# TM 9-2805-212-35

## DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT MAINTENANCE MANUAL

ENGINE, GASOLINE, FUEL INJECTED, SUPERCHARGED, HORIZONTAL-OPPOSED, AIR COOLED, SIX CYLINDER, ASSEMBLY—2805-528-6015 (CONTINENTAL MODEL AOSI-895-5 AND AOSI-895-5M)

END ITEM APPLICATION:

GUN, SELF-PROPELLED, FULL TRACKED: TWIN 40-MM, M42A1 (TM 9-2350-202);
HOWITZER, SELF-PROPELLED, FULL TRACKED: 105-MM, M52A1 (TM 9-2350-209);
HOWITZER, SELF-PROPELLED, FULL TRACKED: 155-MM, M44A1 (TM 9-2350-203);
TANK, COMBAT, FULL TRACKED: 76-MM GUN, M41A2 (TM 9-2350-201);
TANK, COMBAT, FULL TRACKED: 76-MM GUN, M41A3 (TM 9-2350-201);
AND
TRACTOR, FULL TRACKED, HIGH SPEED: M8A2 (TM 9-2410-200)



This copy is a reprint which includes current pages from Changes 2

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*DECEMBER 1959*

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *29 March 1971*

# Field and Depot Maintenance Manual

## ENGINE, GASOLINE, FUEL INJECTED: SUPERCHARGED, HORIZONTAL-OPPOSED, AIR COOLED, SIX CYLINDER, ASSEMBLY—2805-528-6015 (CONTINENTAL MODEL AOSI-895-5 AND AOSI-895-5M)

TM 9-2805-212-35, 8 December 1959, is changed as follows:

*Page 81*, figure 64.

| Change | To read |
|---|---|
| P— 0.6200 X 1 ⅝ Dowel Pin 7403012 (Model AOSI-895-5M Engine Only).<br>⅝ X 1-⅝ Dowel Pin 8717297 (Model AOSI-895-5 Engine Only). | P— 0.6255-0.6257 X 1 ⅝ Dowel Pin 7403012 (Model AOSI-895-5M Engine Only)<br>0.6255-0.6257 X 1 ⅝ Dowel Pin 8717297 (Model AOSI-895-5 Engine Only) |

*Page 312*, paragraph 3105, line 3. Under Wear limits, Field, change "5.7555" to read "5.7550."

*This change supersedes C 1, 1 March 1968.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
*General, United States Army,*
*Chief of Staff.*

Official:
KENNETH G. WICKHAM,
*Major General, United States Army,*
*The Adjutant General.*

Distribution:
To be distributed in accordance with DA Form 12-37, Direct and General Support maintenance requirements for 40-MM Twin Guns M42A1; 155-MM Howitzer M44A1; 105-MM Howitzer M52A1; Tanks M41A2, M41A3 and Tractor High Speed M8A2.

TECHNICAL MANUAL
No. 9-2805-212-35

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *8 December 1959*

# ENGINE, GASOLINE, FUEL INJECTED, SUPERCHARGED, HORIZONTAL-OPPOSED, AIR-COOLED, SIX CYLINDER, ASSEMBLY — 2805-528-6015 (CONTINENTAL MODEL AOSI-895-5 AND AOSI-895-5M)


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# CHAPTER 1
# INTRODUCTION

## Section I. GENERAL

### 1. Scope

*a.* This technical manual contains instructions for field and depot maintenance of the Continental model AOSI–895–5 and AOSI–895–5M engines. It contains descriptions of, and procedures for, disassembly, inspection, repair, rebuild, and assembly of the engines.

*b.* The appendix contains a list of current references, including supply manuals, forms, technical manuals, and other available publications applicable to the Continental model AOSI–895–5 and AOSI–895–5M engines.

*c.* This first edition is being published in advance of complete technical review. Any errors or omissions will be recorded on DA Form 468 Unsatisfactory Equipment Report and forwarded to the Commanding Officer, Raritan Arsenal, Metuchen, N. J., ATTN: ORDJR–CPRA.

*d.* TM 9–2350–201–12, TM 9–7004, TM 9–7204, TM 9–7218, and TM 9–7240 contain operating and lubricating instructions for the material as well as all maintenance operations allocated to the using organizations in performing maintenance work within their scope.

*e.* TM 9–1825E contains service instructions on the Bendix Scintilla magnetos.

*f.* TM 9–1828A contains service instructions on the AC diaphragm-type fuel pump.

*g.* TM 9–8631 contains service instructions on the Eclipse-Pioneer generator and starters.

*h.* TM 9–8637 contains service information and TM 9–2920–203–35 contains a description of and procedure for disassembly, cleaning, inspection, repair, rebuild, and assembly of the Jack and Heintz starters.

*i.* TM 9–2910–200–35 contains a description of and procedure for disassembly, cleaning, inspection, repair, rebuild, and assembly of the Simmonds Aerocessories fuel injector pump.

*j.* TM 9–2910–201–35 contains a description of and procedures for disassembly, cleaning, inspection, repair, rebuild, and assembly of the Titan vane-type fuel pump.

*k.* TM 9–2920–204–35 contains a description of and procedures for disassembly, cleaning, inspection, repair, rebuild, and assembly of the American Bosch magnetos.

### 2. Field and Depot Maintenance Allocation

The publication of instructions for complete disassembly and rebuild is not to be construed as authority for the performance by field maintenance units of those functions which are restricted to depot shops and arsenals. In general, the prescribed maintenance responsibilities will apply as reflected in the allocation of maintenance parts listed in the appropriate columns of the current ORD 8 supply manual pertaining to the engines. Instructions for depot maintenance are to be used by maintenance companies in the field only when the tactical situation makes the repair functions imperative. Supply of parts listed in the depot guide column of ORD 8 supply manuals will be made to field maintenance only when the emergency nature of the maintenance to be performed has been certified by a responsible officer of the requisitioning organization and upon express authorization by the chief of the service concerned. Those operations which can be performed as "emergency field maintenance" are specifically covered as such in this manual.

### 3. Forms, Records, and Reports

*a. General.* Responsibility for the proper execution of forms, records, and reports rests upon the officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the type, quantity, and condition of materiel to be inspected, repaired, or used in repair. Properly executed

forms convey authorization and serve as records for repair or replacement of materiel in the hands of troops and for delivery of materiel requiring further repair to ordnance shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the materiel upon completion of its repair.

*b. Authorized Forms.* The forms generally applicable to units operating and maintaining this equipment are listed in the appendix. No forms other than those approved for the Department of the Army will be used. Pending availability of forms listed, old forms may be used. For a current and complete listing of all forms, refer to current SR 310–20–6. Additional forms applicable to the using personnel are listed in the operation technical manual. For instructions on use of these forms, refer to FM 9–10.

*c. Field Report of Accidents.* The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in SR 385–10–40. These reports are required whenever accidents involving injury to personnel or damage to materiel occur.

*d. Report of Unsatisfactory Equipment, Materials, or Publications.* Any suggestions for improvement in design and maintenance of equipment and spare parts, safety and efficiency of operation, or pertaining to the application of prescribed petroleum fuels, lubricants, and/or preserving materials, or technical inaccuracies noted in Department of the Army publications will be reported through technical channels as prescribed in SR 700–45–5 to the Commanding Officer, Metuchen, N. J., Attn.: ORDJR–CPRA, using DA Form 468, Unsatisfactory Equipment Report. Such suggestions are encouraged in order that other organizations may benefit.

NOTE: Do not report all failures that occur. Report only REPEATED or RECURRENT failures or malfunctions which indicate unsatisfactory design or material. However, reports will always be made in the event that exceptionally costly equipment is involved. See also SR 700–45–5 and the printed instructions on DA Form 468.

## Section II. DESCRIPTION AND DATA

### 4. Engine Nomenclature

In this manual, the following terms will be used to identify the location of parts and assemblies.

*a.* The ends of the engine (figs. 1 and 2) will be called the "accessory end" or "front" and the "flywheel end" or "rear".

*b.* As viewed from the accessory end toward the flywheel end, the side to the right will be called the "right (1–3–5) side" and the side to the left will be called the "left (2–4–6) side." Beginning at the accessory end the right bank of cylinders is numbered 1–3–5, and the left bank of cylinders is numbered 2–4–6.

*c.* Starting from the accessory end, the main bearings are numbered 1 to 4.

*d.* The cylinders, pistons, connecting rods, and connecting rod bearings are numbered with their respective cylinder numbers.

*e.* The supercharger side of the accessory case will be called the "front" and the crankcase side will be called the "rear."

### 5. General Description

*a.* The Continental model AOSI–895–5 and AOSI–895–5M engines are 6-cylinder horizontally opposed, 4-cycle, air-cooled, supercharged, fuel-injected engines. Model AOSI–895–5 designates the engine was manufactured as a fuel-injected engine. Model AOSI–895–5M designates the engine was modified in the field, to incorporate fuel injection, by the application of MWO 9–2805–212–40/1 to a Continental model AOS–895–3 engine.

*b.* The cylinder assemblies are individually replaceable units, with overhead valves and valve rocker assemblies in the head. They are arranged in two banks of three cylinders each, with a camshaft to actuate the valves of each bank. A mechanically driven cooling fan, located on top of the engine, is provided to circulate air around the cylinders and through a cooling fan outlet vane housing (fig. 3). Air deflectors and baffles are mounted on the cylinders to direct the air around the cooling fans.

*c.* An accessory case provides the means for mounting and driving the engine accessories.

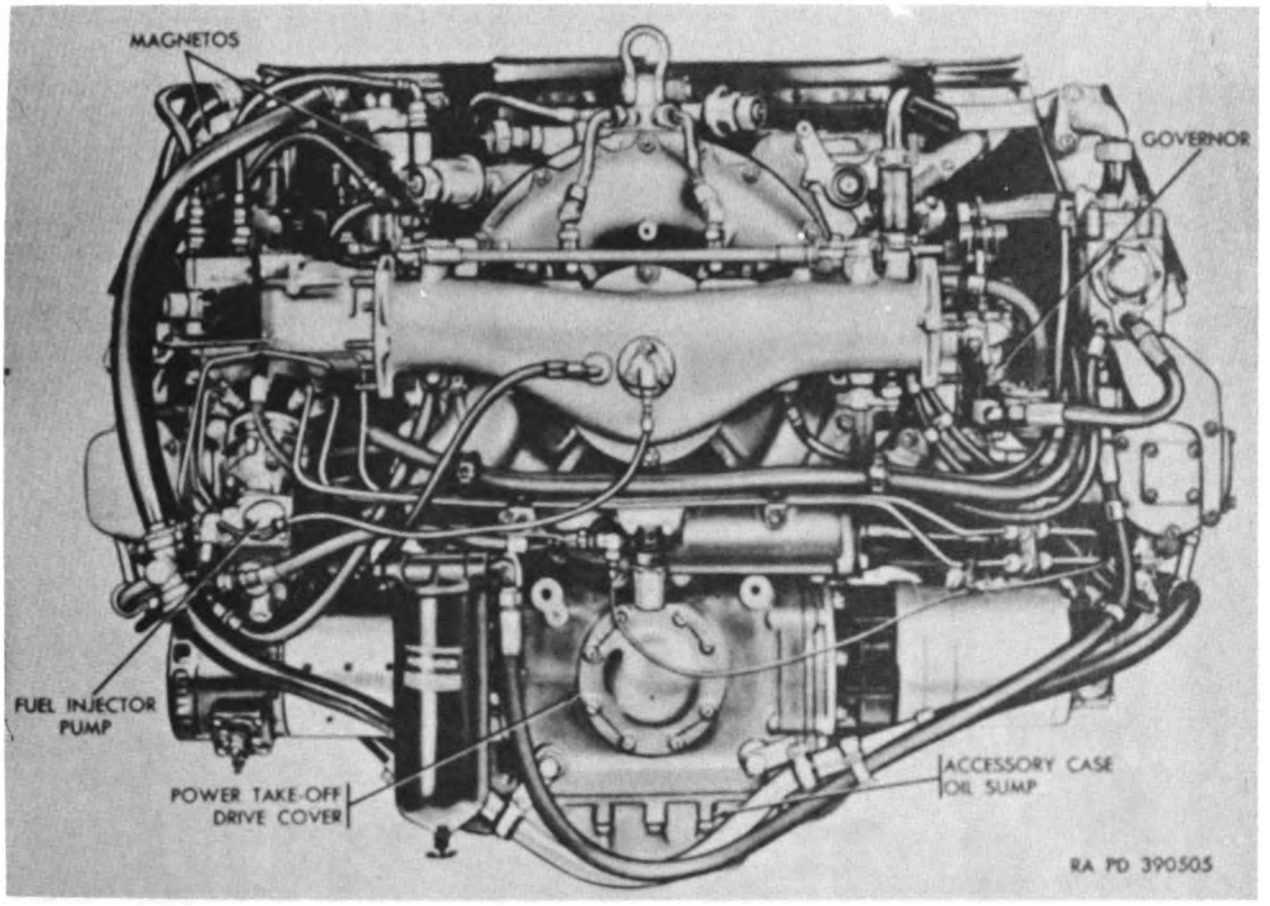



*Figure 1. Model AOSI-895-5 engine—front view.*

The centrifugal-type supercharger is attached to the accessory case and is driven by a train of gears in the accessory case. Air is drawn into the supercharger through a supercharger air inlet housing mounted on the supercharger. The supercharged air then passes to the intake manifolds located on the underside of each bank of cylinders.

*d.* A gear-driven fuel injector pump (fig. 1) is mounted on the left side of the accessory case. The fuel injector pump senses engine speed, intake manifold air pressure, and intake air temperature and delivers a correctly metered amount of fuel to satisfy these variables. Distribution of the metered fuel to the individual cylinders is accomplished through an arrangement of external tubes and nozzles. The fuel is delivered under sufficient pressure for complete atomization by injector nozzles located on the manifold side of the intake valves.

*e.* A diaphragm-type fuel pump (fig. 4) mounted on the right side of the accessory case and actuated by an engine cam, draws fuel from the vehicle fuel supply. The fuel discharged by this pump passes through a fuel vapor separator and to a gear-driven vane-type fuel pump mounted on the left side of the accessory case. The vane-type fuel pump increases the fuel pressure to the level required by the fuel injector pump.

*f.* Dual ignition is provided by two gear-driven magnetos (fig. 1) mounted on the upper left side of the accessory case, each magneto firing six spark plugs. The inner magneto fires the accessory side spark plug in each cylinder and the outer magneto fires the flywheel side spark plug in each cylinder. A vibrator-type ignition booster and filter coil (fig. 4) is used in conjunction with the inner magneto to assist in starting. An ignition harness connects each magneto to its spark plugs. The magnetos and

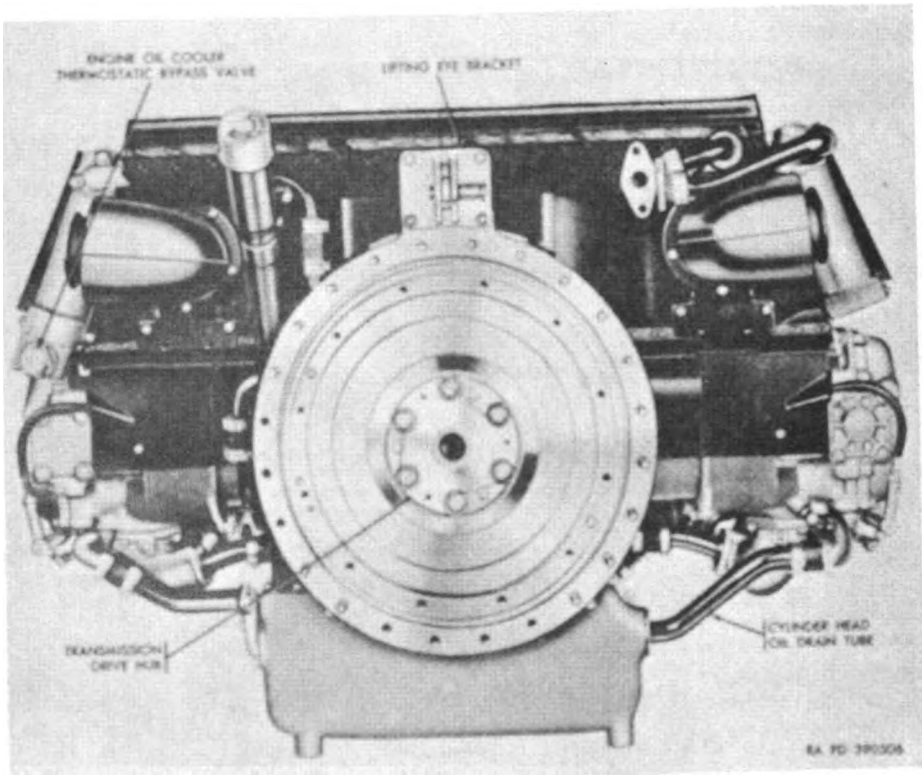



*Figure 2. Model AOSI-895-5 engine—rear view.*

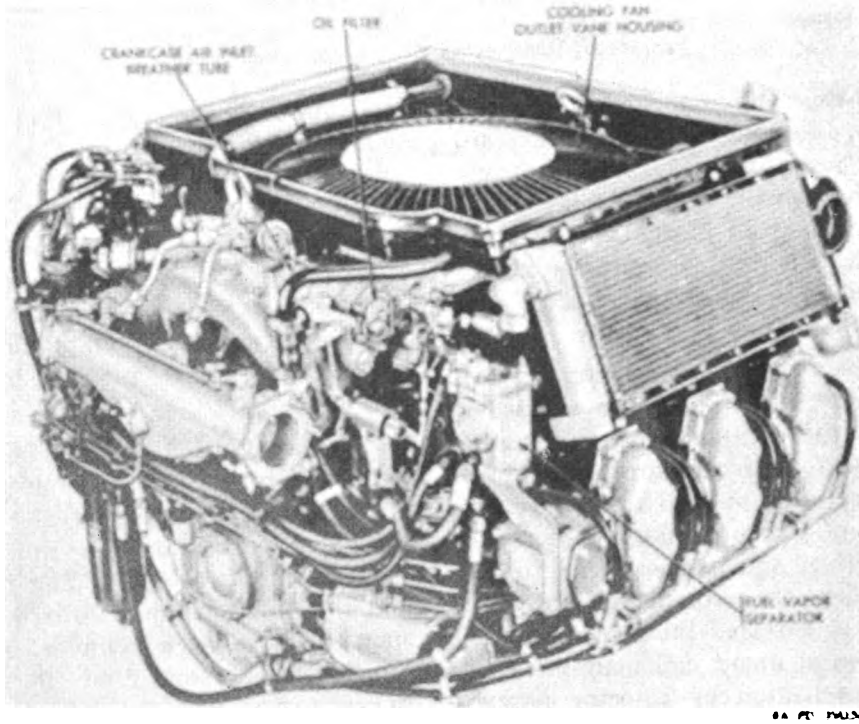



*Figure 3. Model AOSI-895-5M engine—three-quarter right front view.*

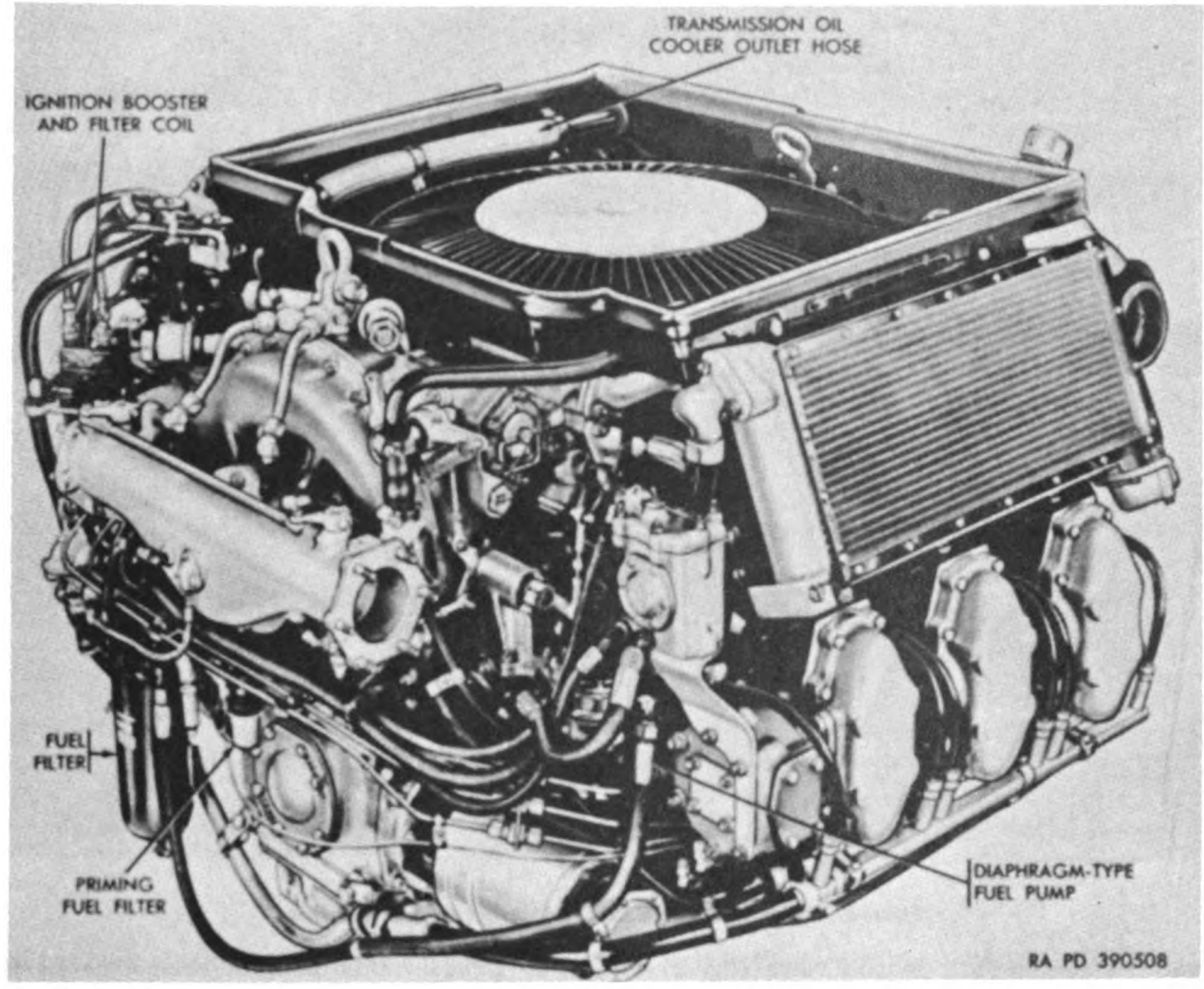



*Figure 4. Model AOSI-895-5 engine—three-quarter right front view.*

ignition harness (fig. 5) are waterproof and shielded to prevent radio interference.

*g.* The engine is lubricated by a force feed system. A combination scavenger and pressure oil pump and a separate accessory case scavenger oil pump supply oil to the lubrication system. The combination pump is mounted on the lower side of the crankcase inside the oil pan. The scavenger pump of this combination unit transfers oil from the flywheel end of the crankcase oil pan (fig. 6) to the pressure pump reservoir. The separate scavenger pump transfers oil from the accessory case oil sump (fig. 1) to the pressure pump reservoir. With the scavenger pumps constantly transferring oil from both ends of the engine, the pressure pump is assured an adequate supply of oil at all times regardless of the operating angle of the engine. In normal operation the oil passes from the pressure pump through passages in the crankcase and accessory case to the external oil coolers (fig. 6) and returns to the engine through the oil control housing and oil filter (fig. 3). The oil flow (fig. 19) is controlled by five valves. A fuel injector oil pressure regulator valve, an oil pressure control valve, an oil filter bypass valve, and an oil cooler bypass valve are all located in the oil control housing. The fifth

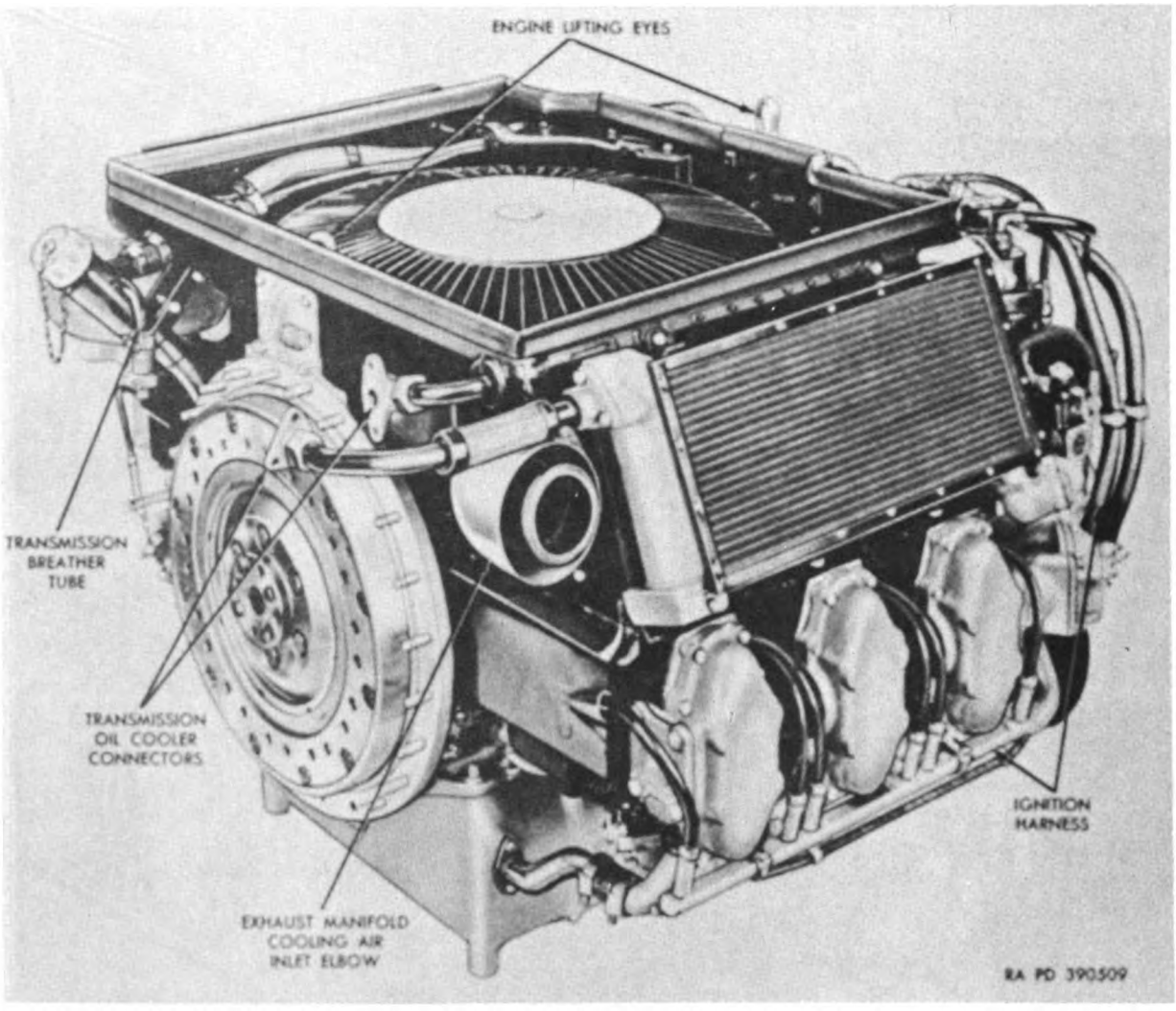



*Figure 5. Model AOSI-895-5M engine—three-quarter left rear view.*

valve, a thermostatic bypass valve (fig. 2) is located in the oil cooler.

*h.* A generator (fig. 7) and starter are located on opposite sides of the accessory case near the bottom. A mechanically controlled, hydraulically operated governor is located on the right side of the accessory case and controls engine speed within predetermined limits.

*i.* A flame arrestor (fig. 8) is incorporated into the crankcase breather system as a safety feature to prevent flame flashbacks into the crankcase.

## 6. Differences Between Models

The differences between model AOSI–895–5 and model AOSI–895–5M engines occur in the exhaust manifolds, engine shrouds, and flywheels as follows:

*a. Exhaust Manifolds.* A hotspot device is not required on a fuel-injected engine. The hotspot outlet extensions from the exhaust manifolds, formerly used on model AOS–895–3 engines, are sealed with a cover (fig. 8) on model AOSI–895–5M engines and have been eliminated from model AOSI–895–5 engine exhaust manifolds.

*b. Engine Shrouds.* The sealed exhaust manifold hotspot extensions extend through two openings in the accessory end of the shroud on model AOSI–895–5M engines. These openings have been omitted from the model AOSI–895–5 engine shroud. The opening in the engine shroud for the hotspot outlet tube, formerly used on model AOSI–895–3 engines, is covered with a plate on model AOSI–895–5M engines

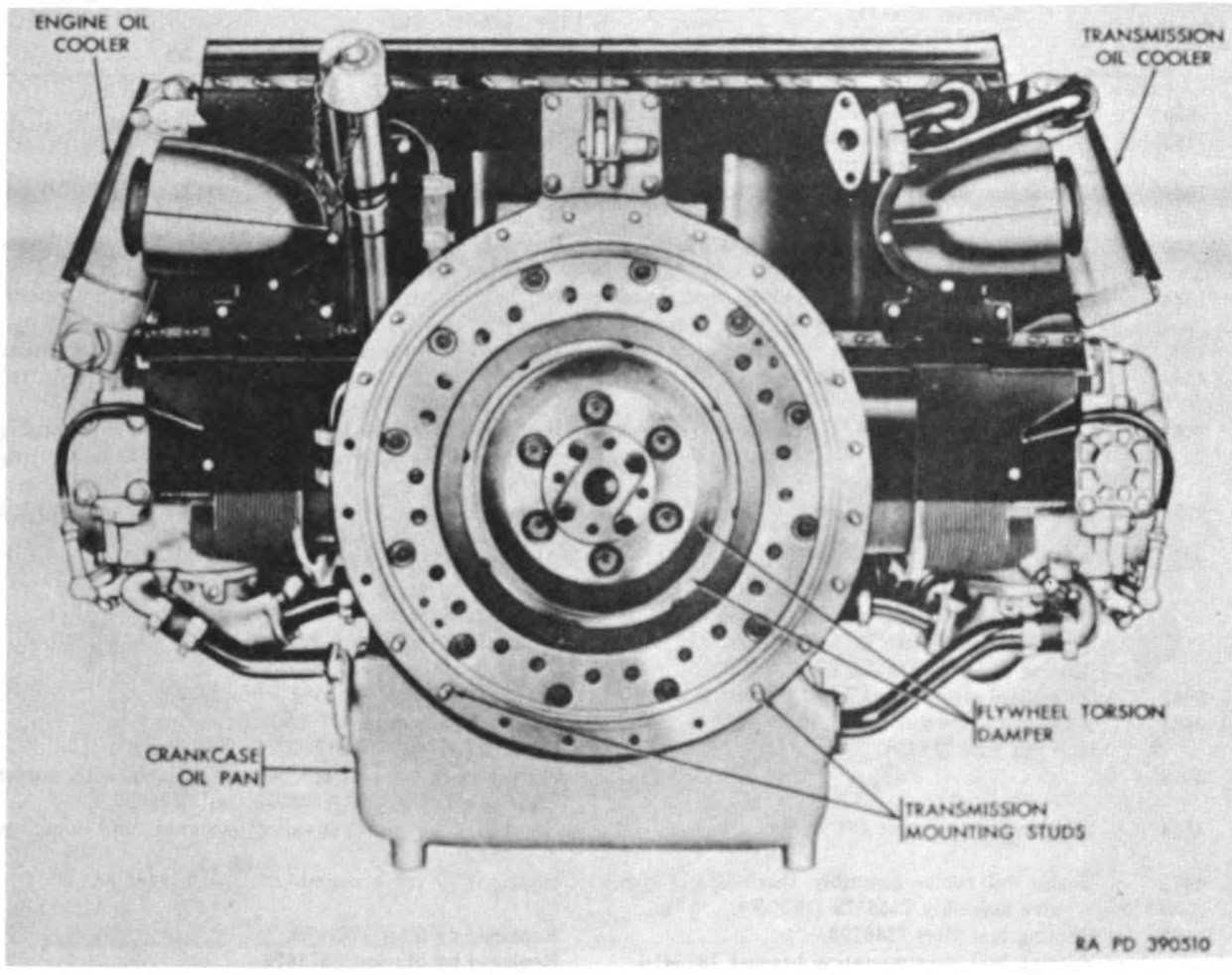



*Figure 6. Model AOSI-895-5M engine--rear view.*

and has been eliminated from the model AOSI–895–5 engine shroud.

*c. Flywheels.* Model AOSI–895–5M engines incorporate a torsion damper assembly (fig. 6) in the flywheel. This item is omitted on model AOSI–895–5 engines.

*d. Hexagonal Self-Locking Nuts.* All hex stamped nut and plain hex nut applications on model AOSI–895–5M engines were replaced by hex self-locking nuts on model AOSI–895–5 engines except the twelve $\frac{7}{16}$-inch holddown nuts securing each cylinder to the crankcase.

## 7. Differences Within Model AOSI–895–5M Engines

Major changes were effected in model AOS–895–3 engines and these changes are reflected in model AOSI–895–5M engines beginning with the serial numbers listed in table I.

*Table I. Differences Within Model AOSI-895-5M Engines.*

| Engine Serial No. | Part | Change |
|---|---|---|
| 650 | Power-take-off adapter 7403367 | Puller screw holes added. |
| 765 | Cylinder head oil drain tube 7348751 | Replace by tubes 7403470 and 7403471. |
| | Cylinder head oil drain tube 7375433 | Replaced by tubes 7403472 and 7403473. |
| 1068 | Magneto assembly 7539854 | Replaced by magneto assembly 7974214. |
| 1401 | Flywheel torsion damper hub 7346580 | Replaced by hub 7403628 with one blind spline. |
| 1440 | Crankcase through bolt bushing 7403730 | Bushing added to crankcase for more accurate alinement of crankcases. |
| 1524 | Generator drive adapter 7346540 and bracket 7346555. | Replaced by generator drive adapter assembly 7403467. |
| 1593 | Cooling fan rotor 7376003 | Replaced by rotor 8357826 with greater blade thickness. |
| 1593 | Starter drive assembly 7346654 | Replaced by drive assembly 7403476 with added "O" ring packing 546874. |
| 1785 | Accessory case 7376006. Camshaft drive housing 7375420. Camshaft drive housing 7375422. | Replaced by case 7414504, housing 7414503, and housing 7414505, with added oil transfer tubes and "O" ring packings. |
| 2066 | Governor 7410402 | Replaced by governor 7954764 and governor oil pressure regulating valve 8365712. |
| 2301 | Bearing 7338680 | Replaced by duplex ball bearing 7376130. |
| | Bearing retaining plate 7403369 | Replaced by plate 7375841. |
| | Impeller shaft oil seal housing 7348548 | Replaced by housing 7375840. |
| | Impeller shaft spacer 7348547 | Replaced by spacer washer 7376007. |
| | Bearing spacers 7372698 and 7372699 | Not required with new bearings. |
| 3041 | Oil control piston rings 7403136 (cast iron) | Replaced by rings 8365689 (chrome plated). |
| 3705 | Accessory drive gear hub nut 7346508 | Replaced by hub nut 7954825. |
| | Hub nut lock 7346507 | Replaced by nut lock 7954826. |
| 3919 | | Starter assembly 8365476 became optional with starter assemblies 7346619, 7538988, and 7705699. |
| 4124 | Ignition advance unit 7767445 | Replaced by spark advance governor unit assenbly 8376450. |
| 4471 | Engine oil cooler assembly thermostatic bypass valve assembly 7346573 (185° F). | Replaced by valve assembly 8357819 (148° F). |
| 5400 | Priming fuel filter 7346703 | Replaced by filter 7761059. |
| | Priming fuel filter mounting bracket 7375416 | Replaced by bracket 8673678. |
| 5447 | Cylinder head oil drain manifold 7375430 | Replaced by manifold 8357821. |
| | Cylinder head oil drain tube 7375424 | Replaced by tube 8357824. |
| 6005 | Cooling fan rotor 8357826 | Replaced by rotor 8376452 with greater blade thickness. |
| 6199 | | Magneto assembly 8344983 became optional with magneto assembly 7403411. |
| 7199 | Low oil pressure warning light sending unit 7321327 (30 psi setting). | Replaced by sending unit 8678906 (17 psi setting). |
| 7492 | Tube assembly 8365713 | Replaced by hose assembly 7376926. |
| 8485 | Oil filler tube cap 8328609. Gage 7403356 | Replaced by cap assembly 8691912, with attached indicator. |
| | Cooling fan clutch hub 7403735 | Replaced by hub 8680528. |
| | Friction disk 7539466 | Replaced by disk 8680529. |
| 8488 | Governor 7954764. Governor oil pressure regulating valve 8365712. | Replaced by governor 8380695, with integral oil pressure regulating valve. |

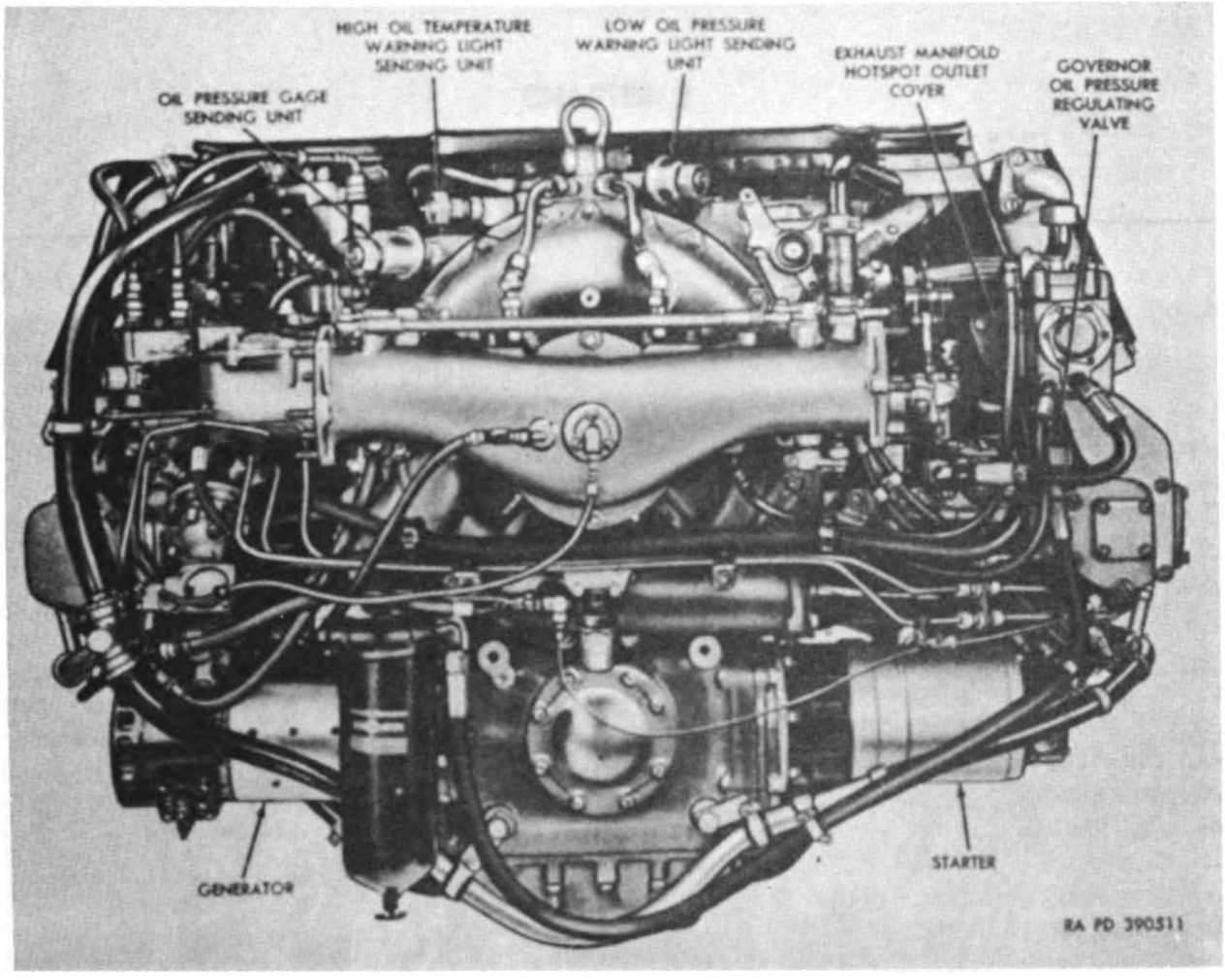



*Figure 7. Model AOSI-895-5M engine—front view.*

## 8. Differences Within Model AOSI–895–5 Engines

A major change made in model AOSI–895–5 engines which affects interchangeability of parts is listed below.

*Table II. Differences Within Model AOSI-895-5 Engines*

| Engine Serial No. | Part | Change |
|---|---|---|
| 528 | Starter drive bevel gear 7372687 (32 teeth) | Replaced by gear 7954848 (29 teeth). |
| | Starter driven gear 7346548 (29 teeth) | Replaced by gear 7954849 (26 teeth). |
| | Accessory case scavenger oil pump drive gear 7372686 (29 teeth). | Replaced by gear 7954850 (26 teeth). |
| | Power-take-off drive adapter assembly 7403367 | Adapter assembly reworked to accommodate new starter driven gear. |

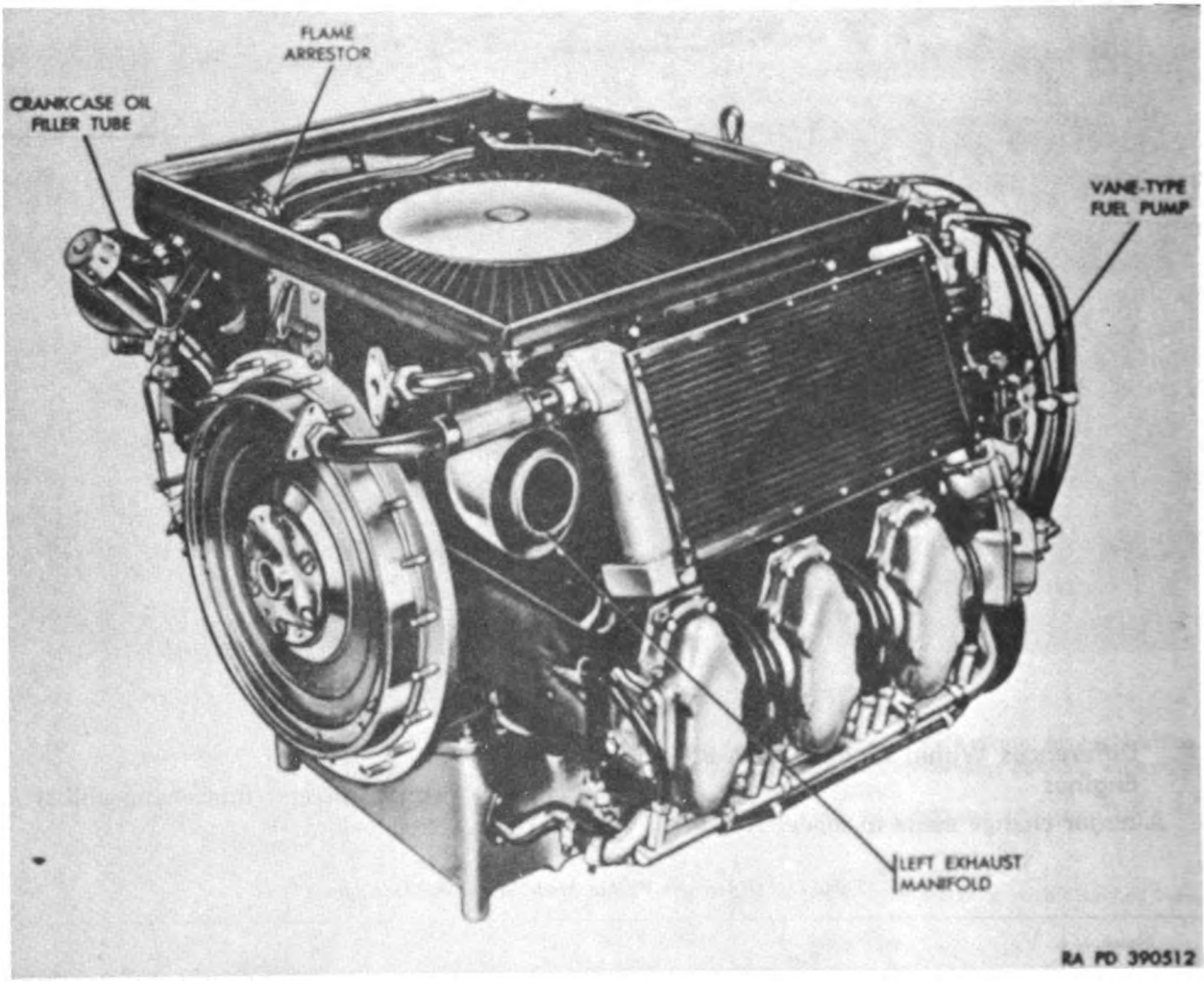



*Figure 8. Model AOSI-895-5 engine—three-quarter left rear view.*

# CHAPTER 2

# PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR FIELD AND DEPOT MAINTENANCE

## 9. General

Tools and equipment and maintenance parts over and above those available to the using organization are supplied to ordnance field maintenance units and depot shops for maintaining, repairing, and/or rebuilding the materiel.

## 10. Repair Parts

*a.* Repair parts supplied for Continental model AOSI–895–5 and AOSI–895–5M engines are listed in ORD 8 SNL G–253 with Change No. 1, which is the authority for requisitioning replacements.

*b.* Repair parts for engine accessories are listed in the following supply manuals:

(1) TM 9–2910–200–35P–Simmonds Aerocessories fuel injector pump.

(2) TM 9–2910–201–35P–Titan vane-type fuel pump.

(3) TM 9–2920–203–35P–Jack and Heintz starter.

(4) TM 9–2920–204–35P–American Bosch magneto.

## 11. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this materiel are listed in ORD 6 SNL J–8, Sections 7, 12, 13, and 18; ORD 6 SNL J–9, Sections 1, 2, 3, 8, and 9; and ORD 6 SNL J–10, Sections 4, 8, and 9; and are authorized for issue by TA and TOE.

## 12. Special Tools and Equipment

Certain tools and equipment specially designed for field and depot maintenance, repair, and general use with the materiel are listed in table III for information only. This list is not to be used for requisitioning replacements. Refer to SM 9–4–5180–J16–44 for listing of authorized special tools and kits.

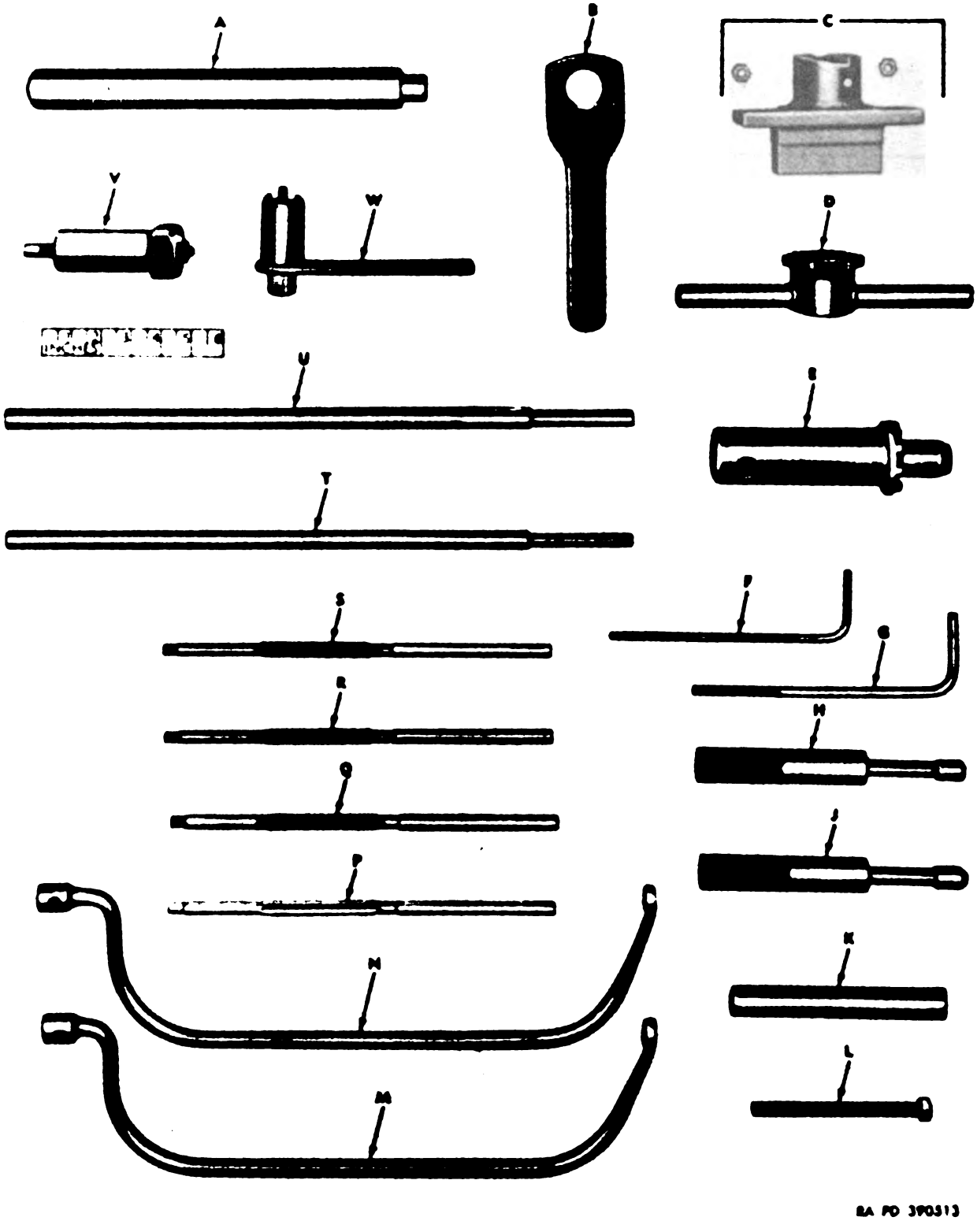



*Figure 9. Special tools and equipment.*

A—Handle 7082881
B—Wrench 7082061
C—Holder 7082054
D—Wrench 7082051
E—Wrench 7083758
F—Puller screw 5379997
G—Puller screw 7083740
H—Replacer 7083685
J—Replacer 7083682
K—Leg 8708180
L—½-20 x 2⅜ hex-head cap screw 8708355
M—Wrench 7082008
N—Wrench 7082856
P—Reamer 7083699
Q—Reamer 7083697
R—Reamer 7083698
S—Reamer 7083696
T—Remover 7083690
U—Remover 7083691
V—Wrench 7083730
W—Wrench 8708650

*Figure 9—Continued.*

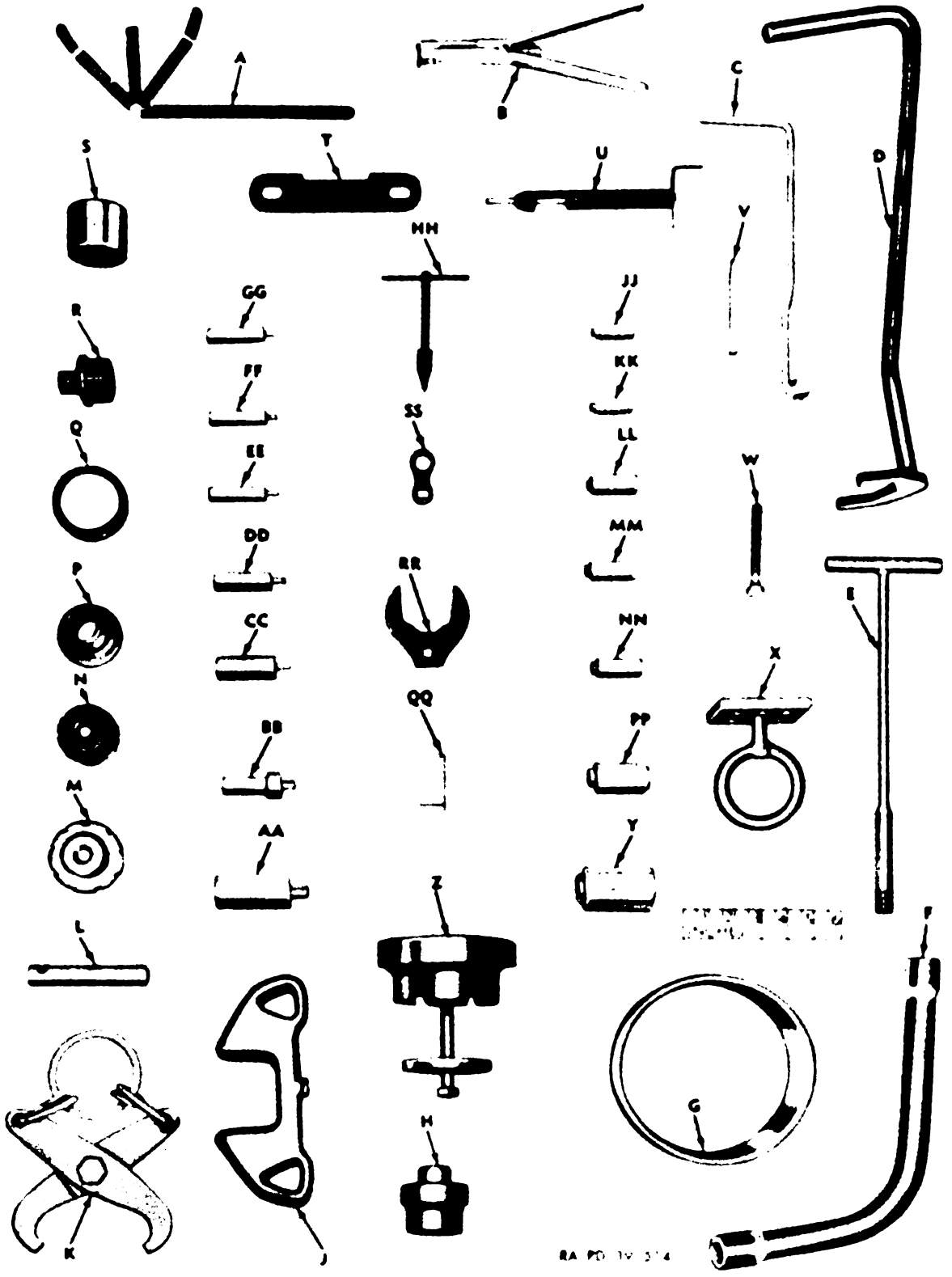



*Figure 10. Special tools and equipment.*

A–Gage 7083769
B–Remover and Replacer 7950177
C–Crowfoot wrench 7950895
D–Wrench 7083792
E–Remover and Replacer 7082029
F–Wrench 8708639
G–Gage and compressor 7082040
H–Wrench 8708400
J–Protector 8390285
K–Lifting sling 7082088
L–Wrench 8708248
M–Bushing 7081635
N–Bushing 7081634
P–Replacer 7082044
Q–Replacer 8708852
R–Wrench 8389952
S–Wrench 8708806
T–Strap 7082259
U–Inserter 8375242
V–Thimble 8708266
W–⅜–24 x 3 hex-head cap screw 10865418
X–Eye 7083793
Y–Wrench 7082138
Z–Fixture 8708181
AA–Driver 7082139
BB–Driver 7082075
CC–Driver 7082135
DD–Driver 7082137
EE–Driver 7082133
FF–Driver 7082643
GG–Driver 7082131
HH–Extractor 7751050
JJ–Wrench 7082130
KK–Wrench 7082642
LL–Wrench 7082132
MM–Wrench 7082136
NN–Wrench 7082134
PP–Wrench 7082309
QQ–Retainer 8708187
RR–Wrench 8708401
SS–Wrench 8708189

*Figure 10—Continued.*

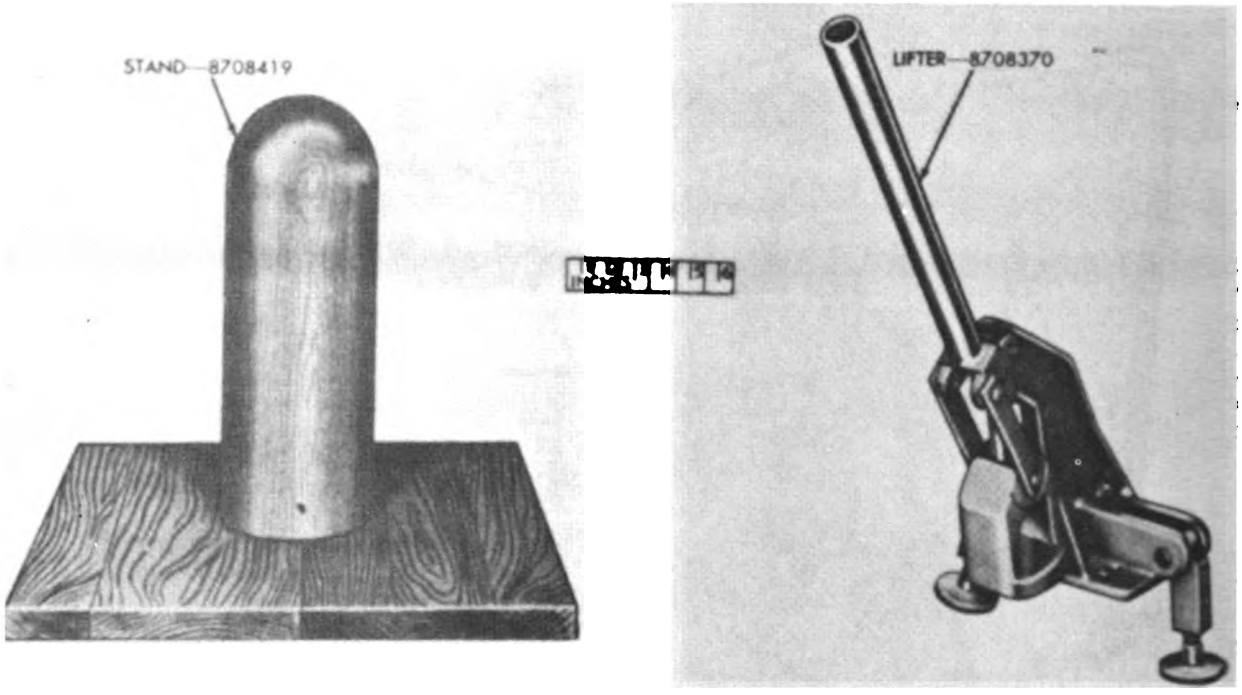



*Figure 11. Special tools and equipment.*

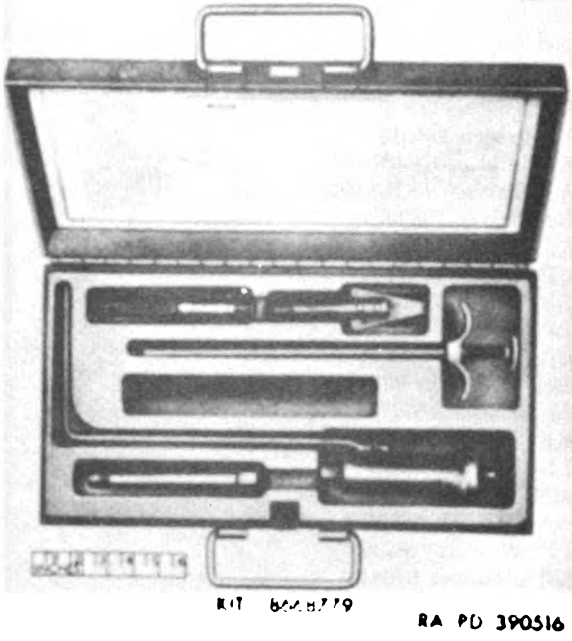



*Figure 12. Special tools and equipment.*

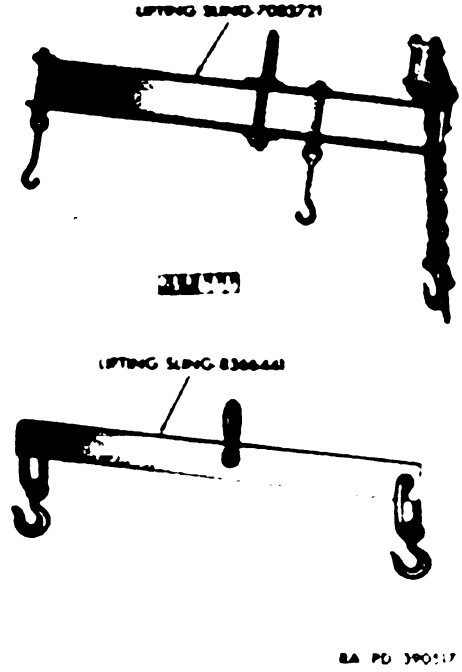


*Figure 13. Special tools and equipment.*

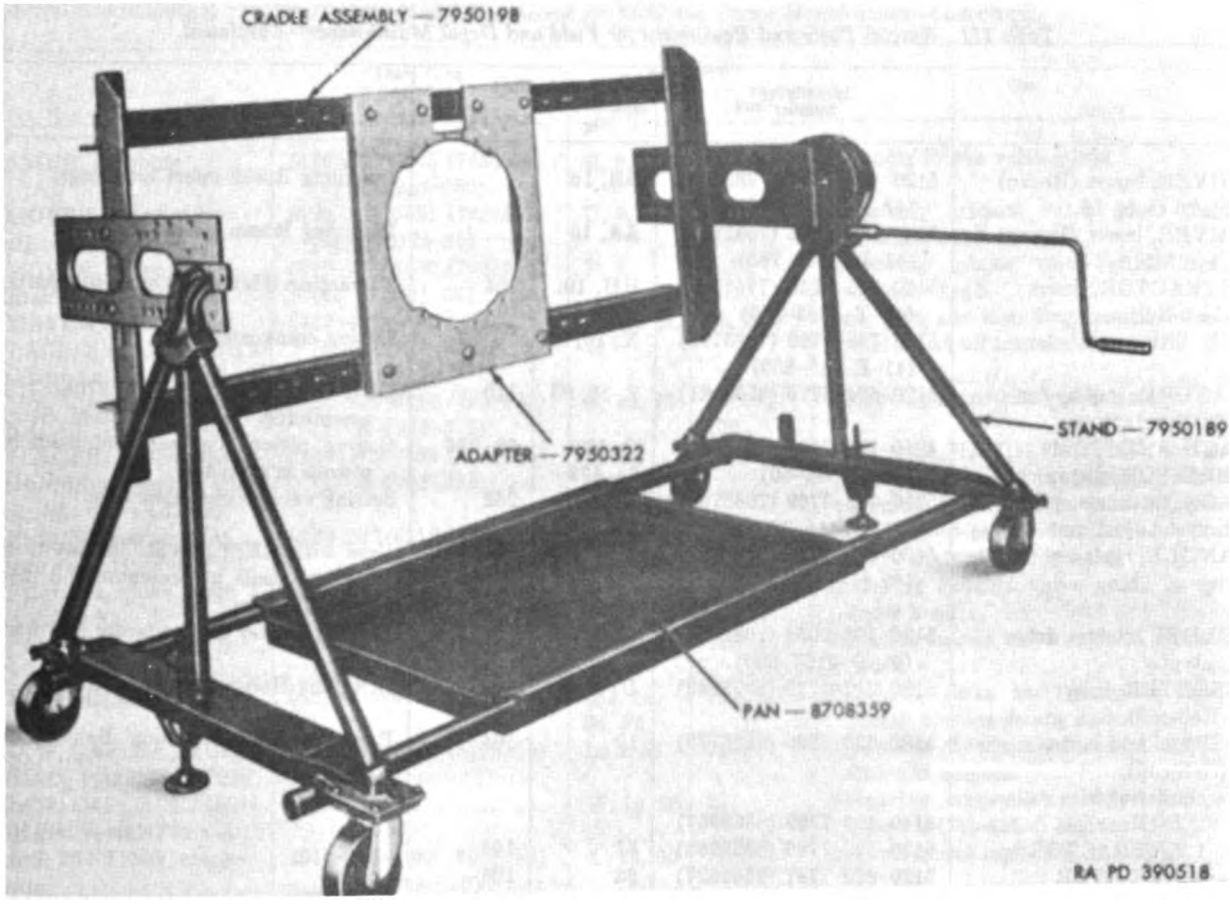



*Figure 14. Special tools and equipment.*

*Table III. Special Tools and Equipment for Field and Depot Maintenance.*

| Item | Identifying number | References | | Use |
|---|---|---|---|---|
| | | Fig. | Par. | |
| **ADAPTER**, engine overhaul stand. | 4910-795-0322 (7950322) (41-A-26-670) | 14, 22 | 42, 255 | Used with CRADLE 7950198 for mounting engine on overhaul STAND 7950189. |
| **BUSHING**, pilot | 5110-473-6976 (7081634) (41-B-2181-150) | N, 10 | 105 | Used with REAMER 7083697 and REAMER 7083696 to ream valve guide stem holes. |
| **BUSHING**, pilot | 5110-473-6977 (7081635) (41-B-2181-175) | M, 10, 89 | 105 | Used with REAMER 7083699 and REAMER 7083698 to ream valve guide stem holes. |
| **CRADLE ASSEMBLY**, engine overhaul stand. | 4910-795-0198 (7950198) (41-C-2674-125) | 14, 22 | ..... | Used with ADAPTER 7950322 for mounting engine on overhaul STAND 7950189. |
| **DRIVER**, insert (Rosan) ¼-28 to ⅜-16. | 5120-473-7013 (7082131) (41-D-2967-750) | GG, 10 | ..... | Installing Rosan insert lock rings. |
| **DRIVER**, insert (Rosan) 5/16-18 to ½-13. | 5120-708-2643 (7082643) (41-D-2967-752) | FF, 10 | ..... | Installing Rosan insert lock rings. |
| **DRIVER**, insert (Rosan) 5/16-24 to 7/16-20. | 5120-473-7014 (7082133) (41-D-2967-755) | EE, 10 | ..... | Installing Rosan insert lock rings. |
| **DRIVER**, insert (Rosan) ⅜-24 to ½-20. | 5120-473-7015 (7082137) (41-D-2967-760) | DD, 10 | ..... | Installing Rosan insert lock rings. |
| **DRIVER**, insert (Rosan) 7/16-20 to 5/8-18. | 5120-473-7016 (7082135) (41-D-2967-765) | CC, 10 | ..... | Installing Rosan insert lock rings. |

*Table III. Special Tools and Equipment for Field and Depot Maintenance—Continued.*

| Item | Identifying number | References | | Use |
|---|---|---|---|---|
| | | Fig. | Par. | |
| DRIVER, insert (Rosan) ½-20 to ¾-16. | 5120-473-7017 (7082075) (41-D-2967-770) | BB, 10 | ..... | Installing Rosan insert lock rings. |
| DRIVER, insert (Rosan) ⅝-18 to 1-14. | 5120-378-4276 (7082139) (41-D-2967-785) | AA, 10 | ..... | Installing Rosan insert lock rings. |
| EXTRACTOR, insert (Heli-coil). | 5120-245-9540 (7751050) (41-T-3093-350) | HH, 10, 86 | 104 | Extracting (Heli-coil) threaded inserts. |
| EYE, lifting crankcase | 5120-708-3793 (7083793) (41-E-615-350) | X, 10, 59 | 75, 83 | Lifting crankcase. |
| FIXTURE, cooling fan clutch retaining. | 5120-694-4775 (8708181) | Z, 10, 93 | 110 | Used with RETAINER 8708187 in assembling cooling fan drive clutch. |
| GAGE AND COMPRESSOR, piston ring. | 4910-473-7107 (7082040) (41-G-534-50) | G, 10, 75, 172 | 98, 256 | Gaging piston ring gap and installing pistons in cylinders. |
| GAGE, thickness, valve tappet adjusting. | 5210-708-3769 (7083769) (41-G-415-375) | A, 10, 175, 176 | 262 | Setting valve rocker clearance. |
| HANDLE, replacer | 5120-473-7121 (7082881) (41-H-1396-510) | A, 9, 130, 140 | 134, 154 | Used with REPLACER 7082044 to install oil seals in generator and magneto adapters. |
| HOLDER, starter drive adapter. | 5120-708-2054 (7082054) (41-H-2197-600) | C, 9, 139 | 155, 159 | Holding starter drive adapter and jaw. |
| INSERTER, insert (Heli-coil). | 5120-212-4710 (8375242) | U, 10, 87 | 104 | Installing Heli-coil threaded inserts. |
| KIT, tool and insert (Heli-coil). consisting of: | 5180-390-7800 (8668779) | 12 | 104 | Removing and installing Heli-coil inserts. |
| 1 BOX | 5140-390-7799 (8389967) | | | |
| 1 EXTRACTOR | 5120-390-7786 (8389963) | 81 | 104 | |
| 1 INSERTER | 5120-390-7787 (8668627) | 83 | 104 | |
| 1 REMOVER | 5120-473-7313 (7082407) | 85 | 104 | |
| 1 TAP | 5110-473-7594 (7082331) | 82 | 104 | |
| 1 TOOL | 5120-473-7625 (7082330) | 84 | 104 | |
| LEG, support | 5120-323-4871 (8708180) | K, 9, 59 | 75, 83, 255 | Supporting crankcase while removing or replacing crankshaft. |
| LIFTER, valve spring | 5120-575-7768 (8708370) | 11, 78 | 101, 105 | Used with STAND 8708419 for compressing valve springs to remove or replace valve spring retainer locks. |
| PAN, drip | 4910-545-8639 (8708359) | 14, 22 | ..... | Used with STAND 7950189 as oil drip pan. |
| PROTECTOR, connecting rod. | 5120-390-7780 (8390285) | J, 10, 54 | 72, 255 | Protecting crankcase while cylinders are removed. |
| PULLER SCREW, ⅝-18NC. | 5120-473-7222 (5379997) (41-P-2906-280) | F, 9, 49, 50, 104, 108, 110, 111, 114, 120, 123, 124 | 70, 119, 120, 130 | Removing power-take-off drive, adapter, supercharger diffuser, supercharger housing, accessory case diaphragm, fan drive shaft oil seal housing, magneto drive adapter, fuel pump drive adapter, magneto driven idler bevel gear adapter, fan drive shaft gear bearing liner, and fan vertical drive shaft bearing housing. |
| PULLER SCREW, ⅜-16NC. | 5120-708-3740 (7083740) (41-P-2908-60) | G, 9, 41, 57, 97, 98 | 66, 73, 111, 112 | Removing starter drive adapter, generator drive adapter, crankcase oil pan, and flywheel cover plate of model AOSI-895-5M engines. |
| REAMER, finishing | 5110-708-3697 (7083697) (41-R-2254-520) | Q, 9 | 105 | Reaming exhaust valve guide. |
| REAMER, finishing | 5110-708-3699 (7083699) (41-R-2254-505) | P, 9, 90 | 105 | Reaming intake valve guide. |
| REAMER, roughing | 5110-708-3696 (7083696) (41-R-2254-570) | S, 9 | 105 | Reaming exhaust valve guide. |

*Table III. Special Tools and Equipment for Field and Depot Maintenance—Continued.*

| Item | Identifying number | References | | Use |
|---|---|---|---|---|
| | | Fig. | Par. | |
| REAMER, roughing | 5110-708-3698 (7083698) (41-R-2254-552) | R, 9, 89 | 105 | Reaming intake valve guide. |
| REMOVER, valve guide (exhaust). | 5120-708-3691 (7083691) (41-R-2371-20) | U, 9, 79 | 101 | Removing exhaust valve guide from cylinder head. |
| REMOVER, valve guide (intake). | 5120-708-3690 (7083690) (41-R-2371-35) | T, 9 | 101 | Removing intake valve guide from cylinder head. |
| REMOVER AND REPLACER, camshaft drive shaft and oil transfer plug. | 5120-473-7402 (7082029) (41-R-2378-575) | E, 10, 43, 44 | 68, 263 | Removing and installing camshaft drive shafts and oil transfer plugs. |
| REMOVER AND REPLACER, piston rings. | 5120-795-0177 (7950177) (41-R-2378-572) | B, 10, 73 | 96, 98, 100 | Removing or installing piston rings. |
| REPLACER, oil seal, generator drive adapter, and magneto drive adapter. | 5120-473-7486 (7082044) (41-R-2392-995) | P, 10, 130, 140 | 134, 154 | Used with HANDLE 7082881 for installing oil seals in generator drive adapter and magneto drive adapter. |
| REPLACER, oil seal, fan drive vertical drive shaft. | 5120-322-6219 (8708852) | Q, 10, 93 | 110 | Installing oil seal in fan drive vertical drive shaft oil seal housing. |
| REPLACER, valve guide (exhaust). | 5120-473-7464 (7083682) (41-R-2390-475) | J, 9 | 105 | Installing exhaust valve guide in cylinder head. |
| REPLACER, valve guide (intake). | 5120-708-3685 (7083685) (41-R-2390-482) | H, 9 | 105 | Installing intake valve guide in cylinder head. |
| RETAINER, fan drive clutch. | 5120-694-4776 (8708187) | QQ, 10, 94, 95 | 110 | Retaining disks and plates in outer clutch housing during assembly. |
| SCREW, CAP, HEXAGON HEAD, ½-20NF-2 x 2⅜. | 5305-532-9125 (8708355) | L, 9, 58 | 73 | Removing flywheel of model AOSI-895-5M engines. |
| SCREW, CAP, HEXAGON HEAD, ⅜-24NF-2 x 3. | (10865418) | W, 10, 55 | 73 | Removing transmission drive hub of model AOSI-895-5 engines. |
| SLING, LIFTING, crankshaft. | 4910-708-2088 (7082088) (41-S-3829-720) | K, 10, 60 | 75, 255 | Removing and replacing crankshaft. |
| SLING, LIFTING, engine | 4910-836-6441 (8366441) (41-S-3831-610) | 13, 21 | 42, 288 | Lifting engine when separated from transmission. |
| SLING, LIFTING, engine and transmission. | 4910-708-3721 (7083721) (41-S-3832-22) | 13 | | Lifting engine and transmission. |
| STAND, engine overhaul | 4910-795-0189 (7950189) (41-S-4942-20) | 14, 22 | 42, 255 | Supporting engine during disassembly and assembly. |
| STAND, valve removing and replacing. | 4910-554-1317 (8708419) | 11, 78 | 101, 105 | Used with LIFTER 8708370 in supporting cylinder while compressing valve springs. |
| STRAP, crankcase cylinder pad. | 4910-708-2259 (7082259) (41-S-5906-300) | T, 10, 54, 59 | 72, 83, 255 | Protecting crankcase cylinder mounting pads while torquing crankcase thru bolts. |
| THIMBLE, booster pump shaft. | 5120-508-1532 (8708266) | V, 10, 128 | 134 | Protecting "O" ring packings while installing booster pump shaft. |
| WRENCH, accessory drive gear hub nut. | 5120-708-3758 (7083758) (41-W-430-275) | E, 9, 113 | 120, 124 | Removing or installing accessory drive gear hub nut on early model AOSI-895-5M engines. |
| WRENCH, camshaft drive shaft housing packing nut. | 5120-708-3792 (7083792) (41-W-871-80) | D, 10, 45 | 68 | Removing or installing camshaft drive shaft housing packing nut. |
| WRENCH, crankshaft damper counterweight pin. | 5120-708-2061 (7082061) (41-W-870-50) | B, 9, 66 | 86, 90 | Removing or installing crankshaft damper counterweight pins. |
| WRENCH, CROWFOOT, ignition harness nut. | 5120-795-0895 (7950895) (41-W-871-62) | C, 10, 27 | 44 | Removing or installing spark plug lead. |
| WRENCH, engine turning through flywheel. | 5120-378-4391 (8389952) (41-W-906-135) | R, 10, 53 | 72, 258 | Turning engine through flywheel drive spline. |
| WRENCH, insert (Rosan) ¼-28 to ⅜-16. | 5120-473-7700 (7082130) (41-W-1536-390) | JJ, 10 | 79 | Installing Rosan inserts. |
| WRENCH, insert (Rosan) 5/16-18 to ½-13. | 5120-708-2642 (7082642) (41-W-1536-391) | KK, 10 | 79 | Installing Rosan inserts. |

*Table III. Special Tools and Equipment for Field and Depot Maintenance—Continued.*

| Item | Identifying number | References | | Use |
|---|---|---|---|---|
| | | Fig. | Par. | |
| WRENCH, insert (Rosan) 5/16-24 to 7/16-20. | 5120-473-7701 (7082132) (41-W-1536-393) | LL, 10 | 79 | Installing Rosan inserts. |
| WRENCH, insert (Rosan) 3/8-24 to 1/2-20. | 5120-473-7702 (7082136) (41-W-1536-396) | MM, 10 | 79 | Installing Rosan inserts. |
| WRENCH, insert (Rosan) 7/16-20 to 5/8-18. | 5120-473-7703 (7082134) (41-W-1536-399) | NN, 10 | 79 | Installing Rosan inserts. |
| WRENCH, insert (Rosan) 1/2-20 to 3/4-16. | 5120-473-7704 (7082309) (41-W-1536-402) | PP, 10 | 79 | Installing Rosan inserts. |
| WRENCH, insert (Rosan) 5/8-18 to 1-14. | 5120-708-2138 (7082138) (41-W-1536-410) | Y, 10 | 79 | Installing Rosan inserts. |
| WRENCH, oil filter bypass valve housing. | 5120-575-7766 (8708400) | H, 10, 100 | 113 | Removing or installing oil filter bypass valve housing. |
| WRENCH, oil pressure control valve housing. | 5120-592-3670 (8708401) | RR, 10, 99 | 113 | Removing or installing oil pressure control valve. |
| WRENCH, pulling and driving supercharger impeller. | 5120-708-3730 (7083730) (41-W-1536-240) | V, 9, 107 | 119, 124 | Removing or installing supercharger impeller. |
| WRENCH, socket, crowfoot attachment, starter. | 5120-323-4875 (8708189) | SS, 10, 30, 31 | 52, 275 | Removing or installing starters. |
| WRENCH, socket, engine turning through power-take-off. | 5120-310-4673 (8708806) | S, 10, 15 | 16, 261, 263 | Turning engine through power-take-off drive shaft. |
| WRENCH, spark plug..... | 5120-098-6723 (8708639) | F, 10, 28 | 44, 278 | Removing or installing spark plug with lead attached. |
| WRENCH, SPLINED, turning fuel injector pump main shaft. | 5120-508-1531 (8708248) | L, 10, 184 | 263 | Timing fuel injector pump. |
| WRENCH, starter jaw retaining nut. | 5120-708-2051 (7082051) (41-W-545-15) | D, 9, 141 | 155, 159 | Used with HOLDER 7082054 in removing or installing starter drive adapter bearing retaining nut. |
| WRENCH, supercharger impeller nut. | 5120-092-9075 (8708650) | W, 9, 106 | 119, 124 | Removing or installing supercharger impeller nut. |
| WRENCH, 7/16-in. cylinder holddown nuts. | 5120-473-7677 (7082856) (41-W-872-710) | N, 9, 52 | 72, 258 | Removing or installing 7/16-in. cylinder holddown nuts. |
| WRENCH, 9/16-in. cylinder holddown nuts. | 5120-473-7678 (7082008) (41-W-872-715) | M, 9 | 72, 258 | Removing or installing 9/16-in. cylinder holddown nuts. |

# CHAPTER 3
# TROUBLESHOOTING

## Section I. GENERAL

### 13. Purpose

NOTE: Information in this chapter is for use of ordnance maintenance personnel in conjunction with and as a supplement to the troubleshooting section in the pertinent vehicle operation technical manual. It provides continuation of instructions where a remedy in the operator's technical manual refers to ordnance maintenance personnel for corrective action.

Operation of a deadlined vehicle without a preliminary examination can cause further damage to a disabled component and possible injury to personnel. By careful inspection and troubleshooting, such damage and injury can be avoided and, in addition, the causes of faulty operation of a vehicle or component can often be determined without extensive disassembly.

### 14. General Instructions and Procedures

This chapter contains inspection and troubleshooting procedures to be performed while a disabled component is still mounted on the vehicle and after it has been removed.

*a.* The inspections made while the component is mounted on the vehicle are for the most part visual and are to be performed before attempting to operate the vehicle. The object of these inspections is to determine the condition of the component, and if found defective, to take precautions to prevent any further damage to it.

*b.* The troubleshooting performed while the component is mounted in the vehicle is that which is beyond the normal scope of the using organization. Check the troubleshooting section of pertinent vehicle operation technical manual, then proceed as outlined in this chapter.

*c.* Inspection after the component is removed from the vehicle is performed to verify the diagnosis made when the component was in the vehicle, to uncover further defects, or to determine malfunctions if the component alone is received by the Ordnance establishment. This inspection is particularly important in the last case because it is often the only means of determining the malfunction without completely disassembling the component.

*d.* Troubleshooting a disabled component after it has been removed from the vehicle consists of subjecting it to tests on a dynamometer. This chapter also discusses symptoms which can be diagnosed by using the testing equipment and interprets the results in terms of probable causes.

## Section II. TROUBLESHOOTING PROCEDURES

### 15. General

Most engine troubles can be traced to the engine accessories. Normally the pertinent vehicle operation technical manual will cover troubleshooting of all engine accessories while mounted on the engine. This chapter also covers troubles which can develop in the engine itself.

### 16. Detailed Procedures

*a. General.* Troubleshooting is a systematic isolation of defective components by means of symptoms, tests for determining the defective components, and included remedies. Information included in the troubleshooting table (table IV) provides a continuation of instructions where a corrective action procedure in the pertinent vehicle operation manual has been referred to ordnance maintenance personnel.

*b. Procedures.*

(1) Ordnance maintenance personnel should make a preliminary examination of the defective components before troubleshooting the materiel.

(2) During troubleshooting, as outlined in table IV, it will be necessary to turn the engine by hand. To turn engine by hand, remove power-take-off cover (par. 120*d*) and install wrench 8708806 (S, fig. 10) on power-take-off drive shaft as shown in figure 15.

(3) After turning engine, remove wrench and install power-take-off drive cover (par. 261).

(4) In the troubleshooting table (table IV), reference is also made to ignition wiring as shown in figure 16.

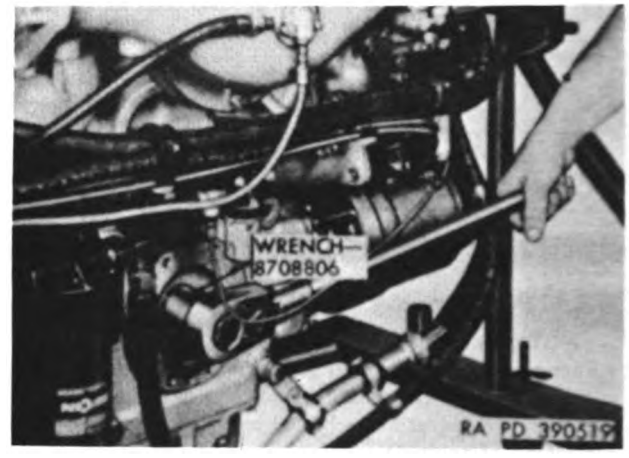



*Figure 15. Turning engine through power take-off drive shaft.*

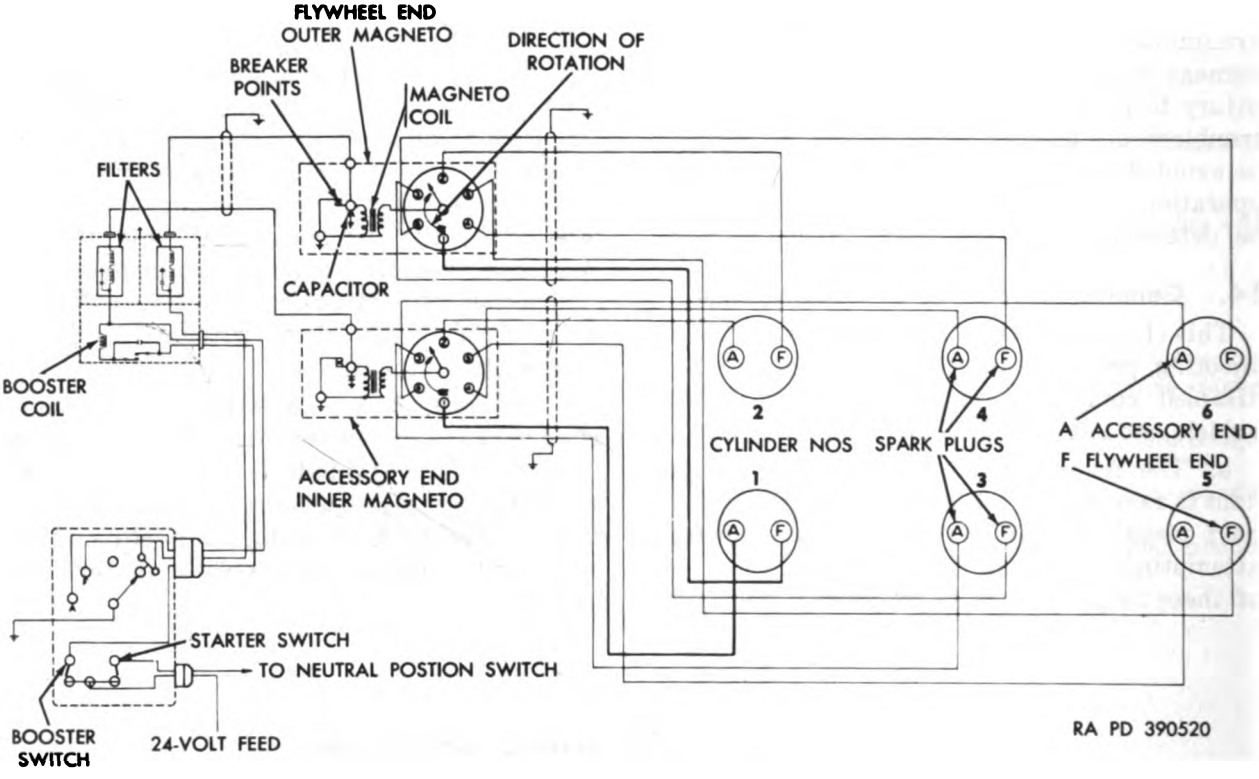



*Figure 16. Ignition wiring—schematic diagram.*

*Table IV. Troubleshooting*

| Malfunction | Probable causes | Corrective action |
|---|---|---|
| | **ENGINE** | |
| 1. Engine will not crank | *a.* Improper starting procedures | *a.* Refer to pertinent vehicle operation manual for proper starting procedures. |
| | *b.* Starter not operating | *b.* Refer to starting system section of this table. |
| | *c.* Hydrostatic lock (fluid in cylinders). | *c.* Refer to pertinent vehicle operation manual for correction of hydrostatic lock. Engine should turn freely after correction. If engine does not turn freely by hand, engine has been damaged by hydrostatic lock. Rebuild engine as necessary (chs 5 through 9). |
| | *d.* Seizure of parts | *d.* Determine whether seizure is in power section or accessory case by checking gear backlash. Install wrench 8708806 (par. 16*b* (2)) and rock crankshaft and check backlash. Rebuild engine as necessary to free seizure (chs 5 through 9). |
| 2. Engine cranks but will not fire. | *a.* Priming fuel not reaching cylinders. | *a.* Refer to fuel system section of this table. |
| | *b.* Overprimed (flooded) | *b.* Turn ignition switch lever to "OFF" position, hold throttle full open, and crank engine to remove excess fuel from cylinders. Close throttle and start engine in normal manner. |
| | *c.* Current not reaching spark plugs. | *c.* Refer to ignition system section of this table. |
| | *d.* Intake air not reaching cylinders. | *d.* Refer to air intake section of this table. |
| | *e.* Low compression | *e.* Refer to pertinent vehicle operation manual for procedures for checking compression. Low compression may be caused by worn piston rings or leaking valves. Disassemble engine as necessary, replace worn rings (pars. 96 through 100), repair or replace leaking valves (pars. 101 through 105), and assemble engine. |
| 3. Engine fires but will not not start. | *a.* Insufficient priming fuel reaching cylinders. | *a.* Refer to fuel system section of this table. |
| | *b.* Overprimed (flooded) | *b.* Refer to 2*b* above. |
| | *c.* Crossed spark plug lead assemblies. | *c.* Remove crossed spark plug lead assemblies (par. 44) from spark plugs. Install lead assemblies on correct spark plugs as shown in figure 16. |
| | *d.* Magnetos improperly timed | *d.* Time magnetos (par. 263*b*). |
| 4. Engine starts on priming fuel but will not keep running. | Fuel injector nozzles not delivering fuel. | Refer to fuel system section of this table. |
| 5. Engine runs rough and misfires. | *a.* Fouled spark plugs | *a.* Refer to pertinent vehicle operation manual. |
| | *b.* Magnetos improperly timed | *b.* Time magnetos (par. 263*b*) |
| | *c.* Intermittent spark at spark plugs. | *c.* Refer to ignition system section of this table. |
| | *d.* Crossed spark plug lead assemblies. | *d.* Refer to 3*c* above. |
| | *e.* Fuel mixture improperly adjusted (mixture too lean). | *e.* Refer to fuel system section of this table. |
| | *f.* Sticking or leaking valves | *f.* Refer to pertinent vehicle operation manual for procedures for checking compression. Disassemble engine as necessary, repair or replace sticking or leaking valves (pars. 101 through 105) and assemble engine. |
| | *g.* Valves improperly timed | *g.* Time valves (par. 263*a* and *c*). |

*Table IV. Troubleshooting—Continued*

| Malfunction | Probable causes | Corrective action |
|---|---|---|
| | **ENGINE—Continued** | |
| 6. Engine does not develop full power. | *a.* Governor improperly adjusted. | *a.* Adjust governor (par. 291). |
| | *b.* Insufficient intake air | *b.* Refer to air intake section of this table. |
| | *c.* Fuel mixture improperly adjusted (mixture too lean). | *c.* Refer to fuel system section of this table. |
| | *d.* Engine improperly timed | *d.* Time engine as necessary (par. 263). |
| | *e.* Low compression | *e.* Refer to 2*e* above. |
| | *f.* Valves not opening sufficiently due to worn camshaft lobes. | *f.* Disassemble engine as necessary, replace worn camshaft (pars. 169 through 173), and assemble engine. |
| 7. Engine smokes (black smoke). | Fuel mixture improperly adjusted (mixture too rich). | Refer to fuel system section of this table. |
| 8. Engine smokes (blue-grey smoke). | *a.* Worn piston rings or cylinders. | *a.* Disassemble engine as necessary, repair or replace worn piston rings (pars. 96 through 100) or worn cylinders (pars. 101 through 105), and assemble engine. |
| | *b.* Broken piston | *b.* Disassemble engine as necessary, replace broken piston (pars. 96 through 100), and assemble engine. |
| | *c.* Worn or damaged supercharger impeller driven shaft gear oil seal. | *c.* Disassemble engine as necessary, replace damaged oil seal (pars. 120 through 124), and assemble engine. |
| 9. Engine noise (knocking) | *a.* Engine overheated | *a.* Refer to cooling system section of this table. |
| | *b.* Broken piston, piston ring, or piston pin. | *b.* Refer to 8*b* above. |
| | *c.* Worn or broken gears and/or bearings. | *c.* Rebuild engine as necessary (chs 5 through 9). |
| | *d.* Excessive crankshaft end play. | *d.* Disassemble engine as necessary and check crankshaft end play (par. 255). If end play is not within limits specified, rebuild engine as necessary (chs 5 through 9). |
| | *e.* Worn connecting rod or main bearings. | *e.* Disassemble engine as necessary, replace worn connecting rod (par. 89) or worn main bearings (par. 84), and assemble engine. |
| 10. Engine noise (tapping) | *a.* Valve clearance improperly adjusted. | *a.* Remove valve rocker covers (par. 67) and adjust valve clearance (par. 262*c*). Install valve rocker covers (par. 264). |
| | *b.* Defective valve (rocker assembly. | *b.* Remove valve rocker cover (par. 67), remove defective valve rocker assembly (par. 68), replace valve rocker assembly (par. 262), and install valve rocker cover (par. 264). |
| 11. Engine noise (grinding) | Worn or broken gears or bearings. | Rebuild engine as necessary, (chs 5 through 9). |
| 12. Engine noise (squealing) | *a.* Defective cooling fan drive clutch. | *a.* Refer to cooling system section of this table. |
| | *b.* Defective operating parts in supercharger group. | *b.* Disassemble engine as necessary, repair or replace defective operating parts in supercharger group (pars. 120 through 124), and assemble engine. |
| | **STARTING SYSTEM** | |
| 1. Starter does not operate | *a.* Improper starting procedures | *a.* Refer to pertinent vehicle operation manual for proper starting procedures. |
| | *b.* Current not reaching starter | *b.* Refer to pertinent vehicle operation manual for trouble-shooting procedures for vehicle electrical system. |
| | *c.* Defective starter | *c.* Remove starter (par. 52) and replace starter (par. 275). |
| 2. Starter operates but does not crank engine. | *a.* Defective starter clutch | *a.* Replace starter as in 1*c* above. |
| | *b.* Hydrostatic lock or seized parts in engine. | *b.* Refer to engine section of this table. |

*Table IV. Troubleshooting—Continued*

| Malfunction | Probable causes | Corrective action |
|---|---|---|
| | **STARTING SYSTEM —Continued** | |
| 2. Starter operates but does not crank engine —Continued | *c.* Defective starter jaw or drive bevel gear. | *c.* Remove starter (par. 52). Remove defective starter drive assembly (par. 111). Repair or replace starter drive assembly (pars. 155 through 159). Install starter drive assembly (par. 161). Install starter (par. 275). |
| | *d.* Defective starter driven gear. | *d.* Disassemble engine as necessary, repair or replace starter driven gear (par. 123), and assemble engine. |
| | **IGNITION SYSTEM** | |
| 1. Current not reaching spark plugs. | *a.* Improper starting procedures. | *a.* Refer to pertinent vehicle operation manual for proper starting procedures. |
| | *b.* Current not reaching ignition booster and filter coil. | *b.* Refer to pertinent vehicle operation manual for troubleshooting procedures for vehicle electrical system. |
| | *c.* Defective ignition booster and filter coil. | *c.* Remove defective ignition filter and booster coil (par. 46) and replace ignition filter and booster coil (par. 277). |
| | *d.* Defective inner magneto ground cable. | *d.* Disconnect coupling nuts of defective inner magneto ground cable from magneto and ignition booster and filter coil, remove cable, and replace cable. |
| | *e.* Defective magneto. | *e.* Remove defective magneto (par. 47) and turn engine with wrench (par. 16) to check gear train. Replace defective magneto (par. 263*b*). |
| | *f.* Defective magneto drive gear train. | *f.* If magneto driven gear does not turn when engine is turned (*e* above), magneto gear train is defective. Remove magneto drive assembly (par. 117), rebuild magneto drive assembly (pars. 130 through 134) if defective, and install magneto drive assembly (par. 166). If magneto drive assembly is not defective, disassemble engine as necessary, rebuild accessory case (pars. 120 through 124), and assemble engine. |
| 2. Intermittent spark at spark plugs. | *a.* Defective spark plug lead assemblies. | *a.* Remove defective spark plug lead assemblies (par. 44) and replace spark plug lead assemblies (par. 278). |
| | *b.* Defective spark plugs. | *b.* Remove defective spark plugs (par. 44) and replace spark plugs (par. 278). |
| | *c.* Defective magneto. | *c.* Remove defective magneto (par. 47) and replace magneto (par. 263*b*). |
| | *d.* Defective ignition booster and filter coil. | *d.* Replace defective ignition booster and filter coil. Refer to 1*c* above. |
| | *e.* Defective magneto ground cables. | *e.* Replace defective ground cables. Refer to 1*d* above. |
| | *f.* Defective ignition harness. | *f.* Remove defective ignition harness (par. 44) and replace harness (par. 278). |
| | **FUEL SYSTEM** | |
| 1. Priming fuel not reaching cylinders. | *a.* Defective vehicle priming system. | *a.* Refer to pertinent vehicle operation manual for procedures for troubleshooting vehicle fuel system. |
| | *b.* Plugged priming fuel filter. | *b.* Remove plugged priming fuel filter (par. 50). Clean or rebuild fuel filter (pars. 219 through 223), and install fuel filter (par. 268). |

*Table IV. Troubleshooting—Continued*

| Malfunction | Probable causes | Corrective action |
|---|---|---|
| | **FUEL SYSTEM—Continued** | |
| 1. Priming fuel not reaching cylinders—Continued | *c.* Plugged priming nozzles | *c.* Disconnect priming line from priming nozzle and remove plugged priming nozzle from cylinder. Clean or rebuild priming nozzle (pars. 219 through 223). Install priming nozzle in cylinder and connect priming line to nozzle. |
| | *d.* Plugged or damaged priming lines or tubes. | *d.* Disconnect defective priming lines and tubes from priming fuel filter and priming nozzles, remove clamps, and remove lines and tubes. Clean or rebuild lines and tubes (pars. 219 through 223). Connect priming lines and tubes to priming fuel filter and priming nozzles and install clamps. |
| 2. Fuel injector nozzles not delivering fuel. | *a.* Defective vehicle fuel system | *a.* Refer to pertinent vehicle operation manual for troubleshooting vehicle fuel system. |
| | *b.* Plugged fuel filter | *b.* Refer to pertinent vehicle operation manual for cleaning, repair, or replacement of fuel filter. |
| | *c.* Damaged fuel injector tubes | *c.* Remove damaged fuel injector tubes as necessary, repair or replace damaged tubes (pars. 214 through 218), and install tubes. |
| | *d.* Defective fuel cutoff valve | *d.* Check fuel flow. Fuel flows from fuel filter to diaphragm-type fuel pump, to fuel vapor separator, to vane-type fuel pump, and to fuel cutoff valve on fuel injector pump. Disconnect hose assembly at fuel cutoff valve and crank engine several revolutions. If fuel is present, fuel cutoff valve is defective. Remove defective fuel cutoff valve and replace. |
| | *e.* Defective vane-type fuel pump. | *e.* Check fuel flow as in *d* above, disconnecting hose assembly at vane-type fuel pump. If fuel is present, remove defective vane-type fuel pump (par. 45) and replace fuel pump (par. 285). |
| | *f.* Defective fuel vapor separator. | *f.* Check fuel flow as in *d* above, disconnecting hose assembly at fuel vapor separator. If fuel is present, remove defective fuel vapor separator (par. 43), repair or replace fuel vapor separator (pars. 194 through 198), and install fuel vapor separator (par. 282). |
| | *g.* Defective diaphragm-type fuel pump. | *g.* Check fuel flow as in *d* above and as described in pertinent vehicle operation manual. Remove defective diaphragm-type fuel pump (par. 54) and replace fuel pump (par. 281). |
| | *h.* Air or vapor in fuel injector tubes. | *h.* Loosen fuel injector tube coupling nuts in injector nozzle elbow. Run engine on priming system to discharge air or vapor from tubes. Tighten coupling nuts. |
| | *i.* Plugged fuel injector nozzles. | *i.* Loosen coupling nuts as in *h* above, crank engine, and check for fuel flow from tube. If fuel is present, remove defective fuel injector nozzles, repair or replace injector nozzles (pars. 214 through 218), and install nozzles. |
| | *j.* Defective fuel injector pump. | *j.* Refer to TM 9-2910-200-35 for troubleshooting procedures for fuel injector pump. If defective, remove fuel injector pump (par. 48) and time and install new fuel injector pump (par. 263*d*). |
| | *k.* Damaged vane-type fuel pump drive gear train. | *k.* Refer to 1*f* in ignition system section of this table. |
| | *l.* Damaged diaphragm-type fuel pump drive gear train. | *l.* Disassemble engine as necessary, repair or replace governor and fuel pump drives (pars. 135 through 139), and assemble engine. |

*Table IV. Troubleshooting—Continued*

| Malfunction | Probable causes | Corrective action |
|---|---|---|
| | FUEL SYSTEM—Continued | |
| 2. Fuel injector nozzles not delivering fuel—Continued. | *m.* Damaged fuel injector pump drive train. | *m.* Refer to 1*f* in ignition system section of this table. |
| | *n.* No oil pressure | *n.* Refer to lubrication section of this table. |
| 3. Lean fuel mixture (under load) | *a.* Low vane-type fuel pump pressure. | *a.* Adjust vane-type fuel pump pressure (par. 292). |
| | *b.* Loose connections or damaged vent hose from supercharger air inlet housing to fuel injector pump. | *b.* Tighten connections. If hose is damaged, replace hose assembly (pars. 239 through 241). |
| | *c.* Defective fuel injector pump or fuel injector improperly adjusted. | *c.* Remove fuel injector pump (par. 48). Refer to TM 9-2910-200-35 for troubleshooting and adjustment procedure for fuel injector pump. |
| 4. Lean fuel mixture (at idle). | Fuel injector pump idle section improperly adjusted. | Adjust fuel injector pump idle section (par. 294). |
| 5. Lean fuel mixture (at acceleration). | *a.* Loose connections or damaged vent hose from No. 2 cylinder intake manifold to fuel injector oil booster pump. | *a.* Tighten connections. If hose is damaged, replace hose assembly (pars. 239 through 241). |
| | *b.* Fuel injector oil booster pump improperly adjusted. | *b.* Adjust fuel injector oil booster pump (par. 293). |
| 6. Rich fuel mixture (under load). | *a.* Defective fuel injector pump or fuel injector pump improperly adjusted. | *a.* Refer to 3*c* above. |
| | *b.* Low oil pressure | *b.* Fuel injector pump requires 30 psi minimum oil pressure to function properly. Refer to lubrication section of this table. |
| 7. Rich fuel mixture (at idle). | *a.* Fuel injector pump idle section improperly adjusted. | *a.* Adjust fuel injector pump idle section (par. 294). |
| | *b.* Vent hoses to fuel injector pump improperly connected. | *b.* Refer to figure 189 for proper connection of vent hoses. |
| | *c.* Defective fuel injector pump or fuel injector pump improperly adjusted. | *c.* Refer to 3*c* above. |
| | *d.* Low oil pressure | *d.* Refer to 6*b* above. |
| 8. Rich fuel mixture (during acceleration). | Fuel injector oil booster pump improperly adjusted | Adjust fuel injector oil booster pump (par. 293). |
| | GENERATING SYSTEM | |
| 1. Generator runs but will not charge. | *a.* Defective generator regulator. | *a.* Refer to pertinent vehicle operation manual for troubleshooting vehicle electrical system. |
| | *b.* Cables improperly connected on generator terminal block. | *b.* Refer to pertinent vehicle operation manual for correct installation of generator cables. |
| | *c.* Defective generator | *c.* Remove defective generator (par. 51) and replace generator (par. 276). |
| 2. Generator does not run | Defective generator drive gear train. | Refer to 1*c* above for removal and installation of generator. Remove generator drive adapter (par. 112), repair or replace generator drive adapter if damaged (pars. 150 through 154). If generator drive adapter is not damaged, disassemble engine as necessary, rebuild accessory case (pars. 120 through 124), and assemble engine. |

*Table IV. Troubleshooting—Continued*

| Malfunction | Probable causes | Corrective action |
|---|---|---|
| | **AIR INTAKE SYSTEM** | |
| 1. Intake air not reaching cylinders. | *a.* Plugged air cleaner | *a.* Refer to pertinent vehicle operation manual for procedures for servicing air cleaners. |
| | *b.* Defective vehicle air induction hose. | *b.* Refer to pertinent vehicle operation manual for repair or replacement of vehicle air induction hose. |
| | *c.* Throttle control linkage improperly adjusted. | *c.* Adjust throttle control linkage (par. 290). |
| | *d.* Worn throttle control linkage. | *d.* Remove throttle control linkage (par. 114). Rebuild throttle control linkage (pars. 140 through 144). Install throttle control linkage (par. 165). |
| | *e.* Defective operating parts in supercharger group. | *e.* Disassemble engine as necessary, repair or replace defective operating parts (pars. 120 through 124), and assemble engine. |
| 2. Engine will not idle correctly due to too much air. | *a.* Throttle control linkage improperly adjusted. | *a.* Adjust throttle control linkage (par. 290). |
| | *b.* Worn throttle control linkage. | *b.* Refer to 1*d* above. |
| | *c.* Defective intake manifolds | *c.* Remove defective intake manifold group (par. 63). Repair or replace intake manifold (pars. 184 through 188). Install intake manifold group (par. 267). |
| | **LUBRICATION SYSTEM** | |
| 1. No oil pressure | *a.* No oil in crankcase | *a.* Refer to pertinent vehicle operation manual for filling crankcase with proper grade oil according to pertinent lubrication order. |
| | *b.* Defective pressure oil pump or oil pump drive gear train. | *b.* Disassemble engine as necessary to remove defective oil pump (par. 74) or repair or replace oil pump drive gear train. |
| 2. Low oil pressure | *a.* Improper grade of oil for prevailing temperature. | *a.* Refer to pertinent vehicle operation manual for draining and filling crankcase with proper grade oil according to pertinent lubrication order. |
| | *b.* High engine temperature | *b.* Refer to cooling system section of this table. |
| | *c.* Oil pressure control valve not properly adjusted. | *c.* Adjust oil pressure control valve (par. 289). |
| | *d.* Defective oil pressure control valve. | *d.* Remove defective oil pressure control valve (par. 113*a*) and replace oil pressure control valve (par. 149*h*). |
| | *e.* Diluted engine oil | *e.* Refer to pertinent vehicle operation manual for draining and filling crankcase with proper grade oil according to pertinent lubrication order. Refer to 3 below for causes of diluted oil. |
| 3. Diluted engine oil | *a.* Defective vane-type fuel pump drive shaft seal. | *a.* Remove vane-type fuel pump (par. 45) and replace fuel pump (par. 285). |
| | *b.* Fuel mixture improperly adjusted (mixture too rich). | *b.* Adjust fuel mixture (pars. 293 and 294). |
| 4. High oil pressure | *a.* Improper grade of oil for prevailing temperature. | *a.* Refer to 2*a* above. |
| | *b.* Oil pressure control valve improperly adjusted. | *b.* Refer to 2*c* above. |
| | *c.* Defective oil pressure control valve. | *c.* Refer to 2*d* above. |
| 5. Fluctuating oil pressure | *a.* Insufficient oil in crankcase | *a.* Refer to 1*a* above. |
| | *b.* Oil pressure control valve improperly adjusted. | *b.* Refer to 2*c* above. |
| | *c.* Defective oil pressure control valve. | *c.* Refer to 2*d* above. |

*Table IV. Troubleshooting—Continued.*

| Malfunction | Probable causes | Corrective action |
|---|---|---|
| | **LUBRICATION SYSTEM—Continued** | |
| 6. High oil consumption | *a.* Improper grade of oil for prevailing temperature. | *a.* Refer to 2*a* above. |
| | *b.* High engine temperature | *b.* Refer to cooling system section of this table. |
| | *c.* Worn piston rings or cylinders | *c.* Refer to 8*a* of the engine section of this table. |
| | **COOLING SYSTEM** | |
| 1. High engine temperature. | *a.* Restricted vehicle cooling air inlet or exhaust. | *a.* Refer to pertinent vehicle operation manual for removal of restrictions from vehicle cooling air inlet and exhaust. |
| | *b.* Dirt, mud, or debris clogging cylinder cooling fins. | *b.* Disassemble engine as necessary and clean cooling fins (par. 102). |
| | *c.* Defective cooling fan drive clutch. | *c.* Remove defective cooling fan drive clutch (par. 59). Repair or replace cooling fan drive clutch (pars. 106 through 110). Install cooling fan drive clutch (par. 273). |
| | *d.* Defective cooling fan drive gear train. | *d.* Disassemble engine as necessary and rebuild or replace defective cooling fan drive gear train (par. 109). |
| | *e.* Fuel mixture improperly adjusted (mixture too lean). | *e.* Refer to fuel system section of this table. |
| | *f.* Engine improperly timed | *f.* Time engine as necessary (par. 263). |
| | *g.* Cooling air not being properly exhausted. | *g.* Inspect engine shroud for damage. Remove damaged shroud (par. 60). Repair shroud (pars. 189 through 191). Install shroud (par. 272). |
| 2. High oil temperature | *a.* Dirt, mud, or debris clogging oil cooler screen or cooler fins. | *a.* Remove clogged oil cooler screen from oil cooler (par. 189), clean screen and oil cooler fins, and replace screen (par. 193). |
| | *b.* Defective oil cooler thermostatic bypass valve. | *b.* Remove defective oil cooler thermostatic bypass valve (par. 209) and replace oil cooler thermostatic bypass valve (par. 213). |
| | *c.* High engine temperature | *c.* Refer to 1 above. |
| | *d.* Defective bearings | *d.* Rebuild engine as necessary (chs. 5 through 9). |

# CHAPTER 4

# CONTINENTAL MODEL AOSI–895–5 AND AOSI–895–5M ENGINES

## Section I. DESCRIPTION AND DATA

### 17. Crankcase

*a.* The crankcase (fig. 59) is a 2-piece aluminum casting. The two crankcase halves (right (1–3–5) side and left (2–4–6) side) are split vertically along the center of the four main bearings for installation of the crankshaft, with the crankcase halves bolted together. There are 12 special long thru bolts, through the four transverse main bearing webs. The bolts are shouldered at three points; the crankcase thru bolt holes have steel bushings to prevent misalinement of the main bearings. Eight of these bolts protrude through holes in the cylinder mounting flanges and help secure the cylinders to the crankcase. The two banks of horizontally opposed cylinders are mounted on machined pads on each crankcase half. The engine cooling fan drive is located in a flanged housing in the center of the top of the crankcase.

*b.* An oil passage is cored into each crankcase casting. Other passages are drilled through the crankcase webs to provide oil for lubrication of the main bearings and to supply oil to the oil control housing, accessory case, and cooling fan drive shaft housing.

### 18. Main Bearings

The four replaceable main bearings (Q and RR, fig. 64) are of the split precision type. They are steel backed and faced with a special bearing alloy. The No. 3 bearing is double flanged with bearing metal to take any crankshaft thrust and to control crankshaft end play. The bearing halves are identical, each having a tang at the joint to prevent rotation of the bearing in the crankcase bore. Oil holes drilled through the bearings register with an oil groove cut in the bearing bore of the crankcase. The bearing faces have annular grooves which register with oil holes in the chankshaft journals.

### 19. Crankshaft and Flywheel

*a. Crankshaft.*

(1) The crankshaft (QQ, fig. 17) is a steel forging. It has four main bearing journals, six crankpins (in pairs), a flanged hub for mounting vibration dampers, and an integrally forged flange for mounting the flywheel. Crankpin pairs are positioned 120 degrees apart, with the crankpins of each pair 180 degrees apart.

(2) All crankpin and main bearing journals are bored to reduce weight. Oil holes are drilled at an angle to connect the main bearing journals and the crankpin journals. The diagonally drilled holes are connected by steel tubes which convey oil from the main bearings to the main bearing journals, through the crankcheek, to the crankpin, and to the connecting rod bearing. A pressed-in crankshaft oil slinger is located in the No. 1 main bearing journal bore to pick up oil thrown by the No. 1 connecting rod, and provides lubrication for the crankshaft vibration damper and accessory drive shaft.

(3) The crankshaft and flywheel (A, fig. 17) are individually balanced, statically and dynamically, by the manufacturer.

(4) A flanged hub is permanently installed on the accessory end of the crankshaft for mounting the pendulum-type vibration damper. The damper reduces the crankshaft vibrations. The crankshaft vibration damper consists of four wedge-shaped vibration damper counterweights (VV, fig. 17), each suspended on two pins supported by holes in the flanged hub.

*b. Flywheels.*

(1) Model AOSI–895–5 engine flywheel

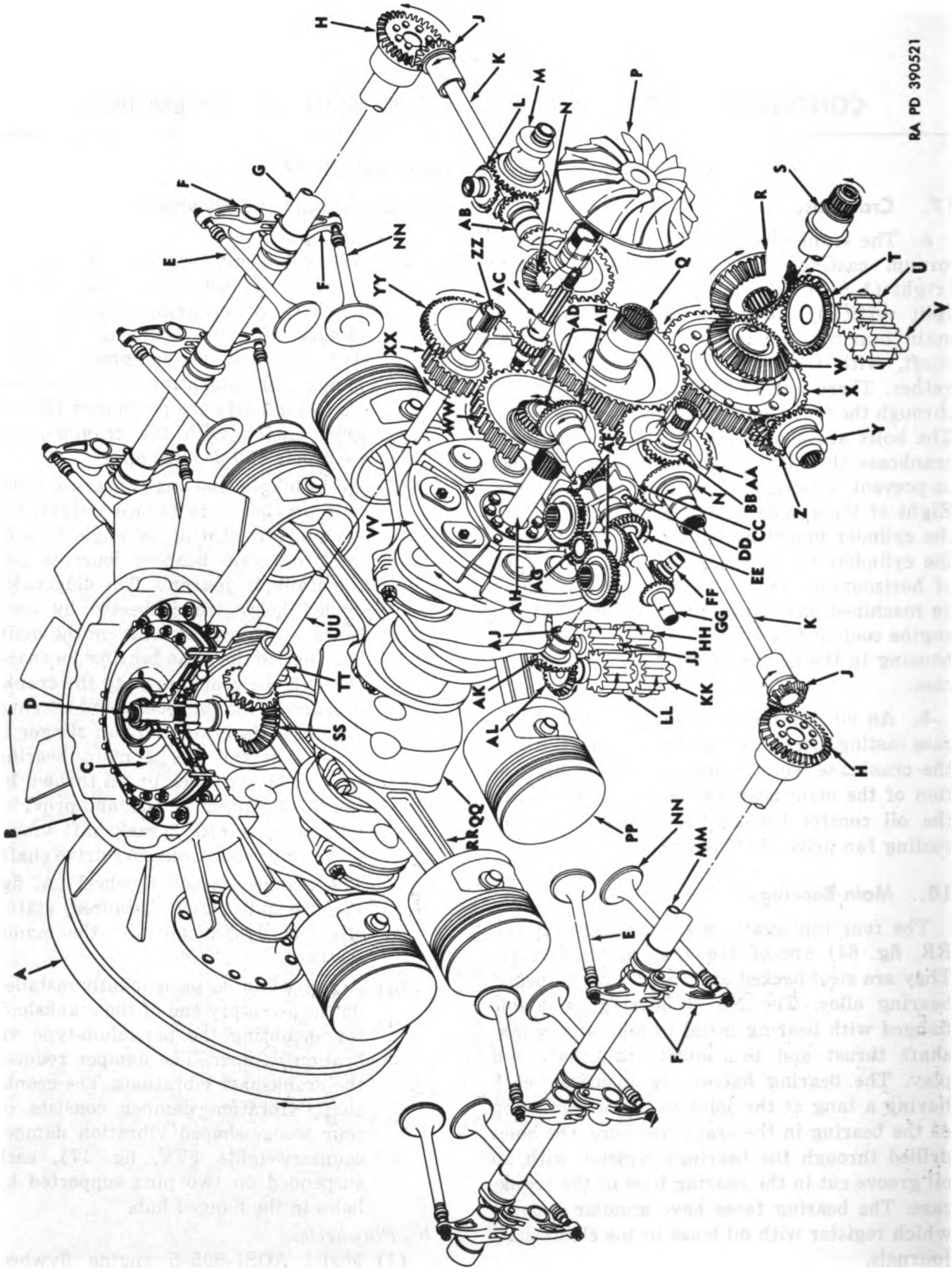



*Figure 17. Gear train and major operating parts diagram.*

A–Flywheel assembly
B–Cooling fan rotor
C–Fan drive clutch assembly
D–Fan drive vertical drive shaft
E–Exhaust valve
F–Valve rocker assembly
G–Right camshaft assembly
H–Camshaft driven gear
J–Camshaft drive gear
K–Camshaft drive shaft
L–Governor driven gear
M–Fuel pump driven shaft gear
N–Camshaft drive idler driven gear assembly
P–Supercharger impeller
Q–Accessory drive gear
R–Starter drive bevel gear
S–Power take-off drive shaft assembly
T–Oil pump drive gear
U–Accessory case scavenger oil pump drive impeller
V–Accessory case scavenger oil pump driven impeller
W–Starter driven gear
X–Power take-off drive gear
Y–Generator driven shaft gear assembly
Z–Generator drive gear assembly
AA–Camshaft drive idler gear
BB–Camshaft drive idler bevel gear
CC–Spark advance governor unit assembly
DD–Spark advance governor coupling assembly
EE–Magneto driven idler gear
FF–Fuel injector pump driven shaft gear
GG–Fuel injector pump drive shaft gear
HH–Pressure oil pump driven impeller
JJ–Scavenger oil pump driven impeller
KK–Pressure oil pump drive impeller
LL–Scavenger oil pump drive impeller
MM–Left camshaft assembly
NN–Intake valve
PP–Piston
QQ–Crankshaft assembly
RR–Connecting rod assembly
SS–Fan drive vertical drive shaft driven gear
TT–Fan drive vertical drive shaft drive gear
UU–Fan drive horizontal drive shaft
VV–Vibration damper counterweight
WW–Accessory drive idler gear
XX–Fan drive shaft gear
YY–Impeller drive shaft gear
ZZ–Impeller drive shaft
AB–Fuel pump and governor drive gear
AC–Impeller driven shaft gear
AD–Magneto drive gear assembly
AE–Magneto driven shaft gear assembly
AF–Magneto driven gear
AG–Magneto driven idler shaft gear
AH–Accessory drive shaft
AJ–Oil pump drive shaft
AK–Pressure pump drive gear
AL–Pressure pump driven gear

*Figure 17—Continued.*

has a rigidly bolted splined hub through which the transmission shaft is driven.

(2) Model AOSI–895–5M engine flywheel has a torsion damper splined hub (fig. 6) through which the transmission shaft is driven. The damper consists of an internally splined hub mounted on a plate which is spring driven by the flywheel. The damper reduces torsional shock on the transmission input shaft.

## 20. Accessory Case

*a.* The accessory case is an aluminum alloy casting containing the gear train that drives the camshafts, magnetos, oil pumps, fuel pumps, governor, supercharger, starter, generator, power-take-off, cooling fan, and fuel injector pump. It also accommodates the oil filter, oil control housing, magneto drive housing, starter, generator, accessory case breather adapter, and engine lifting eye. Where gear loads, are required, bearings are supported by bronze bearing liners. Passages drilled in the case permit pressure lubrication to all bearings.

*b.* The accessory-case-to-crankcase flange contains two locating dowel pins and three oil transfer tubes. The drive connection between the crankshaft and the accessory case drive gear train is a splined drive shaft (AH, fig. 17) which is installed when the accessory case is assembled to the crankcase.

## 21. Oil Pan

*a.* The crankcase oil pan (fig. 6) is an aluminum-alloy casting. It is partitioned to form a reservoir for the pressure oil pump. A plate incloses the top of the reservoir and is sealed to the pump body with an "O" ring gasket to prevent splashing of oil and entrance of air.

*b.* The accessory case oil sump (fig. 1) is an aluminum-alloy casting without baffles and is bolted to the accessory case and the crankcase oil pan.

## 22. Connecting Rods and Bearings

*a.* The connecting rods (RR, fig. 17) are "I" sectioned type rods with tapered shanks. They are machined from steel forgings. Bronze bushing-type piston pin bearings are pressed into the small end of each connecting rod. The bearings are diamond-bored to finished size after being assembled in place. There are two diagonal oil grooves in the inner diameter of the bearing. Oil enters a well drilled in the small end of the connecting rod, and follows the annular grooves to lubricate the piston pin bearing.

*b.* The connecting rod bearings are of the split precision type, steel backed, with a special bearing alloy face. Bearings halves are identical and are prevented from turning in the bearing bores by a tang on the split face of each bearing half.

## 23. Pistons, Piston Pins, and Piston Rings

*a. Pistons.* Pistons are of the forged aluminum solid skirt type. The piston skirt is cam ground and tapered (when cold) to provide accurate fit in the cylinder bore at operating temperature. The pistons are reinforced with piston pin bosses which extend to the crown of the piston.

*b. Piston Pins.* Piston pins are tubular and full floating. Domed aluminum plugs are inserted in each end of the piston pin to center the pin and prevent scoring or damage to the cylinder wall.

*c. Piston Rings.* The pistons have four rings. The top two are compression rings and the bottom two are oil control rings. All rings are chrome faced to prolong wear.

## 24. Cylinders and Valves

*a. Cylinder Assemblies.* Each cylinder assembly is a separate replaceable unit. The cylinder barrel is an alloy-steel shell around which an aluminum muff is cast. Fins are machined in the aluminum muff for air cooling. A finned, cast aluminum cylinder head, internally threaded, engages external threads on the cylinder barrel. The assembly is made permanent by a shrinkage fit. The valve seat inserts are installed in machined recesses in the head by heating the cylinder head and cooling the inserts. Valve stem guides are bronze and are replaceable. An outer extension of the cylinder head forms a recess, or rocker box, in which the valve springs, valve rockers, and rocker shafts are located. The cylinders are arranged into two banks, horizontally opposed. The right bank cylinders are numbered 1–3–5, and the left bank cylinders are numbered 2–4–6, from the

accessory end. Flanges containing 14 stud holes mount the cylinders to the crankcase.

*b. Camshaft Bearings.* One aluminum camshaft bearing cap and valve rocker shaft bracket in each cylinder hold the rocker shafts and valve rockers. The cap and bracket are doweled and bolted to the cylinder head, and the camshaft bearing is bored with the bearing cap in place. Caps and brackets are not interchangeable and must remain as part of the cylinder assembly. Counterbores in the rocker box walls and covers accommodate the camshaft intercylinder pipes.

*c. Valves and Valve Stems.* The valve stems extend into the rocker boxes. Three springs, compressed between retainers and secured to the valve stem by split, cone-shaped locks, hold the valves to their seats. The exhaust valves are sodium filled and have a positive valve rotator which serves as the lower valve spring seat. A valve clearance adjusting screw, with a flat swivel pusher pad, is mounted in one end of the valve rocker.

*d. Valve Rockers* (F, fig. 17). Forged steel valve rockers with roller cam followers are used. The rollers are hardened and honed to provide an extremely smooth surface. The rollers operate on small bronze hubs. Hollow rocker shafts and drilled passages in the rocker arms convey oil to all moving parts. The rockers are fitted with bronze bearings containing annular grooves for oil distribution.

*e. Valve Rocker Covers.* Valve rocker covers are not entirely interchangeable. End valve rocker covers are machined and tapped for the attachment of the camshaft gear housing and end valve rocker box cover plates. End covers are interchangeable with end covers. Intermediate valve rocker covers may be interchanged with other intermediate covers.

## 25. Camshafts

*a.* A hollow camshaft (G and MM, fig. 17) is mounted on each bank of cylinders. The hollow passage reduces the weight of the camshaft and also provides an oil passage for pressure lubrication of the valve parts. Tubular intercylinder pipes inclose the camshaft between cylinders. They are clamped in place by the rocker covers and are sealed by "O" ring gaskets.

*b.* Each camshaft is driven separately by gears (N and BB, fig. 17) in the accessory case. The horizontal, vernier-type, splined drive shafts (K, fig. 17) connecting the drive and driven gears, can be removed to permit separate rotation of the camshaft for engine timing purposes. Regardless of gear positions, splines will mate at the correct point of insertion and will not change the relationship of the camshaft to the crankshaft.

## 26. Lubrication System

*a. Oil Pumps.* Two positive displacement pumps supply oil to the lubrication system. One is a combination scavenger and pressure pump (fig. 18); the other is a scavenger pump (fig. 18). The combination pump is inclosed in a single housing and is secured to a machined mounting pad located on the lower web of No. 2 main bearing in the crankcase. The oil supply for the pressure pump is in a reservoir formed by the oil pan partitions and the baffle plate assembly. The scavenger pump, or top half of this conbination unit, transfers oil from the flywheel end of the oil pan to the pressure pump reservoir. The separate accessory case scavenger oil pump, located on a machined pad on the lower side of the accessory case, transfers oil from the accessory case sump to the pressure pump reservoir. The two scavenger pumps constantly transfer oil from both ends of the engine. This assures the pressure pump an adequate supply of oil when the vehicle is on grades. In normal operation the oil passes from the pressure pump through passages in the crankcase and accessory case to the oil control housing assembly (fig. 19). It then passes through external lines to the engine oil cooler and returns to the oil control housing assembly and to the accessory case. Oil flow is controlled by five valves. The oil pressure control valve, the oil filter bypass valve, the oil cooler bypass valve, and the fuel injector oil pressure regulator valve are located in the oil control housing. A fifth valve, the oil cooler thermostatic bypass valve, is located in the engine oil cooler.

*b. Fuel Injector Oil Pressure Regulator Valve.* The fuel injector oil pressure regulator valve (fig. 19) is a spring-balanced type valve, located in the bottom of the oil control housing. The valve bypasses all oil from the oil cooler and oil filter (fig. 19) to the fuel injector pump

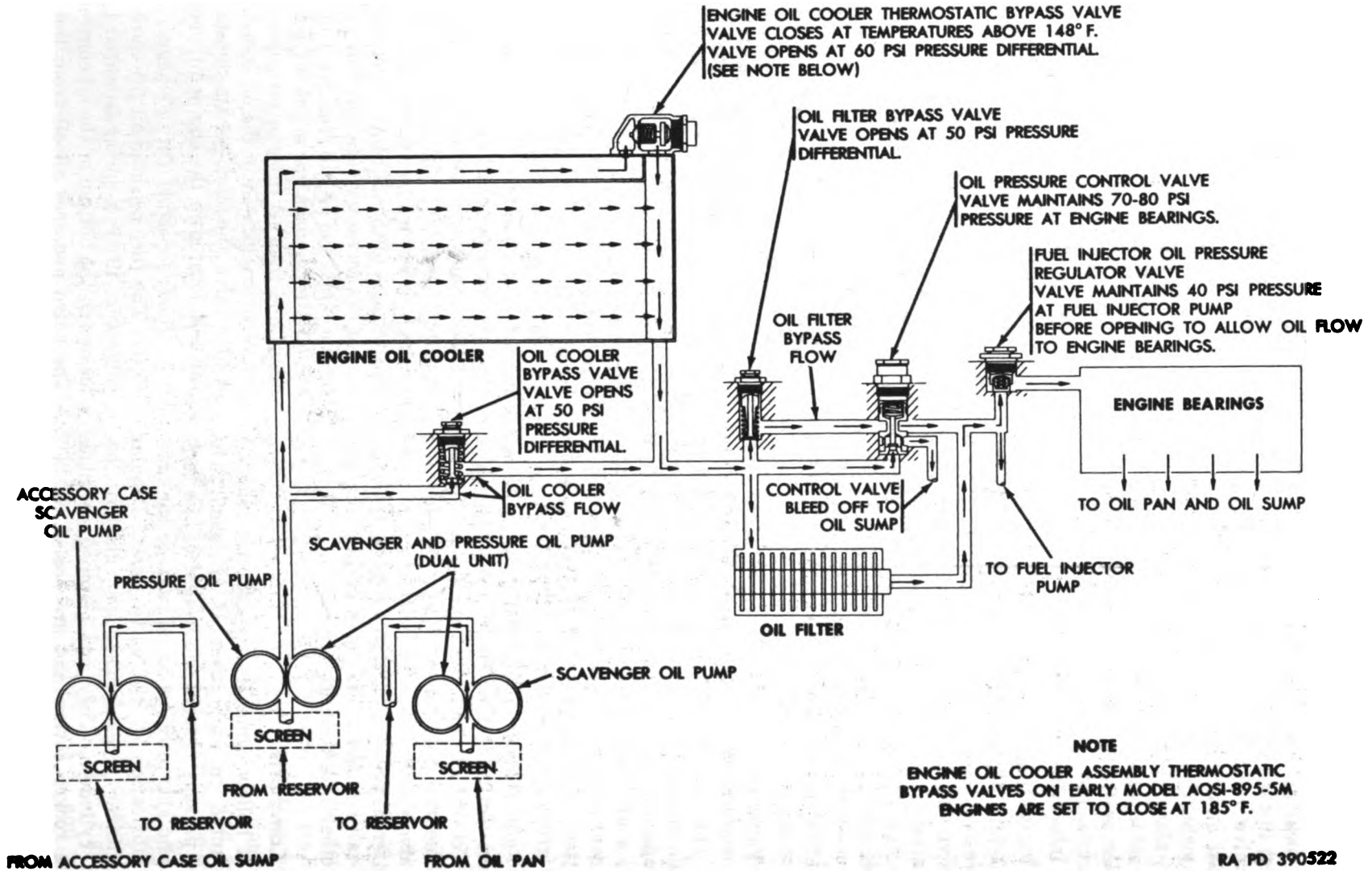



*Figure 18. Oil flow control—schematic diagram.*

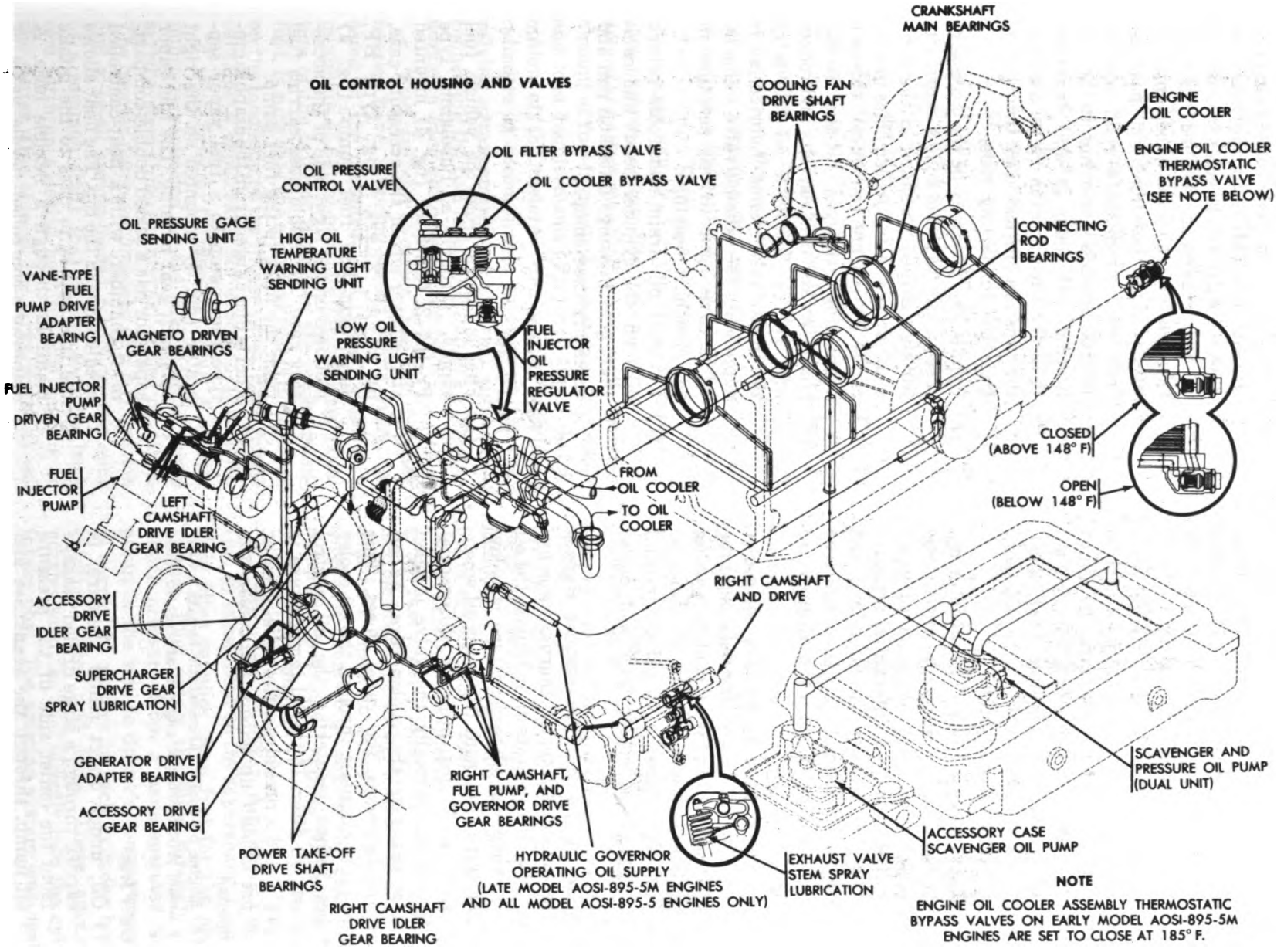



*Figure 19. Engine oil flow diagram.*

until 40 psi pressure is attained in the fuel injector pump. This pressure is necessary to actuate the servo system of the fuel injector pump so the engine can be started. This condition of complete bypass occurs only during engine cranking and the engine parts are lubricated by residual oil during this time.

*c. Oil Pressure Control Valve.* The oil pressure control valve (fig. 19) maintains desired oil pressure in the engine oil passages by allowing a relief opening to the sump. Limited adjustment of the valve is possible (par. 289). Excess oil is bypassed directly to the accessory case sump through a spill tube.

*d. Oil Filter Bypass Valve.* The oil filter bypass valve (fig. 19) is a spring-balanced type valve. Should the oil filter become obstructed the valve will open when a differential pressure of 50 psi (fig. 19) between the filter inlet and outlet is reached. Unfiltered oil is then delivered directly to the engine through the oil pressure control valve.

*e. Oil Cooler Bypass Valve.* The oil cooler bypass valve (fig. 19) is a spring-balanced type valve and bypasses oil in the oil control housing when there is a restriction in the oil cooler or external hose that causes a 50 psi differential pressure between the cooler inlet and outlet (fig. 19).

*f. Engine Oil Cooler Thermostatic Bypass Valve.* The engine oil cooler thermostatic bypass valve (fig. 19) permits oil to bypass the oil cooler core whenever oil temperature is below 148°F. The valve also opens to bypass oil whenever there is a 60 psi pressure differential across the valve. Normally the valve is open so oil flow bypasses the cooler core. As oil temperature increases, the valve closes. This forces the oil to circulate through the oil cooler core tubes before reentering the oil control housing and oil filter. If the oil temperature is above 148°F and a pressure differential greater than 60 psi is built up within the cooler, the valve opens.

NOTE: Engine oil cooler thermostatic bypass valves on early model AOSI-895-5M engines are set to close at 185°F.

*g. Oil Flow.*

(1) Oil, under direct pump pressure, is carried through a large drilled passage from the outlet side of the pressure oil pump, through the crankcase and accessory case, to the oil control housing (fig. 19) on the top right corner of the accessory case. Drilled passages provide lubrication to the accessory case and main oil passages in each side of the crankcase. Drilled passages through the crankcase webs supply oil to the main bearings. Oil passages from each crankshaft main bearing journal provide lubrication to the connecting rod journals and bearings. Cylinder bores, piston rings, and piston pins are lubricated by throwoff oil from the connecting rods.

(2) Connecting passages in the accessory case supply oil to the hollow camshafts through drilled passages in the camshaft drive shafts. Drilled holes in each camshaft journal convey oil through connecting passages to the rocker shafts, rocker arm bearings, and rocker arm rollers. Throwoff oil lubricates the intake valve stems. Lubrication is supplied to the exhaust valve stems by oil streams from drilled passages in the camshaft bearings.

(3) External oil drain manifolds return oil from the cylinder heads and camshaft gear housings to the oil pan and accessory case sump.

## 27. Fuel System

*a. Fuel Flow.*

(1) Fuel is drawn from the vehicle fuel supply, through a Purolator, type Pr-161-2, fuel filter (fig. 4) mounted at the lower left of the accessory case, by an AC Spark Plug, type BF, diaphragm-type fuel pump (fig. 4) mounted on the right side of the accessory case. A flexible hose carries fuel from the filter to the fuel pump.

(2) Fuel is discharged from the diaphragm-type fuel pump to a fuel vapor separator (fig. 3) mounted on the right camshaft gear housing. The fuel vapor separator has a sealed double-compartment chamber, with a float-controlled needle valve in the top. The float allows the fuel vapors to pass to the intake manifold through a flexible hose. A diaphragm-controlled needle valve at

the inlet prevents the fuel from draining from the vapor separator when the engine is stopped.

(3) Fuel passes from the vapor separator through a flexible hose to a Titan, type 200 H2E3–15, vane-type fuel pump (fig. 8) mounted on the magneto drive housing on the left side of the accessory case. The fuel pressure is increased by the vane-type pump from 3½ to 5 psi, as delivered by the diaphragm-type pump, to 15 to 20 psi and delivered to the fuel injector pump through a flexible hose. Excess fuel from the fuel injector pump is returned to the vapor separator through a flexible hose.

*b. Fuel Injector Pump.* The Simmonds Aerocessories, type SU–15D7, fuel injector pump (fig. 1) is a pump and valving mechanism. A pneumatic control system in the fuel injector pump senses the intake manifold air temperature and pressure and reacts to these signals to control a hydraulic servo system in the injector pump. This servo system controls the volumetric delivery of the injector pump at each pumping action. The injector pump is gear driven at engine speed; thus a correctly metered amount of fuel is pumped to match engine speed and load requirements. Properly timed distribution of the metered fuel to the individual cylinders is accomplished through an internal valving arrangement and external rigid tubes connecting the fuel injector pump to an injector nozzle in each cylinder intake port.

*c. Fuel Injector Nozzles.* The fuel injector nozzles have a spring-loaded pintle valve, located in the discharge end, which requires a minimum of 55 psi pressure for opening. Location of the injector nozzle, in the intake manifold, is such that the atomized fuel is discharged on the inlet side of the intake valve. Each nozzle contains a replaceable filter screen (fig. 158).

*d. Fuel Injector Oil Booster Pump.* A booster pump is connected to the fuel injector pump servo system through internal drilled passages. The booster pump is composed of a large piston and a small spring-loaded piston on the ends of a common shaft that is free to move back and forth on a sealed bushing-type bearing in the center. One side of the large piston is exposed to intake manifold air pressure through a connecting hose. The other side is exposed to atmospheric pressure through a connecting hose to the accessory case breather system. The inner side of the small piston is spring loaded toward the outer side, which is connected to the fuel injector pump servo system through drilled passages. In normal engine operation the pistons are held in a state of equilibrium by manifold pressure and atmospheric pressure acting on the large piston, and spring load and servo oil pressure acting on the small piston. A sudden reduction of manifold pressure, caused by engine acceleration, disturbs the equilibrium between the large piston and the spring load on the small piston. The spring load on the small piston forces oil to be returned to the fuel injector pump and momentarily increases the pressure in the servo system. The increased servo pressure provides increased fuel delivery to satisfy the additional fuel requirement of the accelerating engine. The booster pump works inversely during engine deceleration to decrease fuel delivery and reduce torching from the engine exhaust.

*e. Fuel Cutoff Valve.* An electrically operated fuel cutoff valve is mounted at the inlet of the fuel injector pump. Normally the valve is open. Pressing a switch in the vehicle driver's compartment actuates the electrical circuit and closes the valve. Closing of the valve cuts off the fuel supply to the fuel injector pump and stops the engine. A spring-loaded check valve located on the upper side of the fuel injector pump allows excess fuel and vapors to be bypassed through the injector pump and returned to the fuel vapor separator through an external flexible hose. The spring load of the check valve acts as a check to prevent fuel in the vapor separator from returning to the fuel injector pump and provides complete fuel cutoff when stopping the engine.

*f. Priming Fuel Filter.* A priming fuel filter (fig. 4) is mounted on the supercharger housing. This filter supplies clean fuel for the priming system. Fuel enters the filter through a tube under pressure from a hand-operated primer pump in the vehicle driver's compartment and is carried to nozzles in each cylinder head by external tubes and lines. These spray-type nozzles send the fuel directly into the cylinder intake port. The priming system was designed for use only during starting of the engine.

Early model AOSI–895–5M engines are equipped with a Zenith, type F400, priming fuel filter. Late model AOSI–895–5M engines and all model AOSI–895–5 engines are equipped with a Skinner, type 450–OC, priming fuel filter.

### 28. Induction System — Supercharger

Interconnected throttle valves are located in each end of the supercharger air inlet housing, which has an outlet opening at its center. This center outlet is attached to the inlet of the supercharger housing. The supercharger is a gear-driven centrifugal type blower, having scroll outlets to the intake manifolds on either side of the engine. Through the use of the supercharger, intake manifold pressure is raised to 38 to 40 inches of mercury (absolute) at full throttle. A balance pipe, to counteract pressure surge, connects the two intake manifolds between No. 5 and No. 6 cylinders. Tapped openings are provided at each cylinder opening in the intake manifold for mounting the fuel injector nozzles. Tapped openings are provided in the air inlet housings for engine breathing and for venting the accessories. Tapped openings are also provided in the air inlet housing, supercharger housing, and intake manifold for venting and for signalling the fuel injector pump.

### 29. Exhaust System

An exhaust manifold (fig. 8) of welded steel construction, having an inclosed expansion bellows slip joint between cylinder connections, is mounted on the top of each bank of cylinders. The exhaust manifold outlets extend through the rear of the engine shroud and are inclosed in steel air inlet elbows (fig. 5) for circulating cooling air around the outlets. Model AOSI–895–5M engines have a hotspot extension, on the accessory end of each exhaust manifold, that is sealed with a gasket and outlet cover (fig. 7). These hotspot extensions were formerly used on model AOSI–895–3 engines.

### 30. Ignition System

*a. Magnetos.* Two Bendix Scintilla magnetos, type S6LN–32, or American Bosch magnetos, type MRE6A41 or MRE6A43, (fig. 1), driven from the accessory case, are mounted on the top left corner of the accessory case on the magneto drive housing. They are connected to the two spark plugs (fig. 16) in each cylinder by a high-tension ignition harness. The entire ignition system (fig. 20) is ventilated, radio shielded, and waterproofed. Each magneto fires six spark plugs. The inner (right) magneto fires the accessory end spark plug of each cylinder, and the outer (left) magneto fires the flywheel end spark plug of each cylinder.

*b. Spark Advance Governor.* The magneto drive gear train contains an American Bosch spark advance governor. A preset control of the governor provides for a 15-degree spark advance during the 1400 to 2450–rpm engine speed range.

*c. Ignition Booster and Filter Coil.* An American Bosch, type VJT–24B1, or Bendix Scintilla, type 10–55026–1, ignition booster and filter coil (fig. 4), with a radio interference filter, is used to aid in starting the engine. The coil is energized by a 24-volt storage battery. It provides starting impulses for the inner (right) magneto during cranking of the engine, when the magnetos are not being turned fast enough to produce adequate voltage. The coil delivers a shower of sparks at each opening of the magneto breaker points. The coil is connected to the ground connection of the inner (right) magneto through a waterproof radio-shielded cable. The other magneto ground connection is connected through a similar cable to the radio interference filter unit.

*d. Air Circulation.* Air pressure drop between the outlet side and inlet side of the throttle control valves in the supercharger air inlet housing is used to circulate air within the inclosed waterproofed magnetos and ignition harness. The air carries away condensation through hose connected between the supercharger air inlet housing and the magnetos and ignition harness.

### 31. Cooling System

Aluminum muffs are cast to steel barrels and machined to provide air-cooling fins for the cylinders. The aluminum cylinder heads contain cast fins for air cooling. Sheet metal deflectors direct the cooling air across the cylinders. The tops of the cylinders are shrouded to house on axial flow suction-type cooling fan rotor (B, fig. 17) mounted on a vertical drive shaft (D, fig. 17) extending from the fan drive housing in the top of the crankcase. The cast aluminum fan is statically and dynamically balanced by

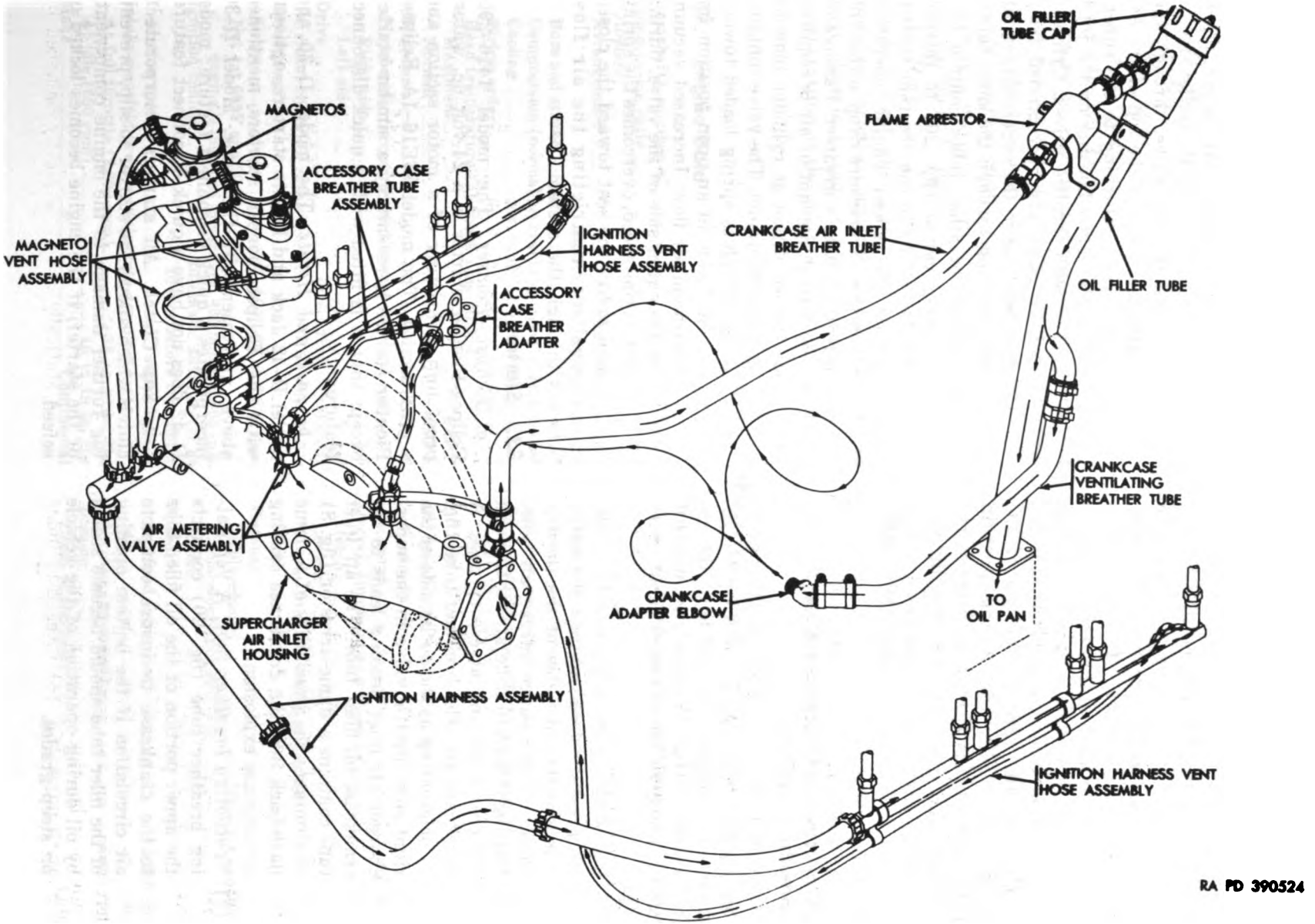



*Figure 20. Crankcase and ignition system ventilation—schematic view.*

the manufacturer and is mounted on a centrifugal-type clutch (C, fig. 17) to relieve stresses on the fan drive gear train during engine acceleration and deceleration and deep water fording. The fan drive vertical drive shaft is driven by gears (SS and TT, fig. 17) housed in the top of the crankcase, the gears being driven by a horizontal drive shaft (UU, fig. 17) from the accessory case gear train. The fan draws cooling air from the underside of the cylinders through the cooling fins and through the engine and transmission oil coolers mounted on either side of the engine shroud, and discharges the heated air vertically through the top of the shroud. A vane housing (fig. 3), mounted on top of the shroud, has curved or fluted vanes to straighten and direct the air flow up and away from the engine to prevent recirculation of exhausted cooling air through the cooling system.

## 32. Crankcase and Accessory Case Breathing Systems

*a. Crankcase Breather System.* The crankcase breather system (fig. 20) is a completely closed system. It enables the inside of the engine to be ventilated at all times and makes it possible to submerge the engine without entry of water.

(1) *Crankcase air inlet breather tube.* The air pressure drop between the outlet side and the inlet side of the throttle valves in the supercharger air inlet housing is used to circulate air through the crankcase and accessory case. A crankcase air inlet breather tube (fig. 3) originating at the outlet side of the right side throttle valve in the supercharger air inlet housing leads to the crankcase oil filler tube. The air inlet tube contains a flame arrestor (fig. 8) to eliminate the possibility of a flame flash-back into the crankcase causing a crankcase explosion.

(2) *Ventilating breather tube.* A ventilating breather tube (fig. 20) connects the upper portion of the oil filler tube to the crankcase to insure complete air circulation if the bottom opening of the filler tube should become sealed by oil during operation of the vehicle on steep grades.

*b. Accessory Case Breather System.*

(1) Two external tubes connect the triangular breather adapter on top of the accessory case to the supercharger air inlet housing on the inlet side of the two throttle valves. Air is circulated from the air inlet at the outlet side of the right throttle valve, through the crankcase, and out the top of the accessory case, returning to the supercharger air inlet housing on the inlet side of both throttle valves. Cylinder blow-by gases are also carried from the crankcase to the supercharger air inlet housing through the same tubes.

(2) The two breather tubes contain air-metering valves (fig. 20) to restrict the flow of air in the breather system during low speed engine operation when the air pressure drop across the throttle valves is greatest. Passage of only a small amount of air is required at this condition as cylinder blow-by is at the minimum. The valve contains a seat which is spring loaded toward the inlet side in an open position for maximum air flow. Increased vacuum on the outlet side of the valve, during low engine speed, overcomes the spring and moves the seat toward the closed position, restricting the air flow through the system.

## 33. Starters

*a. Eclipse - Pioneer.* The model 1416–29G Eclipse-Pioneer starter is a 24-volt dc, waterproof unit, consisting of a motor section and a gear section. The model 36E16–1A Eclipse-Pioneer starter is essentially a similar starter except that it is fitted with a quick disconnect feature.

*b. Jack and Heintz.* The model D–30 and model D–42 Jack and Heintz starters, optional with the Eclipse-Pioneer starters mentioned above, are essentially the same. Model D–30 incorporates a quick disconnect feature; model D–42 does not have a quick disconnect feature.

*c. Slip Clutch.* All starters incorporate a clutch which allows the starter to slip, preventing further damage to the engine components or the starter, if the engine becomes locked or seized.

## 34. Generator

The model 30E00–3A Eclipse-Pioneer generator is a 150-ampere, 28.5-volt dc unit as generally used in 24-volt electrical systems.

## 35. Sending Units

Three AC Spark Plug electrical sending units are located in the main oil passage at the top of the accessory case.

*a. Low Oil Pressure Warning Light Sending Unit* (fig. 19). This oil pressure type sealed unit is internally constructed and calibrated so that electrical contact points close when the pressure in the main oil line of the engine is below 17 ±2 psi, thereby closing the electrical circuit and causing a warning light in the vehicle driver's compartment to light.

*b. High Oil Temperature Warning Light Sending Unit* (fig. 19). This sealed electrical unit is internally constructed and calibrated so that electrical contact points close when the temperature in the main oil line of the engine reaches 245° ±5°F, thereby closing the circuit and causing a warning light in the vehicle driver's compartment to light.

*c. Oil Pressure Gage Sending Unit* (fig. 19). This sealed unit is essentially a rheostat actuated by the engine oil pressure. The unit contains a metal diaphragm exposed to engine oil pressure on one side and connected to a small rheostat on the other. An increase or decrease of oil pressure will cause a corresponding movement of the diaphragm, actuating the rheostat, and causing an increase or decrease of electrical resistance through the unit. This electrical resistance is registered on a gage in the vehicle driver's compartment. The gage is calibrated to indicate oil pressure rather than ohms resistance.

## 36. Governor

A complete description and operating data for the hydraulic governors are contained in paragraphs 297 through 303.

# Section II. TABULATED DATA

## 37. Engine Data

Camshafts, number of ..... 2
Compression ratio ..... 5.5:1
Cylinders:
  Arrangement ..... individual cylinders in a horizontally opposed position
  Bore and stroke ..... 5.75 x 5.75
  Compression (normal, at cranking speed)....80 to 95 psi
  Cooling ..... air, supplied by one integral fan
  Firing order ..... 1–6–3–2–5–4
  Head temperature (at spark plug gasket):
    Maximum ..... 525°F
    Normal ..... 450°F
  Number ..... 6
  Numbering (accessory end toward flywheel end):
    Right side ..... 1–3–5
    Left side ..... 2–4–6
Drive ..... direct from crankshaft
Generator charging rate ..... 150 amp, 28.5 v
Horsepower:
  Gross ..... 500 bhp at 2,800 rpm
  Net (at 60°F and 29.92 in. Hg as engine is installed in vehicle)..405 bhp at 2,800 rpm
Ignition timing ..... automatic advance set at 10 deg before top center
Induction system ..... supercharged
Intake manifold pressure (absolute dry pressure):
  At full throttle (2,800 rpm) ..... 38 to 40 in. Hg
  At idle (650 rpm) ..... 16 to 18 in. Hg
Make ..... Continental
Models ..... AOSI–895–5 and AOSI–895–5M
Oil pan capacity ..... 11 gal
Oil pressure (OE–50 oil at 180°F):
  At full throttle (2,800 rpm)..... 70 to 80 psi
  At idle (650 rpm)..... 30 to 35 psi
Oil pump output (OE–50 oil at 180°F and 65 psi):
  Accessory case scavenger oil pump..... 27.4 gpm
  Pressure oil pump ..... 31 gpm
  Scavenger oil pump ..... 27.4 gpm
Oil specifications (ambient air temperature):
  +30° to +125°F..... OE–50
  −10° to +40°F ..... OE–10
  −70° to 0°F ..... OES
Oil temperature (into engine):
  Maximum ..... 245°F
  Normal ..... 180° to 185°F
Overall dimensions (including flywheel):
  Height ..... 39.19 in.
  Length ..... 41.38 in.
  Weight (dry, with all accessories)..... 1,865 lb
  Width ..... 51.52 in.
Pistons:
  Displacement ..... 895 cu in.
  Displacement per cylinder ..... 149 cu in.
  Stroke ..... 5.75 in.
Speed:
  Full load (governed) ..... 2,800 rpm min
  Idle ..... 650 rpm
  No load (governed) ..... 2,950 rpm max
Torque:
  Gross (2,400 rpm) ..... 1,010 lb-ft

Net (2,000 rpm) (at 60°F and 29.92 in. Hg as engine is installed in vehicle) ..... 860 lb-ft
Type ..... 6-cylinder horizontally opposed, air cooled, supercharged, fuel injected
Valves:
Clearance (cold engine):
Exhaust (0.0140 in. under rocker roller) .... 0.0200 in.
Intake ..... 0.0070 in.
Events (cold engine) (0.0150 in. clearance both valves):
Exhaust closes ..... 10 deg after top center
Exhaust opens ..... 75 deg before bottom center
Exhaust remains open ..... 265 deg
Intake closes ..... 60 deg after bottom center
Intake opens ..... 40 deg before top center
Intake remains open ..... 280 deg
Lift ..... 0.4053 in.
Timing (0.1000-in. clearance) ..... intake closes 60 deg after bottom center

## 38. Accessories Data

Fuel filter (1) ..... Purolator Pr-161-2
Fuel injector pump (1) ..... Simmonds Aerocessories SU-15D7
Fuel pump (diaphragm-type (1) ..... AC SPark Plug 1539721
Fuel pump (vane-type) (1) ..... Titan 200-H2E3-15
Generator (1) ..... Eclipse-Pioneer 30E00-3A
Governor (1) ..... Novi Equipment 54286B1
or Novi Equipment 53855C
or Novi Equipment 53855D
or Novi Equipment 53855D2
High oil temperature warning light sending unit (1) ..... AC Spark Plug 1512366
Ignition booster coil (1) ..... American Bosch VJT-24B1
or Bendix Scintilla 10-55026-1
Low oil pressure warning light sending unit (1) ..... AC Spark Plug 1508166
Magnetos (2) ..... Bendix Scintilla S6LN32
or American Bosch MRE6A41
or American Bosch MRE6A43
Oil filter (1) ..... Air Maze 03530524
Oil pressure gage sending unit (1) ..... AC Spark Plug 1506894
Priming fuel filter (1) ..... Skinner 450-0C
or Zenith F400
Spark plugs (12) ..... Champion RML-12
or AC Spark Plug WR-43-LR
Starter (1) ..... Jack and Heintz D30
or Jack and Heintz D42
or Eclipse-Pioneer 1416-29G
or Eclipse-Pioneer 36E16-1A

## 39. Drive Ratios (To Crankshaft)

Camshafts ..... 0.50:1
Cooling fan ..... 1.58:1
Fuel injector pump ..... 1.00:1
Fuel pump (diaphragm-type) ..... 0.81:1
Fuel pump (vane-type) ..... 1.00:1
Generator ..... 2.60:1
Governor ..... 1.10:1
Magnetos ..... 0.50:1
Power-take-off ..... 1.00:1
Starter ..... 0.91:1
Supercharger impeller ..... 7.04:1
Tachometer drive ..... 0.50:1

## 40. Direction of Rotation

Camshafts (from accessory end) ..... counterclockwise
Cooling fan (from above) ..... clockwise
Crankshaft (from accessory end) ..... clockwise
Fuel pump (vane-type) (from left side) ..... counterclockwise
Generator (from left side) ..... clockwise
Governor (from above) ..... counterclockwise
Magnetos (from above) ..... clockwise
Power-take-off (from accessory end) .. counterclockwise
Starter (from right side) ..... counterclockwise
Supercharger impeller (from accessory end) ..... counterclockwise
Tachometer drive (from accessory end) ..... counterclockwise

# CHAPTER 5
# DISASSEMBLY OF ENGINE

## Section I. PREPARATION OF ENGINE FOR DISASSEMBLY

### 41. General

*a.* Engines removed from vehicles for repair or rebuild must be thoroughly cleaned, drained, and stripped of accessories. Refer to pertinent vehicle operation manual for procedures for removal of engine from vehicles.

*b.* After removing accessories from engine, send accessories to proper department or section for inspection, repair, or rebuilding.

### 42. Cleaning and Draining

*a. Mount Engine on Overhaul Stand.* For ease of cleaning, draining, removing accessories, and disassembling the engine, mount engine on overhaul stand 7950189 (fig. 14) as described in (1) and (2) below.

(1) Lift engine using sling 8366441 (fig. 13) hooked to engine lifting eyes as shown in figure 21.

NOTE: Crankcase oil filler tube (fig. 8), flame arrestor (fig. 8), exhaust manifold cooling air inlet elbows (fig. 5), and transmission oil cooler hose assemblies must be removed before engine can be mounted on overhaul stand adapter 7950322 (fig. 14). Refer to paragraph 58*b* and *c* for removal of flame arrestor and crankcase oil filler tube. Refer to paragraph 60*a* and *b* to remove transmission oil cooler hose assemblies and exhaust manifold cooling air inlet elbows.

(2) Mount engine on overhaul stand by sliding transmission mounting flange studs (fig. 6) through holes in adapter 7950322 (fig. 14) and secure with $\frac{7}{16}$-inch hex self-locking nuts and flat washers. Figure 22 shows engine mounted on overhaul stand.

*b. Cleaning.*

(1) Close or cover all openings to prevent dirt, foreign matter, water, or cleaning solvents from entering the working parts of the engine or its accessories.

(2) Wash engine with water under pressure to remove as much dirt and mud as possible.

(3) Remove remaining grease and dirt, using a stiff brush and dry-cleaning solvent or mineral spirits paint thinner.

*c. Draining.* Place suitable container under engine oil pan to catch oil.

(1) Cut locking wire and remove crankcase oil pan drain plug (K, fig. 23). Remove and discard gasket.

(2) Place suitable container under engine to catch oil. Cut locking wire and remove accessory case oil sump hex-head magnetic drain plug (C, fig. 23). Remove and discard gasket.

(3) Place suitable container under engine to catch oil. Cut locking wire and remove oil filter housing hex-head magnetic drain plug (S, fig. 24). Remove and discard gasket.

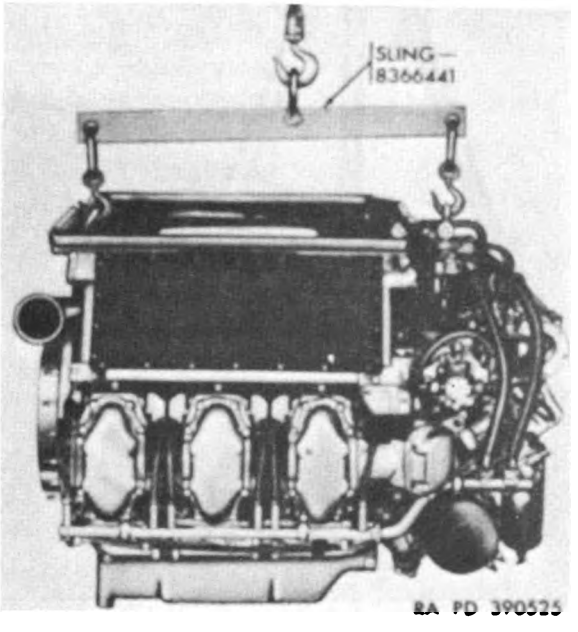



*Figure 21. Lifting engine.*

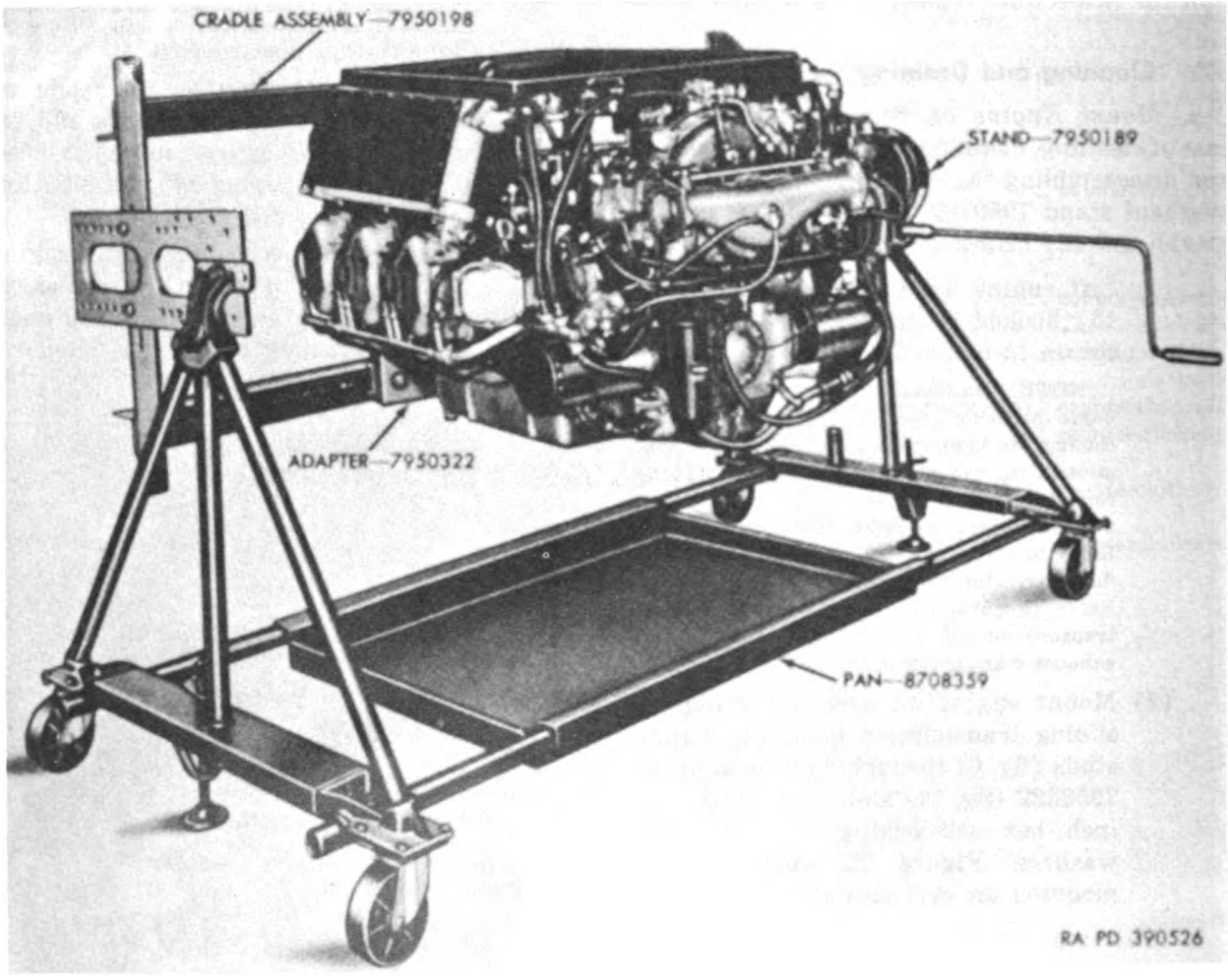
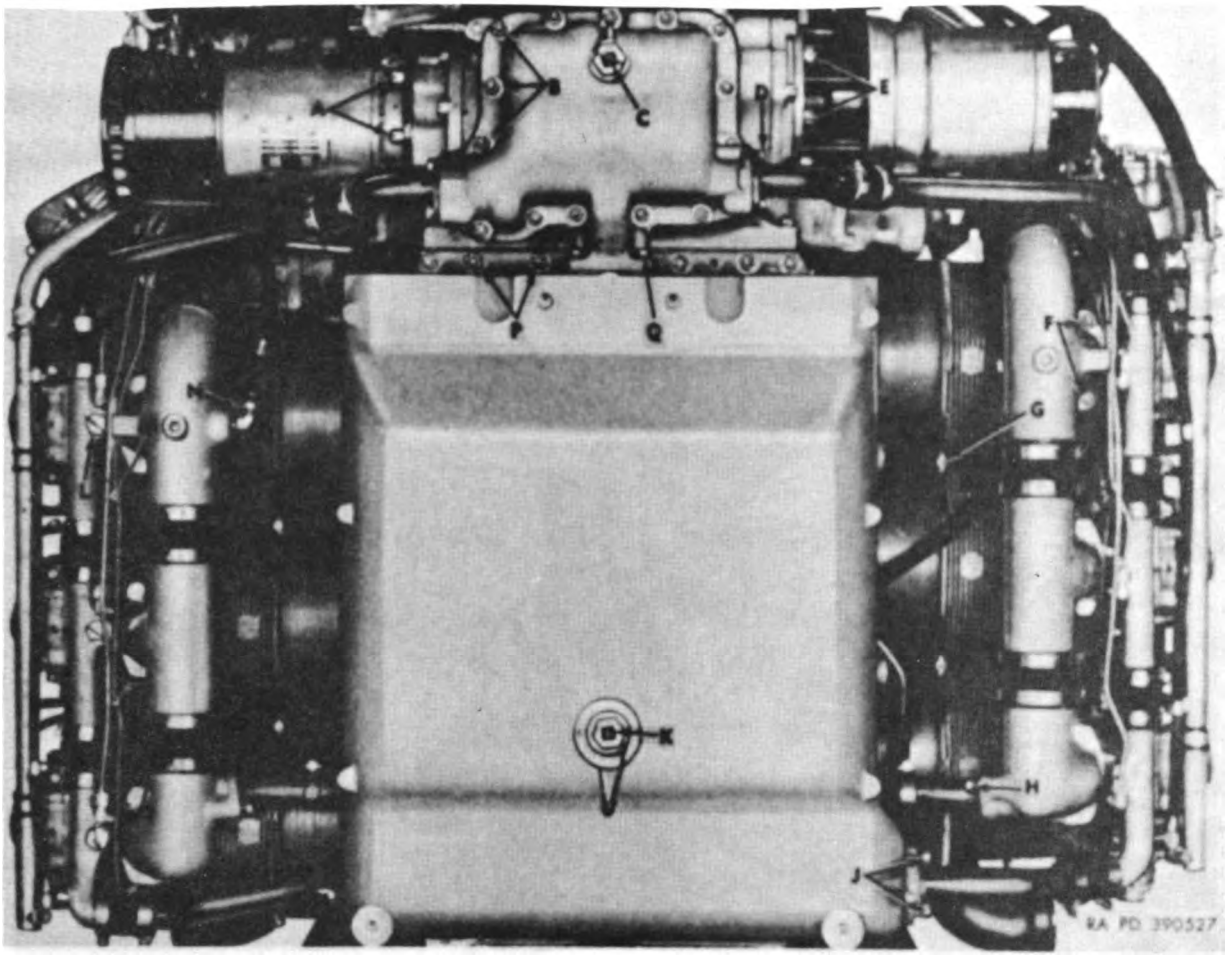



*Figure 22. Engine mounted on overhaul stand.*




A—⅜-inch hex self-locking nut { 503351 or 503383

B—5/16-inch hex self-locking nut { 503345 or 503380

C—⅞-inch hex-head magnetic plug 7375426

D—5/16 x ⅞ hex-head bolt 8365670

E—⅜-inch hex self-locking nut { 503351 or 503383

F—5/16-inch hex self-locking nut { 503345 or 503380

G—No. 10 hex nut 225850

H—5/16 x ⅞ hex-head bolt 8365670

J—5/16 x ⅞ hex-head bolt 8365670

K—Oil pan drain plug 7954708

L—½ x 2 hex-head bolt 7767928

M—¼-inch safety sleeve nut 189894

N—¼-inch coupling nut (part of hose assembly 7973945)

P—⅜-inch hex self-locking nut { 503351 or 503383

Q—⅜ x 1 5/64 hex-head bolt 7376941

*Figure 23. Oil drain points and bottom components disconnect points.*

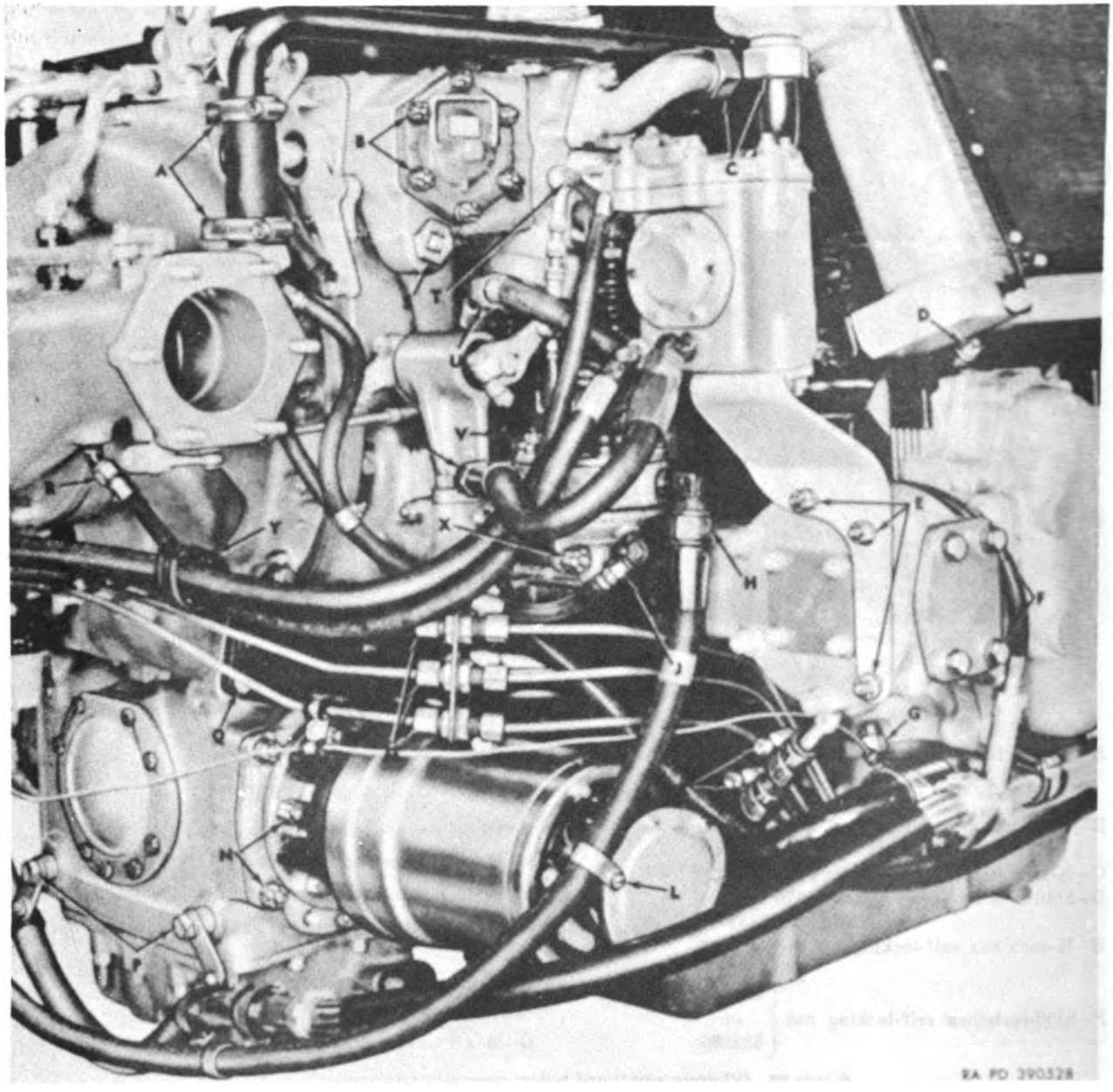



*Figure 24. Right side components disconnect points.*

A—Hose clamp 7350199

B—5/16-inch hex self-locking nut { 503345 or 503380

C—1-inch coupling nut 193449

D—⅜-inch slotted hex nut 122961

E—5/16-inch hex self-locking nut { 503345 or 503380

F—3/16 x 1 9/16 hex-head bolt 7350199

G—¼-inch safety sleeve nut 189894

H—½-inch coupling nut (part of hose assembly 7768134)

J—¼-inch coupling nut (part of hose assembly 8713895)

K—Hose clamp 502912

L—No. 8 x ⅜ fillister-head screw 131979

M—¼-inch safety sleeve nut 189894

N—⅜-inch hex self-locking nut { 503351 or 503383

P—½ x 1 17/32 hex-head bolt 593397

Q—5/16 x 2 7/32 hex-head bolt 583749

R—½-inch coupling nut (part of hose assembly 7973944)

S—⅞-inch hex-head magnetic drain plug 7375426

T—No. 10 slotted hex nut 7403213

U—½-inch coupling nut (part of hose assembly 7410398)

V—5/16-inch hex self-locking nut { 503345 or 503380

W—½-inch coupling nut (part of hose assembly 7410044)

X—5/16-inch hex self-locking nut { 503345 or 503380

Y—Clamp 7403939

*Figure 24—Continued.*

## Section II. REMOVAL OF ACCESSORIES

### 43. Remove Fuel Vapor Separator Assembly

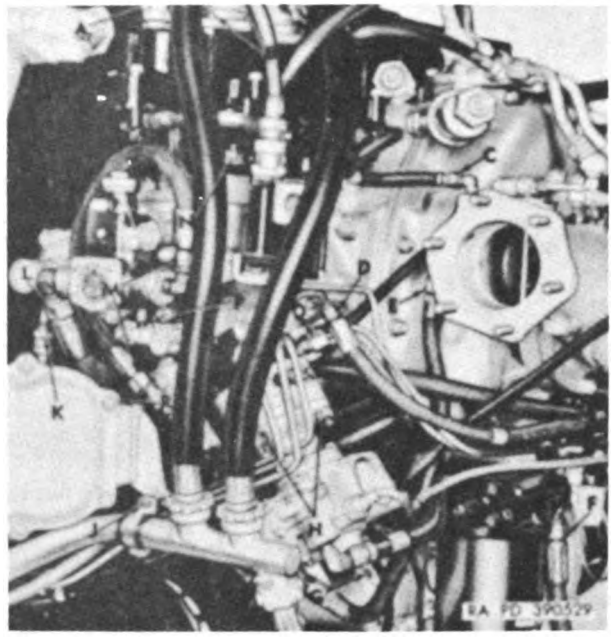
*a.* Disconnect coupling nut (W, fig. 24) of diaphragm-type-fuel-pump-to-vapor-separator hose assembly at fuel pump end.

