(No Model.)

T. JOWLEW & P. WRADY.

AMMONIA MOTOR.

No. 539,685. Patented May 21, 1895.

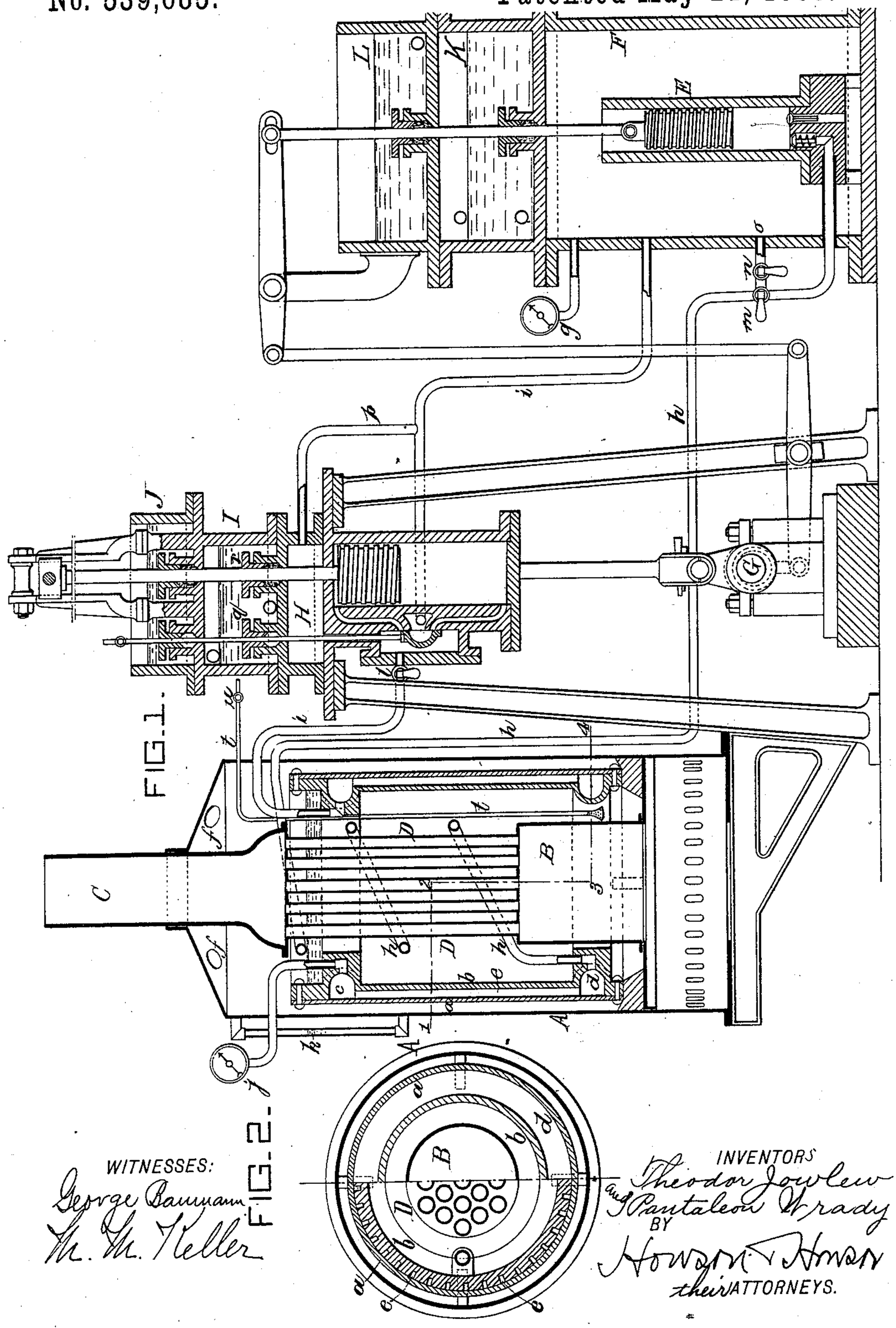

FIG. 1.

