(No Model.) 5 Sheets—Sheet 1.

G. J. ALTHAM.

GOVERNOR.

No. 519,785. Patented May 15, 1894.

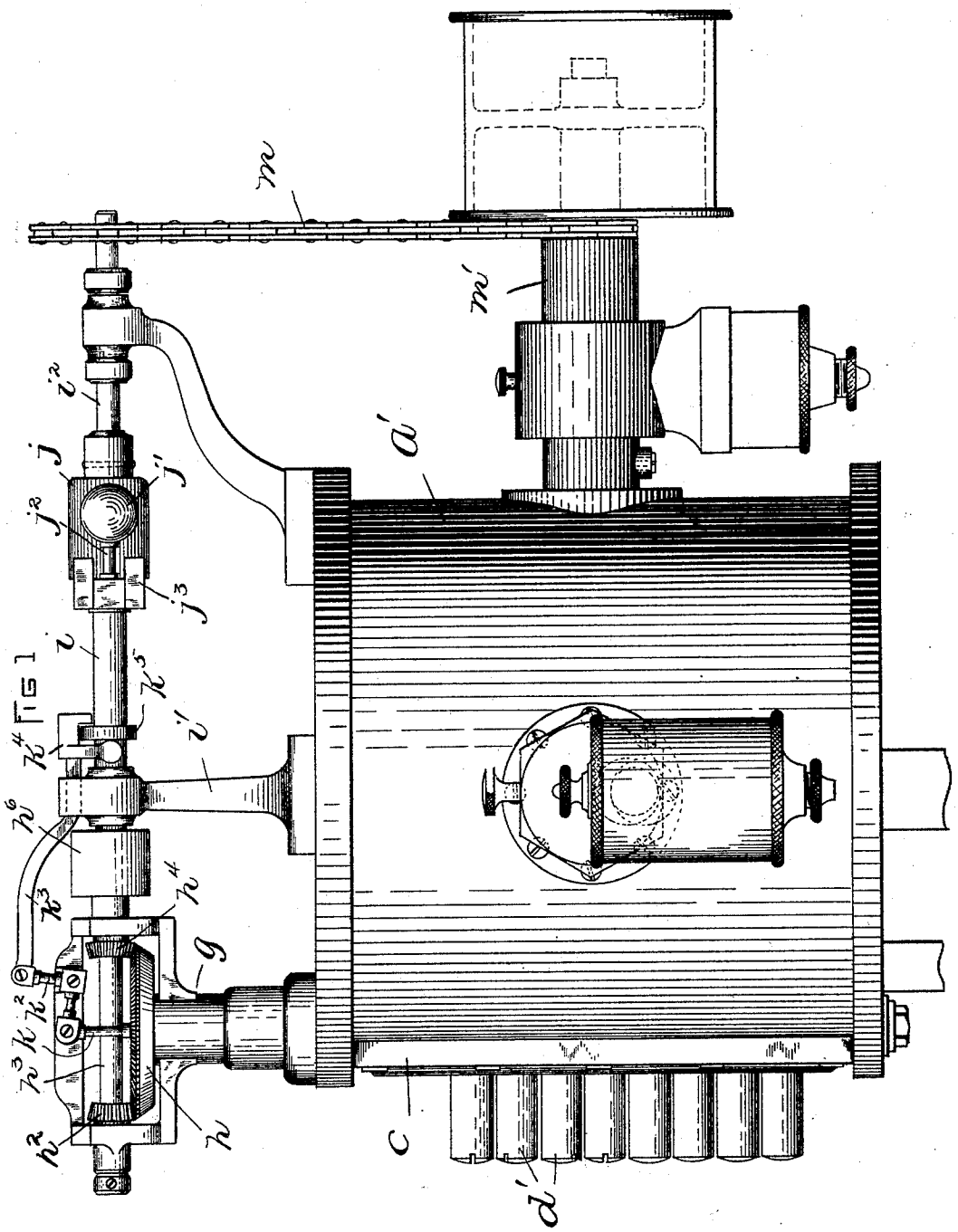

FIG 1.

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WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 2.

G. J. ALTHAM.

GOVERNOR.

