(No Model.) 4 Sheets—Sheet 1.

J. C. SLAUGHTER.

MOTOR FOR STREET CARS.

No. 535,734. Patented Mar. 12, 1895.

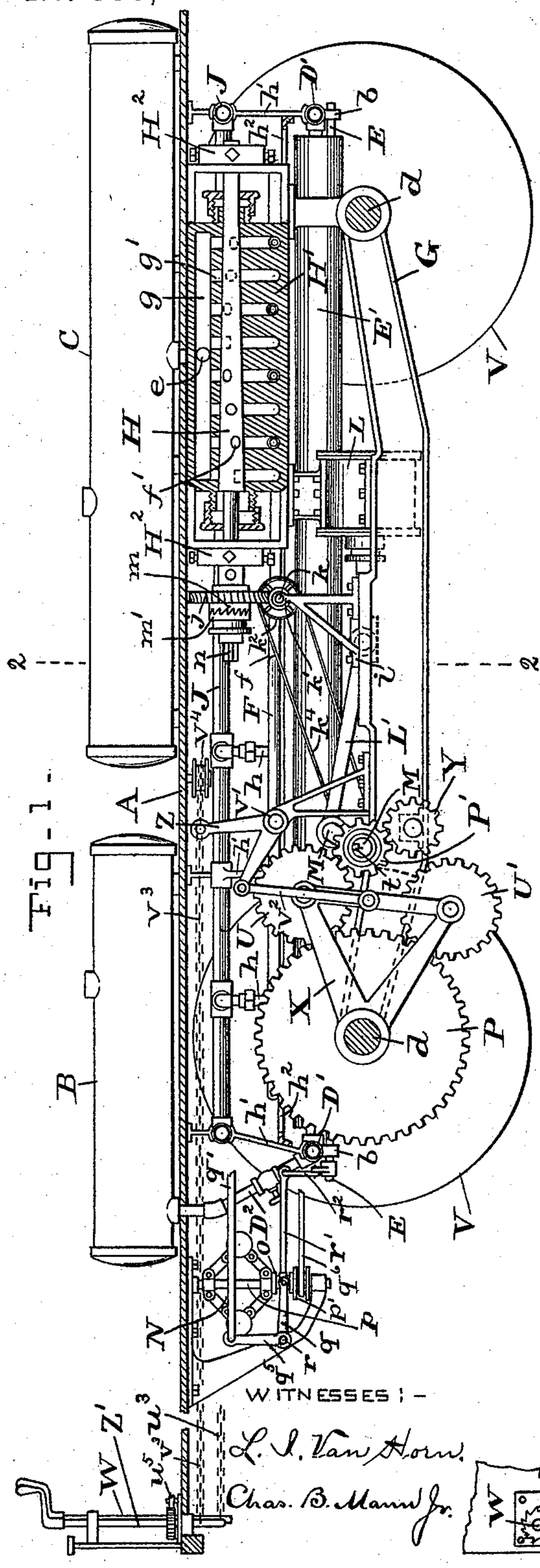

Fig. 1.

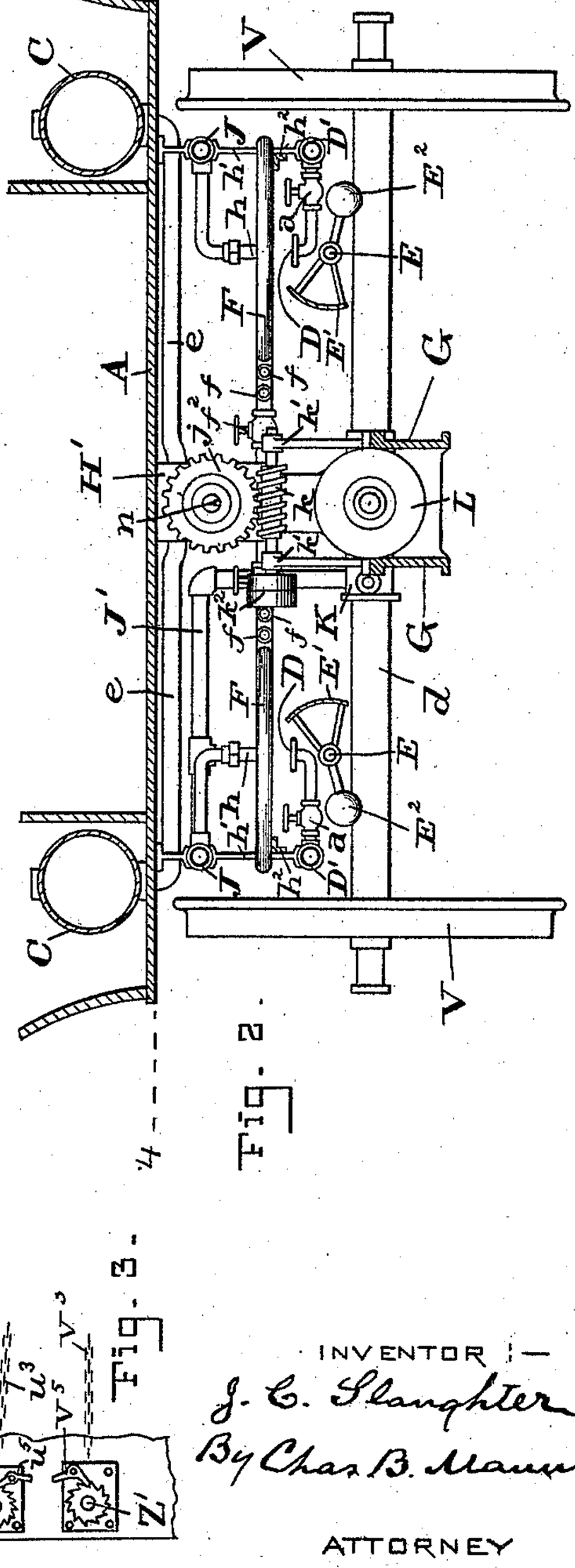

Fig. 2.

