No. 661,409. Patented Nov. 6, 1900.

G. W. LEWIS.

MOTOR VEHICLE.

(Application filed May 25, 1898.)

(No Model.) 4 Sheets—Sheet 1.

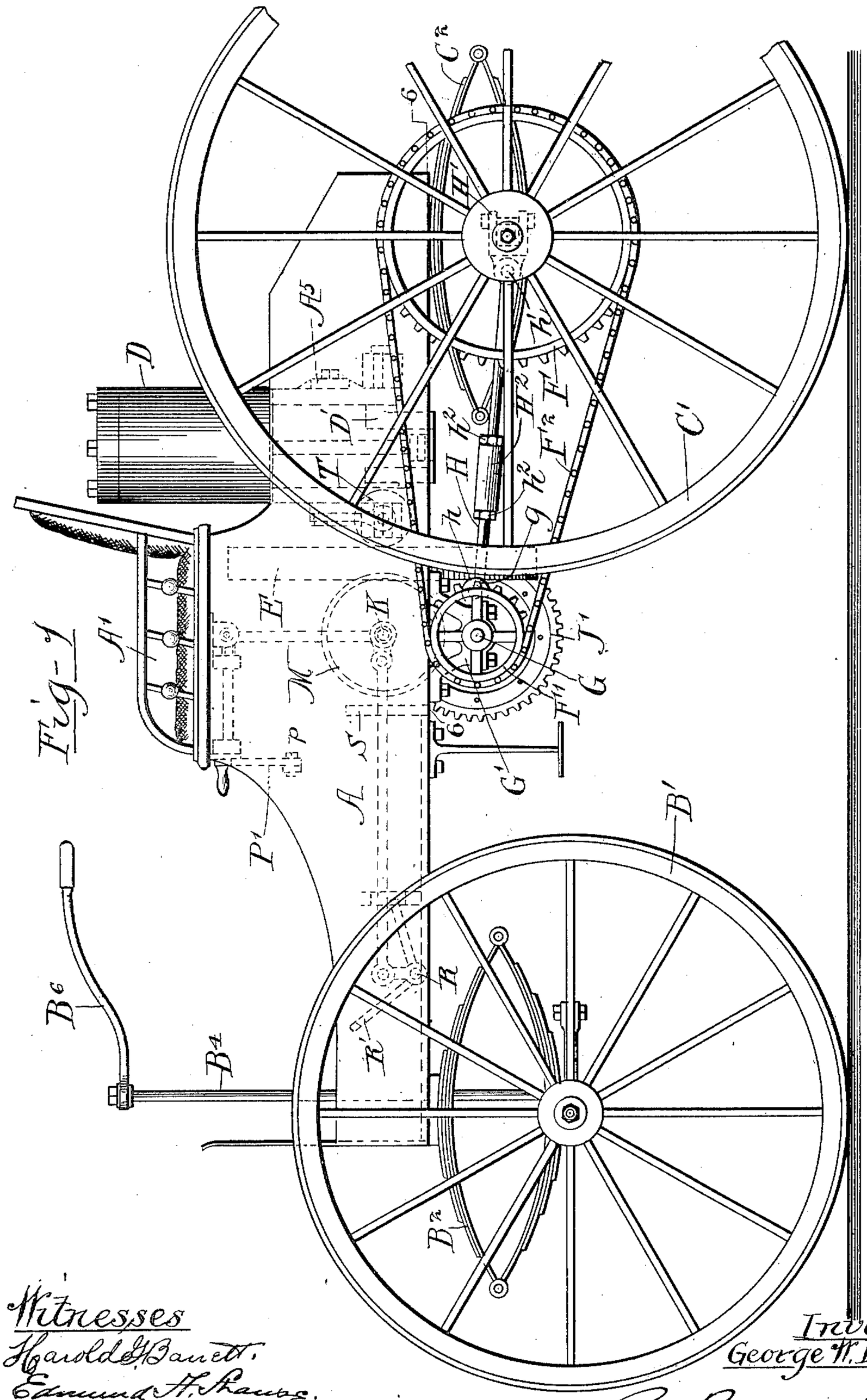

Fig. 1.

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4 Sheets—Sheet 2.

