

TM 10-701

WAR DEPARTMENT TECHNICAL MANUAL

RANGE, FIELD

M-1937

WAR DEPARTMENT • DECEMBER 1945

CONTENTS

PART ONE. INTRODUCTION.

<i>Section I. GENERAL.</i>	Paragraph	Page
Scope	1	1
Records	2	1
 <i>II. DESCRIPTION AND DATA.</i>		
Description	3	1
Tabulated data	4	2
 <i>III. TOOLS, PARTS, AND ACCESSORIES.</i>		
Component parts	5	3

PART TWO. OPERATING INSTRUCTIONS.

<i>Section IV. GENERAL.</i>		
Scope	6	8
Service upon receipt of equipment.....	7	8
 <i>V. CONTROLS AND INSTRUMENTS.</i>		
Controls and instruments	8	8
Principles of fire unit operation.....	9	9
 <i>VI. OPERATION UNDER USUAL CONDITIONS.</i>		
Field foundation for range.....	10	9
Installation in motor vehicle.....	11	9
Installation in railway kitchen cars.....	12	11
Cooking on the field range.....	13	11
Lighting the fire unit.....	14	11
Turning off the fire unit.....	15	12
Precautions to prevent enemy use.....	16	12

PART THREE. MAINTENANCE INSTRUCTIONS.

<i>Section VII. GENERAL.</i>		
Scope	17	13
Lubrication	18	13
 <i>VIII. PREVENTIVE MAINTENANCE.</i>		
General	19	13
Before-operation service	20	13
During-operation service	21	13
After-operation service	22	13
Weekly service	23	14
 <i>IX. TROUBLE SHOOTING.</i>		
Trouble shooting	24	14
 <i>X. FIRE UNIT MAINTENANCE (SECOND EDITION).</i>		
General	25	15
Generator	26	15
Flame valve	27	16
Mixture valve	28	17
Fuel valve	29	18
Fuel output valve and uptake tube.....	30	18
Air input valve.....	31	19
Barner	32	19
Air pressure gauge	33	21
Fuel tank filler tube cap.....	34	21
Tubes	35	21
Barner frame	36	21



Figure 1. Range, field, M-1937, with stove in place.

PART ONE INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel of the units to whom this equipment is assigned. They contain information on the operation and maintenance of the equipment as well as description of the major parts and their function in relation to the other components of the equipment. The instructions are arranged in three parts: Part One, Introduction; Part Two, Operating Instructions; and Part Three, Maintenance Instructions.

b. Supply Catalogs applicable to the equipment covered by this manual are Army Service Forces Catalogs QM 7-Misc. 8A and QM 8-Misc. 8A.

2. Records

No maintenance or performance records are required by The Quartermaster General. When necessary, the Unsatisfactory Equipment Report (WD AGO Form 468) should be submitted. (See TM 37-450.)

Section II. DESCRIPTION AND DATA

3. Description

a. GENERAL. The M1937 field range (fig. 1) (Stock No. 65-J-2225) is designed to provide the complete field kitchen outfit adaptable to the varied requirements of field operations. It consists of a cabinet with necessary cooking utensils and a gasoline-burning fire unit. The range is portable and may be operated while in transit. Each range is a basic self-contained unit that may be used singly or in groups according to the need of organizations of various sizes. A one-unit range set is sufficient to serve up to 50 individuals per meal; the two-unit range set, 100 individuals; a three-unit range set, 225 individuals; and a four-unit range, up to 300 individuals per meal. The number of cabinets used automatically provides for the proper number of utensils required to serve the designated number of individuals. The number of meat grinders, cleavers, fire extinguishers, and maintenance tools required for a four-unit set, however, is the same as for a one-unit set. This equipment is packed and issued separately.

b. IDENTIFICATION INFORMATION. The range is identified by its appearance. (See fig. 1.) No identification marks are on the range.

c. DIFFERENCES IN MODELS. The M1937 range

is furnished in one model only. The range was originally issued with the old type fire unit (Stock No. 65-J-2605) which is identified by the presence of a slender generator tube and an umbrellalike filter case containing an asbestos disk filter. The range is now issued with a simplified converted type fire unit (fig. 3) (Stock No. 65-J-2612), equipped with a tubular generator assembly, containing a steel wool filter, and a redesigned mixture valve. These changes make possible the use of leaded gasoline as a burner fuel. Organizations still using the old type fire units should exchange them as quickly as practicable for converted units.

d. CABINET. The cabinet (fig. 2) is made up of a framework of angle iron and cast sections with sheet metal panels. The top of the cabinet consists of a two-section lid which may be lifted up and folded to the back of the range. The front of the range consists of two doors which permit access to the burner and cooking compartments. The large front door is fitted with a latch which holds the door closed and serves as a support for the door when it is open. The door is fitted with rails to facilitate the placing of the heavy cooking utensils into the cabinet.

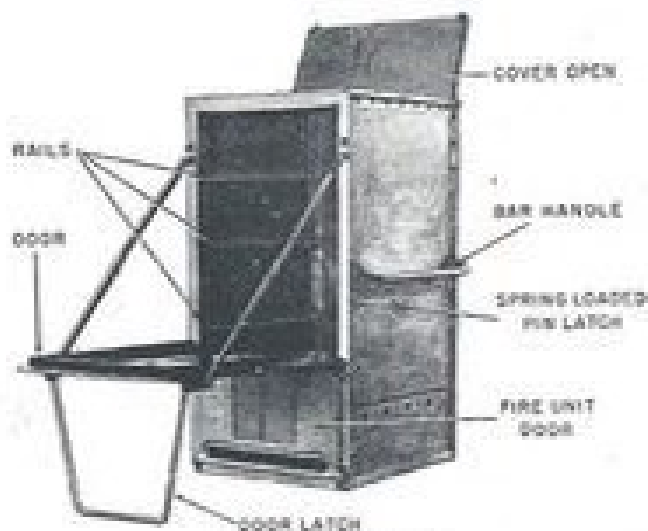


Figure 2. Cabinet.

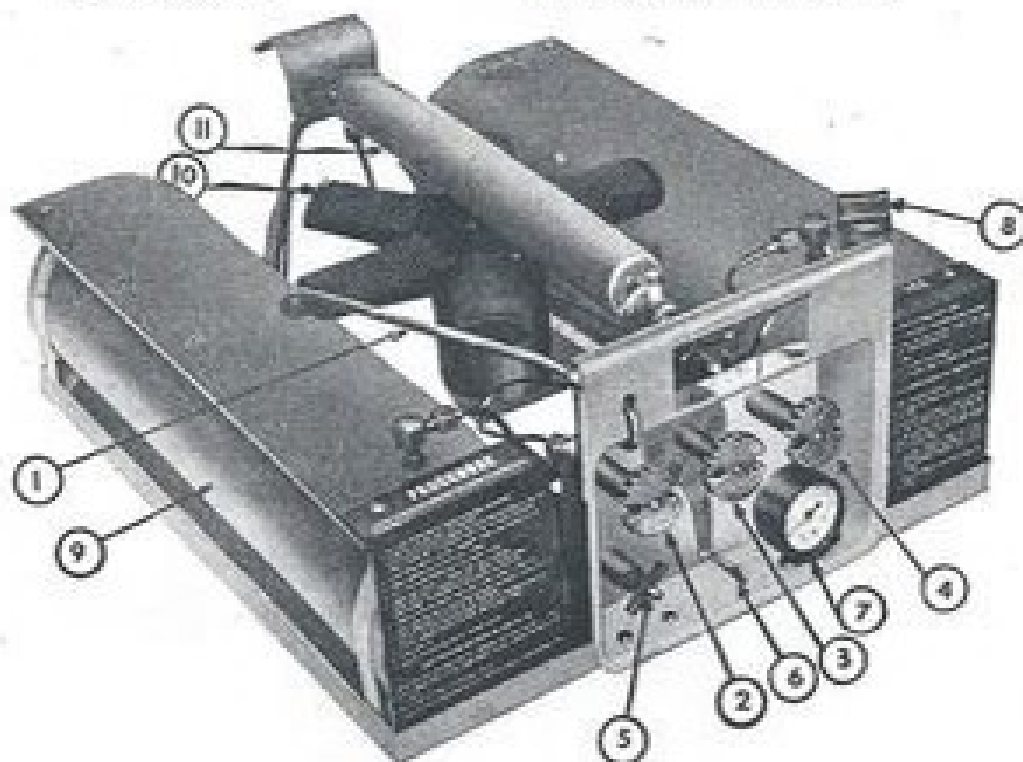


Figure 3. Fire unit.

The interior of the cabinet is fitted with rails upon which may be placed the various cooking utensils or the burner unit. The doors to the cabinet contain three openings fitted with slides, in positions corresponding to the three possible positions of the fire unit within the cabinet. (See fig. 4.) A bar type handle (fig. 2) is fitted on each side of the range to assist in the movement of the range. A spring loaded pin latch (fig. 2) is provided on the right side of each cabinet to assist in connecting cabinets together to form multiple units by fitting into eyes on the left side of the next cabinet. Chains with turnbuckles

(fig. 4) are provided to assist in fastening the cabinet to the truck or railroad car body to prevent its movement in transit, while the range is in operation.

e. FIRE UNIT. The fire unit (fig. 3) consists of an air tank, a fuel tank, a generator, a burner, and the necessary valves and tubes to connect these units, all mounted in a frame. White or leaded motor fuel gasoline is used as the fuel. The generator contains a steel wool filter which removes the dirt and some of the lead from the gasoline before it is burned. This reduces the lead toxicity of the burner fumes and the clogging of burner valves, tubes, and slots. The unit operates under pressure; the hand pump is used to build up and maintain the pressure by pumping air into the system.

