(No Model.) 4 Sheets—Sheet 1.

H. F. HUGHES.

FARE REGISTER.

No. 545,627. Patented Sept. 3, 1895.

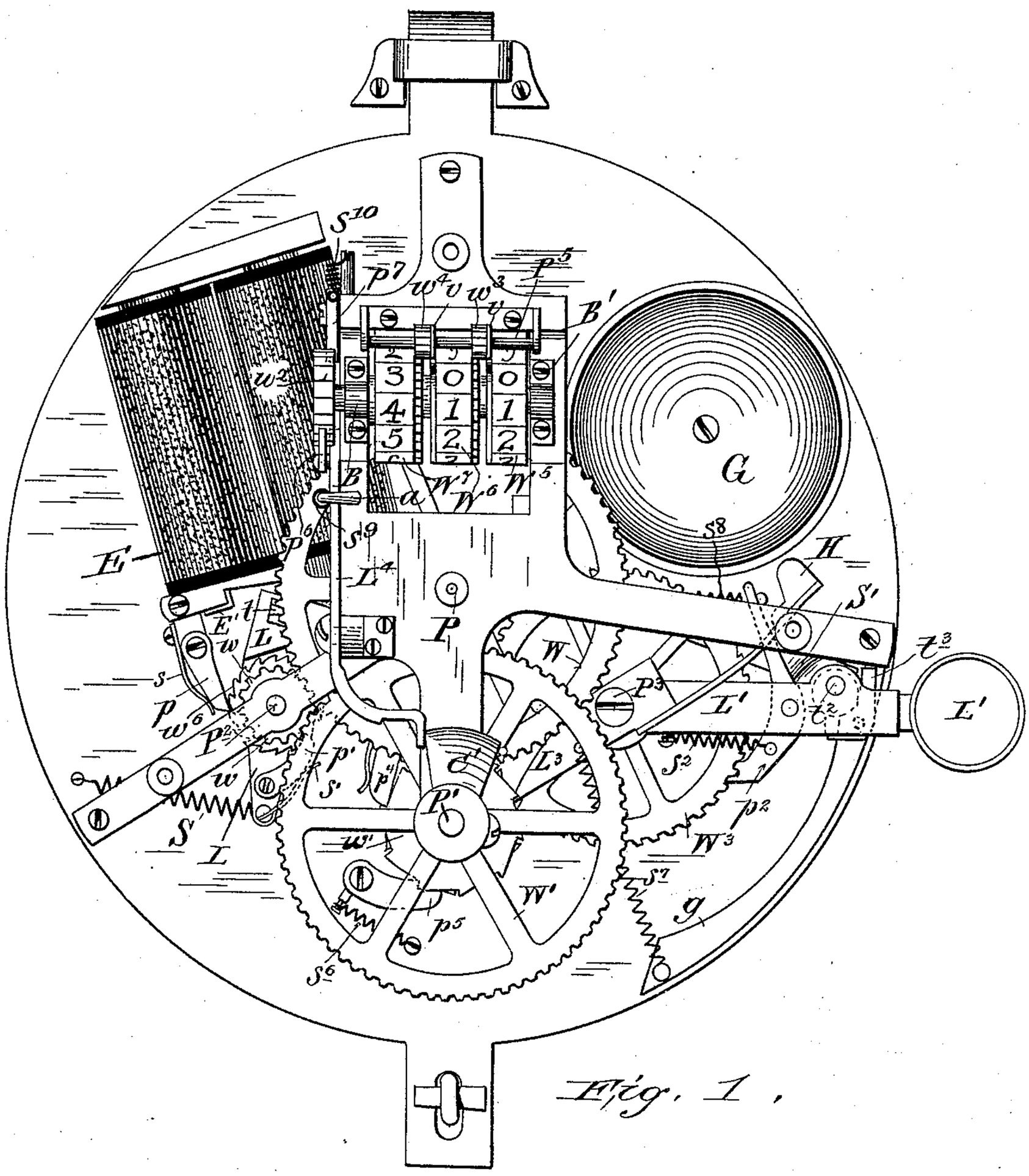

Fig. 1.

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FARE REGISTER.

No. 545,627. Patented Sept. 3, 1895.