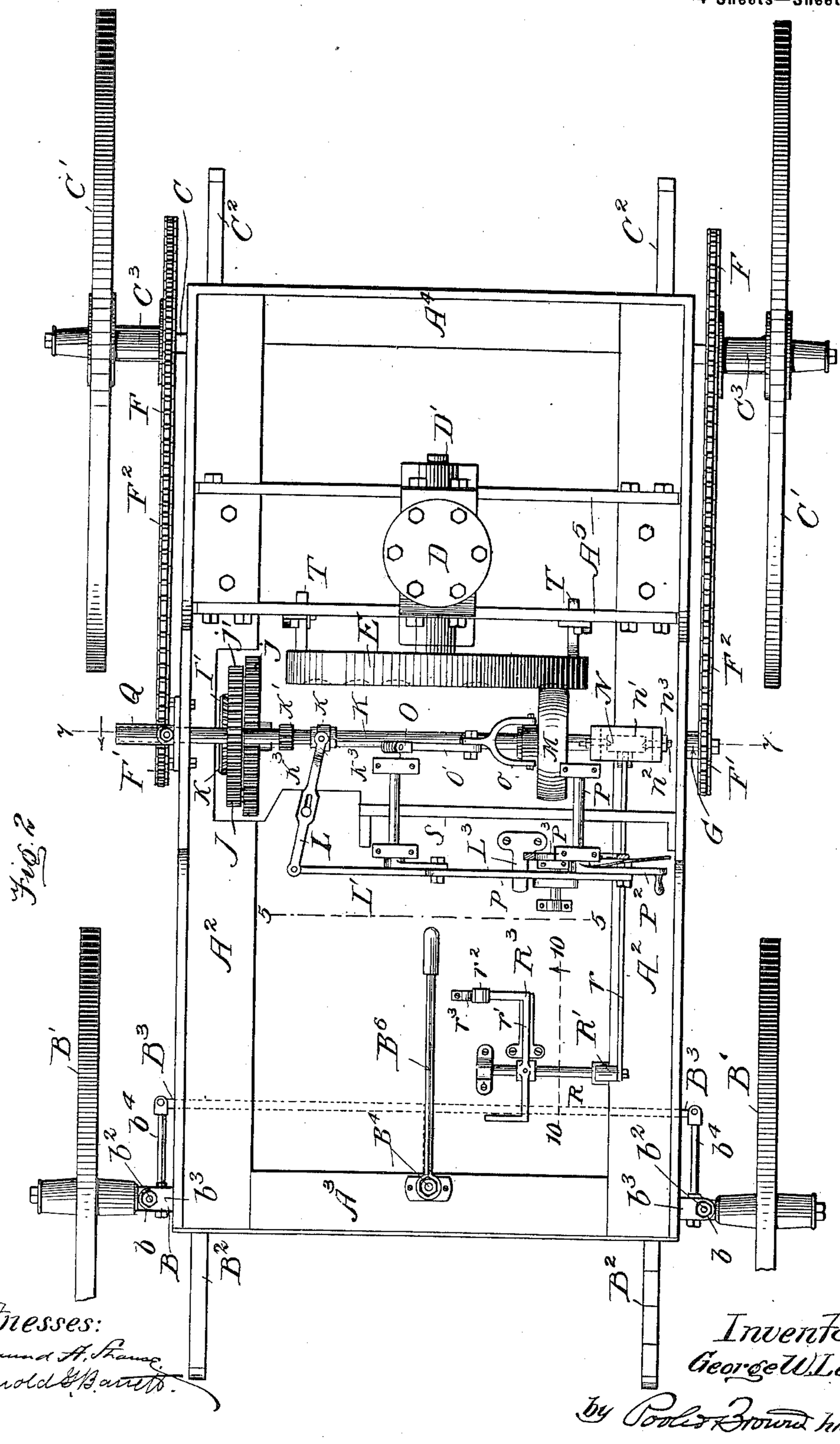

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

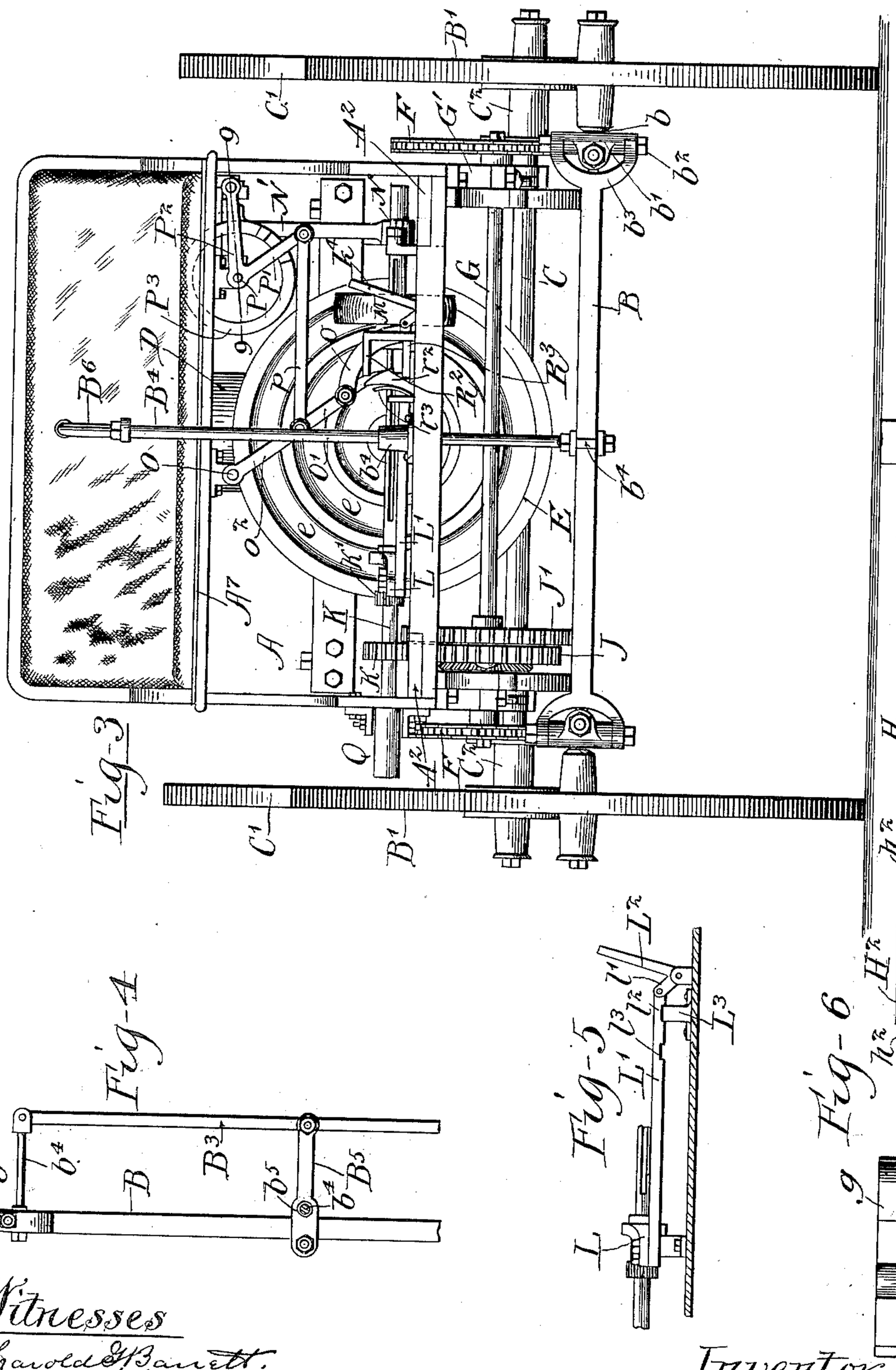

Fig-3

Fig-4

Fig-5

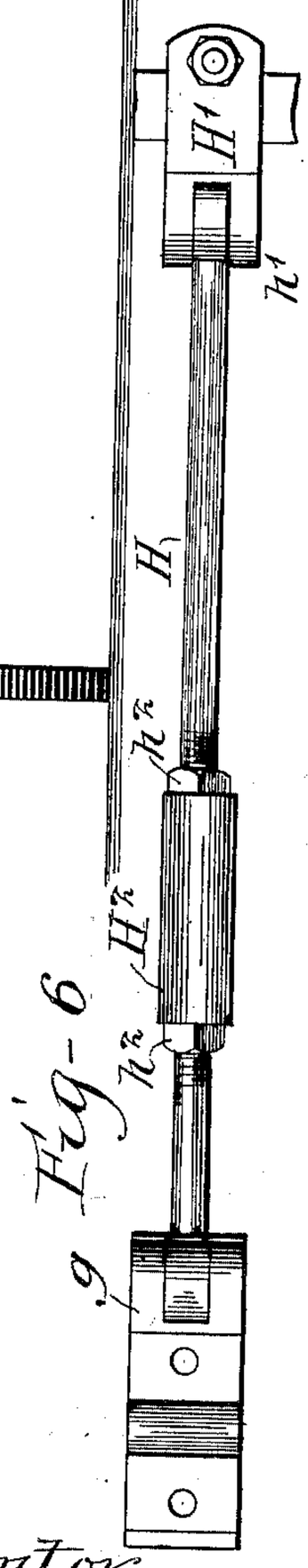

Fig-6

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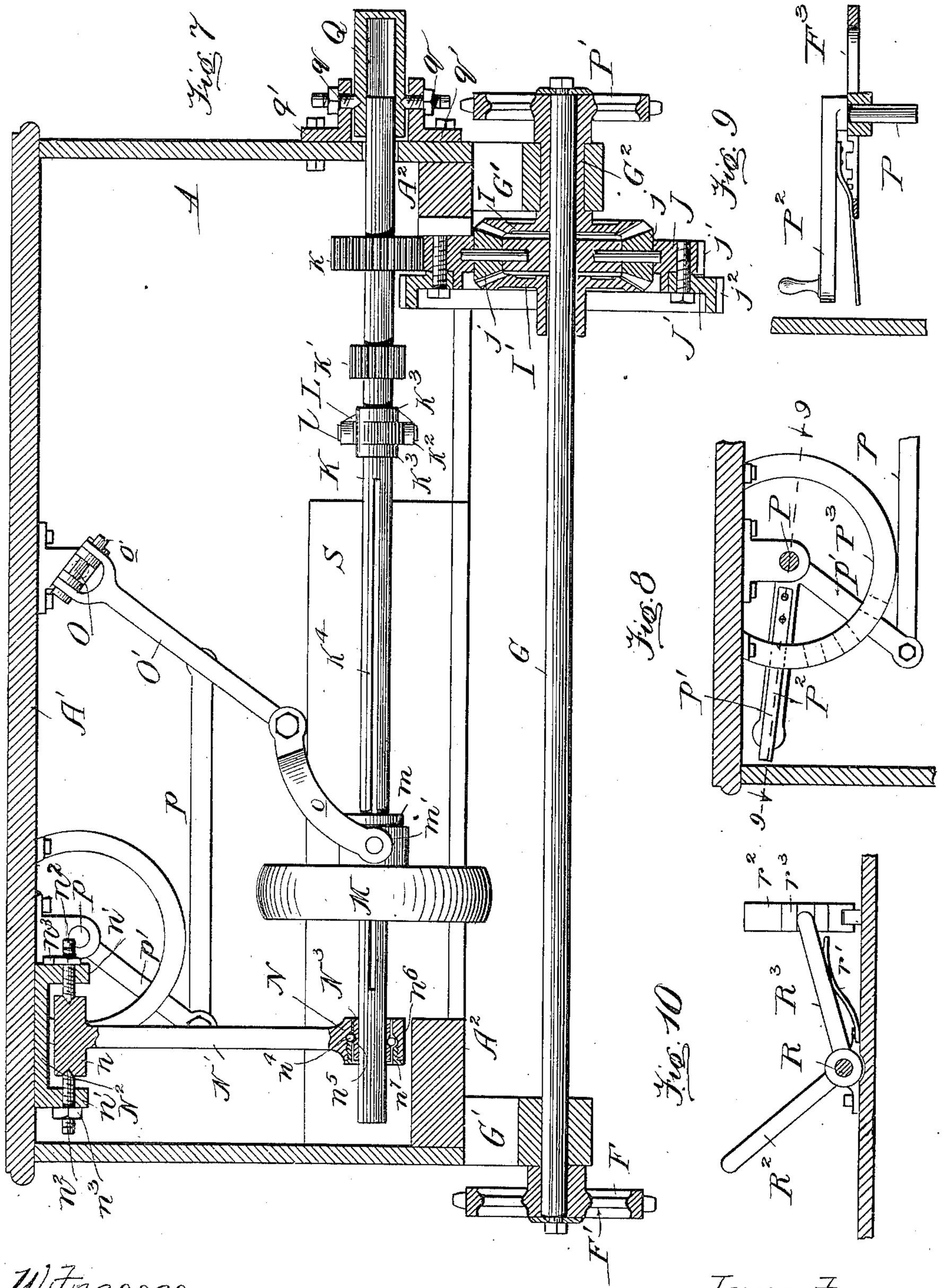
MOTOR VEHICLE.

(Application filed May 25, 1898.)

(No Model.)

4 Sheets—Sheet 4.



Witnesses
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UNITED STATES PATENT OFFICE.

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MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 661,409, dated November 6, 1900.

Application filed May 25, 1898 Serial No. 681,664. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. LEWIS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Motor-Vehicles; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to motors for vehicles, and more especially to the driving connections between the engines or prime movers of such vehicles and the driving-wheels thereof, by which power is transmitted from the former to the latter and by which the vehicle may be stopped or started and its direction of motion and speed changed at the will of the operator.

The invention also embraces a friction-brake by which the speed of the motor may be regulated.

The features of construction embodying my invention are more particularly intended for use in connection with gas or vapor engines; but the principal features thereof may be employed in connection with other motors.

