June 23, 1931. O. H. ESCHHOLZ 1,811,462

GAS EXCHANGE SYSTEM

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Fig. 1.

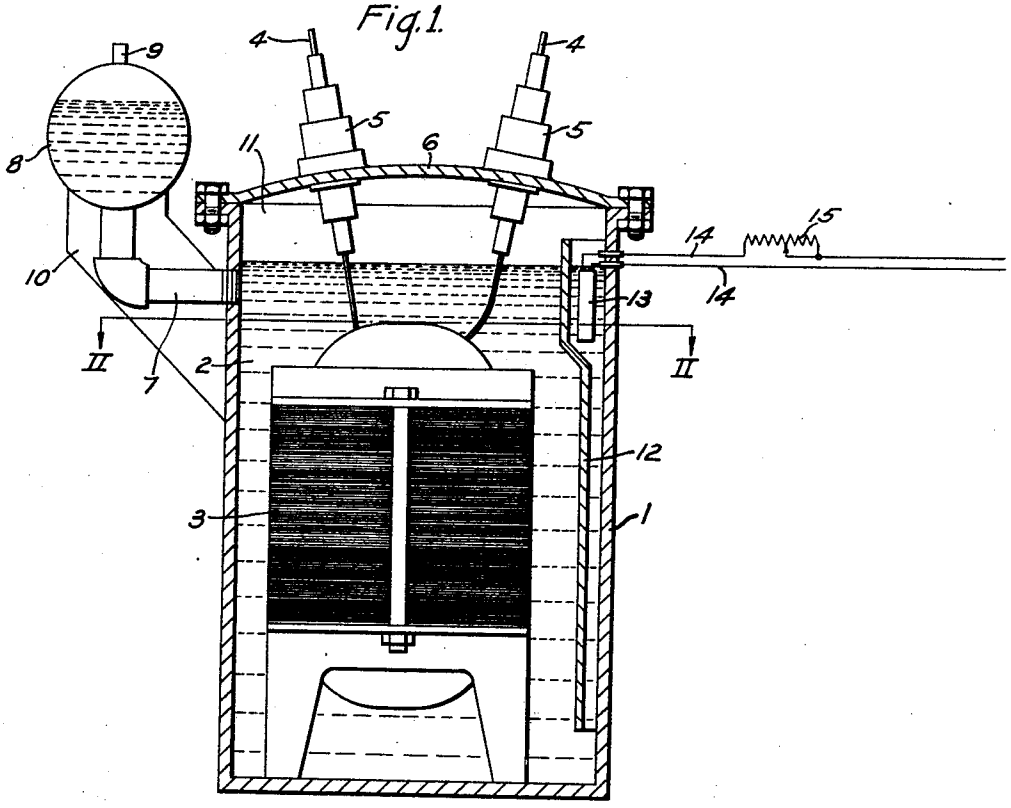
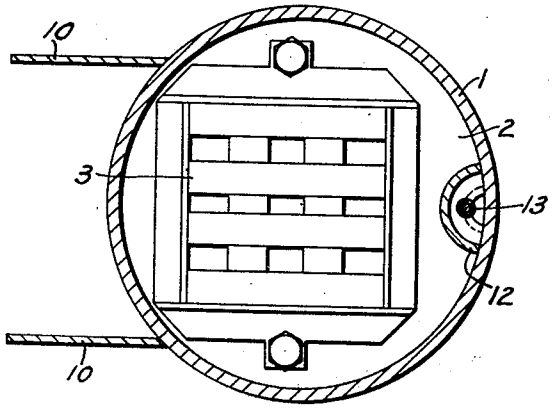


Fig. 2.



INVENTOR

Otto H. Eschholz

BY

Wesley G. Carr

ATTORNEY

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Fig. 3.

