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Definitions.

(1) "Inspect" means to examine by sight and touch.

(2) "Check" means to verify proper operation.

(3) "Troubleshoot" means to analyze and identify malfunctions.

(4) "Service" means to perform functions that assure continued operation.

(5) "Repair" means to correct a defective condition. Repair of an airframe or powerplant system includes component replacement and adjustment, but not component repair.

(6) "Overhaul" means to disassemble, inspect, repair as necessary, and check.

TABLE OF LIMITS W670-23 (Cont.)

| Ref. No. | Chart No. | Description | Serviceable Limit | New Parts | |
|----------|-----------|--|-------------------|-----------|---------|
| | | | | Minimum | Maximum |
| 88 | 2 | High pressure oil relief valve | | | |
| | | Valve seat in body dia before peening: | | .001T | .004T |
| | | Plunger sleeve in body dia: | | .0014T | .0022T |
| | | Guide in lower plate dia: | | .000 | .002L |
| | | Distributor adapter assembly | | | |
| 90 | 3 | Distributor adapter in accessory case pilot dia: | | .001L | .005L |
| 91 | 3 | Bushing in adapter body dia: | | .0005T | .0025T |
| 92 | 3 | Bearing in adapter body OD: | | .0001T | .0008L |
| 93 | 3 | Bearing in adapter body OD: | | .0001T | .001L |
| 94 | 3 | Bearing on shaftgear dia: | | .0001T | .0005L |
| 95 | 3 | Bearing on shaftgear dia: | | .0007T | .0001L |
| 96 | 3 | Drive shaftgear coupling in ignition drive shaftgear (spline serrations) PD: | | .0015L | .0065L |
| 97 | 3 | Drive shaftgear in adapter body end clearance: | | .0065L | .0325L |
| 98 | 3 | Driven gear on shaft dia before peening: | | .0000 | .0015L |
| 99 | 3 | Distribution shaft in adapter bushing dia: | .0045L | .001L | .0025L |
| 100 | 3 | Distributor ring on distributor pilot in accessory case dia: | | .003L | .011L |
| | | Crankshaft assembly | | | |
| 101 | 3 | Governor drive gear on front crankshaft (keyed) . . . dia: | | .0005L | .002L |
| 102 | 3 | Oil seal adapter and ring on front crankshaft dia: | | .0005L | .002L |
| 103 | 3 | Oil seal ring in adapter end clearance: | .008L | .001L | .005L |
| | | Oil ring compressed to standard gap (.003 to .013) tension in lbs: | 3 | 4 | 7 |
| | | Oil rings gap: | .028L | .003L | .013L |
| | | Oil sleeve ID: | 3.386 | 3.374 | 3.376 |
| 104 | 2 | Sleeve in thrust bearing cage dia: | | .001T | .0035T |
| 105 | 3 | Crankshaft oil seal in thrust bearing cover dia: | | .0005T | .0075T |
| 106 | 3 | Governor adapter in crankcase pilot dia: | | .000 | .003L |
| 107 | 3 | Governor drive gear in bushing dia: | .005L | .001L | .003L |
| 108 | 3 | Bushing in governor adapter dia: | | .0015T | .0035T |
| 109 | 3 | Intermediate gear on shaft dia: | .0045L | .001L | .0025L |
| 110 | 3 | Bushing in intermediate gear dia: | | .001T | .003T |
| 111 | 3 | Intermediate gear shaft in crankcase (front) dia: | | .001T | .0025T |
| 112 | 3 | Intermediate gear shaft in crankcase (rear) dia: | | .0005L | .001T |
| 113 | 3 | Plug in intermediate gear shaft dia: | | .0005T | .0025T |

TABLE OF GEAR TEETH BACKLASHES

| | | | | | |
|-----|---|--|------|-------|-------|
| B2 | 1 | Crankshaft cam drive gear to intermediate cam drive gear . . . | .012 | .0048 | .0075 |
| B3 | 1 | Intermediate cam drive pinion gear to cam ring gear | .010 | .004 | .006 |
| B10 | 3 | Crankshaft governor drive gear to intermediate governor drive gear | .021 | .012 | .017 |
| B11 | 3 | Intermediate governor drive to governor drive bevel gear . . . | .016 | .004 | .012 |
| B4 | 1 | Generator drive pinion to intermediate cam drive gear | .010 | .003 | .006 |
| B5 | 1 | Generator drive gear to generator step-up pinion | .016 | .004 | .012 |
| B1 | 1 | Crankshaft starter gear to starter gear | .012 | .004 | .0074 |
| | | Crankshaft starter gear to ignition drive gear | .012 | .004 | .008 |
| B9 | 2 | Ignition drive gears to oil pump driver gears | .012 | .004 | .008 |
| | | Oil pump drive and driven gears | .028 | .014 | .022 |
| | | Pressure oil pump drive and driven gears | .028 | .014 | .022 |
| B7 | 2 | Rocker scavenge oil pump gears | .028 | .014 | .022 |

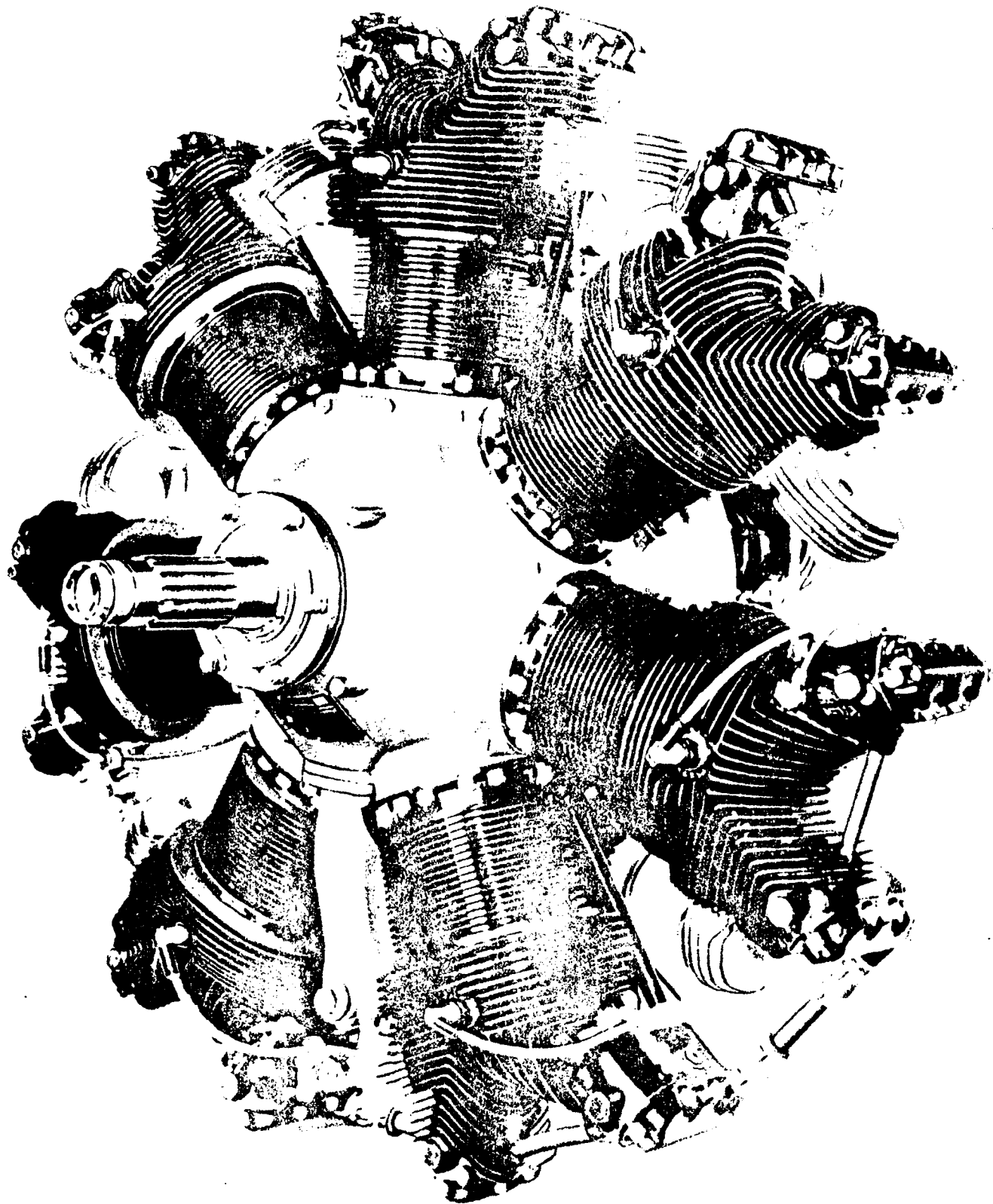


Figure 1 - Three-Quarter Left front View of W670 Engine

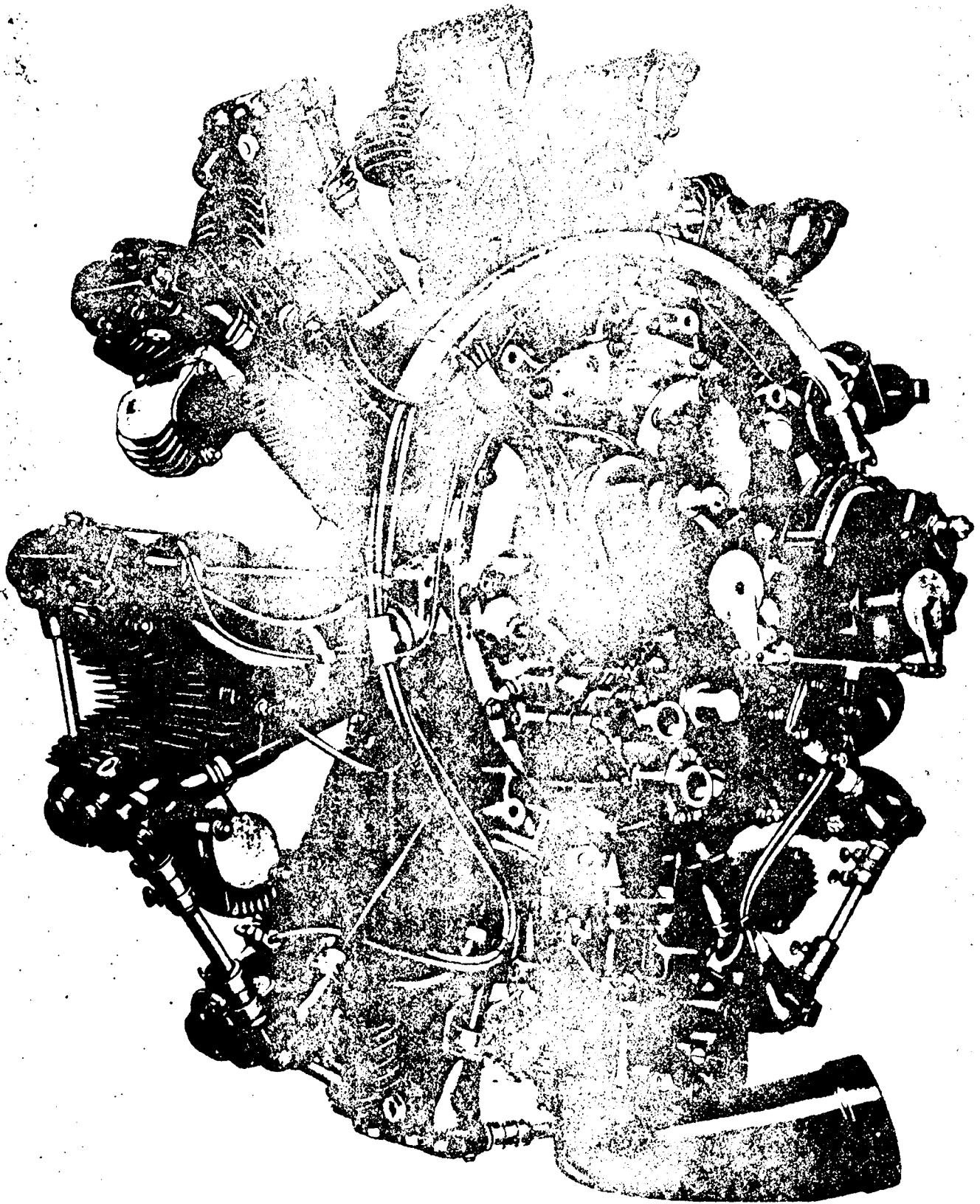


Figure 2—Three-Quarter Left Rear View of W670-6A Engine

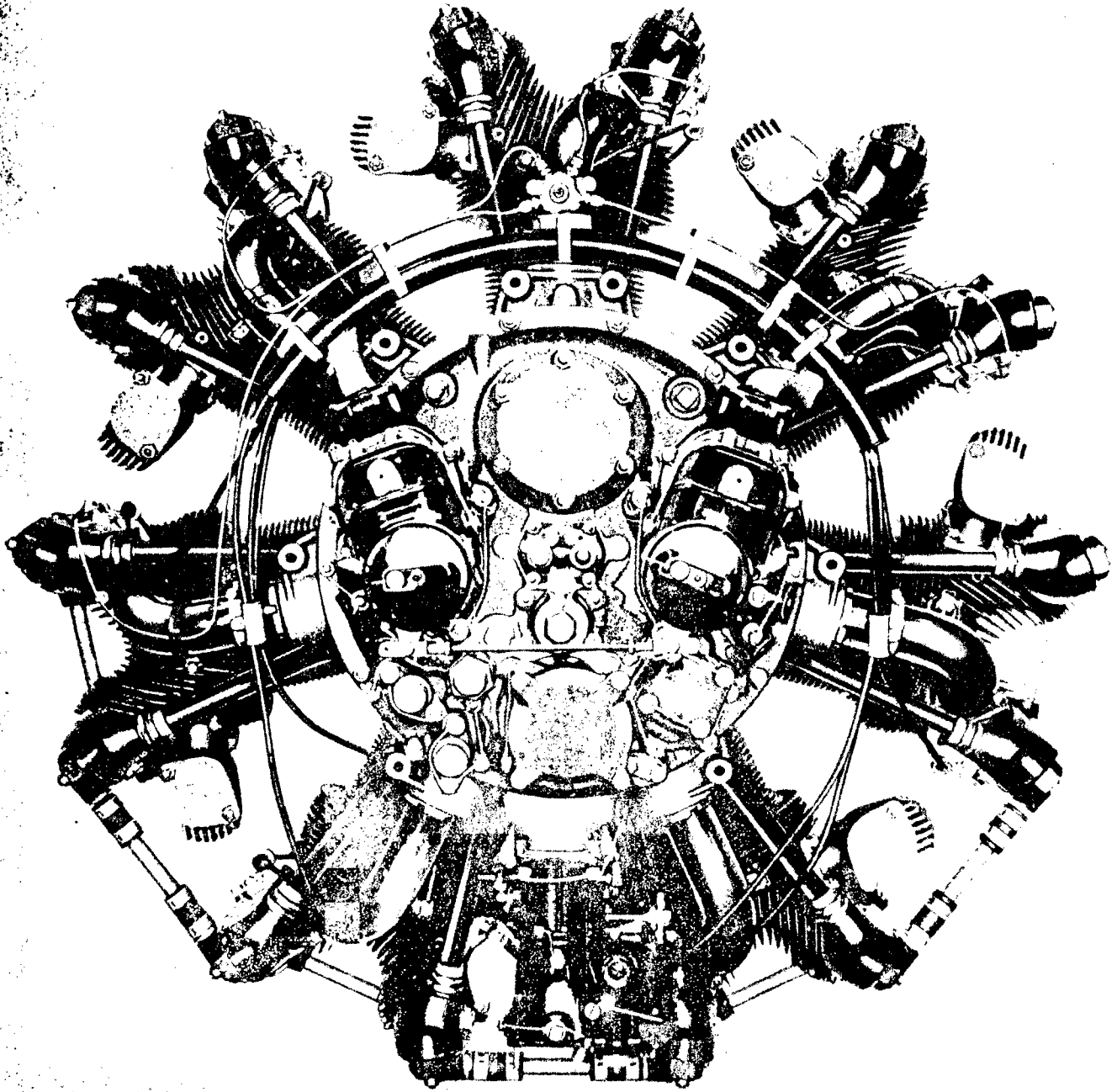


Figure 6 — Rear View of W670-6N Engine

Section 1**INTRODUCTION**

1. This publication comprises the Operating, Service, and Major Overhaul Instructions for the W670-6A, 6N, K, M, 16, 17, 23 and 24 and R670-11A Aircraft Engines manufactured by Continental Motors Corporation, Muskegon, Michigan.

2. In this publication, the following definitions will be used: The propeller end of the engine will be referred to as the "Front," and the anti-propeller end as the "Rear" of the engine. The terms "right" and "left" are determined by viewing the engine from the rear and looking in the direction in which the propeller shaft points. "Top" and "Bottom" are referred to with the engine resting on the base of its carburetor with the propeller shaft extending horizontally to the front. Directions of rotation are determined when looking from the rear toward the front of the engine. The rotation of accessory drives, whose mounting pads are set at an angle, is determined by facing the mounting pad. Cylinders are numbered beginning with the top cylinder, designated as "No. 1," and

continuing in numerical order around the engine in a clockwise direction, when looking from rear to front, as indicated in figure 7.

3. The following positions of the engine will be referred to in this publication:

(a) Vertical or Flying Position — The engine will be turned on its revolving assembly stand so that it is in the same position as when installed in the airplane, for example, the No. 1 cylinder on top, the carburetor at the bottom and the propeller shaft extending horizontally.

(b) Horizontal Position — The engine will be turned on its revolving assembly stand so that it is lying in a flat position with the accessory case towards the floor and the propeller shaft extending upwards vertically.

(c) Inverted Horizontal Position — The engine will be turned on its revolving assembly so that it is lying in a flat position with the propeller shaft extending vertically downward and the accessory case on top. (See Fig. 30).

CAUTION

Paragraphs or steps of procedure not applicable to the W670-23 are bordered by black revision bars. For applicable instructions refer to the supplement following the tool list at the rear of this manual.

Section 2

OPERATING INSTRUCTIONS**1. INSPECTION PRIOR TO OPERATION**

Do not attempt to start the engine unless inspection and service has been completed in accordance with established requirements of the Civil Aeronautics Authority supplemented by the following:

(a) Visually inspect all nuts and bolts on both engine and mount for tightness and safetying, and see that propeller hub nut is tight and properly locked.

(b) Check controls to see that they are functioning properly and that throttle and mixture control levers operate the carburetor to the extremes of their "open" and "closed" positions.

(c) Check ignition and ground wire connections, making sure that there is no possibility of a loose connection.

(d) Make sure that a drain has been provided from the carburetor air horn, and that it is open.

(e) Check fuel and oil lines and fill tanks. See that gasoline is flowing at the carburetor and that all fittings are properly tightened. Check all lines for leaks. Refer to Section 4 for gasoline and oil specifications.

(f) See that tachometer and oil pressure gauge are properly connected and that oil thermometers are properly installed and functioning.

(g) Set switch on "Off" position, turn engine over by hand several times to make certain that everything is in readiness for starting and especially that cylinders are not loaded with engine oil sufficient to restrict rotation of the propeller.

2. STARTING

In extreme cold weather operation, lubricating oil should be removed from oil tank, heated and replaced before starting, unless such preheating can be accomplished by the use of an oil emersion heater inserted in the oil tank. Proceed as follows:

(a) If airplane is equipped with a carburetor air heater, move control to "Cold" position. Open all cowling controls.

(b) Turn on main gasoline supply valve.

(c) Pump throttle from closed to full open position four to five strokes, at the same time turning propeller over by hand. This will prime engine sufficiently for starting except in extreme cases. If necessary to prime engine, use approximately three or four strokes of the primer plunger. **CAUTION: THE CORRECT AMOUNT OF PRIMING REQUIRED FOR EACH ENGINE CAN BE DETERMINED ONLY BY EXPERIMENT. OPERATORS ARE CAUTIONED AGAINST "OVER-PRIMING" AND THE DANGER OF WASHING THE LUBRICATING OIL FROM THE CYLINDER WALLS.**

(d) Set spark control at full "advanced" (except for 23, automatically set).

(e) Move throttle almost to the "closed position" or approximately one-tenth open, and mixture to "full rich" position. Turn ignition switch to "Both On" position and hand or starter crank engine.

(f) In case engine becomes "flooded" with too much gasoline "back engine up" ten to fifteen revolutions with switch "Off" and throttle completely open.

(g) If engine refuses to start, refer to Section VI, "Failure of the Engine to Start."

3. GROUND TESTING

(a) After engine has been started, open the throttle and proceed to warm up at about 700 r.p.m.

(b) Failure of oil pressure gauge to show pressure within thirty seconds after starting is sufficient reason to stop the engine and ascertain trouble before continuing operation. This engine is equipped with an oil pump so designed to admit all by-passed oil direct from the relief valve to the input side of the pressure pump. In some instances it has been known for the oil pump to lose its prime during slow-roll maneuvers, and directly following an oil change. The pump may be reprimed by removing the pressure adjusting screw together with the spring and plunger, and allowing the air to bleed while at the same time oil flows into the gears by gravity from the airplane's main supply tank. Care in marking the position of the relief valve

OPERATING AND MAINTENANCE INSTRUCTIONS—Continued

screw before removal will permit reinstallation without having to readjust the pressure.

(c) After engine has run about five minutes at 700 r.p.m., increase throttle until tachometer shows about 1200 to 1500 r.p.m. and test magnetos separately for proper firing. Speed of engine with steady throttle should not drop over fifty r.p.m. on either single magneto from the "Both" magneto operating position.

(d) All ground testing and running of engine will be done with the carburetor set at the "Full Rich" position and all controllable cowling flaps, baffling, etc., set at their "Full Open" positions. If an oil cooling radiator equipped with shutters is used, open or close shutters as the oil temperature requires.

(e) This engine should not be operated over prolonged periods at idling speed, or at high speeds of over one minute duration while on the ground. Oil temperatures, cylinder head and barrel temperatures, and other conditions set forth on the "Specific Operation Instruction" sheet in this chapter should be complied with.

(f) Engine is ready for flight when engine temperatures and revolutions per minute are within the limits prescribed on the "Specific Operation Sheet."

(g) Set propeller in low pitch, high r.p.m. position.

4. TAKE OFF

Carburetor will be set at "Full Rich" position.

(a) Take-off will be accomplished at maximum throttle and power provided limits of the "Specific Operation Sheet" are not exceeded.

(b) The engine should be throttled to cruising r.p.m. as soon as practical after take-off.

(c) Adjust propeller to cruising position.

5. FLIGHT

All flight conditions of the engine will conform to specifications on the "Specific Operation Sheet," together with other instructions and specifications as set forth in this manual. Operation outside the minimum and maximum limits and specifications as set forth herein may result in damage to the engine.

6. LANDING

(a) From cruising position, slowly close throttle to 1000 r.p.m. and set mixture control at "Full Rich" position. If airplane must ex-

ecute a prolonged glide to reach the ground, keep turning the engine under partial throttle so as to retard rapid cooling.

(b) When within 500 feet of the ground, close throttle to idle position and glide in for landing.

(c) Periodic low r.p.m. "bursts" of the engine will insure clean cylinders and a warm engine ready for instantaneous application of power.

7. STOPPING

Air-cooled engines cool rapidly and should not be shut down quickly except in emergencies.

To stop the engine, throttle to a low enough speed to permit the cylinders to cool to 250-300° F. as indicated by the spark plug thermocouples. Run at idling speed if necessary, to reduce the cylinder temperatures. When the cylinders have been allowed to cool as instructed above, open the throttle and increase the speed to about 1200 r.p.m., running at this speed for a few seconds only, then close the throttle. The purpose of this momentary high speed operation is to burn out any oil which may have accumulated around the spark plugs in the combustion chamber, and thus avoid fouling of spark plugs which might make subsequent starting difficult. **THIS IS IMPORTANT.** As soon as the engine has returned to idling speed, cut the switch and open the throttle slowly to maximum position, cutting the switch at start of throttle movement. The correct r.p.m. at which to operate before opening the throttle and cutting the ignition switch varies with different installations and should be determined by experiment.

By following the above procedure, the possibility of "after-firing" is greatly reduced. The cylinder walls and pistons are left in a well-lubricated condition due to the fact that the oil on them has been allowed to cool and, therefore, does not drain off so readily as is the case when the engine is stopped while at high operating temperatures.

The cooling-off process in stopping an engine is equally as important as the need for care in warming up a newly started engine. By this means of stopping, the warm-up period can be appreciably shortened and the ill effects resulting in loss of lubrication by over-priming are greatly reduced.

OPERATING AND MAINTENANCE INSTRUCTIONS—Continued

8. CARBURETOR AIR HEATER

If engine is equipped with a carburetor air heater, operate engine whenever possible with heater in "Off" position.

Use heat to carburetor only when icing conditions demand, and then only use the smallest amount of heat necessary to secure power and smooth operation. **CAUTION: DO NOT OPERATE ENGINE WITH "CARBURETOR AIR IN" TEMPERATURE IN EXCESS OF 37.3° C. (100° F.)**

9. MIXTURE CONTROL

Engines being run on the ground, during

take-off, and during acrobatics, will be operated with the mixture control in "Full Rich" position.

Engines being operated cross-country at altitudes above 4000 feet may be "leaned out" by adjusting the mixture control as follows: Move control to "Lean" position very slowly and at the same time watch the tachometer carefully. When leaned sufficiently to produce a small increase in r.p.m., move mixture control slightly toward "Rich." **WARNING: A change in altitude will require a re-setting at the above described conditions.**

10. SPECIFIC OPERATION DATA FOR W670 ENGINES

| Model | Take Off | Engine R.P.M. Cruising Desired | Cruising Maximum | *Fuel Consumption Gal. Hr. | *Oil Consumption Qts. Hr. | Fuel |
|-----------------------------|----------|--------------------------------------|---------------------|----------------------------------|---------------------------------|-----------|
| W670-6A, 6N, 16, 17, and 24 | 2075 | 1750 | 1890 | 12.5 | .5 | 73 Octane |
| R670 Series | | | | | | |
| W670-K | 2175 | 1900 | 2000 | 14.0 | .5 | 80 Octane |
| W670-M and 23..... | 2200 | 1900 | 2000 | 14.0 | .5 | 80 Octane |

* Approximate

LUBRICATING OIL RECOMMENDATIONS

| Air Temperature | Oil Operating Temperature | Recommended Lubricating Oil |
|--------------------|------------------------------|--------------------------------|
| Below 32° F..... | Below 120° F..... | SAE-30 |
| 32° to 70° F..... | 120° to 160° F..... | SAE-40 |
| 70° to 100° F..... | 160° to 190° F..... | SAE-50 |
| Above 100° F..... | Above 190° F..... | SAE-60 |

NOTE: If engine oil temperatures exceed the above ranges for a given air temperature, use the next heavier grade of engine oil.

Maximum Cylinder Temperatures:

| | Heads | Barrels |
|-------------------------|---------|---------|
| Take Off and Climb..... | 550° F. | 325° F. |
| Cruising | 455° F. | 284° F. |

Oil Pressure (lbs./sq. in.):

| | |
|----------------------|----------|
| Cruising r.p.m. | 60 to 90 |
| Minimum at idle..... | 15 to 20 |

Oil Inlet Temperature:

| | |
|-------------------------|---------|
| Desired | 160° F. |
| Maximum allowable | 200° F. |

Section 3

GENERAL DESCRIPTION

1. GENERAL

(a) The W670 engine is a seven-cylinder, air-cooled, static radial type gasoline engine with 667.86 cubic inches piston displacement, 5.125-inch bore, and 4.625-inch stroke. The compression ratio is 5.4 to 1 on all models except the W670-M and W670-23 which have a compression ratio of 6.1 to 1.

(b) Serial numbers will be used exclusively for engine identification. Model designation corresponding to serial numbers may be obtained from the following table:

| | | |
|--------------------------------------|------------------------|------------------|
| Serials 5000 through 5045..... | W670-K - W670-M..... | Commercial |
| Serials 5046 through 5199..... | W670-6A - W670-M..... | Air Corps |
| Serials 5200 through 5499..... | W670-6A - W670-M..... | Commercial |
| Serials 5500 through 7970..... | W670-6A..... | Air Corps |
| Serials 8501 through 9133..... | W670-6N..... | Navy |
| Serials 10001 through 11999..... | W670-6A - W670-M..... | General |
| Serials 12001 through 12999..... | W670-6A..... | Commercial |
| Serials 13000 through 24999..... | W670-6A..... | Air Corps |
| Serials 25000 through 29999..... | W670-6N..... | Air Corps - Navy |
| Serials T181000 through T181588..... | W670-16 - W670-17..... | Air Corps - Navy |



Figure 9 - Accessory Case for W670-6A Engine

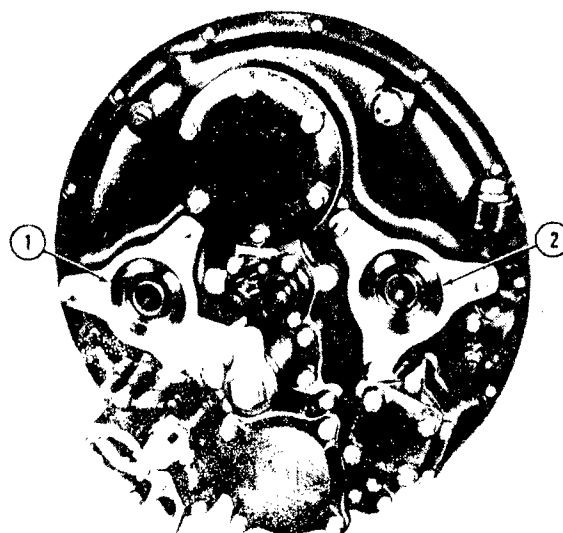


Figure 10 - Accessory Case for W670-6N, 16, and 17 Engines

(c) It is required that all R670 engines, when being transferred to civilian use, have the engine identification plate changed to show the civilian designation. All reference in this manual will be to the civilian designation. The following chart shows the corresponding military and civilian designations for these engines:

| Civilian Designation | Air Corps Designation | Navy Designation |
|----------------------|-----------------------|------------------|
| W670-6A | R670-5 | R670-5 |
| W670-6N | R670-4,-11A | R670-4 |
| W670-K | | |
| W670-M | | |
| W670-16 | | |
| W670-17 | | R670-8 |
| W670-23 | | |
| W670-24 | | |

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued

NOTE: Supplementing the identification plate, Continental serial numbers will be found stamped on a small machined boss area on the crankcase just under the front side of No. 1 cylinder mounting pad.

2. DIFFERENCES BETWEEN MODELS

While all models of this engine are essentially the same, the following detailed description of the differences between models is given:

a. Difference Between the W670-6N and W670-6A Engines

(1) The accessory case on the W670-6A engine is machined to accommodate a 1.875-inch diameter pilot (1 and 2, figure 9) on the magneto mounting pad. On the W670-6N, the provision for the pilot is machined to a 3.000-inch diameter (1 and 2, figure 10.)

(2) The fuel pump mounting pad is on the body of the rocker scavenge oil pump on all W670 models. However, the pad on the W670-6A is an AN standard "Old Type Pad." The W670-6N has an AN standard "Square Type Pad" (two inches between center line of mounting studs). The rocker scavenge oil pump drive gear on the W670-6N has a spline connection for driving the fuel pump and is provided with an oil seal. The W670-6A has a square coupling for driving the fuel pump, and no oil seal is provided.

(3) The drain hole in the oil sump for the W670-6N has a 1-20 tapped hole to provide for the dehydrator plug required for storage, while the oil sump for the W670-6A has a 1-18 tapped drain hole. Extreme care should be taken to see that the correct plug is used. An incorrect plug will cause damage to the threads in the oil sump.

(4) The magnetos used on the W670-6A are Scintilla Model VMN7DF. (See figure 11). The ignition drive shafts on the W670-6A have serrated connections for driving the magneto drive shafts by means of a serrated coupling. The ignition drive gears for the W670-6N have spline connections for driving the spline drive shaft on the SF7RN1 magnetos (See figure 12).

(5) The individual cable lengths for the ignition wiring assembly on the W670-6A are slightly shorter than those for the other models because of the difference in magnetos.

b. Difference Between the W670-6N and W670-16 Engines

(1) Models W670-6N and W670-16 are identical in construction, the only difference is the carburetors. The W670-6N engine is equipped with a Stromberg Model NA-R6D carburetor, for use in gravity-feed systems. The W670-16 engine is equipped with an NA-R6G carburetor, for use in pressure-feed systems. The NA-R6G carburetor also can be used for gravity systems.

(2) The NA-R6G carburetor has a modified float to give a $\frac{5}{8}$ -inch fuel level for use on low wing ships requiring fuel pumps which operate at a maximum pressure of three pounds per square inch. It also has an inverted flight check valve assembly.