4. Tabulated Data

a. GENERAL SPECIFICATIONS.

Height, over-all	inches..	43
Width, over-all	do....	22
Depth, over-all	do....	26
Weight, complete	pounds..	310
Air pressure	do....	45

b. CAPACITIES.

Fuel tank	quarts..	7
Insert, cook pot (Part No. 225) ..	gallons..	10
Pot, cook, heavy (Part No. 222) ..	do....	15
Dipper (Part No. 241)	quart..	1

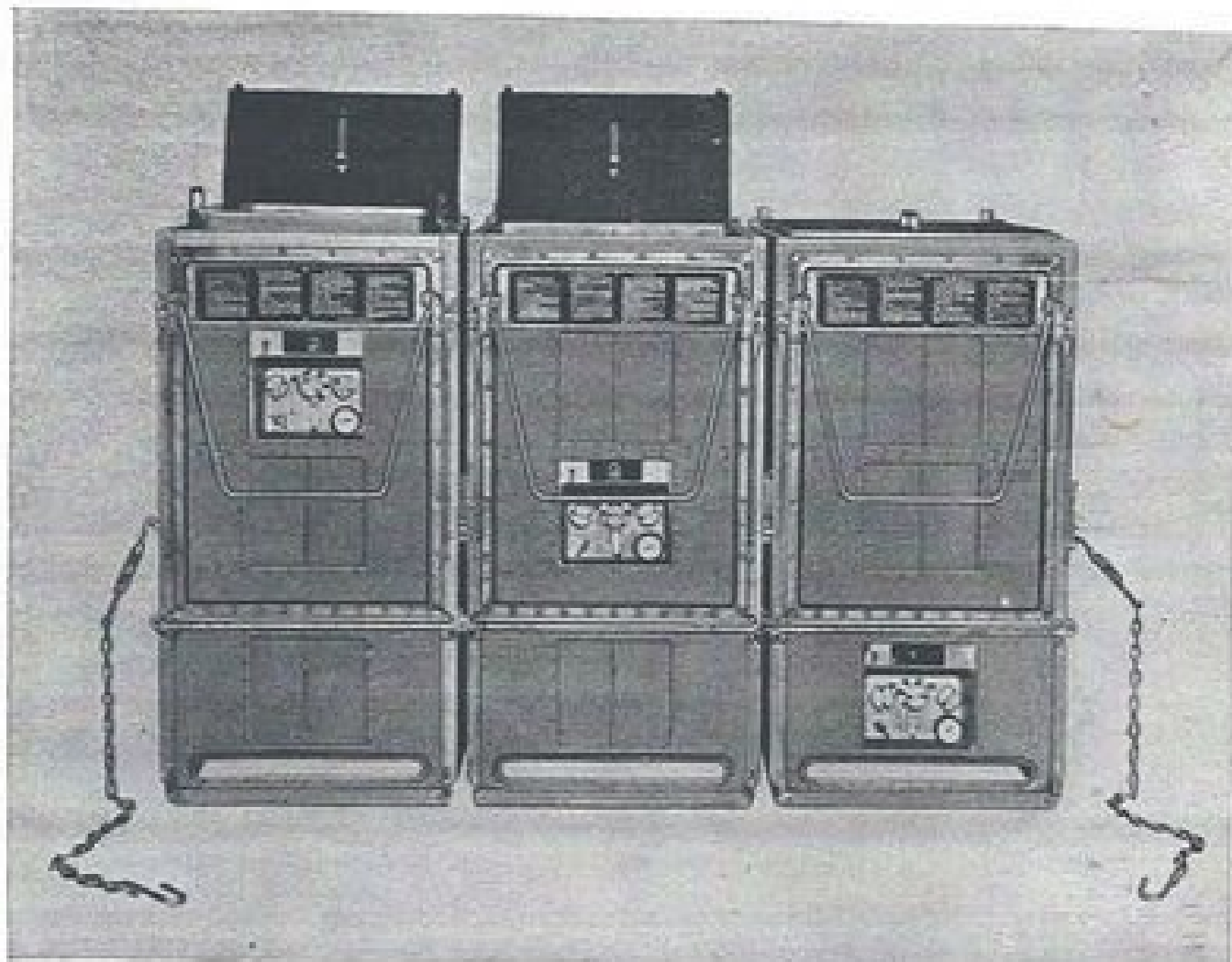


Figure 4. Three-cabinet unit with four units in three possible positions.

Section III. TOOLS, PARTS, AND ACCESSORIES

5. Component Parts

a. In order to provide for the initial issue of the correct quantities of field range equipment required for organizations of various sizes, the M1937 field range is packed in two basic packs. The standard

"A" pack contains accessories and tools that are required in the same proportion for all field kitchens using from one to four range units. The standard "B" pack contains equipment which is required in quantities proportionate to the number of individuals served.

b. Components included in the standard "A" pack (fig. 5) (Stock No. 65-J-3515):

Figure Reference No.	Quantity	Description	Stock No.	Part No.
1	1	Blade, saw, butchers.....	64-B-436	250
2	1	Box, tool, metal, empty.....	65-J-1145	183
3	2	Cap, leather, air pump.....	65-J-1655	197
4	1	Brush, steel wire.....	65-J-1300	213
5	1	Chain, tie-in, left.....	65-J-1470	216
6	1	Chain, tie-in, right.....	65-J-1475	215
7	1	Cleaner, slot, burner.....	65-J-1565	211

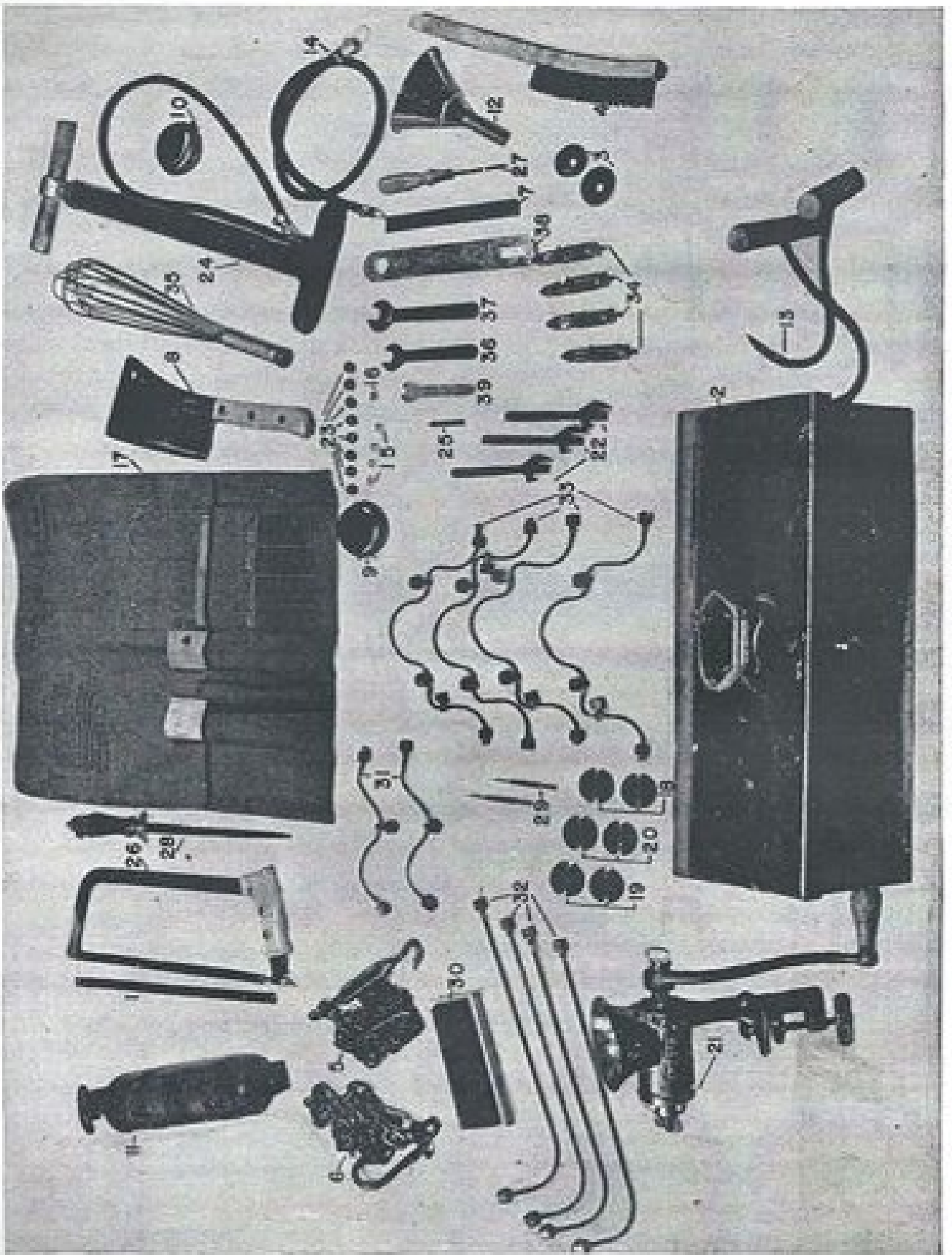


Figure 3. Components of standard "A" pack.

