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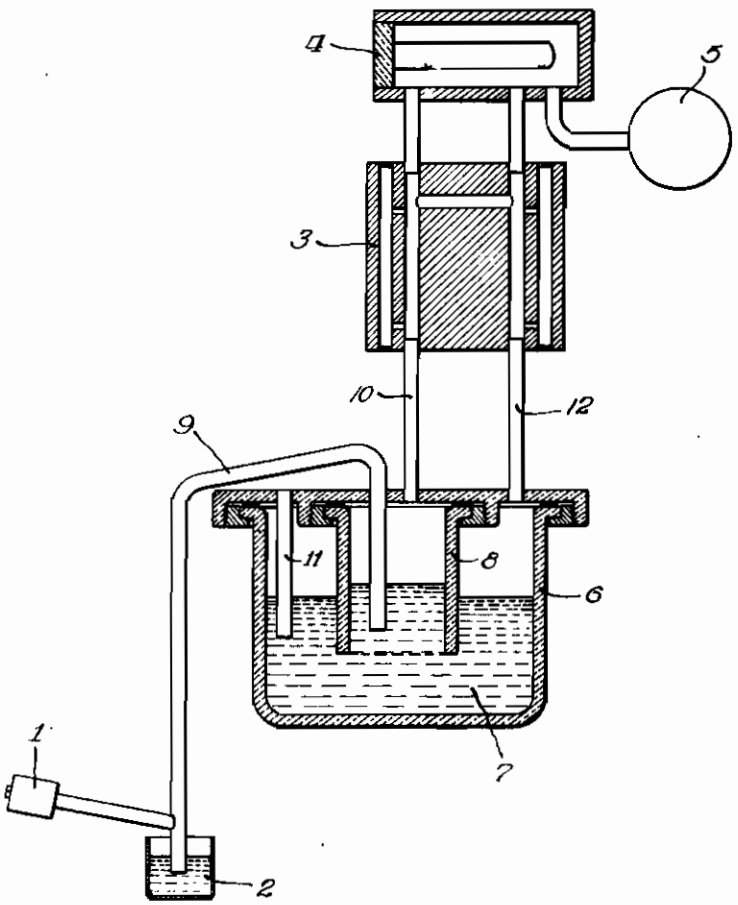

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METHOD OF CONTROLLING THE MOISTURE CONTENT OF GASES TO BE ANALYZED

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This invention relates to a method of controlling the moisture content of gases to be analyzed.

As is well known faults result when analyzing gases if the gas to be analyzed and the standard gas do not have the same moisture. Both gases have therefore been brought to the same dew point either by cooling, which, however, generally presupposes the presence of cooling water which is not always available, for instance, in the tropical region and the employment of which is undesirable in many cases, since it entails upkeep and running expenses or it has also been proposed to convey both gases through drying apparatus in order to remove the moisture therefrom. However, also such apparatus require a continuous control and attendance, since the drying agents become inefficient with time and therefore must be replaced or regenerated. This further entails an interruption of the analysis.

