No. 741,587. PATENTED OCT. 13, 1903.

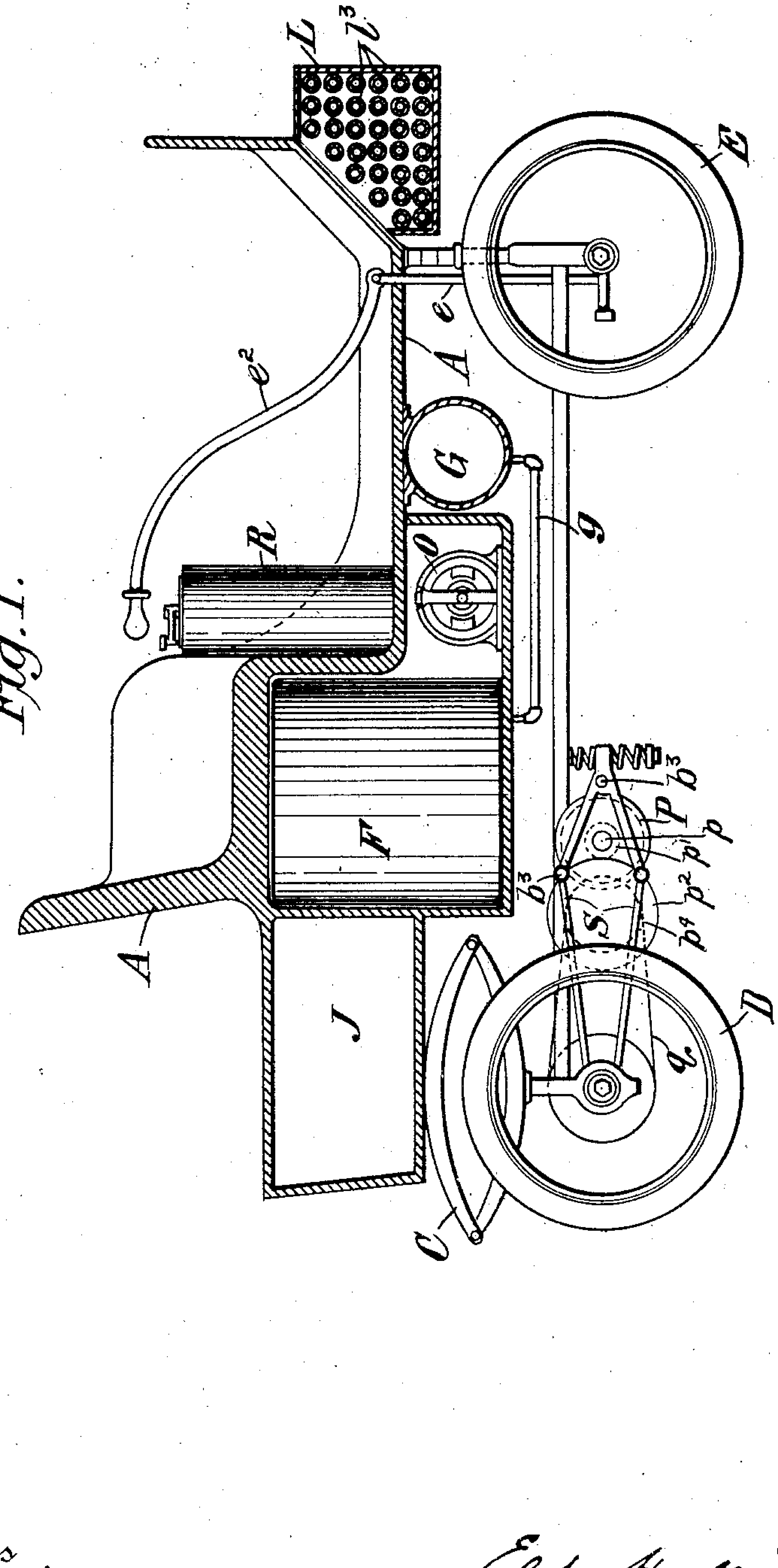
E. H. MEDEN.

MOTOR ROAD VEHICLE.