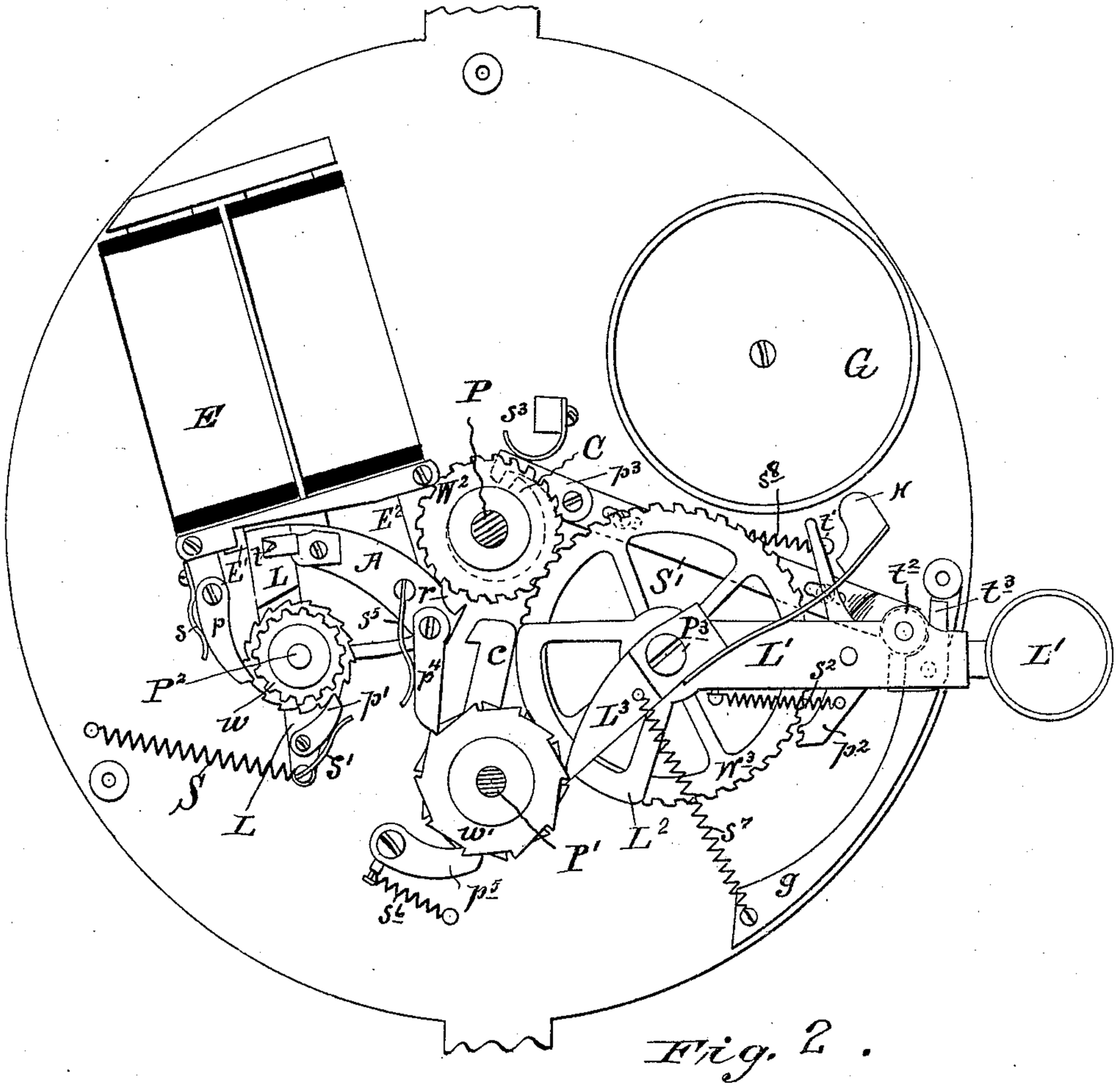

Fig. 2.

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No. 545,627. Patented Sept. 3, 1895.