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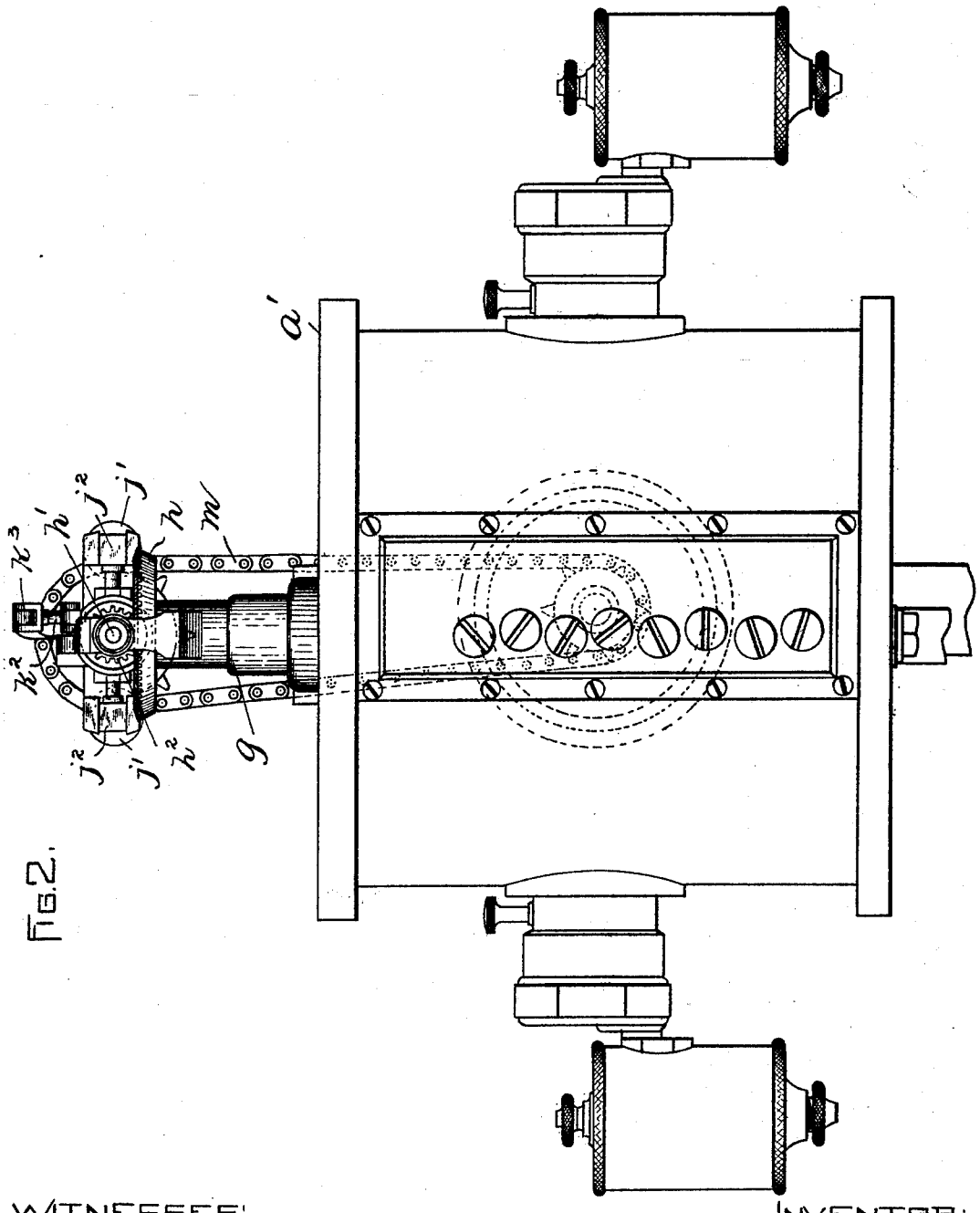

FIG. 2.