*b.* Disconnect coupling nut (R, fig. 24) of vapor-separator-to-air-inlet housing hose assembly at air inlet housing end.

*c.* Disconnect coupling nut (L, fig. 25) of vapor-separator-to-vane-type fuel-pump hose assembly at fuel pump end.

*d.* Disconnect coupling nut (D, fig. 25) of fuel-injector-pump-to-vapor-separator hose assembly at fuel pump end.

*e.* Remove three hex self-locking nuts (E, fig. 24) or hex stamped nuts and hex nuts, securing vapor separator bracket to tachometer drive adapter. Remove fuel vapor separator (fig. 26), with attached bracket and hose, from engine.



A—Coupling nut (part of cable assembly 7353260)
B—No. 10 x ⅝ fillister-head screw 427223
C—¼-inch coupling nut (part of hose asembly 7744709)
D—¼-inch coupling nut (part of hose assembly 7973947)
E—⅜-inch coupling nut (part of hose assembly 7973945)
F—½-inch coupling nut (part of hose assembly 7768134)
G—⅜-inch hex self-locking nut { 503351 or 503383
H—7/16-inch hex self-locking nut { 503345 or 503380
J—No. 10 x 1¼ fillister head screw 132138
K—⅜-inch coupling nut (part of hose assembly 7973945)
L—½-inch coupling nut (part of hose assembly 7973943)
M—½-inch coupling nut (part of hose assembly 7974285)
N—5/16-inch hex self-locking nut { 503345 or 503380
P—5/16-inch hex self-locking nut { 503345 or 503380
Q—¼-inch safety sleeve nut 189894
R—5/16-inch hex self-locking nut { 503345 or 503380

*Figure 25. Left side components disconnect points.*

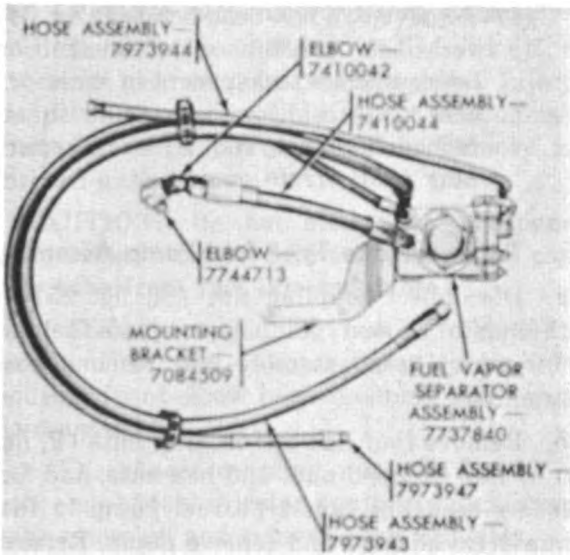



*Figure 26. Fuel vapor separator assembly and hose as removed from engine*

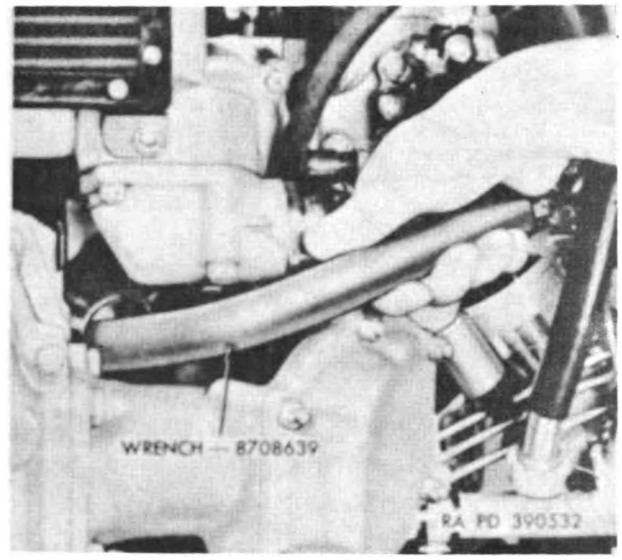



*Figure 28. Removing spark plug.*

## 44. Remove Ignition Harness Assembly

*a. Remove Spark Plugs.*

(1) Disconnect spark plug lead assembly from each of the 12 spark plugs using wrench 7950895 (fig. 27). Pull leads away from spark plugs.

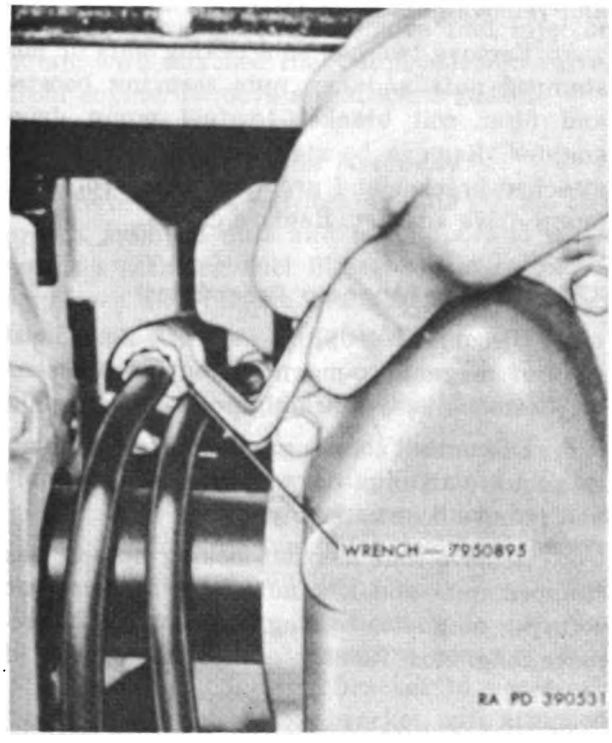



*Figure 27. Disconnecting spark plug lead assembly from spark plug.*

(2) Remove spark plugs from cylinders with wrench 8708639 (fig. 28).

*b. Remove Ignition Harness.*

(1) Disconnect coupling nuts (H, fig. 24 and F, fig. 25) at both ends of fuel filter-to-diaphragm-type-fuel-pump hose assembly.

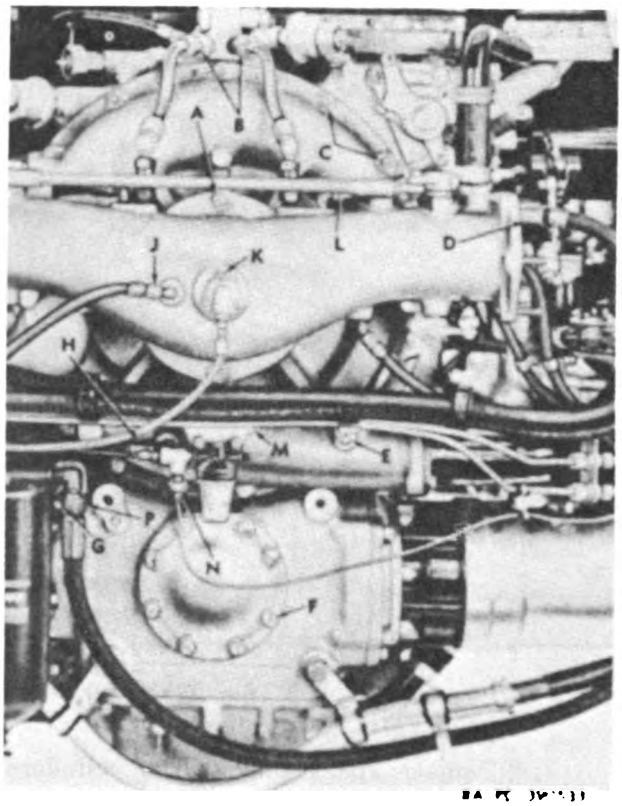
(2) Remove fillister-head screw (L, fig. 24) securing fuel-filter-to-fuel-pump hose assembly to starter cover. Remove clamps (Y, fig. 24) from hose assemblies. Remove hose assembly.

(3) Disconnect coupling nut (J, fig. 24) at both ends of diaphragm-type-fuel-pump-to-air-inlet-housing-elbow vent hose assembly. Remove hose assembly.

(4) Disconnect coupling nuts (L, fig. 29) at air inlet housing end of ignition harness vent hose assemblies.

(5) Remove five fillister-head screws (B, fig. 25) securing ignition harness adapter to magnetos. Lift off adapters. Remove and discard gasket.

(6) Remove fillister-head screw (J, fig. 25) securing ignition harness clamp and spacer to bracket at left camshaft gear housing.



A—⅜-inch hex self-locking nut { 503351 or 503383
B—½-inch coupling nut (part of tube assembly 7737879)
C—5/16-inch hex self-locking nut { 503345 or 503380
D—½-inch coupling nut (part of hose assembly 7410398)
E—5/16-inch hex self-locking nut { 503345 or 503380
F—5/16 x 1 15/64 hex-head bolt 8328909
G—⅜-inch hex self-locking nut { 503351 or 503383
H—⅜-inch coupling nut (part of hose assembly 8713896)
J—¼-inch coupling nut (part of hose assembly 7744710)
K—No. 10 x ⅜ fillister-head screw 8713447
L—¼-inch coupling nut (part of hose assembly 8682942)
M—5/16-inch hex-head bolt 8713951
N—⅛-inch coupling nut 5165169
P—½-inch coupling nut (part of hose assembly 7768134)

*Figure 29. Front end components disconnect points.*

(7) Remove hex-head bolt and lock washer securing each ignition harness clamp to valve rocker covers at Nos 1, 2, 5, and 6 cylinders.

(8) Remove two hex-head bolts (P, fig. 24) and lock washers securing ignition harness links and spacers to accessory case. Lift ignition harness, with attached fuel hose, vent hose, and spark plug leads, from engine.

## 45. Remove Vane-Type Fuel Pump Assembly

*a.* Disconnect coupling nut (M, fig. 25) at both ends of vane-type-fuel-pump-to-fuel-injector-pump hose assembly and remove hose assembly.

*b.* Remove four hex self-locking nuts (P, fig. 25) or hex stamped nuts and hex nuts, and flat washers securing vane-type fuel pump to fuel pump drive adapter and remove pump. Remove and discard gasket.

*c.* Remove two adapter elbows and pipe bushings from fuel pump body.

## 46. Remove Ignition Booster and Filter Coil Assembly

*a.* Disconnect coupling nuts (A, fig. 25) securing magneto ground cable assemblies to magneto covers and remove cables from covers and remove hose assemblies.

*b.* Remove two hex self-locking nuts or hex stamped nuts and hex nuts securing booster and filter coil bracket to fuel pump drive adapter. Remove booster and filter coil, with attached bracket and ground cables, from fuel pump drive adapter. Remove cables.

## 47. Remove Magneto Assemblies

*a.* Disconnect coupling nuts (C, fig. 25) at ends of magneto-to-magneto vent hose assembly. Remove hose assembly.

*b.* Disconnect coupling nuts at ends of inner-magneto-to-air-inlet-housing vent hose assembly and remove hose assembly.

*c.* Remove four hex self-locking nuts or hex stamped nuts and hex nuts, and flat washers securing magnetos to magneto adapter and remove magnetos. Remove and discard gasket, if present.

NOTE: For increased radio suppression the magneto-to-adapter gasket has been eliminated and must not be installed when engine is assembled.

### 48. Remove Fuel Injector Pump Assembly

*a.* Remove three fillister-head screws (K, fig. 29) and lock washers securing fuel injector temperature sensing bulb to air inlet housing and remove bulb from housing. Remove and discard gasket.

**CAUTION: Do not attempt to disconnect temperature sensing bulb and connecting capillary tube from fuel injector pump.**

*b.* Disconnect coupling nut (J, fig. 29) at both ends of fuel-injector-pump-to-air-inlet-housing-front-elbow hose assembly and remove hose assembly.

*c.* Disconnect coupling nut (H, fig. 29) at both ends of fuel-injector-pump-to-supercharger hose assembly and remove hose assembly.

*d.* Disconnect coupling nut (E, fig. 25) at both ends of fuel-injector-pump-to-air-inlet-housing-rear-elbow hose assembly and remove hose assembly.

*e.* Disconnect six safety sleeve nuts (Q, fig. 25) securing fuel injector tube assemblies to injector pump and remove tube assemblies.

*f.* Remove three hex self-locking nuts (H, fig. 25) or hex stamped nuts and hex nuts, and plain washers securing fuel injector pump to magneto drive housing. Remove fuel injector pump, with attached fuel cutoff solenoid valve, from engine. Remove and discard gasket.

### 49. Remove Fuel Filter Assembly

Remove two hex self-locking nuts (G, fig. 29) or hex stamped nuts and hex nuts, and plain washers securing fuel filter bracket to accessory case and remove bracket, with attached fuel filter, from accessory case.

### 50. Remove Priming Fuel Filter Assembly

*a. Skinner Priming Fuel Filter.*

(1) Disconnect two coupling nuts (N, fig. 29) securing priming lines to tube unions in fuel filter tee and remove lines from unions.

(2) Remove two hex-head bolts (M, fig. 29) and lock washers securing fuel filter mounting bracket to accessory case and remove bracket, with attached priming fuel filter, from accessory case.

(3) Remove two fillister-head screws, lock washers, and flat washers securing filter to bracket and remove filter.

*b. Zenith Priming Fuel Filter.*

(1) Disconnect coupling nuts securing priming lines to tube unions in fuel filter mounting bracket and remove lines from unions.

(2) Remove two hex-head bolts and lock washers securing fuel filter mounting bracket to accessory case and remove bracket, with attached priming fuel filter, from accessory case.

(3) Remove fuel filter from filter bracket.

### 51. Remove Generator Assembly

Remove six hex self-locking nuts (A, fig. 23) or hex stamped nuts and hex nuts and flat washers securing generator to generator drive adapter and remove generator. Remove and discard gasket.

### 52. Remove Starter Assembly

NOTE: The engine may be equipped with any one of four different starters. Remove starter according to procedures outlined for the particular starter in *a*, *b*, *c*, or *d* below.

*a. Late Model Eclipse-Pioneer Starter.*

(1) Remove six hex self-locking nuts (E, fig. 23) or hex stamped nuts and hex nuts, and flat washers securing starter to starter drive assembly using wrench 8708189 (fig. 30).

(2) Remove starter and remove and discard gasket.

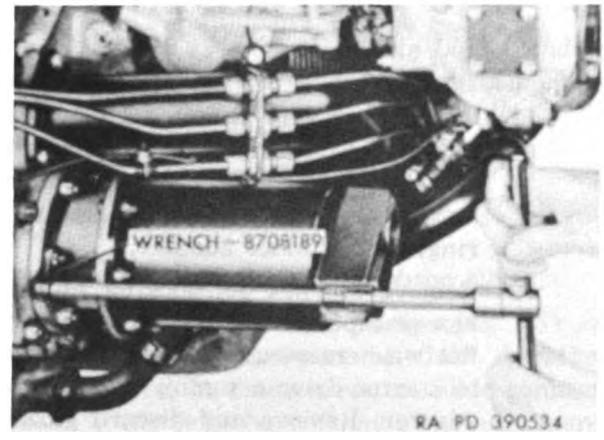



*Figure 30. Removing or installing late model Eclipse-Pioneer starter.*

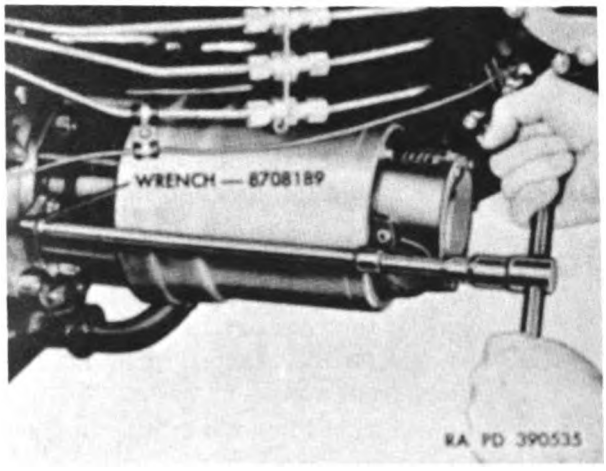



*Figure 31. Removing or installing late model Jack and Heintz starter.*

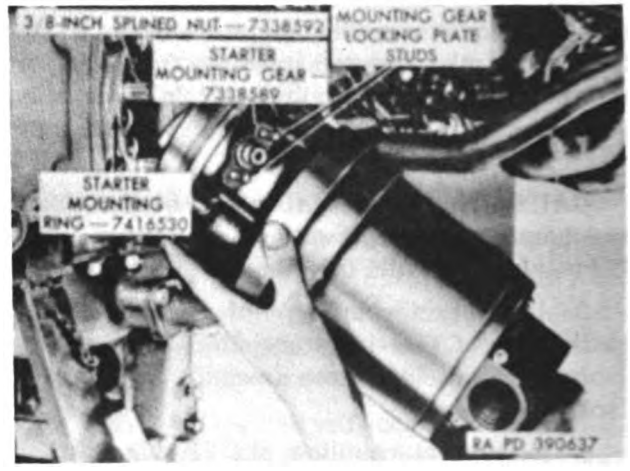



*Figure 33. Removing or installing early model Jack and Heintz starter.*

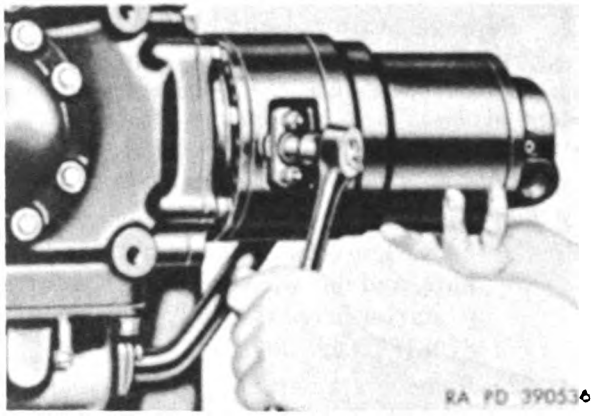



*Figure 32. Disconnecting or connecting early model Jack and Heintz starter.*

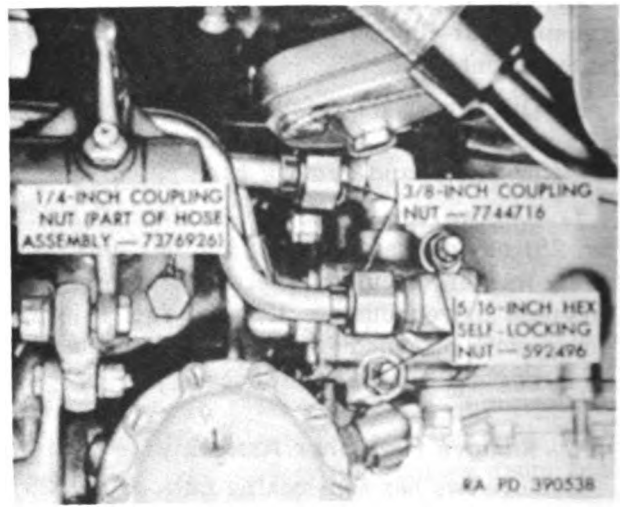



*Figure 34. Governor oil pressure regulating valve disconnect points (model AOSI-895-5M engines only).*

*b. Early Model Eclipse-Pioneer Starter.*

(1) Cut locking wire and loosen clamping screw on retaining ring. Slide retaining ring over adapter flange and remove starter, with attached retaining ring, from starter adapter.

(2) Remove six hex self-locking nuts or hex stamped nuts and hex nuts, and flat washers securing starter adapter to starter drive assembly and remove adapter. Remove and discard gasket.

NOTE: The starter adapter and clamp-type retaining ring are part of the starter assembly and must remain with the starter.

*c. Late Model Jack and Heintz Starter.*

(1) Remove six hex self-locking nuts or hex stamped nuts and hex nuts, and flat washers securing starter to starter drive assembly using wrench 8708189 (fig. 31).

(2) Remove starter and remove and discard gasket.

*d. Early Model Jack and Heintz Starter.*

(1) Depress locking plate with wrench as shown in figure 32 and loosen worm gear bolt. Remove starter as shown in figure 33.

(2) Remove six splined nuts (fig. 33) securing starter mounting ring to starter drive assembly and remove mounting ring. Remove and discard gasket.

NOTE: The mounting ring and splined nuts are part of the starter assembly and must remain with the starter.

### 53. Remove Governor Oil Pressure Regulating Valve Assembly (Model AOSI–895–5M Engine Serial Numbers 2067 Through 8487 Only) (fig. 34)

*a.* Disconnect coupling nuts securing oil inlet and outlet tube assemblies to elbows on regulating valve and to elbow on governor and elbow on accessory case. Remove tube assemblies.

*b.* Disconnect coupling nut securing oil drain hose assembly to elbow on regulating valve and to elbow on bottom of governor. Remove hose assembly.

*c.* Remove two hex self-locking nuts and flat washers securing regulating valve to regulating valve bracket and remove valve.

*b.* Remove two hex self-locking nuts or hex stamped nuts and hex nuts securing regulating valve bracket to right camshaft gear housing and remove bracket.

### 54. Remove Diaphragm-Type Fuel Pump Assembly

*a.* Remove two hex self-locking nuts or hex stamped nuts and hex nuts securing diaphragm-type fuel pump to fuel pump drive adapter on right camshaft drive housing.

*b.* Remove fuel pump from drive adapter, being careful not to damage lever of fuel pump. Remove and discard gasket.

### 55. Remove Governor Assembly

NOTE: Late model AOSI–895–5M engines and all model AOSI–895–5 engines are equipped with governor assembly 8380695 having an integral oil pressure regulating valve. These governors cannot be removed until after oil control housing is removed (par. 113).

*a.* Disconnect coupling nut (U, fig. 24) of governor oil inlet hose assembly from elbow on governor.

*b.* Remove cotter pin from slotted hex nut (T, fig. 24) securing throttle-control-shaft-lever-to-governor-lever rod assembly to governor rocker arm. Remove slotted hex nut and flat washer from hex-head bolt. Remove bolt from rod assembly and governor rocker arm.

*c.* Remove three hex self-locking nuts or hex stamped nuts and hex nuts, and flat washers securing governor to right camshaft drive housing.

*d.* Lift governor from housing. Lift governor drive shaft assembly, with actuating balls, from governor driven gear. Remove and discard gasket.

*e.* Remove elbows from governor.

### 56. Remove Oil Filter Assembly

Remove six hex self-locking nuts (B, fig. 24) or hex stamped nuts and hex nuts, and plain washers securing oil filter to accessory case and remove filter. Remove and discard gasket.

### 57. Remove Sending Units

*a. Oil Pressure Gage Sending Unit* (fig. 7). Unscrew sending unit from elbow in accessory case.

*b. High Oil Temperature Warning Light Sending Unit* (fig. 7). Unscrew sending unit from tee in accessory case.

*c. Low Oil Pressure Warning Light Sending Unit* (fig. 7). Unscrew sending unit from elbow in accessory case.

## Section III. DISASSEMBLY OF STRIPPED ENGINE

### 58. Removal of Crankcase Breather Tubes, Flame Arrestor, and Crankcase Oil Filler Tube

*a. Remove Crankcase Breather Tubes.*

(1) Loosen two hose clamps (A, fig. 24) securing crankcase air inlet breather tube to air inlet housing elbow and slide connector hose from elbow.

(2) Loosen two hose clamps (fig. 35) securing crankcase air inlet breather tube to flame arrestor. Slide connecting hose from flame arrestor, remove hose, breather tube, and rubber grommet.

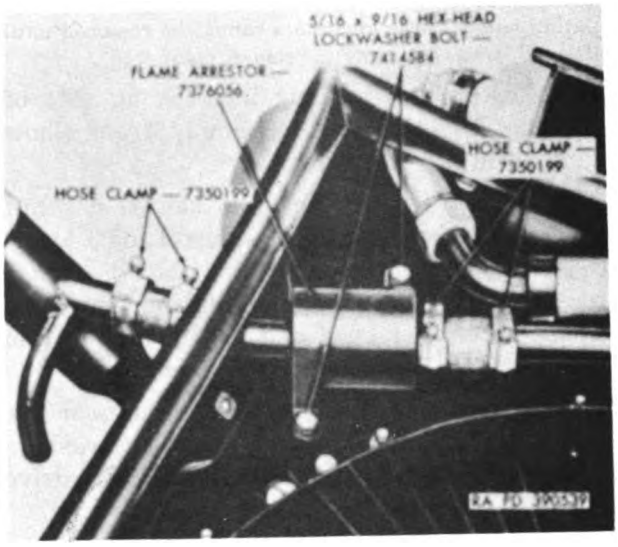



*Figure 35. Flame arrestor and breather tube disconnect points.*

(3) Loosen two hose clamps (K, fig. 36) securing crankcase ventilating breather tube to crankcase oil filler tube and slide connecting hose from oil filler tube.

(4) Loosen two hose clamps at crankcase end of ventilating breather tube below No. 3 cylinder and remove breather tube, with attached hose and clamps.

*b. Remove Flame Arrestor.*

(1) Remove two hex-head lockwasher bolts (fig. 35) securing flame arrestor to engine shroud.

(2) Loosen two hose clamps (fig. 35) securing flame arrestor to oil filler tube and remove flame arrestor.

*c. Remove Crankcase Oil Filler Tube.*

(1) Remove two hex-head lockwasher bolts (A, fig. 36) securing oil filler mounting bracket to engine shroud.

(2) Remove four hex-head bolts (G, fig. 36) and lock washers securing oil filler tube to crankcase oil pan and remove oil filler tube and oil level indicator. Remove and discard gasket.

## 59. Removal of Cooling Fan Rotor and Clutch Assembly

NOTE: To facilitate removal of cooling fan rotor and clutch assembly rotate cradle assembly in overhaul stand so engine is resting on flywheel end as shown in figure 37.

*a. Remove Cooling Fan Outlet Vane Housing.*

(1) Remove three hex-head lockwasher bolts (A, fig. 37) and two hex self-locking nuts (B, fig. 37) securing oil control housing cover to shroud and remove cover.

(2) Remove 14 hex self-locking nuts (C, fig. 37) securing cooling fan outlet vane housing to engine shroud and remove housing.

(3) Remove three round-head lockwasher screws securing rotor cover and fan drive vertical drive shaft cover to fan drive clutch outer housing and remove covers.

*b. Remove Cooling Fan Rotor and Clutch Assembly.* Remove cotter pin (1, fig. 38) and slotted hex nut (F, fig. 38) and slide cooling fan rotor and fan drive clutch assembly from fan drive vertical drive shaft.

## 60. Removal of Shroud and Oil Cooler Assembly

*a. Disconnect and Remove Oil Cooler Hose Assemblies.*

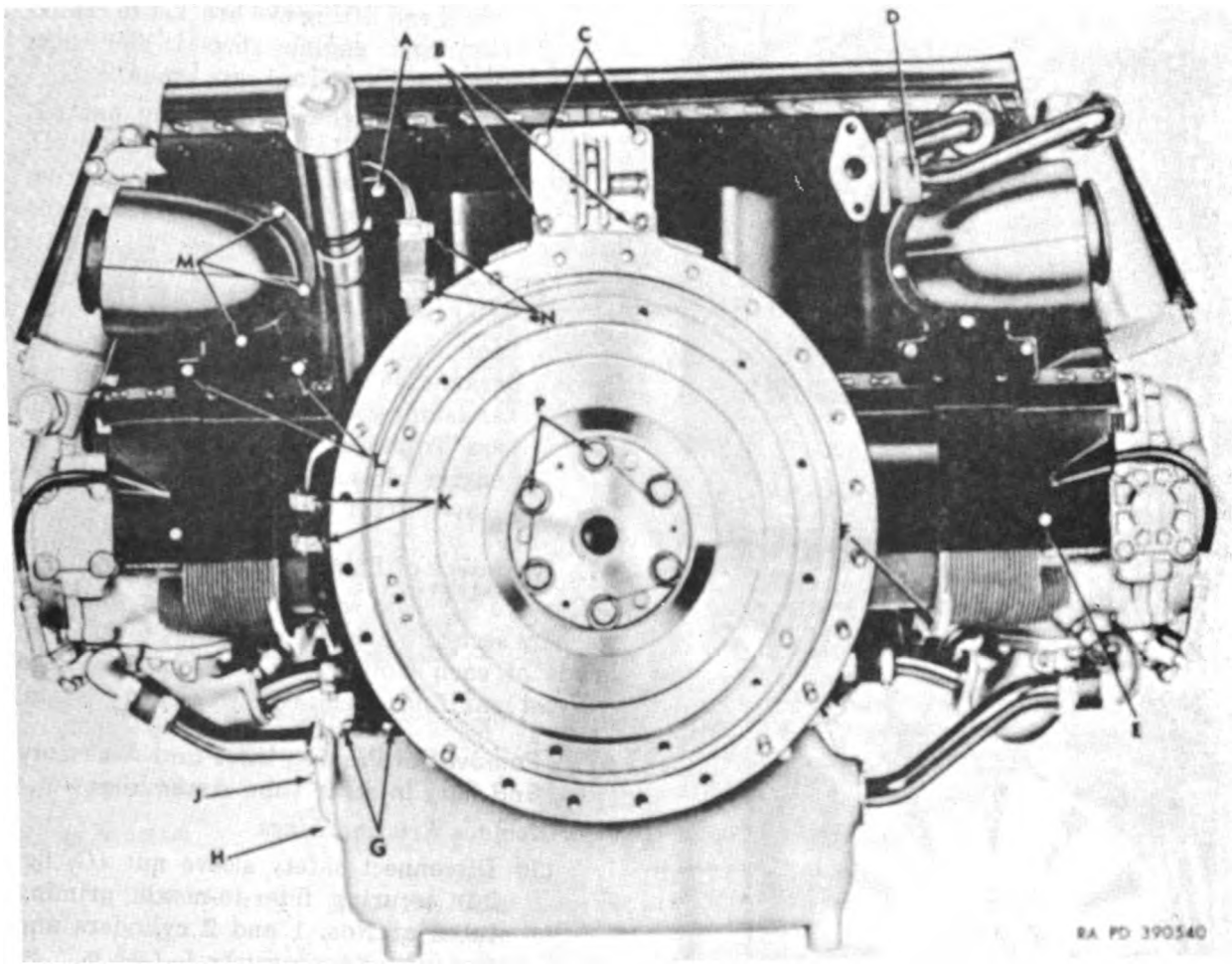
(1) Disconnect two coupling nuts (C, fig. 24) securing engine oil cooler inlet hose assembly to connectors on oil cooler assembly and oil control housing and remove hose assembly.

(2) Disconnect coupling nuts (A, fig. 38) and pull ends of engine oil cooler outlet hose assembly away from connectors on oil cooler and oil control housing.

NOTE: Engine oil cooler outlet hose assembly is removed when shroud assembly is disassembled (par. 189).

(3) Disconnect coupling nuts (D, fig. 36) securing transmission oil cooler inlet and outlet hose assemblies to connectors on oil cooler assembly and remove inlet hose assembly.

(4) Remove hex-head lockwasher bolt securing transmission oil cooler outlet hose clip to engine shroud and remove hose assembly, with attached clip and grommet, from shroud. Remove clip and grommet from hose assembly.




A–5/16 x 9/16 hex-head lockwasher bolt 7414584
B–7/16-inch hex self-locking nut { 503357 or 503386
C–5/16 x 27/32 hex-head bolt 583749
D–1-inch coupling nut 193449
E–¼ x 17/32 hex-head bolt 7376018
F–Spring 7744734
G–5/16 x ⅞ hex-head bolt 8365670
H–5/16 x 27/32 hex-head bolt 7346710
J–5/16 x 1 15/32 hex-head bolt 7348770
K–Hose clamp 7350199
L–5/16 x 9/16 hex-head lockwasher bolt 7414584
M–5/16 x 9/16 hex-head lockwasher bolt 7414584
N–Hose clamp 502914
P–9/16 x 1 15/32 hex-head bolt 8717308

*Figure 36. Rear end components disconnect points.*

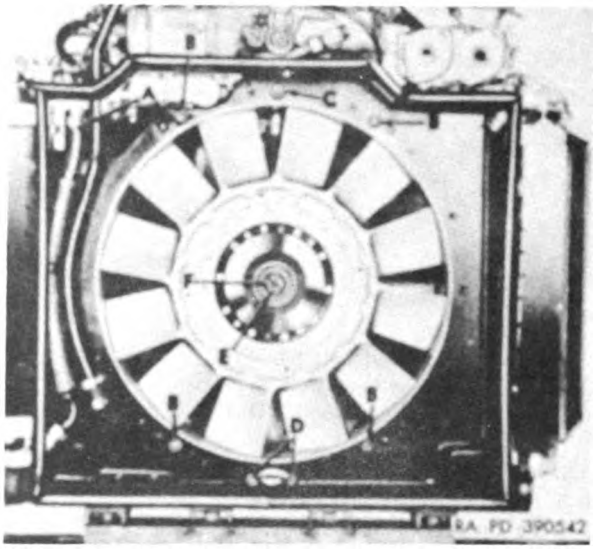
*b. Remove Exhaust Manifold Cooling Air Inlet Elbows.* Remove five hex-head lockwasher bolts (M, fig. 36) securing each exhaust manifold air inlet elbow to the engine shroud and remove elbows.

*c. Remove Exhaust Manifold Shroud Opening Covers.* Remove two hex-head lockwasher bolts (L, fig. 36) securing each flywheel end exhaust outlet opening cover to shroud and remove covers. On model AOSI–895–5M engines, cut locking wire, remove four hex-head lockwasher bolts securing two hot spot opening covers to engine shroud at accessory end, and remove covers.

*d. Remove Engine Shroud and Oil Coolers.*

(1) Remove six cotter pins, slotted hex nuts (D, fig. 24), and plain washers securing engine shroud and oil cooler seal hose brackets to cylinder heads. Remove brackets and oil cooler seal hose.


*Figure 37. Cooling fan outlet vane housing and oil control housing cover disconnect points.*




A—1-inch coupling nut 193449
B—⅜ x 9 hex-head bolt 7376131
C—⅜-inch hex self-locking nut { 503351 or 503383
D—⅜-inch hex self-locking nut { 503351 or 503383
E—⅛ x 1¾ cotter pin 137214
F—¾-inch slotted hex nut 7717728

*Figure 38. Engine shroud and cooling fan disconnect points.*

(2) Remove two hex self-locking nuts (B, fig. 36), two hex-head bolts (C, fig. 36), and lock washers securing flywheel end lifting eye bracket to crankcase and engine shroud and slide bracket from crankcase studs.

(3) Remove one hex self-locking nut (C, fig. 38), two hex self-locking nuts (D, fig. 38), and flat washers securing engine shroud to accessory case and crankcase.

(4) Cut locking wire and remove four hex-head bolts (B, fig. 38), flat washers, and spacers securing engine shroud to crankcase and, with the aid of an assistant, remove shroud and oil coolers from engine. Figure 39 shows engine shroud and oil coolers as removed from engine.

## 61. Removal of Exhaust Manifolds

Remove 12 hex self-locking nuts and flat washers securing exhaust manifolds to cylinder heads of each bank of cylinders and remove exhaust manifolds. Remove and discard gaskets.

## 62. Removal of Priming Lines and Accessory End Fuel Injector Tube Assemblies

*a. Remove Priming Lines.*

(1) Disconnect safety sleeve nut (G, fig. 24) securing filter-to-nozzle priming tubes at Nos. 1 and 2 cylinders and remove tubes from nozzle tees.

(2) Disconnect safety sleeve nut (M, fig. 23) at each end of intercylinder priming line between Nos. 1 and 3 cylinders and remove line.

(3) Repeat step (2) above to remove priming lines between cylinders Nos. 3 and 5, 2 and 4, and 4 and 6.

(4) Remove intercylinder union tees from all priming nozzles.

*b. Remove Accessory End Fuel Injector Tube Assemblies.*

(1) Remove two hex self-locking nuts (E, fig. 29) or hex stamped nuts and hex nuts securing fuel injector tube clamp brackets to supercharger housing.

(2) Disconnect three safety sleeve nuts (M, fig. 24) securing fuel injector tubes to unions and remove tubes, with attached brackets and priming line, from unions.

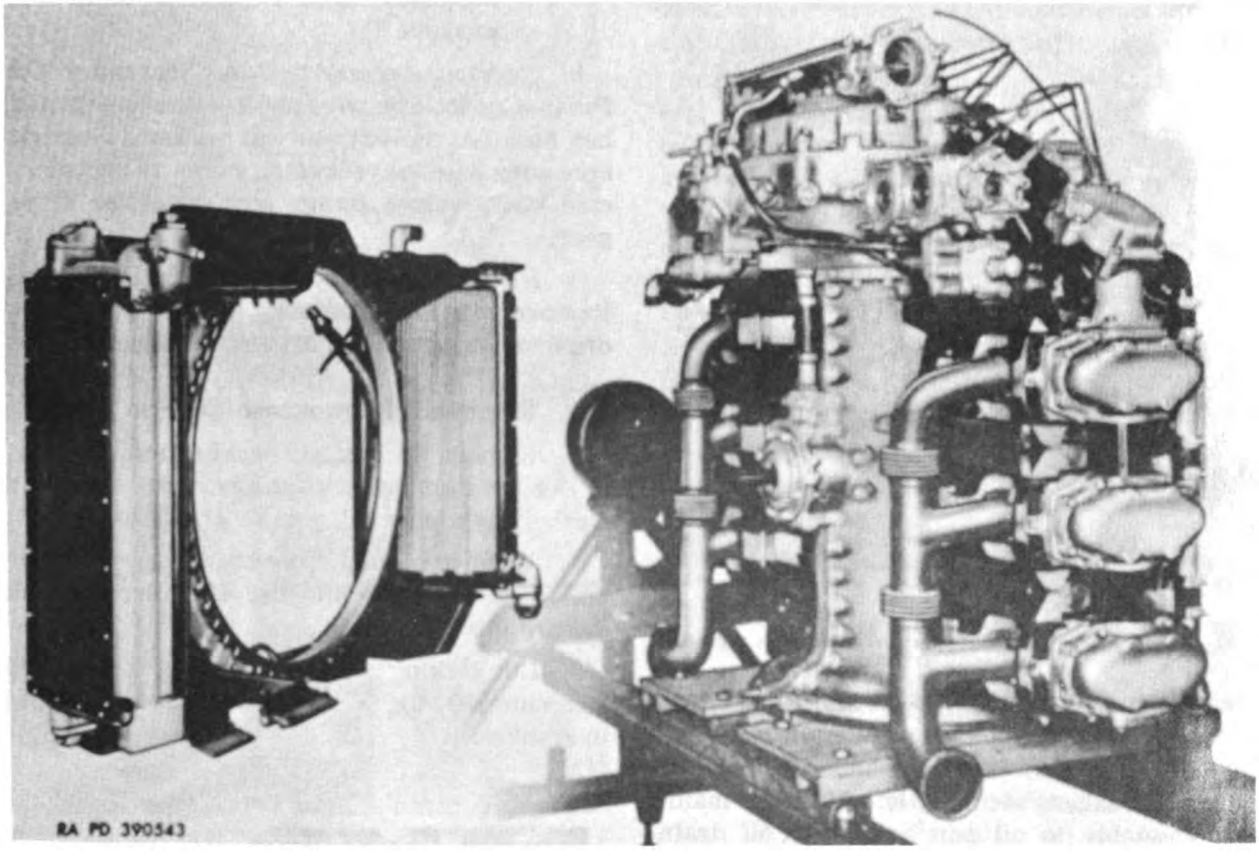



*Figure 39. Engine shroud and oil coolers removed from engine.*

## 63. Removal of Intake Manifolds and Balance Pipe

*a. Remove Intake Manifold Groups.*

(1) Remove three hex-head bolts (Q, fig. 24) and lockwashers securing the two intake manifold connectors to the supercharger housing.

(2) Disconnect coupling nuts (N, fig. 23) and (K, fig. 25) at ends of booster-pump-to-intake-manifold hose assembly and remove hose assembly.

(3) Remove four hex-head bolts (H, fig. 23) and lock washers securing intake manifold balance pipe connector tubes to Nos. 5 and 6 cylinder intake manifold assemblies.

(4) Remove nine hex self-locking nuts (F, fig. 23) or hex stamped nuts and hex nuts securing the intake manifold groups to each bank of cylinders and remove intake manifolds, with attached connectors, fuel injector tubes, and fuel injector nozzles. Figure 40 shows intake manifold groups as removed from engine.

(5) Remove and discard all gaskets connecting manifolds to cylinders, supercharger housing, and balance pipe connector tubes.

*b. Remove Intake Manifold Balance Pipe.*

(1) Loosen four hose clamps securing connector hose to balance pipe and to balance pipe connector tubes and slide connector tubes from balance pipe.

(2) Remove four hex-head bolts and lock washers securing balance pipe flanges to crankcase and remove flanges.

(3) Slide balance pipe from crankcase. Remove and discard "O" ring packings.

## 64. Removal of Cylinder Head Oil Drain Manifolds

*a.* Remove four hex-head bolts (D, fig. 23) and lock washers securing right and left oil

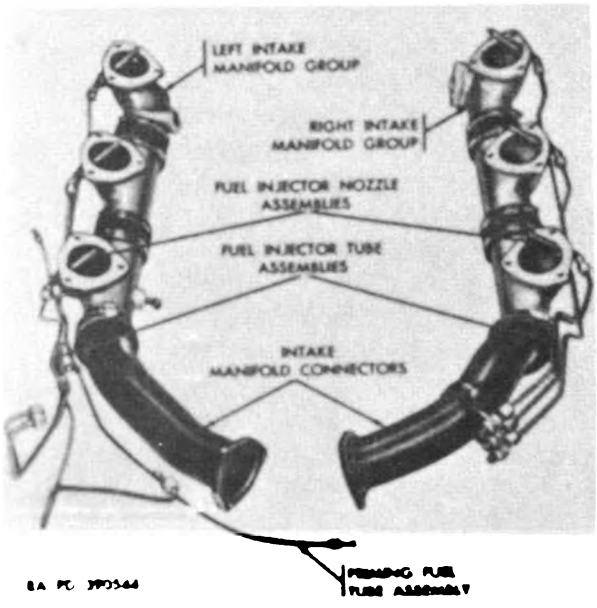



*Figure 40. Intake manifold groups removed from engine.*

drain manifold assemblies to accessory case oil sump.

*b.* Remove four hex-head bolts (J, fig. 23) and lock washers securing left oil drain manifold assembly to oil pan and right oil drain manifold assembly to oil drain tube adapter.

*c.* Cut locking wire and remove six special hex-head bolts (L, fig. 23) securing oil drain manifold assemblies to cylinder heads and remove manifolds and hose as an assembly and discard all gaskets connecting oil drain manifolds to oil pan and oil sump.

*d.* Cut locking wire and remove two hex-head bolts (H and J, fig. 36) and flat washers securing oil drain tube adapter assembly to oil pan and remove adapter assembly. Remove and discard gasket.

## 65. Removal of Accessory Case Oil Sump and Scavenger Oil Pump

*a. Remove Accessory Case Oil Sump.*

(1) Remove 16 hex self-locking nuts (B, fig. 23) or hex stamped nuts and hex nuts, and flat washers securing oil sump to accessory case.

(2) Remove four hex-head bolts (Q, fig. 23), lock washers, and flat washers securing oil sump to crankcase oil pan.

(3) Tap oil sump lightly with soft hammer to loosen and remove oil sump from accessory case. Remove and discard gaskets.

*b. Remove Accessory Case Scavenger Oil Pump.* Cut locking wire and remove five slotted hex nuts (A, fig. 42) and flat washers securing accessory case scavenger oil pump to accessory case and remove pump with attached drive gear.

*c. Remove Oil Pressure Regulator Spill Tube.* Remove retaining ring (B, fig. 42) and withdraw spill tube (C, fig. 42) from accessory case.

## 66. Removal of Crankcase Oil Pan

*a.* Remove 38 hex self-locking nuts (P, fig. 23) or hex stamped nuts and hex nuts and plain washers securing oil pan to crankcase.

*b.* Remove oil pan from crankcase with two puller screws 7083740 (fig. 41). Remove and discard gasket.

*c.* Cut locking wire and remove six slotted hex nuts (D, fig. 42) securing accessory case to crankcase.

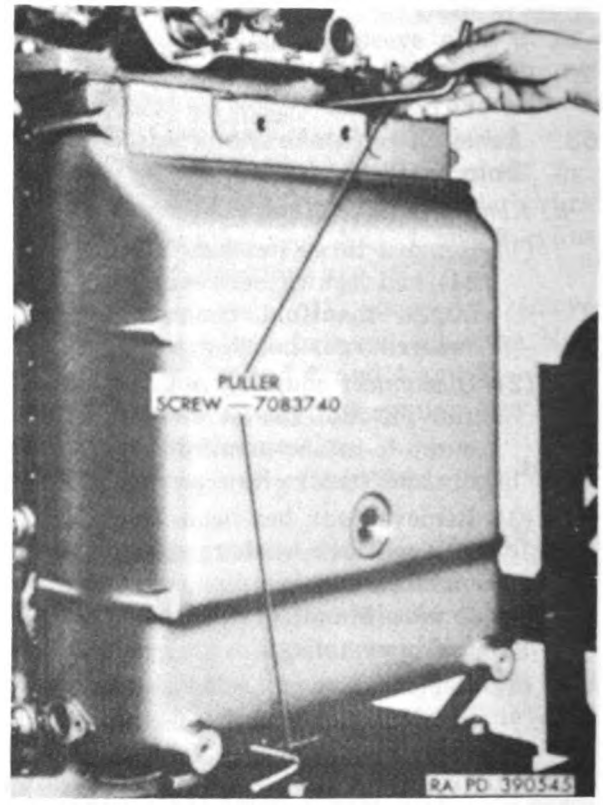
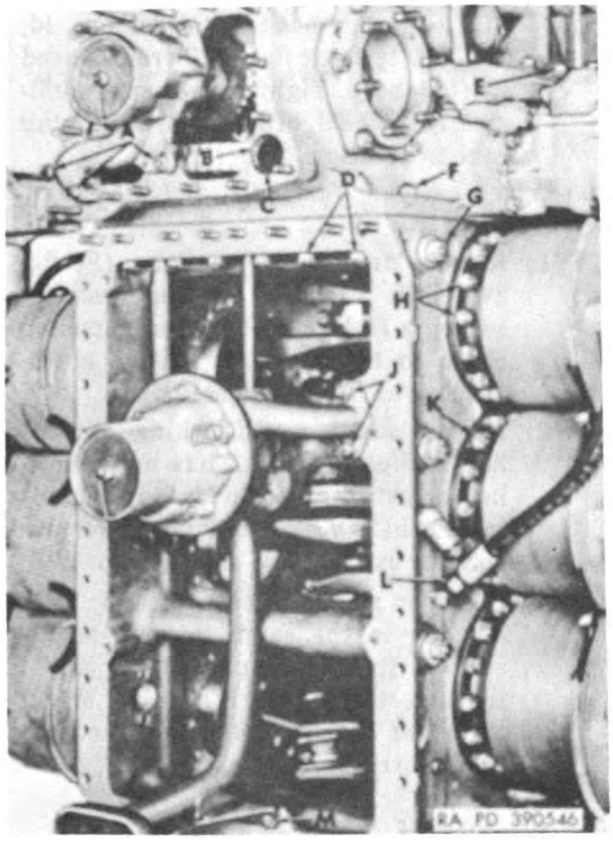



*Figure 41. Removing crankcase oil pan.*




A—5/16-inch slotted hex nut 122942
B—1 23/32-inch housing diameter retaining ring 593364
C—Oil pressure regulator spill tube 7346642
D—7/16-inch slotted hex nut 122978
E—5/16-inch hex self-locking nut { 503345 or 503380
F—7/16-inch hex self-locking nut 503357
G—9/16-inch extended washer hex nut 7338679
H—7/16-inch hex nut 7767432
J—⅜-inch slotted hex nut 122961
K—9/16-inch extended washer hex nut 7338679
L—½-inch coupling nut (part of hose assembly 7410398)
M—5/16-inch slotted hex nut 122942

*Figure 42. Bottom components disconnect points.*

## 67. Removal of Valve Rocker Covers

*a.* Rotate cradle assembly of engine overhaul stand to bring engine to horizontal position as shown in figure 22.

*b.* Straighten tab washers and remove four hex-head bolts and tab washers securing Nos. 1 and 2 cylinder valve rocker covers to camshaft gear housings.

*c.* Straighten tab washers and remove eight hex-head bolts and tab washers securing valve rocker box cover plates to Nos. 5 and 6 cylinder valve rocker covers and cylinder heads. Remove cover plates and remove and discard gaskets.

*d.* Remove eight hex-head bolts, lock washers, and plain washers securing Nos. 2 and 4 cylinder valve rocker covers to cylinder heads and remove covers.

*e.* Remove seven hex-head bolts, lock washers, and plain washers securing remaining valve rocker covers to cylinder heads and remove covers.

## 68. Removal of Camshafts and Camshaft Gear Housing

*a. Remove Left Camshaft and Camshaft Gear Housing.*

(1) Remove six hex self-locking nuts (R, fig. 25) and flat washers securing left camshaft gear housing cover to gear housing and remove cover. Remove and discard gasket.

(2) Remove retaining ring securing oil transfer outer plug in camshaft drive bevel gear. Remove oil transfer outer plug with remover and replacer 7082029 (fig. 43).

(3) Remove camshaft drive shaft with remover and replacer 7082029 (fig. 44).

(4) Cut locking wire and remove camshaft drive housing inner packing nut with wrench 7083792 (fig. 45).

(5) Cut locking wire and remove 12 hex-head bolts and flat washers securing left camshaft bearing caps and valve

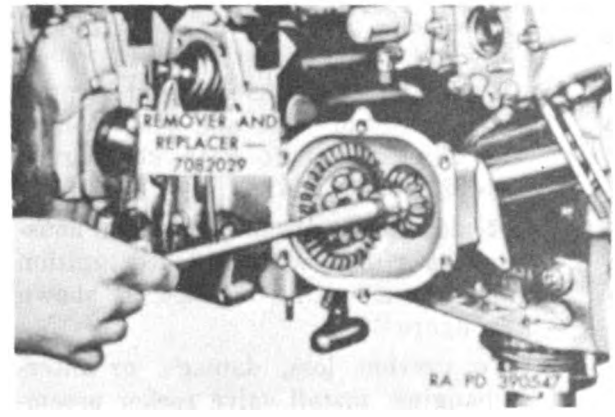



*Figure 43. Removing or installing camshaft drive shaft oil transfer outer plug.*

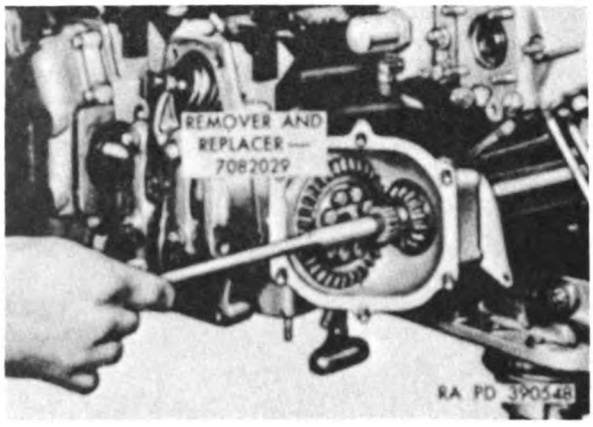



*Figure 44. Removing or installing camshaft drive shaft.*

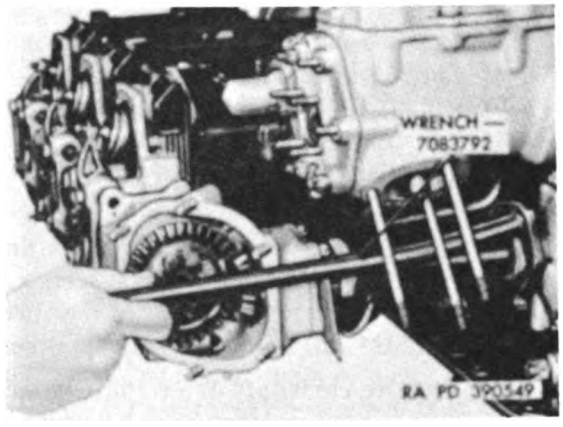



*Figure 45. Removing or installing camshaft drive housing inner packing nut.*

rocker shaft supporting brackets to cylinder heads and remove caps, brackets, and valve rocker assemblies from cylinders.

NOTE: The camshaft bearing caps and supports are marked with a number to match the cylinder from which they were removed and must be installed in the same location.

(6) Straighten tab washers and remove two hex-head bolts and tab washers securing camshaft gear housing to No. 2 cylinder head.

(7) Remove left camshaft and gear housing as a unit, with attached ignition harness mounting bracket, as shown in figure 46.

(8) To prevent loss, damage, or interchanging, install valve rocker assemblies, valve rocker shaft supporting brackets, and camshaft bearing caps on cylinders and secure with twelve $\frac{3}{8} \times 2\frac{13}{16}$ hex-head bolts and $\frac{25}{64}$ id, $\frac{13}{16}$ od, $\frac{1}{8}$ thick flat washers removed in (5) above. Tighten bolts only sufficiently to hold brackets and bearing caps in position.

*b. Remove Right Camshaft and Camshaft Gear Housing.*

(1) Remove four hex-head bolts (F, fig. 24), lock washers, and flat washers securing right camshaft gear housing cover to housing and remove cover. Remove and discard gasket.

(2) Remove six hex self-locking nuts or hex stamped nuts and hex nuts securing tachometer drive adapter assembly to camshaft gear housing and remove adapter assembly.

(3) Remove right camshaft and gear housing in the same manner as described for left camshaft in *a* (1) through (8) above. Figure 47 shows the right camshaft and gear housing as removed from the engine.

## 69. Removal of Accessory Case

*a.* Remove 12 hex self-locking nuts (F, fig. 42) or hex stamped nuts and hex nuts, and flat washers securing accessory case to crankcase.

*b.* Loosen two hose clamps securing cooling fan drive shaft connector hose to hose nipples in crankcase and accessory case.

*c.* Attach hoist to accessory case lifting eye and lift accessory case from crankcase. Refer to figure 48 for view of accessory case as removed from engine.

*d.* Remove fan drive shaft (C, fig. 48), accessory drive shaft (Q, fig. 48), and pressure oil pump drive shaft (G, fig. 48) from accessory case.

*e.* Place accessory case on a suitable table or bench for disassembly. Mount accessory case on wooden blocks to prevent damage to oil sump mounting studs.

## 70. Removal of Cooling Fan Drive

*a. Remove Fan Drive Vertical Drive Shaft Oil Seal Housing.*

(1) Cut locking wire and remove eight slotted hex nuts and flat washers se-

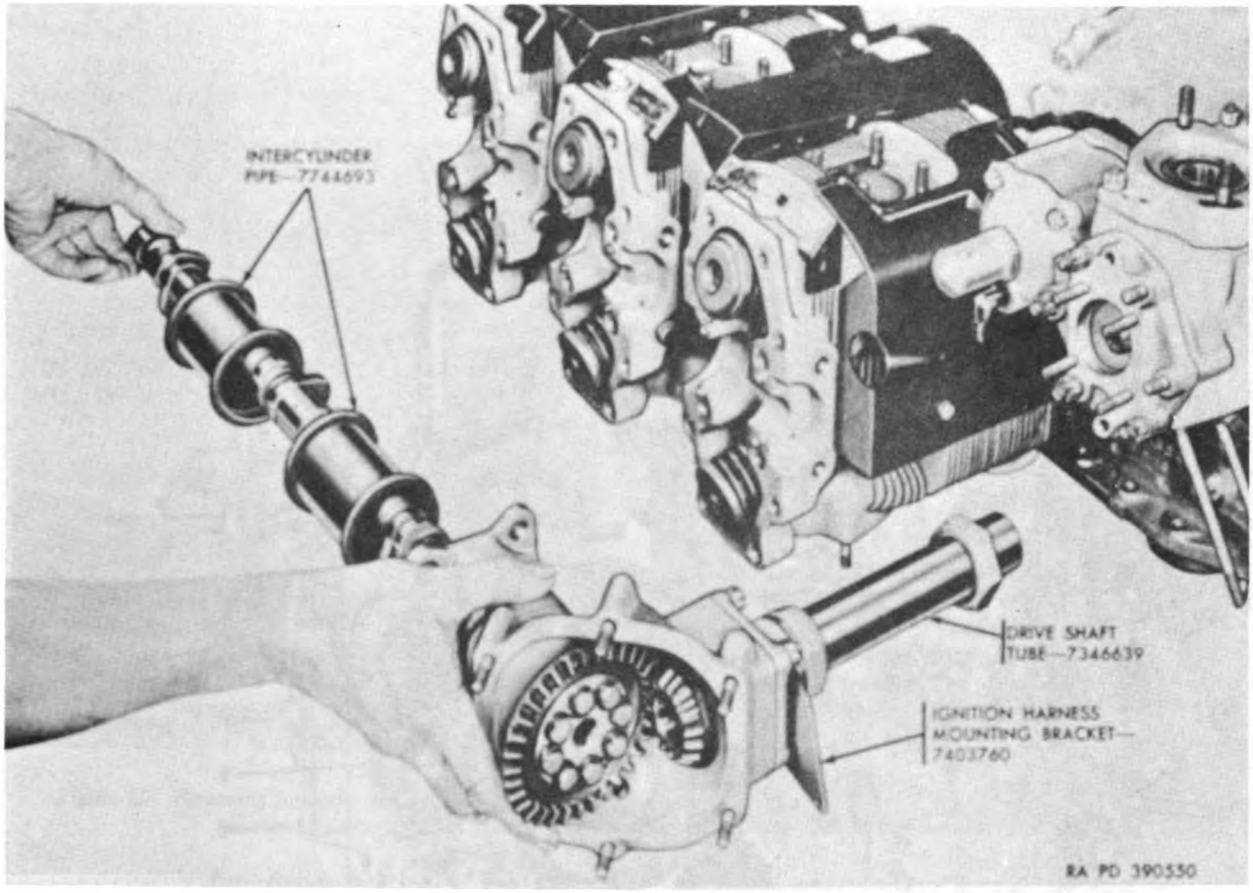



*Figure 46. Removing or installing left camshaft and camshaft gear housing.*

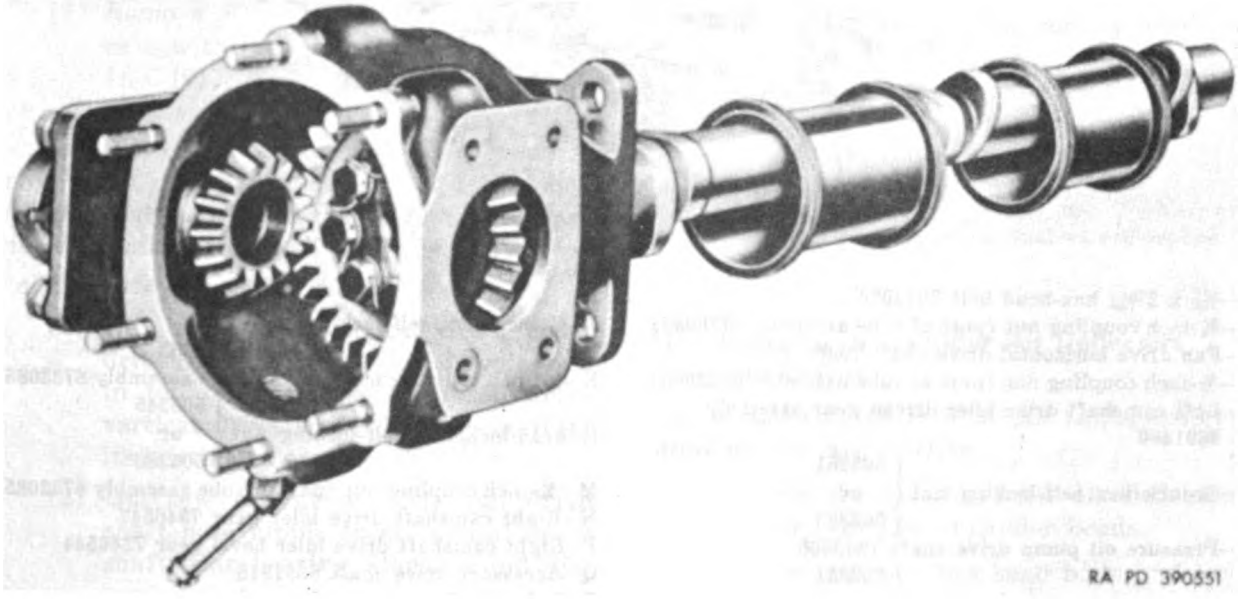
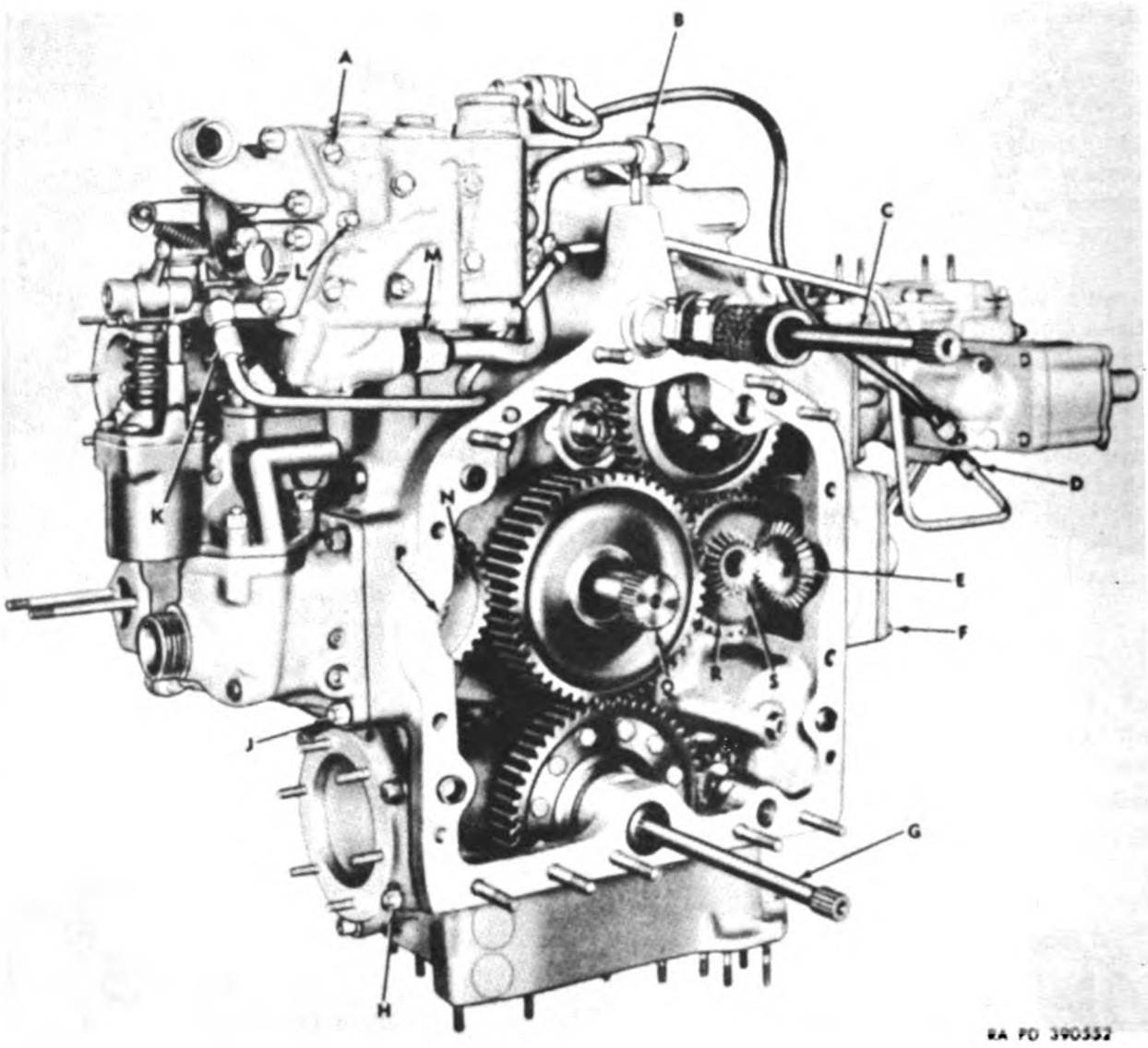



*Figure 47. Right camshaft and camshaft gear housing.*




A—5/16 x 2 15/32 hex-head bolt 7974076
B—¾-inch coupling nut (part of tube assembly 8733085)
C—Fan drive horizontal drive shaft 7346498
D—⅞-inch coupling nut (part of tube assembly 8733086)
E—Left camshaft drive idler driven gear assembly 8691460
F—⅜-inch hex self-locking nut { 503351 or 503383
G—Pressure oil pump drive shaft 7346505
H—⅜-inch hex self-locking nut { 503351 or 503383
J—⅜-inch hex self-locking nut { 503351 or 503383
K—⅞-inch coupling nut (part of tube assembly 8733086)
L—5/16-inch hex self-locking nut { 503345 or 503380
M—¾-inch coupling nut (part of tube assembly 8733085)
N—Right camshaft drive idler gear 7346547
P—Right camshaft drive idler bevel gear 7346544
Q—Accessory drive shaft 8691915
R—Left camshaft drive idler gear 7346547
S—Left camshaft drive idler bevel gear 7346544

*Figure 48. Rear of accessory case and disconnect points.*

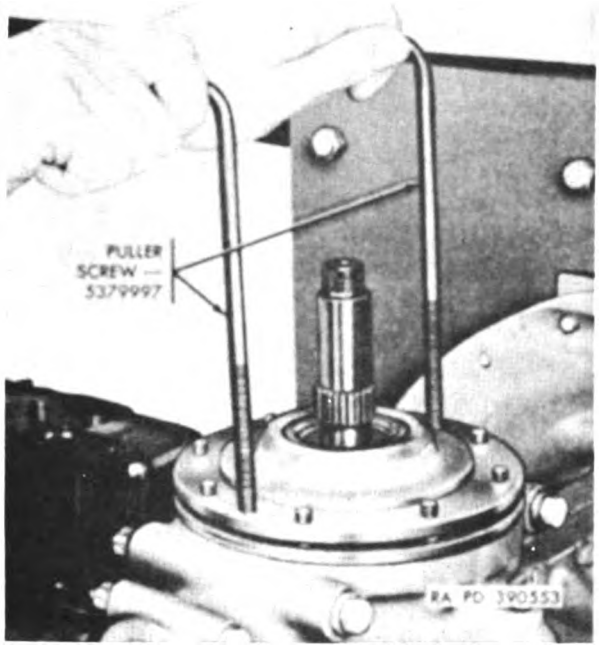



*Figure 49. Removing fan drive vertical drive shaft oil seal housing.*

curing fan drive vertical drive shaft oil seal housing to crankcase.

NOTE: On early model AOSI-895-5M engines, remove two slotted flat-head screws in addition to slotted hex nuts and washers removed in (1) above.

(2) Remove oil seal housing from crankcase with two puller screws 5379997 (fig. 49).

*b. Remove Fan Drive Vertical Drive Shaft Bearing Housing.* Remove fan drive vertical drive shaft bearing housing, with attached drive shaft and ball bearing, from crankcase with two puller screws 5379997 (fig. 50).

*c. Remove Fan Drive Gears.*

(1) Lift fan drive vertical drive shaft driven gear from the fan drive recess in top of crankcase. Slip fan drive vertical drive shaft drive gear from its bearing in crankcase.

(2) Unscrew fan drive horizontal drive shaft hose nipple from vertical drive shaft gear bearing. Remove and discard gasket.

(3) Remove cotter pin, slotted hex nut, and flat washer securing fan tower

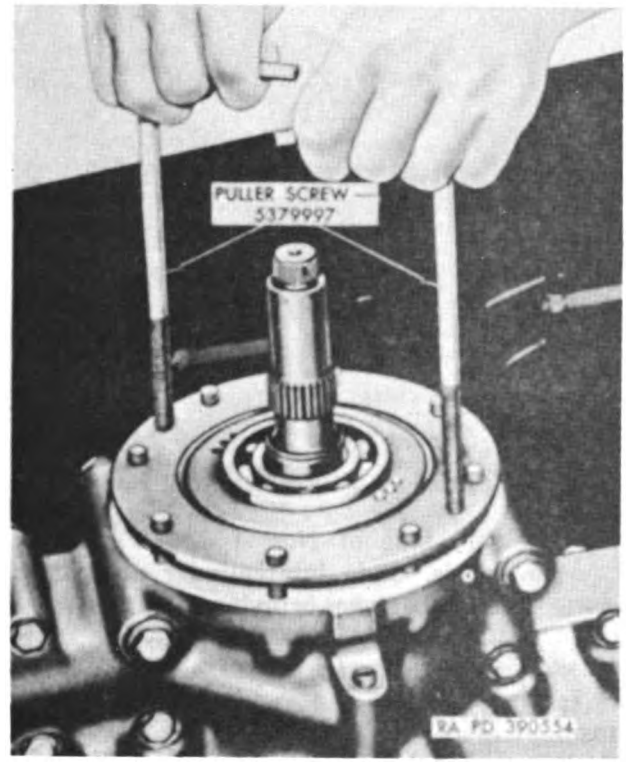



*Figure 50. Removing fan drive vertical drive shaft bearing housing.*

hole plug in fan drive recess and remove plug. Remove and discard gasket.

(4) Cut locking wire and remove hex-head bolt and flat copper washer securing fan drive vertical shaft drive gear bearing in crankcase.

NOTE: The fan drive vertical bearing and fan drive vertical shaft drive gear bearing cannot be removed at this time. They are removed after crankcase halves are separated (par. 75).

## 71. Removal of Cylinder Air Deflectors and Baffles

*a. Remove Cylinder Head Air Deflectors and Intercylinder Air Baffles.*

(1) Lift six cylinder head air deflectors (fig. 51) from cylinder heads.

(2) Remove four hex-head bolts and lock washers securing four intercylinder baffles (fig. 51) to flywheel side of Nos. 2 and 4 cylinder heads, and to acces-

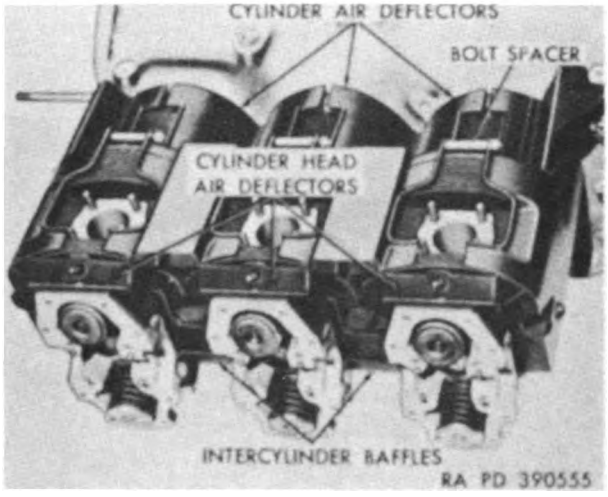



*Figure 51. Cylinder air deflectors and baffles—installed view.*

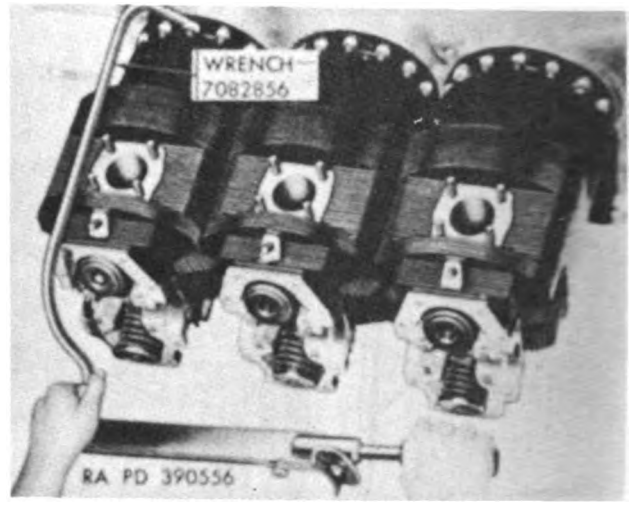



*Figure 52. Torquing cylinder holddown nuts.*

sory side of Nos. 1 and 3 cylinder heads. Slide intercylinder air baffles from between cylinder head fins.

*b. Remove Cylinder Air Deflectors.*

(1) Remove four hex-head bolts (E, fig. 36) and lock washers securing cylinder air deflectors to Nos. 1, 2, 5, and 6 cylinder heads.

(2) Detach and remove four air deflector springs (F, fig. 36).

(3) Remove four hex nuts and lock washers securing cylinder air deflector hooks and clamps to cylinders and remove hooks and clamps.

(4) Remove six cotter pins, slotted hex nuts, hex-head bolts, and spacers securing cylinder air deflectors together and remove deflectors.

## 72. Removal of Cylinders and Pistons

*a. Remove Cylinder Holddown Nuts.*

(1) *Remove stamped nuts and cotter pins.*

(*a*) Remove all hex stamped nuts from cylinder holddown hex nuts (H, fig. 42).

(*b*) Remove cotter pins from all extended washer hex nuts (K, fig. 42) on crankcase thru bolts.

(2) *Check torque of cylinder holddown nuts.*

(*a*) Using a torque wrench in combination with wrench 7082856 (fig. 52) on smaller hex holddown nuts, break nuts loose, checking torque required to loosen nuts.

(*b*) Torque required to break smaller nuts loose should not be less than 300 pound-inches. If torque required is less than 300 pound-inches, remove nut from stud and apply mica-base antiseize compound (Spec. MIL–A–13881 (ORD)) to stud. Install nut on stud and tighten to 350 pound-inches of torque. If nut cannot be tightened to 350 pound-inches of torque, stud is stretching and must be replaced (par. 252).

(*c*) Using a torque wrench in combination with wrench 7082008 (M, fig. 9) on larger extended washer nuts, break nuts loose, checking torque required to loosen nuts.

(*d*) Torque required to break larger nuts loose should not be less than 650 pound-inches. If torque is less, remove nut from crankcase thru bolt and apply mica-base antiseize compound (Spec. MIL–A–13881 (ORD)) to thru bolt. Install nut on thru bolt and tighten to 750 pound-inches of torque. If nut cannot be tightened to 750 pound-inches of torque, thru bolt is stretching and must be replaced.

(*e*) After loosening all nuts with torque wrench, remove all but two nuts

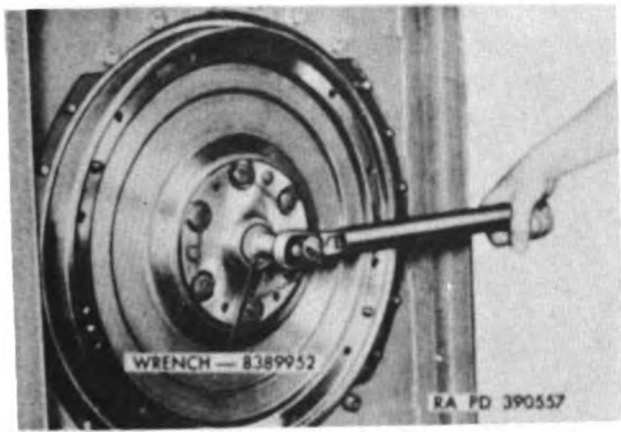



*Figure 53. Turning engine from flywheel end.*

from each cylinder. These nuts will hold cylinder in place until removed from crankcase (*b* below).

*b. Remove Cylinders.*

(1) Turn engine using wrench 8389952 (fig. 53) until piston in No. 1 cylinder is in top dead center position.

(2) Remove remaining two hex nuts securing No. 1 cylinder to crankcase.

(3) Loosen cylinder by jarring with the hands and remove by carefully pulling cylinder straight out until cylinder clears mounting studs. Hold in this position.

(4) Install connecting rod protectors 8390285 (fig. 54) on studs to support connecting rod.

NOTE: Protectors must be installed before removing cylinder from piston to prevent damage to cylinder mounting pads.

(5) Remove cylinder completely from piston, being careful not to damage piston, connecting rod, cylinder or cylinder mounting pad.

*c. Remove Pistons.*

(1) Support piston in one hand, slide out piston pin, and remove piston from connecting rod. If pin is difficult to remove due to carbon deposits, tap pin lightly with a wooden dowel or soft hammer.

(2) Install piston pin in piston to prevent loss or damage to pin.

(3) Check piston pin boss for piston identifying number. If no identifying

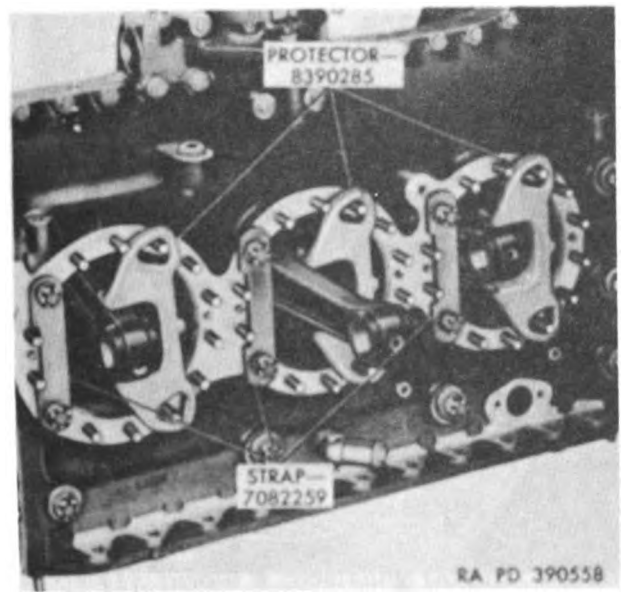



*Figure 54. Connecting rod protectors and thru bolt straps installed on crankcase.*

number is present, stamp number of cylinder, from which piston was removed, on piston pin boss to insure installation of piston in same cylinder during assembly.

NOTE: Pistons in Nos. 1 and 2 cylinders will be at top center at the same time. No. 2 cylinder can be removed without turning engine. Nos. 3 and 4 cylinders may be removed together. Nos. 5 and 6 cylinders can be removed together.

*d. Remove Remaining Cylinders and Pistons.*

(1) Turn engine (*b*(1) above) to bring next two pistons to top center. If crankshaft binds after removal of some cylinders, place strap 7082259 (T, fig. 10) under thru bolt nuts as shown in figure 54 and tighten nuts sufficiently to relieve binding.

(2) Repeat steps *a* through *c* above to remove remaining cylinders and pistons.

## 73. Removal of Flywheel

*a. Model AOSI–895–5 Engine.*

(1) *Remove transmission drive hub assembly.*

(*a*) Cut locking wire and remove six hex-head bolts (P, fig. 36) securing drive hub assembly and flywheel to crankshaft flange.

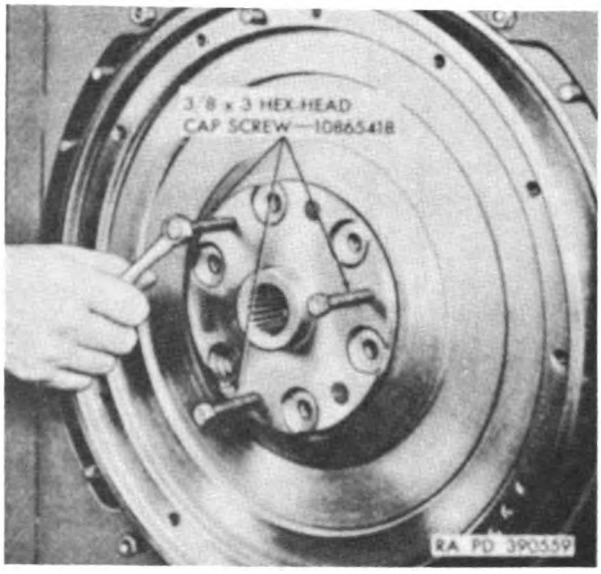



*Figure 55. Removing transmission drive hub assembly (model AOSI-895-5 engines only).*

(*b*) Remove transmission drive hub assembly using three ⅜–24 x 3 hex-head cap screws 10865418 (fig. 55).

(2) *Remove flywheel.*

(*a*) Cut the head from a 9/16 x 3 (or longer) hex-head bolt and screw bolt into uppermost mounting bolt hole in crankshaft flange. The bolt will act as a pilot to support flywheel when removed from dowel pins.

(*b*) Using three of the hex-head bolts removed in step (1)(*a*) above as jackscrews, pull the flywheel from the crankshaft dowel pins by screwing bolts into holes in flywheel as shown in figure 56.

(*c*) Pull flywheel as far as threads on bolts will allow. Remove bolts far enough to place 7/16-inch nuts, or other suitable blocks, between ends of bolts and crankshaft flange as shown in figure 56.

(*d*) Tighten bolts against nuts or blocks to complete removal of flywheel. Remove pilot bolt and place with tools.

*b. Model AOSI-895-5M Engine.*

(1) *Remove torsion damper assembly.*

(*a*) Remove 12 hex-head bolts securing flywheel torsion damper assembly (fig. 6) to flywheel.

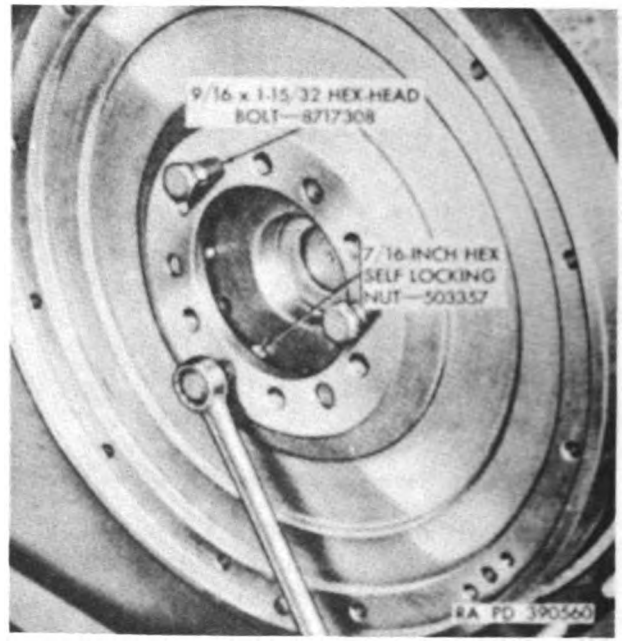



*Figure 56. Removing flywheel (model AOSI-895-5 engines only).*

(*b*) Remove flywheel cover plate using two puller screws 7083740 (fig. 57).

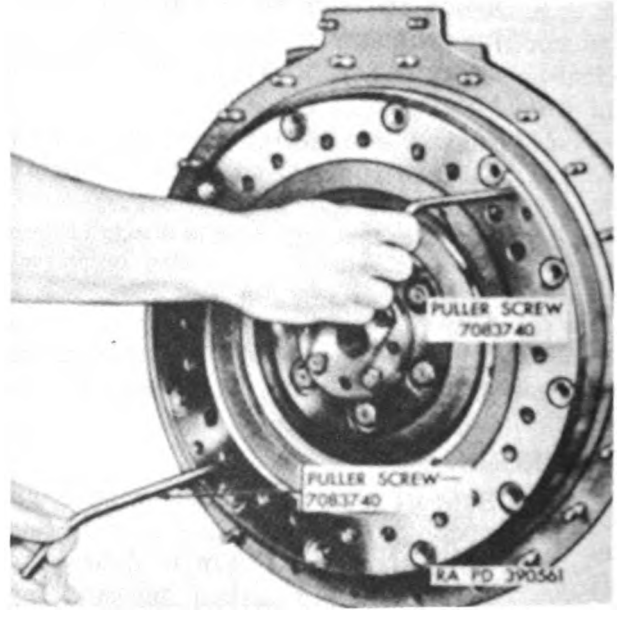



*Figure 57. Removing flywheel cover plate (model AOSI-895-5M engines only).*

(*c*) Remove damper ring, pressure plate, two friction disks, driven plate with drive hub and hub plate, spacer

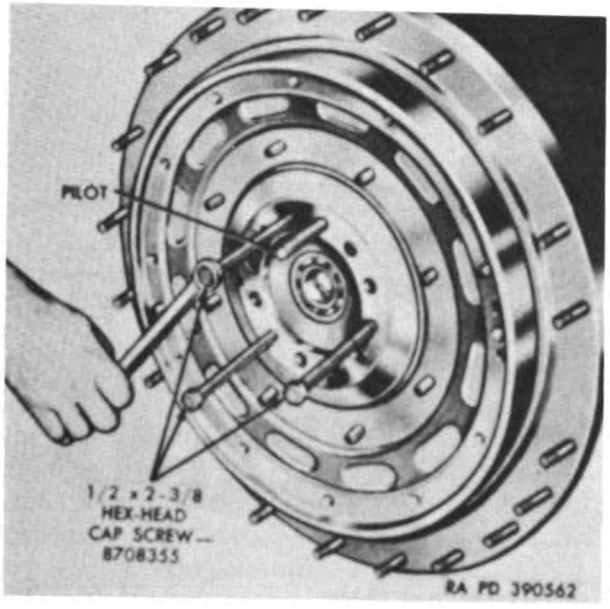



*Figure 58. Removing flywheel (model AOSI-895-5M engines only).*

plate, 12 springs, and 24 spring seats from recess in flywheel.

(2) *Remove flywheel.*

(*a*) Straighten corners of lock plates, securing six hex-head flywheel mounting bolts, away from bolts. Remove bolts and lock plates.

(*b*) Cut the head from a $\frac{9}{16}$ x 3 (or longer) hex-head bolt and screw bolt into uppermost mounting bolt hole in crankshaft flange as shown in figure 58. The bolt will act as a pilot to support flywheel when removed from dowel pins.

(*c*) Remove flywheel from crankshaft dowel pins using three hex-head screws 8708355 (fig. 58). Remove pilot bolt and place with tools.

## 74. Removal of Scavenger and Pressure Oil Pump Assembly

*a.* Rotate cradle assembly in overhaul stand so engine is resting on flywheel end as shown in figure 42.

*b.* Cut locking wire and remove two slotted hex nuts (M, fig. 42) securing scavenger pump pickup tube to crankcase.

*c.* Cut locking wire and remove hex-head bolt securing accessory case scavenger oil pump outlet tube and scavenger oil pump outlet tube to crankcase web.

*d.* Cut locking wire and remove four slotted hex nuts (J, fig. 42) securing scavenger and pressure oil pump to crankcase and remove pump with attached outlet and pickup tubes. Remove accessory case scavenger oil pump outlet tube from crankcase.

*e.* Rotate cradle assembly in overhaul stand to bring engine to horizontal position as shown in figure 22.

## 75. Separation of Crankcases and Removal of Crankshaft and Connecting Rods

*a. Remove Crankcase Assembly from Overhaul Stand.*

(1) Install a rope sling through the Nos. 3 and 4 cylinder openings in the crankcase and attach the sling to a hoist.

(2) Remove hex self-locking nuts and washers securing transmission mounting flange to overhaul stand adapter. Remove crankcase assembly from overhaul stand and place it on oil pan flange on suitable table or bench. Support crankcase assembly on wooden blocks to prevent damage to oil pan mounting surface or studs.

*b. Separate Crankcases and Remove Crankshaft and Connecting Rods.*

(1) Remove cotter pins and extended washer hex nuts from four thru bolts along lower portion of crankcase. Remove extended washer hex nuts and thru bolt straps, if installed, from cylinder mounting pads. Remove the 12 thru bolts.

(2) Remove three hex self-locking nuts, or hex stamped nuts and hex nuts, and plain washers from the special dowel bolts in the crankcase flange. Use soft brass drift to drive dowel bolts from crankcase flange.

NOTE: One dowel bolt is located at the accessory end of crankcase flange and two are located at the top and bottom of crankcase flange at the flywheel end.

(3) Cut locking wire and remove slotted hex nut and flat washer from stud in flywheel end of crankcase.

(4) Install four support legs 8708180 (fig.

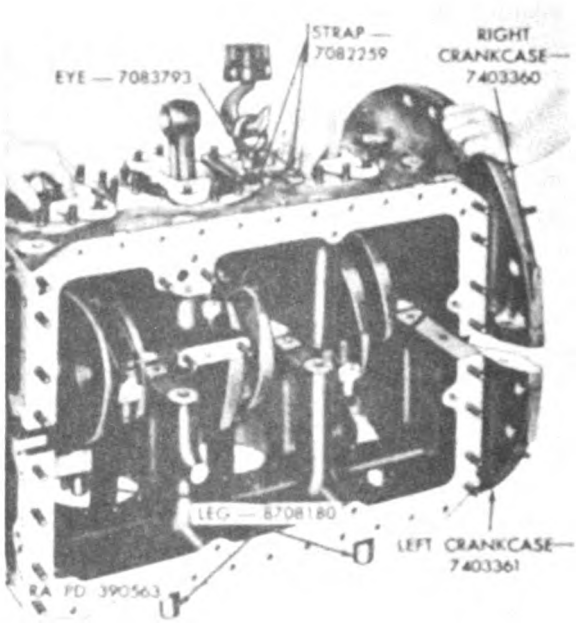



*Figure 59. Separating or joining left and right crankcases.*

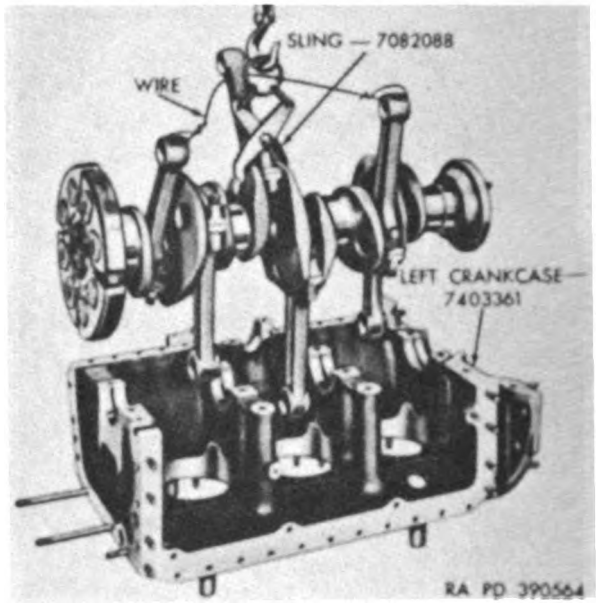



*Figure 60. Removing or installing crankshaft and connecting rods.*

59) on left crankcase; one leg on third stud above and one leg on third stud below dowel pin on accessory side of No. 2 cylinder mounting pad, and two legs on flywheel side of No. 6 cylinder mounting pad. With the aid of an assistant, roll crankcase assembly on left side so it is resting on the support legs, as shown in figure 59.

(5) Remove remaining crankcase flange and crankcase fan drive housing hex self-locking nuts or hex stamped nuts and hex nuts, plain washers, and bolts.

(6) Attach crankcase lifting eye 7083793 (fig. 59) to cylinder mounting studs over thru bolt straps on right crankcase with 7/16-inch hex nuts. Lift right crankcase half from left crankcase using a hoist as shown in figure 59. Set right crankcase half on wooden blocks. Remove hex nuts securing lifting eye to crankcase and remove eye and straps.

**CAUTION: Do not let connecting rods fall and damage machined flanged surfaces of left crankcase half.**

(7) Lift out fan drive vertical shaft drive gear bearing. Remove fan drive vertical shaft bearing from crankcase by tapping with a soft hammer.

(8) Wire connecting rods together in a vertical position and attach crankcase lifting sling 7082088 (fig. 60).

(9) Lift crankshaft and connecting rods from crankcase and place on wooden "V" blocks fastened to work bench so crankshaft rests on the two end main bearing journals.

(10) Remove oil seal, crankshaft main bearing halves, and main thrust bearing halves from crankcase halves. Check backs of bearing halves for location markings. If no markings are present, mark bearing location on bearing with grease pencil for possible reinstallation.

**CAUTION: Do not mark bearings with a metal instrument. This will mar surface of bearing and cause a misfit of bearing in crankcase.**

(11) Remove connecting rod protectors and support legs from crankcases and place crankcases on suitable wooden blocks so as not to damage machined surfaces.

# CHAPTER 6

# REBUILD OF ENGINE

## Section I. GENERAL CLEANING, INSPECTION, REPAIR, AND ASSEMBLY PROCEDURES

### 76. General

*a. Procedures.* The procedures for cleaning, inspection, repair, and assembly of the various parts and components which make up the engine subassemblies will be the same for a great percentage of the parts and components. To avoid repetition of instructions, the general procedures are detailed in paragraphs 77 through 80. Any cleaning, inspection, repair, and assembly procedures which are peculiar to a specific part or component are covered in the section or paragraph relating to that item.

*b. Early and Late Model Applications.* In the rebuild of the engines, numerous references are made to parts peculiar to early or late models. This is the result of engineering changes made during the manufacture of the engines. To establish the serial number of the engine at which a specific change became effective, refer to tables I and II, paragraphs 7 and 8.

### 77. Cleaning

*a. General.* The importance of cleaning operations must be thoroughly understood by ordnance maintenance personnel. Great care and conscientious effort are required in all cleaning operations. The presence of dirt or foreign substances is a constant threat to satisfactory engine operation and maintenance. The following should apply to all cleaning operations:

(1) Clean all parts before inspection, after repair, and before assembly.

(2) Hands should be keep free of any accumulation of grease, which can collect dust and grit.

(3) After cleaning, all parts should be protected from dust and dirt.

*b. Castings.*

(1) Clean the inner and outer surfaces of castings and all areas subject to oil lubrication with dry-cleaning solvent or mineral spirits paint thinner.

(2) Clean sludge and gum deposits from castings using a stiff brush.

(3) Blow out all tapped holes with compressed air and dry casting, after cleaning, with compressed air.

*c. Oil Passages.* Particular attention must be given to all oil passages in castings and machined parts. All oil passages must be free of obstructions.

(1) Clean passages with wire or probes to break up all sludge or gum deposits.

(2) Wash passages by flushing dry-cleaning solvent or mineral spirits paint thinner through them.

(3) Dry passages, after cleaning, by blowing them out with dry, compressed air.

*d. Oil Seals, Air Seals, Electrical Cables, and Flexible Hose.* Clean seals, cables, and flexible hose with soap and water.

**CAUTION: Do not allow dry-cleaning solvent or mineral spirits paint thinner to be in prolonged contact with seals, cables, and flexible hose. These cleaners cause leather, rubber, and synthetic materials to dry, rot, and lose pliability, making them unserviceable.**

*e. Ball and Roller Bearings.*

(1) Bearings require special attention in cleaning and oiling. After removing the surface dirt, and oil or grease, the bearings, except the sealed, permanently lubricated type, should be placed in hot oil (about 140° F) to loosen congealed oil and grease. After cleaning, the bearings should be coated with a film of lubricant and wrapped tightly in oiled or waxed paper until inspection and assembly of parts.

**CAUTION: Do not immerse sealed type ball bearings in dry-cleaning solv-**

**ent, mineral spirits paint thinner, or hot oil. Entrance of the cleaning agent will destroy the lubricants sealed in the bearing at time of manufacture. Loss of lubrication will result in ultimate failure of the bearing and possible severe damage to the engine. Clean sealed ball bearings by wiping the exterior surfaces with a clean cloth moistened in cleaning solvent. Compressed air must never be used in cleaning or drying of ball or roller bearings. Damage to bearings may result from spinning of bearing by air blast.**

(2) Refer to TM 37–265 for information on care and maintenance of bearings.

## 78. Inspection

*a. General.* The engines are precision-built and the repair and rebuild standards found in chapter 10 for the component parts have been fixed at extremely close tolerances. The following should apply to all inspection procedures:

(1) The latest inspection equipment (when available), methods, and procedures should be used to inspect the various components.

(2) Extreme care must be exercised in all phases of inspection. Repair and rebuild standards must be followed exactly.

*b. Castings.*

(1) Inspect all castings for cracks using a magnifying glass and a strong light. Check particularly the areas adjacent to studs, pipe plugs, Rosan or Heli-coil inserts, and in sharp corners and fillets.

(2) Inspect machined surfaces of castings for nicks, burrs, or raised metal. Mark damaged areas for repair.

(3) Check all mating flanges and mounting pads with a straight edge or surface plate for warpage. Inspect mating flanges and mounting pads for discoloration which may indicate persistent oil leakage.

(4) Inspect all pipe plug openings for stripped or damaged threads.

(5) Check all castings for conformance to repair and rebuild standards in chapter 10.

*c. Ball and Roller Bearings.* Refer to TM 37–265 for inspection of ball and roller bearings. Check all bearings for conformance to repair and rebuild standards in chapter 10.

*d. Studs.* Inspect all studs for stripped or damaged threads, bent or loose condition, or for any evidence of stretching.

*e. Gears.*

(1) Inspect all gears for cracks using magnaflux equipment, if available. If magnaflux equipment is not available, use a magnifying glass and a strong light.

(2) Inspect all gear teeth for wear, sharp fins, burrs, and galled or pitted surfaces.

NOTE: There are no established wear limits on gear teeth and splines. Good judgment is required to determine need for replacement.

(3) Inspect splines in hubs of gears for mutilation, wear, and for fit with splines on mating shafts. Mating splines must match without binding or looseness.

(4) Check all gears for conformance to repair and rebuild standards in chapter 10.

*f. Shafts.*

(1) Inspect all shafts for cracks using magnaflux equipment, if available. If magnaflux equipment is not available, use a magnifying glass and a strong light.

(2) Inspect all shafts for nicks, scratches, burs, or raised metal.

(3) Inspect splines on shafts for mutilation, wear, and for fit with splines of mating gears. Mating splines must match without binding or looseness.

(4) Check all shafts for conformance to repair and rebuild standards in chapter 10.

*g. Bushings, Liners, and Bushing-Type Bearings.*

(1) Check all bushings, liners, and bushing-type bearings for secure fit in casting or part and for evidence of

heating, which may be indicated by discoloration of bushing or bearing surface.

(2) Inspect bushings, liners, and bushing-type bearings for wear, burs, nicks, or out-of-round condition.

(3) Check for dirt in lubrication holes or grooves of bushings, liners, or bushing-type bearings. Holes and grooves must be clean and free from mutilation to insure proper lubrication.

(4) Inspect thrust faces of bushing-type bearings for wear and damage. Wear can be determined by assembling mating parts in their proper place and checking end play with a feeler gage inserted between the thrust faces.

(5) Check all bushings, liners, and bushing-type bearings for conformance to repair and rebuild standards in chapter 10.

*h. Oil Seals.* Metal encased oil seals are long-life parts and should not be removed if inspection indicates seals are in good condition.

(1) Inspect for damage to thin feather edge of oil seal which contacts rotating part.

(2) Inspect material of seal for softness and pliability.

*i. Rosan Inserts.*

(1) *Description.* To permit higher stresses on studs and bolts which are set in aluminum castings, it is a common practice to install inserts of a stronger metal into which the studs or bolts are threaded. Rosan inserts (fig. 61) are screwed into softer castings until they are slightly below the casting surface. A lock ring, broached to fit the splined end of the insert and coarse milled on the outer edge, is driven into the counterbore of the casting. The lock ring prevents any turning of the insert.

(2) *Inspection.* Inspect all Rosan inserts for secure fit in casting and for galled or stripped threads.

*j. Heli-coil Inserts.*

(1) *Description.* Heli-coil inserts are designed to perform the same function as Rosan inserts (*i*(1) above). Heli-coil inserts differ from Rosan inserts in that they are steel spiral coils having a right hand thread shaped-form ground, on the inside and outside of the coils. A bar or tang at the bottom end of the coil, which is engaged by an inserting tool, is used for threading the insert into the casting. Some inserts have a serrated tooth section at the top end of the coil to stake them in place in the castings.

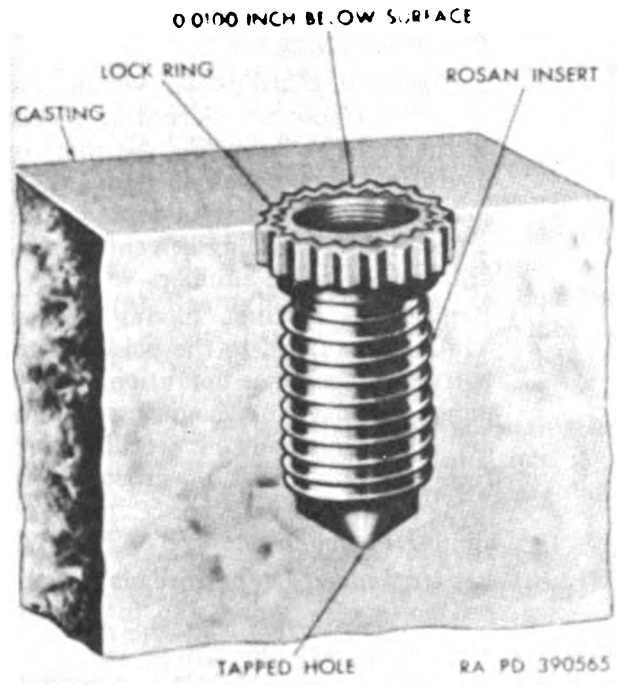



*Figure 61. Rosan insert and locking ring—cross-sectional view of installation.*

(2) *Inspection.* Inspect all Heli-coil inserts for secure fit in the casting and for galled or stripped threads.

## 79. Repair

*a. General.* Repair common parts and components of the engine as outlined below. After repair, clean all parts thoroughly to prevent chips from repair operations, or abrasives used in repair operations, from entering working parts of the engine.

*b. Castings.*

(1) Replace all cracked castings.

(2) Replace all castings which do not conform to tolerances specified in repair

and rebuild standards in paragraphs 304 through 335.

(3) Replace all castings on which machined surfaces are burred or nicked to the point of impairing assembly or operation. Repair minor damages to machined surfaces with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(4) Replace all castings having flanges which are warped to the point of impairing assembly or operation. Repair minor warpage of mounting flanges and mounting pads by working surface across a sheet of crocus cloth held tightly on a surface plate or similar flat surface.

(5) Repair damaged pipe threads in tapped holes with a used tap to prevent cutting threads oversize.

NOTE: Threads must be in good condition to prevent oil leakage.

*c. Ball and Roller Bearings.*

(1) Replace all galled, pitted, or mutilated bearings.

(2) Replace all bearings which do not conform to tolerances specified in repair and rebuild standards in paragraphs 304 through 335.

(3) Remove minor burs and scratches from bore and outside diameter of bearings with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

*d. Studs.* Replace all bent or loose studs or studs showing evidence of stretching. Repair minor thread damage with a thread chaser, if possible. Replace all studs having stripped or damaged threads. Remove and replace studs as outlined in (1) and (2) below.

(1) *Removal.* Using stud extractor, back studs out slowly to avoid heating and possible seizure. If studs are broken off too short to use stud extractor, drill stud and extract with a remover. Short studs may also be removed by welding a piece of bar stock or a nut to stud and removing with a wrench.

**CAUTION: Avoid damage to casting while using welding equipment. Refer to TM 9–2852 and Department of the Army Supply Manual ORD 3 SNL K–2 for welding instructions.**

(2) *Replacement.*

(*a*) If threads in tapped holes appear to be in good condition, retap with a used tap.

(*b*) If threads are stripped or damaged or if stud was removed for insecure fit, tap hole to next larger oversize (par. 252).

(*c*) Oversize studs are supplied for replacement as shown in table V, paragraph 252. Marking on coarse thread end of stud indicates whether it is standard or oversize. Check the marking as shown in figure 166 to be sure replacement is of proper size.

(*d*) Apply small amount of mica-base antiseize compound (Spec. MIL–A–13881 (ORD)) to coarse threads before installing stud.

NOTE: Threads on each end of the stud are a different size. The coarser thread end must enter the casting.

(*e*) Drive stud into hole slowly to prevent heating. Observe setting height as given in stud chart (table V, par. 252).

(*f*) If tapped holes in castings cannot be fitted with oversize studs, it may be possible to fit holes with Rosan inserts (*i* below) or Heli-coil inserts (par. 104) and install studs of the original size.

*e. Gears.*

(1) Replace all cracked gears.

(2) Replace all gears which do not conform to tolerances specified in repair and rebuild standards in paragraphs 304 through 335.

(3) Replace all gears having worn, galled, or pitted teeth. Remove sharp fins and burs from gear teeth with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

NOTE: There are no established wear limits for gear teeth. Good judgment is required to determine need for replacement.

(4) Replace all gears having splines which are mutilated to the point of impairing

assembly or operation. Replace all gears having splines which do not match properly with mating splines. Remove minor burs, nicks, and scratches from splines with a fine stone or crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

*f. Shafts.*

(1) Replace all cracked shafts.

(2) Replace all shafts which do not conform to tolerances specified in repair and rebuild standards in paragraphs 304 through 335.

(3) Replace all shafts which are nicked, scratched, or burred to the point of impairing assembly or operation. Remove minor nicks, scratches, burs, and raised metal with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(4) Replace all shafts having splines which are mutilated or worn to the point of impairing assembly or operation. Replace all shafts having splines which do not match properly with mating splines. Remove minor burs, nicks, and scratches from splines with a fine stone or crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

NOTE: There are no established wear limits for splines. Good judgment is required to determine need for replacement.

*g. Bushings, Liners, and Bushing-Type Bearings.* If bushings, liners, and bushing-type bearings are damaged or worn beyond specified limits, generally the parts in which they are installed must be replaced. Reference to (1) and (2) below will be made in the rebuild section for the particular part if replacement of bushings, liners, and bushing-type bearings is authorized.

(1) *Removal.* Remove bushings, liners, or bushing-type bearings by pressing out the part with a suitable arbor press or with the special tools provided. Drill or pull out bearing retaining pin, if present.

(2) *Installation.*

(*a*) Aline bushing, liner, or bushing-type bearing in casting and press into place with a suitable arbor press or with the special tools provided.

(*b*) Select proper drill size for bearing retaining pin to be installed. Drill through bearing and into casting to proper depth to receive retaining pin. Drive retaining pin into casting and bearing. Cut off any portion of pin remaining above bearing.

(*c*) Ream bushing, liner, or bushing-type bearing to size specified in repair and rebuild standards in paragraphs 304 through 335.

(*d*) Clean repaired part thoroughly before assembly or installation.

*h. Oil Seals.* Replace seal if edges are damaged or if material has deteriorated.

(1) *Removal.* Press or pry damaged oil seal from part, being careful not to damage bore of part.

(2) *Repair.* Replace part if bore for oil seal is burred or mutilated to a point which would prevent seal from making an oiltight unit. Remove slight nicks, burs, and scratches from bore with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(3) *Installation.* Install new oil seal in bore of part with proper oil seal replacer. Refer to tool list in table III, paragraph 12, for proper replacer.

*i. Rosan Inserts.* Replace all inserts which do not fit securely in castings or which have threads that are galled or stripped.

(1) *Removal.*

(*a*) Using a drill slightly smaller than inner serrations of lock ring (fig. 61) drill out center of insert to the depth of lock ring.

(*b*) Remove insert with "Ezy-out" extractor. Lock ring will be removed by insert.

(2) *Installation.*

(*a*) Using proper size Rosan insert wrench as shown in figure 62, turn insert into casting until it is slightly below the surface as shown in figure 61.

NOTE: Rosan insert wrenches (Y, and JJ through PP, fig. 10) are short, hexagonal pieces with internal splines to fit the inserts.

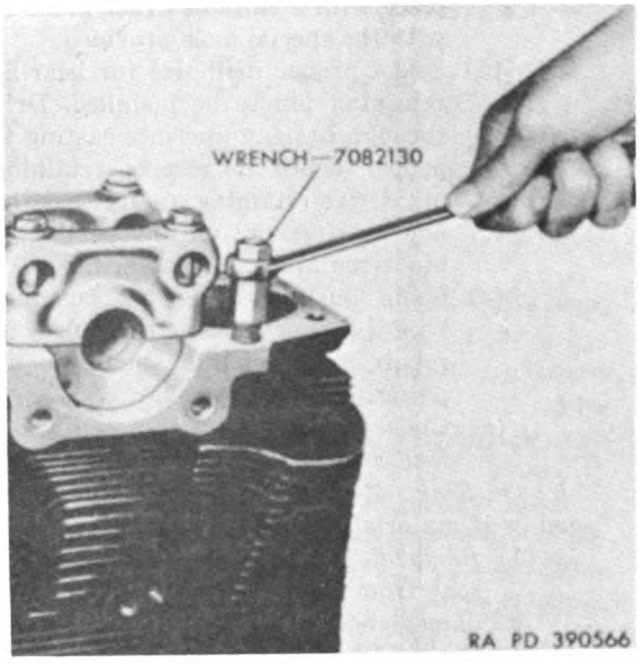



*Figure 62. Installing Rosan insert.*

(*b*) Place new lock ring in position, with teeth of lock ring matching teeth on insert as shown in figure 61.

(*c*) Using proper size Rosan insert driver as shown in figure 63, drive lock ring into place until it is slightly below surface of casting.

NOTE: Rosan insert drivers (AA through GG, fig. 10) are short round pieces with a smaller projection on one end to fit the lock ring.

*i. Heli-coil Inserts.* Replace all inserts which do not fit securely in casting or which have threads that are galled or stripped.

NOTE: Model AOSI–895–5 and AOSI–895–5M engines use Heli-coil inserts in only two locations; the spark plug openings and the shroud mounting bolt hole in the cylinder. Therefore, the removal and installation of these inserts are covered in the rebuild of cylinders section of this chapter.

## 80. Assembly

*a. General.* Extreme care must be exercised in all assembly operations to insure satisfactory engine performance. General rules for assembly are outlined in *b* below. Step-by-step procedures for assembling the various components are covered in the paragraph relating to the specific item.

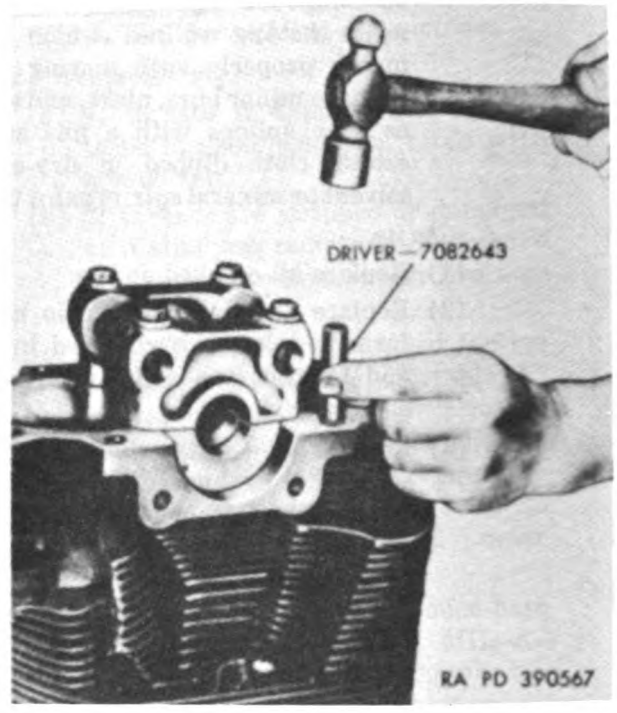



*Figure 63. Installing Rosan insert lock ring.*

*b. Rules.*

(1) Cleanliness is essential in all assembly operations. Dirt and dust, even in minute quantities, are abrasive. Parts must be cleaned as specified and kept clean.

(2) Lubricate all bearings, shafts, and all contact surfaces with engine oil (OE) to insure lubrication of parts when first put into operation.

(3) Replace all gaskets and packings removed in disassembly.

(4) Use plain washers under all nuts on aluminum surfaces.

(5) All bolts and nuts must be secured with lock nuts, lock washers, tab washers, locking wire, or cotter pins, depending on method of locking specified.

NOTE: A large portion of engine failures have been traced to the neglect of this precaution. Make certain all bolts and nuts are locked.

## Section II. REBUILD OF CRANKCASE

### 81. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 64.

*a. Right Crankcase Half.*

(1) *Remove pipe plugs.*

(*a*) Remove hex socket pipe plug (D) from oil passage in top of crankcase.

(*b*) Remove four hex-socket pipe plugs (E); one from oil passage in top of crankcase and three from oil pan mounting surface of crankcase.

(*c*) Remove hex-socket pipe plug (AR) from flywheel end of main oil passage in crankcase.

(*d*) Remove hex-socket pipe plug (AU) from main oil passage in lower side of crankcase. On early model AOSI–895–5M engines remove two of these plugs ((2) (*a*) below).

(2) *Remove elbows.*

(*a*) Remove elbow (AT) from lower side of crankcase. On early model AOSI–895–5M engines, remove pipe plug (AU) from this hole.

(*b*) Remove elbow (AV) from breather opening below No. 3 cylinder mounting pad.

(3) *Remove oil seal retaining plate.* Cut locking wire and remove two hex-head bolts (AF) securing crankshaft oil seal retaining plate (AE) to flywheel end of crankcase half and remove plate.

*b. Left Crankcase Half.*

(1) *Remove pipe plugs.*

(*a*) Remove five hex-socket pipe plugs (Z); two from oil passages in top of crankcase and three from oil pan mounting surface of crankcase.

(*b*) Remove hex-socket pipe plug (MM) from flywheel end of main oil passage in crankcase.

(*c*) Remove two hex-socket pipe plugs (JJ) and one hex-socket pipe plug (KK) from side openings of main oil passage.

(2) *Remove oil seal retaining plate.* Cut locking wire and remove two hex-head bolts (NN) securing crankshaft oil seal retaining plate (PP) to flywheel end of crankcase half and remove plate.

### 82. Cleaning

NOTE: The key letters shown below in parentheses refer to figure 64.

*a. Crankcase Castings.* Clean left and right crankcase castings (S and AS) as described in paragraph 77.

*b. Main Bearings.* Clean crankshaft main bearing (Q) and crankshaft main thrust bearing (RR) by washing bearings in dry-cleaning solvent or mineral spirits paint thinner. Use a stiff brush or wood rod to remove sludge or gum from bearing grooves and oil holes.

*c. Other Parts.* Clean all other parts as described in paragraph 77.

### 83. Inspection

NOTE: The key letters shown below in parentheses refer to figure 64 except where otherwise indicated.

*a. Crankcase Castings* (S and AS). Inspect castings, studs, and Rosan inserts as described in paragraph 78. Refer to paragraph 305 for repair and rebuild standards for the crankcases.

*b. Main Bearings* (Q and RR).

(1) Check bearing for signs of separation between bearing surface and underlying metal. Bearing should show no separation.

(2) Inspect bearing surface for scratches, raised metal at edges of scratches, loss of metal in grid pockets, and foreign matter imbedded in surface.

(3) Check identification markings. Do not destroy or mar markings; serviceable bearings must be installed in their original positions.

(4) Check bearing thickness for conformance to tolerances specified in repair and rebuild standards (par. 305). Bearing thickness is measured at center of bearing.

(5) Inspect thrust faces of crankshaft main thrust bearing (RR) as described in (1) and (2) above. Check thickness

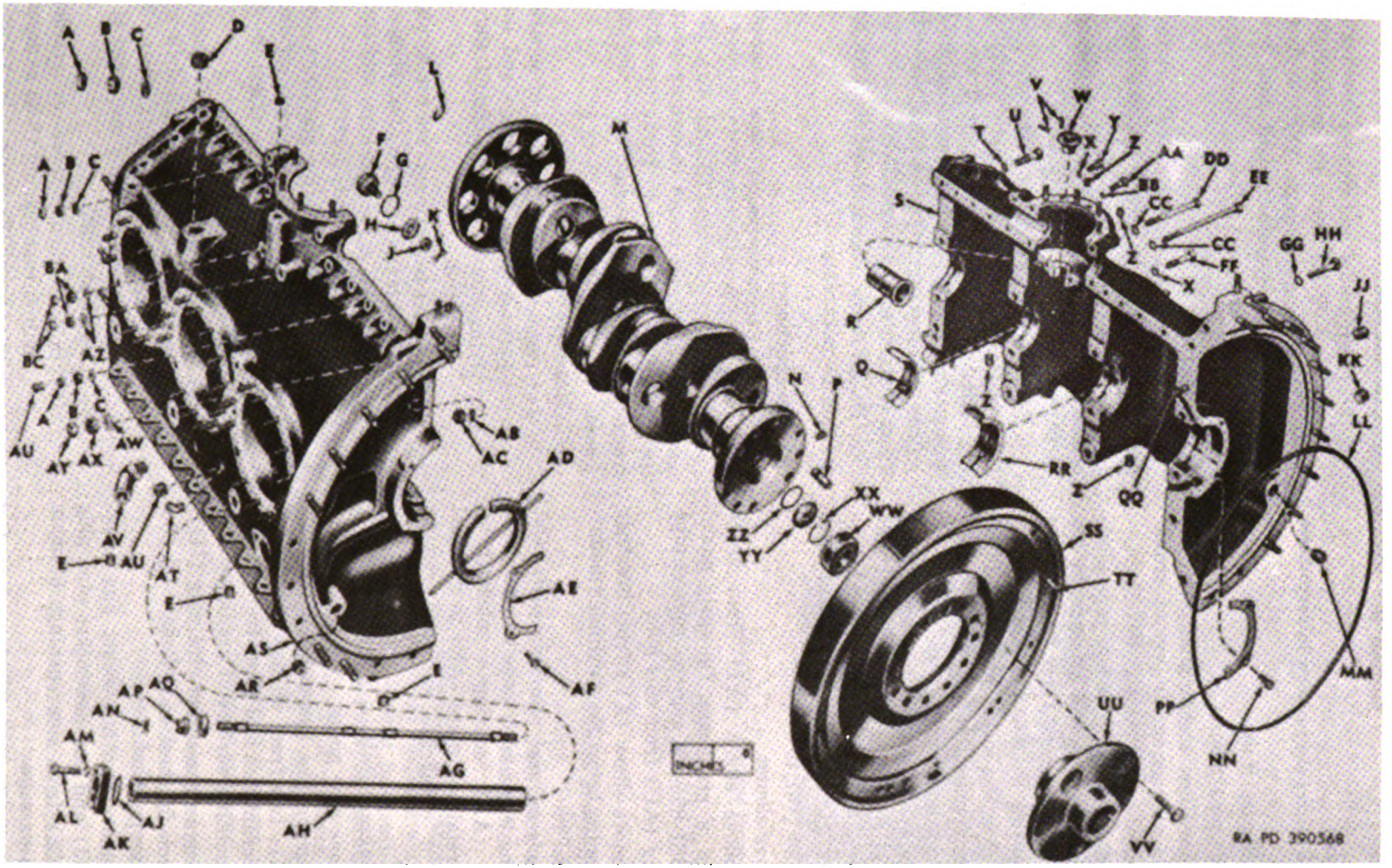



*Figure 64. Crankcase, crankshaft, and flywheel—exploded view.*

A—5/16-inch hex stamped nut 107822 (model AOSI–895–5M engine only)

B—{5/16-inch hex nut 225853 (model AOSI–895–5M engine only) / 5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)}

C—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

D—3/8-inch hex-socket pipe plug 7538997

E—1/8-inch hex socket pipe plug 7538990

F—Fan tower hole plug 7346653

G—Tower hole plug gasket 142756

H—13/32 id, 1 7/16 od, 3/16 thick flat washer 7346692

J—3/8-inch slotted hex nut 122961

K—1/16 x 3/4 cotter pin 121223

L—1 5/8-inch housing diameter retaining ring 593364

M—Crankshaft assembly 7346489

N—No. 10 x 3/16 hex-socket setscrew 140829

P—{0.6200 x 1 3/4 dowel pin 7403012 (model AOSI–895–5M engine only) / 5/8 x 1 3/8 dowel pin 8717297 (model AOSI–895–5 engine only)}

Q—Crankshaft main bearing 7376702

R—Fan drive vertical shaft drive gear bearing 7351189

S—Left crankcase 7403361

T—25/64 id, 5/8 od, 0.0640 thick plain washer 502204

U—3/16 x 2 7/8 hex-head bolt 7410047

V—3/16 x 3/8 dowel pin 7338668

W—Fan drive vertical shaft bearing 7351157

X—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

Y—3/16 x 3 7/32 hex-head bolt 8678914

Z—1/8-inch hex-socket pipe plug 7538990

AA—5/16 x 1 5/16 hex-head bolt 7375421

BB—21/64 id, 9/16 od, 1/16 thick flat copper washer 7375429

CC—25/64 id, 1 3/16 od, 1/8 thick flat washer 7767318

DD—3/8 x 5 13/32 hex-head bolt 8328914

EE—3/8 x 8 1/4 hex-head bolt 8717393

FF—5/16 x 2 11/32 hex-head bolt 7376936

GG—33/64 id, 7/8 od, 1/16 thick flat washer 502268

HH—7/16 x 2 7/16 hex-head bolt 7410053

JJ—3/8-inch hex-socket pipe plug 7767336

KK—1/2-inch hex-socket pipe plug 7767337

LL—18 1/2-inch id "O" ring packing 7723892

MM—1/2-inch hex-socket pipe plug 7767337

NN—1/4 x 13/32 hex-head bolt 583758

PP—Oil seal retaining plate 7744600

QQ—5/16 x 1 9/16 stud 7403070

RR—Crankshaft main thrust bearing 7376703

SS—{Flywheel assembly 7521190 (model AOSI–895–5M engine only) / Flywheel assembly 8717296 (model AOSI–895–5 engine only)}

TT—0.4400 x 1 1/4 dowel pin 7744624

UU—Transmission drive hub assembly 8717314 (model AOSI–895–5 engine only)

VV—9/16 x 1 13/32 hex-head bolt 8717308

WW—Ball bearing 700080 (model AOSI–895–5M engine only)

XX—1 3/8-inch housing diameter retaining ring 593367

YY—Crankshaft oil plug 7744891

ZZ—1 3/8-inch id "O" ring packing 501234

AB—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

AC—3/16-inch slotted hex nut 122942

AD—Oil seal with retaining spring 7744599

AE—Oil seal retaining plate 7744600

AF—1/4 x 15/32 hex-head bolt 583758

AG—Crankcase thru bolt 7372684

AH—Intake manifold balance pipe 7348816

AJ—1 1/4-inch id "O" ring packing 501232

AK—Balance pipe flange 7348815

AL—5/16 x 1 1/8 hex-head bolt 8365671

AM—5/16-inch lock washer 120214

AN—3/32 x 1 cotter pin 121224

AP—9/16-inch extended washer hex nut 7338679

AQ—Thru bolt spacer 7372689

AR—1/2-inch hex-socket pipe plug 7767337

AS—Right crankcase 7403360

AT—Elbow 7410042

AU—3/8-inch hex-socket pipe plug 7767336

AV—Elbow 7410043

AW—21/64 id, 3/4 od, 0.0650 thick plain washer 7725882

AX—{7/16-inch hex nut 7767432 (model AOSI–895–5M engine only) / 7/16-inch hex self-locking nut 503357 or 503386 (model AOSI–895–5 engine only)}

AY—7/16-inch hex stamped nut 107824 (model AOSI–895–5M engine only)

AZ—25/64 id, 1 3/16 od, 1/8 thick flat washer 7767318

BA—{3/8-inch hex nut 225854 (model AOSI–895–5M engine only) / 3/8-inch hex self-locking nut 503351 or 503383 (model AOSI–895–5 engine only)}

BC—3/8-inch hex stamped nut 107823 (model AOSI–895–5M engine only)

*Figure 64—Continued.*

of thrust faces for conformance to tolerances specified in repair and rebuild standards (par. 305).

(6) Pinch check and bore check main bearings as described in (*a*) through (*e*) below.

(*a*) Coat steel backs of all bearings evenly with a thin layer of Prussian blue paste. Install crankshaft main bearings (Q) and crankshaft main thrust bearings (RR) in original positions in crankcases.

(*b*) Install four support legs 8708180 (K, fig. 9) on left crankcase as described in paragraph 75 and set crankcase on support legs.

(*c*) Attach crankcase lifting eye 7083793 (X, fig. 10) over straps 7082259 (T, fig. 10) on right crankcase as described in paragraph 75.

(*d*) Lift right crankcase with hoist and install on left crankcase. Remove hex self-locking nuts and remove lifting eye. Install six crankcase through bolts (AG) through crankcases, but not through cylinder mounting pads. Secure bolts with twelve $\frac{9}{16}$-inch extended washer hex nuts (AP) and through bolt spacers (AQ).

(*e*) With the aid of an assistant, roll crankcase assembly to rest on oil pan mounting surface and supported on wooden blocks. Remove support legs. Install six crankcase through bolts through cylinder mounting pads. Install through bolt straps 7082259 (T, fig. 10) over bolts and secure with twelve $\frac{9}{16}$-inch extended washer nuts (AP).

(*f*) Using a torque wrench, tighten center through bolt nuts first and then alternately tighten nuts to the right and left of center until all nuts have been tightened. Tighten all nuts first to 300, then to 600, and finally to 750 pound-inches of torque.

(*g*) Check main bearing bores for conformance to tolerances specified in repair and rebuild standards (par. 305).

(*h*) Check clearance between crankshaft main thrust bearing (RR) and crankcase web for conformance to tolerances specified in repair and rebuild standards (par. 305).

(*i*) Check bores for fan drive vertical shaft drive gear bearing (R) and fan drive vertical shaft bearing (W) for conformance to tolerances specified in repair and rebuild standards (par. 305).

(*j*) Remove 12 extended washer hex nuts and straps securing cylinder mounting pad through bolts. Remove through bolts. Attach support legs to left crankcase and, with the aid of an assistant, roll crankcase assembly on left side so it is resting on support legs. Remove 12 extended washer hex nuts and spacers securing remaining crankcase through bolts and remove through bolts.

(*k*) Attach crankcase lifting eye 7083793 as described in paragraph 75. Lift right crankcase from left crankcase and set right crankcase on blocks. Remove lifting eye and straps. Set left crankcase on blocks and remove support legs.

(*l*) Remove main bearings and check contact surface as shown by Prussian blue paste transfer. Bearings must make 75 percent contact with crankcase bores or they must be replaced.

*c. Fan Drive Shaft Bearings.* Check outside and inside diameters of fan drive vertical shaft drive gear bearing (R) and fan drive vertical shaft bearing (W) for conformance to tolerances specified in repair and rebuild standards (par. 305).

*d. Hex-Socket Pipe Plugs* (D, E, Z, JJ, KK, MM, AR, and AU). Check pipe plugs for stripped or damaged threads or mutilated socket heads.

*e. Elbows* (AT and AV). Check elbows for stripped threads or damaged hose connection ends.

*f. Oil Seal Retaining Plates* (PP and AE). Check retaining plates for cracked, broken, or bent condition.

## 84. Repair

NOTE: The key letters shown below in parentheses refer to figure 64.

*a. Crankcase Castings* (S and AS).

(1) Repair or replace damaged crankcase castings as described in paragraph 79*b*. If one crankcase half needs replacing, both must be replaced.

(2) Repair or replace damaged studs as described in paragraph 78.

(3) Replace defective Rosan inserts as described in paragraph 78.

*b. Main Bearings* (Q and RR).

(1) Replace all bearings showing separation between bearing surface and underlying metal.

(2) Replace all bearings having scratches destroying more than five percent of the bearing face, all bearings showing raised metal at scratches, all bearings having more than 25 percent loss of metal from grid pockets, and all bearings having a concentration of imbedded foreign matter of more than five percent of the surface.

(3) Replace all bearings which do not conform to tolerances specified in repair and rebuild standards (pars. 305 and 306).

(4) Replace all bearings which do not make 75 percent contact with crankcase bores.

*c. Fan Drive Shaft Bearings* (R and W). Replace all fan drive shaft bearings which do not conform to tolerances specified in repair and rebuild standards (par. 305).

*d. Hex-Socket Pipe Plugs* (D, E, Z, JJ, KK, MM, AR, and AU). Replace all damaged pipe plugs.

*e. Elbows* (AT and AV). Replace all damaged elbows.

*f. Oil Seal Retaining Plates* (PP and AE). Replace all cracked, broken, or bent retaining plates.

## 85. Assembly

NOTE: The key letters shown below in parentheses refer to figure 64.

*a. Left Crankcase Half.*

(1) *Install oil seal retaining plate.* Oil seal retaining plate will be installed after left and right crankcase halves are joined (par. 255).

(2) *Install pipe plugs.* Coat threads of all pipe plugs with gasket forming compound.

(*a*) Install five ⅛-inch hex-socket pipe plugs (Z); two in oil passages in top of crankcase and three in openings in oil pan mounting surface of crankcase. Tighten plugs securely.

(*b*) ½-inch hex-socket pipe plug (MM) in flywheel end of main oil passage in crankcase. Tighten plug securely.

(*c*) Install two ⅜-inch hex-socket pipe plugs (JJ) and one ½-inch hex-socket pipe plug (KK) in side openings of main oil passage. Tighten plugs securely.

*b. Right Crankcase Half.*

(1) *Install oil seal retaining plate.* Refer to *a*(1) above.

(2) *Install elbows.* Coat threads of elbows with gasket forming compound.

(*a*) Install elbow (AV) in breather opening below No. 3 cylinder mounting pad.

(*b*) Install elbow (AT) in governor oil supply opening of main oil passage. On early model AOSI–895–5M engines install ⅜-inch hex-socket pipe plug (AU) in this opening.

(3) *Install pipe plugs.* Coat threads of all pipe plugs with gasket forming compound.

(*a*) Install four ⅛-inch hex-socket pipe plugs (E); one in oil passage in top of crankcase and three in openings in oil pan mounting surface of crankcase. Tighten plugs securely.

(*b*) Install ½-inch hex-socket pipe plug (AR) in flywheel end of main oil passage in crankcase. Tighten plug securely.

(*c*) Install ¾-inch hex-socket pipe plug (D) in oil passage in top of crankcase. Tighten plug securely.

(*d*) Install ⅜-inch hex-socket pipe plug (AU) in main oil passage in lower side of crankcase.

## Section III. REBUILD OF CRANKSHAFT, CONNECTING RODS, AND FLYWHEEL GROUP

### 86. Disassembly

*a. Remove Crankshaft Oil Seal.* Remove spring from recess in crankcase side of oil seal (AD, fig. 64). Disengage ends of retaining spring, remove spring from crankshaft, and discard spring. Remove and discard oil seal.

*b. Remove Connecting Rods* (fig. 65). Remove all six connecting rods as described in (1) through (4) below.

(1) Remove two cotter pins (F–5) and two slotted hex nuts (F–4) from two connecting rod bolts (F–2).

(2) Tap connecting rod cap (F–3–b) lightly with soft hammer to loosen. Remove cap and bolts.

(3) Remove connecting rod (F–3–a) and bearings (E) from crankshaft. Use care in handling bearings as they are easily damaged.

(4) Connecting rod (F–3–a) and connecting rod cap (F–3–b) are a matched assembly and must remain together. Look for rod, cap, and bearing location markings. If number is not legible, mark cylinder number on rod and cap with steel stamp; mark cylinder number on bearings with grease pencil.

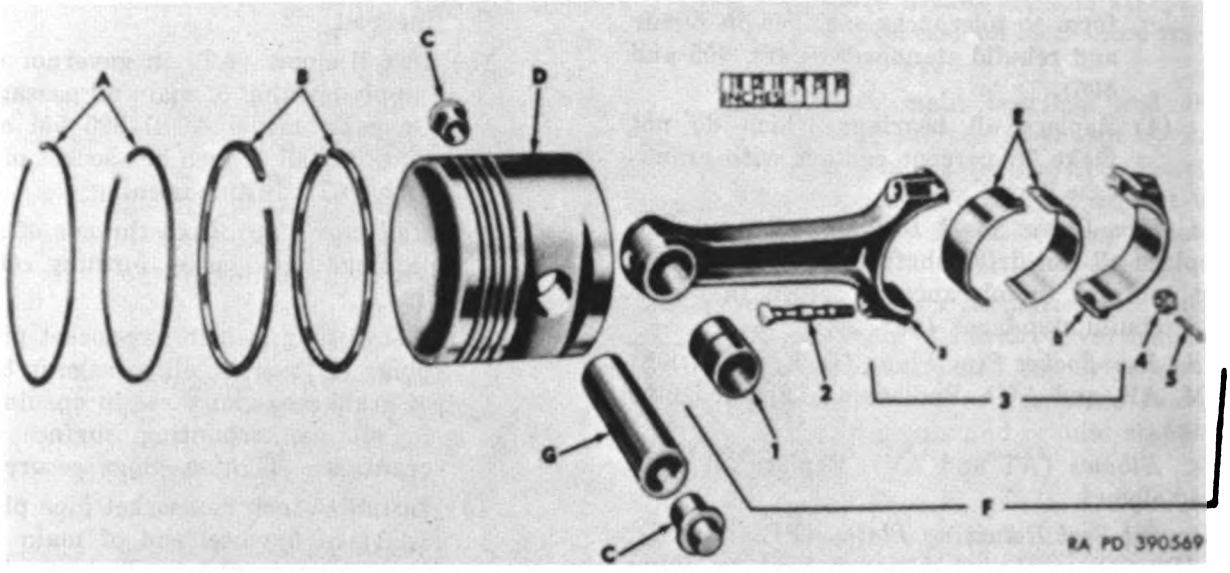
(5) Do not remove piston pin bushing-type bearing (F–1) from connecting rod unless inspection (par. 88) indicates replacement is necessary. Refer to paragraph 79 for removal of bushing.

*c. Remove Vibration Damper Counterweights.*

NOTE: The key letters shown below in parentheses refer to figure 67 except where otherwise indicated.

(1) Cut locking wire and remove four hex-head bolts (K) securing counterweight stop (L) to damper hub (C) and remove stop.

(2) Remove cotter pins (J) from four counterweight female pins (H) securing damper counterweights (D) to hub.




A–Compression ring 7403135
B–Oil control ring 8365689
C–Piston pin plug 7767528
D–Piston 7403340
E–Connecting rod bearing 7767524
F–Connecting rod assembly 7767520
1–Piston pin bushing-type bearing 7767525
2–$^{9}/_{16}$ x $3^{21}/_{32}$ connecting rod bolt 7767521
3–Rod, w/cap 7403005
a–rod 7403006
b–cap 74033007
4–$^{9}/_{16}$-inch slotted hex nut 7767522
5–$^{3}/_{32}$ x $^{7}/_{8}$ cotter pin 108629
G–Piston pin 7767527

*Figure 65. Piston, rings, connecting rod, and bearings—exploded view.*

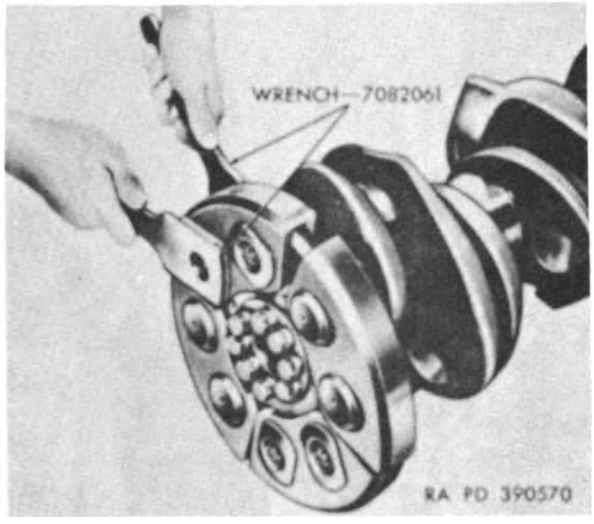



*Figure 66. Removing or installing vibration damper counterweight pins.*

(3) Using two wrenches 7082061 (fig. 66), unscrew four counterweight male pins (F). Remove four male pins, female pins, and counterweight pin bushings (G) from counterweights and hub. Slide two counterweights from hub.

(4) Center holes in two remaining counterweights (B) with mating holes in damper hub (C) and remove counterweight pins (A). Slide counterweights from hub.

NOTE: Crankshaft damper hub (C) is permanently assembled to crankshaft, and damper hub bolts are not to be removed.

(5) Remove internal retaining ring (L, fig. 64) from splines in accessory end of crankshaft.

*d. Remove Transmission Drive Shaft Pilot Ball Bearing and Crankshaft Oil Plug* (fig. 64).

(1) On model AOSI–895–5M engines only, pull transmission drive shaft pilot ball bearing (WW) from bore of flywheel mounting flange of crankshaft with suitable bearing puller.

(2) Remove internal retaining ring (XX) securing crankshaft oil plug (YY) in bore of crankshaft. Remove oil plug and remove and discard "O" ring packing (ZZ).

*e. Remove Crankshaft Dowel Pins.* Do not remove crankshaft dowel pins (P, fig. 64) unless inspection (par. 88) indicates replacement is necessary. To remove dowel pins, remove hex-socket setscrew (N, fig. 64) securing dowel pin to crankshaft flange and drive pin from flange.

*f. Disassemble Flywheel Torsion Damper Assembly (Model AOSI–895–5M Engine Only)* (fig. 68).

(1) Cut locking wire and remove six hex-head bolts (A) securing damper hub (B) and damper hub plate (H) to damper driven plate (G).

(2) Remove damper hub and hub plate from driven plate.

(3) Do not remove headless straight pins (dowel pins) (Q) from damper hub unless inspection (par. 88) indicates replacement is necessary. To remove pins from hub, drive out pins with a suitable drift.

## 87. Cleaning

Clean connecting rod bearings (E, fig. 65) in the same manner described for main bearings in paragraph 83. Clean other parts as described in paragraph 77.

## 88. Inspection

*a. Connecting Rods and Bearings.*

NOTE: The key letters shown below in parentheses refer to figure 65.

(1) *Connecting rod bolts* (F–2).

(*a*) Check bolts for snug fit when assembled in connecting rod.

(*b*) Inspect threads on bolts for stripping or crossing.

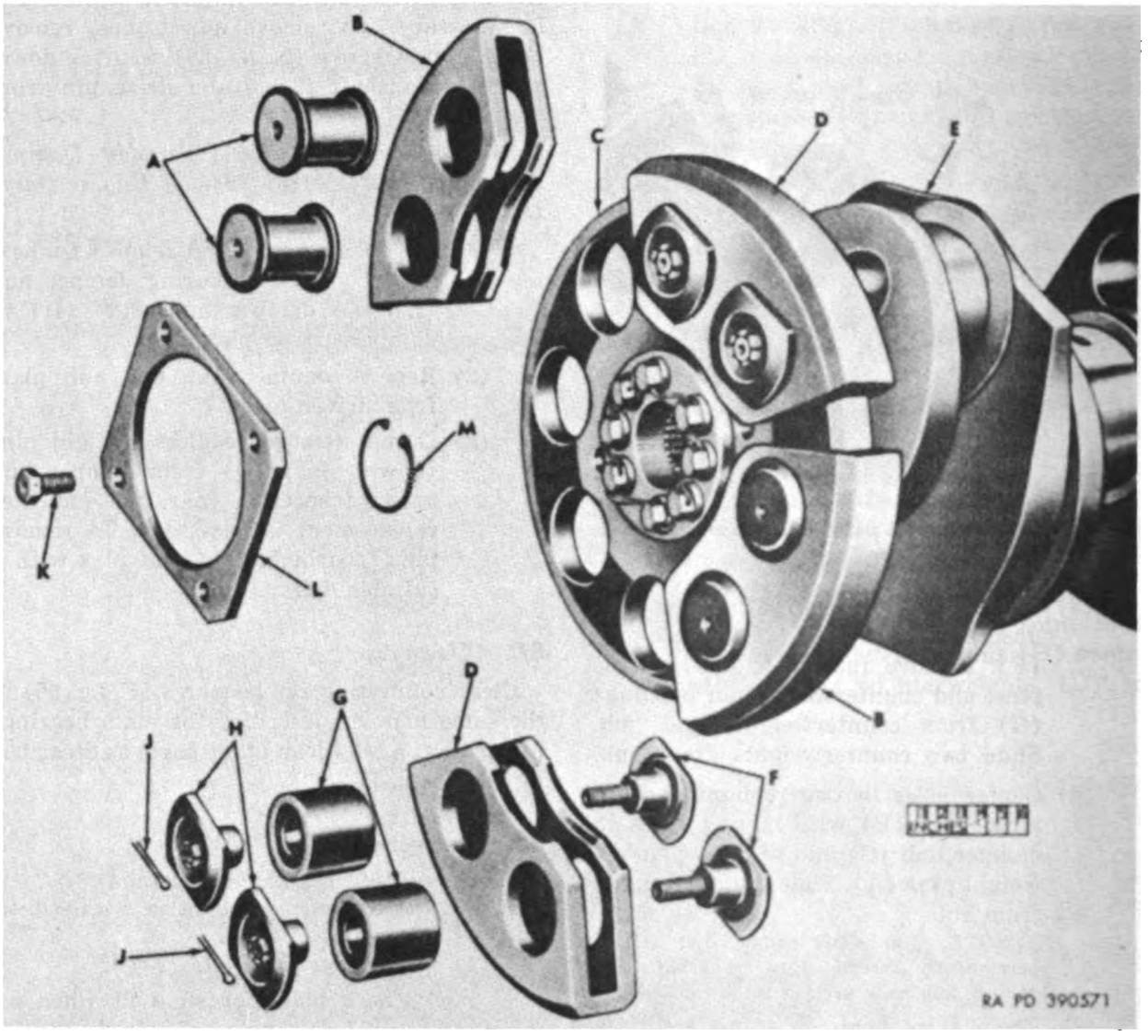
(*c*) Check pilot diameter in center of bolts for galling and for conformance to tolerances specified in repair and rebuild standards (par. 306).

(*d*) Inspect bolts for cracks or scratches and for any evidence of stretching.

(2) *Connecting rod bearings* (E). Inspect bearings in the same manner described for main bearings (par. 83).

(3) *Connecting rod with cap* (F–3).

(*a*) Check rods for conformance to tolerances specified in repair and rebuild standards (par. 306).




A—Counterweight pin 7744596
B—Damper counterweight 7521267
C—Damper hub 7439701
D—Damper counterweight 7521267
E—Crankshaft 7403432
F—Counterweight male pin 7372696
G—Counterweight pin bushing 7346493
H—Counterweight female pin 7372697
J—3/32 x 1 cotter pin 121224
K—3/8 x 5 1/64 hex-head bolt 583741
L—Counterweight stop 7346614
M—1 5/8-inch housing diameter retaining ring 593364

*Figure 67. Crankshaft vibration damper counterweights and hub—exploded view.*

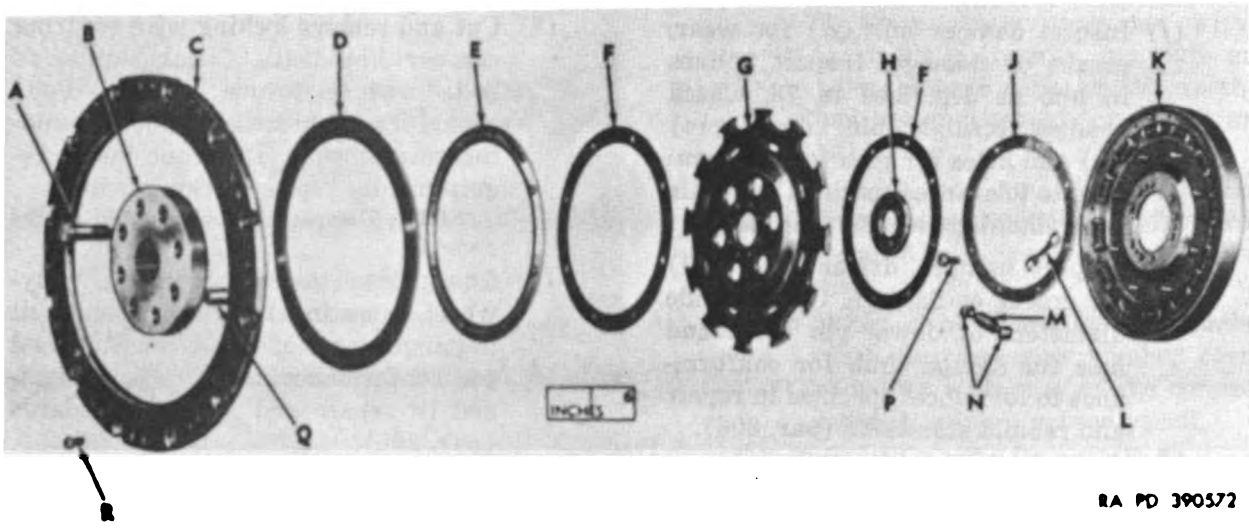
(*b*) Check rods for cracks and for twisted or bent condition. Use standard tool in checking rods for twisted or bent condition.

(*c*) Inspect bearing bore and bore for piston pin bushing of rod for pitting, galling, or scoring.

(*d*) Inspect cap for cracks. Check bearing bore of cap for pitting, galling, or scoring. Check cap for conformance to tolerances specified in repair and rebuild standards (par. 306).

(4) *Piston pin bushing-type bearing* (F–1).

(*a*) Check bearing for conformance to tolerances specified in repair and rebuild standards (par. 306).




A—½ x 1⅜ hex-head bolt 7372614
B—Damper hub 7403628
C—Flywheel cover plate 7744788
D—Pressure plate loading ring 7744785
E—Damper pressure plate 7744736
F—Damper friction disk 7744786
G—Damper driven plate 7744787
H—Damper hub plate 7744633
J—Damper spacing plate 7744784
K—Flywheel assembly 7521190
L—Flywheel mounting bolt lock 7744783
M—Damper drive spring 7744634
N—Drive spring seat 7744635
P—9/16 x 1⅜ hex-head bolt 7744627
Q—½ x 1 headless straight pin 7767363
R—⅜ x ¾ hex-head self-locking bolt 455244

*Figure 68. Flywheel and torsion damper assembly (model AOSI–895–5M engine only)—exploded view.*

(*b*) Inspect surfaces of bearing for cracks, galling, pitting, or scoring.

*b. Flywheel Group.*

(1) *Model AOSI–895–5 engine.*

(*a*) Check fit of crankshaft dowel pins (P, fig. 64) in flywheel dowel pin holes for conformance to tolerances specified in repair and rebuild standards (par. 306). Check inside diameter of dowel pin holes for conformance to tolerances specified in repair and rebuild standards (par. 306).

(*b*) Check flywheel (SS, fig. 64) for conformance to tolerances specified in repair and rebuild standards (par. 306).

(*c*) Inspect flywheel for wear, cracks, burs, or other damage.

(*d*) Check transmission drive hub assembly (UU, fig. 64) for conformance to tolerances specified in repair and rebuild standards (par. 306).

(*e*) Inspect hub assembly for wear, cracks, burs, or other damage. Inspect splines in hub as described in paragraph 78.

(2) *Model AOSI–895–5M engine.*

NOTE: The key letters shown below in parentheses refer to figure 68 except where otherwise indicated.

(*a*) Inspect holes and fit of dowel pins (P, fig. 64) in flywheel as described in (1) (*a*) above.

(*b*) Inspect flywheel assembly (K) as described in (1) (*b*) and (*c*) above. Check damper drive spring (M) and drive spring seats (N) for snug fit in recesses in flywheel.

(*c*) Inspect drive springs for cracks or breaks and for conformance to limits specified in repair and rebuild standards (par. 306).

(*d*) Inspect damper friction disks (F) for wear, cracks, or deterioration.

(*e*) Inspect damper pressure plate (E), damper spacing plate (J), and pressure plate loading ring (D) for wear, cracks, or distortion.

(*f*) Inspect damper hub (B) for wear, cracks or damage. Inspect splines in hub as described in 78. Check headless straight pin (dowel pin) (Q) and holes for pins for conformance to tolerances specified in repair and rebuild standards (par. 306).

(*g*) Inspect damper driven plate (G) for cracks or damage. Check inside diameters of dowel pin holes and hole for damper hub for conformance to tolerances specified in repair and rebuild standards (par. 306).

*c. Crankshaft* (M, fig. 64).

(1) Inspect crankshaft for cracks with magnaflux equipment, if available. If magnaflux equipment is not available, use a magnifying glass and a strong light. Pay particular attention to areas around crankshaft oil holes and fillets adjacent to the checks.

(2) Inspect connecting rod slots in crankshaft for evidence of connecting rods rubbing or touching crankshaft during operation.

(3) Check diameters of main bearing and connecting rod journals for conformance to tolerances specified in repair and rebuild standards (par. 306). Check run-out of crankshaft by supporting end journals in "V" blocks and checking center journals with dial indicator.

(4) Inspect journals for nicks, burs, grooves, scratches, galling, scuffing, or discoloration.

(5) Inspect bores for counterweight pins in crankshaft vibration damper hub (C, fig. 67) for cracks, scoring, or out-of-round conditions. Check bores for conformance to tolerances specified in repair and rebuild standards (par. 306).

(6) Check for any evidence of hub movement on splined shaft or on dowel pins.

(7) Inspect splines for accessory drive shaft in hub as described in paragraph 78.

(8) Cut and remove locking wire securing damper hub bolts. Check torque of bolts with a torque wrench. Bolts should be tightened to 1000 pound-inches of torque. If torque meets requirements, replace locking wire.

NOTE: Damper hub bolts should not be removed.

(9) Check dowel pins (P, fig. 64) in flywheel mounting flange for secure fit in flange or out-of-round condition and for conformance to tolerances specified in repair and rebuild standards (par. 306).

*d. Vibration Damper Counterweights and Pins.*

NOTE: The key letters shown below in parentheses refer to figure 67.

(1) Inspect damper counterweights (B and D) for cracks, scoring, out-of-round pin bores, or burred or nicked slots.

(2) Check counterweights for conformance to tolerances specified in repair and rebuild standards (par. 306).

(3) Inspect counterweight pin bushings (G), counterweight pins (A), counterweight female pins (H), counterweight male pins (F), and counterweight stop (L) for wear, cracks, burs or out-of-round condition. Check all parts for conformance to tolerances specified in repair and rebuild standards (par. 306).

*e. Transmission Drive Shaft Pilot Ball Bearing (Model AOSI–895–5M Engines Only).* Inspect ball bearing (WW, fig. 64) as described in paragraph 78.

## 89. Repair

*a. Connecting Rods and Bearings.*

NOTE: The key letters shown below in parentheses refer to figure 65.

(1) *Connecting rod bolts* (F–2).

(*a*) Replace bolts if they do not fit snug or if bolt threads are stripped or damaged.

(*b*) Replace bolts if pilot diameter in center of bolt is galled or if diameter does not conform to tolerances specified in repair and rebuild standards (par. 306).

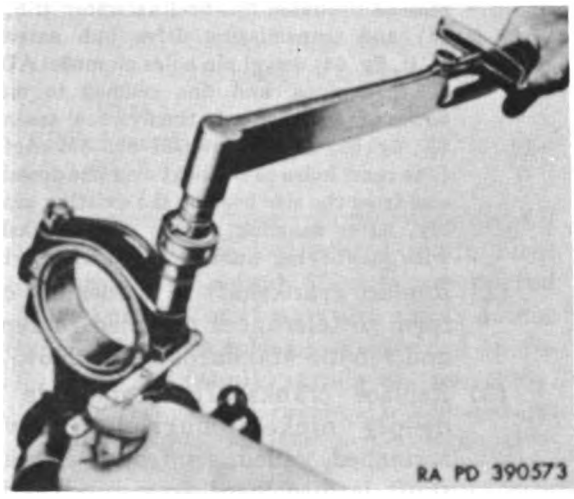



*Figure 69. Pinch checking connecting rod bearing.*

(*c*) Replace bolts if cracked or scratched or if any stretching is evident.

(2) *Connecting rod bearings* (E). Replace all defective bearings as described in paragraph 84*b* (1) through (4). New connecting rod bearings must be pinch checked in the rod and cap as described in (*a*) through (*f*) below.

(*a*) Place connecting rod (F–3–a) securely in vise which has copper or leather jaws. Install new connecting rod bearing (E) in rod and in cap (F–3–b).

(*b*) Apply mica-base antiseize compound (Spec. MIL–A–13881 (ORD) to connecting rod bolts. Secure cap to rod with two $\frac{9}{16}$ x $3\frac{21}{32}$ connecting rod bolts (F–2) and $\frac{9}{16}$-inch slotted hex nuts (F–4). Do not fully tighten nuts.

(*c*) Using a torque wrench, tighten only one nut to 550 pound-inches of torque. On opposite side of rod, insert a 0.0015-inch feeler gage in joint between rod and cap as shown in figure 69.

(*d*) Tighten nut on feeler gage side of cap with torque wrench until cap begins to pinch feeler gage. Torque required to reach this condition must be between 250 and 450 pound-inches.

(*e*) If torque required is not within these limits, remove hex nuts and bolts, remove caps, install another bearing, and repeat test in (*c*) and (*d*) above.

(*f*) Remove hex nuts and connecting rod bolts and remove cap from rod. Remove bearings. Remove rod from vise.

(*g*) When a new bearing is installed, mark bearing with number corresponding with that of the connecting rod, using a grease pencil.

(3) *Connecting rod with cap* (F–3).

NOTE: Rod and cap are machined as a set. Replace both if replacement of either is necessary.

(*a*) Replace rod and cap if rod or cap do not conform to tolerances specified in repair and rebuild standards (par. 306).

(*b*) Replace rod and cap if rod is cracked, twisted, or bent or if bores are pitted, galled, or scored.

(*c*) Replace rod and cap if cap is cracked or if bearing bore is pitted, galled, or scored.

(4) *Piston pin bushing-type bearing* (F–1).

(*a*) Replace bearing if it does not conform to tolerances specified in repair and rebuild standards (par. 306).

(*b*) Replace bearing if surfaces are cracked, galled, pitted, or scored. Remove minor nicks and scratches from surfaces with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

*b. Flywheel Group.*

NOTE: When replacing flywheel, dowel pin holes in new flywheel must be line reamed to match crankshaft (M, fig. 64) and transmission drive hub assembly (UU, fig. 64) dowel pin holes on model AOSI–895–5 engines, and line reamed to match dowel pin holes on the crankshaft and the torsion damper assembly (fig. 68) on model AOSI–895–5M engines. Line ream holes to the next oversize dowel pin size from the size used on the existing assembly. After reaming, stamp flywheel with identifying number to match crankshaft.

(1) *Model AOSI–895–5 engine.*

(*a*) Replace flywheel assembly (SS, fig.

64) if it does not conform to tolerances specified in repair and rebuild standards (par. 306).

(*b*) Replace flywheel if worn, cracked, or damaged. Remove minor nicks and burs with crocus cloth.

(*c*) Replace transmission drive hub assembly (UU, fig. 64) if it does not conform to tolerances specified in repair and rebuild standards (par. 306).

(*d*) If splines are damaged, repair splines as described in paragraph 79 or replace hub assembly.

(2) *Model AOSI–895–5M engine.*

NOTE: The key letters shown below in parentheses refer to figure 68 except where otherwise indicated.

(*a*) Replace flywheel assembly (K) as described in (1) (*a*) and (*b*) above.

(*b*) Replace damper drive springs (M) if fit is not snug in recesses in flywheel or if springs do not conform to limits specified in repair and rebuild standards (par. 306).

(*c*) Replace damper friction disks (F) if worn, cracked, or deteriorated.

(*d*) Replace damper pressure plate (E), damper spacing plate (J), and pressure plate loading ring (D) if worn, cracked, or distorted.

(*e*) Replace damper hub (B) if worn, cracked, or damaged. If splines are damaged, repair splines as described in paragraph 79 or replace hub.

(*f*) Replace headless straight pin (dowel pin) (Q) if pin does not conform to tolerances specified in repair and rebuild standards (par. 306).

(*g*) Replace damper driven plate (G) if cracked or damaged, or if plate does not conform to tolerances specified in repair and rebuild standards (par. 306).

*c. Crankshaft* (M, fig. 64).

(1) Replace cracked crankshaft or crankshaft showing evidence of connecting rods rubbing or touching crankshaft during operation.

NOTE: When replacing crankshaft, dowel pin holes in new crankshaft must be line reamed to match flywheel assembly (SS, fig. 64) and transmission drive hub assembly (UU, fig. 64) dowel pin holes on model AOSI–895–5 engines, and line reamed to match dowel pin holes of only the flywheel assembly (K, fig. 68) on model AOSI–895–5M engines. Line ream holes to the next oversize dowel pin size from the size used on the existing assembly. After reaming, stamp new crankshaft with identifying number to match flywheel.

(2) Replace crankshaft if it does not conform to tolerances specified in repair and rebuild standards (par. 306).

(3) Replace crankshaft if journals are deeply nicked, burred, grooved, scratched, galled, scuffed, or if crankshaft is discolored from overheating. Repair minor nicks, burs, and scratches on journals by polishing with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(4) Replace crankshaft if vibration damper hub (C, fig. 67) is cracked or if bores for counterweight pins are scored, out-of-round, or do not conform to tolerances specified in repair and rebuild standards (par. 306).

NOTE: Replace entire crankshaft if hub requires replacement. Crankshaft and hub are a permanent assembly and cannot be replaced as separate items.

(5) Replace crankshaft if hub is not secure on splined shaft or dowel pins.

(6) If splines for accessory drive shaft in hub are damaged, repair splines as described in paragraph 79*f* or replace crankshaft.

(7) Replace crankshaft if torque test of damper hub bolts (par. 88*c*) indicates replacement is necessary.

(8) Replace dowel pins (P, fig. 64) in flywheel mounting flange if pins do not fit securely in flange, if pins are out-of-round, or if pins do not conform to tolerances specified in repair and rebuild standards (par. 306). Replace pins as described in (*a*) through (*d*) below.

(*a*) Remove hex-socket setscrew (N, fig. 64) securing dowel pin in flange.

(*b*) Drive dowel pin from flange.

(*c*) Line ream holes (refer to note following (1) above).

(*d*) Install next oversize dowel pins in holes. Secure pins with No. 10 x 3/16 hex-socket setscrews (N, fig. 64).

*d. Vibration Damper Counterweights and Pins* (fig. 67).

(1) Replace damper counterweights (B and D) if cracked, scored, if pin bores are out-of-round, if slots are burred or nicked, or if counterweights do not conform to tolerances specified in repair and rebuild standards (par. 306).

NOTE: If replacement of a counterweight is necessary, all four counterweights must be replaced by a matched set. The counterweight sets are accurately matched for weight and the critical balance would be destroyed by the substitution of an unmatched counterweight.

(2) Replace counterweight pin bushings (G), counterweight pins (A), counterweight female pins (H), counterweight male pins (F), or counterweight stop (L), if worn, cracked, burred, or out-of-round, or if any of the parts do not conform to tolerances specified in repair and rebuild standards (par. 306).

*e. Transmission Drive Shaft Pilot Ball Bearing (Model AOSI–895–5M Engines Only).* Repair or replace ball bearing (WW, fig. 64) as described in paragraph 79.

## 90. Assembly

*a. Assemble Flywheel Torsion Damper Assembly (Model AOSI–895–5M Engines Only)* (fig. 68).

(1) If 1/2 x 1 headless straight pins (dowel pins) (Q) were removed, line ream holes in damper hub (B) and damper driven plate (G) to next oversize pin size and install next oversize headless straight pin in damper hub.

(2) Install damper hub (B) and damper hub plate (H) on damper driven plate (G).

(3) Secure hub and hub plate to driven plate wth six 1/2 x 1 3/4 hex-head bolts (A). Tighten bolts with torque wrench to 400 to 500 pound-inches. Secure bolts with locking wire.

*b. Install Crankshaft Dowel Pins.* If crankshaft dowel pins (P, fig. 64) were removed, install pins as described in paragraph 89*c*.

*c. Install Transmission Drive Shaft Pilot Ball Bearing and Crankshaft Oil Plug* (fig. 64).

(1) Install new 1 3/8-inch id "O" ring packing (ZZ) on crankshaft oil plug (YY) and install plug in bore of flywheel mounting flange.

(2) Install 1 3/4-inch housing diameter retaining ring (XX) in bore of flywheel mounting flange.

(3) On model AOSI–895–5M engines only, install transmission drive shaft pilot ball bearing (WW) in bore of flywheel mounting flange with a suitable bearing replacer.

*d. Install Vibration Damper Counterweights.*

NOTE: The key letters shown below in parentheses refer to figure 67 except where otherwise indicated.

(1) Slide two damper counterweights (B) on damper hub (C). Aline holes in counterweights with holes in hub. Secure counterweights to hub by installing two counterweight pins (A) in holes in each counterweight.

(2) Slide two damper counterweights (D) on damper hub (C). Aline holes in counterweights with holes in hub located between counterweight stop mounting holes and directly opposite each other on hub.

(3) Install four counterweight male pins (F) through holes in counterweights from crankshaft side of hub. Install four counterweight pin bushings (G) into holes in counterweights so that shoulders on pins enter bushings.

(4) Install four counterweight female pins (H) into bushings and screw female pins onto male pins. Tighten pins with two wrenches 7082061 (fig. 66). Aline slots in nuts on female pins with holes in male pins and install 3/32 x 1 cotter pins (J) through nuts and male pins. Bend cotter pins.

(5) Install counterweight stop (L) on damper hub and aline holes with mounting holes in hub. Secure stop to hub by installing four 3/8 x 5 1/64

hex-head bolts (K) through holes in stop and into hub. Tighten bolts securely. Secure bolts with locking wire.

(6) Install 1⅝-inch housing diameter retaining ring (L, fig. 64) in the spline in the crankshaft.

*e. Install Connecting Rods.*

NOTE: The key letters shown below in parentheses refer to figure 65.

(1) If piston pin bushing-type bearing (F–1) was removed, refer to paragraph 79*g* for installation of bearing.

(2) Position connecting rod bearings (E) in their respective rods and caps. Install two ⅜ x 3 21/32 connecting rod bolts (F–2) in each connecting rod (F–3–a), making certain each bolt head is properly seated in recess provided.

