(No Model.) 4 Sheets—Sheet 1.

C. E. R. MARTIN.

MOTOR FOR ENGINE GOVERNORS.

No. 528,274. Patented Oct. 30, 1894.

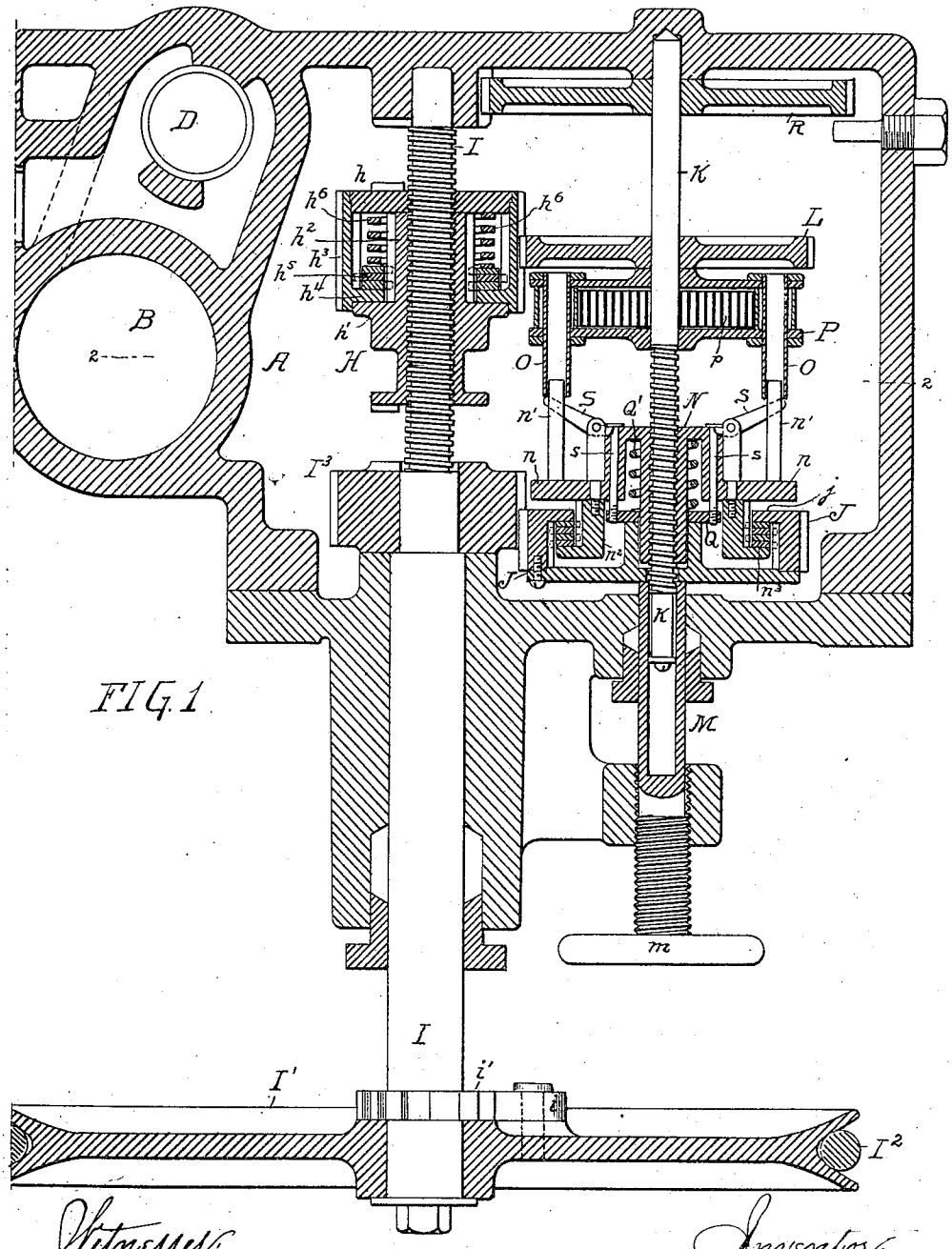

FIG. 1.