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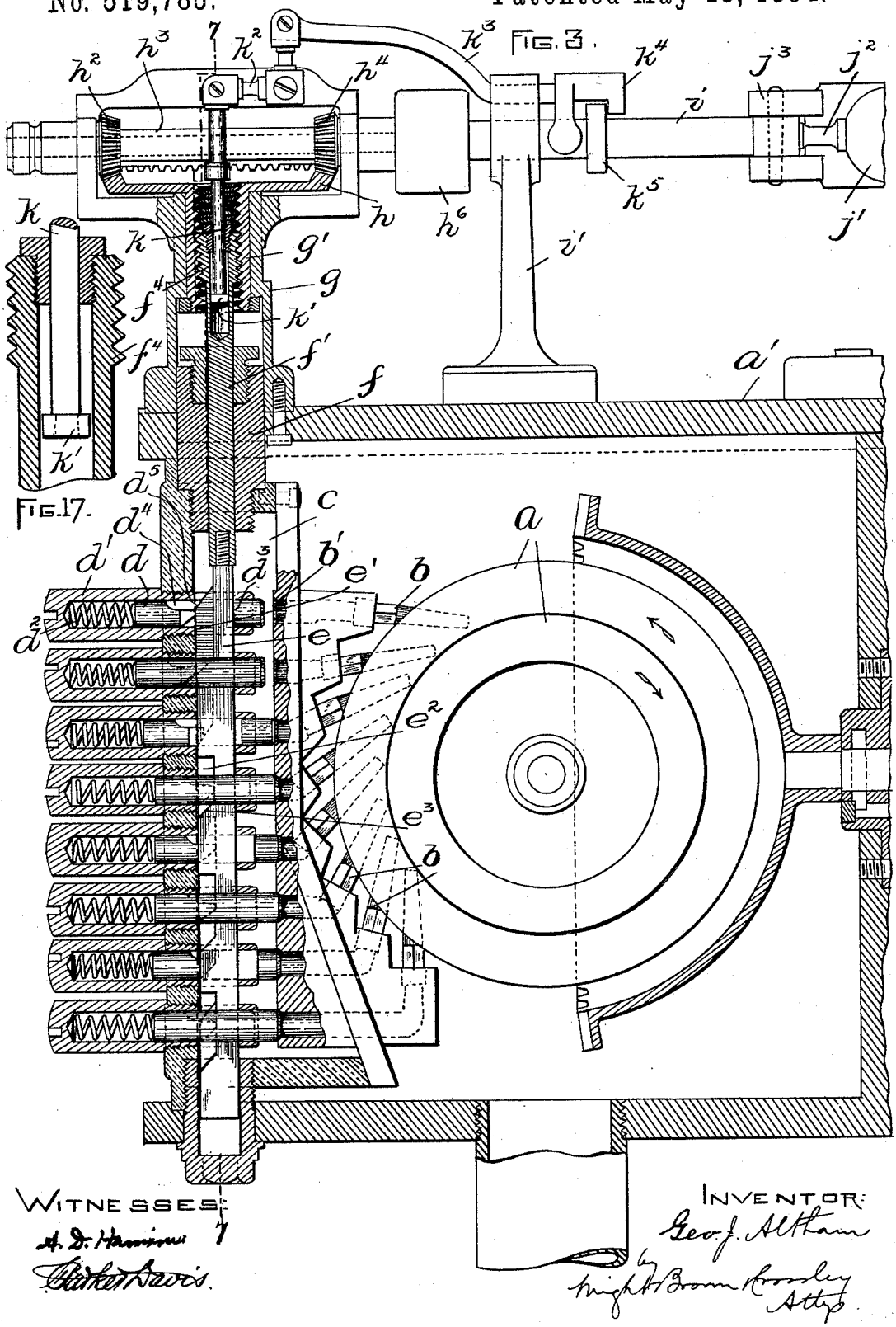
(No Model.) 5 Sheets—Sheet 3.

G. J. ALTHAM.

GOVERNOR.

No. 519,785. Patented May 15, 1894.



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G. J. ALTHAM.

GOVERNOR.

