

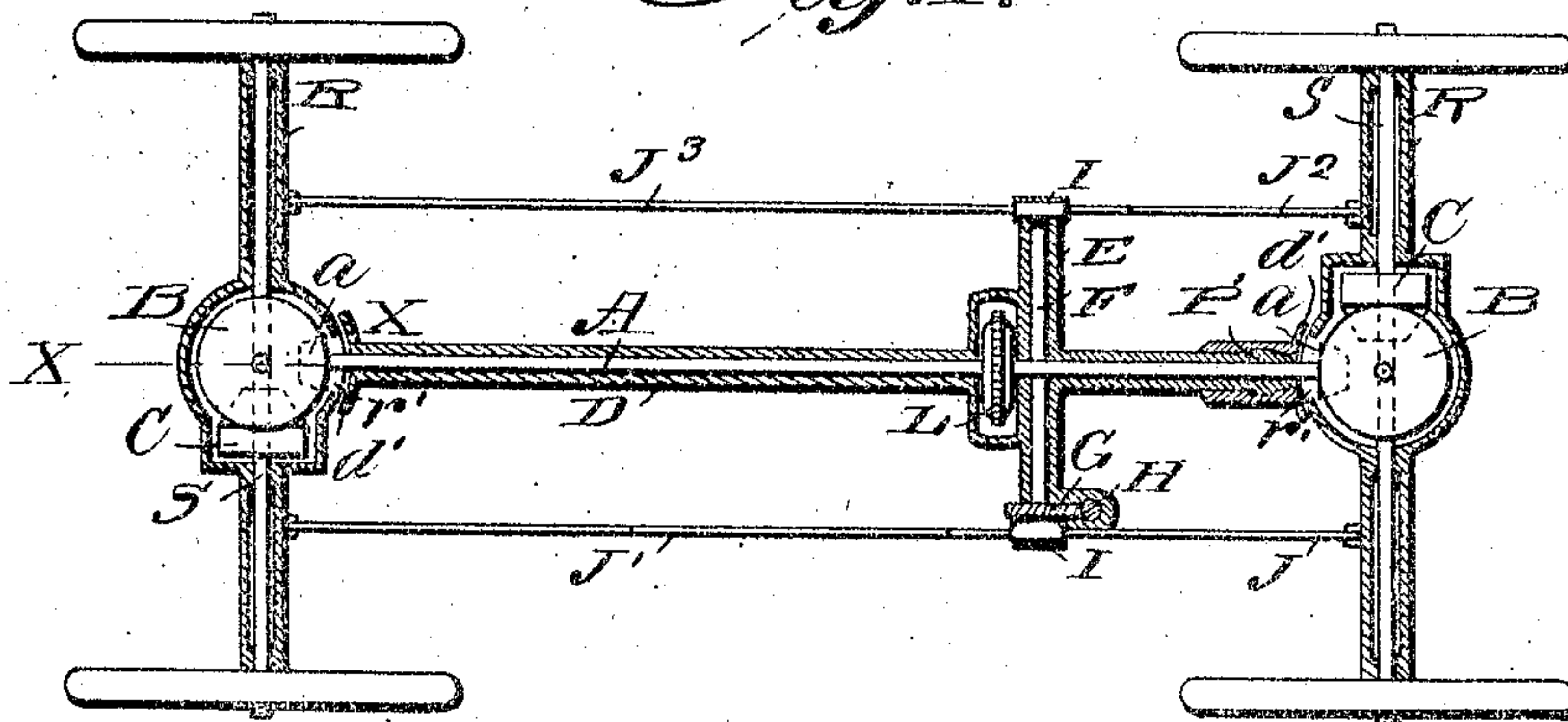
No. 865,901.

PATENTED SEPT. 10, 1907.

