

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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GAS INDICATOR

EXPLOSIMETER, MODEL 2

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1. GENERAL

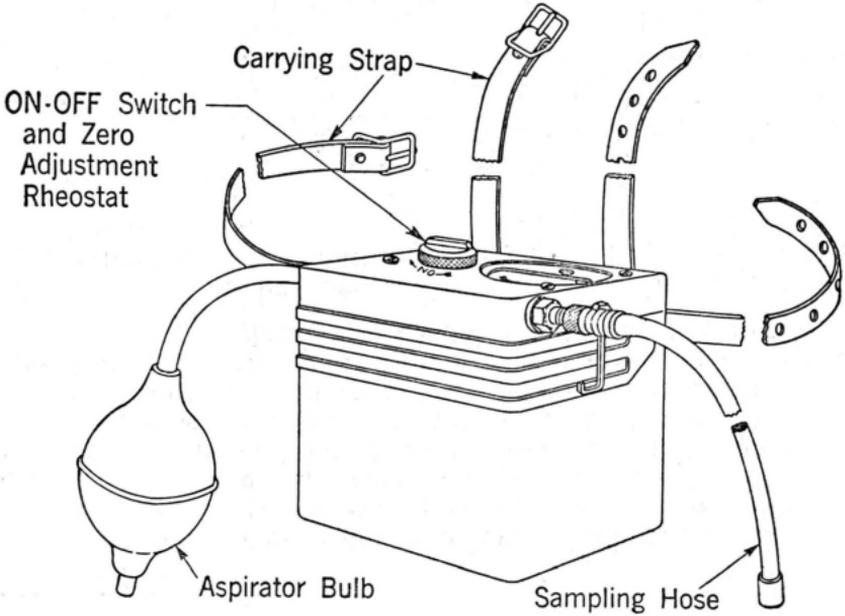
1.01 This section describes the Explosimeter, Model 2, used to test for the presence of gasoline vapors and other combustible gases, except carbon monoxide which is found in manufactured gas and mixtures of manufactured and natural gases. The Carbon Monoxide Detector or the Carbon Monoxide Indicator should be used to detect the presence of gases containing carbon monoxide. The Carbon Monoxide Detector should be used to detect hydrogen sulphide.

1.02 The section has been reissued to permit using the gas indicator in the manhole subsequent to the original test for combustible gas.