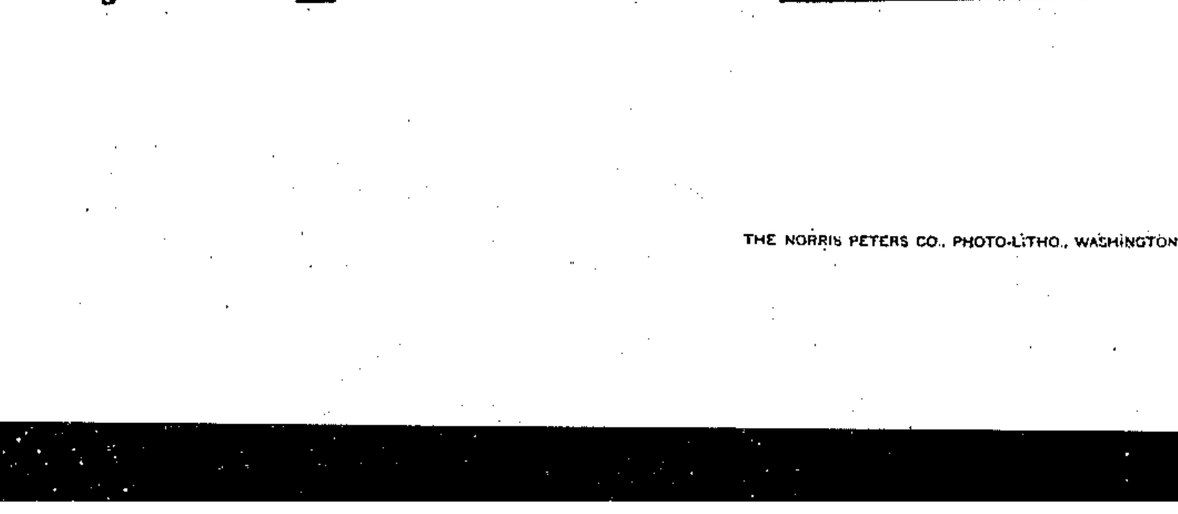

Fig. 3.

WITNESSES:—

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Chas. B. Mann Jr.

INVENTOR:—

J. C. Slaughter

By Chas. B. Mann

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(No Model.) 4 Sheets—Sheet 2.

J. C. SLAUGHTER.

MOTOR FOR STREET CARS.

No. 535,734. Patented Mar. 12, 1895.

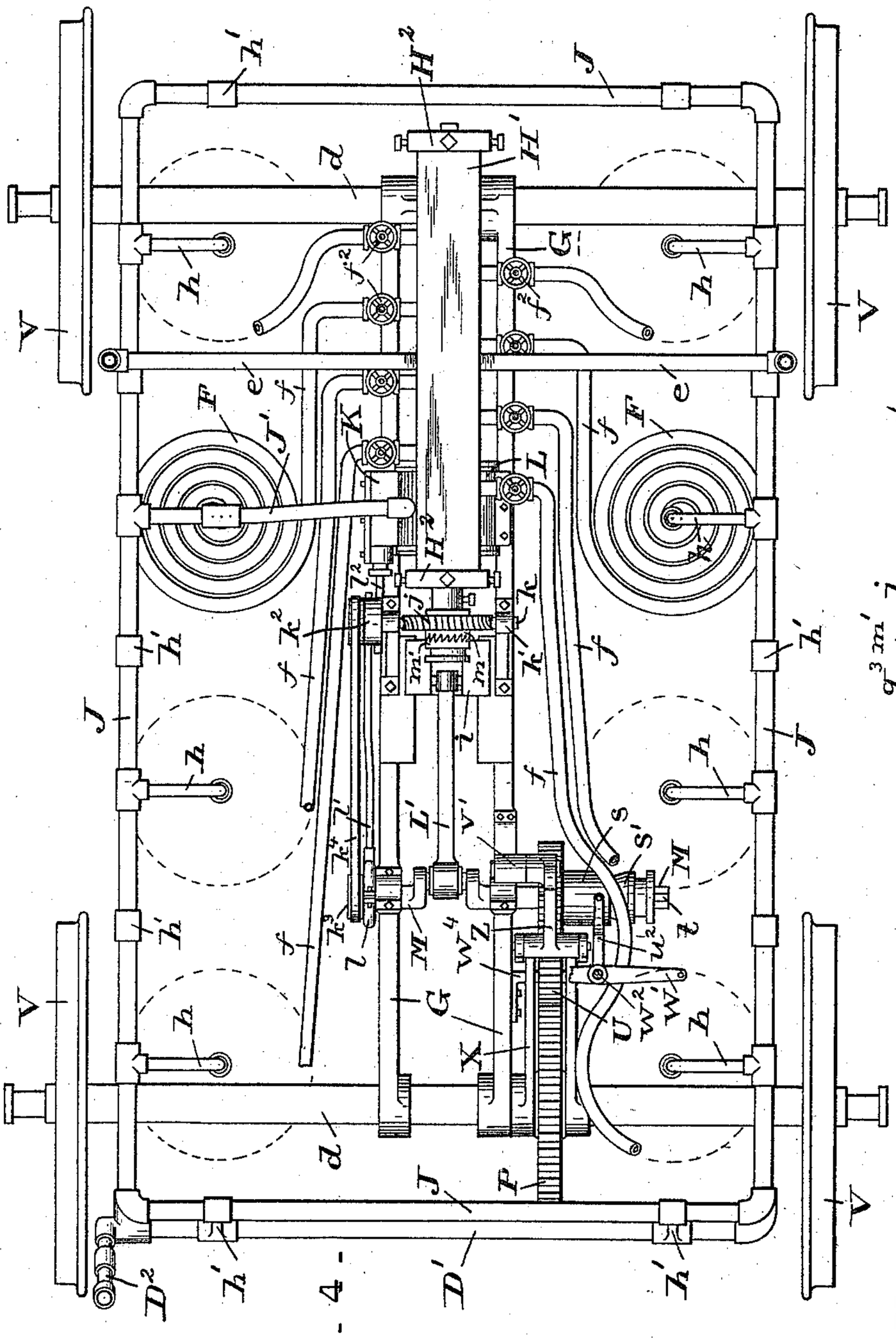

Fig. 4.

