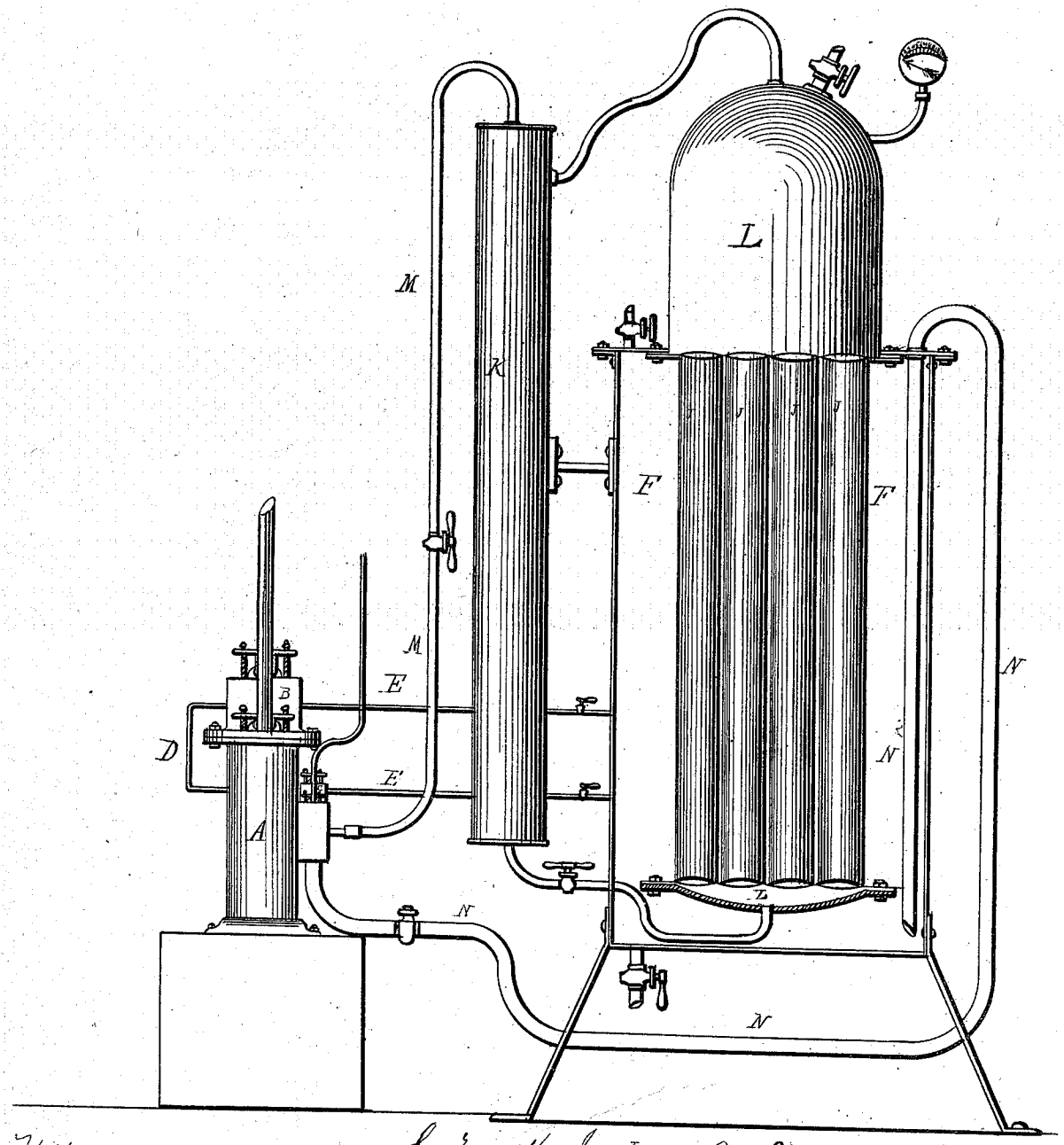
2 Sheets—Sheet 1.

E. LAMM.

AMMONIACAL GAS ENGINE.

No. 105,581. Patented July 19, 1870.

Figure 1st



Witnesses:

Scale 1½ Inches = One Foot.

