

TM 5-6115-312-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL, DS, GS,
AND DEPOT MAINTENANCE MANUAL

GENERATOR SET, GASOLINE DRIVEN:
5 KW, AC, 60 CYCLE; 120, 208 V, 3
PHASE; SKID MOUNTED
(HOL-GAR MODEL CE-56-AC)
FSN 6115-560-5290



HEADQUARTERS, DEPARTMENT OF THE ARMY
MAY 1965

SAFETY PRECAUTIONS

BEFORE OPERATION

Do not attempt to operate or maintain the equipment until complete familiarization is established by reading the instructions in the manual.

Do not operate the generator set in an inclosed building unless the exhaust gases are piped to the outside. Exhaust gases contain carbon monoxide, which is a poisonous, odorless, colorless deadly gas.

Provide a metal-to-metal contact between the container and the fuel tank when filling.

Do not operate the generator set until the ground terminal stud has been connected to a suitable ground. An ungrounded system is dangerous.

DURING OPERATION

Stop the equipment immediately if there is any doubt in the operating conditions.

Do not refuel generator set during operation. Do not perform any maintenance on equipment during operation.

Do not attempt change overboard adjustments or output connections.

AFTER OPERATION

Do not leave fuel system valve open after operation has been completed. Place in OFF position.

ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL

**GENERATOR SET, GASOLINE DRIVEN:
 5KW, AC, 60 CYCLE; 120, 208 V, 3
 PHASE; SKID MOUNTED
 (HOL-GAR MODEL CE-56-AC)
 FSN 6115-560-5290**

	Paragraph	Page
CHAPTER 1. INTRODUCTION		
Section I. General	1-2	2
II. Description and data	3-5	2
CHAPTER 2. INSTALLATION AND OPERATION INSTRUCTIONS		
Section I. Service upon receipt of equipment	6-11	9
II. Controls and instruments	12-31	10
III. Operation under usual conditions	32-34	14
IV. Operation under unusual conditions	35-39	17
V. Operation of auxiliary material used in conjunction with the generator set ...	40-42	17
CHAPTER 3. OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		
Section I. Special tools and lubricants	43-46	19
II. Preventive maintenance services	47-49	26
III. Troubleshooting	50-62	31
IV. Radio interference suppression	63-67	33
V. Exhaust muffler system	68-69	34
VI. Engine housing assembly	70-74	34
VII. Fuel system	75-80	39
VIII. Engine electric system	81-84	46
IX. Ignition system	85-87	50
X. Engine	88-91	53
XI. Controls and instruments	92-102	56
XII. Generator	103-104	64
CHAPTER 4. DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS		
Section I. Overhaul and replacement standards	105	66
II. Removal of major items	106-109	68
III. Fuel systems	110-112	71
IV. Electrical starting system	113-115	74
V. Ignition system	116-117	76
VI. Cooling System	118-120	81
VII. Engine lubricating system	121-123	83
VIII. Engine overhaul	124-131	86
IX. Generator repair	132-136	96
X. Frame and skid base assembly	137-140	100
CHAPTER 5. DEMOLITION, SHIPMENT AND LIMITED STORAGE		
Section I. Demolition of unit to prevent enemy use	141-145	102
II. Shipment and limited storage	146-149	104
APPENDIX I. REFERENCES		107
II. BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES		109
III. MAINTENANCE ALLOCATION CHART		113
INDEX		121

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of the personnel to whom the HOL-GAR Model CE-56-AC Generator Set are issued. Chapters 1 through 3 provide information on the operation and organizational maintenance of the equipment. Chapter 4 provides information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

b. Appendix I contains a list of publications applicable to this manual. Appendix II contains the list of Basic Issue Items and Maintenance and Operating Supplies authorized the operator of this equipment. Appendix III contains the Maintenance Allocation Chart. Organizational, Direct and General Support, and Depot Maintenance Repair Parts and Special tools are listed in TM-6115-312-25P. The levels of maintenance in all cases are governed by the Maintenance Allocation Chart.

c. The direct reporting by the individual user, of errors, omissions, and recommenda-

tions for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting these improvements. This form will be completed in triplicate using pencil pen, or typewriter. The original and one copy will be forwarded direct to Commanding General, U. S. Army Mobility Equipment Center, ATTN: SMOE-MMP, P. O. Drawer 58, St. Louis, Mo. 63166. One information copy will be provided to the individual's immediate supervisor.

d. Report all equipment improvement recommendations as prescribed by TM 38-750.

2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide of Engineer Equipment).

b. For other record and report forms applicable to the operator organizational, direct and general support, and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

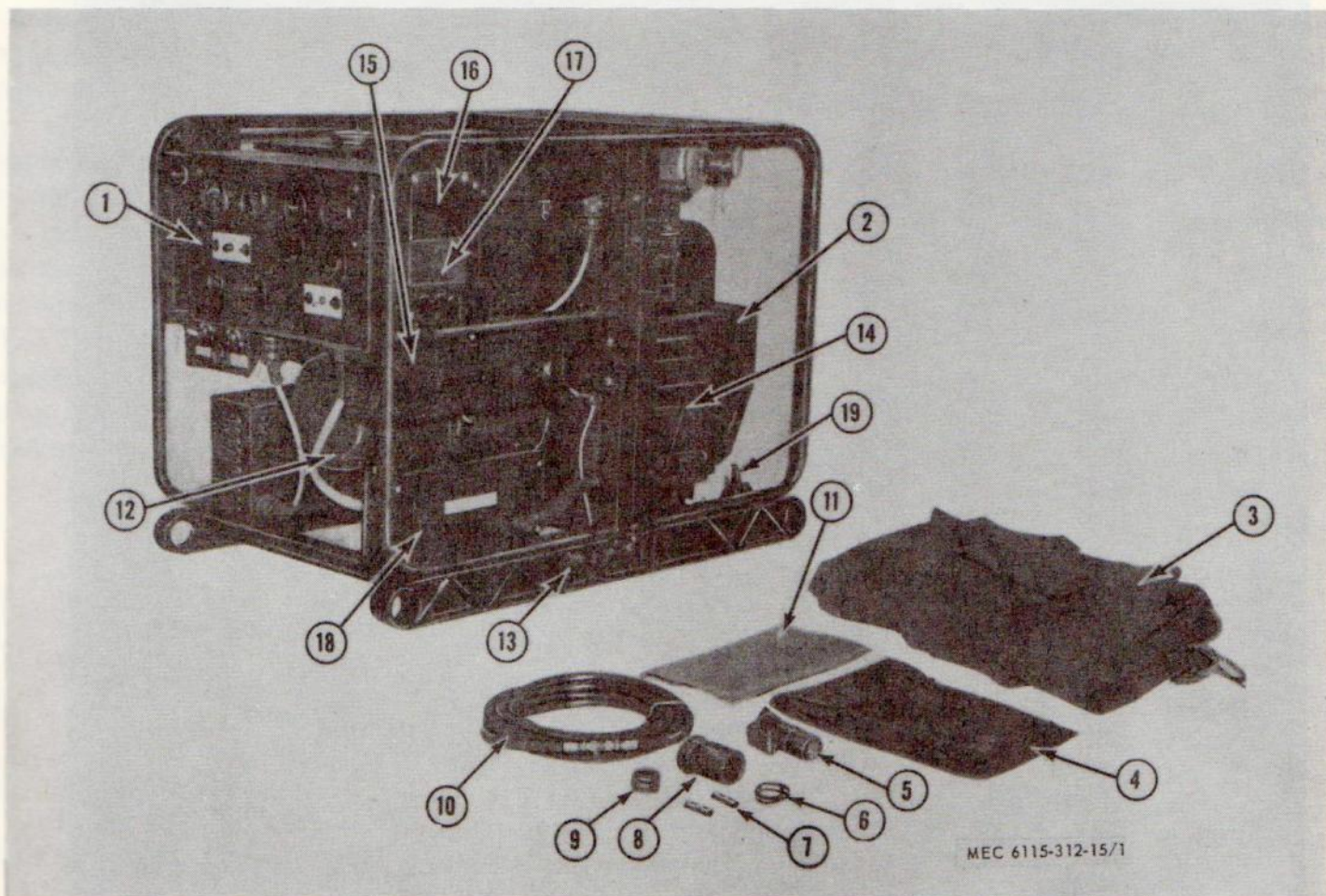
Section II. DESCRIPTION AND DATA

3. Description

a. *Engine Generator Set.* The model CE-56-AC generator set is a self-contained air-cooled, gasoline engine driven electric power unit equipped with electric starter. This unit can provide primary or emergency electric power within its rated capacity (para 5) for communications, lighting or testing equipment and for other electrically powered equipment. All components of the engine generator set are mounted within the tubular frame and protected with a canvas cover. Provisions for lifting are provided at the top-center of the frame.

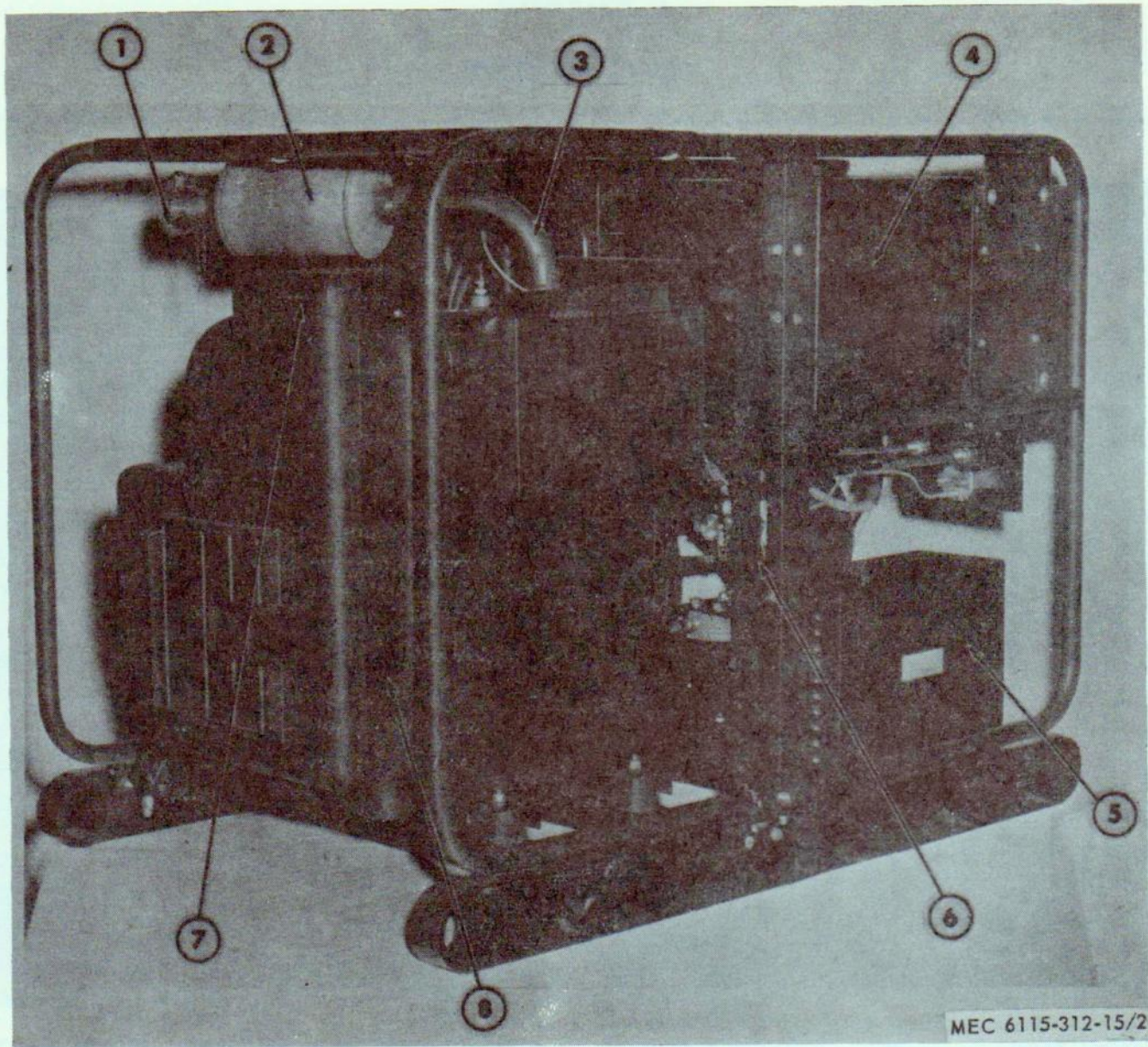
Operational controls and instruments are contained in the control box, with engine controls directly below it. Relay controls are self-housed in a box on the skid. An auxiliary fuel valve is provided to allow for a large external fuel supply. The unit is equipped with a static type battery charger-regulator system to maintain batteries. This unit is electrically isolated for radio interference (figs. 1 and 2).

b. *Engine.* The engine is manufactured by Wisconsin Motor Corporation and is a qualified model MTHDE/218304. It is a 2 cylinder, air-cooled, 4-cycle gasoline engine with a 3 $\frac{1}{4}$ "



- | | |
|-------------------------------|--------------------------|
| 1 Control panel | 11 Manuals |
| 2 Engine assembly | 12 AC generator assembly |
| 3 Canvas cover | 13 Ground post |
| 4 Publication case | 14 Handcrank |
| 5 Shell and cover, receptacle | 15 Load terminal box |
| 6 Clamp | 16 Identification plate |
| 7 Pin, connector | 17 Identification plate |
| 8 Sleeve, connector | 18 Relay control box |
| 9 Insert, connector | 19 Fuel drum adapter |
| 10 Auxiliary fuel line | |

Figure 1. Generator set, right rear view.



SHIPPING DIMENSIONS

LENGTH	45 INCHES
WIDTH	29 INCHES
HEIGHT	34 INCHES
WEIGHT	895 POUNDS

- 1 Rain cap
- 2 Muffler
- 3 Exhaust pipe
- 4 Fuel tank
- 5 Battery charger assembly
- 6 Air cleaner access duct cover
- 8 Engine assembly

Figure 2. Generator set, left front view.

bore, 3 1/4" stroke, 53.9 cubic inch displacement which develops 12.6 net continuous brake horsepower at 3600 rpm. It is equipped with suitable accessories required for the proper operation and safety and is shock mounted to the frame. This engine is designed to accom-

modate military standard interchangeable high mortality service parts. The engine is protected by a temperature safety switch which will stop the engine should it become overheated. The basic engine has a completely integrated environmental housing with control

shutters for regulating air circulation for the engine. A panel opening is provided for blow torch warmup in extreme cold weather.

c. *Generator.* The Hol-Gar model 18970 generator is a single bearing, revolving field, 3600 rpm, synchronous type utilizing a conventional rotator exciter with hermetically sealed plug-in rheostatic voltage regulator. It has 6 leads that are connected to provide voltages listed in paragraph 5. The generator rotor is connected to the engine with a flexible disc type coupling to a hub which is keyed and pressed on the engine shaft. The exciter armature fits to the tapered end of the rotor shaft and is secured with a stud and external hardware. The rotor is electrically and mechanically balanced. The brushes, brush rigging, collector ring and commutator are readily accessible by removal of the end cover. The generator stator

housing is mounted to the engine block with an adapter and shockmounted on two feet to the skid base.

4. Identification

The generator set has four identification plates. The two Corps of Engineers plates, located on right side of control box specifies the official nomenclature, stock number, make, model, serial and electrical output characteristics. The engine identification plates, located on the front air shroud, specifies the manufacturer, model and serial numbers, and starting and stopping instructions for the engine. The generator plate, located on the left side of generator, specifies the manufacturer, model and serial number, and electrical outputs and connection data.

5. Tabulated Data

a. Generator Set.

Manufacturer	HOL-GAR Mfg. Corp.
Model	CE-56-AC
Part number	19440
Kilowatts	5
Voltage	120, 120/208, 240
Current	Alternating
Cycles	60
Duty	Continuous
Mounting	Tubular frame on skid base.

b. Engine.

Manufacturer	Wisconsin Motor Corp.
Model	MTHDE/Spec 218304
HOL-GAR identification	19165
Number of cylinders	2
RPM	3600
Fuel	Gasoline (regular) octane rating 74 or above
Rated horse power	16.8 at 3600 RPM, 60° F. (Fahrenheit)
Bore	3¼ inch
Stroke	3¼ inch
Displacement	53.9 cubic inches
Firing order	360° apart
Cooling	Air Cooled
Brake horsepower (Net)	12.6

c. Generator.

Manufacturer	HOL-GAR Mfg. Corp.
Model	18970
Type	ac (alternating current)
Cycles	60 (cycles per second)
Kilowatts	5
Voltage	240 single phase 2 wire 120 single phase 3 wire delta

120 three phase 3 wire delta
 208 three phase wye w/120 to neutral
 0.8
 65°C. (Centigrade)

d. Accessory Items.

Carburetor	Zenith Carburetor Div. 12956	
Fuel pump	Wisconsin Motor Corp.	Part No. LP 42C-S 1
Governor	Wisconsin Motor Corp.	Part No. T96G-S 1
Fuel strainer	Tillotson	Part No. OW418T
Oil filter	Fram Corp.	Model F21P
Air filter	United Specialties	Model 12B21
Starter	Delco Remy	X13494
	Wisconsin Motor Corp.	YA-47-A
Magneto	Fairbanks-Morse	Model FMPE1-2B73-C
Spark plug	Champion	Part No. XED16
Battery, 12 v, (2 req'd)	Military Standard	Part No. MS 35000-1
Polarity	Negative	

e. Capacities.

Crankcase	3½ qts (quart) with filter
Air cleaner	¾ qts
Fuel tank (approx)	7 gallons

f. Adjustment Data.

Tappets	
Inlet Valves	0.008 inch cold setting
Exhaust Valves	0.016 inch cold setting
Spark Plugs	0.030 inch
Magneto	0.015 inch

g. Nut and Bolt Torque Data.

Spark plugs	24 to 26 foot-pounds
Cylinder head	22 to 24 foot-pounds
Cylinder block	32 to 34 foot-pounds
Intake manifold	26 foot-pounds
Connecting rods	22 to 24 foot-pounds

h. Wiring and Schematic Diagrams.

Schematic	Figure 3
Wiring	Figure 3

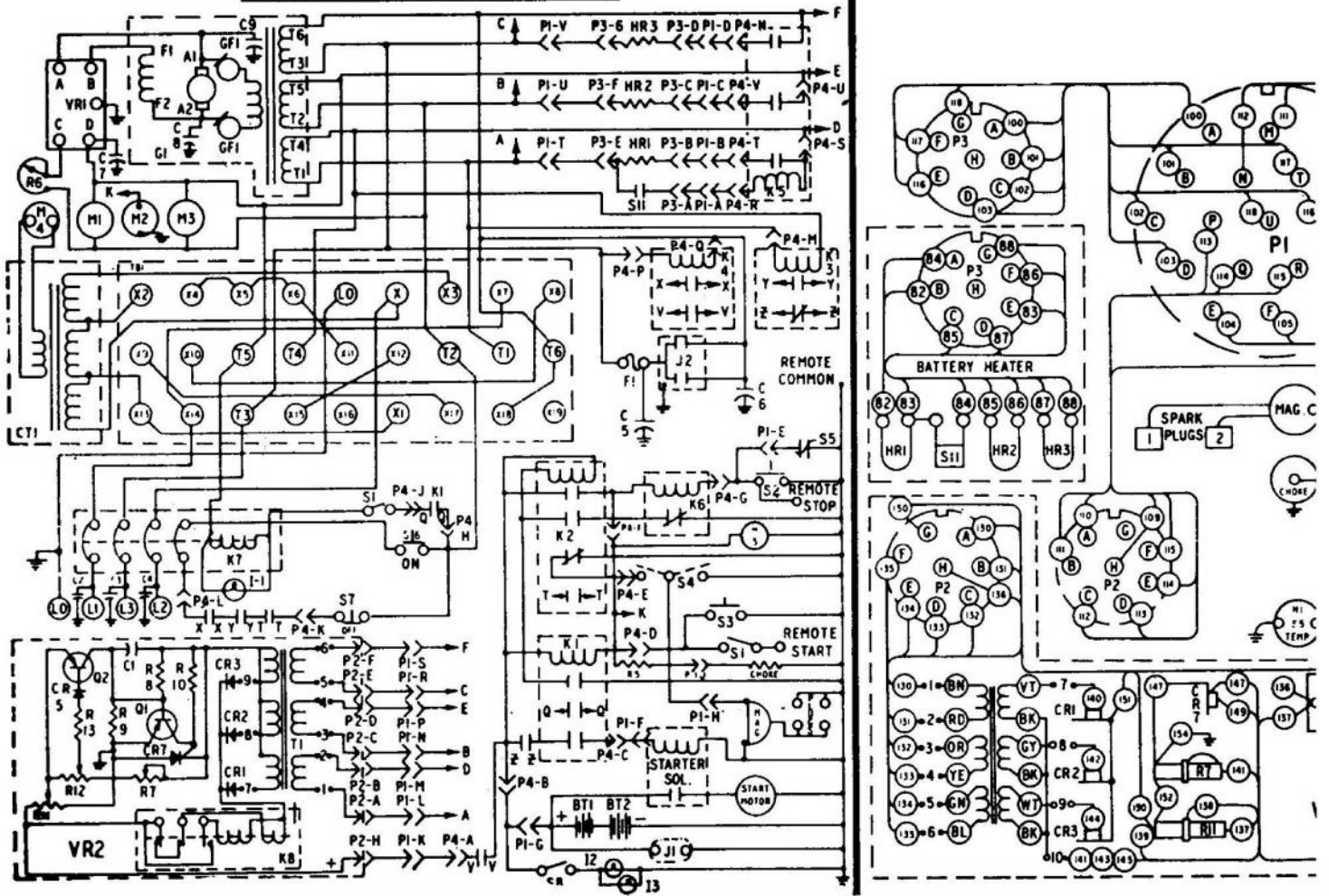
i. Shipping Dimensions. (Fig. 4)

Weight, Method C pack	775 lb (pound)
Method A, B pack ..	895 lb
Length	45 inches
Width	29 inches
Height	34 inches
Cube	30 inches

j. Performance Data.

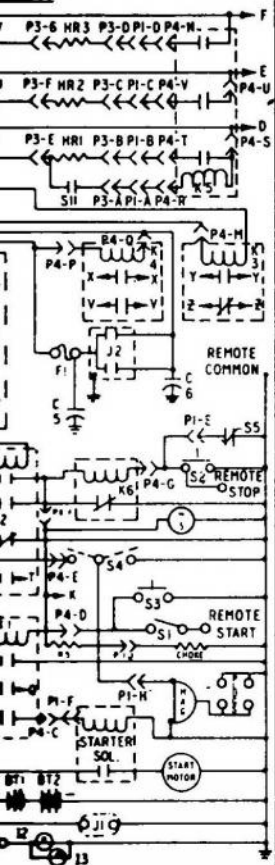
Power output	6.25 kva	
Connection	Volts	Amps
3 phase wye	120/208	17.3
3 phase delta	120	30
1 phase delta	120	52
1 phase zig-zag	240	26

SCHEMATIC DIAGRAM

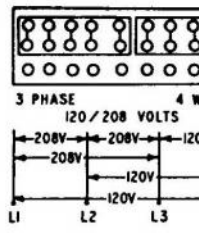
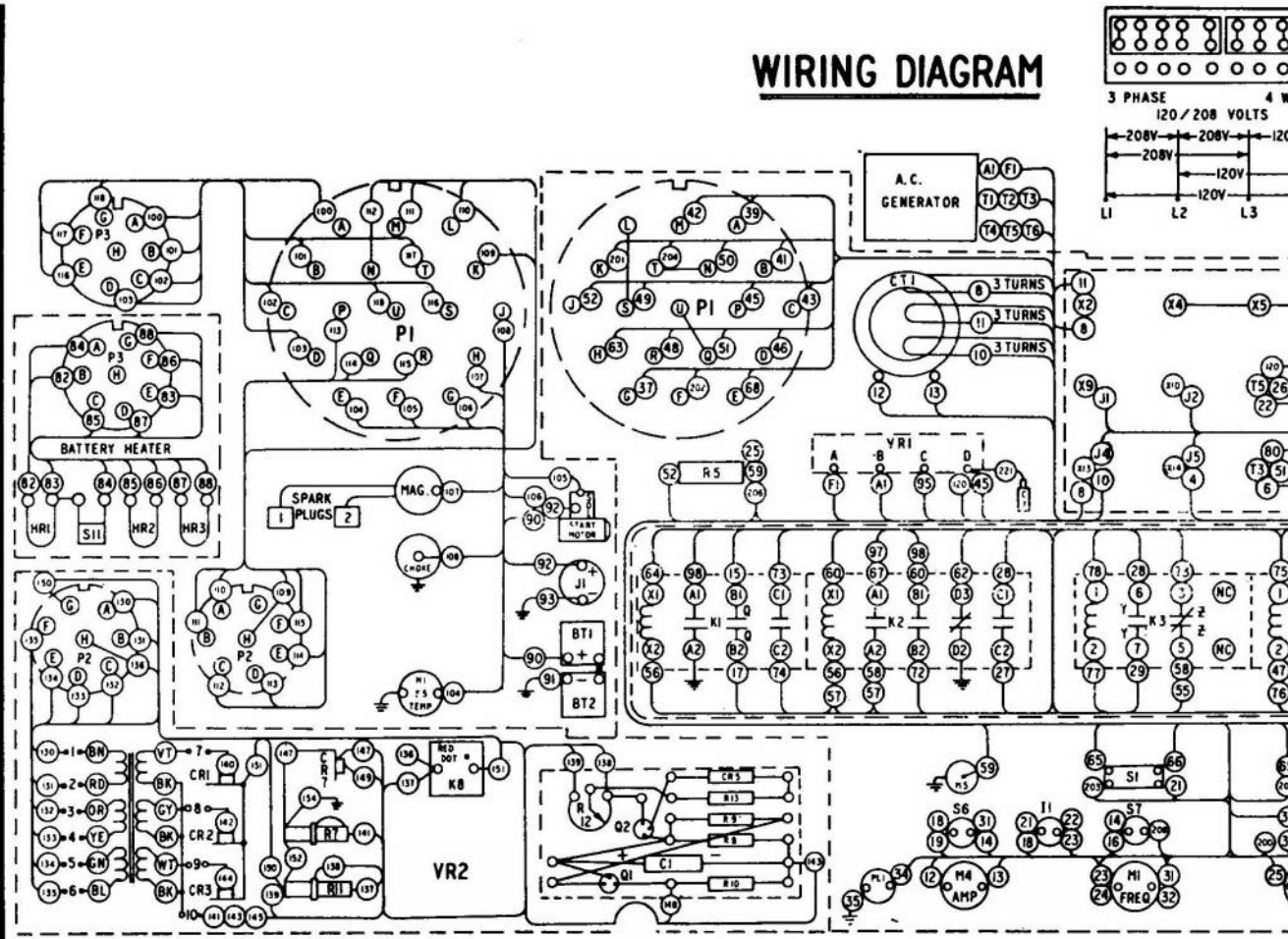


- | | |
|----------------------------|--------------|
| VR1 - AC VOLTAGE REGULATOR | P - CONNEI |
| R - RESISTORS OR RHEOSTATS | CT1 - CURREI |
| C - CAPACITORS | TB1 - CONNEI |
| G1 - GENERATOR | F1 - FUSE |
| M - METERS | J - DUPLI |

RAM



WIRING DIAGRAM

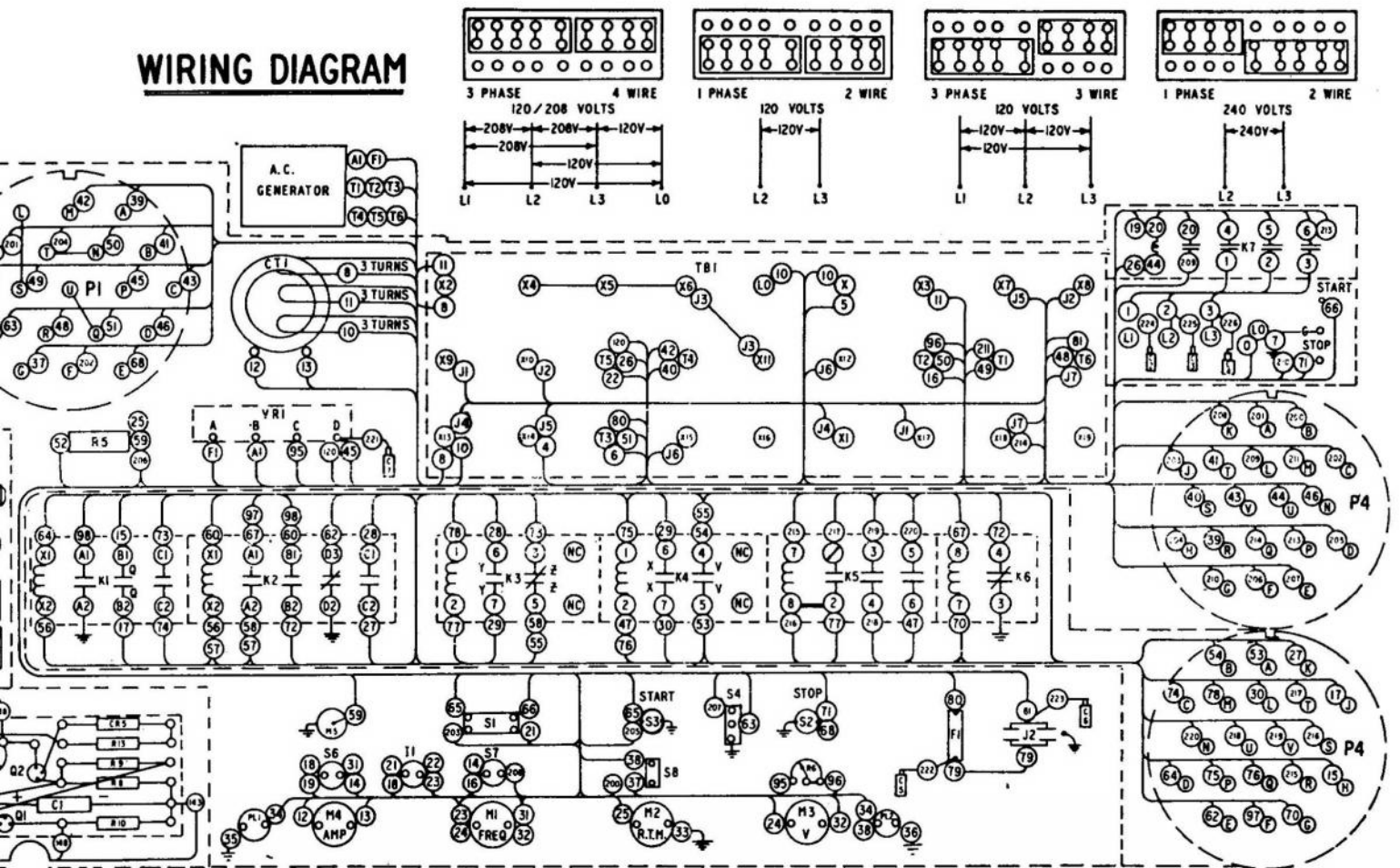


- VR1 - AC VOLTAGE REGULATOR
- R - RESISTORS OR RHEOSTATS
- C - CAPACITORS
- G1 - GENERATOR
- M - METERS

- P - CONNECTOR PLUG PINS
- CT1 - CURRENT TRANSFORMER
- TB1 - CONNECTION BOARD
- F1 - FUSE
- J - DUPLEX RECEPTICAL

- LO, L1, L2, L3 - LOAD TERMINALS
- VR2 - 24 VOLTAGE REGULATOR
- BT - BATTERY
- S - SWITCH
- K - RELAYS
- Q - TRANSISTORS
- CR - RECTIFIERS (DIODES)
- MAG - MAGNETIC
- I - INDICATOR

WIRING DIAGRAM

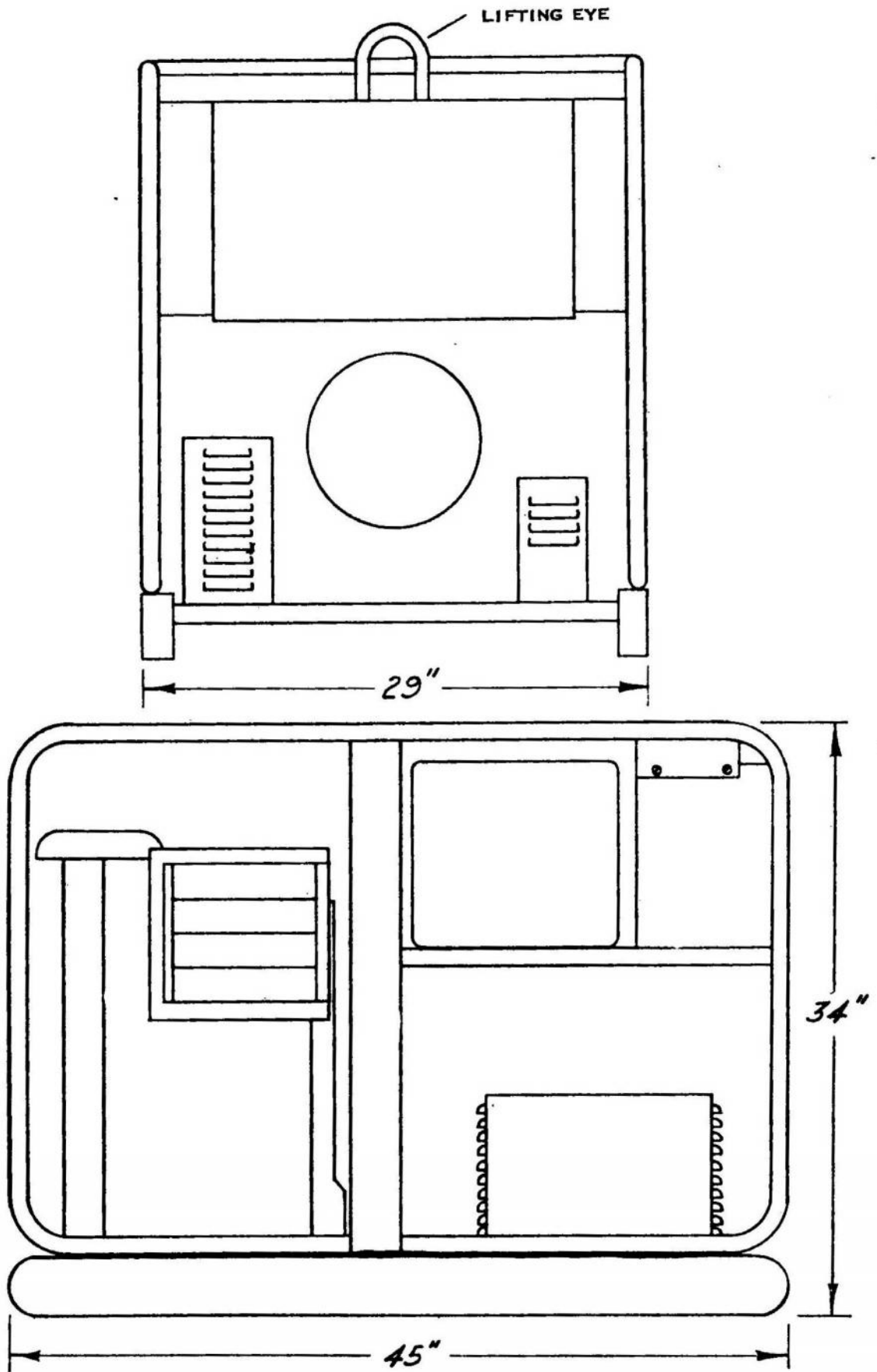


- LO, L1, L2, L3 - LOAD TERMINALS
- VR2 - 24 VDC BATTERY-CHARGER
- S - SWITCH
- BT - BATTERY
- K - RELAYS
- MAG - MAGNETO
- Q - TRANSISTORS
- I - INDICATOR LIGHTS
- CR - RECTIFIERS (DIODES)

MEC 6115-312-15/3

Figure 3. Schematic and wiring diagram.

THIS PAGE LEFT BLANK INTENTIONALLY



MEC 6115-312-15/4

Figure 4. Shipping dimensions.

CHAPTER 2

INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

6. Unloading Equipment

a. The generator set may be crated or secured to a wooden pallet. Before lifting the generator set, remove any tie downs and blocking that secure the crate or pallet to the carrier.

b. The equipment may be lifted by crane or forklift. When lifting a crated equipment, place slings carefully around the crate and draw the slings together at the top. Attach a lifting hook to the slings and lift crate slowly away from carrier. To unload an uncrated equipment, place the lifting hook of the overhead hoist or crane (1000 lbs capacity) through the lifting eye located top center of the equipment (fig. 4).

c. Unload the equipment as close to the installation site as practical to minimize possible handling damage and manual effort.

7. Unpacking Equipment

a. The packing and crating of the generator set varies between domestic and overseas shipments. Care should be taken in unpacking not to damage the equipment.

b. Remove seals, preservative compounds, and process tape from openings. Clean away preservative Compound with a soft cloth saturated with an approved cleaning solvent. Do not allow solvent to enter electrical components nor saturate wiring insulation.

c. Depreservation guide, DA Form 2258, is furnished with the generator. Accomplish depreservation as outlined in the guide.

8. Inspection of Equipment

Perform the daily preventive maintenance services (para 48). Inspect the engine, generator and accessories for loss, looseness, improper fit, or signs of physical damage. Check

the unit for loose connection and insecure mountings. Tighten and secure as required.

9. Servicing Equipment

a. *General.* After operational inspection is completed at the factory, the fuel and lubrication oil are drained from the respective systems. Perform the following installation and operational services, before placing the generator set into operation.

b. *Spark Plugs.* Due to certain shipping and packaging requirements, spark plugs may be removed. If spark plugs have been removed; clean spark plug ports, adjust spark plug gaps, and install. The gap setting is 0.030 inch and tightening torque 24 to 26 foot-pounds.

c. *Fuel.* Fill the fuel tank (4, fig. 2). Take precaution to keep dirt and water out of the fuel and fuel tank during the filling operation. Note that the fuel tank cap has an air vent that may be placed in the open or closed position. Be sure valve is in the open position.

Warning: Do not fill the fuel tank while the generator set is in operation. Gasoline spilled on a hot engine may explode and cause injury to personnel, provide a metal-to-metal contact to the container and fuel tank when filling. This will prevent a spark from being generated as fuel flows over the metallic surface.

d. *Lubrication.* Lubricate the generator set according to the lubrication order (fig. 8).

10. Installation or Setting-Up Instructions

a. *Site Considerations.* Consider the following when selecting and preparing the installation site for the generator set.

- (1) To reduce transmission line electrical losses, place the generator set as close as possible to the load it is to operate.

- (2) The generator set is weather-resistant. However, it is recommended the generator set be placed in adequate shelter to protect unit from climatic and local conditions. The shelter must be ventilated to admit sufficient air for engine combustion and cooling, also to allow heated air and exhaust fumes to escape.

Warning: Do not operate set in an enclosed building unless the exhaust gases are piped to the outside. Exhaust gases contain carbon monoxide, which is a poisonous, odorless, colorless deadly gas. Continued breathing of exhaust fumes is dangerous.

- (3) To ensure an adequate fuel supply, install auxiliary fuel tank or tanks of sufficient capacity to meet operating conditions. Consider installation of the tanks as near the shelter as practicable. Be sure the bottom of the tank is not lower than four feet from the fuel pump on the installed generator set. Connect the fuel line from the auxiliary fuel supply to the auxiliary fuel valve located on the left side of the unit.
- (4) If the generator set is installed in an existing shelter, be sure the bearing surface can support the weight of the unit.
- (5) Since the generator set is a portable unit and designed for transient operation, no special foundation is required. However, place the generator set on

firm dry ground, using planks, timbers or gravel as necessary. Provide for water drainage away from the unit.

b. *Mounting.* The generator set should be level in both planes of the frame base and the base supported on its entire surface. If necessary, the frame may be secured to a suitable base.

c. *Power Transmission Cables.* Use a No. 10 AWG wire size as a minimum cable size. No. 10 AWG wire causes approximately one volt drop for every 25 feet, at full load operation. Increase size of cables to No. 8 and 6 to minimize voltage drop if distances to load are longer.

d. *Ground Connection.* Install a ground cable, a No. 6 AWG bare copper wire, from the ground post (13, fig. 1) to a ground rod ($\frac{5}{8}$ " solid or $\frac{3}{4}$ " pipe to minimum depth of 9 ft) or water pipe. Do not use fuel lines for grounding purposes.

11. Equipment Conversion

a. *General.* The generator set has four output phase and voltage combinations. Selection is made by means of a terminal board located inside the control panel (3, fig. 23 and TBI, fig. 3). Different load terminal connections are necessary for different outputs.

Warning: Do not attempt to change the terminal board adjustments or output connections while the generator is operating.

b. *Phase and Voltage Selection.* To obtain the desired phase and voltage outputs, refer to (fig. 5) and position the patch boards on the change over terminal board as illustrated.

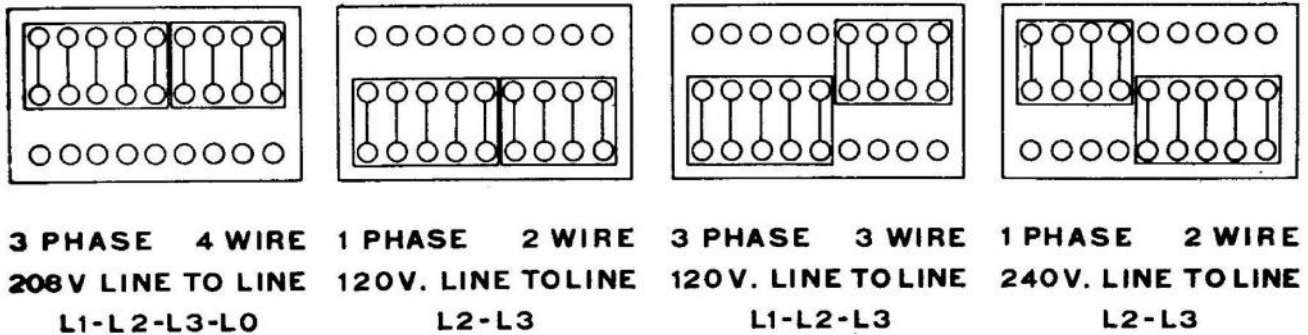
Section II. CONTROLS AND INSTRUMENTS

12. General

This section describes, locates, illustrates, and furnishes the operator with sufficient information about the various controls and instruments for the proper operation of the generator set.

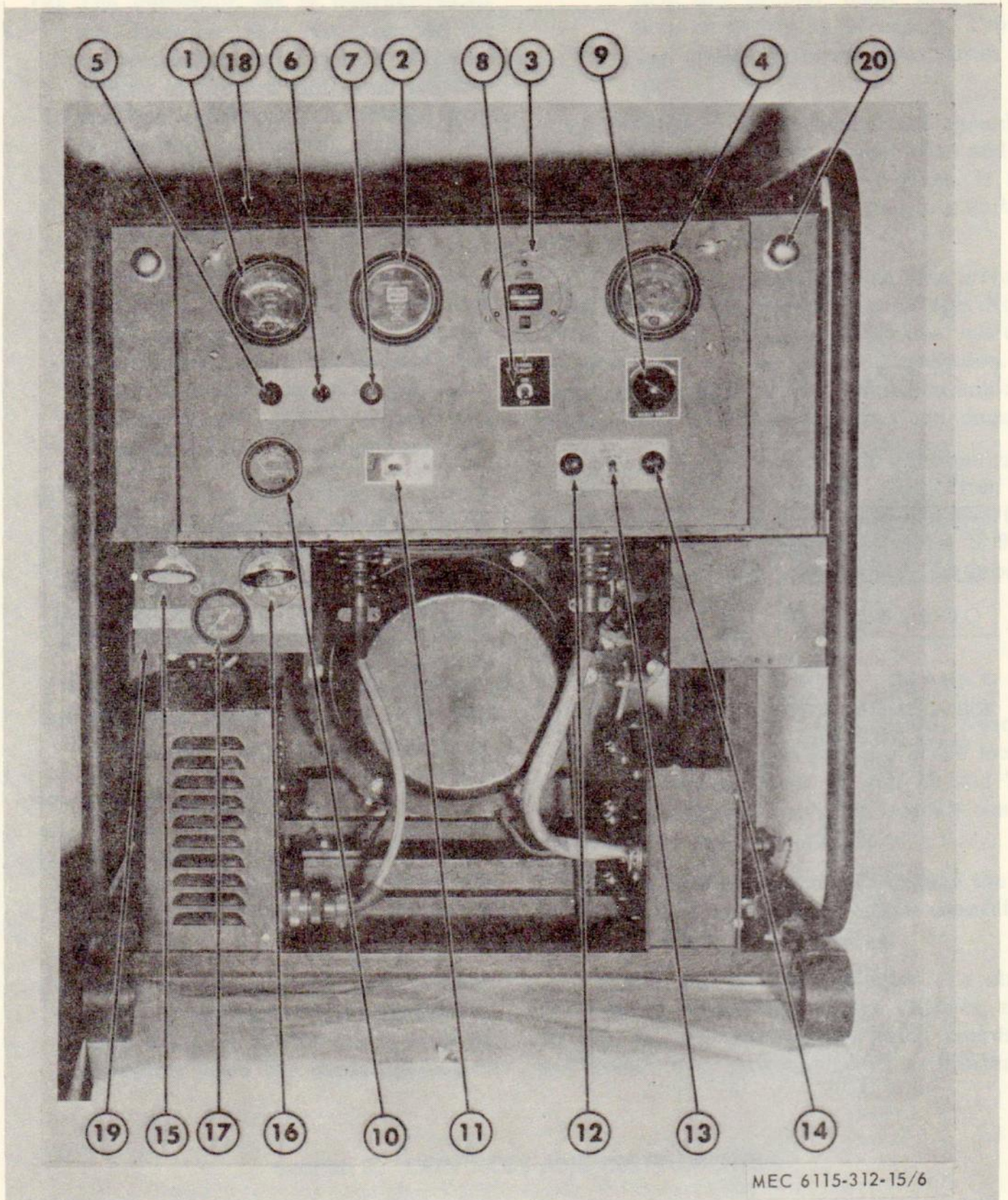
13. Ammeter

The meter (1, fig. 6) is a glass enclosed, needle-indicating type of ammeter, mounted on the control panel. It indicates the output current that the generator set is providing for the total particular load. It has a 0— $\frac{1}{4}$ — $\frac{1}{2}$ — $\frac{3}{4}$ full load scale. Normal readings may vary be-



MEC 6115-312-15/5

Figure 5. Phase and voltage connection diagram.



MEC 6115-312-15/6

- | | | | |
|----|------------------------------|----|--------------------------------|
| 1 | Ammeter | 11 | Local remote starting switch |
| 2 | Frequency meter | 12 | Engine start switch |
| 3 | Time totalizing meter | 13 | Engine start selection switch |
| 4 | Voltmeter | 14 | Engine stop switch |
| 5 | Load on switch | 15 | Throttle |
| 6 | Load indicating light | 16 | Choke |
| 7 | Load off switch | 17 | Cylinder head temperature gage |
| 8 | Panel lights on-off switch | 18 | Fuel tank cap valve |
| 9 | Increase adjust voltage knob | 19 | Engine control panel |
| 10 | Battery charging gage | 20 | Lights |

Figure 6. Controls and instruments.

tween 0 and full load, and the ampere output can be determined by referring to the tabulated data, as the full current output varies with voltage phase connections. Readings in the red portion of the scale indicate the generator set is operating at overload.

14. Frequency Meter

The frequency meter (2, fig. 6) is a vibrating reed type of meter. It has a scale calibrated from 57 to 63 and indicates the frequency of the generator output in cycles per second. Normal reading is 60 cycles.

