No. 615,274.

Patented Dec. 6, 1898.

T. D. HOSKINS.

STREET CAR MOTOR.

(Application filed June 25, 1897.)

(No Model.)

4 Sheets—Sheet 1.

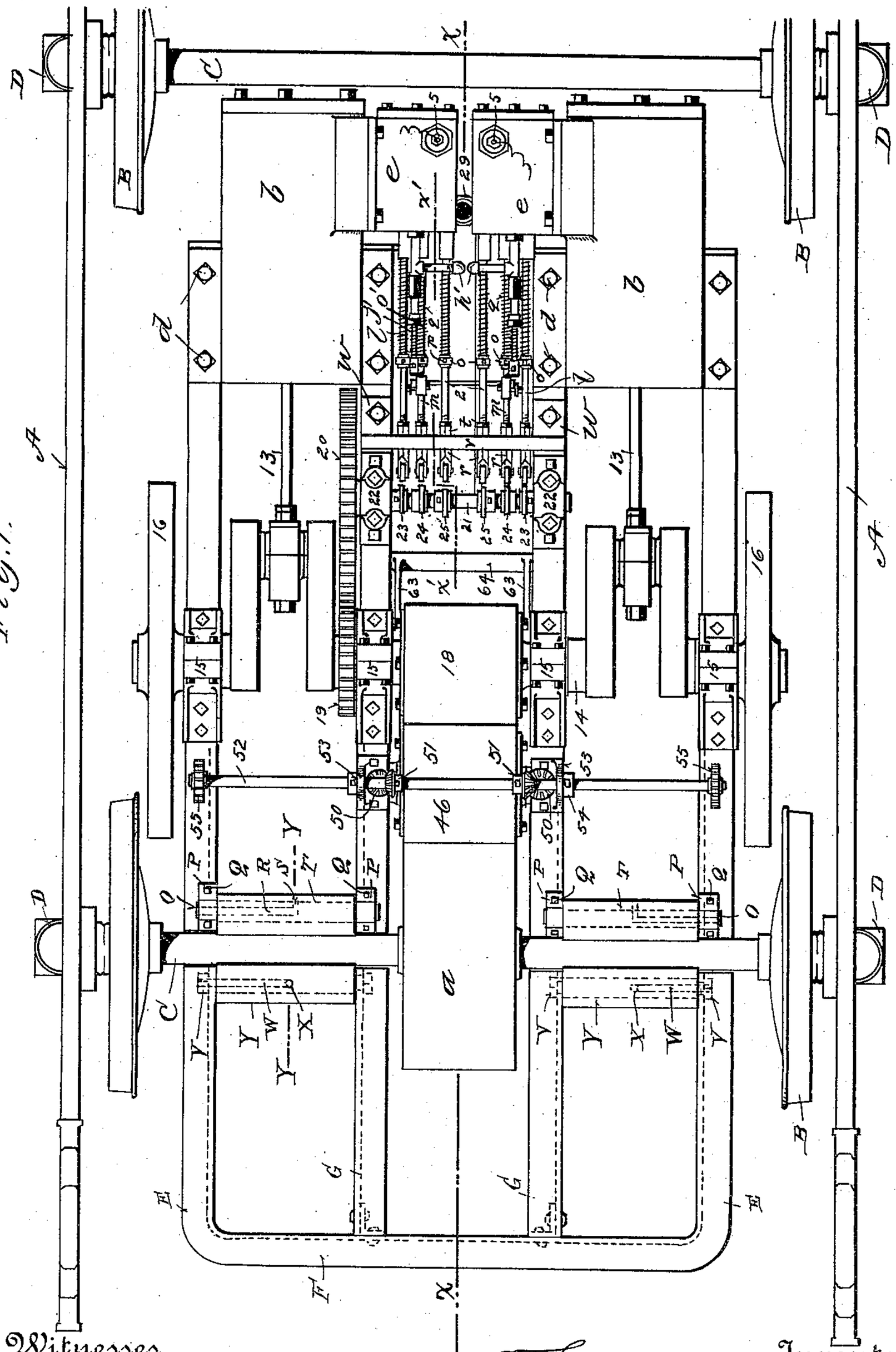

Fig. 1.