(3) Position rods on crankshaft in proper location according to their identifying number. No. 1 connecting rod is connected to the journal at the vibration damper hub end with other rods following in succession. All location numbers are on the bottom, or oil pan side, of crankshaft when the rods are positioned in the cylinders.

(4) Position connecting rod cap (F–3–b), with installed bearing, around journal to mate with its corresponding rod. Secure rod and cap to crankshaft with ⅜-inch slotted hex nuts (F–4) installed on connecting rod bolts.

(5) Using a torque wrench, tighten nuts to 750 pound-inches of torque plus sufficient additional torque to aline slots in nuts with holes in bolts. Do not exceed 850 pound-inches of torque.

(6) Using a feeler gage as shown in figure 70, check the side clearance of each

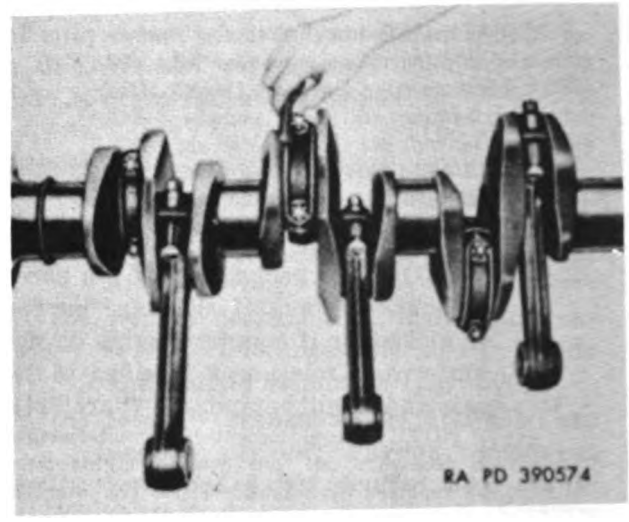



*Figure 70. Checking connecting rod side clearance.*

connecting rod for conformance to tolerances specified in repair and rebuild standards (par. 306). If clearance does not conform to tolerances specfied, remove rod (par. 86*b*) and install new rod as described in (2) through (5) above. Check side clearance of new rod.

(7) Secure slotted hex nuts to connecting rod bolts with 3/32 x ⅞ cotter pins (F–5) installed through nut and bolt.

(8) Install remaining connecting rods in same manner.

*f. Install Crankshaft Oil Seal.*

(1) Apply a light coat of automotive and artillery grease (GAA) to new crankshaft oil seal (AD, fig. 64) and spring.

(2) Install oil seal on crankshaft with closed or flat side toward flywheel mounting flange.

(3) Secure seal to crankshaft by connecting ends of spring and inserting spring in oil seal groove.

## Section IV. REBUILD OF OIL PUMPS AND TUBES

### 91. Disassembly

*a. Disassemble Accessory Case Scavenger Oil Pump* (fig. 71).

(1) Slide drive gear (A) off splines of drive impeller (B–4) and remove from bore of cover.

(2) Cut locking wire and remove six slotted hex nuts (B–1) and flat washers (B–2) securing cover (B–3) to housing (B–6–c) and remove cover.

(3) Lift drive impeller (B–4) and driven impeller (B–5) from pump housing.

(4) Cut locking wire and remove slotted hex nut (B–9) and flat washer (B–8) securing screen (B–7) to pump housing and remove screen.

*b. Disassemble Scavenger and Pressure Oil Pump.*

NOTE: The key letters shown below in parentheses refer to figure 72.

(1) *Remove tubes and gears.*

(*a*) Lift scavenger oil pump outlet tube (U) from scavenger oil pump housing (DD–6).

(*b*) Cut locking wire and remove two slotted hex nuts (X) securing scavenger oil pump pickup tube (V) to housing and remove tube and gasket (Y) from housing. Discard gasket.

(*c*) Cut locking wire and remove two slotted hex nuts (DD–2) and flat washers (DD–3) securing driven gear support assembly (DD–4) to housing and remove support assembly and pressure oil pump driven bevel gear (BB) from housing.

(*d*) Remove pressure oil pump driven bevel gear (BB) from support assembly. Remove retaining ring (AA) from bore of driven gear. Slide pressure oil pump drive bevel gear (Z) off splines on shaft of oil pump impeller and remove gear from housing.

(2) *Disassemble scavenger oil pump.*

(*a*) Cut locking wire and remove five slotted hex nuts (F), five flat washers (G), and three hex-head bolts (Q) securing scavenger oil pump housing (DD–6) to separating plate assembly (M) and pressure oil pump housing (FF–3). Remove housing from separating plate assembly.

(*b*) Slide scavenger oil pump driven impeller (P) from driven impeller shaft (K). Slide scavenger oil pump drive impeller (N) off Woodruff keys in shaft of pressure oil pump drive impeller (J). Remove Woodruff keys (EE) from shaft of drive impeller.

(3) *Disassemble pressure oil pump.*

(*a*) Cut locking wire and remove slotted hex nut (A) and flat washer (B) securing pressure oil pump screen (C) to pressure oil pump housing (FF–3) and remove screen.

(*b*) Cut locking wire and remove slotted hex nut (D) and impeller shaft locking plate (E) from housing.

(*c*) Remove separating plate assembly (M) from housing. Remove "O" ring packing (L) from separating plate and discard packing.

(*d*) Remove driven impeller shaft (K), pressure oil pump driven impeller (H), and pressure oil pump drive impeller (J) from housing.

## 92. Cleaning

Clean all parts as described in paragraph 77.

## 93. Inspection

*a. Accessory Case Scavenger Oil Pump.*

(1) *Scavenger oil pump assembly* (B, fig. 71). Inspect pump and parts as described in paragraph 78.

(2) *Drive gear* (A, fig. 71). Inspect drive gear as described in paragraph 78.

*b. Scavenger and Pressure Oil Pump.*

(1) *Oil pump assembly* (fig. 72). Inspect oil pump and parts as described in paragraph 78.

(2) *Gears.* Inspect pressure oil pump drive and driven gears (Z and BB) as described in paragraph 78.

(3) *Oil pump drive shaft.* Inspect oil pump drive shaft (CC, fig. 72) as described in paragraph 78.

## 94. Repair

*a. Accessory Case Scavenger Oil Pump.*

(1) *Scavenger oil pump assembly* (B, fig. 71). Replace entire pump assembly if any parts are found to be defective.

NOTE: Pump parts are not interchangeable. Do not attempt to replace individual parts; replace entire pump assembly.

(2) *Drive gear* (A, fig. 71). Repair or replace drive gear as described in paragraph 79.

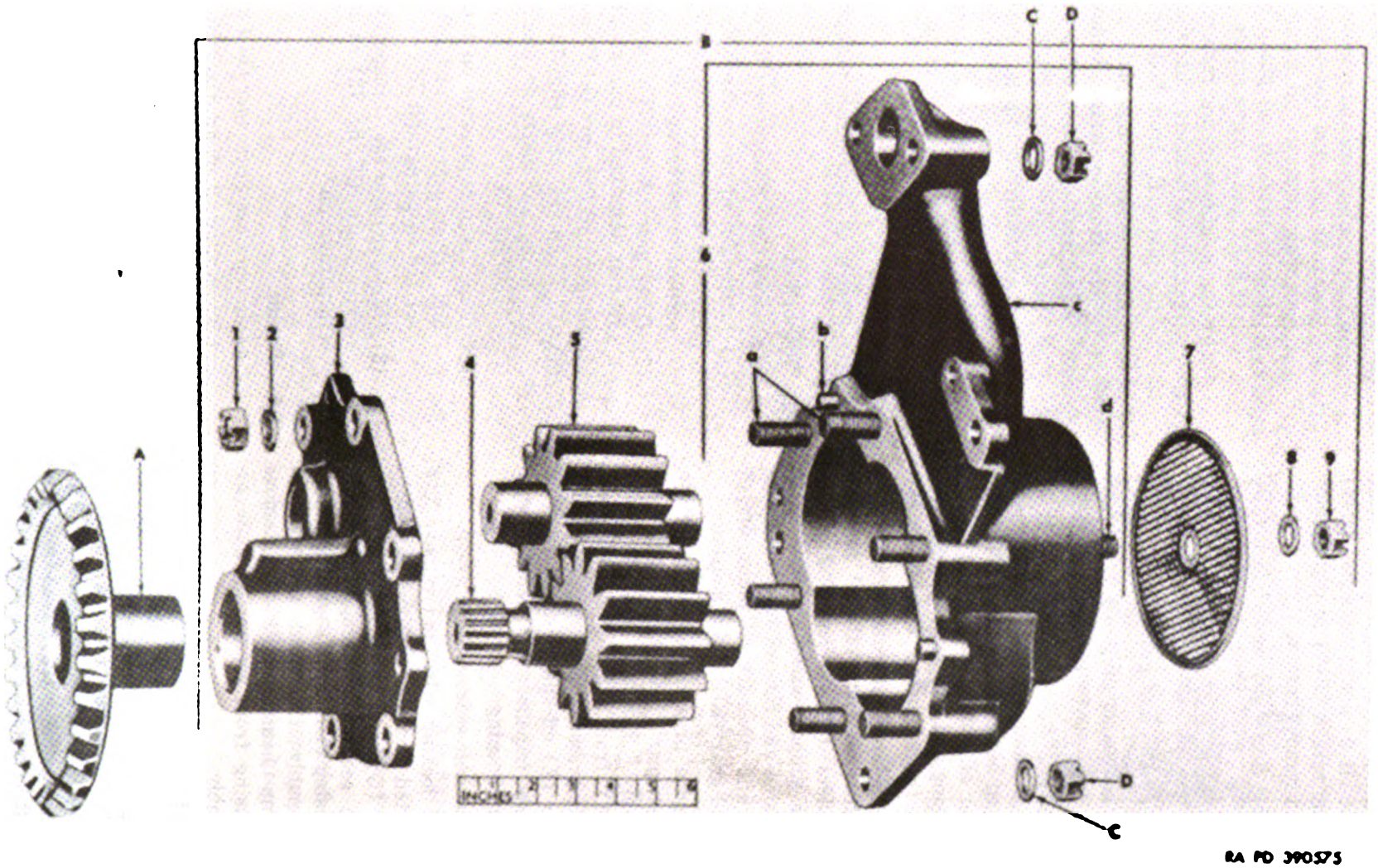



*Figure 71. Accessory case scavenger oil pump and drive gear—exploded view.*

A—Drive gear { 7372686 / 7954850 (late model AOSI–895–5 engines only)

B—Scavenger oil pump assembly 7346644

1—5/16-inch slotted hex nut 122942

2—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

3—Cover 7403343

4—Drive impeller 7403341

5—Driven impeller 7403342

6—Oil pump housing assembly 7403344

a—5/16 x 1 23/64 stud 7403068

b—1/4 x 5/8 tapered pin 589920

c—Housing 7403435

d—5/16 x 1 1/8 stud 7403512

7—Screen 7346597

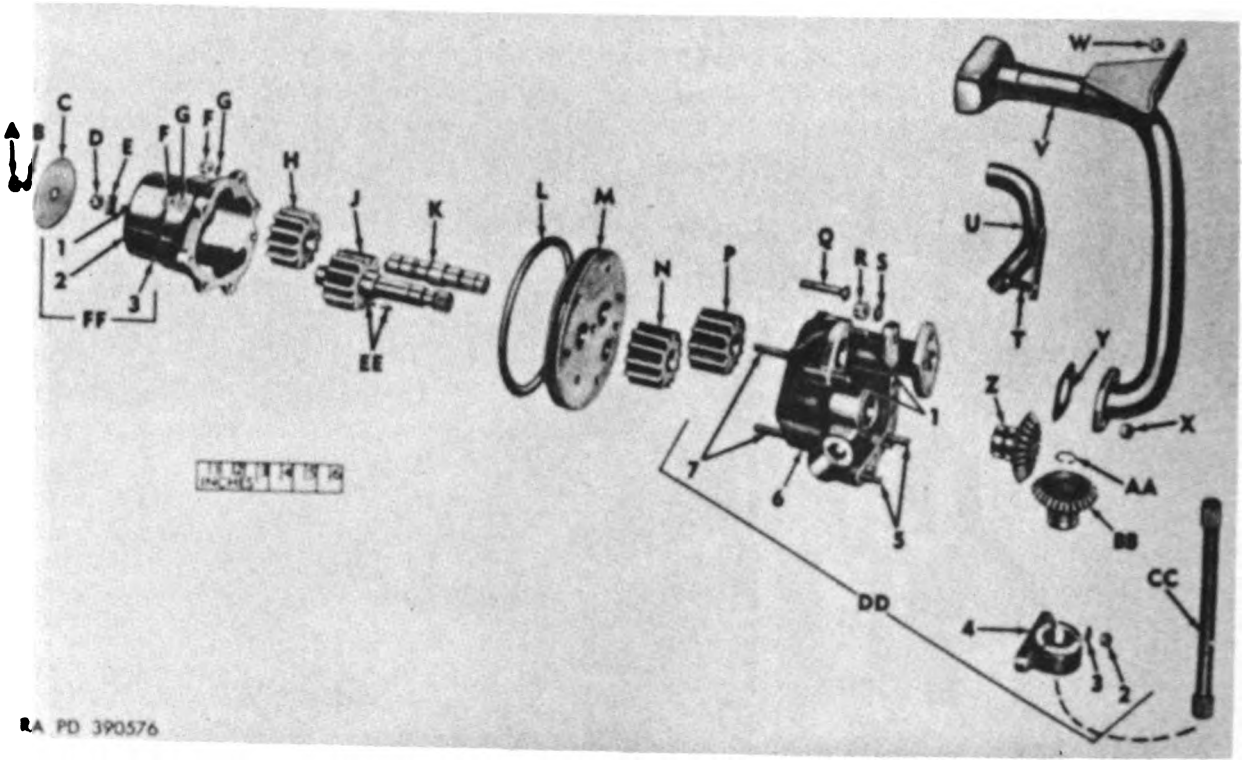
8—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

9—5/16-inch slotted hex nut 122942

C—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

D—5/16-inch slotted hex nut 122942

*Figure 71—Continued.*




A—5/16-inch slotted hex nut 122942
B—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
C—Pressure oil pump screen 7346597
D—1/4-inch slotted hex nut 122945
E—Impeller shaft locking plate 7744628
F—5/16-inch slotted hex nut 122942
G—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
H—Pressure oil pump driven impeller 7403085
J—Pressure oil pump drive impeller 7403348
K—Driven impeller shaft 7408083
L—5 11/16-inch id "O" ring packing 7372649
M—Separating plate assembly 7403345
N—Scavenger oil pump drive impeller 7403086
P—Scavenger oil pump driven impeller 7403087
Q—5/16 x 1 31/32 hex-head bolt 583757
R—3/8-inch slotted hex nut 122961
S—25/64 id, 5/8 od, 0.0640 thick flat washer 502204
T—5/16 x 1 9/32 hex-head bolt 7346699
U—Scavenger oil pump outlet tube 7348752
V—Scavenger oil pump pickup tube 7346673
W—5/16-inch slotted hex nut 122942
X—5/16-inch slotted hex nut 122942
Y—Pickup tube gasket 7346510
Z—Pressure oil pump drive bevel gear 8679605
AA—51/64-inch housing diameter retaining ring 593346
BB—Pressure oil pump driven bevel gear 8679606
CC—Oil pump drive shaft 7346505
DD—Scavenger oil pump housing assembly 7403379
1—5/16 x 1 23/64 stud 7403068
2—5/16-inch slotted hex nut 122942
3—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
4—Driven gear support assembly 7376028
5—5/16 x 1 9/16 stud 7403070
6—Housing 7403462
7—5/16 x 2 1/8 stud 7403075
EE—1/8 x 3/8 Woodruff key 124545
FF—Pressure oil pump housing assembly 7403349
1—5/16 x 1 1/8 stud 7403512
2—1/4 x 7/8 stud 7350204
3—Housing 7403442

*Figure 72. Scavenger and pressure oil pump, tubes, and drive—exploded view.*

NOTE: On model AOSI–895–5 engine serial numbers 528 and above only, if accessory case scavenger oil pump drive gear is to be replaced, count teeth on new gear before installing. New gear must have 26 teeth to mate properly with starter driven gear.

*b. Scavenger and Pressure Oil Pump.*

(1) *Oil pump assembly* (fig. 72). Replace entire pump assembly if any parts are found to be defective.

NOTE: Pump parts are not interchangeable. Do not attempt to replace individual parts; replace entire pump assembly.

(2) *Gears.* Repair or replace pressure oil pump drive and driven bevel gears (Z and BB, fig. 72) as described in paragraph 79.

(3) *Oil pump drive shaft.* Repair or replace oil pump drive shaft (CC, fig. 72) as described in paragraph 79.

## 95. Assembly

*a. Assemble Scavenger and Pressure Oil Pump.*

NOTE: The key letters shown below in parentheses refer to figure 72.

(1) *Assemble pressure oil pump.* Lubricate bearing, shafts, and contact surfaces with engine oil (OE) before assembly.

(*a*) Install pressure oil pump driven impeller (H) on milled-locking face end of driven impeller shaft (K). Insert shaft, with impeller end leading, in well of pressure oil pump housing (FF–3) so that leading end of shaft extends through base of housing.

(*b*) Position impeller shaft locking plate (E) in housing over end of driven impeller shaft. Secure plate and shaft in housing by installing ¼-inch slotted hex nut (D) on ¼ x ⅞ stud (FF–2) in housing. Secure hex nut with locking wire.

(*c*) Position pressure oil pump screen (C) on $\frac{5}{16}$ x 1⅛ stud (FF–1) and secure screen on housing with $\frac{5}{16}$-inch slotted hex nut (A) and $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washer (B). Secure nut with locking wire.

(*d*) Install pressure oil pump drive impeller (J) in well of pressure oil pump housing, meshing teeth on drive impeller with teeth on driven impeller.

(*e*) Position a new $5\frac{11}{16}$-inch id "O" ring packing (L) on separating plate assembly (M) and install separating plate assembly on housing.

(*f*) Install two ⅛ x ⅝ Woodruff keys (EE) in slots in shaft of pressure oil pump drive impeller (J).

(2) *Assemble scavenger oil pump.*

(*a*) Aline keyways in scavenger oil pump drive impeller (N) with Woodruff keys installed in (1) (*f*) above. Slide drive impeller on shaft of pressure oil pump drive impeller (J).

(*b*) Mesh teeth of scavenger oil pump driven impeller (P) with teeth of drive impeller and slide driven impeller on driven impeller shaft (K).

(*c*) Aline impellers and shaft with wells and hole in scavenger oil pump housing (DD–6) and install housing on separating plate assembly (M).

(*d*) Install three $\frac{5}{16}$ x $1\frac{31}{32}$ hex-head bolts (Q) through the two housings and the plate assembly, in holes provided, with bolt heads on scavenger pump housing side.

(*e*) Secure housings to separating plate with three $\frac{5}{16}$-inch slotted hex nuts (F) and $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washers (G) installed on bolts, and two slotted hex nuts (F) and flat washers (G) installed on $\frac{5}{16}$ x 2⅛ studs (DD–7). Secure slotted hex nuts with locking wire.

(3) *Install tubes and gears.*

(*a*) Aline splines in bore of pressure oil pump drive bevel gear (Z) with splines on shaft of pressure oil pump drive impeller (J) and slide drive gear into bore of scavenger oil pump housing (DD–6). Rotate drive gear by hand to make certain pump assembly turns freely.

(*b*) Install $\frac{51}{64}$-inch housing diameter retaining ring (AA) in bore of pressure oil pump driven bevel gear (BB) and install driven bevel gear in driven gear support assembly (DD–4).

(*c*) Mesh teeth on driven gear with teeth on drive gear and install support assembly, with installed driven gear, on scavenger pump housing.

(*d*) Secure support assembly to pump housing with two $\frac{5}{16}$-inch slotted hex nuts (DD–2) and $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washers (DD–3). Secure slotted hex nuts with locking wire.

(*e*) Check backlash between drive and driven gears for conformance to

limits specified in repair and rebuild standards (par. 307). If backlash does not conform to limits specified, remove gears (par. 91*b*) and install new gears ((*a*) through (*d*) above). Repeat backlash check after installing new gears.

(*f*) Position a new pickup tube gasket (Y) on housing and install scavenger oil pump pickup tube (V) over gasket and secure with two 5/16-inch slotted hex nuts (X). Secure slotted hex nuts with locking wire.

(*g*) Install scavenger oil pump outlet tube (U) in outlet opening of oil pump housing.

*b. Assemble Accessory Case Scavenger Oil Pump.*

NOTE: The key letters shown below in parentheses refer to figure 71.

(1) Position screen (B–7) on 5/16 x 1 1/8 stud (B–6–d) and secure with 5/16-inch slotted hex nut (B–9) and 21/64 id, 9/16 od, 0.0630 thick flat washer (B–8). Secure slotted hex nut with locking wire.

(2) Mesh teeth of drive impeller (B–4) and driven impeller (B–5) and install two impellers in housing (B–6–c) so that splined end of shaft of drive impeller protrudes from housing.

(3) Aline bores and holes in cover (B–3) with shafts of impellers and studs and tapered pins on housing and install cover on housing. Secure cover to housing with six 5/16-inch slotted hex nuts (B–1) and 21/64 id, 9/16 od, 0.0630 thick flat washers (B–2). Secure slotted hex nuts with locking wire.

(4) Install drive gear (A) on shaft of drive impeller (B–4) engaging splines in gear and on impeller.

NOTE: Drive gear 7372686 (29 teeth) (A) must be used with starter drive bevel gear 7372687 (32 teeth) and starter driven gear 7346548 (29 teeth) pars. 159*h* and 161). Drive gear 7954850 (26 teeth) must be used with starter drive bevel gear 7954848 (29 teeth) and starter driven gear 7954849 (26 teeth).

## Section V. REBUILD OF PISTONS, RINGS, AND PINS

### 96. Disassembly

NOTE: Before removing compression rings (A, fig. 65) or oil control rings (B, fig. 65) check rings to see if they are free in their grooves in piston (D). Mark rings that stick for detailed inspection.

*a.* Place jaws of remover and replacer 7950177 (fig. 73) in end gap of piston ring. Spread ring, lift out of groove, and remove from piston. Mark ring as to location on piston.

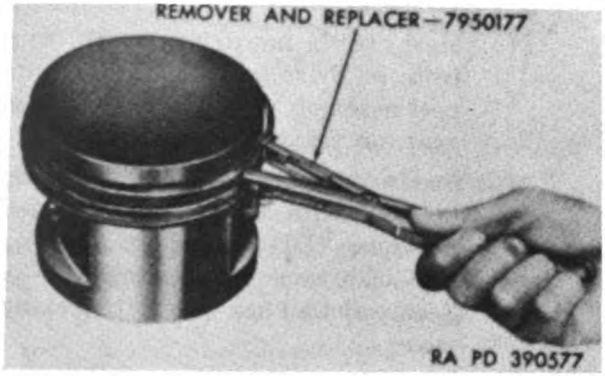



*Figure 73. Removing or installing piston rings.*

*b.* Remove and mark three remaining rings as described in *a* above.

*c.* Remove piston pin (G, fig. 65) from piston. Remove piston pin plugs (C, fig. 65) from piston pin.

### 97. Cleaning

Clean parts by dipping in carbon removing compound (Spec. MIL–S–12382 (ORD), Type 1). Scrape off remaining carbon deposits with a scraper or a broken piston ring used as a scraper. Be careful not to scratch or gouge ring lands on piston while scraping. Clean oil drain holes in oil rings and oil ring grooves. Remove carbon from holes with undersize drill. Clean carbon from piston pins and from bore for piston pin with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

**WARNING: Use goggles, rubber gloves, and rubber apron when cleaning parts with carbon removing compound. Provide adequate ventilation. Avoid inhalation of fumes and skin con-**

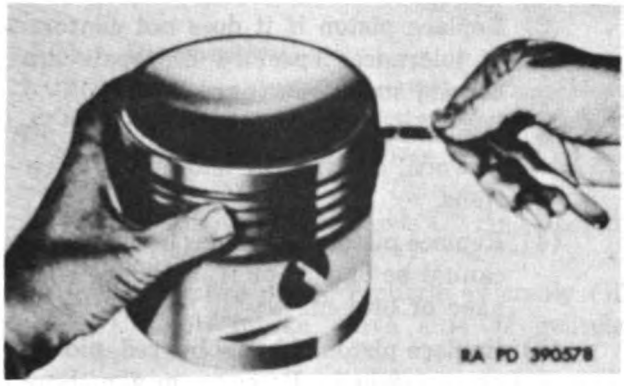



*Figure 74. Measuring piston ring side clearance.*

**tact. If compound is splashed on skin, flush area with plenty of fresh water and wash with alcohol. Alcohol containing 2 to 3 percent camphor is preferable.**

## 98. Inspection

NOTE: The key letters shown below in parentheses refer to figure 65.

*a. Piston Rings.*

(1) Inspect compression rings (A) and oil control rings (B) for scuffing, scoring, chipping, scratches, or abrasions, particularly those rings which were found to be sticking in grooves.

(2) Check side clearance of rings in piston grooves as described in (*a*) through (*e*) below.

(*a*) Insert remover and replacer 7950177 (fig. 73) in end gap of ring and install ring in same groove on piston from which it was removed in paragraph 96. Install all four rings in this manner.

(*b*) Measure side clearance of all four rings with a thickness gage as shown in figure 74. Measurement should conform to tolerances specified in repair and rebuild standards (par. 309).

(*c*) Excessive side clearance may be caused by either the rings being worn or by the ring lands of piston being worn.

(*d*) Less than normal clearance indicates probable breakage or damage to ring land.

(*e*) Remove rings from piston as described in paragraph 96.

(3) Measure end gap of all rings by placing ring in gage and compressor 7082040 (fig. 75). Measurement should conform to tolerances specified in repair and rebuild standards (par. 309).

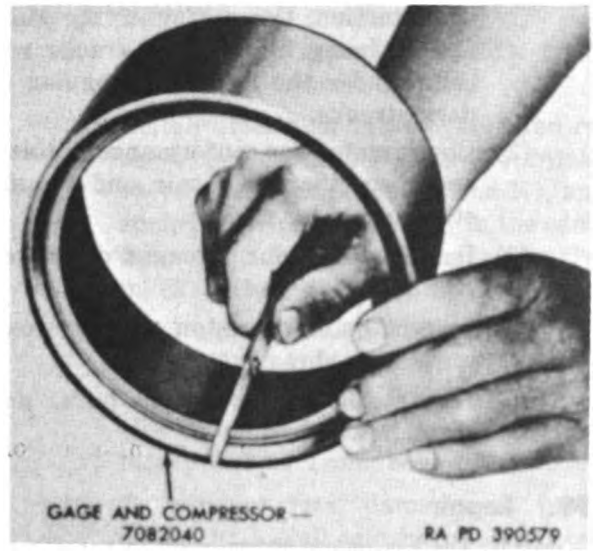



*Figure 75. Measuring piston ring end gap.*

*b. Piston Pin* (G).

(1) Inspect pin for cracks, nicks, scratches, or wear.

(2) Check diameters of pin for conformance to tolerances specified in repair and rebuild standards (par. 309).

*c. Piston Pin Plugs* (C).

(1) Inspect plugs for cracks, nicks, or scratches, particularly on end of plug.

(2) Inspect end of plug for large wear pattern. This is a sign of undue wear which does not allow piston pin to be centrally positioned.

(3) Check outside diameter of plug for conformance to tolerances specified in repair and rebuild standards (par. 309).

*d. Piston* (D).

(1) Inspect entire piston for cracks, flaws, or distortion. Use a magnifying glass and a strong light. Small cracks will show under the light as irregular or dark streaks.

(2) Check piston for conformance to tolerances specified in repair and rebuild standards (par. 309).

(3) Inspect piston for damaged or broken ring lands.

(4) Inspect bores of piston pin for wear, cracks, or abrasions.

(5) Inspect piston for nicks, burs, and scratches.

## 99. Repair

NOTE: The key letters shown below in parentheses refer to figure 65.

*a. Piston Rings.*

NOTE: Piston rings cannot be repaired.

(1) Replace compression rings (A) and oil control rings (B) if scuffed, scored, chipped, scratched, or if they show abrasions.

(2) Replace rings if they do not conform to tolerances specified in repair and rebuild standards (par. 309) for side clearance in piston grooves and for end gap.

(3) Replace oil control rings (B) if oil drain holes cannot be opened.

*b. Piston Pin* (G).

(1) Replace piston pins if pins are cracked, nicked, scratched, or worn.

(2) Replace pins if pins do not conform to tolerances specified in repair and rebuild standards (par. 309).

*c. Piston Pin Plugs* (C).

(1) Replace piston pin plugs if plugs are cracked, nicked, or scratched.

(2) Replace plugs if end of plug shows large wear pattern.

(3) Replace plugs if outside diameter of plug does not conform to tolerances specified in repair and rebuild standards (par. 309).

*d. Piston* (D).

(1) Replace piston if cracked or distorted, or if piston shows any flaws.

(2) Replace piston if it does not conform to tolerances specified in repair and rebuild standards (par. 309).

(3) Replace piston if bore for piston pin is worn, cracked, or shows any abrasions.

(4) Replace piston if oil holes in ring lands cannot be opened or if lands are damaged or broken.

(5) Replace piston if badly burred, nicked, or scratched. Remove minor burs, nicks, and scratches from piston with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

## 100. Assembly

NOTE: The key letters shown below in parentheses refer to figure 65, except where otherwise indicated.

*a.* Install piston pin (G) in bore of piston (D). Center pin in piston and install a piston pin plug (C) in each end of piston pin.

*b.* Check piston pin for freedom of movement in bore. Pin must move freely. Replace pin if any binding is noted.

*c.* Check markings on oil control rings (B) and install rings in same lower grooves in piston from which they were removed in paragraph 96. Install rings with remover and replacer 7950177 (fig. 73) as described in paragraph 98. Use care in installing rings to avoid damaging the ring lands or distorting the rings.

*d.* Check markings on compression rings (A) and install rings in same upper grooves of piston from which they were removed. Install rings in the same manner as described for oil control rings in *c* above.

*e.* If new rings are being installed, measure side clearance of all new rings installed as described in paragraph 98. Replace all rings whose side clearance does not conform to tolerances specified in repair and rebuild standards (par. 309).

*f.* If piston (D) is being replaced, check marking on bottom of piston boss, accessory end. Mark new piston with the same marking found on old piston.

## Section VI. REBUILD OF CYLINDERS

### 101. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 76 except where otherwise indicated.

*a. Remove Priming Nozzle Assembly and Spark Plug.*

(1) Remove and discard "O" ring packing (A).

(2) Remove priming nozzle assembly (K) from intake valve side of cylinder assembly (C).

(3) Remove spark plug, if present.

*b. Remove and Disassemble Valve Rocker Assemblies.*

(1) Remove four hex-head bolts (S) and flat washers (R) securing camshaft bearing cap (Q) and rocker shaft supporting bracket (V) to cylinder and remove cap and bracket, with two valve rocker assemblies (U), from cylinder.

(2) Remove valve rocker shaft assemblies (T), with valve rocker assemblies, from bearing cap and supporting bracket.

(3) Slide two valve rocker assemblies (U) from rocker shaft assemblies.

(4) Remove hex jam nut (fig. 77) from adjusting screw assembly. Remove adjusting screw assembly from rocker.

NOTE: No further disassembly of valve rocker assembly is authorized.

*c. Remove Valves, Retainers, and Springs.*

(1) Place cylinder assembly (C) on stand 8708419 (fig. 11) and clamp valve spring lifter 8708370 (fig. 11) over exhaust valve upper spring retainer as shown in figure 78.

(2) Depress lifter handle to compress springs and remove two spring retainer locks (P) from groove in stem of exhaust valve. Tap exhaust valve spring upper retainer (AA), if necessary, to free locks.

(3) Release lifter handle slowly and remove lifter from cylinder.

(4) Remove exhaust valve spring upper retainer (AA), valve outer spring (BB), valve intermediate spring (CC), valve inner spring (DD), and exhaust valve rotor assembly (EE) from cylinder.

(5) Install lifter over intake valve and remove spring retainer locks (P), intake valve spring retainers (M and N), and springs (BB, CC, and DD) in the same manner as described for exhaust valve in (2) through (4) above.

(6) Hold exhaust valve (PP) and intake valve (B) in position and remove cylinder from stand. Place cylinder on side on bench and remove exhaust and intake valves from bore of cylinder.

(7) To prevent loss, damage, or interchanging, install camshaft bearing cap (Q) and rocker shaft supporting bracket (V) on cylinder and secure with four $\frac{3}{8} \times 2\frac{13}{16}$ hex-head bolts (S) and $\frac{25}{64}$ id, $\frac{13}{16}$ od, $\frac{1}{8}$ thick flat washers (R).

NOTE: Camshaft bearing cap and rocker shaft supporting bracket are machined with the cylinder and must remain with the cylinder as a matched set.

*d. Remove Valve Guides.*

NOTE: Do not remove intake valve guide (L) or exhaust valve guide (FF) unless inspection (par. 103) indicates replacement is necessary.

(1) *Remove exhaust valve guide.*

(*a*) Place cylinder on suitable support.

(*b*) Insert remover 7083691 (fig. 79) in exhaust valve guide (FF) and drive guide from cylinder.

(2) *Remove intake valve guide.* Remove intake valve guide (L) in the same manner as described for exhaust valve guide ((1) above) except use remover 7083690 (T, fig. 9) in place of remover 7083691 (U, fig. 9).

### 102. Cleaning

Clean cylinder and associated parts with dry-cleaning solvent or mineral spirits paint thinner. Remove heavy carbon deposits from cylinder combustion chamber with a scraper or blunt tool which will not nick or scratch the surface. Remove only the heavy deposits. Surfaces do not have to be cleaned to a mirror finish.

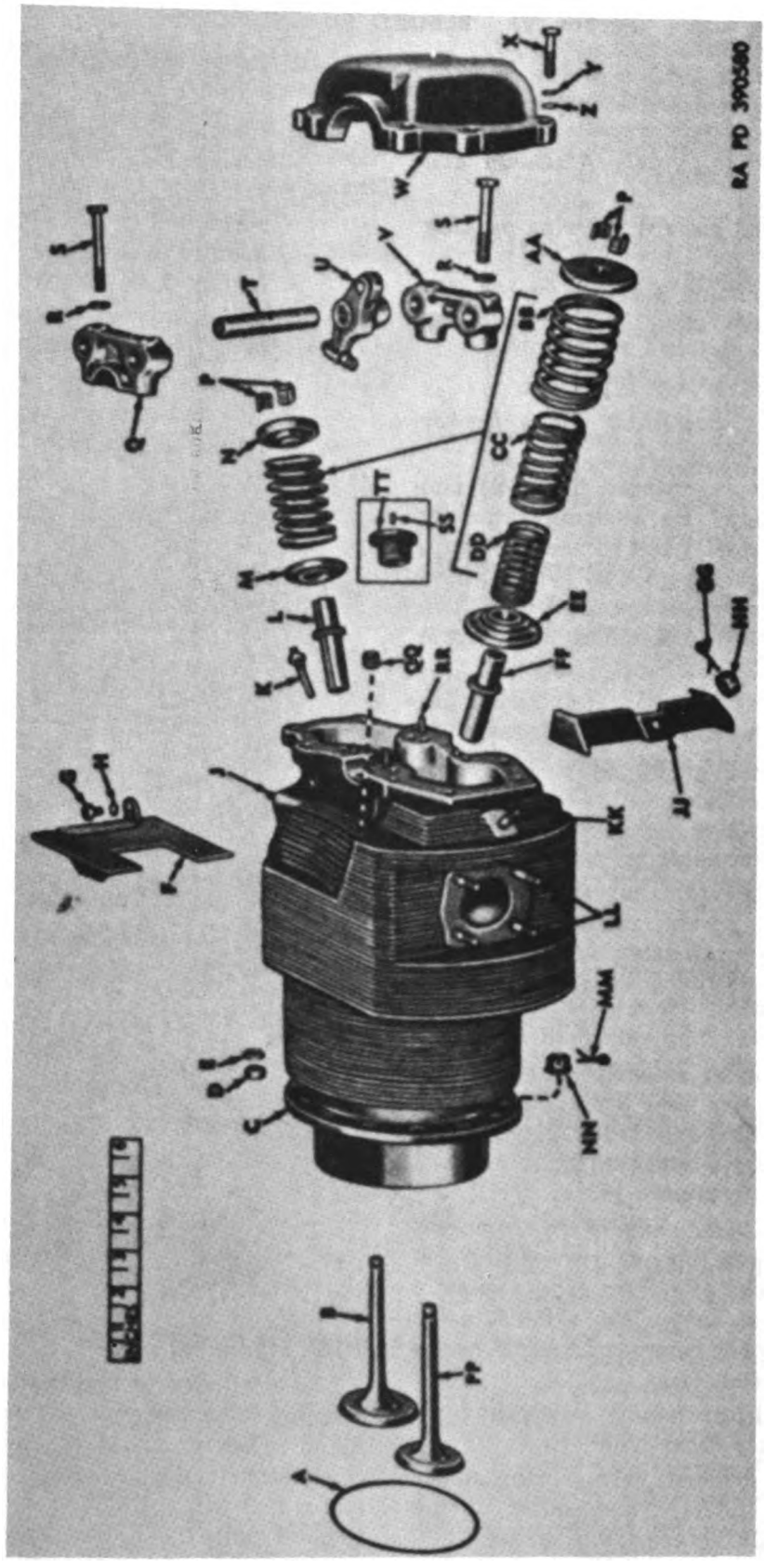



*Figure 78. Cylinder assembly—exploded view.*

A–4.9800-inch id "O" ring packing 5165292
B–Intake valve 7346482
C–Cylinder assembly 7346610
D–7/16-inch hex nut 7767432
E–7/16-inch hex stamped nut 107824
F–Intercylinder air baffle 7376014
G–7/16 x 1/2 hex-head bolt 7744736
H–7/16-inch lock washer 121621
J–5/16 x 1 11/16 stud 7403071
K–Priming nozzle assembly 7410158
L–Intake valve guide 7346483
M–Intake valve spring lower retainer 7744617
N–Intake valve spring upper retainer 7744798
P–Spring retainer lock 7744610
Q–Camshaft bearing cap 7403352
R–25/64 id, 13/16 od, 1/8 thick flat washer 7767318
S–3/8 x 2 13/16 hex-head bolt 7346679
T–Valve rocker shaft assembly 7767322
U–Valve rocker assembly 7410281
V–Rocker shaft supporting bracket 7403353
W–{ Intermediate cylinder valve rocker cover 7375436
W–{ End cylinder valve rocker cover 7348549
X–5/16 x 1 1/16 hex-head bolt 7350199
Y–5/16-inch lock washer 120214
Z–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
AA–Exhaust valve spring upper retainer 7539839
BB–Valve outer spring 7744799
CC–Valve intermediate spring 7744800
DD–Valve inner spring 7744789
EE–Exhaust valve rotor assembly 7539838
FF–Exhaust valve guide 7348533
GG–1/16 x 3/4 cotter pin 121223
HH–3/4-inch slotted hex nut 122961
JJ–Cylinder head air deflector 7376025
KK–3/8 x 1 17/32 stud 7403515
LL–3/8 x 1 3/8 stud 7403097
MM–3/32 x 1 cotter pin 121224
NN–9/16-inch extended washer hex nut 7338679
PP–Exhaust valve 7346481
QQ–Heli-coil insert 7767330
RR–1/4 x 5/8 tapered pin 589920
SS–0.125 x 0.280 headless straight pin 7388669
(model AOSI–895–5M engine only)
TT–Spark plug bushing 7372617
(model AOSI–895–5M engine only)

*Figure 76—Continued.*

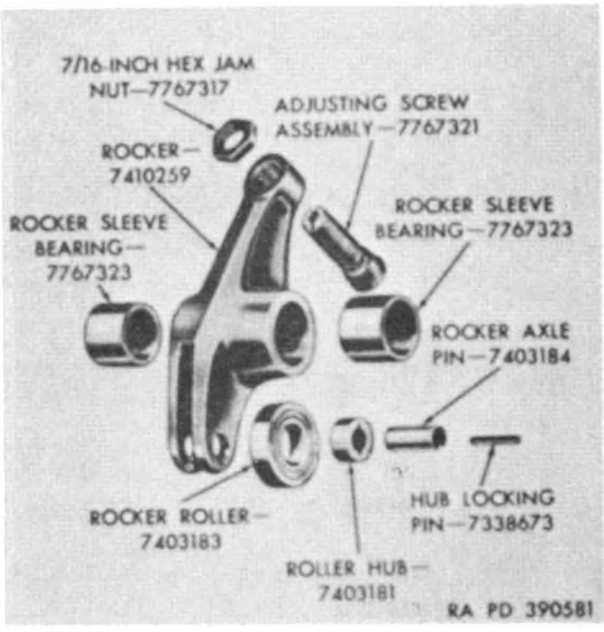



*Figure 77. Valve rocker assembly—exploded view.*

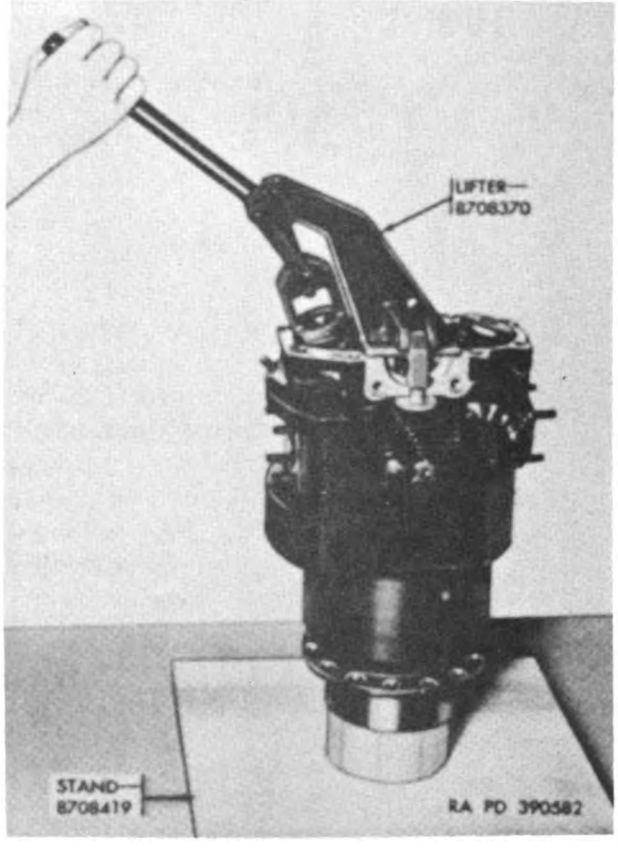



*Figure 78. Removing or installing valves.*

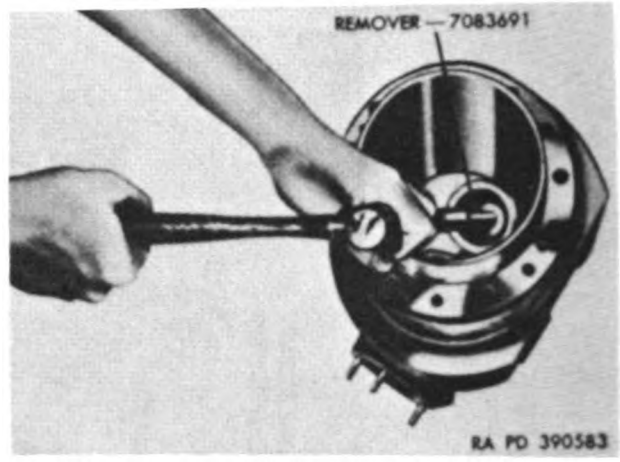



*Figure 79. Removing exhaust valve guide.*

## 103. Inspection

**NOTE: The key letters shown below in parentheses refer to figure 76 except where otherwise indicated.**

*a. Camshaft Bearing Cap* (Q).

(1) Inspect cap for cracks and bearing surface of cap for pitting, galling, burs, and nicks.

(2) Check cap for conformance to tolerances specified in repair and rebuild standards (par. 310).

(3) Inspect rocker shaft supporting bracket (V) for cracks and conformance to tolerances specified in repair and rebuild standards (par. 310).

*b. Valve Rocker Assembly* (fig. 77).

(1) Inspect rocker for cracks, using a magnifying glass and a strong light.

(2) Inspect rocker sleeve bearings for scoring and secure fit in rocker. Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 311).

(3) Inspect rocker roller for scuff or score marks. Rotate roller and check clearance between roller and hub by mounting rocker assembly securely in a vise with leather or copper jaws and setting a dial indicator against contact surface of roller. Move roller through the extremes of its travel, checking reading on dial indicator for conformance to tolerances specified in repair and rebuild standards (par. 311).

(4) Inspect adjusting screw assembly for stripped or damaged threads. Check screw assembly by turning screw in and out of rocker. Screw must turn freely. Rotate pad of screw. Pad must rotate freely.

*c. Valve Rocker Shaft Assembly* (T).

(1) Check rocker shaft assembly for cracks, nicks, scoring, plugged oil passages, or loose oil tube.

(2) Check shaft assembly for conformance to tolerances specified in repair and rebuild standards (par. 310).

*d. Valves, Springs, and Spring Retainers.*

(1) *Valves* (B and PP).

(*a*) Inspect valves for evidence of pitting, imperfect seating, or warping. Heavy discoloration, burning, erosion, or a carbon deposit on valve face indicate a warped valve. Light frosting of valve face does not indicate warped valve; minor discolorations usually appear as valve begins to cool. Valves seat much better than inspection of a cold valve indicates.

(*b*) Inspect stems of valves and locking grooves in stems for pitting, scoring, or cracked or damaged tips. Check valves for conformance to tolerances specified in repair and rebuild standards (par. 310).

(2) *Valve springs* (BB through DD). Inspect springs for wear, cracks, set, or other evidences of failure. Check springs for conformance to limits specified in repair and rebuild standards (par. 310).

(3) *Valve spring retainers, valve rotor assembly, and locks.*

(*a*) Inspect retainers (M, N, and AA) for wear or cracks.

(*b*) Check exhaust valve rotor assembly (EE) by rotating inner section. Inner section must rotate freely. Inspect rotor assembly for wear or cracks.

(*c*) Inspect spring retainer locks (P) for wear or cracks. Worn locks will have ridges on top face.

*e. Cylinder Interior.*

(1) *Valve guides* (L and FF).

(*a*) Inspect valve guides, while installed in cylinder, for cracks, galling, erosion, or scuffing.

(*b*) Check guides for secure fit in cylinder.

(*c*) Check guides for conformance to tolerances specified in repair and rebuild standards (par. 310).

NOTE: Do not remove valve guides unless they are to be replaced.

(2) *Valve seat inserts.*

(*a*) Check valve seat inserts inside cylinder for secure fit. Insert must fit securely.

(*b*) Inspect inserts for burned or pitted surfaces.

(*c*) Check valve contact on seat of insert by bluing face of seat with Prussian blue paste and placing a perfect valve in position on seat. Rotate valve one-half turn on seat and check valve for contact area. Valve must show perfect contact.

(*d*) Check inserts for conformance to tolerances specified in repair and rebuild standards (par. 310).

(3) *Cylinder bore.*

(*a*) Inspect cylinder bore for deep scratches, scoring, or pick up.

(*b*) Inspect joint between cylinder head and cylinder barrel for pitting or erosion.

(*c*) Carefully run finger over cylinder wall to check for ring ridge.

(4) *Cylinder bore dimensions.* At room temperature cylinder bores taper slightly. The bore expands to be essentially straight at engine-operating temperature. Check dimensions as described in (*a*) through (*c*) below for conformance to tolerances specified in repair and rebuild standards (par. 310).

(*a*) With cylinder at room temperature, take two measurements of diameter of bore at top of ring travel; measure diameter approximately parallel to line of valves, and measure diam-

eter at 90 degrees to first measurement. Average the two measurements.

(*b*) Next, take two measurements of diameter of bore at point of deepest ring wear in flange end of cylinder; measure diameter of bore approximately parallel to line of valves, and measure diameter at 90 degrees to first measurement. Average the two measurements.

(*c*) Head end average must not be greater than flange end average.

(*d*) Compare two measurements taken at head end. Head end must not be out-of-round in excess of 0.0030-inch.

(5) *Camshaft bearing surface.*

(*a*) Inspect camshaft bearing surface for pitting, galling, burs, and nicks.

(*b*) Check bearing surface for conformance to tolerances specified in repair and rebuild standards (par. 310).

*f. Cylinder Exterior.*

(1) Inspect cylinder barrel cooling fins for bent or broken fins.

(2) Inspect cylinder head cooling fins for bent or broken fins.

(3) Inspect studs, Rosan inserts, and tapped hole for priming nozzle as described in paragraph 78.

(4) Inspect Heli-coil inserts in spark plug opening and shroud mounting bolt hole as described in paragraph 78.

*g. Valve Rocker Covers* (W). Inspect covers as described in paragraph 77*b*.

## 104. Repair

NOTE: The key letters shown below in parentheses refer to figure 76 except where otherwise indicated.

*a. Camshaft Bearing Cap* (Q).

(1) Replace cylinder if bearing cap is deeply pitted or galled.

(2) Replace cylinder if cap does not conform to tolerances specified in repair and rebuild standards (par. 310).

(3) Remove minor burs and scratches from bearing surface with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(4) Replace cylinder if rocker shaft supporting bracket (V) is cracked or if it does not conform to tolerances specified in repair and rebuild standards (par. 310).

*b. Valve Rocker Assembly* (fig. 77).

(1) Replace rocker assembly if rocker is cracked.

(2) Replace rocker assembly if rocker sleeve bearings are loose, badly scored, or does not conform to tolerances specified in repair and rebuild standards (par. 311).

(3) Replace rocker assembly if rocker rollers are scuffed or scored. Replace rocker assembly if clearance between roller and hub does not conform to tolerances specified in repair and rebuild standards (par. 311).

(4) Replace adjusting screw assembly if threads are stripped or damaged. Replace screw assembly if screw binds in arm. Replace valve rocker assembly if threads in rocker are damaged. Replace screw assembly if pad does not rotate freely on screw.

*c. Valve Rocker Shaft Assembly* (T).

(1) Replace rocker shaft assembly if cracked, nicked, or scored, or if oil tube is loose in shaft.

(2) Replace rocker shaft assembly if it does not conform to tolerances specified in repair and rebuild standards (par. 310).

(3) Replace rocker shaft assembly if oil holes are plugged. Clean oil holes, if possible.

*d. Valves, Springs, and Spring Retainers.*

(1) *Valves* (B and PP).

(*a*) Replace warped valves and valves not conforming to tolerances specified in repair and rebuild standards (par. 310).

(*b*) Replace valves having badly pitted or burned faces or pitted, scored, or cracked stems. Replace valves if locking groove in stem is pitted, scored, or cracked, or if tip is damaged.

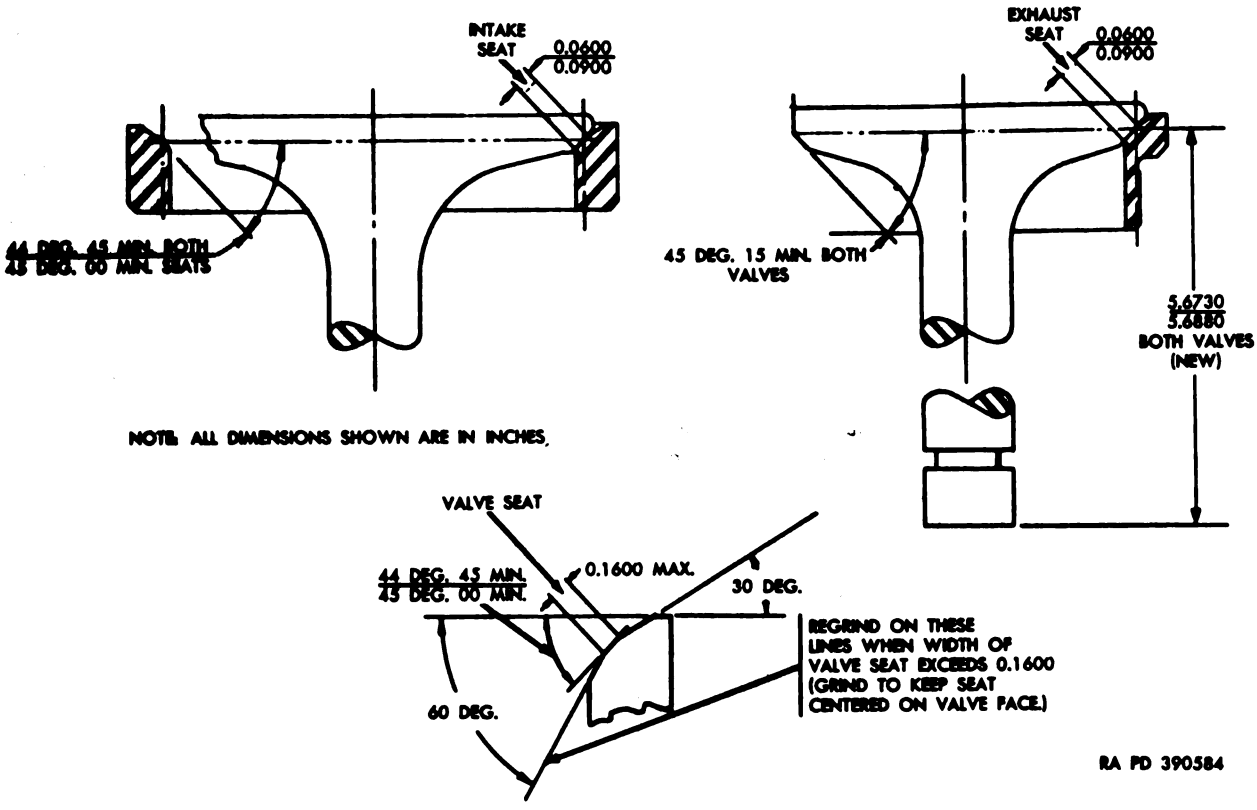



*Figure 80. Valve and valve seat grinding diagram.*

(*c*) Grind pitted or burned valves, or valves that do not seat perfectly, to limits specified in figure 80. Replace valves that cannot be ground to these limits.

(*d*) Check valve length from seat contact to tip of stem after grinding as shown in figure 80. Replace valve if length does not conform to tolerances specified in repair and rebuild standards (par. 310).

(2) *Valve springs* (BB through DD). Replace springs if worn, cracked, set, or otherwise damaged. Replace springs not conforming to limits specified in repair and rebuild standards (par. 310).

(3) *Valve spring retainers, valve rotor assembly, and locks.*

(*a*) Replace valve spring retainers (M, N, and AA) if worn or cracked.

(*b*) Replace exhaust valve rotor assembly (EE) if inner section does not rotate freely or if assembly is cracked or broken.

(*c*) Replace spring retainer locks (P) if worn or cracked.

*e. Cylinder Interior.*

(1) *Valve guides* (L and FF).

(*a*) Replace cracked, galled, eroded, or scuffed guides.

(*b*) Replace guides not conforming to tolerances specified in repair and rebuild standards (par. 310).

(2) *Valve seat inserts.* Replace cylinder if inserts do not fit securely in cylinder. Grind inserts having burned or pitted surface or inserts having seats which do not show perfect contact with valve face. Grind inserts as described in (*a*) through (*f*) below.

(*a*) To grind valve seat on inserts, grinding stone must be true to a 45 degree angle.

(*b*) Dress seat on insert with stone, using a valve seat grinding machine.

(*c*) After grinding seat on insert, check valve contact as described in paragraph 103*e*.

(*d*) When perfect contact is obtained, narrow seat on insert to width specified in figure 80 by grinding inner wall and exposed face of insert to angles specified.

(*e*) Keep seat on insert as near as possible to center of valve face.

(*f*) After correct width is obtained, check contact between insert and valve as described in paragraph 103*e*.

(3) *Cylinder bore.*

(*a*) Replace cylinder if joint between cylinder head and cylinder barrel is pitted or eroded.

(*b*) Replace cylinder if cylinder bore dimensions do not conform to tolerances specified in repair and rebuild standards (par. 310) or if average head end measurement is larger than average flange end measurement.

(*c*) Hone cylinders to remove scratches, scoring, pickup, if ring ridge is felt, or if head end is out-of-round more than 0.0030 inch.

(*d*) If diameter of bore at head end is more than 5.7537 inches after honing, replace cylinder.

(4) *Camshaft bearing surface.*

(*a*) Replace cylinder if bearing surface is deeply pitted or galled.

(*b*) Replace cylinder if bearing surface does not conform to tolerances specified in repair and rebuild standards (par. 310).

(*c*) Remove minor burs and scratches from bearing surface with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

*f. Cylinder Exterior.*

(1) Replace cylinder if more than 1 percent of barrel cooling fin area is broken off. Straighten bent fins as close as possible to original spacing.

(2) Replace cylinder with broken head fins if defect is more than half the depth of fin or more than two inches long. Three defects such as this are allowable, but if there are more than three, or any two defects are adjacent to each other, replace cylinder. Repair damaged cylinder head fins as described in (*a*) through (*c*) below, if possible.

(*a*) Use a fine-mill file to blend sharp corners of broken head fins.

(*b*) Do not remove any more metal than necessary to produce a smoothly blended edge on the damaged fin.

(*c*) Depth of any blended fin must not be less than 50 percent of its original depth. If necessary to go deeper, replace cylinder.

(3) Replace damaged studs and Rosan inserts, and repair damaged tapped hole for priming nozzle, if possible, as described in paragraph 79.

(4) Replace damaged spark plug Heli-coil inserts using kit 8668779 (fig. 12) as described in (*a*) through (*h*) below.

(*a*) Use a diamond-pointed punch to drive staked, serrated-tooth section of insert from thread into which section is imbedded.

(*b*) Insert extractor 8389963 as shown in figure 81. Applying constant pressure to extractor, turn extractor counterclockwise until insert is removed.

(*c*) If necessary, clean threads with tap 7082331 as shown in figure 82.

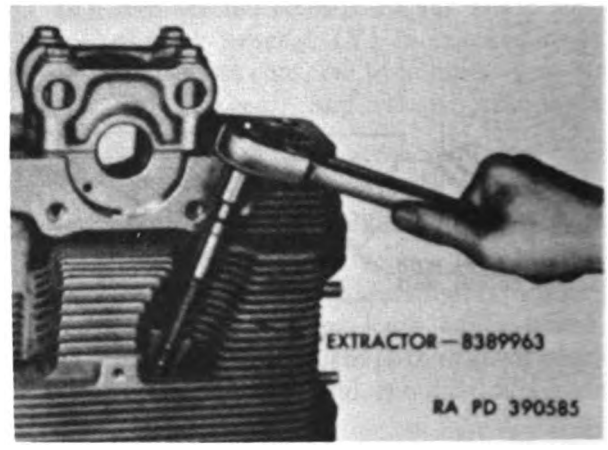



*Figure 81. Removing spark plug Heli-coil threaded insert.*

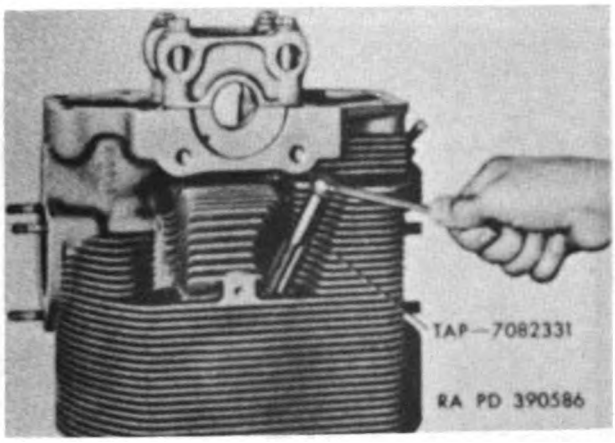



*Figure 82. Retapping thread for Heli-coil insert.*

(*d*) Thread new spark plug Heli-coil insert (QQ) into threaded guide of inserter 8668627 (fig. 83) by slowly turning pilot until insert is flush with end of tool.

(*e*) Insert pilot of inserter in threaded hole in cylinder head casting, with face of inserter resting solidly against casting, as shown in figure 83.

(*f*) Slowly turn pilot clockwise until no further resistance is felt. The insert will then be flush with casting. Remove inserter.

(*g*) Stake insert in place by threading tool 7082330, as shown in figure 84, into insert to drive serrated-tooth section into casting. Remove tool.

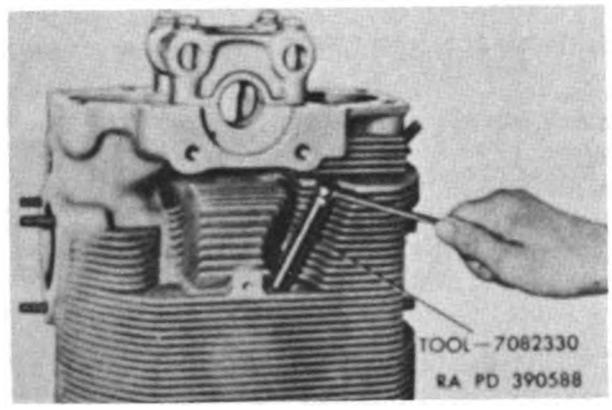



*Figure 84. Staking spark plug Heli-coil threaded insert.*

(*h*) Using remover 7082407 as shown in figure 85, break off and remove tang from inner end of insert.

(5) Replace damaged shroud mounting bolt hole Heli-coil inserts in side of cylinder head in the same manner as described for spark plug Heli-coil inserts ((4) (*a*), (*b*), and (*d*) through (*f*) above) except use extractor 7751050 (HH, fig. 10) and inserter 8375242 (U, fig. 10) as shown in figures 86 and 87, respectively. Remove tang ((4) (*h*) above).

*g. Valve Rocker Covers* (W). Repair or replace covers as described in paragraph 79*b*.

## 105. Assembly

NOTE: The key letters shown below in parentheses refer to figure 76 except where otherwise indicated.

*a. Install Valve Guides.* If valve guides were

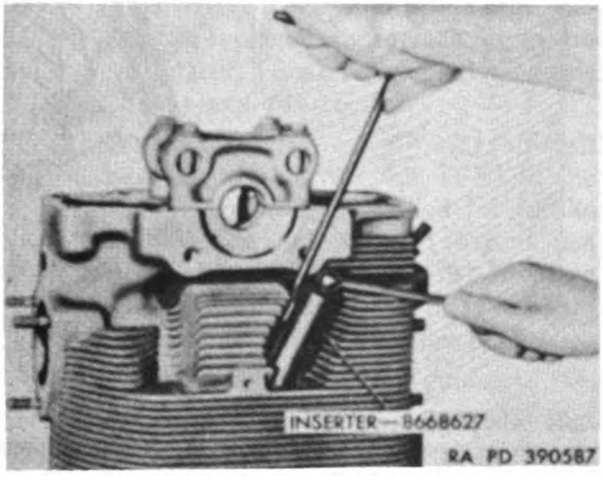



*Figure 83. Installing spark plug Heli-coil threaded insert.*

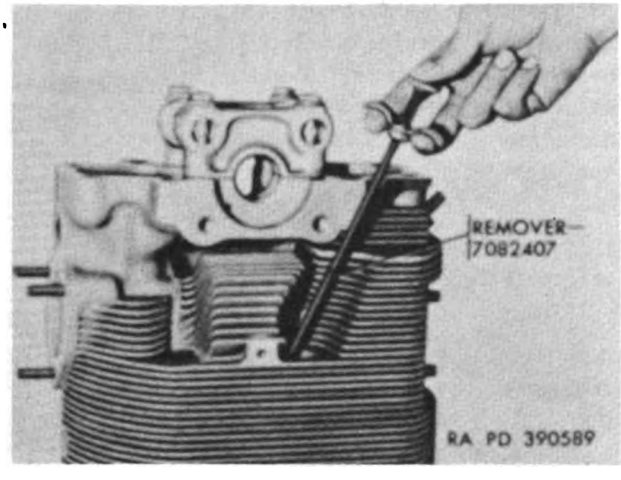



*Figure 85. Removing tang from Heli-coil threaded insert.*

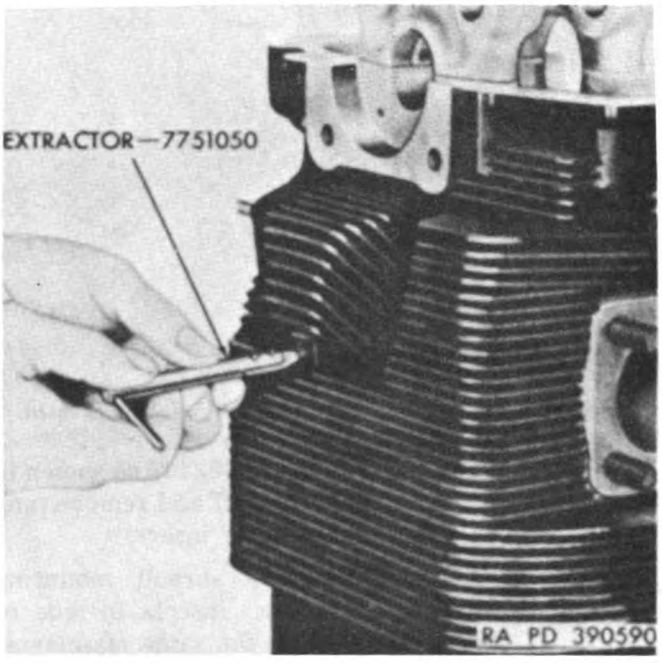



*Figure 86. Removing shroud bolt Heli-coil threaded insert.*

removed, install new valve guides ((1) through (3) below).

(1) *Install intake valve guide.*

(*a*) Place cylinder on a suitable support, with cylinder head end up.

(*b*) Pull loose ferrule from end of replacer 7083685 (H, fig. 9). Place new valve guide (L) over tool, with short end of guide entering hollow replacer handle. Replace ferrule to retain guide on replacer.

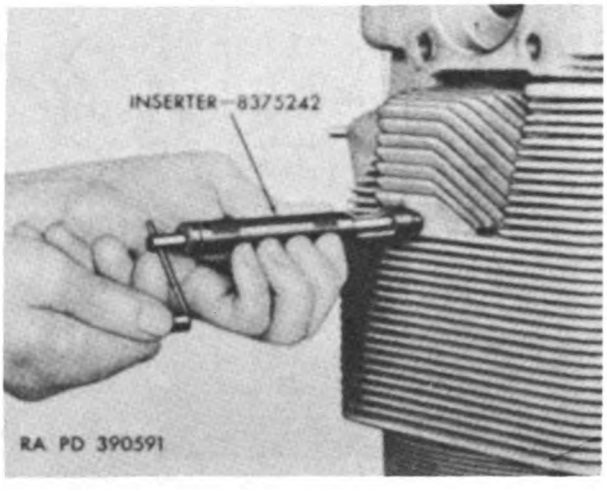



*Figure 87. Installing shroud bolt Heli-coil threaded insert.*

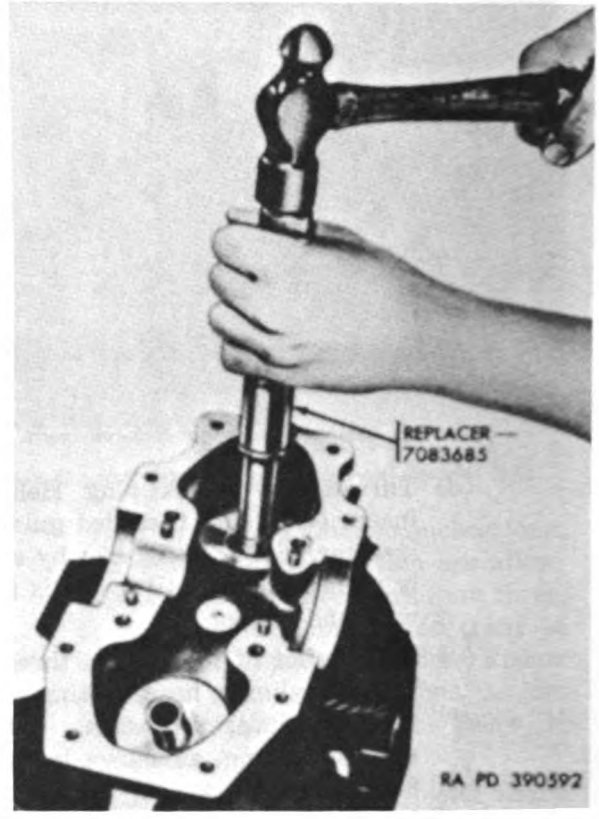



*Figure 88. Installing intake valve guide.*

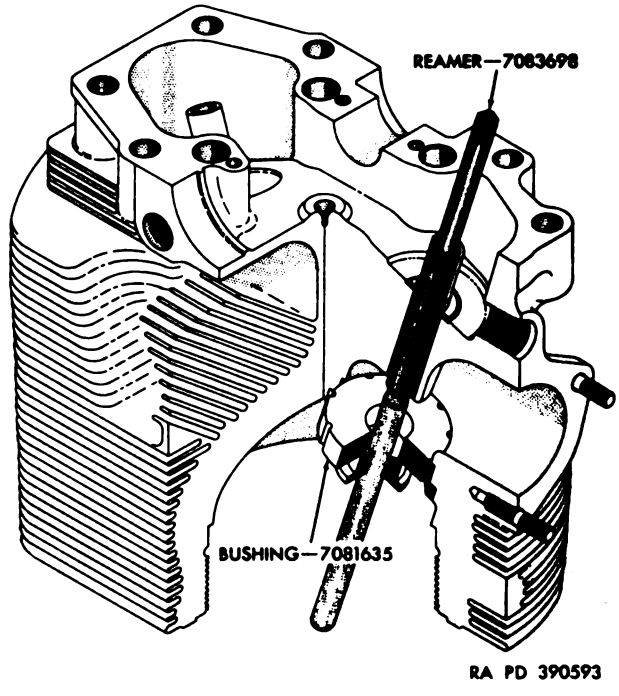



*Figure 89. Valve guide reamer and pilot bushing installed—cutaway view.*

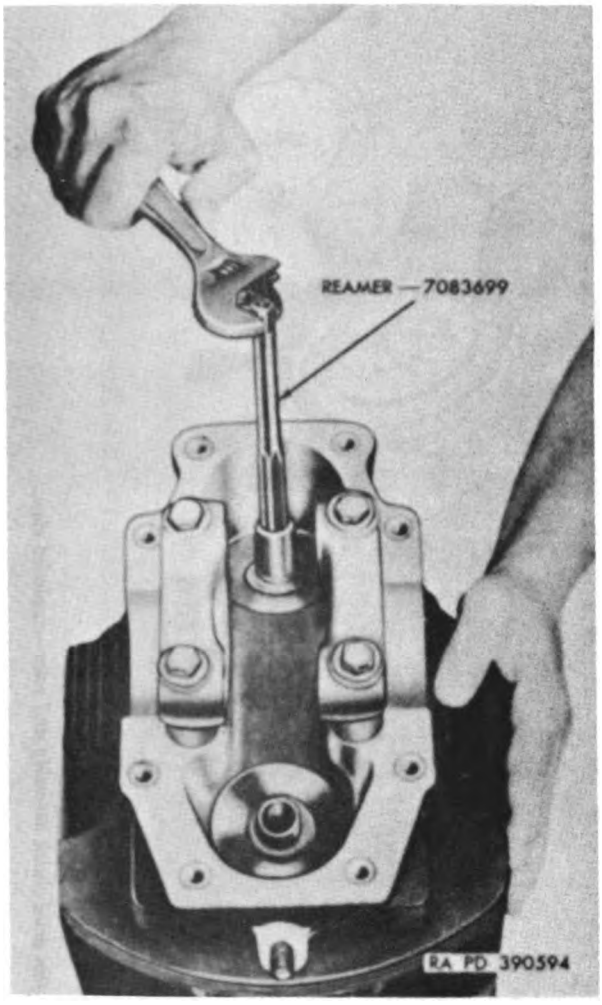



*Figure 90. Reaming intake valve guide.*

(*c*) Slide ferrule into bore for valve guide in cylinder as shown in figure 88. Drive guide into guide seat. Remove replacer and replace ferrule on replacer. Ream new valve guide ((3) and (4) below).

(2) *Install exhaust valve guide.* Install new exhaust valve guide (FF) in the same manner as described for intake valve guide ((1) above) except use replacer 7083682 (J, fig. 9) in place of replacer 7083685 (H, fig. 9). Ream new valve guide ((3) below).

(3) *Ream new intake valve guides.*

(*a*) Install pilot bushing 7081635 (fig. 89) in intake valve insert.

(*b*) Use reamer 7083698 (fig. 89) to rough ream intake valve and use reamer 7083699 (fig. 90) to finish ream intake valve guide.

(4) *Ream new exhaust valve guide.* Ream new exhaust valve guide (FF) in the same manner as described for intake valve guide ((3) above) expect use pilot bushing 7081634 (N, fig. 10), reamer 7083696 (S, fig. 9), and reamer 7083697 (Q, fig. 9).

*b. Install Valves, Retainers, and Springs.*

(1) Remove four hex-head bolts (S) and flat washers (R) holding camshaft bearing cap (Q) and rocker shaft supporting bracket (V) on cylinder. Remove cap and support bracket.

(2) Install exhaust valve (PP) and intake valve (B) in their respective guides in cylinder assembly (C).

(3) Place cylinder assembly on stand 8708419 (fig. 78).

(4) Install exhaust valve rotor assembly (EE), three valve springs (DD, CC, and BB), and exhaust valve spring retainer (AA) over the exhaust valve stem.

(5) Clamp valve spring lifter 8708370 (fig. 78) over exhaust valve spring retainer. Compress springs and install spring retainer locks (P) in valve stem groove. Release lifter handle slowly until spring retainer is in position. Remove lifter.

(6) Install intake valve spring lower retainer (M), three valve springs (DD, CC, and BB), and intake valve spring upper retainer (N) over intake valve stem. Clamp lifter over intake valve spring upper retainer (N), compress springs, and install spring retainer locks (P) in the same manner as described for exhaust valve ((5) above).

*c. Assemble and Install Valve Rocker Assemblies.*

(1) Install adjusting screw assembly (fig. 77) in threaded hole in end of rocker. Secure screw assembly with $\frac{7}{16}$-inch hex jam nut (fig. 77).

(2) Install valve rocker assemblies (U) on valve rocker shaft assemblies (T).

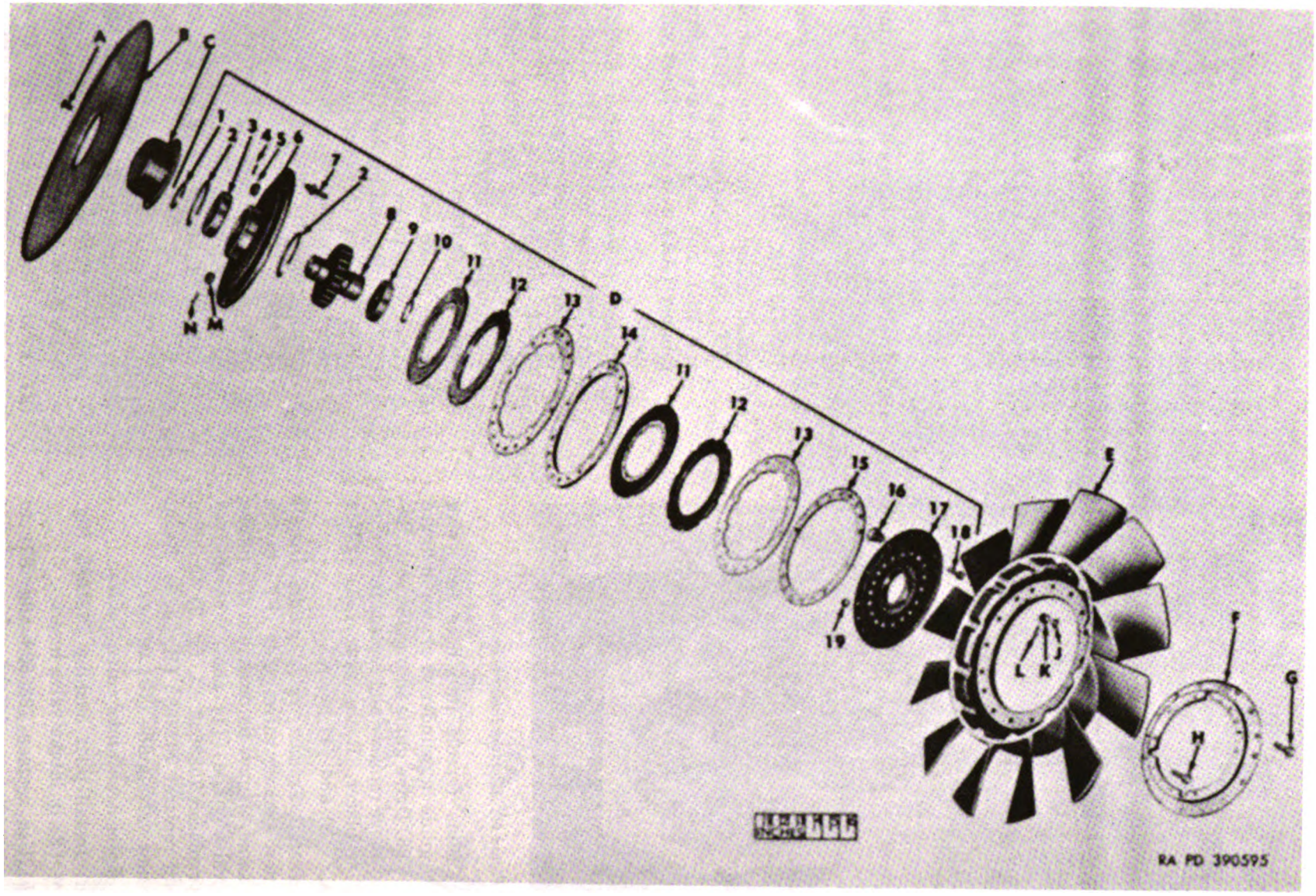



*Figure 91. Cooling fan drive clutch assembly and rotor—exploded view.*

A—¼ x 9/16 round-head lockwasher screw 424673
B—Rotor cover 7410165
C—Fan drive vertical shaft cover 7538982
D—Fan drive clutch assembly 7403737
1—1 13/16-inch shaft diameter retaining ring 583002
2—2 63/64-inch housing diameter retaining ring 596702
3—Ball bearing 7403731
4—1/16 x ½ cotter pin 112726
5—¼-inch slotted hex nut 122925
6—Clutch outer housing 7403736
7—9/32 x 1½ dowel pin 7403729
8—Clutch drive hub 8680528
9—Ball bearing 7403729
10—1 31/64-inch shaft diameter retaining ring 590085
11—Clutch friction disk 8680529
12—Clutch pressure plate 7539470
13—Clutch pressure disk 7403741
14—Clutch disk spacer 7403738
15—Clutch housing spacer 7403746
16—Clutch spring 7403739
17—Clutch inner housing 7376948
18—¼ x 1 23/64 hex-head bolt 7403727
19—⅜-inch ball 587940
E—Fan rotor 8376452
F—Clutch-to-rotor adapter 7403734
G—5/16 x 1 23/64 hex-head bolt 7403743
H—5/16 x 1 51/64 hex-head bolt 7403744
J—21/64 id, 13/16 od, ⅛ thick flat washer 7744766
K—5/16-inch slotted hex nut 122942
L—1/16 x ½ cotter pin 112726
M—5/16-inch slotted hex nut 122942
N—1/16 x ½ cotter pin 112726

*Figure 91—Continued.*

(3) Install valve rocker shaft assemblies, with attached valve rocker assemblies, into bores in camshaft bearing cap and rocker shaft supporting bracket.

(4) Install camshaft bearing cap (Q) and rocker shaft supporting bracket (V) on cylinder head and secure to cylinder head with four $\frac{3}{8}$ x $2\frac{13}{16}$ hex-head bolts (S) and $\frac{25}{64}$ id, $1\frac{3}{16}$ od, $\frac{1}{8}$ thick flat washers (R).

*d. Install Priming Nozzle.* Fuel priming nozzle assembly (K) must be rebuilt (pars. 219 through 223) before installing in cylinder. Install nozzle assembly in tapped hole on intake side of cylinder.

*e. Mark Cylinder.* All cylinders are marked on the intake side of the rocker box flange showing original installation position. Replacement cylinders must be marked the same as the cylinders they are replacing.

## Section VII. REBUILD OF COOLING FAN ROTOR, DRIVE CLUTCH ASSEMBLY, AND DRIVE

### 106. Disassembly

*a. Separate Fan Drive Clutch Assembly from Fan Rotor.*

NOTE: The key letters shown below in parentheses refer to figure 91.

(1) Rotor cover (B) and fan drive vertical shaft cover (C) were removed when fan was removed from engine.

(2) Remove 16 cotter pins (L), slotted hex nuts (K), flat washers (J), and hex-head bolts (G) securing fan drive clutch assembly (D) and clutch-to-rotor adapter (F) to web of fan rotor (E) and remove adapter, with attached clutch assembly.

(3) Remove 10 cotter pins (N), slotted hex nuts (M), and hex-head bolts (H) securing clutch assembly to adapter. Remove clutch assembly.

*b. Disassemble Fan Drive Clutch Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 91.

(1) Remove four cotter pins (D–4), slotted hex nuts (D–5), and hex-head bolts (D–18) securing clutch outer housing (D–6) to clutch inner housing (D–17).

**CAUTION: The clutch assembly is spring-loaded. Maintain pressure on outer and inner housings when removing slotted hex nuts from bolts to prevent parts from springing apart and causing possible loss or damage to parts or injury to personnel.**

(2) Carefully lift outer housing, with attached clutch drive hub (D–8), ball bearing (D–3), and ball bearing (D–9), from inner housing.

(3) Remove two clutch friction disks (D–11), two clutch pressure plates (D–12), two clutch pressure disks (D–13), clutch disk spacer (D–14), clutch housing spacer (D–15), three clutch springs (D–16), and fifteen bearing balls (D–19) from clutch inner housing (D–17).

(4) Remove retaining ring (D–1) from end of clutch drive hub (D–8). Push hub from outer housing ball bearing (D–3).

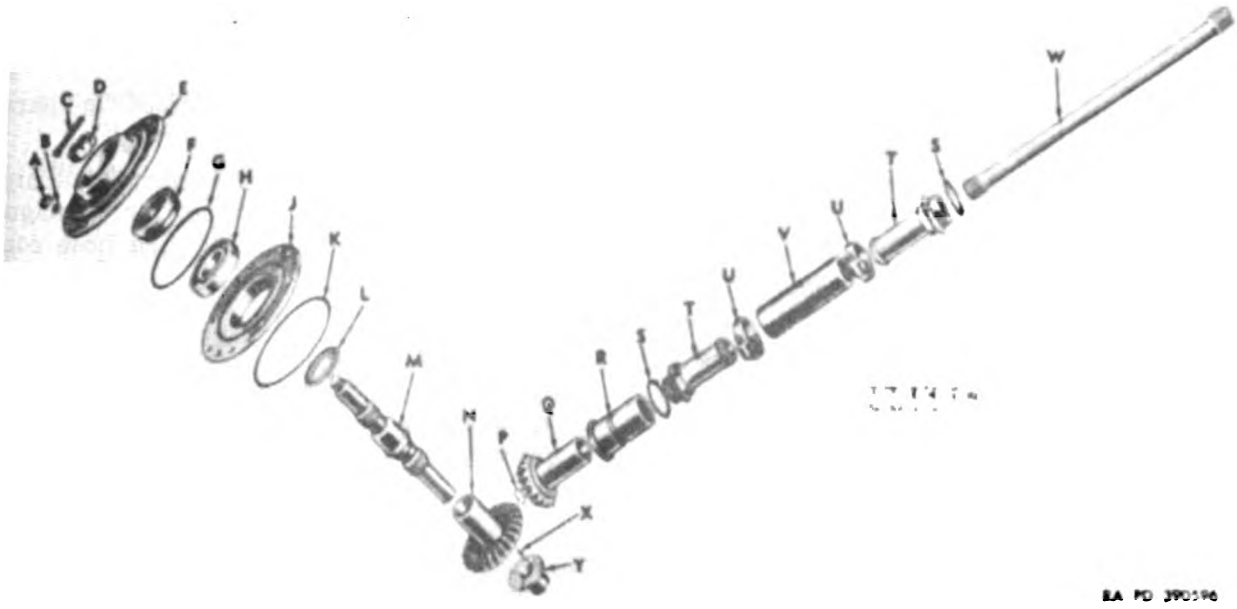
(5) Remove retaining ring (D–10) from end of drive hub. Slide inner housing ball bearing (D–9) from hub.

(6) Remove two retaining rings (D–2) from slots in clutch outer housing (D–6) and remove ball bearing (D–3) from housing.

*c. Disassemble Cooling Fan Drive.*

NOTE: The key letters shown below in parentheses refer to figure 92.

(1) Vertical drive shaft oil seal housing (E), vertical drive shaft bearing housing (J), and vertical drive shaft (M) were removed when engine was disassembled.



A—5/16-inch slotted hex nut 122942
B—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
C—1/8 x 1¾ cotter pin 137214
D—¾-inch slotted hex nut 7767728
E—Vertical drive shaft oil seal housing 7376051
F—Oil seal 7376044
G—4-inch id "O" ring packing 546878
H—Ball bearing 700080
J—Vertical drive shaft bearing housing 7346539
K—4¾-inch id "O" ring packing 546884
L—Vertical drive shaft oil slinger 7346506
M—Vertical drive shaft 7346599
N—Vertical drive shaft driven gear 7351158
P—29/32-inch housing diameter retaining ring 593349
Q—Vertical drive shaft drive gear 7351190
R—Drive gear bearing 7351189
S—Hose nipple gasket 7346727
T—Drive shaft hose nipple 7346497
U—Hose clamp 502919
V—Hose 7403383
W—Horizontal drive shaft 7346498
X—3/16 x ⅜ dowel pin 7338668
Y—Vertical drive shaft bearing 7351157

*Figure 92. Cooling fan drive—exploded view.*

(2) Remove "O" ring packings (G and K) from grooves in vertical drive shaft bearing housing (J). Discard packings.

(3) Remove vertical drive shaft (M) from bearing housing. Remove vertical drive shaft oil slinger (L) from drive shaft.

(4) Press ball bearing (H) from bearing housing.

(5) Do not remove oil seal (F) from vertical drive shaft oil seal housing (E) unless inspection (par. 108) indicates replacement is necessary. To remove oil seal, carefully drive seal from housing.

(6) Remove retaining ring (P) from bore of vertical drive shaft drive gear (Q).

## 107. Cleaning

Clean all parts as described in paragraph 77.

## 108. Inspection

*a. Fan Rotor* (E, fig. 91). Inspect rotor for bent or broken fan blades. Check bore of rotor for conformance to tolerances specified in repair and rebuild standards (par. 313).

*b. Clutch-to-Rotor Adapter* (F, fig. 91). Inspect adapter for bent or warped condition. Check dowel pin holes and adapter pilot for conformance to tolerances specified in repair and rebuild standards (par. 313).

*c. Fan Drive Clutch Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 91.

(1) *Housings.* Inspect clutch outer housing (D–6) and clutch inner housing (D–17) for wear or cracks. Inspect

bearing bores for nicks, pitting, or galling. Check bearing bores for conformance to tolerances specified in repair and rebuild standards (par. 313).

(2) *Friction disks.* Inspect clutch friction disks (D–11) for wear or deterioration.

(3) *Plates, pressure disks, and spacers.* Inspect clutch pressure plates (D–12), clutch pressure disks (D–13), clutch disk spacer (D–14), and clutch housing spacer (D–15) for wear, warping, or mutilation.

(4) *Springs.* Check clutch springs (D–16) for conformance to limits specified in repair and rebuild standards (par. 313).

(5) *Ball bearings.* Refer to TM 37–265 for inspection of ball bearings (D–3 and D–9). Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 313).

(6) *Drive hub.* Check clutch drive hub (D–8) for conformance to tolerances specified in repair and rebuild standards (par. 313).

(7) *Balls.* Check balls (D–19) for conformance to tolerances specified in repair and rebuild standards (par. 313).

*d. Cooling Fan Drive.*

NOTE: The key letters shown below in parentheses refer to figure 92.

(1) *Ball bearing.* Refer to TM 37–265 for inspection of ball bearing (H). Check bearing for conformance to tolerances specified in repair and rebuild standards (par. 312).

(2) *Oil seal.* Inspect oil seal (F) as described in paragraph 78.

(3) *Drive shafts.* Inspect vertical and horizontal drive shafts (M and W) as described in paragraph 78.

(4) *Gears.* Inspect vertical drive shaft drive and driven gears (Q and N) as described in paragraph 78.

(5) *Oil slinger.* Inspect vertical drive shaft oil slinger (L) for cracks and for conformance to tolerances specified in repair and rebuild standards (par. 312).

(6) *Oil seal and bearing housings.* Inspect vertical drive shaft oil seal housing (E) and vertical drive shaft bearing housing (J) as described in paragraph 78*b*.

(7) *Nipples.* Inspect drive shaft hose nipples (T) for stripped or damaged threads and for mutilated hose connection end.

## 109. Repair

*a. Fan Rotor* (E, fig. 91). Replace rotor if blades are bent or broken.

NOTE: Do not attempt to straighten bent blades.

*b. Clutch-to-Rotor Adapter* (F, fig. 91). Replace adapter if bent or warped sufficiently to interfere with assembly, disassembly, or operation. Replace adapter if it does not conform to tolerances specified in repair and rebuild standards (par. 313).

*c. Fan Drive Clutch Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 91. There are no definite limits established for clutch housings, disks, plates, and spacers. Therefore, good judgment must be used in deciding which parts are to be replaced.

(1) *Housings.* Replace entire fan drive clutch assembly (D) if clutch outer housing (D–6) or clutch inner housing (D–17) are worn or cracked or if bearing bores are badly nicked, pitted or galled, or if bores do not conform to tolerances specified in repair and rebuild standards (par. 313). Remove minor nicks and pits from bores with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(2) *Friction disks.* Replace clutch friction disks (D–11) if worn or deteriorated. Minor smearing of copper plating is no cause for replacement.

(3) *Plates, pressure disks, and spacers.* Replace clutch pressure plates (D–12), clutch pressure disks (D–13), clutch disk spacer (D–14), and clutch housing spacer (D–15) if worn, warped, or mutilated.

(4) *Springs.* Replace clutch springs (D–16) if springs do not conform to limits

specified in repair and rebuild standards (par. 313).

(5) *Ball bearings.* Repair or replace ball bearings (D–3 and D–9) as described in paragraph 79.

(6) *Drive hub.* Repair or replace clutch hub (D–8) if hub does not conform to tolerances specified in repair and rebuild standards (par. 313).

(7) *Balls.* Replace balls (D–19) if balls do not conform to tolerances specified in repair and rebuild standards (par. 313).

*d. Cooling Fan Drive.*

NOTE: The key letters shown below in parentheses refer to figure 92.

(1) *Ball bearing.* Repair or replace ball bearing (H) as described in paragraph 79.

(2) *Oil seal.* Replace oil seal (F) if damaged.

(3) *Drive shafts.* Repair or replace vertical and horizontal drive shafts (M and W) as described in paragraph 79.

(4) *Gears.* Repair or replace vertical drive shaft drive and driven gears (Q and N) as described in paragraph 79.

(5) *Oil slinger.* Replace vertical drive shaft oil slinger (L) if cracked or if it does not conform to tolerances specified in repair and rebuild standards (par. 312).

(6) *Oil seal and bearing housings.* Repair or replace vertical drive shaft oil seal housing (E) and vertical drive shaft bearing housing (J) as described in paragraph 79*b*.

(7) *Nipples.* Replace drive shaft hose nipples (T) if threads are stripped or damaged or if hose connection end is mutilated.

## 110. Assembly

*a. Assemble Cooling Fan Drive.*

NOTE: The key letters shown below in parentheses refer to figure 92 except where otherwise indicated.

(1) Install $2^{9}/_{32}$-inch housing diameter retaining ring (P) in bore of vertical drive shaft drive gear (Q).

(2) If oil seal (F) was removed, install new oil seal in vertical drive shaft oil seal housing (E) by using replacer 8708852 (fig. 93).

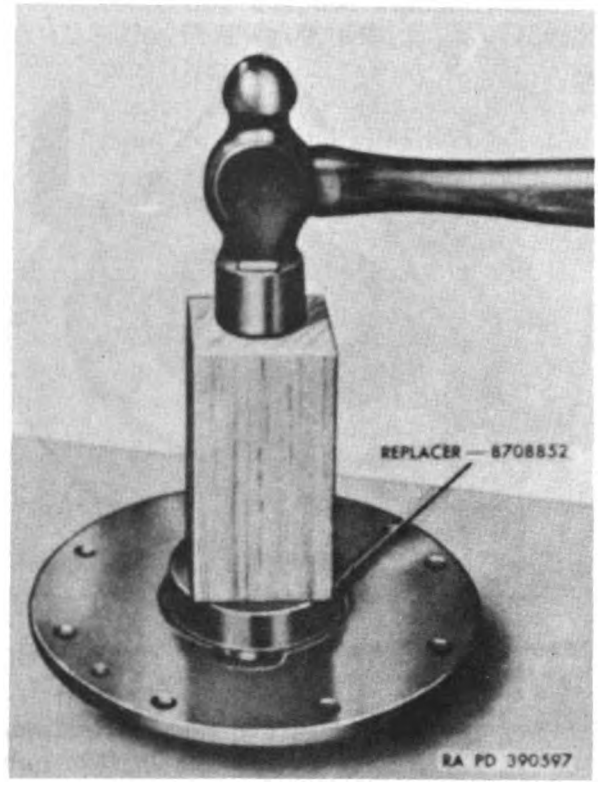



*Figure 93. Installing fan drive vertical drive shaft oil seal.*

(3) Install ball bearing (H) in vertical drive shaft bearing housing (J).

(4) The remainder of the assembly is accomplished when engine is assembled.

*b. Assemble Fan Drive Clutch Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 91 except where otherwise indicated.

(1) Install ball bearing (D–3) in bore of clutch outer housing (D–6). Secure bearing in housing by installing two $2^{63}/_{64}$-inch housing diameter retaining rings (D–2) in grooves in housing bore on each side of bearing.

(2) Press ball bearing (D–9) on lower end of clutch drive hub (D–8). Secure ball bearing on hub by installing $1^{31}/_{64}$-inch shaft diameter retaining ring (D–10) in groove in shaft of hub.

(3) Position upper end of drive hub (D–8) into ball bearing in clutch outer housing (D–6) and secure by installing

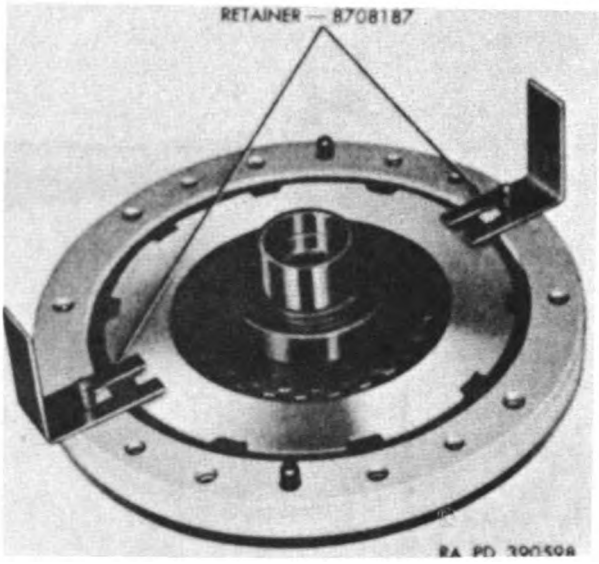



*Figure 94. Retaining plates and disks in fan drive clutch outer housing during assembly.*

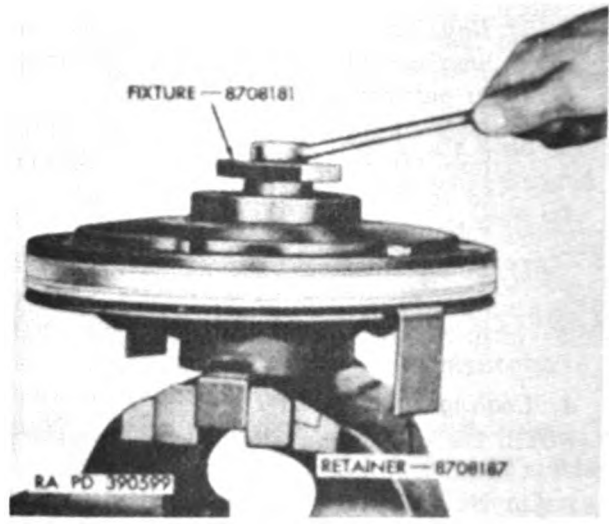



*Figure 95. Assembling cooling fan drive clutch.*

$1^{15}/_{16}$-inch shaft diameter retaining ring (D–1) in groove in shaft of hub.

(4) Place clutch outer housing (D–6) on bench, with drive hub end up.

(5) Install clutch friction disk (D–11) and clutch pressure plate (D–12) on outer housing.

(6) Install clutch pressure disk (D–13) on clutch outer housing over clutch pressure plate (D–12), with splines in bore of pressure disk and on rim of pressure plate alined.

(7) Install clutch disk spacer (D–14) on top of clutch pressure disk installed in (6) above.

(8) Install remaining clutch friction disk (D–11), clutch pressure plate (D–12), clutch pressure disk (D–13), and clutch housing spacer (D–15) on clutch disk spacer in the same manner as described in (5) and (6) above.

(9) Install two $^5/_{16}$ x $1^{23}/_{64}$ hex-head bolts (G) through bolt holes in outer housing and spacer and secure bolts with retainers 8708187 (fig. 94).

(10) Clamp fixture 8708181 (fig. 95) in a vise and remove bolt and bar from fixture. Position clutch inner housing (D–17) on fixture, with side containing ball and spring recesses up.

(11) Install three clutch springs (D–16) and fifteen $^5/_8$-inch balls (D–19) in recesses of clutch inner housing.

(12) Aline outer housing dowel pins with dowel pin holes in inner housing and install outer housing group, with retainers, on inner housing, over balls and springs.

(13) Install bar of fixture over center hole of outer housing. Install bolt through bar and housing and screw bolt into threaded hole in bottom of fixture to compress housings together as shown in figure 95.

(14) Install four $^1/_4$ x $1^{23}/_{64}$ hex-head bolts (D–18), with heads of bolts against inner housing, in holes provided and secure bolts with $^1/_4$-inch slotted hex nuts (D–5). Tighten nuts only finger-tight.

(15) Withdraw two retainers 8708187 (fig. 95) with hex-head bolts (G) from the assembly and tighten the $^1/_4$-inch hex nuts, installed in (14) above, securely. Secure nuts with $^1/_{16}$ x $^1/_2$ cotter pins (D–4).

(16) Remove bolt from fixture and bar. Remove bar from clutch assembly. Re-

move clutch assembly from fixture and fixture from vise.

*c. Assemble Fan Drive Clutch Assembly to Fan Rotor.*

NOTE: The key letters shown below in parentheses refer to figure 91.

(1) Install assembled fan drive clutch assembly (D) on clutch-to-rotor adapter (F), with inner clutch housing side mating with raised center portion of adapter and the four bolt heads located in the cutouts of the adapter.

(2) Secure clutch assembly to adapter with ten $\frac{5}{16}$ x $1\frac{51}{64}$ hex-head bolts (H) and $\frac{5}{16}$-inch slotted hex nuts (M). Install bolts with heads of bolts contacting adapter. Tighten nuts securely and secure with $\frac{1}{16}$ x $\frac{1}{2}$ cotter pins (N).

(3) Center fan rotor (E) on clutch-to-rotor adapter and aline bolt holes in rotor with holes in adapter. Secure rotor to adapter with sixteen $\frac{5}{16}$ x $1\frac{23}{64}$ hex-head bolts (G), $2\frac{1}{64}$ id, $1\frac{3}{16}$ od, $\frac{1}{8}$ thick flat washers (J), and $\frac{5}{16}$-inch slotted hex nuts (K). Place washers under nuts in contact with fan rotor. Tighten nuts securely. Secure nuts with $\frac{1}{16}$ x $\frac{1}{2}$ cotter pins (L).

(4) Fan drive vertical shaft cover (C) and rotor cover (B) are installed when engine is assembled.

## Section VIII. REMOVAL OF ACCESSORY CASE SUBASSEMBLIES

To facilitate rebuilding the accessory case, it is broken down into subassemblies. The removal of the subassemblies is given in a practical order; however, the sequence is not mandatory and may be altered to suit convenience. Make certain accessory case is solidly braced on bench before attempting to remove accessories.

### 111. Remove Starter Drive Assembly

NOTE: The key letters shown below in parentheses refer to figure 96.

*a.* Remove six hex self-locking nuts (AN) or hex stamped nuts (AP) and hex nuts (AN), and flat washers (AM) securing starter drive assembly (AL) to accessory case.

*b.* Remove starter drive assembly from accessory case using two puller screws 7083740 (fig. 97). Remove and discard "O" ring packing (AK).

### 112. Remove Generator Drive Adapter Assembly

NOTE: The key letters shown below in parentheses refer to figure 96.

*a.* Remove six hex self-locking nuts (XX) or hex stamped nuts (YY) and hex nuts (XX), and plain washers (WW) securing generator drive adapter assembly (ZZ) to accessory case.

*b.* Remove generator drive adapter assembly from accessory case using two puller screws 7083740 (fig. 98). Remove and discard "O" ring packings (RR and AB).

### 113. Remove Oil Control Housing Assembly

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

*a. Remove Oil Pressure Control Valve Assembly.* Cut locking wire and remove oil pressure control valve assembly from oil control housing using wrench 8708401 (fig. 99). Remove and discard gasket.

*b. Remove Oil Filter Bypass Valve Assembly.* Cut locking wire and remove oil filter bypass valve assembly from oil control housing using wrench 8708400 (fig. 100). Remove and discard gasket.

*c. Remove Oil Cooler Bypass Valve Assembly.* Cut locking wire and remove oil cooler bypass valve assembly from oil control housing. Remove and discard gasket.

*d. Remove Oil Control Housing Assembly.*

(1) Disconnect coupling nuts (B and M, fig. 48) securing engine oil tube assembly to oil control housing (G) and accessory case tee (T). Remove tube assembly.

(2) Disconnect coupling nuts (D and K, fig. 48) securing fuel injector oil tube assembly to oil control housing and to magneto drive assembly. Remove hex self-locking nut (BD), or hex stamped nut (BC) and hex nut (BD), and plain washer (BA) securing tube

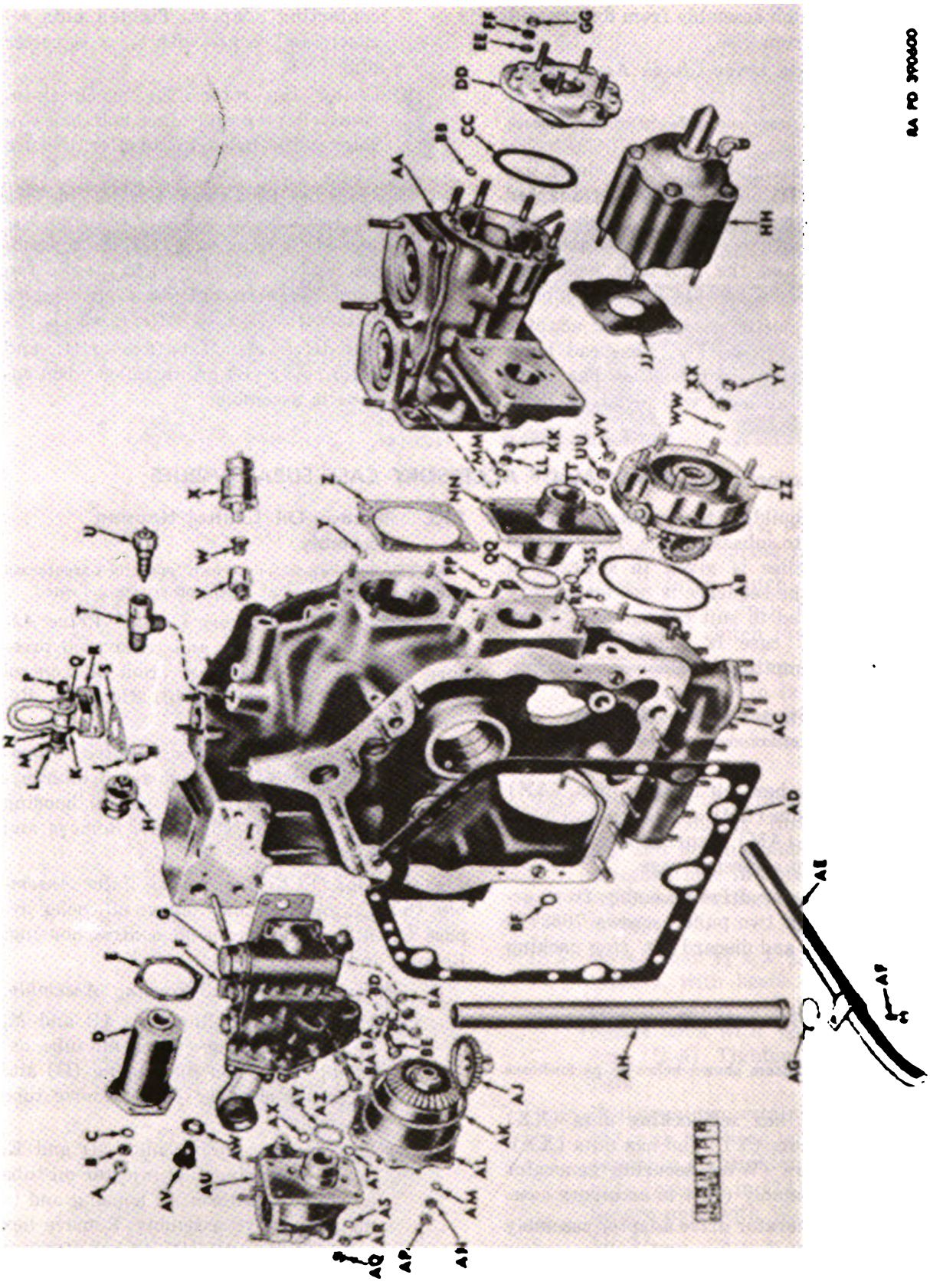


*Figure 96. Accessory case and subassemblies—exploded view.*

A—5/16-inch hex stamped nut 107822

B— { 5/16-inch hex self-locking nut 503345 or 503380 } (model AOSI-895-5 engine only)
B— { 5/16-inch hex nut 225853 (model AOSI-895-5M engine only)

C—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
D—Oil filter assembly 7539861
E—Oil filter mounting gasket 7744815
F—Oil control housing gasket 7346578
G—Oil control housing assembly 7737875
H—Low oil pressure warning light sending unit 8678906
J—Pipe elbow 8365773
K—Lifting eye 7376026
L—1/8 x 1 cotter pin 137185
M—21/32 id, 1.0000 od, 1/8 thick flat washer 7376080
N—Lifting eye spring 7376035
P—7/16-inch slotted hex nut 122961
Q—5/8 x 3 1/8 flat-head pin 7376019
R—Breather adapter 7376017
S—Breather adapter gasket 7410066
T—Tee 8733070
U—High oil temperature warning light sending unit 7386295
V—Pipe elbow 8365774
W—1/2 x 3/8 pipe bushing 8365772
X—Oil pressure gage sending unit 7321347
Y—5/16-inch id "O" ring packing 501219
Z—Magneto drive housing gasket 7348753
AA—Magneto drive assembly 7737837
BB—5/16-inch id "O" ring Packing 591219
CC—3 13/64-inch id "O" ring packing 546822
DD—Fuel pump drive adapter assembly 8679603
EE—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

FF— { 5/16-inch hex self-locking nut 503345 or 503380 } (model AOSI-895-5 engine only)
FF— { 5/16-inch hex nut 225853 (model AOSI-895-5M engine only)

GG—5/16-inch hex stamped nut 107822 (model AOSI-895-5M engine only)
HH—Fuel injector oil booster pump assembly 8698635
JJ—Booster pump gasket 8698572
KK—3/8-inch hex stamped nut 107823 (model AOSI-895-5M engine only)

LL— { 3/8-inch hex self-locking nut 503351 or 503383 } (model AOSI-895-5 engine only)
LL— { 3/8-inch hex nut 225854 (model AOSI-895-5M engine only)

MM—25/64 id, 5/8 od, 0.0640 thick plain washer 502204
NN—Left camshaft drive housing assembly 7414503
PP—5/16-inch id "O" ring packing 501219
QQ—2 1/8-inch id "O" ring packing 546863
RR—5/16-inch id "O" ring packing 501219
SS—7/16-inch id "O" ring packing 501221
TT—25/64 id, 5/8 od, 0.0640 thick plain washer 502204

UU— { 3/8-inch hex self-locking nut 503351 or 503383 } (model AOSI-895-5 engine only)
UU— { 3/8-inch hex nut 225854 (model AOSI-895-5M engine only)

VV—3/8-inch hex stamped nut 107823 (model AOSI-895-5M engine only)
WW—25/64 id, 5/8 od, 0.0640 thick plain washer 502204

XX— { 3/8-inch hex self-locking nut 503351 or 503383 } (model AOSI-895-5 engine only)
XX— { 3/8-inch hex nut 225854 (model AOSI-895-5M engine only)

YY—3/8-inch hex stamped nut 107823 (model AOSI-895-5M engine only)
ZZ—Generator drive adapter assembly 7403467
AB—4 3/4-inch id "O" ring packing 546884
AC—Accessory case assembly 7737872
AD—Accessory case gasket 7346527
AE—Scavenger oil pump outlet tube 7375419
AF—7/16 x 1 9/32 hex-head bolt 7346699
AG—1 23/32-inch housing diameter retaining ring 593364
AH—Oil pressure regulator spill tube 7346642

AJ— { Scavenger oil pump drive gear { 7954850 (late model AOSI-895-5 engine only) 7372686 }

AK—5 5/8-inch id "O" ring packing 546891
AL—Starter drive assembly 7403476
AM—25/64 id, 5/8 od, 1/16 thick flat washer 8679576

AN— { 3/8-inch hex self-locking nut 503351 or 503383 } (model AOSI-895-5 engine only)
AN— { 3/8-inch hex nut 225854 (model AOSI-895-5M engine only)

AP—3/8-inch hex stamped nut 107823 (model AOSI-895-5M engine only)
AQ—3/8-inch hex stamped nut 107823 (model AOSI-895-5M engine only)

AR— { 3/8-inch hex self-locking nut 503351 or 503383 } (model AOSI-895-5 engine only)
AR— { 3/8-inch hex nut 225854 (model AOSI-895-5M engine only)

AS—25/64 id, 5/8 od, 0.0640 thick plain washer 502204
AT—7/16-inch id "O" ring packing 501221
AU—Right camshaft drive housing assembly 7414505
AV—7/8-inch hex-head magnetic plug 7375426
AW—7/8-inch annular gasket 105456
AX—5/16-inch id "O" ring packing 501219
AY—2 1/8-inch id "O" ring packing 546863
AZ—5/16 x 2 11/32 hex-head bolt 7376120
BA—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
BC—5/16-inch hex stamped nut 107822 (model AOSI-895-5M engine only)

BD— { 5/16-inch hex self-locking nut 503345 or 503380 } (model AOSI-895-5 engine only)
BD— { 5/16-inch hex nut 225853 (model AOSI-895-5M engine only)

BE—5/16 x 2 15/32 hex-head bolt 7974076
BF—3/4-inch id "O" ring packing 501225

*Figure 96—Continued.*

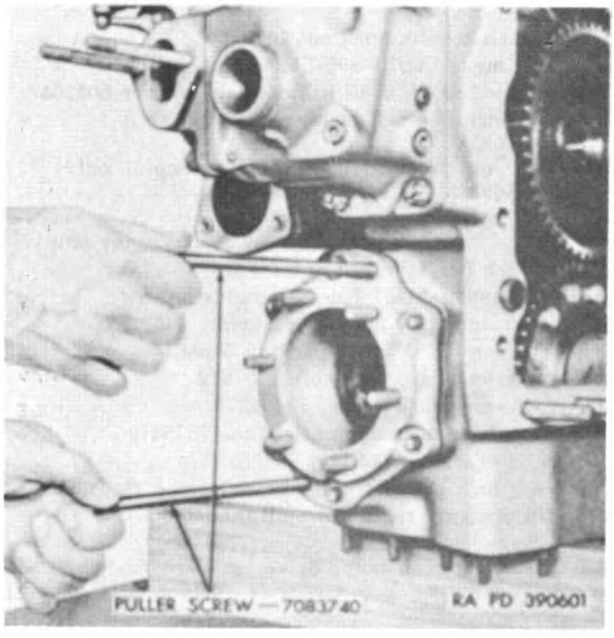



*Figure 97. Removing starter drive assembly.*

clamp bracket to oil control housing mounting stud. Remove hex self-locking nut (LL), or hex stamped nut (KK) and hex nut (LL), and plain washer (MM) securing tube clamp bracket to magneto drive assembly mounting stud. Remove tube assembly.

(3) Cut locking wire and remove three hex-head bolts (AZ), two hex-head bolts (BE), three hex self-locking nuts (BD) or hex stamped nuts (BC) and hex nuts (BD), and eight flat washers (BA) securing oil control housing (G) to accessory case. Remove oil control

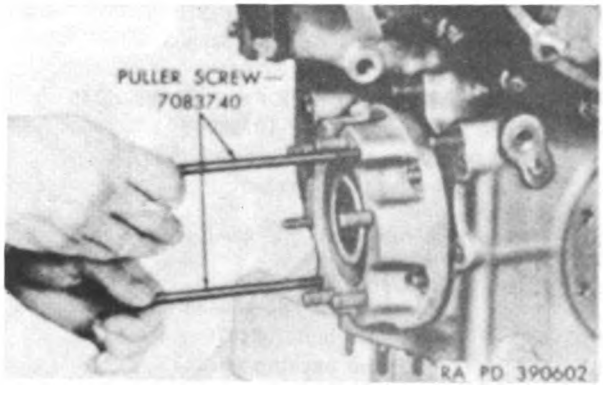



*Figure 98. Removing generator drive adapter assembly.*

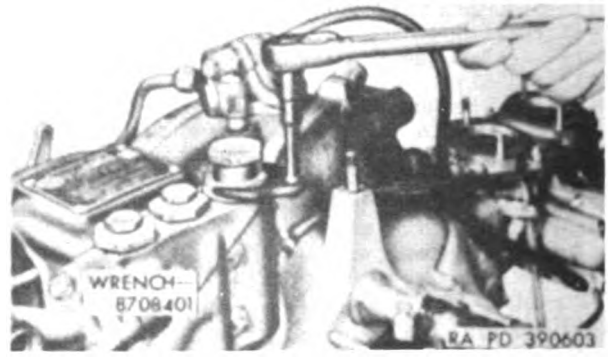



*Figure 99. Removing oil pressure control valve assembly.*

housing. Remove and discard oil control housing gasket (F).

NOTE: Governor assembly 8380695 can now be removed. Remove governor as described in paragraph 55.

*e. Remove Fuel Injector Oil Pressure Regulator Valve Assembly.* Cut locking wire and remove fuel injector oil pressure regulator valve assembly from lower side of oil control housing. Remove and discard gasket.

## 114. Remove Throttle Control Lever Linkages

NOTE: The key letters shown below in parentheses refer to figure 101.

*a.* Remove cotter pin from slotted hex nut (E). Remove hex nut and flat washer from hex-head bolt and remove bolt from lever and control rod.

*b.* Cut locking wire and remove two slotted hex nuts (A) and slotted hex nut (F) and flat

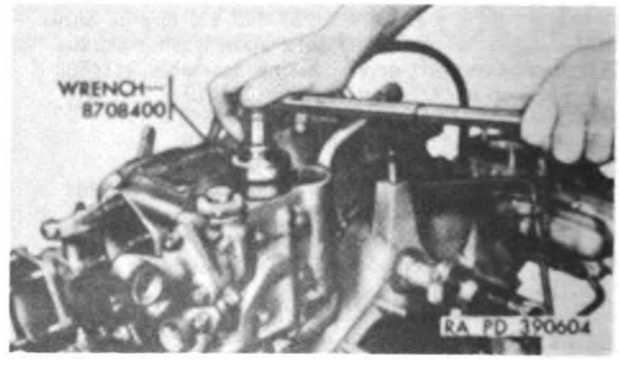
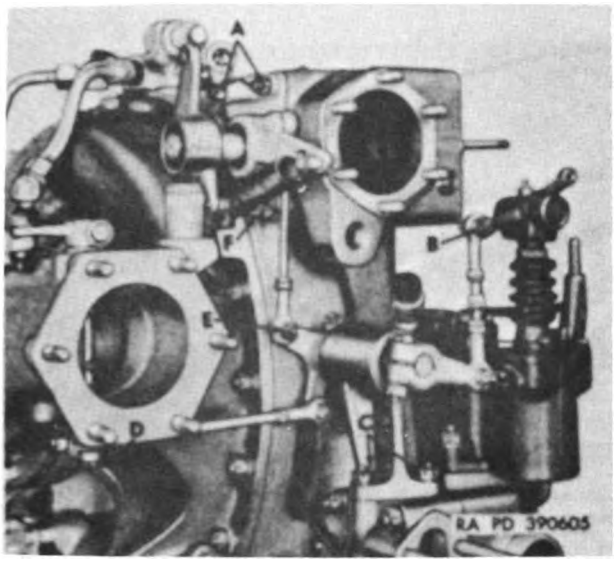



*Figure 100. Removing oil filter bypass valve assembly.*




A—5/16-inch slotted hex nut 122942
B—No. 10 slotted hex nut 7403213
C—5/16-inch hex self-locking nut { 503345 or 503380
D—No. 10 x 1 3/32 hex-head bolt 7350241
E—No. 10 slotted hex nut 7403213
F—5/16-inch slotted hex nut 122942

*Figure 101. Throttle control rods disconnect points.*

washer. Remove vehicle-control-to-throttle-control linkage from accessory case.

*c.* Remove cotter pin from slotted hex nut and remove hex nut and flat washer from hex-head bolt (D). Remove bolt and control rod assembly from air inlet throttle lower lever.

*d.* Remove three hex self-locking nuts (C), or hex stamped nuts and hex nuts, and flat washers securing throttle control lever assembly supporting bracket to fuel pump drive adapter.

*e.* Remove supporting bracket, with attached throttle and governor linkage, from accessory case.

## 115. Remove Right Camshaft Drive Housing Assembly

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

*a.* Remove four hex self-locking nuts (AR), or hex stamped nuts (AQ) and hex nuts, and plain washers (AS) securing right camshaft drive housing assembly (AU) to accessory case.

*b.* Tap right camshaft idler driven gear assembly in accessory case lightly with a soft hammer to loosen housing. Remove housing assembly from accessory case. Remove and discard "O" ring packings (AT, AX, and AY).

*c.* Remove right camshaft drive idler bevel gear (P, fig. 48) from bore of right camshaft drive idler gear (N, fig. 48). Remove right camshaft drive idler gear assembly from accessory case. Remove right camshaft drive idler gear from accessory case.

## 116. Remove Left Camshaft Drive Housing Assembly

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

*a.* Remove four hex self-locking nuts (UU), or hex stamped nuts (VV) and hex nuts (UU), and plain washers (TT) securing left camshaft drive housing assembly (NN) to accessory case.

*b.* Tap left camshaft idler driven gear assembly (E, fig. 48) lightly with a soft hammer to loosen housing. Remove housing assembly from accessory case. Remove and discard "O" ring packings (PP, QQ. and SS).

*c.* Remove left camshaft drive idler bevel gear (S, fig. 48) from bore of left camshaft drive idler gear (R, fig. 48). Remove left camshaft drive idler driven gear assembly (E, fig. 48) from accessory case. Remove left camshaft drive idler gear from accessory case.

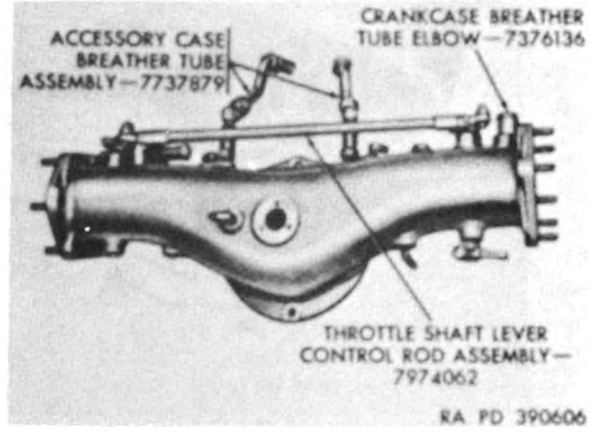



*Figure 102. Supercharger air inlet housing assembly.*

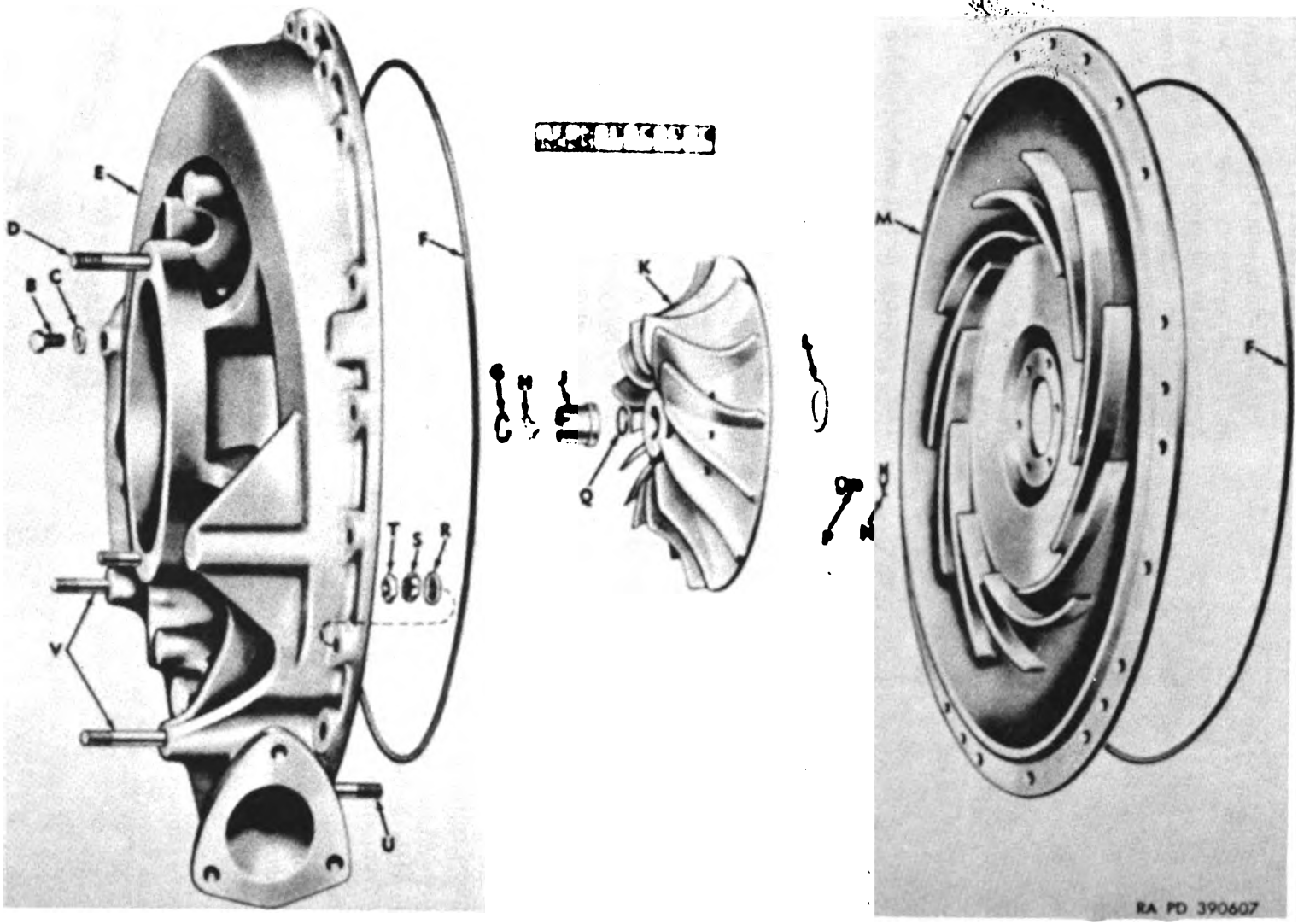



*Figure 103. Supercharger housing, diffuser, and impeller—exploded view.*

A–5 ½-inch id "O" ring packing 546830
B–⅜ x ¾ hex-head bolt 7974358
(model AOSI–895–5M engine only)
C–$^{25}/_{64}$-inch copper washer 8679569
(model AOSI–895–5M engine only)
D–⅜ x 1¾ stud 7403097
E–Supercharger housing assembly 7737869
F–16-inch id "O" ring packing 7374220
G–Nut lock retaining ring 7338666
H–Impeller locking nut lock 7410169
J–Impeller locking nut 7410168
K–Supercharger impeller 7065830
L–Shim { 0.0050 thick 7375239 / 0.0120 thick 7375240 / 0.0160 thick 7372644
M–Supercharger diffuser 7065829
N–1¼-inch tab washer 7338675
P–¼ x $^{25}/_{32}$ hex-head bolt 501813
Q–$^{41}/_{64}$ id, 1⅛ od, $^{3}/_{32}$ thick flat washer 7372659
R–$^{21}/_{64}$ id, $^{9}/_{16}$ od, 0.0630 thick flat washer 502245
S– { $^{5}/_{16}$-inch hex nut 225853 (model AOSI–895–5M engine only) / $^{5}/_{16}$-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)
T–$^{5}/_{16}$-inch hex stamped nut 107822
(model AOSI–895–5M engine only)
U–$^{5}/_{16}$ x 2⅛ stud 7403072
V–⅜ x 1$^{9}/_{16}$ stud 7350203

*Figure 103—Continued.*

## 117. Remove Magneto Drive Assembly

NOTE: The key letters shown below in parentheses refer to figure 96.

*a.* Disconnect coupling nuts securing fuel injector booster pump breather hose assembly to magneto drive assembly and accessory case breather adapter and remove hose assembly.

*b.* Remove four hex self-locking nuts (LL), or hex stamped nuts (KK) and hex nuts, and plain washers (MM) securing magneto drive assembly (AA) to accessory case. Remove magneto drive assembly, with attached fuel pump adapter assembly (DD) and fuel injector oil booster pump assembly (HH), from accessory case. Remove and discard "O" ring packing (Y) and magneto drive housing gasket (Z).

*c.* Remove magneto advance governor unit and coupling from shaft in accessory case.

## 118. Remove Supercharger Air Inlet Housing Assembly

*a.* Disconnect two coupling nuts (B, fig. 29) securing accessory case breather tube assemblies to accessory case breather adapter.

*b.* Remove two hex self-locking nuts (A, fig. 29), or hex stamped nuts and hex nuts, and flat washers securing air inlet housing assembly to supercharger housing.

*c.* Remove supercharger air inlet housing assembly, with attached breather tube assemblies and control rods, from accessory case. Remove and discard "O" ring packing. Figure 102 shows the air inlet housing assembly as removed from engine.

## 119. Remove Supercharger Group

NOTE: The key letters shown below in parentheses refer to figure 103 except where otherwise indicated. The supercharger group is a very precisely machined and balanced assembly and extreme care must be exercised during rebuild operations to prevent damage to parts.

*a.* Remove 19 hex self-locking nuts (S), or hex stamped nuts (T) and hex nuts (S), and flat washers (R) securing supercharger housing assembly (E) to accessory case. Two nuts are on accessory case side of housing.

*b.* Remove supercharger housing assembly (E) from accessory case using three puller screws 5379997 (fig. 104). Remove and discard "O" ring packing (F). Figure 105 shows front of accessory case with supercharger housing assembly removed.

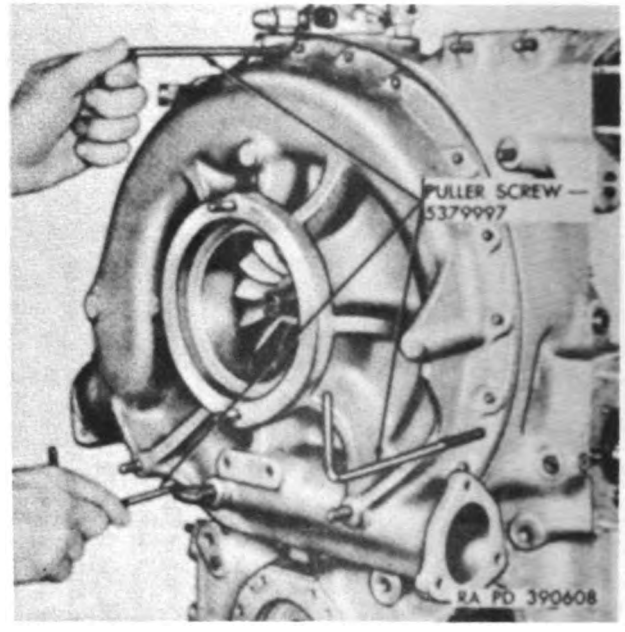



*Figure 104. Removing supercharger housing assembly.*

*c.* Remove impeller nut lock retaining ring (G) and impeller locking nut lock (H) from bore of impeller locking nut (J).

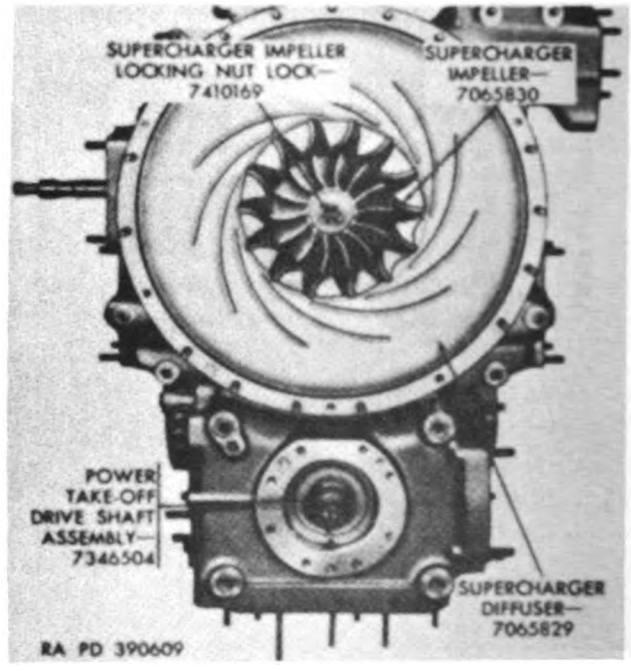



*Figure 105. Front of accessory case—supercharger housing assembly removed.*

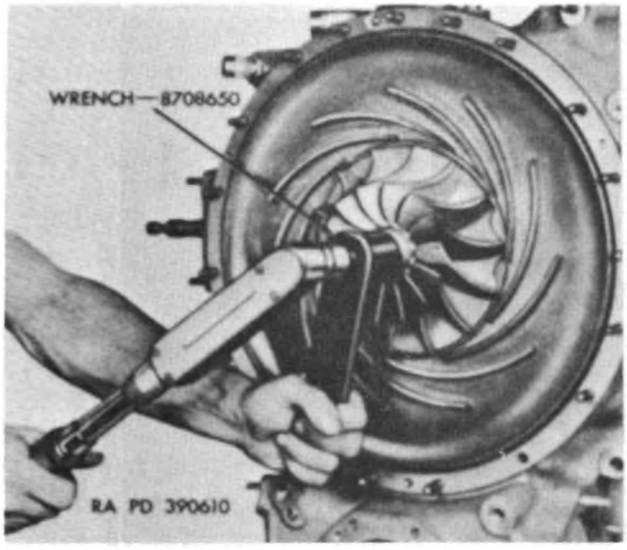



*Figure 106. Removing or Torquing supercharger impeller locking nut.*

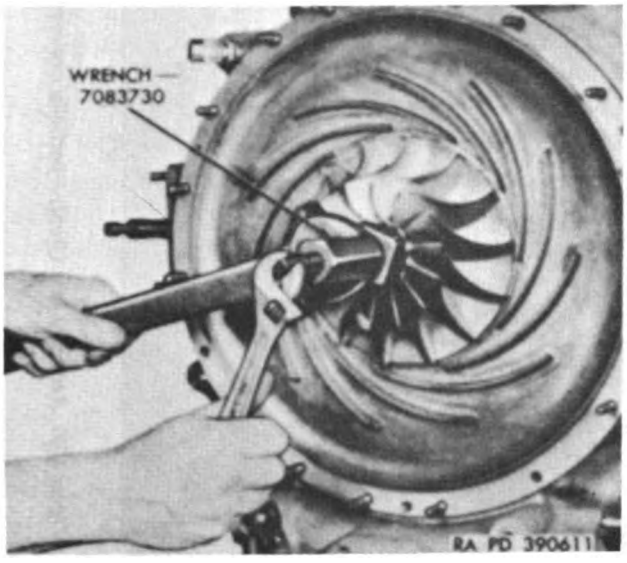



*Figure 107. Removing or installing supercharger impeller.*

*d.* Remove impeller locking nut (J) from impeller driven shaft gear using wrench 8708650 (fig. 106). Remove flat washer (Q).

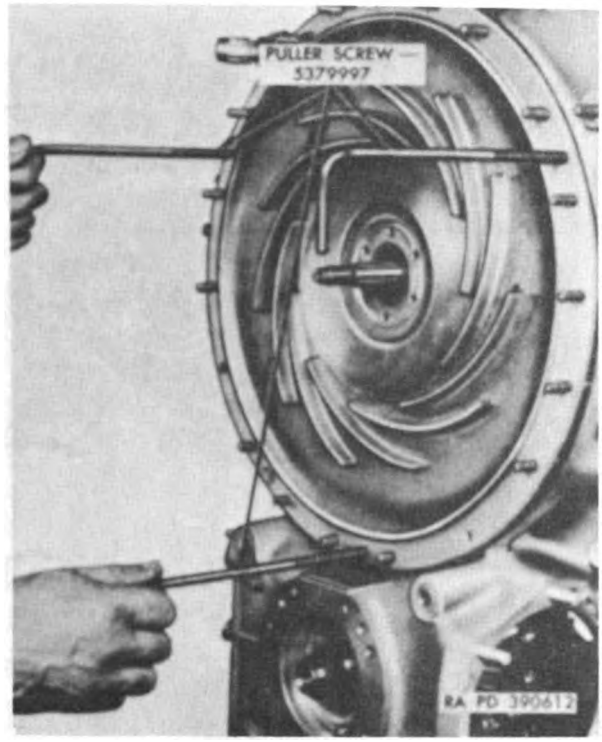



*Figure 108. Removing supercharger diffuser.*

*e.* Remove supercharger impeller (K) from impeller driven shaft gear using wrench 7083730 (fig. 107). Remove shims (L) from shaft gear.

*f.* Straighten tabs of tab washers (N) away from head of hex-head bolts (P) and remove six hex-head bolts and tab washers securing supercharger diffuser (M) to accessory case diaphragm.

*g.* Remove supercharger diffuser from diaphragm using three puller screws 5379997 (fig. 108). Remove and discard "O" ring packing (F).

## Section IX. REBUILD OF ACCESSORY CASE

### 120. Disassembly

*a. Remove and Disassemble Supercharger Drive Group.*

NOTE: The key letters shown below in parentheses refer to figure 109 except where otherwise indicated.

(1) Slide impeller spacer washer (A) and impeller driven shaft gear oil seal housing (D), with oil seal (C) and impeller spacer (B) inside, from impeller driven shaft gear (UU). Do not remove oil seal from housing unless inspection (par. 122) indicates replacement is necessary. To remove oil seal, press seal and spacer from housing with a suitable press.

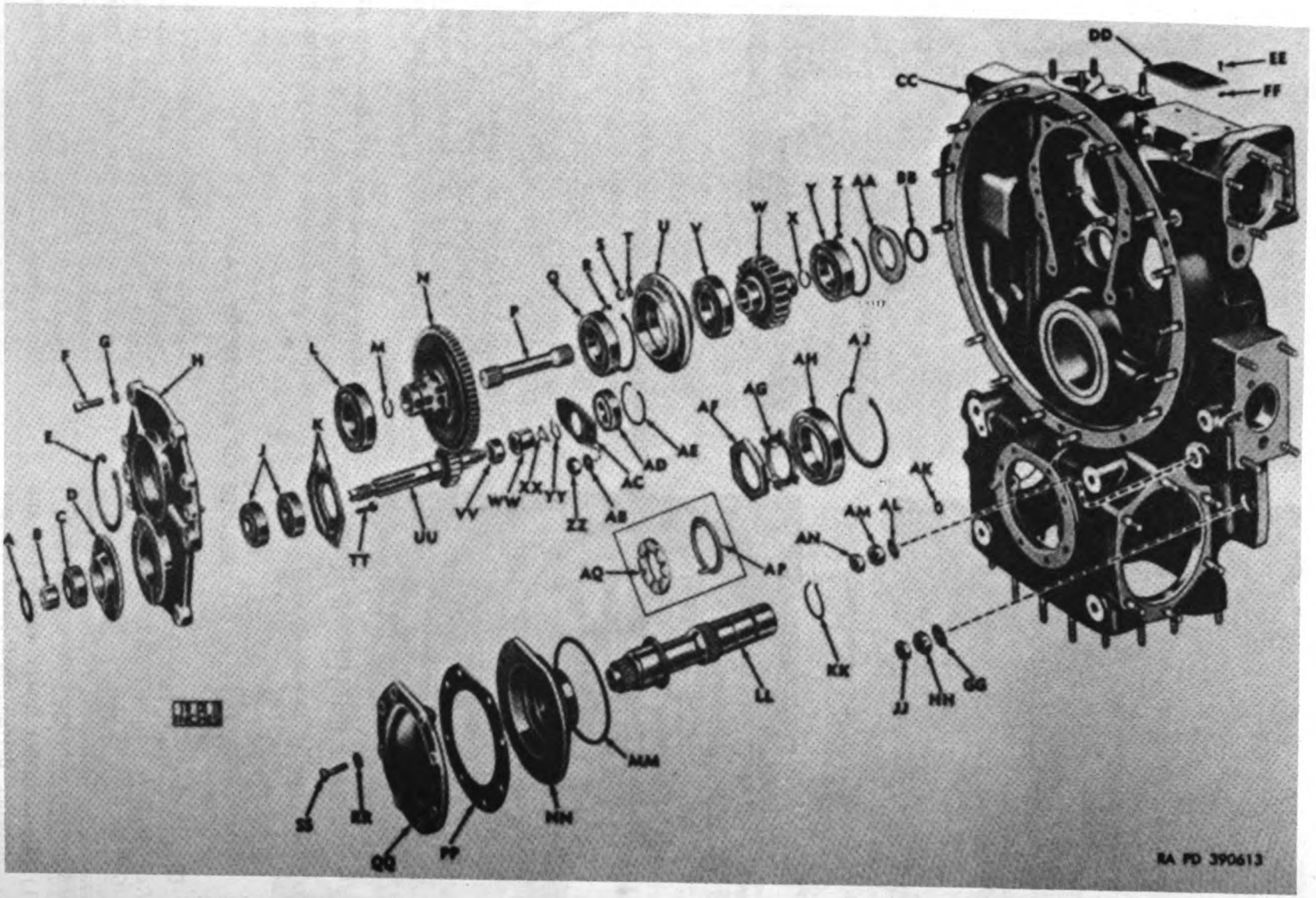



*Figure 109. Accessory case (front)—partially exploded view.*

A–Impeller spacer washer 7376008
B–Impeller spacer 7376007
C–Oil seal { 7374219 or 8717235
D–Impeller driven shaft gear oil seal housing 7375840
E–2 63/64-inch housing diameter retaining ring 597602
F–5/16 x 1 1/4 hex-head bolt 7416581
G–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
H–Accessory case diaphragm assembly 7403362
J–Duplex ball bearing 7376130
K–Ball bearing retaining plate 7375841
L–Roller bearing 712170
M–29/32-inch housing diameter retaining ring 593349
N–Impeller drive shaft gear 7376129
P–Impeller drive shaft 7403757
Q–Roller bearing 712170
R–2 63/64-inch housing diameter retaining ring 597602
S–5/16-inch slotted hex nut 122942
T–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
U–Fan drive shaft gear bearing liner 7403357
V–Roller bearing 712170
W–Fan drive shaft gear 7346501
X–29/32-inch housing diameter retaining ring 593349
Y–Roller bearing 712170
Z–2 63/64-inch housing diameter retaining ring 597602
AA–Fan drive shaft gear oil seal housing assembly 7451159
BB–Oil seal 7375410
CC–Accessory case assembly 7737872
DD–Nameplate 8733081
EE–No. 6 x 1/4 drive screw 145373
FF–1/4-inch washer 7416306
GG–0.4530 id, 0.7500 od, 0.0650 thick plain washer 7725882
HH– { 7/16-inch hex nut 225855 (model AOSI–895–5M engine only) / 7/16-inch hex self-locking nut 503357 (model AOSI–895–5 engine only)
JJ–7/16-inch hex stamped nut 107824 (model AOSI–895–5M engine only)
KK–1 39/64-inch shaft diameter retaining ring 593524
LL–Power-take-off drive shaft assembly 7346504
MM–4 5/8-inch id "O" ring packing 546881
NN–Power-take-off drive adapter assembly 7403367
PP–Power-take-off drive cover gasket 7346657
QQ–Power-take-off drive cover 7346656
RR–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
SS–5/16 x 1 13/64 hex-head bolt 8328909
TT–1/4 x 17/32 hex-head bolt 7346698
UU–Impeller driven shaft gear 7375843
VV–Inner race (part of roller bearing 712176)
WW–Bearing locking nut 7410168
XX–Bearing nut lock 7410169
YY–Nut lock retaining ring 7338666
ZZ–3/16-inch slotted hex nut 122942
AB–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
AC–Bearing retaining plate 7375418
AD–Outer race (part of roller bearing 712176)
AE–1 61/64-inch housing diameter retaining ring 596712
AF–1 15/16-inch hex nut 7954825
AG–1 61/64-inch id key washer 7954826
AH–Roller bearing 713575
AJ–3 33/64-inch housing diameter retaining ring 596712
AK–3/16-inch id "O" ring packing 501219
AL–33/64 id, 7/8 od, 1/16 thick flat washer 502268
AM– { 1/2-inch hex nut 225857 (model AOSI–895–5M engine only) / 1/2-inch hex self-locking nut 503323 (model AOSI–895–5 engine only)
AN–1/2-inch hex stamped nut 107825 (model AOSI–895–5M engine only)
AP–Nut lock 7346507 (early model AOSI–895–5M engines only)
AQ–1 13/16-inch slotted nut 7346508 (early model AOSI–895–5M engines only)

*Figure 109—Continued.*

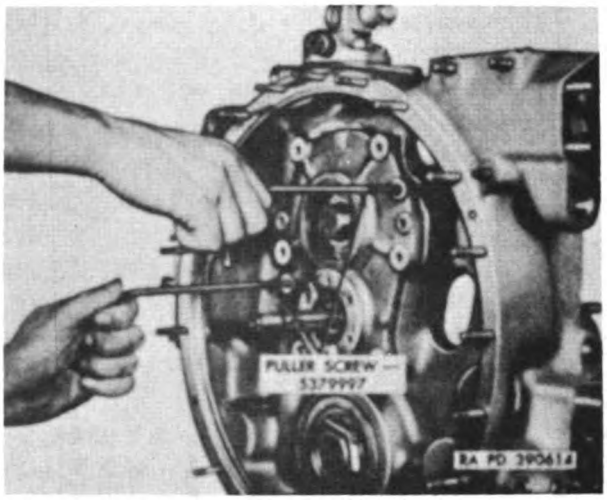



*Figure 110. Removing accessory case diaphragm assembly.*

(2) Cut locking wire and remove six hex-head bolts (F) and flat washers (G) securing accessory case diaphragm assembly (H) to accessory case.

(3) Remove diaphragm assembly (H), with attached impeller drive and driven shaft gears and bearings, from accessory case using two puller screws 5379997 (fig. 110).

(4) Remove impeller drive shaft (P) from splines of fan drive shaft gear (W) in accessory case.

(5) Press impeller drive shaft gear (N), with attached roller bearings (L and Q), from accessory case diaphragm assembly (H). Remove bearings from shaft gear. Remove retaining ring (M) from bore of shaft gear. Remove retaining ring (E) from bore of diaphragm.

(6) Cut locking wire and remove six hex-head bolts (TT) securing ball bearing retaining plates (K) to diaphragm assembly and remove plates.

(7) Press impeller driven shaft gear (UU), with attached duplex ball bearings (J), from diaphragm assembly with a suitable press. Press ball bearings from shaft gear.

NOTE: Duplex ball bearings are matched sets. Fasten two bearings together with twine or wire to prevent loss, damage, or interchanging.

(8) Remove retaining ring (YY) securing bearing nut lock (XX) in bearing locking nut (WW) and remove lock from nut.

(9) Place impeller driven shaft gear (UU) in a vise with leather or copper jaws and remove bearing locking nut (WW) using wrench 8708650 (W, fig. 9). Remove shaft gear from vise. Remove inner race (part of roller bearing 712176) (VV) from shaft gear using a suitable bearing puller.

(10) Cut locking wire and remove two slotted hex nuts (ZZ) and flat washers (AB) securing bearing retaining plate (AC) to accessory case and remove retaining plate.

(11) Remove retaining ring (AE) from accessory case. Press outer race (part of roller bearing 712176) (AD) from accessory case using a suitable bearing press.

*b. Remove Fan Drive Shaft Gear.*

NOTE: The key letters shown below in parentheses refer to figure 109 except where otherwise indicated.

(1) Cut locking wire and remove six slotted hex nuts (S) and flat washers (T) securing fan drive shaft gear bearing liner (U) to accessory case.

(2) Remove bearing liner (U), with attached fan drive shaft gear (W) and roller bearings (V and Y), from accessory case using two puller screws 5379997 (fig. 111).

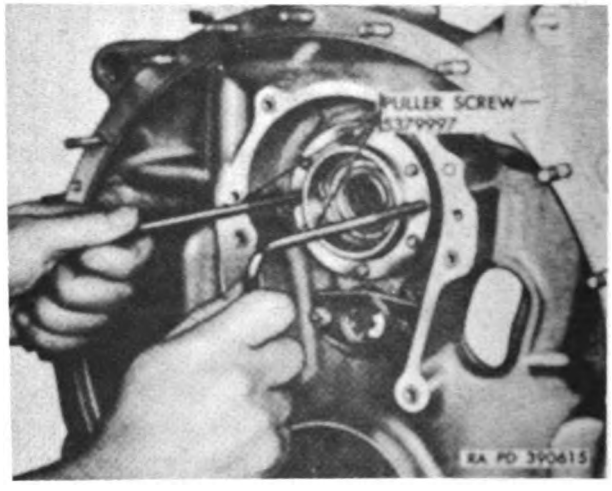



*Figure 111. Removing fan drive shaft gear bearing liner.*

(3) Remove fan drive shaft gear (W) from bearing liner. Remove roller bearings (V and Y) from shaft of shaft gear and retaining ring (X) from bore of shaft gear.

(4) Remove retaining ring (R) from liner.

(5) Remove retaining ring (Z) from fan drive gear recess in accessory case. Push fan drive shaft oil seal housing assembly (AA) and oil seal (BB) from accessory case.

*c. Remove Accessory Drive Gear.*

(1) Straighten tabs of key washer (AG, fig. 109) away from hex nut (AF, fig. 109). Place a piece of wood or similar material at point of mesh of accessory drive gear (W, fig. 112) and power-take-off drive gear (V–3, fig. 112) to prevent accessory drive gear from rotating. Remove hex nut from shaft of accessory drive gear. Remove wood or other material from gears.

NOTE: On early model AOSI–895–5M engines, a slotted nut (AQ, fig. 109) is used to retain accessory drive gear bearings. To remove this nut, straighten tabs of nut lock (AP, fig. 109) away from slotted nut. Remove slotted nut using wrench 7083758 (fig. 113). Remove nut lock.

(2) Remove accessory drive gear, with attached roller bearing (Y, fig. 112) and accessory drive gear housing spacer (Z, fig. 112), from accessory case.

(3) Press spacer and bearing from shaft of drive gear using a suitable press. Remove retaining ring (AA, fig. 112) from bore of drive gear.

(4) Remove roller bearing (AH) from bearing liner in accessory case using a suitable bearing puller. Remove retaining ring (AJ) from groove in bearing liner.

*d. Remove Power-Take-Off Drive Gear.*

NOTE: The key letters shown below in parentheses refer to figure 109 except where otherwise indicated.

(1) If power-take-off drive cover (QQ) has not been removed, cut locking wire and remove eight hex-head bolts (SS) and flat washers (RR) securing cover and power-take-off drive adapter assembly (NN) to accessory case and remove cover. Remove and discard power-take-off drive cover gasket (PP).

(2) Remove power-take-off drive adapter assembly (NN) from accessory case using three puller screws 5379997 (fig. 114). Remove and discard "O" ring packings (MM and AK).

(3) Do not remove sleeve bearing from adapter assembly unless inspection (par. 122) indicates replacement is necessary. Refer to paragraph 79*g* for removal of bearing.

(4) Reach through starter or generator drive adapter opening and hold power-take-off drive gear assembly (V, fig. 112) in place. Remove power-take-off drive shaft assembly (LL) from drive gear assembly through opening in front of accessory case. Remove retaining ring (KK) from shaft of drive assembly.

(5) Remove power-take-off drive gear assembly (V, fig. 112) from rear of accessory case.

(6) Do not remove starter driven gear (V–4, fig. 112) from power-take-off drive gear (V–3, fig. 112) unless inspection (par. 122) indicates replacement of either gear is necessary. Remove starter driven gear as described in (*a*) and (*b*) below.

(*a*) Remove 12 cotter pins (V–1, fig. 112) from slotted hex nuts (V–2, fig. 112). Remove nuts and 12 hex-head bolts (V–5, fig. 112) securing starter driven gear to power-take-off drive gear.

(*b*) Press starter driven gear from power-take-off drive gear using a suitable press. Press ball bearing (T, fig. 112) from bore of starter driven gear using a suitable bearing press. Remove shims (U, fig. 112) from driven gear.

*e. Remove Accessory Drive Idler Gear.*

NOTE: The key letters shown below in parentheses refer to figure 112.

(1) Remove hex-head bolt (C) and lock washer (B) securing accessory drive idler gear shaft (L) in accessory case.

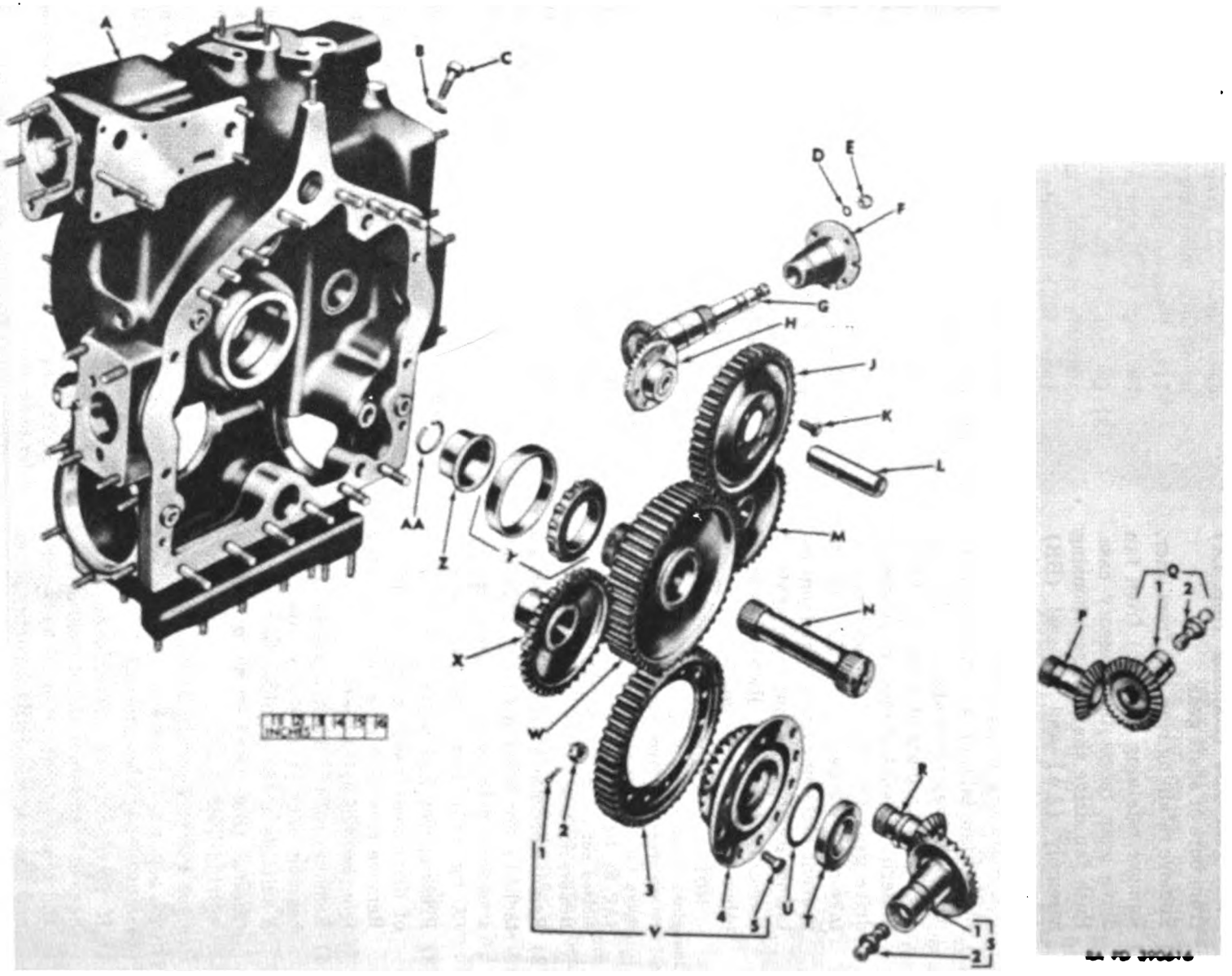



*Figure 112. Accessory case (rear)—partially exploded view.*

A—Accessory case assembly 778872
B—5/16-inch lock washer 120214
C—5/16 x 1½ hex-head bolt 7375435
D—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
E—5/16-inch slotted hex nut 122942
F—Magneto driven shaft gear adapter 7346558
G—Magneto driven shaft gear assembly 7346538
H—Magneto drive gear assembly 7346550
J—Accessory drive idler gear 7346549
K—5/16 x 23/32 hex-head bolt 588598
L—Accessory drive idler gear shaft 7348546
M—Left camshaft drive idler gear 7346547
N—Accessory drive shaft 8691915
P—Left camshaft drive idler bevel gear 7346544
Q—Left camshaft drive idler driven gear assembly 8691460
    1—Gear 8666539
    2—Oil transfer inner plug 7744669
R—Right camshaft drive idler bevel gear 7346544
S—Right camshaft drive idler driven gear assembly 8691460
    1—Gear 8666539
    2—Oil transfer inner plug 7744669
T—Ball bearing 701023
U—Shim 7346683
V—Power-take-off drive gear assembly 7346567
    1—3/32 x ⅛ cotter pin 121222
    2—⅜-inch slotted hex nut 7703684
    3—Power-take-off drive gear 7346500
    4—Starter driven gear { 7346548 / 7954849 (late model AOSI-895-5 engines only)
    5—⅜ x 1 5/64 hex-head bolt 583762
W—Accessory drive gear 7346526
X—Right camshaft drive idler gear 7346547
Y—Roller bearing 707770
Z—Accessory drive gear housing spacer 7346491
AA—1 33/64-inch housing diameter retaining ring 593360

*Figure 112—Continued.*

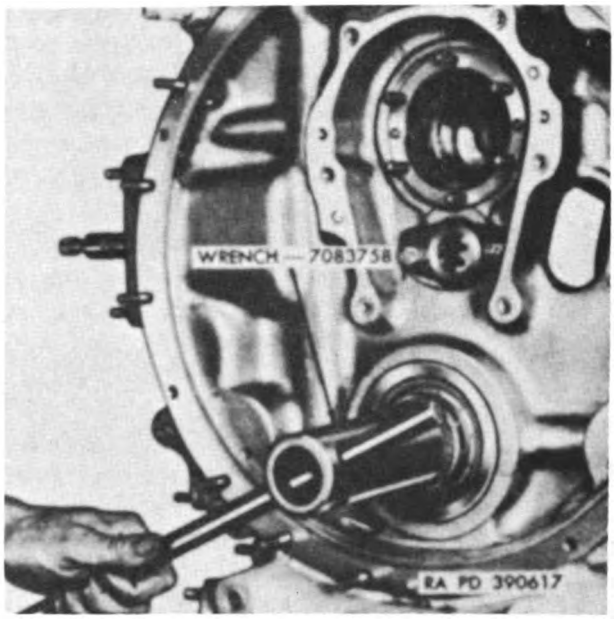



*Figure 113. Removing or installing accessory drive gear bearing nut (early model AOSI-895-5M engines only).*

(2) Thread a ⅜-24NF bolt into end of idler gear shaft. Hold accessory drive idler gear (J) in place with one hand and pull idler gear shaft from idler gear. Remove accessory drive idler gear, with attached magneto drive gear assembly (H), from accessory case.

(3) Do not remove magneto drive gear assembly from accessory drive idler gear unless inspection (par. 122) indicates replacement of either gear is necessary. To separate gears, cut locking wire and remove six hex-head bolts (K) securing magneto drive gear assembly to accessory drive idler gear and remove gear assembly.

*f. Remove Magneto Driven Shaft Gear Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 112.

(1) Cut locking wire and remove four slotted hex nuts (E) and flat washers (D) securing magneto driven shaft gear adapter (F) in recess at upper left side of accessory case.

(2) Remove adapter, with attached magneto driven shaft gear assembly (G), from accessory case using two puller screws 5379997 (F, fig. 9). Remove adapter from gear assembly.

*g. Disassemble Left and Right Camshaft Drive Idler Driven Gear Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 112.

(1) Do not remove oil transfer inner plug (Q-2 or S-2) from bore of gear (Q-1 or S-1) unless inspection (par. 122) indicates replacement is necessary.

(2) To remove plug from gear, drive plug out of bore of gear, using a suitable driving tool.

*h. Remove Accessory Case Breather Adapter Group, Oil Line Tee, Elbows, and Pipe Plugs.*

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

(1) Cut locking wire and remove three slotted hex nuts (P) securing breather adapter group to accessory case and remove group from accessory case. Remove and discard breather adapter gasket (S).

(2) Do not remove lifting eye (K) from breather adapter (R) unless inspection (par. 122) indicates replacement of either is necessary. To remove lifting eye, remove cotter pin (L), flat washer (M), and lifting eye spring (N) from flat-head pin (Q). Remove pin from lifting eye and adapter and remove lifting eye from adapter.

(3) Unscrew pipe elbow (J) from accessory case. Unscrew pipe elbow (V), with attached pipe bushing (W), from accessory case.

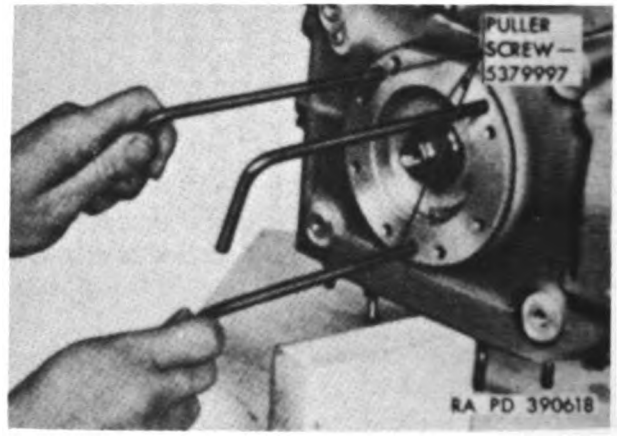



*Figure 114. Removing power-take-off drive adapter assembly.*

(4) Unscrew tee (T) from main oil passage opening in accessory case.

(5) Remove fan drive shaft hose nipple (T, fig. 92) from opening in top center of rear face of accessory case. Remove and discard hose nipple gasket (S, fig. 92).

(6) Remove all hex-socket pipe plugs from various oil passage openings in accessory case to facilitate cleaning.

## 121. Cleaning

Clean accessory case and components as described in paragraph 77.

## 122. Inspection

*a. Supercharger Drive Group.*

NOTE: The key letters shown below in parentheses refer to figure 109.

(1) *Impeller driven shaft gear oil seal housing and oil seal.*

(*a*) *Impeller driven shaft gear oil seal housing* (D). Inspect oil seal housing for cracks and damaged sealing surfaces.

(*b*) *Oil seal* (C). Inspect oil seal as described in paragraph 78.

(2) *Accessory case diaphragm assembly* (H).

(*a*) Inspect diaphragm assembly for cracks, damaged bearing liners, and secure fit of bearing liners.

(*b*) Check diaphragm assembly for conformance to tolerances specified in repair and rebuild standards (par. 316).

(*c*) Refer to TM 37–265 for inspection of duplex ball bearing (J). Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 316).

(3) *Impeller drive shaft, gears, and bearings.*

(*a*) *Impeller drive shaft* (P). Inspect drive shaft as described in paragraph 78.

(*b*) *Impeller drive shaft gear* (N). Inspect drive shaft gear as described in paragraph 78.

(*c*) *Impeller driven shaft gear* (UU). Inspect driven shaft gear for cracked shaft, damaged gear teeth, mutilated splines, and stripped or damaged threads. Check driven shaft gear for conformance to tolerances specified in repair and rebuild standards (par. 316).

(*d*) *Roller bearings* (L, Q, AD, and VV). Refer to TM 37–265 for inspection of roller bearings. Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 316).

(*e*) *Bearing locking nut and nut lock.* Inspect bearing locking nut (WW) for cracked or broken condition, particularly in the area of the slots for nut lock. Inspect nut for stripped or damaged threads. Inspect bearing nut lock (XX) for cracked or broken condition.

*b. Fan Drive Shaft Gear Group.*

NOTE: The key letters shown below in parentheses refer to figure 109.

(1) *Fan drive shaft gear bearing liner* (U).

(*a*) Inspect liner for cracks and damaged bearing surfaces.

(*b*) Check liner for conformance to tolerances specified in repair and rebuild standards (par. 315).

(2) *Fan drive shaft gear* (W). Inspect shaft gear as described in paragraph 78.

(3) *Fan drive shaft gear oil seal housing and oil seal.*

(*a*) *Fan drive shaft gear oil seal housing* (AA). Inspect housing for cracks and damaged sealing surfaces.

(*b*) *Oil seal* (BB). Inspect oil seal as described in paragraph 78.

(4) *Roller bearings* (V and Y). Refer to TM 37–265 for inspection of roller bearings. Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 315).

*c. Power-Take-Off Drive Group.*

NOTE: The key letters shown below in parentheses refer to figure 112 except where otherwise indicated.

(1) *Power-take-off drive adapter assembly* (NN, fig. 109).

(*a*) Inspect adapter assembly for cracks, damaged bearing surfaces, and for secure fit of bearing in adapter.

(*b*) Check adapter assembly for conformance to tolerances specified in repair and rebuild standards (par. 315).

(*c*) Inspect sleeve bearing in adapter assembly for damaged bearing surface and for conformance to tolerances specified in repair and rebuild standards (par. 315).

(2) *Power-take-off drive shaft assembly* (LL, fig. 109). Inspect shaft assembly as described in paragraph 78.

(3) *Ball bearing* (T). Refer to TM 37–265 for inspection of ball bearing. Check ball bearing for conformance to tolerances specified in repair and rebuild standards (par. 315).

(4) *Power-take-off drive gear assembly.*

(*a*) *Starter driven gear* (V–4). Inspect driven gear for damaged bearing surface as described in paragraph 78.

(*b*) *Power-take-off drive gear* (V–3). Inspect drive gear as described in paragraph 78.

(5) *Power-take-off drive cover* (QQ, fig. 109). Inspect cover as described in paragraph 78*b*.

*d. Accessory Drive Gear and Magneto Drive Gear Group.*

NOTE: The key letters shown below in parentheses refer to figure 112 except where otherwise indicated.

(1) *Accessory drive shaft* (N). Inspect shaft as described in paragraph 78.

(2) *Accessory drive gear* (W).

(*a*) Inspect gear as described in paragraph 78.

(*b*) Inspect gear for stripped or damaged threads.

(*c*) Inspect hex nut (AF, fig. 109) or slotted nut (AQ, fig. 109) (early model AOSI–895–5M engines only), for cracked condition and stripped or damaged threads.

(3) *Roller bearings.* Refer to TM 37–265 for inspection of roller bearing (Y) and roller bearing (AH, fig. 109). Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 315).

(4) *Accessory drive idler gear* (J). Inspect idler gear as described in paragraph 78.

(5) *Accessory drive idler gear shaft* (L).

(*a*) Inspect idler gear shaft as described in paragraph 78.

(*b*) Inspect tapped holes in shaft for stripped or damaged threads.

(6) *Magneto drive gear assembly* (H). Inspect drive gear as described in paragraph 78*e* and bearing in gear as described in paragraph 78*g*.

(7) *Magneto driven shaft gear assembly* (G).

(*a*) Inspect shaft of gear assembly as described in paragraph 78*f*.

(*b*) Inspect gear of gear assembly as described in paragraph 78*e*.

(*c*) Inspect magneto driven shaft gear adapter (F) for cracks and conformance to tolerances specified in repair and rebuild standards (par. 315).

*e. Left and Right Camshaft Drive and Driven Gears.*

NOTE: The key letters shown below in parentheses refer to figure 112.

(1) *Left and right camshaft drive idler driven gear assemblies.*

(*a*) *Gears.* Inspect gears (Q–1 and S–1) as described in paragraph 78.

(*b*) *Plugs.* Inspect oil transfer inner plugs (Q–2 and S–2) for plugged oil passages. Check plug for fit in bore of gear. Plug must fit perfectly tight. If removed from gear, check plug for conformance to tolerances specified in repair and rebuild standards (par. 321).

(2) *Left and right camshaft drive idler bevel gears* (P and R). Inspect gears as described in paragraph 78.

(3) *Left and right camshaft drive idler gears* (M and X). Inspect gears as described in paragraph 78.

*f. Accessory Case Breather Adapter Group, Oil Line Tee, Elbows, and Pipe Plugs.*

NOTE: The key letters shown below in parentheses refer to figure 96.

(1) *Accessory case breather adapter group.*

(*a*) *Breather adapter* (R). Inspect adapter for cracks and stripped or damaged threads in tapped holes.

(*b*) *Lifting eye* (K). Inspect lifting eye for cracked or broken condition.

(2) *Oil line tee* (T). Inspect tee for cracks, stripped or damaged threads, and plugged oil passages.

(3) *Pipe elbows* (J and V). Inspect elbows for cracks and for stripped or damaged threads.

(4) *Pipe plugs.* Inspect pipe plugs for stripped or damaged threads or mutilated socket heads.

*g. Supercharger Group.*

NOTE: The key letters shown below in parentheses refer to figure 103.

(1) *Supercharger housing assembly* (E). Inspect housing assembly casting as described in paragraph 78*b* and studs (D, U, and V) as described in paragraph 78*d*.

(2) *Supercharger impeller* (K). Inspect impeller for cracked, broken, or distorted blades and mutilated bore.

(3) *Supercharger diffuser* (M). Inspect diffuser for cracked, broken, or distorted blades and damaged mounting flange.

(4) *Impeller locking nut and nut lock.*

(*a*) *Impeller locking nut* (J). Inspect locking nut for cracked or broken condition, particularly in the area of the slots for the nut lock. Inspect nut for stripped or damaged threads.

(*b*) *Impeller locking nut lock* (H). Inspect nut lock for cracked or broken condition.

*h. Accessory Case* (A, fig. 112).

(1) Inspect accessory case casting as described in paragraph 78*b*.

(2) Inspect liners and bushing-type bearings in accessory case as described in paragraph 78*g*.

(3) Check liners and bushing-type bearings for conformance to tolerances specified in repair and rebuild standards (pars. 314 and 315).

## 123. Repair

*a. Supercharger Drive Group.*

NOTE: The key letters shown below in parentheses refer to figure 109.

(1) *Impeller driven shaft gear oil seal housing and oil seal.*

(*a*) *Impeller driven shaft gear oil seal housing* (D). Replace oil seal housing if cracked or if sealing surfaces are damaged.

(*b*) *Oil seal* (C). Replace oil seal if damaged.

(2) *Accessory case diaphragm assembly* (H).

(*a*) Replace accessory case assembly if diaphragm assembly is cracked, if bearing liners are damaged, or if liners do not fit securely.