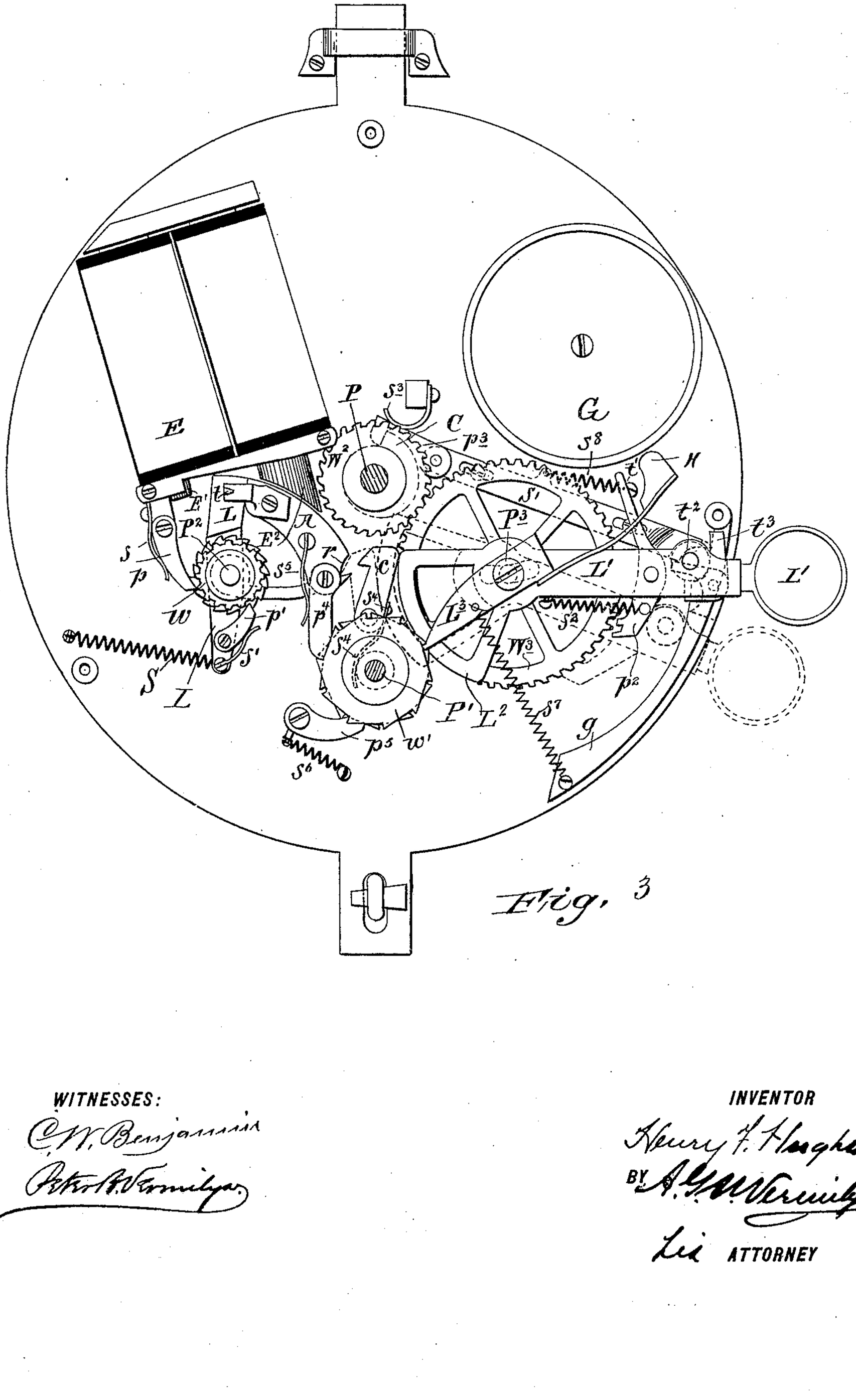

Fig. 3

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No. 545,627. Patented Sept. 3, 1895.

Fig. 4.

