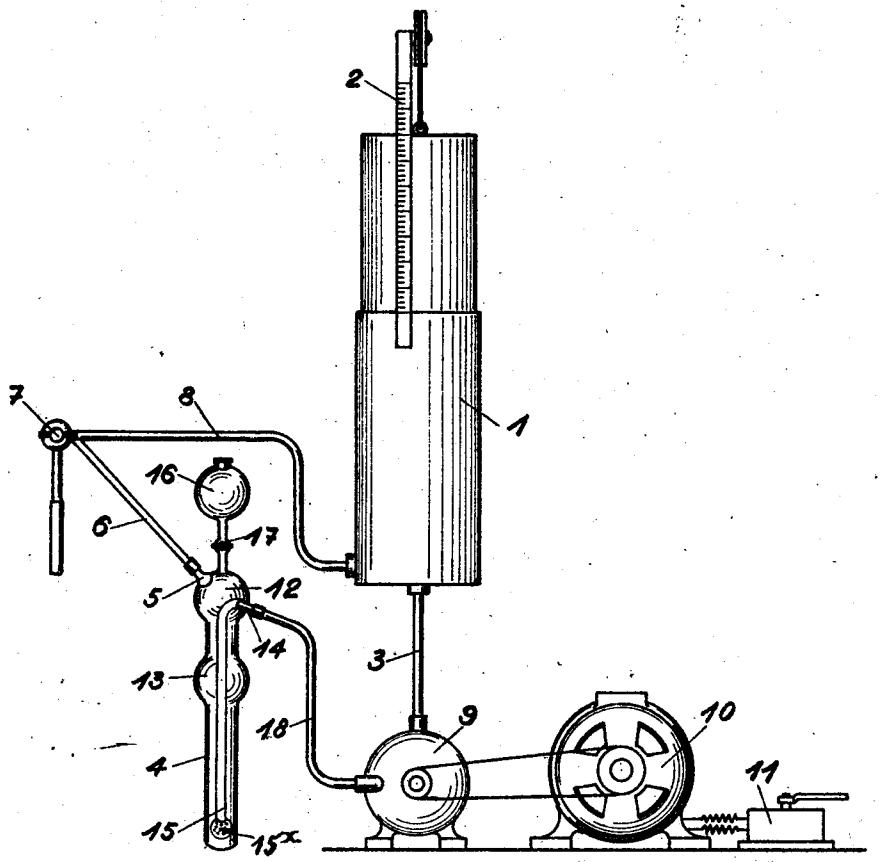
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PROCESS OF AND APPARATUS FOR ASCERTAINING THE CHANGE OF GASEOUS MATTER IN HUMAN BODIES

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PROCESS OF AND APPARATUS FOR ASCERTAINING THE CHANGE OF GASEOUS MATTER IN HUMAN BODIES.

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The subject-matter of the present invention is an improved process of and apparatus for ascertaining the change of gaseous matter in the human body.

The improved process starts from the basis of the well known closed circuit system in which the person for experiment takes, from a gasometer, at first pure oxygen and then, in the sequel of the experiment, a mixture of oxygen and exhaled air. Up to date the carbonic acid in the closed system was absorbed in caustic soda and determined by weighing. This improved process determines the carbonic acid in the closed apparatus by a volumetric system.

In the accompanying sheet of drawing there is shown a diagrammatic view of a contrivance for carrying the improved process into practice.

The oxygen or mixture of oxygen and exhaled air passes from the gasometer 1 provided with a scale or graduation 2 through the hose 3 to the pump 9 and from there through the hose 18 to the washing-bottle 4. From this bottle the gas flows off through the neck 5 and the hose 6 to the threeway-cock 7 which can be adjusted in such a manner that the oxygen or gas mixture passes either to the inhaling mask of the person for experiment and from there through the body of the said person and the pipe 8 back into the gasometer 1, or directly back to the gasometer through the said pipe 8. The circulation of the gas is effected by the pump 9 driven by the motor 10 having a starting-resistance 11.

The calibrated vessel forming the washing-bottle 4 is provided with two globular enlargements or bulbs 12 and 13. An elbow tube 15 is arranged inside the bottle 4 leading from the neck 14 nearly to the bottom of the said bottle. The lower end or foot of the tube 15 is made in the well known form of a perforated bulb 15x. A calibrated glass globe 16 for the reception of sulfuric acid is connected to the bottle 4 by means of a suitable tube provided with a cock 17 adapted to control the communication from the said globe to the washing-bottle.

The improved process may be carried into practice by means of the described contrivance in the following manner.

Before the beginning of the experiment the gasometer is filled up with oxygen and the volume of the same ascertained by reading off the graduation. Thereupon the experiment is started. After the process of inralation and exhalation has taken place for a certain period of time, say for example for fifteen minutes, the patient under treatment is cut out by properly turning the threeway-cock, the consumption of oxygen read off from the scale and a certain amount of sulfuric acid of 15 vol. percent allowed to slowly flow into the caustic potash solution contained in the bottle 4, whereby the carbonate of potassium is decomposed and the carbonic acid liberated. During this decomposition of the carbonate of potassium the pump is still in operation; and the washing-bottle is in communication with the gasometer into which enters the liberated carbon dioxide, the volume of which may be read off from the scale. The ascertained values of oxygen and carbonic acid are reduced in well known manner to 0° and 76 cm. height of the barometer.

The decomposition of the carbonate of potassium is attended, as is well known, with considerable difficulties. By cautiously adding the acid by drops to the solution, the liquids place themselves in layers one above the other, and reaction takes place only at the contacting surfaces. On the other hand when the acid is allowed to enter in great quantity, there will readily take place an explosion-like reaction, so that particles of liquid may be taken along with the gas. This drawback is avoided according to the present invention by the gas-current driven by the pump through the liquid, which gas-current effects a mixing of the acid slowly added in drops.

I claim:

1. The process of ascertaining the change of oxygen gas into carbon dioxide in a living body which comprises establishing a normally closed circuit of oxygen gas or gas including oxygen, withdrawing gas from said circuit for use in breathing by the living body, replacing into said circuit the used gas, absorbing the formed carbon dioxide in said circuit by an absorbing medium therefor, and thereafter liberating and measuring in said circuit the carbon dioxide absorbed by said absorbing medium.

2. An apparatus for measuring the change of oxygen into carbon dioxide comprising a gasometer, a pump, an absorption means for carbon dioxide, gas conveying means con-

necting in a closed circuit the gasometer, pump and absorption means, said absorption means comprising a vessel provided with gas inlet means reaching near the bottom thereof, gas outlet means near the top thereof and means for introducing a substance into said vessel for the purpose of liberating the carbon dioxide absorbed in said vessel.

3. An apparatus for measuring the change of oxygen into carbon dioxide comprising a gasometer having a scale and moving part for indicating changes in volume, a pump, an absorption means for carbon dioxide gas, conveying means connecting in a closed circuit the gasometer, pump and absorption means, and means in said circuit permitting the removal of gas from and the addition of gas to said circuit.

4. An apparatus for measuring changes in the composition of a gas comprising a gasometer, a gas impeller, absorption means for a gaseous substance, gas convoying means connecting in a circuit the gasometer, the impeller and the absorption means, means in said circuit permitting the removal of gas from and the replacing of gas in said circuit, and means associated with said circuit for measuring volumetrically any change in volume of gas in said circuit.

In testimony whereof I affix my signature.

DR. HUGO W. KNIPPING.