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BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

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AT&T Co Standard

GAS INDICATOR
VAPOTESTER, MODEL M-1, TYPE A

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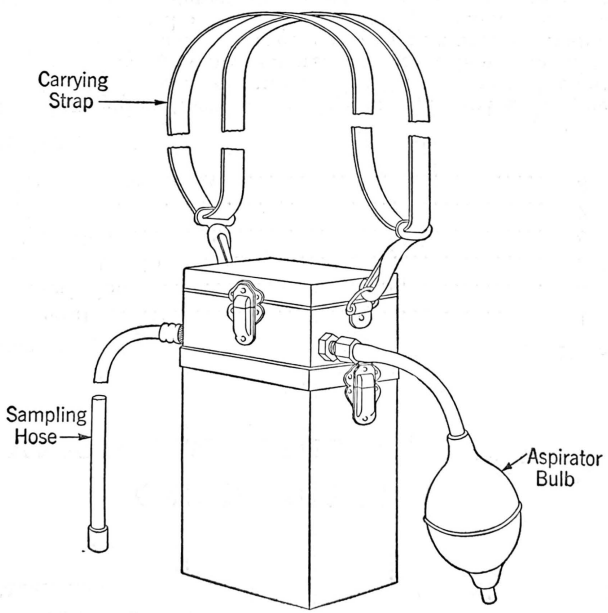
1. GENERAL

1.01 This section describes the Vapotester, Model M-1, Type A used in testing manholes for the presence of combustible gases or gasoline vapors, except carbon monoxide which is found in manufactured gas and mixtures of manufactured and natural gases. The Carbon Monoxide Detector should be used to detect the presence of gases containing carbon monoxide as well as to detect hydrogen sulphide.

1.02 **Precaution:** The indicator must **not** be operated in the manhole.

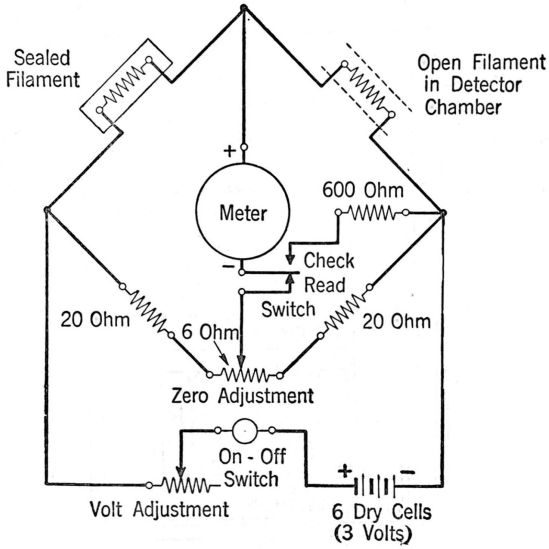
2. DESCRIPTION

2.01 The Vapotester is illustrated in the following sketch. It weighs about 6-1/2 pounds. The instrument operates on the principle of a Wheatstone bridge. The arms of the bridge consist of two identical platinum filaments and two resistors. The filaments are housed in an aluminum block having two chambers. One chamber is completely sealed and contains the reference filament; the other chamber contains the detector filament and is so arranged that the atmosphere to be tested can be drawn through the chamber by means of the aspirator bulb and a 15-foot length of sampling hose. The current for the filaments is supplied by six KS-6522 Dry Batteries and the flow of current in the bridge is indicated by a meter. The outer end of the inlet fitting is equipped with a filter to prevent the entrance of foreign matter into the detector chamber.



Vapotester, Model M-1, Type A

2.02 The circuit diagram of the instrument is shown in the following sketch.



2.03 When a mixture of air and combustible gas is drawn through the detector chamber, the hot filament ignites the gas which raises the temperature of the filament and thereby increases its electrical resistance. This change in resistance unbalances the bridge causing current to flow through the meter. The magnitude of the current is directly proportional to the percentage of combustible gas (up to the lower explosive limit) in the mixture drawn through the detector chamber.

3. SETTING UP INSTRUMENT

3.01 **Aspirator Bulb:** Test the bulb to determine whether it is in working order, as follows: Remove the bulb and tubing from the outlet nipple, hold a finger tightly over the inlet end and depress the bulb. The bulb should not inflate in less than 4 to 6 seconds. If the bulb operates satisfactorily, attach it securely to the instrument.