One practical embodiment of the matters constituting my invention is shown in the accompanying drawings, in which—

Figure 1 is a view in side elevation of a vehicle embodying my invention. Fig. 2 is a plan view thereof. Fig. 3 is a view thereof in front elevation with the front wall of the vehicle-body removed to show the parts behind the same. Fig. 4 is a fragmentary detail plan view of the front axle and connected parts. Fig. 5 is a detail section taken on line 5 5 of Fig. 2. Fig. 6 is a detail plan view of the distance piece or rod which connects the rear axle with the vehicle-body. Fig. 7 is a cross-section through the vehicle-body, taken on line 7 7 of Fig. 2. Fig. 8 is a detail elevation taken from the rear, showing the hand-lever which actuates the speed-controlling devices. Fig. 9 is a plan section taken on line 9 9 of Fig. 8. Fig. 10 is detail sectional elevation taken on line 10 10 of Fig. 2.

As shown in said drawings, the body of the vehicle is indicated by A, the same in this instance having the form of a box or body of a light road-wagon and as being provided with a transversely-arranged seat A′, arranged centrally of the body in the manner illustrated. Said body A is shown as being provided with a rectangular frame, which forms the supporting-frame to which the several operative parts of the motor are attached or on which they are mounted, said frame in this instance consisting of longitudinal frame-pieces A^2 A^2, cross-pieces A^3 A^4 at the front and rear of the vehicle-body, and two parallel cross-girths A^5 A^5, located at the rear of the seat A′ and by which the motor proper or prime mover is supported.

B indicates the front axle of the vehicle; C, the rear axle thereof; B′ B′, the front wheels, and C′ C′ the rear wheels, of the vehicle.

D indicates the cylinder of a gas or vapor engine or other prime mover having a reciprocating piston, the cylinder herein shown being that of an explosive gas or vapor engine, which latter form of prime mover is preferred by reason of its lightness and the ease and convenience with which it may be operated and controlled. Said cylinder is supported by direct attachment to the cross-girths A^5 A^5 of the frame and is located centrally of the vehicle-body.

D′ indicates the crank-shaft of the motor, the same being located below the cylinder and arranged longitudinally of the vehicle-body or at right angles to the rear axle thereof. At its forward end the crank-shaft D′ carries a heavy metal disk E, which in the particular construction shown forms the balance-wheel of the engine, but the essential purpose of which is to form one part or member of a friction-gear, through the medium of which motion is communicated from the crank-shaft of the engine to the driving-wheels of the vehicle.

The use of the friction-disk E as a balance-wheel is not essential, inasmuch as a separate balance-wheel in addition to the disk may be employed if found desirable or necessary.

The rear wheels C′ C′, above referred to, constitute the driving-wheels of the vehicle, and—to first refer to the features of construction in said driving-wheels and the rear axle—these parts are made as follows: Said rear axle C is located below the rear part of the

wagon-body, and the weight of the said body is carried on the axle through the medium of supporting-springs C^2 C^2, herein shown as made of the ordinary elliptical form. The rear driving-wheels C′ are mounted to turn on the end of the rear axle and for this purpose are provided with central hubs or sleeves C^3 C^3, which latter are provided at their inner ends with sprocket-wheels F F, said sprocket-wheels being rigidly attached to the sleeves or hubs and affording means by which motion is transmitted to the driving-wheels. A driving-shaft G, mounted on the vehicle-body at a point considerably in advance of the rear axle and in the instance shown beneath the seat A′, affords the means of communicating motion from the driving devices or motor proper to both driving-wheels, driving connection between said shaft and the sprocket-wheels F F being provided by means of sprocket-wheels F′ F′ on the opposite ends of the shaft G and chains or belts F^2 F^2, which pass over the sprocket-wheels F and F′. The said shaft G is supported in bearings G′ G′, which are attached to the frame-pieces A^2 A^2 and in the instance shown have the form of brackets extending below the wagon-body.

H H are rigid connecting-rods or distance-pieces, which are located at opposite sides of the vehicle-body and pivoted at their rear ends to the ends of the rear axle and at their forward ends to the vehicle-body adjacent to the driving-shaft G. The purpose of these distance-pieces is to maintain the rear axle at approximately a uniform distance from the shaft G, so as to maintain the rear axle accurately in operative position relatively to the driving-shaft, notwithstanding the fact that the rear axle is connected with the wagon-body by spring connection, it being obvious that in the absence of such distance-pieces and connecting-rods the rear axle will have considerable movement either forwardly or rearwardly with relation to the wagon-body under the strains arising from contact of the wheels with irregularities of the ground or other similar causes. The forward ends of the coupling-rods H are preferably pivoted to the wagon-body at points adjacent to the shaft G, and the pivotal connection may be desirably concentric with the shaft. As herein shown, however, the forward ends of the said coupling-rods are connected with eyes *g*, formed integral with the shaft-bearings, by means of pivot-pins *h*. At their rear ends the coupling-rods are connected by pivots *h*′ with shackles H′, secured to the rear axle in the manner shown, Figs. 1 and 6. A turnbuckle H^2, applied to the separated parts of the coupling-rod H, enables the length of the rod to be accurately adjusted, jam-nuts h^2 being employed on the rod to maintain the parts from movement after adjustment.

The driving connection by which motion is transmitted from the motor to the rear or driving wheels embrace a device applied for equalizing the power transmitted to the driving-wheels, and also a speed-changing device, of which the disk E forms a part or member, and a second separate speed-changing device formed by spur-gears, both of the said speed-changing devices being controlled by means of hand or foot levers within reach of the operator. The equalizing device referred to is applied to the shaft G and is made as follows: Mounted on the end portion of said shaft G at one side of the vehicle is a sleeve G^2, to which the sprocket-wheel F′ at that side of the vehicle is attached and which extends through the bearing G′, so that the end of the said shaft G turns in said sleeve instead of resting directly in said bearing. To the inner end of said sleeve is secured a gear-wheel I and to the shaft G is another gear-wheel I′. The gears I and I′ are beveled gears and the teeth thereof intermesh with beveled pinions *j j*, which are carried by a gear-wheel J, which latter is mounted to turn loosely on the shaft G between the said gear-wheels I and I′, the gear-wheel J being considerably larger in diameter than the beveled gears I and I′. Said gear-wheel J is provided with two sets *j*′ j^2 of peripheral gear-teeth or, in other words, is a double gear-wheel having two parts of unequal diameters, the part having the gear-teeth j^2 being larger than that having the gear-teeth *j*′. In the particular construction shown the larger part of the gear carrying the teeth j^2 is formed by a separate ring J′, secured to the side face of the gear J; but this construction is not essential. The gear-wheel J constitutes the medium through which rotary motion is transmitted from the motor to the driving-shaft G, and said gear-wheel J is adapted to engage either the one or the other of two gear-pinions *k k*′, which are mounted on a shaft K, arranged parallel with the shaft G. The said shaft K is driven from and, in fact, forms part of the friction speed-changing devices hereinbefore referred to, and it constitutes, together with the double spur-gear J, a positively-acting speed-changing device adapted to give, when desired, a slow motion with greater power to the driving-wheels. Referring, however, more particularly to the action of the equalizing devices described, it is obvious that as long as both driving-wheels turn at the same speed there will be no relative movement thereof or of the gears I and I′, and the beveled pinions *j* will merely turn with the wheel J and will serve as a means of connecting the said wheel J with the driving-shaft. If, however, one of the driving-wheels is caused to rotate faster than the other, as occurs in turning or altering the course of the vehicle, the gears I and I′ will turn relatively to each other, thereby rotating the pinions *j* while the wheel J continues to rotate at the uniform speed at which it is being driven. The change in the relative motions of the two driving-wheels will thus be permitted without interfering with

