

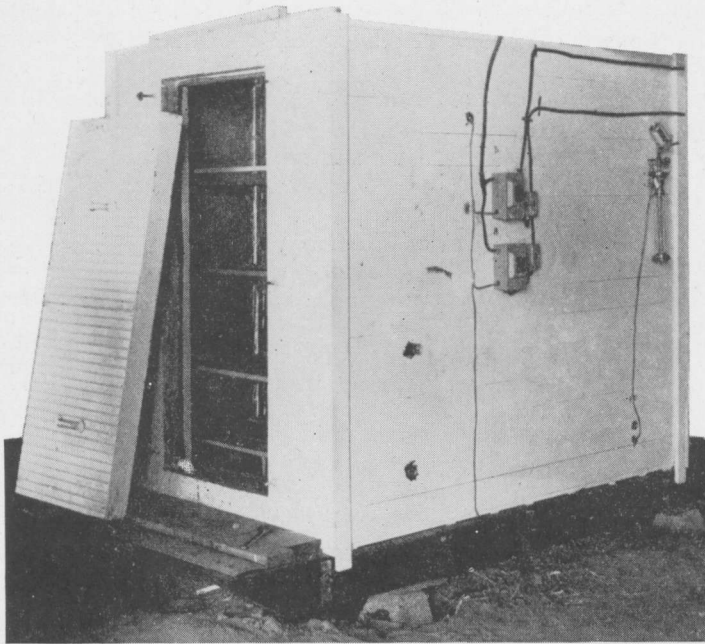
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CHAMBER *for* FUMIGATING PLANTS *with* METHYL BROMIDE

Construction and Operation



AGRICULTURAL EXPERIMENT STATION
of the ALABAMA POLYTECHNIC INSTITUTE

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Auburn, Alabama

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CHAMBER *for* FUMIGATING PLANTS *with* METHYL BROMIDE

Construction and Operation

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METHYL BROMIDE has been used widely in the last few years for fumigating fresh fruits and vegetables, stored grains, and a variety of plants and shrubs for killing insect pests.

Research work with methyl bromide as a fumigant was begun in 1938 by the Alabama Agricultural Experiment Station. Particular emphasis was placed on its use for fumigating camellias and azaleas. As the work has progressed, the scope of the study has been broadened. Fumigation schedules have been established for a wide range of temperature, and many details have been worked out. As a result, fumigation of plants is now a practical measure for nurserymen.

Reported here are the details for construction and use of a chamber suitable for fumigating plants with methyl bromide. The cost of materials and equipment totals about \$200.

Methyl bromide is noninflammable. It is a colorless and odorless gas at ordinary temperatures and pressures. In its manufacture, methyl bromide is compressed to the liquid state, and is put up in cylinders and in 1-pound cans. The can contains 262 cubic centimeters and costs about 85 cents. Since liquid methyl bromide boils at about 40° F., ordinarily there is enough vapor pressure to force it into the chamber where it quickly turns to a gas.

The chamber used for fumigating plants with methyl bromide must be gas-tight and insulated. This is because of the character of the gas and the need to control temperature for a definite period of exposure.

The chamber described here was designed without a ventilating duct, in order to simplify construction and to cut costs. Consequently, it is absolutely necessary that the chamber be placed in an open shed where people will not be exposed to the gas when the door is removed for ventilating.

Since the fumigation period is relatively short and several loads of plants can be fumigated in a day, a chamber having a capacity of 200 cubic feet was found practical for the average nurseryman. This size chamber has a usable floor area of about 27 square feet. However, the floor area can be increased to about 108 square feet by using three removable decks for fumigating small plants.

MATERIALS and EQUIPMENT FOR CHAMBER

A good carpenter should be employed to build the gas-tight chamber. Good workmanship and ability to follow directions are essential.

Dressed, dry lumber should be used. Fir is specified for the frame work of the chamber, because it is important to use straight materials. While a little more costly than pine, the additional expense for fir is justified. Less labor will be required in squaring the frames, and less calking will have to be done to make the chamber gas-tight.

Material List. The following materials will be needed for construction of the chamber:

2 pcs. 6" x 6" x 8' creosoted pine sills (not shown)	4 pcs. 1" x 3" x 12' #1 pine
3 pcs. 2" x 6" x 10' fir	3 pcs. 1" x 2" x 12' #1 pine
2 pcs. 2" x 6" x 8' fir	19 pcs. 1" x 2" x 10' #1 pine
1 pc. 2" x 6" x 5' fir	3 pcs. 2" x 4" x 12' #1 pine
1 pc. 2" x 6" x 12' fir	6 pcs. 5/8" x 4" x 10' ceiling, #1 pine
5 pcs. 2" x 3" x 8' fir	14 pcs. 1" x 6" x 10' #2 cypress or pine
18 pcs. 2" x 3" x 12' fir	1 pc. 2" x 2" x 10' oak
2 pcs. 1" x 3" x 7' fir	8 pcs. 1/2" x 2 1/2" x 7' #1 pine
4 pcs. 2" x 3" x 10' fir	4 pcs. 1/2" x 2 1/2" x 6' #1 pine
2 pcs. 1" x 3" x 12' fir	4 pcs. 1/2" x 2 1/2" x 8' #1 pine
1 pc. 5/4" x 3" x 6' fir	4 pcs. 1/4-round 5' long
70 pcs. 1" x 6" x 8' #1 pine T & G	4 pcs. 1/4-round 6' long
14 pcs. 1" x 6" x 12' #1 pine T & G	4 pcs. 1/4-round 8' long

- | | |
|--|---|
| 3 sheets 28-gauge galv. iron
30" x 120" | 6 door-stop plates (Figure 6.) |
| 10 sheets 28-gauge galv. iron
30" x 96" | 2 gal. <i>Ruberoid</i> or <i>Flintkote</i> plastic
cement |
| 8 to 10 bags rock wool | 1 gal. paint, pearl gray, for outside |
| 1 roll 15-pound builders felt | 20 ft. rubber gasket, ½" x 1" cross
section (gasket coated with ad-
hesive on one side, may be obtain-
ed at auto supply stores) |
| 4 lb. 4d common nails | 20 ft. 12-2 Romex cable |
| 4 lb. 12d common nails | 10 ft. 12-gauge asbestos covered
copper wire |
| 4 lb. 16d common nails | 10 lb. #6 HD bare copper wire, or
enough to run from inside cham-
ber to nearest water pipe |
| 1 lb. 6d box nails | 1 2-circuit porcelain fuse box |
| 10 lb. 8d cement coated box nails | 4 3" galv. outlet boxes with Romex
clamps |
| 6 machine bolts, ½" x 9", with 5"
threads | 1 cover with SP toggle switch,
15 amp. |
| 6 extra nuts for ½" bolts | 1 cover with SP toggle switch,
30 amp. |
| 12 washers for ½" bolts | 2 plain covers for outlet boxes |
| 1 aircock M & F, ¼" | 6 pony cleat receptacles |
| 1 galv. pipe nipple, ¼" x 4" | 6 200-W 120-V lamps |
| 1 galv. pipe bushing, ¼" x ½" | 2 15-amp. plug fuses |
| 1 galv. pipe bushing, ½" x ¾" | 2 30-amp. plug fuses |
| 18 lag screws, ⅜" x 3½" | 2 soldering lugs 5/16" |
| 18 washers for ⅜" lag screws | 12 "nail-it" knobs |
| 4 lag screws, ½" x 6" | 1 ground clamp for water pipe |
| 1 doz. ¾" RH brass wood screws | 1 roll friction tape |
| 1 doz. 1¼" FH brass wood screws | 1 roll rubber splicing compound |
| ½ doz. 1¼" FH wood screws | |
| 2 door pulls with screws | |
| 7 ft. ¼" OD copper tubing | |
| 1 union for ¼" OD copper tubing | |
| 1 pc. ½" hardware cloth 10" x 24" | |
| 1 pc. 6" stove pipe | |
| 2 stove pipe elbows 6" | |

