No. 707,792. Patented Aug. 26, 1902.

J. E. McINTOSH & J. A. SEYMOUR.

ADJUSTER FOR CENTRIFUGAL GOVERNORS.

(Application filed Oct. 8, 1900.)

(No Model.) 3 Sheets—Sheet 1.

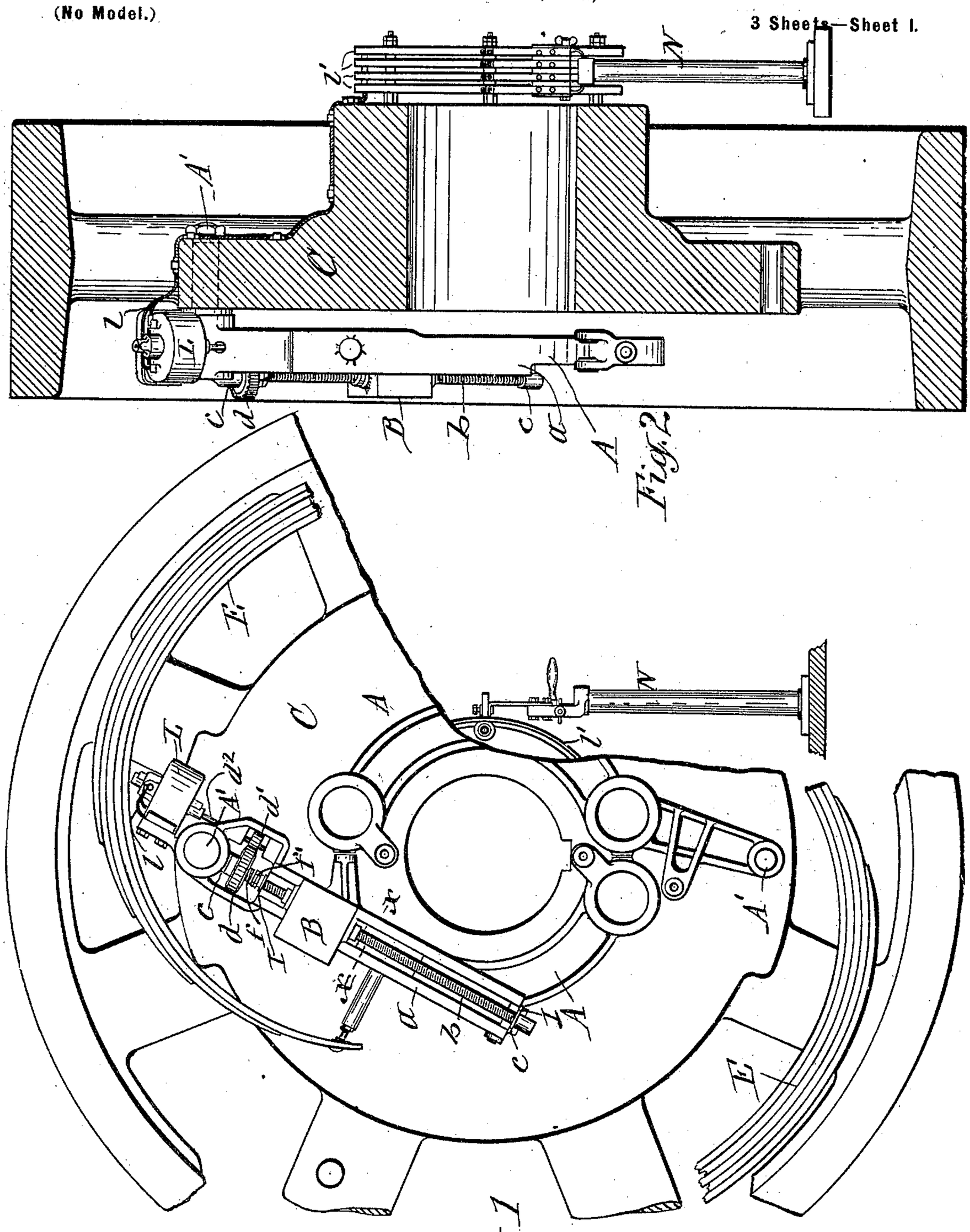

Fig. 2.