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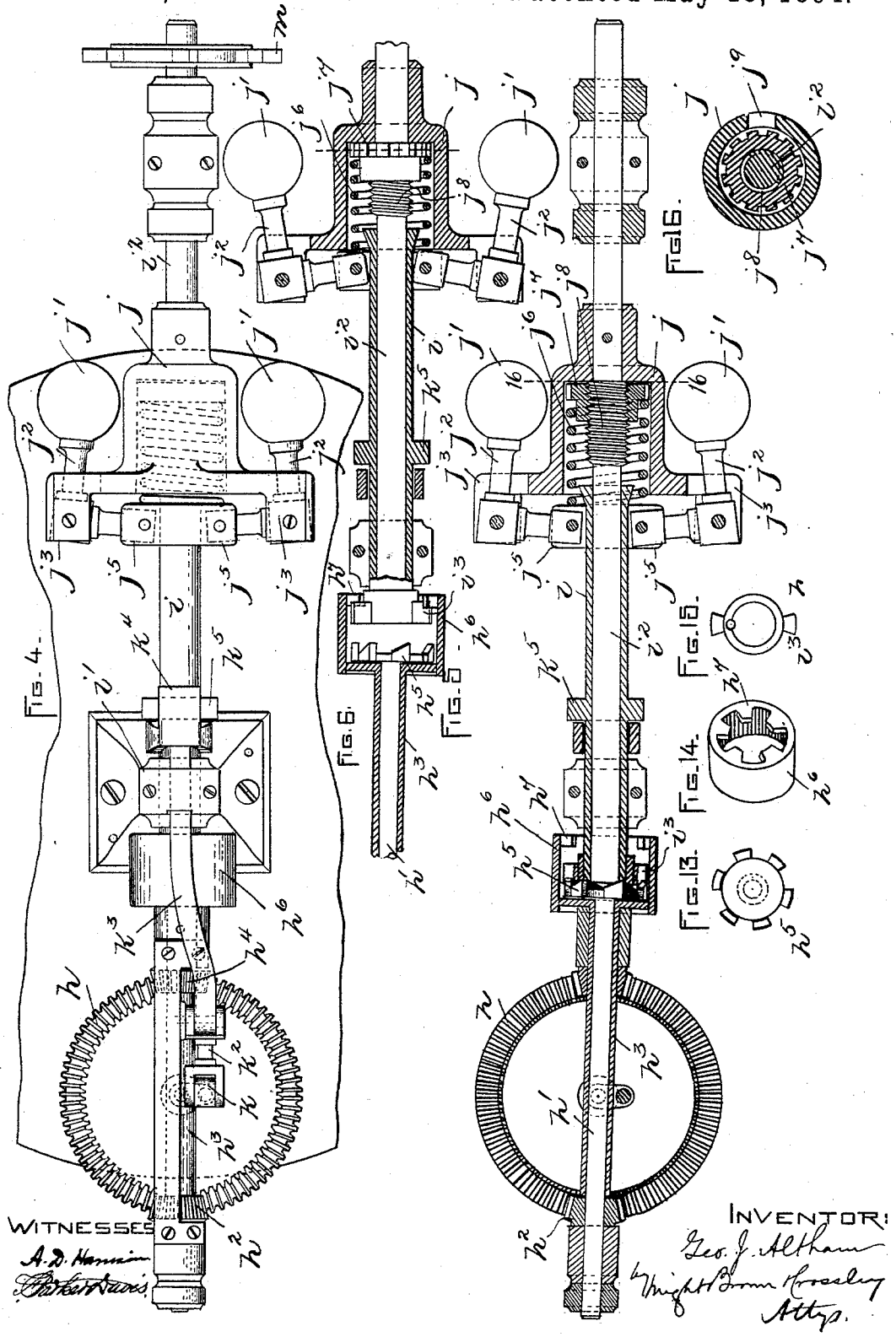

