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REGISTERING DEVICE FOR GAS ANALYZERS.

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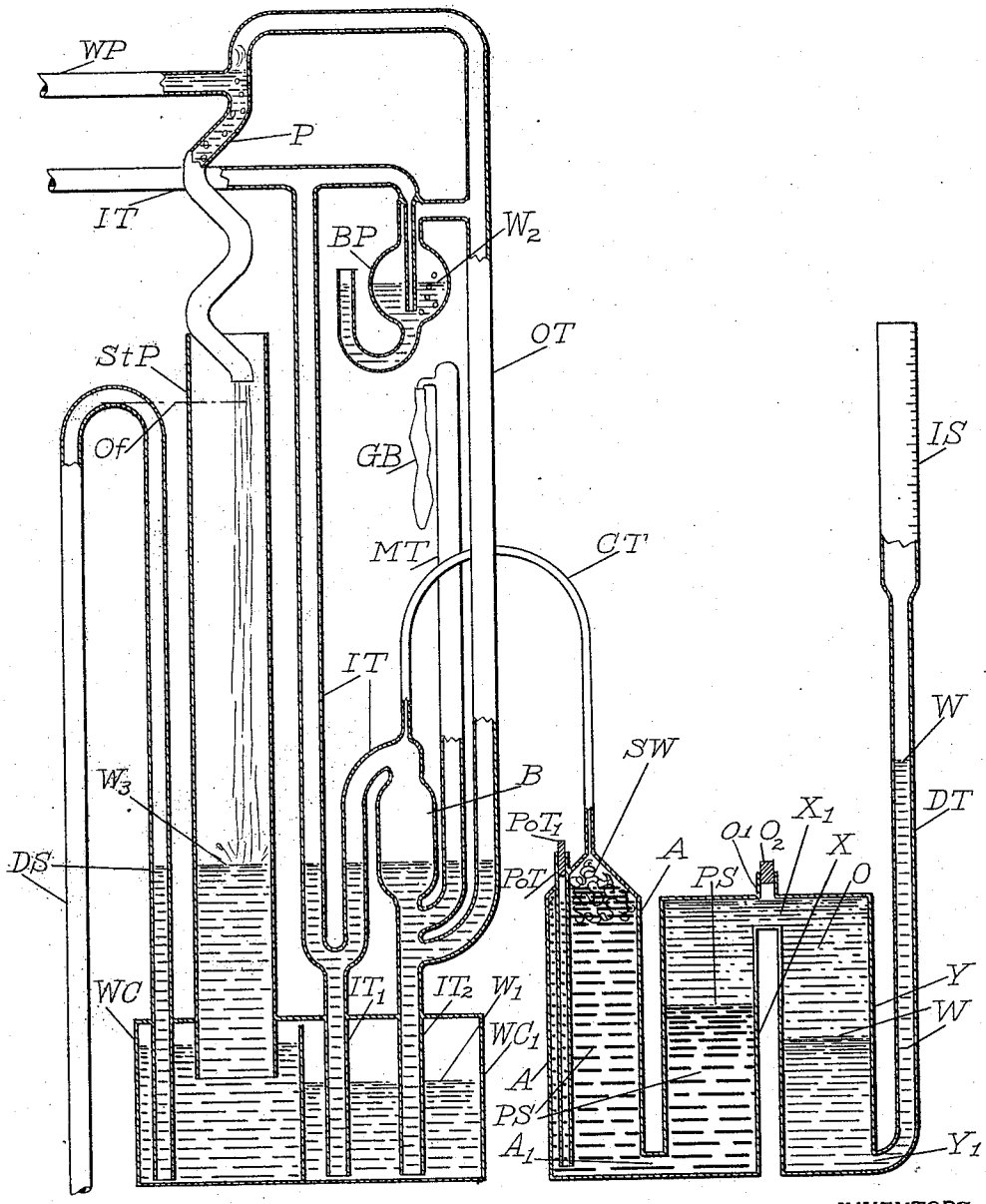
1,184,095. Patented May 23, 1916.



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REGISTERING DEVICE FOR GAS-ANALYZERS.

1,184,095. Specification of Letters Patent. Patented May 23, 1916.

Original application filed July 17, 1913, Serial No. 779,547. Divided and this application filed September 14, 1914, Serial No. 861,736. Renewed September 27, 1915. Serial No. 52,962.

To all whom it may concern:

Be it known that we, JOSEPH W. HAYS and CHARLES W. HAYS, citizens of the United States, residing in the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Registering Devices for Gas-Analyzers, of which the following is a specification.

Our invention relates especially to automatic gas analyzers but it may be applied in a practical way to hand manipulated apparatus as it affords means for a direct reading of the result of the analysis while the gas is in the absorption vessel, thereby materially reducing the time required to make a determination.

We attain the objects of our invention by the means illustrated in the acompanying drawing, in which for the sake of clearness, we have shown only those parts of our automatic gas analyzer that relate to the present invention.

This application is a division of our copending application, Serial No. 779,547, filed July 17, 1913.

In the drawing, "B" is the burette or gas measuring chamber and "A" the absorption chamber. These are connected by the capillary tube, "CT". "A" is connected near the bottom by the tube "A¹" with the chamber "X" and "X" is connected at the top by the tube "X¹" with the chamber "Y". "Y" is connected near the bottom by the tube "Y¹" with the displacement tube, "DT" on which there is a scale, "IS".

"A", "A¹" and the lower part of "X" are filled with a chemical solution, "PS". The lower part of "Y", the tube "Y¹" and the lower part of "DT" are filled with water, "W" while floating upon the chemical solution in "X" and the water in "Y" is a light oil, "O", which completely fills "X¹" and the unoccupied portions of "X" and "Y". A dry chemical may be used in "A" if desired and in such case the use of the oil "O" as a piston operating between the chemical and the water would be unnecessary as the air trapped in "X" and "Y" would act as such piston.

