E. H. COVEL. 2 Sheets—Sheet 1.

PROCESS AND APPARATUS FOR ENRICHING GAS OR AIR WITH A DEFINITE AND REGULATED PERCENTAGE OF HYDROCARBON VAPOR.

No. 169,423. Patented Nov. 2, 1875.

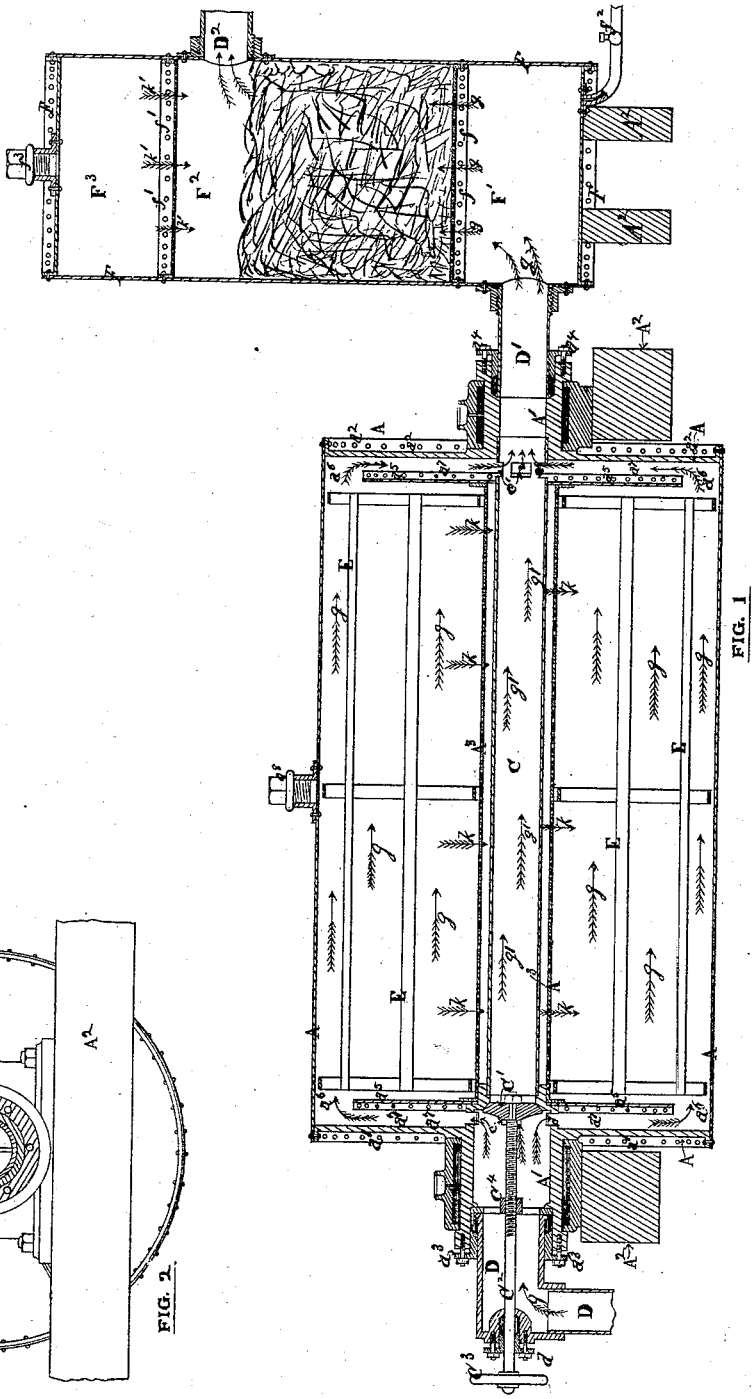

FIG. 1

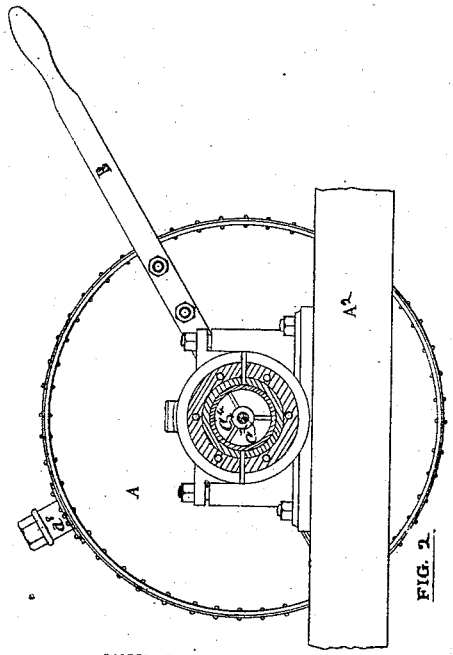

FIG. 2

WITNESSES

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E. H. COVEL. 2 Sheets—Sheet 2.