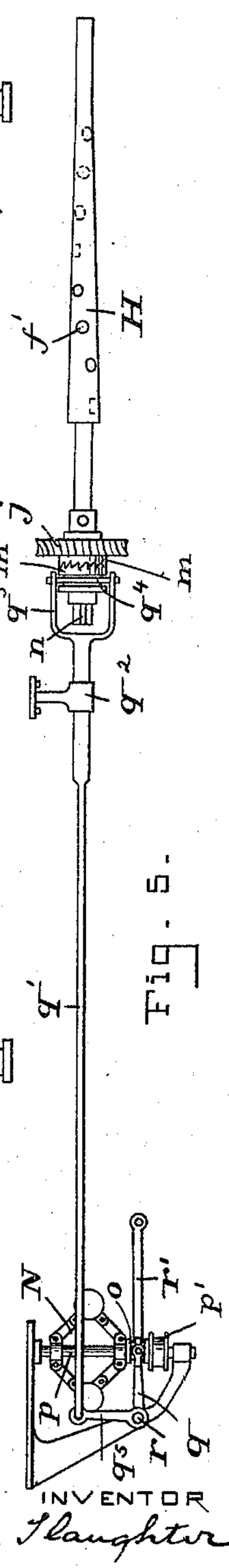

Fig. 5.

WITNESSES :—

L. I. Van Horn,

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INVENTOR :—

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(No Model.)

4 Sheets—Sheet 3.

J. C. SLAUGHTER.

MOTOR FOR STREET CARS.

No. 535,734. Patented Mar. 12, 1895.

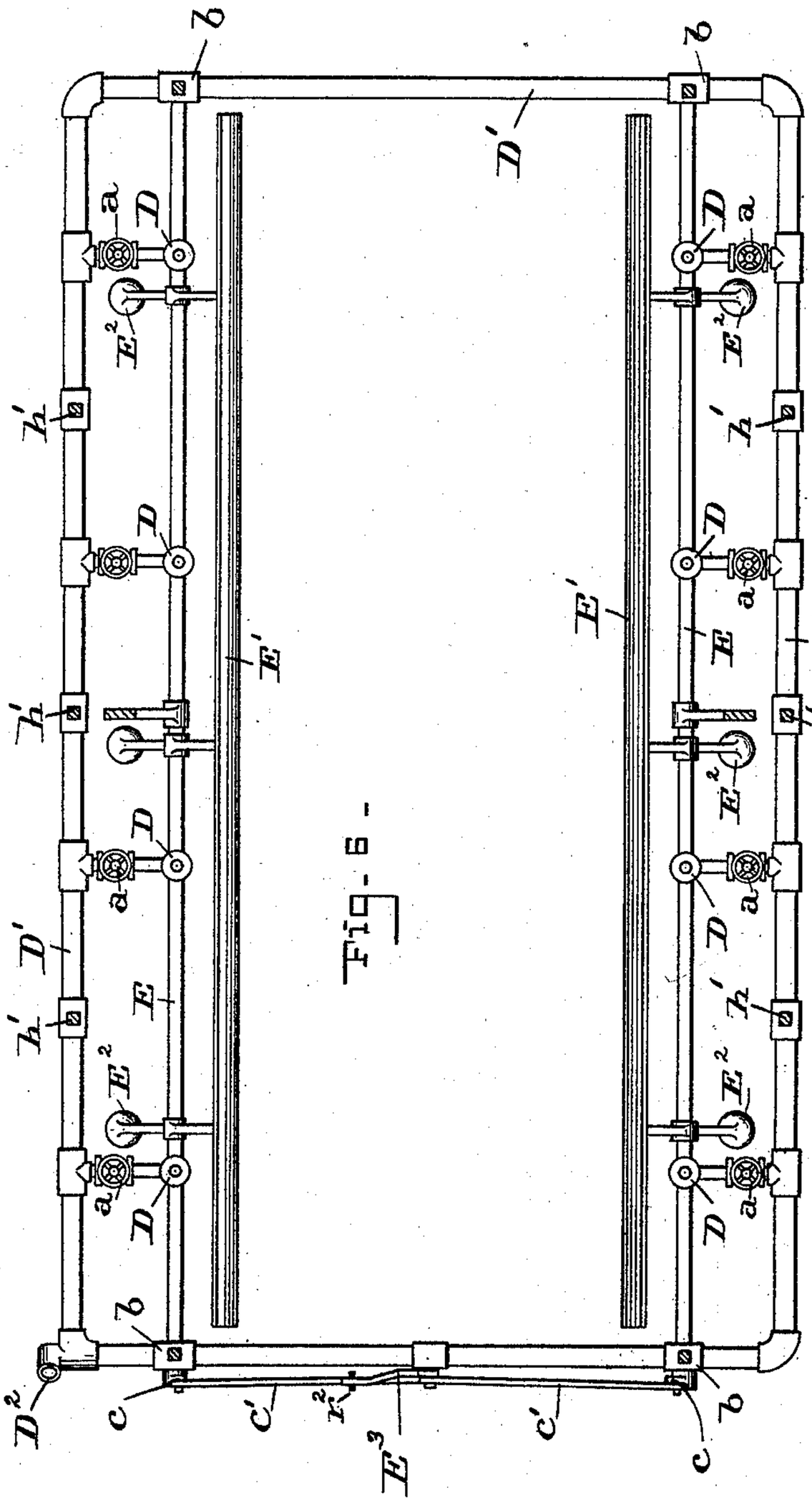

Fig. 6.