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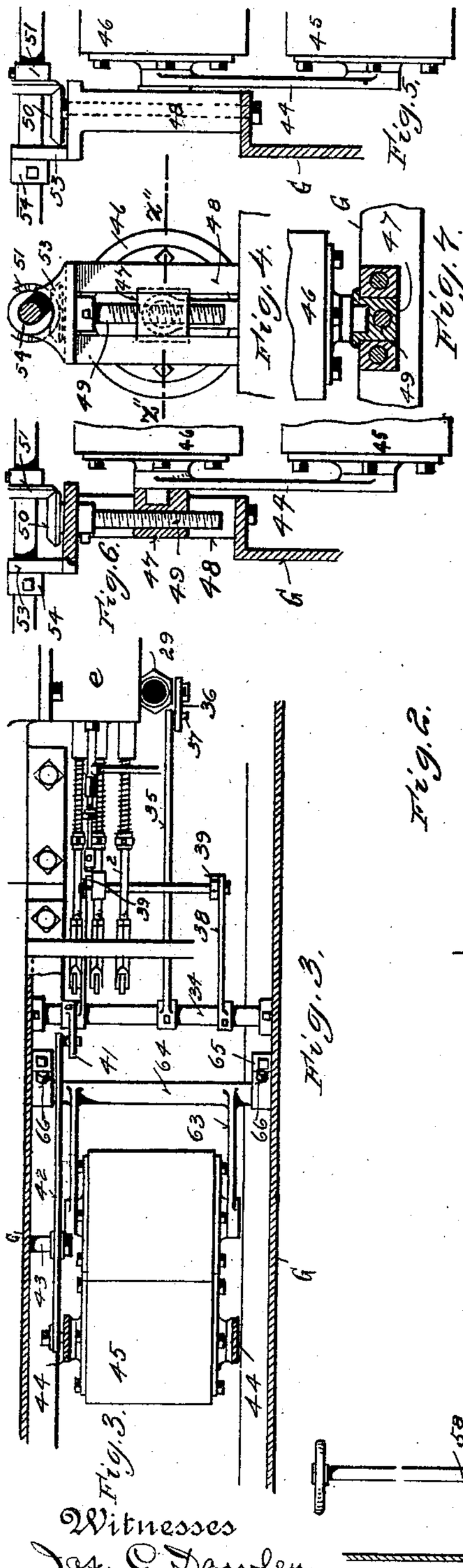
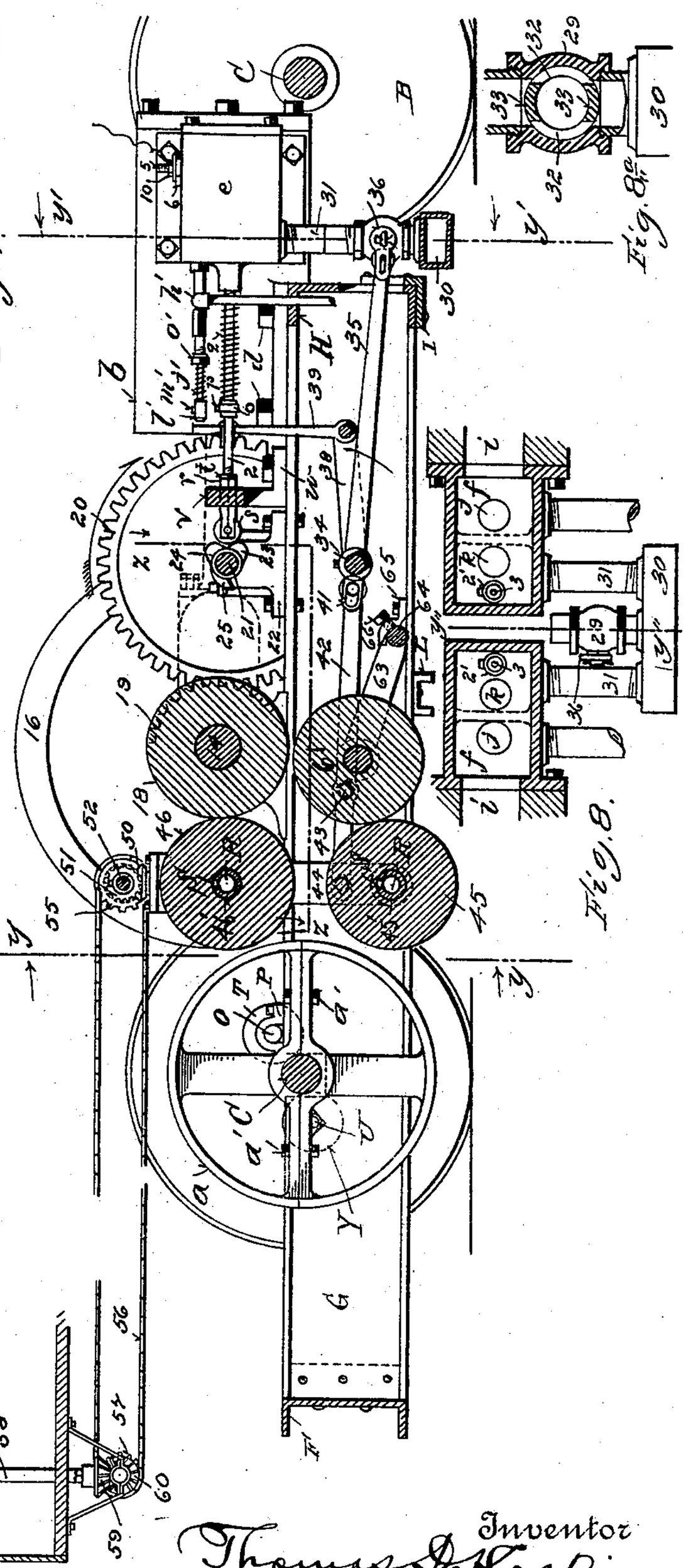
(No Model.) 4 Sheets—Sheet 2.





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(No Model.) 4 Sheets—Sheet 3.

Fig. 9.

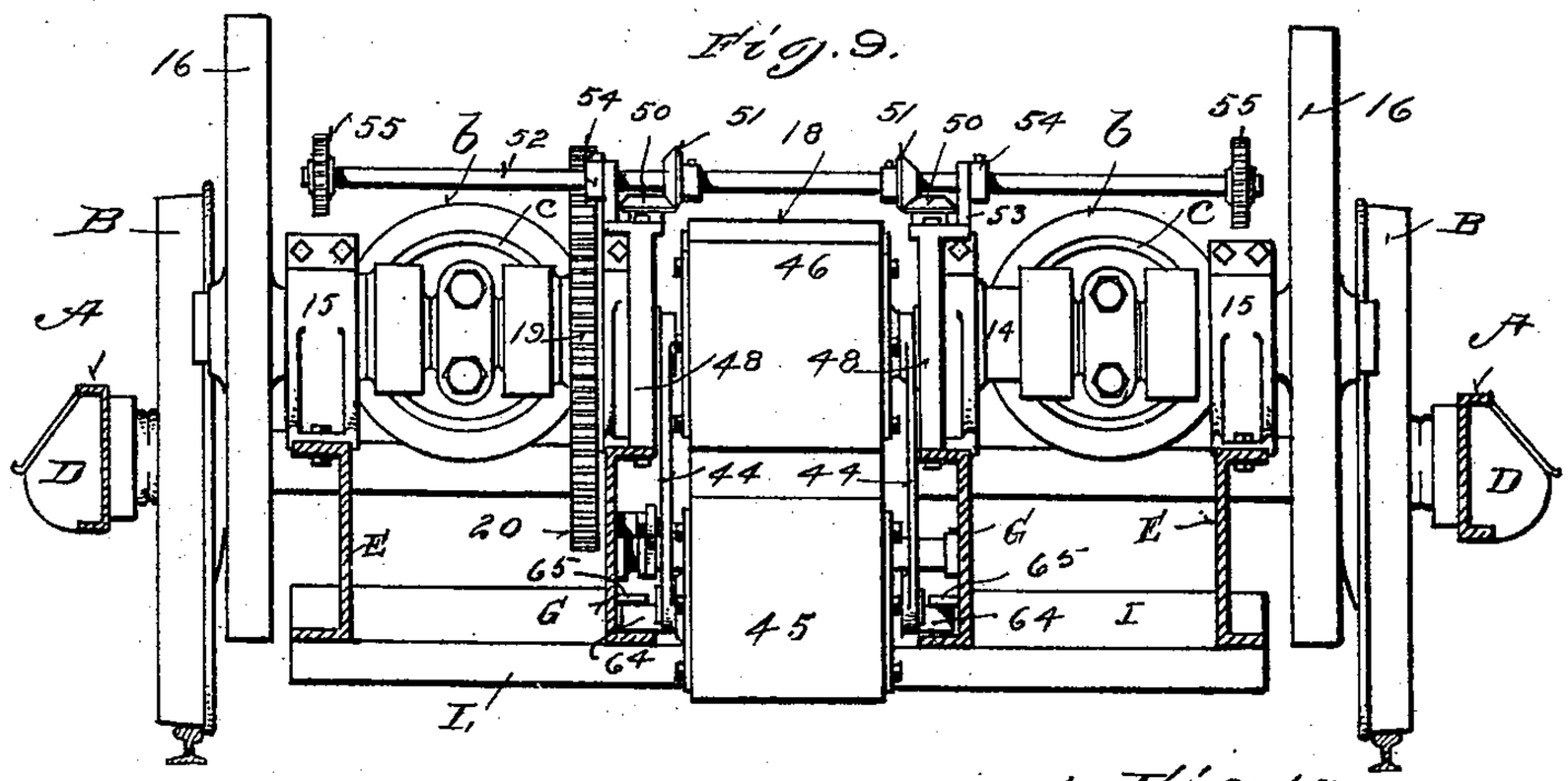


Fig. 10.

