No. 661,844. Patented Nov. 13, 1900.

F. BRUTSCHKE.

ROAD LOCOMOTIVE.

(Application filed Oct. 27, 1899.)

(No Model.) 6 Sheets—Sheet 1.

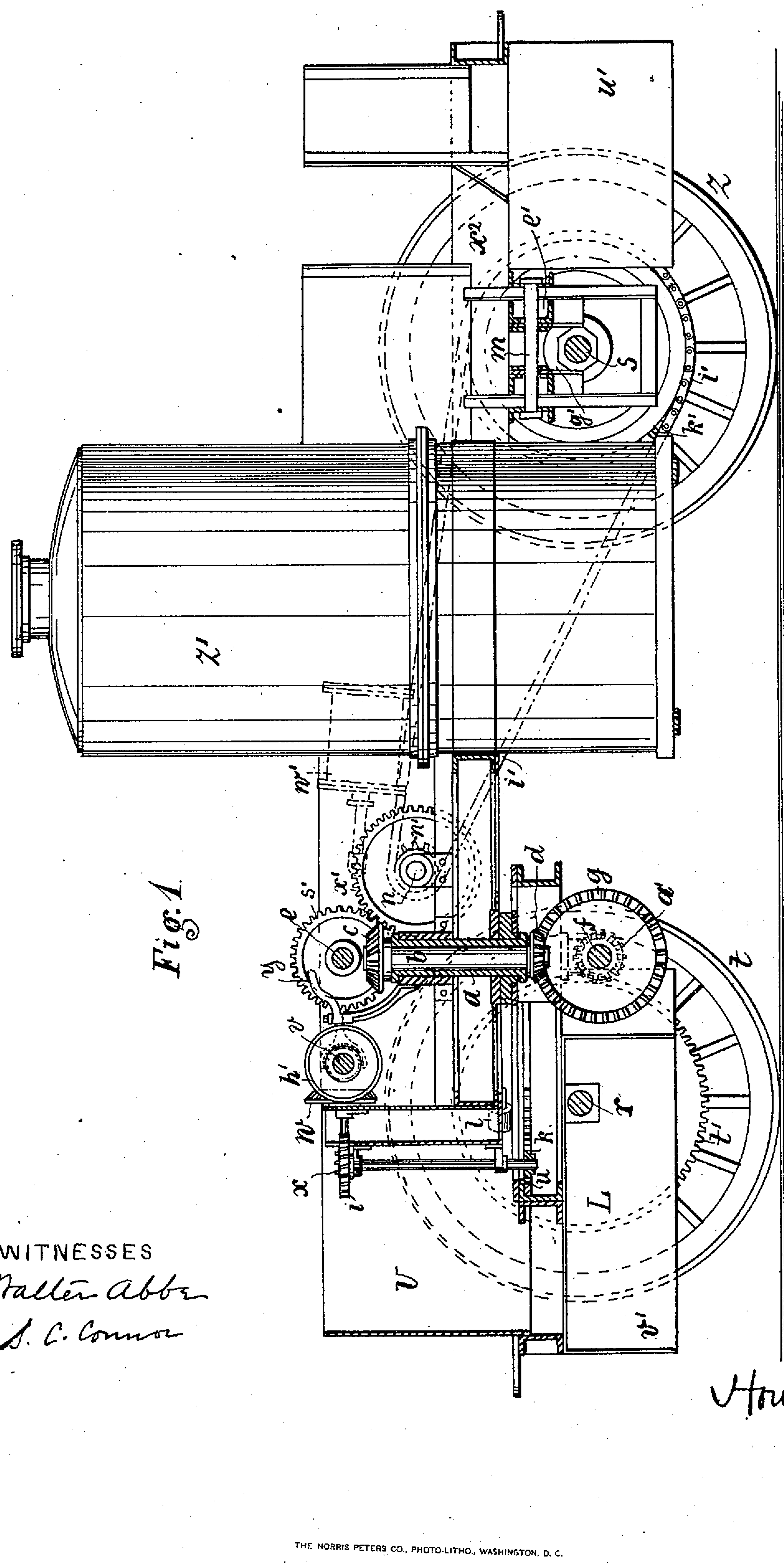

Fig. 1