APPLICATION FILED NOV. 28, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



Witnesses
C. Smith
Alfred W. Kiddle

Inventor
Elof H. Meden
By his Attorneys
Redding, Kiddle & Greeley

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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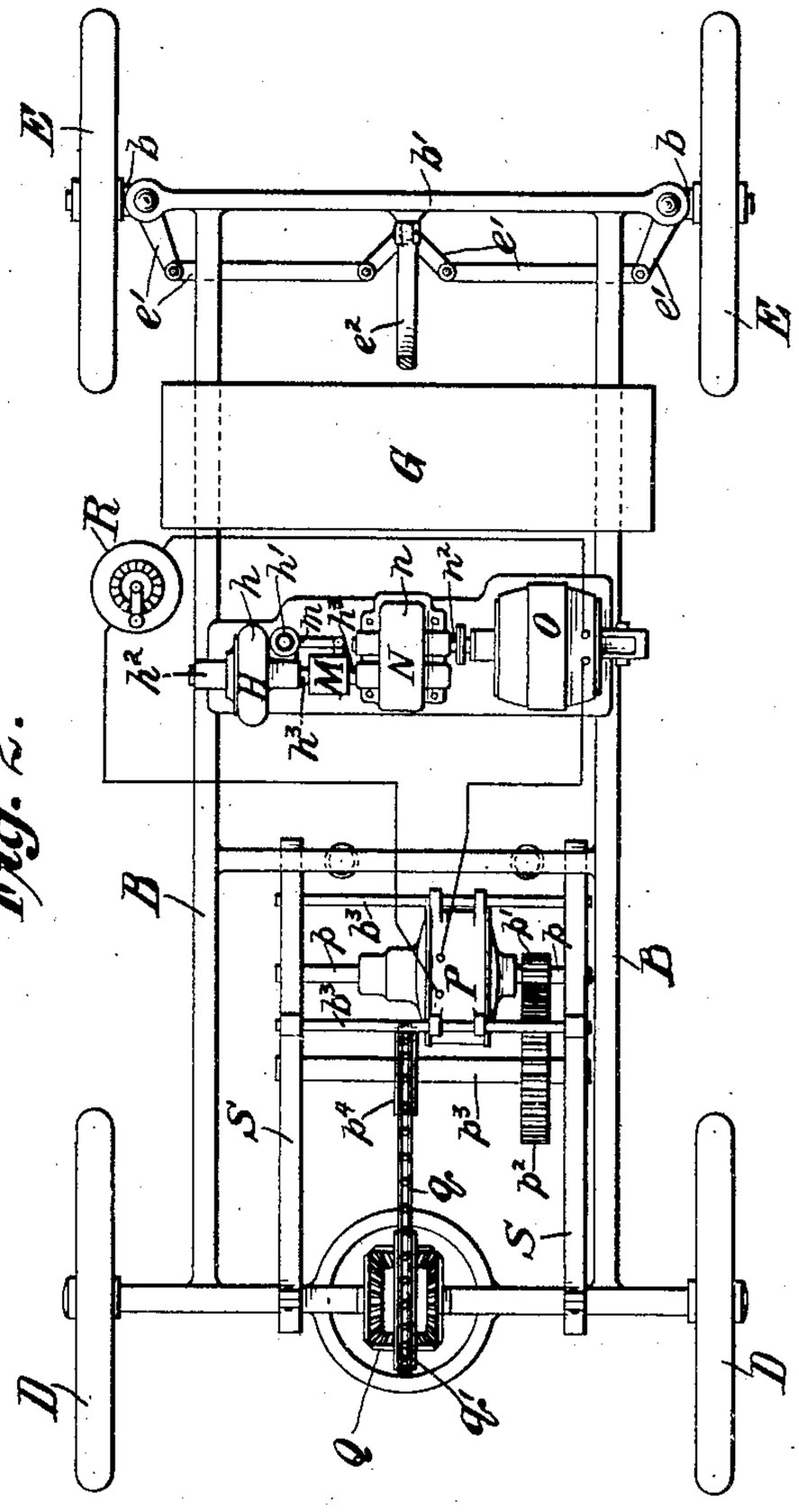
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



Witnesses
E. Mitchell,
Wyllys W. Riddle.

Inventor
Elof H. Meden
By his Attorneys
Redding, Riddle & Grosvenor

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E. H. MEDEN.