the proper transmission of power thereto, or, in other words, the application of power to the two driving-wheels is equalized. It is to be noted in this connection that an equalizing device embracing the same general features of construction is not in itself new, my invention with respect to said equalizing device being limited to the arrangement of the same relatively to other parts of the motor illustrated.

To now refer to the spur-gear or positively-acting speed-changing device hereinbefore referred to, the same consists of the gear-wheel J, having the two sets of teeth j' j^2 and the shaft K provided with the two pinions k k', said pinions being rigidly attached to the shaft and the shaft being movable endwise in its bearings to permit either of the pinions to be thrown into mesh with the gear-wheel J, as desired. Said pinion k is made larger than the pinion k' and is adapted for engagement with the gear-teeth j', while the smaller pinion k' is adapted to intermesh with the gear-teeth j^2 on the larger part of the gear-wheel. In case an ordinary speed of from four to ten miles an hour is required the pinion k is kept in engagement with the wheel J and minor variations in speed required in running are taken care of by the friction speed-changing devices hereinbefore referred to. In case, however, it is desired that the vehicle should run very slowly, but should be propelled with much power, as in climbing hills, the shaft K is shifted endwise to bring the smaller pinion k' into mesh with the wheel J, thereby giving slower motion to the driving-wheels, but turning them with greater power.

For giving endwise movement to the shaft K devices are provided as follows: L, Figs. 2 and 5, is a horizontally-arranged lever which is pivoted to the vehicle-body and connected with the shaft K by means of a forked end l on the lever engaging a ring k^2, which is adapted to revolve freely between two collars k^3 k^3 on said shaft K. To the opposite or forward end of the lever L is pivoted a rod L', which extends horizontally across the floor of the vehicle-body and at the opposite side thereof is connected with an arm l', attached to a foot-lever L^2, located in position convenient for the foot of the operator. A locking device to hold the shaft at either limit of its movement is provided in connection with the shifting devices hereinbefore described, said locking devices consisting of a leaf-spring L^3, attached to the floor of the vehicle-body and adapted to engage one or the other of two notches l^2 l^3, formed in the lower surface of the rod L'. Said spring L^3 is located near the foot-lever L^2 in such position that it may be acted on by one foot of the operator while the other foot is engaged in moving the foot-lever, so that the spring may be easily disengaged from the rod L' at the time it is desired to move or shift the shaft K for changing the speed of the vehicle.

To now refer to the friction speed-changing gear hereinbefore mentioned, the same is constructed as follows: The shaft K, hereinbefore referred to, extends across the machine in front of the disk E and parallel with the latter. Said shaft carries a friction wheel or pulley M, which is adapted to run against the face of the disk E and is mounted to slide endwise on the shaft K. Said pulley acts in connection with the disk E generally in the same manner as the corresponding parts in other similar friction-gearing, giving a more rapid movement to the shaft K when near the outer part of the disk and a slower movement when near the center of the disk. The pulley M, while free to move endwise on the shaft K, is held from turning thereon by means of a longitudinal groove k^4 in the shaft, which is engaged by a spline in the hub m of the pulley M.

For shifting the pulley endwise on the shaft devices are provided as follows: m' is a sleeve or ring which engages a groove in the hub m of the pulley. Mounted on the seat A' or other suitable support above the shaft K is a rock-shaft O, which is provided at its end adjacent to the shaft K with a depending arm O', the lower end of which is connected by means of links o o with the sleeve m'. At its opposite or forward end the shaft O is provided with a second depending arm O^2, located below the front edge of the seat A' at a point beneath said seat. At the right-hand side of the vehicle is mounted a short rock-shaft P, having a depending arm P', the lower end of which is connected with the arm O^2 by a connecting-rod p. Attached to said shaft P is a hand-lever P^2, which is conveniently arranged in the same plane with the arm P' and which is provided at its rear or inner face with a spring arm or detent p', adapted for engagement with either one of a series of notches formed in a segmental bar or notched segment P^3, arranged concentrically with the hand-lever. The spring-detent p' can be moved by the hand of the operator to release it from the notches of the segment P^3, so that the hand-lever may be easily disengaged from the notched segment and moved to any point desired. Actuation of said hand-lever obviously results in the movement of the pulley M along the face of the friction-disk, so as to increase or decrease the speed of the shaft K, as desired. To provide for lateral movement of the arm O' when the shaft K is shifted toward or from the disk, said arm is connected with the rock-shaft O by means of a transverse pivot-pin o', Fig. 7.

The disk E is provided with a plurality of concentric grooves e e and the periphery of the pulley M is rounded to fit within said grooves, this construction affording proper frictional engagement between the pulley and the disk. Provision is made for the movement of the pulley M on the shaft K past the center of the disk E, so that said pulley may be shifted to bring it to a point at either side

of the center of the disk, thereby providing for the reversal of the direction of motion of the vehicle without requiring any manipulation except to throw the hand-lever the distance required for properly shifting the pulley.

