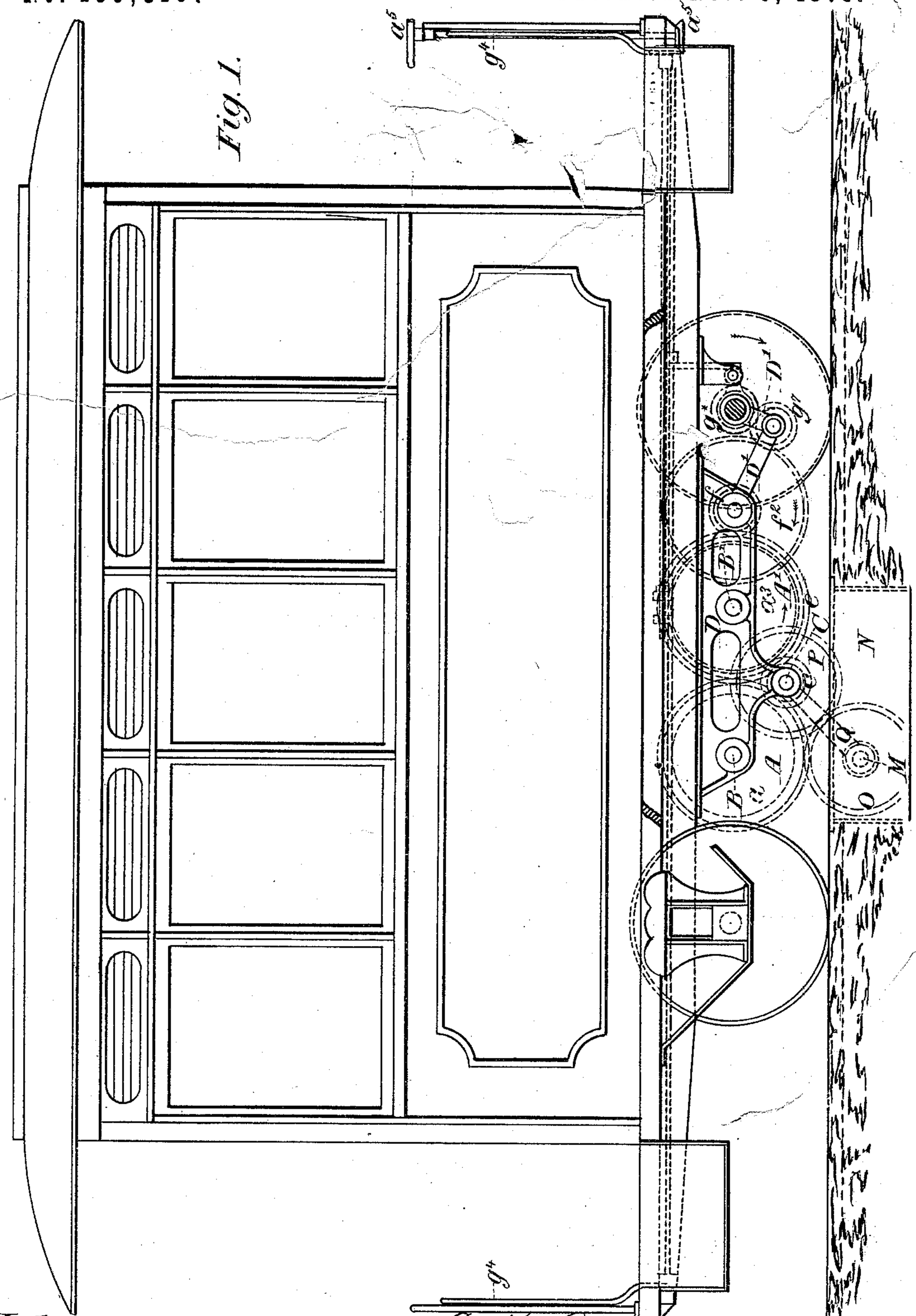
3 Sheets—Sheet 1.