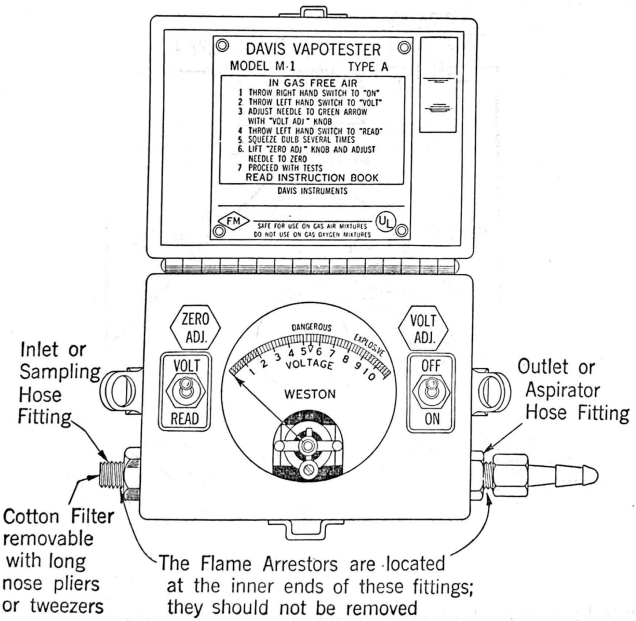
3.02 **Filter:** Examine the inlet fitting to ensure that the cotton filter is in place. Depress the bulb with the sampling hose detached. If the bulb does not inflate within 5 seconds, the filter may be clogged and should be replaced.

3.03 **Gas-tightness:** Test the instrument for gas-tightness, as follows: Hold a finger over the inlet fitting, squeeze the bulb and hold another finger over the outlet end of the bulb. The bulb should remain deflated for not less than 30 seconds. If the bulb inflates quickly, there is probably a leak in the detector which should be corrected. If tightening the connections and screws on the filament housing does not stop the leak, the instrument should be returned for repair in accordance with local routine.

3.04 **Adjust the instrument** as follows:

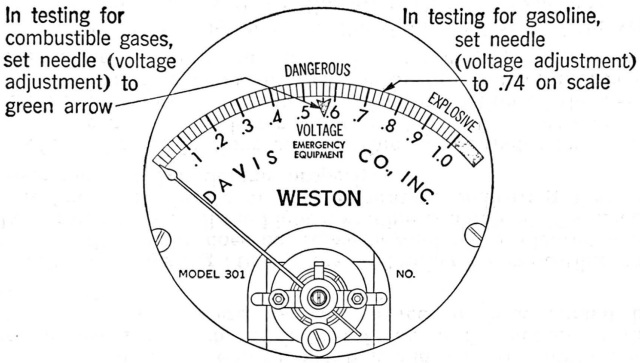
(1) With sampling hose disconnected depress the bulb about 6 times.

(2) Throw the "OFF-ON" switch to the "ON" position.



(3) Throw the "VOLT-READ" switch to the "VOLT" position.

(4) Turn the "VOLT ADJ" knob to the right or the left until the needle comes to rest over the green arrow (located above the word "VOLTAGE") on the dial. If the needle can not be brought to rest over the green arrow, the batteries are probably exhausted and should be replaced. The adjustment of the voltage for testing gasoline vapors is covered in Paragraph 3.06.



(5) Throw the "VOLT-READ" switch to "READ" position.

(6) Squeeze the bulb 4 or 5 times.

(7) Lift the "ZERO ADJ" knob and turn it until the needle returns to zero. If the needle can not be adjusted to zero, one of the filaments is probably burned out and should be replaced.

3.05 **Testing Hose for Contamination:** Test the hose to determine whether it is contaminated with a combustible gas or vapor as follows: Aspirate the bulb without the sampling hose attached to the indicator and make the adjustments described in Paragraph 3.04. Then attach the sampling hose to the indicator and tighten it firmly. Draw fresh air through the indicator (about 5 squeezes of the bulb plus one squeeze for each 5 feet of sampling hose) and if more than a slight fluctuation of the needle occurs, contamination of the hose is indicated. The hose generally can be cleared by aspirating fresh air through it or by flushing it with nitrogen gas.

3.06 **Voltage Adjustment When Testing for Gasoline Vapors:** The voltage adjustment specified in Paragraph 3.04(4) is not suitable for testing atmospheres containing gasoline vapors. To avoid false readings in testing for gasoline, the voltage should be adjusted until the needle rests over .74 instead of at the green arrow; the other adjustments are made as covered in Paragraph 3.04.

3.07 After gasoline vapor tests have been completed, the instrument and the sampling hose should be thoroughly flushed with fresh air or nitrogen to avoid false scale readings.