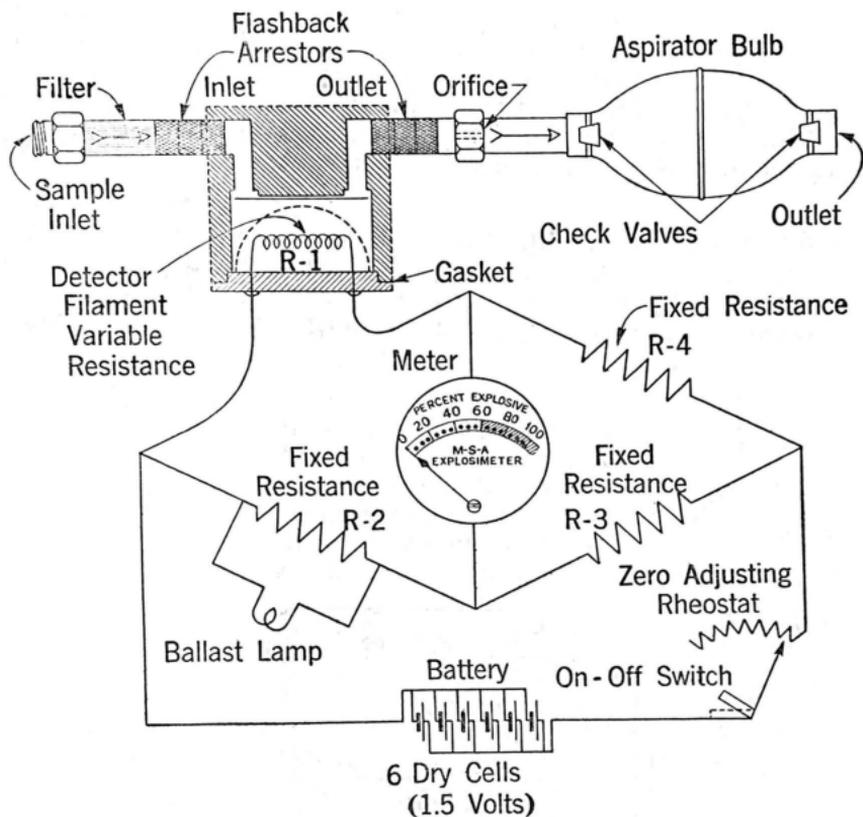
2. DESCRIPTION

2.01 The Explosimeter is illustrated in the following sketch. It operates on the principle of a Wheatstone bridge. The arms of the bridge consist of a detector filament and three resistors. These elements together with the indicating meter and six KS-14711 Dry Batteries are housed in a metal case. The instrument is equipped with an aspirator bulb, a sampling

hose 15 feet long and a spare filament unit. The instrument weighs about four pounds.



2.02 The wiring diagram of the indicator is shown below.



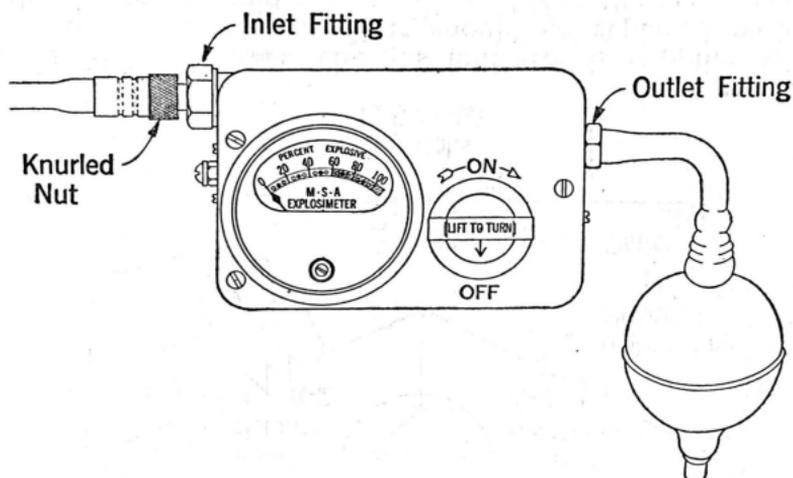
2.03 **Inhibitor Filter:** The gas indicator is supplied with a cotton filter. This filter should be replaced with the Inhibitor Filter to avoid false readings, for in the event gasoline vapor is drawn into the indicator, the inhibitor filter will remove the ingredient in the leaded gasoline which poisons the filament. Crush the filter before placing it in the instrument. The filter should be replaced every four weeks.

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

3. SETTING UP INDICATOR

3.01 The following tests shall be made each day before the indicator is used to test a manhole.

3.02 **Aspirator Bulb Test:** Test the bulb to determine whether it is in working order, as follows: Remove the bulb and short hose from the indicator, hold a finger tightly over the end of the hose and depress the bulb. The bulb should not inflate in less than 4 to 6 seconds. If the bulb operates satisfactorily, attach the short hose to the indicator.



3.03 **Filter Test:** Remove the inlet fitting and examine the chamber to insure that it contains a filter; then 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.

3.04 **Test for Gastightness:** Place one finger over the inlet fitting, squeeze the bulb and hold another finger over the outlet of the bulb. The bulb should remain deflated. If the bulb inflates in less than 30 seconds, there is a leak which should be corrected before the indicator is used. If the leak can not be stopped by tightening the hose fittings and the filament unit, the instrument should be returned for repair in accordance with local routine.

3.05 Adjustment of Indicator:

- (1) Lift the left end of the ON-OFF bar on the rheostat knob and turn the knob one-quarter turn in a clockwise direction.
- (2) Flush the indicator with the sampling hose detached by squeezing the aspirator four or five times.
- (3) Adjust the rheostat knob until the needle comes to rest at zero (0).

