

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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AT&T Co Standard

PRESSURE TESTING

GAS FLOW INDICATORS

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I. GENERAL

1.01 This section describes the Gas Flow Indicators and outlines their use in determining the direction of gas flow in leak locating work on cables maintained under pressure. The indicator currently supplied is illustrated in Part 2 and the instrument it superseded is illustrated in Part 3.

1.02 In general, the indicator is used to verify the location of a small leak after it has been determined approximately by means of pressure gradients. The indicator is especially useful in verifying section leaks in underground cable where the conditions of the sheath may require replacement of the section. The indicator may also be used in locating leaks in aerial cable under favorable conditions, that is, when air temperatures along the cable are reasonably constant; such as the interval between dawn and sunrise, or during a steady, all-day rain. Tests made at other times, even on a cloudy day, may be inaccurate as a result of gas flow due to temperature differences along the cable.

1.03 The general plan followed in locating leaks by means of an indicator is to make tests at various accessible points in the suspected area until the cable section is found into which gas is flowing from both ends.

1.04 The Gas Flow Indicator is a precision tool and careful handling and interpretation of the results are required.

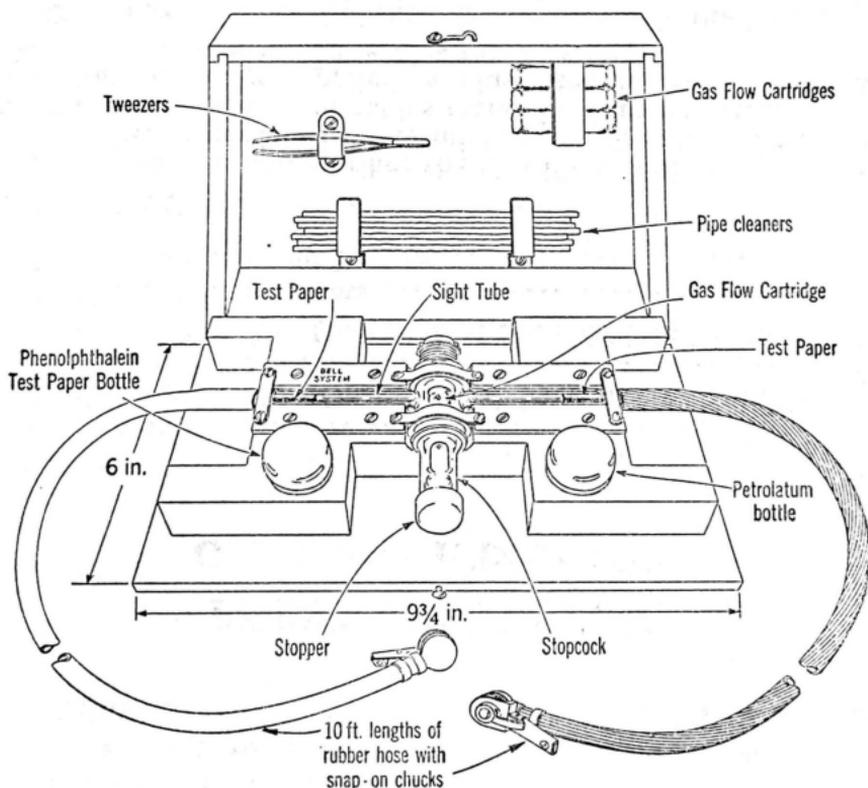
1.05 This section has been revised to include information on the Specification AT-6723 (glass type) indicator. The Ammonia Inhalant Ampoule is no longer used for this pur-

pose. Instead the ammonia fumes are obtained from the B Gas Flow Cartridge, also, prepared phenolphthalein test papers are now provided for use with the new type indicator.

2. DESCRIPTION AND OPERATION OF SPEC. AT-6723 INDICATOR

2.01 **Description:** This Gas Flow Indicator is illustrated below and consists essentially of a clear pyrex glass valve containing a cartridge chamber capped with a rubber stopper, and two sight tubes. The unit is mounted in a wooden case having a removable cover. The case is equipped with commercial pipe cleaners, tweezers, gas flow cartridges, and two one-ounce sealed glass bottles. The cartridges contain an ammonia solution. One bottle contains petrolatum and the other is used for storing the phenolphthalein test papers. Two ten-foot lengths of rubber hose of contrasting colors equipped with snap-on chucks are provided for connecting the indicator to test valves on the cable.