3.08 To turn off the indicator, throw the "OFF-ON" switch to the "OFF" position or close the cover of the case which does this automatically. To prolong the life of the batteries, this switch should be in the "OFF" position except when the instrument is being adjusted or tests are being made.

4. OPERATION

4.01 **Placing Sampling Hose:** Place the free end of the sampling hose in the manhole and draw the atmosphere to be tested through the indicator (about 5 squeezes of the bulb plus one squeeze for each 5 feet of hose should be sufficient).

4.02 If in testing atmosphere containing a combustible gas, the needle does not move beyond the graduated scale, keep aspirating until the highest reading is obtained. The needle will fluctuate slightly at each aspiration, indicating that the instrument is functioning properly.

4.03 The graduations on the scale of the meter are in per cent, of the lower explosive limit of the combustible gas in the atmosphere being tested. A deflection of the needle between 0 and 1.0 shows how closely the atmosphere approaches the minimum concentration required for an explosion.

4.04 If the needle moves to the right-hand end of the scale and remains there, the atmosphere is explosive.

4.05 If the needle moves rapidly to the right-hand end of the scale and then falls back to a point on the scale or to zero or below, it indicates that the mixture is very rich and may be above the upper explosive limit. To verify this, immediately aspirate fresh air through the Vapotester; if the needle moves first to the right and then to the left-hand end of the scale, it indicates that the concentration of inflammable gas is above the upper explosive limit.

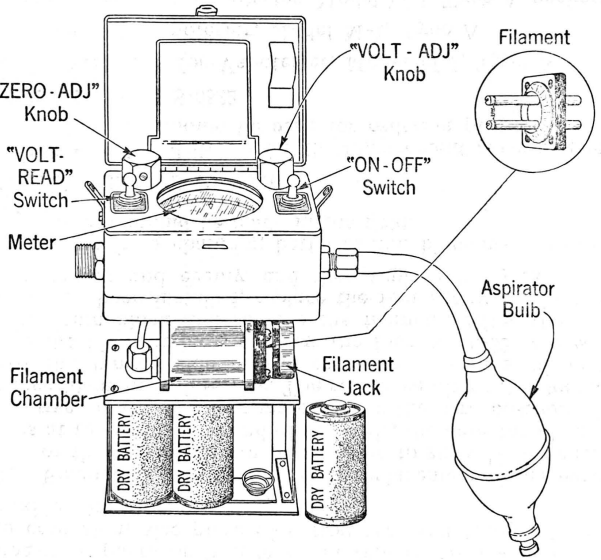
4.06 The voltage and zero adjustments described in Paragraph 3.04 should be made before each test.

4.07 **Precaution:** The operation of the Vapotester should **not** be checked by sampling the vapors from a gasoline container. The lead content of the vapor may deposit on the detector filament, affecting the sensitivity of the instrument. Also, the gasoline vapors will adhere to the sampling tube and cause false readings unless the tube is thoroughly purged and checked to determine that it is free of vapor.

5. MAINTENANCE

5.01 To open the case for the replacement of batteries or filaments, disengage the clamps on the side of the case and remove the lower section of the box.

5.02 The six KS-6522 dry batteries are housed in the battery compartment shown below. The batteries should be replaced as a group when the meter can not be adjusted to the green arrow (or the .74 scale reading if gasoline vapors are to be tested).



5.03 **Filter:** The filter is located at the outer end of the inlet fitting and consists of a small wad of absorbent cotton. If the filter is dirty or clogged, remove it with a pair of long-nose pliers or tweezers and replace with a new filter or an equivalent size piece of cotton removed from a Carbon Monoxide Detector.

5.04 **Filaments:** A filament needs replacement if the needle of the meter can not be adjusted to zero. If the needle remains at the right-hand end of the scale, the detector filament is defective; if the needle remains below the zero position, the reference filament is defective. The reference filament is located toward the hinged side of the case. To replace a filament, remove the filament jack, unscrew the four No. 6-32 screws in the aluminum block and remove the filament. After the new filament has been installed, replace the four screws, tightening them carefully and evenly, and then replace the jack.

5.05 Aside from changing batteries and filaments, no other repairs should be made in the field.

6. REPLACEMENT PARTS

6.01 The standard listing for the replacement parts is given below and should be used for ordering purposes:

Battery, Dry, KS-6522

Bulb, Aspirator, for Vapotester, Model M-1, Type A

Filament for Vapotester, Model M-1, Type A

Filter, Cotton, for Vapotester, Model M-1, Type A, package of 12

Hose, 15-ft., with Couplings, for Vapotester, Model M-1, Type A.