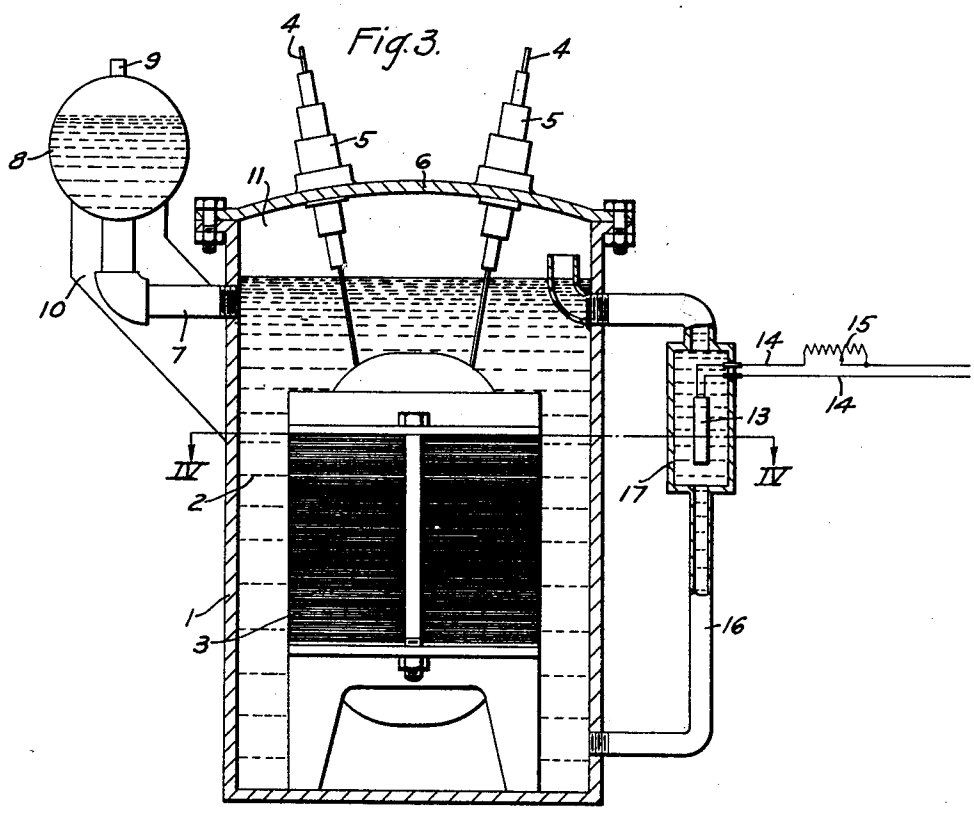
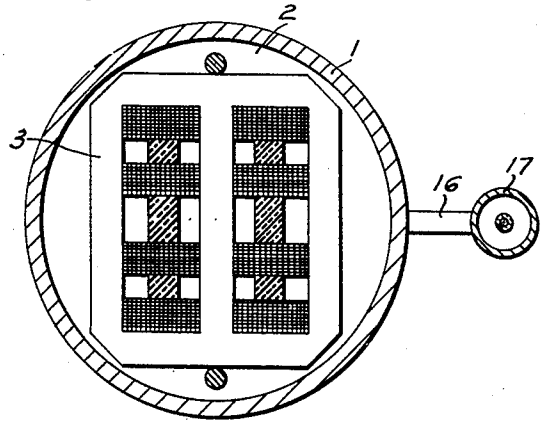


Fig. 4.



INVENTOR

Otto H. Eschholz

BY

Wesley G. Carr

ATTORNEY

Patented June 23, 1931

1,811,462

UNITED STATES PATENT OFFICE

OTTO H. ESCHHOLZ, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

GAS EXCHANGE SYSTEM

Application filed August 6, 1927. Serial No. 211,030.

My invention relates to a method of and apparatus for controlling or effecting the transfer of a constituent of a gaseous medium to a liquid medium contacting therewith.

In accordance with my invention, an effect is produced in one or both of contacting gaseous and liquid mediums to effect the transfer of a constituent of the gaseous medium to the liquid medium aside from or independently of the heat generated by an electrical translating device immersed in the liquid medium.

Further in accordance with my invention, a liquid medium, as the oil in which a transformer or other electrical translating device is immersed, is treated independently of the heat generated by said translating device to accelerate the transfer to said liquid medium of a constituent of a contacting gaseous medium.

Further in accordance with my invention, the oil surrounding an electrical translating device is elevated in temperature independently of the heat generated thereby or is treated with a suitable agent, either catalytic or non-catalytic, preferably in a local region or zone only, to facilitate the passage of a constituent of the gaseous medium to the liquid medium.

Further in accordance with my invention, oxygen occupying the gas space of a casing containing an electrical translating device immersed in a liquid medium is transferred to the latter aside from or independently of the heat generated by said translating device.

My invention resides in the method, apparatus and system of the character hereinafter described and claimed.

For an understanding of my method and for an illustration of some of the forms my apparatus or system may take, reference is to be had to the accompanying drawings, in which,

Figure 1 is a vertical, sectional view of apparatus constructed in accordance with my invention,

Fig. 2 is a transverse, horizontal, sectional view taken on the line II—II of Fig. 1 looking in the direction of the arrows.

Fig. 3 is a vertical, sectional view illustrating a modified form of my invention.

Fig. 4 is a transverse, horizontal, sectional view taken on the line IV—IV of Fig. 3 looking in the direction of the arrows.