Witnesses:
Jno. C. Parker
Stephen N. Flowers

Inventor:
Carl E. R. Martin,
by his Attorney,
Walter W. Calmore

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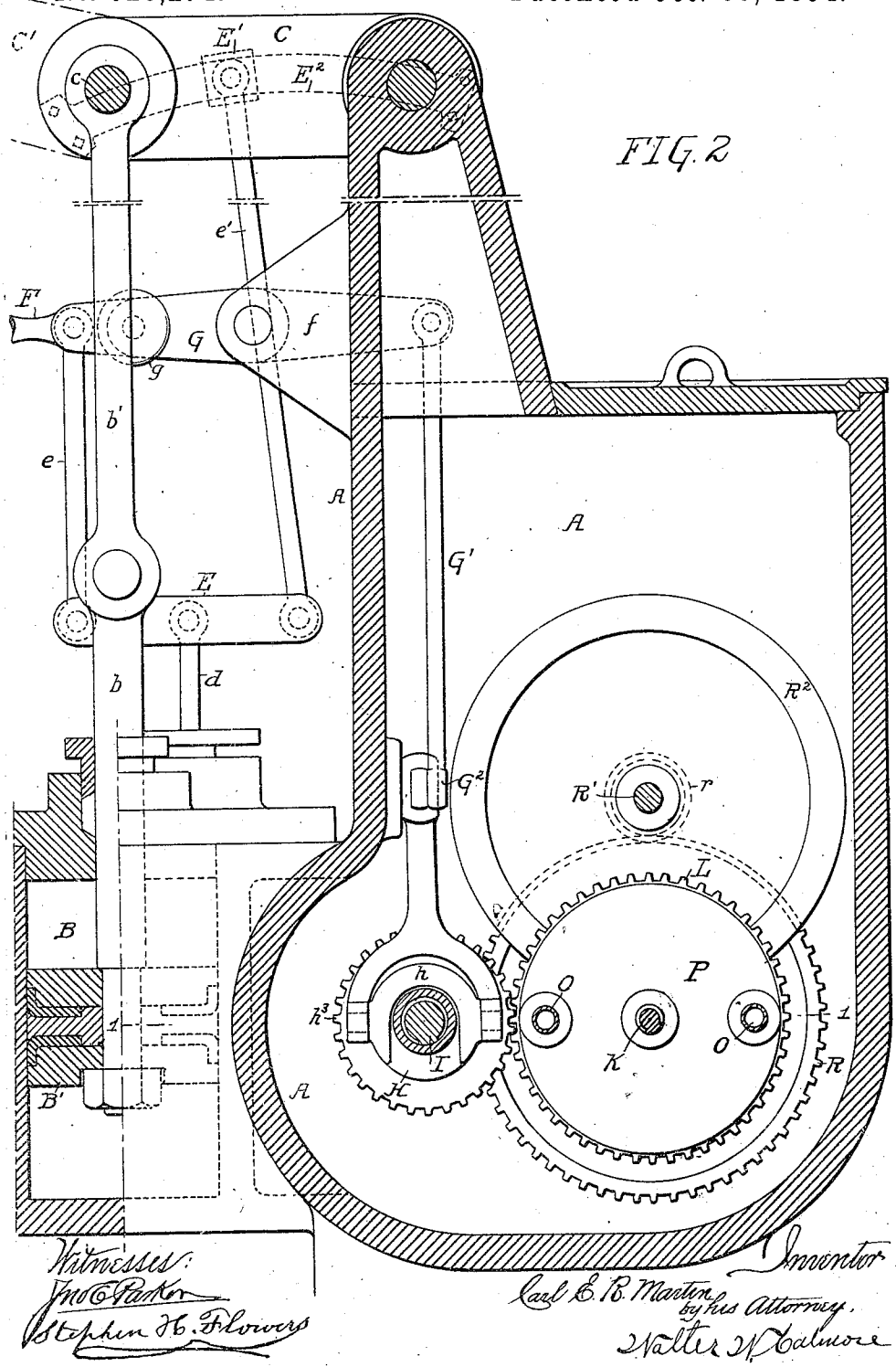
FIG. 2



Witnesses:
Jno. C. Parker
Stephen H. Flowers

Inventor
Carl E. R. Martin
by his Attorney.
Walter H. Talmage

(No Model.) 4 Sheets—Sheet 3.

