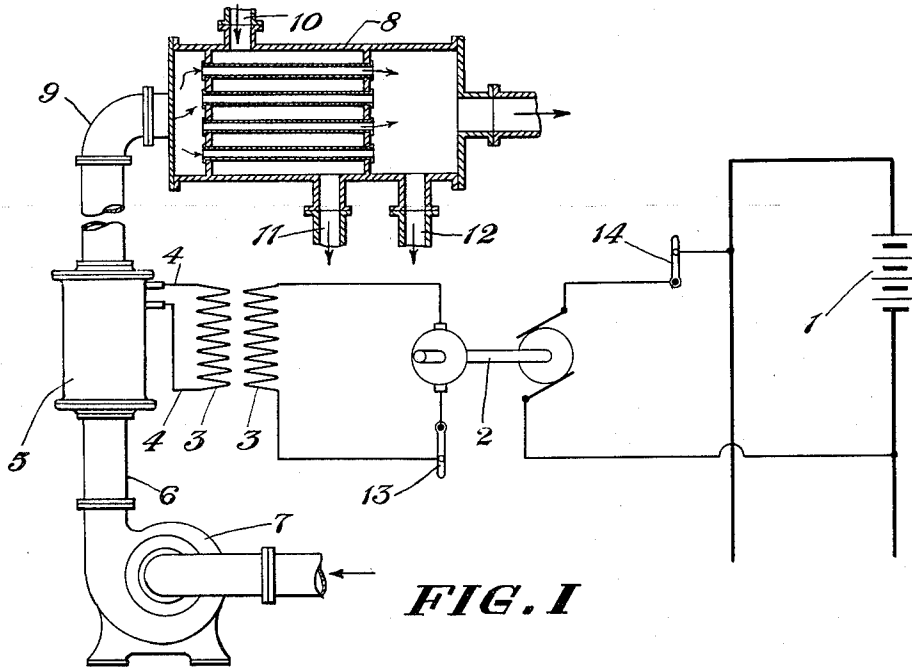


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METHOD AND APPARATUS FOR THE OXIDATION OF COMBUSTIBLE GASES.
APPLICATION FILED AUG. 14, 1917.

1,298,889.

Patented Apr. 1, 1919.



WITNESSES:

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METHOD AND APPARATUS FOR THE OXIDATION OF COMBUSTIBLE GASES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EDWIN M. CHANCE, a citizen of the United States, residing at Wilkes-Barre, in the county of Luzerne and State of Pennsylvania, have invented a certain new and useful Method and Apparatus for the Oxidation of Combustible Gases, whereof the following is a specification.

My invention relates to an improved method and apparatus for the removal of combustible gases from the atmosphere, and also to the recovery of certain products of combustion that may be obtained in such removal.

More particularly, the object of my invention is to provide a method of rendering safe the interior atmosphere of working places in which are employed apparatus that may at times discharge combustible gases and thereby render such interior atmosphere inflammable, and dangerous in the presence of open lights, arcs or other sources of ignition, and in certain cases may render such atmospheres poisonous or injurious to the workmen employed therein.

The characteristic of my invention is that I employ apparatus for oxidizing a combustible gas, such as hydrogen or the like, by means of atmospheric oxygen, said oxidation being rendered possible at temperatures below the temperature of ignition of said combustible gas by means of the silent discharge produced by a relatively high tension electric current.

The drawing is a diagrammatic representation of an apparatus that may be employed when my invention is used for the combustion of the hydrogen produced through the operation of electric storage batteries, such as those employed in the operation of naval submarine war vessels, and illustrates one embodiment of my invention in which the silent discharge produced by an alternating current is employed.

In the drawing, 1 indicates a source of electrical energy, in this case the storage battery circuit, 2 indicates a current changing device, such as a motor generator set or rotary converter, for transforming the direct current energy of the storage battery into the alternating current employed to produce the silent discharge. A step-up transformer for producing high tension alternating current is shown by the numeral 3, the secondary of said transformer being connected to the com-

bustion device 5 by the circuits 4. Said combustion device 5 may be constructed in a manner similar to any of the types of apparatus adapted to employ a silent discharge for the production of photo-electric, or other, effects, and is provided with means for producing such silent discharge internally. A duct 6 connects the interior of said combustion device 5 with the source of combustible gas and air to be burned, and said duct 6 may be advantageously provided with a blower or exhauster 7 for insuring steady flow of said gas and air through said combustion device 5. If it be desired to reclaim a portion of the products of combustion produced within the combustion device 5, a condenser 8 may be employed, said condenser being connected to the discharge 9 of the combustion device 5 and being adapted to be cooled by circulating water contained in the shell thereof, said circulating water entering and leaving the condenser by means of pipes 10 and 11. A drip connection 12 is provided for removing the condensed products of combustion. Disconnecting switches are indicated by 13 and 14.