Fig. 1.

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Fig. 5

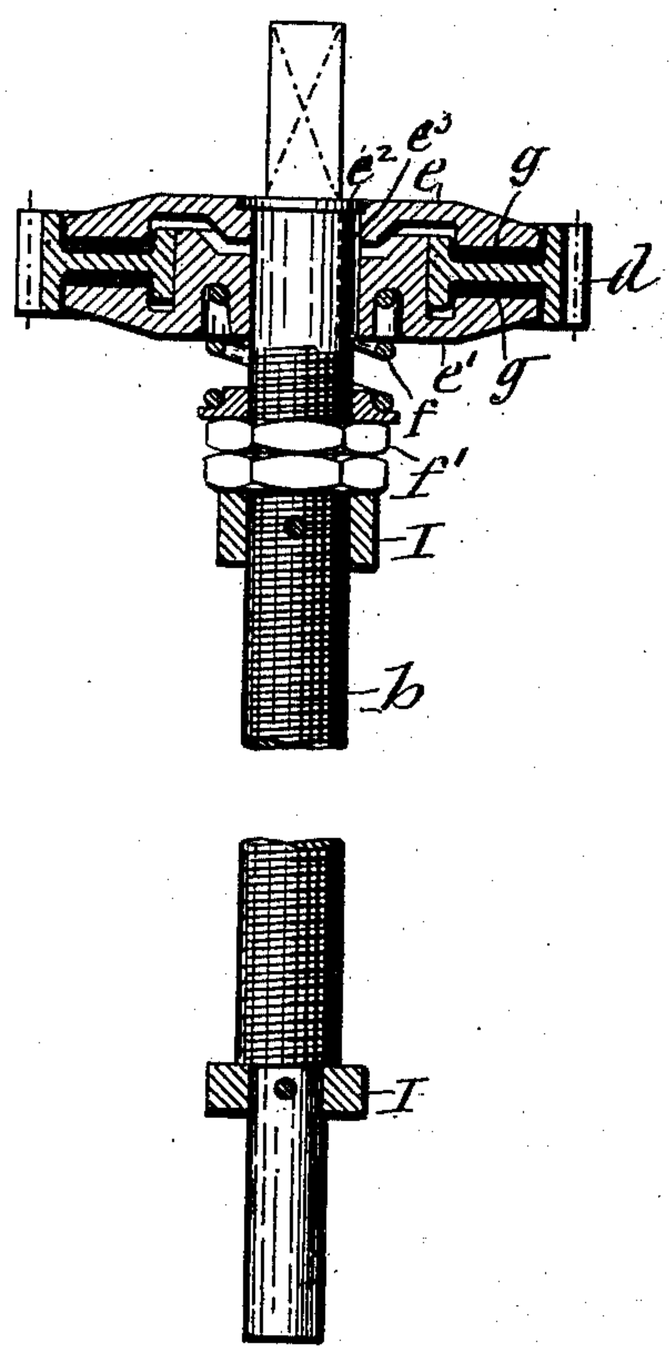
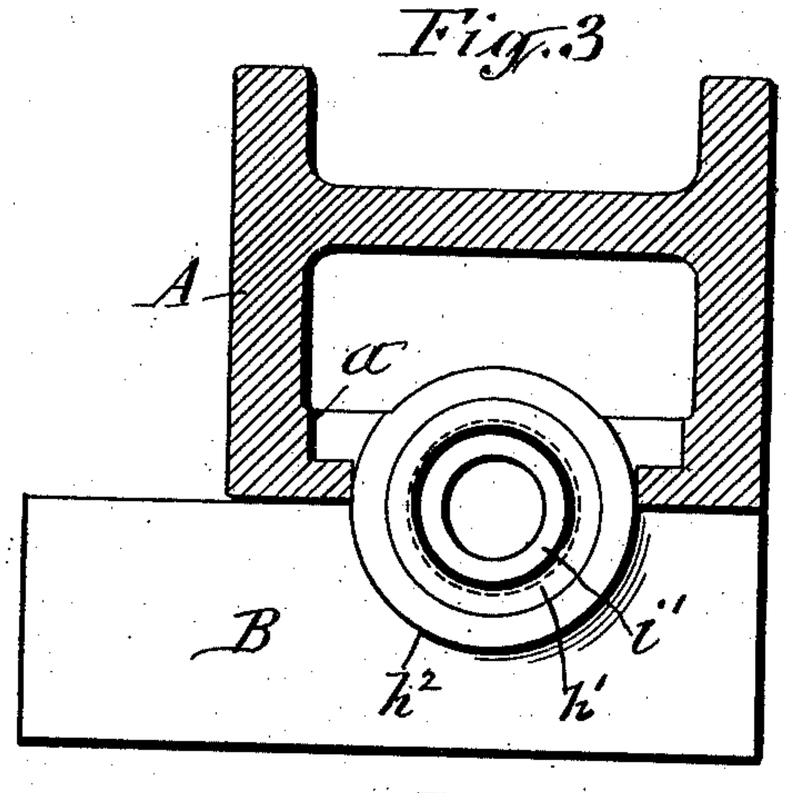