C. E. R. MARTIN.

MOTOR FOR ENGINE GOVERNORS.

No. 528,274. Patented Oct. 30, 1894.

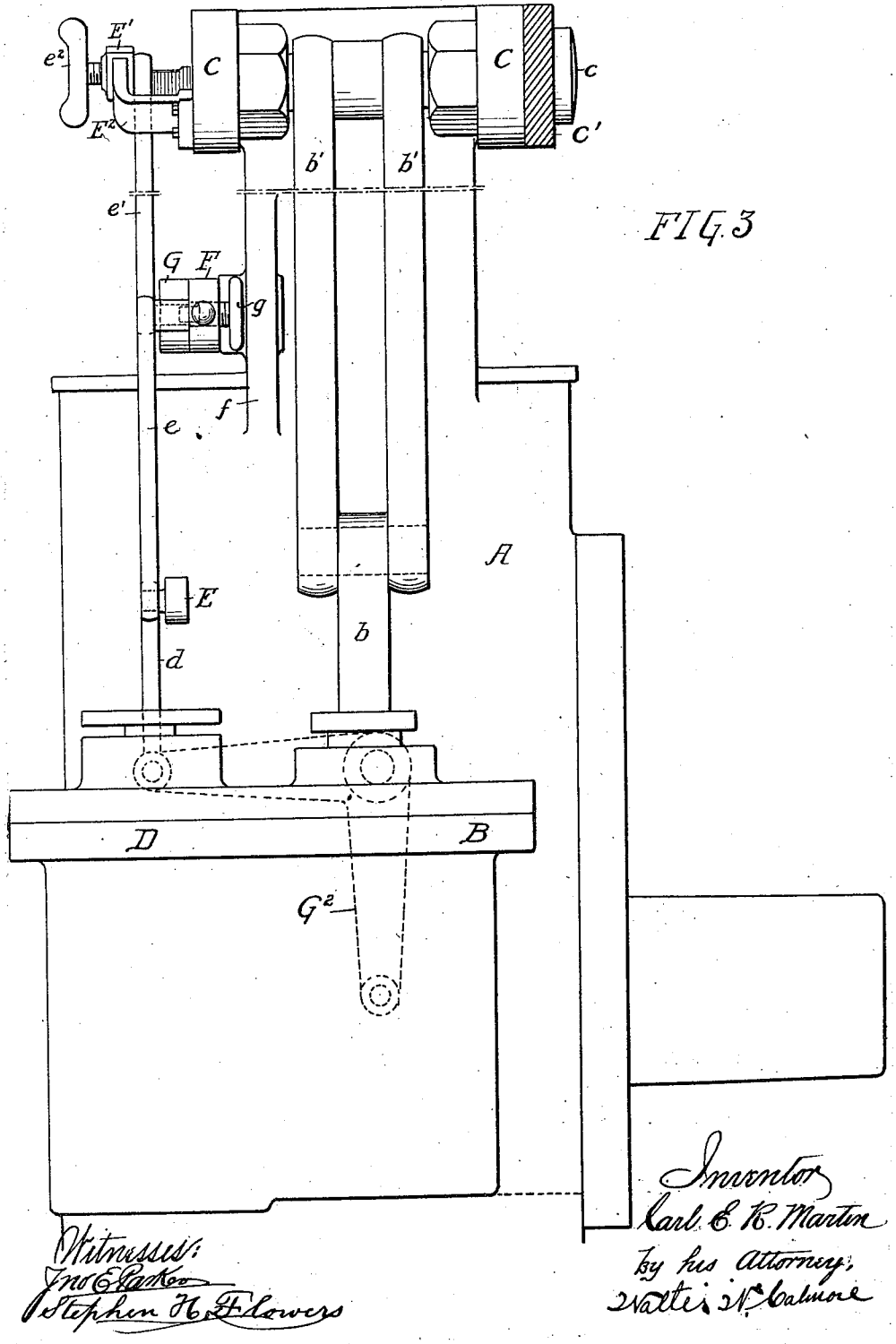


FIG. 3

Witnesses:
Jno. E. Parker
Stephen H. Flowers

Inventor
Carl E. R. Martin
by his Attorneys:
Watts & McCalmont

(No Model.) 4 Sheets—Sheet 4.

