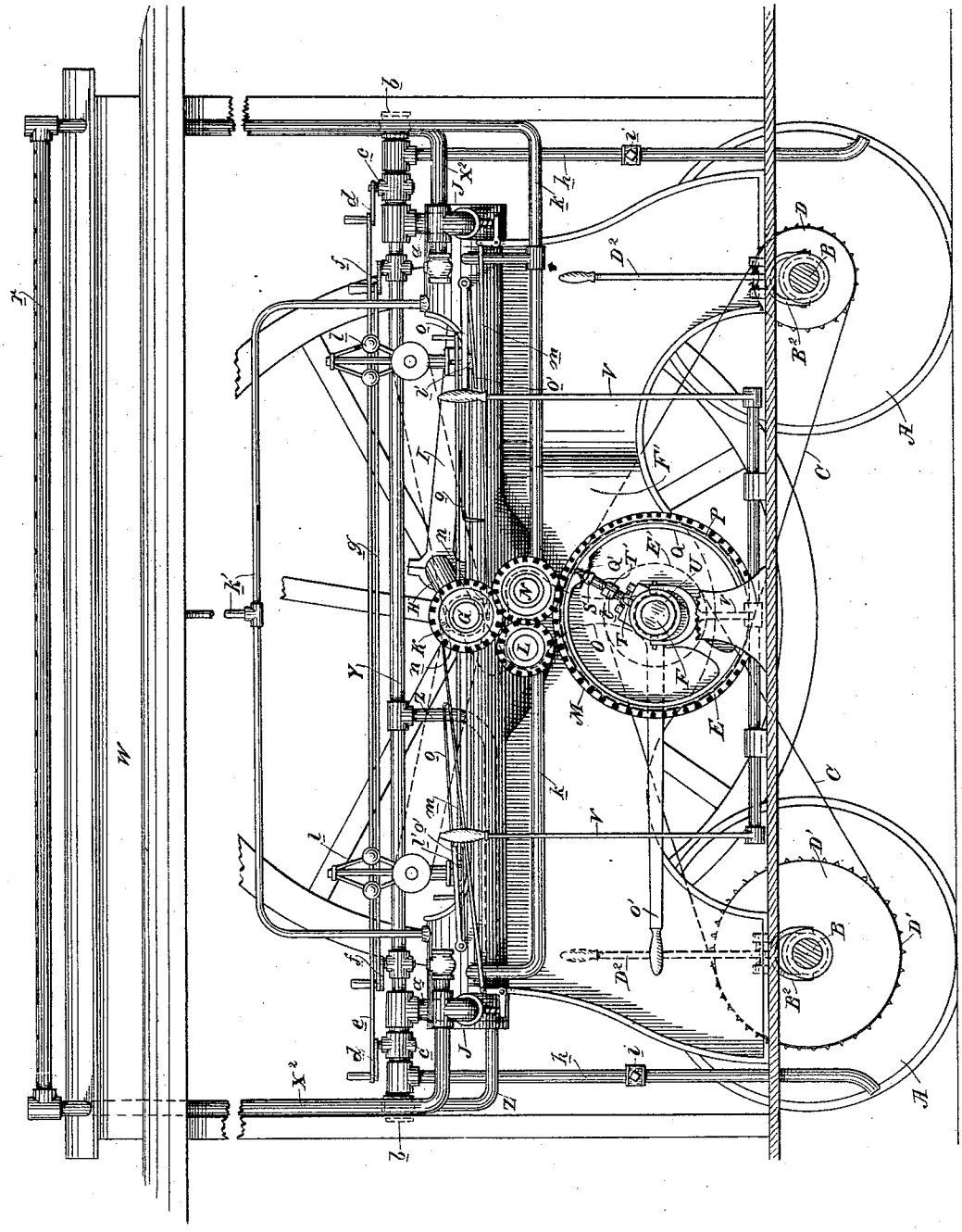
(No Model.) 3 Sheets—Sheet 1.

D. BEST.

GAS ENGINE MOTOR FOR CARS.

No. 484,728. Patented Oct. 18, 1892.



Witnesses,
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Fig. 1.

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Fig. 2.