Special Equipment. The following special equipment will be needed for construction of the chamber:

- 1 Blower unit with bottom horizontal discharge; motor direct connected, 1/8 h.p., 1725 r.p.m., 60 cycle AC current; rotation, counter-clockwise; blower capacity of not less than 350 cubic feet of free air per minute.
- 1 Methyl bromide applicator, 280-cubic centimeter capacity, with can puncture rack and extension tube for use of 1-pound cans.
- 2 Thermometers, 0° to 120° F. range, in 1-degree divisions.

(Because of U. S. postal restrictions on use of manufacturers' names in publications mailed free under the Experiment Station's franking privilege, the sources of methyl bromide, the specific blower, and applicator are omitted. This information may be obtained by writing Agricultural Experiment Station, Auburn, Ala.)

CONSTRUCTION of CHAMBER

The method for building the chamber is given in a step-by-step description, beginning with the floor and sides. Important construction details are given in the accompanying illustrations.

Floor Construction (Figure 1). Cut the following pieces for the floor:

- | | |
|--|---|
| 2 pcs. 6" x 6" x 8' creosoted sills
(not shown) | 2 pcs. 2" x 6" x 7'-7" fir side plates |
| 7 pcs. 2" x 6" x 4'-10" fir joists | 12 pcs. 1" x 2" x 4'-10" #1 pine,
subfloor support |
| 12 pcs. 1" x 6" x 7'-7" T & G floor
sheeting | 72 pcs. 1" x 6" T & G for subfloor to
fit between joists |
| 3 pcs. sheet iron 30" x 60" (from
120" sheets) | |

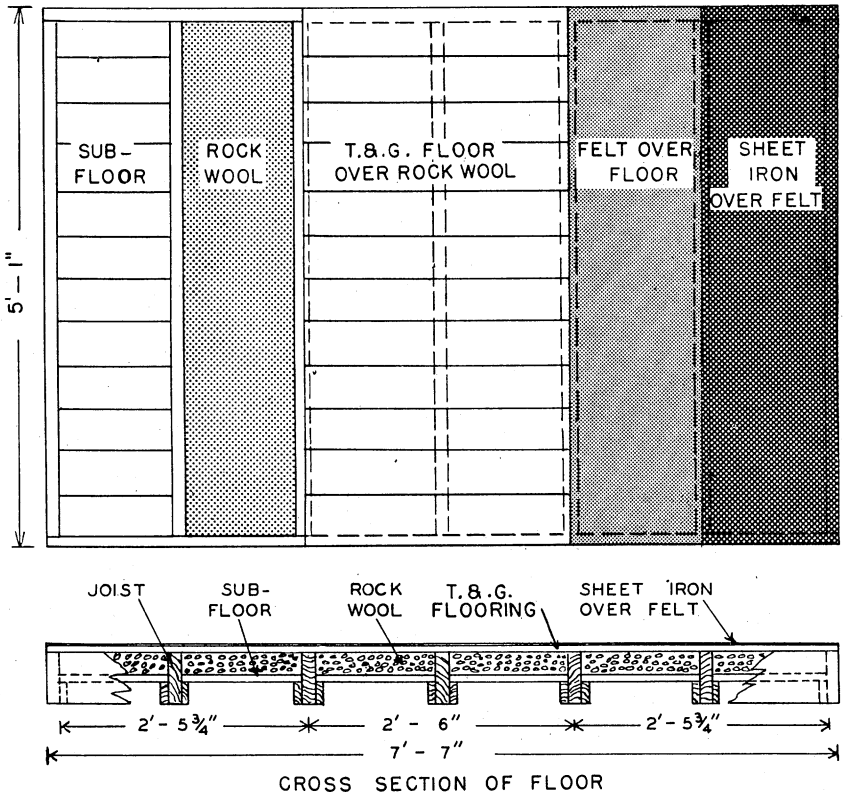


FIGURE 1. Detail of floor construction.

Nail joists and side plates together; put in subfloor and add rock wool; then put on 2" x 6" T & G flooring and felt over flooring. Cover with sheet iron. Pieces should come together (not lapped) at the center of the third and fifth joists. Nail sheet iron about every 12 inches with 4d nails.

Two Side Frames (Figure 2). The following dimension pieces will be needed for the two side frames:

- | | |
|---------------------------------------|---|
| 4 pcs. 2" x 3" x 7'-7" fir plates | 18 pcs. 2" x 3" x 5'-9" fir studs |
| 4 pcs. 1" x 3" x 6' fir braces to fit | 6 pcs. sheet iron 30" x 72" (cut from 96" sheets) |

Use double studs on ends and space others as shown. Mortise corner braces into studs. If 2 x 3's have been rough sawed on one edge, use smooth edge for inside and nail flush with plates. Cover inside frames with sheet iron lengthwise of studs. Sheets of galvanized iron should meet at the center of the third and fifth studs. Nail about every 12 inches with 4d nails.

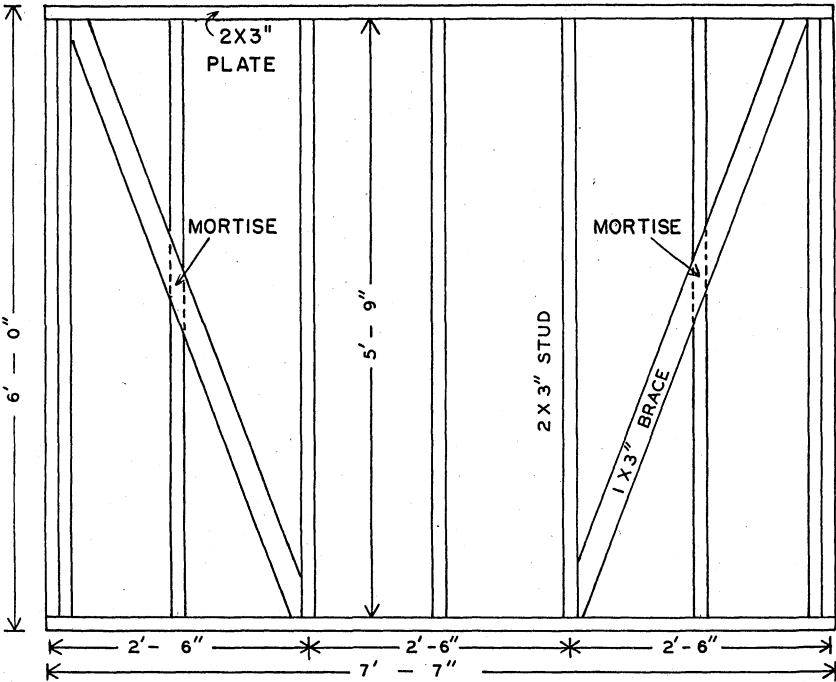


FIGURE 2. Framing details of side walls.