C. E. R. MARTIN.

MOTOR FOR ENGINE GOVERNORS.

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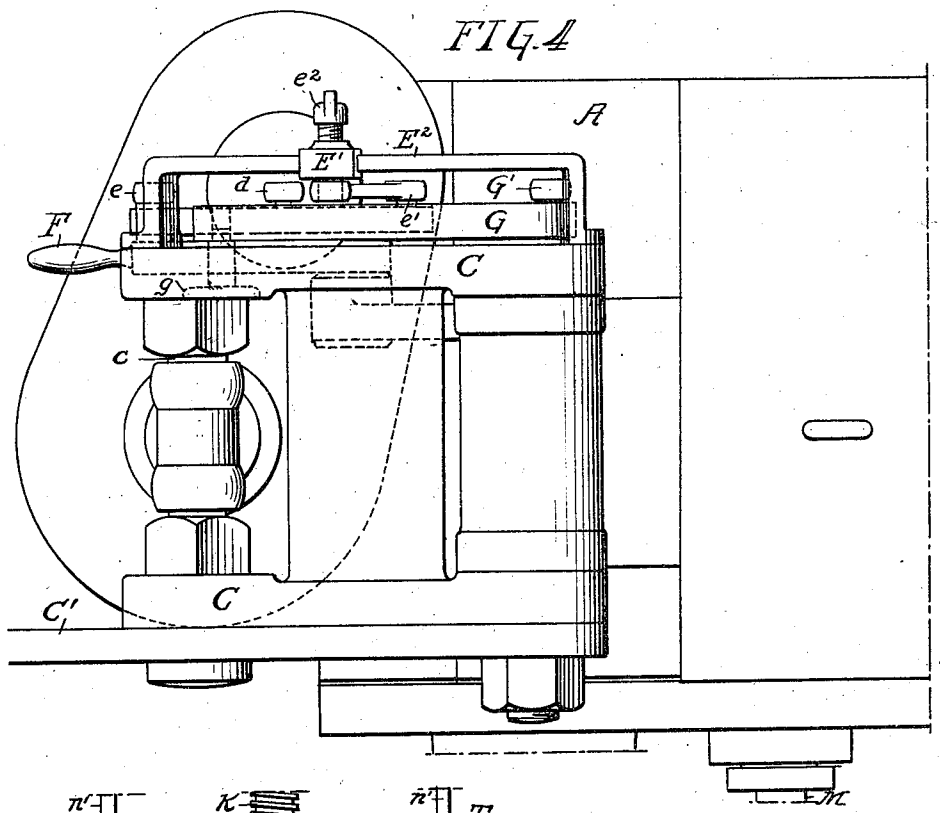
FIG. 4



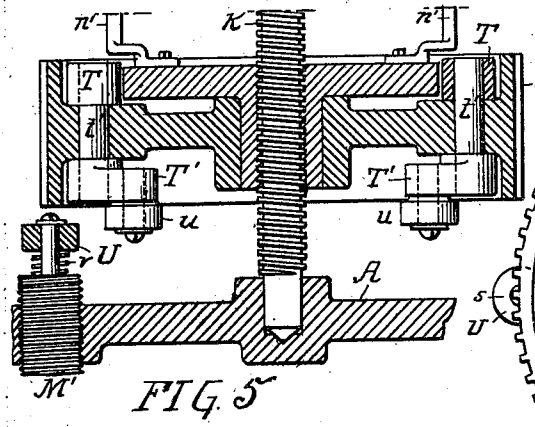
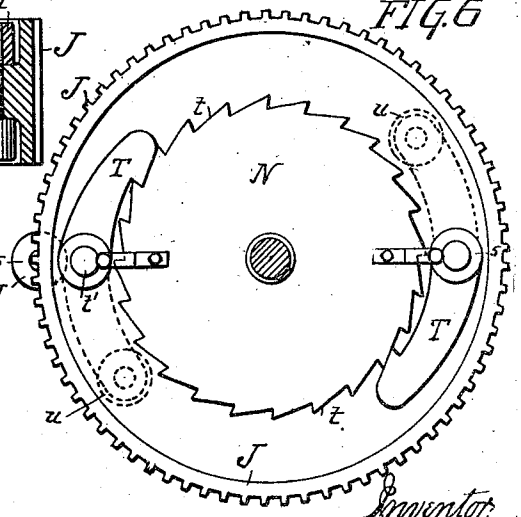