Fig. 3



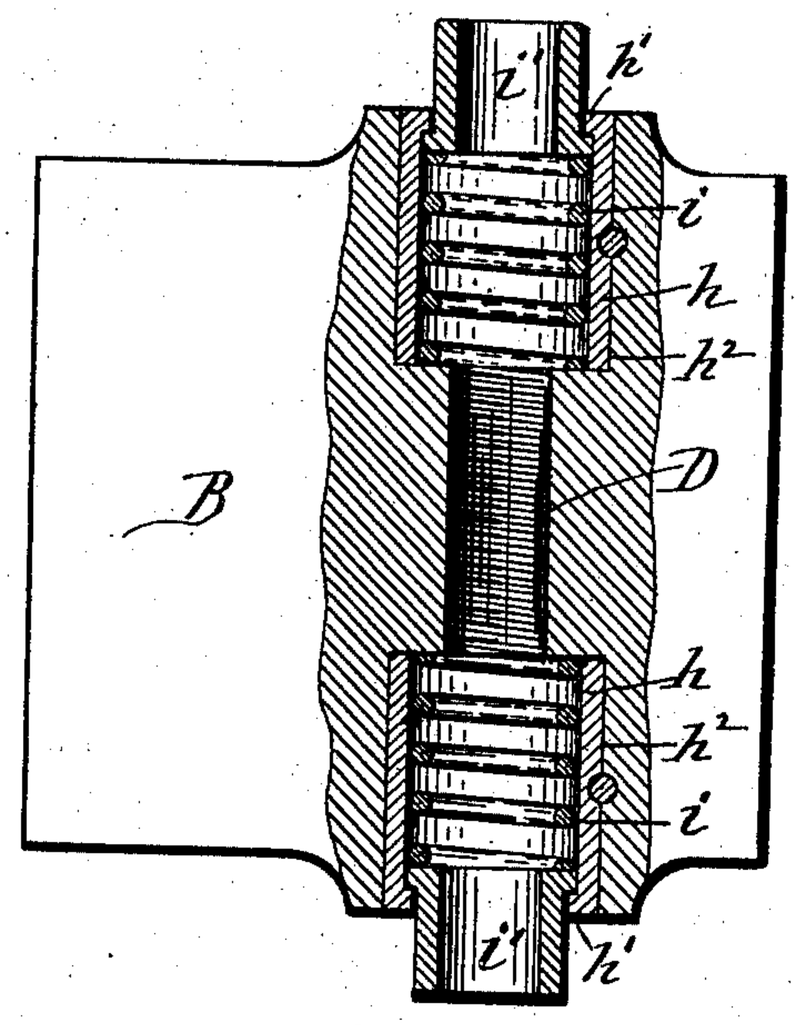


Fig. 4

