(No Model.) 2 Sheets—Sheet 1.

C. R. ARNOLD.

CAR LIGHTING.

No. 376,423. Patented Jan. 17, 1888.

Fig. 1.

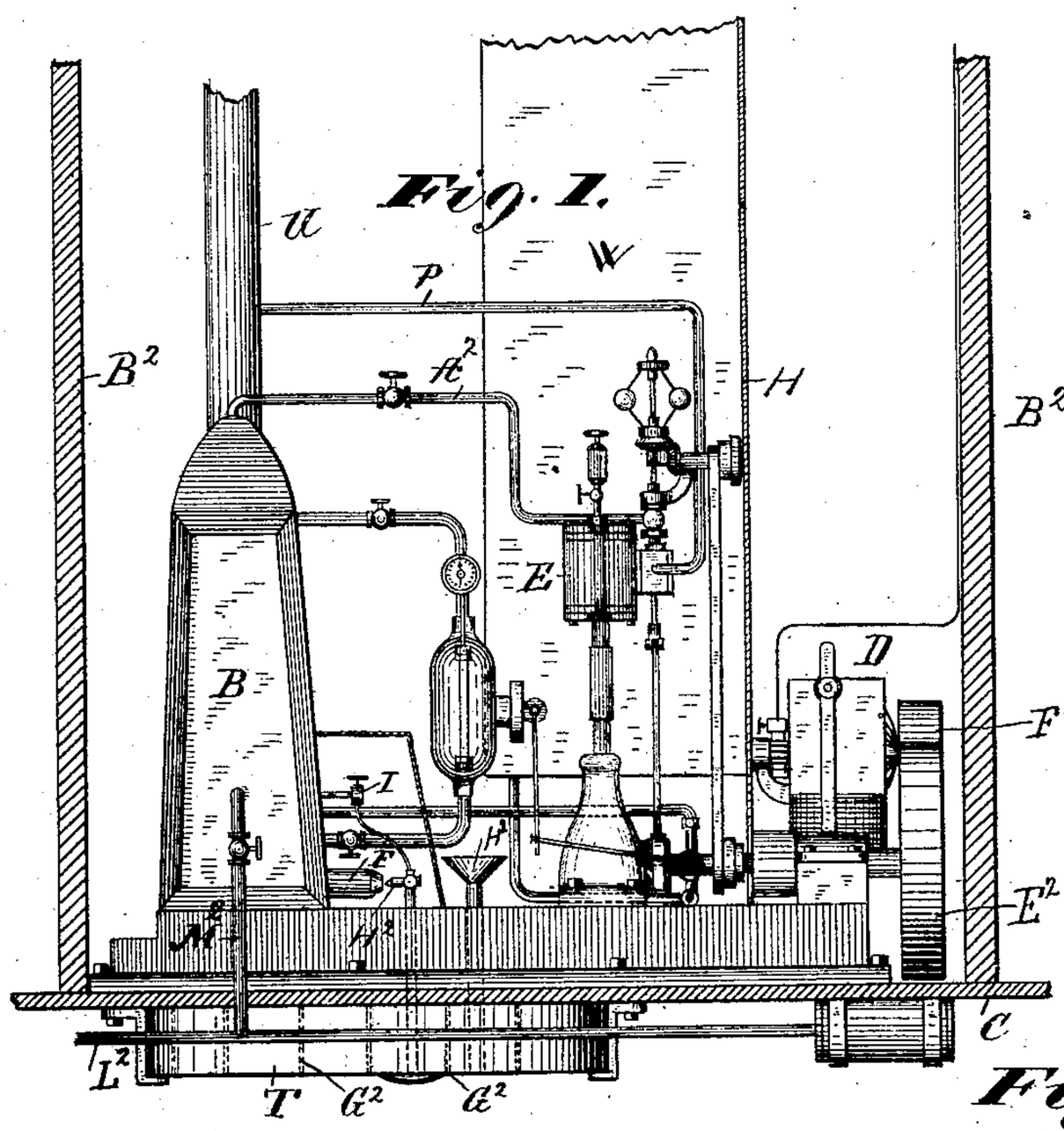

Fig. 2.

