TM5-5396

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

COMPRESSOR, AIR
TRAILER MOUNTED
4 WHEELS
PNEUMATIC TIRES
DIESEL DRIVEN
500 CFM
WORTHINGTON MODEL 500
(LESS ENGINE)

DEPARTMENT OF THE ARMY • APRIL 1955

SAFETY PRECAUTIONS

Never direct a stream of compressed air towards any person.

Do not touch air compressor cylinders or air pipes during operation. High temperatures produced during operation may cause severe burns.

Do not remove or disconnect any part of the air system when it is under pressure.

Do not clean the compressor air cleaner with inflammable solvents.

Do not spill battery electrolyte. The acid solution will damage paint and clothing and cause painful skin irritations.

Storage batteries under charge generate an inflammable mixture of hydrogen and oxygen. Do not expose these gases to flame or sparks since even a small spark may cause an explosion.

Block the compressor securely when operating on a sloping terrain.

Do not tow the compressor faster than 20 miles per hour. See that all tools and attachments are secure and access doors latched before moving.

If unusual noises are noticed during operation, stop the compressor immediately and determine the cause. Notify higher authority if the cause cannot be determined or corrected.

TECHNICAL MANUAL
No. 5–5396

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *11 April 1955*

COMPRESSOR, AIR, TRAILER MOUNTED, 4 WHEELS, PNEUMATIC TIRES, DIESEL DRIVEN, 500 CFM, WORTHINGTON MODEL 500 (LESS ENGINE)

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom this air compressor is issued. They contain information on the operation, organizational maintenance, and field and depot maintenance of the air compressor as well as a description of the major units and their functions in relation to other components of the materiel. They apply only to the Model 500 Worthington Air Compressor.

b. Supply manuals, technical manuals, and other publications applicable to the equipment covered by this manual are listed in Appendix I. Appendix II tabulates the replaceable parts available for the equipment. Appendix III lists the tools and spare parts issued with and carried on or with the equipment.

2. Record and Report Forms

Maintenance record forms listed and briefly described in *a* through *l* below will be used in the maintenance of this equipment.

a. DD Form 110 (Vehicle and Equipment Operational Record). This form is used by equipment operators for reporting the accomplishment of daily preventive maintenance services, and for reporting any equipment deficiencies observed during operation.

b. Standard Form 91 (Operator's Report of Motor Vehicle Accident). One copy of this form is kept with the equipment at all times. In case of an accident resulting in injury or property damage, Form 91 is filled out immediately (or as promptly thereafter as is practical) by the operator.

c. DA Form 464 (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment). This form is used by personnel of the using organization and higher echelons for reporting the results of preventive maintenance services and technical inspections.

d. DA Form 460 (Preventive Maintenance Roster). This form is used for scheduling preventive maintenance services at prescribed intervals.

e. DA Form 478 (Organizational Equipment File). Major repairs or rebuilding, replacement of major unit assemblies, and accomplishment of equipment modifications are recorded on this form.

f. DA Form 468 (Unsatisfactory Equipment Report). This form is used for reporting manufacturing, design, or operational defects in the materiel, with a view to correcting such defects; it is also used for recommending modifications of the materiel. Form 468 is not used for reporting failures, isolated materiel defects, or malfunctions of materiel resulting from fair wear and tear or accidental damage. Form 468 is not used to report issue of parts and equipment, or for reporting replacements and/or repairs.

g. DD Form 6 (Report of Damaged or Improper Shipment). This form is used for reporting damages incurred in shipment.

h. DA Form 9–81 (Exchange Part or Unit Identification Tag. This form is used to accomplish the direct exchange of unserviceable for serviceable parts.

i. DA Form 811 (Work Request and Job Order). This form is used to request work done by higher echelon organizations.

j. DA Form 867 (Status of Modification Work Order). This form is used to maintain records of all modification work performed on equipment.

k. DA Form 5–13 (Spot Check Inspection Report of Organization Maintenance of Engineer Equipment). This form is used by organizations having engineer field maintenance responsibility for reporting the results of semiannual spot check inspections.

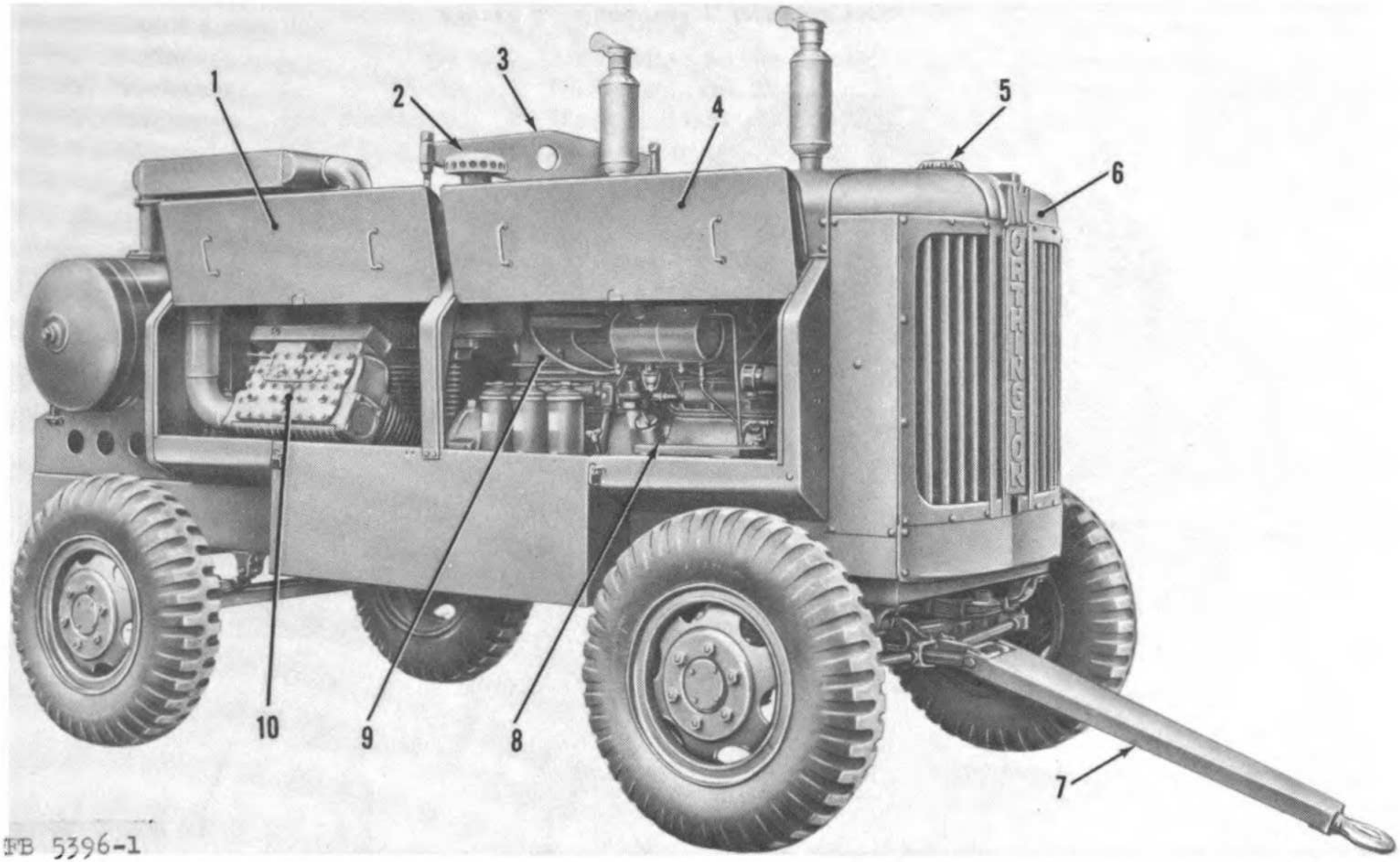
l. DA Form 5–14 (Annual Technical Inspection Report of Engineer Equipment). This form is used by organizations having field maintenance responsibility for reporting the results of annual technical inspections.

Section II. DESCRIPTION AND DATA

3. Description

a. General. The Worthington Air Compressor Model 500 (figs. 1 and 2) is a four-wheel, trailer-mounted, towable unit equipped with pneumatic tires. A two-stage, air-cooled compressor assembly is diesel driven; an automatic unloader system, in conjunction with a throttle control cylinder, is provided to control compressor output. A weather-resistant canopy, equipped with hinged access doors, incloses the unit. The air compressor is suitable for use wherever a mobile source of compressed air is required. It is most frequently used in construction work to drive such pneumatic tools as paving breakers, rock drills, tampers, and hammers.

b. Engine. The engine is an International Harvester Model UD–24. It is modified by the use of a radio-suppressed and fungus-



1 Compressor access door
2 Precleaner
3 Lifting bail
4 Engine access door
5 Radiator fillercap
6 Radiator assembly
7 Drawbar
8 Small toolbox
9 Engine
10 Compressor

Figure 1. Compressor, right side view.

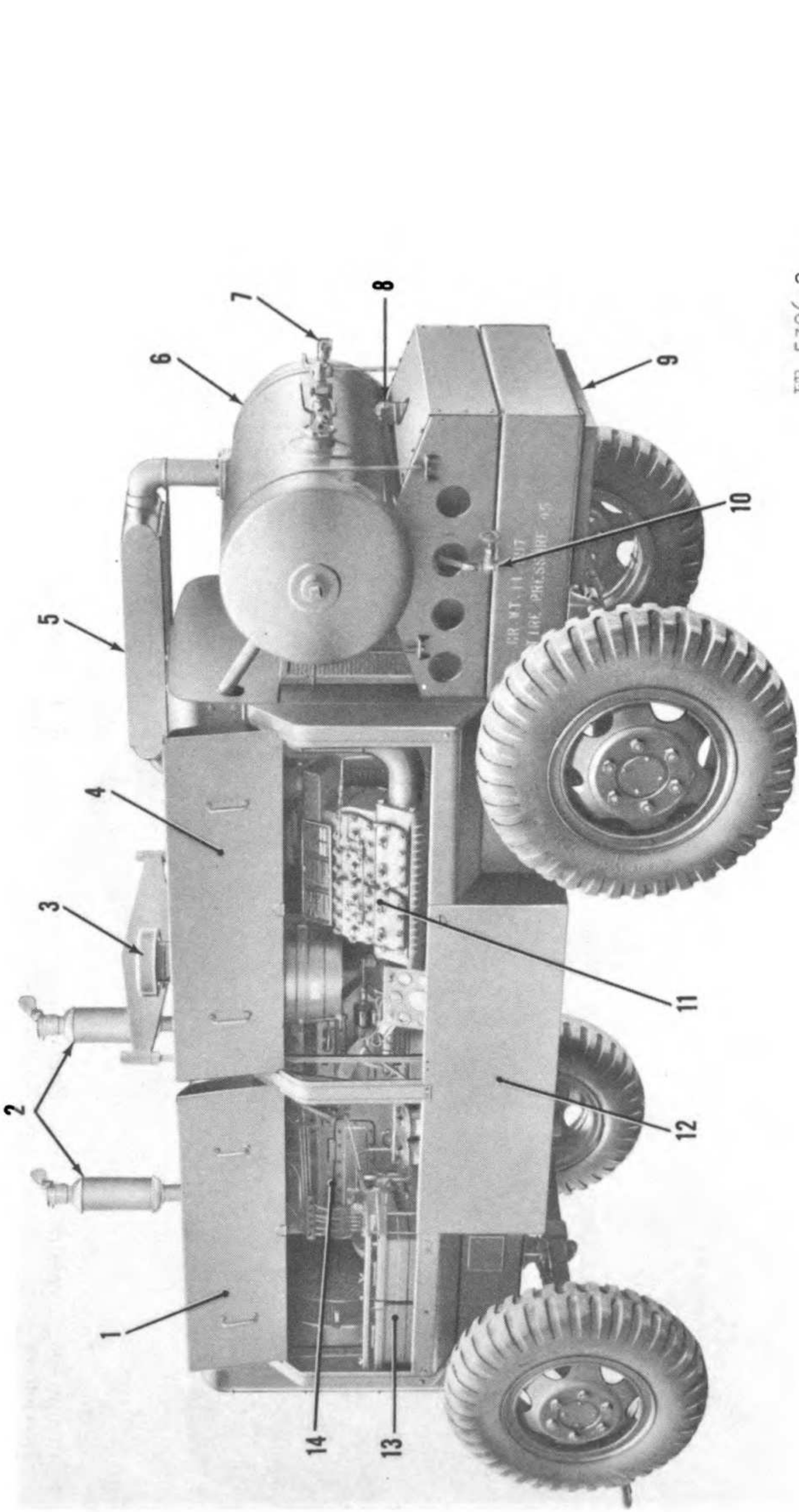


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Figure 2. Compressor, left side view.

1 Engine access door
2 Mufflers
3 Precleaner
4 Compressor access door
5 Aftercooler
6 Air receiver
7 Air receiver service manifold
8 Diesel fuel tank filler cap
9 Diesel fuel tank
10 Air receiver drain valve
11 Air compressor assembly
12 Deep toolbox
13 Batteries
14 Engine

Figure 2—Continued.

proof ignition system, a special flywheel, a fuel injection pump governor spring set to maintain a constant 1,200-rpm (revolutions per minute), and the adaptation of additional operating controls, relocated for ready accessibility on this equipment. Refer to TM 5–5199 for additional engine details.

c. Compressor Assembly. The 2-stage, 6-cylinder, air-cooled compressor will deliver 500 cfm (cubic feet per minute) at 100 psi (pounds per square inch) when driven at 1,200 rpm. It has six cylinders mounted in three banks of two cylinders each in a W-type arrangement. The low-pressure cylinders are mounted on either side of the two vertical high-pressure cylinders which form the center of the W. Air from the first stage of compression in the low-pressure cylinder is cooled by an intercooler; air from the second stage of compression in the high pressure cylinder is cooled by an aftercooler.

d. Frame, Canopy, and Tanks. The frame, on which the engine and compressors are mounted, is of formed steel channel. The inclosing canopy is of steel construction and has hinged metal access doors for easy accessibility to the interior components. There are two tanks on the unit—a cylinder-shaped air receiver mounted at the rear of the compressor and a rectangular diesel fuel tank mounted beneath the air-receiver tank within the air-receiver support cradle.

e. Suspension and Running Gear. The entire unit is mounted for towing on a suspension system composed of four disk wheels with 9.00 x 20 8-ply pneumatic tires, tapered roller wheel bearings, and two axles. The front axle is an automotive steering-knuckle type with a drawbar attached, and the rear is a solid beam type. Each axle is suspended by two semielliptical leaf springs. Track width is 70 inches.

4. Identification

(fig. 3)

There are five plates on the unit, three identification plates and two instruction plates. The transportation data plate Ⓐ, specifies the dimensions and weights of the equipment for shipping purposes. The Corps of Engineers identification plate Ⓑ, located on the frame at the left front, specifies the official nomenclature, the model number, and the serial number of the equipment. The clutch operation instruction plate Ⓒ, located on top of the frame to the rear of the hydro-shifter pump, on the left side of the compressor, provides the basic clutch operating procedure. The engine identification plate Ⓔ, located on the right side of the flywheel housing, provides the serial number of the power unit. The engine serial number is stamped on the left side of the crankcase above the fuel injection pump. The unit operating instruction plate Ⓓ, located on the head of the left bank of the low-pressure cylinders, at the rear of the unit, provides the basic

TRANSPORTATION DATA
FOR
COMPRESSOR, AIR, 500 C.F.M.
100 P.S.I., TRAILER MOUNTED
4 WHEELS, PNEUMATIC TIRES, D.E.D.

OVER-ALL LENGTH 195 IN.
OVER-ALL HEIGHT 106 IN.
OVER-ALL WIDTH 85 IN.
LEAST CUT DOWN HEIGHT TO WHICH VEHICLE CAN BE REDUCED AND STILL OPERATE 90 INCHES.

SHIPPING CUBAGE 863 CU. FT.
SHIPPING WEIGHT 12,500 POUNDS
SHIPPING TONNAGE 21.5 TONS

A

CORPS OF ENGINEERS
U.S. ARMY
COMPRESSOR, AIR, 500 C.F.M.
100 P.S.I., TRAILER MOUNTED
4 WHEELS, PNEUMATIC TIRES, D.E.D.
MAX. OPERATING SPEED - 1150 R.P.M. WEIGHT 11,760 LBS.
MANUFACTURED BY
WORTHINGTON CORPORATION
HOLYOKE WORKS, HOLYOKE, MASS.
MODEL NO. 500TS SERIAL NO. 330-67
PURCHASE ORDER NO. 88B-28534-50 DATED 1-12-52
U.S. REGISTRATION NO. 01304354
STOCK LIST NO. 66-3230-500-900

B

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TO DISENGAGE CLUTCH: CLOSE RELEASE VALVE FIRMLY AND, PUMP 3 OR 4 STROKES AFTER RESISTANCE IS FELT.
TO ENGAGE CLUTCH: OPEN RELEASE VALVE ABOUT 1/2 TURN AND LEAVE OPEN WHILE COMPRESSOR IS RUNNING.
TO REFILL: USE ONLY HYDRAULIC JACK OIL OR IN EMERGENCY OTHER CLEAN LIGHT MINERAL OIL SUCH AS SAE-10W.
IMPORTANT: ALWAYS LEAVE VALVE OPEN AND CLUTCH ENGAGED WHEN COMPRESSOR IS LEFT STANDING IDLE.

C

Figure 3. Identification and instruction plates.

D

E

Figure 3. Identification and instruction plates—Continued.

procedures for starting, operating, stopping, and service of the unit. When requisitioning spare parts for the equipment, specify the Department of the Army registration number, serial and model numbers, and engine serial number.

5. Difference in Models

a. There are no differences in models furnished to the Corps of Engineers. Previous experimental models of this equipment utilized items that have been omitted from the production model furnished under the manufacturer's contract with the Corps of Engineers.

b. One of these items is the oil pressure ignition switch referred to in item 3 on the operating instruction plate (fig. 3Ⓔ). Disregard any reference on the instruction plate to this item.

c. The second item is the fuel saver referred to in item 7 on the same plate. Disregard any reference in the instruction plate to this item.

6. Tabulated Data

a. General.

Manufacturer	Worthington Corp.
Model	500
Length, overall	195 in.
Width, overall	85 in.
Height:	
Overall	106 in.
Less mufflers	90 in.
Weight, operating	11,780 lb.
Weight, dry, except lubricants	10,860 lb.
Weight, domestic shipping	12,500 lb.
Weight, export, crated	16,000 lb.
Cubage, export, crated	863 cu. ft.

(1) *Compressor.*

Cylinder arrangement	W-type
Number of cylinders	6
Stroke	4½ in.
Bore:	
Low pressure	8¼ in.
High pressure	7 in.
Lubrication	Force feed, gear pump
Cooling	Air
Aftercooler	Air-cooled finned pipe design
Intercooler	Air-cooled finned and flat tube design

(2) *Frame, canopy, and tanks.*

Frame	Formed steel channel of ¼ in. plate, arc-welded
Canopy	13 gage plate, hinged
Access doors	16 gage plate, hinged
Air receiver tank	Cylindrical, ASME standard
Diesel fuel tank	11 gage plate, welded

(3) *Suspension and running gear.*

Springs	Semielliptical, 7 leaf
Wheels	Disk
Bearings	Tapered roller
Tires	9.00 x 20, 8-ply
Steering	Knuckle type, automotive
Track width	70 in.

(4) *Engine.*

Manufacturer	International Harvester Co.
Model	Special UD–24, per Worthington Modification LQ20
Type	Full-diesel, solid injection, gasoline starting, valve-in-head
Number of cylinders	6
Bore	5¾ in.
Stroke	7 in.
Piston displacement	1,090.6 cu. in.
Lubrication	Positive pressure, gear pump
Ignition:	
Gasoline cycle	Battery type
Diesel cycle	Compression-injection
Batteries	Two 6 volt, series-connected
Spark plugs	Shielded
Firing order	1–5–3–6–2–4
Starting motor	12 volt, dyer-drive
Generator	12 volt, 15 amp
Cooling	Liquid

b. Classification and ratings.

(1) *Compressor.*

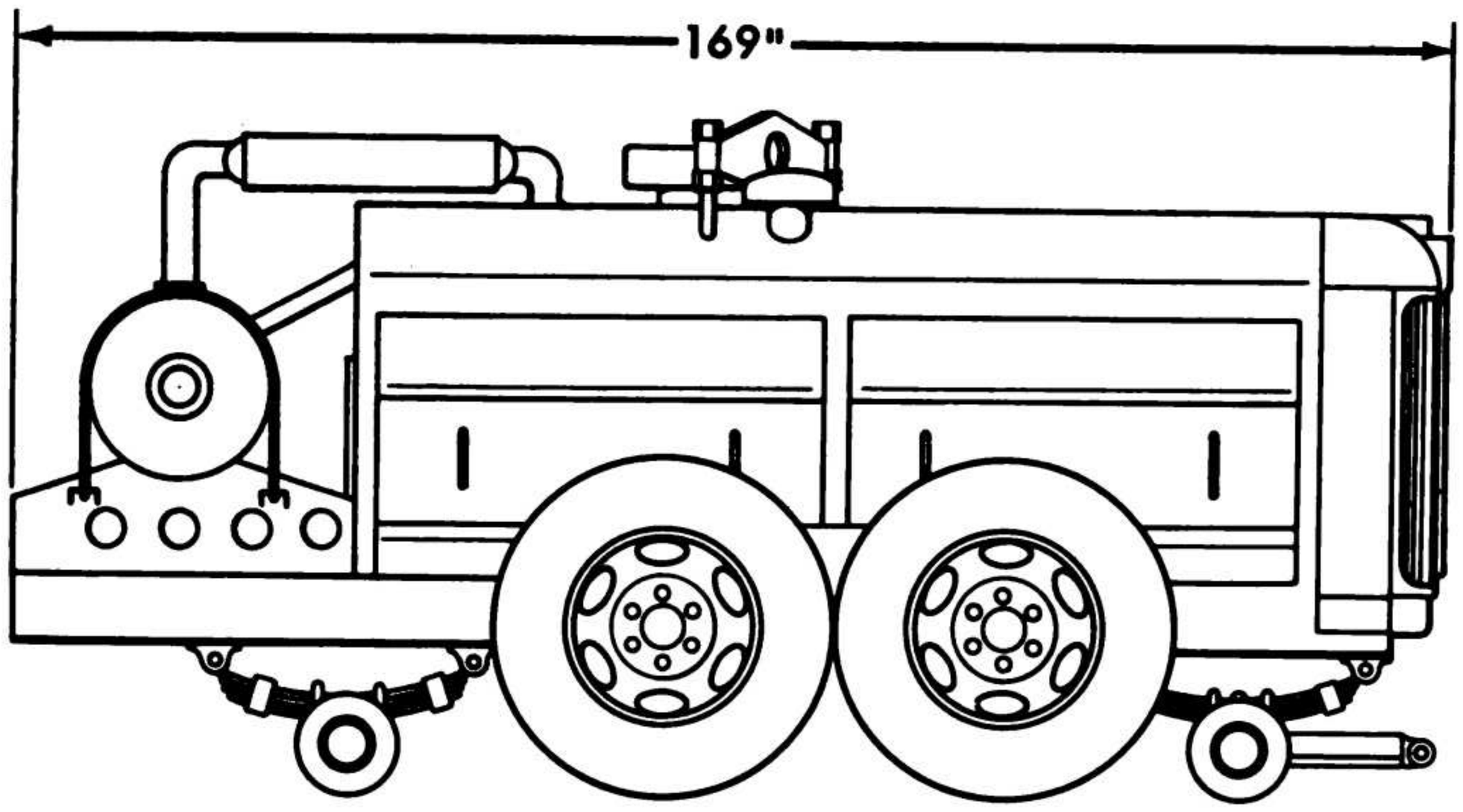
Rated capacity at 100 psi gage	500 cfm
Rated speed	1, 200 rmp
Power required at rated capacity	120 bhp
Displacement at rated speed	668 cfm
Working pressure	100 psi

(2) *Engine.*

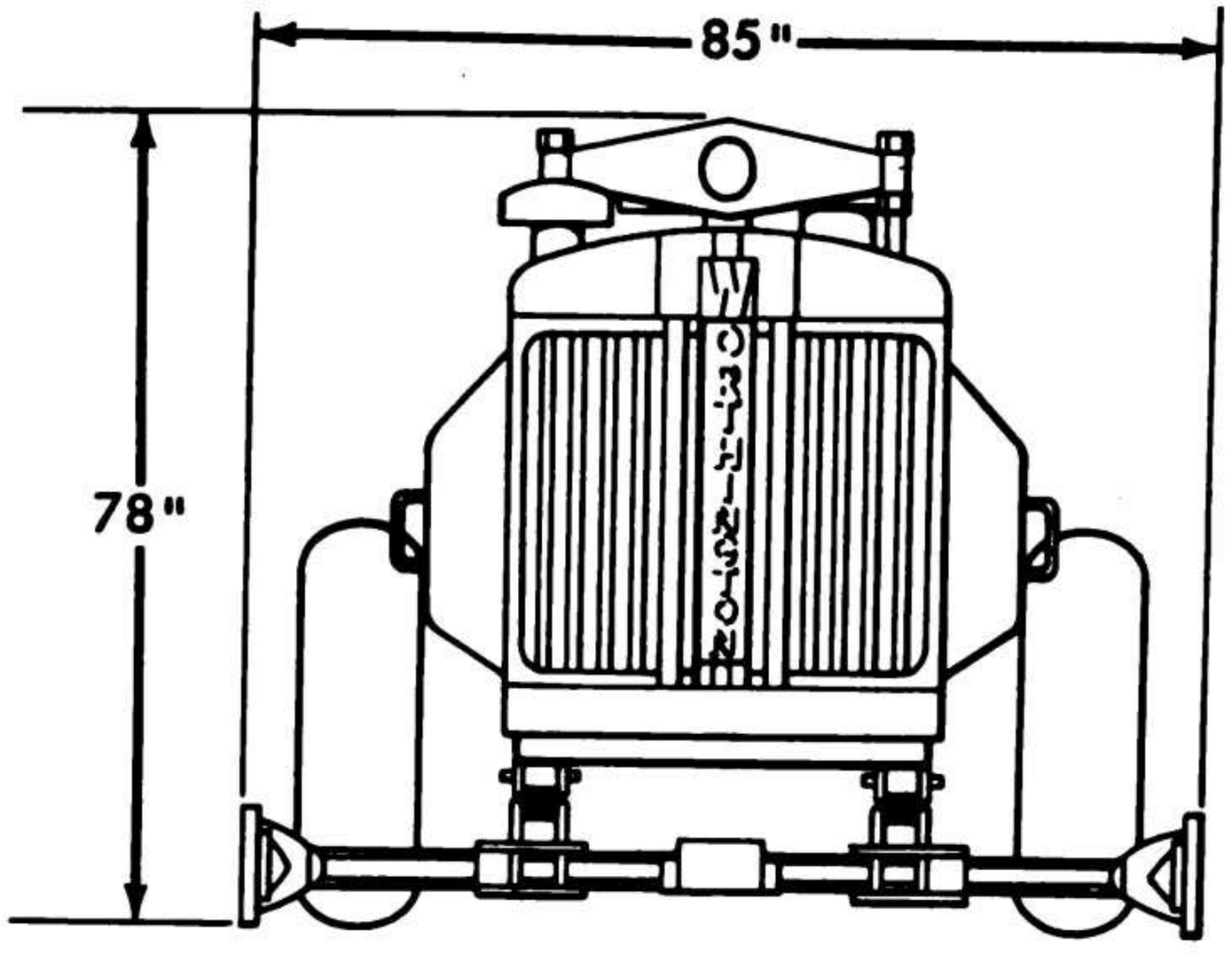
Rated speed	1, 200 rpm
Intermittent power at rated speed	165 bhp
Intermittent torque at rated speed	725 ft-lb
Fuel consumption at full load	7.7 gph
Fuel consumption at idle speed	1. 1 gph

c. Capacities.

Compressor crankcase	13 qt
Compressor air receiver working pressure	125 psi
Compressor air receiver	14. 5 cu ft
Engine cooling system	37 gal
Engine crankcase (with filter)	30 qt
Injection pump housing	⅞ pt
Engine air cleaner cup	4 qt
Diesel fuel tank	85 gal
Gasoline tank	1⅔ gal
Tire pressure (recommended)	45 psi



SIDE VIEW



END VIEW

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Figure 4. Dimensions of air compressor ready for crating.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

7. New Equipment

a. General. All units are shipped crated and preserved for export. Shipment is usually on railroad cars, two units to each car.

b. Unloading. Remove the support blocks holding the units in place on the car.

(1) Place slings around and under each end of crate where skid base is recessed (fig. 5); lift from car with a crane hoist.

(2) When suitable hoisting equipment is not available, a ramp must be constructed (fig. 6) and the unit skidded off the car and down the ramp by towing.

c. Uncrating (fig. 7). When possible, the equipment should be uncrated where shop or maintenance facilities are available, as units require some assembly before service. When uncrating, follow the general procedures given below.

(1) Remove nails from bottom edges along all four sides.

(2) Lift off crate with sling and crane hoist.

(3) Cut the tapes and steel straps holding the four wheels in place and remove wheels (two on each side of skid base).

(4) Cut straps holding electrolyte box (7) mounted over the right end of the rear axle. Remove nails holding box to the axle blocks. Set box aside for later use.

Caution: This box contains a glass bottle filled with battery electrolyte. Use caution when handling this strong acid.

(5) Remove the drawbar mounted over the left rear axle blocks.

(6) Remove the left and right tie rods (2 and 4) from their mounting. Tag each rod as it is removed as right or left to facilitate assembly.

(7) Remove holddown blocks (3) over the axles.

d. Removal of Preservative Tape, Compounds, and Lubricants.

(1) Remove preservative tape or compounds from the following openings:

(*a*) Precleaners (2, fig. 1) and (3, fig. 2).

(*b*) Mufflers (2, fig. 2).

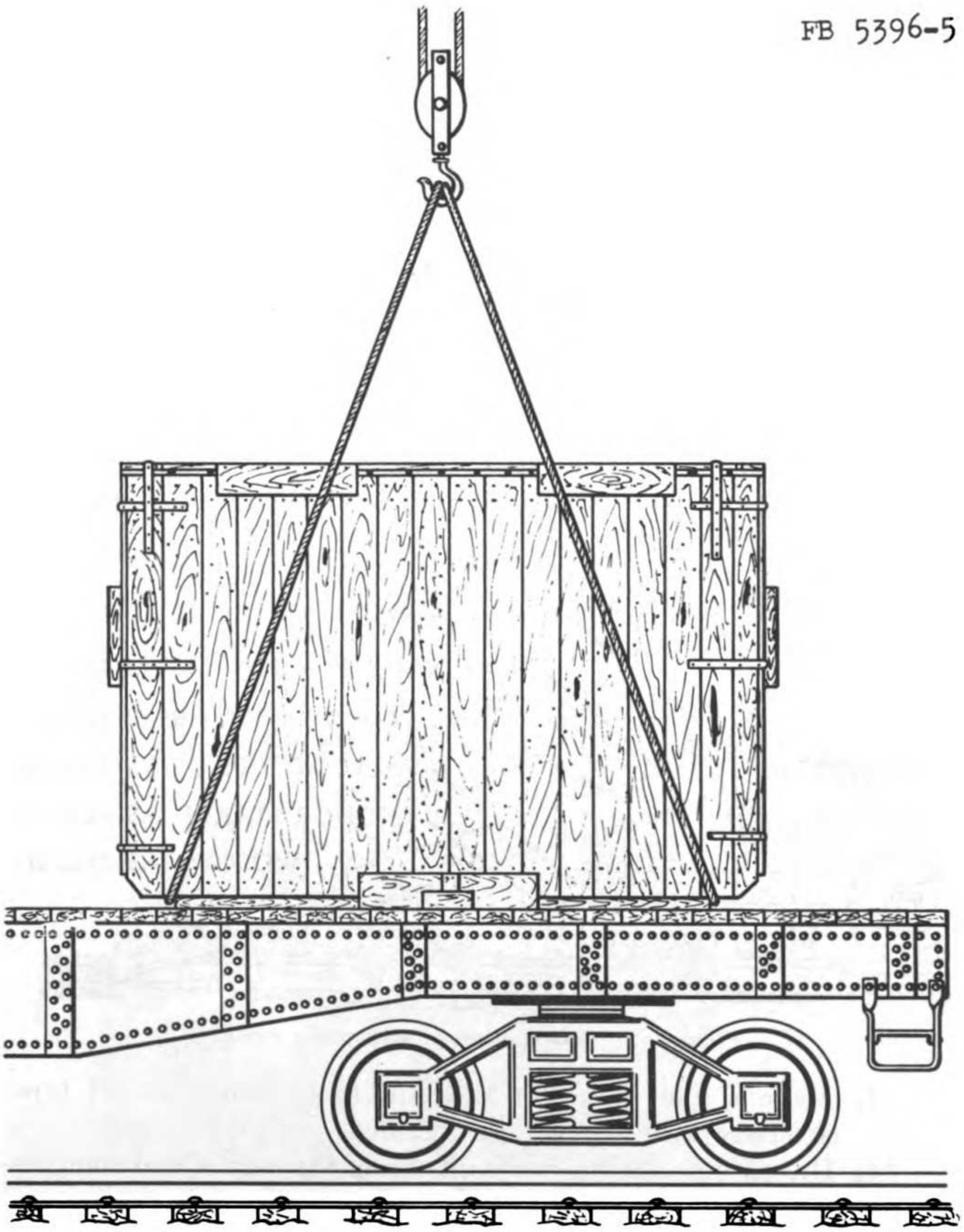


Figure 5. Sling placement and lift points.

(*c*) Service manifold (7, fig. 2).
(*d*) Air receiver drain valve (10, fig. 2).
(*e*) Gasoline tank fillercap (3, fig. 8).
(*f*) Throttle control cylinder (2, fig. 9).
(*g*) Engine speed control (3, fig. 9).
(*h*) Air receiver safety valve (1, fig. 21).
(*i*) Intercooler safety valve (2, fig. 21).
(*j*) Trigger valve (2, fig. 16).
(*k*) Fuel filter bleeder valves (6 and 12, fig. 9).
(*l*) Fuel filter shutoff valve and draincock (11 and 7, fig. 9).

(*m*) Fuel tank fillercap (8, fig. 2).
(*n*) Radiator fillercap (5, fig. 1).
(*o*) Batteries (13, fig. 2).
(*p*) Starting motor (5, fig. 9).
(*q*) Clutch shifter pump (9, fig. 9).
(*r*) Bell housing (fig. 63).
(*s*) Generator (7, fig. 8).
(*t*) Generator regulator (6, fig. 8).
(*u*) Carburetor (15, fig. 8).
(*v*) Engine oil fillercap (13, fig. 8).
(*w*) Compressor oil fillercap (reference 11, fig. 22).

(2) Remove the tape and covers protecting glass-faced instruments and gages on the instrument panel (4, fig. 9); remove tape and covers from the fuel pressure gage (14) and hourmeter (10, fig. 8).

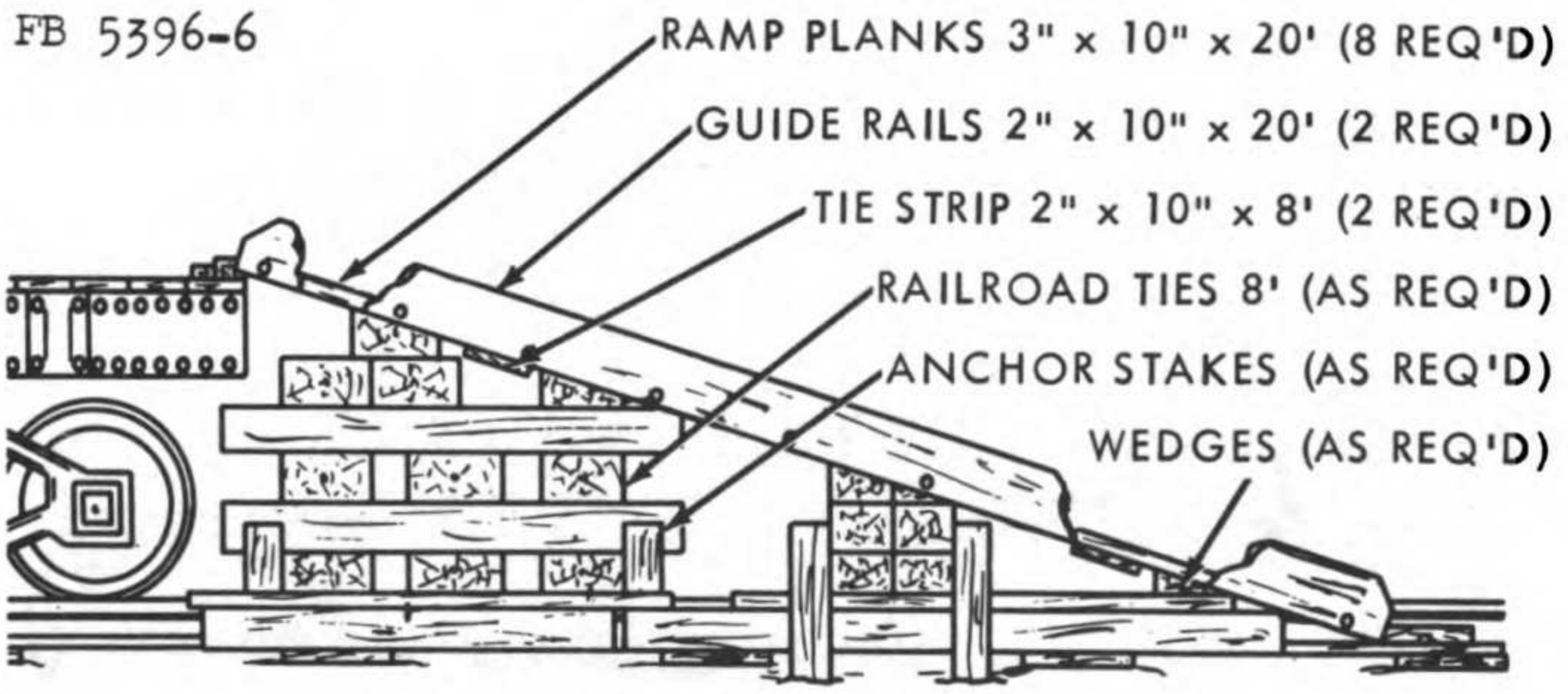


Figure 6. Construction of unloading ramp.

(3) Make a final check of the unit to be sure that all tape-covered openings have been unsealed.
(4) Drain preservative lubricants from the engine and compressor crankcases. Refill as required with correct type and grade of lubricant. Refer to LO 5–5396.

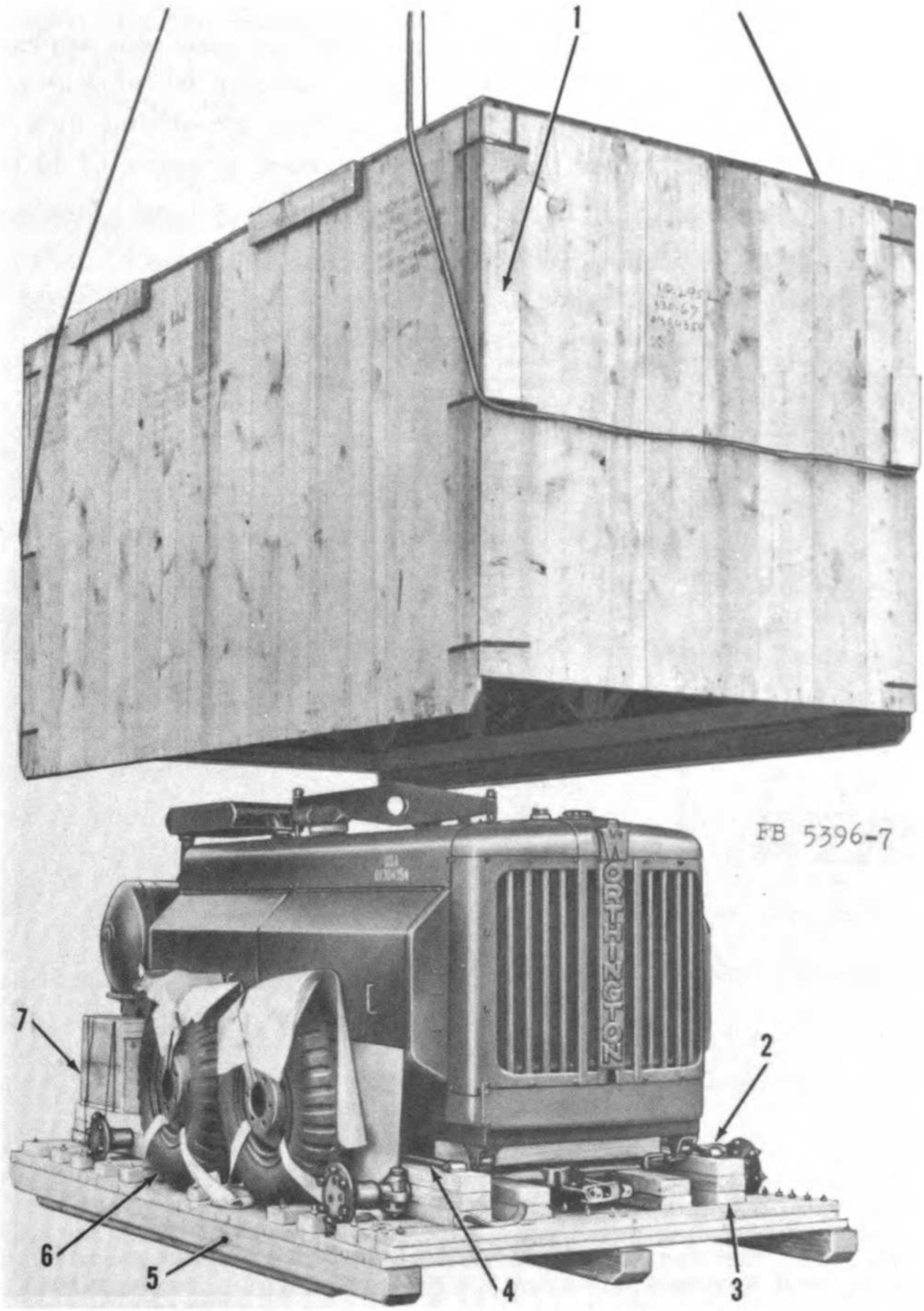
Note. Draining and filling should be accomplished after *e* below, when equipment is received with wheels removed.

e. Assembly for Service. The following items are removed from the equipment for export shipment and must be reassembled to unit before operating.

2 mufflers
1 air receiver service manifold
1 battery-to-battery cable

Note. Items above are stored inside the deep toolbox (12, fig. 2).

4 wheels (6, fig. 7)
1 drawbar (secured over left rear axle for shipping)



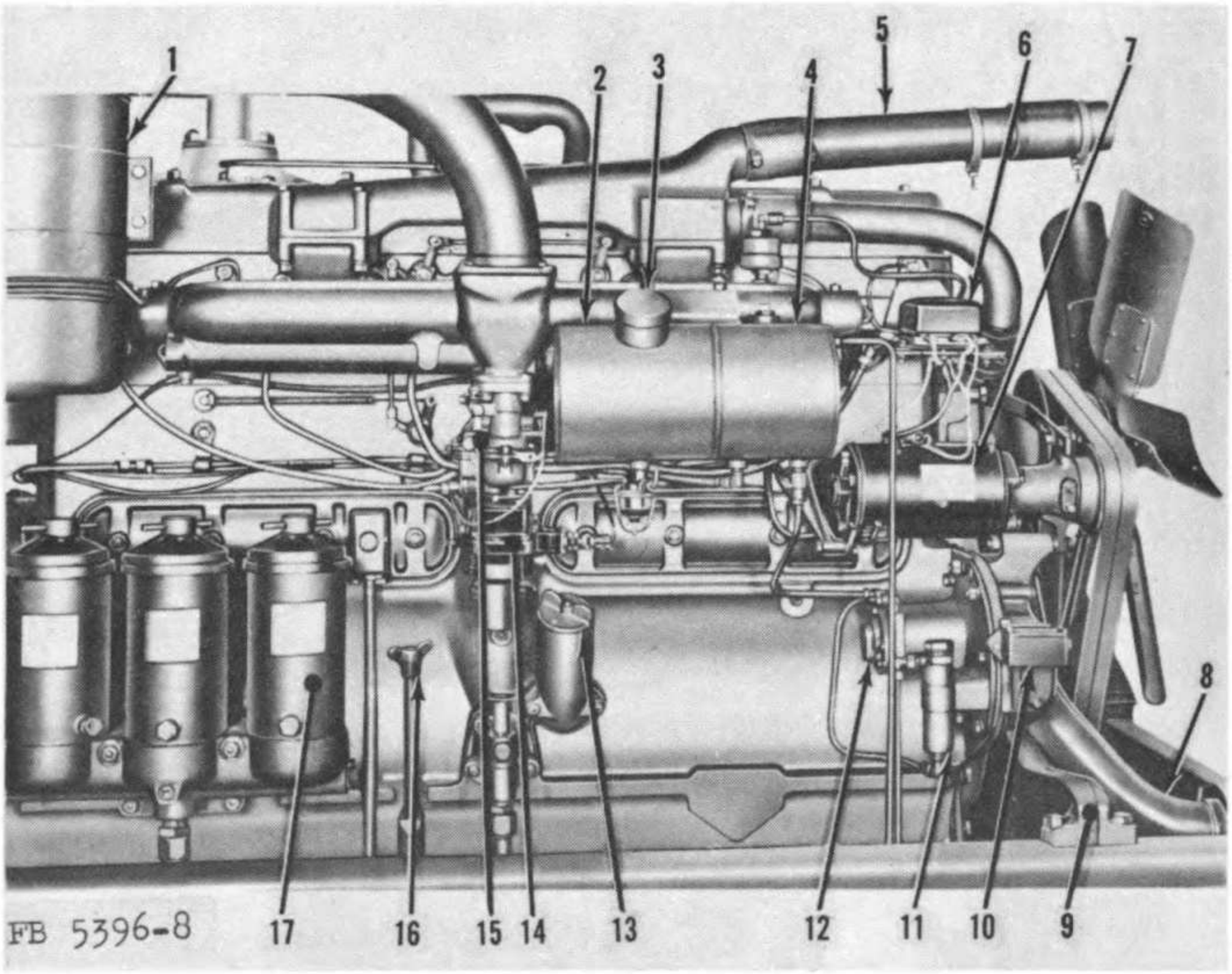
1 Lifting block
2 Left-hand tie rod
3 Holddown block
4 Right-hand tie rod
5 Skid base
6 Wheels
7 Electrolyte box

Figure 7. Uncrating compressor.

2 steering tie rods (2 and 4, fig. 7)

(1) Attach crane or hoist to lifting bail and raise unit approximately 1 foot above the ground. Remove wheel-stud nuts and mount the wheels. Then tighten wheel-stud nuts securely and inflate tires to recommended pressure of 45 psi.

Caution: Unit weighs approximately 6 tons. Use adequate hoisting equipment.



1 Engine air cleaner
2 Gasoline tank
3 Gasoline tank fillercap
4 Air trap
5 Radiator inlet pipe
6 Generator regulator
7 Generator
8 Radiator outlet pipe
9 Front engine support
10 Hour-meter
11 Transfer pump strainer
12 Transfer pump
13 Oil filler
14 Distributor
15 Carburetor
16 Crankcase oil level gage
17 Lubricating oil filter

Figure 8. Engine, right side view.

(2) Lower equipment to the ground and remove hoisting devices.

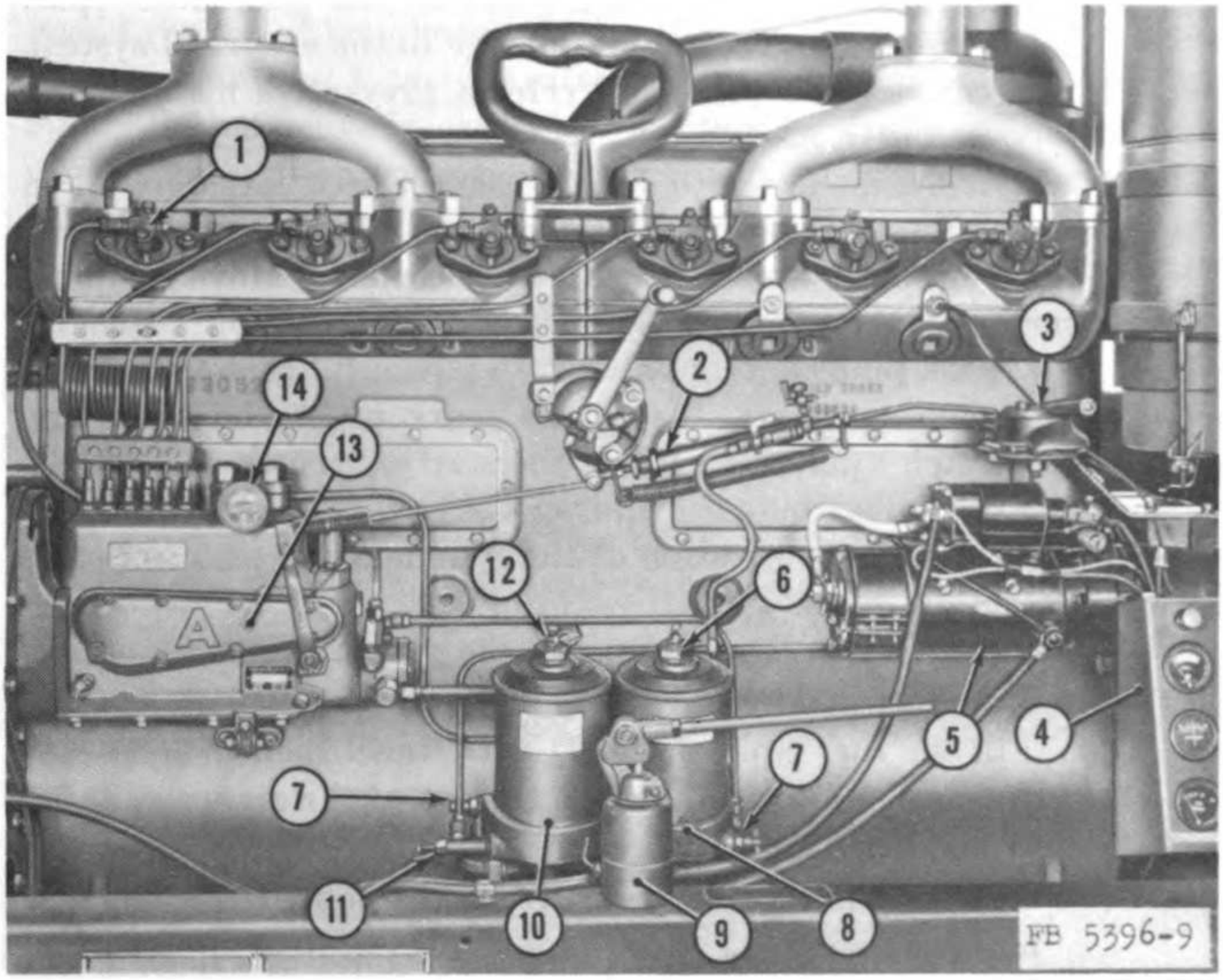
(3) Remove the bolt at wide end of the drawbar. Install drawbar to center of steering arm and secure with bolt.

(4) Remove pins from the left steering tie rod (2, fig. 7). Secure the tie rod between the center steering arm and the left steering knuckle. Mate the ends marked with blue paint. Insert the tie rod pins and secure with cotter pins. Assemble the right tie rod (4) in the same manner.

(5) Slip the slotted end of the mufflers (2, fig. 2) over the exhaust pipes projecting above the canopy. Tighten muffler clamp bolts.

(6) Install the air receiver service manifold (7) in the large outlet at rear of air receiver tank.

f. Inspection After Assembly. See that assembly was complete and that all assembled and mounted parts are secure. Make an overall inspection to discover any parts that may have been damaged in



1	Nozzle vents	8	Final fuel filter
2	Throttle control cylinder	9	Clutch shifter pump
3	Engine speed control	10	Auxiliary fuel filter
4	Instrument panel	11	Shutoff valve
5	Starting motor	12	Auxiliary bleeder valve
6	Final bleeder valve	13	Fuel injection pump
7	Draincock	14	Fuel pressure gage

Figure 9. Air vents in the diesel fuel system.

shipment. Check the engine and intercooler fan belt installations for proper adjustment. Check lines and tanks for any indications of leakage. Inspect wiring for loose terminal connections or broken wires. See that radiator drains (one on bottom of radiator tank, another on left side of the engine cylinder block) are securely closed. See that all protective sealing covering openings has been removed.

g. Service Before Operation.

(1) *Batteries.* Batteries shipped with the equipment are dry charged. The electrolyte container (7, fig. 7) is boxed and shipped inclosed in the unit crating. Fill the batteries (13, fig. 2) with electrolyte and make a test of battery charge (par. 56, service item 47). If batteries have less than a three-fourths charge, remove and charge before continuing to service unit. With batteries in good condition, install the battery-to-battery cable connecting the two 6-volt batteries in series. Before proceeding, polarize the generator (par. 134*d*) to prevent accidental damage to the electrical system.

(2) *Preventive maintenance.* Perform preventive maintenance services (pars. 53–56).

(3) *Lubrication.* Refer to LO 5–5396. Check levels of oil in the engine crankcase, the air cleaner oil cup, and the fuel injection pump to see that they are correct. Move compression release lever to gasoline operating position. Remove the spark plugs and put about 1 teaspoonful of crankcase oil into each cylinder. Install the spark plugs and disengage the clutch (par. 34*b*). Use the starting motor to turn the engine to distribute the oil over the cylinder walls. This assures positive lubrication of the cylinders and pistons before operation.

(4) *Filling the gasoline tank.* Fill the gasoline tank (2, fig. 8).

(5) *Filling fuel tanks and venting air from the fuel system.*

(*a*) Fill the fuel tank (9, fig. 2) with diesel fuel.

(*b*) Remove the pipe plug from the top of the air trap (4, fig. 8) and fill the air trap with fuel.

(*c*) Remove the strainer plug from the top of the transfer pump stainer (11). Continue to fill the air trap until fuel flows through the transfer pump (12) and fills the pump strainer. Replace the strainer plug.

(*d*) Open the auxiliary bleeder valve (12, fig. 9) and shutoff valve (11). Pour fuel into the air trap until fuel appears in the auxiliary bleeder valve, then close the valve. Continue filling the air trap until it is full and replace the pipe plug.

(*e*) After the above operations have been performed and the engine has been started (par. 34) and is running on its gasoline cycle, open the final bleeder valve (6). When fuel flows from the valve free of air, close the valve. Advance the engine speed control slightly and open each nozzle vent (1) individually. When fuel flows from the vents free of air, close the vents. After all nozzles are

vented, move the engine speed control to the shutoff position.

Note. Do not move the compression release lever during this operation; leave the lever in the gasoline position.

(6) *Fire extinguisher.* Remove the fire extinguisher from its mounting. Test the extinguisher (par. 39) for proper operation and remount in proper position.

(7) *Tires.* See that tires are inflated to pressure of 45 psi.

h. Locating Compressor for Operation. Locate the unit on a level site close to the job so that it is easily accessible to operate tools. Avoid the use of long hoses which will cause a pressure drop. Choose a location upwind from excavation work, if possible, to avoid dirt and dust. Be particularly careful to locate the compressor so that corrosive fumes from industrial plants will not enter the air intakes. During operation on uneven terrains, block both sides of the wheels securely. If locating the unit indoors, be sure that adequate intake air is provided and that some means of carrying exhaust to the outside is provided.

8. Used Equipment

The instructions in paragraph 7 may be used, as applicable, with the following caution: Inspection of used equipment should be very detailed and thorough to discover parts unserviceable because of wear and corrosion.

Section II. CONTROLS AND INSTRUMENTS

9. General

(fig. 10)

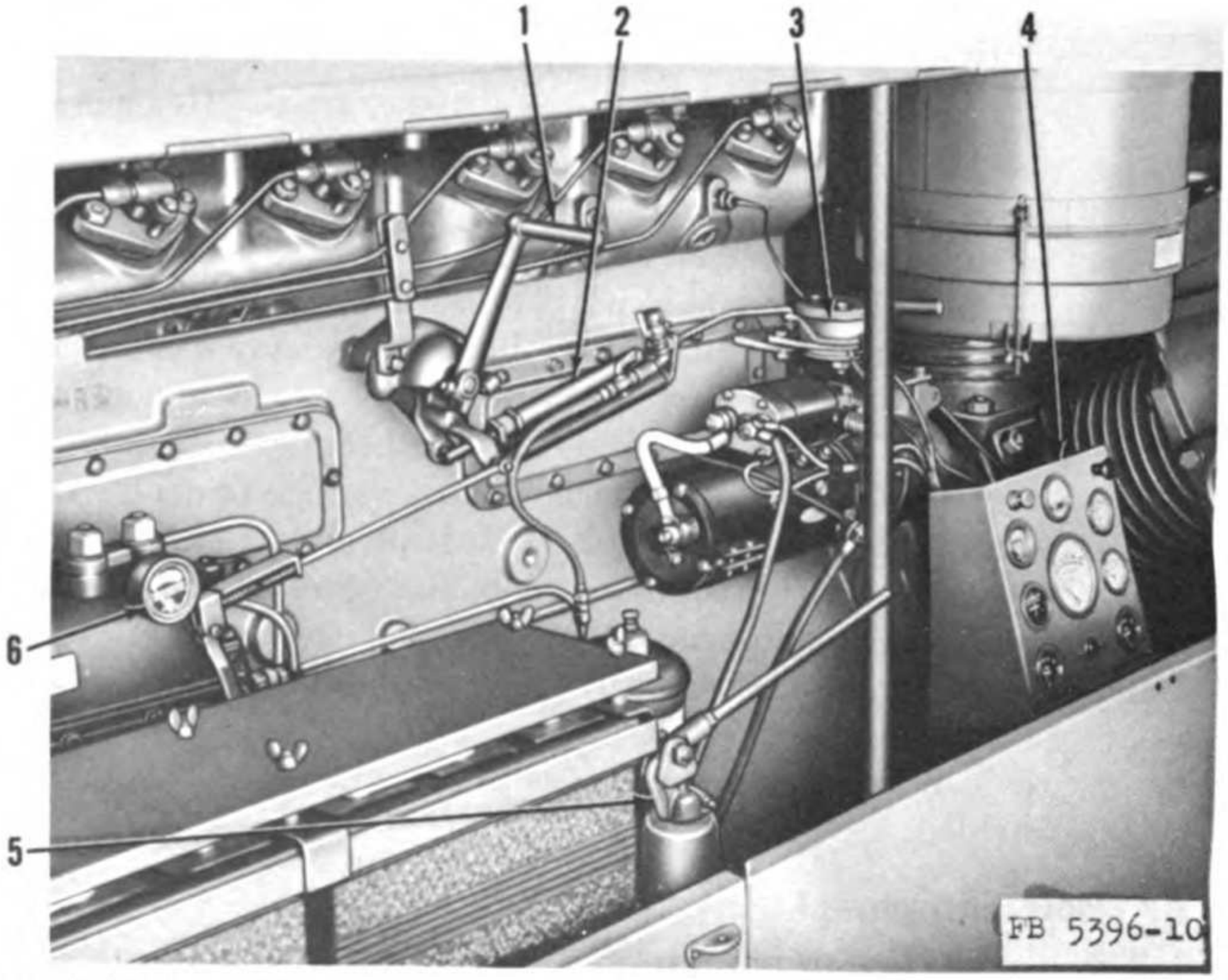
This section describes, locates, illustrates, and furnishes the operator sufficient information about the various controls and instruments for the proper operation of the materiel.

10. Clutch Shifter Pump

(fig. 11)

a. Description and Location. The clutch shifter pump (2) is a manually operated hydraulic pump, located on top of the frame channel to the left of the engine, forward of the instrument panel. A manually operated release valve (3) at the base of the pump controls hydraulic pressure applied to the clutch hydroshifter.

b. Purpose. The clutch shifter pump supplies hydraulic pressure to the hydroshifter assembly to release the clutch when the release valve is closed (turned in) and the handle operated. With the valve open, hydraulic fluid drains from the hydroshifter, allowing the clutch to engage.



1 Compression release lever
2 Throttle control cylinder
3 Engine speed control
4 Instrument panel
5 Clutch shifter pump
6 Diesel fuel pressure gage

Figure 10. Main operating controls.

11. Gasoline Shutoff Valve

(fig. 12)

a. Description and Location. The gasoline shutoff valve (9) is a manually operated needle valve, located in the gasoline strainer body (10), beneath the combination gasoline tank (1) and air trap (4) on the right side of the engine.

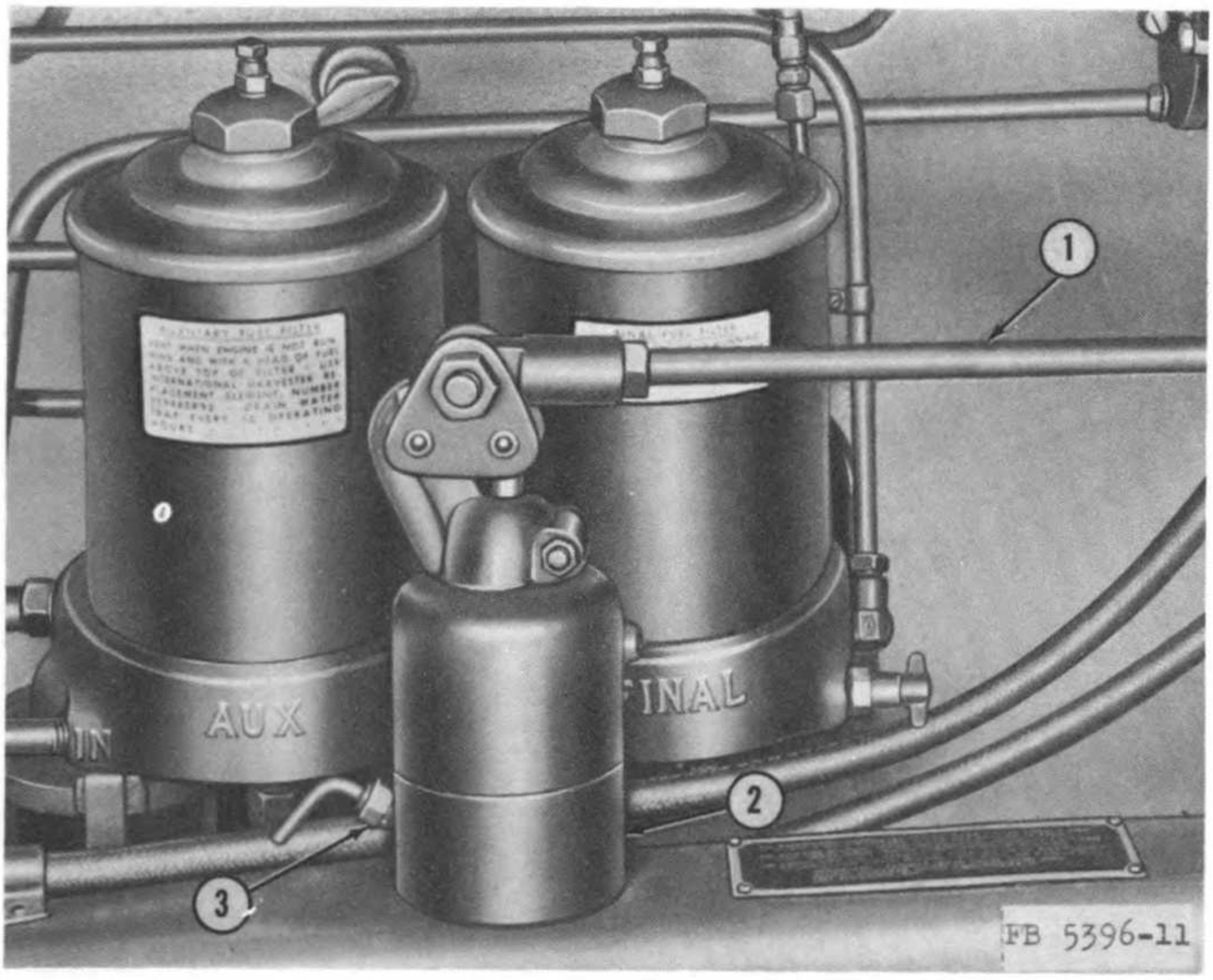
b. Purpose. The valve provides a manual means of shutting off flow of gasoline in the line.

12. Auxiliary Fuel Filter Shutoff Valve

(fig. 13)

a. Description and Location. The auxiliary fuel filter shutoff valve (3) is a manually operated needle valve, mounted on the base of the auxiliary fuel filter on the left side of the engine.

b. Purpose. The valve prevents the flow of diesel fuel from the air trap to the auxiliary fuel filter inlet when filters are cleaned.



1 Clutch shifter pump handle
2 Clutch shifter pump
3 Clutch shifter pump release valve

Figure 11. Clutch shifter pump.

13. Engine Compression Release Lever

(fig. 14)

a. Description and Location. This crank-shaped lever (1) is mounted at the left center of the engine cylinder block.

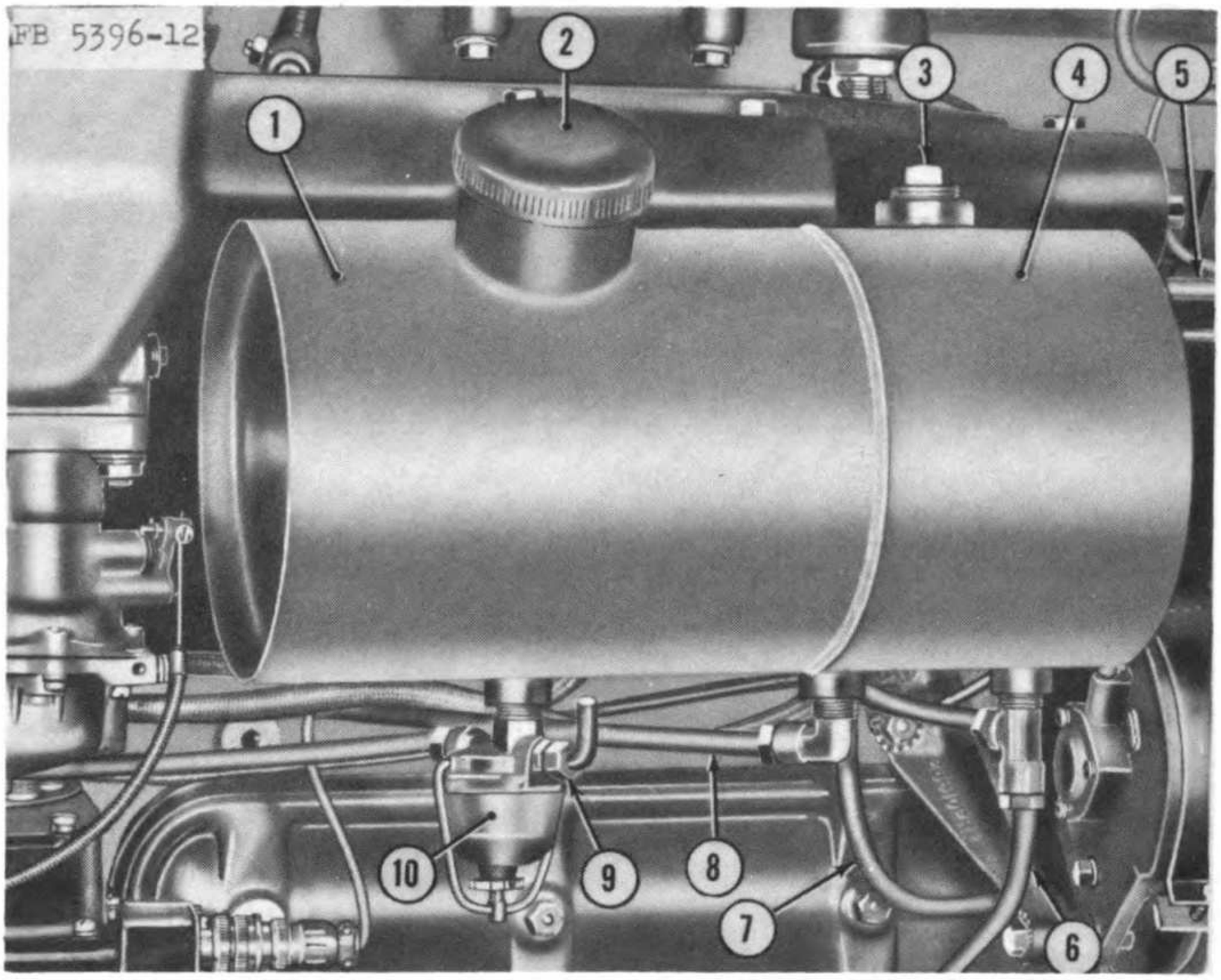
b. Purpose. The lever provides a means of changing from the gasoline to diesel cycle.

14. Engine Speed Control

(fig. 15)

a. Description and Location. The engine speed control is mounted directly above the starting motor. The cast hub of the control houses an adjustable friction disk to maintain the control in the desired position. Adjustable stops are provided to limit lever throw.

b. Purpose. The control permits adjustment of engine speed for starting and stopping operations. During normal operation, it is pushed forward and the governor controls the speed.



1 Gasoline tank
2 Gasoline tank fillercap
3 Pipe plug
4 Diesel fuel air trap
5 Air trap-to-fuel tank return pipe
6 Transfer pump-to-air trap pipe
7 Connector-to-air trap pipe
8 Air trap-to-fuel filter pipe
9 Gasoline shoutoff valve
10 Gasoline strainer

Figure 12. Gasoline shutoff valve.

15. Trigger Valve
(fig. 16)

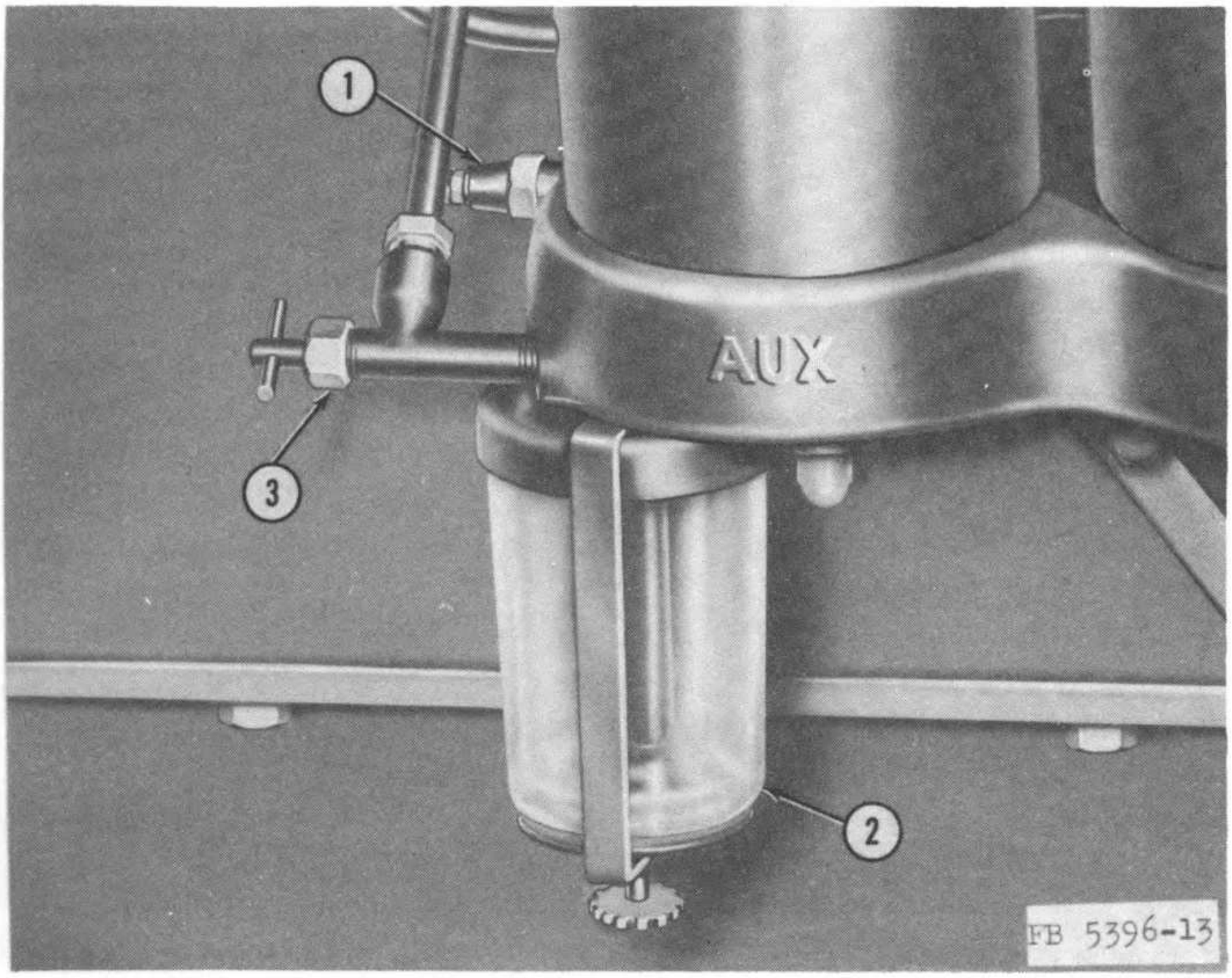
a. Description and Location. The trigger valve (2) is an automatic, adjustable valve, located beneath the low-pressure suction manifold on the left side of the compressor.

b. Purpose. The trigger valve automatically controls the unloaders and may be operated manually by pulling down on the threaded stem.

16. Check Valve
(fig. 17)

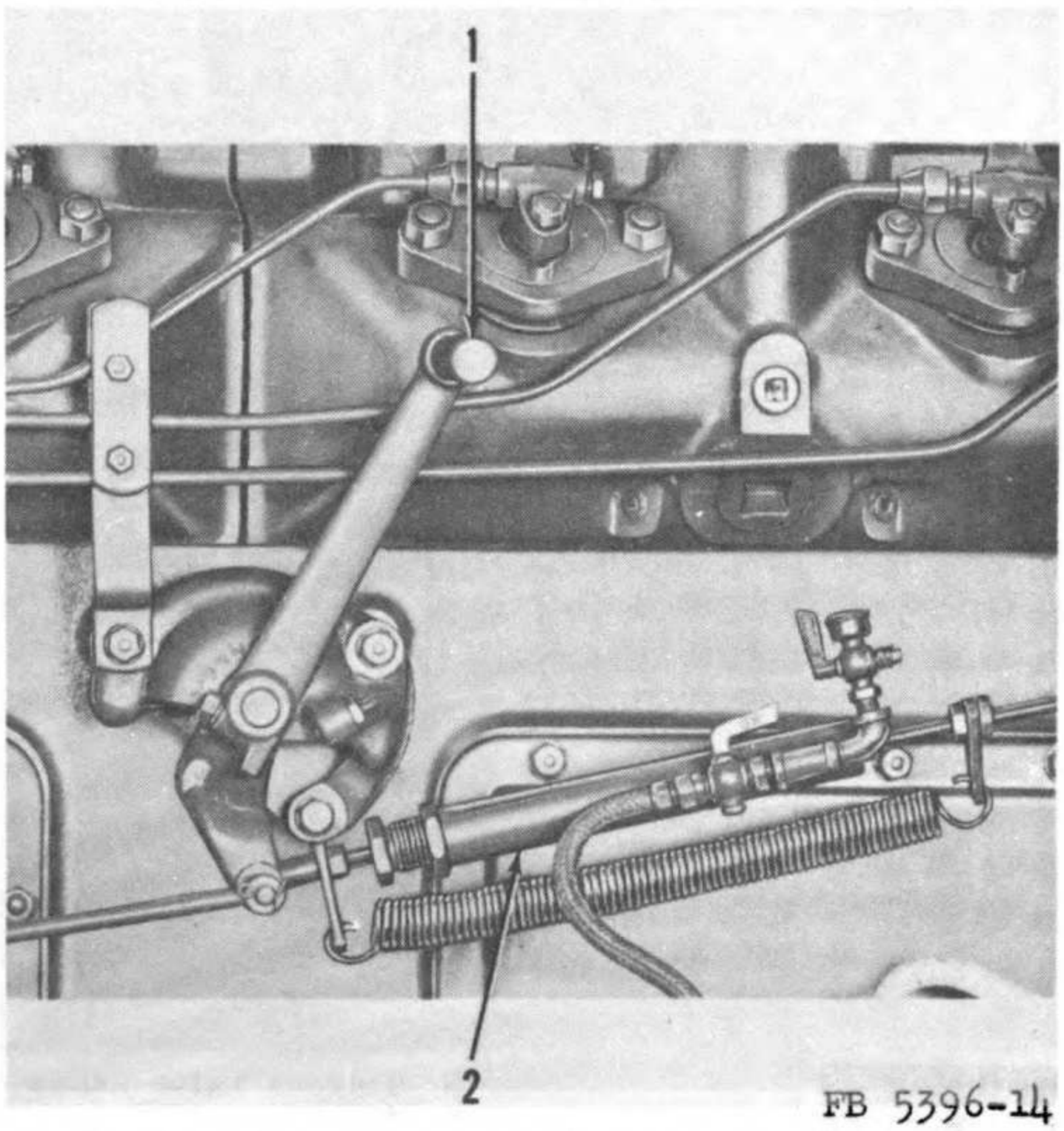
a. Description and Location. The check valve (2) is a combination ball check and needle valve, located on the left side of the compressor, between the trigger valve and unloaders. This valve is fully automatic.

b. Purpose. The valve permits free flow of air to the unloaders when receiver pressure is too high, but it retards the flow of air out of the unloaders when the compressor starts to load. This retarded



1 Draincock **2 Water trap** **3 Shutoff valve**

Figure 13. Auxiliary fuel filter shutoff valve.



1 Compression release lever **2 Throttle control cylinder**

Figure 14. Comprcssion release lever and throttle control cylinder.

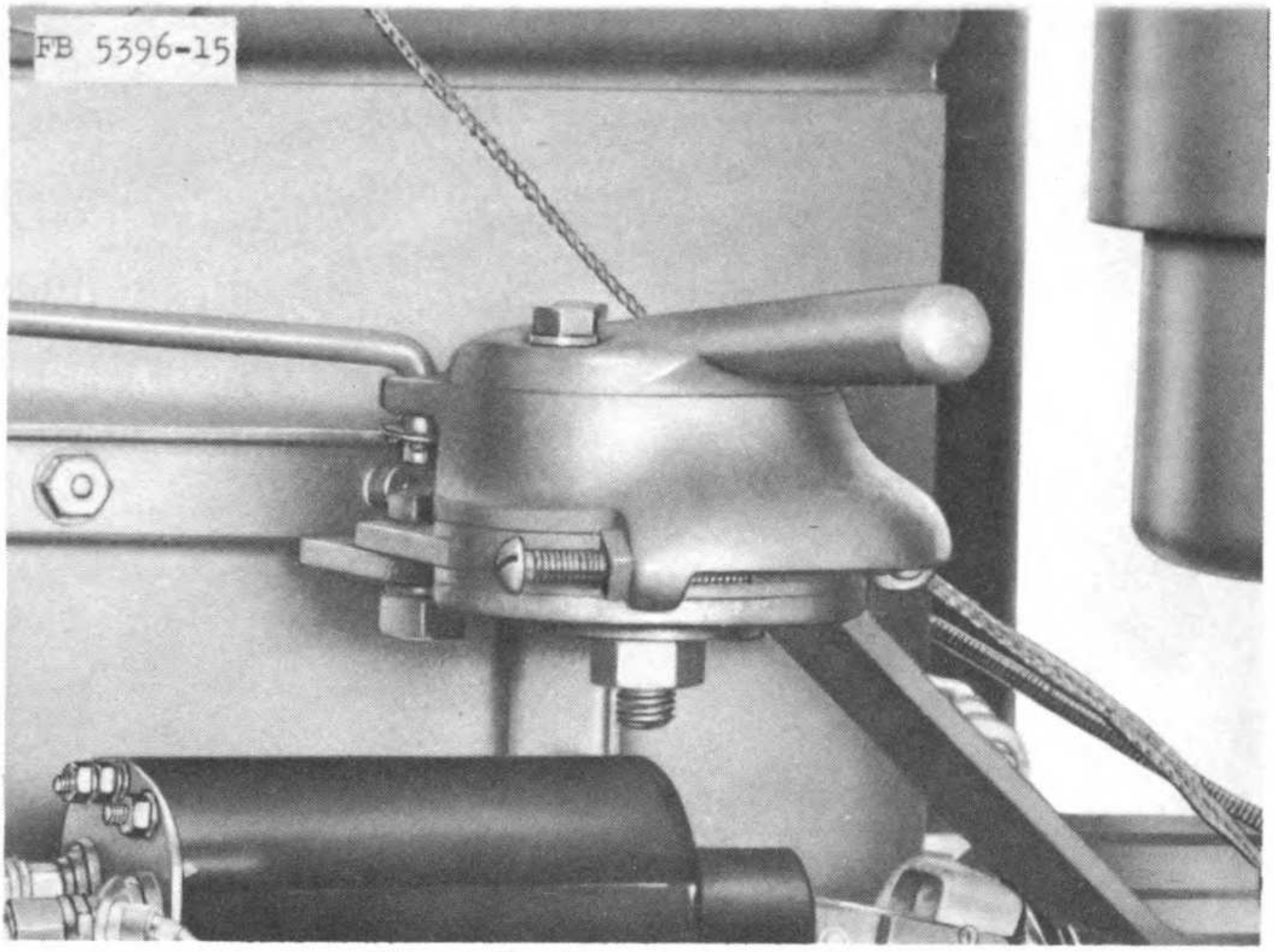
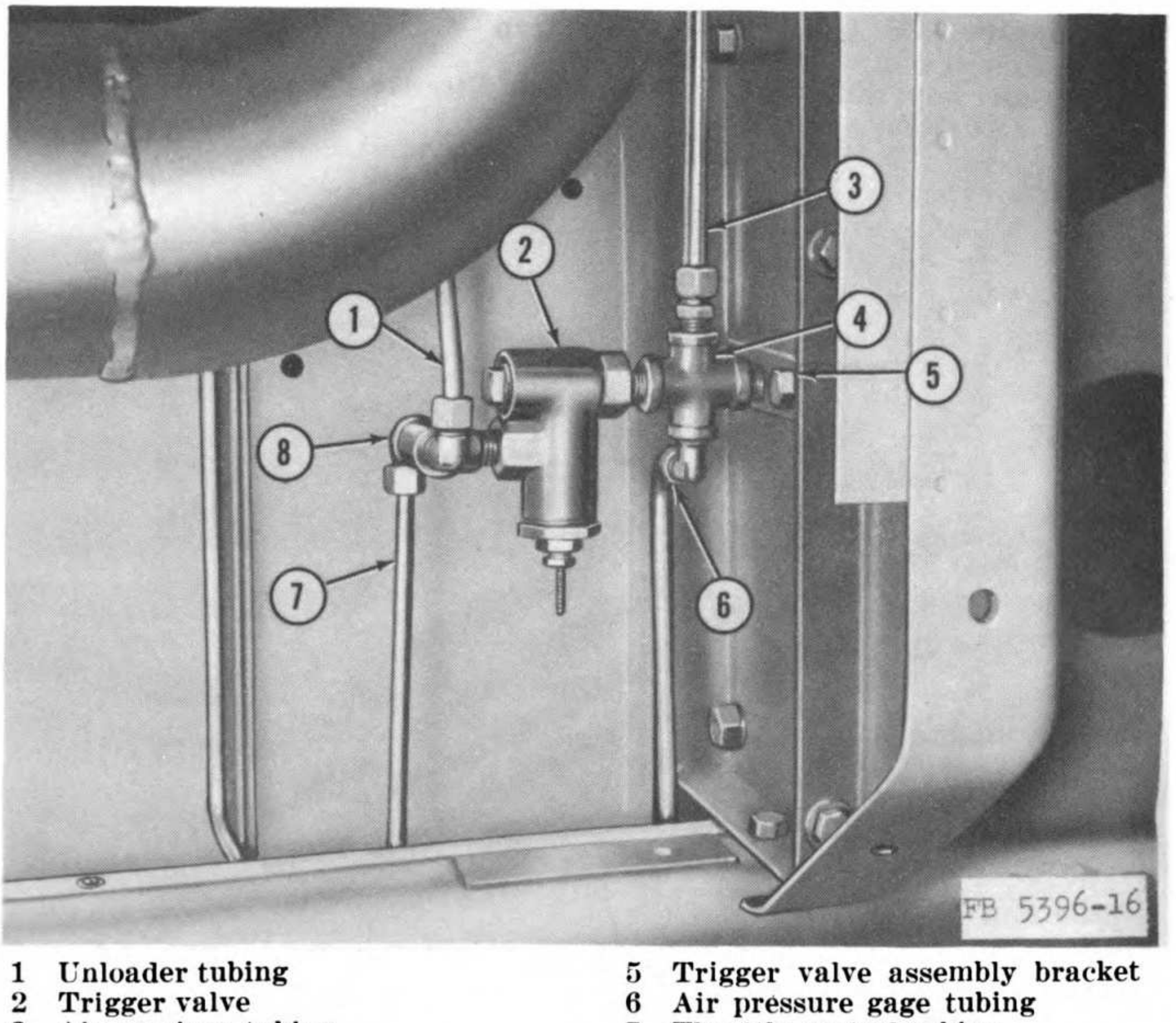
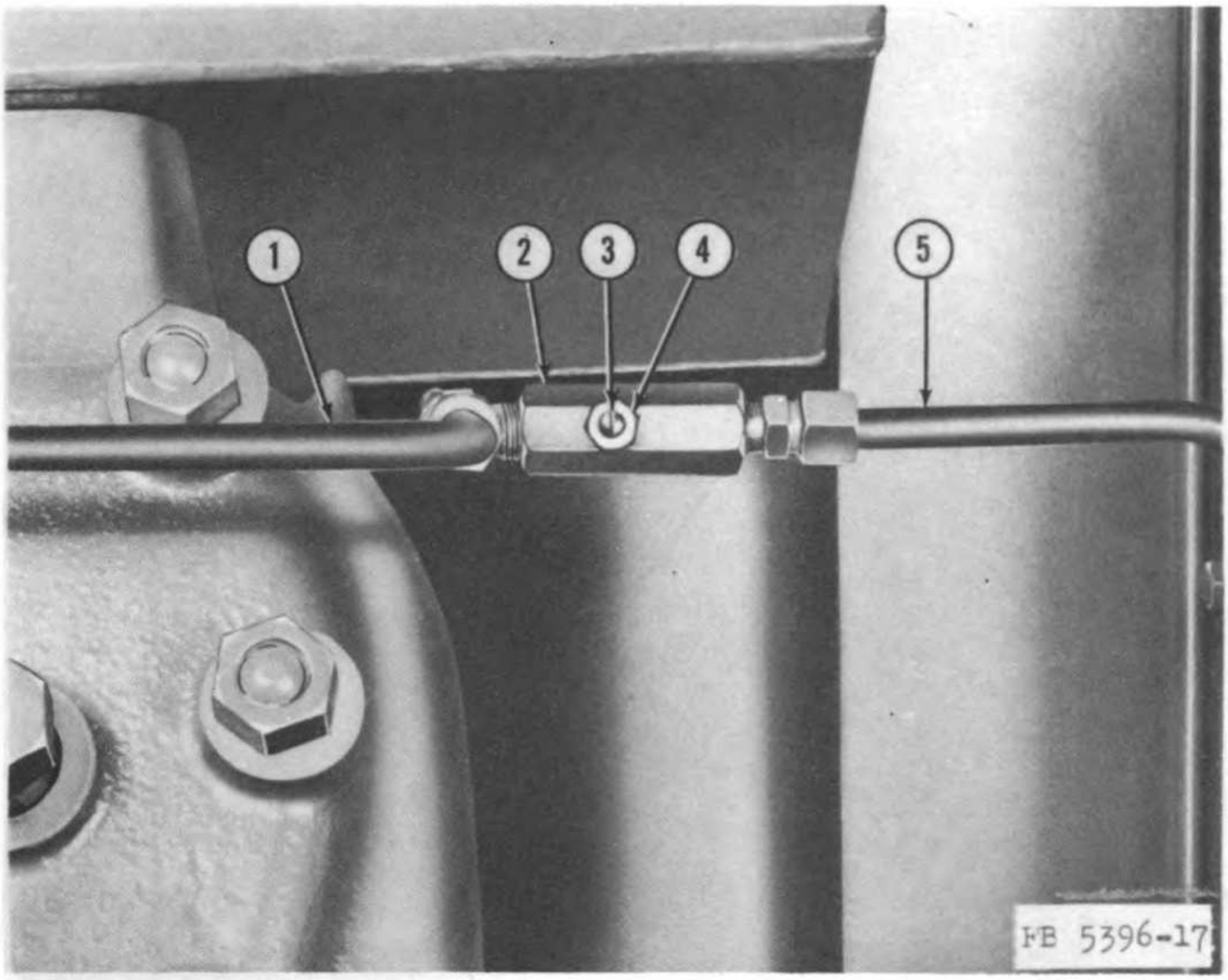


Figure 15. Engine speed control.



1 Unloader tubing
2 Trigger valve
3 Air receiver tubing
4 Cross, pipe, ¼ (1 req'd)
5 Trigger valve assembly bracket
6 Air pressure gage tubing
7 Throttle control tubing
8 Tee, pipe, ¼ (1 req'd)

Figure 16. Trigger valve.



1 Unloader-to-check valve tubing
2 Check valve
3 Adjusting screw
4 Locknut
5 Trigger valve-to-check valve tubing

Figure 17. Check valve.

flow prevents the unloaders from closing the intake valves too quickly and causing the sudden load to stall the engine.

17. Carburetor Choke Control

(fig. 18)

a. Description and Location. A push-pull type choke control knob (3) is located on the instrument panel at the upper right.

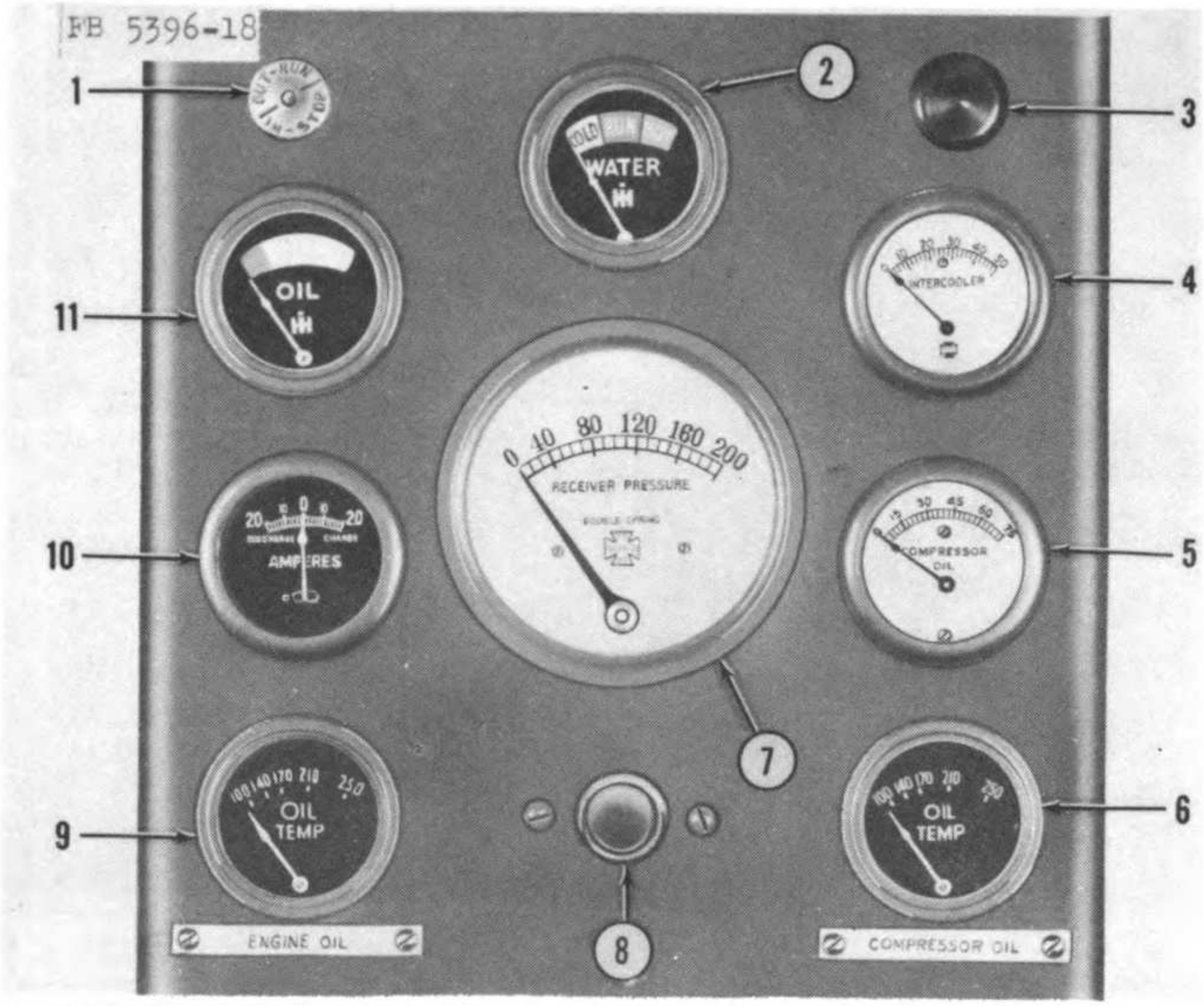
b. Purpose. The choke control provides a temporary means of enriching the air-gasoline mixture for engine starting.

18. Ignition Switch

(fig. 18)

a. Description and Location. A push-pull type ignition switch (1) is located on the instrument panel at the upper left.

b. Purpose. The ignition switch provides a means of opening or closing the ignition circuit.



1 Ignition switch
2 Engine water temperature gage
3 Choke control knob
4 Intercooler pressure gage
5 Compressor oil pressure gage
6 Compressor oil temperature gage
7 Air receiver pressure gage
8 Starter button
9 Engine oil temperature gage
10 Ammeter
11 Engine oil pressure gage

Figure 18. Instrument panel.

19. Starter Button

(fig. 18)

a. Description and Location. The starter button (8) is a momentary-contact pushbutton switch, located near the bottom of the instrument panel.

b. Purpose. The starter button provides a means of energizing a solenoid to engage the starting motor pinion with the ring gear on the engine flywheel and thus rotate the engine.

20. Engine Oil Pressure Gage

(fig. 18)

a. Description and Location. The engine oil pressure gage (11) is an indicating needle gage. It is located at the upper left of the instrument panel.

b. Purpose. The gage indicates engine lubricating oil system pressure. During normal operation, the needle should be in the white operating range of the scale. If needle drops to red range of the scale, stop engine and investigate the cause of oil pressure failure.

21. Compressor Oil Pressure Gage
(fig. 18)

a. Description and Location. The compressor oil pressure gage (5) is an indicating needle-type gage, calibrated in pounds per square inch. It is located at the right center of the instrument panel.

b. Purpose. The gage registers pressure in the compressor lubricating oil system. Pressure may exceed 35 psi during operation in cold weather, or when unit is first started. If gage indicates pressure below 20 psi, stop the unit and investigate the cause.

22. Air Receiver Pressure Gage
(fig. 18)

a. Description and Location. The air receiver pressure gage (7) is an indicating needle-type gage, calibrated in pounds per square inch. It is located in the center of the instrument panel.

b. Purpose. The gage registers working air pressure in the air receiver. During normal operation, the gage must register a pressure of 90 to 100 psi. Pressure below 90 psi indicates equipment overload. Pressure over 100 psi is not recommended.

23. Intercooler Air Pressure Gage
(fig. 18)

a. Description and Location. The intercooler air pressure gage (4) is an indicating needle-type gage, calibrated in pounds per square inch. It is located on the instrument panel, beneath the choke control.

b. Purpose. The gage registers air pressure in the intercooler. Normal working pressure ranges between 26 and 30 psi. If continued deviation from normal pressure is indicated, stop unit and investigate cause of improper compressor action.

24. Engine Oil Temperature Gage
(fig. 18)

a. Description and Location. The engine oil temperature gage (9) is an indicating needle-type gage, calibrated in degrees F. It is located at the bottom left corner of the instrument panel.

b. Purpose. The gage registers the temperature of the engine lubricating oil. Normal temperature range after warmup period is 140° to 170° F. Stop unit and investigate cause if gage registers a temperature in excess of 220° F.

25. Compressor Oil Temperature Gage
(fig. 18)

a. Description and Location. The compressor oil temperature gage (6) is an indicating needle-type gage, calibrated in degrees F. It is located at the bottom right corner of the instrument panel.

b. Purpose. The gage registers the temperature of the compressor lubricating oil. Normal operating temperature range is 130° to 160° F. Stop unit and investigate cause if gage indicates a temperature in excess of 200° F.

26. Engine Water Temperature Gage
(fig. 18)

a. Description and Location. The engine water temperature gage (2) is an indicating needle-type gage, calibrated in degrees F. It is located at the top center of the instrument panel.

b. Purpose. The gage registers the temperature of the liquid in the engine cooling system. The indicator should point to the high side of the RUN range during normal operation. If indicator is in the HOT range, stop unit and determine the cause.

27. Air Receiver Drain Valve
(fig. 2)

a. Description and Location. The air receiver drain valve (10) is a globe-type valve, located on the left side of the unit, beneath the air receiver tank.

b. Purpose. The valve provides a means of draining condensed moisture and oil from the air receiver and of relieving system air pressure rapidly.

28. Ammeter
(fig. 18)

a. Description and Location. The ammeter (10) is an indicating needle gage, deflected by current flow. It is located in the left center on the instrument panel.

b. Purpose. The ammeter indicates the rate at which the generator is charging the batteries and is used to check generator operation. With fully charged batteries, the ammeter will register very little charge or none at all. With a low battery the ammeter will register approximately 10 amperes. If, after starting, the ammeter registers discharge, or registers over 15 amperes, stop the engine and investigate cause.

29. Fuel Pressure Gage
(fig. 19)

a. Description and Location. The fuel pressure gage is an indicating needle gage, located on top of the fuel injection pump.

b. Purpose. The gage indicates the operating condition of the diesel fuel filters. Under normal conditions, the needle will be in the white OPERATING range. If the needle drops to the red CHANGE FILTER range, the auxiliary and final fuel filters must be changed to restore pressure.

Figure 19. Fuel pressure gage.

30. Hour-Meter
(fig. 20)

a. Description and Location. The hour-meter is a geared, mechanical counter mounted horizontally on the timing gear case at the right front side of the engine.

b. Purpose. The hour-meter is used to indicate the number of hours the engine operates.

31. Air Receiver Safety Valve
(fig. 21)

a. Description and Location. This device (1) is a spring-loaded relief valve with a manual release lever, located on the end of a pipe extending from the air receiver tank through the rear canopy support.

b. Purpose. The valve provides an automatic release of air receiver air pressure in excess of 125 psi. The manual release lever is provided to test valve action.

32. Intercooler Safety Valve
(fig. 21)

a. Description and Location. This device (2) is a spring-loaded relief valve with a manual release lever, located on the top center of the intercooler core.

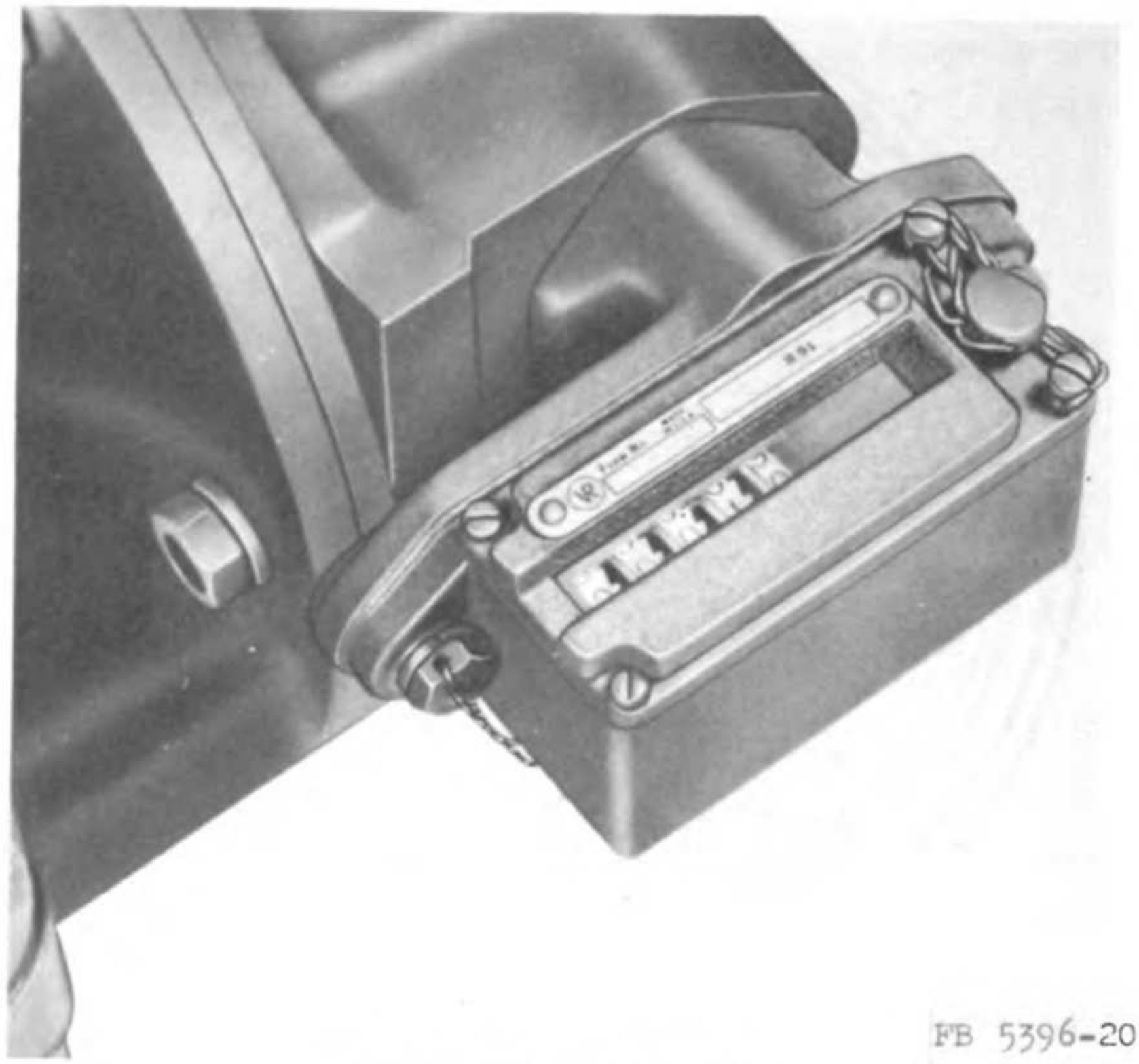


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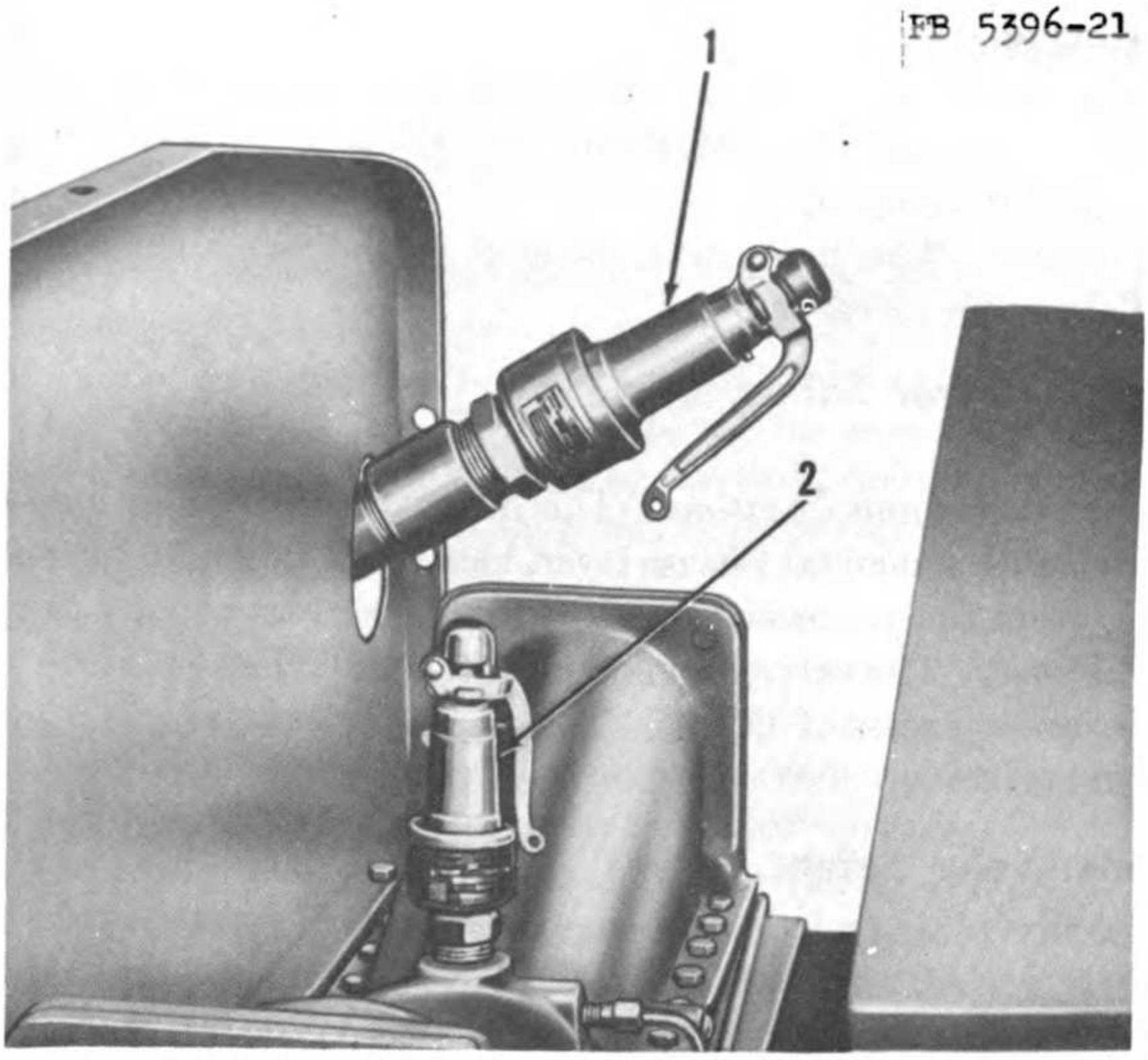
Figure 20. Hour-meter.



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1 Air receiver safety valve 2 Intercooler safety valve

Figure 21. Air receiver and intercooler safety valves.

b. Purpose. The valve provides an automatic release of intercooler air pressure in excess of 45 psi. The manual release lever is provided to test valve action.

Section III. OPERATION UNDER USUAL CONDITIONS

33. General

a. The instructions in this section are provided for the information and guidance of the personnel responsible for the operation of this equipment.

b. It is essential that an operator knows how to perform every operation and make all necessary adjustments to obtain the most efficient performance of the equipment under his care. To become proficient in this task, a thorough familiarity with the equipment and the controls is necessary. This section furnishes information on the starting, stopping, and operating of the unit. A good operator will learn to vary these procedures to meet the demands of varied operation.

34. Starting

a. Refer to paragraph 54*c* for before-operation services.

b. Disengage the clutch by closing the shifter pump release valve (3, fig. 11) firmly and pumping the handle (1) three or four strokes after resistance is felt.

c. Open the gasoline shutoff valve (9, fig. 12) and the auxiliary fuel filter shutoff valve (3, fig. 13).

d. Position the engine compression release lever (1, fig. 14) in the gasoline operating position (pulled back).

e. Place the engine speed control (fig. 15) in the starting (shutoff) position (pulled back).

f. Place the ignition switch (1, fig. 18) in RUN position.

g. Set the choke control (3, fig. 18) in the fully choked position (pull the choke control all the way out). Press the starter button (8) for 3 to 5 seconds. Then push the choke control in to one-third choke position and press starter button until the engine starts. If the engine fails to start after 5 to 10 seconds, repeat the starting operation.

Caution: Never operate the starting motor more than 30 seconds at one time. Allow the starting motor to cool for 2 or 3 minutes before repeating the starting operation.

h. As soon as the engine starts, check the engine oil pressure gage (11) to see that oil is circulating in the system. If gage does not register oil pressure, stop the engine immediately and determine the cause.

i. Once the engine is operating, adjust the choke control (3) so the engine operates smoothly. As the engine warms up, push the choke control all the way in (choke wide open).

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j. As soon as the engine is warm enough to operate smoothly with the choke valve open (choke control in) and the exhaust clear, allow the engine to operate on gasoline for about 1 minute (or 2 to 3 minutes in cold weather).

k. Move the engine compression release lever (1, fig. 10) to the diesel operating position (forward), and immediately shove the engine speed control (3) forward to a fast idle speed.

35. Stopping

a. Disengage clutch (par. 34*b*) to prevent engine from stalling when operating on gasoline cycle.

b. Move the engine speed control (3, fig. 10) back to the shutoff position and pull back on the engine compression release lever (1) (gasoline operating position).

c. Permit the engine to operate on gasoline until the exhaust is clear.

d. Push the ignition switch (1, fig. 18) to STOP and move the compression release lever forward to the diesel operating position. Leave the lever in this position.

Note. Moving the lever into the diesel operating position allows the starting valves to cool on the valve seats, therefore the lever should be moved to the forward (diesel operating) position as soon as the engine stops.

e. If the equipment is to be shut down, perform the after-operation services in paragraph 54*f*.

36. Operating Details

When the engine has warmed up and is operating evenly on the diesel cycle, load the compressor by performing the following steps:

a. Open the air receiver drain valve (10, fig. 2).

b. Engage the clutch by opening the shifter pump release valve (3, fig. 11) one-half turn. Leave valve open.

c. Check the compressor oil pressure gage (5, fig. 18). If inadequate or no pressure is indicated, disengage the clutch (par. 34*b*) immediately and determine the cause before proceeding.

d. Allow the compressor to warm up. Build up pressure by closing the air receiver drain valve (10, fig. 2) and advancing the engine speed control (3, fig. 10) to operating speed.

e. When the air receiver and intercooler pressure gages (7 and 4, fig. 18) indicate pressure in the system, momentarily open the intercooler and air receiver safety valves (2 and 1, fig. 21) by pulling out on the valve levers to see that they are working properly.

f. Once the equipment has been started and the compressor has been loaded, the equipment requires little attention, except for during-operation maintenance (par. 54*d*). Loading and unloading of the compressor and control of the engine speed to meet the demands upon

the air supply in the receiver are accomplished automatically by the combined effects of the trigger valve (2, fig. 16), check valve (2, fig. 17), and throttle control cylinder (2, fig. 14). The compressor may be unloaded manually by pulling out on the threaded stem of the trigger valve.

Note. Always leave clutch release valve (3, fig. 11) open and clutch engaged when compressor is left standing idle.

