

UNITED STATES PATENT OFFICE

1,920,282

PROCESS OF PRODUCING CHLORINATED
HYDROCARBON LIQUIDS

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Serial No. 562,196

Claims 7. (Cl. 260—166.)

It is an object of my invention to provide a process for producing a non-inflammable liquid having great solvent properties, making it valuable for use as a cleaner or as a solvent for use in the paint and varnish industries.

Billions of cubic feet of natural gas from the oil fields as well as from coal mines are being wasted daily. The use of liquid hydrocarbons for fuels, particularly for motor fuels, is rapidly exhausting the product of the oil deposits. The dry cleaning industry and the paint and varnish industry are taking upward of three hundred fifty million gallons per year of gasoline and naphtha which would otherwise be available as motor fuel.

The present invention provides a process that will utilize the otherwise wasted gas to produce a liquid that can be used instead of the motor fuel liquid and therefore prevent the drain upon the available motor fuel oil, at the same time providing as a substitute therefor, for use as a cleaner and as a solvent, a material which is superior to the heretofore used motor fuel in that it is non-inflammable and leaves no disagreeable odor when used as a cleaner.

The use of the fluid provided by the invention for the purposes indicated will prevent fires and explosions.

Natural gas is a composition largely of methane, ethane, propane and butane. All of these elements are gaseous at atmospheric pressure but through their reaction with chlorine in accordance with the present invention, carried out under pressure, provide a liquid at atmospheric pressure and temperature.

In accordance with the invention a closed vat formed of, or lined with, a material which is not attacked by HCl and capable of withstanding a pressure of two hundred fifty pounds per square inch is provided having a pipe connection with a condenser and recovery apparatus for hydrochloric acid, the pipe connection being provided with a safety valve.

To carry out the process of the invention, the vat is first filled with natural gas at a pressure of preferably one hundred twenty pounds and not substantially less than one hundred pounds per square inch, a quantity of antimony or phosphorus pentachloride equivalent to two percent of weight of the gas having been placed in the vat. Chlorine gas is then injected into the vat at a rate of two and one-half per cent of the weight of the gas during the first hour. A manometer with which the vat is provided will indi-

cate increase of pressure as a result of the reaction of the chlorine with the hydrocarbon gas.

To keep down the heat produced by the reaction, the vat has connected thereto a pump to circulate the gas, or the liquid resulting from the pressure and chlorination of the gas, through a cooling coil having a heat exchange capacity to reduce the temperature of the operation to substantially 0° F.

The safety valve in the outlet pipe for hydrochloric acid should be set to allow a pressure of substantially one hundred fifty pounds per square inch.

During the second hour, the chlorine is introduced at a rate of substantially four per cent of the weight of the initially introduced gas, and during the third and fourth hours to five per cent per hour of this weight. During the fifth hour, eight per cent of the chlorine gas, and during the sixth hour and continuously thereafter until completion of the reaction, ten per cent of the chlorine gas may be admitted.

The initial weight of the gas in liquid form will be substantially three and one-half pounds per gallon and the chlorination is carried forward until the resulting liquid has a weight of substantially twelve and one-half pounds per gallon which will require the introduction of eighteen pounds of chlorine per gallon of the resulting liquid, nine pounds of which will have entered into reaction with the hydrocarbon gas and nine pounds will have passed off in the form of HCl.

When the reaction is complete, the chlorinated liquid is removed from the vat and neutralized with a two and one-half per cent solution of NaOH or KOH in water. The neutralized liquid is allowed to separate from the alkaline solution, thus providing an excellent solvent, as stated, for use in the varnish and paint industry and a safe and cheap dry cleaning material both for commercial dry cleaning establishments or for use in the home.

Minor changes in the quantities indicated or in the pressures utilized or in the details of the process may be made within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. The process of producing a non-inflammable solvent and dry cleaning agent which comprises subjecting a mixture of ethane, methane, propane, and butane gases to chlorine gas while under pressure in excess of substantially one hundred pounds per square inch and in the presence of a catalyzer for chlorination.

2. The process of producing a non-inflammable solvent and dry cleaning agent which comprises subjecting a mixture of ethane, methane, propane, and butane gases to chlorine gas while under pressure in excess of substantially one hundred pounds per square inch and in the presence of phosphorus pentachloride.
3. The process of producing a non-inflammable solvent and dry cleaning agent which comprises subjecting natural gas to the action of chlorine gas at a pressure between substantially one hundred pounds and one hundred fifty pounds per square inch in the presence of antimony pentachloride.
4. The process of producing a non-inflammable solvent and dry cleaning agent which comprises subjecting natural gas to the action of chlorine gas at a pressure between substantially one hundred pounds and one hundred fifty pounds per square inch in the presence of antimony pentachloride and maintaining the temperature of the mixture at substantially 0° F.
5. The process of producing a non-inflammable solvent and dry cleaning agent which comprises placing natural gas and antimony pentachloride in a closed chamber under pressure in excess of substantially one hundred pounds per square inch, injecting chlorine gas into the chamber at a gradually increasing rate of introduction and controlling the heat of reaction by refrigeration.
6. The process of producing a non-inflammable solvent and dry cleaning agent which comprises placing natural gas and antimony pentachloride in a closed chamber under pressure in excess of substantially one hundred pounds per square inch, injecting chlorine gas into the chamber at a gradually increasing rate of introduction and controlling the heat of reaction by refrigeration and the pressure by permitting escape of formed HCl.
7. The process of producing a non-inflammable solvent and dry cleaning agent which comprises placing hydrocarbons which are gaseous under normal pressure and temperature with antimony pentachloride in a closed chamber under an initial pressure of substantially one hundred twenty pounds per square inch, gradually injecting chlorine gas into the chamber to an amount of substantially two and one-half per cent of the weight of the hydrocarbon during the first hour, four per cent during the second hour, five per cent during each the third and fourth hours, eight per cent during the fifth hour and ten per cent during each succeeding hour until chlorination is complete, refrigerating the material during reaction and keeping the pressure thereof to substantially one hundred fifty pounds per square inch by allowing escape of formed HCl.
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CERTIFICATE OF CORRECTION.

Patent No. 1,920,282.

August 1, 1933.

FERNANDO SOMOZA VIVAS.

It is hereby certified that the above numbered patent was erroneously issued to the inventor said "Vivas"; whereas said patent should have been issued to "Safety Products, Inc., New York, N. Y., a corporation of New York," as assignee of the entire interest in said invention, as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction there in that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of August, A. D. 1933.