GAS FLOW INDICATOR
(Specification AT-6723)



2.02 **Operation:** The operation of the indicator is based on the chemical reaction of ammonia vapor on phenolphthalein test paper. When the two hoses are connected to the cable at points four or five feet apart, the ammonia vapor in the cartridge chamber is moved toward one or the other of the phenolphthalein test papers in the sight tubes by the movement of the nitrogen gas that is by-passed from the cable and flows through the indicator in the same direction as the gas is flowing in the cable. The action of the ammonia gas on the normally white test paper causes it to turn pink.

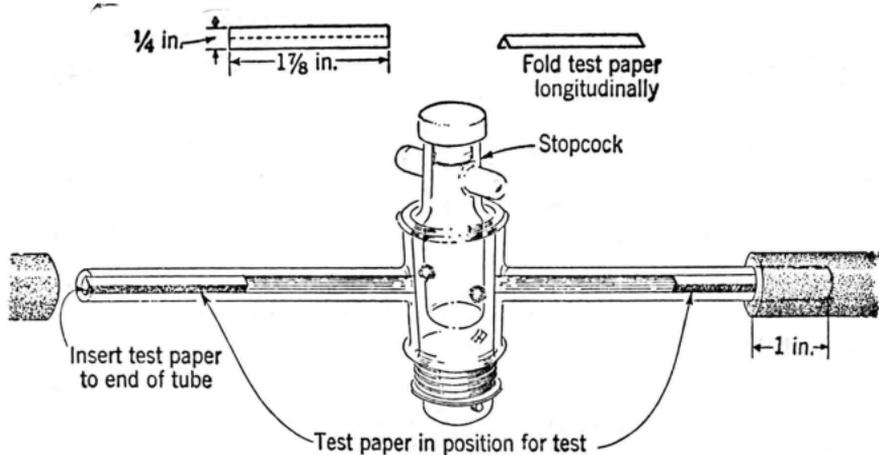
2.03 The glass valve and sight tubes should be cleaned with a pipe cleaner before and after each use to remove all traces of ammonia gas that might otherwise react with the test paper. A fresh cleaner should always be used. From time to time it is advisable to wash the valve in warm water.

2.04 Petrolatum is provided to ensure a gas-tight seal between the ground glass surfaces. It should be applied in a thin even coat when the indicator is being prepared for each test.

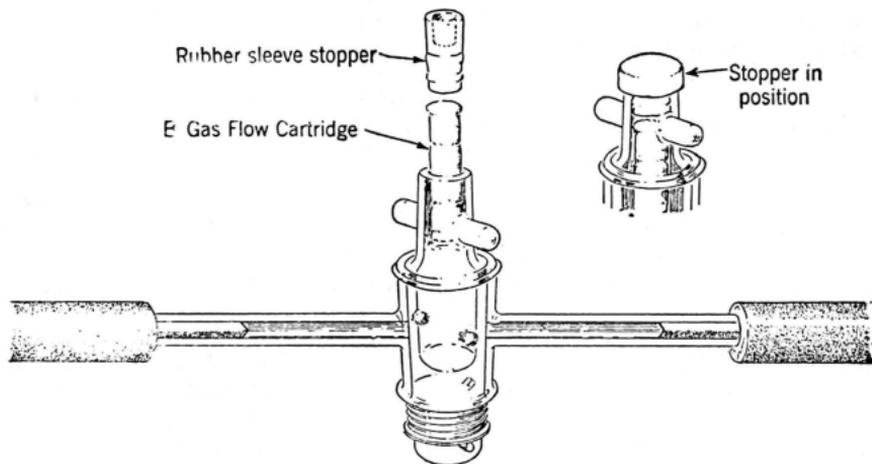
2.05 The rubber hose should fit tightly over the sight tube to ensure a satisfactory seal, and some stretching of the hose may be required in placing it.