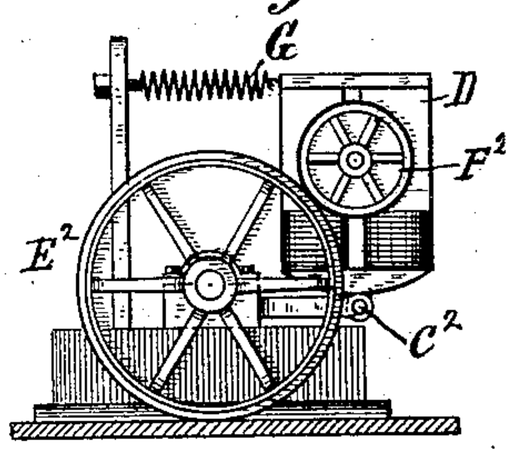

Fig. 3.

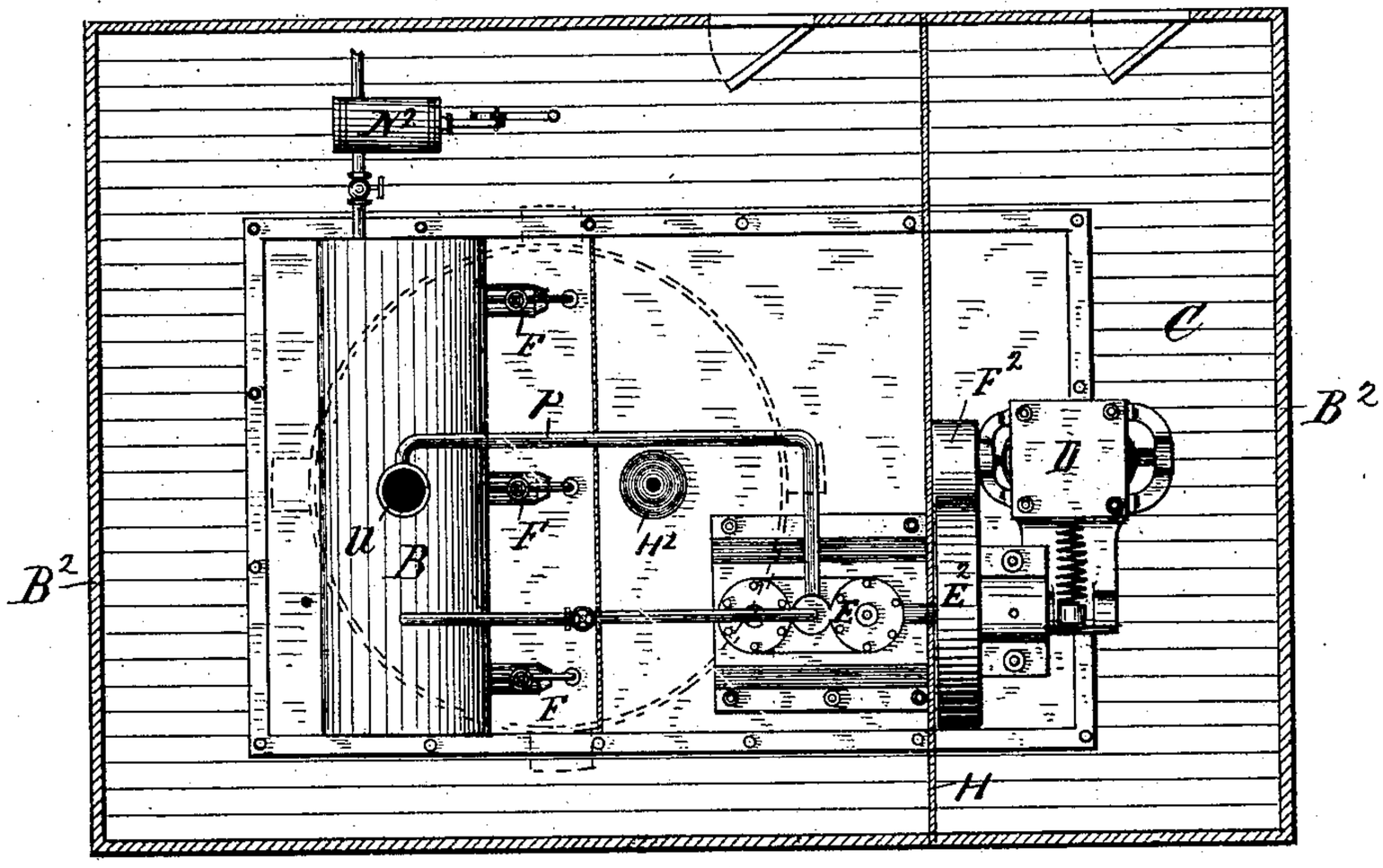

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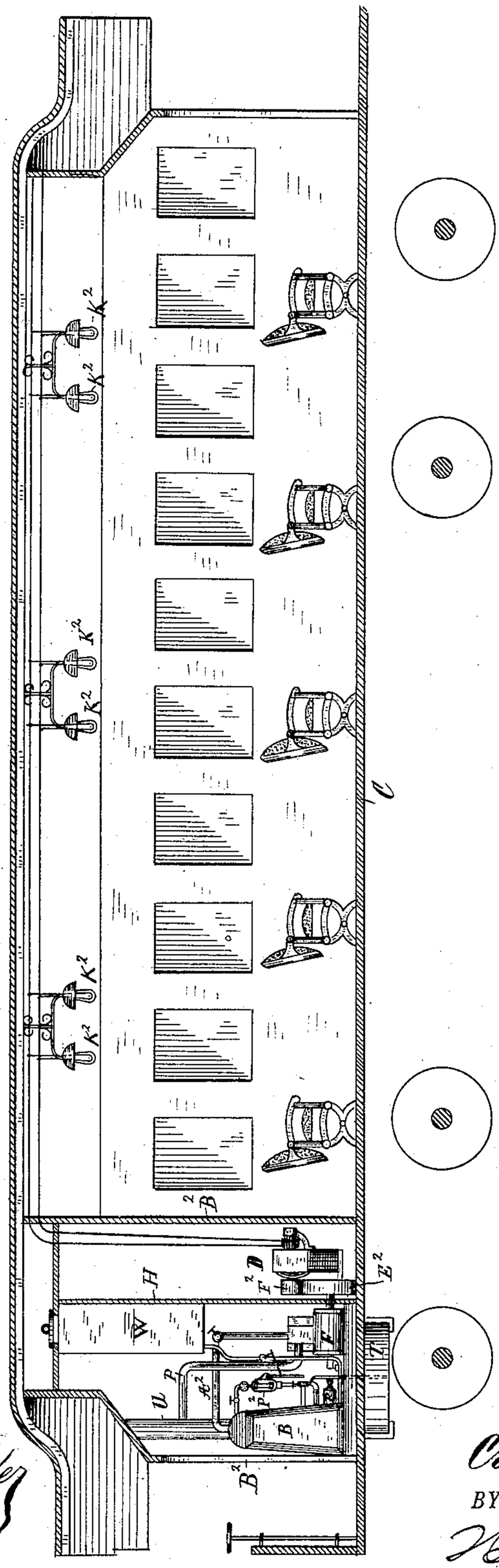
Fig. 4.



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UNITED STATES PATENT OFFICE.

CRAIG R. ARNOLD, OF BROOKLYN, NEW YORK.

CAR-LIGHTING.

SPECIFICATION forming part of Letters Patent No. 376,423, dated January 17, 1888.

Application filed March 29, 1886. Serial No. 196,953. (No model.)

To all whom it may concern:

Be it known that I, CRAIG R. ARNOLD, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful System of Electric Lighting for Railway-Cars, of which the following is a specification.

My invention relates, generally speaking, to appliances for lighting railway-cars by electricity, and has special reference to combinations of apparatus for this purpose in which a dynamo-machine is employed for generating the electricity and a steam-engine is utilized as the motive power for the dynamo, said steam-engine being supplied with steam from a boiler and furnace with which a liquid fluid—such as a hydrocarbon oil—is employed.

The object of my invention is to increase the efficiency of such an apparatus, and to avoid, as far as possible, the dangers incident to the use of a hydrocarbon fuel for the boiler.

A further object of my invention is to prevent unsteadiness in the lights arising from the motion of the car, and any consequent disturbances of the mechanical connection between the engine and the dynamo which would cause irregularity in the rotation of the dynamo-armature.

