(No Model.) 2 Sheets—Sheet 1.

P. J. McMAHON.

AMMONIACAL GAS MOTOR OR ENGINE.

No. 420,241. Patented Jan. 28, 1890.

Fig. 1.

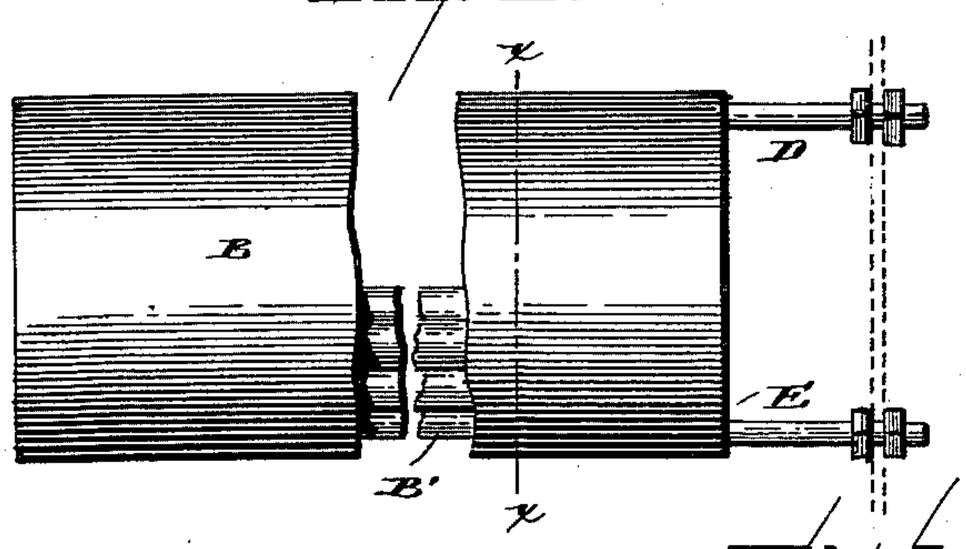


Fig. 2.

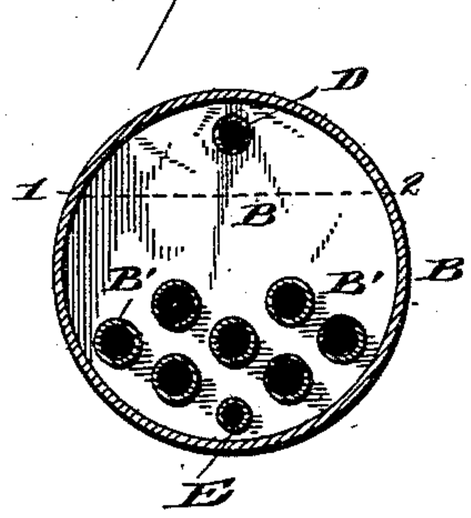


Fig. 3.