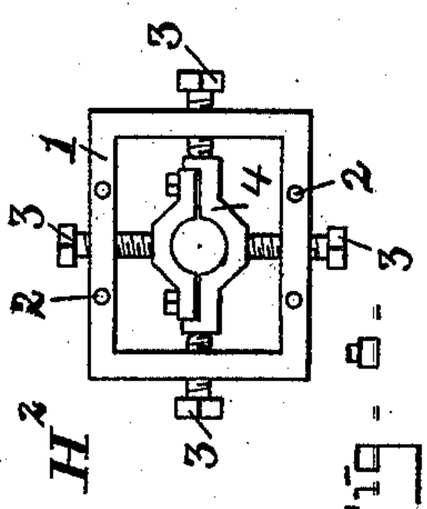

Fig. 8.

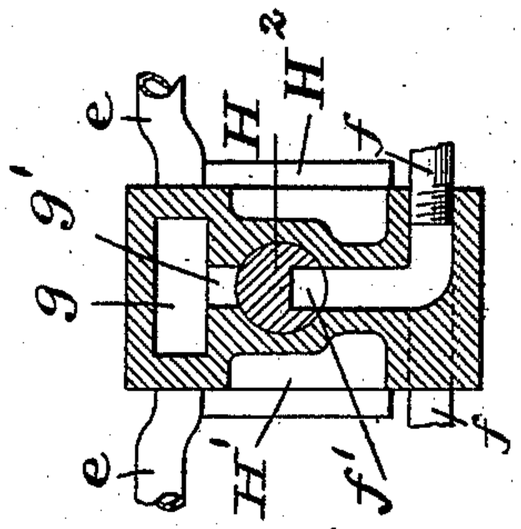

Fig. 7.

WITNESSES :

L. L. Van Dorn.

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(No Model.) 4 Sheets—Sheet 4.

J. C. SLAUGHTER.

MOTOR FOR STREET CARS.

No. 535,734. Patented Mar. 12, 1895.

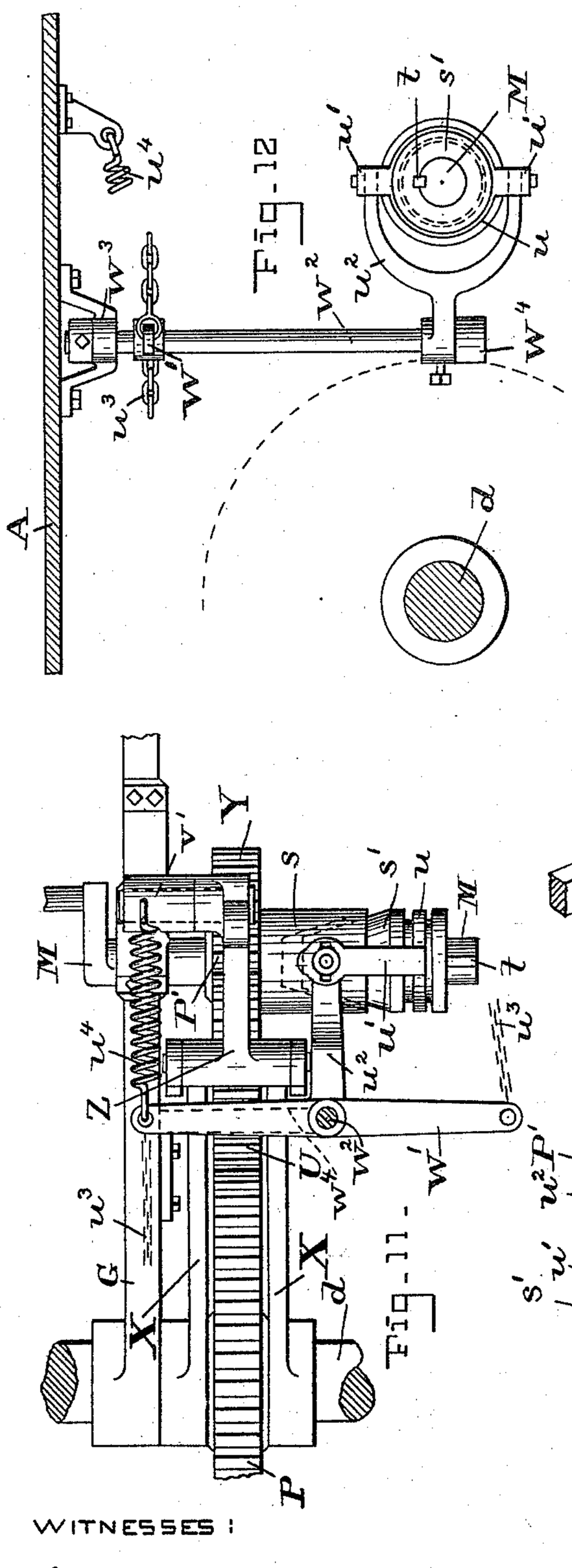

Fig. 12.

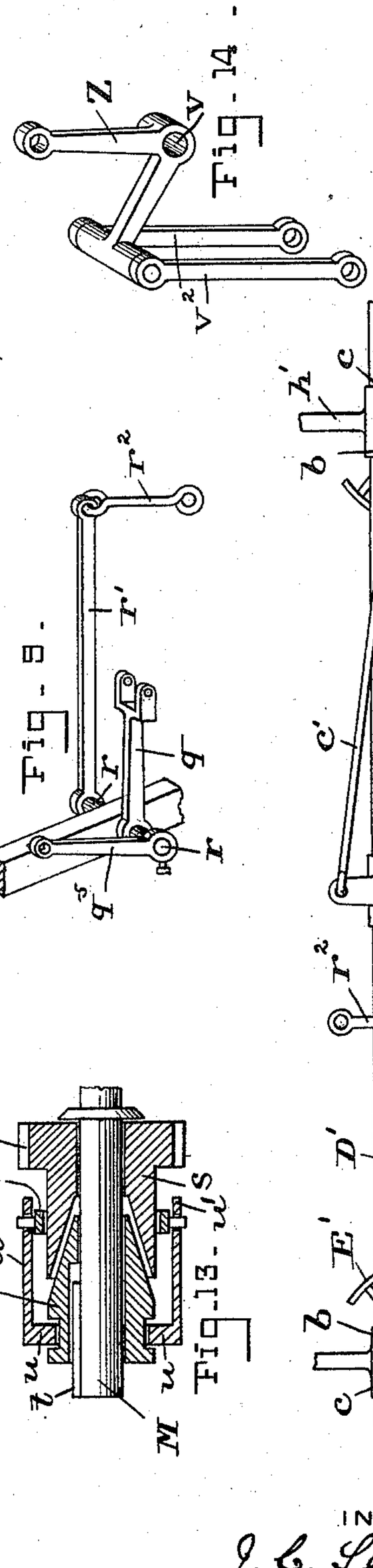

Fig. 14.