P. J. McMahon

E. Labouriau

Emile Lamm

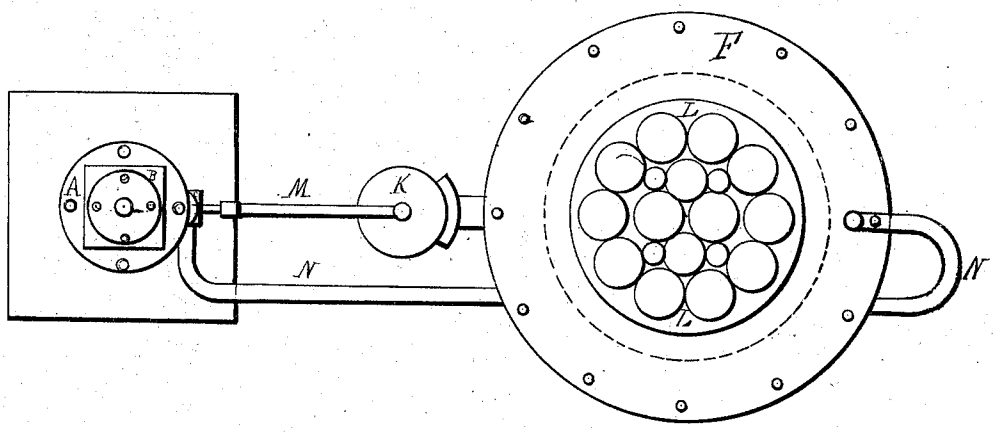
2 Sheets—Sheet 2.

E. LAMM.

AMMONIACAL GAS ENGINE.

No. 105,581. Patented July 19, 1870.

Figure 2nd.



Scale 1½ Inches = One Foot

UNITED STATES PATENT OFFICE.

EMILE LAMM, OF NEW ORLEANS, LOUISIANA.

IMPROVEMENT IN AMMONIACAL-GAS ENGINES.

Specification forming part of Letters Patent No. 105,581, dated July 19, 1870.

To all whom it may concern:

Be it known that I, EMILE LAMM, of New Orleans, in the parish of Orleans, State of Louisiana, have invented an Ammoniacal-Gas Propeller, of which the following is a specification:

The first part of my invention relates to an addition made upon the steam-engine, of water-chambers inclosing the piston-rod and valve-stem, so as to render it capable of being worked by ammoniacal gas instead of steam, without any loss whatever of the gas, which is returned to the common tank, where the exhaust is reabsorbed by a weak solution of aqua ammonia. The second part of my invention relates to the application of liquefied ammoniacal gas, contained in a considerable number of iron tubes, as the liquid from which, instead of water, the motive-power of the engine is derived. The third part relates to a weak solution of aqua ammonia, contained in a tank, in which the iron tubes mentioned above are immersed, and in which, also, the exhaust-pipe of the engine is made to dip near the bottom. The gas exhausted while the engine is working is reabsorbed by this weak solution of aqua ammonia until the solution becomes saturated. The gradual reabsorption of the gas by the weak solution causes the latent heat of the gas to reappear, the consequence being the retransfer, by means of the several aforesaid metallic tubes, (or surfaces,) of the heat thus given out in the weak solution, to the liquefied gas. This retransfer maintains a constant temperature within the tubes, the result of which is to keep an undiminished pressure above the surfaces of the liquefied gas notwithstanding the expenditure of the gas in working the engine. It can, then, be easily perceived that the boiler of this novel motive-power is composed of two parts, viz., first, a tank or shell; second, the tubular reservoir therein contained. There is no communication between those two parts except through the engine. The tubes contain the liquid from which the motive-power is obtained. The tank contains a solution which reabsorbs, as fast as it comes through the exhaust-pipe of the engine, the gas volatilized within the tubes. The ammoniacal solution surrounding the tubes becomes, by a remarkable phenomenon, as soon as the machine is set in motion, the furnace which maintains, by an easily-regulated heat, the motive-power at its maximum of tension. The fourth part relates to the general application of the invention, the most important of which, at the present time, appears to be the propelling of street-cars, for which purpose it will certainly prove very economical, though I am satisfied that it is equally applicable as a motive-power for all purposes whatever, and especially to the driving of machinery requiring only an intermittent action.