A further object of my invention is to couple the engine and the dynamo in such way that the running of the dynamo shall not be attended by the disagreeable noise which would flow from the employment of mechanical connections—such as belts provided with belt-tighteners—and at the same time to secure an efficient mechanical connection of the two.

The invention consists in the novel combinations of appliances and the improved details of construction whereby the above and other objects are attained, and which combinations and improvements will be first described in connection with the accompanying drawings, and will be then more particularly specified in the claims.

Figure 1 is a side elevation of an apparatus embodying my invention. Fig. 2 is a side elevation of the dynamo, and illustrates in detail the means for transmitting the power from the engine-shaft to the dynamo in such way that the dynamo may be run without noise. Fig. 3 is a plan illustrating the relative location of the apparatus, but with a steam-engine of different form from that shown in Fig. 1. Fig. 4 is a longitudinal section of a railway-car, showing the lighting apparatus in place.

C indicates the car-floor, and B^2 B^2 the walls of a compartment at one end of the car. These walls are made of suitable material, or are suitably constructed so that they shall be non-conductors of heat and of sound. The compartment is divided into two chambers by the partition H, which is also constructed or formed so as to be a non-conductor of heat. In one of these chambers is located the dynamo D, while in the other are placed the steam-engine, the water-supply tank, and the boiler and furnace. The object of this arrangement is to shield the dynamo from the heat, so as not to interfere with its efficiency, heat being, as is well known, detrimental to the efficiency of a dynamo-machine. Without such non-conducting partition or shield H the dynamo, being confined in the same compartment with the furnace and steam-engine, would be heated considerably and its efficiency correspondingly reduced.

The boiler from which steam is supplied to the engine is indicated at B. This boiler may be of any kind in which steam is generated by a furnace supplied with fuel consisting of hydrocarbon oil supplied by means of an atomizer by steam, air, or other gas under pressure, after the manner shown in patent to A. H. Shipman, No. 304,365. Other forms of hydrocarbon furnace and boiler in which an inflammable liquid is atomized and burned to heat the boiler would be suitable for the purpose of my invention.

H^2 indicates the atomizer, which is connected through a regulating-cock, I, with the steam space or coils of boiler B, so that steam under pressure may be supplied to said atomizer and may act to spray or atomize the liquid hydrocarbon drawn from a tank, T.

F indicates the combustion-tube, through which the flame of the sprayed oil is introduced into the furnace beneath the boiler. A series of such atomizers and tubes may be employed, as indicated in Fig. 3.

It is obvious that the action of the furnace

and boiler depends upon the supply of steam or its equivalent to the atomizer.

In order to start the boiler I use compressed air introduced into the steam-space of the boiler through a tube, M^2, which latter is connected to the air-brake pipe L^2 beneath the car. The tube M^2 is provided with a suitable cock for cutting off the air when desired, or for admitting it into the boiler-space, and thence through the cock I, and to the atomizer when it is desired to start the boiler and engine.

U indicates the escape-flue, and P the pipe for exhaust-steam from the engine E.

A^2 is a pipe conveying steam from the boiler to the engine.

The tank W is placed in the chamber containing the boiler and engine, in order that the water may be heated as far as possible before its introduction into the boiler and the waste heat from the combustion of the oil and the operation of the boiler and furnace may be utilized as far as possible. The water from the tank W is introduced to the boiler through the action of a feed-water regulator, P^2, of any desired kind. The tank T, containing the hydrocarbon oil, is placed beneath the car-bottom, so as to be sheltered from the heat of the boiler and furnace as far as possible, and so that, further, it may be kept cool by exposure of air outside of the car. By this relative arrangement of the boiler and furnace and the oil-tank I entirely avoid any danger of explosion of the oil-tank from overheating.

When a hydrocarbon fuel is employed on a car and is supplied through a pipe leading from the oil-tank to a suitable atomizer, there is danger of an interruption of the combustion or flame at the mouth of the atomizer through an interruption of the supply of oil, caused by motion of the oil in the tank and the momentary uncovering of the end of the tube leading from said tank and supplying oil to the atomizer. In order to avoid this difficulty I employ a series of vertical diaphragms or partitions, G^2, having perforations or openings that will permit a slow circulation of oil to the section into which the supply-pipe dips, but will prevent such swashing or movement of the body of oil would be liable to uncover the end of the supply-tube and interrupt the supply of oil to the atomizer.