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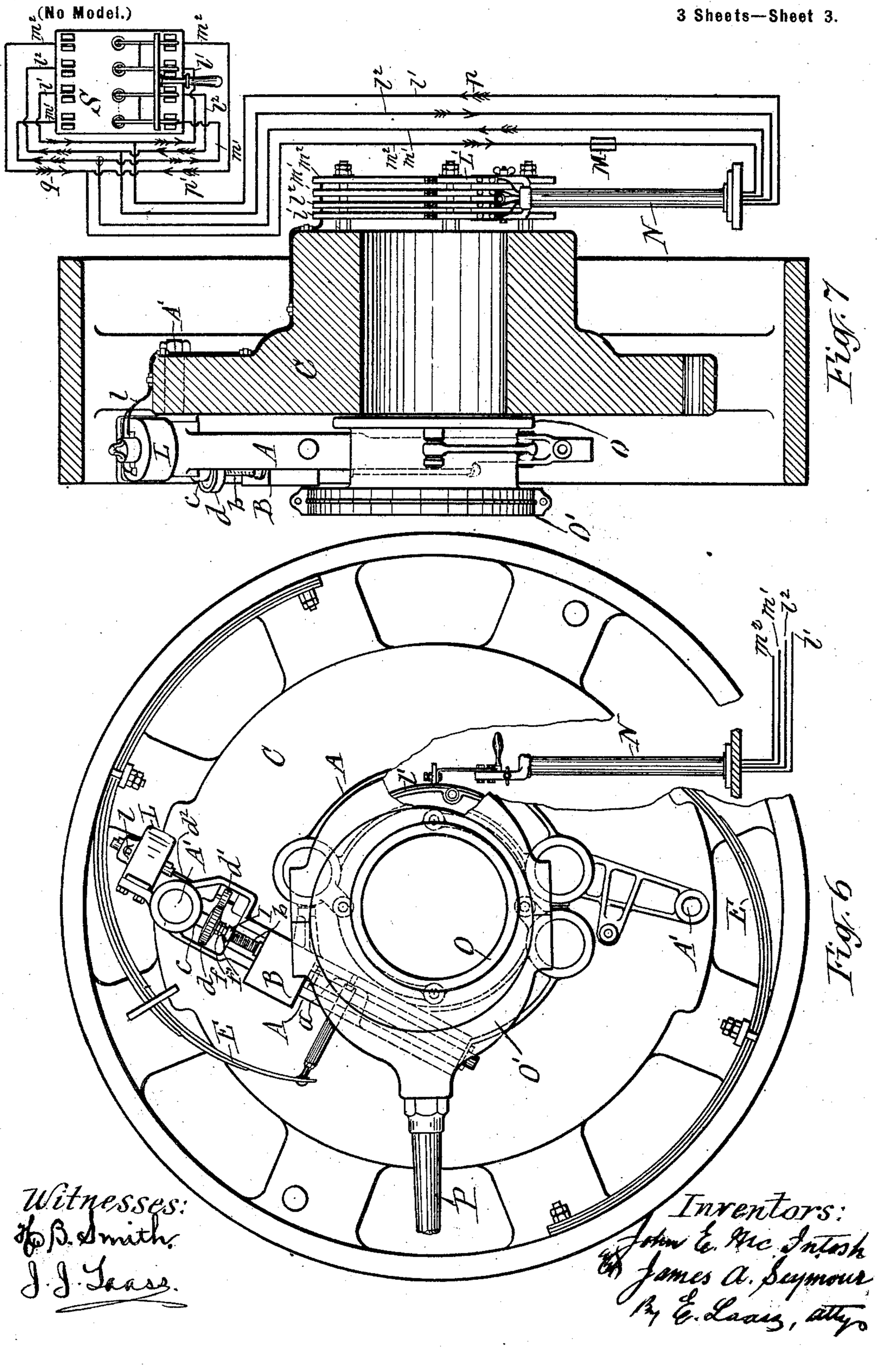

Fig. 1.

Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN E. McINTOSH AND JAMES A. SEYMOUR, OF AUBURN, NEW YORK.

ADJUSTER FOR CENTRIFUGAL GOVERNORS.

SPECIFICATION forming part of Letters Patent No. 707,792, dated August 26, 1902.

Application filed October 8, 1900. Serial No. 32,338. (No model.)

To all whom it may concern:

Be it known that we, JOHN E. MCINTOSH and JAMES A. SEYMOUR, citizens of the United States, and residents of Auburn, in the county of Cayuga, in the State of New York, have invented new and useful Improvements in Adjusters of Centrifugal Governors, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention is designed to afford delicate adjustment of the speed of a steam-engine or prime mover while in motion, such adjustment being more specially desired on engines used for driving alternating-electric-current generators where it is necessary to bring one unit, consisting of an engine and generator, into the same phase as another before putting them into parallel operation or after they are running in such operation to divide the load between the two generators in such a way that any unit may be made to carry any proportion of the entire load desired within the limits of its capacity; and to that end the invention consists in the improved construction and combination of parts hereinafter described and claimed.

In the annexed drawings, Figure 1 is a fragmentary side view of a governor equipped with our invention. Fig. 2 is a transverse section of the same. Fig. 3 is an enlarged transverse section on line X X in Fig. 1. Fig. 4 is a longitudinal sectional view of that part of the auxiliary governor-weight which is provided with the nut and spring-buffers. Fig. 5 is a detached side view of the adjusting-screw of the governor, showing the frictionally-driven actuating-gear of said screw; and Figs. 6 and 7 are side and transverse sectional views showing more fully our invention and its connection with the switchboard.

C represents the wheel of a centrifugal governor, provided with the usual centrifugal weighted arms A A, which are fulcrumed at A′ on said wheel and are opposed by springs E.

O denotes the eccentric-ring, O′ is the eccentric-strap, and P the usual eccentric-rod, which actuates the valve of the engine. Either to one or to each of the governor-weight arms A (which constitute the main centrifugal weights) is firmly secured or preferably formed integral therewith a guide *a*, which extends from the fulcrum of said arm or in any other suitable direction. Upon this guide is mounted a longitudinally-movable auxiliary weight B, which is formed with a nut D, disposed axially parallel with the guide *a*. Through this nut passes a screw *b*, which is pivoted at its ends in suitable bearings *c c* on the guide *a*.

d denotes the actuating-gear of the screw. This gear is secured to the screw by frictional bearings which allow the gear to turn on the screw when subjected to a predetermined excessive strain, and thus obviate certain injurious effects hereinafter described. The following is our preferred construction of the gear *d* and its support on the screw. Said gear is sustained by two disks *e* and *e′*, which clamp between them the web of the gear, as shown in Fig. 5 of the drawings. The disk *e* is firmly secured to the screw by a collar e^2 on the screw bearing on the hub of the disk and by a key e^3 in the side of the screw engaging a groove in the hub of the disk. The companion disk *e′* is movable longitudinally and prevented from turning on the screw by the key e^3 passing through a channel in the hub of said disk. The disk *e′* is forced toward the disk *e* by means of a spiral spring *f*, surrounding the screw and bearing at one end on the disk *e′* and at the opposite end on a nut *f′*, applied to the screw. By means of said nut the tension of the spring *f* can be adjusted to exert the necessary pressure on the disk *e′* to properly clamp the gear between the two disks. Between the said disks and sides of the web of the gear we prefer to interpose leather rings *g g* for the purpose hereinafter explained.