37. Movement to New Location

a. Perform the after-operation services (par. 54*f*), paying particular attention to the security of the battery mountings, tank caps, canopy, and the tools.

b. Back the towing vehicle into position and couple the lunette of the compressor drawbar to the pintle hook of the vehicle. Before towing, remove any blocks or material used to level the compressor.

Caution: The air compressor is not designed for fast highway travel. Do not exceed 20 mph when towing.

Section IV. OPERATION OF MATERIEL USED IN CONJUNCTION WITH AIR COMPRESSOR

38. Engine

Information concerning the operation and lubrication of the engine has been given in preceding paragraphs. Additional descriptive material and maintenance procedures for the engine are contained in TM 5–5199.

39. Fire Extinguisher

The 1-quart, carbon tetrachloride hand-type fire extinguisher is located inside the compressor canopy, mounted on the right front access door end with spring clips. To operate, twist handle, aim nozzle at base of flames, and pump handle to produce a stream of solution over fire. For maintenance and filling instructions, refer to TM 9–1799 and TM 5–687.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

40. Operation in Extreme Cold (Below 0° F.)

a. Cooling System. Operation of the engine in cold weather requires the addition of an antifreeze to the cooling system. All connections must be tight to prevent loss of antifreeze. Perform the following services before filling the system:

(1) Remove the radiator cap and open the radiator and crankcase drains, located on the bottom of the radiator and the side of the crankcase.

(2) Allow the system to drain, then close the drains.

(3) Fill the cooling system with a solution of 10 pounds of washing soda and approximately 37 gallons of water. (Cooling system capacity is 37 gallons.)
(4) Leaving the radiator cap off, operate the engine until the solution in the system becomes hot.
(5) Drain and flush system with clean water.
(6) Close drains and refill the system with water. Check the entire system for leaks in the radiator, water pump, gaskets, and hose connections. Correct or report all deficiencies.
(7) Drain system thoroughly and flush with clean water. Be sure drains are not clogged and that the entire system is empty.
(8) Close drains and fill system with an antifreeze solution and water in accordance with table I.

Table I. Freezing Points, Composition and Specific Gravities of Military Antifreeze Materials.

Lowest expected ambient temperature °F.	Pints of inhibited glycol per gallon of coolant [1]	Compound, Antifreeze, Arctic [2]	Ethylene glycol coolant solution specific gravity at 68° F.[3]
+20	1½	Issued full-strength and ready mixed for 0° to −65° F. temperatures for both initial installation and replenishment of losses. *Do not dilute with water or any other substance.*	1.022
+10	2		1.036
0	2¾		1.047
−10	3¼		1.055
−20	3½		1.062
−30	4		1.067
−40	4¼		1.073
−50	[4]		----------
−60	[4]		----------
−75	[4]		----------

[1] Maximum protection is obtained at 60 percent by volume, that is 4.8 pints of ethylene glycol per gallon of solution.
[2] Military Specification MIL–C–11755 Arctic type, nonvolatile antifreeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines for protection against freezing primarily in Arctic regions where the ambient temperature remains for extended periods of time close to −40° F. or drops below, to as low as −90° F.
[3] Use an accurate hydrometer. To test hydrometer, use 1 part ethylene glycol type antifreeze to 2 parts water. This should produce a hydrometer reading of 0° F.
[4] Arctic antifreeze preferred.

Note. Fasten a tag near the radiator filler cap indicating the type of antifreeze

b. Lubrication. The use of special winter-grade lubricants for the equipment is necessary. Refer to LO 5–5396 for specific instructions on cold-weather lubrication.

c. Fuel Systems.

(1) *Gasoline.* Fill the gasoline tank to capacity at the end of each day's operation. This prevents moisture from condensing inside the tank and freezing and clogging the fuel lines. The use of high-test gasoline is recommended.

(2) *Diesel.* Keep the diesel fuel tank as full as possible to prevent condensation of moisture.

d. Ignition System. If there is difficulty in starting the engine in cold weather, it is possible that the spark plugs may be wet with condensation. Remove the spark plugs and wipe off moisture. Check and maintain a gap of 0.035 to 0.040 in.

e. Batteries. Maintain batteries at full charge during cold weather. As the temperature drops, the efficiency of the battery decreases. A lower specific gravity allows the electrolyte to freeze at a higher temperature.

f. Safety Valves and Compressor Air System. In cold weather it is extremely important to drain the air receiver tank and intercooler to prevent moisture from freezing the safety valves. Open the drain valves a few moments before stopping the engine.

41. Operation in Extreme Heat

a. Cooling System.

(1) Check frequently for loose engine and intercooler fan belts.
(2) Check the coolant level frequently; be sure that radiator fillercap is tight.
(3) Clean and flush the engine cooling system twice a month.
(4) Keep core openings of the radiator, intercooler, and aftercooler free of bugs, dirt, and obstructions.
(5) Operate in the shade when possible.
(6) Open access doors and locate equipment to permit maximum circulation of air.

b. Lubrication. Refer to LO 5–5396 for correct types of lubricants to be used in hot weather.

42. Operation Under Dusty or Sandy Conditions

a. Protection by Location. Wherever possible, the equipment should should be located where blowing dust and sand are reduced to a minimum.

b. Additional Lubrication and Cleaning. In addition to the standard lubricating services listed in LO 5–5396, keep the equipment very clean. Pay particular attention to the air filters. Clean and service them two or three times more often than normal during operations under dusty conditions.

43. Operation in Salt Water Areas

a. Lubrication. Refer to LO 5–5396 for details of lubrication. Wash the entire unit at least twice a week or oftener, depending upon conditions, with soap and water or steam. This process removes the corroding salt formations from the metal exterior. After each washing, lubricate the equipment. Apply a surface film of vaseline or light grease on any unprotected metal parts. Clean all air filters daily.

b. Electrical System. Inspect the ignition distributor and coil assembly to be sure that it is adequately waterproofed.

c. Painting. In addition to the standard painting instructions given in TM 9–2851, observe the following precautions. When corrosion is forming on painted surfaces, as indicated by cracking and blistering, material should be scraped and cleaned and painted with a rust-inhibiting paint. Treat all hidden and bolted surfaces as well.

44. Operation at High Altitudes

Certain precautions must be observed when the equipment is operating at high altitudes.

a. Because of the rarified atmosphere, the compressor may require a longer period to produce the required pressure in the air receiver. Operate fewer tools off the air system when using the compressor at high altitudes.

b. The cooling system may be affected by the decreased atmospheric pressure, causing the coolant to boil at a lower temperature. Check coolant level often.

c. Protect the equipment similarly to that in cold-weather operation in paragraph 40. If equipment is to be idle overnight, fill fuel tanks to prevent moisture condensation and leave air receiver drain valves open.

45. Operation in Humid Areas

a. Starting. In humid weather, condensation of moisture presents a problem for the operator. Spark plugs which become wet must be removed and dried; wiring and connections may also require attention. The gasoline strainer and the diesel fuel water trap should be drained frequently to prevent condensation entering the systems.

b. Lubrication. Crankcase dilution is frequent under these conditions. Test engine and compressor oil frequently for dilution by noticing oil film on oil level gage. If oil appears to be grey in color, or bubbles adhere to gage, drain and refill crankcase with fresh oil.

c. Air Receiver. Drain at least three times daily.

d. Electrical System. Inspect the coil, wiring, and distributor for adequate fungus and waterproofing qualities. Occasionally, check for moisture under distributor cap.

e. Location. If the equipment is located inside a building or inclosure, provide adequate ventilation to prevent fungus formation.

46. Operation in Inclement Weather

a. Protection by Location. During any type of inclement weather, attempt to locate the equipment under some type of cover that affords the maximum amount of protection of the unit, with sufficient safety for the operating personnel.

b. Compressor Air System. Because of the increased moisture intake, the air receiver tank and intercooler should be drained hourly to prevent excessive accumulation of water.

Note. When the equipment is located in areas where the water supply contains a high mineral content, excessive interior rusting and consequent clogging of radiator passages may easily occur. To prevent this, drain and flush the cooling system weekly, using a sodium bicarbonate compound and water solution. Refill the system and add a rust inhibitor to the water in the cooling system.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

47. General

The tools and equipment listed in this section are those that are required to perform organizational maintenance on the Worthington Model 500 Air Compressor. Standard mechanic's hand tools and on-equipment tools are not enumerated in this section.

48. On-Equipment Tools

The on-equipment tools normally supplied with this equipment for the use of the operator are listed in appendix III.

49. Special Organizational Maintenance Tools and Equipment

The tools and equipment in table II bearing identification numbers are listed in Department of the Army Supply Manuals ENG 3–41 and ENG 5–41, or in ORD 6 SNL J–16-series. Table II contains only the tools and equipment necessary to perform the operations illustrated and/or described in this chapter. The table is included for information only and is not to be used for requisitioning tools or equipment.

Table II. Special Organizational Maintenance Tools and Equipment

Item	I. H. C. Tool No.	References		Use
		Fig.	Par.	
Puller	1–020–233–R91	54	128	Injector nozzle pre-combustion chamber.
using:				
Bridge assy	1–020–223–R91	------	------	
Forcing screw	1–020–224–R1	------	------	
Guide collar	1–020–229–R1	------	------	
Puller	1–020–284–R91	53	128	Remove injector nozzles.

Section II. LUBRICATION AND PAINTING

50. General Lubrication Information

a. Lubrication Order 5–5396 prescribes first and second echelon lubrication maintenance for the Model 500 Air Compressor.

b. A lubrication order is published for each item of equipment. The lubrication order shown in figure 22 is a reproduction of an approved lubrication order for this air compressor. For the current LO 5–5396, refer to DA Pamphlet 310–4.

c. Lubrication orders prescribe approved first and second echelon lubrication procedures. The instructions contained therein are mandatory.

51. Detailed Lubrication Information

a. Care of Lubricant. Keep lids and edges of all lubricant containers wiped clean and be sure lids are on securely in storage to keep out dirt or foreign matter. Keep pouring and filling spouts and pipes clean. Do not leave containers uncovered longer than necessary.

b. Points of Application (fig. 22). Follow the detailed lubrication instructions given beneath each lubrication point illustration, which indicates procedures to be followed at each point. Apply lubricant indicated on the equipment lubrication order.

c. Cleaning. Clean the equipment thoroughly before each lubrication service is performed. Be careful to remove contaminated lubricant and dirt from all points of application. Clean with an approved cleaning solvent. Wipe excess lubricant from fittings to prevent contamination.

d. Operation Immediately After Lubrication. Immediately following the lubrication of the equipment or any of its parts, operate the unit (par. 36) for at least 5 minutes if possible. This operating period allows the lubricant to be distributed thoroughly to all moving parts of the equipment.

e. Oil Filter. When replacing the engine lubricating oil filter elements, remove the base plug and drain filter completely. Wipe the inside of the filter case with a rag. Install a new element, keeping the large hole in element end facing up. Refer to paragraph 99 for correct maintenance procedures.

f. Checking Crankcase Level. To check level of engine crankcase, unscrew and remove the oil-level gage. Wipe the gage clear. Insert the gage in the crankcase and allow it to rest on top of threads. *Do not screw down.* Remove gage and read level. Notice that gage has readings on both sides, one for engine operating and the other for engine stopped.

Caution: Notice capacities listed in LO 5–5396. Do not overlubricate. Excessive lubrication can cause damage to operating parts, and cause blown seals, carbon deposits, and equipment failure.

LUBRICATION ORDER **LO5-5396**

7 December 1953

COMPRESSOR, AIR, TRAILER, MOUNTED, 4 WHEEL, PNEUMATIC TIRES, DIESEL DRIVEN, 500 CFM WORTHINGTON MODEL 500 WITH INTERNATIONAL HARVESTER MODEL UD-24 ENGINE.

References. TM 5-5396, TM 5-5199, TB 5-5199-1

Intervals given are maximums for normal 8-hour day operation. For abnormal conditions or activities, intervals should be shortened to compensate.

Clean fittings before lubricating.

Relubricate after washing or fording.

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

Lubricate points indicated by dotted arrow shafts on both sides of the equipment.

Drain crankcases only when hot after operation; check level and replenish when cool.

— KEY —

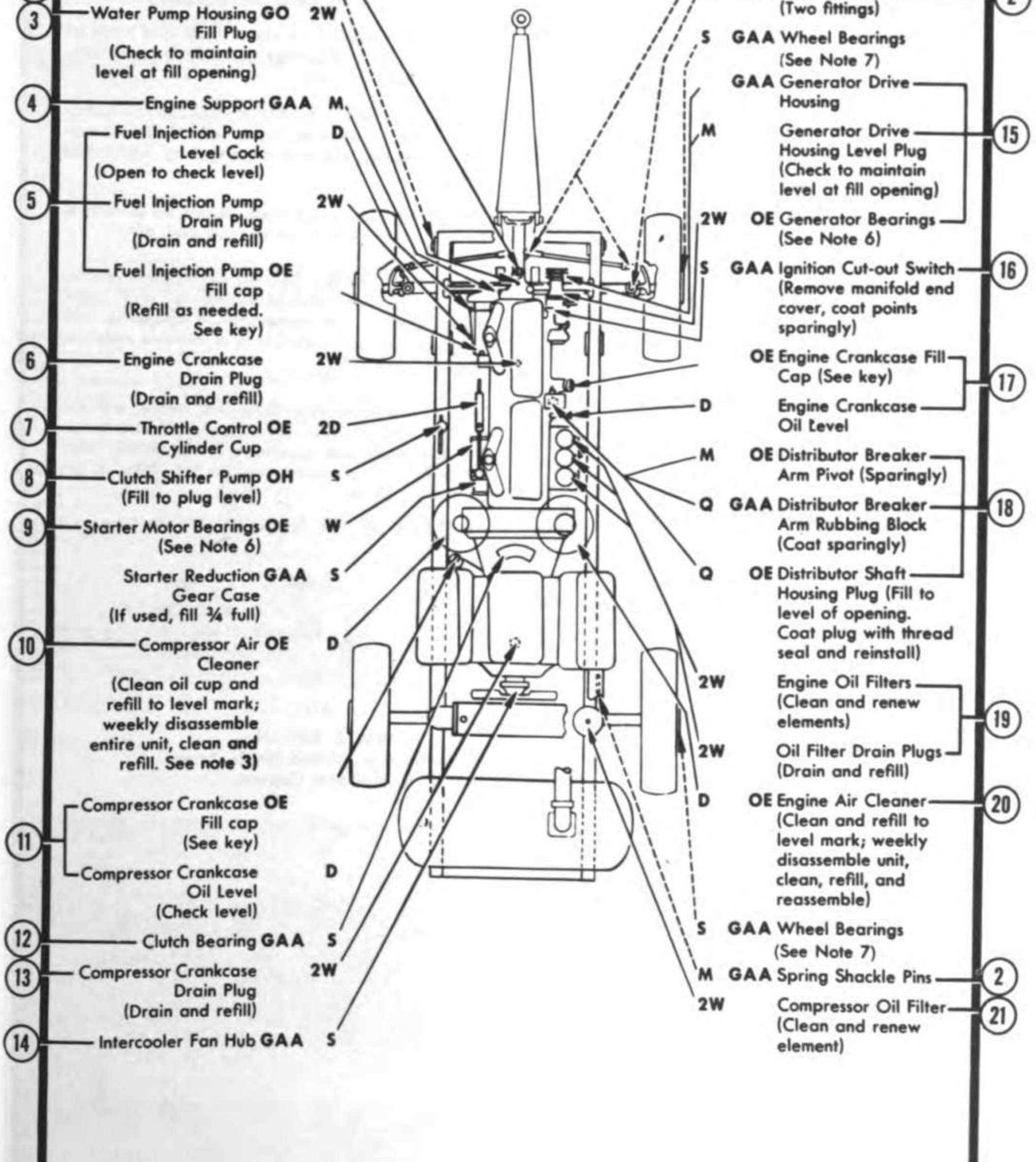
LUBRICANT	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32° F	+32° F to −10° F	Below −10° F	D—Daily 2D—2 Days 2W—2 Weeks W—Weekly M—Monthly Q—Quarterly S—Semiannually
OE—OIL, engine.		**OE** 30 or 9250	**OE** 10 or 9110	See Note 1	
Engine Crankcase	27 qts				
Engine Air Cleaner	4 qts	**OE** 30 or 9250	**OE** 10 or 9110	**OHA**	
Engine Oil Filters	3 qts	**OE** 30 or 9250	**OE** 10 or 9110	**OE** 10 or 9110	
Fuel Injection Pump	⅞ pt				
Compressor Crankcase	13 qts	**OE** 30 or 9250	**OE** 10 or 9110	See Note 1	
Compressor Air Cleaner	3½ qts	**OE** 30 or 9250	**OE** 10 or 9110	**OHA**	
Other Points					
GO—LUBRICANT, gear universal		**GO** 90	**GO** 75	**GO** S	
GAA—GREASE, Automotive and Artillery. All Temperatures.					
OHA—OIL, Hydraulic, Aircraft, petroleum base					
OH—OIL, Hydraulic					

CONTINUED ON THE FOLLOWING PAGE

FB 5396-22/1

Figure 22. Lubrication order.

CONTINUED FROM THE PRECEDING PAGE



CONTINUED ON THE FOLLOWING PAGE

FB 5396-22/2

***Figure 22*—Continued.**

CONTINUED FROM THE PRECEDING PAGE

NOTES:

1. COLD WEATHER—ENGINE CRANKCASE (When winterization kit is not available)—Every 3 days, drain crankcase and refill to "FULL" mark with OE 10. Add 9 quarts of gasoline and run engine 5 minutes to mix. Mark new level on gage for future reference.

CAUTION: Every ½ day check level and fill to "FULL" mark with OE 10. If engine is to be shut down for ½ day or more, add 9 quarts of gasoline to reach new level mark and run engine 5 minutes to mix.

COMPRESSOR CRANKCASE (When winterization kit is not available)—Every 3 days drain crankcase and refill to "FULL" mark with OE 10. Add 4 quarts of gasoline and run engine 5 minutes to mix. Mark new level on gage for future reference.

CAUTION: Every ½ day check level and fill to "FULL" mark with OE 10. If compressor is to be shut down for ½ day or more, add 4 quarts of gasoline to reach new level mark and run compressor 5 minutes to mix.

NOTE: Oil, fuel, Diesel may be used as a temporary diluent, but only when sufficient gasoline is not available. WARNING: Diluent used is inflammable. Do not service equipment near heater or open flame.

2. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW —10° F.—Clean parts with SOLVENT, dry-cleaning and drain all oil housings. Relubricate with lubricants indicated in key for below —10° F.

3. COMPRESSOR AIR CLEANER—Use of highly inflammable solvents in washing the air cleaner can cause a severe explosion in the cleaner.

Use carbon tetrachloride for washing; if it is not available, OIL, fuel, Diesel may be used.

4. DRAWBAR—Weekly coat drawbar pivot pin, lunette eye, and threaded surfaces with GAA.

5. OIL CAN POINTS—Weekly clean and coat all control linkages, all springs, pins, clevises, and exposed threads with OE.

6. STARTER AND GENERATOR BEARINGS—Lubricate sparingly. When equipped with Life-Seal bearings or oil impregnated bushings, no lubrication required.

CAUTION: When so equipped, do not use solvents in cleaning. Wipe with oil-dampened cloth only.

7. WHEEL BEARINGS—Remove wheel, clean and inspect all parts, replace damaged or worn parts. Repack bearing and reassemble. If operating with faulty seals or under conditions of extreme moisture, lubricate with WB.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory and supersede all conflicting lubrication instructions dated prior to the date of this Lubrication Order.

BY ORDER OF THE SECRETARY OF THE ARMY:

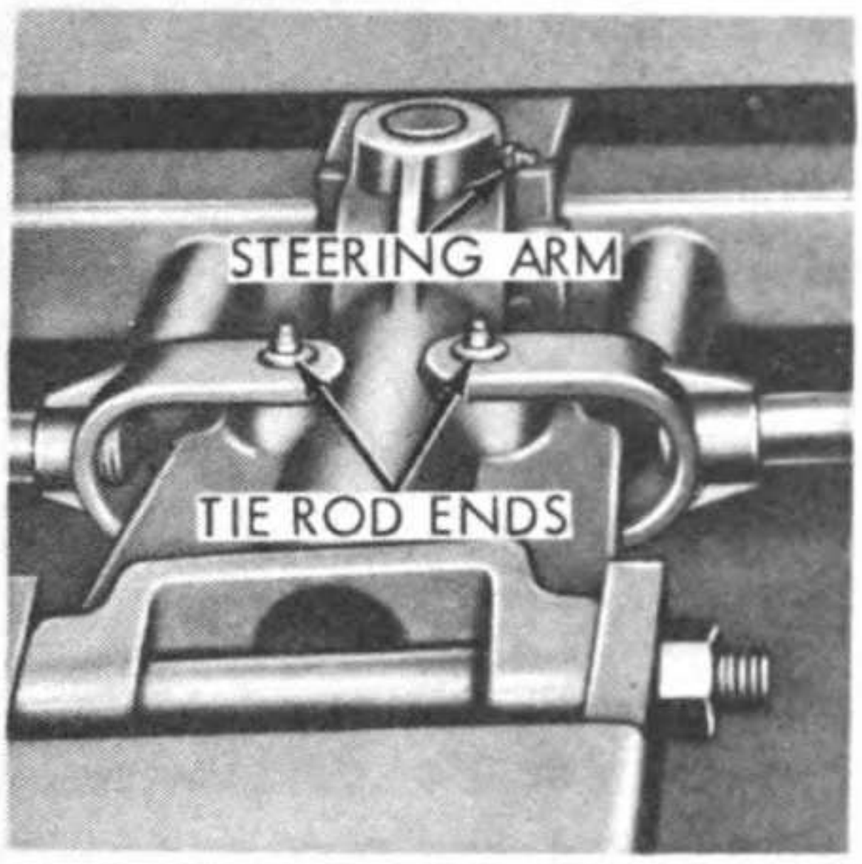
M. B. RIDGWAY
General, United States Army
Chief of Staff

OFFICIAL:

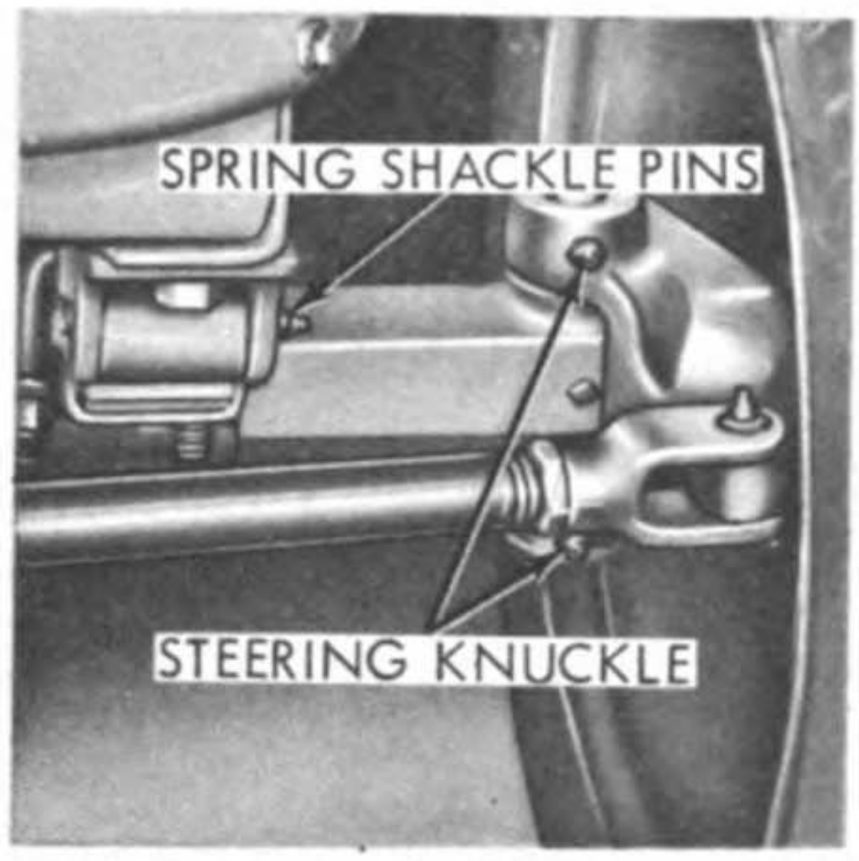
WM. E. BERGIN
Major General, United States Army
The Adjutant General

FB 5396-22/3

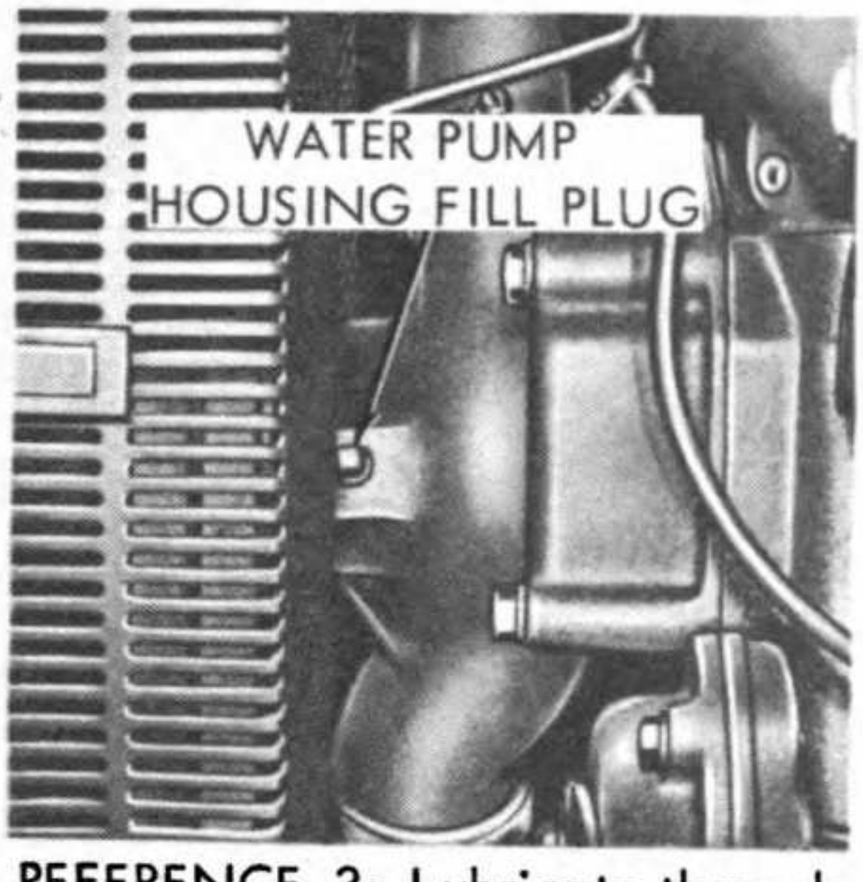
Figure 22. Lubrication order—Continued.



REFERENCE 1: Lubricate through fittings.

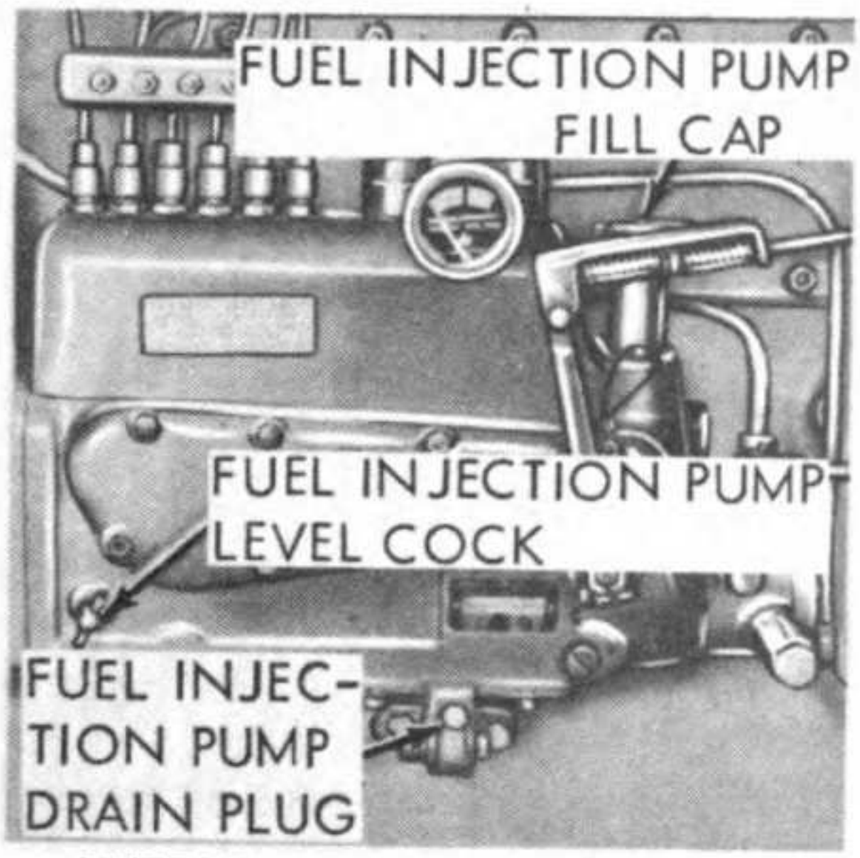


REFERENCE 2: Lubricate through fittings.

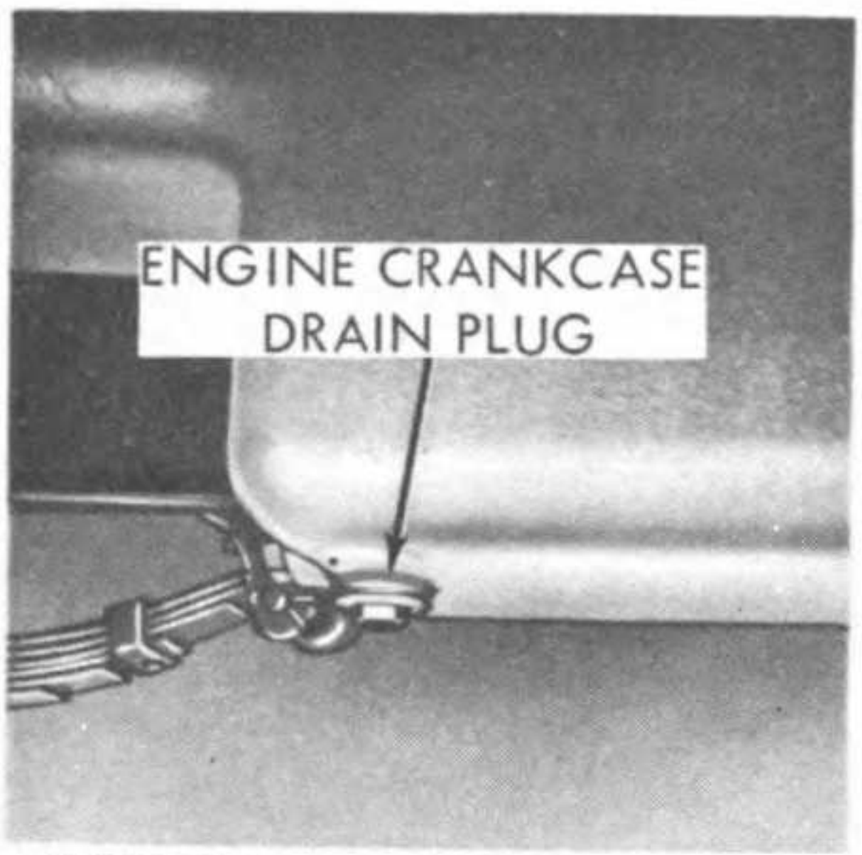


REFERENCE 3: Lubricate through plug.

REFERENCE 4: Lubricate through fitting.



REFERENCE 5: Check level, drain and refill.



REFERENCE 6: Drain and refill.

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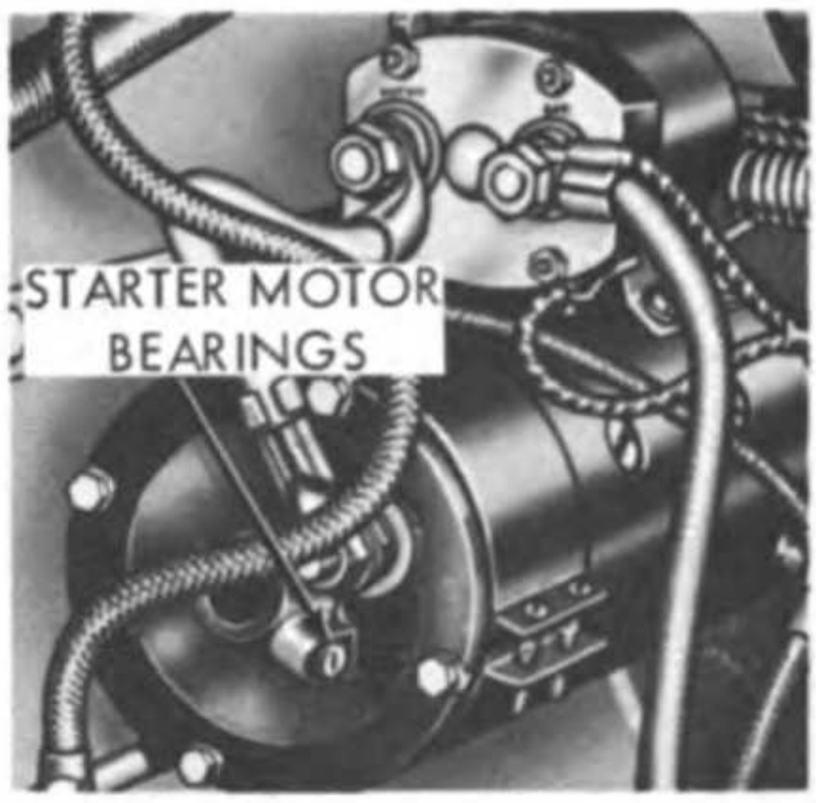
***Figure 22*—Continued.**

REFERENCE 7: Add 10 drops to oil cup.

REFERENCE 8: Fill to plug level.



REFERENCE 9: Remove plug and lubricate sparingly.

REFERENCE 10: Clean cup and refill to level mark.

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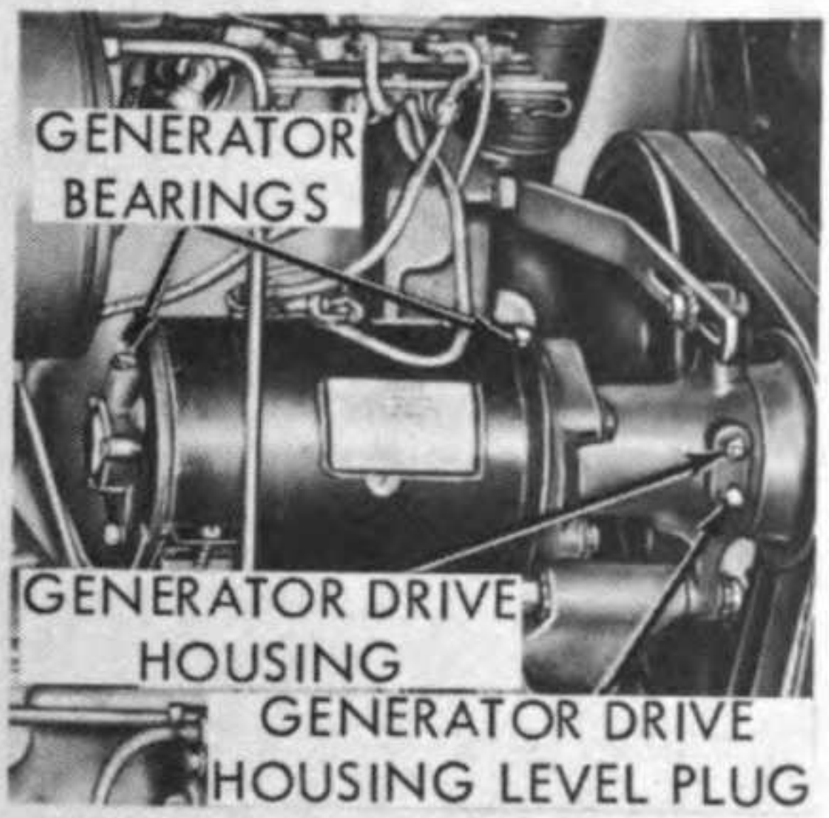
REFERENCE 11: Check level and refill.

REFERENCE 12: Lubricate through fitting.

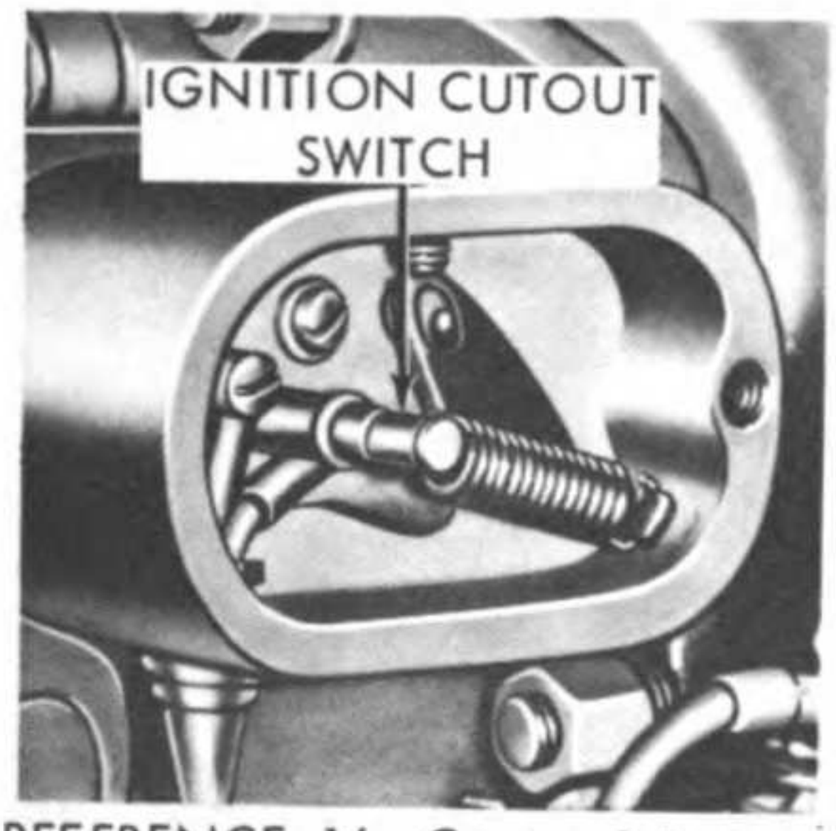
Figure 22. Lubrication order—Continued.

REFERENCE 13: Drain and refill.

REFERENCE 14: Remove plug, install fitting and lubricate; replace plug.

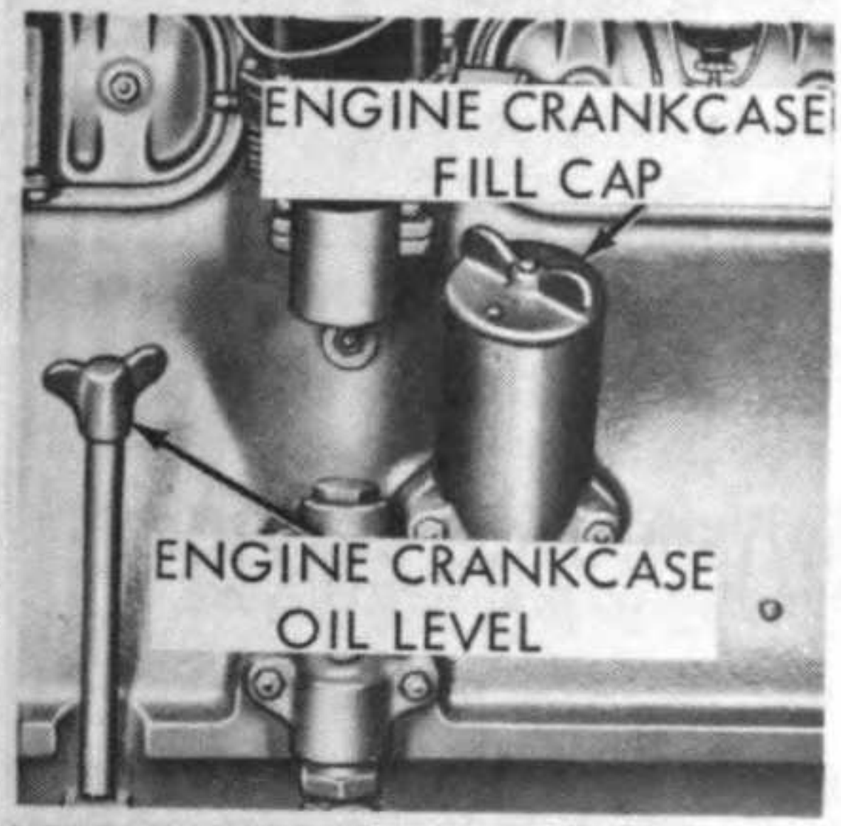


REFERENCE 15: Remove plug; lubricate to level of opening. Lubricate bearings through oil cups.

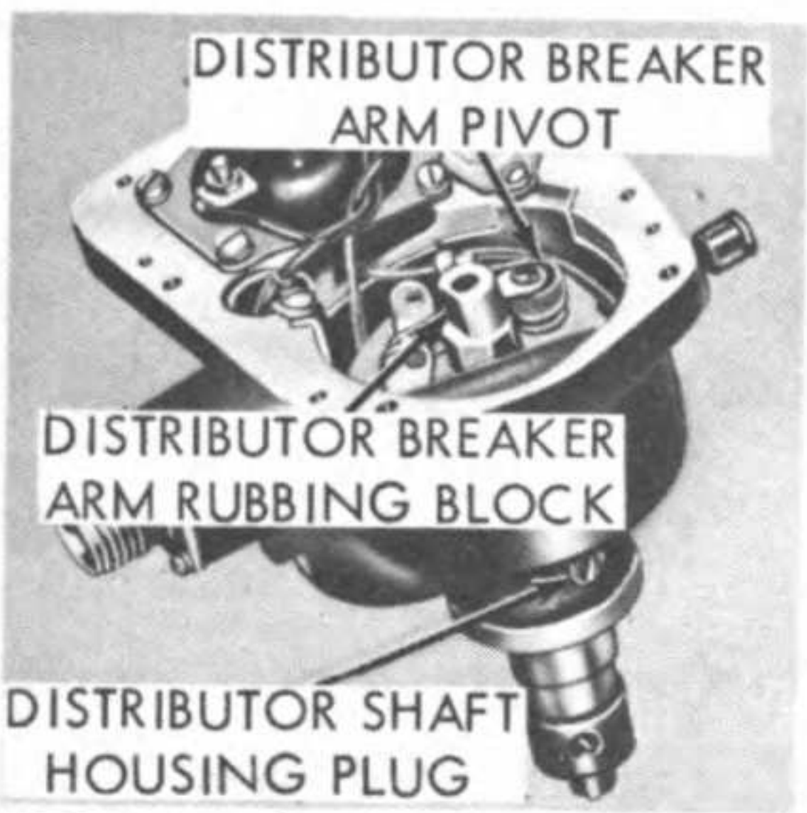


REFERENCE 16: Coat points sparingly with grease.

FB 5396-22/6



REFERENCE 17: Check level and refill.



REFERENCE 18: Coat pivot and block sparingly; remove level plug and refill housing.

***Figure 22*—Continued.**

REFERENCE 19: Clean and renew elements.

REFERENCE 20: Clean and refill to level mark.

REFERENCE 21: Clean and renew element.

FB 5396-22/7

Figure 22. Lubrication order—Continued.

52. Painting

When painting is required, refer to instructions in TM 9–2851 for proper materials and methods of application. Mask all parts which should not be painted, such as wiring and machined surfaces.

Section III. PREVENTIVE MAINTENANCE SERVICES

53. General

The operator of the air compressor and the organizational maintenance personnel must perform their preventive maintenance services regularly to make sure the air compressor operates well and to lessen the chances of mechanical failure.

54. Operator Maintenance

a. Inspections. Inspections must be made before operation, at halt, and after operation, as described in this section. All inspections of assemblies, subassemblies, or parts must include any supporting members or connections and must determine whether the unit is in good condition, correctly assembled, secure, or excessively worn. Any mechanical condition which may result in further damage to the unit must be corrected before the equipment is operated.

(1) The inspection for "good condition" is usually an external visual inspection to determine whether the unit is damaged beyond safe or serviceable limits, or to determine if it is in such a condition that damage will result from the operation. The term good condition is further defined as—not bent or twisted; not chafed or burned; not broken or cracked; not bare or frayed; not dented or collapsed; not torn or cut; adequately lubricated.

(2) Inspection of a unit to see that it is "correctly assembled" is usually an external visual inspection to determine whether it is in its normal assembled position in the equipment.

(3) Check of a unit to determine if it is "secure" is usually an external inspection, a hand-feel, or a pry-bar or wrench check for looseness in the unit. Such an inspection should include brackets, lockwashers, locknuts, locking wires, or cotter pins used in the assembly.

(4) "Excessively worn" means worn close to or beyond serviceable limits, a condition likely to result in a failure if replacement of the affected parts is not made before the next scheduled inspection.

b. Reporting Deficiencies. The operator will report all deficiencies on DD Form 110.

c. Before-Operation Services. The following services will be performed to determine if the condition of the equipment has changed since it was last operated and to make sure the equipment is ready for operation. Any deficiencies must be corrected or reported to the proper authority before the unit is put into operation.

(1) *Fuel.* Check the level of the gasoline tank; fill if needed. Replenish the diesel fuel before operation (par. 7*g*(5)).

Caution: When pouring gasoline, keep pouring spout or funnel in contact with the metal tank to prevent the discharge of static electricity from igniting the fuel vapors.

Notice any indications of leaks. Make sure the vent in the gasoline tank cap is open.

(2) *Oil.* Check the oil level in the crankcase; add oil of proper grade if necessary. Refer to LO 5–5396. Notice any indications of leaks.

(3) *Coolant.* Remove radiator cap and determine if coolant level is sufficient. The level should be slightly below bottom of filler opening. Add coolant as needed. In cold weather when antifreeze is used, a hydrometer test should be made before solution is added to determine if protection of cooling system is adequate.

(4) *Tires.* Check all tires for adequate inflation to recommended pressure of 45 psi; correct if necessary. Check to see that wheel mounting nuts are secure. Check for and remove any foreign material in tire treads.

(5) *Equipment.* Check to see that all accessory equipment and tools are properly mounted or stored in the deep toolboxes, (12, fig. 2), on the sides of the unit. Check to see that necessary equipment is in good working order.

(6) *Leaks, general.* Check under and around equipment and inside the engine-compressor compartment for any indications of fuel, gasoline, oil, water, or lubricant leaks.

(7) *Visual inspection.* Check for loose or missing bolts, nuts, screws, loose connections, broken wires, any damage that may have occurred since the equipment was last operated.

(8) *Valves.* Open air receiver drain valve (10, fig. 2).

(9) *Venting air from diesel fuel system.* Refer to paragraph 7*g*(5).

(10) *Starting.* Refer to paragraph 34 for starting procedure.

d. During-Operation Services. The operator is responsible for correcting or reporting unusual sounds or odors, deficiencies in performance, or other signs of abnormal operation. He will perform the following specific services.

(1) *Instruments.* Check the readings on the gages and meters frequently. At normal operating speeds, temperatures, and load, readings should be as follows:

Engine water temperature gage	RUN range
Engine oil pressure gage	White range
Compressor oil pressure gage	30–35 psi
Fuel pressure gage	OPERATING range
Ammeter	Steady charge or 0
Intercooler pressure gage	26–30 psi
Engine oil temperature gage	140°–170° F.
Compressor oil temperature gage	130°–160° F.
Air receiver pressure gage	90–100 psi

(2) *Unusual operation.* Check for signs of unusual operation such as excessive vibration, erratic engine compressor operation, incorrect instrument readings, burning wires, sparking, smoking and difficult or unusual operation of controls. Report any irregularity immediately to the proper authority.

(3) *Unusual noise.* Listen for unusual or abnormal operating noises. If noticed, stop operation of unit and report to proper authority.

e. At-Halt Services. During halts, even if only for short periods, the operator should make a general check of the equipment and correct or report any deficiencies noted, in addition to performing the following specific duties.

(1) *Fuel.* Check gasoline and diesel fuel supply; add fuel if necessary. Drain diesel fuel system water trap.

(2) *Oil.* Check oil level in crankcases; add oil if necessary.

(3) *Coolant.* Check cooling system level; replenish coolant if necessary.

Caution: If the engine overheats because of lack of coolant, allow it to cool before filling the radiator; otherwise the cylinder head and block may crack. If necessary to fill the radiator before engine cools, fill slowly with engine running at fast idle speed.

(4) *Leaks, general.* Check for fuel, oil, and coolant leaks.

(5) *Visual inspection.* Check for loose or missing bolts, screws, and nuts, and broken, lost, or damaged parts. Replace or report deficiency to the proper authority.

f. After-Operation Services. To insure that the equipment is ready to operate at any time, the following services must be performed by the operator or maintenance section immediately after any operating period of 8 hours or less. All deficiencies must be corrected or reported to the proper authority.

(1) *Shutdown precautions.*

(*a*) Allow engine to operate on gasoline for a few minutes before stopping engine.

(*b*) Push the compression release lever (fig. 14) forward to the diesel operating position immediately on shutting engine down. Leave it in that position after engine has stopped to allow valves to cool.

(*c*) Close gasoline shutoff valve (9, fig. 12).

(2) *Fuel, oil, and water.* Check and refill all tanks. Drain water and sediment from traps. Check antifreeze, if used. If antifreeze is added, run engine to mix thoroughly.

(3) *Clean equipment.* Wipe off any accumulation of oil and dirt. Inspect radiator and cooling fins; brush or blow out any foreign material. Wash unit weekly or more often if needed.

(4) *Tools and equipment.* See that all tools and equipment assigned to the compressor unit are in serviceable condition, clean, and properly stowed or mounted.

(5) *Lubrication.* Lubricate as required by LO 5–5396.

(6) *Fire extinguisher.* Check condition, mounting, and charge (par. 39). Do not discharge contents.
(7) *Visual inspection.* Check for any loss or damage that may have occurred to the unit or equipment during its operation. Correct or report to the proper authority.
(8) *Protection.* Close and secure canopy access doors. Inspect the security of any wheel blocks used. Preferably store the unit in an inclosure, if the situation permits, for protection against inclement weather conditions.

55. Maintenance and Safety Precautions

a. Common sense and normal precaution are invaluable aids in operating and maintaining the equipment. Never perform an operation which is not understood. Seek help from higher authority.

b. Dust and grit entering the compressor or engine fuel system can cause damage and ruin the equipment in a short time. To prevent damage, preventive maintenance accessories such as water traps, oil and fuel filters, strainers, and air cleaners should be given thorough attention and service. Strict adherence to the preventive maintenance services listed in this manual is essential for the efficient and dependable operation of this equipment.

c. High temperatures developed in the engine and compressor assemblies must be dissipated by efficient cooling. Adequate ventilation and an efficient cooling system insure good performance.

d. Inflammable gas is generated in batteries under charge. Never use an open flame or create sparks near the battery vents.

e. Battery electrolyte is an acid solution capable of damaging clothing and injuring personnel. Handle the electrolyte carefully.

56. Organizational Maintenance

a. Organizational preventive maintenance is performed by organizational maintenance personnel, with the aid of the operator, at weekly and monthly intervals. The weekly interval will be equivalent to 60 hours of use. The monthly interval will be equivalent to 4 weeks, or 240 hours, of use, whichever occurs first.

b. The technical inspection column is provided for the information and guidance of personnel performing technical inspection, and constitutes the minimum inspection requirements for the equipment.

c. The preventive maintenance services to be performed at these regular intervals are listed and described below. The numbers appearing in the columns opposite each service refer to a corresponding number appearing on DA Form 464, and indicate that a report of the service should be made at that particular number on Form 464. These numbers appear in either second, third, or both columns as an indication of the interval at which the service is to be performed.

Technical inspection	Service	
	Monthly	Weekly
1	1	1
2	2	2
	2	2
3	3	3
	3	3
4	4	4
5	5	5
6	6	6
	6	6
7	7	------
14	14	14
	14	14
15	15	15
	15	15

GENERAL

Before-operation services. Check and perform services listed in daily before-operation services (par. 54c).

Lubrication. Inspect the entire unit for missing or damaged lubrication fittings, lines, and grease cups and for indication of insufficient lubrication.

Lubricate if necessary. Refer to LO 5–5396. Replace missing or damaged fittings and grease cups.

Tools and equipment. Inspect condition of all tools and equipment assigned to the unit. Check condition and mounting of toolboxes or compartments.

See that all tools and equipment assigned to the unit are clean, serviceable, and properly stowed or mounted. See that toolboxes or compartments are in good condition and that they close and fasten properly.

Fire extinguisher. Check condition of fire extinguisher and inspect for full charge, proper working order, and secure mounting. The amount of charge in the carbon tetrachloride type can be determined by shaking the extinguisher and judging by sound and weight whether it is full.

Publications. See that this technical manual and LO 5–5396, as well as Standard Form 91, are with the equipment and in serviceable condition.

Appearance. Inspect the general appearance of the unit, paying special attention to cleanness, legibility of identification markings, and condition of paint.

See that deficiencies noticed are corrected or reported to the proper authority.

Modifications. See if all available modification work orders applying to this machine have been completed and recorded on DA Form 478.

ENGINE AND ACCESSORIES

Crankcase, breathers. Inspect the crankcase for leaks. Check the condition of crankcase breather and cap.

Correct or report any oil leaks noticed. Change the oil and clean the breather if necessary. Refer to LO 5–5396.

Oil filters. Inspect the oil filter assembly and connections for leaks while the engine is running.

Service the oil filters as specified in LO 5–5396. After servicing, check carefully for leaks while the engine is running.

Technical inspection	Service	
	Monthly	Weekly
		ENGINE AND ACCESSORIES—Continued
16	16	16	*Radiator.* Inspect the radiator for leaks, obstructions in air passages, and loose mounting bolts. Check all cooling system hose for leaks, deterioration, and loose connections. Check operating temperature and condition of coolant. If the engine temperature gage indicates above or below the RUN range during operation, the thermostats may be defective. If antifreeze is used, check the freezing point of the coolant.
	16	16	Drain, flush, and refill the cooling system if coolant is contaminated with rust or dirt. See that core air passages are clean. Renew any damaged or defective cooling system hose, lines, and gaskets. See that all mounting bolts and connections are tight. Protect the coolant from freezing, and record its freezing point on DA Form 464.
17	17	17	*Water pump, fan, and shroud.* Inspect the water pump for leaks and for loose mounting and assembly bolts. Check the condition and mounting of fan blades and shrouds.
	17	17	Tighten or replace loose or missing bolts and screws. If the pump leaks, refer to TM 5–5199, covering maintenance of the engine, for repair procedures.
18	18	18	*Belts and pulleys.* Inspect for excessively cracked or frayed belts. Check belt tension and condition and alinement of pulleys. Belts are properly adjusted when they can be deflected three-fourths of an inch to 1 inch from normal position at a point midway between the pulleys.
	18	18	Adjust the tension of the belts if necessary (par. 117*f*). Replace belts in pairs if frayed or badly worn. Do not use *one new* belt with *one old* belt.
21	21	21	*Compression release lever and linkage.* Inspect the compression release lever for freedom of action, security of mounting, and loose, missing, or damaged parts.
	21	21	Adjust linkage and repair or replace damaged parts as needed.
			FUEL SYSTEMS
39	39	39	*Carburetor and linkage.* See that all carburetor bolts and screws are in place and secure. See that linkage does not bind in operation.
	39	39	Tighten any loose mounting and assembly bolts and screws. Replace excessively worn or damaged linkage parts.
40	40	40	*Filter.* Inspect the gasoline strainer for dirt and sludge in the sediment bowl. Check the filter for secure mounting and tight connections. Check diesel fuel filter condition as indicated by fuel pressure gage.

Technical inspection	Service	
	Monthly	Weekly
		FUEL SYSTEMS—Continued
	40	40	Clean gasoline sediment bowl and screen (par. 120). Be sure gasket is in good condition before replacing bowl. Drain diesel fuel water trap (par. 124) and change filters (par. 125) if needed. Tighten any loose mounting bolts and connections.
41	41	41	*Air cleaner.* Inspect the air cleaner for loose connections. Check condition and level of oil in cup.
	41	41	Service the air cleaner as specified in LO 5–5396. Make sure there are no air leaks between the air cleaner and carburetor.
42	42	42	*Nozzles, injection pump, and housings.* Inspect the injection-pump housing for proper oil level, and inspect all lines and connections for leaks. Notice if the engine does not run smoothly or if the exhaust shows an excessive amount of smoke.
	42	42	Fill the pump housing as needed and retime the pump to correct smoky exhaust (par. 126).
43	43	43	*Gasoline tank, fuel tank, caps, gaskets, and carburetor.* Inspect the mounting of fuel tank, gasoline tank, and carburetor. Check tanks, carburetor, gaskets, and connections for leakage.
	43	43	See that tanks are securely mounted, air vents open, and fillercaps clean and tight fitting. Repair or renew leaky or damaged gaskets or connections.
44	44	44	*Fuel lines.* Check all fuel lines for leaks, loose connections, and damage.
	44	44	Repair or replace damaged or collapsed fuel lines. Tighten loose connections. Report all uncorrected deficiencies to the proper authority.
			ELECTRIC SYSTEM
47	47	47	*Batteries.* Inspect the batteries for cracked and leaky cases, loose holddown clamps, and dirt and corrosion on top of batteries. Check for loose, corroded, or damaged terminals and cables. Check level of electrolyte; proper level is approximately three-eighths to one-half of an inch above the plates. Check specific gravity, and record readings on DA Form 464. Readings from 1.275 to 1.300 at 80° F. indicate a fully charged battery. Readings of 1.225 or below indicate battery should be recharged or replaced.
	47	47	Clean all dirt and corrosion off top of batteries, posts, cables, and terminals. Replace damaged cables. Apply a thin film of chassis grease over terminals. Add distilled water if needed to bring solution up to proper level. If freezing temperatures prevail, battery must be charged long enough to mix solution thoroughly. Where possible, add water just before beginning operation. See that battery is securely mounted, that fillercaps are tight, and that vent holes are open (par. 136).

Technical inspection	Service		
	Monthly	Weekly	
			ELECTRIC SYSTEM—Continued
48	48	------	*Generator and starter.* Inspect generator and starter for loose mounting bolts and wire connections.
48	48	------	Inspect commutators and brushes for excess wear, dirt, and oil deposits. See if brushes are free in their holders and if brush wires are secure. Minimum length of brushes before replacement is five-eighths of an inch.
	48	------	Tighten any loose mounting bolts and wire connections. Replace or free brushes, and clean commutators if necessary (par. 138).
49	49	49	*Distributor and coil.* Inspect security of mounting and assembly.
	49	49	Tighten any loose screws. Wipe off housing.
50	50	50	*Wiring and switches.* Check the wiring for oil-soaked, cracked, or frayed insulation, and broken wires and loose or corroded connections. Test the ignition switch for proper operation.
	50	50	Replace defective wires or switch. See that connections are clean and tight. See that all switch wiring is securely attached.
51	51	51	*Voltage regulator.* Check the voltage (generator) regulator for proper operation and secure mountings. See that wire connections are tight. The regulator should allow the generator to charge the battery after the starter is used. After the battery is fully charged, the ammeter should read only a slight charge or zero.
	51	51	Tighten or replace any loose or missing mounting screws. Replace the regulator if defective (par. 135).
			CONTROL SYSTEM
57	57	57	*Gages.* Inspect the temperature, pressure, and oil gages on the instrument panel, and the pressure gage on the injection pump, for cracked or broken glass, insecure mounting, or defective operation.
	57	57	See that gages are securely mounted. Replace damaged or defective gages (pars. 96, 98, 101, 102, 112, 113, 116, and 127).
58	58	58	*Ammeter.* Inspect ammeter for cracked or broken glass, loose mounting screws, and defective operation.
	58	58	Tighten or replace loose or missing mounting screws. Replace damaged or defective ammeter (par. 137).
69	69	69	*Tie rod, linkage.* Inspect the tie rods and tie rod linkage for loose, missing, or damaged parts, bolts, nuts, and grease fittings. See that cotter pins are secure.
	69	69	Tighten or replace all loose or missing parts, bolts, nuts, and grease fittings. Install new pins if broken or missing (par. 150).

Technical inspection	Service		
	Monthly	Weekly	
			CONTROL SYSTEM—Continued
71	71	71	*Hydraulic control system (clutch hydroshift).* Check to see that clutch shifter pump, lines, and connections are in good condition and securely mounted. Check entire system for leaks. Check fluid level in pump housing. (Proper level is to bottom edge of filler plug.) See that rubber grommet for hydraulic line in clutch housing is in place.
	71	71	Tighten any loose mounting bolts and connections and correct any leaks noted. Fill clutch shifter pump to proper level. Refer to LO 5–5396.
72	72	72	*Drawbar and lunette.* Inspect the drawbar and lunette for secure mounting and bent or broken parts.
	72	72	Tighten, repair, or replace any loose, damaged, or missing parts, and lubricate.
			FRAMES AND MOUNTINGS
76	76	76	*Tires.* Inspect all tires for low air pressure, excessive wear, cuts, embedded foreign material, and missing valve caps.
	76	76	Remove any foreign material from tires. See that all tires are inflated to 45 psi and all valve caps are in place.
78	78	78	*Rear Wheels.* Check stud nuts for tightness. Look for leaky seals.
	78	78	Tighten any loose nuts or cap screws and replace leaky seals (par. 147).
79	79	79	*Front wheels.* Check for loose mounting and leaky seals.
	79	79	Tighten loose nuts. Replace leaky oil seals (par. 148).
80	80	80	*Frame.* Inspect frame for cracks, breaks, broken welds, and loose and missing bolts.
	80	80	Tighten or replace all loose or missing bolts. Repair cracks, breaks, and broken welds before further damage results.
81	81	81	*Front axle assembly.* Check for cracks, bent parts, alinement, and toe-in.
	81	81	Replace, repair, or report any deficiencies noted (pars. 147–152).
82	82	82	*Rear axle assembly.* Inspect axle assembly for alinement and loose or missing bolts and nuts.
	82	82	See that all nuts and bolts are in place and tight. Correct or report any deficiencies noted (par. 152).
83	83	83	*Springs and mountings.* Inspect springs for broken leaves and rebound clips. Check for damaged brackets and shackle pins and evidence of shifting.
	83	83	Replace defective springs. Tighten, repair, or replace missing bolts and shackle pins (par. 149).
95	------	------	*Clutch.* Check for proper clearance between driven plate and lined drive plate (par. 142). Inspect for worn, damaged, or missing parts. Replace, repair, or report any deficiencies noted.

Technical inspection	Service		COMPRESSOR
	Monthly	Weekly	
141	141	141	*Air compressor.* Check the mounting of the air compressor. Check for air and oil leaks and for unusual noises while compressor is operating. Check trigger valve, unloading mechanism, and receiver safety valve for proper operation. Trigger valve should control the unloader mechanism so it will automatically maintain air receiver air pressure at 100 psi. Inspect the air cleaner for loose connections.
	141	141	Tighten any loose mounting bolts and connections. Replace damaged lines and fittings. Adjust pressure range (par. 108) if needed. Remove and disassemble air cleaner. Wash all parts in solvent or fuel oil. Reassemble and service as specified in the lubrication order.
142	142	142	*Intercooler, fan, and shroud.* Inspect intercooler for obstructions in core air passages. See that intercooler safety valve is operable. Check fan, shroud, and pulleys for condition, alinement, and secure mounting. Check condition and tension of belt. Belt is properly adjusted when it can be deflected three-fourths of an inch at a point midway between the pulleys.
	142	142	Clean intercooler core if necessary and tighten any loose mounting bolts and connections. Adjust fan belt if necessary (par. 94). Replace belt if it is badly worn or frayed.
144	144	144	*Valves (inlet and discharge).* Check valves for leaks or faulty valve seats. A leak in the low-pressure suction valve is indicated by a hissing noise in the air filter under load. A constant blowing of the intercooler safety valve indicates a leak in the high-pressure suction valves. Paint air line connections with soapy water. Bubbles indicate air leaks (slight leaks are permissible if air receiver maintains pressure).
	144	144	Remove valves if necessary and clean thoroughly (par. 104). Replace all broken or damaged parts.
145	145	145	*Unloader.* Unloaders should open inlet valves when receiver pressure exceeds 100 psi. After trigger valve cuts off pressure to unloaders, check valve should keep compressor unloaded until engine reaches full-load rpm.
	145	145	Adjust trigger valve if necessary (par. 108). Adjust check valve screw if needed (par. 109).
146	146	146	*Cylinders, heads, and gaskets.* Inspect cylinders and cylinder-head mounting bolts for tightness. Check for leaks at gaskets.
	146	146	Tighten cylinder and head mounting bolts if necessary. Replace leaky gaskets (par. 105).
147	147	147	*Crankcase and oil filter.* Inspect oil pan and plugs, oil filter, and lines and connections for leaks.

Technical inspection	Service		COMPRESSOR—Continued
	Monthly	Weekly	
	147	147	Change crankcase oil and replace oil filter element as directed in LO 5–5396. See that all connections are tight.
148	148	148	*Aftercooler.* Inspect the aftercooler for secure mounting, clogged fins, bent or damaged pipes, and leaks.
	148	148	Tighten any loose bolts. Clean or remove foreign material from between fins (par. 93). Repair or replace damaged parts. Correct leaks.

Section IV. TROUBLESHOOTING

57. Use of Troubleshooting Section

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air compressor unit or any of 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.

Note. All references in this section to paragraphs 187 through 274 pertain to operations that are the responsibility of the field and depot maintenance personnel. Organizational maintenance personnel should not proceed without proper authority.

58. Engine Turns But Does Not Start

Probable cause	*Possible remedy*
Engine flooded	Allow engine to stand with choke open before restarting. Use choke correctly (par. 34*i*).
Gasoline shutoff valve closed	Open valve (par. 34*c*).
Gasoline tank empty	Fill tank (par. 7*g* (5)).
Gasoline lines or strainer clogged	Disconnect lines and blow out with air; clean strainer (par. 120).
Gasoline diluted with water or with diesel fuel.	Drain tank, strainers, and carburetor. Keep tank full to prevent moisture condensation in tank. When filling combination gasoline tank and diesel fuel air trap, pour liquids into correct compartment (par. 7*g* (5)).
Ignition switch in STOP position	Place switch in the RUN position.
Defective ignition distributor and coil assembly.	Replace or repair. See *Note* in paragraph 57.
Ignition timing incorrectly	Time distributor. See *Note* in paragraph 57.
Clutch engaged	Disengage clutch (par. 34*b*) to permit engine to turn without load.
Compression release lever in diesel position.	Pull lever back to gasoline (starting) position.

Probable cause	*Possible remedy*
Carburetor fuel bowl empty	Clean vent in gasoline tank fillercap. Clean lines and fuel strainers (par. 120).
Loose or broken wires	Inspect and tighten or replace defective parts.
Spark plugs wet or defective	Remove spark plugs and check for broken insulators, incorrect gap, moisture, or fouling. Clean and adjust plugs. Refer to TM 5–5199.
Manifold ignition-cutout switch inoperative.	Remove cover and disconnect wires from switch. Connect wires together and try to start engine, if engine starts, switch is defective and must be replaced. ***Caution:*** Do not switch to diesel operation if engine starts during this test. Severe damage may result if spark plugs fire in closed auxiliary combustion chamber.
Broken timing gears	See *Note* in paragraph 57.

59. Engine Does Not Turn

Probable cause	*Possible remedy*
Batteries discharged	Test battery and charge or replace.
Cables and terminals faulty or loose	Inspect for loose or dirty connections, worn insulation, or broken wires. Tape frayed or worn spots, clean and tighten connections, or replace cables.
Starting switch defective	Replace switch.
Starting motor commutator worn or dirty.	Clean and dress commutator (par. 138*d*). See *Note* in paragraph 57.
Starting motor defective	Check (par. 138*b*), replace (par. 138) or repair (par. 247).
Crankcase oil too heavy for cold-weather operation.	Use proper grade. Refer to LO 5–5396 for proper lubricant.
Internal engine parts seized or broken.	Remove spark plugs, disengage clutch, position controls for gasoline starting, and attempt to crank engine with starter. If engine does not turn easily, refer to TM 5–5199 for instruction.

60. Engine Does Not Operate on Diesel Cycle

Probable cause	*Possible remedy*
Shutoff valve closed	Open valves for starting (par. 34).
Air in fuel system	Fill air trap with fuel and vent system (par. 7*g*(5)).
Diesel fuel lines or strainers clogged	Disconnect lines and blow out with air; clean strainers and filters (pars. 123–125).
Compression release mechanism inoperative.	See *Note* in paragraph 57.
Starting valves defective	See *Note* in paragraph 57.
Butterfly valves in intake manifold not operating.	See *Note* in paragraph 57.
Diesel fuel diluted with water	Drain, clean, and refill entire system (pars. 123–125).

61. Engine Operates Erratically on Diesel Cycle

Probable cause	*Possible remedy*
Diesel fuel filters dirty	Check fuel pressure gage (par. 29). If gage indicates CHANGE FILTER, replace filter elements (par. 125).
Improper fuel being used	Use recommended fuel.
Injection nozzles dirty or worn	Replace nozzles (par. 128).
Injection pump not timed to engine	Time pump to engine correctly (par. 126).
Injection pump defective	Replace pump (par. 126).
Engine lacks compression	See *Note* in paragraph 57.
Valve clearance insufficient or valves sticking.	See *Note* in paragraph 57.
Valves, rings, cylinder head, or gaskets defective.	See *Note* in paragraph 57.

62. Engine Exhaust Sooty

Probable cause	*Possible remedy*
Improper or poor grade of fuel	Use correct fuel.
Injection nozzles faulty	Replace (par. 128).
Injection pump timing incorrect	Retime pump to engine (par. 126).
Engine overloaded	Reduce load.

63. Engine Exhausts Blue-White Smoke

Probable cause	*Possible remedy*
Crankcase oil level too high. Engine burning crankcase oil.	Read oil-level gage properly. Do not overfill.
Crankcase oil of improper grade	Use grade of oil specified in LO 5–5396.
Rings, valve guides, cylinder sleeves, pistons, or bearings worn.	See *Note* in paragraph 57.

64. Engine Abnormally Noisy

Probable cause	*Possible remedy*
Distributor timing incorrect (gasoline cycle).	Check and adjust distributor timing (par. 269). See *Note* in paragraph 57.
Firing order incorrect (gasoline cycle).	Check spark plug cable installation sequence.
Worn internal parts	See *Note* in paragraph 57.

Note. For additional engine trouble-shooting, refer to TM 5–5199.

65. Water Temperature Gage in HOT Range

Probable cause	*Possible remedy*
Insufficient coolant in cooling system	Check coolant level and replenish if necessary.
	into system until the engine cools. This prevents cylinder-head damage.
	Caution: Do not pour cold water
Leaks in cooling system	Inspect hoses, radiator caps, water pumps, and gaskets. Tighten connections or replace parts as necessary.
Fan belts slip	Adjust and tighten belts (par. 117).
Cooling system clogged	Clean radiator fins, and flush radiator (par 115).

69. Ammeter Registers Constant Discharge

Probable cause	*Possible remedy*
Drive belts loose	Adjust (par. 117).
Batteries installed incorrectly	Stop engine immediately and connect batteries correctly.
Wiring broken, insulation worn, or short circuits.	Check wiring and insulation; tape and repair as needed.
Battery cutout relay in regulator holding closed.	Disconnect wire from BAT terminal at regulator. If ammeter needle returns to zero, relay contacts are stuck. Replace regulator (par. 135).

70. Ammeter Needle Fluctuates Rapidly Between Charge and Discharge

Probable cause	*Possible remedy*
Loose connections or short circuits	Check, clean, tighten, repair, or replace as needed.
Generator belts loose	Adjust (par. 117).
Generator or regulator defective	To determine which is at fault, connect a jumper lead from the F terminal of the regulator to ground with the engine operating. Slowly increase engine speed. If the ammeter registers charge, the regulator (or the wiring between the regulator and generator) is faulty. If the ammeter fails to register charge, the generator is faulty. Replace the regulator or generator or both (pars. 134 and 135).

71. Compressor Assembly Fails To Maintain Pressure

Probable cause	*Possible remedy*
Compressor air cleaner clogged	Remove and service air cleaner bowl (LO 5–5396). ***Caution:*** Do not use volatile, inflammable solvents to wash the air cleaner or an explosion may occur when operation is resumed. Use carbon tetrachloride or other noninflammable solvents only.
Check valve defective	Adjust check valve regulating screw or replace (par. 109).
Trigger valve dirty or faulty	Remove strainer and clean; reset trigger valve (par. 108) or replace.
Suction or discharge valve faulty	Remove valves and replace parts as needed (par. 104).
Leaks in compressed air system	Check intercooler and air receiver connections, pipes, drain valves, and safety valves. Replace parts as needed.
Clutch disks worn or improperly adjusted	Disengage clutch. Remove clutch housing cover and inspect clutch. Adjust (par. 142).

72. Compressor Air Pressures Too High

Probable cause	*Possible remedy*
Unloaders fail to open valves	Apply soapy solution to unloader pipes and connections to detect leaks. Replace defective parts. Remove unloader cover and check for broken or defective parts (par. 103).
Suction or discharge valves faulty	Remove valves and replace parts as needed (par. 104).

73. Compressor Temperatures Too High

Probable cause	*Possible remedy*
Compressor lubricating oil level too low.	Fill compressor crankcase to proper level. (See LO 5–5396.)
Intercooler and aftercooler fins dirty	Blow air through fins. Wipe off oil accumulations.
Intercooler internal passage clogged	Flush intercooler (par. 95).
Intercooler fan belts loose	Adjust or replace (par. 94).
Compressor cylinder cooling fins oily and dirty.	Clean cylinders with solvent.

74. Compressor Oil Pressure Low

Probable cause	*Possible remedy*
Lubricating oil level too low	Check crankcase oil-level gage. Add oil as needed. (See LO 5–5396.)
Lubricating oil of improper grade	Drain crankcase and refill with oil specified in LO 5–5396.
Lubricating oil filter dirty	Replace filter element (par. 99).
Worn connecting rod bearings or oil pump.	See *Note* in paragraph 57.
Defective gage	Replace gage (par. 101).

75. Throttle Control Fails to Operate During Unloading

Probable cause	*Possible remedy*
Trigger valve faulty	Remove valve. Clean and adjust, or replace (par. 109).
Throttle control cylinder faulty	Remove throttle control cylinder. Clean, repair, and adjust (par. 107).
Leaks in throttle control and unloader system.	Apply soapy solution to all pipes and connections to find leaks. Repair or replace the defective parts.

76. Compressor Noisy in Operation

Probable cause	*Possible remedy*
Connecting rod bearings worn and knocking.	See *Note* in paragraph 57.
Piston pin or connecting rod link pins worn and rapping.	See *Note* in paragraph 57.
Unloaders or valve assemblies loose in mountings.	Check installation of assemblies. Reassemble and tighten (pars. 103, 104.)

77. Compressor Will Not Track When Towed

Probable cause	*Possible remedy*
Steering-knuckle kingpins worn	Replace (par. 151).
Tie rod linkage worn or out of adjustment.	Replace worn yokes and pins. Adjust (par. 150).
Axles bent	Replace (par. 152).
Springs, brackets, or U-bolts broken or shifted.	Replace (par. 149).

78. Intercooler Safety Valve Blows During Loading

Probable cause	*Possible remedy*
Blown high-pressure valve gasket; broken valve strip; or blown high-pressure cylinder-head cover gasket.	If condition continues while unit is unloaded, the trouble can be localized in the discharge valves or gaskets. Stop engine and release compressed air. Remove the high-pressure cylinder-head covers and valves (par. 104). Inspect gaskets and valve strips. Replace as needed.
High-pressure unloader piston stuck in unloading position.	Stop engine and release compressed air. Remove unloader cover, and attempt to move piston with fingers. It should move under finger pressure if not stuck. If stuck, remove and clean (par. 103).
Intercooler tubes clogged	Clean out or replace core (par. 95).

79. Intercooler Safety Valve Blows During Unloading

Probable cause	*Possible remedy*
Blown high-pressure discharge valve gasket or broken strips in high-pressure discharge valve permitting air to leak back from tank.	Remove high-pressure cylinder-head covers and valves. Inspect gaskets and valve strips. Replace as needed (par. 104).
Broken power spring or unloader fingers broken off in a low-pressure cylinder.	Remove low-pressure unloader covers, and check for a piston which is at the bottom of its stroke or can be easily pushed down. Replace damaged parts (par. 103).

80. Intercooler Pressure Abnormally Low During Loading

Probable cause	*Possible remedy*
Blown low-pressure valve or cover gasket or broken strip in low-pressure valve.	To localize the trouble, disconnect the intake hose at the manifolds or cylinder heads. Tightly cover each intake in turn with a piece of stiff cardboard or flat metal sheet. Observe the intercooler pressure each time. The intake covered when the highest pressure reading occurs indicates the cylinder bank at fault. Remove covers, and replace defective gaskets or valve strips (par. 104).
Low-pressure unloader piston stuck down.	Remove low-pressure unloader covers, and check unloader pistons. Repair as needed (par. 103).

81. Air Receiver Safety Valve Blows

Probable cause	*Possible remedy*
Broken unloader tubing or loose fittings.	Check tubing from trigger valve to unloaders. Repair or replace as needed.
Broken high-pressure power spring or unloader fingers.	Remove high-pressure unloader covers, and check for piston at bottom of stroke or an easily depressed piston. Repair or replace as necessary (par. 103).

82. Compressor Unloads at Very Low Pressure

Probable cause	*Possible remedy*
Trigger valve spring broken.	Loosen locknut, and unscrew adjusting screw to inspect spring. Repair and adjust (par. 108).
Trigger valve stuck open by dirt; broken strainer.	Disassemble, clean, inspect, and replace worn parts (par. 108).

83. Compressor Loading Delayed After Engine Accelerates

Probable cause	*Possible remedy*
Check valve regulating screw plugged with dirt or improperly adjusted.	Remove valve, clean out, and adjust regulating screw so compressor loads just as engine reaches full speed (par. 109).

Note. Intercooler gage readings are good indicators of proper compressor operation. When the compressor is building up receiver pressure to 100 psi, the intercooler gage varies from about 26 psi for a cold compressor to 30 psi for a unit operated under full load for 15 or 20 minutes to warm it thoroughly. If the intercooler pressure and the speed are correct, the compressor is delivering its rated capacity.

Section V. RADIO SUPPRESSION

84. Definition of Suppression

Radio noise suppression is the elimination, by the addition of shielding, resistance, and capacitance, of electrical interference generated by the ignition system and generating system when the engine is operating. In unsuppressed systems, this interference is actually "broadcast" in the form of weak radio waves radiated from wires acting as antenna, and from spark gaps. The suppression of this interference is desirable to prevent interference with local radio reception and to prevent the enemy from locating the equipment installation with the aid of sensitive radio direction-finding equipment.

85. Sources of Interference

a. Spark plugs, spark plug wires, the distributor and coil assembly, the starting motor, the generator, and generator regulator relays contribute to the generating of radio interference. In the various components of this system there are numerous places where a rapid "make and break" of the electrical circuit occurs. Whenever current jumps an air gap, electromagnetic waves are sent through the air. Since radio waves are electromagnetic waves, it is easy to see the effect of sparks upon radio reception.

b. In addition, when inductance (coil windings) is present, the rapid making and breaking of the circuit causes an electromotive force (voltage) to build up in the coils. If the circuit is closed and opened rapidly enough, electromagnetic waves at radio frequencies may radiate into the air from the wires connected in the circuit. In the radio receiver these waves are reproduced as static.

86. Methods Used To Suppress Interferences

a. In this system four methods are employed to reduce radio interference to an acceptable minimum. Braided metal coverings woven around the insulated wires in the offending circuits are used as shielding. Wires constructed in this manner are called shielded cable. Both ends of the shielding around the conductors are connected to ground and prevent radiation by providing an easy path to ground for the interference waves. It should be noted that there is no electrical connection between the braided shielding and the insulated wire it shields.

b. Resistor suppressors in the distributor rotor and in each cap terminal prevent current from jumping the gaps until the rotor gap is at a minimum and the secondary voltage is maximum. Thus only one clean spark is produced each time the rotor alines with a cap terminal, and unwanted oscillation is suppressed.

c. Capacitors (condensers) installed at various points in the system serve two purposes in the suppression system. When installed between one contact (of a pair) and ground, the capacitor absorbs the surge of current that would ordinarily attempt to jump the gap when the contacts are separated. In this manner spark, or arc-over, is eliminated.

d. In addition, a capacitor offers a low-resistance path to alternating current but will not pass direct current. (Alternating current is present in the generator armature windings and in portions of the ignition circuit. Stray alternating currents may also be induced in the wiring running near the magnetic fields produced by the circuit.) Thus a capacitor may be connected between a point carrying direct current and ground to allow any alternating current present to flow easily to ground without short circuiting the direct current.

e. Bonding, providing good continuity to ground, is accomplished by using toothed lockwashers under the mounting bolts of the electrical accessories. When tightly compressed by the mounting bolts, the many sharp teeth of the washer dig into the metal and assure positive contact. This bonding prevents the buildup of static charges, which might accumulate on the metal surfaces, by providing a path to ground. Without this path the static charge could jump the gap at the mounting points and produce interference.

87. Effects of Suppression

Radio noise suppression is considered satisfactory when no interference is detected over the frequency range of 0.55 through 156.0 megacycles at a distance of 25 feet from the compressor.

88. Suppression Test Setup

Locate the air compressor in an area that is free of electrical interference produced by other equipment. Then install a radio receiver in good operating condition not more than 25 feet from the air compressor. Select a wide-band receiver covering the frequency range of 0.55 through 156 megacycles, if possible. Before testing the air compressor for proper suppression, listen to the receiver to be sure the test area is relatively free from outside interference.

89. Suppression System Testing

a. Start the compressor engine and operate on the gasoline cycle to permit the electric ignition system to operate. Turn the receiver volume control to maximum and tune through three widely separated frequencies for listening. Select frequencies free from signals with strong carriers so that the receiver will operate at its most sensitive condition. If the receiver has a noise limiter circuit, the switch in the circuit should be in the off position.

b. Listen to the receiver speaker or headset with the engine idling on gasoline. Any ignition interference will be reproduced at the receiver as a regular clicking sound. The clicks will disappear when the ignition is turned off or the engine is shifted to operation on diesel fuel.

c. Operate the engine as a diesel and listen for a high-pitched whine that varies as the engine speed is increased or decreased. The whine is interference caused by the generator. Intermittent clicks during diesel operation are caused by generator regulator action.

d. When the interference has been traced to its source by the above checks, systematically replace the suppression devices in that system, and repeat the check after replacement of each part until the interference is no longer heard.

90. Suppression Component Replacement

a. General. Replacement procedures for suppression components are obvious except as noted in *b* and *c* below. Replacement with identical parts is vital to proper interference suppression. Do not attempt to substitute parts unless the substitution is authorized in an official supply manual. Location and connection of shielding and capacitors in the circuits are clearly indicated in the wiring diagram (fig. 58). Suppression devices are not used in the starting motor

circuit since the starter operates for only a few seconds of each operating period.

b. Ignition System Components. Most of the ignition suppression devices are contained within the ignition distributor and coil assembly under the metal cover. Since removal of the distributor cover requires partial disassembly of the carburetor, organizations not authorized to disassemble the carburetor should not attempt to replace suppression components within the distributor assembly. Only the first two items below can be replaced without removing the distributor and coil cover.

(1) Spark plug cable assemblies are shielded and include spring-loaded terminals.
(2) Spark plugs are a special one-piece shielded type.
(3) The distributor rotor incorporates a built-in resistor as part of the assembly.
(4) The one-piece moulded cap, attached to the inside of the distributor cover, includes built-in resistors for each high-tension outlet. The entire cap must be replaced if one resistor is defective.
(5) A feed-through capacitor is located within the housing of the primary terminal connection at the front of the assembly. The pigtail lead at the inner end is connected to the large primary circuit resistor mounted in a well in the distributor housing.
(6) A bypass capacitor is mounted in a well in the distributor housing. The pigtail lead is connected to the negative terminal of the ignition coil and the case is grounded in the housing.
(7) Bonding washers are used under distributor mounting bolts.

c. Generator and Regulator Components. Capacitors, shielded wires, and bonding washers are employed in this system as follows:

(1) A capacitor, mounted on the generator frame, reduces arc-over from the brushes to the commutator. The capacitor lead is connected to the generator A terminal and the capacitor case is grounded through its mounting clamp to the ground screw on the generator frame (fig. 58).
(2) Two capacitors are mounted to the under side of the generator regulator mounting bracket by a common screw through their mounting clamps. A short lead is connected from the BAT lug on the regulator to the terminal of the rear capacitor. An unshielded lead from the ammeter also connects to the rear capacitor terminal. A short lead from the GEN lug on the regulator connects to the terminal of the forward capacitor; the center conductor of a shielded cable from the

A terminal of the generator also connects to this capacitor terminal.

(3) A braided metal shield surrounds the generator-A-terminal to regulator-GEN-terminal wire. A similar shield is used on the generator-F-terminal to regulator-F-terminal wire. The upper ends of both shields are grounded to the capacitor mounting screw below the regulator bracket. The lower ends of both shields are grounded to the ground screw securing the capacitor on the generator frame.

(4) A braided metal ground strap connects the generator regulator base to the bracket mounting screw.

(5) Toothed bonding washers are used under all mounting bolts at the generator and at the regulator mounting bracket. Metal surfaces under these washers should be clean and free of thick paint deposits.

Section VI. COMPRESSOR ASSEMBLY

91. Description

The compressor assembly is a 6-cylinder, 2-stage unit designed to deliver 500 cfm of compressed air at 100 psi. It consists of four main systems and components—the compressor subassembly (crankcase and cylinders), the compressor lubricating system, the compressor air system, and the throttle control and unloader system.

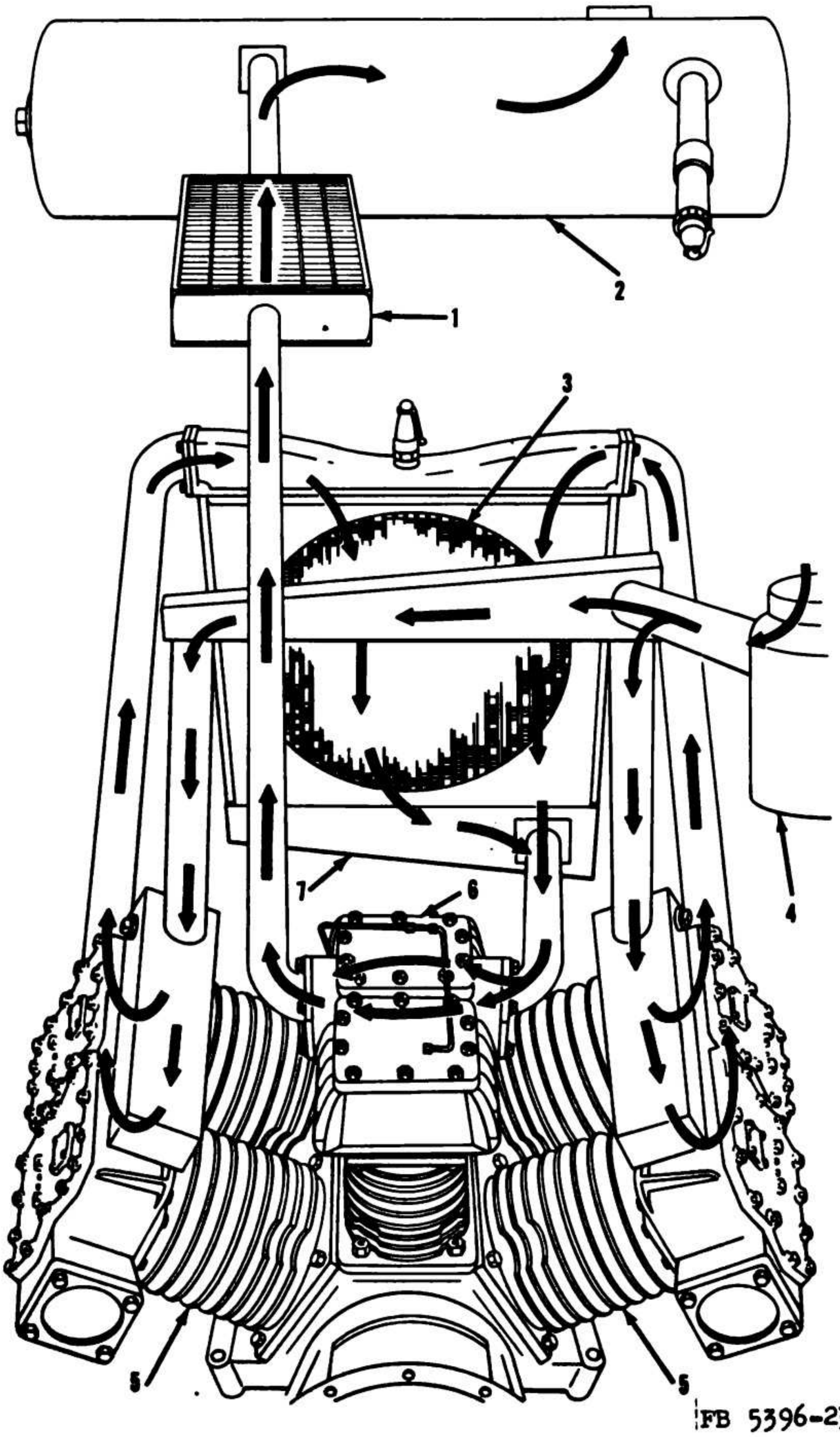
a. Compressor Subassembly. The compressor subassembly has 6 cylinders arranged in 3 banks in the form of the letter **W**. Two high-pressure cylinders in separate castings form the center bank. Two low-pressure cylinders, inclosed in a single casting, form each of the outer banks. There are three cylinder heads, one for each bank of two cylinders. Each cylinder head contains two unloaders and two suction and discharge valves. The unloaders hold the suction valves open when maximum air pressure is reached, thus preventing the pistons from compressing more air.

b. Compressor Lubrication System. The compressor lubrication system consists of an oil sump formed as a part of the compressor crankcase, an oil pump assembled to an oil pump drive cover at the rear of the crankcase, an oil filter mounted on the right side of the intercooler, a pressure relief valve in the drive cover, and an oil pressure gage and oil temperature gage connected into the system. The oil pump is a gear-type pump operated by a gear train coupled to the intercooler-fan drive pulley which is rotated by the compressor crankshaft.

c. Compressor Air System. The air system consists of the air cleaner and manifolds, the intercooler, the intercooler fan, the aftercooler, and the air receiver. The flow of air through the system is

shown in the air flow diagram (fig. 23) and explained in (1) and (2) below.

(1) *First stage action.* Atmospheric air enters the compressor through the oil bath air cleaner (4, fig. 23) which removes particles of dust, dirt, and miscellaneous foreign matter. Air is drawn into the two banks of low-pressure cylinders



1 Aftercooler
2 Air receiver
3 Intercooler
4 Air cleaner
5 Low-pressure cylinders
6 High-pressure cylinders
7 Intercooler tank

Figure 23. Air flow diagram.

(5) through the suction valve strips on the intake stroke. As the piston in the low-pressure cylinder rises on the compression stroke, the air above the piston closes the suction valve strips and the air is compressed, opening the discharge valve strips.

(2) *Second stage action.* The partially compressed air from the low-pressure cylinders then flows through the intercooler (3) where it is cooled by a blower fan. Condensation from the cooled air remains in the tank (7) at the bottom of the intercooler while the air continues on through the high-pressure suction valves and into the high-pressure cylinders (6). In the high-pressure cylinders the air is highly compressed, then forced through the aftercooler (1) and into the air receiver (2).

d. Throttle Control and Unloader System (fig. 24). The throttle control and unloader system consists of a trigger valve (16); an air-operated throttle control cylinder (3) linking the manual engine speed control (4) and the governor control lever on the injection pump; a check valve (12); and six unloaders (11) controlling a suction valve (9) in each cylinder. When the pressure in the air receiver (13) exceeds 100 psi, components of the system are activated to reduce the speed of the engine and to prevent more air from being compressed, by opening all suction valves. The schematic diagram (fig. 24) illustrates the action described in (1) through (6) below.

(1) A line from the air receiver (13) to the inlet side of the trigger valve (16) allows air at receiver pressure to act against the top of the spring-loaded ball in the trigger valve assembly. The spring is adjusted to keep the ball seated against 100 psi. Pressure in excess of 100 psi forces the ball off the upper seat onto the lower seat, allowing air to flow to the throttle control cylinder (3) and check valve (12), but blocking the passage to atmosphere around the stem (15) of the trigger valve.

(2) Air under pressure entering the throttle control cylinder drives the piston and rod (2) forward. (The engine speed control (4) is held in position by friction disks and does not move during this action.) The piston rod is connected through linkage to the governor control lever (1) on the fuel injection pump, and in moving forward the rod moves the control lever forward to reduce engine speed.

(3) At the same time, air flows through the check valve (12) to the unloaders (11) in the compressor cylinder heads. An unloader consists of an airtight cylinder containing a piston (11) working against a spring-loaded rod and finger assembly (10). The unloader is mounted so that the fingers

(10) are directly above and in line with the valve strips (6). When pressure is applied on top of the piston (11), the piston moves down, compresses the springs, and forces the rod and finger assembly down. The fingers pass through grille-like slots in the valve seat (8) and hold the valve strips away from the seat and against the curved faces of the valve guard (7). With the strips off the seat, the valve is open and permits air in the compressor cylinder (5) to flow back into the suction manifold as the compressor piston moves up. Since the air can flow freely through the valve, the air does not compress when the compressor piston moves up.

(4) When air receiver pressure falls to the cut-in pressure setting of the trigger valve (normally about 90 psi), spring action, aided by air pressure on the unloader side of the trigger valve, forces the ball off its lower seat and back to the upper seat, closing the line to the air receiver. In moving away from the lower seat, the ball permits pressurized air to return from the throttle control cylinder and unloaders and exhaust to the atmosphere around the trigger valve stem (15).

(5) As soon as the trigger valve opens a passage to the atmosphere, the extended tension spring at the throttle control cylinder (3) pulls the piston rod (2) back into the cylinder. As the rod moves back it pulls back the governor control lever (1) to increase the engine speed. Notice that this action does not move the manually operated engine speed control (4).

(6) At the same time that air flows from the throttle control cylinder, air from the unloaders exhausts through the trigger valve. However, the return flow from the unloaders is slowed down by an adjustable needle valve in the check valve (12). This restriction of return air from the unloaders permits the throttle control cylinder to accelerate the engine before the unloaders allow the suction valve strips to close. Thus the engine speed is sufficient to prevent a stall when the full load of compressor action is applied.

92. Air Cleaner and Manifolds
(fig. 25)

a. Removal.

(1) Remove the hinge pin securing the access door (4, fig. 2) to the canopy; remove the access door. Loosen the clamp (7, fig. 25); remove the precleaner (6).

(2) Remove the wingnuts (29) and washers (30) holding the oil cup (31) to the air cleaner (36); remove the oil cup.

(3) Loosen the clamp (8) holding the outlet hose (9) at the air cleaner end of the outlet.

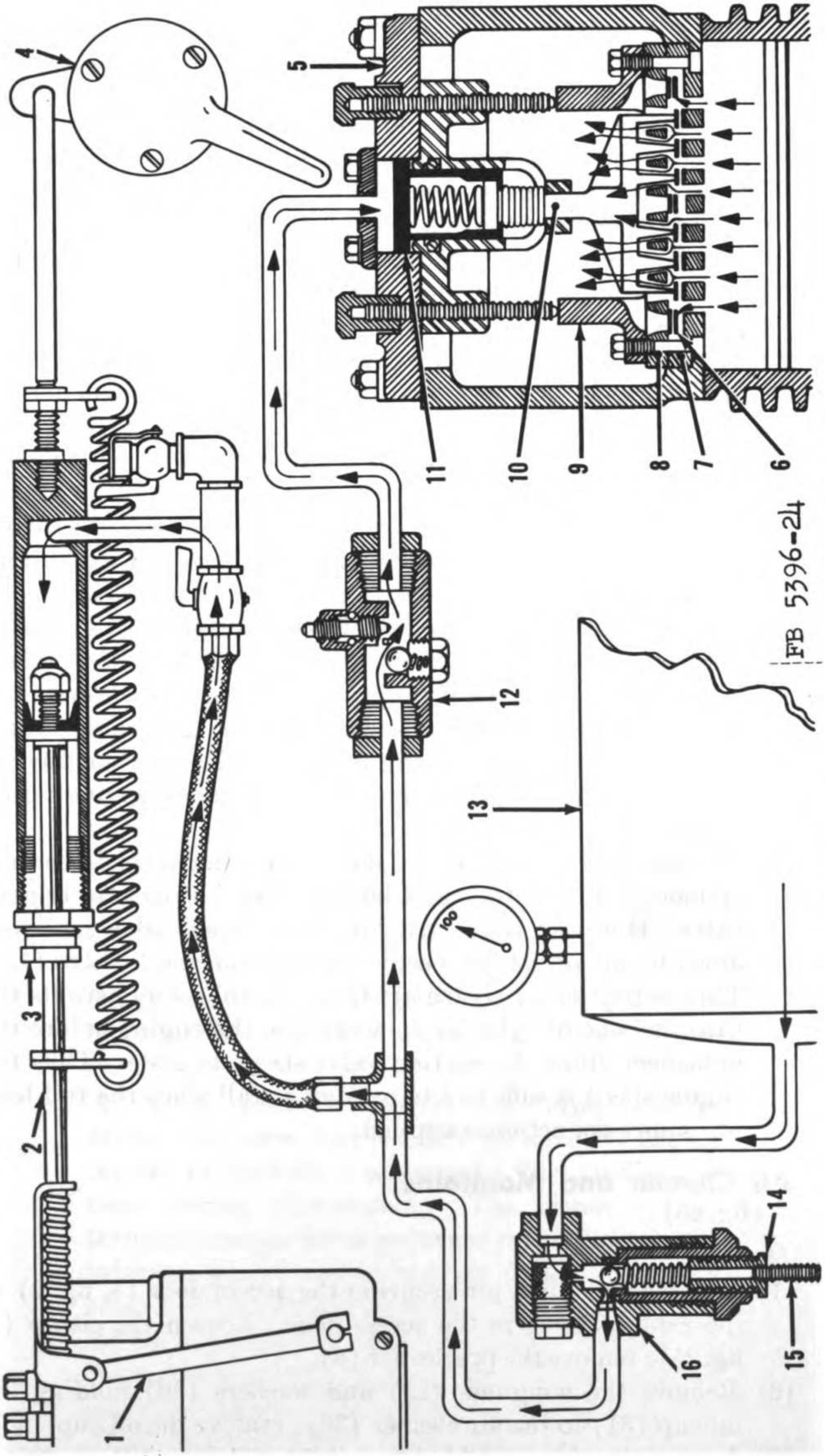


Figure 24. Throttle control and unloader system diagram.

1 Governor control lever
2 Piston rod
3 Throttle control cylinder
4 Engine speed control
5 High-pressure cylinder
6 Valve strips
7 Valve guard
8 Valve seat
9 Suction valve assembly
10 Unloader fingers
11 Unloader piston
12 Check valve
13 Air receiver
14 Adjusting screw
15 Valve stem
16 Trigger valve

Figure 24—Continued.

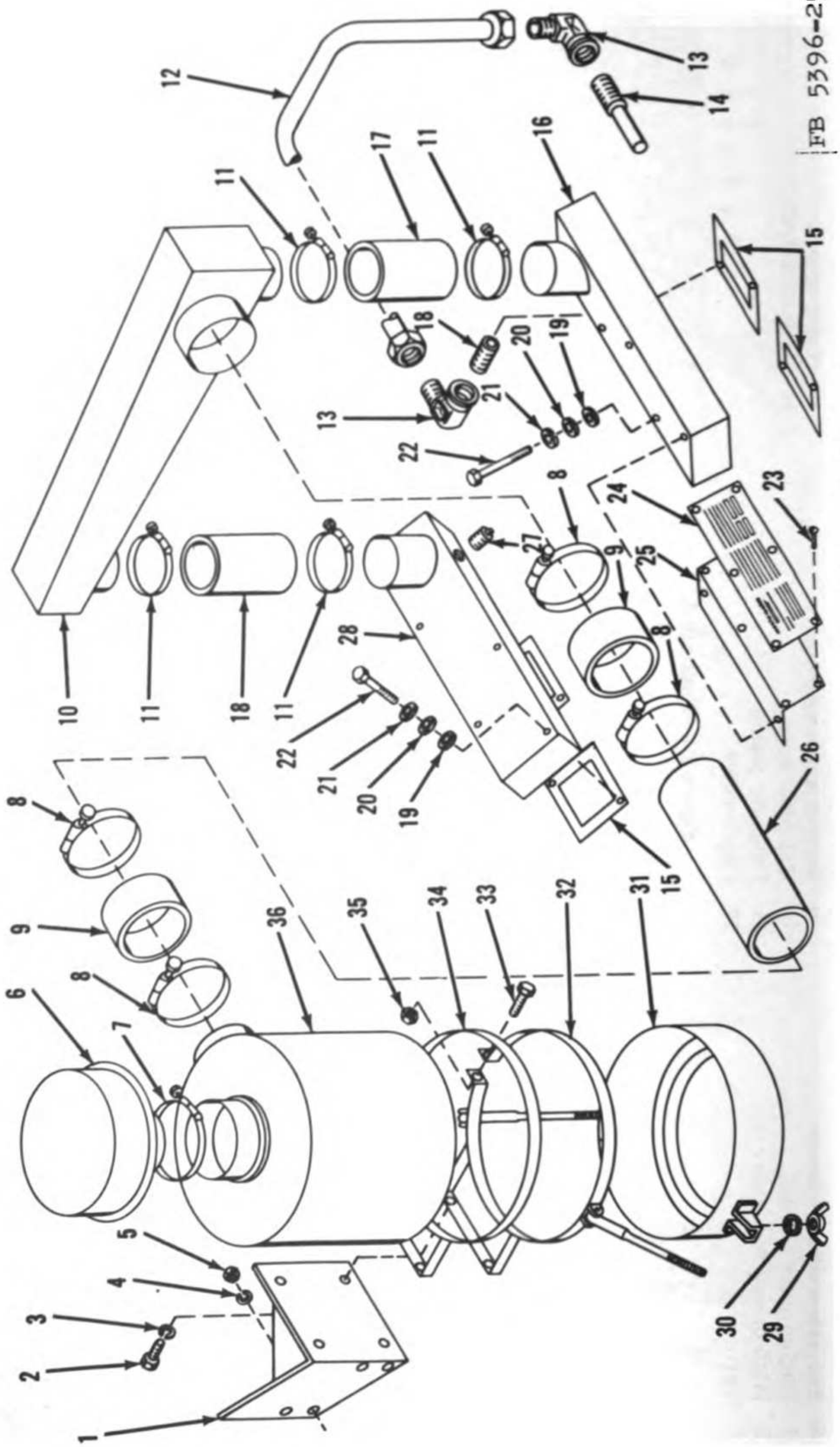


Figure 25. Compressor air cleaner and manifolds, exploded view.

1 Air cleaner support
2 Screw, cap, hex hd, ⅜ x 1 NC (4 Req'd)
3 Lockwasher, ⅜ (4 Req'd)
4 Lockwasher, ½ (4 Req'd)
5 Nut, hex, ½ NF (4 Req'd)
6 Precleaner
7 Precleaner clamp
8 Hose clamp
9 Rubber hose
10 Low-pressure suction manifold
11 Hose clamp (4 Req'd)
12 Breather tubing, 5/16 OD
13 Elbow fitting
14 Breather baffle tube
15 Cork gasket
16 Left low-pressure suction manifold
17 Rubber hose
18 Nipple, close, ¼
19 Cork gasket
20 Washer, plain 7/16 (8 Req'd)
21 Lockwasher, 7/16 (8 Req'd)
22 Screw, cap, hex hd, 7/16 x 3½ NC (8 Req'd)
23 Screw, drive, No. 4 x 3/16 (6 Req'd)
24 Instruction plate
25 Instruction plate bracket
26 Air cleaner pipe
27 Plug, pipe, sq hd, ¼ (1 Req'd)
28 Right low-pressure suction manifold
29 Wingnut (2 Req'd)
30 Washer, plain, ⅜ (2 Req'd)
31 Oil cup
32 Lower clamp ring
33 Screw, cap, hex hd, ⅜ x 1½ NC (2 Req'd)
34 Upper clamp ring
35 Nut, hex, ⅜ NC (2 Req'd)
36 Air cleaner

Figure 25—Continued.

(4) Remove four cap screws (2) and lockwashers (3) attaching the air cleaner to the support (1); remove the air cleaner.
(5) Loosen the clamps (11) at the lower right- and left-hand low-pressure suction manifolds (28 and 16). Remove the upper section of the low-pressure suction manifold (10).
(6) Remove the eight cap screws (22), plain washers (20), lockwashers (21), and gasket (19) holding the manifolds to the low-pressure cylinders. Remove instruction plate bracket (25) from manifold (16). Remove the manifolds (16 and 28), and the gaskets (15).

b. Cleaning and Inspection.

(1) Wash all parts in cleaning solvent and dry thoroughly.
(2) Inspect for stripped threads, cracks, and bent parts of the cleaner or oil cup.

c. Installation.

(1) Position new gaskets (15) and manifolds (16 and 28) on the low-pressure cylinders. Install new gasket (19), plain washer (20), lockwashers (21), and cap screws (22).
(2) Place the upper section of the low-pressure suction manifold (10) in position and tighten clamps (11).
(3) Place outlet hose (9) in position at the air cleaner.
(4) Place air cleaner (36) against support (1). Replace four cap screws (2) and lockwashers (3), and tighten clamps (8).
(5) Place oil cup (31) on air cleaner (36); replace washers (30) and wingnuts (29).
(6) Place precleaner (6) in position; tighten clamp (7).

93. Aftercooler and Manifolds
(fig. 26)

a. Removal.

(1) Remove cap screws (2) and lockwashers (1) at the front and rear high-pressure discharge manifolds (5 and 8).
(2) Remove the manifold collar plate from the canopy (par. 144*a*). Remove aftercooler assembly (7).
(3) Remove nuts (3), lockwashers (4), tie rod (28), and front and rear high-pressure discharge manifolds (5 and 8).
(4) Remove O-rings (6) from the discharge manifolds.

b. Cleaning and Inspection.

(1) Wash parts externally to remove surface dirt. Mix 10 pounds of alkali in 25 gallons of water. Soak aftercooler and manifolds in this solution for 2 or 3 hours at a temperaperature of 180° F. or over. Wash in fresh water, then blow out with compressed air.

Caution: Lye solutions are injurious to the core material; do not use for cleaning.

(2) Inspect for cracks, stripped threads, distortion, and corrosion. Replace damaged parts.

c. Installation.

(1) Place a new O-ring (6) over the front and rear high-pressure discharge manifolds (5 and 8).

(2) Position the discharge manifolds in the aftercooler (7) outlets and loosely install tie rod (28), nuts (3), and lockwashers (4).

(3) Place the aftercooler assembly in position and install two new gaskets (9), cap screws (2), and lockwashers (1).

Note. **To prevent distortion and possible damage to the aftercooler, do not tighten cap screws (2) fully until tie rod (28) and nuts (3) have been tightened.**

(4) Replace the manifold collar plates on the canopy (par. 144*c*).

94. Intercooler Fan

a. Removal.

(1) Remove four bolts (21, fig. 27), lockwashers (26), and nuts (27) securing the fan guard (22); remove the fan guard.

(2) Remove cotter pin (7, fig. 28), nut (29), and washers (27) and (28). Remove fan belt adjusting screw (5).

(3) Remove the fan assembly from fan bracket (2); remove fan belts (12).

(4) Remove cap screws (4), spacers (1), and lockwashers (3); remove fan bracket.

b. Disassembly (fig. 28).

(1) Remove four cap screws (21) and lockwashers (20); remove the fan blade (19).

(2) Remove cotter pin (7), nut (17), and washer (16).

(3) Press spindle (8) out of hub (13) and remove lockwire (26).

(4) Remove retainer (25), cork washer (24), washer (23), and oil gasket (22) from the hub. Remove bearing cones (9 and 15).

(5) Remove the bearing cups (10 and 14) from the hub.

c. Cleaning and Inspection.

(1) Wash all parts thoroughly in cleaning solvent.

(2) Inspect all parts for cracks, stripped threads, distortion, corrosion, or obvious wear. Replace damaged or broken parts.

d. Reassembly (fig. 28).

(1) Replace bearing cups (10 and 14) in hub (13); lubricate with an approved roller bearing grease. Lubricate and install bearing cones (9 and 15) in the hub; install spindle (8) in the hub.

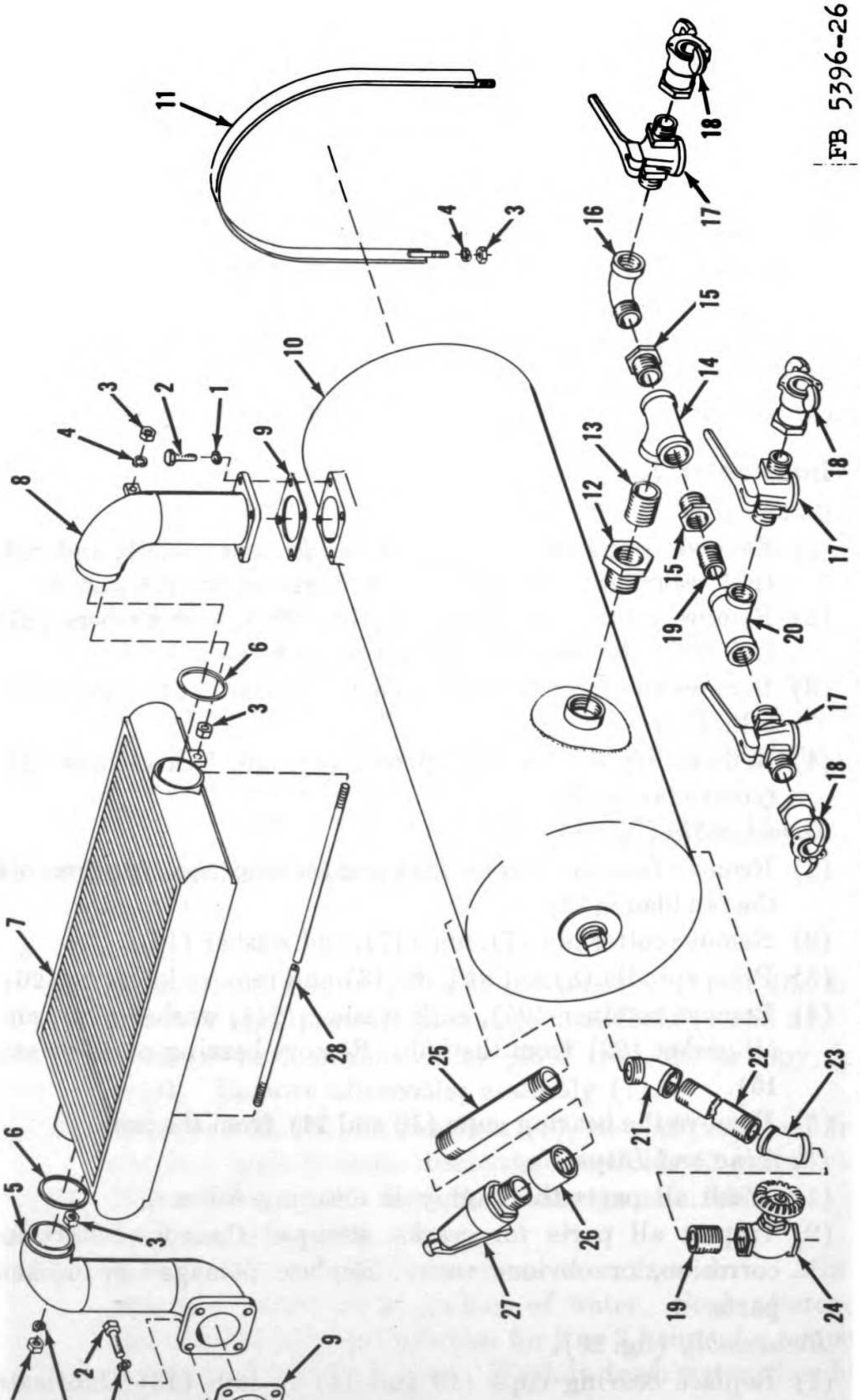


Figure 26. Aftercooler, manifolds, and air receiver, exploded view.