15. Time Totalizing Meter

The meter (3, fig. 6) records the total number of hours that the generator set has been in operation. The time recorded is a guide for making operational checks and periodic inspections.

16. Voltmeter

The voltmeter (4, fig. 6) indicates the voltage that is produced and available at the generator set. It has a 0—30—60—90—120—150 scale with a long line marking the normal full load voltage which is 120 volts. The generator set may operate at load between 0 load and rated loads at voltages between 114 and 126 volts.

17. Load on Switch

The load on switch (5, fig. 6) is a push button type switch. With the generator set operating, depressing the push button connects the output of the load terminal to the load.

18. Load Indicating Light

The load indicating light (6, fig. 6) provides a visual indication when the output of the generator is connected to the load. The light is illuminated when the load is connected to the generator.

19. Load Off Switch

The load off switch (7, fig. 6) is a push button switch similar to the load on switch. Depressing the load off switch, disconnects the

load from the output of the load terminals.

20. Panel Lights On-Off Switch

The panel light on-off switch (8, fig. 6) is a two position toggle switch (on and off) and is used by operator to control the panel lights.

21. Increase-Adjust Volt Knob

The increase-adjust volt knob (9, fig. 6) provides manual adjustment to the regulated output voltage. Manipulation of this knob varies the exciter field voltage, thus the output voltage. Rotating the knob left, decreases voltage; rotating right, increases voltage. Normal voltage output is 120 volts.

22. Battery Charging Gage

The battery charging gage (10, fig. 6) is a needle-indicating, electric current actuated gage. The face of the gage is divided in yellow, green and red portions. Under normal operating conditions the gage will indicate in the yellow or green areas of the gage. When the needle is in the yellow and green areas, it indicates the equipment batteries are charging, while in the red the batteries are being charged at a high rate or indicates trouble in the charging system.

23. Local-Remote Starting Switch

The local-remote starting switch (11, fig. 6) is a two position toggle switch. In the local position the generator set is started and stopped by the controls contained on the equipment. While in the remote position and the utilization of accessory wiring, the generator set may be started and stopped at some remote position, possibly at the load itself.

24. Engine Start Switch

The engine start switch (12, fig. 6) is a push button type switch. It completes the circuit from the batteries to starter solenoid when depressed.

25. Engine Start Selection Switch

The engine start selection switch (13, fig. 6) is a three position toggle switch. The switch

should be placed in the up or normal operation position. For hand-crank starting of engine, the switch should be placed in the center or hand crank emergency run position. Also, in this position the generator set will operate with the safety devices disconnected electrically. In the event of emergency requiring a sudden shut down of the generator set, the switch is placed in the down or emergency stop position. This disconnects the load and stops the engine.

Caution: Repeated sudden stops by the emergency stop will cause damage to the generator set. Always remove load from generator, pull throttle out to allow engine to run at slow speed, then stop.

26. Engine Stop Switch

The engine stop switch (14, fig. 6) is a push button type switch. This switch is depressed to stop the engine, by completing the magneto grounding circuit and disconnecting all the generator circuits consecutively.

27. Throttle

The manual throttle (15, fig. 6) is a manually operated lever used by the operator for manual speed control during warm up. The throttle is placed full in at rated speed, $\frac{3}{4}$ way out for warm up and full out for engine idle speed.

28. Choke

The choke control (16, fig. 6) is connected

to the choke plate on the carburetor by a flexible steel wire and is used by the operator while starting the engine. The choke control is placed full in for automatic choke operation. When manually pulled full out the carburetor is fully choked and unchoked in the half-way out position.

29. Cylinder Head Temperature Gage

The cylinder head temperature gage (17, fig. 6) is calibrated from 250 to 400°F. Normal cylinder head temperature is between 300 and 350°F.

30. Fuel Selector Valve

The fuel selector valve (6, fig. 2) is a 3-way valve marked OFF-AUXILIARY-TANK. This valve connects the external or internal fuel supply to the engine and to close fuel supply completely. When using fuel from an auxiliary source the valve is placed in auxiliary position. In tank position the valve connects the generator set tank to the engine. Place the lever in the OFF position when the generator set is not operating. A cap is provided to cover the auxiliary fuel line port of the valve.

31. Fuel Tank Cap Valve

The fuel tank cap valve (18, fig. 6) is a two position valve marked OPEN-NORMAL and closed. This valve permits the opening or closing of fuel tank air vent. Valve should be placed in open position when using fuel from the generator set tank.

Section III. OPERATION UNDER USUAL CONDITIONS

32. Starting

a. Check the oil level of the engine crankcase by removing and reading oil dipstick. Add oil if required (fig. 8). See that all engine shutters are in place; all shutters must remain in place for engine operation.

b. See that the fuel tank (4, fig. 2) or external supply is filled with a good grade of regular gasoline of at least 75 Octane reading. Premium fuels are not required and highly leaded fuels should be avoided.

c. Be sure the generator set is properly grounded (para. 10d).

d. Check outgoing load cables and external load circuits to ensure that no short circuit possibility exists. See that connections are secure.

e. See that shelter (if used) ventilation facilities are in order.

f. Check exhaust lines (if used); see that exhaust is directed out and away from shelters.

g. Rotate INCREASE ADJUST VOLT KNOB (9, fig. 6) to left stop position.

h. Turn the fuel selector valve (6, fig. 2) to AUXILIARY or TANK depending upon where fuel supply is to be obtained.

i. If generator set fuel tank is to be used, be sure fuel tank cap valve (18, fig. 6) is in the OPEN-NORMAL position.

j. Place local-remote starting switch (11, fig. 6) in the LOCAL position.

k. Place the engine start selector switch (13, fig. 6) in the up or NORMAL OPERATION position.

l. Pull choke (16, fig. 6) out approximately three quarters. In cold weather, it may be necessary to pull the choke control out further.

m. Set throttle (15, fig. 6) approximately three quartered position out.

n. Depress engine start switch (12, fig. 6).

o. Should the carburetor become flooded during starting operation, open the choke by placing it in the one-half way position and open the throttle control full. Turn engine several times to clear excess fuel.

p. After start is attained and as engine warms, remove amount of choke. Allow engine to warm thoroughly in idle position until it runs smoothly without benefit of choke.

q. Push throttle control all the way in to rated speed position.

r. Regulate adjust volt knob to attain proper voltage on the voltmeter.

s. Connect the load by depressing the load on switch (5, fig. 6).

t. Check the load meter to see that it is within the rated operation and capacity.

u. As temperature of various control components stabilize and cause slight variations, check and adjust voltage after the unit has operated under full load for a short time.

33. Stopping

a. Decrease load by turning off components using electricity. Depress load off switch (7, fig. 6).

b. Pull throttle out to allow engine to run at idle or slow speed for a moment.

c. Stop engine by depressing engine stop switch (14, fig. 6) until engine stops completely.

d. Turn fuel selector valve to the off position.

34. Operating Details

a. Refer to figure 5 for connections to be made to terminal board for desired phase and voltage output.

b. Insert the load lines through port in the bottom of terminal box containing the load terminal posts (1, fig. 7).

c. Loosen the nuts on terminals L1, L2, L3 and L0 as required (fig. 5). Insert the bared ends of the load lines under the nuts and tighten the nuts.

Warning: Do not install or change load cables while the generator set is operating.

d. The duplex receptacle (10, fig. 7) are 15 ampere, 120 volts and may provide power for electrically operated hand tools.

e. Start the engine (para 32).

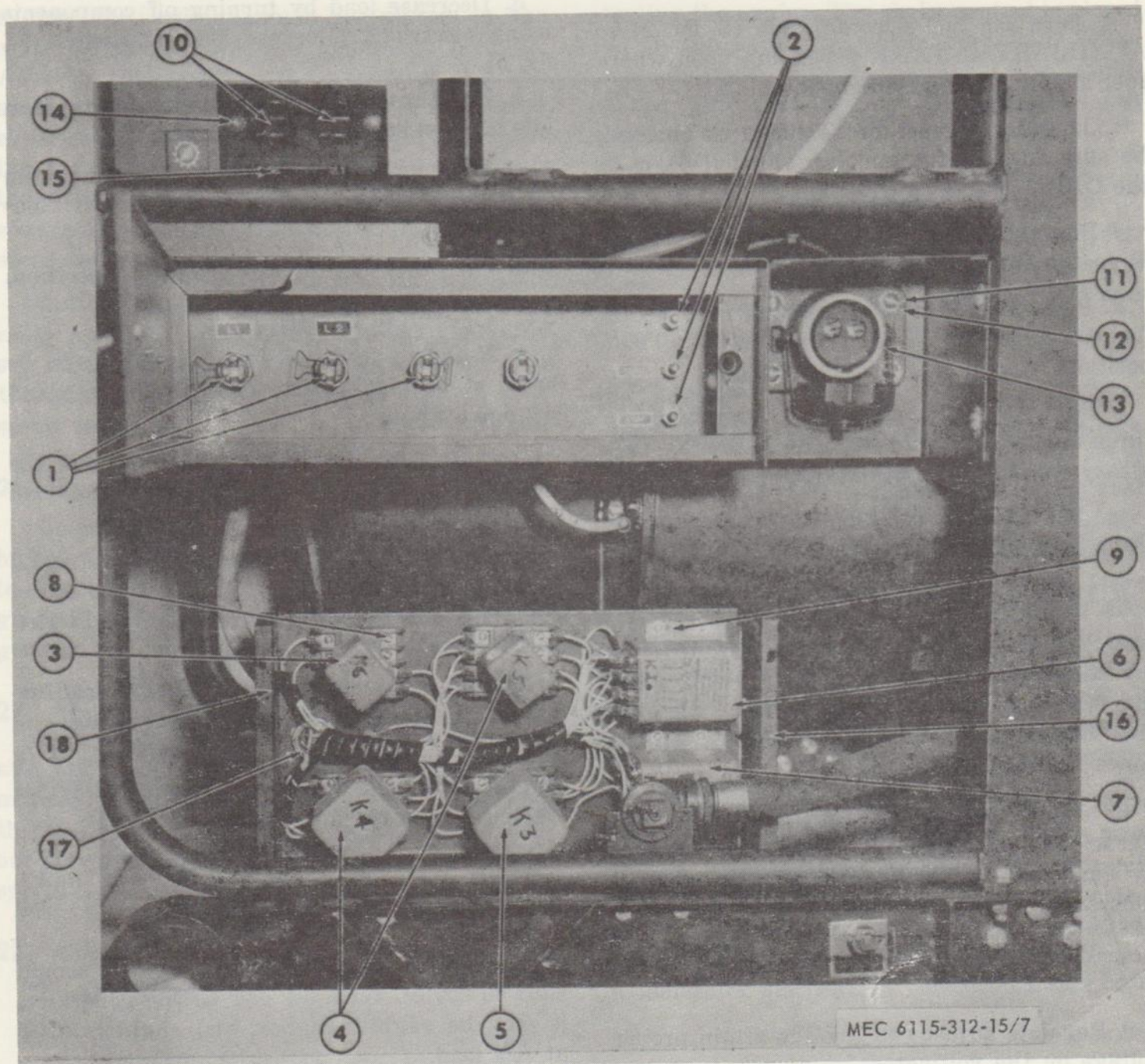
f. Regulate adjust volt knob (9, fig. 6) until voltmeter (4) reads 120 volts.

g. Check the frequency meter (2). It should read 60 cycles. With no load on the generator, it may be slightly higher, and slightly lower at full load.

Note. If the engine speed is too high or too low, as indicated by the frequency meter, adjust the governor control lever.

h. Connect the load by depressing "load on" push button.

Caution: Do not operate the generator set with a load meter indication of more than full load. If the load meter indicates an over load, shut down the unit and trouble shoot for conditions causing the over load.



- 1 Load terminal post
- 2 Remote control terminals
- 3 Relay
- 4 Relay
- 5 Relay
- 6 Relay
- 7 Relay
- 8 Relay socket
- 9 Screw, nut, and lockwasher

- 10 Duplex receptacle
- 11 Screw
- 12 Lockwashers and nut
- 13 Slave receptacle
- 14 Screw and nut
- 15 Identification plate
- 16 Relay box
- 17 Connector
- 18 Box, relay

Figure 7. Load and remote terminals and relay box.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

35. Extreme Cold

(below 0° F.)

a. Lubrication. In extreme cold, refer to the current lubrication chart for the grade of oil suitable for the lowest expected ambient temperature.

b. Fuel System. Keep the fuel tank filled with gasoline. Keeping the fuel tank well filled will help reduce condensation within the tank. Clean the fuel strainer bowl more frequently during extreme cold weather.

c. Electrical System. Remove any ice that may have accumulated on the spark plugs and wiring. Avoid moving wiring as much as possible.

d. Starting With Blow Torch. When cold weather warmup is required insert nozzle of torch through panel opening in engine housing and secure torch to hook. Be sure flame baffle in engine is in full open position. Refer to paragraph 40 for operation of blow torch.

Warning: Keep the flame away from fuel tank and fuel tank cap to avoid fire or explosion.

e. Engine. Once engine is started, allow engine to warm up before applying load to generator.

36. Extreme Heat

a. Lubrication. Refer to the current lubrication order for specific lubrication instructions.

b. Cooling Systems. Keep the generator set clean and free of dust and dirt. Provide adequate space around the unit for maximum

air circulation. Be sure air shroud and shutters are free from foreign matter that might impede the flow of air.

37. Dusty or Sandy Areas

a. Cooling System. Inspect the air shroud and cooling fins for clogging, and clean if necessary.

b. Fuel System. Service the fuel strainer bowl often to keep bowl free of sand and grit. Take necessary precautions to prevent sand and dust from entering the fuel tank.

c. Air Cleaner. Service the air cleaner frequently.

38. Salt Water or High Humidity

a. Salt Water. Salt water causes corrosive action on metal. Care must be taken to avoid contact between the generator set and salt water. If contact is made, or if the unit is exposed to salt water spray, wash the unit with fresh clean water.

b. Humidity. When the generator set is operated outdoors, erect a shelter if possible. Protect the generator set with the waterproof canvas cover when not in operation. Keep the fuel tank full to reduce condensation.

39. High Altitudes

The unit is designed to operate at rated capacity to 5,000 feet altitudes. Because of thinner air at higher altitudes, the carburetor may require an adjustment providing a leaner mixture. Maximum performance can be maintained above 5,000 feet by following all service instructions carefully.

Section V. OPERATION OF AUXILIARY MATERIEL USED IN CONJUNCTION WITH THE GENERATOR SET

40. Blowtorch

a. General. The blowtorch is used to pre-heat the engine base and cylinder block to raise the engine temperature to a point at which the starting parts will operate freely.

b. Operation. This is a typical procedure for starting a blow torch. Always consult instructions provided with torches.

- (1) Close needle valve by turning handle clockwise.

- (2) Remove filler cap and pump assembly and fill tank three-fourths full with white gasoline. Install and tighten pump assembly.
- (3) Operate pump 5 to 10 strokes to build up pressure in the tank.
- (4) Open the needle valve slightly by turning the handle counterclockwise to allow the cup to fill with fuel. Two full turns should be sufficient.
- (5) Close needle valve and ignite the fuel in the cup. Allow to burn until the flame is almost out.
- (6) Open the needle valve to start the burner.

- (7) If a yellow flame results, pump additional air into the tank.
- (8) To extinguish the flame, close the needle valve gently until the flame is out.

41. Fire Extinguisher

This generator set is not authorized a fire extinguisher.

42. Fuel Drum Adapter

The fuel drum adapter (19, fig. 1) is used to obtain fuel from a standard 50-gallon drum or the standard 5-gallon blitz can. Use one section for 5-gallon can and two sections for 50-gallon drum. Separate two sections when storing on unit.

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND LUBRICATION

43. Special Tools and Equipment

No special tools or equipment are required by the operator or organizational maintenance personnel for the maintenance of the generator set.

44. Lubrication Information

a. General Lubrication Information. Figure 2 lubrication order specifies lubrication points, lubricants and intervals instructions. Additional paragraphs contains instructions which are supplemental to, and are not specifically covered by the lubrication order.

b. Detailed Lubrication Information.

- (1) Care of Lubricants and Lubricating Equipment. Keep all lubricants in closed containers and stored in a clean, dry area, away from heat. Do not allow dirt, dust, water, or other foreign material to come in contact with lubricants at any time.
- (2) Clean all surfaces surrounding the points to be lubricated before applying the lubricant. Use an approved cleaning solvent to wash the surfaces. Wipe off all excess lubricant after lubricating.
- (3) Points of Application. Follow the detailed lubrication instructions given for each lubrication point. Apply the lubricant recommended in the lubrication order.
- (4) Operation After Lubrication. Operate the generator set for five minutes immediately after lubrication. Check the oil filter for leaks and correct as necessary. Stop the generator set and check the oil level. Add oil, if necessary, to bring oil level up to the FULL mark.

45. Air Cleaner

- a. Remove air cleaner access duct cover (7, fig. 2)
- b. Remove the wing nut (1, fig. 9).
- c. Remove the air cleaner cap and filter assembly (2, fig. 9) from the oil cup.
- d. Remove oil cup (5) and discard the oil in the oil cup. Do not lose filter gasket (3) or mounting gasket (6).
- e. Wash the oil cup and cap and filter assembly with an approved cleaning solvent and shake dry.
- f. Position cup (5) and gasket (6) on air cleaner bracket (7). Fill the oil cup to the level indicated by the marks on the inside of the cup. Refer to lubrication order for the correct oil.
- g. Install the air cleaner cap and filter assembly unit (2) with gasket (3) in the oil cup and replace the wing nut (1).

46. Oil Filter, Drain and Fill Lines

- a. Remove the cap screw (1, fig. 10) and gasket (2) which secure the cover assembly (3).
- b. Remove the cover assembly (3) gasket (4), and spring, (43) from body assembly (6).
- c. Remove the filter element (5) from the body and discard. Do not remove spacer from center tube.
- d. To remove oil from the body assembly, soak it up with clean cloths. Clean the inside of the body assembly with a cloth dampened with an approved cleaning solvent. Be sure all dirt and sludge is removed.
- e. Install a new filter element (5) and cover gasket (4).

f. Position spring (43) and cover assembly (3) on body. Replace capscrew (1) with new gasket (2) and tighten.

g. Operate engine for 5 minutes. Check filter assembly for leaks, correct as necessary. Stop engine and check crankcase oil level, add oil if necessary.

LUBRICATION ORDER

L05-6115-312-15

22 JANUARY 1965

**GENERATOR SET, GASOLINE DRIVEN: 5 KW, AC, 60 CYCLE;
120, 208 V, 3 PHASE; SKID MOUNTED
(HOL-GAR MODEL CE-56-AC)
(W/WISCONSIN ENGINE MODEL MTHDE 218304)**

Reference: C9100-1L

Intervals are based on normal operation. Reduce to compensate for abnormal operations and severe conditions. During inactive periods sufficient lubrication must be performed for adequate preservation.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, diesel. Dry before lubricating.

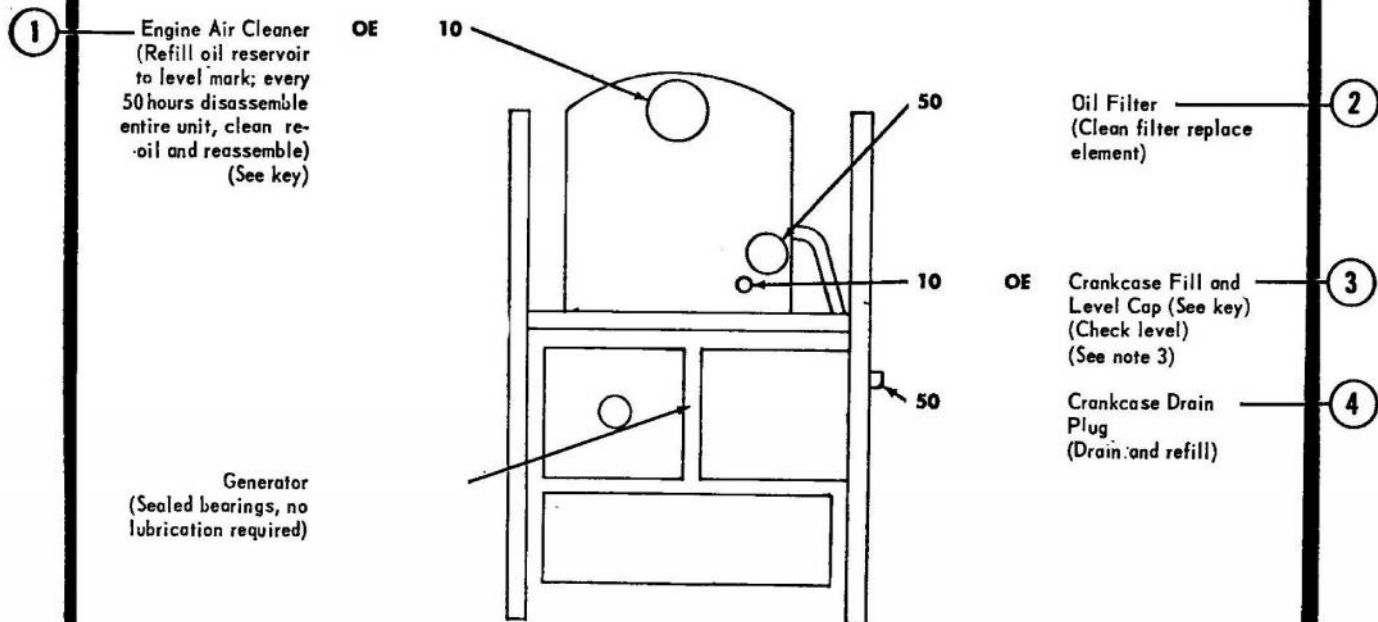
Relubricate after washing.

Clean fittings before lubrication.

Drain crankcase when hot. Fill and check level.

LUBRICANT • INTERVAL

INTERVAL • LUBRICANT



CONTINUED ON
FOLLOWING PAGE

MEC 6115-312-15/8 ①

Figure 8. Lubrication order.

CONTINUED FROM
PRECEDING PAGE

— KEY —

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
OE -OIL, Engine, Heavy Duty		OE 30 or 9250	OE 10 or 9110	OES	Intervals given are in hours of normal operation.
Crankcase	4-1/2 qts.				
Air Cleaner	1/6 qt.				
Oil Can Points					
OES -OIL, Engine, Subzero					

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10° F. Remove lubricants prescribed in the key for temperatures above -10° F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10° F.

2. OIL CAN POINTS. Every 100 hours, lubricate the controls, linkage, and all exposed adjusting threads with OE.

3. When checking oil level, insert bayonet gage with full and low markings toward front of engine, otherwise inconsistent readings will be obtained.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF SECRETARY OF THE ARMY:

HAROLD K. JOHNSON
General, United States Army,
Chief of Staff

OFFICIAL:

J.C. LAMBERT
Major General, United States Army,
The Adjutant General

MEC 6115-312-15/8 (2)

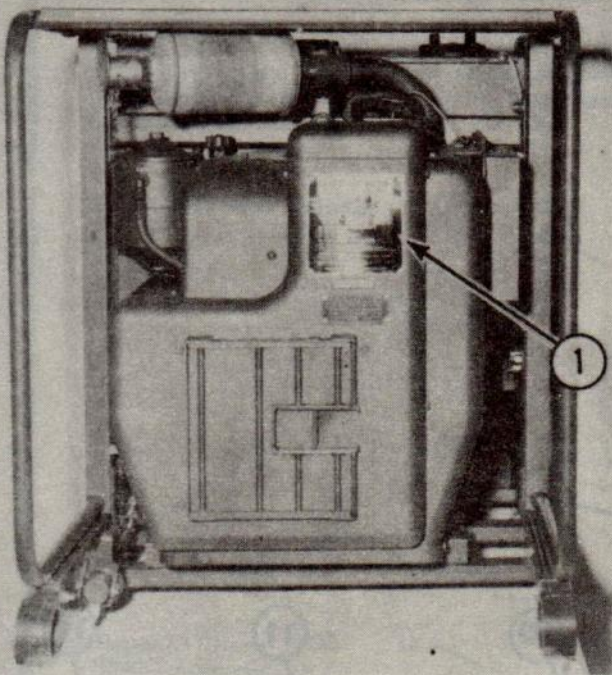
Figure 8—Continued

LUBRICATION
ORDER

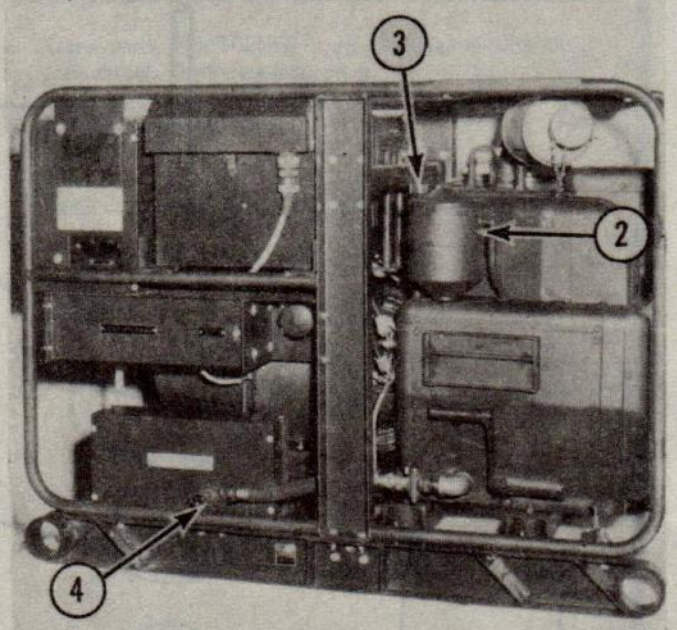
105-6115-312-15

22 JANUARY 1965

GENERATOR SET, GASOLINE DRIVEN: 5 KW, AC, 60 CYCLE;
120, 208 V, 3 PHASE; SKID MOUNTED
(KOL-GAR MODEL GE-50-AC)
(W/WISCONSIN ENGINE MODEL ENDE 218304)



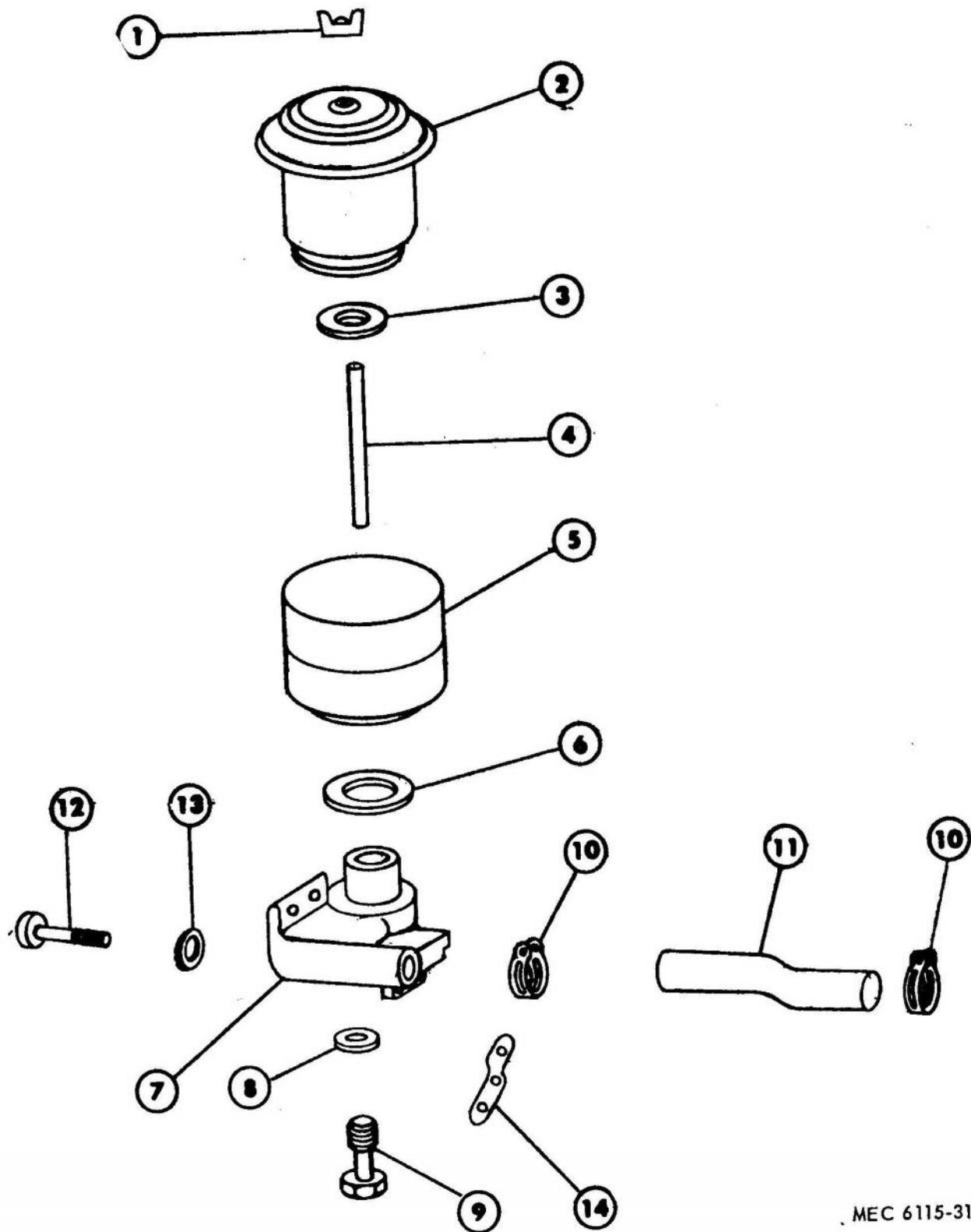
REF 1. AIR CLEANER.



REF 2. OIL FILTER.
REF 3. CRANKCASE FILL AND LEVEL CAP.
REF 4. CRANKCASE DRAIN PLUG.

MEC 6115-312-15/8

Figure 8—Continued

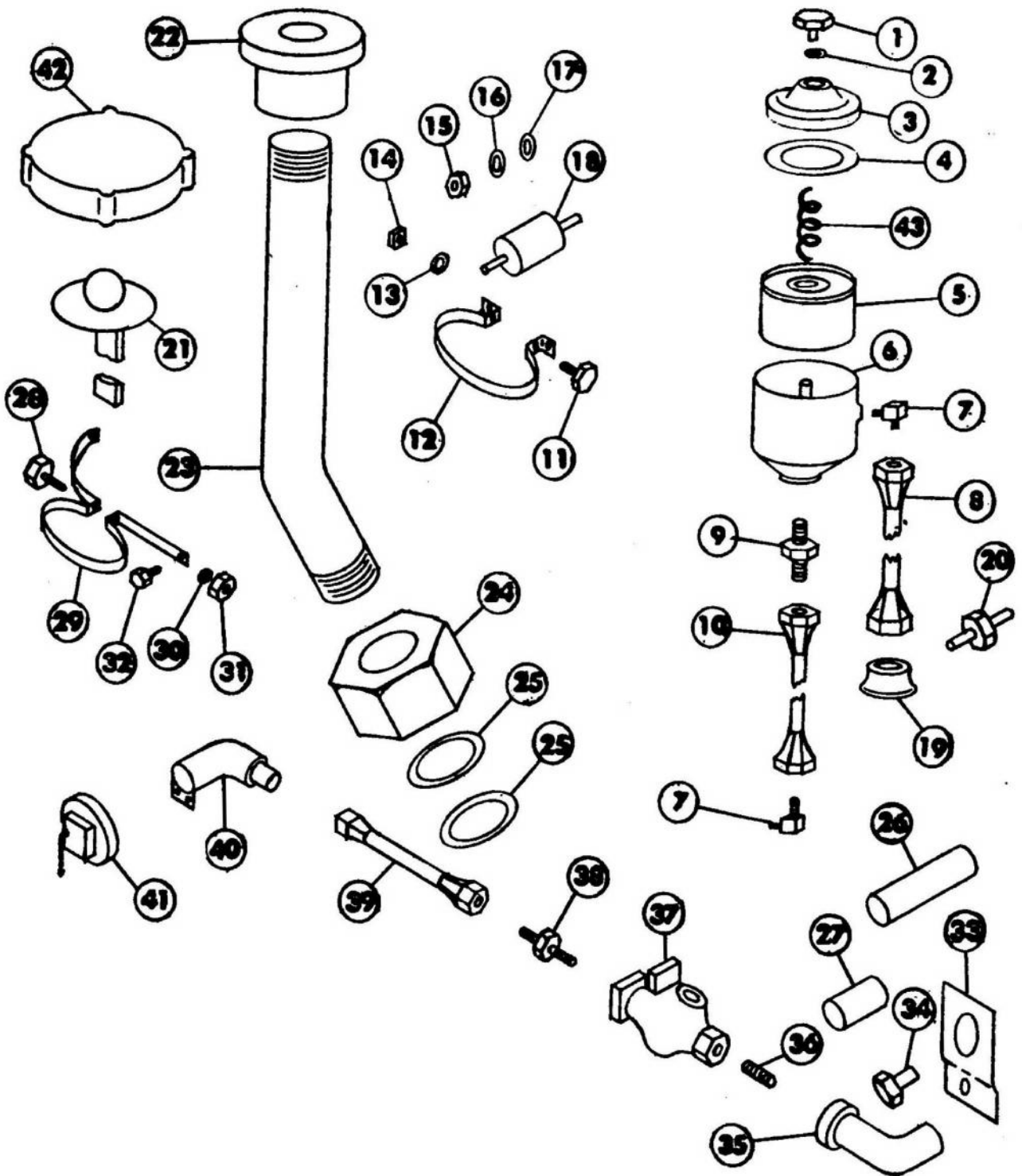


MEC 6115-312-15/9

- 1 Wing nut
- 2 Cap and filter assembly
- 3 Gasket
- 4 Stud
- 5 Oil cup
- 6 Gasket
- 7 Bracket

- 8 Gasket
- 9 Breather
- 10 Clamp
- 11 Hose
- 12 Screw
- 13 Lockwasher
- 14 Gasket

Figure 9. Air cleaner.



MEC 6115-312-15/10

- | | | | | | | | |
|----|------------|----|--------------------|----|--------------|----|-----------------|
| 1 | Screw | 12 | Bracket | 23 | Pipe | 34 | Screw |
| 2 | Gasket | 13 | Washer | 24 | Adapter | 35 | Elbow |
| 3 | Cover assy | 14 | Nut | 25 | O-ring | 36 | Nipple |
| 4 | Gasket | 15 | Nut | 26 | Pipe | 37 | Valve |
| 5 | Body assy | 16 | Washer, lock | 27 | Coupling | 38 | Connector |
| 6 | Body assy | 17 | Washer, flat | 28 | Screw | 39 | Hose assy |
| 7 | Elbow | 18 | Mount, shock | 29 | Bracket | 40 | Adapter |
| 8 | Oil line | 19 | Grommet | 30 | Lockwasher | 41 | Plug assy |
| 9 | Fitting | 20 | Restricted fitting | 31 | Nut | 42 | Cover, oil fill |
| 10 | Oil line | 21 | Oil gage | 32 | Screw | 43 | Spring |
| 11 | Screw | 22 | Coupling | 33 | Plate, drain | | |

Figure 10. Oil filter, drain and fill lines.

Section II. PREVENTIVE MAINTENANCE SERVICES

47. General

To insure that the generator set is ready for operation at all times, it must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary Preventive Maintenance Services to be performed are listed and described in paragraphs 48 and 49. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

48. Daily Preventive Maintenance Services

This paragraph contains an illustrated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to chart 1 for the daily preventive maintenance services.

49. Quarterly Preventive Maintenance Services

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by Organizational Maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to chart 2 for the quarterly preventive maintenance services.

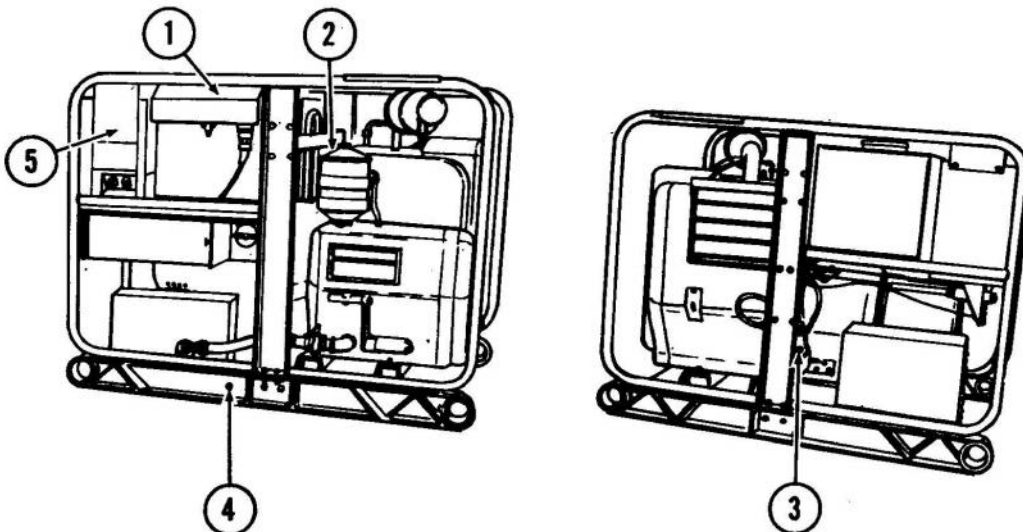
PREVENTIVE MAINTENANCE SERVICES

DAILY

TM 5-6115-312-15

HOL-GAR MODEL CE-56-AC

GENERATOR SET



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM

PAR REF

ITEM		PAR REF
1	<p>BATTERIES. Tighten loose cables and mountings. Remove corrosion. Inspect for cracks and leaks. Fill to 3/8 inch above the plates. Clean vent hole in filler cap before installing. In freezing weather run engine a minimum of 1 hour after adding water. (Weekly)</p>	
2	<p>OIL LEVEL GAGE. Add oil as indicated by level gage, Reference Current L. O.</p>	
3	<p>FUEL FILTERS. Drain water and sediment, inspect for leaks. (Weekly)</p>	
4	<p>GROUND TERMINAL. Check for proper ground. A proper ground will consist of a 3/4 inch dia. hollow or 5/8 inch dia. solid rod, 9 feet long. The cable will be No. 6 AWG copper wire bolted or clamped to the rod and attached to the ground terminal of the equipment.</p>	

MEC 6115-312-15/10.1 ①

Chart 1. Daily preventive maintenance services.

ITEM	PAR REF										
5	<p>CONTROLS AND INSTRUMENTS. Inspect for damage and loose mounting. With the unit operating, check for proper operation. Normal operating readings are as follows:</p> <table data-bbox="225 304 1091 510"> <tr> <td>Frequency Meter</td> <td>60 cycles</td> </tr> <tr> <td>Time Totalizing Meter</td> <td>Records hours of operation</td> </tr> <tr> <td>Voltmeter</td> <td>120 volts, dc</td> </tr> <tr> <td>Battery Charging Gage</td> <td>Green area indicates battery is being charged.</td> </tr> <tr> <td>Cylinder Head Temperature Gage</td> <td>300° to 350°F.</td> </tr> </table>	Frequency Meter	60 cycles	Time Totalizing Meter	Records hours of operation	Voltmeter	120 volts, dc	Battery Charging Gage	Green area indicates battery is being charged.	Cylinder Head Temperature Gage	300° to 350°F.
Frequency Meter	60 cycles										
Time Totalizing Meter	Records hours of operation										
Voltmeter	120 volts, dc										
Battery Charging Gage	Green area indicates battery is being charged.										
Cylinder Head Temperature Gage	300° to 350°F.										

MEC 6115-312-15/10.1 ②

Chart 1—Continued.

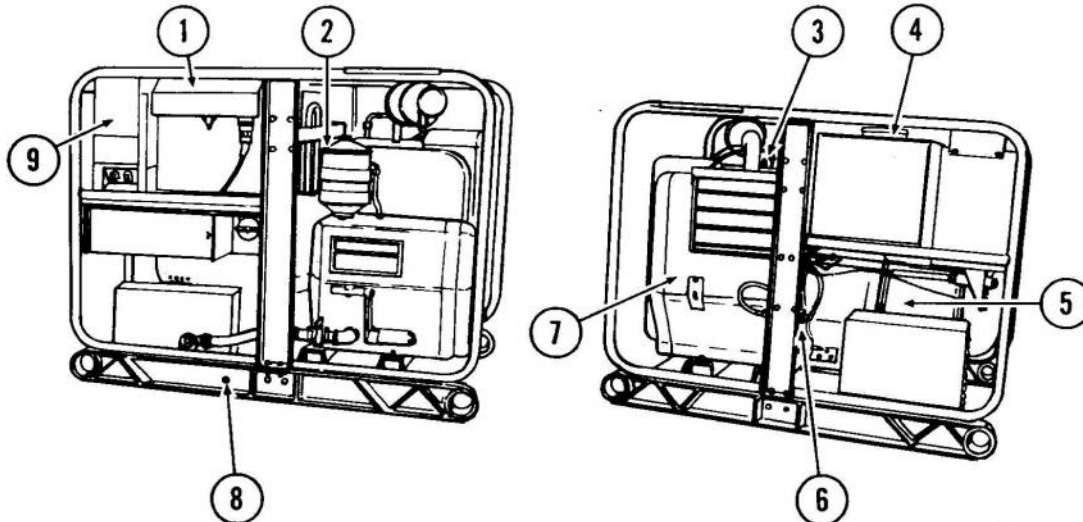
PREVENTIVE MAINTENANCE SERVICES

QUARTERLY

TM 5-6115-312-15

HOL-GAR MODEL CE-56-AC

GENERATOR SET



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	<u>BATTERIES.</u> Tighten loose cables and mounting. Remove corrosion. Fill to 3/8 inch above plates. Clean vent hole in filler cap before installing. In freezing weather run engine a minimum of 1 hour after adding water. Repair or replace a cracked or leaking battery.	82
2	<u>OIL LEVEL GAGE.</u> Add oil as indicated by level gage. Reference current L. O.	
3	<u>SPARK PLUGS.</u> Replace spark plugs that have cracked insulators or burned electrodes. Clean and set spark plug gap for 0.003 inch. Torque spark plugs to 25 foot-pounds. Replace leads which are frayed or broken. Clean and tighten lead connections.	86
4	<u>FUEL TANK.</u> Add fuel as required. Tighten loose mounting. Replace a leaking fuel tank. Replace a defective cap gasket.	79

MEC 6115-312-15/10.2 ①

Chart 2. Quarterly preventive maintenance services.

ITEM		PAR REF										
5	<u>GENERATOR.</u> Clean a dirty commutator. Replace brushes worn to less than 1/2 their original length. Always replace a complete set of brushes.	104										
6	<u>FUEL FILTER.</u> Drain condensate. Replace filter element every 500 hours.											
7	<u>MAGNETO.</u> Replace pitted or burned magneto points. Proper point gap adjustment is 0.015 inch. (Check adjustment every 500 hours).	87										
8	<u>GROUND TERMINAL.</u> Check for proper ground. A proper ground will consist of a 3/4 inch dia. hollow or 5/8 inch dia. solid rod, 9 ft. long. The cable will be No. 6 AWG copper wire bolted or clamped to the rod and attached to the ground terminal of the equipment.											
9	<p><u>CONTROLS AND INSTRUMENTS.</u> Inspect for damage and loose mounting. With the unit operating, check for proper operation. Normal operating readings for instruments are as follows:</p> <table border="0" data-bbox="207 963 1117 1142"> <tr> <td data-bbox="207 963 718 996">Frequency Meter</td> <td data-bbox="734 963 861 996">60 cycles</td> </tr> <tr> <td data-bbox="207 996 718 1030">Time Totalizing Meter</td> <td data-bbox="734 996 1085 1030">Records hours of operation</td> </tr> <tr> <td data-bbox="207 1030 718 1064">Voltmeter</td> <td data-bbox="734 1030 909 1064">120 volts, dc</td> </tr> <tr> <td data-bbox="207 1064 718 1097">Battery Charging Gage</td> <td data-bbox="734 1064 1101 1097">Green shows battery charged</td> </tr> <tr> <td data-bbox="207 1097 718 1131">Cylinder Head Temperature Gage</td> <td data-bbox="734 1097 925 1131">300° to 350°F.</td> </tr> </table>	Frequency Meter	60 cycles	Time Totalizing Meter	Records hours of operation	Voltmeter	120 volts, dc	Battery Charging Gage	Green shows battery charged	Cylinder Head Temperature Gage	300° to 350°F.	
Frequency Meter	60 cycles											
Time Totalizing Meter	Records hours of operation											
Voltmeter	120 volts, dc											
Battery Charging Gage	Green shows battery charged											
Cylinder Head Temperature Gage	300° to 350°F.											

MEC 6115-312-15/10.2 ②

Chart 2—Continued.

Section III. TROUBLESHOOTING

50. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the generator set and its components. Each trouble symptom stated is

followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

51. Engine Hard To Start or Fails To Start

<i>Probable cause</i>	<i>Possible remedy</i>
Fuel tank empty	Fill fuel tank (para 9c).
Fuel selector valve not positioned properly	Correct fuel selector valve position (para 30)
Improper fuel mixture	Adjust carburetor (para 76)
Weak or defective magneto	Check spark. Examine breaker points, clean and adjust, or replace (para 86).
Defective ignition wires	Check for broken wires, cracked, chafed or oil soaked insulation; replace defective wiring.
Starting motor will not crank engine or cranks too slowly	Recharge or replace batteries (para 82). Clean and tighten battery connections.

52. Engine Misses or Operates Erratically

<i>Probable cause</i>	<i>Possible remedy</i>
Sediment or water in fuel system	Service fuel filter (para 77).
Carburetor improperly adjusted	Adjust Carburetor (para 76).
Fuel pump defective	Replace fuel pump (para 78).
Ignition cable connection loose or shorted	Tighten all connections and check for worn insulation.
Spark plugs defective	Clean, regap, or replace spark plugs (para. 86).
Governor out of adjustment	Adjust governor (para 80d).
Magneto points burned, pitted, or out of adjustment	Clean and adjust, replace badly burned or pitted points (para 87).

53. Engine Stops Suddenly

<i>Probable cause</i>	<i>Possible remedy</i>
Fuel tank empty	Fill fuel tank.
Fuel lines clogged	Remove and clean fuel lines. Service fuel filter (para 77).
Fuel pump defective	Replace fuel pump (para 78).
Fuel tank cap valve not positioned properly	Correct position of fuel tank cap valve to open position.

54. Engine Knocks or Develops Excessive Noise

<i>Probable cause</i>	<i>Possible remedy</i>
Low oil supply	Check oil level. Refill to proper level. Refer to current lubrication order.
Tappets out of adjustment	Adjust tappets (para 91).
Spark too early	Retime ignition (para 87c).
Engine, generator or accessories loose on mounts	Tighten loose mounting bolts.

55. Engine Lacks Power

<i>Probable cause</i>	<i>Possible remedy</i>
Carburetor out of adjustment	Adjust carburetor (para 76).
Carburetor choke not opening	Check and adjust choke control.
Engine speed too slow	Adjust governor (para 80d).
Improper ignition timing	Set timing (para 87).
Magneto contacts burned or pitted	Check condition of breaker points; adjust or replace (para 87).

56. Engine Overheats

<i>Probable cause</i>	<i>Possible remedy</i>
Ventilation poor	Check condition of shrouds and shutters. Clean or replace defective housings.
Cylinder cooling fins dirty	Clean dirt from between fins.
Magneto timed late	Reset timing (para 87c).

57. Main Generator Fails To Build Up Rated Voltage

<i>Probable cause</i>	<i>Possible remedy</i>
Volts adjust variable resistor defective	Replace adjust volt rheostat variable resistor para 95).
Brushes worn or not seated properly	Check brush length and reseal brushes (para 104).
Loose leads on exciter	Check and tighten connections.
Exciter open or shorted	Check continuity of exciter. Replace defective part.
Main generator field shorted, open, or grounded	Replace main fields. If grounded due to moisture, clean by spraying with suitable solvent and bake.