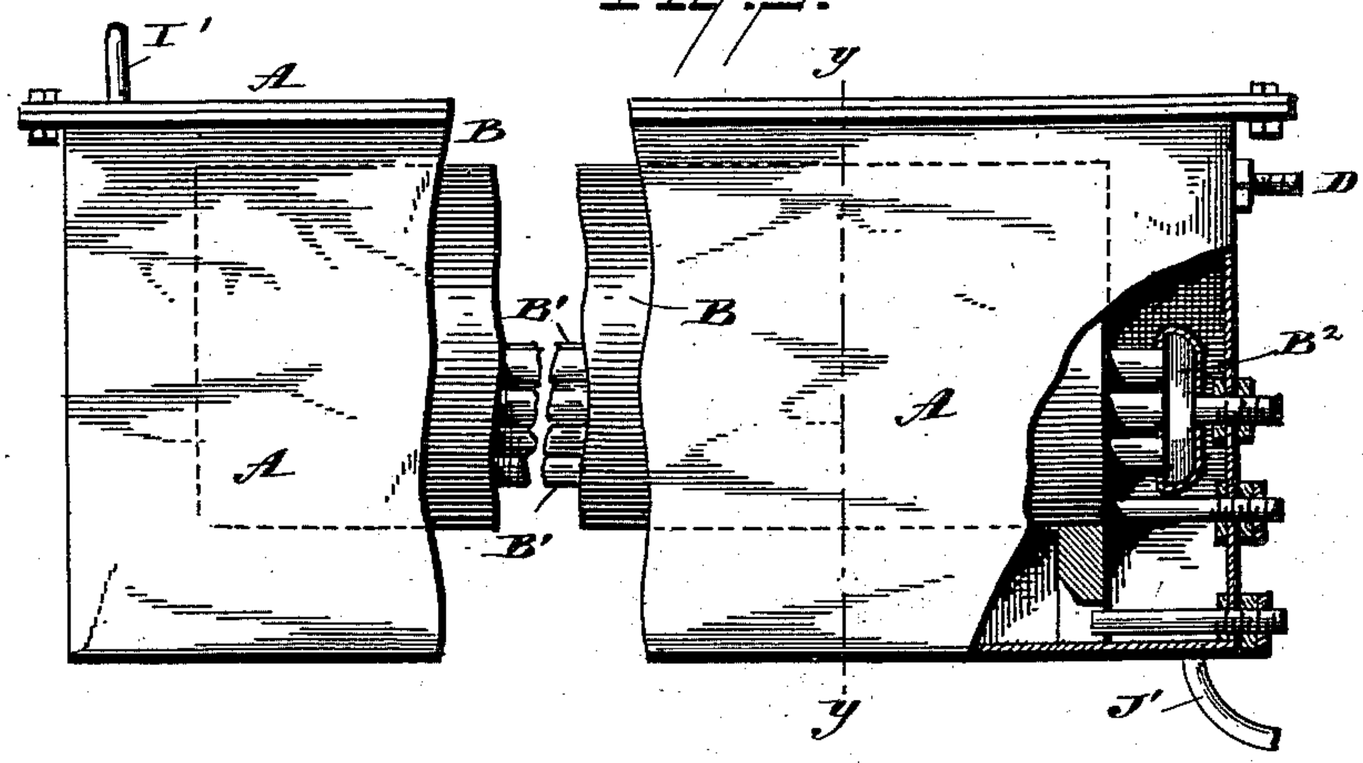
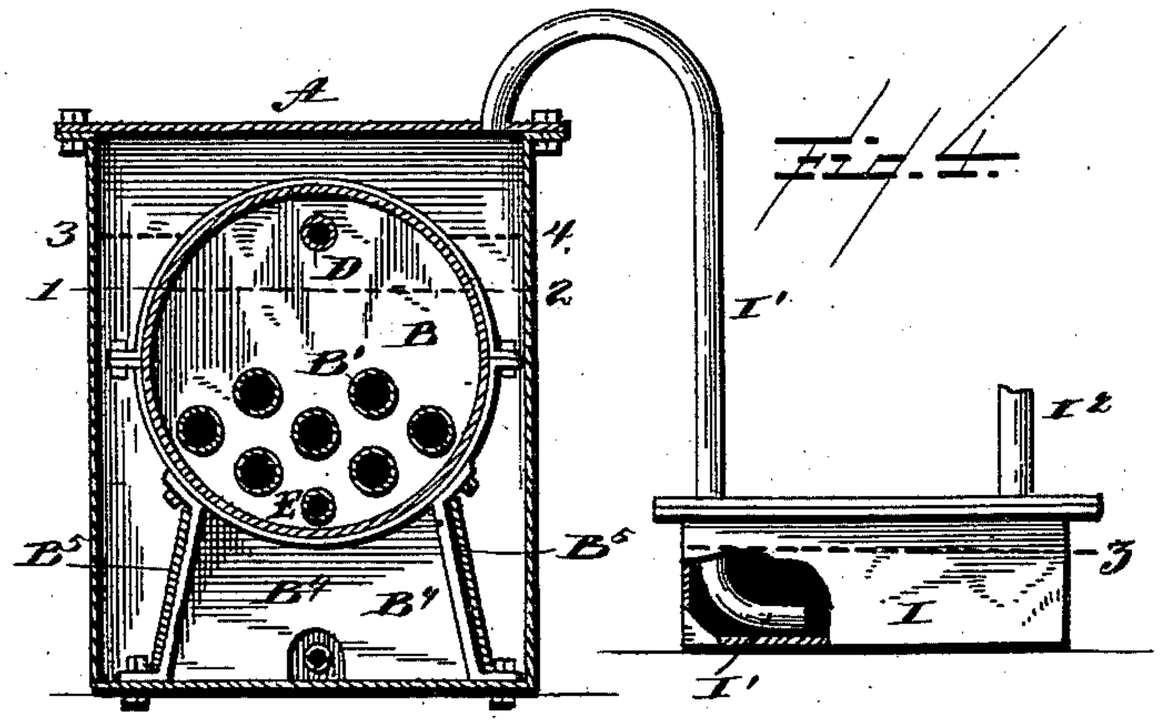


Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

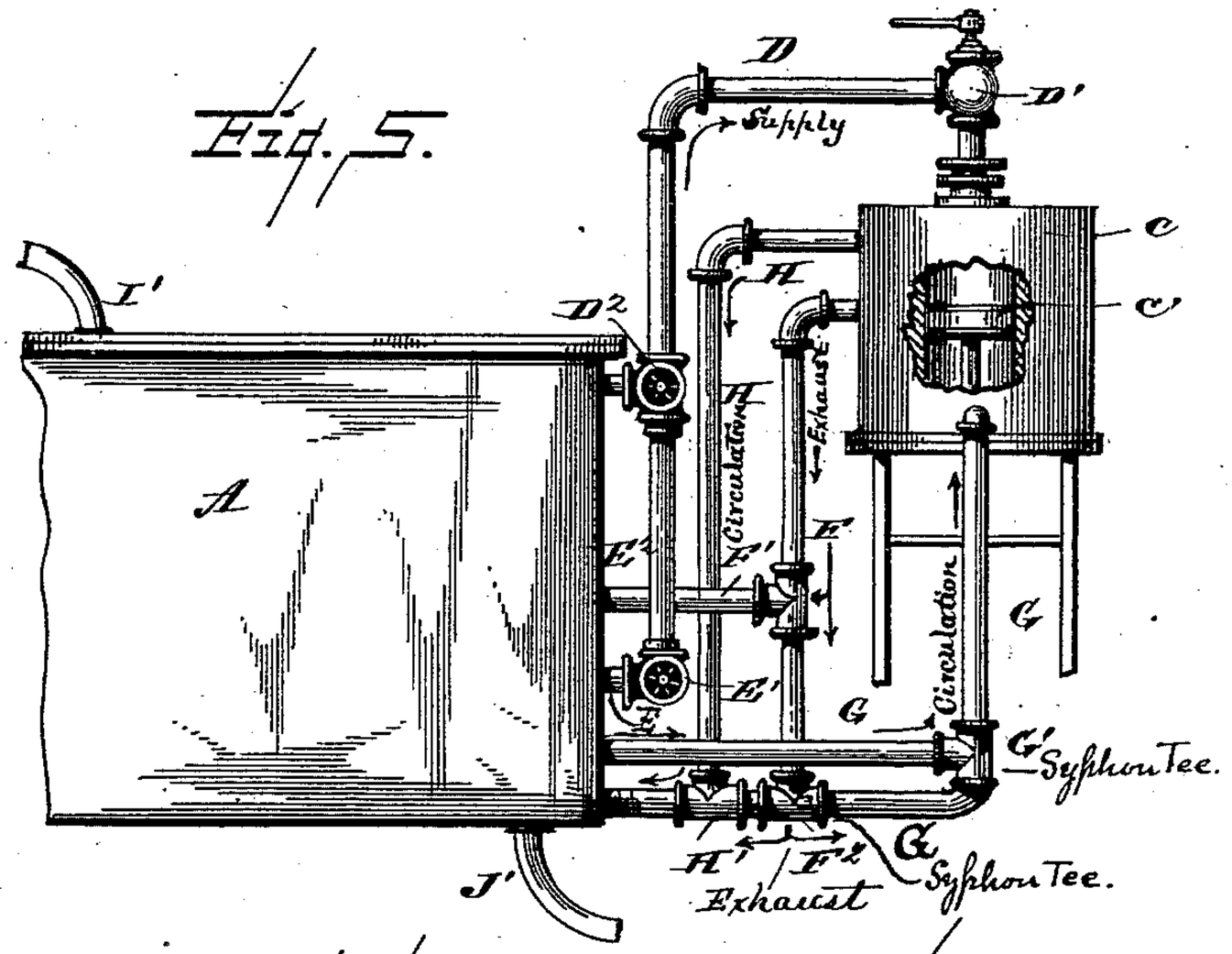


