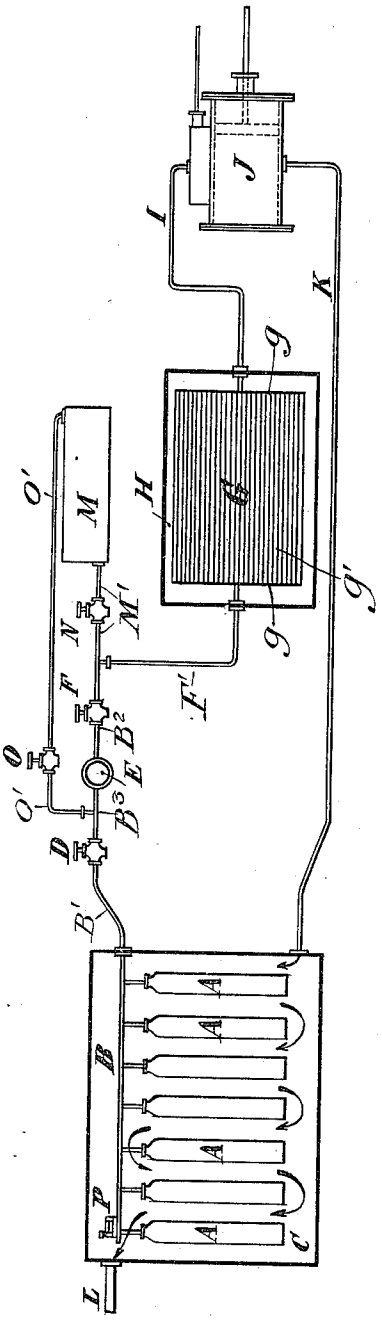
No. 617,049. Patented Jan. 3, 1899.

E. G. RASSINIER.

LIQUID CARBONIC ACID MOTIVE POWER FOR VEHICLES.

(No Model.) (Application filed May 10, 1897.)



Witnesses:
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UNITED STATES PATENT OFFICE.

EUGÈNE GEORGES RASSINIER, OF PARIS, FRANCE.

LIQUID-CARBONIC-ACID MOTIVE POWER FOR VEHICLES.

SPECIFICATION forming part of Letters Patent No. 617,049, dated January 3, 1899.

Application filed May 10, 1897. Serial No. 635,773. (No model.)

To all whom it may concern:

Be it known that I, EUGÈNE GEORGES RASSINIER, of the city of Paris, France, have invented a Liquid-Carbonic-Acid Motive-Power Apparatus for Vehicles, (for which I have obtained Letters Patent in France for fifteen years, dated April 20, 1896, No. 255,679; in Belgium for fifteen years, dated January 19, 1897, No. 125,809, and in England for fourteen years, dated July 3, 1896, No. 14,726,) of which the following is a full, clear, and exact description.

My invention relates to liquid-carbonic-acid motive-power apparatus specially adapted for vehicles.

It is well known that when carbonic acid is used as a motive power the acid in expanding from the liquid to the gaseous state produces such a low temperature congelation of that liquid carbonic-acid gas. Heretofore it has been customary to heat the liquid-carbonic-acid receptacle in order to prevent congelation from the above-mentioned causes. This heating of the carbonic-acid receptacle, however, is not practical where the motor must be stopped and started frequently and is frequently stopped for a considerable length of time, for the reason that if the carbonic-acid receptacle continues to receive heat when the evolved gas is not being used the result will be an extremely high pressure in the said receptacle which must be relieved when the apparatus is at rest. A safety-valve has generally been provided for this purpose, which of course is very wasteful of the carbonic-acid gas. My invention obviates these disadvantages. In addition to obviating the disadvantages mentioned, which result is effected by heating the carbonic-acid-gas receptacle only when the apparatus is in action, my apparatus involves further special advantages. By my construction I am able to cause the carbonic-acid gas to expand three times its volume at a temperature of 200° before its admission to the cylinder, and by admixing a small quantity of steam therewith leakage is prevented, the piston is lubricated, and carbonic-acid gas is economized.