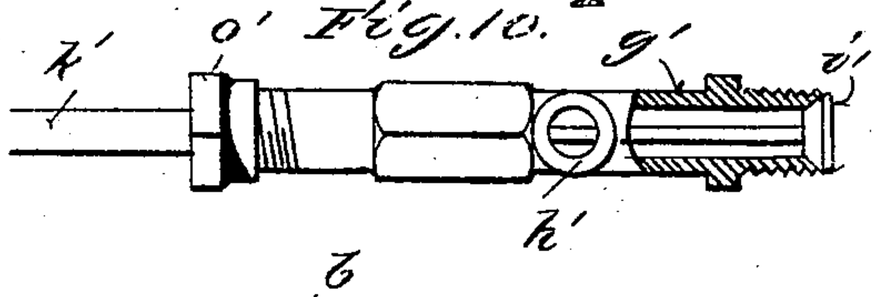


Fig. 11.

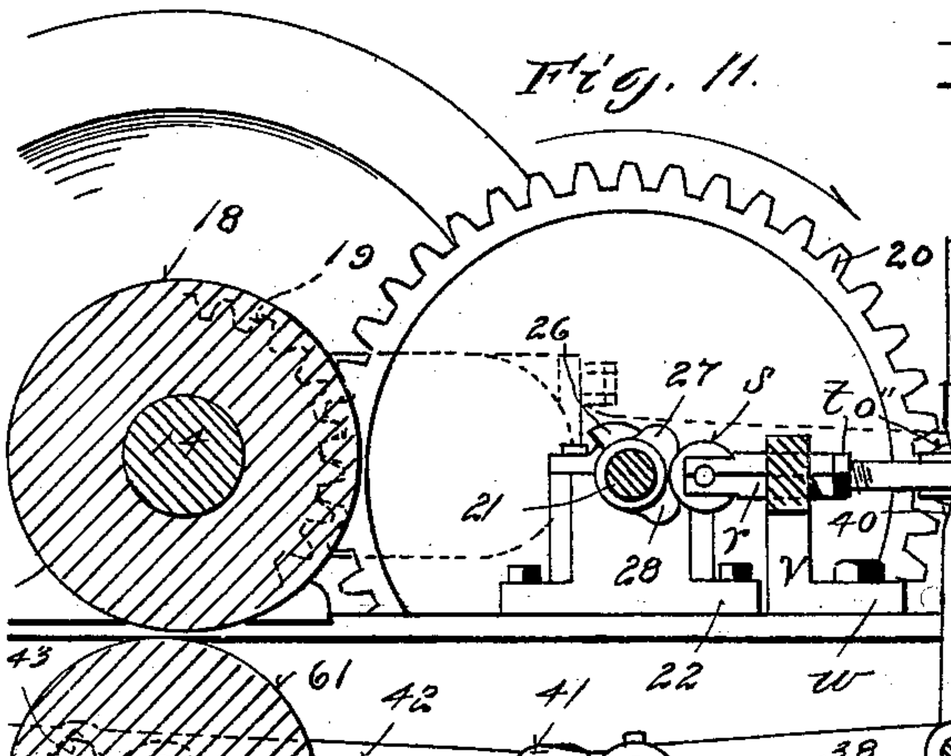
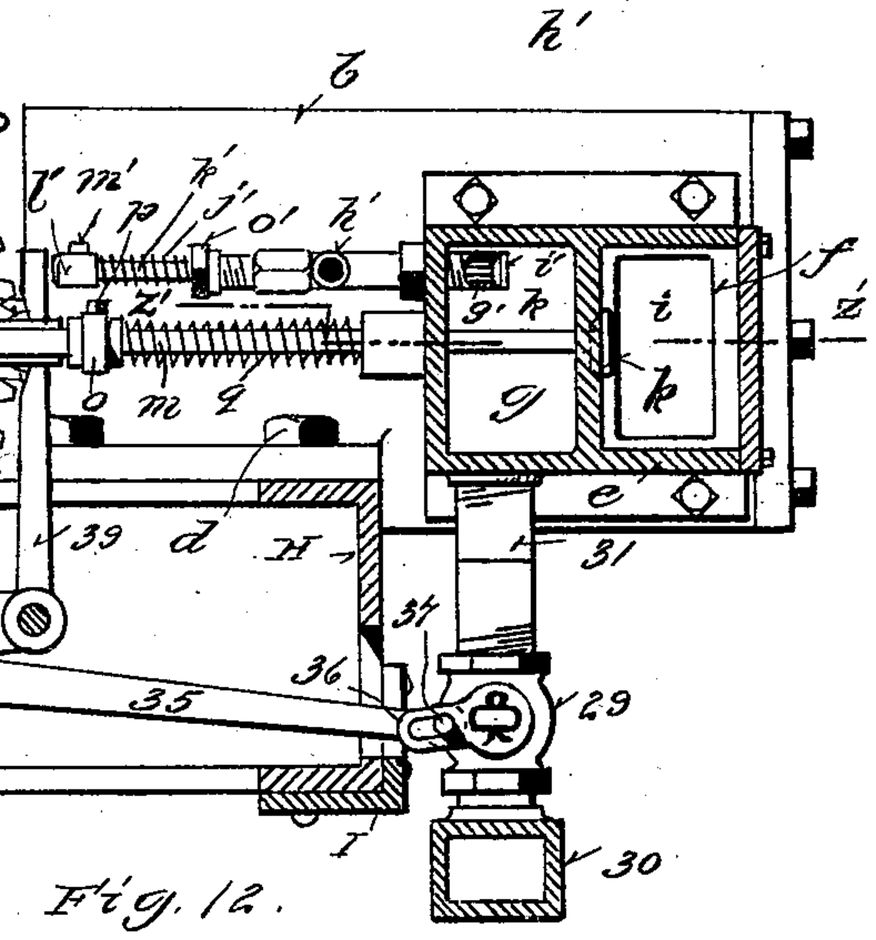
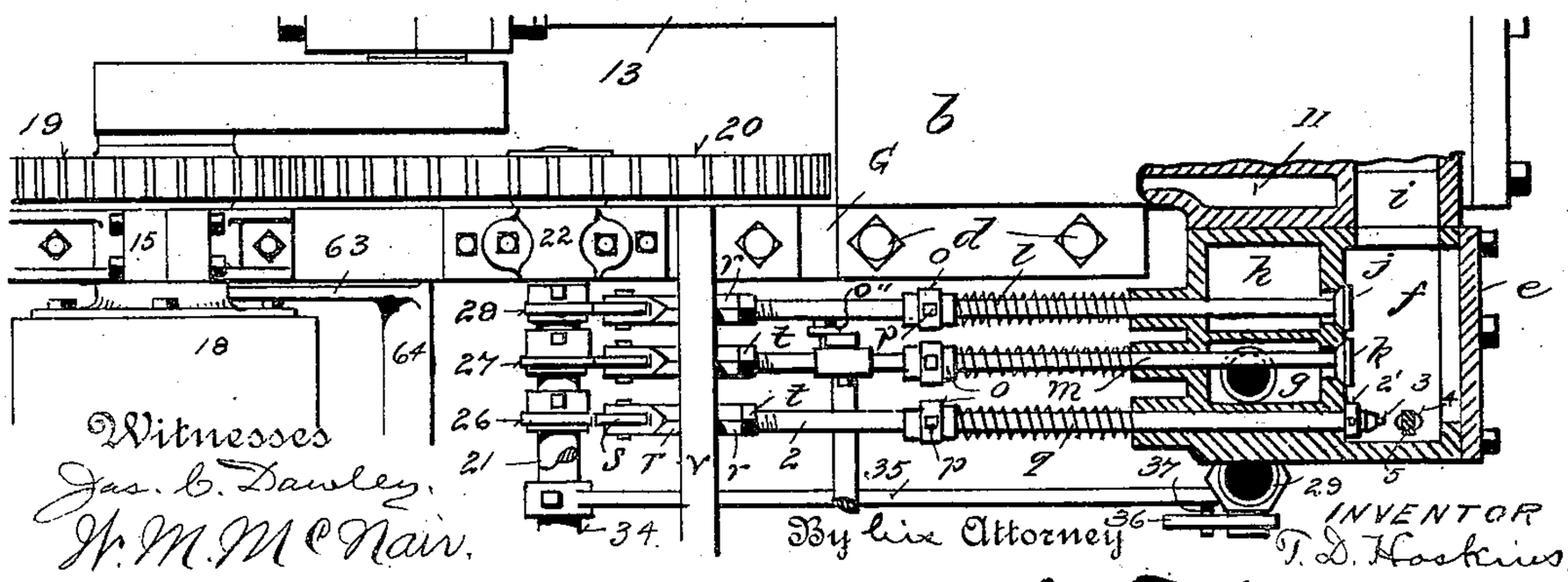