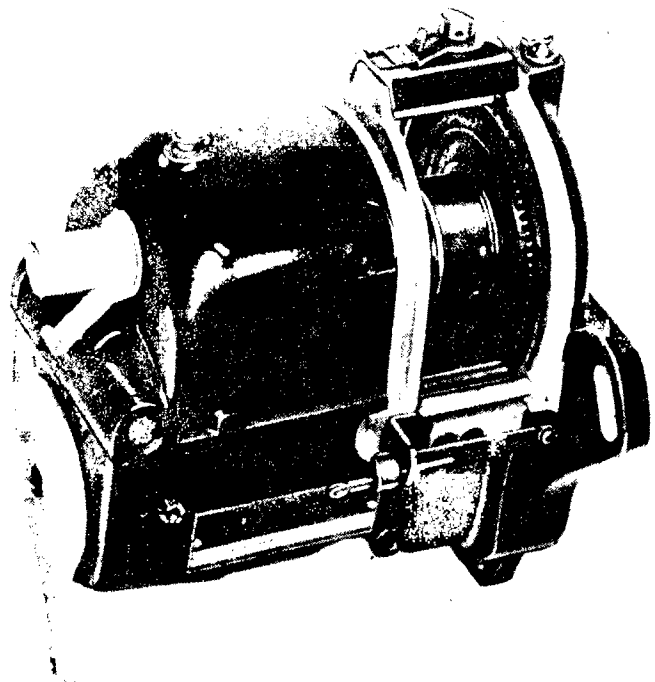


Figure 11 — Scintilla VMN7DF Magneto Used on W670-6A Engine

NOTE: The W-670-6N engine may be converted to a W670-16 engine by removing the NA-R6D carburetor and replacing it with an NA-R6G carburetor. However, if this change is made, the engine data plate must be changed from W670-6N to W670-16. A NA-R6D carburetor never should be used with a W670-16 engine.

c. Difference Between the W670-16 and W670-17 Engines

(1) The only difference between the W670-

OPERATING AND MAINTENANCE INSTRUCTIONS—Continued

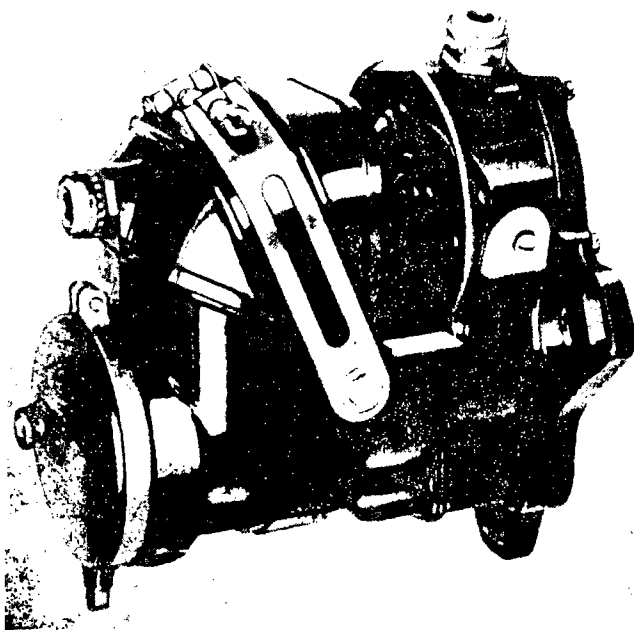


Figure 12—Scintilla SF7RN-1 Magneto Used on W670-6N, 16, and 17 Engines

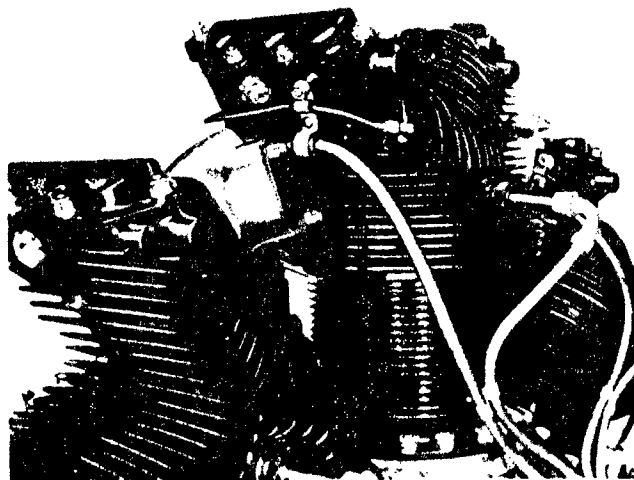


Figure 13—Primer Line and Ignition Wire Clip W670-6A and 6N

16 and W670-17 engines is that the W670-17 has a seventh order dampered crankshaft (Part No. A5881).

d. Difference Between the W670-17 and R670-11A Engines

(1) The only difference between the W670-17 and R670-11A is that the R670-11A has a spacer on the crankpin of the seventh order dampered crankshaft, and the crankpin end of the master rod is correspondingly narrower.

e. Difference Between the W670-6A and W670-K Engines

(1) The W670-6A is rated at 220 h.p. at 2075 r.p.m. while the W670-K is rated at 225 h.p. at 2200 r.p.m.

f. Difference Between the W670-6A and W670-M Engines.

(1) The W670-M is equipped with special pistons to give a compression ratio of 6.1 to 1 instead of 5.4 to 1 as on the W670-6A, and has heavier counterweights on the crankshaft to compensate for the heavier pistons.

g. Difference Between the W670-16 and W670-23 Engines

(1) The W670-23 is equipped with special pistons and crankshaft counterweights. Provision is also made for mounting and driving a constant speed propeller governor on the nose section of the crankcase. The ignition system is radio shielded with a "Breeze" harness. The W670-23 engine is equipped with either dual magnetos or one magneto and one battery distributor unit. An automatic spark advance is incorporated in both the magneto and distributor.

h. Difference Between the W670-16 and the W670-24 Engines

(1) The W670-24 is equipped with a crankshaft of a revised design having a spacer on the crankpin and the crankpin end of the master rod is correspondingly narrower. Magnetos with an automatic spark advance are used in place of the manual control spark as on the W670-16 engine.

3. CRANKCASE (See figure 14)

(a) The main crankcase section consists of a two-piece assembly bolted together at the cylinder center line with seven 7/16-inch nickel-steel bolts. It is cast from a special aluminum alloy and is reinforced with webs and fillets at all points of high stress. Twelve 3/8-inch studs are sunk at each cylinder port for cylinder mounting, and thirteen 5/16-inch studs are provided for attaching the rear accessory case. Internal webs, with pressed-in bronze liners (1), provide for the crankshaft front and rear main ball bearings.

(b) The front end of the front crankcase half is provided with a recess (2) to receive a special steel cage and thrust bearing.

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued

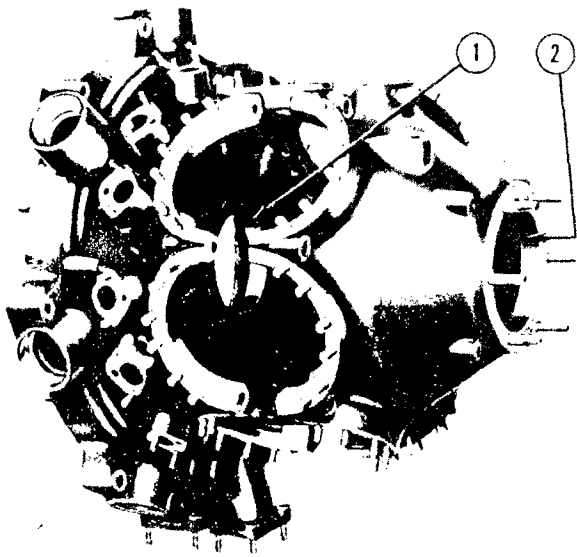


Figure 14 — Crankcase Sections Showing Pressed-in Bronze Main Bearing Liners, Cage and Thrust Bearing Recess

(c) The carburetor induction system is cast integral with the rear half of the case. This provides additional internal reinforcement and a heated passage for the fuel from the top of the carburetor to the individual cylinder intake manifold ports.

(d) Fourteen bosses are located around the outside diameter of the crankcase rear half where the cam followers and guides are installed. The casing is drilled at several points to provide a lubricating oil path to the cam followers, guides, push rods, and rocker arms. The eight main engine mounting lugs are cast integral with the rear half of the rear crankcase and located adjacent to the accessory case mounting flange. The main oil sump attaches to the front crankcase half between No. 4 and 5 cylinder ports.

4. ACCESSORY CASE (See figure 15)

(a) The accessory case is a single-section aluminum alloy casting, internally and externally ribbed for greater strength at all points of high stress. It is machined around its entire mounting flange, at all accessory mounting pads, at all accessory gear train support bushings, and is internally drilled for high and low pressure oil passages. An analysis of the gear train follows:

(1) The rear crankshaft starter gear (1) is driven from the crankshaft by a direct-spline connection and turns in a clockwise direction at crankcase speed.

(2) The cam ring bearing gear (2) is driven through serrations on gear (1) at crankshaft speed in a clockwise direction.

(3) The intermediate cam drive gear (3) is driven by gear (2) in a counterclockwise direction at two-thirds crankshaft speed. The intermediate cam drive gear pinion is integral with gear (3), and drives the internal cam ring gear in a counterclockwise direction at 1/6 crankshaft speed.

(4) The generator step-up drive (4) meshes with gear (3), and turns in a clockwise direction at 1 - 1/5 crankshaft speed.

(5) The generator drive gear (5) is attached to gear (4), and turns the generator final drive pinion (6).

(6) The generator final drive pinion (6) turns in a clockwise direction at 1.95 crankshaft speed.

(7) The starter gear (7) turns in a counterclockwise direction at crankshaft speed.

(8) The right and left magneto drive gears (8) turn in a counterclockwise direction at 7/8 crankshaft speed.

(9) The rocker scavenge oil pump driving gear (9) turns in a clockwise direction at 1 1/4 crankshaft speed.

(10) The rocker scavenge oil pump drive gear (10) is driven by gear (9) through a male-female square coupling, and turns in a clockwise direction at 1 1/4 crankshaft speed.

(11) The rocker scavenge oil pump driven gear (11) turns in a counterclockwise direction at 1 1/4 crankshaft speed.

(12) The duplex oil pump driving gear (12) turns in a clockwise direction at 1 1/4 crankshaft speed.

(13) The duplex pressure oil pump drive gear (13) is driven from gear (12) by a male-female square coupling, and turns in a clockwise direction at 1 1/4 crankshaft speed.

(14) The duplex pressure oil pump driven gear (14) meshes with gear (13), and turns in a counterclockwise direction at 1 1/4 crankshaft speed.

(15) The duplex scavenge oil pump drive gear (15) is keyed to the shaft of gear (14), and turns in a counterclockwise direction at 1 1/4 crankshaft speed.

(16) The duplex scavenge oil pump driven gear (16) meshes with gear (15), and turns in a clockwise direction at 1 1/4 crankshaft speed.

(17) The cam ring gear (17) meshes with the intermediate cam drive gear pinion and turns in a counterclockwise direction at 1/6 crankshaft speed.

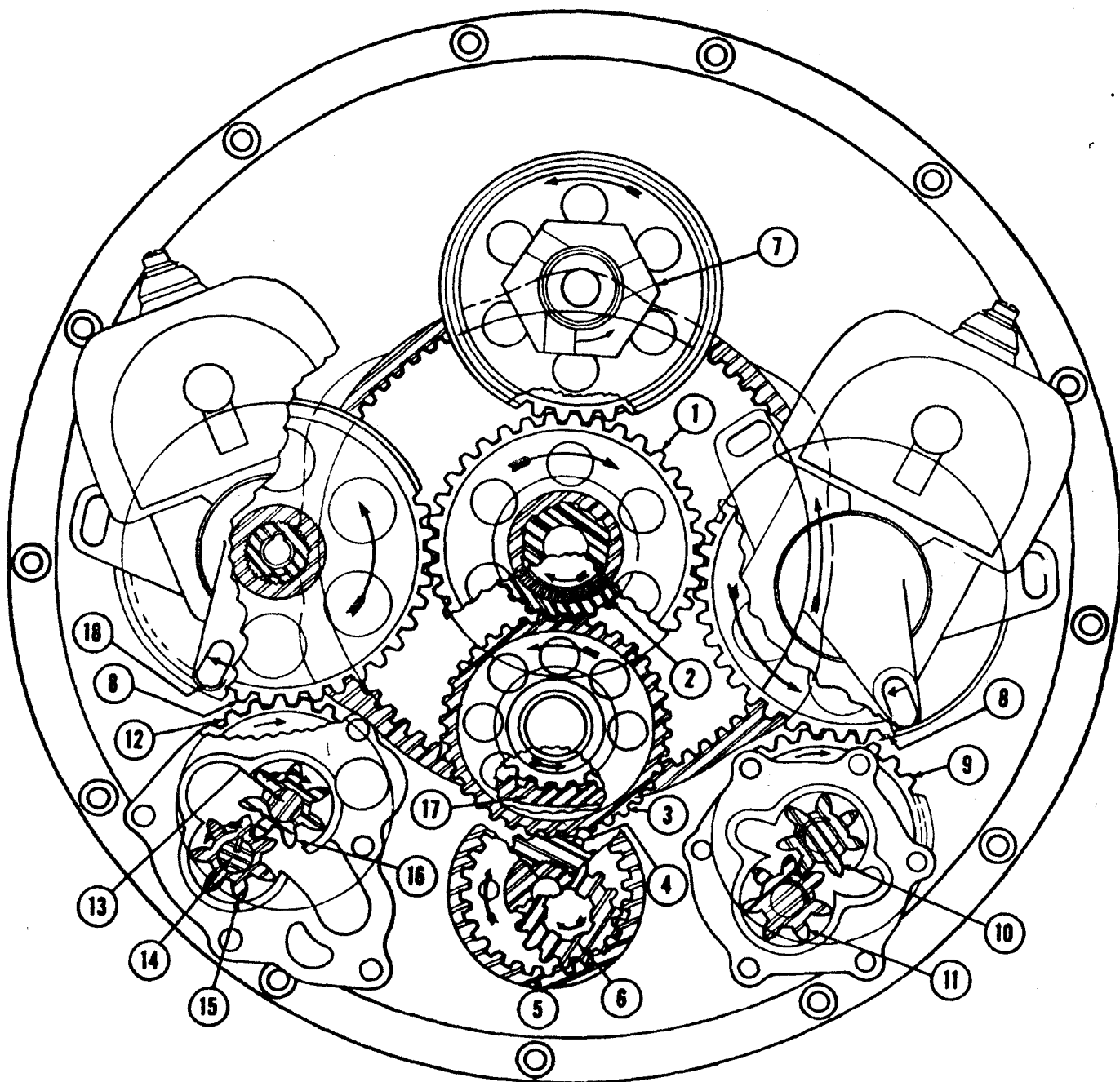


Figure 15 - Gear Train Analysis

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued

(18) The magneto breaker assembly control rotates in a clockwise direction for advanced position.

(b) The entire accessory gear train drive system, with the exception of the cam ring and bearing gear and the crankshaft starter gear, is supported from the accessory case. All engine accessories, except the carburetor, are attached with appropriate mounting studs in a manner to permit maximum ease in installing, removing, inspecting, or maintaining in service.

5. CRANKSHAFT (See figures 16 and 17)

(a) The crankshaft is of two-piece, drop-forged, steel-alloy construction. It is carefully machined over its entirety, and is assembled with a single $\frac{7}{8}$ -inch cap screw at the juncture

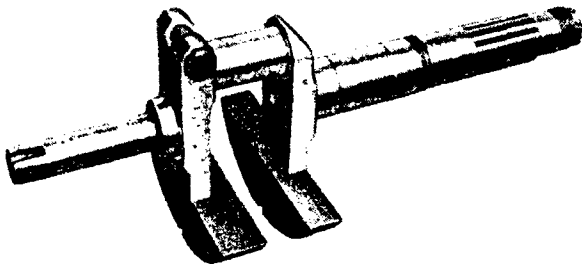


Figure 16 — Crankshaft Assembly Part No. A5180

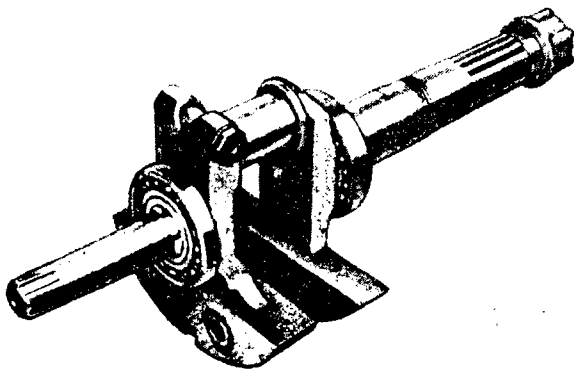


Figure 17 — Crankshaft Assembly Part No. A5891 with Seventh Order Torsional Vibration Damper — Showing Front and Rear Main Bearings and Propeller Thread Protection Cap.

of the rear crankcheek and the master rod journal. The crankshaft bore provides an oil passage to carry pressure lubrication to its single crank throw journal and articulating rod knuckle pin bearings. The crankshaft of models W670-6A, 6N, K, M, 16, 23 and 24 is equipped with two fixed counterbalances to offset the weight of the connecting and articulating rod assembly.

(b) The damper crankshaft has a single-torsional vibration damper attached to the rear crankshaft cheek by two loose pins. Tolerance on the pin clearances are .074 minimum to .080 maximum. Clearances beyond these limits will result in excessively rough engines and possible crankshaft breakage. A bronze ring is shrunk on the crankpin next to the crankpin's fillet for master rod side thrust.

NOTE: Crankshaft part No. A5881 is a seventh order torsional vibration damper crankshaft which uses Master Rod, part No. C5071. Crankshaft part No. A5891 is a seventh-order vibration damper crankshaft which, with its integral bronze washer, uses Master Rod, Part No. A40083.

(c) The propeller shaft is a prolongation of the front half of the crankshaft and is machined with a standard No. 20 spline for receiving the propeller hub. The accessory shaft (tail shaft) is a prolongation of the crankshaft rear half and is provided with a spline and a special female threaded end for power take-off to drive the accessory gear train.

6. CONNECTING AND ARTICULATING ROD ASSEMBLY (See figures 18 and 19)

The connecting and articulating rod assembly is made up of seven separate subassemblies described in detail as follows:

(a) The master rod is of single, drop-forged, "H" section special alloy steel. It is provided with a pressed-in, shell-type bronze bushing, reamed to receive the piston pin, and a one-piece steel-backed lead bronze bearing, 1.992 inches inside diameter by 3.288 inches long, pressed in the crank end and diamond bored to size. Wide cheeks are provided on the crank end as an integral part of the master rod. These cheeks are separately machined, bored, and reamed to receive the knuckle pins attaching the six articulating rods.

(b) Each of the six articulating rods is of an "H" section, drop-forged construction of

OPERATING AND MAINTENANCE INSTRUCTIONS—Continued

special alloy steel. The piston end of each rod is provided with a pressed-in, shell type bronze bushing reamed to take the piston pin. The

rod assembly is installed on the crankshaft throw journal prior to the assembly of the two crankshaft halves.

7. CYLINDERS (See figures 20 and 23)

The cylinder assembly is composed of two

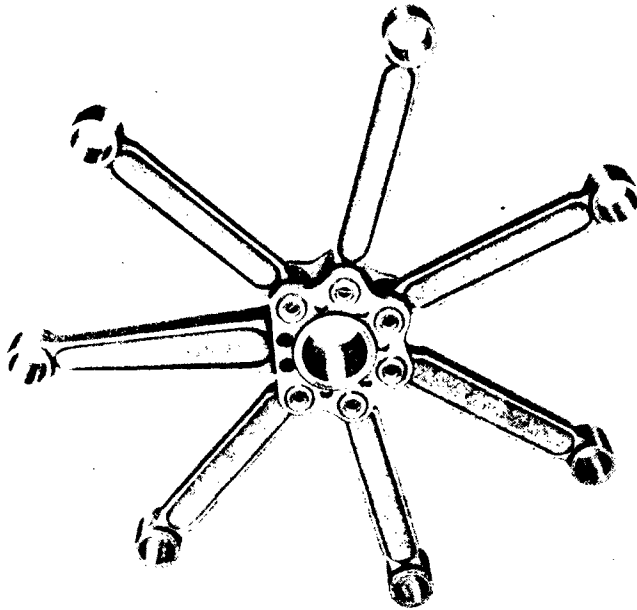


Figure 18 — Master and Articulating Rod Assembly



Figure 20 — Cylinder Assembly



Figure 19 — Cutaway of Master Rod with Complete Bearing

crank end is provided with a shell-type, pressed-in bronze bushing reamed to receive the knuckle pin.

(c) The articulating rods are assembled to the master rod by inserting the knuckle pin end between the master rod cheeks, lining up the bores, and installing the knuckle pins.

(d) The knuckle pins are machined from seamless alloy steel tubing. They are case-hardened, fitted on their inside bore with a pinned-in oil plug, and ground to size. These pins install with a retaining Woodruff key on one end and a circlip on the other.

(e) The complete master and articulating

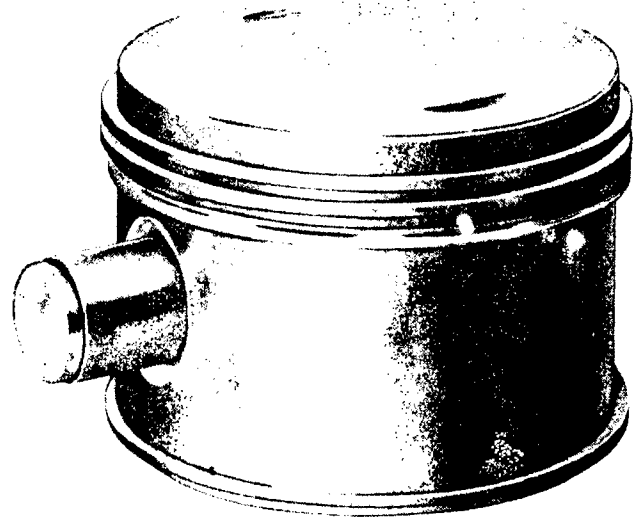


Figure 21 — Piston Assembly

OPERATING AND MAINTENANCE INSTRUCTIONS—Continued

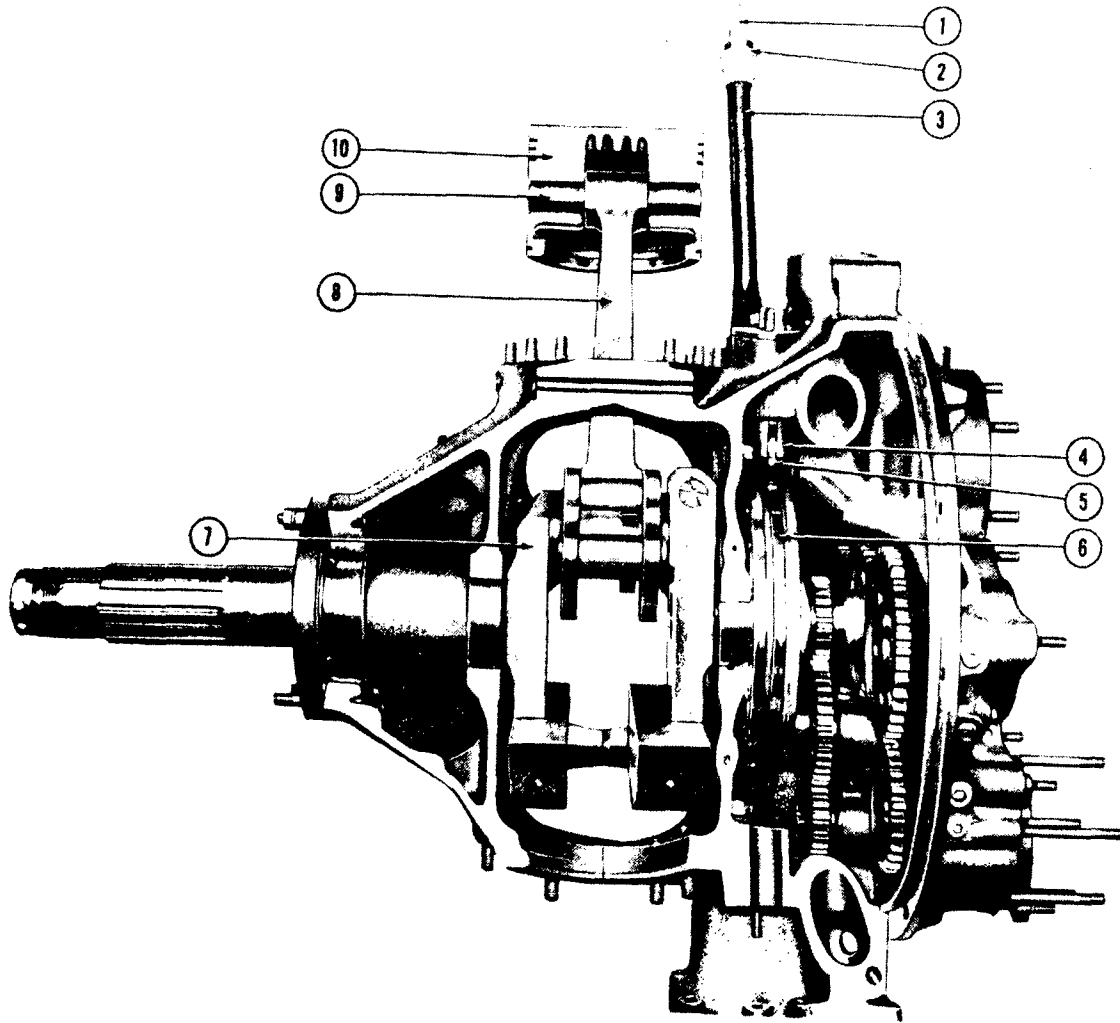


Figure 22—Left Side Cutaway View of Typical W670 Engine

pieces screwed and shrunk together. The following describes the construction:

(a) The cylinder barrel is machined from a single drop-forging of special alloy steel. Its mounting flange is provided with 12 holes to receive the attaching studs from the main crankcase, and the top is provided with a special thread where the aluminum head is screwed and shrunk in place. The bore is machined, ground, and polished to a mirror finish, and the cooling fins are machined their entire depth from the original forging.

(b) The cylinder head is of a special cast aluminum construction with side exhaust and rear intake ports. Provisions are made in the head to receive intake and exhaust valves and two spark plugs. Bronze valve seats and guides are shrunk in place when the head is shrunk to the barrel. The spark plug inserts are installed after the assembly has cooled. Rocker boxes are cast integral with the head and are machined to receive the necessary valve operating mechanism.

OPERATING AND MAINTENANCE INSTRUCTIONS—Continued



Figure 23—Cutaway View of Cylinder Assembly

8. PISTONS (See figure 21)

(a) The piston is of a special aluminum alloy forging with ribs provide d to reinforce and cool the head. The piston is machined over its entire outer surface and is drilled and reamed through its boss to receive the piston pin. The piston is provided with four ring grooves, three above the pin and one below.

(b) The piston pin is machined and ground from a case-hardened, seamless steel alloy tubing, fitted on each end with a special aluminum plug. The pin assembly is of the "full floating" type.

(c) There are four rings to each piston. Two compression rings and one oil ring are located above the pin; one compression ring is located below.

9. VALVE OPERATING MECHANISM (See figures 22 and 23)

(a) The valves are actuated by means of a double track cam ring revolving on the cam ring bearing gear which is located on the crankshaft in the accessory section of the main crankcase. Lobes, provided on the cam ring track, actuate the cam followers through rollers located on their ends. The cam lift action is transmitted to the cylinder valve by means of a

push rod and rocker arm. The rocker arm is equipped with a center ball bearing secured in place by a rocker arm bolt and two side-thrust washers. It has a valve adjusting screw on the push rod end and a roller on the valve end. The rocker arm acts directly from the push rod to the top of the valve stem.

(b) The cam ring is driven by the intermediate cam drive gear pinion meshing with internal teeth around a track near its outside diameter.

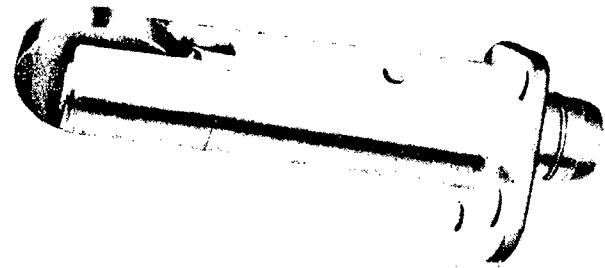


Figure 24—Cam Follower and Guide Assembly

(c) The cam follower assembly is composed of two major parts (see figure 24): the "guide," and the "follower" with its assembly pin, roller, and retaining circlip. The assembly is lubricated by the low pressure oil system, and is drilled to provide passage for this oil to the hollow push rod. The cam follower is secured in its guide with a circlip located near the push rod socket. The assembly is secured in the crankcase by two 1/4-inch studs extending through the cam follower guide shoulder to push rod housing mounting flange.

(d) The push rod is of three-piece construction with two ball socket ends pressed into a tube. The socket ends are drilled to permit passage of low pressure oil from the cam follower to the rocker arm. Push rod ball socket ends are machined steel, case-hardened, and ground to fit their cam follower and valve adjusting screw sockets.

(e) The rocker arm is a drop-forging of alloy steel, bored and threaded on the rear end to receive the valve adjusting screws. It is provided with a recess in the center for the rocker ball bearings, and is machined and bored at the front end for a roller specially designed to elim-

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued

inate wear from the valve stem during operation.

(f) The intake valve is a special steel forging, machined and ground with a 2.250-inch head and a .464-inch Stellite-tipped stem. The valve is ground to its seat and installed in the cylinder with the conventional valve springs and washers, a safety circlip in its stem, and is retained in place by two split-cone keys.

(g) The exhaust valve is a special steel forging, machined and ground with a 2.250-inch head and a .558-inch Stellite-tipped stem that is hollow and filled with sodium. It is installed in the same manner as described in the preceding paragraph.

(h) The aluminum or magnesium rocker box covers are held in place by six 1/4-28 nuts. The covers on cylinders No. 7, 1, and 2 have no external connections. Cylinders No. 3, 4, 5, and 6 are equipped with external piping to scavenge rocker box oil to the oil sump level. There it is picked up by the special low pressure rocker scavenge oil pump. Inter-cylinder rocker scavenge oil drain lines are installed with oil hose connections.

10. FUEL SYSTEM

Fuel is furnished by one single-barrel Stromberg Type NA-R6D carburetor on the W670-6A, 6N, K and M, and a NA-R6G carburetor on the W670-16 and 17, located on a mounting pad at the extreme lower part of the main crankcase. Fuel passes from the carburetor into the intake manifold system, and is distributed to the cylinder manifold ports located around the outside diameter of the main crankcase and to the rear of the cylinder ports. The fuel passes from these ports through external manifold pipes to the cylinder intake valve ports.

11. IGNITION SYSTEM

(a) Ignition is furnished and distributed by two type VMN7DF Scintilla magnetos on the W670-6A engine, and two type SF7RN-1 Scintilla magnetos on the W670-6N, 16 and 17 engines. One magneto is mounted on the left and one on the right side of the accessory case.

(b) Ignition cables, carrying the current from the magnetos to the cylinder spark plugs, pass through a protective ignition cable housing located along the upper diameter of the accessory case.

Champion C26 or M26 spark plugs are used in the W670 engine.

12. LUBRICATION SYSTEM

a. General

The lubrication system of these engines is divided into four divisions: high pressure oil; low pressure oil; rocker scavenge oil; and main scavenge oil.

b. The Oil Pump

(1) The main pressure and scavenge oil pump is of duplex construction. The scavenge oil section is located in a separate housing adjacent to the accessory case, and the pressure oil section is superimposed over the scavenge section in another housing. The duplex pressure and scavenge sections are separated by two plates with oil seals located between them.

(2) Drive and idling gear shafts extend through the duplex pump body assembly from front to rear. Each shaft supports two gears; the front gears operate in the scavenge section and the rear gears in the pressure section. The entire pump is driven by the left accessory case oil pump drive gear through a square type coupling, the male portion of which is integral with the pressure drive gear shaft. The driving scavenge gear is located on and keyed to the driven pressure gear shaft. The driven scavenge gear is mounted on the pressure gear shaft but is not keyed to it.