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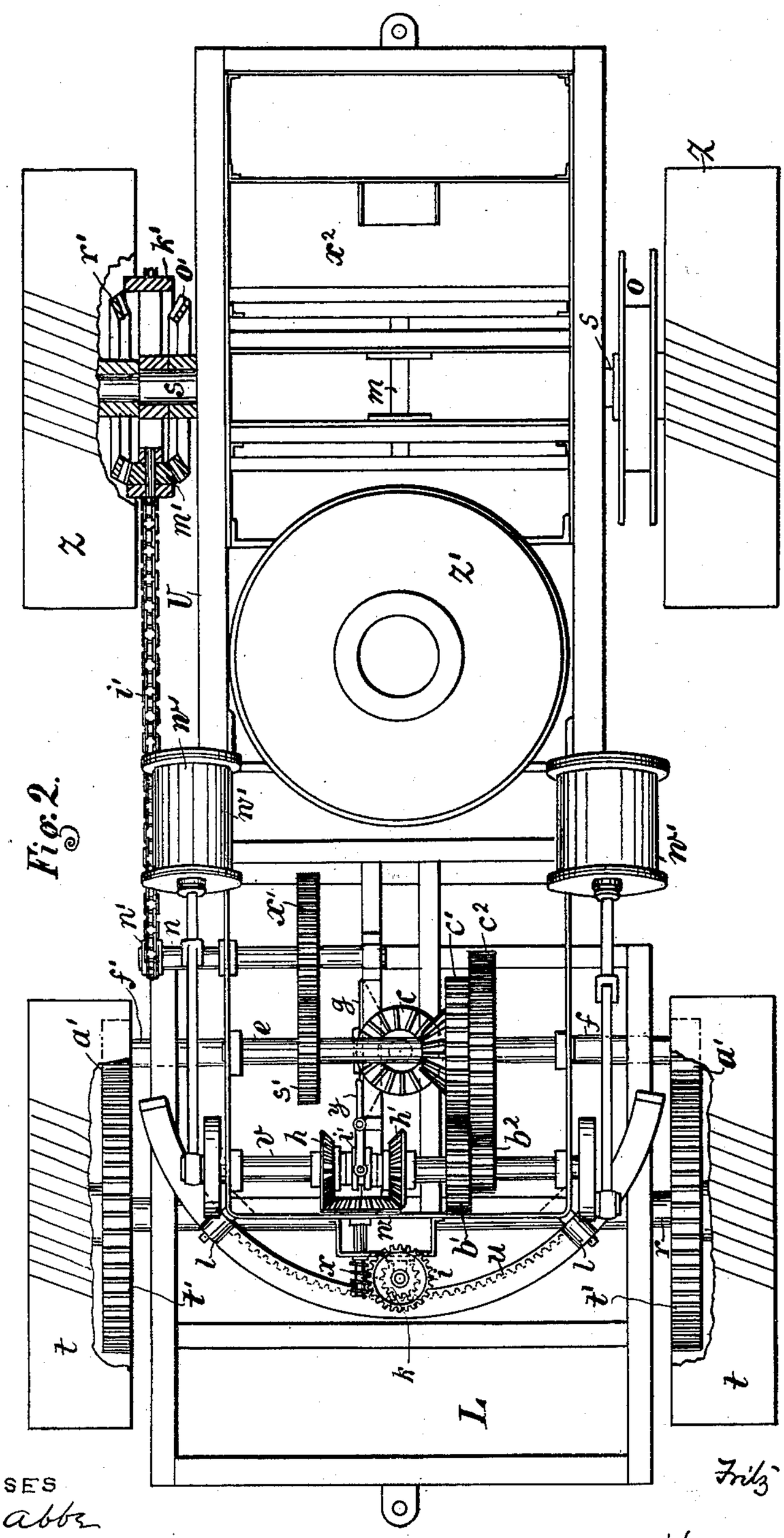

Fig. 2.

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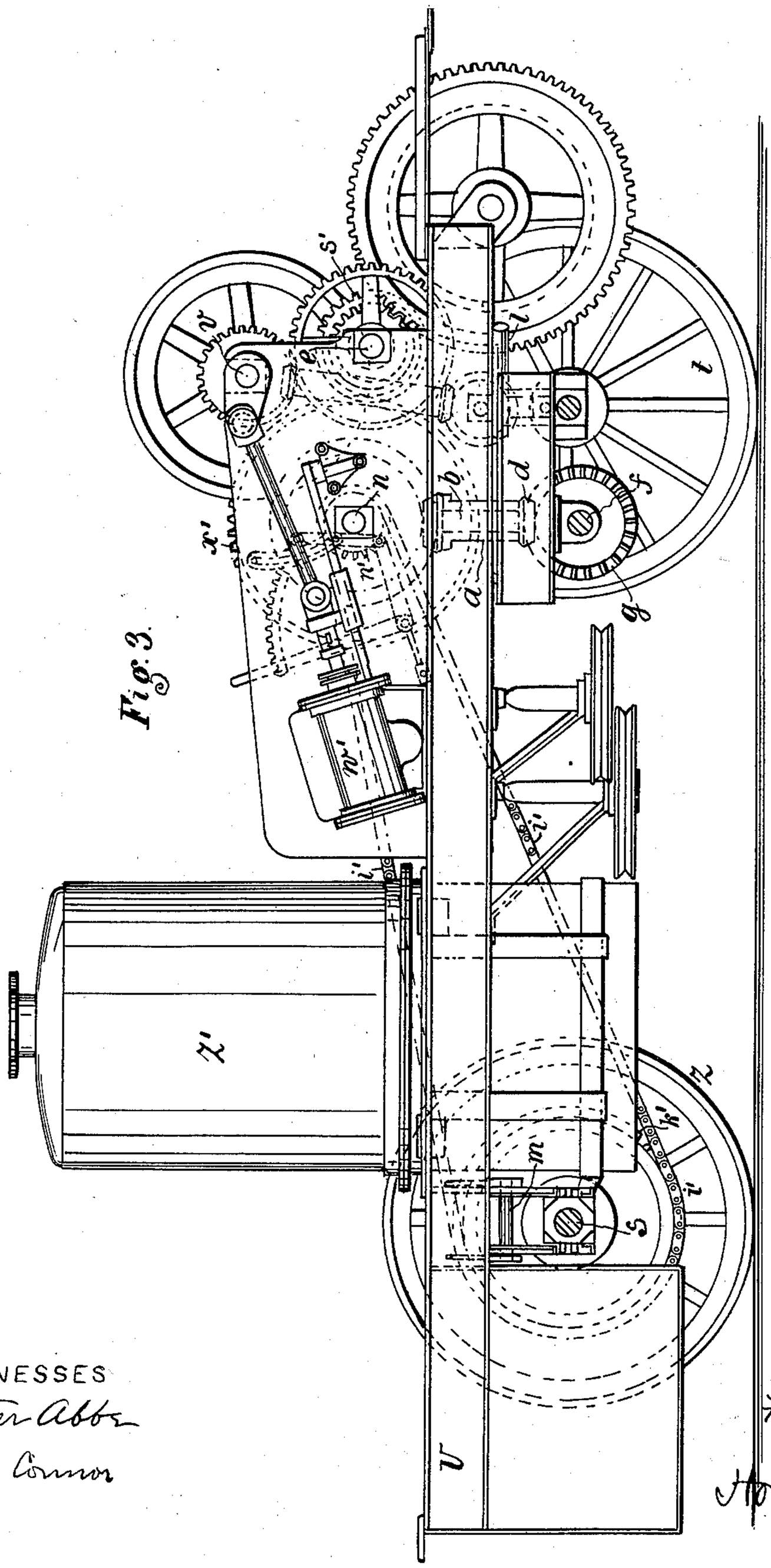