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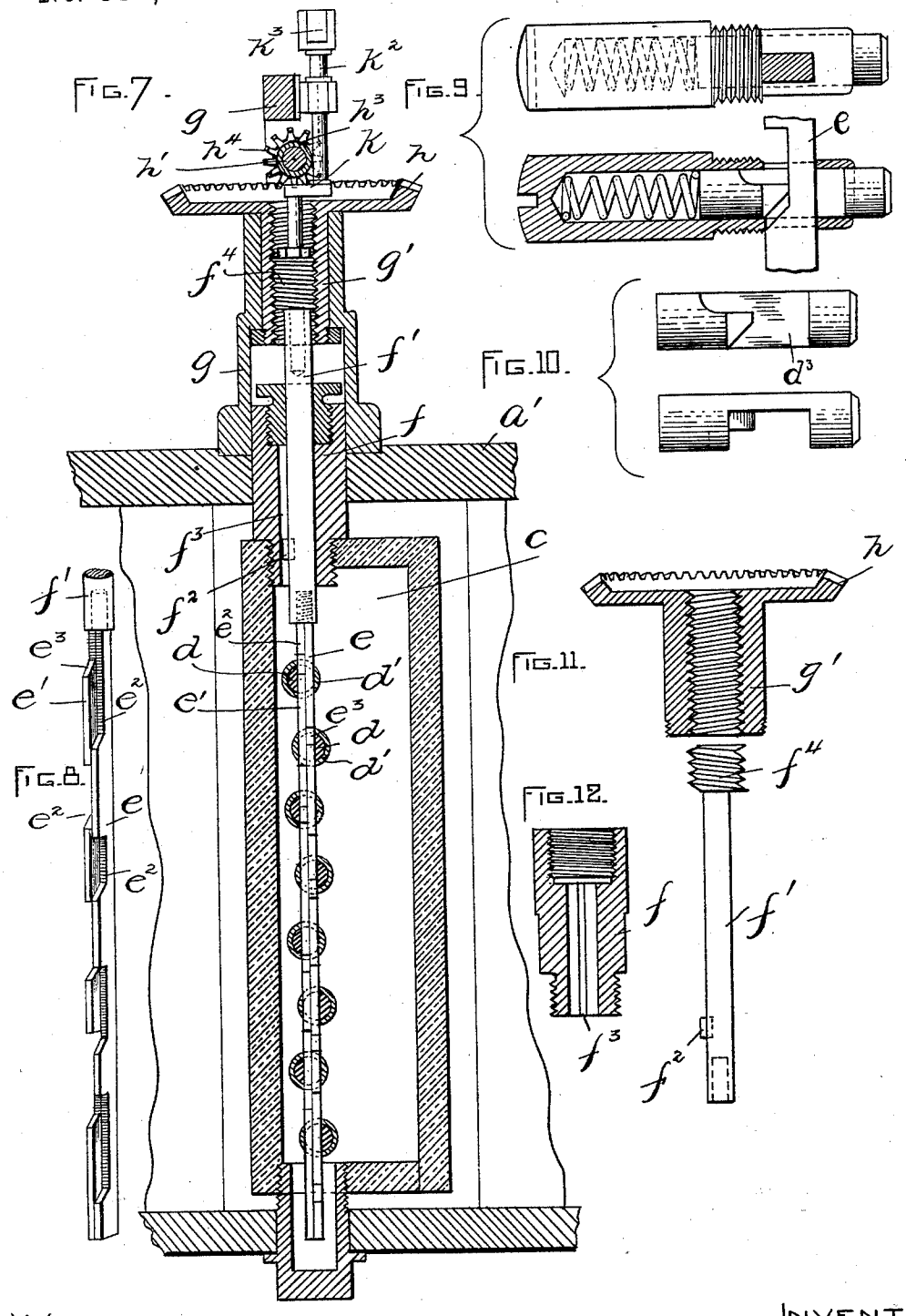
(No Model.) 5 Sheets—Sheet 5

G. J. ALTHAM.

GOVERNOR.

No. 519,785. Patented May 15, 1894.



WITNESSES:
A. D. Harrison
Parker Davis

INVENTOR:
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THE NATIONAL LITHOGRAPHING COMPANY,
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UNITED STATES PATENT OFFICE.

GEORGE J. ALTHAM, OF SWANSEA, MASSACHUSETTS.

GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 519,785, dated May 15, 1894.

Application filed June 12, 1893. Serial No. 477,313. (No model.)

To all whom it may concern:

Be it known that I, GEORGE J. ALTHAM, of Swansea, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Governors, of which the following is a specification.

This invention relates to an improvement in governors, and has been designed especially for application to the style of motor illustrated in my former patent, No. 475,957, issued May 31, 1892.

The accompanying drawings illustrate a construction for carrying out the invention.

Figure 1 shows an elevation of the motor, as viewed from one side, with the improved governor applied thereto. Fig. 2 shows an elevation of the same parts, as viewed from another side. Fig. 3 shows a sectional view of the motor and admission valves, and parts of the governor, other parts of which appear in elevation. While in reality the valves are "staggered," the section is represented as being through the middle of all of them. Fig. 4 shows a top plan view of the governor. Fig. 5 shows a longitudinal section of the governor, with the parts in their normal relation. Fig. 6 shows a similar section of some of the parts, with the governor-balls thrown out to the limit of their movement. Fig. 7 shows a vertical section on line 7—7 of Fig. 3. Figs. 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17 show details of the various parts of the mechanism.

