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W. H. HERMSDORF

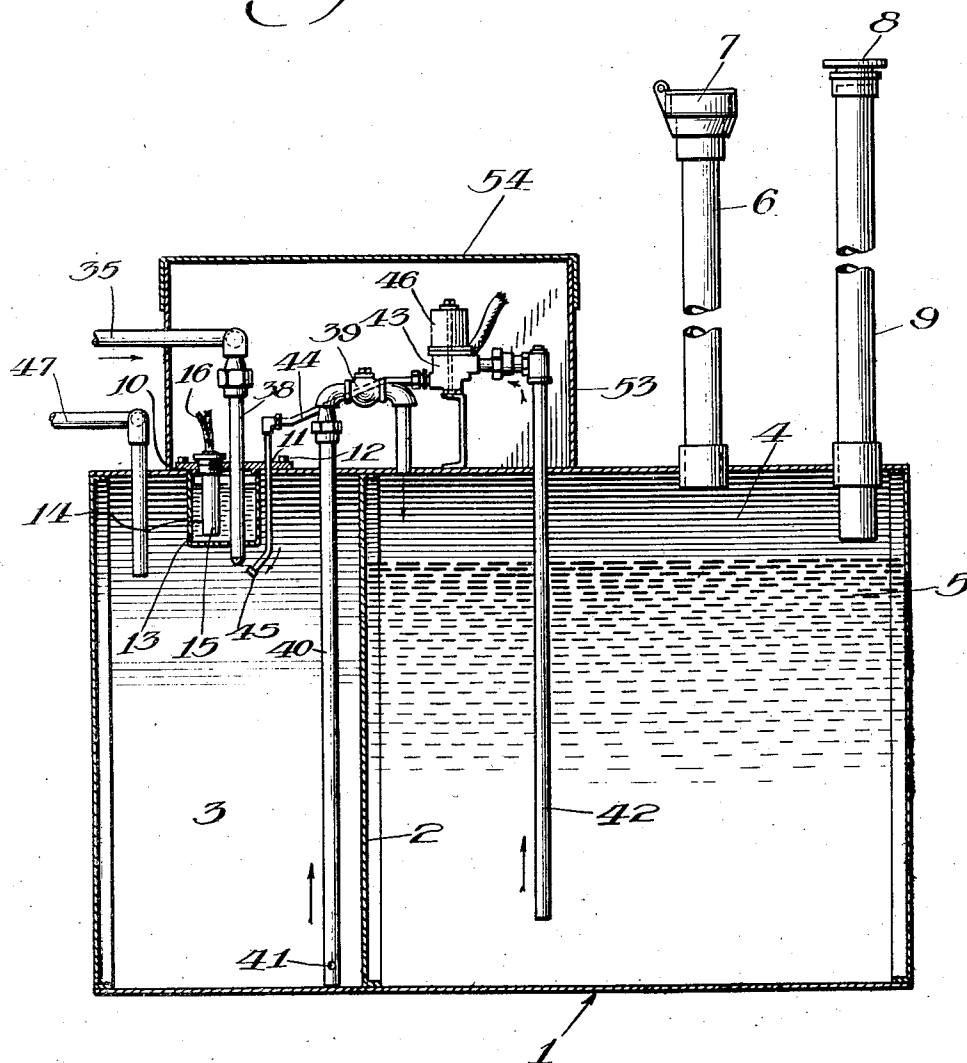
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METHOD FOR GENERATING COMBUSTIBLE GAS

Filed April 24, 1930

2 Sheets-Sheet 1

Fig. 1.



witness:

