(No Model.)

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PROCESS OF AND APPARATUS FOR MANUFACTURING HEATING VAPOR.

No. 275,634. Patented Apr. 10, 1883.

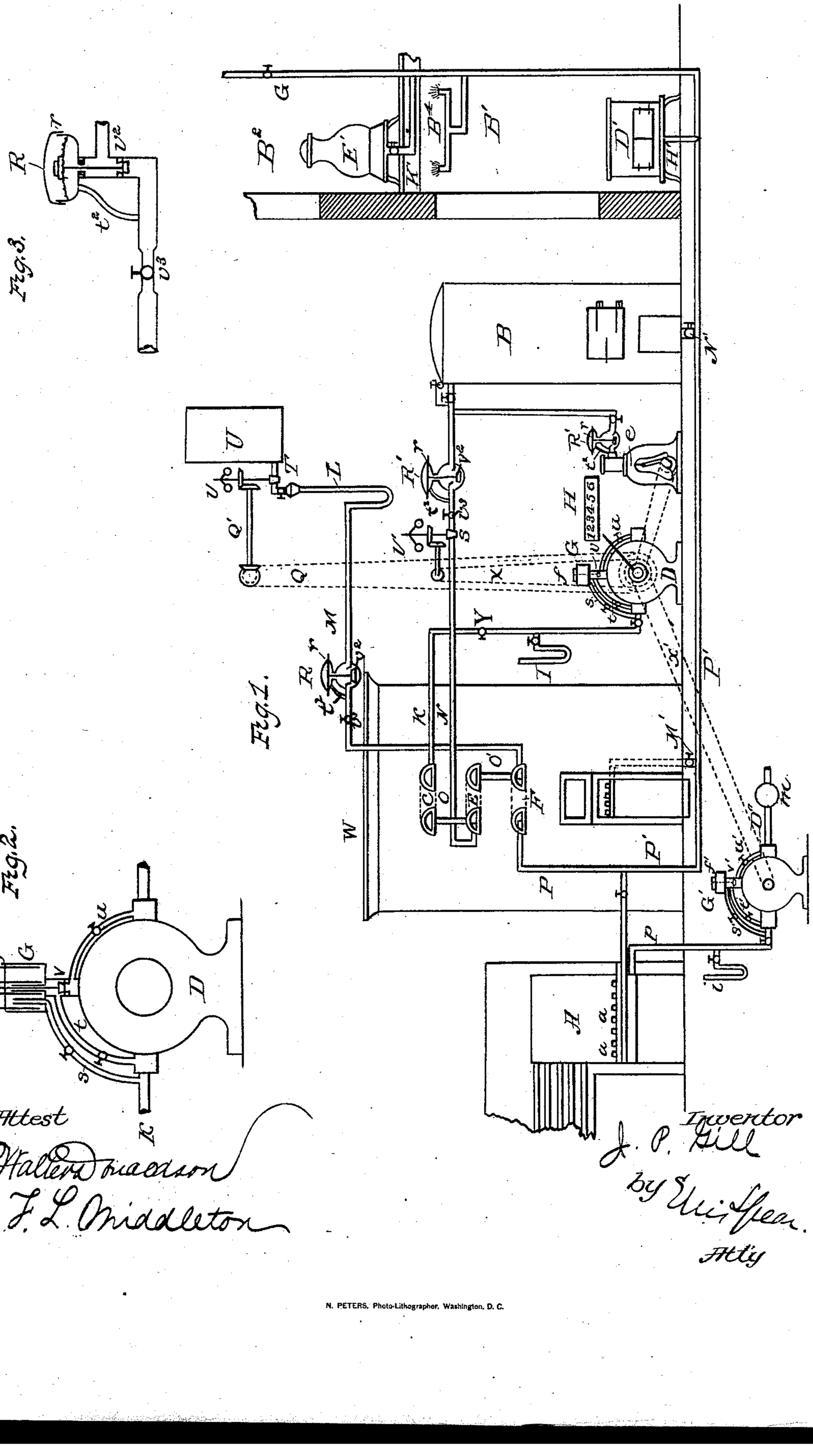

Fig. 1.

Fig. 2.

Fig. 3.