Rear Frame (Figure 3). Cut the following pieces for building the rear frame:

- | | |
|--|---|
| 2 pcs. 2" x 3" x 4'-7½" to 8" fir plates (check length before cutting, since the end frame must fit snugly between the two side frames when they are erected flush with the edge of the floor) | 5 pcs. 2" x 3" x 5'-9" fir studs |
| | 2 pcs. 1" x 2" x 12" |
| | 2 pcs. 1" x 6" x 11½" |
| | 2 pcs. sheet iron 28" x 72" (check measurements for frame before cutting) |

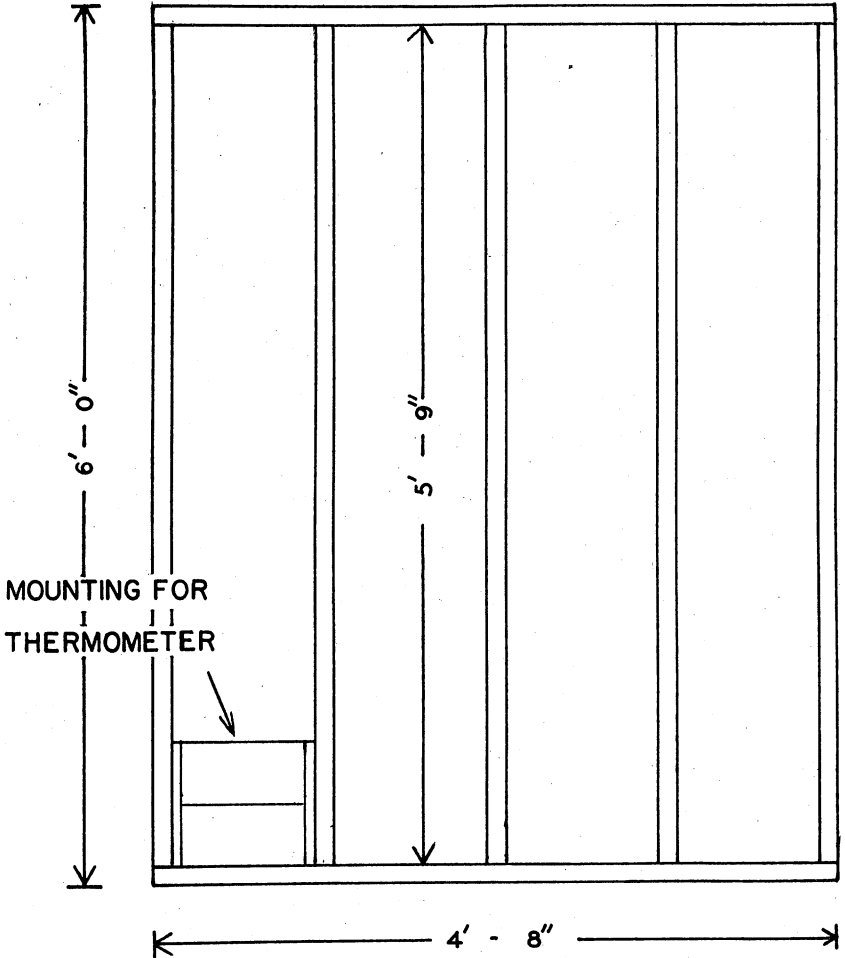


FIGURE 3. Framing details of rear wall.

Nail plates and studs together as shown, using smooth edges of lumber for inside. Square the frame and nail a temporary brace on the outside. Construct support for thermometer out of two 1" x 6" boards, nailed to 1" x 2" x 12" strips. This support should fit snugly between studs in lower back corner, and flush with inside edge of studs. If for any reason the back of the chamber is not accessible, the thermometer support should be constructed in one of the side frames at the back of the chamber. Cover inside of rear frame with sheet iron, lengthwise of studs. It is highly *important* that the sheet iron is flush and true with all four outside edges of this frame.

Front Frame (Figure 4). For the front frame, cut the following pieces:

2 pcs. 2" x 3" x 4'-7½" to 8" fir plates (check length before cutting, since the frame must fit snugly between the two side frames when they are erected flush with the edge of the floor)	6 pcs. 2" x 3" x 5'-9" studs
	2 pcs. sheet iron 13" x 72" (check measurements before cutting)

Use double studs for door frames, single studs on ends. Nail together, square up, and nail a temporary brace on the outside. Cover inside, except door opening, with sheet iron. It is highly *important* that the sheet iron is flush and true with outside edges of frame.

Erection of Frame Work. Before erecting the framework, run a double, continuous line of plastic cement around the floor about an inch from the outside edge with a putty gun. Also run a double line of cement on the sides of studs of end frames where they come together with the side frames. Erect the framework and nail securely together and to the floor. Side frames should be toe-nailed into floor joists.

Top Frame. The following pieces will be needed for the top frame:

7 pcs. 2" x 3" x 5'-1" fir joists	12 pcs. 1" x 3" fir cleats to fit between joists
3 pcs. sheet iron 30" x 60"	

Space joists properly, and square and use temporary braces. Turn frame over and cover with sheet iron, running lengthwise of