3.06 Test the hose to determine whether it is contaminated by combustible gases or vapors as follows:

- (1) Make the adjustments described in Paragraph 3.05, attach sampling hose to the indicator and tighten the knurled nut by hand firmly.
- (2) Draw fresh air through the indicator (about five squeezes of the bulb plus one for each 5 feet of sampling hose). The needle should rest at zero. If more than a slight fluctuation of the needle occurs, the inside of the hose may be contaminated with gas from a previous test. The hose generally can be cleared by aspirating fresh air through it or by flushing with nitrogen gas.

4. OPERATION

4.01 Place the free end of the sampling hose in the manhole (cover removed) and draw the atmosphere to be tested through the indicator until the highest reading is obtained. Make sure that the end of the sampling hose never touches ← water in the manhole. About five squeezes of the bulb plus one ← squeeze for each 5 feet of the hose should be sufficient.

4.02 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 100 per cent shows how closely the atmosphere approaches the minimum concentration required for an explosion. If the needle is deflected to the extreme right-hand side of the scale and remains there, the concentration of gas is in the explosive range.

4.03 If the needle moves rapidly across the scale and then returns to a position on the scale or below zero, it indicates that the concentration of combustible gas may be above the upper explosive limit. To verify this, immediately aspirate fresh air through the Explosimeter; if the needle moves first to the extreme right and then to the left end of the scale, it indicates that the concentration of combustible gas in the sample is above the upper explosive limit.

4.04 Check the zero adjustment of the meter before each test, if practicable. In making a series of tests, the balance adjustment should be checked at 3-minute intervals during the first 10 minutes of testing and every 10 minutes thereafter.

4.05 **Testing for Gasoline Vapors:** The Explosimeter equipped with an Inhibitor Filter can be used in testing for gasoline vapors. Loosen the inlet fitting, remove the filter in the chamber, crush the inhibitor filter, place it in the chamber and replace the inlet fitting. When gasoline is tested, the filter should be used only one day. After gasoline vapor tests are completed, the hose and instrument should be thoroughly cleaned by flushing them with fresh air or nitrogen gas.

4.06 **Testing with the Indicator in the Manhole:** The gas indicator may be used in the manhole provided a test made from the street indicates that the atmosphere is satisfactory. Before entering the manhole, tie the free end of the sampling hose to the top rung of the manhole guard. The other end should be lowered into the manhole for subsequent use in adjusting the Explosimeter. Adjust the setting of the needle in the manhole as follows:

- (1) Attach the sampling hose to the indicator.
- (2) Turn the set on.
- (3) Flush the indicator by squeezing the aspirator bulb two or three times.
- (4) Adjust the rheostat until the needle comes to rest at zero.
- (5) Detach the sampling hose and test for combustible gas.

4.07 To turn off the indicator, rotate the rheostat knob counterclockwise until the arrow on the knob points to OFF. The locking bar will then drop into position. To prolong the life of the batteries and filament, the switch should be kept in the OFF position except when the instrument is in use.

4.08 **Precaution: Do not check the operation of the Explosimeter by sampling vapors from a container of gasoline.**