FIG. 5

FIG. 6



Witnesses:
Jno. E. Parker
Stephen N. Flower

Inventor:
Carl E. R. Martin.
by his Attorney,
Walter N. Dalmas

UNITED STATES PATENT OFFICE.

CARL E. R. MARTIN, OF PHILADELPHIA, PENNSYLVANIA.

MOTOR FOR ENGINE-GOVERNORS.

SPECIFICATION forming part of Letters Patent No. 528,274, dated October 30, 1894.

Application filed February 20, 1894. Serial No. 500,875. (No model.)

To all whom it may concern:

Be it known that I, CARL E. R. MARTIN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Motors for Engine-Governors, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to certain improvements in governors of that class illustrated in the application for Letters Patent filed by me on February 1, 1893, under Serial No. 460,516, and it consists more particularly in the construction and arrangement of the mechanism or motor for regulating the extent of movement of the primary valve rod of a governor of this type.

The invention further consists in certain improvements in the construction of the governor, as more fully set forth hereinafter.

In the accompanying drawings:—Figure 1, is a sectional plan view, on the line 1—1, Fig. 2, of a regulating device constructed in accordance with my invention. Fig. 2, is a sectional elevation of the same, on the line 2—2, Fig. 1. Fig. 3, is an end elevation of the same. Fig. 4, is a plan view. Fig. 5, is a sectional plan on the line 5—5, Fig. 6, of a modified construction of a portion of the invention. Fig. 6, is an elevation of the same.

The device as shown in the accompanying drawings, is intended more especially for use as a governor for a stationary engine, but it may be employed in almost any connection as a regulating device for motors of any construction.

Referring to the drawings, A, represents a casing within which are portions of the mechanism, while its exterior is so arranged as to form a support or bearing for other portions of the same, so as to form a compact structure.

In the casing, A, is formed a cylinder, B, in which is contained a piston, B′, from which extends a piston rod *b*, connected by rods *b′*, to a pin *c* carried by arms C pivoted to the upper portion of the casing. To one of the arms is secured a bar, C′, connected either directly or indirectly to the link block of the engine. The movement of the piston in one direction or the other will effect a corresponding movement of the link block, and effects a decrease or increase in the speed of the engine. The piston is operated by the admission to the cylinder of a greater or less quantity of an actuating fluid, and the mechanism forming the subject of the present invention is designed to regulate the admission of the actuating fluid. Adjoining the cylinder, B, is a valve cylinder, D, having entrance ports and exit ports leading to the cylinder, B. The valve, D′, is of the piston type, and is connected by a rod *d* to the center of a bar, E, from one end of which extends a rod *e* to a handled lever, F, and from the opposite end extends a rod *e′* to a box, E′, adjustably secured by a thumb screw e^2 to a bar, E^2, on one of the arms C.

On a lug *f* on the casing, are pivoted the handled lever, F, and a lever, G, one end of which is connected to the lever, F by a screw *g* adapted to the lever, F, and extending for a sufficient distance into an opening in the lever, G, to firmly engage the two, but in such manner that by a few turns of the screw, the levers may be disconnected and the handled lever, F, be made to operate through rods *e* and *d* on the valve, D′, to admit sufficient fluid into the cylinder to shift the link block and reverse the engine. From the opposite end of the lever, G, extends a rod, G′ to one arm of a bell crank lever, G^2, fulcrumed within the casing, A, the opposite bifurcated arm of the lever carrying a yoke *h* adapted to a groove in a nut, H, on a threaded shaft, I, and the position of this nut determining the extent of movement of the valve, D′, and the consequent shifting of the link block.