Referring to Figs. 1 and 2, there is illustrated a casing or container 1 within which is disposed a liquid medium 2, as oil, surrounding and insulating an electrical translating device, herein illustrated as a transformer 3 having terminals 4, 4 passing, respectively, through suitable bushings 5 carried by a cover member 6 bolted or otherwise suitably secured, to the casing 1.

Communicating with the casing 1 in a region below the level of the liquid medium 2 is a pipe or conduit 7 opening into a suitably dimensioned expansion tank or chamber 8 open to the atmosphere as indicated at 9 and mounted, in the example shown, on brackets 10 projecting from and carried by the casing 1.

Apparatus of the character just described is well known to the art. The liquid head in the conduit 7 and chamber 8 normally maintains the pressure of the gaseous medium in the space 11 slightly in excess of atmospheric pressure. Upon operation of the transformer 3, heat is generated and the liquid medium 2 expands, thereby placing the gaseous medium in the space 11 under increased pressure and effecting passage of some of the liquid medium 2 to the chamber 8 by way of the conduit 7.

Ordinarily, when the apparatus is initially placed in operation, oxygen-containing air occupies the space 11; during operation, more of such air may find its way into the space 11, for example, by passing through a suitable dehydrator and then through the chamber 8 and conduit 7 when the oil within and without the casing 1 assumes substantially the same level. The presence of any large or substantial amount of oxygen in the space 11 mitigates against safe operation, for as is well understood, when the insulating medium 2 is of hydrocarbon oil, an arc in contact therewith may cause the evolution of hydrogen, methane and the like which pass into the

space 11 and there combine with oxygen to form an explosive mixture.

In accordance with my invention, one or both of the aforesaid mediums is or are suitably treated to effect the passage or transfer to the liquid medium 2 of oxygen found in the gaseous medium occupying the space 11. As an example of an arrangement for accomplishing this end, there is illustrated a barrier or wall 12 which is preferably of heat insulating material and welded, or otherwise suitably secured, to the interior surface of casing 1. Wall 12 may be open at both ends and extend upwardly well above the maximum level of the insulating medium 2. Disposed within the compartment bounded by barrier 12 and casing 1 is a suitable heat generating device, herein illustrated as a resistance element 13 having its terminals connected by conductors 14, 14 to a source of electrical current, not shown. A resistance 15 interposed in the circuit comprising the conductors 14, may be adjusted to control the magnitude of the current traversing said circuit and, consequently, the amount of heat disseminated by the element 13.

Generation of heat by the resistance element 13 increases to a marked extent the temperature of the liquid medium disposed within the space bounded by the wall 12 and casing 1. As a result, oxygen is absorbed from the gaseous medium in the space 11 at a much higher rate than would occur if the liquid medium was raised in temperature solely by the heat generated by the translating device 3. Consequently, the gaseous medium in the space 11 is rendered inert, or substantially so, with respect to gases evolved from the hydrocarbon liquid medium 2. Thus, for example, in ordinary operation, the temperature of transformer oil is substantially 80° C. whereas, in accordance with my invention, the temperature of the liquid medium in the compartment bounded by wall 12 and casing 1, may be of the order of 120° C., more or less. At the high temperature last noted, oxygen is absorbed at high rate.

The absorption of oxygen by the aforesaid liquid medium is, in effect, an oxidizing process and when the latter comprises hydrocarbon oil, di-basic organic acids are formed, the latter being harmless when no substantial amount of water is present. In the event that the hydrocarbon oil contains unsaturated hydrocarbons, asphaltic sludging compounds are formed by the aforesaid oxidizing action. In either case, suitable materials may be introduced into the space bounded by wall 12 and casing 1 to absorb or dispose of the volatile and other products resulting from oxidation of the oil. Or, the lower part of wall 12 may constitute a drain for removing the products of oxidation and, if desired, the compartment formed by wall 12 and casing 1 may be entirely isolated from the main space in which the transformer is disposed. Entry to this isolated compartment may be effected in any suitable manner, as by a passage extending through the casing 1, through which the products of oxidation may be removed and the supply of oil replenished.

Referring to Figs. 3 and 4, there is illustrated a modified form of my invention, wherein a portion of the insulating medium 2 passes exteriorly of the casing 1 through a pipe or conduit 16, preferably enlarged as indicated at 17, to provide a chamber wherein the heat generating device 13 is disposed. The upper end of conduit 16, Fig. 3, extends into the space 11 preferably above the maximum oil level and constitutes a stand pipe exposing a surface of hot oil to the gaseous medium in space 11. An arrangement constructed as illustrated in Figs. 3 and 4 operates substantially as does the arrangement illustrated in Figs. 1 and 2.