<i>Figure Reference No.</i>	<i>Quantity</i>	<i>Nomenclature</i>	<i>Draw No.</i>	<i>Part No.</i>
8	1	Cleaver, butcher, blade 8".....	64-C-725	200
9	1	Container, tin, small parts.....	65-J-1585	219
10	1	Container, tin, w/graphic grease.....	65-J-1590	218
11	1	Extinguisher, fire, CTC, hand, 1 qt, w/wall bracket.....	58-E-202	239
12	1	Funnel, w/strainer, 1/2 qt.....	65-F-340	214
13	2	Hook, key or box.....	70-11-1190	233
14	1	Hose, pump, air pressure, complete.....	65-J-1943	202
15	4	Jet, fuel, flame valve.....	65-J-1962	204
16	2	Jet, metering, mixture valve.....	65-J-1964	202
17	1	Kit, curves, utensils.....	64-K-440	244
18	2	Knob, valve stem, w/cotter pin, air.....	65-J-2015	133
19	2	Knob, valve stem, w/cotter pin, flame.....	65-J-2021	135
20	2	Knob, valve, stem, w/cotter pin, fuel.....	65-J-2025	134
21	1	Machine, chopping (grinding), meat and food, hand operated, small.....	64-M-115	208
22	3	Opener, can, hand.....	64-O-130	N.P.N.
23	8	Packing, valve stem.....	65-J-2085	132
24	1	Pump, air pressure.....	65-J-2160	190
25	1	Reamer, fuel-jet.....	65-J-2230	210
26	1	Saw, Butcher, 14" blade.....	64-S-115	209
27	1	Screw driver, common, normal duty, single grip, length of blade 3".....	41-S-1101	200
28	1	Steel, butchers, serrated, length of blade 10".....	64-S-1120	254
29	2	Stem, valve, flame.....	65-J-2407	265
30	1	Stone, sharpening, mounted, medium grip, 1" x 2" x 6".....	41-S-5274	—
31	2	Tube, fuel, converted type.....	65-J-2538	206
32	4	Tube, fuel, or air, long.....	65-J-2546	118
33	4	Tube, manifold.....	65-J-2560	116
34	4	Valve, flame.....	65-J-2652	203
35	1	Whip, egg, 16".....	64-W-200	—
36	1	Wrench, open end, 9/16".....	65-J-2090-35	207
37	1	Wrench, open end, 1/2".....	65-J-2090-45	206
38	1	Wrench, screw cap, filter case.....	65-J-2693	205
39	1	Wrench, set screw, 5/16".....	65-J-2695	208

A copy of this Technical Manual is included with each range for use in operation and maintenance of the unit.

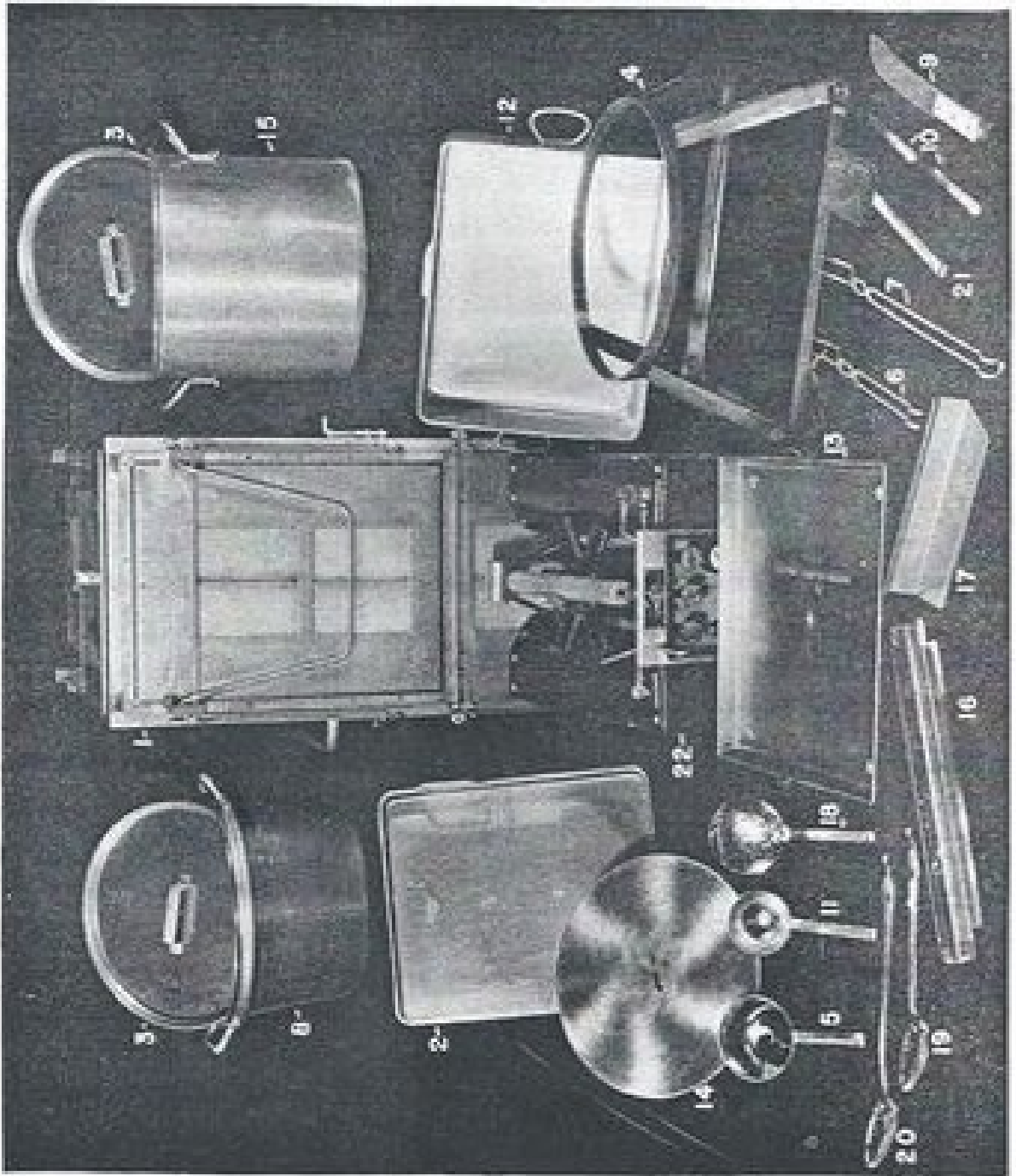


Figure 6. Components of standard "B7" pack.

c. Components included in standard "B" park (fig. 6) (Stock No. 65-J-3525):

Figure Reference No.	Quantity	Description	Stock No.	Part No.
1	1	Cabinet	65-J-1300	1
2	1	Cover, roasting pan, 2' x 17 $\frac{1}{2}$ " x 21 $\frac{1}{4}$ "	64-C-1223	230
3	2	Cover, cook pot, or insert	64-C-1221-50	223
4	1	Cradle, cook pot	65-J-1645	159
5	1	Dipper, 1-qt	64-D-300	241
6	1	Fork, cook, flesh, length over-all, 15"	64-F-275	242
7	1	Fork, cook, flesh, length over-all, 21"	64-F-285	243
8	1	Insert, pot, cook, 10 gal	64-I-080	225
9	1	Knife, butcher, 10" blade	64-K-545	245
10	2	Knife, paring	64-K-600	246
11	1	Ladle, length over-all 21"	64-L-160	247
12	1	Pan, bake and roasting, fold range, M-2917	64-P-275	227
13	1	Pan, cake, 1 $\frac{1}{2}$ " x 10" x 19 $\frac{1}{2}$ "	64-P-311	231
14	1	Plate, splash	65-J-2137	224
15	1	Pot, cook, heavy, 15-gal	64-P-2100	222
16	1	Protector, arm, long	65-J-2142	220
17	1	Protector, arm, short	65-J-2143	221
18	1	Skimmer, length, over-all 15"	64-S-790	251
19	1	Spoon, basting, length over-all 15"	64-S-1000	252
20	1	Spoon, basting, length over-all 21"	64-S-1000	253
21	1	Turner, cake, length over-all 15"	64-T-379	255
22	1	Unit, fire, simplified, converted type	65-J-2612	278

PART TWO OPERATING INSTRUCTIONS

Section IV. GENERAL

6. Scope

Part Two contains information for the guidance of the personnel responsible for the operation of this equipment. It contains information on the operation of the equipment with the description and location of the controls and instruments.

7. Service upon Receipt of Equipment

The following service should be performed before the equipment is put into service:

- a. Uncrate the range carefully to prevent damage to the range.
- b. Check each item against the shipping ticket and the list contained in ASF Catalog QM 7-Misc. 8A to be sure that all parts of the equipment are present. Take the necessary steps to secure any missing parts.

c. Thoroughly inspect the range and utensils to insure that all parts are in good condition.

d. Clean all cooking utensils with hot soapy water in which has been added a little baking soda. Cleaning of the range cabinet should be confined to the operations necessary to remove dirt and preservative material. Do not scour the range cabinet with abrasives.

e. The fire unit should be checked to insure that all parts are in good condition and that all connections are tight. Remove any grease or preservative coating from the unit and make sure that the burner is clean. Test the burner for leaks by putting soap-suds around all valves and connections after having increased the air pressure in the unit to 10 pounds per square inch. Do not put gasoline into system until after this test is complete.

Section V. CONTROLS AND INSTRUMENTS

8. Controls and Instruments

The following controls and instruments are provided to insure proper control of the fire unit (fig. 7):

- a. The mixture (air) valve control knob is at

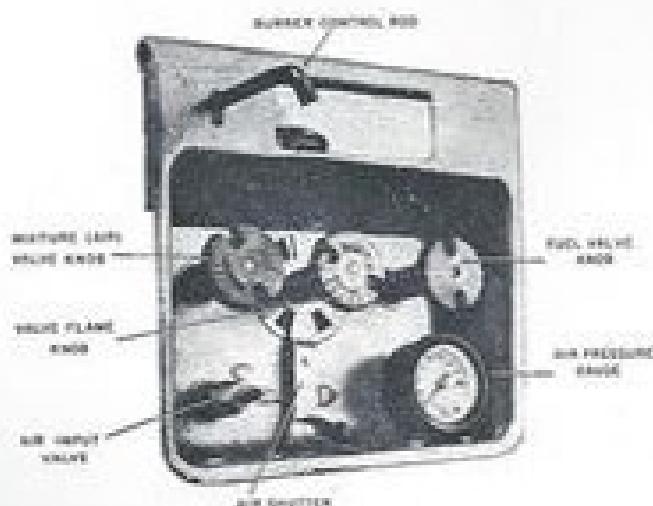


Figure 7. Burner front panel showing controls.