In order that the pulley M may be shifted or moved away from the face of the disk, so as to disengage the parts when it is desired to stop the vehicle, devices are provided as follows: The end of the shaft K nearest the disk E is mounted in a laterally-movable bearing N, which is connected with an actuating-lever under the control of the operator in such manner that the friction-pulley may be thrown against or released from the disk E at will, a spring being preferably applied in such manner as to hold the pulley normally away from the disk, so that the operator need only use power in moving the pulley toward the disk and disengagement of the parts will be effected automatically. In order to permit the necessary amount of movement in the end of the shaft K which engages the bearing N, the opposite end of said shaft or that at which the gear-pinions *k k'* are located is mounted in a bearing Q, which is movably connected with the vehicle-frame in such manner as to afford sufficient freedom of movement in the shaft without any binding of the same in the said bearing. The said bearing Q, as illustrated, consists of a short tube, the opposite sides of which are engaged by means of bearing-pins *q q*, which are inserted through brackets *q' q'* on the side wall of the vehicle and which have conical ends entering correspondingly-shaped recesses in the sleeve to afford suitable pivotal support to the latter. Said bearing-pins *q q* have screw-threaded engagement with the brackets, so that they may be moved vertically therein for the purpose of adjusting the vertical position of the bearing. Said sleeve Q is shown as closed at its outer end and is made of considerable length, so as to allow the end of the shaft to slide otherwise therein to an extent required for the shifting of either of the pinions *k k'* into engagement with the wheel J.

The bearing N is attached to a depending arm or hanger N', which is secured to a rock-shaft *n*. Said rock-shaft *n* is mounted in a bearing which is conveniently attached to the seat A' and which consists of a frame or plate N^2, having two depending arms *n' n'*, through which are inserted opposite bearing-studs n^2 n^2, having at their inner ends conical points which engage correspondingly-shaped recesses in the opposite ends of the rock-shaft. The bearing-studs n^2 have screw-threaded engagement with the arms *n' n'* and are provided with jam-nuts n^3 n^3, whereby said bearing-studs may be adjusted and rigidly secured in their changed position. The bearing N, inasmuch as it is subjected to lateral pressure of the shaft K when the pulley is pressed against the disk E, has the form of an antifriction-roller bearing, and in order that the said shaft K may move freely endwise through said bearing for shifting the gear *k k'* relatively to the wheel J the shaft itself is not directly engaged with the antifriction-rollers of the bearing, but a separate sleeve N^3 is inserted within the bearing and directly engages the shaft, the sleeve being adapted to turn with the shaft, but the shaft being movable endwise through the sleeve. In the instance shown one set n^4 only of antifriction-balls is employed, said balls resting in a groove n^5 of the sleeve N^3 and within a groove n^6, formed between the main or body part of the bearing and a removable thimble n^7, which is inserted in and has screw-threaded engagement with the body of the bearing in the manner illustrated.

For moving the bearing N so as to carry the shaft K and pulley M toward and from the disk E devices are provided as follows: R is a rock-shaft mounted in the forward part of the wagon-body, transversely to the same, and provided at one end with an upwardly-extending arm R', which is connected by a rod *r* with the said bearing N. The rock-shaft R, as clearly seen in Fig. 10, is provided with a foot-lever R^2, which extends forwardly therefrom, and also with another foot-lever R^3, extending rearwardly therefrom. Downward pressure on the foot-lever R^2 serves to draw forward the bearing N and release the pulley M from the friction-disk, while downward pressure on the foot-lever R^3 carries the said pulley toward said disk. A spring *r'*, attached to the bottom of the wagon-body and acting upwardly on the lever R^3, tends to move said foot-lever and turn the rock-shaft in a direction to carry the pulley M away from the friction-disk, so that said pulley stands normally free from the same. A spring-actuated notched detent r^2 is pivoted to the body in position for engagment with the foot-lever R^3, said detent being provided with ratchet-teeth and being held or thrown by its actuating-spring r^3 toward the foot-lever, so that as the foot-lever is depressed it will pass automatically over the ratchet-teeth and will be held by that one of the teeth with which it may be engaged until it is released. Said detent therefore serves to hold the foot-lever from rising under the action of the spring *r'* unless the detent is thrown backwardly to release it from the foot-lever. The foot-lever and detent arranged as described constitute a means by which the pulley M may be thrown and held against the friction-disk, so that the operator may remove his foot from the foot-lever without stopping the motion of the vehicle, while at the same time by throwing backwardly the detent and releasing the foot-lever the spring *r'* is allowed to act, and thus release the said pulley from the friction-disk, thereby disconnecting the motor from the driving-wheels.

The pulley M being movable toward and

from the face of the disk E, as described, and being held normally away from the disk by the spring, as described, the shifting of the said pulley M on the rock-shaft K for changing the speed of the driving-wheels will take place when the pulley is free from the face of the disk. In fact, the shifting of the pulley at such time will be necessary in cases where the pulley E is provided with grooves *e e*, as is the preferable construction and as illustrated in the accompanying drawings.

At the side of the shaft K opposite the friction-disk E and parallel with said shaft is located a friction bar or strip S, the same being located at such distance from the shaft K that the pulley M may be brought against the said strip when thrown away from the disk E. As herein shown, the friction-strip S consists of an upright board or plate which is attached to and rises from the bottom or floor of the vehicle and is secured at one end to the side of the same. It may, however, be rigidly attached or supported in any suitable manner. The friction strip or bar thus arranged in connection with the pulley M serves as a friction-retarding or brake device adapted to control or arrest the movement of the vehicle when it is desired to stop the same or under other circumstances, it being obvious that when the pulley M is brought against the strip S the friction resistance to the turning of the pulley will promptly decrease its speed of rotation, so as to check the movement of the parts of the driving-gear between the pulley and the driving-wheel, as well as to retard the forward movement of the vehicle by preventing further rotation of the driving-wheels themselves. The foot-lever R^2, which extends forwardly from the rock-shaft R, is intended mainly for throwing the pulley M forcibly against the friction-strip S, the downward pressure of the foot of the operator on said lever enabling the pulley to be pressed against the friction-strip with greater or less force, as required in regulating the speed of the vehicle or for stopping the same entirely. Inasmuch as the surface speed of the pulley M is much greater than the peripheral speed of the driving-wheel, it is obvious that a much less pressure of the pulley against the friction-strip will be required to produce the same effect in stopping the vehicle than would be required in the case of a brake-shoe acting on the driving-wheel itself. Moreover, said brake strip or shoe is so located that when the pulley or disk M is moved against the same to retard or arrest its speed said disk is entirely disconnected from the driving means, and the only force to be overcome is that of the momentum of the vehicle, and said brake does not act in any way against the driving means, so that the movement of the vehicle may be quickly controlled or arrested. So far as the brake mechanism is concerned the part of the driving mechanism engaged by the disk or pulley M may be otherwise made than here shown.

