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SHEET METAL CAN FURNACE

Richard C. Doyle and Will D. Phillips

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Richard C. Boyle and Will D. Phillips

Lawrence Radiation Laboratory
University of California
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A need for a small vertical cylinder-type furnace arises frequently in the Chemistry Department at the Lawrence Radiation Laboratory (LRL). Adequate heat is the major requirement; close control or calibration is not usually necessary. A heating unit of this type can either be used for quickly concentrating solutions in centrifuge cones or, by the addition of a refractory pedestal--can be made into a crucible furnace for size 0 and 00 crucibles.

Because much of the chemistry done at LRL is with radioisotopes, disposal of contaminated equipment is an important consideration. In general, furnaces are difficult to decontaminate, hence there was a need for a disposable type. Because nothing meeting the requirements seemed to be commercially available, the Health Chemistry Department made up a simple furnace that has proved useful.

The furnace requirements that we judged to be important are listed below. The furnace should:

(1) be small enough to pass through a gloved-box door opening (5-1/2×8 in.),

(2) open at the top,

(3) have a simple means of external heat control,

(4) be adaptable to use for both 50-ml centrifuge cones and 0 or 00 crucibles,

(5) be inexpensive, and

(6) not be subject to corrosion from acid vapors.

After studying the furnace requirements, we decided that an electric resistance type furnace could be made compact, simple to construct, and safe and easy to operate.

Semicircular ceramic heating elements wound with nichrome resistance wire were available in several sizes. A pair of these heating elements of a size suited to heating 50-ml cones could, by use of a ceramic pedestal, heat 0 or 00 size porcelain crucibles. Vertical alignment of the heating elements provided the required top opening.

A variable transformer could be used to provide temperature control from outside the radioisotope enclosure.

A metal shell to contain the furnace parts and insulation could be protected from corrosion with a coating of epoxy and phenolic resins. This mixture is relatively stable in the temperature range reached outside the furnace insulation.

Such a furnace could be considered as inexpensive from the point of view of parts and assembly cost.

Several experimental furnace models were made before all the requirements were satisfactorily met. The resultant model now in use by a number of researchers is shown in the accompanying photographs and drawing. Figures 1 and 2 show the components necessary to assemble the furnace. Figure 3 shows the assembled furnace. This furnace is generally used for heating 40-ml cones, but it may also be used to heat other small objects, with the addition of appropriate spacers and/or adapters. An example of another use is shown in Figs. 4 and 5. Figure 4 shows the furnace with a spacing pedestal installed, for supporting a small crucible in an accessible position. Figure 5 shows the crucible resting on the pedestal. The pedestal was designed to allow air circulation through the furnace core, to prevent overheating (see Figure 6).

Some of the parts shown are commercially available from laboratory supply houses and manufacturers; the other parts are relatively simple to fabricate.

The following is a list of those parts which are commercially available, and the names of the manufacturers and/or suppliers.

Item	Manufacturer and part number.	Laboratory supplier and part number
Heating unit	Hevi-Duty Electric Co., Milwaukee, Wisconsin Type 73-S 210 Watts 1800° F $4.60 per unit (approx)	Braun-Knecht-Heimann Co. 30787
Thru-Panel Insulator-Bushing (Steatite)	E. F. Johnson Co. Waseca, Minnesota #135-42	L.R.L. #286 (Insulator Service)
Porcelain beads	American Lava Co. Chatanooga, Tennessee P-2496	

FOOTNOTE

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

Figure Legends

Fig. 1. HP-801

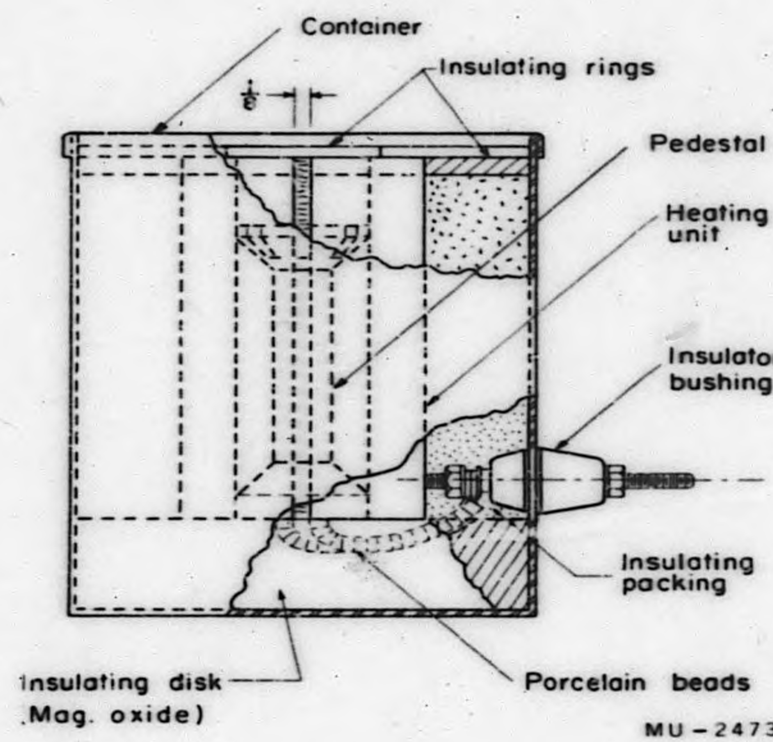
Container
Insulating rings
1/8
Pedestal
Heating unit
Insulator bushing
Insulating packing
Insulating disk
(Mag. oxide)
Porcelain beads
MU-24735