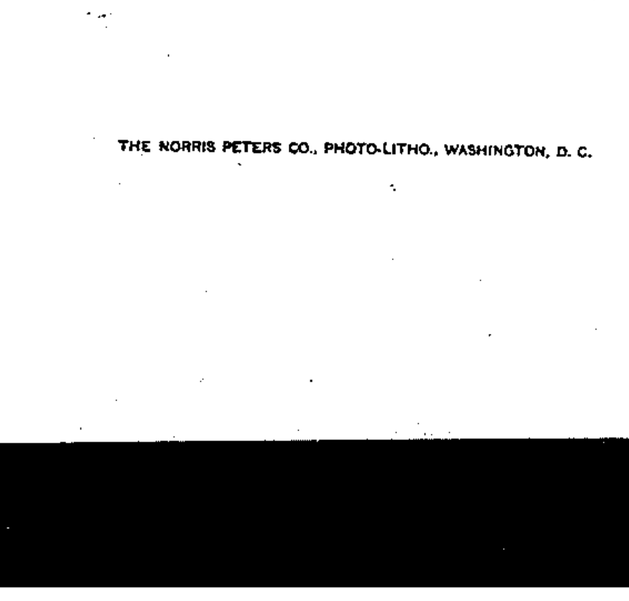

FIG. 2.

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UNITED STATES PATENT OFFICE.

THEODOR JOWLEW AND PANTALEON WRADY, OF ST. PETERSBURG, RUSSIA.

AMMONIA-MOTOR.

SPECIFICATION forming part of Letters Patent No. 539,685, dated May 21, 1895.

Application filed December 18, 1893. Serial No. 493,932. (No model.)

To all whom it may concern:

Be it known that we, THEODOR JOWLEW and PANTALEON WRADY, subjects of the Emperor of Russia, residing at St. Petersburg, Russia, have invented new and useful Improvements in Ammonia-Motors, of which the following is a specification.

Ammoniacal gas becoming liquid at 0° centigrade and under a pressure of four atmospheres, attains, if heated, in a closed vessel, to +25° centigrade, a tension of 19.25 atmospheres, and when the heat is increased to +100° centigrade, a tension of sixty-one atmospheres is produced. Thus, using only this range of temperature (100° to 25°) we will have at our disposal a tension of forty-one to seventy-five atmospheres, which may be utilized in motors of every kind. Notwithstanding such profitable qualities, the use of the ammoniacal gas as a motive power proves to have been hitherto practically inapplicable, chiefly for the reason that there were no means to regulate the vaporizing temperature of ammonia in such a manner, that its initial tension be constant and could not exceed a definite limit. A further disadvantage which seriously interfered with the application of ammoniacal gas in motors was its strong acrid smell, as also the impossibility to prevent its escaping into the atmosphere. We have succeeded in avoiding these disadvantages by the aid of the following improvements: In order to secure a constant initial tension of the ammoniacal gas we place the vessel when liquid ammonia is vaporized in a reservoir, filled with a liquid, boiling at a definite temperature. Under such conditions the liquid ammonia is not allowed to be heated beyond a definite limit, and consequently, a constant initial tension of its vapor is secured. The second of the above-mentioned disadvantages is avoided by immersing in water all joints of the motor where an escapement of gas might be feared, the water absorbing the gas with avidity, does not allow the same to get to the atmosphere. For greater security oil chambers are placed beyond the water chambers, the oil absorbing all traces of ammonia. The motor itself may be constructed in any manner desired. On the accompanying drawings we have represented a motor combined with a generator of ammonia vapors of our system, and a pump forcing the liquid ammonia into the generator.

Figure 1 represents a vertical section of the general arrangement of the generator, the motor, and the pump; and Fig. 2 is a cross-section of the generator on the line 1 2 3 4, Fig. 1.