Fig. 3.

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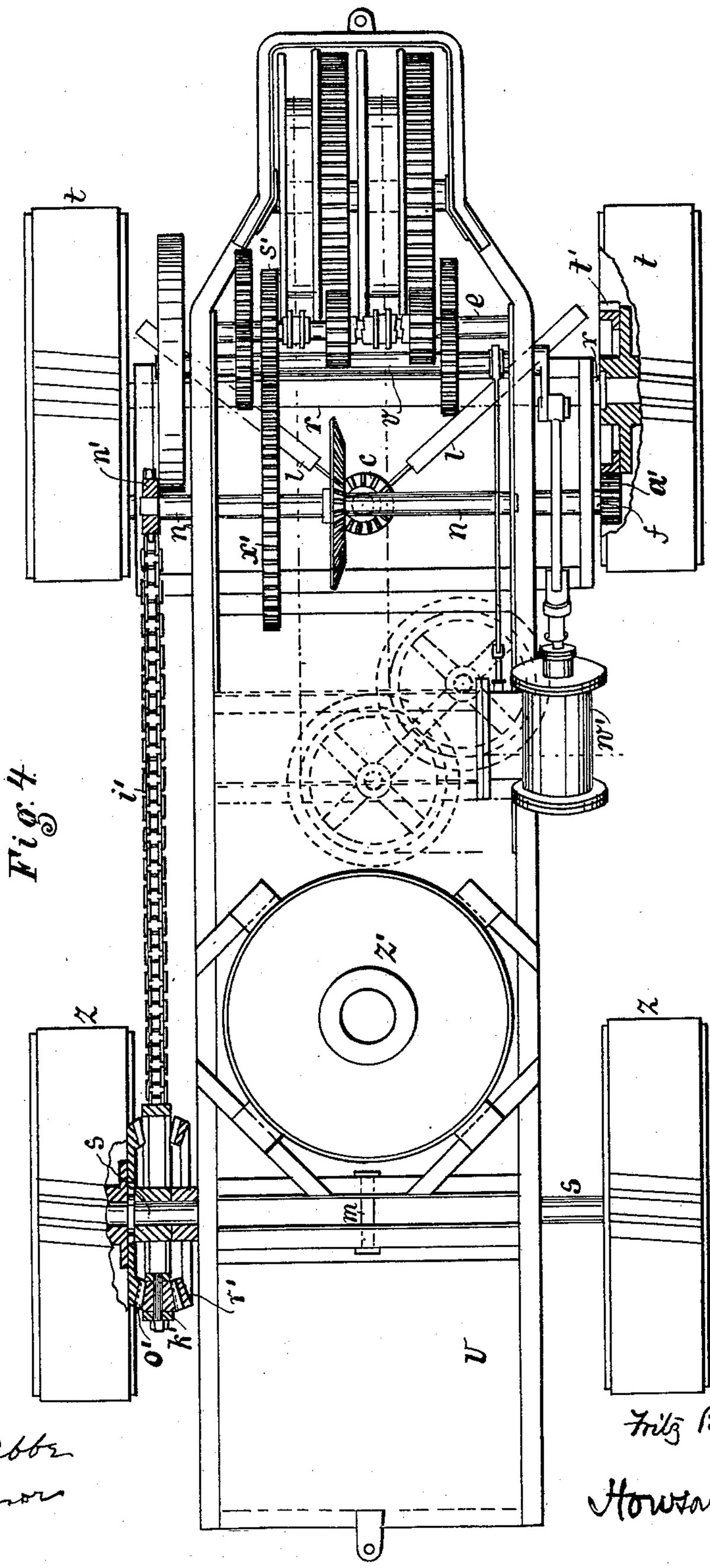

Fig. 4.