Figure 7. Burner front panel showing controls.

the upper left-hand corner of the fire unit front panel as the operator faces the unit; it is marked "Air." The valve is closed by turning the knob clockwise. When open, the valve allows a mixture of air and gasoline from the tanks to enter directly into the mixing chamber, bypassing the generator filter tube. This valve is used only during the starting operation. On the original fire unit it was used to allow air from the tank to enter the generator. In the converted unit this valve allows a mixture of air and gasoline to enter the hot vapor tube, so the valve is now called "mixture" valve.

b. The flame valve control knob is located in the center of the front panel between the mixture (air) valve and the fuel valve knobs and is marked "Flame." The valve is closed by turning the knob clockwise. The flame valve, when opened, allows the vaporized gasoline to pass into the mixing chamber. The height of the flame is adjusted by opening or closing this valve.

c. The fuel valve control knob is located at the upper right-hand corner of the front panel directly above the air pressure gauge and is marked "Fuel,"

To close the valve, turn the knob clockwise. This valve controls the flow of the fuel from the fuel tank to the generator. This valve is opened one half turn when the preheat period has been completed and is left open during the entire time that the burner is in operation. To extinguish the flame, close this valve.

d. The *air shutter* is attached to the flame valve body. To adjust it, move the air shutter handle, which is directly below the flame valve knob in the center of the front panel, to the right or left. The air shutter regulates the amount of air entering the mixing chamber as needed to obtain a green flame at the burner. Moving the handle to right supplies more air. The air which passes through the air shutter comes from the atmosphere, not from the tanks.

e. The *burner control rod* extends out from the upper left-hand corner of the front panel. The rod is pulled outward to move two burner arms under the generator during the preheat process of starting the burner.

f. The *air input valve* is located at the lower left-hand corner of the front panel. The air pump is attached to this valve when it is necessary to increase the air pressure in the system. Turn the handle bar counterclockwise to open the valve. The valve should be closed at all times except when the air pump is attached.

g. The *air pressure gauge* is located directly below the fuel valve knob at the lower right-hand corner of the front panel. It indicates the air pressure in the air and fuel tank system. During operation, the air pressure should be maintained between 30 and 50 pounds per square inch.

9. Principles of Fire Unit Operation (fig. 8)

During the starting or preheating period a mixture of gasoline and air flows, under pressure, from the fuel and air tanks through the mixture (air) valve (fuel valve closed) directly through the flame valve

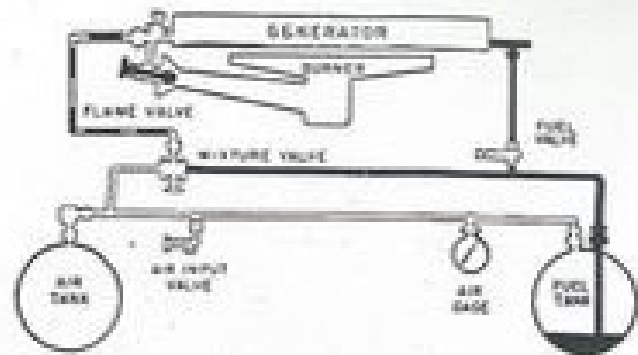


Figure 8. Schematic diagram of fire unit fuel system.

(bypassing the generator) to the burner mixing chamber, then through the burner slots where it is burned. This permits the preheating of the generator, which is directly above the burner. When the generator is heated (approximately 3 minutes) the mixture valve is gradually closed as the fuel valve is gradually opened. This action stops the flow of the air-gasoline mixture and starts a flow of gasoline through the generator, where it is vaporized, and then through the flame valve into the burner mixing chamber. Air from the air tank is used during the burner starting period to assist in the vaporization of the gasoline. This rapidly reduces the air pressure in the system. When the mixture (air) valve is closed the air pressure in the tanks forces gasoline through the fuel valve into the generator only, and very little change in pressure occurs. Opening or closing the flame valve controls the quantity of vaporized gasoline which enters the burner mixing chambers (thus the height of the flame on the burner is controlled). During operation, a part of the air required to burn gasoline is drawn into the burner mixing chamber, through the air shutter, by the velocity of the vaporized gasoline leaving the flame valve. This air is called the "primary" air. The balance of the air required to burn the gasoline (secondary air) mixes with the flame above the burner slots.

Section VI. OPERATION UNDER USUAL CONDITIONS

10. Field Foundation for Range

A firm, level, and well-drained foundation should be provided for the range, both as a safety measure and to insure proper operation. Heavy timbers or planks should be used if available. Be sure that a solid foundation is provided for the front door latch to rest upon when the door is open. This will prevent the range from tipping when the filled cook pot is placed in the cradle on the door. Use the

handles on either side of the range when moving the range.

11. Installation in Motor Vehicle

One-, two-, or three-cabinet units of the range may be installed in the front end of the 1½- or 2½-ton truck body. (See fig. 9.) When cabinet sets of more than one unit are used as a group, the cabinets should be locked together with the spring loaded pin

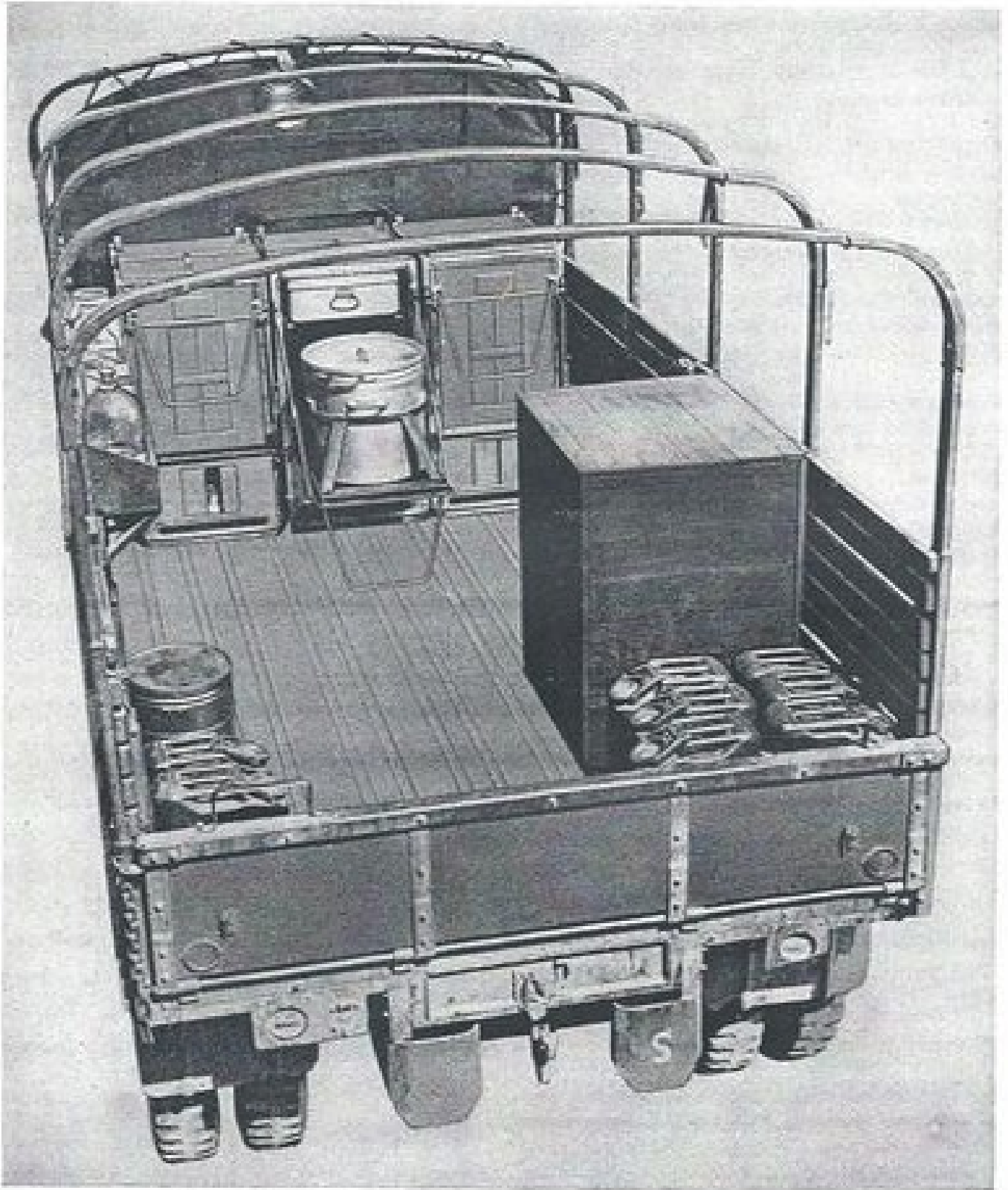


Figure 9. Three-cabinet unit, range, field, MISS, installed in kitchen truck.

latches on the right side of the cabinets. Secure the cabinets in the truck by using the tie-in chains. Anchor the chains securely to the sides of the truck and tighten by means of the turnbuckles. Both as a precaution against contamination of foodstuffs and as a safety factor against fire, do not load gasoline on the kitchen truck.

12. Installation in Railway Kitchen Cars

See TM 10-206.