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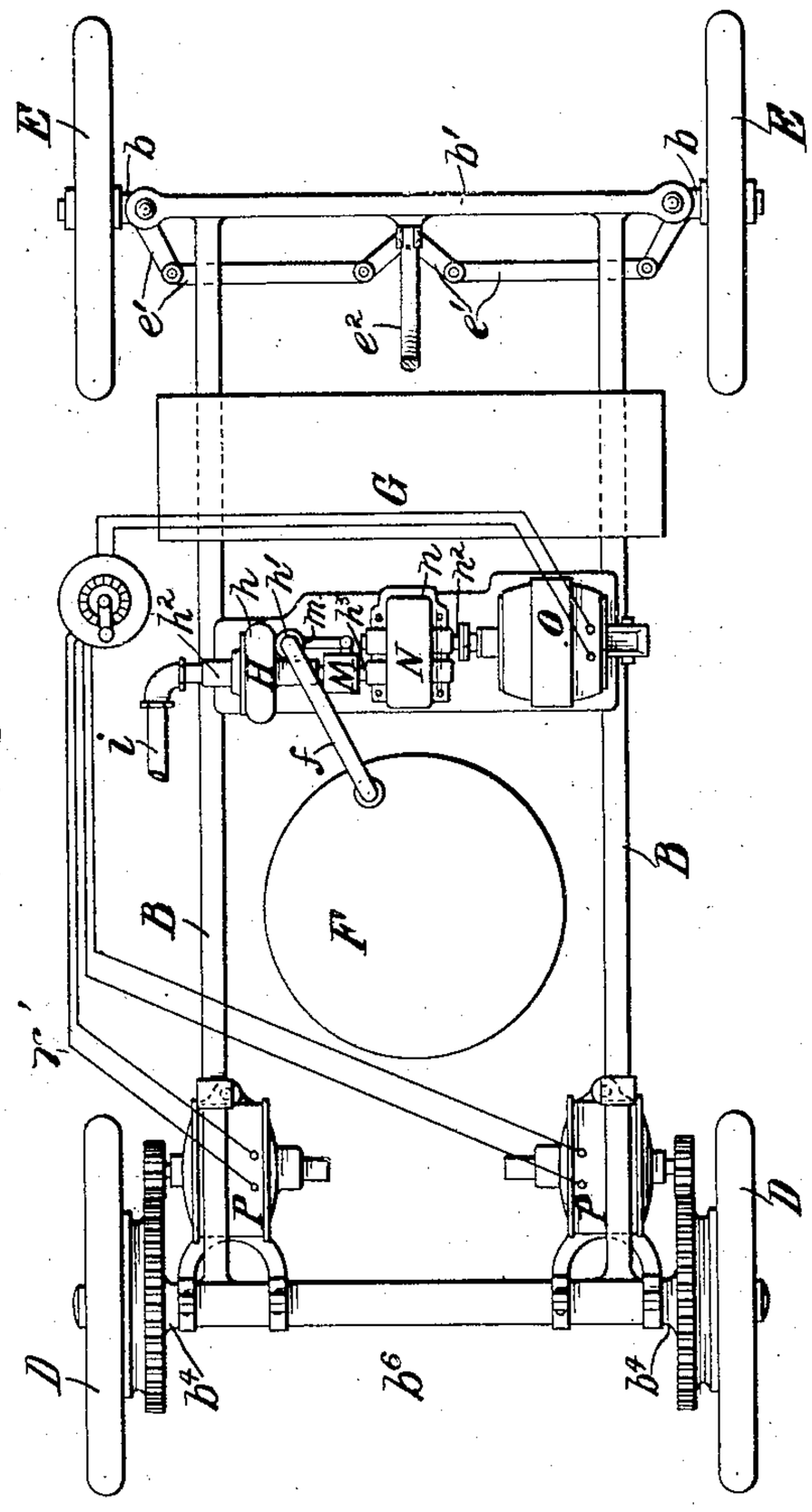
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



Witnesses
C. Smith Mills
Myles B. Tiddle

Inventor
Elof H. Meden
By his Attorneys
Redding & Tiddle Greeley

No. 741,587. PATENTED OCT. 13, 1903.

E. H. MEDEN.

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NO MODEL. 4 SHEETS—SHEET 4.