58. Voltage Drops Upon Increase of Generator Load

<i>Probable cause</i>	<i>Possible remedy</i>
Engine runs erratically or lacks power	Refer to paragraphs 52 and 55.
Component in regulator defective	Check continuity of regulator circuit. Check voltage output at voltage check points.

59. Generator Voltage too High

<i>Probable cause</i>	<i>Possible remedy</i>
Adjust volt rheostat set high	Adjust voltage. If not responsive, check variable resistor. Replace if necessary (para 95).
Defective component in exciter regulator system	Perform continuities check and voltage checks. Replace voltage regulator (para 95).

60. Generator Overheats

<i>Probable cause</i>	<i>Possible remedy</i>
Dirt or poor ventilation	Blow out all dirt from unit. Use solvent on wound sections. Check flow of ventilating air.
Windings grounded	Check for grounds by means of continuity tests (para 133-135).
Bearing worn	Replace bearing (para 134).

61. Sparking At Brushes

<i>Probable cause</i>	<i>Possible remedy</i>
Brushes worn or not seated properly	Check condition of or replace brushes (para 104b(4)).
Poor spring tension	Replace weak springs (para 104).
Open in exciter armature winding	Locate and repair open coil. Replace armature (para 133).

62. Battery Charger Fails To Charge Batteries Properly

<i>Probable cause</i>	<i>Possible remedy</i>
Potentiometer R12 improperly adjusted	Rotate potentiometer clockwise to increase charge rate, counterwise to decrease charge rate.
Resistor R11 improperly adjusted	Set resistor R11 to approximately 50 percent of total value.
Defective transistor or diode	If no charging rate, test for and replace a defective transistor Q2, or diode CR1, CR2, CR3 or CR5. If over charging rate, test for and replace a defective transistor Q1 or diode CR7 (para 115).

Section IV. RADIO INTERFERENCE SUPPRESSION

63. Definition

a. Interference. The term interference, as used herein, applies to electrical disturbances in the radio frequency range which are generated by the generator set and which may interfere with the proper operation of radio receivers or electronic equipment.

b. Interference Suppression. The term interference suppression, as used herein applies to the methods used to eliminate or effectively reduce radio interference generated by the generator set.

64. Purpose of Interference Suppression

The tactical importance of effective interference suppression cannot be stressed too greatly. Since the electrical disturbance generated by the generator set are composed partly of electrical waves in the radio frequency range, they must be suppressed for two important reasons. First they will interfere with the proper operation of the friendly radio net, and second, they will enable the enemy to locate the equipment and its associated units.

65. General Sources of Interference

Generally, radio interference is generated

anywhere a spark occurs or where a high frequency current is present. A spark is a small amount of current jumping an air gap in response to the force of relatively high voltage. The gasoline ignition system is a common source. Magneto breaker points, generator commutators, relay contacts, and static charges collecting on the frame are other common sources which in some way must be suppressed.

66. General Methods Used To Attain Proper Suppression

Essentially, suppression is attained by providing a low resistance path to ground for the stray currents. The methods used to attain suppression include shielding the ignition and high-frequency wires, grounding the frame with bonding straps, and using capacitors and resistors where necessary.

67. Replacement of Suppression Components

a. General. Replace radio interference suppression components with components that are identical in capacitance and voltage rating to those being replaced. If radio interference is indicated, isolate the cause of the interference by replacing each capacitor or other component

in turn until the interference is eliminated (refer to wiring diagram C2-C9, fig. 3).

b. Interference Suppression Components.

- (1) *Power output connector capacitors (C2, C3, C4).* The three power output connector capacitors are connected electrically from contactor relay terminals to equipment ground and suppresses interference that may be caused by the generator.
- (2) *Duplex receptacle capacitors (C5, C6).* The two duplex receptacle capacitors are connected electrically on either side of the duplex receptacle and suppresses interference that may be caused by the use of electrically operated hand tools.

- (3) *Main generator and voltage regulator capacitor (C7, C8, C9).* The voltage regulator capacitor is connected electrically from the voltage regulator terminal D and equipment ground and suppresses interference that may be caused by the exciter brushes.

c. Replacement of Suppression Components.
When replacing suppression components, always replace with the components that are identical in capacitance and voltage rating to those being replaced to provide proper interference suppression. Take special care to obtain a firm metal-to-metal contact between shields, lockwashers, leads capacitor mounting brackets, and electrical leads. Be sure all connections are clean and tight.

Section V. EXHAUST MUFFLER SYSTEM

68. Description

The exhaust muffler system consists of the exhaust pipe, muffler and rain cap which is located above the engine housing.

69. Exhaust Muffler and Pipe

a. Removal.

- (1) Unscrew raincap (1, fig. 2) from muffler (2).
- (2) Unscrew muffler (2) from exhaust pipe (3). When removing muffler, place a pipe wrench on the collar of exhaust pipe, adjacent to the muffler. Hold back on wrench to prevent collar turning and to avoid damage to the exhaust pipe.

- (3) Unscrew exhaust pipe (3) from exhaust manifold.

b. Cleaning, Inspection and Repair.

- (1) Clean the threads of the raincap, muffler and exhaust pipe. Check for stripped or damaged threads. Replace damaged parts.
- (2) Inspect the exhaust pipe and muffler for holes, breaks, dents or cracks. Replace an unserviceable muffler.

c. Installation.

- (1) Screw exhaust pipe (3) in to exhaust manifold.
- (2) Position muffler (2) on exhaust pipe and tighten, screw raincap (1) to muffler.

Section VI. ENGINE HOUSING ASSEMBLY

70. Description

The engine is completely inclosed by a sheet metal housing assembly. The housing protects the engine from dirt and dust and it contains three louver-type shutters for engine cooling.

71. Louver-Type Shutters

a. Removal.

- (1) Remove screws (1, fig. 11) securing the shutter (3) to the front of housing and recirculating shutter (6) to the right side housing.

- (2) To remove exhaust shutter (23) on left side of engine, turn each of the turnlock fasteners one-half turn.

b. Cleaning, Inspection and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the shutters for free operation of louvers. Check cracks, dents, and other physical damage.
- (3) Remove small dents. Replace defective shutters.
- (4) Inspect all mounting hardware for damage and stripped threads. Replace defective hardware.

c. Installation.

- (1) Position the shutter (23) to engine

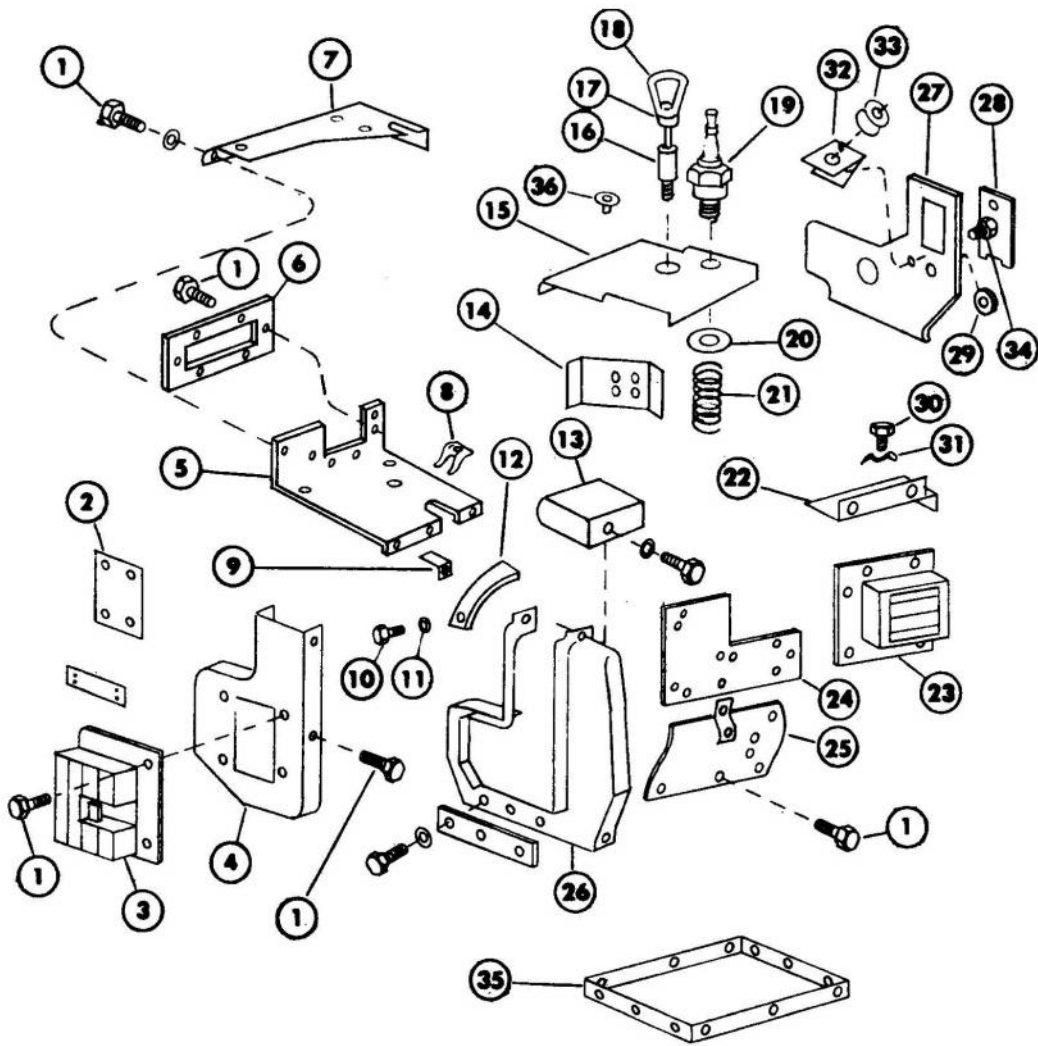
left side housing. Secure by twisting each of the turnlock fasteners.

- (2) Position the shutter (3) to the front and shutter (6) to right side of engine housing and install screws (1).

72. Side Panels

a. Removal.

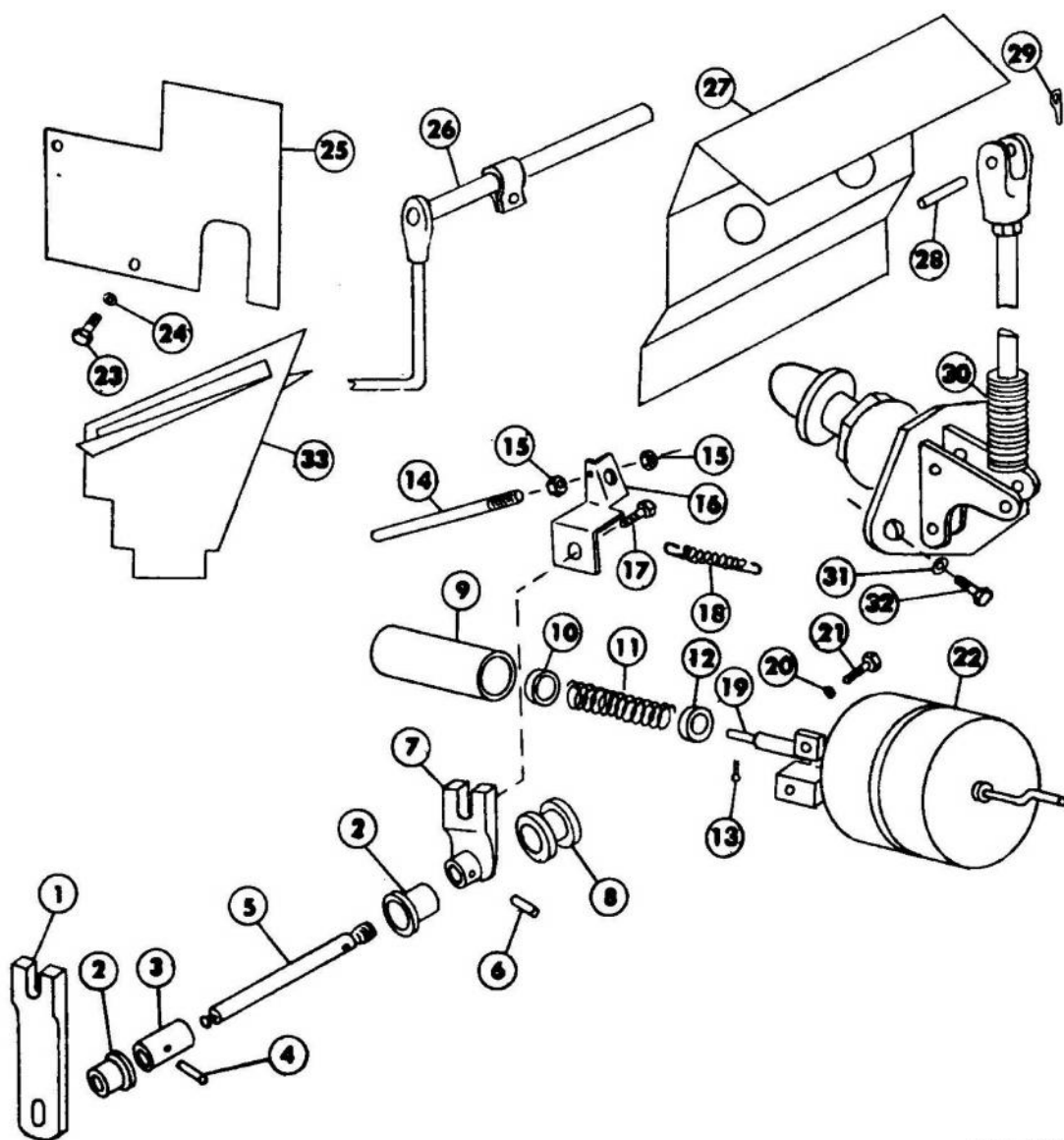
- (1) To remove exhaust shutter panel (24, fig. 11) Turn each of the turnlock fasteners one-half turn.
- (2) Remove screws (1) securing lower panel (25) and starter side panel (5). Remove panels.
- (3) Remove hand crank clip (8) and support (9) from panel (5).



MEC 6115-312-15/11

- | | | | |
|----|------------------------|----|------------------------|
| 1 | Screw | 19 | Spark plug |
| 2 | Nameplate | 20 | Spacer |
| 3 | Shutter | 21 | Spring |
| 4 | Panel, Intake | 22 | Cover, top |
| 5 | Panel, starter side | 23 | Shutter, exhaust |
| 6 | Shutter, recirculating | 24 | Panel, exhaust shutter |
| 7 | Cover, starter side | 25 | Panel, lower |
| 8 | Clip, crank | 26 | Duct, air cleaner |
| 9 | Support, crank | 27 | Panel, rear |
| 10 | Screw | 28 | Door |
| 11 | Lock washer | 29 | Grommet |
| 12 | Gusset | 30 | Screw |
| 13 | Cover, duct | 31 | Clip |
| 14 | Shroud, cylinder | 32 | Bracket |
| 15 | Cover, cylinder head | 33 | Grommet |
| 16 | Stud | 34 | Screw |
| 17 | Washer | 35 | Base |
| 18 | Hook | 36 | Extension |

Figure 11. Engine housing assembly.



MEC 6115-312-15/12

- | | | | |
|----|----------------|----|-----------------------|
| 1 | Lever | 18 | Spring |
| 2 | Bushing | 19 | Rod |
| 3 | Spacer | 20 | Washer |
| 4 | Pin | 21 | Screw |
| 5 | Shaft | 22 | Thermo control |
| 6 | Pin | 23 | Screw |
| 7 | Lever | 24 | Lockwasher |
| 8 | Block, guide | 25 | Deflector, air duct |
| 9 | Housing, guide | 26 | Clamp, tube |
| 10 | Bushing | 27 | Deflector, carburetor |
| 11 | Spring | 28 | Pin |
| 12 | Collar | 29 | Pin, cotter |
| 13 | Pin | 30 | Vernatherm assembly |
| 14 | Rod | 31 | Lockwasher |
| 15 | Nut | 32 | Screw |
| 16 | Bracket | 33 | Deflector, crankcase |
| 17 | Pin | | |

Figure 1x. Snutter control and linkage.

b. Cleaning, Inspection and Repair.

- (1) Clean all parts with an approved cleaning solvent.
- (2) Inspect panels for cracks, tears, and dents. Remove small dents.

c. Installation.

- (1) Secure hand crank clip (8) and support (9) to starter side panel (5). Position panel (5) in place and secure with screws (1).
- (2) Position lower panel (25) to left side of engine and secure with screws. Place exhaust shutter panel (24) in place and secure by turning the turn-lock fasteners one-half turn.

73. Front and Top Covers

a. Removal.

- (1) Front intake panel (4, fig. 11) air cleaner duct (26), duct cover (13) and top cover (22) are removed by removing screws (1).
- (2) To remove cylinder head cover (15), remove hook (18) washer (17) stud (16) and spark plugs (para 86).
- (3) To remove starter side cover (7), it is necessary to disconnect oil lines (8 and 10, fig. 10) and remove oil filter assembly from cylinder shroud (14, fig. 11).

b. Cleaning, Inspection and Repair

- (1) Clean all parts with an approved cleaning solvent.
- (2) Inspect panels and covers for cracks, tears and dents. Remove small dents.
- (3) Inspect hook and stud for cracks or signs of fatigue and damage threads. Replace a defective hood and stud.

c. Installation.

- (1) Install oil filter to cylinder shroud (14, fig. 11) connect oil filter lines (8 and 10, fig. 10) and install the starter side cover (7).

- (2) Position cylinder head cover (15) on cylinder head and install hook (18) washer (17) stud (16) and spark plugs (19).
- (3) Place top cover (22) dust cover (13) air cleaner duct (26), and front intake panel (4, fig. 11) in place and secure with screws (1).

74. Shutter and Heat Deflector Control

a. Removal and Disassembly.

- (1) To remove the thermocontrol (22, fig. 12), remove the two nuts securing the boiler tube clamp (26) to the engine manifolds.
- (2) Remove screws (21) and lockwashers (20) securing the thermocontrol (22). Remove the thermocontrol with boiler tube and shutter actuating mechanism.
- (3) Disconnect spring (18) from bracket (16).
- (4) Extract cotter pin (13) from push rod (19) and remove guide housing (9), bushing (10), spring (11) and collar (12).
- (5) Drive pins (4) and (6) free from shaft (5).
- (6) Unscrew guide block (8) from shaft. Remove lever (1), bushings (2), spacer (3) and lever (7) from shaft.
- (7) To remove the vernatherm assembly (30), extract cotter pin (29) and pin (28). Remove screws (32), lockwashers (31) and pull vernatherm from engine crankcase.

b. Cleaning, Inspection and Repair

- (1) Clean all parts with an approved cleaning solvent.
- (2) Inspect thermocontrol capillary and boiler tubes for kinks, punctures or other signs of damage. Replace a damaged thermocontrol.
- (3) Inspect springs for kinks and proper loading. Inspect that collars, bushings,

levers and shafts are free from excessive wear. Replace defective parts.

- (4) Check the action of the vernatherm assembly and that the control rod is not bent or misshaped. Replace a defective vernatherm assembly.

c. Reassembly and Installation.

- (1) Install lever (1) to shaft (5) and insert with bushings (2) and spacer (3) in bearing bracket of shroud. Install lever (7) and install pins (4) and (6).
- (2) Place collar (12), spring (11), bushing (10) and guide housing (9) on

push rod (19). Secure with cotter pin (13).

- (3) Position thermocontrol (22) on the engine shroud and secure with screws (21) and lockwashers (20).
- (4) Position boiler tube against the manifold and secure with clamps (26) to the manifold studs.
- (5) Insert vernatherm assembly (30) in engine crankcase and secure with screws (32) and lockwashers (31).
- (6) Position upper end of vernatherm rod to the carburetor deflector (27). Install pin (28) and cotter pin (29).

Section VII. FUEL SYSTEM

75. Description

The fuel system consists of a fuel tank mounted above the generator, a camshaft driven diaphragm fuel pump, updraft type carburetor, fuel strainer and necessary fuel lines and fittings. The system is equipped with a fuel selector valve which makes it possible to connect to and utilize an external source of fuel. The intake air necessary for combustion is drawn through an oil bath type air cleaner. The fuel is vaporized in the carburetor and the fuel air mixture is then carried to the combustion chamber through the intake manifold.

76. Carburetor

a. Preliminary Adjustment.

- (1) Set the fuel selector valve in position of fuel supply to be used.
- (2) Set throttle control lever $\frac{3}{4}$ way out and close choke by pulling choke control cable (14, fig. 13) full out.
- (3) Start engine and partially release choke until engine obtains operating temperature. Release choke to wide open position.

b. Main Adjusting Screw. The main adjust screw (15, fig. 13) determines the amount of fuel which may be obtained for high speed operation. To set this adjustment, open the

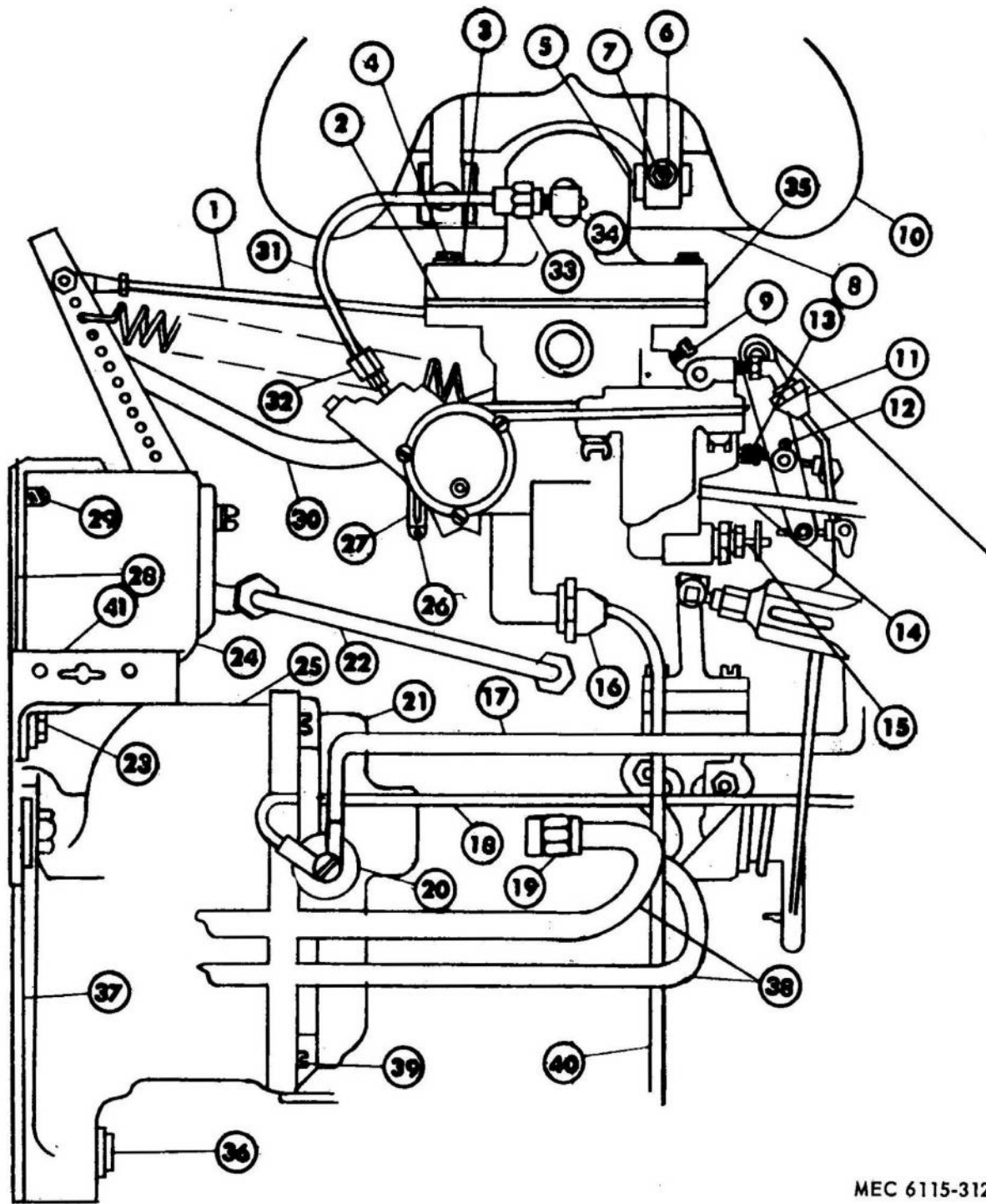
throttle to about $\frac{1}{4}$ open ($\frac{3}{4}$ -way out with throttle control). Turn the adjustment clockwise, reducing the fuel until the engine speed decreases or begins to miss due to lean mixture. Open the adjustment until the engine reaches its maximum speed and runs smoothly without missing.

c. Low Speed or Idle Adjustment.

- (1) Close the throttle plate completely by setting throttle control in full out position.
- (2) Turn idle adjust screw (9) in or clockwise, until the engine begins to falter or roll due to a rich mixture. Then turn screw out, or counter clockwise, until the engine runs smoothly.

d. Removal.

- (1) Set the fuel selector valve to the off position. Disconnect fuel drain line (16) and allow carburetor to drain into a suitable container.
- (2) Disconnect fuel line (11) and drain fuel from fuel line and then loosen tube nut (32) and disconnect vacuum line (31).
- (3) Loosen the clamp screw (26) in the hose clamp (27) and remove air cleaner hose (30) from the carburetor air inlet.



MEC 6115-312-15/13

- | | | |
|-------------------------------|---------------------------------|-------------------------|
| 1 Control rod | 15 Main adjust screw | 29 Screw and lockwasher |
| 2 Gasket | 16 Fuel drain line | 30 Hose |
| 3 Lockwasher | 17 High temperature switch lead | 31 Vacuum line |
| 4 Screw | 18 Press to stop switch lead | 32 Tube nut |
| 5 Clamp washer | 19 Cable nut | 33 Tube nut |
| 6 Lockwasher | 20 Screw and washer | 34 Elbow |
| 7 Nut | 21 End cap | 35 Carburetor |
| 8 Intake manifold | 22 Oil line | 36 Screw and lockwasher |
| 9 Idle adjust screw | 23 Screw and lockwasher | 37 Gasket |
| 10 Exhaust manifold | 24 Governor | 38 Ignition cables |
| 11 Fuel line | 25 Magneto | 39 Screw and lockwasher |
| 12 Cotter pin | 26 Screw | 40 Tubing w/nut |
| 13 Adjusting screw and spring | 27 Hose clamp | 41 Bracket |
| 14 Choke control cable | 28 Gasket | |

Figure 13. Engine assembly — leftside view

- (4) Disconnect the governor control rod (1) from the governor (24).
- (5) Loosen the screw and remove choke control cable (14).
- (6) Remove the two screws (4) and washers (3). Remove the carburetor (35) and gasket (2) from the manifold (8).

e. Cleaning and Inspection.

- (1) Wash exterior surfaces of carburetor with an approved cleaning solvent.
- (2) Inspect carburetor control linkage for unserviceable, excessively worn or corroded parts.
- (3) Inspect the carburetor for cracks, evidence of leaks, worn throttle or choke shaft. Replace any excessively worn parts. Replace a defective carburetor.

f. Repair. Limit repair of the carburetor to replacement of the parts of the gasket set.

g. Installation.

- (1) Position new gasket (2) and carburetor (35) on manifold (8) and install screws (4) and washers (3).
- (2) Install choke control cable (14) and tighten screw.
- (3) Connect the governor control rod (1) to the governor (24).
- (4) Place the air cleaner hose (30) on the air inlet of the carburetor and tighten clamp screw (26) on clamp (27).
- (5) Secure the fuel line (11) to carburetor and bowl drain line (16).
- (6) Connect the automatic choke vacuum line (31) and tighten nut (32).
- (7) Adjust carburetor if necessary.

77. Fuel Filter

a. Removal and Disassembly.

- (1) Place fuel selector valve in off position to shut off fuel supply.
- (2) Remove the two fuel hoses (13, fig.

14) from the connector (23) and elbow (21) of fuel filter (22).

- (3) Place a container under the fuel filter. Remove drain plug and let fuel drain out.
- (4) Remove the four screws (15) and washers (16) that secure filter to mount (17).
- (5) Remove vent plug (A1, fig. 15) cover screw (2) and washer (3).
- (6) Remove head (4) gasket (5) and filter element (6) from body (12).

b. Cleaning and Inspection.

- (1) Clean the fuel filter, lines and fittings with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the fuel lines for breaks and fittings for cracks, damaged threads, or other damage. Replace damaged lines.
- (3) Inspect filter body and cover for cracks and corrosion.

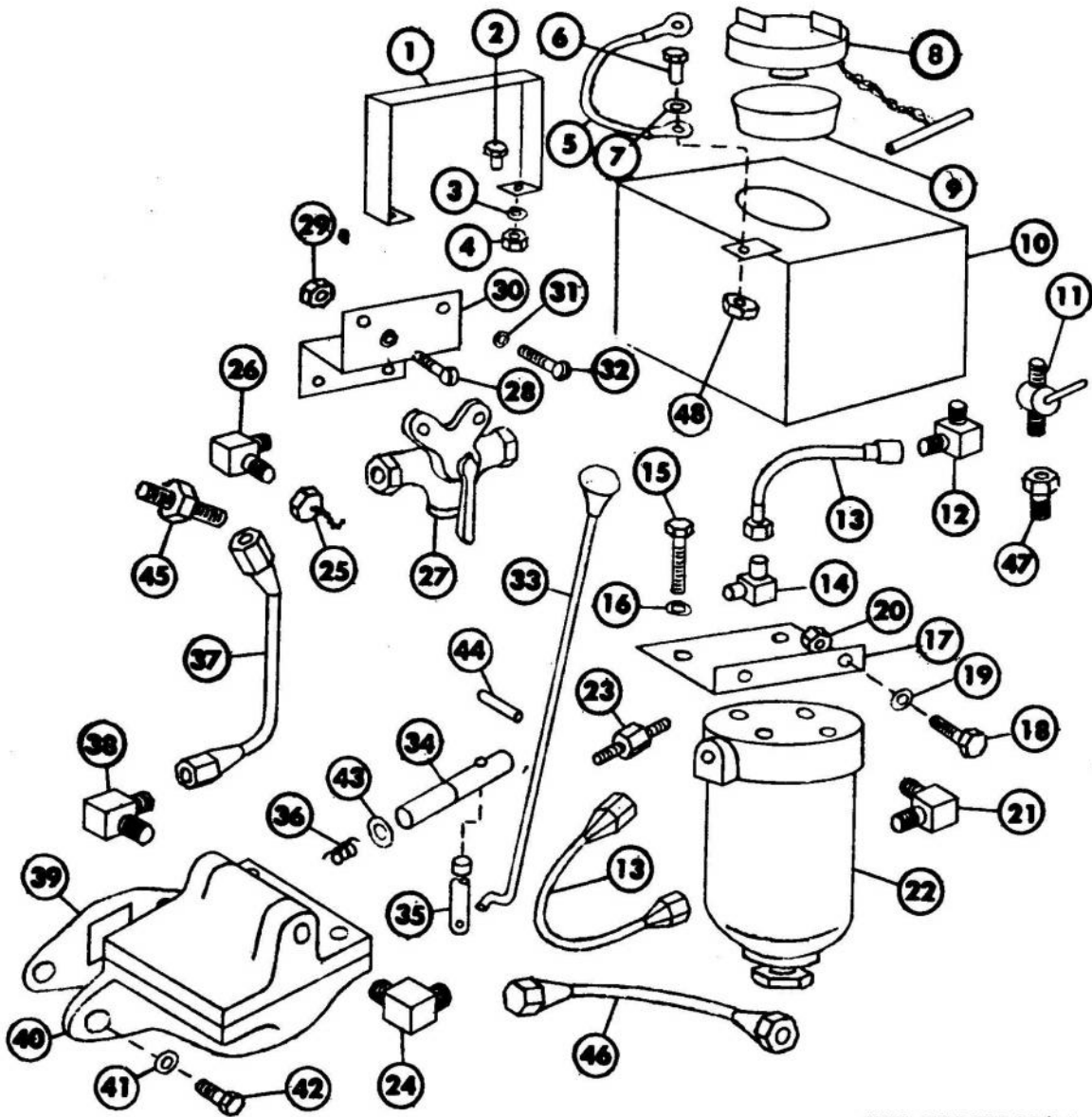
c. Installation.

- (1) Place a new gasket (5) in head (4) of filter. Install filter element (6) in body (12). Position body to cover and secure with screw (2) and washer (3). Install vent plug (1) and drain plug (13).
- (2) Position filter to mount (17, fig. 14) and install the four screws (15) and washers (16).
- (3) Connect inlet and outlet fuel hoses (13) to the connector (23) and elbow (21).

78. Fuel Pump

a. Removal.

- (1) Set fuel selector valve to off position to shut off fuel supply.
- (2) Remove flexible hose (13, fig. 14) from elbow (24) of fuel pump.
- (3) Remove fuel line (37) from pump to carburetor.



MEC 6115-312-15/14

- | | | |
|-----------------|------------------|--------------------|
| 1 Strap | 17 Mount, filter | 33 Primer lever |
| 2 Screw | 18 Screw | 34 Shaft |
| 3 Lockwasher | 19 Lockwasher | 35 Handle |
| 4 Nut | 20 Nut | 36 Spring |
| 5 Bonding strap | 21 Elbow | 37 Fuel line |
| 6 Screw | 22 Filter, fuel | 38 Elbow |
| 7 Lockwasher | 23 Connector | 39 Gasket |
| 8 Cap assembly | 24 Elbow | 40 Fuel pump |
| 9 Strainer | 25 Cap assembly | 41 Lockwasher |
| 10 Tank | 26 Elbow | 42 Screw |
| 11 Valve | 27 3-way valve | 43 O-ring packing |
| 12 Elbow | 28 Screw | 44 Pin |
| 13 Hose | 29 Nut | 45 Elbow |
| 14 Elbow | 30 Bracket | 46 Hose assy |
| 15 Screw | 31 Lockwasher | 47 Connector, male |
| 16 Lockwasher | 32 Screw | 48 Nut |

Figure 14. Fuel tank, lines and fittings.

- (4) Remove two screws (42), and lock washers (41). Remove fuel pump (40) and fuel pump gasket (39).
- (5) Remove fuel pump primer shaft (34) O-ring packing (43), and primer handle spring (36). Remove hand primer lever (33) from primer shaft handle (35).

b. Cleaning and Inspection.

- (1) Clean all exterior parts with an approved cleaning solvent.
- (2) Inspect the fuel pump for smooth operation by operating the rocker arm. Replace the pump if operation is not smooth.
- (3) Inspect primer handle spring for kinks and deformity and primer shaft for burrs. Replace defective parts.

c. Repair. Limit repair of the fuel pump to replacement of the parts of the repair kit (refer fig. 15). If conditions warrant replace other parts only if the general condition of the whole fuel pump has not deteriorated beyond feasible economical repair.

d. Installation.

- (1) Replace a new O-ring packing (43) on primer shaft (34). Position primer handle spring (36) on primer shaft. Install handle (35) to shaft.
- (2) Position fuel pump (40) with new gasket (39) to crankcase and secure with screws (42) and washers (41).
- (3) Connect hose (13) to elbow (4) and install fuel line (37) to pump and carburetor.

79. Fuel Tank

a. Removal.

- (1) Drain fuel tank.
- (2) Remove bonding strap (5, fig. 14) and disconnect fuel hose (13) from bottom of tank (10) and elbow (14) of 3-way fuel selector valve (27).
- (3) To remove tank, release mounting

straps (1) by removing screws (2), lockwashers, (3) and nuts (4).

- (4) Remove the cap assembly (8), strainer (9), elbow (12), and drain valve (11), from the tank (10).

b. Cleaning and Inspection.

- (1) Clean tank, fittings, hoses and valve. Carefully brush threads. See that flared surfaces are not damaged.
- (2) Check seams around tank and fittings under tank for leaks and cracks. Check cap and gasket for damage; see that air vent valve operates. Replace leaking tank. Replace deteriorated cap gasket.
- (3) See that strainer is clean and that screen is not damaged. Replace damaged strainer.
- (4) Inspect fuel lines and fittings for cracks, breaks, or other damage. Replace deteriorated, frayed or porous fuel hoses.

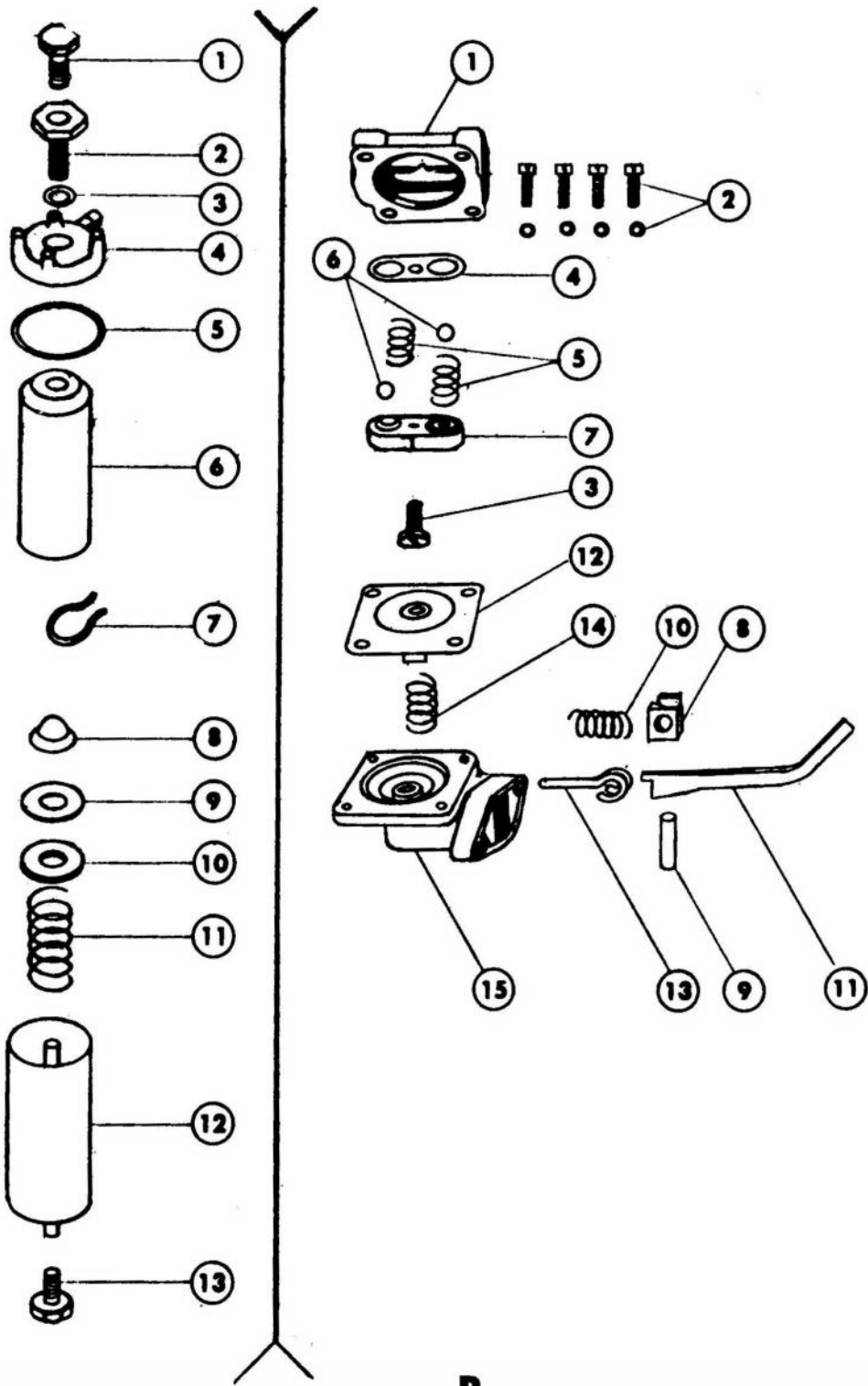
c. Installation.

- (1) Install drain valve (11) and elbow (12) on the fuel tank (10) strainer (9) and cap assembly (8).
- (2) Position fuel tank on frame with bonding strap lug to the front.
- (3) Secure tank with mounting straps (1) screws (2) nuts (4) and lockwashers (3).
- (4) Connect bonding strap (5) to tank lug.
- (5) Connect fuel hose (13) between tank and elbow (14) of 3-way fuel selector valve (27).

80. Engine Speed Governor

a. Removal.

- (1) Remove governor control rod (1, fig. 13).
- (2) Remove governor adjusting screw and spring (13).



A FUEL FILTER

B FUEL PUMP

MEC 6115-312-15/15

Figure 15. Fuel filter and fuel pump.

A Fuel filter

1 Plug, vent	5 Gasket	9 Plate, sealing
2 Screw, cover	6 Filter element	10 Washer
3 Washer	7 Retaining ring	11 Spring
4 Head	8 Grommet	12 Body
		13 Plug

B Fuel pump

1 Head	5 Valve spring*	11 Rocker arm
2 Assembly screw and lockwasher	6 Valve*	12 Diaphragm*
3. Valve plate screw and lockwasher	7 Valve plate and seat	13 Linkage
4 Valve gasket*	8 Spring clip	14 Diaphragm spring*
	9 Rocker arm pin	15 Body
	10 Rocker arm spring	Mounting flange* (not shown)
		* Repair kit

Figure 15—Continued

(3) Remove two lower screws and lockwasher (23) and two upper screws and lockwasher (29).

(4) Carefully remove the governor housing (24), and gasket (38), after which the entire governor can be withdrawn.

b. *Cleaning, Inspection and Repair.*

- (1) Clean all parts with an approved cleaning solvent.
- (2) Inspect governor control rod and adjustment screw for defects. Replace defective parts.
- (3) Inspect the governor for proper operation. See that the housing is free from cracks and the gear for wear or chipping of tooth segments. Replace defective governor.

c. *Installation.*

- (1) Position the governor without housing into gear housing. Install governor housing (24) with a new gasket (28).
- (2) Install the two short screws and lockwasher (23) into the lower holes. In-

stall the longer screws and lockwasher (29) into the upper holes.

- (3) Replace governor adjusting screw with spring (13). Replace control rod (1).

d. *Adjustment.*

- (1) With engine stopped, the governor should hold the throttle butterfly of the carburetor wide open. If necessary, adjust the adjusting screw (13) by turning the rod into or out of the swivel block on the carburetor lever.
- (2) Start the engine and allow it to warm up.
- (3) If the engine surges at no load, shut the unit down and adjust the governor spring tension by means of adjusting screw.
- (4) For proper operation of the generator, the spring should be hooked into hole 12 of the governor lever and the spring tension adjusted for the engine to run at 3600 RPM. The adjusting screw may have to be adjusted one-half turn in or out to obtain engine speed of 3600 RPM with full load.

Section VIII. ENGINE ELECTRICAL SYSTEM

81. Description

The 24-volt, negative grounded electrical system consists of two storage batteries and engine cranking starter. The two 12-volt batteries are connected in series and are used to energize the engine starter. The batteries are maintained in a full state of charge by the main generator and battery charging rectifier. The lid of the battery box is furnished with heating elements to preheat the batteries for cold weather starting.

82. Batteries and Battery Box

a. Removal.

- (1) Remove electrical connector (5, fig. 16) by unthreading the knurled nut of the connector.
- (2) Remove cover (1) by lifting the two spring latches (6).
- (3) Pull the rubber protector (7) away from the terminals and release connector lever (8) to remove cables.
- (4) Remove battery box inner base (13) from battery box outer base (14).
- (5) The battery box outer base is removed by removing the securing hardware.
- (6) Remove the batteries.

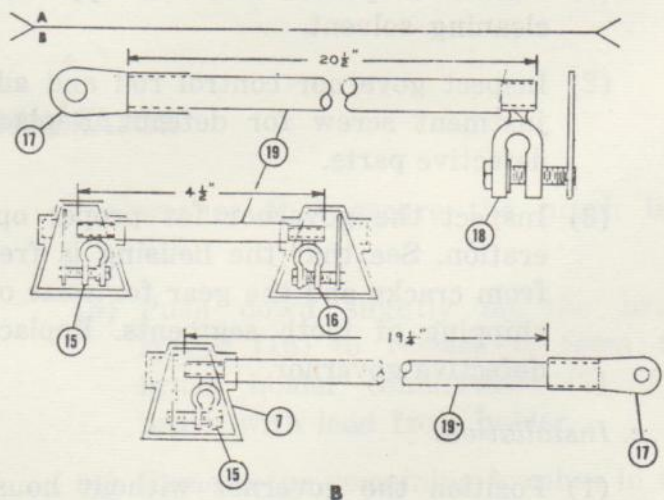
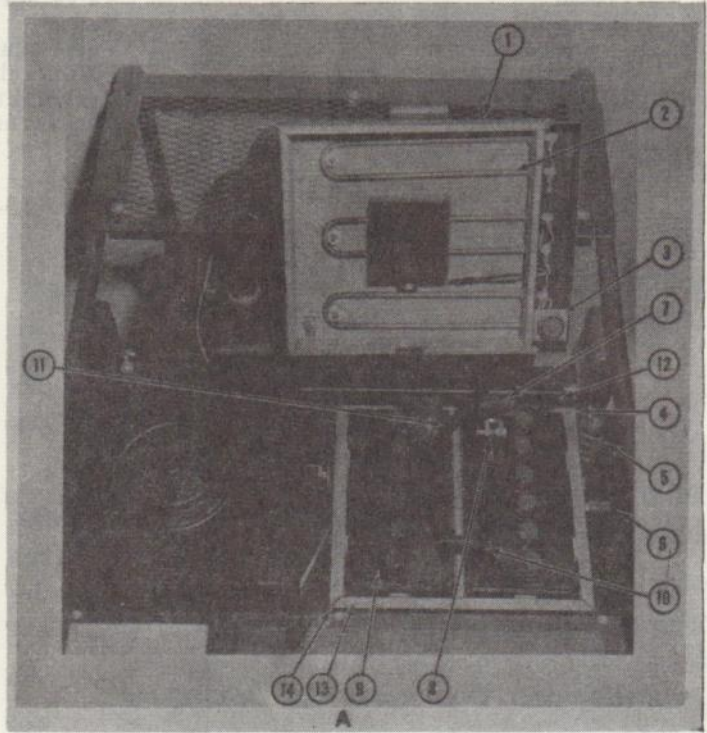
b. Battery Box Cover Disassembly.

- (1) Tag and remove all terminals. Remove nuts (1, fig. 17) lockwashers (2) and remove the heating element (10). Remove screws (11), and remove thermostat (12) from end (22).
- (2) Remove screws and nuts (6) and connector (5).

c. Cleaning and Inspection and Repair.

- (1) Clean the cable terminals and battery terminals with a wire brush. Wash all parts with a solution of baking soda and water that have had electrolyte spilled on them.