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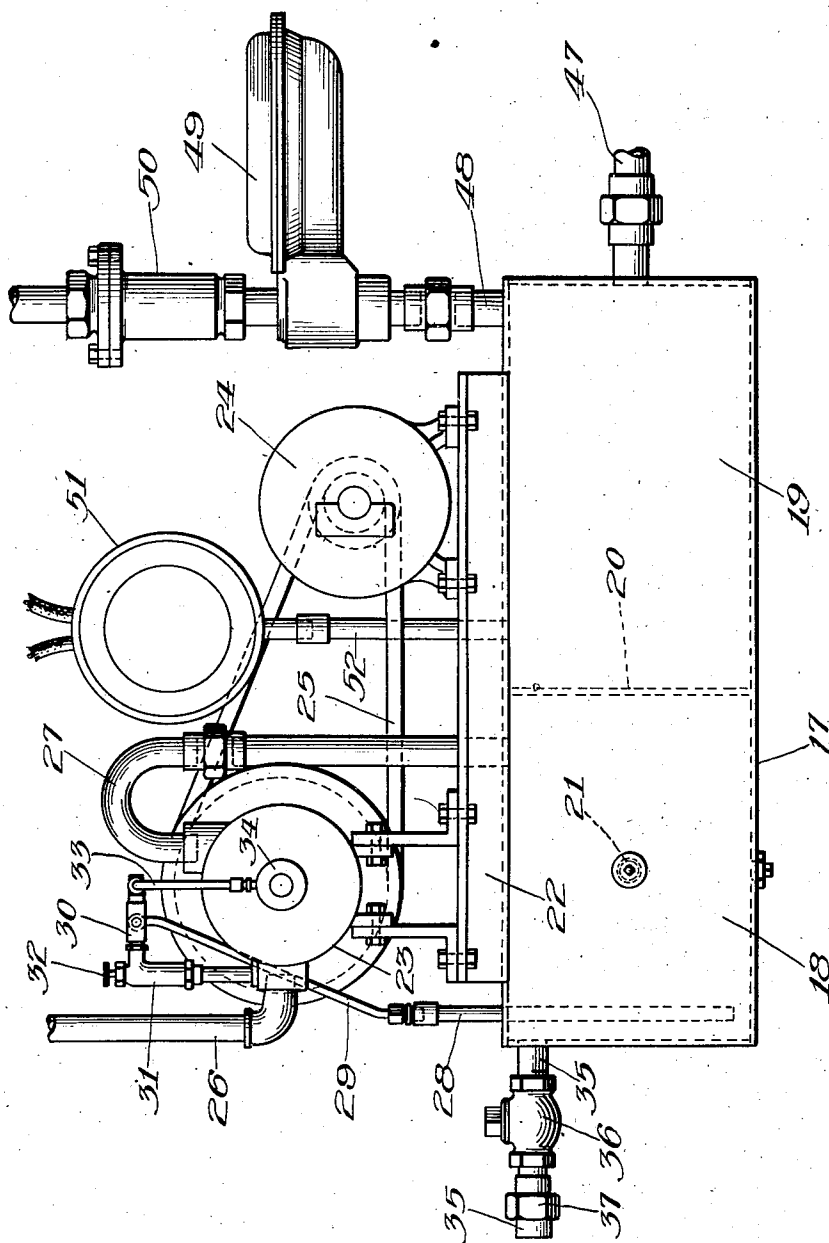
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2 Sheets-Sheet 2

Fig. 2.



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UNITED STATES PATENT OFFICE

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METHOD FOR GENERATING COMBUSTIBLE GAS

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1 Claim. (Cl. 48—219)

This invention relates to a means and method of generating combustible gas by intimately associating air under pressure with a combustible liquid.

5 One of the important features of my invention comprises separating the main bulk supply of combustible liquid from the zone in which the generated combustible gas is confined or stored pending withdrawal for use, and returning any
10 liquid accumulating in the gas generating or storage zone to the main bulk supply of liquid.