1 Lockwasher, ⅝ (8 Req'd)
2 Screw, cap, hex hd, ⅝ x ½ NC (8 Req'd)
3 Nut, hex, ½ NC (4 Req'd)
4 Lockwasher, ½ (2 Req'd)
5 Front high-pressure discharge manifold
6 O-ring
7 Aftercooler
8 Rear high-pressure discharge manifold
9 Gasket
10 Air receiver
11 Air receiver strap
12 Reducing bushing, 2½ x 2
13 Close nipple, 2''
14 Tee, 1½ x 1½ x 2
15 Reducing bushing, 1½ x ¾
16 Street elbow, ¾
17 Hose valve, ¾
18 Universal hose coupling, ¾
19 Close nipple, ¾
20 Tee, 1½ x 1½ x 2
21 Street elbow, ¾, 45°
22 Pipe, ¾
23 Elbow, ¾, 45°
24 Globe valve, ¾
25 Pipe nipple
26 Pipe coupling
27 Safety valve, 1½, 125 psi
28 High-pressure discharge tie rod

Figure 26—Continued.

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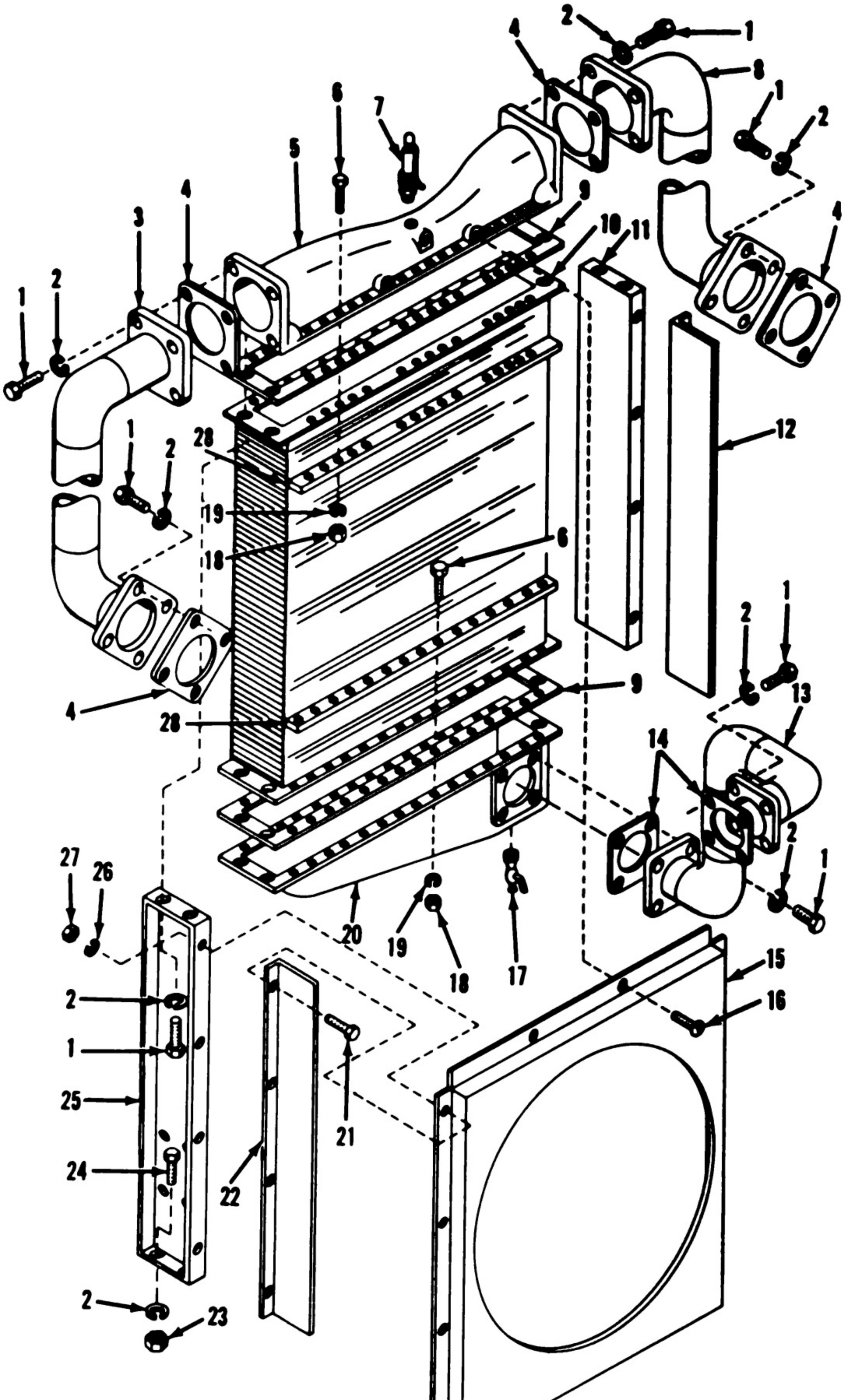


Figure 27. Intercooler and manifolds, exploded view.

(2) Install a new oil gasket (22), washer (23), cork washer (24), and retainer (25); install a new lockwire (26).
(3) Install washer (16) and nut (17), on the fan side of the hub, on the spindle; tighten nut until a slight drag is felt when turning the spindle. Secure with cotter pin (7).
(4) Install gasket (18) and fan blade (19) with the four cap screws (21) and lockwashers (20).

e. Installation.

(1) Insert four cap screws (4) and lockwashers (3) in fan bracket (2). Install spacers (1) and cap screws and install fan bracket on compressor cylinders. Tighten cap screws.
(2) Mount the fan and hub assembly in fan bracket (2); loosely replace nut (29) and washer (28). Install fan belts (12); install adjusting cap screw (5) and washer (6).
(3) Adjust the fan belt tension (see *f* below).
(4) Replace fan guard (22, fig. 27).

f. Intercooler Fan Belt Adjustment (fig. 28).

(1) Remove cotter pin (7) and loosen the nut (29).
(2) Turn the adjusting cap screw (5) until belts (12) can be depressed 1 inch by thumb pressure at a point midway between the pulleys. If a new belt is needed, replace both belts. Never use a new belt with an old one.

95. Intercooler and Manifolds

a. Removal.

(1) Open the intercooler draincock (17, fig. 27).
(2) Remove canopy access doors and top canopy (par. 144*a*); remove intercooler fan (par. 94*a*).

---

1 Screw, cap, hex hd, ⅝ x 1½ NC (24 Req'd)
2 Lockwasher, ⅝ (24 Req'd)
3 Right low-pressure discharge manifold
4 Discharge manifold gasket
5 Top tank
6 Bolt, hex hd, ⅜ x 1½ NC (76 Req'd)
7 Safety valve
8 Left low-pressure discharge manifold
9 Header gasket
10 Core
11 Left side channel
12 Left fan guard
13 High-pressure suction manifold
14 Suction manifold gasket
15 Shroud
16 Screw, mach, rd hd, 5/16 x 1 (4 Req'd)
17 Draincock
18 Nut, hex, ⅜ NC (76 Req'd)
19 Lockwasher, ⅜ (76 Req'd)
20 Bottom tank
21 Bolt, hex hd, ¼ x ¾ NF (8 Req'd)
22 Right fan guard
23 Nut, hex, ⅝ NF (4 Req'd)
24 Bolt, hex hd, ⅝ x 1¾ NF (4 Req'd)
25 Right side channel
26 Lockwasher, ¼ (8 Req'd)
27 Nut, hex, ¼ NF (8 Req'd)
28 Backing strip

Figure 27—Continued.

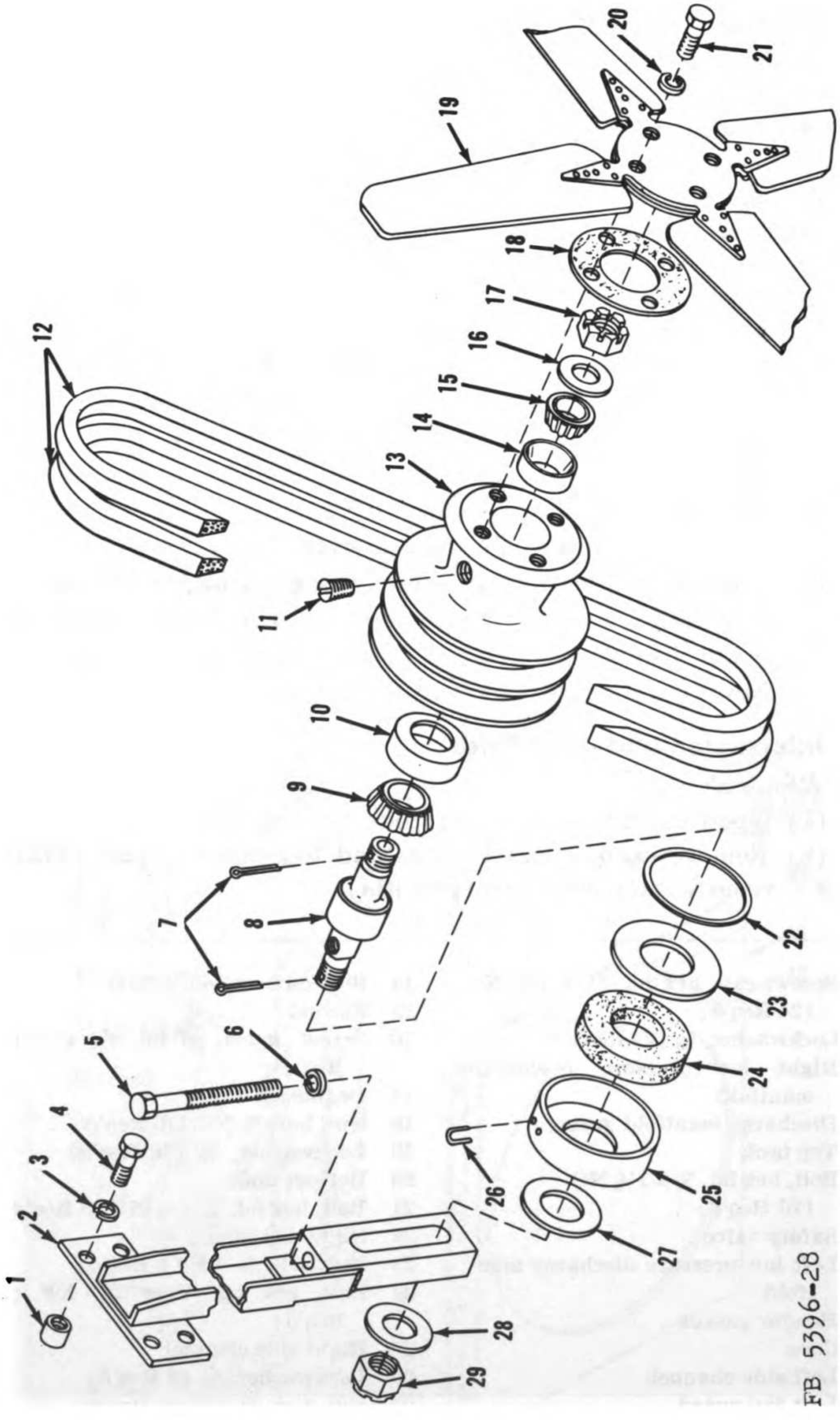


Figure 28. Intercooler fan, exploded view.

1 Fan bracket spacer
2 Fan bracket
3 Lockwasher, ½ (4 Req'd)
4 Screw, cap, hex hd, ½ x 1½ NC (4 Req'd)
5 Screw, cap, hex hd, ½ x 6 NF (1 Req'd)
6 Washer, ½ (1 Req'd)
7 Pin, cotter, ⅛ x 1¼ (2 Req'd)
8 Spindle
9 Bearing cone
10 Bearing cup
11 Plug, pipe, ⅛ (1 Req'd)
12 V-belt
13 Hub
14 Bearing cup
15 Bearing cone
16 Cone clamp washer
17 Nut, castellated, ¾ NF (1 Req'd)
18 Gasket
19 Fan blade
20 Lockwasher, 5/16 (4 Req'd)
21 Screw, cap, hex hd, 5/16 x ⅞ NC (4 Req'd)
22 Oil gasket
23 Cork retaining washer
24 Cork washer
25 Cork retainer
26 Lockwire
27 Clamp washer
28 Clamp washer
29 Nut, slotted, ¾ NF (1 Req'd)

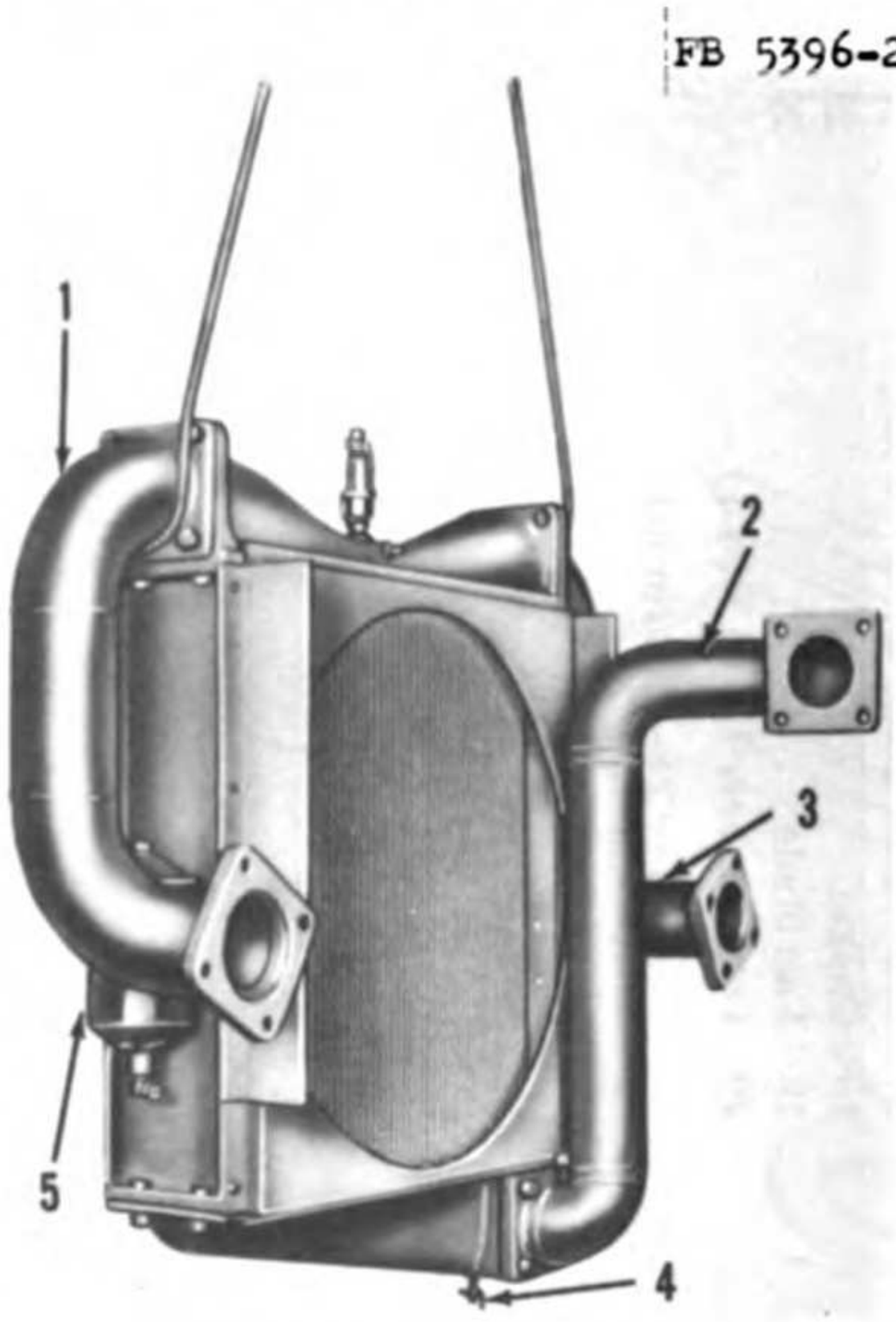
Figure 28—Continued.

(3) Remove air receiver safety valve and nipple (par. 97*a*(2)); disconnect unloader line (1, fig. 17) at inlet side of check valve (2).

(4) Drain the compressor oil filter and disconnect the oil filter hoses (par. 99*a*(1) and (2)).

(5) Place a sling around the upper ends of right and left low-pressure manifolds (1 and 2, fig. 29) and take up the slack.

Note. **The intercooler is completely supported by the manifolds attached to the compressor and is not attached to the frame. Place sling and take up slack to support the intercooler weight before removing the manifold cap screws.**



1 **Right low-pressure discharge manifold**
2 **High-pressure suction manifold**
3 **Left low-pressure discharge manfold**
4 **Draincock**
5 **Compressor oil filter**

Figure 29. Intercooler and manifolds removed from compressor.

(6) Remove cap screws (1, fig. 27) and lockwashers (2) at the compressor end of manifolds (3, 8, and 13).

(7) **Use a hoist and sling to remove the intercooler with manifolds attached (fig. 29).**

b. Dissassembly **(fig. 27).**

(1) **Remove four machine screws (16), two each at top and bottom of shroud (15). Remove shroud.**

(2) Remove four cap screws (1) and lockwashers (2) securing intercooler manifolds (3, 8, and 13) to the top and bottom tanks (5 and 20); remove the manifold and gaskets (4 and 14).

(3) Remove bolts (6), lockwashers (19), and nuts (18) securing the top and bottom tank to the intercooler core assembly (10); remove the side channels (11 and 25), tanks, two gaskets (9), and backing strips (28).

c. Cleaning and Inspection.

(1) Remove surface dirt and particles with compressed air from the fan side. Soak and clean the core as instructed for the aftercooler (par. 93*b*).

(2) Inspect for cracks, distortion, clogged passages, corrosion, and stripped threads; replace broken or defective parts.

d. Reassembly (fig. 27).

(1) Position the backing strips (28), gaskets (9), top and bottom tanks (5 and 20), and side channels (11 and 25); securing cap screws (1), lockwashers (2) with bolts (24), lockwashers (2), and nuts (23).

(2) Position new gaskets (4 and 14) and intercooler manifolds (3, 8, and 13) on the intercooler; secure with cap screws (1) and lockwashers (2).

(3) Place the fan shroud (15) in position and secure with four machine screws (16).

e. Installation.

(1) Lower the assembled intercooler into position in the unit.

(2) Install new gaskets (4 and 14, fig. 27) and secure the intercooler manifolds (3, 8, and 13) to the compressor with cap screws (1) and lockwashers (2). Remove the sling from manifolds (3 and 8).

(3) Connect hoses to the oil filter case (par. 99*e*(2)).

(4) Connect the unloader line (1, fig. 17) to the check valve (2); replace the air receiver safety valve and nipple (par. 97*c*(4)).

(5) Replace the fan assembly (par. 94*e*).

(6) Replace the top canopy and access doors (par. 144*c*).

(7) Close the intercooler draincock (17, fig. 27).

96. Intercooler Air Pressure Gage

a. Removal.

(1) Open receiver drain valve (10, fig. 2) to relieve air pressure.

(2) Disconnect the air line from the rear of the gage (4, fig. 18).

(3) Remove the two nuts, lockwashers, and the U-shaped clamp securing the gage to the instrument panel; remove the gage from the front of the panel.

b. Cleaning and Inspection.

(1) Wipe gage with cloth dampened with cleaning solvent; dry thoroughly.

(2) Inspect for cracks, sticking needle, corrosion, or stripped threads.

(3) Replace gage if damaged or defective.

c. Installation.

(1) Position the gage in the panel and replace the bracket, two lockwashers, and nuts.

(2) Connect the tube at the rear of the gage.

(3) Close the receiver drain valve.

97. Air Receiver

a. Removal.

(1) Disconnect tubing (3, fig. 16) from the air receiver to the trigger valve (2).

(2) Remove safety valve (27, fig. 26), coupling (26), and nipple (25) from the air receiver (10).

(3) Remove the aftercooler (par. 93*a*).

(4) Remove nuts (3), lockwashers (4), and two air receiver straps (11).

(5) Remove the air receiver (10).

b. Cleaning and Inspection.

(1) Remove surface dirt and particles. Clean internally.

(2) Inspect for cracks, distortion, corrosion, or stripped threads.

c. Installation.

(1) Position the air receiver (10, fig. 26) in its cradle and replace straps (11), lockwashers (4), and nuts (3).

(2) Replace the aftercooler (par. 93*c*).

(3) Connect tubing (3, fig. 16) from the air receiver to trigger valve (2).

(4) Install nipple (25, fig. 26), coupling (26), and safety valve (27) in the receiver.

98. Air Receiver Pressure Gage

a. Removal.

(1) Open drain valve (10, fig. 2) to relieve air pressure.

(2) Disconnect the tube from the rear of gage (7, fig. 18).

(3) Remove the two nuts, lockwashers, and the U-shaped clamp securing the gage to the instrument panel; remove the gage.

b. Cleaning and Inspection.

(1) Wipe gage with cloth dampened with cleaning solvent; dry thoroughly.

(2) Inspect for cracks, sticking needle, corrosion, or stripped threads.

(3) Replace gage if damaged or defective.

c. Installation.

(1) Position the gage in the panel and replace the clamp, two lockwashers, and nuts.

(2) Connect the tube at the rear of the gage.

(3) Close air receiver drain valve.

99. Oil Filter
(fig. 30)

a. Removal.

(1) Remove drain plug (13) and gasket (14); drain the oil from the filter.

(2) Disconnect two flex hoses (12 and 16) from the elbows (15).

(3) Remove four nuts (11), lockwashers (10), and bolts (5) attaching oil filter mounting bracket (7) to the intercooler side channel; remove the filter.

b. Disassembly.

(1) Remove the oil filter cover (1) and gasket (2).

(2) Lift out and discard the element (3).

c. Cleaning and Inspection.

(1) Wash all parts thoroughly in cleaning solvent.

(2) Inspect for cracks, corrosion, clogged passages, distortion, and stripped threads.

(3) Replace if damaged or defective.

d. Reassembly.

(1) Install a new element (3); install new gasket (2) and replace cover (1).

(2) Replace the gasket (14) and drain plug (13).

e. Installation.

(1) Position the oil filter and replace four bolts (5), lockwashers (10), and nuts (11).

(2) Connect the two flex hoses (12 and 16) to the elbows (15).

f. Oil Filter Element Replacement.

(1) Replace oil filter element (par. 51*e*).

(2) Check compressor oil level (LO 5–5396).

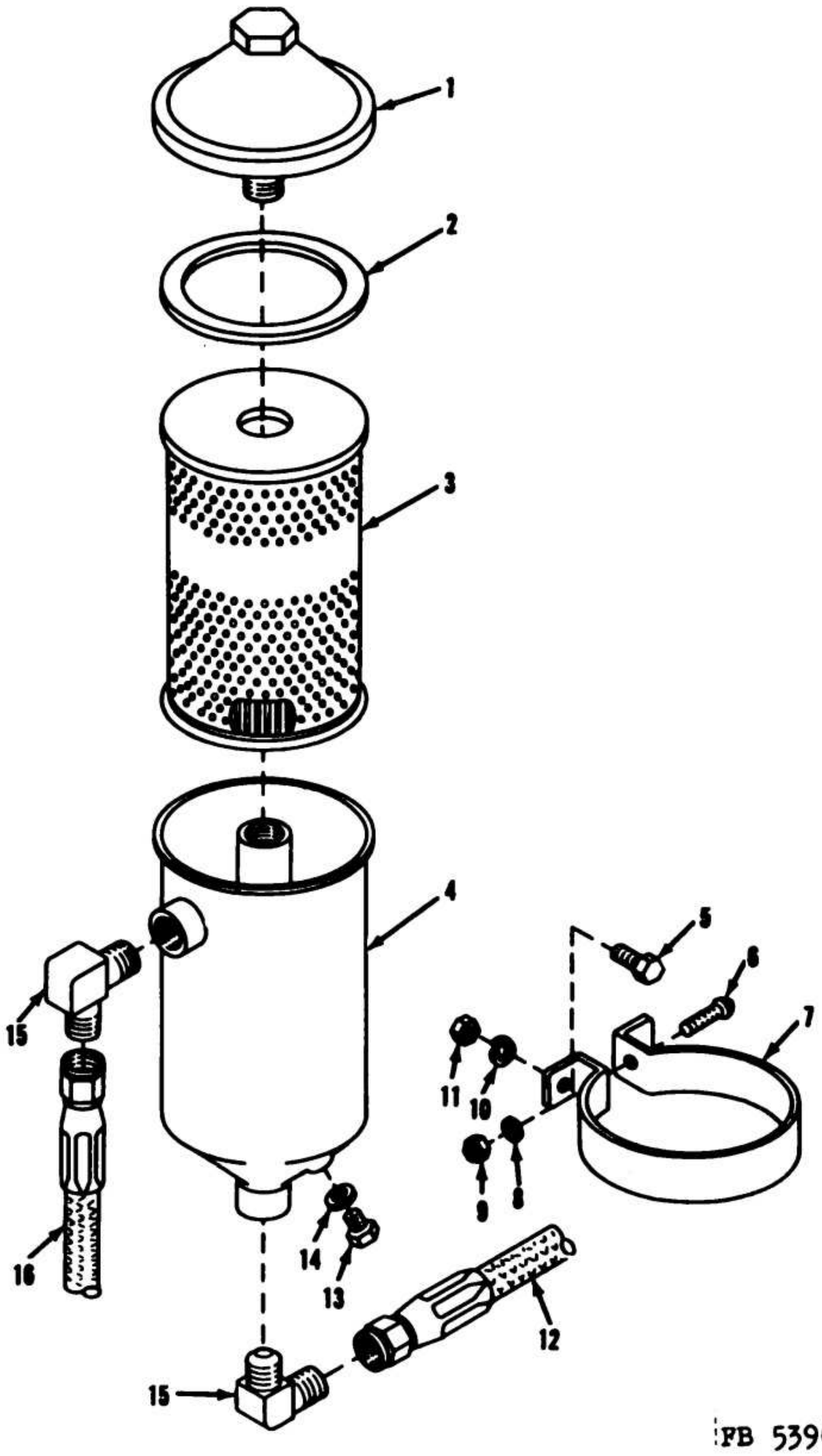
100. Oil Pressure Relief Valve Adjustment
(fig. 31)

a. Remove the oil pressure adjusting screw cap (6) and copper gasket (7).

b. Loosen the jam nut (5) and turn the adjusting screw (4) clockwise to increase oil pressure, and counterclockwise to decrease oil pressure.

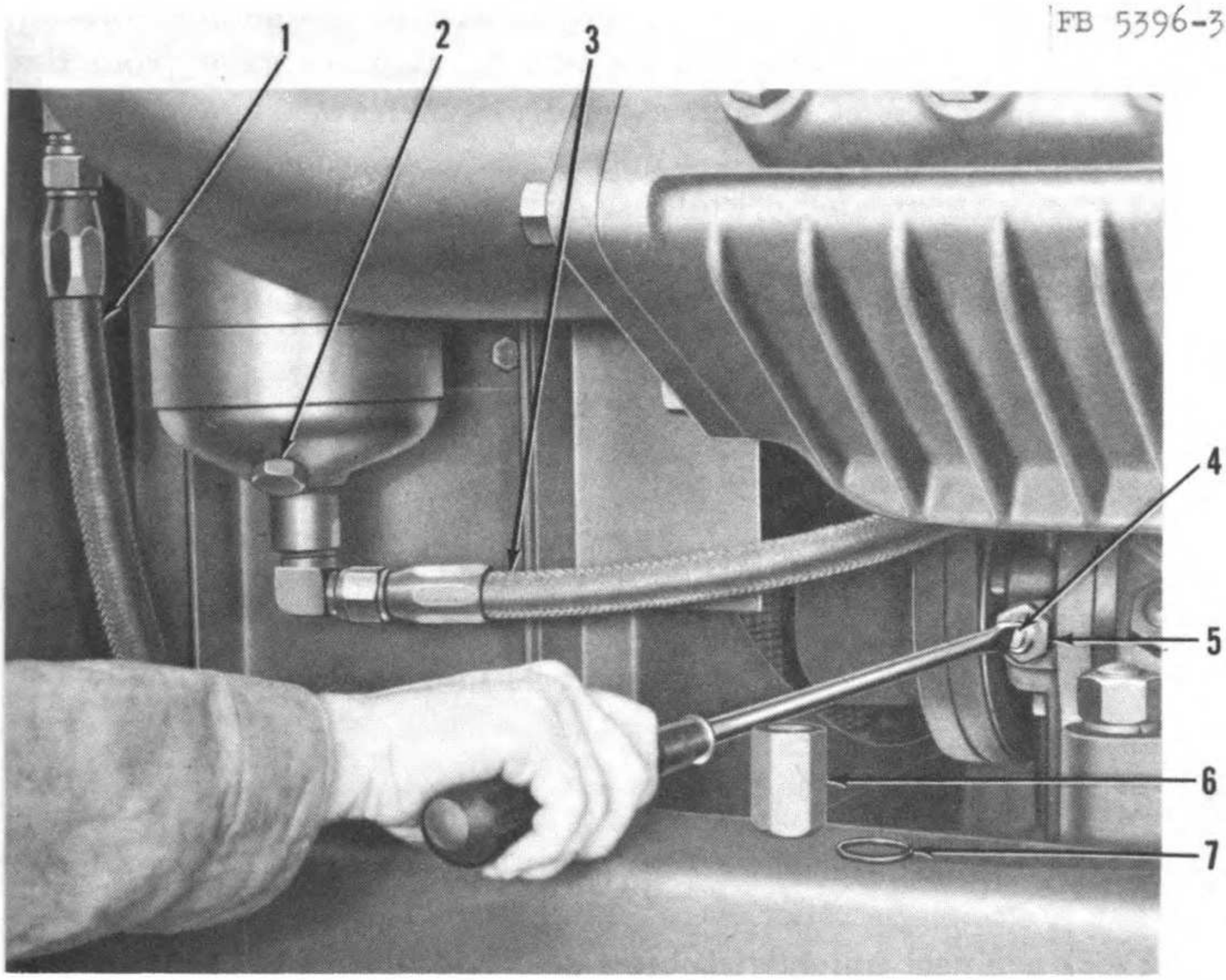
Caution: If oil viscosity is correct for the climate, low oil pressure indicates trouble in the system. Do not adjust pressure to compensate for worn parts. Report to proper authority.

c. Replace the copper gasket (7) and adjusting screw cap (6).



1	Cover	9	Nut, hex, No. 10 (2 Req'd)
2	Gasket	10	Lockwasher, ⅜ (4 Req'd)
3	Element	11	Nut, hex, ⅜ NC (4 Req'd)
4	Case	12	Flex hose
5	Bolt, hex hd, ⅜ x ⅝ NC (4 Req'd)	13	Drain plug
6	Screw, machine, No. 10 x 1¾ (2 Req'd)	14	Drain plug gasket
7	Mounting bracket	15	Elbow, 90°
8	Washer, plain, No. 10 (2 Req'd)	16	Flex hose

Figure 30. Compressor oil filter, exploded view.



1 Flex hose
2 Drain plug
3 Flex hose
4 Pressure adjusting screw
5 Jam nut
6 Adjusting screw cap
7 Copper gasket

Figure 31. Adjusting oil pressure.

101. Oil Pressure Gage

a. Removal.

(1) Disconnect the tubing from the rear of the gage (5, fig. 18).

(2) Remove the two nuts, lockwashers, and the clamp securing the gage to the instrument panel; remove the gage.

b. Cleaning and Inspection.

(1) Wipe the gage with a clean cloth dampened in cleaning solvent and dry thoroughly.

(2) Inspect for cracks, sticking needle, corrosion, or stripped threads.

c. Installation.

(1) Position the gage and replace the clamps, two lockwashers, and nuts.

(2) Connect the indicator pipe.

102. Oil Temperature Gage

a. Removal.

(1) Drain the oil from the compressor oil pan.

(2) Disconnect the oil temperature gage (6, fig. 18) armored tubing at the compressor oil pan.

(3) Remove the two nuts, lockwashers, and the clamp holding the gage to the instrument panel. Remove gage from the front at the panel and carefully withdraw armored tubing permanently attached to gage.

Caution: Do not collapse or kink the armored tubing.

b. Cleaning and Inspection.

(1) Wipe the gage and armored tubing with a cloth dampened in cleaning solvent.

(2) Inspect the gage and tubing for cracks or kinked tubing. Look for damaged threads on the oil pan bulb unit.

c. Installation.

(1) Position the gage in the instrument panel; replace the clamp, two lockwashers, and nuts.

(2) Install the bulb unit in the compressor oil pan.

(3) Refill the compressor with correct lubricant (see LO 5–5396).

(4) Start air compressor and check for leaks.

103. Unloaders

a. Removal. Use the procedure below to remove any one of the unloaders installed in either the high- or low-pressure cylinder heads.

(1) Disconnect unloader tubing (7, fig. 32) at both ends.

(2) Remove nuts (4) and remove cylinder-head cover (5) from cylinder head (6). (Unloader assemblies are assembled to the underside of cylinder-head covers (16, figs. 33 and 34).)

b. Disassembly.

(1) Remove two leakage cap nuts (11, fig. 33), and gaskets (12) from cover (13). Remove four cap screws (9) and gaskets (10) holding unloader cover (7) to cylinder-head cover (13). Remove cover (7), gasket (6), two jam screws (14), unloader (16), and gasket (15).

(2) Remove two jam screws (14) from unloader (16).

(3) Lift out unloader piston (1, fig. 35), power spring (2), and remove O-ring (6) from groove in cylinder (7).

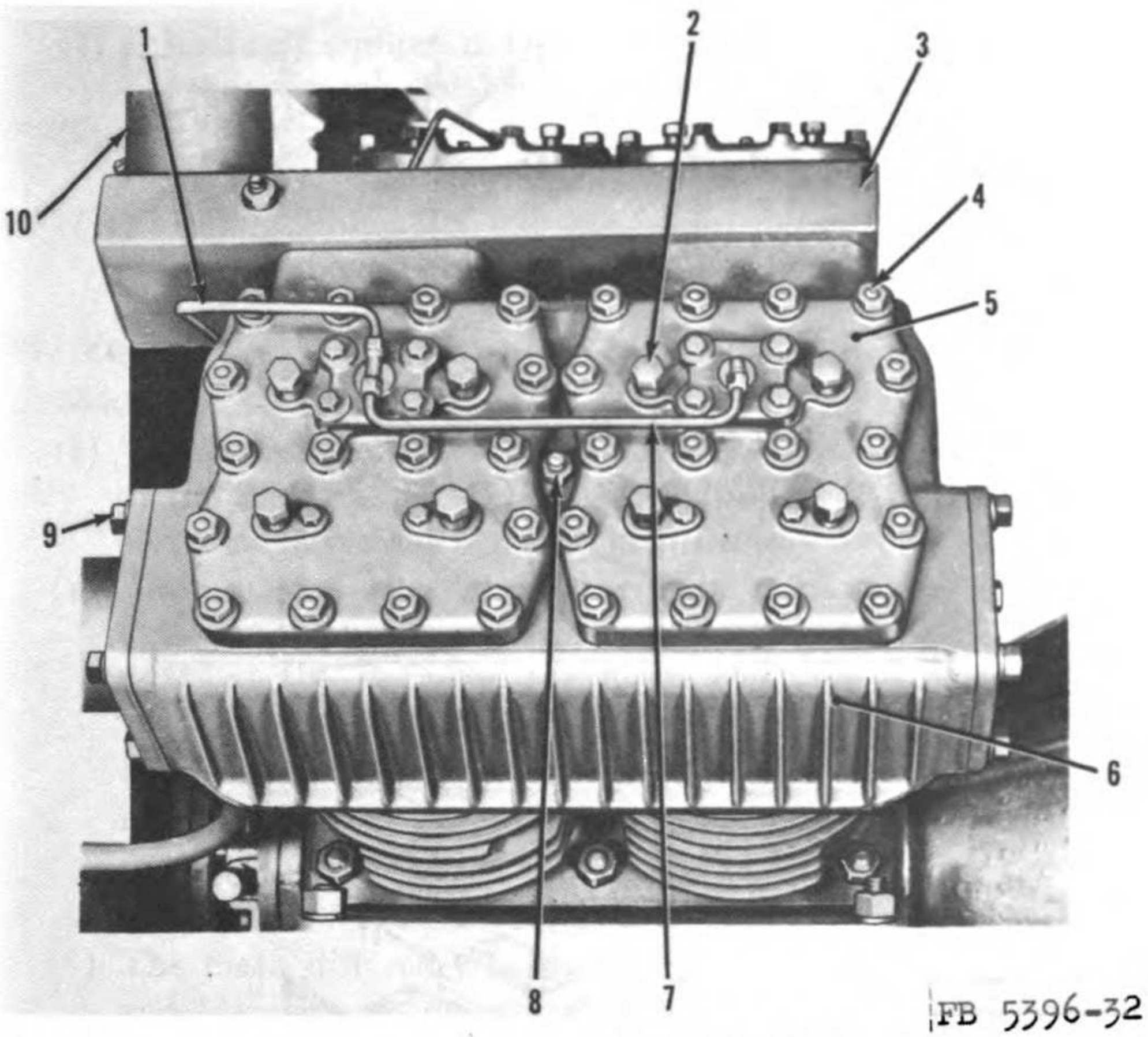
(4) Remove stop nut (3), spring washer (4), and remove return spring (5) and finger assembly (8) from the cylinder.

c. Cleaning and Inspection.

(1) Wash parts thoroughly in cleaning solvent and remove carbon deposits. Polish piston and cylinder walls with crocus cloth and oil.

(2) Inspect finger assembly for cracks and stripped threads. Look for nicks and burs on piston which might damage the O-ring.

(3) Replace damaged or broken parts.



1	Tubing	6	Cylinder head
2	Leakage cap nut	7	Tubing
3	Suction manifold	8	Cylinder-head nut
4	Cylinder-head cover nut	9	Cap screw
5	Cylinder-head cover	10	Hose clamp

Figure 32. Compressor cylinder-head installation.

d. Reassembly (fig. 35).

(1) Insert finger assembly (8) and return spring (5) in the unloader cylinder (7).

(2) Replace the spring washer (4) and elastic stop nut (3).

(3) Install a new O-ring (6). Replace the power spring (2) and unloader piston (1).

e. Installation.

(1) Place the gasket (15, fig. 33) and unloader (16) against the cylinder-head cover (13).

(2) Install new gasket (6), unloader cover (7), and secure with four cap screws and gaskets (9 and 10).

(3) Replace two jam screws (14) through the cover (13) and thread them into the unloader (16).

(4) Install gasket (19) and cylinder-head cover (13) on cylinder head (20).

Caution: To prevent damage to cover (13), jam screws (14, fig. 33) must be backed off to clear valve assemblies (17 and 18) during installation of cover (13) and nuts (1).

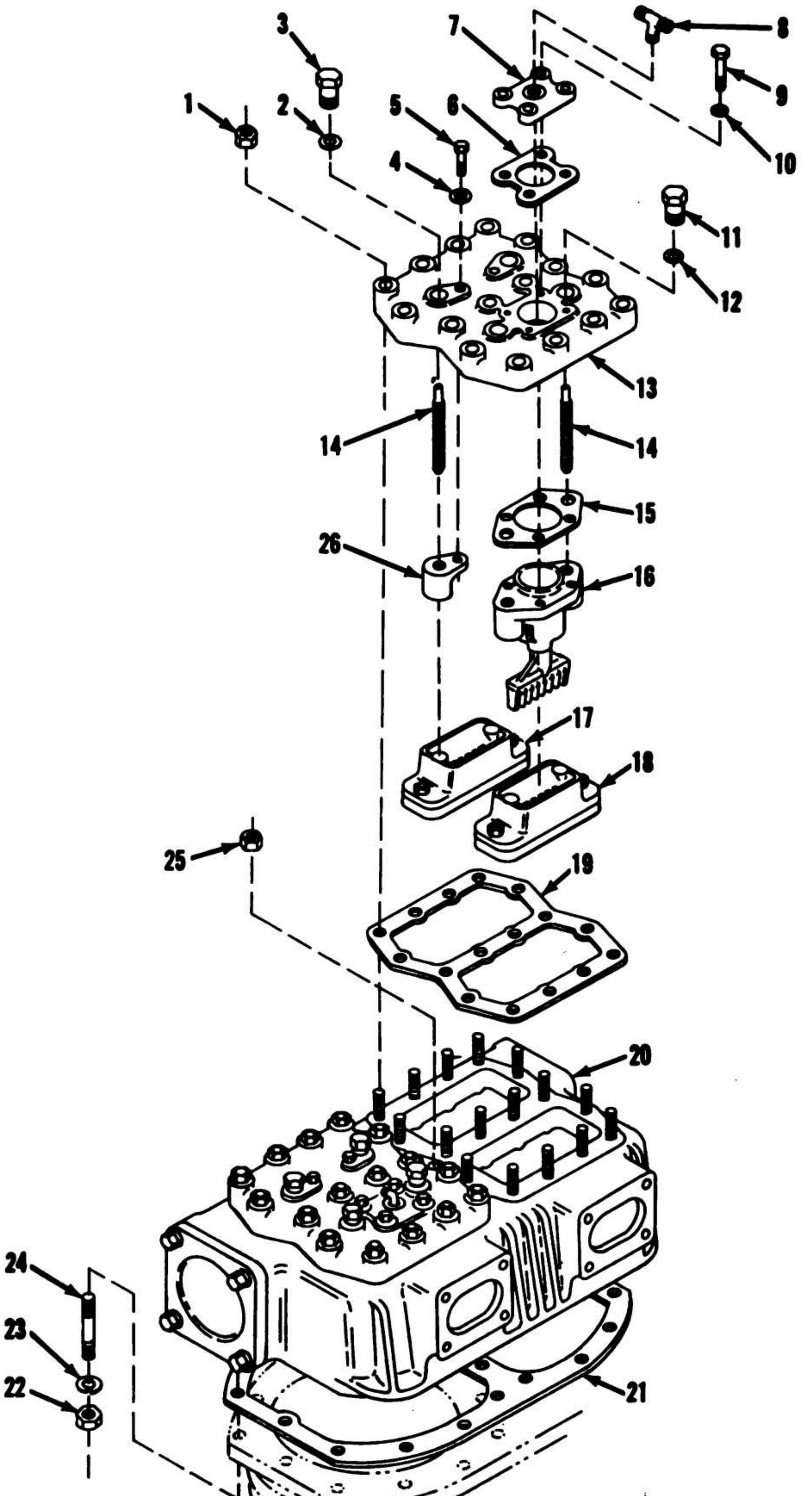


Figure 33. Low-pressure cylinder head, exploded view.

(5) Install and tighten nuts (1); tighten jam screws (14) with a torque wrench until indicator reads 25 foot-pounds.
(6) Install four leakage cap nuts (3 and 11) with gaskets (2 and 12) on the four jam screws.
(7) Reinstall tubing (1, fig. 32), also tubing (7) when a rear cylinder unloader has been removed.

104. Valves

a. General.

(1) The procedures in *b* through *f* below are applicable to any of the 12 valves (6 suction and 6 discharge) in the compressor, since the parts are nearly identical.

(2) The important difference between suction and discharge valves is the position of the hollow-ground face of the valve guard in the assembly. In figure 36Ⓐ, note that the guard (4) is assembled at the bottom of the assembly with the hollowed face of the guard toward the valve yoke (7). In figure 36Ⓑ, the guard (4) is assembled next to the valve yoke (7) with the hollowed face of the guard facing away from the yoke.

(3) The main difference between high-pressure cylinder valves and low-pressure valves is the length of the valve and the number of valve strips used. The low-pressure valves (fig. 36Ⓐ and Ⓑ) use two layers of 14 strips (5), a total of 28 strips per valve. The high-pressure valves (fig. 36Ⓒ and Ⓓ) use two layers of 11 strips, a total of 22 strips per valve.

Note. Mark each valve assembly and its parts so each part can be replaced in the same position in the assembly, and each assembly can be replaced in the same cylinder from which it was removed.

---

1 Nut, hex ½ NC (32 Req'd)
2 Copper gasket
3 Leakage cap nut
4 Copper gasket
5 Bolt, hex hd, ⅜ x 1⅝ NC (2 Req'd)
6 Unloader cover gasket
7 Unloader cover
8 Tee, pipe
9 Screw, cap, hex hd, ⅜ x 2¼ NC (4 Req'd)
10 Copper gasket
11 Leakage cap nut
12 Copper gasket
13 Cylinder-head cover
14 Jam screw
15 Unloader cylinder gasket
16 Unloader
17 Discharge valve assembly
18 Suction valve assembly
19 Cylinder-head cover gasket
20 Cylinder head
21 Cylinder-head gasket
22 Nut, hex, ½ NC (21 Req'd)
23 Lockwasher, ½ (21 Req'd)
24 Stud, ½ x 1⅞ NC (16 Req'd)
25 Nut, hex hd, ½ NC (1 Req'd)
26 Jam screw nut

Figure 33—Continued.

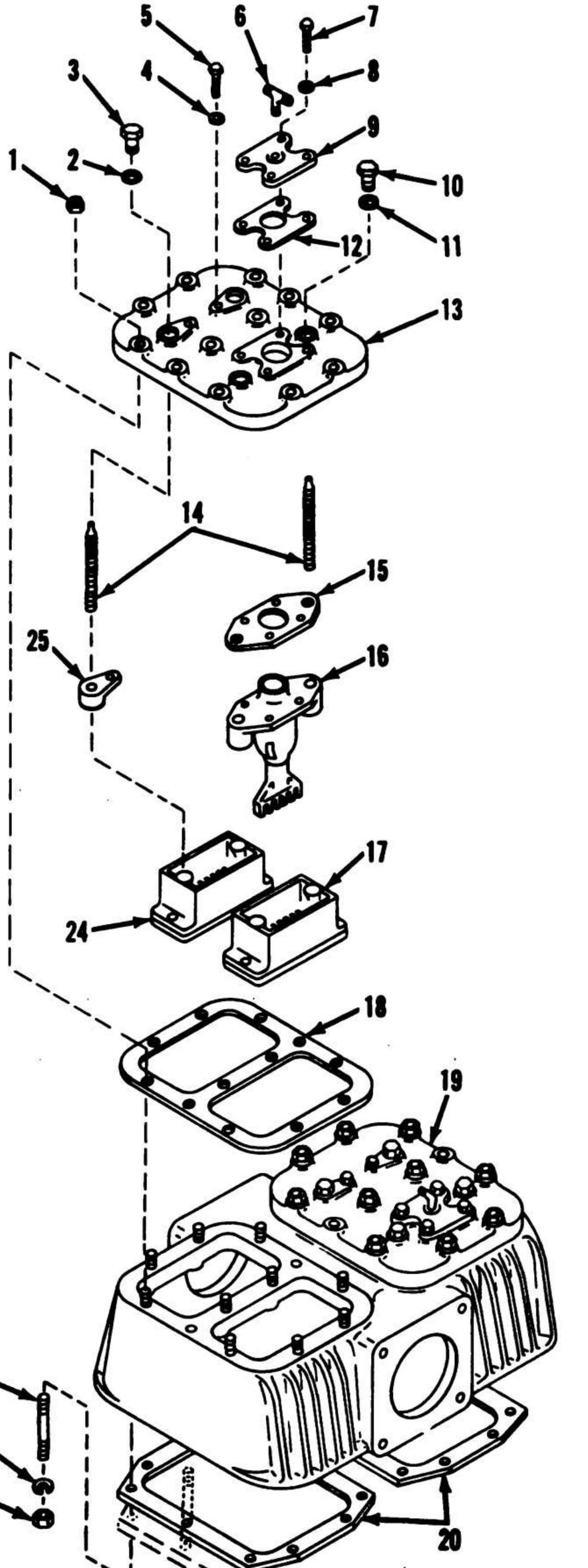


Figure 34. High-pressure cylinder head, exploded view.

b. Removal.

(1) Remove the cylinder-head cover (par. 103*a*(1) and (2)).

(2) Lift valve assemblies (17 and 18, fig. 33) out of cylinder head (20).

c. Disassembly. Remove the two nuts (9, fig. 36), lockwashers (8), copper washers (3), and cap screws (2); separate the valve guard (4) and valve seat (6) from yoke (7).

d. Cleaning and Inspection (fig. 36).

(1) Wash all parts thoroughly in cleaning solvent and clean off carbon.

(2) Inspect yoke (7) for cracks and distortion. Look for broken or worn valve strips (5), and grooves or scores on the guard (4) and seat (6). Check cap screws (2) and nuts (9) and seat (6). Check cap screws (2) and nuts (9) for stripped threads. Replace damaged parts.

e. Reassembly (fig. 36).

(1) Place two valve strips (5) in each of the recesses of the guard (4).

(2) Cover the guard and strips with the valve seat (6), being careful to keep the strips in place.

(3) On the suction valves (fig. 36 Ⓐ and Ⓒ), place the yoke (7) on top of the seat. Insert the two cap screws (2) with copper washers (3) into the flange of the valve cage; secure with lockwashers (8) and nuts (9).

(4) On discharge valves (fig. 36 Ⓑ and Ⓓ), assemble the yoke on top of the valve guard; replace the two cap screws (2), with copper washer (3), lockwashers (8), and nuts (9).

(5) Install a new gasket (1) on the assembly before installation.

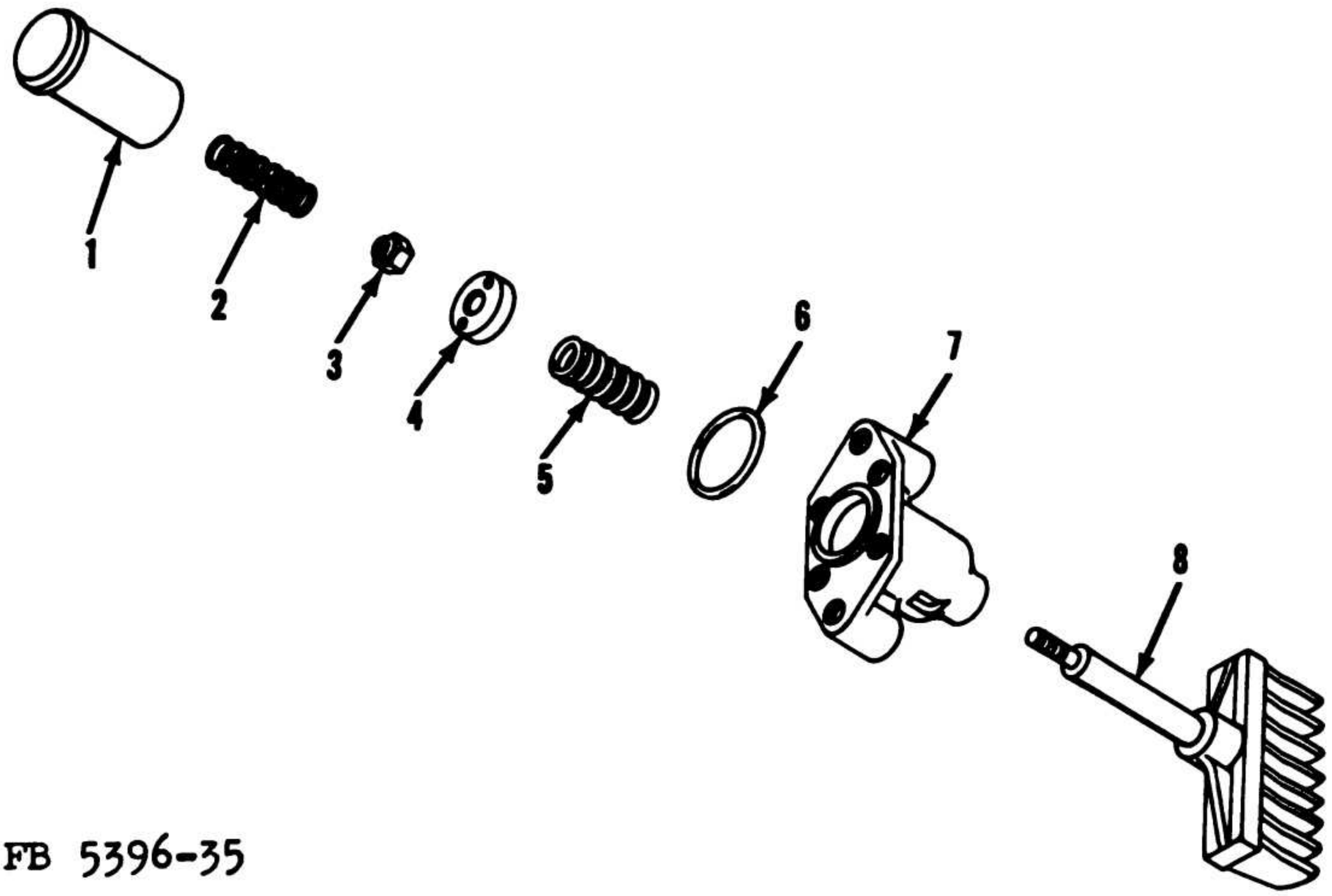
f. Installation.

(1) Install valve assembly (17 or 18, fig. 33) in the cylinder head.

(2) Replace cylinder-head cover (par. 103*e*(4) through (7)).

1 Nut, hex ½ NC (24 Req'd)
2 Copper washer
3 Leakage cap nut
4 Copper gasket
5 Bolt, hex hd, ⅜ x 1⅝ NC (2 Req'd)
6 Tee, pipe (1 Req'd)
7 Screw, cap, hex hd, ⅜ x 2¼ NC (4 Req'd)
8 Copper gasket
9 Unloader cover
10 Leakage cap nut
11 Copper washer
12 Unloader cover gasket
13 Cylinder-head cover
14 Jam screw
15 Unloader cylinder gasket
16 Unloader
17 Suction valve assembly
18 Cylinder-head cover gasket
19 Cylinder head
20 Cylinder-head gasket
21 Nut, hex, ½ NC (20 Req'd)
22 Lockwasher, ½ (20 Req'd)
23 Stud, ½ x 1⅞ NC (16 Req'd)
24 Discharge valve
25 Jam screw nut

Figure 34—Continued.



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1 Unloader piston
2 Power spring
3 Nut, stop, ⅜ NF
4 Spring washer
5 Return spring
6 O-ring
7 Unloader cylinder
8 Finger assembly

Figure 35. Unloader, exploded view.

105. Cylinder Heads

a. Low-Pressure Cylinder-Head Removal.

(1) Remove unloader line tubing (1 and 7, fig. 32) from the elbow and tee on the cylinder-head covers.

(2) Remove the low-pressure suction manifold (par. 92*a*(5)).

(3) Remove cap screws (9, fig. 32) securing the low-pressure discharge manifold to the cylinder head (6); loosen cap screws at intercooler end of manifold.

(4) Remove cylinder-head nut (8).

(5) Remove nuts (22, fig. 33) and lockwashers (23) securing the cylinder head (20) to the cylinder flange.

Note. When removing left-side low-pressure cylinder head, disconnect breather tubing (12, fig. 25) from left low-pressure suction manifold (16) before removing cylinder head.

Caution: Before performing (6 below), be sure to remove nut (8, fig. 32) from the long stud extending through the head from the cylinder barrel. Failure to do so can damage the equipment and cause injury to maintenance personnel.

(6) Attach lifting sling or chain to cylinder head. Raise head sufficiently to clear long stud in the center of the cylinder,

then remove head (20, fig. 33) and gasket (21) from the compressor.

b. High-Pressure Cylinder-Head Removal.

(1) Remove aftercooler (par. 93*a*).

(2) Remove canopy and access doors (par. 144*a* (1) through (14)).

(3) Remove intercooler fan (par. 94*a*).

(4) Disconnect unloader tubing from tee (6, fig. 34).

(5) Remove cap screws (1, fig. 27) and lockwashers (2) at both ends of suction manifold (13); remove manifold and gaskets (14) from cylinder head and intercooler.

(6) Remove nuts (21, fig. 34) and lockwashers (22) from the 16 studs (23) around the cylinder barrel flange.

(7) Remove four nuts (1) (two center and two outer nuts shown removed from the center row of nuts in figure 34) from the long studs extending through the cylinder head from the cylinder barrels.

Caution: Failure to perform (7) above before (8) below can damage the equipment and cause injury to maintenance personnel.

(8) Attach lifting sling or chain to cylinder head. Raise head sufficiently to clear the long studs, then remove cylinder head (19) and two gaskets (20) from the compressor.

c. Cylinder-Head Disassembly.

(1) Remove the unloaders (par. 103).

(2) Remove the valves (par. 104).

d. Cylinder-Head Cleaning and Inspection.

(1) Wash all parts thoroughly in cleaning solvent.

(2) Clean mating surface of the cylinder and cylinder heads, of all foreign matter.

(3) Inspect for cracks, clogged passages, distortion, corrosion, and stripped threads on studs.

e. Cylinder-Head Reassembly. Install the valves and unloaders (par. 104*f*).

f. Low-Pressure Cylinder-Head Installation.

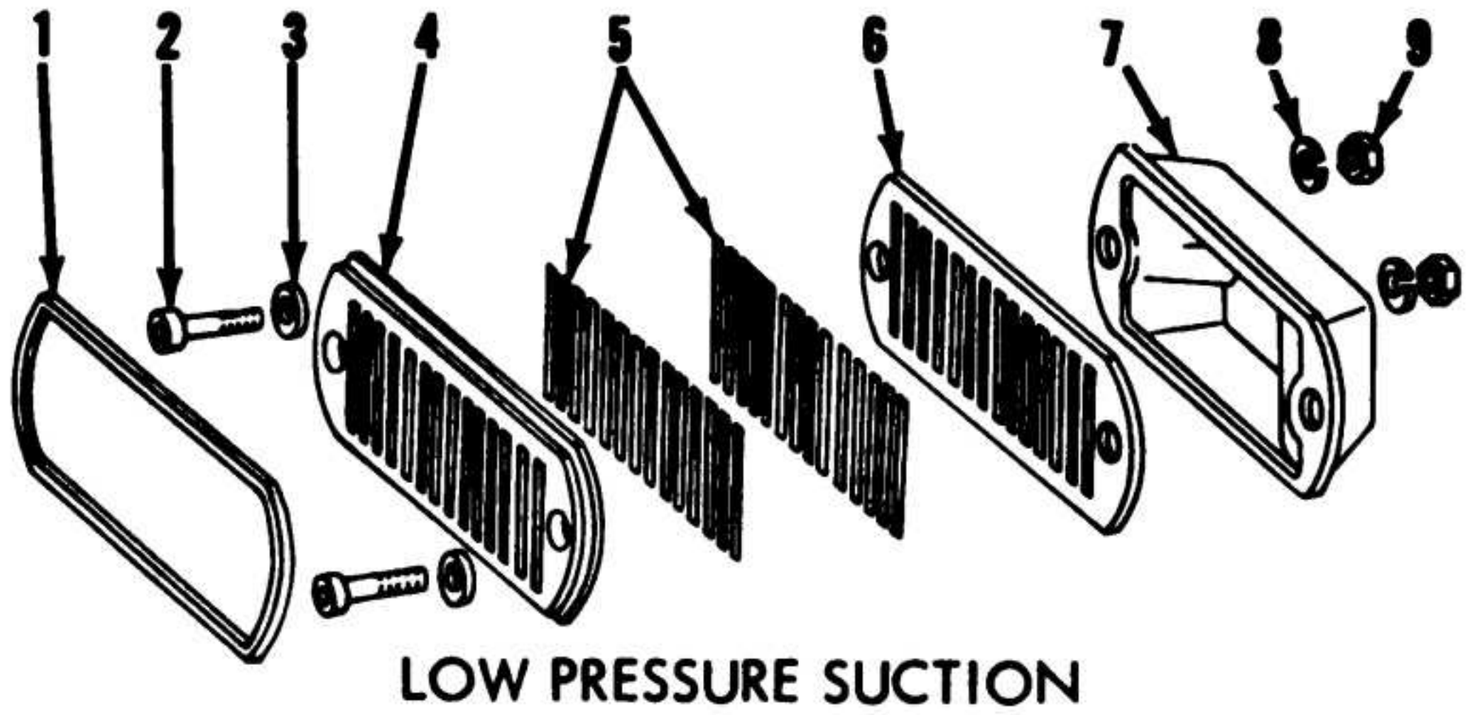
(1) Place a new cylinder-head gasket (21, fig. 33) over the low-pressure cylinders and lower the cylinder head (20) on the cylinders.

(2) Replace lockwashers (23) and nuts (22) on cylinder-head studs (24) and tighten evenly.

(3) Install nut (25) on center stud and tighten.

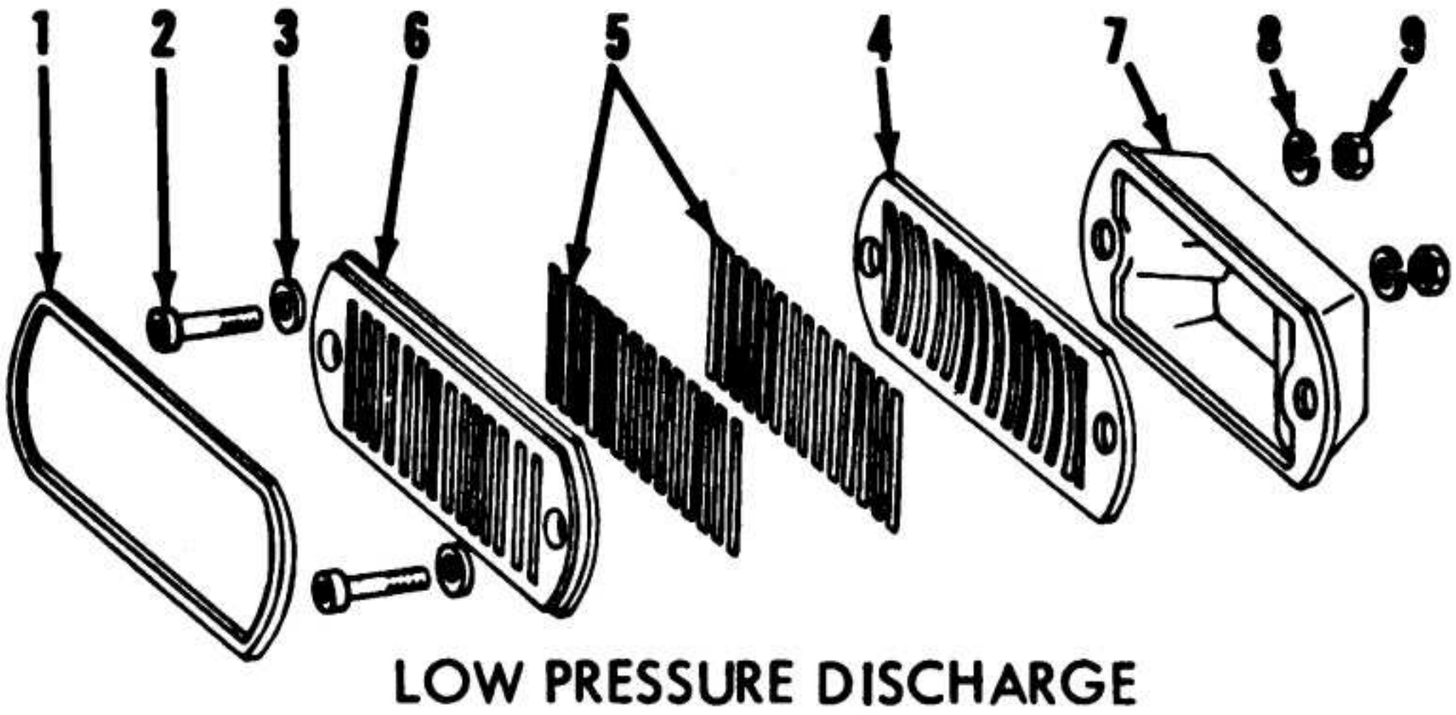
(4) Install discharge manifold (8, fig. 27) with new gaskets (4); replace the lockwashers (2) and cap screws (1).

(5) Replace the low-pressure suction manifold (par. 92*c*).



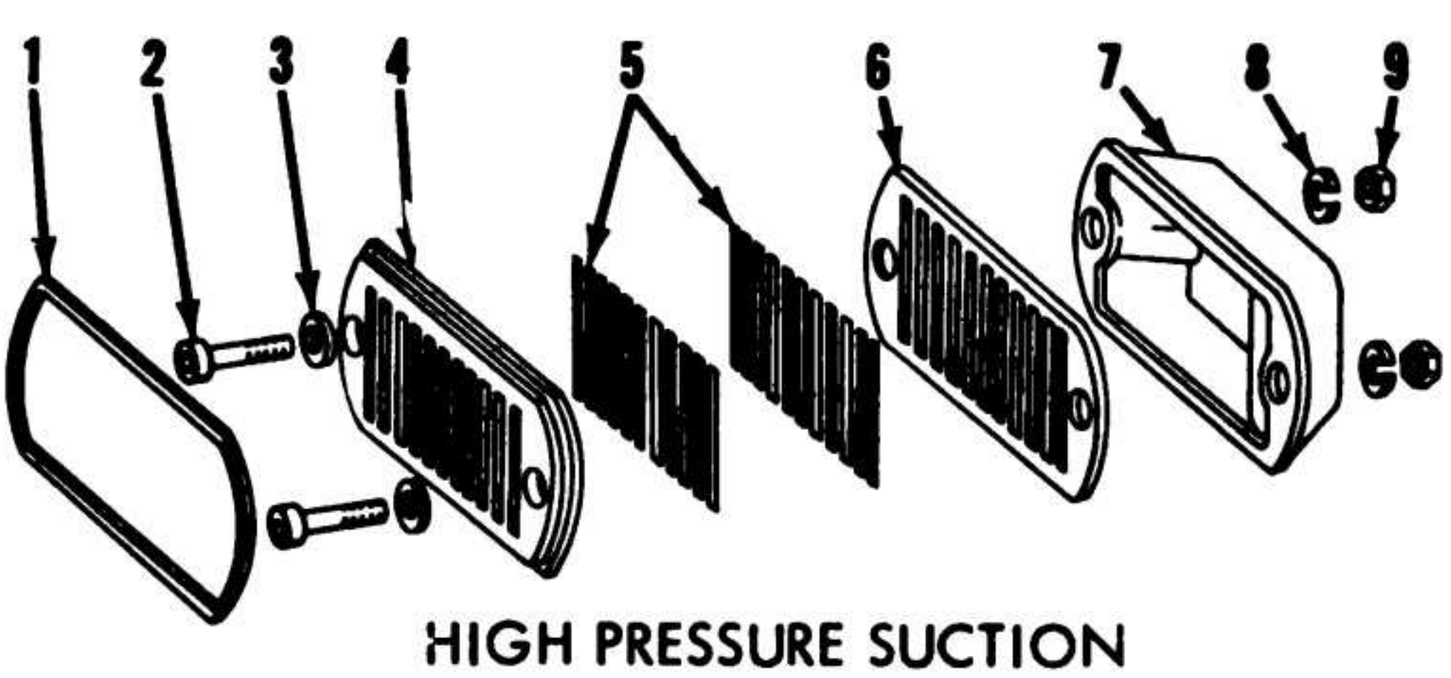
LOW PRESSURE SUCTION

A



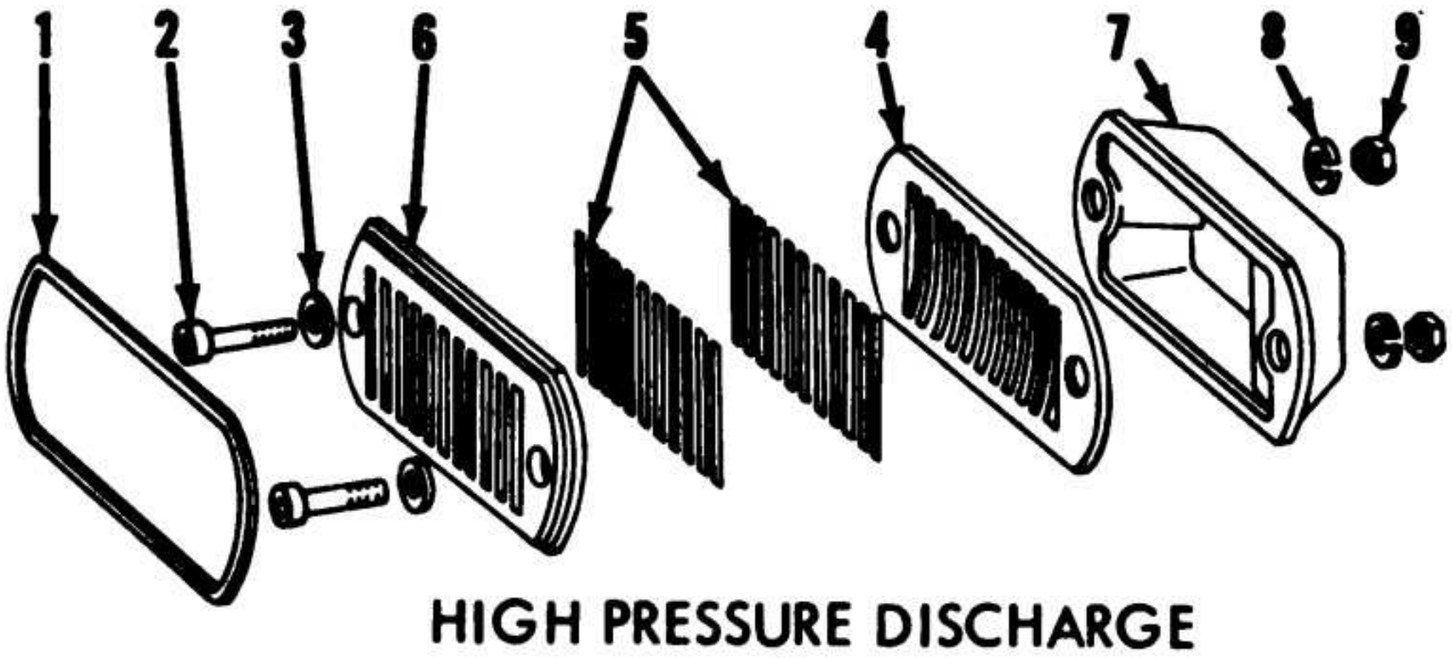
LOW PRESSURE DISCHARGE

B



HIGH PRESSURE SUCTION

C



HIGH PRESSURE DISCHARGE

D

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Figure 36. Valves, exploded view.

(6) Connect breather tubing (12, fig. 25) to elbow (13) in manifold (16). (Left side only.)
(7) Connect unloader tubing to tee (8, fig. 33).

g. High-Pressure Cylinder-Head Installation.

(1) Place new cylinder-head gaskets (20, fig. 34) on the high-pressure cylinders and lower the cylinder head (19) on the cylinders.
(2) Replace the lockwashers (22), nuts (21), and nuts (1); tighten these nuts evenly.
(3) Install high-pressure suction manifold (13, fig. 27) with new gaskets (14) and replace the lockwashers (2) and cap screws (1).
(4) Attach high-pressure discharge manifold (5, fig. 26) and new gasket (9) to cylinder head with cap screws (2) and lockwashers (1).
(5) Install the aftercooler (par. 93*c*).
(6) Install the intercooler fan (par. 94*e*).
(7) Connect unloader tubing to tee (6, fig. 34).
(8) Install canopy and access doors (par. 144*c*).

106. Engine Speed Control
(fig. 37)

a. Removal.

(1) Remove the cotter pin (5) and washer from the throttle control cylinder (2); disconnect the throttle control cylinder from the engine speed control (4).
(2) Remove the two nuts, lockwashers, and bolts securing the engine speed control (4) to its bracket.

b. Cleaning and Inspection.

(1) Wipe external surface of the engine speed control with a cloth dampened in cleaning solvent.
(2) Inspect for cracks, freedom of movement, and stripped threads.
(3) Replace if damaged or defective.

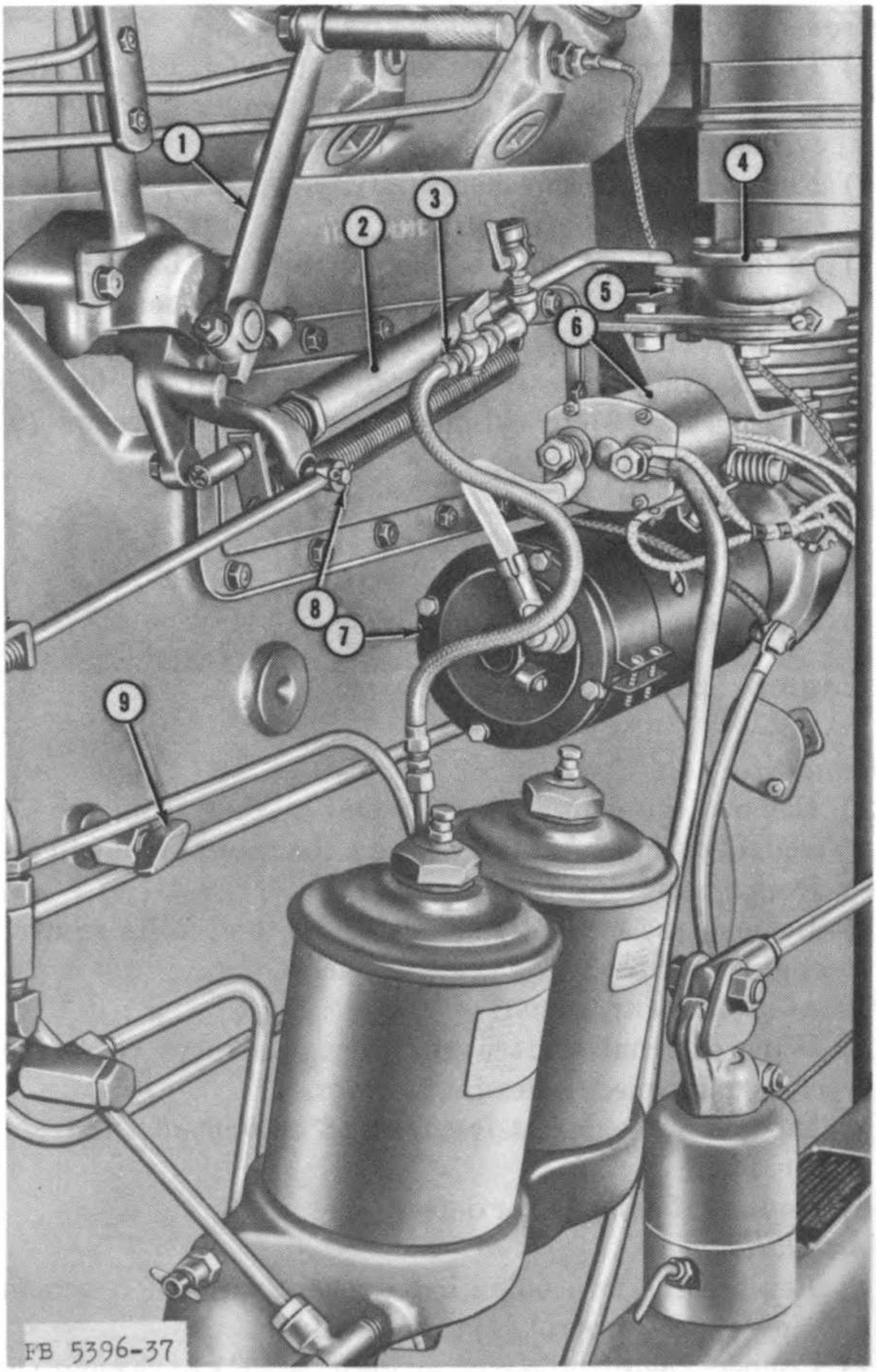
c. Installation.

(1) Replace the two bolts, lockwashers, and nuts securing the engine speed control (4) to its bracket.
(2) Connect the throttle control cylinder (2) to the engine speed control; replace the washer and its cotter pin (5).

---

1 Valve gasket
2 Screw, cap, socket-hd, 5/16 x 1¾ NC (2 req'd)
3 Washer, copper, 5/16 (2 req'd)
4 Valve guard
5 Valve strip
6 Valve seat
7 Yoke
8 Lockwasher, 5/16 (2 req'd)
9 Nut, hex, 5/16 NC (2 req'd)

Figure 36—Continued.



1 Compression release lever
2 Throttle control cylinder
3 Flexible hose connection
4 Engine speed control
5 Cotter pin
6 Starting motor solenoid
7 Starting motor
8 Cotter pin
9 Draincock

Figure 37. Starting motor, engine speed control, and throttle control cylinder, installed view.

d. Engine Speed Control Adjustment. Tighten or loosen the tension nut located on the bottom of the speed control to give the desired friction for proper operation of the speed control. If the friction is insufficient, the control will creep from the set position. Excessive friction will cause difficulty in operating the control.

107. Throttle Control Cylinder

(fig. 37)

a. Removal.

(1) Remove the cotter pin (5) and the washer holding the throttle control cylinder (2) to the engine speed control (4).
(2) Disconnect the flexible hose connection.
(3) Remove the nut and lockwasher attaching the throttle control cylinder to the compression release lever (1); remove the throttle control cylinder.

b. Cleaning and Inspection.

(1) Wipe cylinder and piston rod with a cloth dampened in cleaning solvent. Do not allow cleaning solvent to get into the cylinder.
(2) Inspect for distortion, freedom of movement, corrosion, and stripped threads.

c. Installation.

(1) Position the throttle control cylinder (2) and replace the nut and lockwasher securing the throttle control cylinder to the compression release lever (1).
(2) Connect the throttle control cylinder to the engine speed control; replace washer and cotter pin (5).

108. Trigger Valve

a. Removal.

(1) Disconnect the tubing (1, 3, 6, and 7, fig. 16), from the trigger valve assembly (2).
(2) Remove the two nuts (10, fig. 38), lockwashers (9), and cap screws (11) attaching the trigger valve to the compressor unit; remove the valve.

b. Disassembly (fig. 38).

(1) Remove support bracket (8), pipe cross (7), tee (23), and nipples (26) from the trigger valve body (25).
(2) Loosen jam nut (19); remove adjusting screw (20), spring (18), and stem (17).
(3) Remove spring retainer (16), shims (15), and ball (14).
(4) Remove gauze holder (strainer) (24).

c. Cleaning and Inspection (fig. 38).

(1) Wash parts thoroughly in cleaning solvent. Clean strainer gauze thoroughly with compressed air if necessary.

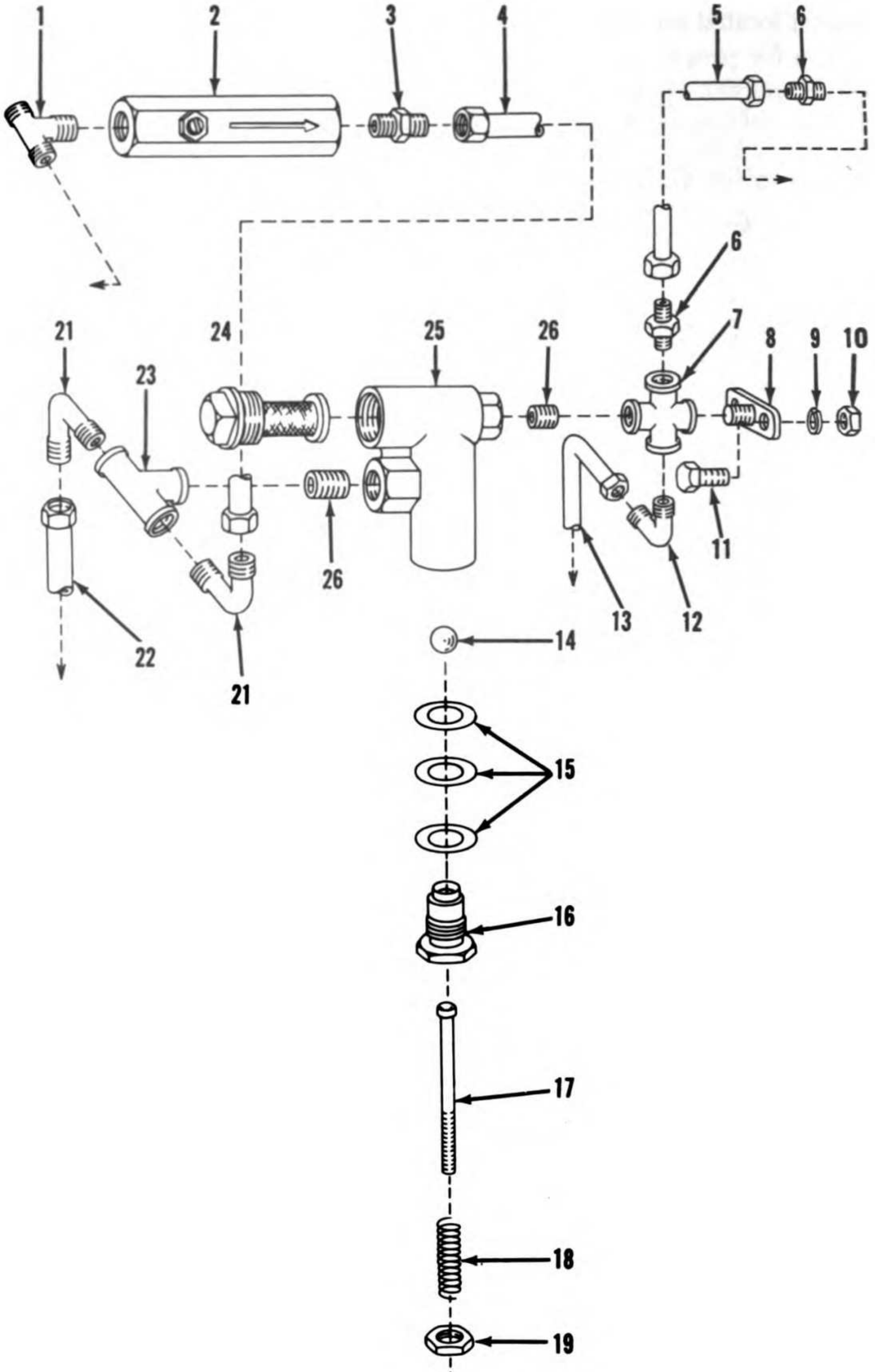


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Figure 38. Trigger valve and check valve, exploded view.

(2) Inspect valve body (25) for cracks and stripped threads; check ball (14) and stem (17) for pits and roughness.
(3) Check ball seat on spring retainer (16) and seat inside valve body (25) for rough spots, nicks, or burs.
(4) Replace damaged parts.

d. Reassembly (fig. 38).

(1) Install gauze holder (24) in trigger valve body (25).
(2) Install ball (14) and spring retainer (16), using same number of shims (15) removed at disassembly.
(3) Install stem (17), spring (18), jam nut (19), and adjusting screw (20).
(4) Install nipples (26), pipe cross (7), support bracket (8), and tee (23).
(5) Leave jam nut (19) and adjusting screw (20) loose and adjust the trigger valve (*f* below) after installation.

e. Installation.

(1) Install trigger valve assembly on the compressor and secure with two cap screws (11, fig. 38), lockwashers (9), and nuts (10).
(2) Connect tubing (1, 3, 6, and 7, fig. 16) to the trigger valve assembly and adjust the unloading pressure (*f* (1) below).

f. Adjustment (fig. 38).

(1) Turn adjusting screw (20) in to raise the air pressure maintained in the receiver (normally 100 psi); turn the screw out to lower the pressure.
(2) Remove one or more shims (15) to decrease the air pressure range (difference in pressure between loading and unloading); add one or more shims (15) to increase the pressure range.

1	Tee	13	Air receiver gage tubing
2	Check valve	14	Ball
3	Coupling	15	Shim
4	Trigger valve-to-unloader check valve tubing	16	Spring retainer
		17	Stem
5	Trigger valve-to-air receiver tubing	18	Spring
		19	Jam nut
6	Coupling	20	Adjusting screw
7	Pipe cross	21	Elbow
8	Support bracket	22	Throttle control tubing
9	Lockwasher, ⅜ (2 Req'd)	23	Tee
10	Nut, hex, ⅜ NC (2 Req'd)	24	Gauze holder
11	Screw, cap, ⅜ x ¾ NC (2 Req'd)	25	Trigger valve body
12	Elbow	26	Nipple

Figure 38—Continued.

109. Check Valve

a. Removal (fig. 17). Disconnect the tubing (5); remove the check valve from unloader tubing (1) connection.

b. Cleaning and Inspection.

(1) Wash in cleaning solvent and blow out passages with air.

(2) Inspect for stripped threads, corrosion, cracks, and restricted passages.

(3) Replace if defective.

c. Installation (fig. 17). Position the check valve (2) and connect the tubing (1 and 5).

Caution: Check valve must be installed with arrow on valve (2, fig. 38) pointing to the rear of the equipment or unloaders will not operate properly.

d. Adjustment. Loosen locknut (4, fig. 17) and turn adjusting screw (3) in to retard unloader release time. Turn adjusting screw out to speed unloader release time. (Do not turn screw (3) in all the way, or unloaders will not operate.) Tighten nut (4) after adjustment.

Warning: Do not turn screw (3) out too far with pressure in the system. With locknut (4) loose, screw (3) will be blown out of the valve.

Section VII. ENGINE LUBRICATING SYSTEM

110. Description

The UD–24 engine is equipped with a pressure-type lubricating system. A gear-type pump, located in the sump of the crankcase oil pan, forces oil through the system. Oil is forced through three radial fin-type filters (17, fig. 8) into the crankcase and engine block passages, and from there, through the crankshaft to the connecting rods. Oil temperature and pressure conditions are indicated by gages mounted on the instrument panel.

111. Oil Filters

(fig. 39)

a. Removal.

(1) Remove the drain plugs (12), gaskets (13), and the pipe plugs (17 and 18); drain the oil from the filters.

(2) Disconnect the oil filter inlet pipe from the union (24).

(3) Remove the four cap screws (26 and 27) and lockwashers (25) securing the oil filter to the engine; remove the oil filter and base gasket (19).

b. Disassembly.

(1) Loosen the cover retainer nut (1); remove the cover (4), gasket (5), and filter element (6).

(2) Remove the three screws (7) and lockwashers (8); remove the standpipe (9), standpipe gasket (10), filter case (11), and filter case gasket (16).
(3) Loosen the jam nut (15) and remove the filter stud (14).
(4) Remove the retainer nut (23) and gasket (22); remove the regulating spring (21) and valve (20).
(5) Disassemble remaining filters in the same way.

c. Cleaning and Inspection.

(1) Wash all parts thoroughly in cleaning solvent; blow out passages.
(2) Inspect for cracks, distortion, stripped threads, and clogged passages.
(3) The regulating valve spring free length is $3\frac{13}{16}$ inches. The pressure required to compress this spring to $3\frac{3}{32}$ inches must be 31 to 37 pounds.
(4) Replace all defective or damaged parts.

d. Reassembly.

(1) Install the regulating valve (20) and spring (21) in the filter base, install the retainer nut (23) and new gasket (22).
(2) Replace the pipe plugs (17 and 18), and the drain plugs (12) and gaskets (13).
(3) Replace the filter stud (14) and tighten the jam nut (15).
(4) Install a new filter case gasket (16) and position the filter case (11).
(5) Install a new standpipe gasket (10) and position the standpipe (9); replace the three lockwashers (8) and screws (7).
(6) Install a new filter element (6) and gasket (5); replace the cover (4) but do not tighten.
(7) Reassemble other two filters in the same way.

e. Installation.

(1) Install a new base gasket (19) and position the filter assembly on the engine; replace the four lockwashers (25) and cap screws (26 and 27) securing the filter assembly to the engine.
(2) Connect the oil filter inlet pipe to the union (24).
(3) Remove cover (4) from all three filters and fill the filters with OE of the same grade as used in the engine (see LO 5–5396).
(4) Replace the covers (4) and tighten nuts (1).

112. Engine Oil Temperature Gage

a. Removal.

(1) Drain oil from the engine crankcase.
(2) Remove the oil temperature gage bulb unit from the engine crankcase.

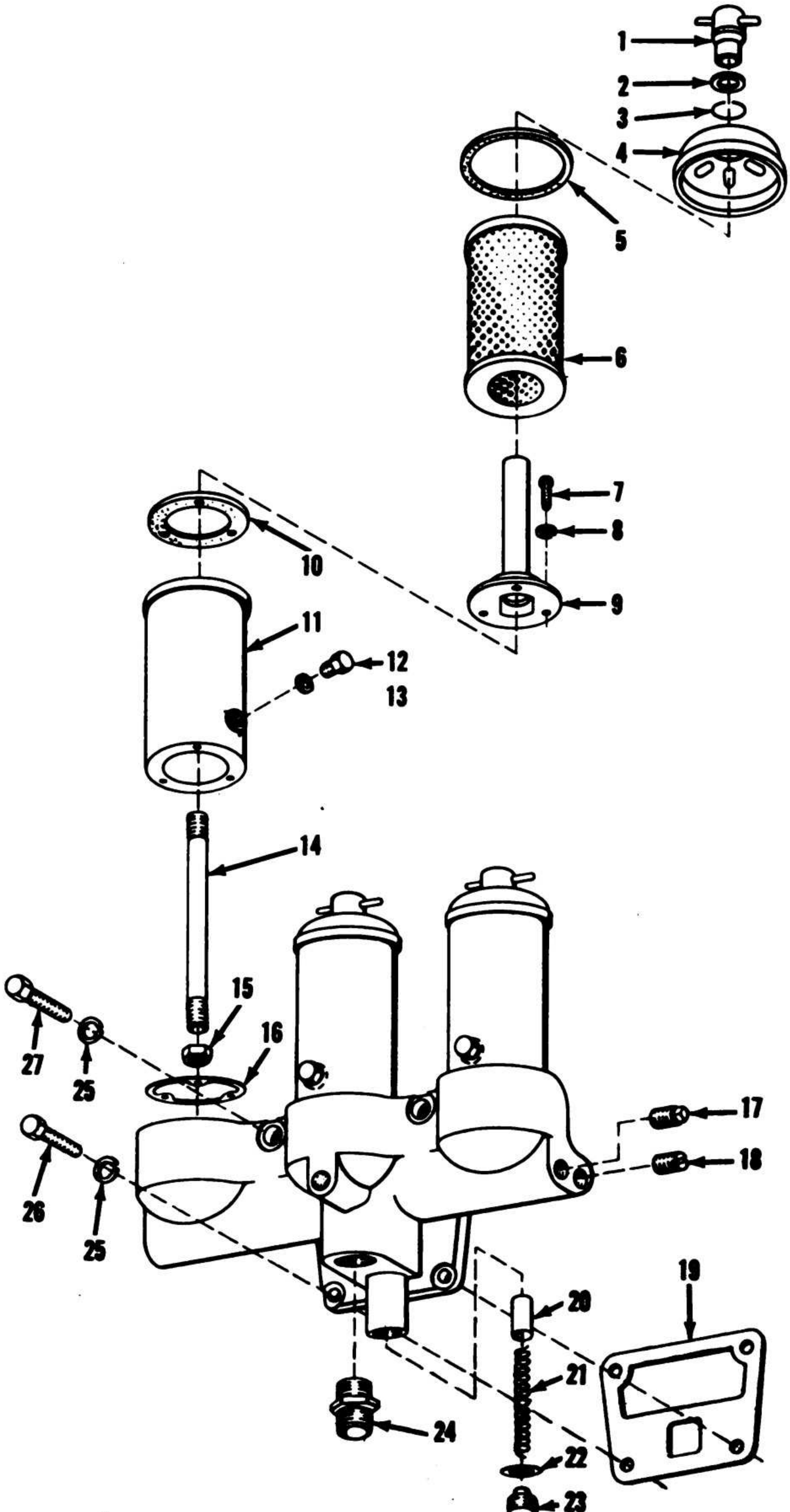

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Figure 39. Engine lubricating oil filter, exploded view.

(3) Remove the two nuts, lockwashers, and U-shaped clamp holding the gage (9, fig. 18) to the instrument panel; remove gage, tubing, and bulb as a unit.

Caution: Do not kink or collapse armored tubing.

b. Cleaning and Inspection.

(1) Wipe the gage with a cloth dampened with cleaning solvent and dry thoroughly.

(2) Inspect for cracked glass, leaks, stripped threads, and kinked tubing.

(3) Replace gage as a unit if damaged or defective.

c. Installation.

(1) Feed bulb unit and tubing through instrument panel and position the gage in the panel; replace the clamp, two lockwashers, and nuts.

(2) Install the bulb unit in the engine crankcase.

(3) Refill the engine with oil (OE) (see LO 5–5396).

113. Engine Oil Pressure Gage

a. Removal.

(1) Disconnect the tubing from the rear of the gage (11, fig. 18).

(2) Remove the two nuts, lockwashers, and U-shaped clamp securing the gage to the instrument panel; remove the gage.

b. Cleaning and Inspection.

(1) Wipe gage with cloth dampened with cleaning solvent; dry thoroughly.

(2) Inspect for cracked glass, broken needle, or stripped threads.

(3) Replace gage if damaged or defective.

---

1 Cover retainer nut
2 Cover retainer nut gasket
3 Cover snap ring
4 Filter case cover
5 Filter case cover gasket
6 Oil filter element
7 Screw, mach rd hd, ⅜ x 1⅛ NC (3 Req'd)
8 Lockwasher, ⅜ (3 Req'd)
9 Standpipe
10 Standpipe gasket
11 Filter case
12 Drain plug
13 Drain plug gasket
14 Filter stud
15 Nut, hex
16 Filter case gasket
17 Pipe plug, ⅜
18 Pipe plug ½
19 Filter base gasket
20 Pressure regulating valve
21 Valve spring
22 Retainer nut gasket
23 Valve retainer nut
24 Filter inlet pipe union
25 Lockwasher, ⅜ (4 Req'd)
26 Screw, cap, hex hd ⅜ x 2¼ (2 Req'd)
27 Screw, cap, hex hd, ⅜ x 2½ (2 Req'd)

Figure 39—Continued.

c. Installation.

(1) Position the gage in the panel and replace the clamp, two lockwashers, and nuts.

(2) Connect the tubing at rear of the gage.

Section VIII. ENGINE COOLING SYSTEM

114. Description

The engine cooling system utilizes a liquid coolant. This coolant is circulated through the engine block, cylinder head, and radiator by a centrifugal pump. When the engine is cold, four bypass type thermostats block circulation to the radiator while permitting circulation in the remainder of the system. When efficient operating temperature has been reached, the thermostats open, permitting the coolant to circulate through the radiator. A blower-type fan, driven by a pair of V-belts from a pulley on the front of the crankshaft, forces air through the radiator core for cooling. A capillary type gage indicates the temperature of the coolant.

115. Radiator

a. Removal.

(1) Drain the cooling system (par. 40*a* (1) and (2)).

(2) Remove access door ends and remove screws attaching canopy to radiator (par. 144*a* (5) and (7)).

(3) Prop up front of canopy with boards to support canopy when radiator is removed (see fig. 40).

(4) Remove cap screws (19, fig. 41), lockwashers (12), and washers (23) securing fan guards (22 and 24) to the fan housing sheets (17 and 18); remove cap screws (2) and lockwashers (3) from guard brace (4) and remove fan guards.

(5) Remove cap screws (2) and lockwashers (3) from outlet pipe (26); remove pipe and gasket (25) from radiator lower tank.

(6) Loosen hose clamp (5) at inlet nipple (16).

(7) Remove cap screws (14 and 15) and lockwashers (13) attaching braces (4 and 8) to the front of the engine cylinder head.

(8) Attach a lifting chain to radiator upper tank using $\frac{7}{16}$–14 cap screws in the tapped holes provided; support radiator with hoist while performing remaining steps.

(9) Remove four cap screws (33, fig. 42), lockwashers (34), and nuts (35) securing radiator assembly to the compressor frame; tilt radiator forward to clear canopy and hoist it enough so the overflow pipe will clear the frame crossmember (fig. 40).

b. Disassembly.

(1) Remove cap screws (11, fig. 41) and lockwashers (12) attaching brace stud (10) to radiator.

(2) Remove overflow pipe (31, fig. 42) from elbow (11).

(3) Remove cap screws (19, fig. 41) and lockwashers (12) from fan housing sheets (17 and 18); remove sheets.

(4) Remove cap screws (18, fig. 42), lockwashers (19), and washers (20); remove grille (21), side sheets (13 and 29), bottom grille (27), and panels (22 and 28).

(5) Remove cap screws (4), lockwashers (2), and cap screws (1) and lockwashers (2) from both core spacers (3).

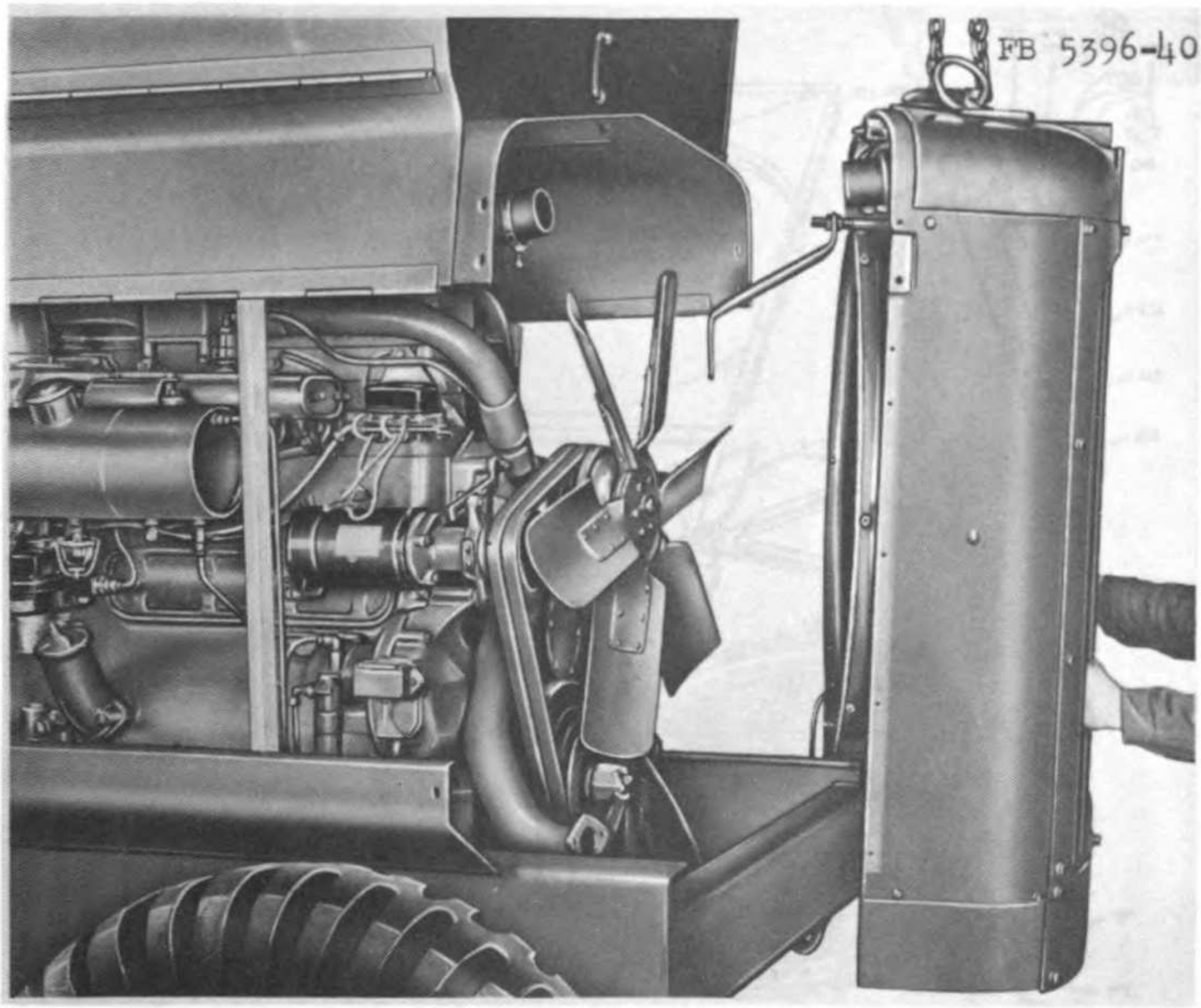

Figure 40. Removing the radiator.

(6) Remove cap screws (5) and lockwashers (19) from tanks (12 and 36); remove upper tank (12), gasket (9), and stiffeners (7) and (8) from core (6). Remove lower stiffeners, lower tank (36), and gasket (32).

c. Cleaning and Inspection.

(1) Soak the radiator core and both tanks in an alkaline solution for 3 hours at a temperature of 180° F. or over.

(2) Use compressed air to blow out rust and scale.

Caution: Lye solutions will damage the core material; do not use for cleaning.

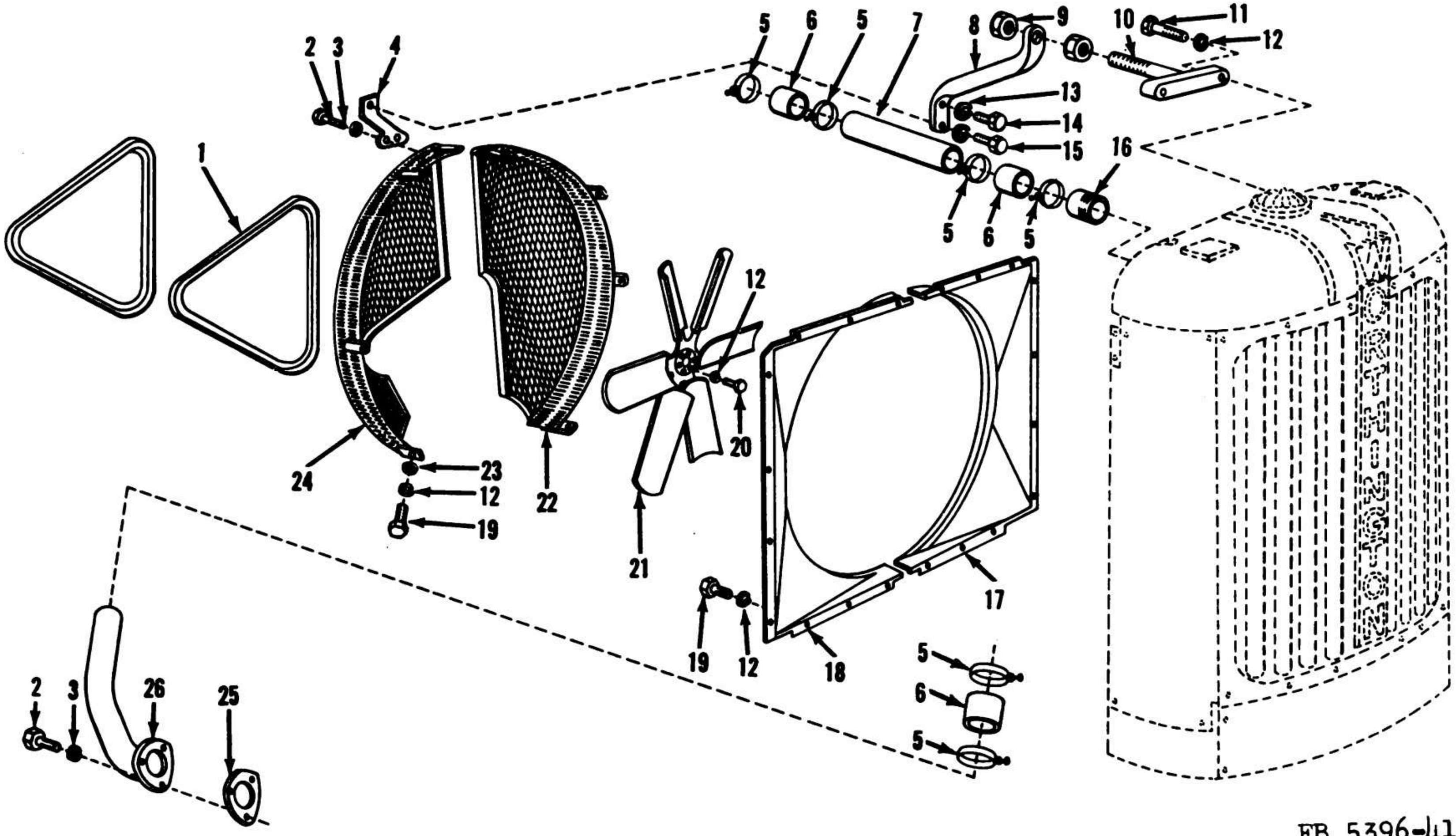

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Figure 41. Engine fan, guards, and hoses, exploded view.

1 Fan belts
2 Screw, cap, hex hd, 5/16 x 5/8 NC (5 Req'd)
3 Lockwasher, 5/16 (5 Req'd)
4 Fan guard brace
5 Hose clamp
6 Inlet hose
7 Inlet pipe
8 Radiator brace
9 Nut, hex, 3/4 NF (2 Req'd)
10 Radiator brace stud
11 Screw, cap, hex hd, 3/8 x 1 3/4 NC (2 Req'd)
12 Lockwasher, 3/8 (34 Req'd)
13 Lockwasher, 1/2 (2 Req'd)
14 Screw, cap, hex hd, 1/2 x 3/4 NC (1 Req'd)
15 Screw, cap, hex hd, 1/2 x 1 NC (1 Req'd)
16 Inlet nipple
17 Left fan housing sheet
18 Right fan housing sheet
19 Screw, cap, hex hd, 3/8 x 5/8 NC (28 Req'd)
20 Screw, cap, hex hd, 5/8 x 1 1/4 NC (6 Req'd)
21 Blower fan
22 Left fan guard
23 Washer, 3/8 (8 Req'd)
24 Right fan guard
25 Outlet pipe flange gasket
26 Outlet pipe

Figure 41—Continued.

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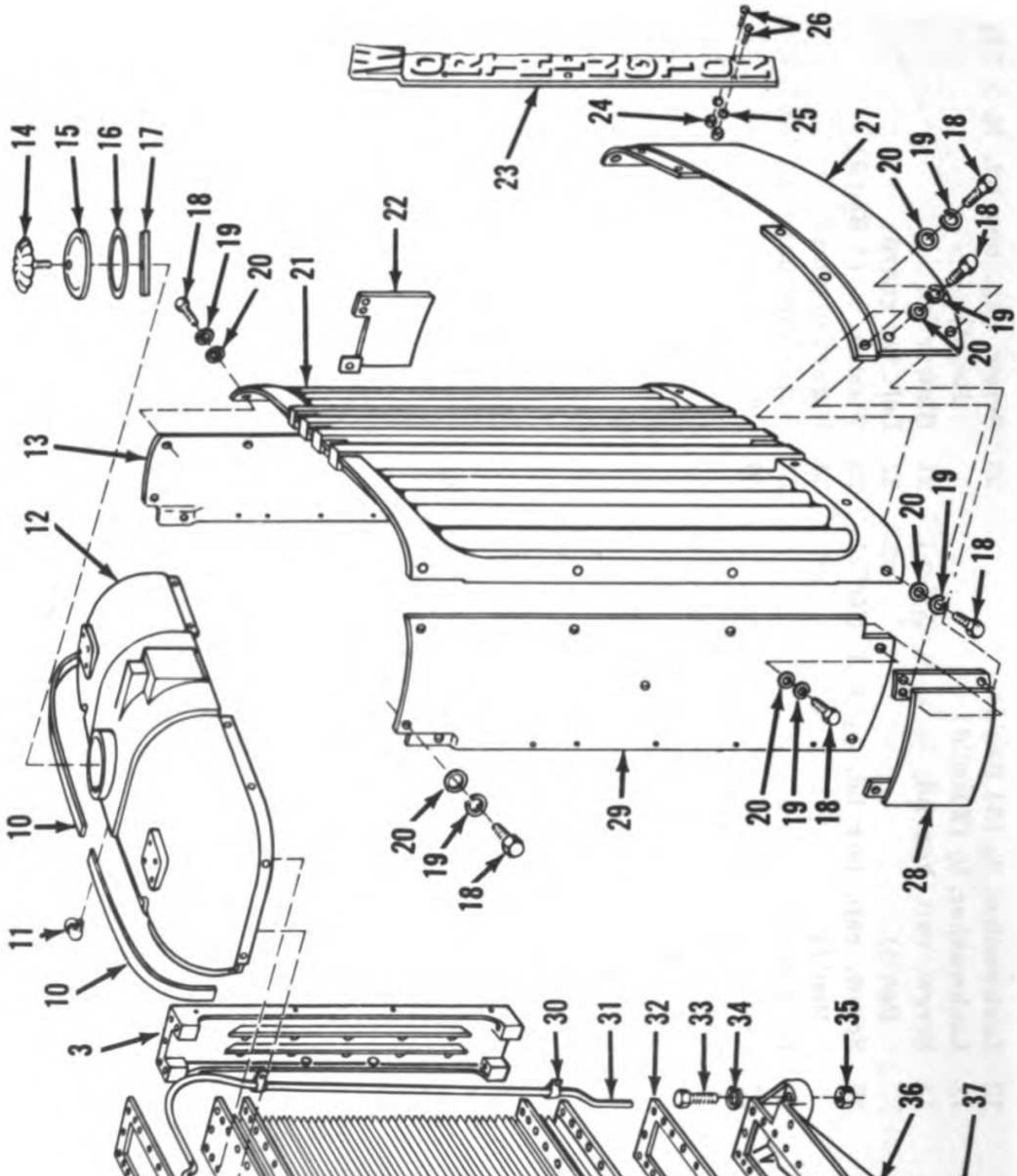


Figure 42. Engine radiator and grille, exploded view.