Attest

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PROCESS OF AND APPARATUS FOR MANUFACTURING HEATING-VAPOR.

SPECIFICATION forming part of Letters Patent No. 275,634, dated April 10, 1883.

Application filed March 16, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH PEARSON GILL, of the city, county, and State of New York, have invented a new and useful Improvement in Processes of and Apparatus for Manufacturing Heating-Vapor; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to an apparatus and method for vaporizing petroleum or other liquid hydrocarbons for heating purposes.

It consists, first, in combining with said liquid hydrocarbons heated air and superheated steam in a vaporizer, in regulated proportionate quantities, at temperatures at or above the boiling-point of the liquid employed and below that of destructive distillation, and in delivering the commingled hydrocarbon vapor, heated air, and superheated steam to burners in furnaces, where the air is supplied automatically in the proportion required to effect the perfect combustion of the commingled gaseous vapors.

It also consists in the automatically-regulated forcing devices for supplying and maintaining the definite proportions and relative quantities of the air, liquid, and steam used in connection with the hydrocarbon supply and heating apparatus, and in the means employed for operating the same, of which the following is a description, illustrated by the accompanying drawings.

In the drawings, Figure 1 represents a side elevation of the apparatus, partly in section, and with the various pipes exposed to view. Fig. 2 represents in detached position the air-forcing device with its automatic regulators. Fig. 3 shows detached and on enlarged plan an automatic regulating or pressure-reducing device for the steam-pipe.

In the drawings, A represents a furnace with burners adapted to burn dry highly-rarefied gaseous hydrocarbon vapors, heated air, and superheated steam, from which the superheated steam may be omitted. A furnace, W, contains superheaters and vaporizers. I provide, also, an air-pump, preferably rotary, (marked D,) an engine, *e*, for working the pump, a compensator, G, on the pump, consisting of the float *f* in a tank-valve, *v*, located between the tank and the inlet-pipe of the pump, the float being operated by the pressure of the air in the outer pipe, K, through the pipe *s*, the air returning in a larger or smaller quantity to the inlet of the pump through the pipe *t*, the valve *v* of the compensator, and the pipe *u*. This maintains a uniform pressure in the pipe K. By adding or removing weights on the float *f*, or by means of a spring or corresponding device, the pressure in the outlet-pipe from the pump may be varied at will without suspending operations. It will be understood that the valve opens and closes as the float rises or falls. A register, H, records the number of revolutions of the pump D and indicates the quantity of air passing. The pipe K leads from the pump to the superheater C, having a pressure-gage, I, and a valve, Y. The superheater C heats the air forced through it by the pump D, the air being thence conveyed by connecting-pipe O to a second superheater, E. Above the furnace is a tank for holding petroleum or other liquid hydrocarbon, with a valve, T, through which the liquid passes to siphon-pipe L in a pipe, M, connected to the superheater or vaporizer F.

In order to maintain the proper proportion between the heated air and hydrocarbon vapor, a governor, V, attached to valve T, is operated by means of connections Q with the pump D, so that the pump, moving faster and forcing more air through the superheater, at the same time opens the valve T wider, admitting corresponding increase in the flow of the liquid to the vaporizer, and decrease in the revolutions in like proportion decreases the flow. Thus an exact proportion is maintained between the superheated air and hydrocarbon vapor. The vapor is taken up and rarefied by and becomes thoroughly commingled with the heated air from superheater E. Thus mixed, they pass from superheater F through pipe P to the fire-box or furnace A through proper outlets *a a*, these outlets having suitable burners for gaseous vapors.

An air-pump, D^2, may be used to supply additional air through pipe *p* to the burners. The pipe *p* has a pressure-gage, *i*, and a meter, *m*, may be used on the other side of the pump D^2 to measure the amount of air fed to the pump when great accuracy is required; but the amount of air may also be known by the num-

ber of revolutions of the pump, which is driven, as represented, from the pump D; but each of course may be independently regulated.

It will be understood that the amount of air supplied to the furnace is exactly proportioned to the requirements of the vapors to produce perfect combustion, all other air being excluded, and the proportion is maintained by means heretofore described. This rarefied and dry vapor secures constantly a perfect combustion, free from smoke, deposits, and obstructions, which heavy and moist vapor would cause. I use preferably with one gallon of petroleum about six hundred and fifty (650) cubic feet of air, varying with the quality of the liquid used. The superheaters and the vaporizers may be of any suitable and known form.