The same letters of reference indicate the same parts in all the figures.

Turbine wheels a, such as described in my former patent, are inclosed within a casing a', and the motive fluid is directed into the tangential buckets of the inner wheel by a series of nozzles b, each of which communicates by ports b' with a steam-chest c. A valve d is supported in a barrel d' opposite each of the ports b', and a spring d^2, inserted behind the valve, tends to seat the valve over the port. Each valve is slotted transversely, as shown at d^3, and provided with a projection d^4 in the slot and formed with an inclined upper side or shoulder d^5. A reciprocal bar engages the slots of all the valves, and is adapted to engage the inclined shoulders d^5 and thereby retract the valves against the action of the springs.

For the sake of compactness, the following construction is employed: The valves are staggered, as shown in Figs. 2 and 7, and the bar which engages them is composed of two portions e and e', which are preferably two separate pieces sweated together. Each portion extends through alternate valves, and is formed with offsets e^2, which receive the projections d^4, and have inclined lower ends e^3 to engage the shoulders d^5. The bars extend centrally through the valves with which they co-act, as best illustrated in Fig. 7, and it will be seen that, by making the bar double and correspondingly arranging the valves, the parts are compacted in smaller compass than if one bar engaged all the valves, for the offsets e^2 may overlap in the double arrangement. The inclines e^3 of the bar are not equidistant, but are graded, so that the valves do not work simultaneously, but successively (see Fig. 3).

A bushing f is fastened in the upper end of the steam-chest c, and a rod f' extends through said bushing and is affixed to the upper end of the bar $e\,e'$. Said rod may slide in the bushing, but is prevented from turning by a key f^2 fastened in it and engaging a groove f^3 in the bushing. A frame g is erected on the upper side of the casing a', and supports an internally-threaded rotary sleeve g'; and the upper end of the rod f' carries a screw f^4, which engages the threads of said sleeve. Movements of the screw from end to end of the sleeve are sufficient to open and close all the valves d. A crown-wheel h is supported in the frame g so as to turn with the sleeve g', and is preferably formed integral with said sleeve. The frame g affords bearings for a shaft h', which extends across the crown-wheel h, and carries a pinion h^2, meshing therewith; and a sleeve h^7, mounted on said shaft so as turn independently thereof, carries a pinion h^4, also in mesh with the crown-wheel. The shaft h' has a clutch-member h^5 on one end, and the sleeve h^3 carries a cylindrical casing h^6, which extends over said clutch-member h^5 and is provided at its outer end with clutch-teeth h^7.

The letter i designates an elongated sleeve, which is supported in a bearing i' erected on the casing a', and incloses a shaft i^2, on which it may slide but may not turn. The sleeve

extends into the cylindrical casing h^6, and has a clutch-member i^3 affixed to its end and adapted to interlock with either of the clutch-members h^5 or h^7. The shaft h' is slightly out of alignment with the shaft i^2, as shown in Fig. 5, the object of which is to insure a more ready engagement and disengagement of the clutch. A head j is affixed to the shaft i^2, and governor-balls j' are pivotally connected by bell-cranks j^2 with oppositely-projecting arms j^3 of said head. The inward-extending arms of the bell-cranks are pivotally connected with ears j^5 on the sleeve i. The head j has a cylindrical chamber, which houses a spring j^6, bearing at one end against the end wall of said chamber, and at the opposite end against the sleeve i, thus tending to hold the balls inward and the clutch-member i^3 in engagement with the clutch-member h^5. Under this relation of parts, which may be termed the normal relation, such a direction of rotation of the crown-wheel h is produced through the pinion h^2 as to cause the bar $e\ e'$ to rise and consequently open the valves d and admit fluid to the motor-wheels. The maximum speed of the motor is regulated by the tension of the spring j^6, and the tension may be adjusted by means of a nut j^7 engaging screw-threads j^8 on the shaft i^2. Access is gained to the said nut, for the purpose of turning it, through an opening j^9 in the head j.

When the increasing speed of the motor throws the balls out, this imparts to the sleeve i a sliding movement, which draws the clutch-member i^3 out of engagement with the clutch-member h^5, and interlocks it with the clutch-teeth h^7. Then the crown-wheel h will be moved in the reverse direction to that in which it has before been driven, as it is now driven by the pinion h^4. This causes the bar $e\ e'$ to move downward, and the springs d move the valves toward their respective ports.