2.06 The method of making connection to the cable is outlined in Part 4. The testing procedure in using the indicator at a test point is as follows:

- (1) Remove the cover from the case, clean the sight tubes by blowing and then swab with a fresh pipe cleaner. Remove the brass pin and take out the glass valve. The rubber stopper should be removed and the valve cleaned.
- (2) Lubricate the ground surface of the stopcock with a thin, even coat of petrolatum, then reassemble the indicator.
- (3) The stopcock should be turned to the "off" position, that is, with the hole through the valve body perpendicular to the sight tubes.
- (4) Fold two test papers lengthwise as illustrated below and place one in each sight tube with the tweezers. When light conditions are unfavorable, breathing on the test papers before they are inserted in the sight tubes will produce a more intense color reaction.
- (5) The ends of the sight tubes should be moistened and the rubber hoses placed over the glass tubes approximately one inch.



(6) A Gas Flow Cartridge should be crushed and placed in the chamber of the stopcock, as shown below. The rubber sleeve stopper should then be replaced.



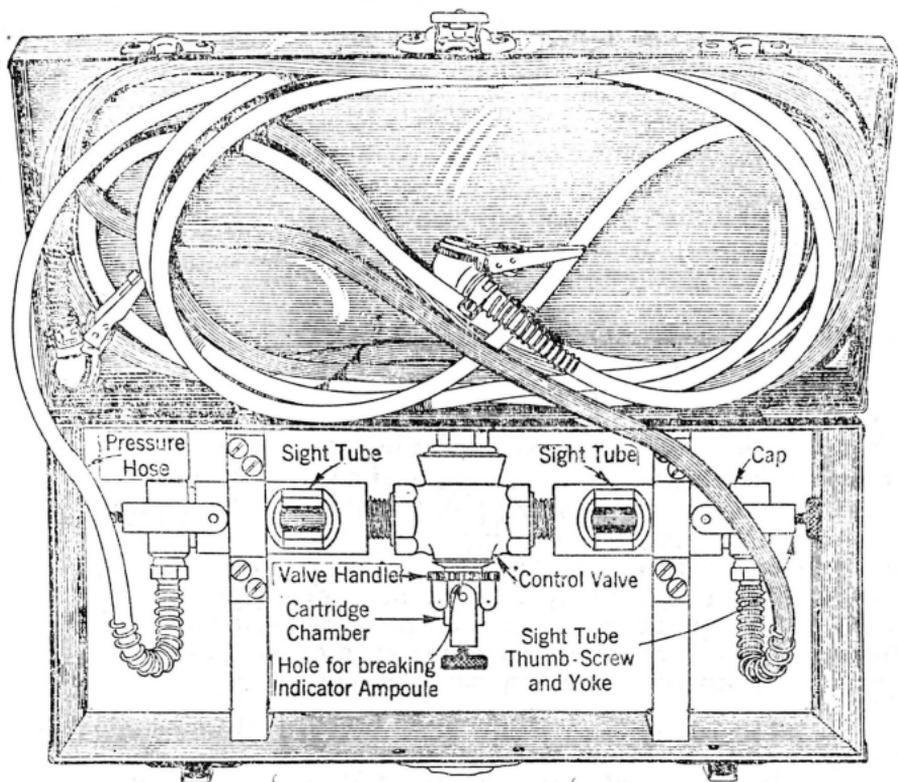
(7) Place the snap-on chucks on the pressure testing valves and carefully observe the test papers for discoloration. If discoloration occurs in either test paper, the valve is leaking. In this event the snap-on chucks should be removed and the foregoing procedure repeated. If no discoloration is noted, carefully soap all joints in the apparatus from one pressure testing valve to the other and observe for leaks. This is an important check as minute gas leaks in the indicator will give erroneous results.