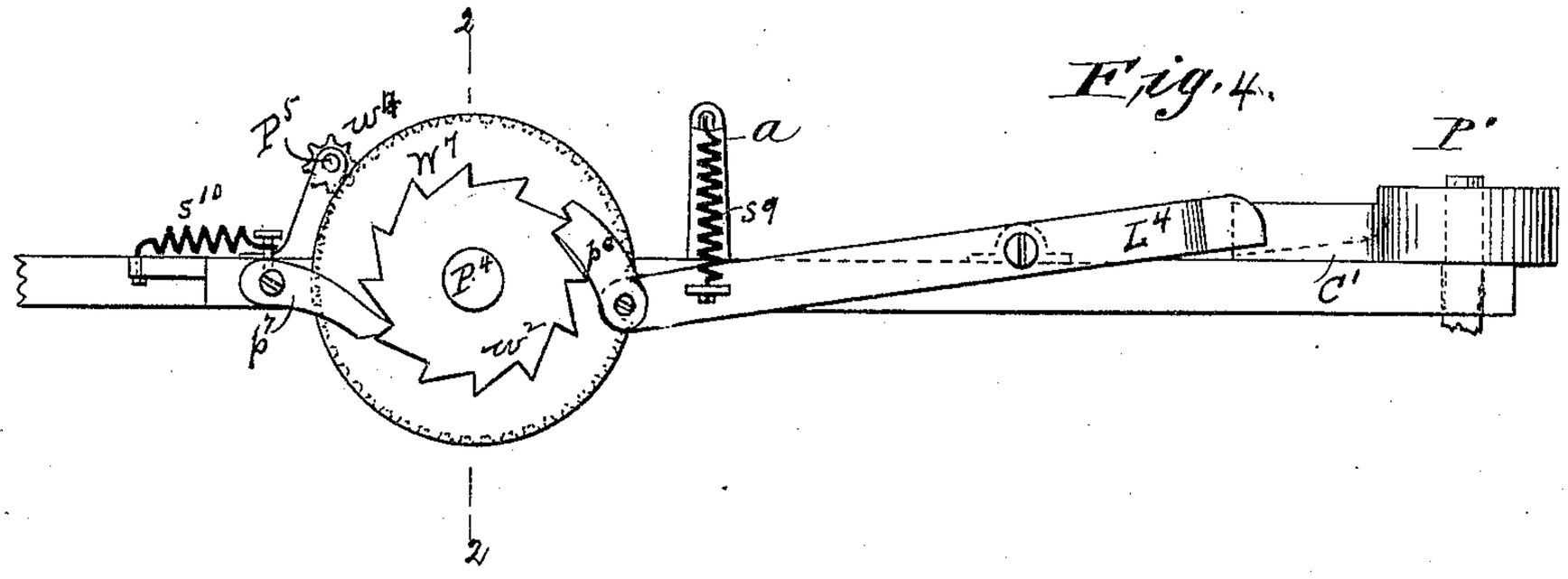


Fig. 5.

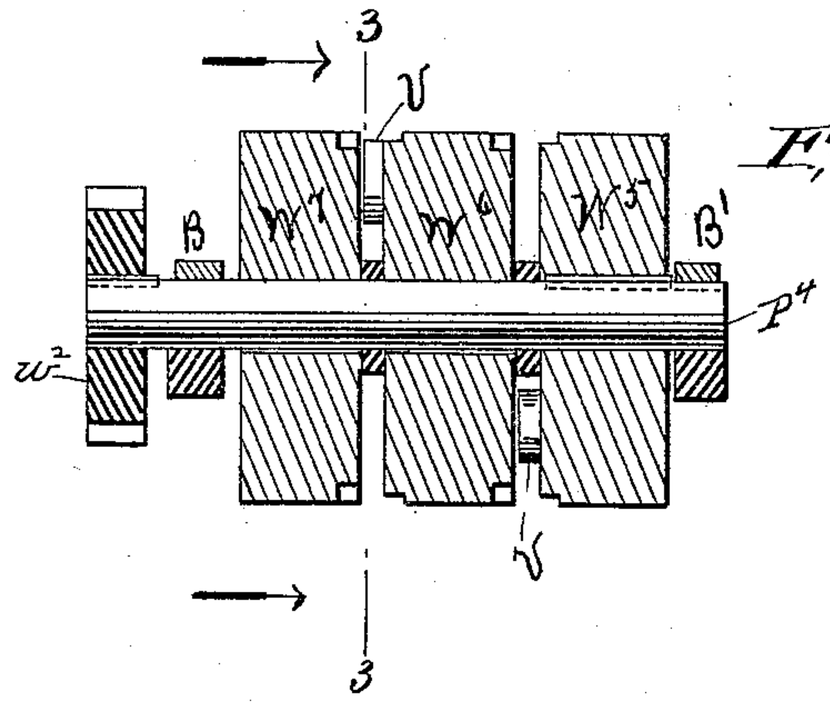
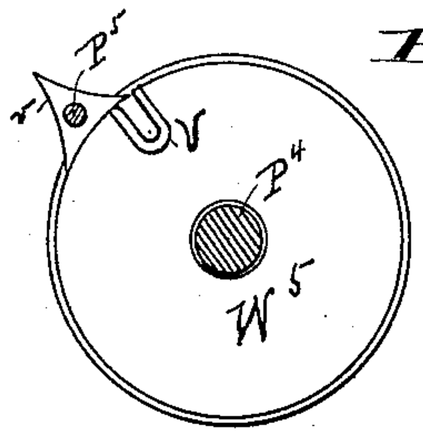


Fig. 6.