(3) The high pressure oil relief valve is incor-

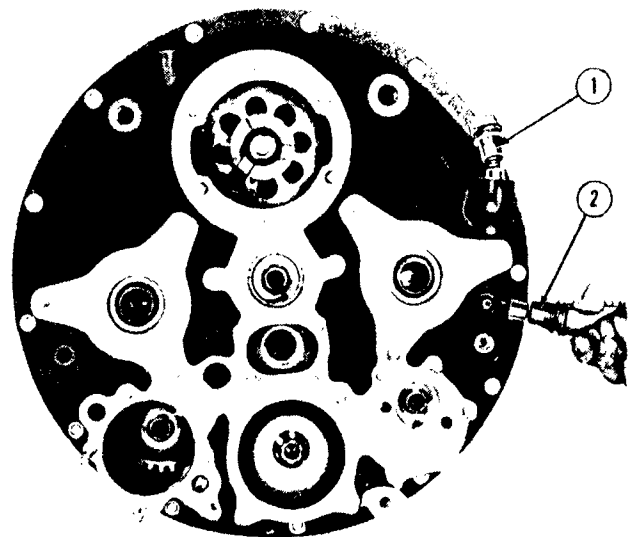


Figure 25 — Location of Low Pressure Oil Relief Valve

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued

porated as an integral part of the duplex pump assembly. (See figure 25, Ref. 1). It is of the spring and plunger type with an adjusting screw regulating the oil pressure. Bypassed oil from this relief valve is admitted directly to the input of the pressure pump by way of a passage in the pump housing.

c. High Pressure Oil (See figures 91 and 92)

For the purpose of this explanation, the cycle of oil will be started at the "oil in" connection on the main duplex oil pump. From this point oil is pumped through the high pres-

sure oil filter (screen) into the main oil distributing passages on the front side of the accessory case. All bearings, located on the accessory case, receive pressure lubrication by way of small oil passages in the accessory case casting connecting each individual bearing with this main oil supply line. Oil enters the rear of the crankshaft through a recessed bronze bearing, and passes through a drilled passage in the rear crank cheek into the hollow crankpin. A small hole drilled in this pin lubricates the master rod bearing and passes oil into the master rod which is drilled for oil passage to the knuckle pins in the articulating rods. Oil

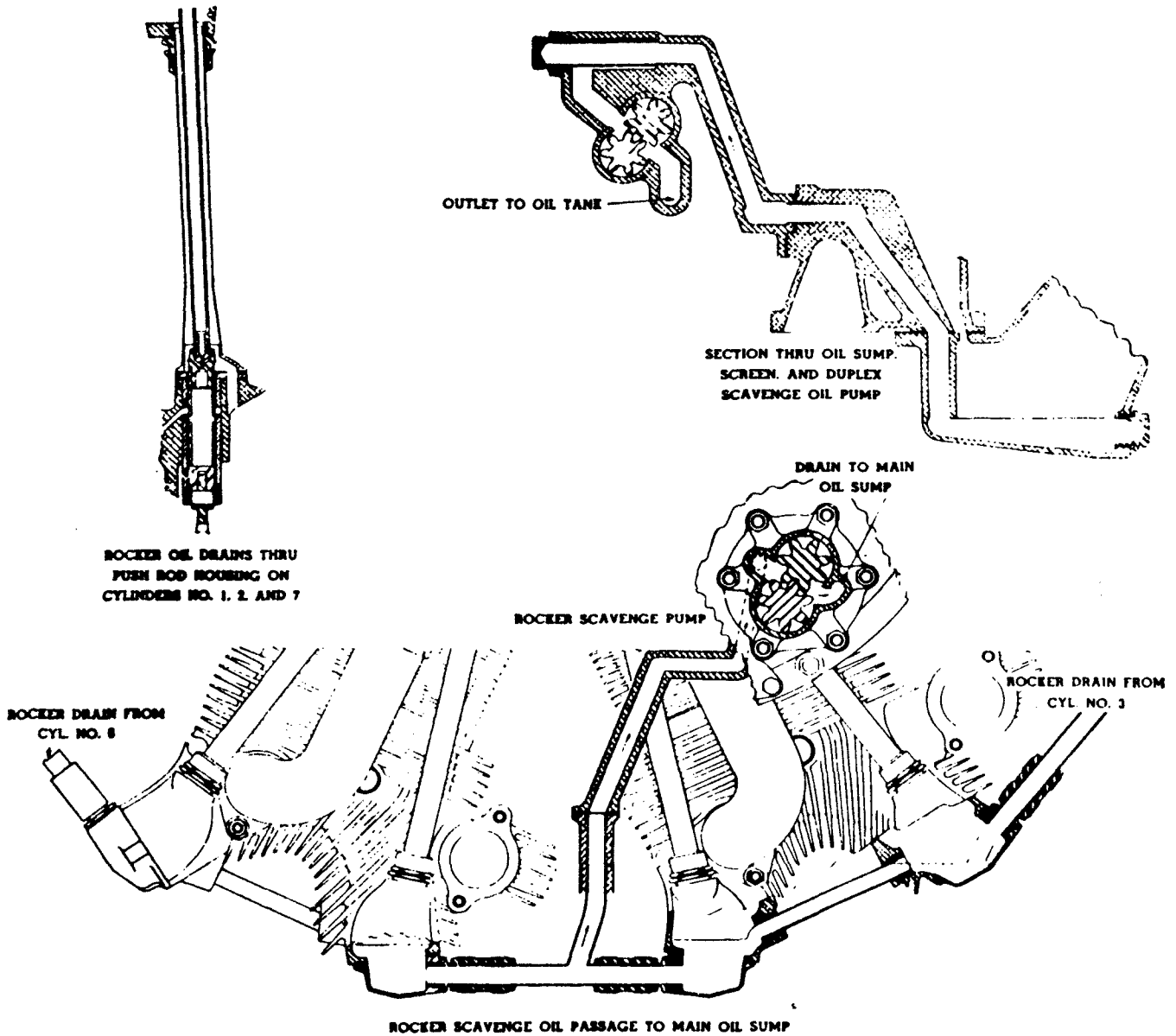


Figure 26 — Scavenge Oil System Diagram

OPERATING AND MAINTENANCE INSTRUCTIONS—Continued

thrown from ends of the master rod bearing lubricates the piston assemblies and cylinder walls. Front and rear main ball bearings and the thrust ball bearing receive their lubrication from the splash and spray of the main crankcase. Accessory gears receive their lubrication by splash and spray of oil escaping from the pressure lubrication of their respective bearings. When circulating crankcase oil is released from pressure, it falls by gravity to the main oil sump located between No. 4 and 5 cylinders.

d. Low Pressure Oil (See figures 91 and 92)

Low pressure oil originates at the end of the main high pressure passage in the accessory case just below the low pressure oil relief valve. High pressure oil passes through a .090-inch orifice to the low pressure relief valve, which maintains a constant pressure of 15 to 18 pounds per square inch in the low pressure rocker system. (See figure 25.) Bypassed oil from this valve empties through a drilled passage in the accessory case casting to the accessory section of the main crankcase. The low pressure oil passes from its valve through drilled passages in the rear crankcase casting to each of the 14 cam follower guides, then through a hole drilled in the center of this guide and cam follower into the rocker arm bearing and roller. Valve stems, springs and washers receive their lubrication by splash. On cylinders No. 7, 1 and 2 the rocker oil scavenges by gravity back to the rear crankcase section by way of the push rod housings and special drain passages provided in the rear half of the main crankcase. Scavenge oil in rocker boxes of cylinders No. 3, 4, 5, and 6 drains by gravity through the external piping provided between the cylinder rocker box covers to the rocker box level of cylinders No. 4 and 5, where it is picked up by the rocker scavenge pump and discharged in the accessory section of the main crankcase. Detailed explanation of this procedure is outlined in the following paragraph.

e. Rocker Scavenge Oil (See figure 26)

Due to the fact that rocker boxes on cylinders No. 4 and 5 are at a lower level than the main

oil sump, it is necessary to provide a separate pump so that these boxes will not be unduly flooded from the main crankcase. As a single-section scavenge pump will not pick up oil from two levels without danger of flooding the lower level, a separate scavenge pump is located on the accessory case to handle the rocker scavenge oil. This pump picks up its oil by way of a hole through the rear end of the oil sump and drilled passages in the rear crankcase and accessory case housing, and empties it into the accessory case section of the main crankcase.

f. Main Scavenge Oil (See figure 26)

Oil draining from all sections of the main crankcase falls into the main oil sump located between cylinders No. 4 and 5 on the front side of the engine. From this sump the duplex scavenge oil pump (a section of the duplex pressure and scavenge oil pump assembly) picks it up through the scavenge oil screen located adjacent to and a little above the main pressure screen housing, and returns it to the oil supply tank. From this point the duplex pressure pump again picks it up and the oil repeats its circulation throughout the engine.

13. PRIMING SYSTEM (See figure 27)

W670 engines are equipped with a conventional external priming system composed of a primer distributor with four standard $\frac{1}{8}$ -inch primer lines. These lines attach to the distributor at one end and to primer jets on cylinders No. 6, 7, 1, and 2 at the other. The airplane's main primer line attaches at the center of the engine's primer distributor with a standard $\frac{1}{8}$ -inch pipe connection.

14. COOLING (See figure 27)

The entire engine is air-cooled. At no time during operation will cylinder head temperature exceed $+260^{\circ}$ C. ($+500^{\circ}$ F.) or "oil in" temperatures exceed $+95^{\circ}$ C. ($+203^{\circ}$ F.)

CONTINENTAL W 670 AIRCRAFT ENGINES

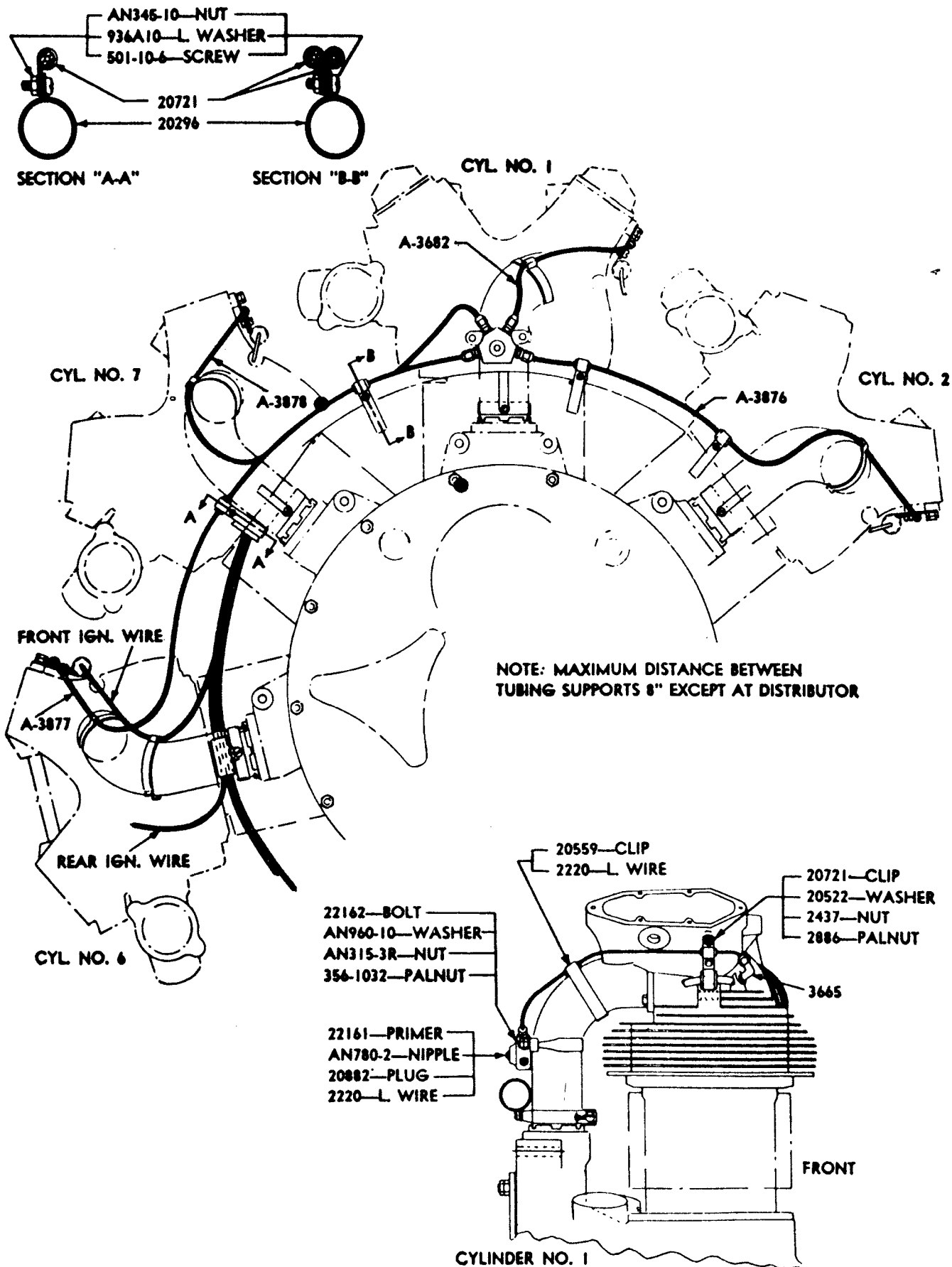


Figure 27 — Priming System Diagram

TABLE OF SPECIFICATIONS

Section 4

NOTE: Direction of rotation of accessories is defined from the viewpoint of the observer facing the drive on the engine.

GENERAL

| | |
|---|--------------------------------------|
| Type Certificate No..... | 162 |
| Models | W670-6A, 6N, K, M, 16, 17, 23 and 24 |
| Type | Single Row, Radial, Air-Cooled |
| Number of Cylinders..... | 7 |
| Bore | 5.125 inches |
| Stroke | 4.625 inches |
| Piston Displacement..... | 667.86 cubic inches |
| Compression Ratio | |
| (W670-6A, 6N, K, 16, 17 and 24)..... | 5.4:1 |
| (W670-M and 23)..... | 6.1:1 |
| Rated B.H.P. at sea level | |
| (W670-6A, 6N, 16, 17, 24 and R670-11A)..... | 220 at 2075 r.p.m. |
| (W670-K) | 225 at 2200 r.p.m. |
| (W670-M and 23)..... | 240 at 2200 r.p.m. |
| Rotation of Crankshaft..... | Clockwise (viewed from rear) |
| Propeller Spline Size..... | No. 20 |
| Diameter of Mounting Bolt Circle..... | 20 inches |
| Number of Mounting Bolts..... | 8 |
| Size of Mounting Bolts..... | $\frac{3}{8}$ inch |
| Overall Diameter of Engine..... | 42 $\frac{1}{4}$ inches |
| Overall Length of Engine..... | 34 $\frac{3}{16}$ |
| POSITION OF CENTER OF GRAVITY: | |
| Distance to rear of front face of thrust nut..... | 10 $\frac{1}{8}$ inches |
| Distance forward of rear face of mounting lugs..... | 6 $\frac{1}{16}$ inches |
| Distance below centerline of crankshaft..... | $\frac{5}{8}$ inch |
| Dry Weight of Engine (Approximate)..... | 485 lbs. |

IGNITION

| | |
|---|---|
| Magneto-Scintilla | |
| (W670-6N, 16, 17, and R670-11A)..... | Type SF7RN-1 |
| (W670-6A) | Type VMN7DF |
| (W670-K and M) | Type MN7DF |
| (W670-23 and 24)..... | Type YMN7DFA |
| Battery Distributor Unit (W670-23)..... | Type W670A |
| Spark Plug Gap Clearance..... | .016 inch plus .002 inch or minus .001 inch |
| Spark Plug | Champion C26 or M26 (C26S shielded) |
| Rotation | Counterclockwise |
| Speed | 0.875:1 |
| Right Magneto Times, Degrees Before Top Center..... | 32 |
| Left Magneto Times, Degrees Before Top Center..... | 29 |

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued

VALVES AND TIMING

HOT RUNNING VALVES:

| | |
|--|-----|
| Intake Opens, Degrees Before Top Center..... | 8 |
| Intake Closes, Degrees After Bottom Center..... | 45 |
| Intake Remains Open, Crank Angle Degrees..... | 209 |
| Exhaust Valve Opens, Degrees Before Bottom Center..... | 63 |
| Exhaust Valve Closes, Degrees After Top Center..... | 20 |
| Exhaust Remains Open, Crank Angle Degrees..... | 263 |

VALVE TIMING (Set valve clearance No. 1 cylinder at .124 inch cold):

| | |
|---|-----------|
| Exhaust Opens, Degrees Before Bottom Center..... | 49 |
| Exhaust Closes, Top Dead Center..... | 0 |
| Intake Valve Opens, Degrees After Top Center..... | 4 |
| Intake Valve Closes, Degrees After Bottom Center..... | 21 |
| Adjust All Valves for Service Cold..... | .010 inch |
| Valve Lift | .500 inch |

FUEL SYSTEM

Carburetor — Stromberg

| | |
|-------------------------------|--------------|
| (W670-6A, 6N, K and M)..... | Model NA-R6D |
| (W670-16, 17, 23 and 24)..... | Model NA-R6G |

Fuel

| | |
|----------------------------------|-----------|
| (All except W670-M, and 23)..... | 73 Octane |
| (W670-M and 23)..... | 80 Octane |

| | |
|---|---------------|
| Carburetor Connection | 3/8-inch Pipe |
| Priming System Inlet Connecting Thread..... | 1/8-inch Pipe |

LUBRICATION SYSTEM

| | |
|--------------------------------------|----------------------|
| Speed of Oil Pump..... | 1.250:1 |
| Oil Inlet and Outlet Connection..... | 3/4-inch Pipe Thread |
| Oil Flow | 15 lbs./minute |
| Oil Pressure Maximum | 90 lbs. |
| Oil Pressure — Normal..... | 60-70 lbs. |
| Oil Pressure — Minimum at idle..... | 15-20 lbs. |
| Minimum safe quantity of Oil..... | 3 gals. |

ACCESSORY DRIVES AND INSTRUMENT CONNECTIONS

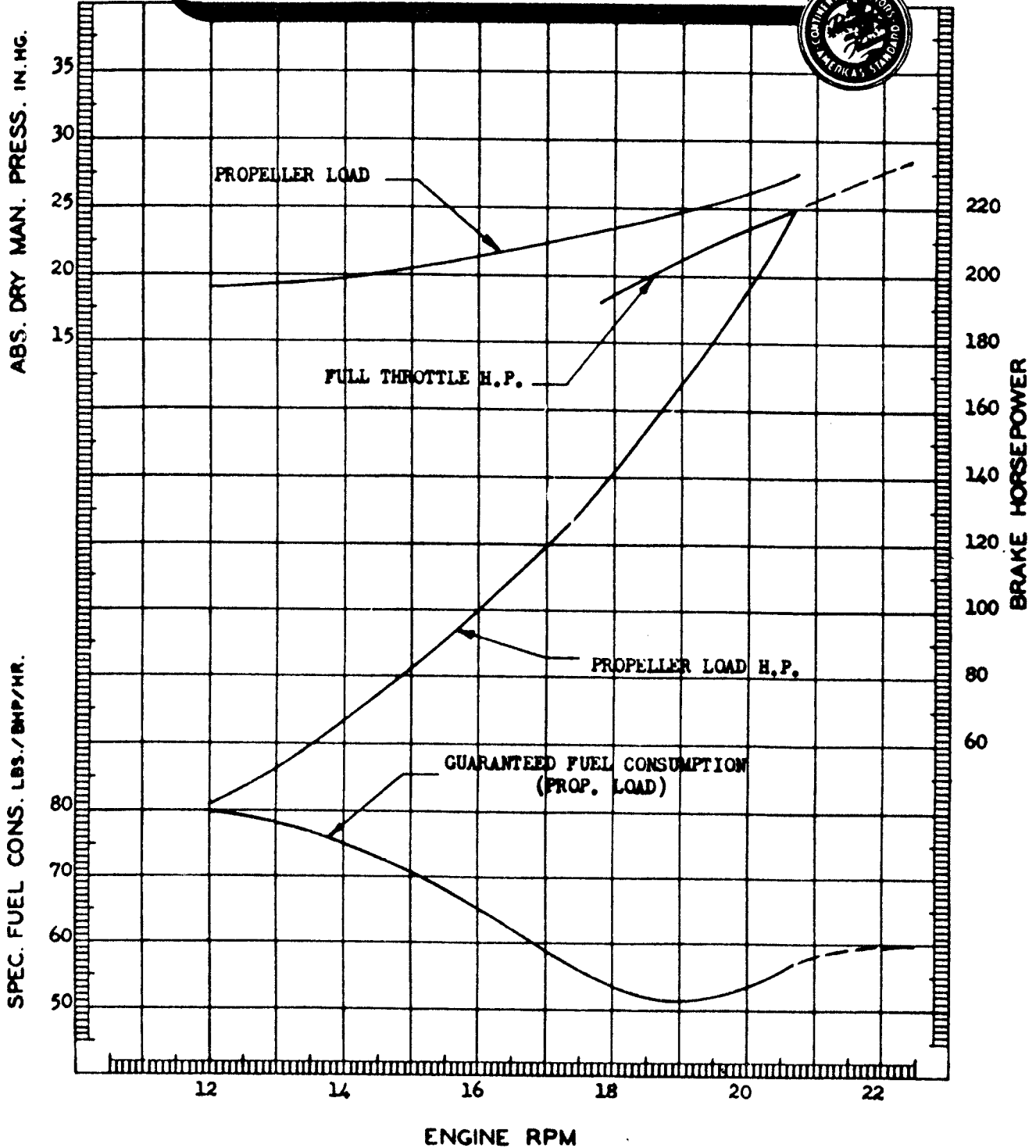
| | |
|---|------------------------|
| Oil Pressure — High and Low..... | 1/8-inch Standard Pipe |
| Crankcase Breather | 1/2-inch Hose |
| Oil Tank Vent Connection on Accessory Case..... | 3/4-inch Standard Pipe |

FUEL PUMP MOUNTING PAD AND DRIVE

| | |
|---|--------------|
| Type of Drive — W670-6N, 16, 17, 23 and 24..... | Spline |
| Type of Drive — W670-6A, K and M..... | Square Shaft |
| Speed | 1.250:1 |
| Direction of Rotation | Clockwise |

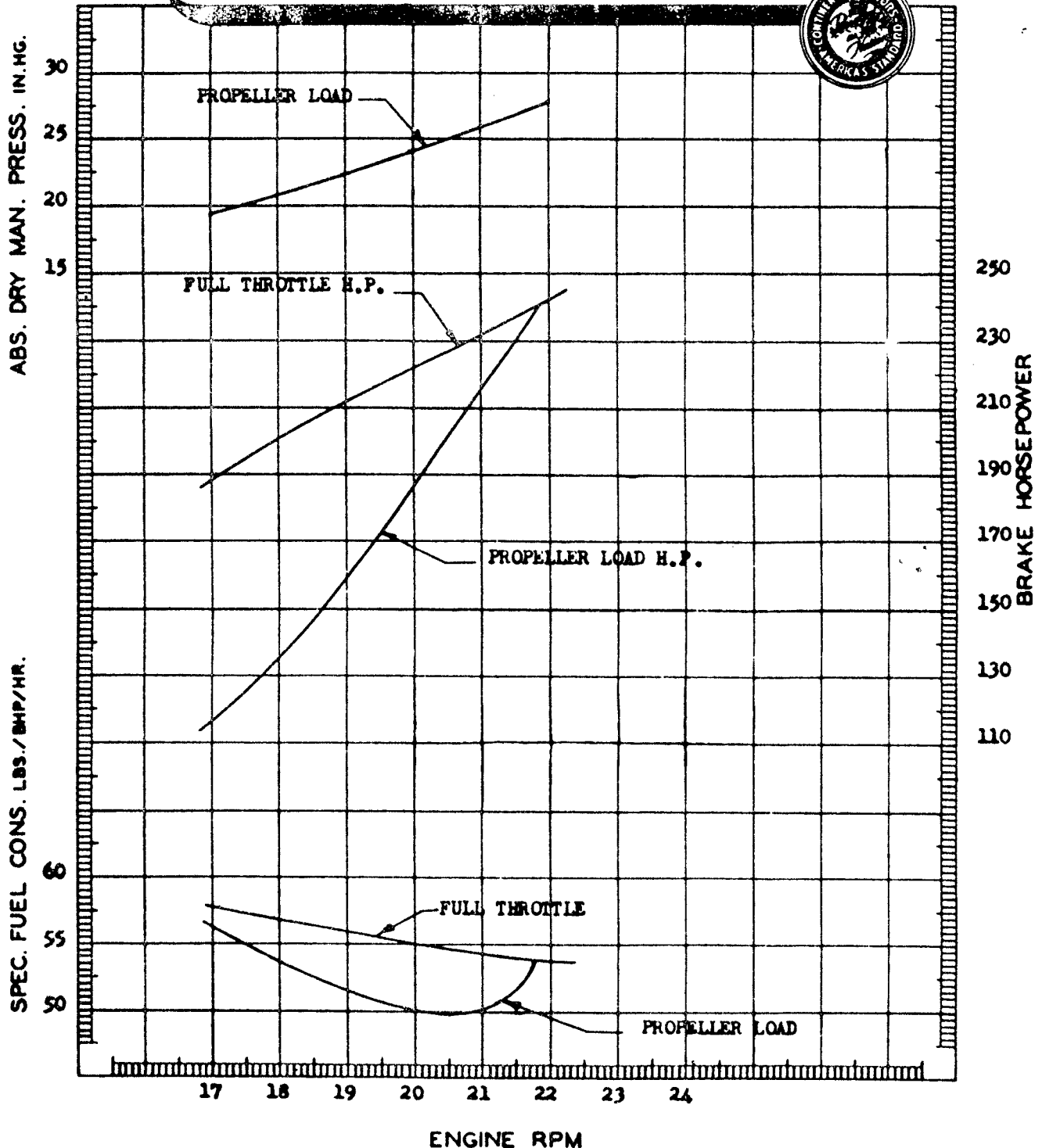
CONTINENTAL MOTORS CORPORATION

SEA LEVEL PERFORMANCE CURVES
ENGINE MODEL W670 SERIES 6A-16-24
 HP. & MANIFOLD PRESSURE PLUS OR MINUS 3% VARIATION
 COMPRESSION RATIO: 5.4 to 1 POWER CORRECTED TO
 DISPLACEMENT: 667.86 CU. IN. 29.92 IN. HG.
 FUEL: OCTANE 60°F. CARB. AIR TEMP.



CONTINENTAL MOTORS CORPORATION

SEA LEVEL PERFORMANCE CURVES
ENGINE MODEL W670 SERIES M & 23
 HP. & MANIFOLD PRESSURE PLUS OR MINUS 3% VARIATION
 COMPRESSION RATIO 6.1 to 1 POWER CORRECTED TO
 DISPLACEMENT: 667.86 CU. IN. 29.92 IN. HG.
 FUEL: 80 OCTANE 60°F. CARB. AIR TEMP.



ENGINE PACKING AND UNPACKING

Section 5

Continental W670 engines are packed for domestic and overseas shipment in a special box of the following general specifications:

| | |
|----------------------|-----------|
| Overall length | 48 inches |
| Overall width | 48 inches |
| Overall height | 48 inches |
| Empty weight | 430 lbs. |
| Gross weight | 930 lbs. |

The base of these shipping boxes is designed as an engine bed with a $\frac{1}{4}$ -inch steel plate serving as the engine mounting ring. The engine is bolted to this plate at the regular crankcase mounting bosses, and the plate is secured to the engine bed by four $\frac{3}{8}$ -inch bolts. The engine is packed for shipment with the center plane of its cylinders in a horizontal position, with the propeller shaft extending vertically up. The top of the shipping box acts as the engine cover, and is equipped with four lifting hooks on the top side that connect direct to the engine bed bearers by four steel straps. These hooks facilitate ease of loading and unloading as the entire unit may readily be suspended from any chain hoist or boom.

UNPACKING

The top of the shipping box may be separated from its base by first removing the four attaching nuts located at the base of each lifting hook strap where it attaches to the engine bed bearer extensions, and then lifting it vertically with the aid of a chain hoist. Remove the shipping cap from the propeller shaft threads and install the crankshaft lifting eye assembly. Remove four bolts securing the engine mounting plate to the shipping box bed, and lift the engine clear with a hoist. Disassemble the engine bed plate from the crankcase mounting boss by removing the attaching bolts. Reinstall the engine bed plate to the shipping box.

Engines are serviced prior to packing to prevent cylinder rust, and if it is desired to prepare it for immediate installation in an airplane, all plugs should be removed from the spark plug holes and the excess oil allowed to drain from the cylinders while the engine is in a horizontal position and the crankshaft is slowly turned one complete revolution.

Attach sling to the crankcase lifting eyes installed on the two crankcase assembly bolts on the right and to the left side of Number One cylinder, and pick engine up by second hoist, suspending it in flying position. Uncouple first chain hoist, remove the crankshaft lifting eye assembly, and reinstall shipping cap on propeller shaft threads.

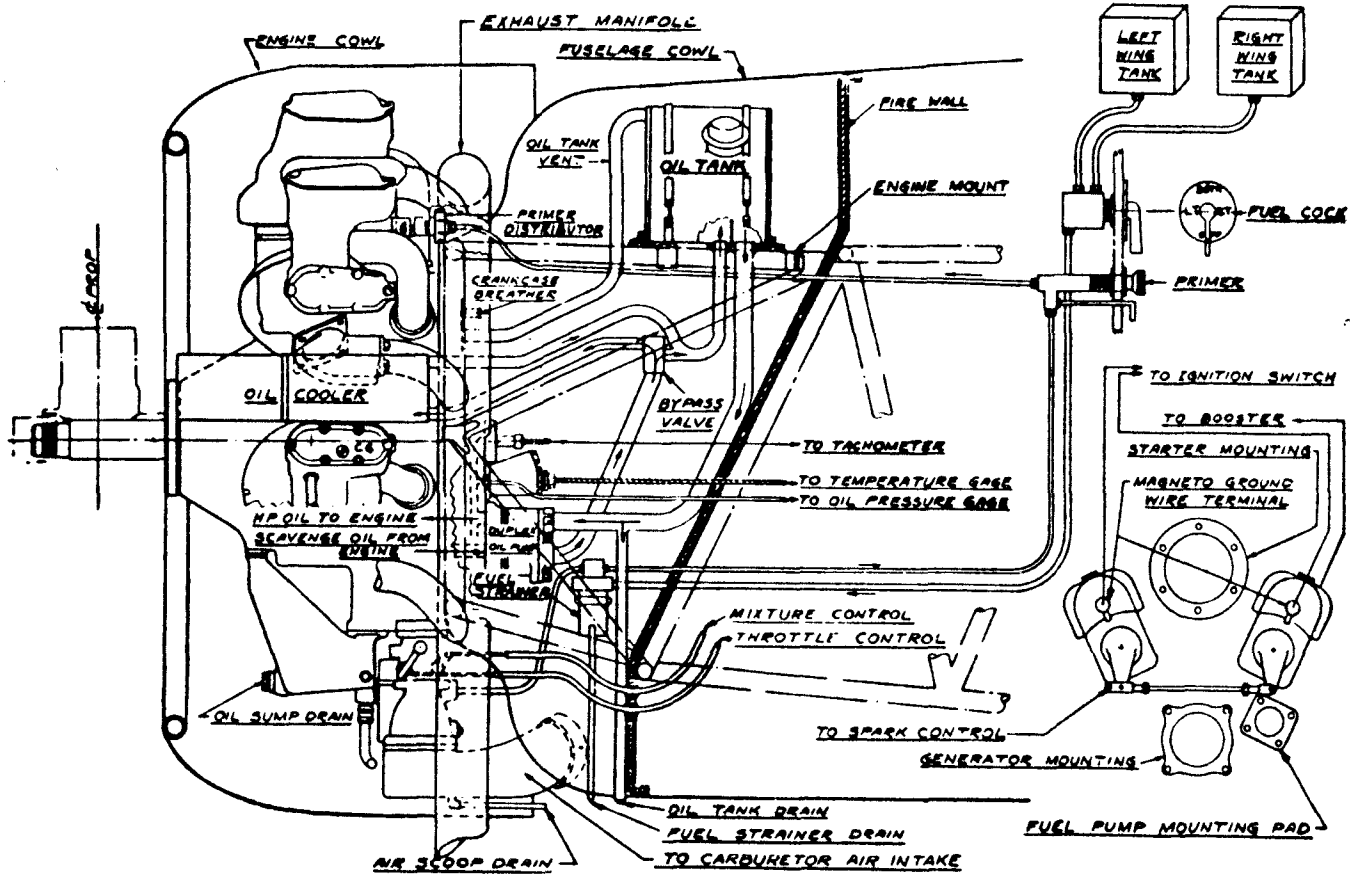
Attach engine to an assembly stand or install in airplane.

PACKING

Customers desiring to ship Continental engines may secure a shipping box and parts listed in the "Engine Shipping Equipment" by contacting a Continental Service Station or Parts Dealer.

Engines being prepared for shipment in the factory shipping boxes should have the inside of the cylinders and all exposed metal parts coated with oil to prevent rust.

The engine is installed in its shipping box following the reverse procedure outlined in the "Unpacking" section of this chapter. Personnel performing the operation are cautioned to securely attach the engine to its mounting plate and the plate to the engine bed. Flat washers should be used under the heads and nuts of all assembling bolts, and lock washers or cotter pins used to prevent retaining nuts from vibrating loose during shipment.