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Fig. 5

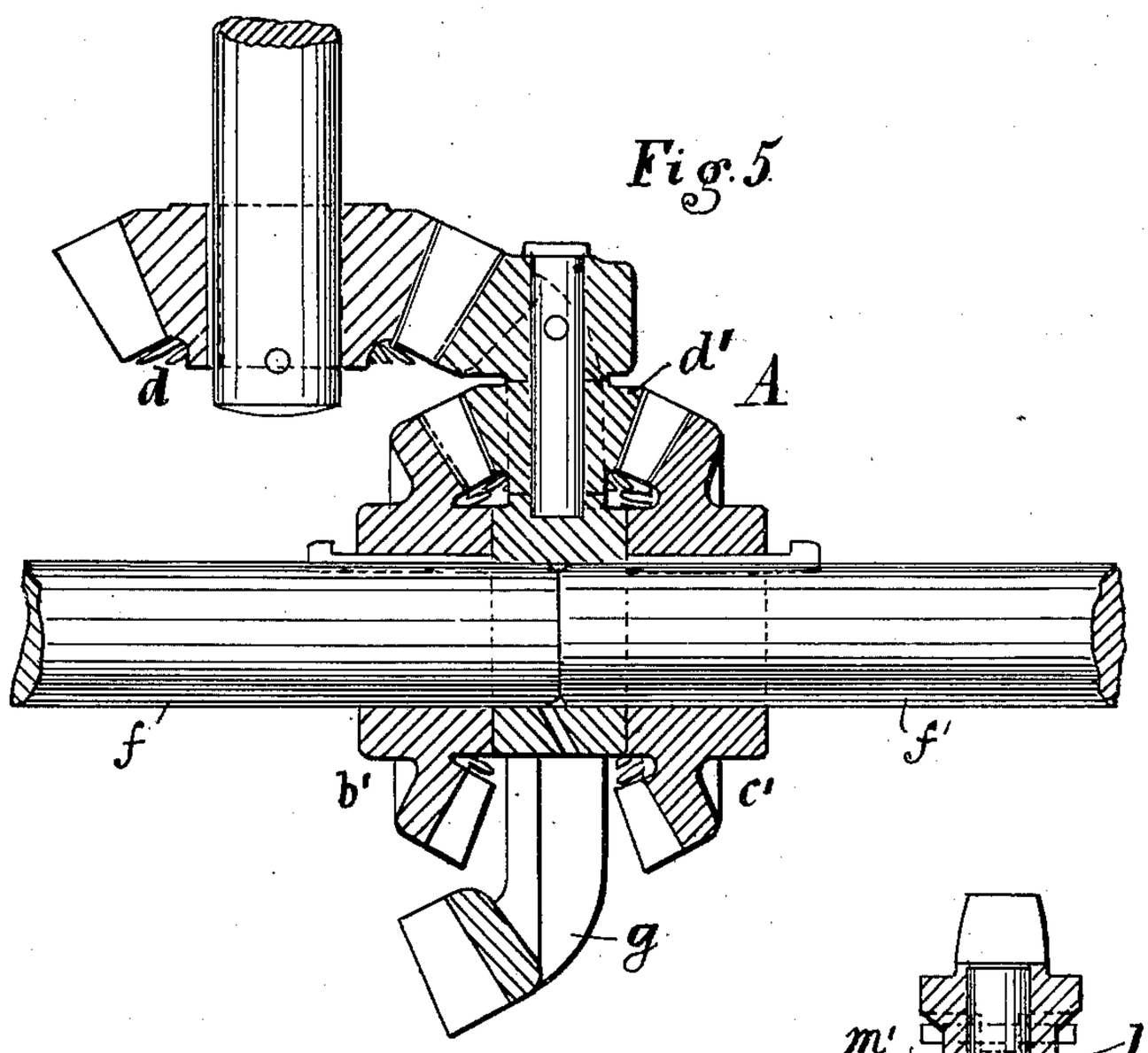

Fig. 6.