The engine E may be of any desired construction, but is preferably a high-speed engine. On the engine-shaft is placed wheel E^2, which is in frictional connection with the wheel F^2 on the armature-shaft of the dynamo-machine D. The latter machine may be of any desired construction, and has its commutator-brushes connected, as more clearly shown in Fig. 3, with a series of electric lights, K^2 K^2, distributed through the car and deriving current from the supply-conductors in multiple arc.

One of the wheels of the friction-gear E^2 F^2 is covered with rubber, or has any other suitably-formed elastic facing which will tend to compensate for any inaccuracies in the surface of the other friction-wheel. The latter wheel has a periphery formed of papier-maché or other suitable non-resonant material. In order to keep the friction-wheels transmitting power to the dynamo in constant connection, I propose to mount the dynamo on a suitable pivotal support pivoted at C^2, and to connect with the dynamo a spring, G, which shall tend to hold or pull the whole machine over in a direction to keep the wheels E^2 F^2 in constant frictional connection.

It will be observed that the engine-shaft is located beneath and the dynamo shaft above and in such relation thereto that the wheel F^2 on the dynamo-shaft makes contact with the wheel E^2 on the upper half of the latter wheel and on the side away from the engine, so that the dynamo is in a neutral field, and the wheels will tend to press more closely into contact as the speed is increased. This means of driving a dynamo on a railway-car is not only an efficient way of transmitting the power from the driving-engine, but possesses the additional advantages that it is noiseless and that there is less liability to interruption of the mechanical connection between the power and the armature-shaft than would be the case with a pulley provided with a belt-tightener, since in the latter instance the jumping of the belt-tightener, owing to motion of the car, would cause slackening of the belt and slipping of the same. My arrangement also occupies less space than a belt and admits of a high speed being attained in the dynamo.

I may employ, if desired, in addition to the appliances described, an air-pump, N^2, connected with the steam-boiler space. This pump may be employed for producing pressure in the boiler when it is desired to start the atomizer. This pump is designed more especially for use when the car is uncoupled from the engine.

When the car is on a train made up and connected to the locomotive, the air-pressure in the air-brake pipe L^2 may be utilized for starting the boiler by simply turning the cock in pipe M^2 and then applying match to the atomizers.

The non-conducting walls B^2 B^2 and the partition H may be made double and filled with mineral wool or other non-radiating and noise-subduing material.

I make no claim in this application to the special form of furnace or boiler shown, as these devices will form the subject of a separate application.

What I claim as my invention is—

1. In a lighting apparatus located in a railway-car, the combination of a dynamo-machine connected to an electric circuit on the car, a steam-engine for driving said dynamo, a boiler and furnace for supplying steam to the engine, all located in a compartment in the car, and a partition or shield which cuts off the dynamo from that chamber of the compartment in which the boiler is located and

protects said dynamo from the heat of the latter, as and for the purpose described.

2. The combination, on a railway-car, of a dynamo-machine, a driving-engine, and a steam-boiler and furnace, all included in a compartment having walls that are non-conductors of heat and sound, and a partition that is also a non-conductor of heat and is placed so as to divide said compartment into two chambers, one of which contains the dynamo and the other the boiler, furnace, and engine, whereby the efficiency of the dynamo may be maintained at its maximum without detriment from the heat of the boiler and furnace.

3. The combination, on a railway-car, of a dynamo-machine, a steam engine, boiler, and water-tank, all contained in a compartment on the car, and a non-conducting partition or shield in said compartment for dividing the compartment into two chambers, one of which contains the dynamo and the other of which contains the water-tank, engine, boiler, and furnace.

4. The combination, on a railway-car, of a dynamo-machine connected to an electric circuit, a steam-engine for driving said dynamo, all located in a compartment of the car, a partition or shield which is a non-conductor of heat, located between said dynamo and steam-engine, a shaft extending from said steam-engine through the partition or shield into the dynamo-chamber, and friction-gear driven thereby for communicating the power of the engine to the dynamo, as and for the purpose set forth.

Signed at New York, in the county of New York and State of New York, this 19th day of March, A. D. 1886.

CRAIG R. ARNOLD.

Witnesses:
WM. H. CAPEL,
GEO. C. COFFIN.