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## Recent Work

### **Title**

A COMPACT INERT -ATMOSPHERE ENCLOSURE FOR ALPHA AND LOW -LEVEL BETA-GAMMA OPERATIONS

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### **Author**

Phillips, Will D.

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**University of California**

**Ernest O. Lawrence  
Radiation Laboratory**

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A COMPACT INERT-ATMOSPHERE ENCLOSURE  
FOR ALPHA AND LOW-LEVEL BETA-GAMMA OPERATIONS

Will D. Phillips

July 1962

A COMPACT INERT-ATMOSPHERE ENCLOSURE  
FOR ALPHA AND LOW-LEVEL BETA-GAMMA OPERATIONS\*

Will D. Phillips

Lawrence Radiation Laboratory  
University of California  
Berkeley, California

A small inert-atmosphere enclosure has been designed at the Lawrence Radiation Laboratory. It was designed for use with alpha and low-level beta-gamma emitters, but is suitable for any air- and moisture-free work.

The Engineering Section of the Health Chemistry Department at the Lawrence Radiation Laboratory has designed a compact, inexpensive inert-atmosphere enclosure. It is constructed of sheet metal and Plexiglass, and is particularly suitable for work with alpha or low-level beta-gamma-emitting radioisotopes.

This model has proven so useful that we have made it a stock item available to researchers on call. It is also used for nonradioactive work in which a reasonably dry or oxygen-free atmosphere is needed. The basic enclosure consists of a welded and flanged sheet metal box open at the top. It is 21-in. wide, 17-in. from front to back, and 10-in. high. This compact design was emphasized in order to conserve bench space and for economy and speed in operation. Using this enclosure, researchers have worked with alpha-emitting radioisotopes up to  $10^{12}$  dis/min.

The principle of operation here is the same as for glove boxes in general, namely the maintenance of a negative pressure of a few tenths of an inch (water gauge) inside the enclosure in relation to the surrounding atmosphere. In an inert-atmosphere enclosure it is usually desirable to continuously bleed inert gas into the box. To avoid pressurizing the box, it is important to keep the input rate below the capacity of the blower or ventilation system. After leaving the box the gas is passed through a suitable filter if radioisotopes or toxic substances are being worked.

Figure 1 shows the box with the 6-in. glove ports in front and the gas inlet on the side. One glove port plug is in place, the other lies in the foreground. Since most oxygen or moisture-vapor penetration occurs through the gloves, the plugs come in handy during the holding periods. It is, of course, desirable to use as heavy a gauge of Neoprene glove as is possible for the work.

The top window is a sheet of 1/2-in. Plexiglass bolted to an outside flange on the sheet metal box with a gasket in between. Removal of this window permits the installation of any equipment too large to pass through the air lock.

Figure 2 shows the back view, with purging nipple and the one-way outlet valve. In operation, gas is passed into the box while both outlets are opened and connected to the ventilation system. When the air is sufficiently removed and replaced by gas, the 2-in. purging hole is plugged with a rubber stopper while the ventilation system continues to apply a negative

\* Work done under the auspices of the U. S. Atomic Energy Commission.

## INERT-ATMOSPHERE ENCLOSURE, Phillips.

pressure through the one-way valve. This end of the enclosure has a Plexiglass pass-in air-lock with expanding O-ring circular doors in place. One door is operated from inside the box; the other outside. Air is removed and replaced by means of the two valves on the cylinder wall.

Figure 3 is a magnified view of the one-way gas vent valve. A rubber flapper is held in position over a  $45^{\circ} \frac{3}{4}$ -in. opening. The valve is enclosed by a length of 2-in. -diameter Plexiglass tubing.

Figure 4 shows the assembly of the circular door. In operation, turning the knurled handle draws two discs together, thus expanding the O ring and making an internal seal with the wall of the air lock.

When this type of enclosure is being connected to the ventilation system, it is well to provide an air relief damper on the downstream side. This makes it possible to adjust the degree of negative pressure inside the box.

The volume of this compact enclosure is approximately  $2.2 \text{ ft}^3$ ; thus, it is thrifty with inert gas.

We have estimated a cost of under \$300 for one of these enclosures. This is not too great a loss when from time to time it is necessary to dispose of one in active waste. However, because of its smooth, easily reached surfaces, satisfactory decontamination is often possible.

Of course much depends on the radioisotopes and the degree of contamination. It has been possible to recover boxes in which levels of alpha activity up to  $10^{12}$  dis/min have been worked. In such cases a clean, careful researcher usually makes the difference between a clean box or a dirty one.