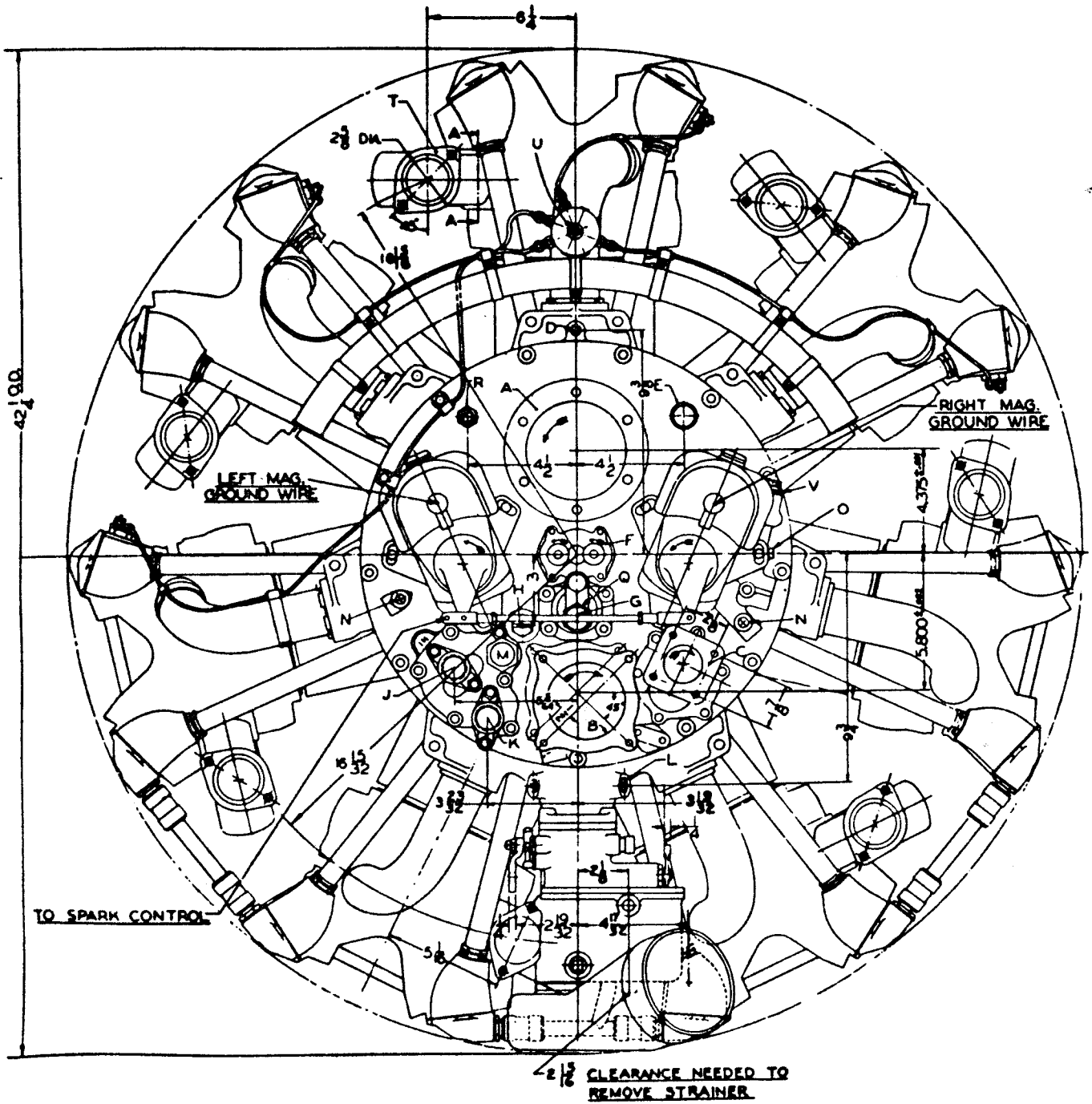


Installation Diagram - Continental W670 Engine

INSTALLATION DRAWINGS

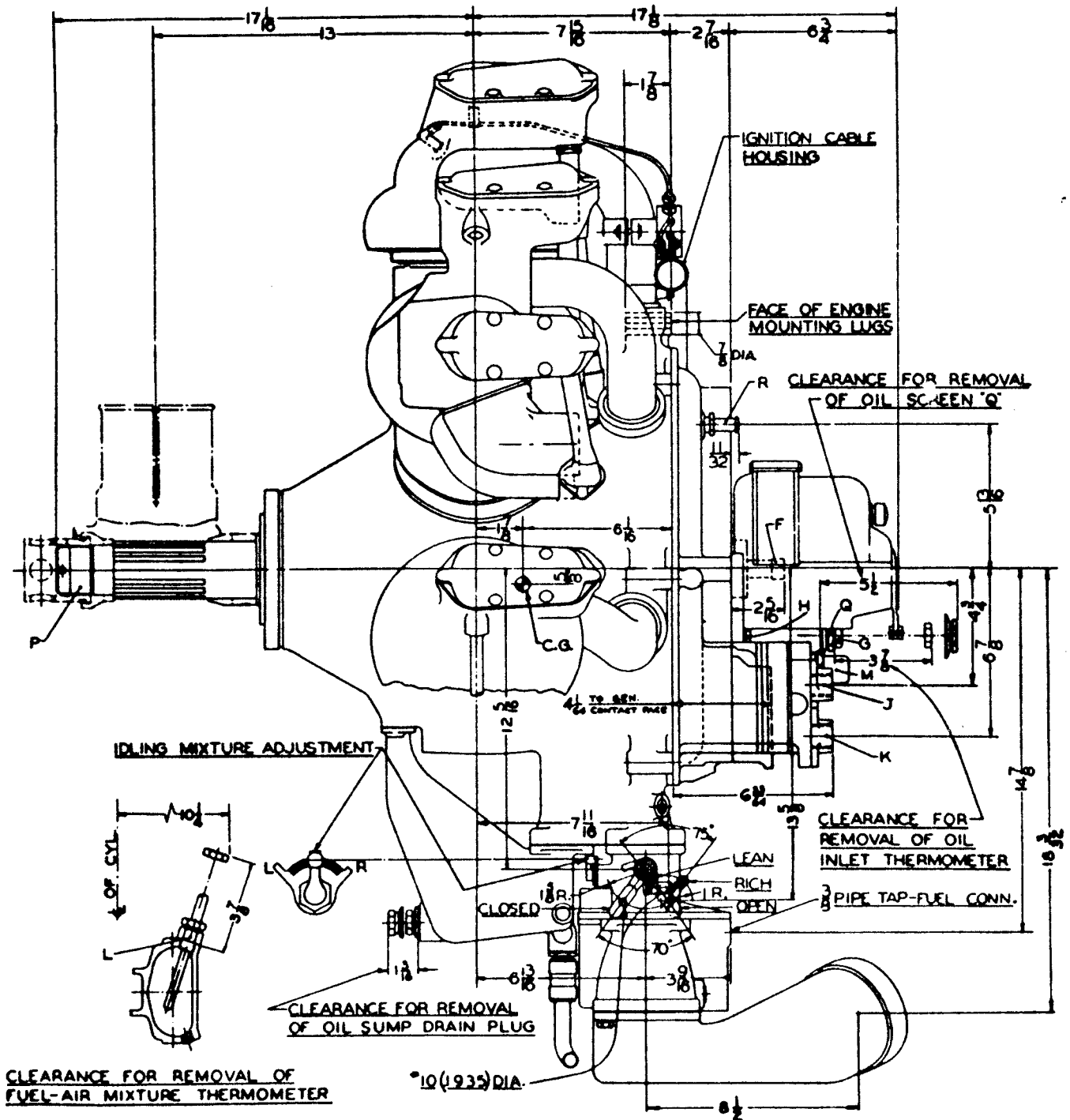
REFERENCE LETTER INDEX

- | | |
|---|---|
| A Starter Mounting Pad and Drive. | M High Pressure Oil Relief Valve. |
| B Generator Mounting Pad and Drive. | N High Pressure Oil Gauge Connection. $\frac{1}{8}$ Pipe Tap (2). |
| C Fuel Pump Mounting Pad and Drive. | O Low Pressure Oil Gauge Connection. $\frac{1}{8}$ Pipe Tap. |
| D Intake Manifold Pressure Connection — $\frac{1}{8}$ Pipe Tap. No. 50 Drilled opening required in companion fitting. | P Propeller Shaft Spline. Air Corps Standard No. 20. |
| E Oil Tank Vent Connection — $\frac{3}{4}$ Pipe Tap. | Q High Pressure Oil Screen. |
| F Dual Tachometer Drive — A. N. Standard $\frac{1}{2}$ Crankshaft Speed. | R Crankcase Breather Connection. $\frac{1}{2}$ I.D. Connection. |
| G Oil Inlet Thermometer Connection. $\frac{5}{8}$ -18 N. F. — 3 Thread. | S Oil Sump Drain. |
| H Duplex Scavenge Oil Screen. | T Exhaust Elbow — Detachable. |
| J Inlet Oil Connection — $\frac{3}{4}$ Pipe Tap. | U Primer Distributor Inlet. $\frac{1}{8}$ Pipe Tap. |
| K Outlet Oil Connection — $\frac{3}{4}$ Pipe Tap. | V Low Pressure Oil Relief Valve. |
| L Fuel-Air Mixture Thermometer Connection $\frac{5}{8}$ -18 N. F. — 3 Thread. | C.G. Center of Gravity. (Without Starter or Generator). |



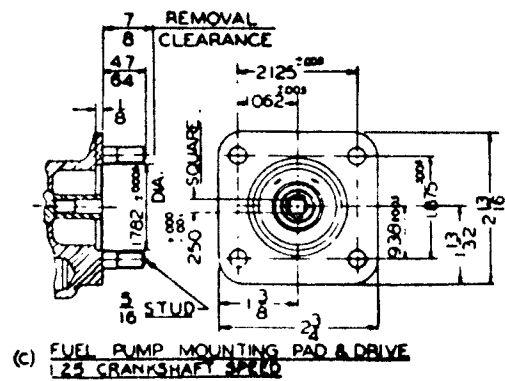
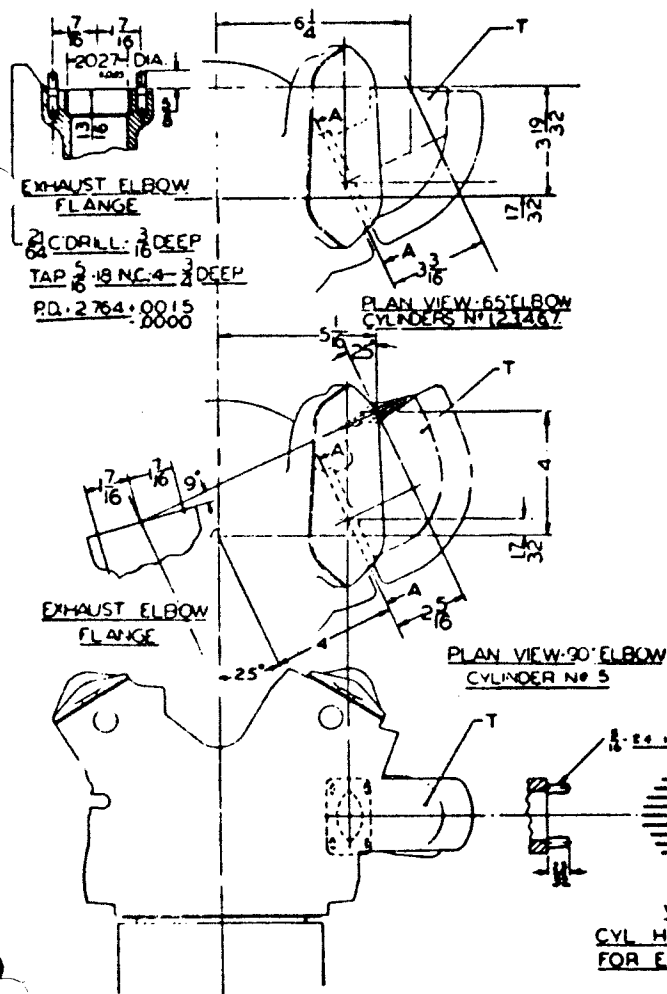
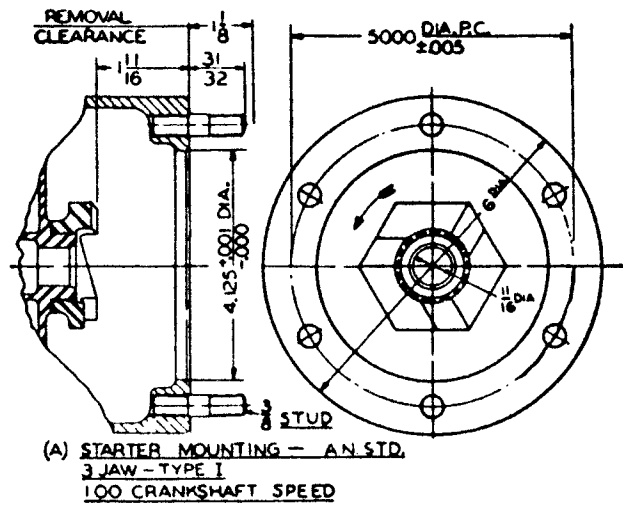
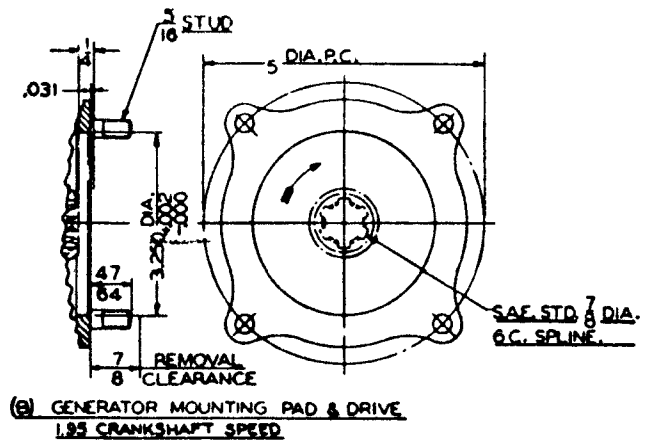
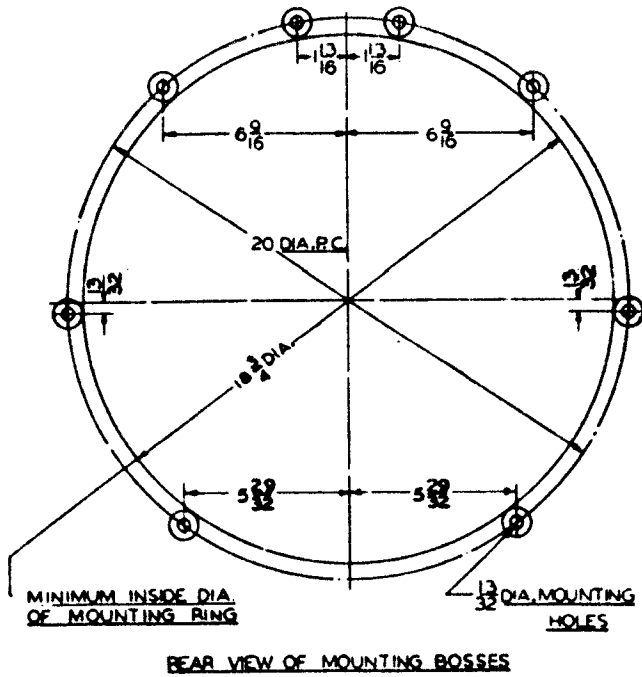
Installation Drawing - Rear View - Continental W670 Engine

CONTINENTAL W670 AIRCRAFT ENGINES



Installation Drawing - Side View - Continental W670 Engine

CONTINENTAL W670 AIRCRAFT ENGINES



Installation Drawing
Engine and
Accessory Mounting
Continental
W670 Engines

Cylinder Exhaust

Section 6

ENGINE TROUBLES AND THEIR REMEDIES**1. FAILURE OF ENGINE TO START****a. Inadequate Fuel Supply**

(1) Ascertain that gasoline is turned "on"; that there is a sufficient amount in the tank to permit flow to the carburetor; that there is a definite gasoline flow at the carburetor; and that the carburetor float is not stuck.

(2) Check for vapor lock in the line and for obstruction of fuel flow due to dirty strainers or water in line or carburetor bowl. Inspect gasoline tank for plugged vent lines.

b. Engine Underprimed or Overprimed

(1) If engine is underprimed, check functioning of the primer system and "load" the engine more by turning its propeller in the direction of rotation with the switch "off" and the throttle "closed."

(2) The correct amount of priming required for each individual engine can be determined only by trial and error. Overpriming, and a resultant flooded condition, is more often experienced during warm or hot weather. This condition is easily identified, especially if the engine seems to fire on one or two cylinders with a fizzling "poof" exhaust report and emits black smoke accompanied by a weak "kick" of the propeller with the engine finally dying. If this condition exists, turn the main gasoline supply off; turn the magneto switch off; open the throttle wide, and turn the propeller 5 to 10 revolutions as rapidly as possible opposite to the direction of rotation. This should "unload" the engine and a new attempt can be made to start.

c. Mixture Control

Set mixture control at "FULL RICH" when starting engine.

d. Throttle Operating

(1) The engine will start more readily with the throttle cracked open about one-tenth of its range.

(2) If the engine starts but dies after a few explosions and no evidence of overpriming is present, pump the throttle a little when the engine fires again on the next attempt to start.

This will permit the accelerating well in the carburetor to pump a small charge of gasoline into the intake manifold with each advance motion of the throttle.

e. Defective Ignition

(1) Examine the ignition wiring for continuity and for leaks resulting from breaks in the insulation.

(2) Check all spark plugs for correct gap setting (.016 inch, plus .002 to minus .001 inch) and see that they are not fouled by oil or carbon.

(3) Check magneto breaker points for proper timing as described in paragraphs 6 and 7, Section XIII.

NOTE—The VMN7DF magneto timing is checked by measuring point clearance. The SF7RN-1 magneto timing is checked by a timing light and the marks on the rim of the breaker cup.

Also check breaker points for proper gap clearance or adjustment, a possible pitted condition, or evidence that the condenser has burned.

(4) Remove booster wire from magneto and hold it about $\frac{1}{4}$ of an inch from the engine while operating the booster. If a spark fails to jump this gap, the booster or booster wire is defective.

(5) Make sure that the ignition switch is turned "on"; that it is not defective; or that the ground wire insulation is not damaged so as to permit a contact with the metal of the airplane somewhere between the switch and magneto ground terminals.

f. Valve Action

(1) Check valve stems to be sure that they are not gummed with carbon and sticking open.

(2) See that all valve springs are in good condition and that their assembly to the valve stem is in good order.

(3) Check for free and good working order of all rocker arm assemblies, and especially for evidence of a rocker arm striking the side of a rocker box causing a delayed action.

(4) Check for worn or bent push rods.

(5) Check for correct valve clearance.

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued**g. Cold Oil**

Turn the propeller by hand 10 to 20 times in the direction of rotation to break the drag created by cold oil. If the engine is excessively stiff, it may be necessary to warm the engine with an engine heater or let the airplane stand for a short while in a heated hangar, or to drain and heat the oil.

h. Hot Engine

In addition to instructions contained in paragraph 1. b (2), this section, the following is important: A hot engine is often easily over-primed and frequently it will start without an additional prime. If the engine is hot and refuses to start for that reason, turn the main gasoline supply "off"; open the throttle wide; turn ignition switch "off"; and allow the engine to cool for 10 or 15 minutes.

i. Air Leaks

Examine intake pipes for cracks and inspect for leaks at all induction system connections. Air leaks sometimes cause a sharp high-pitched whistling noise that is particularly audible at or near idling speeds when the intake manifold vacuum is greatest.

CAUTION — Be sure new-type gasket is being used between carburetor and carburetor boss.

j. Carburetor Flooding

(1) If there is a slight leak, it may be due to sticking of the float. A light tapping of the carburetor housing with the hand usually will remedy this condition.

(2) Because of the fire hazard involved, the engine should not be run if the carburetor leaks excessively.

2. LOW OIL PRESSURE

(a) Determine whether the main oil tank contains a sufficient quantity of lubricating oil.

(b) Carefully inspect the main oil line from the tank to the input side of the duplex oil pressure pump for air leaks which will cause the pump to starve for oil.

(c) Inspect the oil pressure relief valve to be sure that the plunger is operating smoothly in its guide and is seating well, and that the control spring is functioning properly.

(d) Make certain that the oil pump is turn-

ing, that its gears and housing have not worn excessively, and that no failure of the drive shaft has occurred.

(e) Remove oil pressure screen and examine it for sludge and an excessive deposit of metal particles. If metal particles of an appreciable size and quantity are found, the cause should be determined and the engine drained and cleaned out and repaired if necessary before further operation. Inspect the high pressure oil relief valve plunger and be sure that it is not stuck in an open position.

(f) If the oil pressure is still low after the preceding checks have been made, check every possibility to be sure that the system has not "opened up" somewhere due to a lost oil plug. If it is found that the system has not opened up, remove the No. 2 cylinder and inspect the master rod bearing for excessive clearance or evidence of bearing failure.

(g) Insufficient oil pressure in the low pressure rocker oil system could be caused by a leak or opening whereby the capacity of the oil pump would be exceeded. Check the oil inlet orifice below the low pressure oil relief valve for a clogged condition, or for the possibility that the relief valve plunger is stuck open.

3. LOW POWER

(a) Remove the front set of spark plugs and test the compression of each cylinder with a compression gauge.

(b) Check all valves. Any valve having an appreciable increased clearance will indicate cam ring, push rod, or rocker arm trouble. It is impossible for the engine to jump valve timing.

(c) Check ignition system operation, especially for cylinders which cut out periodically, due to failure of spark plugs, ignition wiring, or sticking of magneto points. Be sure that the magneto is functioning properly. Especially under low power conditions, ascertain that the magneto breaker point has minimum clearance behind the point arm when points themselves have their required clearance. (This applies to VMN7DF magnetos only.) Be sure magnetos are in full advance. If necessary, check ignition timing.

(d) Make sure that the pilot's throttle lever

OPERATING AND MAINTENANCE INSTRUCTIONS—Continued

is completely opening the butterfly in the carburetor.

(e) Check the carburetor for proper setting and functioning.

(f) See that an unrestricted flow of gasoline is available at the carburetor.

(g) Ascertain that carburetor air heater (if used) is being operated properly and that there is no evidence of ice.

(h) Check the induction system for air leaks.

(i) Check propeller for correct model and setting.

4. ROUGH RUNNING

(a) Check propeller for balance, track, correct installation on the propeller shaft and crankshaft runout (figures 28 and 29).

(b) Remove and check spark plugs.

(c) Check magneto operation. Ascertain whether insulation of ignition cables is failing at high engine speeds.

(g) In extreme cases, check possibility of magneto ground wire swinging and periodically

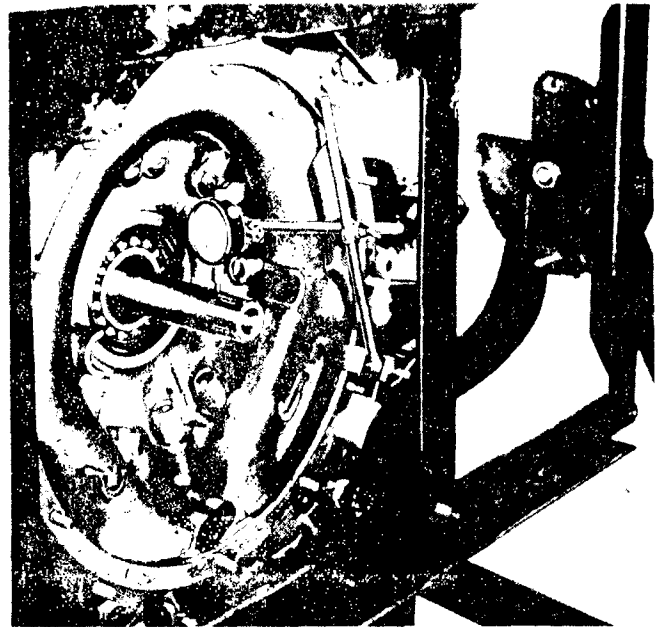


Figure 29 — Checking Rear Crankshaft Runout

grounding, or having damaged insulation at points where they are taped down.

(h) Check carburetor low speed idling jet for proper adjustment.

(i) Check carburetor mounting flange for distortion. Check bolts for looseness; and check for a shrunken gasket.

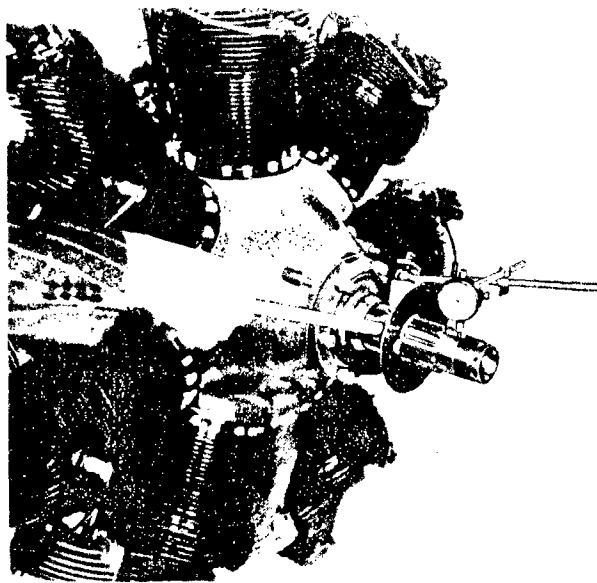


Figure 28 — Checking Front Crankshaft Runout

(d) Check valve operation, especially for evidence of sticking or lag in valve operating mechanism.

(e) Check engine mounting bolts for tightness.

(f) Check engine mount for cracked or broken members.

5. HIGH OIL TEMPERATURE

(a) Check quantity and quality of supply in the main oil tank.

(b) Check functioning of oil cooler and bypass valves if airplane is so equipped.

(c) Check ignition timing. (See Section XIII for detailed instructions covering ignition timing.)

(d) Check compression by pulling the propeller in the direction of rotation to determine that each cylinder has good compression and is about even. Excessive discharge of oil or oil fumes from the crankcase breather or thrust bearing is caused by "blow-by" and increased crankcase pressure, usually due to worn or damaged pistons or piston rings.

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued

(e) Check oil strainer for metal deposits indicating failure in the master rod bearing or other internal parts.

(f) Check for lean mixture in any or all cyl-

inders. This could result from improper setting of the carburetor, air leaks in the induction system, loose carburetor bolts or bent carburetor mounting pad flange.

Section 7

SERVICE INSPECTION AND ASSOCIATED MAINTENANCE

1. DAILY INSPECTION

(a) Inspect for evidence of engine throwing oil.

(b) Inspect oil plugs and drain cocks for proper safetying.

(c) Inspect carburetor and fuel lines for leakage.

(d) Inspect all safety wiring on carburetor.

(e) Make visual inspection of entire engine for loose nuts, screws, safety wiring, air baffles, ignition wire connections, etc.

(f) Check operation of throttle, mixture control and carburetor air heater control.

2. OIL CHANGE

Due to the extreme variations in operating conditions it is impossible to establish any definite period between oil changes. However, unless extreme dust or temperature conditions are experienced, an oil change every 20 to 30 hours of operation should be sufficient. If the engine is equipped with an oil filter, this period may be lengthened. At the time the engine oil is changed, the fuel and oil screens should be removed and cleaned and all visible carburetor moving parts, including linkage, lubricated with a general purpose lubricating oil.

3. 100-HOUR INSPECTION

a. Magnetos — VMN7DF

(1) Remove the breaker cover and check the clearance between the contact points when held open by the cam. Clearance should be from .010 inch to .014 inch, the most desirable being .012 inch. See Section XIII of this manual for adjustment of the contact points.

(2) Put 20 to 30 drops of aircraft engine oil into the oil cup on the front end plate and 5 to 8 drops in the oil cup on the coil cover. Avoid over-oiling. Examine the felt wick at the bottom of the breaker cup. If oil appears on the surface when the felt is squeezed, no additional lubricant is needed. If the felt is dry, moisten with aircraft engine oil.

b. Magnetos — SF7RN

(1) Remove the breaker cover and check the adjustment of the contact points by placing a straight edge on the step-cut in the cam. Turn the crankshaft in the direction of rotation until the straight edge coincides with the timing marks on the rim of the breaker housing. At this position the points should just begin to open. A tolerance of $\frac{1}{8}$ inch on either side of the timing marks is allowable before adjustment is required.

NOTE — The contact points on the pivotless breakers must always be adjusted to open at the proper position of the cam in relation to the timing marks at the breaker end of the magneto, and not for any fixed clearance between the contact points.

(2) Examine the cam follower to see if it is properly lubricated. If oil appears on its surface when squeezed with the finger, no further lubrication is necessary; if dry, moisten with aircraft engine oil. Avoid over-oiling as any excess oil is likely to get between the contact points and cause burning or pitting.

c. Spark Plugs

Inspect and clean spark plugs, replace if necessary.

OPERATING AND MAINTENANCE INSTRUCTIONS — Continued**d. Cooling System**

Inspect cylinders for damaged or broken fins.

e. Manifolds

Inspect intake pipes for security of attachment, broken studs and leaking gaskets. Inspect carburetor heater and carburetor air horn for security of mounting.

f. Valve Mechanism

(1) With rocker box covers removed, make visual inspection of valve mechanism for broken springs, condition of spring washers and security of retaining split cone keys.

(2) Test side motion of rocker arm to ascertain condition of bearing support.

(3) Check valve tappets for proper clearance (.010 inch cold) and re-set if necessary.

(4) Remove main oil pressure screen and inspect for excessive metal deposits and clean.

4. MAJOR OVERHAUL OR RE-MANUFACTURE

After 550 to 750 hours of operation, the engine should be removed from the airplane and overhauled at a Continental Service Station or returned to the factory, through a service station or distributor, for re-manufacture.

Section 8**DISMANTLING AND DISASSEMBLY FOR OVERHAUL****1. GENERAL**

(a) The procedure outlined in this section will cover separation, removal, and disassembly of all unit assemblies from the engine.

(b) In addition to the notes given during the various stages of dismantling, close observation must be made of all the parts for signs of scoring or burning resulting from undue friction. Valuable evidence of defects can be obtained when the oil or the loosened surface of the metal is present to indicate it rather than after the whole has been washed and laid out for examination. Each part should be carefully inspected before being cleaned to note any unusual conditions such as excessive sludge, the collection of metallic chips, or charred oil deposits.

(c) After installation on a suitable assembly stand (See figures 30 and 31), the outside of the engine should be cleaned.

(d) Disassembly of the accessories, such as the magneto and carburetor, will not be covered in this section. For complete and authentic information concerning these items, refer to the particular section at the rear of this manual which applies to the unit.

(e) A mobile rack will be furnished with sufficient space and a specific place for each part as it is removed from the engine. This arrangement will enable inspectors at any point in the engine's travel to determine whether all engine parts are present.

(f) It has been determined that minor nicks, galls, and dents in edges of highly stressed aircraft engine parts may cause failure of the part. This is due to the concentration of stresses that results from nicks, and burrs. Therefore, engine parts should not be allowed to touch each other at any time when handling, cleaning, or storing. Parts such as pistons, link rods, knuckle pins, et cetera, of which there are groups, will be placed in racks or containers designed for the specific parts or groups of parts so that finished surfaces do not touch. They will be built of wood, fiber, or other material that will not damage the parts and will not be injured by cleaning compounds when the parts are being cleaned. The finished surfaces of valve tappets, tappet guides, knuckle pins, piston pins, link rods, valve, pistons, and all parting surfaces will not be allowed to touch other parts.

(g) Observe the following precautions when removing or installing palnuts: to prevent dam-

OVERHAUL INSTRUCTIONS—Continued

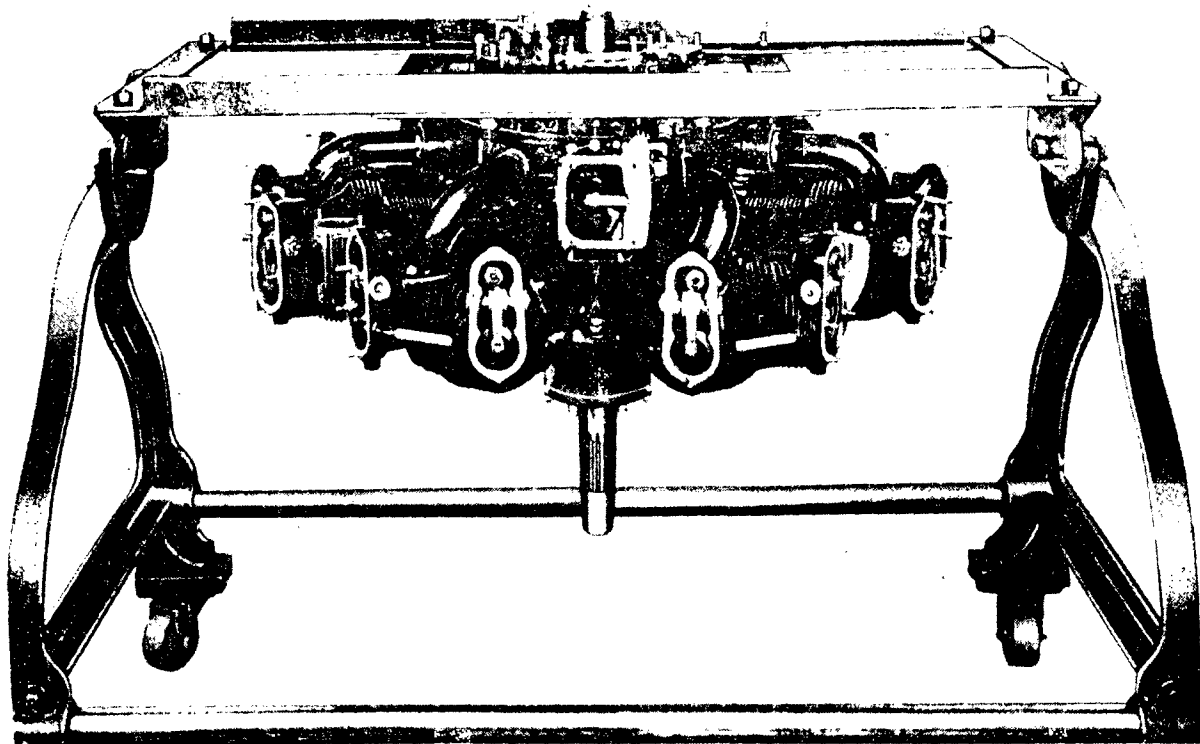


Figure 30—Inverted Horizontal Position of Engine Mounted on Overhaul Stand

age to the threads of the stud, palnuts will be entirely removed before loosening the retaining nuts. Pálnuts may be used again if undamaged. Nuts and washers, when removed, will be segregated according to size.

(h) Propeller shaft threads will be protected at all times by using propeller shaft thread cap.

(i) Tools mentioned in this section are listed at the back of this manual under Section XVII, Overhaul Tool Catalogue, Number 3B List and Tool Kit List.

2. DISMANTLING

a. Ignition and Primer System

(1) Remove spark plugs or dehydrator plugs from all cylinders and place in spark plug rack.

