

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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MANOMETERS

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1. GENERAL

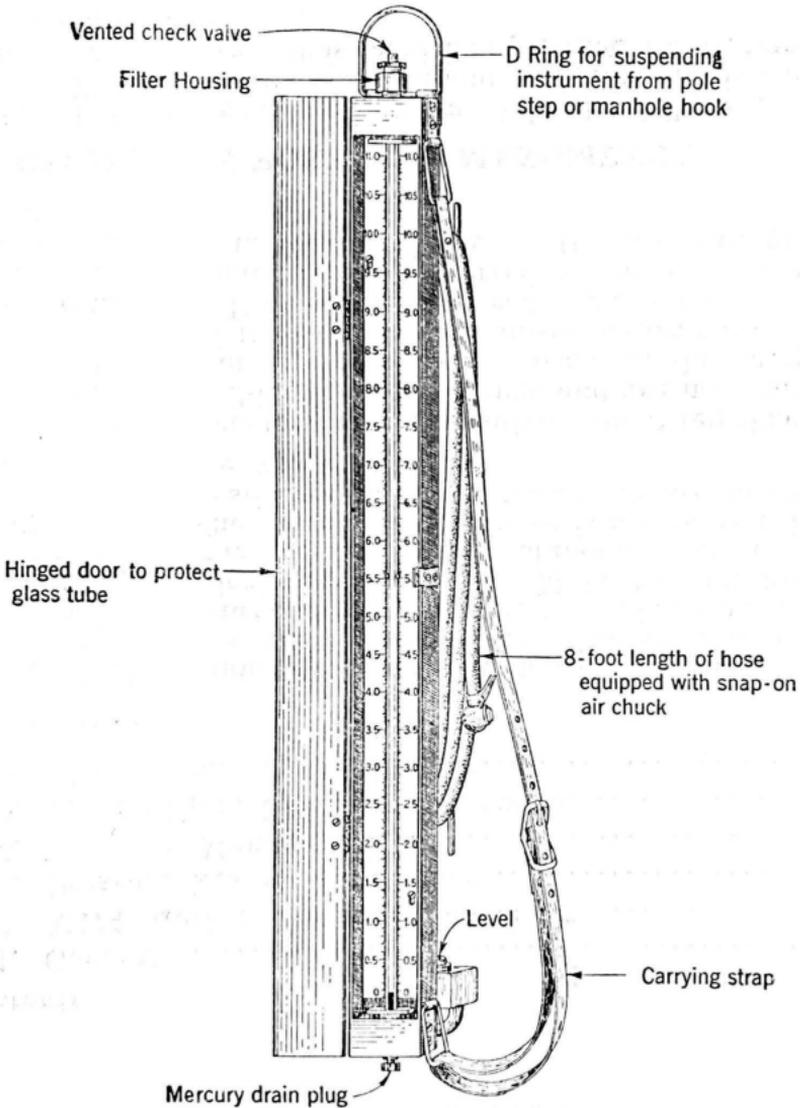
1.01 This section describes the **M174 Meriam Portable Manometer**, the **Pressure Testing Manometer** and the **Mercury Manometer** and covers the methods of setting them up for locating gas leaks in cables. The M174 Meriam Portable Manometer and the Pressure Testing Manometer are currently being supplied. The Mercury Manometer is a superseded type, some of which are still in use. These instruments are all mercury manometers of the well type.

1.02 The manometers have a sensitivity about ten times that of the 3-1/2-inch pressure gauge and are not subject to appreciable instrument errors such as occur in the gauge due to sluggishness of the pointer mechanism, deformation of the Bourdon tube, etc. Pressures can be read to .02 pound per square inch. The manometer is the preferred instrument for taking pressure readings in locating leaks by the pressure gradient method.

2. M174 MERIAM PORTABLE MANOMETER

2.01 This manometer is illustrated in the following sketch. The instrument weighs about 8 pounds and is equipped with a carrying strap. It is particularly suited for testing work on private right-of-way.