Some grades of transformer insulating oil when heated, absorb oxygen to greater extent than do others. Accordingly, with a construction such as illustrated in Figs. 1 and 2, in case the main insulating medium 2 comprises oil incapable of absorbing oxygen at high rate, there may be disposed within the compartment bounded by wall 12 and casing 1, a different grade of insulating oil capable of absorbing oxygen at a high rate when heated. Or, the aforesaid compartment may be entirely isolated from the main space in which the transformer 3 is disposed, and have disposed therein an oxygen-absorbing material of a character entirely different from the insulating medium 2.

It shall be understood that within the scope of my invention, in lieu of the application of heat to a liquid medium, as aforesaid, such medium may retain in suspension a suitable agent, either catalytic or non-catalytic, whereby oxygen or other gaseous component is absorbed from the gaseous medium in the space 11. For example, copper, iron or their oxides, preferably in finely divided form, may be placed in the insulating liquid medium 2. Or, manganous soaps or resinates may be utilized in combination with or in lieu of the aforesaid copper or iron for increasing the oxygen absorbing quality of the insulating liquid medium.

It shall also be understood that the gaseous medium in the space 11 may be suitably treated to facilitate the transfer of a constituent of that medium to the liquid medium 2. Thus, for example, oxygen in the space 11 may be suitably transformed to ozone and the latter combined with the liquid medium 2, the ozonating apparatus being operated, if desired, by the transformer 3.

It shall be understood that arrangements structurally different from that herein disclosed may be utilized. Thus, under some circumstances, it may be desirable to omit the

expansion chamber 8 and the mechanism associated directly therewith, and to substitute a manometer type of breathing arrangement including dehydrating mechanism of a type well known to the art.

In accordance with a preferred form of my invention, a portion of the liquid medium 2, or insulating oil, is brought for oxygen-absorbing purposes, to a temperature substantially higher than the main body of the liquid medium. This action is effected in a chamber or compartment in communication with the main casing and, therefore, the supply of liquid to be brought to high temperature is constantly replenished even though evaporation thereof may occur at a fairly rapid rate, as induced, for example, by the resistance element 13, or equivalent.

In the appended claims, the term "electrical translating device" or "translating device" refers to the transformer 3, or equivalent, and not to the resistance element 13, or equivalent.

I claim as my invention:

1. In the art of controlling interchange between a gaseous medium and a contacting liquid medium in which an electrical translating device is immersed, the step which consists in elevating the temperature of said liquid medium in a local region only independently of the heat generated by said translating device for transferring a constituent of said gaseous medium to said liquid medium.

2. In the art of controlling interchange between contacting liquid and gaseous mediums associated with an electrical translating device, the step which consists in elevating the temperature of said liquid medium in a local region only and independently of said translating device for aiding in transferring a constituent of said gaseous medium to said liquid medium.

3. In the art of controlling interchange between contacting hydrocarbon liquid and oxygen-containing gaseous mediums associated with an electrical translating device, the step which consists in locally heating in said liquid medium independently of the heat generated by said translating device for aiding in transferring the oxygen of said gaseous medium to said liquid medium.

4. In the art of controlling interchange between an oxygen-containing gaseous medium and a contacting hydrocarbon liquid medium associated with an electrical translating device, the step which consists in elevating the temperature of said liquid medium in a local region only independently of the heat generated by said translating device for aiding in transferring the oxygen of said gaseous medium to said liquid medium.

5. The combination with a casing containing contacting liquid and gaseous mediums, and an electrical translating device associated with said liquid medium, of means for aiding in transferring a constituent of said gaseous medium to said liquid medium independently of the heat generated by said translating device.

6. The combination with a casing containing contacting liquid and gaseous mediums, and an electrical translating device immersed in said liquid medium, of heating means effective only in a restricted region of said casing for aiding in transferring a constituent of said gaseous medium to said liquid medium independently of the heat generated by said translating device.

7. The combination with a casing containing contacting liquid and gaseous mediums, and an electrical translating device immersed in said liquid medium, of means forming a compartment in said casing, a liquid medium in said compartment, and means coacting with said second named liquid medium for aiding in transferring a constituent of said gaseous medium to one of said liquid mediums independent of the heat generated by said translating device.

8. The combination with a casing containing contacting liquid and gaseous mediums, and an electrical translating device immersed in said liquid medium, of means forming a compartment in said casing, a liquid medium in said compartment, and heating means coacting with said second named liquid medium for aiding in transferring a constituent of said gaseous medium to one of said liquid mediums independently of the heat generated by said translating device.

In testimony whereof, I have hereunto subscribed my name this 29th day of July, 1927.

OTTO H. ESCHHOLZ.