(2) Remove the ignition harness assembly in a complete unit together with the ignition-wire housing and magneto distributor blocks. Tag the harness with engine number.

(3) Disconnect the primer lines at the elbow type jets on cylinders No. 6, 7, 1, and 2. Disconnect all primer line attaching clips so as to

remove the entire clip or clip assembly from the engine along with the line. Disconnect the primer distributor from cylinder No. 1 intake pipe and temporarily reassemble the clamp with its attaching bolts and nuts to the distributor housing. Remove the priming system as a unit. On late Model W670-6N, 16 and 17 engines, the primer manifold and the ignition harness is secured to the engine with a single clip. On such engines, remove the ignition harness and primer assembly as a unit.

NOTE—All engines having front ignition cables, secured with ferrules to the cylinder head, should have the ferrules replaced with the improved primer line and ignition wire clips, which will eliminate the wearing of the ferrule holes in the cylinder head. (See figure 32.)

(4) Disconnect the magneto breaker assembly control rod from each magneto by removing the attaching clevis pin from each end.

(5) Remove the two magnetos by first removing their retaining nuts and washers, and then withdrawing the magneto from its mounting studs.

OVERHAUL INSTRUCTIONS — Continued

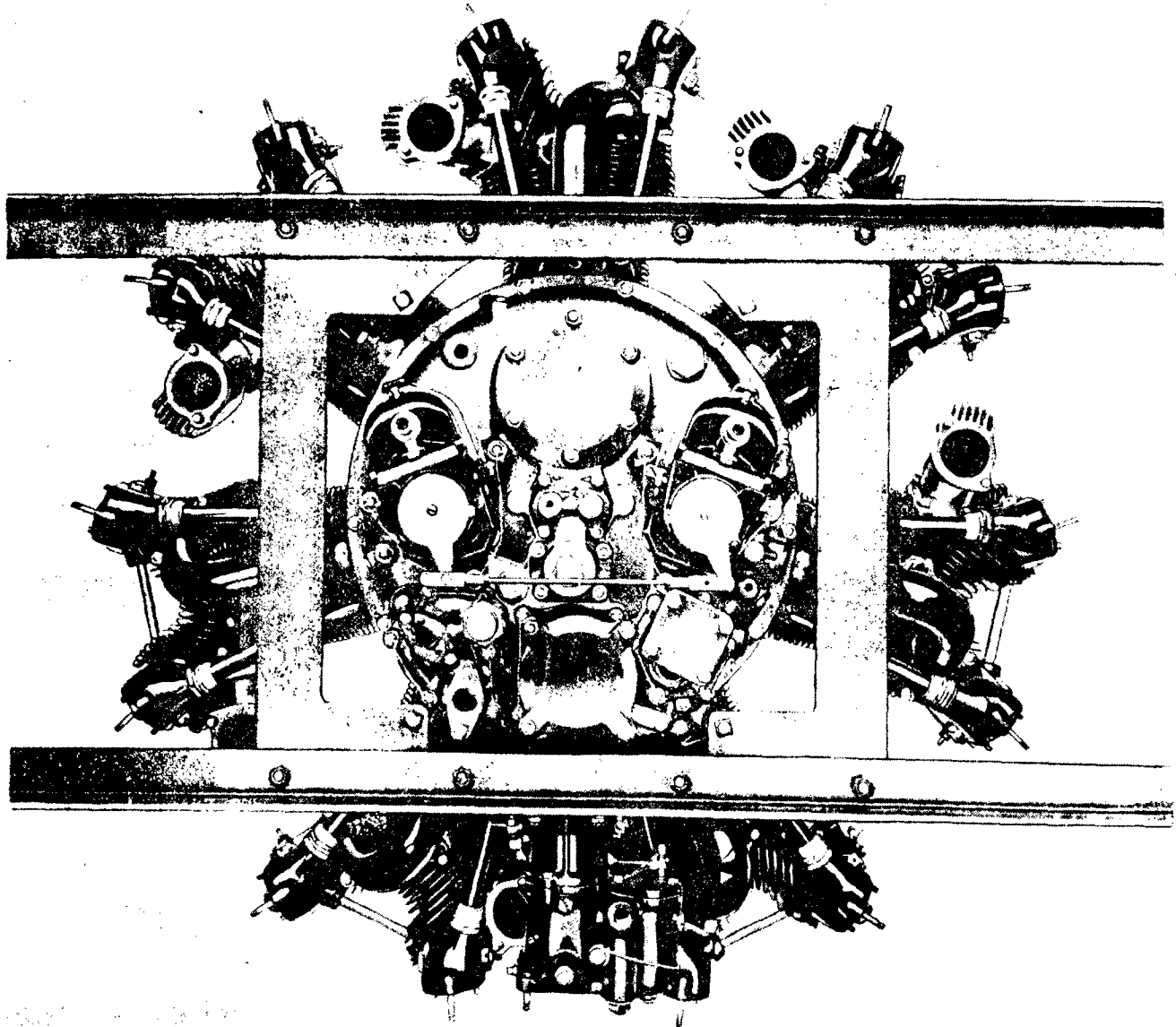


Figure 31 — Rear View of Engine Mounted in Preparation for Disassembly

b. Oil Pumps and Tachometer Drive (See figure 33)

(1) Remove the duplex pressure and scavenge oil pump by first removing its five retaining nuts and washers, and then withdraw the complete assembly from the mounting studs.

CAUTION — Do not remove the one 5/16-24 castle nut holding the two pump bodies together. This nut is located and is adjacent to the pressure relief valve boss.

(2) Remove the rocker scavenge oil pump from the accessory case by first removing its five retaining nuts and washers, and then withdrawing it from its mounting studs.

(3) Remove the tachometer drive housing assembly by first removing its four retaining palnuts, nuts, and washers, and then withdrawing it from its mounting studs.

(4) Loosen the high pressure oil screen nut and also the bypass valve plug, but do not remove at this time. Remove the high pressure housing assembly by removing the four palnuts, plain nuts and washers.

c. Cylinders and Pistons

(1) Turn engine to horizontal position. Turn the crankshaft so that the "O" stamped on the propeller shaft (to show the position of the crankpin) is lined up with No. 2 cylinder.

OVERHAUL INSTRUCTIONS - Continued

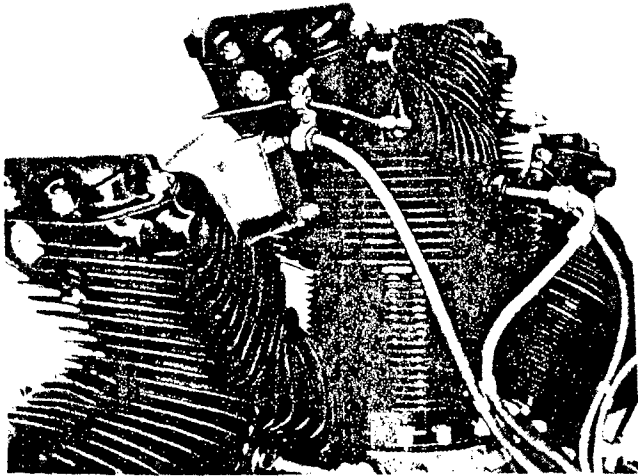


Figure 32 - Primer Line and Ignition Wire Clip

- te: Loosen push rod adjusting nut
 (2) Loosen the push rod housing packing nut and the push rod housing retainer. Allow the retainer to remain on the push rod.
 Remove push rod housing.
 (3) Loosen the intake pipe packing nuts, using Tool No. 3193. (See figure 34.)
 (4) Remove the 12 cylinder hold-down nuts on No. 2 cylinder with tool No. 20555, and remove the cylinder assembly including intake pipe, working it from side to side in a horizontal plane, **never up and down.** (See figure 35.)
 (5) Place intake pipe packing nuts in container.



Figure 33 - Removing Accessories

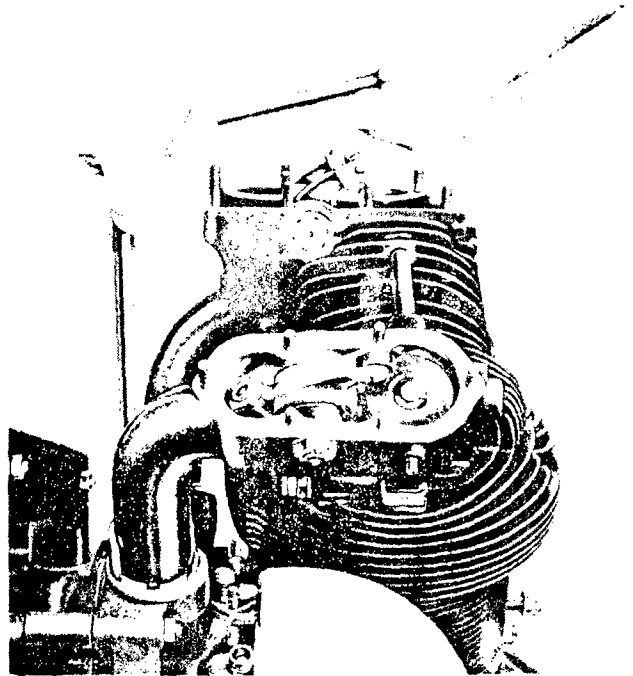


Figure 34 - Loosening Intake Manifold Gland Nut

- (6) Use pieces of hose, or make protectors of fiber, wood, or other soft substances to prevent all seven connecting rods from striking the crankcase (as shown in figure 36).
 (7) Remove the piston from No. 2 articulating rod by withdrawing its full floating piston pin. (See figure 37.) Remove the piston pin plugs from the piston pin and place both parts in their separate containers, and the pistons in

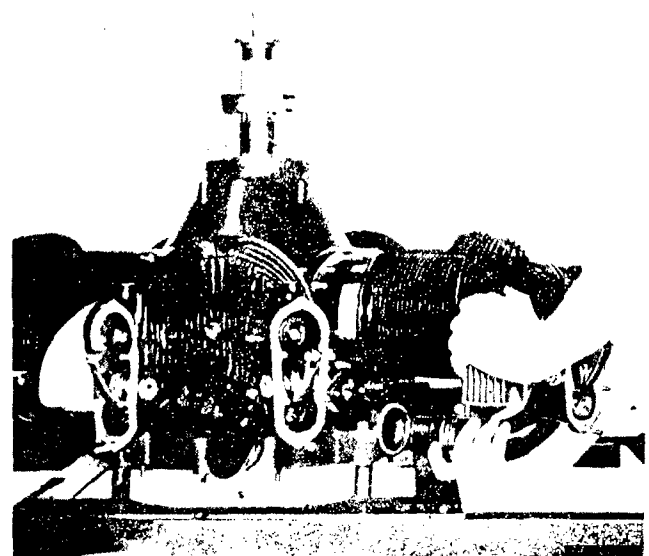


Figure 35 - Removing Cylinder

OVERHAUL INSTRUCTIONS — Continued

the rack. Care will be used when removing the piston that no side pressure is exerted on the articulating rod, causing it to bend.

(8) Turn the crankshaft in a clockwise direction until the "O" stamped near the end of the propeller shaft spline lines up with No. 3 cylinder center line. Remove this cylinder and piston in the same manner as outlined in the preceding paragraph. The remaining cylinders are removed from the engine continuing in numerical order. Remove No. 1 last.

(9) Remove the carburetor and tag with engine number.

d. Accessory Case

- (1) Place the engine in a vertical position.
- (2) Remove the retaining circlip from the crankshaft starter gear bolt, and remove the locking washer.
- (3) Hold the crankshaft steady with the socket wrench, and break loose the rear crankshaft nut using a socket wrench extension and

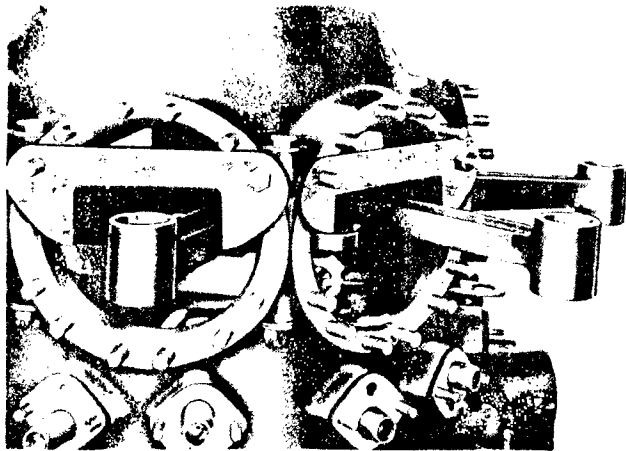


Figure 36 — Main Crankcase Assembly Showing Articulating Rod Protector Straps

tapping the handle with a fiber hammer. Loosen the nut as far as possible without attaining pulling or tightening pressure in a reverse direction.

(4) Remove the 13 nuts and washers holding the accessory case to the main crankcase. Break loose the accessory case from the main crankcase at its parting flange and withdraw it across the mounting studs. Complete the unscrewing of the rear crankshaft nut, and remove the accessory case assembly from the rear of the engine. (See figure 38.)

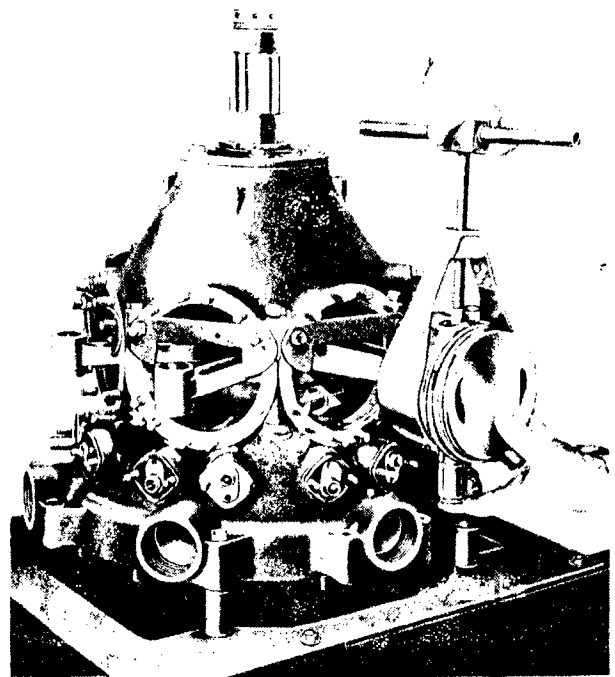


Figure 37 — Removing Piston Pin

(5) Hold the crankshaft with a spline wrench and loosen the thrust nut with a thrust nut wrench.

e. Cam Ring and Gears

Push all cam followers out in the guides to free the cam ring. Remove the crankshaft

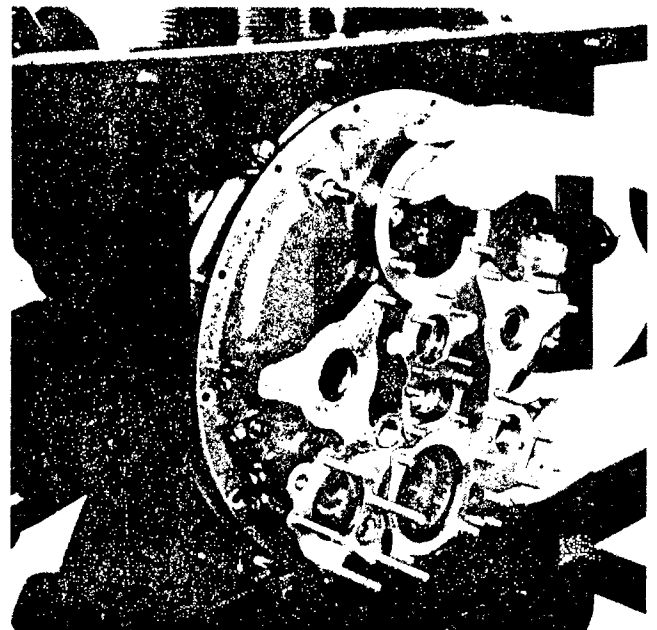


Figure 38 — Removing Accessory Case

OVERHAUL INSTRUCTIONS — Continued

starter gear, cam ring, cam drive gear, and rear crankshaft bearing spacer.

f. Crankcase Front Half

(1) Remove the nut from the crankcase bolt located just above the main oil sump. This nut will be found projecting inside the rear section of the main crankcase.

(2) Turn engine on its assembly stand to a horizontal position.

(3) Remove remaining crankcase bolt nuts.

(4) Use a special drift and drive the crankcase bolts from the crankcase so that the ends of the bolts will be flush with the crankcase.

(5) Pull all crankcase assembly bolts from the case with tool No. A3893. (See figure 39.) Lift off the crankcase front half (with the crankshaft and connecting rod assembly) from the rear half of the crankcase. (See figure 40.)

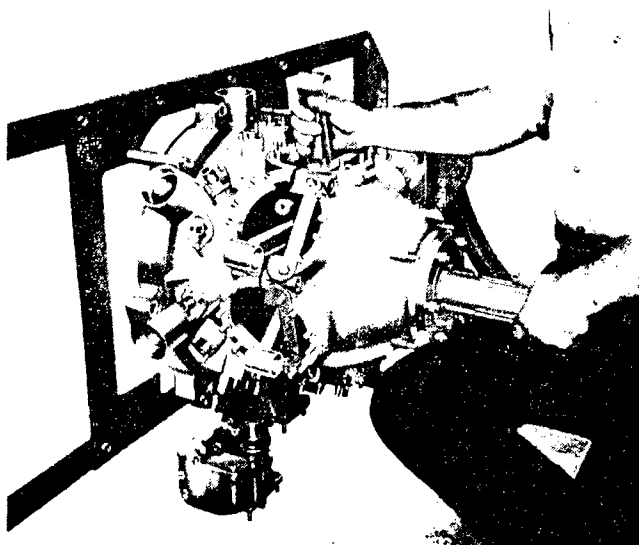


Figure 40 — Removing Front Crankcase and Crankshaft Assembly from Rear Crankcase

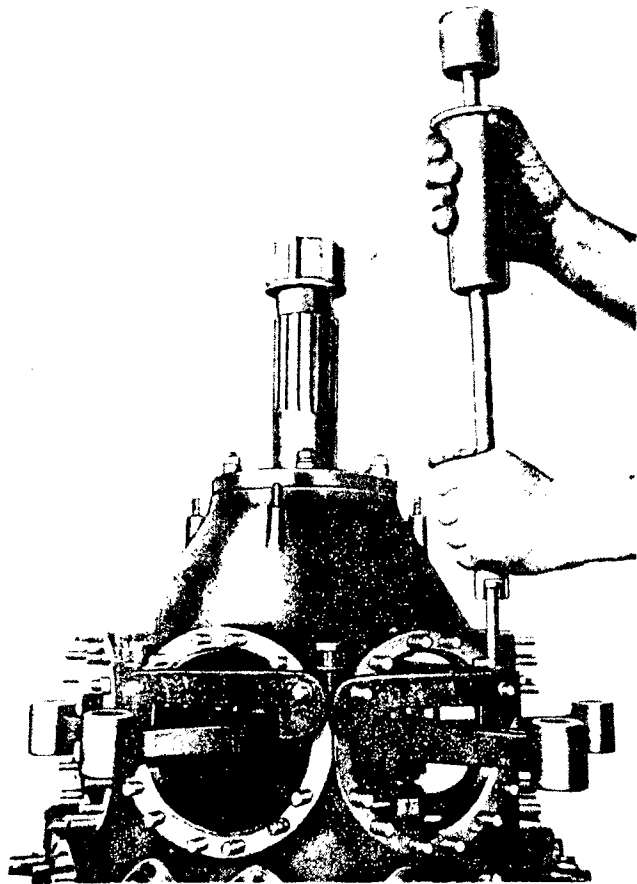


Figure 39 — Removing Crankcase Bolts with Tool No. 3893

3. DISASSEMBLY OF UNIT ASSEMBLIES

a. Accessory Case

(1) Remove the duplex high pressure oil screen by removing the safety wire and turning

the oil screen out of the housing. Remove the high pressure oil screen housing by removing the four palnuts, plain nuts, and washers that attach it to the case.

(2) Remove the scavenge oil screen by cutting the safety wire and turning the screen out of the case.

(3) Remove the generator-speed step-up drive by removing the safety wire, four castle nuts, and plain washers that attach it to the case.

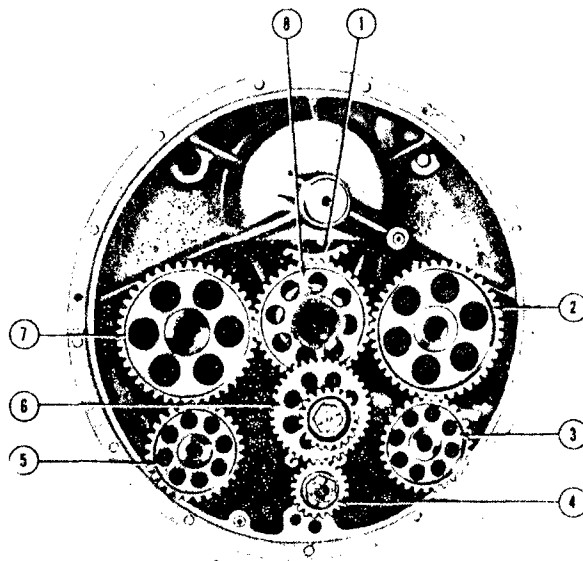


Figure 41 — Accessory Case Gears. Rear View

OVERHAUL INSTRUCTIONS—Continued

(4) Removal of accessory drive gears: (See figure 41.)

(a) Remove the 9/16-18 castle nut holding the intermediate cam drive gear (6) on its bearing pin, and remove the gear. If the bearing pin is damaged, it may be removed by means of a special tool, similar to a bearing puller, which forces it out of the case. However, it is rarely necessary to remove this pin from the accessory case.

(b) Remove the 3/4-16 generator drive gear nut, its thrust washer, and the gear (4). Remove the generator drive pinion from its bearing support by withdrawing it toward the rear of the case.

(c) The crankshaft starter gear assembly (8) installs from the front of the accessory case towards the rear, and is free in its bushing to slide forward or to the rear. Its position in service operation is secured by the rear crankshaft nut. This gear will disassemble from the accessory case by withdrawing it from its bearing following removal of the generator drive gear. The crankshaft starter gear assembly is dismantled into its smallest component parts by removing the internal expanding snap ring which secures the rear crankshaft nut in the hub bore. Do not remove the oil plug from the rear crankshaft nut.

(d) The two magneto drive gears (2) and (7) install from the front of the accessory case toward the rear, and have a retaining circlip on the end of each gear bearing shaft where it projects through to the back of the case. These gears are disassembled from the accessory case by first removing their retaining circlips and then withdrawing the gear from its bearing. Do not remove the plug in the rear end of the shaft.

(e) The two oil pump drive gears (3) and (5) are installed from the front of the accessory case toward the rear and have a retaining circlip on the end of each gear bearing shaft where it projects through to the back of the case. These gears are disassembled from the accessory case by removing their retaining circlips and then withdrawing the gear from its bearing.

(f) The starter gear assembly (1) is located near the top of the accessory case, and is secured in its bearing by a special retainer and screw. To remove this gear, remove the screw and retainer and then withdraw the starter gear.

"OMIT (9)"

(g) An oil seal is provided at each magneto drive gear shaft. These oil seals may be removed by driving them out of their recesses with a fiber hammer and an offset screw driver. Insert the screw driver through the magneto drive shaft bearing from the front of the accessory case to the rear. Rest it against the front face of the seal housing.

CAUTION—Do not remove any bronze bushings from the accessory case unless replacement is necessary.

b. Crankcase Rear Half

(1) Remove the push rods by withdrawing them from the push rod housings.

(2) Remove the rocker push rod housings by removing the 1/4-inch attaching nuts. Withdraw the push rod housings from the studs.

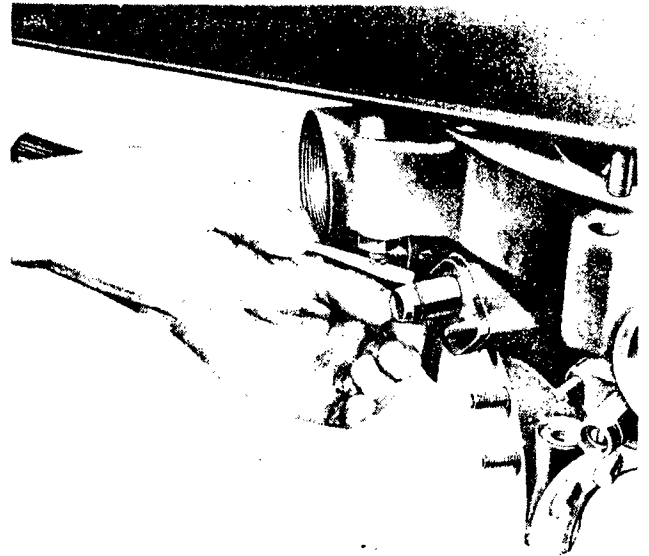


Figure 42—Removing Circlip from Cam Follower

(3) Remove cam followers by removing the circlip located near the outer end. (See figure 42.) Push the cam follower in toward the crankshaft far enough to clear the roller from the guide recess. Remove the pin and roller. Withdraw the cam follower and guide from the crankcase as an assembly. (See figure 43.) Reassemble the roller, roller pin, tappet and guide with the circlip so that these parts will remain together for inspection and subsequent reassembly.

c. Crankcase Front Half

(1) Place the crankshaft front end up in

OVERHAUL INSTRUCTIONS — Continued

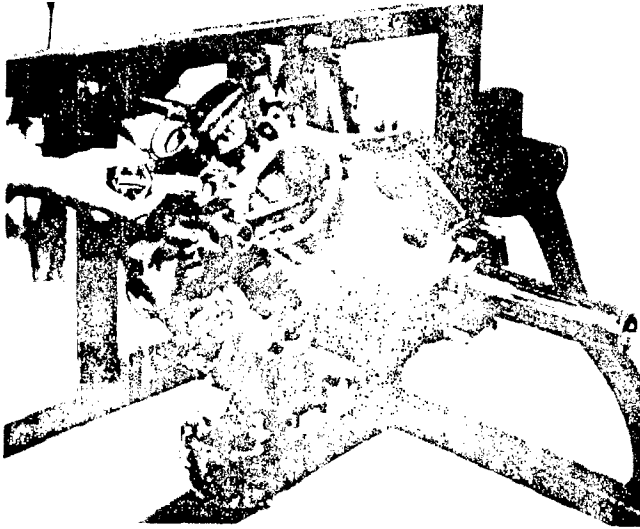


Figure 43 — Removing Cam follower and Guide Assembly

support, tool No. A4288, and remove the thrust nut, thrust plate, and oil thrower.

(2) Install front crankcase puller assembly, tool No. A4230, on the crankshaft. Be sure that adapter, part No. 3396, is screwed well down over the propeller shaft threads.

(3) Install the two-piece bronze flange, tool No. 3395, on the thrust bearing pad. (See figure 44.)

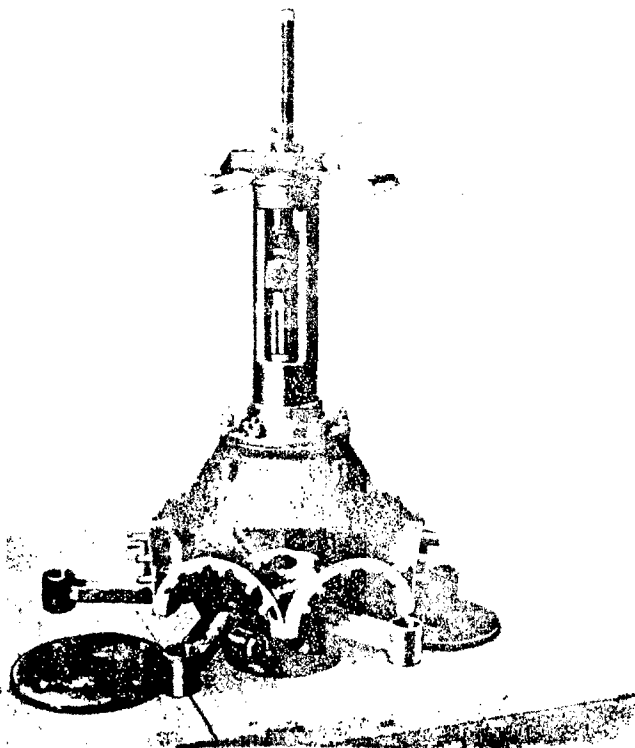


Figure 44 — Removing Front Crankcase from Crankshaft Assembly



Figure 45 — Removing Thrust Bearing and Bearing Cage

(4) Turn the puller screw to pull the front crankcase from the crankshaft. The front main bearing will separate from the crankcase at its outside diameter. The thrust bearing will remain in its cage in the front end of the crankcase.

CAUTION — When using the puller assembly, tool No. A4230, on the front end of the crankshaft, ascertain that adapter, tool No. 3396, is installed and screwed down well over the propeller shaft threads.

(5) Drive the thrust bearing and cage from the case, using a hammer and a drift made of brass or other suitable material. Bearings may be removed from the cage in a similar manner. (See figure 45.)

d. Crankshaft Assembly

(1) Install the puller assembly, tool No. A4230, over the propeller shaft, and with flange, tool No. 3484, linking it to the front main bearing, turn the puller operating screw and "pull" the front main bearing. (See figure 46.)

(2) Place the propeller shaft end of the

OVERHAUL INSTRUCTIONS—Continued

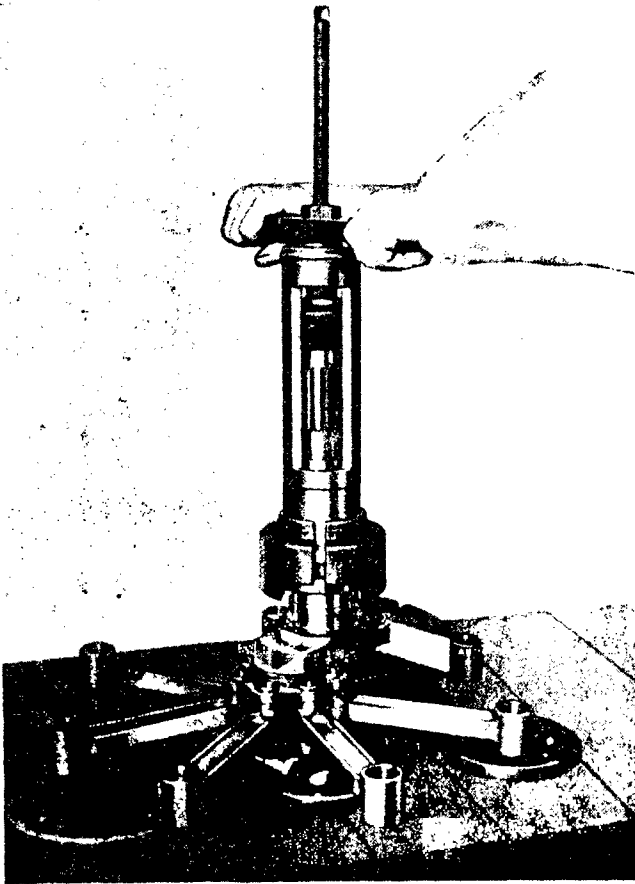


Figure 46—Removing Front Main Crankshaft Bearing

“crankshaft-master rod assembly” in the support assembly, tool No. A4093. Install the puller assembly, tool No. A4230, over the rear crankshaft extension with spacer, tool No. 3288, in place. (See figure 47.) Link the puller assembly to the rear main bearing with adapter, tool No. 3484. Turn the operating screw and pull the rear main bearing.