Fig. 6.

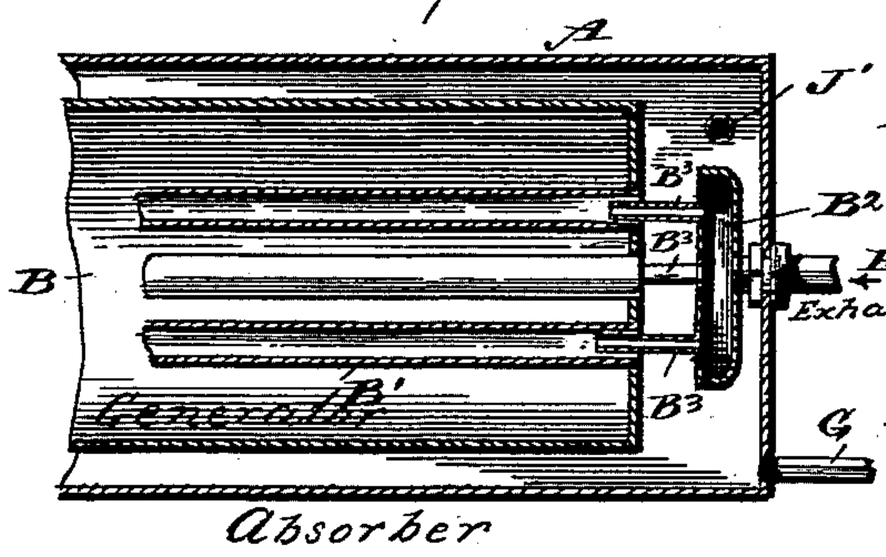
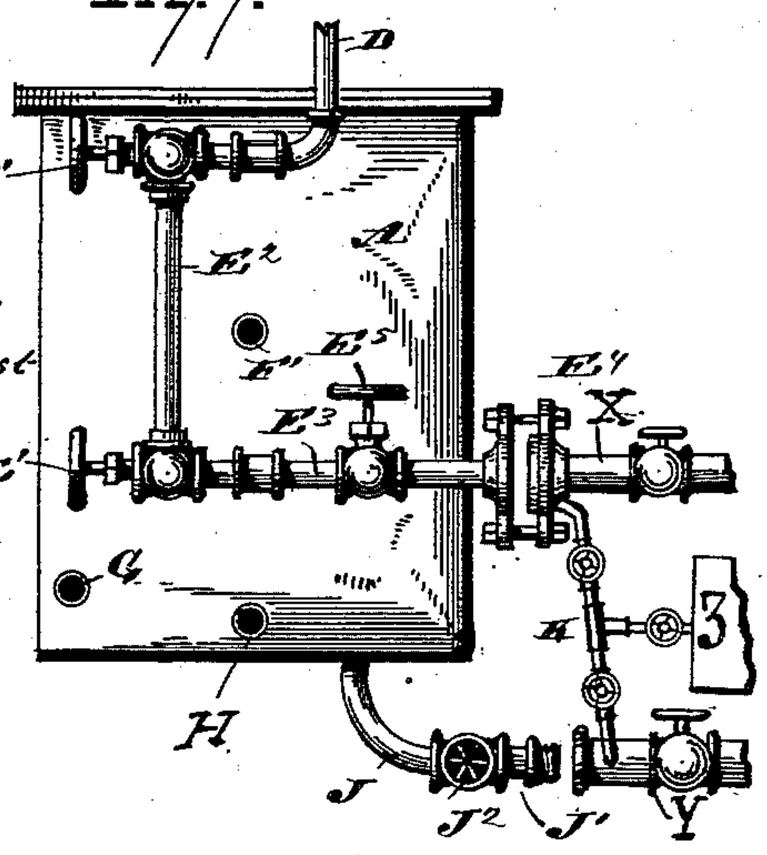