E. H. LEVEAUX.

CAR-PROPELLER.

No. 169,816. Patented Nov. 9, 1875.

Fig. 1.



Witnesses:
Michael Ryan
Fred Haynes

E. H. Leveaux
by his Attorneys
Brown & Allen

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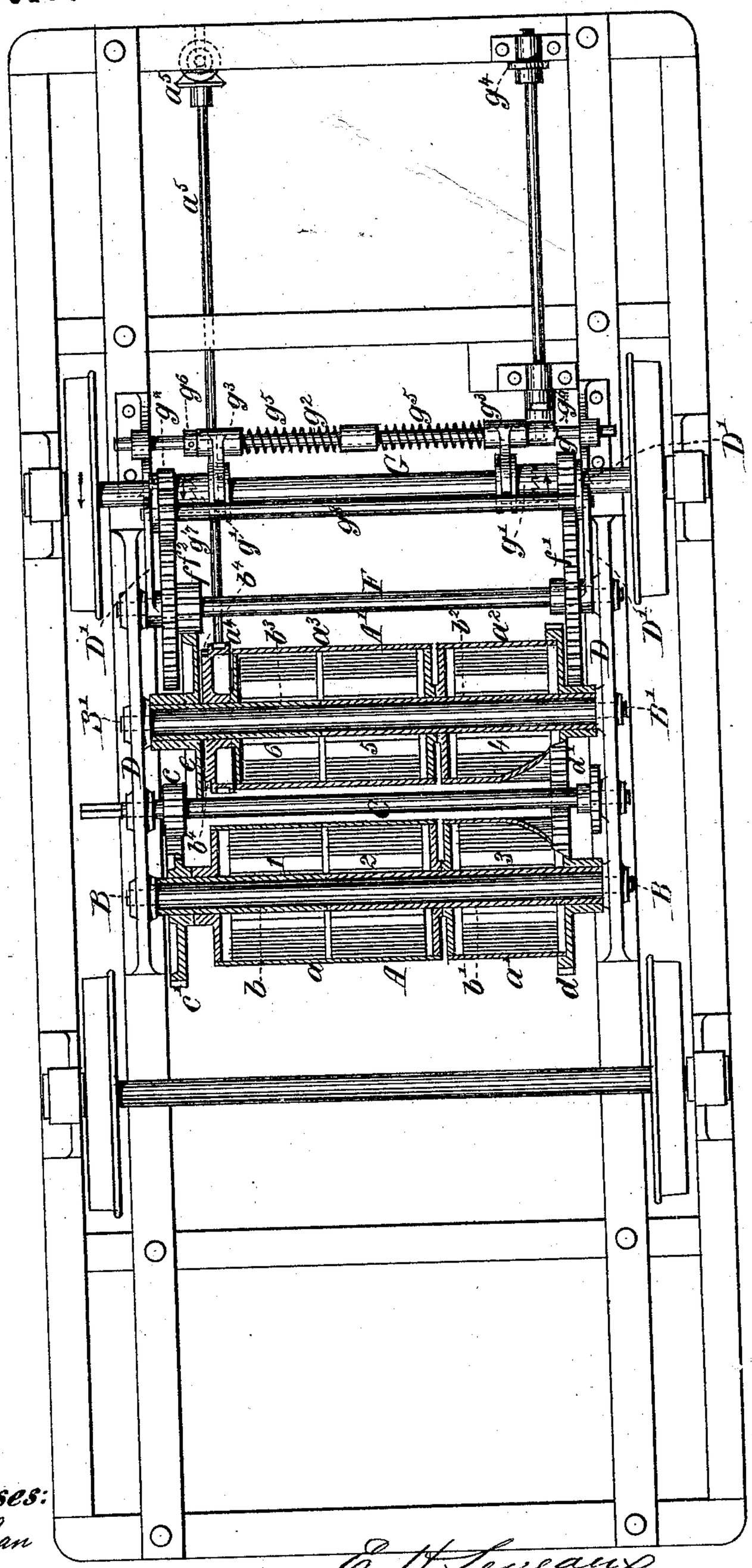

Fig. 2.