(3) Remove the cotter pin and using tool No. 3103, loosen and remove the crankshaft clamp bolt located on the rear cheek adjacent to the crank-throw journal. (See figure 48.) Insert the crankshaft rear cheek spreader plunger, tool No. 2344, in the hole where the clamp bolt was removed, and install the pin part No. 20314, in the plunger hole so as to lie across the gap in the crankshaft rear cheek. Screw the crankshaft clamp bolt in the rear cheek in reverse direction to its installing position, and tighten against the plunger until the crankshaft clamp spreads sufficiently to release its hold on the crank-throw journal. Separate the crankshaft front and rear halves, and re-

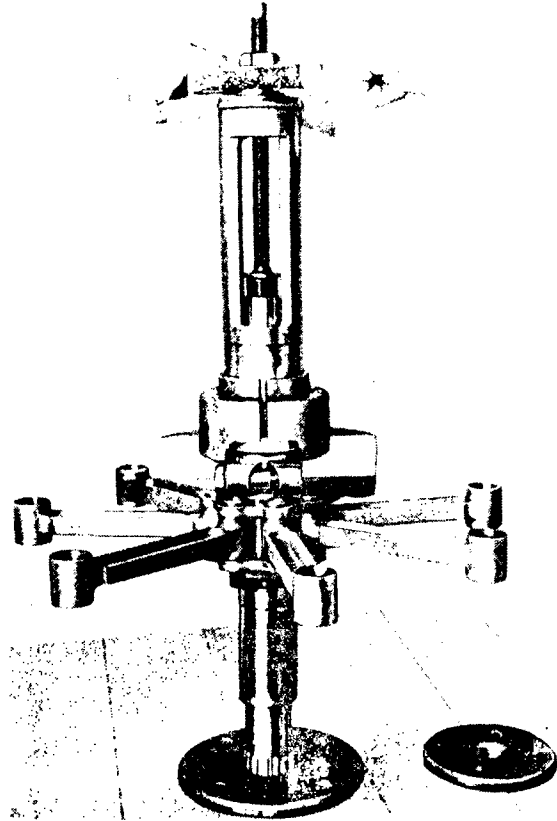


Figure 47—Removing Rear Main Crankshaft Bearing

move the master and articulating rod assembly. (See figure 49.)

e. Master Rod and Link Rod Assembly

(1) Articulating rods will be disassembled from the master rod in the master rod as-

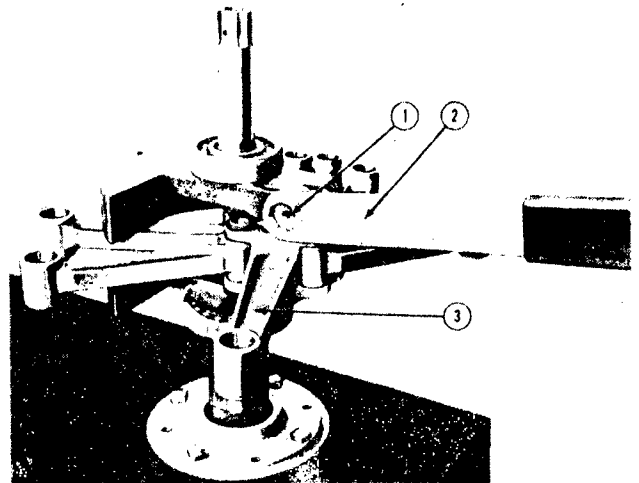


Figure 48—Removing Crankshaft Clamp Bolt

OVERHAUL INSTRUCTIONS—Continued

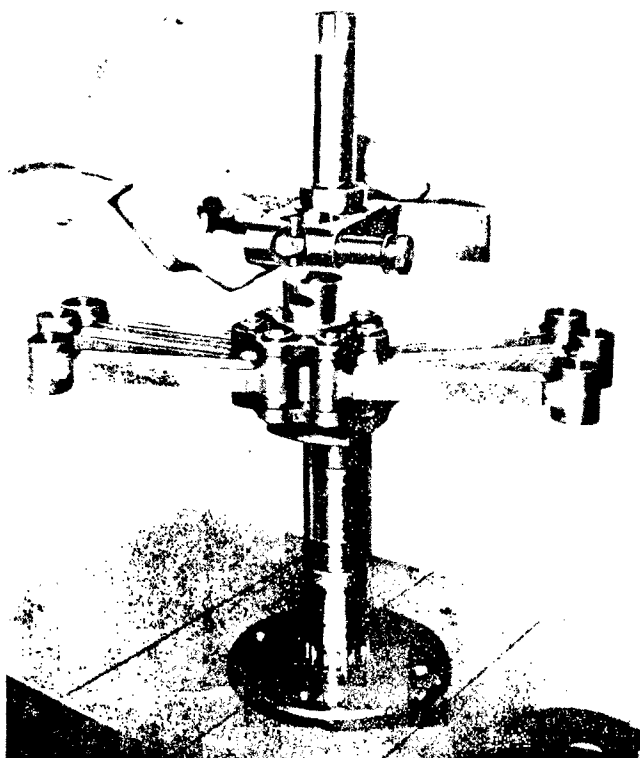


Figure 49 — Disassembling Crankshaft

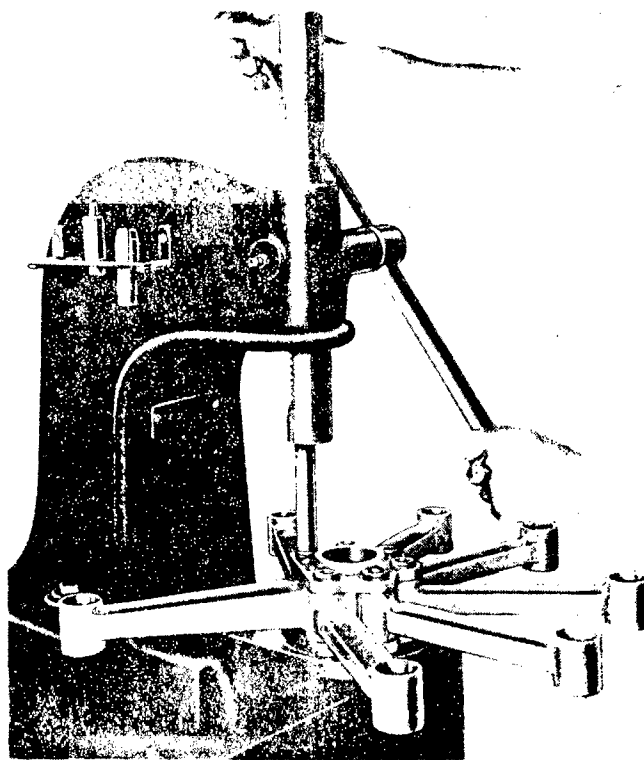


Figure 50 — Removing Knuckle Pin and Articulating Rods

sembling and disassembling tool assembly, tool No. A-500143, which is installed in an arbor press.

(2) Remove the retaining circlips from the knuckle pins and place the master rod bearing over the tool assembly pilot, and line up No. 2 cylinder knuckle pin with the large diameter hole in the plate.

CAUTION — Install the master rod on its pilot with the knuckle pin retaining Woodruff keys down. Place the knuckle pin extractor, tool No. 2852, over the knuckle pin with the extractor pilot recessed in the knuckle pin bore. Press the knuckle pin out. (See figures 50 and 51.) Tag or mark the knuckle pin for future identification with the articulating rod with which it installs. This marking should be standardized to insure reassembly of the pin in the same rod, the rod in the same cheek holes, and the rod with the same side toward the front of the engine. Remove remaining knuckle pins in the manner just described.

(3) The oil plugs will not be removed from the front end of the rear crankshaft half at any time, as irreparable damage to the crankshaft may result.

f. Cylinders

(1) Set cylinder assembly on suitable mounting stand, remove the exhaust elbow and the intake pipe. Remove rocker shaft nuts and loosen rocker shaft with aluminum drift and hammer. Pull out shaft with one hand and lift out the



Figure 51 — Cutaway View of Master Rod with Complete Bearing

rocker arm assembly with the other. Remove valve adjustment screws. Bearing and rollers will not be removed unless found defective during inspection.

(2) Disassemble valves from their cylinder, using spring compressor, tool No. 3096. Compress the valve springs and, with a pair of long-

OVERHAUL INSTRUCTIONS — Continued

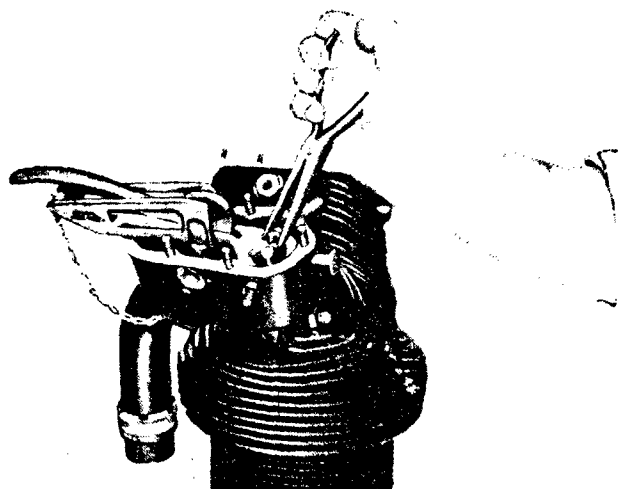


Figure 52 — Removing Valve Spring Locks

nose pliers, remove the two locks that hold the valve spring seat in position on the valve stem. (See figure 52.) Remove the valve seat valve spring and the valve washer. Remove the circlip from the valve stem. With the cylinder still in place, tip the cylinder and stand on its side and carefully remove the valve from the inside of the cylinder.

(3) Remove the elbow type priming jets from cylinders No. 6, 7, 1, and 2. Do not remove the inter-rocker box oil tubes unless obviously damaged or leaking oil.

(4) Piston rings should be removed from the

piston with an expanding tool that will lift the ring clear of the piston lands. All rings should be mounted on a card in proper order for inspection purposes.

g. Accessories and Sub-Assemblies

(1) **Duplex Oil Pump** (See figure 53)

(a) Remove the cap, lock nut, adjusting screw, spring, and plunger from the oil pressure relief valve.

CAUTION — The pressure regulating spring in this pump is much longer and heavier than conventional relief valve springs. Its adjusting nut should be removed with care to avoid possibility of injury due to flying parts.

(b) Remove the "oil in" and "oil out" external oil connections.

(c) Remove the pressure-body-to-scavenge-body dowel by driving it out with a drift.

(d) The pump may be disassembled after removing one 5/16-24 castle nut located adjacent to the oil relief valve boss, and one 10-28 flathead screw installed with its head adjacent to the external pump drive shaft coupling.

(e) Place pump on a work bench with the assembly resting on the "oil in" and "oil out" adapter studs. Part the scavenge section body from its top plate, and remove from the assembly. Remove the scavenge section driven gear from the pressure section drive-gear shaft. Remove the scavenge section drive gear from the pressure section driven gear shaft. (This gear

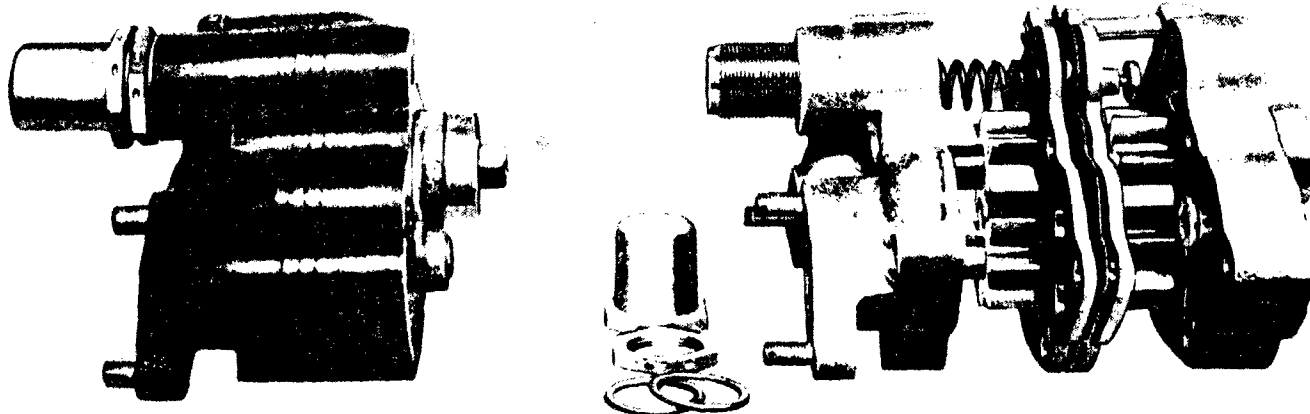


Figure 53 — Duplex Pressure and Scavenge Oil Pump for W670 Engine
Assembled Pump *Partially Disassembled Pump*

OVERHAUL INSTRUCTIONS — Continued

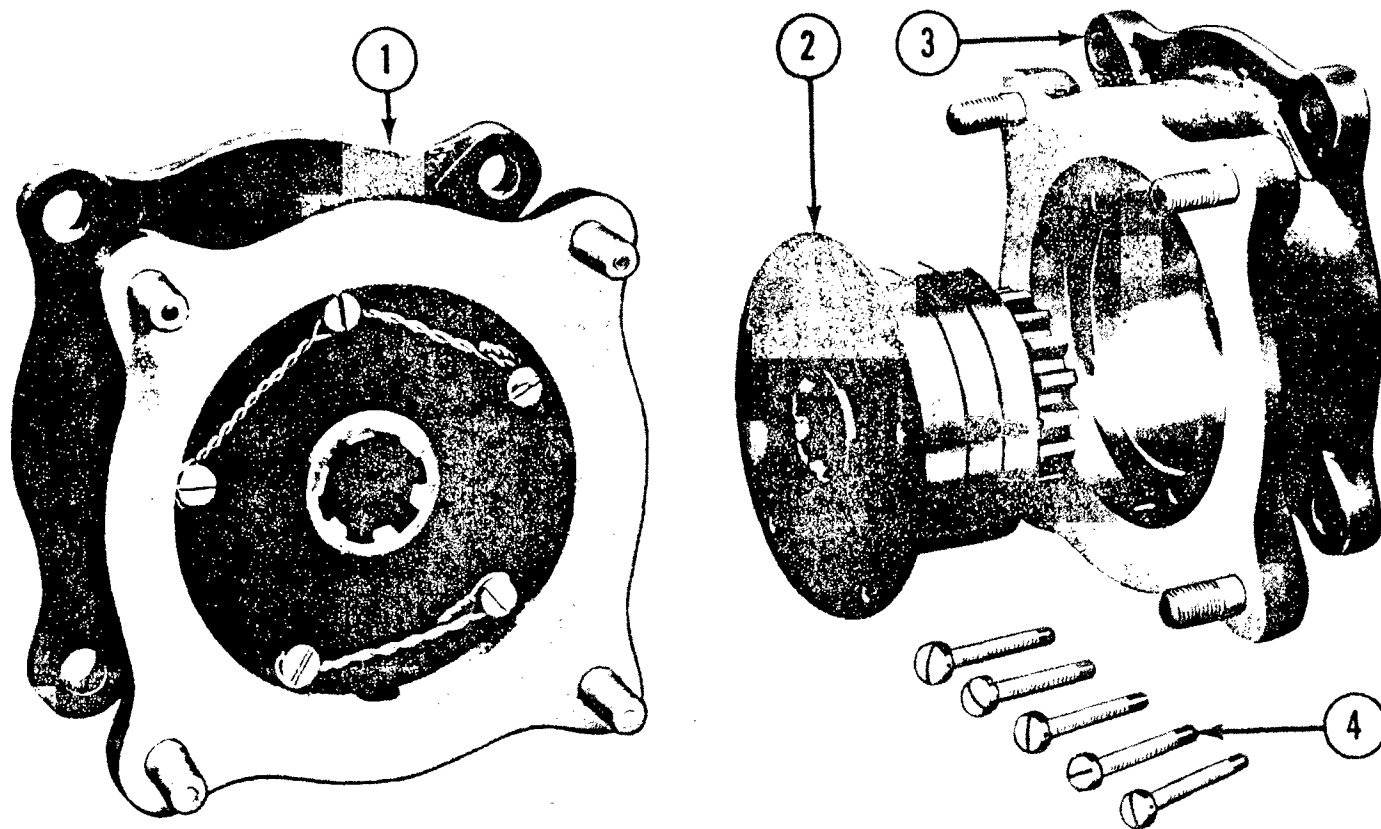


Figure 54 — Generator Speed Step-Up Drive

is secured on its shaft with one Woodruff key.) Remove the Woodruff key from the shaft. Remove the check valve and spring. Remove the high pressure relief valve. Remove the scavenge section plate assembly.

(f) Remove the Vellumoid gasket and pressure section plate assembly. (Pressure section plate assembly contains the duplex pump intersection oil seals.) Remove the pressure section drive gear (integral with the drive shaft and coupling), and the pressure section driven gear (Integral with its shaft). Remove the two oil seals from the pressure section plate assembly.

(2) **Generator Speed Step-Up Drive Cover.**
(See figure 54)

(a) Remove the four nuts and washers.

(b) Remove the five 10-32 fillister head machine screws (4) located inside the generator pilot bore. Remove the retaining plate and gasket.

(c) Press the gear and bearing assembly (2) out of the housing (3) applying pressure against

the driving gear and withdrawing the assembly through the pilot bore.

(d) Pull the Lubriseal bearing from the gear shaft, and remove the spacer ring.

(e) Remove the clip retaining the slit lock ring (located midway on the gear shaft) and remove the slit lock ring in two pieces.

(f) Pull the front ball bearing. Remove the oil thrower installed between the bearing and gear.

(g) Do not remove the oil plug installed inside the shaft.

(3) **Rocker Scavenge Oil Pump.** (See figure 55.) The rocker scavenge oil pump drive gear on the W670-6N has a spline connection for driving the fuel pump and is provided with an oil seal, while the W670-6A has a square coupling for driving the fuel pump, and no oil seal is provided. The pump pilot plate (2) (located on the drive side of the pump housing) serves as the gear rear bearing support and retains the two pump gears (3) and (4) in the housing.

OVERHAUL INSTRUCTIONS — Continued

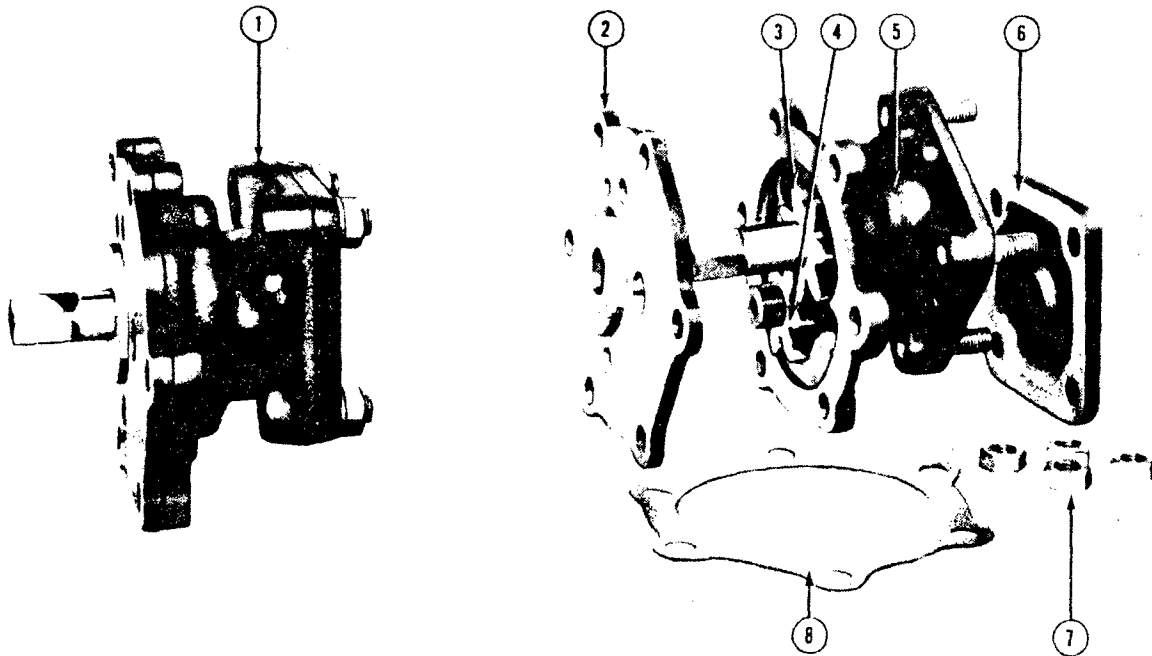


Figure 55—Rocker Scavenge Oil Pump

It is secured to the housing by the press fit of its pilot flange and centering dowel. The pump is disassembled by removing the pilot plate (2) from the pump body (5) and withdrawing the internal driver and driven gears (3) and (4).

(4) **Tachometer Drive.** Remove the two No. 10-32 fillister-head machine screws securing the rear pilot plate. Remove the plate and withdraw the two driven and one drive gear.

(5) **Duplex Scavenge Oil Screen.** This oil screen is soldered to its threaded plug and should not be detached.

(6) Primer Lines.

(a) The primer manifold may be separated from the ignition harness by springing the dual clips apart sufficiently to remove the primer lines or wire.

(b) The individual primer lines disconnect from the distributor at the distributor nipples. Do not unsolder or otherwise disassemble the individual primer lines beyond removing all clips used for support to the engine.

CLEANING

1. GENERAL CLEANING INSTRUCTIONS

(a) As soon as the engine has been disassembled, all parts should be cleaned thoroughly. It is considered advisable that parts be inspected, cleaned, then, if difficulties are noted, they can be marked for a more detailed inspection after oil and other deposits are removed.

(b) Cleaning of engine parts may be divided into two classifications; removal of oil and grease, and removal of hard carbon deposits.

(c) The use of water soluble cleaning compounds on engine parts is strongly discouraged. It has been found that small traces of water soluble alkaline cleaners sometimes remain impregnated in the pores of the metal. Later, during engine operation, the alkali may be released and get into the lubrication system and cause violent oil foaming.

(d) Kerosene as a degreaser, generally has been found satisfactory for cleaning engine parts. Vapor cleaning also is effective. However, vapor degreasers leave the parts perfectly dry when removed from the cleaning tank, and a light coat of corrosion-preventive mixture is needed for protection against corrosion.

(e) To facilitate repair and assembly, all parts from any one of the major engine units should be identified and kept together while cleaning.

(f) It is during the cleaning process that most shop damage occurs to engines because parts strike and nick finished surfaces. Groups of parts such as tappets, piston pins, etc., will be removed from the portable stand and taken to the cleaning tanks in their containers so that unnecessary contacts of finished surfaces will be avoided.

(g) If it appears probable that engine parts will not be inspected until 48 hours or more after cleaning, all steel parts should be covered with a light coat of corrosion preventive mixture.

(h) After inspection, all parts should be covered with a light coat of the above mixture.

2. SPECIFIC CLEANING INSTRUCTIONS

a. Ball Bearings

(1) Clean ball bearings thoroughly and carefully. Wash the bearing in the cleaning solution and blow out with compressed air. When blowing out the bearing with compressed air, hold both races to prevent turning of the bearing.

CAUTION — Do not allow the bearing to spin. Spinning of the bearing in a dry condition will score the races.

(2) The cleaning of the bearing should be continued until the bearing runs smoothly when well oiled. A dry bearing often will appear loose and defective.

(3) When a bearing has been cleaned, it should be oiled, wrapped in wax paper, and placed in a suitable container. A clean bearing never should be allowed to lie exposed on a work bench. Strict observance of these precautions will keep bearing trouble at a minimum.

(4) Lubriscal bearings, part No. 22778, will not be washed with any grease solvent.

b. Crankshaft

To clean the crankshaft front half, the sludge will be removed from the interior of the crankpin as follows: (See figure 56.)

(1) Insert ten 3/16-inch steel ball bearings into the hollow crankpin through the rear oil hole. Insert a piece of 1/16-inch wire, bent into a hook, into the front oil hole to keep the balls from coming out or blocking the hole.

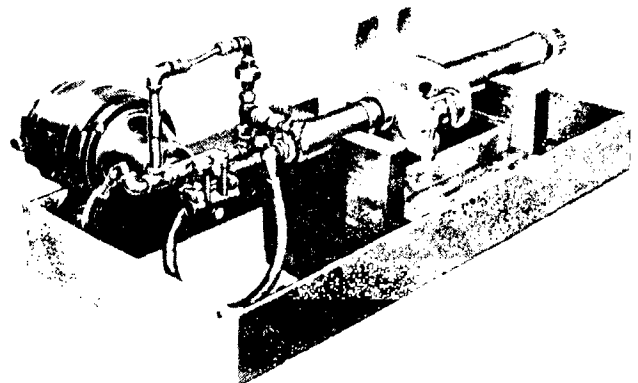


Figure 56 — Flushing the Crankshaft

OVERHAUL INSTRUCTIONS—Continued

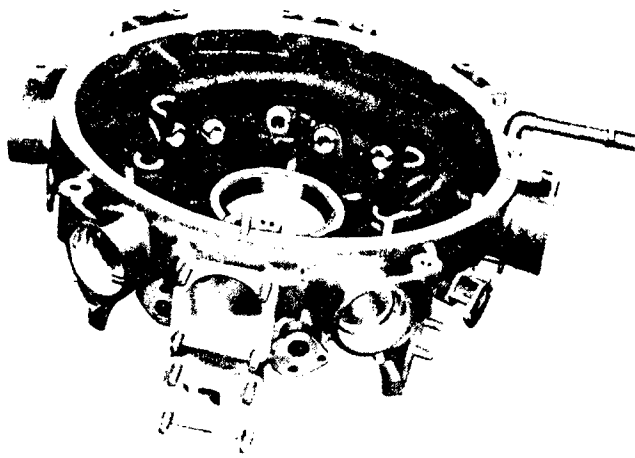


Figure 57 — Flushing the Crankcase

(2) Direct a jet of cleaning compound from a pressure source (or compound and air blast) into the rear oil hole. The steel balls will be agitated, thus loosening the sludge and the compound will carry it out. A dirty crankpin may require an hour of cleaning. When the compound that emerges is clear, the cleaning process is complete.

(3) The ball bearings will be removed from the crankpin and carefully counted to determine that none remain.

c. Crankcase Rear Half

To clean oil passages in the rear half of the crankcase after external surfaces are cleaned: (See figure 57.)

(1) It is not possible to clean the low pressure oil passages between the low pressure relief valve and the valve tappets by direct action. The passages are blocked off by non-removable plugs. To determine that these passages are clean the following procedure will be followed.

(2) Insert all valve tappet guides in the crankcase at a 90-degree angle to their operation position and apply the cleaning compound under pressure.

(3) Remove one tappet guide at a time and observe the amount and cleanliness of the cleaning compound that flows from each oil hole.

(4) If insufficient cleaning compound emerges from any oil hole, it will be necessary to drill out the small brass plugs in order to permit mechanical cleaning of the passages.

(5) If the flow of cleaning compound still indicates restricted oil passages, it may be necessary to remove the rear main bearing liner and

clean the oil groove that is turned in the crankcase under the liner.

d. Cylinders

Removal of carbon from the combustion chamber and loose paint from the outside of the cylinders will be accomplished as follows:

(1) Immerse cylinders in a cleaning compound to loosen and remove as much carbon and dirt as possible.

(2) Prepare the cylinders for sandblasting by installing suitable cylinder wall protectors which must completely cover the cylinder bore to the top of the barrel.

(3) Install valve guide protector plugs and spark plug protector plugs.

(4) Provide suitable protection for rocker arm bolt holes and spot faces as well as the threads and spot faces for push rod housing retainers on rocker boxes. Sandblast on these machined surfaces will result in oil leakage when the engine is returned to service.

(5) Protect all studs, recessed threads, and machined surfaces with tape.

(6) Only that paint which is loose or blistered need be removed from the cylinder.

(7) It is permissible to sandblast the valve seats. Sandblasting removes the glaze and facilitates reseating.

(8) A sandblast sand having round grains is the only material which will be used in abrasive cleaning of aluminum alloy engine parts. A commercial sandblast sand known as "Flint Shot" has round grains and is satisfactory to use. In no case will sharp gritty sand be used for this purpose.

(9) Excessive air pressure will be avoided as it increases the tendency of the abrasive to become imbedded in the metal. The required pressure for cleaning depends on the hardness and the amount of carbon to be removed. The pressure should be adjusted to 15 pounds per square inch and increased in five pounds per square inch increments until the carbon is removed satisfactorily; in no case should a pressure greater than 30 pounds per square inch be used.

e. Pistons

Pistons will be cleaned by the following method:

(1) Immerse the piston in carbon removing

OVERHAUL INSTRUCTIONS — Continued

compound to remove the accumulation of oil and to loosen as much carbon as possible.

(2) The inside may be cleaned by sandblasting after completely protecting the piston skirt and wrist pin hole.

(3) The recommended means for removing hard carbon from the ring grooves, skirt, and the top of the piston is the blast method, substituting cracked wheat, cracked corn, or clover seed for the "Flint Shot" and increasing the air pressure to 65 pounds per square inch maximum. This method has proven most satisfactory because the grain does not damage the surfaces of the pistons. In some instances it may be necessary to clean some portions of the grooves by hand due to an excessive accumulation of hard carbon. The use of sandblast and wire brushes is not recommended for use on piston skirts, heads, or ring grooves because it will result in damage to the surfaces. Extreme caution will be exercised when steel wool, emery cloth, or scrapers are employed in cleaning pistons to prevent damage to the piston surfaces.

(4) The oil holes in the oil ring groove may be cleaned with an undersize drill.

f. Master Rod (See figures 58 and 59)

To permit a sufficient flow of oil to the knuckle pin, the master rod will be cleaned as follows:

(1) Immerse the master rod in cleaning compound to remove the accumulation of oil and sludge.

(2) Figures 58 and 59 show a recommended apparatus to facilitate cleaning of the master rod oil passages that lubricate the knuckle pins.

g. Knuckle Pins

Oil passages in the knuckle pins will be thoroughly cleaned by forcing cleaning compound or air and cleaning compound into each oil hole in turn. Reverse the direction several times to remove loose sludge.

h. Push Rods

The push rods are used as oil passages to lubricate the rockers. Cleaning compound will be forced through the push rods, alternating the direction from one end to the other until they are clean.

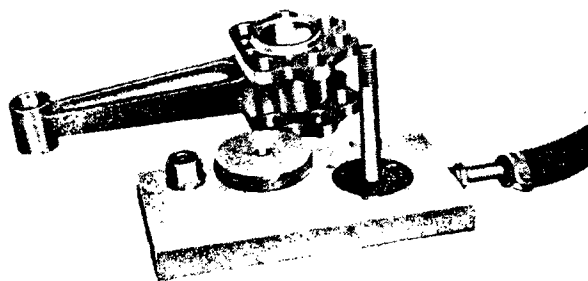


Figure 58 — Preparing to Flush the Master Rod

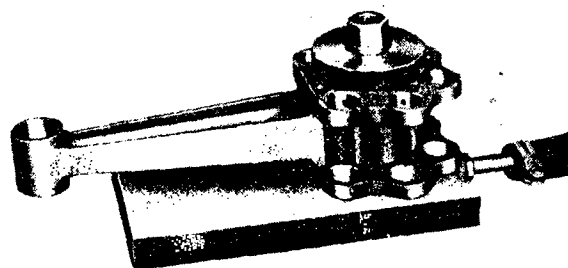


Figure 59 — Flushing the Master Rod

Section 10

OVERHAUL PARTS INSPECTION**1. GENERAL**

(a) This section includes the detailed inspections which are to be applied to each part of the engine at a major overhaul. The work will be treated separately by engine unit assemblies as outlined in the dismantling procedures in Section VIII.

(b) The services of a competent and thoroughly trained aircraft engine inspector are indispensable in arriving at decisions affecting further serviceability of any parts. An understanding of the conditions under which each part operates should aid in determining further usability. For this reason, it is recommended that the inspector become acquainted with the engine operating characteristics. He should be familiar with the power output, manifold pressures used, piston displacement, and the entire gearing and lubrication of the engine.

(c) The "Magnaflux" method of inspection for steel parts will aid in the detection of defects and fatigue cracks which otherwise could not be seen in the normal course of inspection. Stringers or imperfections in the metal, when not located in highly stressed areas, will not be cause for rejection. The use of Magnaflux inspection is mandatory for all steel parts in the engine except ball bearings, springs, and austenetic steel valves.

NOTE — Magnaflux method of inspection should not be used on either ball or roller bearings, since even small traces of residue magnetism may cause pick-up of foreign particles that would be detrimental to satisfactory bearing operation.

(d) The operator of magnaflux testing equipment must be a specialist in that field, trained to evaluate correctly the various indications which may be encountered.

(e) The Table of Limits, Section XV, will be used as one guide to the advisability of replacing any of the wearing parts in the engine. It contains wear limits beyond which parts should not be continued in service.

(1) Where "out of round," "taper," or wear exceeds the replacement values, a new part or reworking of a part will be accomplished to the

standards of oversize or undersize listed in the Numerical Parts List. If necessity requires re-use of parts, it will be permissible to electroplate non-wearing mating parts to maintain tight fits.

(f) Parts recommended for wear check at each overhaul:

- (1) Cylinder bore.
- (2) Wearing surfaces on piston.
- ✓ (3) Piston pins.
- (4) Piston pin bore in piston and articulating rods.
- (5) Crankshaft main and crankpin journals.
- (6) Main bearings.
- (7) Knuckle pins.
- (8) Rocker arm roller.
- ✓ (9) Rocker arm shaft bore.
- ✓ (10) Valve stems, guides, and inserts.
- (11) Accessory case bushings.
- (12) Gears and pinions.

2. INSTRUCTIONS FOR MAGNAFLUX INSPECTION**a. General**

(1) The most common flaw found in aircraft engine parts is an almost straight crack running lengthwise (as in a shaft) and parallel to its axis. These axial flaws are detected by currents running lengthwise through the piece, which are called "Axial" charging. Axial charging also is known as circular magnetization.

(2) Flaws lying at right angles, or nearly so, to axial flaws are known as transverse defects. As a rule these are brought on by fatigue during service. Therefore, they are the ones most likely to be found in the field. They are usually irregular and crooked. Axial charging generally is sufficient to pick up this type; but, for vitally-important, highly-stressed parts, a current at 90 degrees to the axial should be employed. This is called transverse charging. Transverse charging, also known as Bi-Polar magnetization, is accomplished by the use of a solenoid coil.

(3) Slight imperfections in the metal, such as minor inclusions of scale, were passed by

OVERHAUL INSTRUCTIONS — Continued

manufacturing inspection and in themselves will not be cause for rejection of the part after it has passed a satisfactory period of operation.

(4) Care will be taken to avoid the use of excessive current on smaller pieces. Excessive current brings out indications of cracks and flaws that are not defects in the metal but are so-called "flow-lines" or "grain."

(5) All magnaflux procedures described herein are based on the use of an AN Specification magnaflux unit.

(6) Parts to be magnafluxed should be free from oil, grease, loose dirt, or grit.

b. Preparation of Inspection Fluid

(1) Inspection fluid is made up by thoroughly mixing 1½ ounce Magnaflux No. 7 paste to a gallon of mineral spirits. Commercially available mineral spirits recommended are Atlantic Refining Company's "Ultrasene," Standard Oil of Indiana's No. 9 Refined oil, or Texaco's "Crystalite."