- (8) After the tests indicate that the instrument is gas-tight and several minutes have elapsed to ensure gas equalization, turn the stopcock to the "on" position, that is, so that the openings in it are in line with the sight tubes. Carefully observe the test papers for discoloration. If there is a flow of gas through the instrument, one test paper will turn pink while the other will remain white. The time required to get a definite indication will vary from less than a minute to 15 minutes or more, depending on the size and location of the leak. The steeper the slope of the gradient line, the shorter will be the time required for an indication. The flow of gas in the cable is in the direction of the pressure hose connected to the sight tube in which the test paper is pink.
- (9) When the direction of flow has been established, the stopcock should be turned to the "off" position and the snap-on chucks interchanged on the two pressure testing valves. This is done to check the results of the test just made. All joints should again be soaped and inspected for tightness and if satisfactory, the stopcock should again be turned to the "on" position. The test paper which was not discolored should now turn pink and the paper which colored previously should show indications of fading.
- (10) The stopcock should then be turned to the "off" position and the chucks removed from the pressure testing valves. The hoses should be removed from the sight tubes and the test papers removed and discarded. If further tests are to be made, a careful cleaning by blowing through the sight tubes and swabbing with a pipe cleaner without disturbing the valve or the Gas Flow Cartridge should be sufficient. One cartridge is satisfactory for several consecutive uses. However, if the indicator is not to be used again the same day the cartridge should be removed and discarded, the sight tubes swabbed, and the cover of the case replaced.

3. DESCRIPTION AND OPERATION OF SPEC. 6620 INDICATOR

3.01 Description: This Gas Flow Indicator is illustrated below and consists essentially of a valve containing a Gas Flow Cartridge Chamber with two sight tubes (metal cylinders with glass windows) that have hose connections at their opposite ends. The hoses are of contrasting colors to assist in differentiating between them. The indicator is mounted in a sheet metal carrying case in which sufficient space is provided for packing the two lengths of hose and a supply of Gas Flow Indicator Ampoules and B Gas Flow Cartridges.

GAS FLOW INDICATOR
(Specification 6620)



3.02 **Operation:** The operation of this instrument, like the indicator described in Part 2, is based on the chemical action of ammonia vapor on blotting paper strips saturated with a solution containing phenolphthalein. This solution turns to a pink color in contact with ammonia vapor. The ammonia vapor is supplied by a B Gas Flow Cartridge. The blotting paper strips are contained in glass tubes constituting the Gas Flow Indicator Ampoules.

GAS FLOW INDICATOR AMPOULE



3.03 The method of making connection to the cable is outlined in Part 4. The procedure for using the indicator at a test point is as follows:

(1) Remove the hose connections and clean the sight tubes by blowing into the tubes, and then swab them with a fresh pipe cleaner.

(2) Set the indicator control valve in its closed position (i.e., with the valve handle at right angles to the sight tubes). It is imperative that this valve be closed except when gas flow is being observed.

(3) To prepare the instrument for use, break the ends of a Gas Flow Indicator Ampoule at the score marks, using the hole provided in the handle of the control valve for this purpose. Shake the ampoule to dislodge any excess solution, then hold the ampoule at the end containing the paper strip and insert the other end in the socket of the cap. Replace the cap, swing the yoke in place and tighten the thumb screw so as to provide a gas-tight seal. The paper strip should now be in a position to be readily observed through the glass window of the sight tube. Equip the other sight tube in a similar manner.

(4) Loosen the thumb screw of the yoke that holds the cap of the cartridge chamber in place. Swing the yoke aside and remove the cap. Crush one end of a Gas Flow Cartridge between the fingers, and insert the other end of the cartridge in the socket of the cap. Replace the cap so that the cartridge is in the cartridge chamber. Swing the yoke into place and tighten the thumb screw so as to provide a gas-tight seal.

(5) Apply the snap-on chucks of the rubber tubing firmly to the two pressure testing valves in the cable. Test the connection with soap solution to detect any leaks.

(6) Carefully observe the test papers in each sight tube to make sure it is not being discolored. Then slowly open the control valve of the indicator.