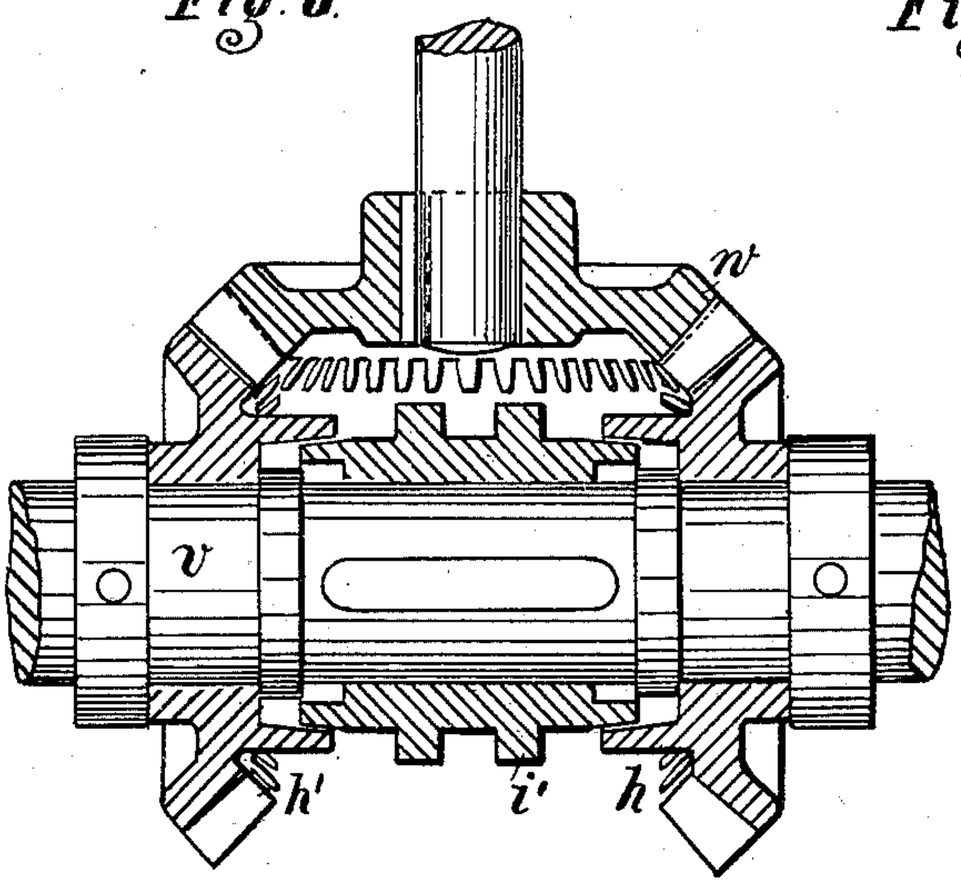

Fig. 7.