I I represent collars fastened to the screw to limit the movement of the weight B. To guard against jamming of said weight on the collars I I and consequent sticking and deadlocking the weight, we provide the weight with suitable spring-buffers, consisting, preferably, of cylindrical cases *h*, fastened in sockets h^2 in the ends of the weight in line with the nut D and provided on their outer ends with inward flanges *h′*, as shown in Fig. 4 of the drawings. In said cases are spiral springs *i*, resting with one end on the inner ends of the sockets h^2 and bearing with their outer ends on flanged thimbles *i′*, which pro-

trude from the weight B and are prevented from slipping out of the cases *h* by the engagement of the flanges on said parts, said thimbles coming in contact with the aforesaid stops I at the ends of the longitudinal travel of the weight. The gear *d* is engaged by a pinion *d'*, fastened to the shaft d^2 of a suitable electric motor L, secured to the centrifugal governor-weight arm A. The motor L is electrically connected by suitable conductors *l l* (which must be flexible to allow for swinging of governor-weight arm A) to the current-collector rings *l'* L', which are in contact with the collector-brushes sustained on the standard N. From these brushes extend insulated wires leading to the switchboard or other suitable current-switching devices, as shown at S in Fig. 7 of the drawings, for starting, operating, and controlling the direction and extent of rotation of the motor L, and thus shifting the weight B lengthwise on the guide *a* by the action of the screw *b*, so as to increase or decrease the pressure on the spring E, which pressure is due to the movement around pivot A' caused by the combined centrifugal force of the governor-weight arm A and auxiliary weight B. This increase or decrease of pressure on spring E causes a corresponding decrease or increase of the speed of the engine as determined by the governor.

The object of transmitting motion from the gear *d* to the screw *b* by the frictional bearings of said gear on its supporting-disks *e* and *e'* and leather rings *g g* is to allow said gear to turn after the movement of the screw has been arrested by the weight B having reached the end of its travel. The gradual stoppage of the travel of the weight afforded by the use of the spring-buffer, in conjunction with the yielding of the gear *d* allowed by its frictional supports, obviates jamming and dead-locking of the weight at the end of its travel, and the friction-drive also serves to guard against burning out the motor. It is therefore evident that the spring-buffer and frictional drive of the screw are important features of our invention, and we do not limit ourselves to the specific construction of said devices, as they are susceptible of modifications without departing from the spirit of our invention, including means for introducing this motion of motor to gearing on governor-weight arm A (which swings with reference to said wheel on pivot A') preferably through gearing concentric with pivot A'.

In Figs. 6 and 7 of the drawings the two armature-wires are represented at m' and m^2, and the two field-wires are shown at l' and l^2. The dynamo is indicated at M, and the direction of the current is indicated by arrows in the wires.

When the switch is closed on the set of the connections at the bottom of the switchboard, the current will flow in the direction of the arrows shown at *p* and *p'*. When the switch-handle is moved to stand at right angles from the plane of the switchboard, the current will be disconnected, and when the switch-handle is pushed up, so as to close the upper set of connections, the current will flow in the direction indicated at *q*.

Obviously the reversing of the direction of the field-currents with respect to armature-currents reverses the action of the motor.

What we claim as our invention is—

1. The combination with an engine and a centrifugal engine-governor controlling the motor fluid and rotating with the engine-shaft, said engine-governor including a weight adjustable to vary the centrifugal effect of the governor, and a screw for adjusting said weight, of electrically-controlled mechanism rotating with the governor for rotating said screw to adjust the weight while the engine is running.

2. The combination with an engine and a centrifugal engine-governor controlling the motor fluid and rotating with the engine-shaft, said engine-governor including a weight adjustable to vary the centrifugal effect of the governor, and a screw for adjusting said weight, of an electric motor rotating with the governor and connections for rotating said screw, and electrical connections for actuating said motor.

3. The combination with an engine, a centrifugally-acting rotating device including a weight adjustable to vary the centrifugal effect, an eccentric and connections for moving the eccentric by the centrifugally-acting device, connections for controlling the motor fluid by said eccentric, and a screw for adjusting said weight, of electrically-controlled mechanism for rotating said screw to adjust the weight while the engine is running.