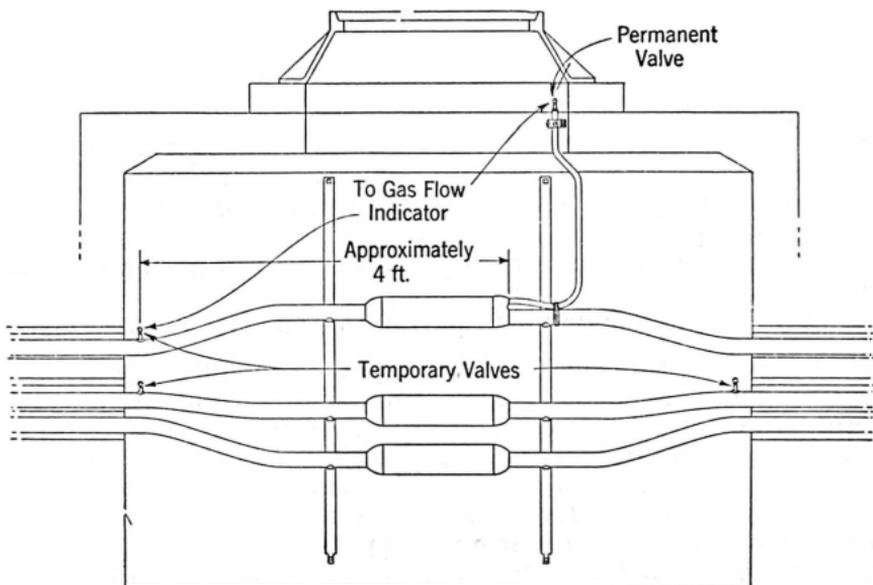
(7) Continue to observe the test papers. If there is a flow of gas through the indicator, the end of one of the papers will gradually assume a pink color while the other strip will remain white. The time required to get a definite indication will vary from less than a minute to 15 minutes or more, depending on the size and location of the leak in the cable. The steeper the slope of the gradient line, the shorter will be the time required for an indication. When a positive color indication is obtained, close the control valve. The flow of gas is in the direction of the pressure hose connected to the sight tube in which the test paper becomes pink.

- (8) Make a check test with the flow of gas through the indicator reversed. To make this test reverse the hose connections at the pressure testing valves. Test the connections with soap solution. Then slowly open the control valve. The test paper which was not discolored should now turn pink and the previously colored paper should now show indications of fading.
- (9) When a positive color indication is obtained, close the control valve. Remove and discard the Gas Flow Indicator Ampoules. The B Gas Flow Cartridge may be left in the chamber and used for tests at five or six other points if required. However, it should never be left in the compartment overnight, but should be discarded at the end of the day's work.
- (10) After observations at each test point are completed and the caps of the sight tubes are removed, it is advisable to blow across the open end of each sight tube and flush both pressure hoses with nitrogen gas from a cylinder, in order to dissipate the ammonia fumes. Otherwise the test papers may become tinted as soon as they are placed in the sight tubes. Never use gas from the cable under test for the purpose, as this would affect the pressure gradient of the cable.

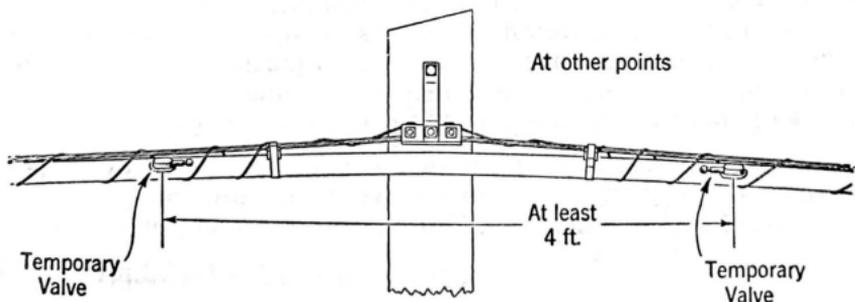
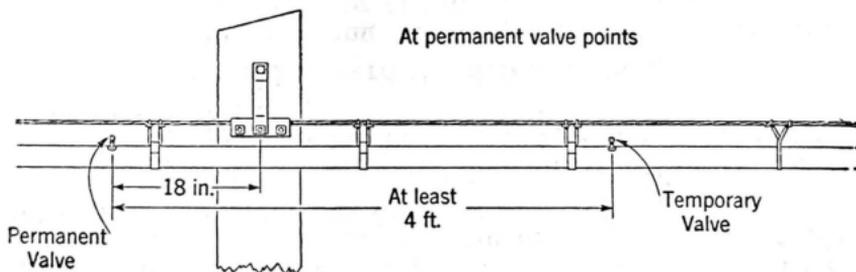
4. VALVE ARRANGEMENTS

4.01 In making tests with a Gas Flow Indicator, two pressure testing valves are required in the cable. The valves should be spaced four or more feet apart. Existing valves should be used when possible and all new valves should be installed using F Pressure Testing Flanges. These can be installed with a minimum loss of gas by soldering them in place before drilling the hole in the sheath. The standard cable drill has a cutter long enough to permit drilling the sheath through the opening in the flange. The valve should, of course, be set in the flange immediately after the hole is drilled. The gas flow measurement should not be made until the gas pressure in the cable has again become stabilized, usually 15 to 30 minutes after a new valve is installed as outlined. Upon completion of the tests all temporary valves should be removed and the pressure testing flange openings capped with screw plugs coated with white lead or an equivalent material.