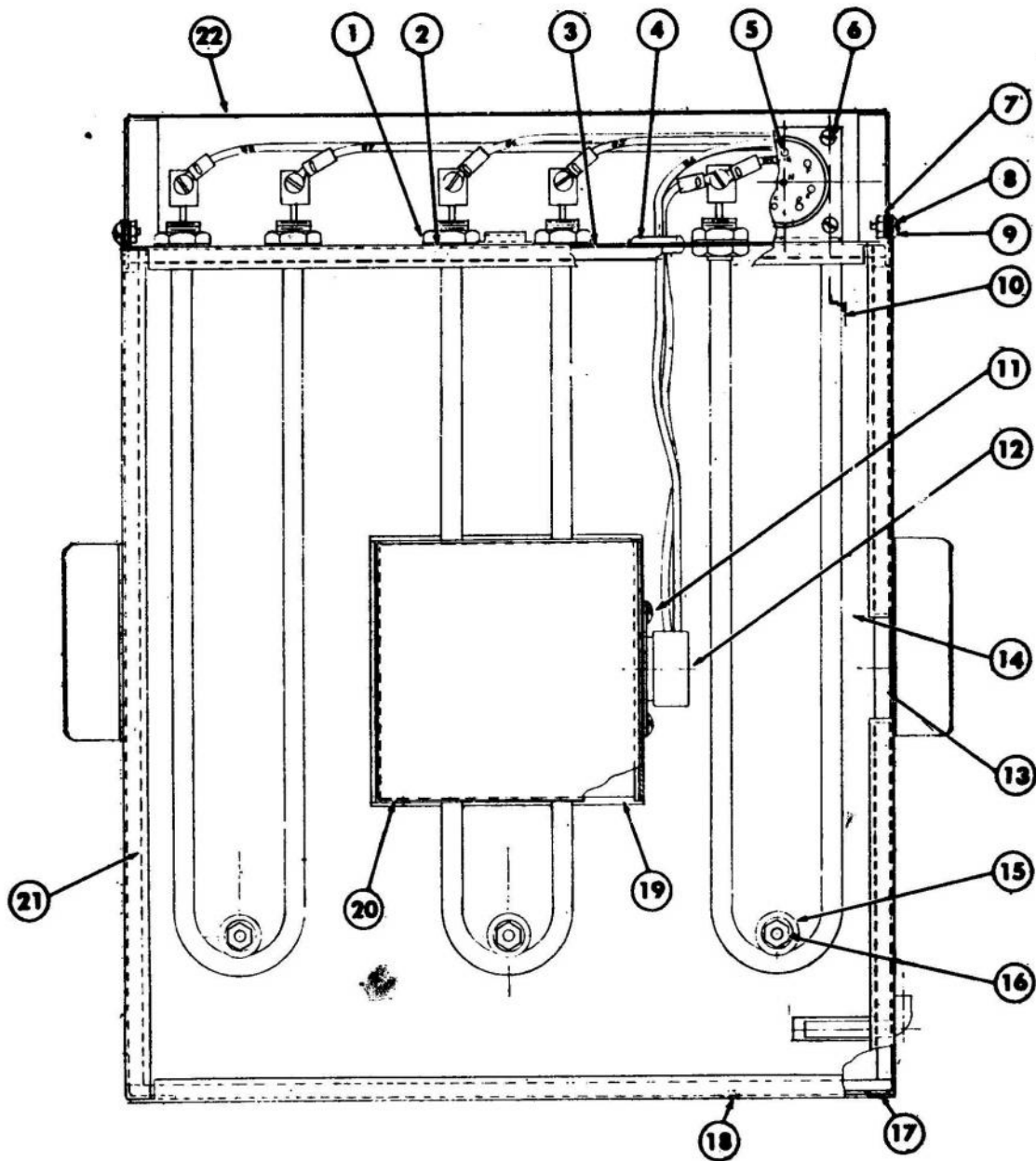
- (2) Clean all other parts with an approved cleaning solvent.
- (3) Inspect the battery casing for cracks or leaks. Replace defective batteries.



MEC 4115-312-15/16

1 Cover	11 Cable assy
2 Heater elements	12 Cable assy
3 Receptacle	13 Battery box inner base
4 Box	14 Battery box outer base
5 Connector	15 Terminal
6 Latch	16 Terminal
7 Protector	17 Terminal
8 Connector lever	18 Terminal
9 Batteries	19 Cable
10 Jumper cable	

Figure 16. Batteries, box and cables.



MEC 6115-312-15/17

- | | |
|------------------------------|---------------------------|
| 1 Nut | 12 Thermostat |
| 2 Lockwasher | 13 Insulation — vent side |
| 3 End insulation | 14 Insulation — top |
| 4 Grommet | 15 Knob |
| 5 Connector | 16 Nut |
| 6 Screw and nut | 17 Insulation — end |
| 7 Nut | 18 Cover |
| 8 Lockwasher | 19 Insulation — filler |
| 9 Screw | 20 pad |
| 10 Heating element | 21 Insulation — side |
| 11 Screw, lockwasher and nut | 22 End |

Figure 17. Battery box cover.

- (4) Inspect filler caps to see that they are in place, fit properly, and the vent holes in filler caps are open.
- (5) Inspect battery cables for wear or corrosion. Replace or fabricate new cables, if defective.
- (6) Inspect battery box for corrosion and rust. Remove all corrosion and rust.
- (7) Inspect battery box lid insulation. Replace any loose insulation.
- (8) Inspect the heating elements and thermostat for evidence of damage. Test element and thermostat for continuity with ohmmeter.

d. Reassembly of Battery Box Cover.

- (1) Position thermostat (12, fig. 17) to cover end (22) and secure with screws (11).
- (2) Position heating element (10) to cover and install nuts (1) and lockwashers (2).
- (3) Install connector (5) and secure with screws and nuts (6).
- (4) Reconnect all terminals to their proper location.

e. Fabricating Battery Cables. Should it be necessary to fabricate new cables, cut cable length as shown in B of figure 16. Solder terminals with the aid of a torch. Be certain the soldered joint is firm. Remove excess solder.

f. Installation.

- (1) Position battery box outer base (14, fig. 16) on frame and secure with hardware. Insert battery box inner base (13).
- (2) Install batteries (9) in battery box, with terminals toward the center. Connect cables and secure to terminals with connector lever (8).
- (3) Place cover (1) on box and snap the spring latches (6) closed. Connect the connector (5) to the receptacle of the heating elements in battery box cover.

83. Starter

a. Removal.

- (1) Disconnect the solenoid lead (15, fig. 18), and positive battery cable (14) from solenoid.

Caution: Disconnect the battery cables from the batteries before disconnecting the starter motor.

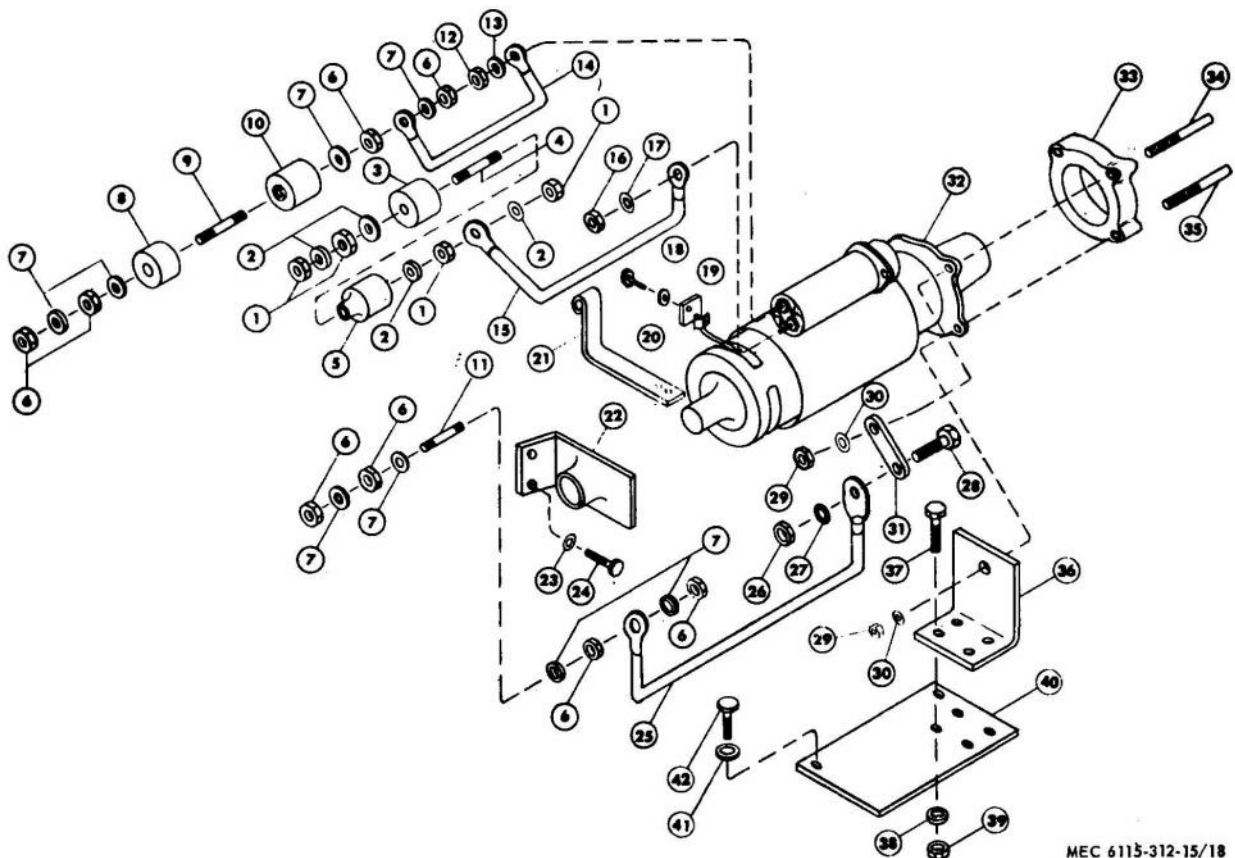
- (2) Remove the two cap screws (24) and lockwashers (23) that secure starter bracket (22).
- (3) Remove the four cap screws (37), lockwashers (38) and nuts (39) that secure starter bracket (36) to bracket plate (40).
- (4) Remove the three nuts (29) and lockwashers (30) that secure the starter mounting adaptor (33) to the engine flywheel housing. Remove the starter.

b. Cleaning and Inspection.

- (1) Clean the outside of engine starter with a cloth dampened with an approved cleaning solvent and dry thoroughly. Be sure solvent does not enter the starter.
- (2) Inspect the starter terminals for corrosion or damaged threads. Clean the terminals with a wire brush.
- (3) Remove the cover band (21) from the starter and inspect the brushes (20). Replace worn brushes.
- (4) Check the brush spring tension by hooking a spring scale to the brush spring. The correct tension is 25 to 30 ounces. Report faulty springs to proper authority.
- (5) Examine the teeth of starter pinion and engine ring gear for good condition. Check to see that the pinion-engaging mechanism does not bind. Replace a defective starter.

c. Installation.

- (1) Position the starting mounting spacer (33) and starter (32) on the flywheel adapter studs.



MEC 6115-312-15/18

- | | | |
|--------------|---------------|------------|
| 1 Nut | 15 Lead | 29 Nut |
| 2 Washer | 16 Nut | 30 Washer |
| 3 Insulator | 17 Washer | 31 Strap |
| 4 Stud | 18 Screw | 32 Starter |
| 5 Insulator | 19 Washer | 33 Adapter |
| 6 Nut | 20 Brush | 34 Stud |
| 7 Washer | 21 Cover band | 35 Stud |
| 8 Insulator | 22 Bracket | 36 Bracket |
| 9 Stud | 23 Washer | 37 Screw |
| 10 Insulator | 24 Screw | 38 Washer |
| 11 Stud | 25 Cable | 39 Nut |
| 12 Nut | 26 Nut | 40 Plate |
| 13 Washer | 27 Washer | 41 Washer |
| 14 Cable | 28 Screw | 42 Screw |

Figure 18. Starter removal.

- (2) Position bracket (36) on the lower stud (35) and strap (31) with ground cable (25) to the center stud (34) and secure with nuts (29) and lockwashers (30). Secure bracket (36) with cap screws (37), lockwashers (38) and nuts (39).
- (3) Position bracket (22) on rear of starter and secure with cap screws (24) and lockwashers (23).

- (4) Connect battery cable (14) and solenoid lead (15) to the solenoid.

84. Slave Receptacle

a. Removal.

- (1) Remove negative cable of the slave receptacle from ground terminal at rear of engine housing.
- (2) Remove positive cable of slave recep-

tacle from stud (9, fig. 18) at the rear of engine housing.

- (3) Remove the four screws (11, fig. 7), lockwashers and nuts (12) that secure slave receptacle (13) to the panel. Remove the slave receptacle with cables from units.

b. Cleaning, Inspection and Repair.

- (1) Clean the slave receptacle with a cloth dampened with an approved cleaning solvent.
- (2) Inspect the cables for corrosion, cracked or frayed insulation. Replace defective cables.

- (3) Inspect the slave receptacle for cracks, breaks, damaged terminals and damaged threads. Replace a defective slave receptacle.

c. Installation.

- (1) Position slave receptacle (13) to panel and secure with four screws (11), lockwashers and nuts (12).
- (2) Attach negative cable from slave receptacle to ground terminal at rear of engine housing.
- (3) Attach positive cable from slave receptacle to the stud (9, fig. 18) at the rear of engine housing.

Section IX. IGNITION SYSTEM

85. Description

The spark for ignition of the fuel mixture is furnished by the magneto driven from the timing gears at crankshaft speed. The magneto contains an impulse coupling, which provides high tension current to the spark plugs. The impulse coupling automatically retards the timing of the spark for starting. To stop the engine, a switch is provided to ground the primary winding of the magneto coil, thereby stopping the flow of current to the spark plugs.

86. Spark Plugs and Cables

a. Testing. If engine fails to start or runs erratically, the ignition system may not be providing a hot spark. First, disconnect the ignition cables from the spark plugs. In succession, hold each terminal end of the cable approximately $\frac{1}{8}$ inch away from the engine cylinder head while depressing the start button. The spark should jump the gap with an intense blue flame. If the spark is satisfactory, check the spark plugs. If the spark is weak or there is no spark disconnect the high temperature safety switch lead to be sure it is not at fault. Repeat test, if condition still exists, check magneto and the ignition cables.

b. Removal. Unscrew the ignition cable connector nut and remove the ignition cables from the top of each spark plug. Unscrew the spark

plugs from the cylinder head and remove the plugs.

c. Cleaning and Inspection.

- (1) Clean the spark plugs with a conventional air blast type spark plug cleaner. If cleaner is not available, scrape as much of the carbon deposits from the electrodes and insulators as possible. Taking care not to damage the insulator. Be sure all abrasive material is blown out of the spark plugs. Wipe the exterior surface of the spark plugs with a clean dry, cloth.
- (2) If the insulator is chipped or damaged in any way, or if the electrodes are badly burned, replace the spark plugs.

d. Adjustments of Spark Gap. Check the gap between the spark plug electrodes. The correct spark gap is 0.030 inch. If necessary, regap the electrodes, carefully bending the outer electrodes until the proper gap is established. Check the dimension of the gap with a spark plug gage.

e. Spark Plug Installation.

- (1) Install the spark plugs in the cylinder head tighten the spark plus to a torque pull of 24 - 26 foot-pounds.
- (2) Install the ignition cable connector on the spark plugs.

87. Magneto

a. Removal and Disassembly.

- (1) Remove the screw and washer (20, fig. 13) and disconnect press-to-stop switch lead (18) and high temperature switch to lead (17).
- (2) Remove the ignition cable nuts (19) and remove the ignition cables (38) from the end cap (21).
- (3) Remove the upper screw and lockwasher that secure the magneto frame to the engine gear cover. Remove screw, nut and lockwasher (36) securing the magneto (25) to the engine gear cover at the bottom.
- (4) Slowly pull the assembly and gasket (37) from the engine gear cover.
- (5) Remove the four screws and lockwashers (39) that secure the end cap (21) to magneto housing. Remove end cap and gasket.

b. Cleaning and Inspection.

- (1) Clean exterior of magneto and face of gear cover with a clean cloth dampened in an approved cleaning solvent.

- (2) Inspect magneto for cracks, breaks, or other damage. Check surface of the mounting flange and surface upon which the magneto is mounted to be sure it is flat, smooth, and free of burrs.

- (3) Inspect the breaker points for pitting or burning and replace if defective.

- (4) Inspect the end cap for breaks, cracks, or other visible damage. Replace defective parts.

- (5) Inspect end cap gasket for tears or other damage and replace if defective.

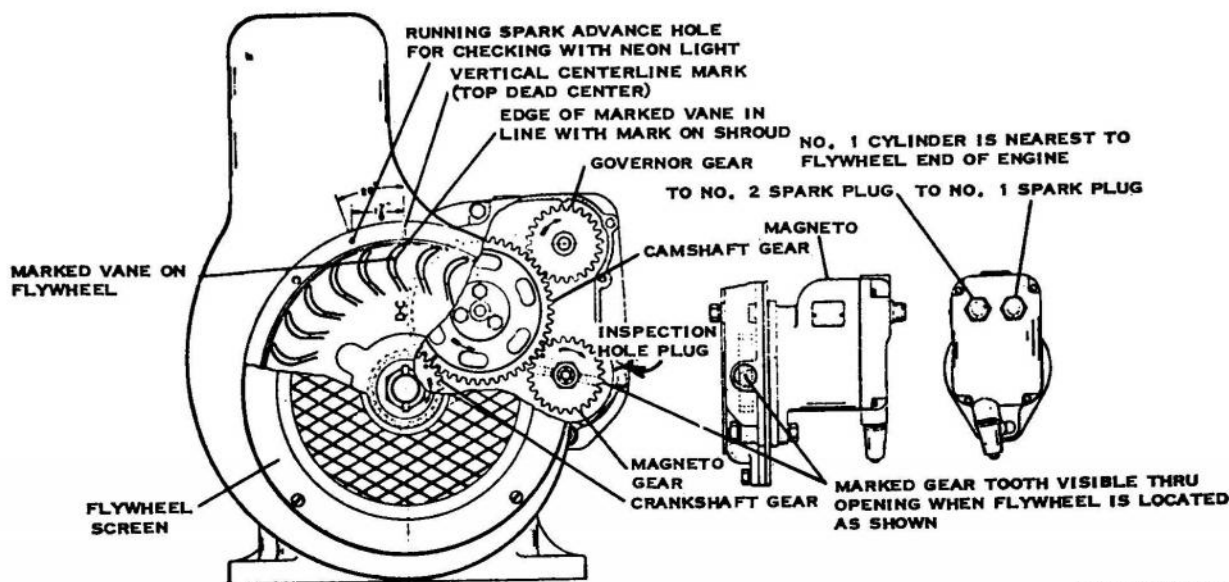
c. Reassembly, Installation and Timing.

- (1) Position end cap (21) with gasket on magneto housing and secure with four screws and lockwashers (39).

- (2) Remove spark plug from No. 1 cylinder, identified as one closest to fan, flywheel end of the engine.

- (3) Crank engine slowly until air blows from the spark plug hole, indicating the start of the compression stroke.

- (4) Continue cranking until the edge of the circulating vane marked with the



MEC 6115-312-15/19

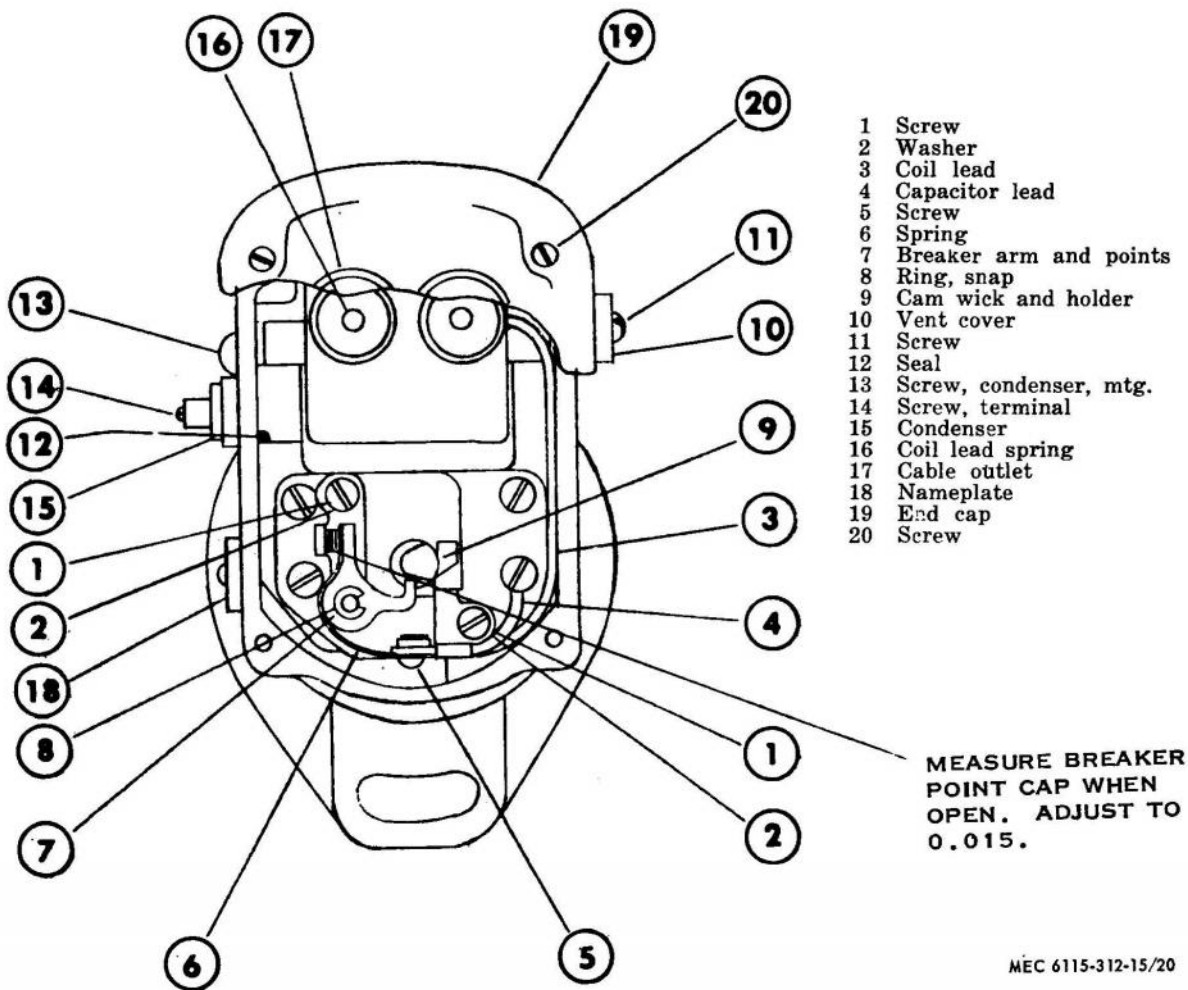
Figure 19. Magneto timing.

letter X and DC is in line with the mark on shroud, as shown in figure 19.

- (5) Remove the inspection plug from the gear cover.
- (6) Rotate the magneto gear clockwise until the impulse snaps. Hold the gear in this position and mount magneto with gasket to engine, meshing the gears so that the marked gear tooth of the magneto is centrally located to the inspection hole as shown in figure 19.
- (7) Secure magneto to gear cover by installing screw lockwashers at top and

screw lockwashers and nuts (36) at bottom.

- (8) Install the inspection plug to gear cover and No. 1 spark plug. Install the spark plug cables to the proper terminals on the magneto end cap.
- (9) The running spark advance is 20° indicated by the $\frac{1}{8}$ -inch diameter hole on shroud as shown in figure 19. To check timing with a timing light, whiten the end of marked vane with chalk or paint; with engine running at normal speed, the ignition spark should take place when the marked vane lines up with the running spark advance hole on the shroud.



MEC 6115-312-15/20

Figure 20. Magneto breaker point adjustment and removal.

d. Magneto Breaker Point Adjustment.

- (1) Remove the end cap from magneto.
- (2) Crank the engine with hand crank until the breaker points are wide open.
- (3) To adjust the breaker points, loosen screw on breaker point plate. Insert the end of a small screw driver into the adjusting slot and open or close breaker point gap until the proper clearance of 0.015 inch is obtained (fig. 20)
- (4) Tighten lock screw, recheck clearance, and install end cap with gasket to magneto.

e. Breaker Point Replacement.

- (1) Remove end cap and gasket.
- (2) Remove terminal screw (5, fig. 20) that secure the coil lead (3), capacitor lead (4) and breaker arm spring (6).

(3) Remove snap ring (8) and lift out breaker arm and points (7).

(4) Remove the two lock screws (1) and washers (2) and remove the contact support plate.

(5) Position new contact support on magneto and secure with screws (1) and washers (2).

(6) Install new breaker arm and points (7) and secure with snap ring (8).

(7) Position breaker arm spring (6) against contact support. Secure coil lead (3), capacitor lead (4) and breaker arm spring with terminal screw (5).

(8) Adjust the breaker point gap as described in *d* above.

(9) Install end cap with gasket to magneto.

Section X. ENGINE

88. General

The generator set is driven by a two cylinder L head gasoline engine which is mounted in front of the generator. To insure that the engine operates well, and to lessen the possibility of mechanical failure, personnel must follow the preventive maintenance services outlined in paragraphs 48, and 49. Additional services covering the engine are provided in paragraphs 89 through 91 below.

89. Manifolds

a. Removal.

- (1) Remove exhaust muffler and pipe (para 69).
- (2) Remove engine front and top covers (para 73) and side panels.
- (3) Remove carburetor (para 76).
- (4) Remove the two nuts (7, fig. 13) lock washers (6) and manifold clamp washers (5) from cylinder block to manifold studs.

(5) Remove the intake and exhaust manifolds (8 and 10), and gaskets from cylinder block.

b. Cleaning and Inspection.

- (1) Clean all parts with an approved cleaning solvent.
- (2) Inspect the manifolds for cracks and breaks. Replace a defective manifold.
- (3) Inspect all hardware for damage. Replace damaged parts as required.
- (4) Replace the three gaskets.

c. Installation.

- (1) Position three new gaskets and manifolds to the cylinder block. Secure with manifold clamp washers (5), lock washers (6) and nuts (7).
- (2) Install carburetor, engine housing, and exhaust muffler and pipe.

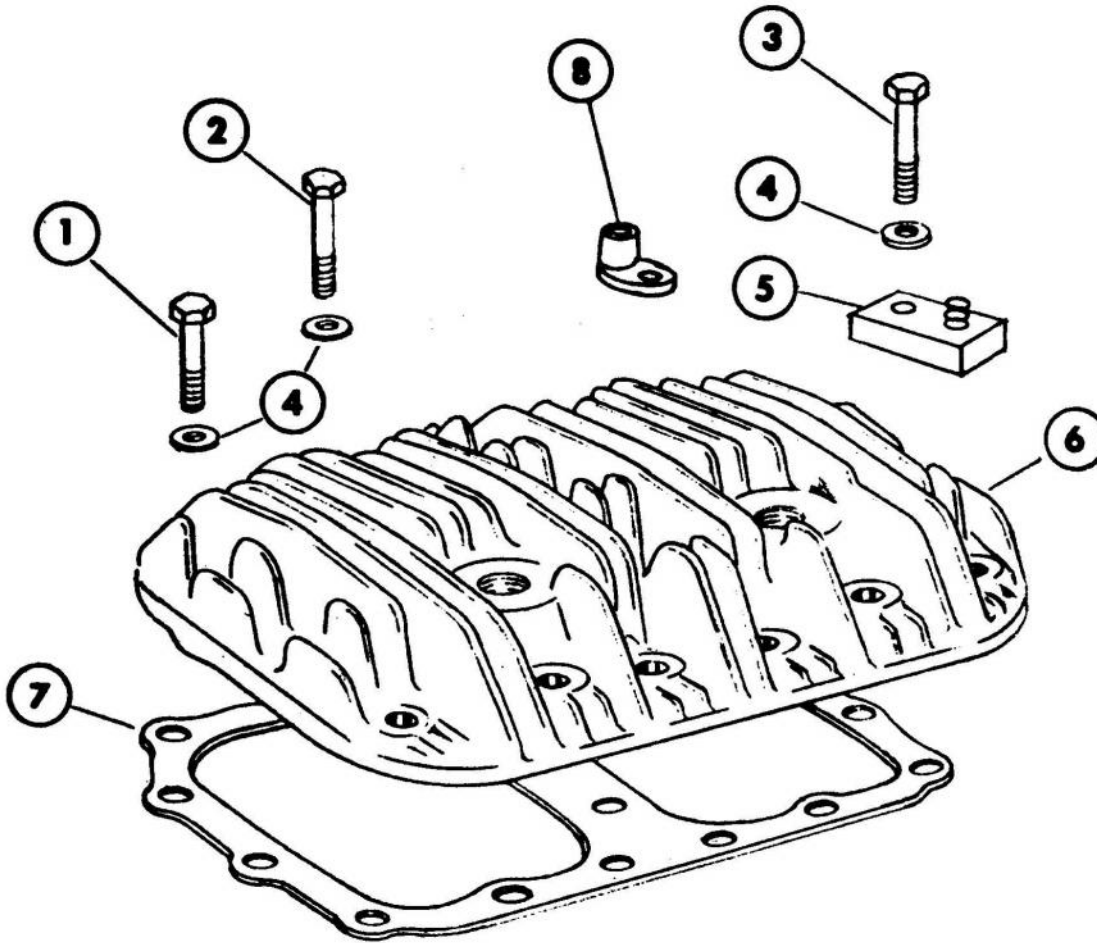
90. Cylinder Head

a. Removal.

- (1) Remove exhaust muffler and pipe (para 69).
- (2) Remove engine side covers, (para 72) and front and top cover (para 73).
- (3) Remove screw (3, fig. 21) and high temperature safety switch (5).
- (4) Remove the two screws (2, fig. 21), the fourteen screws (1), and sixteen lockwashers (4). Remove cylinder head (6), adapter (8), and gasket (7). Discard gasket.

b. Cleaning, Inspection and Repair.

- (1) Clean all carbon deposits from cylinder block. Clean the carbon from the top of pistons and blow away carbon with compressed air.
- (2) Brush or scrape the carbon from the cylinder head. Remove all dirt and foreign matter from between cooling fins.
- (3) Inspect the cylinder head for cracks, breaks, or warping. Replace a defective cylinder head.



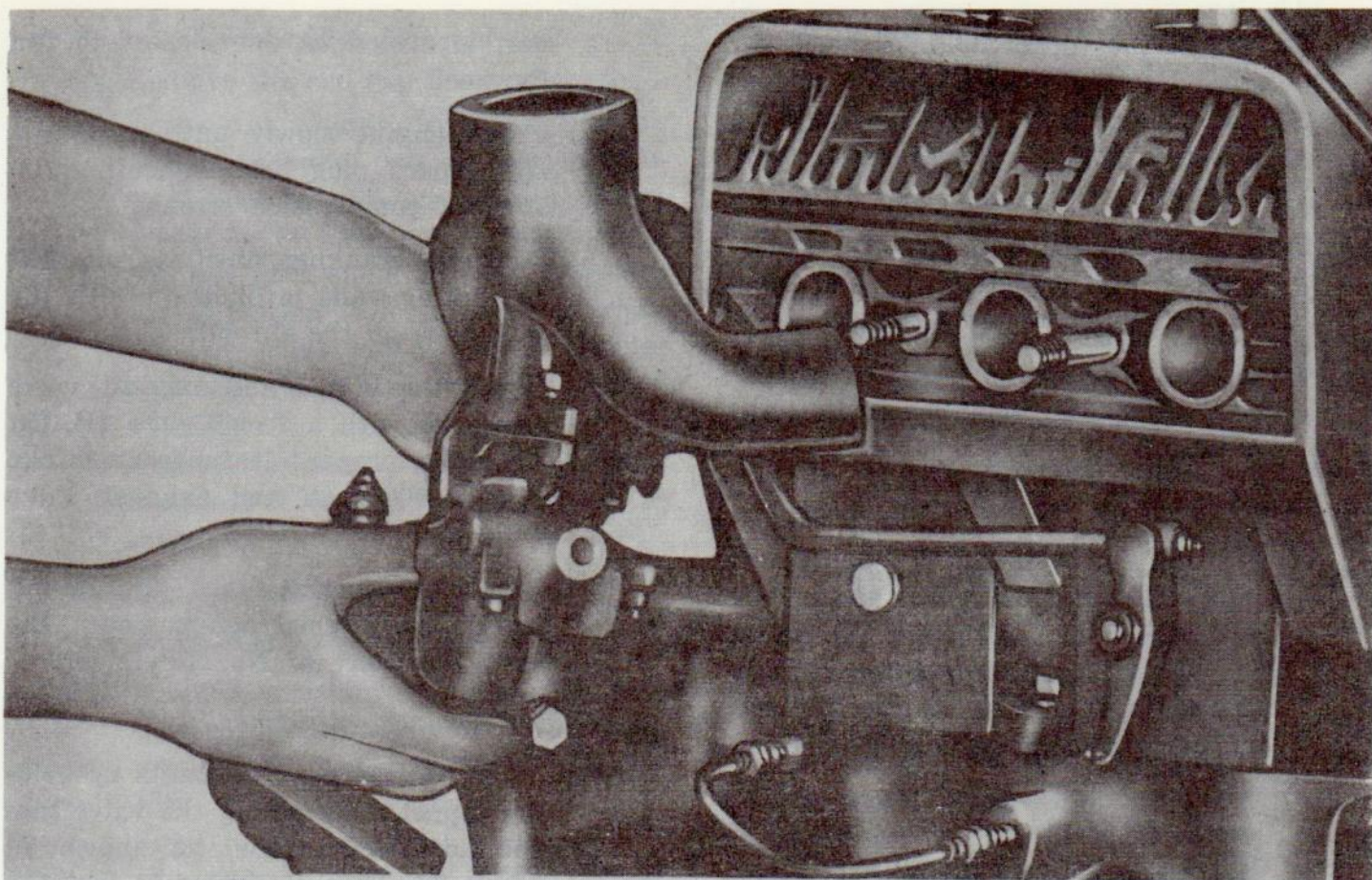
MEC 6115-312-15/21

1 Screw
2 Screw
3 Screw

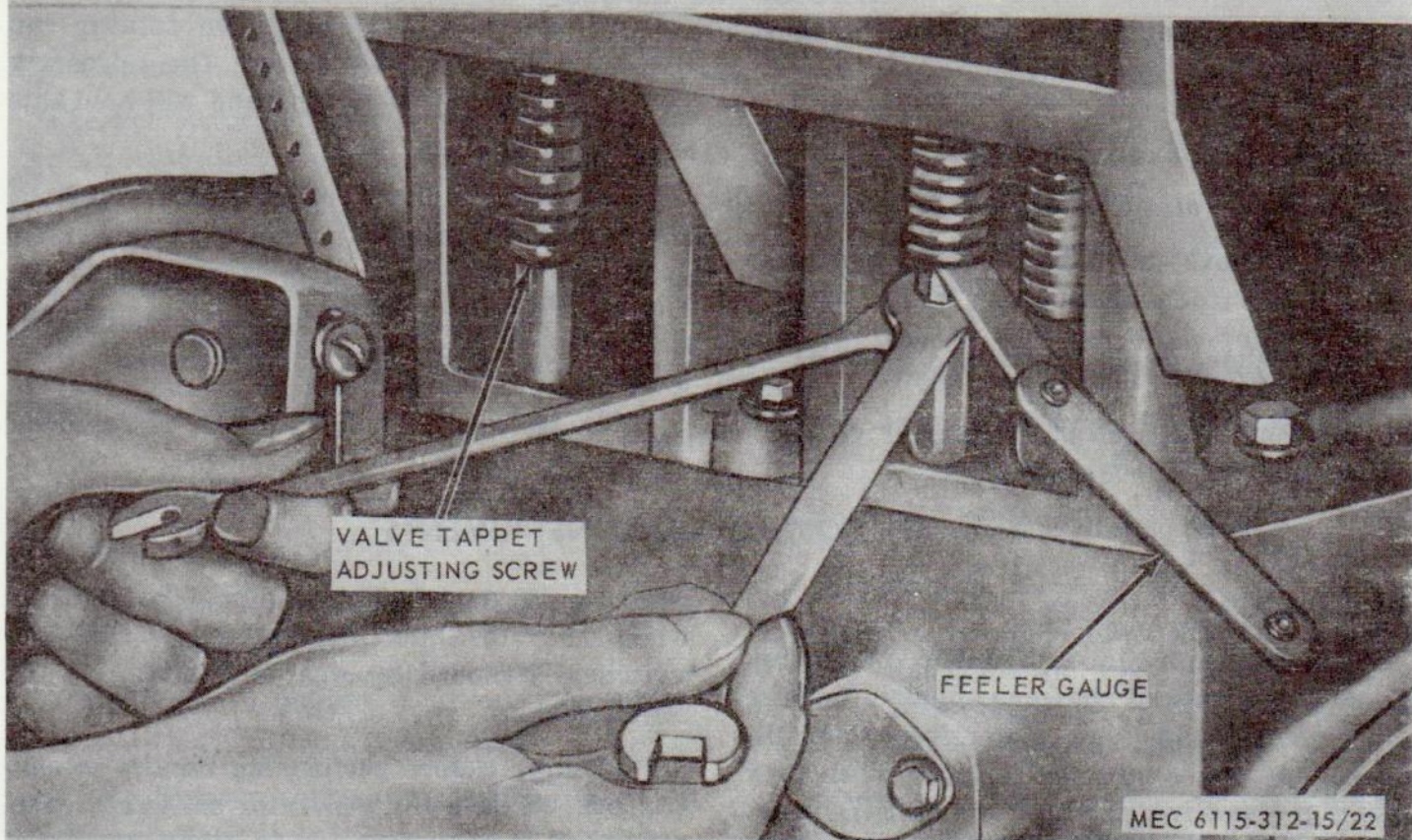
4 Washer
5 High temperature
Safety switch

6 Cylinder head
7 Gasket
8 Adapter

Figure 21. Cylinder head group.



A. CARBURETOR-MANIFOLD REMOVAL



B. ADJUSTING TAPPETS

Figure 22. Adjusting tappets.

- (4) Inspect the top of cylinder block for cracks or breaks. Inspect cylinder walls for scoring or pitting. Report a defective block to direct support maintenance.
- (5) Inspect the valves and top of valve seats. Report defective valves or seats to direct support maintenance.
- (6) Inspect all screws for stripped or damaged threads. Replace a defective screw.

c. Installation.

- (1) Position a new gasket (7) on the cylinder head (6) on block and secure with screws (1 and 2). The two longer (1-1½-inch long) screws are to be installed in the holes on the far side and opposite the spark plug holes.
- (2) Position high temperature safety switch on head over hole adjacent to No. 2 spark plug. Install screw (3). Install adapter (8).
- (3) Install engine housing and exhaust muffler.

91. Intake and Exhaust Valves

a. Checking Valve Clearance.

- (1) Remove manifolds (para 89) with carburetor assembled (A, fig. 22).
- (2) Remove valve covers and gaskets.
- (3) Remove spark plug from No. 1 cylinder,

identified as one closest to fan flywheel.

- (4) Crank engine slowly until air blows from spark plug hole, indicating the start of compression stroke.
- (5) Continue cranking until the marked circulating vane is lined up with the centerline on the shroud.
- (6) Check the intake and exhaust valve clearance with a feeler gage (B, fig. 22). The proper clearance is intake valve 0.008 inch and exhaust valve 0.016 inch.
- (7) Crank the engine until the timing marks are aligned again. Check the valve clearance of No. 2 cylinder.

b. Valve Clearance Adjustment.

- (1) Make necessary adjustments by holding tappet and turning the valve tappet adjusting screw, as shown in figure 22. Turn clockwise to increase or counter clockwise to reduce the clearance between valve rotator cap and adjusting screw. The adjusting screw is self locking and will hold this setting.
- (2) Repeat above procedure for valves of No. 2 cylinder.
- (3) Install new gaskets and covers to cylinder block and secure with support pin, screw, and copper washers.
- (4) Install spark plug in No. 1 cylinder.

Section XI. CONTROLS AND INSTRUMENTS

92. General

Before replacing an instrument or control, inspect the wiring of the component to be sure it is not damaged or defective. Controls, meters, and gages must be replaced when they become inoperative, or show signs of incorrect reading under normal operation. Damage is caused by overloading, wear, and breaking. Always handle controls, meters, and gages with care, since they are sensitive and require accu-

rate adjustment. Switches should be replaced when they become inoperative. Damage to switches is caused by wear and arcing at the control points.

Warning: Before performing repairs to control box, be sure the generator set is not operating and is not connected to other sources of voltage.

Note. When removing any gage or instrument, tag all wires being disconnected as well as the terminals

from which they are disconnected so that proper connections are made when replacing components.

93. Meters

a. Removal.

- (1) Tag and remove leads from the meters.
- (2) Release meters (15 - 18, fig. 23) from panel by removing the three machine screws, hex nuts and lockwashers.
- (3) To remove battery charging generator gage (23), remove the two hex nuts and washers holding meter to mounting bracket.

b. Cleaning, Inspection and Repair.

- (1) Clean all terminals with a brush. Use a suitable solvent to remove dirt and oxidation.
- (2) Inspect meters for broken glass, damaged terminal posts, and bent indicating needles. Replace a damaged meter.

c. Installation.

- (1) Position battery charging generator gage (23) on front of control panel and install mounting bracket, lockwashers and nuts.
- (2) Position meters (15 - 18) on front of control panel and secure with screws, lockwasher and nuts.

94. Switches

a. *Removal.* The push-type and toggle-type switches are best removed by removing the nut holding switch on front of panel. Remove switch from back of panel, for easier access to the wire leads.

b. *Inspection and Repair.* Check the switches for positive action. Use a test lamp to check for continuity of contacts. Replace a defective switch.

c. *Installation.* Connect wire leads to proper terminals. Position switches in the back of control panel and secure with holding nut at front of panel.

95. Adjust Volt Rheostat and Voltage Regulator

a. *Rheostat.* Replace if voltage regulation cannot be attained or if voltage varies erratically, when operated, indicated broken wire element in rheostat. Also check resistance continuity and erratic resistance variation with ohmmeter as knob is revolved.

(1) Removal.

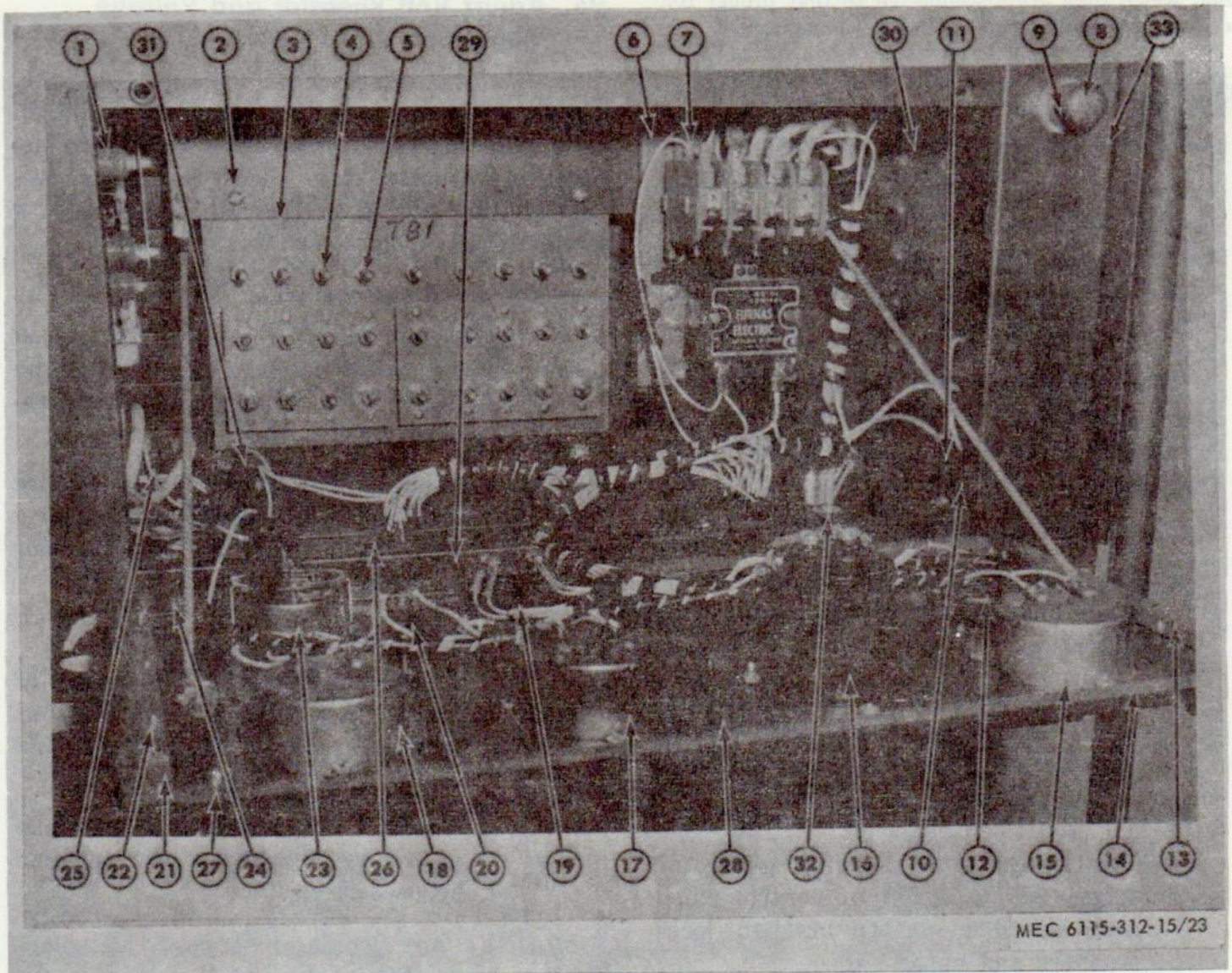
- (a) From front of control box panel, loosen one internal head wrenching screw in the rheostat knob and remove knob.
- (b) Remove the hex nut and washer from rheostat shank and remove rheostat (12, fig. 23) from the rear of panel.

(2) Installation.

- (a) Install rheostat (12) from rear of control box panel. From the front of panel secure with hex nut and washer.
- (b) Position knob on rheostat shaft and secure by tightening the internal headset screw.

b. *AC Voltage Regulator (1, fig. 23).* Replace the regulator plug-in element if voltage regulator cannot be maintained, stabilized or if voltage varies erratically during normal operation of the unit. If the replacement element does not rectify, check for defective resistors on the chassis. Replace chassis as an assembly if there are defective components in it. Keep the chassis clean and be sure that socket pins are secure.

- (1) *Plug-In Element.* This can be released readily by removing the clamp securing it to the regulator chassis and carefully lifting it from its socket. Reverse procedure to install being careful to align pins in socket.
- (2) *Chassis.* If chassis is to be removed, first identify wiring connected to terminals (fig. 3). Then release ground strap and capacitor leads attached to it, and remove its mounting hardware.



MEC 6115-312-15/23

- | | | |
|---------------------------------------|--------------------------|-------------------------------|
| 1 Voltage regulator w/plug-in element | 12 Rheostat | 24 Door seal, bottom |
| 2 Screw, lockwasher, and nut | 13 Door seal, side | 25 Current transformer |
| 3 Change board | 14 Door seal, top | 26 Connector |
| 4 Stud | 15 Voltmeter | 27 Turnlock stud |
| 5 Nut and lockwasher | 16 Time totalizing meter | 28 Panel |
| 6 Mount, contactor | 17 Frequency meter | 29 Horizontal strip |
| 7 Contactor | 18 Ammeter | 30 panel, rear |
| 8 Lampholder | 19 Push switch | 31 Resistor |
| 9 Lamp | 20 Lampholder | 32 Screw, lockwasher, and nut |
| 11 Fuseholder | 21 Strip | 33 Housing, control box |
| | 22 Rivet | |
| | 23 Battery charging gage | |

Figure 23. Control panel inside view.

Reverse procedure to install being careful to reconnect wires to proper terminals (fig. 3).

96. Magnetic Contactor

a. Removal.

(1) Loosen the terminal screws that se-

cure the electrical leads to the magnetic contactor (7, fig. 23). Tag and remove leads.

(2) Remove the screws, lockwashers and nuts that secure the magnetic contactor to contactor mount (6) within the control box.

b. Cleaning, Inspection and Repair.

- (1) Clean the exposed surfaces of the magnetic contactor with a cloth dampened with an approved solvent.
- (2) Inspect the contacts for excessive pitting and burns. Test the coil by connecting, a 120-volt, 60 cycle source to the lower terminals, and observe that the contacts of the magnetic contactor make sharply and break when the electrical source is removed. Replace a contactor whose contacts or coil is defective.

c. Installation.