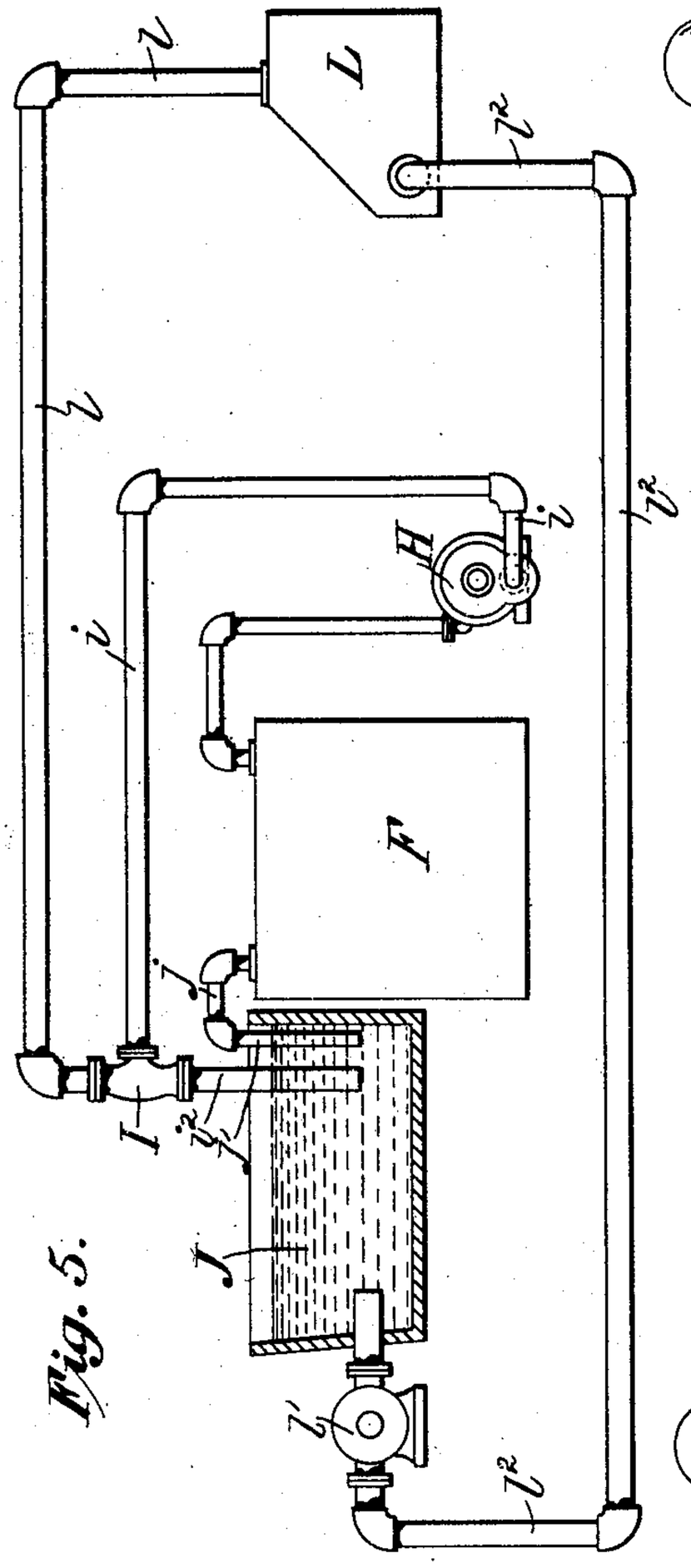

Fig. 5.