1 Screw, cap, hex hd, ½ x 1⅜ NC (12 Req'd)
2 Lockwasher, ½ (20 Req'd)
3 Radiator core spacer
4 Screw, cap, hex hd, ½ x 2¼ (8 Req'd)
5 Screw, cap, hex hd, ⅜ x ⅞ NC (48 Req'd)
6 Radiator core
7 Front core stiffener
8 Rear core stiffener
9 Upper gasket
10 Canopy spacer
11 Overflow pipe elbow
12 Upper tank
13 Left side sheet
14 Cap clamp handle
15 Cap cover
16 Cap gasket
17 Cap clamp
18 Screw, cap, hex hd, ⅜ x ¾ NC (32 Req'd)
19 Lockwasher, ⅜ (87 Req'd)
20 Washer, ⅜ (16 Req'd)
21 Grille
22 Lower left side panel
23 Radiator name plate
24 Nut, hex, ¼ NF (6 Req'd)
25 Lockwasher, ¼ (6 Req'd)
26 Screw, mach, flat hd, ¼ x 2 (6 Req'd)
27 Bottom grille
28 Lower right side panel
29 Right side sheet
30 Overflow pipe clip
31 Overflow pipe
32 Radiator lower gasket
33 Screw, cap, hex hd, ⅝ x 2¼ NC (4 Req'd)
34 Lockwasher, ⅝ (4 Req'd)
35 Nut, hex, ⅝ NC (4 Req'd)
36 Water tank, lower
37 Drain valve

Figure 42—Continued.

(3) Check core for damaged fins and clogged or punctured tubes.
(4) Discard badly damaged parts.

d. Repair. Repair damaged tubes by inserting a smaller diameter tube in the original tube and soldering it to the top and bottom core plates. Clean off flux after soldering.

e. Reassembly.

(1) Place new gasket (9, fig. 42) on core, install upper tank (12), and replace stiffeners (7 and 8) using a few cap screws (5) and lockwashers (19) in center holes of the stiffeners.

Note. Do not tighten cap screws until both tanks and spacers have been assembled to the core.

(2) Install new gasket (32), lower tank (36), lower stiffeners, and install a few cap screws (5) and lockwashers (19) in the center holes of the stiffeners and tank.
(3) Install spacers (3) on each side and secure with cap screws (1), lockwashers (2), and cap screws (4) and lockwashers (2) at top and bottom.
(4) Install and tighten all remaining cap screws securing tanks and spacers to core.
(5) Plug tank openings and immerse assembled core in a radiator test tank. Check for leaks while applying compressed air (approximately 3 psi) inside the core; resolder tubes if necessary. Remove assembled core and dry with air.
(6) Position side sheets (13 and 29), side panels (22 and 28), bottom grille (27), grille (21) on the core and tanks, and secure with cap screw (18), lockwashers (19), and washers (20).
(7) Install fan housing sheets (17 and 18, fig. 41); and secure with cap screws (19) and lockwashers (12).
(8) Install brace stud (10) with cap screws (11) and lockwashers (12); install brace (8) on stud (10) with nuts (9). Leave nuts loose.
(9) Install overflow pipe (31, fig. 42) in elbow (11).

f. Installation.

(1) Attach a lifting chain or sling to upper tank and raise radiator as shown in figure 40.
(2) Swing radiator into position slowly, being careful not to catch the overflow pipe on the compressor frame.
(3) Reach through grille and install two cap screws (33, fig. 42), lockwashers (34), and nuts (35) at each of the front corners; install remaining two cap screws (33) at rear corner and secure with lockwashers (34), and nuts (35).
(4) Connect outlet pipe (26, fig. 41) to lower tank, using new gasket (25), and secure with cap screws (2) and lockwashers (3). Tighten hose clamps (5) at junction of outlet pipe and engine water pump.

(5) Connect hose (6) to inlet nipple (16) in upper tank; tighten clamps (5).
(6) Position guard brace (4) against cylinder head and install lower end of radiator brace (8) over it; secure braces to head with cap screws (14 and 15), and lockwashers (13).
(7) Adjust radiator brace (8), using nuts (9) to increase or decrease tension; tighten nuts after adjustment.
(8) Install fan guards (22 and 24); and secure with cap screws (2), lockwashers (3), cap screws (19), lockwashers (12), and washers (23).
(9) Close radiator draincock (37, fig. 42) and fill radiator with water or antifreeze solution as required (Table I).
(10) Run engine for 10 minutes and check for leaks. Tighten any loose clamps and add coolant if necessary.

116. Engine Water Temperature Gage

a. Removal.
(1) Drain cooling system (par. 40*a*(1)).
(2) Remove the bulb unit and armored tubing from the left side of the engine.
(3) Remove two nuts, lockwashers, and U-shaped clamp securing the gage (2, fig. 18) to the instrument panel; remove the gage with bulb unit and armored tubing attached.

b. Cleaning and Inspection.
(1) Wipe gage with cloth dampened with cleaning solvent and dry thoroughly.
(2) Inspect for cracks, broken needle, cracked glass, and stripped threads.
(3) Replace gage if damaged or defective.

c. Installation.
(1) Insert bulb unit and tubing through panel and position gage in instrument panel; replace the clamp, two lockwashers, and two nuts.
(2) Install bulb unit in the engine.
(3) Fill cooling system with water or antifreeze (See table I).

117. Fan and Belts

a. Fan Removal.
(1) Disconnect a battery cable to prevent accidental cranking of the engine.
(2) Remove fan guards (par. 115*a*(4)).
(3) Loosen cap screw in slotted fan belt idler brace (3, fig. 43).
(4) Loosen two generator mounting bolts, and push generator toward engine to ease belt tension.
(5) Remove cap screws (20, fig. 41) and lockwashers (12); remove fan (21) from pulley.

b. Fan Cleaning and Inspection.

(1) Wash fans in cleaning solvent and dry thoroughly.
(2) Inspect for loose or bent blades, and elongated bolt holes.
(3) Replace fan if defective.

c. Fan Installation.

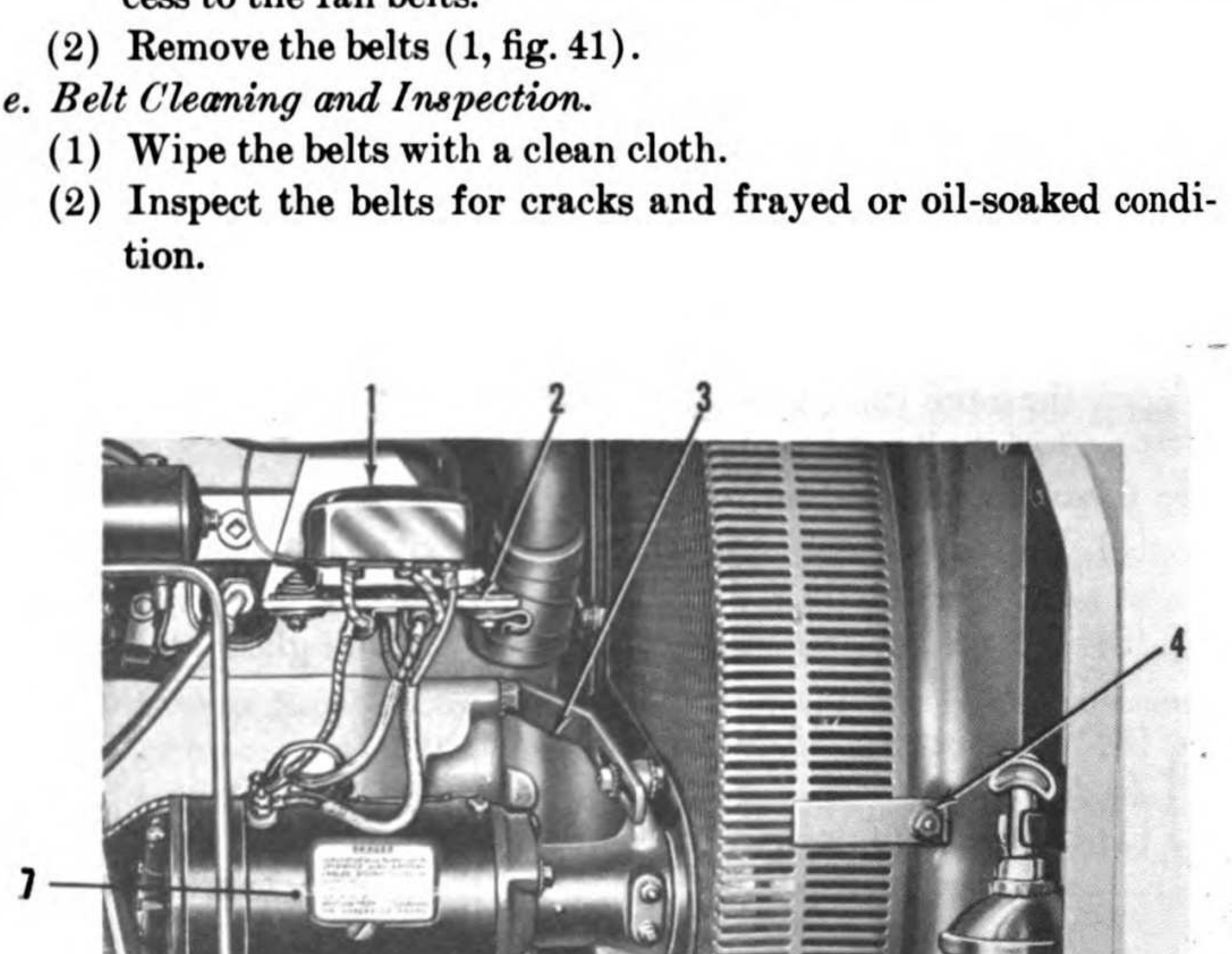
(1) Position the fan (21) and replace the lockwashers (12) and cap screws (20).
(2) Adjust the fan belt tension (*f*(2) and (3) below).
(3) Replace the fan guards (par. 115*f*(8)).
(4) Connect the battery cable.

d. Belt Removal.

(1) Complete *a*(1) through (4) above, as necessary, to gain access to the fan belts.
(2) Remove the belts (1, fig. 41).

e. Belt Cleaning and Inspection.

(1) Wipe the belts with a clean cloth.
(2) Inspect the belts for cracks and frayed or oil-soaked condition.



1 Generator regulator
2 Regulator bracket
3 Fan belt idler brace
4 Fan guard cap screw
5 Fire extinguisher
6 Fan guard
7 Generator

Figure 43. Generator and generator regulator, installed view.

(3) Replace both belts if either one is found defective; they must be replaced in pairs to maintain equal tension.

f. Belt Installation and Adjustment.

(1) Position the fan belts over the pulleys.

(2) Move the generator assembly toward or away from the engine as necessary, to obtain a 1-inch deflection of the belts midway between pulleys with thumb pressure against them. Tighten the cap screw securing the generator assembly to the fan belt idler brace (3, fig. 43).

(3) Tighten the two generator mounting bolts.

(4) Replace fan guard (par. 115*f*(8)).

Section IX. GASOLINE STARTING SYSTEM

118. Description

The gravity feed gasoline system consists of a gasoline tank (1, fig. 12), gasoline strainer (10) with shutoff valve (9), carburetor (15, fig. 8), and connecting tubing. The system is designed for starting the engine and for operating the engine at idle speed only during a short warmup period without load. When the engine has warmed up, manual conversion to the diesel cycle must be made.

119. Gasoline Tank and Air Trap

a. Removal.

(1) Close the shutoff valve (9, fig. 12) on the gasoline strainer (10).

(2) Open the auxiliary fuel filter draincock (1, fig. 13) and shutoff valve (3) to allow diesel fuel to drain from air trap compartment in gasoline tank.

(3) Disconnect the gasoline tank-to-carburetor pipe (29, fig. 44) at the coupling nut.

(4) Hold a clean container to the coupling nut; open the shutoff valve (9, fig. 12) and drain gasoline from the tank.

(5) Disconnect pipes (14 and 21, fig. 44) and tubing (12) at the air trap.

(6) Remove two cap screws (7) and lockwashers (2) securing the tank to the intake manifold; remove tank and strainer.

b. Cleaning and Inspection.

(1) Clean with cleaning solvent; dry with compressed air.

(2) Check tank for stripped threads, cracked welds, and punctures. Make sure vent hole in gasoline tank fillercap is open.

Warning: If tank requires welding repairs, wash thoroughly in carbon tetrachloride and air-dry for several days. Fill with water when welding.

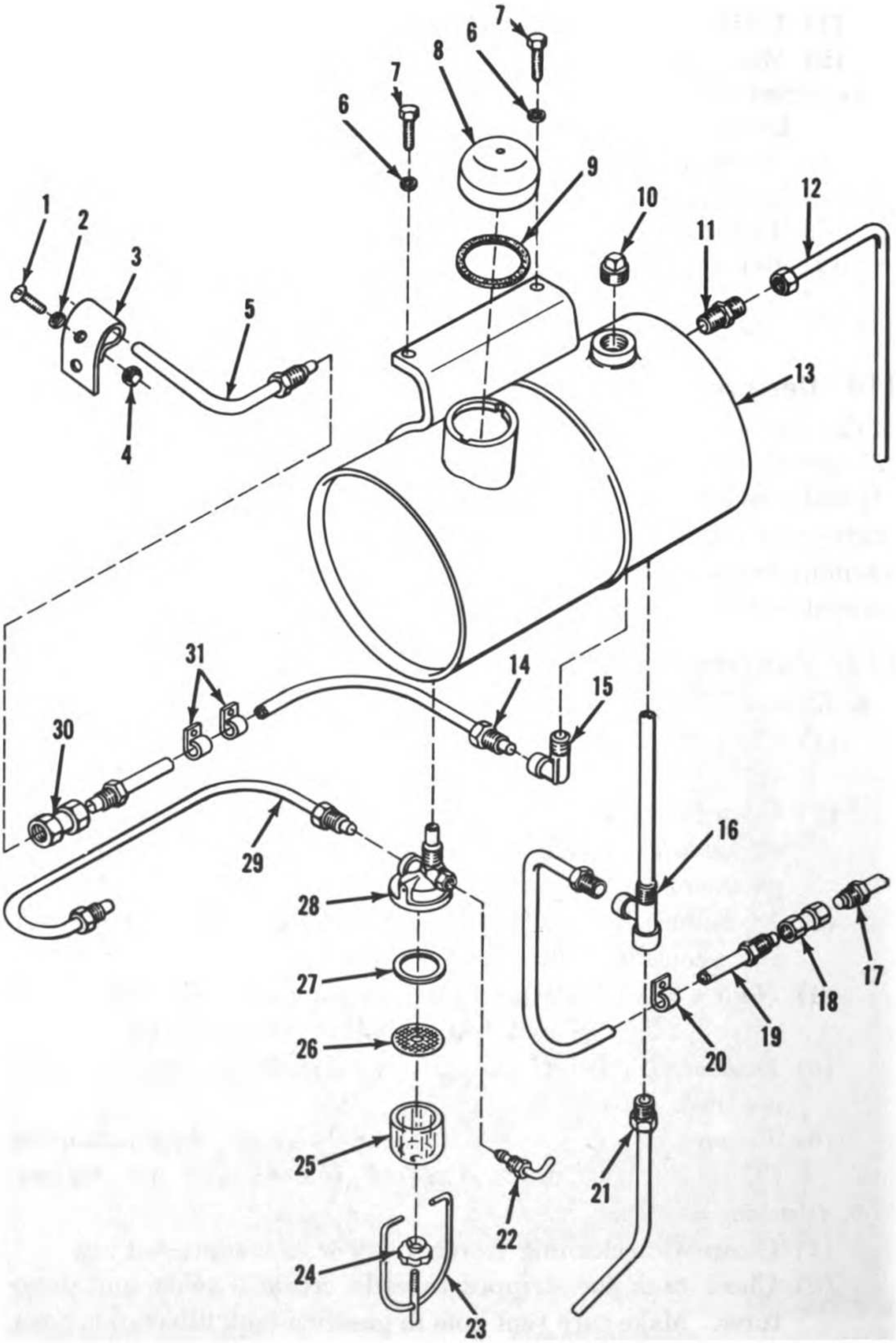


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Figure 44. Gasoline tank and air trap, gasoline strainer, and connections, exploded view.

c. Installation.

(1) Lift tank into position on intake manifold and secure with two lockwashers (6) and cap screws (7).
(2) Connect tubing (12) and pipes (14 and 21) at the air trap.
(3) Connect the gasoline tank-to-carburetor pipe (29) at the coupling nut.
(4) Fill gasoline tank.
(5) Fill air trap with diesel fuel and vent the diesel fuel system (par. 7*g*(5)).

120. Gasoline Strainer

a. Removal.

(1) Close the shutoff valve (9, fig. 12) on the gasoline strainer (10).
(2) Disconnect the gasoline tank-to-carburetor pipe (29, fig. 44) at the coupling nut.
(3) Hold a clean container to the coupling nut; open the shut-off valve and drain gasoline from the tank.
(4) Remove the complete strainer from the gasoline tank.

b. Disassembly (fig. 44).

(1) Loosen thumb nut (24) and remove bail (23).
(2) Remove strainer bowl (25), screen (26), and gasket (27) from strainer body.
(3) Remove strainer stem (22) from strainer body (28).

c. Cleaning and Inspection.

(1) Clean all parts in cleaning solvent; dry thoroughly.

---

1 Screw, mach, rd hd, No. 10 x ½ NF (1 Req'd)
2 Lockwasher, No. 10 (1 Req'd)
3 Rear air trap-to-fuel filter pipe clip
4 Nut, hex, No. 10 NF (1 Req'd)
5 Rear air trap-to-fuel filter pipe
6 Lockwasher, ⅜ (2 Req'd)
7 Screw, cap, hex hd, ⅜ x ⅞ NC (2 Req'd)
8 Gasoline tank fillercap
9 Gasoline tank fillercap gasket
10 Plug, pipe
11 Coupling
12 Air trap-to-fuel tank return tubing
13 Gasoline tank and air trap
14 Air trap-to-fuel filter pipe
15 Air trap-to-fuel filter pipe elbow
16 Transfer pump-to-air trap extension pipe
17 Injection pump-to-connector pipe
18 Injection pump-to-air trap pipe connector
19 Connector-to-air trap pipe
20 Connector-to-air trap pipe clip
21 Transfer pump-to-air trap pipe
22 Strainer stem
23 Strainer bail
24 Strainer thumb nut
25 Strainer bowl
26 Strainer screen
27 Strainer gasket
28 Strainer body
29 Gasoline tank-to-carburetor pipe
30 Air trap-to-fuel filter pipe connector
31 Air trap-to-fuel filter pipe clip

Figure 44—Continued.

(2) Check screen for breaks and clogged holes; replace if necessary.

d. Reassembly (fig. 44).

(1) Install strainer stem (22) in strainer body (28).
(2) Replace strainer gasket (27), screen (26), and bowl (25) on strainer body.
(3) Replace strainer bail (23) and tighten thumb nut (24).

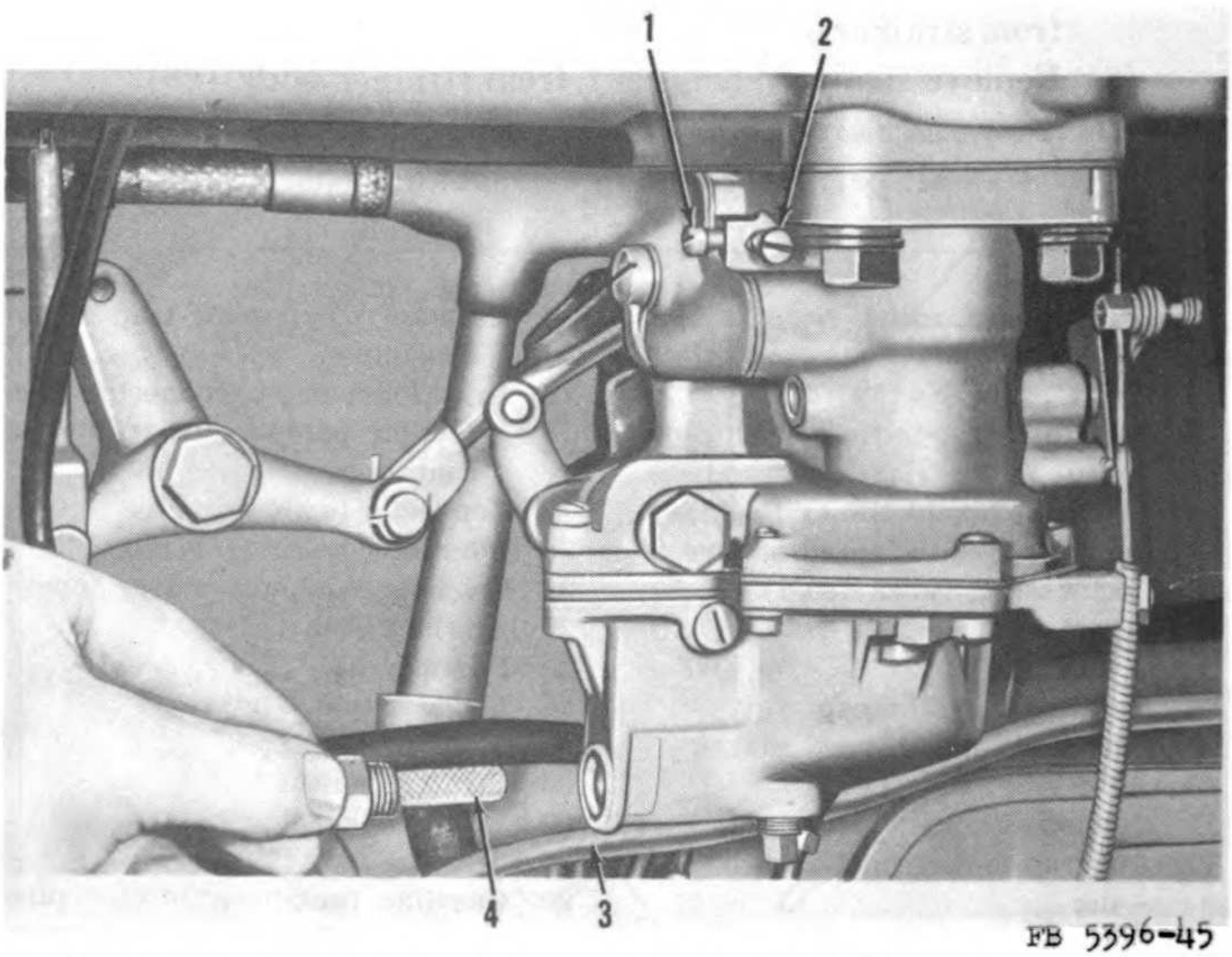
e. Installation (fig. 44).

(1) Screw the complete strainer into the lower side of the gasoline tank.
(2) Position the strainer stem (22) so that it faces to the outside and away from the intake manifold.
(3) Connect the gasoline tank-to-carburetor pipe (29).
(4) Fill the gasoline tank.

121. Carburetor

a. Cleaning Strainer Screen.

(1) Close the gasoline shutoff valve (9, fig. 12).
(2) Disconnect the gasoline tank-to-carburetor pipe (3, fig. 45) at the carburetor inlet.



1 Idle throttle lockscrew
2 Idle throttle stop screw
3 Gasoline tank-to-carburetor pipe
4 Strainer screen

Figure 45. Removing carburetor strainer screen.

(3) Remove strainer screen (4), and wash in cleaning solvent; dry thoroughly.
(4) Replace strainer screen.
(5) Connect gasoline tank-to-carburetor pipe.
(6) Open the gasoline shutoff valve.

b. Idle Speed Adjustment (fig. 45).

(1) Start the engine and loosen the idle throttle lockscrew (1). Turn the idle stop screw (2) clockwise to increase engine speed, and counterclockwise to decrease speed.
(2) When correct idle speed is attained, tighten idle throttle lockscrew. (Correct idle speed is attained when the engine operates steadily, without missing, under no load.)
(3) There is no provision for idle mixture adjustment.

Section X. DIESEL FUEL SYSTEM

122. Description

a. Components. The diesel fuel system consists of a fuel tank (9, fig. 2); fuel transfer pump (12, fig. 8) and strainer (11); air trap (4); two fuel filters (8 and 10, fig. 9); a twin-plunger injection pump (13); and an injection nozzle (1) at each cylinder. Figure 46 illustrates the system schematically.

Note. The gasoline tank (2, fig. 8) and an air trap (4) are formed as a single tank. For air trap maintenance procedures, refer to paragraph 119.

b. Fuel Flow (fig. 46).

(1) Fuel is drawn from the diesel fuel tank into the strainer (31) by the transfer pump (30). Pump pressure forces the fuel into the bottom of the air trap (20) where any air present rises to the top of the trap above the fuel level. Gravity forces fuel to flow out the bottom of the trap through another line to the auxiliary fuel filter (16) and water trap (13). Water is separated from the fuel at the filter and drops into the trap. Pure fuel is drawn from the bottom of the filter to the intake side of the primary pump (9) through the pump, back through the final fuel filter (18), and out the bottom to flow into the injection pump plunger (6).
(2) The plunger forces fuel into three of the distributor valves (32) which are timed to open and admit fuel to the correct cylinder nozzle in firing-order sequence. The plungers, controlled by the rack (7), meter the fuel for varying speeds and load as determined by the governor weights (28).
(3) Excess fuel delivered to the plungers and distributor valves is picked up by the scavenging pump (25) and returned to the air trap (20). The return line (19) carries overflow fuel and air from the air trap back to the diesel fuel tank at the rear of the compressor.

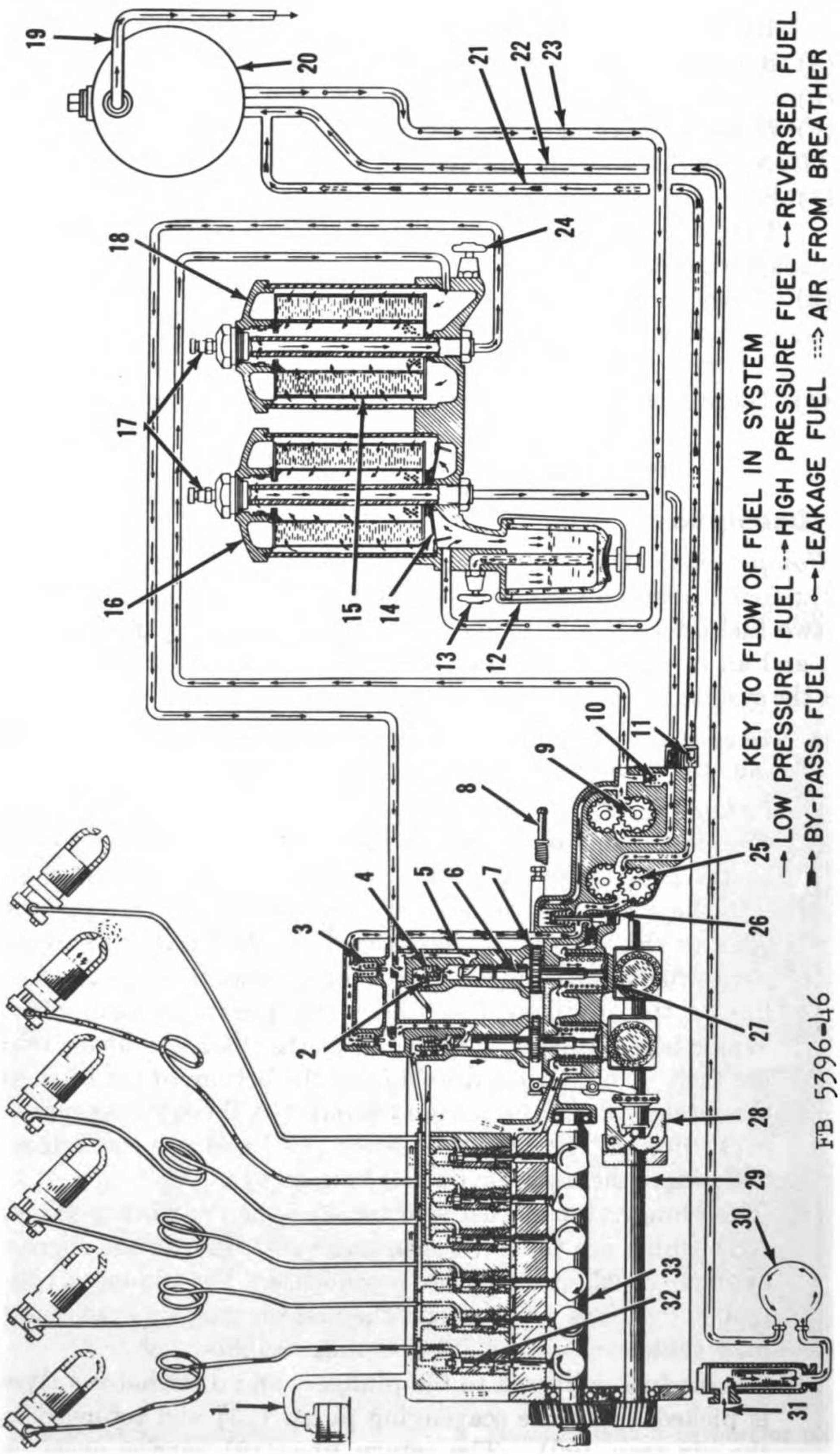


Figure 46. Diesel fuel system, schematic.

1 Tube to air breather
2 Reverse check valve
3 Return check valve
4 Injection valve
5 Inlet and bypass port
6 Plunger
7 Rack
8 Governor spring assembly
9 Primary pump
10 Bypass valve
11 Scavenging check valve
12 Water trap
13 Water trap and auxiliary filter drain
14 Screen strainer
15 Filter element
16 Auxiliary fuel filter
17 Bleeder valve
18 Final fuel filter
19 Return to fuel tank
20 Gasoline tank and air trap
21 Return line
22 Supply line
23 Outlet to filter
24 Filter drain
25 Scavenging pump
26 Scavenging valve
27 Plunger tappet
28 Governor weights
29 Governor shaft
30 Transfer pump
31 Inlet from fuel tank
32 Distributor valve
33 Camshaft

Figure 46—Continued.

123. Fuel Transfer Pump and Strainer

a. Pump Removal (fig. 47).

(1) Disconnect fuel pipes (1 and 7) from the transfer pump (2).

(2) Remove three cap screws (8) and lockwashers; remove transfer pump (2) and mounting gasket from drive housing (3).

b. Pump Installation (fig. 47).

(1) Install new gasket and pump (2) on drive housing (3); secure with three cap screws (8) and lockwashers.

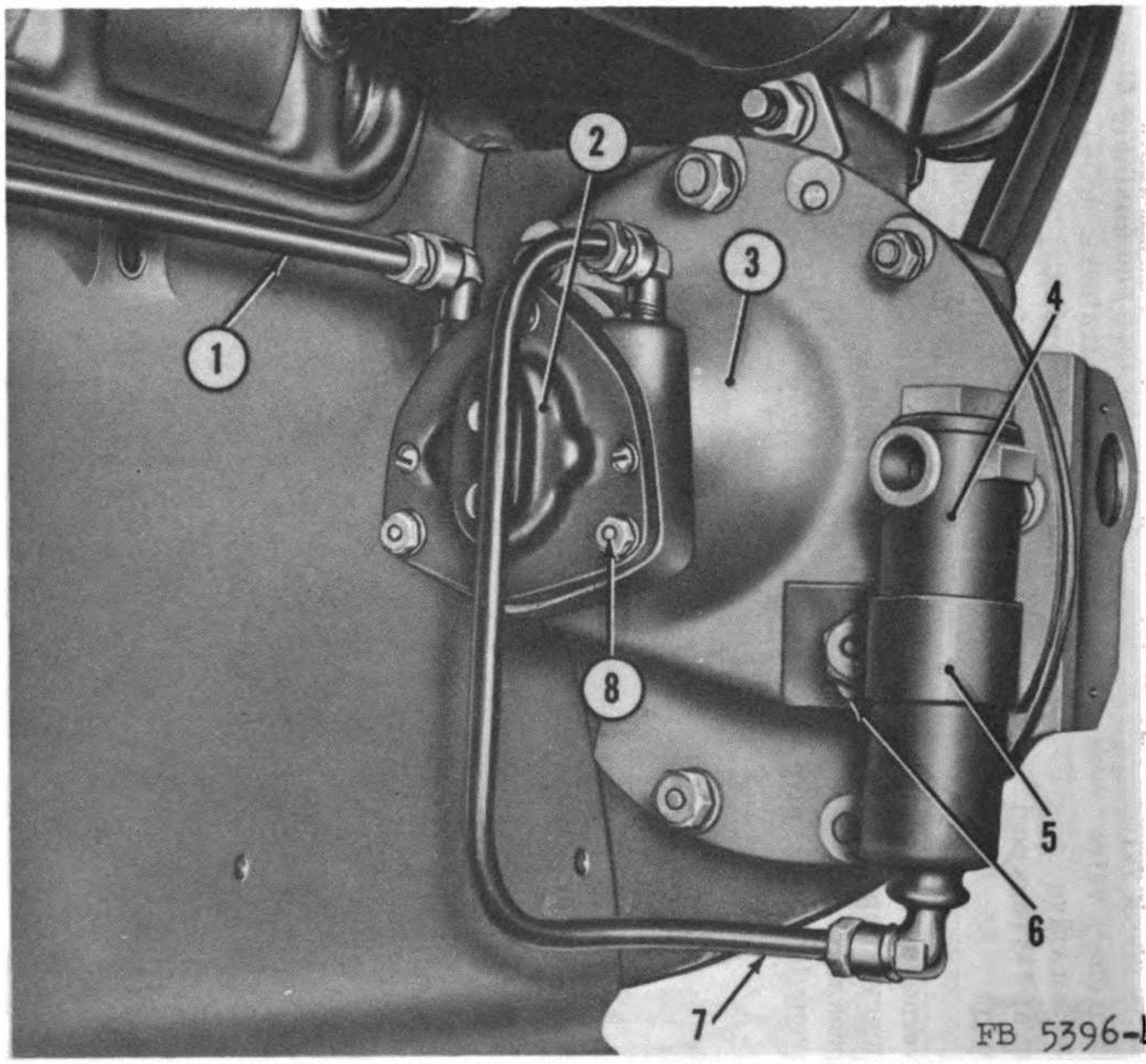
(2) Prime pump with clean fuel through inlet connection.

(3) Connect fuel pipes (1 and 7).

(4) Vent air from the fuel system (par. 7*g*(5)).

c. Strainer Removal.

(1) Disconnect fuel tank tubing (7, fig. 48) from the elbow (1) at the strainer body (20).



1 Fuel transfer pump-to-fuel air trap pipe
2 Fuel transfer pump
3 Pump drive housing
4 Pump strainer
5 Strainer bracket
6 Cap screw
7 Pump strainer-to-fuel transfer pump pipe
8 Cap screw

Figure 47. Fuel transfer pump and strainer mounting.

(2) Disconnect the fuel strainer-to-fuel transfer pump pipe (7, fig. 47) from the elbow on the strainer (4).

(3) Remove cap screw (6) and bracket (5); remove strainer (4).

Caution: Plug all openings and protect all parts from dirt when working on the diesel fuel system.

d. Strainer Disassembly (fig. 48).

(1) Remove strainer plug (4) and gasket (5).

(2) Remove strainer screen (6).

(3) Unscrew elbows (1) and reducing bushing (2) in the strainer body (20).

e. Cleaning and Inspection (fig. 48).

(1) Wash all parts thoroughly in cleaning solvent; clean strainer body (20) and strainer screen (6) with brush to remove sludge.

(2) Dry all parts with compressed air and lint-free cloth.

(3) Inspect for cracks, punctured screen, distortion, or stripped threads. Replace damaged or defective parts.

f. Reassembly (fig. 48).

(1) Install reducing bushing (2) in the upper side hole of the strainer body (20); install two elbows (1) in the strainer body.

(2) Install strainer screen (6) in body (20).

(3) Install new gasket (5) and install plug (4) loosely so strainer body can be filled with clean diesel fuel after installation.

g. Installation.

(1) Position pump strainer (4, fig. 47) and bracket (5) on pump drive housing (3); secure with lockwasher and cap screw (6).

(2) Connect fuel strainer-to-fuel transfer pump pipe (7) to the elbow in the strainer (4). Connect the fuel tank tubing (7, fig. 48) to the elbow (1) on the top of the strainer body (20).

(3) Vent air from system (par. 7*g*(5)).

124. Water Trap

a. Removal (fig. 49).

(1) Close fuel shutoff valve (23).

(2) Open draincock (15) and drain auxiliary filter.

(3) Loosen bail nut; remove bail (22), glass (21), and gasket (20).

(4) Unscrew and remove water trap drain pipe (19).

b. Cleaning and Inspection.

(1) Clean parts thoroughly in cleaning solvent.

(2) Inspect for cracked glass and stripped threads on bail nut. Check drain pipe (19) for restrictions; clean if necessary.

(3) Replace defective parts.

c. Installation (fig. 49).

(1) Screw drain pipe (19) into fuel filter base (13).

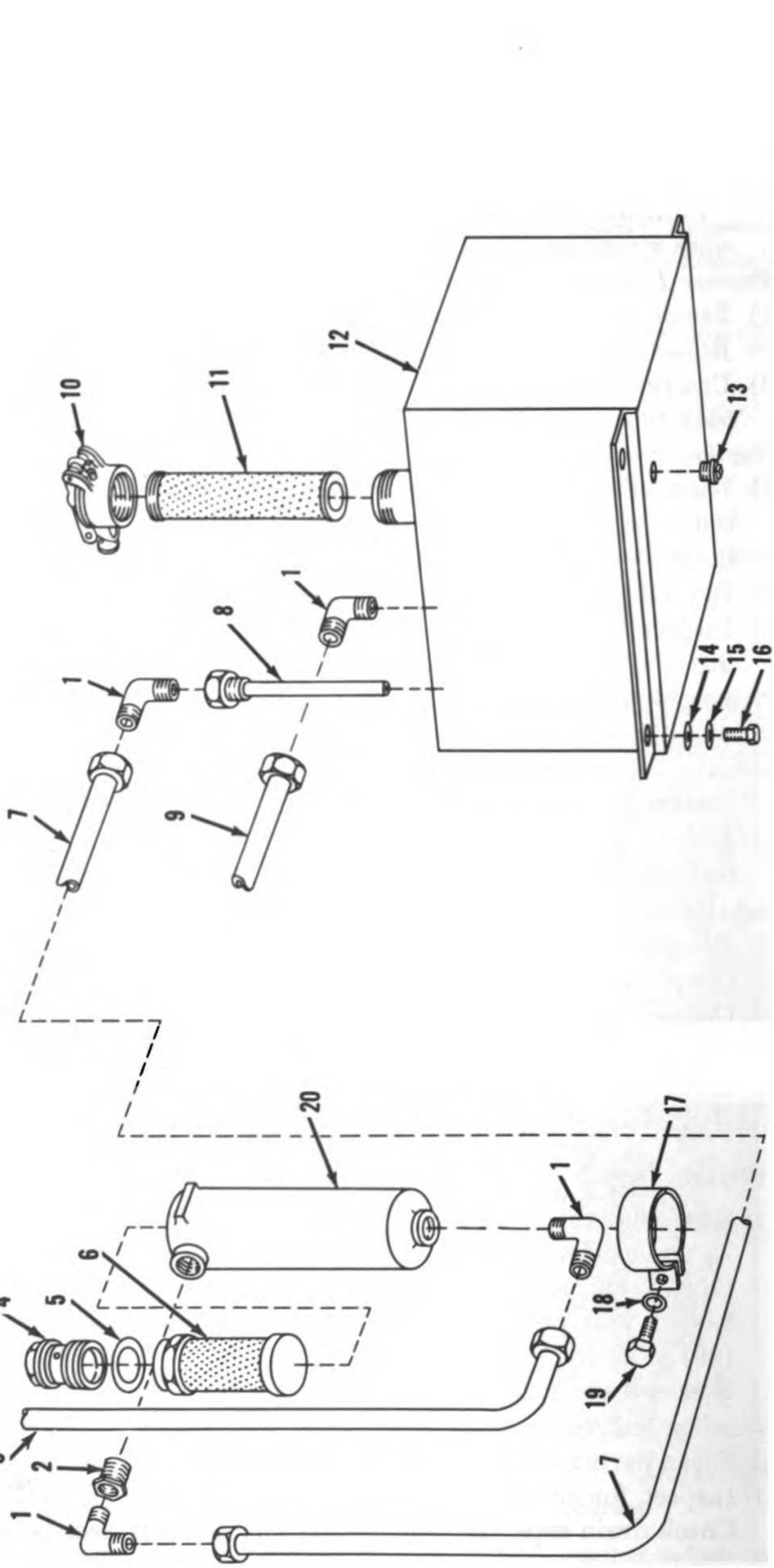


Figure 48. Fuel tank and transfer pump strainer, exploded view.

1 Elbow
2 Reducing bushing
3 Pump strainer-to-transfer pump pipe
4 Strainer plug
5 Strainer gasket
6 Strainer screen
7 Fuel tank tubing
8 Drop tube
9 Air trap-to-fuel tank return tube
10 Fillercap
11 Screen
12 Fuel tank
13 Drain plug
14 Washer, ½ (4 Req'd)
15 Lockwasher, ½ (4 Req'd)
16 Screw, cap, hex hd, ½ x 1½ NC (4 Req'd)
17 Strainer bracket
18 Lockwasher, ½ (1 Req'd)
19 Screw, cap, hex hd, ½ x ⅞ NC (1 Req'd)
20 Strainer body

Figure 48—Continued.

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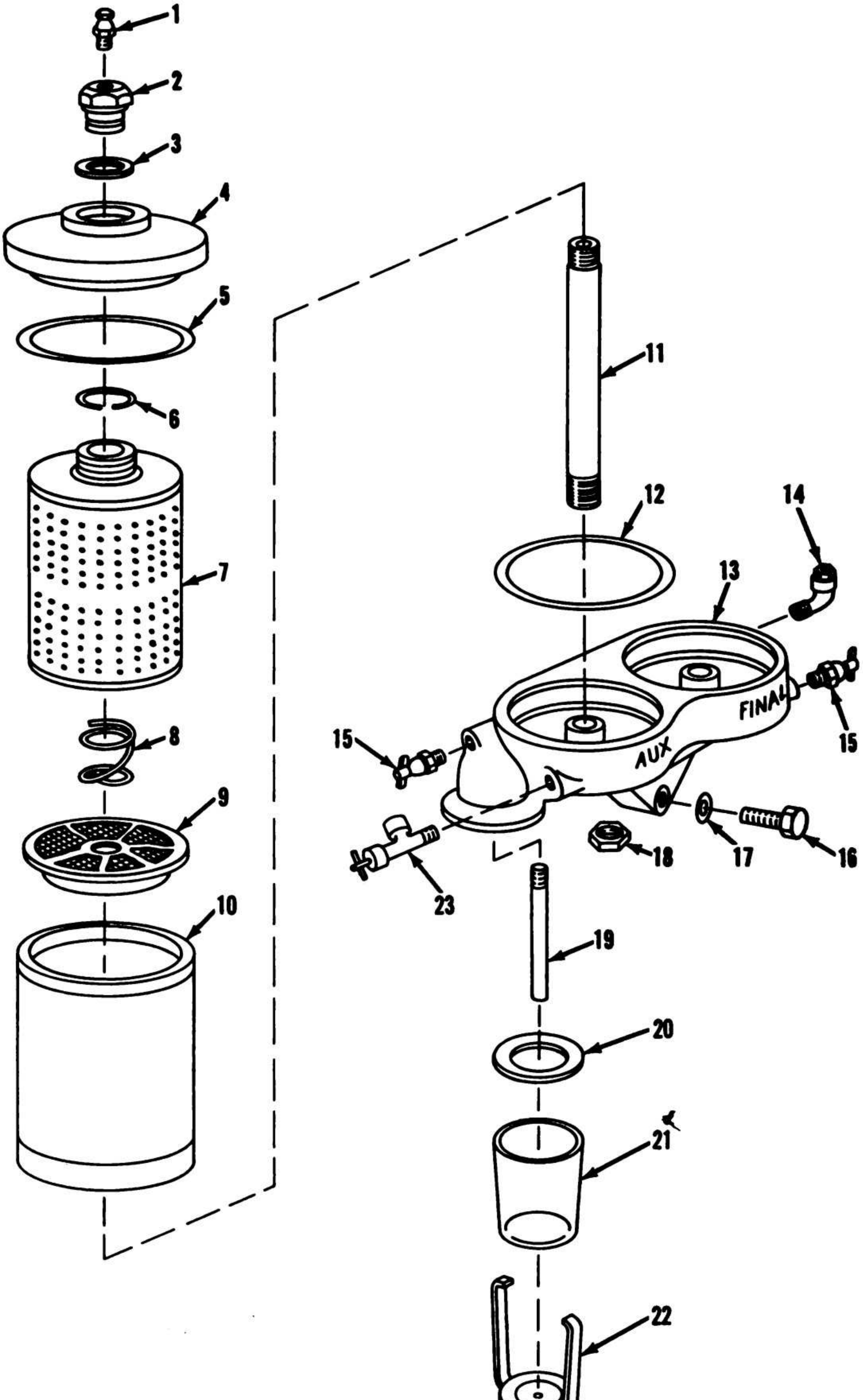


Figure 49. Diesel fuel filters, exploded view.

(2) Position new gasket (20) against fuel filter base (13).
(3) Replace water trap glass (21) and bail (22); tighten bail nut securely.
(4) Vent air from fuel system (par. 7*g*(5)).

d. Cleaning Installed Water Traps.

(1) Open auxiliary fuel filter draincock (7, fig. 50) after every 10 hours of operation to flush water and sediment from trap.

Note. Do not close shutoff valve (10) when draining trap.

(2) Permit trap to drain until clean diesel fuel flows from draincock, then close draincock.

25. Fuel Filters

a. Removal.

(1) Open shut off valve (10, fig. 50).
(2) Open draincocks (7) to drain diesel fuel from filters and air trap compartment in combination gasoline tank and air trap.
(3) Disconnect the tubing from the filter base connections and seal tubing ends with tape to prevent entry of dirt.
(4) Remove three cap screws (8) securing the filter assembly to the cylinder block; remove the filter assembly.

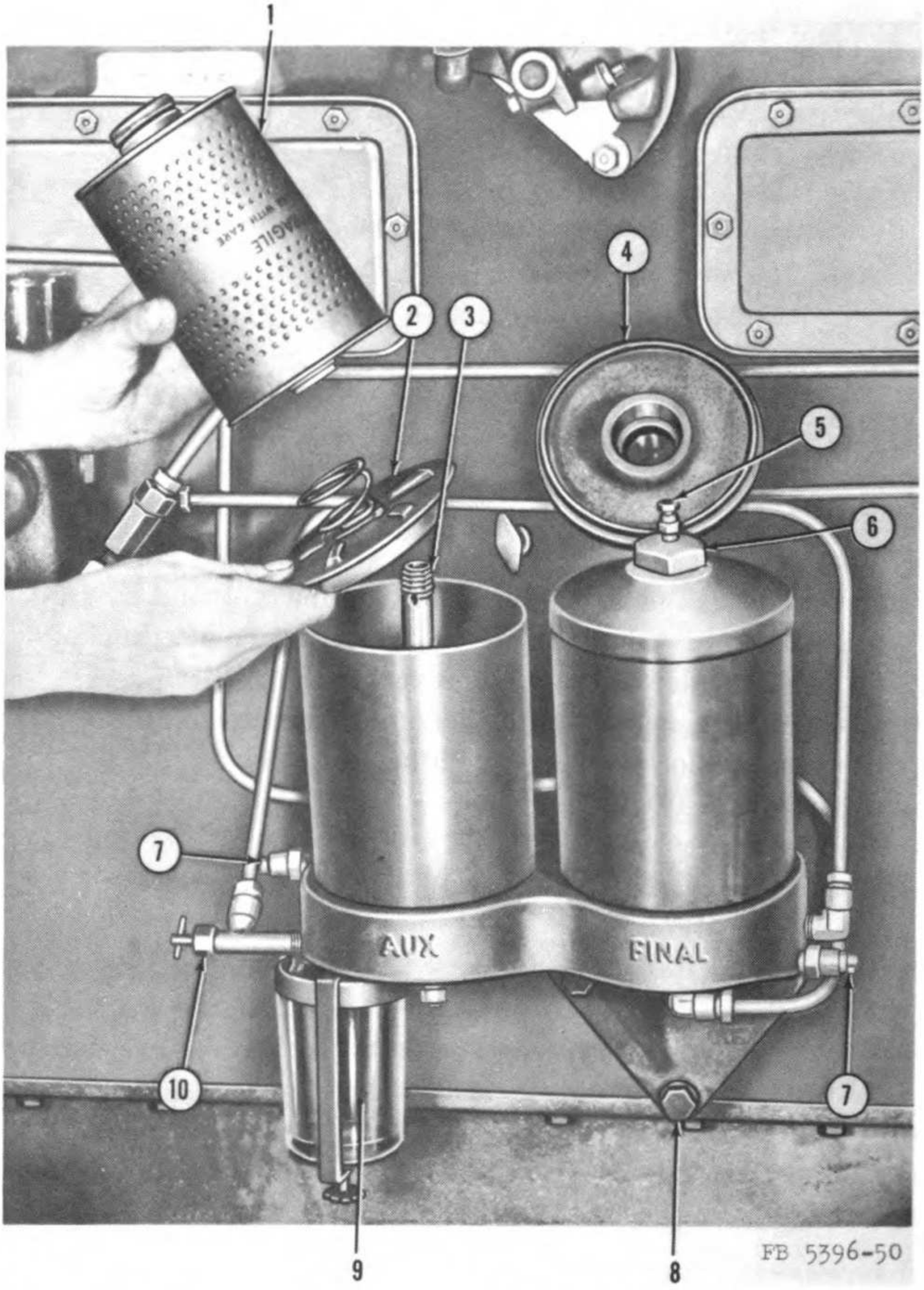
b. Disassembly (fig. 49).

(1) Remove bleeder valve (1).
(2) Remove the filter cover nut (2), gasket (3), and the filter case cover (4).
(3) Remove and discard cover gasket (5), retaining ring (6), and filter element (7).
(4) Remove the water separator screen spring (8) and screen (9) (auxiliary filter only).
(5) Pull filter case (10) from base (13); remove seal ring (12).
(6) Remove the filter case stud locknut (18) and filter case stud (11).

---

1 Bleeder valve
2 Cover nut
3 Cover nut gasket
4 Filter case cover
5 Cover gasket
6 Cover nut retaining ring
7 Filter element
8 Water separator screen spring
9 Water separator screen
10 Filter case
11 Filter case stud
12 Filter case seal ring
13 Fuel filter base
14 Fuel pipe elbow with nut
15 Draincock
16 Screw, cap, hex hd, ½ x 1½ NC (3 Req'd)
17 Lockwasher, ½ (3 Req'd)
18 Filter case stud lock nut
19 Water trap drain pipe
20 Water trap gasket
21 Water trap glass
22 Water trap bail
23 Fuel shutoff valve

Figure 49—Continued.



1	Element	6	Filter cover nut
2	Water separator screen	7	Draincock
3	Case stud	8	Cap screw
4	Filter cover	9	Fuel strainer
5	Bleeder valve	10	Shutoff valve

Figure 50. Changing fuel filter element.

(7) Disassemble final filter, using same procedure.

Note. **It is extremely important to keep the fuel system free of dirt. When disassembling fuel filters, do not place parts on ground or on dirt-covered surface. Cover or plug all openings immediately after removing parts of the system or disconnecting pipes and tubing.**

c. Cleaning and Inspection.

(1) Wash all parts thoroughly in cleaning solvent; dry with compressed air.

(2) Inspect all parts for damage. Inspect screen (9) for punctures; check the filter base for cracks. Replace defective parts.

d. Reassembly (fig. 49).

(1) Replace filter case stud (11) and secure with filter case stud locknut (18).

(2) Install new seal ring (12) and replace filter case (10).

(3) Replace water separator screen (9) and screen spring (8) (auxiliary fuel filter only).

(4) Install new filter element (7) (small pilot end down), using slight twisting motion to ease element on stud.

(5) Install cover nut retaining ring (6).

(6) Replace filter case cover (4), new cover nut gasket (3) and cover nut (2); tighten cover nut.

(7) Replace bleeder valve (1).

e. Installation.

(1) Position filter assembly against cylinder block; secure with three lockwashers and cap screws (8, fig. 50).

(2) Remove tape from fuel connections; connect fuel tubing.

(3) Close draincocks (7); open shutoff valve (10).

(4) Vent air from diesel fuel system (par. 7*g*(5)).

f. Changing Filter Elements.

Note. **Auxiliary filter element life is approximately 1,000 hours. When system is properly maintained, final fuel filter element will last indefinitely. Change the auxiliary fuel filter element when fuel pressure gage (fig. 19) indicates CHANGE FILTER. Change final fuel filter element if indicator hand remains in the CHANGE FILTER position.**

(1) Clean outside of filter covers thoroughly with cleaning solvent to prevent foreign matter from entering filter base (13, fig. 49) once the cover (4) has been removed.

(2) Close auxiliary fuel filter shutoff valve (10, fig. 50) and open draincocks.

(3) Loosen cover nut (6) on both filters and remove cover (4) from both; remove element (1). (Remove screen (2) on auxiliary filter only.)

(4) Clean the inside of the filter case and base with cleaning solvent; examine inside of case stud (3). If dirty, disconnect the outlet pipe beneath the base and flush out stud with cleaning solvent; reconnect the outlet pipe.

(5) Replace water separator screen (2) and screen spring (auxiliary fuel filter only).

(6) Install a new filter element (1) with small pilot hole facing down. Insert the element carefully, using a slight twisting motion to prevent damage to the seal in the bottom of the element.

(7) Replace filter case cover (4), using a new cover gasket (5, fig. 49), and tighten cover nut.

(8) Clean injection pump primary pump screen (par. 126*b* (1) (*b*)).

(9) Vent air from the diesel fuel system (par. 7*g* (5)).

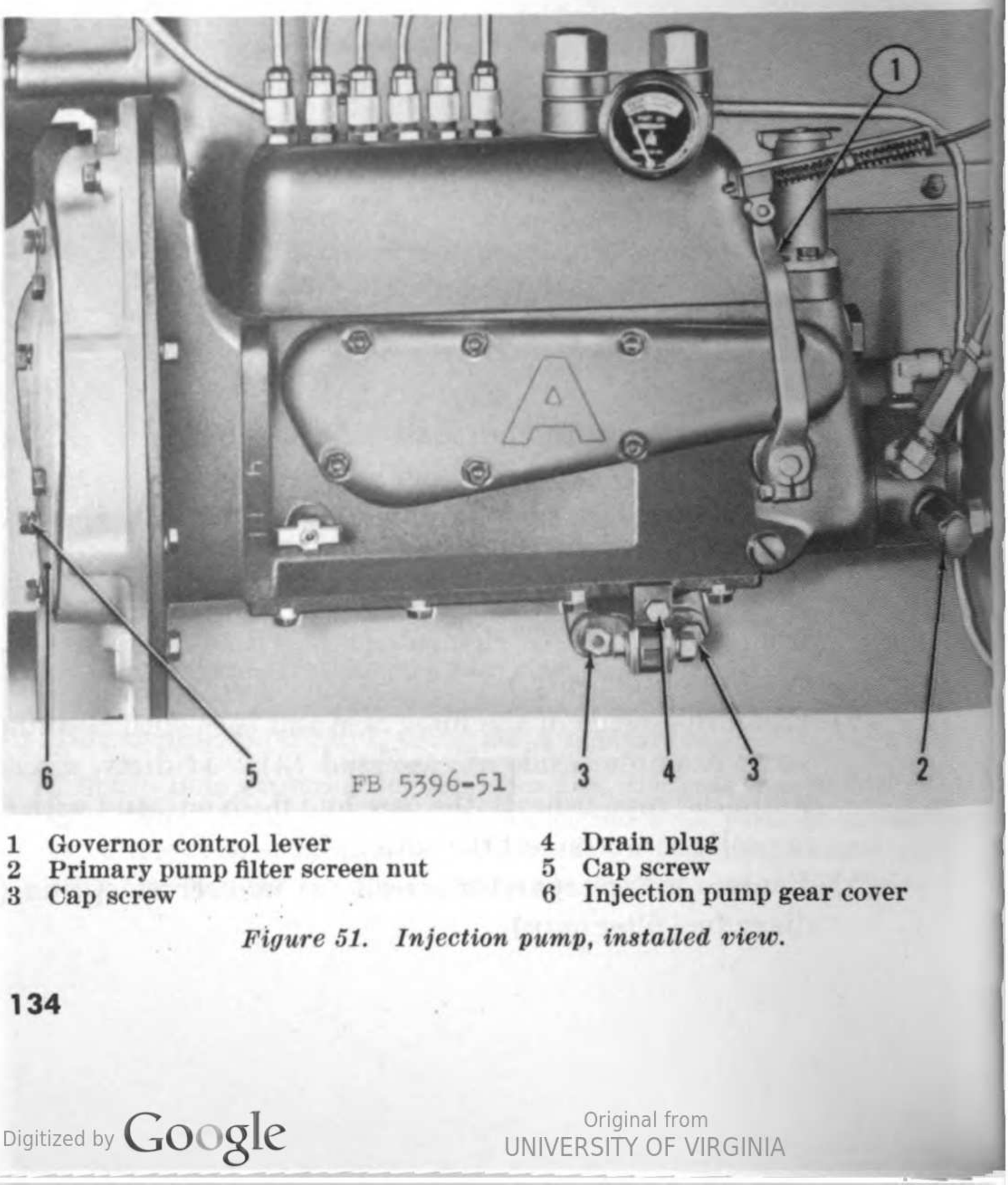
126. Fuel Injection Pump and Governor

a. Removal.

(1) Wash the pump and the surrounding area thoroughly to aid in preventing dirt from entering the pump and lines. As the lines are disconnected and fittings exposed, cover all openings to keep dirt out.

(2) Close the shutoff valve (10, fig. 50).

(3) Remove plug (4, fig. 51) and drain lubricant from pump housing.



1 Governor control lever
2 Primary pump filter screen nut
3 Cap screw
4 Drain plug
5 Cap screw
6 Injection pump gear cover

Figure 51. Injection pump, installed view.

(4) Disconnect all fuel pipes from pump, and cover all openings. Remove fuel injection pipes leading to nozzles to prevent damage during pump removal.

(5) Put compression release lever in gasoline starting position and remove primary wire from distributor to prevent accidental starting.

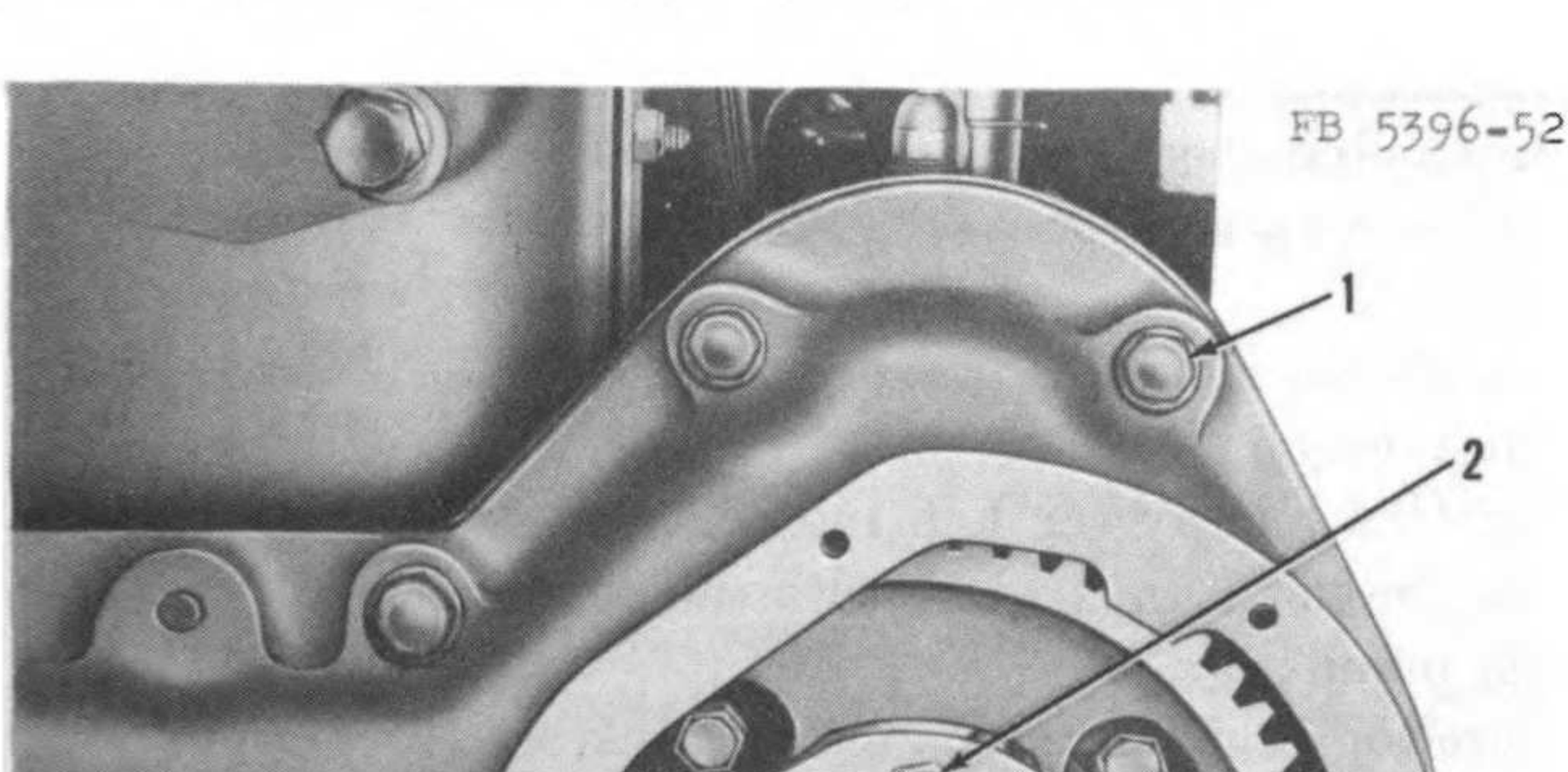
(6) Disconnect rod at governor control lever (1, fig. 51). Remove six cap screws (5) from gear cover (6); remove cover and gasket.

Note. Before performing (7) below, note timing indicator (3, fig. 52) position on gear (4) scale and record for use during installation of pump.

(7) Remove three cap screws (2, fig. 52) securing indicator (3) and pump gear (4) to gear hub; remove indicator.

(8) Remove four cap screws (1) and two cap screws (5) under gear (4). (Crank engine slowly by hand to uncover cap screws (5).)

(9) Install sling and support pump with a hoist.



1 Screw, cap, hex hd, ⅜ x 1½ NC (4 Req'd)
2 Screw, cap, hex hd, ⅜ x 1 NF (3 Req'd)
3 Injection pump gear timing indicator
4 Injection pump drive gear
5 Screw, cap, hex hd, ⅜ x ⅞ NC (2 Req'd)

Figure 52. Timing indicator and gears.

(10) Remove two cap screws (3, fig. 51) securing pump bracket to engine and remove pump assembly from engine with sling and hoist. Place pump in a clean, safe place to protect the precision working parts.

b. Cleaning and Inspection.

(1) *Pump installed.*

(*a*) Wipe pump and connections with cloth dampened in cleaning solvent.

(*b*) Remove primary pump filter screen nut (2, fig. 51) with screen attached; wash screen thoroughly in cleaning solvent.

(*c*) Check screen for punctures and corrosion; examine pump for loose mounting screws, leaking connections, and cracked case.

(*d*) Replace pump filter screen if defective; install new pump and return old pump for overhaul if defective.

(2) *Pump removed.*

(*a*) Clean and inspect as in *b*(1) above.

(*b*) Examine pump drive gear (4, fig. 52) for worn or broken teeth; check hub for loose mounting.

(*c*) Install new injection pump if inspection discloses defects or trouble shooting localized trouble in injection pump; return old pump for overhaul.

c. Installation.

(1) Install a new mounting gasket and position the injector pump on the housing.

(2) Guide the pump gear hub into the drive gear (4, fig. 52). Aline the notch in the hub with the notch on the front face of the pump gear.

(3) Secure top of mounting flange to crankcase front cover with two cap screws (1, fig. 52) and install base bracket cap screws (3, fig. 51).

(4) Assemble timing indicator (3, fig. 52) to gear hub with three cap screws (2) so that indicator points to same scale mark noted during removal.

(5) Crank engine by hand until three large holes in pump gear aline with threaded holes behind gear; install two cap screws (1) visible in figure 52 and the two cap screws (5) behind gear as shown by dotted lines.

Caution: Install the short cap screws (seven-eighths of an inch) in the lower holes as shown by dotted lines.

(6) Install gear cover (6, fig. 51) with new gasket and secure with six cap screws (5). Connect throttle control rod to the governor control lever (1).

(7) Connect all fuel lines. Turn nuts down until there is solid contact with the sleeve, then tighten about one-quarter of a turn with a wrench.
(8) Add lubricant to pump housing (see LO 5–5396); connect primary wire to distributor.
(9) Vent the air from the fuel system (par. 7*g* (5)).
(10) Operate engine on diesel cycle. If engine operation is rough, check and adjust timing (see *d* below).

d. Timing Fuel Injection Pump.

(1) Remove cap screws (5, fig. 51) and pump gear cover (6); loosen cap screws (2, fig. 52) clamping gear between indicator (3) and hub at rear.
(2) Turn the hub clockwise to advance injection timing or counterclockwise to retard injection timing as needed.

Note. Correct timing of the pump to the engine is indicated by maximum engine speed and a clean exhaust with a fixed load on the engine. (Normally zero on the timing scale (fig. 52)).

(3) Tighten the cap screws (2) and replace the pump gear cover (6, fig. 51), gasket, and cap screws (5).

127. Fuel Pressure Gage

a. Removal. Remove gage from inlet fitting on injection pump.

b. Cleaning and Inspection.

(1) Wipe gage with cloth dampened with cleaning solvent; dry thoroughly.
(2) Inspect for cracked glass and stripped threads, or obvious leaks.
(3) Replace gage if damaged or defective.

c. Installation. Install gage in injection pump inlet fitting.

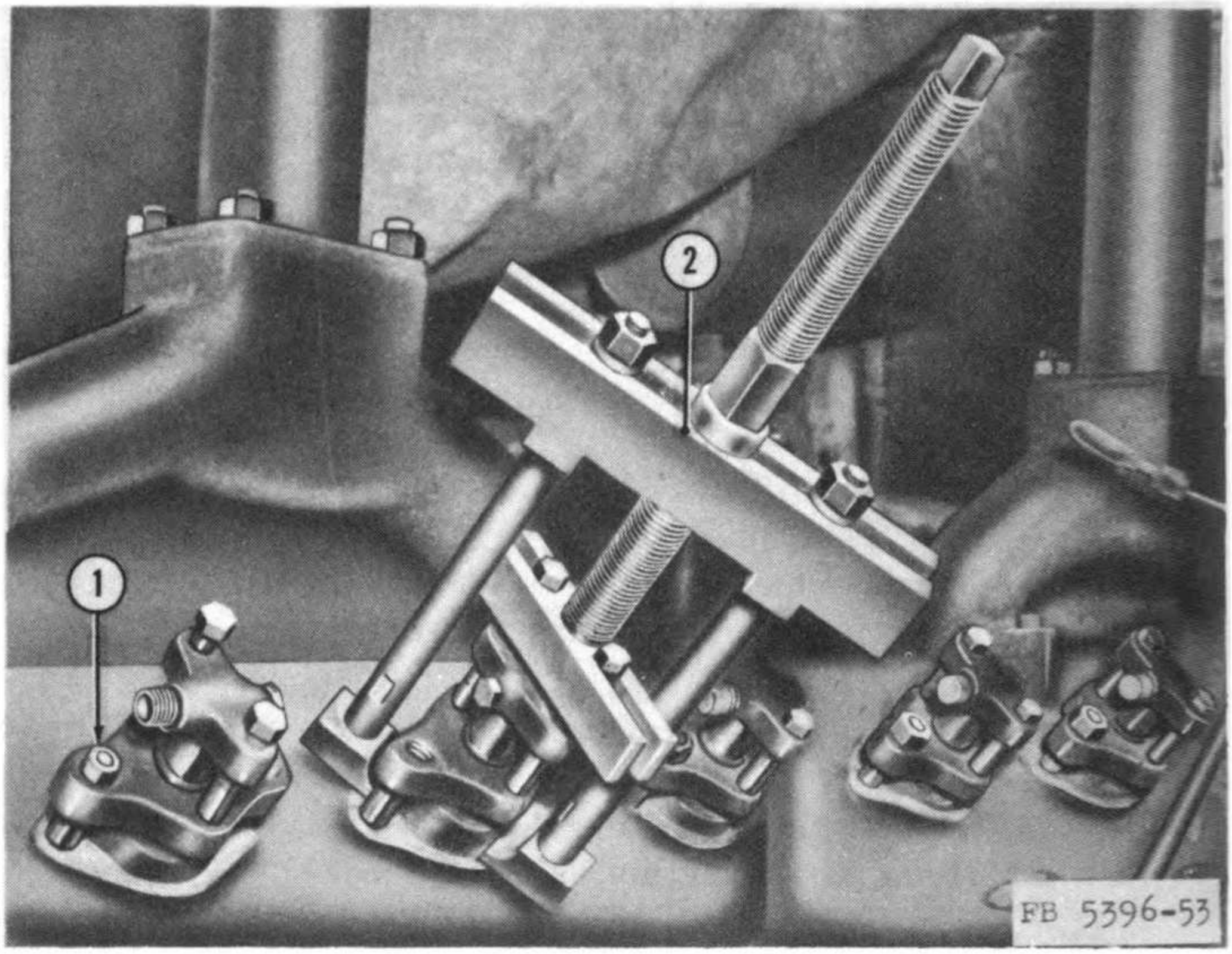
128. Injection Nozzle

a. Removal.

(1) Disconnect and remove entire injection pipe from nozzle and pump to avoid damaging the fitting seals.
(2) Remove two nuts (1, fig. 53) and washers from nozzle studs and lift out nozzle. Use special puller (2) if nozzle sticks.
(3) Install special puller (1, fig. 54) and remove precombustion chamber (2) and gaskets above and below precombustion chamber.

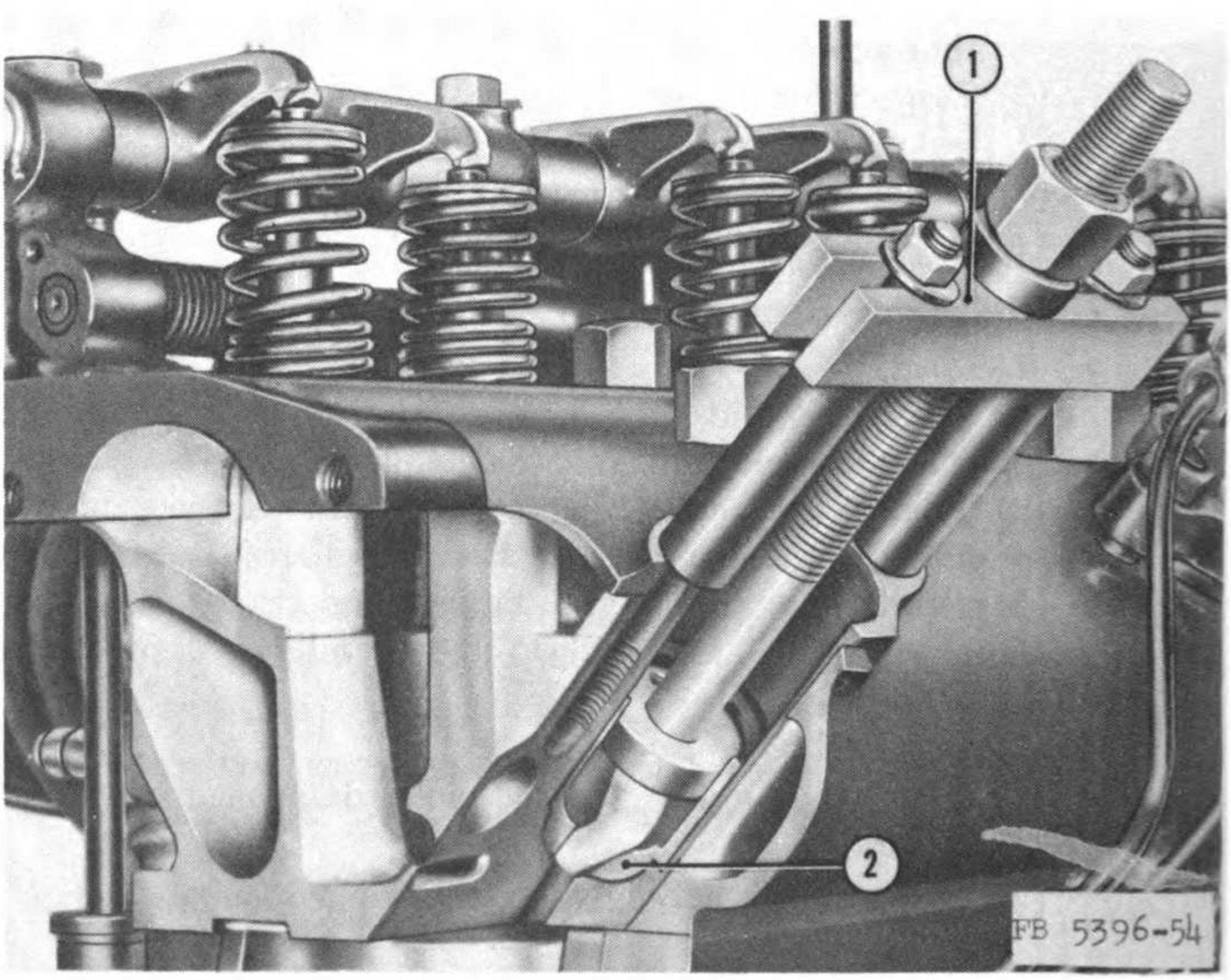
b. Cleaning and Inspection.

(1) Wipe thoroughly with a cloth dampened with cleaning solvent.
(2) Inspect for cracks, distortion, stripped threads, and clogged passages.
(3) Replace all damaged or defective parts.



1 Nozzle nut **2 Nozzle puller**

Figure 53. Removing injection nozzle.



1 Precombustion chamber puller **2 Precombustion chamber**

Figure 54. Removing precombustion chamber.

c. Installation.

(1) Install one precombustion chamber gasket in the cylinder head. Insert the precombustion chamber (2, fig. 54) with the word UP stamped on the chamber upward.

(2) Install the second precombustion chamber gasket on top of the chamber.

(3) Install a new O-ring in the groove on the nozzle body. Use care to avoid twisting the O-ring.

(4) Position the nozzle assembly in the head and replace the lockwashers and nuts (1, fig. 53). Use 45 foot-pounds torque to tighten the nozzle assembly nuts.

(5) Replace the injection pipe between the injection pump and nozzle.

129. Diesel Fuel Tank

a. Removal.

(1) Remove the air receiver (par. 97*a*).

(2) Remove the drain plug (13, fig. 48) ; drain the fuel tank (12).

(3) Disconnect fuel line tubing (7 and 9) at front of tank, below air receiver.

(4) Remove 12 cap screws, lockwashers, and plain washers from cover panel (6, fig. 555) ; remove rear cover panel.

(5) Remove four cap screws (16, fig. 48), lockwashers (15), and plan washers (14) securing fuel tank to frame crossmember.

(6) Place sling around fuel tank and lift from compressor frame.

b. Disassembly.

(1) Turn the fillercap (4, fig. 55) off threads of filler pipe (5).

(2) Remove cap and attached filler screen.

(3) Remove setscrew (10, fig. 55) and remove screen (11, fig. 48) from fillercap (10).

c. Cleaning, Inspection, and Repair.

(1) Clean tank and screen thoroughly in cleaning solvent and dry with compressed air; remove all sludge and scale.

(2) Inspect for stripped fitting threads, punctured screen, broken welds, and leaks.

(3) Weld tank to repair cracks or punctures.

Warning: Before welding fuel tank, clean tank thoroughly with carbon tetrachloride and air-dry for several days. Fill tank with water when welding.

(4) Replace defective strainer parts and fittings.

d. Reassembly.

(1) Replace fillercap (10, fig. 48) on strainer screen (11).

(2) Install setscrew (10, fig. 55) and tighten against screen.

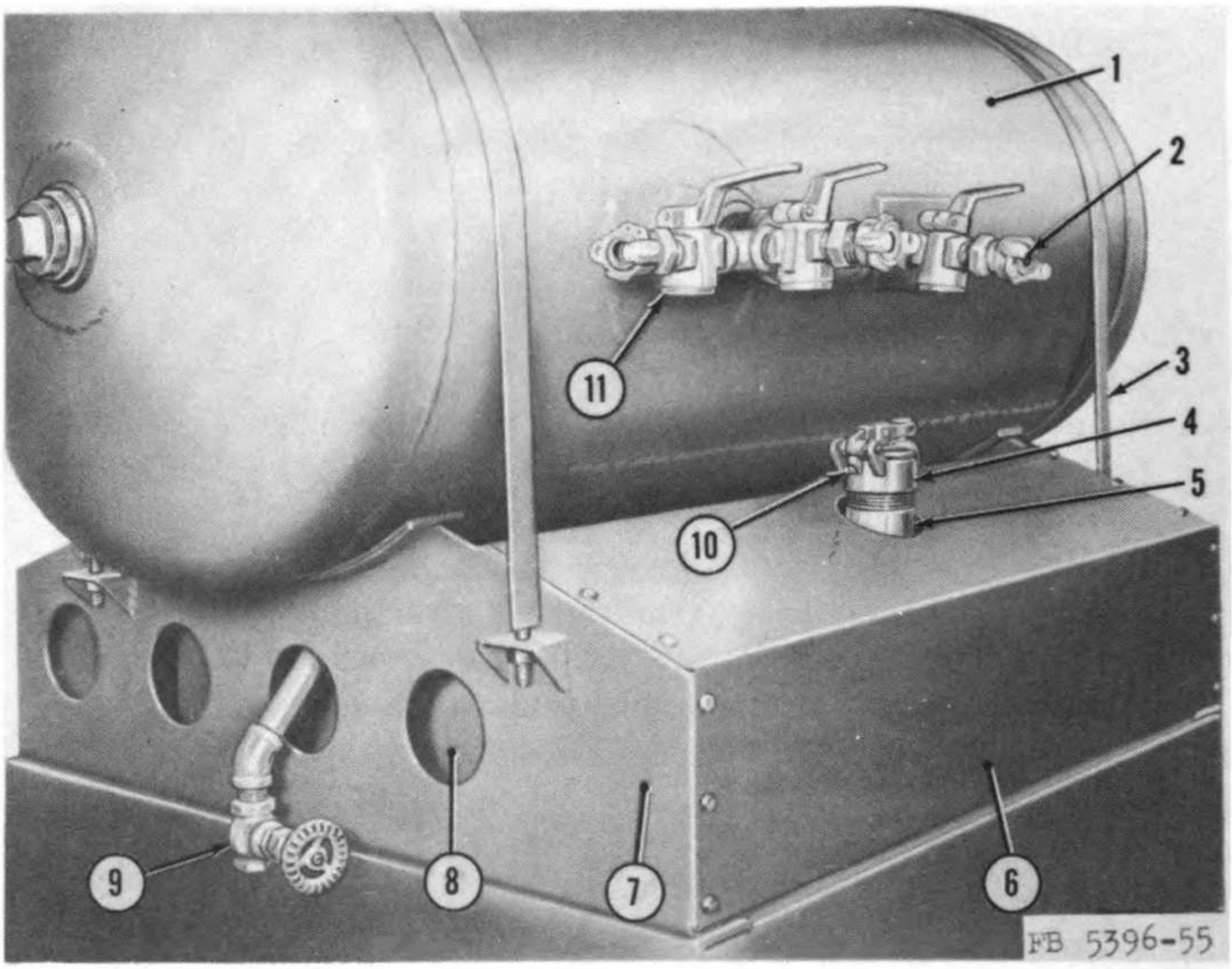
(3) Install cap with screen attached.

e. Installation.

(1) Lower fuel tank onto compressor frame; aline mounting holes and secure tank to frame with four cap screws (16, fig. 48), plain washers (14), and lockwashers (15).

(2) Connect two fuel lines (7 and 9).

(3) Install rear cover panel (6, fig. 55) and secure with 12 cap screws, lockwashers, and plain washers.



1 Air receiver
2 Hose coupling
3 Air receiver straps
4 Fillercap
5 Filler pipe
6 Rear cover panel
7 Air receiver support, left
8 Fuel tank
9 Air receiver drain
10 Setscrew
11 Hose valve

Figure 55. Air receiver and fuel tank installed.

(4) Install air receiver (par. 97*c*).

(5) Fill fuel tank and vent diesel fuel system (par. 7*g*(5)).

f. Cleaning Fuel Tank Filler Screen With Tank Installed.

Note. **The procedures below must be followed or fillercap and screen cannot be removed with air receiver installed.**

(1) Turn fillercap (4, fig. 55) counterclockwise with a pipe wrench to remove from filler pipe (5).

(2) Lift cap and attached strainer screen a few inches above pipe (5) and grasp screen with one hand and remove setscrew (10).

(3) Hold fillercap (4), and rotate attached strainer clockwise to separate the parts.
(4) Remove fillercap (4), then lift strainer clear of pipe (5); cover pipe opening.
(5) Wash strainer screen thoroughly in cleaning solvent; dry with compressed air.
(6) Insert screen part way inside pipe (5), place fillercap (4) on screen and rotate screen counterclockwise until it seats in fillercap (4).
(7) Install setscrew (10) in fillercap (4) to lock screen in fillercap; turn fillercap onto pipe (5).

Section XI. ENGINE AIR INTAKE AND EXHAUST ACCESSORIES

130. Description

a. Air Intake Accessories. An oil-bath air cleaner (reference 20, fig. 22) equipped with a precleaner (2, fig. 1) is furnished on the engine to filter air drawn into the intake manifolds. Dirt filtered out drops into the oil cup and clean air flows on to the cylinders.

b. Exhaust Accessories. Two mufflers (2, fig. 2) are furnished to reduce exhaust noise. Each muffler is equipped with a weather cap counterbalanced to close the exhaust opening automaticaliy when the engine is stopped. The caps prevent rain and dirt from entering the engine through the exhaust. The upper end of the mufflers are threaded internally to permit attachment of exhaust pipe extensions when the engine is operated indoors.

131. Engine Air Cleaner

a. Removal (fig. 56).
(1) Loosen precleaner clamp (2).
(2) Remove precleaner (1).
(3) Remove four nuts (7) and lockwashers (8) securing the air cleaner pipe (6) to the intake manifold.
(4) Loosen hose clamp (4) nearest to the air cleaner body (3); remove air cleaner pipe hose (5), air cleaner pipe (6), and pipe gasket (9).
(5) Remove two cap screws (11), lockwashers (16), and nuts (17) securing support clamp (10) to the support bracket (18); remove air cleaner assembly.

b. Disassembly (fig. 56).
(1) Loosen retaining clamp (14). Clean oil and grit from top bead of tray (12), retaining clamp, and surface under clamp; remove retaining clamp (14) and oil cup (15).
(2) Loosen three wingnuts (13) and remove air cleaner tray (12).

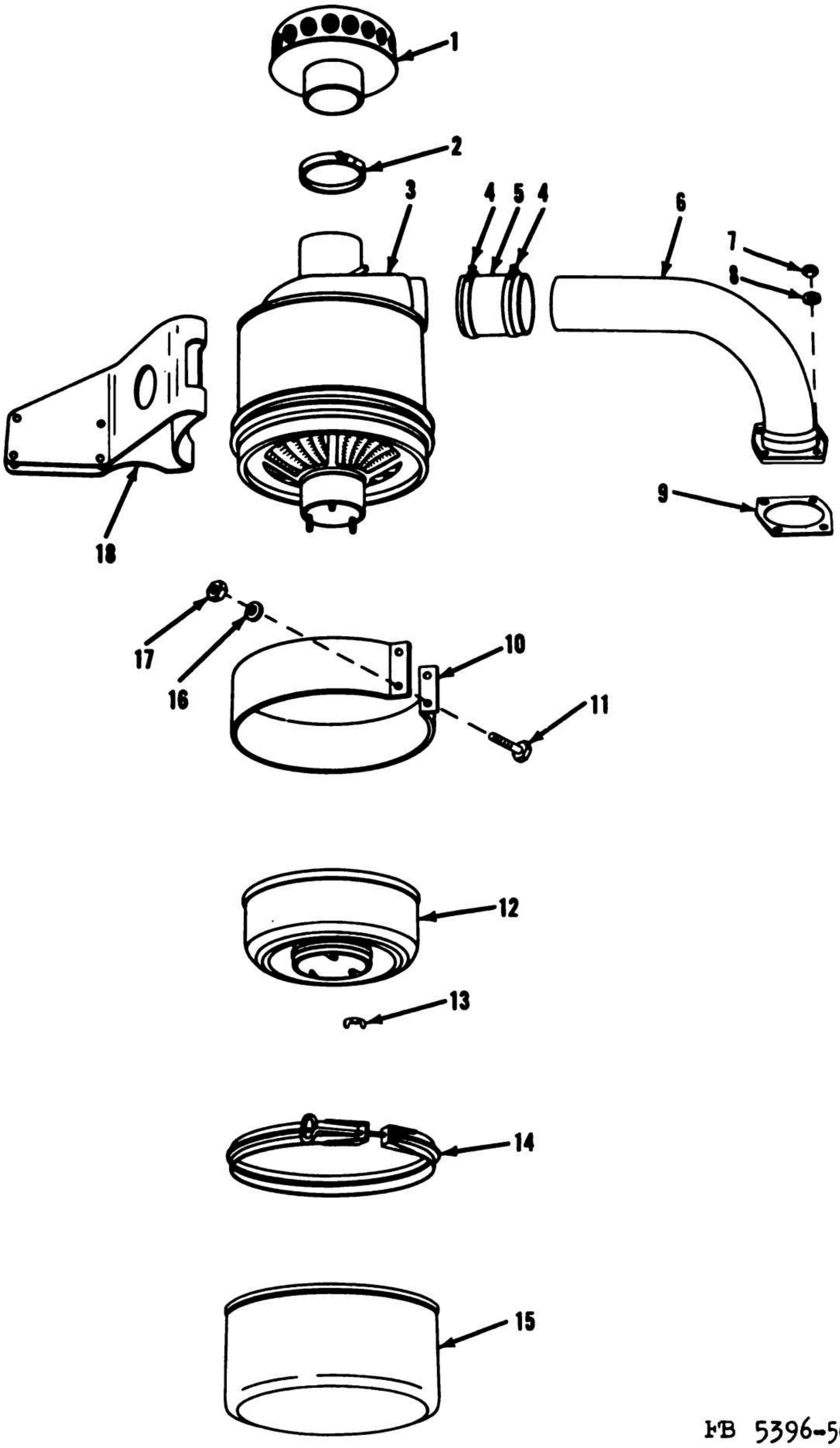


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Figure 56. Engine air cleaner, exploded view.

c. Cleaning and Inspection.

(1) Wash all parts thoroughly in cleaning solvent; clean body air intake pipe with cloth attached to cleaning rod. Dry parts with rags and compressed air.

(2) Clean precleaner screen thoroughly; make sure screen is not clogged.

(3) Check screens and metal parts for punctures, cracks, or dents which would permit unfiltered air to enter engine; look for stripped threads on mounting hardware.

(4) Replace damaged or defective parts.

d. Reassembly.

(1) Position air cleaner tray (12) on cleaner body (3) and tighten three wingnuts (13).

(2) Fill oil cup (15) to level mark with OE. (See LO 5–5396.)

(3) Position oil cup (15) and retaining clamp (14) on cleaner body; tighten retaining clamp.

e. Installation.

(1) Position air cleaner support clamp (10) in support bracket (18) mounted on engine.

(2) Install air cleaner assembly and replace two cap screws (11), lockwashers (16), and nuts (17).

(3) Place new gasket (9) on air intake manifold studs.

(4) Position air cleaner pipe hose (5) and pipe (6) on cleaner body (3) and air intake manifold.

(5) Tighten hose clamps (4) and replace four lockwashers (8) and nuts (7).

(6) Replace precleaner (1) and secure with clamp (2).

132. Exhaust Mufflers

(fig. 57)

a. Removal.

(1) Remove nut (4), lockwasher (3), and cap screw (1).

(2) Remove clamp (6) securing muffler (5) to exhaust pipe (7).

(3) Pull muffler off exhaust pipe.

---

1 Precleaner
2 Precleaner clamp
3 Air cleaner body
4 Air cleaner pipe hose clamp
5 Air cleaner pipe hose
6 Air cleaner pipe
7 Nut, hex, 3/8 NF (4 Req'd)
8 Lockwasher, 3/8 (4 Req'd)
9 Air cleaner pipe gasket
10 Air cleaner support clamp
11 Screw, cap, hex hd, 7/16 x 1¼ NF (2 Req'd)
12 Air cleaner tray
13 Wingnut, ¼ (3 Req'd)
14 Air cleaner oil cup retaining clamp
15 Air cleaner oil cup
16 Lockwasher, 7/16 (2 Req'd)
17 Nut, hex, 7/16 NF (2 Req'd)
18 Air cleaner support bracket

Figure 56—Continued.

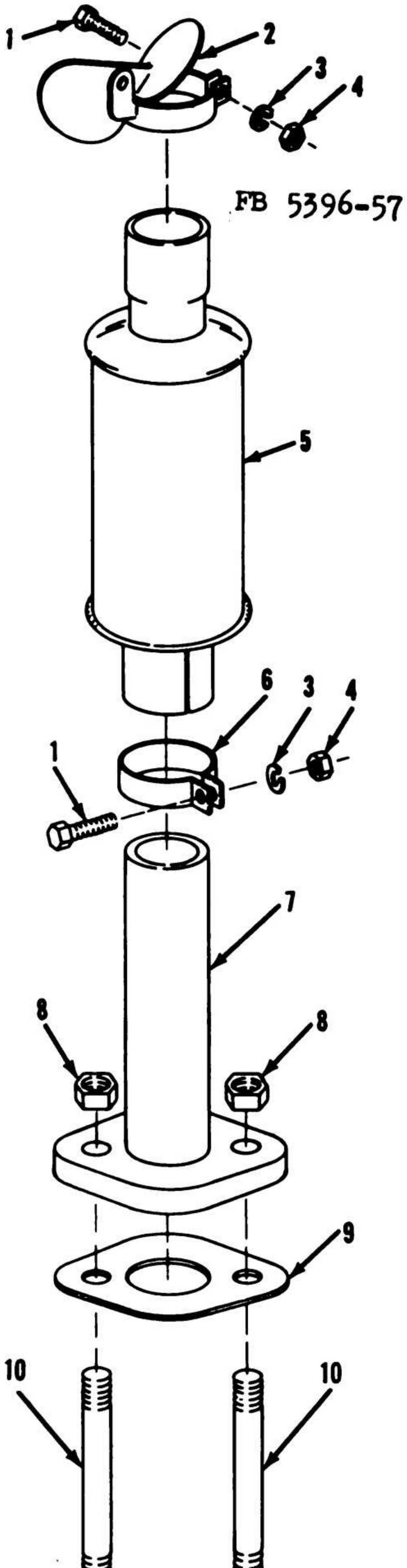


Figure 57. Exhaust pipe, muffler, and weather cap, exploded view.

b. Cleaning and Inspection.

(1) Remove rust and carbon.

(2) Inspect hardware for stripped threads; look for holes in muffler.

(3) Replace if defective.

c. Installation.

(1) Position muffler (5) on exhaust pipe (7).

(2) Install clamp (6).

(3) Install cap screw (1), lockwasher (3), and nut (4); tighten securely.

Section XII. ENGINE ELECTRICAL SYSTEM

133. Description

a. The International Harvester UD–24 diesel engine is equipped with a radio-suppressed and fungusproof, 12-volt electrical system for use during the gasoline-starting cycle of the engine. System components and interconnecting wires are shown in figure 58.

b. The system consists of a generator (7, fig. 43) and generator regulator (1); an ammeter, pushbutton starting switch, and push-pull ignition switch mounted on the instrument panel (fig. 18); a manifold ignition cutout switch (fig. 59) assembled as a part of the front end of the intake manifold; a distributor and coil assembly (14, fig. 8); a starting motor with solenoid switch (6 and 7, fig. 37), and six shielded spark plugs and cable assemblies.

Caution: Before performing any maintenance on the electrical system, disconnect a cable from the positive terminal of one battery to prevent accidental shorting.

134. Generator

a. Removal.

(1) Notice position and connection of all leads to the generator assembly; mark or tag leads for quick installation.

(2) Remove nuts and washers connecting leads to generator assembly.

(3) Remove the nut, lockwasher, and cap screw securing the generator (7, fig. 43) to the generator rear mounting bracket.

---

1 Screw, cap, hex hd, 5/16 x 2 NC (2 Req'd)
2 Exhaust weather cap
3 Lockwasher, 5/16 (2 Req'd)
4 Nut, hex, 5/16 (2 Req'd)
5 Muffler
6 Muffler clamp
7 Exhaust pipe
8 Nut, brass hex, 5/16 NC
9 Exhaust pipe flange gasket
10 Exhaust pipe stud

Figure 57—Continued.

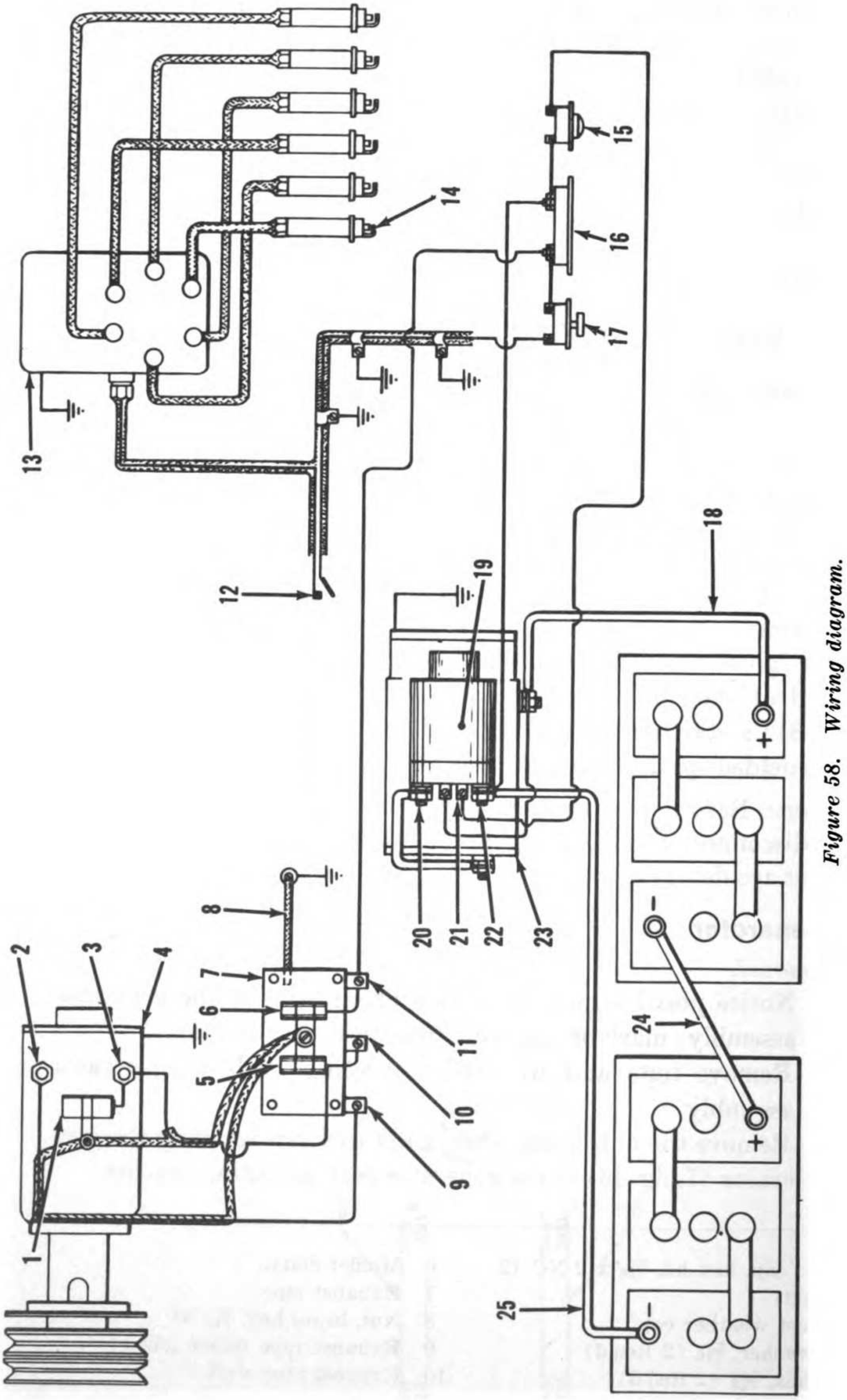


Figure 58. Wiring diagram.

1 Capacitor (generator)
2 Generator F terminal
3 Generator A terminal
4 Generator
5 Capacitor (regulator GEN terminal)
6 Capacitor (regulator BAT terminal)
7 Generator regulator (bottom view)
8 Regulator ground cable
9 Regulator F terminal
10 Regulator GEN terminal
11 Regulator BAT terminal
12 Manifold ignition cutout switch
13 Ignition distributor and coil assembly
14 No. 1 spark plug
15 Starting switch
16 Ammeter
17 Ignition switch
18 Battery-to-starting motor cable
19 Solenoid
20 Solenoid MOTOR terminal
21 Solenoid SW terminal
22 Solenoid BAT terminal
23 Starting motor
24 Battery-to-battery cable
25 Battery-to-solenoid cable

Figure 58—Continued.

(4) Remove the two cap screws and lockwashers securing the rear generator bracket to the engine.
(5) Remove the four cap screws and lockwashers securing the front of the generator to the fan belt idler housing; remove the generator.

b. Cleaning and Inspection.

(1) Wipe outside of generator with cloth dampened in cleaning solvent.

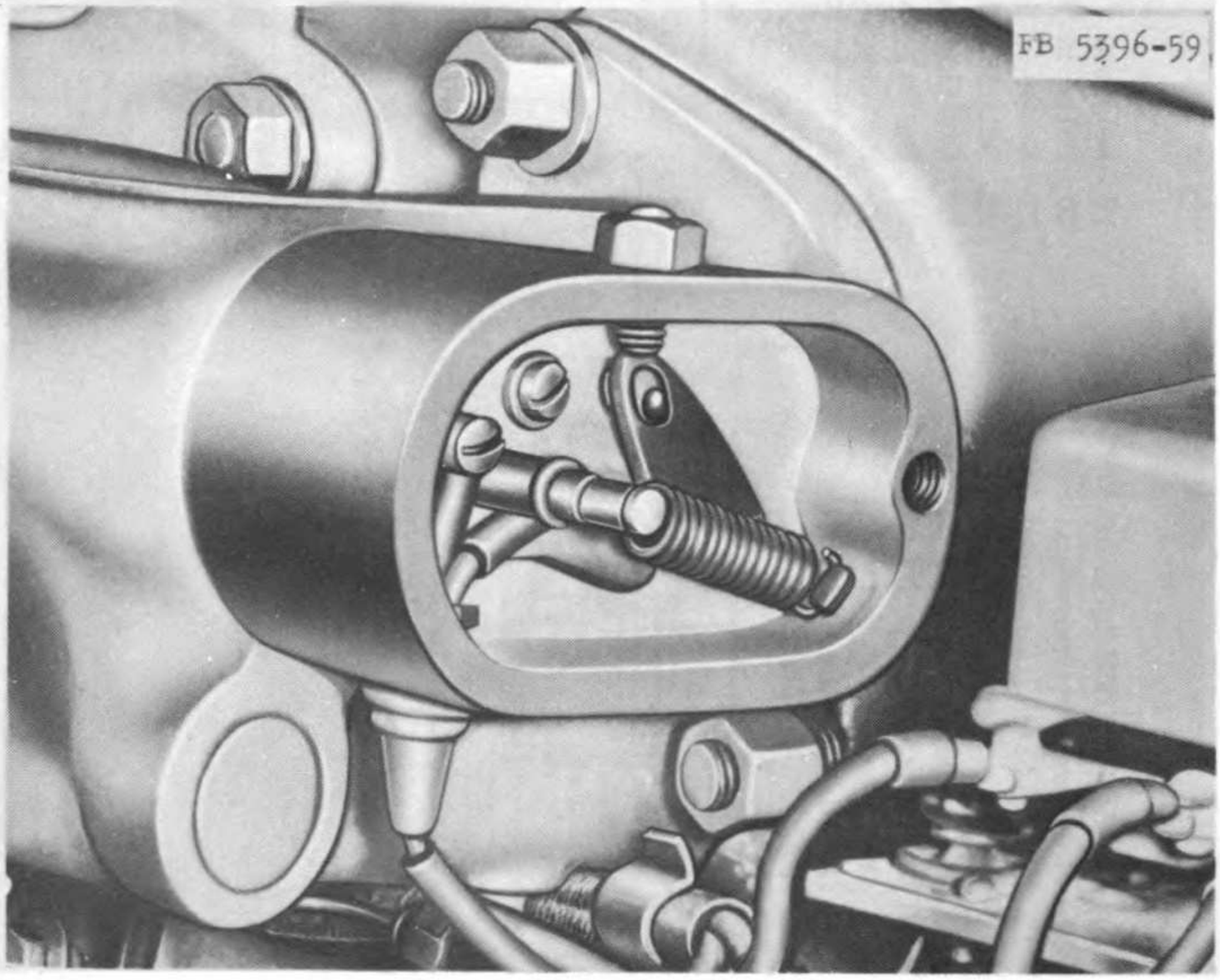


Figure 59. Manifold ignition cutout switch.

(2) Remove cover band and check for charred insulation, burned commutator bars, broken brush springs, and broken or loose connections.
(3) Replace generator if defective; return old generator for overhaul.

c. Installation (fig. 43).

(1) Position the generator (7) against the fan belt idler housing. Replace the four cap screws and lockwashers holding front of generator to the idler housing.
(2) Replace the two cap screws and lockwashers securing the rear generator bracket to the engine.
(3) Replace the nut, lockwasher, and bolt securing the generator to the generator bracket.

(4) Replace the generator leads.
(5) Polarize the generator (*d* below).

Caution: Be sure the generator capacitor lead is connected to A (armature) terminal of the generator. The generator regulator will be damaged if the capacitor is accidentally connected to the F (field) terminal on the generator.

d. Polarizing Generator.

(1) Connect one end of a jumper lead to the BAT terminal of the regulator.
(2) Momentarily touch the other end of the jumper lead to the GEN terminal of the regulator before starting the engine.

Note. This procedure causes a momentary surge of current to flow from the battery to the generator to correctly polarize the generator with respect to the batteries it charges. Failure to do this may result in severe damage to the electrical system.

Caution: Do not operate generator with battery cables disconnected.

e. Cleaning Commutator on Installed Generator. Remove the cover band and clean the commutator as it rotates by touching it lightly with No. 00 sandpaper; blow out dust.

Caution: Emery is a conductor of electricity; do not use emery cloth to clean commutator or other internal parts of the generator.

f. Inspecting and Replacing Brushes With Generator Installed.

(1) Remove cover band.
(2) Pull up on brush arm with a stiff wire as shown in figure 60; remove brush from holder.
(3) Measure overall brush length; if less than three-quarters of an inch in length, install new brush.
(4) Remove screw and lockwasher holding brush lead to terminal; remove brush from generator.
(5) Connect new brush lead to terminal with a screw and lockwasher.
(6) Lift up brush arm and slide new brush into holder; release brush arm.
(7) Repeat above steps to check and replace the other brush.
(8) Replace cover band.

135. Generator Regulator

a. Removal (fig. 43).

(1) Disconnect one of the battery cables.
(2) Mark or tag for reference the three leads and ground strap to the regulator unit; disconnect the leads and strap.
(3) Remove the three screws, lockwashers, and nuts securing the regulator (1) to its bracket (2); remove the regulator.

b. Installation (fig. 43).

(1) Position the regulator (1) on the bracket (2) and replace the three screws, lockwashers, and nuts securing the regulator to its bracket.

(2) Connect the three tagged leads to the regulator; connect ground strap.

(3) Connect the battery cable removed in *a*(1) above.

(4) Polarize the generator (par. 134*d*).

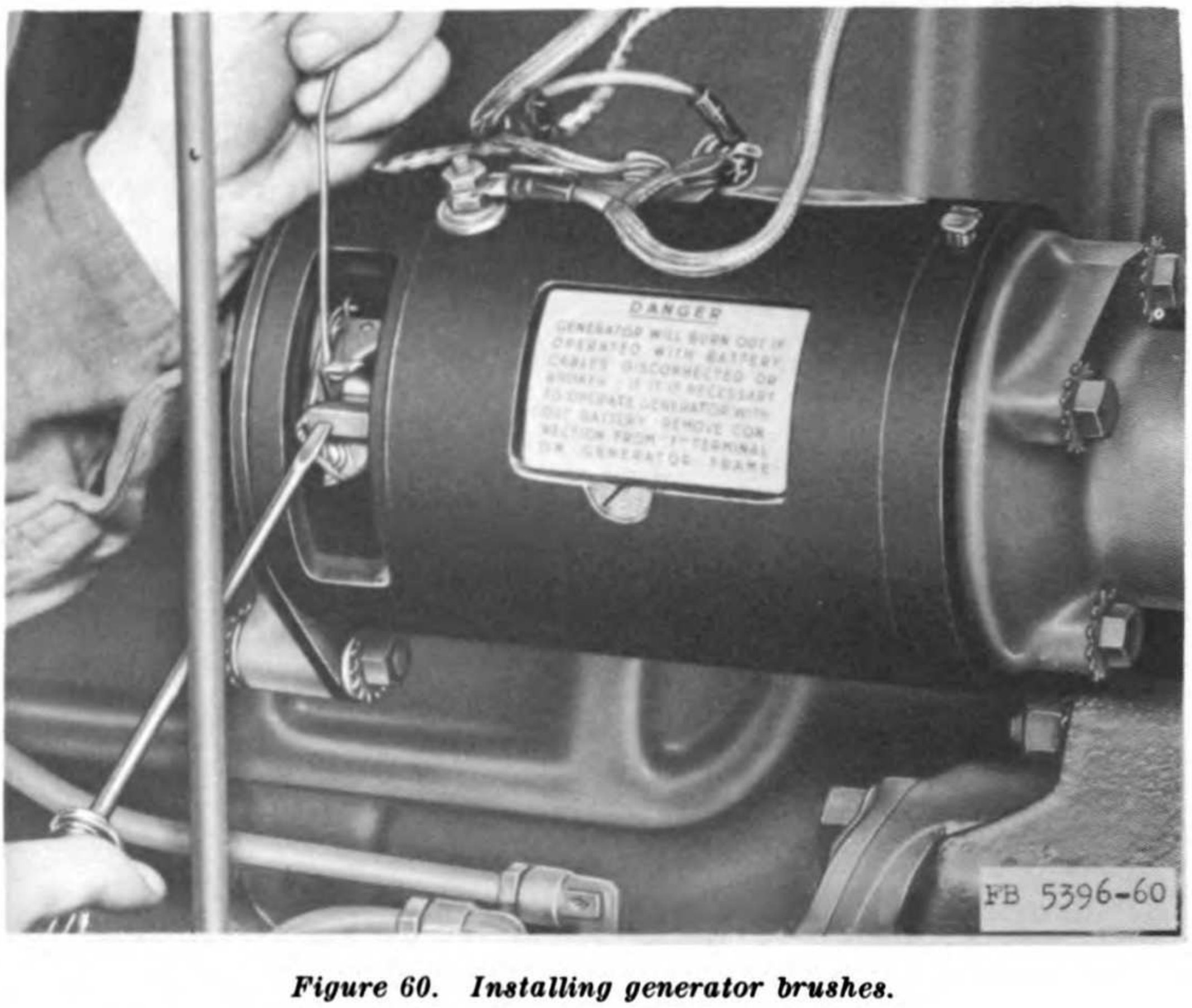


Figure 60. Installing generator brushes.

136. Batteries

a. Removal.

(1) Remove the six wingnuts (fig. 10) securing cover to battery support studs; remove the battery cover and spacers from the studs.

(2) Note the position of the battery positive and negative posts for correct reinstallation.

(3) Disconnect the battery-to-battery cable (24, fig. 58), battery-to-starting motor cable (18), and the battery-to-solenoid cable (25).

(4) Remove the battery clamp from studs; lift out the batteries (13, fig. 2).

Caution: Battery electrolyte contains a strong acid; do not spill on skin or clothing.

b. Cleaning and Inspection.

(1) Clean the battery and surrounding area with a solution of bicarbonate of soda and water. Wash off with clean water and dry.

(2) Clean the battery filler plug vent holes with a stiff brush.

(3) Inspect for corrosion, cracks, distortion, loose terminal posts, and correct electrolyte level. (The electrolyte level must be one-half of an inch above the top of the battery plates; refill with distilled water.)

(4) Replace a damaged battery.

c. Installation.

(1) Position the batteries in the battery support, and replace the battery clamp.

(2) Connect the battery-to-battery cable (24, fig. 58), battery-to-starting motor cable (18), and the battery-to-solenoid cable (25).

Note. The battery-to-solenoid cable (25) must be attached to the negative battery post of one battery, and the battery-to-starting motor cable (18) to the positive post of the other battery.

(3) Replace the six spacers on the studs, the battery cover, and six wingnuts.

d. Testing Battery Electrolyte Specific Gravity.

(1) Brush away dirt from battery caps; remove caps.

Warning: Batteries generate an inflammable mixture of hydrogen and oxygen during charging and for some time after. To prevent a fire or explosion, do not expose these gases to an open flame or even a spark.

(2) Insert hydrometer into cell filler hole and draw electrolyte into hydrometer glass until float is suspended in the liquid.

Note. Use a hydrometer equipped with a thermometer.

(3) Hold hydrometer to eye level and notice scale mark even with the surface of the liquid.

(4) The scale mark indicates the specific gravity and cell charge at a temperature of 80° F.

1.265 to 1.290	fully charged
1.235 to 1.260	three-fourths charged
1.205 to 1.230	one-half charged
1.170 to 1.200	one-fourth charged
1.140 to 1.165	barely operative
1.110 to 1.135	completely discharged

Note. For each 10° increase in temperature, add 0.004 to the specific gravity; for each 10° decrease in temperaure, subtract 0.004 from the reading.

(5) Check all cells in a similar manner.

(6) Remove discharged batteries and recharge.

137. Ammeter

a. Removal.

(1) Mark and disconnect leads to the ammeter (10, fig. 18) terminal at rear of instrument panel.

(2) Remove the two nuts, lockwashers, and the U-shaped clamp securing the ammeter to the instrument panel; remove the ammeter.

b. Cleaning and Inspection.

(1) Wipe with cloth dampened with cleaning solvent; dry thoroughly.

(2) Inspect for cracked glass, broken needle, stripped threads, or loose terminals.

(3) Replace ammeter if damaged or defective.

c. Installation.

(1) Position ammeter in instrument panel and replace the clamp, two lockwashers, and nuts.

(2) Connect leads to ammeter terminal at rear instrument panel.

138. Starting Motor and Solenoid

a. Removal (fig. 37).

(1) Disconnect one of the battery cables.

(2) Notice position and connection of all leads to the starting motor (7) and starting motor solenoid (6); mark or tag leads to facilitate installation.

(3) Remove all the leads from the starting motor assembly.