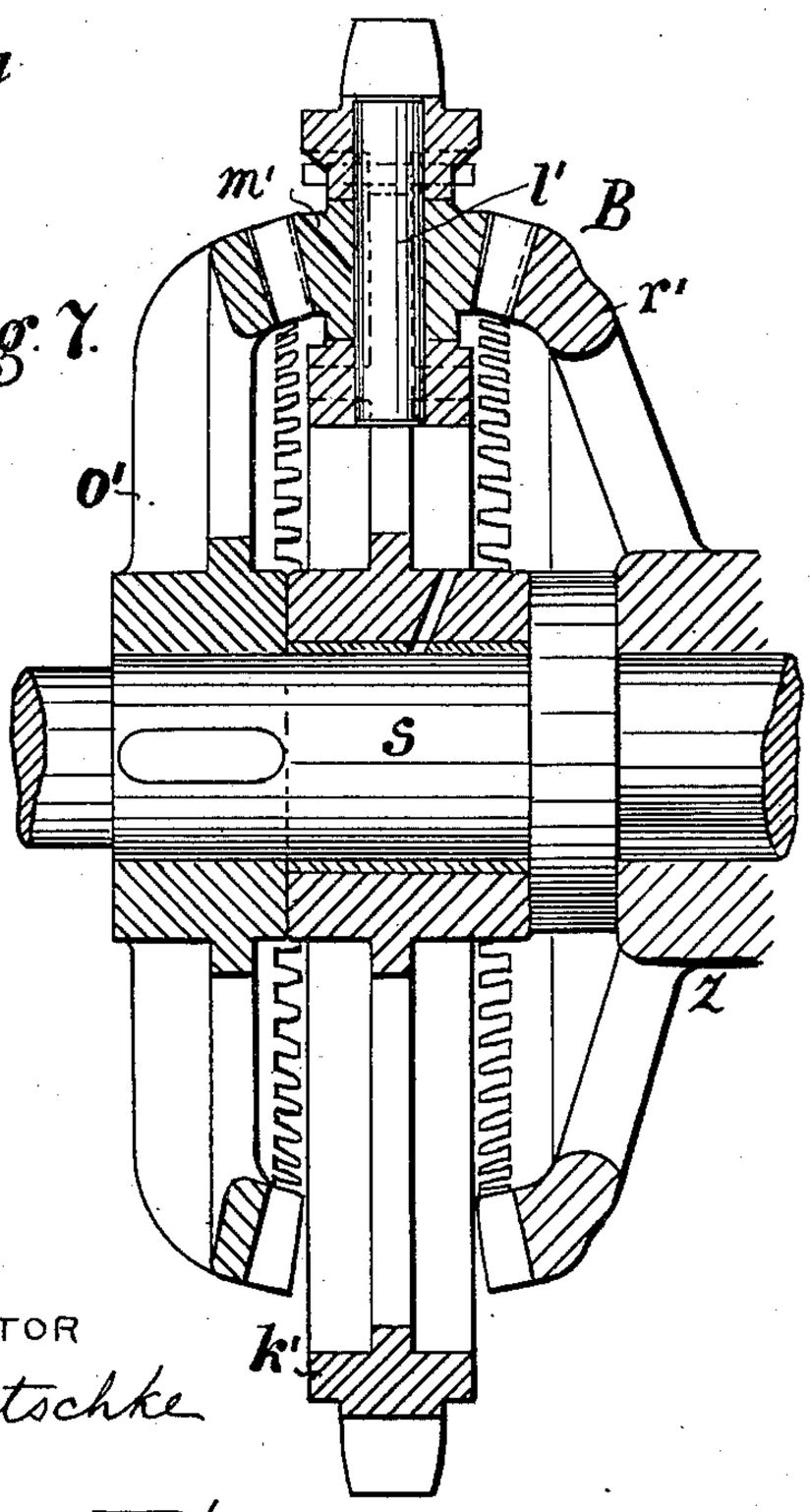

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Fig. 9

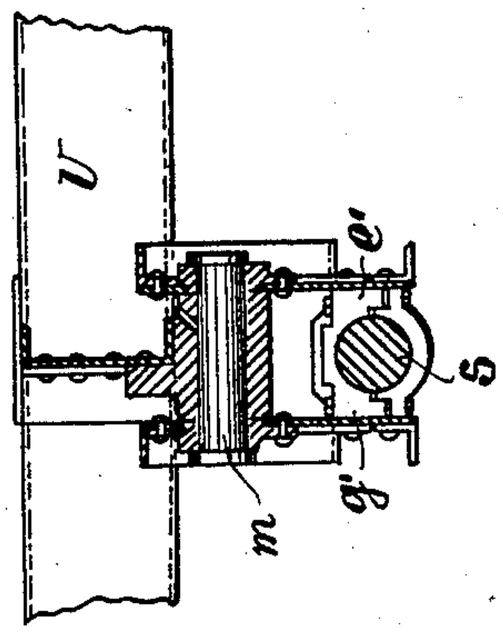
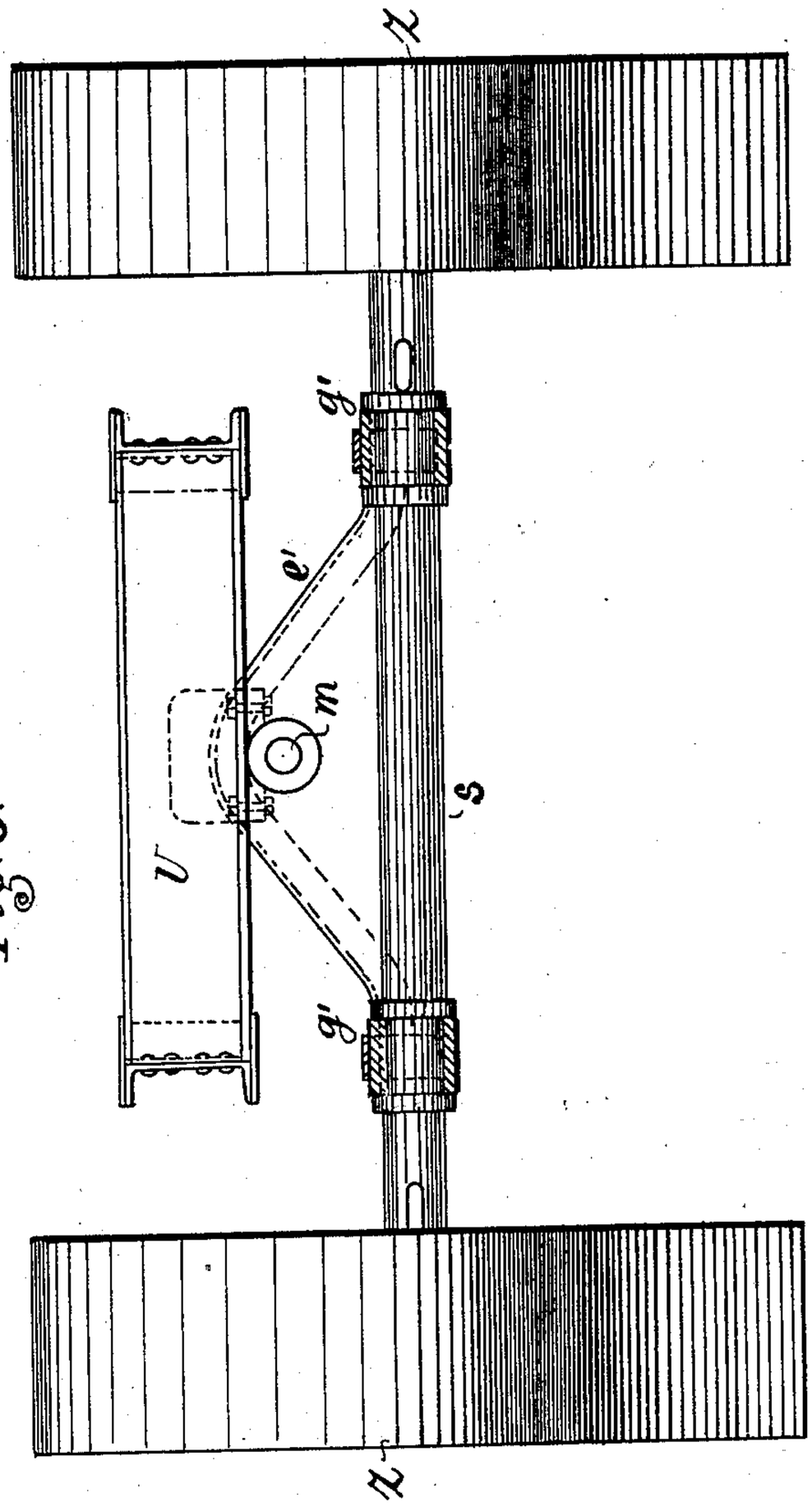


Fig. 8.



WITNESSES
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UNITED STATES PATENT OFFICE.

FRITZ BRUTSCHKE, OF CHARLOTTENBURG, GERMANY.

ROAD-LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 661,844, dated November 13, 1900.

Application filed October 27, 1899. Serial No. 734,951. (No model.)

To all whom it may concern:

Be it known that I, FRITZ BRUTSCHKE, engineer, a subject of the King of Prussia, residing at Charlottenburg, Germany, have invented certain new and useful Improvements in or Connected with Road-Locomotives; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in or connected with road-locomotives.

All vehicles which run upon ordinary roads—such as streets, high-roads, and the like without rails—must be so constructed that the two axles are movable relatively with one another and capable of being turned from their parallel position to an inclination to one another both in the horizontal plane when the vehicle is traveling in curves and also in the vertical plane when the vehicle is passing over inequalities of the ground.