My invention will be understood by referring to the drawing, forming part thereof, which exhibits an apparatus embodying my invention.

In the drawing, A are carbonic-acid-gas receptacles (shown in the present instance as bottles) containing liquid carbonic acid. These bottles communicate with a common tube or header B and are inclosed within a chamber C. The tube or header B communicates through a pipe B′ and a reducing-valve D with an expansion vessel E, where the gas expands. The expansion vessel E communicates through a pipe B^2, a valve F, and a pipe F′ with a tubular heater G, comprising a plurality of oppositely-placed headers *g*, connecting by means of tubes *g′*, the whole being surrounded by an enveloping chamber H, which is suitably heated, preferably by petroleum. The gas in passing through the tubes G is raised to a temperature of 200° and is then conveyed by pipe I to the cylinder J, whence after doing its work upon the piston it is exhausted through the pipe K and chamber C, preventing solidification of the carbonic acid in the bottles A.

M is a water-tank from which water is supplied drop by drop through a pipe M′ and a cock N into the tube F′, which conducts the carbonic acid to the tubular heater G, where the water becomes converted into steam and mixed with the gas before it enters cylinder J, where the said steam-and-gas mixture acts upon the pistons. The tank M receives pressure by the pipe O′, which connects with pipe B′ at the point B^3 beyond the reducing-valve D. The water from the tank M is forced into the tubular heater G, together with the carbonic-acid gas, by the pressure of the carbonic acid in the bottles A, communicated to the tank M, as above described, which pressure is higher than that in and beyond the expansion-chamber E, the pressure in the bottles A being from eight hundred and fifty to eleven hundred pounds per square inch, whereas the pressure in the vessel E is one hundred and forty pounds to the square inch. The pressure in the tank M, and consequently the flow of water, is regulated by a regulating-valve O in the pipe O′.

A safety-valve P is provided in the header B and is set to relieve the pressure therein when the same rises to, say, about fourteen hundred pounds. The mixture of gas and steam after having done its work in the cylinder J passes by the pipe K to the chamber

C, where it gives up its heat to raise the temperature of the bottles A and is finally discharged by the pipe L.

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

1. In an apparatus for the production of motive power from liquid carbonic acid specially adapted for use in motor-carriages, the combination of a liquid-carbonic-acid reservoir provided with a heating-chamber, a gas-expansion chamber E communicating with the liquid-carbonic-acid reservoir, a source of liquid-supply, a heater receiving carbonic acid and liquid from the expansion-chamber and liquid-reservoir respectively and producing steam which is admixed with the carbonic-acid gas in the heater, a motor driven by the said steam-and-gas mixture and an exhaust from the said gas-motor conducting the spent steam-and-gas mixture from the said motor to the heating-chamber for the liquid-carbonic-acid reservoir, whereby, when the motor is in operation, hot spent gases will be supplied by the motor to heat the liquid-carbonic-acid reservoir to prevent the same from freezing, and when the motor is stopped, heat will no longer be supplied to the said liquid-carbonic-acid reservoir whereby a dangerous evolution of gas therein will be avoided when the motor is at rest, substantially as described and for purposes set forth.

2. The herein-described apparatus for utilizing liquid carbonic-acid gas for motive power, lubricating parts and effecting the heating of the liquid carbonic acid to prevent congelation thereof while the motor is running, comprising in its structure, a liquid-carbonic-acid reservoir having a heating-chamber, an expansion-chamber E, a liquid-reservoir M provided with a pressure-pipe communicating with the liquid-carbonic-acid receptacle in advance of the expansion-chamber E, a tubular heater G communicating with the liquid-reservoir and the expansion-chamber E, a motor receiving a mixture of steam and hot carbonic-acid gas from the said tubular heater and an exhaust forming a communication between the motor and the heater for the liquid-carbonic-acid receptacle, and adapted to heat the same only when the motor is running.

The foregoing specification of my liquid-carbonic-acid motive-power apparatus for vehicles signed by me this 24th day of April, 1897.

EUGÈNE GEORGES RASSINIER.

Witnesses:
GEORGES CHARLES COQUET,
EDWARD P. MACLEAN.