The casing, A, forms a bearing for the shaft, I, which carries at one end a loose pulley, I′, connected to the shaft by a pawl *i* carried by the pulley and adapted to engage with a ratchet wheel *i′* carried by the shaft, so that the shaft may be turned in one direction only, viz:—when the engine is running forward. This pulley is connected by a belt, I^2, to a pulley on the main shaft of the engine so as to be driven at the same speed with such shaft.

At a point within the casing, there is secured to the shaft, I, a pinion I^3, meshing with a gear, J, running loosely on a shaft, K, and on the threaded portion of the shaft, I,

is the nut, H, having peripheral gear teeth engaging with a gear wheel, L, fast to the shaft, K.

The shaft, K, finds a needle bearing at one end in a recess in the casing, A, and at its opposite end is adapted to the recessed end of an adjustable sleeve, M, the latter being threaded for a portion of its length and being adjusted by means of a handle, m, its extreme inner end impinging against the gear wheel, J, for a purpose more fully set forth hereinafter.

The shaft, K, is threaded for a portion of its length, and on such threaded portion is a recessed hub, N, having an annular flange or disk n from which project pins n' adapted to tubes, O, carried by a drum, P, mounted loosely on the shaft, K.

The hub, N, is provided with an outwardly projecting annular flange n^2, and the gear wheel, J, has a similar inwardly projecting flange j, the two forming friction faces between which are friction rings n^3, alternate rings being secured respectively to the gear and hub. The gear wheel J, has a recessed hub fitting over the end of the hub, N, and surrounding the latter is a ring, Q, between which and the hub, N, is a coiled spring, Q', which, tending to normally separate the hub, N, from the gear wheel, J, forces the friction faces and friction rings n^3 into intimate contact and transmits the movements of the gear wheel to the hub, and through the pins n' of the latter to the drum, P.

The drum, P, is provided with a volute spring p having its ends connected respectively to the inner periphery of the drum and the shaft, in such manner that the first movement of the drum will partly wind up the spring, and then through the spring transmit the rotative movement to the shaft, K, the movements of the latter being transmitted through the gear, L, to the nut, H, the direction of rotation of the latter being directly opposite to the direction of rotation of the threaded shaft, I, on which it is mounted, and the nut retaining the same or practically the same position on the shaft until the speed of the latter is increased or diminished by the corresponding movement of the engine.

Near one end of the shaft, K, is a gear wheel, R, meshing with a pinion r on a countershaft, R', on which is also secured a fly wheel, R^2, for balancing the movement of the parts, and to keep the shaft, K, in motion for a short time in case the engine breaks down, so as to avoid any sudden stoppage or accidental breakage of the parts. As a further precaution against breakage, the nut, H, is constructed as more clearly shown in Fig. 1, comprising opposite end disk portions h, h' joined by a hub h^2, while the gear teeth are provided on an encircling ring h^3 adapted to these end portions and having an inwardly projecting flange h^4, between which and the disk h are a number of friction ringr h^5 held in contact with each other and with the flange by a coiled compression spring h^6. In this manner the movements of the gear, L, are transmitted by friction to the nut, H, and in case the engine runs away or is broken down suddenly, the gear wheel will not be broken.

It will be noted that the pinion I^3 is a trifle larger in diameter than the nut H and that the gear wheel J is a trifle smaller in diameter than the gear wheel L, so that the hub N will normally tend to move away from the hollow drum P toward the adjusting screw M.

In operation, the hub, N, is, at starting, close to the drum, P, but immediately moves, when turned by frictional engagement with the gear wheel, J, to such a distance along the threaded shaft, K, that it forces the gear wheel into contact with the adjustable sleeve, M, which stops its further movement. The rotation of the hub continues until moving farther along the shaft, K, the friction rings n^3 are moved out of contact with each other, the spring, Q', being compressed. This first movement has however, wound up the spring, in the drum, P, the latter being turned with the hub, N, by the pins n', and so soon as the hub is disengaged from the gear wheel, the spring acts through the drum and pins n' to return it partly to its original rotation, and the balance wheel, R^2 keeps it going steadily tending to counteract the movement of the nut in the opposite direction along the shaft. The parts in this way, after running for a few turns, are balanced and do not move further while the engine maintains an even speed. The speed may be increased by moving the sleeve, M, a short distance farther away from the hub, N, as the spring will then, being turned more, be wound tighter.