Now according to this invention the two axles are arranged for the purpose of enabling the driving power to be exerted upon both axles—that is to say, upon four driving-wheels—in such manner that each axle can move in one plane only—that is to say, the front axle in the horizontal plane for enabling the vehicle to pass through curves and the rear axle in the vertical plane for the compensating for inequalities in the road.

In the accompanying drawings, Figures 1 and 2 are a vertical section and a sectional plan, respectively, of a road-locomotive constructed according to the invention. Figs. 3 and 4 are a side elevation and a sectional plan of a steam plowing locomotive-engine constructed according to the invention. Fig. 5 is a sectional view of the differential driving-gear for the front wheels; Fig. 6, a sectional view of parts of the steering mechanism; Fig. 7, a sectional view of the differential driving-gear for the rear wheels. Fig. 8 is a sectional view of the fulcrumed beam carrying the bearings for the rear axle, and Fig. 9 a cross-section through said beam and the rear axle.

The main frame U, which carries the boiler, the steam-engine, with the driving-gear, and the water and fuel containers, is connected to the lower frame L by means of a vertical hollow pivot *a*, Fig. 1, in such a manner that both frames can move in the horizontal plane relatively with one another, but cannot move in any other direction. To the lower frame L the front axle *r* is rigidly secured, so that the said axle is compelled to partake of the movements of the said frame. Through the vertical hollow pivot *a* there extends the shaft *b*, with the two bevel-wheels *c* and *d*, which shaft transmits power from the upper driving-shaft *e* to bevel-wheel *g*, loosely mounted on the inner ends of the counter-shafts *f f'*, and thence by means of two small pinions *a'* to teeth *t'* on the two front driving-wheels *t*. Motion is transmitted to said driving-shaft *e* from the crank-shaft *v* by means of larger or smaller tooth-wheels *b' b²* meshing with wheels *c' c²* of the shaft *e*, respectively, and being coupled to the shaft *v*, according to whether a lower or higher speed is to be transmitted to the driving-shaft *e*. The crank-shaft *v* is driven by means of the pistons of the two cylinders *w'* of the engine.

Differential driving-gear A, Fig. 5, arranged between the bevel-wheel *g*, which transmits power, and the last-mentioned pinions *a'*, gives to each of the front driving-wheels *t* the velocity corresponding to the radius of the curve through which the vehicle is passing. The bevel-wheel *g*, forming part of said differential driving-gear, is loosely mounted upon the inner ends of the counter-shafts *f f'*. The shaft *f* carries a bevel-wheel *b'*, meshing with a bevel-wheel *d'*, carried by a radial pivot fastened on the rim of the larger bevel-wheel *g*. The shaft *f'* also carries a bevel-wheel *c'*, meshing with said bevel-wheel *d'*. When the locomotive is traveling in a straight line, the bevel-wheel *d'* does not rotate about its own axis, and its bodily movement produces a rotation of the shafts *f f'*, due to the interlocking of the bevel-wheel *d'* with the bevel-wheels *b'* and *c'*. In turning a curve, however, one of the wheels *t* must travel faster than the other, and then the bevel-wheel *d'* rotates upon its own axis sufficiently to accommodate the differences in the speed of rotation of the shafts *f f'*, respectively. As the center of the pivot *a* corresponds exactly with the center of the shaft *b*, power can be transmitted by the bevel-wheels *d* and *g* in any position of the lower

frame L or front axle r, the wheels d g still remaining in gear.

The steering when the locomotive passes through curves is effected mechanically. Upon the crank-shaft v there are mounted steering bevel-wheels h h', which, through the medium of the bevel-wheel w and its shaft carrying a worm x, actuate a worm-wheel i, the vertical shaft of which carries a small wheel k. The latter gears in a toothed sector u, connected to the lower frame, and brings the latter by turning around the pivot a into different positions relatively to the main frame. By means of a hand-lever y the driver of the locomotive can bring a friction-coupling i', to which the movement of the crank-shaft v is transmitted, Fig. 6, into gear with either of the bevel-wheels h or h' of the steering mechanism, and thereby operate the steering apparatus in either direction. To facilitate turning around the pivot a, the main frame U has two rollers l, which are supported upon a curved portion of the lower frame L and roll thereon whenever the frame is turned.

As will be seen from the drawings, the pivot a does not lie in the intersection of the front axle r with the median plane of the locomotive, but is placed toward the rear axles. This arrangement possesses the advantage that a triangular connection between the main and lower frames is obtained through the medium of the pivot a and the two rollers l, which connection offers a better resistance to the forces acting upon the locomotive than a linear connection, and consequently the middle point of the front axle e r during turning around the pivot a always moves to the inside, whereby a larger turning angle and an approximately similar average velocity of both axles are obtained. The rear axle s is adapted to take up oscillations in the vertical plane. To this end the weight upon the same is transmitted to a beam e', fulcrumed at m and carrying at its ends bearings g' for the said rear axle. Axle-holders prevent the said axle from making any other movements than inclinations in the vertical plane to the main frame. To avoid a complicated construction, however, a less accurate arrangement can be used, as the angle through which the rear axle s moves is so unimportant that with the slight inclination which is given to the axles chain driving-gear from the front driving-shaft n directly to the rear axle s is sufficient. A differential gear B, Fig. 7, is employed in this case also for obtaining the different velocities of the two rear wheels z when the locomotive is passing through curves.