Witnesses:
Michael Ryan
F. Haynes

E. H. Leveaux
by his Attorneys
Brown & Allen

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E. H. LEVEAUX.

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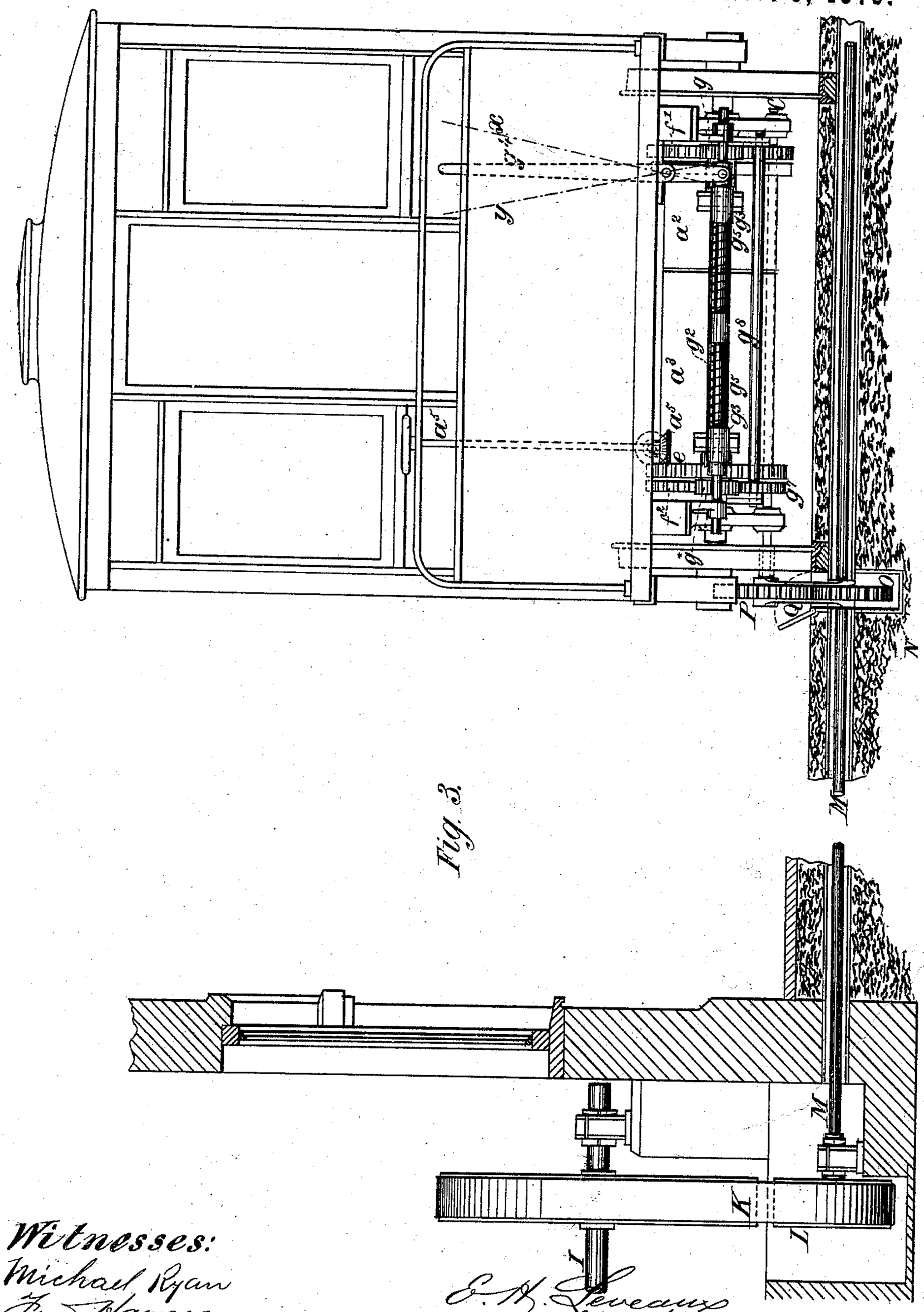

Fig. 3.