Fig. 7.



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UNITED STATES PATENT OFFICE.

PATRICK J. McMAHON, OF NEW ORLEANS, LOUISIANA, ASSIGNOR TO THE STANDARD FIRELESS ENGINE COMPANY, OF SAME PLACE.

AMMONIACAL-GAS MOTOR OR ENGINE.

SPECIFICATION forming part of Letters Patent No. 420,241, dated January 28, 1890.

Application filed July 16, 1887. Serial No. 244,492. (No model.) Patented in France December 2, 1887, No. 3,503, and in England December 9, 1887, No. 10,897.

To all whom it may concern:

Be it known that I, PATRICK J. MCMAHON, a citizen of the United States, residing at New Orleans, in the parish of Orleans, State of Louisiana, have invented certain new and useful Improvements in Ammoniacal-Gas Motors or Engines, (for which I have obtained Letters Patent in Great Britain December 9, 1887, No. 10,897, and in France December 2, 1887, No. 3,503,) of which the following is a specification, reference being had therein to the accompanying drawings.

This invention has relation to an ammoniacal-gas motor or engine and generator combined, and among the objects in view are to provide an apparatus of the above character which is adapted to be charged at a stationary plant with ammonia, and to develop the power thereof and utilize the same at any place remote therefrom.

Other objects and advantages of the invention will hereinafter appear, and the novel features thereof will be pointed out in the claims.

Referring to the drawings, Figure 1 is a side elevation of the generator-cylinder. Fig. 2 is a transverse section of the same on the line *x x*. Fig. 3 is a side elevation of the solution-tank, the generator-cylinder being in position therein. Fig. 4 is a transverse section on the line *y y* of Fig. 3. Fig. 5 is a side elevation of the solution-tank, engine, and their connections. Fig. 6 is a central longitudinal section of the solution-tank and generator-cylinder; and Fig. 7 is an end elevation of the solution-tank, showing means for charging the same with ammonia from the plant.

Similar letters of reference indicate like parts in all the figures.

A represents the solution-tank, which is air-tight, and mounted therein is the generator-cylinder B, which is of cylindrical form, and provided with the longitudinally-disposed tubes B′, extending through both heads of the cylinder, and communicating with a chamber B^2 by means of a smaller tube B^3, acting as a siphon. The cylinder is mounted within the tank A upon legs or standards B^4, secured at each end thereof and resting upon the bottom of the tank, and from leg to leg at each side of the cylinder are light metallic or wood partitions B^5, provided for the purpose of maintaining a circulation within the tank, as hereinafter described.