- (1) Position the magnetic contactor on the mount within the control box and secure with screws, nuts and washers.
- (2) Install the leads to the proper terminals and secure by tightening the terminal screws.

97. Terminal Board and Connectors

a. Removal.

- (1) Remove hardware securing resistors (31, fig. 23). Remove the remaining three screws, nut and washers (2) securing change terminal board (3) to inner panel of control panel.
- (2) Tag and remove leads from rear of terminal board.
- (3) Remove and tag leads from connector (26). Remove the four screws, nuts, and lockwashers and remove connector.

b. Cleaning and Inspection.

- (1) Clean the terminal board with a cloth dampened with an approved cleaning solvent.
- (2) Inspect the terminal board for cracks and terminals for damaged threads. Replace damaged parts.
- (3) Inspect the pin contacts of the connector for corrosion and molded insert for cracks. Replace a damaged connector.

c. Installation.

- (1) Connect the leads to the proper terminals in the rear of the terminal board.
- (2) Secure change terminal board (3) to inner panel of control box with hardware (2). Position resistor (31) to terminal board and install mounting hardware.
- (3) Position connector (26) in control box and secure with hardware. Connect tagged leads to their proper terminals.

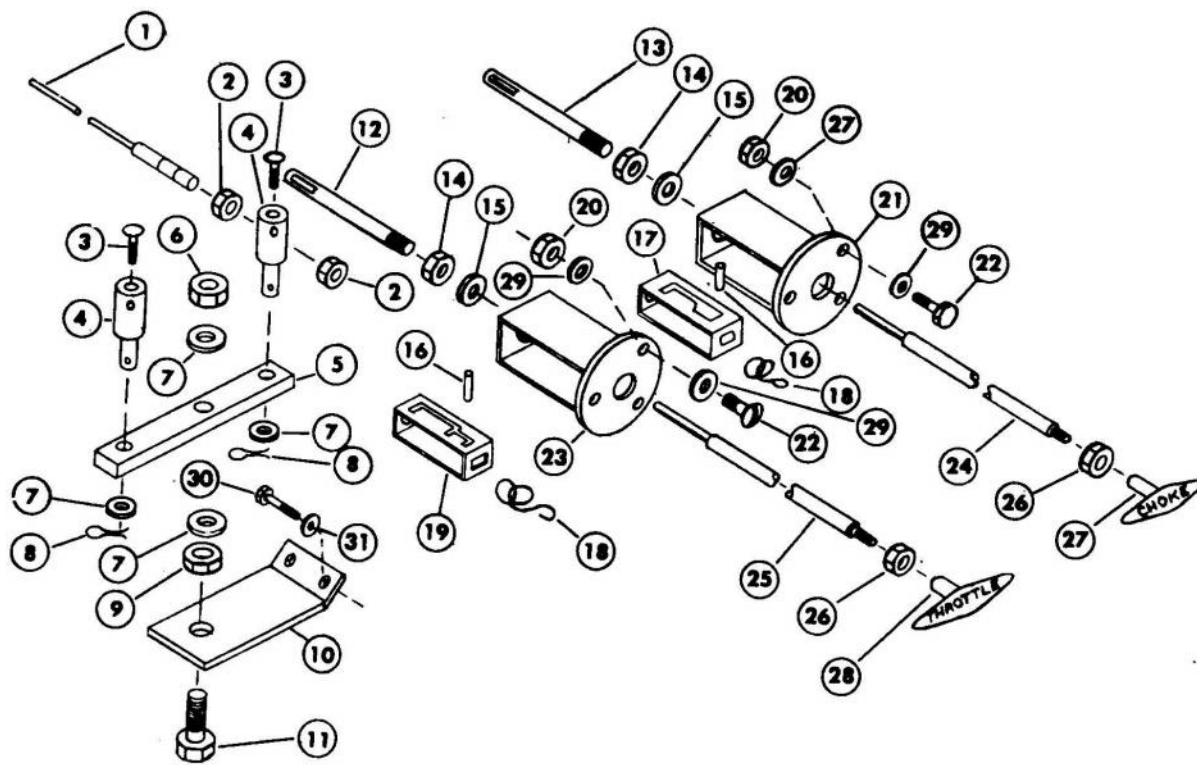
98. Throttle and Choke Terminals

a. Removal.

- (1) Remove the throttle extension (1, fig. 24) and the choke control cable (24) from the carburetor.
- (2) Remove the two nuts (2). Loosen the set screws (3) from the cable fasteners (4). Remove throttle extension cable.
- (3) Remove screws (22) and nuts (20) and remove choke cover (21) and throttle cover (23) with cables from control panel.
- (4) Drive out roll pins (16) and pull the choke handle (27) and throttle handle (28) with nuts (26) and cables (24 and 25) from the choke and throttle covers. Remove springs (18) and choke bracket (17) and throttle bracket (19).

b. Cleaning Inspection and Repair.

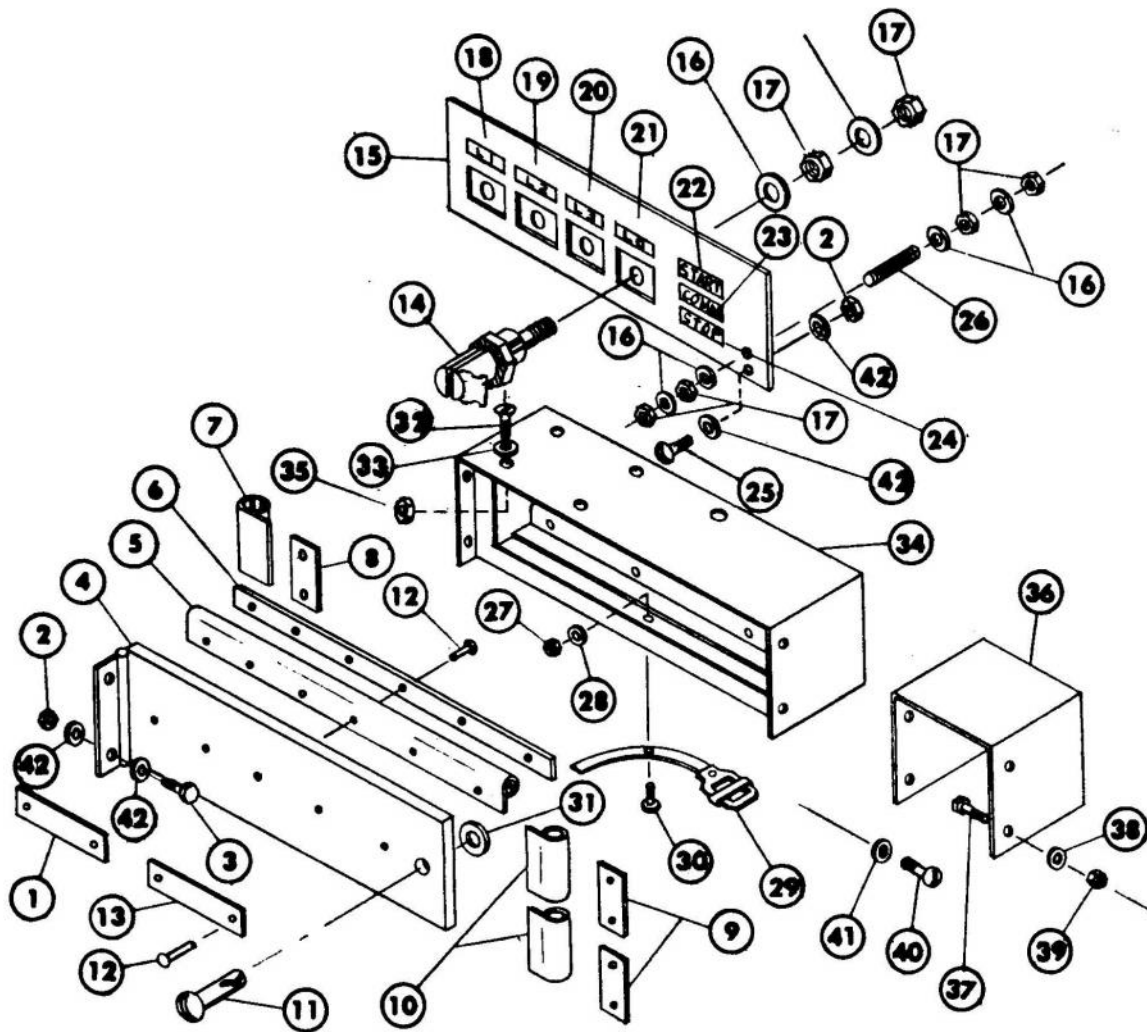
- (1) Clean the choke and throttle controls with a cloth dampened with an approved cleaning solvent.
- (2) Inspect the choke and throttle cables for evidence of excessive wear. Replace a defective choke or throttle cable.
- (3) Inspect the stops in the choke and throttle brackets for excessive elongation where roll pin makes contact. Inspect cable fasteners and transfer link



MEC 6115-312-15/24

- | | | |
|----------------------|---------------------|--------------------|
| 1 Throttle extension | 11 Screw | 21 Cover |
| 2 Nut | 12 Control cable | 22 Screw |
| 3 Set screw | 13 Control cable | 23 Cover |
| 4 Cable fastener | 14 Nut | 24 Choke cable |
| 5 Link | 15 Washer | 25 Throttle cable |
| 6 Nut | 16 Roll pin | 26 Nut |
| 7 Washer | 17 Choke bracket | 27 Choke handle |
| 8 Cotter pin | 18 Spring | 28 Throttle Handle |
| 9 Nut | 19 Throttle bracket | 29 Washer, lock |
| 10 Bracket | 20 Nut | 30 Screw |
| | | 31 Washer, lock |

Figure 24. Choke and throttle controls.



MEC 6115-312-15/25

- | | | |
|--|---------------------------------|---------------------|
| 1 Identification plate (load terminal) | 14 Connection post | 28 Washer |
| 2 Nut | 15 Load board | 29 Strap |
| 3 Screw | 16 Washer | 30 Screw |
| 4 Door | 17 Nut | 31 Grommet |
| 5 Door seal | 18 Identification plate (L 1) | 32 Screw |
| 6 Strip | 19 Identification plate (L 2) | 33 Lockwasher |
| 7 Door seal | 20 Identification plate (L 3) | 34 Load box |
| 8 Strip | 21 Identification plate (L O) | 35 Nut |
| 9 Strip | 22 Identification plate (start) | 36 Receptacle mount |
| 10 Door seal | 23 Identification plate (comm) | 37 Screw |
| 11 Turnlock stud | 24 Identification plate (stop) | 38 Lockwasher |
| 12 Rivet | 25 Screw | 39 Nut |
| 13 Identification plate (remote) | 26 Stud | 40 Screw |
| | 27 Nut | 41 Lockwasher |
| | | 42 Lockwasher |

Figure 25. Load connection box.

for excessive wear. Replace defective parts.

c. Installation.

- (1) Install choke bracket (17), to cover (21) and throttle bracket (19) to cover (23).
- (2) Position spring (18) in bracket and insert cables through covers. Insert roll pins (16).
- (3) Install choke and throttle covers with control cables through engine control panel.
- (4) Connect choke control cable and throttle extension (1) to carburetor.
- (5) Install throttle cable and throttle extension cable fasteners (4). Secure with setscrews (3).

99. Cylinder Head Temperature Gage

a. Removal.

- (1) Unloosen and extract cylinder head temperature bulb from the cylinder head.
- (2) While holding the cylinder head temperature gage (17, fig. 6) at the front of panel (19), remove the nuts, lockwashers and gage mounting bracket behind the panel.
- (3) Remove the cylinder head temperature gage from the front of the instrument panel.

b. Cleaning, Inspection and Repair.

- (1) Clean the gage with a cloth dampened with cleaning solvent. Clean the capillary tube and bulb with cleaning solvent.
- (2) Inspect the gage for damaged case, broken glass, or bent needle.
- (3) Inspect the capillary tube and bulb for kinks, breaks or evidence of leaking.
- (4) Replace a defective temperature gage assembly.

c. Installation.

- (1) Insert the capillary tube through the

instrument panel and secure with bracket, lockwashers and nuts.

- (2) Install bulb attached to capillary tube in the engine cylinder head.

100. Load Connection Box

a. Removal and Disassembly.

- (1) Remove screw (3, fig. 25) nut (2) and remove door (4).
- (2) Remove eight screws (25) nuts (2) and pull load board (15) forward. Tag and remove leads from terminals behind the board. Remove board.
- (3) Remove screws (32), lockwashers (33) and nuts (35) that secure load box (34) to the control panel. Remove screws (40) and washers (41) that secure box to receptacle mount (36). Remove load connection box.

b. Cleaning and Inspection.

- (1) Clean all parts with a cloth dampened with an approved cleaning solvent.
- (2) Inspect the board for cracks and breaks. Check the connector post and terminal studs for signs of pitting or other damage. Replace damaged components.
- (3) Inspect condition of door seal for breaks and deterioration and loose rivets. Replace damaged seals or loose rivets.

c. Reassembly.

- (1) Install connector post and terminal studs to load board (15). Position board into load connection box and connect tagged leads to their proper terminals. Secure board with screws (25) and nuts (2).
- (2) Position cover (4) on box and secure with screws (3) and nuts (2).
- (3) Position load box (34) in place between the receptacle mount and control box. Install four screws (32), washers (33) and nuts (35) that secure load connection box to control box.

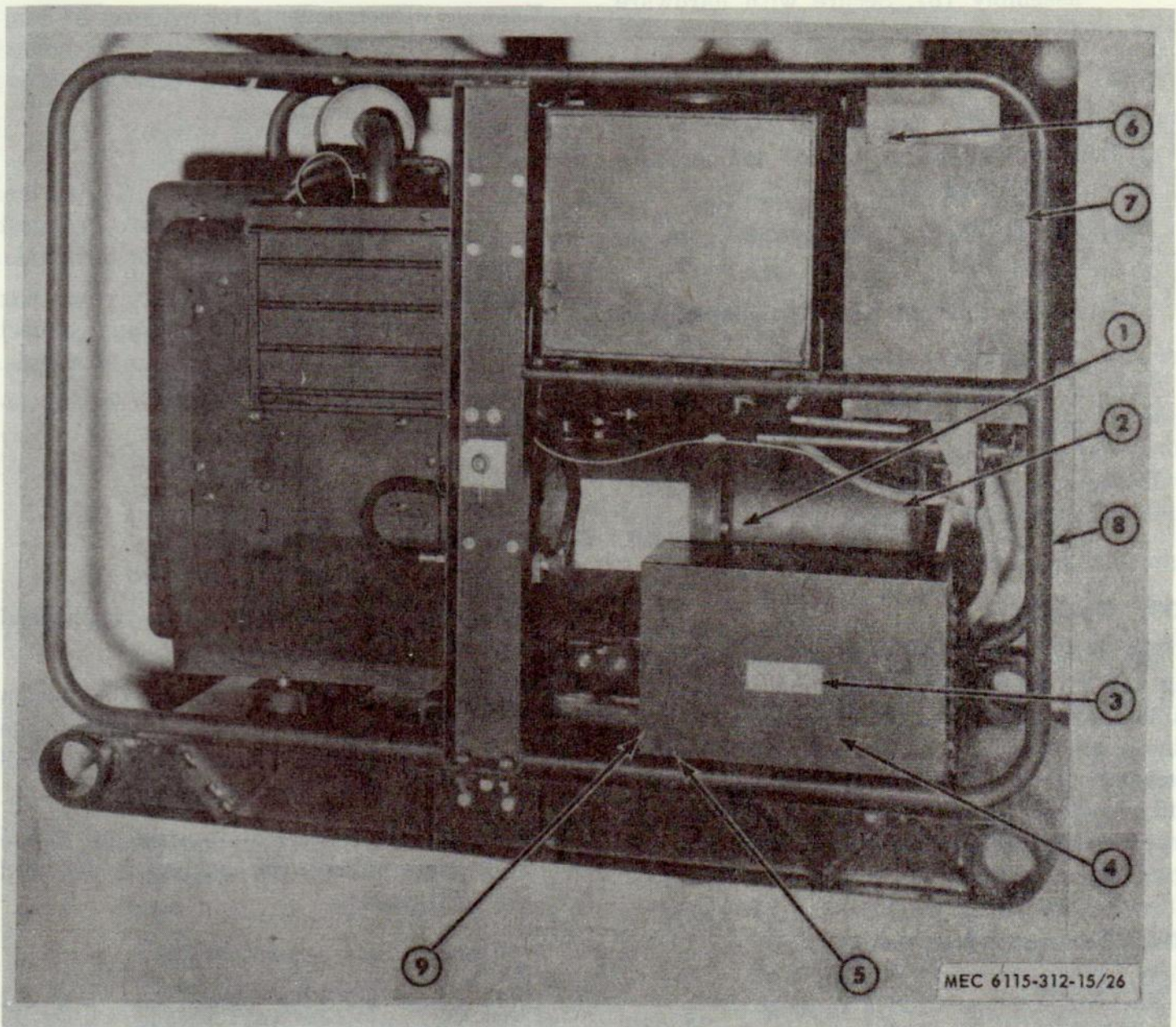
- (4) Install the two screws (40) and lockwashers (41) that secure the load box (34) to the receptacle mount (36).

101. Control Box

a. Removal.

- (1) Disconnect the wiring harness, by loosening the connector plug.
- (2) Remove the terminal board (para 97).

- (3) Remove the choke and throttle controls (para 98).
- (4) Remove the cylinder head temperature gage (para 99).
- (5) Remove load connection box (para 100).
- (6) Remove the six screws, lockwashers, and nuts (6, fig. 26) that secure control box panel (7) to the generator set frame assembly (8). Remove the control box.



- | | | |
|-------------------|-----------------------------|-------------------|
| 1 Screw | 4 Cover-battery charger | 7 Control box |
| 2 Generator cover | 5 Screw | 8 Frame assembly |
| 3 Name plate | 6 Screw, lockwasher and nut | 9 Battery charger |

Figure 26. Control box and battery charger-installed view.

b. Cleaning, Inspection and Repair.

- (1) Remove the dust and dirt by wiping the control box with a clean cloth.
- (2) Inspect the control box for rust spots and other signs of corrosion. Remove rust and touch up paint.
- (3) Inspect control box dents, cracks or other damage. Pound out dents or replace an unserviceable control box.

c. Installation.

- (1) Position control box (7) on frame assembly (8). Secure with hardware (6).
- (2) Install load connection box (para 100).
- (3) Install cylinder head temperature gage (para 99).
- (4) Install choke and throttle controls (para 98).
- (5) Install thermal board to control box para 97).
- (6) Connect wiring harness connector plugs.

102. Relay Box

a. Disassembly.

- (1) The relays (3-5, fig. 7) can be removed by extracting from the sockets (8).
- (2) Remove and tag leads from relays (6 and 7). Remove screws, nuts, washers (9), and remove relays from relay box (16).
- (3) Remove and tag leads from socket (8) and remove sockets from relay box.

b. Inspection and Repair.

Examine all components for evidence of damage caused by excessive heat. Check the molded inserts of the relay sockets for cracks. Replace a damaged component.

c. Reassembly.

- (1) Position relays (6 and 7) in relay box and secure with hardware, connect tagged leads to their proper terminals.
- (2) Install relay socket (8) to relay box and secure with hardware and connect tagged leads to their proper terminals.
- (3) Replace relays (3-5) by inserting relays into sockets.

Section XII. GENERATOR

103. General

The generator consists of a combined rotating field alternator and exciter mounted on the same shaft. It is directly connected to the engine crankshaft by a flexible type coupling. Removal of the end cover permits inspection and servicing of the exciter commutator, brushes, and of the alternator sliprings and brushes.

104. Generator Brushes

a. Removal.

- (1) Remove the end cover (2, fig. 26) by removing the three screws (1) securing it to the bearing bracket.
- (2) Remove the nut (14, fig. 27) and

washer that secure the brush lead (15).

- (3) Push down slightly on the brush spring (16) to release it from the brush holder commutator (7). Pull brush with lead from holder.
- (4) Remove the remaining brushes in the same manner as outlined in (2) and (3) above.

b. Cleaning, Inspection and Repair.

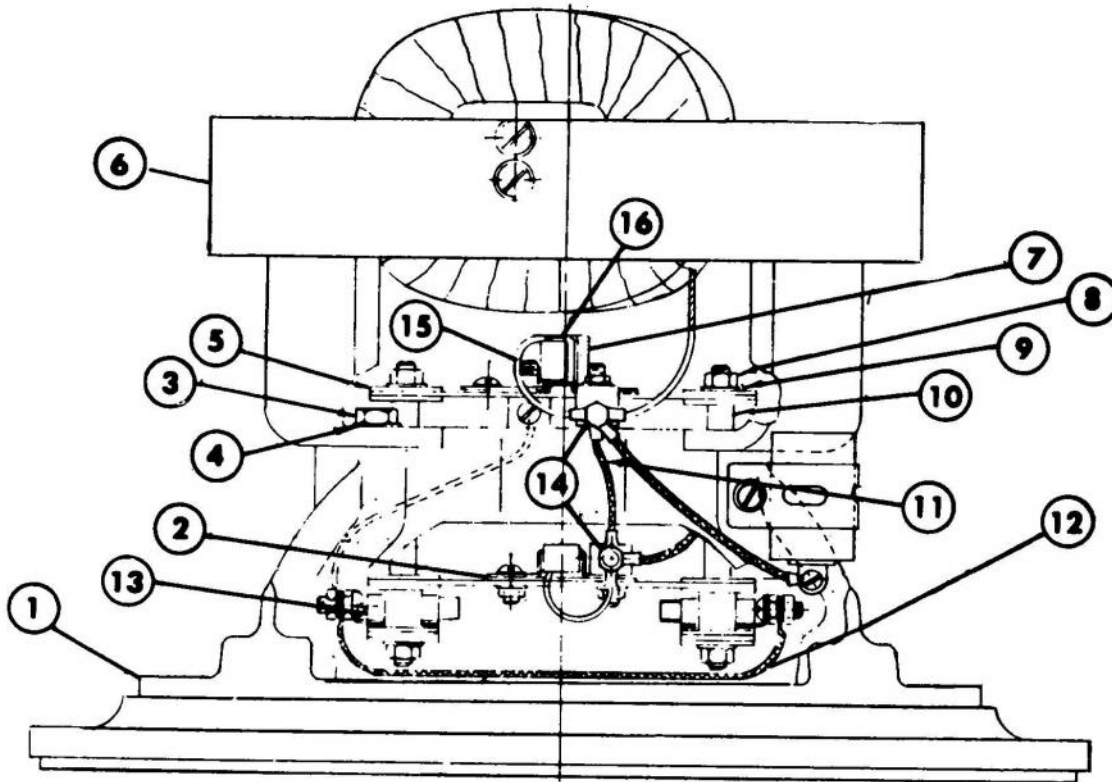
- (1) Clean collector rings that are extremely dirty with a fine non-metallic sand paper. Take care not to dig into the ring surface.
- (2) Sand the commutator with No. 00

sandpaper. Clean all dirt from between the commutator bars. Do not damage or form burrs on the bars or on the mica.

- (3) Inspect the brushes for wear, chipping, or an oil-soaked condition. Replace brushes that are chipped, oil-soaked, or worn less than three-eighths inch from the lower edge of the brush bevel.

c. Installation.

- (1) Brushes are preformed and require no seating.
- (2) Slide brush into brush holder.
- (3) Place spring roll over brush and press down to engage slots on the brush holder.
- (4) Connect brush wire lead (15) and secure with nut and washer (14).



MEC 6115-312-15/27

- | | |
|-----------------------------|----------------------|
| 1 Bearing bracket | 9 Lockwasher |
| 2 Brush holder | 10 Brush holder stud |
| 3 Screw | 11 Lead |
| 4 Lockwasher | 12 Lead |
| 5 Washer | 13 Spacer |
| 6 Exciter field frame | 14 Nut |
| 7 Brush holder — commutator | 15 Brush lead |
| 8 Nut | 16 Brush spring |

Figure 27. Generator bearing bracket and brush removal.

CHAPTER 4

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. OVERHAUL AND REPLACEMENT STANDARDS

105. Tabulated Data

a. Engine Assembly. All measurements are in inches unless otherwise indicated. (Mfr's dim. minimum/maximum*; maximum wear and clearance.)

(1) Crankshaft.

Journal diameters	1.8100/1.8105 * 0.002
Main journal fillet radius	0.125
Con rod journal fillet radius	0.09375
End play of crankshaft in bearing	0.002/0.004 * Adjustable

(2) Cylinders.

Bore Diameter (nominal)	2.254/3.255 * 0.005
-------------------------------	---------------------

(3) Camshaft.

No. 1 Journal	1.8725/1.8730 * 0.002
No. 2 Journal	1.2475/1.2480 * 0.002

(4) Camshaft bushing and bearings.

No. 1 Journal	1.875/1.876 * 0.002
No. 2 Journal	1.250/1.251 * 0.002

(5) Connecting rod.

OD of crankshaft	1.9370/1.93755 * 0.003
ID of installed bushing	1.8115/1.8125
Clearance between bushing and crankshaft	0.0010/0.0025 * 0.003
Side clearance between bushing and crankshaft ..	0.004/0.011
Max. out of round of bushing	0.0005
OD of piston END	0.9125/0.9130
ID of installed bushing	0.8594/0.8597 * 0.001
Interference OD of bushing to ID of rod	0.0025/0.0055
Clearance between piston pin and bushing	0.0001/0.0006 * 0.0006
Allowable twist of connecting rod, measured	0.002

(6) Tappets.

Diameter of guide holes in block	0.6245/0.6255 * 0.002
Clearance, tappet to hole	0.0005/0.0025
Diameter of tappet	0.623/0.624

(7) Valves (intake and exhaust).

Angle of seat	45°
Stem diameter	0.3405/0.3415 * 0.002
Stem to guide hole clearance	0.0025/0.0045
Nominal dimension of valve guide hole	0.344/0.345 * 0.002

(8) Valve seats (inserts).

Nominal dimension of seat diameter	1.3770/1.3765
Angle of seat	45°
Angle of relief	45°
Interference OD of insert to ID of bore	0.001/0.003

(9) *Valve springs (intake and exhaust).*

Scale reading compressed to 1.27 in. 51 lb/53 lb
Scale reading compressed to 1.546 in. 38 lb/39 lb

(10) *Piston.*

Allowable wear from diameter of skirt 0.005
Clearance skirt to cylinder bore 0.0045/0.0050
Diameter of piston pin bore 0.8593/0.8596 * 0.0005
Clearance piston pin — to piston 0.0000/0.0005 * 0.0005
Diameter of piston pin 0.8591/0.8593 * 0.001

(11) *Piston rings.*

Gap clearance (fitted in cylinder) 0.010/0.020 * 0.015
Side Clearance in grooves
Top ring 0.002/0.004 * 0.002
Scraper ring (center) 0.0015/0.0035 * 0.002
Oil ring (bottom) 0.001/0.003 * 0.002

b. Rotating Field Assembly (Main Rotor).

(1) *Winding data.*

Wire No. 14 CCSEP Magnet
No. of Turns 281
Resistance 2.15 ohms

(2) *Balance.* Rotor to be dynamically balanced within 0.5 inch-ozs.

(3) *Impregnation data.*

1 Preheat 1 hr at 250°F.
2 Cool to 150 — 180°F.
3 Dip in Dolphs BC-340 Baking Varnish
4 Drain for 30 minutes
5 Bake for 3 hrs at 275°F.
6 Repeat steps 2, 3, 4
7 Bake for 5 hrs at 275°F.

c. Exciter Armature. To be statically balanced.

(1) *Winding data.*

Wire No. 16 HEP Magnet
Turns/Pitch 5/1-11
Single coil length 5 ft.
Resistance at 25°C. 0.188

(2) *Impregnation data.*

1 Preheat 1 hr at 250°F.
2 Cool to 120°F.
3 Dip in Dolphs BC-340 Baking Varnish
4 Drain for 30 minutes
5 Bake for 2 hrs at 300°F.
6 Repeat steps 2, 3, 4
7 Bake for 4 hrs at 300°F.

d. Stator.

(1) *Coil winding.*

Wire 3 Strands No. 18 HEP Magnet
Coils 5
Turns per Coil 13 — 13 — 5 — 13 — 13
Lead Wires Connect after impregnating
Lead Lengths (ins. from stator O D) T1-27-½; T2-27; T3-26;
T4-26-½; T5-28; T6-28½

(2) *Impregnation data.*

1 Preheat	1 hr at 250°F.
2 Cool to	150 — 180°F.
3 Dip in	Dolphins BC-340 Baking Varnish
4 Drain for	30 minutes
5 Bake for	3 hrs at 275°F.
6 Repeat steps	2, 3, 4
7 Bake for	5 hrs at 275°F.

e. Field Coil.

(1) *Winding data.*

Wire	No. 21 SEP Magnet
Number of turns	900
Resistance at 25°C.	9.3 ohms
Wire lead	5 inch, No. 16 (MIL-W-5086)

(2) *Impregnation data.*

1 Preheat	1 hr at 250°F.
2 Cool to	120°F.
3 Dip in	Dolphins BC-340 Baking Varnish
4 Drain for	30 minutes
5 Bake for	2 hrs at 300°F.
6 Repeat steps	2, 3, 4
7 Bake for	4 hrs at 300°F.
Seal coat	Spray with Dolphins AC-Air Dry Varnish.

Section II. REMOVAL OF MAJOR ITEMS

106. Battery Charger Assembly

a. Removal.

- (1) Remove hardware securing cover of battery charger assembly (9, fig. 28) and remove cover.
- (2) Disconnect wiring harness (7) that connect battery charger to bottom of control panel box.
- (3) Remove four bolts (4), eight washers (5) and four nuts (6) that secure battery charger to skid (8).
- (4) Lift out battery charger assembly.

b. Installation.

- (1) Position Battery Charger Assembly (9, fig. 28) on cross member of skid (8).
- (2) Insert and secure four bolts (4), eight washers (5) and 4 nuts (6) that hold battery charger to skid.

- (3) Install wiring harness (7) that connects to bottom of control panel box.
- (4) Position cover on battery charger and install hardware.

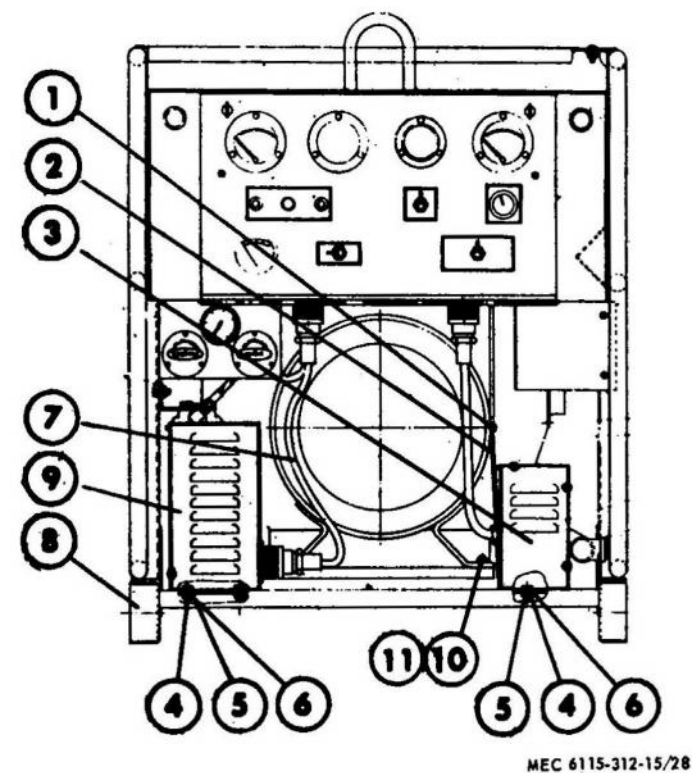
107. Relay Control Assembly

a. Removal.

- (1) Remove hardware securing cover of Relay Control Assembly (3, fig. 28).
- (2) Loosen champ and remove wiring harness to bottom of control panel box.
- (3) Remove two bolts (4) four washers (5) and two hex nuts (6) that hold relay control to skid (8).
- (4) Lift out relay control assembly.

b. Installation.

- (1) Position Relay Control Assembly (3) on cross member of skid (8).



MEC 6115-312-15/28

- 1 Clamp, cable
- 2 Battery drain tube
- 3 Relay control assembly
- 4 Bolt hex $\frac{5}{16}$ — 18 \times $\frac{3}{4}$ in.
- 5 Washer $\frac{5}{16}$ — 18
- 6 Nut $\frac{5}{16}$ — 18
- 7 Wiring harness
- 8 Skid
- 9 Battery charger assembly
- 10 Channel, support
- 11 Bolt hex $\frac{5}{16}$ — 18 \times 1
Washer lock and nut

Figure 28. Battery charger assembly and relay control box assembly.

- (2) Place two bolts (4) four washers (5) and two hex nuts (6) and secure the control relay skid with them.
- (3) Replace wiring harness connecting control relay to bottom of control panel box.
- (4) Replace and tighten mounting hardware for cover of relay cover assembly.

108. Generator Assembly

a. Removal

- (1) Open control panel and remove change over terminal board (para 97).
- (2) Remove and tag generator leads from

rear of terminal board. Pull leads free from the control box.

- (3) Remove clamp (1, fig. 28) and battery drain tube (2) free from generator.
- (4) Remove the brushes (para 104).
- (5) Remove the hex nut (18, fig. 29), lockwasher (15) and plain washer (17) from the rotating field stud (19). Remove exciter armature assy (1) from the rotating field shaft.
- (6) Remove six nuts (28) and lockwashers (25) from stator housing assembly studs (33).
- (7) Remove the four screws (16) and lockwashers (5) that secure the generation assembly to mounting feet (26). Slide stator housing assembly with bearing bracket out over the rotating field assembly (6). A slight force may be required to free bearing (10) from the rotating field shaft.
- (8) Remove the eight screws (2) and lockwashers (5) that secure fan assembly (4) to coupling hub (31) and coupling disc (30) to rotating field shaft.
- (9) Remove rotating field assembly (6), fan assembly (4) and coupling from engine crankshaft.
- (10) Remove the four bolts (3) and lockwashers (32) that secure generation adapter (29) to engine rear main bearing plate. Remove adapter.

b. Installation

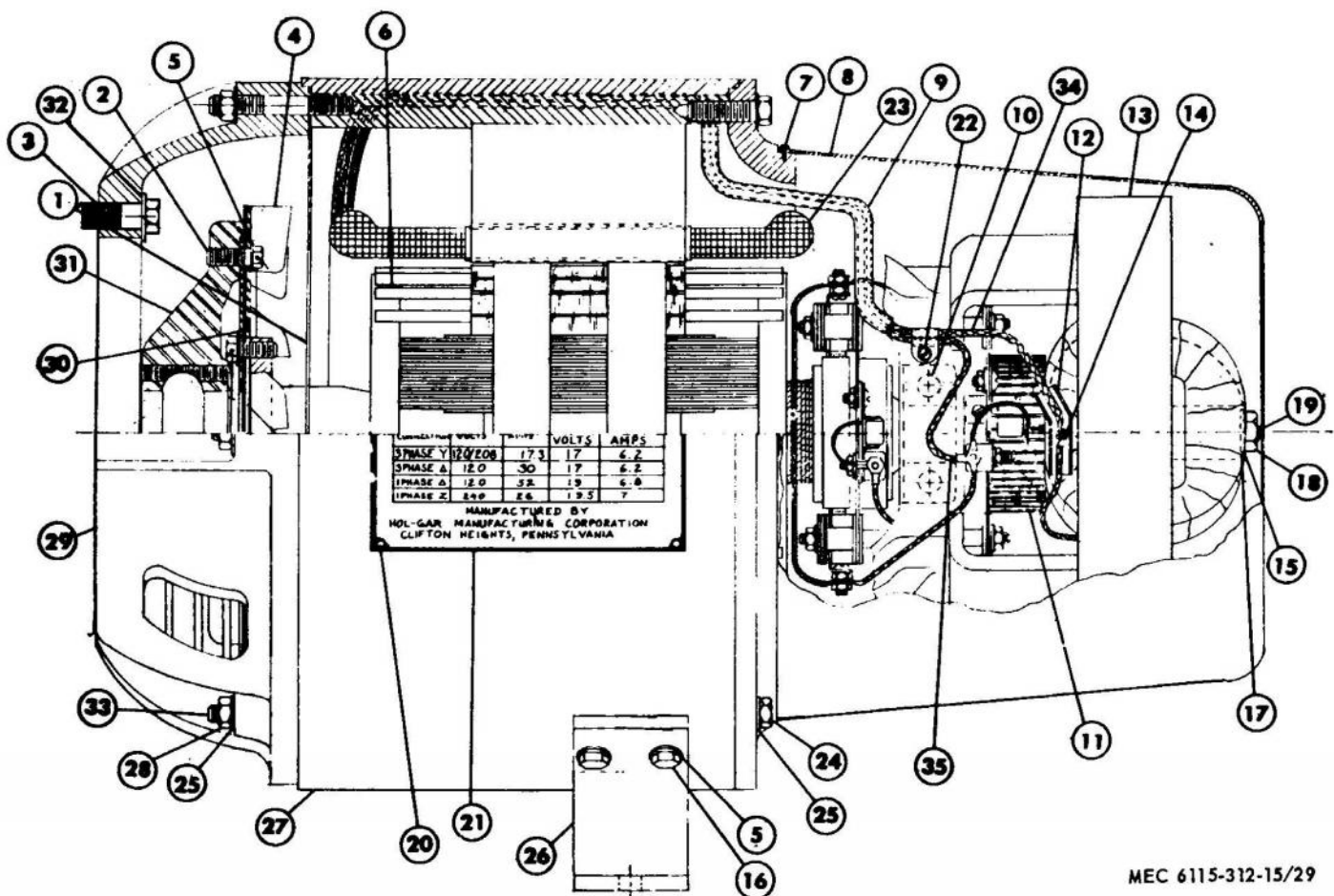
- (1) Position adapter (29) against the engine rear main bearing plate assembly and secure with four screws (3) and lockwashers (32).
- (2) Install coupling hub (31) to engine crankshaft. Assemble fan assembly (4) with coupling disc (30) to rotating field assembly (6).
- (3) Block rotating field assembly in position to the hub and coupling half with eight screws (2) and lockwashers (5).

- (4) Slide stator housing assembly (27) with bearing bracket on feet (26) over the rotating field assembly.
- (5) Secure six nuts (28) and lockwashers (25) to stator housing studs (33).
- (6) Install and tighten four screws (2) and lockwashers (5) that hold stator housing (27) to feet (26).
- (7) Install brushes (para 104).
- (8) Replace tagged leads to their proper terminals on the rear of change over terminal board. Install terminal board (para 97).
- (9) Install clamp (1, fig. 28) and battery box drain tube to generator housing.

109. Engine

a. Removal

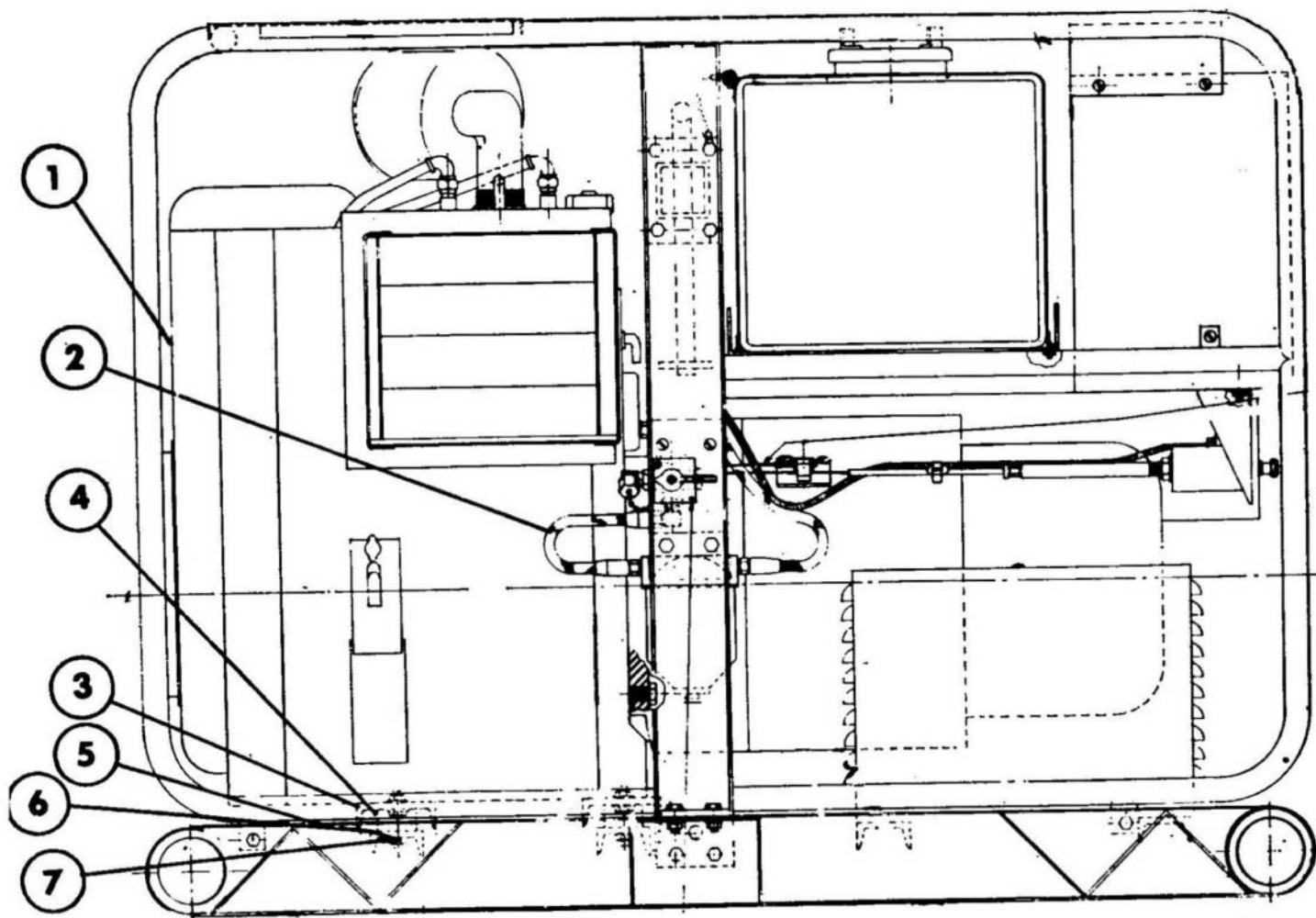
- (1) Remove housing as required (paras 71-73).
- (2) Drain oil from engine.
- (3) Disconnect cable to starter.
- (4) Disconnect ignition cables.
- (5) Disconnect oil drain line.
- (6) Uncouple fuel system (2, fig. 30) from engine (1).
- (7) Remove four nuts (7) and four washers (6) hold shock mounts (4) to channel support (3), and skid (5).
- (8) Remove four bolts (furnished with engine) securing engine to channel support (3).



MEC 6115-312-15/29

- | | | | |
|--|--------------------------|--------------------------|-----------------------------|
| 1 Baffle | 10 Bearing | 19 Stud | 28 Nut, hex |
| 2 Screw, hex | 11 Exciter armature assy | 20 Drive screw U-type | 29 Adapter |
| 3 Bolt $\frac{3}{8}$ -16 \times 1- $\frac{1}{2}$ | 12 Tubing | 21 Plate, identification | 30 Coupling disc |
| 4 Fan assembly | 13 Bearing bracket assy | 22 Screw, and lockwasher | 31 Coupling hub |
| 5 Washer spring lock | 14 Screw, nut and washer | 23 Stator winding assy | 32 Lockwasher $\frac{3}{8}$ |
| 6 Rotating field assy | 15 Washer, lock | 24 Screw, hex | 33 Stud |
| 7 Screw hex slotted | 16 Screw | 25 Washer spring lock | 34 Lead |
| 8 Cover | 17 Washer, Plain | 26 Foot | 35 Lead |
| 9 Varnished tubing | 18 Nut, hex | 27 Stator housing | |

Figure 29. Generator assembly.



MEC 6115-312-15/30

- 1 Engine
- 2 Fuel system (ref fig. 14)
- 3 Channel support
- 4 Mount shock

- 5 Skid
- 6 Washer split $\frac{5}{16}$
- 7 Nut hex $\frac{5}{16}$ - 18

Figure 30. Engine removal.

b. Installation

- (1) Replace and tighten four bolts (furnished with engine) securing engine to channel support (3).
- (2) Replace shock mounts (4) and secure to channel support (3) and skid (5) with four nuts (7) and four washers (6).

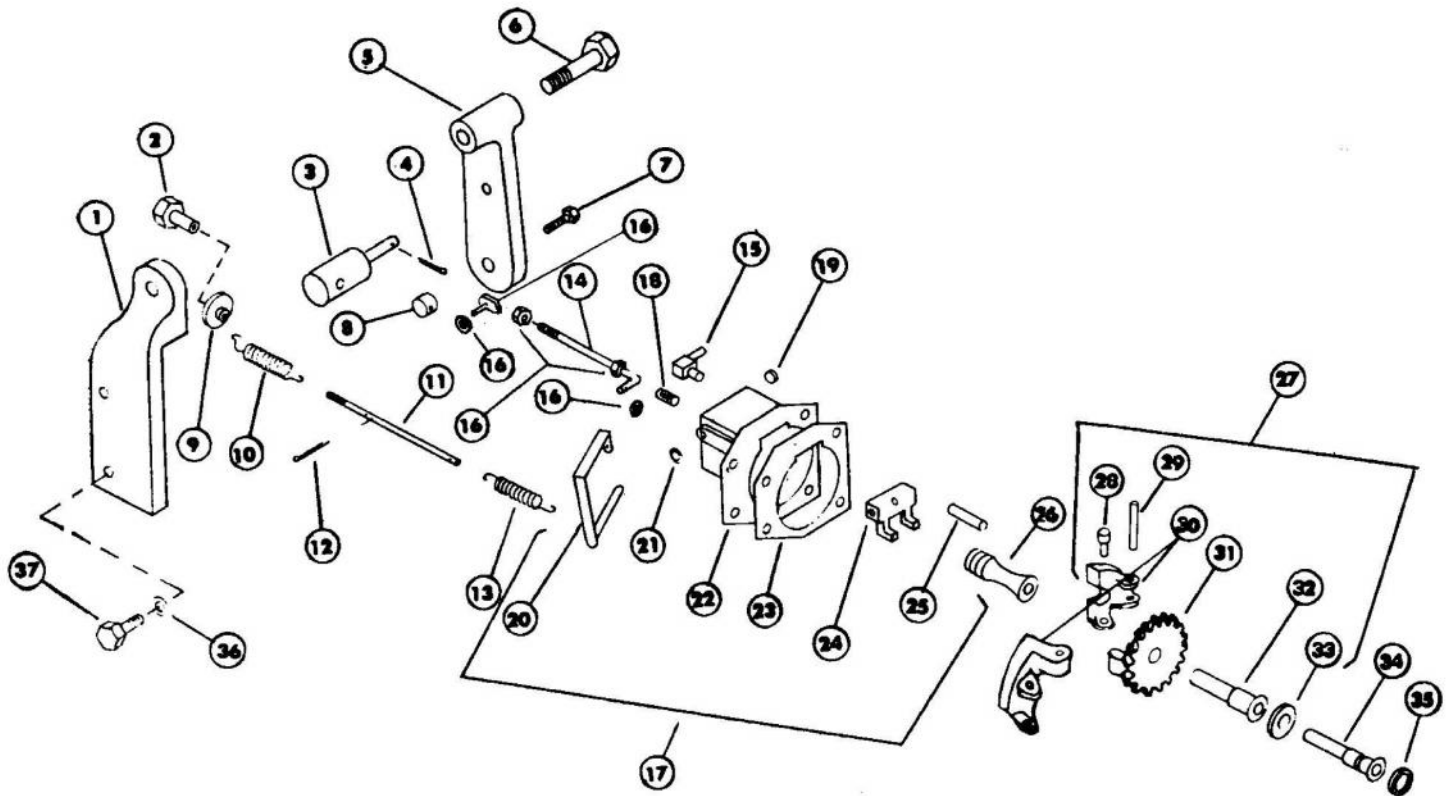
- (3) Connect fuel system (2) to engine.
- (4) Connect oil drain line.
- (5) Connect ignition cable.
- (6) Connect cable to starter.
- (7) Replace engine oil with a grade recommended by lubrication chart.
- (8) Replace removed housing (paras 71-73).