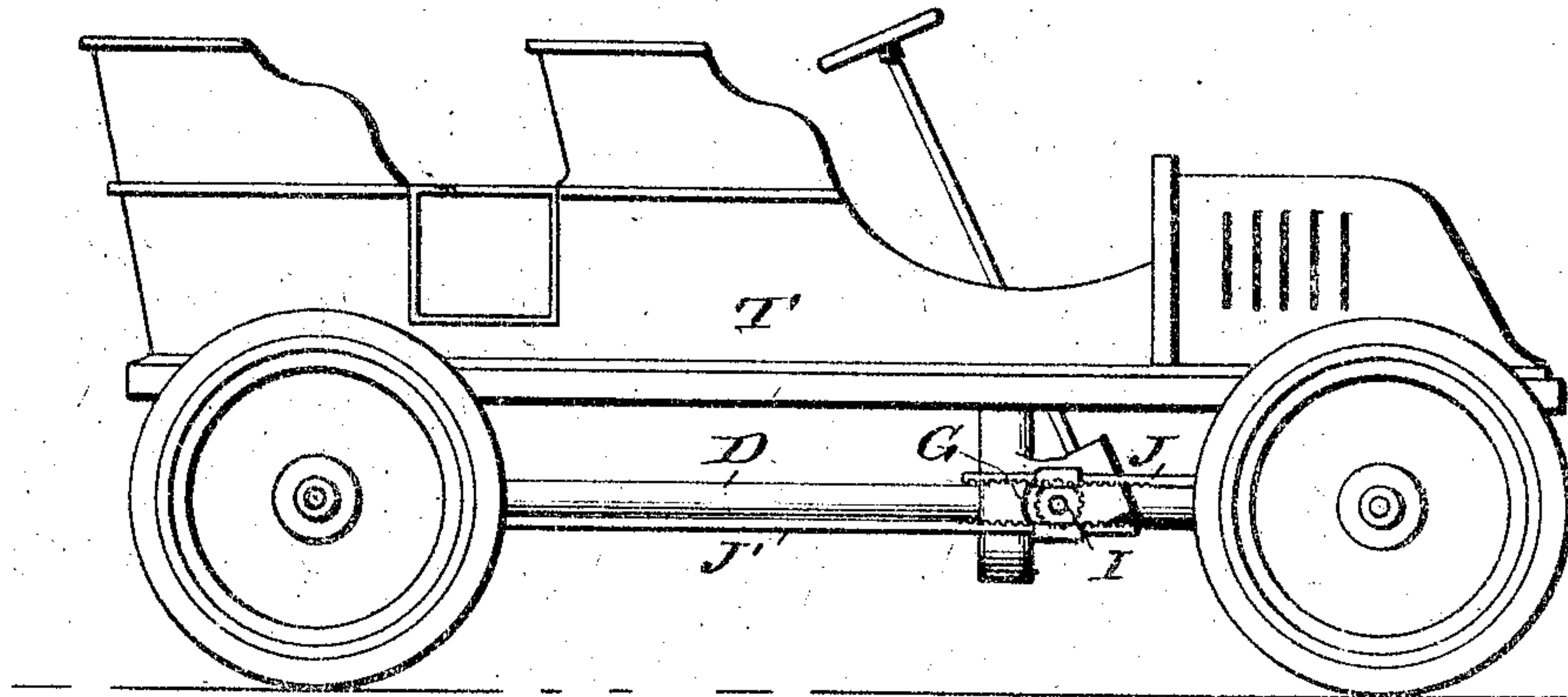
E. HYSLIN.  
AUTOMOBILE.

APPLICATION FILED APR. 9, 1907.

