Westinghouse

Interstage Reservoir and Barometric Seal

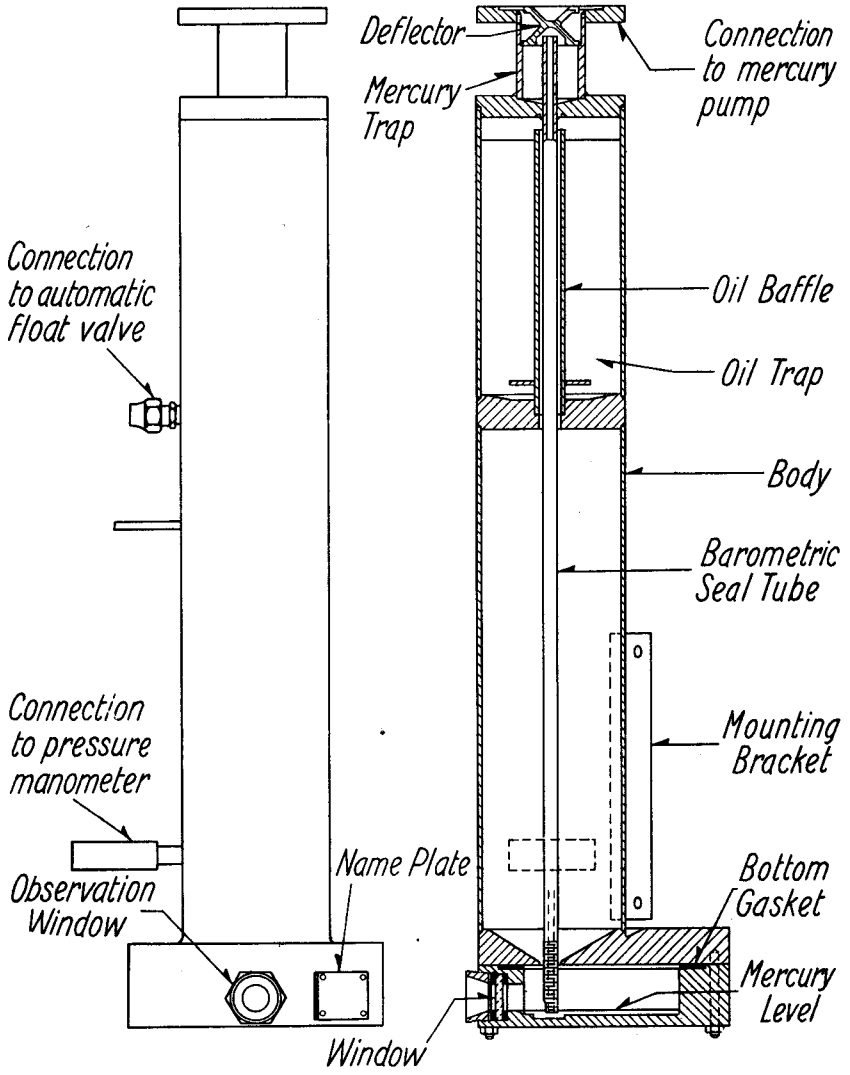

FIG. 1 – FRONT AND CROSS SECTION VIEW OF INTERSTAGE RESERVOIR AND BAROMETRIC SEAL

GENERAL

The interstage reservoir with barometric seal and mercury trap is designed for application between the mercury vapor and rotary oil-sealed vacuum pump. It combines in one device; an interstage reservoir to permit intermittent operation of the backing, rotary pump; a barometric seal to prevent admission of air into the vacuum system in the event of failure of any pumping device; a mercury trap to prevent mercury from passing over from the barometric seal pool to the mercury pump; and an oil trap to catch any oil that leaks past the automatic vacuum valve when the oil pump is not in operation. It has connections for the discharge of the mercury pump, the automatic valve and the mercury manometer.