Section III. FUEL SYSTEM

110. General

The fuel system consists of a fuel tank, fuel pump, governor and fuel lines and fittings. Fuel is pumped from the tank into the carburetor

where it is vaporized and carried into the combustion chambers through the intake manifold. The engine speed governor controls the flow of the fuel-air mixture by linkage connected to the carburetor.



MEC 6115-312-15/31

- | | | |
|--------------------|--|--|
| 1 Control bracket | 15 Elbow | 25 Taper pin |
| 2 Adjusting nut | 16 Nut | 26 Thrust sleeve and bearing |
| 3 Swivel pin | 16A Lockwasher | 27 Flyweight assy
(consist of 28 thru 33) |
| 4 Cotter pin | 16B Washer | 28 Thrust pin |
| 5 Control lever | 16C Ball joint | 29 Roll pin |
| 6 Fulcrum pin | 17 Housing assembly
(consist of 18 thru 25) | 30 Flyweight |
| 7 Screw | 18 Pipe plug | 31 Gear |
| 8 Wire connector | 19 Expansion plug | 32 Bushing |
| 9 Spring seat | 20 Cross shaft lever | 33 Shim |
| 10 Spring | 21 O-ring | 34 Shaft |
| 11 Adjusting screw | 22 Housing | 35 O-ring |
| 12 Cotter pin | 23 Gasket | 36 Lockwasher |
| 13 Spring | 24 Yoke | 37 Screw |

Figure 31. Governor and controls.

111. Engine Speed Governor

a. Removal and Disassembly

- (1) Remove the governor from the engine (para 80).
- (2) Remove the flyweight assembly (27, fig. 31) thrust sleeve (26) from the governor housing assembly (17).
- (3) Press the gear (31) with flyweight from bushing (32). Drive out roll pin (29) that secure the flyweight (30) to the gear. Remove flyweights.
- (4) Remove pipe plug (18). Use a drift

pin to drive out pin (25) that secures yoke (24). Remove cross shaft lever (20) and yoke (24) from governor housing (22).

- (5) Drive the governor shaft (34) with O-ring (35) from the gear cover housing.

b. Cleaning, Inspection and Repair

- (1) Wash all metal parts in an approved cleaning solvent and dry thoroughly.
- (2) Examine the face of the thrust bearing and thrust sleeve for wear, breaks,

or scoring. Replace if defective or badly worn.

- (3) Inspect the governor drive shaft for scoring or wear.
- (4) Inspect fly weights for nicks and burrs. Replace if defective. If one is defective replace both.
- (5) Inspect governor gear for cracked or chipped teeth. Replace the gear if defective.
- (6) Inspect the governor yoke and pin for nicks or wear. Replace a defective or badly worn part.
- (7) Inspect the cross shaft and lever for nicks, breaks or excessive wear. Replace if defective.

c. Reassembly and Installation

- (1) Install the yoke (24) on the cross shaft lever (20) in the governor housing (22) and secure with pin (25).
- (8) Install pipe plug (18) and expansion plug (19).
- (3) Assemble fly weights (30) to gear with roll pins (29). Press bushing (32) into gear 31).
- (4) Prior to installation, press shaft (34) with new O-ring (35) into gear cover housing.
- (5) Install flyweight assembly (27) with shim (33) and thrust sleeve (26) to the installed shaft (34).
- (6) Position housing assembly (17) with new gasket (23) on the engine gear cover housing and install governor (para 80).

112. Governor Controls

a. Removal and Disassembly

- (1) Disconnect throttle extension (1, fig. 24).
- (2) Remove carburetor (para 76d).
- (3) Remove carburetor deflector (27, fig. 12).
- (4) Remove screws (37, fig. 31), lock-washers (36) and remove bracket (1) from carburetor deflector.
- (5) Extract cotter pin (4) and pull swivel pin (3) with control adjusting screw (11) from control lever (5).
- (6) Remove adjusting nut (2) and remove swivel pin (3), spring seat (9) and spring (10) from adjusting screw (11).

b. Cleaning and Repair

- (1) Clean all parts with an approved cleaning solvent.
- (2) Inspect all mounting hardware for damage. Inspect adjusting screw for defects. Replace defective parts.
- (3) Inspect springs for proper tension. Replace defective springs.

c. Reassembly and Installation

- (1) Install cotter pin (12) to adjusting screw (11). Position spring (10), seat (9) and swivel pin (3) to adjusting screw. Install adjusting nut (2).
- (2) Position lever (5) with adjusting rod assembly to bracket (1).
- (3) Position assembly to control lever (5) and insert cotter pin (4) to swivel pin (3).
- (4) Install bracket to carburetor deflector and secure with screws (37) and lock-washers (36).
- (5) Install carburetor deflector (27, fig. 12) to the valve cover studs.
- (6) Install carburetor (76f).

Section IV. ELECTRIC STARTING SYSTEM

113. General

The electrical starting system consists of two 12-volt storage batteries connected in series, the starter and battery charger. The batteries energize the starter, which uses a solenoid-operated over-running clutch to engage the pinion with the fly wheel ring gear for starting. The battery charger utilizes a portion of the AC output of the main generator. This output is stepped down, rectified to a DC voltage and automatically controlled by the battery-charger regulator to maintain the batteries in charged state.

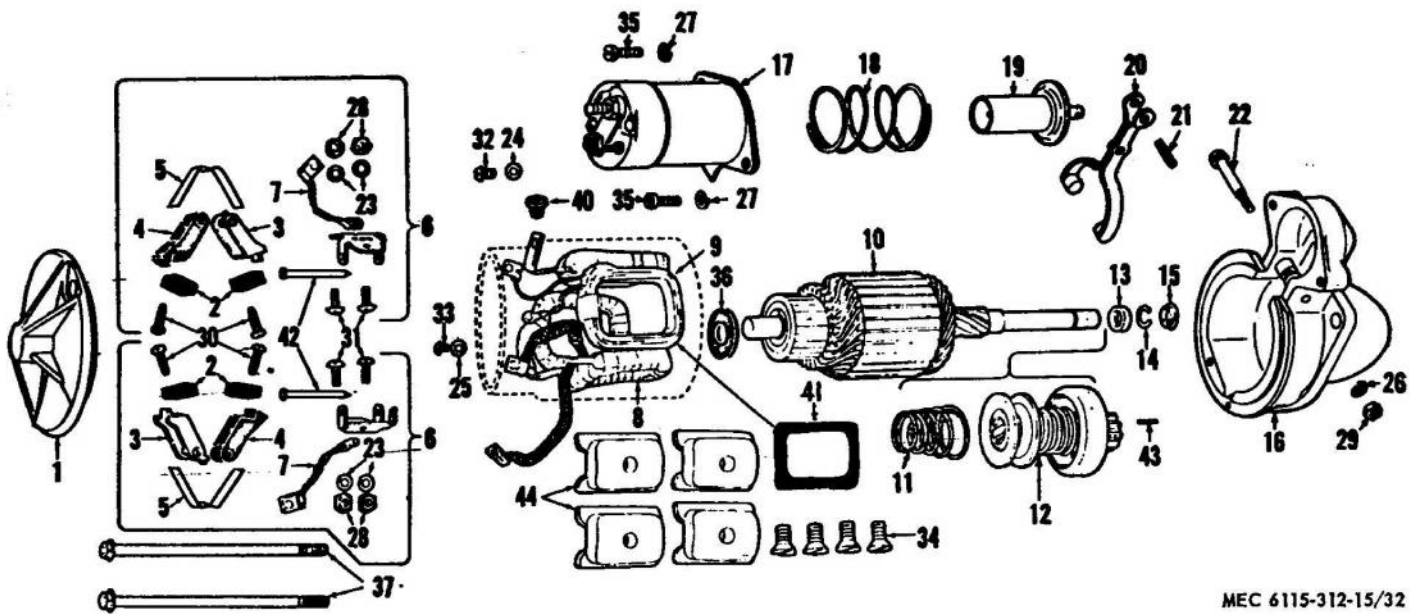
114. Starter

a. Removal and Disassembly

- (1) Remove the starter (para 83).
- (2) Remove pin (21, fig. 32) that secures solenoid plunger to shift lever (20). Remove two screws (35), lockwashers (27) and remove solenoid from starter drive housing (16).
- (3) Remove the two bolts (37) securing the end bell (1) and remove the end bell, field frame (38) and armature (10) from the drive housing (16).
- (4) Remove the flat washer (36) from the armature.
- (5) Remove the brush attaching screws (30) securing the brush and field electrical lead, the brush ground leads (7), and the brushes (2) to the brush holders (3 and 4). Remove the brushes.
- (6) Remove the brush holder supports (6) from the end bell, by removing screws (31), lockwashers (23), nuts (28) and support pins (42).
- (7) Mark the position of each pole piece (44), field winding (8), and shunt field coil (9) in the field frame (38). Remove the four screws (34) that secure the pole pieces and field windings in the frame. Remove the pole pieces and windings.
- (8) Remove the nut (29), lockwasher (26) and stud (22) securing shift lever (20) to drive housing (16). Remove the lever and drive assembly (12).

b. Cleaning, Inspection and Repair

- (1) Clean a slightly dirty or discolored commutator with No. 00 sand paper. Blow the sand off the commutator with clean, dry air. Remove all dirt from between commutator segments.
- (2) Clean the field frame with approved cleaning solvent. Do not soak field windings, insulation or brushes.
- (3) Test the field windings for open circuits by touching one probe of a test set to inlet terminal and the other probe to the outlet terminal of each winding. If the test lamp does not light, there is an open in the winding. Replace a faulty winding.
- (4) Test for grounds by touching one probe of the set to any field lead and the other probe to the unpainted surface of the field frame. If the lamp lights, the winding is grounded. Repeat test for all windings. Replace a grounded winding.
- (5) Inspect the armature shaft bearing surface for wear or damage. Replace a damaged armature.
- (6) Inspect the splines on the armature and in the drive assembly. Replace the armature on the drive assembly if the splines are worn, rounded, chipped or otherwise damaged.
- (7) Check that all windings are pressed into the core slots and are soldered to the commutator risers. Resolder if necessary, using a resin solder for a low-resistance connection.
- (8) Test the armature for shorts and grounds.
- (9) Inspect the end bell and drive housing



MEC 6115-312-15/32

- | | | |
|--------------------------|------------------|------------------|
| 1 End bell | 16 Drive housing | 31 Screw machine |
| 2 Brush | 17 Solenoid | 32 Screw machine |
| 3 Brush holder | 18 Spring | 33 Screw machine |
| 4 Brush holder | 19 Plunger | 34 Screw machine |
| 5 Brush holder spring | 20 Lever | 35 Screw machine |
| 6 Brush holder support | 21 Pin | 36 Washer flat |
| 7 Brush ground lead | 22 Stud | 37 Bolt machine |
| 8 Field winding | 23 Washer lock | 38 Field frame |
| 9 Shunt field coil | 24 Washer lock | 39 Bushing |
| 10 Armature | 25 Washer lock | 40 Screw |
| 11 Spring | 26 Washer lock | 41 Insulator |
| 12 Lever and drive assy. | 27 Washer lock | 42 Pin, support |
| 13 Bushing | 28 Nut hex | 43 Pin |
| 14 Ring retaining | 29 Nut hex | 44 Pole piece |
| 15 Bushing | 30 Screw machine | |

Figure 32. Starter — exploded view.

bushings for wear, scoring or other damage. Replace bushings if damaged or excessively worn.

- (10) Assemble the drive assembly on the armature drive end. Be sure that the drive assembly moves freely on the armature splines. Turn the pinion. The clutch should release and the pinion should turn smoothly, although not necessarily freely. Reverse the direction and rotate the pinion again. The clutch should lock immediately. If the clutch action is sluggish or restricted, replace the drive assembly.

c. Reassembly and Installation

- (1) Position the drive assembly (12, fig. 32) and the shift lever (20) in the drive housing (16) and install the

stud (22). Secure with nut (29) and lockwasher (26). Be sure the yoke end of the lever engages the shift collar of drive assembly.

- (2) Position bearing housing and washer on the drive housing and secure with screws and lockwashers.
- (3) Install the pole pieces (44) and field windings (8 shunt field coil 9) in the field frame matching the marks made before disassembly. Secure pole pieces with screws (34).
- (4) Install the brush holder supports (6) to the end bell (1) with the support pins (42), screws (31), lockwashers (23) and nuts (28).
- (5) Position the brush ground leads (7)

and the brush and field electrical lead to their respective brush holders (3 and 4). Secure with screws (30).

- (6) Install the flat washer (36) on the commutator end of the armature.
- (7) Install the drive end of the armature (10) in the drive housing (16). Install the assembled field frame over the armature. Install the assembled end bell (1) to the field frame. Secure end bell and field frame to drive housing with bolts (37).
- (8) Position solenoid plunger (19) to shift lever (20) and secure with pin (21). Place spring (18) over plunger and position solenoid (17) over plunger. Secure with screws (35) and lockwashers (27).
- (9) Install starting motor (para 83).

115. Battery Charger

a. General. Depending upon the amount of repair that may be required, consider removing the battery charger from the generator set for repair at a more convenient location. When trouble shooting the battery charger, follow a logical systematic method utilizing the schematic and wiring diagram (fig. 33) to localize the trouble and to isolate the faulty component. The trouble-shooting tabulation (para 62) presents typical troubles with possible cause and remedy. Before replacing a component, inspect the wiring of the component to be sure it is not damaged or defective.

b. Removal and Disassembly

- (1) Remove battery charger (para 106).
- (2) To remove resistors (1 and 2, fig. 33), remove mounting kits (4) that secure resistors to brackets (3) and (19).

- (3) Remove hardware (7) securing relay (6) to battery charging housing (14).
- (4) To remove transformer (11), disconnect terminals (8) from terminal board (9).
- (5) To remove diodes (15) from heat sink (16) remove the mounting nut supplied with the diode.
- (6) Remove component board (18) by removing hardware (20) securing board to spacers (21).
- (7) Potentiometer (4, fig. 34) is removed by removing locking nut holding it to the component board (8).

c. Reassembly and Installation.

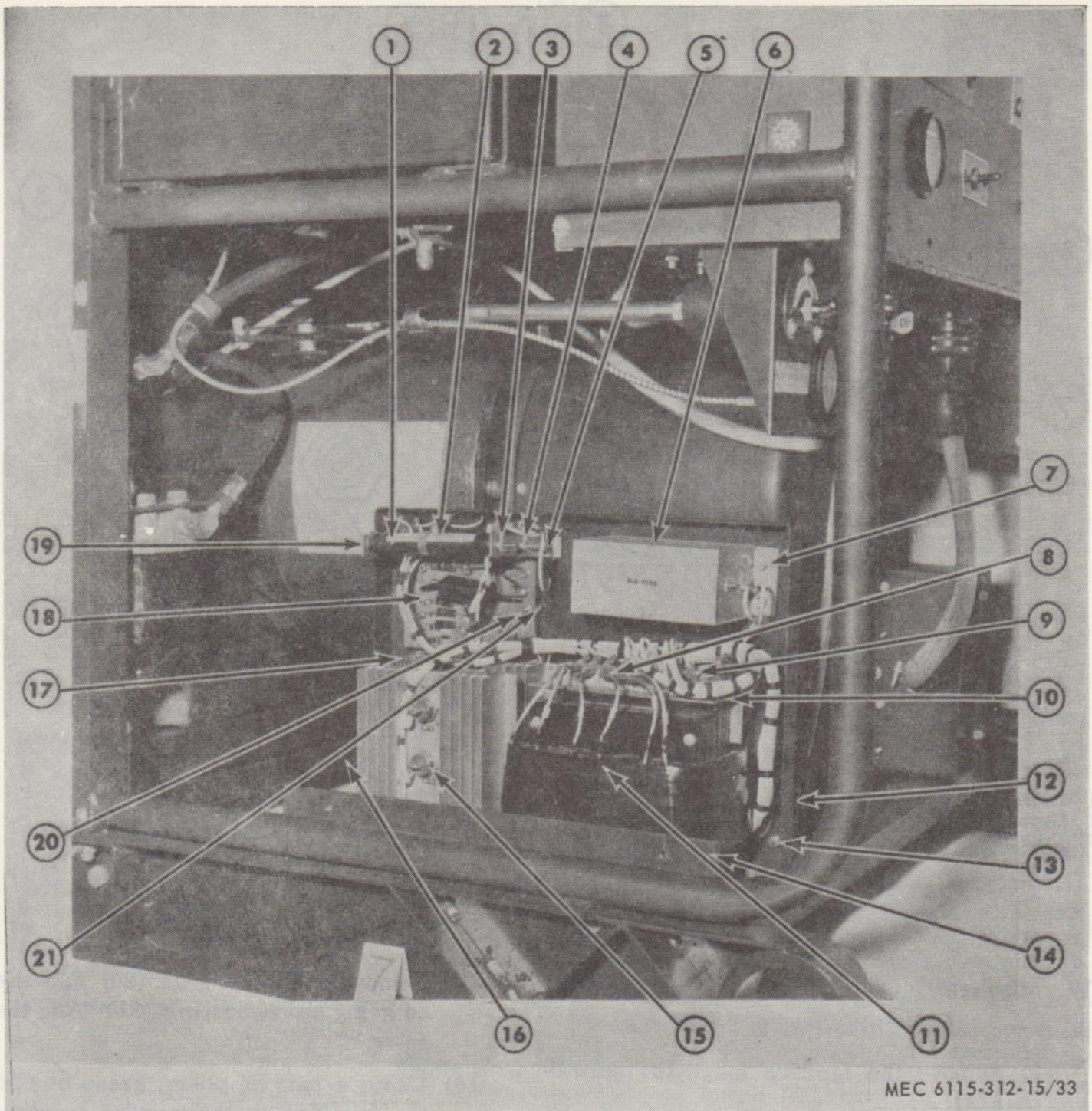
- (1) Position potentiometer (4, fig. 34) to the rear of the component board (8) and secure with nut to the front of board.
- (2) When replacing a new capacitor (2) or diode (6) be sure to observe polarity.
- (3) Make necessary connections to rear of component board and position component board assembly (18, fig. 33) on spacers (21) and secure with hardware (20).
- (4) When replacing a new diode (15) to heat sink (16) or diode to heat sink (17), take care to observe proper polarity.
- (5) Position resistors (1 and 2) to brackets (3 and 19) and secure with mounting kits (4) through the core of the resistor.
- (6) Install battery charger (para 106).

Section V. IGNITION SYSTEM

116. General

The ignition system consists of the magneto, ignition switch, spark plugs, and the necessary cables for connecting the components. The

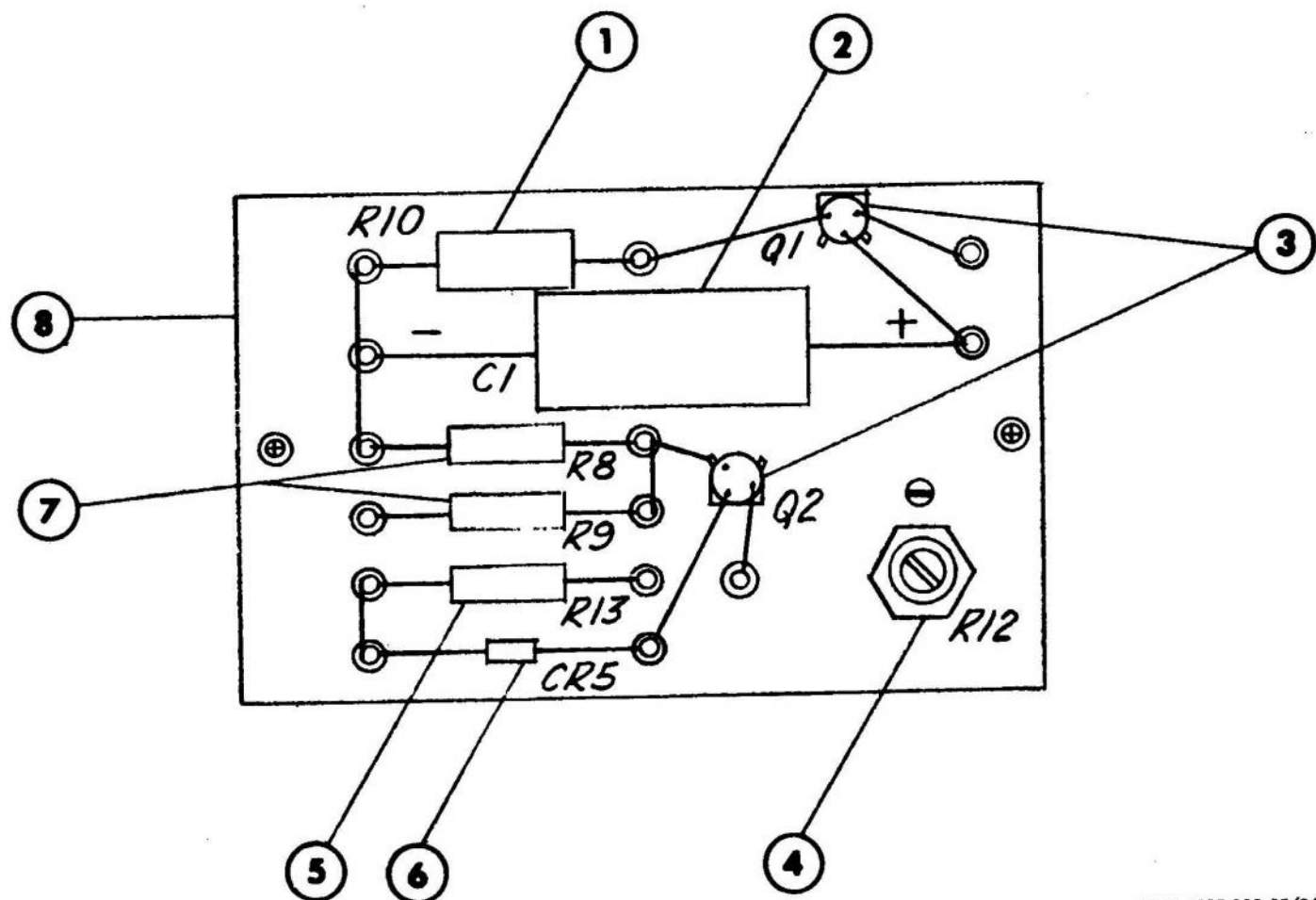
spark for the ignition of the fuel-air mixture in the cylinders is furnished by high-tension magneto which is driven by the timing gears at crankshaft speed.



MEC 6115-312-15/33

- | | |
|-------------------------------|--------------------------------|
| 1 Resistor (R 11) | 12 Receptacle |
| 2 Resistor (R 7) (underneath) | 13 Screw (4 req'd) |
| 3 Bracket-resistor mounting | 14 Housing |
| 4 Mounting kit | 15 Diode |
| 5 Screw (2 req'd) | 16 Heat sink |
| 6 Relay (K 8) | 17 Heat sink with diode (cr 7) |
| 7 Screw (2 req'd) | 18 Component board assembly |
| 8 Terminal lug (20 req'd) | 19 Bracket-resistor mounting |
| 9 Terminal board | 20 Screws |
| 10 Bracket | 21 Spacers |
| 11 Transformer (T 1) | |

Figure 33. Battery charger.



MEC 6115-312-15/34

1 Resistor
2 Capacitor
3 Transistor

4 Potentiometer
5 Resistor
6 Diode

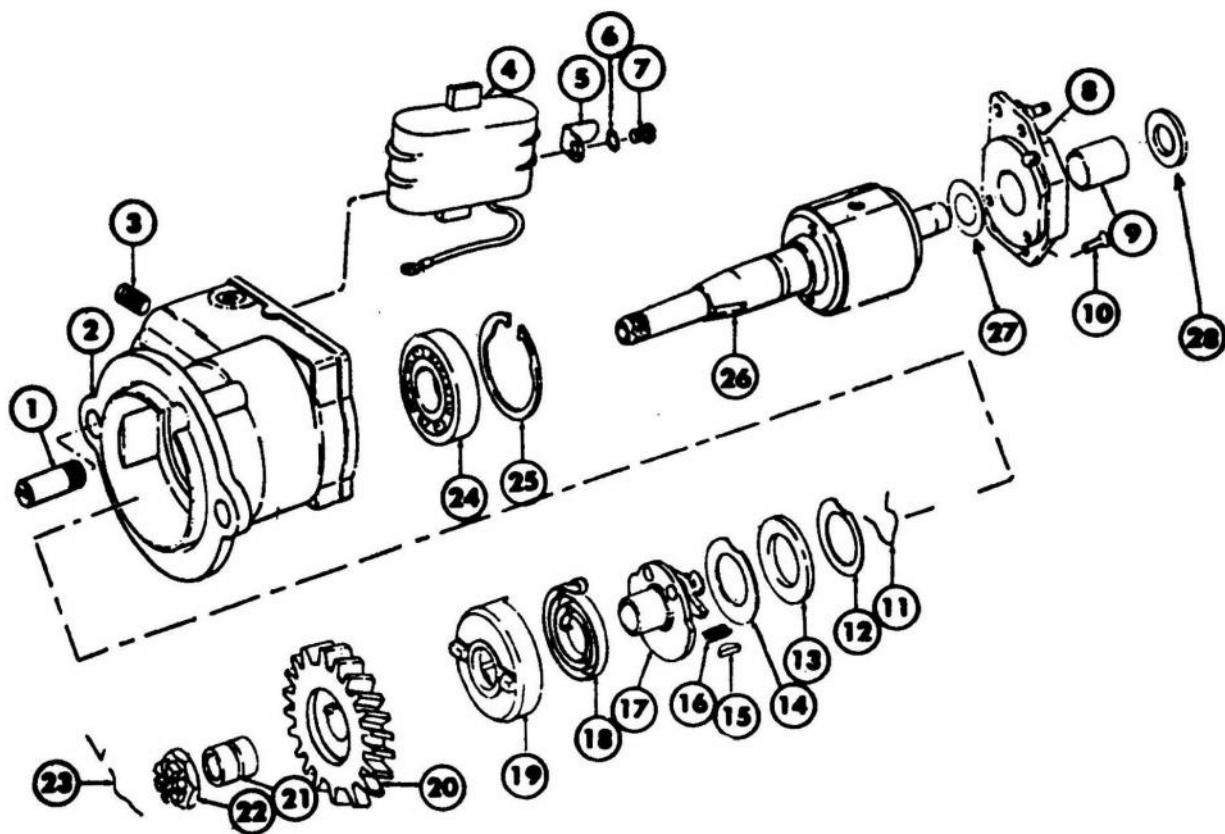
7 Resistor
8 Component board

Figure 34. Component board assembly.

117. Magneto

a. Removal and Disassembly.

- (1) Remove the ignition magneto (para 87a).
- (2) Remove the magneto contact set and capacitor (para 87a).
- (3) Remove the lockwire (23, fig. 35) that secures the sleeve-nut (22) on the rotor (26).
- (4) Clamp the drive gear (20) in a vise equipped with soft metal jaw liners to protect the gear teeth. Then remove the sleeve nut (22) from the drive end of the rotor (26).
- (5) Remove the drive gear (20) and the coupling sleeve bearing (21) from the rotor.
- (6) Using a pair of pliers, grasp one of the five lugs on the impulse coupling shell (19); turn the impulse coupling shell clockwise and slowly pull outward at the same time. Pull the impulse coupling shell just far enough so that a screwdriver can be inserted behind the shell to remove the spiral torsion spring (18) from its anchor slot in the impulse coupling shell. After the spiral torsion spring is released, remove the impulse coupling shell (19) from the rotor (26).



MEC 6115-312-15/35

- | | |
|------------------------------|---------------------------------|
| 1 Pawl stop pin | 15 Key woodruff No. 3 |
| 2 Magneto frame | 16 Helical spring |
| 3 Setscrew | 17 Coupling hub |
| 4 Magneto coil | 18 Spiral torsion spring |
| 5 Coil clip | 19 Coupling shell |
| 6 Washer lock | 20 Drive gear |
| 7 Screw, machine | 21 Coupling sleeve bearing |
| 8 Bearing support plate assy | 22 Nut, sleeve |
| 9 Rotor sleeve bearing | 23 Lockwire 1½ in. |
| 10 Screw machine | 24 Rotor ball bearing |
| 11 Snapring | 25 Retaining ring |
| 12 Washer, inner seal | 26 Rotor |
| 13 Seal | 27 Grease retainer washer inner |
| 14 Washer, seal outer | 28 Grease retainer washer outer |

Figure 35. Ignition magneto.

Caution: Do not try to pull the impulse coupling shell from the rotor while the spiral torsion spring is attached, since damage to the spring may result.

- (7) Remove the impulse coupling hub (17) from the rotor. Lift the spiral torsion spring (18) and the helical torsion spring (16) from the impulse coupling hub.

- (8) Remove the woodruff key (15) from the keyway in the shaft of the rotor.
- (9) Remove the seal outer washer (14), seal (13) and the seal inner washer (12) from the rotor.
- (10) Remove the snap ring (11) from the rotor.
- (11) Remove the four screws (10) that secure the bearing support plate as-

sembly (8) in the magneto frame (2), then remove the bearing support plate assembly.

- (12) Using the arbor press, carefully remove the rotor sleeve bearing (9) from the bearing support plate assembly.
- (13) Press the rotor (26) out of the rotor ball bearing (24) inside the magneto frames (2).

Caution: The magneto frame should be carefully blocked up during removal of the rotor so that the rotor will be pressed out straight and evenly.

- (14) Remove the retaining ring (25) that secures the rotor ball bearing (24) in place inside the magneto frame. Carefully press the rotor ball bearing out of the magneto frame (2).
- (15) Remove the two setscrews (3) that secure the magneto coil (4) in the magneto frame (2) and remove the magneto coil.
- (16) Remove the machine screw (7) and lockwasher (6) that secure the coil clip (5) to the magneto coil and remove the coil clip.
- (17) Remove the pawl stop pin (1) from the threaded hole inside the magneto frame.

b. Cleaning, Inspection and Repair

- (1) Clean all parts, except the magneto coil, with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the magneto coil for cracked or broken insulation. Use a coil tester and test for shorts and leaks. Replace a defective magneto coil.
- (3) Inspect the rotor ball bearing for wear and roughness when rotated. Noisy operation and metal chips in the races are indications of wear.
- (4) Inspect the magneto frame and bearing support plate assembly for breaks and cracks.

- (5) Inspect the rotor sleeve bearing for wear, pitting, burning or scoring.
- (6) Inspect the magneto rotor for wear, pitting, cracks and breaks.
- (7) Inspect all applicable springs for corrosion, distortion and wear.
- (8) Inspect the impulse coupling hub and shell for cracks and breaks.
- (9) Inspect the drive gear for broken, missing or rounded teeth.
- (10) Inspect the fit of the seal on the rotor shaft. The seal must fit closely on the shaft. Replace a loose fitting or damaged seal.
- (11) Inspect all applicable threaded components for damaged threads.
- (12) Replace all worn, damaged, or defective magneto components.

c. Reassembly and Installation

- (1) Install the pawl stop pin (1) in the magneto frame (2).
- (2) Position the coil clip (5) on the magneto coil (4) and secure with the lockwasher (6) and machine screw (7).
- (3) Position the magneto coil in the magneto frame and secure with the two setscrews (3).
- (4) Pack the rotor ball bearing (24) one-half full with an approved bearing lubricant and install the bearing in the magneto frame (2) with the unsealed face toward the drive gear end. Secure with the retaining ring (25).
- (5) Press the drive end of the rotor (26) into the rotor ball bearing (24) and secure at the unsealed face of the bearing with the snap ring (11).
- (6) Press the rotor sleeve bearing (9) into the bearing support plate assembly (8). Lightly oil the inside of the rotor sleeve bearing.
- (7) Install the bearing support plate as-

sembly in the magneto frame and secure with the four machine screws (10).

- (8) Install the seal inner washer (12) and seal (13) with the grooved side outward and the seal outer washer (14) on the shaft of the rotor (26).
- (9) Install the woodruff key (15) in the rotor shaft key slot.
- (10) Install the helical torsion spring (16) on the impulse coupling hub (17).
- (11) Press the impulse coupling hub (17) on the rotor.
- (12) Engage the outer end of the spiral torsion spring (18) with the slot in the impulse coupling shell (19) and wind the spiral torsion spring until it is compressed sufficiently to fit inside the impulse coupling shell.
- (13) Align the impulse coupling shell and spiral torsion spring with the impulse hub (17) on the shaft of the rotor. Lift the inner torque of the spiral torsion spring just enough to engage it with the anchoring slot in the impulse coupling hub and secure the spring in the slot.
- (14) Hold the impulse coupling shell firm-

ly; turn the rotor to wind up the spiral torsion spring (18) until the impulse coupling hub (17) and impulse coupling shell (19) can be pressed together.

- (15) Install the coupling sleeve bearing (21) on the shaft of the rotor (26).
- (16) Hold the magneto upright, in the normal operating position, and rotate the impulse coupling clockwise until the pawl on the hub engages the pawl stop pin (1) in the magneto frame (2). The two drive lugs on the impulse coupling shell (19) should now be in a vertical position.
- (17) Install the drive gear (20) on the rotor shaft and engage the impulse coupling shell drive lugs so that the gear tooth, which is marked on the face of the gear, is located at the top position.
- (18) Install the sleeve nut (22) on the threaded end of the rotor (26) and secure with the lockwire (23).
- (19) Install the magneto contact support and capacitor (para 87e) and adjust points (87d).
- (20) Install the ignition magnets (para 87c).

Section VI. COOLING SYSTEM

118. General

Cooling is accomplished by a flow of air, circulated over the cylinders and head of the engine, by a combination fan-flywheel encased in a sheet metal shroud. The air is divided and directed by ducts to insure uniform cooling of all parts.

119. Flywheel

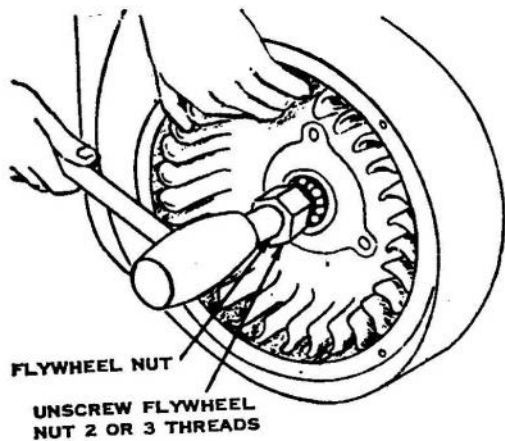
a. Removal and Disassembly

- (1) Drive at flywheel pin (5, fig. 36).
- (2) Loosen but do not remove flywheel nut (1).

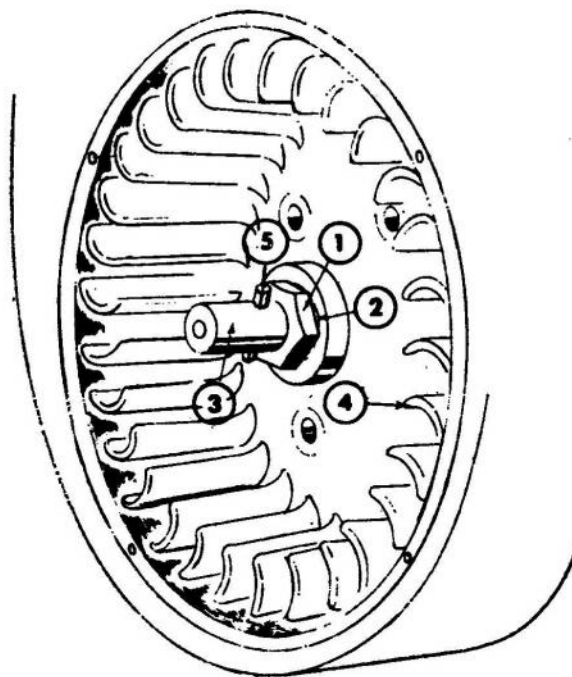
- (3) Take hold on flywheel fins, pull outward and at the same time strike end of the flywheel nut with a babbit hammer.
- (4) Remove loosened flywheel nut (1) and lockwasher (2).
- (5) Slide flywheel off the taper of crankshaft (3). Do not use hard hammer as it may ruin the crankcase and bearings.

b. Cleaning, Inspection, and Repair

- (1) Use a wire brush to remove all rust, dirt, grease and corrosion from the flywheel and flywheel vanes.



- 1 Flywheel nut
- 2 Lockwasher
- 3 Crankshaft
- 4 Flywheel
- 5 Flywheel pin



MEC 6115-312-15/36

Figure 36. Flywheel removal.

- (2) Wash with an approved cleaning solvent and dry thoroughly.
- (3) Inspect the vanes of the flywheel for breaks, bends and cracks. Replace a defective flywheel.
- (4) Inspect the hardware for cracks or damaged threads and replace if defective.

c. Reassembly and Installation

- (1) Position the woodruff key in the crankshaft keyway and align with the keyway of the flywheel and press the flywheel (4) into position on the crankshaft (3).
- (2) Install lockwasher (2) and secure the flywheel with the nut (1).

120. Flywheel Shroud

a. Removal and Disassembly

- (1) Remove the flywheel (para 119).
- (2) Remove 3 capscrews (3 fig. 37) and

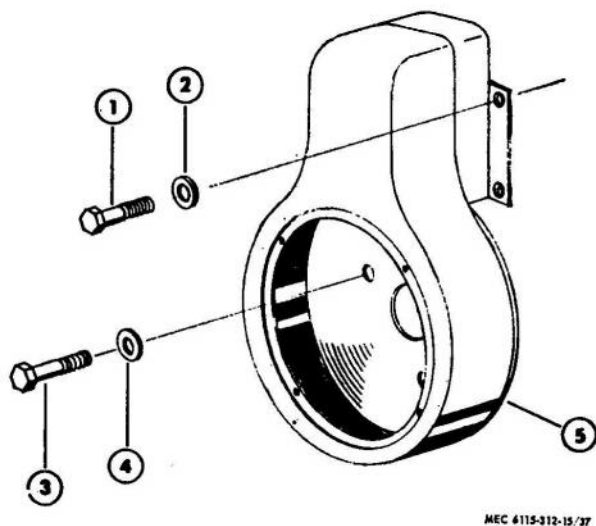
- lockwashers (4) that secure shroud to gear cover.
- (3) Remove the six capscrews (1) and lockwashers (2) from flywheel shroud.
- (4) Remove the flywheel shroud (5).

b. Cleaning, Inspection and Repair

- (1) Clean the flywheel shroud with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the flywheel shroud for bends, breaks, and cracks. Repair any defects or replace shroud if unserviceable.

c. Reassembly and Installation

- (1) Position the flywheel shroud (5) on the flywheel end of the engine.
- (2) Install the six capscrews and lockwashers that secure the shroud to the cylinder shrouding.
- (3) Install the three capscrews that secure flywheel shroud to the gear cover.
- (4) Install the flywheel (para 119).



- 1 Screw
- 2 Lockwasher
- 3 Screw
- 4 Lockwasher
- 5 Flywheel shroud

MEC 4115-312-15/37

Figure 37. Flywheel shroud.

Section VII. ENGINE LUBRICATING SYSTEM

121. General

A plunger type pump supplies oil to a spray nozzle which directs oil streams against holes in the connecting rods, and to an oil header line, connected to the governor housing, which lubricates the timing gear train. Part of the oil from the oil spray nozzle enters the rod bearings through holes in the rods and the balance of the oil forms a spray which lubricates the cylinders and other internal parts of the engine.

122. Engine Base (Oil Pan)

a. Removal

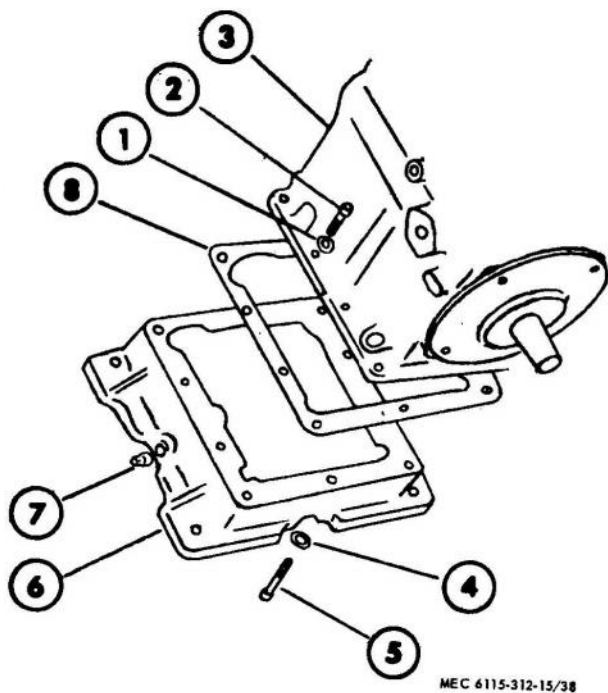
- (1) Remove the engine (para 109).
- (2) Remove oil plug (7, fig. 38) and drain oil into suitable containers.
- (3) Remove 8 screws (2) and 8 washers (1) that secure engine base (6) to crankcase assembly (3).
- (4) Remove 2 screws (5) and 2 washers (4) that mount engine base from the bottom and remove engine base gasket (8).

b. Cleaning, Inspection and Repair.

- (1) Wash the engine base drain plug with an approved cleaning solvent, using a wire brush if necessary.
- (2) Examine the engine base for breaks or cracks.
- (3) Inspect the threaded area of all parts. Replace any defective parts.
- (4) Examine all hardware for flaws and replace as needed.

c. Installation.

- (1) Grease a new gasket (8) lightly and position it on the engine base (6). Position the engine base to the crankcase assembly (3) and secure with screws (2) and washers (1).
- (2) Replace two screws (5) and washers (4) that mount engine base to the bottom.
- (3) Replace oil plug (7).
- (4) Replace oil in crankcase in accordance with lubrication order.
- (5) Replace engine (para 109).



- 1 Washer
- 2 Screw, machine
- 3 Crankcase
- 4 Washer
- 5 Screw
- 6 Engine base
- 7 Oil plug
- 8 Gasket

Figure 58. Engine base.

123. Oil Pump

a. Removal.

- (1) Remove the engine base (para 122).
- (2) Remove the fuel pump (para 78).
- (3) Remove the three screws (12, fig. 39) and lockwashers (13) that secure oil pump in lower part of cylinder and crankcase block and remove oil pump (7).
- (4) Remove oil pump plunger (3) from end of oil pump push rod (2).
- (5) Free oil pump push rod (2) from push rod cap (1) and remove push rod (2) and cap (1).

Note. The oil pump push rod is seated firmly in the base of the cap and will not drop out unless excessively worn. A slight pull downward on the oil pump push rod will free it from the cap.

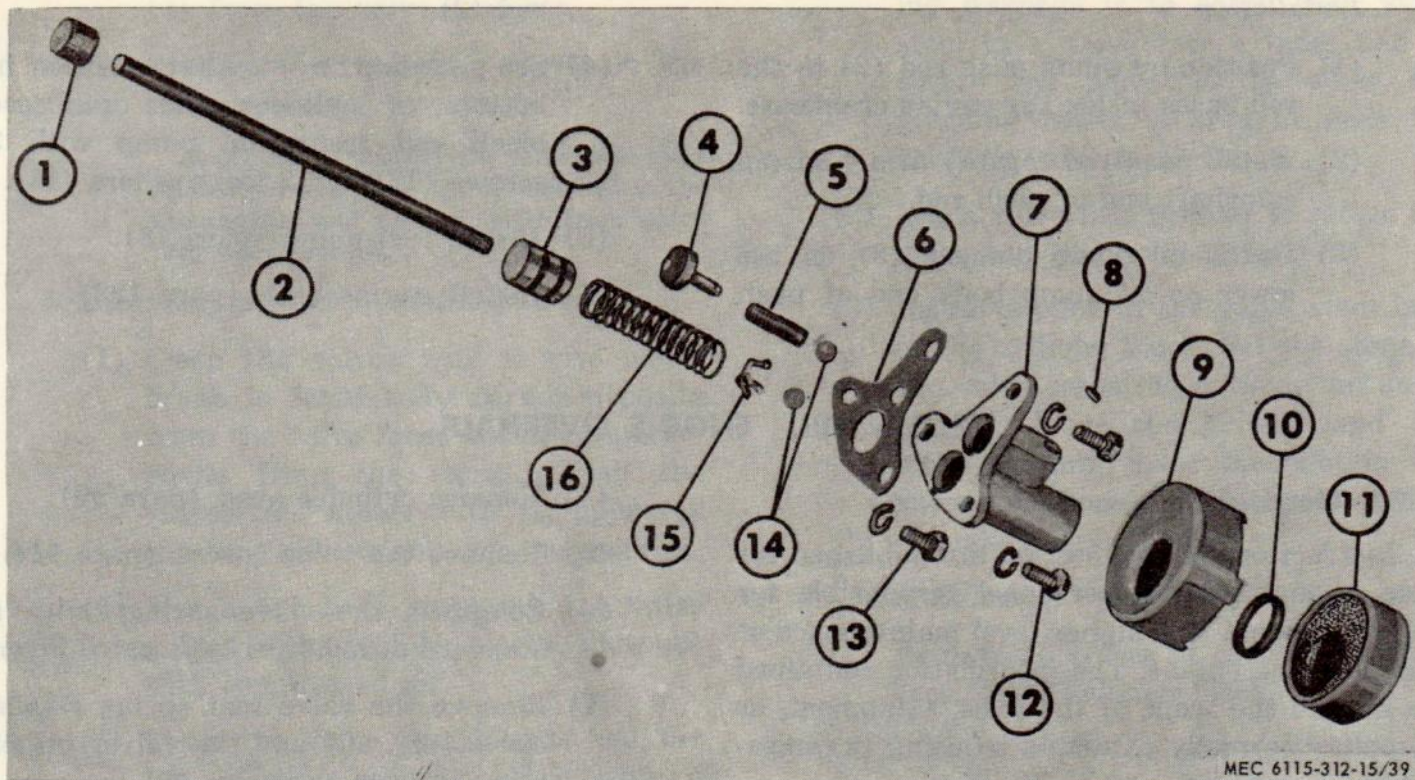
b. Disassembly.

- (1) Remove the oil strainer (11) from the oil pump body (7).

- (2) Remove push rod (2), spring (16), checkball retainer (15) and checkballs.
- (3) Remove slotted plug (8) from threaded hole in oil pump body and remove outlet compression spring (5) and checkball (14) from the oil body.
- (4) Remove the slotted plug (8) from threaded hole in bottom of oil pump body.

c. Cleaning, Inspection and Repair.

- (1) Clean all parts with any approved cleaning solvent and dry thoroughly.
- (2) Inspect all parts for cracks, breaks and signs of wear.
- (3) Inspect checkballs for roughness or corrosion.
- (4) Apply a light film of engine oil to push rod and insert push rod into position in oil pump body assembly. Normal clearance should measure between 0.003 and 0.004 inches. Replace oil pump if worn.



MEC 6115-312-15/39

- | | | |
|---------------------|-----------------------|-----------------|
| 1 Push rod cap | 6 Gasket | 11 Oil strainer |
| 2 Oil pump push rod | 7 Oil pump body assy. | 12 Screw |
| 3 Oil pump plunger | 8 Plug | 13 Lockwasher |
| 4 Retainer | 9 Cup | 14 Checkball |
| 5 Spring | 10 Spacer washer | 15 Retainer |
| | | 16 Spring |

Figure 39. Oil pump assembly.