Witnesses:
Michael Ryan
Fred Haynes

E. H. Leveaux
by his Attorneys
Brown & Allen

UNITED STATES PATENT OFFICE.

EDWARD H. LEVEAUX, OF BROOK GREEN, HAMMERSMITH, ENGLAND.

IMPROVEMENT IN CAR-PROPELLERS.

Specification forming part of Letters Patent No. **169,816**, dated November 9, 1875; application filed September 28, 1875.

To all whom it may concern:

Be it known that I, EDWARD HENRY LEVEAUX, of Brook Green, Hammersmith, in the county of Middlesex, England, have invented certain improvements in the mode of and apparatus for driving carriages on tramways and railways and other roads, of which the following is a specification:

The chief object of this invention is to effect an economy in the working of tramways, adapted for the accommodation of street traffic. In lieu of horse traction, as now commonly employed, I propose to adapt, by the use of a novel arrangement of mechanism, the power of coiled springs to the propulsion of passenger-carriages.

Supposing the ordinary form of tramway-omnibus to be employed, I utilize a portion of the space below the floor of the carriage by arranging therein a series of barrels containing coiled springs, and connected with the driving-wheels of the carriage. These springs, when wound up by the means to be presently described, will serve as a stored power for propelling the carriage.

In the accompanying drawings, Figure 1 is a side elevation of a tramway-carriage, fitted according to this invention, and showing the mechanism applied thereto for winding up the coiled springs. Fig. 2 is an inverted plan view of the same, with the barrels in section. Fig. 3 shows, in elevation, (applied to a tramway-carriage,) the mechanical arrangement which I employ for winding up the springs of such carriages.

Below the floor of the carriage, and near the middle of its length, I arrange groups of spring-barrels, two only being shown in the drawings; but any greater number may be used if found convenient. These barrels A A′ are fitted loosely upon sleeve-arbors, (see Fig. 2,) which arbors are strung upon the axles B B′. C is the winding-shaft, which has its bearings in side frames D, fitted to the under side of the carriage, which frames also form bearings for the axles B B′. The manner of driving the shaft C will be hereafter described. The group of barrels A consists of two barrels, a and a^1, and the group A′ consists of the barrels a^2 a^3. The barrels a and a^3 are made of double the width of the barrels a^1 and a^2, so as to contain each two springs. These barrels a a^1 a^2 a^3 are mounted loosely on their respective sleeve-arbors b b^1 b^2 b^3. The first sleeve-arbor b, strung upon the shaft B, is of length sufficient to pass only half-way through the barrel a; but the other sleeve-arbor, b^1, extends from the middle of that barrel and through the next barrel a^1 to the side frame. The sleeve-arbors on the shaft B′ are arranged in like manner, the sleeve-arbor b^2 being only of sufficient length to reach to the middle of the barrel a^3, and the sleeve-arbor b^3 strung on the same shaft extending from b^2 to the side frame.

The springs 1, 2, 3, 4, 5, and 6 are arranged within the two groups of barrels in the following manner: The inner coil of the spring 1 is attached by a hook to the sleeve-arbor b, which is made fast to the axle B, on which the first barrel a is mounted loosely. The outer coil of this spring is attached to a hook on the inner periphery of the barrel a. Within this barrel a is the second spring 2, having its coils in the reverse direction to the first spring, and attached in a similar manner, the outer coil to a hook in the barrel, and the inner coil to a hook on the second sleeve-arbor b^1. Within the barrel a^1 is fitted the spring 3, with its coils in the reverse direction to those of the spring 2, and the end of its innermost coil is attached to the arbor b^1, and that of the outermost coil to a hook on the barrel a^1. This group of barrels and springs A is coupled with the adjoining group A′ by spur-gear. d is a spur-wheel attached to or forming part of the barrel a^1 of the group A, and into it gears a similar spur-wheel, d^1, made fast to or forming part of the barrel a^2 of the group A′. Within this barrel a^2 the spring 4 is fitted, as before explained, it being connected at its opposite ends to the barrel a^2 and to the sleeve-arbor b^2. To the inner end of the sleeve b^2 is attached the spring 5, its coils being in reverse direction to those of the spring 4. The end of its outermost coil is attached to the barrel a^3, and the end of its innermost coil to the sleeve b^2. This barrel a^3 also contains the spring 6 attached at its opposite ends to the barrel and sleeve-arbor b^3. Near one end of the winding-shaft C is a pinion, c, which gears with a spur-wheel, c^1, made fast to the arbor