NOTE: The diaphragm assembly is machined as part of the accessory case assembly. If diaphragm must be replaced, the complete accessory case must be replaced.

(*b*) Replace accessory case assembly if diaphragm assembly does not conform to tolerances specified in repair and rebuild standards (par. 316).

(*c*) Repair or replace duplex ball bearing (J) as described in paragraph 79. If bearing is to be replaced, both bearings must be replaced as a complete set.

(3) *Impeller drive shaft, gears, and bearings.*

(*a*) *Impeller drive shaft* (P). Repair or replace drive shaft as described in paragraph 79.

(*b*) *Impeller drive shaft gear* (N). Repair or replace drive shaft gear as described in paragraph 79.

(*c*) *Impeller driven shaft gear* (UU). Replace driven shaft gear if shaft is cracked, gear teeth are damaged, splines are mutilated, or threads are stripped or damaged. Replace shaft gear if it does not conform to tolerances specified in repair and rebuild standards (par. 316). Repair mutilated splines, damaged gear teeth,

and stripped or damaged threads, if possible.

(*d*) *Roller bearings* (L, Q, AD, and VV). Repair or replace roller bearings as described in paragraph 79.

(*e*) *Bearing locking nut and nut lock.* Replace bearing locking nut (WW) if cracked or broken or if threads are stripped or damaged. Replace bearing nut lock (XX) if cracked or broken.

*b. Fan Drive Shaft Gear Group.*

NOTE: The key letters shown below in parentheses refer to figure 109.

(1) *Fan drive shaft gear bearing liner* (U).

(*a*) Replace liner if cracked or if bearing surfaces are damaged.

(*b*) Replace liner if it does not conform to tolerances specified in repair and rebuild standards (par. 315).

(2) *Fan drive shaft gear* (W). Repair or replace shaft gear as described in paragraph 79.

(3) *Fan drive shaft gear oil seal housing and oil seal.*

(*a*) *Fan drive shaft gear oil seal housing* (AA). Replace oil seal housing if cracked or if sealing surfaces are damaged.

(*b*) *Oil seal* (BB). Replace oil seal if damaged.

(4) *Roller bearings* (V and Y). Repair or replace roller bearings as described in paragraph 79.

*c. Power-Take-Off Drive Group.*

NOTE: The key letters shown below in parentheses refer to figure 112 except where otherwise indicated.

(1) *Power-take-off drive adapter assembly* (NN, fig. 109).

(*a*) Replace adapter assembly if cracked, bearing surfaces are damaged, or sleeve bearing does not fit securely.

NOTE: On late model AOSI–895–5 engine serial numbers 528 and above only, if power-take-off drive adapter assembly is to be replaced, check number of teeth on starter driven gear. If starter driven gear has 26 teeth, power-take-off drive adapter assembly must be modified to dimensions shown in figure 115 before installation.

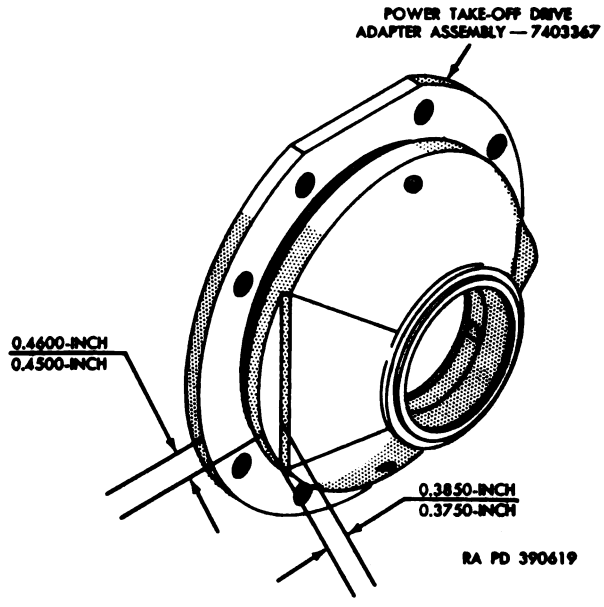



*Figure 115. Rework instructions for power take-off drive adapter assembly.*

(*b*) Replace adapter assembly if it does not conform to tolerances specified in repair and rebuild standards (par. 315.

(*c*) Replace sleeve bearing in adapter assembly if bearing surface is damaged or bearing does not conform to tolerances specified in repair and rebuild standards (par. 315). Refer to paragraph 79*g* for removal of bearing.

(2) *Power-take-off drive shaft assembly* (LL, fig. 109). Repair or replace drive shaft assembly as described in paragraph 79*f*.

(3) *Ball bearing* (T). Repair or replace ball bearing as described in paragraph 79.

(4) *Power-take-off drive gear assembly.*

(*a*) *Starter driven gear* (V–4). Replace driven gear if bearing surface is damaged. Repair or replace gear as described in paragraph 79.

NOTE: On late model AOSI–895–5 engine serial numbers 528 and above only, if starter driven gear is to be replaced, count teeth on new gear before installing. New gear must have 26 teeth to mate properly with starter drive bevel gear and accessory case scavenger oil pump drive gear.

(*b*) *Power-take-off drive gear* (V–3). Repair or replace drive gear as described in paragraph 79.

(5) *Power-take-off drive cover* (QQ, fig. 109). Repair or replace cover as described in paragraph 79*b*.

*d. Accessory Drive Gear and Magneto Drive Gear Group.*

NOTE: The key letters shown below in parentheses refer to figure 112 except where otherwise indicated.

(1) *Accessory drive shaft* (N). Repair or replace drive shaft as described in paragraph 79.

(2) *Accessory drive gear* (W).

(*a*) Repair or replace drive gear as described in paragraph 79.

(*b*) Replace gear if threads are stripped or damaged. Repair damaged threads with a thread chaser, if possible.

(*c*) Replace hex nut (AF, fig. 109), or slotted nut (AQ, fig. 109) (early model AOSI–895–5M engines only), if cracked or threads are stripped or damaged.

(3) *Roller bearings.* Repair or replace roller bearing (Y) and roller bearing (AH, fig. 109) as described in paragraph 79.

(4) *Accessory drive idler gear* (J). Repair or replace idler gear as described in paragraph 79.

(5) *Accessory drive idler gear shaft* (L).

(*a*) Repair or replace gear shaft as described in paragraph 79.

(*b*) Replace shaft if threads in tapped holes are stripped or damaged.

(6) *Magneto drive gear assembly* (H). Repair or replace drive gear assembly as described in paragraph 79*e* and bearing in gear as described in paragraph 79*g*.

(7) *Magneto driven shaft gear assembly* (G).

(*a*) Repair shaft of shaft gear assembly or replace gear assembly as described in paragraph 79*f*.

(*b*) Repair gear of shaft gear assembly or replace gear assembly as described in paragraph 79*e*.

(*c*) Replace magneto drive shaft gear adapter (F) if cracked or adapter does not conform to tolerances specified in repair and rebuild standards (par. 315).

*e. Left and Right Camshaft Drive and Driven Gears.*

NOTE: The key letters shown below in parentheses refer to figure 112.

(1) *Left and right camshaft drive idler driven gear assemblies.*

(*a*) *Gears.* Repair gears (Q–1 and S–1) as described in paragraph 79 or replace complete gear assembly.

(*b*) *Plugs.* Replace oil transfer inner plug (Q–2 or S–2) if oil passages are plugged or plug does not fit securely in bore of gear. Replace plug if it does not conform to tolerances specified in repair and rebuild standards (par. 321).

(2) *Left and right camshaft drive idler bevel gears* (P and R). Repair or replace gears as described in paragraph 79.

(3) *Left and right camshaft drive idler gears* (M and X). Repair or replace gears as described in paragraph 79.

*f. Accessory Case Breather Adapter Group, Oil Line Tee, Elbows, and Pipe Plugs.*

NOTE: The key letters shown in parentheses refer to figure 96.

(1) *Accessory case breather adapter group.*

(*a*) *Breather adapter* (R). Replace adapter if cracked or threads in tapped holes are stripped or damaged. Repair damaged threads, if possible.

(*b*) *Lifting eye* (K). Replace lifting eye if cracked or broken.

(2) *Oil line tee* (T). Replace tee if cracked or threads are stripped or damaged. Repair damaged threads, if possible. Clean all oil passages with a rod and flush with dry-cleaning solvent or mineral spirits paint thinner.

(3) *Pipe elbows* (J and V). Replace elbows if cracked or threads are stripped or damaged. Repair damaged threads, if possible.

(4) *Pipe plugs.* Replace all damaged pipe plugs.

*g. Supercharger Group.*

NOTE: The key letters shown below in parentheses refer to figure 103.

(1) *Supercharger housing assembly* (E). Repair or replace housing assembly casting as described in paragraph 79*b*. Repair or replace studs (D, U, and V) as described in paragraph 79*d*.

(2) *Supercharger impeller* (K). Replace impeller if blades are cracked, broken, distorted or splines in bore are mutilated.

(3) *Supercharger diffuser* (M). Replace diffuser if blades are cracked, broken, or distorted or mounting flange is damaged.

(4) *Impeller locking nut and nut lock.*

(*a*) Replace impeller locking nut (J) if cracked or broken or threads are stripped or damaged.

(*b*) Replace impeller locking nut lock (H) if cracked or broken.

*h. Accessory Case* (A, fig. 112).

(1) Repair or replace accessory case casting as described in paragraph 79*b*.

(2) Replace accessory case if diaphragm is defective, liners and bushing-type bearings are loose or damaged, or liners and bushing-type bearings do not conform to tolerances specified in repair and rebuild standards (pars. 314 and 315).

## 124. Assembly

NOTE: The assembly of the accessory case is given in a practical order; however, the sequence it not mandatory and may be altered to suit convenience.

*a. Install Accessory Case Breather Adapter Group, Oil Line Tee, Elbows, and Pipe Plugs.*

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

(1) Coat threads of oil line tee (T) with gasket forming compound and install tee in main oil passage in top of accessory case. When tee is properly secured in oil passage, tapped opening of tee must be toward front of accessory case.

(2) Coat threads of elbow (V) with gasket forming compound and install elbow, with attached pipe bushing (W), in front oil passage opening to the left of top center in accessory case.

(3) Coat threads on pipe elbow (J) with gasket forming compound and install elbow in oil passage opening in top and slightly to right of the center of accessory case.

(4) Coat threads of hex-socket pipe plugs with gasket forming compound and install pipe plugs in remaining tapped oil passage openings in accessory case.

(5) Position a new breather adapter gasket (S) over studs on top of accessory case and install breather adapter (R) over gasket and secure with three 7/16-inch slotted hex nuts (P). Secure nuts with locking wire.

(6) If lifting eye (K) was removed from adapter, install new lifting eye and secure with 5/8 x 3 1/8 flat-head pin (Q), lifting eye spring (N), and 21/32 id, 1.0000 od, 1/8 thick flat washer (M). Secure pin with 1/8 x 1 cotter pin (L).

(7) Position a new hose nipple gasket (S, fig. 92) on fan drive hose nipple (T, fig. 92) and install nipple in opening in top center of rear of accessory case.

*b. Install Accessory Drive Idler Gear.*

NOTE: The key letters shown below in parentheses refer to figure 112.

(1) If magneto drive gear assembly (H) was removed from accessory drive idler gear (J), install gear assembly on idler gear and secure with six 5/16 x 23/32 hex-head bolts (K). Secure bolts with locking wire.

(2) Install accessory drive idler gear, with attached magneto drive gear assembly, in position in accessory case. Install accessory drive idler gear shaft (L) in bore of idler gear to hold gears in position and secure with 5/16 x 1 1/2-inch hex-head bolt (C) and 5/16-inch lock washer (B).

*c. Install Magneto Driven Shaft Gear Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 112.

(1) Install magneto driven shaft gear assembly (G) in magneto driven shaft gear adapter (F).

(2) Install gear adapter, with gear assembly, in recess in upper left side of accessory case. Mesh teeth in gear assembly with teeth in magneto drive gear assembly (H) installed in *b* above. Notches in adapter mounting flange must aline with oil return holes in accessory case recess.

(3) Secure adapter and gear assembly to accessory case with four 5/16-inch slotted hex nuts (E) and 21/64 id, 9/16 od, 0.0630 thick flat washers (D). Secure nuts with locking wire.

*d. Install Power-Take-Off Drive Gear.*

NOTE: The key letters shown below in parentheses refer to figure 112 except where otherwise indicated.

(1) If starter driven gear (V–4) was removed from power-take-off drive gear (V–3), install starter driven gear as described in (*a*) and (*b*) below.

NOTE: Starter driven gear 7346548 (29 teeth) (V–4) must be used with starter drive bevel gear 7372687 (32 teeth) (N, fig. 142) and accessory case scavenger oil pump drive gear 7372686 (29 teeth) (A, fig. 71). Starter driven gear 7954549 (26 teeth) must be used with starter drive bevel gear 7954848 (29 teeth) and accessory case scavenger oil pump drive gear 7954850 (26 teeth).

(*a*) Aline holes in starter driven gear with holes in power-take-off drive gear, install driven gear, and secure with twelve 3/8 x 1 5/64 hex-head bolts (V–5) and 3/8-inch slotted hex nuts (V–2). Secure nuts with 3/32 x 1/2 cotter pins (V–1).

(*b*) Install shims (U) and ball bearing (T) in bore of starter driven gear. Install correct number of shims to provide a combined thickness of shims and outer race of bearing of 0.5940 to 0.5960-inch.

(2) Install 1 39/64-inch shaft diameter retaining ring (KK, fig. 109) on power-take-off drive shaft assembly (LL, fig. 109).

(3) Install power-take-off drive gear assembly (V) in position in accessory case and insert power-take-off drive shaft assembly through gear assembly and into its bore in rear of accessory case.

(4) If sleeve bearing was removed from power-take-off drive adapter assembly, refer to paragraph 79*g* for installation of new bearing.

(5) Position a new 4 3/8-inch id "O" ring packing (MM, fig. 109) on power-take-off drive adapter assembly (NN, fig. 109) and a new 5/16-inch id "O" ring packing (AK, fig. 109) on adapter oil transfer tube and install adapter assembly over drive shaft and on accessory case. Hold adapter assembly in place by installing two 5/16 x 1 15/64 hex-head bolts (SS, fig. 109) and 21/64 id, 9/16 od, 0.0630 thick flat washers (RR, fig. 109). Install bolts only fingertight. Bolts will be tightened when drive cover is installed (par. 263).

*e. Install Accessory Drive Gear.*

NOTE: The key letters shown below in parentheses refer to figure 112 except where otherwise indicated.

(1) Install 3 53/64-inch housing diameter retaining ring (AJ, fig. 109) in groove in bearing liner in accessory case. Press roller bearing (AH, fig. 109) in bearing liner with a suitable press. Bearing must seat against retaining ring.

(2) Press roller bearing (Y) on shaft of accessory drive gear (W) with a suitable bearing press. Slide accessory drive gear housing spacer (Z) on shaft with flange of spacer in contact with inner race of bearing.

(3) Install 1 33/64-inch housing diameter retaining ring (AA) in bore of accessory drive gear.

(4) Install accessory drive gear in accessory case in mesh with accessory drive idler gear and power-take-off drive gear.

(5) Place a piece of wood or similar material at point of mesh of accessory drive gear and power-take-off drive gear to prevent drive gear from rotating and secure drive gear with 1 15/16-inch hex nut (AF, fig. 109) and 1 61/64-

inch id key washer (AG, fig. 109). Tighten nut securely. Secure nut by bending tabs of key washer over nut. Remove wood or other material from gear teeth.

NOTE: On early model AOSI-895-5M engines, install 1 15/16-inch slotted nut (AQ, fig. 109) and nut lock (AP, fig. 109) on shaft and tighten using wrench 7083758 (fig. 113). Secure slotted nut by bending tabs of nut lock over slotted nut.

*f. Install Fan Drive Shaft Gear.*

NOTE: The key letters shown below in parentheses refer to figure 109.

(1) Install new oil seal (BB) in recess in accessory case. Aline dowel pin on fan drive shaft gear oil seal housing assembly (AA) with dowel hole in accessory case and install housing assembly in accessory case over oil seal and secure with 2 63/64-inch housing diameter retaining ring (Z).

(2) Install 2 9/32-inch housing diameter retaining ring (X) in bore of shaft of fan drive shaft gear (W). Install roller bearings (V and Y) on shaft with one bearing on each side of gear.

(3) Install gear, with attached bearings, in bore of oil seal housing, making certain longer hub end of gear is properly seated in oil seal.

(4) Install 2 23/64-inch housing diameter retaining ring (R) in fan drive shaft gear bearing liner (U). Install bearing liner in accessory case to support fan drive shaft gear front roller bearing and secure with six 5/16-inch slotted hex nuts (S) and 2 1/64 id, 9/16 od, 0.0630 thick flat washers (T). Secure nuts with locking wire.

*g. Assemble and Install Supercharger Drive Group.*

NOTE: The key letters shown below in parentheses refer to figure 109 except where otherwise indicated.

(1) Install 1 61/64-inch housing diameter retaining ring (AE) in bearing bore in accessory case.

(2) Install outer race (part of roller bearing) (AD) in bearing bore against retaining ring. Install bearing retaining plate (AC) to hold race in position and secure with two 5/16-inch slotted hex nuts (ZZ) and 2 1/64 id, 9/16 od, 0.0630 thick flat washers (AB). Secure nuts with locking wire.

(3) Press inner race (part of roller bearing) (VV) on impeller driven shaft gear (UU) using a suitable bearing press.

(4) Secure shaft gear in a vise equipped with leather or copper jaws and secure race on shaft of gear with bearing locking nut (WW). Tighten nut using wrench 8708650 (W, fig. 9) and a torque wrench to torque of 700 pound-inches. Secure nut with bearing nut lock (XX) and nut lock retaining ring (YY). Remove shaft from vise.

NOTE: If slots in bearing locking nut and slots in shaft gear are not alined when nut is torqued to 700 pound-inches, remove nut (par. 120a(8) and (9)) and lap seating surface of nut sufficiently to bring the slots into alinement at that torque. Install nut, nut lock, and retaining ring ((4) above).

(5) Press duplex ball bearings (J) on splined end of impeller driven shaft gear (UU) using a suitable bearing press. The two bearings must be installed so narrower milled slots on face of inner and outer races are facing each other and are alined.

(6) Install impeller driven shaft gear, with attached bearings, in accessory case diaphragm assembly (H). Aline slots in duplex bearings with milled slots in face of diaphragm assembly.

(7) Position ball bearing retaining plates (K) in position in diaphragm assembly and secure with six 1/4 x 1 7/32 hex-head bolts (TT). Secure bolts with locking wire.

(8) Install 2 9/32-inch housing diameter retaining ring (M) in bore of impeller drive shaft gear (N). Install roller bearings (L and Q) on shaft of gear, with one bearing on each side of gear.

(9) Install 2 63/64-inch housing diameter retaining ring (E) in groove in large bore of diaphragm assembly.

(10) Install impeller drive shaft gear (N), with attached bearings, in diaphragm

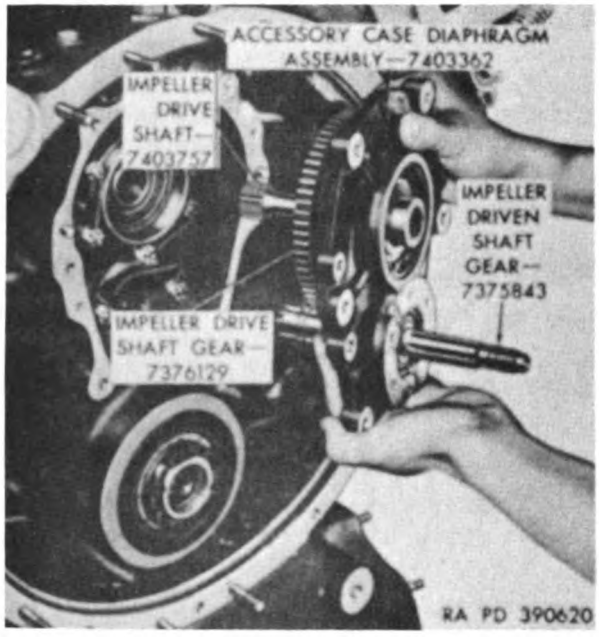



*Figure 116. Installing accessory case diaphragm assembly.*

assembly, meshing teeth of drive shaft gear and driven shaft gear.

(11) Install impeller drive shaft (P) in bore of drive shaft gear, engaging splines on drive shaft with splines in gear.

(12) Aline impeller drive shaft with bore in accessory case and inner race of bearing on impeller driven shaft gear with bore of outer race of roller bearing in accessory case and install diaphragm assembly on accessory case as shown in figure 116. Dowel pin holes in diaphragm must aline with dowel pins in accessory case.

(13) Secure diaphragm assembly to accessory case with six $\frac{5}{16}$ x $1\frac{1}{4}$ hex-head bolts (F) and $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washers (G). Secure bolts with locking wire.

(14) If oil seal (C) was removed from impeller driven shaft gear oil seal housing (D), install impeller spacer (B) in new oil seal. Drive oil seal and spacer in housing using a suitable driving tool, using care not to damage seal. Slide oil seal housing, with oil seal, spacer, and impeller spacer washer (A), onto diaphragm assembly

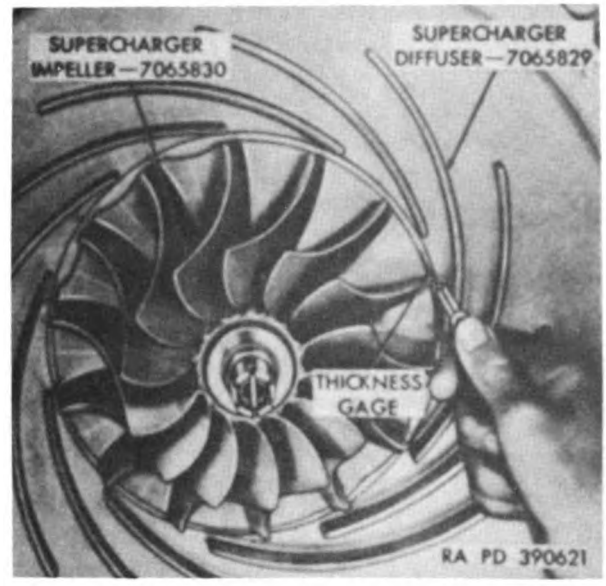



*Figure 117. Checking clearance between supercharger impeller and diffuser.*

around impeller driven shaft gear and in contact with duplex ball bearing.

*h. Install Supercharger Group.*

**NOTE: The key letters shown below in parentheses refer to figure 103 except where otherwise indicated.**

(1) Position a new 16-inch id "O" ring packing (F) on supercharger diffuser (M) and install diffuser on accessory case diaphragm assembly in accessory case.

(2) Secure diffuser to diaphragm with six $\frac{1}{4}$ x $\frac{25}{32}$ hex-head bolts (P) and $\frac{1}{4}$-inch tab washers (N). Tighten bolts securely. Secure bolts by bending tabs of tab washers over heads of bolts.

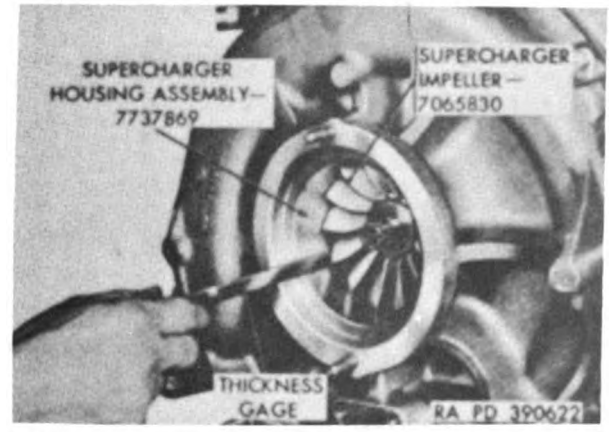



*Figure 118. Checking clearance between supercharger impeller and housing assembly.*

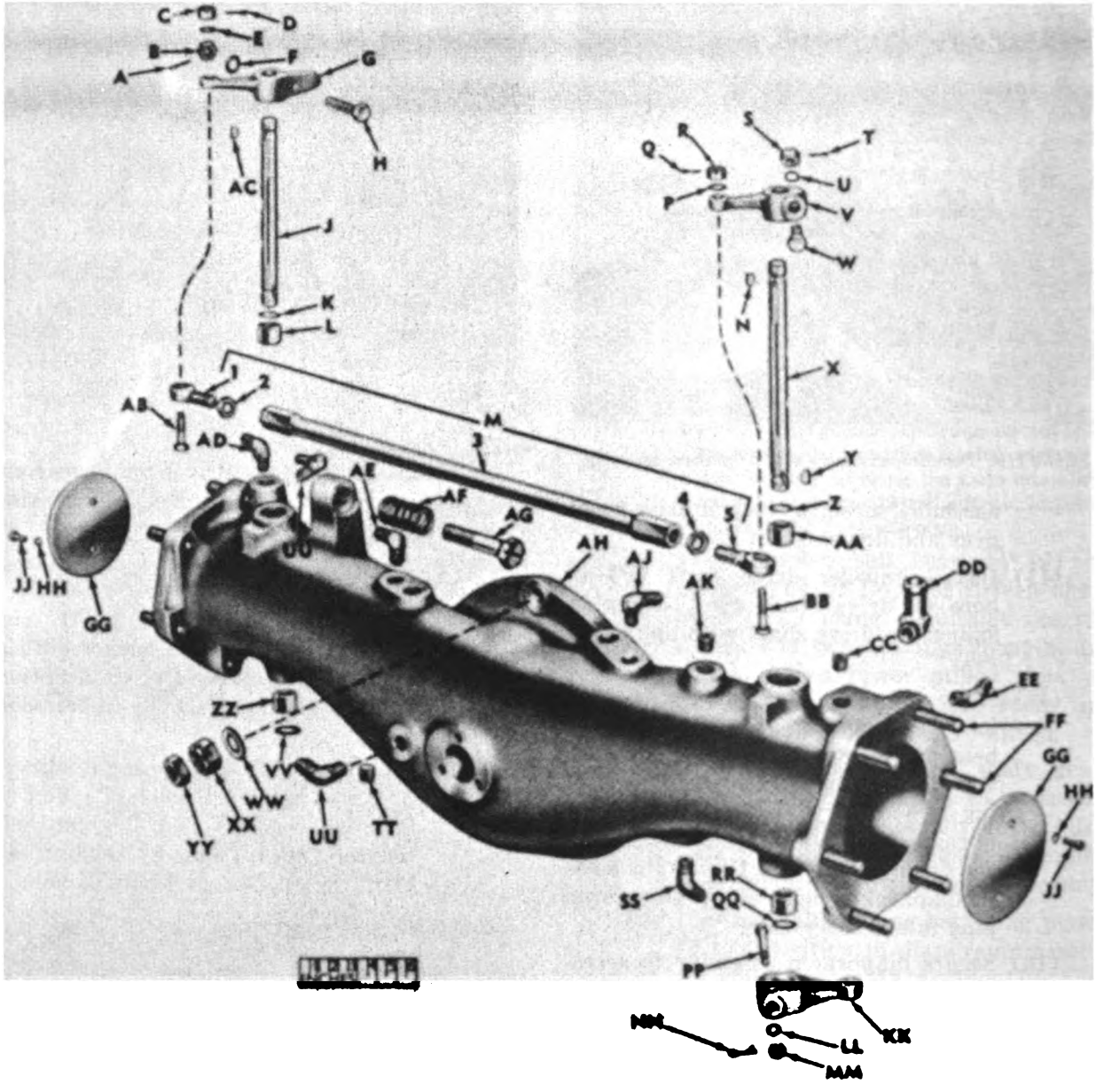



*Figure 119. Supercharger air inlet housing, control rods, and valves—exploded view.*

A–1/16 x 3/4 cotter pin 121223
B–5/16-inch slotted hex nut 122942
C–No. 10 slotted hex nut 7403213
D–1/16 x 3/4 cotter pin 121223
E–13/64 id, 7/16 od, 0.0320 thick flat washer 192588
F–21/64 id, 9/16 od, 0.0310 thick flat washer 502203
G–Throttle shaft stop lever 8733083
H–5/16 x 1 15/32 hex-head bolt 7376704
J–Left throttle shaft 8733068
K–Oil seal 7351671
L–Needle bearing 709413
M–Throttle shaft lever control rod assembly 7974062
  1–Rod end ball bearing 712013
  2–3/8-inch hex jam nut 7767952
  3–Throttle shaft lever control rod 7974062
  4–3/8-inch hex jam nut (lht) 7767958
  5–Rod end ball bearing (lht) 712014
N–3/32 x 1/8 Woodruff key 124542
P–13/64 id, 7/16 od, 0.0320 thick flat washer 192588
Q–1/16 x 3/4 cotter pin 121223
R–No. 10 slotted hex nut 7403213
S–5/16-inch slotted hex nut 122942
T–1/16 x 3/4 cotter pin 121223
U–21/64 id, 9/16 od, 0.0310 thick flat washer 502203
V–Right throttle shaft upper lever 8679598
W–5/16 x 1 15/32 hex-head bolt 7376704
X–Right throttle shaft 8733072
Y–3/32 x 1/8 Woodruff key 124542
Z–Oil seal 7351671
AA–Needle bearing 709413
BB–No. 10 x 1 1/32 hex-head bolt 7350226
CC–1/8-inch hex-socket pipe plug 7538990
DD–Crankcase breather tube elbow 7376136
EE–Adapter elbow 7767516
FF–3/8 x 1 9/16 stud 7350203
GG–Throttle valve 7737759
HH–No. 10 lock washer 120217
JJ–No. 10 x 3/8 fillister-head screw 226401
KK–Right throttle shaft lower lever 8733060
LL–21/64 id, 9/16 od, 0.0310 thick flat washer 502203
MM–5/16-inch slotted hex nut 122942
NN–1/16 x 3/4 cotter pin 121223
PP–5/16 x 1 13/32 hex-head bolt 7376704
QQ–Oil seal 7351671
RR–Needle bearing 709413
SS–1/8-inch 45 degree adapter elbow 7767516
TT–1/8-inch hex-socket pipe plug 7538990
UU–1/8-inch 90 degree adapter elbow 7767517
VV–13/16-inch id "O" ring packing 501224
WW–25/64 id, 5/8 od, 0.0640 thick flat washer 502204
XX–3/8-inch hex self-locking nut 503351 or 503383 (model AOSI–895–5 engines only); 3/8-inch hex nut 225854 (model AOSI–895–5M engines only)
YY–3/8-inch hex stamped nut 107823 (model AOSI–895–5M engines only)
ZZ–Needle bearing 709420
AB–No. 10 x 1 1/32 hex-head bolt 7350226
AC–3/32 x 1/8 Woodruff key 124542
AD–1/8-inch 90 degree adapter elbow 7767517
AE–1/8-inch 90 degree adapter elbow 7767517
AF–Lever stop bolt spring 8679585
AG–Lever stop bolt 8733080
AH–Housing assembly 8745695
AJ–1/8-inch 90 degree adapter elbow 7767517
AK–1/4-inch square-head pipe plug 117244

*Figure 119—Continued.*

(3) Install the same number of supercharger impeller shims (L) on impeller driven shaft gear as were removed in disassembly. Install supercharger impeller (K) on shaft gear.

(4) Install wrench 7083730 (fig. 107) on impeller driven gear and move impeller up tight to diffuser. Check clearance between impeller and diffuser as shown in figure 117. Clearance should be between 0.0300 and 0.0350-inch.

(5) If clearance is not within limits specified in (4) above, remove impeller (par. 119) and add or remove shims (L), as necessary, to obtain the specified clearance. Install impeller ((3) and (4) above) and again check clearance between impeller and diffuser.

(6) Install 13/64 id, 1/2 od, 3/32 thick flat washer (Q) on impeller driven shaft gear. Install impeller locking nut (J) on shaft gear.

(7) Secure impeller by installing wrench 8708650 (fig. 106) on nut and tighten with a torque wrench to 700 pound-inches of torque.

NOTE: If slots in impeller locking nut and slots in shaft gear are not alined when nut is torqued to 700 pound-inches, remove nut (par. 119) and lap seating surface of nut sufficiently to bring slots into alinement at that torque. Repeat steps (6) and (7) above.

(8) Secure nut with impeller locking nut lock (H) and nut lock retaining ring (G).

(9) Position a new 16-inch diameter "O" ring packing (F) on supercharger housing side of diffuser, install supercharger housing assembly (E) on accessory case, and secure with nineteen 5/16-inch hex self-locking nuts

(S) or 5/16-inch hex nuts (S) and 5/16-inch hex stamped nuts (T), and 21/64 id, 5/16 od, 0.0630 thick flat washers (R). Two nuts are located on accessory case side of housing flange.

(10) Check the clearance between supercharger impeller and housing assembly as shown in figure 118. Clearance should be between 0.0215 and 0.0335-inch around the entire circumference of impeller.

(11) If clearance is not within limits specified in (10) above, loosen mounting nuts installed in (9) above and shift housing on studs to equalize clearance. Tighten nuts.

*i. Assemble Left and Right Camshaft Drive Idler Driven Gear Assemblies.* If left or right oil transfer inner plug (Q–2 or S–2, fig. 112) was removed from gear (Q–1 or S–1, fig. 112), press new plug in gear using a suitable press.

## Section X. REBUILD OF SUPERCHARGER AIR INLET HOUSING

### 125. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 119.

*a.* Loosen coupling nuts and remove accessory case breather tubes (fig. 102) from metering valves in housing assembly (AH). Remove metering valves and elbows from housing assembly.

*b.* Remove cotter pin (D), slotted hex nut (C), flat washer (E), and hex-head bolt (AB) securing rod end ball bearing (M–1) to throttle shaft stop lever (G).

*c.* Remove cotter pin (Q), slotted hex nut (R), flat washer (P), and hex-head bolt (BB) securing rod end ball bearing (M–5) to right throttle shaft upper lever (V). Remove throttle shaft lever control rod assembly (M).

*d.* Do not remove rod end ball bearings (M–1 and M–5) from throttle shaft lever control rod (M–3) unless inspection (par. 127) indicates replacement is necessary. To remove rod end ball bearings, loosen hex jam nuts (M–2 and M–4) and remove bearings from control rod. Remove jam nuts from bearings.

*e.* Remove cotter pin (A), slotted hex nut (B), flat washer (F), and hex-head bolt (H) securing throttle shaft stop lever (G) to left throttle shaft (J). Remove lever from shaft.

*f.* Remove cotter pin (T), slotted hex nut (S), flat washer (U), and hex-head bolt (W) securing right throttle shaft upper lever (V) to right throttle shaft (X). Remove lever from shaft.

*g.* Remove cotter pin (NN), slotted hex nut (MM), flat washer (LL), and hex-head bolt (PP) securing right throttle shaft lower lever (KK) to right throttle shaft (X) Remove lever from shaft.

*h.* Remove two fillister-head screws (JJ) and lock washers (HH) securing each throttle valve (GG) to left and right throttle shafts. Remove valves from shafts and housing and remove shafts from housing. Remove Woodruff keys (N, Y, and AC) from shafts.

*i.* The three oil seals (K, Z, and QQ), "O" ring packing (VV), four needle bearings (L, AA, RR, and ZZ), lever stop bolt (AG), lever stop bolt spring (AF), and the various elbows and plugs need not be removed unless inspection (par. 127) indicates replacement is necessary. To remove oil seals, packing, and needle bearings, drive seals and bearings out of housing from opposite side, using a long brass drift. Remove and discard "O" ring packing. To remove bolt, elbows, and plugs, unscrew from housing.

### 126. Cleaning

Clean all parts as described in paragraph 77.

### 127. Inspection

NOTE: The key letters shown below in parentheses refer to figure 119.

*a. Throttle Shaft Lever Control Rod Assembly.*

(1) *Throttle shaft lever control rod* (M–3). Inspect control rod for cracks or for bent condition. Inspect tapped holes in ends of rod for stripped or damaged threads.

(2) *Rod end ball bearings* (M–1 and M–5). Refer to TM 37–265 for inspection of ball bearings. Check bearings for con-

formance to tolerances specified in repair and rebuild standards (par. 318). Inspect bearings for stripped or damaged threads.

*b. Throttle Shaft Levers* (G, V, and KK). Inspect levers for cracks or for bent condition. Inspect keyways in levers for mutilation.

*c. Throttle Valves* (GG). Inspect valves for cracks or bent condition.

*d. Throttle Shafts* (J and X). Inspect shafts for cracks or for bent condition. Inspect keyways and slots for valves for mutilation.

*e. Housing Assembly.*

(1) *Housing assembly* (AH). Inspect housing assembly as described in paragraph 78*b* and *d*.

(2) *Oil seals* (K, Z, and QQ). Inspect oil seals as described in paragraph 78.

(3) *Needle bearings* (L, AA, RR, and ZZ). Refer to TM 37-265 for inspection of needle bearings. Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 318).

(4) *Lever stop bolt and spring.* Check lever stop bolt (AG) for binding by turning bolt in and out of housing. Lever stop bolt spring (AF) must follow movement of bolt.

(5) *Elbows* (EE, SS, UU, AD, AE, and AJ). Inspect elbows for mutilation and stripped or damaged threads.

(6) *Crankcase breather tube elbow* (DD). Inspect breather tube elbow for mutilated hose connection end.

(7) *Pipe Plugs* (CC and TT). Inspect hex-socket pipe plugs and square-head pipe plug (AK) for mutilated heads.

## 128. Repair

NOTE: The key letters shown below in parentheses refer to figure 119.

*a. Throttle Shaft Lever Control Rod Assembly.*

(1) *Throttle shaft lever control rod* (M-3). Replace rod if cracked or bent. Replace rod if threads in tapped holes are stripped or damaged. Repair damaged threads with a used tap and straighten bent rod, if possible.

(2) *Rod end ball bearings* (M-1 and M-5). Repair or replace bearings as described in paragraph 79. Replace bearing if threads are stripped or damaged. Repair damaged threads with a thread chaser, if possible.

*b. Throttle Shaft Levers* (G, V, KK). Replace levers if cracked or bent. Replace levers if keyways are mutilated to the point of interfering with assembly or disassembly. Weld and remill keyways, if possible.

*c. Throttle Valves* (GG). Replace valves if cracked or bent.

*d. Throttle Shafts* (JJ and X). Replace shafts if cracked or bent or worn at needle bearing or oil seal seating surface. Replace levers if slots for valves or keyways are mutilated to the point of interfering with assembly or disassembly. Weld and remill keyways, if possible.

*e. Housing Assembly.*

(1) *Housing assembly* (AH). Repair or replace housing assembly as described in paragraph 79*b* and studs as described in paragraph 79*d*.

(2) *Oil seals* (K, Z, and QQ). Replace oil seals if damaged.

(3) *Needle bearings* (L, AA, RR, ZZ). Repair or replace needle bearings in the same manner as described for ball and roller bearings in paragraph 79.

(4) *Lever stop bolt and spring.* Replace lever stop bolt (AG) if it binds in housing. Replace lever stop bolt spring (AF) if permanently set or if it does not follow movement of bolt properly.

(5) *Elbows* (EE, SS, UU, AD, AE, and AJ). Replace elbows if mutilated or if threads are stripped or damaged.

(6) *Crankcase breather tube elbow* (DD). Replace breather tube elbow if hose connection end is mutilated.

(7) *Pipe plugs.* Replace hex-socket pipe plugs (CC and TT) or square-head pipe plug (AK) if heads are mutilated.

## 129. Assembly

NOTE: The key letters shown below in parentheses refer to figure 119.

*a.* If lever stop bolt ($\frac{7}{16} \times 2\frac{3}{16}$ shoulder bolt) (AG) was removed, install lever stop bolt

spring (AF) and bolt in housing assembly (AH).

*b.* If ⅛-inch hex-socket pipe plugs (CC and TT) and ¼-inch square-head pipe plug (AK) were removed, coat threads of pipe plugs with gasket forming compound and install plugs in housing assembly.

*c.* If crankcase breather tube elbow (DD) was removed, coat threads of elbow with gasket forming compound and install elbow in housing assembly.

*d.* If elbows (EE, SS, UU, AD, AE, and AJ) were removed, coat threads of elbows with gasket forming compound and install elbows in housing. Figure 102 shows angles at which elbows should be placed.

*e.* If needle bearings (L, AA, RR, and ZZ) were removed, install new 1 3/16 id "O" ring packing (VV) in bore for needle bearing (ZZ) and drive bearings into housing using a suitable driving tool. Install new oil seals (K, Z, and QQ) in bearing bores behind needle bearings (L, AA, and RR).

*f.* Install left throttle shaft (J) in needle bearings in housing. Install 3/32 x ½ Woodruff key (AC) in keyway in upper end of shaft.

*g.* Install right throttle shaft (X) in needle bearings in housing. Install 3/32 x ½ Woodruff key (N) in keyway in upper end of shaft and 3/32 x ½ Woodruff key (Y) in keyway in lower end of shaft.

*h.* Position a throttle valve (GG) into each end of housing and through slot in throttle shaft and secure each valve with two No. 10 x ⅜ fillister-head screws (JJ) and No. 10 lock washers (HH).

*i.* Aline keyway in right throttle shaft lower lever (KK) with key in lower end of right throttle shaft (X), slide lever on shaft, and secure with 5/16 x 1 15/32 hex-head bolt (PP), 5/16-inch slotted hex nut (MM), and 21/64 id, 9/16 od, 0.0310 thick flat washer (LL). Secure nut with 1/16 x ¾ cotter pin (NN).

*j.* Install right throttle shaft upper lever (V) on upper end of right throttle shaft in same manner as described for lower lever (*i* above) and secure lever to shaft with 5/16 x 1 15/32 hex-head bolt (W), 5/16-inch slotted hex nut (S), and 21/64 id, 9/16 od, 0.0310 thick flat washer (U). Secure nut with 1/16 x ¾ cotter pin (T).

*k.* Install throttle shaft stop lever (G) on upper end of left throttle shaft (J) in the same manner as described for right throttle shaft lower lever (*i* above) and secure lever to shaft with 5/16 x 1 15/32 hex-head bolt (H), 5/16-inch slotted hex nut (B), and 21/64 id, 9/16 od, 0.0310 thick flat washer (F). Secure nut with 1/16 x ¾ cotter pin (A).

*l.* If rod end ball bearings (M–1 and M–5) were removed from throttle shaft lever control rod (M–3), install ⅜-inch hex jam nut (LH thread) (M–4) on rod end ball bearing (LH thread) (M–5) and screw bearing into left hand threaded end of control rod. Install ⅜-inch hex jam nut (M–2 on rod end ball bearing (M–5) and screw bearing into other end of rod.

*m.* Adjust rod end ball bearings in or out of control rod, as necessary, to provide a distance of 17¼ inches between bearing centers. After adjustment, lock bearings in position by tightening hex jam nuts against shoulder on control rod.

*n.* Secure rod end ball bearing (M–1) to throttle shaft stop lever (G) with No. 10 x 1 1/32 hex-head bolt (AB), No. 10 slotted hex nut (C), and 13/64 id, 7/16 od, 0.0320 thick flat washer (E). Secure nut with 1/16 x ¾ cotter pin (D).

*o.* Secure control rod assembly to right throttle shaft upper lever (V) with No. 10 slotted hex nut (R), and 13/64 id, 7/16 od, 0.0320 thick flat washer (P). Secure nut with 1/16 x ¾ cotter pin (Q).

## Section XI. REBUILD OF MAGNETO DRIVE ASSEMBLY AND FUEL INJECTOR OIL BOOSTER PUMP

### 130. Disassembly

*a. Remove Fuel Pump Drive Adapter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

(1) Remove hex self-locking nuts (FF), or hex stamped nuts (GG) and hex nuts (FF), and flat washers (EE) securing fuel pump drive adapter assembly (DD) to magneto drive housing assembly.

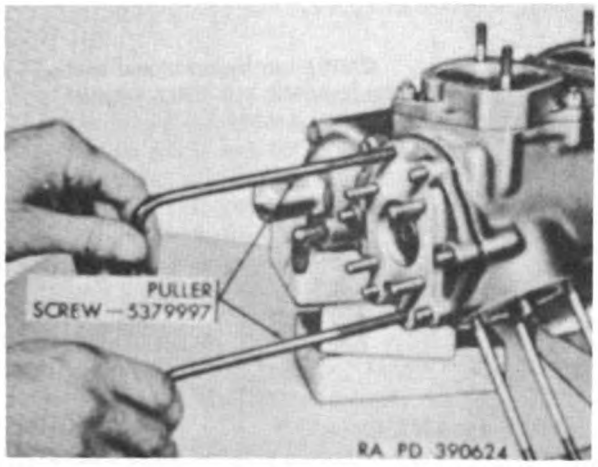
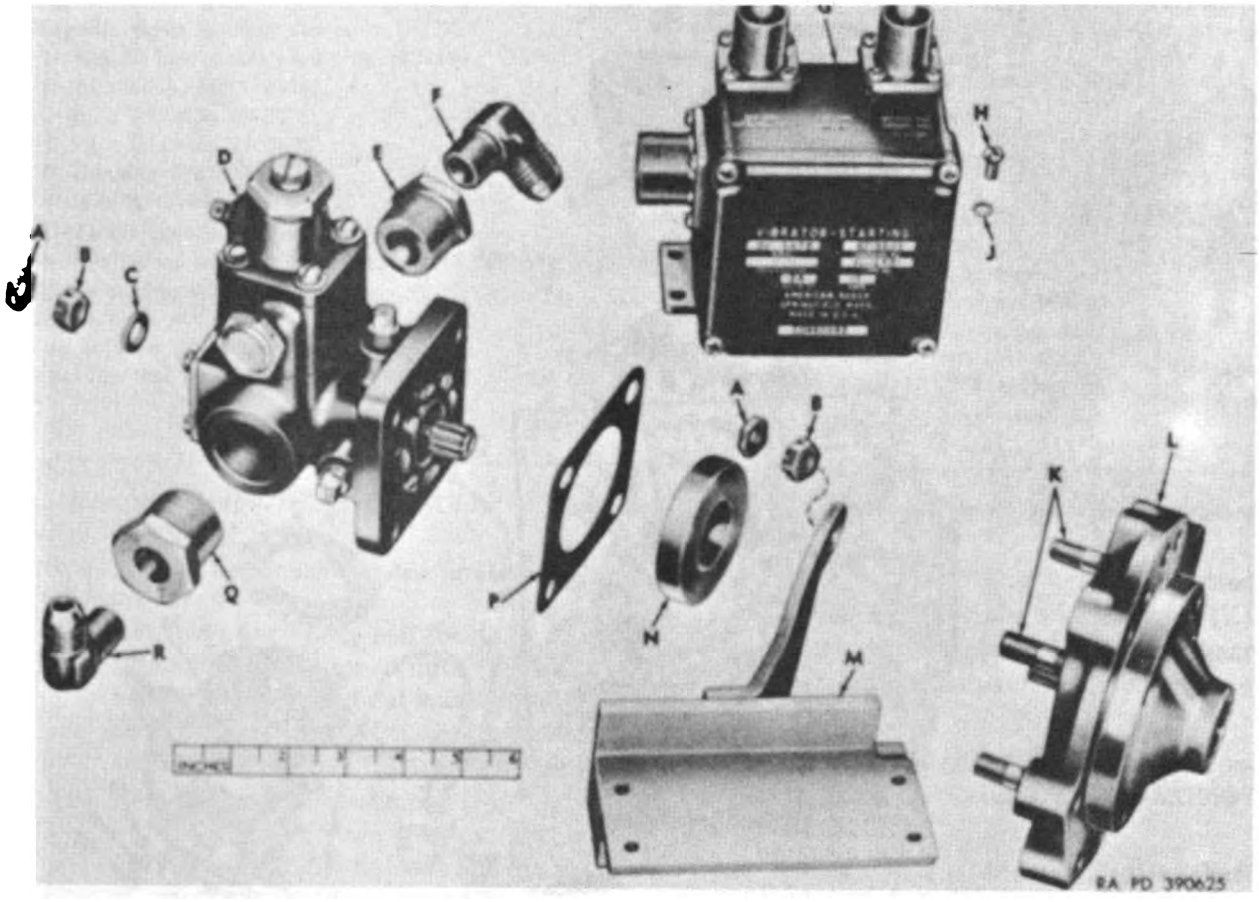



*Figure 120. Removing fuel pump drive adapter assembly.*

(2) Remove adapter assembly from magneto drive assembly using two puller screws 5379997 (fig. 120). Remove and discard "O" ring packings (BB and CC).

(3) Do not remove oil seal (N, fig. 121) from bore of fuel pump adapter assembly unless inspection (par. 132) indicates replacement is necessary. To remove seal, press from adapter assembly using a suitable press.

(4) Remove fuel injector drive shaft gear (W, fig. 122) and fuel injector driven shaft gear (X, fig. 122) from magneto drive housing assembly (K, fig. 122).




A—5/16-inch hex-stamped nut 107822 (model AOSI–895–5M engine only)

B—5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)

B—5/16-inch hex nut 225853 (model AOSI–895–5M engine only)

C—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

D—Fuel pump assembly 8713455

E—⅜ x ⅝ pipe bushing 8713453

F—⅜-inch 90 degree adapter elbow 7346726

G—Ignition booster and filter coil assembly 8719826

H—No. 10 x 7/16 round-head screw 132903

J—No. 10 lock washer MS35335–32

K—5/16 x 1½ stud 7403501

L—Fuel pump drive adapter assembly 8679603

M—Booster coil mounting bracket 7737740

N—Oil seal 500241

P—Fuel pump mounting gasket 7006868

Q—⅜ x ¼ pipe bushing 7974077

R—¼-inch 90 degree elbow 7376122

*Figure 121. Fuel pump assembly and mounting parts—exploded view.*

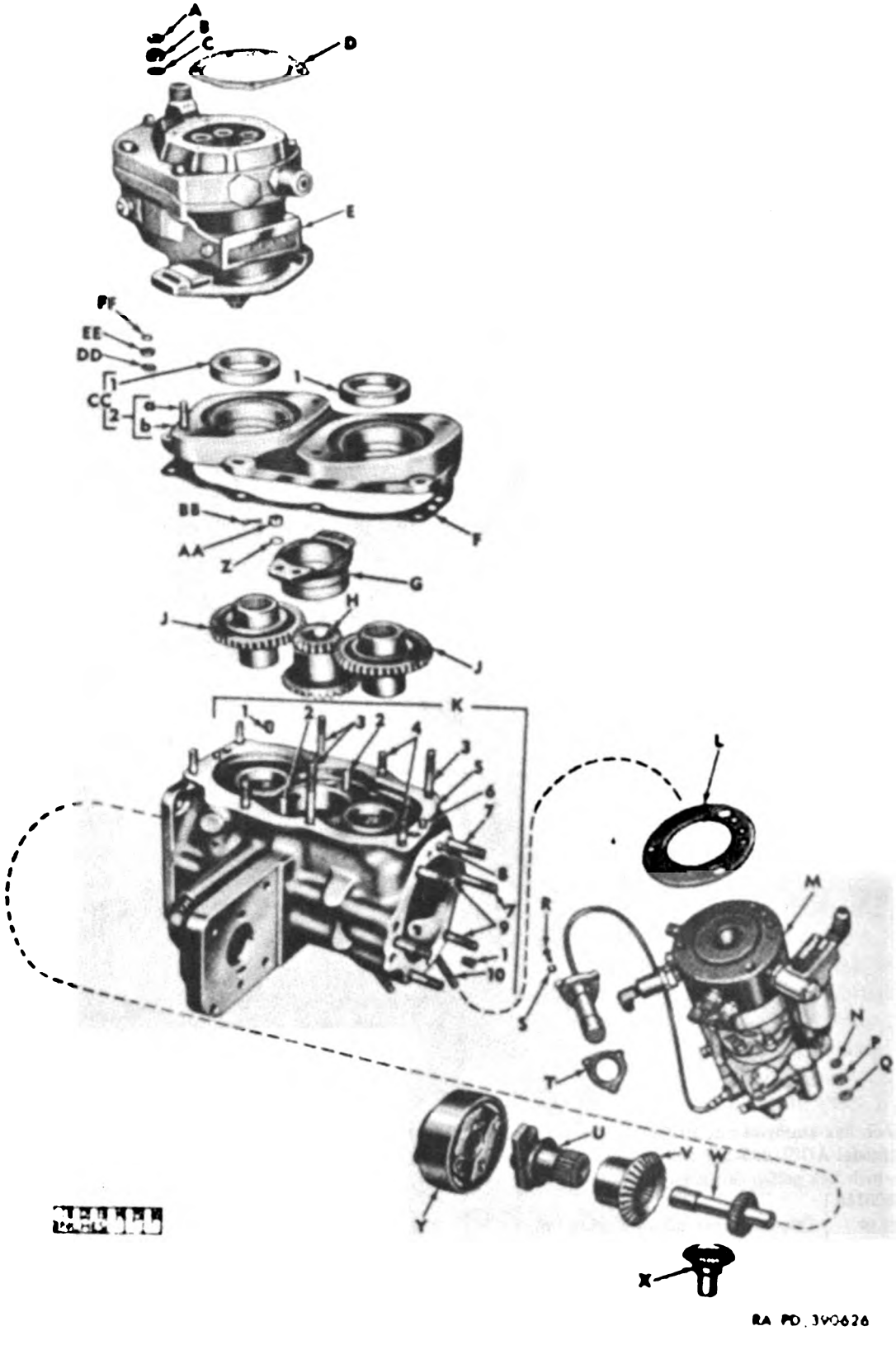



*Figure 122. Magneto drive assembly and fuel injector pump—exploded view.*

A—5/16-inch hex stamped nut 107822
(model AOSI–895–5M engine only)
B—5/16-inch hex nut 225853
(model AOSI–895–5M engine only)
5/16-inch hex self-locking nut 503345
(model AOSI–895–5 engine only)
C—21/64 id, 13/16 od, 1/8 thick plain washer 7744766
D—Magneto adapter gasket 7338655
E—Magneto assembly 8344983
7403411
7974215
7974214
7539584 (early model AOSI–895–5M engines only)
F—Magneto drive adapter gasket 7346502
G—Magneto driven idler gear adapter 7346552
H—Magneto driven idler shaft gear 7346521
J—Magneto driven gear 7410051
K—Magneto drive housing assembly 7737853
1—1/8-inch hex-socket pipe plug 7538990
2—5/16 x 1 11/32 stud 7403068
3—5/16 x 2 3/4 stud 7403073
4—5/16 x 1 7/16 stud 7403503
5—Housing 7737854
6—1/4 x 5/8 tapered pin 589920
7—5/16 x 1 25/32 stud 8680609
8—Fuel pump adapter oil transfer tube 7338667
9—5/16 x 1 15/16 stud 7403500
10—5/16 x 4 7/8 stud 7973964
L—Fuel injector pump gasket 8698693
M—Fuel injector pump assembly 7974355
N—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
P—5/16-inch hex-locking nut 503345 or 503380 (model AOSI–895–5 engine only)
5/16-inch hex nut 225853
(model AOSI–895–5M engine only)
Q—5/16-inch hex stamped nut 107822
(model AOSI–895–5M engine only)
R—No. 10 x 3/4 fillister-head screw 8713447
S—No. 10 lock washer 121801
T—Gasket 8679565
U—Spark advance governor coupling assembly 7346524
V—Magneto drive idler gear 7346520
W—Fuel injector drive shaft gear 8679624
X—Fuel injector driven shaft gear 8679608
Y—Spark advance governor unit assembly 8376450
Z—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
AA—5/16-inch slotted hex nut 122942
BB—1/16 x 3/4 cotter pin 121223
CC—Magneto drive adapter assembly 8380721
1—Oil seal 500048
2—Adapter assembly 7346534
a—5/16 x 1 11/16 stud 7403071
b—Adapter 7403438
DD—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
EE—5/16-inch hex nut 225853
(model AOSI–895–5M engine only)
5/16-inch hex self-locking nut 503345
(model AOSI–895–5 engine only)
FF—5/16-inch hex stamped nut 107822
(model AOSI–895–5M engine only)

*Figure 122—Continued.*

*b. Remove Magneto Drive Adapter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 122.

(1) Remove five hex self-locking nuts (EE), or hex stamped nuts (FF) and hex nuts (EE), and flat washers (DD) securing magneto drive adapter assembly (CC) to magneto drive housing.

(2) Remove adapter assembly from drive housing using two puller screws 5379997 (fig. 123). Remove and discard magneto drive adapter gasket (F).

(3) Do not remove two oil seals (CC–1) unless inspection (par. 132) indicates replacement is necessary. To remove seals, press seals from drive assembly using a suitable press.

(4) Lift two magneto driven gears (J) from magneto drive housing (K–5).

*c. Remove Magneto Driven Idler Gear Adapter.*

NOTE: The key letters shown below in parentheses refer to figure 122.

(1) Remove two cotter pins (BB), slotted hex nuts (AA), and flat washers (Z) securing magneto driven idler gear adapter (G) to magneto drive housing (K–5).

(2) Remove gear adapter from drive housing using two puller screws 5379997 (fig. 124).

(3) Remove magneto driven idler shaft gear (H) and magneto drive idler gear (V) from drive housing.

(4) Remove four hex-socket pipe plugs (K–1), one elbow, and one nipple from openings in drive housing.

*d. Remove Fuel Injector Oil Booster Pump Assembly.*

(1) Cut locking wire and loosen four hex-head bolts securing fuel injector oil

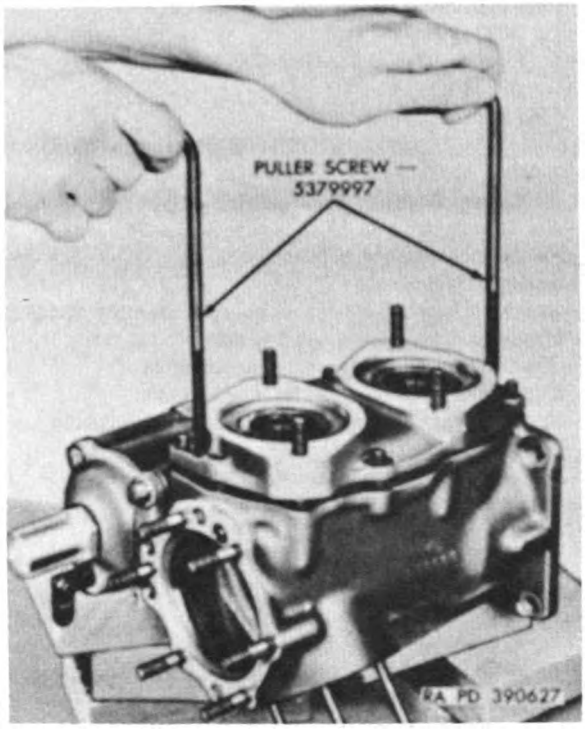



*Figure 123. Removing magneto drive adapter assembly.*

booster pump assembly (HH, fig. 96) to magneto drive housing.

(2) Remove pump assembly from drive housing as shown in figure 125. Remove and discard booster pump gasket (JJ, fig. 96).

*e. Disassemble Fuel Injector Oil Booster Pump Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 126.

(1) Remove cap (U) and remove and discard cap gasket (R).

(2) Remove hex nut (V) and hex jam nut (W) from main shaft. Remove cover (Q), with attached hex-head bolts (T) and flat washers (S). Remove four bolts and washers from cover. Remove and discard cover gasket (G). Remove elbow (X) from cover.

(3) Hold pump housing with large piston (M) up. Press down on large piston to compress spring and remove hex nut (P) and hex nut (N) from shaft. Remove large piston and slide shaft (E), with attached small piston (C) and piston spring (D), from housing.

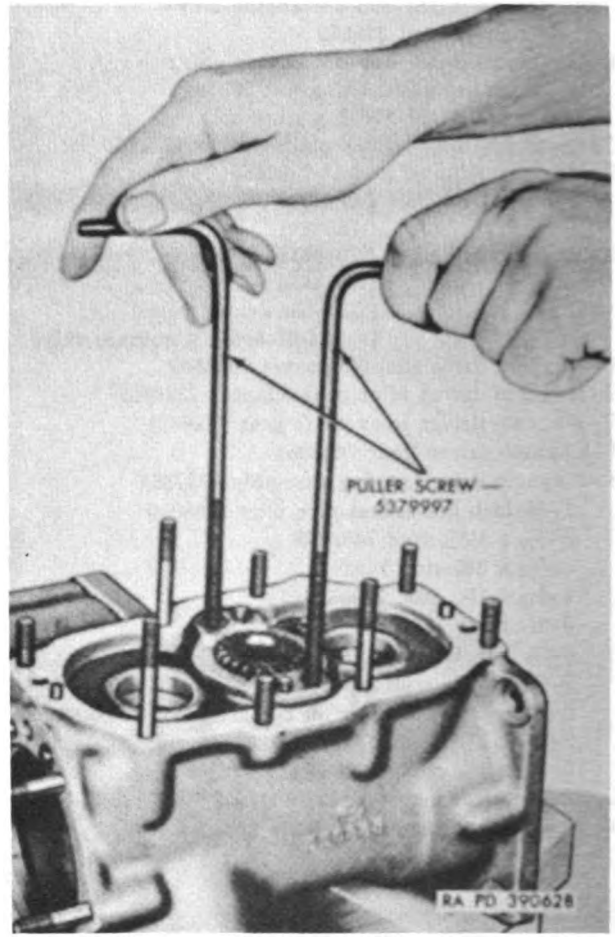



*Figure 124. Removing magneto driven idler gear adapter.*

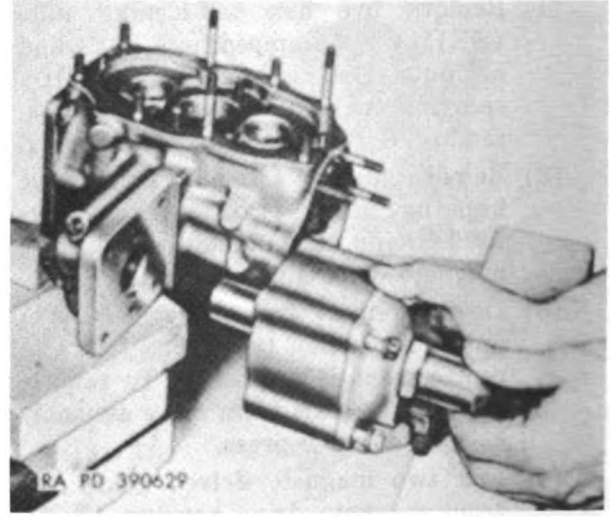
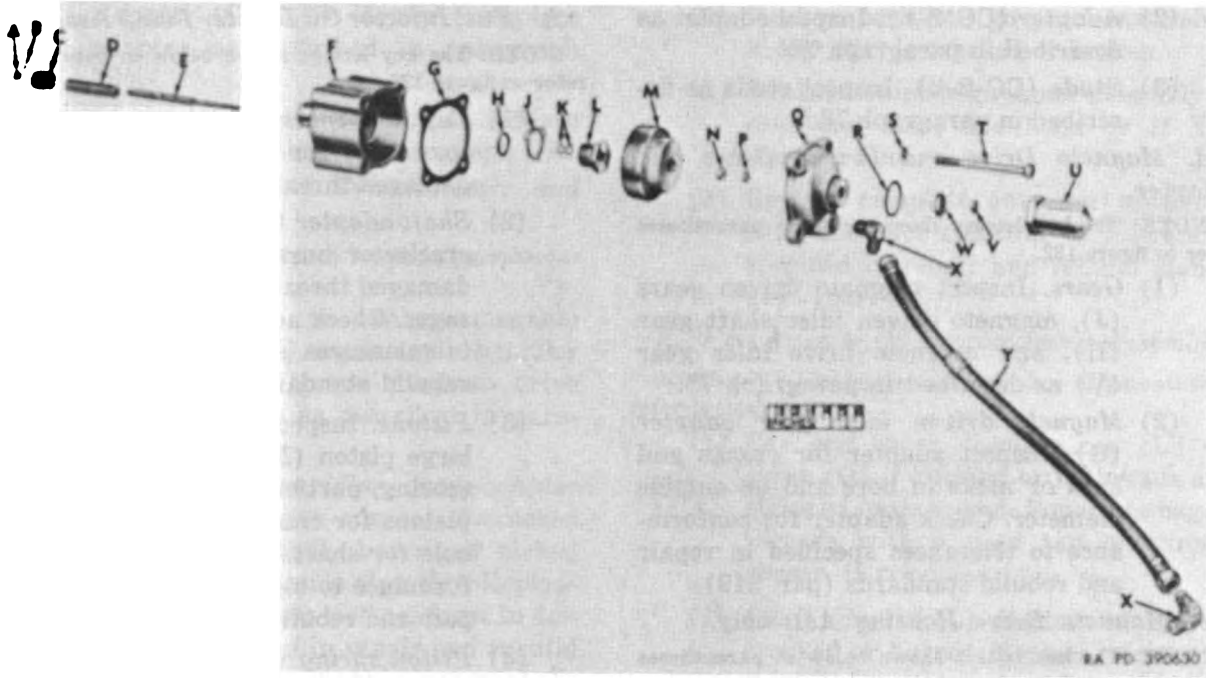



*Figure 125. Removing fuel injector oil booster pump assembly.*



A—¼-inch castellated hex nut 8713467
B—1/16 x ½ cotter pin 190432
C—Small piston 8698765
D—Piston spring 8798575
E—Shaft 8698576
F—Housing 8698571
G—Cover gasket 8698568
H—51/64-inch id "O" ring packing 546874
J—1.0900-inch tab washer 8698577
K—⅜-inch id "O" ring packing 501220
L—Shaft adapter 8698573
M—Large piston 8698574
N—¼-inch hex nut (7/32 thick) 225851
P—¼-inch hex nut (⅛-thick) 7767954
Q—Cover 8698567
R—Cap gasket 115449
S—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
T—5/16 x 3¾ hex-head bolt 8713462
U—Cap 8698570
V—¼-inch hex nut (⅛ thick) 7767954
W—¼-inch hex jam nut 8698569
X—¼-inch 90 degree elbow 7376122
Y—Hose assembly 7973945

*Figure 126. Fuel injector oil booster pump assembly—exploded view.*

(4) Slide piston spring (D) from shaft. Remove cotter pin (B) and castellated hex nut (A) securing small piston (C) to shaft and remove piston.

(5) Straighten tabs of tab washer (J) from head of shaft adapter (L) and remove adapter and washer from housing. Remove and discard "O" ring packing (H) from outer diameter of adapter and two "O" ring packings (K) from bore of adapter.

## 131. Cleaning

Clean all parts as described in paragraph 77.

## 132. Inspection

*a. Fuel Pump Drive Adapter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 121.

(1) *Oil seal* (N). Inspect oil seal as described in paragraph 78.

(2) *Fuel pump drive adapter assembly* (L). Inspect adapter assembly as described in paragraph 78*b*. Inspect studs (K) as described in paragraph 78*d*.

*b. Fuel Injector Drive and Driven Shaft Gears* (W and X, fig. 122). Inspect gears as described in paragraph 78.

*c. Magneto Drive Adapter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 122.

(1) *Oil seals* (CC–1). Inspect oil seals as described in paragraph 78*h*.

(2) *Adapter* (CC–2–b). Inspect adapter as described in paragraph 78*b*.

(3) *Studs* (CC–2–b). Inspect studs as described in paragraph 78*d*.

*d. Magneto Drive and Driven Gears and Adapter.*

NOTE: The key letters shown below in parentheses refer to figure 122.

(1) *Gears.* Inspect magneto driven gears (J), magneto driven idler shaft gear (H), and magneto drive idler gear (V) as described in paragraph 78.

(2) *Magneto driven idler gear adapter* (G). Inspect adapter for cracks and burs or nicks in bore and on outside diameter. Check adapter for conformance to tolerances specified in repair and rebuild standards (par. 319).

*e. Magneto Drive Housing Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 122.

(1) *Hex-socket pipe plugs* (K–1). Inspect pipe plugs for stripped or damaged threads and mutilated socket heads. Inspect elbow and nipple for stripped or damaged threads.

(2) *Fuel pump adapter oil transfer tube* (K–8). Inspect tube for mutilated condition.

(3) *Housing* (K–5). Inspect housing as described in paragraph 78*b*.

(4) *Studs.* Inspect studs on housing as described in paragraph 78*d*.

*f. Spark Advance Governor Coupling Assembly* (U, fig. 122).

(1) Inspect coupling assembly for cracks or burs and mutilated splines.

(2) Check bearing in bore of coupling assembly for conformance to tolerances specified in repair and rebuild standards (par. 319).

*g. Spark Advance Governor Unit Assembly* (Y, fig. 122).

(1) Inspect governor assembly for cracked or broken parts.

(2) Inspect pins and stops for loose mounting and check flyweights for binding.

(3) Check assembly for conformance to tolerances specified in repair and rebuild standards (par. 319).

*h. Fuel Injector Oil Booster Pump Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 126.

(1) *Cap and cover.* Inspect cap (U) and cover (Q) for cracks and stripped or damaged threads.

(2) *Shaft adapter* (L). Inspect adapter for cracks or burs on head, stripped or damaged threads, and plugged oil passages. Check adapter for conformance to tolerances specified in repair and rebuild standards (par. 320).

(3) *Pistons.* Inspect small piston (C) and large piston (M) for burs, nicks, and scoring, particularly on lands. Inspect pistons for cracks in head and around hole for shaft. Check pistons for conformance to tolerances specified in repair and rebuild standards (par. 320).

(4) *Piston spring* (D). Inspect spring for cracks and set, and conformance to limits specified in repair and rebuild standards (par. 320).

(5) *Shaft* (E). Inspect shaft for cracks, burs, nicks, and stripped or damaged threads. Check shaft for conformance to tolerances specified in repair and rebuild standards (par. 320).

*i. Housing* (F). Inspect housing as described in paragraph 78*b*.

## 133. Repair

*a. Fuel Pump Drive Adapter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 121.

(1) *Oil seal* (N). Replace oil seal if damaged.

(2) *Fuel pump drive adapter assembly* (L). Repair or replace fuel pump adapter assembly as described in paragraph 79*b*. Repair or replace studs (K) as described in paragraph 79*d*.

*b. Fuel Injector Pump Drive and Driven Shaft Gears* (W and X, fig. 122). Repair or replace gears as described in paragraph 78.

*c. Magneto Drive Adapter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 122.

(1) *Oil seals* (CC–1). Replace oil seals if damaged.

(2) *Adapter* (CC–2–b). Repair or replace adapter as described in paragraph 78*b*.

(3) *Studs* (CC–2–a). Repair or replace studs as described in paragraph 79*d*.

*d. Magneto Drive and Driven Gears and Adapter.*

NOTE: The key letters shown below in parentheses refer to figure 122.

(1) *Gears.* Repair or replace magneto driven gears (J), magneto driven idler shaft gear (H), and magneto drive idler gear (V) as described in paragraph 78.

(2) *Magneto driven idler gear adapter* (G). Replace gear adapter if cracked or adapter is badly burred or nicked in bore or on outside diameter. Replace adapter if it does not conform to tolerances specified in repair and rebuild standards (par. 319). Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

*e. Magneto Drive Housing Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 122.

(1) *Hex-socket pipe plugs* (K–1). Replace pipe plugs if threads are stripped or damaged or socket head is mutilated. Replace elbow or nipple if threads are stripped or damaged.

(2) *Fuel pump adapter oil transfer tube* (K–8). Replace tube or complete magneto drive housing assembly if tube is mutilated.

(3) *Housing* (K–5). Repair or replace housing as described in paragraph 79*b*.

(4) *Studs.* Repair or replace studs in housing as described in paragraph 79*d*.

*f. Spark Advance Governor Coupling Assembly* (U, fig. 122).

(1) Replace coupling assembly if cracked, burred, or if splines are mutilated.

(2) Replace coupling assembly if bearing in bore does not conform to tolerances specified in repair and rebuild standards (par. 319).

*g. Spark Advance Governor Unit Assembly* (Y, fig. 122).

(1) Replace complete governor assembly if any part is cracked or broken.

(2) Replace complete governor assembly if pins and stops are loose or if flyweights bind.

(3) Replace complete governor assembly if it does not conform to tolerances specified in repair and rebuild standards (par. 319).

*h. Fuel Injector Oil Booster Pump Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 126.

(1) *Cap and cover.* Replace cap (U) or cover (Q) if cracked or if threads are stripped or damaged. Repair damaged threads with a used tap or thread chaser, if possible.

(2) *Shaft adapter* (L). Replace adapter if cracked or burred. Replace adapter if threads are stripped or damaged. Replace adapter if it does not conform to tolerances specified in repair and rebuild standards (par. 320). Repair damaged threads with a thread chaser, if possible.

(3) *Pistons.* Replace small piston (C) or large piston (M) if burred, nicked, or scored. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible. Replace pistons if cracked. Replace pistons if pistons do not conform to tolerances specified in repair and rebuild standards (par. 320).

(4) *Piston spring* (D). Replace spring if cracked, set, or spring does not conform to limits specified in repair and rebuild standards (par. 320).

(5) *Shaft* (E). Replace shaft if cracked, burred, nicked, or scored. Replace shaft if it does not conform to tolerances specified in repair and rebuild standards (par. 320). Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible. Shaft must be smooth and in good condition where it moves on "O" ring packings. Replace shaft if threads are stripped or

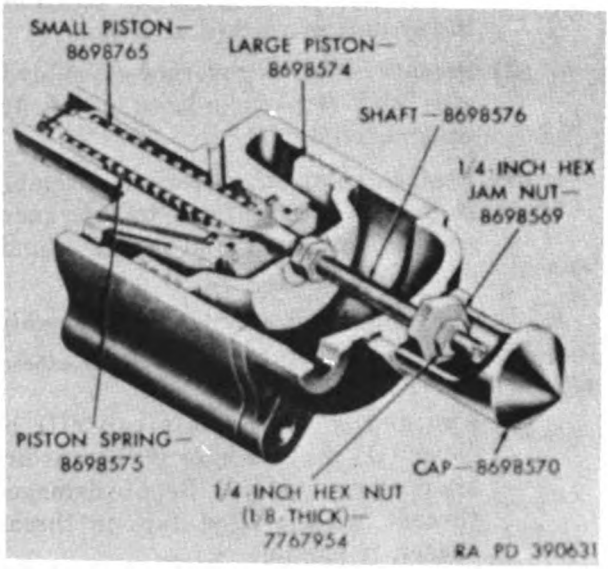



*Figure 127. Fuel injector oil booster pump assembly—cutaway view.*

damaged. Repair damaged threads with a thread chaser, if possible.

*i. Housing* (F). Repair or replace housing as described in paragraph 79*b*.

## 134. Assembly

*a. Assemble Fuel Injector Oil Booster Pump Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 126.

(1) Position small piston (C) on large diameter end of shaft (E) and secure with ¼-inch castellated hex nut (A). Secure nut with 1/16 x ½ cotter pin (B).

(2) Slide piston spring (D) over other end of shaft and into bore of small piston as shown in figure 127.

(3) Position two new ⅜-inch id "O" ring packings (K) in bore of shaft adapter (L) and a new 51/64-inch id "O" ring packing (H) in groove in outer diameter of adapter.

(4) Install adapter and 1.0900-inch tab washer (J) in housing (F) as shown in figure 127. Tighten adapter securely and bend up tabs of washer to secure adapter.

(5) Position thimble 8708266 (fig. 128) over threaded portion of shaft and

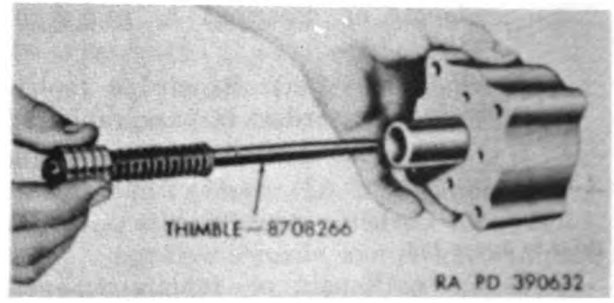



*Figure 128. Installing fuel injector oil booster pump shaft.*

install shaft, with attached spring and small piston, into housing. Remove thimble from shaft and housing.

(6) Position large piston (M) over threaded portion of shaft and into housing and secure with ¼-inch hex nut (7/32 thick) (N) and ¼-inch hex nut (⅛ thick) (P).

(7) Coat threads on ¼-inch 90 degree elbow (X) with gasket forming compound and install elbow in cover (Q). Position a new cover gasket (G) and cover on housing. Install four 5/16 x 3¾ hex-head bolts (T) and 21/64 id, 9/16 od, 0.0630 thick flat washers (S) through cover and into body to hold cover in place.

(8) Install ¼-inch hex jam nut (W) and ¼-inch hex nut (⅛ thick) (V) on shaft. Adjust length of pump stroke as described in (a) through (d) below.

(*a*) Insert wooden dowel into extension on housing behind small piston as shown in figure 129.

(*b*) Press pump down over dowel and compress piston spring to full limit.

(*c*) Screw ¼-inch hex jam nut (W) down on shaft to a distance of ½ inch, measured between face of nut and face of cover.

(*d*) Lock jam nut in position by tightening ¼-inch hex nut (⅛ thick) (V) against jam nut. Remove pump slowly from dowel.

(9) Position a new cap gasket (R) on cover and install cap (U) over gasket.

*b. Install Fuel Injector Oil Booster Pump Assembly.*

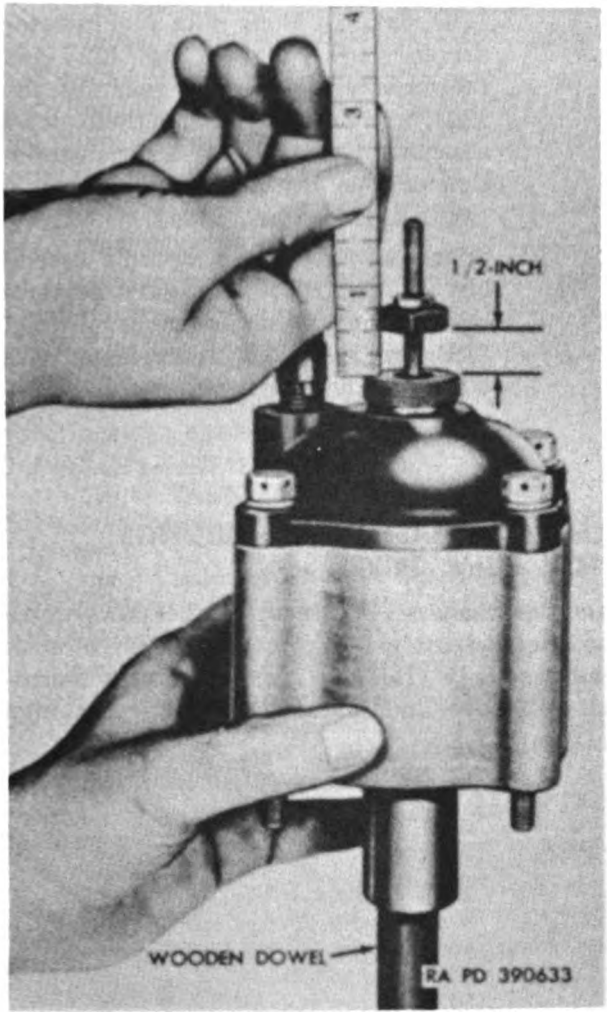



*Figure 129. Adjusting length of fuel injector oil booster pump stroke.*

(1) Position a new booster pump gasket (JJ, fig. 96) on magneto drive housing, insert extension on fuel injector oil booster pump into bore in housing, and slide fuel injector oil booster pump assembly (HH, fig. 96) tight against gasket.

(2) Secure pump assembly to magneto drive housing by tightening four $\frac{5}{16}$ x $3\frac{3}{4}$ hex-head bolts (T, fig. 126) installed in cover (*a*(7) above). Secure bolts with locking wire.

*c. Install Magneto Idler Driven Gear Adapter.*

**NOTE: The key letters shown below in parentheses refer to figure 122.**

(1) Coat threads on four $\frac{1}{8}$-inch hex-socket pipe plugs (K–1) with gasket forming compound and install pipe plugs in magneto drive housing (K–5). Coat threads on elbow and nipple with gasket forming compound and install one elbow and nipple in housing.

(2) Install magneto drive idler gear (V) in bore in housing. Install magneto driven idler shaft gear (H) in housing and mesh teeth of shaft gear with teeth of idler gear.

(3) Install magneto driven idler gear adapter (G) over shaft of magneto driven idler shaft gear (H) and into bore in housing and secure with two $\frac{5}{16}$-inch slotted hex nuts (AA) and $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washers (Z). Tighten nuts securely and secure nuts with two $\frac{1}{16}$ x $\frac{3}{4}$ cotter pins (BB).

*d. Install Magneto Drive Adapter Assembly.*

**NOTE: The key letters shown below in parentheses refer to figure 122.**

(1) Install shafts of two magneto driven gears (J) in bores in magneto drive housing (K–5) and mesh teeth on gears with teeth on magneto driven idler shaft gear (H).

(2) If two oil seals (CC–1) were removed, install new seals in magneto drive

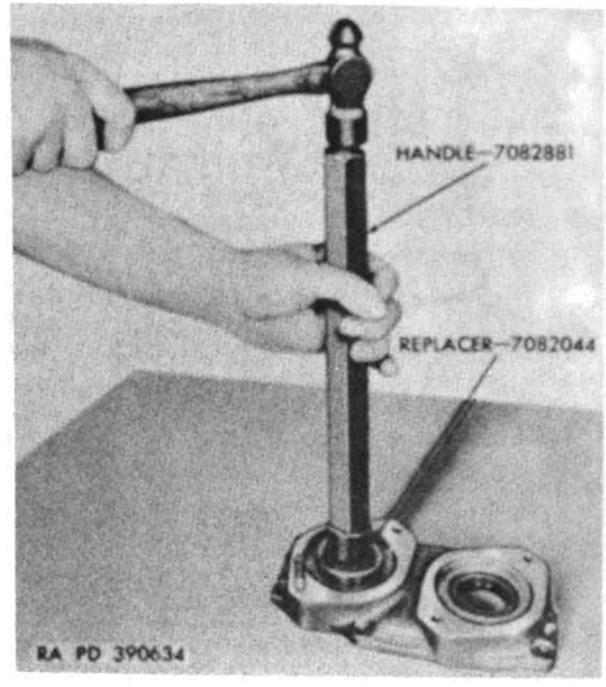



*Figure 130. Installing magneto drive adapter assembly oil seal.*

adapter (CC–2–b) with handle 7082881 and replacer 7082044 (fig. 130).

(3) Position new magneto drive adapter gasket (F) on magneto drive housing, install magneto drive adapter assembly (CC) on gasket, and secure with five 5/16-inch hex self-locking nuts (EE), or 5/16-inch hex nuts (EE) and 5/16-inch hex stamped nuts (FF), and 21/64 id, 9/16 od, 0.0630 thick flat washers (DD).

*e. Install Fuel Pump Drive Adapter Assembly.*

(1) The fuel pump drive adapter assembly (DD, fig. 96), along with fuel injector driven shaft gear (X, fig. 122) and fuel injector drive shaft gear (W, fig. 122), are installed on magneto drive assembly (AA, fig. 96) after installation of fuel injector pump assembly (M, fig. 122) (par. 263*d*).

(2) Spark advance governor unit assembly (Y, fig. 122) and spark advance governor coupling assembly (U, fig. 122) are installed in accessory case when magneto drive assembly is installed (par. 166).

## Section XII. REBUILD OF RIGHT AND LEFT CAMSHAFT DRIVE HOUSINGS AND GOVERNOR AND FUEL PUMP DRIVES

### 135. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 131 except where otherwise indicated.

*a.* Remove four hex self-locking nuts (AA), or hex stamped nuts (BB) and hex nuts (AA), and flat washers (CC) securing fuel pump drive adapter assembly (Q) to camshaft drive housing assembly (H) and remove adapter assembly. Remove and discard "O" ring packings (DD and EE).

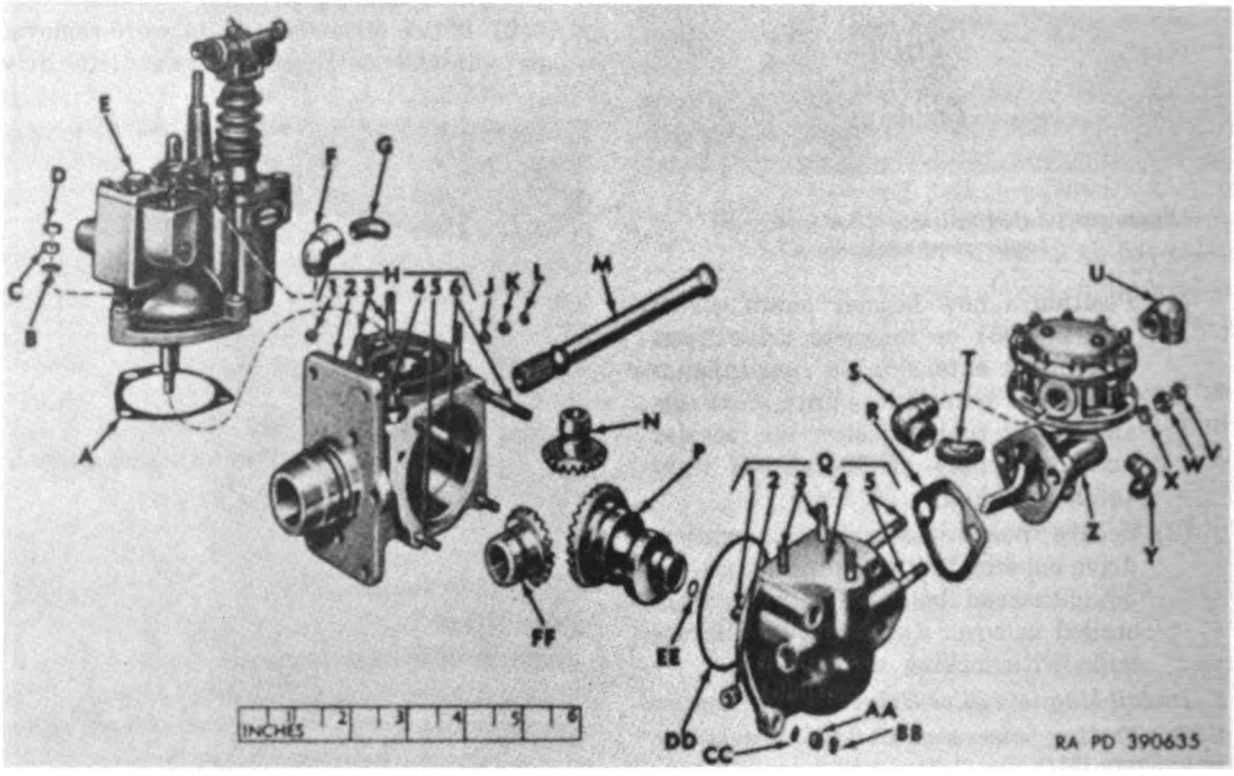



*Figure 131. Right camshaft drive housing and governor and fuel pump drives—exploded view.*

*b.* Lift fuel pump driven shaft gear (P) from adapter assembly. Remove hex-socket pipe plug (Q–2) from adapter assembly.

*c.* Remove governor driven gear (N) and fuel pump and governor drive gear (FF) from bores in drive housing (H–2).

*d.* Remove hex-socket pipe plugs (H–1 and H–4) from housing.

*e.* Remove hex-socket pipe plug from left camshaft drive housing (NN, fig. 96).

## 136. Cleaning

Clean all parts as described in paragraph 77.

## 137. Inspection

NOTE: The key letters shown below in parentheses refer to figure 131 except where otherwise indicated.

*a. Gears.* Inspect governor driven gear (N), fuel pump driven shaft gear (P), and fuel pump and governor drive gear (FF) as described in paragraph 78.

---

A—Governor mounting gasket 7521260

B—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

C—
- 5/16-inch hex nut 225853 (model AOSI–895–5M engine only)
- 5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)

D—5/16-inch hex stamped nut 107825 (model AOSI–895–5M engine only)

E—Governor assembly
- 8380695 (model AOSI–895–5M engine serial numbers 8488 and above and all AOSI–895–5 engines only)
- 7954764 (model AOSI–895–5M engine serial numbers 2067 through 8487 only)
- 7410402 (model AOSI–895–5M engine serial numbers 230 through 2066 only)
- 7376023 (model AOSI–895–5M engine serial numbers 101 through 229 only)

F—
- 3/8-inch 45 degree pipe elbow 7410085 (governor assembly 8380695 only)
- 3/8-inch 90 degree pipe elbow 7744713 (governor assembly 7954764 only)

G—
- 3/8-inch 45 degree adapter elbow 7410042 (governor assembly 8380695 only)
- 3/8-inch 90 degree adapter elbow 7346726 (governor assembly 7954764 only)

H—Camshaft drive housing assembly 7414505
- 1—1/8-inch hex-socket pipe plug 7538990
- 2—Housing 7403478
- 3—5/16 x 1 5/16 stud 7403500
- 4—1/4-inch hex-socket pipe plug 7338670
- 5—5/16 x 1 1/2 stud 8365686
- 6—5/16 x 3 3/4 stud 7403502

J—25/64 id, 5/8 od, 0.0640 thick flat washer 502204

K—
- 3/8-inch hex nut 225854 (model AOSI–895–5M engine only)
- 3/8-inch hex self-locking nut 503351 or 503383 (model AOSI–895–5 engine only)

L—3/8-inch hex stamped nut 107823 (model AOSI–895–5M engine only)

M—Camshaft drive shaft 8666733

N—Governor driven gear 7346542

P—Fuel pump driven shaft gear 7346543

Q—Fuel pump drive adapter assembly 7346591
- 1—Oil transfer tube 7338667
- 2—1/8-inch hex-socket pipe plug 7538990
- 3—5/16 x 1 13/32 stud 7403507
- 4—Adapter 7403445
- 5—3/8 x 3 7/8 stud 7403101

R—Fuel pump mounting gasket 7006868

S—3/8-inch 45 degree elbow 7410042

T—3/8-inch 90 degree elbow 7744713

U—3/8-inch 90 degree adapter elbow 7346726

V—3/8-inch hex stamped nut 107823 (model AOSI–895–5M engine only)

W—
- 3/8-inch hex nut 225854 (model AOSI–895–5M engine only)
- 3/8-inch hex self-locking nut 503351 or 503383 (model AOSI–895–5 engine only)

X—25/64 id, 3/8 od, 0.0640 thick flat washer 502204

Y—1/8-inch 90 degree adapter elbow 7767517

Z—Fuel pump assembly 7410094

AA—
- 5/16-inch hex nut 225853 (model AOSI–895–5M engine only)
- 5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)

BB—5/16-inch hex stamped nut 107825 (model AOSI–895–5M engine only)

CC—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

DD—3 1/8-inch id "O" ring packing 546871

EE—5/16-inch id "O" ring packing 501219

FF—Fuel pump and governor drive gear 7346541

*Figure 131—Continued.*

*b. Fuel Pump Drive Adapter Assembly.*

(1) *Hex-socket pipe plug* (Q–2). Inspect pipe plug for stripped or damaged threads or mutilated socket head.

(2) *Oil transfer tube* (Q–1). Inspect tube for mutilated condition.

(3) *Adapter* (Q–4). Inspect adapter as described in paragraph 78*b*.

(4) *Studs.* Inspect studs (Q–3 and Q–5) as described in paragraph 78*d*.

*c. Right Camshaft Drive Housing Assembly.*

(1) *Hex-socket pipe plugs.* Inspect hex-socket pipe plugs (H–1 and H–4) for stripped or damaged threads or mutilated socket head.

(2) *Studs.* Inspect studs (H–3, H–5, and H–6) as described in paragraph 78*d*.

(3) *Housing* (H–2). Inspect housing as described in paragraph 78*b*.

*d. Left Camshaft Drive Housing Assembly* (NN, fig. 96).

(1) *Hex-socket pipe plug.* Inspect hex-socket pipe plug for stripped or damaged threads or mutilated socket head.

(2) *Housing.* Inspect housing as described in paragraph 78*b*.

## 138. Repair

NOTE: The key letters shown below in parentheses refer to figure 131 except where otherwise indicated.

*a. Gears.* Repair or replace governor driven gear (N), fuel pump driven shaft gear (P), and fuel pump and governor drive gear (FF) as described in paragraph 79.

*b. Fuel Pump Drive Adapter Assembly.*

(1) *Hex-socket pipe plug* (Q–2). Replace pipe plug if damaged.

(2) *Oil transfer tube* (Q–1). Replace tube or replace complete adapter assembly if oil transfer tube is mutilated.

(3) *Adapter* (Q–4). Repair or replace adapter as described in paragraph 79*b*.

(4) *Studs.* Repair or replace studs (Q–3 and Q–5) as described in paragraph 79*d*.

*c. Right Camshaft Drive Housing Assembly.*

(1) *Hex-socket pipe plugs.* Replace pipe plugs (H–1 and H–4) if damaged.

(2) *Studs.* Repair studs (H–3, H–5, and H–6) as described in paragraph 79*d*.

(3) *Housing (H–2).* Repair or replace housing as described in paragraph 79*b*.

*d. Left Camshaft Drive Housing Assembly* (NN, fig. 96).

(1) *Hex-socket pipe plug.* Replace pipe plug if damaged.

(2) *Housing.* Repair or replace housing as described in paragraph 79*b*.

## 139. Assembly

NOTE: The key letters shown below in parentheses refer to figure 131 except where otherwise indicated.

*a.* Coat threads of one ⅛-inch hex-socket pipe plug (H–1) and three ¼-inch hex-socket pipe plugs (H–4) with gasket forming compound and install pipe plugs in openings in drive housing (H–2).

*b.* Install governor driven gear (N) and fuel pump and governor drive gear (FF) in bores in drive housing.

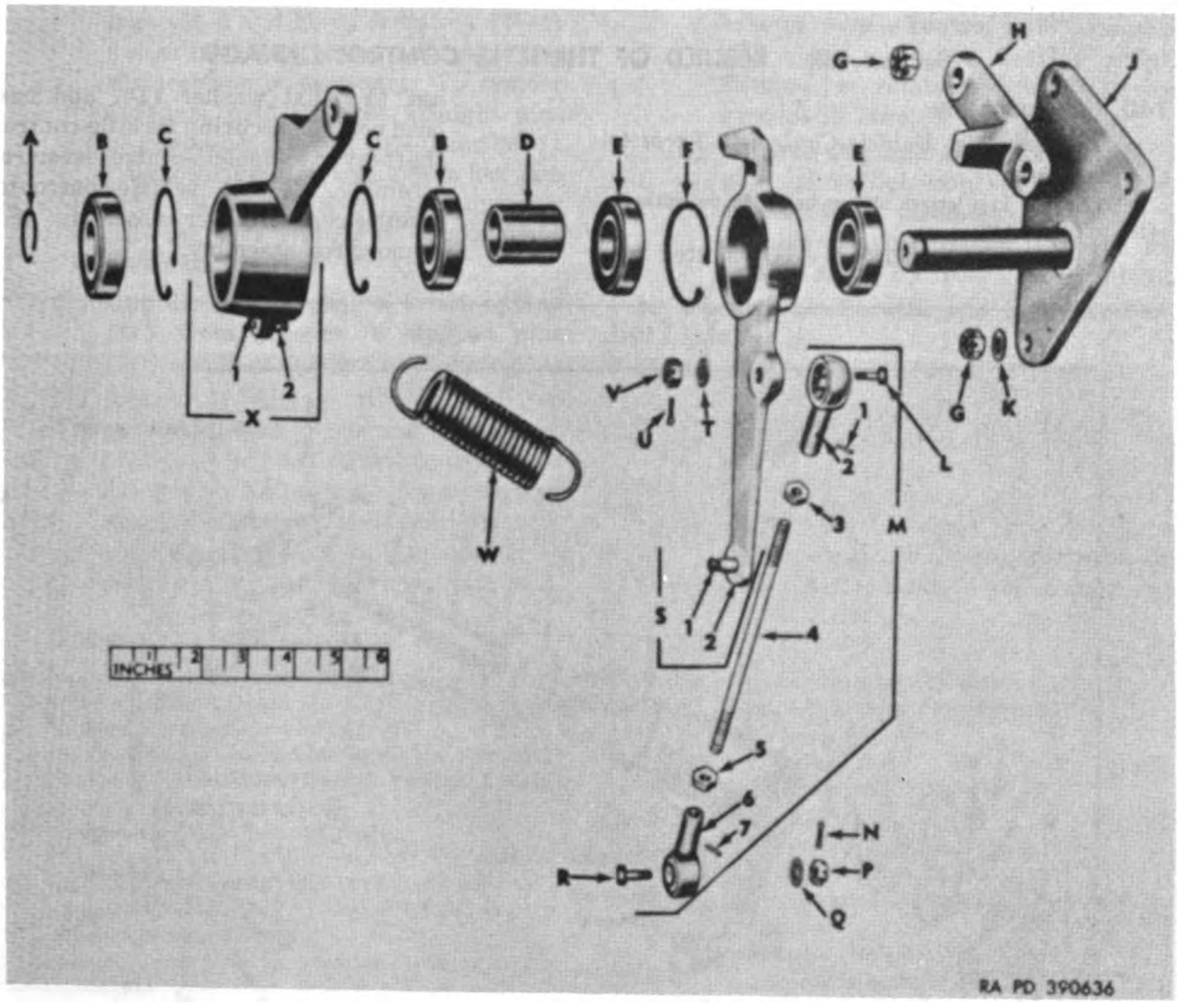
*c.* Coat threads of two ⅛-inch hex-socket pipe plugs (Q–2) with gasket forming compound and install pipe plugs in openings in adapter (Q–4). Install new 5/16-inch id, "O" ring packing (EE) over oil transfer tube (Q–1) on adapter. Install new 3⅛-inch id, "O" ring packing (DD) on adapter.

*d.* Install fuel pump driven shaft gear (P) in bore in adapter.

*e.* Install fuel pump drive adapter assembly (Q) on drive housing assembly, with attached fuel pump driven shaft gear (P) entering bore of drive housing assembly and meshing with teeth on governor driven gear (N) and teeth on fuel pump and governor drive gear (FF).

*f.* Secure adapter assembly to drive housing assembly with four 5/16-inch hex self-locking nuts (AA) or 5/16-inch hex nuts (AA) and 5/16-inch hex stamped nuts (BB), and 21/64 id, 9/16 od, 0.0630 thick flat washers (CC).

*g.* Coat threads of one ¼-inch hex-socket pipe plug with gasket forming compound and install pipe plug in opening in left camshaft drive housing (NN, fig. 96).




A—⅝-inch shaft diameter retaining ring 583037
B—Ball bearing 8393931
C—1.5010-inch housing diameter retaining ring 583015
D—Control lever bearing spacer 7376137
E—Ball bearing 8393931
F—1.5010-inch housing diameter retaining ring 583015
G—⅜-inch slotted hex nut 122942
H—Vehicle control lever stop 7375842
J—Control levers support 7403370
K—$2\frac{1}{64}$ id, 9/16 od, 0.0630 thick flat washer 502245
L—No. 10 x $1\frac{3}{32}$ hex-head bolt 7350241
M—Throttle-control-shaft-lever-to-vehicle-control-lever rod assembly 7376135
1—{ 1/16 x 7/16 headless straight pin 137472; 1/16 x ½ round-head rivet 8719839
2—Rod end ball bearing 712015
3—¼-inch hex jam nut 7767954
4—Rod 7403385
5—¼-inch hex jam nut 7767954
6—Rod end ball bearing 712015
7—{ 1/16 x 7/16 headless straight pin 137472; 1/16 x ½ round-head rivet 8719839
N—1/16 x ½ cotter pin 112726
P—No. 10 slotted hex nut 7403213
Q—$1\frac{3}{64}$ id, 7/16 od, 0.0630 thick flat washer 502244
R—No. 10 x $1\frac{5}{32}$ hex-head bolt 7350241
S—Vehicle-control-to-throttle-control lever assembly 7376054
1—¼ and ⅜ x 1 stepped pin 7376138
2—Lever 7403485
T—$1\frac{3}{64}$ id, 7/16 od, 0.0630 thick flat washer 502244
U—1/16 x ½ cotter pin 112726
V—No. 10 slotted hex nut 7403213
W—Control levers spring 8666535
X—Vehicle control lever assembly 7376055
1—Lever 7403368
2—¼ and ⅜ x 1 stepped pin 7376138

*Figure 132. Vehicle-control-to-throttle-control linkage—exploded view.*

## Section XIII. REBUILD OF THROTTLE CONTROL LINKAGE

### 140. Disassembly

*a. Disassemble Vehicle-Control-to-Throttle-Control Linkage.*

NOTE: The key letters shown below in parentheses refer to figure 132.

(1) Remove cotter pin (U), slotted hex nut (V), flat washer (T), and hex-head bolt (L) securing throttle-control-shaft-lever-to-vehicle-control-lever rod assembly (M) to vehicle-control-to-throttle-control lever assembly (S). Remove rod assembly.

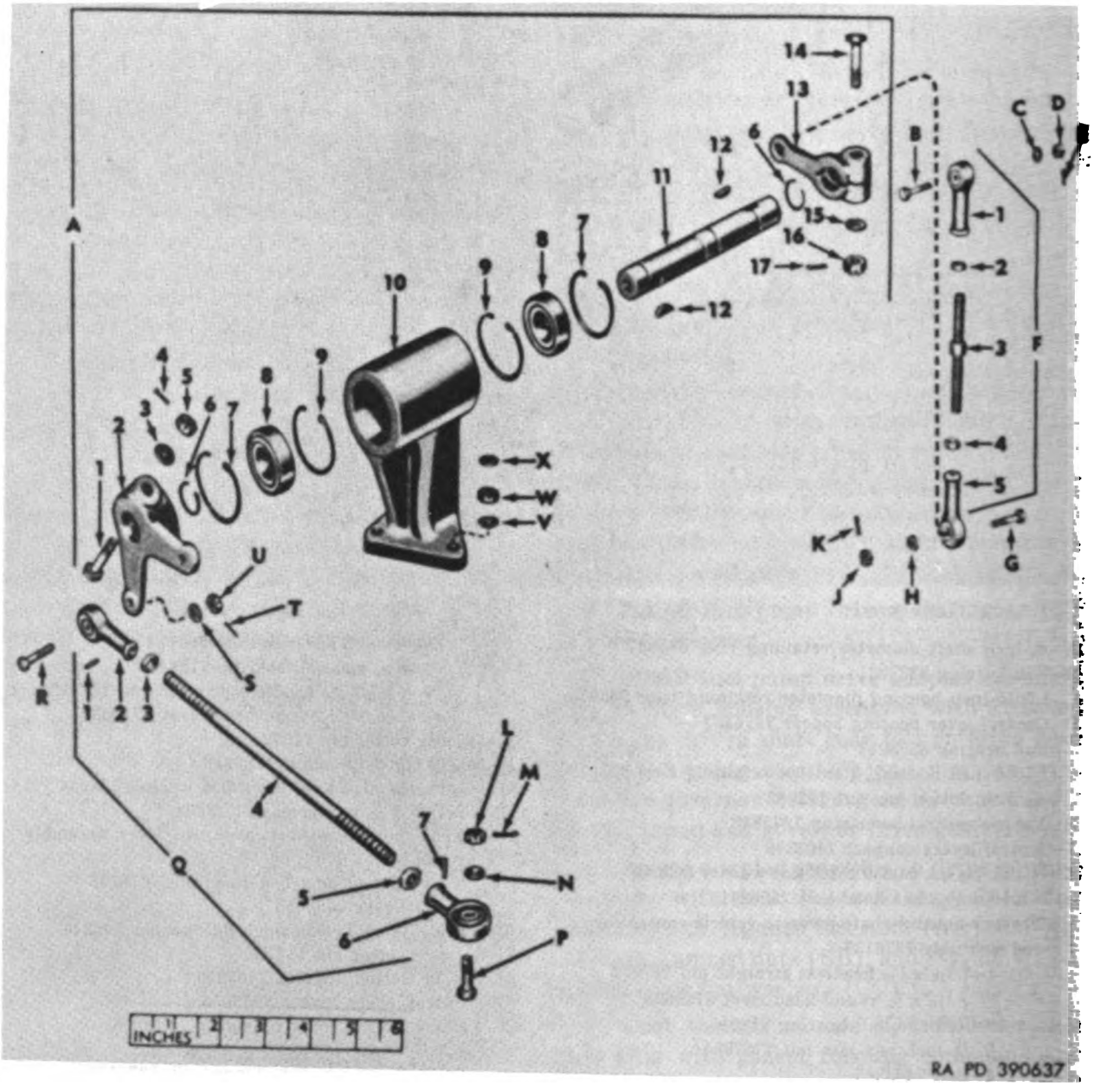



*Figure 133. Throttle and governor control linkage—exploded view.*

(2) Do not remove two rod end ball bearings (M–2 and M–6) from rod (M–4) unless inspection (par. 142) indicates replacement is necessary. To remove bearings, drill headless straight pins or round-head rivets (M–1 and M–7) from bearings and rod, loosen hex jam nuts (M–3 and M–5), and unscrew ball bearings from rod. Remove hex jam nuts.

(3) Unhook ends of control levers spring (W) from grooves in stepped pins (S–1 and X–2) and remove spring.

(4) Remove retaining ring (A) from groove in shaft of control levers support (J) and slide vehicle control lever assembly (X), control lever bearing spacer (D), and vehicle-control-to-throttle-control lever assembly (S) from shaft of control levers support.

(5) Remove two ball bearings (B) from bore of vehicle control lever assembly (X) using a suitable bearing puller. Remove two retaining rings (C) from grooves in bore.

(6) Remove two ball bearings (E) from bore of vehicle-control-to-throttle-control lever assembly (S) using a suitable bearing puller. Remove retaining ring (F) from groove in bore.

*b. Disassemble Throttle and Governor Control Linkage.*

**NOTE:** The key letters shown below in parentheses refer to figure 133.

(1) Remove cotter pin (T), slotted hex nut (U), flat washer (S), and hex-head bolt (R) securing injector-control-shaft-to-throttle-shaft rod assembly (Q) to control-shaft-to-vehicle-control lever (A–2). Remove rod assembly.

---

A—Governor-to-throttle-control-shaft supporting bracket assembly 7416415
- 1—5/16 x 1 19/32 hex-head bolt 7410037
- 2—Control-shaft-to-vehicle-control lever 7376043
- 3—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
- 4—1/16 x 3/4 cotter pin 121223
- 5—5/16-inch slotted hex nut 122942
- 6—5/8-inch shaft diameter retaining ring 583037
- 7—1.5010-inch housing diameter retaining ring 583015
- 8—Ball bearing 8393931
- 9—1.5010-inch housing diameter retaining ring 583015
- 10—Supporting bracket 7414528
- 11—Governor-to-throttle-control shaft 7403372
- 12—1/8 x 5/8 Woodruff key 103905
- 13—Governor-to-throttle-control-shaft lever 7376046
- 14—5/16 x 1 19/32 hex-head bolt 7410037
- 15—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
- 16—5/16-inch slotted hex nut 122942
- 17—1/16 x 3/4 cotter pin 121223

B—No. 10 x 1 3/32 hex-head bolt 7350241
C—13/64 id, 7/16 od, 0.0380 thick flat washer 192588
D—No. 10 slotted hex nut 7403213
E—1/16 x 1/8 cotter pin 112726
F—Throttle-control-shaft-lever-to-governor-lever rod assembly 7410048
- 1—Rod end ball bearing 712015
- 2—1/4-inch hex jam nut 7767954
- 3—Rod 7403388
- 4—1/4-inch hex jam nut (lht) 7767960
- 5—Rod end ball bearing (lht) 712016

G—No. 10 x 1 5/32 hex-head bolt 7350241
H—13/64 id, 7/16 od, 0.0380 thick flat washer 192588
J—No. 10 slotted hex nut 7403213
K—1/16 x 1/8 cotter pin 112726
L—No. 10 slotted hex nut 7403213
M—1/16 x 1/8 cotter pin 112726
N—13/64 id, 7/16 od, 0.0380 thick flat washer 192588
P—No. 10 x 1 5/32 hex-head bolt 7350241
Q—Injector-control-shaft-to-throttle-shaft rod assembly 7974079
- 1—1/16 x 7/16 headless straight pin 137472; 1/16 x 1/8 round-head rivet 8719839
- 2—Rod end ball bearing (lht) 712016
- 3—1/4-inch hex jam nut (lht) 7767960
- 4—Rod 7974078
- 5—1/4-inch hex jam nut 7767954
- 6—Rod end ball bearing 712015
- 7—1/16 x 7/16 headless straight pin 137472; 1/16 x 1/8 round-head rivet 8719839

R—No. 10 x 1 3/32 hex-head bolt 7350241
S—13/64 id, 7/16 od, 0.0380 thick flat washer 192588
T—1/16 x 1/8 cotter pin 112726
U—No. 10 slotted hex nut 7403213
V—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
W—
- 5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)
- 5/16-inch hex nut 225853 (model AOSI–895–5M engine only)

X—5/16-inch hex stamped nut 107822 (model AOSI–895–5M engine only)

*Figure 133—Continued.*

(2) Do not remove rod end ball bearings (Q–2 and Q–6) from rod (Q–4) unless inspection (par. 142) indicates replacement is necessary. To remove bearings, drill out headless straight pins or round-head rivets (Q–1 and Q–7) from bearings and rod, loosen hex jam nuts (Q–3 and Q–5), and unscrew ball bearings from rod. Remove hex jam nuts.

(3) Remove cotter pin (K), slotted hex nut (J), flat washer (H), and hex-head bolt (G) securing throttle-control-shaft-lever-to-governor-lever rod assembly (F) to governor-to-throttle-control-shaft lever (A–13). Remove rod assembly.

(4) Loosen hex jam nuts (F–2 and F–4) and unscrew rod end ball bearings (F–1 and F–5) from rod (F–3). Remove hex jam nuts.

(5) Remove cotter pin (A–4), slotted hex nut (A–5), flat washer (A–3), and hex-head bolt (A–1) securing control-shaft-to-vehicle-control lever (A–2) to governor-to-throttle-control shaft (A–11). Remove lever from shaft.

(6) Remove cotter pin (A–17), slotted hex nut (A–16), flat washer (A–15), and hex-head bolt (A–14) securing governor - to - throttle - control - shaft lever (A–13), to governor-to-throttle-control shaft (A–11). Remove lever from shaft.

(7) Remove two Woodruff keys (A–12) from slots in shaft.

(8) Remove two retaining rings (A–6) from grooves in each end of shaft and slide shaft from bore of ball bearings (A–8) in supporting bracket (A–10).

(9) Remove two outer retaining rings (A–7) from grooves in bore of supporting bracket. Remove two ball bearings (A–8) from bore of bracket with a suitable bearing puller. Remove two inner bearing rings (A–9) from grooves in bore of supporting bracket.

## 141. Cleaning

Clean all parts as described in paragraph 77.

## 142. Inspection

*a. Vehicle - Control - to - Throttle - Control Linkage.*

NOTE: The key letters shown below in parentheses refer to figure 132.

(1) *Rod end ball bearings* (M–2 and M–6). Refer to TM 37–265 for inspection of ball bearings. Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 322). Inspect bearings for stripped or damaged threads.

(2) *Rod* (M–4). Inspect rod for cracks or bent condition. Inspect rod for stripped or damaged threads.

(3) *Control levers spring* (W). Inspect spring for cracks or set. Check spring for conformance to limits specified in repair and rebuild standards (par. 322).

(4) *Control lever bearing spacer* (D). Inspect inner bore of spacer for burs or nicks. Check spacer for conformance to tolerances specified in repair and rebuild standards (par. 322).

(5) *Control levers support* (J). Inspect support and vehicle control lever stop (H) for cracks or mutilation. Inspect shaft of support for burs or nicks and check diameter of shaft for conformance to tolerances specified in repair and rebuild standards (par. 322).

(6) *Ball bearings* (B and E). Refer to TM 37–265 for inspection of ball bearings. Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 322).

*b. Throttle and Governor Control Linkage.*

NOTE: The key letters shown below in parentheses refer to figure 133.

(1) *Rod end ball bearings* (F–1, F–5, Q–2, and Q–6). Refer to TM 37–265 for inspection of ball bearings. Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 322). Inspect bearings for stripped or damaged threads.

(2) *Rods* (F–3 and Q–4). Inspect rods for cracks or bent condition. Inspect rods for stripped or damaged threads.

(3) *Levers.* Inspect control-shaft-to-vehicle-control lever (A–2) and governor-to-throttle-control-shaft lever (A–13) for cracks. Inspect keyways in levers for mutilation.

(4) *Governor - to - throttle - control shaft* (A–11). Inspect shaft for burs and nicks. Check shaft for conformance to tolerances specified in repair and rebuild standards (par. 322). Inspect keyways in shaft for mutilation. Inspect Woodruff keys (A–12) for wear or mutilation.

(5) *Ball bearings* (A–8). Refer to TM 37–265 for inspection of ball bearings. Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 322).

(6) *Supporting bracket* (A–10). Inspect bracket for cracks. Inspect bore of bracket for burs and nicks. Check bore of bracket for conformance to tolerances specified in repair and rebuild standards (par. 322).

## 143. Repair

*a. Vehicle - Control - to - Throttle - Control Linkage.*

NOTE: The key letters shown below in parentheses refer to figure 132.

(1) *Rod end ball bearings* (M–2 and M–6). Repair or replace bearings as described in paragraph 79. Replace bearings if threads are stripped or damaged. Repair damaged threads with a used tap, if possible.

(2) *Control levers spring* (W). Replace spring if cracked or set. Replace spring if it does not conform to tolerances specified in repair and rebuild standards (par. 322).

(3) *Rod* (M–4). Replace rod if cracked or bent. Replace rod if threads are stripped or damaged. Straighten bent rod, if possible. Repair damaged threads with a thread chaser, if possible.

(4) *Control lever bearing spacer* (D). Replace spacer if inner bore is badly burred or nicked. Replace spacer if it does not conform to tolerances specified in repair and rebuild standards (par. 322). Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(5) *Control levers support* (J). Replace support or vehicle control lever stop (H) if cracked or if stop is badly mutilated. Replace support if shaft of support is badly burred or nicked or if diameter of shaft does not conform to tolerances specified in repair and rebuild standards (par. 322). Remove burs and nicks from shaft with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(6) *Ball bearings* (B and E). Repair or replace ball bearing as described in paragraph 79.

(7) *Control lever assemblies.* Replace complete vehicle-control-to-throttle-control lever assembly (S) or vehicle control lever assembly (X) if bores of levers are burred, nicked, or bores of levers do not conform to tolerances specified in repair and rebuild standards (par. 322).

*b. Throttle and Governor Control Linkage.*

NOTE: The key letters shown below in parentheses refer to figure 133.

(1) *Rod end ball bearings* (F–1, F–5, Q–2, and Q–6). Repair or replace ball bearings as described in paragraph 79. Replace bearings if threads are stripped or damaged. Repair damaged threads with a used tap, if possible.

(2) *Rods* (F–3 and Q–4). Replace rods if cracked or bent or if threads are stripped or damaged. Straighten bent rods, if possible. Repair damaged threads with a thread chaser, if possible.

(3) *Levers.* Replace control - shaft - to - vehicle-control lever (A–2) or governor-to-throttle-control-shaft lever (A–13) if cracked. Replace levers if keyways are mutilated to the point of interfering with assembly or dis-

assembly. Weld and remill damaged keyways, if possible.

(4) *Governor-to-throttle-control shaft* (A–11). Replace shaft if badly burred or nicked. Replace shaft if it does not conform to tolerances specified in repair and rebuild standards (par. 322). Replace shaft if keyways are mutilated. Do not attempt to repair keyways. Remove burs and nicks from shaft with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible. Replace Woodruff keys (A–12) if worn or mutilated.

(5) *Ball bearings* (A–8). Repair or replace ball bearings as described in paragraph 79.

(6) *Supporting bracket* (A–10). Replace bracket if cracked or if bore of bracket is badly burred or nicked. Replace bracket if bore of bracket does not conform to tolerances specified in repair and rebuild standards (par. 322). Remove burs and nicks from bore with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

## 144. Assembly

*a. Assemble Throttle and Governor Control Linkage.*

NOTE: The key letters shown below in parentheses refer to figure 133.

(1) Install two 1.5010-inch housing diameter retaining rings (A–9) in inner grooves in supporting bracket (A–10) and install two ball bearings (A–8) in bore of bracket, one from each side. Press bearings into bore, using a suitable bearing press, until bearings are seated against inner retaining rings.

(2) Secure bearings in bore by installing two 1.5010-inch housing diameter retaining rings (A–7) in grooves in bore of bracket.

(3) Slide governor - to - throttle - control shaft (A–11) into bores of bearings so that it extends equally from either side of bracket and secure with two $\frac{5}{8}$-inch shaft diameter retaining rings (A–6).

(4) Install one $\frac{1}{8} \times \frac{5}{8}$ Woodruff key (A–12) in keyway on each end of shaft.

(5) Install control-shaft-to-vehicle-control lever (A–2) over key and onto control shaft. Secure with $\frac{5}{16} \times 1\frac{19}{32}$ hex-head bolt (A–1), $\frac{5}{16}$-inch slotted hex nut (A–5), and $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washer (A–3). Secure nut with $\frac{1}{16} \times \frac{3}{4}$ cotter pin (A–4).

(6) Install governor-to-throttle-control-shaft lever (A–13) on other end of control shaft in same manner as described for control-shaft-to-vehicle-control lever (A–2) in (5) above. Secure lever to shaft with $\frac{5}{16}$-inch slotted hex nut (A–16), $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washer (A–15), and $\frac{1}{16} \times \frac{3}{4}$ cotter pin (A–17).

(7) Install $\frac{1}{4}$-inch hex jam nut (LH thread) (F–4) and rod end ball bearing (LH thread) (F–5) on left hand threaded end of rod (F–3). Install $\frac{1}{4}$-inch hex jam nut (F–2) and rod end ball bearing (F–1) on other end.

(8) Adjust rod end ball bearings on rod, as necessary, to provide a distance of $4\frac{1}{8}$ inches between bearing centers. Bearings must be parallel to each other. After adjustment, lock bearings in position by tightening hex jam nuts against ends of bearings.

(9) Secure throttle-control-shaft-lever-to-governor-lever rod assembly (F) to arm of governor-to-throttle-control-shaft lever (A–13) with No. $10 \times 1\frac{5}{32}$ hex-head bolt (G), No. 10 slotted hex nut (J), and $\frac{13}{64}$ id, $\frac{7}{16}$ od, 0.0380 thick flat washer (H). Secure hex nut with $\frac{1}{16} \times \frac{1}{2}$ cotter pin (K).

(10) If rod end ball bearings (Q–2 and Q–6) were removed from rod (Q–4), install $\frac{1}{4}$-inch hex jam nut (LH thread) (Q–3) and rod end ball bearing (LH thread) (Q–2) on left hand threaded end of rod. Install $\frac{1}{4}$-inch

hex jam nut (Q–5) and rod end ball bearing (Q–6) on other end.

(11) Adjust rod end ball bearings on rod, as necessary, to provide a distance of 7 3/16 inches between bearing centers, with bearing bores at right angles to each other. After adjustment, lock bearings in position by tightening hex jam nuts against ends of bearings.

(12) With bearings locked in position ((11) above), insert 1/16-inch drill through hole in shaft of bearing and drill mating hole through rod. Install 1/16 x 7/16 headless straight pin or 1/16 x 1/2 round-head rivet (Q–1 or Q–7) in hole through bearing and rod. Peen ends of pin or rivet. Repeat operation on bearing on other end of rod.

(13) Secure injector-control-shaft-to-throttle-shaft rod assembly (Q) to lower arm of control-shaft-to-vehicle-control lever (A–2) with No. 10 x 1 5/32 hex-head bolt (R), No. 10 slotted hex nut (U), and 13/64 id, 7/16 od, 0.0380 thick flat washer (S). Secure hex nut with 1/16 x 1/2 cotter pin (T).

*b. Assemble Vehicle - Control - to - Throttle Control Linkage.*

NOTE: The key letters shown below in parentheses refer to figure 132.

(1) Install two 1.5010-inch housing diameter retaining rings (C) in grooves in bore of vehicle control lever assembly (X). Install two ball bearings (B) in bore of lever assembly, one from each side. Press bearings into bore, using a suitable bearing press, until bearings are seated against retaining rings.

(2) Install 1.5010-inch housing diameter retaining ring (F) in groove in bore of vehicle-control-to-throttle-control lever assembly (S). Install two ball bearings (E) in bore of lever assembly, one from each side. Press bearings into bore, using a suitable bearing press, until bearings are seated against retaining ring.

(3) Install vehicle-control-to-throttle-control lever assembly (S) on control levers support (J), making sure stepped pin (S–1) faces away from support.

(4) Slide control lever bearing spacer (D) on shaft until spacer seats against bearing in bore of lever assembly.

(5) Install vehicle control lever assembly (X) on shaft of support, making sure stepped pin (X–2) faces support. Slide lever assembly on shaft until bearing in bore of lever assembly seats against bearing spacer.

(6) Install 5/8-inch shaft diameter retaining ring (A) in groove in end of shaft to secure lever assemblies and bearing spacer on support.

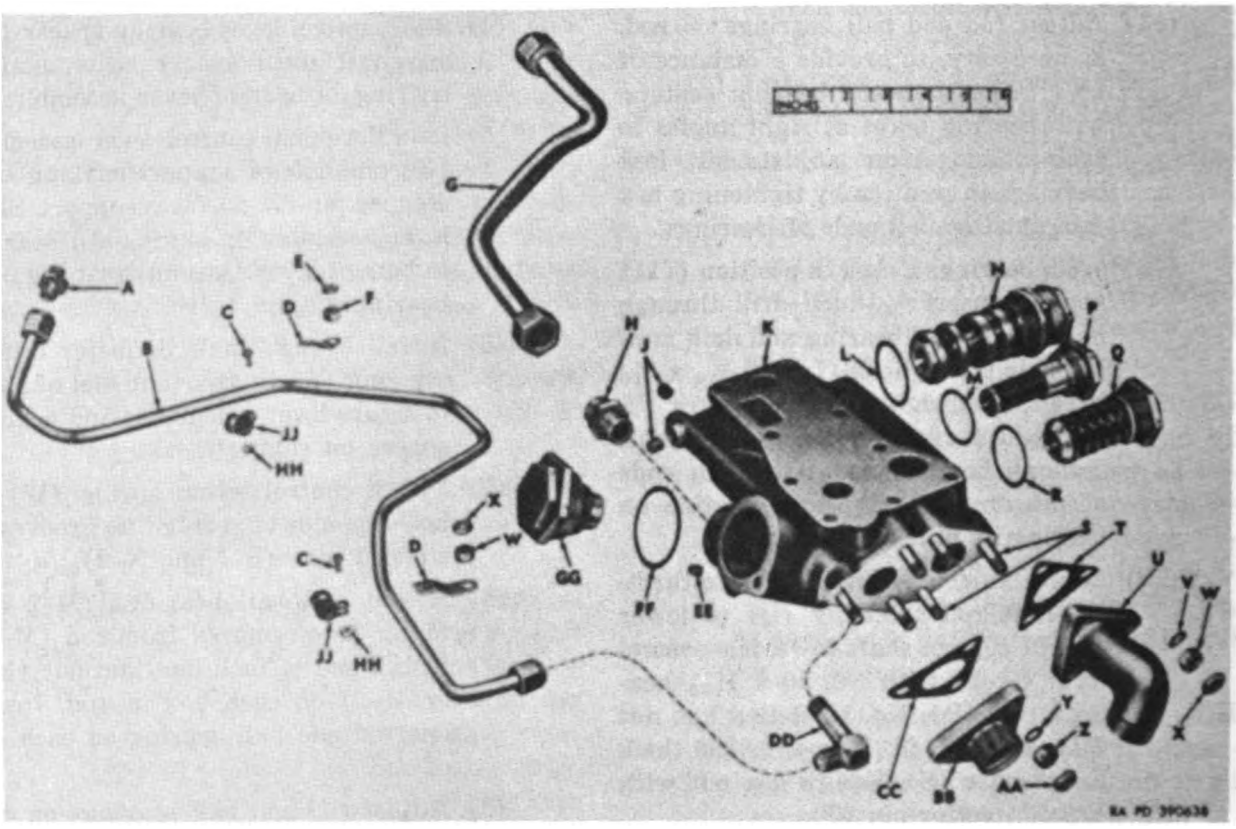
(7) Install control levers spring (W) by hooking ends of spring into grooves on stepped pins (S–1 and X–2).

(8) If rod end ball bearings (M–2 and M–6) were removed from rod (M–4), install one 1/4-inch hex jam nut (M–3 or M–5) on each end of rod. Install one rod end ball bearing on each end of rod.

(9) Adjust rod end ball bearings on control rod, as necessary, to provide a distance of 5 29/32 inches between bearing centers. Bearings must be parallel to each other. After adjustment, lock bearings in position by tightening hex jam nuts against ends of bearings.

(10) With bearings locked in position ( (9) above), insert 1/16-inch drill through hole in shaft of bearing and drill mating hole through rod. Install 1/16 x 7/16 headless straight pin or 1/16 x 1/2 round-head rivet (M–1 or M–7) in hole through bearing and rod. Peen ends of pin or rivet. Repeat operation on bearing on other end of rod.

(11) Secure throttle-control-shaft-lever-to-vehicle-control-lever rod assembly (M) to vehicle-control-to-throttle-control lever assembly (S) with No. 10 x 1 5/32 hex-head bolt (L), No. 10 slotted hex nut (V), and 13/64 id, 7/16 od, 0.0630 thick flat washer (T). Secure hex nut with 1/16 x 1/2 cotter pin (U).




A—⅜-inch nipple 7410040
B—Injector oil tube assembly 8733065
C—No. 10 x ½ fillister-head screw 120216
D—Tube clamp bracket 7737745
E—⅜-inch hex stamped nut 107823
(model AOSI–895–5M engine only)
F—⅜-inch hex nut 225854
(model AOSI–895–5M engine only)
⅜-inch hex self-locking nut
503351 or 503380 (model AOSI–895–5 engine only)
G—Engine oil tube assembly 8733085
H—¾-inch nipple 9402711
J—⅛-inch hex-socket pipe plug 7538990
K—Oil control housing 7737773
L—Control valve gasket 8713449
M—Filter bypass valve gasket 583802
N—Oil pressure control valve assembly 8698578
P—Oil filter bypass valve assembly 7737746
Q—Oil cooler bypass valve assembly 7375859
R—Cooler bypass valve gasket 583803
S—⅜ x 1⅝ stud 7403519
T—Connector mounting gasket 7346579
U—Oil inlet connector 8666730
V—$2\frac{3}{64}$ id, ⅝ od, 1/16 thick plain washer 502204
W—⅜-inch hex nut 225854
(model AOSI–895–5M engine only)
⅜-inch hex self-locking nut
503351 or 503383 (model AOSI–895–5 engine only)
X—⅜-inch hex stamped nut 107825
(model AOSI–895–5M engine only)
Y—$2\frac{3}{64}$ id, ⅝ od, 1/16 thick plain washer 502204
Z—⅜-inch hex nut 225854
(model AOSI–895–5M engine only)
⅜-inch hex self-locking nut
503351 or 503383 (model AOSI–895–5 engine only)
AA—⅜-inch hex stamped nut 107825
(model AOSI–895–5M engine only)
BB—Oil outlet connector 7376009
CC—Connector mounting gasket 7346579
DD—¼-inch 90 degree elbow 7973972
EE—1/16-inch hex-socket pipe plug 7338671
FF—Regulator valve gasket 8713448
GG—Fuel injector oil pressure regulator valve assembly 7737796
HH—No. 10 hex self-locking nut 8344702
JJ—Tube clamp 572902

*Figure 134. Oil control housing, valves, and tube assemblies—exploded view.*

## Section XIV. REBUILD OF OIL CONTROL HOUSING ASSEMBLY AND VALVES

### 145. Disassembly

*a. Disassemble Oil Control Housing Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 134.

(1) Remove three hex self-locking nuts (W), or hex stamped nuts (X) and hex nuts (W), and plain washers (V) securing oil inlet connector (U) to oil control housing (K). Remove connector and remove and discard connector mounting gasket (T).

(2) Remove three hex self-locking nuts (Z), or hex stamped nuts (AA) and hex nuts, and plain washers (Y) securing oil outlet connector (BB) to housing. Remove connector and remove and discard connector mounting gasket (CC).

(3) Remove elbow (DD), nipple (H), four hex-socket pipe plugs (J), and hex-socket pipe plug (EE) from housing.

*b. Disassemble Oil Pressure Control Valve Assembly* (fig. 135).

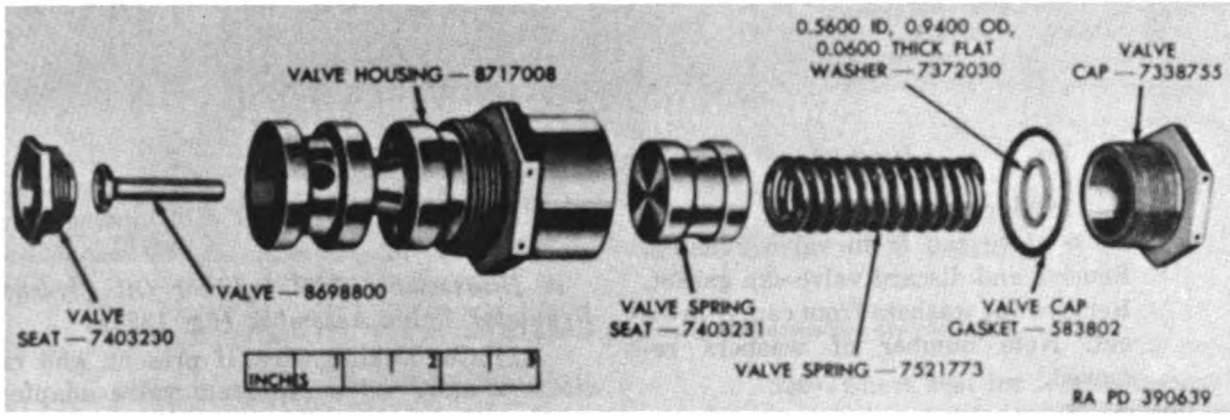



*Figure 135. Oil pressure control valve assembly—exploded view.*

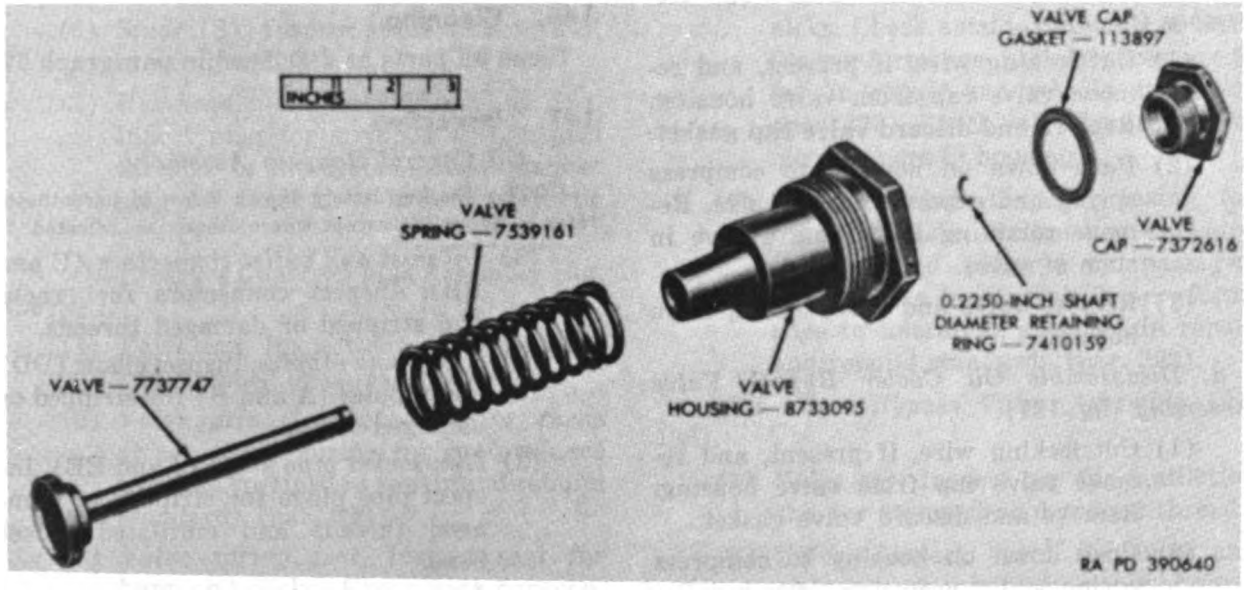



*Figure 136. Oil filter bypass valve assembly—exploded view.*

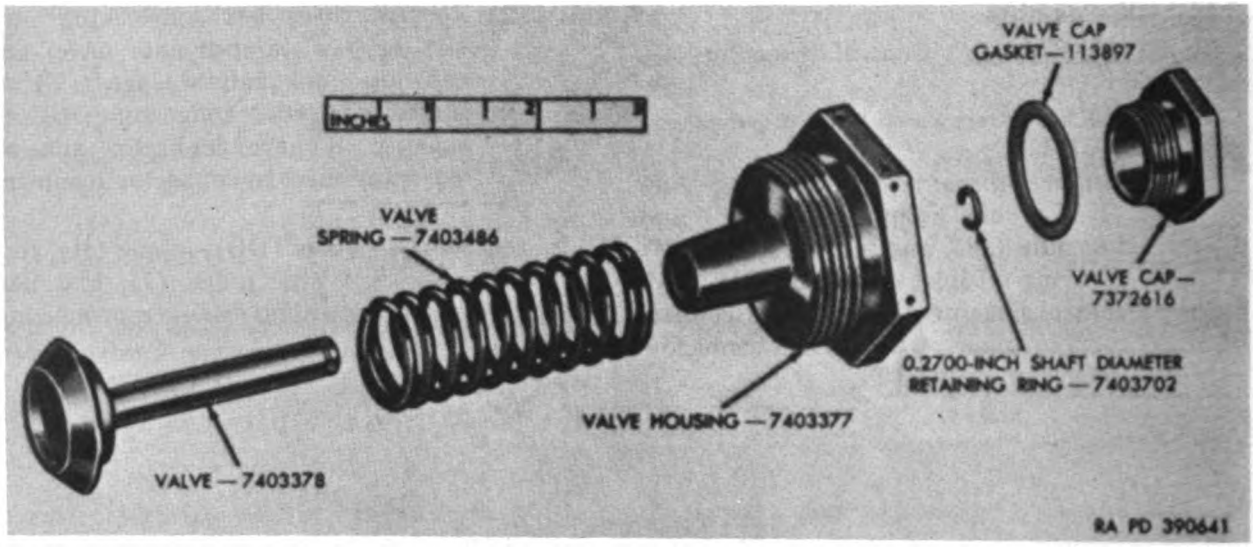



*Figure 137. Oil cooler bypass valve assembly—exploded view.*

(1) Cut locking wire, if present, and remove valve cap from valve housing. Remove and discard valve cap gasket. Remove flat washers from cap, if present. Note number of washers removed.

(2) Remove valve spring, valve spring seat, valve seat, and valve from housing.

*c. Disassemble Oil Filter Bypass Valve Assembly* (fig. 136).

(1) Cut locking wire, if present, and remove valve cap from valve housing. Remove and discard valve cap gasket.

(2) Push down on housing to compress spring and expose stem of valve. Remove retaining ring from groove in stem of valve.

(3) Remove valve and valve spring from housing.

*d. Disassemble Oil Cooler Bypass Valve Assembly* (fig. 137).

(1) Cut locking wire, if present, and remove valve cap from valve housing. Remove and discard valve gasket.

(2) Push down on housing to compress spring and expose stem of valve. Remove retaining ring from groove in stem of valve.

(3) Remove valve and valve spring from housing.

*e. Disassemble Fuel Injector Oil Pressure Regulator Valve Assembly* (fig. 138).

(1) Cut locking wire, if present, and remove valve cap from valve adapter. Remove and discard valve cap gasket.

(2) Remove valve spring and valve from adapter.

## 146. Cleaning

Clean all parts as described in paragraph 77.

## 147. Inspection

*a. Oil Control Housing Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 134 except where otherwise indicated.

(1) *Oil inlet and outlet connectors* (U and BB). Inspect connectors for cracks and stripped or damaged threads.

(2) *Elbow and nipples.* Inspect elbow (DD) and nipples (A and H) for stripped or damaged threads.

(3) *Hex-socket pipe plugs* (J and EE). Inspect pipe plugs for stripped or damaged threads and mutilated socket head.

(4) *Injector oil and engine oil tube assemblies* (B and G). Inspect tubes for splits, cracks, and kinks. Inspect cou-

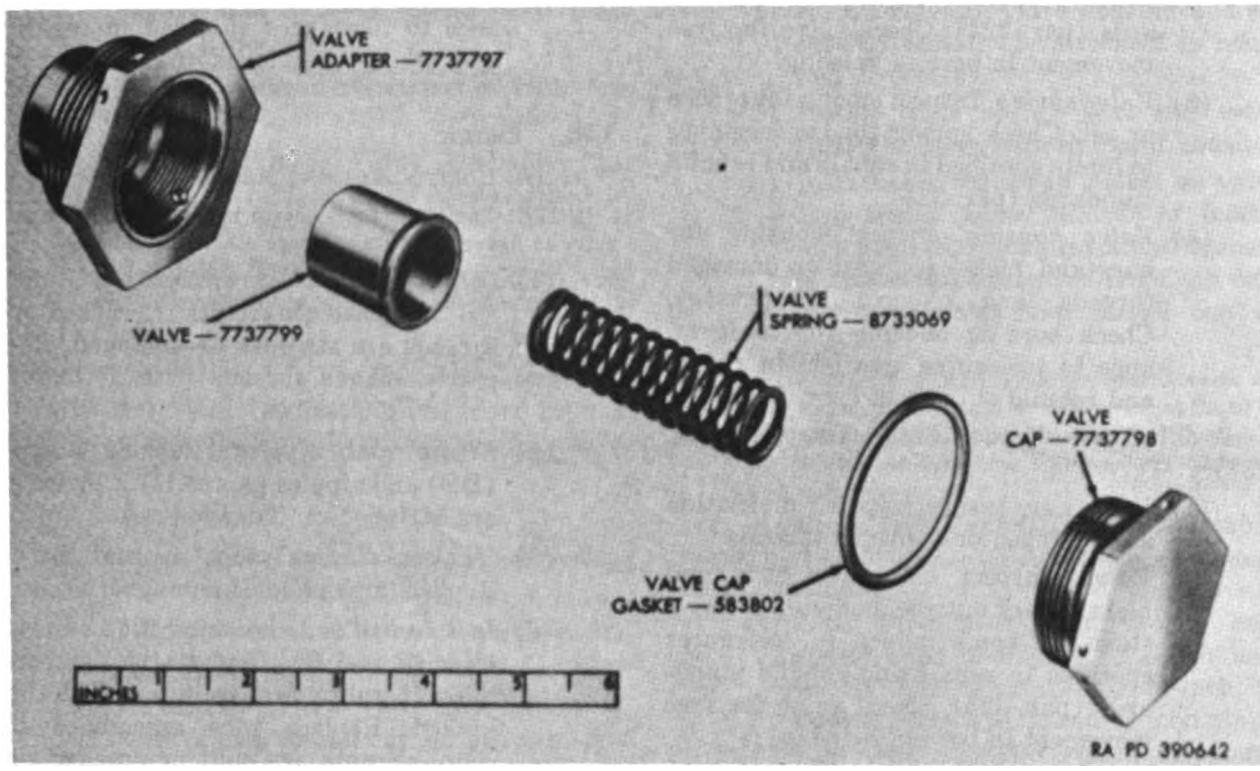



*Figure 138. Fuel injector oil pressure regulator valve assembly—exploded view.*

pling nuts on tubes for splits or cracks and stripped or damaged threads.

(5) *Oil control housing* (K). Inspect housing as described in paragraph 78*b* and for plugged oil passages.

(6) *Studs* (S). Inspect studs as described in paragraph 78*d*.

(7) *Hex-head magnetic plug* (AV, fig. 96). Inpect plug for stripped or damaged threads or mutilated head. Inspect plug for cracked or broken magnetic prongs.

*b. Oil Pressure Control Valve Assembly* (fig. 135).

(1) *Valve cap.* Inspect cap for mutilation and stripped or damaged threads.

(2) *Valve spring.* Inspect spring for cracks or set. Check spring for conformance to limits specified in repair and rebuild standards (par. 323).

(3) *Valve spring seat.* Inspect seat for burs and nicks. Check seat for conformance to tolerances specified in repair and rebuild standards (par. 323). Check seat for free movement in bore in housing.

(4) *Valve seat.* Inspect seat for mutilation and stripped or damaged threads.

(5) *Valve.* Inspect valve for burs and nicks. Check outside diameter of stem for conformance to tolerances specified in repair and rebuild standards (par. 323). Check valve for free movement in bore in housing.

(6) *Valve housing.* Inspect housing for burs and nicks, stripped or damaged threads, and plugged oil passages. Check bores in housing for conformance to tolerances specified in repair and rebuild standards (par. 323).

*c. Oil Filter Bypass Valve Assembly* (fig. 136).

(1) *Valve cap.* Inspect cap for mutilation and for stripped or damaged threads.

(2) *Valve.* Inspect valve for burs and nicks. Check outside diameter of valve stem for conformance to tolerances specified in repair and rebuild stand-

ards (par. 324). Check valve for free movement in bore in housing.

(3) *Valve spring.* Inspect spring for cracks or set. Check spring for conformance to limits specified in repair and rebuild standards (par. 324).

(4) *Valve housing.* Inspect housing for burs and nicks, stripped or damaged threads, and plugged oil passage. Check bore in housing for conformance to tolerances specified in repair and rebuild standards (par. 324).

*d. Oil Cooler Bypass Valve Assembly* (fig. 137).

(1) *Valve cap.* Inspect cap for mutilation and stripped or damaged threads.

(2) *Valve.* Inspect valve for burs and nicks. Check outside diameter of valve stem for conformance to tolerances specified in repair and rebuild standards (par. 325). Check valve for free movement in bore in housing.

(3) *Valve spring.* Inspect spring for cracks or set. Check spring for conformance to limits specified in repair and rebuild standards (par. 325).

(4) *Valve housing.* Inspect housing for burs and nicks, stripped or damaged threads, and plugged oil passage. Check bore in housing for conformance to tolerances specified in repair and rebuild standards (par. 325).

*e. Fuel Injector Oil Pressure Regulator Valve Assembly* (fig. 138).

(1) *Valve cap.* Inspect cap for mutilation and stripped or damaged threads.

(2) *Valve spring.* Inspect spring for cracks or set. Check spring for conformance to limits specified in repair and rebuild standards (par. 326).

(3) *Valve.* Inspect valve for burs and nicks. Check outside diameter of valve for conformance to tolerances specified in repair and rebuild standards (par. 326). Check valve for free movement in bore in adapter.

(4) *Valve adapter.* Inspect adapter for burs and nicks, stripped or damaged threads, and plugged oil passage. Check bore in adapter for conformance to tolerances specified in repair and rebuild standards (par. 325).

## 148. Repair

*a. Oil Control Housing Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 134 except where otherwise indicated.

(1) *Oil inlet and outlet connectors* (U and BB). Replace connectors if cracked or threads are stripped or damaged. Repair damaged threads with a thread chaser, if possible.

(2) *Elbow and nipples.* Replace elbow (DD) and nipples (A and H) if threads are stripped or damaged.

(3) *Hex-socket pipe plugs* (J and EE). Replace pipe plugs if damaged.

(4) *Injector oil and engine oil tube assemblies* (B and G). Replace tube assemblies if tubes are split, cracked, or kinked. Replace tube assemblies if coupling nuts are split or cracked or threads in nuts are stripped or damaged.

(5) *Oil control housing* (K). Repair or replace housing as described in paragraph 79*b*.

(6) *Studs* (S). Repair or replace studs as described in paragraph 79*d*.

(7) *Hex-head magnetic plug* (AV, fig. 96). Replace plug if threads are stripped or damaged, if head is mutilated, or if magnetic prongs are cracked or broken.

*b. Oil Pressure Control Valve Assembly* (fig. 135).

(1) Replace valve spring, valve, or valve housing if parts do not conform to tolerances specified in repair and rebuild standards.

(2) Replace valve cap, valve seat, or valve housing if threads are stripped or damaged. Repair damaged threads with a used tap or thread chaser, if possible.

(3) Replace valve if it does not move freely in bore in housing.

(4) Replace parts if burred, nicked, or mutilated. Remove burs and nicks with crocus cloth dipped in dry-cleaning

solvent or mineral spirits paint thinner, if possible.

(5) Clean plugged oil passages with fine wire.

*c. Oil Filter Bypass Valve Assembly* (fig. 136). Repair or replace parts as described in *b*(1) through (5) above.

*d. Oil Cooler Bypass Valve Assembly* (fig. 137). Repair or replace parts as described in *b*(1) through (5) above.

*e. Fuel Injector Oil Pressure Regulator Valve Assembly* (fig. 138). Repair or replace parts as described in *b*(1) through (5) above.

## 149. Assembly

*a. Assemble Fuel Injector Oil Pressure Regulator Valve Assembly* (fig. 138).

(1) Install valve in bore of adapter. Install spring in bore of valve.

(2) Position a new valve cap gasket on valve cap, install cap on adapter, and secure with locking wire.

*b. Assemble Oil Cooler Bypass Valve Assembly* (fig. 137).

(1) Install valve spring and valve on valve housing. Push down on valve housing to compress spring until valve stem is exposed through top of housing and install 0.2700-inch shaft diameter retaining ring in groove in valve stem to secure valve and valve spring.

(2) Position a new valve cap gasket on valve cap, install cap on housing, and secure with locking wire.

*c. Assemble Oil Filter Bypass Valve Assembly* (fig. 136).

(1) Install valve spring and valve on valve housing. Push down on valve housing to compress spring until valve stem is exposed through top of housing and install 0.2250-inch shaft diameter retaining ring in groove in valve stem to secure valve and valve spring.

(2) Position a new valve cap gasket on valve cap, install cap on housing, and secure with locking wire.

*d. Assemble Oil Pressure Control Valve Assembly* (fig. 135).

(1) Install valve in valve housing and secure by installing valve seat in housing.

(2) Install valve spring seat and valve spring in large bore in top of housing.

(3) Install new valve cap gasket on valve cap. Install same number of 0.5600 id, 0.9400 od, 0.0600 thick flat washers in cap as were removed from cap during disassembly and install cap on housing.

NOTE: The oil pressure control valve assembly is adjusted to deliver oil at 70 to 80 psi (par. 289). This pressure is adjusted by adding or removing flat washers from the valve cap.

*e. Assemble Oil Control Housing Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 134.

(1) Coat threads of four ⅛-inch hex-socket pipe plugs (J), 1/16-inch hex-socket pipe plug (EE), ¼-inch 90 degree elbow (DD), and ¾-inch nipple (H) with gasket forming compound and install plugs, elbow, and nipple in openings in oil control housing (K).

(2) Position a new connector mounting gasket (CC) over lower studs (S) and install oil outlet connector (BB) over gasket and secure with three ⅜-inch hex self-locking nuts (Z), or ⅜-inch hex nuts (Z) and ⅜-inch hex stamped nuts (AA), and 25/64 id, ⅝ od, 1/16 thick plain washers (Y).

(3) Position a new connector mounting gasket (T) over studs and install oil inlet connector (U) over gasket and secure with three ⅜-inch hex self-locking nuts (W), or ⅜-inch hex nuts (W) and ⅜-inch hex stamped nuts (X), and 25/64 id, ⅝ od, 1/16 thick plain washers (V).

*f. Install Oil Cooler Bypass Valve Assembly.* Position a new cooler bypass valve gasket (R) on oil cooler bypass valve assembly (Q) and install valve assembly in housing. Tighten valve assembly securely.

*g. Install Oil Filter Bypass Valve Assembly.* Position a new filter bypass valve gasket (M) on oil filter bypass valve assembly (P) and install valve assembly in housing. Tighten valve assembly with wrench 8708400 (H, fig. 10).

*h. Install Oil Pressure Control Valve Assembly.* Place oil control housing (K) in a vise equipped with leather or copper jaws. Position new control valve gasket (L) on oil pressure control valve assembly (N) and install valve assembly in housing. Tighten valve assembly with wrench 8708401 (RR, fig. 10). The three valve assemblies will be secured to each other with locking wire after adjustment of oil pressure control valve assembly during engine test.

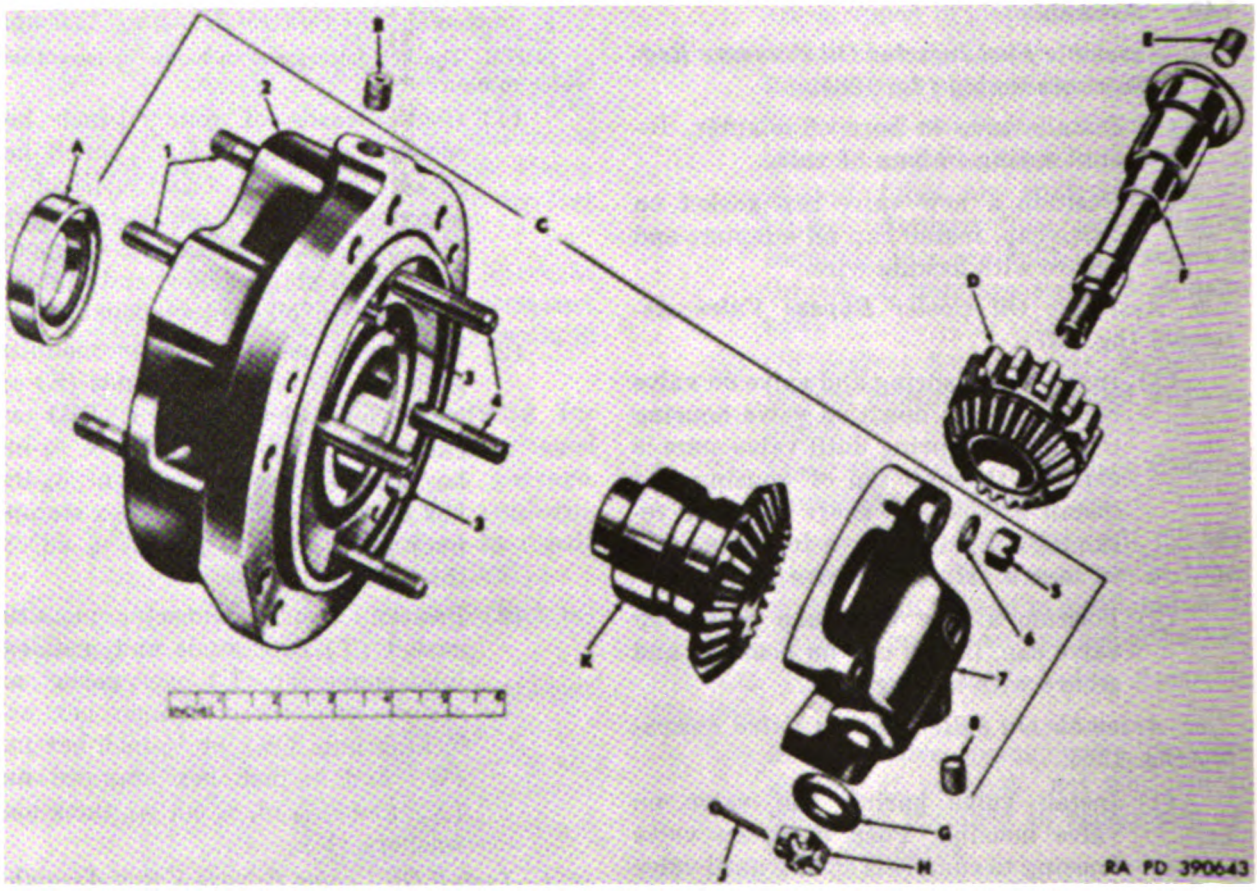
*i. Install Fuel Injector Oil Pressure Regulator Valve Assembly.* Position a new regulator valve gasket (FF) on fuel injector oil pressure regulator valve assembly (GG) and install valve assembly in housing. Secure valve assembly with locking wire. Remove housing from vise.

## Section XV. REBUILD OF GENERATOR DRIVE ADAPTER ASSEMBLY

### 150. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 139.

*a.* Remove cotter pin (J) from castellated hex nut (H) and hex nut and flat washer (G) from drive gear shaft (F).




A—Oil seal 500286
B—⅛-inch hex-socket pipe plug 7358990
C—Adapter assembly 7403679
1—⅜ x 1¾ stud 7403097
2—Adapter 7403441
3—¼ x ⅜ tapered pin 7744684
4—5/16 x 2⅛ stud 7403075
5—5/16-inch slotted hex nut 122942
6—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
7—Drive gear bracket 7403440
8—⅛-inch hex-socket pipe plug 7538990
D—Drive gear assembly 7346546
E—⅛-inch hex-socket pipe plug 7538990
F—Drive gear shaft 7346535
G—½ id, 1.0 od, ⅛ thick flat washer 7372651
H—½-inch castellated hex nut 198293
J—1/32 x ¾ cotter pin 121222
K—Driven shaft gear assembly 7346503

*Figure 139. Generator drive adapter assembly—exploded view.*

*b.* Tap gear shaft lightly with a soft hammer to loosen and remove gear shaft from drive gear bracket (C–7). Slide drive gear assembly (D) from shaft. Remove hex-socket pipe plug (E) from shaft.

*c.* Cut locking wire and remove four slotted hex nuts (C–5) and flat washers (C–6) securing drive gear bracket (C–7) to adapter (C–2) and remove bracket. Remove hex-socket pipe plug (C–8) from bracket.

*d.* Remove driven shaft gear assembly (K) from adapter.

*e.* Remove hex-socket pipe plug (B) from adapter.

*f.* Do not remove oil seal (A) from bore in adapter unless inspection (par. 152) indicates replacement is necessary. To remove oil seal, press seal from adapter, using a suitable press.

## 151. Cleaning

Clean all parts as described in paragraph 77.

## 152. Inspection

NOTE: The key letters shown below in parentheses refer to figure 139.

*a. Drive Gear Assembly* (D).

(1) Inspect gear assembly as described in paragraph 78*e*.

(2) Inspect bushing-type bearing in bore of gear assembly as described in paragraph 78*g*.

*b. Drive Gear Shaft* (F).

(1) Inspect shaft as described in paragraph 78.

(2) Inspect shaft for stripped or damaged threads.

*c. Driven Shaft Gear Assembly* (K).

(1) Inspect gear assembly as described in paragraph 78.

(2) Inspect bearing surfaces of gear assembly for burs and nicks.

*d. Drive Gear Bracket* (C–7). Inspect bracket as described in paragraph 78*b*.

*e. Oil Seal* (A). Inspect oil seal as described in paragraph 78.

*f. Adapter* (C–2).

(1) Inspect adapter as described in paragraph 78*b*.

(2) Inspect studs (C–1 and C–4) as described in paragraph 78*d*.

*g. Hex-Socket Pipe Plugs* (B, C–8, and E). Inspect pipe plugs for stripped or damaged threads and for mutilated socket head.

## 153. Repair

NOTE: The key letters shown below in parentheses refer to figure 139.

*a. Drive Gear Assembly* (D).

(1) Repair or replace gear assembly as described in paragraph 79*e*.

(2) Repair bushing-type bearing as described in paragraph 79*g* or replace gear assembly if bearing cannot be repaired.

*b. Drive Gear Shaft* (F).

(1) Repair or replace shaft as described in paragraph 79.

(2) Replace shaft if threads are stripped or damaged. Repair damaged threads with a used tap or thread chaser, if possible.

*c. Driven Shaft Gear Assembly* (K).

(1) Repair or replace gear assembly as described in paragraph 79.

(2) Replace gear assembly if bearing surfaces are badly burred or nicked. Remove burs and nicks with a fine stone and polish with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

*d. Drive Gear Bracket* (C–7). Repair or replace bracket as described in paragraph 79*b*.

*e. Oil Seal* (A). Replace oil seal if damaged.

*f. Adapter* (C–2).

(1) Repair or replace adapter as described in paragraph 79*b*.

(2) Repair or replace studs (C–1 and C–4) as described in paragraph 79*d*.

*g. Hex-Socket Pipe Plugs* (B, C–8, and E). Replace pipe plugs if threads are stripped or damaged or socket head is mutilated.

## 154. Assembly

NOTE: The key letters shown below in parentheses refer to figure 139.

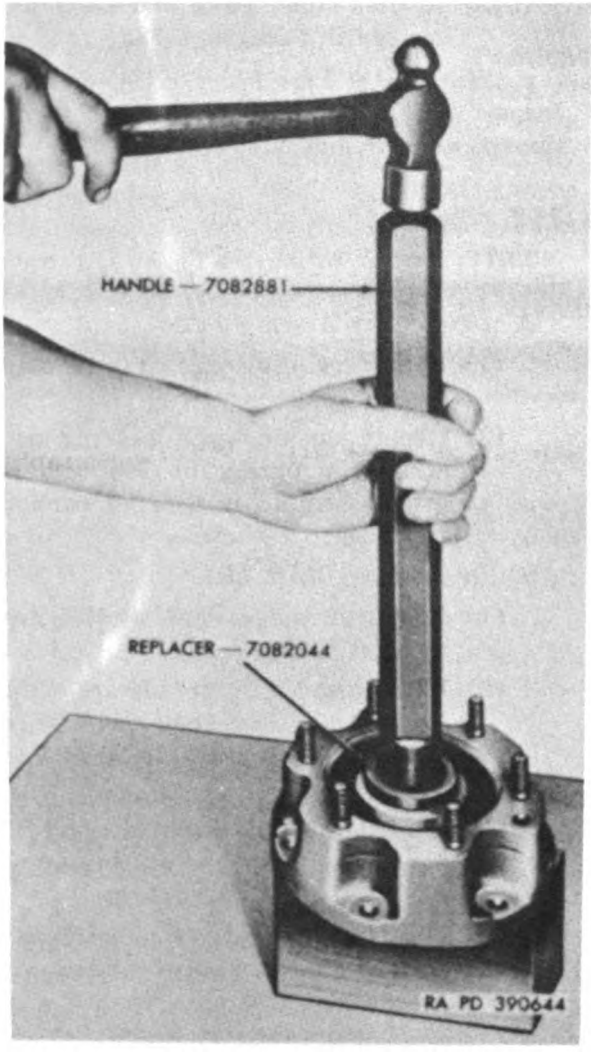



*Figure 140. Installing generator drive adapter oil seal.*

*a.* If oil seal (A) was removed from adapter, drive new oil seal into adapter with replacer 7082044 and handle 7082881 (fig. 140).

*b.* Coat threads on ⅛-inch hex-socket pipe plug (B) with gasket forming compound and install pipe plug in opening in adapter.

*c.* Install driven shaft gear assembly (K) in bore of adapter. Install gear assembly carefully so as not to damage oil seal.

*d.* Coat threads on ⅛-inch hex-socket pipe plug (C–8) with gasket forming compound and install pipe plug in opening in drive gear bracket (C–7).

*e.* Aline holes in bracket with tapered pins (C–3) and install bracket on studs on adapter and secure with four 5/16-inch slotted hex nuts (C–5) and 21/64 id, 9/16 od, 0.0630 thick flat washers (C–6). Secure nuts with locking wire.

*f.* Coat threads on ⅛-inch hex-socket pipe plug (E) with gasket forming compound and install pipe plug in drive gear shaft (F). Slide drive gear assembly (D) on shaft.

*g.* Install drive gear shaft, with attached drive gear assembly, in bracket, meshing teeth on drive gear assembly with teeth of driven shaft gear assembly, and secure with ½-inch castellated hex nut (H) and ½ id, 1.0 od, ⅛ thick flat washer (G). Secure nut with 3/32 x ¾ cotter pin (J).

*h.* Rotate drive gear by hand to be sure it turns freely.

## Section XVI. REBUILD OF STARTER DRIVE ASSEMBLY

### 155. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 142.

*a.* Install holder 7082054 (fig. 141) over starter mounting studs, engaging holder with starter jaw. Secure holder to studs with two ⅜-inch hex nuts provided.

*b.* Clamp holder, with attached drive assembly, in vise as shown in figure 141.

*c.* Remove cotter pin (Q) from hex nut (P) and threaded end of started jaw (E) and remove hex nut from jaw.

*d.* Remove starter drive bevel gear (N) from starter jaw. Remove shims (M). Note number of shims removed.

*e.* Remove bearing nut locking ring (L). Install wrench 7082051 (fig. 141) in jaw bearing nut (K) and remove nut from liner.

*f.* Remove six flat-head screws (D) securing adapter bearing liner (C) to adapter (A–2) and remove holder and adapter from vise. Remove hex nuts securing holder to adapter and remove holder.

*g.* Press liner, with jaw and attached parts, from adapter, using a suitable press. Remove

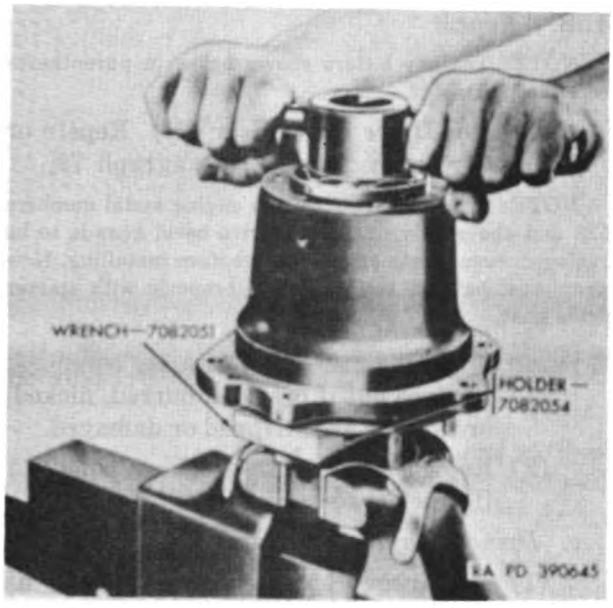



*Figure 141. Removing or installing starter jaw bearing nut.*

and discard "O" ring packing (A–3) from groove in adapter.

*h.* Press starter jaw (E), with attached ball bearing (F), jaw bearing outer spacer (G), jaw bearing inner spacer (H), and roller bearing (J), from liner, using a suitable press.

*i.* Remove roller bearing (J) from jaw with suitable bearing remover. Remove outer spacer (G) from jaw.

*j.* Remove inner spacer (H) and ball bearing (F) from jaw with suitable bearing remover.

*k.* Do not remove oil seal (B) from liner unless inspection (par. 157) indicates replacement is necessary. To remove oil seal, press seal from liner, using a suitable press.

## 156. Cleaning

Clean all parts as described in paragraph 77.

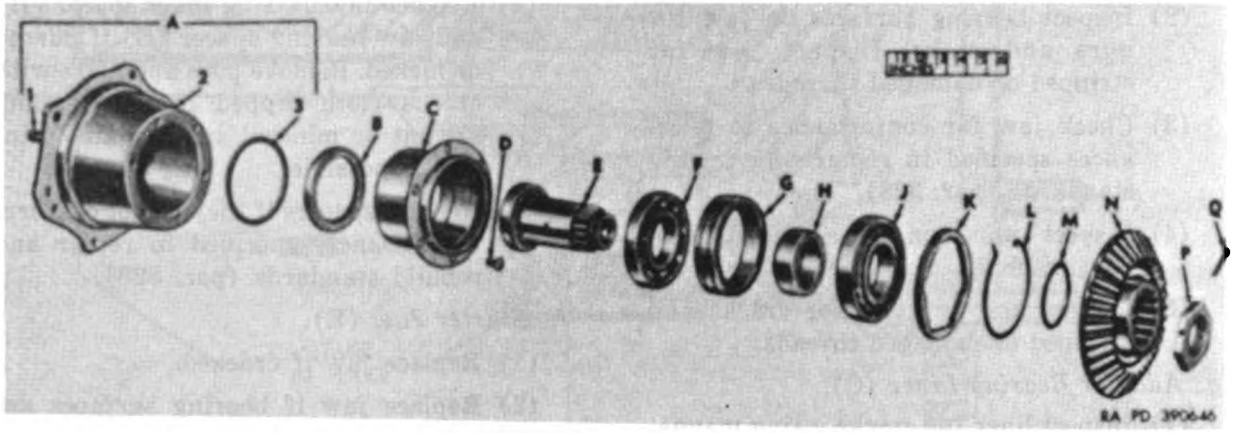
## 157. Inspection

NOTE: The key letters shown below in parentheses refer to figure 142.

*a. Starter Drive Bevel Gear* (N) Inspect gear as described in paragraph 78.

*b. Jaw Bearing Nut* (K).

(1) Inspect nut for cracks, burs or nicks on faces, and stripped or damaged threads.




A–Drive adapter assembly 7348537
  1–⅜ x 1¾ stud 7403097
  2–Adapter 7403434
  3–3½-inch id "O" ring packing 546874
B–Oil seal 7372612
C–Adapter bearing liner 7372691
D–¼ x ¾ flat-head screw 120697
E–Starter jaw 7410459
F–Ball bearing 700081
G–Jaw bearing outer spacer 7372695
H–Jaw bearing inner spacer 7372694
J–Roller bearing 712171
K–Jaw bearing nut 7372693
L–Bearing nut locking ring 7374218
M–Shim { (0.0050 thick) 7416592; (0.0120 thick) 7375638; (0.0160 thick) 7375369; (0.0200 thick) 7375370 }
N–Starter drive bevel gear { 7372687; 7954848 (late model AOSI-895–5 engines only) }
P–1 3/16-inch hex nut 7414500
Q–3/32 x ½ cotter pin 119117

*Figure 142. Starter drive assembly—exploded view.*

(2) Inspect bearing nut locking ring (L) for cracks or set.

*c. Drive Adapter Assembly.*

(1) Inspect adapter (A–2) as described in paragraph 78*b*.

(2) Inspect studs (A–1) as described in paragraph 78*d*.

*d. Bearings.* Refer to TM 37–265 for inspection of ball bearing (F) and roller bearing (J). Check bearings for conformance to tolerances specified in repair and rebuild standards (par. 328).

*e. Bearing Spacers.*

(1) Inspect jaw bearing inner spacer (H) and jaw bearing outer spacer (G) for burs and nicks.

(2) Check spacers for conformance to tolerances specified in repair and rebuild standards (par. 328).

*f. Starter Jaw* (E).

(1) Inspect jaw for cracks, using magnaflux equipment, if available. If magnaflux equipment is not available, use a magnifying glass and a strong light.

(2) Inspect bearing surfaces on jaw for burs and nicks. Inspect jaw for stripped or damaged threads.

(3) Check jaw for conformance to tolerances specified in repair and rebuild standards (par. 328).

(4) Inspect splines on jaw as described in paragraph 78.

(5) Inspect hex nut (P) for cracks and stripped or damaged threads.

*g. Adapter Bearing Liner* (C).

(1) Inspect liner for cracks, using magnaflux equipment, if available. If magnaflux equipment is not available, use a magnifying glass and a strong light.

(2) Inspect inner and outer surfaces of liner for burs and nicks and stripped or damaged threads.

(3) Check liner for conformance to tolerances specified in repair and rebuild standards (par. 328).

(4) Inspect oil seal (B) as described in paragraph 78.

## 158. Repair

NOTE: The key letters shown below in parentheses refer to figure 142.

*a. Starter Drive Bevel Gear* (N). Repair or replace gear as described in paragraph 79.

NOTE: On model AOSI–895–5 engine serial numbers 528 and above only, if starter drive bevel gear is to be replaced, count teeth on new gear before installing. New gear must have 29 teeth to mate properly with starter drive gear.

*b. Jaw Bearing Nut* (K).

(1) Replace nut if cracked, burred, nicked, or threads are stripped or damaged.

(2) Replace bearing nut locking ring (L) if cracked or set.

*c. Drive Adapter Assembly.*

(1) Repair or replace adapter (A–2) as described in paragraph 79*b*.

(2) Repair or replace studs (A–1) as described in paragraph 79*d*.

*d. Bearings.* Repair or replace ball bearing (F) and roller bearing (J) as described in paragraph 79.

*e. Bearing Spacers.*

(1) Replace jaw bearing inner spacer (H) and jaw bearing spacer (G) if burred or nicked. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(2) Replace spacers if they do not conform to tolerances specified in repair and rebuild standards (par. 328).

*f. Starter Jaw* (E).

(1) Replace jaw if cracked.

(2) Replace jaw if bearing surfaces are badly burred or nicked. Replace jaw if threads are stripped or damaged. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible. Repair damaged threads with a thread chaser, if possible.

(3) Replace jaw if it does not conform to tolerances specified in repair and rebuild standards (par. 328).

(4) Repair splines on jaw or replace jaw as described in paragraph 79.

**NOTE 1**

GEAR — 7954848 WITH 29 TEETH IS USED ON MODEL AOSI-895-5 ENGINE SERIAL NUMBERS 528 AND ABOVE.