M174 MERIAM PORTABLE MANOMETER



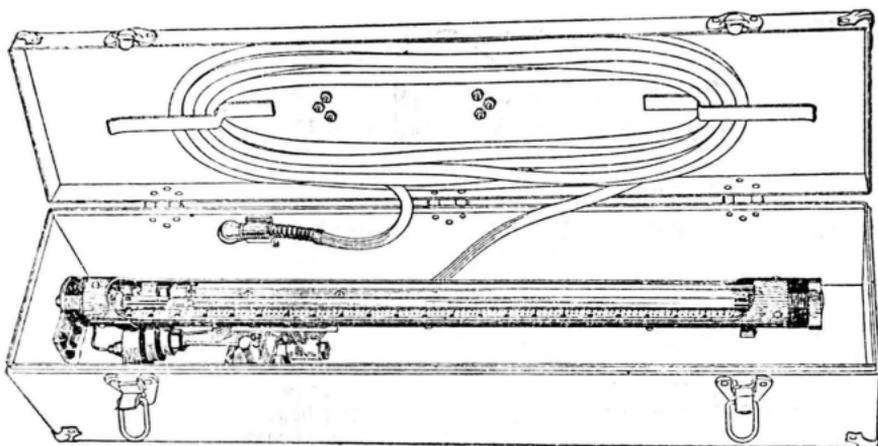
2.02 The instrument will measure pressures up to 11 pounds per square inch. The scale is graduated in units of .02 pound. The zero point is adjusted by loosening the screws on the scale and then moving the scale up or down as required. The screws should be tightened after the adjustment has been made.

- 2.03 The manometer holds about $3/4$ pound of mercury. To prevent spilling the mercury when the manometer is tilted, a filter is provided at the upper end of the glass tube.
- 2.04 The manometer is equipped with 8 feet of pressure testing hose which terminates in a snap-on air chuck.

3. PRESSURE TESTING MANOMETER

- 3.01 The Pressure Testing Manometer is illustrated below. It is permanently mounted in the carrying case.

PRESSURE TESTING MANOMETER AND CARRYING CASE



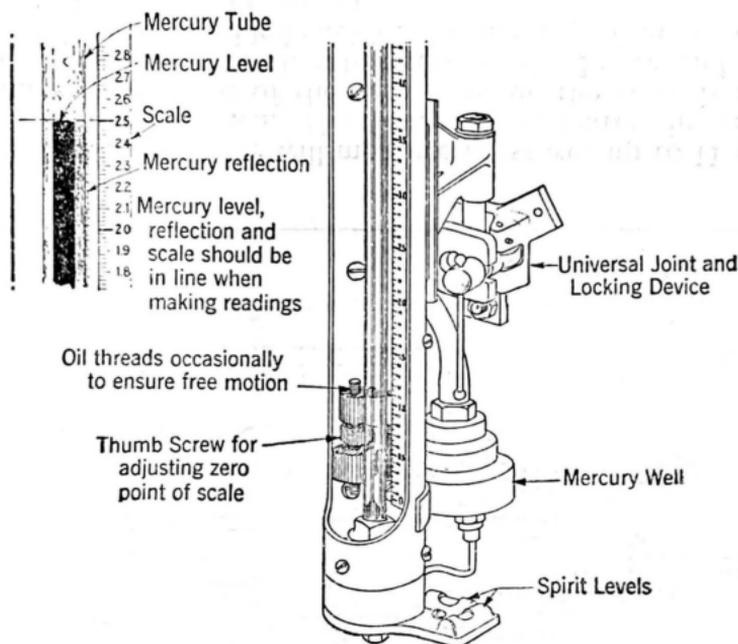
3.02 This manometer will measure pressures up to 11 pounds per square inch. The scale is graduated in units of .02 pound. Adjustment of the zero point on the scale is accomplished by means of a thumb screw at the lower end of the scale. A mirror is provided back of the mercury column to insure accuracy in reading the manometer.

3.03 The instrument holds about one pound of mercury. To prevent spilling the mercury when the manometer is tilted, aluminum filters are provided at the inlet to the well and at the upper end of the glass tube. At pressures within the range of the instrument the filters allow the passage of gas but not of mercury.