Briefly described, my invention comprises automatically passing air under pressure into the gas generating zone until the pressure therein has
15 reached a predetermined maximum, permitting the pressure in the gas compartment and liquid compartment to equalize, drawing off gas from the gas compartment and thereby decreasing the pressure therein until said pressure reaches a
20 predetermined minimum, again automatically building up the pressure in the gas compartment and simultaneously passing liquid from the liquid compartment to the gas compartment and intimately associating said liquid with the incoming
25 air, thereby generating a combustible gas and again building up the pressure in the gas compartment to said predetermined maximum. Hence, in the pressure equalization action between the gas compartment pressure and liquid compartment
30 pressure, accumulated liquid in the gas compartment may be returned to said liquid compartment.

Other and further important objects of my invention will be apparent from the accompanying drawings and following detail description.

35 In the drawings, Figure 1 is a sectional elevation of apparatus suitable for carrying out my invention.

Figure 2 is a vertical elevational view of the motor-blower unit and auxiliary equipment.

40 Referring more in detail to the drawings, 1 indicates a tank or receptacle of any desirable or suitable dimensions, which may be provided with a partition wall 2, dividing the inner portion thereof into a gas compartment 3 and a liquid
45 compartment 4. It is to be understood, of course, that the wall 2 instead of being vertically positioned, as shown, may be disposed at any angle so long as the receptacle 1 is divided into two compartments, one for liquid and the other for gas. A combustible liquid 5 may be introduced
50 in the liquid compartment 4 through filler pipe 6 provided with a suitable closure cap 7. A liquid level gauge 8 may be connected into the liquid compartment 4 by means of conduit 9 and may
55 take the form of any conventional liquid level

measuring device. In practice, tank 1 is usually buried in the ground and the filler pipe 6 and conduit 9 extend substantially to the surface of the ground.

An aperture 10 may be provided in the upper
60 wall of the tank 1 immediately above the gas compartment 3 and may be normally closed by plate 11 fastened to said upper wall by screws or bolts 12. A receptacle or container 13 may be
65 mounted upon the lower surface of the plate 11 and may extend downwardly through aperture 10 into gas compartment 3. The receptacle 13 may contain a suitable quantity of liquid 14, preferably non-inflammable and having comparatively
70 high properties of heat-conductibility. A heating unit 15 may be threadedly positioned in the plate 11 and may depend therefrom into the interior of the container 13, said heating unit preferably being energized by electricity conducted thereto
75 through leads 16.

Referring particularly to Figure 2, 17 indicates a tank divided internally into two compartments 18 and 19 by means of partition wall 20. The compartment 18 may be utilized to contain a
80 quantity of lubricating oil which may be introduced therein through inlet opening 21. A platform 22 may be mounted upon tank 17 and is adapted to support a conventional blower 23. A motor 24 may also be mounted upon platform
85 22 and may drive blower 23 by means of belt 25. Blower 23 may be provided with inlet pipe 26 and discharge pipe 27, said latter pipe connecting into the upper portion of compartment 18.

When the motor 24 is in operation, air will
90 be drawn by blower 23 through intake pipe 26 and be discharged therefrom through pipe 27 into compartment 18, thereby establishing a super-atmospheric pressure upon the surface of the lubricating oil contained in said compartment.
95 A pipe 28 may extend downwardly into compartment 18 and may be connected at its upper end to a comparatively restricted tube 29. Upon establishing pressure on the surface of the lubricating oil in compartment 18, a portion of said oil may be forced up through pipe 28 and tube
100 29 and may be divided at juncture 30, a portion of said oil passing downwardly through leg 31 to the intake of the blower 23. This oil will be carried into the blower by the air passing through intake pipe 26 and is adapted to lubricate the internal moving elements of said blower. The quantity of oil passing through leg 31 may be readily controlled by screw operated valve 32.
105 The remaining portion of the oil may pass down-
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wardly through leg 33 to bearing 34 and suitably lubricate same.

The compartment 18 may be provided with outlet pipe 35, interposed in which may be a conventional check valve 36 which is adapted to normally open away from compartment 18. A union 37 may be interposed in said line to facilitate the coupling and uncoupling of the pipe structure.