**NOTE 2**

GEAR — 7372687 WITH 32 TEETH IS USED ON ALL MODEL AOSI-895-5M ENGINES AND MODEL AOSI-895-5 ENGINES THROUGH SERIAL NUMBER 527.

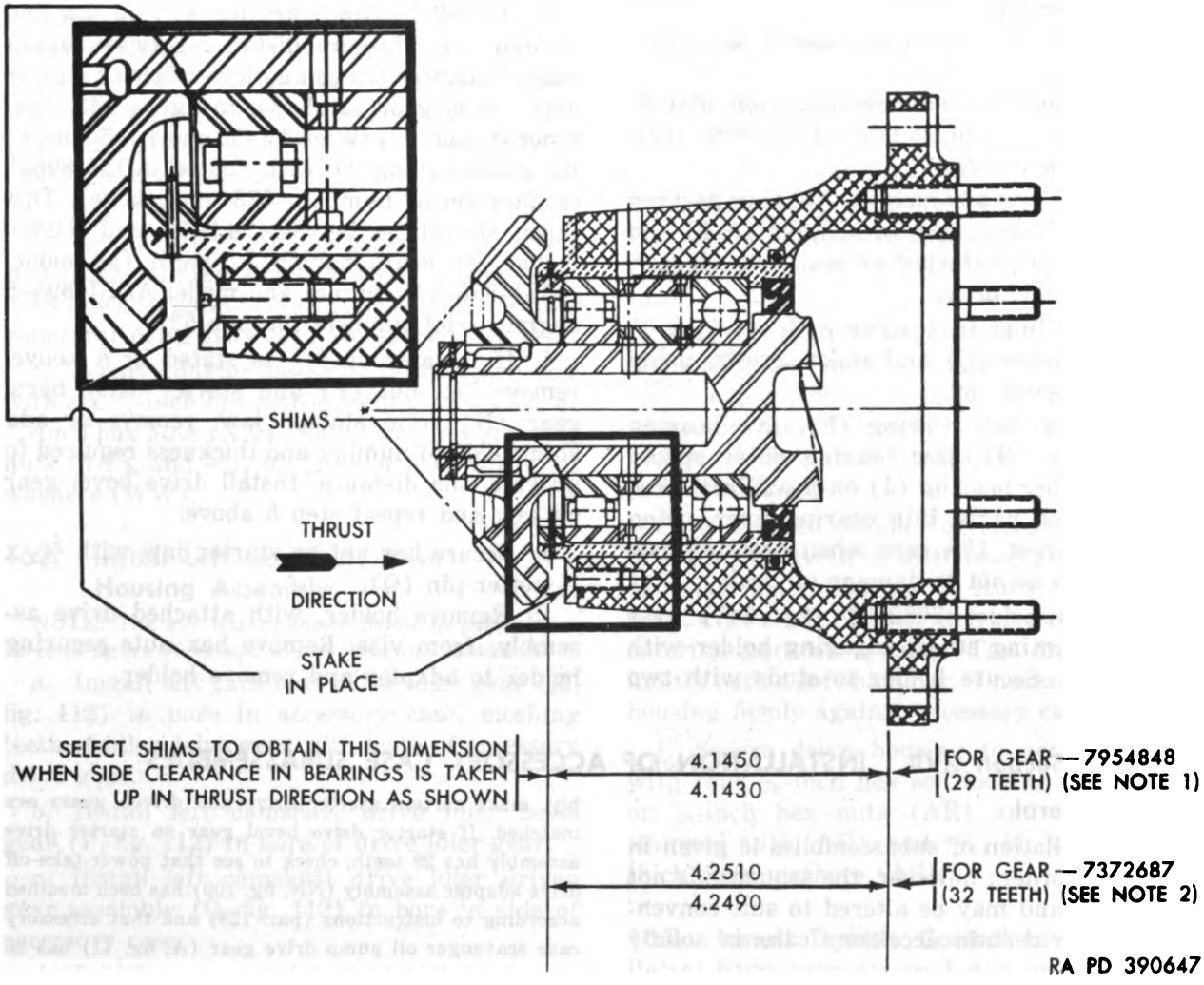



*Figure 143. Determining shim thickness for starter drive bevel gear.*

(5) Replace hex nut (P) if cracked or if threads are stripped or damaged.

*g. Adapter Bearing Liner* (C).

(1) Replace liner if cracked.

(2) Replace liner if surfaces are badly burred or nicked or threads are stripped or damaged. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(3) Replace liner if it does not conform to tolerances specified in repair and rebuild standards (par. 328).

(4) Replace oil seal (B) if damaged.

### 159. Assembly

NOTE: The key letters shown below in parentheses refer to figure 142.

*a.* If oil seal (B) was removed from adapter bearing liner (C), press new oil seal into liner, using a suitable press.

*b.* Install new 3½-inch id, "O" ring packing (A–3) in groove in bore of adapter (A–2) and press liner, with attached oil seal, into adapter, using a suitable press.

*c.* Secure liner in adapter with six ¼ x ¾ flat-head screws (D) and stake screws, using a punch or other tool.

*d.* Position ball bearing (F), jaw bearing inner spacer (H), jaw bearing outer spacer (G), and roller bearing (J) on jaw. Press jaw, with attached parts, into bearing liner, using a suitable press. Use care when pressing jaw into liner so as not to damage oil seal.

*e.* Install holder 7082054 (fig. 141) over started mounting studs, engaging holder with starter jaw. Secure holder to studs with two ⅜-inch hex nuts provided. Clamp holder, with attached adapter, jaw, and bearings, in a vise as shown in figure 141.

*f.* Install jaw bearing nut (K) in liner and tighten nut with wrench 7082051 (fig. 141). Secure nut with bearing nut locking ring (L).

*g.* Install same number of shims (M) on starter jaw as were removed during disassembly. Install starter drive bevel gear (N) on jaw, engaging splines in gear and on jaw.

NOTE: Starter drive bevel gear 7372687 (32 teeth) must be used with accesory case scavenger oil pump drive gear 7372686 (29 teeth) and starter driven gear 7346548 (29 teeth). Starter drive bevel gear 7954848 (29 teeth) must be used with oil pump drive gear 7954850 (26 teeth) and starter driven gear 7954849 (26 teeth).

*h.* Install 1$^{3}/_{16}$-inch hex nut (P) on jaw and tighten nut. Measure distance between upper face of adapter flange and lower face of starter drive bevel gear as shown in figure 143. Distance should be between 4.1430 and 4.1450 inches for gears having 29 teeth (model AOSI–895–5 engines serial numbers 528 and above). Distance should be between 4.2490 and 4.2510 inches for gears having 32 teeth (all model AOSI–895–5M engines and model AOSI–895–5 engine serial numbers through 527).

*i.* If distance is not as stated in *h* above, remove hex nut (P) and starter drive bevel gear (N) from starter jaw, remove or add shims (M) of number and thickness required to provide this distance. Install drive bevel gear on jaw and repeat step *h* above.

*j.* Secure hex nut on starter jaw with $^{3}/_{32}$ x ½ cotter pin (Q).

*k.* Remove holder, with attached drive assembly, from vise. Remove hex nuts securing holder to adapter and remove holder.

## Section XVII. INSTALLATION OF ACCESSORY CASE SUBASSEMBLIES

### 160. General

The installation of subassemblies is given in a practical order; however, the sequence is not mandatory and may be altered to suit convenience. Make certain accessory case is solidly braced on bench before attempting to install subassemblies.

### 161. Install Starter Drive Assembly

NOTE: The key letters shown below in parentheses refer to figure 96. Before installing starter drive assembly, make certain starter drive and driven gears are matched. If starter drive bevel gear on starter drive assembly has 29 teeth, check to see that power-take-off drive adapter assembly (NN, fig. 109) has been modified according to instructions (par. 123) and that accessory case scavenger oil pump drive gear (A, fig. 71) has 26 teeth.

*a.* Position a new 5⅞-inch id "O" ring packing (AK) on starter drive assembly (AL) and slide drive assembly in bore in accessory case, meshing teeth of starter drive bevel gear with

teeth of starter driven gear. Make certain mounting flange of drive assembly is seated squarely against mounting surface on accessory case.

NOTE: The outer diameter of the drive assembly acts as a dowel in the accessory case. The drive assembly must be properly alined before mounting nuts are tightened to prevent damage to drive assembly mounting flange.

*b.* Secure drive assembly to accessory case with six 3/8-inch hex self-locking nuts (AN), or 3/8-inch hex nuts (AN) and 3/8-inch hex stamped nuts (AP), and 25/64 id, 5/8 od, 1/16 thick flat washers (AM).

## 162. Install Generator Drive Adapter Assembly

NOTE: The key letters shown below in parentheses refer to figure 96.

*a.* Position a new 4 3/4-inch id "O" ring packing (AB) on generator drive adapter assembly (ZZ) and a new 5/16-inch id "O" ring packing (RR) on oil transfer tube of accessory case mounting flange.

*b.* Install drive adapter assembly on accessory case, alining drive adapter dowel holes with dowel pins in accessory case and meshing generator drive gear with accessory drive gear.

*c.* Secure adapter assembly to accessory case with six 3/8-inch hex self-locking nuts (XX), or 3/8-inch hex nuts (XX) and 3/8-inch hex stamped nuts (YY), and 25/64 id, 5/8 od, 0.0640 thick flat washers (WW).

## 163. Install Left Camshaft Drive Housing Assembly

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

*a.* Install left camshaft drive idler gear (M, fig. 112) in bore in accessory case, meshing teeth of idler drive gear with teeth of accessory drive gear.

*b.* Install left camshaft drive idler bevel gear (P, fig. 112) in bore of drive idler gear.

*c.* Install left camshaft drive idler driven gear assembly (Q, fig. 112) in bore in side of accessory case.

*d.* Position a new 2 1/8-inch id "O" ring packing (QQ) on left camshaft drive housing assembly (NN) and new 5/16-inch id "O" ring packing (PP) and 7/16-inch id "O" ring packing (SS) on oil transfer tubes.

*e.* Hold teeth on idler driven gear assembly in mesh with teeth on idler bevel gear and slide camshaft drive housing on studs on accessory case, with shaft of idler driven gear assembly entering bore of housing. Tap drive housing lightly with a soft hammer, if necessary, to seat it firmly against accessory case.

*f.* Secure drive housing to accessory case with four 3/8-inch hex self-locking nuts (UU), or 3/8-inch hex nuts (UU) and 3/8-inch hex stamped nuts (VV), and 25/64 id, 5/8 od, 0.0640 thick plain washers (TT).

## 164. Install Right Camshaft Drive Housing Assembly

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

*a.* Install right camshaft drive idler gear (X, fig. 112) in bore in accessory case, meshing teeth of drive idler gear with teeth of accessory drive gear.

*b.* Install right camshaft drive idler bevel gear (R, fig. 112) in bore of drive idler gear.

*c.* Install right camshaft drive idler driven gear assembly (S, fig. 112) in bore in accessory case.

*d.* Position a new 2 1/8-inch id "O" ring packing (AY) on right camshaft drive housing (AU) and a new 7/16-inch id "O" ring packing (AT) and new 5/16-inch id "O" ring packing (AX) on oil transfer tubes of accessory case mounting flange.

*e.* Hold teeth on idler driven gear assembly in mesh with teeth on idler bevel gear and slide camshaft drive housing on studs on accessory case, with shaft of idler driven gear assembly entering bore of housing. Tap drive housing lightly with a soft hammer, if necessary, to seat housing firmly against accessory case.

*f.* Secure drive housing to accessory case with four 3/8-inch hex self-locking nuts (AR), or 3/8-inch hex nuts (AR) and 3/8-inch hex stamped nuts (AQ), and 25/64 id, 5/8 od, 0.0640 thick plain washers (AS).

## 165. Install Throttle Control Lever Linkages

*a.* Position assembled throttle and governor control linkage (fig. 133) on right camshaft drive housing assembly studs as shown in figure 101 and secure supporting bracket (A–10,

fig. 133) to housing with three 5/16-inch hex self-locking nuts (W, fig. 133), or 5/16-inch hex nuts (W, fig. 133) and 5/16-inch hex stamped nuts (X, fig. 133), and 21/64 id, 9/16 od, 0.0630 thick flat washers (V, fig. 133).

*b.* Position assembled vehicle-control-to-throttle-control linkage (fig. 132) on three studs on upper right front of accessory case as shown in figure 101. Position vehicle control lever stop (H, fig. 132) so projection on stop is between control levers and secure vehicle control levers support (J, fig. 132) to accessory case with three 5/16-inch slotted hex nuts (G, fig. 132) and one 21/64 id, 9/16 od, 0.0630 thick flat washer (K, fig. 132). Install washer under nut on lower stud. Secure slotted hex nuts with locking wire.

*c.* Secure throttle-control-shaft-lever-to-vehicle-control-lever rod assembly (M, fig. 132) to upper arm of control-shaft-to-vehicle-control lever (A–2, fig. 133) with No. 10 x 15/32 hex-head bolt (R, fig. 132), No. 10 slotted hex nut (P, fig. 132), and 13/64 id, 7/16 od, 0.0630 thick flat washer (Q, fig. 132). Secure slotted hex nut with 1/16 x 1/2 cotter pin (N, fig. 132).

## 166. Install Magneto Drive Assembly

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated.

*a.* Install spark advance governor unit assembly (Y, fig. 122) on magneto driven shaft gear previously installed in accessory case, engaging splines on shaft gear with splines in governor unit assembly.

*b.* Aline coupling slots in spark advance governor coupling assembly (U, fig. 122) with pins on governor unit flyweights and install coupling assembly on unit assembly, with slots engaging pins.

*c.* Position a new magneto drive housing gasket (Z) on studs on accessory case and a new 5/16-inch id "O" ring packing (Y) on magneto drive housing oil transfer tube and install magneto drive assembly (AA), with attached fuel injector oil booster pump assembly (HH), over gasket, engaging splines in governor coupling assembly with splines on driven shaft gear.

*d.* Secure magneto drive assembly on accessory case with three 3/8-inch hex self-locking nuts (LL), or 3/8-inch hex nuts (LL) and 3/8-inch hex stamped nuts (KK), and 25/64 id, 5/8 od, 0.0640 thick plain washers (MM).

NOTE: Do not install hex self-locking nut or hex nut and hex stamped nut, and flat washer on lower left mounting stud. These parts are installed when the fuel injector oil tube assembly clamp bracket is installed.

## 167. Install Oil Control Housing Assembly

NOTE: The key letters shown below in parentheses refer to figure 96 except where otherwise indicated. Governor assembly 8380695 must be installed before installing oil control housing assembly. Install governor as described in paragraph 279*a*.

*a.* Position new oil control housing gasket (F) on accessory case studs, install oil control housing assembly (G) over gasket, and secure with two 5/16 x 2 15/32 hex-head bolts (BE), three 5/16 x 2 11/32 hex-head bolts (AZ), three 5/16-inch hex self-locking nuts (BD), or 5/16-inch hex nuts (BD) and 5/16-inch hex stamped nuts (BC), and eight 21/64 id, 9/16 od, 0.0630 thick flat washers (BA). Secure bolts with locking wire.

NOTE: Do not install hex self-locking nut or hex nut and hex stamped nut, and flat washer on lower right mounting stud. These parts are installed when fuel injector oil tube assembly clamp bracket is installed.

*b.* Position engine oil tube assembly (G, fig. 134) between oil control housing nipple (H, fig. 134) and accessory case tee (T) and secure tube assembly by tightening coupling nuts of tube assembly on nipple and tee.

*c.* Position fuel injector oil tube assembly (B, fig. 134) between oil control housing elbow (DD, fig. 134) and magneto drive housing nipple (A, fig. 134) and secure tube assembly by tightening coupling nuts of tube assembly on elbow and nipple.

*d.* Secure one tube clamp bracket (D, fig. 134) to magneto drive assembly lower left mounting stud with 3/8-inch hex self-locking nut (LL), or 3/8-inch hex nut (LL) and 3/8-inch hex stamped nut (KK), and 25/64 id, 5/8 od, 0.0640 thick plain washer (MM).

*e.* Secure other tube clamp bracket (D, fig. 134) to oil control housing lower right mounting stud with 5/16-inch hex self-locking nut (BD), or 5/16-inch hex nut (BD) and 5/16-inch hex stamped nut (BC), and 21/64 id, 9/16 od, 0.0630 thick flat washer (BA).

*f.* Position two tube clamps (JJ, fig. 134) on fuel injector oil tube assembly and secure to two tube clamp brackets installed in *d* and *e*

above with two No. 10 x ½ fillister-head screws (C, fig. 134) and No. 10 hex self-locking nuts (HH, fig. 134).

### 168. Install Supercharger Air Inlet Housing Assembly

*a.* Position a new 5½-inch id "O" ring packing (A, fig. 103) on supercharger air inlet housing assembly (fig. 102) and install housing assembly on mounting studs on supercharger housing.

*b.* Secure housing assembly to supercharger housing with two ⅜-inch hex self-locking nuts (XX, fig. 119), or ⅜-inch hex nuts (XX, fig. 119) and ⅜-inch hex stamped nuts (YY, fig. 119), and $^{25}/_{64}$ id, ⅝ od, 0.0640 thick flat washers (WW, fig. 119).

*c.* Secure injection-control-shaft-to-throttle-shaft rod assembly (Q, fig. 133) to right throttle shaft lower lever (KK, fig. 119) with No. 10 x $1^{5}/_{32}$ hex-head bolt (P, fig. 133), No. 10 slotted hex nut (L, fig. 133), and $^{13}/_{64}$ id, $^{7}/_{16}$ od, 0.0380 thick flat washer (N, fig. 133). Secure slotted hex nut with $^{1}/_{16}$ x ½ cotter pin (M, fig. 133).

NOTE: Rod end ball bearing must be in horizontal position on rod assembly.

## Section XVIII. REBUILD OF CAMSHAFTS AND DRIVES

### 169. Disassembly

*a. Disassemble Right Camshaft and Camshaft Drive.*

NOTE: The key letters shown below in parentheses refer to figure 144.

(1) Cut locking wire and unscrew drive housing outer packing nut (C) from drive support (F). Remove drive shaft tube (E) from support. Remove and discard "O" ring packings (A and D) from tube and remove two packing nuts (B and C) from tube.

(2) Remove four hex self-locking nuts (SS), or hex stamped nuts (TT) and hex nuts (SS), and flat washers (RR) securing drive support (F) to gear housing assembly (PP).

(3) Remove drive support and remove and discard "O" ring packing (G). Remove drive bevel gear (H) from bore of support.

(4) Slide two intercylinder pipes (P) from camshaft assembly (AA–1). Remove and discard four "O" ring packings (N) from pipes and one "O" ring packing (N) from gear housing assembly.

(5) Slide camshaft and gear assembly (AA) from gear housing assembly. Clamp camshaft assembly in vise equipped with leather or copper jaws.

(6) Cut locking wire and remove eight hex-head bolts (AA–4) securing driven gear (AA–2) and oil retaining cover assembly (AA–3) to camshaft asembly. Remove cover assembly and gear. Remove camshaft from vise.

(7) Remove elbow (QQ) from gear housing assembly (PP).

(8) Remove tachometer drive shaft (BB) from tachometer drive adapter assembly (DD). Do not remove oil seal (EE) from adapter assembly unless inspection (par. 171) indicates replacement is necessary. To remove oil seal, press seal from adapter, using a suitable press.

*b. Disassemble Left Camshaft and Camshaft Drive.*

NOTE: The key letters shown below in parentheses refer to figure 145.

(1) Cut locking wire and unscrew drive housing outer packing nut (Y) from drive support (V). Remove drive shaft tube (W) from support. Remove and discard "O" ring packings (X and AA) from tube and remove two packing nuts (Y and Z) from tube.

(2) Remove four hex self-locking nuts (CC), or hex stamped nuts (BB) and hex nuts (CC), and flat washers (DD) securing drive support (V) and ignition harness mounting bracket (fig. 46) to gear housing assembly (J). Remove mounting bracket.

(3) Remove drive support and remove and discard "O" ring packing (U).

Remove drive bevel gear (T) from bore of support.

(4) Slide two intercylinder pipes (N) from camshaft (FF–4). Remove and discard four "O" ring packings (M) from pipes and one "O" ring packing (M) from gear housing assembly.

(5) Slide camshaft and gear assembly (FF) from gear housing assembly. Clamp camshaft assembly in vise equipped with leather or copper jaws.

(6) Cut locking wire and remove eight hex-head bolts (FF–1) securing oil retaining cover assembly (FF–2) and driven gear (FF–3) to camshaft. Remove cover assembly and gear. Remove camshaft from vise.

(7) Remove elbow (EE) from gear housing assembly.

## 170. Cleaning

Clean all parts as described in paragraph 77.

## 171. Inspection

*a. Right Camshaft and Camshaft Drive.*

NOTE: The key letters shown below in parentheses refer to figure 144.

(1) *Drive housing inner and outer packing nuts* (B and C). Inspect nuts for cracks and for stripped or damaged threads.

(2) *Drive shaft tube* (E). Inspect tube for mutilation, particularly to flange for packing nut.

(3) *Drive bevel gear* (H). Inspect gear as described in paragraph 78.

(4) *Drive support* (F). Inspect support as described in paragraph 78*b*. Inspect support for stripped or damaged threads.

(5) *Intercylinder pipes* (P). Inspect pipes for mutilation, particularly to flanges for "O" ring packings.

(6) *Camshaft and gear assembly.*

(*a*) *Camshaft assembly* (AA–1). Inspect camshaft assembly for cracks, using magnaflux equipment. If magnaflux equipment is not available, use a magnifying glass and a strong light. Inspect camshaft assembly lobes and camshaft for wear, scuffing, and scoring. Check camshaft assembly for conformance to toler-

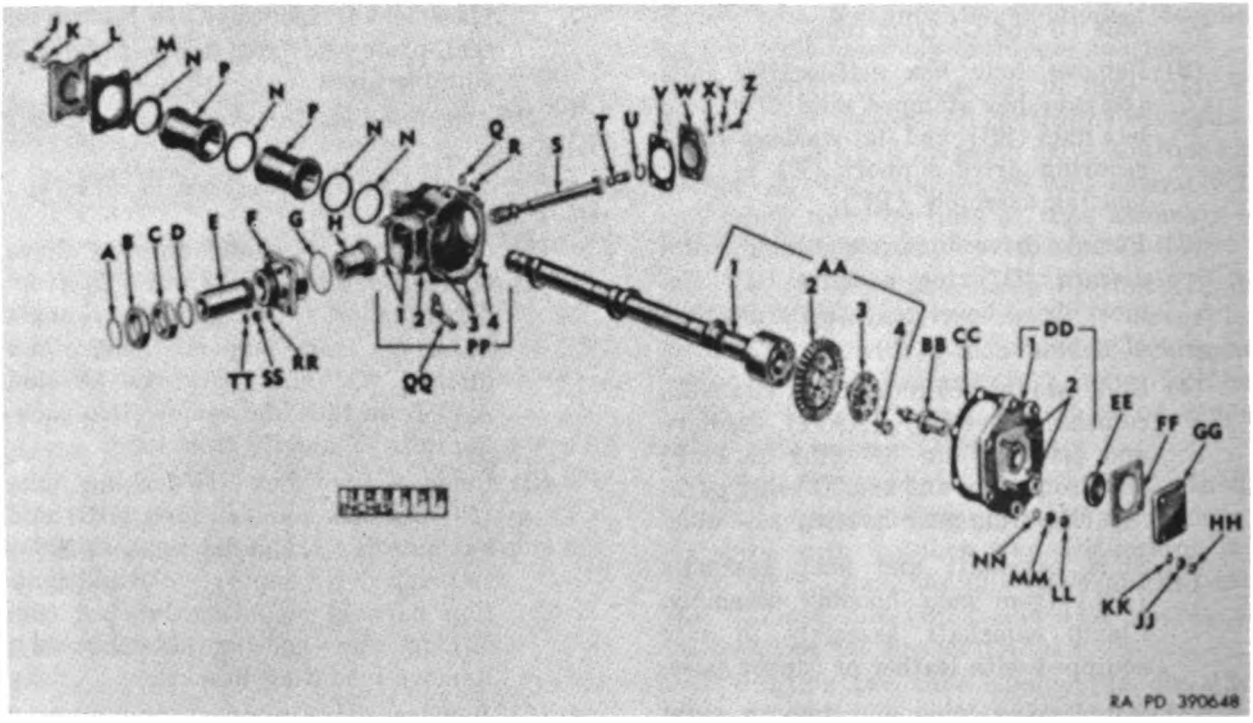



*Figure 144. Right camshaft and camshaft drive—exploded view.*

ances specified in repair and rebuild standards (par. 329). Inspect camshaft for stripped or damaged threads in tapped holes. Inspect plug in end of camshaft for secure fit.

(*b*) *Oil retaining cover assembly* (AA–3). Inspect cover assembly for cracks. Check cover assembly for conformance to tolerances specified in repair and rebuild standards (par. 329). Inspect plug in bore of cover for secure fit.

(*c*) *Driven gear* (AA–2). Inspect gear as described in paragraph 78.

(7) *Drive shaft* (S). Inspect shaft as described in paragraph 78.

(8) *Tachometer drive shaft* (BB). Inspect shaft as described in paragraph 78.

(9) *Tachometer drive adapter assembly.*

(*a*) *Adapter* (DD–1). Inspect adapter as described in paragraph 78*b*.

(*b*) *Studs* (DD–2). Inspect studs as described in paragraph 78*d*.

(*c*) *Oil seal* (EE). Inspect oil seal as described in paragraph 78*h*.

(10) *Oil transfer outer plug* (T).

(*a*) Inspect plug for plugged oil passages.

(*b*) Check fit of plug in bore of drive bevel gear (H). Plug must fit securely.

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A–1 7/16-inch id "O" ring packing 501463
B–Drive housing inner packing nut 7744897
C–Drive housing outer packing nut 7744897
D–1 7/16-inch id "O" ring packing 501463
E–Drive shaft tube 7346639
F–Drive support 7744673
G–2 1/4-inch id "O" ring packing 546864
H–Drive bevel gear 8666538
J–7/16 x 1 hex-head bolt 7744862
K–0.4600-inch id tab washer 7744681
L–Valve rocker box cover plate 7744692
M–Rocker box cover plate gasket 7744889
N–2 3/8-inch id "O" ring packing 7359862
P–Intercylinder pipe 7744693
Q–0.4600-inch id tab washer 7744681
R–7/16 x 1 hex-head bolt 7744862
S–Drive shaft 8666733
T–Oil transfer outer plug 7744853
U–1 1/16-inch housing diameter retaining ring 593354
V–Gear housing cover gasket 7346596
W–Gear housing cover 7346588
X–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
Y–5/16-inch lock washer 120214
Z–5/16 x 31/32 hex-head bolt 583750
AA–Camshaft and gear assembly 7737833
  1–Camshaft assembly 7737834
  2–Driven gear 7744898
  3–Oil retaining cover assembly 7346702
  4–3/8 x 7/8 hex-head bolt 7744865
BB–Tachometer drive shaft 7346602
CC–Tachometer drive adapter gasket 7346634
DD–Tachometer drive adapter assembly 7346600
  1–Adapter 7403483
  2–1/4 x 1 21/64 stud 7403212
EE–Oil seal 500241
FF–Cover gasket 7767519 (for shipping purposes only)
GG–Drive adapter cover 7403615 (for shipping purposes only)
HH–1/4-inch hex stamped nut 107821 (model AOSI–895–5M engine only)
JJ–
  1/4-inch hex self-locking nut 503339 or 503337 (model AOSI–895–5 engine only)
  1/4-inch hex nut 225851 (model AOSI–895–5M engine only)
KK–21/64 id, 9/16 od, 0.0630 thick flat washer 502266
LL–5/16-inch hex stamped nut 107822 (model AOSI–895–5M engine only)
MM–
  5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)
  5/16-inch hex nut 225853 (model AOSI–895–5M engine only)
NN–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
PP–Gear housing assembly 7737836
  1–5/16 x 1 5/8 stud 8365686
  2–Housing 7403444
  3–5/16 x 1 1/2 stud 7403501
  4–5/16 x 1 11/16 stud 7403071
QQ–1/4-inch 45 degree elbow 7346711
RR–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
SS–
  5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)
  5/16-inch hex nut 225853 (model AOSI–895–5M engine only)
TT–5/16-inch hex stamped nut 107822 (model AOSI–895–5M engine only)

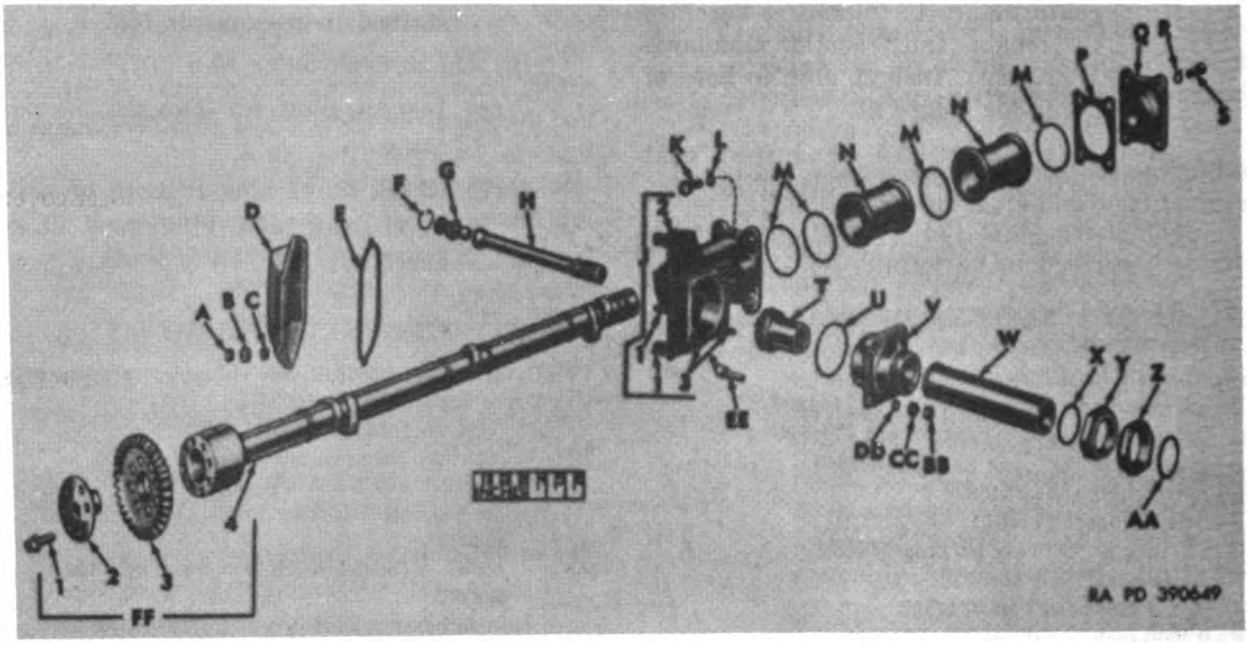
*Figure 144—Continued.*

(c) Check plug for conformance to tolerances specified in repair and rebuild standards (par. 329).

(11) *Valve rocker box cover plate* (L). Inspect cover plate for cracks.

(12) *Gear housing cover* (W). Inspect cover for cracks.

(13) *Elbow* (QQ). Inspect elbow for cracks and stripped or damaged threads.




A–5/16-inch hex stamped nut 107822
(model AOSI–895–5M engine only)

B–
- 5/16-inch hex nut 225853 (model AOSI–895–5M engine only)
- 5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)

C–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
D–Gear housing cover 7348539
E–Cover gasket 7348540
F–1 1/8-inch housing diameter retaining ring 593354
G–Oil transfer outer plug 7744853
H–Drive shaft 8666733
J–Gear housing assembly 7376029
1–5/16 x 1 1/2 stud 7403501
2–Housing 7403464
3–5/16 x 1 1/2 stud 7403501
K–7/16 x 1 hex-head bolt 7744682
L–0.4600-inch tab washer 7744681
M–2 3/8-inch id "O" ring packing 7539862
N–Intercylinder pipe 7744693
P–Rocker box cover plate gasket 7744889
Q–Valve rocker box cover plate 7346604
R–0.4600-inch tab washer 7744681
S–7/16 x 1 hex-head bolt 7744682
T–Drive bevel gear 8666538
U–2 1/4-inch id "O" ring packing 546864
V–Drive support 7744673
W–Drive shaft tube 7346640
X–1 7/16-inch id "O" ring packing 501463
Y–Drive housing outer packing nut 7744897
Z–Drive housing inner packing nut 7744897
AA–1 7/16-inch id "O" ring packing 501463
BB–5/16-inch hex stamped nut 107822
(model AOSI–895–5M engine only)

CC–
- 5/16-inch hex nut 225853 (model AOSI–895–5M engine only)
- 5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)

DD–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
EE–1/4-inch 45 degree elbow 7346711
FF–Camshaft and gear assembly 7737835
1–3/8 x 7/8 hex-head bolt 7744865
2–Oil retaining cover assembly 7346702
3–Driven gear 7744898
4–Camshaft 7737821

*Figure 145. Left camshaft and camshaft drive—exploded view.*

(14) *Gear housing assembly.*

(*a*) *Housing* (PP–2). Inspect housing as described in paragraph 78*b*.

(*b*) *Studs* (PP–1, PP–3, and PP–4). Inspect studs as described in paragraph 78*d*.

*b. Left Camshaft and Camshaft Drive.*

NOTE: The key letters shown below in parentheses refer to figure 145.

(1) *Drive housing inner and outer packing nuts* (Z and Y). Inspect nuts for cracks and stripped or damaged threads.

(2) *Drive shaft tube* (W). Inspect tube for mutilation, particularly to flange for packing nut.

(3) *Drive bevel gear* (T). Inspect gear as described in paragraph 78.

(4) *Drive support* (V). Inspect support as described in paragraph 78*b*. Inspect support for stripped or damaged threads.

(5) *Intercylinder pipes* (N). Inspect pipes for mutilation, particularly to flanges for "O" ring packings.

(6) *Camshaft and gear assembly.*

(*a*) *Camshaft* (FF–4). Inspect camshaft for cracks, using magnaflux equipment. If magnaflux equipment is not available, use a magnifying glass and a strong light. Inspect camshaft lobes and camshaft for wear, scuffing, and scoring. Check camshaft for conformance to tolerances specified in repair and rebuild standards (par. 330). Inspect camshaft for stripped or damaged threads in tapped holes.

(*b*) *Oil retaining cover assembly* (FF–2). Inspect cover assembly for cracks. Check cover assembly for conformance to tolerances specified in repair and rebuild standards (par. 330). Inspect plug in bore of cover for secure fit.

(*c*) *Driven gear* (FF–3). Inspect gear as described in paragraph 78.

(7) *Drive shaft* (H). Inspect shaft as described in paragraph 78.

(8) *Oil transfer outer plug* (G).

(*a*) Inspect plug for plugged oil passages.

(*b*) Check fit of plug in bore of drive bevel gear (T). Plug must fit securely.

(*c*) Check plug for conformance to tolerances specified in repair and rebuild standards (par. 330).

(9) *Valve rocker box cover plate* (Q). Inspect plate for cracks and check plate for conformance to tolerances specified in repair and rebuild standards (par. 330).

(10) *Gear housing cover* (D). Inspect cover for cracks.

(11) *Elbow* (EE). Inspect elbow for cracks and stripped or damaged threads.

(12) *Gear housing assembly.*

(*a*) *Housing* (J–2). Inspect housing as described in paragraph 78*b*.

(*b*) *Studs* (J–1 and J–3). Inspect studs as described in paragraph 78*d*.

## 172. Repair

*a. Right Camshaft and Camshaft Drive.*

NOTE: The key letters shown below in parentheses refer to figure 144.

(1) *Drive housing inner and outer packing nuts* (B and C). Replace nuts if cracked or if threads are stripped or damaged.

(2) *Drive shaft tube* (E). Replace tube if mutilated.

(3) *Drive bevel gear* (H). Repair or replace gear as described in paragraph 79.

(4) *Drive support* (F). Repair or replace support as described in paragraph 79*b*. Replace support if threads are stripped or damaged. Repair damaged threads with a thread chaser, if possible.

(5) *Intercylinder pipes* (P). Replace pipes if mutilated.

(6) *Camshaft and gear assembly.*

(*a*) *Camshaft assembly* (AA–1). Replace camshaft assembly if cracked. Replace camshaft assembly if lobes

or bearing journals of camshaft are badly worn, scuffed, or scored. Replace camshaft assembly if it does not conform to tolerances specified in repair and rebuild standards (par. 329). Replace camshaft assembly if threads in tapped holes are stripped or damaged. Replace camshaft assembly if plug in end of camshaft is loose. Repair damaged threads with a used tap, if possible. Remove slight scuffing and scoring from lobes and camshaft with a fine stone and polish with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(*b*) *Oil retaining cover assembly* (AA–3). Replace cover assembly if cracked. Replace cover assembly if it does not conform to tolerances specified in repair and rebuild standards (par. 329). Replace cover assembly if plug in bore of cover is loose.

(*c*) *Driven gear* (AA–2). Repair or replace gear as described in paragraph 79.

(7) *Drive shaft* (S). Repair or replace drive shaft as described in paragraph 79.

(8) *Tachometer drive shaft* (BB). Repair or replace shaft as described in paragraph 79.

(9) *Tachometer drive adapter assembly.*

(*a*) *Adapter* (DD–1). Repair or replace adapter as described in paragraph 79*b*.

(*b*) *Studs* (DD–2). Repair or replace studs as described in paragraph 79*d*.

(*c*) *Oil seal* (EE). Replace oil seal if damaged.

(10) *Oil transfer outer plug (T).*

(*a*) Replace plug if plug does not fit securely in bore of drive bevel gear.

(*b*) Replace plug if it does not conform to tolerances specified in repair and rebuild standards (par. 329).

(*c*) Clean oil passages if plugged.

(11) *Valve rocker box cover plate* (L). Replace cover plate if cracked.

(12) *Gear housing cover* (W). Replace cover if cracked.

(13) *Elbow* (QQ). Replace elbow if cracked or threads are stripped or damaged.

(14) *Gear housing assembly.*

(*a*) *Housing* (PP–2). Repair or replace housing as described in paragraph 79*b*.

(*b*) *Studs* (PP–1, PP–3, and PP–4). Repair or replace studs as described in paragraph 79*d*.

*b. Left Camshaft and Camshaft Drive.*

NOTE: The key letters shown below in parentheses refer to figure 145.

(1) *Drive housing inner and outer packing nuts* (Z and Y). Replace nuts if cracked or if threads are stripped or damaged.

(2) *Drive shaft tube* (W). Replace tube if mutilated.

(3) *Drive bevel gear* (T). Repair or replace gear as described in paragraph 79.

(4) *Drive support* (V). Repair or replace support as described in paragraph 79*b*. Replace support if threads are stripped or damaged. Repair damaged threads with a thread chaser, if possible.

(5) *Intercylinder pipes* (N). Replace pipes if mutilated.

(6) *Camshaft and gear assembly.*

(*a*) *Camshaft* (FF–4). Replace camshaft if cracked. Replace camshaft if lobes or bearing journals of camshaft are badly worn, scuffed, or scored. Replace camshaft if it does not conform to tolerances specified in repair and rebuild standards (par. 330). Replace camshaft if threads in tapped holes are stripped or damaged. Repair damaged threads in tapped holes with a used tap, if possible. Remove slight scuffing and scoring from lobes and camshaft with a fine stone and polish with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(*b*) *Oil retaining cover assembly* (FF–2). Replace cover assembly if cracked. Replace cover assembly if it does not conform to tolerances specified in repair and rebuild standards (par. 330). Recover assembly if plug in bore of cover is loose.

(*c*) *Driven gear* (FF–3). Repair or replace gear as described in paragraph 79.

(7) *Drive shaft* (H). Repair or replace shaft as described in paragraph 79.

(8) *Oil transfer outer plug (G).*

(*a*) Replace plug if plug does not fit securely in bore of drive bevel gear.

(*b*) Replace plug if it does not conform to tolerances specified in repair and rebuild standards (par. 330).

(*c*) Clean oil passages if plugged.

(9) *Valve rocker box cover plate* (Q). Replace cover plate if cracked. Replace plate if it does not conform to tolerances specified in repair and rebuild standards (par. 330).

(10) *Gear housing cover* (D). Replace cover if cracked.

(11) *Elbow* (EE). Replace elbow if cracked or threads are stripped or damaged.

(12) *Gear housing assembly.*

(*a*) *Housing* (J–2). Repair or replace housing as described in paragraph 79*b*.

(*b*) *Studs* (J–1 and J–3). Repair or replace studs as described in paragraph 79*d*.

## 173. Assembly

*a. Assemble Right Camshaft and Camshaft Drive.*

NOTE: The key letters shown below in parentheses refer to figure 144.

(1) Clamp camshaft assembly (AA–1) in a vise equipped with leather or copper jaws.

NOTE: The right camshaft assembly is shorter than the left because of the staggered position of the cylinders.

(2) Install driven gear (AA–2) and oil retaining cover assembly (AA–3) on large end of camshaft assembly and secure with eight $\frac{3}{8}$ x $\frac{7}{8}$ hex-head bolts (AA–4). Secure bolts with locking wire and remove camshaft from vise.

(3) Coat threads of $\frac{1}{4}$-inch 45 degree elbow (QQ) with gasket forming compound and install elbow in opening in gear housing assembly (PP). Position one new $2\frac{3}{8}$-inch id, "O" ring packing (N) on housing assembly and install camshaft and gear assembly (AA) in gear housing assembly.

(4) Position a new $2\frac{1}{4}$-inch id "O" ring packing (G) on drive support (F). Install drive bevel gear (H) in drive support with shaft of bevel gear entering bore of support and install drive support, with drive bevel gear, on studs on housing assembly, meshing teeth of drive and driven gears.

(5) Secure drive support to gear housing assembly with four $\frac{5}{16}$-inch hex self-locking nuts (SS), or $\frac{5}{16}$-inch hex nuts (SS), and $\frac{5}{16}$-inch hex stamped nuts (TT), and $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washers (RR).

(6) Position a new $2\frac{3}{8}$-inch id, "O" ring packing (N) on each end of the two intercylinder pipes (P) and slide pipes onto the camshaft assembly, centering pipes between the lobes on the camshaft.

(7) Position drive housing inner packing nut (B) and drive housing outer packing nut (C) on drive shaft tube (E), with threaded side of nuts facing ends of tube. Position new $1\frac{7}{16}$-inch id, "O" ring packings (A and D) over each end of drive shaft tube and install tube in bore of drive support. Tighten outer packing nut fingertight on support to hold tube in position.

(8) If oil seal (EE) was removed from tachometer drive - adapter assembly (DD), press new seal into bore of adapter, using a suitable press. Install tachometer drive shaft (BB) into adapter assembly, making certain oil seal is not damaged during installation of drive shaft. Adapter assembly is in-

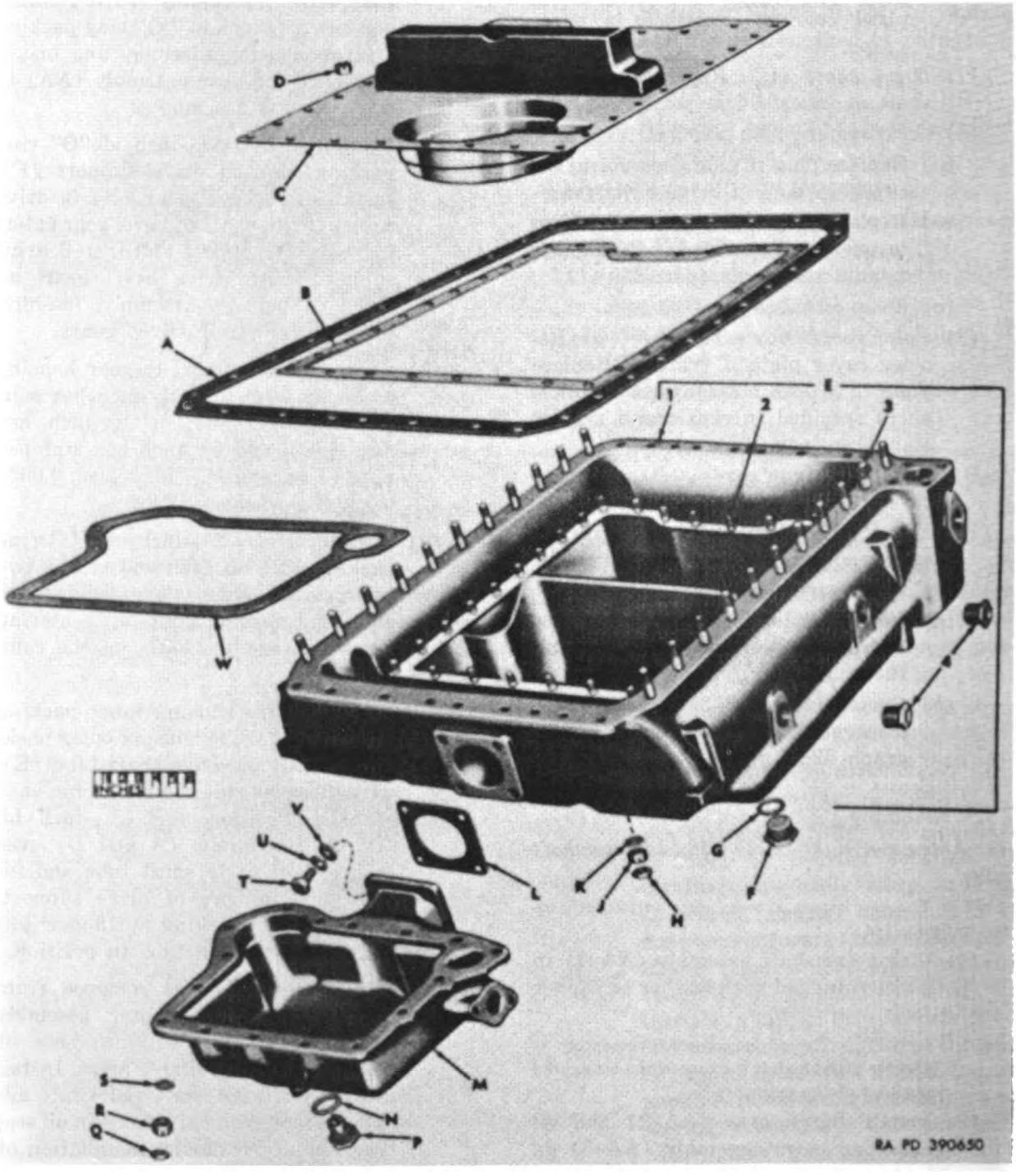



*Figure 146. Crankcase oil pan and accessory case oil sump—exploded view.*

stalled after camshaft is timed (par. 263).

*b. Assemble Left Camshaft and Camshaft Drive.*

NOTE: The key letters shown below in parentheses refer to figure 145.

(1) Clamp camshaft (FF–4) in a vise equipped with leather or copper jaws.

NOTE: The left camshaft is longer than the right camshaft assembly because of the staggered position of the cylinders.

(2) Install driven gear (FF–3) and oil retaining cover assembly (FF–2) on large end of camshaft and secure with eight 3/8 x 7/8 hex-head bolts (FF–1). Secure bolts with locking wire and remove camshaft from vise.

(3) Coat threads of 1/4-inch 45 degree elbow (EE) with gasket forming compound and install elbow in opening in gear housing assembly (J). Position one new 2 3/8-inch id "O" ring packing (M) on housing assembly and install camshaft and gear assembly (FF) in gear housing assembly.

(4) Position a new 2 1/4-inch id "O" ring packing (U) on drive support (V). Install drive bevel gear (T) in drive support with shaft of bevel gear entering bore of support and install drive support, with drive bevel gear, on studs on housing assembly, meshing teeth of drive and driven gears.

(5) Position ignition harness mounting bracket (fig. 46) on outer studs of gear housing assembly. Secure drive support and bracket to housing assembly with four 5/16-inch hex self-locking nuts (CC), or 5/16-inch hex nuts (CC) and 5/16-inch hex stamped nuts (BB), and two 21/64 id, 9/16 od, 0.0630 thick flat washers (DD). Install washers on inner studs without bracket.

(6) Position a new 2 3/8-inch id "O" ring packing (M) on each end of the two intercylinder pipes (N) and slide pipes onto camshaft, centering pipes between lobes on the camshaft.

(7) Position drive housing outer packing nut (Y) and drive housing inner packing nut (Z) on drive shaft tube (W), with threaded side of nuts facing ends of tube. Position new 1 7/16-inch id "O" ring packings (X and AA) over each end of drive shaft tube and install tube in bore of drive support. Tighten outer packing nut fingertight on support to hold tube in position.

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A–Oil pan gasket 7346525
B–Oil pan baffle gasket 7346536
C–Oil pan baffle 7346611
D–1/4-inch slotted hex nut 122925
E–Oil pan assembly 7375417
  1–Oil pan 7403453
  2–1/4 x 7/8 stud 7350204
  3–3/8 x 2 1/4 stud 7403099
  4–1-inch countersunk-head pipe plug 7338672
F–Oil pan drain plug 7954708
G–Oil pan drain plug gasket 142756
H–3/8-inch hex stamped nut 107823 (model AOSI–895–5M engine only)
J–3/8-inch hex nut 225854 (model AOSI–895–5M engine only)
J–3/8-inch hex self-locking nut 503351 or 503383 (model AOSI–895–5 engine only)
K–25/64 id, 5/8 od, 0.0640 thick plain washer 502204
L–Oil sump to oil pan gasket 7346557
M–Accessory case oil sump assembly 7375875
N–Oil sump drain plug gasket 105456
P–7/8-inch hex-head magnetic plug 7375426
Q–5/16-inch hex stamped nut 107822 (model AOSI–895–5M engine only)
R–5/16-inch hex nut 225853 (model AOSI–895–5M engine only)
R–5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)
S–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
T–3/8-inch hex-head bolt 7376941
U–3/8-inch lock washer 120382
V–25/64 id, 5/8 od, 0.0630 thick flat washer 8679576
W–Oil sump gasket 7346528

*Figure 146—Continued.*

## Section XIX. REBUILD OF CRANKCASE OIL PAN AND ACCESSORY CASE OIL SUMP

### 174. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 146.

*a.* Cut locking wire and remove 30 slotted hex nuts (D) securing oil pan baffle (C) to oil pan assembly (E). Remove baffle from oil pan assembly. Remove and discard oil pan baffle gasket (B).

*b.* Remove two countersunk-head pipe plugs (E–4) from right side of oil pan (E–1).

*c.* Remove oil pan drain plug (F) from oil pan, if present. Remove and discard oil pan drain plug gasket (G).

*d.* Remove hex-head magnetic plug (P) from accessory case oil sump assembly (M), if present. Remove and discard oil sump drain plug gasket (N).

### 175. Cleaning

Clean all parts as described in paragraph 77.

### 176. Inspection

NOTE: The key letters shown below in parentheses refer to figure 146.

*a. Oil Pan Baffle* (C). Inspect baffle for cracked, bent, or damaged condition.

*b. Oil Pan Assembly.*

(1) *Countersunk-head pipe plugs* (E–4). Inspect plugs for stripped or damaged threads and mutilated head.

(2) *Oil pan* (E–1). Inspect pan as described in paragraph 78*b*.

(3) *Studs* (E–2 and E–3). Inspect studs as described in paragraph 78*d*.

*c. Oil Pan Drain Plug* (F). Inspect plug for stripped or damaged threads and mutilated head.

*d. Accessory Case Oil Sump Assembly* (M). Inspect oil sump assembly as described in paragraph 78*b*.

*e. Hex-Head Magnetic Plug* (P). Inspect plug for stripped or damaged threads and mutilated head. Inspect plug for cracked or broken magnetic prongs.

### 177. Repair

NOTE: The key letters shown below in parentheses refer to figure 146.

*a. Oil Pan Baffle* (C). Straighten bent or damaged plate as close as possible to original shape. Repair minor cracks by welding or brazing. Replace plate if bends or cracks cannot be repaired.

*b. Oil Pan Assembly.*

(1) *Countersunk-head pipe plugs* (E–4). Replace plugs if threads are stripped or damaged or head is mutilated.

(2) *Oil pan* (E–1). Repair or replace oil pan as described in paragraph 79*b*.

(3) *Studs* (E–2 and E–3). Repair or replace studs as described in paragraph 79*d*.

*c. Oil Pan Drain Plug* (F). Replace plug if threads are stripped or damaged or head is mutilated.

*d. Accessory Case Oil Sump Assembly* (M). Repair or replace oil sump assembly as described in paragraph 79*b*.

*e. Hex-Head Magnetic Plug* (P). Replace plug if threads are stripped or damaged, if head is mutilated or magnetic prongs are cracked or broken.

### 178. Assembly

NOTE: The key letters shown below in parentheses refer to figure 146.

*a.* Position a new oil sump drain plug gasket (N) on ¾-inch hex-head magnetic plug (P) and install plug in opening in accessory case

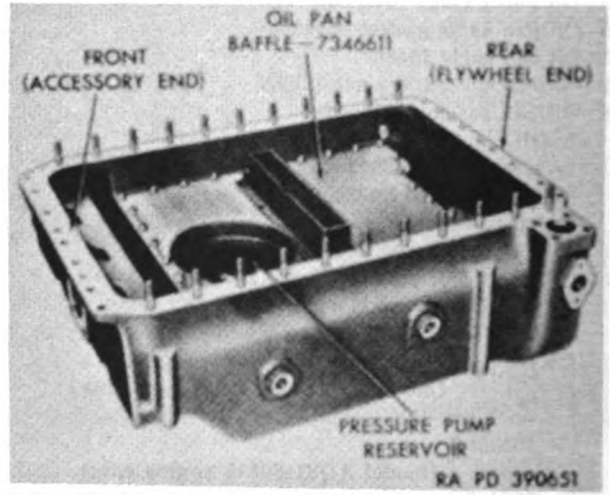



*Figure 147. Oil pan baffle installed in oil pan.*

oil sump assembly (M). Secure plug with locking wire.

*b.* Position a new oil pan drain plug gasket (G) on oil pan drain plug (F) and install plug in opening in oil pan. Secure plug with locking wire.

*c.* Install two 1-inch countersunk-head pipe plugs (E–4) in openings in right side of oil pan (E–1).

*d.* Position a new oil pan baffle gasket (B) in oil pan assembly (E). Install oil pan baffle (C) over gasket on studs in interior of oil pan assembly and secure with thirty ¼-inch slotted hex nuts (D). Secure nuts together, in pairs, with locking wire as shown in figure 147.

## Section XX. REBUILD OF CYLINDER HEAD OIL DRAIN MANIFOLDS

### 179. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 148.

*a.* Loosen hose clamps (E) securing hoses (F) to manifolds (A, G, and T) and tubes (L, Q, R, S, U, and Z). Remove hose, with attached clamps, from manifolds and tubes. Remove clamps from hose.

*b.* Loosen hose clamps (K) securing hose (H) to elbows (J) and tubes (L and S). Remove elbows from hose and remove hose, with attached clamps, from tubes. Remove clamps from hose.

*c.* Remove and discard manifold gaskets (B) from manifolds (A, G, and T). Strip off and discard manifold bolt gaskets (C) from hex-head bolts (D).

*d.* Remove and discard tube gaskets (P) from tubes (Q, R, U, and Z), and from oil drain tube adapter assembly (V).

### 180. Cleaning

Clean all parts as described in paragraph 77.

### 181. Inspection

NOTE: The key letters shown below in parentheses refer to figure 148.

*a. Manifolds* (A, G, and T). Inspect manifolds as described in paragraph 78*b*.

*b. Tubes* (L, Q, R, S, U, and Z). Inspect tubes for bends, cracks, dents, and warped mounting surfaces.

*c. Hose* (F and H). Inspect hose for fraying, cracking, and loss of resilience.

*d. Hose Clamps* (E and K).

(1) Inspect clamps for cracks, breaks, and bends.

(2) Inspect screws in clamps for stripped or damaged threads.

*e. Oil Drain Tube Adapter Assembly* (V).

(1) Inspect adapter assembly as described in paragraph 78*b*.

(2) Inspect Rosan inserts in adapter as described in paragraph 78*i*.

### 182. Repair

NOTE: The key letters shown below in parentheses refer to figure 148.

*a. Manifolds* (A, G, and T). Repair or replace manifolds as described in paragraph 79*b*.

*b. Tubes* (L, Q, R, S, U, and Z).

(1) Replace tubes if cracked.

(2) Replace tubes if badly bent or dented or tubes have badly warped mounting surfaces.

(3) Repair minor warpage of mounting surfaces by rubbing surface over abrasive cloth tightly held on a surface plate or other flat surface.

*c. Hose* (F and H). Replace hose if frayed or cracked or hose have lost their resilience.

*d. Hose Clamps* (E and K).

(1) Replace clamps if cracked, broken, or bent.

(2) Replace clamps if threads on screws are stripped or damaged.

*e. Oil Drain Tube Adapter Assembly* (V).

(1) Repair or replace adapter assembly as described in paragraph 79*b*.

(2) Repair or replace Rosan inserts in adapter as described in paragraph 79*i*.

### 183. Assembly

NOTE: The key letters shown below in parentheses refer to figure 148.

*a.* Install hose clamps (E) on hose (F). Do not tighten clamps.

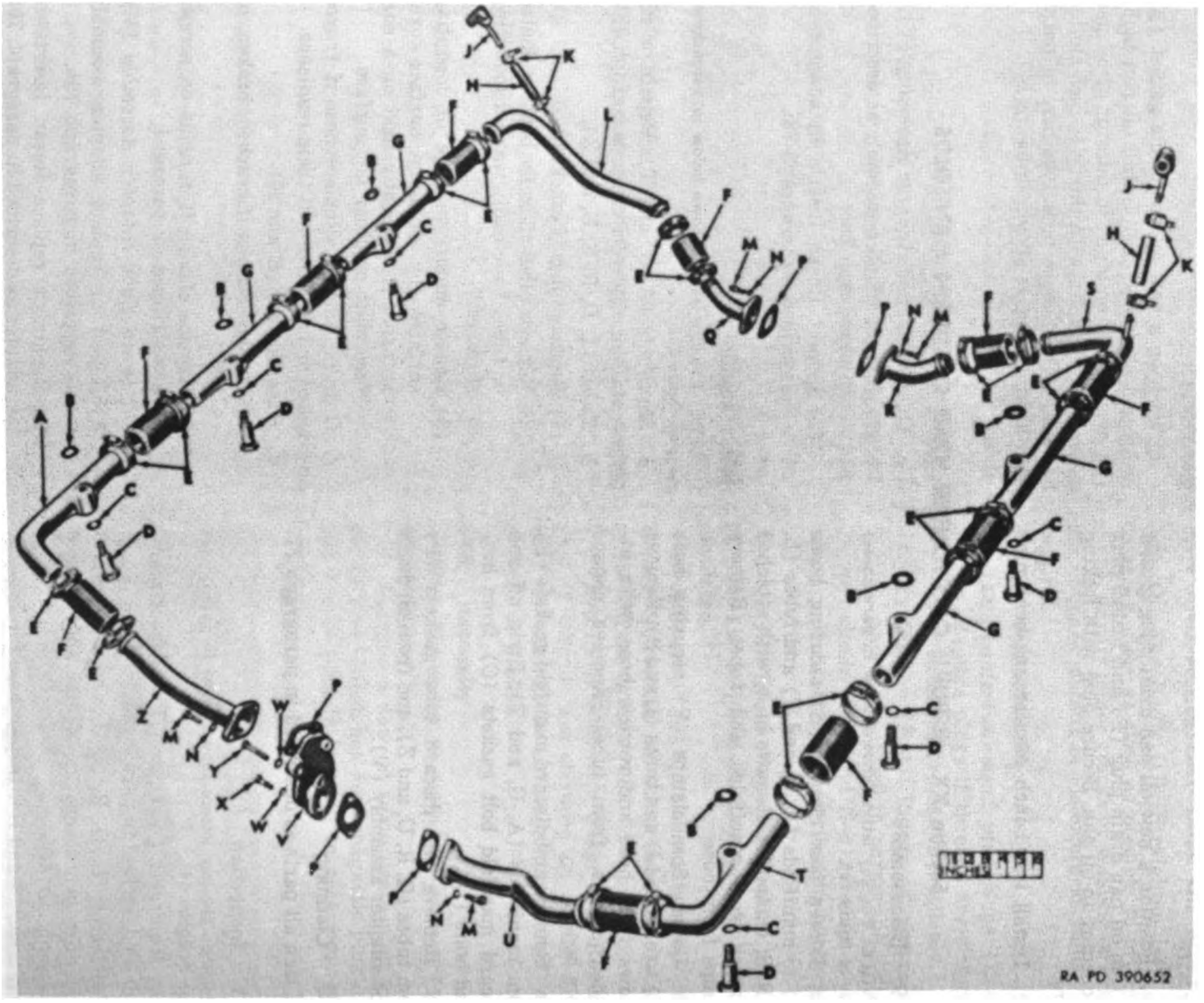



*Figure 148. Cylinder head oil drain manifolds and tubes—exploded view.*

A–Manifold 7346583
B–Manifold gasket 7767933
C–Manifold bolt gasket 105452
D–½ x 2 hex-head bolt 7767928
E–Hose clamp 502919
F–Hose 7403382
G–Manifold 7346582
H–Hose 7403384
J–Elbow 7346711
K–Hose clamp 502912
L–Tube 7403471
M–5/16 x ⅞ hex-head bolt 8365670
N–5/16-inch lock washer 120214
P–Tube gasket 7346510
Q–Tube 7403470
R–Tube 7403472
S–Tube 7403473
T–Manifold 8357821
U–Tube 8357824
V–Oil drain tube adapter assembly 7375423
W–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
X–5/16 x 27/32 hex-head bolt 7346710
Y–5/16 x 1 15/32 hex-head bolt 7348770
Z–Tube 7375425

*Figure 148—Continued.*

*b.* Install tube (U) and manifold (T) into ends of hose (F). Tighten clamps sufficiently to retain tube and manifold in hose. Do not tighten clamps completely.

*c.* Following the procedure in *b* above, install all manifolds and tubes in the left manifold group.

*d.* Install hose clamps (K) on hose (H) as in *a* above. Install hose (H) on extension of tube (S) and install elbow in other end of hose and tighten clamps as in *b* above.

*e.* Install hose, manifolds, and tubes in the right manifold group in the same manner as described for the left manifold group in *b* through *d* above.

## Section XXI. REBUILD OF INTAKE MANIFOLDS, BALANCE PIPE, AND CONNECTORS

### 184. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 149.

*a. Remove Fuel Injector Tube and Nozzle Assemblies.*

(1) Loosen safety sleeve nuts connecting fuel injector tube assemblies (fig. 40) to fuel injector nozzle elbows. Remove fuel injector tube assembly from manifold assembly (G).

(2) Cut locking wire and remove fillister-head screws and flat washers securing tube clamps to manifold assemblies (G and AA). Remove clamps. Remove

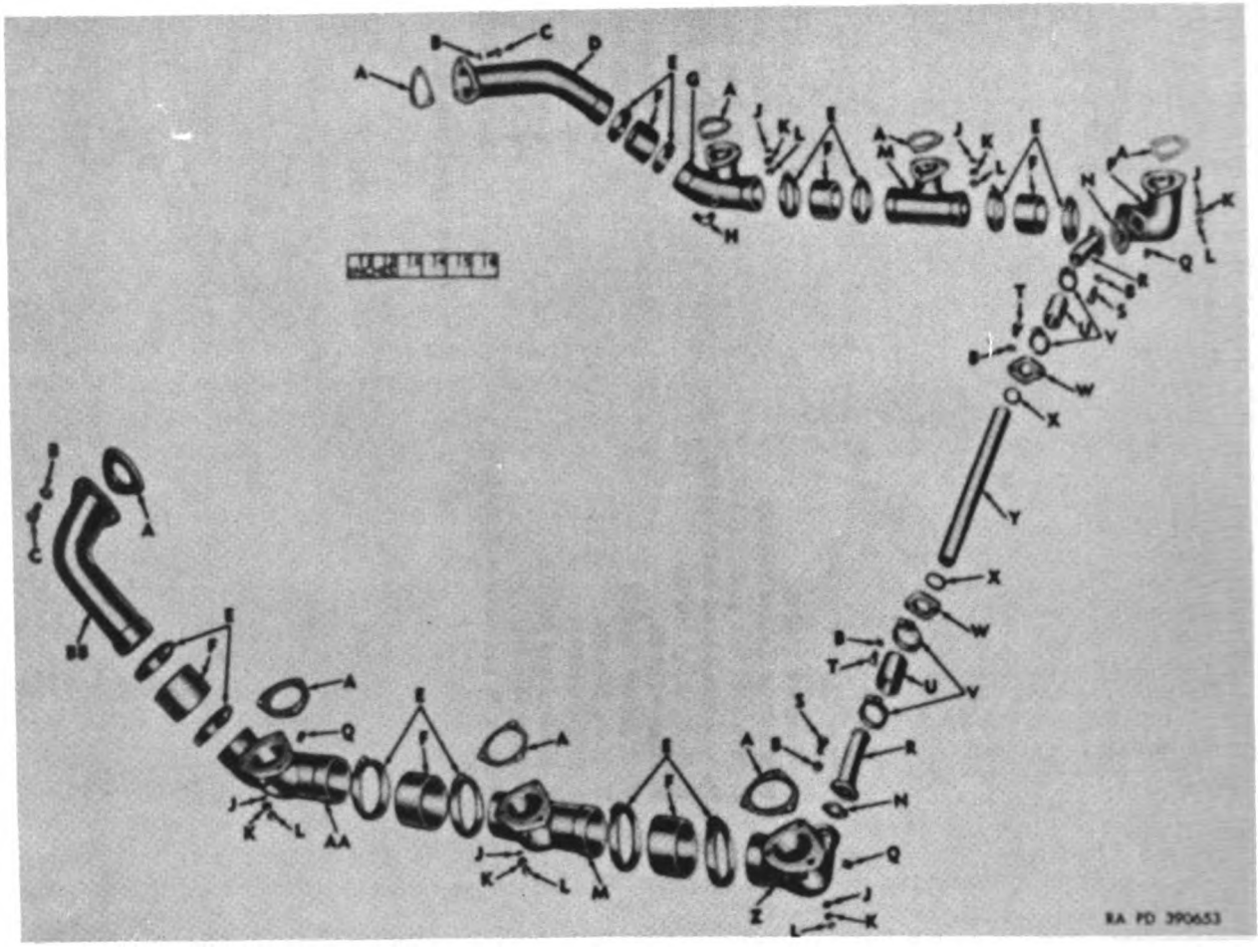



*Figure 149. Intake manifolds, balance pipe, and connectors—exploded view.*

remaining two fuel injector tube assemblies, with attached priming fuel tube assembly, from left intake manifold group.

(3) Remove two hex nuts and lock washers from hex-head bolts securing fuel injector tube supporting brackets to right intake manifold connector (BB). Remove bolts and remove inner bracket and remove outer bracket, with attached fuel injector tube assemblies, from right intake manifold group.

(4) Unscrew six fuel injector nozzle assemblies (fig. 40), with attached elbows, from openings in manifold assemblies (G, M, P, Z, and AA).

*b. Disassemble Intake Manifold Groups.*

(1) Loosen hose clamps (E) securing hose (F) to left and right intake manifold connectors (D and BB) and manifold assemblies (G, M, P, Z, and AA).

(2) Remove hose, with attached clamps, from connectors and manifold assemblies. Remove clamps from hose.

(3) Remove elbow (H) from manifold assembly (G). Remove hex-socket pipe plugs (Q) from manifold assemblies (P, Z, and AA).

## 185. Cleaning

Clean all parts as described in paragraph 77.

## 186. Inspection

NOTE: The key letters shown below in parentheses refer to figure 149.

*a. Left and Right Intake Manifold Connectors* (D and BB). Inspect connectors for cracks, dents, and warped mounting surfaces.

*b. Manifold Assemblies* (G, M, P, Z, and AA). Inspect manifold assemblies as described in paragraph 78*b*.

*c. Balance Pipe* (Y). Inspect pipe for cracks and dents.

*d. Balance Pipe Flanges* (W). Inspect flanges for cracked or broken condition.

*e. Balance Connector Tubes* (R). Inspect tubes for cracks, dents, and warped mounting surfaces.

*f. Hose* (F and U). Inspect hose for fraying, cracking, and loss of resilience.

*g. Hose Clamps* (E and V).

(1) Inspect clamps for cracks, breaks, and bends.

(2) Inspect screws in clamps for stripped or damaged threads.

*h. Elbow* (H). Inspect elbow for cracks and for stripped or damaged threads.

*i. Hex-Socket Pipe Plugs* (Q). Inspect pipe plugs for stripped or damaged threads and mutilated socket head.

## 187. Repair

NOTE: The key letters shown below in parentheses refer to figure 149.

---

A—Manifold gasket 7744566
B—5/16-inch lock washer 120214
C—5/16 x 27/32 hex-head bolt 583749
D—Left intake manifold connector 7346616
E—Hose clamp 502927
F—Hose 7375237
G—Manifold assembly 7737858
H—1/4-inch 90 degree elbow 7376122
J—21/64 id, 9/16 od, 0.0630 thick flat washer 502245
K—5/16-inch hex nut 225853 (model AOSI-895-5M engine only)
K—5/16-inch hex self-locking nut 503345 or 503380 (model AOSI-895-5 engine only)
L—5/16-inch hex stamped nut 107822 (model AOSI-895-5M engine only)
M—Manifold 8679609
N—Connector tube gasket 7346510
P—Manifold assembly 8679613
Q—1/8-inch hex-socket pipe plug 7538990
R—Balance connector tube 7348830
S—5/16 x 7/8 hex-head bolt 8365670
T—5/16 x 1 1/8 hex-head bolt 8365671
U—Hose 7744553
V—Hose clamp 502919
W—Balance pipe flange 7348815
X—1 1/4-inch id "O" ring packing 501232
Y—Balance pipe 7348816
Z—Manifold assembly 8679612
AA—Manifold assembly 7737857
BB—Right intake manifold connector 7346615

*Figure 149—Continued.*

*a. Left and Right Intake Manifold Connectors* (D and BB).

(1) Replace connectors if cracked.

(2) Replace connectors if badly dented or if connectors have badly warped mounting surfaces.

(3) Repair minor warpage of mounting surfaces by rubbing surface over abrasive cloth tightly held on a surface plate or other flat surface.

*b. Manifold Assemblies* (G, M, P, Z, and AA). Repair or replace manifold assemblies as described in paragraph 79*b*.

*c. Balance Pipe* (Y). Replace pipe if cracked or badly dented.

*d. Balance Pipe Flanges* (W). Replace flanges if cracked or broken.

*e. Balance Connector Tubes* (R).

(1) Replace tubes if cracked.

(2) Replace tubes if badly dented or tubes have badly warped mounting surfaces.

(3) Repair minor warpage of mounting surfaces by rubbing surfaces over abrasive cloth tightly held on a surface plate or other flat surface.

*f. Hose* (F and U). Replace hose if frayed or cracked or if hose have lost their resilience.

*g. Hose Clamps* (E and V).

(1) Replace clamps if cracked, broken, or bent.

(2) Replace clamps if threads on screws are stripped or damaged.

*h. Elbow* (H). Replace elbow if cracked or threads are stripped or damaged.

*i. Hex-Socket Pipe Plugs* (Q). Replace pipe plugs if threads are stripped or damaged or socket head is mutilated.

### 188. Assembly

NOTE: The key letters shown below in parentheses refer to figure 149.

*a. Assemble Intake Manifold Groups.*

(1) Coat threads of ⅛-inch hex-socket pipe plugs (Q) with gasket forming compound and install plugs in openings in manifold assemblies (P, Z, and AA).

(2) Coat threads on ¼-inch 90 degree elbow (H) with gasket forming compound and install elbow in opening in manifold assembly (G). Refer to figure 40 for position of elbow after installation.

(3) Position hose clamps (E) on hose (F). Do not tighten clamps.

(4) Install right intake manifold connector (BB) and manifold assembly (AA) into ends of hose (F). Tighten clamps sufficiently to retain connector and manifold assembly in hose. Do not tighten clamps completely.

(5) Following the procedure in (4) above, install all connectors and manifold assemblies in the right intake manifold group.

(6) Install hose, connectors, and manifold assemblies in the left intake manifold group in the same manner as described for the right intake manifold group in (4) and (5) above.

*b. Install Fuel Injector Tube and Nozzle Assemblies.* Fuel injector tube and nozzle assemblies are installed in intake manifold groups after the manifolds have been installed on the engine (par. 267). Refer to paragraph 214 through 218 for rebuild of fuel injector tube and nozzle assemblies. The balance pipe and balance connector tubes are installed when manifolds are installed on the engine (par. 267).

## Section XXII. REBUILD OF ENGINE SHROUD ASSEMBLY

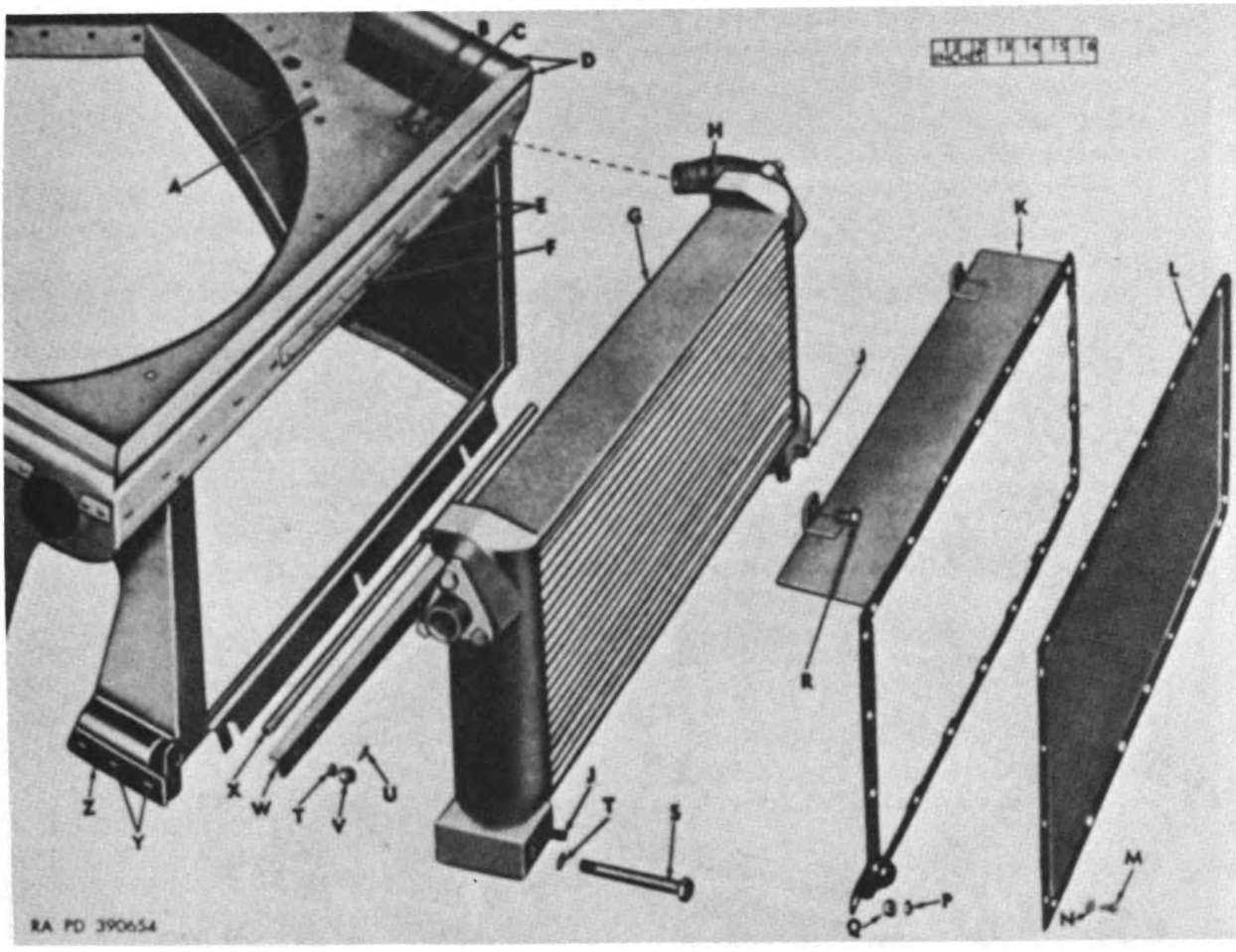
### 189. Disassembly

*a. Remove Oil Cooler Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 150.

(1) *Remove engine oil cooler assembly.*

(*a*) Remove 22 round-head screws (M) and internal-teeth lock washers (N) securing oil cooler screen (L) to oil




A—Engine shroud assembly { 7375868 (model AOSI-895-5M engine only) / 7737950 (model AOSI-895-5 engine only) }
B—⅜-inch hex stamped nut 107823 (model AOSI-895-5M engine only)
C—{ ⅜-inch hex nut 225854 (model AOSI-895-5M engine only) / ⅜-inch hex self-locking nut 503351 or 503383 } (model AOSI-895-5M engine only)
D—Shroud top seal 7403455
E—Shouldered fastener 8365667
F—{ Right top seal reinforcing strip 8380711 / Left top seal reinforcing strip 8380712 }
G—{ Engine oil cooler assembly 8380706 / Transmission oil cooler assembly 8380707 }
H—⅜ x 1 13/32 stud 27462-8518043
J—5/16 x 1⅛ stud 27462-8518145
K—Oil cooler screen support 7403366
L—Oil cooler screen 7376041
M—No. 8 x ⅜ round-head screw 221115
N—No. 8 internal-teeth lock washer 138530
P—5/16-inch hex stamped nut 107822 (model AOSI-895-5M engine only)
Q—{ 5/16-inch hex nut 225853 (model AOSI-895-5M engine only) / 5/16-inch hex self-locking nut 503345 or 503380 } (model AOSI-895-5 engine only)
R—5/16 x 9/16 hex-head lockwasher bolt 7414584
S—⅜ x 3 61/64 hex-head bolt 583759
T—25/64 id, ⅝ od, 0.0640 thick plain washer 502204
U—1/16 x ¾ cotter pin 121223
V—⅜-inch slotted hex nut 122961
W—Oil cooler seal hose bracket 7414506
X—Oil cooler seal hose 7403495
Y—Shouldered fastener 7347780
Z—Shroud seal 7403696

*Figure 150. Oil cooler assembly and screen—exploded view.*

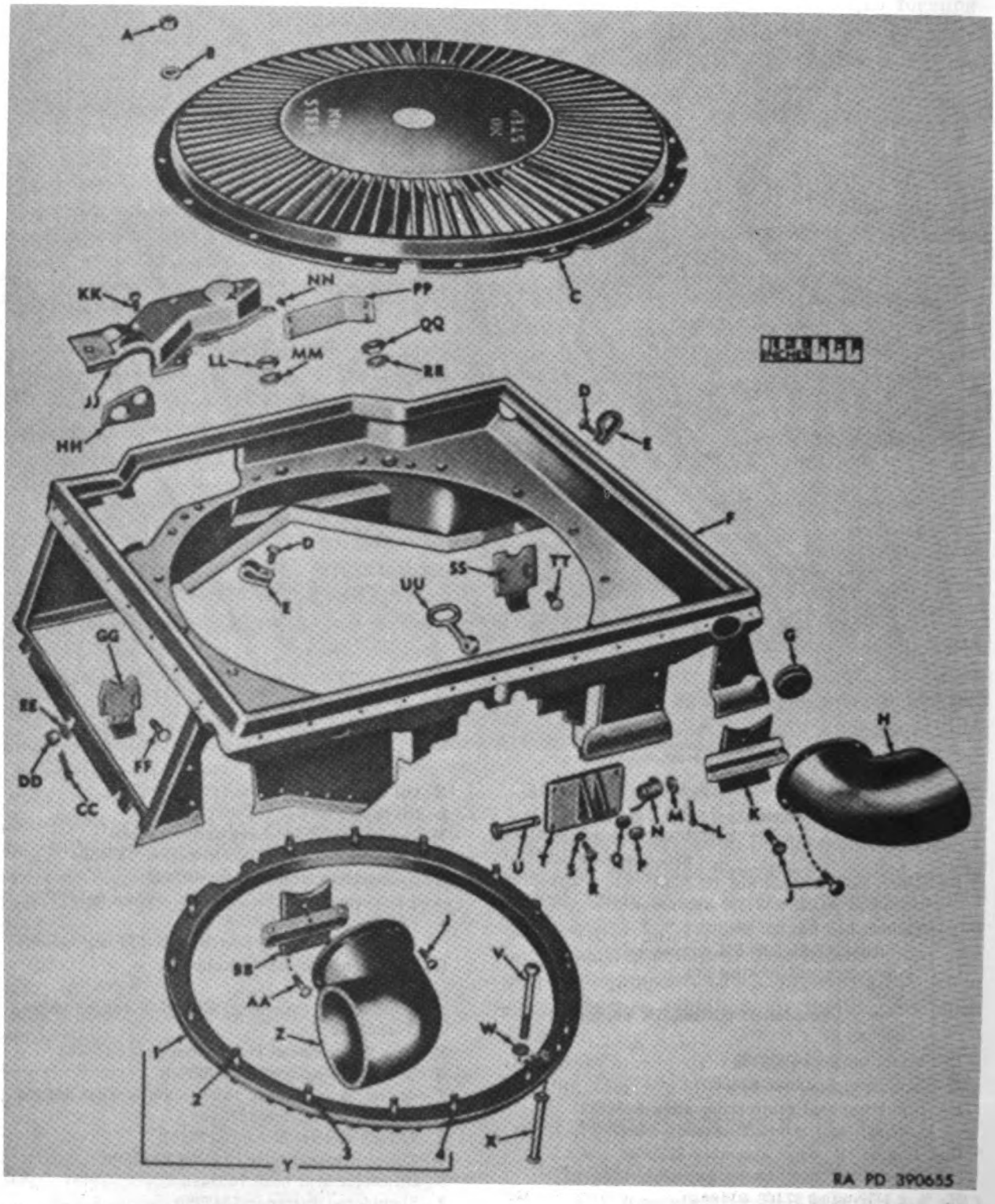



*Figure 151. Engine shroud assembly—exploded view.*

A—5/16-inch hex self-locking nut 592496
B—0.3300 id, 0.8100 od, 1/8 thick flat washer 7744766
C—Fan outlet vane housing assembly 7403381
D—3/8 x 1 hex-head lockwasher bolt 425592
E—Oil cooler outlet hose clip 7376082
F—Engine shroud assembly { 7737950 (model AOSI-895-5 engine only) | 7375868 (model AOSI-895-5M engine only)
G—Grommet 7376701
H—Left cooling air inlet elbow 7376011
J—5/16 x 9/16 lockwasher bolt 7414584
K—Left exhaust slot cover assembly 7375870
L—1/8 x 1 cotter pin 137185
M—2 1/32 id, 1 od, 1/8 thick flat washer 7376080
N—Lifting eye spring 7376032
P—7/16-inch hex stamped nut 107824 (model AOSI-895-5M engine only)
Q—{ 7/16-inch hex nut 225855 (model AOSI-895-5M engine only) | 7/16-inch hex self-locking nut 503357 or 503386 (model AOSI-895-5 engine only)
R—5/16 x 27/32 hex-head bolt 583749
S—5/16-inch lock washer 120214
T—Lifting eye bracket 7376021
U—3/8 x 3 1/8 flat-head pin 7376019
V—3/8 x 9 hex-head bolt 7376131
W—0.3900 id, 0.8100 od, 1/8 thick flat washer 7767318
X—Fan rotor housing support 7375867
Y—Fan rotor housing assembly 7376053
1—Housing 7403456
2—7/16 x 1 1/8 stud 7403066
3—7/16 x 1 13/16 stud 7403067
4—5/16 x 7/16 stud 7403503
Z—Right cooling air inlet elbow 7376010
AA—5/16 x 9/16 hex-head lock washer bolt 7414584
BB—Right exhaust slot cover assembly 7375869
CC—1/16 x 3/4 cotter pin 121223
DD—3/8-inch slotted hex nut 122961
EE—2 3/64 id, 5/8 od, 0.0640 thick plain washer 502204
FF—5/16 x 9/16 hex-head lockwasher bolt 7414584
GG—Left hotspot tube slot cover assembly 7376015 (model AOSI-895-5M engine only)
HH—Rubber insulator 8666731
JJ—Oil control housing cover 7737789
KK—5/16 x 9/16 hex-head lockwasher bolt 7414584
LL—3/8-inch hex self-locking nut 587343
MM—0.3900 id, 0.8100 od, 1/8 thick flat washer 7767318
NN—5/16 x 9/16 hex-head lockwasher bolt 7414584
PP—Hotspot outlet opening cover 8679600 (model AOSI-895-5M engine only)
QQ—5/16-inch hex nut 225853
RR—5/16-inch internal-teeth lock washer 138538
SS—Right hotspot tube slot cover assembly 7376016 (model AOSI-895-5M engine only)
TT—5/16 x 9/16 hex-head lockwasher bolt 7414584
UU—Crankcase lifting eye 7376022

*Figure 151—Continued.*

cooler screen support (K). Remove screen.

(*b*) Remove two hex-head lockwasher bolts (R) and hex self-locking nuts (Q) or hex stamped nuts (P) and hex nuts (Q), securing oil cooler screen support (K) to engine shroud assembly (A) and engine oil cooler assembly (G) and remove support.

(*c*) Cut locking wire and remove hex-head bolt (S), plain washer (T), and two hex self-locking nuts (C), or hex stamped nuts (B) and hex nuts (C), securing engine oil cooler assembly (G) to shroud assembly and remove oil cooler assembly.

(2) *Remove transmission oil cooler assembly.* Remove transmission oil cooler assembly from opposite side of shroud assembly in the same manner as described for engine oil cooler assembly in (1) above.

*b. Disassemble Engine Shroud Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 151 except where otherwise indicated.

(1) Remove cotter pin (L), flat washer (M), lifting eye spring (N), and flat-head pin (U) securing crankcase lifting eye (UU) in lifting eye bracket (T). Remove pin from bracket and eye and remove bracket and eye from engine shroud assembly (F).

(2) Remove four hex self-locking nuts (A) and flat washers (B) securing fan rotor housing assembly (Y) to shroud assembly and remove housing assembly.

(3) Remove hex-head lockwasher bolt (D) securing oil cooler outlet hose clip (E) to shroud assembly. Remove engine oil cooler outlet hose assembly, with attached hose clip and special shaped section rubber (HH), from shroud assembly. Remove clip and rubber from hose assembly.

(4) Do not remove hotspot opening outlet cover (PP) (model AOSI–895–5M engine only) unless inspection (par. 191) indicates replacement is necessary. To remove cover, remove four hex-head lockwasher bolts (NN) and remove cover.

(5) Do not remove shroud seals (D and Z, fig. 150) unless inspection (par. 191) indicates replacement is necessary. To remove seals, bend up tabs of shouldered fasteners (E and Y, fig. 150), remove seal reinforcing strips (F, fig. 150), and remove and discard seals.

## 190. Cleaning

Clean all parts as described in paragraph 77.

## 191. Inspection

NOTE: They key letters shown below in parentheses refer to figure 151 except where otherwise indicated.

*a. Oil Cooler Screens* (L, fig. 150). Inspect screens for cracked, broken, or bent mounting flange and torn or broken screening.

*b. Oil Cooler Screen Supports* (K, fig. 150). Inspect support for cracked, broken, or bent screen mounting flange and support mounting brackets.

*c. Fan Rotor Housing Supports* (X). Inspect supports for cracked, broken, or bent condition.

*d. Fan Rotor Housing Assembly.*

(1) *Housing* (Y–1). Inspect housing for cracked, broken, or bent condition.

(2) *Studs* (Y–2, Y–3, and Y–4). Inspect studs as described in paragraph 78*d*.

*e. Left and Right Cooling Air Inlet Elbows* (H and Z). Inspect elbows for cracks.

*f. Fan Outlet Van Housing Assembly* (C).

(1) Inspect vane housing assembly for bent, cracked, or broken vanes.

(2) Inspect housing for warped condition.

*g. Lifting Eye Group.* Inspect crankcase lifting eye (UU), lifting eye spring (N), and lifting eye bracket (T) for cracked or broken condition.

*h. Covers* (K, BB, GG, JJ, PP, and SS). Inspect covers for cracked, broken, or bent condition.

*i. Engine Shroud Assembly.*

(1) *Seals* (D and Z, fig. 150). Inspect seals for torn or deteriorated condition.

(2) *Special shaped section rubber* (HH). Inspect rubber for torn or deteriorated condition.

(3) *Engine shroud assembly* (F).

(*a*) Inspect sheet metal parts of shroud for cracked, broken, or bent condition.

(*b*) Inspect nuts welded to shroud for secure welds and stripped or damaged threads.

(*c*) Inspect speed grip retaining nuts which secure covers at ends of shroud for secure fit.

(4) *Grommet* (G). Inspect grommet for torn or deteriorated condition.

## 192. Repair

NOTE: They key letters shown below in parentheses refer to figure 151 except where otherwise indicated.

*a. Oil Cooler Screens* (L, fig. 150). Replace screens if mounting flange is cracked or broken or if screens have torn or broken screening. Straighten bent screen to as near original shape as possible.

*b. Oil Cooler Screen Supports* (K, fig. 150). Replace supports if screen mounting flange or support mounting brackets are cracked or broken. Straighten bent supports to as near original shape as possible.

*c. Fan Rotor Housing Supports* (X). Replace supports if cracked, broken or bent.

*d. Fan Rotor Housing Assembly.*

(1) *Housing* (Y–1). Replace housing if cracked or broken.

(2) *Studs* (Y–2, Y–3, and Y–4). Repair or replace studs as described in paragraph 79*d*.

*e. Left and Right Cooling Air Inlet Elbows* (H and Z). Replace elbows if cracked.

*f. Fan Outlet Vane Housing Assembly* (C).

(1) Replace housing if vanes are cracked, broken, or bent.

(2) Replace housing if warped. Straighten warped housing to near original shape, if possible.

*g. Lifting Eye Group.* Replace crankcase lifting eye (UU), lifting eye spring (N), or lifting eye bracket (T) if cracked or broken.

*h. Covers* (K, BB, GG, JJ, PP, and SS). Replace covers if cracked or broken. Straighten bent covers to as near original shape as possible.

*i. Engine Shroud Assembly.*

(1) *Seals* (D and Z, fig. 150). Replace seals if torn or deteriorated.

(2) *Special shaped section rubber* (HH). Replace rubber if torn or deteriorated.

(3) *Engine shroud assembly* (F).

(*a*) Replace shroud if sheet metal parts are cracked or broken. Straighten bent parts to as near original shape as possible.

(*b*) Replace nuts welded to shroud if threads are stripped or damaged. Reweld loose nuts.

(*c*) Replace loose speed grip nuts.

(4) *Grommet* (G). Replace grommet if torn or deteriorated.

## 193. Assembly

*a. Assemble Shroud Assembly.*

NOTE: They key letters shown below in parentheses refer to figure 151 except where otherwise indicated.

(1) If shroud seals (D and Z, fig. 150) were removed, install new seals and secure seals with shouldered fasteners (Ξ and Y, fig. 150) and seal reinforcing strips (F, fig. 150). Bend tabs of fasteners over seals and strips.

(2) If hotspot outlet opening cover (PP) (model AOSI–895–5M engine only) was removed, install cover and secure with four 5/16 x 5/16 hex-head lockwasher bolts (NN).

(3) Install crankcase lifting eye (UU) through opening in engine shroud assembly (F) and into lifting eye bracket (T) and secure with 5/8 x 3 1/8 flat-head pin (U), lifting eye spring (N), 21/32 id, 1.0 od, 1/8 thick flat washer (M), and 1/8 x 1 cotter pin (L).

(4) Install fan rotor housing assembly (Y) in engine shroud assembly (F) and secure housing assembly in shroud with four 5/16-inch hex self-locking nuts (A) and 0.3300 id, 0.8100 od, 1/8 thick flat washers (B).

NOTE: Install fan rotor housing assembly in shroud so notches in housing assembly clear holes for oil control housing cover.

*b. Install Oil Cooler Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 150 except where otherwise indicated. Oil cooler assemblies must be rebuilt before installing assemblies on shroud assembly. Refer to paragraphs 209 through 213 for rebuild of oil cooler assemblies.

(1) *Install transmission oil cooler assembly.*

NOTE: Engine must be removed from overhaul stand to install transmission oil cooler inlet and outlet hose assemblies. Install hose assemblies ((*d*) through (*f*) below) after removing engine from stand (par. 288).

(*a*) Install transmission oil cooler assembly (G) on left side of shroud and secure with two 3/8-inch hex self-locking nuts (C), or 3/8-inch hex nuts (C) and 3/8-inch hex stamped nuts (B), two 3/8 x 3 61/64 hex-head bolts (S), and 25/64 id, 5/8 od, 0.0640 thick plain washer (T). Secure bolt with locking wire.

(*b*) Install oil cooler screen (L) on oil cooler screen support (K) and secure with twenty-two No. 8 x 3/8 round-head screws (M) and No. 8 internal-teeth lock washers (N).

(*c*) Install support, with attached screen, on oil cooler assembly and secure with two 5/16 x 5/16 hex-head lockwasher bolts (R) and 5/16-inch hex self-locking nuts (Q), or 5/16-inch hex nuts (G) and 5/16-inch hex stamped nuts (P).

(*d*) Position grommet (G, fig. 151) and oil cooler outlet hose clip (E, fig. 151) on transmission oil cooler outlet hose assembly and position hose assembly in shroud, with ends of hose assembly extending through holes in shroud. Slide grommet along hose assembly toward rear of shroud and install grommet in hole in shroud.

(*e*) Connect outlet hose assembly to connector on front end of oil cooler assembly and secure hose clip with 3/8

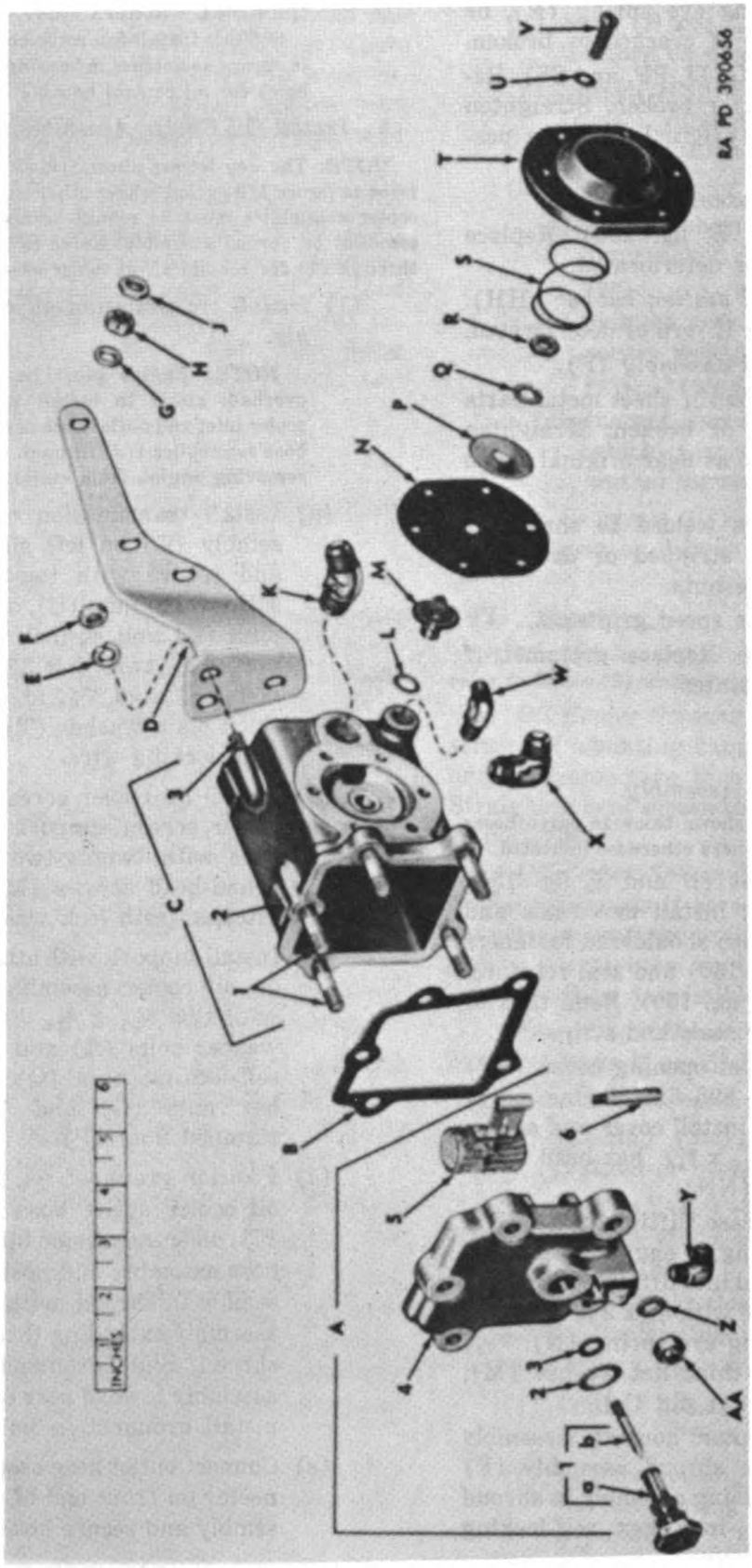



*Figure 152. Fuel vapor separator assembly, elbows, and mounting bracket—exploded view.*

A—Cover assembly 7737849
- 1—Vapor valve assembly 7973931
  - a—Vapor valve seat 7973937
  - b—Vapor valve 7973933
- 2—Vapor valve mounting gasket 7973938
- 3—Vapor valve gasket 7973939
- 4—Cover 7737795
- 5—Vapor valve float 7973940
- 6—Float fulcrum screw 7973941

B—Cover gasket 7737788

C—Body assembly 7737841
- 1—5/16 x 1 11/16 stud 7403071
- 2—Body 7737842
- 3—5/16 x 1 13/32 stud 7403507

D—Mounting bracket 7084509

E—5/16-inch lock washer 120379

F—5/16-inch hex nut 225853

G—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

H—
- 5/16-inch hex nut 225853 (model AOSI–895–5M engine only)
- 5/16-inch hex self-locking nut 503345 or 503380 (model AOSI–895–5 engine only)

J—5/16-inch hex stamped nut 107822 (model AOSI–895–5M engine only)

K—3/8-inch 45 degree elbow 7410042

L—0.3620-inch id "O" ring packing 7974615

M—Inlet valve 7737844

N—Inlet valve diaphragm 7737845

P—Inlet valve recessed washer 7737846

Q—5/16-inch lock washer 120379

R—5/16-inch hex nut 8682934

S—Inlet valve spring 7737847

T—Inlet valve cover 7737843

U—0.2030 id, 0.4380 od, 0.0320 thick flat washer 192588

V—No. 10 x 3/4 fillister-head screw 586906

W—1/8-inch 45 degree adapter elbow 7767516

X—3/8-inch 90 degree adapter elbow 7346726

Y—1/8-inch 90 degree adapter elbow 7767517

Z—21/64 id, 9/16 od, 0.0630 thick flat washer 502245

AA—5/16-inch hex self-locking nut 592496

*Figure 152—Continued.*

x 1 hex-head lockwasher bolt (D, fig. 151).

(*f*) Connect hose assembly to connector on rear end of oil cooler assembly.

(2) *Install engine oil cooler assembly.*

(*a*) Install engine oil cooler assembly on opposite side of shroud assembly in the same manner as described for transmission oil cooler assembly in (1)(*a*) through (*c*) above.

(*b*) Position oil cooler outlet hose clip (E, fig. 151) and special shaped section rubber (HH, fig. 151) on engine oil cooler outlet hose assembly, with hose assembly through larger hole in rubber, and install hose assembly in shroud. Connect hose to connector on rear of oil cooler assembly and secure hose clip with ⅜ x 1 hex-head lockwasher bolt (D, fig. 151).

(*c*) Connect inlet hose assembly to connector on front of oil cooler assembly.

## Section XXIII. REBUILD OF FUEL VAPOR SEPARATOR ASSEMBLY

### 194. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 152.

*a. Remove Hose Assemblies and Elbows.*

(1) Disconnect coupling nuts and remove four hose assemblies (fig. 26) from elbows in fuel vapor separator assembly.

(2) Remove elbows (K, W, X, and Y) from body assembly (C) and cover (A–4).

*b. Disassemble Fuel Vapor Separator Assembly.*

(1) Remove three hex nuts (F) and lock washers (E) securing mounting bracket (D) to body assembly and remove bracket.

(2) Cut locking wire and remove six fillister-head screws (V) and flat washers (U) securing inlet valve cover (T) to body assembly and remove cover.

(3) Remove inlet valve spring (S) and inlet valve (M), with attached inlet valve diaphragm (N) and inlet valve recessed washer (P), from body assembly. Remove and discard "O" ring packing (L).

(4) Remove hex nut (R) from inlet valve and remove lock washer (Q), inlet valve recessed washer (P), and inlet valve diaphragm (N) from inlet valve.

(5) Cut locking wire and remove vapor valve seat (A–1–a) from cover (A–4). Remove vapor valve (A–1–b) from well in cover. Remove and discard vapor valve mounting gasket (A–2) and vapor valve gasket (A–3).

(6) Remove five hex self-locking nuts (AA) and flat washers (Z) securing cover (A–4) to body assembly and remove cover. Remove and discard cover gasket (B).

(7) Remove float fulcrum screw (A–6) from cover and vapor valve float (A–5) and remove float.

### 195. Cleaning

Clean all parts as described in paragraph 77.

### 196. Inspection

NOTE: The key letters shown below in parentheses refer to figure 152.

*a. Elbows* (K, W, X, and Y). Inspect elbows for cracks and stripped or damaged threads.

*b. Mounting Bracket* (D). Inspect bracket for cracked, broken, or bent condition.

*c. Inlet Valve Cover* (T).

(1) Inspect cover for cracks and burred mounting surface.

(2) Inspect two small vent holes in cover to be sure they are open.

*d. Inlet Valve Spring* (S). Inspect spring for cracks or breaks and check spring for conformance to limits specified in repair and rebuild standards (par. 331).

*e. Inlet Valve Diaphragm* (N).

(1) Inspect diaphragm for torn or deteriorated condition. Inspect diaphragm closely for pin holes in rubber.

(2) Inspect inlet valve recessed washer (P) for cracks.

*f. Inlet Valve* (M).

(1) Inspect valve for burred or nicked seats.

(2) Inspect valve for stripped or damaged threads.

(3) Check valve for conformance to tolerances specified in repair and rebuild standards (par. 331).

*g. Cover Assembly.*

(1) *Vapor valve assembly.*

(*a*) *Vapor valve seat* (A–1–a)). Inspect seat for wear, cracks, and stripped or damaged threads. Check seat for conformance to tolerances specified in repair and rebuild standards (par. 331).

(*b*) *Vapor valve* (A–1–b). Inspect valve for wear and cracks. Check valve for conformance to tolerances specified in repair and rebuild standards (par. 331).

(2) *Vapor valve float* (A–5).

(*a*) Inspect float for cracked, broken, or bent bracket.

(*b*) Inspect cork for deteriorated condition.

(*c*) Check float for conformance to tolerances specified in repair and rebuild standards (par. 331).

(3) *Float fulcrum screw* (A–6). Inspect screw for wear and for stripped or damaged threads. Check screw for conformance to tolerances specified in repair and rebuild standards (par. 331).

(4) *Cover* (A–4).

(*a*) Inspect cover for cracks and stripped or damaged threads.

(*b*) Check cover for conformance to tolerances specified in repair and rebuild standards (par. 331).

*h. Body Assembly.*

(1) *Body* (C–2). Inspect body as described in paragraph 78*b*.

(2) *Studs* (C–1 and C–3). Inspect studs as described in paragraph 78*d*.

## 197. Repair

**NOTE: The key letters shown below in parentheses refer to figure 152.**

*a. Elbows* (K, W, X, and Y). Replace elbows if cracked or threads are stripped or damaged.

*b. Mounting Bracket* (D). Replace bracket if cracked, broken, or bent.

*c. Inlet Valve Cover* (T).

(1) Replace cover if cracked or mounting surface is burred. Remove burs from mounting surface with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(2) If small vent holes in cover are plugged, clean holes with fine wire.

*d. Inlet Valve Spring* (S). Replace spring if cracked or broken or spring does not conform to limits specified in repair and rebuild standards (par. 331).

*e. Inlet Valve Diaphragm* (N).

(1) Replace diaphragm if torn or deteriorated or holes are evident.

(2) Replace inlet valve recessed washer (P) if cracked.

*f. Inlet Valve* (M).

(1) Replace valve if seats are burred or nicked.

(2) Replace valve if threads are stripped or damaged.

(3) Replace valve if valve does not conform to tolerances specified in repair and rebuild standards (par. 331).

*g. Cover Assembly.*

(1) *Vapor valve assembly.*

(*a*) *Vapor valve seat* (A–1–a). Replace complete vapor valve assembly if seat is worn or cracked or if threads are stripped or damaged. Replace vapor valve assembly if seat does not conform to tolerances specified in repair and rebuild standards (par. 331).

(*b*) *Vapor valve* (A–1–b). Replace complete vapor valve assembly if valve is worn or cracked. Replace vapor valve assembly if valve does not conform to tolerances specified in repair and rebuild standards (par. 331).

(2) *Vapor valve float* (A–5).

(*a*) Replace float if bracket is cracked, broken, or bent.

(*b*) Replace float if cork is deteriorated.

(*c*) Replace float if it does not conform to tolerances specified in repair and rebuild standards (par. 331).

(3) *Float fulcrum screw* (A–6). Replace screw if worn, threads are stripped or damaged, or screw does not conform to tolerances specified in repair and rebuild standards (par. 331).

(4) *Cover* (A–4).

(*a*) Replace cover if cracked or threads are stripped or damaged.

(*b*) Replace cover if it does not conform to tolerances specified in repair and rebuild standards (par. 331).

*h. Body Assembly.*

(1) *Body* (C–2). Repair or replace body as described in paragraph 79*b*.

(2) *Studs* (C–1 and C–3). Repair or replace studs as described in paragraph 79*d*.

## 198. Assembly

NOTE: The key letters shown below in parentheses refer to figure 152.

*a. Assemble Fuel Vapor Separator Assembly.*

(1) Position bracket of vapor valve float (A–5) between bosses on underside of cover (A–4) and secure with float fulcrum screw (A–6). Pivot float on screw to be sure float is free.

(2) Install vapor valve (A–1–b), new vapor valve gasket (A–3), and new vapor valve mounting gasket (A–2) on vapor valve seat (A–1–a). Install vapor valve seat, with installed vapor valve, in well in cover and secure with locking wire.

(3) Position a new cover gasket (B) over studs on body assembly (C), install cover assembly (A) over gasket, and secure with five 5/16-inch hex self-locking nuts (AA) and 21/64 id, 9/16 od, 0.0630 thick flat washers (Z).

(4) Position a new 0.3620-inch id, "O" ring packing (L) in groove in stem of inlet valve (M), install inlet valve diaphragm (N) and inlet valve recessed washer (P) on threaded stem of valve, and secure with 5/16-inch hex nut (R) and 5/16-inch lock washer (Q).

(5) Install inlet valve (M), with attached diaphragm and recessed washer, in well in side of body assembly. Aline holes in diaphragm with holes in body assembly.

(6) Install inlet valve spring (S) and inlet valve cover (T) on body assembly and secure with six No. 10 x 3/4 fillister-head screws (V) and 0.2030 id, 0.4380 od, 0.0320 thick flat washers (U). Secure screws with locking wire.

(7) Install mounting bracket (D) over three studs on under side of body assembly and secure with three 5/16-inch hex nuts (F) and 5/16-inch lock washers (E).

*b. Install Hose Assemblies and Elbows.*

NOTE: Hose assemblies must be rebuilt before installation on fuel vapor separator assembly. Refer to paragraphs 239 through 241 for rebuild of hose assemblies.

(1) Install elbows (K, W, X, and Y), in openings in fuel vapor separator assembly. Refer to figure 26 for positions of elbows after installation.

(2) Hose assemblies (fig. 26) are installed after fuel vapor separator is installed on engine (par. 287).

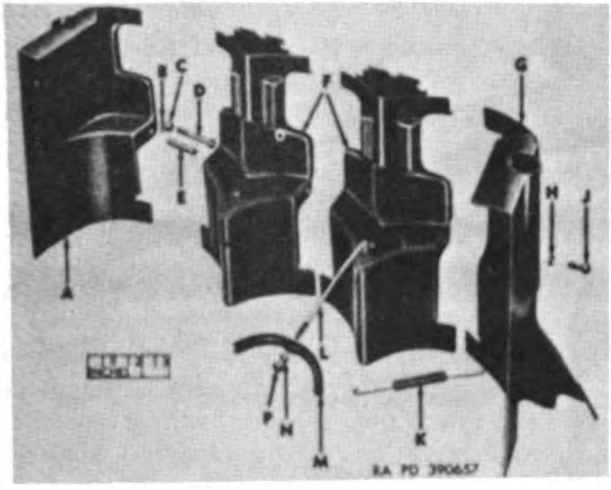
# Section XXIV. REBUILD OF CYLINDER AIR DEFLECTORS

## 199. Disassembly

The cylinder air deflectors (fig. 153) were disassembled as they were removed from the engine (par. 71).

## 200. Cleaning

Clean all parts as described in paragraph 77.



A—End cylinder (No. 2 and No. 5) air deflector 7375871
B—1/16 x 3/4 cotter pin 121223
C—1/4-inch slotted hex nut 122925
D—1/4 x 2 21/32 hex-head bolt 583752
E—Bolt spacer 7744730
F—Intercylinder air deflector 7375414
G—End cylinder (No. 1 and No. 6) air deflector 7375873
H—1/4-inch lock washer 120380
J—1/4 x 1 7/32 hex-head bolt 7376018
K—Spring 7744734
L—Intercylinder deflector bolt hook 7744720
M—Intercylinder deflector clamp 7744861
N—No. 10 lock washer 120217
P—No. 10 hex nut 225850

*Figure 153. Cylinder air deflectors—exploded view.*

## 201. Inspection

NOTE: The key letters shown below in parentheses refer to figure 153.

*a. Air Deflectors.* Inspect air deflectors (A, F, and G) for cracks, dents, or deformation.

*b. Intercylinder Deflector Bolt Hooks* (L). Inspect hooks for cracked or bent condition and stripped or damaged threads.

*c. Intercylinder Deflector Clamps* (M). Inspect clamps for cracked or bent condition.

*d. Springs* (K). Inspect springs for cracked or broken end hooks and weak spring action.

*e. Baffles and Cylinder Head Air Deflectors.* Inspect intercylinder air baffles (F, fig. 76) and cylinder head air deflectors (JJ, fig. 76) for cracks, dents, or deformation.

## 202. Repair

NOTE: The key letters shown below in parentheses refer to figure 153.

*a. Air Deflectors.* Replace air deflectors (A, F, and G) if cracked. Remove dents and straighten deformed deflectors as close to original shape as possible.

*b. Intercylinder Deflector Bolt Hooks* (L). Replace hooks if cracked or if threads are stripped or damaged. Straighten bent hooks.

*c. Intercylinder Deflector Clamps* (M). Replace clamps if cracked. Straighten bent clamps to as near original shape as possible.

*d. Springs* (K). Replace springs if end hooks are cracked or broken or if spring action is weak.

*e. Baffles and Cylinder Head Air Deflectors.* Replace intercylinder air baffles (F, fig. 76) and cylinder head air deflectors (JJ, fig. 76) if cracked. Remove dents and straighten deformed baffles and deflectors to as near original shape as possible.

## 203. Assembly

The cylinder air deflectors (fig. 153) are assembled when they are installed on the engine (par. 259).

# Section XXV. REBUILD OF EXHAUST MANIFOLDS

## 204. Disassembly

The left and right exhaust manifolds (figs 154 and 155) are welded and cannot be disassembled except for the removal of the hotspot outlet covers (D, fig. 155) from the model AOSI–895–5M engine exhaust manifolds. To remove the covers, cut locking wire and remove three hex-head bolts (E, fig. 155) and remove the covers. Remove and discard gaskets (C, fig. 155).

## 205. Cleaning

Clean all parts as described in paragraph 77. Use a stiff wire brush to remove rust and corrosion from parts.

## 206. Inspection

*a. Exhaust Manifolds* (A and B, fig. 155, and fig. 154).

(1) Inspect manifolds for cracked or damaged bellows and flanges.

(2) Inspect welded areas at joints for cracks or holes.

*b. Hotspot Outlet Covers* (D, fig. 155) (model AOSI–895–5M engine only). Inspect covers for cracks.

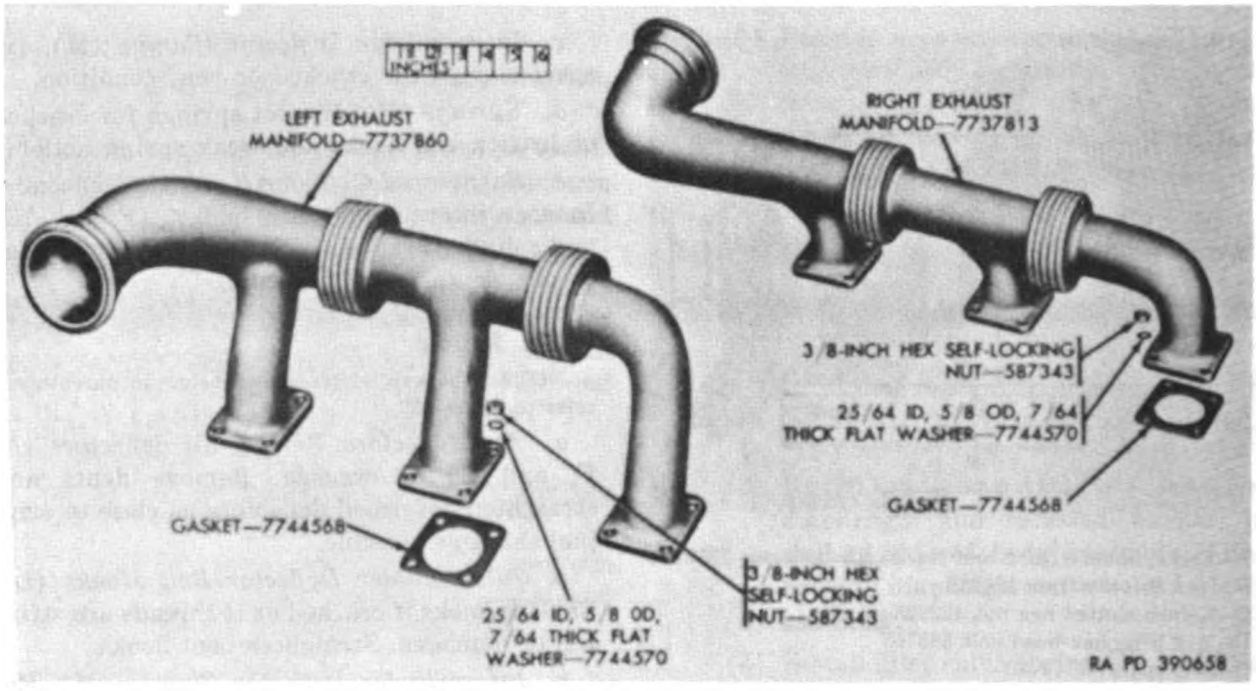



*Figure 154. Exhaust manifolds (model AOSI-895-5 engines only)—exploded view.*

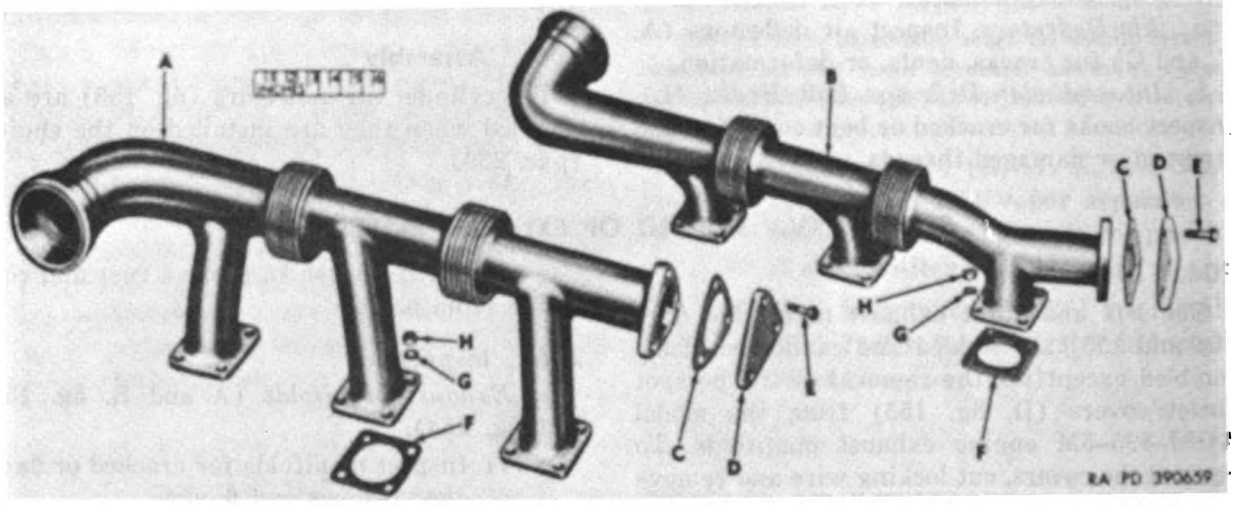
## 207. Repair

*a. Exhaust Manifolds* (A and B, fig. 155, and fig. 154).

(1) Replace manifolds if bellows or flanges are cracked. Repair cracks by welding, if possible.

(2) Replace manifolds if welds at joints are cracked or have holes. Repair cracks and holes in welds by reweldings if possible.

*b. Hotspot Outlet Covers* (D, fig. 155) (model AOSI–895–5M engine only). Replace covers if cracked. Repair cracks in covers by welding, if possible.




A—Left exhaust manifold 7376124
B—Right exhaust manifold 7376123
C—Gasket 7376057
D—Hotspot outlet cover 8679601
E—⅜ x 5¾₆₄ hex-head bolt 8691905
F—Gasket 7744568
G—²⁵⁄₆₄ id, ⅝ od, ⁷⁄₆₄ thick flat washer 7744570
H—⅜-inch hex self-locking nut 587343

*Figure 155. Exhaust manifolds (model AOSI-895-5M engines only)—exploded view.*

### 208. Assembly

On model AOSI–895–5M engine exhaust manifolds, install new gaskets (C, fig. 155) and install hotspot outlet covers (D, fig. 155) on left and right exhaust manifolds (A and B, fig. 155). Secure covers to manifolds with three $\frac{3}{8}$ x $\frac{53}{64}$ hex-head bolts (E, fig. 155). Secure bolts with locking wire.

## Section XXVI. REBUILD OF OIL COOLER ASSEMBLIES AND HOSE ASSEMBLIES

### 209. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 156.

*a. Remove Oil Cooler Assemblies.* The oil cooler assemblies were removed from the engine shroud assembly in paragraph 189.

*b. Disassemble Engine Oil Cooler Assembly.*

(1) Cut locking wire and remove hex-head bolts (F–2 and F–3) and plain washers (F–1) securing outlet and inlet connectors (F–4 and F–7) to oil cooler assembly (F–6) and remove connectors. Remove and discard connector gaskets (F–5).

(2) Cut locking wire and remove thermostatic bypass valve assembly (F–12) from valve housing (F–13). Remove and discard thermostatic bypass valve gasket (F–11).

NOTE: Do not attempt to disassemble thermostatic bypass valve assembly. Valve assembly is permanently assembled by manufacturer.

(3) Cut locking wire and remove hex-head bolts (F–9 and F–10) and flat washers (F–8) securing bypass valve housing to oil cooler assembly and remove housing. Remove and discard bypass valve housing gasket (F–14).

*c. Disassemble Transmission Oil Cooler Assembly.*

(1) Cut locking wire and remove hex-head bolts (H–4 and H–5) and plain washers (H–3) securing outlet and inlet connectors (H–2 and H–14) to oil cooler assembly (H–13) and remove connectors. Remove and discard connector gaskets (H–1).

(2) Cut locking wire and remove thermostatic bypass valve assembly (H–9) from bypass valve housing (H–7). Remove and discard thermostatic bypass valve gasket (H–8).

NOTE: Do not attempt to disassemble thermostatic bypass valve assembly. Valve assembly is permanently assembled by manufacturer.

(3) Cut locking wire and remove hex-head bolts (H–10 and H–12) and flat washers (H–11) securing bypass valve housing to oil cooler assembly and remove housing. Remove and discard bypass valve housing gasket (H–6).

### 210. Cleaning

Clean all parts as described in paragraph 77. Flush out oil cooler assemblies and hose assemblies with dry-cleaning solvent or mineral spirits paint thinner to remove all sludge and gum deposits.

### 211. Inspection

NOTE: The key letters shown below in parentheses refer to figure 156.

*a. Hose Assemblies* (A, C, E, and G).

(1) Inspect hose assemblies for breaks or abrasions in woven shielding.

(2) Inspect tubes of hose assemblies for cracked, bent, or mutilated condition.

NOTE: Contour of bends in tubes must be correct to insure proper installation.

(3) Inspect coupling nuts on hose assemblies for cracks and stripped or damaged threads.

(4) Inspect safety sleeves on hose assemblies for cracks and burred or nicked sealing surfaces.

*b. Connectors* (B, F–4, F–7, H–2, and H–14).

(1) Inspect connectors for cracked or broken condition.

(2) Inspect connectors for stripped or damaged threads.

(3) Inspect gasket contact surfaces for burs and raised metal.

*c. Thermostatic Bypass Valve Assemblies* (F–12 and H–9).

(1) Inspect valve assemblies for stripped or damaged threads.

(2) Check operation of valve assemblies by immersing valve in heated water. Check temperature of water with accurate thermometer. Gradually raise temperature of water to temperature indicated on valve cover. Valves

marked 145°–148°F on cover should travel at least ¼ inch between 80° and 148°F. Valves marked 180°–185° F on cover should travel at least ¼ inch between 80° and 185°F. Remove valve from water.

NOTE: All transmission oil cooler assemblies are equipped with thermostatic bypass valve assemblies which should close at 185°F. Engine oil cooler assemblies on model AOSI-895-5M engine serial numbers 101 through 4470 are equipped with thermostatic bypass valve assemblies which should close at 185°F. Engine oil cooler assemblies on model AOSI-895–5M engine serial numbers 4471 and above and on all model AOSI–895–5 engines are equipped with thermostatic bypass valve assemblies which should close at 148°F.

*d. Bypass Valve Housings* (F–13 and H–7). Inspect housing as described in paragraph 78*b*.

*e. Oil Cooler Assemblies* (F–6 and H–13).

(1) Inspect cooler assemblies for dented or bent tubing.

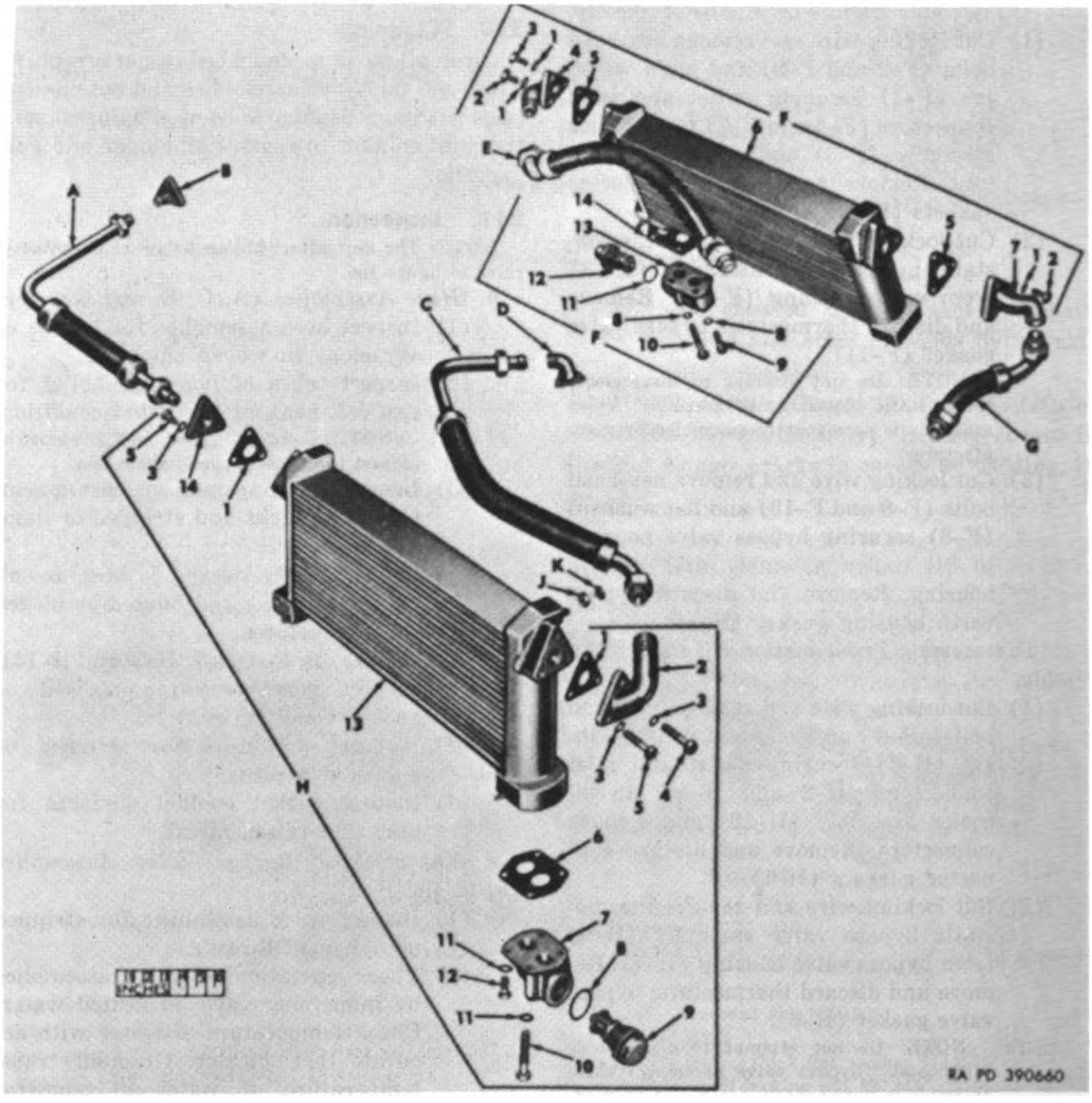



*Figure 156. Oil cooler assemblies, connectors, and hose assemblies—exploded view.*

(2) Pressure check cooler assemblies by sealing openings and pumping engine oil (OE) into assembly at 400 psi hydrostatic pressure. Cooler assemblies should hold 400 psi for 10 minutes without pressure dropping. Check cooler assemblies for leaks. Discontinue pressure, drain oil from cooler assembly, and flush with dry-cleaning solvent or mineral spirits paint thinner (par. 210).

(3) Inspect studs as described in paragraph 78*d*.

(4) Inspect Rosan inserts as described in paragraph 78*i*.

(5) Inspect gasket contact surfaces for burs and raised metal.

## 212. Repair

NOTE: The key letters shown below in parentheses refer to figure 156.

*a. Hose Assemblies* (A, C, E, and G).

(1) Replace hose assemblies if woven shielding is broken or abrased.

(2) Replace hose assemblies if tubes are cracked, bent out of shape or mutilated.

(3) Replace hose assemblies if coupling nuts are cracked or threads are stripped or damaged.

(4) Replace hose assemblies if safety sleeves are cracked or have burred or nicked sealing surfaces.

*b. Connectors* (B, F–4, F–7, H–2, and H–14).

(1) Replace connectors if cracked or broken.

(2) Replace connectors if threads are stripped or damaged.

(3) Remove burs and raised metal from gasket contact surfaces with a fine file or with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

*c. Thermostatic Bypass Valve Assemblies* (F–12 and H–9).

(1) Replace valve assembly if threads are stripped or damaged.

(2) Replace valve assembly if valve does not open at temperature indicated on valve cover. Replace valve assembly if valve travel is less than ¼ inch at temperature stated in paragraph 211*e*.

*d. Bypass Valve Housings* (F–13 and H–7). Repair or replace housing as described in paragraph 79*b*.

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A–Transmission oil cooler inlet hose assembly 7376839
B–Transmission oil outlet connector 7376009
C–Transmission oil cooler outlet hose assembly 7410080
D–Elbow 7410081
E–Engine oil cooler outlet hose assembly 8666732
F–Engine oil cooler assembly 8380706
1–25/64 id, 5/8 od, 0.0640 thick plain washer 502204
2–3/8 x 1 5/64 hex-head bolt 8365662
3–3/8 x 1 61/64 hex-head bolt 7376759
4–Outlet connector 7376012
5–Connector gasket 7346579
6–Oil cooler assembly { 7376040 or 8678911 }
7–Inlet connector 7376013
8–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
9–3/16 x 1 hex-head bolt 7767924
10–3/16 x 2½ hex-head bolt 8680568
11–Thermostatic bypass valve gasket 7403580
12–Thermostatic bypass valve assembly { 7346573 (early model AOSI–895–5M engines only) 8357819 }
13–Bypass valve housing 7375877
14–Bypass valve housing gasket 7375878
G–Engine oil cooler inlet hose assembly 7375861
H–Transmission oil cooler assembly 8380707
1–Connector gasket 7346579
2–Outlet connector 7376012
3–25/64 id, 5/8 od, 0.0640 thick plain washer 502204
4–3/8 x 1 61/64 hex-head bolt 7376759
5–3/8 x 1 5/64 hex-head bolt 8365662
6–Bypass valve housing gasket 7375878
7–Bypass valve housing 7375877
8–Thermostatic bypass valve gasket 7403580
9–Thermostatic bypass valve assembly 7346573
10–5/16 x 2½ hex-head bolt 8680568
11–21/64 id, 9/16 od, 0.0630 thick flat washer 502245
12–3/16 x 1 hex-head bolt 7767924
13–Oil cooler assembly { 7376040 or 8678911 }
14–Inlet connector 7376009
J–{ 5/8-inch hex nut 225854 (model AOSI–895–5M engine only); 5/8-inch hex self-locking nut { 503351 or 503383 } (model AOSI–895–5 engine only) }
K–5/8-inch hex stamped nut 107823 (model AOSI–895–5M engine only)

*Figure 156—Continued.*

*e. Oil Cooler Assemblies* (F–6 and H–13).

(1) Replace cooler assembly if tubes are dented or bent.

(2) Replace cooler assembly if cooler assembly does not hold pressure (par. 211) for the specified time without pressure dropping.

(3) Replace cooler assembly if leakage is evident. Repair leaks in coolers by welding, if possible.

NOTE: Do not attempt to solder leaks. Solder is not acceptable because of high operating temperature and pressure.

(4) Repair or replace studs as described in paragraph 79*d*.

(5) Repair or replace Rosan inserts as described in paragraph 79*i*.

(6) Remove burs and raised metal from gasket contact surfaces with a fine file or crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

## 213. Assembly

NOTE: The key letters shown below in parentheses refer to figure 156.

(1) Position a new bypass valve housing gasket (H–6) on bypass valve housing (H–7), install housing on oil cooler assembly (H–13), and secure with two 5/16 x 2½ hex-head bolts (H–10), two 5/16 x 1 hex-head bolts (H–12), and four 21/64 id, 9/16 od, 0.0630 thick flat washers (H–11). Secure bolts with locking wire.

(2) Position a new thermostatic bypass valve gasket (H–8) on thermostatic bypass valve assembly (H–9), install valve assembly in bypass valve housing, and secure with locking wire.

(3) Position a new connector gasket (H–1) on outlet connector (H–2), install connector on bypass valve end of oil cooler assembly (H–13), and secure with two 3/8 x 1 5/64 hex-head bolts (H–5), one 3/8 x 1 61/64 hex-head bolt (H–4), and three 25/64 id, 5/8 od, 0.0640 thick plain washer (H–3). Secure bolts with locking wire.

(4) Position a new connector gasket (H–1) on inlet connector (H–14), install connector on inlet end of oil cooler assembly, and secure with three 3/8 x 1 5/64 hex-head bolts (H–5) and 25/64 id, 5/8 od, 0.0640 thick plain washers (H–3). Secure bolts with locking wire.

*b. Assemble Engine Oil Cooler Assembly.*

(1) Position a new bypass valve housing gasket (F–14) on bypass valve housing (F–13), install housing on oil cooler assembly (F–6), and secure with two 5/16 x 2½ hex-head bolts (F–10), two 5/16 x 1 hex-head bolts (F–9), and four 21/64 id, 9/16 od, 0.0630 thick flat washers (F–8). Secure bolts with locking wire.

(2) Position a new thermostatic bypass valve gasket (F–11) on thermostatic bypass valve assembly (F–12), install valve assembly in bypass valve housing, and secure with locking wire.

(3) Position a new connector gasket (F–5) on outlet connector (F–4), install connector on bypass valve end of oil cooler assembly, and secure with two 3/8 x 1 5/64 hex-head bolts (F–2), one 3/8 x 1 61/64 hex-head bolt (F–3) and three 25/64 id, 5/8 od, 0.0640 thick plain washers (F–1). Secure bolts with locking wire.

(4) Position a new connector gasket (F–5) on inlet connector (F–7), install connector on inlet end of oil cooler assembly, and secure with three 3/8 x 1 5/64 hex-head bolts (F–2) and 25/64 id, 5/8 od, 0.0640 thick plain washers (F–1). Secure bolts with locking wire.

*a. Install Oil Cooler Assemblies.* Install oil cooler assemblies on engine shroud assembly as described in paragraph 193*b* after rebuilding (pars. 209 through 213).

## Section XXVII. REBUILD OF FUEL INJECTOR TUBE AND NOZZLE ASSEMBLIES

## 214. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 157.

*a. Disassemble Fuel Injector Tube Assemblies.*

(1) Cut locking wire and remove four fillister-head screws (RR) and flat washers (SS) securing clamps (QQ) to brackets (TT) and remove clamps from tube assemblies (W, X, and Y).

(2) Loosen safety sleeve nuts (F) securing fuel injector tube assemblies (G, L, and M) to tube unions (V) and remove tube assemblies.

(3) Remove three hex nuts (Q) and internal-teeth lock washers (P) securing unions in outer support bracket (R) and remove unions.

*b. Disassemble Fuel Injector Nozzle Assembly.* (fig. 158).

(1) Remove copper washer from fuel injector nozzle body and discard washer. Remove elbow from nozzle body.

(2) Loosen screen assembly by tapping open end of nozzle body against a wooden block, or similar object, and slide screen assembly out of body far enough to be withdrawn with a pair of needle-nose pliers.

(3) Remove hex-head screw and internal-teeth lock washer securing screen to screen support and remove screen from support.

(4) Remove and discard "O" ring packing.

NOTE: Do not attempt to remove pintle valve and spring from nozzle body. They are permanently assembled at manufacture.

## 215. Cleaning

Clean all parts as described in paragraph 77. Clean carbon deposits from exterior of nozzle body with a wire brush, being careful not to raise burs around pintle valve opening in tip of nozzle.

## 216. Inspection

NOTE: The key letters shown below in parentheses refer to figure 157.

*a. Tube Assemblies* (A, G, L, M, W, X, Y, CC, and DD).

(1) Inspect tube assemblies for split, cracked, weakened, or bent tubes.

(2) Inspect safety sleeve nuts (F) on tube assemblies for cracks and stripped or damaged threads.

(3) Inspect safety sleeves (E) on tube assemblies for cracks and burred or mutilated sealing surfaces.

*b. Clamps and Brackets.* Inspect clamps (K and QQ) and brackets (R, S, and TT) for cracked or bent condition.

*c. Elbows and Unions.* Inspect elbows (D) and unions (V) for cracks and for stripped or damaged threads.

*d. Fuel Injector Nozzle Assembly* (fig. 158).

(1) Inspect nozzle body for stripped or damaged threads, mutilated tip, and plugged fuel outlet.

(2) Inspect screen for clogged or torn screening.

(3) Inspect screen support for mutilation, stripped or damaged threads, and plugged fuel outlet passage.

(4) Assemble fuel injector nozzle assembly (par. 218*a*). Connect nozzle assembly to a source delivering dry-cleaning solvent or mineral spirits paint thinner to nozzle assembly up to 95 psi static hydraulic pressure. Nozzle assembly should not leak at pressures below 55 psi and should produce a uniform cone-shaped spray pattern at pressures from 55 to 95 psi.

NOTE: The pintle valve is designed to be self-cleaning. Increased pressure and flow of fluid through a malfunctioning nozzle may wash dirt from the valve and allow nozzle to function satisfactorily.

## 217. Repair

NOTE: The key letters shown below in parentheses refer to figure 157.

*a. Tube Assemblies* (A, G, L, M, W, X, Y, CC, and DD).

(1) Replace complete tube assembly if tubes are split, cracked, weakened, or severely bent. Straighten bent tubes, if possible.

(2) Replace complete assembly if safety sleeve nuts (F) are cracked or threads are stripped or damaged.

(3) Replace complete assembly if safety sleeves (E) are cracked or sealing surfaces are burred or mutilated.

*b. Clamps and Brackets.* Replace clamps (K and QQ) and brackets (R, S, and TT) if cracked or bent. Straighten bent brackets, if possible.

*c. Elbows and Unions.* Replace elbows (D) and unions (V) if cracked or threads are stripped or damaged.

*d. Fuel Injector Nozzle Assembly* (fig. 158).

(1) Replace nozzle body, with valve, if threads are stripped or damaged, tip is mutilated, or fuel outlet is plugged.

(2) Replace nozzle body, with valve, if assembly leaks at pressures below 55 psi or nozzle does not produce a uniform

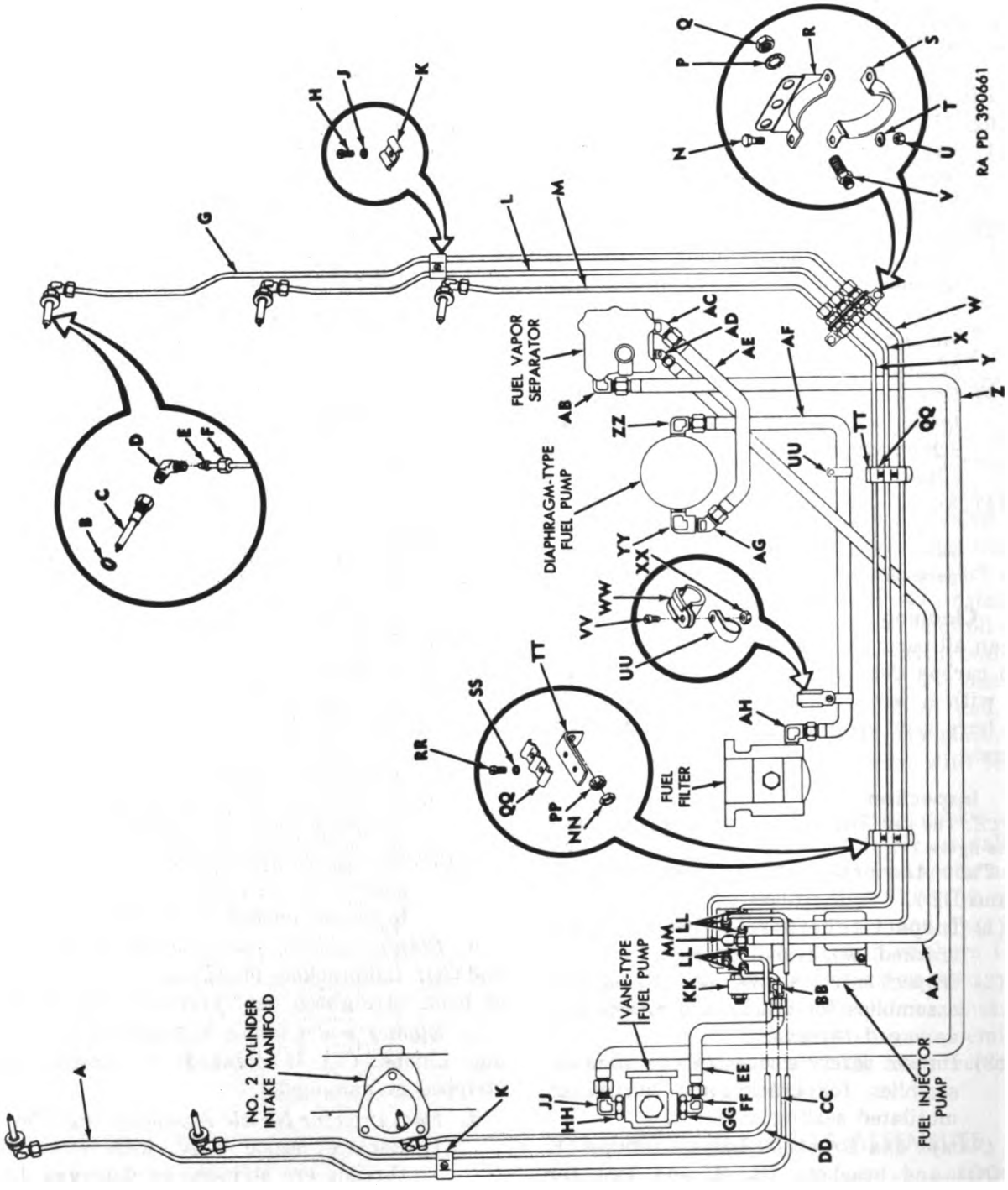



*Figure 157. Fuel supply system—schematic view.*

A—Tube assembly 8679623
B—0.5150 id, 0.6900 od, 0.0600 thick plain copper washer 8679568
C—Fuel injector nozzle assembly 8679602
D—⅛-inch 90 degree elbow 189928
E—¼-inch safety sleeve 189911
F—¼-inch safety sleeve nut 189894
G—Tube assembly 8679619
H—No. 10 x ½ fillister-head screw 541874
J—$1\frac{3}{64}$ id, 7/16 od, 0.0320 thick flat washer 192588
K—Clamp 7737839
L—Tube assembly 8679617
M—Tube assembly 8679607
N—$\frac{5}{16}$ x $\frac{23}{32}$ hex-head bolt 7414569
P—½-inch internal-teeth lock washer 138549
Q—½-inch hex nut 190784
R—Outer support bracket 7737792
S—Inner support bracket 7737791
T—$\frac{5}{16}$-inch lock washer 120214
U—$\frac{5}{16}$-inch hex nut 225853
V—¼-inch tube union 190781
W—Tube assembly 8679620
X—Tube assembly 8679618
Y—Tube assembly 8679616
Z—Hose assembly 7973943
AA—Hose assembly 7973947
BB—¼-inch 90 degree elbow 7376122
CC—Tube assembly 8679622
DD—Tube assembly 8679621
EE—Hose assembly 8735452
FF—¼-inch 90 degree elbow 7376122
GG—Bushing 7974077
HH—Bushing 8713453
JJ—⅜-inch 90 degree adapter elbow 7346726
KK—Fuel cutoff solenoid valve assembly 7974286
LL—⅛-inch connector 189920
MM—⅛-inch 90 degree adapter elbow 7767517
NN—⅜-inch hex stamped nut 107823 (model AOSI–895–5M engine only)
PP—⅜-inch hex nut 225854 (model AOSI–895–5M engine only)
PP—⅜-inch hex self-locking nut 503451 or 503383 (model AOSI–895–5 engine only)
QQ—Clamp 8679567
RR—No. 10 x ⅛ fillister-head screw 541132
SS—$1\frac{3}{64}$ id, 7/16 od, 0.0320 thick flat washer 192588
TT—Bracket 7737780
UU—Clamp 7403271
VV—No. 10 x ⅛ fillister-head screw 541874
WW—Clamp 7403577
XX—No. 10 hex self-locking nut 8344702
YY—⅜-inch 90 degree elbow 7744713
ZZ—⅜-inch 90 degree adapter elbow 7346726
AB—⅜-inch 90 degree adapter elbow 7346726
AC—⅜-inch 45 degree elbow 7410042
AD—⅛-inch 45 degree adapter elbow 7767516
AE—Hose assembly 7410044
AF—Hose assembly 7768134
AG—⅜-inch 45 degree elbow 7410042
AH—⅜-inch 90 degree adapter elbow 7346726

*Figure 157—Continued.*

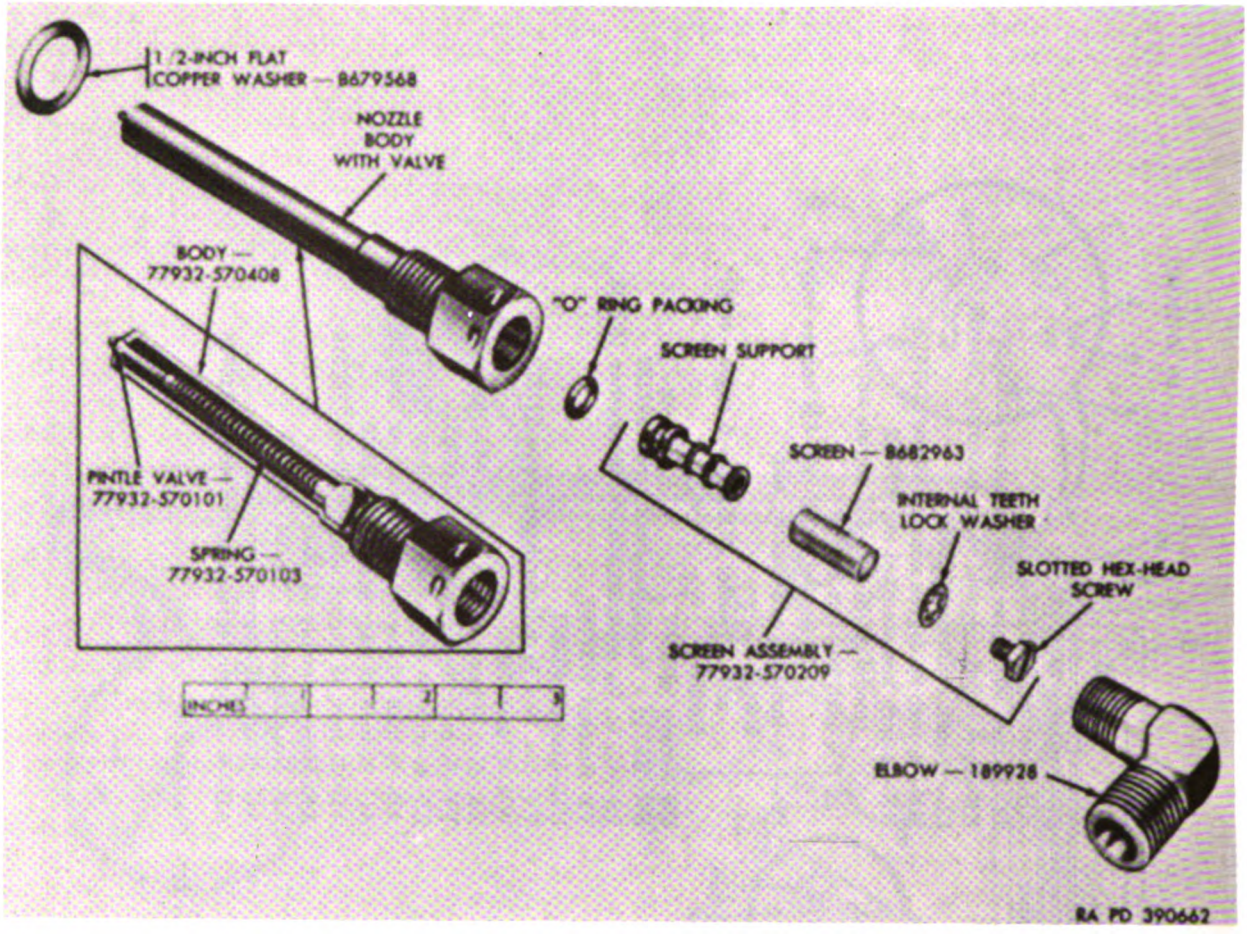



*Figure 158. Fuel injector nozzle assembly—exploded view.*

cone-shaped spray pattern at pressures from 55 to 95 psi.

(3) Replace screen assembly if screen is clogged or torn, screen support is mutilated, support threads are stripped or damaged, or oil passage in support is plugged.

## 218. Assembly

NOTE: The key letters shown below in parentheses refer to figure 157.

*a. Assemble Fuel Injector Nozzle Assembly* (fig. 158).

(1) Install new "O" ring packing in groove on screen support. Install screen on support and secure with slotted hex-head screw and internal-teeth lock washer.

(2) Install screen assembly in bore of fuel injector nozzle body. Push screen assembly firmly into body to seat "O" ring packing in body.

(3) Install elbow in bore of body, following screen assembly.

**CAUTION: Do not use thread sealing or gasket forming compound on any fuel system fittings. Assemble the parts dry or coat with clean engine oil (OE) only.**

*b. Assemble Fuel Injector Tube Assemblies.*

(1) Install three ¼-inch tube unions (V) through holes in outer support bracket (R) from mounting flange side of bracket and secure with three ½-inch hex nuts (Q) and ½-inch internal-teeth lock washers (P) installed on unions on opposite side of bracket.

(2) The tube assemblies, clamps, and brackets are installed when engine is assembled (par. 269).

## Section XXVIII. REBUILD OF PRIMING FUEL SYSTEM

### 219. Disassembly

*a. Disassemble Priming Nozzle Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 159.

(1) Remove spiral spray nozzle assembly (D–1) from priming nozzle (D–2).

(2) Remove spiral spray nozzle (D–1–b) from spray nozzle body (D–1–a).

(3) Remove fuel tee hole plug assembly (A) from intercylinder union tee (B). Remove plug (A–1) from tube coupling nut (A–2).

(4) On Skinner fuel filters only, remove two tube unions (P) from fuel filter tee (Q) and remove tee from filter head.

(5) On Zenith fuel filters only, remove two tube unions (P) from mounting bracket (Z).

*b. Disassemble Skinner Priming Fuel Filter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 160 except where otherwise indicated.

(1) Cut locking wire and remove filter bowl (F–4) from filter head (F–1).

(2) Remove element (F–2–b) and compression spring (F–2–c) from bowl. Remove and discard "O" ring packing (F–3) from bowl.

(3) Remove and discard compression washer (F–2–a) from head. Remove hex-socket pipe plug (U, fig. 159) from head.

*c. Disassemble Zenith Priming Fuel Filter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 160 except where otherwise indicated.

(1) Loosen knurled nut on bail assembly (A–5), swing bail away from bowl (A–4), and remove bowl from head (A–1). Remove bail assembly from head by removing ends of bail from holes of head.

(2) Unscrew element (A–3) from head and remove and discard bowl gasket (A–2).

(3) Do not remove head from mounting bracket (Z, fig. 159) unless inspection (par. 221) indicates replacement is necessary. To remove head, unscrew from bracket.

### 220. Cleaning

Clean all parts as described in paragraph 77. Remove carbon deposits from priming nozzle assembly with a wire brush. Remove scale and rust from filter bowl with a wire brush.

### 221. Inspection

*a. Priming Line, Tube, and Nozzle Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 159.

(1) *Priming nozzle* (D–2). Inspect nozzle for cracks, stripped or damaged threads, and for mutilation.

(2) *Spiral spray nozzle assembly.* Inspect spray nozzle body (A–1–a) and spiral spray nozzle (D – 1 – b) for cracks, plugged fuel passages, and stripped or damaged threads.

(3) *Test priming nozzle assembly.* Assemble priming nozzle assembly (par. 223*c*) and install intercylinder tee. Connect tube assembly to tee and plug other end of tee with plug assembly. Connect tube assembly to a vehicle primer pump connected to a filtered fuel supply. Actuate pump and note spray pattern from nozzle. Nozzle should produce a uniform cone-shaped pattern.

(4) *Tees and unions.* Inspect intercylinder union tees (B), tube unions (P), and fuel filter tee (Q) for cracks and stripped or damaged threads.

(5) *Fuel tee hole plug assembly.* Inspect plug (A–1) for mutilation and tube coupling nut (A–2) for cracks and stripped or damaged threads.

(6) *Line and tube assemblies.* Inspect fuel line assemblies (E) and fuel tube assemblies (L) for split, cracked, weakened, or bent lines and tubes. Inspect tube coupling nuts (M) for cracks and stripped or damaged threads. Inspect tube fittings (N) for cracks or mutilation.

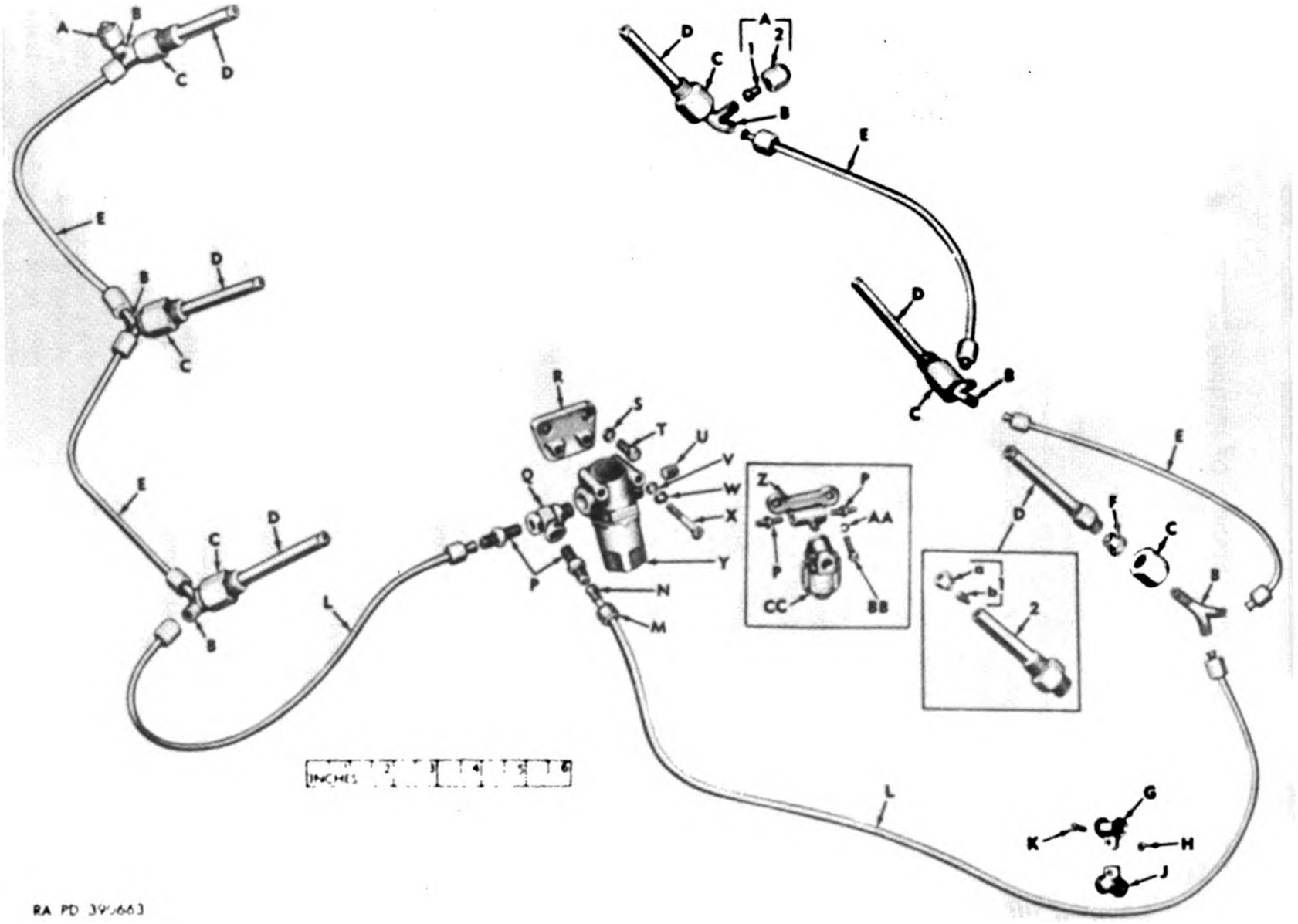
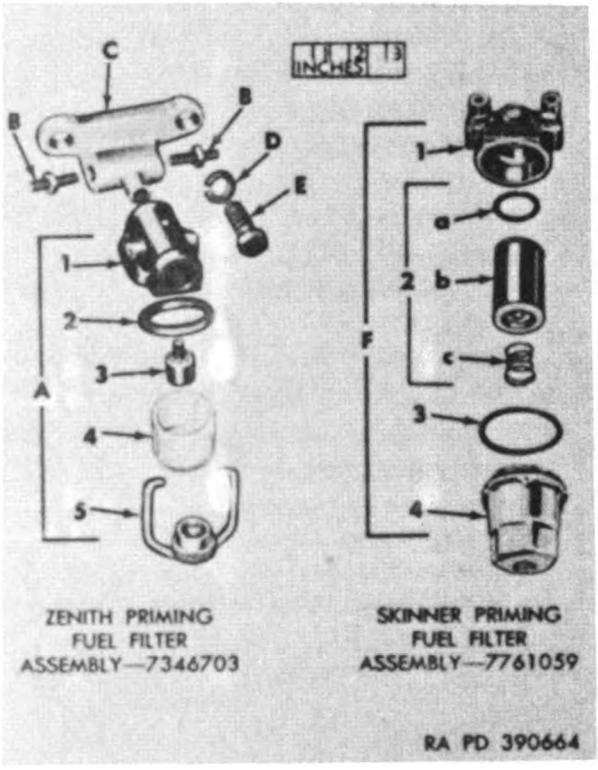



*Figure 159. Priming fuel system—exploded view.*

A—Fuel tee hole plug assembly 7744647
  1—Plug 7403125
  2—Tube coupling nut 5165169
B—Intercylinder union tee 7744648
C—¼-inch safety sleeve nut 189894
D—Priming nozzle assembly 7410158
  1—Spiral spray nozzle assembly 7410285
    a—Spray nozzle body 7410282
    b—Spiral spray nozzle 7410283
  2—Priming nozzle 7410284
E—Fuel line assembly 7372618
F—¼-inch safety sleeve 189911
G—¼-inch tube clip 572920
H—No. 10 hex self-locking nut 502309
J—¼-inch tube clamp 572898
K—No. 10 x ½ fillister-head screw 120216
L—Fuel tube assembly 7376038
M—Tube coupling nut 5165169
N—⅛-inch tube fitting 504252
P—⅛-inch tube union 501105
Q—Fuel filter tee 7954766
R—Mounting bracket 8733093
S—5/16-inch lock washer 120214
T—5/16 x 1 3/32 hex-head bolt 8713951
U—⅛-inch hex-socket pipe plug 7538990
V—13/64 id, 7/16 od, 0.0630 thick flat washer 502244
W—No. 10 lock washer 120217
X—No. 10 x 1¾ fillister-head screw 132148
Y—Priming fuel filter assembly (Skinner) 7761059
Z—Mounting bracket 7375416
AA—5/16-inch lock washer 120214
BB—5/16 x 1 3/32 hex-head bolt 8713951
CC—Priming fuel filter assembly (Zenith) 7346703

*Figure 159—Continued.*




A–Zenith priming fuel filter assembly 7346703
- 1–Head 5226292
- 2–Bowl gasket 7413742
- 3–Element 7413741
- 4–Bowl 7413740
- 5–Bail assembly 7413739

B–⅛-inch tube union 501105
C–Mounting bracket 7375416
D–5/16-inch lock washer 120214
E–5/16 x 1 3/32 hex-head bolt 8713951
F–Skinner priming fuel filter assembly 7761059
- 1–Head 7416621
- 2–Element assembly 8382647
  - a–Compression washer 55168–565288
  - b–Element 55168–569807
  - c–Compression spring 55168–26417A
- 3–1 5/16-inch id "O" ring packing 7412738
- 4–Bowl 7413736

*Figure 160. Priming fuel filter assemblies—exploded view.*

(7) *Nuts and sleeves.* Inspect safety sleeve nuts (C) for cracks and stripped or damaged threads. Inspect safety sleeves (F) for cracks and burred or mutilated sealing surfaces.

*b. Priming Fuel Filter Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 160 except where otherwise indicated.

(1) *Mounting bracket* (R or Z, fig. 159). Inspect bracket for cracks and stripped or damaged threads.

(2) *Bowl* (A–4 or F–4). Inspect bowl for cracks and also inspect bowl (F–4) for stripped or damaged threads.

(3) *Bail assembly* (A–5). Inspect bail assembly for cracked or stretched bail and loose or damaged knurled nut.

(4) *Element* (A–3 or F–2–b). Inspect element to make certain it is clean.

(5) *Compression spring* (F–2–c). Inspect spring for cracks and weak spring action.

(6) *Head* (A–1 or F–1). Inspect head for cracks and for stripped or damaged threads.

(7) *Hex-socket pipe plug* (U, fig. 159). Inspect pipe plug for stripped or damaged threads and mutilated socket head.

## 222. Repair

*a. Priming Line, Tube, and Nozzle Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 159.

(1) *Priming nozzle assembly* (D). Replace complete nozzle assembly if any parts are damaged. Replace complete assembly if spray pattern is not uniform. Clean plugged fuel passages with fine wire, if possible.

(2) *Tees and unions.* Replace intercylinder union tees (B), tube unions (P), and fuel filter tee (Q) if cracked or threads are stripped or damaged.

(3) *Fuel tee hole plug assembly* (A). Replace complete plug assembly if parts are damaged.

(4) *Line and tube assemblies.* Replace fuel line assemblies (E) and fuel tube assemblies (L) if split, cracked, weakened, or bent. Replace complete line assembly or tube assembly if coupling nuts or fittings are damaged.

(5) *Nuts and sleeves.* Replace safety sleeve nuts (C) if cracked or threads are stripped or damaged. Replace safety sleeves (F) if cracked or sealing surfaces are burred or mutilated.

*b. Priming Fuel Filter Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 160 except where otherwise indicated.

(1) *Mounting bracket* (R or Z, fig. 159). Replace bracket if cracked or if threads are stripped or damaged.

(2) *Bowl* (A–4 or F–4). Replace bowl if cracked and also replace bowl (F–4) if threads are stripped or damaged.

(3) *Bail assembly* (A–5). Replace bail assembly if bail is cracked or stretched or knurled nut is loose or threads are damaged.

(4) *Element* (A–3 or F–2–b). Replace element if damaged. Clean element to remove rust and corrosion. Replace compression spring (F–2–c) if cracked or weak.

(5) *Head* (A–1 or F–1). Replace head if cracked or threads are stripped or damaged.

(6) *Hex-socket pipe plug* (U, fig. 159). Replace pipe plug if threads are stripped or damaged or socket head is mutilated.

## 223. Assembly

*a. Assemble Zenith Priming Fuel Filter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 160 except where otherwise indicated.

(1) If head (A–1) was removed from mounting bracket (Z, fig. 159), install head on bracket.

(2) Expand ends of bail assembly (A–5) and install ends in holes of head.

(3) Screw element (A–3) into head. Position new bowl gasket (A–2) in head, position bowl (A–4) in head around element, slide bail assembly down over bowl, and tighten knurled nut on bail assembly against bowl.

*b. Assemble Skinner Priming Fuel Filter Assembly.*

NOTE: The key letters shown below in parentheses refer to figure 160.

(1) Position a new $1\frac{5}{16}$-inch id, "O" ring packing (F–3) on bowl (F–4), and install compression spring (F–2–c) and element (F–2–b) in bowl.

(2) Position a new compression washer (F–2–a) in bore of head (F–1) and screw bowl (F–4) into head. Torque bowl into head to 40 to 50 pound-inches. Secure bowl with locking wire.

*c. Assemble Priming Nozzle Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 159.

(1) Install spiral spray nozzle (D–1–b) into spray nozzle body (D–1–a). Install spiral spray nozzle assembly (D–1) into priming nozzle (D–2), and stake in place using a punch or other suitable tool.

(2) The remainder of the line and tube assemblies and fittings are assembled when the priming system is installed on the engine.

# Section XXIX. REBUILD OF FUEL FILTER ASSEMBLY

## 224. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 161.

*a.* Open drain cock plug (A) and drain filter assembly. Remove drain cock plug.

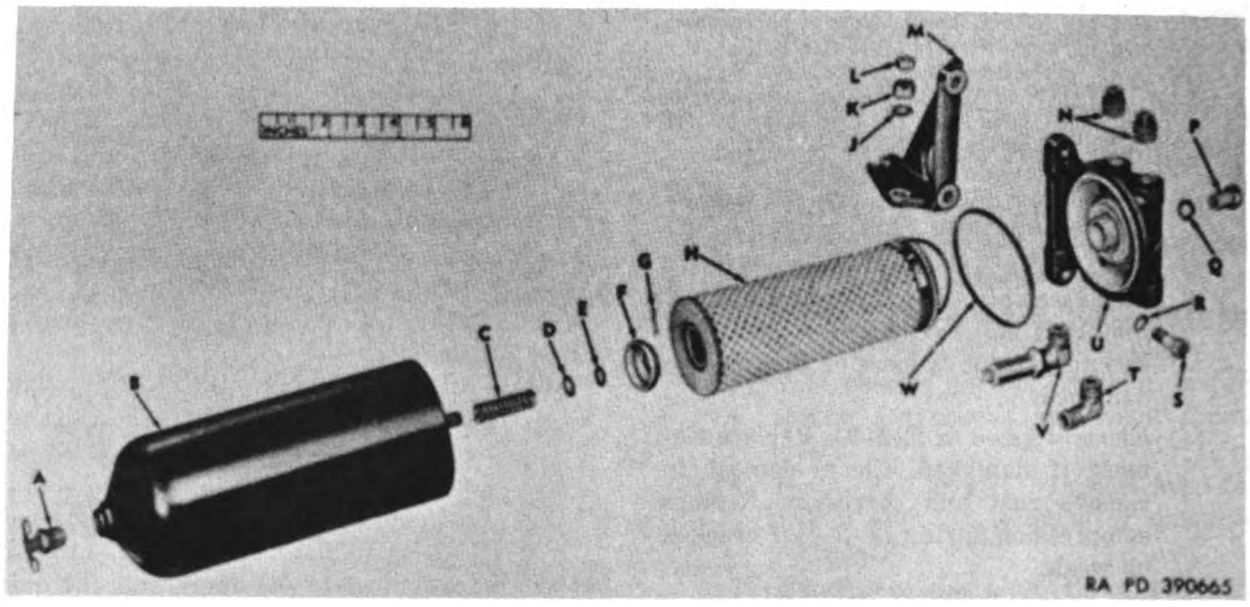
*b.* Cut locking wire and remove two hex-head bolts (S) and flat washers (R) securing filter assembly to mounting bracket (M) and remove bracket.

*c.* Remove head retaining screw (P) and retaining screw gasket (Q) from head (U) and remove head. Discard gasket.

*d.* Lift strainer element assembly (H) from case. Do not remove element sealing cup (F) from case unless inspection (par. 226) indicates replacement is necessary. To remove cup, remove cotter pin (G), element sealing cup (F), "O" ring gasket (E), cup washer (D), and cup retaining spring (C) from stem in case. Discard "O" ring gasket.

*e.* Remove and discard case gasket (W).

*f.* Do not remove square-head pipe plugs (N), adapter elbow (T), or elbow (V), with attached fitting and plug, from head unless inspection (par. 226) indicates replacement is necessary.




A—Drain cock plug 81321–6288
B—Case 81321–2426
C—Cup retaining spring 81321–52183
D—Cup washer 81321–15080–1
E—"O" ring gasket 81321–52176
F—Element sealing cup 81321–52692
G—Cotter pin 81321–52694
H—Strainer element assembly 8713904
J—25/64 id, 5/8 od, 0.0640 thick flat washer 502204
K—{ 3/8-inch hex nut 225854 (model AOSI–895–5M engine only); 3/8-inch hex self-locking nut 503351 or 503383 (model AOSI–895–5 engine only) }
L—3/8-inch hex stamped nut 107823 (model AOSI–895–5M engine only)
M—Mounting bracket 8733057
N—3/8-inch square-head pipe plug 501501
P—Head retaining screw 81321–39948
Q—Retaining screw gasket 81321–39724
R—25/64 id, 5/8 od, 0.0640 thick flat washer 502204
S—3/8 x 1 5/64 hex-head bolt 7346718
T—3/8-inch 90 degree adapter elbow 7346726
U—Head 81321–52174–1
V—3/8-inch 90 degree elbow 7744713
W—Case gasket 81321–8927

*Figure 161. Fuel filter assembly and mounting bracket—exploded view.*

## 225. Cleaning

Clean all parts as described in paragraph 77. Dry strainer element assembly (H) thoroughly to see whether dirt is present. Clean rust and scale from inside of filter case with a wire brush.

## 226. Inspection

NOTE: The key letters shown below in parentheses refer to figure 161.

*a. Head* (U).