"IT" and "OT" are gas inlet and outlet tubes leading respectively to and from "B".

"P" is a gas pump, operated by a stream of water delivered through the pipe, "WP". The water is delivered from "P" into the standpipe, "S*t*P". The standpipe is soldered into the water chamber "WC" and extends down a short distance into same.

"D" is a discharge siphon which empties the stand-pipe and the water chamber when the water has accumulated in the stand-pipe to the overflow point, "OF". The tubes "IT¹" and "IT²", connect with the pipes, "IT" and "OT", as shown and are soldered into the top of "WC".

"BP" is a by-pass valve connecting the tubes, "IT" and "OT".

The measurement of the gas sample at atmospheric pressure is accomplished by means of the tube "MT" and the gas bag, "GB" as hereinafter described. The apparatus is charged with the caustic potash solution or other liquid chemical used through the tube, "POT", which is closed by the plug, "POT¹". The oil, "O" is introduced through the tube, "O¹", which is closed by the plug "O²". The percentage of the gas being determined is indicated upon the scale "IS" by the displacement of water upward into "DT". The chamber, "WC¹" and the by-pass valve, "BP" are filled with water, "W¹" and "W²."

The apparatus operates as follows: The gas pump, or aspirator, "P", which is operated by a small stream of water delivered through "WP", creates a partial vacuum in the pipe, "OT". This is communicated to "B" and the pipe, "IT", the latter being connected with the source of gas supply. As a result of the lowered pressure, gas flows through "IT", "B" and "OT" to "P", where it mingles with the water. The water "W³" is discharged into "S*t*P" and accumulates in "WC". The water in a few moments reaches and seals the lower end of "S*t*P". A quantity of air is trapped in "WC". This air is compressed by the static action of the water accumulating in "S*t*P". As a result of this pressure, water "W¹" is displaced from the chamber, "WC¹", through the tubes, "IT¹" and "IT²", into the tubes, "IT", "OT" and "MT" and the burette, "B". When the water reaches and seals the lower ends of the tubes "IT" and "OT", the flow of gas is shut off, and a quantity of gas is trapped in "B" and "MT". The gas flow is short-circuited through "BP", following the stoppage of flow through "B". As the water rises toward "B", some of the trapped gas is displaced into "MT" and the distensible

gas bag, "GB". When "MT" is sealed by the water the exact quantity of gas required is trapped off in "B" and in the tube connecting the upper part of "B" with "IT". This exact quantity of gas is measured at the pressure of the atmosphere. The water continues to rise and pushes the gas through the capillary tube, "CT", into "A", displacing the liquid chemical, "PS". This, in its turn, displaces the oil piston, "O", which in its turn displaces the water, "W", causing the latter to rise in the tube, "DT". "A" may be packed with a fibrous material, "SW", preferably steel wool, to increase surface exposure and expedite absorption. It is plain to be seen that the height to which the water rises along the scale, "IS", is inversely proportional to the volume of gas absorbed in "A". If it is desired to produce a record of the analysis, a low pressure recording gage may be connected by tube with the tube, "DT". By this arrangement we are able to confine the chemical in the chambers, "A" and "X", where it will not be exposed to anything except the gas introduced into "A". It will be necessary in some cases to employ a chemical that will be affected by the oxygen of the air and if such chemical were displaced into an open tube and used as an indicating fluid it would rapidly deteriorate. The arrangement enables us to employ a liquid, such as water, having a constant specific gravity, as an indicating fluid.

We claim.

1. A gas analyzer consisting of gas measuring and absorber vessels; a gas absorbing chemical in said absorber vessel; a tube connected with said absorber vessel; a liquid in said tube and a third liquid intermediate between said gas absorbing chemical and said first mentioned liquid.

2. A gas analyzer consisting of gas measuring and absorber vessels; a gas absorbing chemical in said absorber vessel; a tube connected with said absorber vessel; a liquid in said tube and a liquid piston between said chemical and said last mentioned liquid.

3. A gas analyzer consisting of gas measuring and absorber vessels; a gas absorbing chemical in said absorber vessel; a tube connected with said absorber vessel; a liquid in said tube; a third liquid intermediate between said gas absorbing chemical and said first mentioned liquid, said third liquid being of less gravity than either said gas absorbing chemical or said first mentioned liquid and soluble in neither.

4. A registering device for a gas analyzer, consisting of a tube and connected chambers; a liquid in said tube and one of said chambers; a gas absorbing chemical in one of said chambers and a fluid in one of said chambers, intermediate between said liquid and said chemical.

5. A registering device for a gas analyzer consisting of an absorption chamber connected near the bottom with a second chamber, said second chamber being connected at the top with a third chamber and said third chamber being connected at the bottom with a tube; a gas absorbing chemical in said absorption chamber and the lower part of said second chamber; a liquid in said tube and the lower part of said third chamber and a third liquid of less gravity than either of said others and soluble in neither, floating upon both of said first mentioned liquids and filling the upper portions of said second and third chambers.

6. A gas analyzer consisting of connected gas measuring, gas absorbing and absorption registering vessels; a gas absorbing chemical in the gas absorbing vessel; a liquid in the registering vessel; a separating movable medium between said chemical and said liquid and means for forcing gas from the measuring vessel into the absorbing vessel thereby displacing the liquid in said registering vessel.

In witness whereof, we have hereunto set our hands and seals this 17th day of August, 1914.

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Witnesses:
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