In case of a break down of the engine, the shaft, I, ceases to rotate, as does also the gear wheel, J, and the action of the spring p will then cause the hub to move rapidly toward the drum. To avoid excessive friction in such cases, the ring, Q, is connected by pins s to levers, S, fulcrumed in standards on the hub N, and having short arms projecting under the headed ends of the pins and longer arms projecting into the path of the tubes, O, so that as the hub moves toward the drum, P, the ring, Q, will also be moved in the same direction, but at a greater speed, and the force of the spring will then be taken up between the hub, and the ring, Q, and removed from the gear wheel, J.

The various parts of the device contained within the casing are submerged in oil, so that they may run more readily and without any attention.

It will be understood that pulleys connected by belting may be substituted for the various gear wheels described, but the latter are preferred as the movement is more positive.

In Figs. 5 and 6, I have illustrated a modified construction, in which the hub, N, is in the form of a disk having ratchet teeth t, with which are adapted to engage pawls, T, pivoted at t' to the gear wheel, J, the pawls

being so arranged that but one is in action at a time while its fellow is midway between two teeth. On the opposite side of the gear wheel, arms, T′, are secured to the pins t′, and carry at their outer ends anti-friction rollers *u* adapted to engage a roller, U, held on an adjustable spindle, M′, the position of which may be adjusted to permit the rollers to come into contact with the roller, U, at any desired point. The roller, U, is held on a pin at the end of the spindle, M′, by a spring R which may yield if the rollers *u* touch its inner face before engaging its periphery. In operation, each time the rollers *u* strike the roller, U, the pawls are lifted out of engagement with the teeth of the ratchet wheel, and permit the spring of the drum to return the disk part way, the pitch of the teeth being such that at each movement of the pawl, the disk will be moved backward a distance slightly greater than the increased forward movement given it by reason of the difference in diameter of the gear wheels as previously described.

I claim as my invention—

1. The combination of the threaded shaft I, a nut thereon operatively connected to a governing device, *a*, threaded shaft K, a threaded hub mounted thereon, a loose gear wheel mounted on the shaft K and adapted to rotate said hub, means for rotating the shaft K, means for rotating the gear wheel, and an adjusting screw or sleeve adapted to regulate the longitudinal movement of the pulley.

2. The combination of the threaded shaft I, a nut thereon operatively connected to a governing device *a*, threaded shaft K, means for rotating the same, a hollow drum mounted on the shaft K, a volute spring connecting the drum and the shaft, a hub mounted on the shaft K and engaging the hollow drum, a gear wheel in frictional engagement with the said hub, and means for rotating said gear wheel.

3. The combination of the threaded shaft I, a nut thereon operatively connected to a governing device *a*, threaded shaft K, means for rotating the same, a hollow drum on said shaft provided with tubes or transverse openings around its circumference, a hub moving longitudinally on the shaft K and provided with a series of pins engaging the openings in the drum, a gear wheel loosely mounted on the shaft K and in frictional engagement with the hub, and means for rotating said gear wheel.

4. The combination of the threaded shaft I, a nut thereon operatively connected to a governing device *a*, threaded shaft K, the hollow drum, the spring connecting said drum and shaft, the hub mounted on the shaft, the gear wheel loosely fitted on the shaft K, a ring Q, provided with pins extending through the hub, levers pivoted on the hub and engaging said pins, and a spring arranged between the ring and the hub and holding the ring normally against the gear wheel.

5. The combination of the threaded shaft, a nut thereon operatively connected to a governing device, a threaded shaft, as K, a hub mounted thereon, means for connecting said hub to a rotated wheel, a spring drum, a spring connecting said drum to the shaft, K, and a gear wheel mounted on the shaft, K, and intermeshing with gear teeth provided on said nut, substantially as specified.