The air passing through pipe 35 may discharge into gas compartment 3 through discharge pipe 38. Said air tends to increase the pressure within compartment 3, and the arrangement may be such that when the pressure in compartment 3 exceeds the pressure in compartment 4, a check valve 39, interposed in transfer line 40, which connects compartment 3 and compartment 4, will open and thereby subject liquid 5, contained in compartment 4, to a pressure equal to the pressure in gas compartment 3. Pipe 40 preferably extends to the lower portion of compartment 3 and may be provided at its lower end with a plurality of apertures 41.

A liquid pipe 42 may connect into compartment 4 and may terminate adjacent the lower portion thereof. The opposite end of pipe 42 may extend exterior of tank 1 and may be connected through solenoid valve 43 to liquid pipe 44. The pipe 44 may be connected into gas compartment 3 and may terminate adjacent the outlet pipe 38, the discharge end thereof being provided with a removable nozzle 45. The construction of valve 43 may be such that it is normally closed, and may be opened by energizing solenoid 46.

Upon the introduction of air through pipes 35 and 38 super-atmospheric pressure may be established in zone 3, valve 43 will have opened and if the pressure within zone 3 exceeds the pressure within zone 4, air will pass through pipe 40, check valve 39 and into compartment 4. Air will also pass through pipe 44, valve 43 and pipe 42. However, due to the restricted diameter of the pipe 44 and nozzle 45, this latter quantity will be substantially negligible. When the zone 3 reaches a predetermined maximum pressure the blower will automatically stop and valve 43 will close, and as soon as the pressure within the zones 3 and 4 has been equalized, valve 39 will close. Fluid may then be drawn from the zone 3 thereby reducing the pressure within said zone to a predetermined minimum. The blower will then operate to again introduce air into zone 3 and inasmuch as the zone 4 is then under higher pressure than zone 3, liquid will pass from zone 4 to zone 3 and will admix with the air introduced therein. It can readily be seen that at this period the pressure within zone 3 is rapidly increasing from said minimum pressure. While the pressure within zone 4 is slowly decreasing, a balance of pressures will eventually be reached which is slightly below the maximum at which the blower stops. From this point on to the period when the maximum pressure is reached, check valve 39 will open and any liquid accumulation at the bottom of zone 3 will be returned to zone 4 until both zones reach the maximum predetermined pressure at which the blower stops.

The gas thus formed may be drawn from compartment 3 through gas outlet pipe 47, which connects at its opposite end into compartment 19 of tank 17. The gas in compartment 19 may be withdrawn therefrom through outlet pipe 48 and may pass through pressure regulator 49 and through flash-back arrestor 50 to a point of use,

not shown. Pressure regulator 49 and flash-back arrestor 50 may be of any suitable conventional design.

In carrying out my invention, blower 23 may be operated by motor 24, the air from said blower being conducted through pipe 27, compartment 18, pipes 35 and 38, and be discharged into container 3. Simultaneously with the energization of the driving motor 24, the heating element 15 may be energized, thereby heating liquid 14 within container 13, which heat may be imparted to the walls of pipe 38. In this manner, the reduction in temperature, due to the rapid vaporization of the liquid 5 issuing from nozzle 45, may be compensated, and the natural tendency of moisture contained in the incoming air to freeze in pipe 38 adjacent the discharge end thereof will be eliminated.

Upon the gas pressure in compartment 3 building up in excess of the pressure in compartment 4, the check valve 39 will open, thus subjecting the liquid in compartment 4 to the pressure existent in compartment 3. Simultaneously with the functioning of driving motor 24 and the heating of element 15, the solenoid 46 may be energized, thus opening valve 43 and permitting liquid 5 to pass through pipe 42, opened valve 43, pipe 44, into compartment 3 adjacent the discharge of the air pipe 38.

To accomplish this simultaneous operation of the driving motor, heating unit and solenoid-operated valve, and the electrical connections thereof may all be connected in parallel or shunt.