The generator consists of two cylinders *a* and *b* made of steel, the cylinder *b* fitting closely into the cylinder *a* and the two are tightly riveted together or otherwise fastened at their ends. The interior cylinder *b* has at its upper and lower parts horizontal annular cavities *c* and *d*, and vertical grooves *e e* or channels, connecting the two cavities *c* and *d*. See Fig. 2. The generator thus arranged is placed in a boiler open to the air and consisting of an external jacket A and an interior fire-place B connected with the chimney C by pipes D, D. For motors of ordinary size, it will be sufficient to place in the fire-room an ordinary petroleum lamp, while for more powerful motors the heat may be obtained by any fuel, though we prefer to heat by petroleum burners. As the pipes D do not touch the interior cylinder *b*, the whole generator is surrounded outside and inside by water or any other liquid contained in the boiler A, and as this boiler freely communicates with the atmosphere through the apertures *f*, *f*, the temperature of the liquid in the boiler remains always constant, securing a constant temperature, and consequently a constant initial tension of the ammoniacal gases produced in the generator.

The liquid ammonia is forced into the generator by aid of the pump E, located in a closed cylinder or condenser F which is previously filled with liquid ammonia under a pressure of 19.25 atmospheres at 25° centigrade, or of eleven atmospheres at 0° centigrade. The pressure in the cylinder F is indicated by the pressure gage *g*.

The liquid ammonia is forced through the pipe *h*, which pipe enters the boiler A and forms a coil around the pipes D and discharges in the lower cavity *d* of the generator, whence it rises through the grooves *e* to the upper cavity *c*, and from here it flows in the

form of gas, having a tension of sixty-one atmospheres, along the pipe *i* to the steam box of the motor.

The exhaust gas from the motive power cylinder is returned through the pipe *i'* to the reservoir or condenser F, to be again liquefied and forced by the pump E into the generator.

Motion is imparted to the pump rod from the working shaft G of the motor, as shown on the drawings or in any other manner.

The pressure of ammonia vapors in the generator is indicated by the pressure gage *j*, and the level of the liquid in the boiler A by the glass gage K.

The feeding of the liquid to the boiler A is through the pipe *t* which is provided with a stop-cock *u*.

For regulating the amount of gas to the motor cylinder a cock *l* is provided on the pipe *i*. If the motor is to be stopped this cock is closed, and, simultaneously, the cocks *m* and *n* are turned in such a manner that should the pump E continue to work the liquid ammonia is forced back through the pipe *o* in the reservoir F, and not into the generator.

To prevent the ammoniacal gas from escaping into the atmosphere a closed case or box H is arranged above the motive power cylinder in which box the ammoniacal vapors escaping along the piston rod or valve rod are liquefied, and the liquid ammonia is returned by the pipes *p* and *i* in the reservoir F.

Above the box H are two other cases I and J, the lower of which is a chamber for circulating water which absorbs the ammoniacal gases escaping through the stuffing boxes *q* and *r*, while the upper box J is filled with oil which retains all trace of ammonia. Two similar boxes K and L are also arranged above the reservoir F.

We claim as our invention—

1. In an ammonia motor, the combination of a condenser, a circulating pump, a vaporizer and a motive power cylinder having a piston and valve, with a chamber through which the piston rod and valve-rod pass, the said chamber being connected to the condenser to return any leakage therefrom, with two superposed chambers, one to contain water, and the other oil, and through both of which the piston-rod and the valve-rod work, substantially as and for the purpose set forth.

2. A generator to produce ammoniacal gas, consisting of a boiler open to the atmosphere and provided with an interior fire-place, and two hollow cylinders tightly joined together, one within the other, and having horizontal and vertical grooves between them in which the gas is generated, the said cylinders being placed within the boiler so as to be surrounded outside and inside by the fluid in the boiler, substantially as and for the purposes set forth.

3. A generator to produce ammoniacal gas, consisting of a boiler open to the atmosphere and provided with an interior fire-place and pipes leading from the fire-place to the chimney, two hollow cylinders tightly joined together one within the other and having grooves between them in which the gas is generated, an inlet and outlet to the grooves, the said cylinders being placed within the boiler so as to be surrounded outside and inside by the fluid in the boiler, and a pipe coiled around the pipes leading from the fire-place, the said pipe connected to the said inlet to the grooves, all substantially as and for the purposes set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

THEODOR JOWLEW.
PANTALEON WRADY.

Witnesses:
N. TSCHEKALOFF,
J. FLIERLING.