PROCESS AND APPARATUS FOR ENRICHING GAS OR AIR WITH A DEFINITE AND REGULATED PERCENTAGE OF HYDROCARBON VAPOR.

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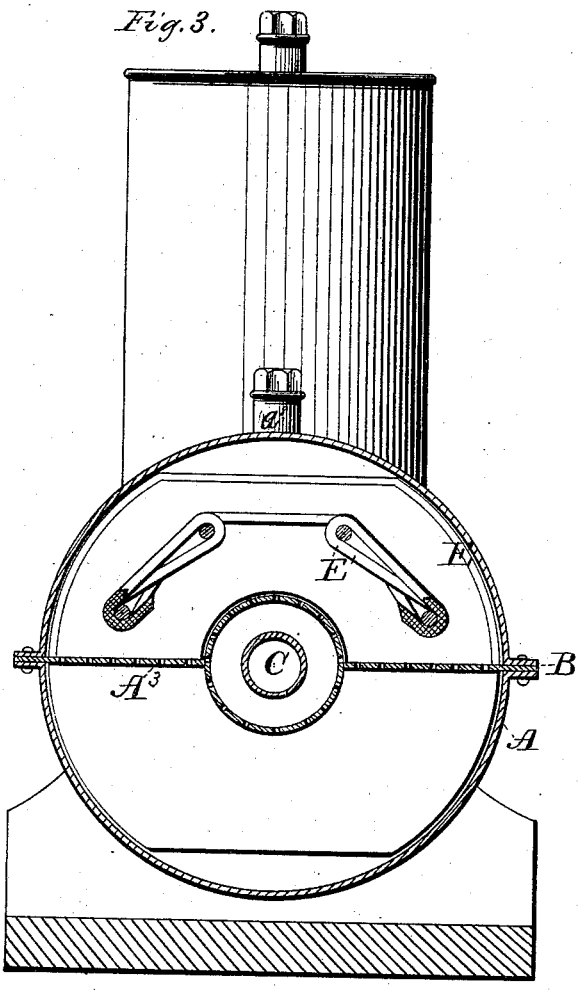
Fig. 3.



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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN PROCESSES AND APPARATUS FOR ENRICHING GAS OR AIR WITH A DEFINITE AND REGULATED PERCENTAGE OF HYDROCARBON VAPOR.

Specification forming part of Letters Patent No. **169,423**, dated November 2, 1875; application filed June 7, 1875.

To all whom it may concern:

Be it known that I, EDWARD HALL COVEL, of the city, county, and State of New York, have invented a new and useful Improvement in Process and Apparatus for Enriching Gas or Air with a Definite and Regulated Percentage of Hydrocarbon Vapor, to fit them for illuminating and other purposes; and I hereby declare the following to be the specification of the same.

The invention relates to an apparatus in which the light and heavy fluid hydrocarbons are used simultaneously by rotating, at intervals, the chamber in which they are contained, thereby causing a uniform carbonization, or nearly so, to the gas or air passing the machine, and utilizing all of the hydrocarbon. The gas or air, after leaving the rotary chamber, passes through another chamber, which may be used as a mixer or carbonizer at pleasure. The degree of carbonization may be regulated at the will of the operator, by means of an adjustable valve, which, in its different positions, will cause the whole, or only a part, of the gas or air passing through the machine to pass through the rotating carbonizing-chamber.

The invention will be readily understood by reference to the accompanying drawings, of which—

Figure 1 is a sectional elevation of the improved apparatus. Fig. 2 is an end elevation of the rotating chamber. Fig. 3 is a central tranverse sectional elevation of the rotating chamber.