MERCURY TRAP

The mercury trap is merely a chamber, mounted at the top of the barometric tube, with a baffle so arranged that if mercury comes up the tube due to surge action the stream is broken up and the mercury returned to the pool through a hole at the bottom of the trap. It has a sufficient number of passages so as to offer little impedance to the passage of gases.

BAROMETRIC SEAL

The barometric seal consists of a tube slightly longer than barometric length, 760 mm., which dips into a pool of mercury at the bottom of the reservoir. The lower end of this tube has

a guide to keep it in the center of the reservoir. The design is such that the mercury vapor pump discharges into the top of the tube and out through the mercury pool into the reservoir. The reservoir is evacuated by the rotary oil-sealed vacuum pump.

The depth to which the tube is immersed in the mercury pool determines the back pressure against which the mercury vapor pump must discharge, and if it becomes too great the pump stops working. If the depth is too little the tube bottom becomes exposed before the mercury rises to barometric height in the tube. There are three marks near the bottom of the tube, visible from outside the reservoir through the small window near the bottom, from which the depth of mercury may be gauged. The correct depth is 5/32", with approximately equal pressure in the tube and reservoir, and corresponds to the middle mark.

In order to permit the mercury to rise in the tube without a prohibitive drop in the level of the pool, the pool area must be large with respect to the cross section of the tube. This requires a larger area at the bottom of the reservoir than is necessary over the entire length. This bottom is offset from the rest of the reservoir to permit it to extend under the evacuated vessel body and conserve room.

If the interstage reservoir is used with a rectifier then under normal operating conditions the barometric tube and the connection between the reservoir and the mercury vapor pump are filled with gas at the mercury pump discharge pressure. When this pump stops working this gas will equalize with that in the rectifier and raise the rectifier pressure slightly. This pressure increase is of the order of 1 to 2 microns.

The barometric seal should not be depended upon to hold the vacuum in an evacuated tank or rectifier when it is being moved, as a jar sufficient to cause appreciable motion of the mercury in the pool will expose the bottom of the tube. The hand-operated valve should always be closed before moving the tank.

OIL TRAP

In case the automatic valve does not hold perfectly when the rotary pump is stopped and permits some oil to leak back into the interstage reservoir, a partition is placed in the reservoir and the inlet to the rotary pump located above this partition to prevent the oil from reaching and contaminating the mercury of the barometric seal. This oil trap is so located that any oil that gathers will run down into the rotary pump when it starts operating. A baffle is placed over the connection to the pump to prevent oil from spraying over the top of the reservoir in the event of a rapid entry of oil.

RESERVOIR

The interstage reservoir is designed with a volume such that the rotary pump is required to operate only at long intervals. The interval varies from a few hours to several days, depending upon the rate that gas is given off in the rectifier or evacuated vessel.

A window is located near the bottom of the reservoir through which to view the setting of the barometric tube in the mercury. This is sealed with a rubber gasket, and an additional rubber gasket is provided on the outside of the glass to effect uniform pressure and prevent breaking of the glass.

ADJUSTMENTS AND MAINTENANCE

The only adjustment to be made on the interstage reservoir and barometric seal is the distance the barometric seal tube dips in the mercury. A light held near the window aids in viewing the setting. As mentioned previously there are three lines near the bottom of the tube, ".039 or 1 mm. apart, and the middle line is 5/32" or 4 mm., from the bottom. In case too much mercury is present, some may be taken out by removing the bottom of the interstage reservoir. If too little mercury is present, more may be added through the mercury trap at the top of the reservoir by merely breaking the connection to the mercury pump. Care must be exercised before opening any connection on the interstage reservoir that the tank valve is closed and the mercury vapor pump cool. One hour must be allowed for the mercury vapor pump to cool after de-energizing the heater.

The condition of the mercury should be checked periodically by observation through the window, and in case oil or dirt appears on the surface the mercury should be renewed.

Frequent operation of the rotary pump may be due to a faulty gasket or leaking Kerotest fittings. This may be corrected by tightening the retaining bolts or fittings. It may be necessary to replace the rubber gaskets; however the usual life of these gaskets is several years.

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