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UNITED STATES PATENT OFFICE.

HENRY F. HUGHES, OF BROOKLYN, ASSIGNOR TO W. KENNON JEWETT, OF NEW YORK, N. Y.

FARE-REGISTER.

SPECIFICATION forming part of Letters Patent No. 545,627, dated September 3, 1895.

Application filed September 27, 1894. Serial No. 524,315. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. HUGHES, a citizen of the United States of America, and a resident of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Fare-Registers, of which the following is a specification, reference being had to the accompanying drawings, forming part of the same, in which—

Figure 1 is a front face view of the machine with the dial-face removed. Fig. 2 is a similar view of the machine, but with the front frame and the register-wheels removed and the armature drawn to the magnet. Fig. 3 is another face view of the parts shown in Fig. 2, but with the operating mechanism in a slightly-different position, the parts being at rest and showing, also, in dotted lines the locking mechanism engaged to hold the actuating mechanism securely locked. Fig. 4 is a side elevation of the ten-thousands wheel of the totalizer, its actuating and detent pawls, and the actuating-lever with some other parts. Fig. 5 is a view of the shaft on which said ten-thousands wheel and also the thousands and hundreds wheels are mounted, showing said wheels in section; and Fig. 6 is a side face view of the hundreds-wheel and the triangle by means of which motion is communicated to the thousands-wheel.

P is the trip-register shaft, intended to carry the long hand or pointer, which will indicate on the dial the number of fares collected on one trip. On said shaft I mount a gear-wheel W, (shown in Fig. 1,) having as many teeth (usually one hundred) as it is intended shall be shown by one rotation of the long hand. Wheel W is not rigidly secured to shaft P, but there is sufficient friction between them to insure the shaft's turning when the wheel does.

On the second shaft P′, I mount a similar wheel W′, intended to be the units-wheel of the totalizer or continuous-registering device.

w is a pinion mounted on a third shaft P^2, so placed that the pinion shall engage the teeth of both wheels W and W′, and that its turning the space of one tooth shall turn each of said wheels W and W′ one tooth also. This same shaft P^2 is utilized as the pivot of the operating-lever L, which is fulcrumed thereon and preferably extends in both directions therefrom. To it at one side I attach a retracting spring S and on the other side a piece of soft iron A, adapted to constitute the armature of an electromagnet. Opposite the post P^2, and sufficiently distant to permit the movement of the actuating-lever, is the electromagnet E, with its poles E′ E^2 preferably facing the pivot P^2 and cut away, as shown, one with a step in it and the other so as to present a concave curved surface. The armature is also preferably constructed with a curved face and with a greater body of metal at the side corresponding to the side on which the curved faced pole of the magnet lies, and the lever L and the armature A so pivoted and stopped that the great body of the armature (when the magnet is uncharged) will lie on one side of a line drawn through the center of the magnetic field. In accomplishing this use is made of the spring S and a tooth *t* on the armature, which engages the depression between two teeth on the wheel W, when the armature moves back to its position of rest. (Shown in Fig. 1.) This stop *t* likewise locks the wheel W, and through wheel W and pinion *w* locks wheel W′ also so long as it engages the teeth of said wheel W.

As it is necessary to bring back the armature to its normal position after operating the lever and at the same time leave the registering devices at the points to which they have been carried, one of the devices (the lever L or the pinion *w*) here the lever, is sleeved on the shaft P^2, and with teeth cut on or secured to the pinion *w*, a detent-pawl *p* (pivoted on some fixed part of the machine) engages. In the present instance such teeth are in the form of a ratchet-wheel w^6, secured to the pinion *w* and free to move on the shaft P^2, though the detent-pawl *p* might readily be arranged to engage directly with the pinion *w*. This pawl *p* is held in engagement by a spring *s* and holds the pinion, and of course the wheels W and W′, from any backward movement, except as hereinafter described.

