

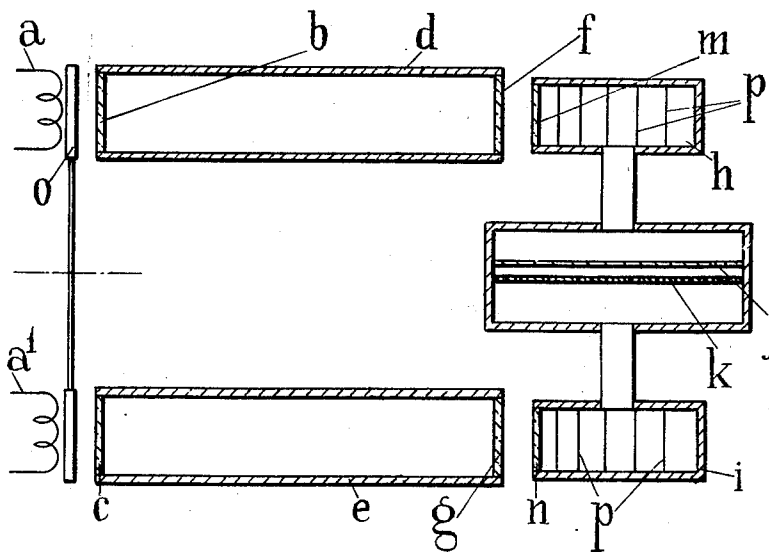
Jan. 22, 1952

A. E. MARTIN

2,583,221

INFRARED GAS ANALYZING APPARATUS

Filed Oct. 9, 1948



INVENTOR.
ALBERT EDWARD MARTIN
BY

Harvey E. Kennedy
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,583,221

INFRARED GAS ANALYZING APPARATUS

Albert Edward Martin, Newcastle-on-Tyne, England, assignor to C. A. Parsons & Company Limited, Newcastle-on-Tyne, England

Application October 9, 1948, Serial No. 53,678
In Great Britain October 9, 1947

3 Claims. (Cl. 250—83)

1

This invention relates to infra-red gas analysers of the kind wherein infra-red rays are passed by way of a rotary shutter device through two gas filled tubes fitted at each end with windows transparent to these rays, the rays afterwards acting upon the contents of two chambers partitioned from one another by a thin metal diaphragm adjacent to a fixed electrode.

In such instruments the two latter chambers are filled with the gas to be detected and energy is absorbed as radiation passes through them according to the nature of infra-red absorption of the gas in question. As the gas heats up an increase of pressure is produced and any difference between the pressures in the two chambers causes the diaphragm to deform and so gives rise to changes of capacity in respect to an insulated perforated metal plate which is fixed in close proximity to the diaphragm.

The radiation from the heaters passing through the two absorption tubes into the chambers is interrupted by a rotating shutter which admits radiation simultaneously to the tubes, and if both these contain gas with no infra-red absorption, the pressure pulses in the chambers will balance and no movement of the diaphragm will result, but if some of the gas to be detected is passed into one of the absorption tubes, energy will be absorbed before it can reach the corresponding detecting chamber. The balance will now be upset and the diaphragm will vibrate at the frequency of interruption of the radiation. The capacity changes are amplified electronically and finally an indication is obtained on a meter which can be calibrated in gas concentration.

In such instruments it is customary to fill the detecting chambers with the gas to be detected, this gas being heated to a greater or lesser extent by the infra-red radiations absorbed during their passage through the detecting chambers.

The object of the present invention is to provide improved forms of such apparatus wherein there need be no question of change of sensitivity with time on account of a leakage of gas and wherein an extended range of compounds may be detected.

The invention consists in gas analysers embodying features as set forth in the claims appended hereto.

In carrying the invention into effect according to one form illustrated by way of example in the accompanying drawing, I provide two nichrome heaters *aa'* adjacent respectively to transparent windows *bc* at one end of each of two absorption

2

tubes *de* furnished also at the other end with transparent windows *fg*. The latter windows are disposed respectively adjacent to two chambers *hi* separated from each other by a thin metal diaphragm *j* adjacent to a fixed insulated perforated plate *k*. The chambers *hi* are furnished with transparent windows *mn* and are filled with the gas to be detected and energy is absorbed as radiation passes through them according to the nature of infra-red absorption of the gas in question. As the gas in the chambers heats up an increase of pressure is produced causing the diaphragm *j* to deform. The balance will be upset and the diaphragm will vibrate at the frequency of interruption of the radiation, this interruption being produced by a rotary shutter device *o* which admits light simultaneously to the two absorption tubes.

In accordance with the present invention solid material, preferably in the form of thin film *p* is provided in the detecting chambers *hi* in place of or in addition to an absorbing gas. Absorption takes place in the solid film or films which thereby suffer a rise in temperature, and in turn the air or other gas in the vessel is heated by conduction from the solid material. In this way a pressure increase is produced in the detecting chamber each time radiation enters, exactly as with the usual gas filled detecting chambers. There need be no question of change of sensitivity with time on account of a leakage of gas, since the gas is merely used to convert the temperature rise of the solid film into a pressure increase and air can be used for this purpose.

Solids with specially desirable absorption characteristics can be used where difficulty would be found in finding a gas or gases with equally suitable characteristics. For example, polythene (polyethylene) films could be used for an instrument designed to measure CH₂ groups in organic compounds. Such films consist essentially of long chains of CH₂ groups.

I claim:

1. In gas analysing apparatus wherein infra-red rays are passed by way of a rotary shutter device through two gas filled tubes fitted at each end with windows transparent to these rays, the rays afterwards acting upon the contents of two detecting chambers partitioned from one another by a thin metal diaphragm adjacent to a fixed electrode, the provision in the detecting chambers of solid material for absorbing infra-red radiations, the detecting chambers being arranged to hold gas

3

for heating by the solid material and exerting pressure on the diaphragm.

2. Gas analysing apparatus as claimed in claim 1, wherein said solid material is in the form of a thin film.

3. Gas analysers as claimed in claim 2 wherein said thin film is composed of polyethylene.

ALBERT EDWARD MARTIN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,695,031	Schmick	Dec. 11, 1928
2,212,211	Pfund	Aug. 20, 1940

4

Number	Name	Date
2,424,976	Golay et al.	Aug. 5, 1947
2,431,019	Barnes	Nov. 18, 1947
2,435,519	Tolson	Feb. 3, 1948
2,451,019	Moore	Nov. 18, 1948
2,456,801	Tolson	Dec. 21, 1948

OTHER REFERENCES

10 An Optical-Acoustic Method of Gas Analysis by Callisen, Nature, Feb. 1, 1947, page 167.

Infra-Red Instrumentation and Technique, by V. Z. Williams, Review of Scientific Instruments, Mar. 1948, pp 176-177.

15 Recording Infra-Red Analyzers, by N. Wright et al., Journal of the Optical Society of America, pp. 199-200, Apr. 1946.