The rotating chamber A is a cylindrical vessel, built of sheet metal, except possibly its ends, which may be of cast-iron. On each of its ends, and concentric with the cylinder, is a hollow trunnion, A^1, which rests on the timbering or other fixed supports A^2. One or more levers, B, are secured to either or both ends of the cylinder, for the purpose of turning it over a half a revolution on its trunnions. The vessel A is built of two half-cylinders, as shown in Fig. 3, each half-cylinder having an externally-projecting flange, *a*, by means of which the two semi-cylinders are bolted together. Screw-bolts should be used for this purpose, as it may be necessary to take the vessel apart at intervals for the purpose of cleaning or repairs. Between the two flanges *a*, as above described, there may be introduced the edges of the diaphragm A^3, which divides the chamber A into two equal, or nearly equal, compartments. The bolt, which holds the two flanges *a* together, will also pass through the diaphragm and hold it in position. The diaphragm A^3 is divided into two parts in the center of the vessel, so as to form a small cylinder concentric with the vessel A, and through the center of the cylinder thus formed the regulating gas or air pipe C will be placed so as to leave an annular opening between the pipe and the cylindrical part of the diaphragm, as shown in Figs. 1 and 3. The ends of the gas-pipes C are joined with the ends or heads of the cylinder A; and open ports *c* in the sides of the said pipe, just inside of the front head a^1, permit the incoming gas to pass into the chamber A as required, and the gas so passed into the carbureting-chamber returns to the pipe C again through the open ports c', which are located at the other end of the chamber A, just inside of the head a^2. The diaphragm A^3 is to be finely perforated throughout its entire extent within the chamber A, both in its flat and in its cylindrical part. The induction gas-pipe D is connected with the hollow trunnion on the front end of the cylinder A by means of the stuffing-box a^3, and the connecting gas-pipe D^1 is attached to the other end of the rotary carbonizer by the stuffing-box a^4. By this arrangement the gas to be carbonized may be conducted into and out of the rotary carbonizer without leakage, and the chamber A be at the same time left free to turn on its axis. Whether the chamber A is allowed to make a complete rotation around its axis, or only a semi-rotation or rocking motion, is entirely immaterial, and will depend upon the arrangement of the lever B, which may permit a whole rotation or not.

At the front end of the machine is a valve, C^1, which is arranged to close the front end of the pipe C, on which the said valve is seated, as shown in Fig. 1. This valve may be opened or closed, or adjusted to suit, by means of the valve-rod C^2, and the operating wheel C^3, which wheel is in an accessible position out-

side of the machine. The rod C^2 passes through a stuffing-box, *d*, on the induction-pipe D, and inside of the said pipe it is threaded so as to engage the nut C^4, which is fixed inside of the said pipe, or to the hollow trunnion on that end of the machine. Just inside of the two heads of the chamber A are placed two diaphragms, a^5, which close down tightly to the pipe C, and also to the cylindrical sides of A, except in the small port-spaces a^6. (Shown in Figs. 1 and 3.) The spaces a^7, between the diaphragms a^5 and the ends of the chamber A, are sufficiently large to accommodate the flow of gas through the machine, and are in open communication with the ports *c c'* of the pipe C. Within each of the compartments of A is placed a frame-work, E, as shown in Figs. 1 and 3, and between the ribs of this frame-work are stretched wires, cords, or other suitable appliances, as represented by E′ in Fig. 3. The object of these obstructions will appear in the description of the process. The connection-pipe D^1 connects the cylinder A with a secondary chamber, F, which is divided into three compartments, F^1 F^2 F^3, by the perforated diaphragms *f* f^1. The pipe D^1 leads into F^1, the lowest of these compartments, a short distance below the lower diaphragm *f*, and a sufficient distance above the bottom of F to form a basin for the drippings, which may be drawn off through the waste-cock f^2. The middle compartment, F^2, is partially filled with branches of trees, shavings, or some other suitable material, for stripping off from the gas any globules of fluid or impurities that it may have carried mechanically with it from A, and this material will also act as a mixer to give uniformity to the gas produced. The upper compartment, F^3, is used as a reservoir to hold a hydrocarbon liquid, to add to the carbonization in case the carbonization in A should at times prove insufficient. The eduction-pipe D^2 leads out from the upper part of the chamber F^2, and conveys the carbonized gas to the holder direct, or first through a heated retort, and thence through an ordinary gas purifier and condenser to the holder, so as to render the gas permanent; or the heated retort may be omitted, and also the holder, and the gas passed directly to the burners, as may be found most desirable. The man-hole plugs a^8 and f^3 are used to fill the chambers A and F with some fluid hydrocarbon.

The apparatus constructed as above described, the process is as follows: A sufficient quantity of fluid hydrocarbon (the quantity varying, of course, with the size of the machine, but usually several barrels) will be put in the chamber A, through its man-hole a^8, and the fluid so introduced will pass through the perforations of the diaphragm in the direction of the arrows *k*, and will fall into the lower half of cylinder A in a fine shower, this operation being continued until all of the fluid shall have passed below the diaphragm, and then the cylinder will be given a half revolution by means of the lever B, when the fluid will again pass through the diaphragm, as before, and so on. This operation of turning the cylinder will be repeated throughout the process, until the fluid shall have all been used up.

In turning the cylinder over, a small quantity of the fluid will run down between the transverse diaphragms a^5 and the end of the cylinder, and through the open ports *c c'* of the pipe C into the lower compartment, but not a quantity of any importance.