To secure the forward movement of the pinion *w* another pawl *p′* is used, which is pivoted to the lever L, retained in place by a spring *s′* and engages the teeth of the pinion

w. It is manifest that instead of securing the ratchet-wheel w^6 to the pinion *w* and the pawl *p'* to the lever L any ordinary mechanic could readily reverse the arrangement so that the ratchet-wheel w^6 would be secured to the lever L and the pawl *p'* to the pinion *w*, pawl *p* being also then arranged to engage the pinion *w* instead of the ratchet-wheel w^6 and the ratchet-wheel w^6 itself turned over so its teeth will be reversed. The operation of these pawls, springs, and engaging-teeth is too evident to need statement, but the peculiar construction and arrangement of the armature and magnet enable me to secure much more power where I desire to use it than other forms produce. It will be noticed that I desire to swing the actuating-lever L from right to left. If the armature were merely placed opposite the poles of the magnet in the ordinary manner, the leverage would be very little or the distance from the poles would be considerable, with consequent diminution of the effect of the current. By curving the face of the armature and also the face of one pole I am enabled to provide a considerable movement with what leverage I desire and at the same time to utilize the full power of a current acting through a magnet whose poles are all the time almost in contact with the armature. Some of this advantage would be lost if the mass of the armature were evenly disposed, as the attractive power of the magnet would be acting against as well as in aid of the desired movement, but by constructing and locating the armature and pole as shown and described the full attractive power at short range is utilized in aid of the desired lever movement and the required length of stroke is obtained.

Now, in addition to operating the registering devices it is necessary to provide for reversing the trip hand or pointer, that at the beginning of each trip it may be started at zero, and this must be done without affecting the totalizer. To accomplish this a toothed wheel W^2 is rigidly secured on the shaft P. Between said shaft P and the hub of the wheel W there is sufficient friction to secure the turning of the pointer with the wheel normally, but the connection is not rigid. On a fourth pivot P^3 another gear W^3 is mounted and arranged to mesh with the wheel W^2. A lever L' is likewise pivoted on shaft P^3 and provided with a handle extending to where it may be reached by the fare-taker. On the lever L' is pivoted a pawl p^2, one end adapted to engage the teeth of the wheel W^3 and the other end adapted to engage a stop *t'*, secured to the frame, when the lever L' is thrown fully up. The one end of pawl p^2, then riding down on stop *t'*, throws the other end out of engagement with the wheel W^3; but at other times it is returned and held in engagement by the spring s^2.

When the trip is ended, the fare-taker seizes lever L' and swings it down. The instant the upper end of pawl p^2 passes stop *t'* spring s^2 draws the lower end of said pawl into engagement with the teeth of wheel W^3, which wheel, acting upon the gear W^2, reverses the trip-pointer and carries it back to zero. This wheel W^2 carries also a cam C, (shown in Fig. 1,) and in proximity to it is a pawl p^3, adapted to be engaged by the cam on said reverse movement, but the pawl is so held by a slide S' that it will not permit the wheel W^2 and the pointer in the reverse movement to be carried beyond the zero-point. This slide extends outward to a point where, unless it is drawn up by the action of the gears W^2 W^3 and pawls p^2 p^3, it will engage the lever L', (usually through a stop t^2,) preferably constructed in the form of a roller and secured to the rear side of lever L' by a pin or shaft, as shown in dotted lines, and prevent its returning to its normal position of rest, and a swinging two-armed stop t^3, secured to the frame and engaging first one arm and then the other with the stop ^2t on lever L', aids slide S' in preventing the return of said lever to its normal position. This stop t^3 is in the form of an elbow-lever. (Shown partly in full and partly in dotted lines in its normal position in all the figures and also in its locking position in dotted lines in Fig. 3.) When the lever L' is in normal position, its stop t^2 rests inside the turn of the elbow. When it is swung down, it turns the stop t^3 to the position shown only in dotted lines in Fig. 3. Then the slide S', theretofore held up by the stop t^2, moves outward beyond the end of stop t^3 and of course holds that fast and prevents lever L' from returning to normal position, because stop t^2 bears against stop t^3 and that against the side of slide S' till that has been drawn back by the rotation of wheel W^2 to zero, acting through cam C and pawl p^3, when the arm of stop t^3 is free to turn back again under the end of slide S' and permit the movement of lever L' and its stop t^2, back to its highest limit of movement, and the end of pawl p^2 may ride upon stop *t'*, throwing it out of engagement with wheel W^3, which, with its connected gear W^2, is free to turn as the fares are rung up.