Fig. 12.





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STREET CAR MOTOR.

(Application filed June 25, 1897.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 13.

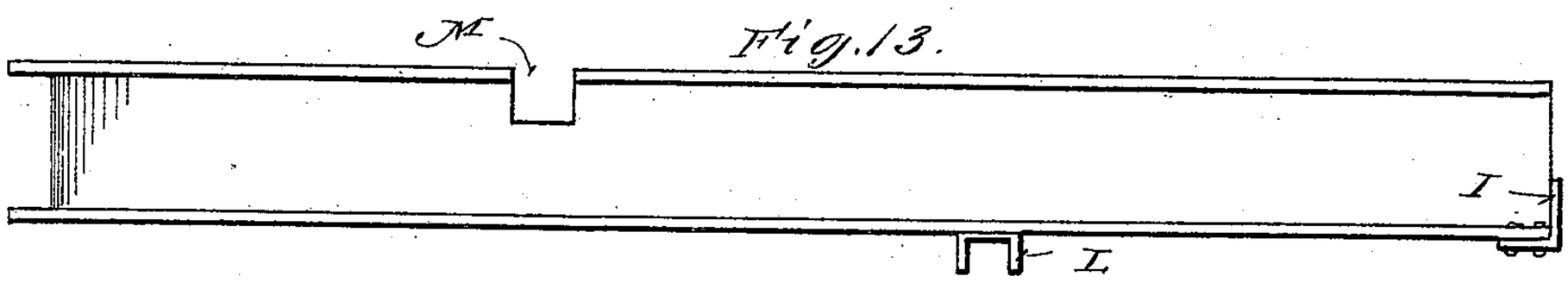


Fig. 14.