(1) Inspect head for cracks and stripped or damaged threads.

(2) Inspect square-head pipe plugs (N) and elbows (T and V) for cracks and stripped or damaged threads.

(3) Inspect head retaining screw (P) for stripped or damaged threads.

*b. Strainer Element Assembly* (H).

(1) Inspect element for dirt or damage.

(2) Inspect element sealing cup (F) for cracks.

(3) Inspect cup retaining spring (C) for cracks and weak spring action.

*c. Case* (B).

(1) Inspect case for cracks and stripped or damaged threads on stem and in opening for drain cock plug.

(2) Inspect drain cock plug (A) for plugged fuel passage and stripped or damaged threads.

*d. Mounting Bracket* (M). Inspect bracket as described in paragraph 78*b*.

### 227. Repair

NOTE: The key letters shown below in parentheses refer to figure 161.

*a. Head* (U).

(1) Replace head if cracked or threads are stripped or damaged. Repair damaged threads with a used tap, if possible.

(2) Replace square-head pipe plugs (N) and elbows (T and V) if cracked or threads are stripped or damaged.

(3) Replace head retaining screw (P) if threads are stripped or damaged.

*b. Strainer Element Assembly* (H).

(1) Replace element assembly if element is dirty or damaged. Clean dirty element, if possible.

(2) Replace element sealing cup (F) if cracked.

(3) Replace cup retaining spring (C) if cracked or weak.

*c. Case* (B).

(1) Replace case if cracked or threads are stripped or damaged.

(2) Replace drain cock plug (A) if threads are stripped or damaged.

*d. Mounting Bracket* (M). Repair or replace bracket as described in paragraph 79*b*.

### 228. Assembly

NOTE: The key letters shown below in parentheses refer to figure 161.

*a.* Install drain cock plug (A) in opening in bottom of case (B).

*b.* If element sealing cup (F) was removed, install cup retaining spring (C), cup washer (D), new "O" ring gasket (E), and element sealing cup (F) on center stem in case and secure with cotter pin (G).

*c.* Install strainer element assembly (H) around center stem of case, with stem protruding from top of element assembly.

*d.* Position a new case gasket (W) in head.

*e.* If $\frac{3}{8}$-inch square-head pipe plugs (N), $\frac{3}{8}$-inch 90 degree adapter elbow (T), and $\frac{3}{8}$-inch 90 degree elbow (V), with attached fitting and plug, were removed from head, install new plugs and elbows in head. Position head on case so center stem of case protrudes through center of head and secure with head retaining screw (P) and new retaining screw gasket (Q).

*f.* Install mounting bracket (M) on filter assembly and secure with two $\frac{3}{8}$ x $1\frac{5}{64}$ hex-head bolts (S) and $\frac{25}{64}$ id, $\frac{5}{8}$ od, 0.0640 thick flat washers (R). Secure bolts with locking wire.

## Section XXX. REBUILD OF OIL FILTER ASSEMBLY

### 229. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 162.

*a.* Remove hex-head bolt (D) and head bolt gasket (C) securing filter head assembly (B) to filter element assembly (A) and remove head assembly. Discard gasket. Do not remove handle (B–3) and handle spring (B–2) unless inspection (par. 231) indicates replacement is necessary. To remove handle, spread ends and remove from holes of head. Remove spring.

*b.* Remove hex nut (A–4) from end of element center tubes (A–2). Remove elements (A–1) and element spacing washers (A–3) from center tube.

### 230. Cleaning

Clean all parts as described in paragraph 77. Remove sludge, gum, and carbon deposits from filter elements with a stiff brush. Blow compressed air through screens of elements to remove deposits loosened by brush.

### 231 Inspection

NOTE: The key letters shown below in parentheses refer to figure 162.

*a. Filter Head Assembly.*

(1) Inspect head (B–1) for cracks.

(2) Inspect handle (B–3) for cracked or bent condition.

(3) Inspect handle spring (B–2) for cracked or broken extension and weak spring action.

*b. Filter Element Assembly.*

(1) Inspect elements (A–1) for holes, mu-

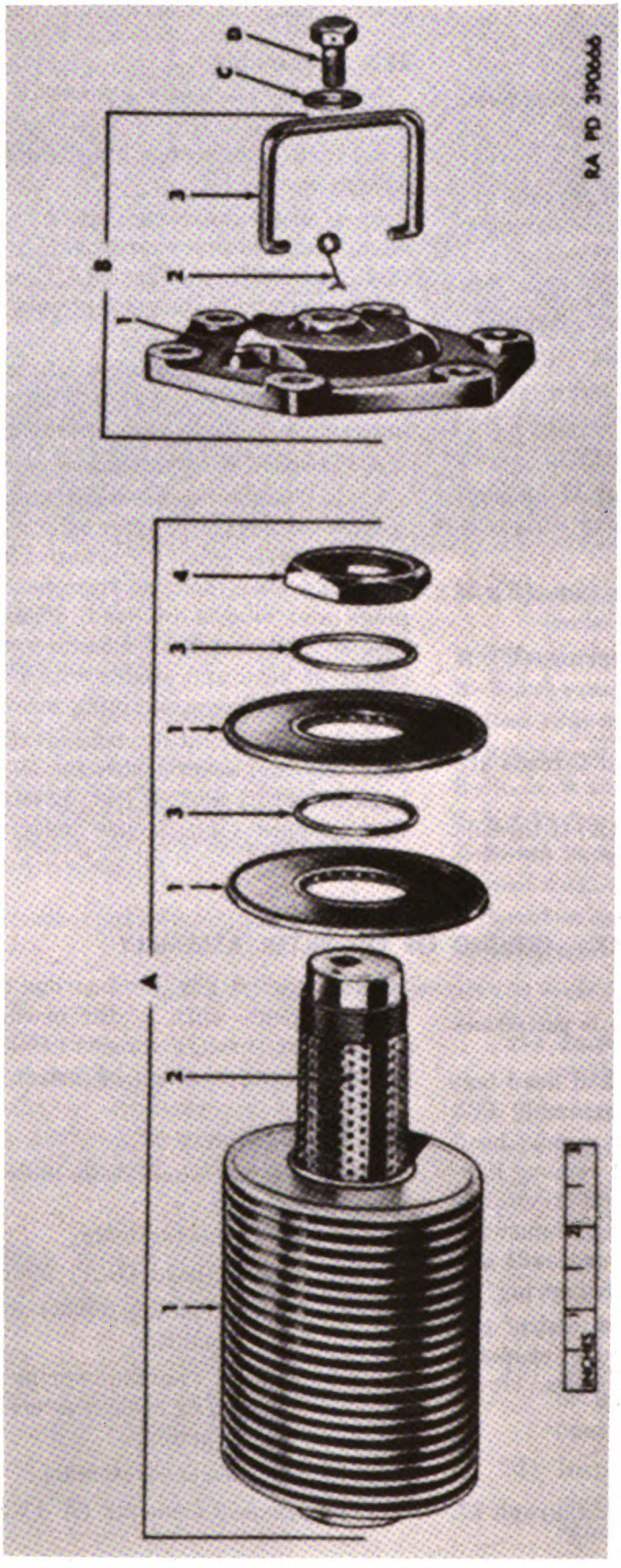



*Figure 162. Oil filter assembly—exploded view.*

A—Filter element assembly 00736–03S524–231

1—Element 7348755

2—Element center tube 7971418

3—Element spacing washer 7374145

4—Hex nut 7971417

B—Filter head assembly 00736–03S573–156

1—Head 00736–03S573–140

2—Handle spring 7994794

3—Handle 8343854

C—Head bolt gasket 105451

D—⅜ x 5⅝₄ hex-head bolt 583742

*Figure 162—Continued.*

tilation, and dirt by holding elements before a strong light.

(2) Inspect element center tube (A–2) for plugged holes, mutilation, and stripped or damaged threads. Check outside diameter of tube for conformance to tolerances specified in repair and rebuild standards (par. 314).

## 232. Repair

NOTE: The key letters shown below in parentheses refer to figure 162.

*a. Filter Head Assembly.*

(1) Replace head (B–1) if cracked.

(2) Replace handle (B–3) if cracked or bent. Straighten bent handle, if possible.

(3) Replace handle spring (B–2) if extension is cracked or broken or if spring action is weak.

*b. Filter Element Assembly.*

(1) Replace elements (A–1) if elements have holes, are mutilated, or dirty. Clean dirt and gum from elements, if possible.

(2) Replace element center tube (A–2) if holes are plugged, tube is mutilated, or threads are stripped or damaged. Replace tube if it does not conform to

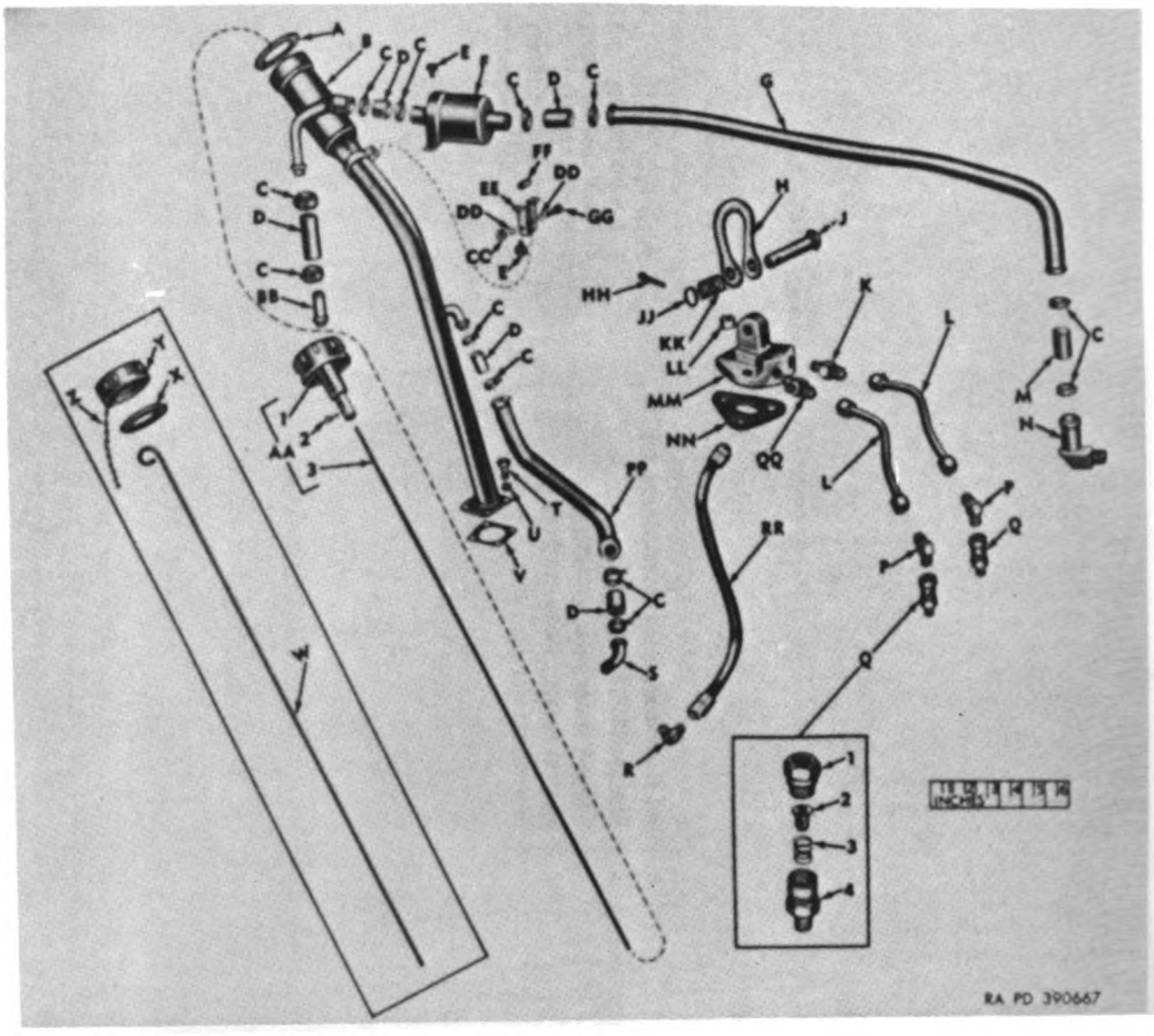



*Figure 163. Oil filler tube and breather tubes—exploded view.*

tolerances specified in repair and rebuild standards (par. 314). Clean plugged holes with wire, if possible.

### 233. Assembly

NOTE: The key letters shown below in parentheses refer to figure 162.

*a.* Position an element (A–1) and an element spacing washer (A–3) on element center tube (A–2), seating washer against element.

*b.* Position remaining 29 elements and washers alternately on tube as described in *a* above and secure with hex nut (A–4).

*c.* If handle (B–3) and handle spring (B–2) were removed from head (B–1), install spring on one end of handle, spread ends of handle and insert ends of handle in holes of head. Extension on spring must lay flat against head.

*d.* Install filter head assembly (B) on filter element assembly (A) and secure with new head bolt gasket (C) and $\frac{3}{8}$ x $5\frac{9}{64}$ hex-head bolt (D).

## Section XXXI. REBUILD OF OIL FILLER TUBE AND BREATHER TUBES

### 234. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 163.

*a. Disassemble Oil Filler Tube and Breather Tubes.*

(1) Remove hose clamps (C) and connecting hose (D and M) from oil filler tube (B), crankcase air inlet breather tube (G), crankcase ventilating breather tube (PP), and hose adapter (BB).

(2) Remove filler tube cap assembly (AA) from oil filler tube. Remove oil seal (A) from tube.

(3) On early model AOSI–895–5M engines only, remove filler cap assembly (Y) from oil filler tube and disconnect cap retaining chain (Z) from oil filler tube. Remove oil level gage (W) from tube. Remove oil seal (X) from tube.

(4) Do not remove filler tube bracket (EE) from oil filler tube (B) unless

---

A–Oil seal 8328610
B–Oil filler tube { 8691911 / 8328608 (early model AOSI–895–5M engines only)
C–Hose clamp 7350199
D–Hose 7403387
E–$\frac{5}{16}$ x $\frac{5}{16}$ hex-head lockwasher bolt 7414584
F–Flame arrestor 7376056
G–Crankcase air inlet breather tube 7376126
H–Lifting eye 7376026
J–$\frac{5}{8}$ x $3\frac{1}{8}$ flat-head pin 7376019
K–$\frac{3}{8}$-inch tube nipple 9402709
L–Accessory case breather tube assembly 7737879
M–Hose 8357973
N–Elbow 7376136
P–$\frac{1}{4}$-inch 45 degree elbow 7744714
Q–Air metering valve assembly 7705708
  1–Nut 6246309
  2–Seat 7410317
  3–Spring 5291787
  4–Body 70040–154348
R–$\frac{1}{8}$-inch 45 degree adapter elbow 7767516
S–$\frac{1}{8}$-inch 45 degree hose elbow 7410043
T–$\frac{5}{16}$ x $\frac{7}{8}$ hex-head bolt 8365670
U–$\frac{5}{16}$-inch lock washer 120214
V–Filler tube gasket 7767802
W–Oil level gage 7403356
  (early model AOSI–895–5M engines only)
X–Oil seal 8328610
  (early model AOSI–895–5M engines only)
Y–Filler tube cap assembly 8328609
  (early model AOSI–895–5M engines only)
Z–Cap retaining chain 7403389
  (early model AOSI–895–5M engines only)
AA–Filler tube cap assembly 8691912
  1–$\frac{3}{32}$ x $\frac{3}{4}$ round-head rivet 8719858
  2–$\frac{1}{16}$ x $\frac{7}{16}$ countersunk-head rivet 8719857
  3–Oil level indicator 8717379
BB–Hose adapter 7403524
CC–$\frac{5}{16}$-inch hex self-locking nut 592496
DD–$2\frac{1}{64}$ id, $\frac{5}{16}$ od, 0.0630 thick flat washer 502245
EE–Filler tube bracket 7403718
FF–Tube bracket spacer 7403678
GG–$\frac{5}{16}$ x $2\frac{11}{32}$ hex-head bolt 7346713
HH–$\frac{1}{8}$ x 1 cotter pin 137185
JJ–$2\frac{1}{32}$ id, 1.0000 od, $\frac{1}{8}$ thick flat washer 7376080
KK–Lifting eye spring 7476035
LL–$\frac{3}{8}$-inch slotted hex nut 122961
MM–Accessory case breather adapter 7376017
NN–Adapter mounting gasket 7410066
PP–Crankcase ventilating breather tube 7376005
QQ–$\frac{3}{8}$-inch pipe-to-tube tee 7973973
RR–Booster pump breather hose assembly 7744711

*Figure 163—Continued.*

inspection (par. 236) indicates replacement is necessary. To remove bracket, remove hex self-locking nut (CC), flat washer (DD), hex-head bolt (GG), flat washer (DD), and tube bracket spacer (FF) and remove bracket.

*b. Disassemble Air Metering Valve Assemblies.*

(1) Remove nut (Q–1) from body (Q–4).

(2) Remove seat (Q–2) and spring (Q–3) from well in body.

## 235. Cleaning

Clean all parts as described in paragraph 77.

## 236. Inspection

NOTE: The key letters shown below in parentheses refer to figure 163.

*a. Oil Filler Tube* (B).

(1) Inspect tube for cracked or bent contion.

(2) Inspect tube for loose welds.

(3) Inspect filler tube cap assembly (AA) for loose rivets and loose, bent, or broken oil level indicator (AA–3).

(4) Inspect filler tube cap assembly (Y) for cracks. Inspect oil level gage (W) for bent or broken condition and condition of oil level marks.

(5) Inspect oil seal (A or X) for torn or deteriorated condition.

(6) Inspect filler tube bracket (EE) for cracked or bent condition.

*b. Breather Tubes* (G and PP). Inspect tubes for cracked or bent condition.

*c. Hose* (D and M). Inspect hose for fraying, cracking, and loss of resilience.

*d. Hose Clamps* (C).

(1) Inspect clamps for cracks, breaks, and bends.

(2) Inspect screws on clamps for stripped or damaged threads.

*e. Air Metering Valve Assemblies.*

(1) Inspect nut (Q–1) and body (Q–4) for cracks and stripped or damaged threads.

(2) Inspect seat (Q–2) for mutilation and plugged air passages.

(3) Inspect spring (Q–3) for cracks and weak spring action.

*f. Flame Arrestor* (F). Inspect flame arrestor for cracks, loose internal parts, and mutilated hose connections.

*g. Booster Pump Breather Hose Assembly* (RR). Inspect hose for fraying, cracking, or loss of resilience. Inspect coupling nuts for cracks and stripped or damaged threads.

*h. Elbows, Nipple, and Tee.* Inspect elbows (N, P, R, and S), tube nipple (K), pipe-to-tube tee (QQ), and hose adapter (BB) for cracks and for stripped or damaged threads.

*i. Accessory Case Breather Tube Assemblies* (L). Inspect tube assemblies for split, cracked, or bent tubes. Inspect nuts and sleeves for cracks and for stripped or damaged threads.

## 237. Repair

NOTE: The key letters shown below in parentheses refer to figure 163.

*a. Oil Filler Tube* (B).

(1) Replace tube if cracked or bent.

(2) Replace tube if welds are loose. Reweld loose welds, if possible.

(3) Replace filler tube cap assembly (AA) if rivets are loose, or if oil level indicator (AA–3) is bent or loose. Peen loose rivets to tighten, if possible. Straighten bent indicator, if possible.

(4) Replace filler tube cap assembly (Y) if cap is cracked. Replace oil level gage (W) if bent or broken. Straighten bent gage, if possible. Restamp oil level marks, if not clear.

(5) Replace oil seal (A or X) if torn or deteriorated.

(6) Replace filler tube bracket (EE) if cracked or bent. Straighten bent bracket, if possible.

*b. Breather Tubes* (G and PP). Replace breather tubes if cracked or bent. Straighten bent tubes, if possible.

*c. Hose* (D and M). Replace hose if frayed cracked, or if hose have lost their resilience.

*d. Hose clamps* (C).

(1) Replace clamps if cracked, broken, or bent.

(2) Replace clamps if threads on screws are stripped or damaged.

*e. Air Metering Valve Assemblies* (Q). Replace complete valve assembly if any parts are cracked, mutilated, if threads are stripped or damaged, or spring is weak.

*f. Flame Arrestor* (F). Replace arrestor if cracked or mutilated.

*g. Booster Pump Breather Hose Assembly* (RR). Replace hose assembly if hose is frayed, cracked, or has lost its resilience. Replace assembly if coupling nuts are cracked or threads are stripped or damaged.

*h. Elbows, Nipple, and Tee.* Replace elbows (N, P, R, and S), tube nipple (K), pipe-to-tube tee (QQ), and hose adapter (BB) if cracked or threads are stripped or damaged.

*i. Accessory Case Breather Tube Assemblies* (L). Replace tube assemblies if tubes are split, cracked, or bent. Replace tube assemblies if nuts and sleeves are cracked or threads are stripped or damaged.

### 238. Assembly

NOTE: The key letters shown below in parentheses refer to figure 163.

*a. Assemble Air Metering Valve Assemblies.* Install spring (Q–3) and seat (Q–2) in body (Q–4) and secure with nut (Q–1).

*b. Assemble Breather Tubes and Oil Filler Tube.*

(1) If filler tube bracket (EE) was removed from oil filler tube (B), position bracket in mounting clamp welded to tube and position tube bracket spacer (FF) in bracket and secure with $\frac{5}{16}$ x $2\frac{11}{32}$ hex-head bolts (GG), $\frac{5}{16}$-inch hex self-locking nut (CC), and two $\frac{21}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washers (DD).

(2) Position oil seal (A) on oil filler tube (B) and install filler tube cap assembly (AA) in filler tube.

(3) On early model AOSI–895–5M engines, position oil seal (X) and oil level gage (W) in oil filler tube (B). Hook cap retaining chain (Z) of filler tube cap assembly (AA) on tube and install cap assembly in tube.

(4) The breather tubes, adapters, and flame arrestor are connected as they are installed on the engine.

## Section XXXII. REBUILD OF FUEL SUPPLY AND VENT HOSE ASSEMBLIES

### 239. Cleaning

Clean all hose assemblies with a stiff bristle brush and strong soap and water. Blow dry with compressed air.

### 240. Inspection

*a.* Inspect all hose assemblies for cracking, fraying, loss of resilience, and deterioration. Inspect for spots or areas which have been damaged by being in contact with other parts.

*b.* Inspect all connectors and coupling nuts on hose assemblies for cracks and stripped or damaged threads.

*c.* Inspect all elbows, adapters, tees, and fittings for cracks and stripped or damaged threads.

### 241. Repair

*a.* Replace all hose assemblies which are cracked, frayed, deteriorated, damaged, or if hose have lost their resilience.

*b.* Replace all hose assemblies if connectors or coupling nuts are cracked or have stripped or damaged threads.

*c.* Replace all elbows, adapters, tees, and fittings if cracked or threads are stripped or damaged.

## Section XXXIII. REBUILD OF IGNITION SYSTEM

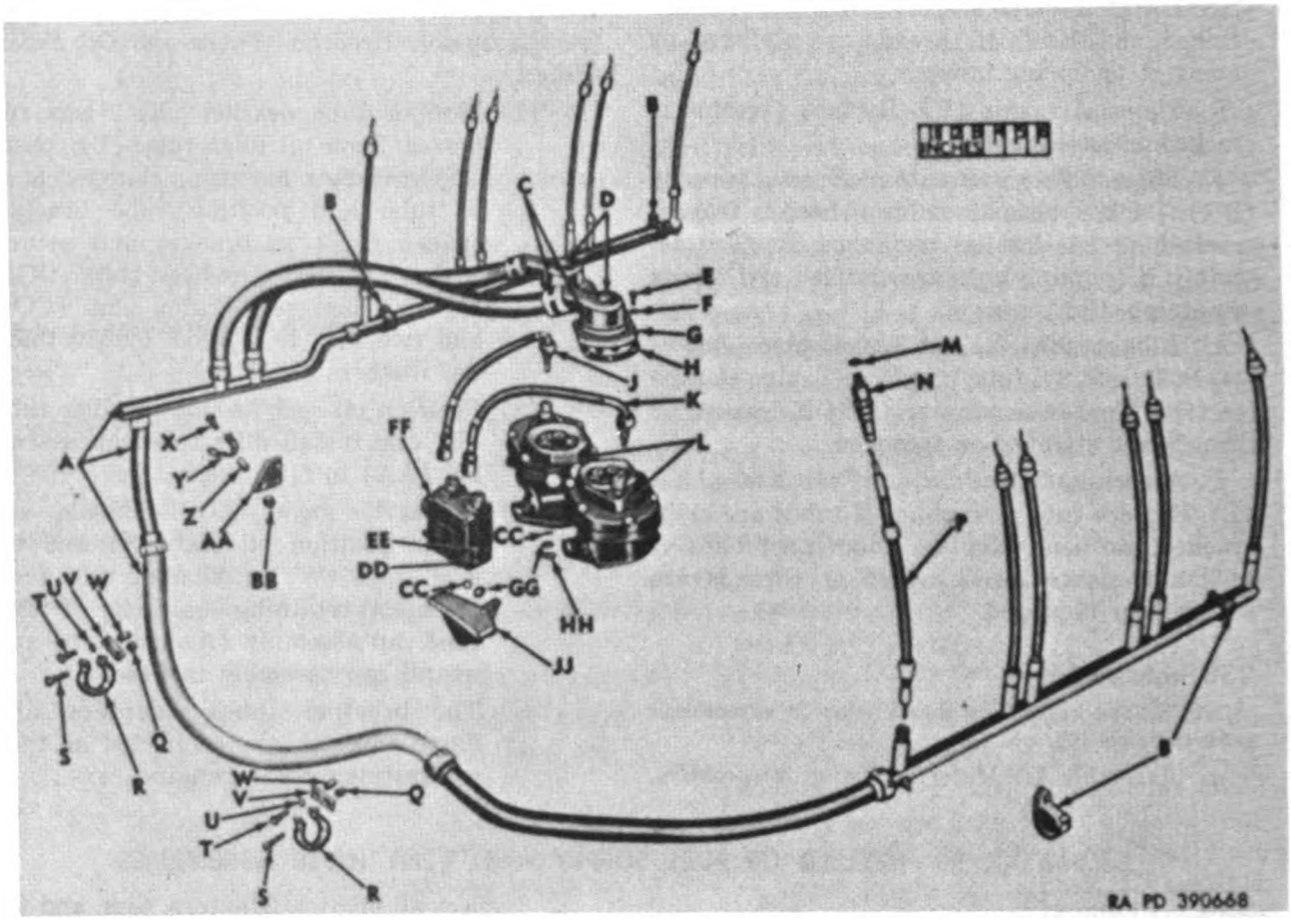
### 242. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 164.

*a.* Remove coupling nuts and clamps securing fuel hose assemblies and vent hose assemblies to ignition harness and remove hose assemblies. Refer to paragraphs 239 through 241 for rebuild of hose assemblies.

*b.* Remove four rubber cushioned clips (B) and 12 spark plug lead assemblies (P).

*c.* Remove round-head screws (S) and hex self-locking nuts (Q) securing clamps (R) and




A–Ignition harness assembly 7414507
B–Clip 7065871
C–Magneto upper adapter 7403759
D–3/16-inch hex head bolt 7403756
E–No. 10 x 5/8 fillister-head screw 427223
F–No. 10 lock washer 131183
G–Magneto lower adapter 7403758
H–Magneto lower adapter gasket 7338655
J–Outer magneto ground cable assembly 7414527
K–Inner magneto ground cable assembly 7353260
L–Magneto assembly { 8344983 | 7403411 | 7974215 | 7974214 | 7539854 (early model AOSI-895-5M engines only)
M–Spark plug gasket 5296665
N–Spark plug 8668752
P–Spark plug lead assembly 8741865
Q–No. 10 hex self-locking nut 503209
R–Clamp 7403577
S–No. 10 x 5/8 round-head screw 7403667
T–1/2 x 1 17/32 hex-head bolt 593397
U–1/2-inch lock washer 120239
V–Harness link 8732728
W–Link spacer 7403682
X–No. 10 x 1 1/4 fillister-head screw 132138
Y–Clamp 1403577
Z–Spacer 7737744
AA–Ignition harness mounting bracket 7403760
BB–No. 10 hex self-locking nut 8344702
CC–5/16-inch hex stamped nut 107822 (model AOSI-895-5M engine only)
DD–No. 10 lock washer 120217
EE–No. 10 x 7/16 round-head screw 132903
FF–Ignition booster and filter coil assembly 8719826
GG– { 5/16-inch hex nut 225853 (model AOSI-895-5M engine only) | 5/16-inch hex self-locking nut 503345 or 503380 (model AOSI-895-5 engine only)
HH–21/64 id, 13/16 od, 1/8 thick flat washer 7744766
JJ–Booster coil mounting bracket 7737740

*Figure 164. Ignition system—exploded view.*

harness links (V) to ignition harness and remove clamps and links.

*d.* Remove four round-head screws (EE) and lock washers (DD) securing ignition booster and filter coil assembly (FF) to booster coil mounting bracket (JJ) and remove coil assembly.

### 243. Cleaning

*a.* Clean ignition harness assembly (A), magneto ground cable assemblies (J and K), and spark plug lead assemblies (P) with soap and water and blow dry with compressed air.

*b.* Clean all clamps, clips, links, brackets, and spacers with dry-cleaning solvent or mineral spirits paint thinner and blow dry with compressed air.

### 244. Inspection

NOTE: The key letters shown below in parentheses refer to figure 164.

*a. Ignition Harness Assembly and Cable and Lead Assemblies.*

(1) Inspect ignition harness assembly (A), magneto ground cable assemblies (J and K), and spark plug lead assemblies (P) for loose, burned, or damaged connections and for frayed insulation or shielding.

(2) Inspect insulators and contact springs on spark plug lead assemblies (P) for cracks, burns, or other damage.

(3) Check all cables and lead assemblies for continuity, using an ohmmeter.

(4) Check all cables and lead assemblies for leakage, using a high-tension ignition tester.

*b. Spark Plugs* (N). Refer to TB ORD 373 for inspection of spark plugs.

*c. Clamps, Clips, Links, Brackets, and Spacers.* Inspect all parts for cracked, bent, or mutilated condition. Inspect rubber cushion on clips (B) for torn or deteriorated condition.

*d. Magneto Upper and Lower Adapters* (C and G). Inspect adapters for cracked or mutilated condition.

### 245. Repair

NOTE: The key letters shown below in parentheses refer to figure 164.

*a. Ignition Harness Assembly and Cable and Lead Assemblies.*

(1) Replace ignition harness assembly (A), magneto ground cable assemblies (J and K), and spark plug lead assemblies (P) if connections are loose, burned, or damaged, or if insulation or shielding is frayed. Repair loose connections by soldering, if possible.

(2) Replace insulators and contact springs on spark plug lead assemblies (P) if insulators and springs are cracked, burned, or otherwise damaged.

(3) Replace any cables or lead assemblies showing shorts or opens when checked for continuity with an ohmmeter.

(4) Replace any cables or lead assemblies showing leakage when checked with a high-tension ignition tester.

*b. Spark Plugs* (N). Refer to TB ORD 373 for reconditioning of spark plugs. Replace spark plugs which cannot be reconditioned.

*c. Clamps, Clips, Links, Brackets, and Spacers.* Replace parts if cracked or mutilated. Replace clip (B) if rubber cushion is torn or deteriorated. Straighten bent clamps, clips, links, or brackets, if possible.

*d. Magneto Upper and Lower Adapters* (C and G). Replace adapters if cracked or mutilated.

### 246. Assembly

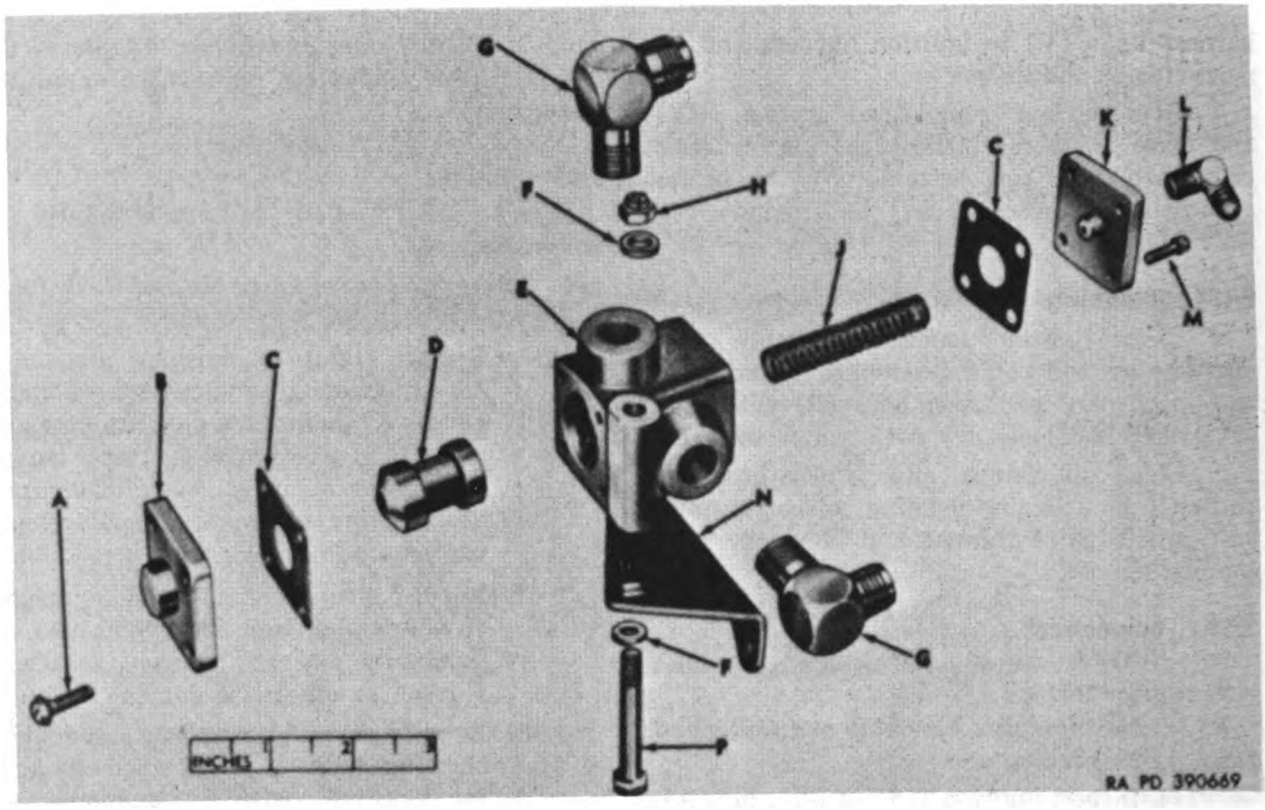
The ignition system is assembled when parts are installed on engine (par. 278).

## Section XXXIV. REBUILD OF GOVERNOR OIL PRESSURE REGULATING VALVE ASSEMBLY

### 247. Disassembly

NOTE: The key letters shown below in parentheses refer to figure 165. Governor oil pressure regulating valve assemblies are used on model AOSI-895-5M engine serial numbers 2067 through 8487 only.

*a.* Remove two adapter elbows (G) from valve body assembly (E) and remove adapter elbow (L) from tapped valve cap (K).




A—No. 10 x ⅝ fillister-head lockwasher screw 76820–54121A3
B—Valve cap 76820–54185B
C—Valve cap gasket 8713844
D—Oil pressure regulating valve 8713743
E—Valve body assembly 76820–54209A
F—$2\frac{1}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washer 502245
G—⅜-inch 90 degree adapter elbow 7346726
H—$\frac{5}{16}$-inch hex self-locking nut 592496
J—Valve spring 76820–51045–41
K—Tapped valve cap 76820–54185C
L—⅛-inch 90 degree adapter elbow 7767517
M—No. 10 x ⅝ fillister-head lockwasher screw 76820–54121A3
N—Valve support bracket 8365710
P—$\frac{5}{16}$ x 2½ hex-head bolt 8365676

*Figure 165. Governor oil pressure regulating valve assembly and support bracket—exploded view.*

*b.* Cut locking wire and remove four fillister-head lockwasher screws (A) securing valve cap (B) to valve body assembly (E) and remove cap. Remove and discard valve cap gasket (C).

*c.* Cut locking wire and remove four fillister-head lockwasher screws (M) securing tapped valve cap (K) to body assembly and remove cap. Remove and discard valve cap gasket (C).

*d.* Remove oil pressure regulating valve (D) and valve spring (J) from body assembly.

## 248. Cleaning

Clean all parts as described in paragraph 77.

## 249. Inspection

NOTE: The key letters shown below in parentheses refer to figure 165.

*a. Caps* (B and K). Inspect caps for cracks. Inspect tapped hole in tapped valve cap (K) for stripped or damaged threads.

*b. Valve Body Assembly* (E).

(1) Inspect body for cracks and tapped holes in body for stripped or damaged threads.

(2) Check body for conformance to tolerances specified in repair and rebuild standards (par. 332).

*c. Oil Pressure Regulating Valve* (D).

(1) Inspect valve for nicks and scratches.

(2) Check valve for conformance to tolerances specified in repair and rebuild standards (par. 332).

*d. Valve Spring* (J).

(1) Inspect spring for cracks, breaks, or set.

(2) Check spring for conformance to limits specified in repair and rebuild standards (par. 332).

*e. Valve Support Bracket* (N). Inspect bracket for cracked or bent condition.

*f. Adapter Elbows* (G and L). Inspect elbows for cracks and stripped or damaged threads.

### 250. Repair

NOTE: The key letters shown below in parentheses refer to figure 165.

*a. Governor Oil Pressure Regulating Valve Assembly.*

(1) Replace complete valve assembly if any of the parts (par. 249 *a* through *d*) are cracked, if threads are stripped or damaged, or if parts do not conform to tolerances specified in repair and rebuild standards (par. 332).

(2) Remove nicks and scratches from oil pressure regulating valve (D), if possible, with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner.

(3) Repair threads in tapped holes with a used tap, if possible.

*b. Valve Support Bracket* (N). Replace bracket if cracked. Straighten bent bracket.

*c. Adapter Elbows* (G and L). Replace elbows if cracked or threads are stripped or damaged.

### 251. Assembly

NOTE: The key letters shown below in parentheses refer to figure 165.

*a.* Position a new valve cap gasket (C) on tapped valve cap (K), install valve cap on end of valve body assembly (E) farthest from tapped opening marked "OIL OUT," and secure with four No. 10 x 5/8 fillister-head lockwasher screws (M). Secure screws with locking wire.

*b.* Install valve spring (J) and oil pressure regulating valve (D) in body assembly.

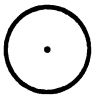
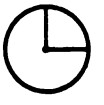
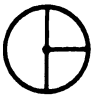
*c.* Position a new valve cap gasket (C) on valve cap (B), install cap on body assembly, and secure with four No. 10 x 5/8 fillister-head lockwasher screws (A).

*d.* Install 3/8-inch 90 degree adapter elbows (G) in tapped openings in body assembly marked "OIL IN" and "OIL OUT" and 1/8-inch 90 degree adapter elbow (L) in tapped opening in tapped valve cap (K).

## Section XXXV. STUD DATA

### 252. Stud Identification

Note that studs are threaded NC (national coarse) on one end and NF (national fine) on the other. The NC end is threaded into the casting. Part numbers (table V) for oversize studs have a letter suffix to indicate the size. The coarse thread ends of oversize studs are marked as shown in figure 166.

| STUD | STANDARD | 0.003 OVERSIZE | 0.007 OVERSIZE | 0.012 OVERSIZE |
|---|---|---|---|---|
| CO PART NO SUFFIX | NONE | H | S | J |
| MARK |  |  |  |  |

RA PD 162555

*Figure 166. Oversize stud identification.*

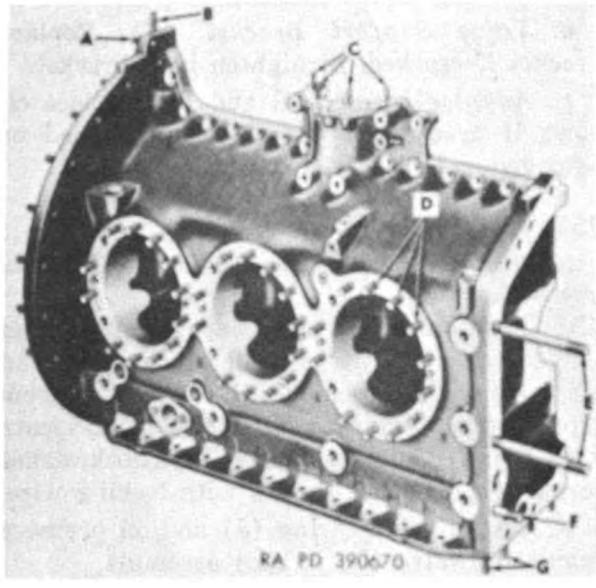



*Figure 167. Crankcase studding—left (2–4–6) side view.*

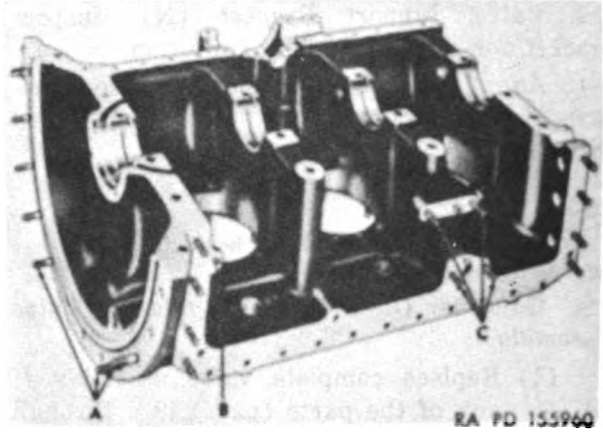



*Figure 168. Crankcase studding—right (1–3–5) side view.*

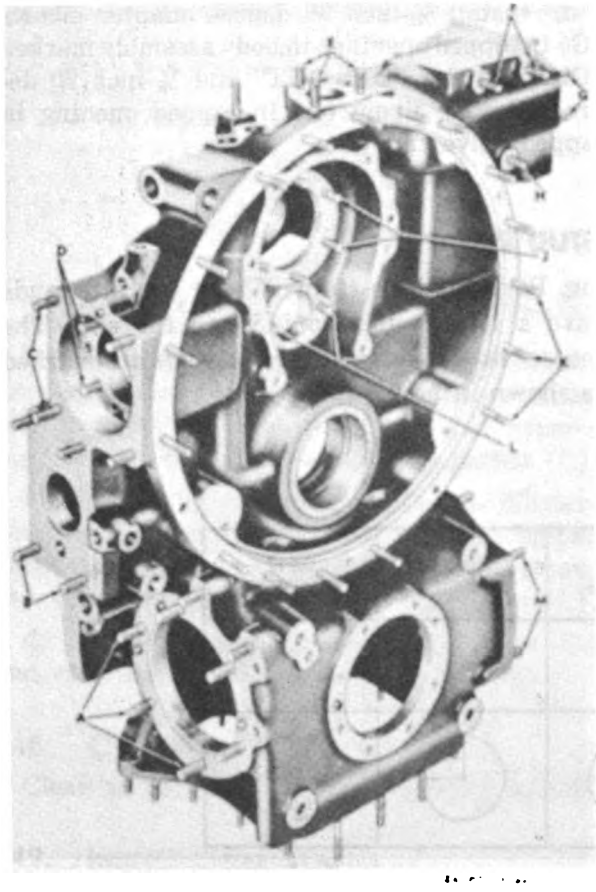


*Figure 169. Accessory case studding—left front view.*

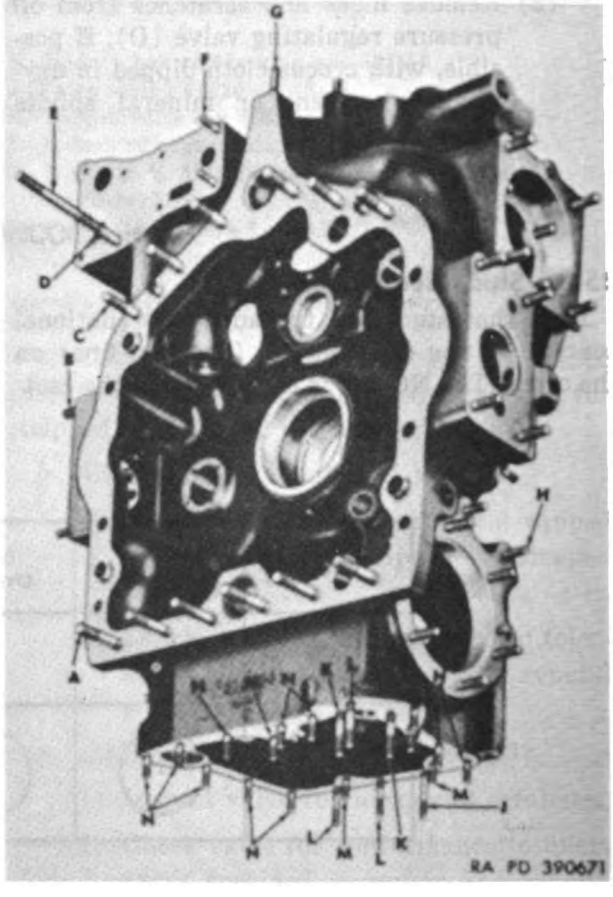



*Figure 170. Accessory case studding—right rear view.*

*Table V. Stud Identification*

| Fig. no. | Ref. ltr | Setting height (inch) | No. reqd | Mfg. no. (Continental) | Ord. no. |
|---|---|---|---|---|---|
| 64 | QQ | 31/32 | 1 | 401812 | 7403070 |
| | | | | 401812-H | 7744801 |
| | | | | 401812-S | 7744630 |
| | | | | 401812-J | 7744629 |
| 71 | B-6-A | 53/64 | 6 | 401823 | 7403068 |
| | | | | 401823-H | 7744855 |
| | | | | 401823-S | 7744732 |
| | | | | 401823-J | 7744731 |
| | B-6-D | 9/16 | 1 | 401882 | 7403512 |
| | | | | 401882-H | 7348782 |
| | | | | 401882-S | 7348783 |
| | | | | 401882-J | 7348784 |
| 72 | DD-1 | 11/16 | 2 | 401823 | 7403068 |
| | | | | 401823-H | 7744855 |
| | | | | 401823-S | 7744732 |
| | | | | 401823-J | 7744731 |
| | DD-5 | 61/64 | 2 | 401812 | 7403070 |
| | | | | 401812-H | 7744801 |
| | | | | 401812-S | 7744630 |
| | | | | 401812-J | 7744629 |
| | DD-7 | 1 33/64 | 3 | 401931 | 7403075 |
| | | | | 401931-H | 7767348 |
| | | | | 401931-S | 7767361 |
| | | | | 401931-J | 7767362 |
| | FF-1 | 37/64 | 1 | 401882 | 7403512 |
| | | | | 401882-H | 7348782 |
| | | | | 401882-S | 7348783 |
| | | | | 401882-J | 7348784 |
| | FF-2 | 7/16 | 1 | 401869 | 7350204 |
| | | | | 401869-H | 7348785 |
| | | | | 401869-S | 7348786 |
| | | | | 401869-J | 7348787 |
| 76 | J | 31/32 | 18 | 401813 | 7403071 |
| | | | | 401813-H | 7744803 |
| | | | | 401813-S | 7744555 |
| | | | | 401813-J | 7744556 |
| | KK | 23/32 | 6 | 401867 | 7403515 |
| | | | | 401867-H | 7348779 |
| | | | | 401867-S | 7348780 |
| | | | | 401867-J | 7348781 |
| | LL | 15/16 | 24 | 401861 | 7403097 |
| | | | | 401861-H | 7744572 |
| | | | | 401861-S | 7744573 |
| | | | | 401861-J | 7744574 |
| 108 | D | 1 | 2 | 401861 | 7403097 |
| | | | | 401861-H | 7744572 |
| | | | | 401861-S | 7744573 |
| | | | | 401861-J | 7744574 |

*Table V. Stud Identification—Continued*

| Fig. no. | Ref. ltr | Setting height (inch) | No. reqd | Mfg. no. (Continental) | Ord. no. |
|---|---|---|---|---|---|
| 103 | U | 1½ | 2 | 401837 | 7403072 |
| | | | | 401837-H | 7767378 |
| | | | | 401837-S | 7767446 |
| | | | | 401837-J | 7767447 |
| | V | 27/32 | 2 | 401860 | 7350203 |
| | | | | 401860-H | 7414217 |
| | | | | 401860-S | 7414218 |
| | | | | 401860-J | 7403328 |
| 119 | FF | 15/16 | 12 | 401860 | 7350203 |
| | | | | 401860-H | 7414217 |
| | | | | 401860-S | 7414218 |
| | | | | 401860-J | 7403328 |
| 121 | K | 31/32 | 4 | 401824 | 7403501 |
| | | | | 401824-H | 7348668 |
| | | | | 401824-S | 7348869 |
| | | | | 401824-J | 7348670 |
| 122 | K-2 | 49/64 | 2 | 401823 | 7403068 |
| | | | | 401823-H | 7744855 |
| | | | | 401823-S | 7744732 |
| | | | | 401823-J | 7744731 |
| | K-3 | 2 1/64 | 3 | 401833 | 7403073 |
| | | | | 401883-H | 7744654 |
| | | | | 401883-S | 7744656 |
| | | | | 401883-J | 7744655 |
| | K-4 | 53/64 | 5 | 401836 | 7403503 |
| | | | | 401836-H | 7410395 |
| | | | | 401836-S | 7348596 |
| | | | | 401836-J | 7348597 |
| | K-7 | 1 5/32 | 4 | 401857 | 8680609 |
| | | | | 401857-H | 7348776 |
| | | | | 401857-S | 7348777 |
| | | | | 401857-J | |
| | K-9 | 1 9/32 | 2 | 401822 | 7403500 |
| | | | | 401822-H | 7348665 |
| | | | | 401822-S | 7348666 |
| | | | | 401822-J | 7348667 |
| | K-10 | 4¼ | 3 | 401950 | 7973964 |
| | | | | 401950-H | |
| | | | | 401950-S | |
| | | | | 401950-J | |
| | CC-2-A | 1 | 1 | 401813 | 7403071 |
| | | | | 401813-H | 7744803 |
| | | | | 401813-S | 7744555 |
| | | | | 401813-J | 7744556 |
| 131 | H-3 | 1 19/64 | 3 | 401822 | 7403500 |
| | | | | 401822-H | 7348665 |
| | | | | 401822-S | 7348666 |
| | | | | 401822-J | 7348667 |

*Table V. Stud Identification—Continued*

| Fig. no. | Ref. ltr | Setting height (inch) | No. reqd | Mfg. no. (Continental) | Ord. no. |
|---|---|---|---|---|---|
| 131 | H-5 | 2 3/16 | 4 | 401971 | 8365686 |
| | | | | 401971-H | 8365809 |
| | | | | 401971-S | 8365810 |
| | | | | 401971-J | |
| | H-6 | 2 17/32 | 2 | 401831 | 7403502 |
| | | | | 401831-H | 7369955 |
| | | | | 401831-S | 7369956 |
| | | | | 401831-J | 7369957 |
| | Q-3 | 1/8 | 3 | 401809 | 7403507 |
| | | | | 401809-H | 7348659 |
| | | | | 401809-S | 7348663 |
| | | | | 401809-J | 7348664 |
| | Q-5 | 3 1/32 | 2 | 401873 | 7403101 |
| | | | | 401873-H | 7744795 |
| | | | | 401873-S | 7744605 |
| | | | | 401873-J | 7744604 |
| 134 | S | 31/32 | 6 | 401945 | 7403519 |
| | | | | 401945-H | 7348812 |
| | | | | 401945-S | 7348813 |
| | | | | 401945-J | 7348814 |
| 139 | C-1 | 31/32 | 6 | 401861 | 7403097 |
| | | | | 401861-H | 7744572 |
| | | | | 401861-S | 7744573 |
| | | | | 401861-J | 7744574 |
| | C-4 | 1 29/64 | 4 | 401931 | 7403075 |
| | | | | 401931-H | 7767348 |
| | | | | 401931-S | 7767361 |
| | | | | 401931-J | 7767362 |
| 142 | A-1 | 1 | 6 | 401861 | 7403097 |
| | | | | 401861-H | 7744572 |
| | | | | 401861-S | 7744573 |
| | | | | 401816-J | 7744574 |
| 144 | DD-2 | 3/4 | 4 | 401808 | 7403212 |
| | | | | 401808-H | 7338646 |
| | | | | 401808-S | 7348651 |
| | | | | 401808-J | |
| | PP-1 | 31/32 | 2 | 401971 | 8365686 |
| | | | | 401971-H | 8365809 |
| | | | | 401971-S | 8365810 |
| | | | | 401971-J | |
| | PP-3 | 55/64 | 3 | 401824 | 7403501 |
| | | | | 401824-H | 7348668 |
| | | | | 401824-S | 7348669 |
| | | | | 401824-J | 7348670 |
| | PP-4 | 1 1/16 | 3 | 401813 | 7403071 |
| | | | | 401813-H | 7744803 |
| | | | | 401813-S | 7744555 |
| | | | | 401813-J | 7744556 |

# CHAPTER 7
# ASSEMBLY OF ENGINE

## Section I. ASSEMBLY INSTRUCTIONS

### 253. General

Refer to paragraph 80 for general assembly procedures.

### 254. Torquing Instructions

*a. Torque Readings and Specifications.* During engine assembly, numerous references are made to torque specifications (par. 335). Torque wrenches, with indicating scales, are provided for tightening nuts and bolts to these specifications. Readings on these scales are worthless unless the wrenches are used properly. It must be understood that it is not the force required to turn the nut or bolt that is important, but the resultant pull on the stud or bolt that is of prime importance.

*b. Use of Torque Wrenches.* To obtain correct readings, follow the procedures outlined in (1) through (4) below.

(1) Threads must be undamaged and clean and lubricated with mica-base anti-seize compound (Spec. MIL–A–13881 (ORD)) to reduce unavoidable friction.

(2) When using a torque wrench, the final reading must be taken while the nut or bolt is still turning.

(3) If torque reading is close to that specified when the wrench is at the end of its swing, back off nut or bolt slightly and change the wrench position; then pull to the specified reading while nut or bolt is turning.

(4) A much higher torque is required to start a partially tightened nut or bolt than is required to keep it turning. Do not exceed specified torque.

NOTE: The ratio of pounds-torque to pounds-pull on the stud or bolt is not an even ratio. Excess torque may easily overstress the stud or bolt.

## Section II. ASSEMBLY OF ENGINE FROM SUBASSEMBLIES

### 255. Installation of Crankshaft and Connecting Rods and Assembly of Crankcases

NOTE: The key letters shown below in parentheses refer to figure 64 except where otherwise indicated.

*a. Install Crankshaft and Connecting Rods.*

(1) Install four support legs 8708180 (K, fig. 9) on left crankcase half as shown in figure 59 and as described in paragraph 75.

(2) Lay two crankcase halves on suitable bench, with bearing bores up.

(3) Install six crankshaft main bearings (Q) and two crankshaft main thrust bearings (RR) in their respective bores. Coat bearings with engine oil (OE–50). Install bearings in same locations as marked on bearings during disassembly.

(4) Wire connecting rods for right side cylinders together as shown in figure 60. Attach crankcase lifting sling 7082088 (K, fig. 10) to crankshaft. Lift crankshaft, with attached connecting rods, and lower gently into left crankcase, guiding the left side connecting rods through the cylinder mounting holes. Remove wire from connecting rods.

**CAUTION: Do not let connecting rods fall and damage machined flanged surfaces of left crankcase half.**

*b. Assemble Crankcases.*

(1) Install thru bolt straps 7082259 (T, fig. 10) over studs on right crankcase. Position crankcase lifting eye 7083793 (X, fig. 10) over straps and attach to cylinder mounting studs with $\frac{7}{16}$-inch

hex nuts as shown in figure 59. Using hoist attached to lifting eye, lift right crankcase half high enough to clear connecting rods.

(2) Lower right crankcase half gently into place on left crankcase half, guiding connecting rods through cylinder mounting holes.

(3) Remove hoist. Remove hex nuts securing lifting eye to crankcase and remove lifting eye and straps. Install six connecting rod protectors 8390285 (J, fig. 10) on studs on cylinder mounting holes and around connecting rods as shown in figure 54.

(4) Install two special dowel type 7/16 x 2 7/16 hex-head bolts (HH) and 33/64 id, 7/8 od, 1/16 thick flat washers (GG) in crankcase flange from left crankcase side, one in top flange and the other in bottom flange at flywheel end. Tap lightly with a soft hammer to seat bolts properly.

(5) Install special dowel type 5/16 x 2 7/8 hex-head bolt (U) and 25/64 id, 5/8 od, 0.0640 thick plain washer (T) in crankcase flange, from left side, at accessory case end. Tap lightly with a soft hammer to seat bolt properly.

(6) Secure hex-head bolts (HH) installed in (4) above with two 7/16-inch hex self-locking nuts (AX), or 7/16-inch hex nuts (AX), and 29/64 id, 3/4 od, 0.0650 thick plain washers (AW). Tighten nuts snugly but do not torque.

(7) Secure hex-head bolt (U) installed in (5) above with 5/16-inch hex self-locking nut (B), or 5/16-inch hex nut (B), and 21/64 id, 9/16 od, 0.0630 thick flat washer (C). Tighten nuts snugly but do not torque.

(8) Install 12 crankcase thru bolts through crankcases. Install 12 thru bolt spacers (AQ) and 9/16-inch extended washer hex nuts (AP) on thru bolts at all locations except on cylinder mounting pads. Use straps 7082259 (fig. 54) under twelve 9/16-inch extended washer hex nuts on cylinder mounting pads to protect the machined surface. Tighten nuts snugly but do not torque.

(9) Install eight 5/16 x 2 11/32 hex-head bolts (FF) and 21/64 id, 9/16 od, 0.0630 thick flat washers (X) through holes in crankcase top flange, from left crankcase side. Secure bolts with 5/16-inch hex self-locking nuts (B), or 5/16-inch hex nuts (B), and 21/64 id, 9/16 od, 0.0630 thick flat washers (C). Tighten nuts snugly but do not torque.

(10) Before proceeding further with assembly of crankcases, check crankshaft end play as described in (*a*) and (*b*) below.

(*a*) Install a dial indicator on transmission adapter flange, with needle of indicator touching flywheel mounting flange on crankshaft as shown in figure 171.

(*b*) Insert a pinch bar or large screwdriver between crankshaft counterweight and crankcase main bearing web. Pry crankshaft through the limits of its end play, checking readings on dial indicator. End play should be 0.0100 to 0.0140-inch for new parts and 0.0100 to 0.0170-inch for reconditioned parts.

(*c*) If crankshaft end play is not within limits specified in (*b*) above, remove dial indicator, separate crankcases, remove crankshaft, and remove main

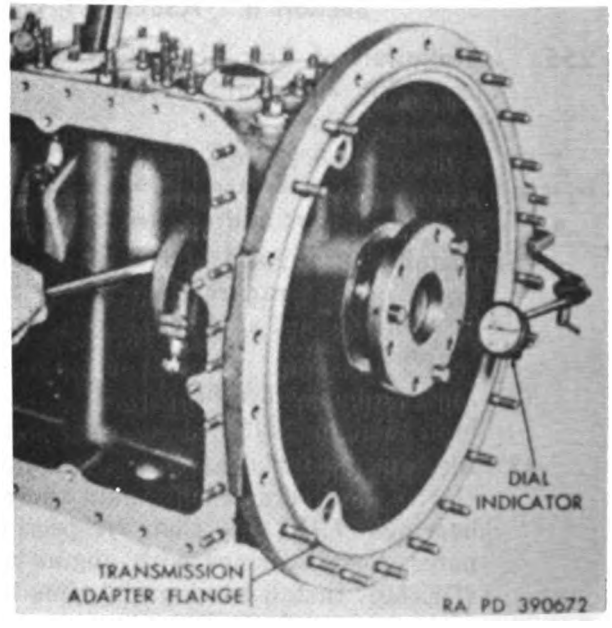



*Figure 171. Checking crankshaft end play.*

thrust bearing (par. 75*b*), install new crankshaft main thrust bearing (*a*(3) above), and install crankshaft and assembly crankcases (*a* and *b*(1) through (9) above).

(*d*) Check crankshaft end play ((*a*) and (*b*) above) to be certain end play is within limits specified in (*b*) above.

(*e*) Remove dial indicator.

(11) Press crankshaft oil seal (AD) on crankshaft into recess in crankcase. Be certain parting line of oil seal is away from parting line of crankcase.

(12) Install two oil seal retaining plates (PP and AE) on crankcases against seal. Secure plates with four 1/4 x 15/32 hex-head bolts (NN and AF). Secure bolts with locking wire.

(13) Install fan drive vertical shaft drive gear bearing (R) in crankcase. Aline locking bolt hole in bearing with bolt hole in left crankcase. Lock bearing in crankcase with 5/16 x 1 5/16 hex-head bolt (AA) and 21/64 id, 9/16 od, 1/16 thick flat copper washer (BB). Secure bolt with locking wire.

(14) Aline dowel pin hole in fan drive vertical shaft bearing (W) with dowel pin in crankcase and install bearing in bore in crankcase. Tap lightly with a brass drift to seat bearing in bore and on dowel pin.

(15) Install four 5/16 x 3 7/32 hex-head bolts (Y) and 21/64 id, 9/16 od, 0.0630 thick flat washers (X), two 3/8 x 5 15/32 hex-head bolts (DD), two 3/8 x 8 1/4 hex-head bolts (EE), and four 25/64 id, 13/16 od, 1/8 thick flat washers (CC) through proper holes surrounding fan drive housing in crankcase. Secure hex-head bolts (Y) with four 5/16-inch hex self-locking nuts (B), or 5/16-inch hex nuts (B), and 21/64 id, 9/16 od, 0.0630 thick flat washers (C). Secure hex-head bolts (DD and EE) with four 3/8-inch hex self-locking nuts (BA), or 3/8-inch hex nuts (BA), and 25/64 id, 13/16 od, 1/8 thick flat washers (AZ).

(16) Install 5/16-inch slotted hex nut (AC) and 21/64 id, 9/16 od, 0.0630 thick flat washer (AB) on stud in flywheel recess of crankcase. Tighten nut to torque specified in paragraph 335. Secure nut with locking wire.

*c. Install Crankcase Assembly on Overhaul Stand.*

(1) With the aid of an assistant, turn crankcase so oil pan mounting flange is resting on wooden blocks. Remove four support legs 8708180 (R, fig. 9) from left crankcase half.

(2) Install a suitable rope sling through No. 3 and No. 4 cylinder openings. Attach hoist to rope sling and lift crankcase assembly.

(3) Install crankcase assembly, with transmission mounting flange studs entering holes in adapter 7950322 (fig. 14), on overhaul stand 7950189 (fig. 14). Secure assembly to adapter with 7/16-inch hex nuts and flat washers installed on studs.

(4) Remove hoist from sling and sling from crankcase.

## 256. Installation of Flywheel

*a. Model AOSI-895-5 Engine.*

**NOTE: The key letters shown below in parentheses refer to figure 64.**

(1) Aline dowel pin holes in flywheel assembly (SS) with dowel pins in crankshaft hub and install flywheel assembly on crankshaft hub.

**NOTE: One dowel pin is located 3 degrees off center line to assure proper installation of flywheel in reference to timing marks.**

(2) Install six 9/16 x 1 15/32 hex-head bolts (VV) through flywheel assembly and into crankshaft hub. Alternately tighten bolts until flywheel is seated against hub. Remove bolts.

(3) Locate transmission drive hub assembly (UU) on dowel pins in crankshaft hub. Install six 9/16 x 1 15/32 hex-head bolts (VV) through hub assembly, flywheel assembly, and into crankshaft hub.

(4) Alternately tighten bolts until hub assembly is seated against flywheel. Torque the bolts to 1,000 pound-inches and secure with locking wire.

*b. Model AOSI–895–5M Engine.*

NOTE: The key letters shown below in parentheses refer to figure 68 except where otherwise indicated.

(1) Aline dowel pin holes in flywheel assembly (K) with dowel pins in crankshaft hub and install flywheel assembly on crankshaft hub.

NOTE: One dowel pin hole is located 3 degrees off center line to assure proper location of flywheel in reference to timing marks.

(2) Position flywheel mounting bolt locks (L) over mounting holes and install six 7/16 x 1 3/8 hex-head bolts (P) through flywheel assembly and into crankshaft hub. Alternately tighten bolts until flywheel is seated against hub. Torque bolts to 1,000 pound-inches. Secure bolts by bending corners of bolt locks around bolt heads.

(3) Press ball bearing (WW, fig. 64) in bore of crankshaft hub with a suitable bearing adapter.

(4) Install 12 damper drive springs (M) and 24 drive spring seats (N) in their recesses in flywheel assembly.

(5) Install damper spacing plate (J), damper friction disk (F), damper driven plate (G), with attached damper hub (B) and damper hub plate (H), another damper friction disk (F), damper pressure plate (E), and pressure plate loading ring (D) on flywheel in that order. Aline holes in ring, disks, and plates with holes in flywheel.

(6) Aline dowel pin holes in flywheel cover plate (C) with dowels in flywheel and install plate on flywheel over parts installed in (5) above.

(7) Install twelve 3/8 x 3/4 hex-head self-locking bolts (R) through cover plate and into flywheel. Alternately tighten bolts until cover plate seats in flywheel. Torque bolts to 300 pound-inches.

## 257. Installation of Cooling Fan Drive

NOTE: The key letters shown below in parentheses refer to figure 92 except where otherwise indicated.

*a. Install Fan Drive Gears.*

(1) Install new tower hole plug gasket (G, fig. 64) on fan tower hole plug (F, fig. 64) and install plug in flywheel end opening of fan drive housing on crankcase, from inside housing. Secure plug in housing with 3/8-inch slotted hex nut (J, fig. 64) and 1 3/32 id, 1 7/16 od, 3/16 thick flat washer (H, fig. 64). Secure nut with 1/16 x 3/4 cotter pin (K, fig. 64).

(2) Position new hose nipple gasket (S) on drive shaft hose nipple (T) and install nipple in accessory end opening in fan drive housing on crankcase. Screw nipple securely into vertical shaft drive gear bearing (R) previously installed in crankcase. Install hose (V), with attached hose clamps (U), on nipple. Tighten clamp only enough to hold hose in position.

(3) Install vertical drive shaft drive gear (Q) through top opening of fan drive housing and into bore of vertical drive shaft drive gear bearing (R).

(4) Through same opening, install vertical drive shaft driven gear (N), mesh teeth on drive and driven gears, and seat driven gear against thrust face of vertical drive shaft bearing (Y) previously installed in crankcase.

(5) Install vertical drive shaft (M), with attached oil slinger (L), through driven gear and into vertical drive shaft bearing, engaging splines on drive shaft with splines in driven gear.

*b. Install Fan Drive Vertical Drive Shaft Bearing Housing.* Position new 4 3/4 id "O" ring packing (K) in groove on underside of vertical drive shaft bearing housing (J). Install housing, with installed ball bearing (H), over drive shaft and onto studs in fan drive housing. If necessary, tap bearing inner race gently with a hammer to install it on drive shaft.

*c. Install Fan Drive Vertical Drive Shaft Oil Seal Housing.*

(1) Position a new 4-inch id "O" ring packing (G) in groove in underside of vertical drive shaft oil seal housing (E). Install housing, with installed oil seal (F), over drive shaft and onto studs in fan drive housing.

(2) Secure oil seal housing and bearing housing to fan drive housing with eight 5/16-inch slotted hex nuts (A) and 21/64 id, 9/16 od, 0.0630 thick flat wash-

ers (B). Secure hex nuts with locking wire.

NOTE: On early model AOSI–895–5M engines, install two ¼ x ¾ flat-head screws in addition to slotted hex nuts and flat washers installed in (2) above.

## 258. Installation of Cylinders and Pistons

*a. Install Pistons in Cylinders.*

(1) Thoroughly coat cylinder bore, piston, piston rings, and piston pins with engine oil (OE–50).

(2) Stand cylinder assembly on head end and place gage and compressor 7082040 (fig. 172) on cylinder skirt.

(3) Check identifying number on piston and cylinder to make certain they are identical.

NOTE: Cylinders are marked on rocker box flange on the intake side. Pistons are marked on the bottom of piston pin boss. Side of piston having marking must go to accessory side of cylinder.

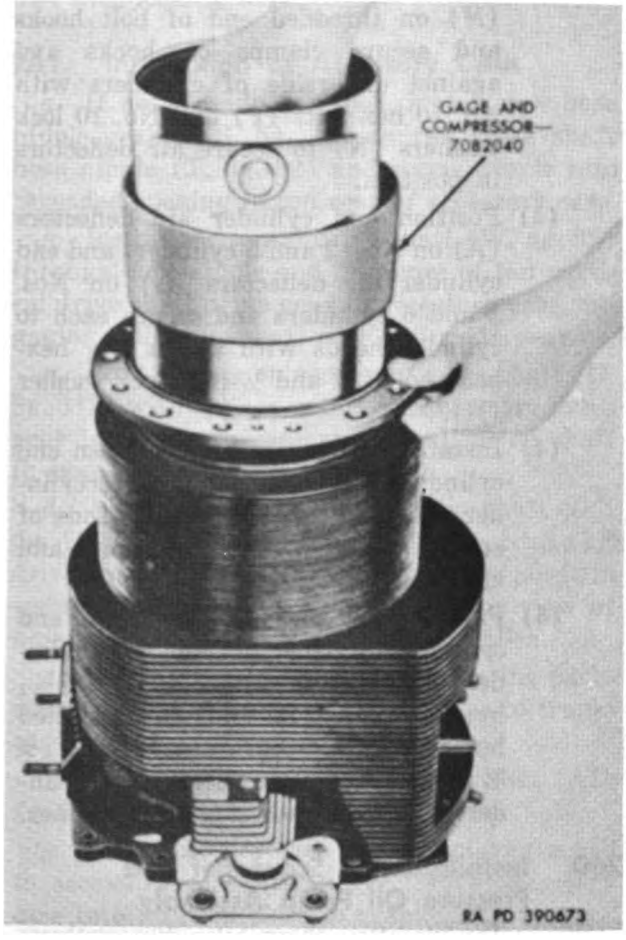



*Figure 172. Installing piston in cylinder.*

(4) Insert piston, with piston rings attached, into large end of gage and compressor. Press piston through gage and compressor and into bore of cylinder until all rings have entered bore. Remove gage and compressor.

(5) Install new 4.9800-inch id "O" ring packing (A, fig. 76) on cylinder base.

(6) Install remaining pistons in correct cylinders as described in (1) through (5) above.

*b. Install Cylinders.*

(1) Install engine turning wrench 8389952 (fig. 53) on flywheel. Rotate crankshaft with wrench to bring No. 5 and 6 connecting rods out of the crankcase as far as possible. Remove wrench.

(2) Remove four extended washer hex nuts from crankcase thru bolts on No. 5 and 6 cylinder mounting pads and remove thru bolt straps.

(3) Press piston pin of No. 5 piston to one side of piston pin boss. Position the cylinder, with installed piston, over the connecting rod as shown in figure 173. Aline piston pin bore of piston and connecting rod piston pin bearing and insert piston pin through connecting rod and center it in piston. Remove connecting rod protector (fig. 54) and push cylinder forward over piston and onto mounting studs.

(4) Install 12 7/16-inch hex nuts (D, fig. 76) on studs to secure cylinder to crankcase. Torque nuts to 400 pound-inches, using wrench 7082856 (fig. 52) in conjunction with a torque wrench. Install 7/16-inch hex stamped nuts (E, fig. 76) to lock hex nuts.

(5) Install No. 6 cylinder in the identical manner as described for No. 5 cylinder in (3) and (4) above.

NOTE: After installation of each pair of opposite cylinders, install four 9/16-inch extended washer hex nuts on cylinder mounting pad thru bolts and tighten sufficiently to relieve binding of crankshaft.

(6) Install remaining four cylinders in a similar manner to that described for

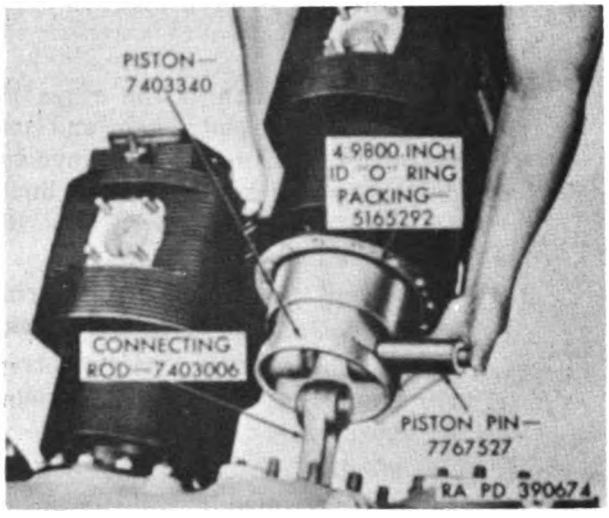



*Figure 173. Installing cylinder.*

Nos. 5 and 6 cylinders in (1) through (5) above, rotating crankshaft each time to bring desired pair of connecting rods into position for assembly.

*c. Torque Crankcase Thru Bolt and Flange Bolt Nuts.*

(1) Make sure the twelve $\frac{9}{16}$-inch extended washer hex nuts (NN, fig. 76) have been installed on cylinder mounting pad thru bolts.

(2) Using wrench 7082008 (M, fig. 9), torque all crankcase thru bolt nuts by progressively tightening all nuts to 300, 600, and 750 pound-inches. Start with nuts on center cylinder and alternately work toward each end. Secure nuts with $\frac{3}{32}$ x 1 cotter pins (MM, fig. 76).

(3) Torque all hex nuts along the crankcase flange to limits specified in standard torque table in paragraph 335 according to size of nut. Install $\frac{5}{16}$-inch hex stamped nuts (A, fig. 64, $\frac{3}{8}$-inch hex stamped nuts (BC, fig. 64), or $\frac{7}{16}$-inch hex stamped nuts (AY, fig. 64) to secure the plain hex nuts, if used.

## 259. Installation of Cylinder Air Deflectors and Baffles

NOTE: The key letters shown below in parentheses refer to figure 153 except where otherwise indicated.

*a. Install Cylinder Head Air Deflectors and Baffles.*

(1) Position four intercylinder air baffles (F, fig. 76) between Nos. 1 and 3, 3 and 5, 2 and 4, and 4 and 6 cylinder heads. Secure the baffles to the cylinder heads with four $\frac{7}{16}$ x $\frac{1}{2}$ hex-head bolts (G, fig. 76) and $\frac{7}{16}$-inch lock washers (H, fig. 76).

(2) Install six cylinder head air deflectors (JJ, fig. 76) over studs on top of cylinder heads.

NOTE: Refer to figure 51 for installed view of cylinder air deflectors and baffles.

*b. Install Cylinder Air Deflectors.*

(1) Position four intercylinder air deflectors (F) on top of cylinders between Nos. 1 and 3, 3 and 5, 2 and 4, and 4 and 6 cylinders. Install intercylinder deflector bolt hooks (L) through holes in air deflectors and down between cylinders.

(2) Install intercylinder deflector clamps (M) on threaded end of bolt hooks and secure clamps on hooks and against underside of cylinders with No. 10 hex nuts (P) and No. 10 lock washers (N) to secure air deflectors in position.

(3) Position end cylinder air deflectors (A) on Nos. 2 and 5 cylinders and end cylinder air deflectors (G) on Nos. 1 and 6 cylinders and secure each to cylinder heads with a $\frac{1}{4}$ x $1\frac{7}{32}$ hex-head bolt (J) and $\frac{1}{4}$-inch lock washer (H).

(4) Install four springs (K) between end cylinder air deflectors and intercylinder deflector clamps, hooking ends of spring in holes in air deflectors and clamps.

(5) Position bolt spacer (E) between end cylinder air deflectors and intercylinder air deflectors and install $\frac{1}{4}$ x $2\frac{21}{32}$ hex-head bolts (D) and $\frac{1}{4}$-inch slotted hex nuts (C). Secure nuts with $\frac{1}{16}$ x $\frac{3}{4}$ cotter pins (B). Secure intercylinder air deflectors in a similar manner.

## 260. Installation of Scavenger and Pressure Oil Pump Assembly

NOTE: The key letters shown below in parentheses refer to figure 72 except where otherwise indicated. To facilitate installation of scavenger and pressure oil

pump, rotate cradle assembly in overhaul stand so engine is resting on flywheel end as shown in figure 42. Refer to this figure for installed view of scavenger and pressure oil pump and tubes.

*a.* Position scavenger and pressure oil pump, with attached scavenger oil pump outlet and pickup tubes, on studs in crankcase. Secure pump to crankcase with four 3/8-inch slotted hex nuts (R) and 25/64 id, 5/8 od, 0.0640 thick flat washers (S). Secure nuts with locking wire.

*b.* Position scavenger oil pump pickup tube (V) on stud on crankcase and secure with two 5/16-inch slotted hex nuts (W). Secure nuts with locking wire.

*c.* Position accessory case scavenger oil pump outlet tube (AE, fig. 96) in crankcase with straight end of tube extending through opening in accessory end of crankcase. Aline holes in mounting brackets of two outlet tubes with tapped hole in crankcase web and secure tubes with 5/16 x 1 9/32 hex-head bolt (T). Secure bolt with locking wire.

## 261. Installation of Accessory Case

*a.* If not already installed, install new hose nipple gasket (S, fig. 92) on fan drive shaft hose nipple (T, fig. 92) and screw nipple into threaded opening in top rear of accessory case.

*b.* Install horizontal drive shaft (W, fig. 92) through hose nipple and into bore of fan vertical drive shaft drive gear in accessory case, engaging splines on shaft with splines in gear.

*c.* Aline splines on accessory drive shaft (N, fig. 112) with splines in bore of accessory drive gear in accessory case and install drive shaft in gear in accessory case.

*d.* Aline splines on oil pump drive shaft (CC, fig. 72) with splines in bore of power-take-off drive shaft and install oil pump drive shaft in accessory case. Refer to figure 48 for view of accessory case with drive shafts installed.

*e.* Install three new 3/4-inch id "O" ring packings (BF, fig. 96) on accessory-case-to-crankcase oil transfer tubes.

*f.* Position new accessory case gasket (AD, fig. 96) on studs on accessory case.

*g.* Lift accessory case with a hoist attached to accessory case lifting eye. Move accessory case into position close to crankcase.

*h.* Aline hole in bottom of accessory case with accessory case scavenger oil pump outlet tube. Aline splines on accessory drive shaft (Q, fig. 48) with splines in bore of vibration damper hub. Aline splines on pressure oil pump drive shaft (G, fig. 48) and fan drive horizontal drive shaft (C, fig. 48) with splines in bores of their respective gears.

NOTE: It may be necessary to rotate crankshaft with wrench 8708806 (fig. 15) through power-take-off drive shaft to engage splines on shafts with splines in bores of gears.

*i.* Install accessory case on crankcase and secure with eight 7/16-inch hex self-locking nuts (HH, fig. 109) or 7/16-inch hex nuts (HH) and 7/16-inch hex stamped nuts (JJ, fig. 109), six 7/16-inch slotted hex nuts (D, fig. 42), and fourteen 0.4530 id, 0.7500 od, 0.0650 thick flat washers (GG, fig. 109). Secure slotted hex nuts with locking wire. Complete installation of accessory case by installing four 1/2-inch hex self-locking nuts (AM, fig. 109), or 1/2-inch hex nuts (AM, fig. 109) and 1/2-inch hex stamped nuts (AN, fig. 109), and 33/64 id, 7/8 od, 1/16 thick flat washers (AL, fig. 109). Remove hoist.

## 262. Installation of Camshafts and Camshaft Gear Housing

NOTE: The key letters shown below in parentheses refer to figure 76 except where otherwise indicated.

*a. Install Left Camshaft and Camshaft Gear Housing.*

(1) Remove hex-head bolts (S) and flat washers (R) securing camshaft bearing caps (Q) and rocker shaft supporting brackets (V) to the cylinder heads and remove caps and brackets, with attached valve rocker assemblies (U) and valve rocker shaft assemblies (T), from cylinder heads.

(2) Install left camshaft and camshaft gear housing as a unit (fig. 46) on the cylinders with intercylinder pipes (N, fig. 145) entering cylinder head counterbores and drive shaft tube (W, fig. 145) entering bore of camshaft drive housing.

(3) Install camshaft bearing caps (Q) and rocker shaft supporting brackets (V), with attached valve rocker assemblies (U) and valve rocker shaft assemblies (T), on cylinder heads over camshaft.

(4) Secure bearing caps and supporting brackets to cylinder heads with 3/8 x

$2\frac{13}{16}$ hex-head bolts (S) and $\frac{25}{64}$ id, $\frac{13}{16}$ od, $\frac{1}{8}$ thick flat washers (R). Torque bolts to 175 pound-inches as shown in figure 174. Secure bolts with locking wire.

(5) Secure camshaft gear housing to No. 2 cylinder head with two $\frac{7}{16}$ x 1 hex-head bolts (S, fig. 145) and 0.4600-inch tab washers (R, fig. 145). Bend up tabs to secure bolts.

(6) Tighten drive housing inner and outer packing nuts on camshaft drive housing and camshaft gear housing using wrench 7083792 (fig. 45). Secure nuts with locking wire.

*b. Install Right Camshaft and Camshaft Gear Housing.* Install right camshaft and camshaft gear housing in the same manner as described for left camshaft and camshaft gear housing in *a* above.

*c. Set Valve Clearances.*

(1) *Exhaust valve clearance* (fig. 175).

NOTE: Exhaust valve clearance is set by setting clearance between camshaft lobe and valve rocker roller. The end of the exhaust valve is recessed in the valve spring retainer and cannot be reached by a gage. Rotate camshaft to bring base circle opposite camshaft lobe under No. 1 exhaust valve rocker roller.

(*a*) Insert 0.0140-inch leaf of gage 7083769 (fig. 175) between camshaft and exhaust valve rocker roller.

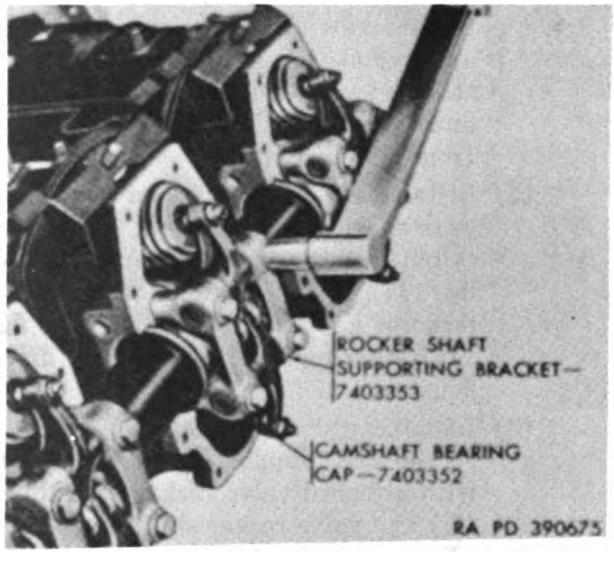



*Figure 174. Torquing valve rocker shaft supporting bracket and bearing cap bolts.*

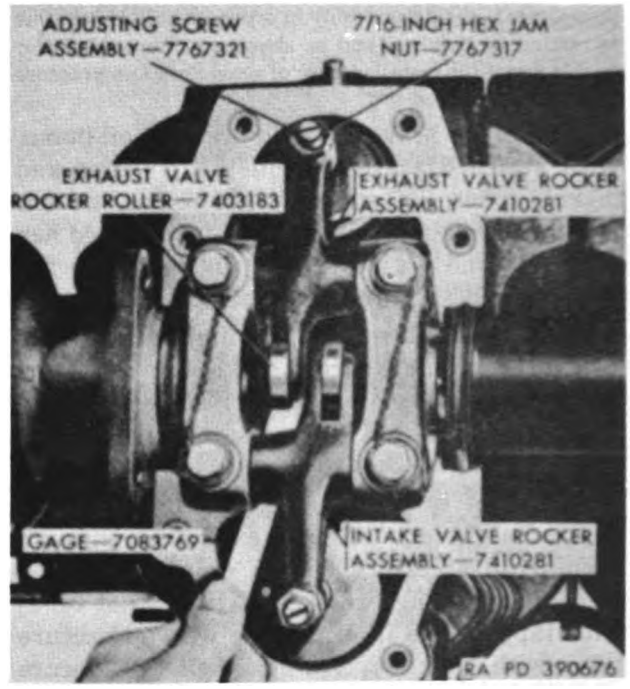



*Figure 175. Checking exhaust valve clearance.*

(*b*) Insert a screwdriver in slot in adjusting screw, loosen hex jam nut and turn adjusting screw assembly in or out of rocker assembly until 0.0140-inch clearance between roller and camshaft is attained. Clearance of 0.0140-inch under rocker roller provides clearance of 0.0200-inch between exhaust valve stem and adjusting screw swivel pad.

(*c*) Tighten hex jam nut securely on adjusting screw assembly to lock adjusting screw in place. Be careful not to change setting of adjusting screw when tightening nut.

(*d*) Insert gage as described in (*a*) above to check valve clearance after tightening nut. Remove gage.

(*e*) Adjust exhaust valve clearance on remaining five cylinders as described in (*a*) through (*d*) above, rotating camshaft each time to bring base circle opposite camshaft lobe under exhaust valve rocker roller.

(2) *Intake valve clearance* (fig. 176).

NOTE: Nos. 1 and 2 cylinder intake valves

are set at 0.1000-inch clearance for timing purposes only. Clearance must be adjusted to 0.0070-inch after valves and magnetos have been timed.

(*a*) Rotate camshaft to bring base circle, opposite lobe on camshaft, under No. 1 cylinder intake valve rocker roller. Insert 0.1000-inch leaf of gage 7083769 (fig. 176) between swivel pad on adjusting screw assembly and intake valve stem.

(*b*) Insert a screwdriver in slot in adjusting screw, loosen hex jam nut, and turn adjusting screw assembly in or out of rocked assembly until 0.1000-inch clearance between swivel pad and valve stem is attained.

(*c*) Tighten hex jam nut securely on adjusting screw assembly to lock adjusting screw in place. Be careful not to change setting of adjusting screw when tightening hex nut.

(*d*) Insert gage as described in (*b*) above to check valve clearance after tightening hex nut. Remove gage.

(*e*) Set clearance of No. 2 cylinder intake valve to 0.1000-inch as described in (*a*) through (*d*) above.

(*f*) Set clearance of intake valves on remaining four cylinders to 0.0070-inch, using the 0.0070-inch leaf of gage 7083769 (A, fig. 10), in same manner as described for No. 1 cylinder in (*a*) through (*d*) above.

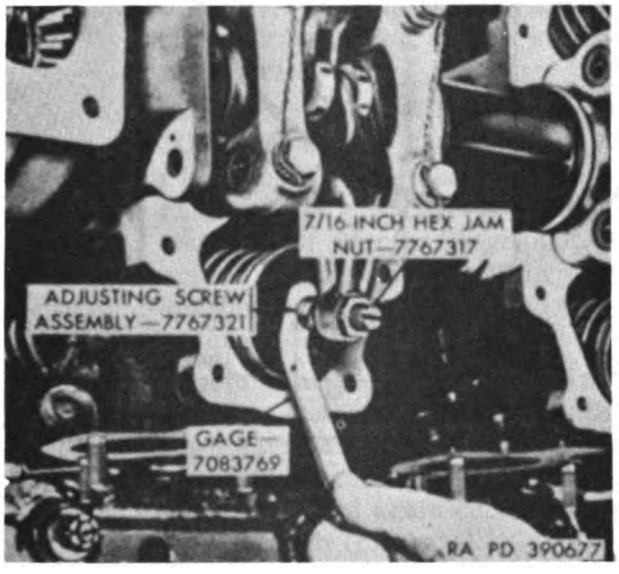



*Figure 176. Checking intake valve clearance.*

## 263. Timing of Engine

NOTE: For complete engine timing the sequence of operations described below must be followed to arrive at proper engine timing.

*a. Time Right Side Valves.*

NOTE: The key letters shown below in parentheses refer to figure 144 except where otherwise indicated. Clearance of intake valve on No. 1 cylinder must be set at 0.1000-inch for correct timing of valves (par. 262*c*).

(1) Install wrench 8708806 (fig. 15) on power-take-off drive shaft. Rotate crankshaft clockwise (as viewed from accessory end) until timing mark "OPP. ENG. 1 & 2 INT. CL. .100 CLR." on rim of flywheel is alined with notch marked "TIMING MARK" on transmission adapter flange pilot.

NOTE: The rim of flywheel is also marked with "V-ENG." (V-engine) markings. Do not confuse these markings with those marked "OPP. ENG." (opposed engine). Figure 177 shows relative location of timing marks on flywheel.

(2) Slowly rotate right side camshaft counterclockwise, as viewed from the accessory end (fig. 178), until No. 1 cylinder intake valve has just closed. The closing point is precisely determined by turning swivel pad on intake valve adjusting screw assembly as shown in figure 179, while camshaft is being rotated. Valve is closed the instant swivel pad is free.

(3) Install camshaft drive shaft (S) using remover and replacer 7082029 (fig. 44), through opening in camshaft drive housing, through drive shaft tube, and into splines in bore of right camshaft drive idler driven gear assembly (S, fig. 112).

**CAUTION: If drive shaft splines do not engage gear assembly splines, withdraw shaft and rotate slightly, continue to withdraw and rotate shaft until splines mate. Do not force drive shaft into gear assembly. The camshaft drive shaft has a 21 tooth spline on the inner end and a 25 tooth spline on the outer end. This differential in number of spline teeth gives the drive shaft a vernier effect and makes it possible to**

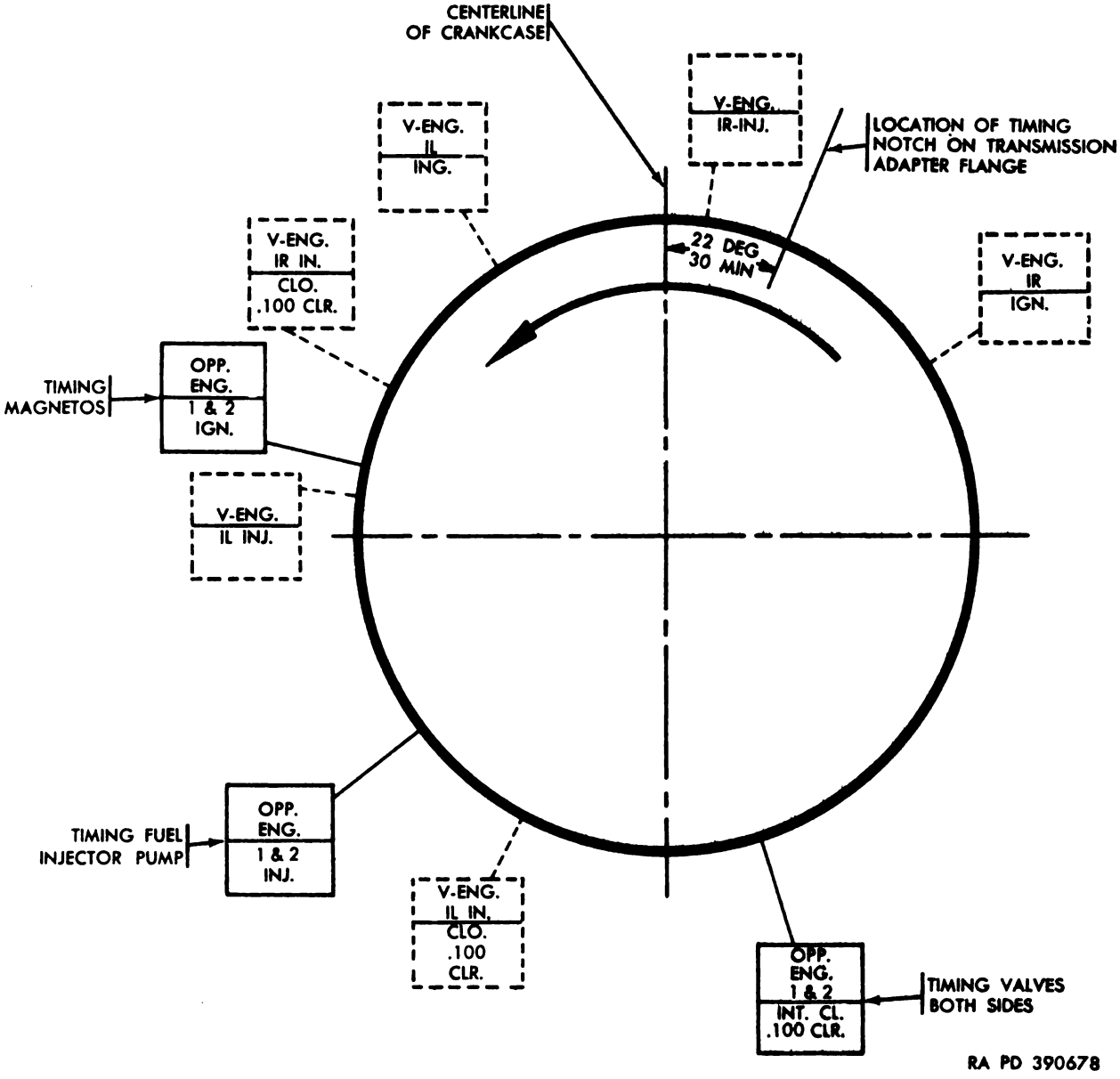



*Figure 177. Timing marks on flywheel.*

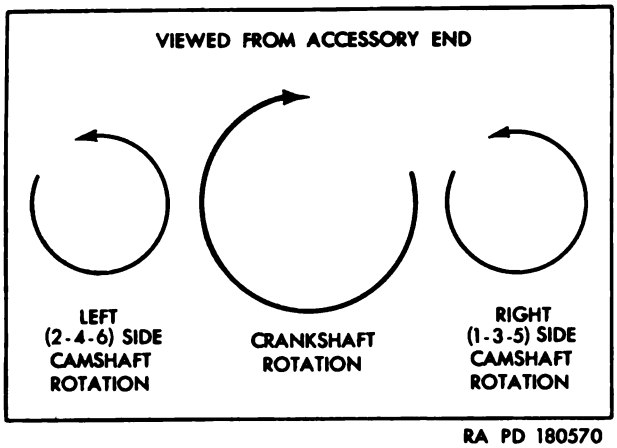



*Figure 178. Direction of rotation of crankshaft and camshafts*

**index the shaft so it will engage the mating splines of the two gears without changing the relationship of the camshaft to the crankshaft, thereby providing an accurate valve timing setting.**

(4) Check valve timing as described in (*a*) through (*c*) below.

(*a*) Rotate camshaft, as described in (1) above, one-eight turn counterclockwise, as viewed from accessory end, to remove gear backlash.

(*b*) Slowly rotate crankshaft clockwise, at the same time turning the swivel pad on No. 1 cylinder intake valve adjusting screw assembly, as shown in figure 179. Stop rotating crankshaft at the instant swivel pad becomes free.

(*c*) Observe position of timing mark "OPP. ENG. 1 & 2 INT. CL. .100 CLR." on flywheel in relation to notch marked "TIMING MARK" on transmission adapter flange pilot. If marks are alined, or within one-quarter inch of each other, the valve is timed correctly.

(*d*) If timing marks and notch are not alined as stated in (*c*) above, withdraw camshaft drive shaft and repeat timing procedure ((1) through (3) above) and again check timing ((*a*) through (*c*) above).

NOTE: If correct timing cannot be obtained as described above, it may be necessary to set mark and notch one-eighth to one-quarter inch out of alinement before installing drive shaft.

(5) After valve timing is correct and drive shaft is installed, install oil transfer outer plug (T) in bore of camshaft drive bevel gear (H) using remover and replacer 7082029 (fig. 43). Secure plug in gear by installing $1\frac{1}{16}$-inch housing diameter retaining ring (U) in groove in bore of gear.

(6) Position a new gear housing cover gasket (V) on gear housing and install gear housing cover (W) over gasket. Secure cover to housing with four $\frac{5}{16}$ x $3\frac{1}{32}$ hex-head bolts (Z), $\frac{5}{16}$-inch lock washers (Y, and $2\frac{1}{64}$ id, $\frac{9}{16}$ od, 0.0630 thick flat washers (X).

(7) Position a tachometer drive adapter gasket (CC) on studs on gear housing. Install tachometer drive adapter assembly (DD), with attached tachometer drive shaft (BB) and oil seal (EE), on gear housing, engaging drive

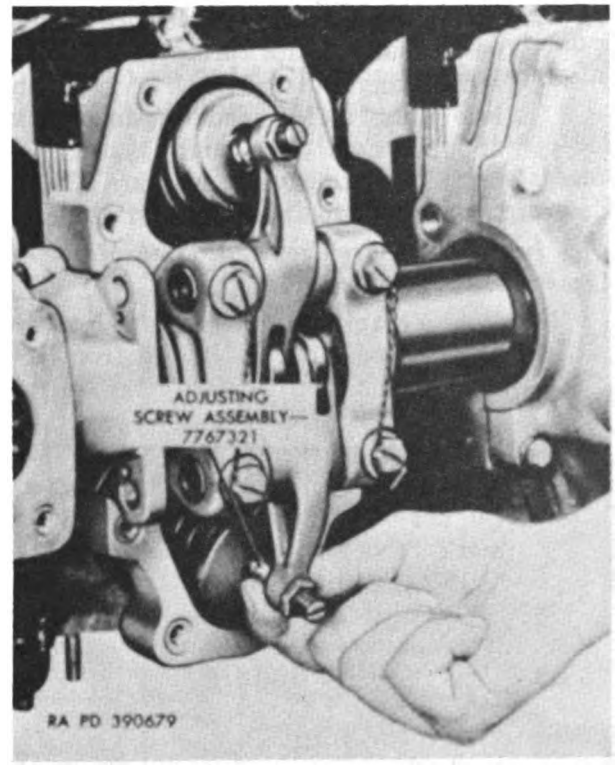



*Figure 179. Determining closing point of No. 1 cylinder intake valve.*

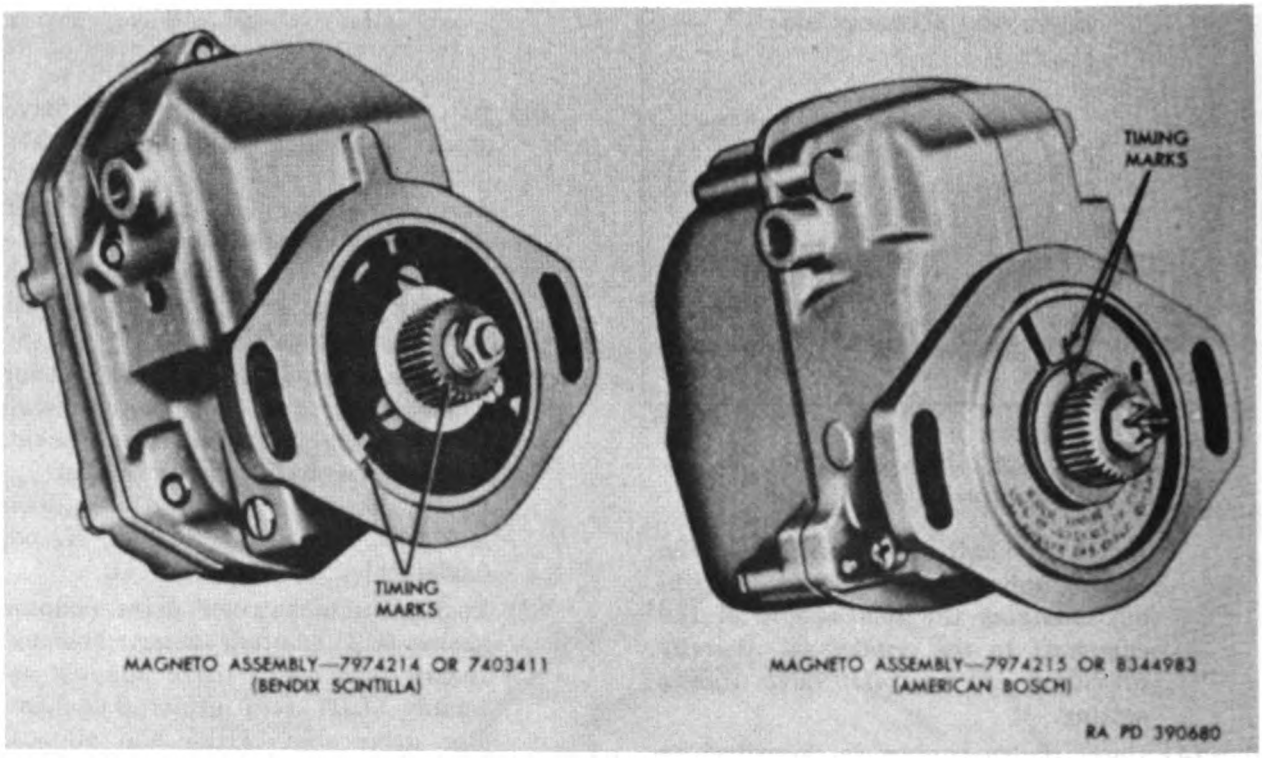



*Figure 180. Magneto timing marks.*

shaft with camshaft oil retaining cover assembly (AA–3). Secure adapter to housing with three 5/16-inch hex self-locking nuts (MM), or 5/16-inch hex nuts (MM) and 5/16-inch hex stamped nuts (LL), and 21/64 id, 9/16 od, 0.0630 thick flat washers (NN) installed on the three shorter studs.

*b. Install, Synchronize, and Time Magneto Assemblies.*

(1) Rotate crankshaft with wrench (*a* (1) above) clockwise, as viewed from accessory end, until timing mark "OPP. ENG. 1 & 2 IGN." (fig. 177) is alined with notch marked "TIMING MARK" on transmission mounting flange pilot. Do not confuse the injector timing mark "INJ" with the ignition mark "IGN".

NOTE: If magneto timing is to be performed independently of valve timing, aline "IGN" marking on flywheel with notch on flange pilot when the No. 1 cylinder is on compression stroke.

(2) If engine is equipped with late model Bendix Scintilla magneto assemblies 7974214 or 7403411 or American Bosch magneto assemblies 7974215 or 8344983, set timing marks on drive end of magneto as shown in figure 180.

(3) If engine is early model AOSI–895–5M engine equipped with early model Bendix Scintilla magneto assembly 7539854, remove hex-head lockwasher screws and remove covers and gaskets. Aline timing marks on magneto as shown in figure 181.

NOTE: Use timing line marked "L" on housing as shown. The timing line marked "R" is for magnetos rotating in the opposite direction.

(4) Aline splines on magneto drive gears with splines in magneto driven gears (J, fig. 122) and install magnetos on magneto drive adapter assembly (CC, fig. 122) with mounting studs positioned as close as possible to center of magneto adjusting slots.

NOTE: Do not install magneto mounting gaskets. Radio suppression is increased if gaskets are not installed.

(5) Secure each magneto with two 5/16-inch hex self-locking nuts (B, fig. 122), or 5/16-inch hex nuts (B, fig. 22) and

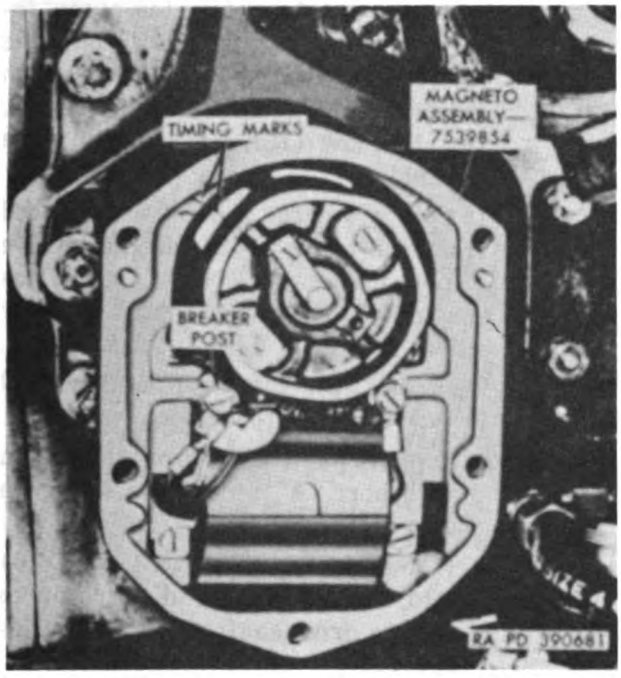



*Figure 181. Magneto timing marks (early model AOSI-895-5M engines only).*

$^{21}/_{64}$ id, $^{13}/_{16}$ od, $^{1}/_{8}$ thick flat washers (C, fig. 122). Tighten nuts only finger-tight to allow movement of magnetos during timing and synchronization.

(6) On magneto assemblies 7974214, 7974215, 7403411, or 8344983 only, install outer magneto ground cable assembly (J, fig. 164) on connector on outer magneto, and inner magneto ground cable assembly (K, fig. 164) on connector on inner magneto.

(7) Insert a $^{1}/_{8}$ x 1 cotter pin in end of each ground cable and clip two positive (red) leads of magneto timing light to cotter pins as shown in figure 182.

NOTE: On magneto assembly 7539854 only, clip positive leads to magneto breaker posts (fig. 181).

(8) Clip ground (black) lead of magneto timing light to one of the magneto housings.

(9) Place magneto timing light switch in "ON" position. Rotate magnetos on their mounts, as necessary, to make both lights just come on. Hold magnetos in position and secure by tightening mounting nuts installed in (5) above.

(10) Check synchronization of magnetos as described in (*a*) and (*b*) below.

(*a*) Using wrench, rotate crankshaft one-eighth turn counterclockwise, as viewed from accessory end, to remove gear backlash.

(*b*) Slowly rotate crankshaft clockwise until both timing lights come on and not alignment of magneto timing mark on flywheel and timing notch. Both lights should come on simultaneously at the instant the mark and notch are alined.

(*c*) If lights do not come on at the correct instant, loosen magneto mounting nuts and rotate magnetos, as necessary, until both lights come on at the instant the flywheel timing mark and timing notch are alined. Tighten mounting nuts and again check synchronization ((*a*) and (*b*) above).

(11) Place timing light switch in "OFF" position. Remove timing light leads from magnetos and remove timing light. Install $^{5}/_{16}$-inch hex stamped nuts (A, fig. 122) to lock hex nuts installed in (5) above.

(12) If engine is early model AOSI–895–5M engine equipped with magneto assembly 7539584, install new cover gaskets

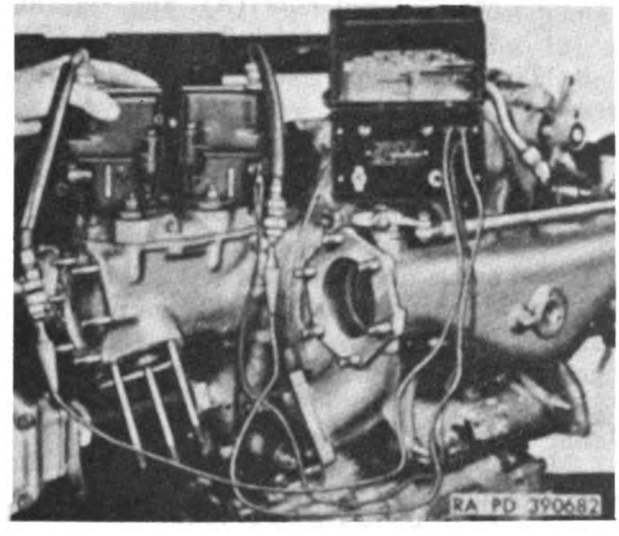



*Figure 182. Synchronizing magnetos.*

and install covers on magnetos. Secure covers to magnetos with ten ¼ x 1½ hex-head lockwasher screws. Connect ground cables to magnetos.

*c. Time Left Side Valves.*

NOTE: The key letters shown below in parentheses refer to figure 145.

(1) After magneto synchronization and timing is correct, use wrench to rotate crankshaft clockwise, as viewed from accessory end, until timing mark "OPP. ENG. 1 & 2 INT. CL. .100 CLR." (fig. 177) is alined with notch marked "TIMING MARK" on transmission adapter flange pilot.

(2) Time and check left side valves and install camshaft drive shaft (H) in the same manner as described for right side valves in *a* (1) through (4) above.

(3) Install oil transfer outer plug (G) in bore of camshaft drive bevel gear (T), using remover and replacer 7082029 (fig. 43). Secure plug in gear by installing 1⅛-inch housing diameter retaining ring (F) in groove in bore of gear.

(4) Position a new gear housing cover gasket (E) on studs on gear housing and install gear housing cover (D) over gasket. Secure cover to housing with six 5/16-inch hex self-locking nuts (B), or 5/16-inch hex nuts (B) and 5/16-inch hex stamped nuts (A), and 21/64 id, 9/16 od, 0.0630 thick flat washers (C).

*d. Time and Install Fuel Injector Pump Assembly.*

(1) Using wrench, rotate crankshaft clockwise, as viewed from accessory end until timing mark "OPP. ENG. 1 & 2 INJ." on flywheel is alined with notch marked "TIMING MARK" on transmission adapter flange pilot.

NOTE: If fuel injector pump is to be timed independently, timing mark on flywheel must aline with notch when No. 1 cylinder exhaust valve is open.

(2) Install connectors (LL, fig. 157) in fuel injector pump ports marked A, B, C, D, E, and F (fig. 183).

(3) If fuel cutoff solenoid valve assembly was removed from injector pump, install cutoff valve assembly in left side inlet port of pump, as viewed from antidrive end, as shown in figure 184. Install elbow (BB, fig. 157) in valve assembly.

(4) If spillport check valve was removed from injector pump, install check valve in port marked "VENT" (fig. 183) as shown in figure 184. Install adapter elbow (MM, fig. 157) in check valve.

(5) Time fuel injector pump as described in (*a*) through (*g*) below.

(*a*) Support pump in horizontal position with port "A" upright as shown in figure 184.

(*b*) Install wrench 8708248 (L, fig. 10) into bore in drive end of pump to engage drive shaft as shown in figure 184.

(*c*) Fill port "A" with dry-cleaning solvent or mineral spirits paint thinner or light lubricating oil (LO).

(*d*) Rotate drive shaft several revolutions in direction indicated by arrow on mounting face by turning wrench. Refill port "A" with dry-cleaning solvent or mineral spirits paint thinner or light lubricating oil (LO).

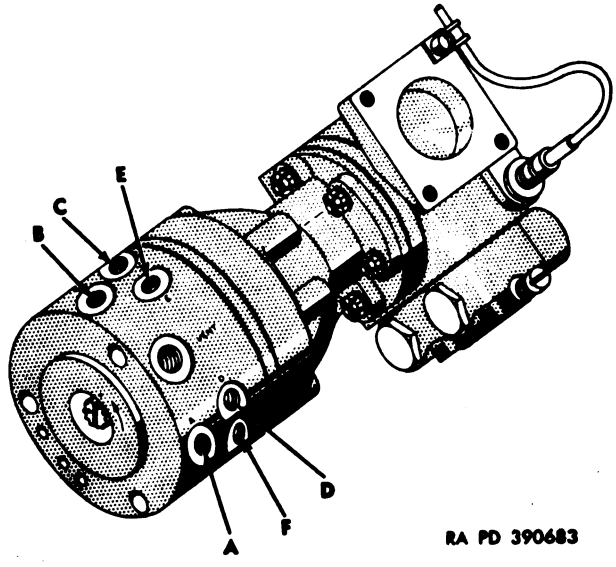



*Figure 183. Fuel injector pump port identification.*

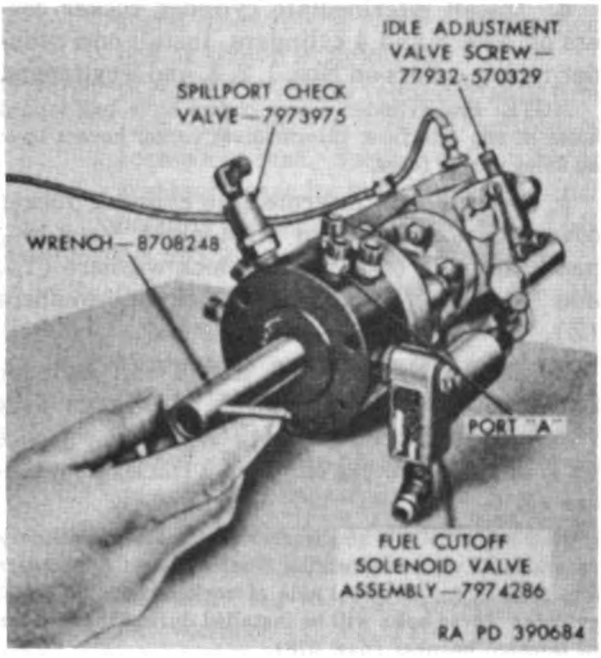



*Figure 184. Timing fuel injector pump.*

(*e*) Slowly turn wrench in direction indicated by arrow until a slight fall and rise of the fluid level in port "A" is detected.

NOTE: A slight rocking of drive shaft in a forward and reverse rotation will assist in determining exact point of rise and fall of fluid in port "A".

(*f*) Carefully remove wrench from drive shaft, being careful not to change position of shaft. Note relation of arrow on drive shaft with timing dot between letters "A" or "D" (fig. 184). Arrow should be alined with dot.

(*g*) If arrow and dot are not alined, install wrench and rotate drive shaft (usually in a reverse direction) to aline drive shaft arrow and dot. Carefully remove wrench when checking alinement.

(6) Install new fuel injector pump gasket (L, fig. 122) on long studs at bottom of magneto drive housing. Install fuel injector pump assembly (M, fig. 122) on studs and secure with three 5/16-inch hex self-locking nut (P, fig. 122), or 5/16-inch hex nuts (P, fig. 122) and 5/16-inch hex stamped nuts (Q, fig. 122), and 2 1/64 id, 9/16 od, 0.0630 thick flat washers (N, fig. 122).

(7) Install fuel injector driven shaft gear (X, fig. 122) through opening in magneto drive housing and into bore of fuel injector pump, engaging splines in bore of shaft gear with splines on pump drive shaft.

(8) Install fuel injector drive shaft gear (W, fig. 122) through same opening, engaging splines of drive shaft gear with splines on magneto driven shaft gear assembly and teeth on drive shaft gear with teeth on driven shaft gear as shown in figure 185.

NOTE: If splines and gear teeth cannot be engaged, withdraw drive shaft gear, rotate slightly, and reinstall. Continue withdrawing and rotating gear until splines and gear teeth are in alinement and gear can be installed. If matching teeth and splines cannot be located, withdraw fuel injector drive shaft gear completely, lift fuel injector driven shaft gear from pump drive shaft and rotate driven shaft gear one spline tooth in either direction and reinstall gear in pump. Install drive shaft gear and repeat matching process until gear can be installed. The fuel injector drive shaft gear is machined with a differential number of gear teeth and splines. This provides a vernier effect so shaft gear may be installed without disturbing relationship between the fuel injector pump drive shaft and the crankshaft.

(9) Install new 5/16-inch id "O" ring packing (BB, fig. 96) on fuel pump adapter oil transfer tube on magneto drive housing. Install new 3 15/64 id "O" ring packing (CC, fig. 96) on fuel pump drive adapter assembly (L, fig. 121).

(10) Install fuel pump adapter assembly on magneto drive housing over fuel injector drive shaft gear and onto mounting studs, being careful not to damage oil seal in bore of adapter assembly.

(11) Position booster coil mounting bracket (M, fig. 121) on the two longer fuel pump adapter mounting studs. Secure bracket and adapter to drive housing with six 5/16-inch hex self-locking nuts (FF, fig. 96), or 5/16-inch hex nuts (FF, fig. 96) and 5/16-inch hex stamped nuts (GG, fig. 96), and four 2 1/64 id, 9/16 od, 0.0630 thick flat washers (EE, fig. 96).

(12) Position a new gasket (T, fig. 122) on fuel injector pump temperature bulb, install bulb in opening in supercharger air inlet housing, and secure with three No. 10 x ¾ fillister-head screws (R, fig. 122) and No. 10 lock washers (S, fig. 122).

(13) Set clearance of Nos. 1 and 2 cylinder intake valves to 0.0070-inch as described in paragraph 262*c*.

(14) Remove wrench from power-take-off drive shaft. Remove two hex-head bolts (SS, fig. 109) and flat washers (RR, fig. 109) from power-take-off adapter. Position a new power-take-off drive cover gasket (PP, fig. 109) on power-take-off drive cover (QQ, fig. 109) and install cover on power-take-off drive adapter assembly. Secure cover and adapter assembly with eight 5/16 x 1 15/64 hex-head bolts (SS, fig. 109) and 21/64 id, 9/16 od, 0.0630 thick flat washers (RR, fig. 109). Secure bolts with locking wire.

## 264. Installation of Valve Rocker Covers

NOTE: The key letters shown below in parentheses refer to figure 76 except where otherwise indicated.

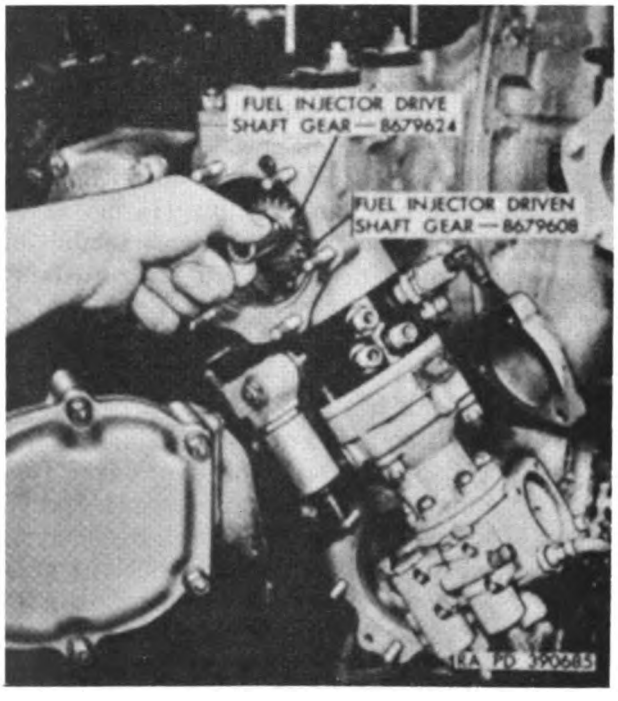



*Figure 185. Timing fuel injector pump to engine.*

*a.* Install intermediate cylinder rocker covers on Nos. 3 and 4 cylinders. Install end cylinder rocker covers on Nos. 1, 2, 4, and 6 cylinders.

NOTE: End cylinder rocker covers have two tapped holes in one side face. Intermediate rocker covers have no holes in side faces.

*b.* Secure each intermediate cylinder rocker cover to cylinder head with eight 5/16 x 1 9/16 hex-head bolts (X), 5/16-inch lock washers (Y), and 21/64 id, 9/16 od, 0.0630 thick flat washers (Z).

*c.* Secure Nos. 1, 2, 5, and 6 end cylinder rocker covers to cylinder heads with seven 5/16 x 1 9/16 hex-head bolts (X) 5/16-inch lock washers (Y), and 21/64 id, 9/16 od, 0.0630 thick flat washers (Z).

NOTE: Omit bolt and washers from lower accessory case side of rocker covers on Nos. 1, 5, and 6 cylinders and from lower flywheel side of rocker cover on No. 2 cylinder. These bolts will be installed during installation of ignition harness (par. 278).

*d.* Torque all cylinder rocker cover bolts to 150 to 175 pound-inches.

*e.* Secure Nos. 1 and 2 cylinder rocker covers to right and left camshaft gear housings with two 7/16 x 1 hex-head bolts (R, fig. 144 and K, fig. 145) and 0.4600-inch id tab washers (Q, fig. 14 and L, fig. 145). Bend tabs of washers to secure bolts.

*f.* Position a new valve rocker box cover plate gasket (M, fig. 14) on valve rocker box cover plate (L, fig. 144) and install cover plate on No. 5 cylinder. Secure plate to cylinder head and rocker cover with four 7/16 x 1 hex-head bolts (J, fig. 144) and 0.4600-inch id tab washers (K, fig. 144). Bend tabs of washers to secure bolts.

*g.* Position a new valve rocker box cover plate gasket (P, fig. 145) on valve rocker box cover plate (Q, fig. 145) and install cover plate on No. 6 cylinder. Secure plate to cylinder head and rocker cover with four 7/16 x 1 hex-head bolts (S, fig. 145) and 0.4600-inch id tab washers (L, fig. 145). Bend tabs of washers to secure bolts.

## 265. Installation of Accessory Case Scavenger Oil Pump Assembly and Oil Pressure Regulator Spill Tube

*a. Install Oil Pressure Regulator Spill Tube.*

(1) Rotate cradle assembly of overhaul

stand so engine is resting on flywheel end as shown in figure 42.

(2) Install oil pressure regulator spill tube (AH, fig. 96) in hole in bottom of accessory case. Secure spill tube in accessory case by installing $1^{23}/_{32}$-inch housing diameter retaining ring (AG, fig. 96) in groove in accessory case.

*b. Install Accessory Case Scavenger Oil Pump.*

(1) Mesh teeth on accessory case scavenger oil pump drive gear (A, fig. 71) with teeth on starter drive gear and install oil pump on studs and dowels on accessory case.

(2) Secure pump to accessory case with five $5/16$-inch slotted hex nuts (D, fig. 71) and $^{21}/_{64}$ id, $9/16$ od, 0.0630 thick flat washers (C, fig. 71). Secure nuts with locking wire.

## 266. Installation of Crankcase Oil Pan and Accessory Case Oil Sump

NOTE: The key letters shown below in parentheses refer to figure 146.

*a. Install Crankcase Oil Pan.*

(1) Position a new oil pan gasket (A) on crankcase oil pan studs.

(2) Install crankcase oil pan assembly (E) on crankcase studs and secure oil pan with thirty-eight $3/8$-inch hex self-locking nuts (J), or $3/8$-inch hex nuts (J) and $3/8$-inch hex stamped nuts (H), and $^{25}/_{64}$ id, $5/8$ od, 0.0640 thick flat washers (K).

*b. Install Accessory Case Oil Sump.*

(1) Position a new oil sump gasket (W) on studs on bottom of accessory case. Position oil sump assembly (M) on studs.

(2) Slide new oil-sump-to-oil-pan gasket (L) between oil sump and oil pan. Aline holes in gasket with holes in sump and pan and secure sump to oil pan with four $3/8$-inch hex-head bolts (T), $3/8$-inch lock washers (U), and $^{25}/_{64}$ id, $5/8$ od, 0.0630 thick flat washers (U).

(3) Secure oil sump to accessory case with sixteen $5/16$-inch hex self-locking nuts (R), or $5/16$-inch hex nuts (R) and $5/16$-inch hex stamped nuts (Q), and $^{21}/_{64}$ id, $9/16$ od, 0.0630 thick flat washers (S).

## 267. Installation of Intake Manifolds and Balance Pipe

NOTE: The key letters shown below in parentheses refer to figure 149.

*a. Install Balance Pipe.*

(1) Install balance pipe (Y) through holes in crankcase below Nos. 5 and 6 cylinders with pipe extending equally on both sides of crankcase.

(2) Install a new $1\frac{1}{4}$-inch id "O" ring packing (X) and a balance pipe flange (W) on each end of balance pipe. Secure each flange to crankcase with two $5/16 \times 1\frac{1}{8}$ hex-head bolts (T) and $5/16$-inch lock washers (B).

(3) Install hose (U) on balance connector tubes (R). Install hose clamps (V) on hose.

(4) Install other end of hose (U) on ends of balance pipe. Tighten hose clamps sufficiently to hold tubes in position on balance pipe.

*b. Install Intake Manifold Groups.*

(1) *Install Right Side Intake Manifold Group.*

(*a*) Position new manifold gaskets (A) on Nos. 1, 3, and 5 cylinder head intake port studs.

(*b*) Install right side intake manifold group on cylinder heads.

(*c*) Position a new manifold gasket (A) on manifold connector (BB) and install connector on supercharger housing. Secure connector to housing with three $5/16 \times {}^{27}/_{32}$ hex-head bolts (C) and $5/16$-inch lock washers (B).

(*d*) Position a new connector tube gasket (N) on balance connector tube (R) and secure tube to manifold assembly (Z) with two $5/16 \times 7/8$ hex-head bolts (S) and $5/16$-inch lock washers (B).

(*e*) Secure manifold assemblies (M, Z, and AA) to cylinder heads with nine $5/16$-inch hex self-locking nuts (K), or $5/16$-inch hex nuts and $5/16$-

inch hex stamped nuts (L), and 21/64 id, 9/16 od, 0.0630 thick flat washers (J).

(*f*) Center all connecting hose on manifold assemblies and tighten all hose clamps (E and V) securely on connecting hose.

(2) *Install Left Side Intake Manifold Group.*

(*a*) Position new manifold gaskets (A) on Nos. 2, 4, 6 cylinder head intake port studs.

(*b*) Install left side intake manifold group on cylinder heads.

(*c*) Position a new manifold gasket (A) on manifold connector (D) and install connector on supercharger housing. Secure connector to housing with three 5/16 x 27/32 hex-head bolts (C) and 5/16-inch lock washers (B).

(*d*) Position a new connector tube gasket (N) on balance connector tube (R) and secure to manifold assembly (P) with two 5/16 x 7/8 hex-head bolts (S) and 5/16-inch lock washers (B).

(*e*) Secure manifold assemblies (G, M, and P) to cylinder heads with nine 5/16-inch hex self-locking nuts (K), or 5/16-inch hex nuts (K) and 5/16-inch hex stamped nuts (L), and 21/64 id, 9/16 od, 0.0630 thick flat washers (J).

(*f*) Center all connecting hose on manifold assemblies and tighten all hose clamps (E and V) securely on connecting hose.

## 268. Installation of Priming Lines and Priming Fuel Filter Assemblies

NOTE: The key letters shown below in parentheses refer to figure 159 except where otherwise indicated.

**CAUTION: Do not use thread sealing or gasket forming compound on any fuel tubes, fuel hose, or fittings. Assemble the parts dry or coat with clean engine oil (OE) only.**

*a. Install Zenith Priming Fuel Filter.*

(1) Install two 1/8-inch tube unions (P) in tapped openings in sides of mounting bracket (Z).

(2) Screw priming fuel filter assembly (CC) on threaded extension of mounting bracket.

(3) Install mounting bracket, with attached filter assembly, on supercharger housing and secure with two 5/16 x 13/32 hex-head bolts (BB) and 5/16-inch lock washers (AA).

*b. Install Skinner Priming Fuel Filter.*

(1) Install 1/8-inch hex-socket pipe plug (U) in tapped opening in right side of priming fuel filter assembly (Y). Install fuel filter tee (Q) in tapped opening in left side of filter assembly. Install two 1/8-inch tube unions (P) in tee.

(2) Install filter assembly on mounting bracket (R) and secure with two No. 10 x 1 3/4 fillister-head screws (X), No. 10 lock washers (W), and 13/64 id, 7/16 od, 0.0630 thick flat washers (V).

(3) Install mounting bracket, with attached filter assembly, on supercharger housing and secure with two 5/16 x 1 3/32 hex-head bolts (T) and 5/16-inch lock washers (S).

*c. Install Priming Lines.*

(1) Install intercylinder union tees (B) into 1/4-inch safety sleeve nuts (C). Screw safety sleeve nuts, with attached union tees, on priming nozzle assemblies (D) previously installed in cylinders. Do not tighten nuts completely.

(2) Install priming fuel line assemblies (E) between Nos. 1 and 3, 3 and 5, 2 and 4, and 4 and 6 cylinders. Tighten coupling nuts on tees securely.

(3) Install fuel tee hole plug assemblies (A) on open end of Nos. 5 and 6 cylinder union tees. Tighten plugs securely.

(4) Install fuel tube assemblies (L) between Nos. 1 and 2 cylinder tees and priming fuel filter unions. Tighten nuts securely.

(5) Tighten all 1/4-inch safety sleeve nuts on union tees securely.

## 269. Installation of Fuel Injector Tube Assemblies

NOTE: The key letters shown below in parentheses refer to figure 157 except where otherwise indicated.

**CAUTION: Do not use thread sealing or gasket forming compound on any fuel tubes, fuel hose, or fittings. Assemble the parts dry or coat with clean engine oil (OE) only.**

*a. Install Right Side Fuel Injector Tube Assemblies.*

(1) Install new 0.5150 id, 0.6900 od, 0.0600 thick plain copper washers (B) on all fuel injector nozzle assemblies (C). Install nozzle assemblies, with attached elbows, in intake manifolds on Nos. 1, 3, and 5 cylinders. Tighten nozzle assemblies securely in manifolds.

(2) Install one end of tube assembly (G) on No. 5 cylinder injector nozzle elbow, one end of tube assembly (L) on No. 3 cylinder nozzle elbow, and one end of tube assembly (M) on No. 1 cylinder nozzle elbow. Do not tighten coupling nuts completely.

(3) Install other end of tube assemblies (G, L, and M) on tube unions (V) installed in tube support outer bracket (R). Do not tighten coupling nuts completely.

(4) Position tube support inner bracket (S) around inside of right intake manifold connector and aline holes in inner bracket with holes in tube support outer bracket (R). Secure two brackets to each other and to manifold connector with two $\frac{5}{16}$ x $\frac{23}{32}$ hex-head bolts, $\frac{5}{16}$-inch hex nuts (U), and $\frac{5}{16}$-inch lock washers (T).

(5) Tighten all coupling nuts on injector nozzle elbows and on tube unions securely.

(6) Aline hole in clamp (K) with tapped hole in No. 1 cylinder intake manifold and position clamp over tube assemblies (G and L) and against intake manifold. Secure clamp to manifold with No. 10 x $\frac{1}{2}$ fillister-head screw (H) and $\frac{13}{64}$ id, $\frac{7}{16}$ od, 0.0320 thick flat washer (J). Secure screw with locking wire.

*b. Install Left Side Fuel Injector Tube Assemblies.*

(1) Install fuel injector nozzle assemblies (C), with attached elbows, in Nos. 2, 4, and 6 cylinder intake manifolds. Tighten nozzle assemblies securely in manifolds.

(2) Install one end of tube assembly (A) on fuel injector pump connector at port "B" (fig. 183) and other end of No. 6 cylinder injector nozzle elbow. Tighten both coupling nuts securely.

(3) Install one end of tube assembly (CC) on fuel injector pump connector at port "F" (fig. 183) and other end on No. 4 cylinder injector nozzle elbow. Tighten both coupling nuts securely.

(4) Install one end of tube assembly (DD) on fuel injector pump connector at port "D" (fig. 183) and other end on No. 2 cylinder injector nozzle elbow. Tighten both coupling nuts securely.

(5) Aline hole in clamp (K) with tapped hole in No. 2 cylinder intake manifold and position clamp over tube assemblies (A and CC) and against intake manifold. Secure clamp to manifold with No. 10 x $\frac{1}{2}$ fillister-head screw (H) and $\frac{13}{64}$ id, $\frac{7}{16}$ od, 0.0320 thick flat washer (H). Secure screw with locking wire.

*c. Install Accessory End Fuel Injector Tube Assemblies.*

(1) Install one end of tube assembly (Y) on fuel injector pump connector at port "A" (fig. 183) and other end on upper union in tube support outer bracket. Tighten both coupling nuts securely.

(2) Install one end of tube assembly (X) on fuel injector pump connector at port "C" (fig. 183) and other end on center union in tube support outer bracket. Tighten both coupling nuts securely.

(3) Install one end of tube assembly (W) on fuel injector pump connector at port "E" (fig. 183) and other end to lower union in tube support outer bracket. Tighten both coupling nuts securely.

(4) Position two brackets (TT) on studs on supercharger housing below tube assemblies (W, X, and Y) and secure with 3/8-inch hex self-locking nuts (PP) or 3/8-inch hex nuts (PP) and 3/8-inch hex stamped nuts (NN).

(5) Aline holes in two clamps (QQ) with holes in brackets (TT) and position clamps over three tube assemblies. Secure each clamp with two No. 10 x 1/2 fillister-head screws (RR) and 13/64 id, 7/16 od, 0.0320 thick flat washers (SS). Secure screws with locking wire.

(6) Install one 1/4-inch tube clamp (J, fig. 159) around priming fuel tube assembly under right side injector tube assemblies. Install 1/4-inch tube clip (G, fig. 159) around lower injector tube assembly ahead of tube support brackets in line with clamp. Refer to figure 24 for proper location of clip and clamp. Secure clip and clamp together with No. 10 x 1/2 fillister-head screw (K, fig. 159) and No. 10 hex self-locking nut (H, fig. 159).

(7) Install tube clamp and clip as in (6) above on priming fuel tube assembly under left side injector tube assemblies above generator and secure with screw and self-locking nut.

## 270. Installation of Cylinder Head Oil Drain Manifolds

NOTE: The key letters shown below in parentheses refer to figure 148.

*a. Install Right Side Oil Drain Manifolds.*

(1) Position a new tube gasket (P) on oil drain tube adapter assembly (V). Install adapter assembly on oil pan and secure with 5/16 x 1 15/32 hex-head bolt (Y) placed in upper hole and 5/16 x 2 7/32 hex-head bolt (X) in lower hole and two 21/64 id, 9/16 od, 0.0630 thick flat washers (W).

(2) Install new manifold bolt gaskets (C) on all special 1/2 x 2 hex-head bolts (D). Install new manifold gaskets (B) on cylinder head over manifold bolt holes.

(3) Install right side cylinder head oil drain manifold group on Nos. 1, 3, and 5 cylinder heads. Secure group to cylinder heads with three special 1/2 x 2 hex-head bolts. Secure bolts with locking wire.

(4) Position a new tube gasket (P) on tube (Q) and install tube on accessory case oil sump. Secure tube with two 5/16 x 7/8 hex-head bolts (M) and 5/16-inch lock washers (N).

(5) Position a new tube gasket (P) on tube (Z) and install tube on oil drain tube adapter assembly (V). Secure tube with two 5/16 x 7/8 hex-head bolts (M) and 5/16-inch lock washers (N).

(6) Slide hose (H) onto elbow (J) installed in right camshaft gear housing. Tighten hose clamps (K) securely on hose.

(7) Center all hose on manifolds and tubes and tighten all hose clamps (E) securely on hose (F).

*b. Install Left Side Oil Drain Manifolds.*

(1) Install left side oil drain manifolds on Nos. 2, 4, and 6 cylinder heads in same manner as described for right side oil drain manifolds in (2) and (3) above.

(2) Position a new tube gasket (P) on tube (R). Install tube on accessory case oil sump and secure with two 5/16 x 7/8 hex-head bolts (M) and 5/16-inch lock washers (N).

(3) Position a new tube gasket (P) on tube (U). Install tube on crankcase oil pan and secure with two 5/16 x 7/8 hex-head bolts (M) and 5/16-inch lock washers (N).

(4) Slide hose (H) onto elbow (J) installed in left camshaft gear housing and tighten hose clamps (K) securely on hose.

(5) Center all hose on manifolds and tubes and tighten all hose clamps (E) securely on hose (F).

(6) Rotate cradle assembly of engine overhaul stand to bring engine to horizontal position as shown in figure 22.

## 271. Installation of Exhaust Manifolds

*a.* Position new exhaust manifold gaskets

(figs. 154 and 155) over exhaust manifold mounting studs on all six cylinders.

*b.* Install a right and left exhaust manifold (figs. 154 or 155) on mounting studs on each bank of cylinders and secure with 3/8-inch hex self-locking nuts and 25/64 id, 5/8 od, 7/64 thick flat washers.

## 272. Installation of Engine Shroud and Oil Coolers

NOTE: The key letters shown below in parentheses refer to figure 151 except where otherwise indicated.

*a. Install Engine Shroud and Oil Coolers.*

(1) With the aid of an assistant, install engine shroud and oil coolers on engine. Make certain all bolt holes, stud holes, and bracket holes are correctly alined with mating parts.

(2) Position four fan rotor housing supports (X) between fan rotor housing and crankcase and secure with four 3/8 x 9 hex-head bolts (V) and 0.3900 id, 0.8100 od, 1/8 thick flat washers (W).

(3) Secure rotor housing to one accessory case stud and two crankcase studs with three 3/8-inch hex self-locking nuts (LL) and 0.3900 id, 0.8100 od, 1/8 thick flat washers (MM).

(4) Secure crankcase lifting eye bracket (T) to crankcase studs with two 7/16-inch hex self-locking nuts (Q), or 7/16-inch hex nuts (G) and 7/16-inch hex stamped nuts (P) and to engine shroud with two 5/16 x 27/32 hex-head bolts (R) and 5/16-inch lock washers (S).

(5) Position two oil cooler seal hose (X, fig. 150) across top of cylinder heads and two oil cooler seal hose brackets (W, fig 150) over oil cooler seal hose and secure brackets and shroud to cylinder studs with six 3/8-inch slotted hex nuts (V, fig. 150) and 25/64 id, 5/8 od, 0.0640 thick flat washers (T, fig. 150). Secure slotted hex nuts with 1/16 x 3/4 cotter pins (U, fig. 150).

*b. Install Exhaust Manifold Shroud Opening Covers.*

(1) Install right exhaust slot cover assembly (BB) on shroud and secure with two 5/16 x 9/16 hex-head lock washer bolts (AA).

(2) Install left exhaust slot cover assembly (K) on shroud and secure with two 5/16 x 9/16 hex-head lock washer bolts (J).

(3) On model AOSI–895–5M engines only, install right hotspot tube slot cover assembly (SS) and left hotspot tube slot cover assembly (GG) on engine shroud and secure each with four 5/16 x 9/16 hex-head lock washer bolts (TT or FF).

*c. Install Exhaust Manifold Cooling Air Inlet Elbows.*

NOTE: Engine must be removed from overhaul stand to install exhaust manifold cooling air inlet elbows. Install elbows after removing engine from stand (par. 288).

Install left cooling air inlet elbow (H) and right cooling air inlet elbow (Z) around exhaust manifolds and secure each with five 5/16 x 9/16 lock washer bolts (J).

*d. Install Oil Cooler Hose Assemblies.*

(1) Oil cooler hose assemblies were installed on oil coolers during repair of engine shroud.

(2) Connect engine oil cooler inlet and outlet hose assemblies to connectors on oil control housing.

(3) Install oil control housing cover (JJ) over oil control housing assembly and engine oil cooler outlet hose assembly and secure with six 5/16 x 9/16 hex-head lock washer bolts (KK).

## 273. Installation of Cooling Fan Rotor and Clutch Assembly

*a. Install Cooling Fan Rotor and Clutch Assembly.*

(1) Position cooling fan rotor and fan drive clutch assembly on fan drive vertical shaft in fan drive housing, engaging clutch hub and shaft splines, and secure clutch hub to drive shaft with 3/4-inch slotted hex nut (D, fig. 92). Secure slotted hex nut to shaft with 1/8 x 1 3/4 cotter pin (C, fig. 92).

(2) Check clearance between rotor blades and rotor housing. Minimum clearance should be 0.0700-inch.

(3) If clearance is less than stated in (2)

above, loosen nuts securing fan rotor housing to shroud and crankcase and shift rotor housing, as necessary, to obtain correct clearance. Tighten nuts.

(4) Install fan drive vertical shaft cover (C, fig. 91) and rotor cover (B, fig. 91) on clutch outer housing and secure with three ¼ x 9/16 round-head lock washer screws (A, fig. 91).

*b. Install Cooling Fan Outlet Vane Housing.*

(1) Position cooling fan outlet vane housing assembly (C, fig. 151) over cooling fan and on rotor housing studs and secure with fourteen 5/16-inch hex self-locking nuts (A, fig. 151).

(2) Secure four ⅜ x 9 hex-head bolts (V, fig. 151), installed, paragraph 272*a*, to vane housing with locking wire.

## 274. Installation of Crankcase Oil Filler Tube, Flame Arrestor, and Crankcase Breather Tubes

*a. Install Crankcase Breather Tubes.*

NOTE: The key letters shown below in parentheses refer to figure 163.

(1) Install hose (M) on curved end of crankcase air inlet breather tube (G). Install hose clamps (C) on hose. Do not tighten clamps.

(2) Insert straight end of breather tube through special shaped section rubber in oil control housing cover in shroud and across shroud.

(3) Slide hose (M) around crankcase breather tube elbow (N) in air inlet housing and secure by tightening hose clamps.

(4) Install hose (D) and two hose clamps (C) on each end of crankcase ventilating breather tube (PP). Slide hose on lower end of breather tube over ⅛-inch 45 degree hose elbow (S) in right side of crankcase below No. 3 cylinder and tighten hose clamps.

(5) Install two air metering valve assemblies (Q) in tapped openings in top of air inlet housing. Install ¼-inch 45 degree elbows (P) in air metering valve assemblies, if not already installed.

(6) Install ⅜-inch tube nipple (K) in tapped opening in right side of accessory case breather adapter (MM) and ⅜-inch pipe-to-tube tee (QQ) in tapped opening in left side of adapter.

(7) Connect coupling nuts on lower end of accessory case breather tube assemblies (L) to elbows (P) in air metering valve assemblies and coupling nuts on upper end of tube assemblies to tube nipple (K) and pipe-to-tube tee (QQ) in breather adapter.

*b. Install Flame Arrestor.*

NOTE: The engine must be removed from the overhaul stand to install flame arrestor. Install flame arrestor after removing engine from stand (par. 288).

Install hose (D) and two hose clamps (C) on short tube extension of flame arrestor. Slide flame arrestor connecting hose on end of crankcase air inlet breather tube (G), secure flame arrestor to shroud with two 5/16 x 9/16 hex-head lockwasher bolts (E), and tighten hose clamps. Install hose (D) and two hose clamps (C) on other end of flame arrestor.

*c. Install Crankcase Oil Filler Tube.*

NOTE: The engine must be removed from overhaul stand to install crankcase oil filler tube. Install crankcase oil filler tube ((1) through (4) below) after removing engine from stand (par. 288).

(1) Position extensions on oil filler tube (B) with hose (D) on flame arrestor (F) and crankcase ventilating breather tube (PP).

(2) Position a new filler tube gasket (V) on oil filler tube (B), install oil filler tube on crankcase, and secure with four 5/16 x ⅞ hex-head bolts (T) and 5/16-inch lockwashers (U).

(3) Slide hose on flame arrestor and breather tube onto extensions on filler tube and tighten hose clamps (C).

(4) Secure filler tube bracket (EE) to engine shroud with two 5/16 x 9/16 hex-head lockwasher bolts (E).

## Section III. INSTALLATION OF ACCESSORIES

### 275. Install Starter Assembly

NOTE: The key letters shown below in parentheses refer to figure 186 except where otherwise indicated. The engine may be equipped with any one of the four different starters. Install starter according to procedures outlined for the particular starter in *a* through *d* below.

*a. Late Model Eclipse-Pioneer Starter.*

(1) Position new starter mounting gasket (U) on starter drive assembly studs.

(2) Install starter assembly (N) over gasket with starter cable terminal opening positioned as shown in figure 30 and secure with six 3/8-inch hex self-locking nuts (L), or 3/8-inch hex nuts (L) and 3/8-inch hex stamped nuts (M), and 25/64 id, 5/8 od, 0.0640 thick flat washers (K). Tighten nuts with wrench 8708189 (fig. 30).

*b. Early Model Eclipse-Pioneer Starter.*

(1) Position new starter mounting gasket (U) on starter drive assembly studs.

(2) Install starter mounting adapter assembly (H) over gasket and secure with six 3/8-inch hex self-locking nuts (L), or 3/8-inch hex nuts (L) and 3/8-inch hex stamped nuts (M), and 25/64 id, 5/8 od, 0.0640 thick flat washers (K).

(3) Install starter assembly (P) in adapter with cable terminal opening positioned as shown in figure 30. Install mounting adapter retaining ring (J) over flanges on starter and adapter and secure by tightening clamping screw. Secure clamping screw with locking wire.

*c. Late Model Jack and Heintz Starter.*

(1) Position new starter mounting gasket (U) on starter drive assembly studs.

(2) Install starter assembly (R) over gasket with starter cable opening positioned as shown in figure 31 and secure with six 3/8-inch hex self-locking nuts (L), or 3/8-inch hex nuts (L) and 3/8-inch hex stamped nuts (M), and 25/64 id, 5/8 od, 0.0640 thick flat washers (K). Tighten nuts with wrench 8708189 (fig. 31).

*d. Early Model Jack and Heintz Starter.*

(1) Position new starter mounting gasket (U) on starter drive assembly studs.

(2) Install starter mounting ring (T) over gasket and secure with six 3/8-inch splined nuts (S).

(3) Position starter assembly (Q) on mounting ring with starter cable opening positioned as shown in figure 32.

(4) Using a wrench as shown in figure 32, depress mounting gear locking plate and turn pinion gear clockwise to secure starter in mounting ring. Release wrench and engage splines in locking plate with splines on pinion gear.

### 276. Install Generator Assembly

NOTE: The key letters shown below in parentheses refer to figure 186.

*a.* Position new generator mounting gasket (B) on generator drive adapter assembly studs.

*b.* Install generator assembly (A) over gasket with cable mounting studs positioned as shown in figure 1 and secure with six 3/8-inch hex self-locking nuts (L), or 3/8-inch hex nuts (L) and 3/8-inch hex stamped nuts (M), and 25/64 id, 5/8 od, 0.0640 thick flat washers (K).

### 277. Install Ignition Booster and Filter Coil Assembly

Position ignition booster and filter coil assembly (FF, fig. 164) on booster coil mounting bracket (JJ, fig. 164) and secure with four No. 10 x 7/16 round-head screws (EE, fig. 164) and No. 10 lockwashers (DD, fig. 164).

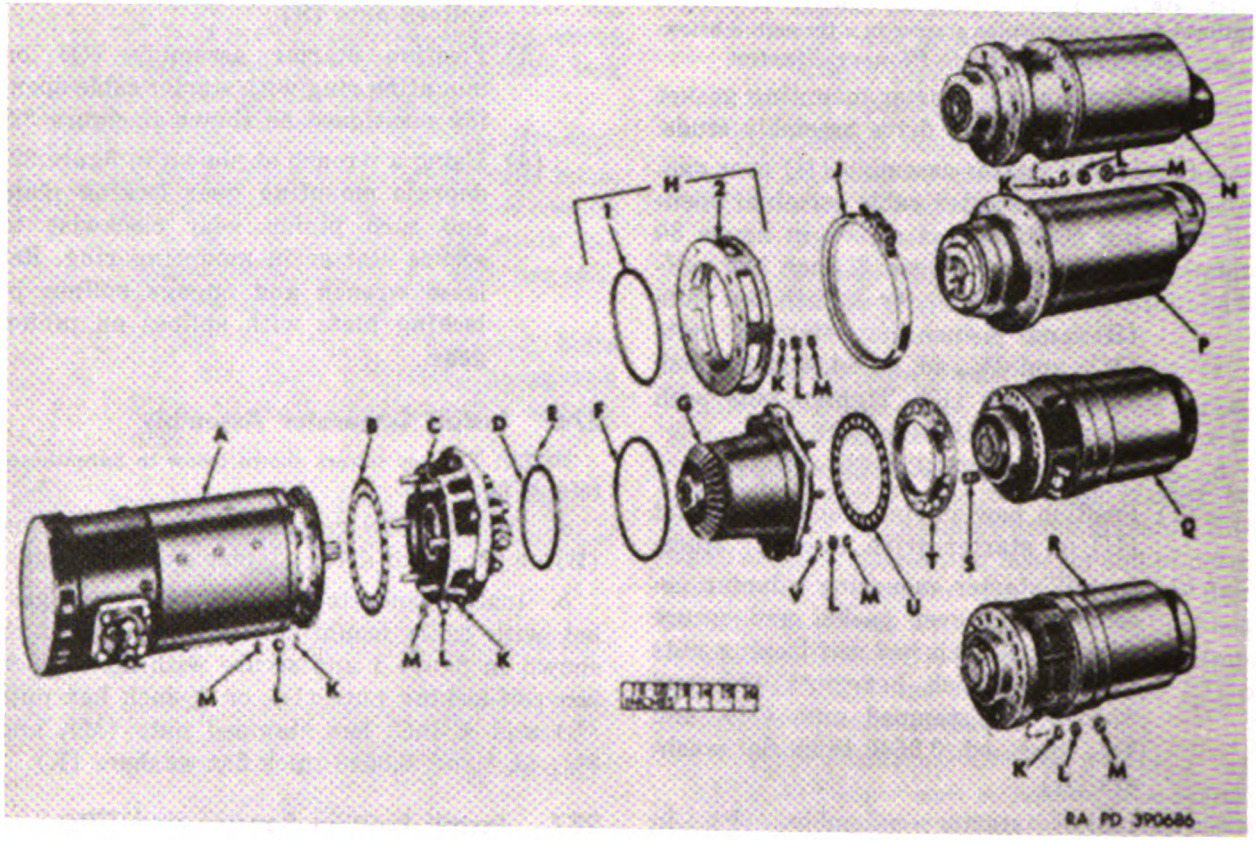
### 278. Install Ignition Harness Assembly

NOTE: The key letters shown below in parentheses refer to figure 164 except where otherwise indicated.

*a. Install Spark Plugs.*

(1) Install spark plug lead assemblies (P) on each of 12 spark plugs (N).

(2) Position new spark plug gaskets (M) on spark plugs. Coat threads on spark plugs with a light coating of white-lead base antiseize compound (Spec. JAN–A–669). Make certain compound does not contact center electrode or ground strap of spark plug.




A—Generator assembly 7727461
B—Generator mounting gasket 8666738
C—Generator drive adapter assembly 7403467
D—4¾-inch id "O" ring packing 546884
E—3/16-inch id "O" ring packing 501221
F—5⅝-inch id "O" ring packing 546891
G—Starter drive assembly 7403476
H—Starter mounting adapter assembly 7386251
(early model Eclipse-Pioneer starters only)
1—Adapter 19315–859915
2—4⅛-inch id "O" ring packing 546879
J—Mounting adapter retaining ring 7386252
(early model Eclipse-Pioneer starters only)
K—2 3/64 id, ⅝ od, 0.0640 thick flat washer 502204
L—⅜-inch hex self-locking nut 503351 or 503383 (model AOSI–895–5 engines only)
⅜-inch hex nut 225854 (model AOSI–895–5M engine only)
M—⅜-inch hex stamped nut 107822
(model AOSI–895–5M engines only)
N—Starter assembly 7705699
(late model Eclipse-Pioneer)
P—Starter assembly 7346519
(early model Eclipse-Pioneer)
Q—Starter assembly 7538988
(early model Jack and Heintz)
R—Starter assembly 8365476
(late model Jack and Heintz)
S—⅜-inch splined nut 7338592
(early model Jack and Heintz starters only)
T—Starter mounting ring 7416530
(early model Jack and Heintz starters only)
U—Starter mounting gasket 7767382
V—25/64 id, ⅝ od, 1/16 thick flat washer 8679576

*Figure 186. Generator, starter, and drive assemblies—exploded view.*

(3) Insert lead assembly in wrench 8708639 (F, fig. 10), engage spark plug with wrench, and install spark plug, with lead attached, in cylinder.

(4) Install remaining spark plugs as described in (3) above.

*b. Install Ignition Harness.*

(1) Position ignition harness assembly (A) on engine. Position four rubber-cushioned clips (B) around harness in line with open holes in Nos. 1, 2, 5, and 6 cylinder valve rocker covers and secure with four 5/16 x 1 9/16 hex-head bolts (X, fig. 76) and 5/16-inch lock washers (Y, fig. 76) where bolts were omitted when rocker covers were installed.

(2) Install spark plug lead assemblies on ignition harness assembly at their respective terminals and secure by tightening lead assembly coupling nuts.

(3) Slide two 1/2-inch lockwashers (U), harness links (V), and link spacers (W) on two 1/2 x 17/32 hex-head bolts (T) and install bolts, with attached parts, in tapped holes in accessory case below power-take-off drive cover. Tighten bolts only sufficiently to hold links and spacers in position.

(4) Position two rubber-cushioned hinged clamps (R) around harness in line with harness links and secure with No. 10 x 5/8 round-head screws (S) and No. 10 hex self-locking nuts (Q).

(5) If ignition harness mounting bracket (AA) is not already installed, remove two outer hex self-locking nuts, or hex stamped nuts and hex nuts, and flat washers securing drive support to left camshaft gear housing. Discard washers.

(6) Aline two larger holes in ignition harness mounting bracket (AA) with studs exposed by removing nuts in (5) above, install bracket, and secure with two 5/16-inch hex self-locking nuts or 5/16-inch hex nuts and 5/16-inch hex stamped nuts removed in (5) above.

(7) Position rubber-cushioned hinged clamp (Y) around harness and secure to mounting bracket with No. 10 x 1 1/4 fillister-head screw (X), spacer (Z), and No. 10 hex self-locking nut (BB).

(8) Position magneto lower adapter gaskets (H) on magnetos and install magneto lower adapters (G) over gaskets and secure with ten No. 10 x 5/8 fillister-head screws (E) and No. 10 lockwashers (F).

(9) Install free end of outer magneto ground cable assembly (J) on connector on top of ignition booster and filter coil assembly (FF) marked "TOP MAG OUTBOARD MAG."

(10) Install free end of inner magneto ground cable assembly (K) on connector on top of ignition booster and filter coil assembly (FF) marked "BOTTOM MAG INBOARD MAG BOOSTER."

(11) Connect hose assembly (K, fig. 187) (1/4 id, 53 1/2 inch long) to adapter elbow (J, fig. 187).

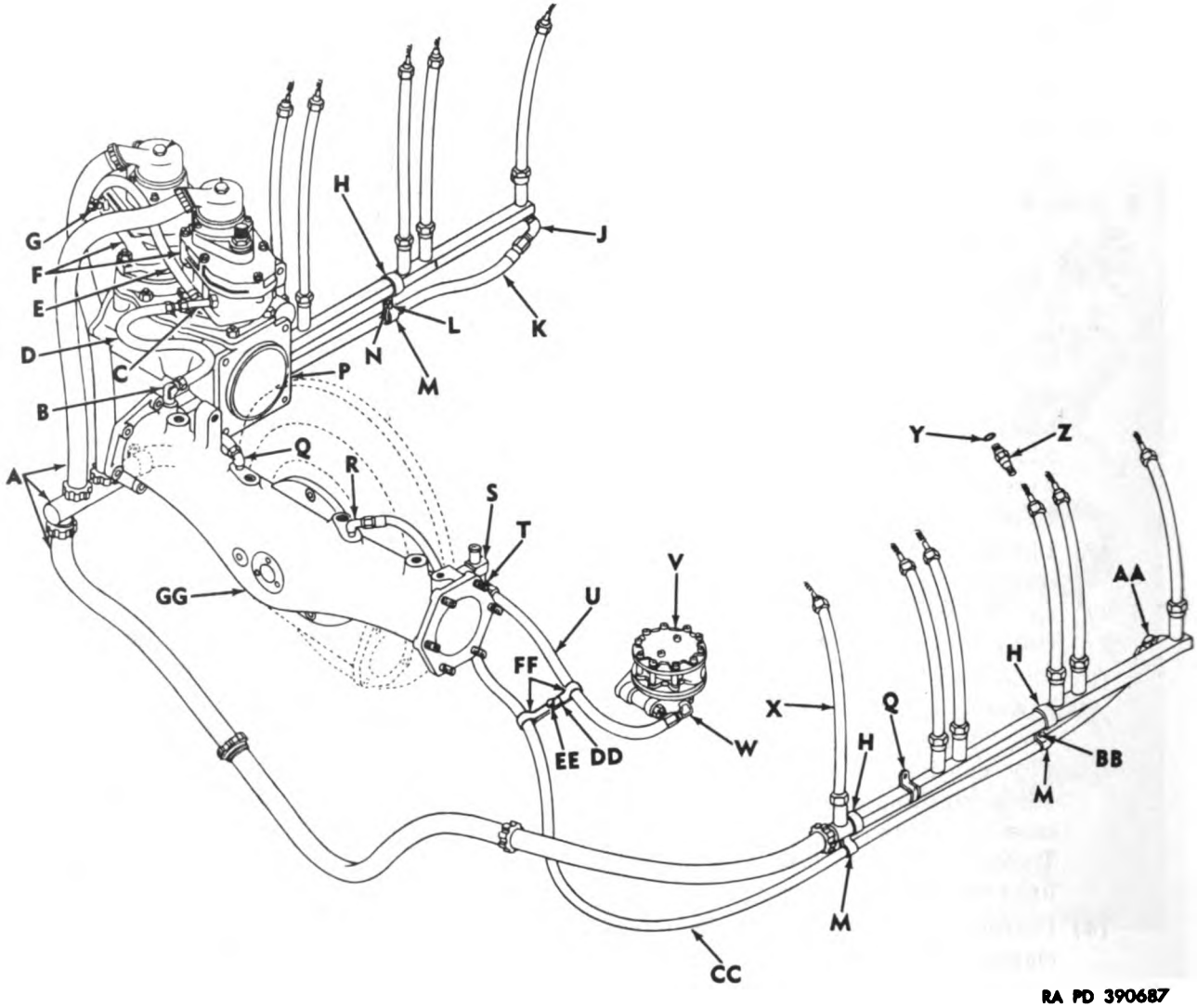
(12) Install two clamps (H, fig. 187) around ignition harness. Install two clamps (M, fig. 187) around left ignition harness vent hose assembly (K, fig. 187). Secure each pair of clamps with No. 10 x 7/16 round-head screw (BB, fig. 187), No. 10 lock washer (N, fig. 187), and No. 10 hex nut (L, fig. 187).

(13) Slide other end of hose assembly (K, fig. 187) under ignition harness assembly and fuel injector pump and connect to adapter elbow (Q, fig. 187) on air inlet housing.

(14) Connect one end of right ignition harness vent hose assembly (CC, fig. 187) (1/4 id, 53 1/2-inch long) to adapter elbow (AA, fig. 187).

(15) Install clamps (H and M, fig. 187) on ignition harness and hose assembly installed in (14) above in same manner as described for hose assembly (K, fig. 187) in (12) above.

(16) Slide other end of hose assembly (CC, fig. 187) under ignition harness behind fuel injector tube assemblies and connect to adapter elbow (R, fig. 187) on air inlet housing.




A–Ignition harness assembly 7414507
B–Adapter elbow 7767517
C–Tee 7065764
D–Hose assembly 7744709
E–Hose assembly 7744709
F–Magneto assembly { 8344983 / 7403411 / 7974214 / 7974215 / 7539854 (early model AOSI-895-5M engines only) }
G–Adapter elbow 7767517
H–Clamp 573145
J–Adapter elbow 7767517
K–Hose assembly 8682942
L–No. 10 hex nut 225850
M–Clamp 572898
N–No. 10 lock washer 120217
P–Magneto drive housing assembly 7737853
Q–Adapter elbow 7767517
R–Adapter elbow 7767517
S–Elbow 7376136
T–Adapter elbow 7767516
U–Hose assembly 8713895
V–Fuel pump assembly 7910094
W–Adapter elbow 7767517
X–Spark plug lead assembly 8741865
Y–Spark plug gasket 5296665
Z–Spark plug 8668752
AA–Adapter elbow 7767517
BB–No. 10 x 7/16 round-head screw 132903
CC–Hose assembly 8682942
DD–No. 10 hex self-locking nut 8344702
EE–No. 10 x ½ fillister-head screw 120216
FF–Clamp 572914
GG–Supercharger air inlet housing assembly 7737859

*Figure 187. Ignition and fuel pump ventilating systems—schematic view.*

(17) Connect hose assembly (E, fig. 187) (¼ id, 9½-inch long) to adapter elbow (G, fig. 187) on outer magneto assembly and tee (C, fig. 187) on inner magneto assembly.

(18) Connect hose assembly (D, fig. 187) (¼ id, 9½-inch long) to other side of tee on inner magneto and to adapter elbow (B, fig. 187) in air inlet housing.

## 279. Install Governor Assembly

NOTE: Late model AOSI-895-5M engines and all model AOSI-895-5 engines are equipped with governor assembly 8380695 which has an integral oil pressure regulating valve. These governors must be installed before oil control housing is installed (par. 167). All governors must be rebuilt before installing governor on engine. Refer to paragraphs 299-303 for rebuild of governors.

*a. Governor Assembly 8380695.*

NOTE: The key letters shown below in parentheses refer to figure 131 except where otherwise indicated.

(1) Install ⅜-inch 45 degree pipe elbow (F) in opening in governor assembly (E). Install ⅜-inch 45 degree adapter elbow (G) in elbow (F).

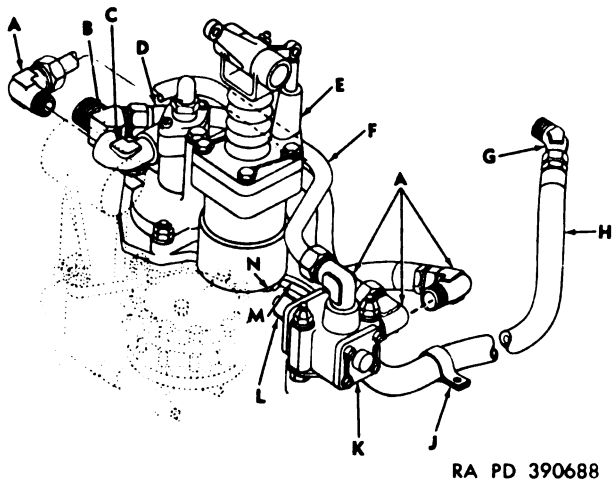
(2) Install governor drive shaft assembly in square bore of governor driven gear (N) in right camshaft drive housing. Make certain drive shaft engages driven gear correctly.

(3) Position new governor mounting gasket (A) on studs on drive housing. Install governor assembly over gasket and secure with three 5/16-inch hex self-locking nuts (C), or 5/16-inch hex nuts (C) and 5/16-inch hex stamped nuts (D), and 21/64 id, 9/16 od, 0.0630 thick flat washers (B).

(4) Connect hose assembly (H, fig. 188) (13/32 id, 26-inch long) to elbow (G) and slide free end of hose assembly down past No. 1 cylinder and connect to adapter elbow in right side of crankcase.

(5) Remove hex self-locking nut, or hex stamped nut and hex nut, and flat washer from No. 1 cylinder intake manifold inner stud. Discard washer.

(6) Position clip (J, fig. 188) around hose assembly and on stud exposed by removing nut in (5) above and secure with 5/16-inch hex self-locking nut or 5/16-inch hex nut and 5/16-inch hex stamped nut removed in (5) above.




A—⅜-inch 90 degree adapter elbow 7346726
B—⅛-inch 45 degree pipe-to-tube elbow 8365711
C—⅜-inch 90 degree elbow 7744713
D—Tube assembly 8365713
E—Governor assembly 7954764
F—Tube assembly 8365714
G—⅜-inch 45 degree adapter elbow 7410042
H—Hose assembly 7376926
J—Clip 8680541
K—Governor oil pressure regulating valve assembly 8365712
L—⅛-inch 90 degree adapter elbow 7767517
M—Hose assembly 7410049
N—⅛-inch 45 degree adapter elbow 7767516

*Figure 188. Governor and governor oil pressure regulating valve installation (model AOSI-895-5M engines only)—schematic view.*

(7) Secure throttle-control-shaft-lever-to-governor-lever rod assembly (F, fig. 133) to governor rocker arm with No. 10 x 1 5/32 hex-head bolt (B, fig. 133), No. 10 slotted hex nut (D, fig. 133), and 13/64 id, 7/16 od, 0.0380 thick flat washer (C, fig. 133). Secure slotted hex nut with 1/16 x ½ cotter pin (E, fig. 133).

*b. Governor Assemblies 7376023 and 7410402.*

NOTE: The key letters shown below in parentheses refer to figure 131 except where otherwise indicated. Governor assemblies 7376023 and 7410402 do not have oil pressure regulating valves.

(1) Install governor drive shaft assembly in square bore of governor driven gear

(N) in right camshaft drive housing. Make certain drive shaft engages driven gear correctly.

(2) Position new governor mounting gasket (A) on studs on drive housing. Install governor assembly (E) over gasket and secure with three 5/16-inch hex self-locking nuts (C), or 5/16-inch hex nuts (C) and 5/16-inch hex stamped nuts (D), and 21/64 id, 9/16 od, 0.0630 thick flat washers (B).

(3) Secure throttle-control-shaft-lever-to-governor-lever rod assembly (F, fig. 133) to governor rocker arm with No. 10 x 1 5/32 hex-head bolt (B, fig. 133), No. 10 slotted hex nut (D, fig. 133), and 13/64 id, 7/16 od, 0.0380 thick flat washer (C, fig. 133). Secure slotted hex nut with 1/16 x 1/2 cotter pin (E, fig. 133).

*c. Governor Assembly 7954764.*

NOTE: The key letters shown below in parentheses refer to figure 188 except where otherwise indicated. Model AOSI-895-5M engine serial numbers 2067 through 8427 are equipped with governor assembly 7954764 and an external oil pressure regulating valve. Install the oil pressure regulating valve before installing governor. Refer to paragraph 280 for installation of regulating valve.

(1) Install 3/8-inch 90 degree elbow (C) in governor oil inlet opening. Install 3/8-inch 90 degree adapter elbow (A) in 3/8-inch 90 degree elbow (C) in governor. Install 1/8-inch 45 degree adapter elbow (N) in bottom of governor cylinder.

(2) Install governor drive shaft assembly in square bore of governor driven gear (N, fig. 131) in right camshaft drive housing. Make certain drive shaft engages driven gear correctly.

(3) Position new governor mounting gasket (A, fig. 131) on studs on drive housing. Install governor assembly over gasket and secure with three 5/16-inch hex self-locking nuts (C, fig. 131), or 5/16-inch hex nuts (C, fig. 131) and 5/16-inch hex stamped nuts (D, fig. 131), and 21/64 id, 9/16 od, 0.0630 thick flat washers (B, fig. 131).

(4) Position tube assembly (F) between adapter elbow (A) on top of governor oil pressure regulating valve and inlet adapter elbow (A) on governor. Tighten coupling nuts of tube assembly on elbows.

(5) Connect coupling nuts on hose assembly (M) (1/4 id, 6 1/4-inch long) to adapter elbow (N) in bottom of governor and to adapter elbow (L) in regulating valve.

(6) Secure throttle-control-shaft-lever-to-governor-lever rod assembly (F, fig. 133) to governor rocker arm with No. 10 x 1 5/32 hex-head bolt (B, fig. 133), No. 10 slotted hex nut (D, fig. 133), and 13/64 id, 7/16 od, 0.0380 thick flat washer (C, fig. 133). Secure slotted hex nut with 1/16 x 1/2 cotter pin (E, fig. 133).

## 280. Install Governor Oil Pressure Regulating Valve (Model AOSI-895-5M Engine Serial Numbers 2067 through 8487 Only)

NOTE: The key letters shown below in parentheses refer to figure 165 except where otherwise indicated.

*a.* Remove two upper hex stamped nuts, hex nuts, and flat washers securing drive support to right side camshaft gear housing. Discard flat washers.

*b.* Install 21/64 id, 9/16 od, 0.0630 thick flat washers (F) on two 5/16 x 2 1/2 hex-head bolts (P) and install bolts, with attached washers, through holes in triangular section of valve support bracket (N).

*c.* Hold bolts in place in bracket, position bracket on studs exposed by removal of nuts in *a* above, and secure with two 5/16-inch hex nuts and 5/16-inch hex stamped nuts removed in *a* above.

*d.* Install governor oil pressure regulating valve, with attached elbows, on bolts on support bracket and secure with two 5/16-inch hex self-locking nuts (H) and 21/64 id, 9/16 od, 0.0630 thick flat washers (F).

*e.* If tube assembly (D, fig. 188) is to be installed, remove 1/2-inch hex-socket pipe plug from oil passage opening in right side of accessory case above camshaft drive housing and install 1/2-inch 45 degree pipe-to-tube elbow (B,

fig. 188). Connect coupling nuts of tube assembly to adapter elbow (A, fig. 188) in side of regulating valve and to elbow (B, fig. 188) in accessory case.

*f.* If hose assembly (H, fig. 188) (13/32 id, 26-inch long) is to be installed instead of tube assembly (D, fig. 188) (*e* above), remove 3/8-inch hex-socket pipe plug from opening in main oil passage in right side of crankcase between Nos. 3 and 5 cylinders. Install 3/8-inch 45 degree adapter elbow (G, fig. 188) in opening in crankcase. Connect coupling nuts of hose assembly to adapter elbow (A, fig. 188) in side of regulating valve and to adapter elbow (G, fig. 188) in crankcase.

*g.* If hose assembly is installed (*f* above), remove hex stamped nut, hex nut, and flat washer from No. 1 cylinder intake manifold stud. Discard washer. Position clip (J, fig. 188) around hose assembly and over stud exposed by removal of nuts and secure with 5/16-inch hex nut and 5/16-inch hex stamped nut removed from stud.

