Subsequent to the air-sampling operation the collector grid assemblies **26** are removed from the rotor and placed in a double vaporizing chamber **56**, generally designated, preferably of aluminum, including a collector grid assembly cavity **58** into which air inlet duct **60** and air outlet duct **62** open.

When the two grids are placed in the vaporizing chamber, the silver wire grid is heated to approximately 400°—450° C. to desorb the amalgamated mercury extracted from the air. A schematic of the electronics for practicing the invention is shown in FIG. **5** of the drawings. With the grids placed in the vaporizing chamber **56**, air is drawn thereinto through air inlet **60** as indicated by arrow **64** and heated by heater **66** to vaporize mercury. Any desired means can be utilized for forcing air through the vaporizer. A blower unit in the nature of a 110-volt AC brushless motor and blower can be used. The sample air passes over heater **66** thence through the vaporizer unit, passing over grids **26** selectively actuated from a 110-volt AC power source controllable by a timer **68** with the circuit including a fail-safe mechanism indicated by box **70**. The timer **68** also controls a valve **72** for selected airflow control. The air then flows as indicated by arrow **74** into an absorption chamber **76** which constitutes, in part, a photometric testing device of a known type. Operatively associated are a photometer tube **78** and an ultraviolet lamp **80**. The photometer, specially designed for the desired airflow rates and geometry of the sampler grids and related heating requirements, utilizes a well-known technique. For example, a dual-beam type of photometer is described by Samuel H. Williston in "Journal of Geophysical Research," Volume 73, Number 22, Nov. 15, 1968, pages 7051—7055 and a single-beam device has been taught by W. W. Vaughn et al. in "Geological Survey Research," 1964, U. S. Geological Survey, Prof. Paper 501-D, pages D123—D127 and "U. S. Geological Survey Circular 540," U. S. Department of Interior, 1967. Obviously different photometers can be utilized within the teachings of the invention and are well known to those skilled in the art. Additional details are not considered necessary herein. The circuit operationally includes a bridge **82** from power source PS with operational amplifiers PP **55**, SP 2A, PP **25**, valves **84**, **86** and power source LVPS. A setup and test apparatus is indicated by box **88** with an analog to digital converter schematically indicated at **90** and a printer **92**.

Operation of the device is as follows:

Air, passed over the collecting grid surfaces as a consequence of the rotational movement of the rotor, may be sampled at rates controlled by the electrical input of the motor. Rotational rates from 200 to 1,200 r.p.m. have been preferred. For smaller rotors or other rotor configurations, higher rotational velocities may be utilized. During the processing cycle, the first grid winding is heated, desorbing the mercury and contaminants. These vapors flow across the second grid where the mercury vapors, being much more strongly absorbed than the other vapor components, reabsorb. The contaminants from the first grid are then measured in the photometer. This gives an electronic signal value V_1. V_1 is the integrated area under the voltage-time curve obtained from the photometer when the first grid is heated. After 20 seconds (adjustable), the second grid is heated. The optical absorption of these vapors in the photometer gives a value V_2. V_2 is the signal obtained from all the mercury vapor plus those obtained from materials other than mercury. The measure of the signals caused by materials other than mercury is first obtained while simultaneously concentrating the mercury from the first grid on the second one. Then when the second grid is heated the photometer signal which results is electronically decreased by the signal from the first grid. This procedure corrects the signal caused by mercury vapor for whatever interferences may be absorbed on the sampler. The resultant light absorption as measured by the photometer is, after appropriate calibration, directly related to the absolute amount of mercury vapor found in the air. V_2 is the integrated area under the voltage-time curve obtained from the photometer when the second grid is heated. The difference V_2 minus V_1 equals V_S and is read as the system output. V_S is the difference between the two integrated voltage-time outputs. The signal difference V_S is directly proportional to the mercury concentration in the cell and can be read by a number of techniques depending upon the data handling technique which is selectable. The difference V_S can be digitally indicated as shown.

In FIG. **6** the results of test data for the device indicates photometer signals (volts) plotted against mercury vapor concentrations (n.g. per $m.^3$). Actual data points are indicated and clearly, the response of the device is linear over the range normally encountered in areas exhibiting geological anomalies.

While a preferred embodiment of apparatus has been shown and described, and the principles of operation described with reference thereto, manifestly changes in minor details of construction and operation can be incorporated within the teachings of the invention as defined in and limited solely by the appended claims.

We claim:

1. In a system for sampling and measuring mercy content in air for geological studies:

A. means to sample quantities of air and collect mercury in vapor form contained therein by absorption of said mercury on a noble metal wire grid collector comprising:

i. a horizontally mounted double-arm rotor;

ii. means to drive said rotor;

iii. said grid collector being a silver wire grid wound in convolute form, so as to be adapted for sensitized absorption of mercury on the surfaces of the wire, said silver wire grid being vertically mounted on each arm of said rotor and adapted on rotation of said rotor to collect mercury vapor from the atmosphere;

B. means to desorb collected mercury from the collector by ohmic heating of the grid; and

C. means to quantitatively measure the mercury content released from the grid.

2. A system as claimed in claim **1**, said grid comprising spaced posts, upper and lower bars interconnecting said posts, said posts being threaded, said wire being wound in said threads to form the grid, and said rotor including means vertically mounting said grid for orbital movement through the atmosphere.

3. A system as claimed in claim **2** including said rotor arm mounting said grid, and means detachably interconnecting said grid and rotor for attachment and detachment of the grid.

4. A system as claimed in claim **3** including a sealable airtight compartment separate and remote from said rotor, said grid upon removal from said rotor being insertable in said compartment, the desorption means constituting heating means for said grid by direct passage of electric power therethrough.

5. A system as claimed in claim **4** and including two separate grids detachably mounted on the rotor, both said grids being insertable in said compartment and said heating being consecutively instituted with respect to the two grids whereby a measure of signals caused by materials other than mercury is first obtained, while desorbing mercury from the first grid, then obtaining a measure of mercury content by reabsorbing said mercury on the second grid, then heating of the second grid to desorb mercury quantity actually being measured by correlation with the said measure of signals caused by materials other than mercury to determine the absolute amount of mercury vapor in the air.

6. Method for sampling and measuring mercury content in air for geological studies comprising:

A. sampling quantities of air and collecting mercury in vapor form contained therein by absorption on a wire grid collector comprised of noble metal wire;

B. resistance heating the grid to desorb collected mercury therefrom and in a manner to separate mercury from background contaminants or interferences in said air; and

C. quantitatively measuring the desorbed mercury content released from the grid.