3.04 The manometer is equipped with 30 feet of pressure testing hose which terminates in a snap-on air chuck. This hose is used to connect the instrument to the cable. The

cover of the case is equipped with two brackets around which the hose may be coiled.

3.05 The carrying case is 31 inches long, 7 inches wide and 7 inches deep and the entire unit weighs about 28 pounds. The case is used to support the instrument while in use. The leveling of the manometer is accomplished by means of the universal joint connection between the manometer and the case and the two spirit levels shown below.



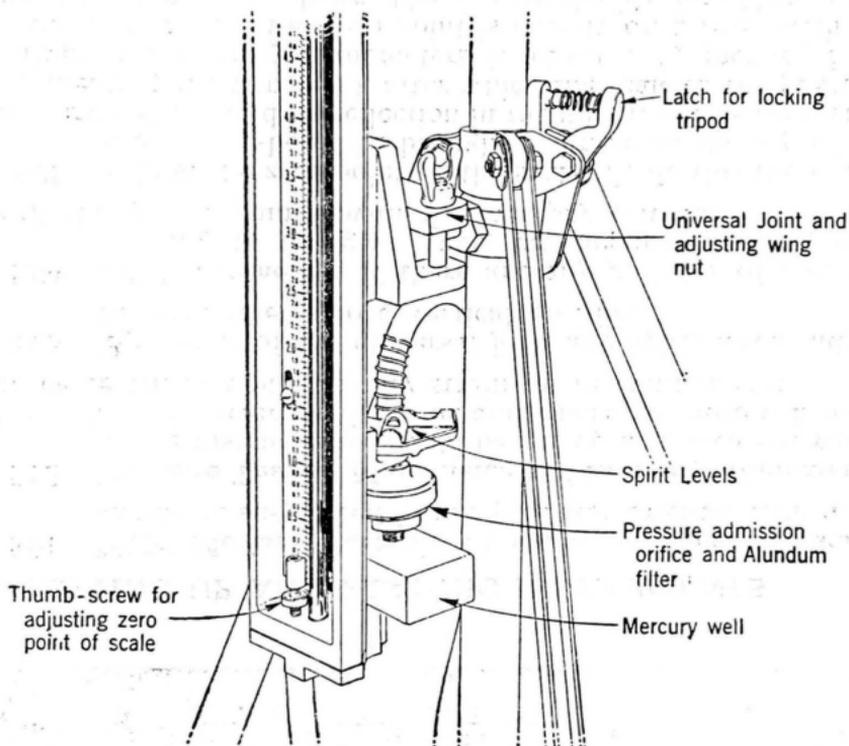
4. MERCURY MANOMETER

4.01 The following illustration shows the Mercury Manometer. Set up for use, the over-all height of the instrument is 51 inches. When the legs of the tripod are collapsed and folded, the over-all length is 43 inches. The instrument with case weighs about 35 pounds.

4.02 This manometer will measure pressures up to 15 pounds per square inch and the scale is graduated into units of .05 pound. A metal mirror is mounted back of the mercury column to ensure accuracy in reading the instrument. Adjustment of the zero point on the scale is accomplished by means of the thumb screw provided at the lower end of the scale.

4.03 The manometer holds about one pound of mercury. To prevent spilling of the mercury when the manometer is tilted, alundum filters are provided at the inlet to the well and the upper end of the glass tube.

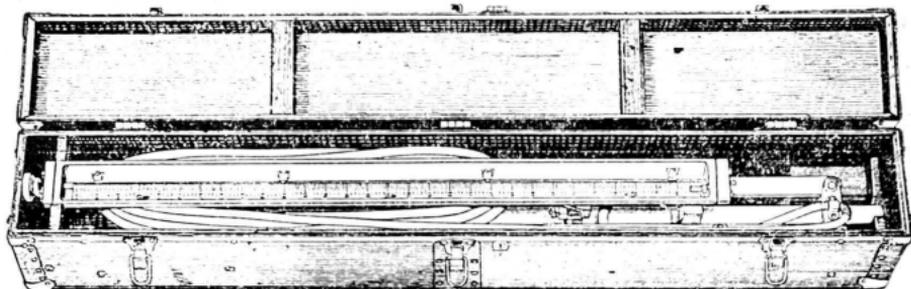
4.04 The manometer is mounted on a collapsible tripod by means of a universal joint. This joint and the two spirit levels below the joint facilitate adjustment of the instrument to a vertical position for use.