b of the barrel a. Near the opposite end of the shaft C is a ratchet-wheel, the retaining-pawl of which is attached to the frame D to prevent the running back of the winding-shaft. The sleeve-arbor b^2 carries a pulley embraced by a friction-strap, which serves to fix the sleeve, and prevent its rotation when desirable.

In winding up the springs the clutches g^1 g^1, described hereafter, are to be in gear when the brake is not in use, so as to stop the running down of the springs. The shaft C is rotated, and by means of the gearing c c^1 and d d^1 the train of springs is coiled up. Made fast to the sleeve b^3 is a ratchet-wheel, b^4, into the teeth of which takes a pawl, carried on the inner face of the spur-wheel e, which wheel runs loosely on the sleeve-arbor b^3. Gearing into the spur-wheel e is a pinion, f, keyed on the shaft F. This shaft has its bearings in the side frames D, and serves to communicate, through spur-gearing f^1 and f^2, rotary motion to the axle G of the running wheels. On the axle G two pinions, g g^*, are mounted loosely, and on their bosses clutch-teeth are formed to receive, respectively, the teeth of a pair of clutches, g^1, which slide on feathers on the shaft G, and are operated by the clutch-rod g^2.

This pair of pinions and clutches are used for the purpose of driving the carriage in opposite directions, as desired. The clutch-rod g^2 is mounted on the side frames, so as to be capable of being traversed endwise by the reversing-lever g^4, and is provided with two loose sleeves or bosses, g^3, from which project the forks which embrace the sliding clutches. Around the clutch-rod g^2 are two helical springs, g^5, separated by a loose central collar, or it may be one spring extending from one sliding fork to the other. These helical springs g^5, being in compression, will bear the clutch-forks against the fixed collars g^6 on the clutch-rod g^2, and keep their respective sliding clutches in gear with the pinions g g^*, when the reversing-lever g^4 is in its intermediate position, thereby stopping the running down of the springs and admitting of their being wound up.

The pinion g on the shaft G is driven direct from the spur-wheel f^1 on the shaft F, as before explained; but the pinion g^* is driven through the intermediate pinion g^7 from the spur-wheel f^2 on the shaft F, and, therefore, the pinions g and g^* are driven in opposite directions, as indicated by the arrows. When it is required to drive the carriage to the right hand, (as seen in side elevation,) the reversing-lever g^4 is to be thrown into the position indicated by the dotted line x in Fig. 3; the clutch-rod g^2 will be thereby slidden endwise and cause one of its fixed collars g^6 to press against the sleeve of the fork and move the sliding clutch out of gear with the pinion g and compress the spring of the opposite clutch and hold it in gear with the pinion g^* more firmly. The power stored in the springs is then allowed to drive the axle G of the running-wheels through the spur-wheel f^2, the intermediate pinion g^7, and the pinion g^*, on the driving-axle G, and thereby give motion to the carriage. This intermediate pinion g^7 is carried by a shaft, g^8, which has its bearings in radius-links D^1 pendent, respectively, from the shafts F and G. When, however, the direction of the carriage is to be reversed the reversing-lever g^4 is thrown into the position indicated by the dotted line y of Fig. 3, by which means the acting-clutch will be slidden out of gear and the idle clutch will be thrown into action, when motion will be thereby transmitted to the shaft G from the spur-wheel f^1 on the shaft F direct to the pinion g, thus transmitting motion to the driving-axle in a reverse direction to that given to it when the motion was transmitted to it through the intervention of the intermediate pinion g^7.