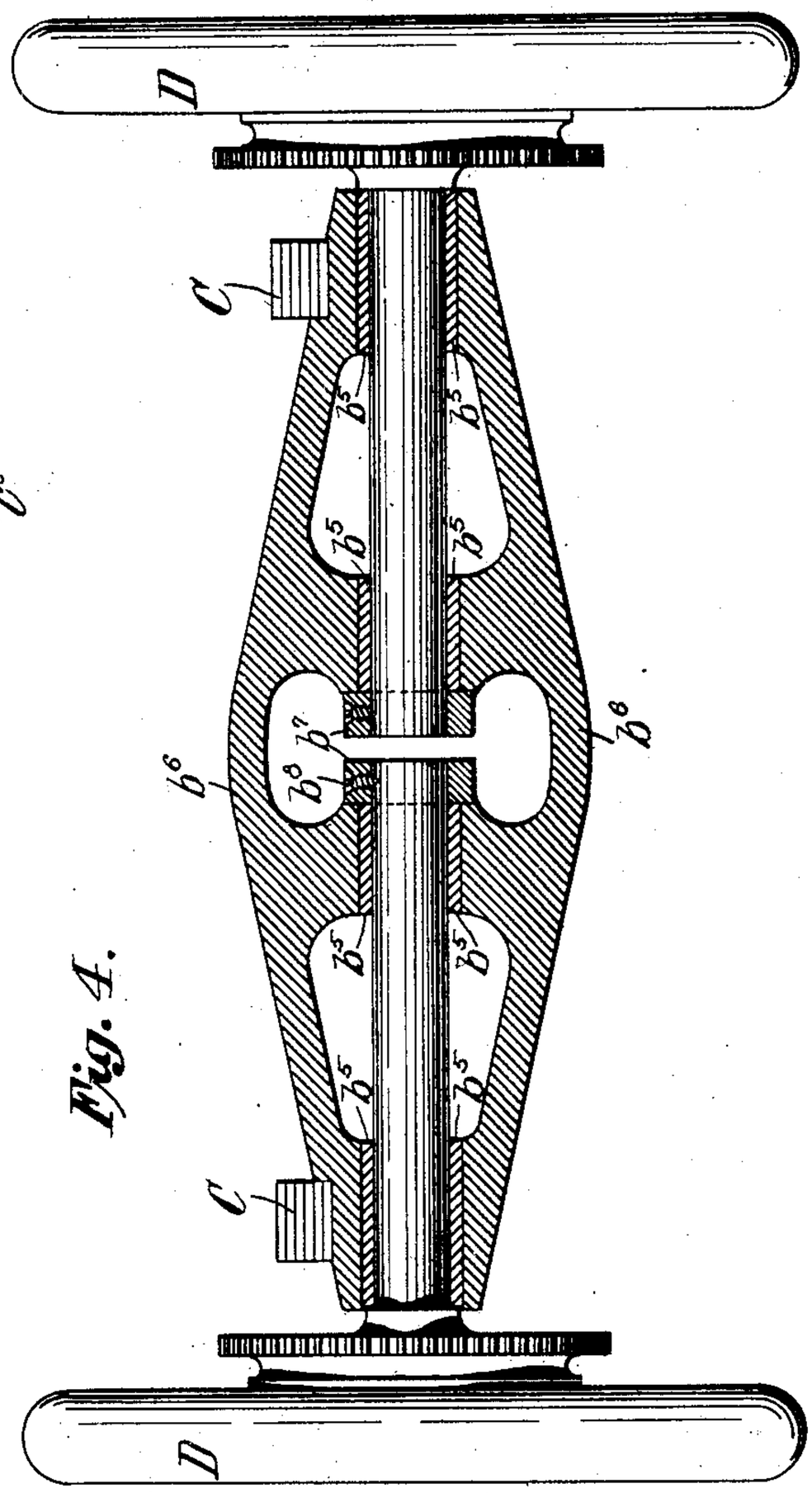

Fig. 4.

Witnesses
C. Smith Hill,
Alfred W. Kiddle.

Inventor
Elof H. Meden
By his Attorneys
Redding, Kiddle & Gourley.

No. 741,587. Patented October 13, 1903.

UNITED STATES PATENT OFFICE.

ELOF H. MEDEN, OF TRENTON, NEW JERSEY.

MOTOR ROAD-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 741,587, dated October 13, 1903.

Application filed November 28, 1902. Serial No. 133,037. (No model.)

To all whom it may concern:

Be it known that I, ELOF H. MEDEN, a subject of the King of Sweden and Norway, residing in Trenton, county of Mercer, State of New Jersey, have invented certain new and useful Improvements in Motor Road-Vehicles, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to motor road-vehicles, and particularly to vehicles of that class in which a motive fluid—such as steam, compressed air, &c.—is employed as the source of power.

The main object of the invention is to provide a novel, efficient, and durable mechanism intermediate the source of power-supply and the driving-wheels, whereby the steam or other motive fluid is received and made available as power and whereby said power is transmitted to the driving-wheels and controlled.