(4) Remove the three cap screws and lockwashers securing the starting motor to the engine; remove the starting motor.

b. Cleaning and Inspection.

(1) Wipe with a cloth dampened in cleaning solvent and dry thoroughly; remove cover band.

(2) Inspect for charred insulation, burned commutator, worn brushes, and stripped threads.

(3) Replace if damaged or defective; send old unit to overhaul.

c. Installation (fig. 37).

(1) Position the starting motor (7) and replace the three cap screws and lockwashers securing it to the engine.

(2) Replace all leads to the starting motor and starting motor solenoid (6).

(3) Connect the battery cable.

d. Cleaning Commutator.

(1) Remove cover band.

(2) Touch commutator with No. 00 sandpaper while motor is operated.

(3) Blow out dust; replace cover band.

Caution: Emery is a conductor of electricity; do not use emery cloth to clean commutator.

e. Inspecting and Replacing Brushes With Starter Installed.

(1) Remove cover band.

(2) Pull up on brush arm with a stiff wire as shown in figure 61; remove brush from brush holder.

(3) Measure overall brush length; if less than three-quarters of an inch, install new brushes.

(4) Remove screw and lockwasher holding brush lead to terminal; remove brush from starter.

(5) Disconnect new brush lead to terminal and secure with a screw and lockwasher.

(6) Lift brush arm and insert brush in holder; release brush arm.

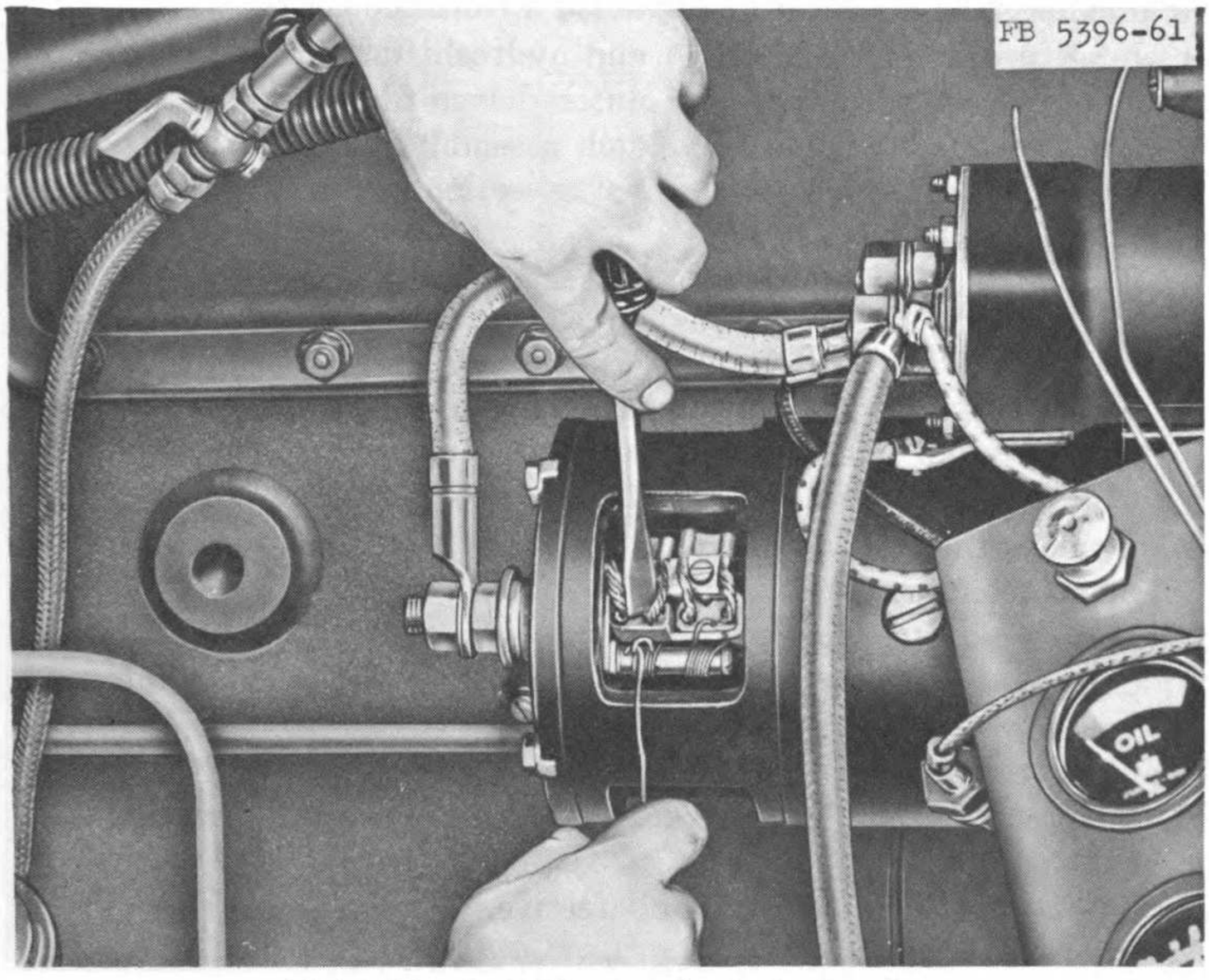


Figure 61. Installing starting motor brushes.

f. Solenoid Removal (fig. 37).

(1) Notice position of and tag all leads connected to the solenoid (6).

(2) Remove cotter pin holding shift lever pin in shift lever.

(3) Remove four cap screws and lockwashers holding solenoid to starting motor (7).

g. Solenoid Installation (fig. 37).

(1) Position the solenoid (6).

Note. **If a new solenoid is used, the shift lever link must be removed from the old solenoid and placed on the new one. Count the number of turns required to remove link and use same number of turns to replace it on the new solenoid.**

(2) Replace the four cap screws and lockwashers securing the solenoid (6) to the starting motor (7).
(3) Replace the shift lever pin securing the shift lever to the shift lever link; replace the cotter pin securing the shift lever pin.
(4) Reconnect all leads to solenoid.

Section XIII. CLUTCH

139. Description

a. The air compressor is coupled to the engine through a double-disk clutch. The two lined drive disks are used in this application to furnish a greater friction surface. Each disk is assembled from a set of four lined segments interlocked to form a continuous disk.

b. A clutch shifter pump (fig. 11) and hydroshifter, which utilize hydraulic power to spread apart the clutch driven plates, are related components used to disengage the clutch assembly. The clutch assembly and hydroshifter are shown in cross section in the illustration of the components (fig. 62).

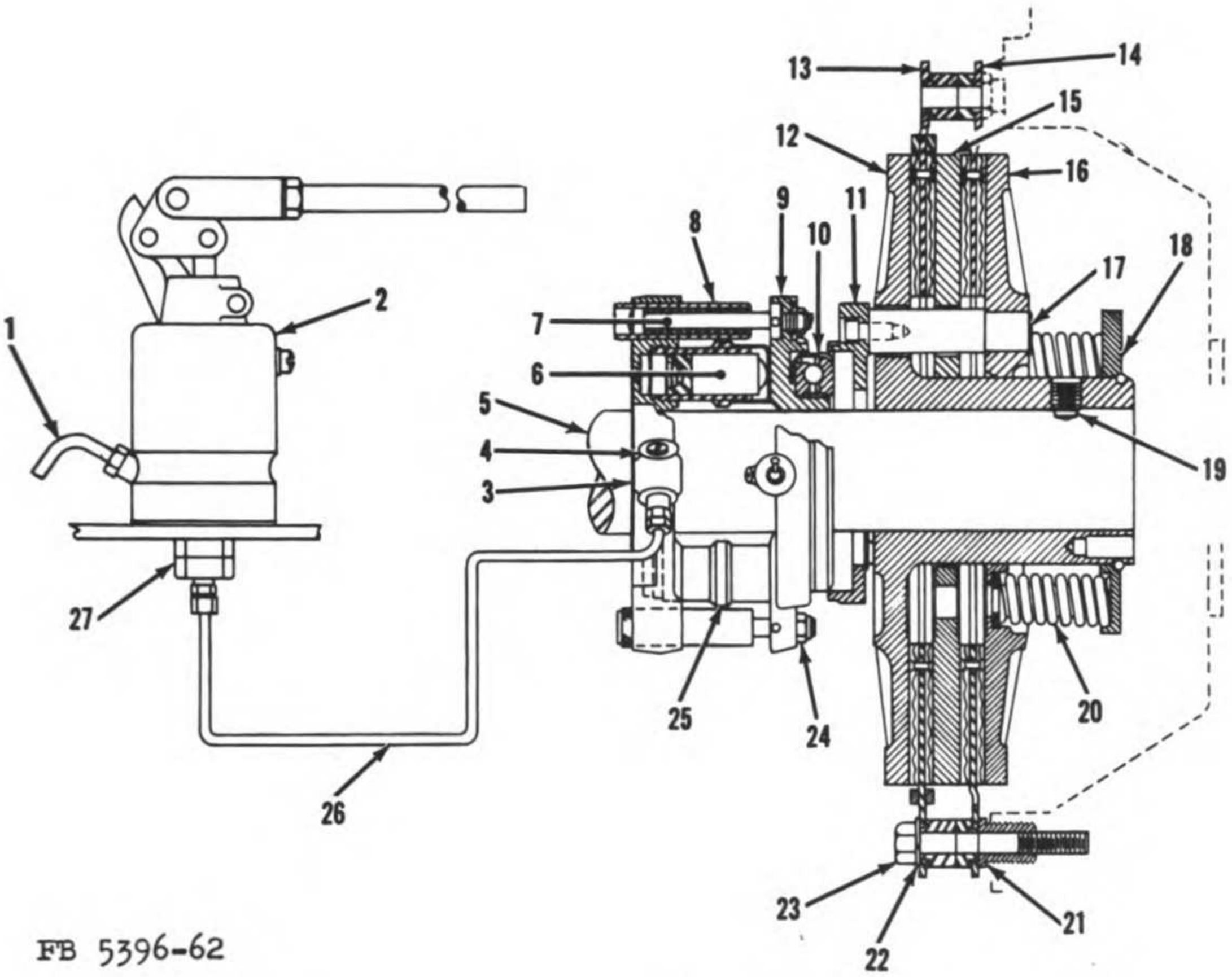
140. Clutch Shifter Pump

a. Removal (fig. 62).
(1) Disconnect the discharge tube (26) at the bottom of the clutch shifter pump (2); tape the end of the tube to prevent entry of foreign material.
(2) Remove the two jam nuts (27), lift the clutch shifter pump out of the frame.

b. Cleaning and Inspection.
(1) To prevent entry of cleaning solvent, plug the opening left by removal of the discharge tube.
(2) Wash the pump thoroughly in cleaning solvent.
(3) Inspect for fluid leaks, cracks, obvious wear, and stripped threads.
(4) Replace pump if damaged or defective.

c. Installation (fig. 62).
(1) Remove plug inserted in the pump to prevent entry of cleaning solvent.
(2) Position the clutch shifter pump (2) on the compressor frame; replace the two jam nuts (27).
(3) Remove tape from the end of the discharge tube (26); connect the tube to the bottom of the pump.
(4) Fill the clutch shifter pump (see LO 5–5396); bleed air from the system (*d* below).

d. Bleeding Air From Clutch Shifter and Pump (fig. 62).
(1) Remove the bearing housing cover from the compressor bearing housing.
(2) Loosen the plug (4) just enough to allow fluid to escape.



FB 5396-62

1 Release valve
2 Clutch shifter pump
3 Body
4 Plug
5 Crankshaft
6 Ram
7 Bolt
8 Guide tube
9 Shifter head
10 Thrust bearing
11 Thrust plate
12 Hub plate
13 Drive disk assembly
14 Drive disk assembly
15 Center plate
16 Back plate
17 Push studs
18 Spring plate
19 Hub plate setscrew
20 Clutch springs
21 Adjusting nut
22 Lockwasher, ½ (8 Req'd)
23 Adjusting cap screw
24 Shifter head locknut
25 Dust shield
26 Discharge tube
27 Jam nut

Figure 62. Clutch assembly, cross-section view.

(3) Keep the clutch shifter pump filled (refer to LO 5–5396), and pump the clutch shifter pump handle slowly until air ceases to escape with the fluid; tighten the plug.

141. Hydroshifter

a. Removal (fig. 62).

(1) Remove the bearing housing cover from the compressor bearing housing.
(2) Disconnect the discharge tube (26) at the hydroshifter.
(3) Remove the two cap screws and lockwashers securing the hydroshifter to the compressor bearing housing.

(4) Loosen the two shifter head locknuts (24); pull up to remove the hydroshifter subassembly (shifter head (9) and thrust bearing (10) will remain on compressor crankshaft (5)).

b. Cleaning and Inspection.

(1) Wipe hydroshifter with a cloth dampened with cleaning solvent; dry thoroughly.

(2) Inspect for cracks, distortion, obvious wear, and leaks.

(3) Replace hydroshifter if damaged or defective.

c. Installation (fig. 62).

(1) Position the hydroshifter subassembly astride the crankshaft; tighten the two shifter head locknuts (24) holding the hydroshifter subassembly to the shifter head (9).

(2) Replace the two cap screws and lockwashers securing the hydroshifter to the compressor bearing housing.

(3) Connect the discharge tube (26) to the hydroshifter.

(4) Replace the bearing housing cover on the compressor bearing housing.

(5) Bleed system (par. 140*d*).

142. Clutch Assembly

a. Cleaning and Inspection.

(1) Remove the bearing housing cover; clean the clutch assembly with clean compressed air.

(2) Inspect the clutch assembly for distortion, excessive heat, broken clutch springs, and obviously worn or damaged lining.

(3) Report defects to proper authority.

b. Adjustment (fig. 63).

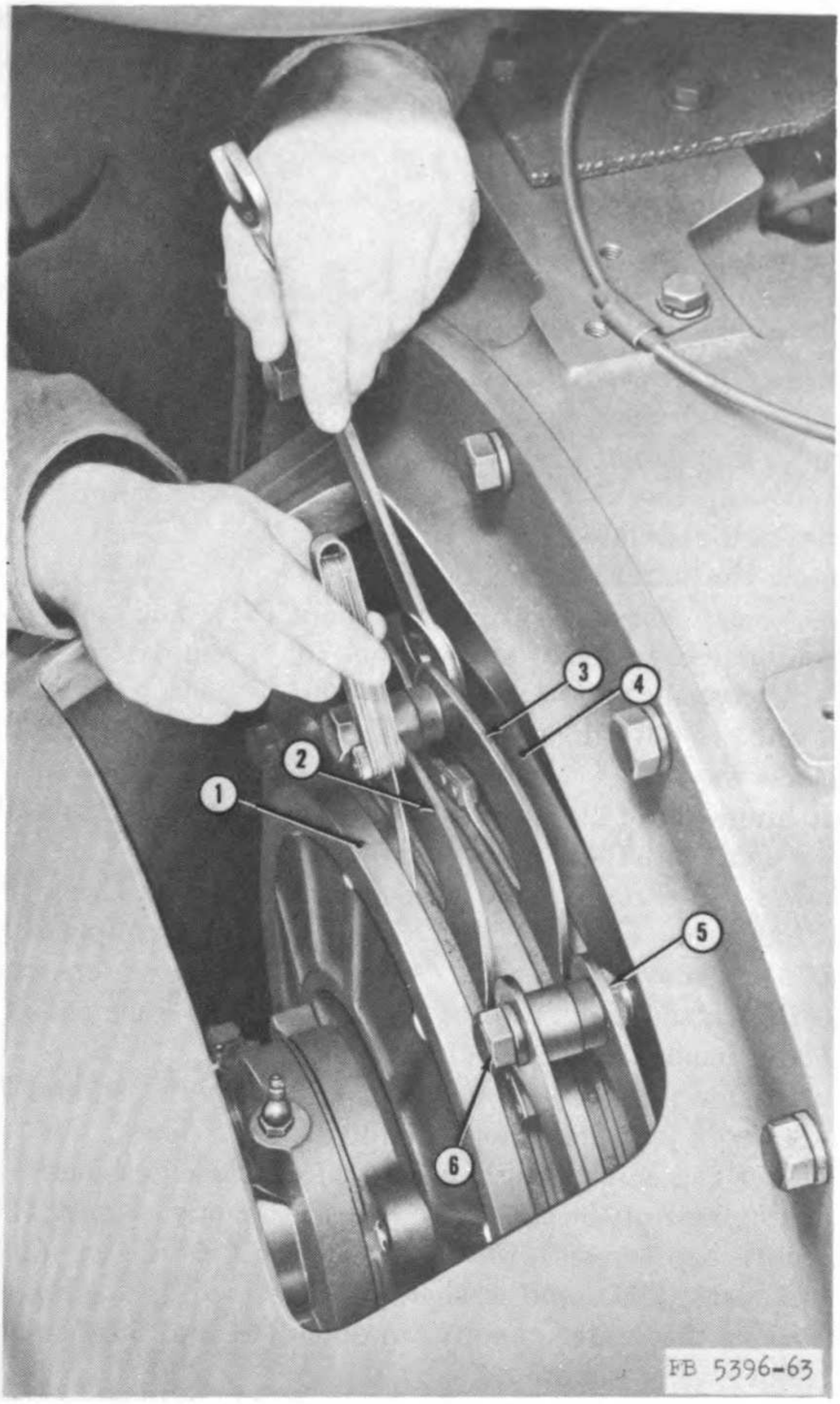
(1) Remove the bearing housing cover, and disengage the clutch.

(2) Insert a thickness (feeler) gage between the hub plate (1) and drive disk assembly (2).

(3) There must be 0.015-inch clearance between the lining of the drive disk assembly and the hub plate, throughout their circumference.

(4) To adjust the clearance, loosen the eight cap screws (6) holding the drive disks to the flywheel (4) and turn each of the adjusting nuts (5) an equal amount to obtain the 0.015-inch clearance. Turn nuts clockwise to increase clearance and counterclockwise to decrease clearance.

(5) After adjustment, tighten the eight cap screws securely.



1 Hub plate (driven)
2 Drive disk assembly
3 Drive disk assembly
4 Flywheel
5 Adjusting nut
6 Adjusting cap screw

Figure 63. Adjusting the clutch.

Section XIV. CANOPY AND MISCELLANEOUS CHASSIS PARTS

143. Description

a. A weather-resistant sheet metal inclosure is installed on the compressor frame to protect the equipment. The inclosure includes the top canopy, engine and compressor access doors, and supporting framework.

b. Chassis parts such as the air receiver supports, canopy support, and intercooler guard support the canopy and tanks. The deep toolboxes provide storage space for pneumatic tools; the small toolbox contains handtools.

144. Canopy, Doors, and Toolboxes

a. Removal and Disassembly.

(1) Remove nuts (1, fig. 64) and lockwashers (2); remove lifting bail yoke (3).

(2) Remove mufflers (par. 132*a*).

(3) Remove precleaners (2, fig. 1) and (3, fig. 2).

(4) Remove aftercooler (par. 93).

(5) Remove cap screws (34, fig. 64) attaching the canopy (36) to the engine radiator.

(6) Remove the batteries (par. 136*a*).

(7) Remove cap screws (56), lockwashers (57), and nuts (58) attaching door end (59) and valance (55); remove cap screws (84), lockwashers (101) and nut (100) attaching valance to door end; remove door end (59). Remove door end (28) in the same way.

(8) Pull hinge pin (42) from upper access doors (46 and 48) where doors join the canopy; remove doors.

(9) Remove cap screws (82), nuts (81), and lockwashers (80) attaching door ends (70 and 83) to door end supports (71 and 79); remove cap screws (84), nuts (100), and lockwashers (101) attaching valances (88 and 102) to door ends (70 and 83); remove door ends (70 and 83).

(10) Pull hinge pin (42) from upper access doors (66 and 96) where doors join the canopy; remove access doors.

(11) Remove cap screws (39), nuts (41), and lockwashers (40) attaching rear of the canopy to the rear canopy support (68).

(12) Remove cap screws (108) lockwashers (107), nuts (106), lockwashers (105), and washers (104) attaching the top and bottom of the center canopy supports (64 and 65); remove the center canopy supports.

(13) Remove screws (38) from the manifold collar plates (37); remove the collar plates.

(14) Lift up the assembled canopy to clear the high-pressure discharge manifold, and remove the canopy from the compressor.

(15) Remove cap screws (89), nuts (92), and lockwashers (91) securing valances (88, 102, 49, and 55) to the deep toolboxes (90 and 103).

(16) Remove cap screws (93), nuts (95), and lockwashers (94) attaching the toolboxes (90 and 103) to the compressor frame; remove the toolboxes.

(17) Remove cap screws (27), nuts (54), and lockwashers (53) attaching battery support (61) to valance (55) and compressor frame; remove battery support.

(18) Remove cap screws (43), nuts (51), and lockwashers (50) attaching the small toolbox (44) to valance (49) and compressor frame.

(19) Remove cap screws (87), nuts (85), and lockwashers (86) attaching valances (88, 102, and 55) to the compressor frame; remove valances.

b. Cleaning, Inspection, and Repair.

(1) Wash all parts thoroughly in cleaning solvent; steam clean stubborn deposits of oil and grease. Dry with rags or compressed air.

(2) Inspect all parts for cracks, warping, dents, and rust.

(3) Weld cracks, and straighten dents and warped parts; repaint parts as needed (see TM 9–2851).

c. Reassembly and Installation.

(1) Install the deep toolboxes (90 and 103, fig. 64); secure to the compressor frame with cap screws (93), lockwashers (94), and nuts (95).

(2) Install valances (88, 102, 49, and 55) to the compressor frame; secure with cap screws (87), lockwashers (86), and nuts (85).

(3) Install battery support (61) on valance (55); secure with cap screws (27), lockwashers (53), and nuts (54).

(4) Install the small toolbox (44); secure with cap screws (43), lockwashers (50), and nuts (51).

(5) Install door ends (28 and 59); secure with cap screws (56), lockwashers (57), and nuts (58). Install door ends (70 and 83); secure with cap screws (82), lockwashers (80), and nuts (81).

(6) Attach valances (49, 55, 88, and 102) to door ends (28, 59, 70, and 83) with cap screws (84), lockwashers (101), and nuts (100).

(7) Install canopy (36); secure to radiator with cap screws (34); secure canopy to rear canopy support (68) with cap screws (39), lockwashers (40), and nuts (41).

(8) Install center canopy supports (64 and 65); secure at top and bottom with cap screws (108), washers (107), lockwashers (104 and 105), and nuts (106).

(9) Install assembled upper and lower access doors (45 and 46) on canopy, and insert hinge pin (42); install access doors (48 and 52, 96 and 99, and 66 and 67) in the same way.

(10) Install manifold collar plates (37) on canopy (36); secure with screws (38).

(11) Install aftercooler (par. 93).

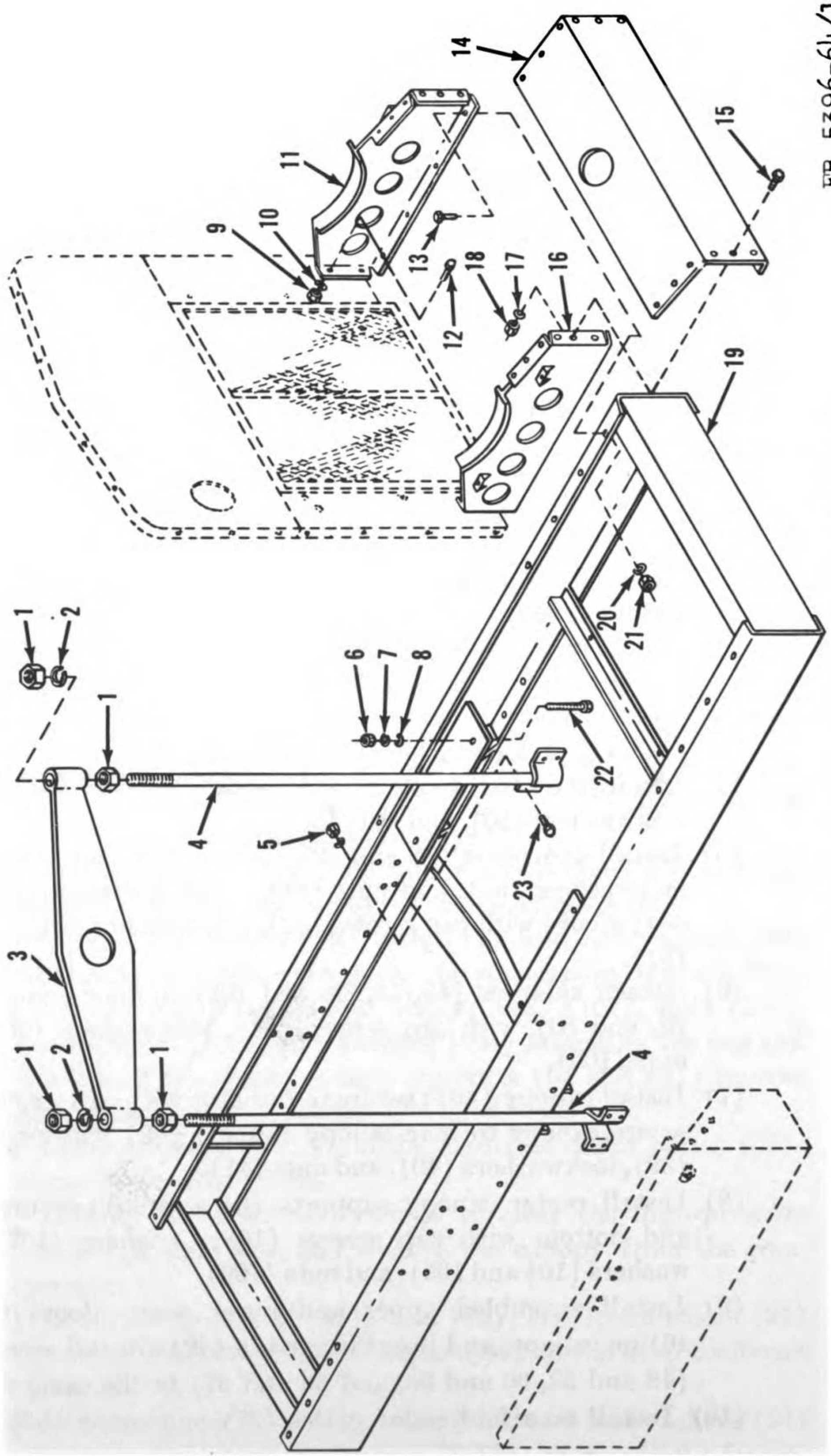


Figure 64. Canopy, frame, and chassis parts, exploded view.

1 Nut, hex, 1¼ NC (4 Req'd)
2 Lockwasher, 1¼ (2 Req'd)
3 Lifting bail yoke
4 Lifting bail rod
5 Nut, ⅝ NC (8 Req'd)
6 Nut, hex, ¾ NC (4 Req'd)
7 Lockwasher, ¾ (4 Req'd)
8 Compressor mounting shim
9 Nut, hex, ⅜ (4 Req'd)
10 Lockwasher, ⅜ (4 Req'd)
11 Right air receiver support
12 Screw, cap, hex hd, ⅜ x ¾ NC (4 Req'd)
13 Screw, cap, hex hd, ⅜ x ⅞ NC (8 Req'd)
14 Rear cover panel
15 Screw, cap, hex hd, ¼ x ⅝ NC (12 Req'd)
16 Left air receiver support
17 Lockwasher, ¼ (12 Req'd)
18 Nut, hex, ¼ NC (12 Req'd)
19 Frame
20 Lockwasher, ⅜ (8 Req'd)
21 Nut, hex, ⅜ NC (8 Req'd)
22 Bolt, mach, ¾ x 5½ NC (4 Req'd)
23 Screw, cap, hex hd, ⅝ x 1½ NC (8 Req'd)

Figure 64—Continued.

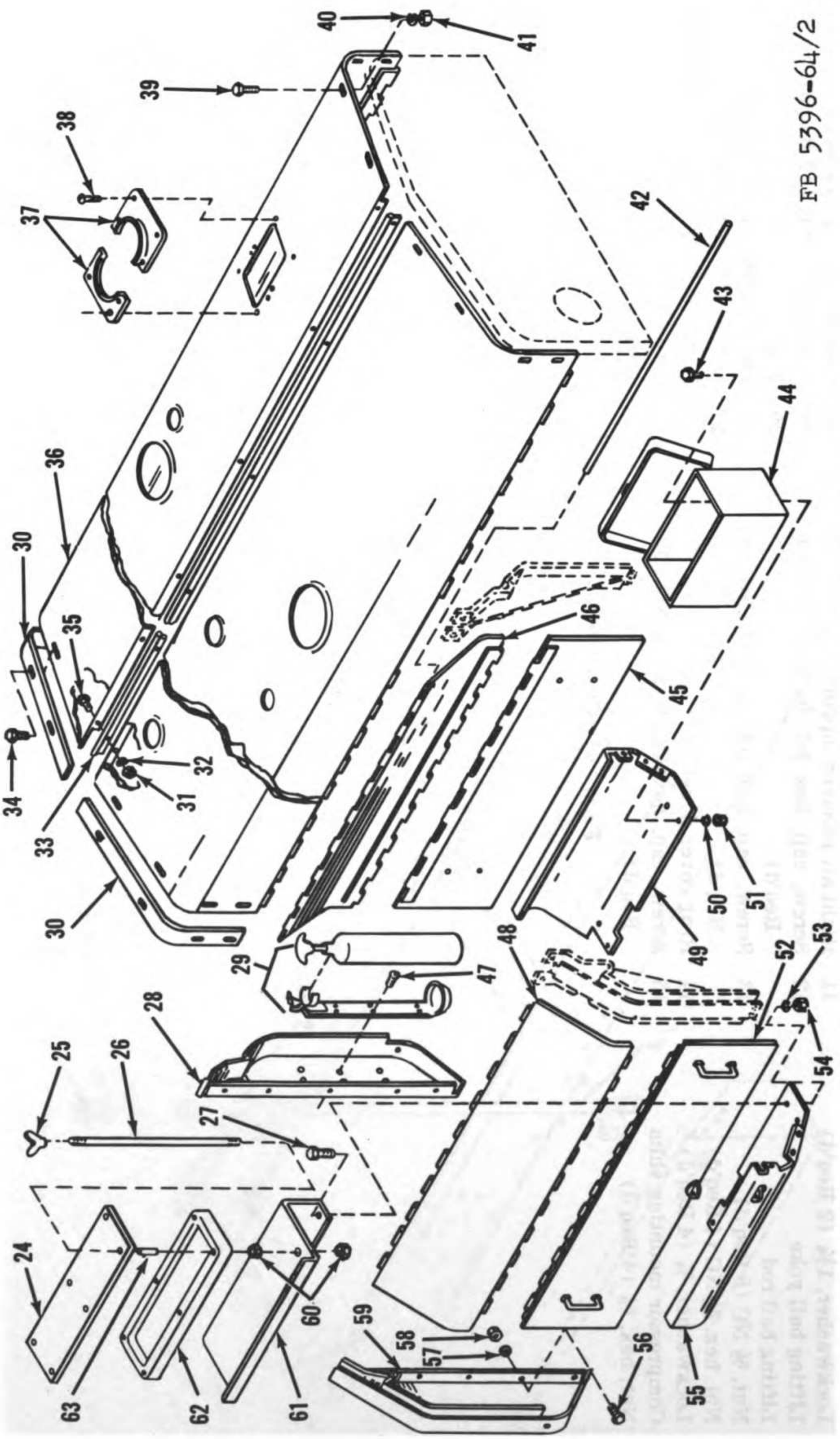


Figure 64. Canopy, frame, and chassis parts, exploded view—Continued.

24 Battery cover (1 Req'd)
25 Wingnut, 5/16 (6 Req'd)
26 Battery bolt
27 Screw, cap, hex hd, 3/8 x 5/8 NC (5 Req'd)
28 Right front door end (1 Req'd)
29 Fire extinguisher and bracket
30 Canopy spacer
31 Nut, hex, 3/8 NC (6 Req'd)
32 Lockwasher, 3/8 (6 Req'd)
33 Canopy joint strip
34 Screw, cap, hex hd, 3/8 x 7/8 NC (4 Req'd)
35 Screw, cap, hex hd, 3/8 x 5/8 NC (6 Req'd)
36 Right canopy
37 Manifold collar plate
38 Screw, self-tapping, No. 8 (8 Req'd)
39 Screw, cap, hex hd, 3/8 x 5/8 NC (14 Req'd)
40 Lockwasher, 3/8 (14 Req'd)
41 Nut, hex, 3/8 NC (14 Req'd)
42 Hinge pin
43 Screw, cap, hex hd, 5/16 x 3/4 NC (2 Req'd)
44 Toolbox
45 Right lower access door
46 Right upper access door
47 Screw, mach, rd hd, No. 8 x 5/8 NC (6 Req'd)
48 Left upper access door
49 Right front valance
50 Lockwasher, 5/16 (2 Req'd)
51 Nut, hex, 5/16 NC (2 Req'd)
52 Left lower access door
53 Lockwasher, 3/8 (5 Req'd)
54 Nut, hex, 3/8 NC (5 Req'd)
55 Left front valance
56 Screw, cap, hex hd, 3/8 x 7/8 NC (8 Req'd)
57 Lockwasher, 3/8 (8 Req'd)
58 Nut, hex, 3/8 NC (8 Req'd)
59 Left front door end (1 Req'd)
60 Nut, hex, 5/16 NC (12 Req'd)
61 Battery support
62 Battery clamp
63 Battery cover spacer

Figure 64—Continued.

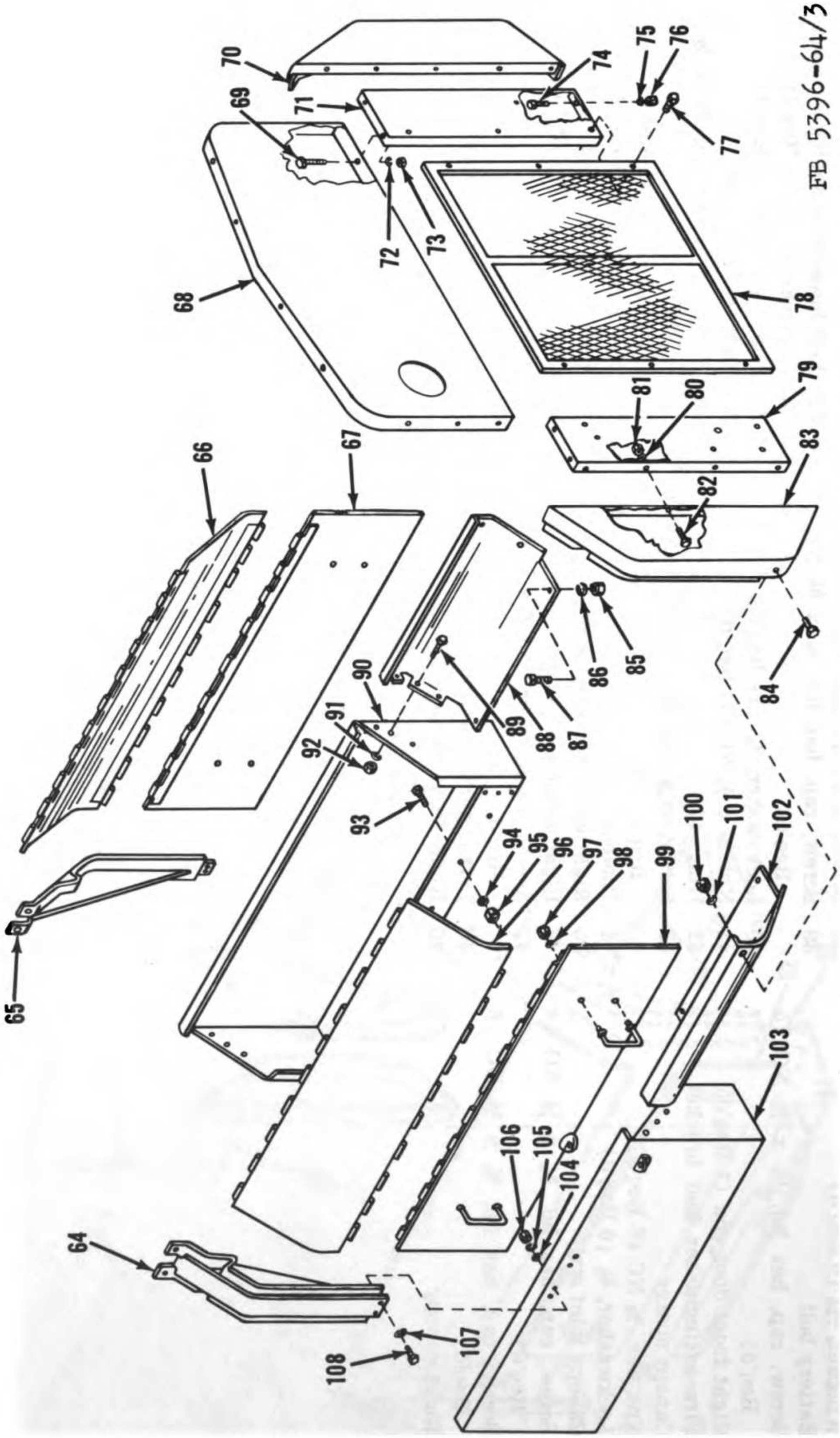


Figure 64. Canopy, frame, and chassis parts, exploded view—Continued.

64 Center canopy support
65 Center canopy support
66 Right upper access door
67 Right lower access door
68 Rear canopy support
69 Screw, cap, hex hd, ⅜ x ⅞ NC (4 Req'd)
70 Right rear door end
71 Right rear door end support
72 Lockwasher, ⅜ (4 Req'd)
73 Nut, hex, ⅜ NC (4 Req'd)
74 Screw, cap, hex hd, ⅜ x 1 NC (2 Req'd)
75 Lockwasher, ⅜ (2 Req'd)
76 Nut, hex, ⅜ NC (2 Req'd)
77 Screw, cap, hex hd, ⅜ x 1½ NC (6 Req'd)
78 Intercooler guard
79 Left rear door end support
80 Lockwasher, ⅜ (20 Req'd)
81 Nut, hex, ⅜ NC (20 Req'd)
82 Screw, cap, hex hd, ⅜ x ⅞ NC (20 Req'd)
83 Left rear door end
84 Screw, cap, hex hd, 5/16 x ⅝ NC (8 Req'd)
85 Nut, hex, 5/16 NC (8 Req'd)
86 Lockwasher, 5/16 (8 Req'd)
87 Screw, cap, hex hd, 5/16 x ¾ (8 Req'd)
88 Right rear valance
89 Screw, cap, hex hd, ⅜ x ⅝ NC (12 Req'd)
90 Deep toolbox
91 Lockwasher, ⅜ (12 Req'd)
92 Nut, hex, ⅜ NC (12 Req'd)
93 Screw, cap, hex hd, ⅜ x ¾ NC (22 Req'd)
94 Lockwasher, ⅜ (22 Req'd)
95 Nut, hex, ⅜ NC (22 Req'd)
96 Left upper access door
97 Nut, hex, ⅜ NC (16 Req'd)
98 Lockwasher, ⅜ (16 Req'd)
99 Left lower access door
100 Nut, hex, 5/16 NC (8 Req'd)
101 Lockwasher, 5/16 (8 Req'd)
102 Left rear valance
103 Deep toolbox
104 Washer, ⅜ (8 Req'd)
105 Lockwasher, ⅜ (8 Req'd)
106 Nut, hex, ⅜ (8 Req'd)
107 Lockwasher, ⅜ (8 Req'd)
108 Screw, cap, hex hd, ⅜ x ⅝ NC (8 Req'd)

Figure 64—Continued.

(12) Install mufflers (par. 132*c*).
(13) Install precleaners (2, fig. 1) and (3, fig. 2).
(14) Install lifting bail yoke (3, fig. 64); secure with lockwashers (2) and nuts (1).

145. Air Receiver Supports, Intercooler Guard, and Supports

a. Removal and Disassembly (fig. 64).
(1) Remove air receiver (par. 97*a*).
(2) Remove cap screws (15), nuts (18), and lockwashers (17) attaching rear cover (14) to receiver supports (11 and 16).
(3) Remove cap screws (13), nuts (21), and lockwashers (20) attaching supports (11 and 16) to the compressor frame (19).
(4) Remove cap screws (12), nuts (9), and lockwashers (10) attaching air receiver supports (11 and 16) to intercooler guard and door end supports; remove air receiver supports.
(5) Remove cap screws (39), nuts (41), and lockwashers (40) attaching canopy (36) to rear canopy support (68).
(6) Remove cap screws (84), nuts (100), and lockwashers (101) attaching valances (88 and 102) to door ends (70 and 83).
(7) Support rear of canopy with wooden props; remove cap screws (74), nuts (76), and lockwashers (75) securing the assembled door end supports (71 and 79), intercooler guard (78), and rear canopy support (68) to the compressor frame; remove the assembly.

b. Cleaning, Inspection, and Repair.
(1) Steam clean or wash all parts in cleaning solvent; dry with rags or compressed air.
(2) Inspect all parts for cracks, warping, dents, and rust.
(3) Weld cracks, and straighten warped parts; repaint parts as needed (see TM 9–2851).

c. Reassembly and Installation (fig. 64).
(1) Install assembled door end supports (71 and 79), intercooler guard (78), and rear canopy support (68) on the compressor frame (19); secure with cap screws (74), lockwashers (75), and nuts (76).
(2) Remove the props holding the canopy, and secure the canopy to the rear canopy support with cap screws (39), lockwashers (40), and nuts (41).
(3) Install cap screws (84), lockwashers (101), and nuts (100) attaching valances (88 and 102) to door ends (70 and 83).
(4) Install air receiver supports (11 and 16); secure to door supports (71 and 79) with cap screws (12), lockwashers (10), and nuts (9); secure supports to compressor frame (19) with cap screws (13), lockwashers (20), and nuts (21).

(5) Install rear cover (14); secure with cap screws (15), lockwashers (17), and nuts (18).
(6) Install air receiver (par. 97*c*).

Section XV. SUSPENSION AND RUNNING GEAR

146. Description

The compressor has beam-type front and rear axles suspended from the frame by four identical semielliptical springs. The front axle has reverse Elliott steering knuckles connected by tie rods to a center steering arm. A lunette equipped drawbar is attached to the steering arm for connecting the compressor to a towing vehicle. The hubs have tapered roller bearings and are identical, except that the hubs for the left side have studs with left-hand threads. The wheels are an advanced type ordnance standard 20 by 7.5 rim, with a split side ring.

147. Wheels and Tires
(fig. 65)

Remove and install any of the four wheels in the following manner:

a. Wheel removal.
(1) Block the compressor wheels to prevent the compressor from moving.
(2) Raise the wheel off the ground, and block under the axle securely.
(3) Remove the wheel nuts (25); remove the wheel and tire.

b. Tire Removal.
(1) Remove the wheel and tire (*a* above). Lay the wheel on a flat surface with the locking ring side of the wheel up.
(2) Remove the valve core from the inner tube valve stem and completely deflate the tube; reinstall valve core.
(3) Remove the lock ring from the wheel.
(4) Remove the tire and tube from the wheel.

c. Cleaning and Inspection.
(1) Wash wheel and tire thoroughly with soap; rinse with clean water.
(2) Inspect for stripped threads and wheel distortion; inspect tire for cracks, breaks, obvious wear, and scuffing.
(3) Replace if damaged or defective.

d. Tire Installation.
(1) Install the tube in the tire and inflate enough to hold the tube in place.
(2) Lay wheel on flat surface, with locking ring removed and wheel rim locking rim surface up.

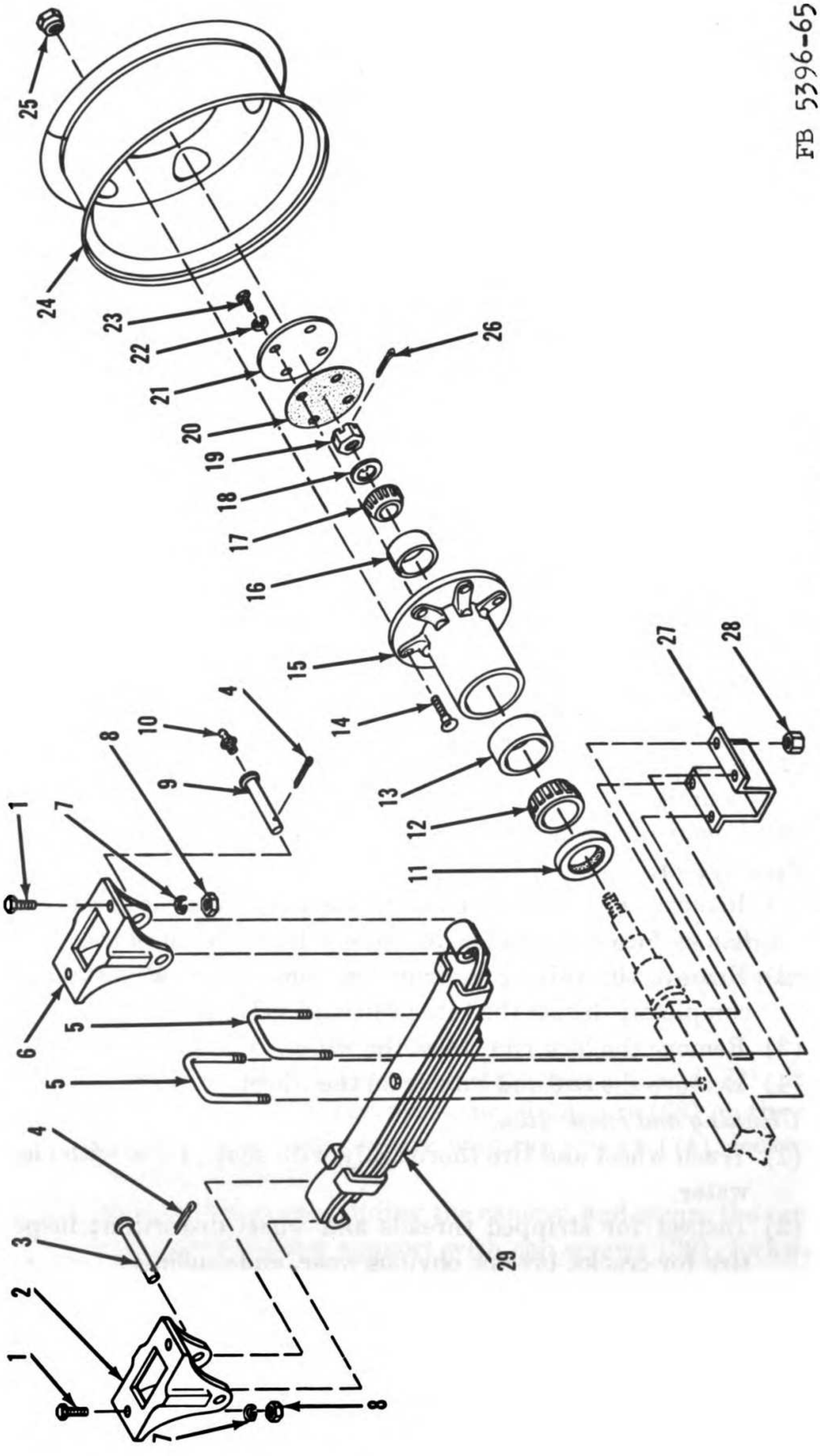


Figure 65. Suspension and running gear, exploded view.

1 Bolt, hex hd, ⅝ x 1¾ NC (16 Req'd)
2 Spring bracket
3 Spring shackle pin
4 Cotter pin
5 Spring shackle U-bolt
6 Spring bracket
7 Lockwasher, ⅝ (16 Req'd)
8 Nut, hex, ⅝ NC (16 Req'd)
9 Spring shackle pin
10 Grease fitting
11 Wheel oil seal
12 Inner hub bearing cone
13 Inner hub bearing cup
14 Stud
15 Hub
16 Outer hub bearing cup
17 Outer hub bearing cone
18 Spindle washer
19 Spindle nut
20 Grease cap gasket
21 Grease cap
22 Lockwasher, ¼ (16 Req'd)
23 Screw, cap, hex hd, ¼ x ¾ NC (16 Req'd)
24 Disk wheel
25 Nut
26 Cotter pin
27 Spring and axle clamp
28 Nut
29 Spring

Figure 65—Continued.

(3) Install tire and tube, with tube valve stem through hole in wheel.
(4) Install locking ring.

Caution: Locking ring must seat securely in wheel before inflating tire.

(5) Inflate tire to 45 psi.
(6) Install tire and wheel (*e* below).

e. Wheel Installation (fig. 65).

(1) Position the wheel and tire; replace the wheel nuts (25).
(2) Remove the blocks placed under the axle, and lower the wheel to the ground.

148. Hubs and Bearings

(fig. 65)

Remove and install any of the four hubs and hub bearings in the following manner:

a. Removal.

(1) Remove the wheels and tires (par. 147*a*).
(2) Remove four cap screws (23) and lockwashers (22); remove the grease cap (21) and grease cap gasket (20).
(3) Remove cotter pin (26), spindle nut (19), spindle washer (18), and outer hub bearing cone (17); remove the hub (15).

b. Disassembly. Press the wheel oil seal (11), inner hub bearing cone (12), and inner and outer hub bearing cups (13) and (16) out of the hub (15).

c. Cleaning and Inspection.

(1) Wash all parts thoroughly in cleaning solvent; dry with compressed air.

Note. **Do not permit bearings to rotate while drying them. The bearings will be damaged if permitted to rotate without adequate lubrication.**

(2) Inspect the bearings for freedom of rotation, pitting, obvious wear, and cracks.
(3) Inspect the hubs for cracks, distortion, and stripped threads.
(4) Replace all damaged or defective parts.

d. Reassembly. Press the inner and outer hub bearing cups (13 and 16) into the hub (15). Pack the inner hub bearing cone (12) with an approved roller bearing grease and place it in bearing cup. Press the wheel oil seal (11) into the hub and apply a light film of an approved roller bearing grease to the sealing surface of the oil seal.

e. Installation.

(1) Position the hub (15) on the axle. Use care not to allow axle threads to damage wheel oil seal (11).
(2) Pack the outer hub bearing cone (17) with an approved roller bearing grease and replace it in the hub.

(3) Install the spindle washer (18) and spindle nut (19). Turn the spindle nut down tightly, then back off one-quarter turn and install the cotter pin (26).

Note. Inspect hub for end play. Rotate hub, and inspect for bearing drag. Take corrective measures if either condition exists.

(4) Replace the grease cup gasket (20) and grease cap (21); replace four lockwashers (22) and cap screws (23).
(5) Install the wheels and tires (par. 147*e*).

149. Springs and Brackets

(fig. 65)

Remove and install any of the four springs in the following manner:

a. Spring Removal.

(1) Block the wheels securely to prevent the compressor from moving; remove the four nuts (28) securing the spring U-bolts (5) to the spring and axle clamps (27); remove the clamps.
(2) Raise the compressor at a point close to the spring being removed, until the spring center bolt clears the axle.
(3) Block under the frame as close as possible to the spring being removed.
(4) Remove the cotter pins (4), spring shackle pin (3), and spring shackle pin (9); remove the spring (29).

b. Spring Cleaning and Inspection.

(1) Wash the spring thoroughly in cleaning solvent.
(2) Inspect for broken leaves, broken or loose center bolt, and loose spring clips.
(3) Replace spring if damaged or defective.

c. Spring Installation.

(1) Position the spring (29) in the spring bracket (2) with the end of the spring that has the closed eye to the front of the compressor.
(2) Replace the spring shackle pin (3), spring shackle pin (9), and cotter pins (4).
(3) Remove the blocking from under the frame, and lower the compressor to the ground; at the same time, guide the spring center bolt into the axle recess.
(4) Position the spring and axle clamps (27) and spring U-bolts (5); replace nuts (28), and draw down evenly.
(5) Lubricate spring shackle pin (see LO 5–5396).

d. Bracket Removal. Remove and install any of the eight brackets in the following manner:

(1) Block the wheels securely to prevent the compressor from moving.

(2) Raise the compressor at a point close to the spring bracket (2) or (6) being removed.

Note. Raise the compressor until all load is removed from the spring (29). Do not raise too high, or the weight of the running gear will rest on the brackets, causing difficulty in removal.

(3) Block securely under the frame at a point nearest the spring.
(4) Remove the cotter pins (4), spring shackle pin (3), and spring shackle pin (9).
(5) Remove the nuts (8), lockwashers (7), and bolts (1); remove the spring bracket (2 or 6).

e. Bracket Cleaning and Inspection.

(1) Clean the bracket in cleaning solvent.
(2) Inspect for cracks and elongation of bolt and pin holes.
(3) Replace bracket if damaged or defective.

f. Bracket Installation.

(1) Position the spring bracket (2 or 6); replace bolts (1), lockwashers (7), and nuts (8).
(2) Replace spring shackle pin (3) and pin (9); replace cotter pins (4).
(3) Lubricate spring shackle pin (see LO 5–5396).
(4) Remove blocking from under the frame and lower compressor to the ground.

150. Tie Rods and Steering Arm

(fig. 66)

a. Removal.

(1) Mark or tag the tie rods (13) for easier adjustment when replacing.
(2) Remove the cotter pins (6), tie rod-to-knuckle yoke pins (8), and tie rod-to-center arm pins (15 and 25); remove the tie rods.
(3) Remove the drawbar nut (18) and bolt (24); remove the drawbar (19) from the center steering arm (17).
(4) Remove center steering arm pin nut (16) and bolt (26); remove center steering arm pin (2) and center steering arm (17).

b. Cleaning and Inspection.

(1) Clean all parts thoroughly in cleaning solvent.
(2) Inspect for stripped threads, elongated holes, cracks, and obvious wear.
(3) Replace damaged or defective parts.

c. Installation.

(1) Position the center steering arm (17); replace center steering arm pin (2), pin bolt (26), and nut (16).

(2) Position the drawbar (19) on the center steering arm (17) and replace drawbar bolt (24) and nut (18).
(3) Position the tie rods (13); replace the tie rod-to-center arm pins (15 and 25) and tie rod-to-knuckle yoke pins (8). Secure with cotter pins (6).
(4) Lubricate tie rods and steering arm (see LO 5–5396).

d. Adjustment.

(1) With the front wheels resting on a smooth surface, aline both wheels in a straightahead position.
(2) Install a toe-in gage between inside rims of the front wheels approximately level with and to the rear of the front axle beam (3). Make sure each end is an equal distance above the floor, and note the gage reading.
(3) Keeping the wheels straight, roll the compressor backwards to bring the gage to approximately the same position forward of the front axle beam. Note the gage reading to provide front wheel toe-in; the distance between the rims forward of the axle beam should range from zero to five-sixteenths of an inch less than the distance at the rear.
(4) If toe-in is not within limits, remove pins (8), loosen nuts (11), and turn yokes (10) to lengthen or shorten the rods as required. Equalize the adjustment so that both tie rods are of equal length. Reinstall pins in the tie rod yokes, and recheck toe-in.

151. Steering Knuckles and Pins
(fig. 66)

Remove and install each of the steering knuckle assemblies in the following manner:

a. Removal.

(1) Remove wheel and tire (par. 147*a*).
(2) Remove hub and bearing (par. 148*a*).
(3) Remove cotter pin (6) and tie rod-to-kunckle yoke pin (8); disconnect the tie rods (13) from the steering knuckle assembly (9).
(4) Remove the kingpin nut (4) and bolt (12); remove the kingpin (5), steering knuckle thrust washer (14), and steering knuckle assembly (9).

b. Cleaning and Inspection.

(1) Wash all parts thoroughly in cleaning solvent.
(2) Inspect for cracks, obvious wear, stripped threads, and elongated steering knuckle pin and kingpin holes.
(3) Replace damaged or defective parts.

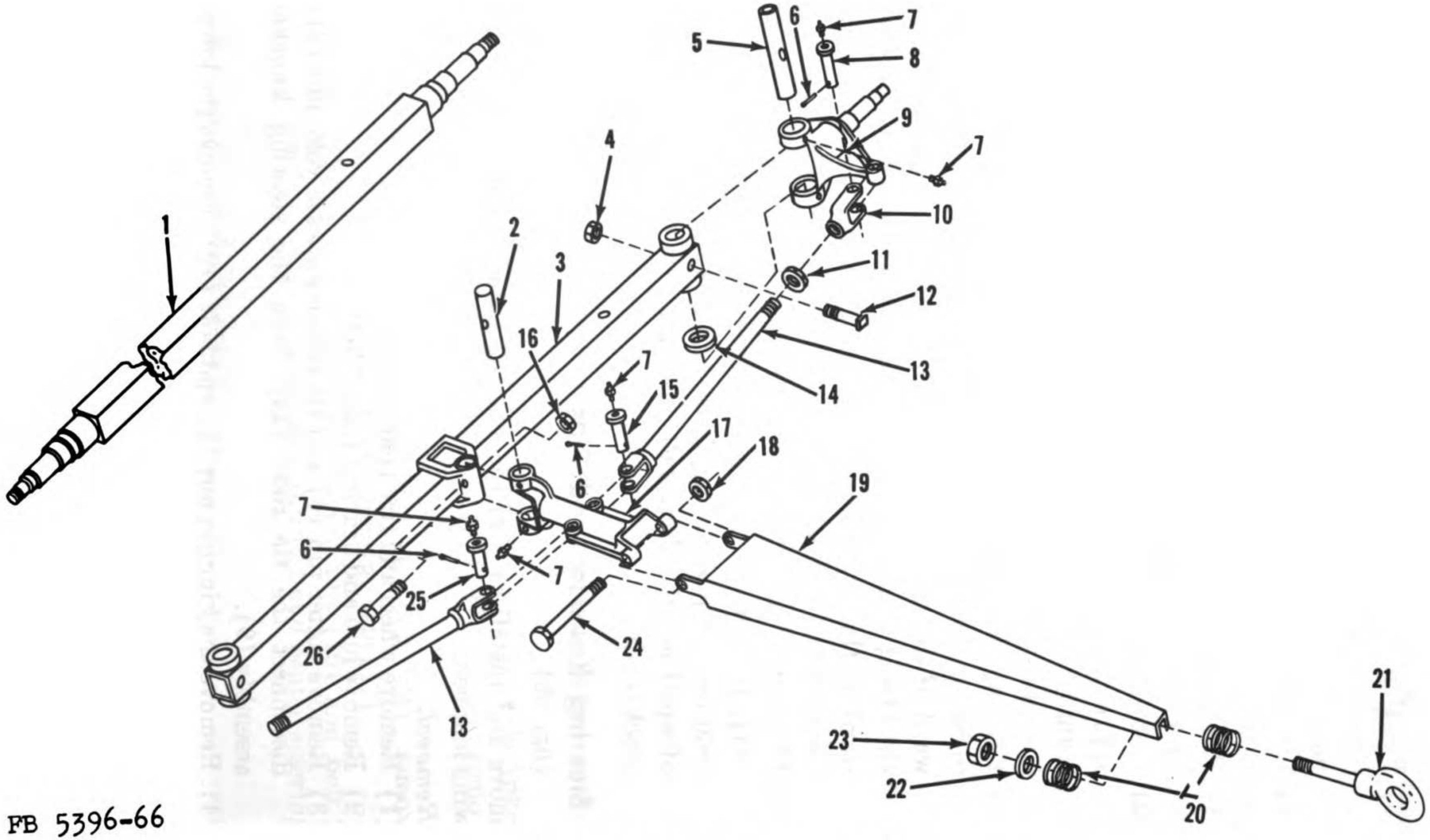


Figure 66. Axles and steering gear, exploded view.

1 Rear axle beam
2 Center steering arm pin
3 Front axle beam
4 Kingpin nut
5 Kingpin
6 Cotter pin
7 Grease fitting
8 Tie rod-to-knuckle yoke pin
9 Steering knuckle assembly
10 Tie rod yoke
11 Tie rod yoke nut
12 Kingpin bolt
13 Tie rod
14 Steering knuckle thrust washer
15 Tie rod-to-center arm pin
16 Center arm pin nut
17 Center steering arm
18 Drawbar nut
19 Drawbar
20 Spring
21 Lunette and shaft
22 Spring retaining nut washer
23 Spring retaining nut
24 Drawbar bolt
25 Tie rod-to-center arm pin
26 Center arm pin bolt

Figure 66—Continued.

c. Installation.

(1) Position the steering knuckle assembly (9) and steering knuckle thrust washer (14); install kingpin (5) and replace kingpin nut (4) and bolt (12).

(2) Position the tie rod (13) on the steering knuckle yoke (10); replace the tie rod-to-knuckle yoke pin (8) and cotter pin (6).

(3) Replace hub and bearing (par. 148*e*).

(4) Replace wheel and tire (par. 147*e*).

152. Axles (fig. 66)

a. Removal.

(1) Remove the springs (par. 149*a*).

Caution: Make certain blocking under compressor frame is adequate before performing (2) below.

(2) Roll the axle assemblies out from under the compressor.

(3) Apply suitable blocking.

d. Disassembly.

(1) Remove wheels and tires (par. 147*a*).

(2) Remove hubs and bearings (par. 148*a*).

(3) Remove tie rods and steering arm (par. 150*a*).

(4) Remove steering knuckles and pins (par. 151*a*).

c. Cleaning and Inspection.

(1) Wash axles thoroughly in cleaning solvent.

(2) Inspect for cracked or bent axles and elongated kingpin holes.

(3) Replace axles if damaged or defective.

d. Reassembly.

(1) Replace steering knuckles and pins (par. 151*c*).

(2) Replace tie rods and steering arm (par. 150*c*).

(3) Replace hubs and bearings (par. 148*e*).

(4) Replace wheels and tires (par. 147*e*).

e. Installation.

(1) Roll axle assemblies under compressor.

(2) Replace springs (par. 149*c*).

(3) Remove blocking.

(4) Adjust tie rods (par. 150*d*).

CHAPTER 4

MATERIEL USED IN CONJUNCTION WITH AIR COMPRESSOR

Section I. INFORMATION ON PNEUMATIC TOOLS

153. General

The air compressor supplies power to operate pneumatic tools. Some of the typical tools are listed in separate sections of this chapter. Paragraphs 154 through 162 give general operating instructions and precautions for pneumatic tools.

154. Unit Inspection

Inspect the security of nuts, bolts, and other assembly parts of the tool. On all types of pneumatic tools it is important to inspect the exterior of the cylinder and driver housing for metal fractures or breaks in these parts.

155. Safety Retainer

Pneumatic concrete breakers, diggers, hammers, tampers, and other reciprocating pneumatic tools have a device which prevents the tool being ejected from the barrel during its use. These safety retainers vary in design and method of attachment but they all serve to prevent the tool from being shot out of the barrel. Be sure the safety retaining device is secure before operating the tool.

156. Tool Rests and Guards

Pneumatic saws, grinders, and other rotating tools have handguards, work guides, and tool rests attached to the unit for the protection of the operator. Check the condition and security of these parts before operating the unit.

157. Hose Couplings

Inspect the hose couplings before attaching sections together or to the pneumatic unit. Wire, clay, stones, or other obstructions will prevent the couplings from seating properly.

158. Cleaning Air Receiver and Hose

Before attaching the hose to the pneumatic tool, open the valve on the air receiver service manifold to blow out condensation and sludge

from the tank. Close the valve, and attach the hose to the pneumatic tool. Before applying the full operating pressure from the compressor, slowly open the valve on the air receiver service manifold to check for hose connections that may not be secure.

159. Operating Air Pressures

Piston-type tools such as the concrete breaker, digger, and earth tamper type require a minimum of 70 to 90 psi and an air volume of 20 to 27 cfm. Air motor type tools such as saws or grinders require 80 to 100 psi and from 50 to 75 cfm.

160. Overheating

Excessive heat indicates that the tool is operating with insufficient or contaminated oil or that the air pressure supplied to the unit is not sufficient for the workload. Oil containing foreign matter, such as a gummy substance from previous use, may cause the unit to overheat and be sluggish in action.

161. Lubrication

Do not allow the oil reservoir on a pneumatic tool to exhaust all the oil before refilling. Hold a paper close to the exhaust port of the tool to check lubrication flow in the unit. If the tool is receiving lubrication, a fine film of oil will be deposited on the paper.

162. Water Cooling and Flushing

When water cooling and flushing equipment is used in conjunction with pneumatic tools, the water pressure must not be greater than the air pressure operating the tool.

Section II. PNEUMATIC PAVING BREAKER

163. Description and Use

The pneumatic paving breaker is a portable piston-type handtool used for general rock breaking and for breaking concrete, walls, and columns or piers. A variety of tools may be attached to the unit for digging, tamping, ice breaking, or general demolition work.

164. Servicing and Maintenance

Refer to TM 5–4022 for complete instructions on maintenance of the pneumatic paving breaker.

Section III. PNEUMATIC CLAY DIGGER

165. Description and Use

The pneumatic clay digger is a portable, compressed air powered, manually operated unit, used for digging clay, trenches, shale, and the like.

166. Operating Requirements

a. Air Pressure. The pneumatic clay digger can be operated on air pressures of 80 to 90 psi.

b. Air Volume. A minimum air volume of 24 to 27 cfm (cubic feet per minute) is required for efficient operation.

c. Lubrication. Before starting the unit, fill the oil reservoir with the lubricant specified in TM 5–4024. Check the oil remaining in the reservoir every 2 hours of operating use. The oil is carried by the air flow to the piston valves and other lubricated parts. Do not allow the reservoir to exhaust all of the oil before refilling.

167. Servicing and Maintenance

Refer to TM 5–4024 for complete servicing and maintenance of the pneumatic clay digger.

Section IV. PNEUMATIC BACKFILL TAMPER

168. Description and Use

The pneumatic backfill tamper is a portable, compressed air powered, manually operated unit, used for tamping earth, clay, and the like to compress the ground in all types of excavation fills.

169. Operating Requirements

a. Air Pressure. The pneumatic backfill tamper is operated on air pressures of 80 to 90 psi.

b. Air Volume. A minimum air volume of 24 to 27 cfm is required for efficient operation.

c. Lubrication. Before operating the unit, fill the oil reservoir with specified oil. Check the oil remaining in the reservoir every 2 hours of operating use. The oil is carried to the piston and valves by the air flow. Do not allow the reservoir to exhaust all of the oil before refilling.

170. Service and Maintenance

Refer to TM 5–4062 for complete instructions on maintenance of the pneumatic backfill tamper.

Section V. PNEUMATIC DRILLS

171. Description and Use

The pneumatic drill is a portable unit, used for drilling rock, cement, and the like.

172. Operating Requirements

a. Air Pressure. The pneumatic drill is operated on air pressures of 70 to 90 psi.

b. Air Volume. A minimum air volume of 24 to 27 cfm is required for efficient operation.

c. Lubrication. Before starting, fill the oil reservoir with lubricant. Check the oil remaining in the reservoir every 2 hours of operating use. The oil is carried by the air flow to the moving lubricated parts. Do not allow the oil reservoir to exhaust all of the oil before refilling.

173. Servicing and Maintenance

Refer to TM 5–4036 for complete servicing and maintenance of the pneumatic drill.

Section VI. PNEUMATIC HAMMER AND NAIL DRIVER

174. Description and Use

The pneumatic hammer and nail driver is a portable unit, used for driving large nails or spikes, breaking rivet heads, and the like.

175. Operating Requirements

a. Air Pressure. The pneumatic hammer is operated on air pressures of 70 to 90 psi.

b. Air Volume. A minimum air volume of 24 to 27 cfm is required for efficient operation.

c. Lubrication. Before starting the unit, add a small quantity of lubricating oil to the operating mechanism. Every hour of continuous operation, add additional oil. The oil is conveyed to the moving lubricated parts by the air flow.

176. Servicing and Maintenance

Refer to TM 5–4060 for complete instructions on maintenance of the pneumatic hammer and nail driver.

Section VII. PNEUMATIC GRINDER

177. Description and Use

The pneumatic grinder is a portable unit, used for either portable application or mounted operation in the removal of metal from a large variety of objects.

178. Operating Requirements

a. Air Pressure. The pneumatic grinder operates on 90 psi.

b. Air Volume. A minimum air volume of 24 to 27 cfm is required for efficient operation.

c. Lubrication. Before starting the unit, check the oil level in the gearcase and other lubricated parts. Check the lubrication of the

actuating parts by holding a small paper close to the exhaust port. If the parts are lubricated sufficiently, a very fine film of oil, carried out by the exhaust air flow, will be deposited on the paper.

179. Servicing and Maintenance

Refer to TM 5–4120 complete instructions on maintenance of the pneumatic grinder.

Section VIII. PNUEMATIC SKILL SAW

180. Description and Use

The pneumatic skill saw is a portable unit, used for cutting wood. It is also adaptable, when equipped with the proper cutting disk, for sawing or cutting tile, steel, iron, brick, stone, or concrete.

181. Operating Requirements

a. Air Pressure. A minimum of 80 psi is required for operating the pneumatic skill saw. Maximum work is delivered at 100 psi.

b. Air Volume. A minimum air volume of 50 to 55 cfm is required under normal load. Approximately 75 cfm is required when the unit is working under maximum load.

c. Lubrication. There are four lubricating points on the saw. The air motor is fitted with two high-pressure grease fittings, an oil reservoir also lubricates the air motor. The filler plug on the gearcase is the fourth lubricating point. Service the high-pressure grease fittings every 4 hours of continuous operation. Refill the oil reservoir every 4 hours of continuous operation. The oil level in the gearcase should just cover the steel worm gear. Add oil when the oil level falls below this point.

182. Servicing and Maintenance

Refer to TM 5–4004 for complete servicing and maintenance of the pneumatic skill saw.

Section IX. PNEUMATIC WRENCH

183. Description and Use

The pneumatic wrench is a portable unit, used to set and tighten a large variety of retaining bolts, nuts, screws, and the like.

184. Operating Requirements

a. Air Pressure. The air pressure required to operate the pneumatic wrench varies with the type of work to be done. Normally, 70 psi is required for work that could be done with a hand wrench, and 100 psi or more is required for work that could not be performed with a hand wrench.

b. Air Volume. The air volume required will range from 50 to 75 cfm, depending on the size of the unit.

c. Lubrication. There are usually three main lubricating points to be serviced at regular intervals—the gear reduction box, the air motor bearing points, and the driving shaft and assembly.

185. Precautions

a. Overheating. Heat is an indication that the unit needs lubrication. Oil previously used, or contaminated with dirt and the like, will cause the pneumatic wrench to overheat and have a sluggish action. Disconnect the air hose from the unit and introduce a small quantity of kerosene into the air inlet opening. Attach the hose and run the unit for a minute. Introduce a small quantity of oil in the air inlet opening and operate the unit. Clean and flush the gearbox and drive shaft assembly with kerosene every 1,000 hours of operation. The gearcase and drive shaft assembly should be lubricated only to the point indicated on the unit lubrication level indicator.

Caution: Do not use gasoline for cleaning and flushing.

b. Attaching Sockets. Inspect the socket to be attached to the unit for foreign objects such as dirt, stones, wire, and the like. Socket arbors have a great variety of holding devices, the most common being the spring ball lock type. Inspect these spring ball locks for tension before attaching the socket.

c. Personal Safety. Before operating the pneumatic wrench, inspect the torque setting by attaching a wrench to the socket driving arbor and turning while holding the pneumatic unit.

Caution: Before making this test, disconnect the air supply hose from the pneumatic unit.

Set the torque adjustment at the lowest holding tension, and increase the torque of the tool gradually to the point where security of the part being assembled is correct.

186. Servicing and Maintenance

Refer to the technical manual on the pneumatic wrench for complete servicing and maintenance information.

CHAPTER 5

FIELD AND DEPOT MAINTENANCE

Section I. INTRODUCTION

187. General

Instructions in this chapter are published for the information and guidance of maintenance personnel responsible for third and higher echelons of maintenance of the air compressor. They contain information on maintenance which is beyond the scope of the tools, equipment, or supplies normally available to using organizations. No specially designed tools and equipment are required for the overhaul of the air compressor.

188. Procedure

The following sections describe the complete disassembly, repair, and reassembly of each major unit or system comprising the air compressor unit. Before proceeding with overhaul, check to see that replacement parts are available.

189. Field and Depot Maintenance Tools and Equipment

The tools and equipment in table III bearing identification numbers are listed in Department of the Army Supply Manuals ENG 3–41

Table III. Field and Depot Maintenance Tools and Equipment

Item	Stock No.	References		Use
		Fig.	Par.	
Growler, electric, armature testing.	17–5550. 600–700	----	247, 256	Test starter and generator armature.
Spreader, pole shoe-----	41–7841. 500–370	85	246, 255	Remove pole shoes from generator and starter.
Micrometer, outside-----	41–1945. 300. 009	----	209, 227	Measure pistons and crankshaft.
Micrometer, inside------	41–1940. 500–015	----	205	Measure cylinder bore.
Expander, ring---------	41–3160. 800–057	----	208, 210	Remove and install piston rings.
Compressor, ring-------	41–2430. 500–700	----	206	Install piston and piston rings.
Puller, gear, heavy duty, with wheel puller attachment.	41–6272. 330–500	----	194	Remove clutch.

and ENG 5–41. The tabulation contains only the tools and equipment necessary to perform the operations illustrated as described in this chapter. This table is included for information only and is not to be used for requisitioning tools and equipment.

Section II. COMPRESSOR

190. Description

a. Construction. The compressor is of two-stage design with cylinders arranged in pairs in three banks. Two high-pressure cylinders form the center bank, and four low-pressure cylinders form the two outer banks. Connecting rods are the articulated type with two rod links attached to the main connecting rod.

b. Mounting. The compressor is mounted on pads welded to the compressor frame and is secured with four large cap screws that attach the compressor crankcase to the mounting pads. The bell-shaped front of the compressor, called the bearing housing, is attached to the engine flywheel housing with cap screws and is the only support for the rear of the engine. The engine and compressor thus form a rigid assembly supported at the front of the frame by the front engine support and at the rear of the frame by compressor mounting flanges secured to the mounting pads.

c. Drive. The engine supplies driving power to a double-disk clutch mounted on the compressor crankshaft and attached to the engine flywheel with special cap screws. The flywheel is a special recessed type for this application.

191. Compressor Removal

a. Remove the canopy and access doors (par. 144*a*).

b. Remove the engine (par. 270).

c. Remove the air receiver safety valve (par. 97*a* (2)) to provide clearance to lift the compressor.

d. Disconnect the unloader tubing from the unloaders (par. 103*a* (1)) and at check valve unloader tubing (1, fig. 16).

e. Remove the intercooler gage tubing at intercooler connection (1, fig. 67).

f. Disconnect clutch hydroshifter-to-pump tubing (6) at the connection on left side of bearing housing (8).

g. Drain the compressor oil pan.

h. Disconnect the compressor oil pressure gage tubing from the oil pump drive cover at the rear of compressor.

i. Remove the nuts and lockwashers from cap screw (3) at each of the four corners of the compressor.

j. Install a lifting cable around the compressor mounting flanges; lift slightly, and move the compressor forward a few inches to clear

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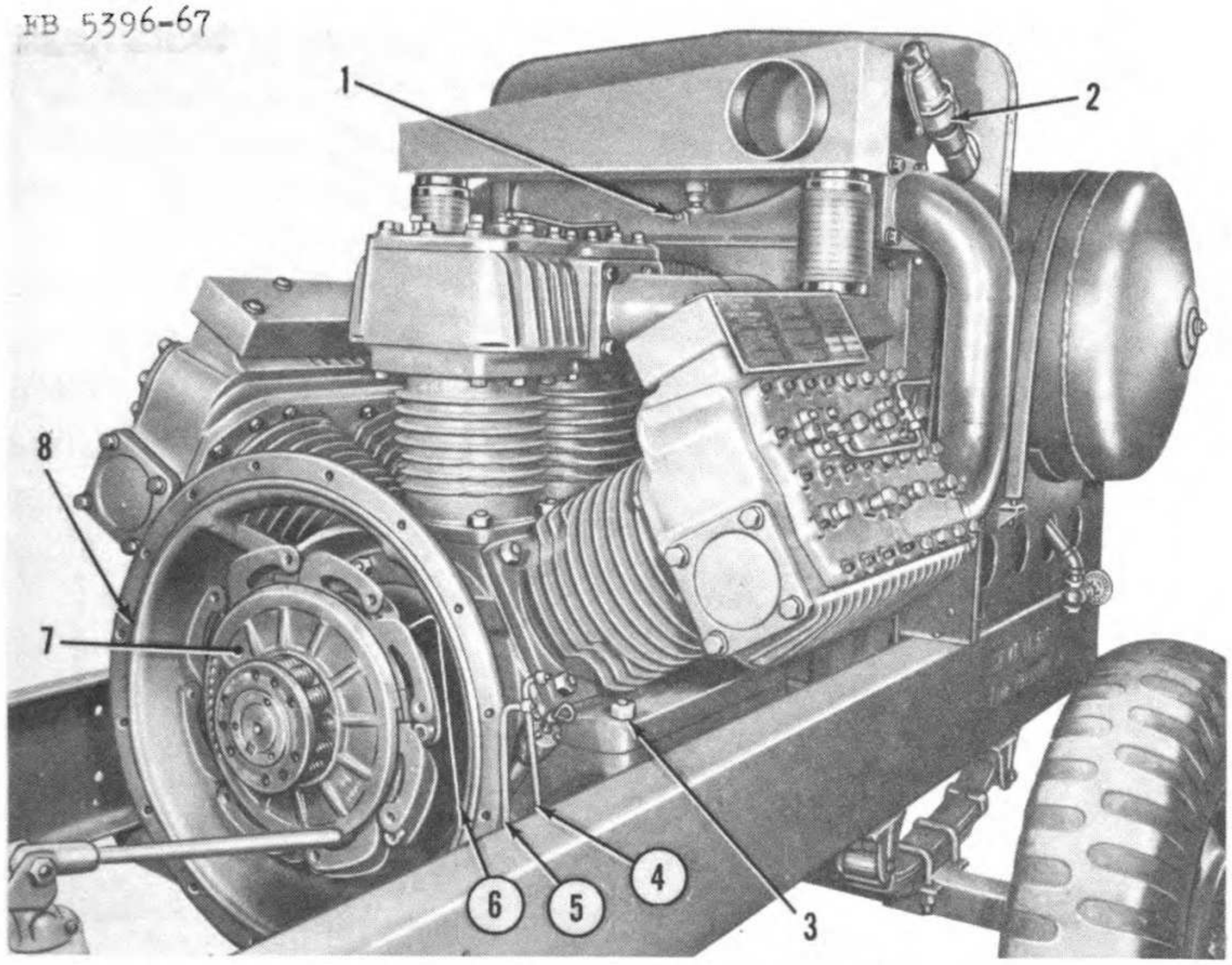


1 Intercooler pressure gage tubing connection
2 Air receiver safety valve
3 Compressor mounting cap screw
4 Intercooler pressure gage tubing
5 Air receiver pressure gage tubing
6 Clutch hydroshifter-to-pump tubing
7 Double-disk clutch
8 Compressor bearing housing

Figure 67. Compressor in frame with engine removed.

the sheet metal at the rear. Steady the compressor by hand, and lift it clear of the frame as shown in figure 68.

Note. **Watch for shims under the compressor mounting flanges. Mark shims for installation.**

k. Remove the intercooler from the compressor (par. 95*a* (5) through (7)).

192. Compressor Installation

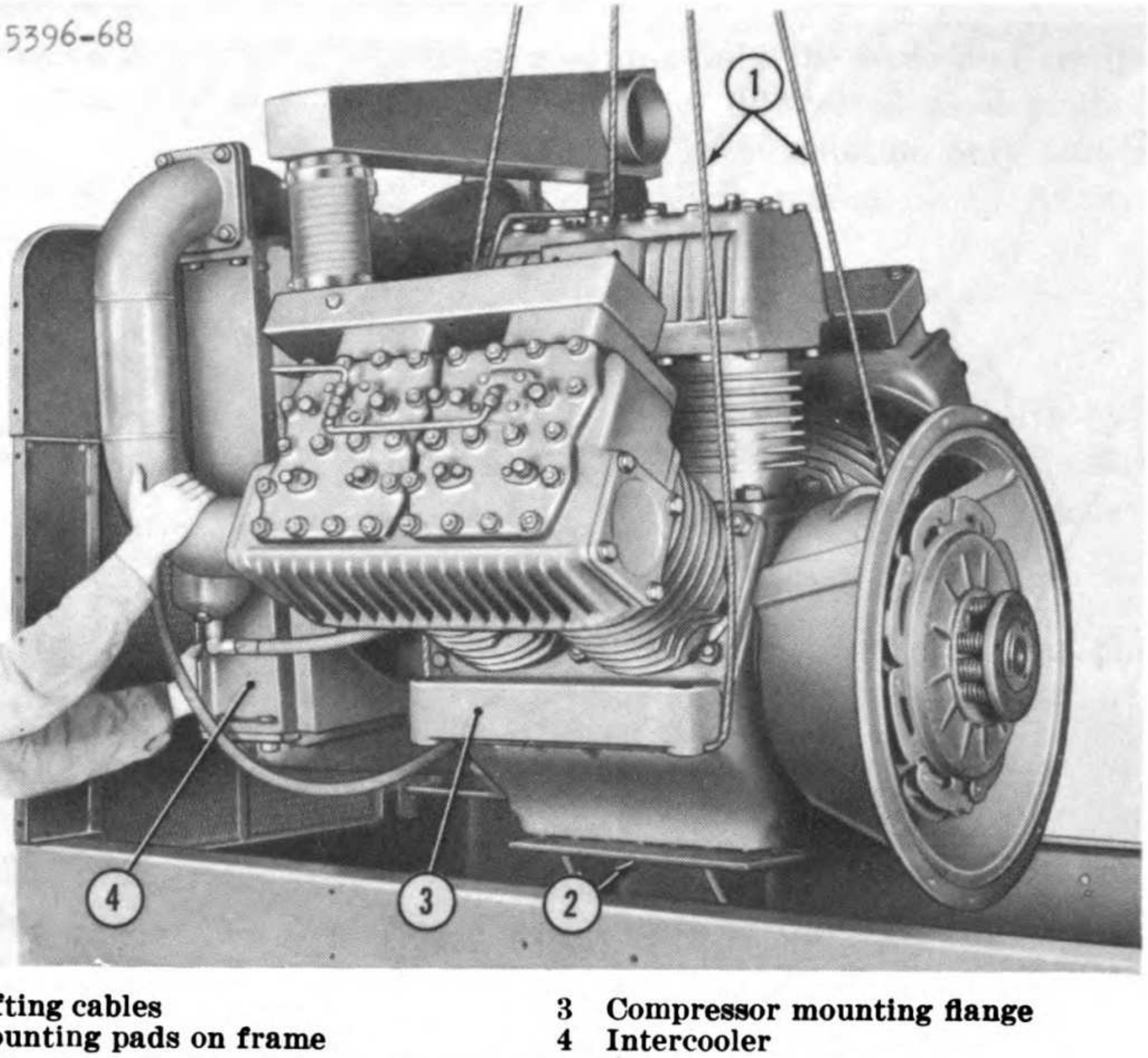
a. Install the intercooler on the compressor (par. 95*e* (1) through (3)).

b. Lift the compressor into position above mounting pads on frame (2, fig. 68); install same shims marked for position during removal, and lower compressor onto pads. Secure compressor with one cap screw (3, fig. 67) and lockwasher and nut.

c. Connect intercooler pressure gage tubing to connection (1).

d. Install air receiver safety valve (2).

e. Connect check valve unloader tubing (1, fig. 16) and connect unloader tubing to unloaders (par. 103*e* (7)).



1 Lifting cables
2 Mounting pads on frame
3 Compressor mounting flange
4 Intercooler

Figure 68. Removing the compressor with intercooler attached.

f. Connect the compressor oil pressure gage tubing to the oil pump drive cover at the rear of the compressor.

g. Connect clutch hydroshifter-to-pump tubing (6, fig. 67) at the connection on the left side of bearing housing (8).

h. Install the engine (par 271).

i. Install the canopy and access doors (par. 144*c*).

j. Add lubricants to the compressor and engine as instructed in LO 5–5396.

Section III. CLUTCH AND HYDROSHIFTER

193. Description

The double-disk clutch (7, fig. 67) and the hydroshifter are mounted on an extension of the compressor crankshaft extending into the bearing housing (8). The flex-arms on the lined drive disks are attached to the engine flywheel, and the driven plates are keyed to the compressor crankshaft. Because of the clutch design, the engine must be removed before removing the clutch from the compressor crankshaft.

194. Clutch Removal

a. Remove the engine (par. 270).

b. Remove the setscrews (1, fig. 69) securing the hub of clutch assembly (2) to the crankshaft (7).

c. Install three cap screws and thick washers in the three threaded holes in the face of the clutch hub; install a suitable three-jaw puller on the cap screws, and pull the clutch assembly (2) from the crankshaft (7). Remove square key (8) from the crankshaft.

Caution: The assembled clutch weighs about 85 pounds; do not remove without help.

195. Clutch Disassembly

(fig. 70)

a. Remove three thrust stud screws (11), and lift off thrust plate (10).

b. Place the assembly under a hydraulic press with spring plate (2) face up; apply pressure to force spring plate (2) to compress springs (3).

c. Use snap ring pliers to remove snap ring (1) from groove in the hub of plate (9), then slowly relieve pressure in the hydraulic press.

d. Lift off plate (2), springs (3), insulators (4), plate and pin assembly (5), and plate (7), from hub plate (9).

e. Grasp opposing flex-arms of the drive disk segments (8) with both hands, one hand on each side of a segment joint. Separate the segments by pulling up and out with one hand while pushing down with the other hand. (This will pull the locking loop of one segment over the projecting ear of its mating segment and release the joint.)

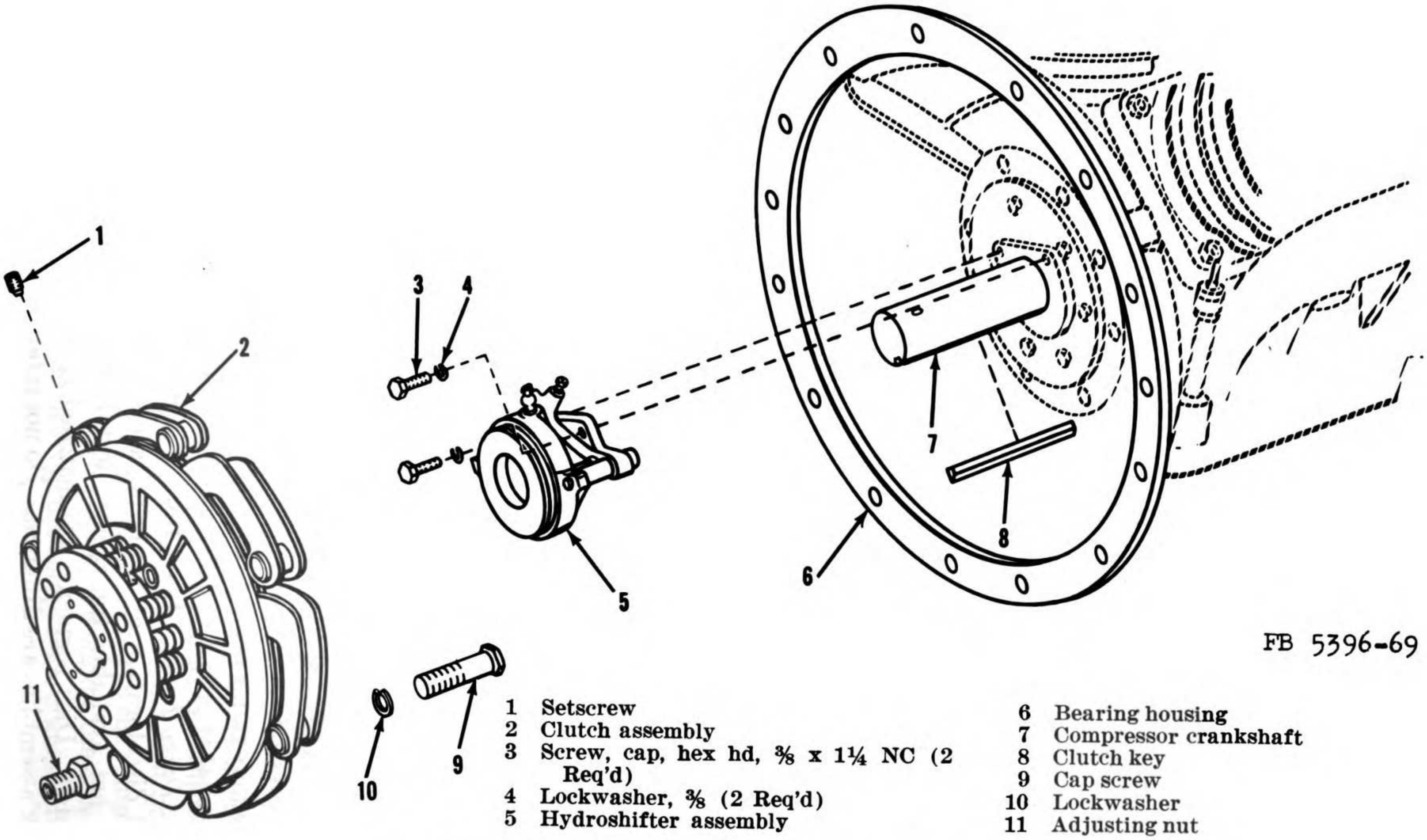
f. Disassemble drive disk assembly (6) in the same manner (*e* above).

196. Clutch Inspection and Repair

a. Springs. Inspect springs for distortion. Free length is 3½ inches. Check spring pressure with a spring compressor scale. Correct pressure is 380 pounds when compressed to 2⅜ inches long. Pressure may range between 365 to 395 pounds, but it is advisable to install a new set if pressures differ greatly within a set.

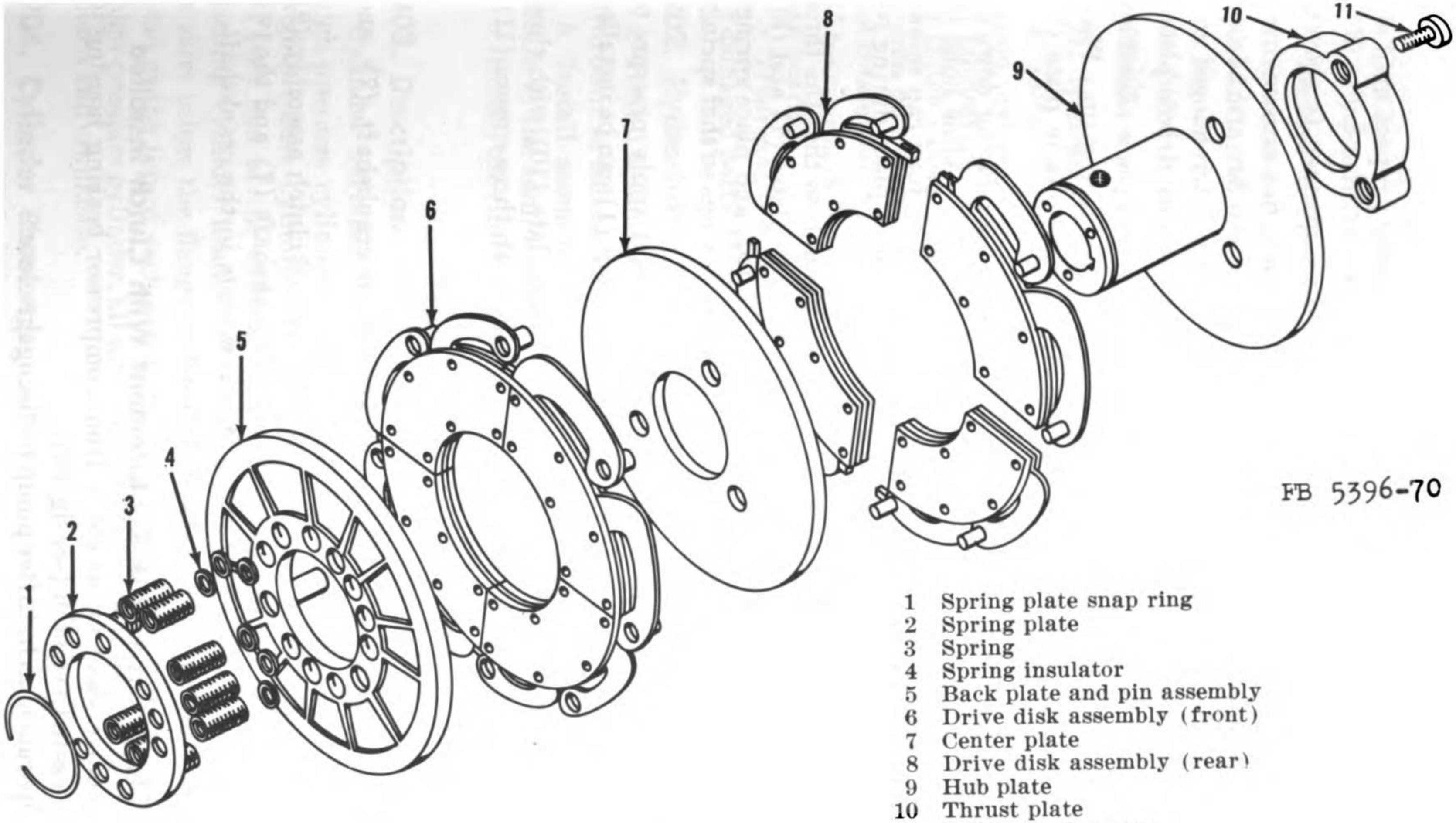
b. Drive Disks. Look for worn or oil-soaked linings, loose rivets, and discoloration of the metal arms due to excessive heat. Linings are not available for repair; install a new set of disk segments if needed. Disk segments are matched in sets of four; front and rear disk assemblies are different. Do not intermix disks.

c. Driven Plates. Look for cracks, heat checks, warped plates, and rivet scores on the surface of the plates; resurface if needed.



1 Setscrew
2 Clutch assembly
3 Screw, cap, hex hd, ⅜ x 1¼ NC (2 Req'd)
4 Lockwasher, ⅜ (2 Req'd)
5 Hydroshifter assembly
6 Bearing housing
7 Compressor crankshaft
8 Clutch key
9 Cap screw
10 Lockwasher
11 Adjusting nut

Figure 69. Clutch and hydroshifter assemblies.



1 Spring plate snap ring
2 Spring plate
3 Spring
4 Spring insulator
5 Back plate and pin assembly
6 Drive disk assembly (front)
7 Center plate
8 Drive disk assembly (rear)
9 Hub plate
10 Thrust plate
11 Thrust stud screw

Figure 70. Clutch, exploded view.

197. Clutch Reassembly
(fig. 70)

a. Interlock the segments of disk (8) by slipping the locking loop of one segment over the ear of its mating segment; repeat until all four segments are joined.

b. Interlock segments of disk (6) in the same manner (*a* above).

Caution: The boss around the bolt hole on each flex-arm on drive disk (8) is longer than the corresponding boss on the flex-arm of disk (6). Make sure segments from the disks are not interchanged and that assembled disks are installed between the proper driven plates.

c. Place hub plate (9) on a bench with hub up and place assembled drive disk (8) over hub with the flex-arm bosses facing up. Place plate (7) over the disk, and aline the three large holes in plate (7) with holes in hub plate (9) below it.

d. Install disk (6) over hub with flex-arm bosses facing down to mate with bosses on disk (8), installed in *c* above. Aline holes in arms of both disks, and temporarily insert three or four cap screws through the flex-arms of both disks to keep them in place during remaining assembly.

e. Slide plate and pin assembly (5) over the hub so that the three pins on the rear of plate (5) pass through holes in plates (7) and (9). Install insulators (4) in recesses around plate (5), and place springs (3) on insulators. Place spring plate (2) over springs so that springs seat in recesses on surface of plate (5).

f. Place the assembly in a hydraulic press, and apply pressure to spring plate (2); compress springs until snap ring (1) can be installed in groove on the hub of plate (9).

g. Remove assembly from press, aline thrust plate (10) with three pins projecting through plate (9), and secure with three screws (11).

198. Clutch Installation
(fig. 69)

a. Install square key (8) in the keyway in crankshaft (7), and start clutch assembly (2) on shaft.

b. Use heavy bronze bar stock to drive hub of clutch assembly (2) onto shaft until hub is flush with end of crankshaft (7) and the two setscrew holes in the hub aline with screw seats in the crankshaft.

c. Install two setscrews (1), and tighten.

199. Clutch Drive Disk Replacement With Clutch Installed

a. Remove sheet metal cover from compressor bearing housing to gain access to the clutch (see fig. 63).

b. Operate clutch shifter pump to disengage clutch.

c. Remove cap screws (6, fig. 63) from all disk flex-arms.

d. Disassemble clutch drive disks as described in paragraph 195*e*.

e. Install new drive disks by inserting segments in place and interlocking the segments as described in paragraph 197*a*.

f. Install cap screws (6, fig. 63), and adjust the clutch (par. 142*b*).

200. Hydroshifter Removal and Disassembly

a. Remove the clutch (par. 194).

b. Remove cap screws (3, fig. 69), and lockwashers (4) securing hydroshifter (5) to the compressor.

c. Remove two shifter head locknuts (24, fig. 62) and pull assembled shifter head (9) and bearing (10) from the hydroshifter subassembly.

201. Hydroshifter Inspection and Repair

a. Shifter Head and Thrust Bearing. Check the bearing for rough action, extreme looseness, and discoloration from heat due to lack of lubrication. Bearing should hold up well in service, since design of clutch causes bearing to rotate only for a short interval until the driven plates are separated from the lined drive disks. Bearing does not rotate when clutch is disengaged as it does in conventional designs. If bearing is defective, pull it from collar on shifter head and install new bearing.

b. Hydroshifter Subassembly. Look for hydraulic leaks and bent or damaged parts. Replace subassembly if defective.

202. Hydroshifter Reassembly and Installation

a. Install assembled shifter head (9, fig. 62) and bearing (10) on hydroshifter subassembly; secure with locknuts (24).

b. Install assembled hydroshifter (5, fig. 69) on crankshaft (7); secure to the compressor with cap screws (3) and lockwashers (4).

c. Install the clutch (par. 198).

Section IV. CYLINDERS

203. Description

Cylinder barrels of cast iron are used for both low-pressure and high-pressure cylinders. Low-pressure cylinders are cast in pairs; high-pressure cylinders are single cast. Mounting flanges are cast at each end of the cylinders for mounting to the crankcase and attaching cylinder heads. The high-pressure cylinders are made with a skirt below the flange at the crankcase end. Except for one long stud at the top of each low-pressure pair and two long studs in each high-pressure cylinder, all attaching studs are installed in the cylinder heads and crankcase.

204. Cylinder Removal

(fig. 71)

a. Low-Pressure Cylinders.

(1) Remove low-pressure cylinder head (par. 105*a*).

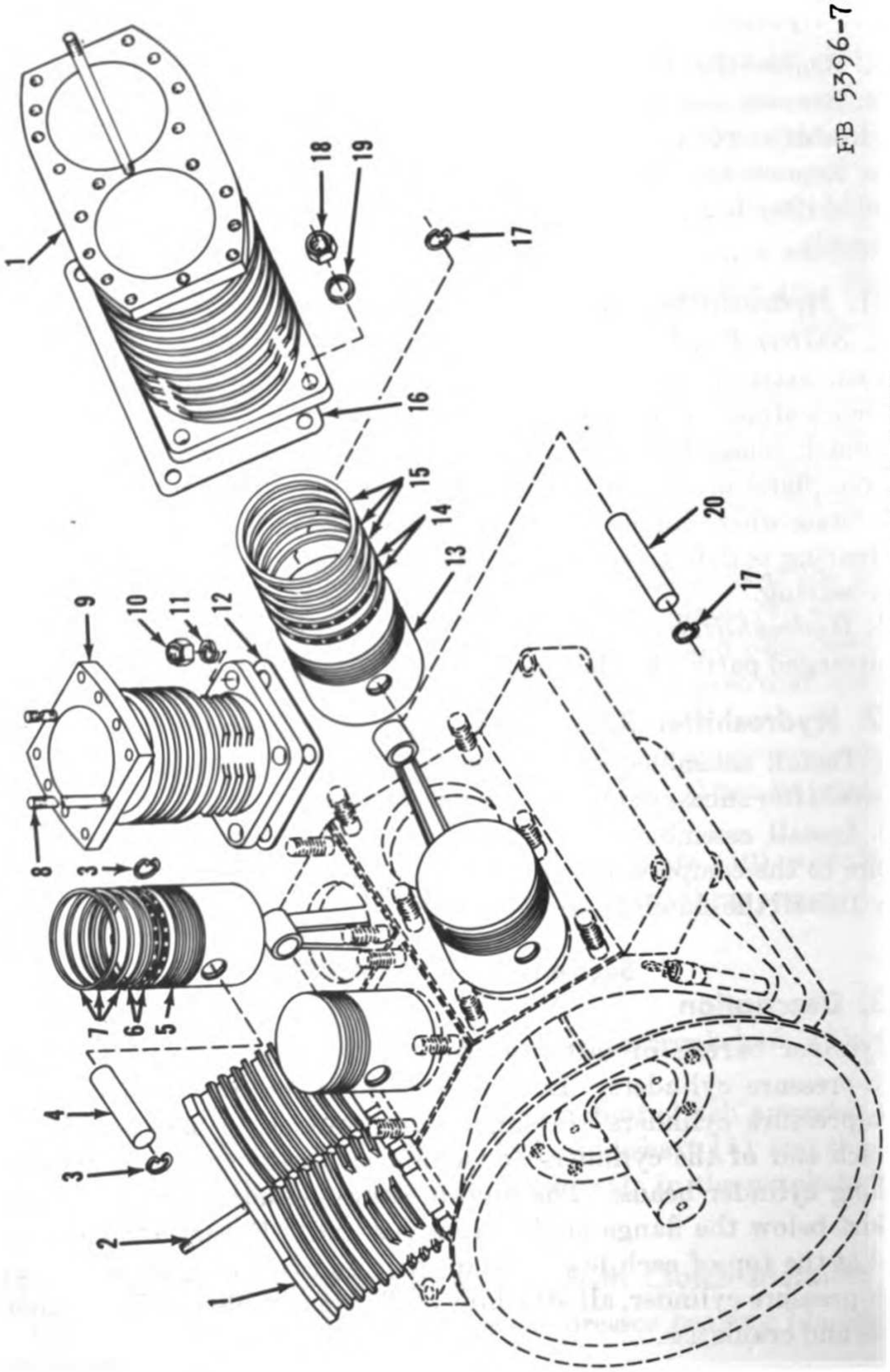


Figure 71. Cylinders, pistons, and rings, exploded view.

1 Low-pressure cylinder
2 Stud
3 High-pressure piston pin retaining ring
4 High-pressure piston pin
5 High-pressure piston
6 Oil control rings
7 Compression rings
8 Stud
9 High-pressure cylinder
10 Nut, hex, ¾ NC (8 Req'd)
11 Lockwasher, ¾ (8 Req'd)
12 High-pressure cylinder gasket
13 Low-pressure piston
14 Oil control rings
15 Compression rings
16 Low-pressure cylinder gasket
17 Low-pressure piston pin retaining ring
18 Nut, hex, ¾ NC (12 Req'd)
19 Lockwasher, ¾ (12 Req'd)
20 Piston pin

Figure 71—Continued.

(2) Remove six nuts (18) and lockwashers (19) securing cylinder (1) to the crankcase studs.
(3) Put a sling around the cylinder, and remove the cylinder carefully; remove gasket (16) from crankcase.

Caution: Cylinder pair weighs about 175 pounds.

(4) Remove other cylinder in the same manner.

b. High-Pressure Cylinders.

(1) Remove the high-pressure cylinder head (par. 105*b*).
(2) Remove nuts (10) and lockwashers (11) securing cylinder (9) to the crankcase.
(3) Put a sling around the cylinder and remove the cylinder carefully; remove gasket (12) from the crankcase.
(4) Remove the other high-pressure cylinder in the same manner.

Caution: High-pressure cylinder weighs about 75 pounds.

205. Cylinder Cleaning, Inspection, and Repair

a. Clean cylinders in degreasing tank or wash with cleaning solvent. Remove old gasket pieces that may cling to cylinder flanges.

b. Look for cracks in cylinder flanges and bore and for scored cylinder walls. Measure cylinder bore at top and bottom of ring travel; the manufactured bore on low-pressure cylinders is 8.250 to 8.251 inches. The high-pressure cylinder bore is 7.00 to 7.01 inches.

c. Replace badly worn or tapered cylinders. Rebore or hone cylinders which will clean up at 0.015-inch oversize or 0.030-inch oversize.

206. Cylinder Installation

(fig. 71)

a. Low-Pressure Cylinders.

(1) Place a new gasket (16) over the studs on the crankcase.
(2) Rotate crankshaft so that one low-pressure piston is near the bottom of its stroke and one is near the top of the stroke.
(3) Brush both pistons and rings with light engine oil. Install an open type ring compressor around rings on the higher piston and lower cylinder (1) over the piston until all rings are inside bore.
(4) Remove the ring compressor and install it around the rings on the lower piston; then lower the cylinder over the piston and rings. Remove ring compressor and lower cylinder over studs on the crankcase.
(5) Install six washers (19) and nuts (18) on the studs; tighten all nuts evenly.
(6) Install the low-pressure cylinder head (par. 105*f*).
(7) Install the other low-pressure cylinder in the same manner.

b. High-Pressure Cylinders.

(1) Place new gasket (12) over studs on crankcase.
(2) Wipe piston and rings with OE 10 and install an open type ring compressor around rings.
(3) Lower cylinder (9) on the piston, remove the ring compressor, and lower the cylinder over the studs on the crankcase.
(4) Install washers (11) and nuts (10); tighten securely.
(5) Install cylinder head (par. 105*g*).
(6) Install the other high-pressure cylinder in the same manner.

Section V. PISTONS, RINGS, AND CONNECTING ROD ASSEMBLIES

207. Description

a. Pistons and Rings. Low-pressure pistons are of aluminum alloy; high-pressure pistons are cast iron. Both types are fitted with full-floating piston pins, and each piston has five rings above the pin. Compression rings are installed in the top three ring grooves, oil control rings in the two lower grooves in the piston.

b. Connecting Rods. Connecting rods are of the articulated type consisting of one master rod with one link rod on each side. The link rods are attached to the master rod with link pins secured by a lock-screw. Link rods have replaceable bronze bushings at both ends. The master rod has a replaceable bronze bushing at the piston end and is fitted with two steel-backed, babbitt-lined bearing halves at the crank pin end.

208. Piston Removal and Disassembly

(fig. 71)

a. Low-Pressure Pistons.

(1) Remove the cylinder head (par. 105*a*).
(2) Remove the cylinder (par. 204*a*).

Caution: To avoid distorting piston, heat low-pressure pistons to 150° F. before driving out piston pin.

(3) Remove retaining rings (17) at each end of piston pin (20). Drive out the piston pin and remove piston (13) from the connecting rod; mark mating piston and pin to insure installation in the same cylinder.
(4) Remove remaining low-pressure pistons in the same manner; mark mating pistons and pins to insure installation in same cylinder.
(5) Spread rings (14 and 15) with an expander, and remove rings from pistons.

b. High-Pressure Pistons.

(1) Remove the cylinder head (par. 105*b*).
(2) Remove the cylinder (par. 204*b*).

(3) Remove retaining rings (3) from both ends of piston pin (4), and drive out piston pin. (The cast iron high-pressure piston (5) does not have to be heated to remove the pin.)
(4) Remove the other high-pressure piston in the same way.
(5) Spread rings (6 and 7) with an expander, and remove rings from pistons.

209. Piston Cleaning and Inspection

a. Use a stiff wire brush and cleaning solvent to remove all traces of sludge, varnish, and carbon from the piston. Scrape ring grooves thoroughly, and open oil drain holes in lower grooves.

b. Look for cracks, scored walls, and worn ring lands. Use new rings, and check side clearance in piston grooves. Clearance should not exceed 0.002 to 0.004 inch for any groove in any piston.

c. Use a micrometer below pin hole to check piston diameters. New low-pressure pistons measure 8.241 inches. New high-pressure pistons measure 6.992 inches.

d. Discard pistons with worn ring lands, scored walls, cracks, or worn skirts.

210. Piston Reassembly and Installation

(fig. 71)

a. Low-Pressure Pistons.

(1) Use a ring expander to spread rings (14 and 15), and install a new set on each piston. Install oil control rings (with slots in face) in two lower grooves first; follow with three compression rings in top grooves. Rotate rings in grooves to stagger end-gaps at least 90° apart.

Caution: To avoid distorting the pistons, heat low-pressure pistons to 150° F. before installing the piston pins.

(2) Install the piston on the link rod and drive piston pin (20) through the piston and rod; secure the pin with retaining rings (17).
(3) Install the cylinder (par. 206*a*).
(4) Install the cylinder head (par. 105*f*).

b. High-Pressure Pistons.

(1) Use a ring expander to spread rings (6 and 7), and install a new set on each high-pressure piston.
(2) Install the piston on the connecting rod and drive the piston pin through the piston and connecting rod; secure the pin with retaining rings (3).
(3) Install the cylinder (par. 206*b*).
(4) Install the cylinder head (par. 105*g*).

211. Connecting Rod Assembly Removal

a. Remove all three cylinder heads (par. 105*a* and *b*), remove both low-pressure cylinder pairs (par. 204*a*), and remove the high-pressure cylinder (par. 204*b*) from the bank in which the rod is to be removed.

b. Remove the pistons from the rod assembly (par. 208*a* and *b*).

c. Rotate the compressor crankshaft to bring the connecting rod cap (18, fig. 72) opposite a low-pressure cylinder opening in the crankcase, and remove four cotter pins (17) and connecting rod nuts (16).

d. Pull out four connecting rod bolts (7), and remove connecting rod cap (18) through the cylinder opening in the crankcase.

e. Lift connecting rod clear of the crankshaft, and rotate the crankshaft until the crankpin is at the bottom center of rotation.

f. Push the cap end of the connecting rod to one side, partially out of the low-pressure cylinder opening as shown in figure 73. This will draw the connecting rod inside crankcase and withdraw link from opposite low-pressure cylinder opening, pulling the link inside the crankcase alongside the connecting rod.

g. Reach through the high-pressure cylinder opening in the center of the crankcase; fold the piston ends of the connecting rod and link together, and pull ends out through the center opening. As the rod and link are pulled through the opening folded together, slant them toward the cylinder opening through which other link extends, and pivot the assembly to bring the large assembled end of the rod through center opening as shown in figure 74.

212. Connecting Rod Disassembly

(fig. 72)

a. Remove lockscrew (8) from the link pin boss. Push out link pin (11), and detach link (4) from connecting rod (6). Mark mating parts for reassembly in same position.

b. Remove other link in the same manner.

c. Remove upper half bearing insert (12) from connecting rod, and remove lower half bearing insert (19) from cap (18).

213. Connecting Rods Cleaning, Inspection and Repair

a. Wash all parts in cleaning solvent; dry with clean compressed air. Make sure oil passages in rod and links are open.

b. Check rod and links for worn bushings and loose pins. Examine bearing inserts for roughness and wear. Install connecting rod only on crankshaft, and check bearing running clearance with a strip of plastic gage. Bearing clearance should be 0.0016 to 0.0037 inch. Replace worn bushings, pins, or bearings.