### 281. Install Diaphragm-Type Fuel Pump Assembly

NOTE: The key letters shown below in parentheses refer to figure 131.

*a.* Install 3/8-inch 90 degree elbow (T) in opening in mounting flange side of fuel pump assembly (Z). Elbow must be positioned on a horizontal plane parallel with top of fuel pump, with elbow opening on right side. Install 3/8-inch 45 degree elbow (S) in elbow (T) with opening in same place as 90 degree elbow.

*b.* Install 3/8-inch 90 degree adapter elbow (U) in fuel pump inlet opening, with elbow opening turned toward bottom of pump as shown in figure 24.

*c.* Install 1/8-inch 90 degree adapter elbow (Y) in vent opening in underside of pump, with elbow opening at right side of pump as shown in figure 24.

*d.* Position new fuel pump mounting gasket (R) on fuel pump drive adapter assembly studs. Install fuel pump over gasket and secure with two 3/8-inch hex self-locking nuts (W), or 3/8-inch hex nuts (W) and 3/8-inch hex stamped nuts (V), and 25/64 id, 5/8 od, 0.0640 thick flat washers (X).

### 282. Install Fuel Vapor Separator Assembly

Install fuel vapor separator mounting bracket, with attached fuel vapor separator assembly, on right camshaft gear housing studs and secure with three 5/16-inch hex self-locking nuts (H, fig. 152), or 5/16-inch hex nuts H, fig. 152) and 5/16-inch hex stamped nuts (J, fig. 152), and 21/64 id, 9/16 od, 0.0630 thick flat washers (G, fig. 152).

### 283. Install Fuel Filter Assembly

Install fuel filter mounting bracket, with attached fuel filter assembly, on accessory case studs above generator drive adapter and secure with two 3/8-inch hex self-locking nuts (K, fig. 161), or 3/8-inch hex nuts (K, fig. 161) and 3/8-inch hex stamped nuts (L, fig. 161), and 25/64 id, 5/8 od, 0.0640 thick flat washers (J, fig. 161).

### 284. Install Oil Filter Assembly

*a.* Position new oil filter mounting gasket (E, fig. 96) on accessory case studs.

*b.* Install oil filter assembly (D, fig. 96) over gasket, being careful to aline oil filter element center tube with pilot bore in accessory case, and secure with six 5/16-inch hex self-locking nuts (B, fig. 96), or 5/16-inch hex nuts (B, fig. 96) and 5/16-inch hex stamped nuts (A, fig. 96), and 21/64 id, 9/16 od, 0.0630 thick flat washers (C, fig. 96).

*c.* Position a new 7/8-inch annular gasket (AW, fig. 96) on 7/8-inch hex-head magnetic plug (AV, fig. 96) and install plug in oil filter housing. Secure plug to oil filter center hex-head bolt with locking wire.

### 285. Install Vane-Type Fuel Pump Assembly

NOTE: The key letters shown below in parentheses refer to figure 121.

*a.* Install 3/4 x 3/8 pipe bushing (E) in fuel pump inlet. Install 3/8-inch 90 degree adapter elbow (F) in inlet housing. Refer to figure 25 for position of elbow after installation.

*b.* Install 3/4 x 1/4 pipe bushing (Q) in fuel pump outlet. Install 1/4-inch 90 degree elbow (R) in outlet bushing. Refer to figure 25 for position of elbow after installation.

*c.* Position new fuel pump mounting gasket (P) on studs on fuel pump drive adapter and

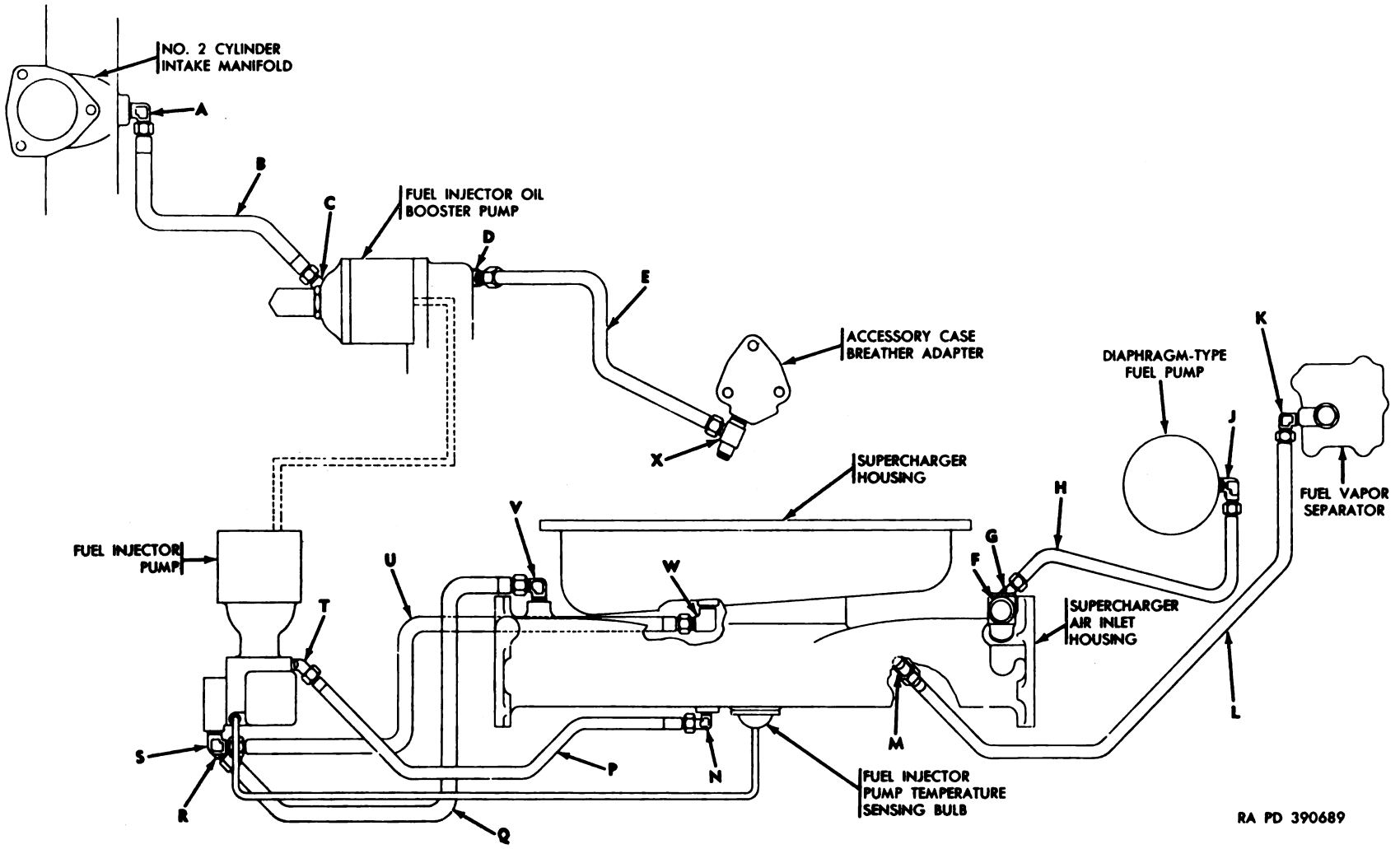



*Figure 189. Fuel supply system vent hose assemblies and related parts—schematic diagram.*

A—Elbow 7376122
B—Hose assembly 7973945
C—Elbow 7376122
D—Adapter elbow 7767516
E—Hose assembly 7744711
F—Elbow 7376136
G—Adapter elbow 7767516
H—Hose assembly 8713895
J—Elbow 7767517
K—Elbow 7767517
L—Hose assembly 7973944
M—Adapter elbow 7767516
N—Elbow 7767517
P—Hose assembly 7744710
Q—Hose assembly 7973945
R—Elbow 7410041
S—Elbow 7376122
T—Adapter elbow 7767516
U—Hose assembly 8713896
V—Elbow 7376122
W—Elbow 7376122
X—Pipe-to-tube tee 7973973

*Figure 189—Continued.*

install fuel pump assembly (D), with attached bushings and elbows, over gasket and secure with four 5/16-inch hex self-locking nuts (B), or 5/16-inch hex nuts (B) and 5/16-inch hex stamped nuts (A), and 21/64 id, 9/16 od, 0.0630 thick flat washers (C).

## 286. Install Sending Units

NOTE: The key letters shown below in parentheses refer to figure 96.

*a. Oil Pressure Gage Sending Unit (X).* Install sending unit in pipe bushing (W) installed in pipe elbow (V) in top left side of accessory case.

*b. High Oil Temperature Warning Light Sending Unit (U).* Install sending unit in tee (T) in top center of accessory case.

*c. Low Oil Pressure Warning Light Sending Unit (H).* Install sending unit in pipe elbow (J) in top right side of accessory case.

## 287. Installation of Fuel Supply Hose Assemblies and Fuel System Vent Hose Assemblies

*a. Install Fuel Supply Hose Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 157.

**CAUTION: Do not use thread sealing or gasket forming compound on any fuel tubes, fuel hose, or fittings. Assemble the parts dry or coat with clean engine oil (OE) only.**

(1) Connect hose assembly (AF) (13/32 id, 43½-inch long) to fuel filter outlet adapter elbow (AH) and to fuel pump inlet adapter elbow (ZZ).

(2) Position clamp (UU) around hose assembly and rubber-lined clamp (WW) around ignition harness below starter as shown in figure 1 and secure with No. 10 x ½ fillister-head screw (VV) and No. 10 hex self-locking nut (XX).

(3) Install another clamp (UU) around hose assembly. Remove screw from starter cover, install ends of clamp over hole in cover, and secure with removed screw.

(4) Connect hose assembly (AE) (13/32 id, 15-inch long) to fuel pump outlet elbow (AG) and to fuel vapor separator inlet elbow (AC).

(5) Connect hose assembly (Z) (13/32 id, 52½-inch long) to fuel vapor separator outlet adapter elbow (AB) and to fuel pump assembly inlet adapter elbow (JJ).

(6) Connect hose assembly (EE) (5/16 id, 15-inch long) to fuel pump assembly outlet elbow (FF) and to fuel injector pump assembly fuel solenoid cutoff valve elbow (BB).

(7) Connect hose assembly (AA) (¼ id, 45-inch long) to elbow (MM) in fuel injector pump assembly spillport check valve adapter and to adapter elbow (AD) in fuel vapor separator return fuel inlet.

*b. Install Fuel System Vent Hose Assemblies.*

NOTE: The key letters shown below in parentheses refer to figure 189 except where otherwise indicated.

(1) Connect hose assembly (H) (¼ id, 15-inch long) to adapter elbow (J) in bottom of fuel pump and to adapter elbow (G) located below crankcase breather tube elbow (F) in supercharger air inlet housing. Install clamps (FF, fig. 187) around hose assembly (H) and around ignition harness vent hose assembly (CC, fig. 187). Secure clamps to each other, as shown in figure 1, with No. 10 x ½ fillister-head screw (EE, fig. 187) and No. 10 hex self-locking nut (DD, fig. 187).

(2) Connect hose assembly (B) (⅜ id, 16-inch long) to elbow (C) in cover of fuel injector oil booster pump and to elbow (A) in No. 2 cylinder intake manifold.

(3) Connect hose assembly (E) (¼ id, 21-inch long) to adapter elbow (D) in inner side of fuel injector oil booster pump adapter and to open side of pipe-to-tube tee (X) in accessory case breather adapter.

(4) Connect hose assembly (L) (¼ id, 21-inch long) to elbow (K) in side of fuel vapor separator cover and to adapter elbow (M) in bottom right side of supercharger air inlet housing.

(5) Connect hose assembly (U) (⅜ id, 15-inch long) to elbow (W) in bottom

of supercharger housing and to elbow (S) in upper opening of fuel injector pump idle block marked "INTAKE MANIFOLD."

(6) Connect hose assembly (Q) (⅜ id, 16-inch long) to elbow (V) in rear of supercharger air inlet housing and to elbow (R) in lower opening of fuel injector pump idle block marked "THROTTLE HOUSING."

(7) Connect hose assembly (P) (¼ id, 18-inch long) to adapter elbow (T) in fuel injector metering valve assembly and to elbow (N) in front of supercharger air inlet housing.

(8) Install two rubber-lined clamps (Y, fig. 24) around fuel system vent and supply hose assemblies to support hose.

## 288. Remove Engine from Overhaul Stand

*a.* Install sling 8366441 (fig. 13), with hooks on sling hooked to engine lifting eyes as shown in figure 21. Attach hoist to sling.

*b.* Remove hex nuts and flat washers securing engine to overhaul stand adapter.

*c.* Remove engine from overhaul stand and set engine on suitable blocks, transport stand, or, if engine is to be tested, install engine on test stand for operational tests.

*d.* Install flame arrestor as described in paragraph 274*b*. Install crankcase oil filler tube as described in paragraph 274*c*. Install exhaust manifold cooling air inlet elbows as described in paragraph 272*c*. Install transmission oil cooler inlet and outlet hose assemblies as described in paragraph 193*b*.

# CHAPTER 8

# TESTS AND ADJUSTMENTS

## Section I. ADJUSTMENTS

### 289. Oil Pressure

*a. Correct Pressure Setting.* Engine oil pressure is properly adjusted when it registers between 70 and 80 psi, with engine oil (OE 50) at 148°F to 180°F and engine running at 2,800 rpm. If pressure is not within these limits, adjust oil pressure control valve as described in *b* below.

*b. Adjustment.*

(1) *Increase oil pressure.* To increase oil pressure follow procedure described in (*a*) through (*c*) below.

(*a*) Connect an accurate pressure gage to the outlet side of the oil control housing or, if engine is installed in vehicle, use oil pressure gage on instrument panel.

(*b*) Remove valve cap (fig. 135) from oil pressure control valve assembly in oil control housing.

(*c*) Install up to three 0.5600 id, 0.9400 od, 0.0600 thick flat washers (fig. 135) into bore of cap, as necessary, to raise oil pressure.

(*d*) Install cap on valve assembly. Make certain cap gasket is in place. Check oil pressure. If pressure cannot be adjusted to within limits specified in *a* above, replace oil pressure control valve assembly.

(*e*) If gage was installed, remove gage.

(2) *Decrease oil pressure.* To decrease oil pressure, follow procedure described in (*a*) through (*c*) below.

(*a*) Connect gage as in (1) above.

(*b*) Remove valve cap (fig. 135) from oil pressure control valve assembly in oil control housing.

(*c*) Remove 0.5600 id, 0.9400 od, 0.0600 thick flat washers (fig. 135) from bore of valve cap, as necessary, to lower oil pressure.

(*d*) Install cap on valve assembly. Make certain cap gasket is in place. Check oil pressure. If pressure cannot be adjusted to within limits specified above, replace oil pressure control valve assembly.

(*e*) If gage was installed, remove gage.

*c. Lock Valve Assemblies.* After oil pressure is adjusted to within limits specified in *a* above, lock oil pressure control valve assembly, oil filter bypass valve assembly, and oil cooler bypass valve assembly to each other with locking wire.

### 290. Throttle Control Linkage

*a. Correct Positions of Throttle Valves.*

(1) With vehicle control lever and vehicle-control-to-throttle-control lever (fig. 190) held against full throttle stops, both throttle valves should be in full open position and there should be 0.0100-inch clearance between governor rocker arm and governor rocker arm stop.

(2) With vehicle control lever and vehicle-control-to-throttle-control levers in the closed position (limit of counterclockwise travel) and lever stop bolt (idle speed adjusting bolt) (fig. 190) turned counterclockwise to provide no clearance at throttle shaft stop lever, both throttle valves should be in the closed position.

(3) If the conditions in (1) and (2) are not as stated, adjust throttle control linkage as described in *b* below.

*b. Adjustment.*

NOTE: These adjustments, if required, must be made before test run of the engine.

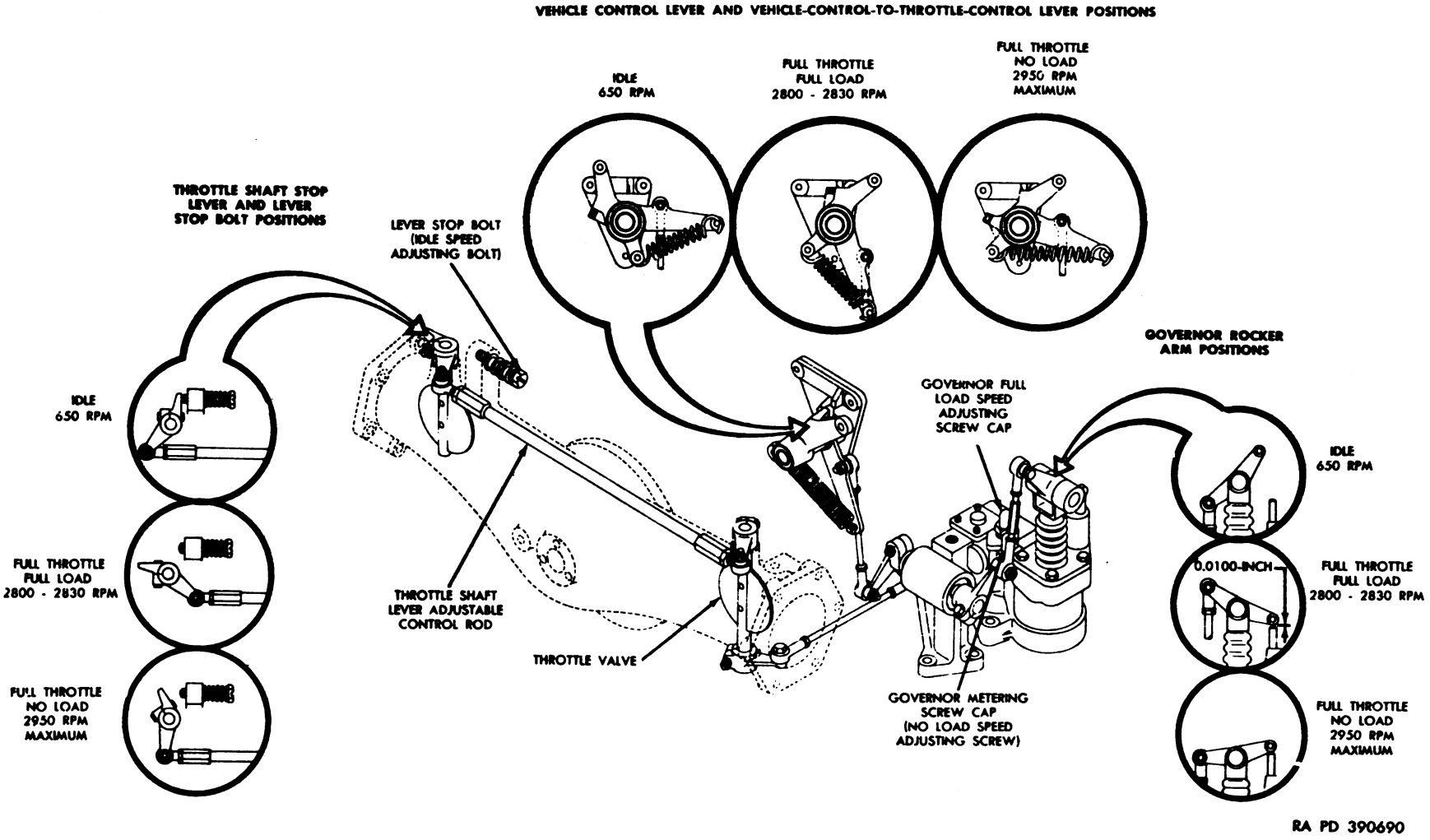



*Figure 190. Throttle control linkage and related parts operating positions—schematic view.*

(1) Turn lever stop bolt (fig. 190) clockwise to provide clearance between bolt and throttle shaft stop lever when throttle is closed.

(2) Loosen hex jam nuts on throttle shaft lever adjustable rod (fig. 190). Hold vehicle-control-to-throttle-control lever in the closed position (limit of counterclockwise travel). Turn throttle shaft lever control rod in rod end ball bearings until throttle valves are fully closed. Tighten hex jam nuts against rod end ball bearings.

(3) Loosen hex jam nuts on throttle-shaft-lever-to-governor-lever rod assembly.

(4) Hold vehicle-control-to-throttle-control lever against full throttle stops. Adjust turnbuckle on throttle-control-shaft-lever-to-governor-lever rod assembly to provide 0.0100-inch clearance between governor rocker arm and rocker arm stop. Tighten hex jam nuts against rod end ball bearings.

(5) If both throttle valves are full open, adjustment is correct. Move vehicle control lever to closed position. Turn lever stop bolt two turns beyond contact with throttle shaft stop lever.

NOTE: Adjust idle speed to 650 rpm with lever stop bolt (idle speed adjusting bolt) after engine is started and warmed up to operating temperature.

(6) If throttle valves cannot be adjusted to positions stated in *a* above, the throttle control linkage is worn or damaged. Repair or replace throttle control linkage (pars. 125 through 129 and pars. 140 through 144).

## 291. Governor

NOTE: All governor adjustments should be made after run-in test (par. 296). To completely check and adjust governor, engine must be mounted on a suitable dynamometer; speed must be registered on an accurate tachometer; and engine oil must be at operating temperature (oil at 148°F to 180°F).

*a. Correct Speed.* The governor is properly adjusted when conditions described in (1) and (2) below are met.

(1) Engine speed must be controlled between 2,800 and 2,830 rpm when operating at full throttle, full load (dynamometer test stand only).

(2) Engine speed must not exceed 2,950 rpm, and engine must not surge, when operating at full throttle, no load.

(3) If conditions in (1) and (2) are not as stated, adjust governor as described in *b* below.

*b. Adjustment.*

(1) *Adjust full load speed.*

(*a*) Remove governor full load speed adjusting screw cap (fig. 190). Loosen adjusting screw lock nut.

(*b*) Operate engine at full throttle, full load. Turn governor full load speed adjusting screw to adjust speed to between 2,800 to 2,830 rpm. To increase speed, turn screw clockwise. To decrease speed, turn screw counterclockwise.

(*c*) Tighten lock nut to lock speed adjusting screw in position. Install cap.

(2) *Adjust no load speed.*

(*a*) Remove cap from governor metering screw (no load speed adjusting screw) (fig. 190). Loosen metering screw lock nut.

NOTE: On governor assembly 7376023, remove metering screw plug from side of governor body to obtain access to metering screw.

(*b*) Operate engine at full throttle, no load. Turn governor metering screw to adjust speed to between 2,900 to 2,950 rpm. To increase speed, turn screw counterclockwise. To decrease speed, turn screw clockwise.

NOTE: If engine surges when running at no load, it may be necessary to decrease the full load speed ((1) above) and to increase the no load speed. Surging may also be caused by governor rocker arm being out of adjustment. Check clearance between rocker arm and rocker arm stop (par. 290*a*). Adjust clearance if necessary (par 290*b*). On governor assembly 8380695, surging can also be adjusted by changing position of lock nut on clevis. To decrease surging, remove cotter pin, unscrew lock nut as necessary to decrease surging, and install cotter pin.

(c) Tighten lock nut to lock metering screw in position. Install cap, on governor assembly 7376023, install plug in side of governor body.

(d) If speed cannot be adjusted to within limits stated in *a* above, repair or replace governor as described in paragraph 297 through 303.

## 292. Vane-Type Fuel Pump

*a. Correct Outlet Pressure.* The vane-type fuel pump must provide an outlet pressure between 15 and 20 psi throughout the entire speed range if the fuel injection system is to operate properly.

*b. Adjustment.*

NOTE: This adjustment, if required, must be made during the test run of the engine (par. 296).

(1) Connect accurate pressure gage on outlet side of fuel pump, between pump and fuel injector pump.

(2) Loosen large hex locking nut on top of pump.

(3) Operate engine at full throttle, no load (2,900 to 2,950 rpm).

(4) Turn knurled adjusting screw, by hand or with a screwdriver installed in slot in screw, to adjust pressure. To increase pressure, turn screw clockwise. To decrease pressure, turn screw counterclockwise.

(5) Adjust pressure to between 15 and 20 psi at full throttle, no load (2,900 to 2,950 rpm). Tighten large hex nut to lock adjusting screw in position. Close throttle on engine to idle (650 rpm). Pressure should remain between 15 and 20 psi.

(6) If pressure cannot be adjusted to limits stated in *a* above, fuel pump is malfunctioning and must be repaired. Refer to TM 9-2910-201-35 for procedures.

## 293. Fuel Injector Oil Booster Pump

*a. Correct Operation.* With the engine at correct operating temperature (oil at 148°F to 180°F), the engine should accelerate from idle speed to full throttle speed, at a normal rate, without indications of a lean fuel mixture (backfiring) or rich fuel mixture (engine loading and black smoke from exhaust). If engine does not accelerate as specified, adjust fuel injector oil booster pump as described in *b* below.

NOTE: A very rapid acceleration of the engine will normally cause a backfire. This type of backfire should not be confused with the backfiring caused by a lean fuel mixture.

*b. Adjustment.*

NOTE: This adjustment, if required, must be made during test run of the engine (par. 296).

(1) With engine at correct operating temperature (oil at 148°F to 180°F), throttle engine to idling speed (650 rpm).

(2) Remove booster pump cap (U, fig. 126) and loosen hex nut (V, fig. 126).

(3) Turn hex jam nut (W, fig. 126) to adjust booster pump stroke and provide correct operation specified in *a* above. To lean accelerating fuel mixture turn nut clockwise. To richen accelerating fuel mixture, turn nut counterclockwise.

(4) Adjust fuel injector oil booster pump to provide smooth acceleration, with no backfiring, loading, or smoking.

(5) Tighten hex nut, loosened in (2) above, to lock hex jam nut in position. Install booster pump cap. Make certain cap gasket (R, fig. 126) is in place.

(6) If proper adjustment of fuel mixture cannot be obtained, repair or replace fuel injector oil booster pump (pars. 130 through 134).

## 294. Fuel Injector Pump

*a. Correct Operation.* With the engine at correct operating temperature (oil at 148°F to 180°F), the engine should operate throughout its entire speed range with no indications of a lean fuel mixture (overheating or backfiring) or rich fuel mixture (engine loading or black smoke from exhaust). If engine does not operate as specified, adjust fuel injector pump as described in *b* below.

*b. Adjustment.*

NOTE: These adjustments, if required, must be made during test run of the engine (par. 196).

(1) *At idle.*

(*a*) With engine at correct operating temperature (oil at 148°F to 180°F), throttle engine to idling speed (650 rpm).

(*b*) Turn idle adjustment valve screw (fig. 184) on fuel injector pump to adjust fuel mixture and provide correct operation specified in *a* above. To lean operating fuel mixture, turn screw clockwise. To richen operating fuel mixture, turn screw counterclockwise.

(*c*) If correct engine operation cannot be obtained at idling speed by adjustment, fuel injector pump must be repaired or replaced (TM 9–2910–200–35).

(2) *At engine speeds above idle.*

(*a*) Refer to TM 9–2910–200–35 for adjusting fuel injector pump at engine speeds above idle.

(*b*) If correct engine operation cannot be obtained at engine speeds above idle, fuel injector pump must be repaired or replaced (TM 9–2910–200–35).

## Section II. RUN-IN TEST

### 295. Preparation for Run-In

After the engine has been rebuilt in accordance with this manual, a run-in test of the engine is necessary. Test the engine as outlined below. Refer to TB 9–2800–200–50 for further information on run-in test procedures for Continental model AOSI–895–5 and AOSI–895–5M engines.

*a.* Couple the engine to a suitable load, the load may be a water brake or dynamometer. If neither is available, use the transmission from the type of vehicle in which the engine is to be installed.

*b.* Make the necessary external fuel and electrical connections. Install the same type air cleaners as are used in the vehicle (refer to pertinent vehicle operation manual). Air intake should be located so that only fresh cool air is inducted into the engine. Exhaust piping to be attached to exhaust manifolds should be constructed to reduce back pressure to a minimum, since slightest back pressure has considerable effect upon the power output of the engine. The exhaust piping should be as short as possible and free from restrictions caused by reduction in pipe diameter, sharp bends, or angles. Provision must be made to prevent recirculation of exhausted engine cooling air, which could cause the engine to overheat during test.

*c.* Lubricate the engine by forcing the specified engine oil (OE–50, unless otherwise specified) under pressure into the engine lubrication system. This prelubrication insures adequate lubrication to engine parts until full lubrication is obtained normally under pressure from the engine oil pump. If prelubrication equipment is not available, fill all external oil lines and oil cooler with proper grade oil. Fill the crankcase with proper grade oil to the level indicated on the oil level gage.

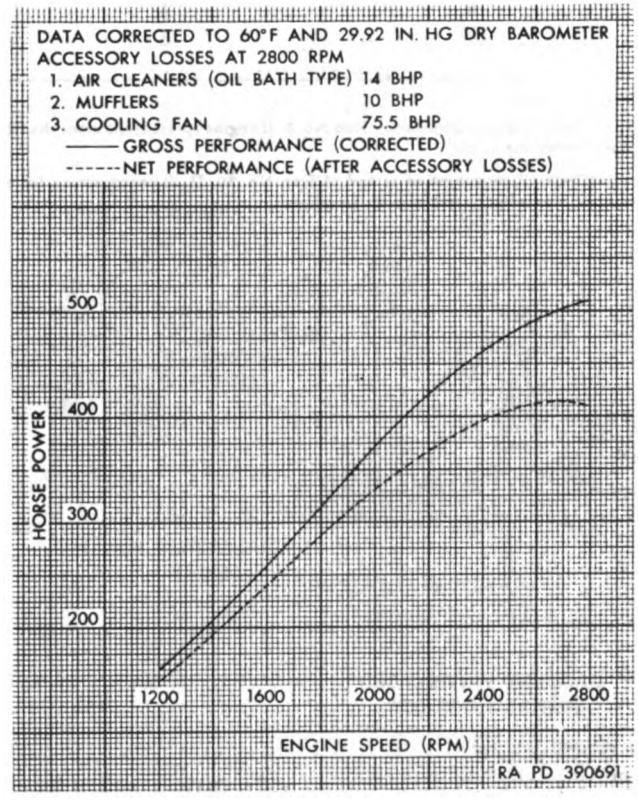



*Figure 191. Typical performance curve for model AOSI-895-5 and AOSI-895-5M engines.*

## 296. Run-In Schedule

*a. Schedule.* Start and operate the engine in accordance with the run-in schedule in Table VI. During run-in, operate the engine in successive periods (Run No. column) for the length of time indicated (Three-minutes column) at the designated engine speed (RPM column) at the manifold pressure indicated (Abs man. press. in. hg column).

*b. Adjustments.* Adjust idle speed (par. 290) to 650 rpm. Adjust vane-type fuel pump outlet pressure (par. 292), if necessary. Adjust fuel injector oil booster pump (par. 293), if necessary. Adjust fuel injector pump (par. 297), if necessary. Malfunctions noted during the run must be corrected.

*c. Compute Brake Horsepower.* Compute observed brake horsepower for full throttle periods and correct to standard conditions as shown in TB 9–2800–200–50. The corrected (gross) brake horsepower during these periods should correspond to the performance curve shown in figure 191.

*d. Adjust Governor.* Adjust governor after completion of run-in schedule. Refer to paragraph 291 for procedures.

*Table VI. Run-in Schedule*

| Run No. | Time-minutes | RPM | Abs man. press. in. hg |
|---|---|---|---|
| 1 | 10 | 1000 | 19.0 |
| 2 | 15 | 1400 | 20.0 |
| 3 | 15 | 1800 | 22.0 |
| 4 | 15 | 2200 | 26.0 |
| 5 | 15 | 2600 | 33.0 |
| 6[1] | 30 | 2800 | Full throttle |
| 7 | 5 | 2400 | Full throttle |
| 8 | 5 | 2000 | Full throttle |
| 9 | 5 | 1600 | Full throttle |
| 10[2] | 5 | 1200 | Full throttle |

[1] Check magneto drop during Run No. 6. If engine speed drops more than 250 rpm while operating on either magneto at 2,800 rpm full throttle, investigate and correct the cause.

[2] Check oil consumption at end of Run No. 10. If oil consumption for complete run-in, Runs Nos. 1 through 10, exceeds 13 pounds (approximately 6 quarts), investigate and correct the cause.

# CHAPTER 9
# GOVERNOR ASSEMBLY

## Section I. DESCRIPTION AND DATA

### 297. Description

*a. Governor.*

(1) *General.*

(*a*) The engine governor (fig. 1) is mounted on the right camshaft drive housing and is driven by the governor driven gear (L, fig. 17). The function of the governor is to maintain engine speed below predetermined limits regardless of loads imposed on the engine.

(*b*) The engines may be equipped with any one of four different governor assemblies. A complete listing of all governor assemblies used on model AOSI–895–5M and model AOSI–895–5 engines, showing serial number applications, is listed in the data section (par. 298).

(2) *Basic systems.* The governor is composed of three basic operating systems: the drive, or actuating balls and race-type mechanism; an oil distributing valve system; and a servo system.

(*a*) *Actuating balls and race-type mechanism.* The actuating balls (fig. 192) rotate in their lower race, which is attached to the drive shaft. This rotation causes the conical upper race (fig. 192), which is in direct contact with the balls, to rotate, actuating the oil distributing valve system.

(*b*) *Oil distributing valve system.* Axial movement of the upper race, caused

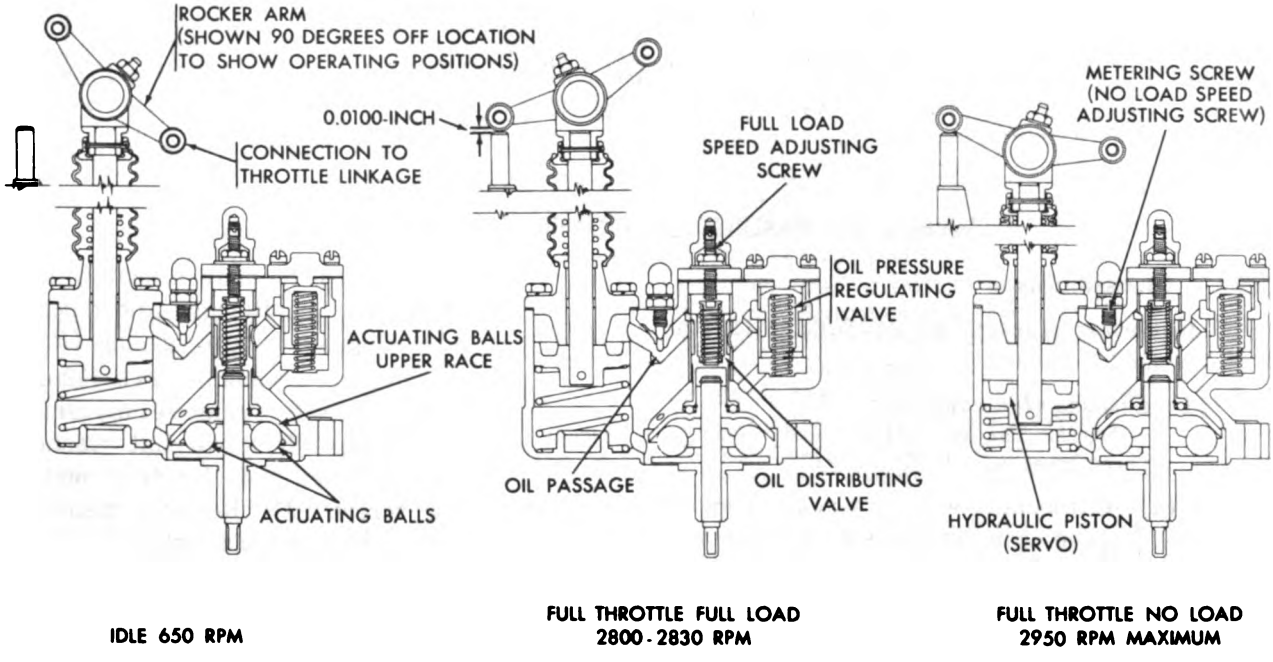



*Figure 192. Governor assembly—8380695—cross-sectional view.*

by the centrifugal force of the rotating balls, actuates the oil distributing valve system. The oil distributing valve (fig. 192) moves over oil passage openings, controlling the flow of oil through these passages to the hydraulic piston or servo system.

(*c*) *Servo system.* Oil entering the servo system behind the piston, under pressure, forces the piston down against the piston spring. The piston rod, being pinned to the rocker arm clevis, pulls the clevis down and, with it, the rocker arm. The movement of the rocker arm controls the position of the throttle valves through the throttle linkage.

*b. Adjustment.* Desired engine speed at full throttle, full load, is obtained by adjustment of the speed adjustment screw (fig. 192), which controls the spring tension on the oil distributing valve. Desired engine speed at full throttle, no load, is obtained by adjustment of the metering screw, which regulates the servo system oil pressure by regulating the amount of oil which is bled off from the system.

*c. Governor Oil Pressure Regulating Valve.* On model AOSI–895–5M engine serial numbers 2067 through 8487 only, an external governor oil pressure regulating valve (fig. 165) is incorporated in the governor oil supply system. This valve supplies oil to the governor at a constant pressure, regardless of fluctuations caused by varying engine speed, oil viscosity, or temperature, thereby producing a constant governor action. Model AOSI–895–5M engine serial numbers 8488 and above and all AOSI–895–5 engines have governors with an oil pressure regulating valve (fig. 192) which is an integral part of the governor assembly.

## 298. Data

| | |
|---|---|
| Manufacturer | Novi |
| Type | centrifugal |
| Rotation (mechanical) | counterclockwise |

| Ordnance | Manufacturer | Engine model and serial numbers | |
|---|---|---|---|
| 7376023 | 76820–53855–C | AOSI–895–5M | 101 through 229 |
| 7410402 | 76820–53855–D | AOSI–895–5M | 230 through 2066 |
| 7954764 | 76820–53855–D–2 | AOSI–895–5M | 2067 through 8487 |
| 8380695 | 76820–54286–B–1 | AOSI–895–5M | 8488 and above |
| 8380695 | 76820–54286–B–1 | AOSI–895–5 | all engines |

## Section II. REBUILD OF GOVERNOR ASSEMBLIES

### 299. Disassembly

*a. Governor Assemblies 7376023, 7410402, and 7954764.*

(1) *Disassemble governor.*

NOTE: The key letters shown below in parentheses refer to figure 193.

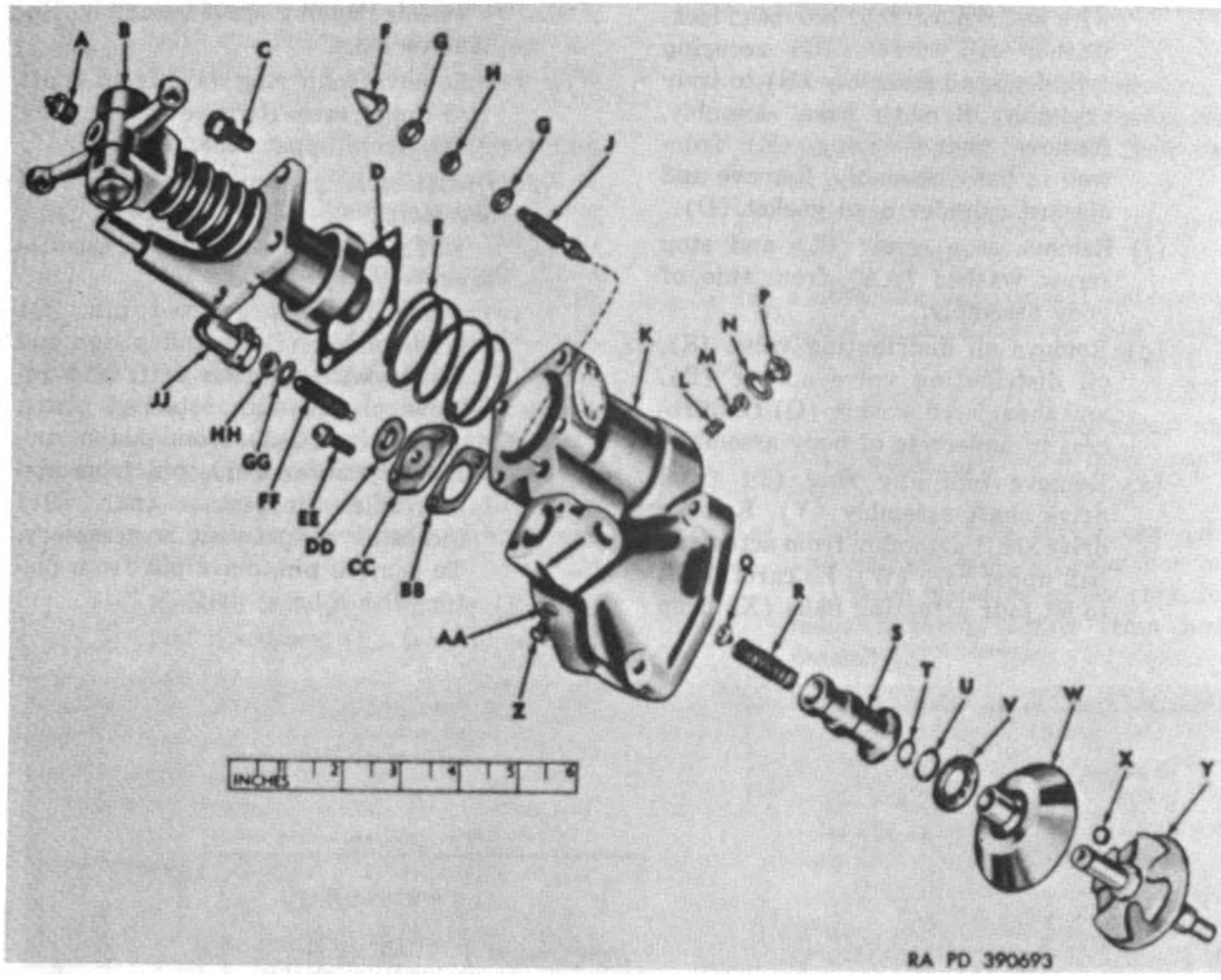
(*a*) Cut locking wire or seal and remove speed adjusting screw cap (JJ), hex nut (HH), and lock washer (GG), from speed adjusting screw (FF). Remove speed adjusting screw and flat washer (DD) from body assembly (K).

(*b*) Remove two lockwasher screws (EE) securing adjusting screw cover (CC) to body assembly and remove cover. Remove and discard adjusting screw cover gasket (BB).

(*c*) On governor assemblies 7410402 and 7954764 only, remove metering screw cap (F), two flat washers (G), and hex nut (H) from metering screw (J). Remove metering screw from body assembly.

(*d*) On governor assembly 7376023 only, remove metering screw plug (P), flat washer (N), metering screw (M), and metering screw spring (L) from opening in side of body.

(*e*) Remove lubrication fitting (A) from cylinder head assembly. Cut locking




A—⅛-inch lubrication fitting 504208

B—Cylinder head assembly { 76840–54226A (governor assembly 7954764 only); 7521293 (governor assemblies 7376023 and 7410402 only) }

C—5/16 x ¾ hex-head lockwasher cap screw 7954701

D—Cylinder head gasket 7008455

E—Piston spring 7376084

F—Metering screw cap 131658

G—0.3300 id, 0.5000 od, 0.0300 thick flat washer 8680533

H—5/16-inch hex nut 124920

J—Metering screw { 8680531 (governor assembly 7954764 only); 7416392 (governor assembly 7410402 only) }

K—Body assembly { 76820–52511C (governor assembly 7376023 only); 7954588 (governor assembly 7410402 only); 76820–52511E (governor assembly 7954764 only) }

L—Metering screw spring 7767254 }
M—Metering screw 7744997 } (governor assembly
N—Washer 7744173 } 7376023 only)
P—Metering screw plug 7744998 }

Q—Shouldered washer 7744996

R—Oil distributing valve spring 7744190

S—Oil distributing valve 7521292

T—7/16-inch shaft diameter retaining ring 583033

U—0.6700-inch od snap ring 7745000

V—Ball bearing 7402489

W—Actuating ball upper race 7744999

X—Actuating ball 104924

Y—Drive shaft assembly 76820–52517B

Z—Stop screw 8357831

AA—Stop screw washer 8357833

BB—Adjusting screw cover gasket 7744172

CC—Adjusting screw cover 7767258

DD—21/64 id, ¾ od, 1/32 thick flat washer 7008794

EE—No. 12 x ¾ fillister-head lockwasher screw 7954702

FF—Speed adjusting screw 7008795

GG—5/16-inch lock washer 120379

HH—5/16-inch hex nut 124920

JJ—Speed adjusting screw cap 7008443

*Figure 193. Governor assemblies—7376023, 7410402, and 7954764—exploded view.*

wire and remove four hex-head lockwasher cap screws (C) securing cylinder head assembly (B) to body assembly. Remove head assembly. Remove piston spring (E) from well in body assembly. Remove and discard cylinder head gasket (D).

(*f*) Remove stop screw (Z) and stop screw washer (AA) from side of body assembly.

(*g*) Remove oil distributing valve (S), oil distributing valve spring (R), and shouldered washer (Q) from recess in underside of body assembly.

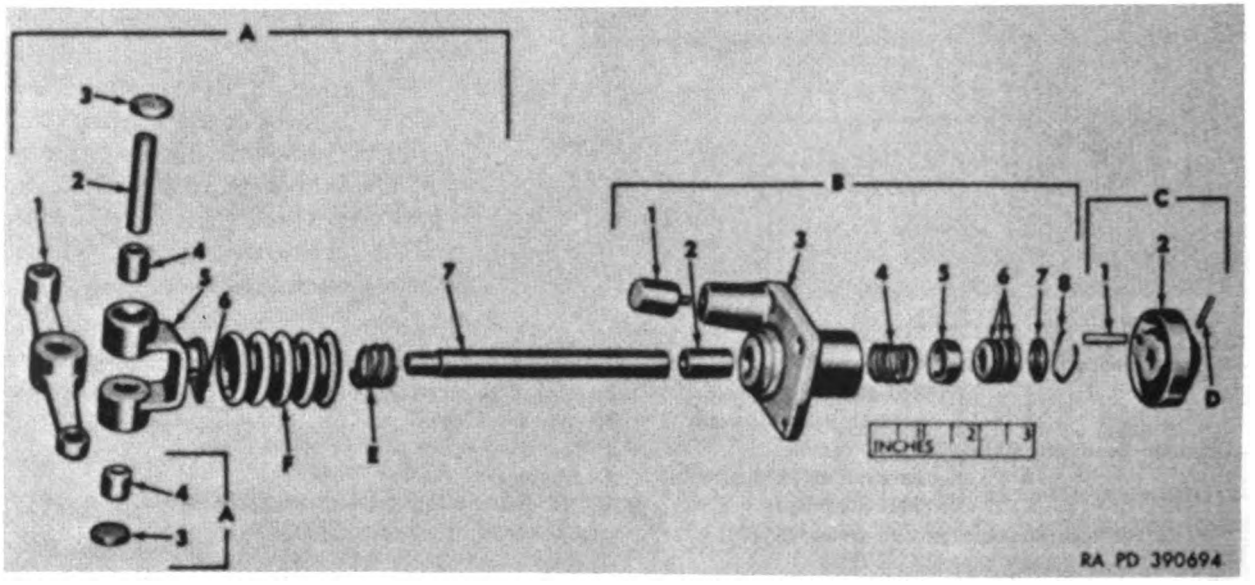
(*h*) Remove retaining ring (T) from drive shaft assembly (Y). Remove drive shaft assembly from actuating ball upper race (W). Be careful not to let four actuating balls (X) drop when removing shaft assembly. Remove balls.

(*i*) Remove snap ring (U) from shaft of upper race. Remove ball bearing (V) from upper race.

(2) *Disassemble governor cylinder head assembly.*

NOTE: The key letters shown below in parentheses refer to figure 194.

(*a*) Drive headless grooved pin (D) from piston (C–2) and piston rod (A–7) with a brass drift and remove piston, with attached piston guide pin, (C–1) from piston rod. Do not remove guide pin from piston unless inspection (par. 301) indicates replacement is necessary. To remove pin, drive pin from piston with a brass drift.




A–Rocker arm assembly 7744168
- 1–Rocker arm 8357832
- 2–Rocker arm shaft 7744179
- 3–¾-inch expansion plug 501593
- 4–Shaft bushing 8357827
- 5–Piston rod clevis 8357828
- 6–3/32 x ⅞ headless grooved pin 142494
- 7–Piston rod 8357829

B–Head assembly 76820–52513A
- 1–Rocker arm stop pin 7954696
- 2–Bearing 7767256
- 3–Head 7954695
- 4–Packing spring 7058772
- 5–Packing upper gland 7058775
- 6–Piston rod packing 7058776
- 7–Packing lower gland 7744181
- 8–Packing gland retaining ring 7744182

C–Piston assembly 7744169
- 1–Piston guide pin 7954698
- 2–Piston 7954697

D–3/32 x 1 headless grooved pin 142495

E–Piston rod spring
- 7376085 (cylinder head assembly 76820–54226A only)
- 7539757 (cylinder head assembly 7521293 only)

F–Piston rod seal 7008453

*Figure 194. Governor cylinder head assemblies—76820-54226A and 7521293—exploded view.*

(*b*) Remove rocker arm assembly (A), with attached piston rod spring (E) and piston rod seal (F), from head assembly (B).

(*c*) Remove packing gland retaining ring (B–8) from bore in bottom of head (B–3). Remove packing lower gland (B–7), three piston rod packings (B–6), packing upper gland (B–5), and packing spring (B–4) from head. Discard packings.

(*d*) Do not remove bearing (B–2) or rocker arm stop pin (B–1) from head unless inspection (par. 301) indicates replacement is necessary. To remove pin or bearing, drive pin or bearing out of head with a brass drift.

(*e*) Remove piston rod spring (E) and piston rod seal (F) from piston rod (A–7).

(*f*) Do not remove piston rod from piston rod clevis (A–5) unless inspection (par. 301) indicates replacement is necessary. To remove piston rod, drive headless grooved pin (A–6) out of clevis with a brass drift and remove piston rod.

(*g*) Do not remove rocker arm (A–1) from clevis unless inspection (par. 301) indicates replacement is necessary. To remove rocker arm, pry out expansion plugs (A–3) from clevis and drive rocker arm shaft (A–2) from clevis with a brass drift. Remove rocker arm.

(*h*) Do not remove shaft bushings (A–4) from clevis unless inspection (par. 301) indicates replacement is necessary. To remove bushings, drive bushings from arms of clevis with a brass drift.

*b. Governor Assembly 8380695.*

(1) *Disassemble governor.*

NOTE: The key letters shown below in parentheses refer to figure 195.

(*a*) Cut locking wire and remove four fillister-head lockwasher screws (JJ) securing oil regulating valve cap (HH) to body assembly (AA). Remove cap and remove and discard valve cap gasket (FF).

(*b*) Remove automatic pressure regulating valve (DD) and pressure regulating valve spring (CC) from well in body assembly.

(*c*) Remove slotted pipe plug (Q) from body assembly.

(*d*) Cut locking wire or seal and remove speed adjusting screw cap (KK), hex nut (E), and lock washer (GG) from speed adjusting screw (EE). Remove speed adjusting screw and flat washer (H) from body assembly.

(*e*) Remove metering screw cap (K), two flat washers (L), and hex nut (E) from metering screw (M). Remove metering screw from body assembly.

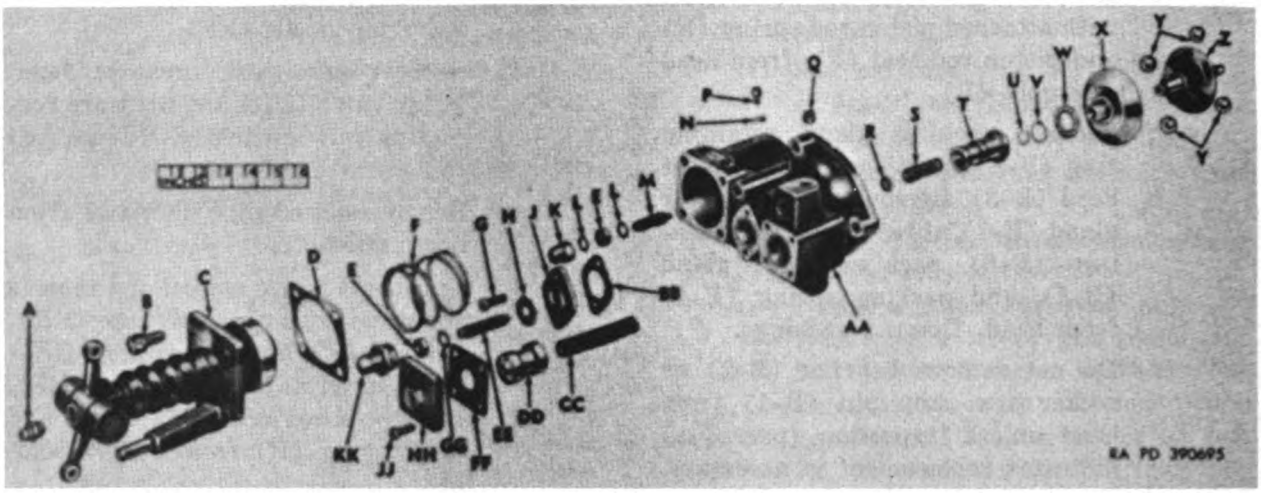
(*f*) Remove lubrication fitting (A) from cylinder head assembly (C). Cut locking wire and remove four hexhead lockwasher cap screws (B) securing cylinder head assembly to body assembly. Remove head assembly. Remove piston spring (F) from well in body. Remove and discard cylinder head gasket (D).

(*g*) Remove two fillister-head lockwasher screws (G) securing adjusting screw cover (J) to body assembly and remove cover. Remove and discard adjusting screw cover gasket (BB).

(*h*) Remove stop screw (P) and stop screw washer (N) from body assembly.

(*i*) Remove oil distributing valve (T), oil distributing valve spring (S), and shouldered washer (R) from recess in underside of body assembly.

(*j*) Remove retaining ring (U) from shaft of drive shaft assembly (Z). Remove shaft assembly from actuating ball upper race (X). Be careful not to let four actuating balls (Y) drop when removing shaft assembly. Remove balls.



A—⅛-inch lubrication fitting 504208
B—5/16 x ⅞ hex-head lockwasher cap screw 76820–54120A7
C—Cylinder head assembly 76820–54397B1
D—Cylinder head gasket 7008455
E—5/16-inch hex nut 118624
F—Piston spring 7376084
G—No. 12 x ¾ fillister-head lockwasher screw 7954702
H—21/64 id, ¾ od, 1/32 thick flat washer 7008794
J—Adjusting screw cover 7767258
K—Metering screw cap 8680532
L—21/64 id, ½ od, 0.03000 thick flat washer 8680533
M—Metering screw 7971303
N—Stop screw washer 8357833
P—Stop screw 8357831
Q—⅛-inch slotted pipe plug 76820–50133–1
R—Shouldered washer 7744996
S—Oil distributing valve spring 7744190
T—Oil distributing valve 7421292
U—7/16-inch shaft diameter retaining ring 583033
V—0.6700-inch od snap ring 7745000
W—Ball bearing 7402489
X—Actuating ball upper race 7744999
Y—Actuating ball 104924
Z—Drive shaft assembly 76820–52517B
AA—Body assembly 76820–54495B
BB—Adjusting screw cover gasket 7744172
CC—Pressure regulating valve spring 76820–51045–91
DD—Automatic pressure regulating valve 8713742
EE—Speed adjusting screw 76820–51281–1
FF—Valve cap gasket 8713744
GG—5/16-inch lock washer 120214
HH—Oil regulating valve cap 76820–54185D
JJ—No. 10 x ⅝ fillister-head lockwasher screw 76820–54121A3
KK—Speed adjusting screw cap 7008443

*Figure 195. Governor assembly—8380695—exploded view.*

(*k*) Remove snap ring (V) from shaft of upper race. Remove ball bearing (W) from upper race.

(2) *Disassemble governor cylinder head assembly.*

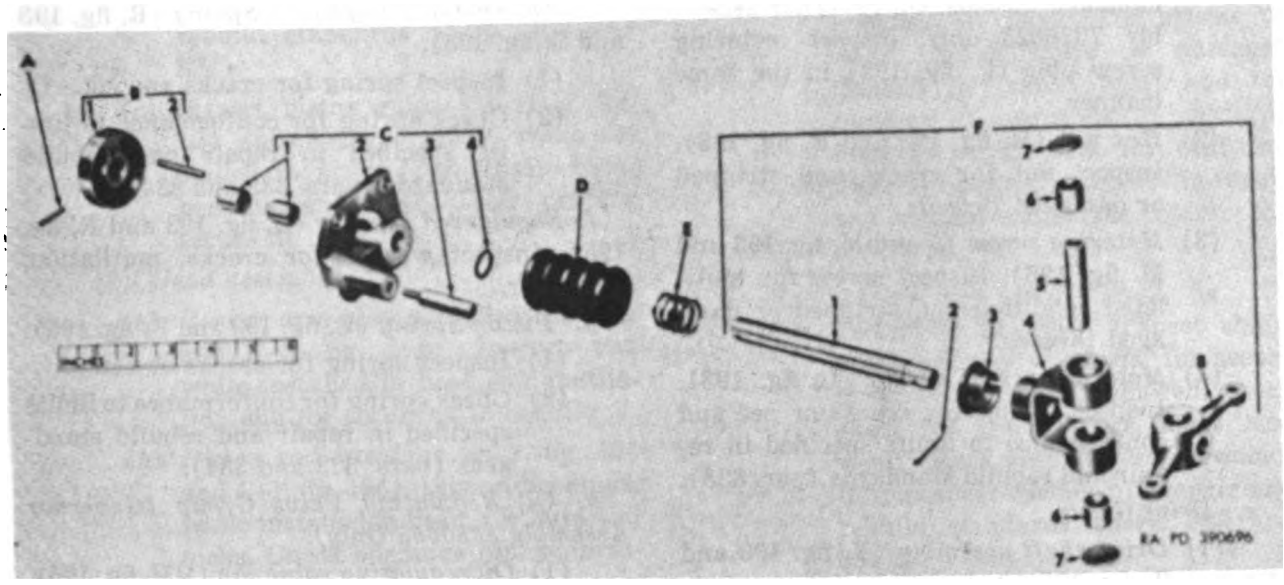
NOTE: The key letters shown below in parentheses refer to figure 196.

(*a*) Drive headless grooved pin (A) from piston rod (F–1) with a brass drift and remove piston (B–1), with attached piston guide pin (B–2), from piston rod. Do not remove guide pin from piston unless inspection (par. 301) indicates replacement is necessary. To remove pin, drive pin from piston with a brass drift.

(*b*) Remove rocker arm assembly (F), with attached piston rod spring (E) and piston rod seal (D), from head assembly (C).

(*c*) Remove and discard "O" ring packing (C–4) from head (C–2). Do not remove rocker arm stop pin (C–3) or piston rod bushings (C–1) from head unless inspection (par. 301) indicates replacement is necessary. To remove pin or bushings, drive pin or bushings out of head with a brass drift.

(*d*) Remove piston rod spring (E) and piston rod seal (D) from piston rod (F–1).



A—Headless grooved pin 76820–50591–5
B—Piston assembly 76820–54487B
  1—Piston 76820–54463B
  2—Piston guide pin 7954698
C—Head assembly 76820–54398B
  1—Piston rod bushing 76820–51209–20
  2—Head 76820–54597
  3—Rocker arm stop pin 7954696
  4—⅛-inch id "O" ring packing 76820–54399–1
D—Piston rod seal 7008453
E—Piston rod spring 76820–51045–62
F—Rocker arm assembly 76820–54502B
  1—Piston rod 76820–54585
  2—Cotter pin 76820–51154–7
  3—Piston rod lock nut 76820–54584
  4—Piston rod clevis 76820–54462B
  5—Rocker arm shaft 7744179
  6—Shaft bushing 8357827
  7—¾-inch expansion plug 501593
  8—Rocker arm 8357832

*Figure 196. Governor cylinder head assembly—76820-54397B1—exploded view.*

(*e*) Remove cotter pin (F–2) from piston rod lock nut (F–3), piston rod clevis (F–4), and piston rod. Remove piston rod and lock nut from clevis.

(*f*) Do not remove rocker arm (F–8) from clevis unless inspection (par. 301) indicates replacement is necessary. To remove rocker arm, pry out expansion plugs (F–7) from clevis and drive rocker arm shaft (F–5) from clevis with a brass drift. Remove rocker arm.

(*g*) Do not remove shaft bushings (F–6) from clevis unless inspection (par. 301) indicates replacement is necessary. To remove bushings, drive bushings from arms of clevis with a brass drift.

## 300. Cleaning

Clean all parts as described in paragraph 77.

## 301. Inspection

*a. Speed Adjusting Screw Group.*

(1) *Speed adjusting screw cap* (JJ, fig. 193 and KK, fig. 195). Inspect cap for cracked or mutilated condition and stripped or damaged threads.

(2) *Hex nut* (HH, fig. 193 and E, fig. 195). Inspect nut for cracks and stripped or damaged threads.

(3) *Speed adjusting screw* (FF, fig. 193 and EE, 195). Inspect screw for mutilated condition and stripped or damaged threads.

(4) *Adjusting screw cover* (CC, fig. 193 and J, fig. 195). Inspect cover for cracks, damaged sealing surfaces, and stripped or damaged threads.

*b. Metering Screw Group.*

(1) *Metering screw cap* (F, fig. 193 and K, fig. 195). Inspect cap for cracked or mutilated condition and stripped or

damaged threads. On governor assembly 7376023 only, inspect metering screw plug (P, fig. 193) in the same manner.

(2) *Hex nut* (H, fig. 193 and E, fig. 195). Inspect nut for cracks and stripped or damaged threads.

(3) *Metering screw* (J and M, fig. 193 and M. fig. 195). Inspect screw for mutilated condition and stripped or damaged threads.

(4) *Metering screw spring* (L, fig. 193). Inspect spring for cracks or set and conformance to limits specified in repair and rebuild standards (par. 333).

*c. Drive Group.*

(1) *Drive shaft assembly* (Y, fig. 193 and Z, fig. 195).

(*a*) Inspect shaft assembly for cracks, burs, nicks, and wear.

(*b*) Check shafts for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(2) *Actuating balls* (X, fig. 193 and Y, fig. 195).

(*a*) Inspect balls for burs, rough spots, and out-of-round condition.

(*b*) Check diameter of balls for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(3) *Ball bearing* (V, fig. 193 and W, fig. 195). Refer to TM 37–265 for inspection of ball bearing.

(4) *Actuating ball upper race* (W, fig. 193 and X, fig. 195).

(*a*) Inspect race for cracks, burs, nicks, and wear.

(*b*) Check race for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

*d. Oil Distributing Valve* (S, fig. 193 and T, fig. 195).

(1) Inspect valve for cracks, burs, nicks, and wear.

(2) Check outside diameter of valve for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

*e. Oil Distributing Valve Spring* (R, fig. 193 and S, fig. 195).

(1) Inspect spring for cracks and set.

(2) Check spring for conformance to limits specified in repair and rebuild standards (pars. 333 and 334).

*f. Shouldered Washer* (Q, fig. 193 and R, fig. 195). Inspect washer for cracks, mutilation, and wear.

*g. Piston Spring* (E, fig. 193 and F, fig. 195).

(1) Inspect spring for cracks or set.

(2) Check spring for conformance to limits specified in repair and rebuild standards (pars. 333 and 334).

*h. Oil Regulating Valve Group (Governor Assembly 8380695 Only).*

(1) *Oil regulating valve cap* (HH, fig. 195).

(*a*) Inspect cap for cracks or damaged sealing surfaces.

(*b*) Check cap for conformance to tolerances specified in repair and rebuild standards (par. 334).

(2) *Automatic pressure regulating valve* (DD, fig. 195).

(*a*) Inspect valve for cracks, burs, nicks, and wear.

(*b*) Check valve for conformance to tolerances specified in repair and rebuild standards (par. 334).

(3) *Pressure regulating valve spring* (CC, fig. 195).

(*a*) Inspect spring for cracks and set.

(*b*) Check spring for conformance to limits specified in repair and rebuild standards (par. 334).

*i. Body Assembly* (K, fig. 193 and AA, fig. 195). Inspect body assembly as described in paragraph 78*b*.

*j. Stop Screw* (Z, fig. 193 and P, fig. 195). Inspect screw for mutilation and stripped or damaged threads.

*k. Cylinder Head Assembly.*

(1) *Piston* (C–2, fig 194 and B–1, fig. 196).

(*a*) Inspect piston for cracks, burs, nicks, and wear.

(*b*) Check piston for conformance to tolerances specified in repair and

rebuild standards (pars. 333 and 334).

(c) Inspect piston guide pin (C–1, fig. 194 and B–2, fig. 196), while installed in piston, for cracks, burs, bending, and wear. Check pin for secure fit in piston.

(2) *Head assembly.*

(a) *Rocker arm stop pin* (B–1, fig. 194 and C–3, fig. 196). Inspect pin, while installed in head, for mutilation and for secure fit in head.

(b) *Piston rod bushings* (B–2, fig. 194 and C–1, fig. 196). Inspect bushings, while installed in head, for burs and nicks. Check bushings for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(c) *Head* (B–3, fig. 194 and C–2, fig. 196). Inspect head as described in paragraph 78*b*.

(d) *Packing glands* (B–5 and B–7, fig. 194). Inspect glands for cracks and mutilation.

(e) *Packing spring* (B–4, fig. 194). Inspect spring for cracks and set, and check spring for conformance to limits specified in repair and rebuild standards (par. 333).

(3) *Rocker arm assembly.*

(a) *Piston rod* (A–7, fig. 194 and F–1, fig. 196). Inspect piston rod for cracks, burs, nicks, and wear. Check rod for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(b) *Piston rod spring* (E, fig. 194 and E, fig. 196). Inspect spring for cracks and set. Check spring for conformance to limits specified in repair and rebuild standards (pars. 333 and 334).

(c) *Piston rod seal* (F, fig. 194 and D, fig. 196). Inspect seal for cracks, torn condition, deterioration, and loss of resilience.

(d) *Rocker arm* (A–1, fig. 194 and F–8, fig. 196). Inspect rocker arm, while installed in clevis, for cracks or wear; for stripped or damaged threads in tapped hole; and for freedom of movement on shaft. If removed, check arm for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(e) *Rocker arm shaft* (A–2, fig. 194 and F–5, fig. 196). Inspect shaft, while installed in clevis, for secure fit in bushings. If removed, check shaft for cracks, burs, nicks, and wear. Check shaft for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(f) *Shaft bushings* (A–4, fig. 194 and F–6, fig. 196). Inspect bushings, while installed in clevis, for secure fit in clevis. If shaft is removed, inspect inside diameter of bushings for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334). If bushings are removed, check outside diameter of bushings for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(g) *Piston rod clevis* (A–5, fig. 194 and F–4, fig. 196). Inspect clevis for cracks and mutilation. If arm, shaft, and bushings were removed, check clevis for conformance to tolerances specified in repair and rebuild standards (pars. 333 and 334). Also inspect piston rod clevis for stripped or damaged threads.

(h) *Piston rod lock nut* (F–3, fig. 196). Inspect nut for cracks and distortion, and stripped or damaged threads.

(i) *Headless grooved pins* (A–6 and D, fig. 194 and A, fig. 196). Inspect pin for cracks and mutilation.

*l. Lubrication Fitting* (A, fig. 193 and A, fig. 195). Inspect fitting for plugged lubrication passage and stripped or damaged threads.

## 302. Repair

NOTE: In repair of governors, refer to pertinent SNL for repair kits and spare parts provided for repairing governors.

*a. Speed Adjusting Screw Group.*

(1) *Adjusting screw cap* (JJ, fig. 193 and KK, fig. 195). Replace cap if cracked or mutilated or if threads are stripped or damaged.

(2) *Hex nut* (HH, fig. 193 and E, fig. 195). Replace nut if cracked or threads are stripped or damaged.

(3) *Speed adjusting screw* (FF, fig. 193 and EE, fig. 195). Replace screw if mutilated or threads are stripped or damaged.

(4) *Adjusting screw cover* (CC, fig. 193 and J, fig. 195). Replace cover if cracked, sealing surfaces are damaged, or threads are stripped or damaged.

*b. Metering Screw Group.*

(1) *Metering screw cap* (F, fig. 193 and K, fig. 195). Replace cap if cracked or mutilated or threads are stripped or damaged.

(2) *Hex nut* (H, fig. 193 and E, fig. 195). Replace nut if cracked or threads are stripped or damaged.

(3) *Metering screw* (J and M, fig. 193 and M, fig. 195). Replace screw if mutilated or threads are stripped or damaged.

(4) *Metering screw spring* (L, fig. 193) (governor assembly 7376023 only). Replace spring if cracked or set or spring does not conform to limits specified in repair and rebuild standards (par. 333).

*c. Drive Group.*

(1) *Drive shaft assembly* (Y, fig. 193 and Z, fig. 195).

(*a*) Replace shaft assembly if cracked, burred, nicked, or worn. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(*b*) Replace drive shaft assembly if shafts do not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(2) *Actuating balls* (X, fig. 193 and Y, fig. 195).

(*a*) Replace balls if they are burred, have rough spots, or are worn out of round.

(*b*) Replace balls if diameter does not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(3) *Ball bearing* (V, fig. 193 and W. fig. 195). Repair or replace ball bearing as described in paragraph 79*c*.

(4) *Actuating ball upper race* (W, fig. 193 and X, fig. 195).

(*a*) Replace race if burred, nicked, or worn. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(*b*) Replace race if it does not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

*d. Oil Distributing Valve* (S, fig. 193 and T, fig. 195).

(1) Replace valve if cracked, burred, nicked, or worn. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(2) Replace valve if outside diameter of valve does not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

*e. Oil Distributing Valve Spring* (R, fig. 193 and S, fig. 195).

(1) Replace spring if cracked or set.

(2) Replace spring if it does not conform to limits specified in repair and rebuild standards (pars. 333 and 334).

*f. Shouldered Washer* (Q, fig. 193 and R, fig. 195). Replace washer if cracked, mutilated, or worn.

*g. Piston Spring* (E, fig. 193 and F, fig. 195).

(1) Replace spring if cracked or set.

(2) Replace spring if it does not conform to limits specified in repair and rebuild standards (pars. 333 and 334).

*h. Oil Regulating Valve Group (Governor Assembly 8380695 Only).*

(1) *Oil regulating valve cap* (HH, fig. 195).

(*a*) Replace cap if cracked or sealing surface is damaged.

(*b*) Replace cap if it does not conform to tolerances specified in repair and rebuild standards (par. 334).

(2) *Automatic pressure regulating valve* (DD, fig. 195).

(*a*) Replace valve if cracked, burred, nicked, or worn. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(*b*) Replace valve if it does not conform to tolerances specified in repair and rebuild standards (par. 334).

(3) *Pressure regulating valve spring* (CC, fig. 195).

(*a*) Replace spring if cracked or set.

(*b*) Replace spring if it does not conform to limits specified in repair and rebuild standards (par. 334).

*i. Body Assembly* (K, fig. 193 and AA, fig. 195). Repair or replace body assembly as described in paragraph 79*b*.

*j. Stop Screw* (Z, fig. 193 and P, fig. 195). Replace screw if mutilated or threads are stripped or damaged.

*k. Cylinder Head Assembly.*

(1) *Piston* (C–2, fig. 194 and B–1, fig. 196).

(*a*) Replace piston if cracked, burred, nicked, or worn. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible.

(*b*) Replace piston if it does not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(*c*) Replace piston guide pin (C–1, fig. 194 and B–2, fig. 196) if pin is cracked, burred, bent, or worn. Replace pin if it does not fit securely in piston.

(2) *Head Assembly.*

(*a*) *Rocker arm stop pin* (B–1, fig. 194 and C–3, fig. 196). Replace pin if mutilated or pin does not fit securely in head.

(*b*) *Piston rod bushings* (B–2, fig. 194 and C–1, fig. 196). Replace bushings if burred or nicked. Replace bushings if they do not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(*c*) *Head* (B–3, fig. 194 and C–2, fig. 196). Repair or replace head as described in paragraph 79*b*.

(*d*) *Packing glands* (B–5 and B–7, fig. 194). Replace glands if cracked or mutilated.

(*e*) *Packing spring* (B–4, fig. 194). Replace spring if cracked or set. Replace spring if it does not conform to limits specified in repair and rebuild standards (par. 333).

(3) *Rocker Arm Assembly.*

(*a*) *Piston rod* (A–7, fig. 194 and F–1, fig. 196). Replace piston rod if cracked, burred, nicked, or worn. Remove burs and nicks with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible. Replace rod if it does not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(*b*) *Piston rod spring* (E, fig. 194 and E, fig. 196). Replace spring if cracked or set. Replace spring if it does not conform to limits specified in repair and rebuild standards (pars. 333 and 334).

(*c*) *Piston rod seal* (F, fig. 194 and D, fig. 196). Replace seal if cracked, torn, deteriorated, or has lost its resilience.

(*d*) *Rocker arm* (A–1, fig. 194 and F–8, fig. 196). Replace rocker arm if cracked or worn. Replace rocker arm if threads in tapped hole are stripped or damaged. Repair threads in tapped hole with a used tap, if possible. Replace rocker arm if it does not move freely on shaft. Replace rocker arm if it does not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(*e*) *Rocker arm shaft* (A–2, fig. 194 and F–5, fig. 196). Replace shaft if it does not fit securely in bushings. Replace shaft if cracked, burred, nicked, or worn. Remove burs and nicks from shaft with crocus cloth dipped in dry-cleaning solvent or mineral spirits paint thinner, if possible. Replace shaft if it does not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(*f*) *Shaft bushings* (A–4, fig. 194 and F–6, fig. 196). Replace bushings if they do not fit securely in clevis. Replace bushings if inside or outside diameters do not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334).

(*g*) *Piston rod clevis* (A–5, fig. 194 and F–4, fig. 196). Replace clevis if cracked or mutilated. Replace clevis if it does not conform to tolerances specified in repair and rebuild standards (pars. 333 and 334). Also replace piston rod clevis (F–4, fig. 196) if threads are stripped or damaged.

(*h*) *Piston rod lock nut* (F–3, fig. 196). Replace lock nut if cracked or distorted or if threads are stripped or damaged.

(*i*) *Headless grooved pins* (A–6 and D, fig. 194 and A, fig. 196). Replace pins if cracked or mutilated.

*l. Lubrication Fitting* (A, fig. 193 and A, fig. 195). Replace fitting if lubrication passage is plugged. Clean passage with wire, if possible. Replace fitting if threads are stripped or damaged.

## 303. Assembly

*a. Governor Assemblies 7376023, 7410402, and 7954764.*

(1) *Assemble governor cylinder head assembly.*

NOTE: The key letters shown below in parentheses refer to figure 194.

(*a*) If shaft bushings (A–4) were removed from piston rod clevis (A–5), aline bushings in bores in arms of clevis and press into clevis using a suitable press.

(*b*) If rocker arm (A–1) was removed from clevis, position arm between arms of clevis and position rocker arm shaft (A–2) so that hole in shaft is alined with lubrication hole in rocker arm. Press shaft through bushings and arm with a suitable press. Install two ¾-inch expansion plugs (A–3) in arms of clevis to seal ends of shaft. Check movement of arm. Arm must move freely on shaft.

(*c*) If piston rod (A–7) was removed from clevis, install rod in clevis and secure by pressing 5/32 x 7/8 headless grooved pin (A–6) through holes in clevis and rod with a suitable press.

(*d*) Install piston rod seal (F) and piston rod spring (E) on piston rod.

(*e*) If bearing (B–2 was removed from head (B–3), press bearing into bore of head with a suitable press.

(*f*) If rocker arm stop pin (B–1) was removed from head, press pin into bore of head with a suitable press.

(*g*) Install rocker arm assembly, with attached seal and spring, by inserting piston rod through bearing in head. Check piston rod movement in bearing. Rod must move freely. Install packing spring (B–4) on piston rod and into bore of head.

(*h*) Install packing upper gland (B–5) on rod and seat gland against spring. Install three new piston rod packings (B–6) and packing lower gland (B–7) on rod and secure with packing gland retaining ring (B–8).

(*i*) If piston guide pin (C–1) was removed from piston (C–2), press pin into small hole in piston with a suitable press.

(*j*) Install piston on piston rod and secure by pressing 5/32 x 1 headless grooved pin (D) through hole in piston and in rod.

(2) *Assemble governor.*

NOTE: The key letters shown below in parentheses refer to figure 193.

(*a*) Install piston spring (E) in large bore of body assembly (K).

(*b*) Position new cylinder head gasket (D) on body assembly and install cylinder head assembly (B) over gasket. Rocker arm stop pin of head assembly must be located directly opposite governor name plate.

(*c*) Secure head assembly to body assembly with four 5/16 x 3/4 hex-head lockwasher cap screws (C) and secure screws with locking wire. Install 1/8-inch lubrication fitting (A) in tapped hole in rocker arm.

(*d*) On governor assemblies 7410402 and 7954764 only, install metering screw (J) in body assembly. Install screw to fullest limit of travel, then turn screw out one complete revolution. Lock screw in this position with 5/16-inch hex nut (H) and 0.3300 id, 0.5000 od, 0.0300 thick flat washer (G).

NOTE: Final adjustment of metering screw is accomplished when governor is adjusted (par. 291).

(*e*) Install metering screw cap (F) and 0.3300 id, 0.5000 od, 0.0300 thick flat washer (G) on metering screw installed in (*d*) above.

(*f*) On governor assembly 7376023 only, install metering screw spring (L) in well in side of body. Install metering screw (M) through spring in body assembly. Install screw to fullest limit of travel, then turn screw out one complete revolution.

NOTE: Final adjustment of metering screw is accomplished when governor is adjusted (par. 291).

(*g*) Install metering screw plug (P) and washer (N) in well over screw installed in (*f*) above.

(*h*) Position oil distributing valve (S) in bore in underside of body assembly. Install stop screw (Z) and stop screw washer (AA) in tapped hole in side of body assembly to hold oil distributing valve in place.

(*i*) Position oil distributing valve spring (R) in bore of oil distributing valve from top of body assembly. Install shouldered washer (Q) on top of spring, with projection of washer entering bore of spring.

(*j*) Position speed adjusting screw (FF) in bore of adjusting screw cover (CC) and position a new adjusting screw cover gasket (BB) on body assembly. Install cover with attached screw, over gasket and secure with two No. 12 x 3/4 fillister-head lockwasher screws (EE). Turn speed adjusting screw into cover until approximately 11 threads remain above cover.

(*k*) Lock speed adjusting screw in position with 5/16-inch hex nut (HH), 21/64 id, 3/4 od, 1/32 thick flat washer (DD), and 5/16-inch lock washer (GG).

NOTE: Final adjustment of speed adjusting screw is accomplished when governor is adjusted (par. 291).

(*l*) Install speed adjusting screw cap (JJ) on speed adjusting screw over hex nut.

(*m*) Install ball bearing (V) on shaft of actuating ball upper race (W) and secure with 0.6700-inch od snap ring (U).

(*n*) Position four actuating balls (X) in slots of drive shaft assembly (Y). Install actuating ball upper race, with attached ball bearing, on drive shaft assembly over actuating balls and secure with 7/16-inch shaft diameter retaining ring (T).

(*o*) Aline shaft of drive shaft assembly with bore of oil distributing valve and install drive group on underside of governor, with distributing valve seating on ball bearing (V).

(3) *Test and adjust governor.* Refer to paragraph 291 for tests and adjustments of the governor.

*b. Governor Assembly 8380695.*

(1) *Assemble governor cylinder head assembly.*

NOTE: The key letters shown below in parentheses refer to figure 196.

(*a*) If shaft bushings (F–6) were removed from piston rod clevis (F–4), aline bushings in bores in arms of

clevis and press into clevis, using a suitable press.

(*b*) If rocker arm (F–8) was removed from clevis, position arm between arms of clevis and position rocker arm shaft (F–5) so that hole in shaft is alined with lubrication hole in rocker arm. Press shaft through bushings and arm with a suitable press. Install two ¾-inch expansion plugs (F–7) in arms of clevis to seal ends of shaft. Check movement of arm. Arm must move freely on shaft.

(*c*) Install piston rod lock nut (F–3) on clevis to fullest limit of its travel, turn lock nut off three complete revolutions, and aline slots in lock nut with hole in clevis.

(*d*) Install small end of piston rod (F–1) into bore of lock nut and clevis and secure with cotter pin (F–2).

(*e*) Install piston rod seal (D) and piston rod spring (E) on piston rod.

(*f*) If two piston rod bushings (C–1) were removed from head (C–2) press bushings into bore of head with a suitable press.

(*g*) If rocker arm stop pin (C–3) was removed from head, press pin into head with a suitable press.

(*h*) Position a new ½-inch id "O" ring packing (C–4) in bore in top of head against piston rod bushings.

(*i*) Install rocker arm assembly, with attached seal and spring, by inserting piston rod through bushings in head. Check movement of piston rod. Rod must move freely in bushing.

(*j*) If piston guide pin (B–2) was removed from piston (B–1), press pin into small hole in piston with a suitable press.

(*k*) Install piston on piston rod and secure by pressing headless grooved pin (A) through hole in piston and in rod.

(2) *Assemble governor.*

NOTE: The key letters shown below in parentheses refer to figure 195.

(*a*) Install ⅛-inch slotted pipe plug (Q) in tapped hole in side of body assembly (AA).

(*b*) Install piston spring (F) in large bore of body assembly.

(*c*) Position a new cylinder head gasket (D) on body assembly and install cylinder head assembly (C) over gasket. Rocker arm stop pin of head assembly must be located directly opposite governor name plate.

(*d*) Secure head assembly to body assembly with four 5/16 x ⅞ hex-head lockwasher cap screws (B) and secure screws with locking wire. Install ⅛-inch lubrication fitting (A) in tapped hole in rocker arm.

(*e*) Install metering screw (M) in body assembly. Install screw to fullest limit of travel, then turn screw out one complete revolution. Lock screw in this position with 5/16-inch hex nut (E) and 21/64 id, ½ od, 0.3000 thick flat washer (L).

NOTE: Final adjustment of metering screw is accomplished when governor is adjusted (par. 291).

(*f*) Install metering screw cap (K) and 21/64 id, ½ od, 0.3000 thick flat washer (L) on metering screw.

(*g*) Position oil distributing valve (T) in bore in underside of body assembly. Install stop screw (P) and stop screw washer (N) in tapped hole side of body assembly to hold distributing valve in place.

(*h*) Position oil distributing valve spring (S) in bore of oil distributing valve from top of body assembly. Install shouldered washer (R) on top of spring, with projection of washer entering bore of spring.

(*i*) Position speed adjusting screw (EE) in bore of adjusting screw cover (J) and position a new adjusting screw cover gasket (BB) on body assembly. Install cover, with attached screw, over gasket and secure with two No. 12 x ¾ fillister-head lockwasher screws (G). Turn speed adjusting screw into

cover until approximately 11 threads show above cover.

(*j*) Lock speed adjusting screw in position with 5/16-inch hex nut (E), 21/64 id, 3/4 od, 1/32 thick flat washer (H) and 5/16-inch lockwasher (GG).

NOTE: Final adjustment of speed adjusting screw is accomplished when governor is adjusted (par. 291).

(*k*) Install speed adjusting screw cap (KK) on speed adjusting screw over hex nut.

(*l*) Install pressure regulating valve spring (CC) in well in body assembly, with end of spring in seat in bottom of bore.

(*m*) Install automatic pressure regulating valve (DD) in bore over spring, with spring entering bore of valve.

(*n*) Position a new valve cap gasket (FF) on body assembly, install oil pressure regulating valve cap (HH) over gasket, and secure with four No. 10 x 5/8 fillister-head lockwasher screws (JJ). Secure screws with locking wire.

(*o*) Install ball bearing (W) on shaft of actuating ball upper race (X) and secure with 0.6700-inch od snap ring (V) in groove in shaft.

(*p*) Position four actuating balls (Y) in slots of drive shaft assembly (Z). Install actuating ball upper race, with attached ball bearing, on drive shaft assembly over actuating balls and secure with 7/16-inch shaft diameter retaining ring (U).

(*q*) Aline shaft of drive shaft assembly with bore of oil distributing valve and install drive group on underside of governor, with oil distributing valve seating on ball bearing (W).

(3) *Test and adjust governor.* Refer to paragraph 291 for tests and adjustments of governor.

# CHAPTER 10
# REPAIR AND REBUILD STANDARDS

## 304. General

The repair and rebuild standards contained herein give the minimum, maximum, and key clearances of new or rebuilt parts. They also give wear limits which indicate that point to which a part or parts may be worn before replacement, in order to receive maximum service with minimum replacement. Normally, all parts which have not been worn beyond the dimension shown in the "Wear limits" columns or damaged from corrosion will be approved for service. An asterisk (*) in the "Wear limits" column indicates that the part or parts should be replaced when worn beyond the limits given in the "Sizes and fits of new parts" column. In the "Sizes and fits of new parts" column, the letter "L" indicates a loose fit (clearance) and the letter "T" indicates a tight fit (interference).

## 305. Crankcase and Main Bearings (par. 84)

*a. Cylinder Pad Bore.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 197 | A | Inside diameter of cylinder pad bore in crankcase | 6.1290 to 6.1340 | * | * |
| 197 | G | Outside diameter of cylinder barrel skirt | 6.1120 to 6.1160 | * | * |
| | G—A | Fit of cylinder barrel skirt in crankcase | 0.0130L to 0.0220L | | |

*b. Main Bearings.*

| | | | | | |
|---|---|---|---|---|---|
| 197 | F | Inside diameter of main bearing bores in crankcase | 3.8140 to 3.8145 | * | * |
| 197 | C | Main thrust bearing thickness (at center of bearing) | 0.1562 to 0.1567 | 0.1542 | 0.1557 |
| 197 | E | Outside width of main thrust bearing web in crankcase | 1.7450 to 1.7470 | * | * |
| 197 | D | Width inside main thrust bearing flanges | 1.7490 to 1.7510 | * | * |
| 197 | D—E | Fit of main thrust bearing over crankcase web | 0.0020L to 0.0060L | * | * |
| 198 | M | Outside diameter of main bearing journals on crankshaft | 3.4970 to 3.4980 | 3.4950 | 3.4965 |
| 197 | B | Inside diameter of main bearings (at proper torque tightness) | 3.5015 to 3.5040 | 3.5060 | 3.5045 |
| | B—M | Fit (oil clearance) of crankshaft journals in main bearings | 0.0035L to 0.0070L | 0.0090L | 0.0075L |

*c. Fan Drive Vertical Shaft Bearing Housing and Bore.*

| | | | | | |
|---|---|---|---|---|---|
| 199 | B | Inside diameter of vertical drive shaft bearing housing bore in crankcase | 4.7500 to 4.7510 | * | * |
| 208 | Q | Outside diameter of vertical drive shaft bearing housing | 4.7480 to 4.7490 | * | * |
| | Q—B | Fit of vertical drive shaft bearing housing in crankcase | 0.0010L to 0.0030L | * | * |

*d. Fan Drive Vertical Shaft Bearing.*

| | | | | | |
|---|---|---|---|---|---|
| 199 | G | Inside diameter of vertical drive shaft bearing bore in crankcase | 1.2500 to 1.2510 | * | * |
| 199 | F | Outside diameter of vertical drive shaft bearing | 1.2488 to 1.2493 | * | * |
| | F—G | Fit of vertical drive shaft bearing in crankcase | 0.0007L to 0.0022L | * | * |
| 199 | H | Inside diameter of vertical drive shaft bearing dowel pin bore in crankcase | 0.1835 to 0.1845 | * | * |
| 199 | E | Outside diameter of vertical drive shaft bearing dowel pin | 0.1850 to 0.1870 | * | * |
| | E—H | Fit of dowel pin in crankcase bore | 0.0005T to 0.0035T | * | * |

*e. Fan Drive Vertical Shaft Drive Gear Bearing.*

| | | | | | |
|---|---|---|---|---|---|
| 199 | D | Inside diameter of drive gear bearing bore in crankcase | 1.6880 to 1.6890 | * | * |
| 199 | C | Outside diameter of drive gear bearing | 1.6875 to 1.6880 | * | * |
| | C—D | Fit of drive gear bearing in crankcase | 0.0000 to 0.0015L | * | * |

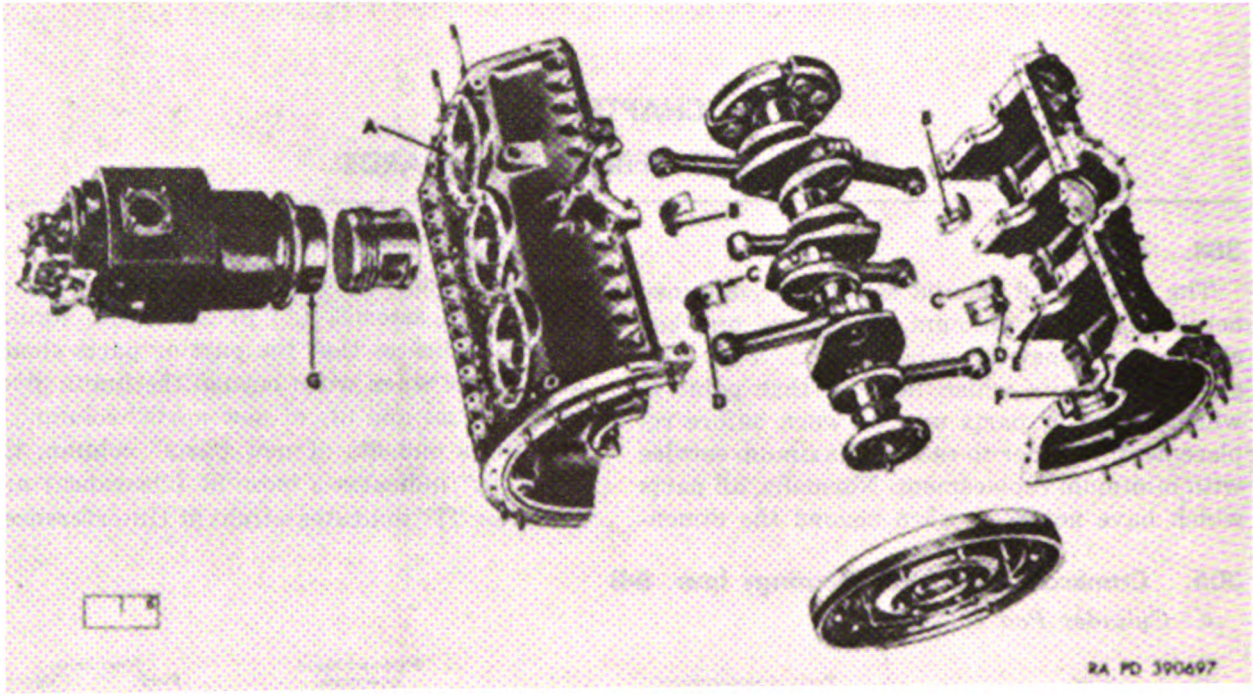



*Figure 197. Repair and rebuild standard points of measurement for crankcase and main bearings.*

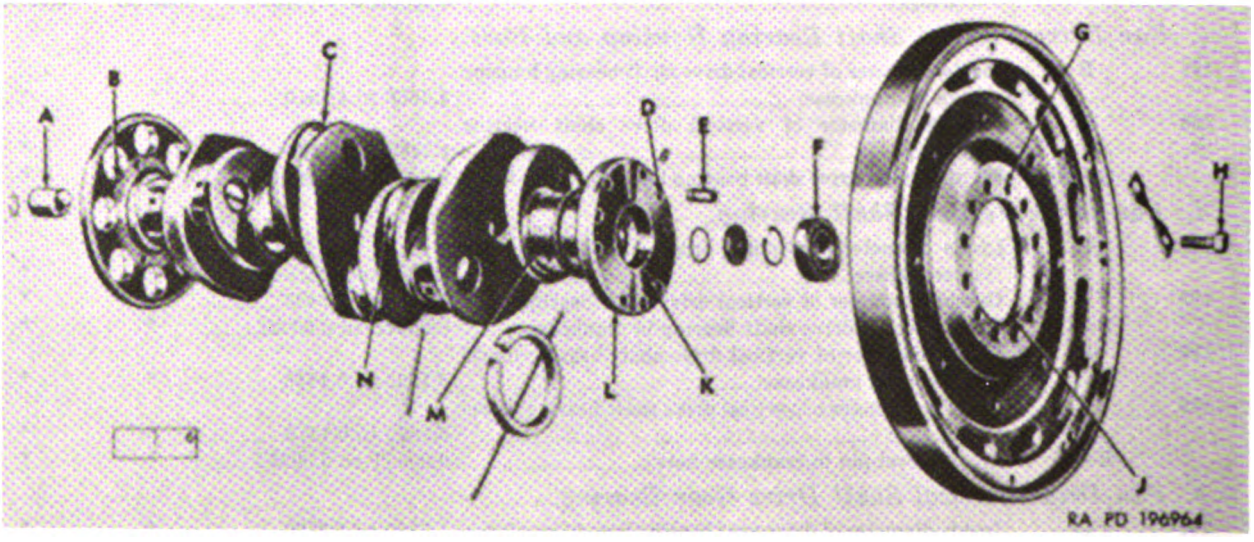



*Figure 198. Repair and rebuild standard points of measurement for crankshaft and flywheel.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| **306.** | | **Crankshaft, Connecting Rods, and Flywheel Group (par. 89)** | | | |
| *a.* | | *Crankshaft.* | | | |
| | | Crankshaft to be in dynamic balance within 0.2500 oz-in. at 2,800 rpm | | * | * |
| 198 | B | Inside diameter of oil slinger bore in crankshaft | 1.5690 to 1.5710 | * | * |
| 198 | A | Outside diameter of crankshaft oil slinger | 1.5710 to 1.5720 | * | * |
| | A—B | Fit of oil slinger in crankshaft | 0.000 to 0.0030T | * | * |
| 198 | K | Inside diameter of transmission drive shaft pilot ball bearing bore in crankshaft | 2.8338 to 2.8346 | 2.8350 | 2.8347 |
| 198 | F | Outside diameter of transmission drive shaft pilot ball bearing | 2.8340 to 2.8346 | 2.8336 | 2.8339 |
| | F—K | Fit of bearing in crankshaft | 0.0006L to 0.0008T | 0.0010L | 0.0007L |
| 198 | D | Inside diameter of dowel pin bore in crankshaft | 0.6245 to 0.6255 | * | * |
| 198 | E | Outside diameter of dowel pin | 0.6255 to 0.6257 | * | * |
| | E—D | Fit of dowel pin in crankshaft | 0.0000 to 0.0012T | * | * |
| 198 | L | Outside diameter of crankshaft flywheel mounting flange | 6.9985 to 6.9995 | * | * |
| 198 | J | Inside diameter of crankshaft pilot bore in flywheel | 7.0000 to 7.0010 | * | * |
| | J—L | Fit of flywheel on crankshaft | 0.0005L to 0.0025L | * | * |
| 198 | M | Outside diameter of main bearing journals | 3.4970 to 3.4980 | 3.4950 | 3.4965 |
| 198 | B | Inside diameter of main bearings at proper torque tightness | 3.5015 to 3.5040 | 3.5060 | 3.5045 |
| | B—M | Fit (oil clearance) of bearings on journals | 0.0035L to 0.0070L | 0.0090L | 0.0075L |
| 198 | M | Taper in length of one main bearing journal (taper must be uniform) | 0.0005 | 0.0010 | 0.0007 |
| | | Maximum out-of-round of main bearing journals | 0.0010 | 0.0020 | 0.0010 |
| | | Maximum run out by Nos. 2 and 3 main journals when supported at Nos. 1 and 4 journals (full indicator reading) | 0.0050 | 0.0100 | 0.0070 |
| 198 | C | Outside diameter of connecting rod journal | 3.2480 to 3.2490 | 3.2460 | 3.2475 |
| 200 | N | Inside diameter of connecting rod bearings at proper torque tightness | 3.2530 to 3.2552 | 3.2572 | 3.2557 |
| | C—N | Fit (oil clearance) of connecting rod journal in bearing | 0.0040L to 0.0072L | 0.0092L | 0.0067L |
| 198 | C | Inside width of connecting rod journal | 1.5770 to 1.5810 | 1.5840 | 1.5815 |
| 200 | P | Outside width of connecting rod at crankshaft end | 1.5670 to 1.5690 | 1.5640 | 1.5665 |
| | C—P | Fit (side clearance) of connecting rod on crankshaft | 0.0080L to 0.0140L | 0.0170L | 0.0145L |
| 198 | C | Maximum out-of-round of connecting rod journal | 0.0010 | 0.0020 | 0.0010 |
| | | Taper in length of one connecting rod journal (taper must be uniform) | 0.0005 | 0.0010 | 0.0005 |
| *b.* | | *Main Bearings.* | | | |
| 197 | C | Outside width of main thrust bearing | 1.9860 to 1.9900 | 1.9810 | 1.9850 |
| 198 | N | Inside width of main thrust bearing journal | 1.9990 to 2.0010 | 2.0060 | 2.0020 |
| | C—N | Crankshaft end play | 0.0090 to 0.0150 | 0.0190 | 0.0170 |
| 197 | B | Inside diameter of main bearings (at proper torque tightness) | 3.5015 to 3.5040 | 3.5060 | 3.5045 |
| 198 | M | Outside diameter of main bearing journals | 3.4970 to 3.4980 | 3.4950 | 3.4965 |
| | B—M | Fit (oil clearance) of bearings on journals | 0.0035L to 0.0070L | 0.0090L | 0.0075L |
| 197 | C | Main thrust bearing thickness (at center of bearing) | 0.1562 to 0.1567 | 0.1542 | 0.1557 |
| *c.* | | *Connecting Rods.* | | | |
| 200 | K | Inside diameter of piston pin bushing-type bearing bore in connecting rod | 1.5340 to 1.5350 | * | * |
| 200 | S | Outside diameter of piston pin bushing-type bearing | 1.5370 to 1.5375 | * | * |
| | S—K | Fit of bushing-type bearing in connecting rod | 0.0020T to 0.0035T | * | * |
| 200 | R | Inside diameter of piston pin bushing bore | 1.3762 to 1.3764 | 1.3770 | 1.3765 |
| | U | Outside diameter of piston pin | 1.3750 to 1.3752 | 1.3745 | 1.3749 |
| | U—R | Fit of piston pin in bushing-type bearing | 0.0010L to 0.0014L | 0.0020L | 0.0015L |
| 200 | L | Inside diameter of bolt hole in connecting rod and cap | 0.5620 to 0.5630 | * | * |
| 200 | Q | Outside diameter of connecting rod bolt | 0.5613 to 0.5618 | * | * |
| | Q—L | Fit of bolt in connecting rod and cap | 0.0002L to 0.0017L | * | * |

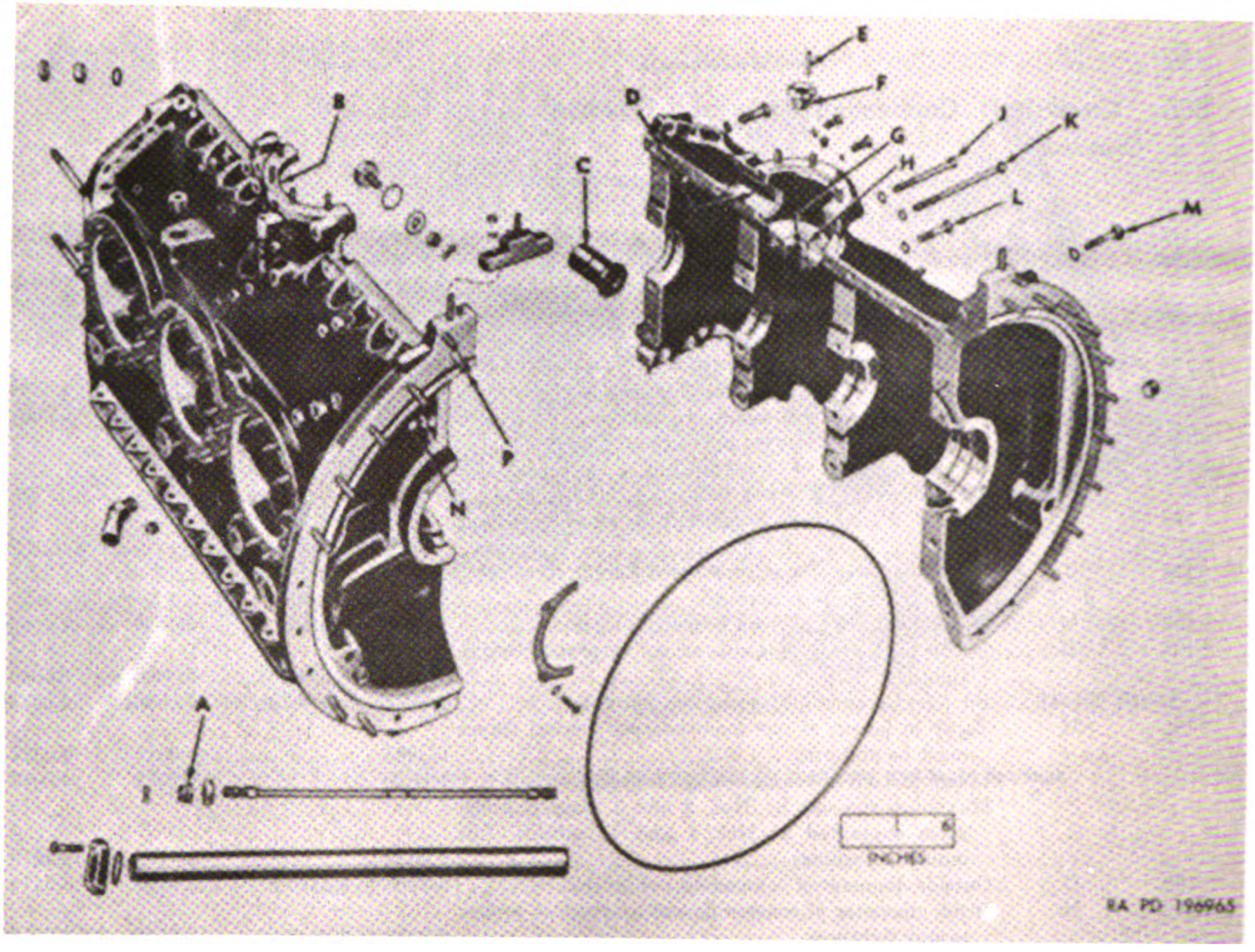



*Figure 199. Repair and rebuild standard points of measurement for crankcase and fan drive shaft bearings.*

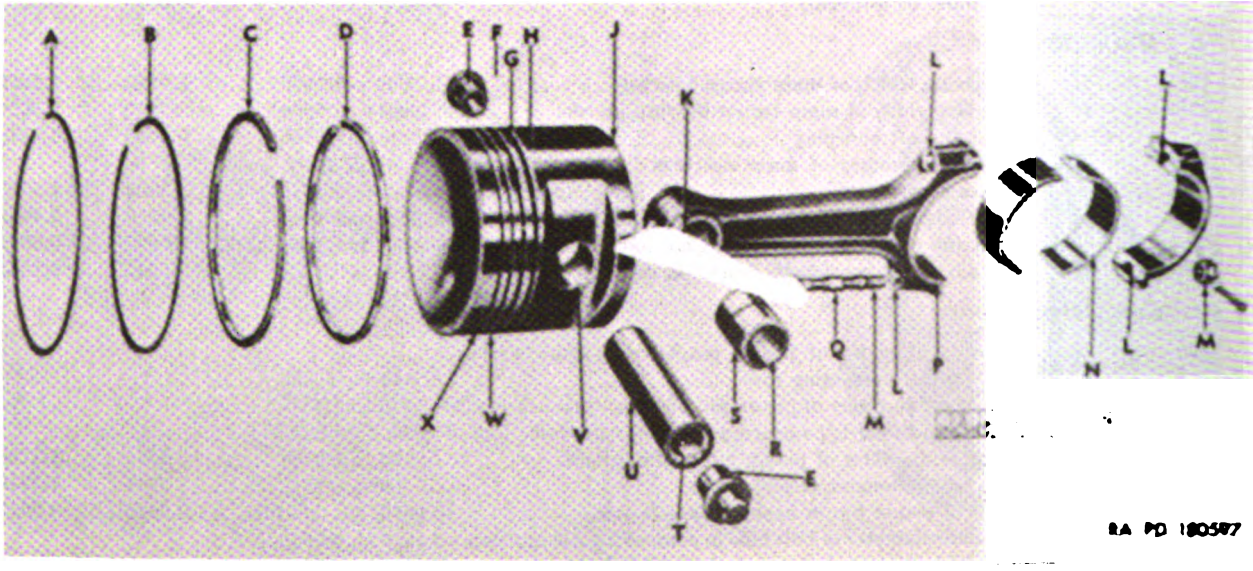



*Figure 200. Repair and rebuild standard points of measurement for connecting rods and pistons.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| 200 | P | Inside diameter of bore in crankshaft end of connecting rod | 3.5315 to 3.5320 | * | * |
| 200 | N | Inside diameter of connecting rod bearing (at proper torque tightness) | 3.2530 to 3.2552 | 3.2572 | 3.2557 |
| | | Connecting rod bearing thickness (at ends of bearing) | 0.1389 to 0.1392 | 0.1379 | 0.1387 |
| | | Connecting rod bearing thickness (at bearing center) | 0.1394 to 0.1389 | 0.1384 | 0.1392 |
| 198 | C | Outside diameter of crankshaft connecting rod journals | 3.2480 to 3.2490 | 3.2460 | 3.2475 |
| | C—N | Fit (oil clearance) of connecting rod journals in connecting rod bearings | 0.0040L to 0.0072L | 0.0092L | 0.0067L |
| 200 | P | Outside width of connecting rod at crankshaft end | 1.5670 to 1.5690 | 1.5640 | 1.5665 |
| 198 | C | Inside width of crankshaft connecting rod journals | 1.5770 to 1.5810 | 1.5840 | 1.5815 |
| | P—C | Fit (side clearance) of connecting rods on crankshaft | 0.0080L to 0.0140L | 0.0170L | 0.0145L |
| | | Allowable twist of connecting rod | 0.0005 per inch of bearing length. | * | * |
| *d. Crankshaft Vibration Damper.* | | | | | |
| 201 | F | Inside diameter of damper hub bores | 1.8125 to 1.8140 | 1.8160 | 1.8145 |
| 201 | C | Outside diameter of counterweight pins | 1.3647 to 1.3657 | 1.3630 | 1.3642 |
| | C—F | Fit of counterweight pins in damper hub | 0.4468L to 0.4493L | 0.4513L | 0.4498L |
| 201 | D | Inside diameter of counterweight bores | 1.8125 to 1.8140 | 1.8160 | 1.8145 |
| | C—D | Fit of counterweight pin in counterweight | 0.4468L to 0.4493L | 0.4513L | 0.4498L |
| 201 | L | Outside diameter of counterweight pin bushing | 1.6994 to 1.7004 | 1.6980 | 1.6989 |
| | D—L | Fit of bushing in counterweight | 0.1121L to 0.1146L | 0.1160L | 0.1126L |
| | F—L | Fit of bushing in damper hub | 0.1121L to 0.1146L | 0.1160L | 0.1126L |
| 201 | A | Inside diameter of counterweight stop | 3.6875 to 3.6900 | * | * |
| 201 | G | Outside diameter of damper hub flange | 3.6855 to 3.6870 | * | * |
| | A—G | Fit of stop on hub | 0.0005L to 0.0045L | * | * |
| 201 | K | Inside width of counterweight | 0.7570 to 0.7630 | 0.7690 | 0.7640 |
| 201 | H | Outside width of damper hub | 0.7490 to 0.7510 | 0.7430 | 0.7480 |
| | K—H | Fit of counterweight over damper hub | 0.0060L to 0.0140L | 0.0200L | 0.0150L |
| 201 | E | Outside width of counterweight | 1.6530 to 1.6630 | * | * |
| 201 | B | Inside width of counterweight pin | 1.6750 to 1.6800 | * | * |
| | E—B | Fit (end play) of pin in counterweight | 0.0120L to 0.0270L | * | * |
| 201 | J | Outside diameter of counterweight male pin | 0.8730 to 0.8740 | * | * |
| 201 | N | Inside diameter of counterweight bushing | 0.8745 to 0.8755 | * | * |
| | J—N | Fit of male pin in bushing | 0.0005L to 0.0025L | * | * |
| 201 | P | Outside diameter of counterweight female pin | 0.8730 to 0.8740 | * | * |
| | P—N | Fit of female pin in bushing | 0.0005L to 0.0025L | * | * |
| *e. Flywheel and Transmission Drive Hub Assembly (Model AOSI–895–5 Engine Only).* | | | | | |
| 198 | E | Outside diameter of dowel pin | 0.6255 to 0.6257 | * | * |
| 198 | D | Inside diameter of dowel pin bore in crankshaft | 0.6245 to 0.6255 | * | * |
| | E—D | Fit of dowel pin in crankshaft bore | 0.0000 to 0.0012T | * | * |
| 198 | G | Inside diameter of dowel pin bore in flywheel and transmission drive hub assembly | 0.6245 to 0.6255 | * | * |
| | E—G | Fit of dowel pin in flywheel and drive hub assembly bores | 0.0000 to 0.0012T | * | * |
| 198 | J | Inside diameter of crankshaft flange bore in flywheel | 7.0000 to 7.0010 | * | * |
| 198 | L | Outside diameter of crankshaft flywheel mounting flange | 6.9985 to 6.9995 | * | * |
| | J—L | Fit of flywheel on crankshaft flange | 0.0005L to 0.0025L | * | * |
| *f. Flywheel and Torsion Damper Assembly (Model AOSI–895–5M Engine Only).* | | | | | |
| NOTE: Refer to *e* above for flywheel to crankshaft standards. | | | | | |
| (1) *Flywheel and flywheel cover plate.* | | | | | |
| 202 | J | Inside diameter of cover plate dowel pin bore in flywheel | 0.4365 to 0.4375 | * | * |
| 202 | E | Outside diameter of cover plate dowel pin | 0.4376 to 0.4378 | * | * |
| | E—J | Fit of dowel pin in flywheel | 0.0001T to 0.0013T | * | * |
| 202 | G | Inside diameter of friction disk dowel pin bore in flywheel | 0.4995 to 0.5005 | * | * |

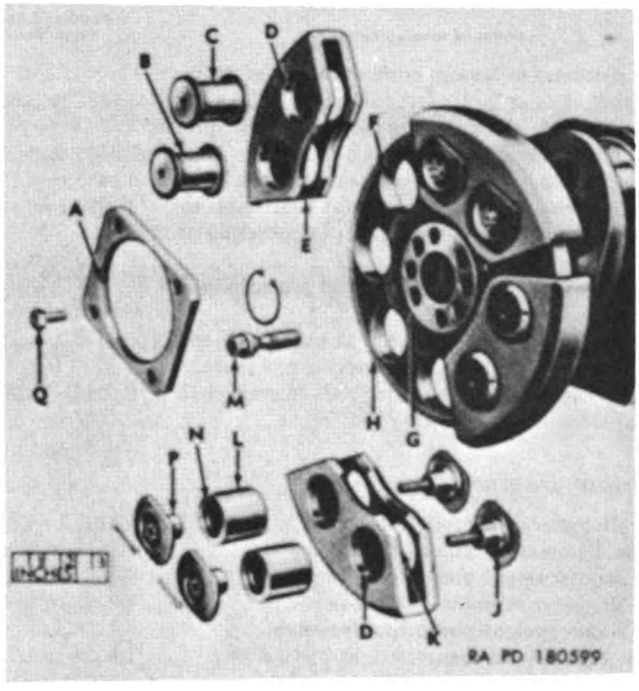



*Figure 201. Repair and rebuild standard points of measurement for crankshaft and vibration damper.*

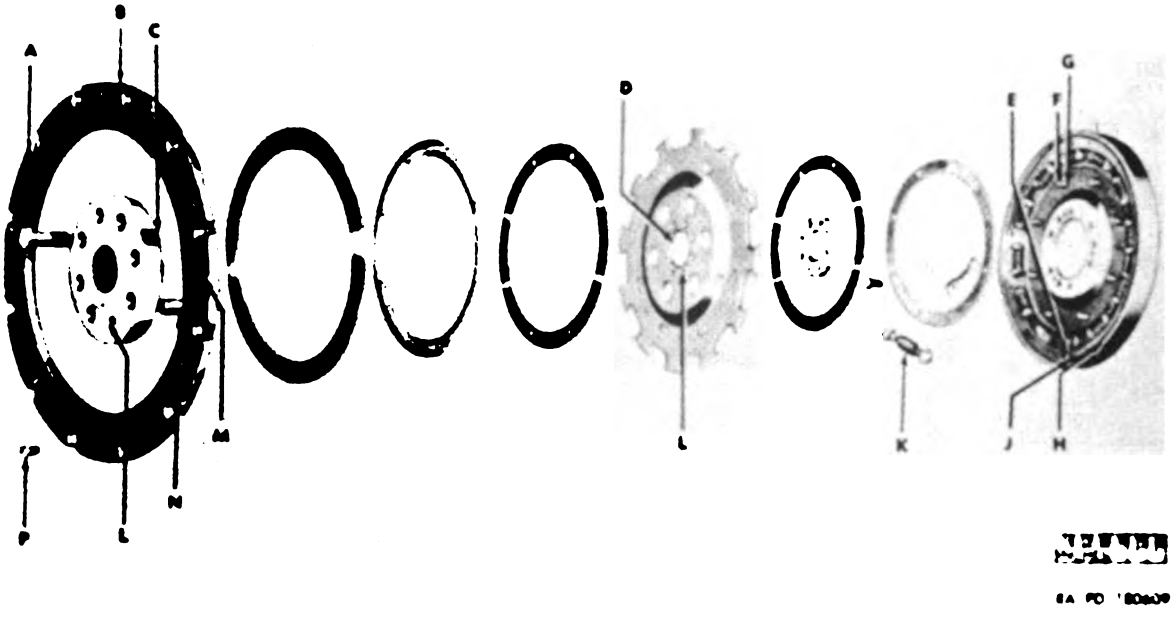



*Figure 202. Repair and rebuild standard points of measurement for flywheel and torsion damper assembly (model AOSI-895-5M engine only).*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 202 | F | Outside diameter of friction disk dowel pin | 0.5009 to 0.5011 | * | * |
| | F—G | Fit of dowel pin in flywheel | 0.0004T to 0.0016T | * | * |
| 202 | M | Inside diameter of dowel pin bore in cover plate | 0.4380 to 0.4390 | * | * |
| 202 | E | Outside diameter of cover plate dowel pin | 0.4376 to 0.4378 | * | * |
| | E—M | Fit of dowel pin in cover plate bore | 0.0002L to 0.0014L | * | * |
| 202 | B | Outside diameter of cover plate | 18.1220 to 18.1240 | * | * |
| 202 | H | Inside diameter of cover plate flange in flywheel | 18.1250 to 18.1270 | * | * |
| | B—H | Fit of cover plate in flywheel | 0.0010L to 0.0050L | * | * |
| | (2) | *Damper hub and damper driven plate.* | | | |
| 202 | L | Inside diameter of dowel pin bore in damper hub and damper driven plate | 0.4990 to 0.5000 | * | * |
| 202 | N | Outside diameter of damper hub dowel pin | 0.5001 to 0.5003 | * | * |
| | N—L | Fit of dowel pin in hub and plate bores | 0.0001T to 0.0013T | * | * |
| 202 | C | Smallest outside diameter of damper hub | 2.1240 to 2.1250 | * | * |
| 202 | D | Inside diameter of damper driven plate | 2.1250 to 2.1260 | * | * |
| | C—D | Fit of damper hub in damper driven plate | 0.0000 to 0.0020L | * | * |
| | (3) | *Damper drive spring.* | | | |
| 202 | K | Free length of drive spring | 1.7820 to 1.7970 | * | * |
| | | Maximum solid height | 1.3750 | * | * |
| | | Scale reading at 1.7500-inch height | 38 to 56 lb | * | * |

## 307. Scavenger and Pressure Oil Pump, Tubes, and Drive (par. 94)

### *a. Oil Pump Housings and Separating Plate.*

| | | | | | |
|---|---|---|---|---|---|
| 203 | H | Thickness of separating plate | 0.6200 to 0.6300 | * | * |
| 203 | CC | Inside diameter of dowel pin bore in separating plate | 0.2490 to 0.2500 | * | * |
| 203 | DD | Outside diameter of separating plate dowel pin | 0.2501 to 0.2503 | * | * |
| | DD—CC | Fit of dowel pins in separating plate dowel bores | 0.0001T to 0.0013T | | |
| 203 | W | Inside diameter of dowel pin bores in pump housings | 0.2500 to 0.2510 | * | * |
| | DD—W | Fit of dowel pins in dowel pin bores in housings | 0.0009L to 0.0003T | | |

### *b. Impeller End Play.*

| | | | | | |
|---|---|---|---|---|---|
| 203 | KK | Depth of impeller bore in scavenger (upper) pump housings | 1.6280 to 1.6300 | 1.6330 | 1.6310 |
| 203 | JJ | Length of scavenger pump impellers | 1.6250 to 1.6260 | 1.6220 | 1.6245 |
| 203 | X | Depth of impeller bore in pressure (lower) pump housing | 1.5030 to 1.5050 | 1.5080 | 1.5060 |
| 203 | AA | Length of pressure pump impellers | 1.5000 to 1.5010 | 1.4970 | 1.4995 |
| | KK—JJ X—AA | End play between impellers and housings with pump bolted tight (both pumps) | 0.0020 to 0.0050 | 0.0080 | 0.0055 |

### *c. Impellers and Shafts.*

| | | | | | |
|---|---|---|---|---|---|
| 203 | D | Outside diameter of pressure pump end of driven impeller shaft | 0.8106 to 0.8110 | 0.8090 | 0.8101 |
| 203 | A | Inside diameter of small bore in pressure pump housing | 0.8120 to 0.8130 | 0.8146 | 0.8141 |
| | D—A | Fit of shaft in housing | 0.0010L to 0.0024L | 0.0035L | 0.0029L |
| 203 | HH | Outside diameter of bearing surface on pressure pump end of pressure pump drive impeller | 0.9350 to 0.9356 | 0.9330 | 0.9345 |
| 203 | LL | Inside diameter of large bore in pressure pump housing | 0.9370 to 0.9380 | 0.9400 | 0.9385 |
| | HH—LL | Fit of impeller in housing | 0.0014L to 0.0030L | 0.0050L | 0.0035L |
| 203 | C | Major outside diameter of all impellers | 2.3306 to 2.3310 | 2.3290 | 2.3304 |
| 203 | B | Inside diameter of impeller bores in both housings | 2.3350 to 2.3360 | 2.3376 | 2.3362 |
| | B—C | Fit (radial clearance) of impellers in housings | 0.0020L to 0.0027L | 0.0035L | 0.0029L |
| 203 | K | Inside diameter of driven impellers | 0.8197 to 0.8202 | 0.8216 | 0.8205 |
| 203 | E | Outside diameter of impeller bearing surfaces on driven impeller shaft | 0.8171 to 0.8175 | 0.8157 | 0.8168 |
| | K—E | Fit of impellers on driven shaft | 0.0022L to 0.0031L | 0.0045L | 0.0030L |
| 203 | FF | Outside diameter of bearing surface on shaft of pressure pump drive impeller | 0.8192 to 0.8196 | * | * |
| 203 | Z | Inside diameter of scavenger pump driven impeller | 0.8197 to 0.8202 | * | * |
| | FF—Z | Fit of impeller on shaft | 0.0001L to 0.0010L | * | * |

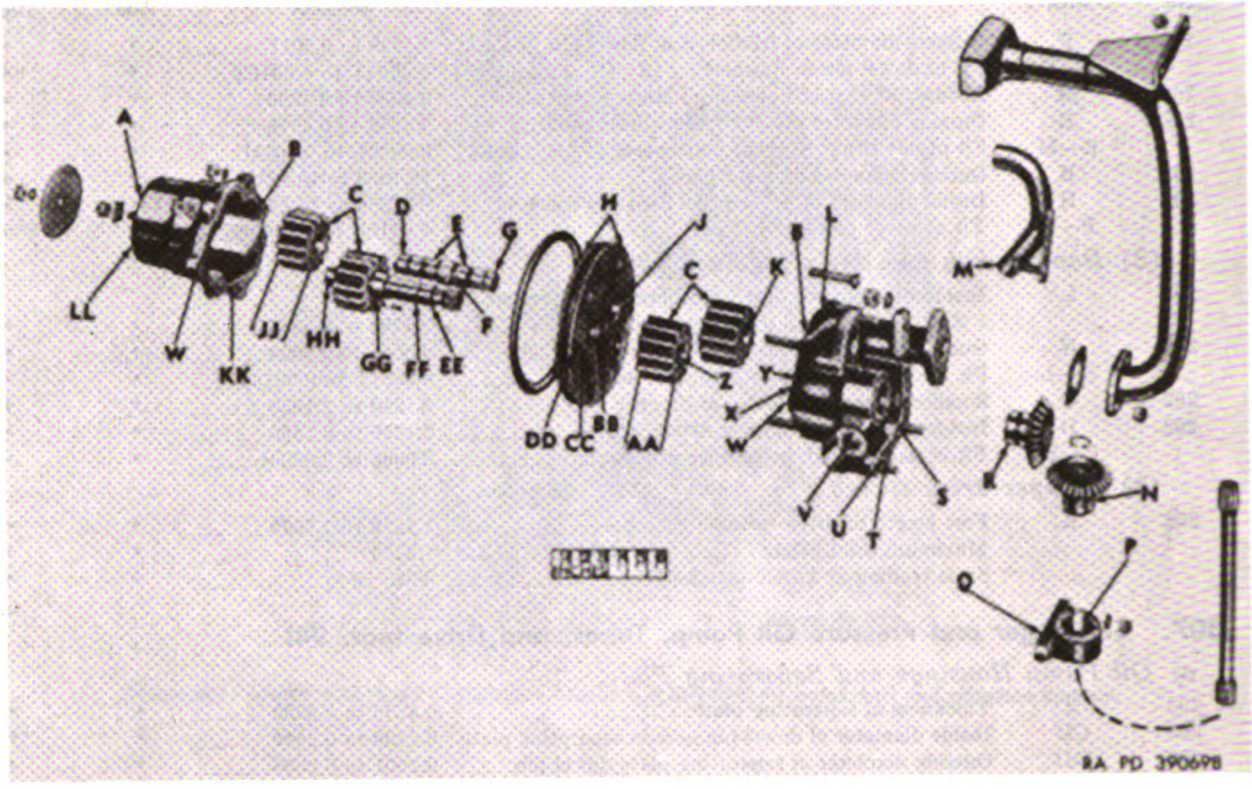



*Figure 203. Repair and rebuild standard points of measurement for scavenger and pressure oil pump, tubes, and drive.*

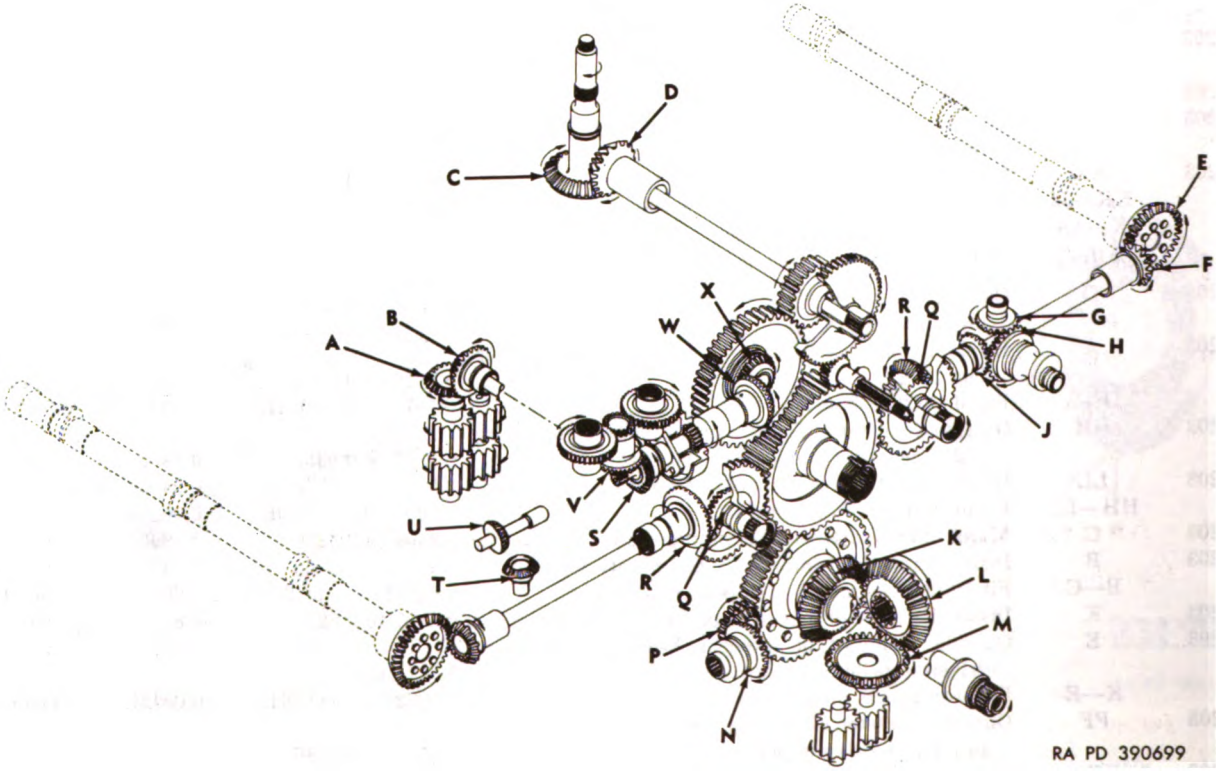



*Figure 204. Repair and rebuild standard points of measurement for accessory case gear backlash.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| 203 | F | Outside diameter of large bearing surface on driven impeller shaft | 0.9981 to 0.9985 | 0.9977 | 0.9979 |
| 203 | J | Inside diameter of bore in separating plate | 0.9995 to 1.0005 | 1.0015 | 1.0010 |
| | F—J | Fit of shaft in plate | 0.0010L to 0.0024L | 0.0040L | 0.0019L |
| 203 | GG | Outside diameter of large bearing surface on shaft of pressure pump drive impeller | 0.9978 to 0.9982 | 0.9955 | 0.9973 |
| 203 | BB | Inside diameter of bore in separating plate | 0.9995 to 1.0005 | 1.0028 | 1.0010 |
| | GG—BB | Fit of shaft in plate | 0.0013L to 0.0027L | 0.0050L | 0.0032L |
| 203 | G | Outside diameter of bearing surface on scavenger pump end of driven impeller shaft | 0.8106 to 0.8110 | 0.8102 | 0.8104 |
| 203 | L | Inside diameter of bearing bore in scavenger pump housing | 0.8120 to 0.8130 | 0.8140 | 0.8135 |
| | G—L | Fit of shaft in housing | 0.0010L to 0.0024L | 0.0040L | 0.0029L |
| 203 | EE | Outside diameter of bearing surface on scavenger pump end of drive impeller | 0.8103 to 0.8107 | 0.8080 | 0.8098 |
| 203 | Y | Inside diameter of bearing bore in scavenger pump housing | 0.8120 to 0.8130 | 0.8153 | 0.8135 |
| | EE—Y | Fit of impeller shaft in housing | 0.0013L to 0.0027L | 0.0050L | 0.0030L |
| | *d. Pressure Oil Pump Drive Bevel Gear.* | | | | |
| 203 | R | Outside diameter of bearing surface on gear | 1.2475 to 1.2485 | 1.2465 | 1.2470 |
| 203 | S | Inside diameter of bearing bore in scavenger pump housing | 1.2500 to 1.2510 | 1.2520 | 1.2515 |
| | R—S | Fit of gear in housing | 0.0015L to 0.0035L | 0.0045L | 0.0040L |
| 204 | A—B | Desired backlash (at mean dimension) with pressure pump driven bevel gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0065 to 0.0135 | 0.0174 | 0.0139 |
| | *e. Pressure Oil Pump Driven Bevel Gear.* | | | | |
| 203 | N | Outside diameter of bearing surface on gear | 1.2475 to 1.2485 | 1.2465 | 1.2470 |
| 203 | P | Inside diameter of bearing bore in driven bevel gear support | 1.2500 to 1.2510 | 1.2525 | 1.2513 |
| | N—P | Fit of gear in support | 0.0015L to 0.0035L | 0.0045L | 0.0040L |
| 204 | A—B | Desired backlash (at mean dimension) with pressure pump drive bevel gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0065 to 0.0135 | 0.0174 | 0.0139 |
| | *f. Scavenger Oil Pump Housing Assembly.* | | | | |
| 203 | U | Inside diameter of dowel pin bore in scavenger pump housing | 0.2490 to 0.2500 | * | * |
| 203 | T | Outside diameter of drive bevel gear support dowel pin | 0.2501 to 0.2503 | * | * |
| | T—U | Fit of dowel pin in housing dowel pin bore | 0.0001T to 0.0013T | * | * |
| 203 | Q | Inside diameter of dowel pin bore in drive bevel gear support | 0.2500 to 0.2510 | * | * |
| | T—Q | Fit of dowel pin in support dowel pin bore | 0.0009L to 0.0003T | * | * |
| 203 | V | Inside diameter of outlet tube hole in scavenger pump housing | 0.8745 to 0.8755 | * | * |
| 203 | M | Outside diameter of connecting end of scavenger pump outlet tube | 0.8700 to 0.8740 | * | * |
| | M—V | Fit of tube in housing | 0.0005L to 0.0055L | * | * |

## 308. Accessory Case Scavenger Oil Pump and Drive Gear (par. 94)

| | | | | | |
|---|---|---|---|---|---|
| | *a. Impeller End Play.* | | | | |
| 205 | D | Depth of impeller bores in housing | 1.6280 to 1.6300 | 1.6330 | 1.6305 |
| 205 | L | Length of impellers | 1.6250 to 1.6260 | 1.6230 | 1.6245 |
| | L—D | End play between impellers and housing with pump bolted tight | 0.0020L to 0.0050L | 0.0080L | 0.0055L |
| | *b. Impellers.* | | | | |
| 205 | M | Outside diameter of external spline of drive impeller | 0.7885 to 0.7910 | * | * |
| 205 | B | Inside diameter of internal spline in drive gear | 0.8300 to 0.8400 | * | * |

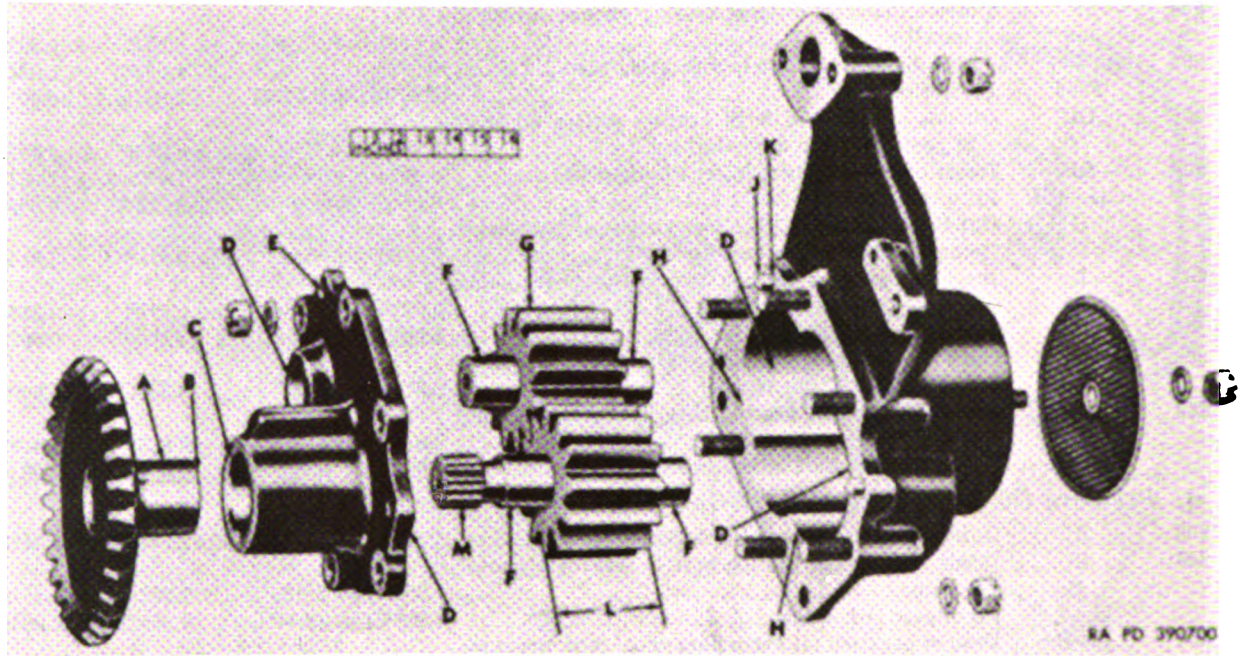



*Figure 205. Repair and rebuild standard points of measurement for accessory case scavenger oil pump and drive gear.*

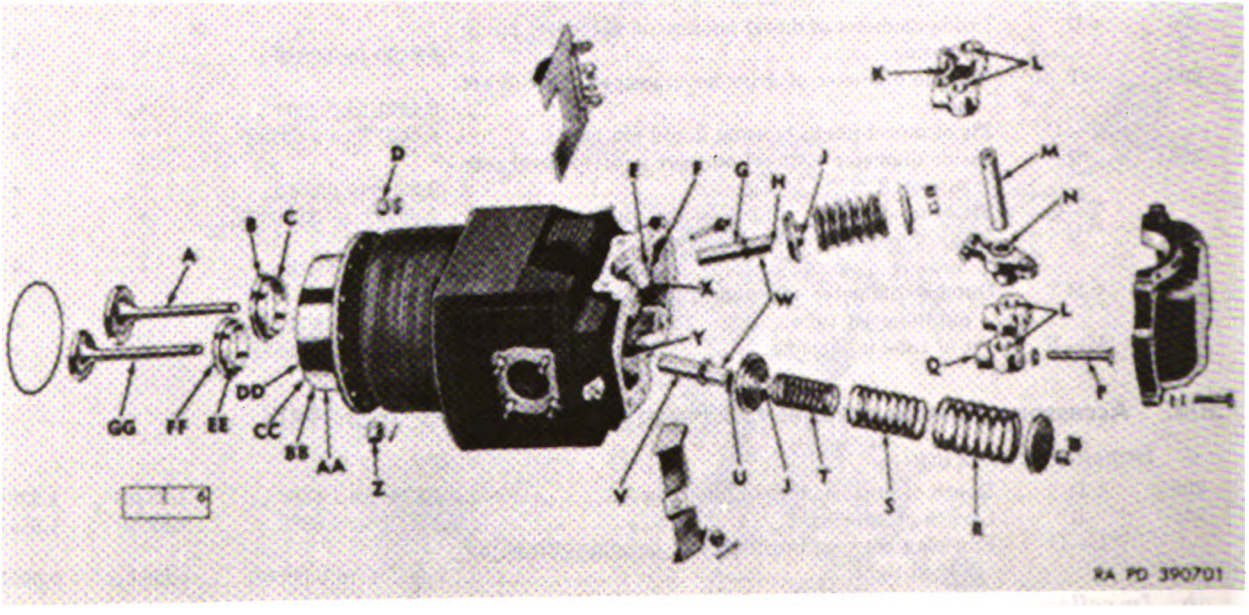



*Figure 206. Repair and rebuild standard points of measurement for cylinders.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| | M—B | Fit of impeller spline in gear spline | 0.0390L to 0.0515L | * | * |
| 205 | F | Outside diameter of shafts of impellers | 0.8100 to 0.8106 | 0.8080 | 0.8097 |
| 205 | D | Inside diameter of impeller shaft bores in cover and housing | 0.8120 to 0.8130 | 0.8150 | 0.8133 |
| | F—D | Fit of shafts on impellers in cover and housing | 0.0014L to 0.0030L | 0.0050L | 0.0033L |
| 205 | G | Major outside diameter of both impellers | 2.3306 to 2.3310 | 2.3290 | 2.3304 |
| 205 | H | Inside diameter of impeller bores in housing | 2.3350 to 2.3360 | 2.3376 | 2.3362 |
| | G—H | Fit (radial clearance) of impellers in housing | 0.0020L to 0.0027L | 0.0035L | 0.0029L |
| | *c. Scavenger Oil Pump Drive Gear.* | | | | |
| 205 | A | Outside diameter of bearing surface on drive gear | 1.1220 to 1.1230 | 1.1205 | 1.1215 |
| 205 | C | Inside diameter of bearing bore in cover | 1.1250 to 1.1260 | 1.1275 | 1.1265 |
| | A—C | Fit of gear in cover | 0.0020L to 0.0040L | 0.0055L | 0.0045L |
| 205 | B | Inside diameter of internal spline in bevel gear | 0.8300 to 0.8400 | * | * |
| 205 | M | Outside diameter of external spline of drive impeller | 0.7885 to 0.7910 | * | * |
| | B—M | Fit of gear on impeller spline | 0.0390L to 0.0515L | * | * |
| 204 | M—L | Desired backlash (at mean dimension) with starter drive bevel gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0060 to 0.0140 | 0.0179 | 0.0149 |
| | *d. Scavenger Oil Pump Housing.* | | | | |
| 205 | K | Inside diameter of dowel pin bores in housing | 0.2480 to 0.2490 | * | * |
| 205 | J | Outside diameter of dowel pins | 0.2501 to 0.2503 | * | * |
| | J—K | Fit of dowel pins in housing dowel pin bores | 0.0011T to 0.0023T | * | * |
| 205 | E | Inside diameter of dowel pin bores in cover | 0.2500 to 0.2510 | * | * |
| | J—E | Fit of dowel pins in cover dowel pin bores | 0.0009L to 0.0003T | * | * |

## 309. Pistons, Rings, and Pins (par. 99)

| | | | | | |
|---|---|---|---|---|---|
| | *a. Piston Diameters.* | | | | |
| 200 | H | Piston diameter at top of skirt at 90 degrees to piston pin | 5.7210 to 5.7220 | 5.7180 | 5.7200 |
| 200 | J | Piston diameter at bottom of skirt at 90 degrees to piston pin | 5.7240 to 5.7250 | 5.7210 | 5.7230 |
| | *b. Piston Rings.* | | | | |
| 200 | A | Width of compression ring (No. 1 (top) ring) | 0.0925 to 0.0935 | 0.0890 | 0.0920 |
| 200 | X | Width of No. 1 (top) ring groove in piston | 0.0980 to 0.0990 | 0.1025 | 0.0995 |
| | A—X | Fit (side clearance) of No. 1 ring in groove | 0.0045L to 0.0065L | 0.0100L | 0.0075L |
| | | Gap clearance of No. 1 ring when fitted in 5.7500-inch ring gage | 0.0500 to 0.0600 | 0.0800 | 0.0700 |
| 200 | B | Width of compression ring (No. 2 ring) | 0.0925 to 0.0935 | 0.0900 | 0.0920 |
| 200 | W | Width of No. 2 ring groove in piston | 0.0980 to 0.0990 | 0.1015 | 0.0995 |
| | B—W | Fit (side clearance) of No. 2 ring in groove | 0.0045L to 0.0065L | 0.0090L | 0.0070L |
| | | Gap clearance of No. 2 ring when fitted in 5.7500-inch gage | 0.0500 to 0.0600 | 0.0800 | 0.0700 |
| 200 | C | Width of oil control ring (No. 3 ring) | 0.1860 to 0.1865 | 0.1850 | 0.1858 |
| 200 | F | Width of No. 3 ring groove in piston | 0.1890 to 0.1900 | 0.1910 | 0.1905 |
| | C—F | Fit (side clearance) of No. 3 ring in groove | 0.0025L to 0.0040L | 0.0050L | 0.0045L |
| | | Gap clearance of No. 3 ring when fitted in 5.7500-inch ring gage | 0.0350 to 0.0450 | 0.0600 | 0.0550 |
| 200 | D | Width of oil control ring (No. 4 (bottom) ring) | 0.1860 to 0.1865 | 0.1850 | 0.1858 |
| 200 | G | Width of No. 4 ring groove in piston | 0.1880 to 0.1890 | 0.1910 | 0.1895 |
| | D—G | Fit (side clearance) of No. 4 ring in groove | 0.0015L to 0.0030L | 0.0050L | 0.0035L |
| | | Gap clearance of No. 4 ring when fitted in 5.7500-inch ring gage | 0.0350 to 0.0450 | 0.0600 | 0.0550 |
| | *c. Piston Pins.* | | | | |
| 200 | U | Outside diameter of piston pin | 1.3750 to 1.3752 | 1.3745 | 1.3749 |
| 200 | V | Inside diameter of piston pin bore in piston | 1.3755 to 1.3757 | 1.3762 | 1.3758 |
| | U—V | Fit of pin in piston | 0.0003L to 0.0007L | 0.0012L | 0.0008L |
| 200 | R | Inside diameter of piston pin bushing | 1.3762 to 1.3764 | 1.3770 | 1.3765 |
| | U—R | Fit of pin in bushing | 0.0010L to 0.0014L | 0.0020L | 0.0016L |
| 200 | T | Inside diameter of piston pin | 0.9678 to 0.9688 | * | * |

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| 200 | E | Outside diameter of piston pin plug | 0.9668 to 0.9678 | * | * |
| | E—T | Fit of plug in piston pin | 0.0000 to 0.0020L | * | * |

## 310. Cylinders (par. 104)

### *a. Cylinder Barrel.*

| | | | | | |
|---|---|---|---|---|---|
| 206 | AA | Outside diameter of cylinder barrel skirt | 6.1120 to 6.1160 | * | * |
| 197 | A | Inside diameter of cylinder pad bore in crankcase | 6.1290 to 6.1340 | * | * |
| | AA—A | Fit of cylinder barrel in crankcase | 0.0130L to 0.0220L | * | * |

### *b. Cylinder Bore.*

| | | | | | |
|---|---|---|---|---|---|
| 206 | BB | Diameter of bore one-inch from bottom of skirt (bottom of ring travel) | 5.7460 to 5.7490 | 5.7590 | 5.7560 |
| | | Diameter of bore opposite center of barrel fins | 5.7425 to 5.7455 | 5.7555 | 5.7525 |
| | | Diameter of bore ¾-inch from top of cylinder barrel | 5.7407 to 5.7437 | 5.7537 | 5.7457 |
| | | Maximum out-of-round of cylinder bore | 0.0010 | 0.0050 | 0.0020 |

### *c. Valves.*

| | | | | | |
|---|---|---|---|---|---|
| 206 | A | Outside diameter of intake valve stem | 0.4975 to 0.4980 | * | * |
| 206 | H | Inside diameter of intake valve guide | 0.4995 to 0.5005 | 0.5025 | 0.5010 |
| | A—H | Fit of intake valve stem in guide | 0.0015L to 0.0030L | 0.0050L | 0.0035L |
| 80 | | Angle of intake valve seat with stem | 45 degrees 15 minutes | | |
| 80 | | Length of intake valve from seat contact line to tip of stem | 6.7090 to 6.7240 | 6.7560 | 6.7360 |
| 206 | GG | Outside diameter of exhaust valve stem | 0.5575 to 0.5580 | * | * |
| 206 | U | Inside diameter of exhaust valve guide | 0.5615 to 0.5625 | 0.5655 | 0.5630 |
| | GG—U | Fit of exhaust valve stem in guide | 0.0035L to 0.0050L | 0.0080L | 0.0055L |
| 80 | | Angle of exhaust valve seat with stem | 45 degrees 15 minutes | | |
| 80 | | Length of exhaust valve from seat contact line to tip of stem | 6.6510 to 6.6660 | 6.6980 | 6.6780 |

### *d. Valve Guides.*

| | | | | | |
|---|---|---|---|---|---|
| 206 | G | Outside diameter of intake valve guide | 0.6890 to 0.6895 | * | * |
| 206 | X | Inside diameter of intake valve guide bore in cylinder head | 0.6870 to 0.6880 | * | * |
| | G—X | Fit of guide in cylinder head | 0.0010T to 0.0025T | * | * |
| 206 | V | Outside diameter of exhaust valve guide | 0.7525 to 0.7530 | * | * |
| 206 | Y | Inside diameter of exhaust valve guide bore in cylinder head | 0.7495 to 0.7505 | * | * |
| | V—Y | Fit of guide in cylinder head | 0.0020T to 0.0035T | * | * |

### *e. Intake Valve Seat Inserts.*

| | | | | | |
|---|---|---|---|---|---|
| 206 | C | Small outside diameter of insert | 2.6927 to 2.6942 | * | * |
| 206 | DD | Small inside diameter of bore in cylinder head | 2.6840 to 2.6860 | * | * |
| | C—DD | Fit of insert in cylinder head | 0.0067T to 0.0102T | * | * |
| 206 | B | Large outside diameter of insert | 3.1220 to 3.1260 | * | * |
| 206 | CC | Large inside diameter of bore in cylinder head | 3.1300 to 3.1320 | * | * |
| | B—CC | Fit of insert in cylinder head | 0.0040L to 0.0100L | * | * |
| 80 | | Width of valve seat | 0.0600 to 0.0900 | | |
| 80 | | Angle of seat | 44 degrees 45 minutes to 45 degrees 0 minutes | | |
| 80 | | Angles of relief (for narrowing width of seat) | 30 degrees and 60 degrees | | |

### *f. Exhaust Valve Seat Inserts.*

| | | | | | |
|---|---|---|---|---|---|
| 206 | EE | Small outside diameter of insert | 2.2557 to 2.2572 | * | * |
| 206 | DD | Small inside diameter of bore in cylinder head | 2.2470 to 2.2490 | * | * |
| | EE—DD | Fit of insert in cylinder head | 0.0067T to 0.0102T | * | * |
| 206 | FF | Large outside diameter of insert | 2.6840 to 2.6880 | * | * |
| 206 | CC | Large inside diameter of bore in cylinder head | 2.6920 to 2.6940 | * | * |
| | FF—CC | Fit of insert in cylinder head | 0.0040L to 0.0100L | * | * |
| 80 | | Width of valve seat | 0.0600 to 0.0900 | | |
| 80 | | Angle of seat | 44 degrees 45 minutes to 45 degrees 0 minutes | | |
| 80 | | Angles of relief (for narrowing width of seat) | 30 degrees and 60 degrees | | |

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| *g.* | | *Valve Springs.* | | | |
| 206 | R | Valve outer spring: | | | |
| | | Scale reading at 2.1200-inch height | 85.0000 ± 4.2500 lb | * | * |
| | | Scale reading at 1.5600-inch height | 124.4000 ± 12.4400 lb | * | * |
| | | Maximum solid height | 1.4700-inch | * | * |
| 206 | S | Valve intermediate spring: | | | |
| | | Scale reading at 2.1200-inch height | 51.2000 ± 2.5600 lb | * | * |
| | | Scale reading at 1.5600-inch height | 74.9000 ± 7.4900 lb | * | * |
| | | Maximum solid height | 1.3400-inch | * | * |
| 206 | T | Valve inner spring: | | | |
| | | Scale reading at 1.9300-inch height | 25.8000 ± 1.2900 lb | * | * |
| | | Scale reading at 1.3800-inch height | 40.0000 ± 4.0000 lb | * | * |
| | | Maximum solid height | 1.2800-inch | * | * |
| *h.* | | *Valve Spring Seats.* | | | |
| 206 | J | Inside diameter of valve spring retainers | 0.7870 to 0.7930 | * | * |
| 206 | W | Large outside diameter of valve guides (on shorter end) | 0.7780 to 0.7840 | * | * |
| | J—W | Fit of retainers on guides | 0.0030L to 0.0150L | * | * |
| *i.* | | *Valve Rocker Shafts.* | | | |
| 206 | M | Outside diameter of valve rocker shaft | 0.7480 to 0.7485 | 0.7455 | 0.7475 |
| 206 | N | Inside diameter of valve rocker sleeve bearing | 0.7495 to 0.7505 | 0.7530 | 0.7510 |
| | M—N | Fit of shaft in valve rocker sleeve bearing | 0.0010L to 0.0025L | 0.0050L | 0.0030L |
| 206 | L | Inside diameter of bores in valve rocker shaft bracket and camshaft bearing cap | 0.7485 to 0.7495 | * | * |
| | M—L | Fit of shafts in bracket and bearing cap bores | 0.0000 to 0.0015L | * | * |
| *j.* | | *Camshaft Bearing Cap and Valve Rocker Shaft Supporting Bracket.* | | | |
| 206 | Q | Inside diameter of dowel pin holes in camshaft bearing cap and valve rocker shaft supporting bracket | 0.2500 to 0.2510 | * | * |
| 206 | F | Outside diameter of cylinder head dowel pins | 0.2501 to 0.2503 | * | * |
| | F—Q | Fit of dowel pins in cap and bracket bores | 0.0009L to 0.0003T | * | * |
| 206 | K | Inside diameter of camshaft bearing cap (with cap tightened to proper torque) | 1.3120 to 1.3130 | 1.3150 | 1.3135 |
| 228 | Z | Outside diameter of | | | |
| 229 | S | camshaft journals | 1.3090 to 1.3100 | 1.3070 | 1.3085 |
| | S—Z—K | Fit (oil clearance) of journals in bearings | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| *k.* | | *Cylinder Head Dowel Pins.* | | | |
| 206 | E | Inside diameter of dowel pin bores in cylinder head | 0.2470 to 0.2480 | * | * |
| 206 | F | Outside diameter of dowel pins | 0.2501 to 0.2503 | * | * |
| | F—E | Fit of dowel pins in cylinder head bores | 0.0021T to 0.0033T | * | * |

## 311. Valve Rocker Assembly (par. 104)

| | | | | | |
|---|---|---|---|---|---|
| *a.* | | *Valve Rocker Rollers.* | | | |
| 207 | F | Inside diameter of valve rocker roller | 0.5625 to 0.5630 | 0.5650 | 0.5635 |
| 207 | E | Outside diameter of roller hub | 0.5580 to 0.5585 | 0.5560 | 0.5575 |
| | E—F | Fit of hub in roller | 0.0040L to 0.0050L | 0.0070L | 0.0055L |
| 207 | G | Width of roller | 0.3060 to 0.3080 | 0.3035 | 0.3055 |
| 207 | J | Inside width of valve rocker | 0.3115 to 0.3135 | 0.3160 | 0.3140 |
| | G—J | Fit (side clearance) of roller in rocker | 0.0035L to 0.0075L | 0.0100L | 0.0080L |
| *b.* | | *Valve Rocker Bushing-Type Bearing.* | | | |
| 206 | N | Inside diameter of bearing | 0.7495 to 0.7505 | 0.7530 | 0.7510 |
| 206 | M | Outside diameter of valve rocker shaft | 0.7480 to 0.7485 | 0.7455 | 0.7475 |
| | M—N | Fit of valve rocker shaft in bearing | 0.0010L to 0.0025L | 0.0050L | 0.0030L |
| 207 | A | Outside diameter of bearing | 0.8780 to 0.8790 | * | * |
| 207 | B | Inside diameter of bearing bore in valve rocker | 0.8745 to 0.8755 | * | * |
| | A—B | Fit of bearing in valve rocker | 0.0025T to 0.0045T | * | * |
| *c.* | | *Valve Rocker Roller Axle Pin.* | | | |
| 207 | C | Outside diameter of valve rocker roller axle pin | 0.3120 to 0.3130 | * | * |
| 207 | H | Inside diameter of axle pin bore in valve rocker | 0.3120 to 0.3130 | * | * |

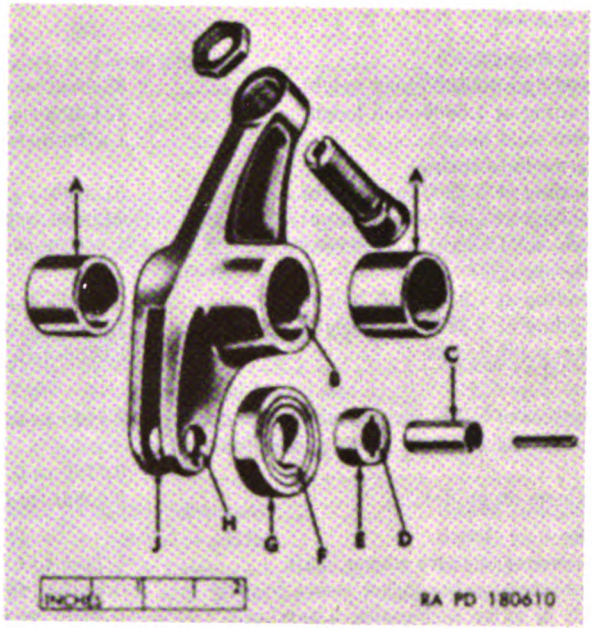



*Figure 207. Repair and rebuild standard points of measurement for valve rocker assembly.*

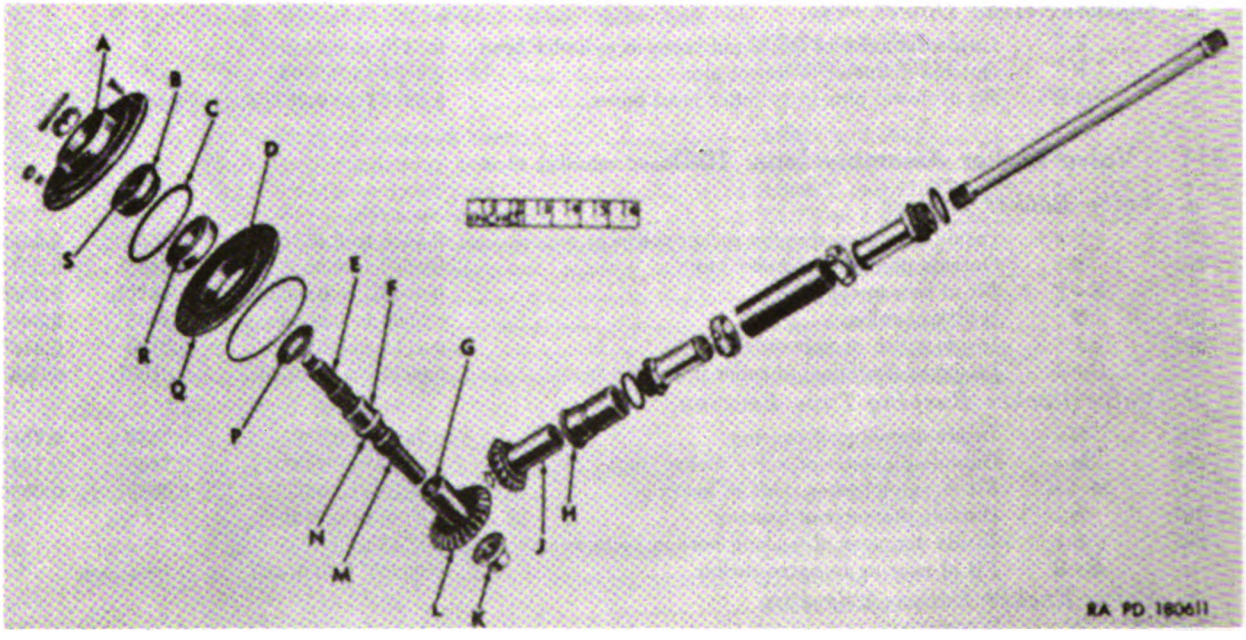



*Figure 208. Repair and rebuild standard points of measurement for cooling fan drive.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| | C—H | Fit of axle pin in valve rocker | 0.0010L to 0.0010T | * | * |
| 207 | D | Inside diameter of valve rocker roller hub | 0.3115 to 0.3125 | * | * |
| | C—D | Fit of axle pin in roller hub (roller hub also locked to pin) | 0.0005L to 0.0015T | * | * |

## 312. Cooling Fan Drive (par. 109)

### *a. Fan Drive Vertical Drive Shaft Drive Gear.*

| | | | | | |
|---|---|---|---|---|---|
| 208 | J | Outside diameter of drive gear | 1.3725 to 1.3730 | 1.3705 | 1.3720 |
| 208 | H | Inside diameter of drive gear bearing bore | 1.3750 to 1.3760 | 1.3780 | 1.3765 |
| | J—H | Fit of gear in bearing | 0.0020L to 0.0035L | 0.0055L | 0.0040L |
| 204 | C—D | Desired backlash (at mean dimension) with vertical drive shaft driven gear | 0.0100 to 0.0140 | | |
| | | Total backlash | 0.0084 to 0.0158 | 0.0197 | 0.0163 |

### *b. Fan Drive Vertical Drive Shaft Driven Gear.*

| | | | | | |
|---|---|---|---|---|---|
| 208 | L | Inside diameter of driven gear lower pilot bearing bore | 0.9365 to 0.9375 | 0.9390 | 0.9380 |
| 208 | M | Outside diameter of vertical drive shaft lower pilot bearing surface | 0.9350 to 0.9355 | 0.9340 | 0.9345 |
| | M—L | Fit of shaft in gear pilot bore | 0.0010L to 0.0025L | 0.0040L | 0.0025L |
| 208 | G | Inside diameter of driven gear upper pilot bearing bore | 1.2500 to 1.2510 | 1.2530 | 1.2515 |
| 208 | N | Outside diameter of vertical drive shaft upper pilot bearing surface | 1.2485 to 1.2490 | 1.2475 | 1.2480 |
| | N—G | Fit of shaft in gear pilot bore | 0.0010L to 0.0025L | 0.0040L | 0.0025L |
| 204 | C—D | Desired backlash (at mean dimension) with fan drive vertical drive shaft drive gear | 0.0100 to 0.0140 | | |
| | | Total backlash | 0.0084 to 0.0158 | 0.0197 | 0.0163 |

### *c. Fan Drive Vertical Drive Shaft.*

| | | | | | |
|---|---|---|---|---|---|
| 208 | M | Outside diameter of vertical drive shaft lower pilot bearing surface | 0.9350 to 0.9355 | 0.9330 | 0.9345 |
| 208 | K | Inside diameter of vertical drive shaft bearing bore | 0.9370 to 0.9380 | 0.9400 | 0.9385 |
| | M—K | Fit of shaft in bearing | 0.0015L to 0.0030L | 0.0050L | 0.0035L |
| 208 | L | Inside diameter of driven gear lower pilot bearing bore | 0.9365 to 0.9375 | 0.9385 | 0.9380 |
| | M—L | Fit of shaft in gear pilot bore | 0.0010L to 0.0025L | 0.0045L | 0.0030L |
| 208 | N | Outside diameter of vertical drive shaft upper pilot bearing | 1.2485 to 1.2495 | 1.2475 | 1.2480 |
| 208 | G | Inside diameter of driven gear upper pilot bearing surface | 1.2500 to 1.2510 | 1.2530 | 1.2515 |
| | G—N | Fit of shaft in gear pilot bore | 0.0010L to 0.0025L | 0.0045L | 0.0030L |
| 208 | F | Outside diameter of large bearing surface on vertical drive shaft | 1.3779 to 1.3784 | * | * |
| 208 | P | Inside diameter of oil slinger | 1.3780 to 1.3790 | * | * |
| | P—F | Fit of oil slinger on shaft | 0.0011L to 0.0004T | * | * |
| 208 | R | Inside diameter of vertical drive shaft ball bearing | 1.3775 to 1.3780 | * | * |
| | R—F | Fit of shaft in ball bearing | 0.0001L to 1.3900 | * | * |
| 208 | S | Inside diameter of vertical shaft oil seal | 1.3800 to 0.0121L | * | * |
| | S—F | Fit of shaft in oil seal | 0.0016L to 0.0041L | * | * |
| 208 | E | Outside diameter of upper end of vertical drive shaft | 0.9835 to 0.9840 | 0.9815 | 0.9830 |
| 209 | Q | Inside diameter of clutch drive hub | 0.9845 to 0.9865 | 0.9885 | 0.9870 |
| | Q—E | Fit of shaft in hub | 0.0005L to 0.0030L | 0.0050L | 0.0035L |

### *d. Vertical Drive Shaft Bearing Housing.*

| | | | | | |
|---|---|---|---|---|---|
| 208 | D | Inside diameter of bearing housing | 2.8345 to 2.8353 | * | * |
| 208 | C | Outside diameter of vertical drive shaft ball bearing | 2.8340 to 2.8346 | * | * |
| | C—D | Fit of ball bearing in housing | 0.0013L to 0.0001T | * | * |
| 208 | Q | Outside diameter of bearing housing | 4.7480 to 4.7490 | * | * |
| 199 | B | Inside diameter of bearing housing bore in crankcase | 4.7500 to 4.7510 | * | * |
| | Q—B | Fit of housing in crankcase | 0.0010L to 0.0030L | * | * |

### *e. Vertical Drive Shaft Oil Seal Housing.*

| | | | | | |
|---|---|---|---|---|---|
| 208 | A | Inside diameter of bore in oil seal housing | 2.6230 to 2.6250 | * | * |
| 208 | B | Outside diameter of vertical drive shaft oil seal | 2.6290 to 2.6330 | * | * |

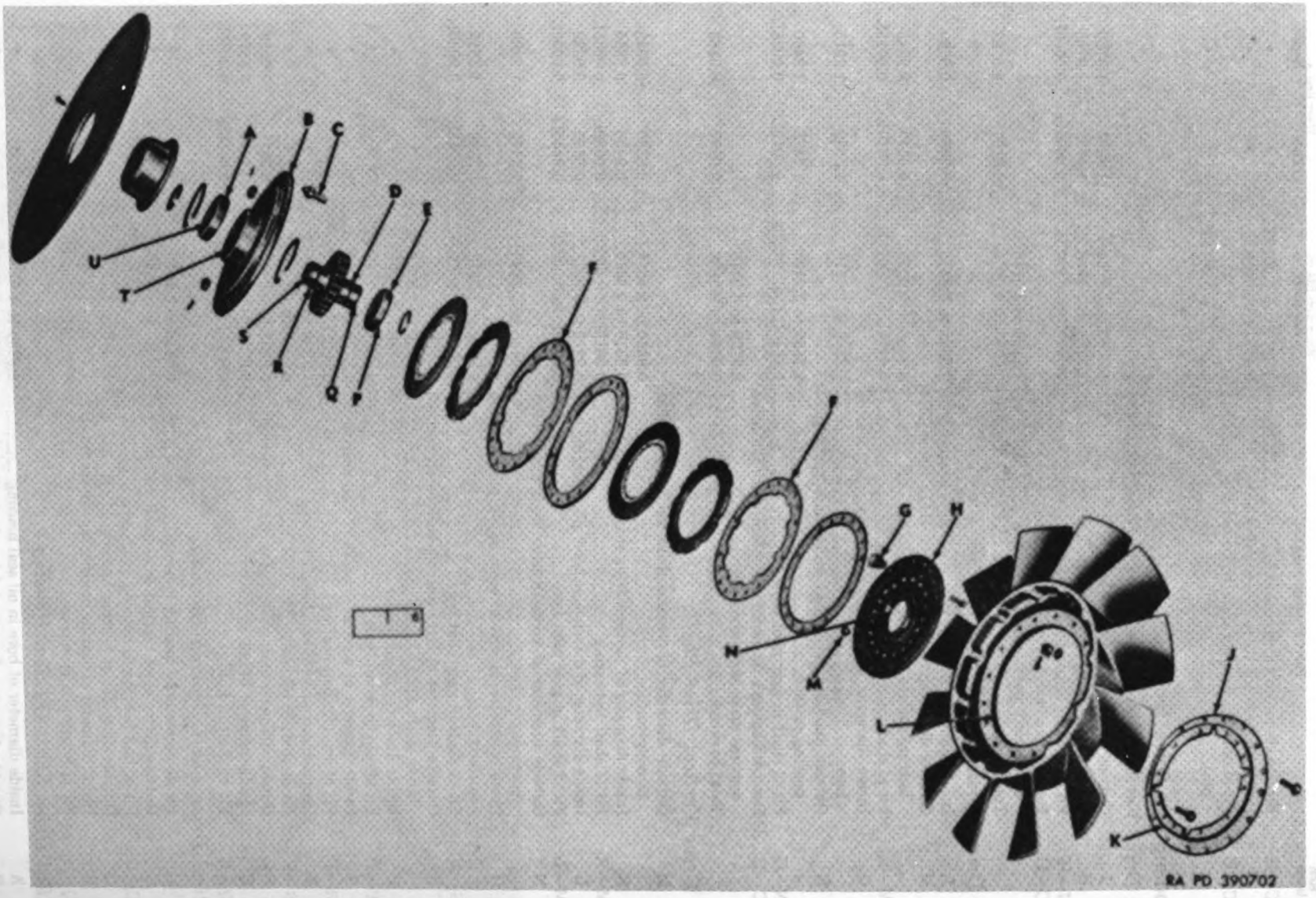



*Figure 209. Repair and rebuild standard points of measurement for cooling fan drive clutch assembly and rotor.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| | B—A | Fit of seal in housing | 0.0040T to 0.0100T | * | * |
| | *f. Vertical Drive Shaft Drive Gear Bearing.* | | | | |
| 199 | C | Outside diameter to drive gear bearing | 1.6875 to 1.6880 | * | * |
| 199 | D | Inside diameter of drive gear bearing bore in crankcase | 1.6880 to 1.6890 | * | * |
| | C—D | Fit of bearing in crankcase | 0.0000 to 0.0015L | * | * |
| | *g. Vertical Drive Shaft Bearing.* | | | | |
| 199 | F | Outside diameter of vertical drive shaft bearing | 1.2488 to 1.2493 | * | * |
| 199 | G | Inside diameter of vertical drive shaft bearing bore in crankcase | 1.2500 to 1.2510 | * | * |
| | F—G | Fit of bearing in crankcase | 0.0007L to 0.0022L | * | * |
| 199 | E | Outside diameter of bearing dowel pin | 0.1850 to 0.1870 | * | * |
| 199 | H | Inside diameter of dowel pin bore in bearing | 0.2010 to 0.2070 | * | * |
| | E—H | Fit of bearing on dowel pin | 0.0140L to 0.0220L | * | * |
| | **313. Cooling Fan Rotor and Fan Drive Clutch Assembly (par. 109)** | | | | |
| | *a. Clutch Outer (Upper) Housing.* | | | | |
| 209 | T | Inside diameter of bearing bore in outer housing | 2.8336 to 2.8346 | * | * |
| 209 | A | Outside diameter of clutch drive hub outer ball bearing | 2.8341 to 2.8346 | * | * |
| | A—T | Fit of bearing in housing | 0.0005L to 0.0010T | * | * |
| 209 | B | Inside diameter of dowel pin bore in outer housing | 0.2795 to 0.2805 | * | * |
| 209 | C | Outside diameter of dowel pin | 0.2810 to 0.2815 | * | * |
| | C—B | Fit of dowel pin in housing bore | 0.0005T to 0.0020T | * | * |
| | *b. Clutch Inner (Lower) Housing.* | | | | |
| 209 | N | Inside diameter of bearing bore in inner clutch housing | 2.6774 to 2.6782 | * | * |
| 209 | E | Outside diameter of clutch drive hub inner ball bearing | 2.6767 to 2.6772 | * | * |
| | E—N | Fit of bearing in housing | 0.0002L to 0.0015L | * | * |
| 209 | H | Inside diameter of dowel pin bore in housing | 0.2835 to 0.2845 | * | * |
| 209 | C | Outside diameter of dowel pin | 0.2810 to 0.2815 | * | * |
| | C—H | Fit of dowel pin in housing bore | 0.0020L to 0.0035L | * | * |
| | *c. Clutch Drive Hub.* | | | | |
| 209 | S | Small inside diameter of clutch hub bore | 0.9845 to 0.9865 | 0.9885 | 0.9870 |
| 208 | E | Outside diameter of upper end of vertical drive shaft | 0.9835 to 0.9840 | 0.9815 | 0.9830 |
| | S—E | Fit of shaft in hub | 0.0005L to 0.0030L | 0.0050L | 0.0035L |
| 209 | Q | Large inside diameter of clutch hub | 1.3790 to 1.3810 | 1.3829 | 1.3815 |
| 208 | F | Outside diameter of large bearing surface on vertical drive shaft | 1.3779 to 1.3784 | 1.3760 | 1.3774 |
| | Q—F | Fit of shaft in hub | 0.0006L to 0.0031L | 0.0050L | 0.0036L |
| 209 | D | Outside diameter of large end of hub | 1.5745 to 1.5750 | * | * |
| 209 | P | Inside diameter of clutch drive hub inner ball bearing | 1.5743 to 1.5748 | * | * |
| | P—D | Fit of hub in bearing | 0.0003L to 0.0007T | * | * |
| 209 | R | Outside diameter of small end of hub | 1.3770 to 1.3775 | * | * |
| 209 | U | Inside diameter of clutch drive hub outer ball bearing | 1.3775 to 1.3780 | * | * |
| | U—R | Fit of hub in bearing | 0.0000 to 0.0010L | * | * |
| | *d. Clutch Pressure Disk.* | | | | |
| 209 | F | Inside diameter of dowel pin bore in pressure disk | 0.2835 to 0.2845 | * | * |
| 209 | C | Outside diameter of dowel pin | 0.2810 to 0.2815 | * | * |
| | C—F | Fit of dowel pin in pressure disk bore | 0.0020L to 0.0035L | * | * |
| | *e. Clutch-to-Rotor Adapter.* | | | | |
| 209 | J | Inside diameter of dowel pin bore in adapter | 0.2835 to 0.2845 | * | * |
| 209 | C | Outside diameter of dowel pin | 0.2810 to 0.2815 | * | * |
| | C—J | Fit of dowel pin in adapter bore | 0.0020L to 0.0035L | * | * |
| 209 | K | Outside diameter of adapter pilot | 9.4360 to 9.4380 | * | * |
| 209 | L | Inside diameter of rotor | 9.4380 to 9.4400 | * | * |
| | K—L | Fit of adapter pilot in rotor | 0.0000 to 0.0040L | * | * |