Fig. 9.

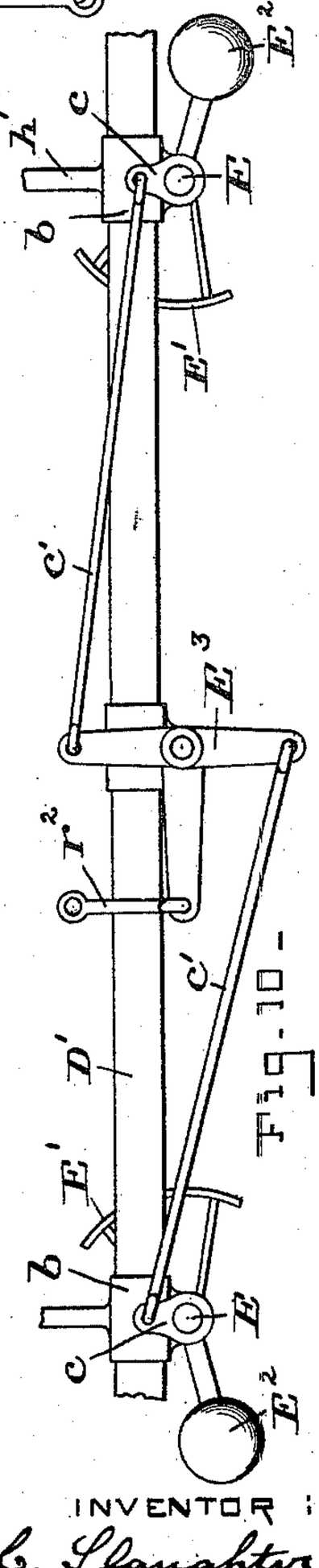

Fig. 10.

Fig. 11.

Fig. 13.

WITNESSES:

L. I. Van Horn.

Charles B. Mann Jr.

INVENTOR:

J. C. Slaughter

By Chas B. Mann

ATTORNEY.

UNITED STATES PATENT OFFICE.

JOEL C. SLAUGHTER, OF DALLAS, TEXAS.

MOTOR FOR STREET-CARS.

SPECIFICATION forming part of Letters Patent No. 535,734, dated March 12, 1895.

Application filed June 21, 1894. Serial No. 515,219. (No model.)

To all whom it may concern:

Be it known that I, JOEL C. SLAUGHTER, a citizen of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented certain new and useful Improvements in Motors for Street-Cars, of which the following is a specification.

My invention relates to a car motor, and the object of the invention is to provide a car which shall be equipped with a new and improved steam motor.

By my invention each car will have its own motor and will thus be entirely independent of every other car running on the same line.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of the floor-frame and running-gear of a street car embodying my invention. Fig. 2 is a cross-section of the same on the line 2—2. Fig. 3 is a top or plan view of the two ratchets and pawls of the starting and stopping shaft, and the reversing shaft, respectively. Fig. 4 is a plan view of the parts comprising the steam generator and motor. The horizontal plane of these is on the line 4—4 of Fig. 2. Fig. 5 is a view of the governor, feed-water plug and clutch. Fig. 6 is a plan view of the oil-distributing pipes, burners and the shield to cover the burners. Fig. 7 is a vertical cross-section view of the feed-water case. Fig. 8 is a view of one of the bearings of the revoluble feed-water plug. Fig. 9 is a perspective view of the bell-crank lever operated by the governor. Fig. 10 is an end view of the two pivoted shields and their operative parts. Figs. 11 and 12 are plan and elevation views, respectively, of the clutch mechanism employed when starting and stopping the car. Fig. 13 is a section view of the clutch on the crank shaft. Fig. 14 is a view separate of the lever used in reversing the direction of the motor.

In general my invention comprises a steam cylinder and piston with which are employed suitable gearing to connect with one or more of the axles of the car. The fuel employed in generating the steam is oil. The heat is produced by burners, and water, in small quantities at a time, is supplied to steam coils over the burners. With this brief general statement I will now describe the parts, their construction and arrangement, and will then explain the operation of the generator and motor.

The letter, A, designates the floor-frame of a car; B, oil cylinders carried on the car, and C, water reservoirs also on the car. In the present instance these are located under the seats.

The burners, D, of which any required number may be used,—in the present instance eight being shown—are attached to the distributing oil pipes, D′, extending below the car-body and these pipes are connected with the oil cylinder, B, by means of a pipe, D^2. Each burner is on a short branch and is controlled by a valve, *a*. Four burners, D, are in line on each side of the car and two rock shafts, E, extend longitudinally, one at each side, being supported in bearings, *b*. Each rock-shaft carries a shield, E′, and counterpoise weights, E^2, to balance the shield. This shield is a suitable curved plate to take over or above the burners, D, and interpose between the burner and the water coil, F, so as to cut off the flame and prevent the flame from any longer heating the water coil. These two rock-shafts have at one end short arms, *c*, and a double bell-crank lever, E^3, is mounted on one of the pipes and each short arm is connected by a rod, *c*′, to the said double bell-crank lever. Thus a pull on this lever will tilt both rock-shafts and thereby move the shields, E′, so as to cover all the burner flames, and thereby arrest the generation of steam.