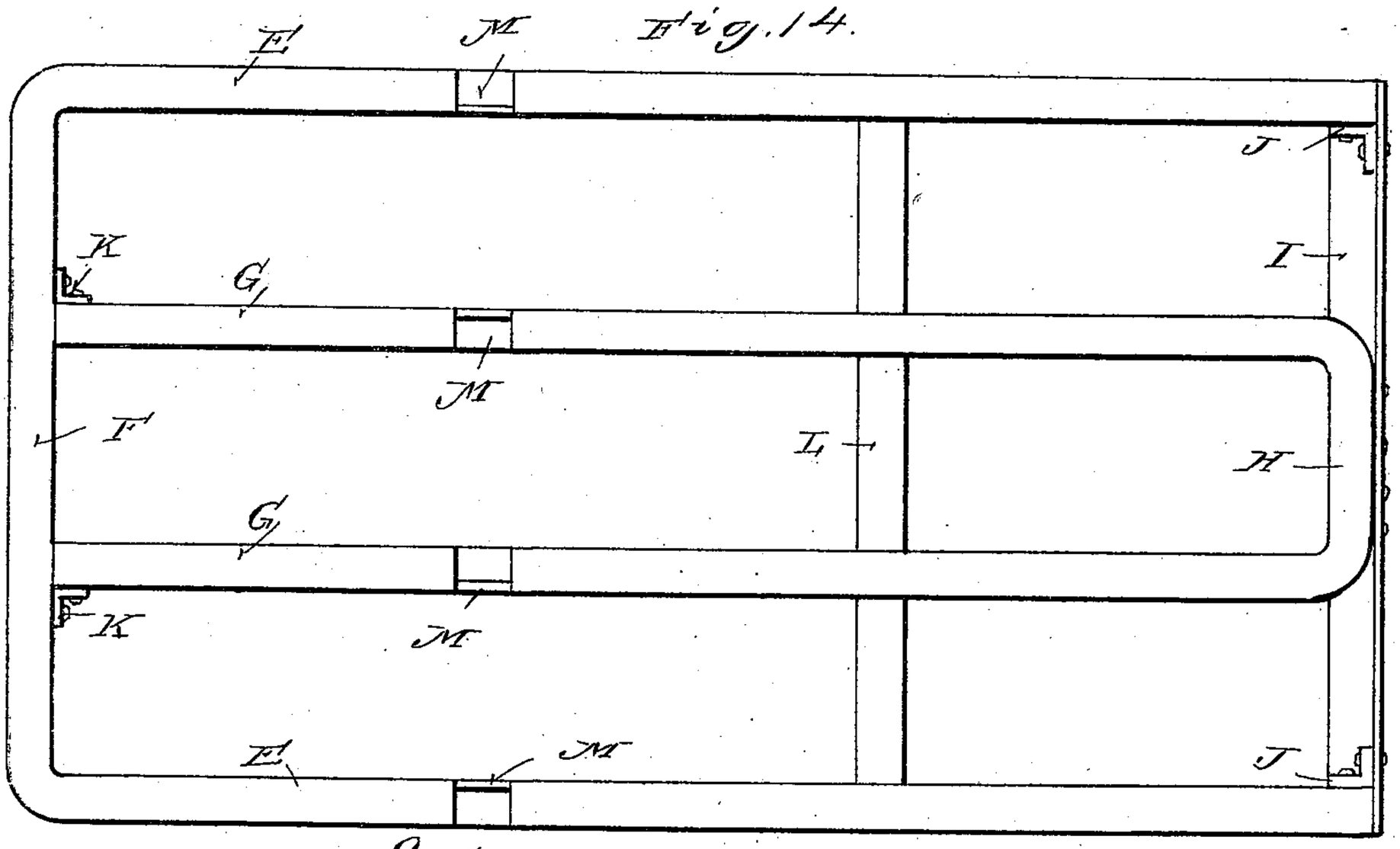


Fig. 15.

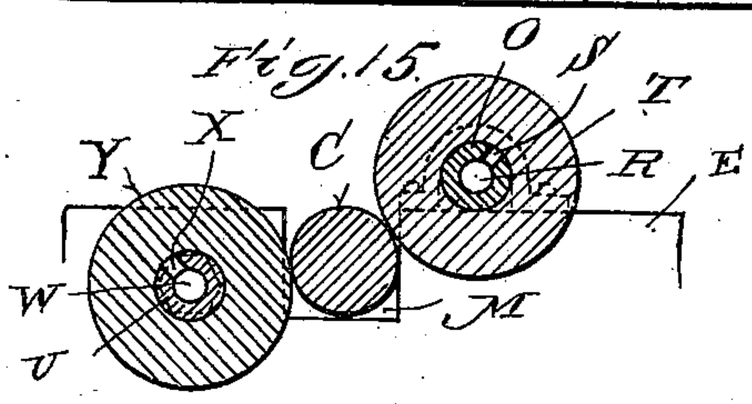


Fig. 16.

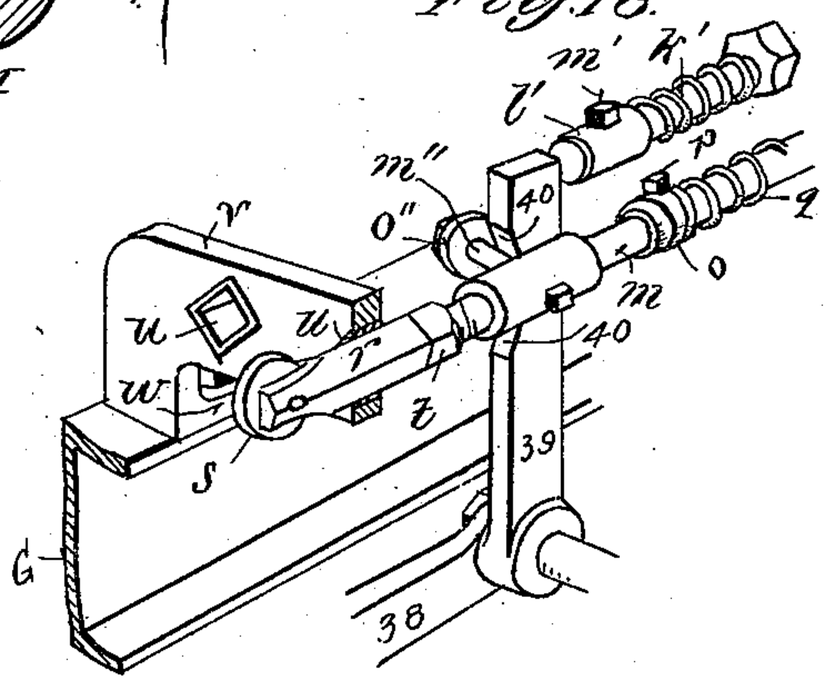


Fig. 17.

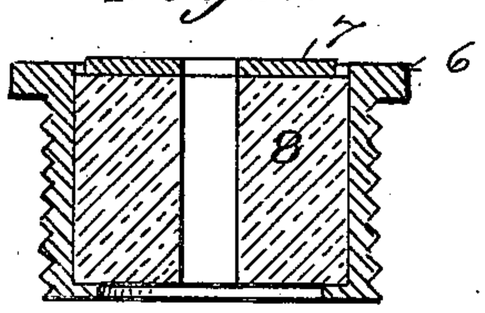
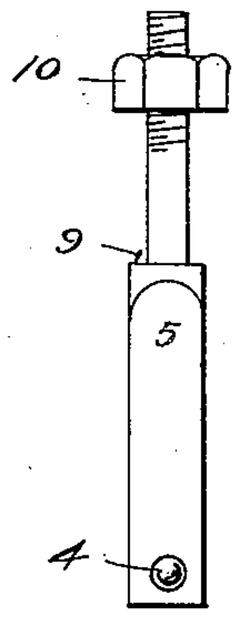


Fig. 18.



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UNITED STATES PATENT OFFICE.

THOMAS D. HOSKINS, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO SARAH E. WARNER.

STREET-CAR MOTOR.

SPECIFICATION forming part of Letters Patent No. 615,274, dated December 6, 1898.

Application filed June 25, 1897. Serial No. 642,338. (No model.)

To all whom it may concern:

Be it known that I, THOMAS D. HOSKINS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Street-Car Motors, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in gasolene-motors for operating cars, particularly street-cars.

My invention relates to an improved organization of power-transmitting pulleys with a governor and charge-admission devices in such wise that an adjustment of such pulleys will cause the governor to vary the quantity of the charge admitted to the explosive-chamber; relates to the arrangement of this governor with the charge-admission devices and the actuating means by which such devices are operated and controlled; relates to an improved type of frame upon which the motor mechanism is mounted, and relates to numerous other features that enter into the construction and organization of the general apparatus.