FRONT VIEW

W. C. PHILLIPS

COMPACT ENCLOSURE

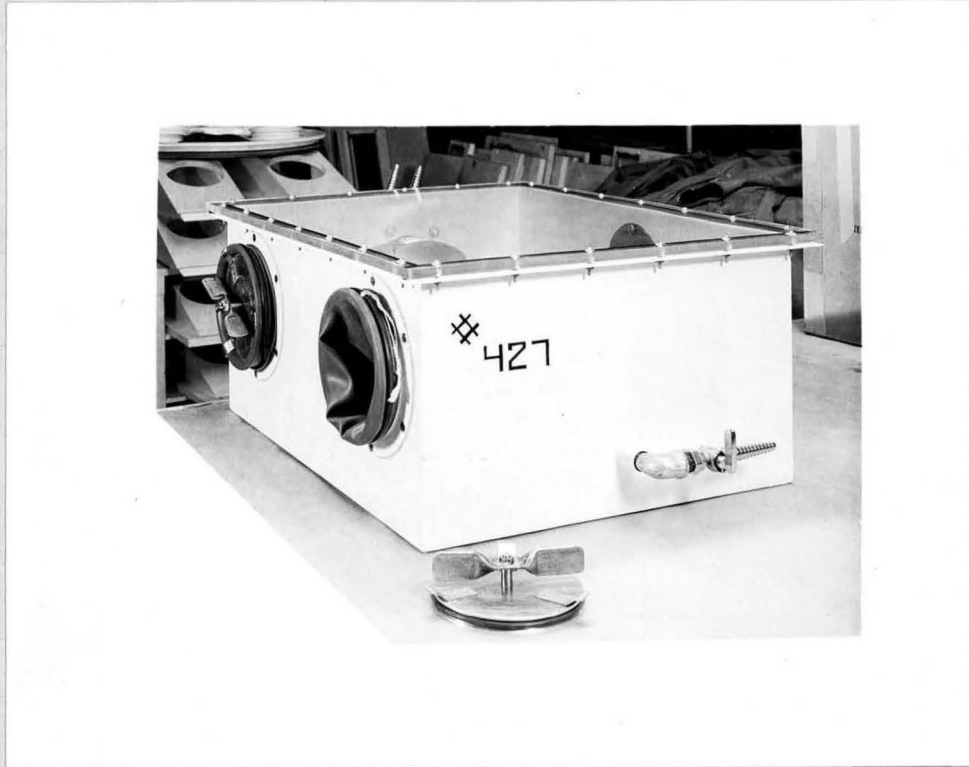


Fig. 1.

BACK VIEW

W.S. PHILLIPS

COMPACT ENCLOSURE

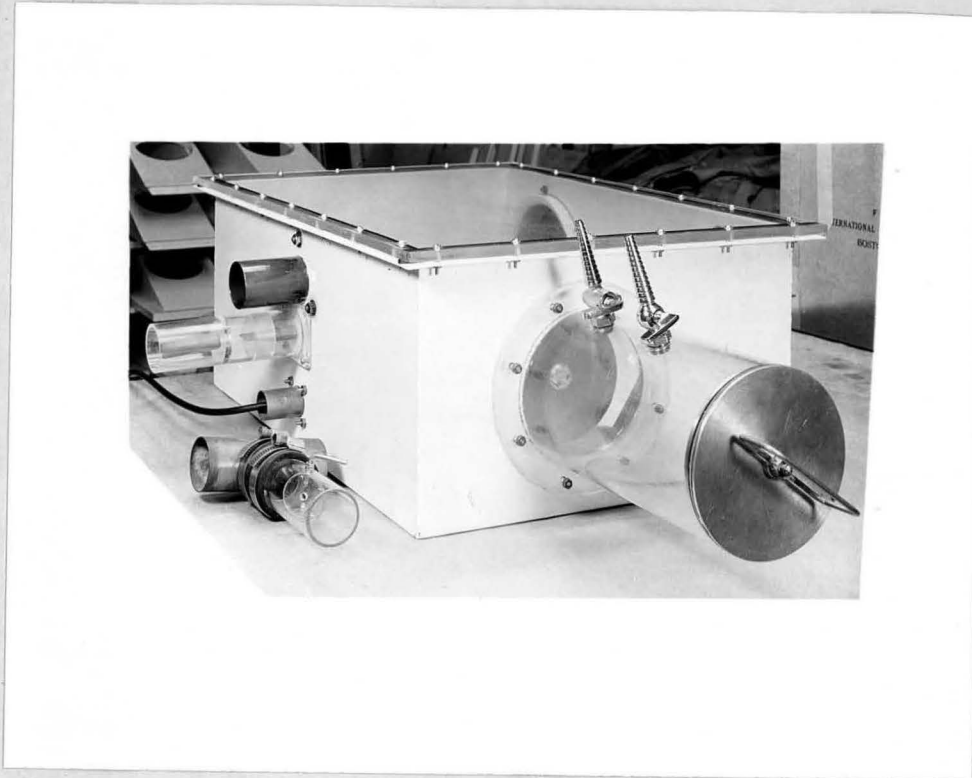
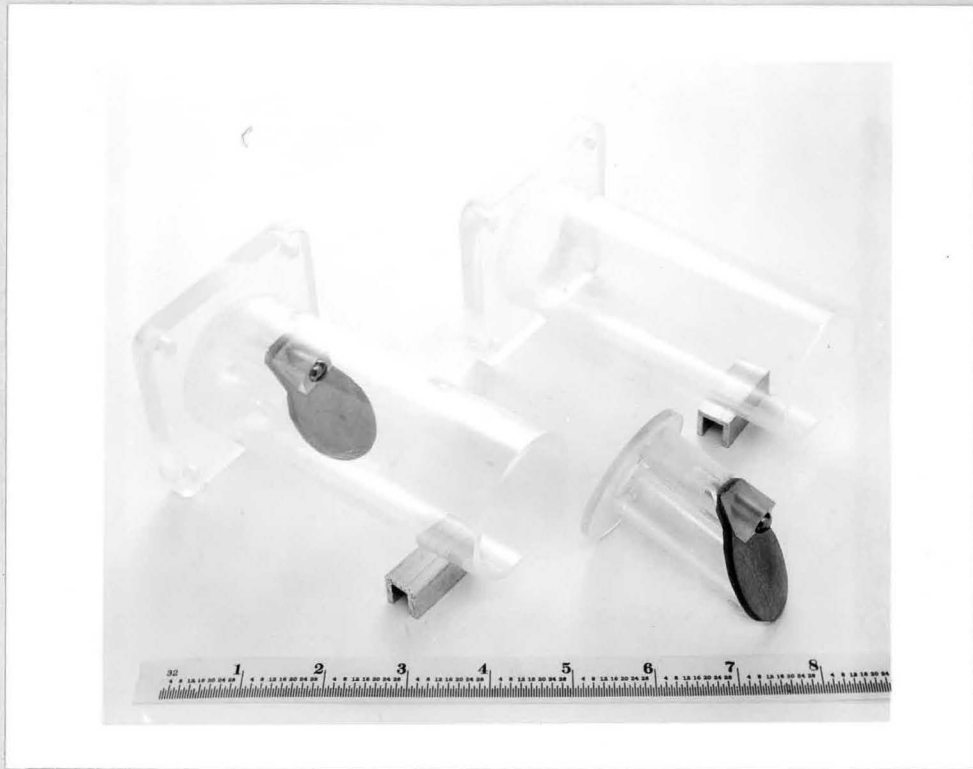