- (5) Examine all applicable threaded components for damaged threads.
- (6) Inspect plunger push rod head, push rod, and cap for cracks, breaks and signs of wear.
- (7) Position push rod inside cylinder and crankcase block. Make certain push rod moves freely.
- (8) Examine fit of cap and push rod head on push rod.
- (9) Replace a defective or excessively worn push rod, push rod head or cap.

d. Reassembly.

- (1) Install plug (8) in top of oil pump body (7). Notch edge of plug to insure secure position.
- (2) Install check ball (14) in bore inside

oil pump body. Insert outlet compression spring (5) into same hole and secure with retainer (4).

- (3) Position other check ball (14) in bore in top of oil pump body and install retainer (15) and spring (16) and oil pump plunger (3).
- (4) Position oil strainer (11) on bottom of oil pump body.
- (5) After the oil pump has been assembled, and prior to installation in cylinder and crankcase block, test the pumping efficiency of the oil pump. Set the lower half of oil pump in a container of clean oil and push oil pump plunger (3) down repeatedly until a steady stream of oil sprays from the hole in the side of the spray nozzle. This indicates that the oil pump is functioning properly.

e. Installation.

- (1) Position oil pump push rod (2) in the rod bases inside the engine crankcase.
- (2) Install push rod cap (1) firmly on top camshaft end of push rod.
- (3) Install oil pump plunger (3) on the lower or oil pump body end of push

rod (2).

- (4) Set oil pump in mounting position in bottom of cylinder and crankcase block and secure oil pump with 3 screws (12) and 3 lockwashers (13).
- (5) Install fuel pump (para 78).
- (6) Install engine base (para 122).

Section VIII. ENGINE OVERHAUL

124. General

Instructions in this section are published for use of maintenance personnel responsible for direct support and higher level maintenance of the gasoline engine. The information contained is beyond the scope of the tools, equipment, or supplies normally available to using organizations.

125. Valves

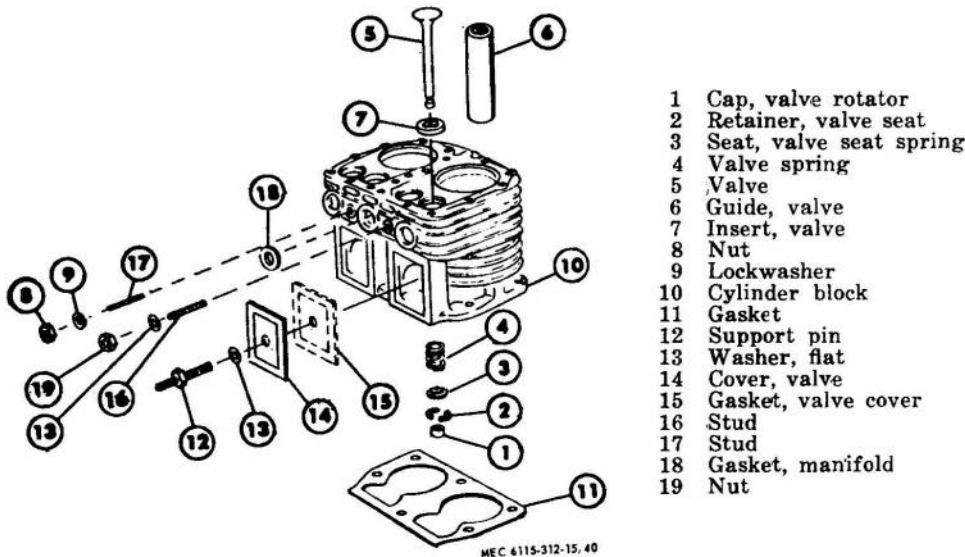
a. Removal and Disassembly.

- (1) Remove the carburetor (para 76d).
- (2) Remove the governor (para 80).
- (3) Remove the manifolds (para 89).

- (4) Remove cylinder head (para 90).
- (5) Remove the valve covers (para 91).
- (6) Compress the valve springs with a standard automotive type valve lifter.
- (7) Remove the valve seat spring retainers (2, fig. 40) and the valve rotator cap (1) from the valve (5).

Caution: Insert a rag in the opening at the bottom of the valve chamber so the valve spring seat retainers do not fall into engine crankcase.

- (8) Remove the spring compressor and lift out the valve (5). Remove the valve spring seat (3) and valve spring



- 1 Cap, valve rotator
- 2 Retainer, valve seat
- 3 Seat, valve seat spring
- 4 Valve spring
- 5 Valve
- 6 Guide, valve
- 7 Insert, valve
- 8 Nut
- 9 Lockwasher
- 10 Cylinder block
- 11 Gasket
- 12 Support pin
- 13 Washer, flat
- 14 Cover, valve
- 15 Gasket, valve cover
- 16 Stud
- 17 Stud
- 18 Gasket, manifold
- 19 Nut

Figure 40. Valves and related parts.

(4) from the valve chamber.

- (9) Remove the remaining valves in the same manner.

Note. Tag or identify the valves and their related parts so they can be installed in the same guides and valve chamber from which they were removed.

b. Cleaning, Inspection and Repair.

- (1) Clean the valves with a wire wheel brush to remove the carbon deposits from the valve faces and the gum deposits from the stems. Wash the valves and stems with an approved cleaning solvent and dry thoroughly.
- (2) Use a brush to clean out the valve guides in the cylinder blocks. Blow out with compressed air.
- (3) Clean the valve seat inserts and the top of the cylinder block with a scraper and wire brush.
- (4) Inspect the valves for burned, pitted or cracked faces. Replace a burned, cracked or deeply pitted valve.
- (5) Measure a cleaned valve stem diameter. Replace any valves where the stems do not measure between 0.3403 and 0.3415 inches.
- (6) Inspect the valve springs for cracks or pitting. Check the spring tension with a dial-type spring tester. The correct spring tension must be between 51 and 53 pounds with the valve spring compressed to 1.27 inches and 38 to 39 pounds with the valve spring compressed to 1.546 inches.
- (7) Inspect the valve seat inserts for looseness and wear.
- (8) Measure the clearance between the valve stems and guides. Replace the guides if the clearance is more than 0.0045 inches.

c. Valve and Valve Seat Refacing.

- (1) Reface the valves and valve seats only when there is evidence of warping and deep pits. A good method for detect-

ing warpage is to check each valve stem in a valve face grinder and to rotate the valve slowly while the grinding wheel is brought near the rotating valve face.

- (2) Use a valve face grinder to reface the valve to a 45° seat angle.
- (3) Install a pilot in the valve stem bore of the cylinder block. Set the stone of the valve reseating outfit at an angle of 45°. Place the grinder and the stone assembly over the pilot in the valve stem bore and grind just enough to make a smooth seat.

d. Valve Grinding Procedure.

- (1) Remove all traces of carbon from the face of the cylinder block.
- (2) Lightly coat the entire valve seat with a good quality water soluble, valve grinding compound. Slip a light lifting spring over the valve stem and lubricate the stem. Drop the valve into its original place in the cylinder block. The lifting spring should barely hold the valve off its seat. Position the grinding tool on the valve head and press down until the valve is seated. Then turn the valve back and forth, pressing down gently on the valve. Occasionally allow the spring to lift the valve away to insure that the compound is spread smoothly and evenly on the valve and seat. Repeat the grinding operation as necessary.
- (3) Avoid over grinding the valves; occasionally clean the valve and seat to see how the grinding is progressing. When all the pits and grooves have disappeared, wipe the valve and its seat clean. Coat the face of the valve with chalk or blueing and press it against the valve seat. Rotate with firm pressure.
- (4) Lift the valve and inspect the valve face. If the chalk or blueing is rubbed off, the grinding operation is completed. If not, repeat the grinding op-

erations (1) through (3) above until the valves are completely seated.

- (5) When the valves are completely seated, flush the valves, valve seats, and valve guides with an approved cleaning solvent. Check the valve seats for concentricity with a dial indicator.

e. Reassembly and Installation.

- (1) Insert the valves (5, fig. 40) in their respective guides, and the valve springs (4) in their respective valve chambers from which they were removed.
- (2) Assemble the valve spring seats (3) and caps (1) on the valve stems.
- (3) Compress the valve springs (4) with a valve compressor and install the valve seat spring retainers (2).
- (4) When each valve is assembled, release and remove the valve spring compressor.
- (5) Install the valve cover (para 91).
- (6) Install the cylinder head (para 90).
- (7) Install the manifolds (para 29).
- (8) Install the governor (para 80).
- (9) Install the carburetor (para 76f).

126. Valve Seats, Inserts and Guide

a. Cleaning and Inspection.

- (1) Remove the valves (para 125a).
- (2) Use a valve guide cleaning tool to remove the carbon from the valve guides. Rotate the cleaning tool until the gum, carbon, and other foreign material have been removed. Clean the valve guides with an approved cleaning solvent and blow dry with compressed air.
- (3) Clean the face of the valve seat inserts with wire brush or buffing wheel.
- (4) Clean the valve stem and install the valve in the valve guide.

- (5) Attach a dial indicator to a convenient cylinder head bolt. Lift the valve head about one-half inch above the cylinder block and adjust the plunger of the dial indicator so that it will touch the edge of the valve head.

- (6) Hold the valve so that it will not turn and move it toward and away from the dial indicator plunger. Note the amount of play shown on the indicator dial.

- (7) The clearance between the valve stem and valve guide will be one-half of the amount shown on the dial indicator. The desired stem clearance is 0.003 inch to 0.005 inch. If the clearance is greater than 0.006 inch, the valve guides must be replaced.

- (8) Inspect the valve seat inserts for pitting, excessive or uneven wear, cracks or damage. If the inserts cannot be repaired by grinding, they must be placed.

b. Removal.

- (1) Use a drift to drive the valve guides (6, fig. 40) down through the block into the valve chamber.
- (2) Use a valve seat insert puller to remove the valve seat inserts (7, fig. 40). Be certain to follow the manufacturer's instruction supplied with the valve seat insert puller.
- (3) Prepare the counterbore to receive a 0.010 inch oversize insert. Ream the counterbore to an inside diameter 0.004 inch smaller than the valve seat insert puller, stalled (para 105).

c. Installation.

- (1) Place the valve (7, fig. 40) in position, with the counter-sunk end downward. Drive the guide in place, with the top of the guide flush with the top of the valve guide seat.
- (2) Chill each new insert in dry ice for ten minutes. The chilling of the insert

will reduce its diameter slightly to permit it to be driven into the recess.

- (3) Using a suitable valve seat driver tap the insert (7) in place with light blows of a hammer.
- (4) Grind the valves (5) in the inserts (7) to form a gas-tight seat (para. 125c).
- (5) Install the valves (para 125e).
- (6) Adjust the valve tappets (para 91).

127. Pistons and Connecting Rods

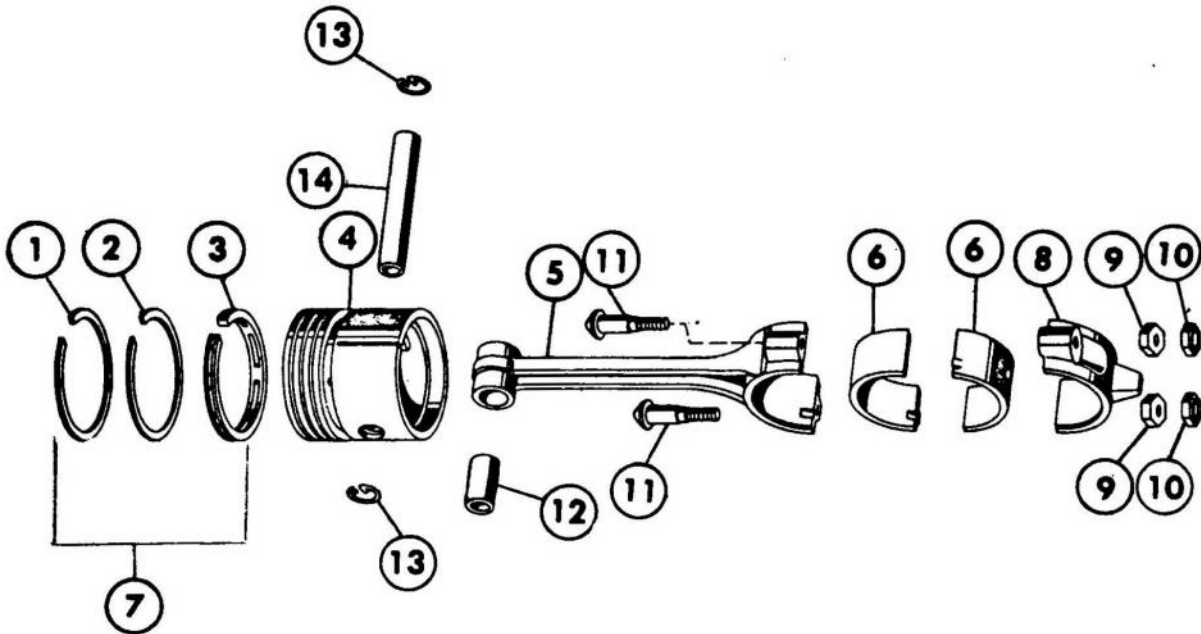
a. Removal.

- (1) Remove the engine base (para 122).
- (2) Remove the cylinder heads (para 90).
- (3) Turn the crankshaft until the lower end of the desired connecting rod (5, fig. 41) is accessible.

- (4) Remove the stamped nuts (10) and hex nuts (9) from the connecting rod shoulder bolts (11). Loosen the cap (8) by tapping it with a soft-faced hammer. Remove cap (8) lower bearing half (6) and upper bearing half (6).
- (5) Remove the carbon ridge at the top of the cylinder bores.
- (6) Push the connecting rod and piston through the top of the cylinder bore. Reassemble the connecting rod bearings and cap loosely on the connecting rod.

Note. The connecting rods, bearings, and caps are matched and must be paired together to insure correct installation. The caps and rod are marked on the side with their respective cylinder numbers.

- (7) Remove the remaining piston and connecting rod in the same manner.



MEC 6115-312-15/41

- 1 Piston ring, compression
- 2 Piston ring, scraper
- 3 Piston ring, oil
- 4 Piston
- 5 Connecting rod
- 6 Bearing half
- 7 Piston ring set

- 8 Cap
- 9 Nut, hex
- 10 Nut, stamped
- 11 Shoulder bolts
- 12 Sleeve bearings
- 13 Retaining ring
- 14 Piston pin

Figure 41. Piston and connecting rod.

b. Disassembly.

- (1) Remove the piston rings (1, 2 and 3) from the piston (4).
- (2) Remove the retaining rings (13) and push the piston pins (14) out of the pistons (4) and connecting rods (5).
- (3) Remove the sleeve bearings (12) only if worn. Place the connecting rods in a press and press out the bearings.

c. Cleaning, Inspection and Repair.

- (1) Clean the carbon from the top of the piston. Clean the ring grooves with a ring groove tool.
- (2) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (3) To measure the piston ring gap, place the ring into the cylinder bore in the approximate operating position, and measure the gap with a feeler gage. The ring gap must be between 0.010 and 0.020 inch. If the ring gap is too large, replace the ring. If the ring gap is too small, clamp a file in a vise and position the ring on the file with a file in the ring gap. Lightly squeeze the ring together and move the ring back and forth to file both ends at the same time. Measure the gap frequently to keep from filing off too much stock.
- (4) Check the cylinder bore. If the diameter exceeds 3.260 inches, rebore the cylinder.
- (5) Measure the piston ring side clearance. Replace the piston when the clearance exceeds 0.006 inch in the top and bottom grooves or 0.005 inches in the intermediate groove.
- (6) Measure the piston pin fit in the piston. If the clearance exceeds 0.0005 inch, replace the piston and piston pin.
- (7) Check the piston pin sleeve bearing for wear, scoring, or out-of-round. The clearance between the piston pin and the bearing should not exceed 0.0011 inch. If the clearance exceeds 0.0011

inch, replace the bearing. When pressing in new bearings, be sure to align the oil hole in the bearing with the oil hole in the connecting rod.

- (8) Check the connecting rod for twist. Use bending bars to straighten twisted rods. Be sure the oil holes in the connecting rods are open.
- (9) Inspect the bearing halves for wear or scoring. Replace both bearing halves if either one is unserviceable. Assemble the connecting rod and cap to the appropriate crankshaft journal and tighten the nuts to a torque of 14–18 foot-pounds. A slight drag on the shaft when turned by hand, indicates the proper bearing clearance. If the crankshaft binds, stop turning the shaft immediately and try pieces of shim stock not less than 0.0005 inch thick. If the shaft turns too freely, replace bearing halves.

d. Reassemble.

- (1) If the sleeve bearing (12, fig. 41) has been removed, press in a new bearing. Be sure to align the oilhole in the bearing with the oilhole in the connecting rod. Ream and hone the new bearing to provide a clearance of 0.0001–0.0006 inch between the piston pin and bearing.
- (2) Use a soft-face hammer to tap the piston pin (14) into the boss of piston (4). Place the proper connecting rod (5) in the matched piston so that the stamped arrow on the top of the piston faces the side of the connecting rod that is opposite the oilhole in the connecting rod cap. Tap the piston pin through the connecting rod and into the other boss of the piston and install the two retaining rings (13).
- (3) Expand the oil ring (3) and install it in the bottom groove of the piston, with the scraper edge of the ring facing toward the bottom of the piston. Install the scraper piston ring (2) in

the groove above the oil ring (3), with the scraper edge of the ring facing toward the bottom of the piston. Install the compression ring (1) in the top groove. Stagger the ring end gaps on the piston.

- (4) Reassemble the remaining pistons and connecting rods in the same manner.

e. Installation.

- (1) Place the connecting rod shoulder bolts (11, fig. 41) in the connecting rod (5). Position upper bearing half (6) so that the oilhole in the bearing aligns with the oilhole in the rod. Lightly oil the piston, piston rings, and cylinder walls.
- (2) Turn the crankshaft so that the crankshaft journal to which the rod is to be attached is at top dead center.
- (3) Place a ring compressor on the piston.

Note. When installing the pistons in the cylinders place No. 1 piston with the slit in the skirt toward the center of the engine. The slit in No. 2 piston should face away from the center of the engine.

- (4) Lower piston into the cylinders facing the slits in the skirts as outlined in the above note. Use the butt end of a hammer and carefully push the piston and connecting rod into the cylinder until the connecting rod seats on the crankshaft. This action will release the piston ring compressor.
- (5) Position the lower bearing half (6) on the cap (8) so that the oil holes will align. Push the piston down while rotating the crankshaft to bottom dead center. Position the cap (8) on the rod so that its oil holes face the oilspray nozzle of the oil header in the crankcase. Install the hex nuts (9) and tighten to a torque of 14-18 foot-pounds. Install two stamped nuts (10) and tightened with a wrench one-fourth turn beyond the finger-tight position.
- (6) Install the remaining piston and con-

necting rod in the same manner.

- (7) Measure the side clearance between the bearing and the crankshaft with a feeler gage. It should measure at least 0.0004 inch and not more than 0.016 inch.
- (8) Install the cylinder head (para 90).
- (9) Install the engine base (para 122).

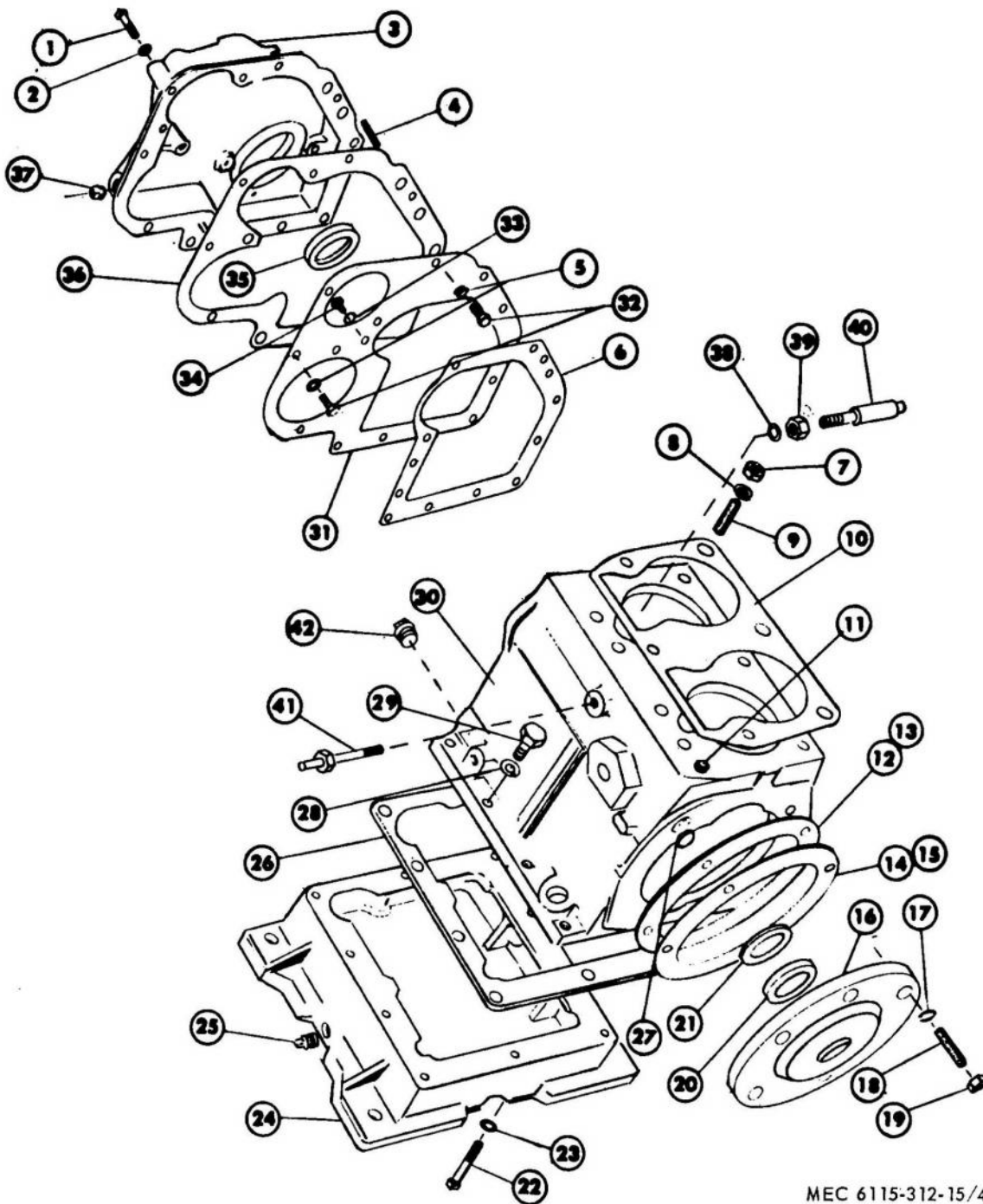
128. Cylinder Block

a. Removal and Disassembly.

- (1) Remove the engine (para 109).
- (2) Remove the valves para 125a).
- (3) Remove the connecting rods and pistons (para 127).
- (4) Remove the six nuts (8, fig. 40) and lockwasher (9) that secure the block (10) to the crankcase. Remove the cylinder block (10) and the gaskets (11). Tag them so they will be reinstalled on the same side from which they were removed.

b. Cleaning, Inspection and Repair.

- (1) Use an inside micrometer to measure the cylinder bores for wear. Rebore and hone any cylinder when the measurement exceeds 3.255 inches.
- (2) Rebore worn cylinders to the next available size piston. When reboring cylinders, follow the instructions supplied with the boring machinery. After reboring, hone the cylinder with a honing machine. The finished hone should form a diamond pattern on the cylinder walls.
- (3) Using a wire brush, compressed air, and an approved cleaning solvent, clean the cooling fins on the blocks. Inspect the cylinder blocks for cracks, breaks or damaged cooling fins. Replace a defective cylinder block.
- (4) Inspect the mounting hardware and replace any defective hardware.
- (5) Examine the threaded cylinder head



MEC 6115-312-15/42

- | | | | |
|----------------|-----------------------|----------------------|------------------------|
| 1 Screw, mach. | 12 Shim | 23 Washer plain | 33 Washer, lock |
| 2 Washer, lock | 13 Shim | 24 Engine base | 34 Screw |
| 3 Gear cover | 14 Gasket | 25 Plug | 35 Crankshaft oil seal |
| 4 Dowel pin | 15 Gasket | 26 Gasket | 36 Gasket |
| 5 Washer, lock | 16 Main bearing plate | 27 Plug | 37 Pipe plug |
| 6 Gasket | 17 Washer, lock | 28 Washer, lock | 38 Washer |
| 7 Nut, hex | 18 Stud | 29 Screw, mach. | 39 Nut |
| 8 Washer, lock | 19 Nut | 30 Crankcase assy. | 40 Oil spray nozzle |
| 9 Stud | 20 Cork oil seal | 31 Gear cover spacer | 41 Straight fitting |
| 10 Gasket | 21 Retainer | 32 Screw | 42 Pipe plug |
| 11 Plug | 22 Screw, mach. | | |

Figure 42. Crankcase, gear cover and base group.

mounting holes. Retap any holes that have defective threads.

c. Reassembly and Installation.

- (1) Place a new gasket (11) over the studs and secure with lockwashers (9) and nuts (8). Tighten the nuts to a torque of 40–50 foot pounds.
- (2) Install the pistons and connecting rods (para 127).
- (3) Install the valves (para 125).
- (4) Install the engine (para 109).

129. Timing Gear Cover

a. Removal.

- (1) Remove the governor (para 80).
- (2) Remove the magneto (para 87).
- (3) Drain the oil from the crankcase into a suitable container.
- (4) Remove flywheel shroud (para 120).
- (5) Remove the eight screws (1, fig. 42) and lockwashers (2) that secure gear cover (3) to crankcase (30).
- (6) Remove the two screws (32) and lockwashers (5) that secure gear cover to spacer plate (31).
- (7) Screw a $\frac{5}{16}$ –18 by 2 inches long bolt into the flywheel shroud mounting hole adjacent to the magneto opening. Lightly tap on screw through the magneto opening, to drive the gear cover off without damage to dowel pins.
- (8) Remove the four screws (34) and lockwashers (33) that secure spacer (31) to crankcase. Remove spacer and gasket (6).

b. Cleaning, Inspection, and Repair.

- (1) Wash gear cover and spacer with an approved cleaning solvent and dry thoroughly.
- (2) Wipe gaskets with a clean cloth dampened with an approved cleaning solvent.

- (3) Inspect the gear cover, spacer for breaks, cracks or warpage. Repair any slight damage or replace an unserviceable gear cover or spacer.
- (4) Examine mating surfaces of the gear cover and gear cover spacer.

c. Installation.

- (1) Position a new gasket (6) and spacer (31) on the crankcase (30) and secure with screws (34) and washers (33).
- (2) Position a new gasket (36) and gear cover (3) to the crankcase dowel pins (4). Install screws (1) and lockwashers (2). Tighten screws to 16 to 18 foot pounds torque.
- (3) Install screws (32) with lockwashers (5) through spacer to gear cover.

130. Crankshaft

a. Removal.

- (1) Remove the engine (para 108).
- (2) Remove pistons and connecting rods from the crankshaft (para 127).
- (3) Remove the gear cover (para 129).
- (4) Remove the four nuts (19, fig. 42) and lockwashers (17) that secure the main bearing retainer plate (16) to the engine crankcase. Remove the bearing plate, gasket (14, and 15) and shims (12 and 13).

Note. Keep the shims together so that the same shim thickness will be reinstalled. If any shims are damaged, replace them with shims of the same thickness.

- (5) Remove the four screws (10, fig. 43) and lockwashers (9) that secure the bearing retainer plate (8) to the crankcase. Remove the bearing retainer plate and oil slinger (11).
- (6) Carefully remove the crankshaft assembly through the rear opening of the crankcase.

b. Disassembly.

- (1) Use a hammer-type puller to pull the

bearing cup (7) from the bearing plate. Pull bearing cup (1) in a similar manner.

(2) Remove the crankshaft gear (6) with a press plate by pressing the crankshaft (3) through the gear (6) with an arbor press. Remove the key (4) from the crankshaft.

(3) Remove the bearing cones (2 and 5) from crankshaft with a press plate, by pressing crankshaft through bearing cones with an arbor press. Remove the key (13) from the crankshaft.

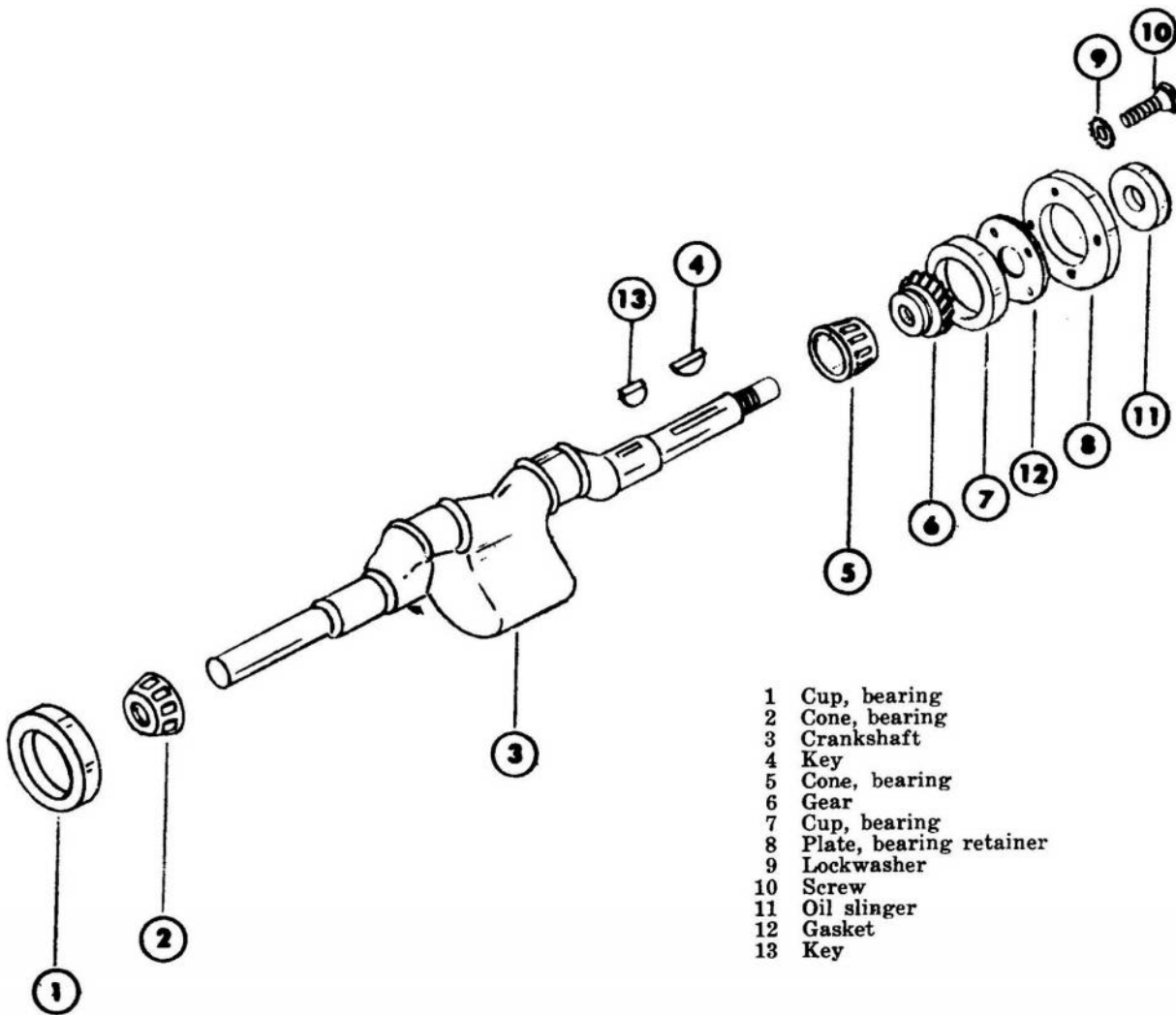
c. Reassembly.

(1) Install the key (13) in the crankshaft and press the bearing cones (2 and 5) on the crankshaft (3).

(2) Install the key (4) in the crankshaft keyway. Align the crankshaft gear (6) keyway with the installed key and press gear on the shaft.

(3) Press the bearing cup (7) in the bearing retainer plate (8). Install bearing cup (1) to its bearing retainer plate in the same manner.

d. Installation.



MEC 6115-312-15/43

Figure 43. Crankshaft assembly — exploded view.

- (1) Carefully guide the assembled crankshaft into the crankcase. Engage crankshaft gear so that the punched timing mark on the crankshaft gear aligns with the mark on the camshaft gear.
- (2) Install a new gasket (12, fig. 43) and install bearing retainer plate (8) assembled with bearing cup (7) to the crankcase. Secure with screws (10) and lockwashers (9).
- (3) Install new gaskets (14 and 15, fig. 42) along with the previously removed shims (12 and 13) to the crankcase. Install the main rear bearing plate (16) assembled with bearing cup to the crankcase. Secure with nuts (19) and lockwashers (17) to studs (18). Tighten the nuts to a torque of 25-30 foot pounds.
- (4) Set the contact point of a dial indicator against the end of the crankshaft. Adjust the end play of the crankshaft to 0.002 to 0.004 inch by removing or adding shims (12 and 13) as required.
- (5) Install the gear cover (para 129).
- (6) Install the connecting rods and pistons to the crankshaft (para 127).
- (7) Install the engine (para 109).

131. Camshaft and Tappets

a. Removal.

- (1) Remove the valves (para 125).
- (2) Remove the crankshaft (para 130).
- (3) Lift the valve tappets (1, fig. 44) up into the valve chambers of the cylinder blocks and secure them with wire to keep them free of the camshaft.
- (4) Screw a $\frac{5}{16}$ -18 bolt into one of the camshaft gear mounting holes and pulling on the bolt, carefully withdraw the camshaft (10).

b. Disassembly.

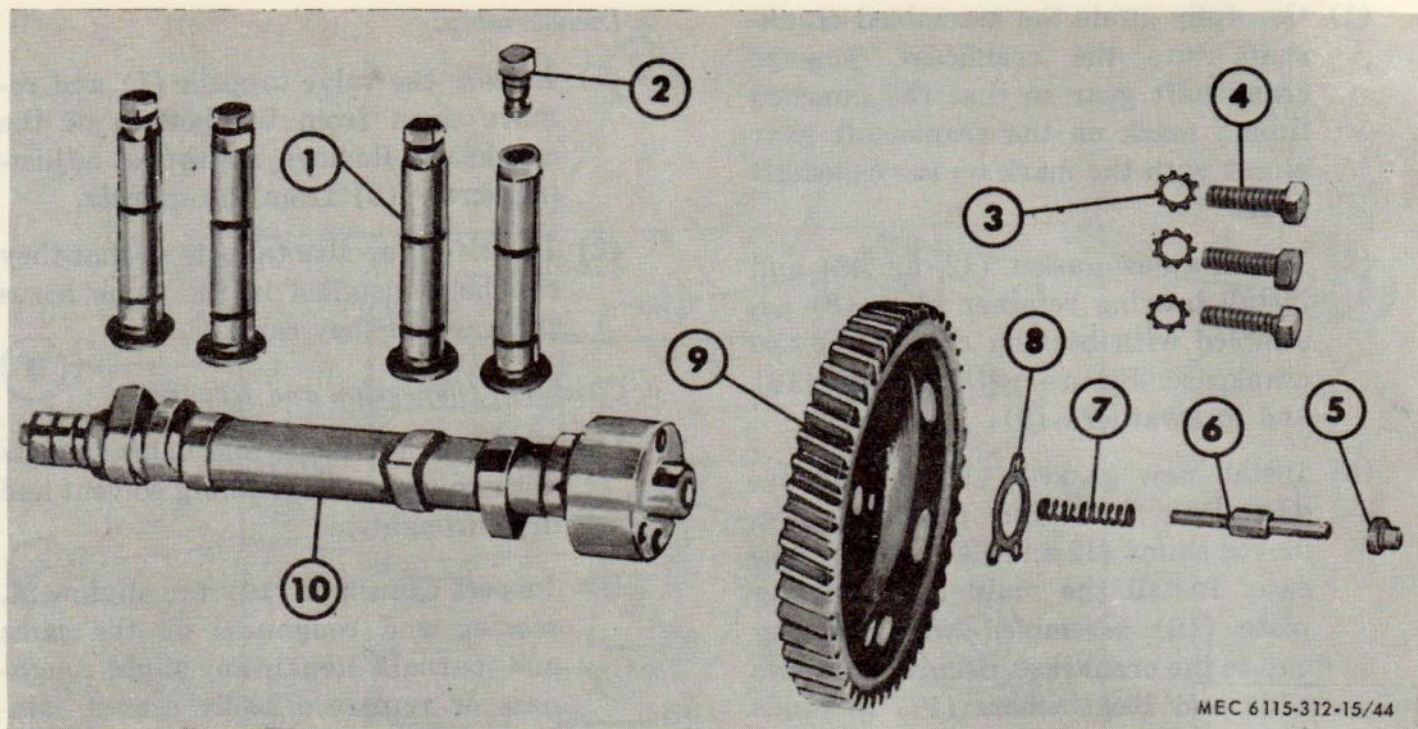
- (1) Release the valve tappets (1) and remove them from the bottom of the crankcase. Remove the tappet adjusting screw (2) from the tappets.
- (2) Identify the valve tappets so that they can be reinstalled in the same bores from which they came.

c. Cleaning, Inspection and Repairs.

- (1) Clean the camshaft and valve tappets with an approved cleaning solvent and dry thoroughly.
- (2) Inspect camshaft (10) for alignment, scoring and roughness on the cams and journals. Repair any slight roughness or replace a badly scored camshaft.
- (3) Measure the camshaft journals and cams. Replace the camshaft if journal No. 1 is less than 1.8725 inches or if No. 2 journal is less than 1.2475 inches.
- (4) Inspect the valve tappets. If the diameter of the tappets measures pressures less than 0.623 inches replace them.

c. Cleaning, Inspection and Repairs.

- (1) Apply a thin coat of oil to the valve tappets (1) and install them in the proper bores in crankcase. Raise the valve tappets up into the valve chambers of the cylinder blocks and secure with wire to keep them free of the camshaft (10).
- (2) Apply a thin coat of oil to the camshaft (10) and install it in the crankcase. Remove wires from under the tappets.
- (3) Install the crankshaft (para 130). Install the valves (para 125).
- (4) Adjust the valve tappets (para 91).



- 1 Valve tappet
- 2 Valve tappet adjusting screw
- 3 Lockwasher $\frac{5}{16}$ inch
- 4 Screw $\frac{5}{16}$ inch
- 5 Button

- 6 Camshaft thrust plunger
- 7 Spring
- 8 Plate
- 9 Camshaft gear
- 10 Camshaft

Figure 44. Camshaft and tappets.

Section IX. GENERATOR REPAIR

132. General

a. The flexible-type coupling assembly and fan are installed between the engine and AC generator. One coupling half being installed on the engine crankshaft and the other half with the assembled fan is installed on the generator rotating field shaft, providing a flexible drive between the engine and AC generator. The coupling hub-half is positioned on and secured to the crankshaft with a key. The fan which supplies AC generator cooling is fastened to the coupling disc-half.

b. The revolving field of the generator, exciter armature and collector rings are mounted on a common shaft. The rotating field is supplied with direct current excitation through the sliprings from the exciter. The revolving field, when energized and in motion, induces an alternating voltage in the stator windings. The exciter field, and the AC and DC brush holders are mounted to the rear bearing bracket.

133. Exciter Armature

a. Removal.

- (1) Remove brushes (para 104).
- (2) Remove screw and lockwasher (22, fig. 29) and screw, nut and lockwasher (14), tag and remove the generator field winding wires.
- (3) Remove nut (18), lockwasher (15) and plain washer (17) from rotating field shaft. Remove exciter armature (11) from the rotating field shaft.

b. Inspection, Testing and Repair.

- (1) Inspect the armature for secure seating of all coils in their coil slots and secure soldered connection. Replace or repair the armature if windings are loose in the coil slots.
- (2) Inspect the commutator for wear, roughness, or out-of-round. Check the

concentricity of the commutator with a dial indicator. Turn down the commutator if it is worn, rough or for excessive eccentricity.

- (3) Test the armature for open and shorted circuits using a growler.

c. Installation.

- (1) Position the armature (11) on the rotating field shaft. Install plain washer (17), lockwasher (15) and nut (18).
- (2) Connect the generator field wires to their proper terminals. Install nut and lockwasher (14) and screw and lockwasher (22).
- (3) Install brushes (para 104).

134. Bearing Bracket Assembly

a. Removal and Disassembly.

- (1) Remove brushes (para 104).
- (2) Remove exciter armature (para 133).
- (3) Remove the six screws (24, fig. 29) and lockwashers (25) that secure the bearing bracket assembly (13) to the stator housing (27).
- (4) Slide the bearing bracket from the rotating field assembly (6). A slight force may be required to free bearing (10) from the shaft. Press bearing (10) from the bearing bracket.
- (5) Remove four screws and captive lockwashers (6, fig. 45) and remove the two exciter field pole pieces (7). Remove the two field coils (8).
- (6) Remove four screws (3) and lockwashers (2) that secure field frame (5) to bearing bracket (13). Remove field frame.
- (7) Remove the eight nuts (10) and lockwashers (11) that secure the two commutator's brush holders assemblies (15) and the four collector ring brush holder assemblies (1) to the brush holder (12). Remove the brush

holder assemblies and 24 insulating washers (4).

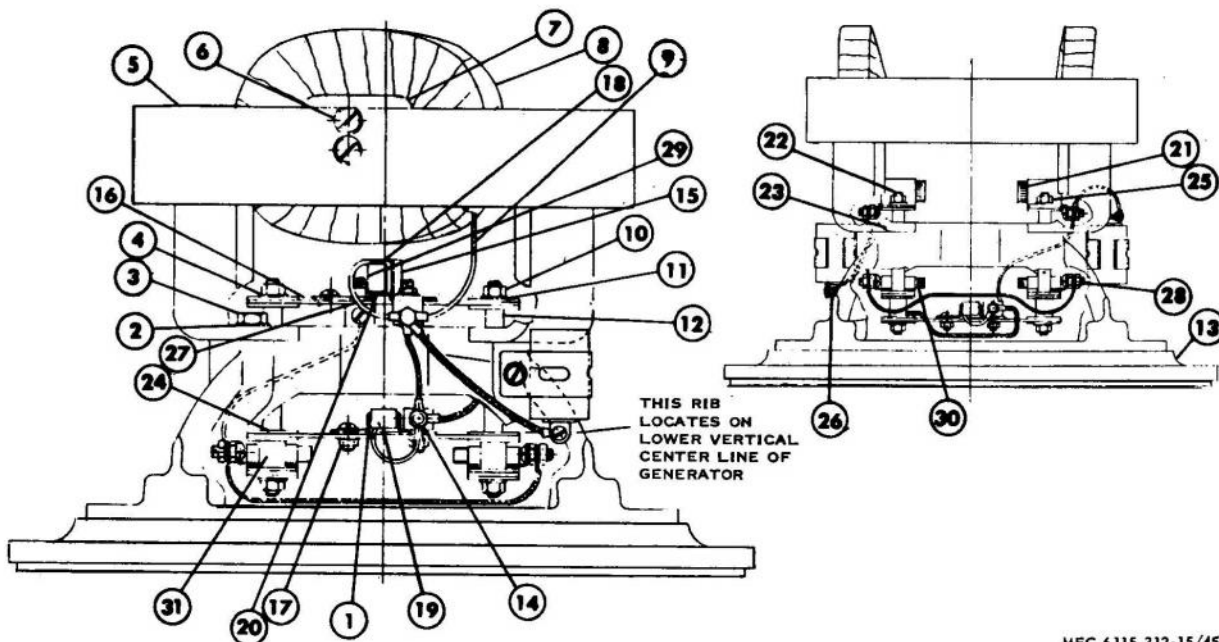
- (8) Disassemble brush holders assemblies (1) and (15) by removing hardware (28 and 22) respectively.

b. Cleaning, Inspection and Repair.

- (1) Clean all parts, with the exception of exciter field windings and brushes, with an approved cleaning solvent.
- (2) Inspect the bearing bracket and field frame for cracks, breaks or other damage. Replace a defective part.
- (3) Inspect brush holder insulators for cracks or breaks. Replace a defective insulator.
- (4) Inspect all threaded parts for worn or stripped threads and other damage. Replace defective parts.

c. Reassembly and Installation.

- (1) Assemble brush holder box (29) with brush holder plate (27) to insulator (24). Repeat procedure for remaining three collector ring brush holders.
- (2) Assemble brush holder (19) with brush holder back plate (20) to insulator (16). Repeat procedure for the remaining commutator brush holder.
- (3) Position two collector ring brush assemblies (1), on opposite sides of bearing bracket (13), the brush holder (12). Be sure to install washers (4) to the studs on both sides of the brush holder.
- (4) Install the four spaces (31) to the studs and install the remaining two collector brush holder assemblies.
- (5) Position the two commutator brush holder assemblies (15) to the brush holder studs (12) from the rear of the bearing bracket. Secure brush holder assemblies with nuts (10) and lockwashers (11).
- (6) Position exciter field coil windings



MEC 6115-312-15/45

- | | | | |
|----|------------------------------------|----|-------------------------|
| 1 | Brush holder assy — collector ring | 16 | Insulator |
| 2 | Lockwasher | 17 | Screw, nut and washer |
| 3 | Washer | 18 | Spring assembly |
| 4 | Washer | 19 | Brush holder |
| 5 | Exciter field frame | 20 | Brush holder back plate |
| 6 | Screw and captive lockwasher | 21 | Brush |
| 7 | Field pole piece | 22 | Screw, nut and washer |
| 8 | Field coil | 23 | Tab |
| 9 | Connector | 24 | Insulator |
| 10 | Nut | 25 | Tab |
| 11 | Lockwasher | 26 | Screw, nut, and washer |
| 12 | Brush holder | 27 | Brush holder plate |
| 13 | Bearing bracket | 28 | Screw, nut and washer |
| 14 | Terminal lug | 29 | Brush holder box |
| 15 | Brush holder assy commutator | 30 | Brush |
| | | 31 | Spacer |

Figure 45. Bearing bracket assembly.

(8) to pole pieces (7). Install pole pieces to the exciter field frame (5) with screws and captive lockwashers (6).

(7) Position assembled exciter field assembly to the bearing bracket and secure with four screws (3) and lockwashers (2).

(8) Apply a light film of grease to bearing (10, fig. 29) and position it on rotating field shaft. Slide bearing bracket assembly (13) on rotating field assembly shaft (6).

(9) Install the six screws (24) and lock-

washers (25) that secure bearing bracket assembly to the stator housing (27).

(10) Install the exciter armature (para 133).

(11) Install the brushes (para 104).

135. Stator Housing Assembly

a. On-Unit Testing.

(1) Open the control panel and remove changeover terminal board (para 97).

(2) Disconnect the marked electrical leads T1 through T5. Using a test lamp,

test for continuity between marked electrical wires NOS. T1 and T4, T2 and T5 and T3 and T6. If the lamp fails to light on any of these tests, an open circuit is indicated and the generator stator housing must be replaced.

- (3) Use a megohmmeter and test between the housing frame and one wire of each of the field winding groups enumerated in (2) above. A reading of less than 0.25 megohm indicates faulty insulation and generator stator housing must be replaced.
- (4) With the megohmmeter, test between the field winding groups. A reading of less than 0.25 megohm indicates faulty insulation.

b. Removal.

- (1) Remove the bearing bracket assembly (para 134).
- (2) Remove the six nuts (28, fig. 29) and lockwashers (25) from the stator housing studs (33).
- (3) Remove the four screws (16) and lockwashers (5) that secure the stator housing to the mounting feet (26).
- (4) Slide stator housing (27) from the rotating field assembly (6). Prop up rotating field with blocks of wood.

c. Cleaning, Inspection and Repair.