In the accompanying drawings, on which like reference letters and numerals indicate corresponding parts, Figure 1 is a plan view of my motor and the axles, wheels, and truck-frame of a street-car; Fig. 2, a vertical longitudinal sectional view of the same on the line *x x* of Fig. 1; Fig. 3, a horizontal sectional view of a portion of the frame with the governor mechanism and other parts in plan view, taken on the line *z z* of Fig. 2, looking in the direction of the arrows; Fig. 4, a detail side elevation of one of the bearings and hangers for the power-transmitting pulleys; Fig. 5, an end view of the same with adjacent parts; Fig. 6, a vertical sectional view of such bearings and their connected parts; Fig. 7, a horizontal sectional view on the line Z″ Z″ of Fig. 4; Fig. 8, a detail transverse sectional view of the air-valve devices and cylinder-chests on the line *y′ y′* of Fig. 2, looking in the direction of the arrow; Fig. 8ª, a detail view of the air-valve and its devices on the line *y″ y″* of Fig. 8; Fig. 9, a partial transverse section and end elevation of the apparatus entire on the line *y y* of Fig. 2, looking in the direction of the arrow; Fig. 10, a detail view, on an enlarged scale, of the gasolene-valve; Fig. 11, an enlarged vertical sectional view on the line X′ X′ of Fig. 1; Fig. 12, a partial plan and horizontal sectional view on the line Z′ Z′ of Fig. 11; Fig. 13, a side elevation of the frame alone; Fig. 14, a plan view of the frame alone; Fig. 15, a vertical sectional view of the car-axle and roller-bearings on the line Y Y of Fig. 1; Fig. 16, a detail perspective view of a part of the governor, the air-valve, the frame, and the gas-valve; Fig. 17, a detail vertical sectional view of the stationary-electrode insulator, and Fig. 18 a detail view of the stationary electrode.

The letter A designates the side rails of a car-truck of any approved type—say of an ordinary street-car—and the letter B the wheels which run upon the tracks and are carried by axles C, mounted in suitable boxes D. Upon one of these axles I mount the frame of my motor, while the other end thereof I support in a manner that forms no part of this invention, but may be stated to be in a suitable manner. This frame, as seen more clearly in Figs. 13 and 14, is made of channel-iron in the form of an outer section composed of sides E and an end F of one piece and an inner section composed of sides G and an end H of one piece. The ends F and H are placed in opposite ends of the frame, and the end H is bolted to an angle-iron cross-piece I, itself secured to brackets J and suitable rivets to the ends of the outer side pieces E. The ends of the side pieces G are secured to the cross-piece F by brackets K with suitable rivets, and an intermediate cross-piece L, of channel-iron, is secured to the under edge of both sections, as shown in Figs. 9 and 13. The upper edges of both sections of the frame are cut out, as shown at M, to leave space for the car-axles C, as shown particularly in Fig. 15. This frame so made is comparatively light, but is very strong and rigid in every direction.

Referring again to the roller-bearings by which the frame is supported upon one of the car-axles, I provide a stout shaft O, which I hold stationarily down upon the side bars E and G by a box P and bolts Q, there being

two of these shafts, as shown in Fig. 1. I bore these shafts part way in an axial direction to form a lubricant-orifice R, which, through a radial orifice S, conducts the lubricant, preferably grease packed in the orifice R, to the orifice of the shaft. On the shaft I mount a roller T, which rests on the car-axle C. On the other side of the axle I secure to the webs of the bars E and G a shaft U by nuts V and likewise bore this shaft with an axial orifice W and a radial orifice X for the lubricant. On it I mount a roller Y, which rests on the car-axle also. Thus one end of the frame is supported in a manner to throw its weight upon the axle to give additional traction to the car-wheels, and the rollers T and Y being as long as the space between the two sections of the frame they will run easy and not yield readily to wear and will also prevent the axle from springing when the transmitting-pulleys are forced into forcible contact with the driven pulley on the axle. The position of the rollers Y also causes them to resist the thrust of the axle by reason of such pressure of the pulleys. On the axle I mount a driving friction-pulley *a*, divided, as shown in Fig. 2, and secured by bolts *a'*, which receives motion in a manner hereinafter described.

Referring now to the motor proper, the letter *b* designates a pair of gasolene-engine cylinders, having plungers *c* and bolts *d*, by which they are secured in the frame, as seen in Fig. 1. Each cylinder has secured to it a chest *e*, and each chest is divided into a mixing-chamber *f*, an air-chamber *g*, and an exhaust-chamber *h*, as more clearly seen in Figs. 8 and 12. A passage *i* leads from the mixing-chamber *f* to the cylinder, and in charging the explosive enters there, while in exhausting the explosive exhausts there. An exhaust-valve *j* is seated to control the passage between the chamber *h* and chamber *f*, and an air-valve *k* is seated to control the passage between the chamber *g* and the igniting-chamber *f*. These valves have stems *l* and *m*, respectively, carrying adjustable collars *o*, held by set-screws *p*, and are acted on by springs *q* to seat the valves. These stems are respectively screwed into a sliding head *r*, so as to vary the extreme length of the stems from the valves to the rollers *s*, carried by the heads, while jam-nuts *t* lock the stems and heads. By this construction the minutest fraction of an inch in the adjustment of the length of the valve-stems may be effected to compensate for wear—a very convenient feature in an apparatus of this kind. The heads *r* are fitted in Babbitt boxes *u*, carried by a cross-bar *v* and secured by brackets and nuts *w* to the side bars G. (See Fig. 16.) Each chest receives a reciprocating electrode composed of a stem 2, likewise screwed into one of the heads *r* with a jam-nut *t* and one of the springs *q* and collars *o*. This electrode has a collar 2′ to limit its outward movement and has a platinum point 3, which makes contact with a platinum point in the form of a rivet 4, carried by the fixed electrode 5, mounted in the chamber *f* through a sleeve 6, with a cap 7 inclosing a porcelain insulator 8, through which the electrode 5 passes, with its shoulder 9 pressing against the insulator and a nut 10 binding the upper end of the latter to make a tight joint against the escape of gases. (See Figs. 12 and 17.) Each cylinder and each chest *e* is thus equipped with an exhaust-valve, an air-valve, and sparking device.