A spur-wheel s' on the driving-shaft e meshes with a spur-wheel x' on a parallel shaft n, and the latter drives, by means of a sprocket-wheel n' and a chain i'', a sprocket-wheel k', which is loosely mounted upon the rear shaft s, Figs. 2 and 7. Upon a radial pivot l', secured on the rim of the wheel k', is mounted a small bevel-wheel m', meshing with two larger bevel-wheels o' and r'. The bevel-wheel o' is fastened on the rear shaft s, upon which is secured one of the rear wheels, while the bevel-wheel r' is secured to the other rear wheel loosely mounted upon the rear shaft. When the locomotive is traveling in a straight line, the bevel-wheel m' does not rotate upon its pivot l', and its bodily movement produces a rotation both of the bevel-wheels o' and r' and both rear wheels z run at equal speed. In turning a curve, however, one of the rear wheels z must travel faster than the other, and then, as in the case described with reference to the driving-gear A, the small bevel-wheel m' rotates upon its own axis to accommodate the difference in the speed of the two rear wheels z.

Upon the rear axles there is arranged the winding-drum o, Fig. 2, which can be independently operated by itself when the locomotive is not running if, for example, a weight is to be hauled over bad roads, bridges, and the like by winding up a wire rope. The boiler is shown as an upright boiler and indicated with z'. Water-containers u' and v' are situated both behind the rear axle s and between the front wheels t, respectively. At x^2 is the stand for the driver.

The advantages of the above-described construction of road-locomotive are as follows:

First. In a road-locomotive as heretofore constructed with a driving weight of about twenty thousand kilograms about fifteen thousand kilograms are supported upon the rear axle and about ten thousand upon the front axle. For driving, therefore, only about fifteen thousand kilograms are effective and a large part of the force generated is employed for the movement of the front axle and is thus lost for the transport of loads. Roads, short bridges, &c., must be very rigid for a weight of fifteen thousand kilograms. In the above-described construction of locomotive, on the contrary, each axle is only weighted with ten thousand kilograms and the force generated in the case of twenty thousand kilograms of utilizable weight is all employed for the transport of loads.

Second. Road-locomotives of ordinary construction will not act efficiently upon soft ground, as the front axle enters so deeply into the ground from the push of the rear axle s that all further movement is prevented. The wheels must then be dug out and raised, which always requires a large amount of labor and occasions loss of time. If, however, as in the above-described construction of locomotive, a force is applied to the front wheels for the independent movement thereof, the machine can work itself out of ruts and when sunk, &c., and more easily and surely overcome difficulties in the track than has been possible with locomotives as heretofore constructed.

Third. The steering of the locomotive is effected mechanically by the driving-engine,

the said steering being always possible by simple manipulation, even under the most difficult conditions.

Fourth. As when turning through curves the direction in which the force acts is, even in the case of the front axle, always tangential, the new locomotives can with the small distance apart of their wheels pass through curves of very small radius.

The improved construction may be employed for a steam plowing-locomotive, as shown in Figs. 3 and 4. In both modes of construction similar parts have like letters. In such a steam plowing-locomotive, for which the above-named advantages are important, the stand for the driver is so arranged that when the locomotive is moving forward he has a clear view in front of him. The regular distribution of the weight upon both axles is of especial importance for steam plowing-locomotives, as, even under the most difficult positions of the track, the vehicle cannot be shifted laterally and because this construction permits of the possibility of building a two-machine steam-plow wherein both locomotives uninterruptedly give power to one and the same agricultural implement.

In this system each locomotive forms the anchor-carriage for the second, and consequently has to withstand an increased lateral pull. Smaller locomotives than usual can with this arrangement be employed for obtaining large results, and from the smaller weight and the more certain forward movement I thus provide a steam plowing system which is most useful while most efficiently using the forces at hand. In the large steam plowing-locomotive at present in use the great weight of the rear axle gives rise to constant complaint. The locomotives are prevented from moving by the slightest unevenness in the ground. Sometimes they sink into the ground and sometimes the friction of the rear axle is of itself not sufficient to drive the apparatus forward. In this respect the above-described locomotive is a practical improvement and insures an extended use for steam plowing-locomotives—for example, they can be employed in countries having badly-made roads.

As above explained, the described construction cannot only be used as a road-locomotive, but also as a plow-locomotive, and it may be driven by any suitable form of motor—for example, a steam-engine, an explosion-engine, electromotor, &c.

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

1. In a road-locomotive with four driving-wheels the combination of one axle and its carrying-frame pivoted to turn in a horizontal plane for steering the locomotive with another axle which is movable in the vertical plane for enabling the locomotive to pass over inequalities in the ground and means for applying driving power to all four wheels, substantially as described.

2. In a road-locomotive the combination of the main frame with an under frame carrying one of the axles and movable in a horizontal plane, and a triangular structure supporting the main frame on the under frame, the connecting-pivot being displaced toward the other axle, substantially as described.

3. In a road-locomotive, the combination of the main frame with an under frame carrying the front axle with a pivotal connection between the two frames at the rear of said front axle, with means for transmitting driving power to said front axle, said pivot being the center of the transmission connection.

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

FRITZ BRUTSCHKE.

Witnesses:

WOLDEMAR HAUPT,

HENRY HASPER.