The operation of the device is as follows:

Assuming the storage battery circuit 1 to be closed and the motor generator set 2 to be thereby placed in operation, alternating current is generated and by means of step-up transformer 3 is transformed to the potential necessary for the operation of the apparatus. Said high tension current is transmitted by circuit 4 to the terminals of the silent discharge device located within the combustion device 5. If the blower 7 be now placed in operation and the air containing combustible gas be thereby passed through the combustion device 5, the said gas will be caused to combine with the oxygen of said air when the mixture of gas and air comes within the zone of the silent discharge occurring in said combustion device. If this gas be principally hydrogen, the resultant combustion will produce water in the form of steam and this steam, together with the unconsumed oxygen, nitrogen and other constituents of the air will pass out through discharge 9 and enter condenser 8. The cooling water introduced through pipe 10 keeps the interior of the condenser below the vapor temperature of the steam, hence the steam is condensed and collecting in the far end of the condenser it is withdrawn in the form of water by

means of the drip 12. The uncondensed air passes out of the condenser and mixes with the atmosphere exterior to the apparatus.

It will of course be understood that the drawing is purely diagrammatic and that the general arrangement of apparatus and electrical circuits shown therein may be greatly varied without departing from the spirit of my invention.

In certain cases the temperature of the gases passing out through discharge 9 may be so low as to render unnecessary the use of a condenser, an ordinary drip being placed in the discharge line to catch the water, while in other cases it may be desirable to artificially cool the combustion device so that no unnecessary temperature rise may occur therein. In certain cases the blower 7 may be dispensed with and natural draft employed.

From the foregoing description of the operation of my invention it will be clear that my method is particularly advantageous for use in connection with the operation of storage batteries on board naval submarines, for not only will it be possible to eliminate the dangerous condition produced by the generation of hydrogen from such batteries, but the hydrogen so generated may be turned to the batteries in the form of distilled water, a feature that is exceedingly desirable.

I have found that by the use of a silent discharge of this character it is entirely possible to reduce the percentage of a combustible gas such as hydrogen without maintaining the whole body of air and hydrogen to be treated at the ignition temperature of the hydrogen. This discovery is of the utmost importance as it makes possible the oxidation of gases of this nature without the presence of flame or highly heated materials, an end that has heretofore been impossible to attain without actual combustion of the gas and air in a furnace, or other highly heated device, fitted with suitable gauze or other means for the prevention of the propagation of flame.

While my method contemplates operation at temperatures below the temperature of ignition of the gas under ordinary conditions, I may at times find it advantageous to employ safety devices for the prevention of flame propagation, such as gauzes or the like, to guard against accident due to short-circuits, accidental internal rises of temperature, arcs, etc.

My invention is particularly applicable to operation in atmosphere containing hydrogen or gases of like nature, and it may at times be profitably employed in oxidizing poisonous gases, such as the carbon monoxid that may be contained in the exhaust gases from the internal combustion engines employed for driving such submarines when

not under electric power. In this case I would of course oxidize the highly lethal carbon monoxid to carbon dioxid, a gas that does not possess the toxic properties of carbon monoxid, in the case of oxidation of inflammable gases containing hydrocarbons, such as mine gases, the products of oxidation would be carbon dioxid and water vapor, so that whether my invention be applied to the oxidation of combustible gases, or of poisonous gases, the products where carbon and hydrogen are constituents of the gases to be destroyed, will be carbon dioxid and water vapor.

Having described my invention I claim:

1. The method of oxidizing a combustible gas which consists in subjecting said combustible gas in admixture with atmospheric oxygen, to the action of the silent discharge produced by a high tension electric current, in permitting said silent discharge to cause the oxidation of said combustible gas by said atmospheric oxygen, and in removing the products of combustion thus formed from the region of said silent discharge.

2. The method of oxidizing hydrogen which consists in subjecting said hydrogen in admixture with atmospheric oxygen, to the action of the silent discharge provided by a high tension electric current, in permitting said silent discharge to cause the oxidation of said hydrogen by said atmospheric oxygen and in removing the products of combustion thus formed from the region of said silent discharge.

3. The method of oxidizing hydrogen which consists in subjecting said hydrogen in admixture with atmospheric oxygen, to the effect of the silent discharge produced by a high tension electric current, in permitting said silent discharge to cause the oxidation of said hydrogen by said atmospheric oxygen, in removing the products of combustion thus formed from the region of said silent discharge, and in recovering the water produced by the oxidation of said hydrogen.

4. Apparatus for the oxidation of a combustible gas comprising in combination a source of electrical energy, means for producing a silent discharge connected thereto and arranged to produce said discharge within a combustion chamber, and means for passing the gas to be burned, in admixture with atmospheric oxygen, through said combustion chamber.

5. Apparatus for the oxidation of hydrogen comprising in combination a source of electrical energy, means for producing a silent discharge connected thereto and arranged to produce said discharge within a combustion chamber, means for passing the hydrogen to be burned, in admixture with atmospheric oxygen, through said combustion chamber and means for recovering the water produced as a product of the combina-

tion of said hydrogen with said atmospheric oxygen.

6. Apparatus for the oxidation of poisonous gases comprising in combination a
5 source of electrical energy, means for producing a silent discharge connected thereto and arranged to produce said discharge within a combustible chamber and means for passing the gas to be oxidized in admixture

with atmospheric oxygen through said com- 10
bustible chamber.

In testimony whereof I have hereunto signed my name at Washington, D. C. this 13th day of August, 1917.

EDWIN M. CHANCE.

Witnesses:

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G. K. THORNTON.