6. The combination of the threaded shaft, means for rotating the same, a nut on said threaded shaft operatively connected to a governing device, a pinion secured to said shaft, a second threaded shaft, K, a gear wheel loosely mounted thereon and intermeshing with said pinion, a hub mounted on said threaded shaft, K, means for clutching the hub to said gear wheel, a hollow drum also loosely mounted on shaft, K, a volute spring connecting the drum to the shaft, means for operatively connecting the hub to said drum, and a gear wheel secured to said shaft, K, and meshing with gear teeth provided on said nut, substantially as specified.

7. The combination of the threaded shaft, a nut thereon operatively connected to a governing device, a threaded shaft, as K, a hub mounted thereon, means for connecting said hub to a rotated wheel, a spring drum, a spring connecting said drum to the shaft, K, a gear wheel secured to the shaft, K, and intermeshing with gear teeth provided on the said nut, a countershaft, a balance wheel secured thereon, and gearing connecting said countershaft to the shaft, K, substantially as specified.

8. The combination of the threaded shaft, means for rotating the same, a nut on said threaded shaft operatively connected to a governing device, a pinion secured to said shaft, a second threaded shaft, K, a gear wheel loosely mounted thereon and intermeshing with said pinion, a hub mounted on said threaded shaft, K, friction rings situate between said hub and gear wheel, a spring normally tending to force said friction rings into intimate contact with each other, a hollow drum also loosely mounted on said shaft, K, a volute spring connecting the drum to the shaft, means for operatively connecting the hub to said drum, and a gear wheel secured to said shaft, K, and meshing with gear teeth provided on said nut, substantially as specified.

9. The combination of the threaded shaft, means for rotating the same, a nut on said threaded shaft operatively connected to a governing device, a pinion secured to said shaft, a second threaded shaft, K, a gear wheel loosely mounted thereon and intermeshing with said pinion, a hub mounted on said threaded shaft, K, friction rings situated between said hub and gear wheel, a spring normally tending to force said friction rings into intimate contact with each other, a hollow drum also mounted on said shaft, K, a volute spring connecting the drum to the shaft, tubes provided on said drum, pins *n*′ projecting from the hub and adapted to en-

gage in said tubes, pivoted levers carried by said hub and adapted to be acted upon by the drum to move the spring out of contact with the gear wheel, and a gear wheel, L, secured to said shaft, K, and intermeshing with gear teeth on said nut, substantially as specified.

10. The combination of the threaded shaft I, a nut thereon operatively connected to a governing device, the threaded shaft K, the gear wheel J thereon, the spring drum P and its connected parts, a hub N, mounted on the shaft K, an annular flange n^2 on said hub, an annular flange j on the gear wheel, a series of friction rings situate between said flanges, a loose ring, Q, bearing against the hub of the gear wheel, a compression spring extending between the hub and said ring, Q, the bars s connected to said ring, and levers, S, fulcrumed to the hub and adapted to act upon said bars s and ring, Q, when depressed by the spring drum, substantially as specified.

11. The combination with the nut, H, and its shaft, of its gear wheel, J, means for revolving the same, the hub, N, the threaded shaft on which said gear wheel and hub are mounted, means for connecting the hub to the gear wheel and for transmitting the rotations of the latter to the nut, H, and an adjusting sleeve, as M, for regulating the extent of movement of said gear wheel, J, substantially as specified.

12. The combination of the threaded shaft, I, the sectional nut, H, thereon, comprising opposite end disk portions h, h' a connecting sleeve h^2, gear teeth h^3 carried by the disk portions, and spring actuated friction rings connecting the disk portions to the gear teeth, substantially as specified.

13. The combination of the cylinder, B, its piston, levers connecting the piston to governing levers, the cross bar, E, the valve rod d connected thereto, the rod e' extending from said cross bar to a sliding block on one of said governing levers, a lever, G, fulcrumed to the frame, and connected at one end to the governing mechanism, a handled reversing lever, F, detachably connected to the lever, G, and a rod e connecting said lever, F, to the cross bar, E, substantially as specified.

In testimony whereof I affix my signature in the presence of two witnesses.

CARL E. R. MARTIN

Witnesses:
ERNEST LOWENGRUND,
JOS. S. MERRICK.