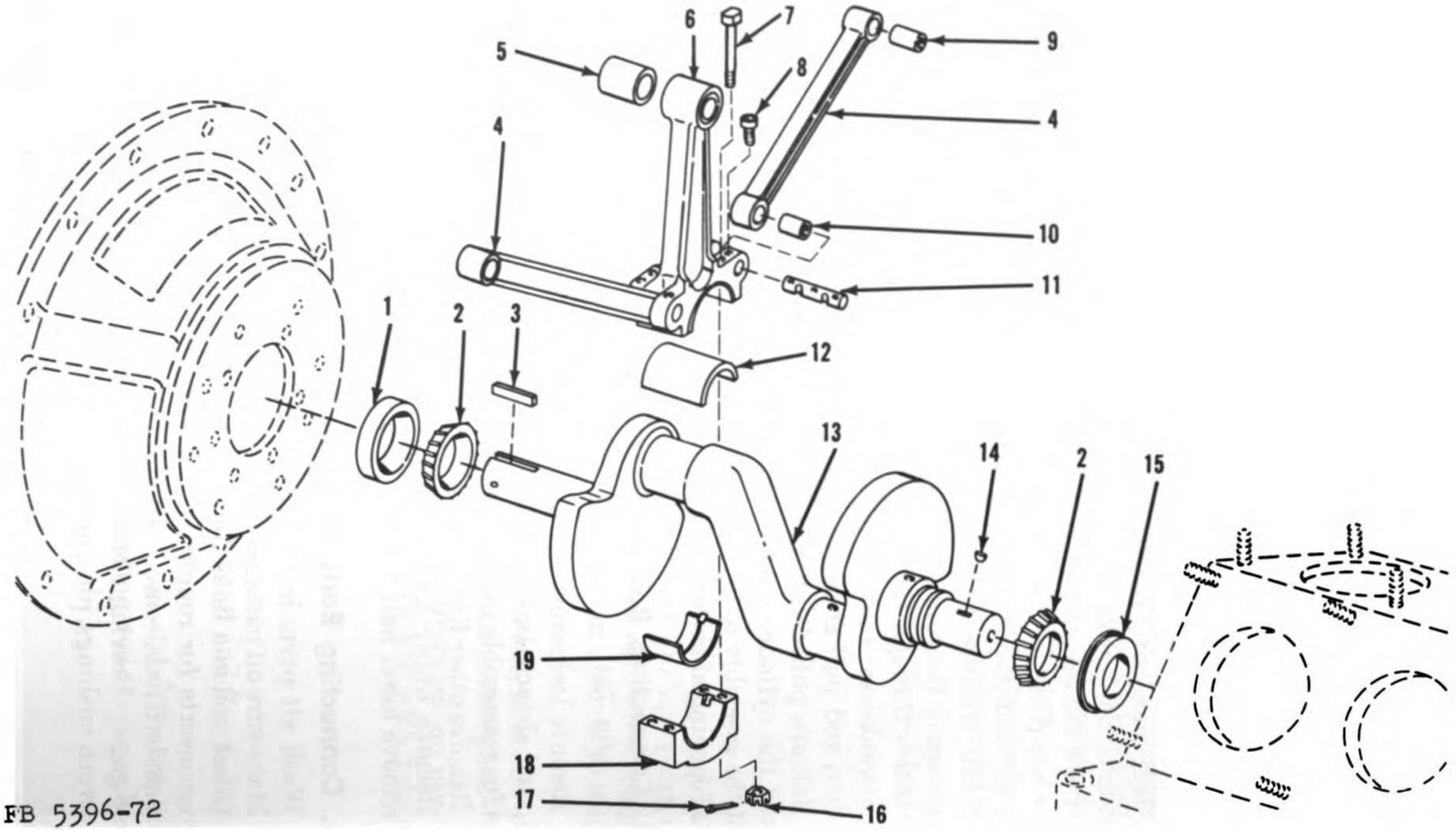


Figure 72. Crankshaft, connecting rod, and bearings, exploded view.

1 Bearing cup
2 Bearing cone
3 Clutch key
4 Connecting rod link
5 Piston pin bushing
6 Connecting rod
7 Connecting rod bolt
8 Link pin lockscrew
9 Piston pin bushing
10 Link pin bushing
11 Connecting rod link pin
12 Upper half bearing insert
13 Crankshaft
14 Woodruff key
15 Bearing cup
16 Connecting rod nut
17 Cotter pin, 1/16 x 3/4 (8 Req'd)
18 Connecting rod cap
19 Lower half-bearing insert

Figure 72—Continued.

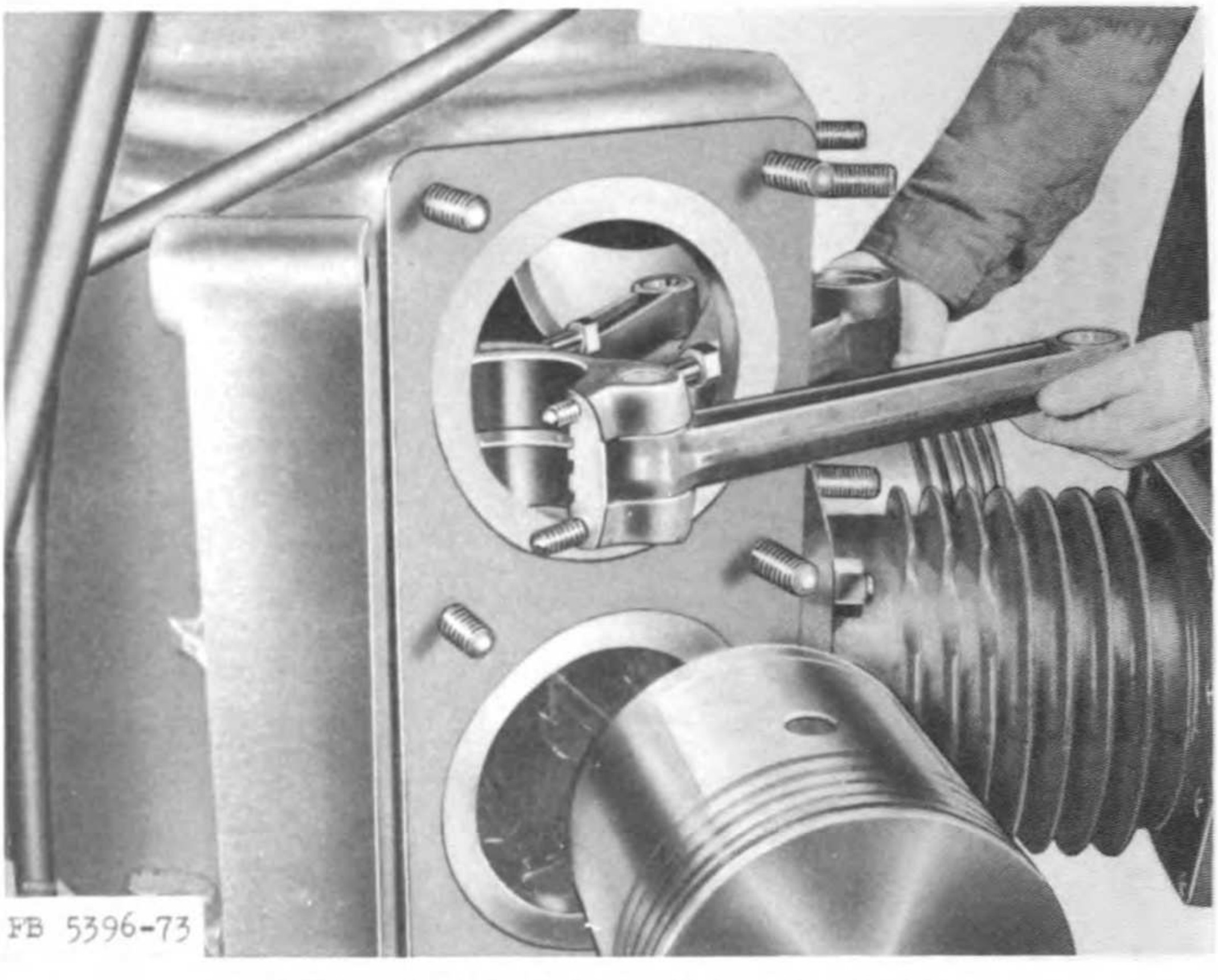


Figure 73. Preparing to remove rod assembly.

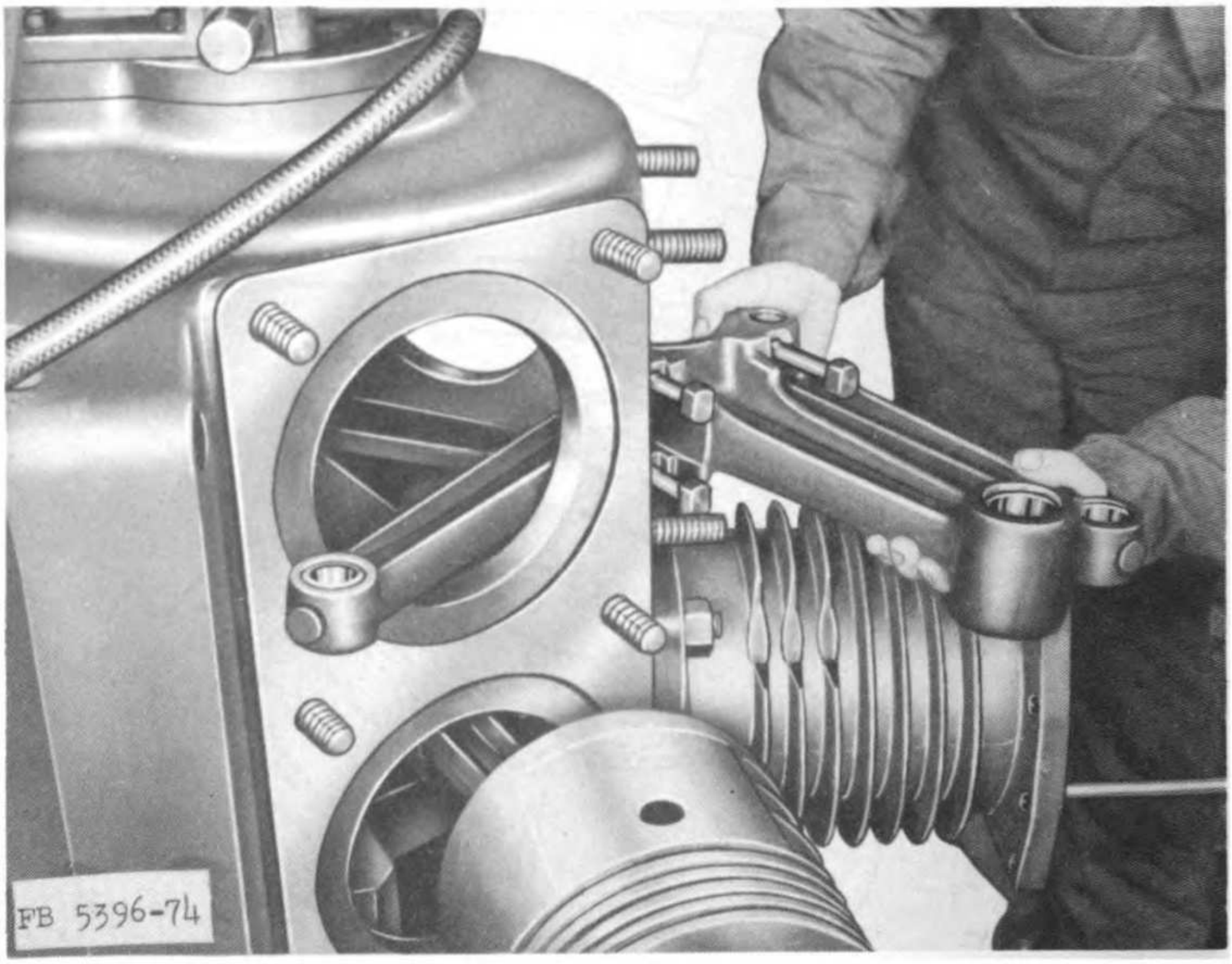


Figure 74. Withdrawing rod assembly.

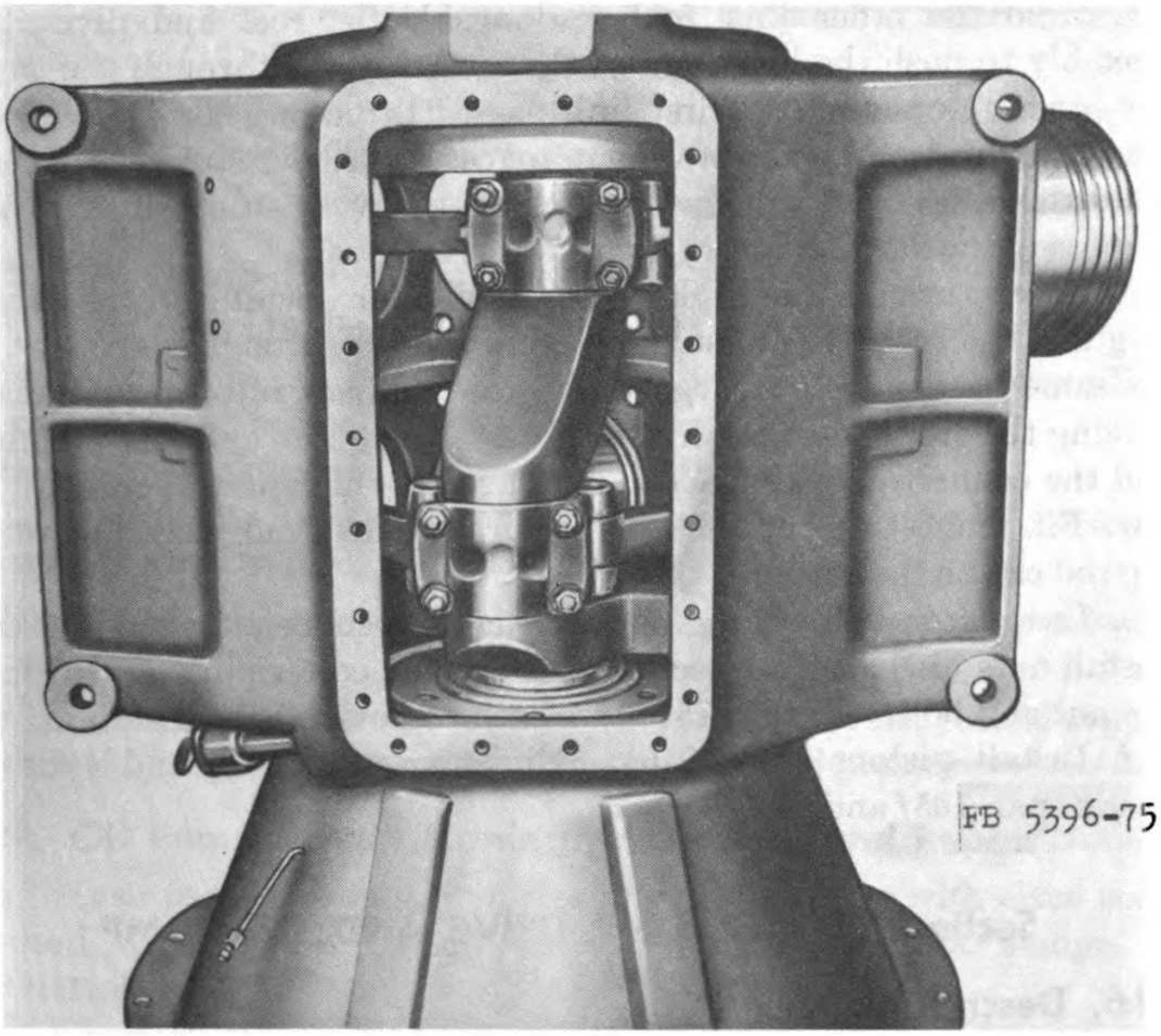


Figure 75. Rods installed, bottom view.

214. Connecting Rod Reassembly

(fig. 72)

a. Place small end of link (4) between the bosses on connecting rod (6), and push link pin (11) through the bosses until the setscrew seat in the pin alines with the threaded hole in the boss.

b. Insert lockscrew (8) and tighten securely.

c. Attach the other link in the same way.

d. Install lower half bearing insert (19) (with oil groove) in connecting rod cap (18). Be sure tang on upper side is seated in the cap groove.

e. Install upper bearing half (12) (without oil groove) in the connecting rod. Be sure tang on insert seats in mating groove in rod bore.

215. Connecting Rod Assembly Installation

a. Fold one link in against the connecting rod, and position the assembly over the high-pressure cylinder opening in the center of the crankcase. Invert the rod so the free ends point toward the cylinder opening. Insert the free end of one link through center opening and pass it out through the low-pressure cylinder opening on the side of the crankcase in the same position shown in figure 74 for removal.

b. Hold the other link folded alongside the rod, and pivot the assembly to push the large end of the assembly out through the same low-pressure opening the first link passed through. This will draw the folded rod and link into the crankcase with the large end of the rod extending from the low-pressure cylinder opening on the side in the same position shown in figure 73 for removal.

c. Reach through the high-pressure cylinder opening in the center to guide the free end of the connecting rod up through opening. At the same time, push the large end of the rod back into the crankcase, forcing the free end of the link opposite through its cylinder opening, and the connecting rod free end out through the center opening.

d. Fit connecting rod bore on the crankshaft, and install connecting rod cap on the bottom.

e. Insert four bolts (7, fig. 72) through the connecting rod and cap. Install nuts (16) ; tighten securely, and install cotter pin (17) through the nut and bolt. Figure 75 shows both rod assemblies installed.

f. Install pistons (par. 210), cylinders (par. 206), and cylinder heads (par. 105*f* and *g*).

Section VI. OIL PUMP DRIVE AND OIL PUMP

216. Description

a. The oil pump (16, fig. 76) is assembled to the inside of drive cover (30) at the rear of the compressor crankcase. The cover is attached to an adapter on the crankcase and holds the oil pump suspended over the oil in the oil pan. The oil pump drive gears are mounted between the cover and the adapter. The drive gear (14) fits around the crankshaft and meshes with the idler gear (15) which turns the driven gear on the oil pump assembly (16).

b. The drive gear (14) is not keyed to the crankshaft. Instead, the internal slots on the gear mate with the jaws on spacer (5) which mounts around and is keyed to the crankshaft and extends through the opening in the drive cover to mate with slots on the fan drive sheave (4). The sheave (4) is keyed to the crankshaft and rotates with it, turning the spacer (5), drive gear (14), idler gear (15), and finally the driven gear on the oil pump (16).

c. Oil is pumped from the pan through channels in the drive cover to an external oil filter, back to the cover through tee (10), through holes in the adapter on the crankcase, to a bushing surrounding an annular groove on the crankshaft, and into drilled passages in the crankshaft to lubricate the working parts.

217. Oil Pump Drive Removal
(fig. 76)

a. Remove the intercooler (par. 95*a*).

b. Remove cap screw (1) and washers (2 and 3); remove sheave (4) and key (17) from crankshaft.

c. Remove cap screws (6, 7, and 29) and gaskets (8) from oil pump drive cover (30); remove cover with gear (15) and pump (16) attached. Slide driver gear (14) and spacer (5) from the crankshaft.

218. Oil Pump Drive Disassembly

a. Slide gear (15, fig. 76) from shaft (13) pressed into cover (30).

b. Remove two cap screws (18) attaching pump (16) to cover (30); set pump aside for disassembly (par. 220).

c. Press out synthetic rubber oil seal (9), and discard.

d. Remove cap (19) and copper gasket (22) covering oil pressure adjusting screw (20).

Note. **Before removing screw, count threads extending beyond nut, and record for use at reassembly.**

e. Loosen nut (21); remove screw (20), nut (21), and second copper gasket (22) together. Remove spring (23) and oil pressure valve (24).

219. Oil Pump Drive Cleaning, Inspection, and Repair

a. Wash parts thoroughly in cleaning solvent; dry with clean compressed air. Check all oil passages, and clean out sludge or restrictions.

b. Examine oil-pressure valve face for wear; replace if necessary.

c. Examine shaft (13) for scoring and wear. If defective, press out of cover and install new shaft.

d. If bushing (25), installed in cover (30), is worn, remove welch plug (26), drive out bushing (25), and install new bushing and plug.

220. Oil Pump Disassembly
(fig. 77)

a. Remove four screws (13) attaching oil pump cover (12) and cover plate (11) to oil pump body (6). Invert body and remove drive gear (9) and its key (3) and driven gear (10).

b. Withdraw driven gear (1) and shaft (4) together from body (6).

c. Remove hub screw (2) from gear (1); remove the gear from shaft (4).

221. Oil Pump Cleaning, Inspection, and Repair

a. Wash all parts in cleaning solvent; clean oil passages thoroughly. Dry with clean compressed air.

b. Inspect gears for worn or chipped teeth. Check shafts for worn bearing surfaces, and check bushings for wear.

c. Drive out worn bushings (5 and 8, fig. 77), and install new parts. Press shaft (7) out of body (6), if worn, and install new part. Inspect plate (11) for gear marks or rough surface. Lap the plate on emery cloth placed on a surface plate to refinish.

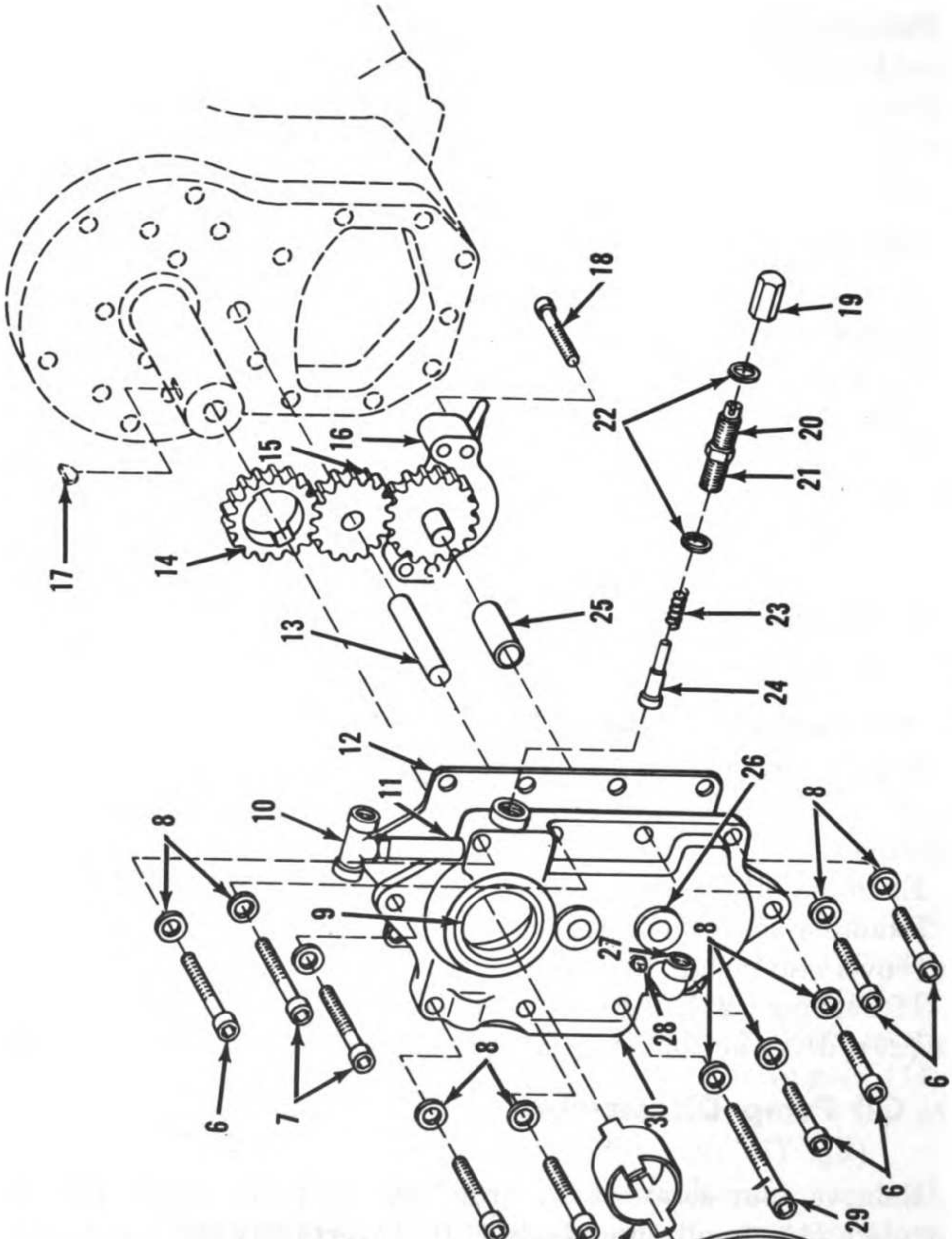
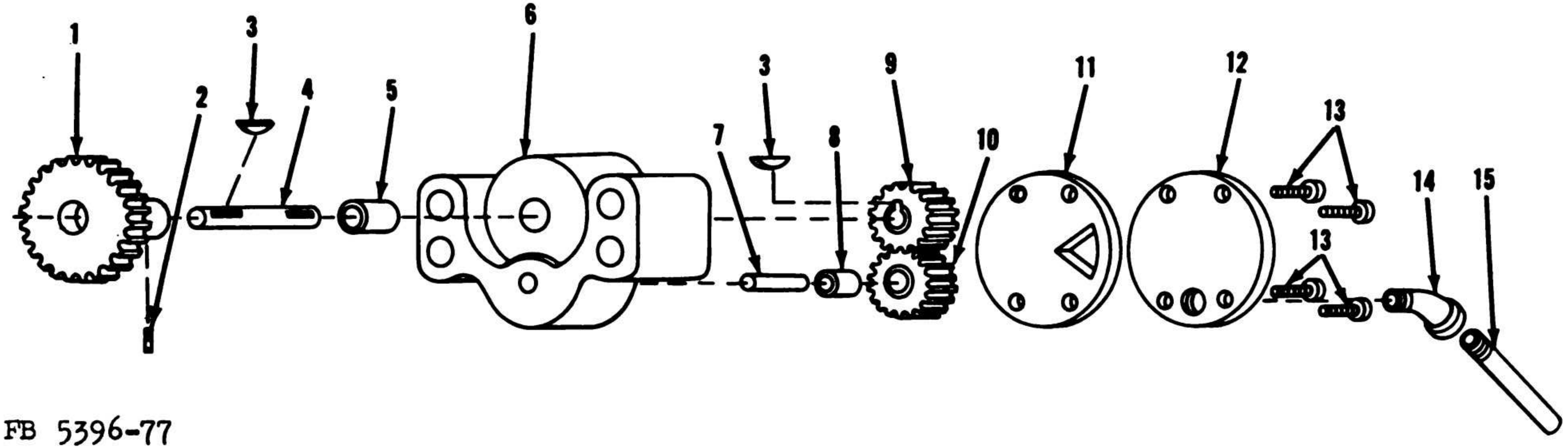


Figure 76. Oil pump drive, exploded view.

1 Screw, cap, hex hd, ½ x 1 NC (1 Req'd)
2 Lockwasher, ½ (1 Req'd)
3 Pump end shaft washer
4 Fan drive sheave
5 Spacer
6 Socket hd cap screw
7 Socket hd cap screw
8 Copper gasket
9 Oil seal
10 Tee, ⅜ (1 Req'd)
11 Nipple, ¾ x 3 (1 Req'd)
12 Oil-pump-cover gasket
13 Idler gear shaft
14 Oil-pump-drive driver gear
15 Oil-pump-drive idler gear
16 Oil pump assembly
17 Key, woodruff, No. 808 (1 Req'd)
18 Socket hd cap screw
19 Oil-pressure adjusting-screw cap
20 Oil pressure adjusting screw
21 Nut, hex jam, ⅝ NC (1 Req'd)
22 Oil-pressure adjusting-screw cap gasket
23 Oil pressure adjusting spring
24 Oil pressure adjusting valve
25 Oil-pump shaft bushing
26 Welch plug
27 Elbow, street, ⅜ x 45° (1 Req'd)
28 Plug, pipe, ⅜ (1 Req'd)
29 Socket hd cap screw
30 Oil-pump-drive cover

Figure 76—Continued.



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1	Oil-pump-drive driven gear	6	Pump body	11	Oil-pump cover plate
2	Driven-gear hub screw	7	Oil-pump driven-gear shaft	12	Oil pump cover
3	Woodruff key	8	Oil-pump driven-gear bushing	13	Oil-pump cover screws
4	Oil-pump drive-gear shaft	9	Oil-pump drive gear	14	Street elbow
5	Oil-pump drive-gear bushing	10	Oil-pump driven gear	15	Oil-pump suction pipe

Figure 77. Compressor oil pump, exploded view.

222. Oil Pump Reassembly
(fig. 77)

a. Install gear (1) on shaft (4); secure with screw (2).

b. Insert shaft (4) (with gear (1) attached) through body (6). Install second key (3) in shaft (4) and slide gear (9) over shaft and key.

c. Install gear (10) over shaft (7) (pressed in body). Assemble plate (11), and cover (12), with elbow and pipe attached, to pump body.

d. Insert and tighten four screws (13).

Caution: Make certain elbow (14) and pipe (15) are assembled to point down toward oil pan when installed in crankcase.

223. Oil Pump Drive Reassembly
(fig. 76)

a. Install new seal (9) in cover (30).

Caution: Do not use sharp tools to install seal (9). Seal does not have metal cover and can be damaged by improper handling.

b. Slip spring (23) over stem on valve (24) and insert both inside the hollow end of adjusting screw (20). Install two new copper gaskets (22), one on each side of nut (21), and insert assembled parts in threaded hole in cover (30). Turn screw (20) into housing to same depth noted during disassembly; then tighten nut (21). Install cap (19); tighten securely.

c. Position oil pump (16) with shaft inserted in bushing (25) in cover (30). Install two cap screws (18) through oil pump; secure to the back of cover (30). Install gear (15) on shaft (13) (pressed in cover), slip gear (14) over crankshaft, and install new gasket (12) on cover (30).

224. Oil Pump Drive Installation
(fig. 76)

a. Assemble cover (30) to the compressor, carefully slipping cover and seal over the crankshaft. Install screws (6, 7, and 29) and copper gaskets (8) in correct holes and tighten.

Note. Screws are different lengths and use copper gaskets to prevent oil leaks from passages in cover. Study figure and legend for correct installation.

b. Make sure plug (28) is in place in unused hole in cover.

c. Make a cone from thin shim stock and insert it between the crankshaft and seal (9) in cover (30). Slip spacer (5) over the crankshaft, using shim stock as a guide, and push spacer through seal carefully. Remove shim stock and rotate spacer until jaws engage the slots in gear (14) behind the seal. Install key (17) in the crankshaft. Rotate spacer (5) until sheave (4) can be installed on shaft engaging key

(17) and the spacer jaws. Install cap screw (1) and washers (2 and 3); tighten securely.

d. Install intercooler (par. 95*e*).

Section VII. CRANKCASE, CRANKSHAFT, AND MAIN BEARINGS

225. Description

a. Crankcase.

(1) The crankcase (18, fig. 78) is a single casting with a large bell-shaped bearing housing (8) attached to one end by studs and nuts. A bearing cup (1, fig. 72) in the bearing housing and a cup (15) in the opposite end of the crankcase support the crankshaft (13) and bearing cones (2). An oil-pump-cover adapter (26, fig. 78) at the crankcase end opposite the bearing housing supports a bearing adapter (25) and oil transfer bushing. The cover adapter provides mounting for the oil pump drive gears and cover.

(2) A breather baffle tube (28) extends through the crankcase at the oil pump end of the crankcase. The inner end of the tube is shielded from oil splash by a box-shaped baffle (21) secured to the inside of the crankcase with two cap screws from the outside. Copper gaskets installed under the cap screws prevent oil leaks. The breather baffle tube is connected on the tubing to a fitting on the left intake manifold on the low-pressure cylinders; this arrangement assures positive crankcase ventilation.

(3) A plate-type oil pan covers the underside of the crankcase. The pan has a magnetic drain plug and a threaded boss to accommodate the oil-temperature-gage bulb.

b. Crankshaft and Main Bearings. The crankshaft (13, fig. 72) is a single-piece, two-throw shaft with integral counterweights. Drilled oil passages extend the length of the shaft from an annular groove at the oil pump end of the crankshaft. The oil transfer bushing in the bearing adapter (25, fig. 78) fits around this groove when the crankshaft is installed in the crankcase. The bushing does not support the shaft; it is used only to transfer oil. Shaft load is on the tapered roller bearings installed at each end of the shaft. Main bearing adjustment is obtained by shims (7) installed under the bearing retainer (6) at the bearing housing end of the crankcase.

226. Crankcase, Crankshaft, and Main Bearings Disassembly

a. Remove the compressor assembly (par. 191).

b. Remove the intercooler from the compressor (par. 95*a* (4) through (7)).

c. Remove the intercooler fan from the compressor (par. 94*a* (2) through (4)).

d. Remove both connecting rod assemblies (par. 211).

e. Remove cap screws (37, fig. 78) and lockwashers (38); remove oil pan (35) and gasket (34).

f. Support the compressor on the flat surface of the lower crankcase.

g. Remove the clutch assembly (par. 194*b* and *c*) and clutch hydroshifter (par. 200*b*).

h. Remove the oil pump drive and oil pump (par. 217).

i. To provide support for the crankshaft during disassembly, feed a rope through a high-pressure cylinder opening; loop it underneath the crankshaft, and secure each end around the crankcase studs.

j. Remove cap screws (4) and lockwashers (5) securing bearing retainer (6) to bearing housing (8); remove retainer (6) and shims (7).

Note. **Notice the thickness of shims (7) and the quantity used. Record data for reference during assembly.**

k. Remove nuts (1) and lockwashers (2) from the studs extending through bearing housing (8). Place a sling through the opening in the bearing housing to support it, lift slightly, and pull the bearing housing from crankcase (18).

l. Station a helper at the free end of the crankshaft (13, fig. 72) to support the shaft and aid in pulling it from the crankcase.

m. Reach through the high-pressure cylinder openings with both hands, and guide the crankshaft out of the crankcase as the helper withdraws it.

n. Heat the roller bearings (2) to approximately 200° F.; remove both bearings from the crankshaft with a puller.

o. Remove adapter (26, fig. 78) and adapter (25) from the crankcase as an assembly, then drive bearing cup (15, fig. 72) from its seat in the crankcase with a brass drift.

p. Drive bearing cup (1) from bearing housing (8, fig. 78) with a brass drift; drive oil seal (3) from bearing retainer (6).

q. Remove breather baffle tube (28) and elbow (27) from the crankcase.

r. Reach inside the crankcase, and remove nuts (19) and lockwashers (20) from breather baffle (21) mounted to the inside wall of the crankcase. Withdraw cap screws (30) and copper gaskets (29); remove baffle (21).

227. Crankcase, Crankshaft, and Main Bearings Cleaning, Inspection, and Repair

a. Clean all parts in degreasing tank. Be sure that oil passages in the crankshaft, adapters, and baffle tube are open.

b. Look for burs on castings, and dress with file. Check crankcase and bearing housing for cracks. Use a micrometer to check the diameter of both crank pin journals. Correct diameter is 3.249 to 3.250

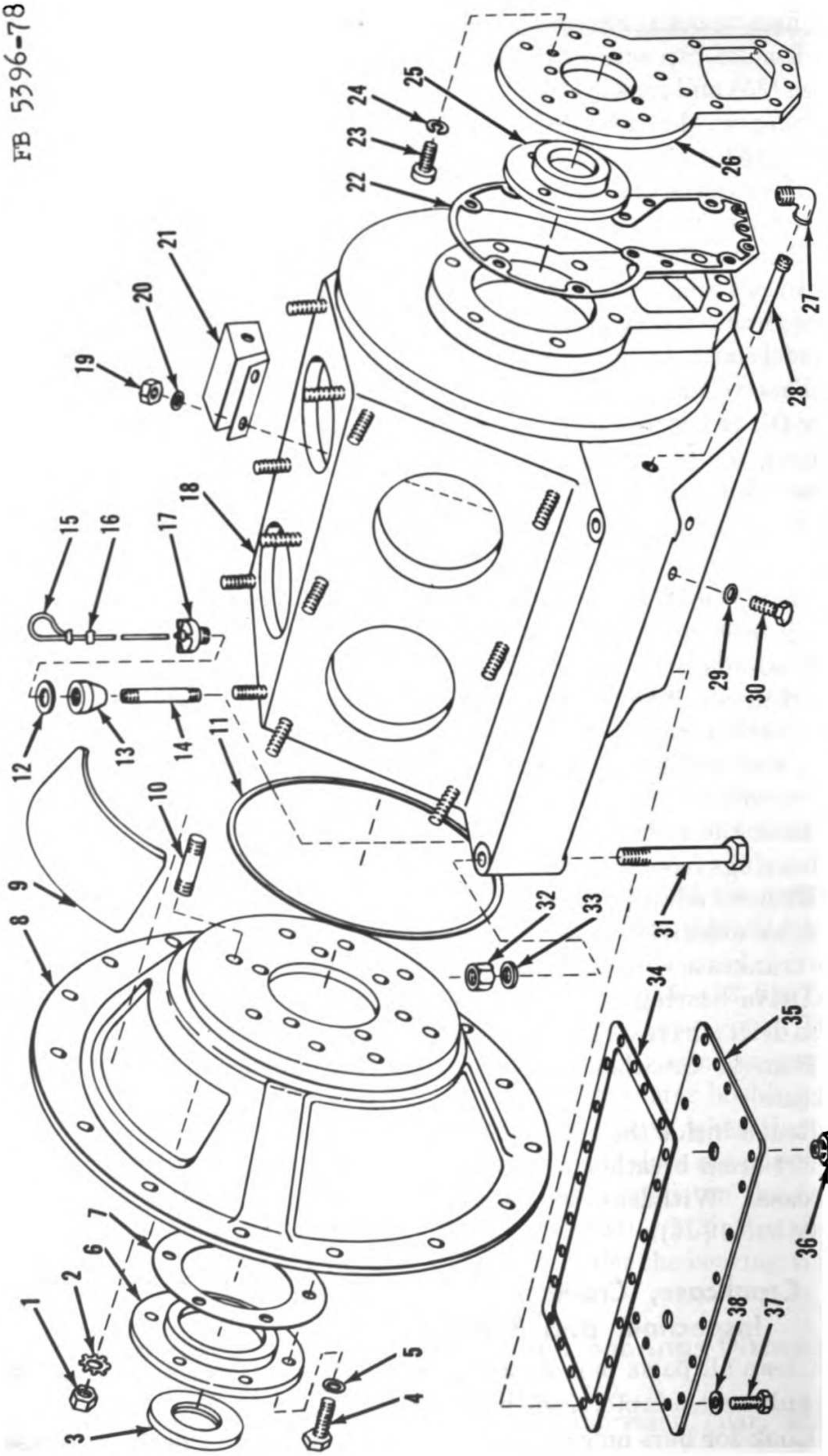

Figure 78. Compressor crankcase and bearing housing, exploded view.

1 Nut, hex, ⅝ NC (8 Req'd)
2 Lockwasher, ⅝ (8 Req'd)
3 Oil seal
4 Screw, cap, hex hd, ⅝ x 1¼ NC (6 Req'd)
5 Lockwasher, ⅝ (6 Req'd)
6 Bearing retainer
7 Housing shim (used as Req'd)
8 Bearing housing
9 Bearing housing cover
10 Stud
11 Bearing housing gasket
12 Oil stick plug gasket
13 Crankcase oil filler
14 Crankcase oil filler nipple
15 Oil stick
16 Oil stick gasket
17 Oil stick plug
18 Crankcase
19 Nut, hex, ⅜ NC (2 Req'd)
20 Lockwasher, ⅜ (2 Req'd)
21 Crankcase breather baffle
22 Oil-pump-cover adapter gasket
23 Screw, cap, socket hd, ¼ x ⅞ NC (4 Req'd)
24 Lockwasher, ¼ (4 Req'd)
25 Bearing adapter
26 Oil-pump-cover adapter
27 Elbow fitting
28 Breather baffle tube
29 Baffle screw gasket
30 Screw, cap, hex hd, ⅜ x 1¼ NC (2 Req'd)
31 Screw, cap, hex hd, ¾ x 5½ NC (2 Req'd)
32 Nut, hex, ¾ NC (2 Req'd)
33 Lockwasher, ¾ (2 Req'd)
34 Oil pan gasket
35 Oil pan
36 Magnetic drain plug
37 Screw cap, hex hd, ⅜ x ¾ NC (22 Req'd)
38 Lockwasher, ⅜ (22 Req'd)

***Figure 78*—Continued.**

inches. Connecting rod bearing inserts are available for crank pin diameters ground 0.020 inch undersize. Grind journals which measure more than 0.0015 inch out-of-round.

228. Crankcase, Crankshaft, and Main Bearings Reassembly

a. Install baffle (21, fig. 78) on the inside wall of the crankcase; attach with cap screws (30), new copper gaskets (29), lockwashers (20), and nuts (19).

b. Install baffle tube (28) through crankcase, and attach elbow (27).

c. Install new bearing cup (15, fig. 72) in crankcase end, and install assembled bearing adapter (25, fig. 78) and attached oil pump cover adapter (26) on the crankcase, using new gasket (22).

d. Install new cup (1, fig. 72) in bearing housing (8, fig. 78), and install new gasket (11) over the bearing housing shoulder.

e. Install new bearing cones (2, fig. 72) on the journal at each end of crankshaft (13).

Note. Heat bearing cones to facilitate installation, but allow cones to cool before installing crankshaft.

f. With assistant, guide the crankshaft into the crankcase until the rear bearing cone seats in cup (15, fig. 72) previously installed in the rear of the crankcase.

g. Loop a rope under the crankshaft and secure the rope ends to studs on the crankcase to support the crankshaft until the bearing housing is installed.

h. Press new oil seal (3, fig. 78) into bearing retainer (6) flush with the outside face. Insert cap screws (4) with lockwashers (5) through holes in retainer (6); install shims (7) on retainer.

Note. Install same size and quantity of shims (7) noted during disassembly. Normally 10 shims are required.

i. Hoist bearing housing into alinement with crankshaft installed in *f* above, and slide housing over studs (10) on the crankcase.

j. Install lockwashers (2) and nuts (1) on the studs; tighten securely.

k. Install bearing retainer (6) assembled in *h* above; tighten cap screws (4).

l. Swing a brass mallet against the end of the crankshaft to seat the bearings, then retighten bearing housing nuts (1) and bearing retainer cap screws (4).

m. Rotate shaft by hand to check crankshaft bearing adjustment. The crankshaft should turn easily without binding and should not shake or move endwise when shaken by hand. If perceptible play or binding is present, remove the bearing retainer installed in *k* above. Add one or more shims (7) to remove play; deduct shims to reduce binding. Reinstall retainer (6). Again seat the crankshaft with a

mallet, and recheck the adjustment. Repeat this procedure until correct adjustment is obtained.

n. Install the oil pump drive and oil pump (par. 224).

o. Install the hydroshifter (par. 202*b*) and clutch (par. 198).

p. Install both connecting rod assemblies (par. 215), pistons (par. 210*a* and *b*), and cylinders (par. 206*a* and *b*).

q. Install intercooler fan (par. 94*e*) and intercooler (par. 95*e* (1) through (3)).

r. Place a sling around the crankcase mounting flanges, and raise the assembly. Install new pan gasket (34) and oil pan (35) with cap screws (37) and lockwashers (38).

s. Install compressor assembly (par. 192), and fill crankcase with the lubricant specified in LO 5–5396.

Section VIII. THROTTLE CONTROL CYLINDER

229. Description

The throttle control cylinder (2, fig. 14) is a single-acting pneumatic cylinder connecting the engine speed control and the injection-pump governor control lever. The cylinder forms a part of the unloading system (fig. 24) and is operated by air from the trigger valve during unloading.

230. Throttle Control Cylinder Disassembly
(fig. 79)

a. Remove the throttle control assembly from the engine (par. 107*a*).

b. Disconnect and remove spring (29) from anchor plates (5).

c. Count the number of threads exposed on sleeve (7) and note for use in reassembly. Loosen sleeve locknut (8), unscrew sleeve (7), and withdraw stem (10) and attached parts (2 through 9) and (23 through 28) from throttle control cylinder (22).

231. Throttle Control Cylinder Cleaning, Inspection, and Repair
(fig. 79)

a. Wash parts in cleaning solvent; dry with compressed air. Make sure all air passages are open.

b. Check for cracks, scratches in cylinder walls, or damaged threads. Make sure that stem (10) is straight.

c. Smooth rough surfaces with fine emery; replace defective parts.

d. Replace leather packing (26) as follows:

(1) Remove nut (23), washer (24), bushing (25), packing (26), washer (27), and washer (28) from stem (10).

(2) Install new washer (28), washer (27), packing (26), bushing (25), washer (24), and nut (23) on stem.

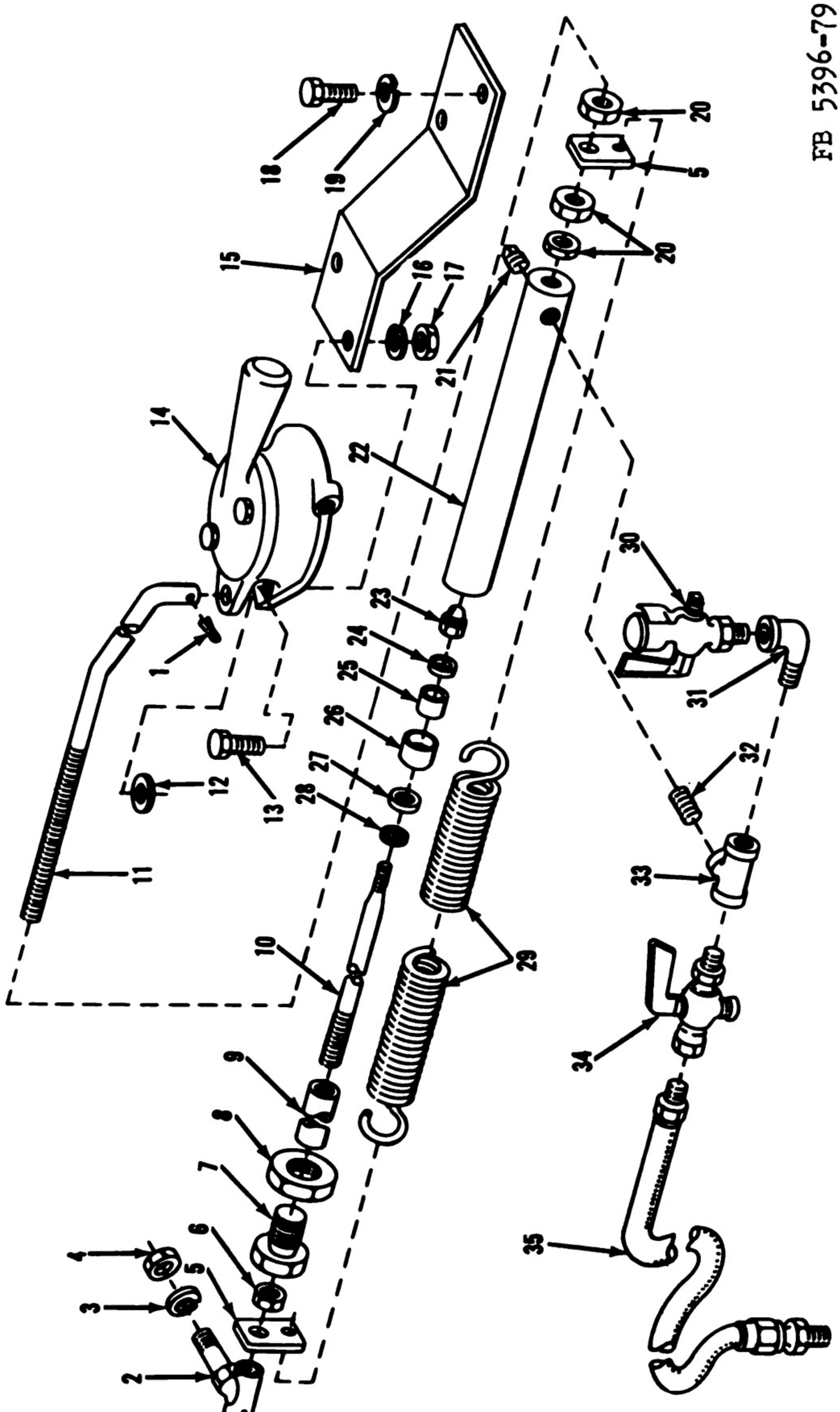

Figure 79. Throttle control cylinder, exploded view.

1 Pin, cotter, 1/16 x 3/4 (2 Req'd)
2 Ball joint
3 Lockwasher, 5/16 (1 Req'd)
4 Nut, hex, 5/16 NF (1 Req'd)
5 Spring anchor plate
6 Nut, hex, 5/16 NF (1 Req'd)
7 Sleeve
8 Sleeve locknut
9 Spacer
10 Stem
11 Rod
12 Washer, flat, 3/8 (1 Req'd)
13 Screw, cap, hex hd, 3/8 x 7/8 NC (2 Req'd)
14 Engine speed control
15 Engine speed control bracket
16 Lockwasher, 3/8 (2 Req'd)
17 Nut, hex, 3/8 NC (2 Req'd)
18 Screw, cap, hex hd, 3/8 x 5/8 NC (4 Req'd)
19 Lockwasher, 3/8 (4 Req'd)
20 Nut
21 Plug, pipe, 1/8 (1 Req'd)
22 Throttle control body
23 Nut, elastic stop, 1/4 NF (1 Req'd)
24 Washer
25 Bushing
26 Packing
27 Washer
28 Washer
29 Spring
30 Oiler
31 Elbow, street, 1/8 (1 Req'd)
32 Nipple, close, 1/8 (1 Req'd)
33 Tee, 1/8 (1 Req'd)
34 Shutoff cock
35 Flex hose

Figure 79—Continued.

232. Throttle Control Cylinder Reassembly
(fig. 79)

a. Coat inside of cylinder (22) and packing (26) sparingly with OH or equivalent.

b. Install a thin piece of shim stock, rolled into a cylinder, around packing (26). Wrap the shim tightly and coat with OH or equivalent.

c. Insert the stem (10) and packing with the shim in place into the open end of cylinder (22). Push the shim in far enough to cover internal threads in cylinder (22) so that the packing will not be damaged by the sharp threads.

d. Push the stem into the cylinder and remove the shim stock as soon as the packing passes beyond the threaded area.

e. Thread sleeve (7) with sleeve locknut (8) attached into cylinder (22). Turn sleeve clockwise until number of threads exposed equals number noted during disassembly in paragraph 230*c*. Tighten the sleeve locknut.

f. Stretch spring (29) and attach to anchor plates (5).

g. Install throttle control cylinder on engine (par. 107*c*).

Section IX. CARBURETOR

233. Description
(fig. 80)

The carburetor is the standard model for use on the UD–24 engine. It is an automatic-throttle type adjusted to maintain an idling speed of 1,000 to 1,200 rpm. A cam (7), actuated by the compression release lever linkage, contacts the float lever springs (49) and (50) and holds the needle valve (35) on its seat so that no gasoline is delivered to the carburetor when the compression release lever is moved to the diesel position. After starting on the gasoline cycle, the engine accelerates with wide-open throttle until it reaches a speed of about 1,500 rpm on the gasoline cycle. At this speed the velocity of the gas moving past the throttle begins to overcome the tension in the spring which controls the throttle valve, and closes the throttle butterfly valve (22) to a 1,000-rpm idle setting.

234. Carburetor Removal

a. Close gasoline shutoff valve (9, fig. 12). Disconnect gasoline tank-to-carburetor pipe (3, fig. 45) at the carburetor. Remove cap screws (26, fig. 80) attaching the fuel bowl (44) to the carburetor body (63); remove the fuel bowl as shown in figure 81.

Note. Because of the close mounting of the carburetor and distributor, the carburetor fuel bowl must be removed before either the carburetor or the distributor can be removed from an assembled engine.

b. Disconnect the link attached to the locking shaft and lever (1, fig. 80). Disconnect the starting shutter (60) from the starting shutter shaft (55). Remove nuts (29), lockwashers (28), and washers (27) from the studs on the engine intake manifold; remove the carburetor body (63).

235. Carburetor Disassembly

(fig. 80)

a. Remove cap screws (31) securing the bottom plate (32) to the body (63). Pry off the bottom plate and gaskets (30 and 52).

b. Remove strainer screen and retainer (37) and strainer screen gasket (38) from the fuel bowl (44).

c. Remove float lever pivot screw (40) and pivot screw gasket (39) from the fuel bowl; remove float assembly (45 through 51).

d. Lift needle valve out of cage (35); remove needle valve cage and needle valve cage gasket (36) from fuel bowl.

e. Remove metering well (53). Take care not to bend bottom plate (32). Remove metering well gasket (54). Drive drip hole filler (33) and filler plug (34) from bottom plate, and discard.

f. Remove locking shaft body plug (25) from carburetor body. Remove nut (9) and lockwasher (8) from locking shaft and lever (1) with a thin open end wrench. Withdraw shaft, together with dust washer (2), dust washer retainer (3), and cork dust washers (4). Lift out cam (7). Remove locking shaft bearing (5) from the carburetor body.

g. File off the ends of two screws (59) holding starting shutter (60) in place; remove screws, and lift out starting shutter. Withdraw starting shutter shaft (55) together with packing spring (56) and packing retainer (57). Withdraw and discard starting shutter dust packing. Remove short starting shutter shaft (61) from the side of the carburetor body opposite the choke.

h. Unscrew throttle lever cover clamp screw (18); remove throttle lever cover (16) and gasket (15). Remove idle stop lockscrew (23) and throttle stop screw (14). Remove throttle stop pin (12) and throttle spring screw (19); lift out throttle lever spring (21) and end spring (20). File off ends of two butterfly screws (11) securing throttle butterfly (22) to throttle shaft (13); remove screws, lift out butterfly, and withdraw throttle shaft from carburetor body.

236. Carburetor Cleaning and Inspection

a. Clean all metal parts thoroughly with cleaning solvent; dry with compressed air. If gum deposit is present, clean the parts with acetone and blow out with compressed air.

b. Inspect the cork float (46, fig. 80) for evidence of deterioration; replace if necessary by assembling to the float lever (47) and float spring (49).

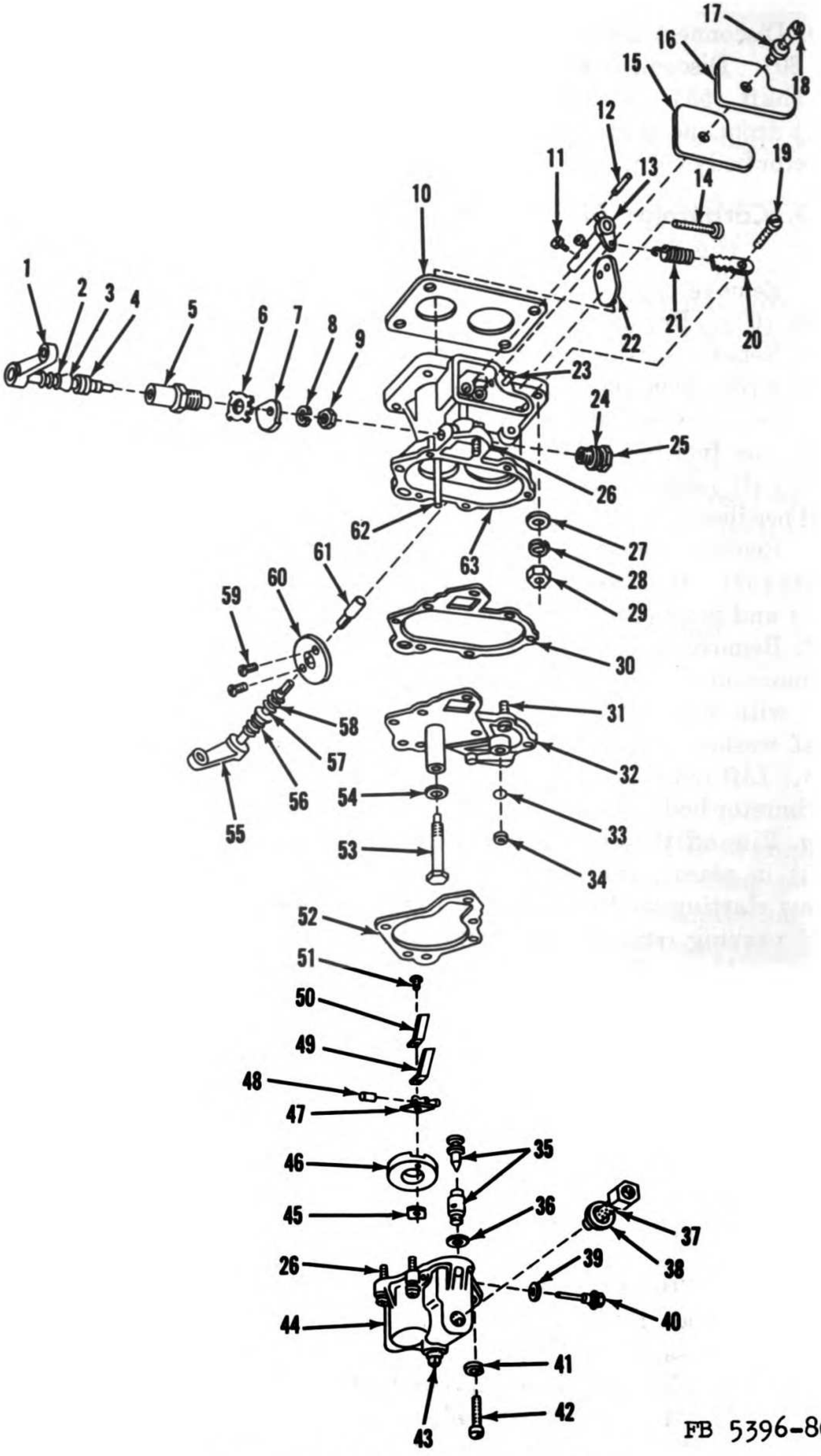

Figure 80. Carburetor, exploded view.

c. Inspect the needle valve and cage (35) for wear. If either part is defective, both must be replaced. Check operation of needle valve and cage in the following manner:

(1) Assemble needle valve and cage assembly to fuel bowl (44). Install carburetor float assembly (45 through 51) and float lever pivot screw (40) and gasket (39). Install strainer screen gasket (38) and strainer screen and retainer (37) in the fuel bowl (44).

(2) Connect the gasoline tank-to-carburetor pipe (3, fig. 45).

(3) Make sure the fuel bowl is level. Slowly open the gasoline shutoff valve (9, fig. 12). The float should close the needle valve when gasoline reaches a $^{13}/_{32}$- to $^{7}/_{16}$-inch level below the top of the fuel bowl. If the float valve does not shut off the

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1 Locking shaft and lever
2 Dust washer spring
3 Dust washer retainer
4 Dust washer
5 Locking shaft bearing
6 Bearing lock
7 Cam
8 Lockwasher, No. 8 (1 Req'd)
9 Nut, hex, No. 8 NC (1 Req'd)
10 Carburetor gasket
11 Butterfly screw
12 Throttle stop pin
13 Throttle shaft
14 Throttle stop screw
15 Throttle lever cover gasket
16 Throttle lever cover
17 Throttle lever cover clamp screw gasket
18 Throttle lever cover clamp screw
19 Throttle spring screw
20 Throttle lever end spring
21 Throttle lever spring
22 Throttle butterfly
23 Idle stop lockscrew
24 Locking shaft body plug gasket
25 Locking shaft body plug
26 Screw, cap, fil hd, No. 12 x 1 NC (4 Req'd)
27 Washer (4 Req'd)
28 Lockwasher, ⅜ (4 Req'd)
29 Nut, hex, ⅜ NF (4 Req'd)
30 Carburetor bottom plate gasket
31 Screw, cap, fil hd, No. 12 x ¾ NC (3 Req'd)
32 Carburetor bottom plate
33 Drip hole filler
34 Drip hole plug
35 Needle valve and cage
36 Needle valve cage gasket
37 Strainer screen and retainer
38 Strainer screen gasket
39 Float lever pivot screw gasket
40 Float lever pivot screw
41 Lockwasher, No. 12 (8 Req'd)
42 Screw, cap, fil hd, No. 12 x ¾ NC (1 Req'd)
43 Plug, pipe, ⅛ (1 Req'd)
44 Fuel bowl
45 Reinforcing plate
46 Float with ferrule
47 Float lever
48 Float lever spacer
49 Lower leaf float lever spring
50 Upper leaf float lever spring
51 Screw
52 Fuel bowl gasket
53 Metering well
54 Metering well gasket
55 Starting shutter shaft
56 Starting shutter shaft packing spring
57 Starting shutter shaft packing retainer.
58 Starting shutter dust packing
59 Starting shutter screw
60 Starting shutter
61 Short starting shutter shaft
62 Idling tube and plug
63 Carburetor body

Figure 80—Continued.

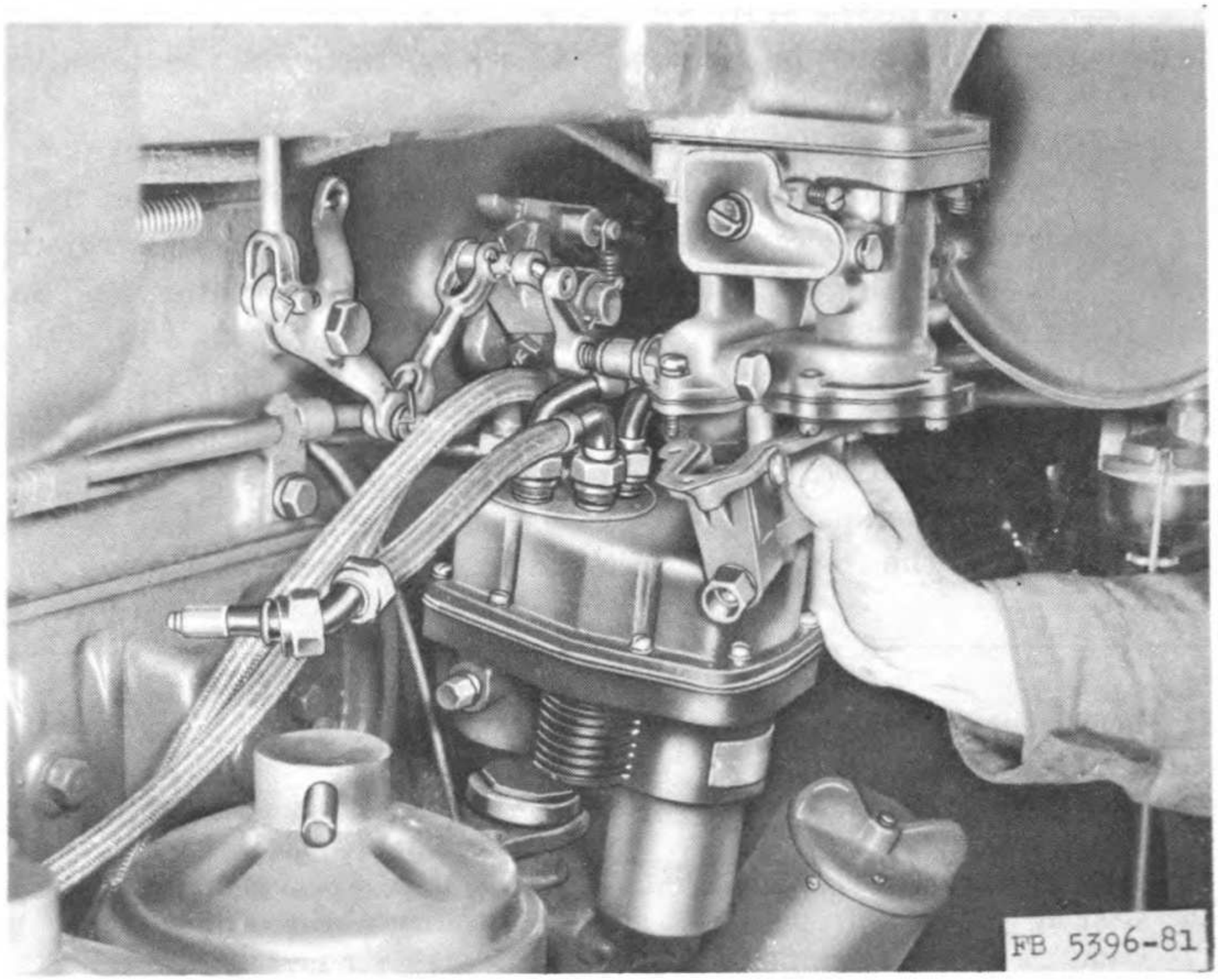


Figure 81. Removing carburetor fuel bowl.

gasoline flow, the valve and cage are defective and must be replaced.

(4) Close the gasoline shutoff valve, and disconnect the gasoline tank-to-carburetor pipe.

d. Measure the distance between the top face of the float and top of fuel bowl; when the needle valve is closed there should be a ¼- to $\frac{9}{32}$-inch distance. Measure the distance between the end of the upper spring leaf and the mounting face of the bowl; distance should be 0.234 to 0.312 of an inch with the needle valve closed. Replace spring leaves with new parts if measurements do not fall within these limits

237. Carburetor Reassembly

(fig. 80)

Note. **Install new fiber washers, gaskets, and cork dust seals.**

a. Insert throttle shaft (13) through carburetor body (63). Place throttle butterfly (22) on shaft so that the beveled edges completely shut off the air passage when the throttle is closed. Secure butterfly to shaft with new screws (11). Upset the ends of the screws after installation to lock the butterfly in place. Hook throttle lever spring (21) into throttle shaft (13). Secure end spring (20) to carburetor body (63) with throttle spring screws (19). Replace throttle stop pin (12), throttle stop screw (14), and idle stop lockscrew (23). In-

stall throttle lever cover gasket (15) and cover (16); secure with throttle lever clamp screw gasket (17) and clamp screw (18).

b. Insert short starting shutter shaft (61) into carburetor body. Slip packing retainer (57), packing spring (56), and starting shutter dust packing (58) onto the starting shutter shaft (55). Insert shaft part way through the side of the carburetor body. Slide starting shutter (60) through slots in shaft and attach with new starting shutter screws (59). Upset ends of screws after installation.

c. Install locking shaft bearing (5) into carburetor body. Slip dust washer spring (2), retainer (3), and new dust washers (4), over locking shaft and lever (1). Insert shaft halfway into carburetor body. Place cam (7) on the shaft; secure with lockwasher (8) and nut (9). Install a locking shaft body plug (25) and gasket (24).

d. Drive a new drip hole filler (33) and plug (34) into bottom plate (32). Place new metering well gasket (54) over metering well (53), and install metering well securely into bottom plate. Be careful not to bend bottom plate.

e. Slip a new gasket (36) over needle valve cage (35) and screw cage into fuel bowl. Place needle valve in cage. Put a new fiber washer on float lever pivot screw (40). Hold float (46) in position, and push screw through float lever (47) and spacer (48). Install pivot screw in fuel bowl (44). Install strainer screen and retainer (37) and gasket (38).

f. Shellac new gaskets to fuel bowl and bottom plate. Position the bottom plate on the body; secure with cap screws (31).

238. Carburetor Installation

a. Install carburetor body (63, fig. 80) on intake manifold studs. Replace washers (27), lockwashers (28), and nuts (29); do not tighten securely, as slight movement of the body is required to facilitate installation of fuel bowl (44).

b. Install fuel bowl on carburetor body; secure with cap screws (26).

c. Tighten nut (29) to secure the carburetor body to the engine intake manifold studs.

d. Connect starting shutter (60) to the starting shutter shaft (55). Connect the link to locking shaft and lever (1).

e. Connect gasoline tank-to-carburetor pipe (3, fig. 45) to the carburetor. Open gasoline shutoff valve (9, fig. 12).

Section X. FUEL TRANSFER PUMP

239. Description

The fuel transfer pump and strainer (fig. 47) are mounted at the right front side of the engine. The pump is a positive gear type driven by a gear train in the engine front cover. The pump draws

fuel through a fine mesh strainer, contained in a cylindrical case adjacent to the pump. Fuel line tubing connects the strainer to the diesel fuel tank at the rear and to the bottom of the air trap on the engine.

240. Fuel Transfer Pump Disassembly

(fig. 82)

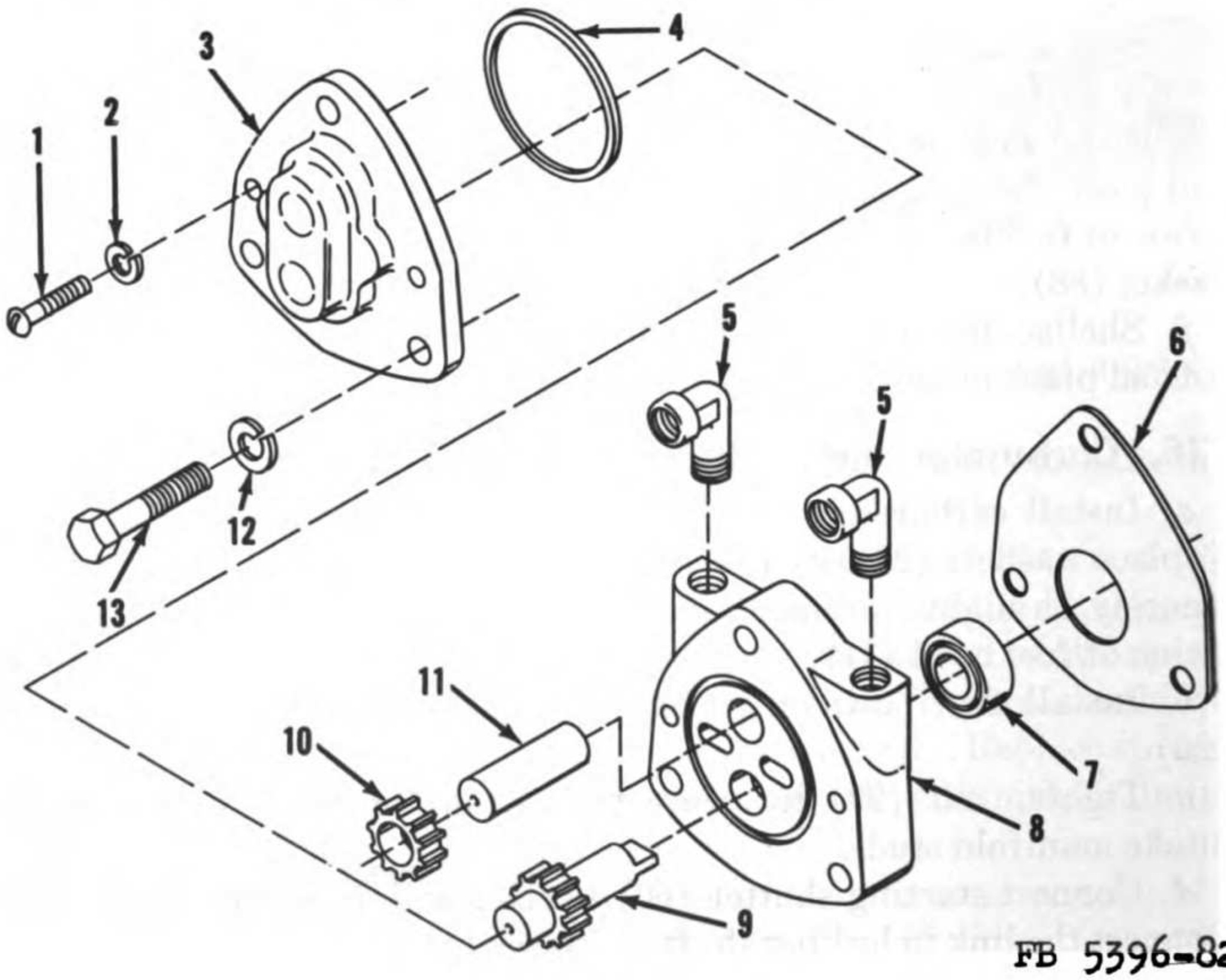
a. Remove the fuel transfer pump from the engine (par. 123*a*).

Caution: Cover all openings and work in a clean place free of dirt and foreign matter.

b. Remove two screws (1) and lockwashers (2) securing pump body cover (3) to pump body (8); remove cover.

c. Remove pump body cover gasket ring (4) from pump body. Lift out pump idler gear (10) and pump drive gear and shaft (9) from body.

d. Press out drive shaft oil seal (7) from body.



1 Screw, mach, ¼ x ⅞ NC (2 Req'd)
2 Lockwasher, ¼ (2 Req'd)
3 Pump body cover
4 Pump body cover gasket ring
5 Elbow
6 Pump gasket
7 Drive shaft oil seal
8 Pump body
9 Pump drive gear and shaft
10 Pump idler gear
11 Pump idler gear shaft
12 Lockwasher, 5/16 (3 Req'd)
13 Screw, cap, hex hd, 5/16 x 1¾ NC (3 Req'd)

Figure 82. Fuel transfer pump, exploded view.

241. Fuel Transfer Pump Cleaning and Inspection

a. Wash all parts in cleaning solvent. Remove dirt, sludge, and scale from gear teeth and all openings. Protect cleaned parts in a covered container.

b. See that gears turn freely on shafts without noticeable side play. Look for pitted gear teeth, worn shafts, or scored gear pockets and cover. Replace defective parts.

242. Fuel Transfer Pump Reassembly

(fig. 82)

a. Press new drive shaft oil seal (7) into pump body (8). Do not distort or damage seal.

b. Install pump idler gear (10) on shaft in pump body, and insert drive gear and shaft (9) into pump body.

c. Install new pump body cover gasket (4) in groove in pump body. Install pump body cover (3); secure with two lockwashers (2) and screws (1).

d. Install the pump on the engine (par. 123*b*).

Section XI. FUEL INJECTION PUMP

243. Description

a. The UD–24 engine used with the compressor is equipped with a twin-plunger injection pump (fig. 51) designed for use with engines operating at 1,200 rpm, full-rated load. The pump uses conventional helix-groove plungers supplying fuel to eight distributor valves in the pump. A flyweight governor is built into the pump. The injection pump is the same as the standard UD–24 model except for a different governor spring used for 1,200 rpm operation.

b. The twin-plunger pump is used on UD–16, UD–18, and UD–24 series engines with minor modifications to adapt them to the different engine sizes. A majority of the parts used in the different pumps are identical.

244. General

The pumps for the UD–24 and UD–18 series differ only in the mounting attachment, plunger unit, governor spring, and control lever. While the dimensions and specifications of these parts differ, overhaul operations and special tools used to perform the operation are identical. The injection pump assembly and mounting attachments is shown in exploded view in figure 83. Pump test specifications are listed under engineering data (pars. 272 through 274). Refer to TM 5–5170 for overhaul instructions.

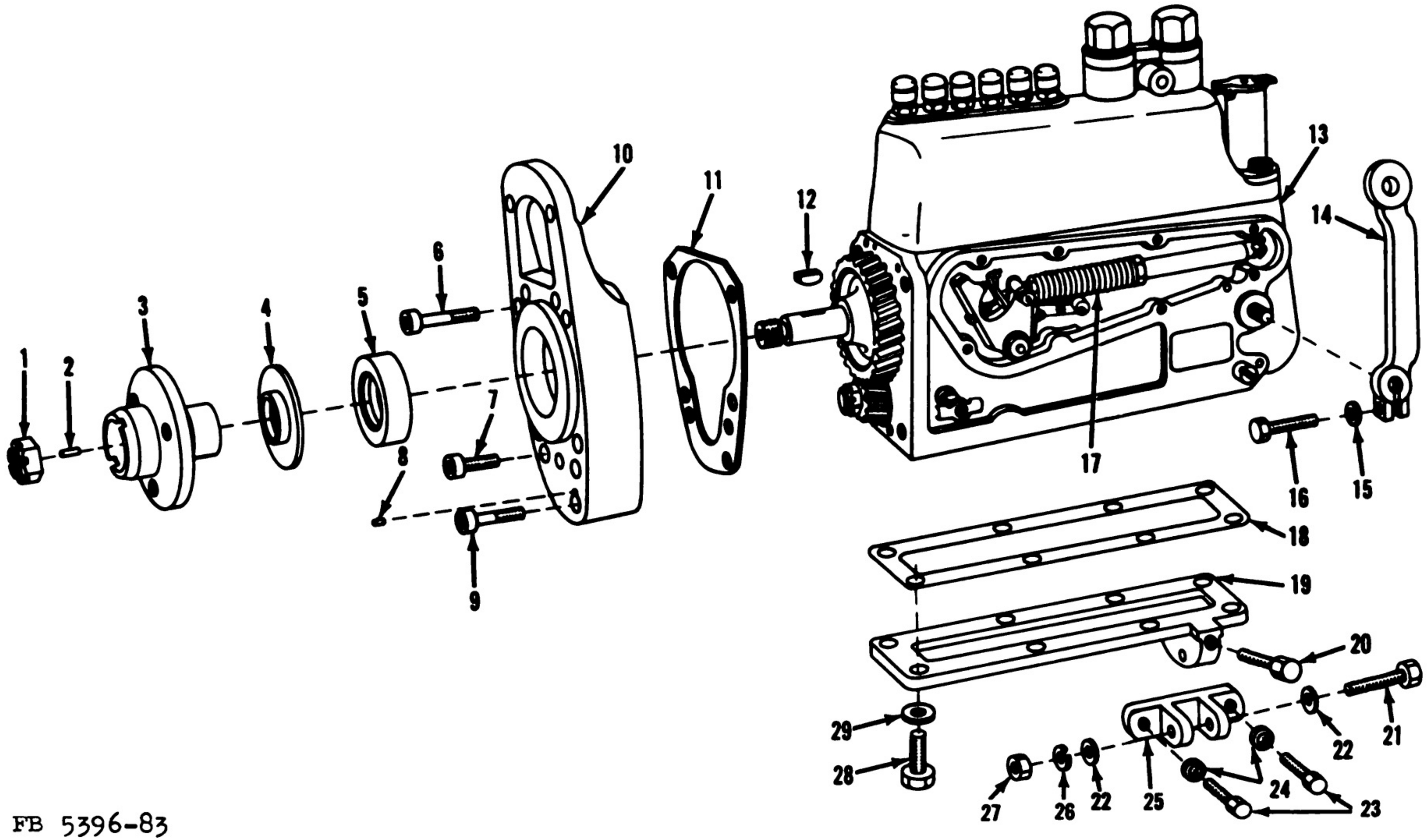


Figure 83. Fuel injection pump assembly, exploded view.

1 Camshaft nut
2 Gear hub packing
3 Gear hub
4 Oil slinger
5 Front cover oil seal
6 Pump flange socket hd cap screw
7 Bearing retainer socket hd screw
8 Lock pump flange cap screw
9 Pump flange socket hd cap screw
10 Pump flange
11 Pump flange gasket
12 Key, woodruff, No. 5—⅛ x ⅝ (1 Req'd)
13 Basic pump
14 Governor control lever
15 Lockwasher, ¼ (1 Req'd)
16 Screw, cap, hex hd, ¼ x ⅞ NC (1 Req'd)
17 Governor spring
18 Pump housing bottom plate gasket
19 Pump housing bottom plate
20 Drain plug
21 Screw, cap, hex hd, ⅜ x 1⅜ NC (1 Req'd)
22 Washer, plain, 13/32 (2 Req'd)
23 Screw, cap, hex hd, ⅜ x 1 NC (2 Req'd)
24 Lockwasher, ⅜ (2 Req'd)
25 Bracket
26 Lockwasher, ⅜ (1 Req'd)
27 Nut, hex, ⅜ NC (1 Req'd)
28 Screw, cap, hex hd, 5/16 x ¾ NF (8 Req'd)
29 Copper washer

Figure 83—Continued.

333270 O—55——15

Section XII. STARTER

245. Description

The heavy-duty starter is a four-pole, eight-brush unit designed for 12-volt operation. It consists of a starting motor and solenoid mounted on the motor frame; both are corrosion and fungus proofed. The starter employs a Dyer drive to engage the drive pinion and flywheel for cranking the engine. Rotation is clockwise viewed from the drive end.

246. Starter Disassembly

(fig. 84)

a. Remove starter (par. 138*a*).

b. Remove lead (3).

c. Remove solenoid (par. 138*f*).

d. Mark the drive housing, center bearing plate, and frame with mating punch marks for reassembly.

e. Remove screws (70) and lockwashers (71); remove motor drive housing (69) together with armature (50).

f. Remove safety wire, screws, (53), and lockwashers (54); remove armature (50) together with Dyer drive assembly from drive housing.

g. Remove dust cover band (35), and disconnect leads from field coils at brushes.

h. Remove screws (8), lockwashers (9), and end frame (11).

Note. Clean and inspect parts at this point. In most cases, further disassembly is not necessary. If, *after* cleaning, opens, shorts, or grounds are found, continue the disassembly to the point needed for repairs.

i. Disassemble Dyer drive as follows:

(1) Remove cotter pin (63). Rotate pinion stop (62) until notches are in register with shaft splines, and slide stop off shaft.

(2) Remove pinion (61) spring (60), shift sleeve (58), washers (56 and 57), and center bearing plate (55).

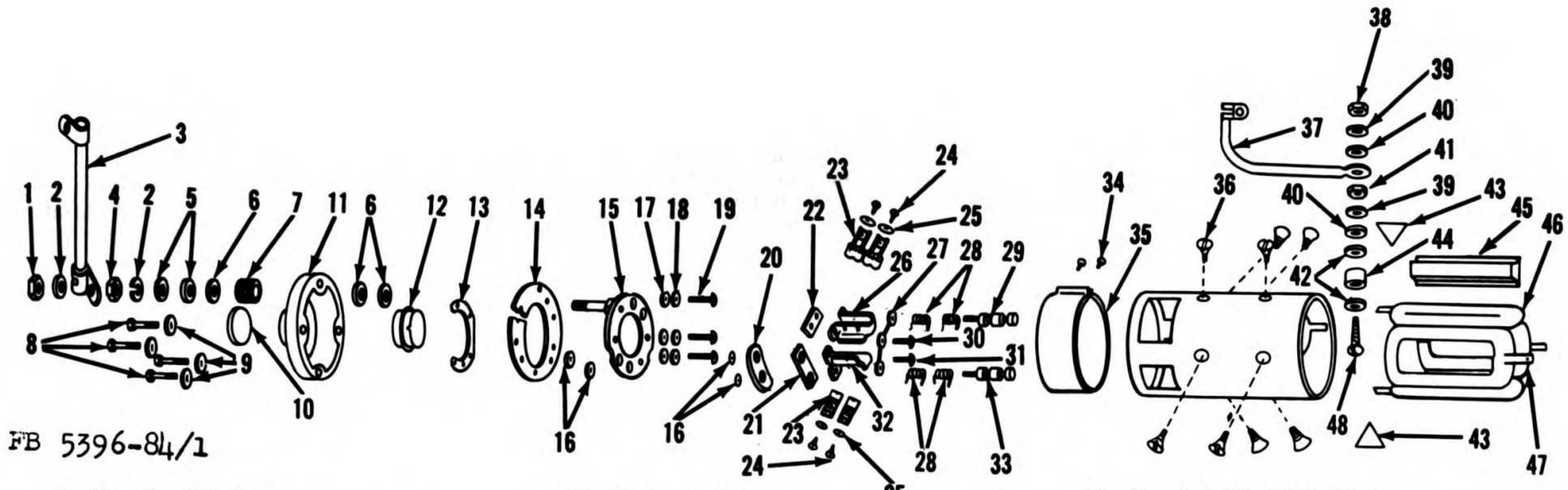
j. Disassemble commutator end frame as follows:

(1) Remove screws (24), washers (25), and brushes (23).

(2) Remove the nut (4), lockwasher (2), and insulating washers (5 and 6) from the brush plate stud.

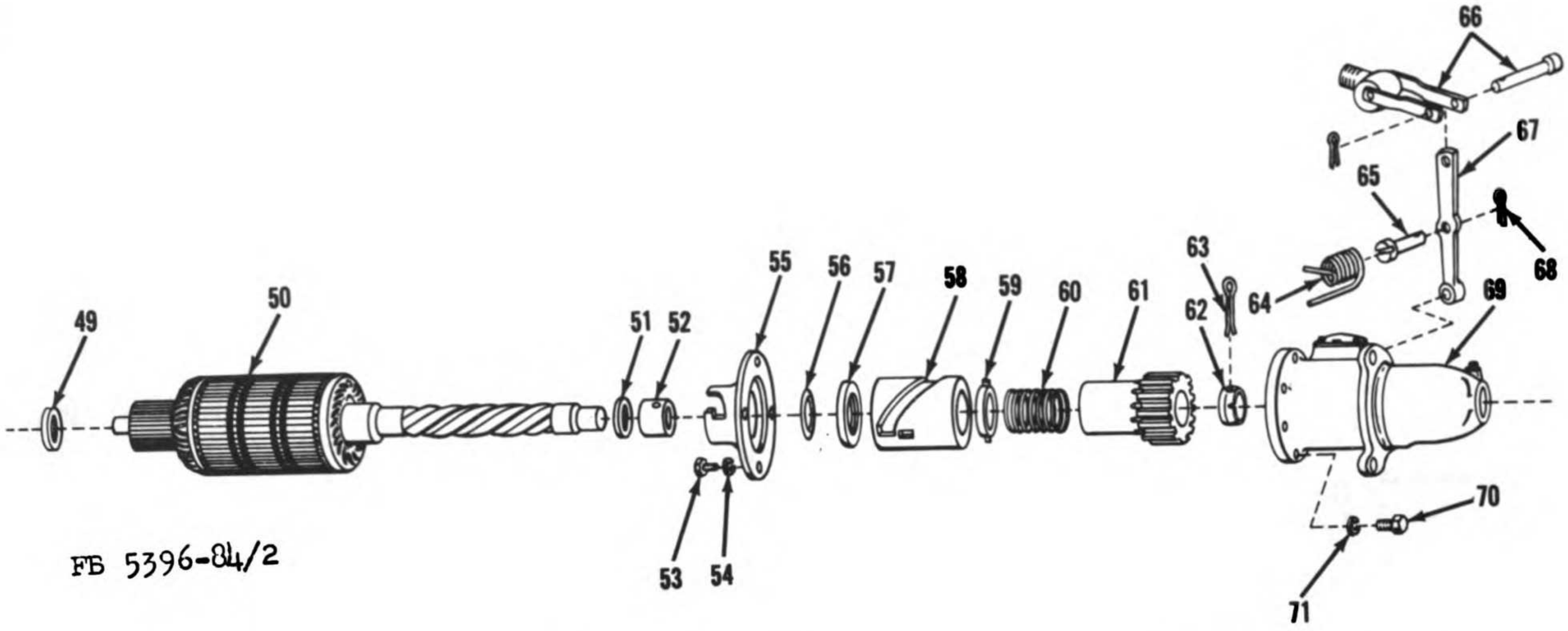
(3) Remove screws (19), lockwashers (18), and washers (17); remove brush plate (15) from end frame (11). Remove bushings (6 and 7).

(4) Remove long and brush holder screws (29 and 30), springs (28), lockwashers (27), grounded brush holder (26), and spacer plate (22).



1 Terminal stud nut
2 Terminal stud lockwasher (2 Req'd)
3 Terminal lead
4 Terminal stud nut
5 Terminal stud insulation washer
6 Terminal stud insulation washer
7 Insulating terminal stud bushing
8 Frame attaching screw (4 Req'd)
9 Frame attaching screw lockwasher (4 Req'd)
10 End plug
11 Commutator end frame
12 Bushing
13 Brush holder support plate (brass)
14 Insulating brush plate
15 Brush stud and plate
16 Washer bushing
17 Plain washer
18 Lockwasher
19 Screw
20 Insulating brush holder plate (2 hole)
21 Brush holder space plate (2 hole insulating brush)
22 Brush holder space plate (2 hole grd brush)
23 Brush
24 Brush lead attaching screw
25 Lockwasher
26 Grounded brush holder
27 Brush holder screw lockwasher
28 Brush spring
29 Grounded brush holder screw
30 Grounded brush holder screw
31 Insulated brush holder screw
32 Insulated brush holder
33 Insulated brush holder screw
34 Cover band screw
35 Cover band
36 Pole shoe screw
37 Solenoid switch cable
38 Field terminal stud nut
39 Field terminal stud lockwasher
40 Field terminal stud plain washer
41 Field terminal stud nut
42 Insulating field terminal stud washer
43 Field coil insulating strip
44 Insulating field terminal stud bushing
45 Pole shoe
46 Right field coil
47 Left field coil
48 Field terminal stud

Figure 84. Starting motor, exploded view.



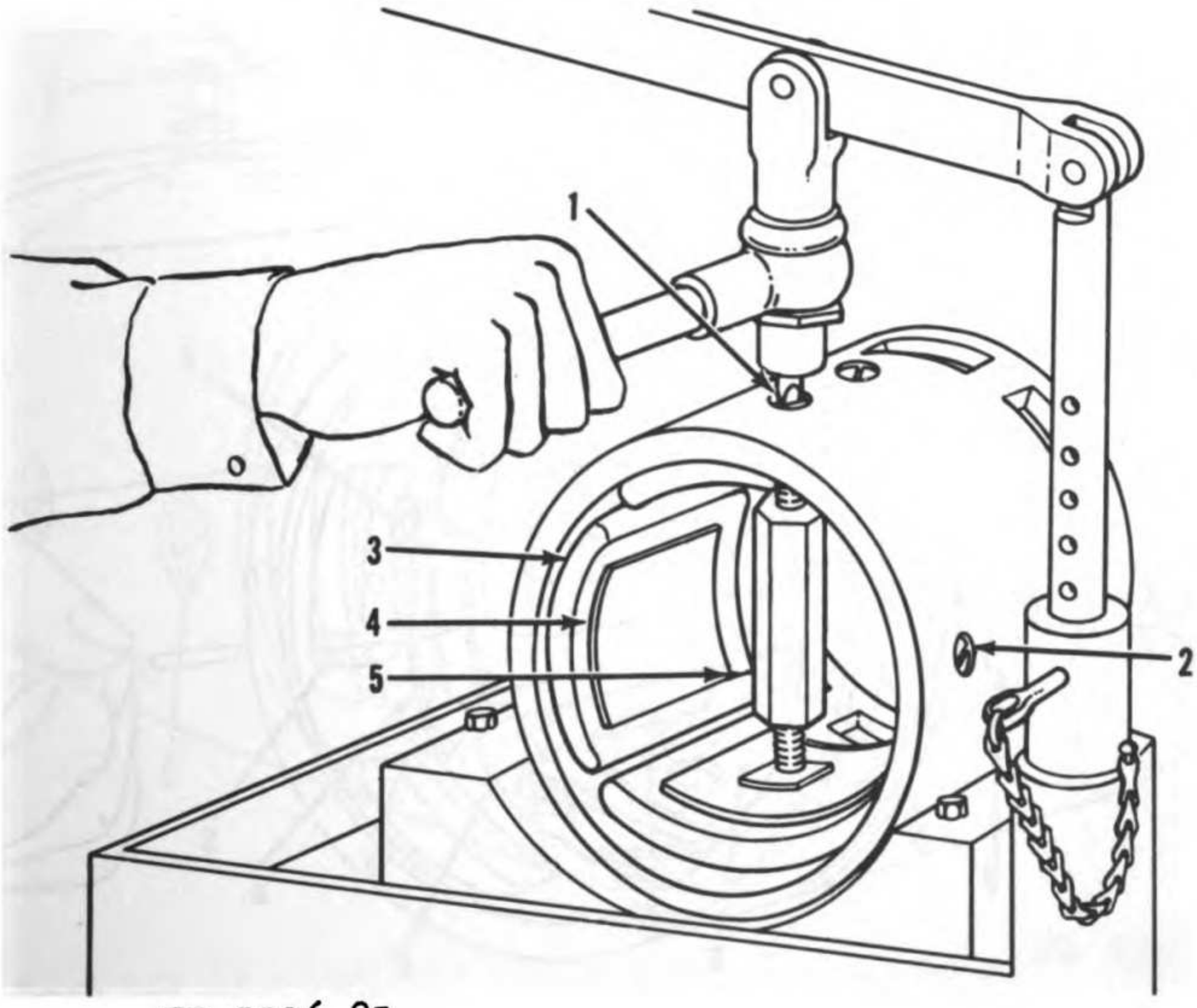
49 Brake washer C. E.
50 Armature
51 Brake shoe washer
52 Bushing
53 Cover plate attaching screw
54 Cover plate attaching lockwasher
55 Center bearing plate
56 Space washer
57 Cupped space washer
58 Motor drive shift sleeve
59 Motor drive pinion guide
60 Motor drive pinion meshing spring
61 Motor drive pinion
62 Motor drive pinion collar stop
63 Stop collar cotter pin
64 Shift lever spring
65 Shift lever pin
66 Shift lever link and adjusting screw
67 Shift lever
68 Shift lever pin, cotter pin
69 Motor drive housing
70 Attaching screw
71 Attaching screw lockwasher

Figure 84. Starting motor, exploded view—Continued.

(5) Remove long and short brush holder screws (31 and 33), springs (28), lockwashers (27), insulated brush holder (32), space plate (21), and insulating plate (20).
(6) Remove brush holder support plate (13), insulating brush plate (14), and bushings (16).
(7) Remove end plug (10) and bushing (12) from end frame (11).

k. Disassemble field frame as follows:
(1) Remove nut (41), lockwasher (39), flat washer (40), and insulating washer (42).
(2) Unsolder filed terminals at head of stud (48), and remove stud, insulating washer (42), and bushing (44).
(3) Remove pole shoe screws (36) (see fig. 85), pole shoes (45, fig. 84), field coils (46 and 47), and insulating strips (43).

l. Disassemble drive housing as follows:
(1) Remove cotter pin (68), pin (65), spring (64).
(2) Remove shift lever (67).



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1 Pole shoe screwdriver
2 Pole shoe screw
3 Pole shoe spreader
4 Pole shoe
5 Field coil

Figure 85. Removing or installing field coils.

247. Starter Inspection and Repair

a. Blow dust and dirt from field frame, commutator end frame, and armature and Dyer drive with dry compressed air. Clean nonelectrical parts with cleaning solvent; dry with compressed air.

b. Inspect all wiring for brittle or damaged insulation. Check all terminal connections and make sure that they are electrically and mechanically secure. Resolder or replace damaged wires.

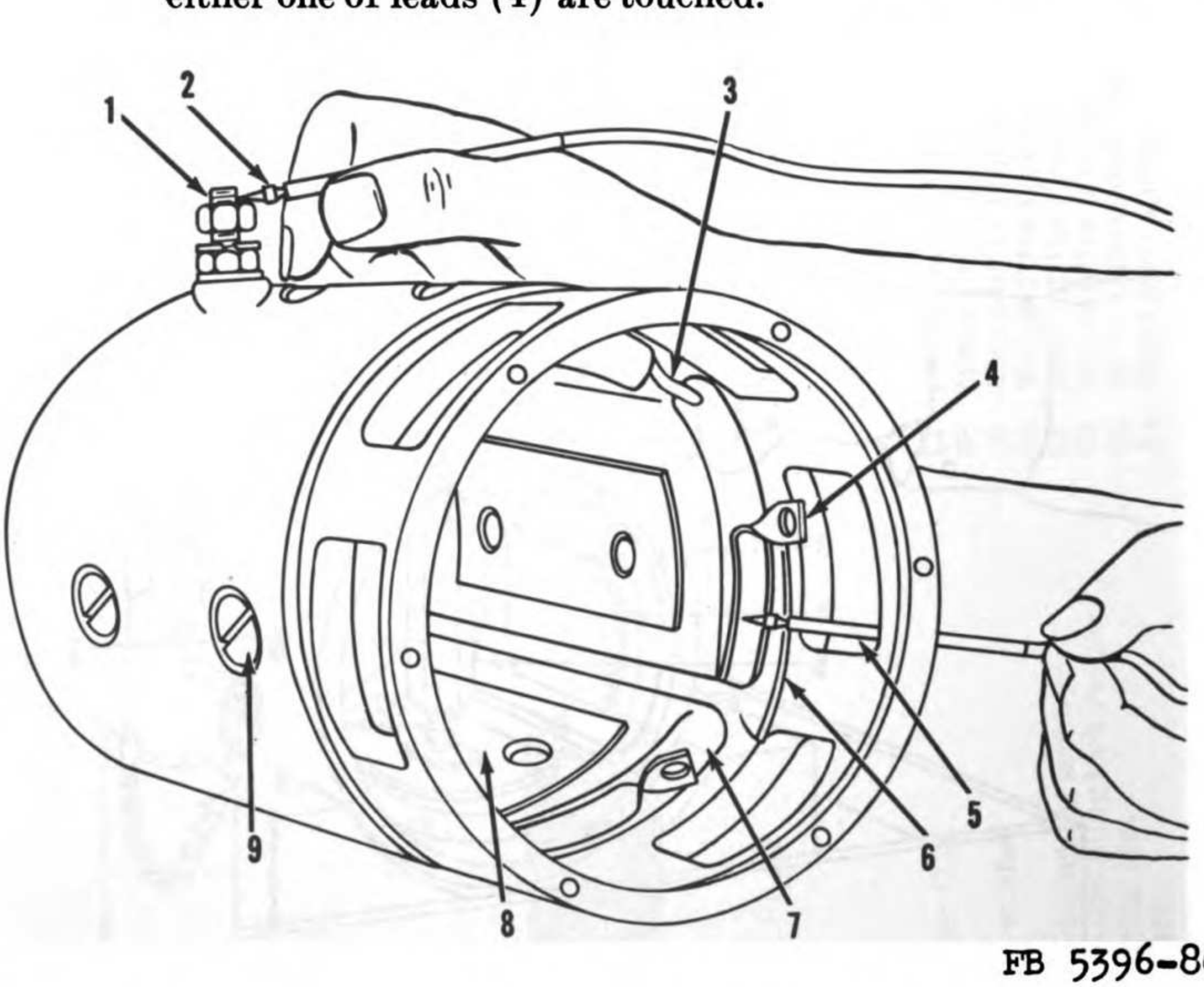
c. Check armature splines and undercut into which pinion stop fits for excessive wear. Replace armature if worn excessively.

d. Check bushings in commutator end frame, drive housing, and center bearing plate for excessive wear. Replace worn bushings.

e. Check drive pinion for chipped or broken teeth. Replace broken glass.

f. Make the following electrical tests on the starter:

(1) Check the field coils for opens as shown in figure 86. A test lamp and test prods are connected in series with a 12-volt battery. Place one prod on field terminal (1) and the other prod on field coil leads (4). The lamp should light when either one of leads (4) are touched.



1 Field terminal
2 Test prod
3 Field coil interconnection
4 Field coil lead
5 Test prod
6 Triangular insulation
7 Field coil
8 Pole shoe
9 Pole shoe screw

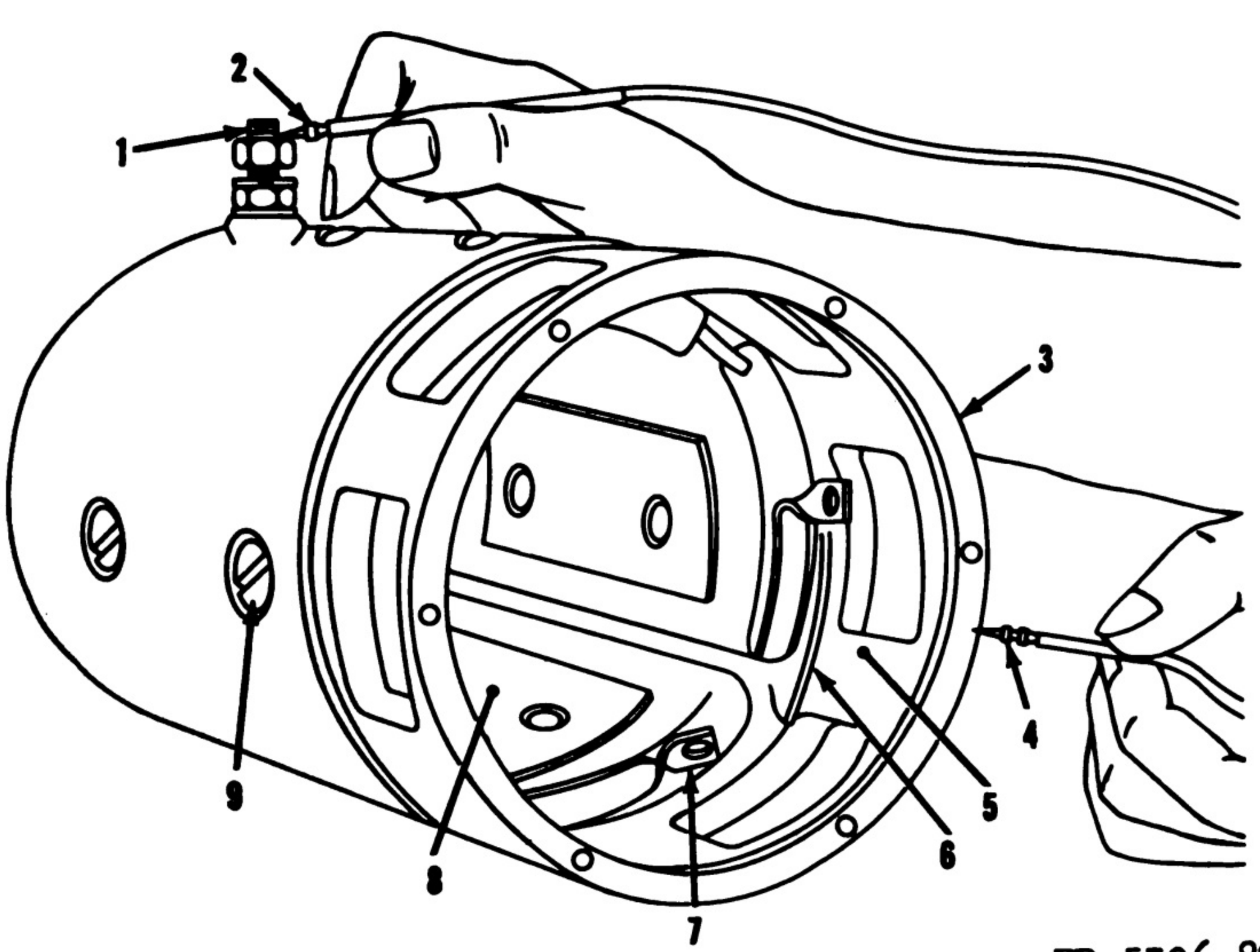
Figure 86. Testing starter field coil for open circuit.

(2) If lamp does not light, check soldered connections at terminal (1). If trouble is not located here, check each coil individually; replace defective coil.

(3) Check starter fields for grounds (fig. 87) by placing one prod on field terminal (1) and the other prod on field frame (3). The lamp should not light; if it does, check insulation of the field coils. Check field coil leads (7) to see that they are touching the frame. Check for damaged field terminal bushing and insulating washers. If trouble is not found at one of these points, check each coil individually; replace defective coil.

(4) Check starter armature for grounds by placing one test prod on the commutator and the other prod on the shaft. The lamp should not light; if it does, replace armature.

(5) Check the armature for open circuits. Place one test prod on one commutator bar and run the other prod around the commutator. One bar on the opposite side of the commutator should cause the lamp to light, indicating a complete circuit.



1 Field terminal
2 Test prod
3 Field frame
4 Test prod
5 Triangular insulation
6 Field
7 Field coil lead
8 Pole shoe
9 Pole shoe screw

Figure 87. Testing starter field coil for ground.

Test each armature winding in the same manner. If lamp does not light, check commutator riser bar for loose leads. Resolder loose leads and recheck. If open cannot be found and repaired, replace armature.

(6) Place the armature on a growler and check for short circuits. Revolve the armature in the growler while holding a hack-saw blade or steel strip on top of it. The blade will vibrate above any shorted winding of the armature. If a short is found, check the commutator bars and risers for shorts. Copper from the brushes, or metal pulled across the commutator bars when the armature is turned, will cause a short.

(7) If commutator is badly worn, burned, or has high mica, turn it down and undercut the mica. Take light cuts, removing only enough metal to bring the commutator to a true surface. Undercut mica segments to one thirty-second of an inch below surface of commutator bars. Clean slots, being careful to remove any copper burs pulled across commutator bars while turning. Sand commutator lightly with No. 00 sandpaper.

(8) Check commutator end frame for opens or grounds. Place one test prod on the insulated brush holder and the other prod on the end frame. The lamp should not light. Repeat this procedure at the other insulated brush holder. If the lamp lights, remove brush holder and install new insulating strips and bushings.

(9) Place one test prod on the grounded brush holder and the other prod on the end frame. The lamp should light. Repeat this procedure at the other grounded brush holder. If the lamp does not light, remove brush holder and clean, or install new brush holder and space plate.

248. Starter Reassembly

a. Reassemble Dyer drive as follows (fig. 84):

(1) Place collar (51), center bearing plate (55), plain thrust washer (56), cupped thrust washer (cupped side toward shift sleeve) (57), and shift sleeve (58) on armature shaft.

(2) Place pinion guide (4, fig. 88) on the armature shaft (lugs toward pinion), and push it onto the shaft as far as groove.

(3) Place spring (5) and pinion (6) on shaft.

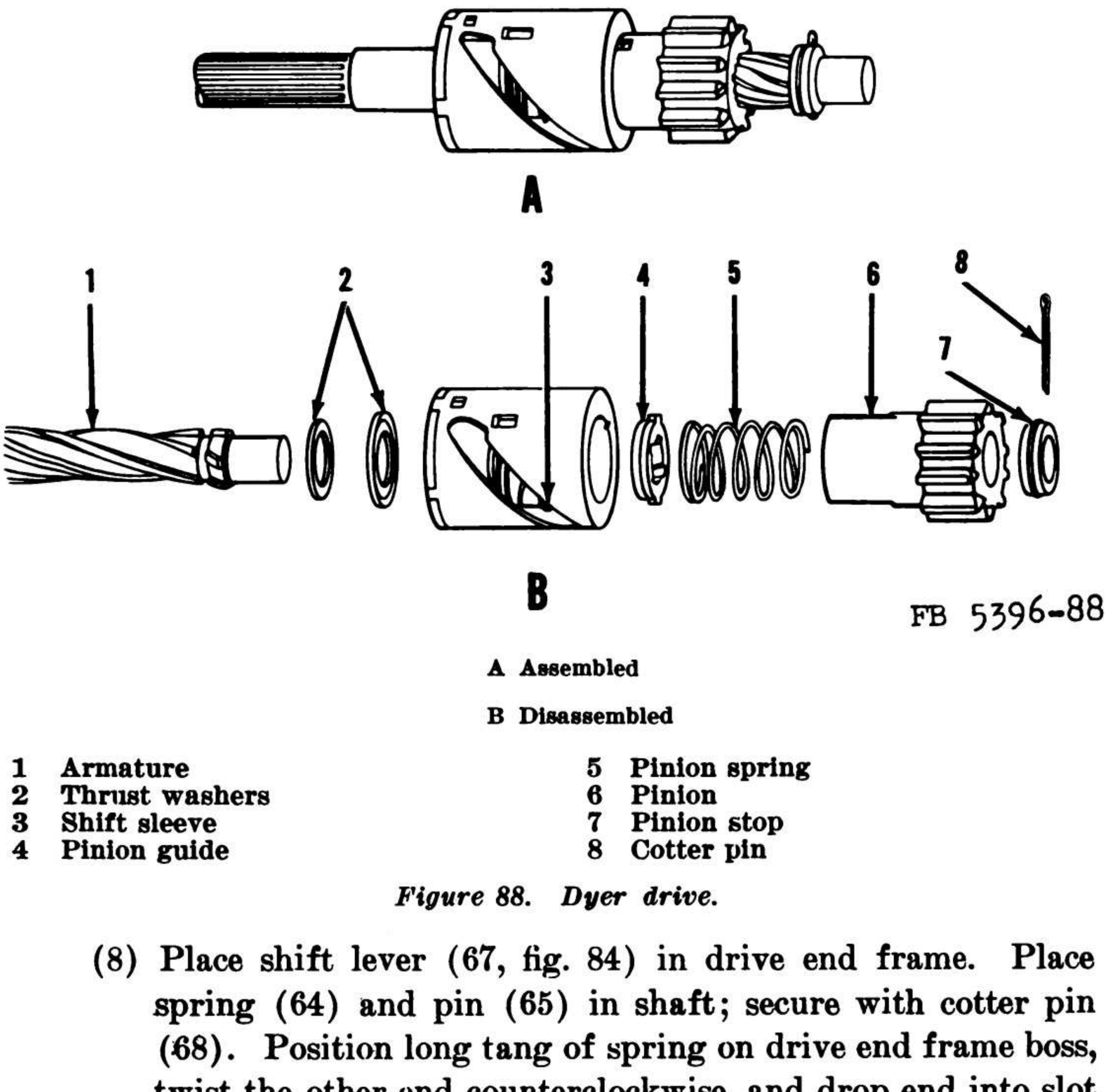
(4) Aline lugs on pinion guide (4) with slots in skirt of pinion (6).

(5) Hold the pinion guide stationary on shaft, and push the pinion onto the shaft with the spring between the guide and the pinion. When the guide lugs are about halfway into the slots in the pinion skirt, rotate the pinion and guide until

the pinion splines and shaft spines aline. Release pinion guide and twist assembly into the shift sleeve.

(6) Twist the assembly on the armature shaft spline grooves until a click is heard. This click results from the pinion guide dropping into the undercut section of the shaft splines, thus locking the assembly in place.

(7) Place pinion stop (7) on the shaft, and position it in groove. Install cotter pin (8), bending ends close around the stop, to prevent interference with the pinion.



A Assembled

B Disassembled

1 Armature
2 Thrust washers
3 Shift sleeve
4 Pinion guide
5 Pinion spring
6 Pinion
7 Pinion stop
8 Cotter pin

Figure 88. Dyer drive.

(8) Place shift lever (67, fig. 84) in drive end frame. Place spring (64) and pin (65) in shaft; secure with cotter pin (68). Position long tang of spring on drive end frame boss, twist the other end counterclockwise, and drop end into slot in shaft.

b. Reassemble commutator end frame as follows:

(1) Press bushing (12) into end frame (11) and ream to size if necessary. Install plug (10) and stake in place.

(2) Install insulating plate (14) and support plate (13) on brush holder plate (15).

(3) Place plate (22) and brush holder (26) on brush plate (15). Secure one side with short screws (30), and lockwashers

(27). Place springs (28) and lockwashers (27) on long screws (29), and secure the other side.

(4) Place bushings (16) in plate (15). Install insulating plate (20), spacer plate (21), and brush holder (32). Secure one side with short screws (31) and lockwashers (27). Place spring (28) and lockwashers (27) on long screws (33), and secure the other side of brush holders.

(5) Place insulating washers (6) on terminal stud, and install brush holder plate in end frame (11); secure loosely with screws (19) and washers (17 and 18).

(6) Place insulating bushing (7), insulating washer (6), plain washer (5), lockwasher (2), and nut (4) on terminal stud in that order; tighten nut. Retighten screws (19) assembled in (5) above.

c. Reassemble field frame as follows:

(1) Place pole shoes (45) in field coils (46 or 47), and install in field frame. Place insulating strips (43) in field frame; secure pole shoes with screws (36) (see fig. 85).

Note. Make sure field coils are properly insulated from the frame, and that right and left coils are installed in their original position. Use spreader bar to hold field coils against frame.

(2) Install field terminal stud (48, fig. 84) and insulating washer (42) in field frame, and solder two field coil leads into the slot in the stud head.