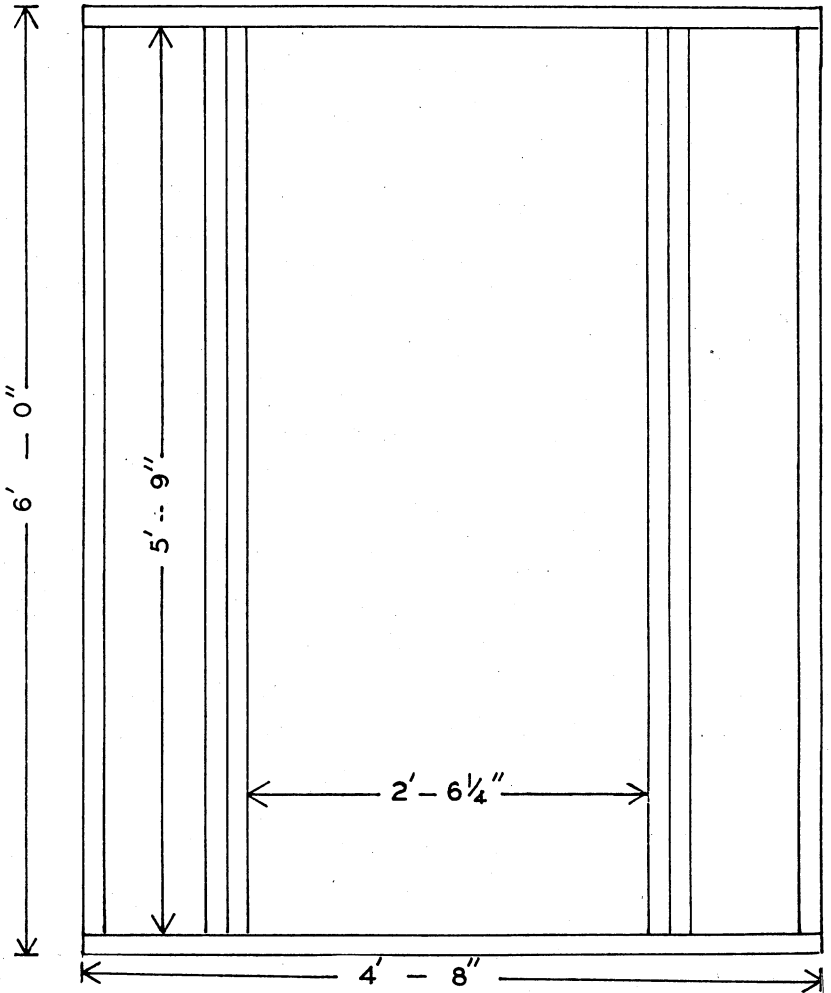


FIGURE 4. Framing details of front wall.

joists. Sheet iron should come together in center of third and fifth joists. Nail about every 12 inches with 4d nails. Run a double line of plastic cement on top of plates of side and end frames with a putty gun. Lay top frame, with sheet iron down, on top of plates. Nail in place. Fit 1" x 3" cleats between joists on top of sheet iron and nail in place with 8d coated box nails.

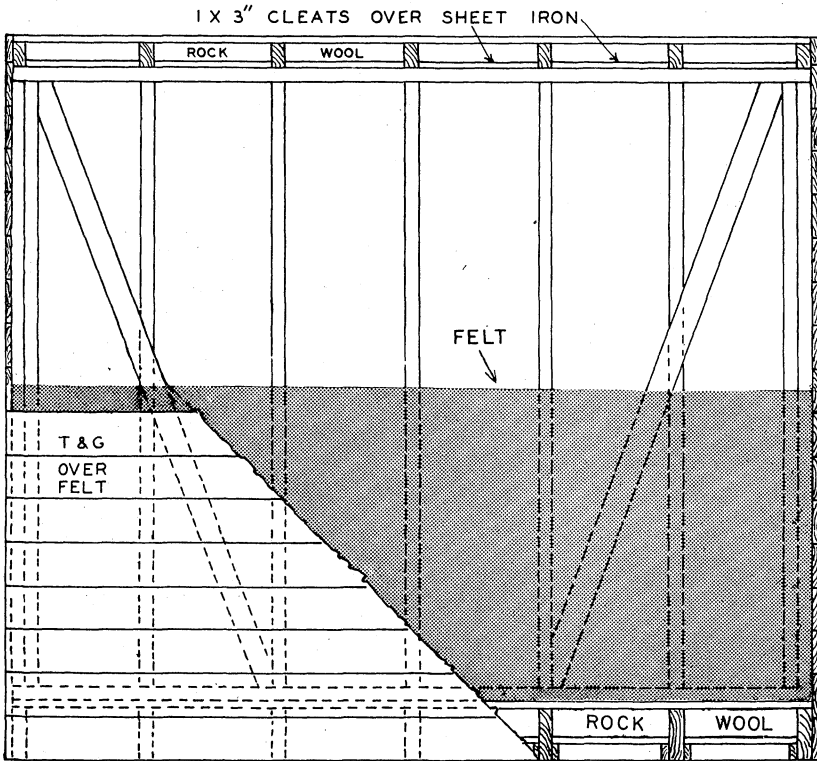


FIGURE 5. Side view of chamber showing application of sheeting.

Outside Sheeting (Figure 5). Beginning at the bottom of the chamber, put on a strip of felt crosswise of studs, and board up with 1" x 6" T & G nearly to the top of the felt strip. Drop the rock wool between sheet iron and outside wall. (If the rock wool is obtained in roll or bat form, it should be placed between studs before boarding up the sides.) The rock wool should be placed evenly and firmly, but should not be packed so tightly that it causes bulging of the sheet iron. Continue with another strip of felt, lapped, another section of boards, rock wool, and so on until the walls are completed.

Put rock wool between ceiling joists, cover with felt and then T & G lumber. Trim the corners with 1/2" x 2 1/2" strips.

Door Stop (Figure 6). Construct door stop according to Figure 6, using two pieces of 2" x 6" and two pieces of 2" x 3" fir.

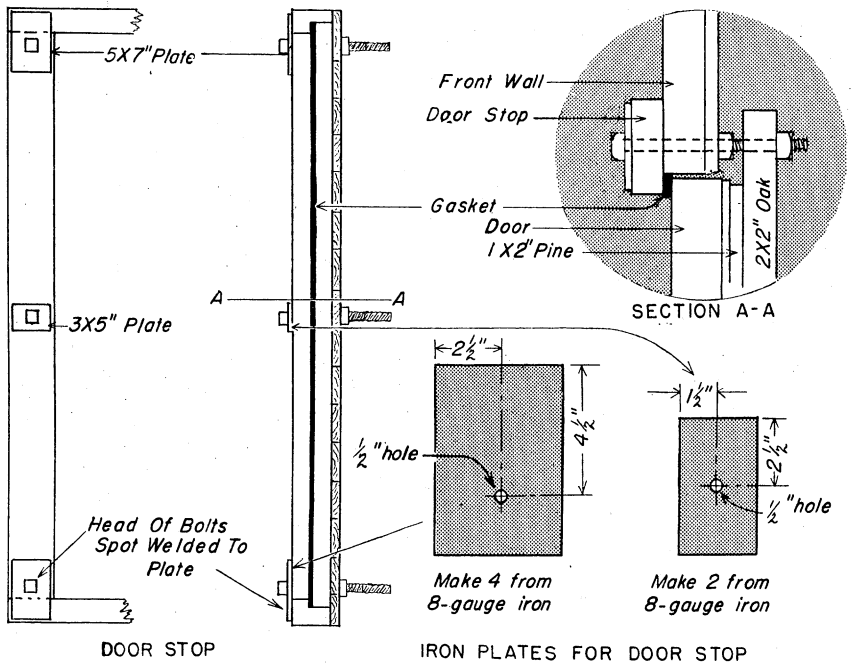


FIGURE 6. Construction details of door stop.

The door stop should provide a 1-inch flange for the gasket all the way around the door opening. Use great care in locating the holes for the bolts, which are spot-welded to the plates. Apply a liberal amount of plastic cement to that part of the inside wall that is to be covered by the door stop. Also apply plastic cement to the iron plates and force some into the holes through the walls and 2 x 6's. Draw door stop tightly against inside with nut and washer on outside. Do not put on the gasket until the chamber is completed.

Deck Supports (Figure 7). Install deck supports according to Figure 7. Locate holes in three studs for $\frac{3}{8}$ " x $3\frac{1}{2}$ " lag screws for each 2" x 3" support. Squirt plastic cement into holes. Also apply cement around holes and over sheet iron joists the full width of the supports. Draw supports tightly against wall with the lag screws. Cut 1" x 6" boards for deck, slightly shorter than inside width of chamber.