13. Cooking on the Field Range

Almost all types of cooking may be performed on the M1937 field range as follows:

a. *Boiling* is done in either the cook pot or the insert, which is placed in the cradle separately, or the two may be fitted together to form a double boiler. Use the heavy cover when cooking with either vessel. It is possible to boil 12 gallons of water in 30 minutes. Place the fire unit in the bottom position. The cabinet lid should be closed.

b. *Roasting* is done in the covered roasting pan with the fire unit either in the bottom or middle position. If boiling and roasting is to be done at the same time, place the fire unit in the bottom position, the cook pot or insert in the cradle and the roasting pan above the cook pot. The cabinet lid should be closed.

c. *Frying* is done with the roasting pan placed in the top position and with the fire unit in the middle position. To prevent burns, use the arm protectors (Parts Nos. 220 and 221), which are fitted between the side of the roasting pan and the cabinet, one placed along the front and the other along the side of the range where the cook is working.

d. For *griddle cooking*, the top of the roasting pan is turned upside down and fitted into the bracket in the top corners of the cabinet. Place the arm protectors in position along the front and side of the range. Place the fire unit in the top position.

e. *Baking* is done in the covered roasting pan or in the cake pan, placed inside the covered roasting pan. Pies will bake well in the roasting pan alone, but for other baked foods, the cake pans should be used. Place the fire unit in the middle position. The cabinet lid should be closed.

14. Lighting the Fire Unit

The following procedure must be followed when lighting the fire unit:

- a. Remove the fire unit from the cabinet and take the unit away from the range.
- b. See that the fuel tank is full.
- c. Close all valves.
- d. Tilt the fire unit forward (or back) to allow any liquid fuel to run out of the mixing chamber.
- e. Pump up air pressure to 45 pounds in warm weather, 60 pounds in cold weather (below 32°F.).
- f. Close air shutter (move to left).
- g. Pull out burner control rod to line burner arms under generator.
- h. Place unit two-thirds of the way into the cabinet.
 - i. Open flame valve (turn "Flame" knob six half turns).
 - j. Hold lighted match over most convenient burner arm and open mixture (air) valve three half turns of the knob.
 - k. Adjust flame valve ("Flame" knob) immediately to obtain green flame to height of generator (this saves air pressure and prevents large flame).
 - l. Adjust air shutter as necessary to keep low green flame (open air shutter if flame is yellow, close if flame is blue).
 - m. After generator is hot (approximately 3 minutes) push unit into cabinet. Open shutter in cabinet door and close door.
 - n. Open the fuel valve ("Fuel" knob) one half turn.
 - o. Gradually close mixture valve (air knob) and slowly open air shutter at same time to keep flame green (watch flame through mirror on burner front panel).
 - p. If flame turns yellow, open flame valve ("Flame" knob) farther.
 - q. Push burner control rod into place.
 - r. Keep air pressure between 30 and 50 pounds per square inch. (Reduce air pressure by opening mixture valve ("Air" knob) one-fourth turn.)
 - s. Adjust height of flame to provide required amount of heat by opening or closing the flame valve and adjusting the air shutter to keep the flame green. (A yellow flame indicates that the air shutter is not open enough. A blue flame indicates the air shutter is open too far.)

15. Turning off the Fire Unit

The flame on the fire unit is extinguished by closing the fuel valve. The fire will go out as soon as the fuel in the generator has been consumed. Do not close the flame valve until after the fire unit has cooled, as doing so will damage the flame valve stem and nozzle.

16. Destruction to Prevent Enemy Use

Smash in the front panel of the fire unit with a sledge hammer. Chop open the fuel and air tanks. Puncture and otherwise mutilate the cabinet and boilers with an ax. Crack off one of the sections of the burner with a hammer. Drench with gasoline and complete destruction by burning.

PART THREE MAINTENANCE INSTRUCTIONS

Section VII. GENERAL

17. Scope

Part three contains information for the guidance of the personnel of using organizations responsible for the maintenance (first and second echelons) of this equipment. It contains information needed for the performance of the scheduled lubrication and preventive maintenance services, as well as a description of the major system and units and their function in relation to other components of the equipment. Using organizations should not attempt repairs beyond those indicated. For heavier repairs,

consult the agency responsible for third echelon maintenance.

18. Lubrication

The cradle rails on the cabinet door and the rails within the cabinet are the only parts of the equipment which should be kept lubricated. Use the graphite grease (Stock No. 65-J-1585) supplied with the range on these rails as required to keep the cradle, burner, and cooking utensils from sticking.

Section VIII. PREVENTIVE MAINTENANCE

19. General

Preventive maintenance services are a function of the using organization (first and second echelons) of maintenance. These services consist of before-, during-, and after-operation services as well as a weekly service.

20. Before-Operation Service

The following inspections and services should be performed each time before range is put into operation:

- a. Make sure that the range is resting firmly on a solid level foundation or securely fastened to the vehicle body.
- b. Make sure that the cabinet is not damaged, that the doors operate properly, and that the rails are secure.
- c. Clean the range as required.
- d. Inspect the fire unit to insure that it is clean, not damaged, and that all parts are serviceable and connections tight.
- e. Fill the fuel tank if required.
- f. Pump up air pressure in system to 45 pounds.
- g. Report any unsatisfactory conditions found which could not be corrected.

21. During-Operation Service

The following inspections and services should be performed while the range is being used:

- a. Make sure that the range foundation remains level and firm or that the range remains firmly attached to the vehicle body.
- b. Inspect the fire unit to insure that leaks have not developed and that the unit is not overheating.
- c. Adjust the flame valve and air shutter to maintain a green flame at the desired height. (Look at flame through mirror on unit front panel.)
- d. Observe the air pressure gauge and maintain the air pressure between 30 and 50 pounds (air pressure may be reduced by temporarily opening the mixture ("air") valve one-quarter turn).
- e. Keep the range as clean as possible.

22. After-Operation Service

The following inspections and services should be performed each time after the range has been used:

- a. Remove the fire unit from the cabinet and inspect it for leaks and unserviceable parts.
- b. Clean cabinet thoroughly with hot soap and water. Do not use abrasives.
- c. Inspect cabinet for damage and proper operation of doors and shutters; make sure that rails are tight and lubricated.

d. When the fire unit has cooled, fill the fuel tank. Clean the unit and burner slots.

e. Disassemble and clean flame valve and hot vapor tube if necessary.

f. Replace generator if necessary (generator should operate satisfactorily for 300 to 500 hours).

g. Report any unsatisfactory conditions found which could not be corrected.

23. Weekly Service

The following services should be performed at least weekly, and more frequently if inspection indicates the need:

a. Disassemble and clean the metering jet in the mixture valve.

b. Disassemble and clean the safety check in the fuel output valve.

c. Disassemble and clean the air input valve.

d. Disassemble and clean the flame valve and hot vapor tube.

e. Thoroughly clean the fire unit and inspect for damages and leaks and replace unserviceable parts.

f. Thoroughly clean cabinet and inspect for damaged and unserviceable parts.

g. Report any unsatisfactory condition found which could not be corrected.

Section IX. TROUBLE SHOOTING

24. Trouble Shooting

The following is a tabulation of some of the troubles which may occur during operation of the range, together with the possible causes and remedies. In

some cases a trouble may have several possible causes. When trying to determine the cause of trouble, follow the procedures described in this manual. Do not tinker, as tinkering may destroy an essential part of the unit.

Trouble Shooting Chart

Trouble	Possible Cause	Correction
a. Yellow flame	(1) Insufficient air	Open air shutter.
	(2) Dirt in flame valve (during starting)....	Turn stem all the way to closed position, then open and relight. If condition is not corrected, then flame valve must be dismantled and cleaned. (Mixture ("Air") valve should be opened at least 1½ turns.)
	(3) Air tank side of mixture valve plugged during starting)	Disassemble and clean mixture valve.
b. Excessive pressure drop	(1) Flame too high (during starting).....	Keep flame no higher than necessary to completely envelop generator; additional flame height uses air pressure at a unusually rapid rate.
	(2) Leaky connections	Tighten connections or replace defective parts.
c. Flooding of mixing chambers (during starting)	(1) Air pressure too low	Pump up to 45 pounds.
	(2) Bent fire unit front panel	Bent panel causes stream from flame valve to strike side of mixing chamber. Replace front panel.
d. Low flame—flame divider unit will not light	(1) Insufficient gasoline	Fill tank if empty or low.
	(2) Dirty flame valve and/or dirty generator	Screw flame valve stem all the way in to closed position, then open and relight unit. If this does not correct trouble, clean flame valve and hot vapor tube. If small flame still persists, install new generator. Check fuel tube, fuel valve, and fuel output valve and uptake tube.
	(3) Air pressure too low	Pump air pressure to 45 pounds.
	(4) A loose connection	Check all nuts on unit for tightness but do not investigate any fitting.
	(5) Dirty metering jet	Disassemble and clean.
	(6) Fuel uptake tube loose or dirty.....	Tighten or clean.

Trouble Shooting Chart—(Continued)

Trouble	Possible Cause	Correction
c. Flame at joint of hot vapor tube and flame valve socket...	Generator improperly installed	Shut off unit, loosen yoke, locate hot vapor tube properly in socket, replace yoke and tighten setscrew moderately tight.
f. Leak at filler tube cap	(1) Dirt on seat of the fuel tank filler tube (or)	Clean the seat and replace the cap. If seat is rough and leaking, grind parts lightly with valve compound.
	(2) Loose filler tube cap	Tighten the filler tube cap.
	(3) Defective seal	Replace the seal.
g. Overheating of burner (blue flame instead of green)	Too much air	Partially close air shutter until flame is green.
k. No control over primary air	Bent air shutter	Straighten or reshape the air shutter to fit closely over end of mixing chamber.
i. Yellow flame at certain settings of flame valve (If the color cannot be corrected by adjusting the air shutter)	Dirt in flame valve	Screw stem all the way in, then out, and re-light unit. If this does not correct trouble, then the flame valve must be cleaned.