4.02 **Underground Cable:** Typical arrangements of valves for gas flow indicator tests in manholes are shown in the following figure. The distance between the valve and the duct entrance should be not less than 4 inches.



4.03 **Aerial Cable: Typical arrangements of valves for gas flow indicator tests in aerial cable are shown in the following figures.**



5. MAINTENANCE AND REPAIRS

5.01 The list of replacement parts for the two types of Gas Flow Indicators is contained in Section G73.207. The indicators should be repaired in the field whenever possible.

5.02 **Specification AT-6723 Gas Flow Indicator:** The rubber hoses should be replaced when the over-all spread of the hoses when attached to the Gas Flow Indicator is less than six feet, or when the hoses show general deterioration. Tight joints should be maintained with the sight tubes by cutting off short lengths of hose when the latter slides onto the sight tubes too readily.

5.03 The valve body is fragile and must be handled carefully to avoid breakage. In case of breakage, the replacing unit should be installed as follows:

- (1) Loosen the screws holding the four brass mounting strips and slip the hooked end of the strips out of the holding position.
- (2) Remove and discard the defective body.
- (3) Clean the carrying case, paying particular attention to the white sighting chamber.
- (4) Place the new body in position.
- (5) Replace and tighten the brass mounting strips.

5.04 **Specification 6620 Gas Flow Indicator:** The indicator and the hoses should be inspected at intervals to ensure that there are no leaks, as the slightest leak will affect the accuracy of observation. The indicator may be tested for leaks by filling the carrying case with water while the pressure hoses are connected to a pressure supply of not more than nine pounds per square inch. Should the seams of the case open up in service due to injury to the paint coating, the joints can be touched up in the field with clear lacquer or other paint to make them sufficiently watertight for the purpose of this test.

5.05 The hoses may be tested using soap solution. As a part of the test of the indicator, operate the control valve from its closed to its open position several times. Then with the valve in its closed position, disconnect one of the hoses from the pressure supply and paint the chuck of this hose with soap solution to detect any leakage through the valve from one sight tube to the other.

5.06 If a leak is discovered in the valve, follow the procedure outlined below for cleaning and lubricating the valve.

- (1) Loosen the screws in the U clamps holding the indicator in the case.
- (2) Rotate the indicator to bring the handle end of the valve on top.
- (3) Remove the nut on the handle end of the valve. This nut carries the clamping device for tightening the Gas Flow Cartridge Holder.
- (4) Remove the handle, noting its position with relation to the rest of the assembly so that when it is replaced it will be in the same position.
- (5) Rotate the indicator 180° to bring the bottom of the valve on top.
- (6) Remove the nut from the bottom of the valve. If this nut turns very hard remove the U clamps, take the indicator out of the case and hold the valve of the indicator in a vise to prevent straining the connections.
- (7) Carefully remove the tapered body of the valve through the bottom of the housing and clean the body and conical seat thoroughly.
- (8) Lubricate the surfaces of both the valve body and seat with petrolatum.
- (9) Assemble the valve using white lead or its equivalent on the threads of the nut on the bottom of the valve.
- (10) Test for gas-tightness as outlined in Paragraph 5.04.

5.07 The valve should be tested and the lubricant renewed at intervals of six months to a year, depending on the frequency of use.

5.08 The original rubber bushings for the Gas Flow Indicator Ampoules and the washers for the cartridge holder will be found cemented into their respective places in order to avoid displacement in handling. Should it become necessary to replace these parts, it is suggested that they be secured in place by means of a light application of rubber cement such as that used for tire repairs.

5.09 When the indicator is not in use, the caps of the cartridge chamber and the sight tubes should not be tightened more than is necessary to hold them loosely in place.