Pivoted so as to swing into and out of the path of armature A is a catch *c*, held from engagement in a recess *r* in the armature by a spring s^4, but also arranged to lie against a quarter-circle extension L^2 of lever L'. Lever L' is slotted at its bearing on shaft P^3, and when pushed inward will force the catch *c* into the depression *r* in armature A and hold it there, as shown in dotted line in Fig. 3, thus locking the operating means of both the trip-register wheel and the totalizer from any movement whatever, and the extension L^2 will continue to hold the catch in engagement and yet permit the lever L' to be moved to reverse the trip-pointer and return it to zero.

Secured to the frame there is a guide *g*, extending from the limit of the downward movement of lever L' to a point just beyond its

upward limit of movement, and for all but the extreme upper end it is struck on a circle with a radius equal to the shortest distance from the center of the pivot of lever L′, when thrown inward, to the outer side of its stop t^2. This guide holds the lever thrown inward during all its movement in reversing the trip-pointer. At the extreme upper limit, however, this guide is carried a little farther away from the pivot of lever L′ and permits it to be drawn back, so as to release catch *c* and permit the movement of the armature. Even here, however, it is possible by pushing in the lever L′ to engage the catch and lock the registering apparatus, a matter of great convenience when the fare-taker desires to leave the car, as he can thus prevent unauthorized persons from maliciously registering fares in his absence by merely operating the push-buttons (if they are used and located somewhere on the car away from the register, but connected to the magnet by wires not shown) unless they first reach up and free the armature by pulling out lever L′. A gong G is also provided with a hammer H on a lever L^3 pivoted on shaft P^3. Loose on shaft P′ there is a ratchet-wheel *w′* having two sets of teeth reversed, one set engaging the lower end of lever L^3 and the other set engaged by two pawls, one p^4 extending from the armature A and held in place by spring s^5 and the other p^5 pivoted to the frame and held in place by spring s^6. The first pawl p^4 on the return movement of the armature caused by the spring carries the ratchet *w′* around one step, said ratchet sliding under the other pawl p^5, which then holds it while the first pawl on the movement of armature A slides backward to engage the next tooth. Meanwhile the reverse tooth engaging the end of lever L^3 has drawn the hammer back from the bell, passed on from under the end, releasing it, and the retracting-spring s^7 has swung the hammer down to contact with the gong and the fare has been rung up as well as registered, and it will be noticed that the pawls and ratchet-teeth are so arranged that pawl p^4 will not be carried back sufficiently to engage the next tooth unless the armature has been drawn to substantially its extreme limit of movement, but that when so sufficiently drawn back it will, upon the release of the armature, be sure to ring the bell independently of the will of the fare-taker. The result is that the bell cannot be rung by a partial operation of lever L, which is not sufficient to move the pointer. Lever L must move far enough to move the register-wheels a full point before the pawl p^4 operating the bell will have passed to the operating-point and no bell can be rung unless a fare is registered, while at the same time, if the fare is registered, the bell will be sure to ring.

On the spindle P′, which carries the totalizer-wheel W′, I have arranged a cam C′ to operate the hundreds-wheel W^5, and from that the thousands-wheel W^6 and the tens-of-thousands wheel W^7 are operated.

The cam C′ is constructed with a sleeve to encircle spindle P′ and provided with a set-screw to secure it in position, so that it partakes of the movement of the units-wheel W′ of the totalizer system. Pivoted to the frame of the register in such manner that its lower end will lie within a circle drawn with spindle P′ for a center and the distance from said spindle to the outer edge of the cam C′ for a radius, but slightly above the plane of the thin edge of said cam C′, is a lever L^4, held in normal position by a spring a^9, which is supported by an arm *a* which, as here shown, rises from the frame and extends in front of said lever L^4. (See Figs. 1 and 4.) This lever L^4 carries at its upper end a pawl p^6, which engages the teeth of a ratchet-wheel w^2 connected to the axle p^4 (see Figs. 4, 5, and 6) of the hundreds-wheel W^5 of the totalizer system. When the units-wheel W′ of the totalizer approaches the completion of a rotation, the cam C′ takes under the lower end of lever L^4 and moves it outward, and the opposite end of said lever of course moves in the opposite direction and carries the pawl p^6 backward to engagement with a succeeding tooth of the ratchet-wheel w^2. When the units-wheel W′ completes its full rotation, registering, say, 100, the cam C′ passes the lower end of lever L^4 and releases it, said end of lever L^4 moves backward, its upper end moves forward, carrying pawl p^6, which turns the ratchet-wheel w^2 one step, wheel w^2 turns its connected shaft P^4 a like distance, shaft P^4 turns the hundreds-wheel W^5, and that is advanced one step.