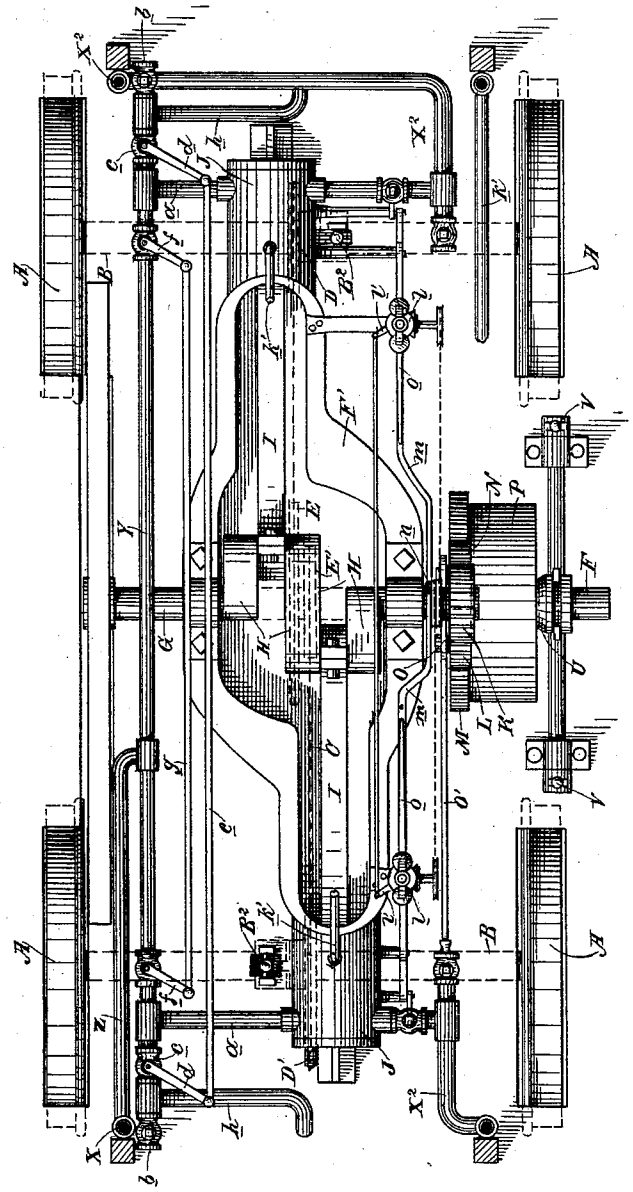

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Fig. 3.

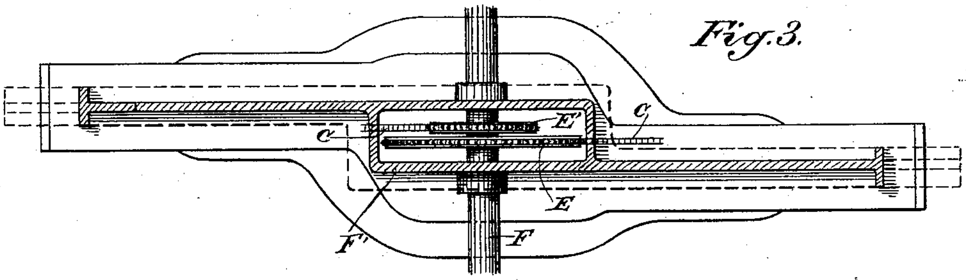


Fig. 4.

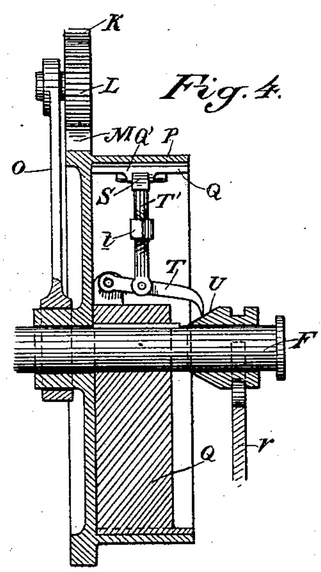


Fig. 5.

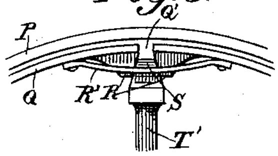


Fig. 6.