By means of this invention any number of cars can be propelled, without fire thereon, for any reasonable distance, for liquefied ammoniacal gas gives a pressure, at the mean temperature of our atmosphere, of one hundred pounds to the square inch, and can be readily and economically liquefied under pressure by a process now well known in the arts. For example, the cars can be propelled at the expense of one single fire, heating, at the depot, a large feeding-boiler containing a concentrated solution of aqua ammonia.

The process of liquefying the ammoniacal gas is rendered continuous by a fresh concentrated solution constantly pumped back into the boiler to replace the weak solution, which is drawn off from its bottom. The process for a continuous supply of liquefied ammoniacal gas being well known, is here mentioned only for clearness' sake.

Figure I is a vertical section of the machine. Fig. II is a horizontal section of the machine.

Fig. I, A represents the cylinder of a steam-engine. B and C are two water-chambers, inclosing within them the packing-boxes of the piston-rod and of the valve-stem. Those chambers are also each provided with a packing-box for the piston-rod and valve-stem to glide through, and are cast of a piece, B, with the bonnet of the cylinder, and C, with the steam-chest. They communicate with each other by means of a small pipe, D. Each water-chamber is connected with tank F by means of pipes E E, so as to allow a free circulation of water from them to the tank. Any leakage which may accidentally occur from the cylinder is necessarily absorbed by the weak aqua ammonia in chambers B and C, there being no loss of gas from leakage, which must go the same way as the exhaust. The tubes lettered J J, belonging to the reservoir L L, are calked in the tube-sheets, top and bottom. These tubes comprise almost all the heating-surface of the said reservoir. They are surmounted by a dome, bolted gas-tight on the outer rim of the upper

tube-sheet, and are inclosed at the bottom by a dished iron bonnet bolted on the rim of the lower tube-sheet. A flange, on the lower portion of the dome, is bolted gas-tight on the top of tank F, to which it serves as a cover, while it is, at the same time, a support to reservoir L L. The tube K is connected, both above and below, with the reservoir, and affords additional room for the expansion of the gas. At the top of tube K is attached the pressure-pipe M M, which is provided with a valve. The pipe N N is the exhaust-pipe of the engine, and dips down in tank F to within two or three inches of the bottom. This exhaust-pipe is provided with a check-valve, in order to prevent the aqua ammonia in the tank from flooding the cylinder on stopping the engine.

I will now describe the working of the machine: The tubes in reservoir L L are filled with liquefied ammoniacal gas and tank F is two-thirds filled with a weak solution of aqua ammonia. The engine is now in condition to communicate motion, by pulley or any other gearing, to any machinery or vehicle, by simply opening the valve in pipe M M; and it works along, as if propelled by steam, until the liquefied ammoniacal gas in reservoir L L becomes exhausted. Now, if the engine is used to propel street-cars, as each car has partly expended the gas contained in reservoir L L, said gas having been during the trip absorbed by the weak solution of aqua ammonia, this now saturated solution is pumped back, at the depot, into the feeding-boiler for redistillation. The reservoir is then charged anew with liquefied gas, the tank resupplied with a weak ammoniacal solution, at a proper temperature, drawn from the feeding-boiler; the car is then ready for the trip. Thus, the sole expense of propelling an unlimited number of cars is that of the fuel necessary to heat the feeding-boiler at the central depot.

A further proof of the economy of working liquefied ammoniacal gas, instead of steam, is derived from this fact, that one gallon of liquefied ammoniacal gas, under a pressure of six and a half atmospheres at 50° Fahrenheit, expands into nine hundred and eighty-three volumes of gas, while water, under the same pressure at 320° Fahrenheit, only gives a volume of two hundred and ninety-five of steam to one of water; also, the quantity of coal necessary to evaporate four gallons of water will produce five gallons of liquefied ammoniacal gas.

What I claim as my own invention, and desire to secure by Letters Patent, is—

1. The addition of water-chambers to the steam-engine, for the purposes set forth and specified.

2. The tubular reservoir containing the liquefied ammoniacal gas, substantially as specified.

3. The tank F, or its equivalent, in combination with the reservoir L, as and for the purpose specified.

4. The combination of the reservoir and tank with the engine and water-chambers, for the purposes set forth and specified.

EMILE LAMM.

Witnesses:
E. SABOURIN,
P. J. MCMAHON.