The means above described for connecting the groups of spring-barrels with the axle G of the running-wheels admits of the spring-power being held back, when desired, by means of the brake a^4 forming part of the ratchet-wheel b^4. This brake is operated through the connecting-shafts and gearing a^5 from the platform of the carriage. A brake of the ordinary description is also to be applied to the running-wheels for the purpose of stopping the car.

I will now describe the means which I employ for winding up the spring-barrels. Along the track or course to be traversed I provide a series of motive-power engines, arranged at suitable distances apart—say, a convenient length for a run. The places at which these engines are situate will form stopping-stations, where passengers may alight from or enter the carriages. While this is taking place the engine will be employed in winding up the springs, so as to prepare the carriage for continuing the journey.

Referring to Figs. 1 and 3, I is the shaft of a stationary-engine, which serves to give motion to a belt-wheel, K, the belt from which passes to a pulley, L, keyed to a horizontal shaft, M, which shaft is supported in bearings placed below the roadway, and, for the sake of convenience, inclosed in a metal casing or tube. Close to one side of the tramway-track, over which the carriage is intended to run, a box, N, is sunk in the roadway, and through this box passes the shaft M. Keyed onto the shaft, within the box, is a spur-wheel, O, (see also Fig. 1,) which gears with a spur-wheel carried by a pair of radius-arms, Q, which have for their support the shaft M. The axle of the spur-wheel P is fitted with a sleeve, so shaped as to connect with the winding-axle C of the carriage and to permit of its instant disconnection therefrom when required. The box N is fitted with a lid to cover the gearing when out of action. When it is desired to wind up the spring-barrels the carriage is brought up to position, as shown at Fig. 1. The lid of the box N is thrown back and the spur-wheel P is raised to the dotted position and the sleeve of its axle is slidden into con-

nection with the shaft C. The engine I is then set in motion, and by means of its connection with the shaft M it will cause the spur-wheels O and P to rotate, and through the sleeve or other couplings give rotary motion to the shaft C and thereby wind up the spring-barrels. To prevent overwinding a friction-coupling may be introduced at any convenient part of the apparatus, or a means of forcibly disconnecting the sleeve or other coupling from the shaft C may be provided. When the spur-wheel P has been disconnected from the carriage it will be returned to its depressed position and the lid of the box will be closed. It will, of course, be necessary to provide that the stored power of the springs shall more than suffice for completing the run to the next station in order to avoid the possibility of the carriage being brought to a stand-still before the power can be renewed.

Having now set forth the nature of my invention and explained the manner of carrying the same into effect, I claim—

1. In combination with a carriage provided with motive-power springs for propelling the same, a series of stationary engines set at given distances apart along the route to be traversed, each engine being coupled with underground shafting M, fitted with a spur-wheel, O, in gear with a spur-wheel, P, carried by the radius arms Q, and fitted with a sliding sleeve for engaging with the squared end of the winding-shaft C of the carriage, substantially as and for the purpose described.

2. In combination with a tramway-carriage, the groups of spring-barrels a a^1 a^2 a^3, with their coiled springs 1 2 3 4 5 6, secured at their opposite ends, as described, such groups being coupled together by spur-gearing d and d^1, and connected at one end by gearing to the winding-shaft C, and at the opposite end with a friction-strap, all as and for the purpose above described.

3. The arrangement of gearing e, f, f^1, f^2, g, and g^*, with their sliding clutches g^3, sliding rod g^2, and reversing-lever g^4, for transmitting motion from the barrel a^3 to the axle G of the running-wheels of the carriage, in the manner above described.

London, the 13th day of August, 1875.

EDW. H. LEVEAUX.

Witnesses:
H. K. WHITE,
A. S. BISHOP,
66 *Chancery Lane, London.*