(3) Place insulating bushing (44), insulating washer (42), plain washer (40), lockwasher (39), and nut (41) on terminal stud in that order; tighten nut, being careful not to break soldered connection made in (2) above.

d. Reassemble starter as follows:

(1) Place assembled commutator end frame on field frame and secure with screws (8) and washers (9).

(2) Install brushes (23) in brush holders; connect brushes and field terminals to holder with screws (24) and washers (25).

Note. Field coil terminals are connected to the insulated brush holders.

(3) Raise the brushes in the brush holder, and wedge them in the top of the holder to allow clearance for the commutator. If the brushes will not wedge in the brush holders, hold them up by hooking pieces of wire or nails under the brush leads.

(4) Install armature and Dyer drive in drive housing; secure center bearing plate (55) to drive housing with screws (53) and washers (54). Safety-wire screws.

(5) Install armature and drive housing on field frame; secure with screws (70) and washers (71).

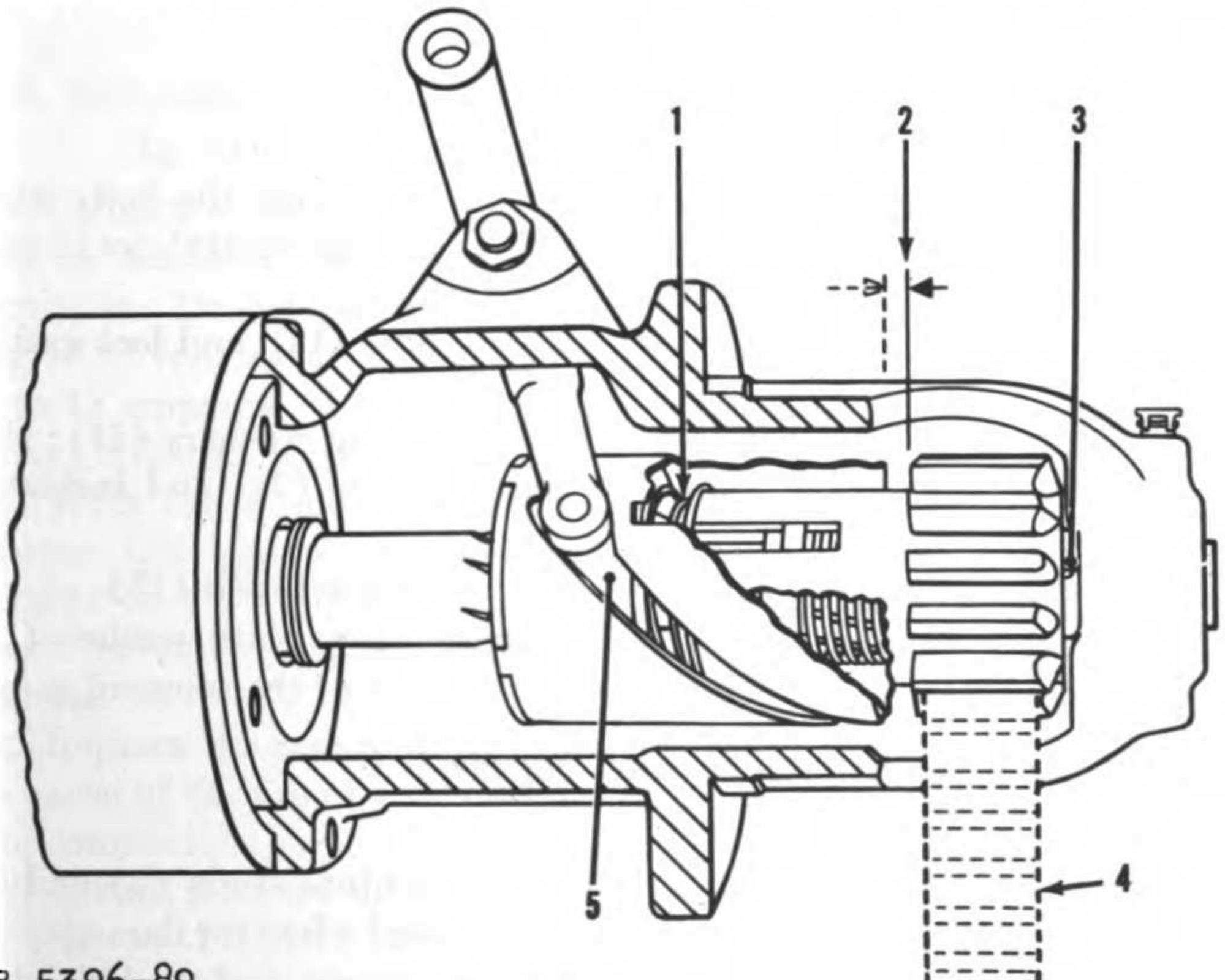
Note. Aline punch marks made before disassembly on drive housing, center bearing plate, and field frame.

(6) Release brushes, making sure that they ride the commutator and that no lead wires to the insulated brushes touch the field frame or armature.

(7) Install cover band (35); secure with screws (34).

e. Install solenoid (par. 138*g*).

f. Disconnect heavy lead between solenoid and starter. Apply battery voltage to solenoid, and help move the shift lever by hand.



1 Shift sleeve spring
2 ⅛-inch pinion travel
3 Pinion stop
4 Engine flywheel
5 Shift sleeve spiral slot

Figure 89. Pinion travel with drive pinion in cranking position.

When the solenoid completes shift lever movement, push the pinion back and measure travel against pinion spring (fig. 89).

g. Adjust pinion travel by removing cotter pin and pin from solenoid linkage and turning stud in or out of solenoid core. Adjustment must be accurate since improper adjustment places sufficient thrust against pinion guide lugs to break them off.

h. Install starter (par. 138*c*).

Section XIII. SOLENOID

249. Description

a. The starter solenoid (6, fig. 37) engages the starter pinion with the flywheel, and closes the circuit energizing the starting motor.

b. The solenoid switch contains a pull-in winding and a hold-in winding. When the starter switch is closed, these windings produce a magnetic field, thus pulling in the plunger. At the same time the starter drive pinion is shifted to mesh with the engine flywheel through a lever and linkage connected to the solenoid plunger. Completion of plunger travel also closes the main switch contacts to energize the motor, and shunts out the pull-in winding.

250. Solenoid Disassembly

(fig. 90)

a. Remove the solenoid from the starter (par. 138*f*).

b. Remove nuts (15) and lockwashers (16) from the body studs. Remove terminal plate (23) and gasket (8), being careful not to damage the solenoid coil lead attached to stud (25).

c. Remove nuts (17), lockwashers (18), nuts (19), and lockwashers (18) from terminal studs (25 and 26).

d. Remove plain washers (20) and insulating washers (21); slide terminal plate (23) off studs. Remove washers (22) and insulation strip (24).

e. Remove cotter pin (2), nut (14), and contact disk (13).

f. Remove cupped washer (12), spring (11), plain washer (10), and cupped washer (9); slide plunger (1) out of the solenoid case.

251. Solenoid Inspection and Repair

(fig. 90)

a. Inspect the contact disk (13) and terminal studs (25 and 26) for burning or pitting. Check spring (11) and wires for damage.

b. Inspect plunger (1) and core for dirt, grease, and the like which might retard movement. Check all insulating washers for cracks or breakdown.

c. Replace any defective parts.

Note. The head on terminal stud (25) is thinner than the head on terminal stud (26) to allow for the coil terminal. Make sure the proper parts are used if new studs are installed.

252. Solenoid Reassembly

(fig. 90)

a. Insert plunger (1) into case (5). Install cupped washer (9) in groove of the plunger rod. Slide plain washer (10), spring (11), plain washer (12), and contact disk (13) over the plunger rod; secure

with nut (14). Install cotter pin (2), and place gasket (8) on the case.

b. Place insulation strip (24) on terminal plate (23), and insert studs (25 and 26) through both pieces. Turn studs so that they are in their original positions.

c. Place washers (22) over studs and push them into the terminal plate.

d. Place insulating washers (21), plain washers (20), lockwashers (18), and nuts (19) on studs in that order. Tighten nuts, being careful not to twist studs in the insulating strip. Lockwashers (18) and nuts (17) are used when the terminal studs are connected to the starting cables.

e. Test the solenoid (par. 253) before installation.

253. Solenoid Testing

(fig. 91)

a. Connect a 12-volt battery across the control terminals in series with an ammeter and rheostat, with a voltmeter across the control terminals. Do not connect jumper at this time. Adjust the rheostat to give 10 volts across the coils, and note the ammeter; it should read 11 to 13 amperes. The plunger should hold itself fully in until the battery is disconnected.

b. With the solenoid connected as in *a* above, add a jumper wire between the control terminal and the terminal stud. Adjust the rheostat to place 10 volts across the coils. The plunger should be drawn in fully, and the ammeter should read between 49 and 55 amperes.

c. Replace the case and coil assembly, if inspection does not reveal the cause of failure of either tests *a* or *b* to be caused by broken leads, poor connections, or burned contacts.

d. Install solenoid on starter (par. 138*g*).

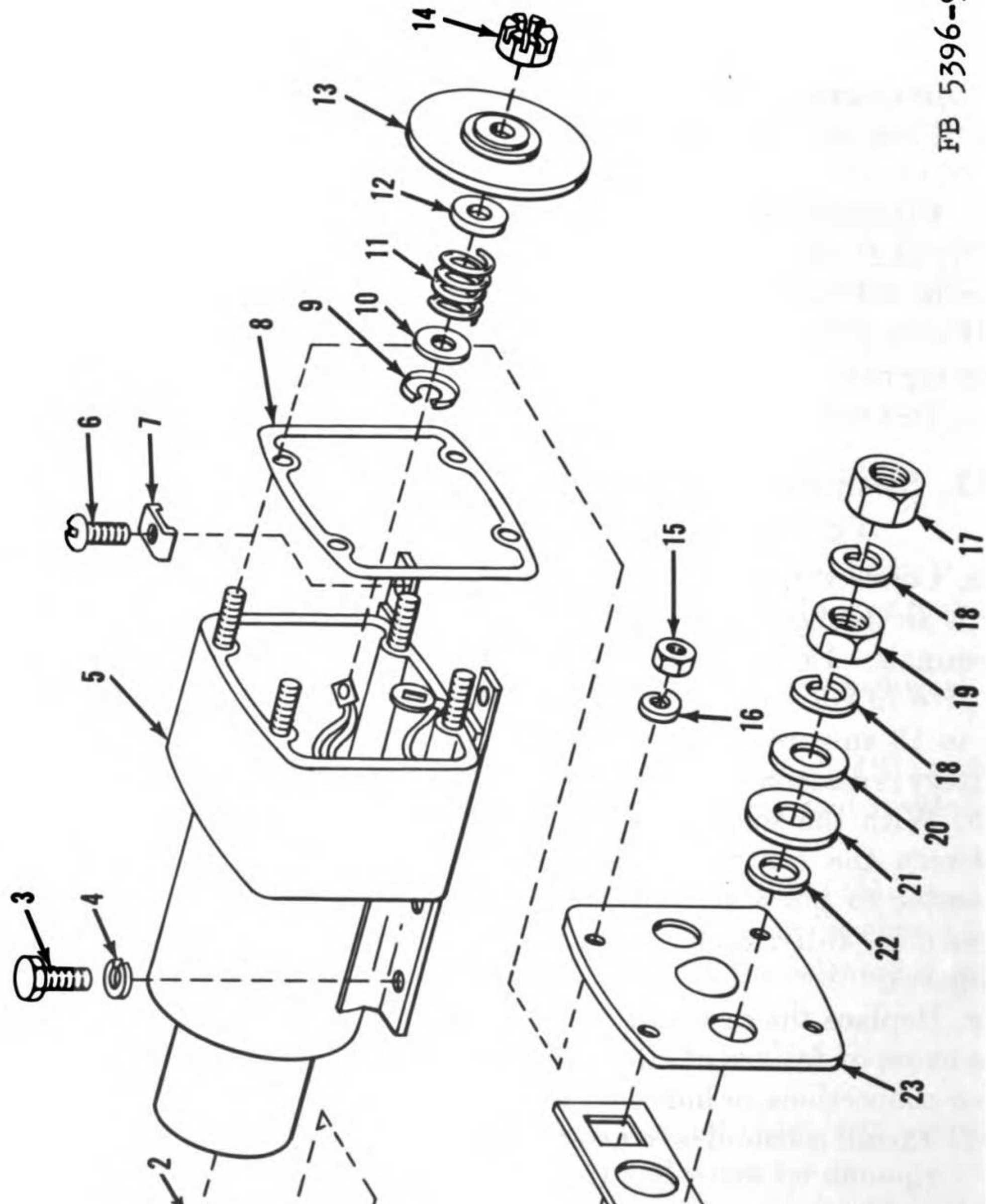


Figure 90. Starting motor solenoid, exploded view.

1 Plunger and rod assembly
2 Pin, cotter, 3/32 x 1 (1 Req'd)
3 Screw
4 Lockwasher
5 Case and assembly
6 Terminal screw
7 Terminal clip
8 Terminal plate gasket
9 Contact spring retainer cupped and slotted washer
10 Contact spring plain washer
11 Contact spring
12 Contact spring retainer cupped washer
13 Contact disk
14 Contact attaching nut
15 Terminal plate nut
16 Lockwasher
17 Terminal stud nut
18 Lockwasher
19 Terminal stud nut
20 Washer
21 Insulation washer
22 Insulation washer
23 Terminal plate
24 Insulation strip
25 Terminal stud
26 Terminal stud

Figure 90—Continued.

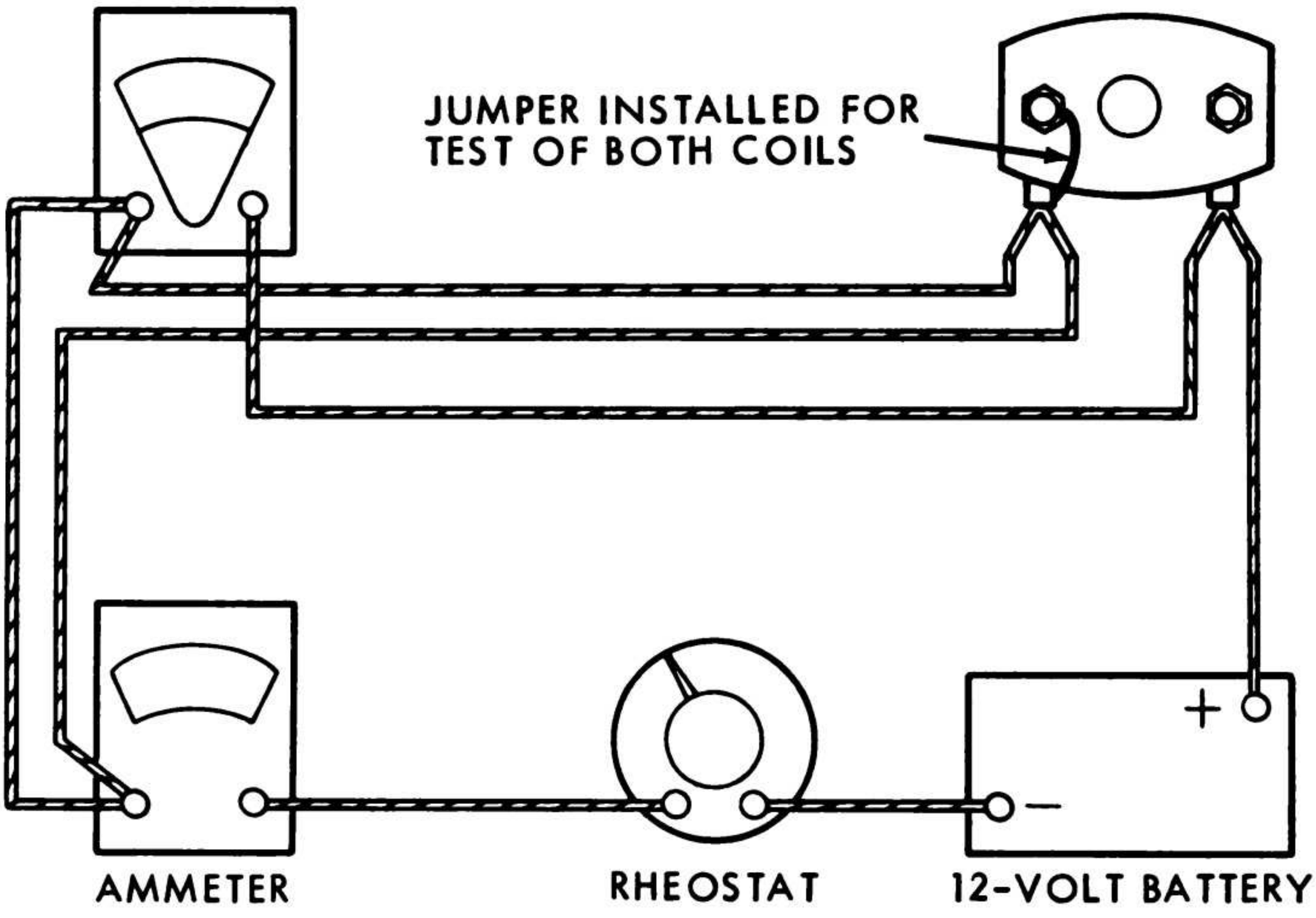


Figure 91. Testing solenoid.

Section XIV. GENERATOR

254. Description

A regulator-controlled generator (7, fig. 43) is mounted on the fan idler bracket and is driven through a coupling connected to the generator fan belt idler. The generator is a 12-volt, two-brush, shunt unit with ball bearings at both drive and commutator ends of the shaft. The generator has been treated against both fungus and corrosion and uses a capacitor (condenser) for radio-interference suppression.

255. Generator Disassembly

(fig. 92)

a. Remove generator (par. 134*a*).

b. Remove cover band (11) and disconnect ends from armature brush. Remove through bolts (2) and lockwashers (3). Remove armature (32) together with drive end frame (24) from field frame (18); remove commutator end frame (7), and remove brushes (9) from the end frame.

Note. **Make punch marks on drive end frame and field frame so they can be reassembled in their original positions.**

c. Clean and inspect generator at this point; usually further disassembly is not necessary. If further repairs are needed after cleaning, continue the disassembly.

d. Place the armature in a vise with soft copper jaws. Remove nut (20), lockwasher (21), coupling (22), space collar (23), drive end frame (24), woodruff key (31), and space washer (30). Use a puller on the coupling if necessary.

e. Remove bearing retainer plate (29), gasket (28), bearing (27), felt washer retainer (26), and felt washer (25). Do not press against the inner race of bearing (27).

f. Remove end cover plate (1), gasket (4), and bearing (5) from the commutator end frame (7). Do not press against the inner race of bearing (5).

g. Remove screw (12), lockwasher (13), and capacitor (condenser) (14). Remove armature and field terminal stud nuts and washers. Remove pole shoe screws, pole shoes, and field coils (fig. 85). Mark pole shoes, coils, and field frame so they can be reassembled in their original positions.

256. Generator Inspection and Repair

a. Clean dirt and dust out of generator parts with dry compressed air. Clean nonelectrical parts in cleaning solvent; dry with compressed air. Clean bearings; lubricate with light oil. Spin bearings and check for roughness; replace rough bearings. Check wiring for insulation. Check connections to make sure that they are electrically and mechanically sound. Replace or resolder if necessary, using a rosin flux.

b. Connect two test prods and a 12-volt lamp in series with a 12-volt battery to make electrical checks. Check the field coils (fig. 93) for open circuits by placing one prod on the field terminal stud (3) and the other prod on the field coil lead (8). The lamp should light; if it does not, check connection at field terminal stud and connecting wire between the two field coils. If trouble is not located at one of these points, check each coil individually, and replace open coils.

c. Check field coils for grounds. Place one prod on the field terminal stud (3) and the other prod on the field frame. The lamp should not light; if it does, check for dirt or damaged insulating bushing and washers at the field terminal stud. Check insulation of field coils and interconnecting wire (7). If trouble is not located at one of these points, check each coil and the field terminal stud individually. Replace the defective part.

d. Check field coils for shorts. Connect an ammeter in series with the test prods and battery; place one prod on field terminal stud (3) and the other on field coil lead (8). The current flow through both coils should be between 1.22 and 1.32 amperes at 80° F. If the ampere reading is high, replace the coils.

Note. Make this test as rapidly as possible, as a shorted field may draw excessive current which can damage the ammeter.

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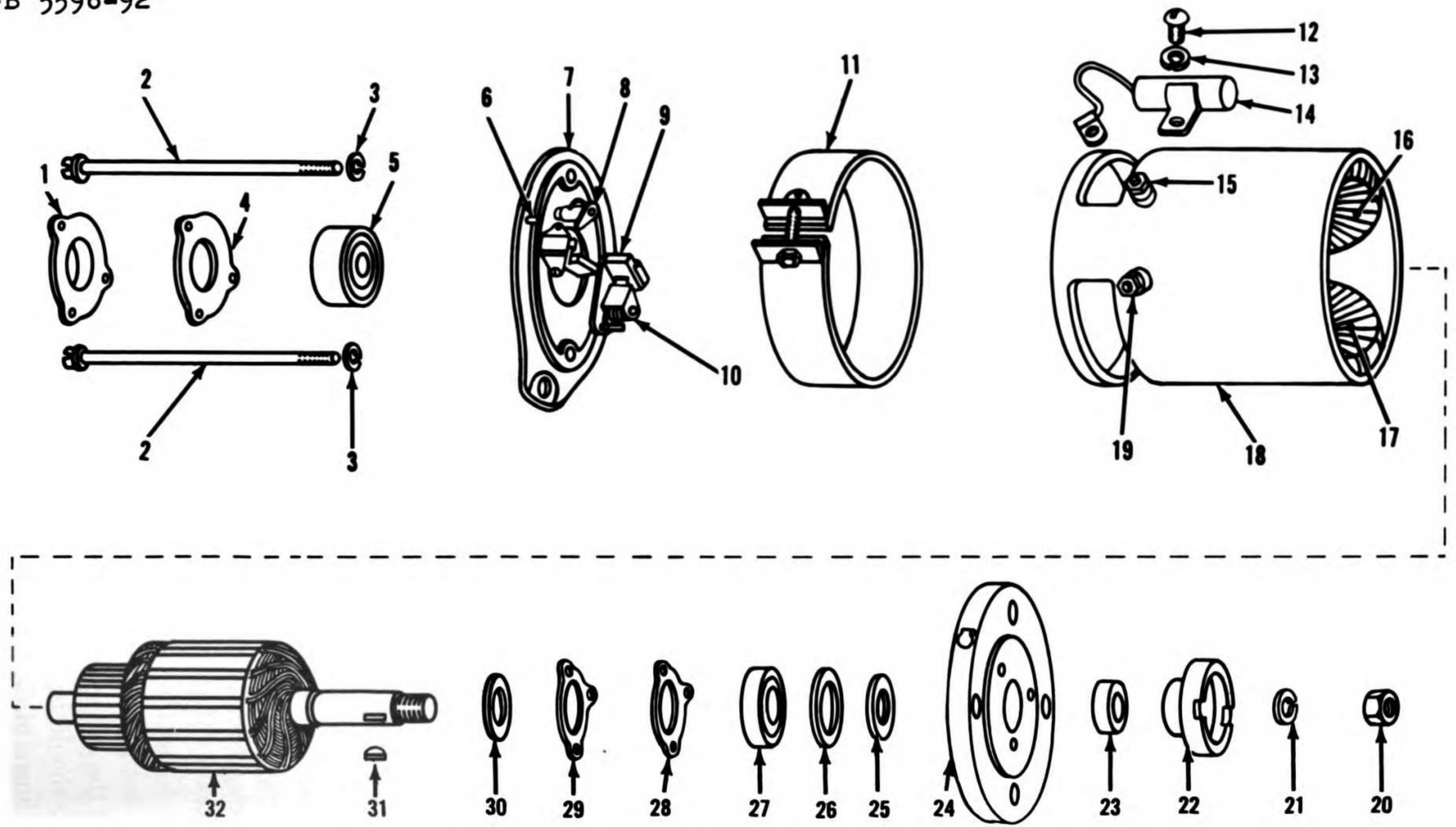
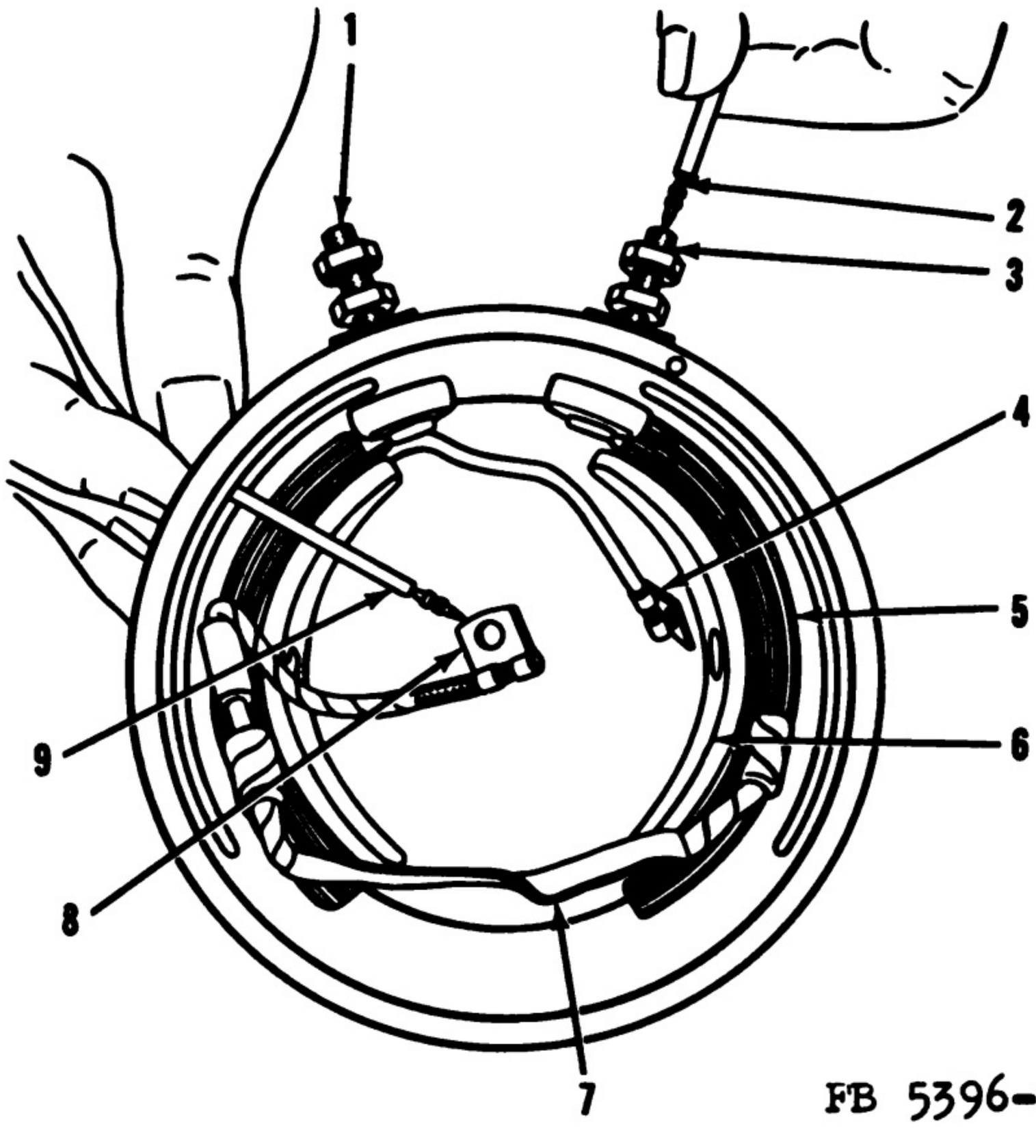


Figure 92. Generator, exploded view.

1 End cover plate
2 Through bolt
3 Through bolt lockwasher
4 End cover plate gasket
5 Ball bearing
6 Dowell pin
7 Commutator end frame
8 Brush arm
9 Brush
10 Brush spring
11 Cover band
12 Cover screw
13 Cover screw lockwasher
14 Capacitor (generator A terminal)
15 Terminal stud
16 Right field coil
17 Left field coil
18 Frame
19 Terminal stud
20 Shaft nut
21 Shaft nut lockwasher
22 Coupling
23 Outside space collar
24 Drive end frame
25 Felt washer
26 Felt washer retainer
27 Ball bearing
28 Ball bearing retainer plate gasket
29 Ball bearing retainer plate
30 Inside space washer
31 Woodruff key
32 Armature

Figure 92—Continued.



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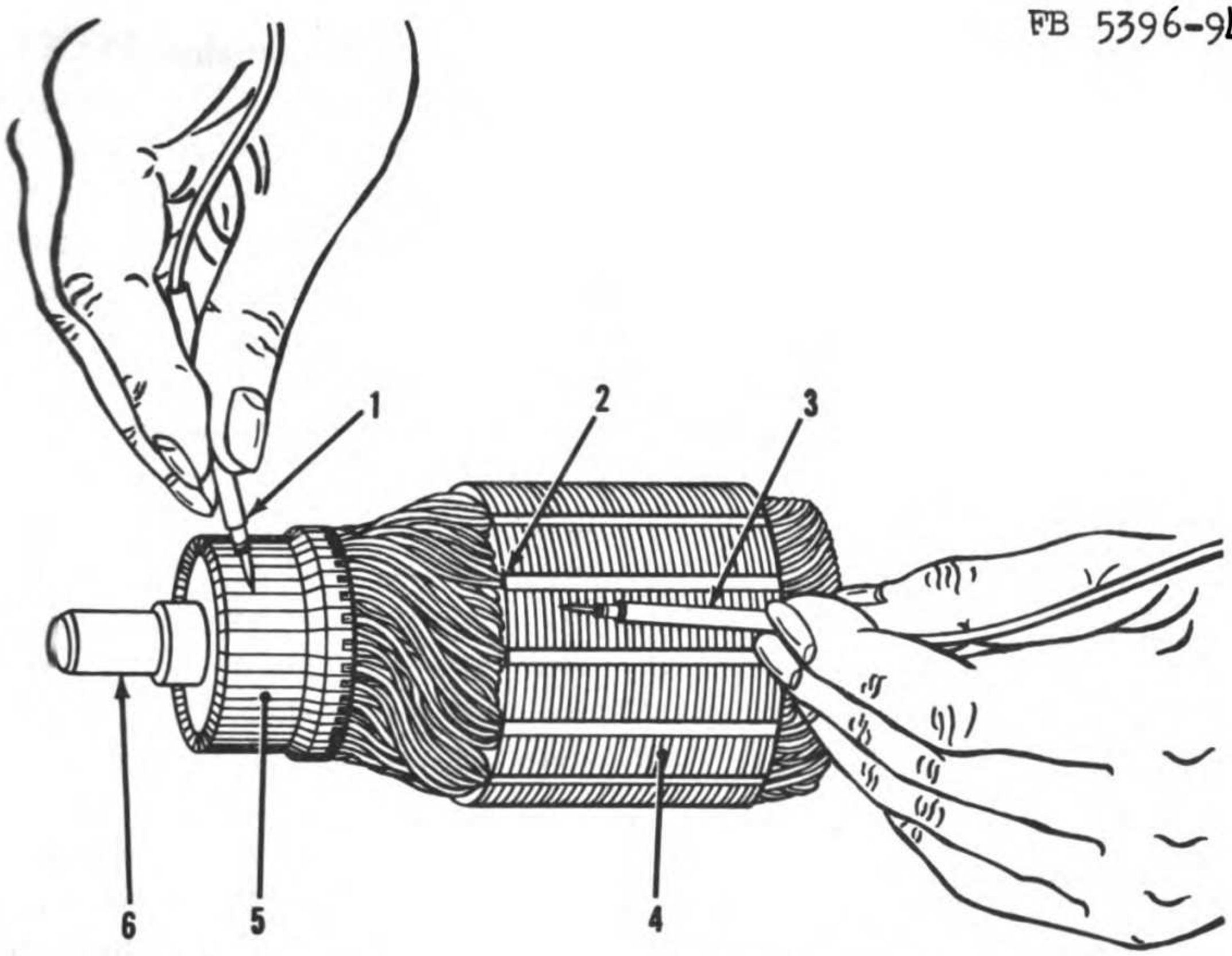
1	Armature terminal stud	6	Pole shoe
2	Test prod	7	Insulating tube on coil interconnection
3	Field terminal stud	8	Field coil lead
4	Leadout to main brush	9	Test prod
5	Field coil		

Figure 93. Testing generator field coils.

e. Check the commutator end frame for grounds or opens. Place one prod on the armature brush holder (insulated) and the other prod on the field frame. The lamp should not light; if it does, check for a dirty or corroded brush holder. If the trouble is not located there, replace end frame. Place one prod on the grounded brush holder and the other prod on the frame. The lamp should light; if it does not, replace the end frame.

f. Check the armature for grounds or opens (fig. 94). Place one test prod on commutator (5) and the other prod on core (4). The lamp should not light; if it does, replace the armature. Place one test prod on a commutator bar and run the other prod back and forth on the opposite side of the commutator. One bar on the opposite side should cause lamp to light. Check each commutator bar in this manner. If lamp does not light, check for loose windings in the riser bars. Resolder any loose windings, and recheck. If trouble is not found and repaired, replace armature.

g. Check the armature for shorts, using a growler. Place the armature in the growler and revolve the armature slowly while holding a



1	**Test prod**	**4**	**Armature core**
2	**Slot in armature core**	**5**	**Commutator**
3	**Test prod**	**6**	**Armature shaft**

Figure 94. Testing generator armature.

hacksaw blade or thin strip of steel on top of the armature. The blade will vibrate above any shorted coil in the armature. If the blade vibrates, check the commutator and riser bars to make sure they are all insulated from one another. Dirt, brush dust, or metal, pulled across the commutator bars when turning down the commutator, will short the field coils.

h. Repair the armature by cutting down the commutator bars and undercutting the mica. Take light cuts and remove only enough metal to bring the commutator to a true surface. Undercut mica to one thirty-second of an inch below the commutator surface. Sand the commutator lightly with No. 00 sandpaper. Check the commutator for out-of-round; it should be true within 0.005 inch. Repeat test procedures described in *f* and *g* above.

257. Generator Reassembly

a. Replace field coils (16 and 17, fig. 92) and terminal studs (15 and 19) in field frame. Make sure that the coils are reassembled in their original location and that they are properly insulated from the field frame. Repeat tests described in paragraph 256*b*, *c*, and *d*.

b. Reassemble drive end frame (24). Place felt washer (25) in end frame; secure with retainer (26). Press bearing (27) into end frame, pressing on outer race only. Place gasket (28) and bearing retainer plate (29) on the end frame; secure with three screws.

c. Place armature (32) in a copper-jawed vise, and place spacer washer (30) over shaft. Install assembled end frame (24) on shaft. Place spacer collar (23) on shaft. Install woodruff key (31) in slot in armature shaft. Aline slot in coupling (22) with woodruff key, and slide coupling onto the shaft; secure with lockwasher (21) and nut (20).

d. Reassemble commutator end frame. Press bearing (5) into frame (7) (pressing on outer race only). Place gasket (4) and end cover plate (1) on end frame; secure with three screws and lockwashers. Install brushes (9) in brush holders. Secure grounded brush lead to brush holder with screw and lockwasher, then wedge both brushes at the top of brush holders to provide clearance for the commutator.

e. Install the armature and drive end frame on field frame housing (18), alining the punch marks made at disassembly. Place commutator end frame (7) on housing, alining dowel pin (6) with hole in housing. Place lockwashers (3) on through bolts (2), and insert bolts into holes in the commutator end frame. Push bolts through field frame and tighten in drive end frame. Draw the bolts down evenly to prevent cocking the bearings on the armature shaft.

f. Release the brushes, making sure that they ride the commutator; connect the brush lead, field coil, and armature lead to the insulated brush holder. Secure with screw and lockwasher. Spin generator (clockwise as viewed from drive end) by hand to make sure that the shaft is not binding and that the brushes are installed properly. A rather loud clicking is heard at the brushes if they are installed backward. Install cover band (11) and tighten screw. Place capacitor (14) on field frame; secure with screw (12) and lockwasher (13). (The capacitor lead is connected to the A terminal on the generator.)

258. Generator Testing

a. Place the generator in a generator test bench, and drive the generator in a clockwise direction as viewed from the drive end.

b. Ground the field terminal to the frame, and connect the armature terminal to an ammeter and switch in series with a 12-volt battery. Connect a voltmeter with a 20-volt scale from the armature terminal to ground.

c. Drive the generator at about 500 rpm, and close the switch. Increase speed to 1,300 rpm, and observe voltmeter and ammeter readings. The cold output should be 13 amperes at 15 volts.

d. The above test can be made with the generator mounted on the engine; however, take care not to run the generator too fast, as the excess voltage may damage the generator, test equipment, or other electrical accessories.

e. Install the generator (par. 134*c*).

Section XV. GENERATOR REGULATOR

259. Description

a. Generator output is controlled by a three-unit generator regulator. The regulator is designed for use with a shunt-type generator with externally grounded field circuits and contains a cutout relay,

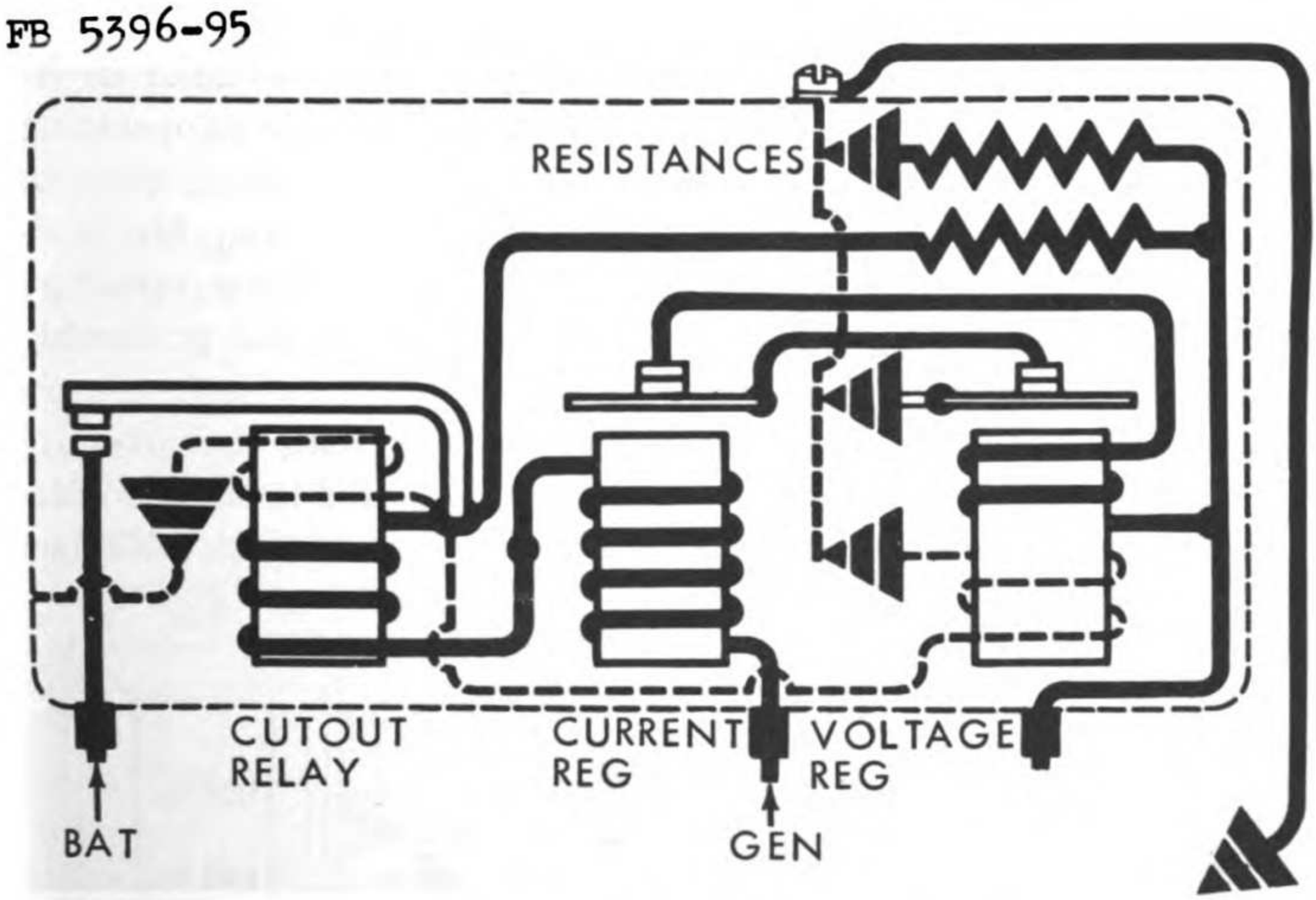


Figure 95. Generator regulator windings.

voltage regulator, current regulator, and two resistors, connected as shown in figure 95.

b. The cutout relay acts as an automatic switch between the generator and battery; it closes when the generator voltage is higher than battery voltage to permit generator current to flow to the battery. The cutout relay closes and interrupts this charging circuit when generator speed and voltage drop.

c. The current regulator consists of a series winding assembled on a core with an armature and contact above the core; all the generator output flows through this winding. The regulator is adjusted to limit the maximum output of the generator by inserting a resistance in the

generator field circuit if output exceeds the regulator setting. The regulator points vibrate about 250 times per second.

d. The voltage regulator consists of a series winding (solid line, fig. 95) and a shunt winding (dotted line) assembled on a common core with an armature and contact above the core. The shunt winding is paralleled to the main circuit connecting the generator brush to the battery. With this circuit the regulator makes and breaks the generator field circuit about 250 times a second and maintains constant generator voltage. (The voltage regulator does not operate when the current regulator operates.)

260. Generator Regulator Checks and Adjustments

a. General.

(1) Electrical checks and adjustments may be made either on or off the unit. The regulator should be mounted in its operating position with the cover on and must be at operating temperature. Operate the engine for 15 or 20 minutes to bring the regulator up to operating temperature. Mechanical checks and adjustments (air gaps and point opening) must be made with the battery disconnected and preferably with the regulator removed (par. 135*a*).

(2) Make electrical checks on the regulator with the cover installed and the readings noted and compared to the specifications in table IV; then remove the cover and adjust. Replace

Table IV. Generator Regulator Adjustments

Cutout relay:		
Air gap	Measure between armature and center of core.	0.020 in.
Point opening	Measure between points	0.020 in.
Closing voltage [1]		11.8–13.6 volts
Adjust to		12.8 volts.
Voltage regulator:		
Air gap	Measure between armature and center of core.	0.075 in.
Voltage setting range [2]		13.9–14.9 volts.
Adjust to		14.3 volts.
Current regulator:		
Air gap	Measure between armature and center of core.	0.075 in.
Current setting range		10.5–13.5 amp.
Adjust to		12 amp.

[1] Current and voltage apply only at operating temperature. Operating temperature will be assumed to exist after not less than 15 minutes of continuous operation with a charge rate of 8 to 10 amperes.

[2] Adjustment need not be made if check shows value within range given. When adjustment is necessary, adjust to specified value.

cover and recheck the settings; if the settings are not correct, remove the cover and readjust.

Caution: The cutout relay contact points must not be closed by hand when the battery is connected to the regulator. This regulator must be used only with an electrical system having a positive ground.

b. Electrical Checks.

(1) Check the cutout relay for contact point closing voltage (fig. 96). Connect a voltmeter between the regulator GEN terminal and ground. Slowly increase the generator speed and note the relay closing voltage (the voltmeter hand will jump as cutout closes). If the engine cannot be idled slowly enough to open the cutout relay contact points, an alternate method may be used (fig. 96). Connect a 25-ohm, 25-watt variable resistance in series with the field circuit. With the generator operating at medium speed, slowly decrease resistance until cutout relay points close and note closing voltage. If closing voltage is not in accordance with table IV, adjust voltage by turning screw clockwise to increase voltage and counterclockwise to decrease voltage (fig. 97). If the cutout relay cannot be adjusted to meet the electrical

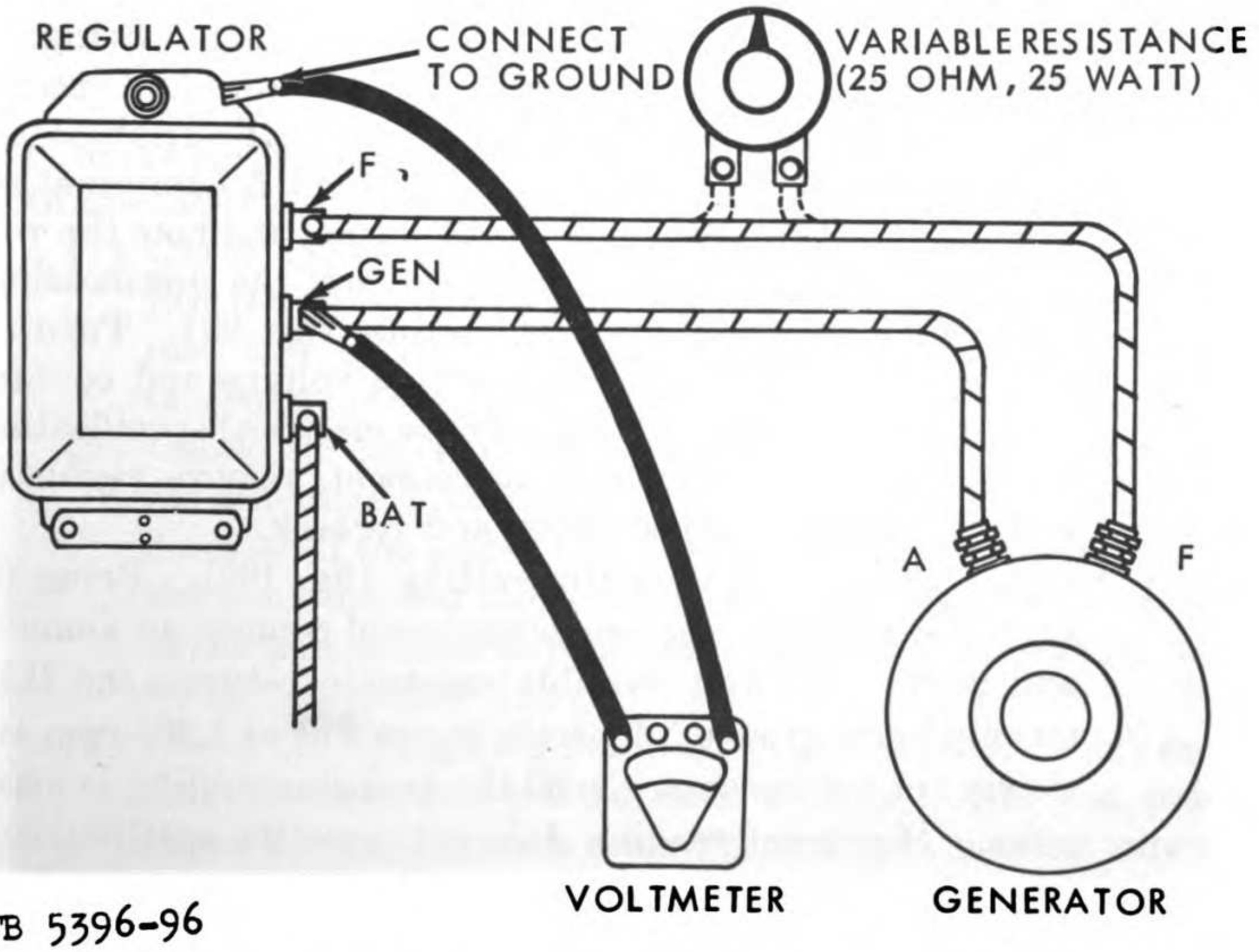


Figure 96. Checking cutout relay closing voltage.

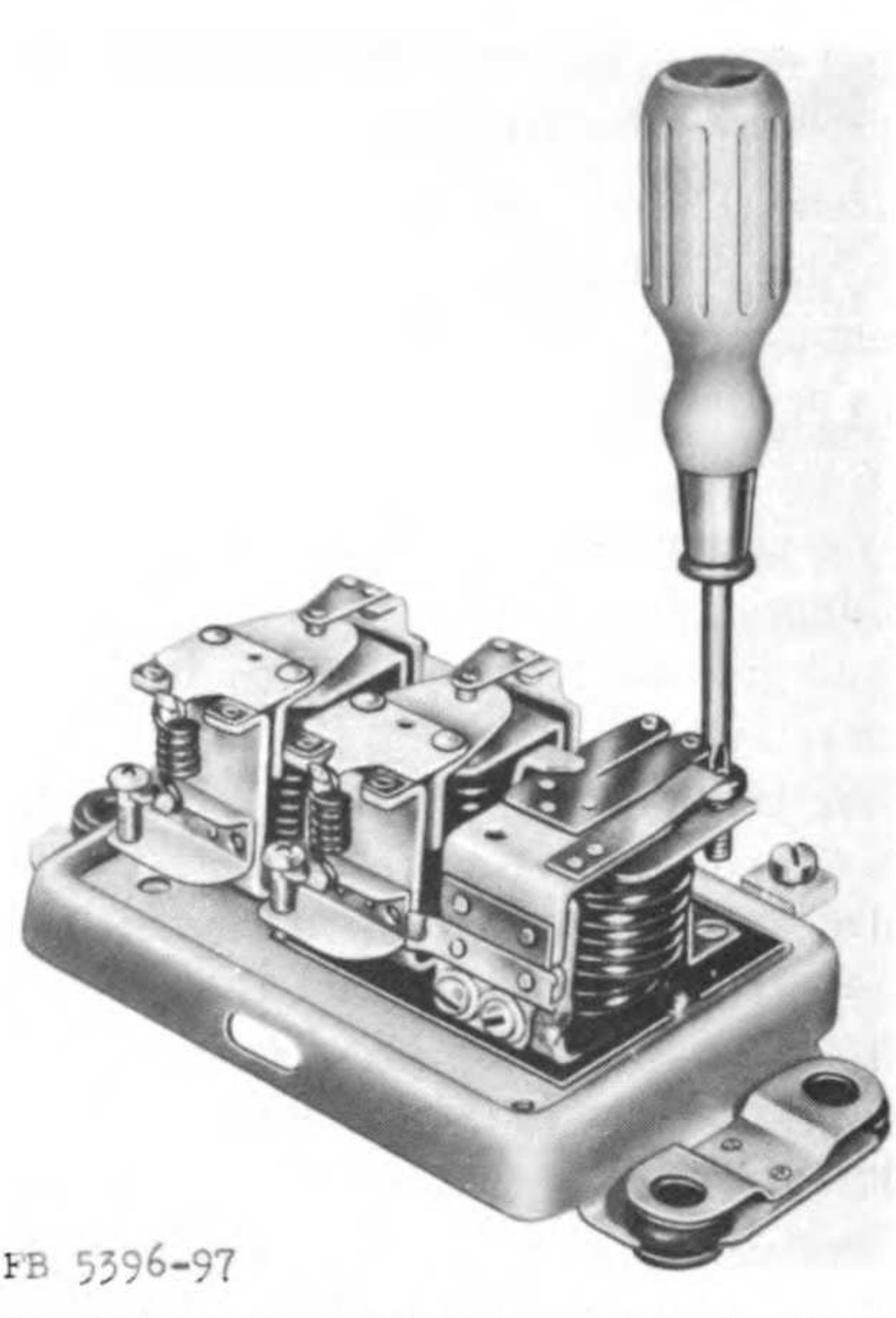


Figure 97. Adjusting point for the cutout relay closing voltage.

specifications, remove the regulator, make mechanical adjustments, and recheck.

(2) Check the voltage regulator setting (fig. 98). Bring the voltage regulator up to operating temperature and insert a 1½-ohm resistor between the battery BAT terminal and ground. Connect a voltmeter between the BAT terminal and ground. Operate the engine at 1,200 rpm, and note the voltage setting. If the setting does not meet the specifications, remove the regulator cover and adjust (fig. 99). Turn the adjusting screw clockwise to increase voltage and counterclockwise to decrease voltage. If the electrical specifications cannot be obtained by this adjustment, remove regulator, make mechanical adjustments, and recheck.

(3) Check the current regulator setting (fig. 100). Bring the regulator to operating temperature and connect an ammeter and 2-ohm, 250-watt variable resistance between the BAT terminal and ground. Operate the engine at 1,200 rpm and slowly cut out resistance until the ammeter reading is maximum. If current reading does not meet the specifications, remove the regulator cover and adjust the current setting. Turn the adjusting screw clockwise to increase current and counterclockwise to decrease current. If the electrical speci-

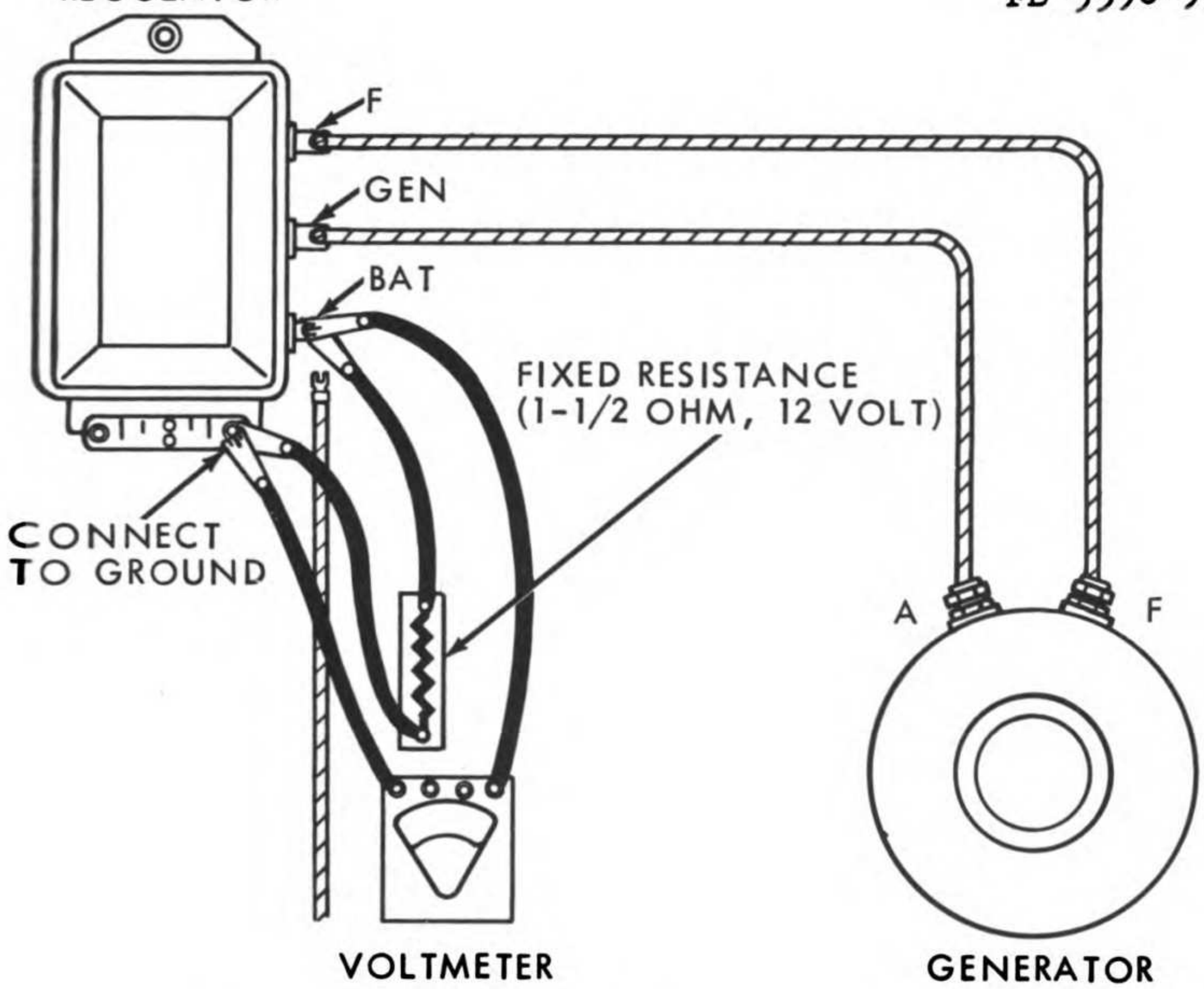


Figure 98. Checking voltage regulator voltage setting.

fications cannot be met by this adjustment, remove regulator, make mechanical adjustments, and recheck.

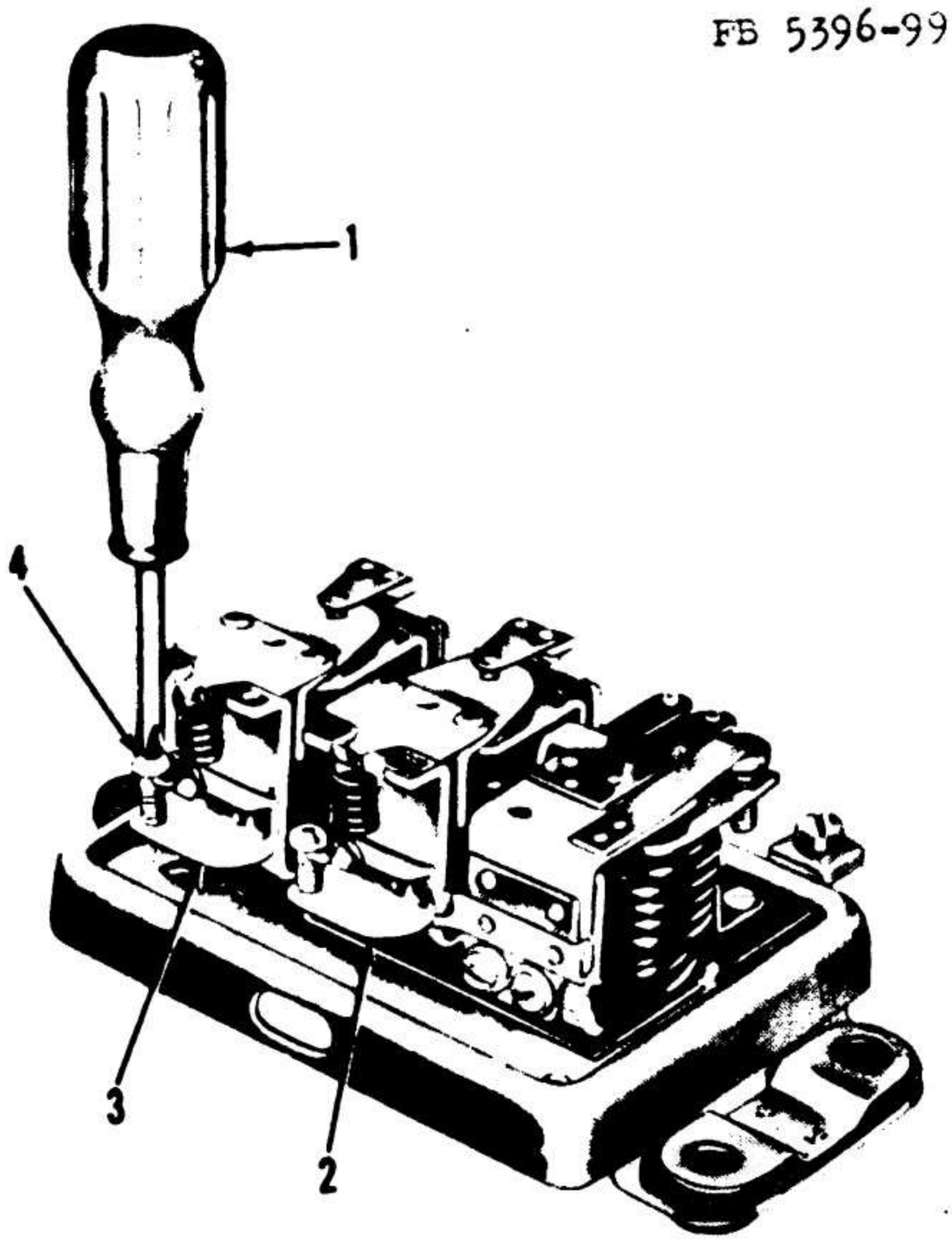
c. Make mechanical adjustments with the regulator off the unit or with the battery cable disconnected.

(1) Check and adjust the cutout relay point gap (fig. 101). Adjust the point gap to 0.020 inch by bending the upper armature stop (1). Make sure that both points close simultaneously; if not, bend spring fingers.

(2) Check the cutout relay air gap (fig. 102). Place fingers on the armature directly above the core, and move the armature down until the points just close. Check the air gap between the armature and the center of the core. Loosen two screws at the back of the relay and raise or lower the armature to set the air gap at 0.020 inch.

(3) Check the voltage regulator air gap (fig. 103). Push down the armature and release until contact points just touch. Check air gap between armature and core, making sure the gage does not touch the rivets on the armature. Loosen the contact mounting screws, and set the air gap to 0.075 inch. Make sure that the points are perfectly alined, and tighten screws.

FB 5396-99



1	Screwdriver	3	Voltage regulator
2	Current regulator	4	Adjusting screw

Figure 99. Adjusting point for the voltage regulator voltage setting.

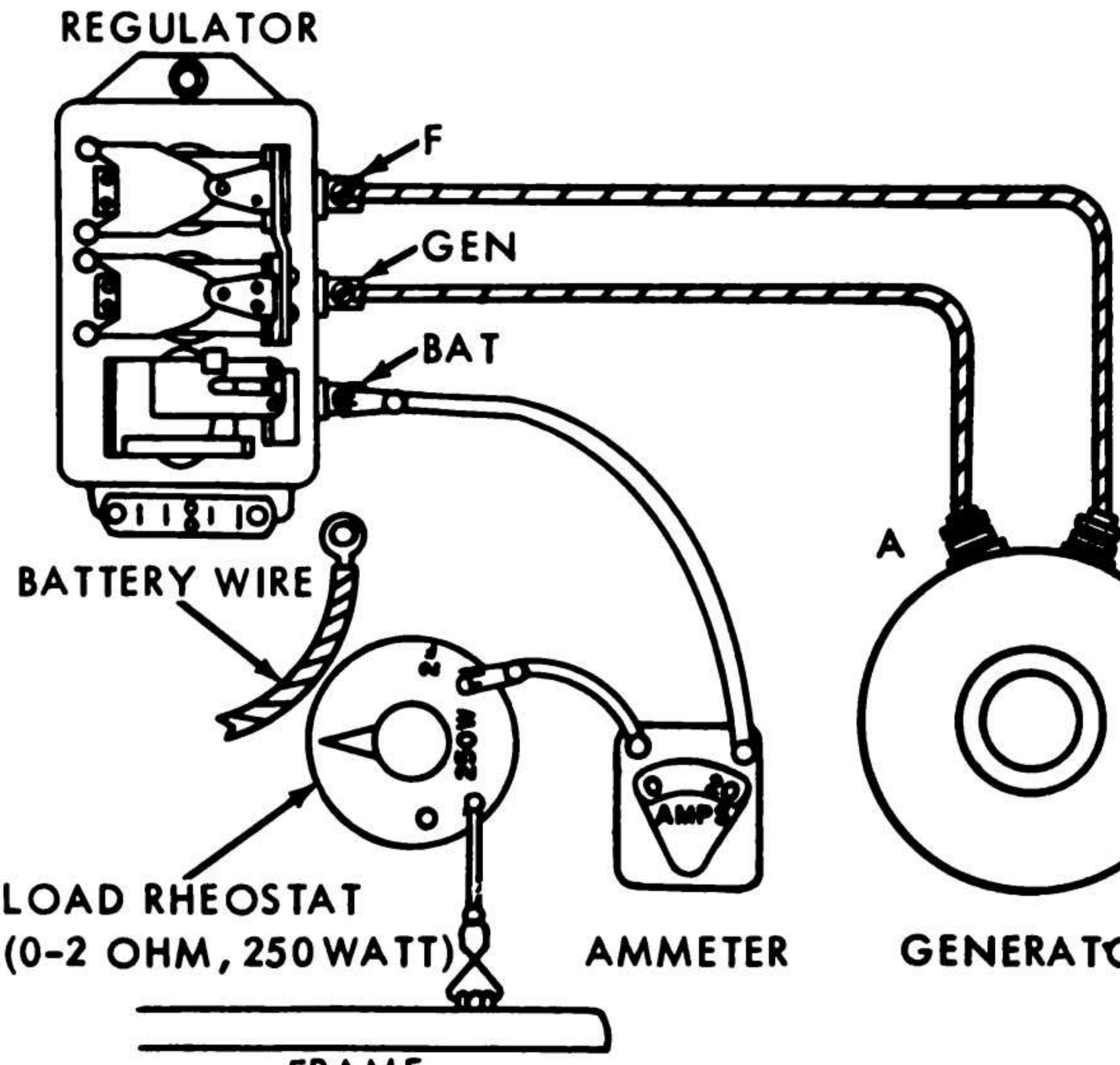


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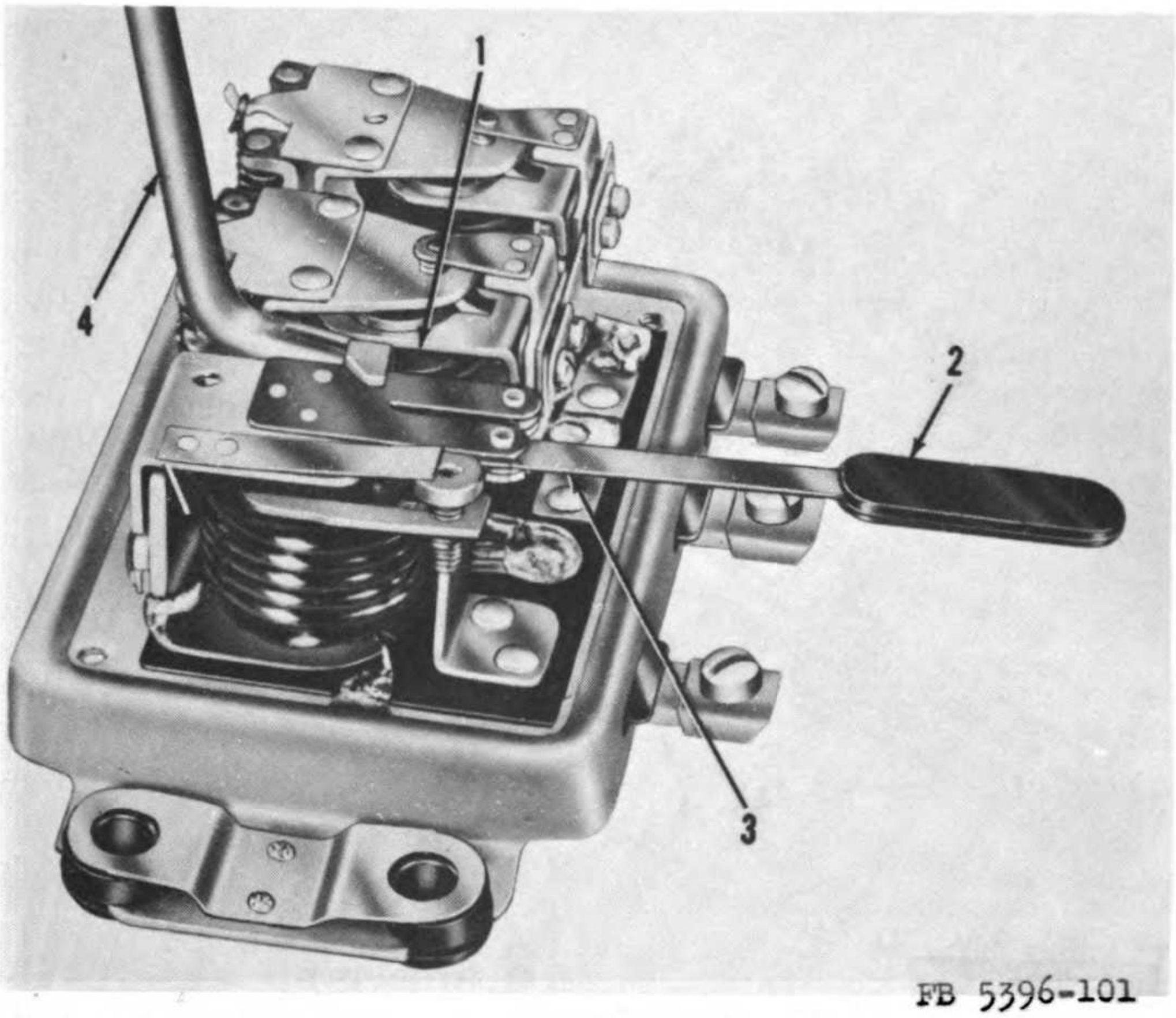
Figure 100. Checking the current regulator current setting.



1 Upper armature stop
2 Feeler gage
3 Point opening
4 Point adjusting tool

Figure 101. Adjusting points for the cutout relay point opening.

(4) Check current regulator air gap, using the same procedure as in (3) above.

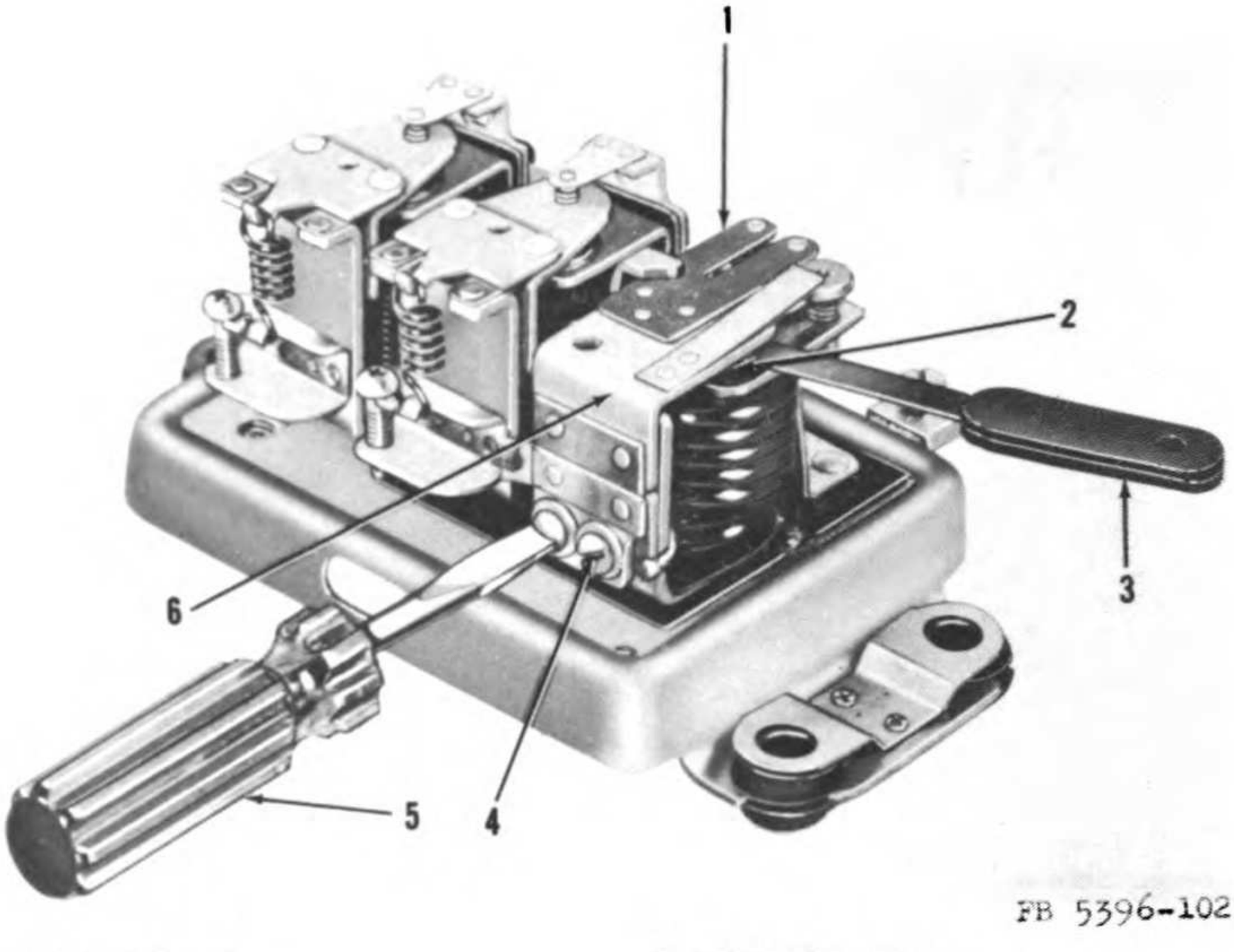
261. Generator Regulator Inspection and Repair

a. Check the regulator contact points for dirt or oxidation. If points are burned or pitted, clean with a riffler or spoon file.

Note. **Never use sandpaper or emery cloth to clean the contact points.**

b. If the contact points cannot be cleared, replace the upper contact support brackets by following the relationship illustrated in figure 104. Note particularly that the connector (12) is insulated from the voltage regulator contact mounting screws, but the connector is electrically connected to the current regulator contact mounting screws. Use new insulator bushings when installing a contact support bracket.

c. Repeat all electrical checks and install the regulator (par. 135*b*).



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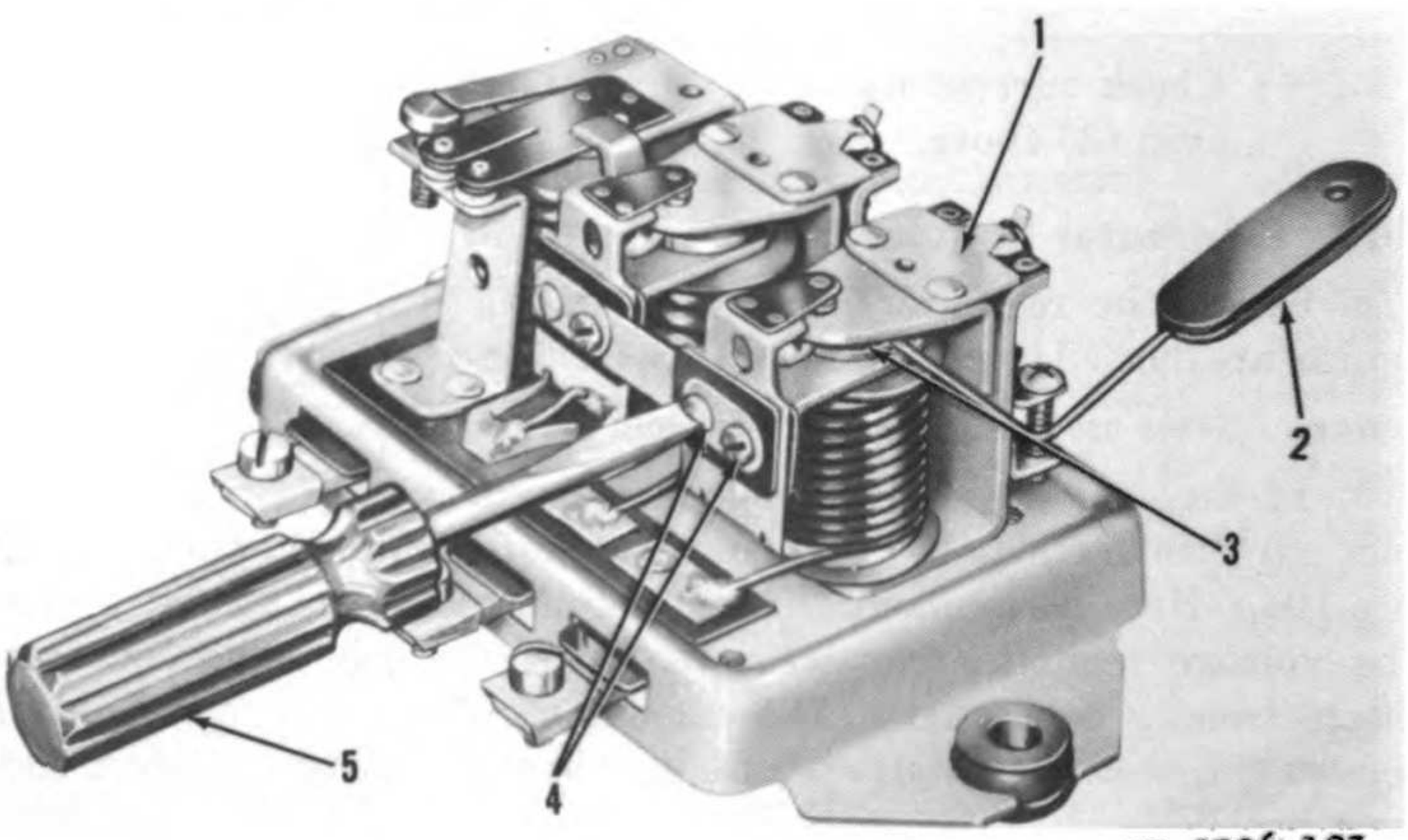
1 Spring finger
2 Air gap
3 Feeler gage
4 Adjusting screw
5 Screwdriver
6 Armature

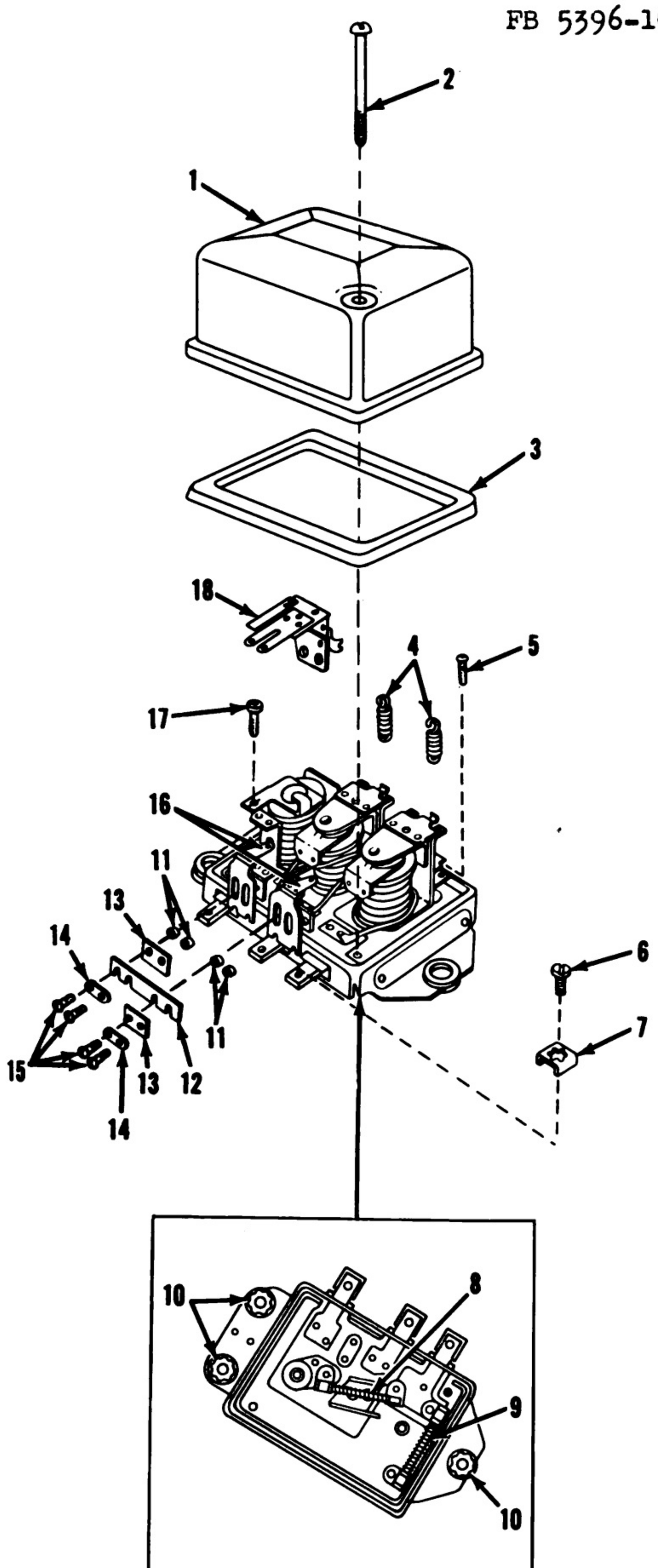
Figure 102. Adjusting points for the cutout relay air gap.



FB 5396-103

1 Armature
2 Feeler gage
3 Air gap
4 Contact mounting screws
5 Screwdriver

Figure 103. Adjusting points for the voltage regulator air gap.



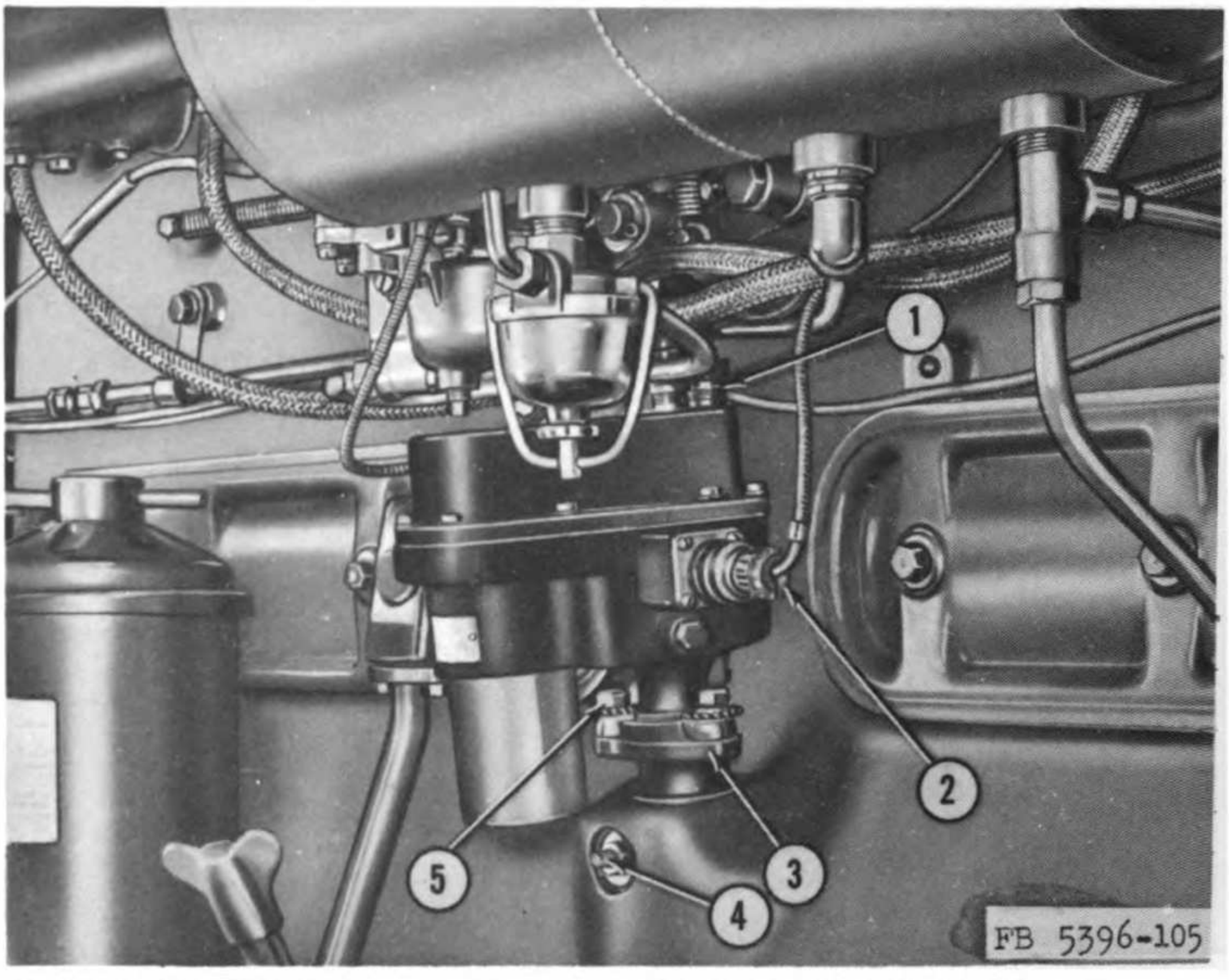
1 Cover
2 Cover screw
3 Cover gasket
4 Regulator armature spring
5 Regulator armature adjusting screw
6 Grommet
7 Resistor, F terminal to relay
8 Resistor, F terminal to ground
9 Terminal screw
10 Terminal clemp
11 Contact attaching screw
12 Contact attaching screw lockwasher
13 Contact attaching screw insulator
14 Contact attaching screw connector
15 Contact attaching screw insulating bushing
16 Contact and support
17 Relay adjusting screw
18 Relay armature

Figure 104. General regulator, exploded view.

Section XVI. IGNITION DISTRIBUTOR AND COIL ASSEMBLY

262. Description

a. The ignition distributor and coil assembly (fig. 105) is a shielded, fungusproof and waterproof type combined in a single housing. The unit is a flange-mounted, grounded type for operation with a 12-volt system. Centrifugal advance weights are eliminated in this modification, since the assembly operates at low speed during gasoline starting only. Main shaft rotation is counterclockwise as viewed from the top of the distributor.



1 Spark plug cable
2 Primary wire connector
3 Distributor bracket
4 Setscrew and locknut
5 Clamp screw

Figure 105. Ignition distributor and coil, installed view.

b. Construction features devoted to radio noise suppression include a built-in resistor in the rotor, one resistor at each spark plug wire terminal in the cap, a feed-through capacitor (condenser), a metal-cased capacitor mounted in a well in the housing, and a primary circuit resistor in a well in the housing.

263. Distributor and Coil Removal

a. Remove the carburetor (par. 234).

Note. **Because of the close mounting of the distributor and carburetor, the carburetor must be removed before the distributor can be withdrawn from the engine.**

b. Disconnect and remove the spark plug cables (1, fig. 105) and the primary wire connector (2) at the side of the housing. Loosen locknut and setscrew (4) in the engine crankcase and lift the assembly out of the housing.

264. Distributor and Coil Disassembly
(fig. 106)

a. Remove cap screws (53), lockwashers (54), and clamps (55); pull bracket (57) off distributor housing. Remove seals (56 and 58).

b. Remove screws and lockwashers (1), cap cover (3), and cover gasket (4). Remove the cap attaching screws and lockwashers (7), cap (9), and gaskets (5).

c. Remove rotor (10), and disconnect the leads at the coil and resistor.

d. Remove coil holddown plate screws and washers (24), holddown plate (25), and coil (28). Remove screws and washers (30), resistor bracket (33), resistor (35), and insulator (36). Remove screw and lockwasher (37), capacitor clamp (39), and capacitor (40). Remove breaker lever screw (20), nut (11), lockwasher (13), and condenser lead (12). Remove capacitor screw (16), lockwasher (17), capacitor (18), and bracket (19). Remove attaching screw and contact point and support (15), and breaker lever (14). Remove the plug from the shaft housing, and drain oil from the distributor. Remove screws and lockwashers (46), terminal coupling (45), gasket (44), capacitor (43), and spring (41).

Note. **Clean and inspect distributor; usually further disassembly is not necessary. If inspection determines the need for further repair, continue disassembly only to the point necessary to make repairs.**

e. Remove breaker plate (21), drive out pin (52), and pull main shaft (23) and spacer (34) out of housing; coupling and collar (51); spacer (49), and shims (47 and 48) will slide off the lower end of the shaft. Support the distributor on a wooden block (shaft end up) and, using the proper size bushing driver, drive out bushing (38).

265. Distributor and Coil Inspection and Repair

a. Clean dust and dirt from distributor parts with dry compressed air. Clean nonelectrical parts in cleaning solvent; dry with compressed air. Flush out oil reservoir in housing. Check side play of drive shaft in bushing; if in excess of 0.005 inch, install a new bushing.

b. Check coil, ignition condenser, and radio noise suppressor with a suitable tester in accordance with the manufacturer's instructions. Usually the points and condenser are replaced at overhaul; however, if the condenser meets electrical specifications and the points are not badly pitted, they can be cleaned and replaced.

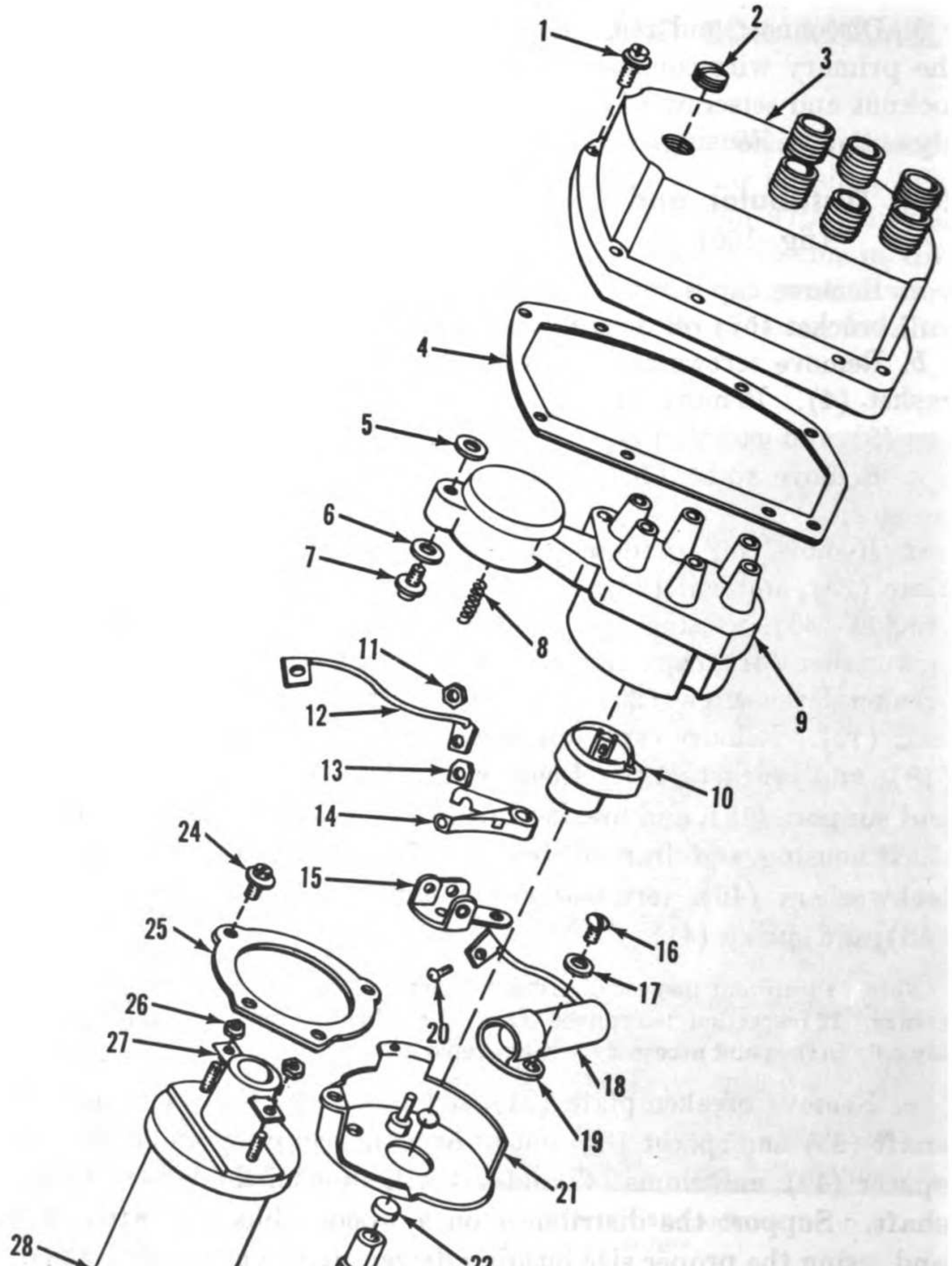


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Figure 106. Ignition distributor and coil, exploded view.

c. Check rotor and plastic cap for burned or corroded electrodes, cracks, and carbonized leakage paths. Corrosion can be cleaned off the electrodes with the point file.

266. Distributor and Coil Reassembly

a. Press bushing (38, fig. 106) into housing (42). Place spacer washer (34) on main shaft (23), and install the shaft in the housing. Place shims (47 and 48), spacer washer (49), and couplings and collar (51) on lower end of the shaft; secure with pin (52). Check end play of shaft; if more or less than 0.005 inch, add or remove shims (47 and 48).

b. Place contact point and support (15) on breaker plate (21); secure with attaching screw. Place a small amount of vaseline in the breaker lever bushing, and slide breaker lever (14) over the stud on the breaker plate. Install capacitor (18); secure to breaker plate with screw (16) and lockwasher (17). Place lead terminal from capacitor (18) on screw (20), and insert screw from the inside through the fiber block on contact point support (15). Bend the spring on breaker lever (14) around, and position the slot over the screw (20). Place lockwasher (13) over the screw and spring.

Note. The lockwasher has two tangs bent in one direction to hold the nut and one tang bent in the opposite direction to hold it in position on the contact support. This tang must be hooked over the top of the support; otherwise it will touch the metal on the support and short out the points.

Place the terminal from condenser lead (12) over screw (20) and between two tangs of lockwasher (13); secure with nut (11). Tighten screw (20), making sure the spring on a breaker lever (14) is down, so that points are in perfect alinement. Hold breaker lever (14) back to provide clearance over cam lobes, and install assembled breaker plate (21) in the housing.

---

1 Cover screw and lockwasher
2 Plug
3 Cap cover
4 Cover gasket
5 Cap attaching screw gasket
6 Cap attaching washer
7 Cap attaching screw and lockwasher
8 Coil contact spring
9 Cap
10 Rotor
11 Breaker lever nut
12 Capacitor lead
13 Breaker lever lockwasher
14 Breaker lever
15 Contact point and support
16 Capacitor screw
17 Capacitor washer
18 Capacitor
19 Capacitor bracket
20 Breaker lever screw
21 Breaker plate
22 Wick
23 Main shaft (with cam)
24 Coil holddown plate screw with washer
25 Coil holddown plate
26 Coil terminal nut
27 Coil terminal lock clip
28 Ignition coil

Figure 106—Continued.

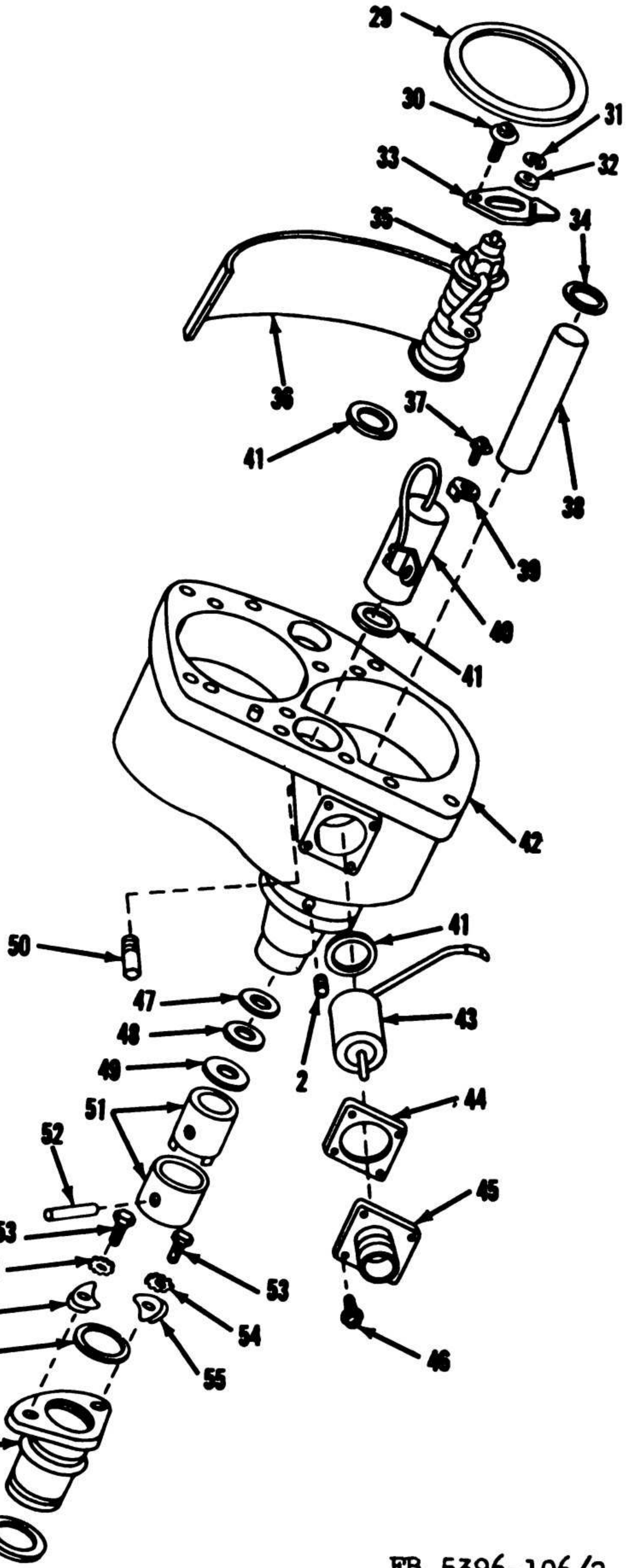

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Figure 106. Ignition distributor and coil, exploded view—Continued.

c. Install spring (41) and capacitor (40); secure with clamp (39) and screw and lockwasher (37). Install insulation (36) and resistor (35); secure with clamp (33) and screws and lockwashers (30). Install spring (41), capacitor (43), gasket (44), and terminal coupling (45); secure with screws and lockwashers (46). Install coil (28) and holddown plate (25); secure with screws and lockwashers (24). Connect lead from ignition capacitor (18) to − (negative) terminal of coil. Connect lead from capacitor (43) to resistor (35). Connect lead from resistor (35) and lead from capacitor (40) to + (positive) terminal of the coil (see fig. 107).

d. Install inner oil seal (56, fig. 106) and bracket (57) on the distributor housing; secure with clamps (55), lockwashers (54), and screws (53). Place outer oil seal (58) on bracket (57). Check point gap (par. 267), and install distributor on engine (par. 268).

267. Contact Point Adjustment

a. If a synchroscope is available, install and connect the distributor in accordance with the manufacturer's specification. Adjust dwell angle to 31° to 37°. It is considered good practice to set new points on the low side of the specification. This allows for rapid wear of a new fiber block during the first 15 to 20 hours of operation.

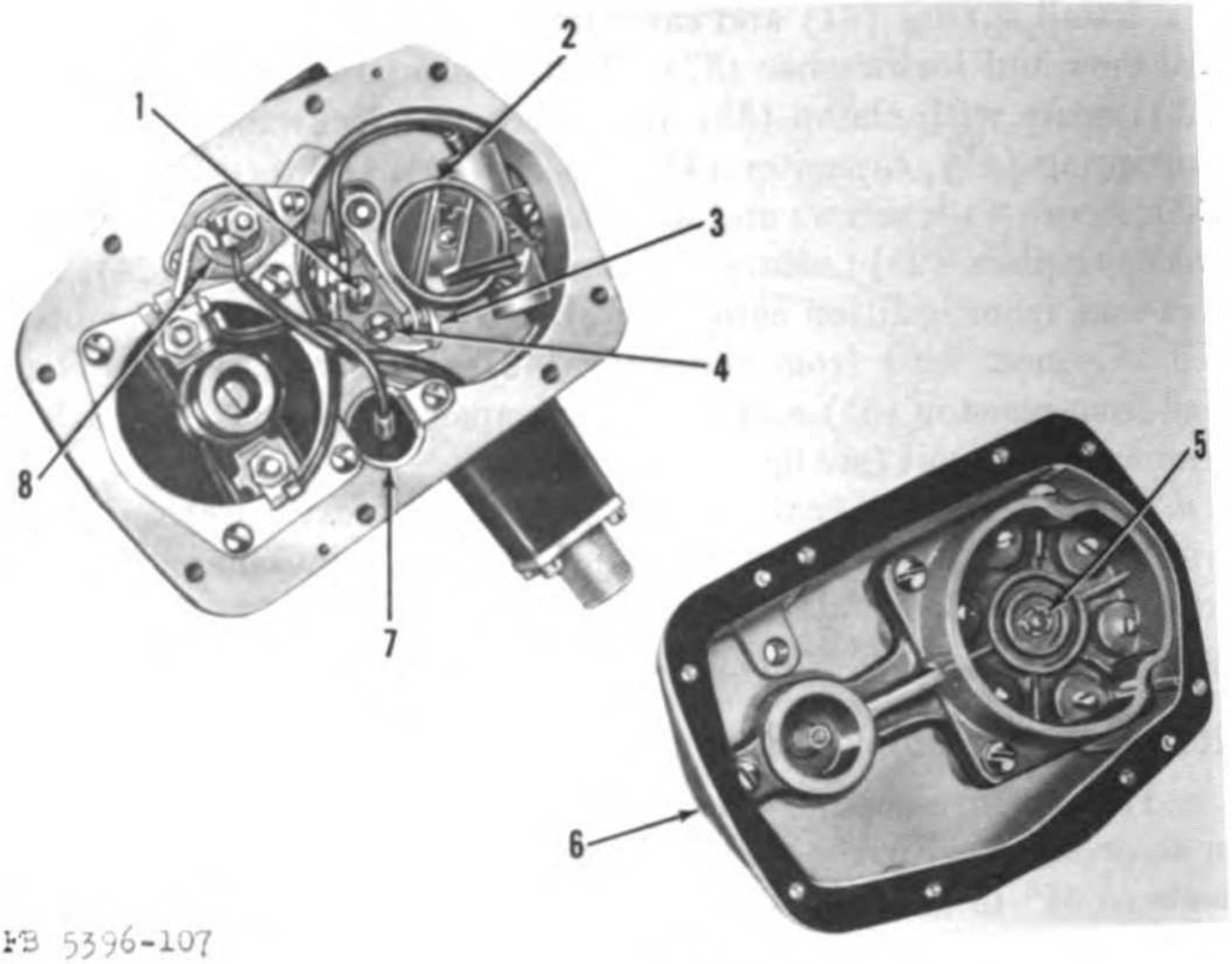
b. If a synchroscope is not available, rotate the distributor until the fiber block on the breaker lever is riding the top of a lobe on the breaker cam. Loosen lockscrew (4, fig. 107) on contact point support, and turn eccentric (1) to obtain 0.022 inch point gap. New points are usually set 0.002 to 0.003 inch over specifications to allow for rapid wear of the fiber block during the first 15 to 20 hours of operation.

c. Check contact spring pressure. Hook a spring scale over the breaker lever and pull at right angles. Note the reading as the points

---

29 Coil flange gasket
30 Screw and lockwasher
31 Resistor lead attaching nut
32 Resistor terminal washer
33 Resistor bracket
34 Spacer washer
35 Resistor
36 Resistor insulator
37 Screw and lockwasher
38 Bushing
39 Capacitor clamp
40 Capacitor
41 Spring
42 Housing
43 Capacitor
44 Coupling gasket
45 Terminal coupling
46 Coupling screw and lockwasher
47 Shim (0.005") (used as Req'd)
48 Shim (0.010") (used as Req'd)
49 Spacer washer
50 Breather
51 Shaft coupling with collar
52 Coupling pin
53 Screw, cap, hex hd, ⅜ x ¾ NC (2 Req'd)
54 Lockwasher, internal-external tooth, ⅜ (2 Req'd)
55 Clamp
56 Inner oil seal bracket
57 Bracket
58 Outer oil seal bracket

Figure 106—Continued.



FB 5396-107

1 Eccentric
2 Rotor
3 Gap setting 0.022
4 Lockscrew
5 Cap
6 Cover
7 Suppression capacitor
8 Resistor

Figure 107. Distributor with cover removed.

break. Adjust the breaker lever spring by binding it to obtain a reading of 17 to 21 ounces.

268. Distributor and Coil Installation

(fig. 105)

Insert distributor into mounting hole of engine. Turn rotor until dogs on distributor shaft aline with slots in engine oil pump shaft. Make sure that the distributor is down as far as it will go to insure seating of the dogs in the slot. Draw setscrew (4) down until it engages the slot in distributor bracket (3). Leave the screw loose enough to allow the distributor to be rotated with a slight drag when timing. Connect primary wire (2) to distributor.

269. Distributor Timing

a. Remove No. 1 spark plug. Place compression release lever in starting position, and turn engine over by hand until the piston in No. 1 cylinder is coming up on the compression stroke. (Hold finger over spark plug hole, and feel for pressure in cylinder.)

b. Remove inspection plate on left side of flywheel housing, and continue turning the engine by hand until the mark is in line with the

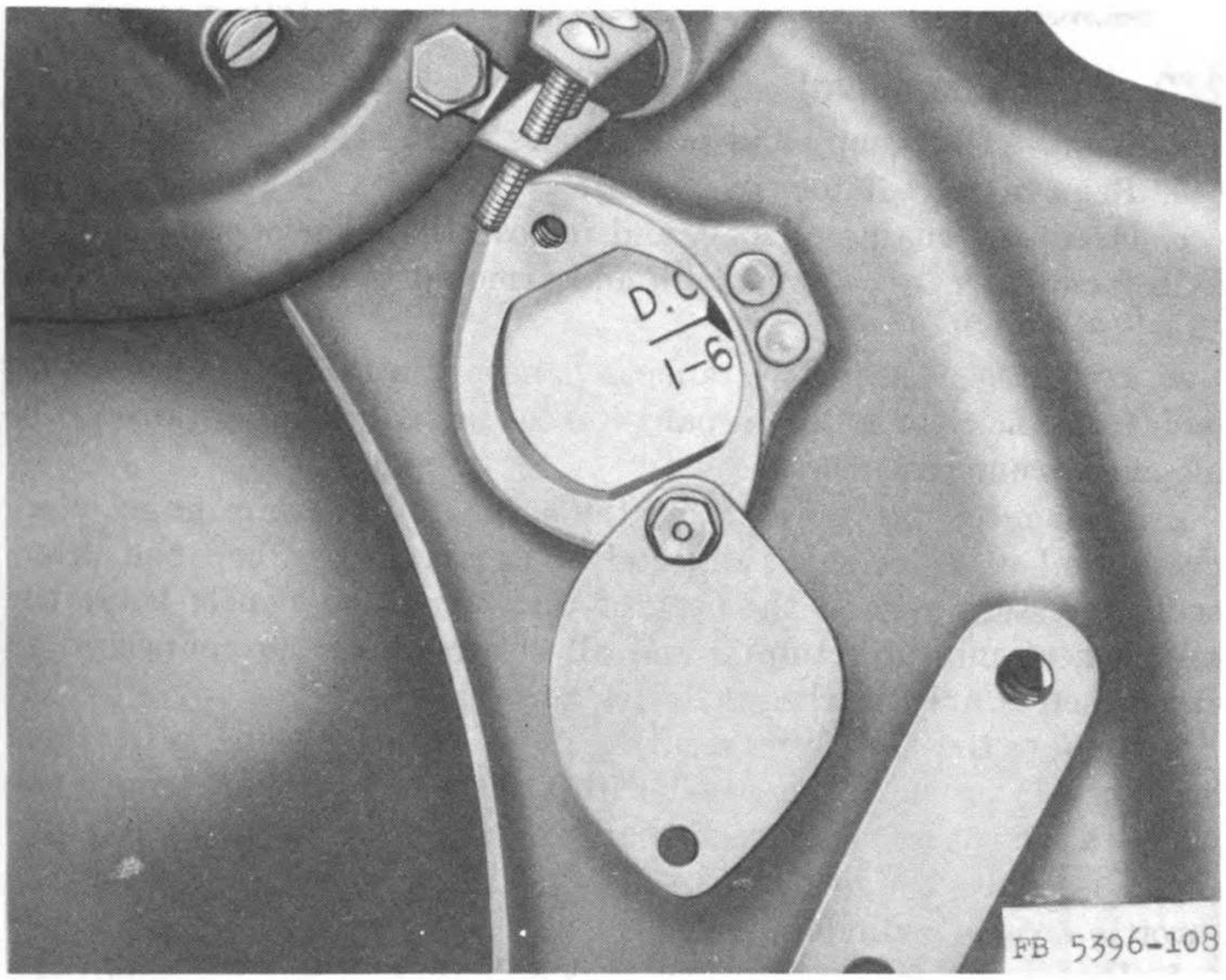


Figure 108. Timing marks on flywheel.

pointer (fig. 108). The points should now be set so that they are just breaking.

c. Rotate the distributor counterclockwise in the housing until the points just break. If the points are already open, turn distributor clockwise a few degrees, and then come back counterclockwise until the points open. Stop rotation and hold distributor stationary in the position where the points break. Lock distributor in place with setscrew and locknut (4, fig. 105). Always set the timing while turning the distributor counterclockwise.

Note. Point opening can be determined by turning on the ignition switch and hooking a test lamp across the points. A strip of cellophane from a cigarette package is also an accurate check. Open the points and insert the cellophane between the points. Pull on the cellophane at the same time the distributor is being slowly rotated. As soon as the cellophane starts to slip from between the points, stop rotation and lock the distributor in the engine housing with the lockscrew. The points will have broken approximately 0.001 inch.

d. Install the rotor on the distributor cam. The electrode on the rotor will be alined with the electrode in the cap for No. 1 cylinder. Note which electrode in the cap is for No. 1 cylinder, and install the cap and cover on the distributor.

e. Place the secondary terminal from No. 1 plug in the cap at position noted in *d* above. Continue in a clockwise direction, and install the secondary terminals from plugs 5–3–6–2–4, in that order.

f. Replace carburetor (par. 238).

Section XVII. ENGINE REMOVAL AND INSTALLATION

270. Engine Removal

a. Remove the canopy and access doors (par. 144*a*).

b. Remove the radiator (par. 115*a*).

c. Drain the engine oil pan, and remove the oil temperature gage bulb from the pan; coil the bulb and armored tubing on instrument panel (6, fig. 109).

d. Drain the compressor crankcase, and remove the oil temperature bulb from the compressor oil pan; coil the bulb unit and armored tubing on instrument panel (6).

e. Disconnect the tubing from the engine oil pressure gage, compressor oil pressure gage, air receiver pressure gage, and the intercooler pressure gage at the back of the instrument panel; leave the engine heat indicator tubing and all electrical wiring connected to gages, meters, and switches on the instrument panel.

f. Remove the cap screws securing the instrument panel to flywheel housing (4); remove the panel with attached wires, and secure the panel to the engine with mechanics' wire as shown in figure 109.

g. Disconnect the steel tubing from flexible hose (3) (fig. 37) at the throttle control cylinder.

h. Disconnect air trap-to-fuel tank tubing (12, fig. 44) from the front end of the air trap; drain the air trap.

i. Disconnect fuel supply inlet tubing (7, fig. 48) from the transfer pump strainer and the fuel tank.

j. Disconnect compressor air cleaner pipe (26, fig. 25) at the air cleaner (36).

k. Hang battery cables (7, fig. 109) over the compression release lever on the engine.

l. Remove screws (6, fig. 63) securing clutch drive disks (2 and 3) to the engine flywheel (4).

m. Attach a hook (1, fig. 109) to the center notch in the lifting eye (2); support the weight of the engine with a hoist before proceeding with the removal.

n. Remove the cap screws attaching compressor bearing housing (3) to flywheel housing (4).