For many reasons it is undesirable to employ a reciprocating engine in vehicles of the type above referred to. These engines are, as a rule, bulky and extremely heavy, there is very little room in the vehicle in which to mount them, and their size is necessarily cramped at the expense of efficiency. Besides they are of necessity exposed to the dust and dirt of the road, which easily adheres to their oily parts and by which those parts consequently become clogged and grit-worn.

Instead of employing a reciprocating engine subject to the above conditions of wear and of comparatively low efficiency it is proposed by this invention to make use of a rotary engine of the turbine type which has none of the features of the ordinary reciprocating engine that render it unfit for use in this connection. In the first place an engine of this type sufficiently powerful for the requisite purposes will be neither bulky nor heavy, but, on the contrary, will be compact and relatively light. The operative parts of the turbine being thoroughly inclosed by its casing or walls are wholly protected from all dust and dirt, and the engine is therefore neither hindered nor clogged by the caking of the oil-moistened particles nor worn by grit-grinding. The power-transmission mechanism intermediate the engine and driving-wheels, with which mechanism this invention is also concerned, comprises among its several parts means for converting the mechanical power developed in the engine into electrical power, although it will be understood that the vehicle may be driven by the power directly as it is furnished from the turbine. The translation of the mechanical power into electrical power, however, renders the control of the vehicle simpler and easier and permits the elimination of more or less complex gearing through which the changes of speed and the reversing in motor-vehicles are sometimes effected.

Accordingly the invention also relates to electrically-propelled vehicles, as well as to those motor-vehicles in which steam or some other motive fluid is the source of power, and considering the invention from the point of view of electric vehicles the storage battery, which is the common source of power in such vehicles, is replaced by a motive-fluid generator, a turbine, and a dynamo. In many respects such a combination is highly preferable and advantageous for replacing the storage battery in electrically-propelled vehicles, and it realizes its most practical efficiency and utility when the weight and size of the engine in such combination is so reduced that the combined generator, engine, and dynamo are lighter and more compact than the storage battery, and these results are made possible and attained by the employment of an engine of the turbine type.

The invention is further concerned with the provision of automatic controlling mechanism in combination with the turbine, whereby the amount of steam or other motive fluid is supplied to the turbine in quantities proportionate to the load, the controlling proper of the vehicle, however, being done by means of an ordinary form of electric controller, which is placed near the operator's seat and which is electrically connected with the motor; but said controlling proper may also be effected by providing means for varying the resistance of the field-circuit of the dynamo, as is hereinafter more fully explained.

The character and scope of the invention will be ascertained not only by the foregoing recitation of the general objects of the inven-

tion, but also from an examination of the drawings and study of the description and claims hereinafter following.

The several features of the invention will be more particularly described with reference to said drawings, in which—

Figure 1 is a longitudinal sectional view of a motor road-vehicle embodying the invention, the running-gear being shown in elevation and the condenser and circulating-pipes for cooling the condenser-water being omitted. Fig. 2 is a plan view of the running-gear and frame, showing a single-motor drive. Fig. 3 is a plan view of the running-gear and frame, showing a two-motor drive. Fig. 4 is a detail view of the rear axle and driving-wheels on a larger scale and showing in section the housing for said rear axle when a two-motor drive is used.

The motor-vehicle shown in the above-described accompanying drawings and in which the several features of the present invention have been embodied for the purpose of illustration and explanation comprises the usual vehicle parts, such as the vehicle-body A, running-gear B, springs C, connecting the vehicle-body and running-gear, driving-wheels D, and steering-wheels E. The steering-wheels are preferably journaled on stub-axles b, which are swiveled to the front axle b', and said stub-axles are connected to a steering-post e, mounted upon the fore part of the vehicle-body by intermediate links and levers e', whereby the steering-wheels are under control of a steering-handle e^2, which is pivotally secured to the steering-post e.

The motive fluid which it is preferable to employ is steam, and a boiler for generating the same is indicated at F, the particular construction of which is not material. Neither is the construction of the boiler-furnace material, and the same is not shown; but, as will readily be understood without illustration, it may comprise any suitable means for heating, vaporizing, and consuming a hydrocarbon fuel, which is introduced into the furnace by a pipe g from a fuel-tank G, located in the forward part of the vehicle-body.