Fig. 2.

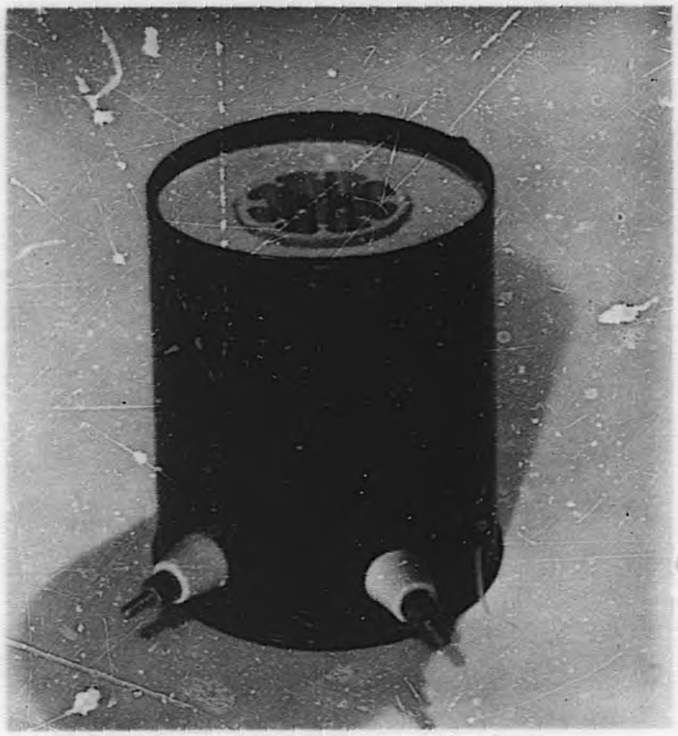

Fig. 3. HP-775

Fig. 4. HP-764

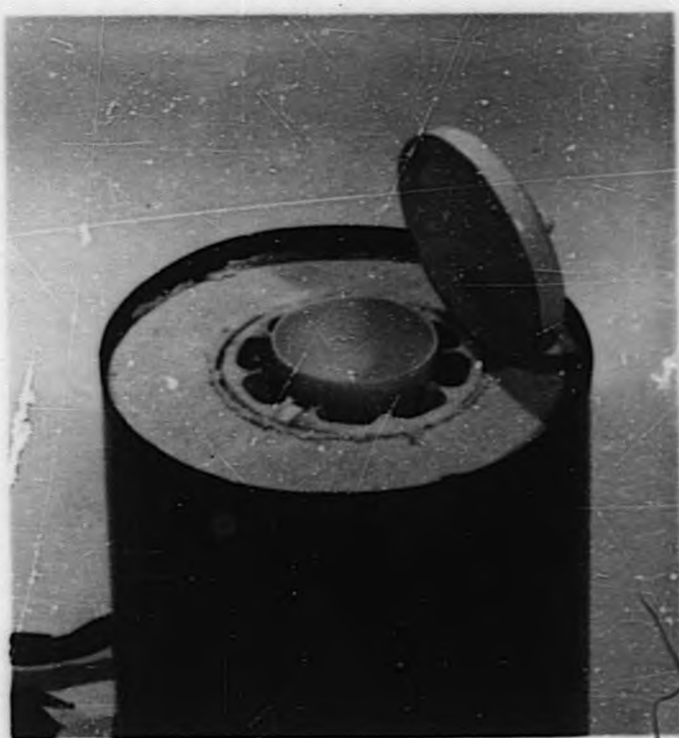

Fig. 5. HP-763

Fig. 6.

HP-817