The boiler B supplies steam for working the pumps, and also to mix with the hydrocarbon vapor in the vaporizer F. It is conveyed through a pipe, N, to superheater E, in which the steam is superheated, together with the air from superheater C, and the combined air and steam pass through the pipe O′ into the vaporizer F, where they are mixed with the hydrocarbon vapors. When steam in the proper proportion is thus combined with the air and vapor it has the effect of expanding and rarefying the vapor to a still greater extent, and of adding to the intensity of the heat in the furnace. It has also a further tendency to prevent deposits and obstructions in the combustion-chamber and passages thereof.

The steam-pipe N has a regulator, R′, with a valve, v^3, on its outlet-pipe, securing uniform given pressure in the section of pipe between the regulator R′ and the valve v^3, and a uniform given flow of steam through the valve v^3 to the superheater E. This regulator is shown on larger scale in Fig. 3. It shows a flexible diaphragm, r, and valve v^2, on the line of the pipe, and a pipe, t^2, leading from the outlet-pipe into the chamber underneath the diaphragm. Increase of pressure in said outlet-pipe thereby raises the diaphragm, the pressure closing the valve at v^2 and reducing the flow of the steam. The fall of the pressure below the normal amount reverses the operation and opens the valve, allowing larger flow. By these means a constant and known quantity of steam is automatically passed through the valve v^3, and may be varied at pleasure. The pressure of the flexible diaphragm r may be varied by means of weights, a spring, or an analogous device.

The liquid-supply pipe M also has an automatic regulator, R, and valve v^3, for regulating the supply of the liquid, which have a similar construction and operate in a manner similar to the regulator R′ and valve v^3 on the steam-supply pipe N.

At S is a valve connected to a governor, operated by pump D through suitable connections, X, whereby the amount of steam is always proportioned to the number of revolutions of the pump, and the relative proportion of superheated steam, heated air, and vapor is constantly and uniformly maintained in the vaporizer. This produces perfect combustion and intense heat in the furnace.

Steam from the boiler may pass into the superheater C, provided it be made of proper dimensions, and the steam and air may pass directly into the vaporizer F if this be sufficiently enlarged. The commingled superheated steam, heated air, and hydrocarbon vapor, or steam and hydrocarbon vapor, or air and hydrocarbon vapor, may be used for heating the furnace A, or by means of pipes P′ and M′ for heating the furnace W, or through pipes P′ and N′ H′ K′ for heating the boiler B, range D′, stove E′; or they may be taken to burners, as at B^4, for lighting. The temperature of the commingled vapors at the point of combustion should be at all times sufficient to prevent the vapors from condensing or becoming moist and heavy.

The governors V and V′ may be of ordinary construction.

It will be borne in mind, as stated heretofore, that the heat of the furnace W is to be so regulated that the temperature shall be maintained at or above the boiling-point of the liquid hydrocarbon, but below that of its destructive distillation, so that the liquid shall only be converted into vapor and be taken up by the steam or air and thoroughly commingled therewith.

The pressure-regulator R and air-forcing device D are illustrated in Fig. 5 of the drawings and described in the specification (though indicated by different letters of reference) of the United States Patent No. 241,208, granted to me on the 10th day of May, 1881; but no claims were made in that patent therefor, reference being made therein to the claims for them preferred by me in the application made herewith.

Having thus described my invention, what I claim is—

1. The process of manufacturing a heating-vapor, as herein described, consisting in the combination of liquid hydrocarbons and heated air or superheated steam, or a mixture of both heated to a point above the boiling-point of the liquid used and below that of its destructive distillation, commingled in a vaporizer, where the supply of each is maintained in definite proportions and automatically regulated, and where the heat is continuously and sufficiently maintained, in the manner herein described, and for the purpose set forth.

2. The combination, in an apparatus for manufacturing a heating-vapor, of an air-supply pipe and an automatically-regulated forcing device for the air, the liquid-hydrocarbon and steam-supplying devices provided with automatic regulators, superheaters, and a vaporizer, all substantially as set forth.