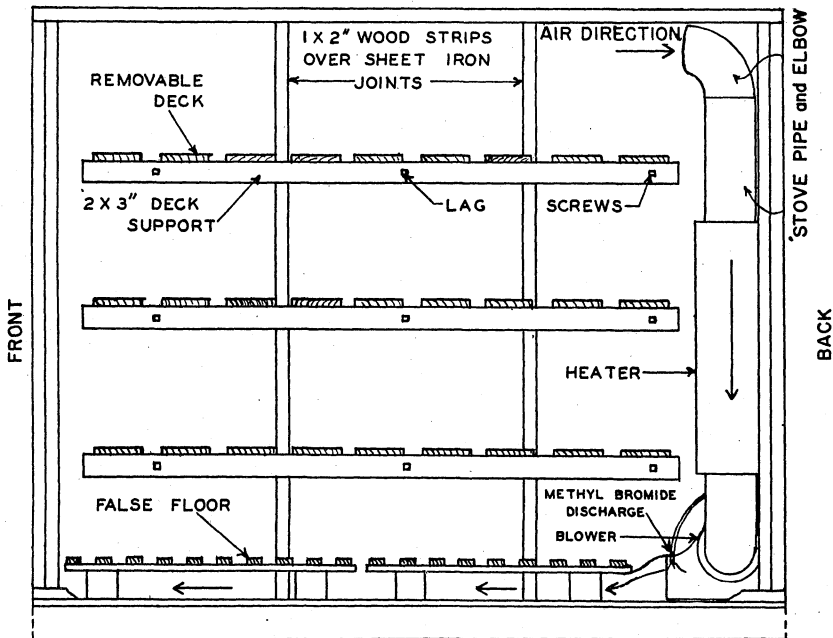


FIGURE 7. Cross section of chamber showing deck supports and subfloor.

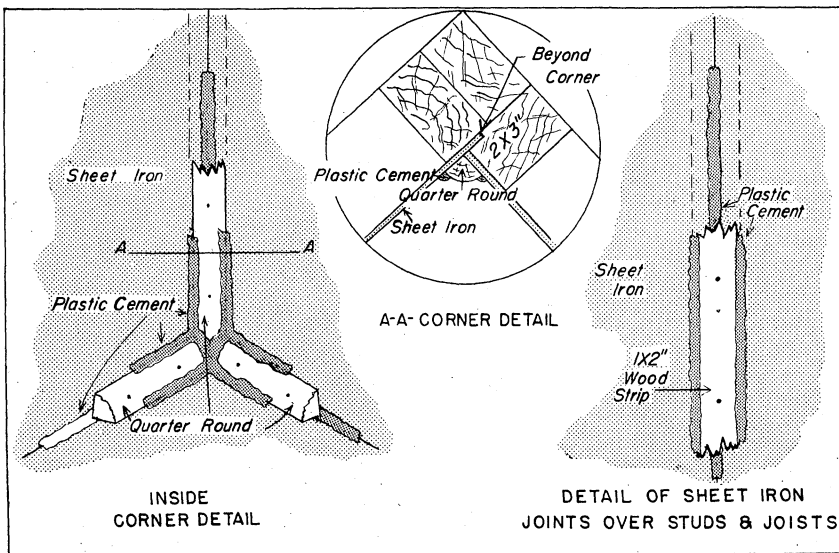


FIGURE 8. Details for making inside of chamber gas-tight.

Making Inside Gas-Tight (Figure 8). Make a liberal and continuous application of plastic cement to sheet iron joints on floor, ceiling, and walls. Fit 1" x 2" wood strips over joints and nail securely to studs with 8d coated nails. Run a continuous line of plastic cement in all corners with a putty gun. Fit quarter-

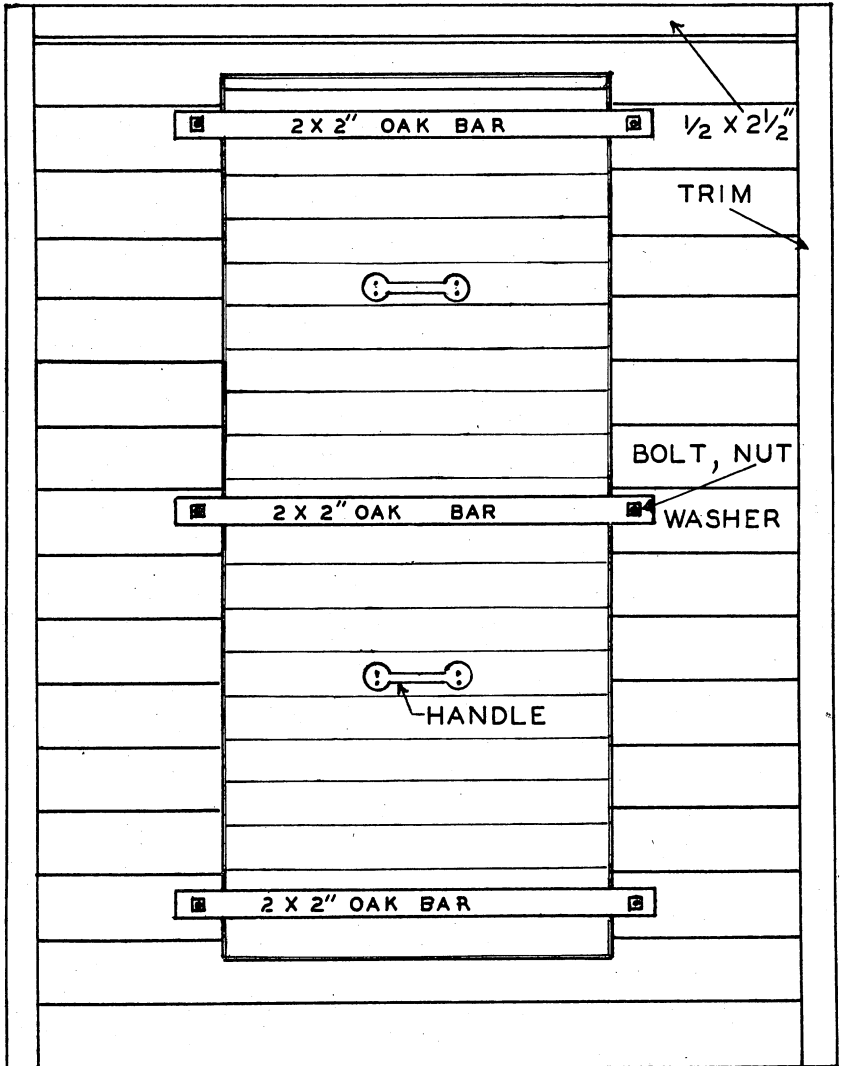


FIGURE 9. Front wall of chamber with door in place.

round to corners and nail securely with 8d coated box nails. With a putty gun, run a continuous line of plastic cement on each side of quarter-round and 1" x 2" strips.