Leading from the boiler F is a live-steam pipe f, which communicates with the inlet-opening h' of a turbine-engine H, which is firmly mounted upon and secured to the under side of the vehicle-body by suitable supports, the position of said turbine being preferably near and in advance of the boiler. The form of turbine which it is desirable to use in this connection is that shown and described in Letters Patent of the United States No. 522,066, granted to Carl G. P. De Laval, under date of June 26, 1894. Said turbine, so far as it is necessary to describe the same for the purposes of this application, comprises a casing h, having inlet and exhaust ports h' and h^2, a turbine-wheel inclosed by said casing and not shown in the drawings, and a shaft h^3, operatively secured to said turbine-wheel.

Operatively connected with the shaft h^3 of the turbine is an automatic governor M, operating a cut-off m. This governor and cut-off mechanism is preferably of the form shown and described in the United States Letters Patent No. 701,500, granted to De Laval Steam Turbine Company and dated June 3, 1902, and by means of which the supply of steam to the turbine is so regulated as to secure the rotation of the turbine and shaft at a uniform rate of speed under all conditions of load to which the vehicle is subjected. Other forms of governors and cut-off mechanisms, however, may be used to effect this result, and, as will be mentioned hereinafter, the governor may be dispensed with and the cut-off mechanism may be operated electrically.

The shaft h^3 of the turbine, which, it will be understood, is adapted to be run constantly at a very high speed, is geared to mechanism for effecting speed reduction, (indicated at N.) Said speed-reducing mechanism may comprise a suitable gearing, such as is ordinarily employed for this purpose, its form not being of any essential importance to this case. Said gearing is, however, preferably inclosed in a casing n, which is secured to the vehicle-body. A shaft n^2, driven by said reduction-gearing N at a much-reduced rate of speed, is geared to a dynamo O, which is suitably mounted on the vehicle-body. This dynamo, the turbine H, and the gearing N are preferably placed close together, the turbine being on one side of the vehicle and the dynamo on the other side, so as to be readily accessible for inspection, cleaning, and repairing. Said dynamo may supply a direct or alternating current which is transmitted through suitable conductors to motors P. Two motors, one geared to either driving-wheel, may be employed to drive the vehicle, or a single-motor drive with a compensating gear may be used. In the latter case, as shown in Fig. 2, a motor P is mounted upon a frame S, suitable cross-bars b^3 being provided upon said frame to sustain said motor. The motor driving-shaft p may be provided with a pinion p', which meshes with the pinion p^2, carried upon a shaft p^3, which shaft is journaled in the frame S. A sprocket-wheel p^4, secured upon said shaft p, drives by means of a chain q a sprocket-wheel q' upon a compensating or differential gear Q, motion being imparted from said gear Q to the driving-wheels in the ordinary way.

In the two-motor drive shown in Fig. 3 motors P may be mounted on each side of the vehicle, said motors being geared, respectively, with the driving-wheels. The driving-wheels in this case are rigidly secured to the rear axle b^4, which is divided near its center and provided with journal-bearings b^5 in a housing b^6. Provided upon the ends of said rear axle are collars b^7, which are secured thereto by the screws b^8. Said collars bear

against the housing b^6 and prevent each portion of the axle from working out of said housing.

In order to control the speed of the vehicle and in order to reverse the motion of the vehicle, an electric controller of the ordinary type having a controller-handle and a reversing-handle may be employed. Such a controller is indicated at R, being placed in the vehicle in a position to be easily operated by the driver. In such a controller the changes of speed are effected by throwing into the motor-circuit a quantity of dead resistance, and where a two-motor drive is used by connecting up the two motors and the resistance in different ways after a manner which is well known in the art and common to the different forms of electric controllers. Electrical connections between the motors and controller are shown at r'.