- (1) Clean the stator housing with a cloth dampened with an approved solvent and dry thoroughly. Do not allow the solvent to get on the windings.
- (2) Inspect all threaded parts for stripped or damaged threads. Retap damaged threaded holes. Replace damaged screws, washers and studs.
- (3) Inspect the winding impregnation for cracks, holes and other damage. Inspect the wires for cracks, fraying, loose terminals and other damage. Revarnish and bake if necessary.

d. Installation

- (1) Slide stator housing (27) over rotating field (6). Install and tighten six nuts (28) lockwashers (25) to studs (33).
- (2) Install four screws (16) and lockwashers (5) to mounting feet (26).
- (3) Install bearing bracket assembly (para 134).

136. Rotating Field Assembly

a. On-Unit Testing

- (1) Raise the AC brushes from the slip-rings. Test the resistance between the slip-rings with a multimeter. If the resistance is more than 5 percent above or below 9 ohms the revolving field windings are faulty.
- (2) With a megohmmeter, test between the rotor shaft and one of the slip-rings. A reading of less than 0.5 megohms indicates faulty insulation.
- (3) Raise the DC brushes from the armature. With a megohmmeter, test the resistance between a commutator bar and rotor shaft. A reading of less than 0.5 megohms indicates faulty insulation.

b. Removal.

- (1) To remove the rotating field, follow the procedures outlined in paragraph 108 for the removal of the generator.

c. Cleaning, Inspection and Repair.

- (1) Clean the rotating field and shaft with a clean lint-free cloth.
- (2) Inspect rotating field and shaft for damaged insulation, nicks, burrs, broken electrical wires and other defects. Make necessary repairs or replace a defective rotor.
- (3) Clean the fan assembly and coupling assembly with an approved cleaning solvent.
- (4) Inspect the fan and coupling assembly for cracks, breaks, bends and

other damage. Replace a defective fan or coupling assembly.

d. Installation. Installation of rotating field

assembly is performed by following the procedures outlined in paragraph 108 for installation of the generator.

Section X. FRAME AND SKID BASE ASSEMBLY

137. General

The frame and lifting bracket is constructed of angle and tubular steel welded together upon which the gas tank, control box and battery box are mounted. The lifting bracket contains a U-bolt for lifting the generator set. The skid base is of welded steel construction and forms a rigid support for mounting the generator and engine assemblies.

138. Removal

a. Remove the control panel assembly (para 101).

b. Remove the battery charger assembly (para 106).

c. Remove the relay control assembly (para 107).

d. Remove the generator assembly (para 108).

e. Remove the engine assembly (para 109).

f. Remove the three screws (2, fig. 46), lockwasher (4), nuts (5) and clamps (3). Remove the muffler guard (1).

g. Remove the eight screws (9) lockwashers (7) and nuts (8) and remove lifting bracket assembly (6).

h. Remove the four screws (15), flat washers (16), lockwashers (17) and nuts (18). Remove the four screws (11) and six screws (12), 20 lockwashers (13) and 10 nuts (14). Remove the frame assembly (10) from the skid base (19).

139. Cleaning, Inspection and Repair

a. Clean all parts with an approved cleaning solvent.

b. Inspect the lifting bracket, steel angles and U-bolt for cracks and file all welds smooth.

c. Inspect all welded joints of the skid base for cracks or breaks. Reweld a cracked or broken joint.

140. Installation

a. Position the frame assembly (10) on the skid base assembly (19). Install the four screws (11) with lockwashers (13) and nut (14). Install the six screws (12) with lockwashers and nuts.

b. Install four screws (15), flat washers (16), lockwashers (17) and nuts (18).

c. Position the lifting bracket assembly (6) to the frame and secure with screws (9), lockwashers (7) and nuts (8).

d. Position muffler guard (1) on frame and secure with clamps (3) screws (2) lockwashers (4) and nuts (5).

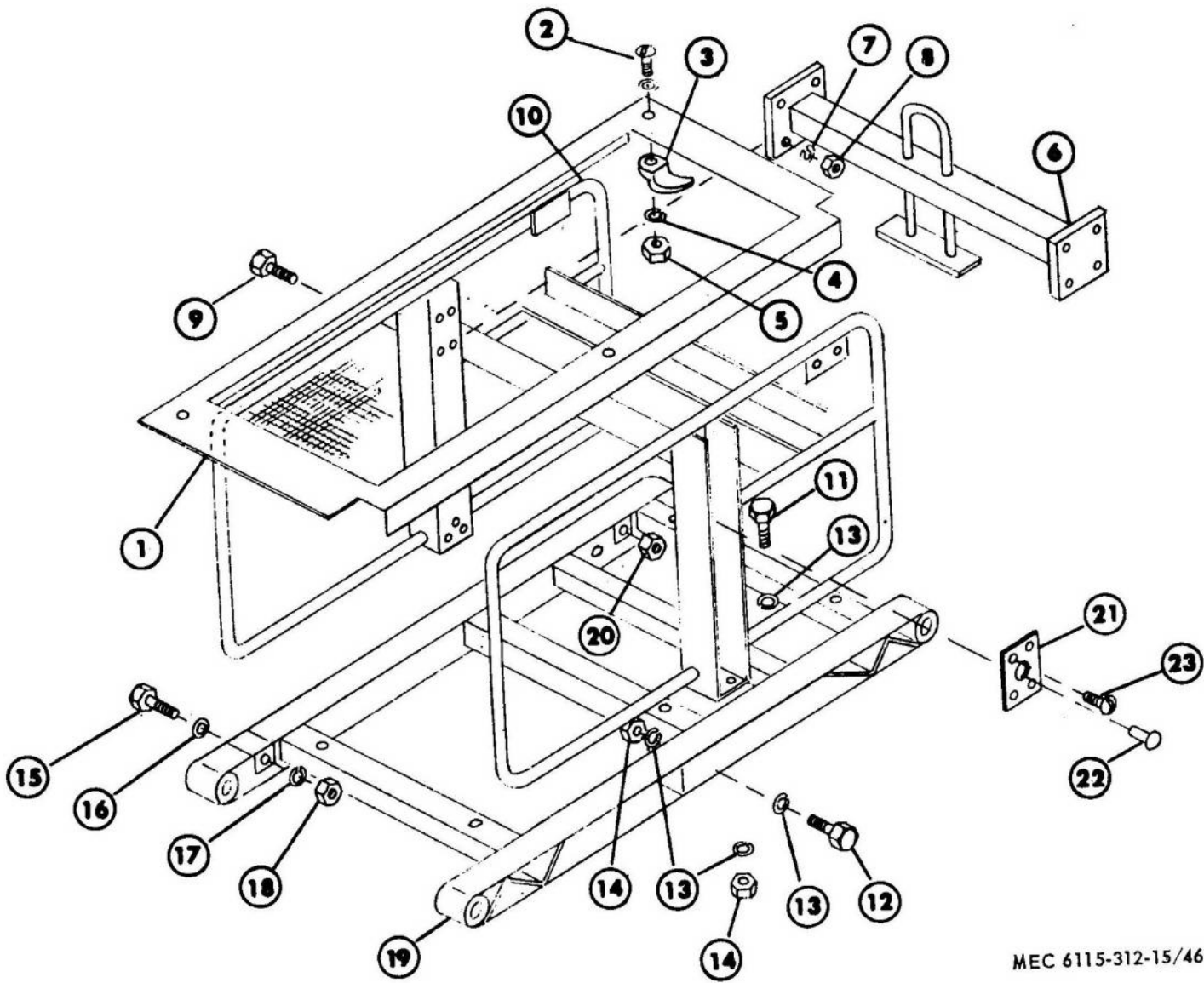
e. Install engine assembly (para 109).

f. Install generator assembly (para 108).

g. Install relay control assembly (para 107).

h. Install battery charger assembly (para 106).

i. Install control panel assembly (para 101c).



MEC 6115-312-15/46

- | | |
|----------------------------|----------------------|
| 1 Muffer guard | 13 Lockwasher |
| 2 Screw | 14 Nut |
| 3 Clamp | 15 Screw |
| 4 Lockwasher | 16 Flatwasher |
| 5 Nut | 17 Lockwasher |
| 6 Lifting bracket assembly | 18 Nut |
| 7 Lockwasher | 19 Skidbase assembly |
| 8 Nut | 20 Nut |
| 9 Screw | 21 Plate |
| 10 Frame assembly | 22 Rivet |
| 11 Screw | 23 Screw |
| 12 Screw | |

Figure 46. Frame and skid base assembly.

CHAPTER 5

DEMOLITION, SHIPMENT AND LIMITED STORAGE

Section I. DEMOLITION OF UNIT TO PREVENT ENEMY USE

141. General

When capture or abandonment of the generator set to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of the generator set and all corresponding repair parts.

142. Demolition To Render the Set Inoperative

a. Demolition by Mechanical Means. Using an axe, sledge hammer, pick, pickmattock, or other tools available, punch holes in the fuel tank, and inflict severe damage to such items as the generator, control panel, carburetor assembly, exhaust manifold, and the engine.

b. Demolition by Misuse. Add sand to the oil in the engine base, and throw sand and metal filings into the generator. Run the engine until the generator set fails.

143. Demolition by Explosives or Weapons' Fire

a. Demolition by Explosives. Place charges as indicated in figure 47 as situation permits, and detonate them simultaneously choosing best firing method that will secure best results.

b. Demolition by Weapons' Fire. Fire on the generator set with the heaviest suitable weapons available.

144. Other Demolition Methods

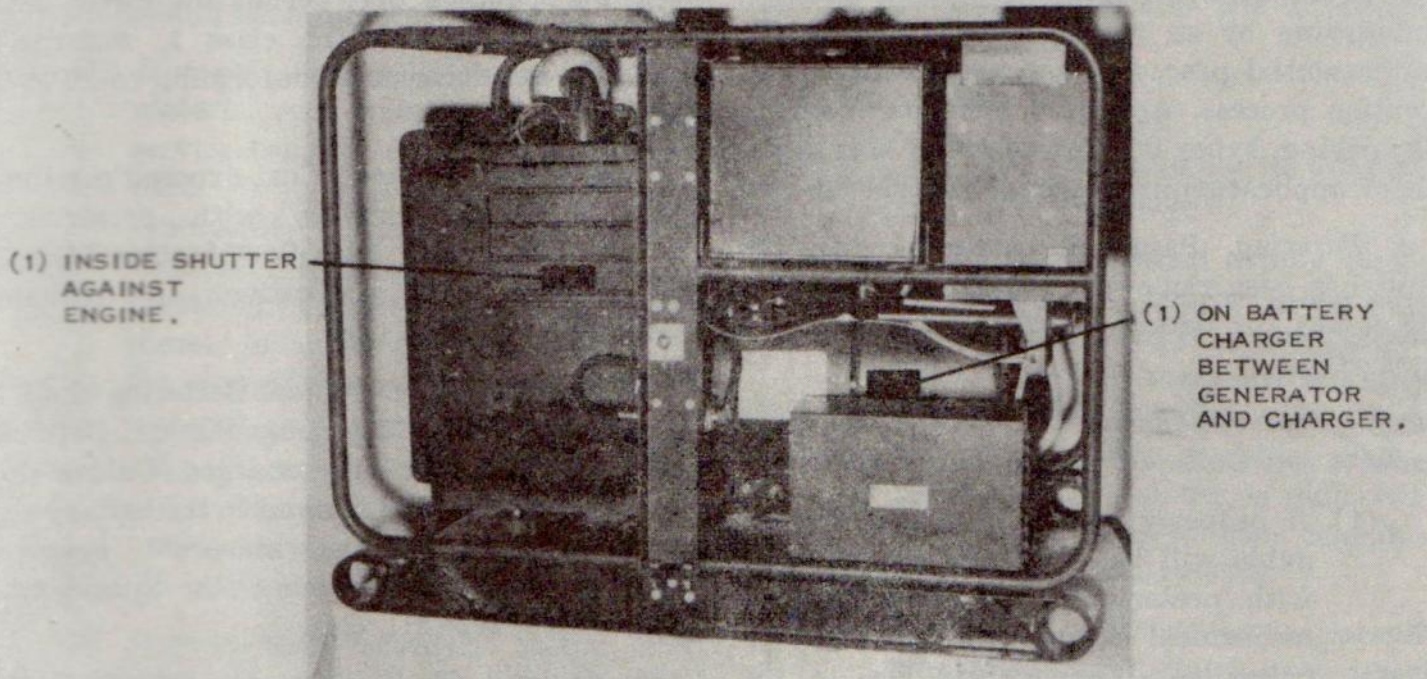
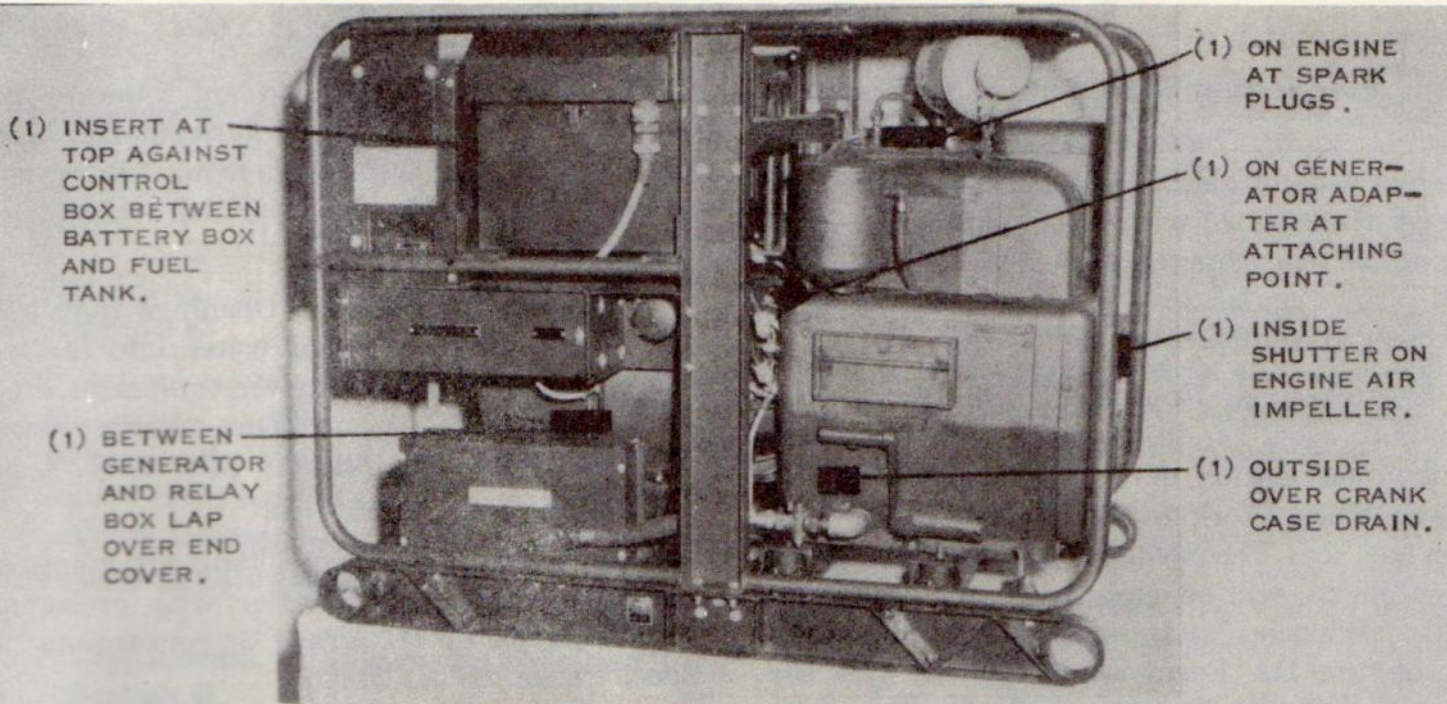
a. Demolition by Scattering and Concealment. Remove all easily accessible parts such as the air cleaner, carburetor, magneto, and generator brushes, and scatter them through dense foliage, bury them in dirt or sand, or throw them in lake, river, stream, or other body of water.

b. Demolition by Burning. Pack rags, clothing, or canvas under or around engine and generator. Saturate this packing with gasoline, oil or diesel fuel, and ignite.

c. Demolition by Submersion. Knock the spark plug base from the engine with any convenient tool and completely submerge the generator set in a body of water to provide water damage and concealment. Salt water will do greater damage to metal parts than fresh water.

145. Training

All operators should receive thorough training in the destruction of the generator set. Refer to FM 5-25. Simulated destruction, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training, that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason it is necessary that operators be thoroughly familiar with all methods of destruction of equipment, and be able to carry out demolition instructions without reference to this or any other manual.



LEGEND: BLOCK ■ INDICATES ONE 1/2 IB CHARGE. AS CONDITIONS WARRANT CHOOSE BEST FIRING METHOD THAT WILL SECURE BEST RESULTS (TOTAL 1/2 IB CHARGES = 8)

MEC 6115-312-15/47

Figure 47. Placement of demolition charges.

Section II. SHIPMENT AND LIMITED STORAGE

146. Preparation of Equipment for Shipment

a. General. Detailed instructions for the preparation of generator set for domestic shipment are outlined within this paragraph. Preservation will be accomplished in sequence that will not require the operation of previously preserved components.

b. Inspection. Equipment will be inspected for any usual condition such as damage, rusting, accumulation of water, or pilferage, DA Form 2404, Work Sheet of Preventive Maintenance and Technical Inspection of Engineer Equipment, will be executed on the equipment. All deficiencies and shortcomings will be recorded on DA Form 2404 together with corrective action taken.

c. Cleaning and Drying. Thorough cleaning and drying by an approved technique is the first essential procedure in any effective preservation process. Approved methods of cleaning, drying, types of preservatives, and methods of application are described in TM 38-230.

d. Painting. Paint all surfaces when the paint has been removed or damaged. Refer to TM 9-213 for detailed cleaning and painting instructions.

e. Depreservation Guide. DA Form 2258 (Depreservation Guide of Engineer Equipment).

- (1) A properly annotated depreservation guide will be completed concurrently with preservation for each item of mechanical equipments with any peculiar requirements outlined in the Remarks column. The completed depreservation guide will be placed with the equipment in a waterproof envelope marked "Depreservation Guide", and fastened in a conspicuous location or near the operator's controls.
- (2) Prior to placing equipment in operation or to the extent necessary for inspection, depreservation of the item shall be performed as outlined on the Depreservation Guide.

f. Lubrication System (Wet Sump) Boxed or

Crated. Check level of Lubricant. Operate the engine at a fast idle until lubricant has been circulated throughout the system. The crankcase will then be drained and the drain plugs reinstalled.

g. Sealing of Openings. Openings that will permit the direct entry of water into the interior of gasoline engine-driven equipment, etc., shall be sealed with pressure-sensitive tape conforming to Specification PPP-T-60, type III, class 1.

h. Fuel Tank. Drain fuel tank after engine preservation and fog interior with preservative oil, type C. M., grade 2, conforming to Specification Mil-L-21260.

i. Air Cleaners. Drain the air cleaner and seal all openings that permit the direct entry of water. Use type III, class 1, waterproof pressure-sensitive tape conforming to PPP-T-60.

j. Exterior Surfaces. Coat exposed machined ferrous metal surfaces with preservative (C.L.) conforming with Specification MIL-C-11796, class 3. If preservative is not available, cup grease may be used.

k. Batteries and Cables. Batteries shall be secured in the battery compartment. Batteries shall be filled and fully charged. Cables shall be disconnected, and secured to the battery support or carriers with waterproof, pressure-sensitive tape conforming to Specification PPP-T-60, type III, class 1.

l. Marking. Shall conform to Mil-STD-129.

m. Basic Issue Items.

- (1) Cover unit with its canvas cover. Secure to frame with tie rope.
- (2) Loose items shall be packed in cover pockets or publications case which may be secured to frame prior to covering. Otherwise items will be packed in a suitable container and secured to the equipment to prevent loss or pilferage.

n. Crating. If packing is required to provide

adequate protection against damage during shipment, refer to TM 38-230 for guidance in crate fabrication. If crate is used allow a 2 inch clearance between the unit and the crate at top, side, front and rear. This will allow room for a vapor proof barrier. Use desiccants in barrier. Total overall crated dimensions are approximately 48" L x 32" W x 37" H. Approximate crated weight is 895 pounds.

147. Loading Equipment for Shipment

Load the generator set on the carrier, using a forklift, crane or if feasible manually with enough manpower. Approximate weight of a crated unit is 895 pounds; uncrated 775 pounds. Keep the generator set right side up when handling and block or tie it to the bed of the carrier to prevent shifting while it is being transported (paras 6 and 7).

148. Limited Storage

a. *General.* Detailed instructions for preserving and maintaining equipment in limited storage are outlined in this paragraph. Limited storage is defined as storage not to exceed 6 months. Refer to AR 743-505.

- (1) *Inspection.* Equipment will be inspected for any unusual condition such as damage, rusting, accumulation of water, or pilferage. DA Form 2404 (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment) will be executed on the equipment. All deficiencies and shortcomings will be recorded on DA Form 2404 together with corrective action taken.
- (2) *Cleaning and Drying.* Thorough cleaning and drying by an approved technique is the first essential procedure in any effective preservation process. Approved methods of cleaning, drying, types of preservatives, and methods of application are described in TM 38-230.
- (3) *Painting.* Paint all surfaces when the

paint has been removed or damaged. Refer to TM 9-213 for detailed cleaning and painting instructions.

- (4) *Depreservation Guide.* DA Form 2258 (Depreservation Guide of Engineer Equipment).
 - (a) A properly annotated depreservation guide will be completed concurrently with preservation for each item of mechanical equipment with any peculiar requirements outlined in remarks column. The completed depreservation guide will be placed with the equipment in a waterproof envelope, marked "Depreservation Guide", and fastened in a conspicuous location on or near the operator's controls.
 - (b) Prior to placing equipment in operation or to the extent necessary for inspection, depreservation of the item shall be performed as outlined on the Depreservation Guide.
- (5) *Lubrication System (Wet Sump), Boxed or Crated.* Check level of lubricant. Operate the engine at a fast idle until lubricant has circulated throughout the system. The crankcase will then be drained and the drain plugs reinstalled.
- (6) *Sealing of Openings.* Openings that will permit the direct entry of water into the interior of gasoline engine-driven equipment, etc., shall be sealed with pressure-sensitive tape conforming to Specification PPP-T-60 type III, class 1.
- (7) *Fuel Tank.* Drain fuel tank after engine preservation and fog interior with preservative oil, type C.M., grade 2, conforming to Specification Mil-L-21260.
- (8) *Exterior Surfaces.* Coat exposed machined ferrous metal surfaces with preservative (C.L.) conforming with Specification Mil-C-11796, class 3. If preservative is not available, cup grease may be used.

(9) *Batteries and Cables.* Batteries shall be secured in the battery compartment. Batteries shall be filled to fully charged. Cables shall be disconnected, and secured to the battery support or carrier with waterproof pressure-sensitive tape conforming to Specification PPP-T-60, type III, Class 1.

(10) *Basic Issue Items.*

(a) Loose items shall be packed in cover pockets or publication case. Otherwise, items will be packed in a suitable container and secured to the equipment to prevent loss or pilferage. Publications case may be secured to frame before covering.

(b) Cover unit with its canvas cover

and secure to frame with tiedown rope.

149. Inspection and Maintenance of Equipment in Storage

a. Inspection. When equipment has been placed in storage, all scheduled preventive maintenance services, including inspection, will be suspended and preventive maintenance inspection will be performed as specified herein, refer to AR 743-505.

b. Weatherproofing. When suitable shelter is not available, select a firm, level, well-drained storage location, protected from prevailing winds. Position the equipment on heavy planking or other solid surfaces. Cover the equipment with a tarpaulin or other suitable waterproof covering and tie down securely.

APPENDIX I

REFERENCES

1. Dictionaries of Terms and Abbreviations

- AR 320-5 Dictionary of United States Army Terms.
AR 320-50 Authorized Abbreviations and Brevity Codes.

2. Fire Protection

- TM 5-687 Repairs and Utilities: Fire Protection Equipment and Appliances; Inspections, Operations, and Preventive Maintenance.
TM 9-1799 Ordnance Maintenance: Fire Extinguishers.

3. Lubrication

- LO 5-6115-312 Engine, Gasoline.

4. Operating Instructions

- TM 5-6115-312-15 Operator, Organizational, Direct and General Support, and Depot Maintenance Manual. Generator Set, GED, 5 KW, 60 cycle, air-cooled, portable, tubular frame, shock-mounted FSN 6115-560-5290 Serial Nos. 1 thru 602.

5. Painting

- TM 9-213 Painting instructions for Field Use.
DA Form 2404 Equipment inspection and Maintenance worksheet.

6. Preventive Maintenance

- AR 750-5 Organization, Policies, and Responsibilities for Maintenance Operation.
TM 38-750 Army Equipment Record Procedures.
TB ENG 347 Winterization Techniques for Engineer Equipment.

7. Publication Indexes

- DA Pam 108-1 Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings.
DA Pam 310-1 Index of Administrative Publications.
DA Pam 310-2 Index of Blank Forms.
DA Pam 310-3 Index of Training Publications.
DA Pam 310-4 Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 4, 6, 7, 8, and 9), Supply Bulletins, Lubrication Orders and Modification Orders.
DA Pam 310-5 Index of Graphic Training Aids and Devices.
DA Pam 310-25 Index of Supply Manuals—Engineer Type Items.

8. Radio Interference Suppression

- TM 11-483 Radio Interference Suppression.

9. Shipment, Export and Limited Storage

AR 743-505	Limited Storage of Engineer Mechanical Equipment.
TM 38-230	Preservation Packaging, and Packing of Military Supplies and Equipment.
TB 5-9711-1	Preparation of Corps of Engineers Equipment for Over-seas shipment.
TB 5-9713-1	Preparation for Export, Spare Parts for Corps of Engineers Equipment.

10. Supply Publications

FSC C9100-IL	FSC Group 91; Fuels, Lubricants, Oils, and Waxes.
FSC C6800-IL	Chemicals and Chemical Products.

11. Training Aids

FM 5-25	Explosives and Demolition.
FM 21-5	Military Training Management.
FM 21-6	Techniques of Military Instruction.
FM 21-30	Military Symbols.

APPENDIX II

BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES

Section I. INTRODUCTION

1. General

Section II lists the accessories, tools, and publications required for maintenance and operation by the operator, initially issued with, or authorized for the generator set. Section III lists the maintenance and operating supplies required for initial operation.

2. Explanation of Columns Contained in Section II

a. Source Codes. The information provided in each column is as follows:

- (1) *Materiel.* This column lists the basic materiel code number of the supply service assigned responsibility for the part. Blank spaces denote supply responsibility of the preparing agency. General Engineer Supply parts are identified by the letters GE in parentheses, following the nomenclature in the description column. Other basic materiel code numbers are:

- 3 — Chemical Materiel
- 5 — Engineer Materiel
- 9 — Ordnance Materiel
- 10 — Quartermaster Materiel

- (2) *Source.* The selection status and source of supply for each part are indicated by one of the following code symbols:

(a) P—applied to high-mortality repair parts which are stocked in or supplied from the supply service depot system, and authorized for use at indicated maintenance level.

(b) Pl—applied to repair parts which are low-mortality parts, stocked in or supplied from supply service depots, and authorized for installation at indicated maintenance level.

- (3) *Maintenance.* The lowest maintenance level authorized to use, stock, install, or manufacture the part is indicated by the following code symbol:

O — Organizational Maintenance

- (4) *Recoverability.* When no code is shown in the recoverability column the part is considered expensable.

b. Federal Stock Number. When a Federal stock number is available for a part, it will be shown in this column, and will be used for requisitioning purposes.

c. Description.

- (1) The item name and a brief description of the part are shown.

- (2) A five-digit Federal supply code for manufacturers and/or other supply services is shown in parentheses followed by the manufacturer's part number. This number shall be used for requisitioning purposes when no Federal stock number is indicated in the Federal stock number column.
Example: (08645) 86543

- (3) The letters GE, shown in parentheses immediately following the description, indicates General Engineer supply responsibility for the part.

d. Unit of Issue. If no abbreviation is shown in this column, the unit of issue is "each".

e. Quantity Authorized. This column lists the quantities of repair parts, accessories, tools, or publications authorized for issue to the equipment operator or crew as required.

f. Quantity Issued with Equipment. This column lists the quantities of repair parts, accessories, tools, or publications that are initially issued with each item of equipment. Those in-

licated by an asterisk are to be requisitioned through normal supply channels as required.

g. Illustrations. This column is subdivided into two columns which provide the following information:

- (1) *Figure number.* Provides the identifying number of the illustration.
- (2) *Item number.* Provides the referenced number for the parts shown in the illustration.

3. Explanation of Columns Contained in Section III

a. Item. This column contains numerical sequenced item numbers, assigned to each component application, to facilitate reference.

b. Component Application. This column identifies the component application of each maintenance or operating supply item.

c. Source of Supply. This column lists the basic materiel code number of the supply service assigned responsibility for the item. Blank

spaces denote supply responsibility of the preparing agency. Other basic materiel code numbers are:

9 — Ordnance Materiel

10 — Quartermaster Materiel

Note. Include only the applicable materiel codes.

d. Federal Stock Number. The Federal stock number will be shown in this column and will be used for requisitioning purposes.

e. Description. The item and a brief description are shown.

f. Quantity Required for Initial Operation. This column lists the quantity of each maintenance or operating supply item required for initial operation of the equipment.

g. Quantity Required for 8 Hours Operation. Quantities listed represent the estimated requirements for an average eight hours of operation.

h. Notes. This column contains informative notes keyed to data appearing in the preceding column.

Section II. BASIC ISSUE ITEMS LIST

Source codes				Federal stock No.	Description	Unit of issue	Quantity authorized	Quantity issued with equipment	Illustration	
Material	Source	Maintenance	Recoverability						Figure	Item
					GROUP 31 — BASIC ISSUE ITEMS MANUFACTURER INSTALLED					
					3100 — BASIC ISSUE ITEMS, MANUFACTURER OR DEPOT INSTALLED					
10	P1	0	.....	7510-889-3494	BINDER, log book	ea	1	1		
				6140-057-1554	BATTERY, STORAGE 12V 6 cell (Repair parts manual group 0612). DEPARTMENT OF THE ARMY LUBRICATION ORDER LO 5-6115-312-15. DEPARTMENT OF THE ARMY OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUP- PORT, AND DEPOT MAINTEN- ANCE MANUAL TM 5-6115- 312-15. DEPARTMENT OF THE ARMY ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT, AND DEPOT MAINTENANCE MAN- UAL TM 5-6115-312-25P.	.....	2	2		
						.....	1	1		
						.....	2	2		
						.....	2	2		
3	P1	0	.....	2910-786-0091	FUEL LINE, Auxiliary .....	.....	1	1		
	P	0	.....	6810-264-9063	SULPHURIC ACID: Electrolyte	gal	4	4		
					GROUP 3200 — BASIC ISSUE ITEMS, TROOP INSTALLED					
					3200 — BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED					
9	P1	0	.....	5975-243-5861	CLAMP, electrical, ground rod ½ in. to 1 in. id.	ea	1	*		
10	P1	0	.....	5120-223-7396	PLIERS, combination: slip joint w/ cutter, 6 in. lg.	ea	1	*		
5	P1	0	.....	5975-642-8937	ROD, ground, 9 ft. lg., ⅝ in. dia. cone point, 3 sections (GE).	ea	1	*		
10	P1	0	.....	5120-278-1283	SCREWDRIVER, FLAT TIP: ⅝ in. wide tip 6 in. blade lg.	ea	1	*		
5	P1	0	.....	6145-189-6685	WIRE, electrical No. 6 AWG (10 ft. req'd) (GE).	ft	.....	*	
10	P1	0	.....	5120-264-3796	WRENCH, open end adjustable: crescent type.	ea	1	*		

Section III. MAINTENANCE AND OPERATING SUPPLIES

Item	Component application	Source of supply	Federal stock No.	Description	Quantity required for initial operation	Quantity required for 8 hours operation	Notes
1	0101 CRANKCASE (1)	10	9150-265-9435	LUBRICATING OIL: 5 gal. pails as follows:	3 1/2 qt	(3)	(1) Includes quantity of oil to fill engine oil system as follows: 3 qt-Crankcase 1/2 qt-oil filter
		10	9150-265-9428	OE-30	3 1/2 qt	(3)	(2) See (C9100-IL for additional data and requisitioning procedure.
		10	9150-242-7603	OE-10	3 1/2 qt	(3)	(3) See current LO for grade application and replenishment intervals.
2	0304 AIR CLEANER (4)				% qt	(3) 4	(4) Use oil as prescribed in item 1 above. (5) Tank capacity.
3	0306 FUEL TANK (5)	10	9130-160-1818	FUEL, GASOLINE: bulk as follows: Automotive, Combat 91A.	7 gal	14 gal	(6) Average fuel consumption is 2 gal per hour of continuous operations.

APPENDIX III

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

1. General

This Appendix contains the explanations of all the maintenance and repair functions authorized the various maintenance levels.

Section II MAC (MAINTENANCE ALLOCATION CHART) designates overall responsibility for the performance of maintenance operations. The implementation of maintenance tasks upon the end item or component will be consistent with the assigned maintenance operations.

Section III (TOOL and TEST EQUIPMENT REQUIREMENTS) contains a list of the special tools and special test equipment required for each maintenance operation as referenced from the MAC section II column K. This section cross references a particular maintenance operation on the MAC when special tools and equipment are required to perform a specific maintenance task.

Section IV (REMARKS) contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance operation. This section is cross referenced to the MAC section II column L.

2. Maintenance

Maintenance is any action taken to keep material in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of material includes the following:

a. Service. Operations required periodically to keep the item in proper operating condition, i.e., to clean, preserve, drain, paint, and replenish fuel, lubricants, hydraulic and deicing fluids or compressed air supplies.

b. Adjust. Regulate periodically to prevent malfunction. Adjustments will be made com-

mensurate with adjustment procedures and associated equipment specifications.

c. Aline. Adjust two or more components of an electrical or mechanical system so that their functions are properly synchronized or adjusted.

d. Calibrate. Determine check, or rectify the graduation of an instrument, weapon, or weapons system or components of a weapons system.

e. Inspect. Verify serviceability and detect incipient electrical or mechanical failure by close visual examination.

f. Test. Verify serviceability and detect incipient electrical or mechanical failure by measuring the mechanical or electrical characteristics of the item and comparing those characteristics with authorized standards. Tests will be made commensurate with test procedures and with calibrated tools and/or test equipment referenced on the MAC.

g. Replace. Substitute serviceable components, assemblies and subassemblies for unserviceable counter parts or remove and install the same item when required for the performance of other maintenance operations.

h. Repair. Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools, equipment and skill to include welding, grinding, riveting, straightening, adjusting and facing.

i. Overhaul. Restore an end item to completely serviceable condition as prescribed by serviceability standards developed and published by national maintenance points having maintenance responsibility for the item. This is accomplished through employment of the technique of "Inspection and repair only as necessary" (IROAN). Maximum use of diagnostic and test equipment is combined with

minimum disassembly during overhaul, "Overhaul" may be assigned to any level of maintenance except organizational, provided the time, tools, equipment, repair parts authorization, and technical skills are available at that level. Normally, overhaul as applied to end items, is limited to depot maintenance level.

j. Rebuild. Restore to a condition comparable to new, by disassembling to determine the condition of each component part and reassembly using serviceable, rebuilt, or new assemblies, subassemblies, and parts.

3. Explanation of Columns Section II

a. Functional Group Number. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1 Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Component Assembly Nomenclature. This column contains the functional grouping index heading, Subgroups heading, and a brief description of the part starting with the noun name.

c. Essentiality. The essentiality column reflects whether or not an assembly, or repair part, is combat essential to the tactical use of the end item. The letter E: in this column indicates the items are combat essential.

d. Maintenance Operations and Maintenance Levels. This column contains the various maintenance operations A through J, service, adjust, etc.

A symbol indicating the maintenance level placed in the appropriate column in line with an indicated maintenance operation authorizes that level to perform the function. The symbol indicates the lowest level of maintenance responsible for performing the function, but does not necessarily indicate repair parts stockage

at that level. Higher levels of maintenance are authorized to perform the indicated functions of lower levels. The symbol designation for the various maintenance levels are as follows:

O/C — Operator or crew
O — Organizational
DS — Direct Support
GS — General Support
D — Depot

e. Reference Note. This column is subdivided in two columns. Column K references the tool and test equipment requirements (T & TE) section III of the MAC. Column L references the remarks section IV of the MAC.

4. Explanation of Columns Section III

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T & TE requirements column on the MAC. The latter represents the specific maintenance operation the item is to be used with. The letter is representative of column A through J on the MAC.

b. Maintenance Level. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal stock number, of tools and test equipment.

5. Explanation of Columns Section IV

a. Reference Code. This column consists of two letters separated by a dash. The first letter references column L, the second letter references a maintenance operation, column A through J on the MAC section II.

b. Remarks. This column lists the remarks and other information pertinent to the operation being performed as indicated on the MAC section II.

Section II. MAINTENANCE ALLOCATION CHART

Functional group No.	Component assembly nomenclature	Essentiality	Maintenance operations										Maintenance levels				Note reference				
			A	B	C	D	E	F	G	H	I	J	K	L							
01	ENGINE <i>Note. This Draft Maintenance Allocation Chart is subject to proof-testing by disassembly and reassembly of the equipment.</i>																				
0100	ENGINE ASSEMBLY																				
0101	Engine Gasoline CRANKCASE, BLOCK, CYLINDER HEAD Block Assembly, Cylinder Crankcase Assembly Head, Cylinder																				
0102	CRANKSHAFT Crankshaft Bearing and Seal Slinger, Oil																				
0103	FLYWHEEL ASSEMBLY Flywheel																				
0104	PISTONS, CONNECTING RODS Piston, Assembly Rod Assembly																				
0105	VALVES, CAMSHAFTS, AND TIMING SYSTEM Valves and Inserts Guides and Springs Cap, Rotor, Valve Stem Lifter, valve Camshaft Gear, Timing																				
0106	ENGINE LUBRICATION SYSTEM Pump Assembly, Oil Filter, Oil Breather, Crankcase Gage and Cap Assembly Line Assemblies, Oil																				
0107	ENGINE STARTING SYSTEM Crank, Hand																				

Functional group No.	Component assembly nomenclature	Essentiality	Maintenance operations							Maintenance levels				Notes reference				
			A	B	C	D	E	F	G	H	I	J	K		L			
0605	IGNITION COMPONENTS Magnetto Contact Set and Capacitor Cable, Assembly, Ignition Spark Plug			0														
0606	ENGINE SAFETY CONTROLS Switch, High Cylinder Head Temperature			0														
0607	INSTRUMENT OR ENGINE CONTROL PANEL Switches, Engine Ammeter																	
0612	LEAD, ELECTRICAL BATTERIES, STORAGE Battery																	
0615	RADIO INTERFERENCE SUPPRESSION Strap, Ground								0									
15	FRAME FRAME ASSEMBLY Frame, Tubular																	
1501	Skid																	
22	MISCELLANEOUS BODY, CHASSIS OR HULL AND ACCESSORY ITEMS CANVAS ITEMS Cover, Canvas																	
2201	WINTERIZATION EQUIPMENT Heating Unit, Battery Box																	
2207	DATA PLATES AND INSTRUCTION Plates, Instruction																	
2210	PLATES, IDENTIFICATION (C.O.E.) ELECTRIC GENERATOR GENERATOR ASSEMBLY Generator Assembly																	
40	ROTOR ASSEMBLIES Rotor Assembly																	
4000																		
4001																		

Functional group No.	Component assembly nomenclature	Essentiality	Maintenance operations										Maintenance levels			Note reference					
			A	B	C	D	E	F	G	H	I	J	K	L							
4002	STATOR ASSEMBLIES																				
4003	Stator Assembly									DS											
	BRUSH HOLDERS																				
	Brush																				
	Holder, Brush																				
4004	VENTILATING SYSTEM																				
	Fan																				
4005	FRAME SUPPORT AND HOUSING																				
	Bearing, Rotor																				
	Cover End																				
4007	DRIVE COMPONENTS																				
	Coupling, Engine to Generator																				
4009	CONTROL PANELS, CUBICLES																				
	Meters, Electrical																				
	Harness, Wiring																				
	Light, Panel																				
	Lamp																				
	Receptacle																				
	Leads																				
4011	CIRCUIT BREAKERS, FUSE AND FUSE HOLDERS																				
	Circuit Breaker Assembly																				
	Fuse																				
	Holder Fuse																				
4012	SWITCHES																				
	Switch																				
4013	REGULATOR, VOLTAGE																				
	Regulator Assembly, Voltage																				
4014	RESISTORS																				
	Resistors, Fixed or Variable																				
	Rheostat																				
4015	RELAY OR ASSEMBLY																				
	Relay Assembly																				
4017	TRANSFORMERS																				
	Transformer, Current																				

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool No.
		No special tools and equipment are required.	

Section IV. REMARKS

Reference code	Remarks
A-F	Test includes compression and engine operation.
B-H	Repair includes refacing valve seats.
C-A	Replace element of oil filter.
D-G	External only.
E-A	Service includes cleaning bowl and replacing gasket.
F-A	Replace element.
G-I	Rewind.
H-I	Rewind.

INDEX

	Paragraph	Page		Paragraph	Page
Adjust volt rheostat	95	57	Frame and skid base:		
Air cleaner	45	19	Cleaning, inspection, repair	139	100
Batteries and battery box	82	46	Installation	140	100
Battery charger assembly	106, 115	68-76	Removal	138	100
Battery charging gage	22	13	Frequency meter	14	13
Blowtorch	40	17	Fuel selector valve	30	14
Camshaft and tappets	131	95	Fuel system:		
Choke	28	14	Carburetor	76	39
Controls and instruments	92-102	56-63	Fuel filter	77	41
Connectors	97	59	Fuel pump	78	41
Crankshaft	130	93	Fuel tank	79	43
Cylinder block	128	91	Fuel tank cap valve	31	14
Cylinder head	90	53	Generator		
Cylinder head temperature gage	29, 99	14-62	Bearing bracket	135	98
Demolition to render the set inoperative ..	142	102	Brushes	104	64
By explosives or weapons fire	148	105	Exciter armature	133	96
Other demolition method	144	102	Main generator fails to build up		
Training	145	102	rated voltage	57	32
Description	3	2	Overheats	60	32
Dusty or sandy areas	37	17	Removal	108	69
Engine			Totating field	136	99
Adjusting tappets	91	56	Voltage drops upon increase		
Air cleaner	45	19	of generator loads	58	32
Cylinder heads	90	53	Voltage too high	59	32
Hard to start or fails to start	51	31	Governor	80	43
Lacks power	55	32	High altitudes	39	17
Misses or runs erratically	52	31	Identification	4	5
Noisy	54	31	Ignition system		
Overheats	56	32	Description	85	50
Repair and Overhaul Instructions			Magnet	87	51
Removal	109	70	Spark plug cables	86	50
Base (oil pan)	122	83	Spark plugs	86	50
Stops suddenly	53	31	Increase-adjust volt knob	21	13
Upper branch manifold	90	53	Inspection of equipment	8	9
Valve covers	125	86	Installation of setting up instructions ...	10	9
Will not idle smoothly	52	31	Intake and exhaust valves	91	56
Engine housing assembly			Load connection box	100	62
Front and top covers	73	38	Load indicating light	18	13
Louver-type shutters	71	34	Load off switch	19	13
Shutter and heat deflector control	74	38	Load on switch	17	13
Side panels	72	35	Local-remote starting switch	23	13
Engine speed governor	111	72	Lubrication information	44	19
Governor controls	112	73	Magnetic contactor	96	58
Engine start selection switch	25	13	Magneto	87, 117	51-78
Engine start switch	24	13	Manifolds	89	53
Engine stop switch	26	14	Meters		
Equipment conversion	11	10	Frequency meter	14	13
Exhaust muffler and pipe	69	34	Ammeter	13	10
Extreme cold (below 0°F)	35	17	Time totalizing meter	15	13
Extreme heat	36	17	Voltmeter	16	13
Fire extinguishers	41	18	Meters	93	57
Flywheel	119	81	Oil filter, drain and fill lines	46	19
Shroud	120	82	Oil pump	123	84
Forms: Record and report	2	2			

	Paragraph	Page		Paragraph	Page
Operating details	34	15	Spark plugs	86	50
Operator's daily services	48	26	Sparkling at brushes	62	33
Panel lights on-off switch	20	13	Starting	32	14
Piston and connecting rods	127	89	Starter	83, 114	48-74
Preventive maintenance	155		Stopping	33	15
Quarterly preventive			Switches		
Maintenance services, daily	48	26	Engine start selection switch	25	13
Radio suppression:			Engine start switch	24	13
Definition	63	33	Engine stop switch	26	14
General methods used to attain			Load off switch	19	13
proper suppression	66	33	Load on switch	17	13
General sources of interference	65	33	Local-remote starting switch	23	13
Purpose of interference suppression	64	33	Panel lights on-off switch	20	13
Replacement of suppression			Switches	94	57
components	67	33	Tabulated data	5	5
Record and report forms	2	2	Terminal board	98	59
Relay box	102	64	Throttle	27	14
Relay control assembly	107	68	Throttle and choke controls	98	59
Salt water or high humidity	38	17	Timing gear cover	129	93
Servicing equipment	9	9	Tools and equipment, special	43	19
Shipment and storage			Time totalizing meter	15	13
Inspection and maintenance of			Unloading equipment	6	9
equipment in storage	149	106	Unpacking equipment	7	9
Loading equipment for shipment	147	105	Valves	125	86
Preparation of equipment for shipment	146	105	Fuel selector valve	30	14
Shipment, export and limited storage	147	104	Fuel tank cap valve	31	14
Storage	148	105	Seats, inserts and guide	126	88
Slave receptacle	84	49	Valves, intake and exhaust	91	56
Spark plug cables	86	50	Voltage regulator (AC)	95	57
			Voltmeter	16	13

BY ORDER OF THE SECRETARY OF THE ARMY:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General United States Army,
The Adjutant General.

Distribution:

Active Army:

USASA (3)
ACSI (1)
DCSLOG (1)
CNGB (1)
TSG (1)
CofEngrs (3)
CC-E (1)
Dir of Trans (1)
CofSptS (1)
USAMB (1)
USAARTYBD (2)
USAARMBD (2)
USAIB (2)
USARADB (2)
USAAESWBD (2)
USAAVNBD (2)
USCONARC (3)
OS Maj Comd (5) except
 USASETAF (2)
 USARJ (10)
USAMOCOM (2)
USASMC (1)
MDW (1)
 Armies (2)
 Corps (2)
 Div (2)
 Engr Bde (1)
USAC (1)
USMA (2)
Svc Colleges (2)

Br Svc Sch (2) except
 USAES (100)
 USAARMS (4)
GENDEP (10)
Engr Dep (10)
Army Dep (2)
USA Tml Comd (2)
Army Tml (1)
Div Engr (2)
Engr Dist (2)
USA Engr Rsch & Dev Lab (3)
USA Mob Equip Cen (46)
Engr Cen (5)
USAREUR Engr Proc Cen (2)
USAREUR Engr Sup Con Agcy (10)
Chicago Proc Ofc (10)
Engr Fld Maint Shops (2)
Fld Comd, DASA (8)
AMS (3)
USAREURCOMZ (2)
MAAG (1)
JBUSMC (1)
Units org under fol TOE:
 5-48 (2)
 5-237 (5)
 5-262 (5)
 5-267 (1)
 5-278 (5)
 5-279 (2)

NG: State AG (3).

USAR: Same as Active Army except allowance is one copy for each unit.

For explanation of abbreviations used, see AR 320-50.

TM 5-6115-312-15 GENERATOR SET, GASOLINE DRIVEN — 1965