Two longitudinal beams, G, have their ends supported on the car axles, *d*, and these beams serve as a frame on which the engine and other parts are mounted.

A revoluble water-feeder, H, is inclosed in a case, H′, and pipes, *e*, connect the water storage reservoirs, C, with the said case, supplying the latter. The steam is generated in coils of pipe, F, which are located over or above the burners, D. In the present instance one coil is above each burner. A separate pipe, *f*, leads from the water-feeder case, H′, to each generating coil, F, and a cock, f^2, controls each pipe.

The revoluble water-feeder, H, comprises a cylindric or tapered plug having small recesses, *f*′, which are spaced apart along the plug and spirally thereon. The plug fits in a bored out case, H′, wherein it is revolved, as

will be hereinafter described. This case has a horizontal position and at its upper side is provided with a longitudinal passage, *g*, into which the supply pipes, *e*, lead. From this passage are a number of short lateral passages, *g'*, to the tapered plug, H. These short passages are spaced apart longitudinally to correspond with the spacing of the recesses, *f'*, in the plug. As the plug, H, revolves only one of its recesses, *f'*, at the same time will be coincident with one of the short lateral passages, *g'*. In revolving as it does, with a slow motion, one after another of the plug recesses, *f'*, will take small quantities of water from the said lateral passages, *g'*, and deliver such water to the pipes, *f*, leading to the coils, F. Only one recess, *f'*, at a time will take feed-water. This action results from the relative spiral position which the said recesses on the plug have to each other. It will be seen that as each recess, *f'*, is very small, only a minute quantity of water will be fed at a time to each generating coil.

Each generating coil, F, has its outer coil connected with a water supply pipe, *f*, and its center coil is connected with a steam pipe, *h*, which is attached to the larger steam pipe, J, which in the present instance is in the form of a rectangular frame above the oil pipes, D', which has a similar rectangular frame. This pipe, J, has a branch, J', which communicates with the steam chest, K. The lower oil pipe frame, D', is suspended from the upper water pipe frame, J, by hangers, *h'*; and a horizontal bar, h^2, extends along the hangers between the said upper and lower pipe-frames and said bar serves to support the steam generating coils, F. The steam cylinder, L, is supported on the longitudinal beams, G, and the steam-chest is on the side of the cylinder. A crank-shaft, M, is mounted in bearings also on the beams. The piston-rod has a slide head, *i*, and a connecting rod, L', connects from the slide head to the crank shaft, M. Suitable gearing connects between the crank shaft and the axle, *d*, and thus transmits motion to the car wheels. This particular gearing will be presently described.

The end of the revoluble water feeder, H, which projects from the casing is provided with a worm gearwheel, *j*, in the present instance loose thereon, and a worm shaft, *k*, is mounted in bearings, *k'*, and is in gear with the said wheel, *j*, to which it gives continuous motion. By this particular gearing a slow revolution is imparted to the water feeder. The worm shaft, *k*, has two pulleys, k^2, and the crank axle also has a pulley, k^3, and a belt, k^4, running over this last pulley and one of the pulleys, k^2, serves to drive the worm shaft.

The crank shaft, M, has an eccentric with a collar, *l*, and a rod, *l'*, extends from said collar to and is jointed with the rod, l^2, of the valve gear. The side of the worm wheel, *j*, has part of a clutch, *m*, and the other clutch part, *m'*, is on the projecting end of the water-feeder, H, and is movable longitudinally thereon by means of a spline and groove connection, *n*. By sliding the clutch part, *m'*, connection can be made or broken between the worm wheel, *j*, and the revoluble water-feeder plug, H. Thus the feed-plug may be caused to revolve or to cease revolving.

A governor, N, is employed for two purposes, to wit: first, to actuate the clutch, *m'*, and cause the revoluble water-feed plug, H, to cease revolving, and, second, to shift the shield plates, E', and thereby cut off the heat from the steam generators, I. Connected with the governor's grooved head, *o*, which revolves with the shaft, *p*, but is free to slide thereon, is one arm *q* of a bell crank. The other arm q^5, of this bell crank has attached a rod, *q'*, which passes loosely through a hanger, q^2, and has a yoke-end, q^3, which is connected with a collar, q^4, loose in a groove around the sliding clutch part, *m'*. It will be seen the action of the governor will be such as to cause the rod, *q'*, to have an endwise movement and thereby the clutch part, *m'*, will be actuated or shifted. The governor's bell-crank is fixed tight on a rock-shaft, *r* (see Fig. 9) which has an arm, *r'*, and a link, r^2, connects this arm with the double bell-crank lever, E^3, which operates the two shields, E'. It will thus be seen that when the speed of the engine increases beyond a certain point the action of the governor will pull on the double bell-crank and cause the shield plates to cut off the heat of the burners from the coils, F. A belt, q^6, connects governor pulley, *p'*, with one of the pulleys, k^2, of the worm shaft. As constructed in the present instance it is intended for the engine to run continuously; the governor, N, regulating the supply of feed-water and also the heat to the generators, F.

In order to start and stop the car the following mechanism is provided: One of the car-axles, *d*, has on it a fixed gear-wheel, P, and the crank shaft, M, has on it a loose gear wheel, P', which is provided with a hollow or socket part, *s*, of the clutch. The tapered or cone part, *s'*, of the clutch is also mounted on the crank-shaft, and has longitudinal movement thereon by means of the well known spline and groove, *t*. This cone part, *s'*, however, must revolve with the shaft, M. An intermediate wheel, U, gears with both the fixed wheel, P, on the axle and the loose wheel, P', on the crank-shaft, and thereby the revolution of the crank-shaft and its wheel, P', will impart motion to the car-axle and car-wheels, V.