The vehicle may be and preferably is controlled, however, according to a novel method of control invented by me, which consists in varying the strength of the field-circuit of the generator by placing a rheostat in one or more of the circuits of said field, as is more fully explained in an application for Letters Patent filed by me on December 4, 1902, and serially numbered 133,824. In such case the controller-box R, mounted on the body of the vehicle adjacent to the driver's seat, will be a simple resistance-box, the handle of the controller corresponding to the usual pivoted contact-bar of a rheostat. There is also preferably provided in said field-circuit an auxiliary generator or exciter, the shaft of which exciter may be geared to shaft m at any convenient point and is driven thereby. The portion of the field of the main generator which is thus separately excited is varied in strength by the movements of the controller-handle, and the current generated by said main generator or dynamo also responds in strength to the movements of the controller-handle, as will clearly appear upon reference to the aforesaid application; but I do not include any claims for said novel method in this application, the same being reserved by me herefrom and fully set forth and claimed by me in the said application, filed by me as aforesaid. As the vehicle is being driven, therefore, the variations of current generated in the dynamo will tend to cause inverse variations of the speed of shaft h^3 and the turbine; but these variations instantly affect the governor and cut-off mechanism, which in turn will so control the supply of steam to the turbine that said shaft h^3 is always driven at a substantially constant speed, the quantity of steam admitted to the turbine at any particular moment determining the force with which the vehicle is being driven at that moment, as will be readily understood.

I claim as my invention—

1. A dirigible steam-vehicle provided with a steam-generator, a steam-turbine, power-transmitting means intermediate the turbine and driving-wheels, power-controlling means operatively connected with the power-transmitting means, and means operated by the turbine to regulate automatically the supply of steam to the turbine.

2. A dirigible steam-vehicle provided with a steam-generator, a steam-turbine, power-transmitting means intermediate the turbine and driving-wheels, power-controlling means operatively connected with the power-transmitting means, and means operated by the turbine to supply steam to the turbine in proportion to the power required at a particular moment.

3. A dirigible steam-vehicle provided with a steam-generator, a steam-turbine, means intermediate the turbine and driving-wheels for electrically transmitting power, power-controlling means operatively connected with the power-transmitting means, and means operated by the turbine to regulate automatically the supply of steam to the turbine.

4. A dirigible steam-vehicle, provided with a steam-generator, a steam-turbine, an electric generator operated by said turbine, an electric motor connected with the driving-wheels and driven by said generator, power-controlling means operatively connected with said motor, and means operated by the turbine to regulate automatically the supply of steam to the turbine.

5. The combination with a motor road-vehicle provided with suitable running-gear including driving-wheels and steering mechanism, of an engine of the turbine type comprising one or more rotating members, a motive-fluid generator, a power-shaft, gearing intermediate said shaft and driving-wheels for speed reduction, and an automatic cut-off to regulate the supply of motive fluid to the turbine.

6. The combination with a motor road-vehicle provided with suitable running-gear including driving-wheels and steering mechanism, of an engine of the turbine type comprising one or more rotating members, a motive-fluid generator, a power-shaft, power-transmitting mechanism including speed reduction, gearing intermediate said shaft and driving-wheels, power-controlling means operatively connected with said power-transmitting means, and an automatic cut-off to regulate the supply of steam to the turbine.

7. The combination with a motor road-vehicle provided with suitable running-gear including driving-wheels and steering mechanism, of an engine of the turbine type comprising one or more rotating members, a motive-fluid generator, a power-shaft, means intermediate the turbine and driving-wheels for electrically transmitting power, power-controlling means operatively connected with said power-transmitting means, and an automatic cut-off to regulate the supply of steam to the turbine.

8. The combination with a motor road-ve-

hicle provided with suitable running-gear including driving-wheels and steering mechanism, of an engine of the turbine type comprising one or more rotating members, a motive-fluid generator, a power-shaft, an electric generator operated by said turbine, a motor connected with the driving-wheels and driven by said generator, power-controlling means operatively connected with the motor, and an automatic cut-off to regulate the supply of steam to the turbine.

9. In an electrically-propelled vehicle the combination of two motors geared respectively to each of the driving-wheels, a divided rear axle, and a housing for said divided axle, the driving-wheels being rigidly secured to each part respectively of said divided axle.

10. In an electrically-propelled vehicle, the combination of two driving-wheels, two motors having their shafts geared respectively to said driving-wheels, a two-part driving-axle to each part of which said driving-wheels are respectively keyed, and a housing for said divided axle.

11. In an electrically-propelled vehicle, the combination of two driving-wheels, two motors having their shafts geared respectively to said driving-wheels, a two-part driving-axle, said driving-wheels being rigidly secured to the outer ends of said divided axle, and a collar secured to the inner end of each part of said divided axle and bearing against said housing.

This specification signed and witnessed this 25th day of November, 1902.

ELOF H. MEDEN.

In presence of—
ANTHONY N. JESBERA,
ALFRED W. KIDDLE.