To now refer to the construction of the front axle and means illustrated for steering or directing the course of the vehicle, said front axle B is connected with the vehicle-body at each end by a spring B^2, so that the axle itself is held parallel with the front edge of the vehicle-body and is non-pivotal. The front wheels B′ are mounted on short or stub axles *b*, which, as clearly seen in Fig. 3, are secured to upright sleeves and are pivotally connected with the ends of the axle by means of vertical pivots b^2, passing through the sleeves and engaged at their ends with forked ends b^3 of said axle. Attached to said sleeves are rearwardly-extending rigid arms b^4, Fig. 4, which are connected with each other by a horizontal rod B^3, which extends across the vehicle at the rear of the front axle.

B^4 is a vertical rod having bearings in the front frame-piece A^3 and on the middle part of the front axle, as indicated at b^4 b^5. Said vertical rod is provided at its lower end with a rigid arm B^5, which is connected with the center of the rod B^3 and has at its upper end an actuating-lever B^6, which extends rearwardly toward the operator's seat A′.

The vehicle is steered by moving the operating-lever B^6 from right to left, such movement of the lever being transmitted through the rod B^4 and arm B^5 to the connecting-rod B^3, which being moved or shifted endwise turns the stub-axles on their vertical pivots. As hereinbefore stated, the friction driving device is adapted for giving such changes of speed as are required in the ordinary operation of the vehicle, while the positively-acting speed-changing device is used only when it is desired to give a very slow speed with great power for use in ascending hills, in the case of a sandy road, or under like circumstances. The disk E of the friction speed-changing device has a plurality of grooves in its face and either of which the driving-pulley may operate, and inasmuch as the positively-acting or spur-gear speed-changing device gives two different degrees of speed it follows that the machine illustrated may be driven at different degrees of speed equal in number to twice the number of grooves in the disk E^3. As shown in the drawings, the disk is provided with three grooves, and it follows that by the gearing illustrated six different degrees of speed may be obtained. It will of course be understood that when moving either at its ordinary speed or at a very slow speed the vehicle may be driven backward by shifting the driving-pulley to the opposite side of the friction-disk from that at which it is shown in the drawings. I prefer to make the friction-disk with grooves, as shown, and to cover the face of the friction-disk with leather in order to secure better adhesion of the parts in frictional contact; but this construction may not in all cases be found necessary, and it may be

found desirable to omit the grooves, in which case the pulley M may be held at any distance desired from the center of the friction-disk, thereby enabling the vehicle to be run at any intermediate speed between the maximum and minimum afforded by the friction-gearing. By providing the device which moves the pulley endwise on the shaft with a locking mechanism such as is described I am enabled to hold the said pulley positively from endwise movement either when the grooves *e e* are employed or when they are absent. The use of such locking device is desirable in any case in order that the pulley may be held from movement with the shaft K when said shaft is shifted endwise in changing from a high to a low speed, or vice versa, by bringing the pinion *k* or *k'* into mesh with the gear-wheel J.

T T are backing-rollers mounted on the cross-piece A^5 of the frame at the rear of the friction-disk E and serving to take from the crank-shaft D' the lateral thrust which would result from pressure of the friction-pulley M against the face of said disk.

I claim as my invention—

1. The combination with vehicle driving-wheels and a motor, of a driving and brake gear embracing two rotating disks adapted for frictional contact with each other, one of said disks being driven by the motor and the other or second disk being operatively connected with the driving-wheels by gearing acting to transmit motion to the driving-wheels from said disk at a less speed but greater power, said second disk being movable laterally into and out of frictional contact with the first disk, and a friction strip or shoe located in position for contact of the second disk therewith when it is shifted away from the first disk, whereby the friction-brake acts on a part which is driven at a higher speed and with less power than the driving-wheels.

2. The combination with vehicle driving-wheels and a motor, of a driving and brake gear embracing two rotating disks adapted for frictional contact with each other, one of said disks being driven by the motor and the other or second disk being operatively connected with the driving-wheels by gearing acting to transmit motion to said driving-wheels from said disk at a less speed but greater power, said second disk being movable laterally into and out of frictional contact with the first disk, and being movable in a direction parallel with its axis for varying the rotative speed thereof and of the driving-wheels, and a friction strip or shoe located in position for contact of the second disk therewith when it is shifted away from the first disk, whereby the friction-brake acts on a part which is driven at a higher speed but less power than the driving-wheels.

3. The combination with vehicle driving-wheels and a motor, of a driving and brake gear embracing two friction-disks adapted for frictional contact with each other, one of said disks being driven by the motor and the other or second disk being operatively connected with the driving-wheels by gearing acting to transmit motion to the driving-wheels from said disk at a less speed but with greater power, said second disk being movable laterally into and out of contact with the first disk, a friction strip or shoe located in position for contact of the second disk therewith when it is shifted away from the first disk, a rock-shaft at the front end of the vehicle which is operatively connected with said second disk to shift it into and out of contact with the first disk, and forwardly and rearwardly extending foot-levers rigid with said shaft.

4. The combination, with vehicle driving-wheels and a prime mover, of driving connections comprising a friction-disk, a pulley adapted for contact with the face of the same, a shaft supporting the pulley with which said pulley has sliding engagement, a laterally-movable bearing for one end of said shaft, and a pivotal bearing for the opposite end of the shaft, comprising a tube or sleeve and pivot-studs engaging the opposite sides of the said tube or sleeve.

5. The combination, with vehicle driving-wheels and a prime mover, of a driving-gear comprising a friction-disk, a pulley adapted for contact with said disk, a movable shaft with which said pulley has sliding but non-rotative connection, and an actuating-lever connected with said pulley for moving it endwise on the shaft, the actuating connection between said actuating-lever and the pulley embracing a pivotal joint permitting lateral movement with the shaft of the parts immediately engaged with the pulley.