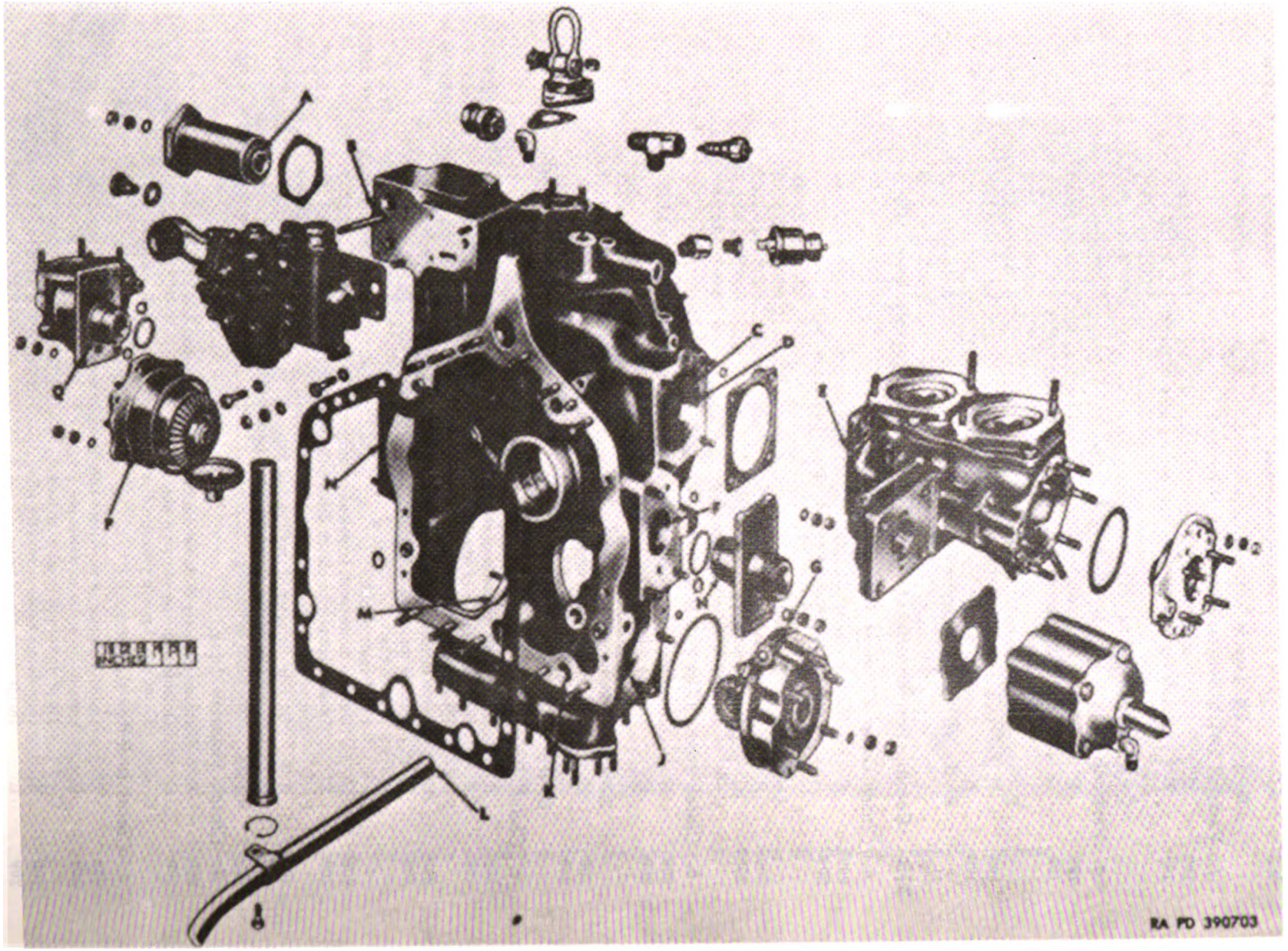



*Figure 210. Repair and rebuild standard points of measurement for accessory case pilot bores and accessory mating pilots.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| *f. Fan Drive Clutch Ball.* | | | | | |
| 209 | M | Spherical diameter of clutch ball | 0.6245 to 0.6255 | * | * |
| *g. Fan Drive Clutch Spring.* | | | | | |
| 209 | G | Approx free length of spring | 1.2900 | * | * |
| | | Solid height of spring | 0.5500-inch | * | * |
| | | Scale reading at 0.6300-inch height | 38.0000 ± 2.0000 lb | * | * |
| **314. Accessory Case Pilot Bores and Accessory Mating Pilots** | | | | | |
| *a. Starter Drive Assembly* (par. 158). | | | | | |
| 210 | M | Inside diameter of pilot bore in accessory case | 5.6875 to 5.6895 | 5.6910 | 5.6900 |
| 210 | P | Outside diameter of drive assembly pilot | 5.6860 to 5.6875 | 5.6840 | 5.6870 |
| | P—M | Fit of starter drive assembly in accessory case | 0.0000 to 0.0035L | 0.0055L | 0.0020L |
| *b. Generator Drive Adapter Assembly* (par. 153). | | | | | |
| 210 | J | Inside diameter of pilot bore in accessory case | 4.8125 to 4.8165 | * | * |
| 210 | G | Outside diameter of drive adapter pilot | 4.8060 to 4.8100 | * | * |
| | G—J | Fit of drive adapter in accessory case | 0.0025L to 0.0105L | * | * |
| *c. Magneto Drive Assembly* (par. 133). | | | | | |
| 210 | D | Inside diameter of pilot bore in accessory case | 4.2500 to 4.2510 | * | * |
| 210 | E | Outside diameter of drive assembly pilot | 4.2485 to 4.2495 | * | * |
| | E—D | Fit of magneto drive assembly in accessory case | 0.0005L to 0.0025L | * | * |
| *d. Magneto Driven Shaft Gear Adapter* (par. 123). | | | | | |
| 210 | C | Inside diameter of pilot bore in accessory case | 2.8750 to 2.8760 | * | * |
| 211 | G | Outside diameter of shaft gear adapter pilot | 2.8735 to 2.8745 | * | * |
| | G—C | Fit of shaft gear adapter in accessory case | 0.0005L to 0.0025L | * | * |
| *e. Right Camshaft Drive Housing* (par. 138). | | | | | |
| 210 | N | Inside diameter of pilot bore in accessory case | 2.1250 to 2.1260 | 2.1272 | 2.1265 |
| 210 | Q | Outside diameter of camshaft drive housing pilot | 2.1237 to 2.1247 | 2.1225 | 2.1232 |
| | Q—N | Fit of drive housing in accessory case | 0.0003L to 0.0023L | 0.0035L | 0.0028L |
| *f. Left Camshaft Drive Housing* (par. 138). | | | | | |
| 210 | F | Inside diameter of pilot bore in accessory case | 2.1250 to 2.1260 | 2.1272 | 2.1265 |
| 210 | H | Outside diameter of camshaft drive housing pilot | 2.1237 to 2.1247 | 2.1225 | 2.1232 |
| | H—F | Fit of drive housing in accessory case | 0.0003L to 0.0023L | 0.0035L | 0.0028L |
| *g. Oil Filter Assembly* (par. 232). | | | | | |
| 210 | B | Inside diameter of pilot bore in accessory case | 1.5000 to 1.5020 | * | * |
| 210 | A | Outside diameter of filter element center tube | 1.4950 to 1.4990 | * | * |
| | A—B | Fit of filter element center tube in accessory case | 0.0010L to 0.0070L | * | * |
| *h. Accessory Case Scavenger Oil Pump Outlet Tube* (par. 94). | | | | | |
| 210 | K | Inside diameter of bore in accessory case | 0.8745 to 0.8755 | * | * |
| 210 | L | Outside diameter of outlet tube | 0.8700 to 0.8740 | * | * |
| | L—K | Fit of tube in accessory case | 0.0005L to 0.0055L | * | * |
| *i. Supercharger Diffuser* (par. 123). | | | | | |
| 212 | U | Inside diameter of bore in accessory case flange | 16.3750 to 16.3780 | * | * |
| 213 | E | Outside diameter of diffuser flange | 16.3710 to 16.3740 | * | * |
| | E—U | Fit of diffuser in accessory case | 0.0010L to 0.0070L | * | * |
| *j. Fan Drive Gear Bearing Liner* (par. 123). | | | | | |
| 212 | T | Inside diameter of bearing liner pilot bore in accessory case | 3.3750 to 3.3760 | * | * |
| 212 | N | Outside diameter of bearing liner pilot | 3.3735 to 3.3745 | * | * |
| | N—T | Fit of bearing liner in accessory case | 0.0005L to 0.0025L | * | * |
| *k. Fan Drive Shaft Gear Oil Seal Housing* (par. 123). | | | | | |
| 212 | V | Inside diameter of oil seal housing bore in accessory case | 2.4375 to 2.4385 | * | * |
| 212 | MM | Small outside diameter of oil seal housing | 2.4395 to 2.4410 | * | * |
| | MM—V | Fit of oil seal housing in accessory case | 0.0010T to 0.0035T | * | * |

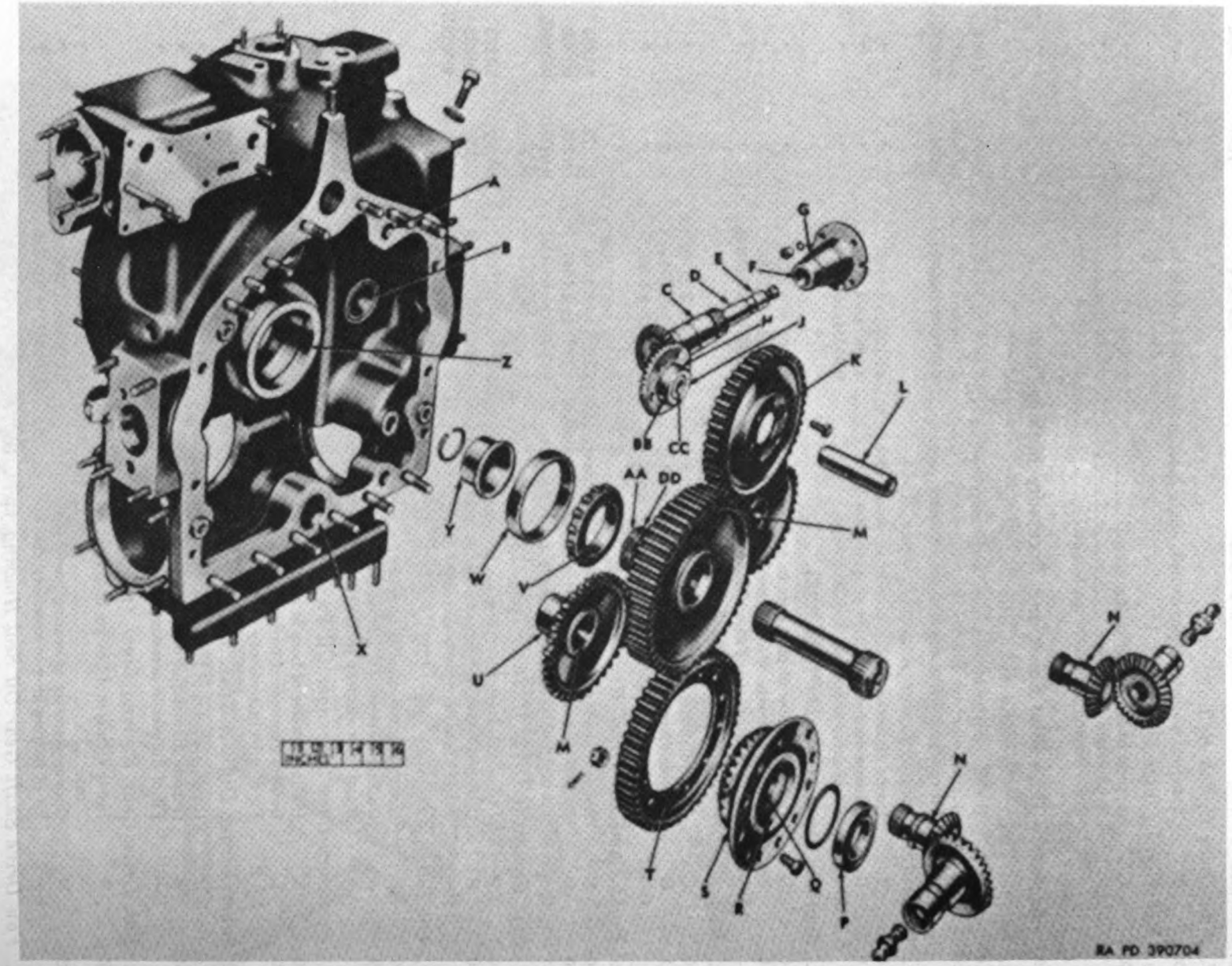



*Figure 211. Repair and rebuild standard points of measurement for rear of accessory case and gearing.*

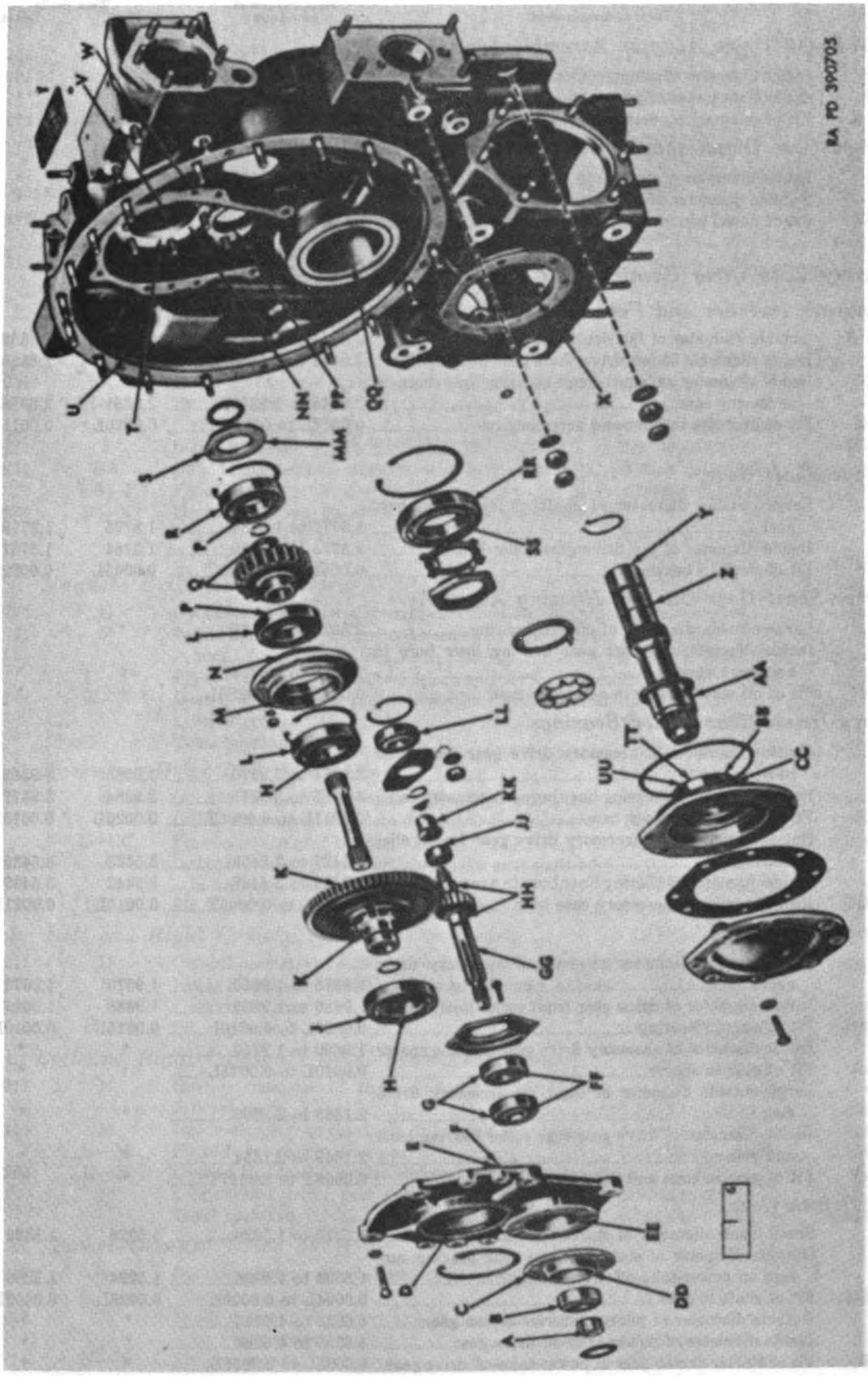



*Figure 212. Repair and rebuild standard points of measurement for front of accessory case and gearing.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| *l. Power-Take-Off Drive Adapter Assembly* (par. 123). | | | | | |
| 212 | X | Inside diameter of adapter pilot bore in accessory case | 4.6250 to 4.6270 | * | * |
| 212 | CC | Outside diameter of power-take-off adapter pilot | 4.6230 to 4.6240 | * | * |
| | CC—X | Fit of adapter in accessory case | 0.0010L to 0.0040L | * | * |
| *m. Accessory Case Diaphragm Dowel Pins* (par. 123). | | | | | |
| 212 | W | Inside diameter of dowel pin bore in accessory case | 0.3125 to 0.3135 | * | * |
| 212 | F | Outside diameter of dowel pin | 0.3126 to 0.3128 | * | * |
| | F—W | Fit of dowel pin in accessory case bore | 0.0009L to 0.0003T | * | * |

## 315. Accessory Case Drive Gearing (par. 123)

| | | | | | |
|---|---|---|---|---|---|
| *a. Supercharger Impeller and Fan Drive Gear Roller Bearings.* | | | | | |
| 212 | L and R | Outside diameter of fan drive gear roller bearings | 2.8341 to 2.8346 | 2.8333 | 2.8338 |
| 212 | M | Inside diameter of fan drive shaft gear bearing liner | 2.8345 to 2.8353 | 2.8361 | 2.8356 |
| 212 | NN | Inside diameter of shaft gear bearing liner bore in accessory case | 2.8345 to 2.8353 | 2.8361 | 2.8356 |
| | L—M R—NN | Fit of bearings in liner and accessory case | 0.0012L to 0.0001T | 0.0020L | 0.0015L |
| *b. Fan Drive Shaft Gear.* | | | | | |
| 212 | Q | Large outside diameter of shaft of fan drive shaft gear | 1.3779 to 1.3784 | 1.3775 | 1.3778 |
| 212 | P | Inside diameter of fan drive gear roller bearing | 1.3775 to 1.3780 | 1.3784 | 1.3781 |
| | Q—P | Fit of shaft in bearing | 0.0001L to 0.0009T | 0.0005L | 0.0002L |
| *c. Fan Drive Shaft Gear Oil Seal Housing Assembly.* | | | | | |
| 212 | S | Large outside diameter of oil seal housing | 2.8070 to 2.8170 | * | * |
| 212 | NN | Inside diameter of shaft gear bearing liner bore in accessory case | 2.8345 to 2.8353 | * | * |
| | S—NN | Fit of oil seal housing in accessory case | 0.0175L to 0.0283L | * | * |
| *d. Accessory Drive Gear Roller Bearings.* | | | | | |
| 211 | W | Outside diameter of accessory drive gear rear roller bearing cup | 3.9364 to 3.9370 | 3.9355 | 3.9362 |
| 211 | Z | Inside diameter of bearing liner bore in accessory case | 3.9365 to 3.9375 | 3.9384 | 3.9377 |
| | W—Z | Fit of cup in accessory case | 0.0011L to 0.0005T | 0.0020L | 0.0013L |
| 212 | RR | Outside diameter of accessory drive gear front roller bearing | 3.5427 to 3.5433 | 3.5423 | 3.5426 |
| 212 | QQ | Inside diameter of bearing liner bore in accessory case | 3.5428 to 3.5438 | 3.5442 | 3.5439 |
| | RR—QQ | Fit of bearing in accessory case bore | 0.0011L to 0.0005T | 0.0015L | 0.0021L |
| *e. Accessory Drive Gear.* | | | | | |
| 211 | AA | Small outside diameter of shaft of accessory drive gear | 1.9675 to 1.9680 | 1.9670 | 1.9678 |
| 212 | SS | Inside diameter of drive gear front roller bearing | 1.9680 to 1.9685 | 1.9688 | 1.9686 |
| | AA—SS | Fit of gear in bearing | 0.0000L to 0.0010L | 0.0015L | 0.0010L |
| 211 | Y | Inside diameter of accessory drive gear housing spacer | 1.9690 to 1.9750 | * | * |
| | Y—AA | Fit of gear in spacer | 0.0010L to 0.0075L | * | * |
| 211 | DD | Large outside diameter of shaft on accessory drive gear | 2.1660 to 2.1666 | * | * |
| 211 | V | Inside diameter of drive gear rear roller bearing cone and rollers | 2.1649 to 2,1654 | * | * |
| | DD—V | Fit of gear in cone and rollers | 0.0006T to 0.0017T | * | * |
| *f. Starter Driven Gear.* | | | | | |
| 211 | Q | Small inside diameter of starter driven gear | 1.5310 to 1.5320 | 1.5326 | 1.5322 |
| 212 | Z | Outside diameter of starter driven gear bearing surface on power-take-off drive shaft | 1.5300 to 1.5306 | 1.5294 | 1.5298 |
| | Z—Q | Fit of shaft in gear | 0.0004L to 0.0020L | 0.0026L | 0.0022L |
| 211 | S | Outside diameter of pilot on starter driven gear | 4.6235 to 4.6245 | * | * |
| 211 | T | Inside diameter of power-take-off drive gear | 4.6250 to 4.6260 | * | * |
| | S—T | Fit of starter driven gear in power-take-off drive gear | 0.0005L to 0.0025L | * | * |

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| 211 | R | Large inside diameter of starter driven gear | 2.6774 to 2.6784 | * | * |
| 211 | P | Outside diameter of starter driven gear ball bearing | 2.6767 to 2.6772 | * | * |
| | R—P | Fit of bearing in gear | 0.0002L to 0.0017L | * | * |
| 204 | K—L | Desired backlash (at mean dimension) with starter drive bevel gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0048 to 0.0152 | 0.0191 | 0.0162 |
| | | ***g. Supercharger Impeller Driven Shaft Gear Roller Bearing.*** | | | |
| 212 | LL | Outside diameter of impeller driven shaft gear roller bearing | 1.8502 to 1.8504 | 1.8497 | 1.8500 |
| 212 | PP | Inside diameter of bearing liner bore in accessory case | 1.8502 to 1.8507 | 1.8512 | 1.8509 |
| | LL—PP | Fit of roller bearing in accessory case | 0.0005L to 0.0002T | 0.0010L | 0.0007L |
| | | ***h. Magneto Drive Gear Assembly.*** | | | |
| 211 | H | Outside diameter of pilot flange on magneto drive gear | 1.6240 to 1.6250 | * | * |
| 211 | K | Inside diameter of bore in accessory drive idler gear | 1.6250 to 1.6260 | * | * |
| | H—K | Fit of magneto drive gear pilot flange in accessory drive idler gear | 0.0000 to 0.0020L | * | * |
| 211 | J | Inside diameter of bore in magneto drive gear | 1.1562 to 1.1572 | * | * |
| 211 | BB | Outside diameter of magneto drive gear bearing | 1.1580 to 1.1590 | * | * |
| | BB—J | Fit of bearing in drive gear | 0.0008T to 0.0028T | * | * |
| 204 | W—X | Desired backlash (at mean dimension) with magneto driven shaft gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0060 to 0.0140 | 0.0179 | 0.0145 |
| | | ***i. Magneto Driven Shaft Gear.*** | | | |
| 211 | C | Large outside diameter of magneto driven shaft gear | 1.4975 to 1.4985 | 1.4955 | 1.4970 |
| 211 | F | Inside diameter of magneto driven shaft gear adapter bore | 1.5000 to 1.5010 | 1.5030 | 1.5015 |
| | C—F | Fit of shaft gear in adapter | 0.0015L to 0.0035L | 0.0055L | 0.0040L |
| 204 | W—X | Desired backlash (at mean dimension) with magneto drive gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0060 to 0.0140 | 0.0179 | 0.0145 |
| | | ***j. Accessory Drive Idler Gear Shaft.*** | | | |
| 211 | L | Outside diameter of accessory drive idler gear shaft | 0.9988 to 0.9993 | 0.9970 | 0.9985 |
| 211 | CC | Inside diameter of magneto drive gear bearing bore | 1.0013 to 1.0023 | 1.0048 | 0.0027 |
| | L—CC | Fit of shaft in gear bearing bore | 0.0020L to 0.0035L | 0.0060L | 0.0045L |
| 211 | A | Inside diameter of accessory drive idler gear shaft bore in accessory case | 0.9995 to 1.0005 | * | * |
| | L—A | Fit of shaft in accessory case | 0.0002L to 0.0017L | * | * |
| | | ***k. Left and Right Camshaft Drive Idler Gears.*** | | | |
| 211 | U | Outside diameter of shaft of camshaft drive idler gears | 1.6220 to 1.6230 | 1.6200 | 1.6215 |
| 211 | B | Inside diameter of camshaft idler gear bearing bore in accessory case | 1.6250 to 1.6260 | 1.6280 | 1.6265 |
| | U—B | Fit of gear in bearing bore | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| | | ***l. Left and Right Camshaft Drive Idler Bevel Gears.*** | | | |
| 211 | N | Outside diameter of shaft of camshaft drive idler bevel gears | 1.3115 to 1.3120 | 1.3095 | 1.3110 |
| 211 | M | Inside diameter of camshaft drive idler gear bore | 1.3125 to 1.3135 | 1.3155 | 1.3140 |
| | N—M | Fit of bevel gear in idler gear | 0.0005L to 0.0020L | 0.0040L | 0.0025L |
| 204 | Q—R | Desired backlash (at mean dimension) with camshaft drive idler driven gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0058 to 0.0142 | 0.0181 | 0.0147 |
| | | ***m. Power-Take-Off Drive Shaft.*** | | | |
| 212 | Y | Outside diameter of small end of power-take-off drive shaft | 1.4970 to 1.4980 | 1.4950 | 1.4965 |
| 212 | X | Inside diameter of power-take-off drive shaft bearing bore in accessory case | 1.5000 to 1.5010 | 1.5030 | 1.5015 |
| | Y—X | Fit of drive shaft in bearing | 0.0020L to 0.0040L | 0.0060L | 0.0045L |

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 212 | AA | Outside diameter of power-take-off drive shaft bearing surface | 1.7470 to 1.7480 | 1.7450 | 1.7465 |
| 212 | BB | Inside diameter of bearing bore in power-take-off drive adapter | 1.7500 to 1.7510 | 1.7530 | 1.7515 |
| | AA—BB | Fit of shaft in adapter bearing | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| *n.* | *Power-Take-Off Drive Adapter Assembly.* | | | | |
| 212 | CC | Outside diameter of power-take-off drive adapter pilot | 4.6230 to 4.6240 | * | * |
| 212 | X | Inside diameter of pilot bore in accessory case | 4.6250 to 4.6270 | * | * |
| | CC—X | Fit of power-take-off drive adapter in accessory case | 0.0010L to 0.0040L | * | * |
| 212 | TT | Inside diameter of bearing bore in power-take-off drive adapter | 2.0000 to 2.0010 | * | * |
| 212 | UU | Outside diameter of power-take-off drive adapter sleeve bearing | 2.0015 to 2.0025 | * | * |
| | TT—UU | Fit of bearing in adapter | 0.0005T to 0.0025T | * | * |

## 316. Accessory Case Diaphragm Assembly and Supercharger Impeller Driven Shaft Gear (par. 123)

| | | | | | |
|---|---|---|---|---|---|
| *a.* | *Accessory Case Diaphragm Assembly.* | | | | |
| 212 | D | Inside diameter of large bearing liner bore in accessory case diaphragm | 2.8345 to 2.8353 | 2.8361 | 2.8355 |
| 212 | J | Outside diameter of impeller drive shaft gear roller bearing | 2.8341 to 2.8346 | 2.8333 | 2.8339 |
| | J—D | Fit of roller bearing in diaphragm | 0.0012L to 0.0001T | 0.0020L | 0.0014L |
| 212 | E | Inside diameter of dowel pin bore in diaphragm | 0.3115 to 0.3125 | * | * |
| 212 | F | Outside diameter of dowel pin | 0.3126 to 0.3128 | * | * |
| | F—E | Fit of dowel pin in diaphragm dowel pin bore | 0.0001T to 0.0013T | * | * |
| 212 | EE | Inside diameter of small bearing liner bore in accessory case diaphragm | 1.8502 to 1.8507 | 1.8512 | 1.8509 |
| 212 | G | Outside diameter of impeller driven shaft gear duplex ball bearing | 1.8502 to 1.8504 | 1.8497 | 1.8500 |
| | G—EE | Fit of duplex ball bearing in diaphragm | 0.0005L to 0.0002T | 0.0010L | 0.0007L |
| *b.* | *Supercharger Impeller Driven Shaft Gear Oil Seal Housing.* | | | | |
| 212 | C | Outside diameter of oil seal housing pilot | 1.8470 to 1.8490 | * | * |
| 212 | EE | Inside diameter of small bearing liner bore in accessory case diaphragm | 1.8502 to 1.8507 | * | * |
| | C—EE | Fit of oil seal housing in diaphragm | 0.0012L to 0.0037L | * | * |
| 212 | DD | Inside diameter of oil seal housing bore | 1.6240 to 1.6250 | * | * |
| 212 | B | Outside diameter of oil seal | 1.6260 to 1.6280 | * | * |
| | B—DD | Fit of oil seal in housing bore | 0.0010T to 0.0040T | * | * |
| *c.* | *Supercharger Impeller Driven Shaft Gear.* | | | | |
| 212 | GG | Minor diameter of external spline on shaft gear | 0.6140 to 0.6200 | * | * |
| 213 | F | Minor diameter of internal spline in impeller | 0.6365 to 0.6375 | * | * |
| | F—GG | Fit of impeller on shaft gear | 0.0165L to 0.0235L | * | * |
| 212 | GG | Major diameter of external spline on shaft gear | 0.7570 to 0.7580 | * | * |
| 213 | F | Major diameter of internal spline in impeller | 0.7590 to 0.7600 | * | * |
| | F—GG | Fit of impeller on shaft gear | 0.0010L to 0.0030L | * | * |
| 212 | A | Inside diameter of impeller spacer | 0.7610 to 0.7620 | * | * |
| | A—GG | Fit of impeller spacer on major diameter of external spline on shaft gear | 0.0030L to 0.0050L | * | * |
| 212 | HH | Outside diameter of bearing surface on shaft gear | 0.7873 to 0.7875 | 0.7871 | 0.7872 |
| 212 | FF | Inside diameter of impeller driven shaft gear duplex ball bearing | 0.7872 to 0.7874 | 0.7876 | 0.7875 |
| | FF—HH | Fit of shaft gear in duplex ball bearing | 0.0001L to 0.0003T | 0.0003L | 0.0002L |
| 212 | JJ | Inside diameter of impeller driven shaft gear roller bearing | 0.7872 to 0.7874 | 0.7876 | 0.7875 |
| | JJ—HH | Fit of shaft gear in roller bearing | 0.0001L to 0.0003T | 0.0003L | 0.0002L |

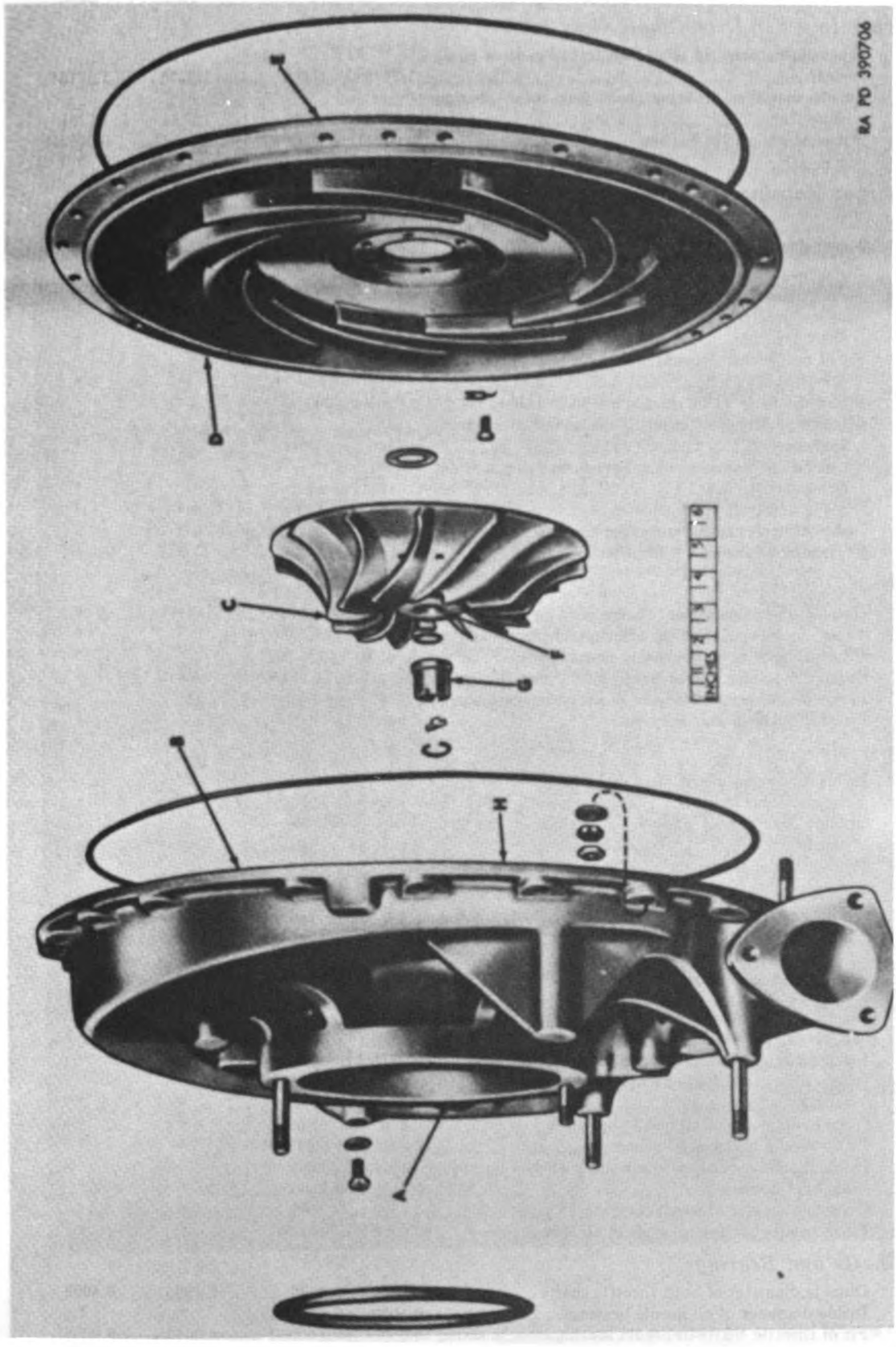



*Figure 218. Repair and rebuild standard points of measurement for supercharger impeller, housing, and diffuser.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| | | *d. Supercharger Impeller Drive Shaft Gear.* | | | |
| 212 | K | Outside diameter of shafts on impeller drive shaft gear | 1.3779 to 1.3784 | 1.3775 | 1.3778 |
| 212 | H | Inside diameter of drive shaft gear roller bearing inner race | 1.3775 to 1.3780 | 1.3784 | 1.3781 |
| | H—K | Fit of shaft gear in bearing | 0.0001L to 0.0009T | 0.0005L | 0.0002L |

## 317. Supercharger Housing, Impeller, and Diffuser (par. 123)

| | | | | | |
|---|---|---|---|---|---|
| | | *a. Supercharger Impeller.* | | | |
| | | Clearance between back face of impeller and front face of diffuser | 0.0300 to 0.0350 | * | * |
| 213 | F | Major diameter of internal spline in impeller | 0.7590 to 0.7600 | * | * |
| 212 | GG | Major diameter of external spline on impeller driven shaft gear | 0.7570 to 0.7580 | * | * |
| | F—GG | Fit of major diameters of splines in impeller and on driven shaft gear | 0.0010L to 0.0030L | * | * |
| 213 | F | Minor diameter of internal spline in impeller | 0.6365 to 0.6375 | * | * |
| 212 | GG | Minor diameter of external splines on impeller driven shaft gear | 0.6140 to 0.6200 | * | * |
| | F—GG | Fit of minor diameters of splines in impeller and on driven shaft gear | 0.0165L to 0.0235L | * | * |
| 213 | C | Outside diameter of impeller | 5.0900 to 5.1100 | * | * |
| 213 | H | Inside diameter of supercharger housing | 5.1530 to 5.1570 | * | * |
| | C—H | Fit (radial clearance) of impeller in housing | 0.0215L to 0.0335L | * | * |
| | | *b. Supercharger Diffuser.* | | | |
| 213 | D | Outside diameter of front flange pilot on diffuser | 16.3710 to 16.3740 | * | * |
| 213 | B | Inside diameter of pilot bore in supercharger housing | 16.3750 to 16.3780 | * | * |
| | D—B | Fit of diffuser in supercharger housing | 0.0010L to 0.0070L | * | * |
| 213 | E | Outside diameter of rear flange on diffuser | 16.3710 to 16.3740 | * | * |
| 212 | U | Inside diameter of pilot bore in accessory case | 16.3750 to 16.3780 | * | * |
| | E—U | Fit of diffuser in accessory case | 0.0010L to 0.0070L | * | * |
| | | *c. Supercharger Housing.* | | | |
| 213 | A | Inside diameter of air inlet housing pilot bore in supercharger housing | 6.1250 to 6.1270 | * | * |
| 214 | G | Outside diameter of pilot on supercharger air inlet housing | 6.1220 to 6.1240 | * | * |
| | G—A | Fit of air inlet housing pilot in supercharger housing | 0.0010L to 0.0050L | * | * |

## 318. Supercharger Air Inlet Housing Assembly and Control Rods (par. 128)

| | | | | | |
|---|---|---|---|---|---|
| | | *a. Supercharger Air Inlet Housing.* | | | |
| 214 | G | Outside diameter of pilot on supercharger air inlet housing | 6.1220 to 6.1240 | * | * |
| 213 | A | Inside diameter of air inlet housing pilot bore in supercharger housing | 6.1250 to 6.1270 | * | * |
| | G—A | Fit of air inlet housing pilot in supercharger housing | 0.0010L to 0.0050L | * | * |
| 214 | E | Inside diameter of all needle bearing bores in air inlet housing | 0.6860 to 0.6870 | * | * |
| 214 | D | Outside diameter of all needle bearings | 0.6860 to 0.6870 | * | * |
| | D—E | Fit of needle bearings in housing | 0.0010L to 0.0010T | * | * |
| 214 | F | Inside diameter of all needle bearing oil seal bores in air inlet housing | 0.7490 to 0.7500 | * | * |
| 214 | B | Outside diameter of needle bearing oil seals | 0.7520 to 0.7560 | * | * |
| | B—F | Fit of needle bearing oil seals in air inlet housing | 0.0020T to 0.0070T | * | * |
| | | *b. Throttle Shafts and Bearings.* | | | |
| 214 | A | Outside diameter of both throttle shafts | 0.5000 to 0.5005 | 0.4995 | 0.4998 |
| 214 | C | Inside diameter of all needle bearings | 0.5000 to 0.5005 | * | * |
| | A—C | Fit of throttle shafts in needle bearings | 0.0005L to 0.0005T | 0.0010L | 0.0007L |

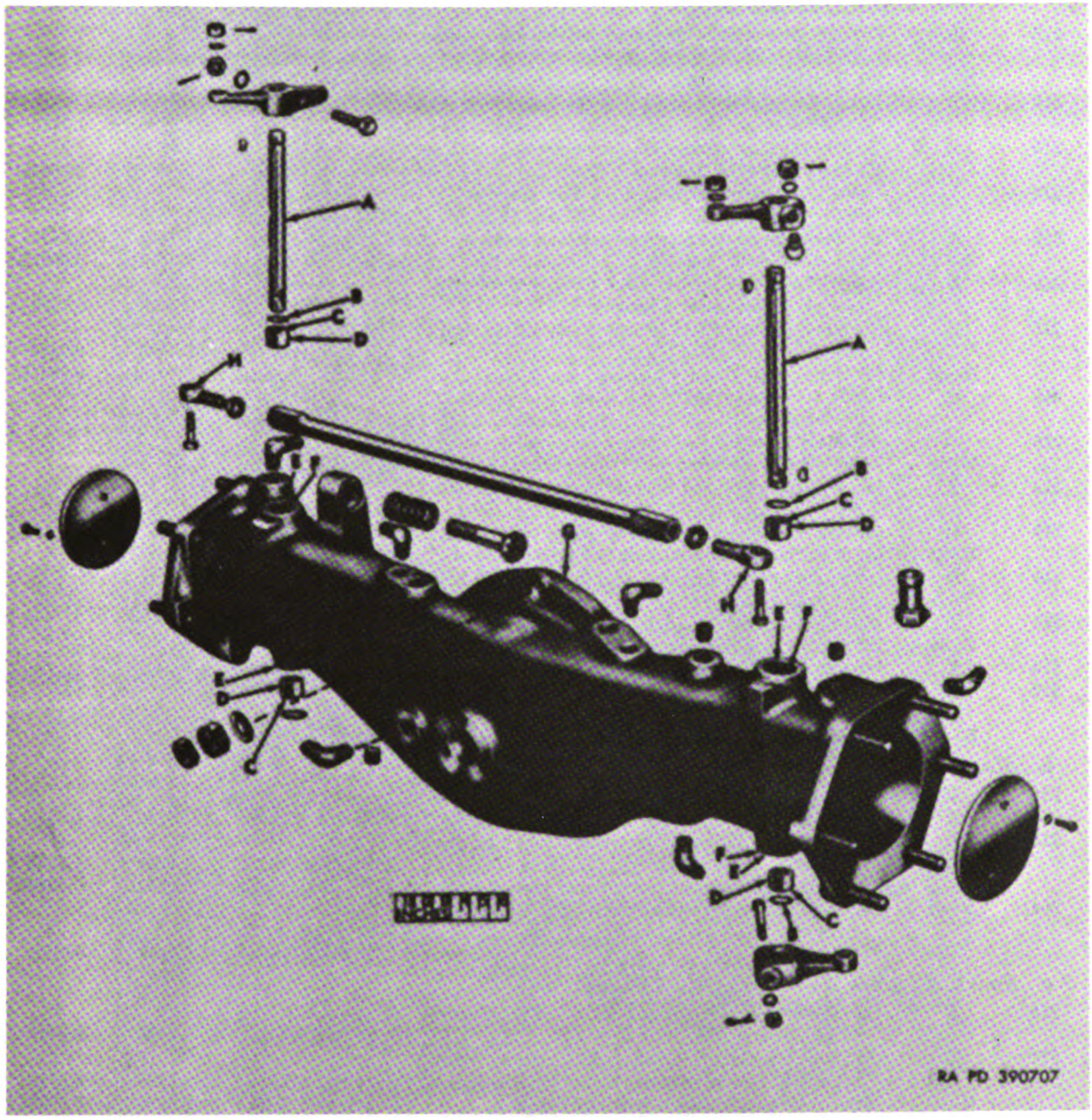



*Figure 214. Repair and rebuild standard points of measurement for supercharger air inlet housing and control rods.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| | | *c. Control Rod End Ball Bearings.* | | | |
| 214 | H | Clearance between ball and socket parallel to threaded shank | 0.0005L tc 0.0015L | 0.0100L | 0.0015L |
| | | **319. Magneto Drive Assembly (par. 133)** | | | |
| | | *a. Magneto Drive Assembly.* | | | |
| 215 | G | Inside diameter of magneto driven idler gear adapter bore in drive housing | 2.1875 to 2.1885 | * | * |
| 215 | E | Outside diameter of magneto driven idler gear adapter | 2.1860 to 2.1870 | * | * |
| | E—G | Fit of adapter in housing | 0.0005L to 0.0025L | * | * |
| 215 | H | Inside diameter of magneto driven gear bores in drive housing | 1.3750 to 1.3770 | 1.3787 | 1.3775 |
| 215 | F | Outside diameter of magneto driven gears | 1.3720 to 1.3730 | 1.3703 | 1.3715 |
| | F—H | Fit of gears in drive housing | 0.0020L to 0.0050L | 0.0067L | 0.0055L |
| 215 | V | Inside diameter of magneto drive idler gear bore in drive housing | 1.7500 to 1.7510 | 1.7530 | 1.7515 |
| 215 | S | Outside diameter of magneto drive idler gear | 1.7480 to 1.7485 | 1.7460 | 1.7475 |
| | S—V | Fit of idler gear in housing | 0.0015L to 0.0030L | 0.0050L | 0.0035L |
| 215 | N | Inside diameter of fuel injector pump driven shaft gear shaft bore in drive housing | 0.7495 to 0.7505 | 0.7525 | 0.7510 |
| 215 | R | Outside diameter of fuel injector pump driven shaft gear shaft | 0.7485 to 0.7490 | 0.7470 | 0.7480 |
| | R—N | Fit of gear shaft in drive housing | 0.0005L to 0.0020L | 0.0035L | 0.0025L |
| 215 | M | Inside diameter of fuel pump adapter pilot bore in drive housing | 3.2500 to 3.2510 | * | * |
| 216 | C | Outside diameter of fuel pump adapter pilot | 3.2490 to 3.2500 | * | * |
| | C—M | Fit of fuel pump adapter pilot in pilot bore in housing | 0.0000 to 0.0020L | * | * |
| 215 | P | Inside diameter of fuel injector pump pilot bore in drive housing | 2.0000 to 2.0020 | * | * |
| 215 | L | Outside diameter of fuel injector pump pilot | 1.9987 to 1.9997 | * | * |
| | L—P | Fit of pump pilot in pilot bore in housing | 0.0003L to 0.0033L | * | * |
| 215 | K | Inside diameter of magneto adapter dowel pin bore in drive housing | 0.2490 to 0.2500 | * | * |
| 215 | J | Outside diameter of magneto drive adapter dowel pin | 0.2501 to 0.2503 | * | * |
| | J—K | Fit of dowel pin in housing bore | 0.0001T to 0.0013T | * | * |
| 210 | E | Outside diameter of magneto drive assembly pilot | 4.2485 to 4.2495 | * | * |
| 210 | D | Inside diameter of magneto drive assembly pilot bore in accessory case | 4.2500 to 4.2510 | * | * |
| | E—D | Fit of drive assembly pilot in accessory case | 0.0005L to 0.0025L | * | * |
| | | *b. Magneto Driven Idler Shaft Gear and Adapter.* | | | |
| 215 | W | Outside diameter of shaft of magneto driven idler shaft gear | 1.6225 to 1.6230 | 1.6210 | 1.6225 |
| 215 | D | Inside diameter of bore in magneto driven idler gear adapter | 1.6250 to 1.6260 | 1.6280 | 1.6265 |
| | W—D | Fit of idler shaft gear in gear adapter bore | 0.0020L to 0.0035L | 0.0055L | 0.0040L |
| 204 | V—S | Desired backlash (at mean dimension) with magneto drive idler bevel gear | 0.0080 to 0.0120 | * | * |
| | | Total backlash | 0.0065 to 0.0135 | 0.0159 | 0.0140 |
| | | *c. Spark Advance Governor and Coupling.* | | | |
| 215 | U | Inside diameter of bearing bore in spark advance unit governor | 0.8735 to 0.8740 | 0.8760 | 0.8745 |
| 211 | D | Outside diameter of spark advance unit governor bearing surface on magneto driven shaft gear | 0.8715 to 0.8725 | 0.8695 | 0.8710 |
| | U—D | Fit of shaft gear in advance unit governor | 0.0010L to 0.0025L | 0.0045L | 0.0030L |
| 215 | T | Inside diameter of spark advance governor coupling bore | 0.8745 to 0.8755 | 0.8775 | 0.8760 |
| 211 | E | Outside diameter of spark advance governor coupling bearing surface on magneto driven shaft gear | 0.8715 to 0.8725 | 0.8695 | 0.8710 |
| | T—E | Fit of shaft in coupling bore | 0.0020L to 0.0040L | 0.0060L | 0.0045L |

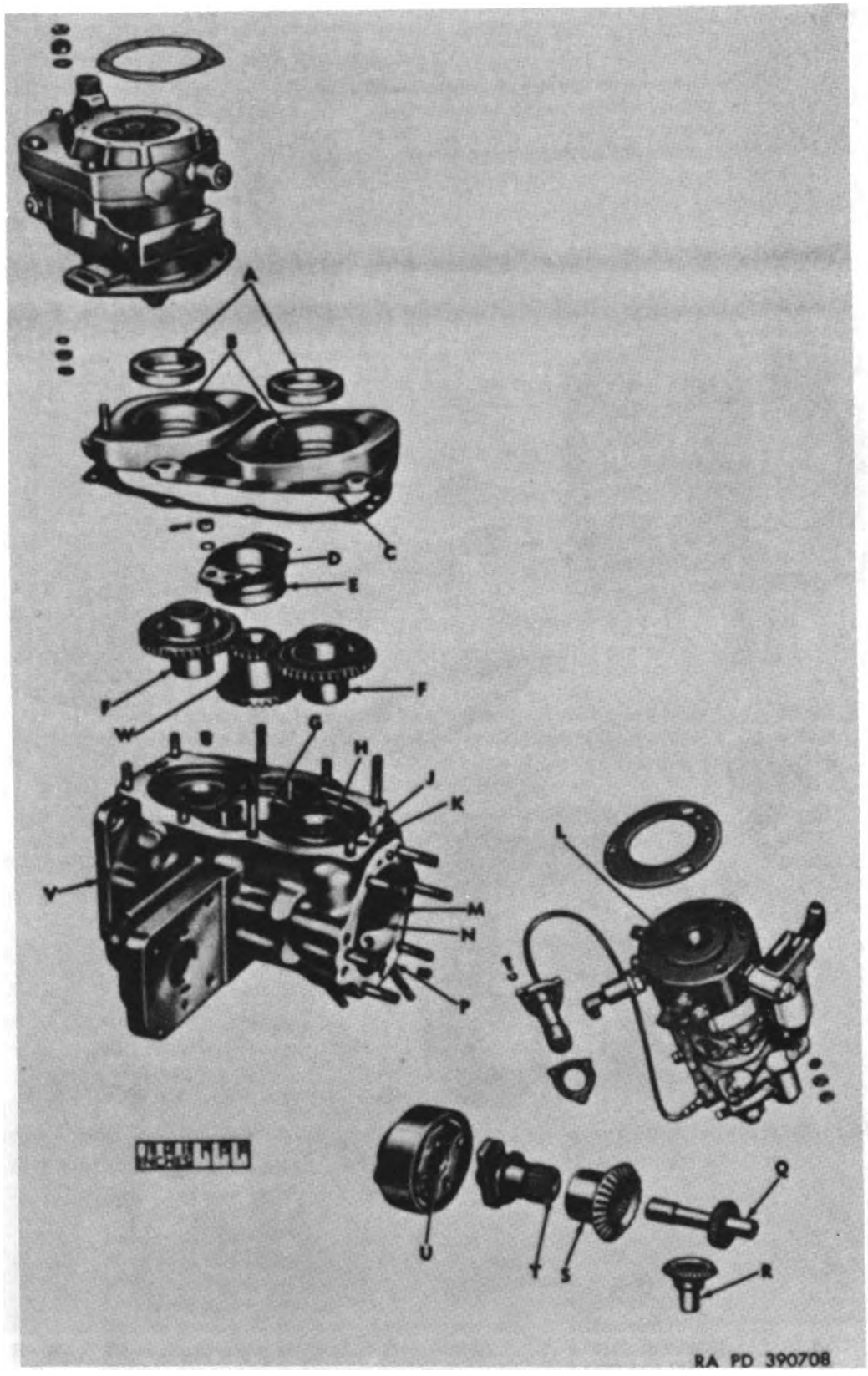



*Figure 215. Repair and rebuild standard points of measurement for magnetic drive assembly and fuel injector pump*

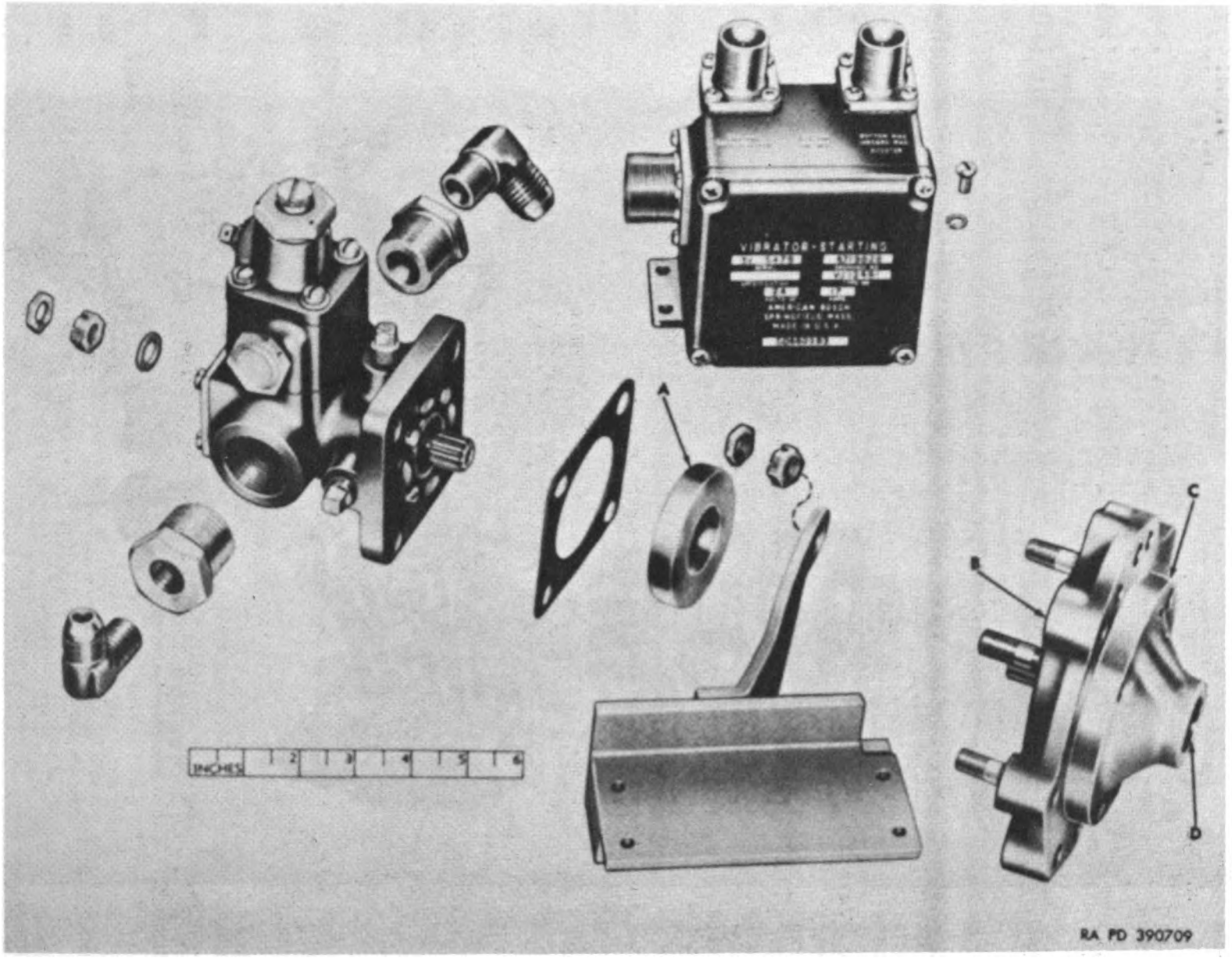



*Figure 216. Repair and rebuild standard points of measurement for vane-type fuel pump drive adapter assembly.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| | | ***d. Vane-Type Fuel Pump Drive Adapter.*** | | | |
| 216 | A | Outside diameter of fuel pump drive adapter oil seal | 1.5010 to 1.5050 | * | * |
| 216 | B | Inside diameter of oil seal bore in drive adapter | 1.4990 to 1.5000 | * | * |
| | A—B | Fit of oil seal in drive adapter bore | 0.0010T to 0.0060T | * | * |
| 216 | C | Outside diameter of fuel pump drive adapter pilot | 3.2490 to 3.2500 | * | * |
| 215 | M | Inside diameter of fuel pump adapter pilot bore in drive housing | 3.2500 to 3.2510 | * | * |
| | C—M | Fit of adapter in drive housing bore | 0.0000 to 0.0020L | * | * |
| 216 | D | Inside diameter of fuel injector pump drive gear shaft bearing bore in fuel injector pump adapter | 0.7495 to 0.7505 | 0.7525 | 0.7510 |
| 215 | Q | Outside diameter of shaft of fuel injector drive shaft gear | 0.7485 to 0.7490 | 0.7460 | 0.7480 |
| | Q—D | Fit of gear shaft in adapter bore | 0.0005L to 0.0020L | 0.0035L | 0.0025L |
| 204 | U—T | Desired backlash (at mean dimension) with fuel injector pump driven shaft gear | 0.0040 to 0.0080 | | |
| | | Total backlash | 0.0020 to 0.0100 | 0.0125 | 0.0115 |
| | | ***e. Magneto Drive Adapter Assembly.*** | | | |
| 215 | B | Inside diameter of oil seal bores in magneto drive adapter | 2.1240 to 2.1260 | * | * |
| 215 | A | Outside diameter of magneto drive adapter oil seals | 2.1270 to 2.1310 | * | * |
| | A—B | Fit of oil seals in drive adapter | 0.0010T to 0.0070T | * | * |
| 215 | C | Inside diameter of dowel pin bore in magneto drive adapter | 0.2500 to 0.2510 | * | * |
| 215 | J | Outside diameter of dowel pin | 0.2501 to 0.2503 | * | * |
| | J—C | Fit of dowel pin in adapter bore | 0.0009L to 0.0003T | * | * |

## 320. Fuel Injector Oil Booster Pump Assembly (par. 133)

| | | | | | |
|---|---|---|---|---|---|
| | | ***a. Large Piston.*** | | | |
| 217 | G | Outside diameter of booster pump large piston | 2.9980 to 2.9990 | 2.9960 | 2.9970 |
| 217 | E | Inside diameter of large bore in booster pump housing | 3.0000 to 3.0010 | 3.0030 | 3.0020 |
| | G—E | Fit of large piston in booster pump housing | 0.0010L to 0.0030L | 0.0050L | 0.0040L |
| | | ***b. Small Piston.*** | | | |
| 217 | A | Outside diameter of booster pump small piston | 0.8413 to 0.8423 | 0.8393 | 0.8383 |
| 217 | D | Inside diameter of small bore in booster pump housing | 0.8433 to 0.8443 | 0.8473 | 0.8463 |
| | A—D | Fit of small piston in booster pump housing | 0.0010L to 0.0030L | 0.0050L | 0.0040L |
| | | ***c. Booster Pump Shaft and Adapter.*** | | | |
| 217 | C | Outside diameter of booster pump shaft | 0.3725 to 0.3735 | 0.3705 | 0.3715 |
| | F | Inside diameter of fuel injector oil booster pump shaft adapter bore | 0.3745 to 0.3755 | 0.3775 | 0.3765 |
| | C—F | Fit of shaft in shaft adapter bore | 0.0010L to 0.0030L | 0.0050L | 0.0040L |
| | | ***d. Booster Pump Piston Spring.*** | | | |
| 217 | B | Approximate free length of spring | 3.2200 | | |
| | | Scale reading at 3.0600-inch height | 5.4000 ± 0.5000 lb | | |
| | | Maximum solid height | 1.8200-inch | | |

## 321. Right Camshaft Drive Housing and Governor and Fuel Pump Drives (par. 138)

| | | | | | |
|---|---|---|---|---|---|
| | | ***a. Right Camshaft Drive Housing.*** | | | |
| 218 | A | Inside diameter of governor pilot bore in camshaft drive housing | 3.0000 to 3.0010 | * | * |
| 218 | W | Outside diameter of governor body pilot | 2.9970 to 2.9990 | * | * |
| | W—A | Fit of governor body pilot in camshaft drive housing | 0.0010L to 0.0040L | * | * |
| 218 | N | Inside diameter of fuel pump drive adapter pilot bore in camshaft drive housing | 3.1250 to 3.1260 | * | * |
| 218 | H | Outside diameter of fuel pump drive adapter pilot | 3.1230 to 3.1240 | * | * |
| | H—N | Fit of adapter pilot in camshaft drive housing | 0.0010L to 0.0030L | * | * |
| 210 | Q | Outside diameter of camshaft drive housing pilot | 2.1237 to 2.1247 | 2.1225 | 2.1232 |
| 210 | N | Inside diameter of pilot bore in accessory case | 2.1250 to 2.1260 | 2.1272 | 2.1265 |
| | Q—N | Fit of drive housing in accessory case pilot bore | 0.0003L to 0.0023L | 0.0035L | 0.0028L |

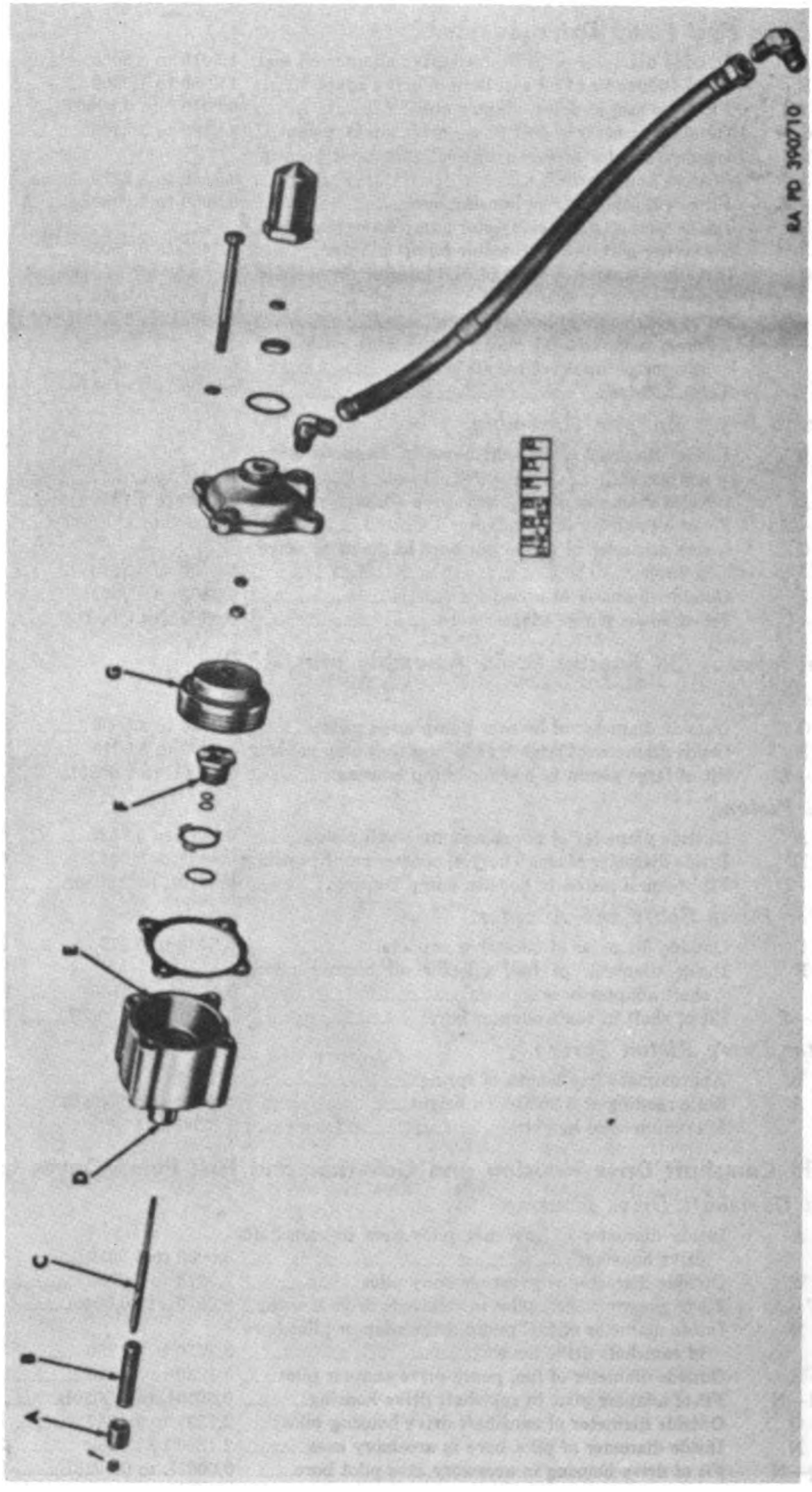



*Figure 217. Repair and rebuild standard points of measurement for fuel injector oil booster pump assembly.*

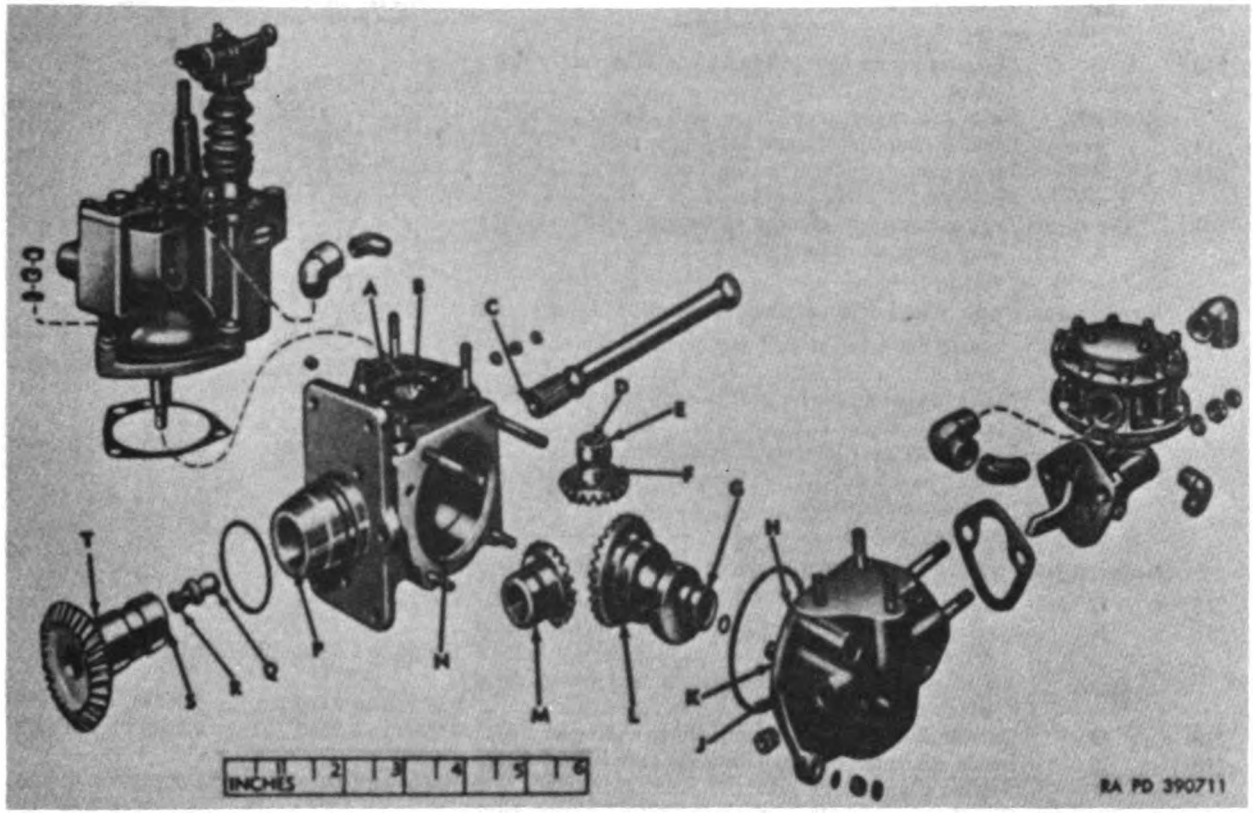



*Figure 218. Repair and rebuild standard points of measurement for right camshaft drive housing and governor and fuel pump drives.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| | | ***b. Camshaft Drive Idler Driven Gear Assembly.*** | | | |
| 218 | T | Outside diameter of idler driven gear | 1.3095 to 1.3105 | 1.3075 | 1.3090 |
| 218 | P | Inside diameter of bearing bore in camshaft drive housing | 1.3125 to 1.3135 | 1.3155 | 1.3140 |
| | T—P | Fit of driven gear in drive housing | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| 218 | S | Inside diameter of idler driven gear | 0.6245 to 0.6255 | * | * |
| 218 | R | Outside diameter of camshaft drive oil transfer inner plug | 0.6260 to 0.6270 | * | * |
| | R—S | Fit of oil transfer plug in gear | 0.0005T to 0.0025T | * | * |
| 204 | R—Q | Desired backlash (at mean dimension) with camshaft drive idler bevel gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0058 to 0.0142 | 0.0181 | 0.0147 |
| | | ***c. Camshaft Drive Shaft.*** | | | |
| 218 | C | Inside diameter of inner end of camshaft drive shaft | 0.4995 to 0.5005 | 0.5020 | 0.5010 |
| 218 | Q | Spherical outside diameter of camshaft drive oil transfer inner plug | 0.4970 to 0.4980 | 0.4955 | 0.4965 |
| | Q—C | Fit of oil plug in drive shaft bore | 0.0015L to 0.0035L | 0.0050L | 0.0040L |
| | | ***d. Governor Driven Gear.*** | | | |
| 218 | D | Inside diameter of governor drive shaft bore in governor driven gear | 0.6250 to 0.6260 | 0.6280 | 0.6265 |
| 218 | V | Outside diameter of governor drive shaft | 0.6240 to 0.6245 | 0.6220 | 0.6235 |
| | V—D | Fit of drive shaft in gear | 0.0005L to 0.0020L | 0.0040L | 0.0025L |
| 218 | E | Distance across flats of square hole in governor driven gear | 0.3120 to 0.3140 | 0.3190 | 0.3150 |

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 218 | U | Distance across flats of square end of governor drive shaft | 0.3040 to 0.3060 | 0.2990 | 0.3030 |
| | U—E | Fit of square section of drive shaft in gear | 0.0060L to 0.0100L | 0.0150L | 0.0110L |
| 218 | F | Outside diameter of governor driven gear | 0.9970 to 0.9980 | 0.9950 | 0.9965 |
| 218 | B | Inside diameter of gear bearing bore in drive housing | 0.9995 to 1.0005 | 1.0025 | 1.0010 |
| | F—B | Fit of gear in drive housing | 0.0015L to 0.0035L | 0.0055L | 0.0040L |
| 204 | G—H | Desired backlash (at mean dimension) with fuel pump and governor drive gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0059 to 0.0141 | 0.0180 | 0.0148 |
| | *e. Diaphragm-Type Fuel Pump and Governor Drive Gear.* | | | | |
| 218 | M | Outside diameter of fuel pump and governor drive gear | 1.3095 to 1.3105 | 1.3075 | 1.3090 |
| 218 | P | Inside diameter of drive gear bearing bore in camshaft drive housing | 1.3125 to 1.3135 | 1.3155 | 1.3140 |
| | M—P | Fit of drive gear in drive housing bore | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| 204 | J—H | Desired backlash (at mean dimension) with fuel pump driven shaft gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0059 to 0.0141 | 0.0180 | 0.0148 |
| | *f. Diaphragm-Type Fuel Pump Driven Shaft Gear.* | | | | |
| 218 | L | Large outside diameter of driven shaft gear | 1.9335 to 1.9345 | 1.9320 | 1.9330 |
| 218 | K | Inside diameter of large bearing bore in fuel pump drive adapter | 1.9360 to 1.9370 | 1.9384 | 1.9375 |
| | L—K | Fit of driven shaft gear shaft in fuel pump drive adapter | 0.0015L to 0.0035L | 0.0050L | 0.0040L |
| 218 | G | Outside diameter of fuel pump driven shaft gear shaft | 0.9980 to 0.9990 | 0.9965 | 0.9975 |
| 218 | J | Inside diameter of small bearing bore in fuel pump drive adapter | 1.0000 to 1.0010 | 1.0025 | 1.0015 |
| | G—J | Fit of driven shaft gear shaft in fuel pump drive adapter | 0.0010L to 0.0030L | 0.0045L | 0.0035L |
| 204 | H—J | Desired backlash (at mean dimension) with fuel pump and governor drive gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0059 to 0.0141 | 0.0180 | 0.0148 |
| 204 | G—H | Desired backlash (at mean dimension) with governor driven gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0059 to 0.0141 | 0.0180 | 0.0148 |

## 322. Throttle Control Linkage (par. 143)

| | | | | | |
|---|---|---|---|---|---|
| | *a. Throttle and Governor Control Linkage.* | | | | |
| 219 | D | Outside diameter of governor-to-throttle-control shaft | 0.6240 to 0.6245 | * | * |
| 219 | A | Inside diameter of ball bearing bore | 0.6247 to 0.6250 | * | * |
| | A—D | Fit of shaft in bearing | 0.0002L to 0.0010L | * | * |
| 219 | C | Inside diameter of control shaft supporting bracket | 1.3748 to 1.3756 | * | * |
| 219 | B | Outside diameter of ball bearing | 1.3745 to 1.3750 | * | * |
| | B—C | Fit of bearing in bracket | 0.0011L to 0.0002T | * | * |
| 219 | E | Clearance between ball and socket of rod end ball bearings (parallel to threaded shank) | 0.0005L to 0.0015L | 0.0100L | 0.0015L |
| | *b. Vehicle-Control-to-Throttle-Control Linkage.* | | | | |
| 220 | F | Outside diameter of shaft on control levers support | 0.6240 to 0.6245 | * | * |
| 220 | A | Inside diameter of ball bearing | 0.6247 to 0.6250 | * | * |
| | A—F | Fit of ball bearing on shaft | 0.0002L to 0.0010L | * | * |
| 220 | D | Inside diameter of bearing spacer | 0.6300 to 0.6400 | * | * |
| | D—F | Fit of bearing spacer on shaft | 0.0055L to 0.0160L | * | * |
| 220 | C | Inside diameter of vehicle control lever | 1.3748 to 1.3756 | * | * |
| 220 | B | Outside diameter of ball bearings | 1.3745 to 1.3750 | * | * |
| | B—C | Fit of ball bearing in lever | 0.0011L to 0.0002T | * | * |
| 220 | E | Inside diameter of throttle-control-shaft-to-vehicle-control lever | 1.3748 to 1.3756 | * | * |
| | B—E | Fit of ball bearing in lever | 0.0011L to 0.0002T | * | * |

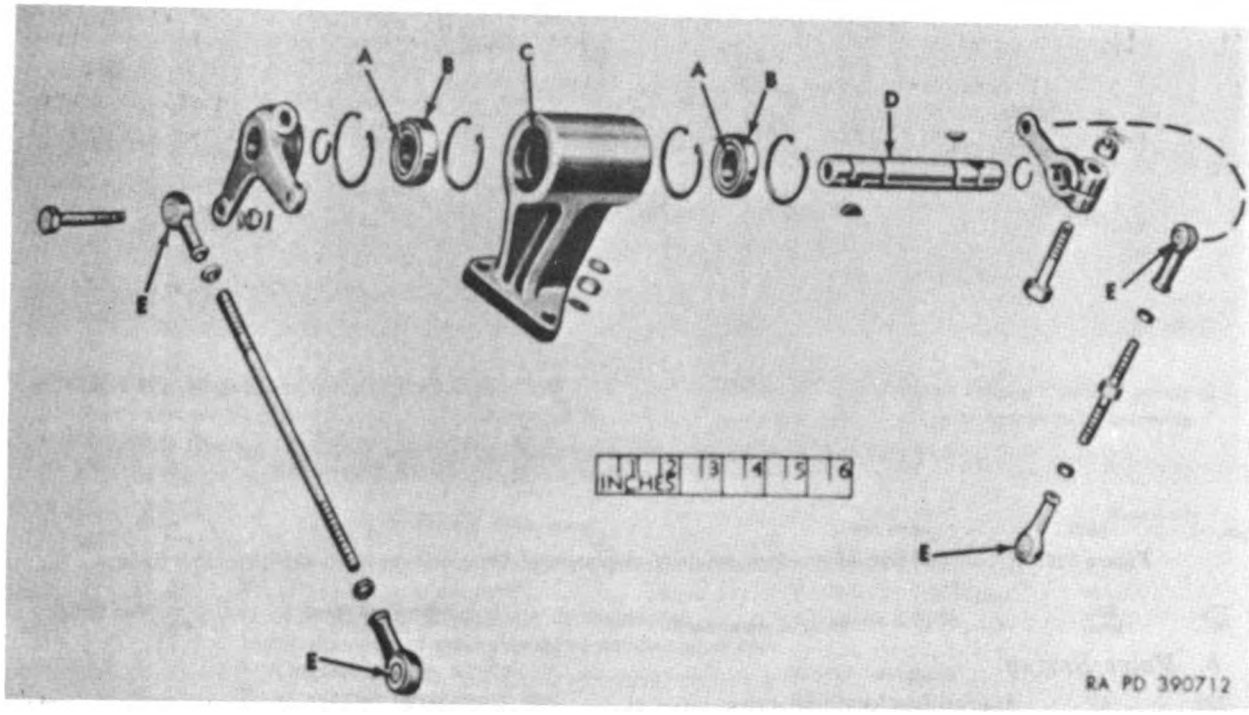



*Figure 219. Repair and rebuild standard points of measurement for throttle and governor control linkage.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 220 | G | Clearance between ball and socket of rod end ball bearings (parallel to threaded shank) | 0.0005L to 0.0015L | 0.0100L | 0.0015L |
| | *c. Spring.* | | | | |
| 220 | H | Spring | | | |
| | | Approximate free length (inside of hooks) | 3.5500 | * | * |
| | | Load at 4.5000-inches inside hooks | 14.7500 to 17.7500 lb | * | * |
| | | Load at 6.1500-inches inside hooks | 42.2500 to 46.2500 lb | * | * |

## 323. Oil Pressure Control Valve Assembly (par. 148)

| | | | | | |
|---|---|---|---|---|---|
| | *a. Valve Stem.* | | | | |
| 221 | A | Outside diameter of valve stem | 0.2420 to 0.2460 | 0.2385 | 0.2415 |
| 221 | B | Inside diameter of valve stem bore in housing | 0.2490 to 0.2505 | 0.2540 | 0.2510 |
| | A—B | Fit of stem in housing | 0.0030L to 0.0085L | 0.0120L | 0.0090L |
| | *b. Valve Spring Seat.* | | | | |
| 221 | D | Outside diameter of valve spring seat | 1.2470 to 1.2475 | 1.2450 | 1.2465 |
| 221 | C | Inside diameter of valve spring seat bore in housing | 1.2500 to 1.2510 | 1.2530 | 1.2515 |
| | D—C | Fit of spring seat in housing | 0.0025L to 0.0040L | 0.0060L | 0.0045L |
| | *c. Valve Spring.* | | | | |
| 221 | E | Approx. free length | 2.9100 | * | * |
| | | Maximum solid height | 2.0000 | * | * |
| | | Scale reading at 2.2500-inch height | 107 ± 5 lb | * | * |

## 324. Oil Filter Bypass Valve Assembly (par. 148)

| | | | | | |
|---|---|---|---|---|---|
| | *a. Valve Stem.* | | | | |
| 222 | A | Outside diameter of valve stem | 0.2420 to 0.2460 | 0.2385 | 0.2415 |
| 222 | B | Inside diameter of valve stem bore in valve housing | 0.2490 to 0.2505 | 0.2540 | 0.2510 |
| 222 | A—B | Fit of stem in valve housing | 0.0030L to 0.0085L | 0.0120L | 0.0900L |

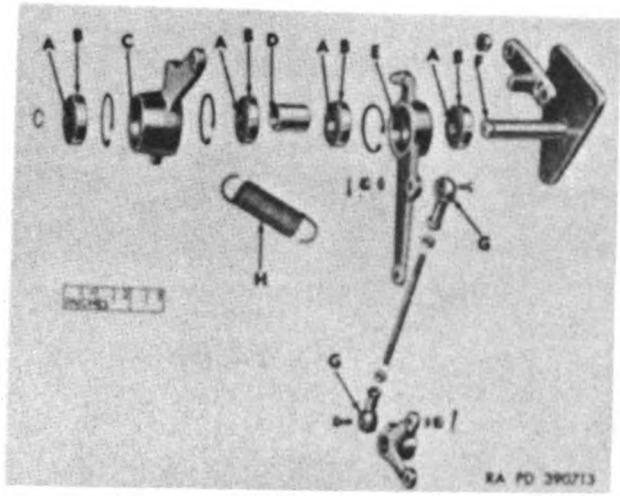


*Figure 220. Repair and rebuild standard points of measurement for vehicle-control-to-throttle-control linkage.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| | | ***b. Valve Spring.*** | | | |
| 222 | C | Approx. free length of spring | 2.1600 | * | * |
| | | Maximum solid height | 1.060 | * | * |
| | | Scale reading at 1.3800-inch height | 27.7000 ± 2.5000 lb | * | * |
| | | **325. Oil Cooler Bypass Valve Assembly (par. 148)** | | | |
| | | ***a. Valve Stem.*** | | | |
| 223 | A | Outside diameter of valve stem | 0.3070 to 0.3090 | 0.3015 | 0.3065 |
| 223 | B | Inside diameter of valve stem bore in housing | 0.3115 to 0.3135 | 0.3190 | 0.3140 |
| | A—B | Fit of stem in housing | 0.0025L to 0.0065L | 0.0120L | 0.0700L |
| | | ***b. Valve Spring.*** | | | |
| 223 | C | Approx. free length of spring | 2.1000 | * | * |
| | | Maximum solid height of spring | 1.3600 | * | * |
| | | Scale reading at 1.7500-inch height | 96.5000 ± 9.5000 lb | * | * |
| | | **326. Fuel Injector Pump Oil Pressure Regulator Valve Assembly (par. 148)** | | | |
| | | ***a. Valve*** | | | |
| 224 | B | Outside diameter of fuel injector oil pressure regulator valve | 0.9340 to 0.9345 | 0.9320 | 0.9335 |
| 224 | A | Inside diameter of bore in valve adapter | 0.9370 to 0.9380 | 0.9405 | 0.9385 |
| | B—A | Fit of valve in adapter | 0.0025L to 0.0040L | 0.0060L | 0.0045L |
| | | ***b. Spring.*** | | | |
| 224 | C | Approx. free length of spring | 2.3700 | * | * |
| | | Maximum solid height of spring | 1.2450 | * | * |
| | | Scale reading at 1.6000-inch height | 20.8000 ± 1.0000 lb | * | * |
| | | **327. Generator Drive Adapter Assembly (par. 153)** | | | |
| | | ***a. Generator Drive Adapter.*** | | | |
| 225 | B | Inside diameter of oil seal bore in generator drive adapter | 1.9990 to 2.0010 | * | * |
| 225 | A | Outside diameter of oil seal | 2.0020 to 2.0060 | * | * |
| | A—B | Fit of oil seal in adapter | 0.0010T to 0.0070T | * | * |
| 225 | P | Inside diameter of dowel pin bore in generator drive adapter | 0.2500 to 0.2510 | * | * |
| 225 | Q | Outside diameter of adapter dowel pin | 0.2501 to 0.2503 | * | * |
| | Q—P | Fit of dowel pin in drive adapter bore | 0.0009L to 0.0003T | * | * |
| 226 | B | Inside diameter of drive adapter pilot bore | 4.1250 to 4.1270 | * | * |

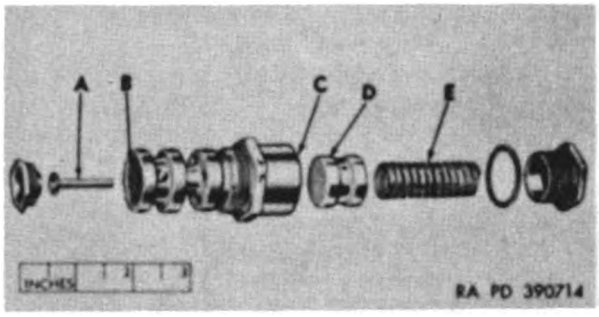



*Figure 221. Repair and rebuild standard points of measurement for oil pressure control valve assembly.*

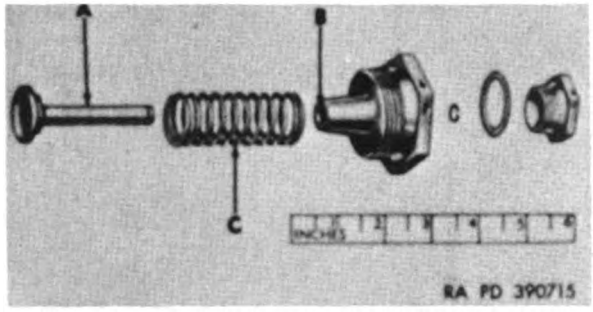



*Figure 222. Repair and rebuild standard points of measurement for oil filter bypass valve assembly.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 226 | A | Outside diameter of pilot flange on generator assembly | 4.1200 to 4.1220 | * | * |
| | A—B | Fit of generator in adapter | 0.0030L to 0.0070L | * | * |
| 210 | G | Outside diameter of generator drive adapter | 4.8060 to 4.8100 | * | * |
| 210 | J | Inside diameter of generator drive adapter pilot bore in accessory case | 4.8125 to 4.8165 | * | * |
| | G—J | Fit of adapter in accessory case | 0.0025L to 0.0105L | * | * |
| | | ***b. Generator Driven Shaft Gear Assembly.*** | | | |
| 225 | D | Outside diameter of generator driven shaft gear | 1.8715 to 1.8720 | 1.8710 | 1.8713 |
| 225 | C | Inside diameter of generator drive adapter | 1.8750 to 1.8760 | 1.8780 | 1.8765 |
| | D—C | Fit of driven shaft gear in drive adapter | 0.0030L to 0.0045L | 0.0070L | 0.0055L |
| 204 | N—P | Desired backlash (at mean dimension) with generator drive gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0042 to 0.0158 | 0.0197 | 0.0165 |
| | | ***c. Generator Drive Gear Assembly.*** | | | |
| 225 | J | Inside diameter of generator drive gear | 1.1875 to 1.1890 | * | * |
| 225 | K | Outside diameter of generator drive gear bearing | 1.1900 to 1.1910 | * | * |
| | K—J | Fit of bearing in generator drive gear | 0.0010T to 0.0035T | * | * |
| 204 | N—P | Desired backlash (at mean dimension) with generator driven shaft gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0042 to 0.0158 | 0.0197 | 0.0165 |
| | | ***d. Generator Drive Gear Bearing.*** | | | |
| 225 | L | Inside diameter of generator drive gear bearing (after assembly) | 0.9995 to 1.0005 | 1.0025 | 1.0010 |
| 225 | H | Outside diameter of bearing surface on generator drive gear shaft | 0.9980 to 0.9985 | 0.9960 | 0.9975 |
| | L—H | Fit of shaft in drive gear bearing | 0.0010L to 0.0025L | 0.0045L | 0.0030L |
| 225 | F | Inside diameter of dowel pin bore through generator drive gear bearing | 0.1180 to 0.1230 | * | * |
| 225 | E | Outside diameter of dowel pin | 0.1235 to 0.1265 | * | * |
| | E—F | Fit of dowel pin in bearing dowel pin bore | 0.0005T to 0.0085T | * | * |
| | | ***e. Generator Drive Gear Bracket.*** | | | |
| 225 | M | Inside diameter of bore in generator drive gear bracket | 0.6870 to 0.6880 | * | * |
| 225 | G | Outside diameter of generator drive gear shaft pilot | 0.6865 to 0.6870 | * | * |
| | G—M | Fit of shaft in bracket | 0.0000 to 0.0015L | * | * |
| 225 | N | Inside diameter of dowel pin bore in generator drive gear bracket | 0.2480 to 0.2490 | * | * |
| 225 | Q | Outside diameter of dowel pin | 0.2501 to 0.2503 | * | * |
| | Q—N | Fit of dowel pin in bracket pin bore | 0.0011T to 0.0023T | * | * |

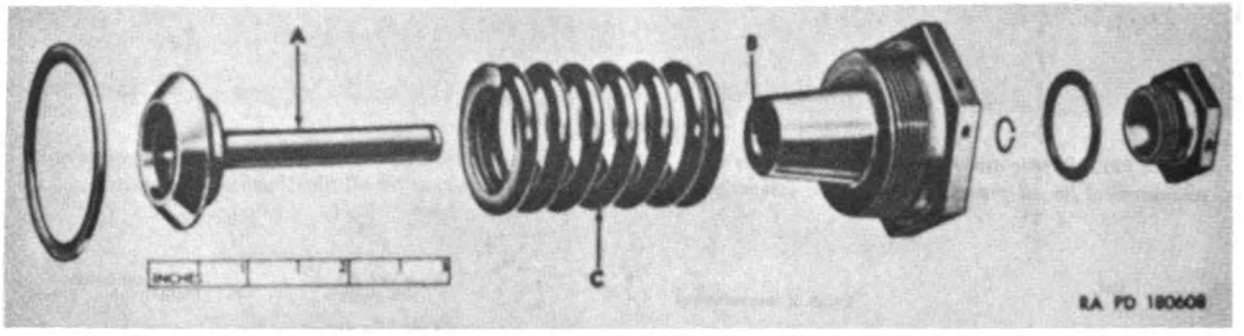



*Figure 223. Repair and rebuild standard points of measurement for oil cooler bypass valve assembly.*

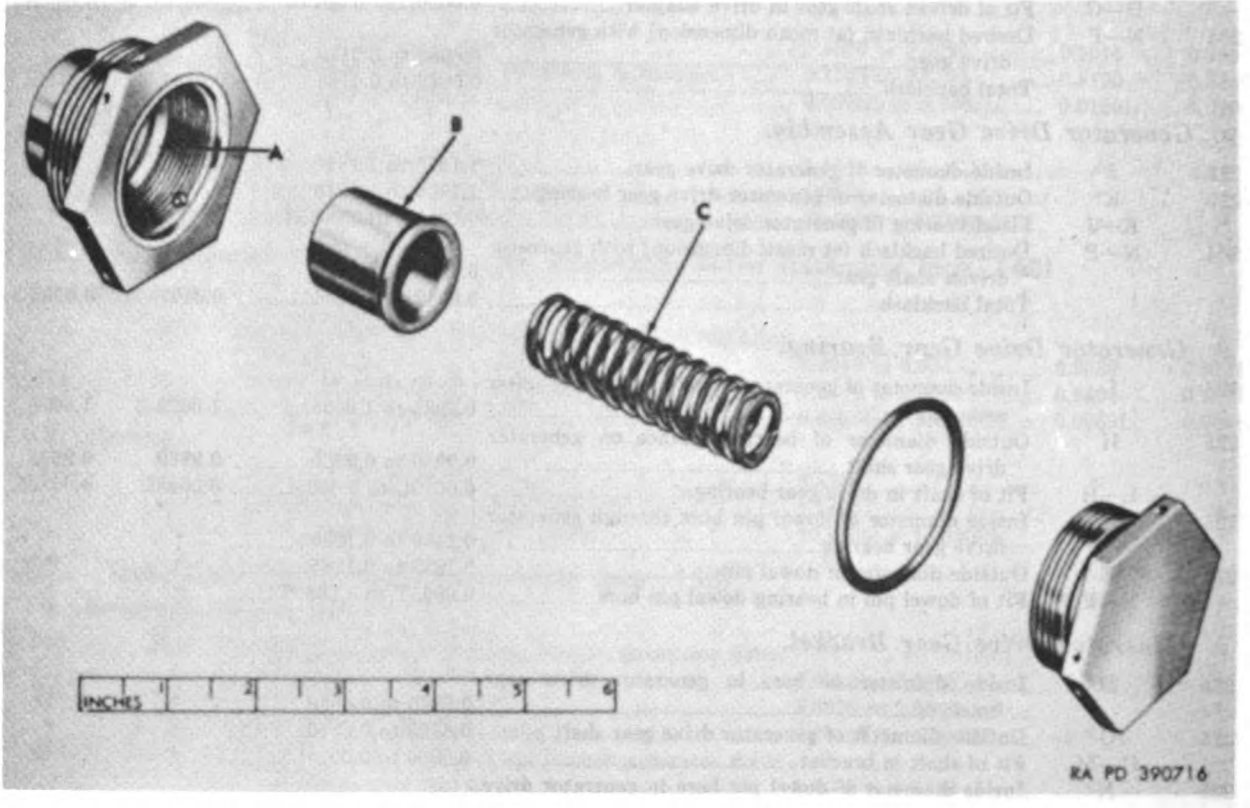



*Figure 224. Repair and rebuild standard points of measurement for fuel injector oil pressure regulator valve assembly.*

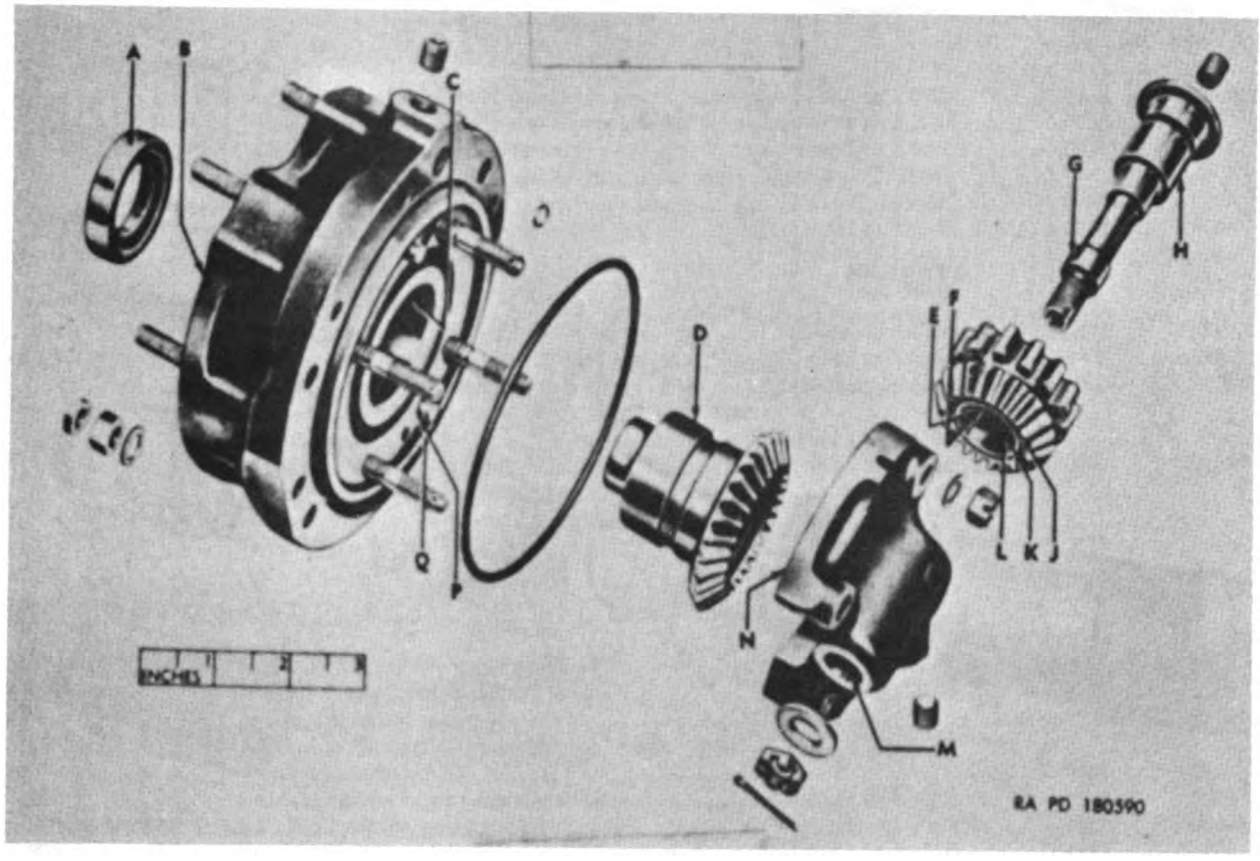



*Figure 225. Repair and rebuild standard points of measurement for generator drive adapter assembly.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| **328.** | | **Starter Drive Assembly (par. 158)** | | | |
| | | *a. Starter Drive Assembly.* | | | |
| 227 | A | Inside diameter of starter drive adapter bore | 3.5000 to 3.5020 | * | * |
| 227 | D | Outside diameter of drive adapter bearing liner | 3.4970 to 3.4990 | * | * |
| | D—A | Fit of bearing liner in adapter | 0.0010L to 0.0050L | * | * |
| 226 | C | Inside diameter of starter drive adapter pilot bore | 4.1250 to 4.1270 | * | * |
| 226 | D | Outside diameter of starter mounting adapter or starter assembly pilot | 4.1180 to 4.1220 | * | * |
| | D—C | Fit of starter assembly or mounting adapter in drive adapter bore | 0.0030L to 0.0090L | * | * |
| 210 | P | Outside diameter of starter drive assembly | 5.6860 to 5.6875 | 5.6850 | 5.6860 |
| 210 | M | Inside diameter of starter drive assembly pilot bore in accessory case | 5.6875 to 5.6895 | 5.6920 | 5.6910 |
| | P—M | Fit of starter drive assembly in accessory case | 0.0000 to 0.0035L | 0.0045L | 0.0035L |
| | | *b. Starter Drive Adapter Bearing Liner.* | | | |
| 227 | C | Small inside diameter of bearing liner bore | 3.1235 to 3.1265 | * | * |
| 227 | B | Outside diameter of drive adapter oil seal | 3.1280 to 3.1320 | * | * |
| | B—C | Fit of oil seal in bearing liner | 0.0015T to 0.0085T | * | * |
| 227 | E | Large inside diameter of bearing liner bore | 3.1496 to 3.1503 | 3.1511 | 3.1506 |
| 227 | G | Outside diameter of starter jaw ball bearing | 3.1491 to 3.1496 | 3.1483 | 3.1488 |
| | G—E | Fit of starter jaw ball bearing in bearing liner | 0.0000 to 0.0012L | 0.0020L | 0.0015L |
| 227 | J | Outside diameter of starter jaw bearing outer spacer | 3.1380 to 3.1440 | * | * |
| | J—E | Fit of bearing outer spacer in bearing liner | 0.0056L to 0.0123L | * | * |
| 227 | L | Outside diameter of starter jaw roller bearing | 3.1491 to 3.1496 | 3.1483 | 3.1488 |
| | L—E | Fit of roller bearing in bearing liner | 0.0000 to 0.0012L | 0.0020L | 0.0015L |

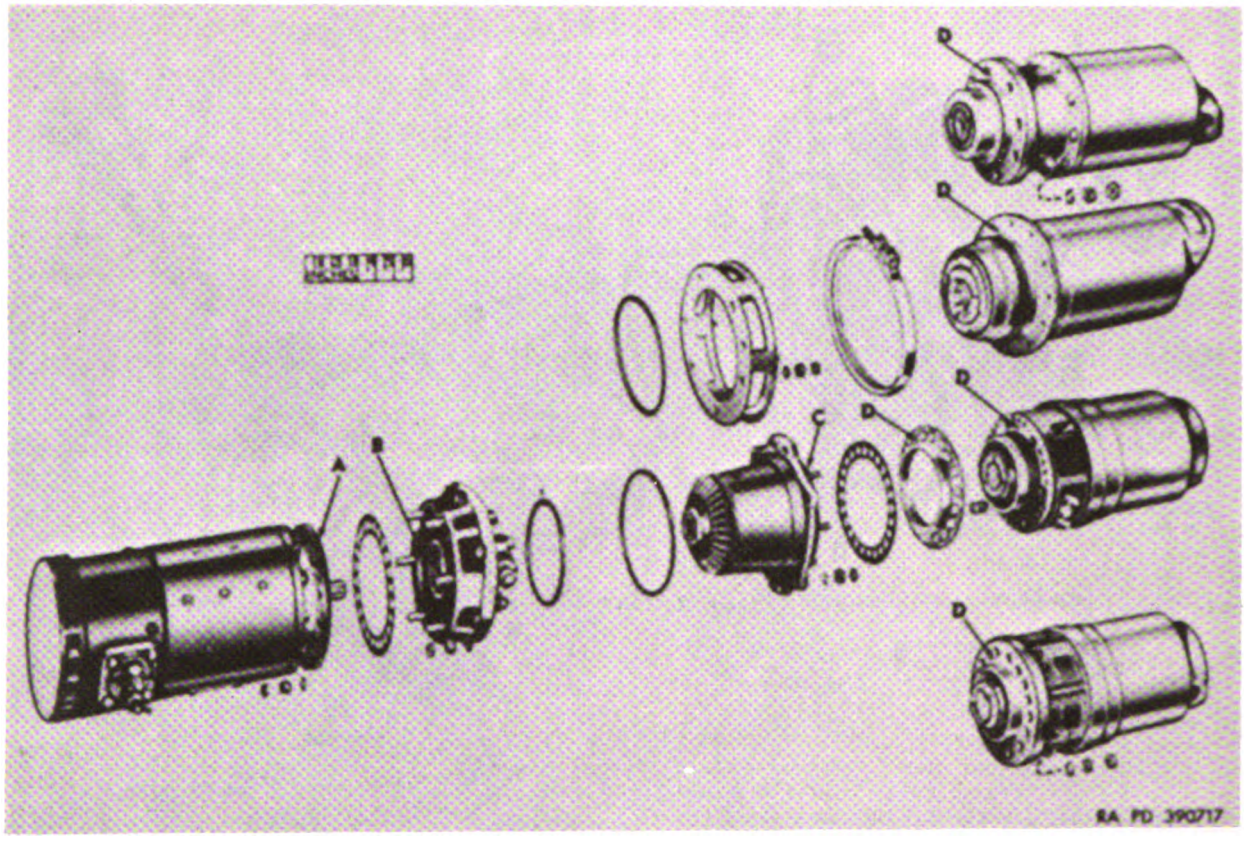



*Figure 226. Repair and rebuild standard points of measurement for starter and generator mounting pilots.*

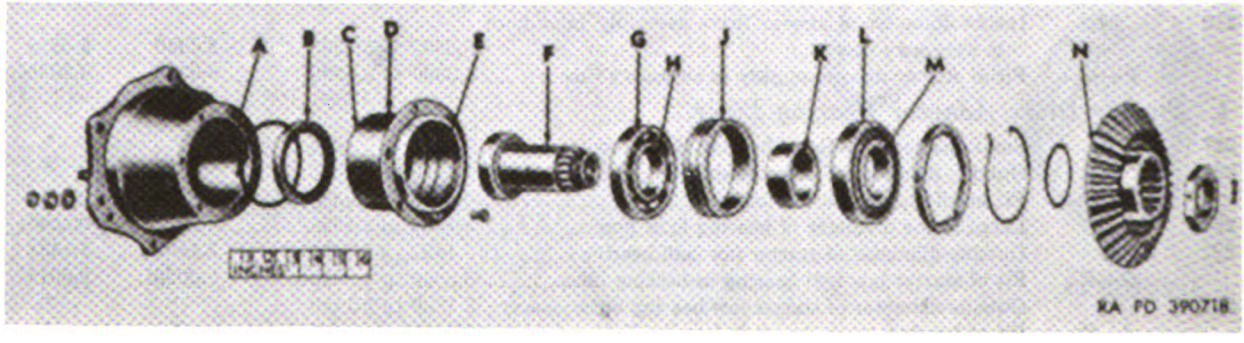



*Figure 227. Repair and rebuild standard points of measurement for starter drive assembly.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| *c. Starter Jaw.* | | | | | |
| 227 | F | Outside diameter of shaft on starter jaw | 1.5748 to 1.5753 | 1.5738 | 1.5743 |
| 227 | H | Inside diameter of starter jaw ball bearing | 1.5743 to 1.5748 | 1.5758 | 1.5753 |
| | H—F | Fit of shaft on jaw in ball bearing | 0.0000 to 0.0010T | 0.0010L | 0.0005L |
| 227 | K | Inside diameter of starter jaw bearing inner spacer | 1.5910 to 1.5970 | * | * |
| | K—F | Fit of bearing inner spacer on shaft of jaw | 0.0157L to 0.0222L | * | * |
| 227 | M | Inside diameter of starter jaw roller bearing | 1.5743 to 1.5748 | 1.5758 | 1.5753 |
| | M—F | Fit of shaft on jaw in roller bearing | 0.0000 to 0.0010T | 0.0010L | 0.0005L |
| *d. Starter Drive Bevel Gear.* | | | | | |
| 227 | N | Inside diameter of starter drive bevel gear bore | 1.5755 to 1.5765 | 1.5775 | 1.5770 |
| 227 | F | Outside diameter of shaft on starter jaw | 1.5748 to 1.5753 | 1.5738 | 1.5743 |
| | N—F | Fit of shaft on jaw in starter drive bevel gear | 0.0002L to 0.0017L | 0.0027L | 0.0022L |
| 204 | K—L | Desired backlash (at mean dimension) with starter driven gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0048 to 0.0140 | 0.0191 | 0.0149 |
| 204 | L—M | Desired backlash (at mean dimension) with accessory case scavenger oil pump drive gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0060 to 0.0140 | 0.0179 | 0.0145 |

## 329. Right Camshaft and Camshaft Drive (par. 172)

| | | | | | |
|---|---|---|---|---|---|
| *a. Camshaft.* | | | | | |
| 228 | Y | Outside diameter of camshaft journals | 1.3090 to 1.3100 | 1.3070 | 1.3085 |
| | | Maximum out-of-round of journals | 0.0010 | 0.0020 | 0.0015 |
| | | Maximum run out of center journal when supported on end journals | 0.0020 | 0.0150 | 0.0050 |
| 206 | K | Inside diameter of camshaft bearing bores | 1.3120 to 1.3130 | 1.3150 | 1.3135 |
| | Y—K | Fit of journals in bearings | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| 228 | X | Outside diameter of large journal on end of camshaft | 2.4965 to 2.4975 | 2.4945 | 2.4960 |
| 228 | Z | Inside diameter of bearing bore in camshaft gear housing | 2.5000 to 2.5010 | 2.5030 | 2.5015 |
| | X—Z | Fit of camshaft in gear housing | 0.0025L to 0.0045L | 0.0065L | 0.0050L |
| *b. Camshaft Drive Idler Driven Gear.* | | | | | |
| 228 | B | Inside diameter of idler driven gear bore | 0.6245 to 0.6255 | * | * |
| 228 | E | Outside diameter of camshaft drive oil transfer inner plug | 0.6260 to 0.6270 | * | * |
| | EE—B | Fit of oil transfer inner plug in gear | 0.0005T to 0.0025T | * | * |
| 228 | A | Outside diameter of idler driven gear | 1.3095 to 1.3105 | 1.3075 | 1.3090 |
| 228 | C | Inside diameter of bearing bore in camshaft drive housing | 1.3125 to 1.3135 | 1.3155 | 1.3140 |
| | A—C | Fit of idler driven gear in drive housing | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| 204 | R—Q | Desired backlash (at mean dimension) with camshaft drive idler bevel gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0058 to 0.0142 | 0.0181 | 0.0148 |
| *c. Camshaft Drive Housing.* | | | | | |
| 210 | Q | Outside diameter of camshaft drive housing pilot | 2.1237 to 2.1247 | 2.1225 | 2.1232 |
| 210 | N | Inside diameter of pilot bore in accessory case | 2.1250 to 2.1260 | 2.1272 | 2.1265 |
| | Q—N | Fit of drive housing in accessory case | 0.0003L to 0.0023L | 0.0035L | 0.0028L |
| *d. Camshaft Drive Bevel Gear.* | | | | | |
| 228 | D | Outside diameter of camshaft drive bevel gear | 1.4030 to 1.4040 | 1.4010 | 1.4025 |
| 228 | CC | Inside diameter of camshaft drive shaft support bore | 1.4065 to 1.4075 | 1.4095 | 1.4080 |
| | D—CC | Fit of gear in support | 0.0025L to 0.0045L | 0.0065L | 0.0050L |
| 228 | BB | Inside diameter of camshaft drive bevel gear | 1.0750 to 1.0760 | 1.0770 | 1.0765 |
| 228 | H | Outside diameter of camshaft drive oil transfer outer plug | 1.0740 to 1.0745 | 1.0730 | 1.0735 |
| | H—BB | Fit of oil transfer outer plug in camshaft drive bevel gear | 0.0005L to 0.0020L | 0.0030L | 0.0025L |

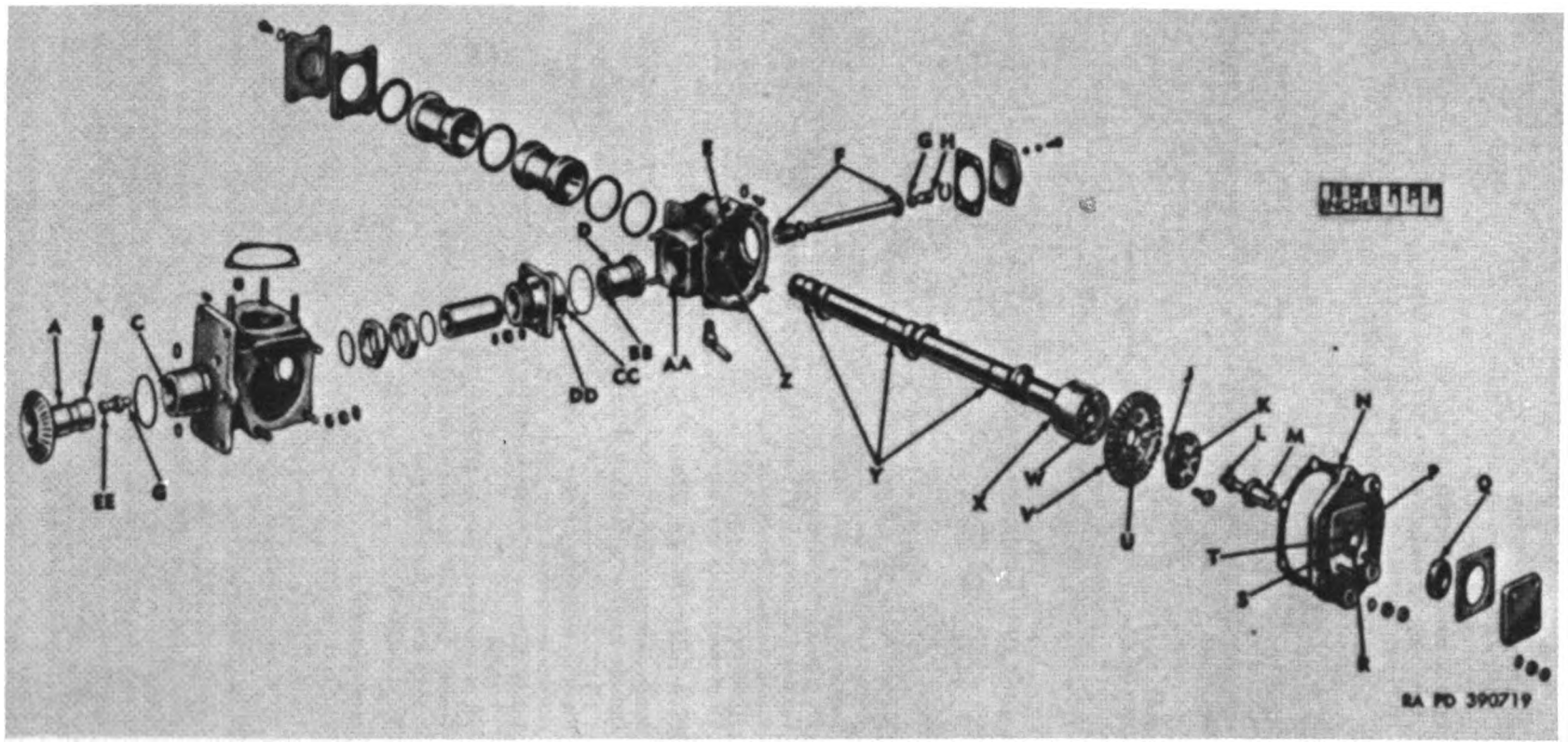



*Figure 228. Repair and rebuild standard points of measurement for right camshaft and camshaft drive.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 204 | F—E | Desired backlash (at mean dimension) with camshaft driven gear | 0.0060 to 0.0120 | | |
| | | Total backlash | 0.0055 to 0.0165 | 0.0204 | 0.0180 |
| *e.* | *Camshaft Driven Gear.* | | | | |
| 228 | V | Outside diameter of pilot flange on camshaft driven gear | 3.3115 to 1.3125 | * | * |
| 228 | W | Inside diameter of mating bore in camshaft | 1.3120 to 1.3130 | * | * |
| | V—W | Fit of camshaft driven gear pilot in camshaft | 0.0015L to 0.0005T | * | * |
| 228 | U | Inside diameter of camshaft driven gear | 1.0000 to 1.0010 | * | * |
| 228 | J | Small outside diameter of camshaft oil retaining cover | 0.9980 to 0.9990 | * | * |
| | J—U | Fit of oil retaining cover in camshaft bevel gear | 0.0010L to 0.0030L | * | * |
| 204 | E—F | Desired backlash (at mean dimension) with camshaft drive bevel gear | 0.0060 to 0.0120 | | |
| | | Total backlash | 0.0055 to 0.0165 | 0.0204 | 0.0180 |
| *f.* | *Camshaft Drive Shaft.* | | | | |
| 228 | F | Inside diameter of bores in both ends of camshaft drive shaft | 0.4995 to 0.5005 | 0.5020 | 0.5010 |
| 228 | G | Spherical outside diameter of camshaft drive oil transfer inner and outer plugs | 0.4970 to 0.4980 | 0.4955 | 0.4965 |
| | F—G | Fit of plugs in drive shaft | 0.0015L to 0.0035L | 0.0050L | 0.0040L |
| *g.* | *Camshaft Gear Housing.* | | | | |
| 228 | AA | Inside diameter of support bore in gear housing | 2.4380 to 2.4390 | * | * |
| 228 | DD | Outside diameter of camshaft drive shaft support | 2.4367 to 2.4377 | * | * |
| | AA—DD | Fit of drive shaft support in gear housing | 0.0003L to 0.0023L | * | * |
| *h.* | *Tachometer Drive Shaft and Adapter Assembly.* | | | | |
| 228 | L | Distance across flats of square end of tachometer drive shaft | 0.5070 to 0.5090 | * | * |
| 228 | K | Distance across flats of bore in camshaft oil retaining cover | 0.5100 to 0.5120 | * | * |
| | L—K | Fit of drive shaft in oil retaining cover | 0.0010L to 0.0050L | * | * |
| 228 | M | Outside diameter of tachometer drive shaft | 0.7470 to 0.7480 | 0.7450 | 0.7465 |
| 228 | R | Inside diameter of tachometer drive adapter bearing bore | 0.7495 to 0.7505 | 0.7525 | 0.7510 |
| | M—R | Fit of drive shaft in adapter bearing | 0.0015L to 0.0035L | 0.0055L | 0.0040L |
| 228 | N | Outside diameter of tachometer drive adapter pilot | 4.3090 to 4.3100 | 4.3070 | 4.3085 |
| 228 | E | Inside diameter of tachometer drive adapter bore in camshaft gear housing | 4.3115 to 4.3135 | 4.3155 | 4.3140 |
| | E—N | Fit of tachometer drive adapter in camshaft gear housing | 0.0015L to 0.0045L | 0.0065L | 0.0050L |
| 228 | P | Inside diameter of oil seal bore in tachometer drive adapter | 1.4990 to 1.5000 | * | * |
| 228 | Q | Outside diameter of tachometer drive adapter oil seal | 1.5010 to 1.5050 | * | * |
| | Q—P | Fit of oil seal in tachometer drive adapter | 0.0010T to 0.0060T | * | * |
| 228 | S | Inside diameter of bearing bore in tachometer drive adapter | 0.8750 to 0.8755 | * | * |
| 228 | T | Outside diameter of tachometer drive adapter bearing | 0.8770 to 0.8780 | * | * |
| | S—T | Fit of bearing in adapter | 0.0015T to 0.0030T | * | * |

## 330. Left Camshaft and Camshaft Drive (par. 172)

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| *a.* | *Camshaft.* | | | | |
| 229 | S | Outside diameter of camshaft journals | 1.3090 to 1.3100 | 1.3070 | 1.3085 |
| | | Maximum out-of-round of journals | 0.0010 | 0.0020 | 0.0015 |
| | | Maximum run out of center journal when supported on end journals | 0.0020 | 0.0150 | 0.0050 |
| 208 | K | Inside diameter of camshaft bearing bores | 1.3120 to 1.3130 | 1.3150 | 1.3135 |
| | S—K | Fit of journals in bearings | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| 229 | G | Inside diameter of bore in rocker box cover plate (No. 6 cylinder) | 1.3120 to 1.3130 | 1.3150 | 1.3135 |

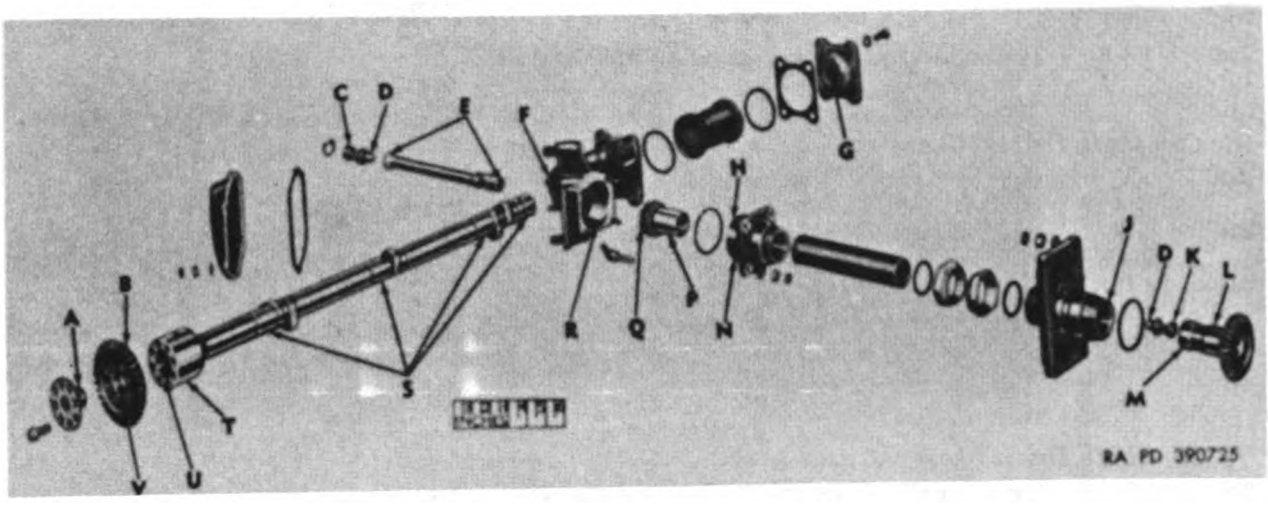



*Figure 229. Repair and rebuild standard points of measurement for left camshaft and camshaft drive.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| | S—G | Fit of camshaft in cover plate | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| 229 | T | Outside diameter of large journal on end of camshaft | 2.4965 to 2.4975 | 2.4945 | 2.4960 |
| 229 | F | Inside diameter of camshaft bearing bore in gear housing | 2.5000 to 2.5010 | 2.5030 | 2.5015 |
| | T—F | Fit of camshaft in gear housing | 0.0025L to 0.0045L | 0.0065L | 0.0050L |
| | *b. Camshaft Drive Idler Driven Gear.* | | | | |
| 229 | M | Inside diameter of bore in idler driven gear | 0.6245 to 0.6255 | * | * |
| 229 | K | Outside diameter of camshaft drive oil transfer inner plug | 0.6260 to 0.6270 | * | * |
| | K—M | Fit of oil transfer inner plug in idler driven gear | 0.0005T to 0.0025T | * | * |
| 229 | L | Outside diameter of idler driven bevel gear | 1.3095 to 1.3105 | 1.3075 | 1.3090 |
| 229 | J | Inside diameter of bearing bore in camshaft drive housing | 1.3125 to 1.3135 | 1.3155 | 1.3140 |
| | L—J | Fit of gear in drive housing | 0.0020L to 0.0040L | 0.0060L | 0.0045L |
| 204 | R—Q | Desired backlash (at mean dimension) with camshaft drive idler bevel gear | 0.0080 to 0.0120 | | |
| | | Total backlash | 0.0058 to 0.0142 | 0.0181 | 0.0148 |
| | *c. Camshaft Drive Housing.* | | | | |
| 210 | H | Outside diameter of camshaft drive housing pilot | 2.1237 to 2.1247 | 2.1225 | 2.1232 |
| 210 | F | Inside diameter of pilot bore in accessory case | 2.1250 to 2.1260 | 2.1272 | 2.1265 |
| | H—F | Fit of drive housing in accessory case | 0.0003L to 0.0023L | 0.0035L | 0.0028L |
| | *d. Camshaft Drive Bevel Gear.* | | | | |
| 229 | P | Outside diameter of camshaft drive bevel gear | 1.4030 to 1.4040 | 1.4010 | 1.4020 |
| 229 | H | Inside diameter of camshaft drive shaft support bore | 1.4065 to 1.4075 | 1.4095 | 1.4080 |
| | P—H | Fit of drive bevel gear in support | 0.0025L to 0.0045L | 0.0065L | 0.0050L |
| 229 | Q | Inside diameter of drive bevel gear bore | 1.0750 to 1.0760 | 1.0770 | 1.0765 |
| 229 | C | Outside diameter of camshaft drive oil transfer outer plug | 1.0740 to 1.0745 | 1.0730 | 1.0735 |
| | C—Q | Fit of oil transfer outer plug in drive bevel gear | 0.0005L to 0.0020L | 0.0030L | 0.0025L |
| 204 | E—F | Desired backlash (at mean dimension) with camshaft driven gear | 0.0060 to 0.0120 | | |
| | | Total backlash | 0.0055 to 0.0165 | 0.0204 | 0.0180 |
| | *e. Camshaft Driven Gear.* | | | | |
| 229 | B | Outside diameter of pilot flange of camshaft driven gear | 1.3115 to 1.3125 | * | * |
| 229 | U | Inside diameter of mating bore in camshaft | 1.3120 to 1.3130 | * | * |
| | B—U | Fit of gear pilot in camshaft | 0.0015L to 0.0005T | * | * |

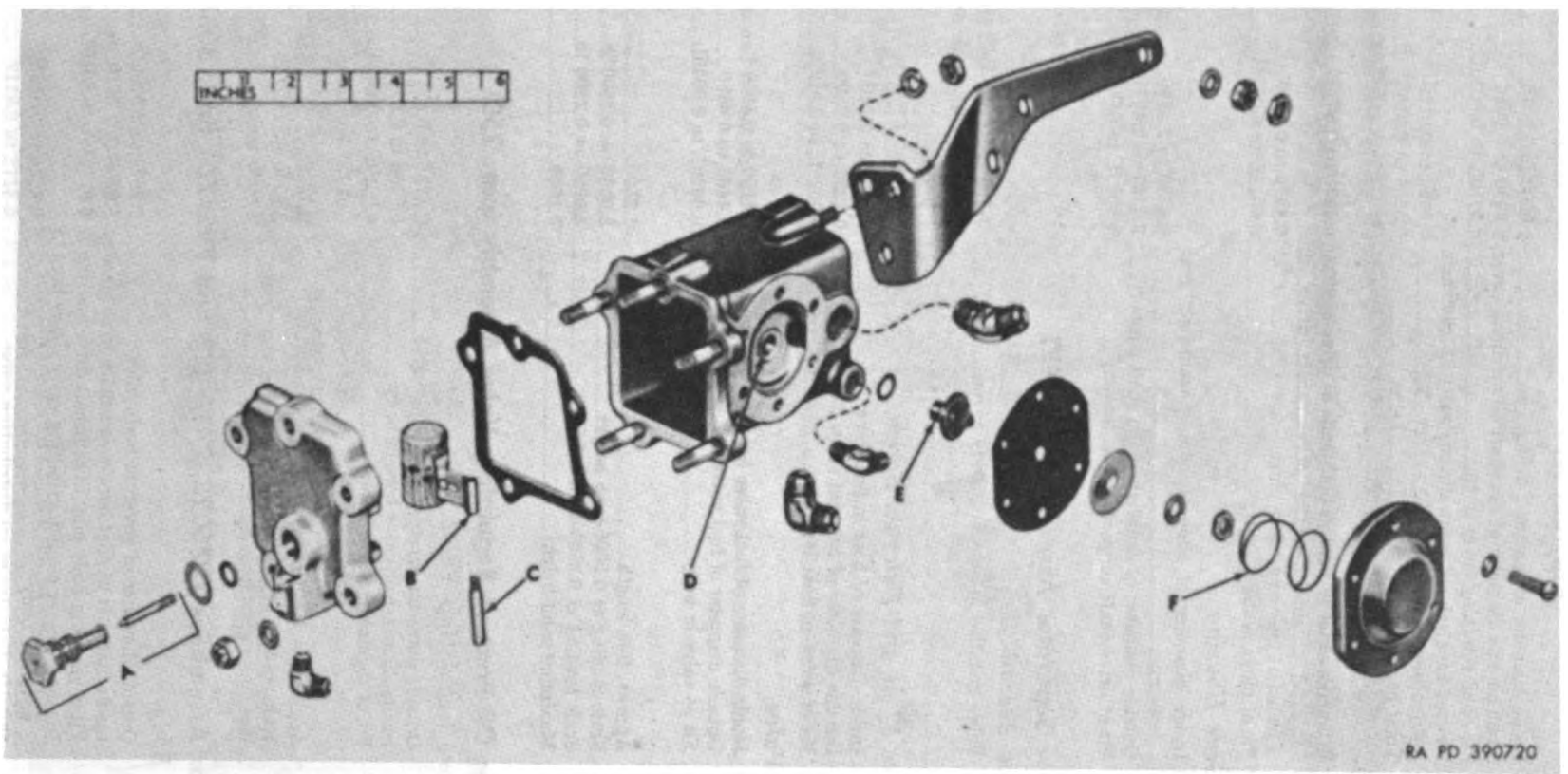



*Figure 230. Repair and rebuild standard points of measurement for fuel vapor separator assembly.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 229 | V | Inside diameter of camshaft driven gear | 1.0000 to 1.0010 | * | * |
| 229 | A | Small outside diameter of camshaft oil retaining cover | 0.9980 to 0.9990 | * | * |
| | A—V | Fit of oil retaining cover in gear | 0.0010L to 0.0030L | * | * |
| 204 | E—F | Desired backlash (at mean dimension) with camshaft drive bevel gear | 0.0060 to 0.0120 | | |
| | | Total backlash | 0.0055 to 0.0165 | 0.0204 | 0.0180 |
| | *f. Camshaft Drive Shaft.* | | | | |
| 229 | E | Inside diameter of bore in both ends of drive shaft | 0.4995 to 0.5005 | 0.5020 | 0.5010 |
| 229 | D | Spherical outside diameter of camshaft drive oil transfer inner and outer plugs | 0.4970 to 0.4980 | 0.4955 | 0.4965 |
| | E—D | Fit of plugs in drive shaft | 0.0015L to 0.0035L | 0.0050L | 0.0040L |
| | *g. Camshaft Gear Housing.* | | | | |
| 229 | R | Inside diameter of support bore in camshaft gear housing | 2.4380 to 2.4390 | * | * |
| 229 | N | Outside diameter of camshaft drive shaft support | 2.4367 to 2.4377 | * | * |
| | N—R | Fit of drive shaft support in gear housing | 0.0003L to 0.0023L | * | * |

## 331. Fuel Vapor Separator Assembly (par. 197)

| | | | | | |
|---|---|---|---|---|---|
| | *a. Vapor Valve Assembly.* | | | | |
| 230 | A | Valve installed in separator body cover | Valve must not leak air with 4 psi load on plunger | | |
| | *b. Vapor Valve Float and Fulcrum Screw.* | | | | |
| 230 | B | Inside diameter of bore in float lever | 0.2320 to 0.2400 | * | * |
| 230 | C | Outside diameter of fulcrum screw | 0.2280 to 0.2300 | * | * |
| | C—B | Fit of screw in float lever | 0.0020L to 0.0120L | * | * |
| | *c. Fuel Inlet Valve.* | | | | |
| 230 | D | Inside diameter of fuel valve bore in separator body | 0.4490 to 0.4500 | 0.4520 | 0.4510 |
| 230 | E | Outside diameter of fuel valve | 0.4460 to 0.4480 | 0.4440 | 0.4450 |
| | E—D | Fit of valve in body | 0.0010L to 0.0040L | 0.0060L | 0.0050L |
| | *d. Spring.* | | | | |
| 230 | F | Approx. free length | 1.2500 | * | * |
| | | Scale reading at 0.5000-inch height | 3.0000 ± 0.2500 lb | * | * |
| | | Scale reading at 0.2500-inch height | 4.0000 ± 0.2500 lb | * | * |
| | | Maximum solid height | 0.2000 | * | * |

## 332. Governor Oil Pressure Regulating Valve Assembly (par. 250)

| | | | | | |
|---|---|---|---|---|---|
| | *a. Oil Pressure Regulating Valve.* | | | | |
| 231 | A | Outside diameter pressure regulating valve | 0.8735 to 0.8740 | 0.8725 | 0.8730 |
| 231 | B | Inside diameter of valve bore in body | 0.8750 to 0.8755 | 0.8770 | 0.8760 |
| | A—B | Fit of regulating valve in body | 0.0010L to 0.0020L | 0.0030L | 0.0025L |
| | *b. Spring.* | | | | |
| 231 | C | Approx free length of regulating valve spring | 2.7300 | * | * |
| | | Scale reading at 2.5300-inch height | 3.8000 ±0.1900 lb | * | * |
| | | Maximum solid height | 1.4000-inch | * | * |

## 333. Governor Assemblies 7376023, 7410402, and 7954764 (par. 303)

| | | | | | |
|---|---|---|---|---|---|
| | *a. Governor Body.* | | | | |
| 218 | W | Outside diameter of governor body pilot | 2.9970 to 2.9990 | * | * |
| 218 | A | Inside diameter of pilot bore in camshaft drive housing | 3.0000 to 3.0010 | * | * |
| | W—A | Fit of governor body pilot in camshaft drive housing | 0.0010L to 0.0040L | * | * |
| 232 | M | Inside diameter of oil distributing valve sleeve bore in governor body | 0.8125 to 0.8135 | 0.8162 | 0.8140 |
| 232 | F | Outside diameter of oil distributing valve | 0.8112 to 0.8117 | 0.8085 | 0.8107 |
| | F—M | Fit of oil distributing valve in sleeve | 0.0008L to 0.0023L | 0.0050L | 0.0028L |

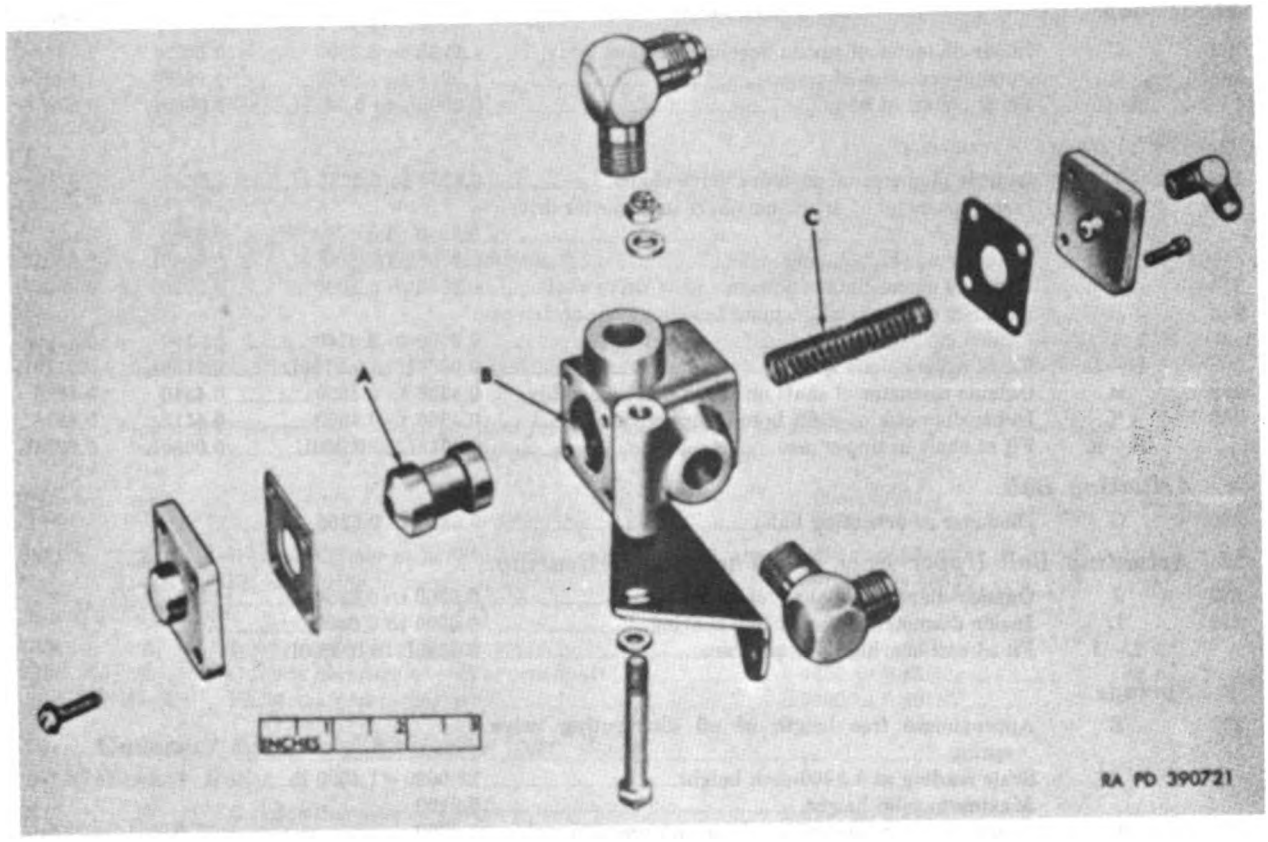



*Figure 231. Repair and rebuild standard points of measurement for governor oil pressure regulating valve assembly.*

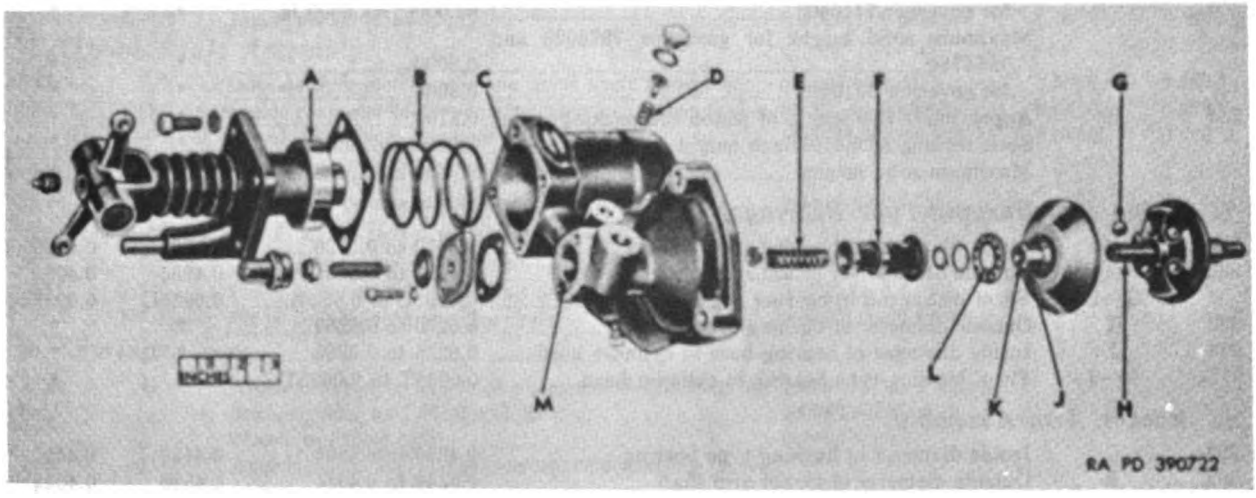



*Figure 232. Repair and rebuild standard points of measurement for governor assemblies—7376023, 7410402, and 7954764.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| 232 | C | Inside diameter of piston bore in governor body | 1.9995 to 2.0005 | 2.0025 | 2.0010 |
| 232 | A | Outside diameter of piston | 1.9980 to 1.9990 | 1.9955 | 1.9975 |
| | A—C | Fit of piston in body | 0.0005L to 0.0025L | 0.0050L | 0.0030L |
| | | ***b. Drive Shaft Assembly.*** | | | |
| 218 | V | Outside diameter of governor drive shaft | 0.6240 to 0.6245 | 0.6220 | 0.6235 |
| 218 | D | Inside diameter of drive shaft bore in governor driven gear | 0.6250 to 0.6260 | 0.6280 | 0.6265 |
| | V—D | Fit of drive shaft in gear | 0.0005L to 0.0020L | 0.0040L | 0.0025L |
| 218 | U | Distance across flats of square end of drive shaft | 0.3040 to 0.3060 | 0.2990 | 0.3030 |
| 218 | E | Distance across flats of square hole in governor driven gear | 0.3120 to 0.3140 | 0.3190 | 0.3150 |
| | U—E | Fit of square shaft in gear | 0.0060L to 0.0100L | 0.0150L | 0.0110L |
| 232 | H | Outside diameter of shaft on drive shaft assembly | 0.4330 to 0.4350 | 0.4310 | 0.4325 |
| 232 | K | Inside diameter of shaft bore in upper race | 0.4365 to 0.4390 | 0.4415 | 0.4395 |
| | H—K | Fit of shaft in upper race | 0.0015L to 0.060L | 0.0080L | 0.0065L |
| | | ***c. Actuating Ball.*** | | | |
| 232 | G | Diameter of actuating ball | 0.6245 to 0.6255 | * | * |
| | | ***d. Actuating Ball Upper Race and Thrust Ball Bearing.*** | | | |
| 232 | J | Outside diameter of shaft of upper race | 0.6200 to 0.6250 | * | * |
| 232 | L | Inside diameter of thrust ball bearing | 0.6300 to 0.6400 | * | * |
| | L—J | Fit of ball bearing on upper race | 0.0050L to 0.0200L | * | * |
| | | ***e. Springs.*** | | | |
| 232 | E | Approximate free length of oil distributing valve spring | 1.5000 | * | * |
| | | Scale reading at 1.3000-inch height | 28.0000 ±1.4000 lb | * | * |
| | | Maximum solid height | 0.8100 | | |
| 232 | B | Approximate free length of piston compression spring | 1.8700 | * | * |
| | | Scale reading at 1.6700-inch height | 7.0000 ±0.3500 lb | * | * |
| | | Maximum solid height | 0.5200-inch | * | * |
| 232 | D | Approximate free length of metering screw spring for governor 7376023 | 0.5000 | | |
| | | Scale reading at 0.3000-inch height | 6.0000 ±0.3000 lb | | |
| | | Maximum solid height | 0.1400-inch | | |
| 233 | F | Approximate free length of piston rod compression spring for governor 7376023 and 7954764 | 0.6000 | * | * |
| | | for governor 7410402 | 0.8600 | * | * |
| | | Scale reading at 0.4000-inch height for governor 7376023 and 7954764 | 28.0000 ±1.4000 lb | * | * |
| | | for governor 7410402 | 92.0000 ±4.6000 lb | * | * |
| | | Maximum solid height for governor 7376023 and 7954764 | 0.2000 | * | * |
| | | for governor 7410402 | 0.3060 | * | * |
| 233 | H | Approximate free length of piston rod packing spring | 0.8100 | * | * |
| | | Scale reading at 0.6100-inch height | 3.6000 ±0.1800 lb | * | * |
| | | Maximum solid height | 0.3150-inch | * | * |
| | | ***f. Piston Rod Bushing-Type Bearings.*** | | | |
| 233 | L | Inside diameter of bushing-type bearing | 0.5010 to 0.5020 | 0.5060 | 0.5030 |
| 233 | G | Outside diameter of piston rod | 0.4995 to 0.5005 | 0.4955 | 0.4985 |
| | G—L | Fit of piston rod in bearing | 0.0005L to 0.0025L | 0.0065L | 0.0035L |
| 233 | K | Outside diameter of bushing-type bearing | 0.6270 to 0.6280 | * | * |
| 233 | J | Inside diameter of bearing bore in cylinder head | 0.6255 to 0.6265 | * | * |
| | K—J | Fit of bushing-type bearing in cylinder head | 0.0005T to 0.0025T | * | * |
| | | ***g. Rocker Arm Assembly.*** | | | |
| 233 | C | Inside diameter of bushing-type bearing | 0.4390 to 0.4400 | 0.4430 | 0.4405 |
| 233 | B | Outside diameter of rocker arm shaft | 0.4350 to 0.4355 | 0.4320 | 0.4345 |
| | B—C | Fit of shaft in bearing | 0.0035L to 0.0050L | 0.0080L | 0.0055L |
| 233 | D | Outside diameter of bearing | 0.5650 to 0.5660 | * | * |

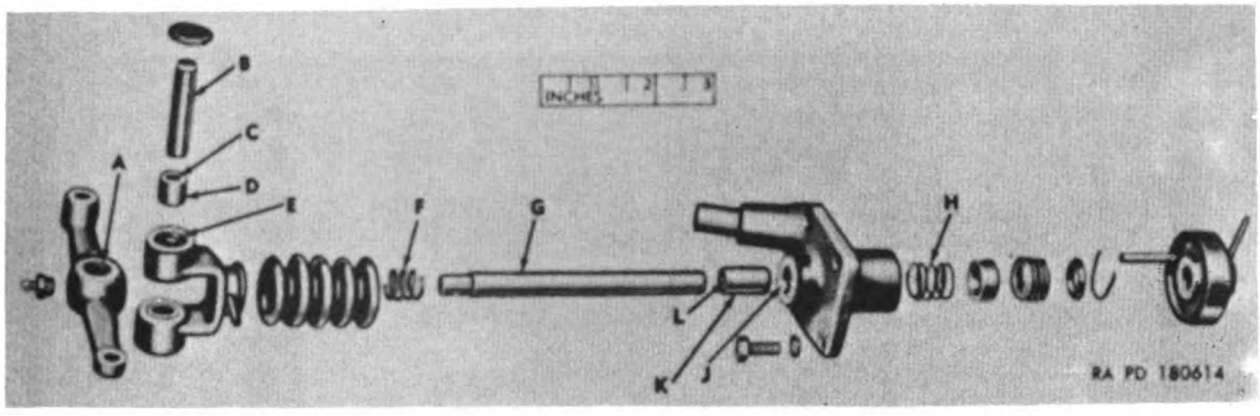



*Figure 233. Repair and rebuild standard points of measurement for governor cylinder head assemblies—76820-54226A and 7521293.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Wear limits Depot |
|---|---|---|---|---|---|
| 233 | E | Inside diameter of bore in clevis | 0.5630 to 0.5640 | * | * |
| | D—E | Fit of bearing in clevis | 0.0010T to 0.0030T | * | * |
| *h.* | *Rocker Arm.* | | | | |
| 233 | A | Inside diameter of rocker arm | 0.4340 to 0.4350 | * | * |
| 233 | B | Outside diameter of rocker arm shaft | 0.4350 to 0.4355 | * | * |
| | B—A | Fit of shaft in rocker arm | 0.0000 to 0.0015T | * | * |
| **334.** | **Governor Assembly 8380695 (par. 302)** | | | | |
| *a.* | *Governor Body.* | | | | |
| 218 | W | Outside diameter of governor body pilot | 2.9970 to 2.9990 | * | * |
| 218 | A | Inside diameter of pilot bore in camshaft drive housing | 3.0000 to 3.0010 | * | * |
| | W—A | Fit of governor body pilot in camshaft drive housing | 0.0010L to 0.0040L | * | * |
| 234 | M | Inside diameter of oil distributing valve sleeve bore in governor body | 0.8125 to 0.8135 | 0.8145 | 0.8140 |
| 234 | E | Outside diameter of oil distributing valve | 0.8112 to 0.8117 | 0.8092 | 0.8110 |
| | E—M | Fit of oil distributing valve in sleeve | 0.0008L to 0.0023L | 0.0033L | 0.0028L |
| 234 | L | Inside diameter of oil pressure regulating valve sleeve bore in governor body | 0.8750 to 0.8760 | 0.8765 | 0.8762 |
| 234 | P | Outside diameter of oil pressure regulating valve | 0.8735 to 0.8740 | 0.8730 | 0.8733 |
| | P—L | Fit of oil pressure regulating valve in governor body | 0.0010L to 0.0025L | 0.0030L | 0.0027L |
| 234 | C | Inside diameter of piston bore in governor body | 1.9995 to 2.0005 | 2.0025 | 2.0010 |
| 234 | A | Outside diameter of piston | 1.9980 to 1.9990 | 1.9955 | 1.9975 |
| | A—C | Fit of piston in body | 0.0005L to 0.0025L | 0.0050L | 0.0030L |
| *b.* | *Drive Shaft Assembly.* | | | | |
| 234 | K | Outside diameter of shaft on drive shaft assembly | 0.4330 to 0.4350 | 0.4310 | 0.4320 |
| 234 | G | Inside diameter of bore in actuating ball upper race | 0.4365 to 0.4390 | 0.4410 | 0.4395 |
| | K—G | Fit of drive shaft in upper race | 0.0015L to 0.0060L | 0.0080L | 0.0065L |
| *c.* | *Actuating Ball.* | | | | |
| 234 | J | Diameter of actuating ball | 0.6245 to 0.6255 | * | * |
| *d.* | *Actuating Ball Upper Race and Thrust Ball Bearing.* | | | | |
| 234 | H | Outside diameter of shaft of upper race | 0.6200 to 0.6250 | * | * |
| 234 | F | Inside diameter of thrust ball bearing | 0.6300 to 0.6400 | * | * |
| | F—H | Fit of ball bearing on upper race | 0.0050L to 0.0200L | * | * |
| *e.* | *Springs.* | | | | |
| 234 | B | Approximate free length of piston compression spring | 1.8700 | * | * |
| | | Scale reading at 1.6700-inch height | 7.0000 ± 0.3500 lb | * | * |
| | | Maximum solid height | 0.5200-inch | | |
| 234 | D | Approximate free length of oil distributing valve spring | 1.5000 | * | * |
| | | Scale reading at 1.3000-inch height | 28.0000 ± 1.4000 lb | * | * |
| | | Maximum solid height | 0.8100-inch | | |

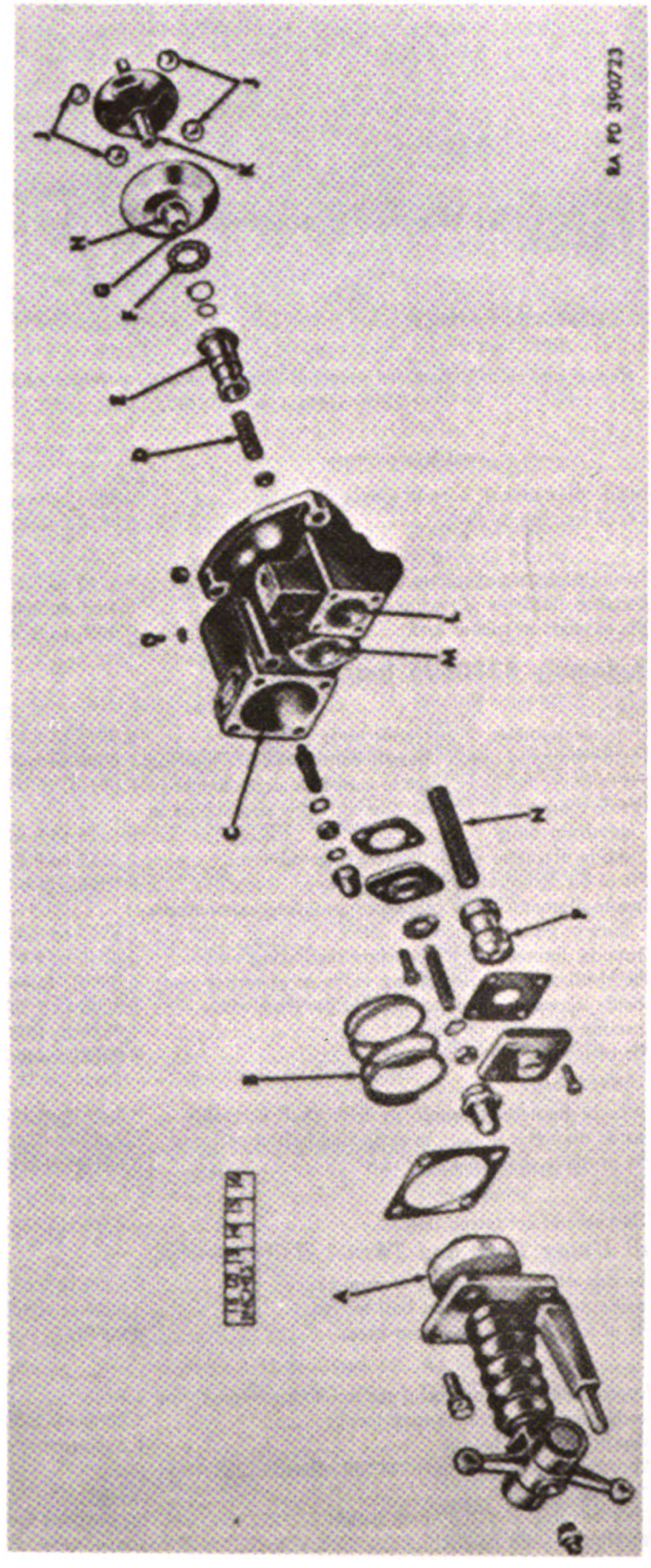


*Figure 234. Repair and rebuild standard points of measurement for governor assembly—8380695.*

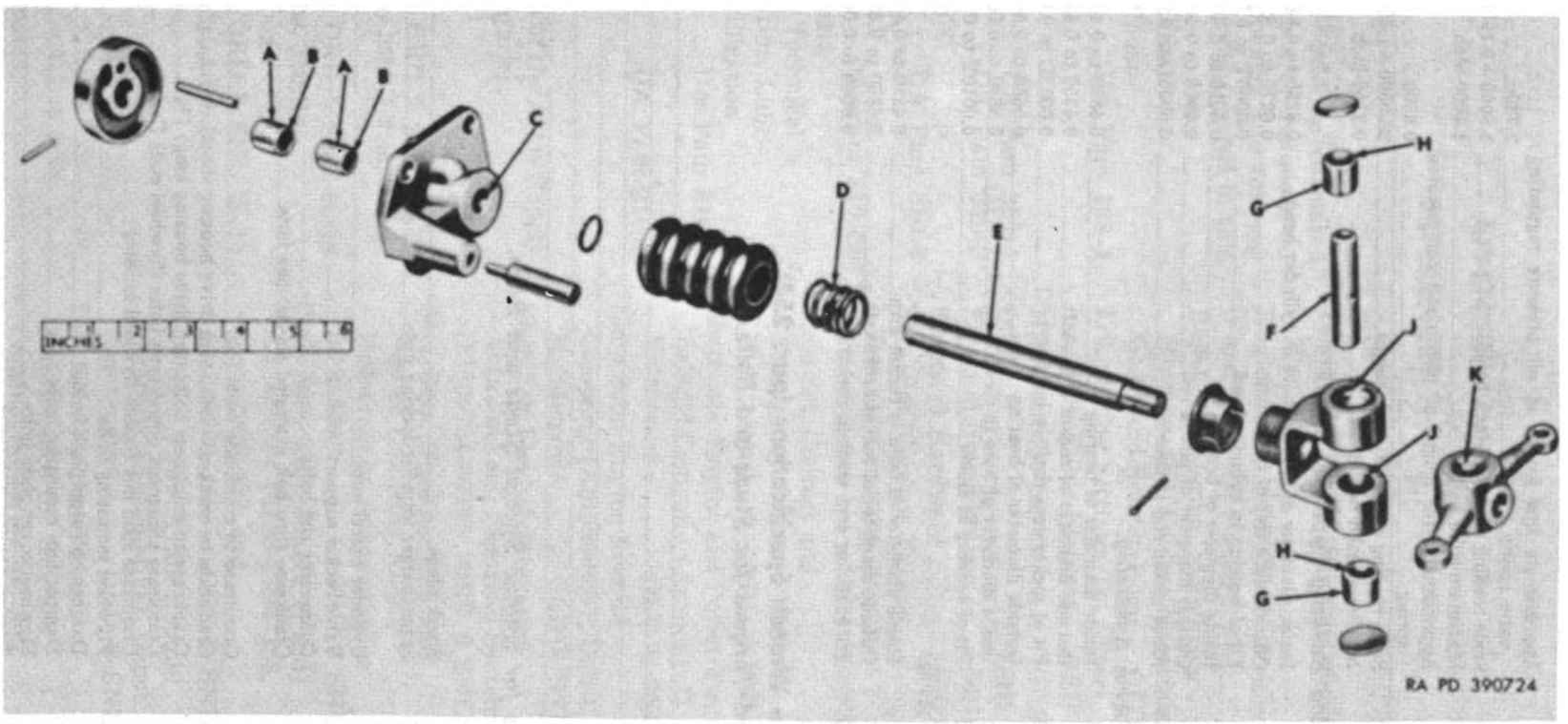



*Figure 235. Repair and rebuild standard points of measurement for governor cylinder head assembly—76820-54397B1.*

| Fig. No. | Ref. letter | Point of measurement | Sizes and fits of new parts | Wear limits Field | Depot |
|---|---|---|---|---|---|
| 234 | N | Approximate free length of oil pressure regulating valve spring | 2.7300 | * | * |
| | | Scale reading at 2.5300-inch height | 3.8000 ± 0.1900 lb | * | * |
| | | Maximum solid height | 1.4000-inch | | |
| 235 | D | Approximate free length of piston rod compression spring | 0.8500 | * | * |
| | | Scale reading at 0.6500-inch height | 28.0000 ± 1.4000 lb | * | * |
| | | Maximum solid height | 0.3750-inch | | |
| *f. Piston Rod Bushing-Type Bearings.* | | | | | |
| 235 | C | Inside diameter of bearing bore in cylinder head | 0.6255 to 0.6265 | * | * |
| 235 | A | Outside diameter of bearing | 0.6270 to 0.6280 | * | * |
| | A—C | Fit of bearing in cylinder head | 0.0005T to 0.0025T | * | * |
| 235 | B | Inside diameter of bearing | 0.5010 to 0.5020 | 0.5040 | 0.5025 |
| 235 | E | Outside diameter of piston rod | 0.4995 to 0.5005 | 0.4975 | 0.4990 |
| | E—B | Fit of piston rod in bearing | 0.0005L to 0.0025L | 0.0065L | 0.0035L |
| *g. Rocker Arm Assembly.* | | | | | |
| 235 | H | Inside diameter of bearing | 0.4390 to 0.4400 | 0.4410 | 0.4405 |
| 235 | F | Outside diameter of rocker arm shaft | 0.4350 to 0.4355 | 0.4345 | 0.4348 |
| | F—H | Fit of rocker arm shaft in bearing | 0.0035L to 0.0050L | 0.0065L | 0.0057L |
| 235 | G | Outside diameter of bearing | 0.5650 to 0.5660 | * | * |
| 235 | J | Inside diameter of bore in clevis | 0.5630 to 0.5640 | * | * |
| | G—J | Fit of bearing in clevis | 0.0010T to 0.0030T | * | * |
| *h. Rocker Arm.* | | | | | |
| 235 | K | Inside diameter of bore in rocker arm | 0.4340 to 0.4350 | * | * |
| 235 | F | Outside diameter of rocker arm shaft | 0.4350 to 0.4355 | * | * |
| | K—F | Fit of rocker arm shaft in rocker arm | 0.0000 to 0.0015T | * | * |

## 335. Torque Wrench Specifications (par. 254)

### *a. Standard Torques for Studs and Bolts.*

| Size (diameter) | Torque (lb-in.) |
|---|---|
| ¼ (0.2500) | 75–100 |
| 5/16 (0.3125) | 150–175 |
| ⅜ (0.3750) | 275–325 |
| 7/16 (0.4375) | 400–450 |
| ½ (0.5000) | 550–600 |
| 9/16 (0.5625) | 800–850 |

### *b. Torques for Engine Special Studs and Bolts.*

| Fig. No. | Ref. letter | Location | Torque (lb-in.) |
|---|---|---|---|
| 164 | N | Spark plugs | 150–175 |
| 212 | KK | Supercharger impeller locking nuts | 700 |
| 213 | G | | |
| 206 | D | Cylinder barrel nuts | 350–400 |
| 206 | P | Valve rocker support bolts | 170–180 |
| 200 | M | Connecting rod bolts | 750–850 |
| 202 | A | Crankcase thru bolt extended washer hex nuts | 725–775 |
| 206 | Z | | |
| 202 | L | Crankcase to crankcase bolts (5/16) | 175 |
| 202 | J | Crankcase to crankcase bolts (fan drive housing short) (5/16) | 175 |
| 202 | K | Crankcase to crankcase bolts (fan drive housing long) (⅜) | 300 |
| 202 | M | Crankcase alinement dowel-type bolts (flywheel end) (7/16) | 400–425 |
| 202 | N | Crankcase stud nut (inside flywheel housing) | 150–175 |
| 198 | H | Flywheel mounting bolts | 1,000 |
| 201 | Q | Damper hub stop plate bolts | 275–325 |
| 201 | M | Damper hub mounting bolts | 1,000 |
| 202 | P | Flywheel cover plate bolts | 300 |
| 202 | A | Torsion damper hub bolts | 400–450 |
| 199 | P | Transmission mounting studs | 450 |

# APPENDIX

# REFERENCES

## 1. Publication Indexes

The following indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this technical manual:

Index of Army Motion Pictures, Film Strips, Slides and Phono-Recordings ..... DA Pam 108–1

Military Publications:

- Index of Administrative Publications ..... DA Pam 310–1
- Index of Blank Forms ..... DA Pam 310–2
- Index of Graphic Training Aids and Devices ..... DA Pam 310–5
- Index of Supply Manuals — Ordnance Corps ..... DA Pam 310–29
- Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders ..... DA Pam 310–4
- Index of Training Publications ..... DA Pam 310–3

## 2. Supply Manuals

The following Department of the Army Supply Manuals pertain to this materiel:

*a. Repair and Rebuild.*

Antifriction Bearings and Related Items ..... ORD 5 SNL H–12

NOTE: Portions superseded by SM 9–1–3110, 30 June 1956, "will not be reprinted."

Batteries ..... ORD 5 SNL H–15

Brake Lining Kits, Curtains, Paulins, "V" Belts and Miscellaneous Materials ..... ORD 5 SNL H–17

Cleaners, Preservatives, Lubricants, Recoil Fluids, Special Oils, and Related Maintenance Materials ..... ORD 3 SNL K–1

Common Hand Tools ..... ORD 3 SNL J–17

Electrical Fittings ..... ORD 5 SNL H–4

Engine Fuel System Components, Nonaircraft ..... SM 9–1–2910

Engine Cooling System Components, Nonaircraft ..... SM 9–1–2930

Engine Air and Oil Filters, Strainers, and Cleaners, Nonaircraft ..... SM 9–1–2940

Items of Soldering, Metallizing Brazing, and Welding Materials; Gases and Related Items .... ORD 3 SNL K–2

Lubricating Fittings, Oil Filters, and Oil Filter Elements .. ORD 5 SNL H–16

Miscellaneous Hardware ..... ORD 5 SNL H–2

Oil Seals ..... ORD 5 SNL H–13

Pipe and Hose Fittings ..... ORD 5 SNL H–6

Standard Hardware ..... ORD 5 SNL H–1

Shop Set, Combat Vehicle Rebuild Company, Depot Maintenance ..... ORD 6 SNL J–9, Sec. 9

Shop Set, Contact and Emergency Repair, Field Maintenance ..... ORD 6 SNL J–8, Sec. 18

Shop Sets, Engine and Power Train Rebuild Company (Armament), Depot Maintenance ..... ORD 6 SNL J–9, Sec. 8

Shop Sets, Engine Rebuild Company (Automotive), Depot Maintenance ..... ORD 6 SNL J–9, Sec. 3

Shop Set, Field Maintenance, Auto Fuel and Electrical System (5180–754–0714).. ORD 6 SNL J–8, Sec. 12

Shop Sets, Headquarters and Service Company, Depot Maintenance, Automotive or Armament ..... ORD 6 SNL J–9, Sec. 2

Shop Sets, Maintenance (Field) Automotive (41–S–2990–158, 41–S–2990–159, and 41–S–2990–160) .. ORD 6, SNL J–8, Sec. 13

Shop Sets, Power Train Rebuild Company (Automotive), Depot Maintenance ..... ORD 6 SNL J–9, Sec. 1

Tool Kits, Field and Depot Maintenance for Engines, Continental Series AO–895 and AV–1790 ..... SM 9–4–5180–J16–44

Tool Kit, Field Maintenance, Motor Vehicle Assembly Company (5180–754–0703) .... ORD 6 SNL J–8, Sec. 7
Tool Set, Auto Fuel and Electrical System Repairman (MOS 3912) (41–T–3499–160) .. ORD 6 SNL J–10, Sec. 8
Tool Set, General Mechanic's (41–T–3534–30) .. ORD 6 SNL J–10, Sec. 4
Tool Set, Machinist's ORD 6 SNL J–10, Sec. 9

*b. Vehicle.*

Gun, Self-Propelled, Full Tracked, Twin 40–MM, M42A1 .... ORD (*) SNL G–253
Howitzer, Self-Propelled, Full Tracked, 105–MM, M52A1 (T98E1) ..... ORD (*) SNL G–258
Howitzer, Self-Propelled, Full Tracked, 155–MM, M44A1 ..... ORD (*) SNL G–279
Tank, Combat, Full Tracked, 76–MM Gun, M41A2 and M41A3 ..... ORD (*) SNL G–251
Tractor, Full Tracked, High Speed, M8A2 ..... ORD (*) SNL G–252

## 3. Forms

The following forms pertain to this materiel: (Refer to DA Pam 310–2 for index of blank forms.)

DA Form 9–1, Materiel Inspection Tag
DA Form 9–3, Processing Record for Shipment and Storage of Vehicles and Boxed Engines (Tag)
DA Form 9–4, Vehicular Storage and Servicing Record (Card)
DA Form 9–69, Spot Check Inspection for Full-Tracked and Tank-Like Wheeled Vehicles
DA Form 9–79, Parts Requisition
DA Form 9–80, Job Order File
DA Form 9–81, Exchange Part or Unit Identification Tag
DA Form 446, Issue Slip
DA Form 447, Turn-In Slip
DA Form 460, Preventive Maintenance Roster
DA Form 461–5, Limited Technical Inspection
DA Form 462, Preventive Maintenance Service and Inspection for Full-Tracked Vehicles
DA Form 468, Unsatisfactory Equipment Report
DA Form 478, MWO and Major Unit Assembly Replacement Record and Organizational Equipment File
DA Form 811 and 811–1, Work Request and Job Order and Receipt (Set)
DA Form 865, Work Order
DD Form 6, Report of Damaged or Improper Shipment
DD Form 317, Preventive Maintenance Service Due (Sticker)

## 4. Other Publications

The following publications contain information pertinent to major item materiel and associated equipment:

*a. General.*

Basic Arctic Manual ..... FM 31–70
Cleaning and Black Finishing of Ferrous Metals ..... TM 9–1861
Cooling Systems: Vehicle and Powered Ground Equipment ..... TM 9–2858
Fording Kits for Combat and Transport Vehicles ..... MIL F–3201
Inspection of Ordnance Materiel in Hands of Troops ..... TM 9–1100
Lubrication Order ..... LO 9–(**)
Manual for Full-Tracked Vehicle Driver ..... TM 21–306
Military Symbols ..... FM 21–30
Military Training Aids ..... FM 21–8
Military Vehicles (Ordnance Corps Responsibility) ..... TM 9–2800–1
Motor Transportation, Operations ..... FM 25–10
Mountain Operations ..... FM 70–10
Operation and Maintenance of Ordnance Material in Extreme Cold Weather (0° to –65°F) ..... TM 9–207
Operations in the Arctic ..... FM 31–71
Ordnance Maintenance and General Supply in the Field ..... FM 9–10
Ordnance Operational List of Packaging Specifications and Instructions (General Supply) .... ORDP 30–2
Packaging and Packing for Shipment and Storage of Spare Parts for Military Vehicles ..... MIL–P–11443 (ORD)
Packaging General Supplies ..... ORD M3–5
Packaging of On Vehicle Materiel (OVM) for Military Vehicles, Transport and Combat ..... MIL–P–12841 (ORD)

*See DA Pam 310–29 for Index of Supply Manuals

**Refer to applicable vehicle

Precautions in Handling Gasoline.....AR 850–20
Preparation of Ordnance Materiel for Deep-Water Fording.....TM 9–2853
Preservation, Methods of .....MIL–P–116
Principles of Automotive Vehicles....TM 9–8000
Spark Plugs .....TM 9–8638
Storage Batteries, Lead-Acid Type .....TM 9–6140–200–15
Supplies and Equipment (Motor Vehicles) .....AR 700–2300–1
Supplies and Equipment: Unsatisfactory Equipment Report .....AR 700–38
*b. Operation.*
Gun, Self-Propelled, Full Tracked, Twin, 40–MM, M42 (T141).....TM 9–7218
Howitzer, Self-Propelled, Full Tracked, 105–MM, M52 (T98E1).....TM 9–7204
Howitzer, Self-Propelled, Full Tracked, 155–MM, M44, M44A1 (T194).....TM 9–7004
Tank, Combat, Full Tracked, 76–MM Gun, M41.....TM 9–2350–201–12
Tractor, Cargo, Full Tracked, High Speed, M8 .....TM 9–7420
*c. Repair and Rebuild.*
Abrasives, Cleaning, Preserving, Sealing, Adhesive and Related Materials Issued for Ordnance Materiel .....TM 9–1007
Automotive Vehicles with 24-Volt Electrical System: Operating Precautions and Maintenance and Storage of New 12-Volt Lead-Acid Storage Batteries 2HN and 6TN.....TB ORD 463
Disposal of Supplies and Equipment: Uneconomically Repairable Ordnance Vehicles .....AR 755–2300–2
Emergency Repair of Cracks in Cylinder Heads, Cylinder Blocks, Radiators, Fuel Tanks, and Liquid Containers .....TB ORD 607
General Supply: Winterization Equipment for Automotive Materiel .....SB 9–16
Instruction Guide: Care and Maintenance of Ball and Roller Bearings .....TM 37–265
Lead-Acid Type Storage Batteries: Restoration of Sulfated Batteries to Serviceable Condition .....TB 9–2857–1
Lubrication .....TM 9–2835
Maintenance: General Supplies .....ORDM 3–3
Maintenance and Care of Hand Tools .....TM 9–867
Maintenance of Supplies and Equipment: Maintenance Responsibility and Shop Operation.....AR 750–5
Welding Theory and Application.....TM 9–237
*d. Ordnance Maintenance.*
Conversion of Continental Model AOS–895–3 Engine to AOSI–895–5M Fuel Injection Engine .....MWO 9–2805–212–40/1
Cross-Drive Transmission (Allison-GM Models CD–500–3 and –4 .....TM 9–1730B
Engine (Continental Model AOS–895–3) .....TM 9–1730A
Fuel Injector Pump (Simmonds Aerocessories) .....TM 9–2910–200–35
Fuel Pump (Diaphragm-Type) (AC) .....TM 9–1828A
Fuel Pump (Vane-Type) (Titan) .....TM 9–2910–201–35
Generator and Starter (Eclipse-Pioneer) .....TM 9–8637
Magnetos (American Bosch) .....TM 9–2920–204–35
Magnetos (Bendix-Scintilla) .....TM 9–1825A
Starter (Jack and Heintz)....TM 9–2920–203–35
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