contact, and the electrical connections between the contacts and the magnets, substantially as described.

WINFIELD S. LIBBEY.

Witnesses:
ADDISON SMALL,
R. B. HAYES.