(2) Where inspection fluid is to be used on parts having dark surfaces, a red oxide inspection fluid is used. This is made by substituting Magnaflux No. 9 paste for Magnaflux No. 7 paste.

(3) The ratio of paste to spirits should be checked occasionally by measuring a sample taken at the flow nozzle. A sample of the fluid flowing from the nozzle is collected in a standard 100-milliliter graduated glass cylinder, filling the latter to the 100-milliliter mark. This is allowed to stand undisturbed for 30 minutes or until the solid magnetic matter seems completely settled at bottom. As much of the clear liquid should be poured off as is practicable without loss of the magnetic matter. The graduate should then be refilled with benzene, shaken well, and again allowed to stand undisturbed for one hour. The height of the precipitate at the bottom of the cylinder then is read directly from the graduated scale. There should be a minimum reading of 2 milliliter of precipitate, which is equivalent to a concentration of 1 ounce by weight of solid to 1 gallon of liquid.

c. Instructions for Axial Method

(1) Solid pieces should be clamped between the machine heads and the direct current passed directly through the piece. Be sure the contact plates are clean. Use sufficient pressure to prevent burning.

(2) Whenever possible, suspend hollow pieces on a copper or brass bar and place the ends of the bar on notched bar supports of the machine heads. Any number of parts may be put on the same bar and magnafluxed together. Do not allow parts to touch each other on bar. Pass current through the bar. Each piece is shot at a time. Be certain that the liquid is flowing over the part when the current is applied.

(3) Use 1000 to 1500 amperes-per-inch of piece diameter. For pieces more than four inches in diameter, use the full capacity of the batteries, or a minimum of 3000 amperes. Current shots should be between 1/5 and 1/2 second duration.

NOTE — It is important that the amperage specified is not exceeded. If greater than specified amperage is used, local overheating or burning of the part will occur. Burning also will result if parts made of thin material are tested by clamping between the machine heads with current passing directly through the piece. These always should be tested by suspending on a copper bar.

(4) Flood the part with inspection fluid. (Refer to paragraph 2.b, this section.) Apply one or two shots of current while the liquid is flowing. Remove the stream of liquid immediately so as not to wash off faint indications.

(5) One shot of current should be sufficient unless the piece is too long to be flooded at one time. In order to have inspection fluid flowing over the surface when the current is applied, it may be necessary to use several shots on long pieces.

(6) Inspect for magnaflux indications of longitudinal flaws. This axial method of magnetization brings out the flaws running lengthwise of the part, that is, in the direction of the flow.

d. Instructions for the Transverse Method

(1) Place the part in the solenoid coil with the axis of the part passing through the coil opening. If the part is too large to go inside the coil as described, place it adjacent to the coil with its axis perpendicular to the coil. The flaws most effectively indicated by this method are those lying transversely (crosswise) across the part, when the part is placed in the solenoid coil

OVERHAUL INSTRUCTIONS — Continued

as described above. Flood with inspection fluid. While flooded, apply two shots of maximum amperage unless amperage is otherwise specified.

(2) Remove the fluid flow quickly after the last shot to avoid washing off weak indications.

(3) Only the portion inside or projecting six inches beyond either end of the coil is effectively magnetized. Long pieces, therefore, should be treated by placing the coil in successive positions, flooding the portion of the part inside the coil, and giving it one shot of current for each position.

(4) Inspect for transverse indications. Cracks in fillets at changes of section and cracks lying across the shank and pin end of connecting rods are effectively shown by this method.

e. Preservation of Defect Patterns

If a permanent record of the defect pattern is desired, it may be preserved on the part itself or on paper. To preserve the indication on the part itself, drop a few drops of carbon tetrachloride on and adjacent to the indication. This will clean away the particles of inspection compound which are not held to the indication by the magnetic current. Then, drop a drop or two of clear lacquer on the indication. This will seal the indication to the part. To transfer the indication to a sheet of paper, drop a few drops of carbon tetrachloride. Then cover the indication with a piece of scotch tape. When the scotch tape is peeled from the part, the adhesive will lift the indication intact and it can then be placed on the sheet of paper by sticking the scotch tape to the paper.

f. Demagnetization

(1) After a part has been magnetized and inspected, it must be carefully demagnetized to prevent its carrying or picking up metallic particles in the engine assembly.

(2) This is done by placing the part in an alternating or reversing magnetic field of an alternating current solenoid coil. Then, by slowly withdrawing the part from the field of the coil three or four feet, the strength of the magnetization at each cycle becomes weaker during withdrawal until at three or four feet the residual magnetism left when current is cut off is negligible. To be fully effective, the a-c field must be nearly as strong as the d-c field used in magnetizing. If demagnetization is not

complete, repeat the process and turn the part while withdrawing.

(3) Do not shut off the current while the part is inside the demagnetizer or within the field, as a strong residual magnetization will be left in the direction determined by the last half cycle in effect when the current is broken.

(4) When parts are much smaller than the demagnetizer, pass them through the coil close to its inside wall and not through the center of the opening.

g. Rinse and Slush Treatment

(1) After being demagnetized, the parts should be thoroughly rinsed in a suitable solution of mineral spirits, to completely remove the magnaflux inspection materials. Place on a drain board or rack until the rinsing fluid is completely drained off.

(2) If it appears that the parts will not be inspected again within 24 hours, dip the part into a bath of fuel tank slushing compound, and place on a drain board or rack to drain.

h. Shafts

(1) This includes such parts as camshaft, small idler shafts, and other shafts which have integral gears and are not provided with a center hole. All rotating shafts should be tested by both the axial and transverse methods.

(2) In the axial method, the shaft should be mounted lengthwise by clamping it to the machine heads, and it should be charged with 1000 to 1500 amper-per-inch of shaft diameter. Pieces more than four inches in diameter should be charged with a minimum of 3000 amperes. Flood, as per general instructions paragraph 2 c. (4), this section, and inspect for axial indications, paying particular attention to the fillets, the region within $\frac{1}{8}$ -inch of fillets and the region immediately around any hole. Demagnetize.

(3) In the transverse method, the shaft should be placed inside of and at right angles to the solenoid coil. The coil should be charged with the maximum specified amperage. Since the magnetizing will extend only six inches on either side of the coil, the process should be repeated at least once in each 12 inches of shaft length. Flood, as per general instructions, paragraph 2 c. (4), this section, and inspect for transverse indications. Demagnetize and rinse.

OVERHAUL INSTRUCTIONS - Continued

(4) All parts, that successfully pass magnaflux inspection, will receive the magnaflux stamp of approval in ink.

i. Recommended Amperage for Magnetic Inspection of Continental W670 Engine Parts

| Part No. | Name of Part | Amperage |
|----------------|---|-----------|
| 2050 | Bolt - Crankcase..... | 1000-1500 |
| 2057 | Nut - Thrust bearing..... | 1800-2000 |
| 2129 | Roller - Valve tappet..... | 1000-1500 |
| 2254 | Roller - Rocker..... | 1000-1500 |
| 2255 | Rocker - Roller bushings.. | 500-1000 |
| 2256 | Rocker - Roller pin..... | 500-1000 |
| 2584 | Gear - Tachometer..... | 1000-1500 |
| 2585 | Gear - Tachometer driven | 1000-1500 |
| 2593 | Gear - Oil pump..... | 1000-1500 |
| 2835 | Bolt - Crankshaft..... | 1000-1500 |
| A3062 | Gear - Cam drive..... | 2000-2500 |
| 3064 | Gear - Pump drive..... | 1500-2000 |
| 3067 | Gear - Crankshaft starter | 2000-2500 |
| 3068 | Gear - Cam drive..... | 1500-2000 |
| 3113 | Pin - Intermediate cam drive gear bearing..... | 1000-1500 |
| 3192 | Rod - Articulating..... | 1000-2000 |
| 3348 & 3349 | Arm - Rocker..... | 1500-2000 |
| A3841 | Gear - Ignition (W670- 6A) | 1500-2500 |
| A3891 | Gear - Ignition (W670- 6N) | 1500-2500 |
| 3915 | Gear - Starter..... | 1500-2000 |
| 5071 | Rod - Master..... | 1500-2000 |
| A5160 | Ring - Assembly - Cam..... | 2500-3000 |
| A5180 | Crankshaft - Front (finished) | 2000-2500 |
| A5180 | Crankshaft - Rear (finished) | 1500-2500 |
| 20249 | Shaft - Rocker | 1000-1500 |
| 20255 | Pin - Valve tappet roller | 1500-2000 |
| 20260 | Pin - Piston..... | 1500 |
| 20267 | Rod - Push..... | 1500-2000 |
| 20281 | End - Ball..... | 1000-1500 |
| 20284 | Nut - Propeller..... | 2000-2500 |
| 20292 | Follower - Cam | 1500-2000 |
| 20293 | Insert - Cam follower..... | 500-1000 |
| 20997 | Bolt - Crankcase..... | 1000-1500 |
| 23152 | Pin - Knuckle | 1500-2000 |

| | | |
|--------|-------------------------------------|-----------|
| 35204 | Cage - Thrust bearing.... | 2000-2500 |
| 500051 | Gear - Generator drive.... | 1500-2000 |
| 500053 | Pinion - Generator drive.. | 1500-2000 |
| 500055 | Pinion - Generator step-up | 1500-2000 |

3. SPECIFIC INSTRUCTIONS FOR INSPECTION OF PARTS

a. Bearings

(1) Where ball bearings are of a type that cannot be completely disassembled, the bearings should be thoroughly cleaned and visually inspected as far as possible. An effort should be made to examine carefully the inner and outer races and balls for roughness and excessive wear. The bearings then should be oiled with a light oil and checked for smoothness. Dry bearings are quite apt to feel rough and sound noisy when turned. Inspect ball retainers for cracks or defects, loose rivets, and signs of corrosion.

(2) The inner diameter of inner races and the outer diameter of outer races should be examined for indications of spinning. Such an indication warrants an investigation of the fits involved.

(3) Radial and axial wear of bearings usually is negligible if the bearings are satisfactory in other respects. Bearings may be continued in service as long as they appear in good condition and turn smoothly.

(4) Rocker bearings will be inspected for indications of roughness and excessive wear without being removed from the rocker. If doubt exists, remove and inspect. Replace if necessary.

b. Piston Rings

(1) Piston rings removed from engines that are in the shop for overhaul may be used in the second and fourth piston ring grooves under the following conditions:

(a) Side clearances must be within the standard limits. (See figure 60.)

(b) Gap clearance must be less than 40 per cent over standard limits. (See figure 61.)

(c) Ring tension must be from 11 to 15 pounds.

OVERHAUL INSTRUCTIONS — Continued

(d) Rings must not be feathered, noticeably worn, scored, or burned.



Figure 60 — Checking Piston Ring Side Clearance

(2) All piston rings taken from engines which were removed from service at a low number of hours because of accident may, if not worn, be reinstalled in the same piston and cylinder for further service. They must, however, comply with above requirements.

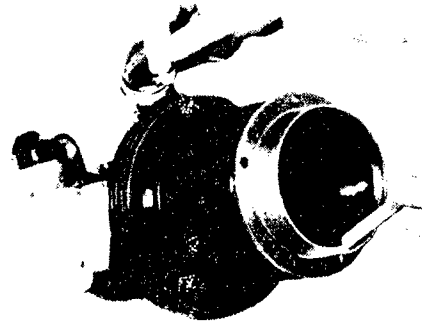


Figure 61 — Checking Piston Ring End Gap Clearance

Section 11

REPAIR AND REPLACEMENT

1. GENERAL

a. Work Treatment

This section includes detailed instructions necessary to restore the engine to a completely satisfactory operating condition. The work will be treated separately by engine unit assemblies as outlined in the dismantling procedure.

b. General Assembly Instructions

(1) No part will be used for final assembly unless it possesses the final inspection approval. No steel part (except anti-friction bearings, springs, austenitic steel valves, studs, standard nuts, and washers) will be used for final assembly unless it has the Magnaflux stamp of approval at some point on its surface.

(2) Fits, clearances, and other applicable specification values listed in Section XV will govern throughout the assembly of all component parts and assemblies.

(3) Backlash will be measured with the mating gear teeth clean and dry.

(4) Remove all nicks, scratches, or undesirable blemishes from all parts prior to assembly.

being. These instructions apply especially to all mating bearing surfaces, and at any other place where they might serve as a starting point for structural failure.

(5) All parts will be thoroughly washed and cleaned immediately preceding oiling for assembly.

(6) The surface of any part of this engine that has motion against an adjoining surface, when in operation, will be thoroughly lubricated with new aircraft engine lubricating oil, at assembly.

(7) Use the largest standard diameter cotter pin or wire possible.

(8) All loose, bent or otherwise damaged studs will be replaced by the next oversize stud. Replacement of steel studs driven in aluminum or magnesium alloy parts requires good judgment as well as a great deal of care on the part of the mechanic. Unless the replacement is made properly, more difficulties may be encountered than would have been had no attempt been made to correct the original difficulty.

(a) The first problem is not one of removing the broken or damaged stud but to remove it

OVERHAUL INSTRUCTIONS — Continued

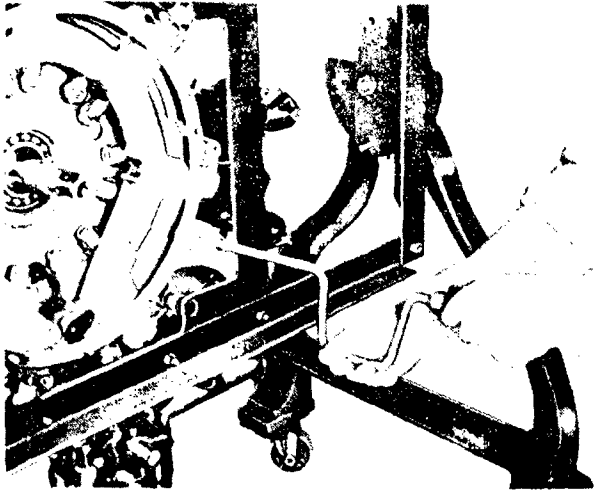


Figure 62 — Removing Damaged Studs

without injury to the part in which it has been set. If the outside threads have been stripped, it usually is a simple matter to remove the stud. A stud driver or a small pipe wrench, if necessary, may be used. (See figure 62.) Apply pressure on the handle of the tool so that there will be no tendency to bend the stud. Back the stud out slowly to avoid overheating the threads. It should be remembered that any thread lubricant or sealing material used when the part was installed probably has congealed, and rapid withdrawal of the parts may cause damage to the housing threads. Either of two methods may be used to remove studs which have been broken off at or near the base.

(1) The center section of the stud may be drilled out and a square-shank stud remover installed. Use a wrench of the proper size and back out the stud carefully.

(2) If the preceding method does not work satisfactorily, it may be possible to electric weld a short piece of steel bar stock or a steel nut to the broken stud. The bar stock or the nut then may be used to withdraw the broken piece. The welding must be done carefully to avoid melting or damaging the metal around the base of the stud.

CAUTION — Magnesium alloys are highly inflammable when heated to the high temperatures required to weld steel parts. Therefore, extreme care should be used when welding bar stock or drill rod to a broken stud setting in a magnesium alloy housing. Under no circum-

stances should a gas torch be used for welding a magnesium alloy housing.

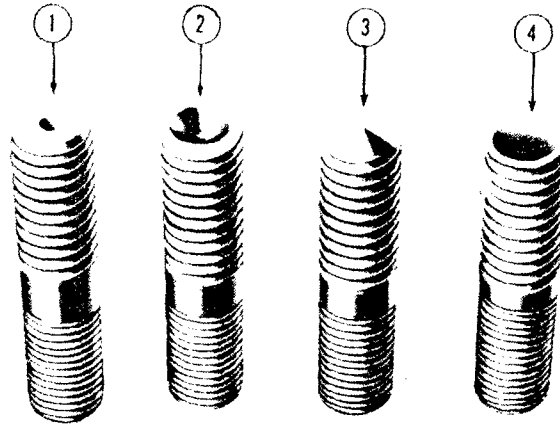


Figure 63 — Stud Identification Drawing

| Index Number | Part Number Designation | Stub Identification (End Finish) |
|--------------|-------------------------|----------------------------------|
| 1. | XXXX-09 | .009" Oversize |
| 2. | XXXX-06 | .006" Oversize |
| 3. | XXXX-03 | .003" Oversize |
| 4. | XXXX | Standard Size |

(b) Clean the threads in whatever part the stud is to be replaced before attempting to drive a new stud. Be sure that the tap used is the correct size. New taps usually cut oversize, and the mechanic should handle them carefully. If the tap appears to be cutting material away instead of just cleaning out the threads, withdraw it and use an older tool. Rough edges or burrs on a tap also may cause it to cut oversize. Carefully inspect all taps before using.

(c) If a stud was removed because it was

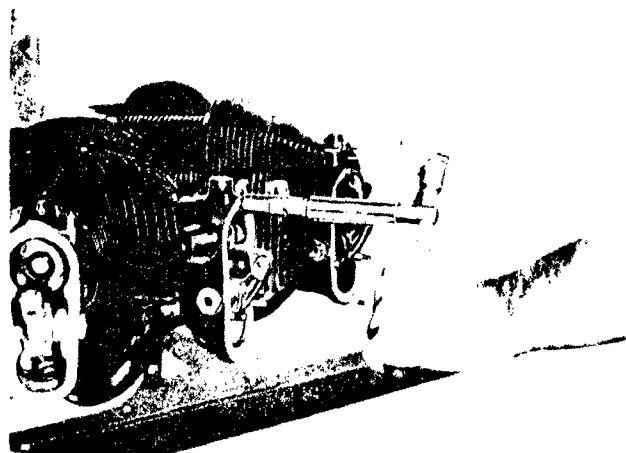


Figure 64 — Driving Studs with T-Handle Driver

loose, the next oversize stud should be installed. Oversizes of .003 inch, .006 inch, and .009 inch are supplied to replace the standard studs. (See figure 63.) These studs may be identified by the machining on the end that is driven into the housing. Examine the stud removed to determine its size and install the next oversize available.

(d) High temperature, water-resistant grease should be applied to the stud threads before they are installed. The lubricant should be stirred before using and applied in conservative quantities.

(e) Before installing a stud, make certain that it is the correct part and that the right end will be inserted in the housing, since these parts become mixed in stock.

(f) When driving the stud, feed it in carefully until reasonably sure the threads are meshing properly. Then turn in slowly and steadily until the stud is approximately in position. A T-handle stud driver always should be used. (See figure 64.)

(g) Do not turn in the studs rapidly or it is possible that the threads may overheat and either seize or be damaged.

2. ACCESSORY CASE

(a) Loose, damaged, or worn bushings will be removed and new ones installed. Caution will be exercised when inserting the oil feed bushing to determine that it is in perfect alignment with crankcase main bearing liners and that the oil hole is in line with the oil passage in the accessory case. After assembly bushings will be reamed to the minimum clearance specified in Section XV.

(b) With the use of tool No. 22360, install new oil seals in the recesses provided on the rear side of the accessory case at each of the magneto drive gear bushings. These oil seals are installed with the smooth face of their retainer to the rear of the case.

3. CRANKCASE

a. Cam Followers

(1) Cam followers are not repairable in event of a structural failure or wear beyond limits. If a cam follower or guide is replaced without its mating part, care will be exercised that all clearances are within limits.

(2) If there is evidence of slight scuffing on the guide bore or on the cam follower, the outside diameter may be smoothed by using a very fine stone.

b. Main Bearing Liners

(1) If, for any reason, either crankcase section becomes unserviceable, the entire crankcase will be condemned and so tagged for disposal in accordance with existing regulations.

(2) The main bearing liner will be replaced in accordance with the following instructions when dimensions are beyond 4.7268 for the front crankshaft bearings, or 4.3331 for the rear crankshaft bearing:

(a) The front and rear sections of the main crankcase will be separated as in standard overhaul procedure. Working with the rear section first (part No. 6087), mount the crankcase on a vertical turret lathe table and center it with respect to the bearing liner. Proceed to cut down the entire liner so that only .010 to .015-inch remains. Then, by the use of a small punch, lift up on the edge of the remaining part of the liner. Catch it with a pair of pliers and pull it out. With pliers; or any other suitable tool, pull out the three securing pins.

NOTE — This is an excellent opportunity to ascertain if the oil passages back of the rear bearing liner are clean, as well as the passages to the tappet.

(b) The liner on the front section of the crankcase (part No. 6447) may be removed like the one in the rear section. It also is permissible to use a drift with a blunt point, whose thickness does not exceed the thickness of the liner. Drive out the liner from front to rear. Allow the securing pins to shear off as the liner is driven out. It is not necessary to remove the stub ends of the pins from the case.

(c) Check the bore in front and rear crankcase sections for size and roundness. If out-of-round more than .002 inch, the bore should be re-machined to trueness, keeping the oversize to a minimum (maximum oversize diameter .100 inch over a standard) as the new liner will be specially machined for any specific crankcase.

(d) Determine the exact size of the bore in both the front and rear sections of the crankcase. For the front position, select a liner (part No. 3005) having an outside diameter of from

OVERHAUL INSTRUCTIONS — Continued

.005 to .007 inch larger in diameter than the bore. For the rear position, select a liner (Part No. 3006), also having an outside diameter of from .005 to .007 inch larger in diameter than the bore. When necessary, machine an oversized liner to the exact size required. Mark the exact location of the pins that secured the original liner on the crankcase webbing where the marking can be seen after the new liners are installed.

(e) Place both sections of the crankcase in an oven and heat to approximately 121° F. (250° C.) and at the same time, place the two new bearing liners in a refrigerator or dry ice and cool to a temperature of from -23° C. to -45° C. (-10° F. to -50° F.). All parts will have reached a stable temperature within 20 minutes.

(f) After a liner has been chilled, place the liner so that the liner can be installed quickly in the case after removal of the case from the oven. Install each liner so it is flush with the side of the case toward the cylinder wall center liner. Hold the liner in place momentarily and the crankcase will shrink to it quickly.

(g) Drill and pin the liner, making sure that a slightly different location for the pins is used. This can be determined by the earlier marking placed on the crankcase webbing.

(h) Due to the many types of machines and the different methods of procedure, no specific instructions for the boring of newly installed liners are given. Instead, exact conditions which must be met are pointed out. All boring procedure should be accomplished with these conditions in mind.

(1) When the new liners are exactly centered, only .015 inch of stock is available on the side for truing up and bringing to exact size.

(2) When finished, each liner must be square within .002 inch of the accessory pilot face and with the thrust bearing counterbore face.

(3) Each liner must be concentric within .001 inch of the accessory case pilot and thrust bearing counterbore at the front crankcase section.

(4) Perfect concentricity is necessary to maintain the alignment of the crankshaft and connecting rods in the assembled engines.

(5) A boring bar, centered in the oil feed bearing in the accessory case and the thrust bearing location is recommended for this work.

(i) Finish the liner in the rear section of the crankcase to a diameter of 4.3310 inches (plus .005-minus .000) and the liner in the front section to 4.7247 inches (plus .0005-minus .000).

4. CYLINDERS

a. General

(1) Cylinder assemblies which have loose heads or cracks, except for small cracks near the surface of the cooling fins, are to be replaced. Small nicks on the edge of the cylinder fins should be removed carefully by filing. Sharp corners should be rounded off.

(2) Nicks on the flanged surface of the cylinder barrel flanges should be removed by hand stoning. Polish flanges with crocus cloth.

(3) Cylinder bores, which are slightly corroded, scored, or pitted may be repaired by honing. If either the maximum permissible out-

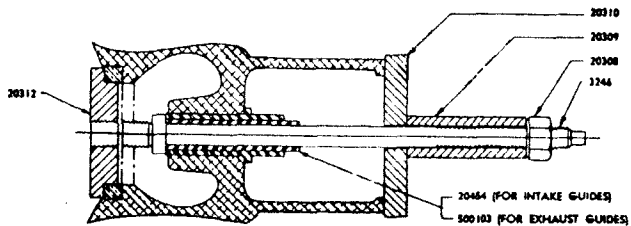


Figure 65 — Valve Guide Puller and Inserter — Tool No. A3373

of-round condition or the maximum permissible taper or the average maximum barrel diameter is exceeded, the cylinder bore should be re-ground and honed to the first standard oversize that will remove all excessive out-of-round and taper. Surface finish must be 14-20 microfinish,

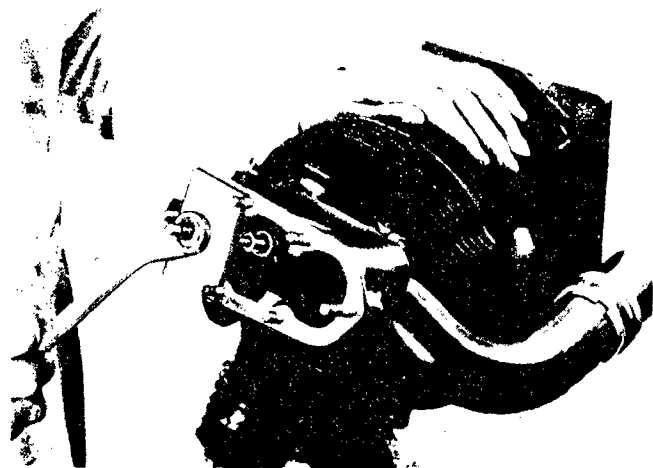


Figure 66 — Removing Valve Guide with Tool No. A3373

OVERHAUL INSTRUCTIONS — Continued

which is a smooth finish grind or the equivalent to the finish of a new cylinder. If cylinders are ground oversize, it will be necessary to fit oversize pistons and piston rings. Pistons are available to fit cylinders .010- and .020-inch oversize. Cylinders will not be ground more than .020-inch oversize.

b. Valve Guide Replacement

(1) Install cylinder on holding plate, tool No. A4116.

(2) To pull the valve guide proceed as follows: (See figures 65 and 66.) Install the valve guide puller and inserter screw through the valve guide with the screw head on the inside of the cylinder. Install the intake bushing (part No. 20454) or exhaust bushing (part No. 500-103) over the screw and in the inside diameter of the valve guide. Install the valve guide puller plate, tool No. 20310, over the puller screw and rest it against the rocker box parting flange. Install the valve guide puller and inserter spacer (part No. 20309) on the screw and apply nut (part No. 20308). Heat should be applied carefully to the cylinder head, bringing the temperature up to approximately 93.3° C. (200° F.). Operate the nut, (part No. 20308) and pull the guide (See figure 65 for illustrated diagram of tool set-up).

(3) To install a valve guide, proceed as follows: Screw the valve guide inserter disk nut (part No. 20312) on the screw (part No. 3247). Place the intake or exhaust valve guide bushing on the screw (part No. 3246). Insert the assembly through the valve guide boss hole with the disk nut resting against the valve seat. The cylinder head should be heated carefully as directed in the preceding paragraph. The valve guide should be chilled in a solution of commercial dry ice and alcohol or in a pan of alcohol placed in an electric refrigerator. Immediately preceding installation, the outside diameter of the guide should be thinly coated with petrolatum. Place the new valve guide on the puller and inserter screw and slide it down over its bushing. Install the valve guide puller and inserter spacer (part No. 20309) on the screw and apply the nut. Turn the valve guide puller and inserter nut, forcing the valve guide into the cylinder head.

CAUTION — If the valve guide is installed rapidly enough, the tools may not be required.

When installing the valve guide, it is essential that the operation be completed rapidly. Any delay in getting the valve guide into its final position will permit it to warm up and expand, thereby increasing its resistance to installation.

c. Valve Seat Replacement

(1) Defective seats will be cut to a thin shell using a suitable cutter. The thin shell will be pried loose from the recess with a knife or similar tool.

(2) Measurements will be taken to determine that the replacement seats have a minimum pitch of .0065 inch.

(3) Heat the cylinder head in an oven to 288° C. (550° F.). Chill the valve seats for at least 20 minutes in a pan of alcohol in an electric refrigerator or dry ice to -45.5° C. (-50° F.).

(4) Hold the seat with a suitable tool and insert it in the cylinder head as rapidly as possible. Hold securely in the cylinder until the seats expand.

CAUTION — The cylinder will be allowed to cool at room temperature to avoid possible cracks or distortions.

d. Valve and Valve Seat Reconditioning (See figure 67)

(1) Care will be taken, when refinishing valves and valve seats, to insure that the angle of the valve and the angle of the seat are iden-

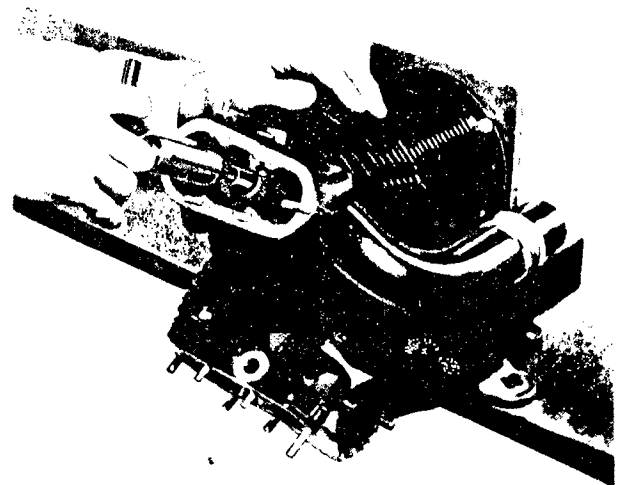


Figure 67 — Grinding Valves

OVERHAUL INSTRUCTIONS — Continued

tical. If these operations are done carefully, it will not be necessary to lap all of the valve seats. One or more valves of a set should be lapped to their valve seats sufficiently to determine that the work has been accomplished satisfactorily.

(2) Cylinders will be tested to determine that satisfactory seal has been obtained between the valves and the valve seats in the following manner:

(a) Install the valves in cylinders with a safety circlip on each valve stem, a valve spring seat, the outer, intermediate and inner valve springs (with the closed up coils next to the cylinder valve spring washer), and two retaining split cone locks. Install dummy spark plugs.

(b) Place the cylinder assembly on a rack with the cylinders in an inverted position. Place approximately two quarts of kerosene in the cylinders. Watch the valve ports for leakage. If leakage is observed, lap the valves to the valve seats.

e. Spark Plug Bushing Replacement

(1) Using a No. 31 drill, drill the brass locking pin that holds the spark plug bushings in place to a depth of $\frac{1}{4}$ -inch from the flange of the insert. Mark the cylinder at the location of this hole.

(2) Insert a large Easyout in the bushing and remove the bushing from the cylinder.

(3) Select the next oversize bushing and screw into place firmly.

(4) Using a No. 31 drill, drill the new bushing in the center of its flange at any position (other than the previous hole) to a depth of $\frac{7}{16}$ inch.

(5) Drive the locking pin into place until the exposed end of the pin is flush with the flange of the insert.

f. Rocker Arm Bearing Replacement

Bearings will not be removed from rockers unless inspection reveals defects. When replacement of the rocker bearing is required, the bearing will be pressed out of the rocker box with an arbor press. The new bearing may be installed in like manner.

MASTER AND LINK RODS**Replacing Master Rod Bearings**

If the master-rod-bearing clearances are be-

yond limits, the master rod bearing will be replaced in the following manner:

(1) Mount the master rod in a suitable holding fixture on a drill press, boring mill or lathe. Use a fly-cutter, or other boring tool, and cut the bearing from the master rod, leaving only a thin shell.

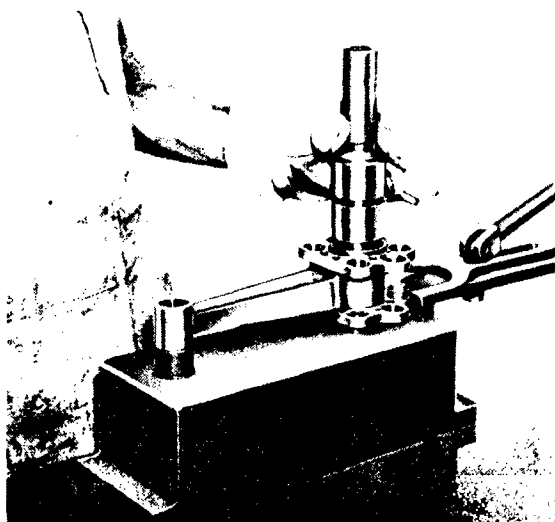


Figure 68 — Replacing Master Rod Bearing

(2) Push the liner from the master rod with an arbor press.

(3) Polish the bore and clean the oil passages.

(4) Place the master rod in an oven and heat it to 204.5° C. (400° F.). Place a new master bearing in an electric refrigerator and chill it to -23.5° C. to -45.5° C. (-10° F. to -50° F.)

(5) Place the bearing in the master rod, making sure that the oil hole opposite the groove in the master rod bearing is installed next to the groove in the master rod. The bearing must come to rest flush with the bottom edge of the master rod. The beveled edge of the bearing should be .015 inch below the upper edge of the master rod. (See figure 68.)

(7) After installation, the crankshaft crank-pin will be measured accurately and the master rod bearing diamond bored to not less than .0023-inch clearance in accordance with the limits in Section XV.

b. Improving Knuckle Pin Fit

(1) Grind all knuckle pin holes to .945 (+.001) inch.

OVERHAUL INSTRUCTIONS — Continued

(2) Make a .020- to .030-inch radius on each end of each knuckle pin hole, using a strip of emery cloth or other satisfactory method.

(3) Chrome plate the knuckle pin holes .005 to .006 inch to a maximum diameter of .935 inch.

(4) Regrind the knuckle pin holes between .9371-.9365 of an inch. These are the limits required in manufacturing new master rods. The holes also must be parallel to the crankpin hole and each other within .0005 per inch of length.