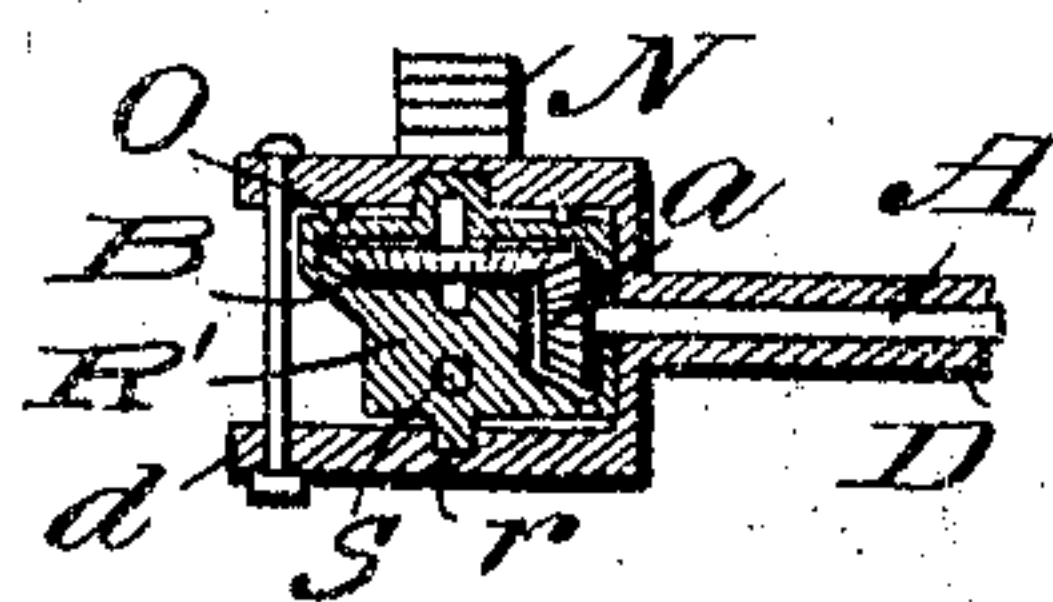
*Fig. 1.*



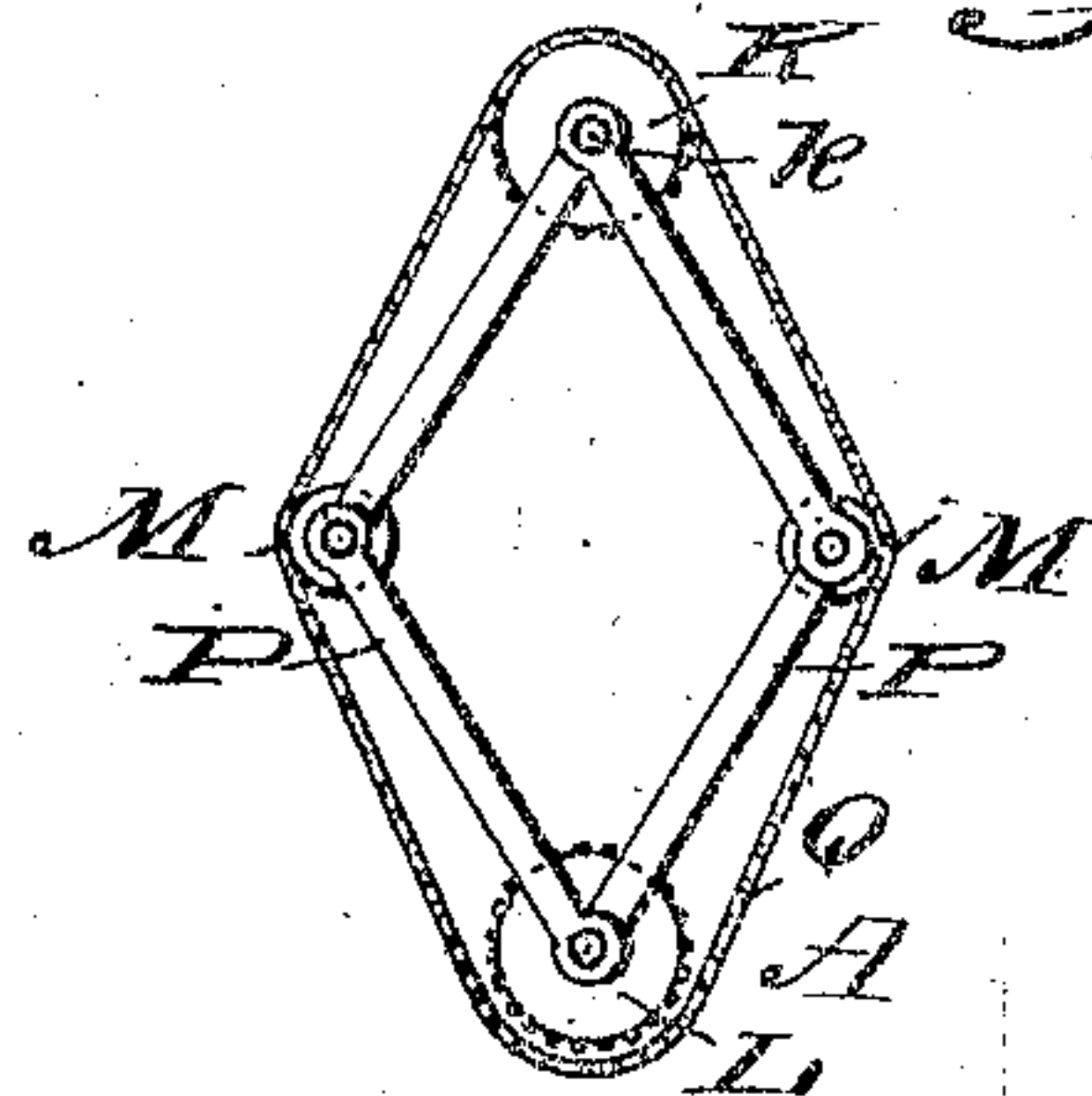
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



WITNESSES

*J. E. Barry*  
*E. Chaffey*

INVENTOR

EVAN HYSLIN

BY

*Wm. H. Co.*

ATTORNEYS



# UNITED STATES PATENT OFFICE.

EVAN HYSLIN, OF KINDRED, NORTH DAKOTA.