Each cylinder has a water-jacket 11, as usual, and pistons *c* and piston-rods 13, connected with a crank-shaft 14, mounted in divided boxes 15, secured by bolts or otherwise to the frame-bars E and G, as shown at Fig. 1, so as to sustain the shaft from the possibility of springing. This shaft has balance-wheels 16 near its ends and a centrally-located friction driving-pulley 18 near its middle and a pinion 19, which meshes with a spur-gear 20 on a cam-shaft 21, mounted in suitable boxes 22, secured by bolts or otherwise to the bars G of the frame. This shaft carries cams 23 for operating the sliding heads *r* of the exhaust-valve stems, cams 24 for operating the heads *r* of the air-valve stems, and cams 25 for operating the sliding heads *r* of the movable electrodes. (See Fig. 1.) The contour of these cams is shown in Fig. 11, where 26 designates the one for the movable electrodes, 27 the one for the air-valves and incidentally one of the gasolene-valves, as will presently appear, and 28 the one for the exhaust-valves. These several cams are in duplicate, there being three for each set of exhaust, air, and gasolene valves and electrodes. These cams receive rotary motion by the rotation of the shaft 21 through the spur-gear 20 and pinion 19, and they are so set as to operate their respective valves and electrodes at the proper time, as hereinafter more fully pointed out.

I will refer now to the gasolene-valve and pipe. These are in duplicate, one being supplied for each cylinder, and are shown in Figs. 10 and 11 more clearly. In the upper part of the air-chamber *g* a pipe *g'* is projected, having a branch *h'*, adapted to connect with a suitable supply of gasolene carried in a tank at a convenient place in or on the car. This pipe forms a valve-seat at its inner end, where a valve *i'* is seated by a spring *j'* acting on its stem *k'*. A collar *l'* is held by a screw *m'* on this stem and receives the pressure of the spring at one end, while at the other end of the spring presses against a stuffing-box *o'* on the pipe *g'* and fits snugly to the stem to prevent leakage of gasolene. Thus the arrangement is such practically that the gasolene is taken up by the air as the latter enters, and this chamber *g* is therefore, in fact, a mixing-chamber, the air and gasolene thence passing by the valve *b* into the ignition-chamber *f*.

Air is supplied to the chamber *g* through

a cock 29, mounted on a hollow yoke 30, connected by a pipe 31 with said chamber *g*, so that by the "sucking" action of the engine-pistons air is drawn in through the cock to the hollow yoke, and thence divided passes by the pipe 31 into said chambers *g*. The plug of this cock is made as shown more clearly in Fig. 8ª, wherein it will be seen to have its openings 32 at each side of a remaining central solid partition 33, so that when the plug is in normal position some air will be admitted to support the operation of the engines when the car is standing still and the transmitting-pulleys are out of contact with the driving or driven pulleys. This is done because it is contemplated to keep the engines in motion when the car is standing to avoid the necessity of starting up the engines after each time the car is stopped. This construction and position of the plug in the air-cock is also due to the fact that the governor is arranged to open or close the cock from the position shown at Fig. 8ª only when the car is in motion. The parts are also so adjusted that the gasolene-valve described is slightly opened when the car is standing, but the engine is operating so as to keep up the operation of the engine, as the governor, which controls the opening of the gasolene-valves to varying degrees, merely opens them slightly when the car is standing. These things will be more fully brought out hereinafter.

At this point I will describe the governor, first saying that its functions are to vary the amount of air and of gasolene more or less, according to the position of the power-transmitting pulleys, so that if they are in light or moderate contact with the driving and driven pulleys, as in running on level ground or with light loads, the supply of air and gasolene will be in quantites suited to that condition, while if they are in severe contact with the driving and driven pulleys, as with heavy loads or traveling uphill, the supply of air and gasolene will be correspondingly greater to form a larger charge and develop greater power. I regard myself as the first to devise this principle of operation, and I wish to be understood as laying thereto the broadest claim and as showing in the accompanying drawings but one form of the many that may be adopted to carry this particular feature in practical operation. Referring now to this type of governor shown, it consists of a shaft 34, mounted in the main frame, with a bar 35 running to and adapted to open or close the air-cock more or less when said bar 35 is vibrated by the rocking of the shaft 34. The cock has a slotted crank-arm 36 and a bar 35 and pin 37, which travels in said slot as the bar vibrates. The shaft 34 carries also a frame 38, and two standards 39 are pivotally mounted in this frame, as seen in Fig. 16, and extend up to near the end of the gasolene-valve stem *k'*, so as to strike said stem and open the valve more or less, according to how far the standard is forced toward the stem. The standards are operated by the air-valve *m* through a stud *m''*, carried thereby, having a washer *o''*, by which each standard is slightly clamped, so as to carry it with a tappet-like motion with the movements of the air-valve stem. Each standard has a double-inclined surface 40, and when raised or lowered different places along the inclines are presented to the stud *m''* to vary the distance the standard is moved toward the gasolene-valve stem. An arm 41, carried by the rock-shaft 34, is operated by a lever 42 on a fulcrum 43, projecting from the main frame, and is connected to one of the hangers of the upper transmitting-pulleys, so that when said pulleys are adjusted up and down the standards 39 are adjusted, as also the bar 35 vibrated. These hangers 44 form the bearing for the lower power-transmitting pulley 45 and are themselves suspended from the shaft of the upper power-transmitting pulley 46, whose shaft is fitted in a sliding box 47, mounted in vertical ways 48, secured to the bars G of the frame. These boxes 47 are adjusted up and down in their ways by screw-threaded shafts 49, threaded into them, and rotated by means of miter-pinions 50 on said shafts and miter-pinions 51 on a horizontal shaft 52, extending across the frame and mounted in brackets 53, secured upon the ways 48. A collar 54 on each shaft 49, fitting beneath the bracket 53, prevents the shaft 49 from being forced upward by the resistance of the boxes 47. The shaft 52 carries sprocket-wheels 55, which by sprocket-chains 56, (one chain only being shown,) leading to the respective platforms of the car, are rotated, such chains passing over a sprocket-wheel 57, operated by a hand-shaft 58 through miter-pinions 59 and 60. Thus the power-transmitting pulleys are under the perfect control of the motorman and can be thrown in and out of contact with the driving and driven pulleys by raising and lowering them, while at the same time the position of the governor is correspondingly changed and the quantity of gasolene and air varied in proportion to the degree of contact or pressure between either of the power-transmitting pulleys and the driving and driven pulleys, or if the power-transmitting pulleys are adjusted to the intermediate position, so as to be clear of the other pulleys, then the governor is at normal position and the amount of gasolene and air admitted is the minimum amount to maintain the operation of the engine while the car is standing.

Referring again to the friction transmitting-pulleys 45 and 46, it will be seen that their shafts 45' and 46' are bored out to form lubricant-orifices (see Fig. 2) in the same manner as described in reference to the shafts O and U.