When it is desired to stop the car, the cone part, *s'*, of the clutch must be caused to slide longitudinally on the crank shaft and disengage from the socket part, *s*, and thereby allow the crank-shaft to turn freely without revolving the wheel, P'. To start the car again it is only necessary to move the cone part, *s'*, of the clutch into contact with the socket part, *s*. The movement of this cone part, *s'*, is effected by means of a vertical winding shaft, W, on the front of the car, and connections between it and the said cone part, as

follows: The cone part has a groove around it and a collar, u, fits loose in said groove and the collar has two parallel arms, u', which project partly over on the socket part, s. A horizontal lever, W′, is mounted by its center on a vertical shaft, W^2, which is supported under the car by a hanger, W^3, and an arm, W^4. This vertical shaft carries a yoke-arm, u^2, which projects at right angles with respect to the lever, see Figs. 11 and 12, and each of the two arms of this yoke is attached by pivots to one of the parallel arms, u', on the loose collar. A chain, u^3, connects from the winding shaft, W, to one end of the horizontal lever, W′. It will be seen that by pulling on either end of the lever, W′, the yoke arm, u^2, will draw the cone part, s', of the clutch into contact with the socket part, s. A spiral spring, u^4, has one end fixed and the other end is connected with one end of the horizontal lever, W′. This spring serves to draw back the lever, W′, after either of the chains, u^3, have been relaxed. Thus the spring, u^4, also separates the two parts of the clutch. The winding shaft, W, has a ratchet wheel, see Figs. 1 and 3, and a pawl, u^5, engages therewith. In order to start the car the winding shaft, W, must to turned to draw on chain, u^3. This will press the cone part, s', of the clutch against the socket part, s. As long as the ratchet pawl, u^5, holds the shaft, W, and keeps the chain, u^3, taut, the car will move. To stop the car, the motorman will release the pawl, u^5.

The mechanism thus far described will cause the car to move in one direction. To move it in the opposite direction the following reversing mechanism is employed:

The intermediate wheel, U, already mentioned, and shown in Fig. 1, is in the operative position for transmitting motion from wheel, P′, to the wheel, P. The operation of this wheel, U, causes the car to move in the direction toward the left hand. This wheel, U, and a second similar wheel, U′, are both mounted on and carried by the two triangular frames, X,—one frame being at one side and the other frame at the opposite side of the fixed wheel, P, on the axle, d, and both frames being pivoted by one of their angles on the axle. The two intermediate wheels, U, U′, are mounted at the other angles of the said frames. It will thus be seen the frames, X, pivoted on the axle are capable of being so raised and lowered as to shift the position of the two intermediate wheels, U, U′. A wheel, Y, is mounted on the bars, G, and is in constant engagement with the loose wheel, P′. When the upper intermediate wheel, U, is transmitting this wheel, Y, is running idle; but when the frames, X, are raised so as to lift the two wheels, U, U′, and disengage the upper wheel, U, and engage the lower wheel, U′, with the wheel, Y, then this last wheel and the wheel, U′, are transmitting.

The means for raising the pivoted frames, X, and wheels, U, U′, when it is desired to reverse the direction of the motor, comprise a bell-crank lever, Z, (see Figs. 1, 11 and 14) pivoted at v, on a standard or bearing, v'. Two pendent link bars, v^2, connect one arm of this lever, Z, with the free ends of the two pivoted frames, X, and the other arm of the lever, Z, has a chain, v^3, attached. This chain passes about a pulley, v^4, and then passes to the reverser winding shaft, Z′, on the front of the car, adjoining the start and stop winding shaft, W.

The reverser winding shaft, Z′, has a ratchet wheel, see Figs. 1 and 3, and a pawl, v^5, engages therewith. When running the car in the direction toward the left hand, see Fig. 1, the chain, v^3, will be slack, but when it is desired to run in the opposite direction the shaft, Z′, must be turned to tighten this chain and thereby raise the two wheels, U, U′.

It is to be understood that I contemplate using the two winding shafts, W, and Z′ at both ends of the car, although in the drawings, for want of room, they are shown only at one end.

At each end of the feed-water case, H′, is an adjustable bearing, H^2. See Figs. 1, 4 and 8. This bearing comprises the frame, 1, secured at the end of the case, H, by pins or screws, 2, and having adjusting screws, 3, and the box, 4, supported by said screws. The revoluble plug, H, has its ends in these boxes which support the plug and save from wear the tapered part.

It is obvious that some of the parts and combinations here shown may be used without using all that are shown. It is also obvious that the construction of many of these parts may be varied or changed.

From this description of the several parts and their action, the operation of the motor will be readily understood.

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

1. In a car motor, the combination of a water reservoir; a number of steam generators; a case provided with a bore and a longitudinal passage, g, which has a connection with the said water reservoir, and also a number of lateral passages, g', from said longitudinal passage to the bore; a plug, H, revoluble in said bore and provided with water-receiving recesses; and a separate pipe, f, leading from the said case to each steam generator.

2. In a car motor, the combination of a water-reservoir; a number of steam generators; a case having inlet pipe connections with the water-reservoir and outlet pipe connections with each of the steam generators; a water feed-plug having water-receiving recesses and movable in said case and adapted to deliver only a small quantity of water at a time to each of the said steam generators; means to move said feed-plug; an engine; and a governor co-acting therewith and with the feed-plug, whereby when the speed of the engine

increases beyond a certain point the governor will automatically stop the movement of the feed-plug.

3. In a car motor, the combination of a water-reservoir; a number of steam generators; a case having inlet pipe connections with the water-reservoir and outlet pipe connections with each of the steam generators; a revoluble water feed plug having water-receiving recesses and adapted to deliver only a small quantity of water at a time to each of said steam generators; means to revolve the water-feed plug; an engine supplied with steam from said generators; a governor; and a clutch connection between the revoluble water-feed plug and governor—said clutch being actuated by the governor.