By the alternate filling of both the top and bottom parts of each of the compartments of A, as above described, all of the obstructions E′ will, at intervals, become submerged in the fluid, and thoroughly saturated with the heavier parts of the hydrocarbon, and by the alternate filling of each of the compartments, as described, all of the light and heavy parts of the hydrocarbon will be subject to simultaneous combination with the gas passing through the machine, and there will, therefore, be no waste or residuum.

The hydrocarbon being placed in A and agitated, as above described, the air, hydrogen, or other gas to be carbureted, will be turned on through the pipe D, in the direction of the arrows *g*. The gas will pass through the ports *c*, thence through the passages a^7 and the openings a^6 at sides of diaphragm a^5, and thence through both of the chambers of A, until the lower opening a^6 shall have become sealed by the fluid rising to the edge of the diaphragm a^5, after which it will only pass through the upper compartment, until the machine shall have been again turned over. After passing through the compartments of A, the gas-currents *g* will pass through the openings a^6, passages a^7, and open ports *c'* at the back end of the machine, and so on into the pipe D^1, and thence to the chamber F^1 of the secondary apparatus. The gas will pass from the compartment F^1, in the direction of the currents *g*, up through the perforations of diaphragm *f*, and through the obstructions of chamber F^2, and out of said chamber through pipe D^2, which will conduct it to the fixing-retorts, holders, or burners, in the usual manner.

In passing through the chambers of A, the air or gas will take up from the shower through which it passes, and from contact with the saturated obstructions or channels of E′, the atoms of the hydrocarbon, and thereby become carbonized to a high degree.

In order to regulate the amount of carbonization, I introduce the gas-regulating pipe C, which will, on the opening of the valve C^1, admit the uncarbureted air or gas in a current, represented by the arrows *g'*. This uncarbureted current *g'* will mingle with the carbureted current *g* in the pipe D^1 and chamber F^1, where the different gases will blend together and pass on into the chamber F^2, which will act as a mixer, and the gases so combined may easily be rendered of a uniform quality,

and of any photometric standard required, by simply adjusting the valve C^1, as may be desired from time to time.

In passing through the obstructions in the chamber F^2, the gas will be stripped of any globules of fluid or mechanical impurities that it may have become charged with in passing through A, and these fluid strippings will fall into the bottom of the chamber F^1, whence they may be drawn off through the cock f^2.

In case the carbonization in the chamber A should not at any time be sufficient, the auxiliary chamber F^3 is provided, which, when used, will be filled with a fluid hydrocarbon, which will pass through its perforated bottom f^1, in the direction of the arrows k', and fall in a shower upon the obstructions in F^2, and the gas passing through the said chamber will thereby be carbonized to a very high degree.

In lieu of the mixing and carbureting chamber F^2, what is known in the art as a gas-mixer may be used, as the principal object of this chamber is to thoroughly mix the air or gas with the hydrocarbon or the carbonizing vapors, and render the gas produced of a homogeneous character; or neither the mixing and carbureting chamber F, nor any other mixer, need be used under certain circumstances, for there are cases where the rotary carbonizer A will be all that will be required, and the regulating-valve C^1 may be so adjusted as to produce a sufficiently homogeneous gas for all necessary uses. Neither will it be always necessary to send the gas carbonized in this machine to a fixing-retort, as the carbureted gas passing this machine in certain localities may be used as a mechanical mixture. It may be found, also, that in certain localities it will be necessary to heat, to a moderate degree, the carbonizer, or the air or gas sent into it; and, when such is required, the carbonizer may be heated by means of a steam-jacket, or by steam-pipes, or the air or gas may be heated outside of the carbureter in any desirable manner.

Having described my invention, I claim—

1. The process of carbureting air or gas, which consists of passing the air or gas through a shower of liquid hydrocarbon, and continuing the shower and the operation by reversing the carbureter, substantially as set forth.

2. The reversible carbureter A, constructed with the diaphragm A^3, passing through its diameter, and hung in the hollow trunnions A^1, so that it may be reversed when the hydrocarbon fluid has passed from the upper to the lower section, bringing the fluid in position to again pass through the diaphragm, substantially as described.

3. The regulating gas-pipe C, arranged concentrically with the carbureter A, substantially as and for the purposes set forth.

4. The combination and arrangement of the carbureter A and the dripping and mixing chambers F^1 F^2, substantially as and for the purpose set forth.

5. The auxiliary carbonization and mixing apparatus, consisting of the chambers F^2 F^3, in combination with the rotary carbonizer A, substantially in the manner herein shown and described.

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Witnesses:
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A. B. HUTCHINS.