During the operation of the motor, the clutch-member i^3 is constantly oscillating between the clutches h^5 and h^7, and alternately engaging them, and thereby the speed of the motor is kept substantially uniform.

Auxiliary governing means are provided, to act in case of a failure of the balls to properly perform their work.

A tappet-rod k extends into a bore in the rod f', and has a head k' adapted to abut the ends of the bore. The upper end of this tappet-rod is connected with one arm of a bell-crank lever k^2, pivoted to the frame g; and the other arm of said lever is connected with a rod k^3 which is fitted to slide through a portion of the bearing i', and carries a forked head k^4, straddling a collar k^5 on the sleeve i.

Continued rotation of the crown-wheel in either direction, caused by failure of the balls to work, brings one end or the other of the bore in the rod against the head k' of the tappet-rod, and, by moving said rod, shifts the sleeve i, through the bell-crank lever k^2 and rod k^3, and disconnects the clutches that are in mesh.

The shaft i^2 is positively driven by a chain m, connecting it with the main-shaft m' of the motor.

It is evident the invention disclosed may be carried out by other means than here shown, and therefore is not limited to the construction by which I have chosen to illustrate it.

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

1. In a fluid motor having a plurality of admission ports, a plurality of separate and independent valves, one for each port, and means controlled by the speed of the motor for separately actuating said valves.

2. In a fluid motor having a plurality of admission ports, a plurality of separate and independent valves, one for each port, a reciprocal bar adapted to separately actuate said valves, and means for governing the bar by the speed of the motor.

3. In a fluid motor having a plurality of admission ports, a spring-pressed valve for each port having an inclined shoulder, a reciprocal bar having inclines to engage said shoulders, and means for governing said bar by the speed of the motor.

4. In a fluid motor having a plurality of admission ports, a spring-pressed valve for each port having an inclined shoulder, said valves being staggered, a double bar having inclines to engage said shoulders, each portion of the bar engaging alternate valves, and means for governing said bar by the speed of the motor.

5. A governor for fluid motors, comprising in its construction a reciprocal bar controlling the admission-valve or valves, a screw carried by said bar, a rotary screw-threaded sleeve engaging said screw, a crown-wheel fast with said sleeve, a shaft extending across the said crown-wheel and carrying a pinion at one end in mesh therewith and a clutch-member at the opposite end, a sleeve inclosing said shaft and rotatable thereon, said sleeve carrying a pinion in mesh with the crown-wheel and a cylindrical casing projecting beyond the shaft and having an internal clutch-part, a governor-shaft driven by the motor, a longitudinally-movable sleeve on said shaft and carrying a clutch-member within the said cylindrical casing and adapted to make connection with the clutch-member on the first-named shaft or that on the sleeve surrounding the latter, and governor-balls on the governor-shaft and controlling the longitudinally-movable sleeve.

6. A governor for fluid motors, comprising in its construction a reciprocal bar controlling the admission valve or valves, a screw carried by said bar, a rotary screw-threaded sleeve engaging said screw, a crown-wheel fast with said sleeve, a shaft carrying a pinion in mesh with said wheel and a clutch-member, a sleeve rotatable on said shaft and carrying a pinion in mesh with the crown-

wheel and a clutch-member, a governor-shaft driven by the motor, a longitudinally-movable sleeve on said shaft and carrying a clutch-member between the two first-named clutch-members and adapted to interlock with either, the sleeve being out of alignment with the first-named shaft and sleeve, and governor-balls on the governor-shaft and controlling the longitudinally-movable sleeve.

7. A governor for fluid motors, comprising in its construction a reciprocal bar controlling the admission valve or valves, a screw carried by said bar, a rotary screw-threaded sleeve engaging said screw, a governor-shaft driven by the motor, reversible means for connecting said shaft with the screw-threaded sleeve and governed by the speed of the motor, and auxiliary governing means comprising a tappet-rod in engagement with the screw, and suitable connections between said tappet-rod and the governor-shaft, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 3d day of June, A. D. 1893.

GEORGE J. ALTHAM.

Witnesses:
C. F. BROWN,
A. D. HARRISON.