The method according to the invention removes the above drawbacks completely. According to this method the drying agent for the wet gas is at the same time continuously regenerated without it being necessary to interrupt the analysis or without replacing the drying agent. Consequently, the apparatus operates without any attention at all. This may be accomplished by the fact that to control the moisture of the standard gas to be employed for the gas analysis the gas is preferably treated with liquid solvents for water, the solvent being maintained in a state of equilibrium with the water by continuously supplying or drawing off water. Particularly when employing a gas to be analyzed and a standard gas the equilibrium of moisture between these two gases is attained by bringing the gases into the state of equilibrium before analyzing the same so as to bring about a thermodynamic exchange of their moisture. This is accomplished according to the invention preferably by the use of a liquid seal which effects the exchange by dissolving the water of the wetter gas and by revaporating this water into the drier gas as well as the drying of the gas containing a greater moisture than the other gas. In this case care should be taken to employ a liquid seal which does not appreciably dissolve the gas to be analyzed and/or the standard gas, since otherwise such a gas when dissolved in the liquid and diffused would reach the chamber intended for the other gas. If the analysis is carried out with gases having a relatively small moisture content glycerine is, for instance, suitable as a liquid seal which owing to its great viscosity dissolves the gases under consideration only to a negligible extent. If, however, flue gas which has a high moisture content is to be analyzed glycerine is less suitable, since it would soon become so diluted owing to its great water solubility that the liquid seal would practically consist only of water which constitutes a good solvent for gases. In order to avoid this inconvenience, for instance, an admixture of phenol, cresol or aniline may be employed which on the one hand may be mixed with the glycerine in any proportion and which on the other hand dissolve water only to a slight extent so as to ensure a viscosity of about 5 to 15 centipois which the liquid seal must have at an operating temperature in order to effect an analysis free of faults. Of course, it is also possible to use phenol alone instead of adding phenol to glycerine. Instead of phenol also other suitable liquids may be utilized which have a certain solubility necessary for the water exchange and which are sufficiently viscous and therefore dissolve and exchange the gases to a slight extent. The drier the gas to be analyzed should become the more standard gas must be supplied to the exchanger or the drier the standard gas supplied must be.

An embodiment for an arrangement by means of which the method according to the invention may be carried into practice is shown in the accompanying drawing. The supply device with filter 1, condensing vessel 2 and the device 3 and 4 for transmitting the value to be measured as well as the suction fan 5 are devices known in the art and connected in series in the usual manner.

In this case a flue gas taken from the chimney is to be analyzed for the CO_2-content (transmitter 3) and $CO+H_2$-content (transmitter 4). 6 is a container connected in series with the transmitter and in which takes place the moisture exchange according to the method of the invention. The container 6 has, for instance, a circular cross-section and supports inside a cylindric body 8 cooperating with the liquid seal 7. The conduit 8 extends from the supply device into the cylindric container 6 for some distance below the level of the liquid 7 so that the gas to be analyzed drawn in by the suction fan must first bubble through the liquid seal 7 before passing to the transmitter through the conduit 10. In the annular space formed by the outer wall of the container 6 and the cylinder 8 is arranged a conduit 11 extending also for some distance below the level of the liquid seal 7 and through which the standard gas, for instance, atmospheric air is supplied to the liquid in the same manner as

the gas to be analyzed, i. e., also the standard gas first bubbles through the liquid seal through which it passes into the standard gas conduit 12 extending to the transmitter. As will be apparent, a mixture of the gas to be analyzed and the standard gas is not possible in this case, since the one gas is limited to the inner space of the cylinder 8 and the other gas to the above-mentioned annular space. The use of finely distributed gases in the liquid or in apparatus which retain the gases for a longer period is not necessary when carrying out the analysis in the usual manner.

It is to be understood that the invention is not limited to the above-described embodiment. Thus it is also possible to provide two cylinders cooperating with the liquid or to modify the apparatus in such a manner that instead of causing the gases to bubble through the liquid seal the latter is raised by a pump to flow over cooling towers. However, an apparatus operating on the principle of the above-described apparatus appears to be more advantageous in that it is not only simpler than the other but also a proper flowing of the gases may be controlled in an easier and more economic manner owing to the bubbling of the gas through the liquid seal.

For this reason it is therefore preferable to make the container 6 of transparent material. The method is not limited to the use of the gas to be analyzed and of the standard gas. For instance, the same gas can flow before and after the reaction through the two separated parts of the equalizing vessel and of the apparatus for analyzing flue gases in order to carry out a differential measurement. When carrying out volumetric measurements, for instance, of the chemical absorption of a gas it is possible according to the method of the invention to bring the liquid seal for the burette to a constant vapor pressure which corresponds, for instance, to the vapor pressure of the agent employed for the absorption in the manner that an exchange of the water content of the two liquids coming into contact with the gas to be analyzed is effected by means of a particular gas current.

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