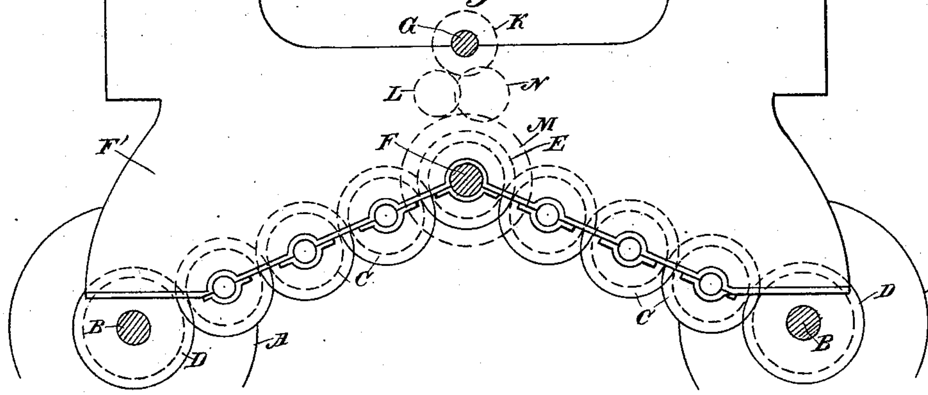
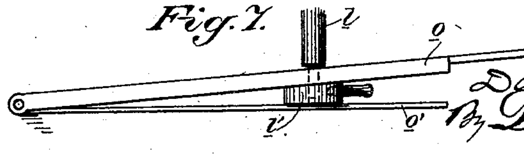


Fig. 7.



Witnesses,
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H. F. Ascheck

Inventor,
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UNITED STATES PATENT OFFICE.

DANIEL BEST, OF SAN LEANDRO, CALIFORNIA.

GAS-ENGINE MOTOR FOR CARS.

SPECIFICATION forming part of Letters Patent No. 484,728, dated October 18, 1892.

Application filed April 1, 1892. Serial No. 427,395. (No model.)

To all whom it may concern:

Be it known that I, DANIEL BEST, a citizen of the United States, residing at San Leandro, Alameda county, State of California, have invented an Improvement in Gas-Engine Motors; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to a gas-engine and the transmission of power from it to propel a car.

It consists in certain details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of the motor-car with a sufficient portion removed to show the interior arrangement of the mechanism. Fig. 2 is a plan view of the operating mechanism. Fig. 3 is a horizontal cross-section through the frame, showing the location of the sprocket-wheels upon the shaft F. Fig. 4 is a vertical section through the gear M and drum P, showing the friction-clutch mechanism. Fig. 5 is a detail of the clutch-actuating wedge and the guide. Fig. 6 shows a train of gears which may be substituted for the sprocket wheels and chains. Fig. 7 is a detail showing a device for throwing the governor out of action.

In the present case I have shown my apparatus as mounted upon a car having bearing-wheels A and the axles B, through which power is transmitted to rotate the wheels by means of chains C, passing around sprocket-wheels D D′ upon the axles B, and corresponding sprocket-wheels E E′ upon the main driving-shaft F. This shaft receives power by means of intermediate gearing, to be hereinafter described, from the crank-shaft G, which is journaled in a framework directly above the shaft F, and its cranks H have connected with them the pitmen I, and these connect with the pistons in the two oppositely-placed horizontal cylinders J, the operation of which will be very fully described hereinafter.

The two sprocket-wheels E E′ upon the shaft F are inclosed in a rectangular chamber made in that part of the frame F′ through which the shaft F passes. The opposite sides of the rectangle are in line with the end extension of the frame, as shown in Fig. 3. Vertical slots are made through the ends of the rectangular chamber, through which the chains from the sprocket-wheels E E′ pass to the sprockets D and D′ upon the two bearing-wheel shafts. These sprocket-wheels are made of different proportions, so that a fast speed may be given the car by throwing the sprockets E D into action, and a slow speed by the use of the sprockets E D′.

D^2 are levers by which clutches B^3 are actuated, so that either one of the driving-sprockets D D′ may be caused to drive the car while the other is disengaged. These clutches may be of that class in which one member slides upon a feather upon the shaft and the other turns loosely upon the shaft, but is caused to turn with it when the two parts of the clutch are engaged.