Section X. FIRE UNIT MAINTENANCE (SECOND ECHELON)

25. General

The paragraphs below give a description of the procedure for disassembly of the various parts of the fire unit for purpose of replacement in maintenance of these parts. Parts should be disassembled only after a careful inspection indicates the need.



Figure 10. Generator (cut-away view).

26. Generator

a. GENERAL. The generator (fig. 10) is located on the top of the unit directly above the burner. It consists of a steel tube, filled with steel wool, having smaller tubes projecting out from each end, to which connecting tubes are attached. The generator is used to preheat and vaporize the gasoline from the fuel tank before it passes to the flame valve. The filter in the generator removes the solid particles from the gasoline as well as some of the lead from leaded gasoline, plus reducing the possibility of clogged valves and of lead poisoning from the

burner flames. The generator will normally operate for 300 to 500 hours without becoming clogged.

b. REMOVAL. (1) Relieve the air pressure in the tanks by loosening the fuel tank filter cap.

(2) Disconnect the fuel tube from the connection at the rear of the generator.

(3) Disconnect the mixture tube from the front of the generator.

(4) Withdraw the setscrew (Part No. 158) from the generator yoke (Part No. 157) sufficiently to allow the yoke to be removed. Lift the front end of the generator enough to disengage the hot vapor tube from the flame valve and mixing chamber, then pull the generator forward to disengage the rear of the generator from the burner frame. The flame valve is now loose and may fall out of place.

c. INSTALLATION. (1) Place a small tube at the rear end of the generator into the hole in the rear bracket of the unit frame and lower the front of the generator until the hot vapor tube fits properly into the mixing chamber and the flame valve body.

(2) Place the generator yoke in place and tighten the yoke setscrew, being careful that the hot vapor tube is properly seated in the flame valve body.

(3) Connect the mixture tube onto the front of the generator tube.

(4) Connect the fuel tube to the tube connection at the rear of the generator.

(5) Pump up pressure in system and test for leaks.

d. MAINTENANCE. (1) Weekly, or after each 10 tanks full of gasoline, remove the generator and clean the hot vapor tube, using the drill type cleaner.

(2) Replace the generator when it has been damaged or when the test (sec. IX) indicates that the generator is clogged to the extent that it will not permit a sufficient quantity of gasoline to reach the flame valve to give the necessary flame.

e. EMERGENCY REPAIRS. When the generator becomes clogged, and it is impossible to secure another generator, an emergency generator may sometimes be improvised in the manner described below. This should be resorted to as an emergency measure only. Cut the tube in half, remove the old steel wool, and replace it with new steel wool. Pack the new steel wool in tight by use of a broom handle or similar object, then weld the tube together again. Care must be taken not to damage the screens at each end of the generator as doing so may retard the flow of the fuel through the generator.

Caution: In removing the old steel wool from the generator tube, care must be exercised not to breathe any of the dust or to get the wool on the hands. This will have a considerable quantity of lead on it. Careless handling may result in lead poisoning. It is desirable to remove the steel wool from the generator in the open in such a manner that the breeze will blow the dust away from the workman.

27. Flame Valve

a. GENERAL. The flame valve (fig. 11) is the valve which fits into the end of the burner mixing chamber. This valve is used to regulate the amount of fuel which is allowed to pass into the mixing chamber of the burner while the burner is in use.

b. REMOVAL. (1) Remove the generator as indicated in paragraph 25.

(2) Move the flame valve forward out of the front panel of the burner.

(3) Take the air shutter off the valve body.

c. INSTALLATION. (1) Place the air shutter on the body of the valve.

(2) Push the flame valve into place through the front panel. The flame valve will fit into the front panel of the burner in one position only, that is, with the opening for the hot vapor tube up and the projection on the body of the valve pointing down.

(3) Install the generator as indicated in paragraph 26.

d. MAINTENANCE. (1) Open the flame valve about one turn, then remove the flame valve nut.

(2) Remove the flame valve jet from the nut by tapping the threaded end of the nut on a solid surface.

(3) Clean the jet with the jet reamer.

(4) Screw out the packing gland and flame valve stem together. Clean the valve stem with the wire brush or a cloth, wet with gasoline.

(5) Look through the passages in the flame valve body and remove any dirt present by use of

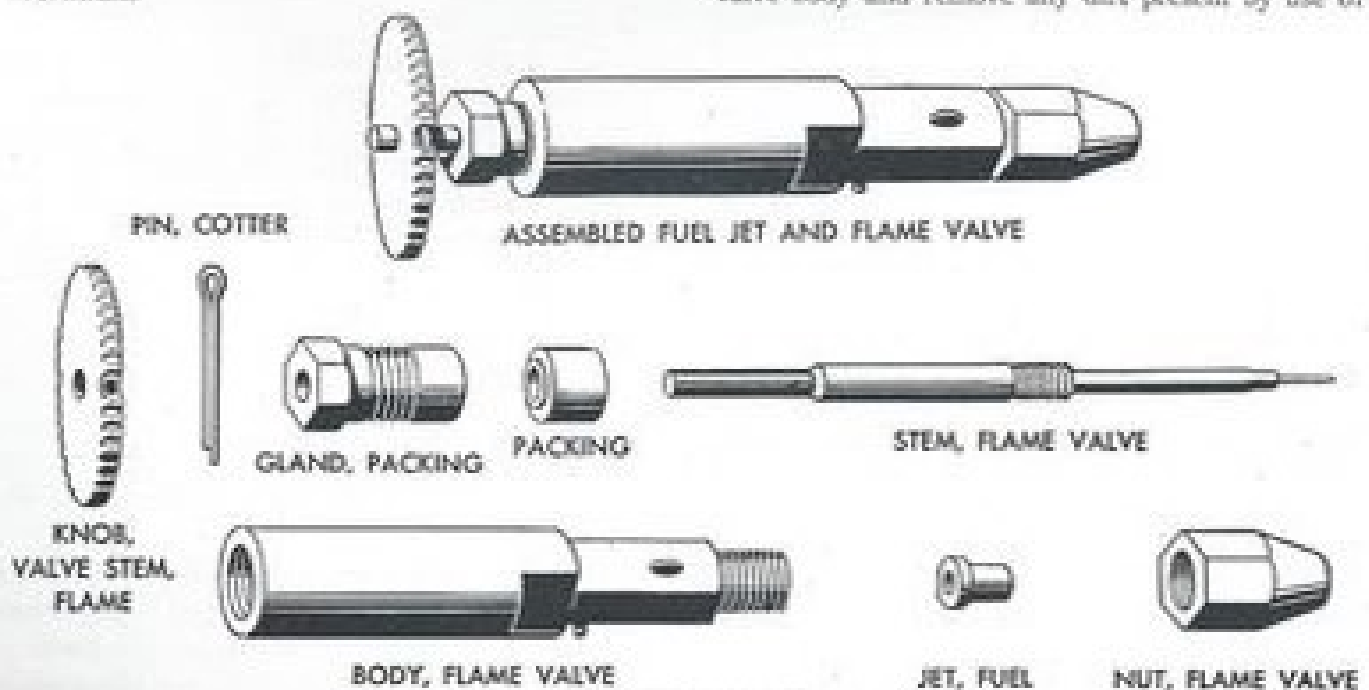


Figure 11. Flame valve.

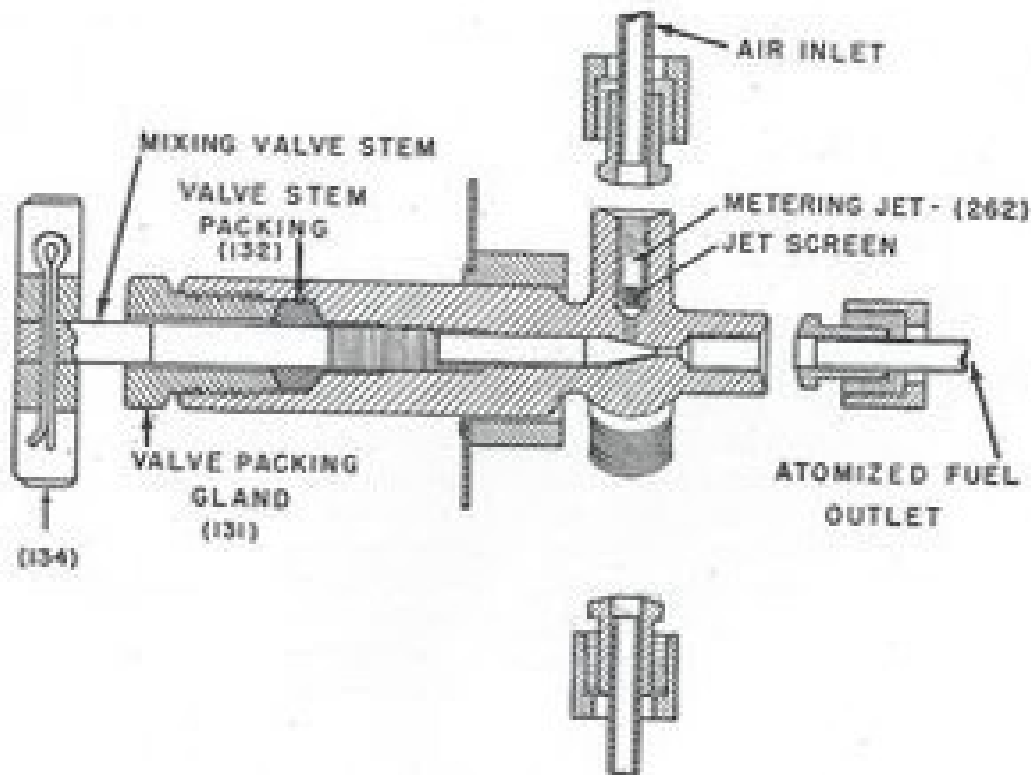


Figure 12. Mixture (air) valve (cut-away view).

soft wire or wood cleaner. Do not use the reamer.