A detent-pawl p^7, held in position by a spring s^{10}, holds the ratchet-wheel w^2 from any reverse movement. The shaft P^4, on which said ratchet-wheel w^2 is secured, is mounted in suitable bearings B B′, secured to the frame, and carries three wheels W^5, W^6, and W^7, which are respectively hundreds, thousands, and tens-of-thousands wheels, the hundreds-wheel W^5 being fixedly secured to said shaft and the other two loosely mounted thereon. At the left-hand side of wheels W^5 and W^6 there is an offset, or I may say the periphery is turned down a little and a U-shaped projection V extends from the same side of each of said two wheels, as seen in Fig. 6. The right-hand edge of the periphery of wheels W^6 and W^7 is toothed, as shown in Figs. 1 and 4. Parallel with the shaft P^4 another shaft P^5 is mounted, and it carries two small gear-wheels w^3 and w^4, and to each is secured a triangular piece *v*, whose edges are curved to fit the circle of the wheels W^5 and W^6, where their peripheries are turned down. The wheel w^3 and its triangle are placed so that the wheel w^3 engages the teeth on wheel W^6 and one side of its triangle *v* engages the offset of wheel W^5 and wheel w^4, and its triangle is similarly situated with ref-

erence to wheels W⁷ and W⁶, the projections V being so located that when the figure 9 on its wheel appears at the visible point of the apparatus said projection will have just reached a place opposite the point of the triangle *v* nearest to it.

The operation of the devices is manifest. While wheel W⁵ is turning from showing 0 to showing 9, under repeated impulses communicated through ratchet-wheel w^2 and the anterior mechanism, the piece *v* has been riding on the offset part of wheel W⁵ and held from turning itself, has held its attached wheel w^3 from turning and that has held wheel W⁶. Wheel W⁶ has held the sequential piece *v* and its wheel w^4 and that has held wheel W⁷, but when wheel W⁵ moves again after having exposed 9 to view and thus completes a full rotation it carries one, thus: The point of triangle *v* takes into the slot of the projection V, and as wheel W⁵ moves on the triangle is turned partly round (in this instance one-third) that causes wheel w^3 to turn likewise, and its teeth acting on the teeth of wheel W⁶ turn that far enough to expose the figure 1, where 0 was before exposed, and thus the fact that ten hundreds or one thousand has been rung up is made visible. The carrying 1 from thousands to ten thousands is accomplished in an exactly similar manner.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a fare register the combination of an actuating lever, a locking lever having a finger piece and adapted to be moved in and out, as described, and to remain in either position it is placed in an engaging device connected with the actuating lever, and an engaging device in engagement with the locking lever and adapted, as described, to be by it moved into engagement with the engaging device connected with the actuating lever, substantially as set forth.

2. In a fare register, the combination of an actuating lever, a reversing lever provided with a finger piece and a sector extension and adapted to be moved in and out as described, an engaging device connected with the actuating lever, in engagement with the face of said sector extension and adapted to be by it moved into engagement with the engaging device of the actuating lever, a cam guide and an engaging device on the reversing lever, which will engage with the cam guide upon the movement of the reversing lever and hold it inward except when in its normal position, all substantially as described.

3. In a fare register, the combination of a shaft, a pinion mounted in fixed position (as to lateral movement) on said shaft, a trip register wheel and a totalizer wheel, both continuously engaging said pinion, an operating lever mounted on the same shaft with the pinion, a ratchet-wheel and a pawl (engaging its teeth) one of which is secured to the lever and the other of which is secured to the pinion, all substantially as set forth.

4. The combination of a slide, a locking lever provided with a stop adapted to move across the path of the slide when that is retracted, but engage it when extended, a pawl on the slide and a cam secured to the trip registering device, substantially as described, and adapted to engage said pawl when moved in one direction, but disengage therefrom when moved in the other direction, said cam and registering device being arranged as described, whereby, when at zero, it will hold said slide retracted, all substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 18th day of September, 1894.

H. F. HUGHES.

Witnesses:
PETER B. VERMILYA,
A. G. N. VERMILYA.