4.05 The manometer is equipped with 30 feet of pressure testing hose for connecting the instrument to the cable. The free end of the hose terminates in a snap-on air chuck. When not in use, the hose should be coiled on the two brackets at the rear of the manometer.

4.06 The carrying case is 44 inches long, 6-1/2 inches wide and 9 inches high. The manometer in the carrying case is illustrated in the following figure.

MERCURY MANOMETER IN CARRYING CASE

**5. SETTING UP AND READING INSTRUMENTS**

- 5.01 **M174 Meriam Portable Manometer:** This instrument should be suspended from a pole step or cable rack hook.
- 5.02 **Pressure Testing Manometer and Mercury Manometer:** These instruments should be set up at a location where they will not interfere with traffic and where the hose will reach the cable without placing any strain on the manometer.
- 5.03 By means of the universal joint and spirit levels, adjust the manometer to a vertical position.
- 5.04 **All Instruments:** If there are any globules of mercury clinging to the glass tube, tap the manometer gently until the globules unite with the mercury column.
- 5.05 Adjust the zero point on the scale. To do this the eye of the tester should be brought in line with the top of the mercury column and its reflection in the mirror (pressure testing and mercury manometers), after which the scale in the pressure testing and mercury manometers is adjusted by means of the thumb screw until the zero point is exactly on a level with the top of the mercury column. The scale in the Meriam Manometer should be moved with the fingers.
- 5.06 Place the air chuck firmly in position on the pressure testing valve. After the mercury column has come to rest, inspect it to make sure that it contains no air bubbles. Then bring the eye in line with the top of the mercury column in the case of the Meriam Manometer and the top of the mercury column and its reflection in the mirror in the case of the Pressure Testing and Mercury Manometers and observe the pressure corresponding to the top of the column. The reading should be estimated to the nearest hundredth of a pound.

5.07 After making a reading and before the manometer is moved, disconnect the air chuck from the pressure testing valve and depress the pin in the air chuck so that the gas can escape from the tubing and allow the mercury column to return to the zero point on the scale. If the mercury does not return to the zero point after making a pressure measurement, the scale should be readjusted and another measurement made.

5.08 After a measurement is completed with the manometer, coil the hose on the brackets. The pressure testing and mercury manometers should be placed in their carrying cases. In transporting an instrument from one measuring point to another, care should be taken not to jar it.

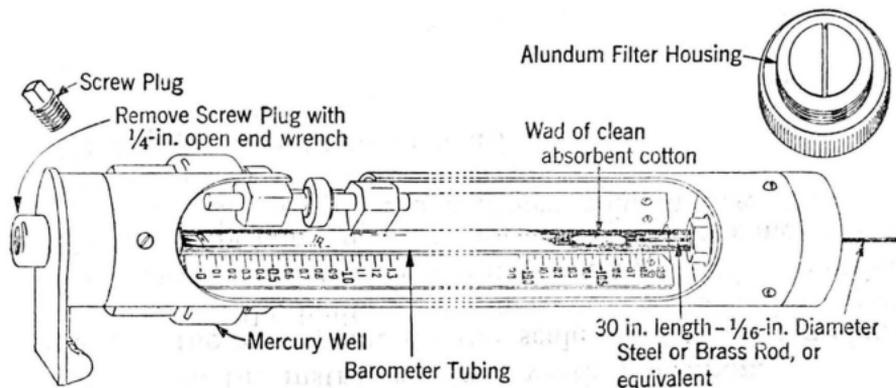
6. MAINTENANCE

6.01 **Pressure Testing Manometer:** This instrument should require no maintenance except an occasional cleaning of the tube. The tube should be cleaned as follows:

- (1) Lay the instrument in a horizontal position with the face of the manometer up.
- (2) Unscrew and remove the upper alundum filter housing.
- (3) Unscrew and remove the mercury drain plug at the well end of the instrument.
- (4) Place a small wad of clean absorbent cotton at the upper end of the glass tube and push it through the tube with a brass rod. This process should be repeated several times using new wads of cotton until the foreign material is removed.
- (5) Replace the housing and screw plug.