Door Construction (Figure 9). Make frame of the door of 2" x 3" fir. Allow not more than 1/8-inch clearance for opening on each side, and top and bottom. Brace door frame diagonally with 1 1/4" x 3" fir. Cover inside with sheet iron, nailing about every 6 inches with 4d nails 1/2 inch from edge of door frame. Put in the rock wool, cover with felt, and then sheet outside with 5/8" x 4" ceiling. Attach handles. Make door bars of 2" x 2" oak.

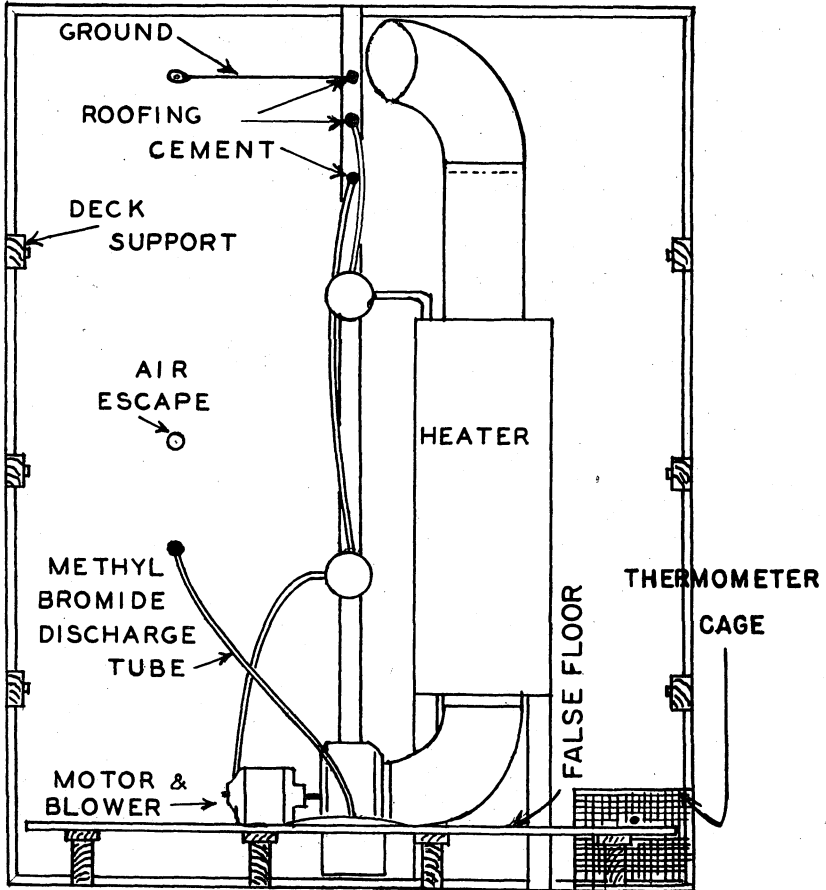


FIGURE 10. Inside detail at rear of chamber.

Nail a piece of 1" x 2" pine the width of the door on the inside of each bar, so that the door can be pressed tightly against the gasket. Thoroughly clean surface of door stop for the gasket. Fit the gasket carefully according to directions on package. Do not stretch it while fitting.

Painting. The outside of the chamber should be given two coats of pearl gray paint.

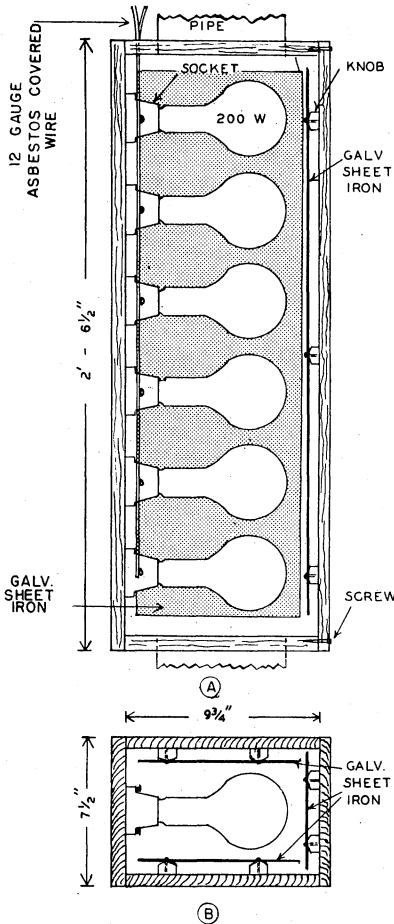


FIGURE 11. Construction details of heater.

Blower Installation. (Figure 10). Install blower on floor at rear of chamber. Apply plastic cement around and in holes before the blower is placed and tightened to the floor.

Heater Construction. (Figure 11). Construct heater according to Figure 11. Lumber for the heater is not included in the material list because enough scrap lumber usually can be found for its construction. With a coping saw, cut an elliptical hole in each end piece to fit a 6-inch stove pipe. Support the heater on legs and fit stove pipe. The two sides and top are lined inside with galvanized sheet iron, which is set away from the wood with porcelain knobs. The six 200-watt bulbs are wired in a series, using 12-gauge asbestos-covered wire.

Electrical Installations. Install outlet boxes, switches, and fuse box (see Figure 12). Run the Romex cable and ground wire

through separate holes in stud. Use plastic cement to make holes gas-tight, both inside and outside of chamber. Solder a lug on the end of ground wire and tighten to ground bus of fuse box. Also, solder a lug on the other end of ground wire inside chamber.