The shaft G has fixed to it a pinion K, and upon the shaft F is loosely mounted a friction-drum and a gear-wheel M, the periphery of which is sufficiently different from the pinion K to admit the intermediate pinions L and N, which are journaled upon a movable yoke O. This yoke has its center about the shaft F, and it is moved by a lever O′, which partially rotates it around the shaft F. The pinions L and N mesh with each other and the pinion N always remains engaged with the gear M, because it is moved with the yoke about the shaft F, upon which M is mounted. The pinions L and N being both journaled upon the yoke O are movable with it, and when one is thrown into gear with pinion K the other is thrown out of gear. Thus when the yoke is moved to the left, as in Fig. 1, N gears with K and M and transmits motion to the gear M and shaft F, while pinion L (which always remains in gear with pinion N) turns as an idler. If the yoke is moved to the right, the pinion N will be disengaged from the pinion K and the pinion L will be thrown into gear with it, thus introducing one more pinion into the train between K and M, which reverses the movement of the latter and its connections with the bearing-wheels A.

In order to prevent sudden abrupt shocks to the gearing when such reversals take place, I employ a friction-clutch consisting of the exterior drum P, turning loosely upon the shaft F and in unison with the gear M, and an elastic expansible band Q, so connected as to turn with the shaft, and having a mech-

anism by which it can be expanded to bind tight within the drum, so that the movement of the gear may be gradually transmitted to the wheel-axles.

The clutch mechanism consists of an elastic band Q, extending around within the periphery of the drum P, the ends of the band being separated from each other at one side, as shown at Q′, and connected with the shaft from the opposite side. Within each of these adjacent but separated ends are inclined faces, and between these faces is a wedge S, which may be forced outward between these inclined faces, thus forcing the separated ends of the band Q apart and causing the whole of the band to press tightly against the interior of the drum P, thus causing the drum to communicate its motion through the band Q to the shaft F, with which the opposite part of the band is connected.

The means for operating the wedge S consist of the arm T, which is acted upon by the beveled face of a hub U, which slides upon the shaft F and is actuated by a lever, as shown at V. When this hub is moved in one direction, its inclined face lifts up the lever-arm T, forcing it outward and through the connecting-rod T′. The wedge S is forced outward between the inclined sides R, thus expanding the band Q. When the hub is moved in the opposite direction, the lever T will be allowed to drop toward the center, thus relieving the pressure upon its band Q and releasing the drum. The length of the rod T is adjusted by means of a nut *t*, turning upon the right and left screw-threads of the meeting ends of the two parts of which the rod is composed. The wedge S is guided and kept in place between the inclined jaws R by a slotted elastic guide-plate R′, bolted to the band Q and extending upon each side of the wedge S as shown in Fig. 5.

It is manifest that various devices may be employed to reverse the motion of the car-wheels while the engines are always traveling in the same direction; but the device here described is simple, easily manipulated, and fulfills all requirements.

The supply of gasoline or other liquid for producing the inflammable vapor by which the engines are actuated is contained in a tank within the roof W of the car, the vapor passing down from the vaporizing-chamber through a pipe X by the side of one of the posts by which the roof of the car is supported, and passes thence into a horizontal pipe Y through a connecting-pipe Z. (Plainly shown in Fig. 2.) From the horizontal pipe Y the vapor is delivered to either of the cylinders J, as desired, through pipes *a*. The air which is mixed with the vapor to make it explosive enters through the ends *b*, and the supply is controlled by cocks at *c*, which are actuated by levers *d*. These levers are connected together by a rod *e*, extending from one to the other, as shown in Fig. 2, and the levers *f*, by which the supply of gasoline vapor is admitted to meet the air-supply, are connected by the rod *g*, so that they may be operated simultaneously by the engineer, who may be either at one end or the other of the car. There is a check-valve at each of the ends *b* of the air-admission pipe, so that when the vapor is ignited and the explosion takes place in the cylinder the outward force of the small portion of the gas will be prevented from passing through the open ends at *b*. A pipe *h* is connected with the main supply-pipe intermediate between the valve *c* and the check-valve at the outer end, and this pipe discharges underneath the car, as shown in Fig. 1, so that the small portion of gas escaping in this manner will be discharged beneath the car and not in such a way as to annoy passengers. This pipe is also provided with the check-valve at *i*, which closes inwardly and prevents air being drawn in through the pipes *h*, which would also allow dust to pass into the engine-cylinders if they were used as supply-pipes. The exhaust from the engine-cylinders passes up through the roof by pipes X^2 and into a horizontal pipe *r*, having numerous small perforations, as shown, through which the exhaust-products escape with little or no noise.