3. In an apparatus for the manufacture of a heating-vapor, the combination of an air-pump, D, compensator G, heaters C E, tank U, hydrocarbon-liquid-supply pipe and valve T,

governor V, connections Q Q′, pipe M, regulator R v^3, and vaporizer F, connected and constructed substantially in the manner herein described, and for the purpose set forth.

4. In an apparatus for the manufacture of a heating-vapor, the combination of an air-pump, D, compensator G, heaters C and E, steam-supply pipe N, regulator R v^3, governor V′ S, connections X, tank U, hydrocarbon-liquid-supply pipe and valve T, governor V, connections Q Q′, pipe M, regulator R′ v^3, and vaporizer F, connected and constructed substantially in the manner herein described, and for the purpose set forth.

5. In an apparatus for the manufacture of a heating-vapor, the combination of a steam-supply pipe, N, regulator R′ v^3, superheater E, hydrocarbon-liquid-supply pipe M, regulator R v^3, and vaporizer F, all constructed substantially in the manner herein described, and for the purpose set forth.

6. In combination with an apparatus for manufacturing heating-vapor, a pressure-regulator to regulate the flow of liquids, steam, or air, consisting of the following parts: a flexible diaphragm, *r*, regulated by weights or pressure, a valve, v^2, situated on the line of the supply-pipe and connected with the diaphragm, constructed to close when the diaphragm rises and to open when the diaphragm falls, a pipe, t^2, connecting the outlet-pipe from the valve v^2 and the chamber below the diaphragm *r*, to communicate the pressure in the outlet-pipe to the diaphragm, whereby a uniform pressure is maintained in the outlet-pipe, and valve v^3 on the outlet-pipe, constructed substantially as set forth.

7. In combination with an apparatus for manufacturing heating-vapor, an automatically-regulated air or gas forcing device, consisting of an air-pump, D, a compensator, G, regulated by weights or pressure, containing a float, *f*, connected with a valve, *v*, the said valve being so constructed as to open when the float rises and to close when the float falls, a pipe, *s*, connecting the outlet-pipe K of the pump to the interior of the float *f*, to communicate the pressure in the pipe to the float, a pipe, *t*, connecting the outlet-pipe K to the chamber above the valve *v*, and a pipe, *u*, connecting the chamber below the valve with the inlet-pipe of the pump, to allow a circulation of air from the outlet to the inlet pipe, whereby a uniform pressure is maintained in the outlet-pipe K, constructed substantially as set forth.

8. An automatically-regulated air or gas forcing device of substantially the construction above described, in combination with a suitable closed furnace and intermediate pipes, said forcing device being placed between the supply and the burners and operating substantially as described, whereby the amount of gas or air is supplied to the closed furnace in regulated and definite quantities and with continuous and unremitting pressure.

9. In combination, a vapor-generating apparatus, devices for supplying to said apparatus the materials for said vapors, and automatic regulating devices whereby the materials are supplied in proper quantities, a closed furnace with pipe leading to the generating apparatus, an air-forcing device connected with the furnace for automatically supplying air wholly thereto, and connections between the regulating mechanisms which supply materials to the generating apparatus and the air-forcing device, whereby the speed of one automatically regulates the speed of the other, as described.

10. In an apparatus for the manufacture of a heating-vapor, the combination of an air-pump, D, compensator G, superheaters C E, tank U, hydrocarbon-liquid-supply pipe and valve T, governor V, connections Q Q′, vaporizer F, air-pump D″, compensator G′, connection *x*′, and an air-pipe, *p*, for wholly supplying air for the combustion of the vapor, connected and constructed substantially in the manner herein described, and for the purpose set forth.

11. In an apparatus for the manufacture of a heating-vapor, the combination of an air-pump, D, compensator G, superheaters C E, steam-supply pipe N, regulator R′, governor V′S, connection X, tank U, hydrocarbon-liquid-supply pipe and valve T, governor V, connections Q Q′, vaporizer F, air-pump D″, compensator G′, connection X′, and an air-pipe, *p*, for wholly supplying air for the combustion of the vapor, connected and constructed substantially in the manner herein described, and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOSEPH PEARSON GILL.

Witnesses:
B. F. JAMES,
WM. H. GRENELLE.