6.02 The alundum filters will ordinarily prevent loss of mercury from the manometer. If mercury is lost, however, and it is not possible to adjust the scale to zero, additional mercury should be added as follows:

- (1) Set up the instrument in a vertical position.
- (2) Set the zero point on the scale so that it is midway between the limits of the upper and lower adjustments.
- (3) Unscrew and remove the upper alundum filter housing.
- (4) Carefully pour into the glass tube sufficient mercury to bring the top of the mercury column level with the zero point on the scale.
- (5) Replace the alundum housing.

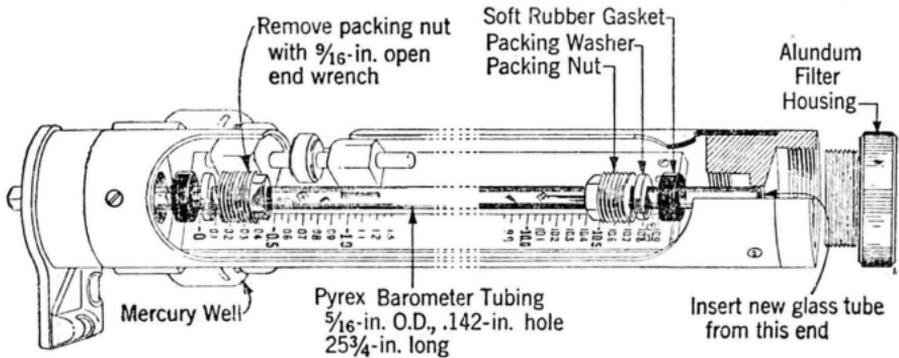


Note:-

Lay Manometer horizontally with Mercury Well down

6.03 In the event the glass tube is broken, the instrument may be returned for repair, or the tube can be replaced in the field as follows:

- (1) Lay the manometer in a horizontal position with the face plate up.
- (2) Unscrew and remove the upper alundum filter housing.
- (3) Remove the upper and lower packing glands and rubber gaskets.
- (4) Remove the broken tube.
- (5) Insert a new tube through the upper end of the manometer. Place the rubber gaskets and glands on the tube. (A Pyrex Barometer tube 5/16-inch outside diameter with .142-inch hole and 25-3/4 inches long should be used.)
- (6) Carefully turn up the nuts of the glands until it appears that sufficient pressure has been placed on the glass tube by the rubber gaskets to form gas-tight joints.
- (7) Replace the filter housing.
- (8) Set up the manometer for use and test it with a pressure of about 5 pounds per square inch. Soap the connections and any leaky joint will be indicated by the formation of soap bubbles.



Note:-

Lay Manometer horizontally with Mercury Well down

6.04 **M174 Meriam Portable Manometer:** Under ordinary circumstances this manometer should require no maintenance except an occasional cleaning of the tube. The tube should be cleaned as outlined in Paragraph 6.01.

6.05 The filter will ordinarily prevent loss of mercury from the manometer. If mercury is lost however, and it is not possible to adjust the scale to zero, additional mercury should be added as covered in Paragraph 6.02.

6.06 In the event that the glass tube should become broken, the instrument may be returned for repair, or the tube can be replaced in the field. The method of replacing the tube is essentially the same as for the Pressure Testing Manometer described in Paragraph 6.03. The barometer tube required is of the same size as that indicated in Paragraph 6.03.

6.07 **Mercury Manometer:** This instrument should be handled carefully as the glass tube may be easily broken. If the tube becomes broken, the manometer should be returned for repair. When the glass tube becomes soiled, it should be cleaned as described in Paragraph 6.01.

6.08 The alundum filters will ordinarily prevent loss of mercury from the manometer. If mercury is lost, however, and it is not possible to adjust the scale to zero, additional mercury should be added as covered in Paragraph 6.02.