Water for circulation around the cylinders passes down from a tank in the roof or upper part of the car and is delivered through a pipe *k*, while the return-pipes, through which the water is circulated and returned to the tank, are shown at *k*′.

l are governors, one for each of the engines, both being driven by belts from the engine-shaft.

The exhaust-valves in this engine are closed by springs and are opened by rods *m*, which are actuated by lugs or cams *n* upon the shaft G, so as to alternately open those valves which are closed by the springs as soon as the rods are released from the cams.

The governors are connected with rods *o*, which are movable so as to engage these connecting-rods *m*, and when the speed increases to too great a degree these rods engage holes in the connecting-rods *m* and hold them back so as to prevent the springs from closing the valves which thus remain open to allow air to be freely sucked in and forced out of the cylinder through the exhaust-openings, while no explosive mixture will be drawn in through the inlet-valves by the movement of the piston. This same object may be accomplished by a hand device which will throw the rods *o* into engagement with the valve-connecting rods *m* and produce the same result. This device consists of a wedge-shaped disk *l*′, in the center of which the lower end of the governor-spindle has its step. The disk is supported upon a bar or plate *o*′, and has a handle by which it may be rotated. The rod *o* passes across the top of the disk *l*′, and when the disk is turned so that the narrowest edge is nearest the fulcrum of the arm *o* the latter drops low enough to allow its hooked end

to engage the hole in the rod *m*. When the disk is turned half a revolution to bring its thickest edge nearest the fulcrum of *o*, it raises the rod until its hooked end is disengaged from the rod *m*, and the governors will then have no effect upon the engines. When the engines run slower, these hook-rods *o* are disengaged from the rods *m*, and the latter and the valves are then subjected to the usual action of the cams upon the shaft G.

The whole mechanism is designed to produce a double-acting double-ended motor, with such connections that the operating mechanism can be controlled from either end at pleasure, while the engine may be reversed and made to run in either direction without reversing the motion of the engines.

By the novel construction of the engine-frame shown in Fig. 3 I am enabled to use the rectangular chamber F′ in the web of the frame as a housing for the sprocket-wheels E E′, and I am enabled to locate them directly beneath the engines and in the center of the car. This economizes space and enables me to place the sprocket-wheels upon the bearing-axles approximately near the central portion of the axles, and the clutch-levers D^2 are also conveniently located on a central line.

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

1. A car having mounted upon it the horizontal gas-engines, an interposed crank-shaft to which the connecting-rods of these engines are united from opposite sides, a pinion mounted upon the engine-shaft, a supplemental shaft having a gear-wheel mounted upon it, and intermediate movable pinions and reversing mechanism whereby the car may be driven in opposite directions without reversing the motion of the engines, substantially as herein described.

2. A car having the horizontal cylinders mounted upon opposite sides of a crank-axle, to which their pistons are connected by connecting-rods, a pinion K, mounted upon the engine-shaft, a shaft journaled beneath the engine-shaft, and a gear-wheel M, turning loosely upon said shaft and adapted to be engaged by either one or the other of two pinions movable between the gears K and M, a drum connected with the gear M, a clutch mechanism, and a means for actuating the same, whereby the drum may be temporarily connected with the shaft or disengaged therefrom, sprocket-wheels upon this shaft, chains passing around said sprocket-wheels, and other sprocket-wheels D upon the axles of the car, whereby power is transmitted to the car, substantially as herein described.

3. A car or motor having engines connected with a crank-shaft, a pinion K, fixed upon the shaft, a second transverse shaft journaled parallel with the engine-shaft and having a gear-wheel M fitted upon it, with a space intervening between the peripheries of the gear M and pinion K, an arm or yoke fulcrumed upon the gear-shaft, and a lever by which it is turned about its fulcrum, in combination with pinions L and N, journaled upon the yoke and movable with it about the gear-shaft, whereby either the pinion L or N is engaged with the pinion K, while the pinion N remains constantly engaged with the gear M, substantially as herein described.