6. The combination, with vehicle driving-wheels and a prime mover, of a driving-gear comprising a friction-disk, a pulley adapted for contact with said disk, a movable shaft with which said pulley has sliding but non-rotative connection, an actuating-lever for moving said pulley endwise on the shaft, and connections between said lever and the pulley embracing a horizontally-arranged rock-shaft and an arm connected with the rock-shaft by a pivotal joint to allow lateral movement of the outer end of the arm when the pulley is laterally shifted.

7. The combination, with vehicle driving-wheels and a prime mover, of a driving-gear comprising a friction-disk, a pulley adapted for contact with the face of the disk, a shaft with which said pulley has longitudinally-sliding but non-rotative connection, said shaft being movable toward and from the disk, an actuating device for moving the shaft toward and from the disk, and means for moving the pulley endwise on the shaft embracing a rock-shaft having an arm the free end of which is connected with the pulley, a second rock-shaft connected with the first by means of rigid arms on both rock-shafts and a connect-

ing-rod, a hand-lever on the second rock-shaft, a notched segment, and a spring-detent on the hand-lever adapted for engagement with the notched segment.

8. The combination, with vehicle driving-wheels and a prime mover, of driving connections embracing a spur-gear speed-changing mechanism, consisting of a shaft carrying two gear-wheels of different sizes which are rigidly attached to the shaft and a second endwise movable shaft carrying two gear-pinions of different sizes which are rigidly attached to the said shaft, and actuating devices for the shaft by means of which said shaft may be shifted endwise at the will of the operator.

9. The combination, with vehicle driving-wheels and a prime mover, of driving connections comprising a friction-disk, a pulley adapted for contact with the face of the disk, which pulley is movable toward and from the face of the disk and also toward and from the center of the same, and a spur-gear speed-changing mechanism consisting of two gear-wheels and an endwise-movable shaft carrying two gear-pinions of different sizes, either of which may be engaged with one of the gear-wheels, and means for giving endwise movement to said shaft.

10. The combination, with vehicle driving-wheels and a prime mover, of driving-gear comprising a friction-disk, a shaft movable toward and from the face of the disk, a pulley movable endwise on the shaft adapted for contact with the face of the disk, two gear-wheels having operative connection with the driving-wheels, and two gear-pinions mounted on said shaft, said gear-pinions being movable to permit the engagement of one or the other of them with one or the other of the gear-wheels.

11. The combination, with vehicle driving-wheels and a prime mover, of driving connections comprising a friction-disk, a shaft movable toward and from the face of the disk, said shaft being movable endwise in its bearings, a pulley movable endwise on the shaft and adapted to engage the face of the disk, two gear-wheels of different sizes having operative connection with the driving-wheels, and two pinions affixed to the shaft and adapted for engagement with said gear-wheels by the endwise shifting of the shaft.

12. The combination, with vehicle driving-wheels and a prime mover, of driving connections comprising a friction-disk, a shaft movable toward and from the face of the disk and also movable endwise, a pulley having sliding but non-rotative connection with said shaft, a pivotally-supported bearing for one end of the shaft through which the latter is adapted to slide endwise, a laterally-movable bearing for the opposite end of the shaft through which the shaft is also adapted to slide endwise, and a spur-gear speed-changing device comprising two pinions on said shaft and two gear-wheels having operative connection with the driving-wheels.

13. The combination, with a friction-disk, a shaft movable toward and from the disk and also movable endwise, a pulley having sliding but non-rotative engagement with the shaft, and a laterally-movable bearing for the shaft embracing a sleeve which immediately engages the shaft and through which it is adapted to slide endwise, and antifriction balls or rollers interposed between said sleeve and the main part of the bearing.

14. The combination, with a friction-disk, a shaft movable toward and from the disk and movable also endwise in its bearings, a pulley having sliding but non-rotative connection with said shaft, and a spur-gear speed-changing device comprising two pinions affixed to the shaft, two gear-wheels of different sizes adapted for engagement with said pinions by the endwise movement of the shaft, a lever connected with said shaft, a foot-lever for actuating the shaft, a longitudinally-movable bar connecting said levers, said bar being provided with notches and a spring-detent adapted for engagement with the notches of the bar.

15. The combination, with vehicle driving-wheels and a motor, of driving connections comprising a friction-disk, a shaft extending transversely of the vehicle and movable toward and from the face of the disk, a friction-pulley having sliding but non-rotative engagement with the shaft, a second shaft parallel with the first one and provided at each end with a sprocket-wheel, a spur-gear speed-changing device connecting said shafts, said sprocket-wheels being mounted to turn independently of each other and being connected with the speed-changing device through the medium of an equalizing driving-gear, a sprocket-wheel attached to each driving-wheel, and chain belts connecting the sprocket-wheels on the said second shaft with those attached to the driving-wheels.

16. The combination, with vehicle driving-wheels and a motor, of driving connections comprising a friction-disk, a shaft extending across the vehicle-frame parallel with the face of the disk, said shaft being movable toward and from the disk and being also movable endwise, a friction-pulley having sliding but non-rotative engagement with the shaft, a second shaft arranged parallel with the first shaft, a speed changing and equalizing gear connecting said shafts consisting of two rigidly-connected gear-wheels of different diameters mounted to turn on the shaft, gear-pinions affixed to the first shaft and adapted for engagement with said gear-wheel by the endwise movement of said first shaft, sprocket-wheels mounted on said second shaft and adapted to turn independently of each other, gear-wheels mounted on said second shaft

and rigidly connected one with each of said sprocket-wheels, a gear-pinion mounted in said rigidly-connected gear-wheels first mentioned with its axis radial to the shaft, said gear-pinion intermeshing with both of the gear-wheels which are connected with the sprocket-wheels, sprocket-wheels attached to the said driving-wheels, and chain belts connecting the sprocket-wheels of the said second shaft with the sprocket-wheels attached to the driving-wheels.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

GEORGE W. LEWIS.

Witnesses:

BERTHA A. PRICE,

R. CUTHBERT VIVIAN.