(6) Replace the packing if it will not stop leakage when it is tightened. The packing may be removed by inserting a screw driver into the valve stem hole and turning the screw driver counter-clockwise.

(7) Replace worn or damaged parts and assemble in reverse order of disassembly.

28. Mixture Valve

a. GENERAL. The mixture valve (fig. 12) is a valve at the upper left-hand corner of the burner front panel. It is used to provide a mixture of air and gasoline from the tanks to the flame valve during the process of starting the burner. The fuel inlet side of the valve contains a metering jet (Part No. 262) which limits the flow of fuel when the valve is opened.

b. REMOVAL. (1) Relieve the pressure in the tank by opening the fuel tank filler cap.

(2) Remove the valve knob (Part No. 134) by pulling out the cotter pin.

(3) Unscrew the packing gland (Part No. 131).

(4) Disconnect the three tubes from the body of the valve. When removing the fuel inlet tube, be careful not to lose or damage the metering jet screen.

(5) Remove the setscrew which holds the body

of the valve in the front panel and pull the body of the valve to the rear of the front panel.

c. INSTALLATION. (1) Place the valve in position in the front panel from the rear and tighten the setscrew enough to hold the valve in position. (The packing gland must be off.)

(2) Connect the three tubes to the body of the valve. Tighten the nuts on the body of the valve only tight enough to prevent leakage, as overtightening may destroy the threads. Be sure the screen is properly installed in the fuel inlet.

(3) Screw the packing gland into place and tighten just enough to prevent leakage. Install the valve stem knob.

(4) Pump up pressure in system and test for leaks.

d. MAINTENANCE. (1) Remove and clean the valve stem with a wire brush or rag wet with gasoline, being careful not to damage it in any way.

(2) Remove the metering jet from the valve body, using a screw driver, and clean the metering jet and screen by washing carefully in gasoline.

(3) Look through the passages in the body of the valve and remove any dirt that might be present by using a soft wire or wood cleaner.

(4) Replace the gland packing (Part No. 132) if it is damaged and will not prevent leakage when the packing gland is tightened. The packing may be removed by inserting a screw driver in the valve

stem hole and turning the screw driver counterclockwise.

(5) See that the ground surfaces, upon which the ends of the tubes seat when the tubes are attached to the body of the valve, are clean and smooth.

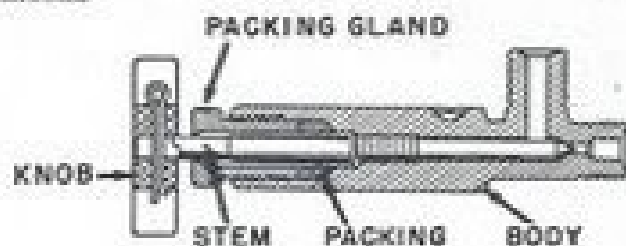


Figure 13. Fuel valve (sectional view).

29. Fuel Valve

a. **GENERAL.** The fuel valve (fig. 13) is the valve at the upper right-hand corner of the front panel of the burner. When this valve is opened the fuel passes from the fuel tank to the input end of the generator. This valve is used to shut the fuel off when the flame is to be extinguished.

b. **REMOVAL.** (1) Relieve pressure in fuel tank by opening fuel tank filler cap.

(2) Remove the valve knob by withdrawing the cotter key.

(3) Remove the packing gland by turning the nut counterclockwise.

(4) Disconnect the tubes from the valve body.

(5) Withdraw the setscrew which holds the valve body in the front panel.

(6) Pull the valve body to the rear out of the unit front panel.

c. **INSTALLATION.** (1) Place the valve (less packing gland) into the front panel from the rear so that the setscrew in the front panel will seat in the hole in the body of the valve. Tighten the setscrew enough to hold the valve in place.

(2) Place the packing gland over the valve stem and tighten just enough to prevent leakage.

(3) Install the valve stem knob on the valve stem by inserting the cotter key through the valve knob and valve stem.

(4) Install the fuel lines on the valve body, tightening the nuts just tight enough to prevent leakage.

(5) Pump up pressure in system and test for leaks.

d. **MAINTENANCE.** (1) Remove the valve stem by turning it counterclockwise (the packing gland has been removed while removing the valve from the front panel).

(2) Clean the valve stem with a wire brush or

cloth wet with gasoline, being careful not to damage the stem in any way.

(3) Look through the holes in the valve body and remove any dirt present by use of soft wire or wood cleaner.

(4) See that seats upon which the tube ends rest are smooth and clean and that the threads on the valve body are in good condition.

(5) Replace the packing gland in the valve body when it will not prevent leakage after the packing gland has been tightened. The packing gland may be removed from the body of the valve by carefully inserting the blade of a screw driver into the holes through which the valve stem passes and then turning the screw driver in a counterclockwise direction. Do not force the screw driver into the packing any farther than is necessary, as doing so may damage the packing.

(6) Assemble the valve carefully in reverse order of disassembly.

30. Fuel Output Valve and Uptake Tube

a. **GENERAL.** The fuel output valve and the uptake tube (fig. 14) are located on the top of the fuel tank just behind the fuel tank filler cap. The fuel output valve is a safety device placed in the fuel line to prevent fuel from flowing when the fuel tube becomes broken or loose. The fuel rushing through this valve causes the valve to close and it stays

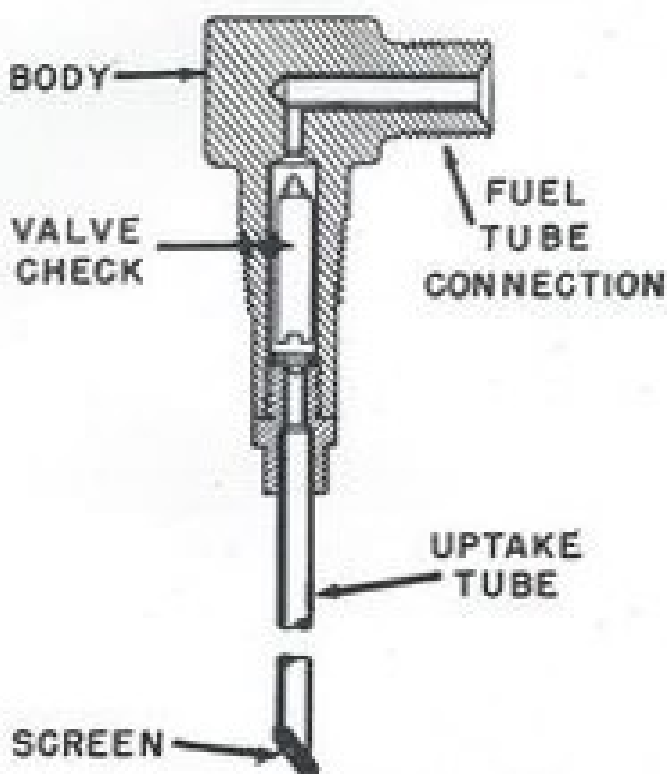


Figure 14. Fuel output valve and uptake tube.

closed until the pressure in the fuel tank has been relieved. The fuel uptake tube extends to the bottom of the fuel tank to insure a flow of fuel through the fuel tube as long as there is fuel in the tank. The end of the fuel uptake tube is covered with a screen to prevent large particles of foreign matter from getting into the fuel output valve and fuel tube.

b. REMOVAL. (1) Relieve the pressure in tanks by opening the fuel tank filler cap.

(2) Disconnect the fuel tube from the fuel output valve.

(3) Unscrew the fuel output valve from the fuel tank.

(4) Unscrew the uptake tube from the output valve.

(5) Remove the valve check from the output valve. This check will fall out if the valve is held in an upright position.

c. INSTALLATION. (1) Place the valve check in the uptake valve so that the point of the check fits into the seat in the valve body.

(2) Install the fuel uptake tube into the valve body. Tighten only enough to prevent leakage.

(3) Insert the fuel uptake tube through the output valve flange in the fuel tank and tighten the valve in the flange just enough to prevent leakage.

(4) Connect the fuel tube to the output valve and tighten nut just enough to prevent leakage.

(5) Pump air pressure in system and test for leaks.

d. MAINTENANCE. (1) After each 10 tanks full of fuel, or oftener as required, remove the output valve and uptake tube and clean the valve and screen.

(2) Inspect valve to insure that valve seat and check are smooth and that the threads in the valve body are in good condition.

(3) Test the valve by blowing through the uptake tube while the valve is being held in a normal position. A sudden rush of air through the valve should cause the valve to close.

(4) Replace any defective parts.

31. Air Input Valve

a. GENERAL. The air input valve (fig. 15) is

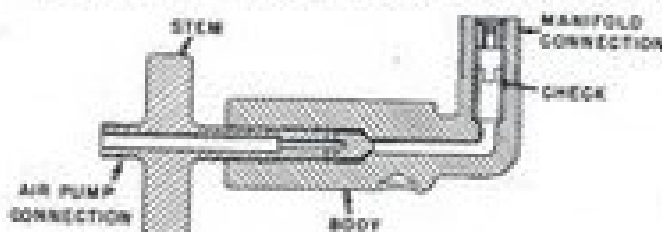


Figure 15. Air input valve (sectional view).

located at the lower left-hand corner of the burner front panel. The air pump is attached to this valve when it is necessary to pump air into the system. Turning the valve stem handle bars in a counterclockwise direction opens the valve so that air may be pumped into the system. The valve contains a check (Part No. 122) which prevents air from returning from the system.

b. REMOVAL. (1) Remove the valve stem from the valve by turning it counterclockwise.