4. A car or motor having engines connected with a crank-shaft, a pinion fixed upon the crank-shaft, a second shaft F parallel with the crank-shaft, having a gear-wheel M and drum P turning loosely upon it, intermediate pinions movably journaled to transmit and reverse motion from the crank-shaft pinions to the gear M, and a hand Q, fixed to the shaft F concentric within the drum and having the inclined separated ends, in combination with the wedge S, the lever T, connected with it, and the sliding cone U, movable upon the shaft and engaging the lever to move the wedge and expand the band to form a frictional driving-contact between itself and the drum or to release it therefrom, substantially as herein described.

5. A car having horizontal engines mounted thereon, the connecting-rods of said engines uniting with the crank of a shaft journaled transversely upon the car, a second shaft journaled below the engine-shaft with sprocket-wheels, and chains connecting the sprocket-wheels with the axles of the car, a gear M, mounted loosely upon the second shaft, a pinion K upon the engine-shaft, a yoke turning about the second shaft, intermediate-engaged pinions L N, journaled upon the yoke and movable therewith, so that either of the pinions L or N may be engaged with the pinion K to propel or reverse the motion of the car, the clutch mechanism, and shifting-lever whereby the loose gear M is connected with the shaft or disengaged therefrom, substantially as herein described.

6. The car having the oppositely-placed horizontal gas-engines, intermediate connection between said engines and the car-axles, whereby they may be driven in either direction, a gasoline tank and vaporizer situated in the roof of the car, posts by which the roof is supported, a pipe adjacent to one of said posts and connecting with the vaporizer, a horizontal pipe situated within the body of the car and connected with the vertical pipe, pipes connecting said horizontal pipe with the two cylinders, valves by which the supply to the cylinders is controlled, and a rod connecting said valves, so that they may be opened or closed simultaneously from either end of the car, substantially as herein described.

7. A car having the oppositely-placed horizontal engines connected with a crank-shaft, intermediate mechanism through which power is transmitted from the engines to drive the car in either direction, a gasoline tank and vaporizer situated in the upper part of the

car, a pipe leading therefrom delivering vapor into a horizontal reservoir-pipe, connections from said reservoir-pipe to the engine-cylinders, controlling-cocks united and movable together, and air-supply cocks similarly connected and controlled, whereby the air to be mixed with the gasoline vapor is delivered with the latter to the engine-cylinder, substantially as herein described.

8. In a car or motor, the wheel-axles, sprocket-wheels, chain-driving shaft, and intermediate gearing, a gas-engine from which power is derived, posts supporting the car-roof, adjacent pipes and connection between said pipes and the exhaust-ports of the engine, and a perforated horizontal pipe supported above the roof and connected with the exhaust-pipes, so that the exhaust-gases are subdivided before escaping into the open air, substantially as herein described.

9. In a car or motor, the bearing-wheel axles having sprocket-wheels D D′ of different sizes turning loosely upon them and carrying one member each of a clutch, other clutch members moving upon longitudinal feathers and turning with the axles, and levers whereby one clutch is engaged with its sprocket-wheel and the other disengaged to change the speed of the car, connecting-chains and corresponding sprocket-wheels E E′ upon a counter-shaft extending across the car beneath the engine-shaft and centrally between the axles, a loose gear-wheel M upon this shaft, through which motion is derived from the engine-shaft, and a frictional clutch by which the gear-wheel is connected to turn with the shaft or disengaged therefrom, substantially as herein described.

10. The sprocket-wheels D D′ upon the bearing-wheel axles and corresponding sprocket-wheels E E′ upon a counter-shaft driven from the engine of a car or motor, in combination with the web or frame F′, formed with a central rectangular housing through which the counter-shaft passes and within which the sprocket-wheels E E′ are inclosed and protected, substantially as herein described.

11. In a car or motor, the bearing-wheels, a counter-shaft, and intermediate driving gear, engines from the crank-shaft of which the counter-shaft is driven, engine-valves, and connecting-rods *m*, driven by rotating lugs carried by the engine-shaft attachments, and governors connected with hook-rods *o*, which engage with or are disengaged from the rods *m*, in combination with supplemental controlling device consisting of the rotary wedge-shaped disks *l′*, upon which the rods *o* bear, and means for turning the disks so as to allow the hook-rods *o* to engage with or be disengaged from the rods *m*, substantially as herein described.

In witness whereof I have hereunto set my hand.

DANIEL BEST.

Witnesses:
C. H. GRAY,
W. S. PETERS.