## AUTOMOBILE.

No. 865,901.

Specification of Letters Patent.

Patented Sept. 10, 1907.

Application filed April 9, 1907. Serial No. 367,182.

*To all whom it may concern:*

Be it known that I, EVAN HYSLIN, a citizen of the United States, residing at Kindred, in the county of Cass and State of North Dakota, have invented a new and useful Improvement in Automobiles, of which the following is a specification.

This invention relates to a supporting steering or driving gear for motor vehicles, embodying a four wheel drive in which the power is at all times applied equally to all four wheels, and in which both axles or all four wheels are used in steering.

The advantages of the invention are that slipping of the drive wheels on muddy or sandy roads, or in hill climbing under high power, is prevented to a large extent, as well as skidding or side slip or slipping on sandy roads, or when running on an incline or in making abrupt turns.

Other advantages with respect to construction and lightness of parts, direct driving, and quick and efficient steering, will be apparent from the following description and the drawings.

In the accompanying drawings, Figure 1 is horizontal sectional view of the gear. Fig. 2 is a side elevation. Fig. 3 is a section on the line  $x-x$  of Fig. 1. Fig. 4 is an elevation showing the means for transmitting the power from the change speed mechanism to the drive shaft.

Referring specifically to the drawings, A indicates a longitudinal drive shaft carried in a housing D which extends lengthwise at the middle line of the gear from the front to the rear axle. This shaft is formed in two sections connected by a differential gear L properly located for a convenient driving connection with the engine, and said shaft has at each end a bevel pinion  $a$  which engages a larger bevel gear disk B which is set in the shaft casing R and engages a bevel gear on the outside of the differential gear C on the divided sections of the driving axles S. The shaft casing is tubular, as usual, with a casting or housing R' at the middle, of proper shape and sufficient body to support the gears referred to.

The drive shaft casing D forms a reach between the front and rear axle casings and is provided at each end with a fork  $d$  the upper and lower branches of which embrace therebetween the housing R' of the axle casing which is pivoted therein by pivot studs or trunnions  $r$  fitting in appropriate recesses in the branches, and preferably with ball bearings O between the housing and the fork. The housing R' is slotted as at  $r'$  where the shaft A passes through, to allow the turn incident to steering, and the slot is covered by flanges  $d'$  which fit close and cover the slot in all positions, making it dust and oil proof.

In advance of the middle of the reach D is a transverse horizontal tube E, which is preferably integral with the reach, and contains a steering shaft F which is rotated by means of a worm wheel G thereon engaged by

a worm H on the lower end of the steering column which extends up through the carriage body to convenient position for the driver. On each end of the shaft F is a pinion I which pinions engage racks  $j$  on the steering rods J, J', J<sup>2</sup> and J<sup>3</sup> which are pivotally connected to the axle casings R at front and rear. On the right side, as shown, the front steering rod J engages the pinion I above, and the rear rod J' engages the same below. On the left side this is reversed, the front rod J<sup>2</sup> engaging the pinion below, and the rear rod J<sup>3</sup> above, so when the shaft F is rotated, the front and rear axles are turned in opposite directions and are held at any desired angle to steer the vehicle.

For transmitting the power from the motor shaft to the drive shaft, a sprocket K is fixed on the shaft  $k$  of the change speed and reverse gear and is connected to the outside sprocket of the differential L on the drive shaft A by means of a chain Q which also passes over idle sprockets M, on each side, connected and supported by a quadrilateral toggle frame P the bars of which are pivotally connected at the ends of the shafts of the sprockets K, L, M and M, respectively. By this construction vibration or variation of the vehicle body with respect to the running gear does not vary the tension of the chain and the pull of the chain is sustained by the frame and not by the springs of the vehicle.

The vehicle body T may be supported on elliptical end springs indicated at N and resting on the fork of the reach at each end, directly over the housing at the middle of each axle. One end of the reach casing D is provided with a swivel P' to allow for distortion or twisting on uneven roads.