C represents the engine-cylinder. Within the engine-cylinder is the piston C′, to be operated by the ammoniacal gas, as will be described.

D′ represents the usual throttle-valve, mounted upon the jacket above the piston, and leading from said valve is pipe D, leading from the top of the tank A, and provided with a cut-off or valve D^2. A pipe E, having a cut-off or valve E′, projects from the tank A, near the lower end thereof, and is connected with the pipe D by means of a glass gage-tube E^2, whereby the level of the liquid within the tank may be observed from the outside. An exhaust-pipe F, having a discharge-branch F′ leading therefrom to the tank and communicating with the chamber B^2, is connected to the cylinder or jacket C, and the lower end of said pipe communicates with the solution-pipe G, leading from the bottom of the tank A to the bottom of the jacket C by T-coupling F^2. An overflow-pipe H is connected at the top of the jacket C, and extends down and is connected to the solution-pipe G, said pipe H, and also the exhaust F, being connected to the solution-pipe G by means of an ordinary T-coupling H′ and siphon T-couplings F′ and G′.

I represents the air-escape and gas-trap, and is connected to the top of the tank A by means of a pipe I′, leading therefrom to and below the water-line Z in the trap. In this manner the air is forced by the ammoniacal gas from the tank, is carried to the trap, and is filtered through the water therein, whereby all gas is extracted and absorbed by the water, and the air may then pass out of the outlet I^2. By this arrangement not only is a great waste prevented, but unpleasant odors from the ammonia cannot escape. Afterward the ammonia may be extracted from the water and again utilized.

Branching at a right angle from the pipe

E is the branch pipe E^3, having at its outer end a suitable coupling E^4, and provided with an intermediate cut-off E^5.

J represents the tank supply-pipe, which is provided with a coupling J′ at its end and an intermediate cut-off J^2.

A pipe X leads from a stationary plant, (not shown,) the construction and operation of which are set forth in my application Serial No. 210,960, and is connected to the pipe E^3 by means of the coupling E^4, and through pipe, which it is understood is provided with suitable cut-off devices, the generator is charged with ammonia, the cut-off E^5 having been previously opened. The ammonia is under pressure at the time and passes through the pipe E into the cylinder B. In the same manner—namely, by opening the cut-off J^2 in the pipe J and a similar cut-off in the pipe Y—the solution-tank A is charged with the weak solution. Through the pipe E^3, when the strength or density of a charge has been expended, it is withdrawn from the cylinder, and when the weak solution becomes concentrated the same is drawn off through the pipe J.

When the tank and generator-cylinder are to be charged, the stop-cocks or cut-offs E^5 J^2 are closed, and the charging-pipes (between the stop-cocks therein and those leading to the generator-cylinder and tank) are emptied and a partial vacuum produced in them before charges are introduced. This is accomplished through the small pipe K, which leads to a vessel Z of the stationary plant in which a vacuum is maintained, as described in my aforesaid application.

In charging my apparatus, the generator-cylinder B is filled with anhydrous ammonia to the line 1 2, (see Fig. 2,) and the tank is filled to the line 3 4 (see Fig. 4) with the weak solution to reabsorb the gas.

Referring more particularly to Fig. 4, in which is shown the gas-trap or air-escape, the use of this device will be apparent, in that when the engine is put in operation the level of the liquid ammonia will gradually fall below the line 1 2 by reason of the evaporation of the gas therefrom, and as the exhaust-gas escapes into the solution-tank during the operation of the engine it is absorbed by the solution, and the level of the solution will gradually rise below the line 3 4. Now the space above this line is full of air before the starting, and it is necessary to dispose of it in some way. It would not do to have it escape directly into the surrounding atmosphere, as it would make bad and disagreeable odors, and the ammoniacal gas contained therein would be also wasted. Furthermore, should it be allowed to remain during the operation of the engine, the increasing volume of the solution would compress the same and produce back-pressure on the exhaust side of the piston. Therefore to avoid these objections the air is conducted from the top of the tank through the pipe I′ down below the waterline in the trap I, where the ammonia is trapped and absorbed by the water and the remaining air is conducted up and out through the escape I^2.