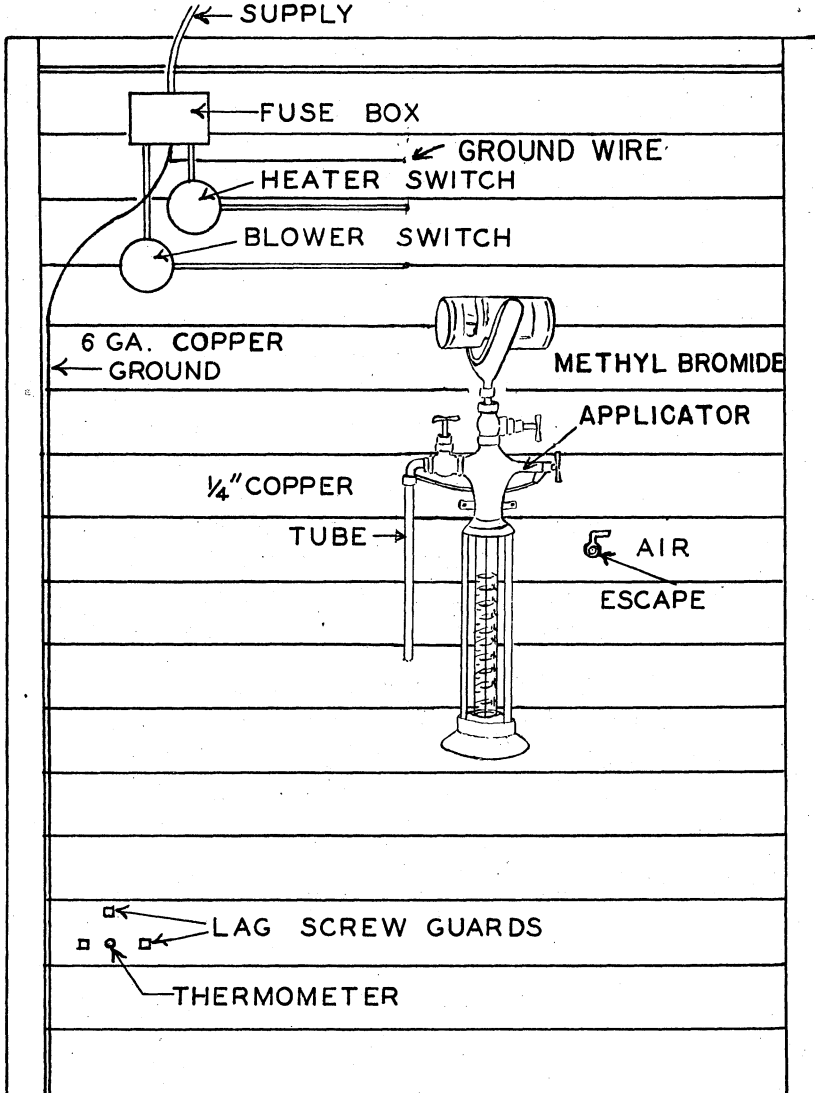


FIGURE 12. Rear view of chamber showing location of switches, outlet boxes, applicator, thermometer, and escape valve.

Fasten lug into stud with a screw and solder to sheet iron. Cover with plastic cement. Splice and solder another piece of ground wire to the first piece just outside the fuse box. Run to nearest water pipe and secure end of wire to pipe with a ground clamp. If the water pipe is rusty, file clean before attaching the clamp. Make electrical connections to heater, blower, and switches. Solder all splices. Switches *must* break the "hot" wire. Connect all sheet iron on inside of chamber by soldering 1½ x 6-inch strips of sheet iron across the joints, so that all of the sheet metal work completes the ground circuit. Before connecting the electrical supply line, determine the polarity of the circuit and connect accordingly. *This is important.*

Methyl Bromide Applicator (Figure 12). Fasten applicator to outside wall at a suitable height with the screws provided. Drill a hole in the side of outlet of blower for ¼-inch copper tube. Extend tube about 1 inch inside blower outlet and mash end of tube with pliers so that methyl bromide will be sprayed into the air blast. Drill a hole through stud for tube and nail sheet iron to stud around hole with 4d nails. Run tube through wall to applicator and connect. (A union on the inside of the chamber will make the connections easier.) Apply plastic cement to wall around tube both inside and outside of chamber.

Air Escape. Drill a hole through stud for ¼-inch pipe nipple. Connect air cock to one end of nipple and pass nipple through wall. Apply plastic cement around hole and end of nipple on inside of chamber and tighten with a bushing.

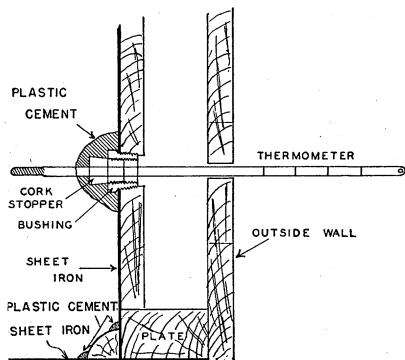


FIGURE 13. Cross section detail of thermometer installation.

Thermometer Installation. (Figure 13). The thermometer is installed about 6 inches from the floor in one corner at the rear of the chamber where the sheet iron is supported with T & G sheeting as shown in Figure

3. Drill a 1-inch hole through inside wall only. If carefully centered, a $\frac{3}{8}$ -inch hole will allow passage of the thermometer through outside wall. Screw $\frac{3}{4}$ -inch pipe bushing into 1-inch hole tightly against sheet iron. Drill a No. 4 cork stopper to fit the thermometer snugly. Adjust cork to proper place on thermometer so that 55 to 60 degrees of the scale can be read on the outside of the chamber. Pass the thermometer through wall and screw cork tightly into bushing. Cover cork and bushing with plastic cement. Screw lag screws into outside wall to serve as guards. Build a frame of scrap lumber and cover with $\frac{1}{2}$ -inch mesh hardware cloth to protect the thermometer bulb on the inside of chamber. Apply plastic cement liberally where frame is nailed to floor.

It is a good idea to build wooden box covers out of $\frac{1}{2}$ -inch lumber and fit with hinges and hasps, to cover both the thermometer and methyl bromide applicator when not in use.

False Floor (Figures 7 and 10). Use 1 x 3-inch pieces for lengthwise members and 1 x 2-inch material for the spaced cross members. Support on 2 x 4 x 4-inch blocks set on edge. Make the false floor in two sections, so that it can be removed for cleaning the chamber.

Final Finishing. Cover nail heads on sheet iron with spots of plastic cement.

OPERATION *of* CHAMBER

Before the chamber is used, and at least once a year thereafter, it should be tested for leaks by an inspector or some person familiar with the method of testing. A kerosene manometer¹, Figure 14, designed for a reading of 50 millimeters, is used for this purpose. The manometer is attached to the air vent cock with a suitable hose. Air pressure is introduced into the chamber until a reading of 50 millimeters is obtained on the manometer. The air pump is then shut off and the time required

¹ The authors are indebted to Randall Latta, U. S. Bureau of Entomology and Plant Quarantine, for suggesting this method of testing chambers for leaks.

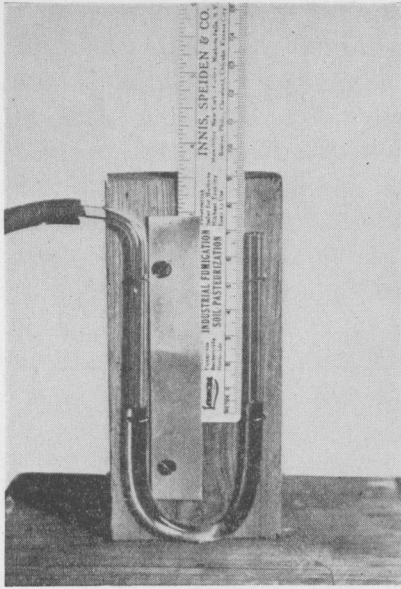


FIGURE 14. Manometer used for testing chamber for leaks.

and an effort is made to locate the leak with a halide leak detector, which may be obtained at a refrigerator service shop.

Loading. The floor of the chamber is sprinkled with water before loading. Plants growing in pots or dug B & B can be fumigated as they are. Bare-rooted plants should be placed in flats or open crates and the roots protected with moist sand or soil. It is better to cover the roots and then sprinkle the soil or sand. Care should be taken that the foliage is not covered. The plants should not be packed tightly together. They must be freely exposed to the gas.

Fumigation. *Methyl bromide is poisonous to all animal life, and, since there is no warning odor, it must be used with care and intelligence.* It is rapidly dissipated in the open air, however, and there is little danger unless a person is confined with the gas. Breathing the fumes should be avoided, and the chamber should never be entered until properly ventilated.