4. The combination with an engine, of a centrifugally-acting rotating weight, a pivoted arm carrying said weight, an auxiliary weight carried by and adjustable longitudinally of said arm, an eccentric and connections for moving the eccentric by the centrifugally-acting weight, connections for controlling the motor fluid by said eccentric, a screw for adjusting said auxiliary weight, electrically-controlled mechanism for rotating said screw to adjust the weight while the engine is running.

5. The combination with an engine, of a centrifugally-acting device rotating with the engine-shaft and including a weight adjustable to vary the centrifugal effect, an eccentric and connections for moving the eccentric by the centrifugally-acting device, connections for controlling the motor fluid by said eccentric, a screw for adjusting said weight, and means for rotating said screw to adjust the weight while the engine is running.

6. The combination, with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide, a nut on said weight, a screw passing through said nut and pivotally supported

on the main centrifugal weight, a gear connected to said screw, a pinion engaging said gear, an electric motor carried on said main centrifugal weight actuating said pinion, and means for controlling said motor.

7. The combination, with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide and formed with a nut disposed axially parallel with the guide, a screw passing through said nut, spring-buffers disposed to cushion the auxiliary weight at the ends of its travel, an electric motor carried on the governor-wheel, gearing transmitting motion from said motor to the screw, and means for controlling said motor.

8. The combination, with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide and formed with a nut disposed axially parallel with the guide, a screw passing through said nut, spring-buffers disposed to cushion the auxiliary weight at the ends of its travel, an electric motor carried on said main centrifugal weight and actuating said screw, and means for controlling said motor.

9. The combination, with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide, a screw moving said weight, stops in the path of said weight to limit the travel thereof, an electric motor carried on the governor-wheel, gearing transmitting motion from said motor to the screw and comprising a friction-drive to allow the motor to slip and continue running after the auxiliary weight has reached the end of its travel, and means for controlling said motor.

10. The combination with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide, a screw moving said auxiliary weight, stops in the path of said weight to limit the travel thereof, an electric motor carried on said main centrifugal weight, gear transmitting motion from said motor to the screw and comprising a friction-drive to allow the motor to continue running after the auxiliary weight has reached the end of its travel, and means for controlling said motor.

11. The combination, with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide and formed with a nut disposed axially parallel with the guide, a screw passing through said nut, spring-buffers disposed to cushion the auxiliary weight at the ends of its travel, an electric motor carried on the governor-wheel, gear transmitting motion from said motor to the screw, a friction-drive interposed in said gearing to allow the motor to slip and continue running after the auxiliary weight has reached the end of its travel, and means for controlling said motor.

12. The combination, with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide and formed with a nut disposed axially parallel with the guide, a screw passing through said nut, spring-buffers disposed to cushion the auxiliary weight at the end of its travel, an electric motor carried on said main centrifugal weight, gears transmitting motion from said motor to the screw and comprising a friction-drive to allow the motor to continue running after the auxiliary weight has reached the end of its travel, and means controlling said motor.

13. The combination, with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide and formed with a nut disposed axially parallel with the guide, a screw passing through said nut, and mounted in bearings on the main centrifugal weight, a disk fastened to said screw, a companion disk mounted longitudinally movable on the screw and locked from turning thereon, a gear sustained by the interposition of its web between said disks, a nut connected to the aforesaid screw, a spring interposed between said nut and movable disk to clamp the gear between the disks, a motor carried on said arm actuating the gear, and means for controlling said motor.

14. The combination, with the rotary frame, eccentric and the main centrifugal weight, of a guide carried on said weight, an auxiliary weight mounted longitudinally movable on said guide and formed with a nut disposed axially parallel with the guide, a screw passing through said nut, spring-buffers disposed to cushion the auxiliary weight at the end of its travel, a friction-drive consisting of a disk fastened to the screw, a companion disk mounted longitudinally movable on the screw and locked from turning thereon, a gear sustained by the interposition of its web between said disks, a nut connected to the aforesaid screw, a spring interposed between said nut and movable disks, a motor carried on said arm and actuating the gear, and means for controlling said motor.

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