As will be seen, all the wheels are drive wheels, and the direction of travel thereof will be substantially in line with the direction of travel of the vehicle. Consequently slipping or skidding will be practically prevented and the driver will have much better control of the vehicle. The four drive wheels will give twice as much hold on the road as two drive wheels and therefore the wheels will be much less liable to dig down into snow or sand. Also, by applying power to two axles instead of to four the strain on the axles and their gears is correspondingly reduced, and the diameter of the wheels may be greatly increased without increasing the strain on the axles and gears and with the advantages of higher speed and easier riding quality of larger wheels. In consequence of the double steering axles the vehicle will readily respond to the steering wheel, since a slight turn of the two axles in opposite directions will enable the driver to make as abrupt a turn as desired.

If desired in vehicles of heavy construction or in those designed to carry heavy loads, such as trucks and drays, the reach D may be secured rigidly to the rear axle casing R and pinion  $a$  may engage the differential C directly without the interposition of disk B at the



rear axle. The rear end of the body could then be supported on two springs, one on each side and resting directly on the axle, and the steering be effected by swinging the front axle alone. In this case the axle differentials would both be placed on the same side of the driving shaft.

The quadrilateral frame P may of course have two of its sides adjustable in length in order to provide a suitable chain tension.

10 I claim .

1. In a running gear, the combination with sectional axles and their casings, of a tubular reach casing connecting said casings at the middle and joined at its ends by vertical pivots thereto, a drive shaft extending through the reach casing and geared at the ends to the axles, and steering connections between the axle casings.

2. In a running gear the combination with sectional axles and their casings, of a tubular reach casing connecting the axle casings at the middle and pivoted thereto by vertical pivots and a drive shaft extending through the reach casing and geared at its ends to the axles, substantially as set forth.

3. In a running gear, the combination with front and rear axles and their casings, of a tubular reach casing having forks at the ends embracing and pivoted to the axle casings, and a drive shaft in said reach casing and geared at the ends to the axles.

4. In a running gear the combination with front and rear axles, a middle reach extending between the front and rear axles, a cross shaft intermediate the front and rear axles, means for turning said cross shaft, pinions on the shaft and racks meshing with said pinions and connected with the axles, substantially as set forth.

5. The combination of front and rear axles, a cross shaft between the same and provided with pinions and with a worm wheel, a shaft having a worm meshing with said worm wheel whereby to turn the cross shaft, and racks meshing with the pinions of the cross shaft and connected with the axles, substantially as set forth.

6. The combination of the body, its running gear, a drive shaft in the running gear, a motor shaft carried by the body, a driving belt and sprockets connecting the

motor shaft and drive shaft, and a toggle frame within the driving belt whereby to maintain its tension in all positions of the body with respect to the running gear, substantially as set forth.

7. In a running gear, the combination of front and rear axles, and their casings having housings at the middle provided with horizontal slots, a longitudinal reach casing pivotally connected at its ends to the housings, and a drive shaft in said reach casing and extending at its ends through the slots and into the housings, and geared to the axles.

8. In a running gear the combination with front and rear axles and casings therefor, of a drive shaft extending between the front and rear axles and geared therewith and a reach casing inclosing the drive shaft and forked at its ends for connection with the axle casings, substantially as set forth.

9. The combination of front and rear axles and casings, a reach at the middle pivotally connected at its ends to said casings, a cross shaft and means to turn the same, and connections between said cross shaft and the axles, to turn the same oppositely.

10. The combination of front and rear axles and casings, a reach at the middle pivotally connected at its ends to the casings, a cross shaft having means to rotate the same, and pinions at its ends, and rack bars engaging opposite sides of the pinions and connected to the axle casings respectively.

11. The combination of an axle, and a longitudinal drive shaft geared thereto, of a motor shaft, belt and sprocket gearing between the shafts, opposite idlers between the sprockets, and a quadrilateral frame pivotally connecting to the shafts and axles of the idlers, and supporting the latter in tension against the belt irrespective of variation in distance between the shafts.

12. The combination with a spring supported vehicle body and its running gear, of a drive shaft extending lengthwise in the running gear, a motor shaft on the body, a driving belt and sprockets connecting the shafts and means to maintain the tension of the belt in all positions of the body with respect to the running gear.

EVAN HYSLIN.

Witnesses:

JOHN OTTIS,

MAX H. STREHLOW.