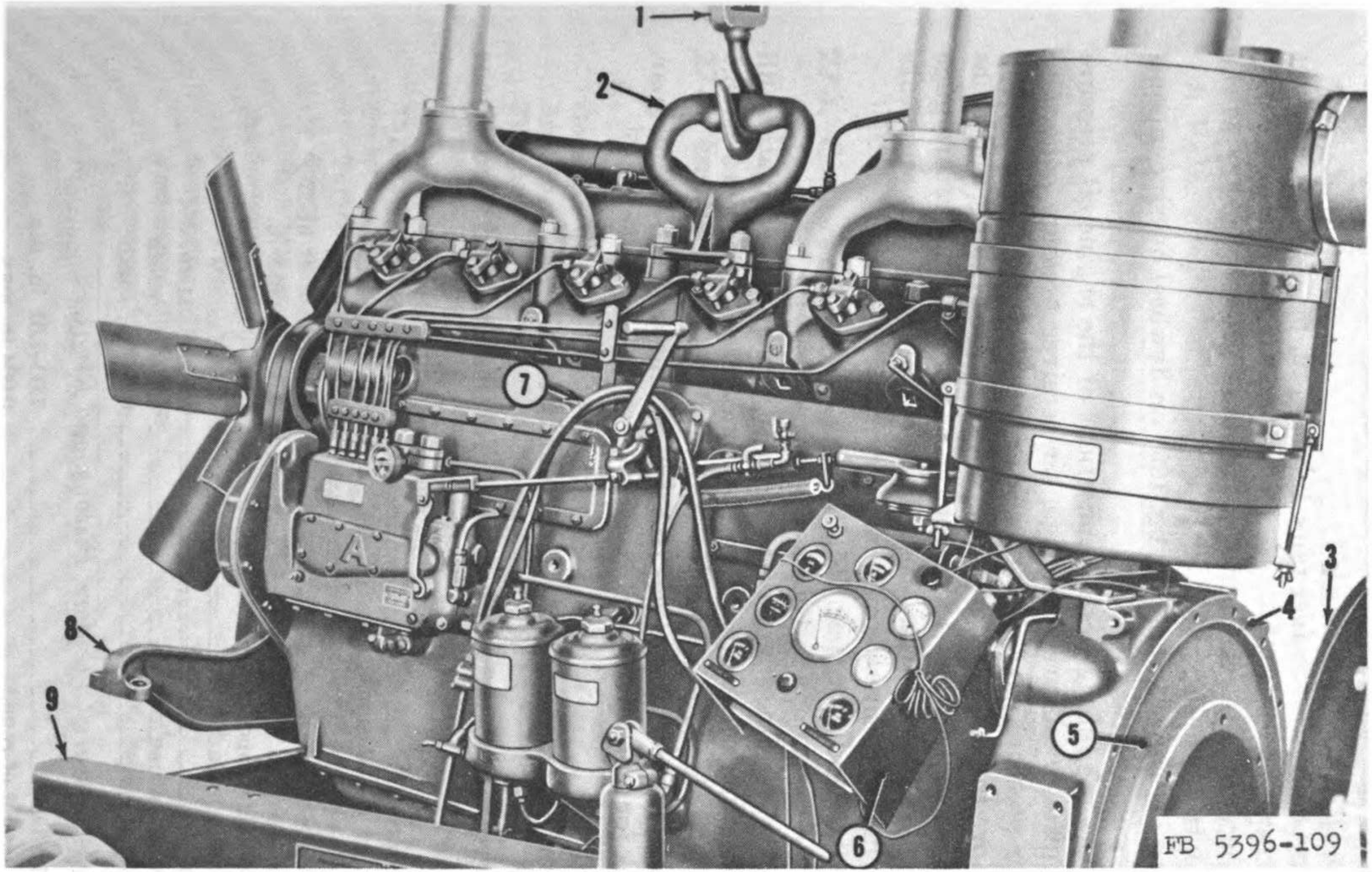
o. Remove the four bolts (two at each side) securing front engine support (8) to compressor frame (9); lift and remove engine.

271. Engine Installation

a. Lower the engine into position on compressor frame (9, fig. 109).

b. Install the four bolts securing front engine support (8) to frame (9).

c. Install the cap screws attaching compressor bearing housing (3) to flywheel housing (4).



1 Hook
2 Lifting eye
3 Compressor bearing housing
4 Engine flywheel housing
5 Engine flywheel
6 Instrument panel
7 Battery cables
8 Front engine support
9 Compressor frame

Figure 109. Removing the engine.

d. Install screws (6, fig. 63) securing clutch drive disks (2 and 3) to engine flywheel (4) ; adjust the clutch (par. 142*b*).

e. Connect compressor air cleaner pipe (26, fig. 25) to air cleaner (36).

f. Connect fuel supply inlet tubing (7, fig. 48) to the transfer pump strainer and to the fuel tank.

g. Connect air trap-to-fuel tank tubing (12, fig. 44) to the front of the air trap.

h. Connect the steel tubing to the flexible hose (3, fig. 37) at the throttle control cylinder.

i. Install instrument panel (6, fig. 109) on flywheel housing mounting pad; secure with cap screws.

j. Connect the tubing to the connections of the engine oil pressure gage, compressor oil pressure gage, air receiver pressure gage, and intercooler pressure gage on the back of the instrument panel.

k. Remove the temperature gage, coiled armored tubing, and bulbs from the instrument panel; install the engine oil temperature gage bulb in the engine oil pan. Install the compressor oil temperature gage bulb in the compressor oil pan.

l. Install the radiator (par. 115*f*).

m. Install the canopy and access doors (par. 144*c*).

n. Fill the gasoline tank, air trap, fuel tank, and the radiator; fill the engine crankcase and the compressor crankcase. (See LO 5–5396.)

o. Vent the diesel fuel system (par. 7*g*(5)).

p. Connect the battery cables (see fig. 58) and start the engine (par. 34) ; check for and repair leaks.

Section XVIII. ENGINEERING DATA

272. Compressor Parts Dimensions, Tolerances, and Clearances

a. Low-Pressure Cylinders, Pistons and Rings.

Cylinder bore	8.250–8.251 in. dia
Taper or out-of-round	0.004 in. max
Piston-to-cylinder clearance	0.008–0.010 in.
Piston pin fit in piston	Hand-push fit at 150° F.
Piston pin fit in bushing	0.0005–0.0015 in.
Ring side clearance in groove	0.002–0.004 in.
Ring and clearance	0.024 in.
Piston skirt	8.240–8.241 in. dia
Compression ring	0.250 in. width
Oil control ring	0.375 in. width

b. High-Pressure Cylinders, Pistons, and Rings.

Cylinder bore	7.00–7.01 in. dia
Taper or out-of-round	0.004 in. max
Piston-to-cylinder clearance	0.009–0.011 in.
Piston pin fit in piston	Hand-push fit at 75° F.
Piston pin in bushing	0.0005–0.0015 in.

Ring side clearance in groove	0.002–0.004 in.
Ring end clearance	0.021 in.
Piston skirt	6.993 in. dia
Compression ring	0.1875 in. width
Oil control ring	0.3125 in. width

c. Connecting Rods and Crankshaft.

Crankshaft crank pin	3.249–3.250 in. dia
Out-of-round	0.015 in. max
Main bearing journal	3.2525 in. dia
Connecting rod bearing clearance	0.0016–0.0037 in.

d. Valve Strips.

End play in seat	0.010–0.015 in.
Side play in seat	0.002–0.004 in.

e. Clutch.

Facing thickness	0.1875 in.
Disk clearance at backplate	0.015 in.

f. Front Axle.

Toe-in	0.3125 in.
Caster (fixed)	2°

273. Compressor Torque Valves

Unloader leakage cap nuts	25 ft-lbs
All other compressor nuts and cap screws	Hand-wrench tight

274. Engine Accessories Dimensions, Tolerances, Clearances, and Test Specification

a. Fuel Injection Pump.

Governed speed setting	1,200 rpm
Speed regulation	11%
Fuel delivery in 1 minute at 550 rpm	114 cc
Fuel delivery variation at each nozzle	5 cc
Camshaft and governor shaft gears backlash.	0.002–0.004 in.
Tappets recessed	0.052–0.054 in.
Preset torque settings:	
Torque lever stop screw	0.4375 in.
Torque spring shoe screw	0.725 in.
High idle gap	0.125 in.
Fuel pressure at—	
Primary pump	45–50 psi
Scavenging valve	20–25 psi
Fuel return check valve	62–68 psi
Reverse check valve	450–600 psi
Nozzle	700 psi
Distributor block (no leaks)	2,500 psi

Torque values for—	
Fuel return pipe cap	**80 ft-lbs**
Plunger bushing clamp	**70–100 ft-lbs**
High-pressure screws	**20 ft-lbs**
Self-locking nut, camshaft	**115–125 ft-lbs**
Distributor valve bushing clamp	**20 ft-lbs**
Discharge fitting	**30 ft-lbs**
Distributor block cap screws	**20 ft-lbs**
Self-locking nut on governor shaft, both ends.	**40–45 ft-lbs**
Governor fork shaft nut	**8–10 ft-lbs**
Camshaft retainer cap screws	**7½–10 ft-lbs**
Governor-weight thrust shoe pin	**6–8 ft-lbs**
Injection pump clearances:	
Idler gear and bore of pump housing	**0.0015–0.0025 in.**
Scavenger idler gear and housing	**0.002–0.0045 in.**
End of plunger and spring seat	**0.001–0.0035 in.**
End of distributor valve beyond block	**0.045–0.050 in.**
Lift of distributor valves	**0.012–0.019 in.**
Camshaft lobe height	**0.020 in.**

b. Distributor and Coil Assembly.

Make	**Delco-Remy**
Model	**1111562**
Rotation (viewing drive end)	**Clockwise**
Contact point pressure	**17–21 oz.**
Contact point opening	**0.022 in.**
Shaft end play	**0.005 in. max**
Ignition capacitor capacity	**0.18–0.23 mfd**
Volts	**12**

c. Starting Motor.

Make	**Delco-Remy**
Model	**1108886**
Solenoid model	**1118179**
Rotation (viewing drive end)	**Clockwise**
Winding	**Shunt**
Brush spring tension	**36–40 oz**
No load current draw	**65 amperes, at 11.4 volts, 6,000 rpm**
Lock torque	**32 ft-lbs**
Lock current draw	**525 amperes at 3 volts**

d. Generator.

Make	**Delco-Remy**
Model	**1105929**
Rotation (viewing drive end)	**Clockwise**
Brush spring tension	**28 oz**
Field current draw	**1.22–1.32 amperes at 12 volts**
Output, cold	**13 amperes at 15 volts, 1,300 rpm**

e. Generator Regulator.

Make	**Delco-Remy**
Model	**1118372P**
Ground	**Positive**
Cutout relay:	
Air gap	**0.020 in.**
Point opening	**0.020 in.**
Closing voltage range	**11.8–13.6 volts at operating temperature**
Adjust to	**12.8 volts at operating temperature**
Current regulator:	
Air gap	**0.075 in.**
Current setting range	**10.5–13.5 amperes at operating temperature**
Voltage regulator:	
Air gap	**0.075 in.**
Voltage setting range	**13.9–14.9 volts, at operating temperature**
Adjust to	**14.3 volts, at operating temperature**

f. Spark Plugs.

Make	**Champion**
Part No. (IHC)	**280550R91**
Type	**Shielded**
Gap	**0.035–0.040 in.**

CHAPTER 6

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

275. Limited Storage

a. Inspection. Perform organizational preventive maintenance services described in paragraph 56.

b. Cleaning and Painting.

(1) Wash exterior of the unit to remove dirt, grease, or other foreign material.

(2) Inspect surfaces of the unit for rust and peeled or blistered paint.

(3) Repaint damaged surfaces. Refer to TM 9–2851.

c. Lubrication. Completely lubricate the unit. Refer to lubrication instructions (LO 5–5396).

d. Protection in Storage.

(1) Chock unit securely.

(2) Protect engine cooling system with antifreeze if cold weather is anticipated.

(3) Remove batteries in extremely cold climates (par. 136*a*).

(4) Apply suitable covers to all openings to the items listed in paragraph 7*d*.

276. Domestic Shipment

a. General. Prepare unit for domestic shipment by following applicable procedures given in paragraph 275.

b. Hoisting and Handling. Attach a hook to the lifting bail (3, fig. 1), and raise the unit with a crane hoist.

Caution: Hoist unit slowly to prevent excessive twisting or swinging.

c. Crating and Blocking.

(1) Crate unit for domestic shipment as shown in figure 7.

(2) Block crate securely at sides (fig. 5) and ends.

Section II. DEMOLITION OF AIR COMPRESSOR TO PREVENT ENEMY USE

277. General

When capture or the abandonment of the Worthington Model 500 Air Compressor to an enemy is imminent, the responsible unit commander makes the decision either to destroy the unit 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 all air compressors and all corresponding repair parts.

278. Preferred Demolition Methods

Explosives and mechanical means, either alone or in combination, are the most effective methods to employ. Listed below are the vital parts in order of priority of demolition for each preferred method. In each case, completion of the (1) and (2) will render the unit inoperative. Completion of the additional steps listed will further destroy the unit.

a. Explosives (fig. 110). Place as many of the following charges as the situation permits and detonate them simultaneously with detonating cord and a suitable detonator:

(1) Four ½-pound charges at the compressor bearing housing.
(2) Four ½-pound charges at the fuel injection pump.

Note. The above charges are the minimum requirements for this method.

(3) Four ½-pound charges on the diesel fuel tank, between the intercooler and the air receiver.
(4) One ½-pound charge at each injection nozzle.

b. Mechanical Means. Use sledge hammers, crowbars, picks, axes, or any other heavy tools which may be available, together with the tools normally included with the air compressor, to destroy the following:

(1) The fuel injection pump.
(2) The compressor crankcase and cylinders.

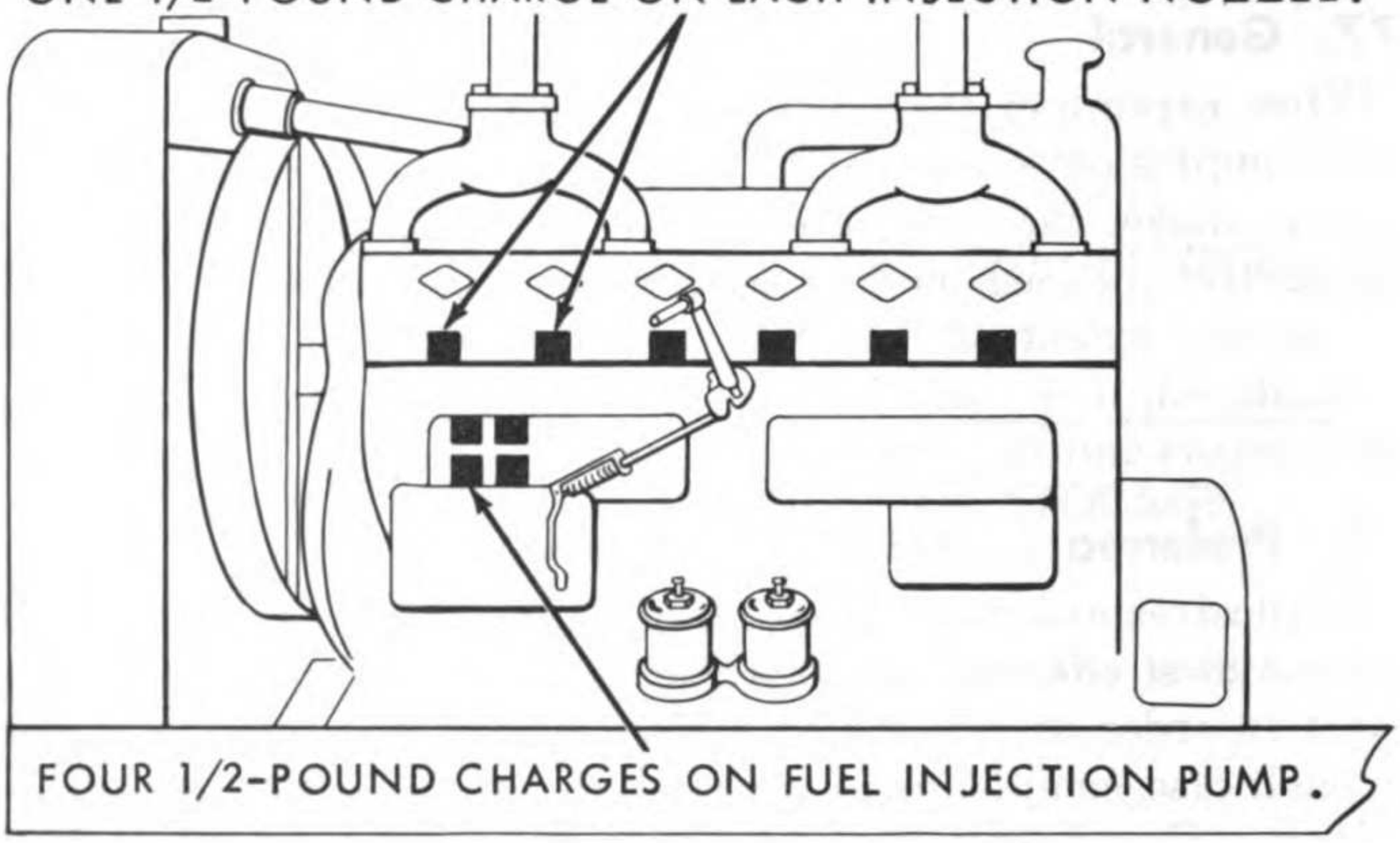
Note. The above steps are the minimum requirements for this method.

(3) Carburetor.
(4) Timing gears, cover.

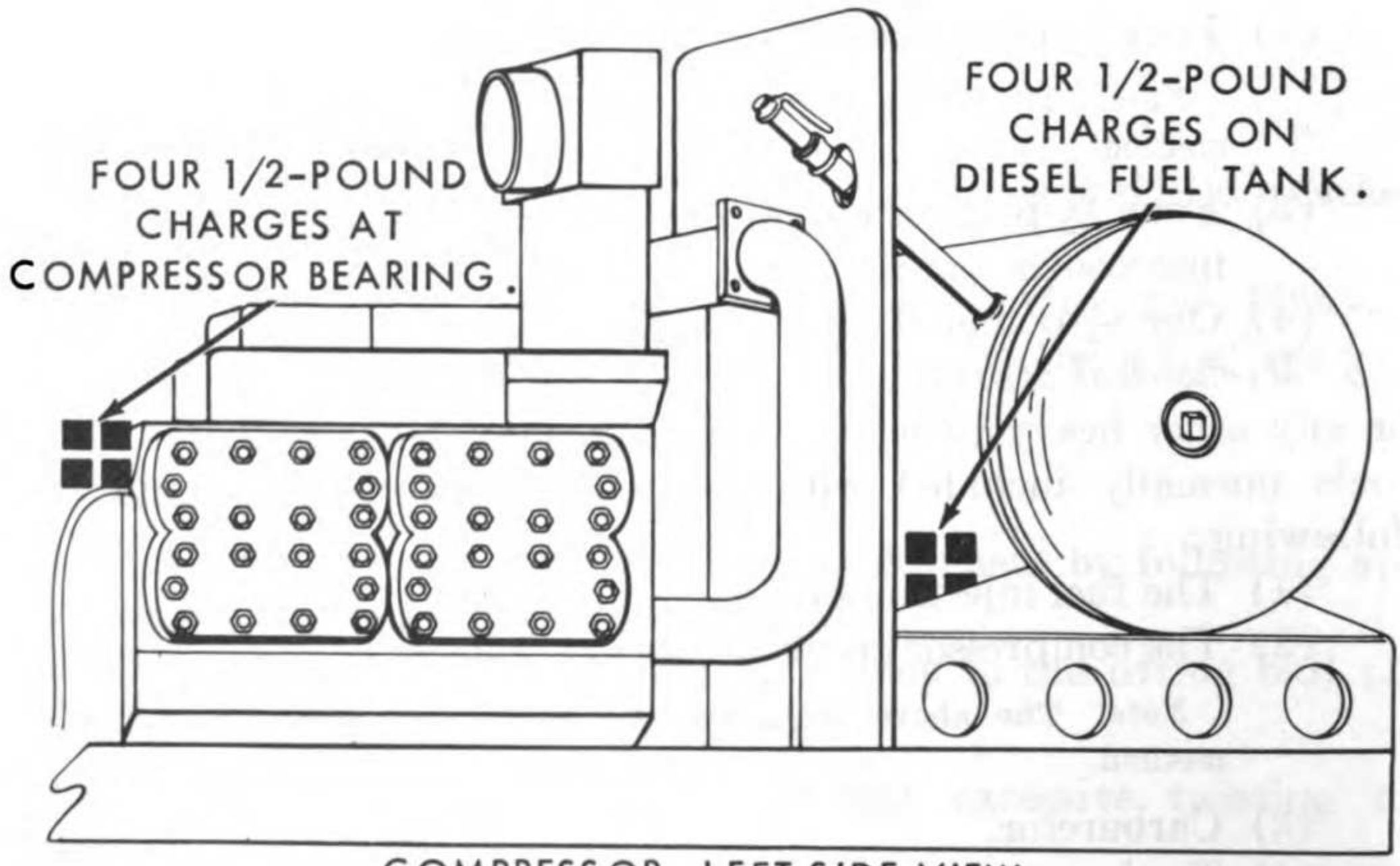
279. Other Demolition Methods

If the situation prohibits employing either of the preferred methods, use the following, either singly or in combination.

a. Weapons Fire. Fire on the air compressor with the heaviest weapons available.



ENGINE, LEFT SIDE VIEW.



COMPRESSOR, LEFT SIDE VIEW.

LEGEND:

■ 1/2 POUND CHARGE

FB 5396-110

Figure 110. Placement of demolition charges.

b. Scattering and Concealment. Remove all easily accessible vital parts such as batteries, generator, starter, fuel injection pump, gasoline-air tank, and aftercooler, and scatter them through dense foliage, bury them in dirt or sand, or throw them in a lake, stream, well, or other body of water.

c. Burning. Pack rags, clothing, or canvas under and around the unit. Saturate this packing with gasoline, oil, or diesel fuel, and ignite.

d. Submersion. Totally submerge the unit in a body of water to provide some water damage and concealment. Salt water will do the greatest damage to metal parts.

e. Misuse. Perform the steps listed below to make the unit inoperative:

(1) Start the engine, and pour metal filings, sand, salt, or other abrasives into the engine and operate at full speed.

(2) Start the engine, and drain the water from the cooling system and the oil from the engine and compressor.

280. Training

All operators should receive thorough training in the destruction of the air compressor. Simulated destruction, using all 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 the time available for destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction and be able to carry out demolition instructions without reference to this or any other manual.

APPENDIX I

REFERENCES

1. Accessory Equipment

TM 5–5199 Engine, Diesel, International Harvester Model UD–24.

TM 5–5170 Engine, Diesel, International Harvester, Models UD–18 and UD–18A.

TM 5–687 Inspection and Preventive Maintenance. Services for Fire-Protection Equipment and Appliances.

TM 9–1799 Ordnance Maintenance: Fire Extinguisher.

2. Auxiliary Equipment

TM 5–4004 Saw, Circular, Portable, Pneumatic, 12-in. Blade, Skilsaw, Model 2127.

TM 5–4018 Grinder, Pneumatic, Rotary Type, 4 x 1-inch Vitrified, 6 x 1-inch Organic Wheel, Independent Pneumatic Thor, Size No. 255, Model No. 5294.

TM 5–4022 Breaker, Paving, Pneumatic, Independent, Pneumatic, Thor, Model No. 25.

TM 5–4024 Digger, Clay, Pneumatic, Independent Pneumatic, Thor, No. 412, Model No. 4193.

TM 5–4036 Drill, Pneumatic, Portable, Rock, 35-lb. Class, Model JA–35 Jackhammer, Ingersoll-Rand.

TM 5–4060 Naildriver, Pneumatic, Ingersoll-Rand Model 6–CND.

TM 5–4062 Tamper, Back-Fill, Pneumatic, Ingersoll-Rand Model 34.

TM 5–4120 Grinder, Electric, Portable, ¾ HP, 110-Volt, Universal Motor, 6-In. Wheel, Independent Pneumatic No. U60, Model 3032, With Thor Horizontal Bench Stand No. 60, Model 3473.

TM 5–4066 Drill, Pneumatic, Portable, Rock, 55-lb. Class, Model JB–5, Ingersoll-Rand; Maintenance Manual and Parts List.

3. Dictionaries of Terms and Abbreviations

SR 320–5–1 Dictionary of United States Army Terms.

SR 320–50–1 Authorized Abbreviations.

4. Lubrication and Painting

LO 5–5396 Lubrication Order.
TM 9–2851 Painting Instructions for Field Use.

5. Preparation for Export Shipment

TB 5–9711–1 Preparation of Corps of Engineers Equipment for Oversea Shipment.
TB 5–9713–1 Preparation for Export, Spare Parts for Corps of Engineers Equipment.

6. Preventive Maintenance

TM 5–505 Maintenance of Engineer Equipment.

7. Publications Indexes

DA Pamphlet 108–1, Index of Army Motion Pictures, Television Recordings, and Filmstrips.
DA Pamphlet 310–1, Index of Administrative Publications.
DA Pamphlet 310–3, Index of Training Publications.
DA Pamphlet 310–4, Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
ENG 1 Introduction, Department of the Army Supply Manual.
DA Pam 310–25 Index of Supply Manuals—Corps of Engineers.
SR 310–20–6 Index of Blank Forms.

8. Supply Publications

ENG 7 & 8–5396 Compressor, Air: Trailer-Mounted, 4 Wheels; Pneumatic Tires, Diesel Driven; 500 Cubic Feet Per Minute; JAN–C–555; Class C; Size 3, Worthington Model 500 Blue Brute.
ENG 3–41 Hand Tools.
ENG 5–41 Hand Tools.

9. Training Aids

FM 21–8 Military Training Aids.

APPENDIX II

IDENTIFICATION OF REPLACEABLE PARTS

1. Standard Hardware

Engineer stock No.		Federal supply class and item identification No.	Description	Quantity per unit
Code No.	Part No.			
ORD	H001–5452340		Bolt, hex hd, ¼ x ¾ NF	8
ORD	5305–261–2766		Bolt, hex hd, ⅜ x ⅝ NC	4
ORD	H101–0179843		Bolt, hex hd, ⅜ x 1½ NC	76
ORD	H001–5454680		Bolt, hex hd, ⅜ x 1⅝ NC	2
ORD	H101–0179929		Bolt, hex hd, ⅝ x 1¾ NC	16
ORD	H101–0181482		Bolt, hex hd, ⅝ x 1¾ NF	4
ORD	5305–268–5958		Bolt, machine, ¾ x 5½ NC	4
914	45–3772–830–001	4730–010–5422	Elbow, street, ⅛ x 90°	1
914	45–3772–450–004		Elbow, street, ⅜ x 45°	1
			Key, woodruff	3
914	45–5600–007–030	192–9484	Nipple, ¾ x 3	1
914	45–5600–001–004	4730–253–6339	Nipple, close, ⅛	1
ORD	H001–1518004		Lockwasher, No. 8	8
ORD	H001–1518005		Lockwasher, No. 10	9
ORD	H001–1518006		Lockwasher, No. 12	8
ORD	5310–010–3319		Lockwasher, ¼	41
ORD	H001–1518008		Lockwasher, 5/16	37
ORD	H001–1518009		Lockwasher, ⅜	287
ORD	H001–1518010		Lockwasher, 7/16	10
ORD	H001–1518011		Lockwasher, ½	89
ORD	H001–1518013		Lockwasher, ⅝	66

ORD	H001-1518015		Lockwasher, ¾	26
ORD	H001-1518019		Lockwasher, 1¼	2
			Lockwasher, int-ext th, ⅜	2
ORD	H101-8456597		Nut, castellated, ¾ NF	1
ORD	H001-0725640		Nut, elastic stop, ¼ NF	2
ORD	H101-0110633		Nut, hex, No. 10 NC	2
ORD	H001-4135680		Nut, hex, No. 10 NF	2
ORD	5310-266-0385		Nut, hex, ¼ NC	12
ORD	5310-265-9213		Nut, hex, ¼ NF	14
ORD	5310-266-0386		Nut, hex, 5/16 NC	32
ORD	H101-8457826		Nut, hex, ⅜ NC	212
ORD	5310-265-9214		Nut, hex, 5/16 NF	2
ORD	5310-265-9215		Nut, hex, ⅜ NF	4
ORD	5310-265-9216		Nut, hex, 7/16 NF	2
ORD	5310-266-0387		Nut, hex, ½ NC	97
ORD	5310-265-9217		Nut, hex, ½ NF	4
ORD	5310-266-0389		Nut, hex, ⅝ NC	36
ORD	5310-265-9219		Nut, hex, ⅝ NF	4
ORD	H101-8456617		Nut, hex, ¾ NC	26
ORD	5310-265-9220		Nut, hex, ¾ NF	2
ORD	5310-266-0394		Nut, hex, 1¼ NC	4
ORD	H001-0716003		Nut, hex, jam, ⅜ NC	1
ORD	5310-266-0436		Nut, slotted hd, ¾ NF	1
			Pipe, cross	1
ORD	H001-0811027		Pin, cotter, 1/16 x ¾	3
ORD	H001-0811040		Pin, cotter, 3/32 x 1	1
ORD	H001-0811053		Pin, cotter, ⅛ x 1¼	2
914	45-6040-500-001	4730-187-4206	Plug, pipe, ⅛	6
914	45-6040-500-004	010-3867	Plug, pipe, ⅜	1
914	45-6040-500-003	187-4207	Plug, pipe, sq hd, ¼	1
ORD	H001-1026127		Screw, cap, fil hd, ¼ x ⅞ NC	4
ORD	H001-5451600		Screw, cap, hex hd, ¼ x ⅝ NC	12

1. Standard Hardware—Continued

Engineer stock No.		Federal supply class and item identification No.	Description	Quantity per unit
Code No.	Part No.			
ORD	H001–5451640		Screw, cap, hex hd, ¼ x ¾ NC	16
ORD	H001–5451660		Screw, cap, hex hd, ¼ x ⅞ NC	1
ORD	H001–5453100		Screw, cap, hex hd, 5/16 x ⅝ NC	13
ORD	H001–5453140		Screw, cap, hex hd, 5/16 x ¾ NC	10
ORD	H001–5419160		Screw, cap, hex hd, 5/16 x ⅞ NC	4
ORD	H001–5453320		Screw, cap, hex hd, 5/16 x 1¾ NC	3
ORD	H101–0179826		Screw, cap, hex hd, 5/16 x 2 NC	2
ORD	5305–261–2766		Screw, cap, hex hd, ⅜ x ⅝ NC	77
ORD	H001–5454520		Screw, cap, hex hd, ⅜ x ¾ NC	84
ORD	H001–5454540		Screw, cap, hex hd, ⅜ x ⅞ NC	76
ORD	H001–5454560		Screw, cap, hex hd, ⅜ x 1 NC	4
ORD	H101–0181364		Screw, cap, hex hd, ⅜ x 1 NF	3
ORD	H001–5454600		Screw, cap, hex hd, ⅜ x 1¼ NC	4
ORD	H101–0179843		Screw, cap, hex hd, ⅜ x 1½ NC	12
ORD	H101–0179845		Screw, cap, hex hd, ⅜ x 1¾ NC	3
ORD	H001–5454760		Screw, cap, hex hd, ⅜ x 2¼ NC	6
ORD	H001–5454780		Screw, cap, hex hd, ⅜ x 2½ NC	2
ORD	H001–5456960		Screw, cap, hex hd, 7/16 x 1¼ NF	2
ORD	H101–0179872		Screw, cap, hex hd, 7/16 x 3½ NC	8
ORD	H101–0179879		Screw, cap, hex hd, ½ x ¾ NC	1
ORD	H101–0179880		Screw, cap, hex hd, ½ x ⅞ NC	1
ORD	H001–5457720		Screw, cap, hex hd, ½ x 1 NC	1
ORD	H001–5457780		Screw, cap, hex hd, ½ x 1¾ NC	12
ORD	H001–5457800		Screw, cap, hex hd, ½ x 1½ NC	14
ORD	H101–0179890		Screw, cap, hex hd, ½ x 2¼ NC	8

ORD	5305–266–6382		Screw, cap, hex hd, ½ x 6 NF	1
			Screw, cap, hex hd, ⅝ x ½ NC	8
ORD	H001–5460980		Screw, cap, hex hd, ⅝ x 1½ NC	24
ORD	H101–0179925		Screw, cap, hex hd, ⅝ x 1¼ NC	11
ORD	H101–0179932		Screw, cap, hex hd, ⅝ x 2¼ NC	4
ORD	5305–268–5958		Screw, cap, hex hd, ¾ x 5½ NC	1
ORD	H101–8456748		Screw, cap, socket hd, ¼ x ⅞ NC	4
ORD	H101–8456761		Screw, cap, socket hd, 5/16 x 1¼ NC	2
			Screw, mach, flat hd, ¼ x 2	6
ORD	5305–010–0752		Screw, mach, rd hd, No. 8 x ⅝ NC	6
ORD	H001–1030586		Screw, mach, rd hd, No. 10 x ½ NF	1
			Screw, mach, rd hd, No. 10 x 1¼	2
ORD	H001–1030137		Screw, mach, rd hd, ¼ x ⅞ NC	2
			Screw, mach, rd hd, ⅜ x 1⅛ NC	3
ORD	H001–1030152		Screw, mach, rd hd, 5/16 x 1 NC	4
			Screw, mach, self-tapping, No. 8	8
			Stud, ½ x 1⅞ NC	16
914	45–7725–500–003	249–2029	Tee, pipe, ¼	4
ORD	H001–1530005		Washer, plain, No. 10	2
ORD	H001–1530009		Washer, plain, ⅜	34
			Washer, plain, 13/32	2
ORD	H001–1530010		Washer, plain, 7/16	8
ORD	H001–1530011		Washer, plain, ½	5
			Wingnut, ¼	5

2. Parts List

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
25	1	798	SUP778A	798	SUP–778A		Support, air cleaner	1
	6	602	C16528	798	CLE–250		Precleaner	1
	8	798	CMP85	798	CMP–85		Clamp, hose	4
	9	798	HOS108	798	HOS–108		Hose, rubber	1
	10	798	MFD167	798	MFD–167		Manifold, low-pressure suction	1
	11	798	CMP86	798	CMP–86		Clamp, hose	4
	15	798	GKT2332	798	GKT–2332		Gasket, cork	4
	16	798	MFD169	798	MFD–169		Manifold, left low-pressure suction	1
	17	798	HOS107	798	HOS–107		Hose, rubber	1
	19	798	GKT677	798	GKT–677		Gasket, cork	8
	24	798	PLT1640	798	PLT–1640		Plate, instruction	1
	25	798	ANG1127	798	ANG–1127		Bracket, instruction plate	1
	26	798	PIP892	798	PIP–892		Pipe, air cleaner	1
	28	798	MFD168	798	MFD–168		Manifold, right low-pressure suction	1
	36	602	J850AF	798	CLE–249		Cleaner, air	1
26	5	798	MFD171	798	MFD–171		Manifold, front high-pressure discharge	1
	6	798	RNG1228	798	RNG–1228		Ring, "O"	1
	7	798	AFT36	798	AFT–36		Aftercooler	1
	8	798	MFD170	798	MFD–170		Manifold, rear high-pressure discharge	1
	9	798	GKT1108	798	GKT–1108		Gasket	1
	10	798	TNK363	798	TNK–363		Receiver, air	1
	11	798	SRP533A	798	SRP–553–A		Strap, air receiver	2
	12	914	45–1760–030–020	798	BUS–549		Bushing, reducing 2½ x 2	1
	13	914	45–5480–020–025	798	NIP–694	193–2720	Nipple, close 2 inch	1
	14	798	TEE570	798	TEE–570		Tee, 1½ x 1½ x 2	1

	15	914	45–1760–015–007	798	BUS–530	4730–196–0846	Bushing, reducing, 1½ x ¾	1
	16	914	45–3772–830–007	798	ELL–538	----------	Elbow, street, ¾	1
	17	798	4JL	798	4–JL	----------	Valve, hose, ¾	1
	18	731	AM8	798	140–J	3425–376–8490	Hose, universal coupling, ¾	1
	19	914	45–5480–007–020	798	NIP–622	193–2715	Nipple, close, ¾ x 2	1
	20	914	45–7384–500–007	798	TEE–548	----------	Tee, ¾, STD	1
	21	914	45–3772–400–007	798	ELL–781	----------	Elbow, street, ¾, 45°	1
	22	914	45–5600–007–080	798	NIP–1142	4730–253–6349	Nipple, ¾ x 8	1
	23	914	45–3716–453–007	798	ELL–537	230–8685	Elbow, ¾, 45°	1
	24	914	45–8700–600–007	798	VAL–651	----------	Valve, globe, ¾	1
	25	798	NIP1251	798	NIP–1251	----------	Nipple, pipe	1
	26	GE	45–2624–500–015	798	CPL–546	----------	Coupling, pipe	1
	27	798	VAL1049	798	VAL–1049	----------	Valve, safety, 1½–125 psi	1
	28	798	ROD343	798	ROD–343	----------	Rod, tie high-pressure discharge	1
27	3	798	MFD162	798	MFD–162	----------	Manifold, right low-pressure discharge	1
	4	798	GKT1109	798	GKT–1109	----------	Gasket, low-pressure discharge manifold	4
	5	798	TNK138	798	TNK–138	----------	Tank, top	1
	7	798	VAL998	798	VAL–998	----------	Valve, safety	1
	8	798	MFD161	798	MFD–161	----------	Manifold, left low-pressure discharge	1
	9	798	GKT2358	798	GKT–2358	----------	Gasket, header	2
	10	798	COR51	798	COR–51	----------	Core	1
	11	798	CHN953	798	CHN–953	----------	Channel, left side	1
	12	798	GRD400	798	GRD–400	----------	Guard, left fan	------
	13	798	MFD163	798	MFD–163	----------	Manifold, high-pressure suction	1
	14	798	GKT1108	798	GKT–1108	----------	Gasket, high-pressure suction manifold	1
	15	798	SHR40	798	SHR–40	----------	Shroud	1
	17	896	6892	798	COC 517	----------	Cock, drain, ¼	1
	20	798	TNK139	798	TNK–139	----------	Tank, bottom	1
	22	798	GRD401	798	GRD–401	----------	Guard, right fan	1
	25	798	CHN954	798	CHN–954	----------	Channel, right side	1
	28	798	STR484	798	STR–484	----------	Strip, backing	4

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
28	1	798	SPC–149	798	SPC–149	------	Spacer, fan bracket	4
	2	798	BRK216	798	BRK–216	------	Bracket, fan	1
	8	798	SHF126	798	SHF–126	------	Spindle	1
	9	------	3110–100–3167	798	CNE–17118	3110–100–3176	Cone, bearing	1
	10	------	3110–100–0527	798	CUP–17244	3110–100–0527	Cup, bearing	1
	12	834	B38	798	B–38	------	V-belt	2
	13	798	HUB25	798	HUB–25	------	Hub	1
	14	------	3110–100–0637	798	CUP–07204	3110–100–0637	Cup, bearing	------
	15	------	3110–100–3699	798	CNE–07098	3110–100–0637	Cone, bearing	------
	16	798	WAS117	798	WAS–117	------	Washer, cone clamp	1
	18	798	GKT2080	798	GKT–2080	------	Gasket	1
	19	798	FAN78	798	FAN–78	------	Blade, fan	1
	22	798	GKT2082	798	GKT–2082	------	Gasket, oil	1
	23	798	WAS118	798	WAS–118	------	Washer, cork retaining	1
	24	798	WAS119	798	WAS–119	------	Washer, cork	1
	25	798	RTR41	798	RTR–41	------	Retainer, cork	1
	26	798	SPR211	798	SPR–211	------	Wire, lock	1
	27	798	WAS81	798	WAS–81	------	Washer, clamp	1
	28	798	WAS120	798	WAS–120	------	Washer, clamp	1
30	------	876	P92–03	876	P–9203	------	Purolater oil filter assembly, consisting of items 1, 2, 3, 4, 7, 13, and 14.	------
	1	876	34412	876	34412	------	Cover	1
	2	876	20509–2	876	20509–2	------	Gasket	1
	3	876	P92	876	33316–13	------	Element	1
	4	876	34421	876	34421	------	Case	1

	7	876	19983	876	19983		Bracket, mounting	2
	12	798	HOS109	798	HOS–109		Hose, flex, 36	1
	13	876	7335	876	7335		Plug, drain	1
	14	876	7494	876	7494		Gasket, drain plug	1
	15	798	ELL901	798	ELL–901		Elbow, 90°	2
	16	798	HOS110	798	HOS–110		Hose, flex, 20	1
33	2	798	WAS43	798	WAS–43		Gasket, copper	8
	3	798	NUT477	798	NUT–477		Nut, leakage cap	8
	4	798	GKT594	798	GKT–594		Gasket, copper	8
	5	ORD	H001–5454680	798	SCR–897		Bolt, hex hd, ⅜ x 1⅝ NC	8
	6	798	GKT998	798	GKT–998		Gasket, unloader cover	4
	7	798	COV133	798	COV–133		Cover, unloader	4
	10	798	GKT594	798	GKT–594		Gasket, copper	16
	11	798	NUT477	798	NUT–477		Nut, leakage cap	8
	12	798	WAS43	798	WAS–43		Gasket, copper	8
	13	798	COV166	798	COV–166		Cover, cylinder head	4
	14	798	SCR1160	798	SCR–1160		Screw, jam	16
	15	798	GKT997	798	GKT–997		Gasket, unloader cylinder	4
	16	------	----------	798	----------		Unloader	4
	17	798	VAL195	798	VAL–195B		Valve, discharge assembly	4
	18	798	VAL194	798	VAL–194B		Valve, suction assembly	4
	19	798	GKT1180	798	GKT–1180	5330–354–7553	Gasket, cylinder head cover	4
	20	798	HD43	798	HD–43	4310–354–7573	Head, cylinder	2
	21	798	GKT987	798	GKT–987	4310–377–5481	Gasket, cylinder head	2
	26	ORD	H001–0716003	798	NUT–416		Nut, jam screw, ⅜	8
34	1	ORD	5310–266–0387	798	½ NC		Nut, hex	4
	3	798	NUT477	798	NUT–477		Nut, leakage cap	4
	4	798	GKT594	798	GKT–594		Gasket, copper	4
	5	ORD	H001–5454680	798	SCR–897		Bolt, hex hd, ⅜ x 1⅝ NC	4
	7	ORD	H001–5454760	798	SCR–869		Cap screw, hex hd, ⅜ x 2¼ NC	8
	8	798	GKT–594	798	GKT–594		Gasket, copper	8

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
34	9	798	COV133	798	COV–133		Cover, unloader	2
	10	798	NUT477	798	NUT–477		Capnut, leakage	4
	11	798	WAS43	798	WAS–43		Washer, copper	4
	12	798	GKT998	798	GKT–998		Gasket, unloader cover	2
	13	798	COV234	798	COV–234		Cover, cylinder head	2
	14	798	SCR1160	798	SCR–1160		Screw, jam	8
	15	798	GKT997	798	GKT–997		Gasket, unloader cylinder	2
	17	798	VAL196	798	VAL–196B		Valve, suction assembly	------
	18	798	GKT–1183	798	GKT–1183	5330–354–7554	Gasket, cylinder head cover	2
	19	798	HD45	798	HD–45		Head, cylinder	1
	20	798	GKT990	798	GKT–990	5330–354–7564	Gasket, cylinder head	2
	24	798	VAL197	798	VAL–197B		Valve, discharge assembly	------
	25	ORD	H001–0716003	798	NUT–416		Nut, jam screw, ⅜	4
35	1	798	PST237	798	PST–237		Piston	6
	2	798	SPG302	798	SPG–302		Spring, power	6
	3	ORD	H001–0725660	798	NUT–654		Nut, stop	6
	4	798	WAS61	798	WAS–61		Washer, spring	6
	5	798	SPR157	798	SPR–157		Spring, return	6
	6	798	RNG1224	798	RNG–1224		Ring, "O"	6
	7	798	CYL294	798	CYL–294		Cylinder, unloader	6
	8	798	FGR58A	798	FGR–58A		Finger assembly, low-pressure	4
	8	798	FGR59A	798	FGR–59A		Finger assembly, high-pressure	2
36	A	------	----------	------	----------		Low-pressure suction valve	------
	1	798	GKT994	798	GKT–994		Gasket	4
	4	798	GRD356	798	GRD–356B		Guard	4

	5	798	STR113	798	STR–113	4310–374–7507	Strip	114
	6	798	SET106	798	SET–106		Seat	4
	7	798	YOK3	798	YOK–3		Yoke	4
36	B						Low-pressure discharge valve	
	1	798	GKT994	798	GKT–994		Gasket	4
	4	798	GRD357	798	GRD–357B		Guard	4
	5	798	STR113	798	STR–113	4310–374–7507	Strip	114
	6	798	SET107	798	SET–107		Seat	4
	7	798	YOK3	798	YOK–3		Yoke	4
36	C						High-pressure suction valve	
	1	798	GKT993	798	GKT–993		Gasket	2
	4	798	GRD358	798	GRD–358B		Guard	2
	5	798	STR113	798	STR–113	4310–374–7507	Strip	44
	6	798	SET108	798	SET–108		Seat	2
	7	798	YOK2	798	YOK–2		Yoke	2
36	D						High-pressure discharge valve	
	1	798	GKT993	798	GKT–993		Gasket	2
	4	798	GRD359	798	GRD–359B		Guard	2
	5	798	STR113	798	STR–113		Strip	44
	6	798	SET109	798	SET–109		Seat	2
	7	798	YOK2	798	YOK–2		Yoke	2
38	1	896	W72X5	798	TEE–680	2815–361–7282	Tee	1
	2	798	VAL1028	798	VAL–1028		Valve, check	1
	3	896	W68X5A	798	CPL–613		Coupling	1
	6	896	W68X6	798	CPL–612		Coupling	1
	7	798	CRO505	798	CRO–505		Cross, pipe	1
	8	798	SUP758	798	SUP–758		Bracket, support	1
	12	896	W69X5A	798	ELL–613		Elbow	1
	13			798			Tubing, air receiver gage	1
	14	798	BAL17	798	BAL–17		Ball	1

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
38	------	798	VAL955A	798	VAL–955A	----------	Trigger and valve assembly, consisting of items 14, 15, 16, 17, 18, 19, 20, 24, and 25.	1
	15	798	SHM37	798	SHM–37	----------	Shim	10
	16	798	RTR33	798	RTR–33	----------	Retainer, spring	------
	17	798	STM14	798	STM–14	----------	Stem	1
	18	798	SPR139	798	SPR–139	----------	Spring	1
	19	ORD	5310–266–0343	798	NUT–558	----------	Nut, jam	1
	20	798	SCR1037	798	SCR–1037	----------	Screw, adjusting	1
	21	896	W69X5A	798	ELL–613	----------	Elbow	1
	23	896	3700X4	798	TEE–513	----------	Tee	1
	24	798	HOL1	798	HOL–1	----------	Holder, gauze	1
	25	798	BOD43	798	BOD–43	----------	Body, trigger valve	1
	26	896	3326X4	798	NIP–526	----------	Nipple	1
39	1	975	261–621–R11	975	261–621–R11	----------	Nut, cover retainer	3
	2	975	261–624–R1	975	261–624–R1	2940–374–9201	Gasket, cover retainer nut	3
	3	975	48–512–D	975	48–512–D	5340–424–7732	Ring, cover snap	3
	4	975	261–620–R1	975	261–620–R1	----------	Cover, filter case	3
	5	975	261–626–R2	975	261–626–R2	----------	Gasket, filter case cover	3
	6	876	PR–1	975	261–627–R91	----------	Element, oil filter	3
	9	975	261–830–R11	975	261–830–R11	----------	Standpipe	3
	10	975	----------	975	261–835–R1	5330–248–0993	Gasket, standpipe	3
	11	975	----------	975	261–833–R11	----------	Case, filter	3
	12	975	445–084	975	445–084	----------	Plug, drain	3
	13	975	105–453	975	105–453	----------	Gasket, drain plug	3

	14	975	261–614–R11	975	261–614–R11	5305–374–9200	Stud, filter	3
	15	975	218–445	975	218–445		Nut, hex	3
	16	975	261–836–R1	975	261–836–R1	5330–355–3569	Gasket, filter case	3
	17	914	45–6040–500–004	975	103–867	010–3867	Plug, pipe	
	18	914	45–6068–500–005	975	103–874	4730–263–3120	Plug, pipe	
	19	975	261–610–R1	975	261–610–R1		Gasket, filter base	1
	20	975	261–611–R1	975	261–611–R1		Valve, pressure regulating	1
	21	975	263–508–R1	975	263–508–R1		Spring, regulating valve	1
	22	975	115–449	975	115–449		Gasket, retainer nut	1
	23	975	261–613–R1	975	261–613–R1	5310–355–3565	Nut, valve retainer	1
	24	975	261–632–R2	975	261–632–R2		Union, filter inlet pipe	1
41	1	975	250–678–R11	975	250–678–R11		Belts, fan (1 matched pair)	1
	4	975	255–824–R11	975	255–824–R11		Brace, fan guard	1
	5	910	33–2340–100–300	975	91–406–HA		Clamp, hose	6
	6	975	42–612–D	975	42–612–D	2930–424–7494	Hose, inlet	3
	7	975	251–794–R1	975	251–794–R1		Pipe, inlet	1
	8	975	255–170–R1	975	255–170–R1		Brace, radiator	1
	10	975	255–173–R91	975	255–173–R91		Stud, radiator brace	1
	16	975	251–793–R1	975	251–793–R1		Nipple, inlet	1
	17	975	262–725–R21	975	262–725–R21		Sheet, left fan housing	1
	18	975	262–726–R21	975	262–726–R21		Sheet, right fan housing	1
	21	975	256–216–R91	975	256–216–R19		Fan, blower	
	22	975	255–816–R92	975	255–816–R92		Guard, left fan	1
	24	975	255–823–R92	975	255–823–R92		Guard, right fan	1
	25	975	251–797–R1	975	251–797–R1		Gasket, outlet pipe flange	1
	26	975	251–795–R11	975	251–795–R11		Pipe, outlet	1
42	3	975	251–773–R3	975	251–773–R3		Spacer, radiator core	2
	6	975	251–798–R92	975	251–798–R93	2930–355–3319	Core, radiator	1
	7	975	251–781–R2	975	251–781–R2		Stiffener, front core	2
	8	975	263–936–R1	975	263–936–R1		Stiffener, rear core	2
	9	975	259–844–R1	975	259–844–R1		Gasket, upper	1
	11	975	37–323–D	975	37–323–D		Elbow, overflow pipe	1

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
42	12	975	251–770–R3	975	251–770–R3		Tank, upper	1
	13	975	255–165–R11	975	255–165–R11		Sheet, left side	1
	14	975	46–610–D	975	46–610–D		Handle, cap clamp	1
	15	975	5–913	975	5–913		Cover, cap	1
	16	975	255–047–R1	975	255–047–R3		Gasket, cap	1
	17	975	42–158–D	975	42–158–D		Clamp, cap	1
	21	975	251–784–R91	975	251–784–R91		Grille	1
	22	798	PNL–1612A	798	PNL–1612A		Panel, lower left side	1
	23	798	PLT–298	798	PLT–298		Nameplate, radiator	1
	27	975	255–168–R11	975	255–168–R11		Grille, bottom	1
	28	798	PNL–1612A	798	PNL–1612A		Panel, lower right side	1
	29	975	255–166–R11	975	255–166–R11		Sheet, right side	1
	30	975	66–076–D	975	66–076–D		Clip, overflow pipe	2
	31	975	251–783–R11	975	251–783–R11		Pipe, overflow	1
	32	975	259–844–R1	975	259–844–R2		Gasket, lower, radiator	1
	36	975	251–769–R3	975	251–769–R3		Water tank, lower	1
	37	975	42–605–D	975	42–605–D		Valve, drain cock	1
44	3	975	259–753–R1	975	259–573–R1		Clip, rear air trap-to-fuel filter pipe	1
	5	975	260–949–R11	975	260–949–R11		Pipe, rear air trap-to-fuel filter	1
	8	975	23–995–DA	975	23–995–DA		Cap, gasoline tank filler	1
	9	975	23–977–DA	975	23–977–DA		Gasket, gasoline tank filler cap	1
	10	914	45–6040–500–007	975	103–869	4730–263–3124	Plug, pipe	1
	11	896	W68X6	798	CPL–612		Coupling	1
	13	975	259–569–R91	975	259–569–R91		Tank, gasoline and air trap	1
	14	975	260–948–R11	975	260–948–R11		Pipe, air trap-to-fuel filter	1

	15	975	42-411-DX	975	42-411-DX	----------	Elbow, air trap-to-fuel filter pipe	1
	16	975	259-576-R91	975	259-576-R91	----------	Pipe, extension, transfer pump-to-air trap	1
	17	975	260-950-R11	975	260-950-R11	----------	Pipe, injection pump-to-connector	1
	18	975	55-999-DX	975	55-999-DX	----------	Pipe, connector, injection pump-to-air trap	1
	19	975	260-951-R11	975	260-951-R11	----------	Pipe, connector-to-air trap	1
	20	975	27-388-D	975	27-388-D	----------	Clip, pipe, connector-to-air trap	1
	21	975	259-577-R11	975	259-577-R11	----------	Pipe, transfer pump-to-air trap	1
	22	975	259-403-R91	975	259-403-R91	----------	Stem, gasoline strainer	1
	23	855	26-984	975	17-564-D	----------	Bail, gasoline strainer	1
	24	855	27-208	975	17-565-DA	2910-533-2131	Nut, thumb, gasoline strainer	1
	25	600	FP5	975	51-344-V	2910-474-6443	Bowl, gasoline strainer	1
	26	855	25-854	975	13-194-D	2910-553-2128	Screen, gasoline strainer	1
	27	855	5330-199-0445	975	13-193-D	5330-199-0445	Gasket, strainer	1
	28	975	259-402-R91	975	259-402-R91	----------	Body, gasoline strainer	1
	29	975	259-570-R11	975	259-570-R11	----------	Pipe, gasoline tank-to-carburetor	1
	30	975	55-999-DX	975	55-999-DX	----------	Connector, air trap-to-fuel filter pipe	1
	31	975	23-125-D	975	23-125-D	4730-424-7146	Clip, pipe, front air trap-to-fuel filter	1
48	1	896	W69X6	798	ELL-652	----------	Elbow	4
	3	975	259-909-R11	975	259-909-R11	----------	Pipe, pump strainer-to-transfer pump	1
	4	975	60-350-D	975	60-350-D	----------	Plug, strainer	1
	5	975	60-352-D	975	60-352-D	----------	Gasket, strainer	1
	6	975	60-351-D	975	60-351-D	----------	Screen, strainer	1
	8	798	TUB2580	798	TUB-2580	----------	Tube, drop	1
	10, 11	798	CAP183	798	CAP-183	----------	Cap, filler and screen	1
	12	798	TNK133	798	TNK-133	----------	Tank, fuel	1
	17	975	54-873-D	975	54-873-D	2910-431-1133	Bracket, strainer	1
	20	975	60-349-D	975	60-349-D	----------	Body, strainer	1
49	1	975	39-677-D	975	39-677-D	----------	Valve, bleeder	2
	2	975	260-703-R2	975	260-703-R2	----------	Nut, cover	2
	3	------	5330-245-5457	975	261-535-R1	5330-245-5457	Gasket, cover nut	2
	4	975	261-192-R91	975	261-192-R91	----------	Cover, filter case	2

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
49	5	975	260–839–R1	975	260–839–R1		Gasket, filter case cover	2
	6	975	260–705–R1	975	260–705–R1		Ring, cover nut retaining	2
	7	975	259–480–R91	975	259–480–R91		Element	2
	8	975	260–707–R1	975	260–707–R1		Spring, water separator screen	1
	9	975	260–706–R91	975	660–706–R91		Screen, water separator	1
	10	975	260–699–R1	975	260–699–R1		Case, filter	2
	11	975	260–700–R1	975	260–700–R1		Stud, filter case	2
	12	975	260–710–R2	975	260–710–R2		Ring, filter case seal	2
	13	975	260–698–R21	975	260–698–R21		Base, filter	1
	14	855	89L3–8X1–4	975	37–323–DX		Elbow with nut, fuel pipe	2
	15	896	140	975	9–982–T		Cock, drain, fuel filter	2
	18	975	260–701–R1	975	260–701–R1		Nut, lock, filter case stud	2
	19	975	260–709–R1	975	260–709–R1		Pipe, drain, water trap	1
	20	------	5330–245–5456	975	260–708–R1	5330–245–5456	Gasket, water trap	1
	21	975	60–877–D	975	60–877–D	2815–356–0714	Glass, water trap	1
	22	975	60–878–DX	975	60–878–DX	2815–360–3635	Bail, water trap	1
	23	975	260–750–R91	975	260–750–R91		Valve, fuel shutoff	1
56	1	975	251–831–R91	975	251–831–R91		Precleaner	1
	3	431	P7871	975	255–404–R91		Body	1
	4	975	261–860–R91	975	261–860–R91		Clamp, pipe hose	2
	5	975	251–836–R2	975	251–836–R2		Hose, pipe	1
	6	975	255–138–R11	975	255–138–R11		Pipe	1
	9	975	251–835–R2	975	251–835–R2		Gasket, air cleaner pipe	1
	10	975	255–142–R1	975	255–142–R1		Clamp, air cleaner support	1
	12	431	P7878	975	255–405–R91		Tray	1

	14	431	P7884	975	255-407-R91	----------	Clamp, air cleaner oil cup retaining	------
	15	431	P7881	975	255-406-R91	----------	Cup, oil	1
	18	975	255-139-R31	975	255-139-R31	----------	Bracket, air cleaner support	1
57	2	798	CAP185	798	CAP-185	----------	Cap, weather, exhaust	2
	5	975	115-24-1	975	115-24-1	----------	Muffler	2
	6	975	U14284	975	U14-284	----------	Clamp, muffler	2
	7	975	252-090-R11	975	252-090-R11	----------	Pipe, exhaust	2
	9	975	255-133-R1	975	255-133-R1	----------	Gasket, exhaust pipe flange	2
	10	975	250-527-R1	975	250-527-R1	----------	Stud, exhaust pipe	4
64	3	798	YOK66	798	YOK-66	----------	Yoke, lifting bail	1
	4	798	ROD536A	798	ROD-536A	----------	Rod, lifting bail	1
	11	798	SUP776A	798	SUP-776A	----------	Support, right air receiver	1
	14	798	PNL1626	798	PNL-1626	----------	Panel, rear cover	1
	16	798	SUP777A	798	SUP-777A	----------	Support, left air receiver	1
	19	798	FRM424	798	FRM-424	----------	Frame	1
	24	798	COV485	798	COV-485	----------	Cover, battery	1
	26	798	BLT1012	798	BLT-1012	----------	Bolt, battery	6
	28	798	END157A	798	END-157A	----------	End, door, right front	1
	30	798	SPC156	798	SPC-156	----------	Spacer, canopy	2
	33	798	STR470	798	STR-470	----------	Strip, canopy joint	1
	36	798	CAN70A	798	CAN-70A	----------	Canopy, right	1
	37	798	PLT1645	798	PLT-1645	----------	Plate, manifold collar	1
	42	798	PIN363	798	PIN-363	----------	Pin, hinge	3
	44	798	BOX221A	798	BOX-221A	----------	Box, tool	1
	45	798	CUR91A	798	CUR-91A	----------	Door, access, right lower	1
	46	798	CUR90A	798	CUR-90A	----------	Door, access, right upper	1
	48	798	----------	798	CUR-90A	----------	Door, access, left upper (duplicate)	1
	49	798	VCE44A	798	VCE-44A	----------	Valance, right front	1
	52	798	----------	798	CUR-91A	----------	Door, access, left lower (duplicate)	1
	55	798	VCE43A	798	VCE-43A	----------	Valance, left front	1
	59	798	END156A	798	END-156A	----------	End, door, left front	1

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
64	61	798	SUP783	798	SUP–783		Support, battery	1
	62	798	CMP82	798	CMP–82		Clamp, battery	1
	63	798	SPC157	798	SPC–157		Spacer, battery cover	6
	64	798		798	SUP–768A		Support, center canopy	2
	66	798		798	CUR–90A		Door, access, right upper (duplicate)	1
	67	798		798	CUR–91A		Door, access, right lower (duplicate)	1
	68	798	SUP793A	798	SUP–793A		Support, rear canopy	1
	70	798	END156A	798	END–156A		End, door, right rear	1
	71	798	SUP785	798	SUP–785		Support, right rear door end	1
	78	798	GRD391	798	GRD–391		Guard, intercooler	1
	79	798	SUP784	798	SUP–784		Support, left rear door end	1
	83	798	END157A	798	END–157A		End, door, left rear	1
	88	798	VCE45A	798	VCE–45A		Valance, right rear	1
	90	798	BOX223A	798	BOX–223A		Box, deep tool	1
	96	798		798	CUR–90A		Door, access, left upper (duplicate)	1
	99	798		798	CUR–91A		Door, access, left lower (duplicate)	1
	102	798	VCE46A	798	VCE–46A		Valance, left rear	1
	103	798		798	BOX–223A		Box, deep tool (duplicate)	1
65	2	798	30564	(*)	30564		Bracket, spring	4
	3	ORD			30545		Pin, spring shackle	4
	4	ORD	H001–0811079		9X–186		Pin, cotter	8
	5	798	30583		30583		U-bolt, spring shackle	8
	6	798	30565		30565		Bracket	2
	9	798	30522T		30522–T		Pin, spring shackle	2

	10	806	1610B	------	30949	----------	Fitting, grease	4
	11	798	30558	------	30558	----------	Seal, wheel oil	4
	12	------	3110–100–0378	------	3820	3110–100–0378	Cone, inner hub bearing	4
	13	------	3110–100–3108	------	3877	3110–100–3108	Cup, inner hub bearing	4
	14	------	----------	------	31106	----------	Stud	4
	15	798	31106	------	31106	----------	Hub assembly	4
	16	------	3110–100–0355	------	2523	3110–100–0355	Cup, outer hub bearing	4
	17	------	3110–100–0731	------	2585	3110–100–0731	Cone, outer hub bearing	4
	18	208	1500–6	------	1500–6	----------	Washer, spindle	4
	19	ORD	5310–266–4165	------	5X408	----------	Nut, spindle	4
	24	798	31076	------	31076	----------	Wheel, disc	4
	25	204	37888	------	30369–R	----------	Nut	2
	26	ORD	H001–0811079	------	9X–186	----------	Pin, cotter	4
	27	798	30544	------	30544	----------	Clamp, spring and axle	4
	28	ORD	5310–265–9208	(*)	5X106	----------	Nut	32
	29	208	1634	------	1634	----------	Spring	4
66	1	208	31109	(*)	31109	----------	Beam, rear axle	1
	2	798	30502	------	30502	----------	Pin, center steering arm	1
	------	208	7–11260	798	AXL–88	----------	Front axle assembly	1
	3	798	31108	------	31108	----------	Beam, front axle	1
	4	ORD	5305–263–6504	------	3X–166	----------	Nut, king pin	2
	5	798	30851	------	30851	----------	Pin, king	2
	6	208	3X206	------	3X–206	----------	Pin, cotter	2
	7	806	1610B	------	30949	----------	Fitting, grease	10
	8	798	30189T	------	30189–T	----------	Pin, yoke, tie rod-to-knuckle	1
	9	798	30965	------	30965	----------	Steering knuckle assembly	2
	10	------	----------	------	R–2909	----------	Yoke, tie rod	2
	11	208	5X171	------	5X–171	----------	Nut, tie rod yoke	2
	13	798	R2409	------	R–2409	----------	Rod, tie	2
	14	ORD	H001–1530007	------	11X148	----------	Washer, steering knuckle thrust	2

*Parts without code No. manufactured by United Mfg. Co.

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
66	15	798	30522T	------	30522–T	----------	Pin, tie rod-to-center arm	2
	16	208	3X164–½	------	3X164–½	----------	Nut, center arm pin	1
	17	798	30961	------	30961	----------	Arm, center steering	1
	18	208	3X391B	------	3X391–B	----------	Nut, drawbar	1
	19	798	5–7008	------	5–7008	----------	Drawbar	1
	20	208	1634	------	1634	----------	Spring	1
	21	798	31107	(*)	31107	----------	Lunnette and shaft	1
	22	ORD	H001–1518017	------	11X146	----------	Washer, spring retaining nut	1
	23	ORD	5310–266–4166	------	5X110	----------	Nut, spring retaining	1
	25	798	30522T	798	30522T	----------	Pin, tie rod-to-center arm	1
69	1	798	131117	798	131117	----------	Screw, set	2
	2	798	CLT28	798	CLT–28	----------	Clutch assembly	2
	5	798	131180H	798	SFR–1	----------	Hydro-shifter assembly	1
	6	798	HUS39	798	HUS–39	----------	Housing, bearing	1
	7	798	CKS134	798	CKS–134	4310–354–7547	Crankshaft, compressor	1
	8	ORD	H101–8456269	798	KEY–84	----------	Key, clutch	1
	9	ORD	H001–5457800	798	SCR–1388	----------	Screw, cap, hex hd	8
	10	ORD	H001–15180011	798	WAS–512	----------	Lockwasher	8
	11	798	NUT1040	798	NUT–1040	----------	Nut, adjusting	8
70	1	798	131107A	------	131107–A	----------	Ring, snap, spring plate (Industrial Clutch Corp.)	1
	2	798	131106A	------	131106–A	4310–360–3660	Plate, spring (Industrial Clutch Corp.)	1
	3	798	131104A	------	131104–A	----------	Spring, clutch (Industrial Clutch Corp.)	9
	4	798	131105	------	131105	----------	Spring, insulator (Industrial Clutch Corp.)	9

	5	798	131102AD	------	131102	----------	Backplate and pin assembly (Industrial Clutch Corp.)	1
	6	798	131108C	------	131108–C	----------	Disc assembly, drive, front (set of 4) (Industrial Clutch Corp.)	1
	7	798	132202	------	132202	----------	Plate, center (Industrial Clutch Corp.)	1
	8	798	132208C	------	132208	----------	Disc assembly, drive, rear (set of 4) (Industrial Clutch Corp.)	1
	9	798	132201	------	132201	----------	Plate, hub (Industrial Clutch Corp.)	1
	------	------	----------	------	CLT–28	----------	Clutch assembly, consisting of items 1–11	------
	10	798	131112H	------	131112–H	----------	Plate, thrust (Industrial Clutch Corp.)	1
	11	ORD	H101–8456766	------	115717	----------	Screw, thrust stud (Industrial Clutch Corp.)	3
71	1	798	CYL123	798	CYL–123	----------	Cylinder, low-pressure	2
	2	798	STU696	798	STU–696	----------	Stud, ½ x 7½ NC	2
	3	798	SPG40	798	SPG–40	----------	Retaining ring, piston pin	8
	4	798	PIN174	798	PIN–174	----------	Pin, piston	2
	5	798	PST144	798	PST–144	----------	Piston, high-pressure	2
	6	798	RNG712	798	RNG–712	----------	Rings, oil control, standard	4
	------	798	----------	798	RNG–712x15	----------	Rings, oil control, 0.015 oversize (as req'd)	------
	------	798	----------	798	RNG–712x30	----------	Rings, oil control, 0.030 oversize (as req'd)	------
	7	798	RNG112	798	RNG–112	4310–496–0520	Rings, compression	6
	------	798	----------	798	RNG–112x15	----------	Rings, compression, 0.015 oversize (as req'd).	------
	------	798	----------	798	RNG–112x30	----------	Rings, compression, 0.030 oversize (as req'd).	------
	8	798	STU695	798	STU–695	----------	Stud, ½ x 8⅝ NC	4
	9	798	CYL119	798	CYL–119	----------	Cylinder, high-pressure	2
	12	798	GKT988	798	GKT–988	----------	Gasket, high-pressure cylinder	2
	13	798	PST145	798	PST–145	----------	Piston, low-pressure	4
	14	798	RNG745	798	RNG–745	4310–496–0525	Rings, oil control	8
	------	------	----------	798	RNG–745x15	----------	Rings, oil control, 0.015 oversized (as req'd)	------

*Parts without code No. manufactured by United Mfg. Co.

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
71	------	------	----------	798	RNG–745x30	----------	Rings, oil control, 0.030 oversized (as req'd)	------
	15	798	RNG135	798	RNG–135	4310–496–0521	Rings, compression	12
	------	------	----------	798	RNG–135x15	----------	Rings, compression, 0.015 oversized (as req'd).	------
	------	------	----------	798	RNG–135x30	----------	Rings, compression, 0.030 oversized (as req'd).	------
	16	798	GKT987	798	GKT–987	----------	Gasket, low-pressure cylinder	2
	17	798	SPG44	798	SPG–44	----------	Retaining ring, low-pressure piston pin	4
	20	798	PIN175	798	PIN–175	----------	Pin, piston	4
72	1	------	3110–142–4368	798	CUP–832	3110–142–4368	Cup, bearing	1
	2	------	3110–100–0703	798	CNE–842	3110–100–0703	Cone, bearing	2
	3	ORD	H101–8456269	798	KEY–84	----------	Key, catch	1
	4	------	----------	798	LNK–5	----------	Link, connecting rod	4
	5	798	BUS99	798	BUS–99	----------	Bushing, wrist pin	4
	6	798	ROD62	798	ROD–62	----------	Rod, connecting, with cap	2
	7	798	BLT4	798	BLT–4	----------	Bolt, connecting rod	4
	8	798	SCR1137	798	SCR–1137	----------	Screw, link pin lock	4
	9	------	----------	798	BUS–61	----------	Bushing, wrist pin	4
	10	------	----------	798	BUS–62	----------	Bushing, link pin	4
	11	798	PIN104A	798	PIN–104A	----------	Pin, connecting rod link	4
	12	798	BRG472	798	BRG–472	----------	Bearing insert, upper half	2
	------	------	----------	798	BRG–472X20	----------	Bearing insert, upper half, ID 0.020 undersize (as req'd).	------
	13	798	CKS134	798	CKS–134	----------	Crankshaft	1

	14	ORD	H001–0518036	798	KEY–40	----------	Key, woodruff, ¼ x 1	1
	15	------	3110–159–9508	798	CUP–832B	3110–159–9508	Cup, bearing	1
	16	ORD	H101–8456592	798	NUT–563	----------	Nut, connecting rod	8
	19	798	BRG473	623	BRF–473	----------	Bearing insert, lower half	2
	------	------	----------	------	BRG–473 x 20	----------	Bearing insert, lower half, ID 0.020 undersize (as Req'd).	------
76	3	798	WAS645	798	WAS–645	----------	Washer, pump end shaft	1
	4	798	SHE457	798	SHE–457	----------	Sheave, fan drive	1
	5	798	SPC145	798	SPC–145	----------	Spacer	1
	6	ORD	H101–8460710	798	SCR–892	----------	Screw, cap, socket hd	7
	7	ORD	H101–8456769	798	SCR–825		Screw, cap, socket hd	2
	8	798	GKT593	798	GKT–593	----------	Gasket, copper	9
	9	798	SEL79	798	SEL–79	----------	Seal, oil	1
	12	798	GKT1188	798	GKT–1188	5330–354–7555	Gasket, oil pump cover	1
	13	798	SHF56	798	SHF–56	----------	Shaft, idler gear	1
	14	798	GER65	798	GER–65	----------	Gear, driver, oil pump drive	1
	15	798	GER24A	798	GER–24A	----------	Gear, idler, oil pump drive	1
	16	798	PMP5B	798	PMP–5B	4310–371–6456	Pump, assembly, oil	1
	18	ORD	H101–8460712	798	SCR–940	----------	Screw, cap, socket hd	2
	19	798	CAP25	798	CAP–25	----------	Cap, oil pressure adjusting screw	1
	20	798	SCR1022	798	SCR–1022	----------	Screw, oil pressure adjusting	1
	22	798	GKT1179	798	GKT–1179	----------	Gasket, oil pressure adjusting screw cap	2
	23	798	SPG4	798	SPR–4	----------	Spring, oil pressure adjusting	1
	25	798	BUS92	798	BUS–92	----------	Bushing, oil pump shaft	1
	26	798	PLU67	798	PLU–67	----------	Plug, welch	1
	29	ORD	H101–8460712	798	SCR–940	----------	Screw, cap, socket hd	1
77	1	798	GER25A	798	GER–25A	----------	Gear, driven, oil pump drive	------
	2	798	SCR690	798	SCR–690	----------	Screw, driven gear hub	1
	3	798	KEY34	798	KEY–34	----------	Key, woodruff	2
	4	798	SHF119	798	SHF–119	----------	Shaft, oil pump drive gear	1
	5	798	BUS92	798	BUS–92	----------	Bushing, drive gear shaft	1

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
77	6	798	BOD34	798	BOD–34	----------	Body, oil pump	1
	7	798	SHF120	798	SHF–120	----------	Shaft, oil pump driven gear	1
	8	798	BUS126	798	BUS–126	----------	Bushing, oil pump driven gear	1
	9	798	GER35	798	GER–35	----------	Gear, oil pump drive	1
	10	798	GER36	798	GER–36	----------	Gear, oil pump driven	1
	11	798	PLT311	798	PLT–311	----------	Plate, oil pump cover	1
	12	798	COV207	798	COV–207	----------	Cover, oil pump	1
	13	ORD	H101–8456748	798	SCR–886	----------	Screws, oil pump cover	4
	14	914	45–3772–450–004	798	ELL–184	254–1801	Elbow, street	1
	15	798	PIP603	798	PIP–603	----------	Pipe, oil pump suction	1
78	3	226	350224	798	KOS–156	----------	Seal, oil	1
	6	798	RTR92	798	RTR–92	4310–374–7496	Retainer, bearing	6
	7	892	K22705	798	SHM–110	----------	Shim, housing (as req'd)	------
	8	798	HUS39	798	HUS–39	----------	Housing, bearing	1
	9	798	COV463A	798	COV–463A	----------	Cover, bearing housing	1
	10	ORD	5305–261–0387	798	STU–640	----------	Stud	20
	11	798	GKT2316	798	GKT–2316	----------	Gasket, bearing housing	1
	12	798	GKT865	798	GKT–865	----------	Gasket, oil stick plug	1
	13	798	FIL4	798	FIL–4	----------	Filler, oil crankcase	1
	14	798	NIP714	798	NIP–714	----------	Nipple, crankcase oil filler	1
	15	798	STC17	798	STC–17	----------	Stick, oil	1
	16	798	GKT1197	798	GKT–1197	----------	Gasket, oil stick	1
	17	798	PLU88	798	PLU–88	----------	Plug, oil stick	1
	18	798	CCS101	798	CCS–101	----------	Crankcase	1

	21	798	BAF22	798	BAF-22	----------	Baffle, crankcase breather	1
	22	798	GKT2288	798	GKT-2288	5330-354-7560	Gasket, oil pump cover adapter	1
	25	798	ADP75	798	ADP-75	----------	Adapter, bearing	1
	26	798	ADP76	798	ADP-76	----------	Adapter, oil pump cover	1
	27	798	ELL614	798	ELL-614	----------	Fitting, elbow	2
	28	798	TUB1351A	798	TUB-1351A	----------	Tube, breather baffle	1
	29	798	GKT594	798	GKT-594	----------	Gasket, baffle screw	2
	34	798	GKT968	798	GKT-968	----------	Gasket, oil pan	1
	35	798	PAN187A	798	PAN-187A	----------	Pan, oil	1
79	2	798	JNT5	798	JNT-5	----------	Joint, ball	1
	5	798	PLT1349	798	PLT-1349	----------	Plate, spring anchor	2
	7	798	SLV10	798	SLV-10	----------	Sleeve	1
	8	798	NUT823	798	NUT-823	----------	Nut, sleeve lock	1
	9	798	SPC166	798	SPC-166	----------	Spacer	1
	10	798	STM27	798	STM-27	----------	Stem	1
	11	798	ROD531	798	ROD-531	----------	Rod	1
	14	798	CNT10	798	CNT-10	----------	Control, engine speed	1
	15	798	BRK950	798	BRK-950	----------	Bracket, engine speed control	1
	20	ORD	5310-266-0386	798	NUT-530	----------	Nut	3
	22	798	BOD58	798	BOD-58	----------	Body, throttle control	1
	24	798	WAS23	798	WAS-23	----------	Washer	1
	25	798	BUS129	798	BUS-129	----------	Bushing	1
	26	798	PKG121	798	PKG-121	----------	Packing	1
	27	798	WAS551	798	WAS-551	----------	Washer	1
	28	798	WAS116	798	WAS-116	----------	Washer	1
	29	798	SPG205	798	SPG-205	----------	Spring	1
	30	------	----------	798	----------	----------	Oiler	1
	34	896	6824	798	COC-508	----------	Cock, shutoff, M and F, ⅛	1
	35	798	TUB148	798	TUB-148	----------	Hose flex, 3/16 ID	------
80	13	975	32-602-DAX	975	32-602-DAX	2910-424-7365	Shaft, throttle	-- 1
	14	975	32-600-D	975	32-600-D	5305-424-7363	Screw, throttle stop	1

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
80	15	975	32-607-DA	975	32-607-DA	----------	Gasket, cover-throttle lever	1
	16	975	32-608-D	975	32-608-D	2910-431-0821	Cover, throttle lever	1
	17	975	32-610-D	975	32-610-D	2910-424-7368	Gasket, clamp screw, throttle lever cover	1
	18	975	32-609-D	975	32-609-D	5305-424-7367	Screw, cover clamp, throttle lever cover	1
	19	975	354-766-R1	975	354-766-R1	----------	Screw, throttle spring	1
	20	975	27-436-D	975	27-436-D	2910-424-7253	Spring end, throttle lever	1
	21	975	27-435-D	975	27-435-D	----------	Spring, throttle lever	1
	22	975	32-601-D	975	32-601-D	----------	Butterfly, throttle	1
	23	ORD	H001-1026070	975	131-693	----------	Screw, cap, fil hd. (No. 8 x ⅜ NC) Cadmium plated.	1
	24	FSN	5330-245-5452	975	18-377-D	5330-245-5452	Gasket, body plug-locking shaft	1
	25	975	42-844-D	975	42-844-D	2910-431-0894	Plug, body-locking shaft	1
	27	ORD	H001-1530009	975	103-341	----------	Washer	4
	30	975	32-597-D	975	32-597-D	5330-424-7361	Gasket, carburetor bottom plate	1
	32	975	5-975-DX	975	5-975-DX	----------	Plate, carburetor bottom (includes drip hole filler and plug items 34 and 35).	1
	33	975	27-445-DB	975	27-445-DB	----------	Filler, drip hole	1
	34	975	57-957-D	975	57-957-D	----------	Plug, drip hole	1
------	------	975	60-947-D	975	60-947-D	----------	Drip hole filler and plug complete (consists of one each of items 33 and 34).	1
------	------	975	351-491-R91	975	351-491-R91	----------	Fuel bowl complete	1
	35	975	251-648-R11	975	251-648-R11	2910-424-7205	Cage, needle valve, with gasket	1
	36	975	25-948-D	975	25-948-D	----------	Gasket, needle valve cage	1
	37	975	29-902-DX	975	29-902-DX	2910-424-7277	Screen, strainer, with retainer	1

	38	FSN	5330-245-5452	975	18-377-D	5330-245-5452	Gasket, strainer screen	1
	39	975	25-948-D	975	25-948-D	----------	Gasket, pivot screw, float lever	1
	40	975	32-576-DX	975	32-576-DX	----------	Screw, pivot, float lever	1
	44	975	5-051-DX	975	5-051-DX	2910-424-7836	Bowl, fuel (consists of one each of items 23, 40, 41, 42, and 49).	1
	------	975	9-390-DX	975	9-390-DX	----------	Fuel bowl (optional with 5-051-DX)	------
	------	975	251-652-R91	975	251-652-R91	----------	Float and lever complete (consists of items 46-50).	1
	45	975	----------	975	----------	----------	Plate, reinforcing	1
	46	975	251-650-R11	975	251-650-R11	----------	Float, with ferrule	1
	47	975	251-651-R1	975	251-651-R1	----------	Lever, float	1
	48	975	32-604-D	975	32-604-D	----------	Spacer, float lever	1
	49	975	32-577-D	975	32-577-D	5340-424-7352	Spring, float lever—lower leaf	1
	50	975	32-578-D	975	32-578-D	5340-424-7353	Spring, float lever—upper leaf	1
	51	ORD	H001-1030037	975	132-646	----------	Screw	1
	52	975	32-606-DA	975	32-606-DA	----------	Gasket, fuel bowl	1
	53	975	250-614-R1	975	250-614-R1	----------	Well, metering	1
	54	975	32-615-D	975	32-615-D	----------	Gasket, metering well	1
	55	975	42-863-D	975	42-863-D	3040-424-7548	Shaft, starting shutter (includes one of item 61 and two of item 59).	1
	56	975	27-452-D	975	27-452-D	5340-253-6913	Spring, packing—starting shutter shaft	1
	57	975	32-590-D	975	32-590-D	5330-424-7359	Retainer, packing—starting shutter shaft	1
	58	975	14-581-D	975	14-581-D	5330-424-7079	Packing, dust—starting shutter	1
	59	975	31-636-D	975	31-636-D	5305-424-7296	Screw, starting shutter	2
	60	975	251-644-R11	975	251-644-R11	----------	Shutter, starting	1
	61	975	25-969-DA	975	25-969-DA	3040-424-7246	Shaft, starting shutter short	1
	62	975	32-614-DX	975	32-614-DX	----------	Tube and plug, idling	1
	63	975	354-770-R11	975	354-770-R11	----------	Body, carburetor (includes item 62)	1
82	3	975	252-769-R11	975	252-769-R11	----------	Cover, fuel transfer pump body	1
	4	975	255-010-R1	975	255-010-R1	----------	Gasket, ring, pump body cover	1
	5	855	89L3-8X1-4	975	37-323-DX	----------	Elbow	2

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
82	6	975	252–045–R1	975	252–045–R1	----------	Gasket, fuel transfer pump	1
	7	975	252–767–R91	975	252–767–R91	----------	Seal, oil, pump drive shaft	1
	8	975	252–761–R11	975	252–761–R11	----------	Body, fuel transfer pump	1
	9	975	252–765–R1	975	252–765–R1	3020–355–3362	Gear, drive and shaft	1
	10	975	252–764–R1	975	252–764–R1	3020–355–3361	Gear, idler	1
	11	975	252–763–R1	975	252–763–R1	----------	Shaft, idler gear	1
	------	975	253–803–R92	975	253–803–R92	----------	Fuel injection pump, complete	1
83	1	975	59–676–D	975	59–676–D	----------	Nut, camshaft (optional with 250–257–R92).	1
	------	975	250–257–R1	975	250–257–R1	----------	Nut, camshaft (optional with 59–676–D)	1
	2	975	260–487–R1	975	260–487–R1	----------	Packing gear hub	------
	3	975	62–943–DB	975	62–943–DB	----------	Hub, gear	1
	4	975	260–488–R1	975	260–488–R1	----------	Slinger, oil	1
	5	226	212–D17	975	59–675–D	----------	Seal, oil-front cover	1
	6	913	43–6710–030–170	975	59–710–D	431–4477	Screw, cap, socket hd, ¼ x 1¾ NC	2
	7	975	260–262–R1	975	260–262–R1	----------	Screw, socket hd, bearing retainer	2
	8	975	57–712–D	975	57–712–D	----------	Lock, pump flange cap screw	7
	9	913	43–6710–035–170	975	59–711–D	5305–431–4480	Screw, cap, socket hd, 5/16–18 x 1¾ pump flange.	3
	10	975	253–958–R21	975	253–958–R21	----------	Flange, pump (with 2 dowels 59–609–D and one of item 5).	1
	11	975	260–627–R1	975	260–627–R1	----------	Gasket, pump flange	1
	13	975	253–956–R94	975	253–956–R24	----------	Pump, basic plunger	1
	14	975	253–584–R1	975	253–584–R1	----------	Lever, control, governor	1

	17	975	257–712–R91	975	257–712–R91		Spring, governor	1
	18	975	259–841–R1	975	259–841–R1		Gasket, bottom plate—pump housing	1
	19	975	260–495–R21	975	260–495–R21		Plate, bottom, pump housing (includes 2 dowels 59–606–D and one of item 20).	------
	20	975	258–995–R1	975	258–995–R1		Plug, drain	------
	29	975	260–780–R1	975	260–780–R1		Washer, copper	8
84	1	623	453285	623	453285		Nut, terminal stud, C. E	1
	2	623	1914647	623	1914647		Lockwasher, terminal stud	2
	3	623	1915106	623	1915106		Lead, solenoid to C. E. terminal	1
	4	623	453287	623	453287		Nut, terminal stud	1
	5	623	1914646	623	1914646		Washer, ins., terminal stud, C. E	1
	6	623	1921643	623	1913084		Washer, ins., terminal stud, C. E	3
	7	623	1914645	623	1914645		Bushing, ins., terminal stud	1
	8	623	1914869	623	1914869		Screw, C. E. frame attaching	4
	9	623	1913130	623	1913130		Lockwasher, C. E. frame attaching screw	4
	10	623	1914634	623	453894		Plug, end, C. E	1
	11	623	1914633	623	1914633		Frame commutator end	1
	12	623	38273	623	38273		Bushing	1
	------	623	1914635	623	1922869	2920–353–9837	Plate, brush, complete (consists of one each of items 13, 14, 15; two each of items 20, 21, 22, 26, 29, 30, 31, 32, 33; eight each of items 27, 28.	1
	13	623	1914641	623	1914641		Plate, brush holder support	1
	14	623	1914639	623	1914639		Plate, ins. brush	1
	15	623	1914636	623	1914636		Stud and plate, brush	1
	16	623	1913080	623	1913080		Bushing, washer, ins. brush holder screw	8
	17	623	1913086	623	1913086		Washer, plain, brush plate attaching	3
	18	623	1914107	623	1914107		Lockwasher, brush plate ass'y attaching	3
	19	623	453293	623	453293		Screw, brush plate ass'y attaching	3
	20	623	1914643	623	1914643		Plate, ins. brush holder (2 hole)	2
	21	623	1914644	623	1914644		Plate, space, brush holder (2 hole ins. brush)	2

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
84	22	623	1914636	623	1914636		Plate, space, brush holder (2 hole grd. brush)	2
	23	623	1906902	623	1906902		Brush	8
	24	ORD	H001–5147521	623	453281		Screw, brush lead attaching	8
	25	ORD	H001–7025591	623	453299		Lockwasher, brush lead attaching	8
	26	623	1907475	623	1907475		Holder, brush, grounded	2
	27	ORD	H001–7025621	623	453296		Lockwasher, brush holder screw	8
	28	623	1904981	623	1904981		Spring, brush	8
	29	623	445546	623	445546		Screw, brush holder, short, grounded	2
	30	623	1861787	623	1904983	5305–371–5138	Screw, brush holder, long, grounded	2
	31	623	1914642	623	1914642		Screw, brush holder, short, insulated	2
	32	623	1907475	623	1907475		Holder, brush, insulated	2
	33	623	1861786	623	1904982		Screw, brush holder, long, insulated	2
	34	623	453479	623	453479		Screw, cover band	2
	35	623	1914877	623	1914877		Cover band (includes two of item 34)	1
	36	623	1885037	623	1913100		Screw, pole shoe	8
	37	623	1913122	623	1913122		Cable, solenoid switch	1
	38	623	453285	623	453285		Nut, field terminal stud, 7/16 thick	1
	39	623	453298	623	453298		Lockwasher, field terminal stud	2
	40	623	1914647	623	1914647		Washer, plain, field terminal stud	2
	41	623	453287	623	453287		Nut, field terminal stud, 5/16 thick	1
	42	623	1921643	623	1921643		Washer, ins. field terminal stud	2
	43	623	1914873	623	1914873		Strip, insulating, field terminal (triangular)	2
	44	623	1914645	623	1914645		Bushing, ins. field terminal stud	1
	45	623	1914872	623	1914872		Shoe, pole	4

	46	623	1911221	623	1911221	----------	Coil, field, RH	1
	47	623	1911217	623	1911217	----------	Coil, field, LH	1
	48	623	1861906	623	1861906	----------	Stud, field terminal	1
	49	623	1914649	623	1914649	----------	Washer, brake (fibre C. E.)	1
	50	623	1915114	623	1915114	----------	Armature	1
	51	623	1915189	623	1915189	----------	Washer, brake shoe	1
	52	623	1856826	623	1856826	----------	Bushing, D. E	1
	53	623	453471	623	453471	----------	Screw, D. E. cover plate attaching	4
	54	623	453303	623	453303	----------	Lockwasher, D. E. cover plate attaching	4
	55	623	1915113	623	1915113	----------	Plate, center bearing	1
	56	623	1906089	623	1906089	----------	Washer, space (between center bearing and shift sleeve).	1
	57	623	1906090	623	1906090	----------	Washer, space, cupped (between bearing and shift sleeve).	1
	58	623	1913115	623	1913115	----------	Sleeve, shift, motor drive	1
	59	623	1906081	623	1906081	----------	Guide, motor drive pinion	1
	60	623	1913132	623	1913132	----------	Spring, meshing, motor drive pinion	1
	61	623	1907171	623	1907171	----------	Pinion, motor drive	1
	62	623	1915190	623	1915190	----------	Stop, collar, motor drive pinion	1
	63	623	1913131	623	1913131	----------	Pin, cotter, stop collar	1
	64	323	1918264	623	1918264	----------	Spring, shift lever	1
	65	623	1913133	623	1913133	----------	Pin, shift lever	1
	66	623	1915108	623	1915108	----------	Link and adjusting screw, shift lever	1
	67	623	1915109	623	1915109	----------	Lever, shift	1
	68	ORD	H101–8460629	623	453323	----------	Pin, cotter, shift lever pin	1
	69	623	1915112	623	1915112	2920–353–9870	Housing, motor drive	1
	70	623	1913128	623	1913128	----------	Screw, D. E. attaching	5
	71	623	1913130	623	1919529	----------	Lockwasher, D. E. attaching screw	5
90	1	623	1913011	623	1913011	5945–371–5155	Plunger and rod assembly	1
	3	623	1860959	623	1860959	----------	Screw	4
	4	623	120380	623	120380	----------	Lockwasher	4

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quautity per unit
		Code No.	Part No.	Code No.	Part No.			
90	5	623	1915703	623	1915703	----------	Case and coil assembly----------	1
	6	623	1915717	623	1915717	----------	Screw, terminal----------	2
	7	623	1915718	623	1915718	----------	Clip, terminal----------	2
	8	623	----------	623	1906053	----------	Gasket, terminal plate----------	1
	9	623	1913043	623	1913043	5310–371–5156	Washer, contact spring retainer cupped and slotted.	1
	10	623	1913044	623	1913044	5310–262–2988	Washer, plain, contact spring----------	1
	11	623	1913042	623	1913042	----------	Spring, contact----------	1
	12	623	1913041	623	1913041	----------	Washer, cupped, contact spring retainer----	1
	13	623	1915701	623	1915701	----------	Disc, contact----------	1
	14	623	1913039	623	453688	----------	Nut, contact attaching----------	1
	15	623	432230	623	432230	5310–220–6702	Nut, terminal plate----------	4
	16	ORD	H001–7025621	623	453296	----------	Lockwasher----------	4
	17	623	453287	623	453287	----------	Nut, terminal plate----------	2
	18	623	1914648	623	1914648	5310–276–2746	Lockwasher----------	2
	19	623	453285	623	453285	----------	Nut, terminal stud----------	2
	20	623	1914647	623	1914647	----------	Washer----------	2
	21	623	1914646	623	1914646	----------	Washer, insulation----------	2
	22	623	1915615	623	1914615	----------	Washer, insulation----------	2
	23	623	1915713	623	1915713	----------	Plate, terminal----------	1
	24	623	1913025	623	1913025	----------	Strip, insulation----------	1
	25	623	1915714	623	1915714	----------	Stud, terminal----------	1
	26	623	1915715	623	1915715	----------	Stud, terminal----------	1
	------	623	1105929	623	1105929	2920–353–9548	Generator, complete----------	1

92	1	623	1914752	623	1914752	----------	Plate, end cover	1
	2	623	1914755	623	1914755	----------	Bolt, thru	2
	3	623	453301	623	453301	----------	Lockwasher, thru bolt	2
	4	623	1914753	623	1914753	----------	Gasket, end cover plate	1
	5	FSN	3110–156–3493	623	908503	----------	Bearing, ball	1
	6	623	809062	623	908062	----------	Pin, dowel	2
	7	623	1915319	623	1915318	2920–353–9887	Frame, commutator end	1
	8	623	1904514	623	1904514	----------	Arm, brush	2
	9	623	1904828	623	1904828	----------	Brush	2
	10	623	1905219	623	1905219	----------	Spring, brush	2
	11	623	1915323	623	1915323	----------	Band, cover	1
	12	623	1914757	623	132250	----------	Screw, cover	1
	13	623	453983	623	453983	----------	Washer, screw cover	1
	14	------	----------	977	CA–446	----------	Capacitor, gen A terminal	1
	15	623	1914186	623	194186	----------	Stud, terminal	1
	16	623	1914735	623	194735	2920–353–9843	Coil, right field	1
	17	623	1914737	623	194737	2920–353–9844	Coil, left field	1
	19	623	1858749	623	1958749	----------	Stud, terminal	1
	20	623	453327	623	453327	----------	Nut, shaft	1
	21	623	804000	623	804000	5310–261–7391	Lockwasher, shaft nut	1
	22	623	1914205	623	1914205	----------	Coupling	1
	23	623	1915325	623	1915325	2920–353–9890	Collar, space, outside	1
	24	623	1915322	623	1915222	2920–353–9889	Frame, drive end	1
	25	623	820706	623	802706	----------	Washer, felt	1
	26	623	820709	623	820709	5330–364–1308	Retainer, feltwasher	1
	27	870	3204S1446	623	954521	3110–198–1786	Bearing, ball	1
	28	623	1915089	623	1915089	----------	Gasket, ball bearing retainer plate	1
	29	623	1915326	623	1915326	----------	Plate, ball bearing retainer	1
	30	623	1915086	623	1915086	5310–262–4755	Washer, space, inside	1
	31	623	453325	623	453325	----------	Key, woodruff	1
	32	623	1915320	623	1915320	2920–353–9888	Armature	1

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
104	1	623	1914807	623	1914807		Cover	1
	2	623	1914799	623	1914799		Screw, cover	2
	3	623	1878510	623	1878510		Gasket, cover	1
	4	623	1914831	623	1914831		Spring, regulator armature	2
	5	623	1912365	623	1922408		Screw, regulator armature adjusting	2
	6	623	1914766	623	1914766		Grommet (rubber)(in base)	3
	7	623	1910174	623	1910174	6150–367–4835	Resistor, "F" to relay	1
	8	623	1885300	623	1885300		Resistor, "F" to ground	1
	9	623	1914800	623	1914800		Screw, terminal	3
	10	623	1914801	623	1914801		Clamp, terminal	3
	11	623	1914800	623	1914800		Screw, contact attaching	4
	12	623	1914803	623	1914803		Lockwasher, contact attaching screw	2
	13	623	1922599	623	1922599		Insulator, contact attaching screw	4
	14	623	1914802	623	1914802		Connector, contact attaching screw	1
	15	623	1914805	623	1914805		Bushing, contact attaching screw insulating	4
	16	623	1915038	623	1915038		Contact and support	2
	17	623	1912159	623	1912159		Screw, relay adjusting	1
	18	623	1914764	623	1914764		Armature, relay	1
------		623	1111562	623	1111562	2920–371–5115	Distributor complete (consists of one each of items 3, 4, 8, 9, 10, 11, 12, through 16, 18, 19, 20, 21, 22, 23, 25, 29, 30, 32, 33, 35, 36, 37, 38, 39, 40, 42, 43, 44, 45, 47, 51, 52; two each of items 2, 27, 31, 50; three each of items 24, 46; five each of items 5, 6, 7; and eight each of item 1).	1

106	1	623	454429	623	454-429	----------	Screw and lockwasher, cover attaching	8
	2	623	1913035	623	453-465	----------	Plug	2
	3	623	1915961	623	1915-961	2920-353-9920	Cover, cap (includes item 2)	1
	4	623	1916005	623	1916-005	2920-753-9568	Gasket, cover	1
	5	623	1916006	623	1916-006	----------	Gasket, cap attaching screw	5
	6	623	1906367	623	1906-367	----------	Washer, cap attaching	5
	7	623	453697	623	453-697	----------	Screw, cap attaching, with lockwasher	5
	8	623	1915957	623	1915-957	----------	Spring, coil contact	1
	9	623	1915950	623	1915-950	2920-353-9919	Cap (includes one of item 8)	1
	10	623	1915959	623	1915-959	2920-753-9588	Rotor	1
	11	623	1913199	623	1913-199	5310-428-6525	Nut, breaker lever	1
	12	623	1916615	623	1916-615	----------	Lead, condenser	1
	13	623	1915995	623	1915-995	----------	Washer, breaker lever lock	1
	14	623	1905344	623	1905-344	2920-428-6486	Lever, breaker	1
	15	623	1915969	623	1915-969	----------	Point and support, contact	1
	16	623	453304	623	453-304	----------	Screw, capacitor	1
	17	ORD	H001-7025591	623	453-299	----------	Washer, capacitor	1
	18	FSN	5910-248-5466	623	1915-976	5910-248-5466	Capacitor, ignition	1
	19	623	1916616	623	1916-616	2920-753-9572	Bracket, condenser	1
	20	623	1915995	623	1915-995	----------	Screw, breaker lever	1
	21	623	1915968	623	1915-968	2920-353-9922	Plate, breaker	1
	22	623	1916408	623	1916-408	9390-753-9570	Wick	1
	23	623	1919334	623	1919-334	3040-354-0005	Shaft, main, with cam	1
	24	623	453699	623	453-699	----------	Screw, coil holddown plate with lockwasher	1
	25	623	1916000	623	1916-000	2920-353-9926	Plate, coil holddown	1
	26	623	453284	623	453-284	----------	Nut, coil terminal	2
	27	623	1914615	623	1914-615	----------	Clip, coil terminal lock	2
	28	399	2920-257-1346	623	1915-922	----------	Coil, ignition	1
	29	623	1915999	623	1915-999	----------	Gasket, coil flange	1
	30	623	453696	623	453-696	----------	Screw, and lockwasher	1
	31	623	453996	623	453-996	----------	Nut, resistor lead attach	2

2. Parts List—Continued

Fig. No.	Index No.	Engineer stock No.		Manufacturer's stock No.		Federal supply class and item identification No.	Description	Quantity per unit
		Code No.	Part No.	Code No.	Part No.			
106	32	ORD	H001–7025591	623	453–299	----------	Washer, resistor terminal	1
	33	623	1915998	623	1915–998	2920–353–9925	Bracket, resistor	1
	34	623	1914935	623	1914–935	5310–262–4765	Washer, spacer	2
	35	623	1919338	623	1919–338	2920–374–4489	Resistor	1
	36	623	1916501	623	1916–501	5970–389–6578	Insulator, resistor	1
	37	623	453696	623	453–696	----------	Screw, with lockwasher	1
	38	623	1909003	623	1909–003	----------	Bushing	1
	39	623	1916622	623	1916–622	2920–753–9573	Clamp, capacitor	1
	40	359	5910–753–9574	623	1916–625	----------	Capacitor, to ignition coil	1
	41	623	1916003	623	1916–003	----------	Spring	3
	42	623	1915940	623	1915–940	2920–353–9916	Housing, complete (includes one of item 38, and two of item 2).	1
	43	FSN	5910–256–9729	623	1915–978	5910–256–9729	Capacitor, to resistor	1
	44	623	1916621	623	1916–621	----------	Gasket, coupling	1
	45	623	1916620	623	1916–620	----------	Coupling, terminal	1
	46	623	453698	623	453–698	----------	Screw and lockwasher, coupling	4
	47	623	1912128	623	1912–128	5310–262–5421	Shim, 0.005 (as req'd)	------
	48	623	1912129	623	1912–129	----------	Shim, 0.010 (as req'd)	------
		623	1915967	623	1915–967	----------	Plate, breaker complete (consists of one each of items 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 32).	------
	50	623	1919341	623	1919–341	2920–354–0006	Breather	2
	51	623	1915988	623	1915–988	2920–353–9923	Coupling, shaft, with collar	1
	52	ORD	H101–0141159	623	1916004	----------	Pin, coupling	1

		54	975	178551	975	178551	----------	Washer, internal and external tooth lock ⅜	2
		55	975	98-002-R1	975	98002R1	----------	Clamp	2
		56	975	254-954-R1	975	254954R1	----------	Seal, oil inner bracket	1
		57	975	280-432-R21	975	280432R21	2815-355-3595	Bracket	1
		58	975	252-483-R1	975	252483R1	----------	Seal, oil, outer bracket	1
		------	798	TUB905	798	TUB-905	----------	Tubing, 3/16 OD	3 ft
		------	798	TUB906	798	TUB-906	----------	Tubing, ¼ OD	14 ft
		------	798	TUB908	798	TUB-908	----------	Tubing, 5/16 OD	16 ft
		------	798	TUB913	798	TUB-913	----------	Tubing, ⅜ OD	28 ft
109		5	975	258-942-R91	975	258-942-R91	----------	Flywheel, engine	1
		------	975	32-333-D	975	32-333-D	5305-424-7314	Bolts, flywheel	6
		8	975	250-688-R2	975	250-688-R2	----------	Support, front engine	1
----	------		975	280-376-R91	975	280-376-R91	----------	Cable, shielded sparks plug, #1 and 6 cylinders.	2
----	------		975	280-377-R91	975	280-377-R91	----------	Cable, shielded spark plug, #2 and 5 cylinders.	2
----	------		975	280-378-R91	975	280-378-R91	----------	Cable, shielded spark plug, #3 cylinder	1
----	------		975	280-379-R91	975	280-379-R91	----------	Cable, shielded spark plug, #4 cylinder	1
----	------		975	280-431-R1	975	280-431-R1	----------	Plug, shielded spark (CHAMPION) (optional with AL).	6
----	------		910	17-7624-270-160	975	280-550-R91	248-1620	Plug, shielded spark (AL) (optional with CHAMPION).	6
----	------		975	263-285-R91	975	263-285-R91	----------	Plug, oil pan magnetic drain	1
----	------		975	261-933-R92	975	261-933-R92	----------	Meter, service	1
----	------		ORD	HO-15-0500905	AL	4 HR-152R	----------	Battery	2

APPENDIX III

ON-EQUIPMENT TOOLS AND SPARE PARTS

1. On-Equipment Tools

Fig. No.	Index No.	Description	Quantity
111	1	LUBRICATOR: Hand operated	1
111	2	WRENCH: Open-end, 5/8 x 3/4 in	1
111	3	WRENCH: Open-end, 7/16 x 9/16 in	1
111	4	GAGES: Distributor point and spark plug gap	1
111	5	WRENCH: Open-end, 3/8 x 1/2 in	1
111	6	WRENCH: Open-end, 3/16 x 1 in	1
111	7	PLIERS: Combination, 6 in	1
111	8	WRENCH: Monkey, 9 in	1
111	9	CHISEL: Cold	1
111	10	HAMMER: Ballpeen, 10 oz	1
111	11	WRENCH: Socket, 31/32 x 15/32 in	1
111	12	OILER: Steel, round, 1/2 pt capacity, 6 in. spout	1
111	13	HANDLE: Wrench	1
111	14	SCREWDRIVER: 5 in. blade	1

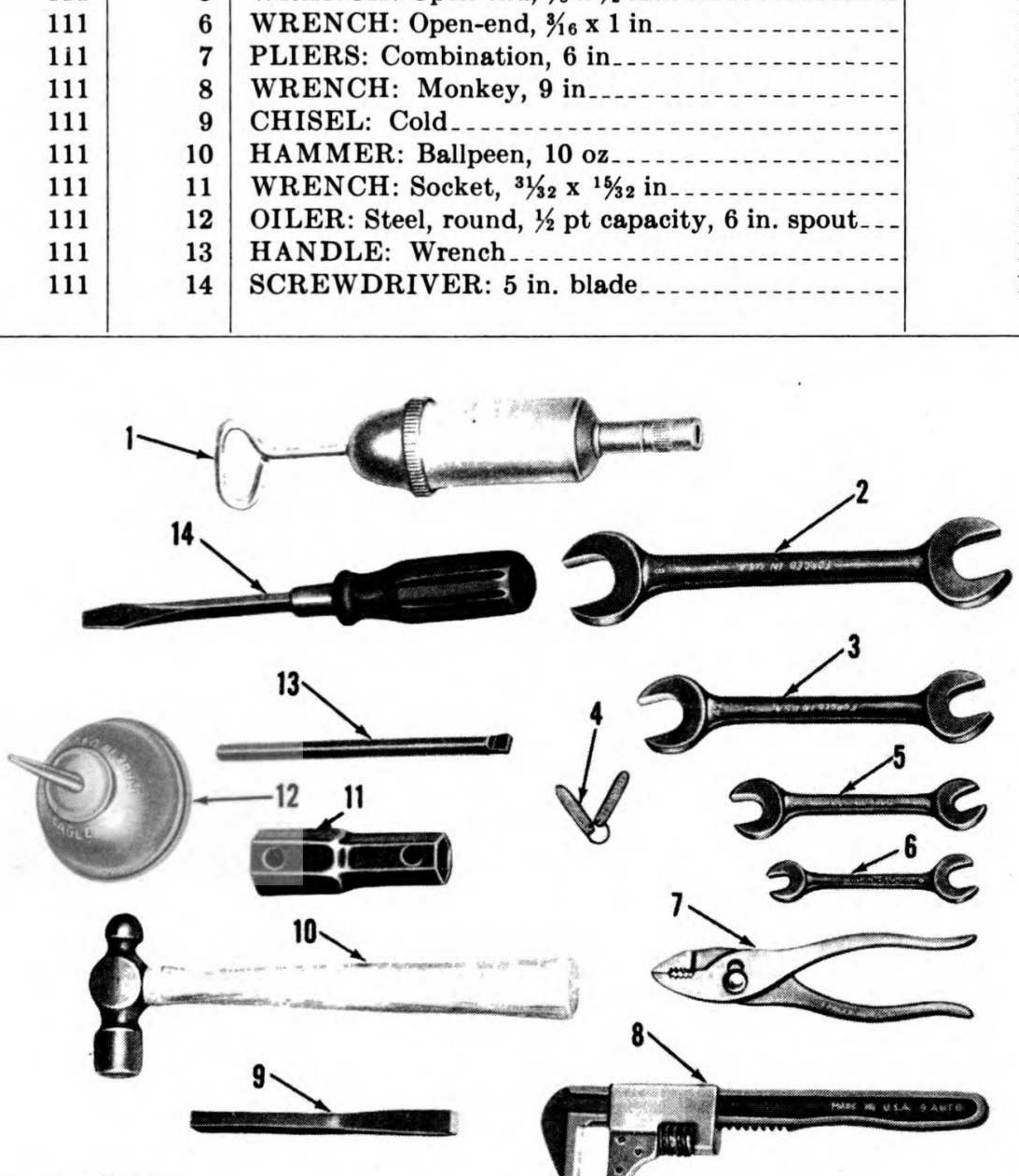


Figure 111. On-equipment tools.

2. On-Equipment Spare Parts

Fig. No.	Index No.	Description	Quantity
112	1	GASKETS: Valve	6
112	2	STRIPS: Valve	100

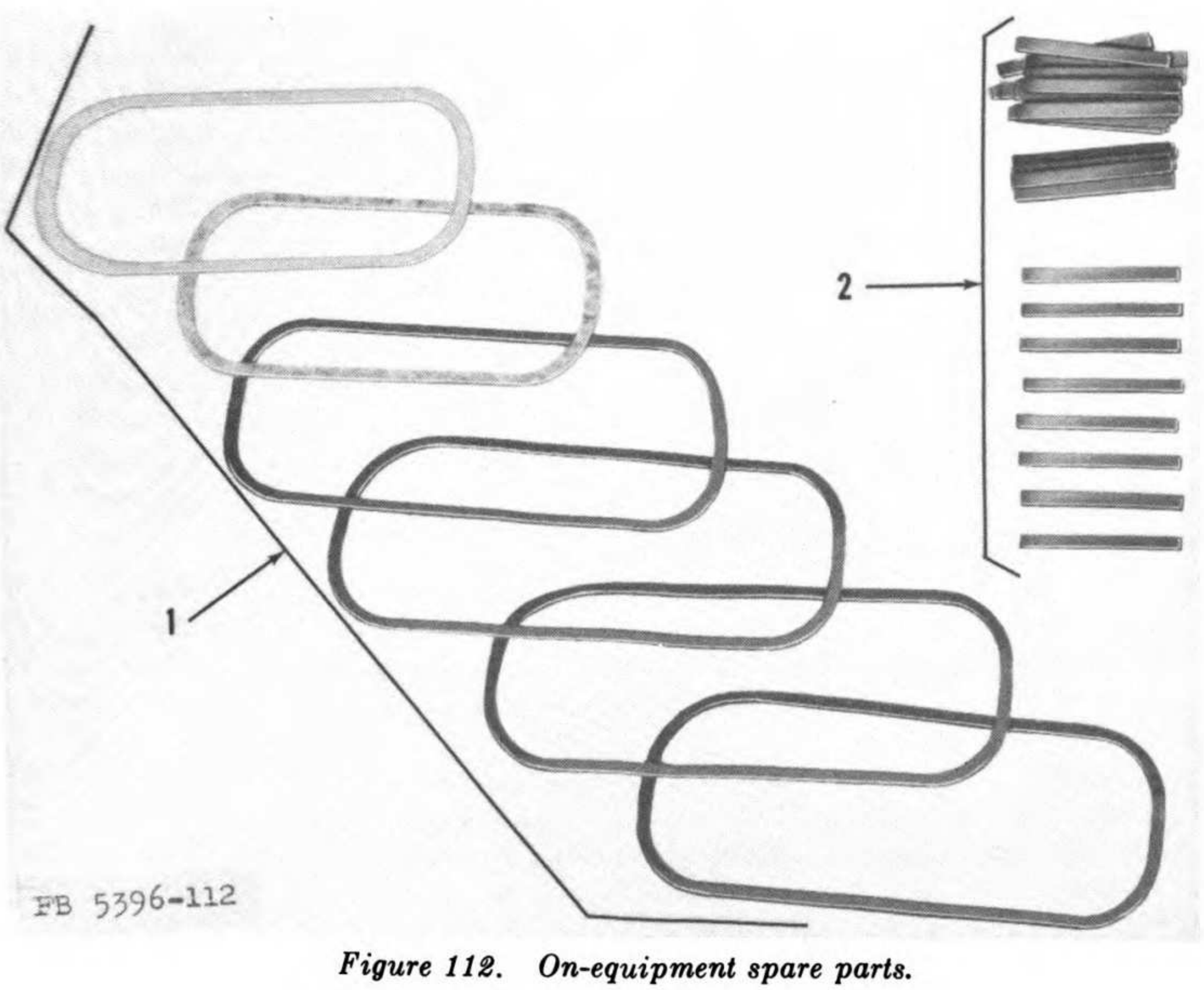


Figure 112. On-equipment spare parts.

INDEX

[AG 412.3 (27 Jan 55)]

BY ORDER OF THE SECRETARY OF THE ARMY:

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For explanation of abbreviations used, see SR 320–50–1.

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