The provision of the partitions B^5, which extend the length of the generator-cylinder B, is for the purpose of confining the solution which had been heated by the absorption of the gas to the bottom of the generator until it has reached the opposite end thereof, and thereby to secure the circulation of the solution the whole length of the generator underneath it as well as through the tubes to accomplish the complete absorption of the gas as well as the application of the heat rendered sensible thereby to the metallic surfaces around which the anhydrous ammonia is distributed. The solution becomes cooler as it approaches the rear end of the generator and passes out and circulates back to the front end of the generator outside of the partitions. The exhaust from the cylinder makes it circulate around continuously in this course while the engine is working, and this accomplishes the desired object.

By opening the cock D^2 gas is supplied from the top of cylinder B to the engine-cylinder, it being regulated by the throttle D′. The piston having been operated, the gas passes down through the exhaust-pipe F, part of said exhaust-pipe passing through the pipe F′ into the tubes B′ of the cylinder, the remaining through the siphon-coupling F^2, circulating the solution from the tank through pipe G into the lower end of the casing and up through the overflow-pipe H, and back to the tank A, while the other portion of the exhaust enters the siphon-coupling G′ and assists the circulation through the jacket. That portion of the exhaust which enters the siphon-coupling G′ becomes absorbed in the solution, passing up the pipe G, giving out its latent heat, and heating the solution as it passes into the jacket or casing. By this means the jacket-cylinder is not only prevented from freezing, but is superheated, and this without the application of external heat. The solution overflowing from the jacket is again met by a portion of the exhaust through the siphon H′, where it acquires additional heat by the absorption of this gas and is made to circulate through under the cylinder, keeping up the temperature of its surface, as previously described, as well as that of the tubes, so that the evaporation of the gas in the generator is kept up in the most efficient manner while the engine is in operation, and the engine-cylinder is also kept superheated.

There is a material advantage in arranging the component parts in the generator, especially the cylinder-tubes, in a horizontal position, in that the exhaust-gas is submerged for a longer time and during a longer course or portion of the circulation than when arranged vertical, and thus securing its complete absorption and materially aiding in the prevention of the collection within the gen-

erator of unabsorbed gas, which would tend to produce back-pressure on the piston.

Certain features of construction herein claimed are shown but not claimed in my companion application, Serial No. 244,491.

Having described my invention and its operation, what I claim is—

1. In a generator of the class described, a tank, a cylinder arranged within the tank free from its walls, partitions arranged parallel with the cylinder, and an exhaust-pipe arranged beneath the cylinder and between the partitions, substantially as specified.

2. The combination, with the cylinder of a motor and with the jacket thereof, of a generator and a surrounding reabsorbing tank, a supply-pipe extending from the generator to the motor-cylinder, and pipes communicating with the jacket of the cylinder and directly with the absorbing-tank, and siphon-couplings arranged in said pipes to produce the circulation of reabsorbent liquid directly from the tank into and through the jacket of the cylinder and directly back to the tank, substantially as specified.

3. The combination, with the cylinder of a motor, of a generator, a supply-pipe extending from the same to the motor-cylinder, and exhaust-pipes, one extending from the motor-cylinder to the tank of the generator and communicating with the tubes of the cylinder therein, and the other extending from the motor-cylinder to and beneath said cylinder within the tank of the generator, substantially as specified.

4. The combination, with a motor and a generator of the class described, and provided with tubes, of an exhaust-pipe extending from the motor to the generator and entering said tubes to produce a circulation of the reabsorbing liquid therethrough, substantially as specified.

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

PATRICK J. McMAHON.

Witnesses:
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W. S. DUVALL.