If desired, a pressure operated switch 51 may be connected by means of pipe 52 into compartment 19 and may be adapted to function driving motor 24, heating unit 15 and solenoid 46 whenever the pressure within compartment 19, and hence the pressure within compartment 3, falls below a predetermined minimum. The switch 51 may also be adapted to de-energize these various units when the pressure in compartment 19 reaches a predetermined maximum value. In this manner, automatic operation of the entire system may be brought about.

The liquid 5 may be of a combustible nature, such as gasoline, pentane, benzol, alcohols, or the like, which when intimately mixed with a suitable quantity of air will form a combustible gas. By the provision of the separating wall 2, the gas compartment 3 is isolated from the main body of the combustible liquid 5 and hence will not be exposed to evaporation from said main body of liquid. In this manner, the heat content of the gas produced will be solely dependent upon the quantity of air and quantity of liquid brought into contact within the compartment 3, and a combustible gas of constant and unvarying calorific value will result.

In the event that all of the liquid issuing from nozzle 45 does not evaporate within the compartment 3, the same will accumulate at the lower portion of said compartment and will be forced by the pressure in the compartment through apertures 41, pipe 40, check valve 39 into the liquid compartment 4. Thus it will be substantially impossible for an accumulation of liquid to form in compartment 3, and the possibility of said accumulated liquid passing out through pipe 47 will be negated.

To prevent moisture from the ground in which the tank 1 may be buried from detrimentally affecting the various connections of the instrumentalities disposed above said tank, a casing 53 may be positioned about said instrumentalities

and may be provided with a removable cover 54, casing 53 and cover 54 being preferably watertight.

5 In initially carrying out my invention, it can be readily seen that the compartments 3 and 4 will be at an equal pressure and valves 39 and 43 will be closed. Upon introducing air into compartment 3, the pressure therein will be raised and simultaneously with the introduction of air 10 therein, valve 43 will open. Valve 39 will open due to the pressure in compartment 3 rising in value above the pressure in compartment 4, and hence pressures in both compartments will tend to equalize. Upon the pressure in compartment 15 3 reaching a predetermined maximum, the introduction of air will automatically cease and valve 43 will simultaneously automatically close. In a relatively short interval thereafter, the pressures in compartments 3 and 4 will equalize and 20 valve 39 will close. The gas in compartment 3 may then be drawn therefrom, thereby reducing the pressure in said compartment until said pressure reaches a predetermined minimum value.

25 It can readily be observed that due to the fact that the valves 39 and 43 at this period are closed, the pressure in compartment 4 will be maintained at its maximum value while the pressure in compartment 3 is decreasing. After the pressure in compartment 3 has been reduced to said minimum 30 value, air will again be automatically introduced into said compartment and simultaneously therewith valve 43 will open, permitting the residual pressure in compartment 4 to force liquid through pipe 42, valve 43, pipe 44 and into compartment

3 adjacent the outlet of the air pipe 38. In this manner, a combustible gas will be generated in compartment 3, which may be drawn off through gas outlet pipe 47 and utilized as desired. Subsequent to this initial charging step, the generation of the gas, as has been hereinbefore described, is carried on cyclically whenever the pressure within compartment 3 decreases below said predetermined value.

80 It is apparent that herein is provided a method of generating a combustible gas of uniform B. t. u. value; a method which isolates the main body of liquid from the gas generation and storage zone, and eliminates the possibility of liquid accumulating in the gas storage chamber from being conducted to the point of gas consumption. 85 90

I claim as my invention:

A method of generating combustible gas, which comprises maintaining a bulk supply of combustible liquid under pressure in a closed zone, periodically introducing a stream of air under pressure to a separate closed zone normally containing no liquid and contacting a stream of said liquid and said air stream in said separate closed zone to form a combustible gas, thereby increasing the pressure in said separate zone to a predetermined maximum, subjecting the liquid zone to the pressure in said separate zone and substantially equalizing the pressures in both zones, and during said equalization step returning unvaporized liquid under pressure accumulated in said gas generating zone to said liquid zone. 95 100 105 110

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