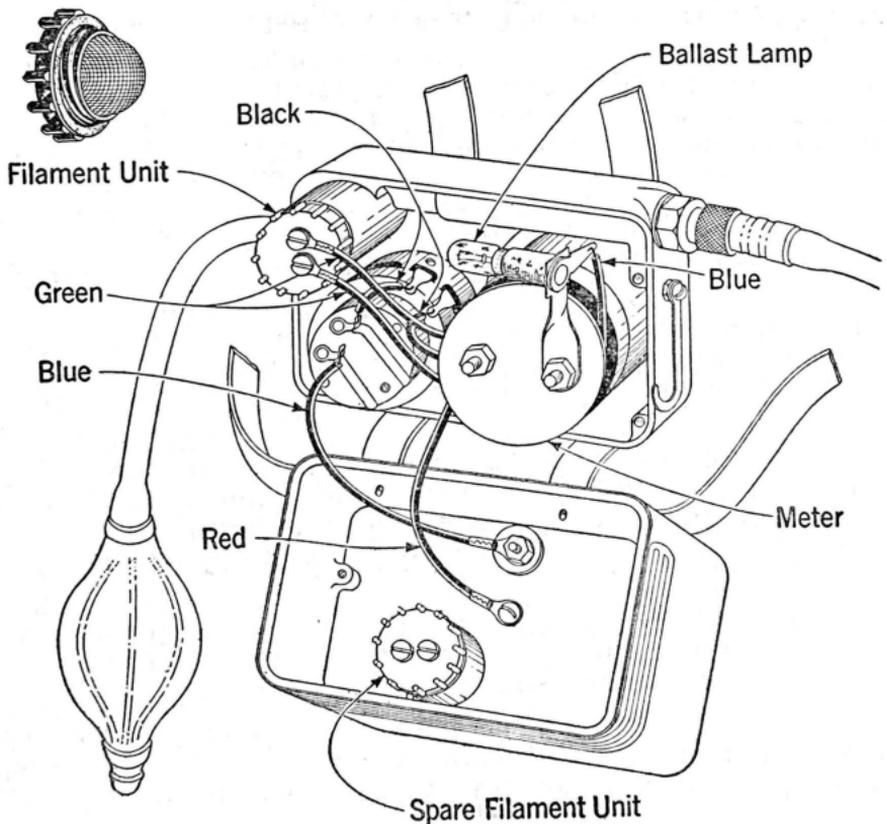
5. MAINTENANCE

5.01 **Dry Batteries:** Six KS-14711 dry batteries are located in the bottom of the case. To replace the batteries, loosen the two thumb screws in the bottom of the case and remove it. The batteries operate in parallel and should be installed with their tops toward the top of the battery compartment. The batteries should be replaced as a group. The

position of the arrow on the rheostat gives an approximate indication of the condition of the batteries. With fresh batteries in the case and the circuit balanced, the arrow should point toward the inlet side of the indicator; when the batteries are nearly exhausted, the arrow will point toward the outlet side of the indicator. The batteries are exhausted when the meter needle remains below zero and can not be brought up to zero when the rheostat is turned to its extreme clockwise position.

5.02 **Detector Unit:** If the meter needle moves to the extreme right side of the scale when the indicator is turned on and can not be adjusted to zero, it indicates that the filament is burned out and should be replaced.

5.03 To replace the filament unit, remove the top of the case, disconnect the two green wires from the terminals at the base of the filament unit; then unscrew the unit counterclockwise. Screw the replacing unit tightly in the combustion chamber, making sure that the gasket is clean and



properly seated. Then replace the green wires and replace the top of the case. Space is provided in the case for a spare filament unit, as shown.

5.04 **Ballast Lamp:** This lamp must be kept firmly screwed in the socket. It should have indefinite life. In case of breakage, it should be replaced with the lamp indicated in Part 6.

5.05 **Filter Chamber:** The filter chamber is located in the inlet fitting and is reached by unscrewing the inlet fitting. The inhibitor filter should be replaced if clogged or after a day of testing gasoline vapors or every four weeks in ordinary use.

5.06 **Meter:** When the indicator is not in operation, the meter should rest at zero. If the mechanical adjustment of the needle has been disturbed, it should be reset using a small screwdriver.

5.07 **Flashback Arrestors:** The flashback arrestors are located in the inlet and outlet of the detector filament chamber. The inlet arrestor is reached by removing the detector chamber and the baffle plate at the bottom of the detector chamber. The outlet flashback arrestor is reached by removing the aspirator bulb coupling. The arrestors are made of cadmium plated copper screen tightly wrapped on a rod. Be sure they are in place.

5.08 **Flow Regulating Orifice:** The orifice controlling the rate of flow through the Explosimeter is located in the aspirator bulb coupling. It can be screwed out after the rubber tubing is removed. If it is clogged, it may be cleaned by pushing a fine wire through its opening.

6. REPLACEMENT PARTS

Battery, Dry, KS-14711

Bulb, Aspirator, for Explosimeter, DN-16839

Filter, Cotton, for Explosimeter, Model 2, package of 6, DN-16499

Filter, Inhibitor, for Explosimeter, Model 2, package of 6, DN-47740

Hose, 15-ft., with couplings, for Explosimeter, Model 2, DN-11912

Lamp, Ballast, for Explosimeter, Model 2, DN-52148

Unit, Filament, for Explosimeter, Model 2, DN-11355

Arrestor, Flashback, for Explosimeter, Model 2, DN-15264

Tube, Aspirator Bulb, for Explosimeter, DN-14762