In order to drive the axle in different directions while still running the driving-pulley in the same direction, an idler-pulley is intro-

duced into the train of pulleys. This idler-puller in the exemplification shown is placed between the driving-pulley 18 and the transmitting-pulley 45 and is mounted in swinging arms 63 on a shaft 64, which rocks in clips or boxes 65, secured to the frame, and is adjusted to get perfect alinement by screws 66. When the transmitting-pulley 45 is adjusted upward against the driven pulley *a*, this idler-pulley 61 assumes its proper position and is tightly pressed upon by the transmitting-pulley 45 and against the driving-pulley 18.

Thus it will be seen that my invention comprehends several fundamental features and numerous detail constructions which go to constitute a complete concrete gasolene-motor for street and other cars, but especially street-cars. One of the fundamental features is that of the transmitting-pulleys, with mechanism to adjust their bearings from the motorman's place on the car-platform, so that when one moves into contact with the driving and driven pulleys the other moves out of contact, and vice versa, while at an intermediate adjustment of their bearings both are out of such contact as will drive the driven pulley. Another fundamental feature is the feature just described in combination with a governor by which the amount of the charge is increased or decreased relatively with the varying degrees of pressure between the pulleys, so as to increase or decrease the power of the engine correspondingly with the load to be carried. I have shown a direct connection between the mountings of the transmitting-pulleys and this governor, and I have shown one form of governor; but it is obvious that these particulars may be departed from and yet the mode of operation and the results still be preserved and at the same time be within my invention. A part of these two fundamental features is that of mechanism by which said transmitting-pulleys and the governor are manipulated by the motorman from his place on the car, and I have shown this mechanism in the form of shafts, miter-pinions, and a sprocket-chain, which is the form I prefer, as it is positive and reliable; but I do not confine myself to such form of mechanism so long as said pulleys and the governor are controlled to produce the results stated by the motorman from his place on the car.

The driving, transmitting, and driven pulleys and the idler are all friction-pulleys, as shown, and while I contemplate using such pulleys I do not wish to be understood as imposing this limitation upon the term "pulley" unless the word friction or its equivalent is used in my claims in speaking of the pulleys.

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

1. In a car-motor, the combination with a driving-pulley, and a driven pulley connected with the car-wheels, of a pair of power-transmitting pulleys, slidable bearings therefor, a cross-shaft geared to said bearings to reciprocate them by its rotation and operating means to rotate said shaft from the motorman's place on the car, and an idler-pulley between one of the transmitting-pulleys and one of said other pulleys.

2. In a car-motor, the combination with a driving-pulley, and a driven pulley connected to the car-wheels, of a power-transmitting pulley, and slidable bearings therefor mounted on threaded shafts, a cross-shaft geared to the threaded shafts to rotate them, means to rotate the screw-shaft from the motorman's place on the car, hangers on the shaft of said transmitting-pulley, a second transmitting-pulley mounted in said hangers and a movable idler-pulley between the latter transmitting-pulley and the driving-pulley.

3. In a car-motor, the main frame, ways secured thereto, slidable bearings in said ways, threaded shafts working in the bearings and having miter-pinions, and a cross-shaft having meshing miter-pinions and a sprocket-wheel, a sprocket-chain therefor, a hand-shaft at the motorman's place on the car geared to another sprocket-wheel for said chain.

4. In a car-motor, the combination with a motor proper having charge-admission devices, of a driving-pulley, a driven pulley connected with the car-wheels, and power-transmitting devices between said pulleys capable of variable engagements therewith, means to so operate said transmitting devices, and a governor controlled by the adjustment of said devices and adapted to correspondingly actuate the charge-admission devices.

5. In a car-motor, the combination with a motor proper having charge-admission devices, of a driving-pulley, and a driven pulley connected with the car-wheels, power-transmitting pulleys and means to adjust them into variable contact with said other pulleys, an idler to complete the contacting, and a governor adapted to actuate said charge-admission devices and connected to said transmitting-pulleys to vary its actuation of said charge devices correspondingly with the degree of engagement between the transmitting and other pulleys.

6. In a car-motor, the combination with a motor proper having charge-admission devices, of a driving-pulley, a driven pulley connected with the car-wheels, power-transmitting pulleys capable of variable contact with said other pulleys, means to so actuate them, and an idler-pulley to complete the contact, and a governor consisting of a bar and a standard to actuate the charge devices, respectively, a rocking arm and a frame, a lever to rock the same and connected with the transmitting-pulleys, and a device to operate the standard.

7. In a car-motor, the combination with a motor proper, an air-cock, a gasolene-valve, a reciprocating head, a governor consisting of a bar to actuate said cock, a standard to actuate said valve with an inclined surface ac-

tuated by said reciprocating head, a rock-arm, a frame for the bar and standard, a lever to actuate the rock-arm, power-transmitting pulleys which actuate said lever, means to actuate said pulleys, a driving-pulley, and a driven pulley connected to the car-wheel adapted to be engaged by said transmitting-pulley, and an idler to complete the engagement.

8. In a car-motor, the following instrumentalities: two motors proper operating a driving-pulley and a cam-shaft, each having a gasolene-valve, and a common air-cock for both, a governor actuating said cock and each of said valves, power-transmitting pulleys in slidable bearings connected to said governor, means to operate said bearings from the motorman's place on the car, a driven pulley connected with the car-wheels and adapted to be interconnected with the driving-pulley through said transmitting-pulleys, alternately, and an idler-pulley to complete one of said engagements.

9. In a car-motor, the following instrumentalities: two motors proper operating in one direction a driving-pulley, also a cam-shaft, heads operated by said cam-shafts, a gasolene-valve for each motor, an air-cock for the two in common, a governor having a vibrating bar actuating said cock, and a reciprocating standard for each gasolene-valve, each standard having a double incline actuated by one of the heads, a lever for said bar and standards, slidable bearings connected to said lever, power-transmitting pulleys in said bearings, means to actuate said bearings, a driven pulley connected with the car-wheels and an idler-pulley.

10. In a car-motor, a frame for the motor devices consisting of reversely-placed inner and outer U-shaped structures and suitable cross-pieces secured together.

11. In a car-motor, a frame for the motor devices consisting of reversely-placed U-shaped structures, each formed of channel-iron and one piece and suitable cross-pieces, all secured together.

12. In a street-car motor, the combination with the frame having roller-bearings resting upon one of the car-axles, a friction-pulley mounted on the axle, a driving-shaft operated by the motor mounted on said frame and having a friction-pulley; a pair of friction transmitting-pulleys between said other pulleys, one above and the other below them, an idler friction-pulley between one transmitting-pulley and one of said other pulleys, sliding bearings for the upper transmitting-pulley, and swinging hangers for the lower transmitting-pulley, cross-shaft geared to reciprocate said sliding bearing with said hangers and means to rotate said cross-shaft from the motorman's place on the car.

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

THOMAS D. HOSKINS.

Witnesses:
EDWARD J. O'GORMAN,
DAVID CAHART.