(2) Disconnect the manifold tube from the valve.

(3) Loosen the setscrew and pull the valve to the rear out of the panel.

c. INSTALLATION. (1) Place the body of the valve into position from the rear of the front panel and tighten set enough to hold valve in position. The setscrew should set into the resets in the valve body.

(2) Connect the manifold tube to the valve by tightening the nut just enough to prevent leakage.

(3) Install the valve stem.

(4) Pump up air pressure in system and test for leaks.

d. MAINTENANCE. (1) When the valve is removed from the fire unit, remove the check valve retainer (Part No. 123) and remove the valve check. Clean the valve check and see that its seat is smooth.

(2) Look through the passages in the valve body and remove any dirt present by use of soft wire or wood cleaner. Inspect the valve check seat in the body of the valve to insure that it is clean and smooth.

(3) Install valve check and retainer in body of valve. Test the valve check by holding the valve in the normal position and attempting to blow through the valve from retainer. The valve should seat tightly and not allow air to pass.

(4) Inspect the threads on the valve body and valve stem to insure that they are in good condition.

(5) Replace defective parts.

32. Burner

a. GENERAL. The burner (fig. 16) consists of two cast-iron parts, the burner head (Part No. 145), and the mixing chamber (Part No. 144). The

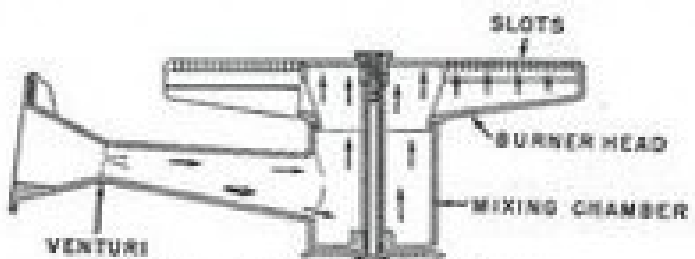
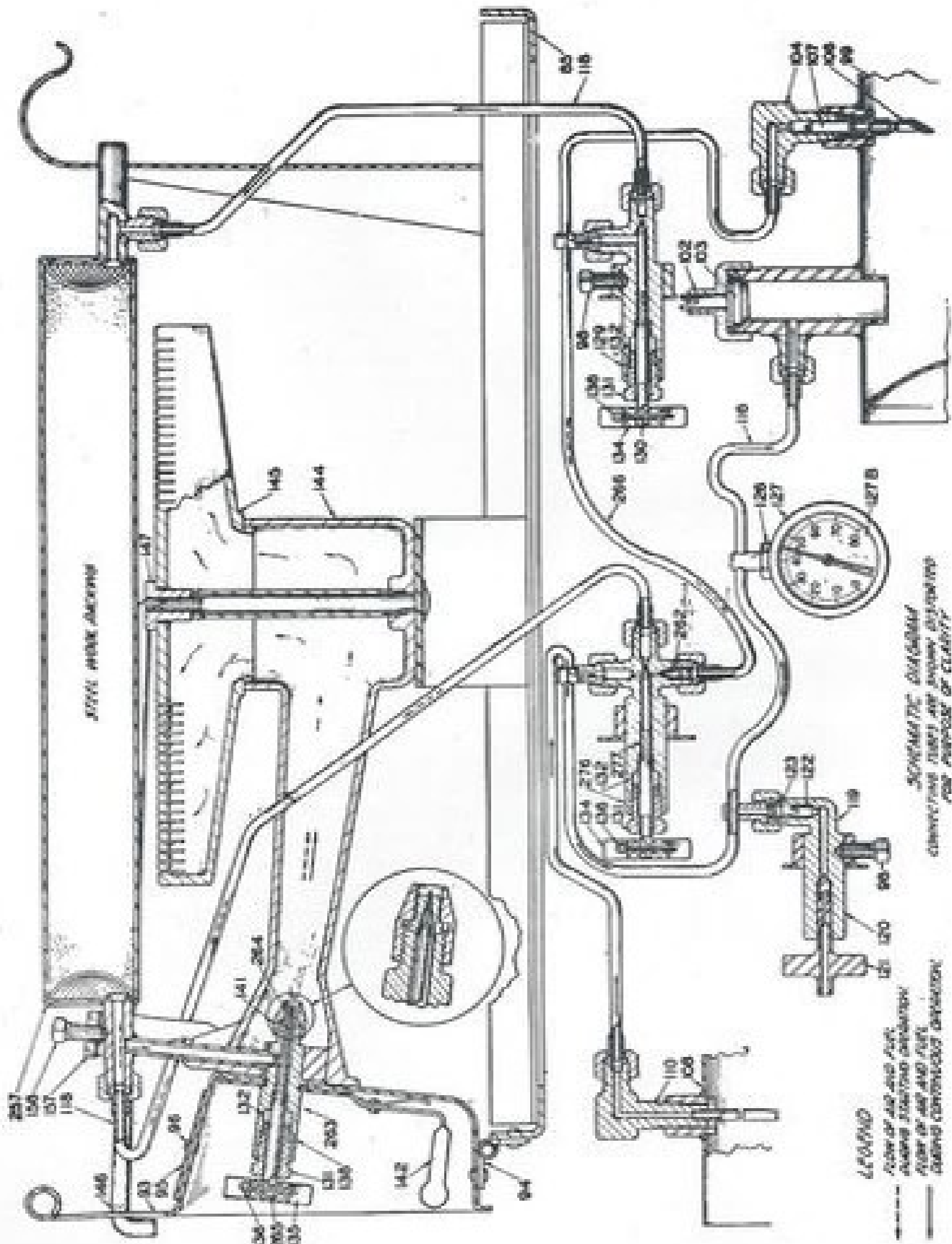


Figure 16. Burner (sectional view)



GROUND
 SIDE OF AIR AND AIR
 SIDE OF AIR AND AIR
 SIDE OF AIR AND AIR
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SCHEMATIC DIAGRAM
 CONNECTING TUBES AND PIPING SYSTEM
 FOR PURPOSE OF CLARITY

Figure 17. Air pressure pump.

burner has six arms which are slotted to allow the mixture of air and gasoline to pass from the mixing chamber to the top of the burner, where it is burned. The throat of the mixing chamber is constructed in the form of a venturi. The flame valve is located in this venturi so that the velocity of the vaporized gasoline leaving the flame valve causes the air from the atmosphere (primary air) to be drawn into the mixing chamber. The air shutter (Part No. 142) is located over the end of the mixing chamber and is used to regulate the amount of air which is drawn into the mixing chamber. The balance of the air required to burn the gasoline (secondary air) comes direct from the atmosphere outside the burner. The burner arms are held in position by the burner control rod (Part No. 146) which passes through the front panel.

b. REMOVAL. (1) Remove the generator as indicated in paragraph 26.

(2) Remove the flame valve and air shutter as indicated in paragraph 27.

(3) Disconnect the end of the mixing chamber from the front panel by removing the bolts. Remove the burner control rod.

(4) Remove the burner nut which is located on top of the burner at the center of the arms and lift the burner head and mixing chamber from the fire unit.

c. INSTALLATION. (1) Place the mixing chamber in place on the bolt on the burner bracket.

(2) Install the bolts through the front panel and mixing chamber flange.

(3) Place the burner head on the mixing chamber and tighten the burner nut. Install the burner control rod.

(4) Install the flame valve and air shutter as indicated in paragraph 27.

(5) Install the generator as indicated in paragraph 26.

d. MAINTENANCE. (1) Keep the slots in the burner head clean by use of the wire brush and slot cleaner.

(2) Keep the mounting bolts tight. Keep the air shutter adjusted so that it fits closely over the end of the mixing chamber.

33. Air Pressure Gauge

The air pressure gauge (fig. 17) is used to indicate the air pressure in the fuel and air tank system. It

is connected to the manifold tube (Part No. 116). This gauge requires no service. When air is being pumped into the system the gauge should show an increase of pressure with each pump stroke. If the gauge seems to stick while air is being pumped into the system, it may be disassembled and washed in gasoline and reassembled after drying.

34. Fuel Tank Filler Tube Cap

The fuel tank filler tube cap (fig. 17) consists of a cap and a plug (Part No. 103) which has a ground surface that fits into a ground surface of the top of the filler tube. These ground surfaces must be kept clean and in good condition in order to insure an airtight fit when the cap is installed on the tube. Special care must be exercised to prevent damage to these surfaces while the fuel tank is being filled. Tighten the cap just tight enough to prevent air leakage when the air pressure in the system is increased. Do not open or loosen this cap to reduce the air pressure in the system when the burner is operating. Gasoline fumes will escape and catch fire.

35. Tubes

Copper tubes with brass fittings (fig. 17) are used to connect the tanks, valves, and generator. These tubes must be kept in good condition and replaced when damaged. The ends of the tubes are fitted with ground connecting surfaces which must be kept smooth and clean. The nuts which hold the tubes to the various fittings should be tightened only tight enough to prevent leakage at the joints. Further tightening will damage the threads on the nut and valves, thus destroying the unit.

36. Burner Frame

The burner frame (fig. 3) consists of the angle iron and bracket assembly which holds the various parts of the burner unit in the proper position. The air and fuel tank shields form a part of this frame and are placed between the fuel and air tanks and the burner to prevent the tanks from overheating. The burner front panel is attached to the frame by means of a hinge to facilitate maintenance. All parts of the frame must be kept clean and tight. The unit should be replaced if the frame becomes damaged.