When the chamber is loaded, the door is put in place and is tightened against the gasket with the six door nuts. The air cock is opened and the blower is turned on. After the blower has been running for a few minutes, the temperature is noted. If the temperature is 60° F. or above, the blower is run for 30 minutes, after which the air cock is closed. The temperature is again noted. The dosage of methyl bromide in cubic centimeters and the exposure at the particular temperature are given in Table 1. The gas is then introduced into the chamber.

If the initial temperature inside the chamber is below 60 degrees F., it will be necessary to turn on the heater and heat the load until it will remain at 60 or above after the heater is turned off. In the winter, heating the chamber may require an hour or two. It is essential that the plants, as well as the air inside the chamber, are warmed to 60 or above.

Dosages have been worked out for an exposure of 2½ hours for temperatures ranging from 60 to 80° F., and for an exposure of 1½ hours for temperatures ranging from 81 to 100° F. The blower should be allowed to run throughout the entire exposure period. Sometimes during warm weather, the motor that operates the blower may generate sufficient heat to raise the temperature inside the chamber. If after gassing the temperature goes up more than 2 degrees on this account, the blower should be turned off.

Successful fumigation is dependent on attention to details. A notebook should be provided for recording the fumigation data. It is best to introduce the gas either on the hour or half hour for ease in keeping records. The time the gas is introduced, temperature, dosage, and the opening time should be recorded in the notebook, so that there will be no doubt about when the chamber should be opened.

At the end of the fumigation period, the blower is shut off. The door nuts and the bars are taken off and the door removed. The operator should *get away from the door opening quickly*. The blower is again turned on and the chamber is aerated for at least 15 minutes before starting to unload. *Keep the plants in dense shade for at least 24 hours after fumigation to avoid burning.*

Fumigation Effective Against Many Pests. Fumigation with methyl bromide, using the dosages and exposures given in Table 1, probably will destroy all insects and mites and their eggs, infesting the wood and foliage of plants. Fumigation at atmospheric pressure (that is, in this type of chamber) is not completely effective against certain soil-infesting insects.

Fumigation of Azaleas. Most varieties of azaleas can be fumigated with methyl bromide. A few varieties cannot be fumigated because of their susceptibility to the gas. Among these are Coral Bell and Salmon Beauty. Rooted azalea cuttings can be successfully fumigated for the control of red spider and thrips if the cuttings are heeled in flats of moist sand. In fumigating cuttings, it is recommended that the 90 per cent dosage be used.

Fumigation of Camellias. Several hundred varieties of camellias have been fumigated experimentally and commercially. None has been found susceptible to injury. Although they may be fumigated any season of the year, it is better to fumigate during the inactive or winter months. Open flowers will be damaged, but tight buds will not. Small plants with new growth should not be fumigated until the foliage has hardened. Camellia cuttings, rooted cuttings, and scion wood for grafting have been successfully fumigated. In fumigating cuttings, it is recommended that the 90 per cent dosage be used. Cuttings should not be wet before fumigating. The fumigation of rooted cuttings in flats of moist sand has become routine in some nurseries.

Many Kinds of Plants Can be Fumigated. Methyl bromide fumigation is adapted to a wide variety of plants. However, some plants are susceptible to methyl bromide injury and their susceptibility can be determined only by trial. In general, plants are least susceptible to injury when they are not actively growing. Plants that have been fumigated experimentally to determine their reaction to methyl bromide are given in the lists, pages 23-24.

Table 1. Recommended Dosages of Methyl Bromide for a 200-Cubic Foot Chamber

For exposure of 2½ hours			For exposure of 1½ hours		
Tempera- ture	Cubic centimeters for 200 cubic feet		Tempera- ture	Cubic centimeters for 200 cubic feet	
	Normal dosage	90 per cent dosage		Normal dosage	90 per cent dosage
Degrees F.			Degrees F.		
60	193	174	81	168	151
61	187	168	82	161	145
62	181	163	83	155	139
63	176	158	84	149	134
64	171	154	85	143	129
65	165	148	86	137	123
66	160	144	87	132	119
67	155	139	88	127	114
68	151	136	89	122	110
69	147	132	90	117	105
70	142	128	91	112	101
71	138	124	92	108	97
72	133	120	93	104	94
73	129	116	94	99	89
74	126	113	95	96	86
75	122	110	96	92	83
76	118	106	97	88	79
77	115	103	98	85	76
78	111	100	99	81	73
79	108	97	100	78	70
80	105	94			

Plants Not Injured by Methyl Bromide Fumigation

Acuba japonica	Callistemon
Berberis atroparpa	Cleyera japonica
Berberis thunbergi atropurpurea	Cydonia japonica
Berberis sargentii	Cedrus deodara
Buxus japonica	Cunninghamia lanceolata
Buxus sempervirens	Eurya japonica
Buxus harlandi	Feijoa sellowiana

Gardenia florida
Gardenia mystery
Gardenia radicans
Ilex cassine
Ilex cassine myrtifolia
Ilex crenata microphylla
Ilex crenata bullata
Ilex crenata rotundifolia
Ilex cornuta burfordi
Ilex cornuta femina
Ilex opaca femina
Jasminum floridum
Jasminum primulinum
Juniperus chinensis albo-variegata
Juniperus chinensis densa glauca
Juniperus chinensis pfitzeriana
Juniperus communis
Juniperus excelsa stricta
Juniperus sabina
Juniperus sabina vonehron
Laurocerasus caroliniana
Laurus officinale
Ligustrum ciliatum variegatum
Ligustrum coriaceum
Ligustrum japonicum
Ligustrum lucidum compactum
Ligustrum lucidum pyramidalis

Ligustrum lucidum repandens
Liriope muscari densiflora
Liriope muscari variegata
Magnolia fuscata
Magnolia glauca
Mahonia bealei
Mahonia fortunei
Malpighia glabra
Mellitia japonica
Nandina domestica
Ophiopogon japonica
Osmanthus americanus
Osmanthus fortunei
Osmanthus fragrans
Osmanthus fragrans aurea
Photinia glabra
Photinia serrulata
Pittosporum tobira
Pyracantha coccinea lalandi
Podocarpus sinensis
Retinospora ericoides
Retinospora pisifera filifera
Thuja orientalis aurea conspicua
Thuja orientalis aurea nana
Thuja orientalis bakeri
Viburnum suspensum
Viburnum tinus

Plants Partially or Completely Defoliated But Not Killed by Methyl Bromide Fumigation

Abelia grandiflora
Cotoneaster francheti
Elaeagnus pungens
Elaeagnus pungens fruitlandi
Elaeagnus pungens aureo-maculata
Ligustrum quihoui

Ligustrum quihoui pendulum
Magnolia grandiflora
Viburnum macrophyllum
Viburnum odoratissimum
Spiraea reevesiana
Juniperus chinensis sargentii

Plants Too Seriously Injured by Methyl Bromide to be Fumigated

Camellia theae
Pyracantha formosana (hard to
transplant)
Pyracantha yunnanensis (hard to
transplant)
Juniperus chinensis femina
(Sylvestris)

Juniperus chinensis japonica
Juniperus communis depressa
plumosa
Juniperus japonica oblonga
Retinospora pisifera filifera aurea
Retinospora pisifera plumosa aurea