4. In a car motor, the combination of a water reservoir; a number of steam generators; burners located underneath said generators; a case having inlet pipe connections with the water reservoir and outlet pipe connections with each of the steam generators; a water feed-plug having water receiving recesses and movable in said case and adapted for supplying only a small quantity of water at a time to each of said steam generators; an engine without throttle to run continuously as long as the generators furnish steam; and means for automatically and simultaneously stopping the movement of the feed-plug and shutting off the heat from the burners to the steam generators when the speed of the engine increases beyond a certain point.

5. In a car motor, the combination of an oil cylinder; steam generators; burners connected by means of pipes with the oil cylinder and located under the steam generators; an engine supplied with steam from said generators; a shield plate adapted to be interposed between the said burners and the steam generators so as to cut off the flame from the latter; and means for automatically shifting the shield plate to a position between the steam generators and burners when the speed of the engine increases beyond a certain point.

6. In a car motor, the combination of the oil cylinder; water reservoir; coil-pipe generators in communication with the water reservoir; burners located underneath said coil-pipe generators; an engine without throttle to run continuously as long as the generators furnish steam; a crank-shaft revolved by the action of the engine; gearing connecting the crank-shaft and a car-axle; a clutch device coacting with the crank-shaft and said gearing; and means for shifting the clutch for starting and stopping the car.

7. In a car motor, the combination of the oil cylinder; steam generators; an engine supplied with steam from said generators; burners connected by means of pipes with the oil cylinder and located under the steam generators; a shield plate which is movable and adapted to be interposed between the said burners and the steam generators so as to cut off the flame from the latter; and a governor co-acting with said engine and shield plate, whereby when the speed of the engine increases beyond a certain point the governor will automatically shift the shield plate.

8. In a car motor, the combination of the oil cylinder; steam generators; burners connected by means of pipes with the oil cylinder and located under the steam generators; a shield plate which is movable and adapted to be interposed between the said burners and the steam generators so as to cut off the flame from the latter; a water-reservoir; a water feed device having communication with the reservoir and the steam generators; an engine supplied with steam from said generators; and a governor connected with the engine, the movable shield plate and the water-feed device, whereby when the speed of the engine increases beyond a certain point the governor will automatically shift the said shield plate and also cut off the supply of water through the feed-water device.

9. In a car motor, the combination of an oil storage cylinder; two parallel pipes, D′, each having burners and in communication with said oil cylinder; a water reservoir; two sets of steam generators in communication with the water-reservoir and one set located above each of the said burner pipes; two pivoted shield plates one of which coacts with each of the said burner pipes; and a double bell-crank lever connected with both of said shield plates.

10. In a car motor, the combination of a water-reservoir; a number of steam generators; a case having inlet pipe connections with the water-reservoir and outlet pipe connections with each of the steam generators; a revoluble feed-water plug having water-receiving recesses and adapted to deliver only a small quantity of water at a time to each of said steam generators; a worm gear wheel loose on said plug; a worm shaft in gear with said wheel to impart continuous motion thereto; and a clutch device also on the feed-plug to make and break connections and cause the feed-plug to revolve or cease to revolve.

11. In a steam motor, the combination of a steam generator; a water-feed device supplying water to the generator in small quantities at a time; an engine supplied with steam power from said generator; a governor; and a clutch connection between the water feed device and the governor, said clutch being actuated by the governor.

12. In a car motor, the combination of a car-axle provided with a fixed gear-wheel, P; a crank-shaft provided with a loose gear-wheel, P′; an engine whose piston is connected with the crank-shaft; an intermediate wheel connecting the said fixed gear wheel and loose gear wheel; a clutch on the crank-shaft co-acting with the said loose gear wheel; a winding shaft, W; and connections between the clutch and winding shaft, whereby the

car may be started or stopped without stopping the engine.

13. In a car motor, the combination of a car-axle provided with a fixed gear-wheel, P; a crank-shaft provided with a loose gear-wheel, P′; an engine whose piston is connected with the crank-shaft; a clutch on the crank-shaft co-acting with the said loose gear-wheel; a winding shaft, W; a lever, W′, for operating the clutch; a chain, w^3, connecting the winding shaft and said lever; and a spring, w^4, also connected with the said lever.

14. In a car motor, the combination of an engine without throttle to run continuously so long as the generators furnish steam; a shaft driven by said engine and provided with a loose wheel, P′; a clutch on said shaft co-acting with the loose wheel; a fixed gear wheel on the car-axle; means to transmit motion between the loose wheel and said fixed wheel; and means to shift the clutch for starting and stopping the car.

15. In a car motor, the combination of a car-axle provided with a fixed gear-wheel, P; a crank-shaft provided with a loose gear-wheel, P′; an engine whose piston is connected with the crank-shaft; a wheel, Y, in constant engagement with the said loose wheel; a frame pivoted on the car-axle and carrying two intermediate wheels, U, U′, which are in constant engagement with the said fixed wheel and one of said intermediate wheels, U, adapted to engage with the said loose gear wheel, and the other intermediate wheel, U′, adapted to engage with the said wheel, Y; and means for raising the said pivoted frame.

16. In a car motor, the herein-described reversing mechanism having in combination a car-axle provided with a fixed gear-wheel; a wheel, P′, driven by the motor; a wheel, Y, in constant engagement with the said driven wheel; a pivoted frame carrying two intermediate wheels, U, U′; a bell-crank lever, Z; links connecting one arm of the bell-crank lever with the pivoted frame; a winding shaft; and a chain connecting the other arm of the bell-crank lever with the winding shaft.

17. In a car motor, the combination of an engine without throttle to run continuously as long as the generators furnish steam; a shaft driven by said engine and provided with a loose wheel, P′; a clutch on said shaft co-acting with the loose wheel; a fixed gear wheel on the car axle; a wheel, Y, in constant engagement with the loose wheel; a pivoted frame carrying two intermediate wheels; a winding shaft, W; and connections for operating the clutch to stop and start the car; and a second winding shaft, Z′, connected with the said pivoted frame to reverse the movement of the car.

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

JOEL C. SLAUGHTER.

Witnesses:
H. D. S. KNIFFIN,
C. GORDON.