Fig. 2.





.Fig. 3.

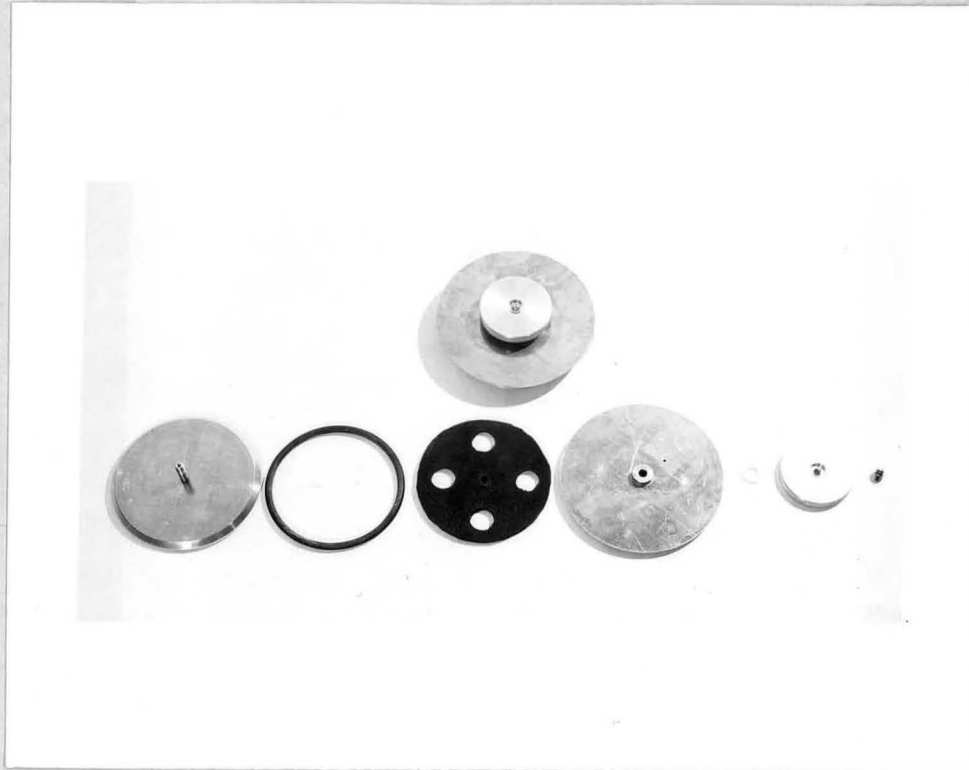


Fig. 4.