(5) Round off the sharp edges so that installation of knuckle pins will not lift the plating.

CAUTION — This machining operation is extremely critical. If satisfactory facilities are not available, the master rods should be forwarded to Continental Motors Corporation for reconditioning.

c. Master Rod and Articulating Rod Bushings

(1) The master rod bushing may be pressed out on an arbor press.

(2) A new bushing should be chilled to approximately -23.5° C. (-10° F.) and pressed in with a suitable mandrel and an arbor press, and bored to the minimum clearances given in the Table of Limits, section XV.

(3) The articulating rod bushings may be replaced in the same manner.

6. CRANKSHAFT

Rusted, pitted, and/or galled crankshaft bearing locations will be chrome plated in the following manner, provided they are serviceable in all other respects.

(a) Only the defective bearing locations will be ground undersize approximately to the following dimensions and in no instance will the crankshaft be ground more than .015-inch undersize.

(1) 2.550 inches at the thrust and front bearing locations.

(2) 2.350 inches at the rear bearing location.

(b) The remainder of the crankshaft will be protected to prevent its being plated.

(c) Chrome plate the undersize bearing locations to approximately the following sizes:

(1) 2.570 inches at the thrust and front bearing locations.

(2) 2.372 inches at the rear bearing location.

(d) The chrome plated locations then will be ground to the following sizes:

(1) 2.5596 inches (+ .0000, — .0005 inch) at the thrust and front bearing locations.

(2) 2.3624 inches (+.0000, —.0005 inch) at the rear bearing location.

(e) All sharp corners will be rounded to a radius of .020 to .030 inch.

(f) Crankshaft will be rejected for the following defects:

(1) If the radius of the fillet between the bearing and the front crankshaft cheek is not approximately $3/16$ inch.

(2) Tool marks on the crankshaft cheek or journal.

(3) Unsatisfactory plating or machining.

7. DUPLEX PRESSURE AND SCAVENGE OIL PUMP

a. Housings and Plate

(1) Clean all finished surfaces with crocus cloth and lead-free gasoline. Nicks or burrs on the mounting flanges may be cleaned up with a fine flat stone. A deep groove or scratch on the parting flanges should not be removed entirely, as the work probably will leave a low spot in the surface that easily could permit oil leakage. If any of the studs are loose, refer to the instructions contained in paragraph 1. b (8), this section. Deep scratches or excessive wear of the walls in the oil gear chambers increase the amount of oil slippage past the gears when the pump is operating. Therefore, if the gear locations are scored, smooth the surfaces, but do not attempt to completely remove deep scratches as this will cause excessive clearance between the gears and the housing.

(2) The separating plate between the scavenge and pressure pump should be flat and smooth. This plate may be cleaned up by rubbing lightly over a lapping block. Use light pressure and lap carefully to remove only the minimum amount of material necessary to smooth up any ridges or nicks. Be sure to thoroughly clean the separating plate after lapping until all of the abrasive compound is removed. Do not clean in a bath in which engine parts are washed before assembly.

OVERHAUL INSTRUCTIONS — Continued

b. Gears

The gears should be free from nicks, burrs, or sharp edges. It is particularly important that the tips of the teeth be smooth and free from sharp edges, since any slight imperfections probably will damage the pump housings during operation. This same condition is true of the flat ends of the teeth. The bearing diameters of the oil pump drive shaft should be cleaned and smoothed with crocus cloth and lead-free gasoline. Three Woodruff keys hold the scavenge pump gear to the main drive shaft. Stone any burrs that may have been raised when the keys were removed from the shaft. When small burrs are allowed to remain at the edges of the keyways, they may pick up as the gear is installed and lodge between the separating plate and the end of the gear.

8. GENERATOR SPEED STEP-UP DRIVE

The lubriseal bearing installed on the pinion gear shaft cannot be cleaned or lubricated by ordinary tools. Do not, at any time, place in cleaning solution of any kind.

9. CAMS

Cams will be inspected carefully for pits or roughness in the cam track, and the cam hub must be within limits in the cam hub sleeve. They are repaired with a new cam hub and reground cam track.

10. IGNITION

(a) The magnetos will be overhauled in accordance with instructions in the Magneto Section in this manual.

(b) The wire harnesses will be overhauled and tested at each overhaul. The wires will be renewed when the engine is overhauled for completion of time allowed and otherwise as necessary. All damaged springs, insulators, and terminals will be replaced.

(c) The following table shows individual ignition cable lengths in inches and the total amount required per engine:

W670-6A

| <i>Cylinder Number</i> | <i>Left Magneto to Rear of Cylinder</i> | <i>Right Magneto to Front of Cylinder</i> |
|------------------------|---|---|
| 1 | 23 inches | 42 inches |
| 2 | 36 inches | 29½ inches |
| 3 | 52 inches | 40 inches |
| 4 | 61 inches | 51 inches |
| 5 | 40 inches | 71 inches |
| 6 | 30 inches | 59 inches |
| 7 | 19½ inches | 48 inches |

Total length required for one engine — 50 feet, 2 inches.

W670-6N, 16 and 17

| <i>Cylinder Number</i> | <i>Left Magneto to Rear of Cylinder</i> | <i>Right Magneto to Front of Cylinder</i> |
|------------------------|---|---|
| 1 | 25½ inches | 43 inches |
| 2 | 36 inches | 30½ inches |
| 3 | 52 inches | 42 inches |
| 4 | 61 inches | 55 inches |
| 5 | 43 inches | 71 inches |
| 6 | 31 inches | 59½ inches |
| 7 | 17½ inches | 47½ inches |

Total length required for one engine: 51 feet 2.4 inches.

Section 12

ASSEMBLY OF SUB-ASSEMBLIES AFTER OVERHAUL

GENERAL

(a) This section includes the detailed instructions necessary for assembly of the various engine sub-assemblies.

(b) Tools required are a regular part of the engine mechanics tool kit.

(c) Backlash between gears, bearing and pilot fits, clearances, and tightening torques,

OVERHAUL INSTRUCTIONS — Continued

where required, are listed in the Table of Limits, section XV.

(d) Responsibility for satisfactory and safe engine performance probably is more dependent on the assembly mechanic than any other individual in the overhaul organization.

(e) Prior to assembly of sub-assemblies, all parts will be cleaned to remove all traces of corrosion-preventive mixture and accumulated foreign matter. During assembly, all steel parts will be covered with a heavy coat of one part corrosion-preventive compound, mixed with three parts aircraft engine lubricating oil. This mixture will be used on all internal parts on which corrosion may occur and will include all bearing surfaces, cylinder bores, and piston rings. The practice of using plain aircraft engine lubricating oil during assembly should be avoided.

(f) When an engine is started, it usually requires several turns of the propeller before the oil pump is delivering a supply of lubricant to the farthest points. Therefore, unless these parts have been well coated with the corrosion-preventive mixture, prior to assembly, they probably will operate dry for a few seconds when the engine is first started.

(g) The use of a suitable torque indicating wrench is an absolute requirement when tightening any parts for which torque values are included in the Table of Limits, section XV.

(h) Certain items such as gaskets, clamps, safety wire, rubber oil seals, cotter pins, palnuts, and bolt head locking straps should not be used a second time. Use all new safety and locking material each time the engine is assembled.

(i) As soon as each sub-assembly is completed, plug all external openings and leave them plugged until it is necessary to open them. This is important, since nuts, washers, and palnuts may be dropped in accidentally and result in damage to the engine when it is operated. The mechanic should guard against small pieces of safety wire getting into the engine when trimming the ends with side cutters.

(j) Cotter pins and safety wire should be selected to fit snugly in the drilled holes where they are used. When the cotter pin is used to lock a castle nut, the looped head of the pin should set inside the castellations; not outside or across it. Unless otherwise specified, one tab of the cotter pin should be bent up and over flat

against the top of the bolt or stud. The other tab should be bent down against the side of the nut. Safety wire should be twisted evenly and drawn up tightly. Loose safety wiring may vibrate enough during operation of the engine to wear through. This is especially true since the safety wire is most generally assembled around sharp edged parts.

(k) Palnuts will be installed finger-tight after the retaining nuts have been tightened to the required torque. Palnuts will be locked with a minimum of $1/6$ of a turn and a maximum of $1/4$ of a turn. Palnuts will not be used on any internal threads.

(l) Never back off a nut to line castellations with the hole drilled in a bolt or stud for inserting safety wire. If the nut must be tightened excessively, or the specified torque limit exceeded, use either a new washer or a new nut.

(m) Safety all bolts, nuts, and other items that require it as the assembly progresses. Do not wait until the sub-assembly has been completed, or some of the nuts will be missed. Every assembly should be completed before leaving a job. If there is not sufficient time left to finish the work, it should not be started.

(n) When a unit sub-assembly of the engine is being built up, it will be advisable to check for free movement after each moving part is installed and secured in place. See that the part turns freely with no binding, rubbing, or interference of any kind. If difficulty is noted, immediately after any particular part has been assembled and it was not evident before, there should be little trouble in locating the cause and taking corrective action.

2. GENERATOR STEP-UP DRIVE

(a) Ascertain that the oil plug is in the inside bore of the pinion gear. Press the following parts on the pinion gear shaft in the order named:

(1) Oil thrower, with the concave face adjacent to the gear.

(2) Install the front ball bearing.

(3) Install the two split keys midway of the pinion shaft with a retaining clip around their outside diameter.

(4) Install the bearing spacer.

(5) Install the Lubriseal ball bearing. This

OVERHAUL INSTRUCTIONS — Continued

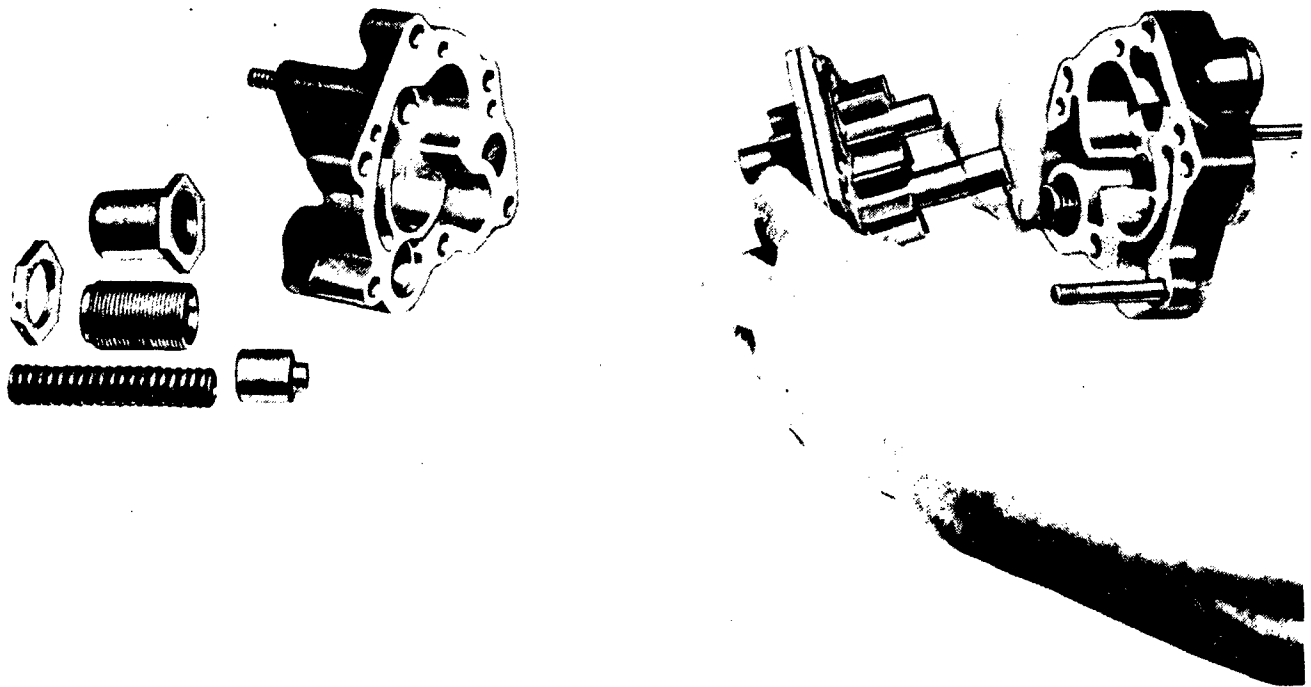


Figure 69 — Assembling Duplex Oil Pump

bearing is visually identified as being the heavier of the two.

(b) Press this sub-assembly into its housing with the pinion gear teeth installing on the side of the housing opposite the cover studs. The sub-assembly should be pressed down tight enough against the housing shoulder to hold the oil thrower tight.

(c) Install the bearing retainer gasket and the bearing retainer. Install five No. 10-32 filler-head screws that retain the assembly in the housing. Safety with wire.

CAUTION — Safety wire will be installed below the elevation of the screw heads.

(d) Install one external $\frac{1}{8}$ -inch pipe plug in the housing.

3. DUPLEX OIL PUMP (See figure 69)

(a) Place pressure pump body on a bench resting on the "oil in" and "oil out" connection studs. Make certain that the air relief check ball, spring, and plug are properly installed on the drive gear.

(b) Place the pressure section driving and driven gear in the housing with their long shaft extending vertically and apply a thin layer of sealing compound on the body parting flange.

(c) Install the two oil seals in the pressure oil pump plate assembly and install the plate over the pressure gear shafts. Install the duplex scavenge to the pressure pump gasket.

(d) Place the high pressure oil relief valve guide and the check valve seat in the duplex scavenge oil pump plate assembly, and install the plate.

(e) Install the Woodruff key on the pressure pump driven gear shaft, and install the gear. Install the driven gear on the pressure pump driving gear shaft.

(f) Install the check valve plunger and spring in the scavenge section body. Apply a thin layer of gasoline and oil resistant grease, on the scavenge oil pump parting flange and install the scavenge section body. There are two centering dowels extending between the pressure and scavenge section. The assembly is held together as an independent unit by one 5/16-24

OVERHAUL INSTRUCTIONS — Continued

castle nut, installed adjacent to the pressure relief valve adjusting screw boss, and one flat-head machine screw installed with its head adjacent to the pump's external drive.

(g) Install the high pressure relief valve plunger, springs, adjusting screw, washer, lock nut, washer, and cap in the order named.

(h) Install the "oil in" and "oil out" connections and safety their retaining nuts together with twisted wire.

(i) When assembled, the pump should operate freely with the external square drive coupling turned by hand. Any binding probably would be caused by the pressure to scavenge gear shafts failing to line up in their bearings. Light tapping on the side of either body will assist in "setting" the position of the component parts in a more perfect alignment.

(j) The oil pump will be tested in actual oil pumping operation before installation on the engine. This may be accomplished by the use of a test stand. (See figure 70.)

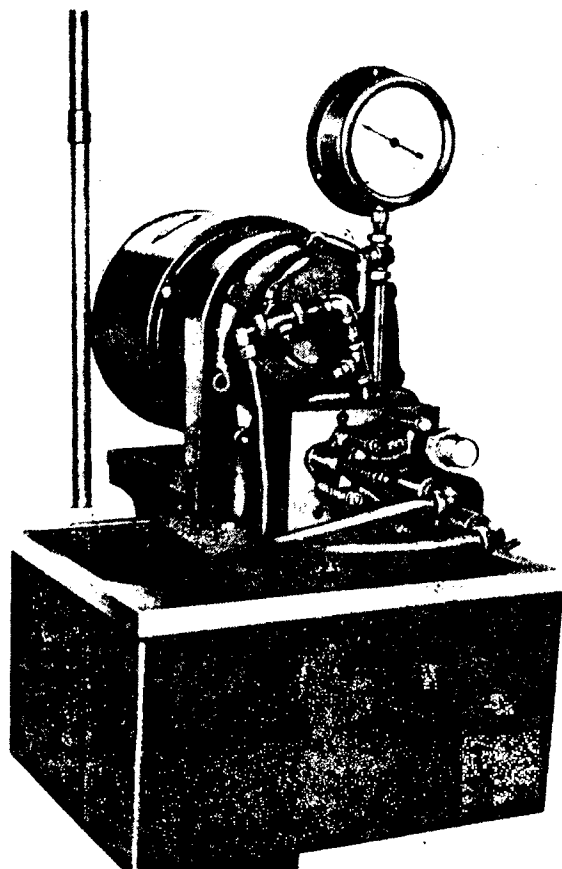


Figure 70 — Testing Duplex Oil Pump

4. ROCKER SCAVENGE OIL PUMP

Place the scavenge oil pump body on a bench resting on its cover flange. Install the drive gear and driven gear, and the pilot gasket in the pilot cover. This pump is held together, prior to assembly on the engine, by a single dowel and a press fit of the pilot cover. The oil pump should be bolted together temporarily through its mounting holes and tested for free turning, and actual oil pump operations on test stand. (See figure 70.)

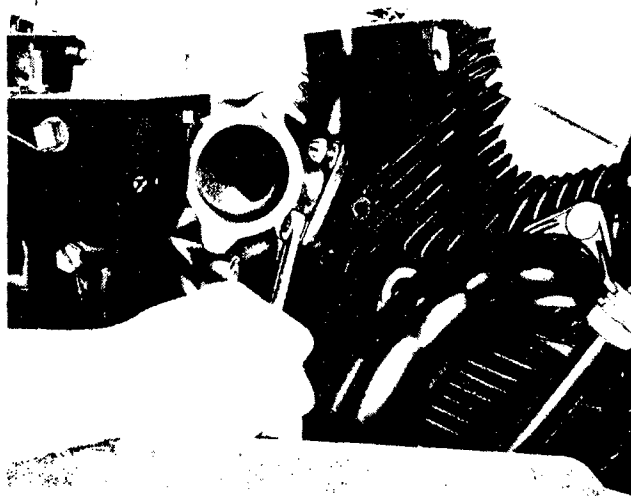


Figure 71 — Installing Exhaust Elbows

NOTE — An oil seal is provided on the pump used on the W670-6N, 16 and 17 engines which is pressed into the housing before assembly on the engine.

5. TACHOMETER DRIVE

Assemble the two driven gears with their long shafts located in their bearing bosses. Install the pinion gear and pilot cover. The assembly is secured with two No. 10-32 fillister-head machine screws extending through the housing to the outside of the housing.

6. CYLINDERS

(a) Cylinders are received with valves installed and tested.

(b) The rocker and bearing assembly is secured in the rocker box by a through-bolt locked by a castle nut and cotter pin. The rockers with ball bearings require a thrust washer on each

OVERHAUL INSTRUCTIONS — Continued

side. A thin film of gasoline and oil resistant grease will be used under the head of the through bolt and under the outer washer.

(1) The nut on the rocker through-bolt will be tightened to a torque not to exceed 275 inch-pounds, however, the rocker bearings must not bind. A minimum torque of 100 inch-pounds is permissible, providing the side motion of the rocker does not exceed .010 inch measured at the rocker roller pin.

(c) Install the intake pipe and flange with a gasket and three 5/16-24 plain nuts. These flange nuts should be sufficiently loose to permit the pipe to rotate in its flange to facilitate subsequent cylinder assembly on the crankcase. Install packing nut and packing on end of intake pipe.

(d) Install exhaust elbows, except on No. 5 cylinder. Secure with four plain steel washers, four brass castle nuts, and safety wire. No gasket is used between the exhaust elbow and the cylinder. (See figure 71.)

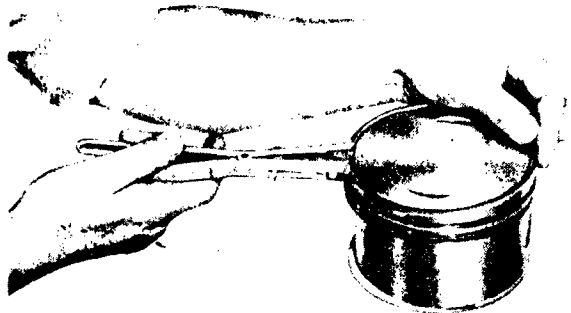


Figure 72 — Installing Piston Rings

7. PISTON RINGS (See figure 72)

(a) After the proper piston ring side clearance and gap have been determined for the cylinder in which they will be installed, the piston rings will be installed on the pistons with a suitable expander. It is necessary to exercise extreme care in this operation to prevent damage to the pistons.

(b) Piston rings, part No. 35294, which incorporate a small bevel on the inside upper cor-

ner, will be installed in the two top grooves with the beveled side up. The rings are marked "top" near the gap. The oil ring, part No. 35596, is installed in the third groove with beveled edge down. Piston ring, part No. 35594, is installed in the bottom groove.

8. ACCESSORY CASE

(a) If the intermediate cam drive gear pin had been damaged and removed during disassembly, install by pressing into position with an arbor press. It is retained in place with two 5/16-24 castle nuts safetied together with braided wire. Inspection will be made to determine that the end of the bearing pin did not pick up metal from the case when it was pressed in.

NOTE — The pin must be assembled with the oil hole up.

(b) Thoroughly clean all oil lines with compressed air and a suitable solvent, and install all oil plugs. All plug threads will be lubricated with thread compound, prior to assembly.

(c) Install the generator drive pinion from the rear of the accessory case toward the front. Install the generator drive gear on the end of the pinion gear where it projects through the front side of the case. The drive gear is retained to the pinion with a washer, nut, and cotter pin. Test the gear for free rotation and proper clearance in the bearing.

(d) Install the right and left oil pump drive gears from the front of the accessory case to the rear. These gears are retained in their

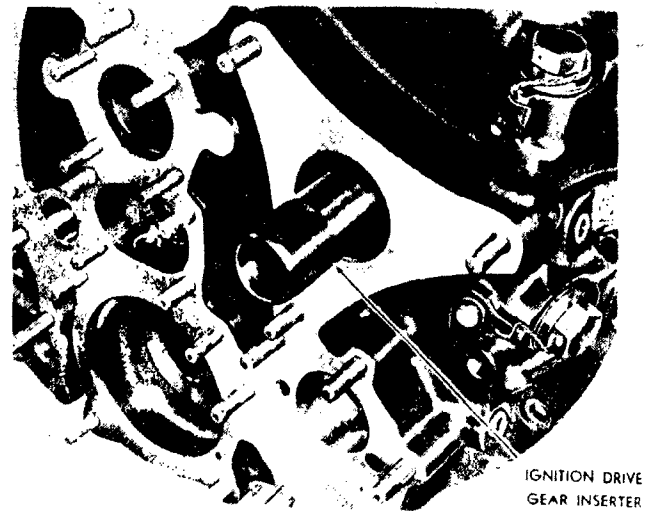


Figure 73 — Ignition Drive Gear Inserter

OVERHAUL INSTRUCTIONS — Continued

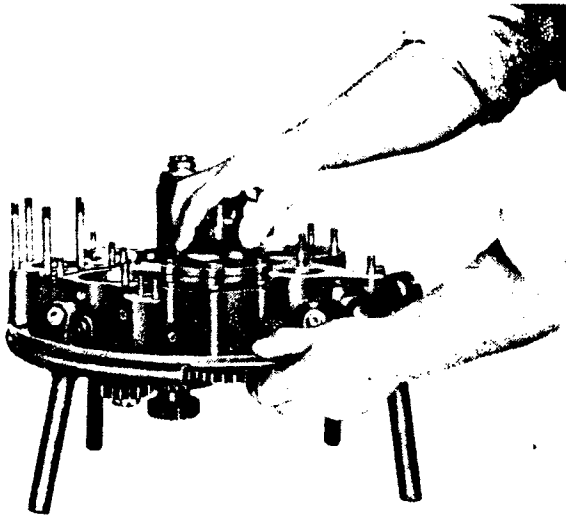


Figure 74 — Installing Rocker Scavenger Oil Pump

bearings by a circlip installed on the end of the gear shaft where it projects through to the rear side of the case. Test for free rotation and clearance of the gears in their bearings.

(e) Inspect the oil plugs on the inside bores of the right and left magneto drive gears, and ascertain that they are tightly in place. Insert the ignition drive gear inserter, tool No. 22360, through the seal from the outer side of the case using a twisting motion. From the inner side of the accessory case carefully insert an ignition drive gear and push it in place, catching the

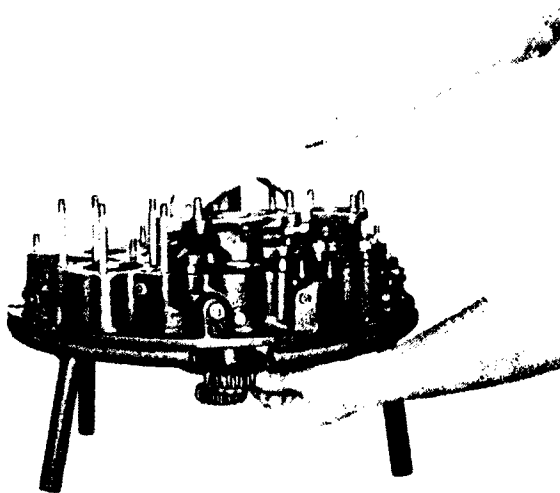


Figure 73 — Installing Generator Speed Step-Up Drive

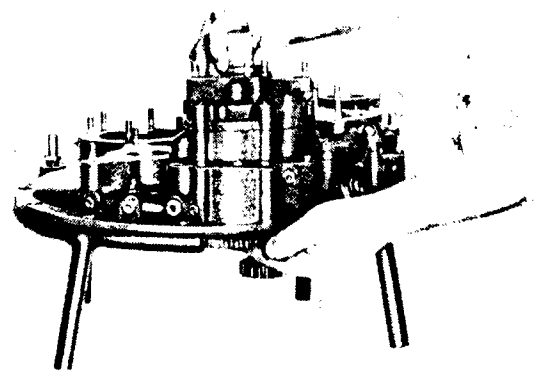


Figure 76 — Installing Duplex Pressure and Scavenger Oil Pump

inserter tool as it is freed from the oil seal. (See figure 73.) Secure the gear with a retaining circlip. Do not force the shaft through the seal in any manner that might bend the seal backwards or in any way damage it. Test for free rotation and clearance of the gear in its bearing, and its teeth clearance with the oil pump gears.

(f) Make sure that the rear crankshaft oil plug is tight in the rear crankshaft nut. Install the nut assembly in the crankshaft starter gear and secure it in the gear with a snap ring (part No. 22094). Install the gear in the accessory case from the front towards the rear and test for free rotation and clearance in the bearing. Test the gear teeth clearance with the two magneto drive gears.

NOTE — This gear is not retained in its proper operating position until it is assembled to the crankshaft.

(g) Install the intermediate cam drive gear on its pin bearing, and secure with a thrust washer, nut and cotter pin. This gear should have .0015 to .002 end play when installed, and should be tested for correct gear teeth clearance and rotation with the mating generator drive gears.

(h) If the gear backlash exceeds the limits given in section XV, an inspection will be made of the accessory case bushing gear shafts and

OVERHAUL INSTRUCTIONS — Continued

gear teeth to determine excessive wear or improper location of the bushing.

(i) Install the accessory case drain screw which locates under the generator speed step-up drive mounting pad. This screw safeties to one of the generator step-up drive attaching castle nuts, the safetying being completed when the drive is installed.

(j) Install the accessory case breather nipple.

(k) Install the rocker scavenge elbow pad cover with its retaining nuts and palnuts.

(l) Install the starter gear from the rear of the accessory case toward the front. Install the starter gear retainer assembly from the front to the rear and lock with a washer, screw and lock wire.

(m) Install the rocker scavenge oil pump on its mounting pad on the right side of the accessory case. (See figure 74.) The fuel pump drive coupling recesses in the right oil pump drive gear hub. Secure the pump with six flat washers and castle nuts. Install the fuel pump drive coupling and pump cover and secure with four flat washers, plain nuts, and palnuts on the W670-6A only. The W670-6N, 16 and 17 engines have a splined connection for driving the fuel pump; the cover is secured with washers, castle nuts and lock wire.

(n) Install the generator speed, step-up drive with its external driving gear meshing with the internal teeth of the generator drive pinion located in the accessory case. (See figure 75.) Attach the drive with four flat washers and castle nuts. Safety with braided wire and be sure to include the accessory case drain screw located just below the mounting pad. Install the generator speed step-up drive cover and retain with four flat washers, plain nuts and palnuts. If the generator speed, step-up drive is not installed, install the cover and secure with washers, nuts and palnuts.

(o) Install the high pressure oil screen housing with a gasket and its four retaining washers, plain nuts and palnuts. The scavenge oil screen is installed and safetied with twisted wire under one of the oil pressure screen housing retaining palnuts. Install the relief valve ball, spring and plug in the bore of the boss located adjacent to the high pressure oil screen assembly.

(p) Install the duplex pressure and scavenge oil pump, engaging its square external drive coupling in the center of the left accessory case

oil pump drive gear. (See figure 76.) The pump is retained by five plain washers and castle nuts. The duplex pressure-to-scavenge section retaining castle nut (located adjacent to the pressure relief valve box) is included in the safety wiring of the duplex pump retaining nuts.

9. MASTER AND ARTICULATING ROD ASSEMBLY

(a) Place the master rod on fixture No. A-500143, with half moon keyways facing up.

(b) Place a thick coat of castor oil on the knuckle pins ~~and chill them in an electric refrigerator or dry ice to -34°C . (-29.2°F .) or less.~~

(c) Place the articulating rod in position to receive the knuckle pin. Place Woodruff key in knuckle pins so that they line up with the keyway in the master rod cheek. Press the knuckle pin in place using a pilot, tool No. 20411 and inserter, tool No. 2853.

(d) Install the remaining rods and knuckle pins in the same manner.

(e) Check end clearances between the articulating rods and master rod cheeks in accordance with Table of Limits, section XV. Re-

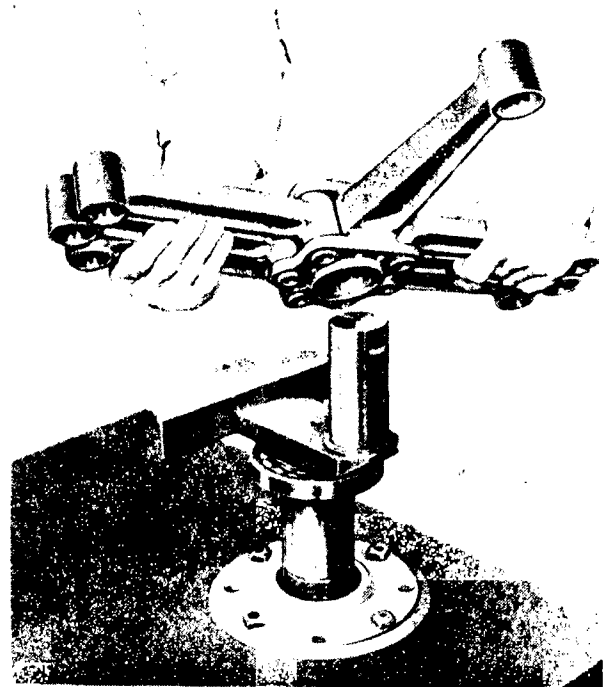


Figure 77 — Installing Master Rod Assembly on Crankshaft

OVERHAUL INSTRUCTIONS — Continued

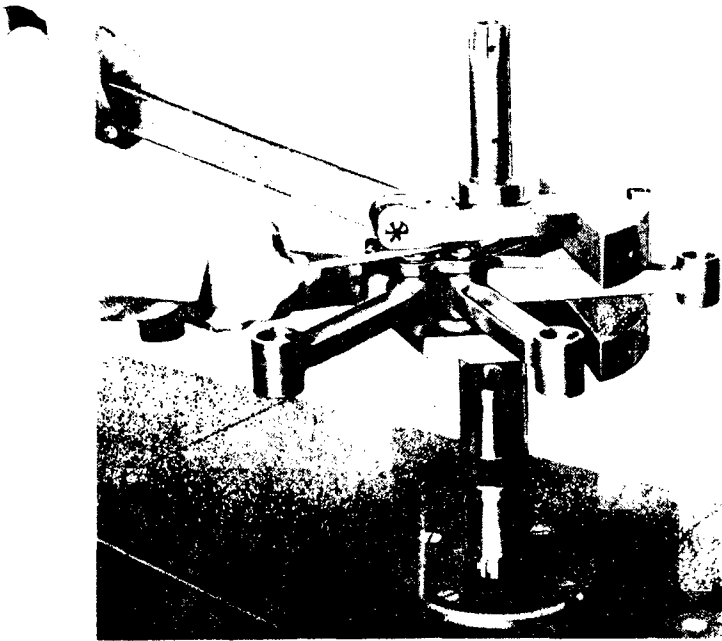


Figure 78 — Assembling Crankshaft

move from fixture and install knuckle pin circlips.

10. CRANKSHAFT AND MASTER ROD ASSEMBLY

(a) Secure the crankshaft front half in the support assembly, tool No. A4093. Oil the crankpin, pick up the master rod and articulating rod assembly, and with the Woodruff key side of the master rod down, slip the master rod assembly on the crankpin, chamfer side down. (See figure 77.)

(b) Remove all traces of oil from the protruding end of the crankpin with carbon tetrachloride. Spread the rear crankshaft cheek with the spreader plunger, tool No. 2344, and the plunger pin (part No. 20314); place the rear crankshaft section in position on the crankpin.

(c) Line up the slots in the front and rear counter weights and insert a crankshaft alignment bar. (See figure 78.)

NOTE — Use either alignment bar, tool No. 22992 or 22993. Alignment bar, tool No. 22992, has side thicknesses of .4995 inch and .4998 inch. Tool No. 22993 has side thicknesses of .5001 inch and .5005 inch. It is important to select the alignment bar that will fit into the crankshaft counterweight slots of any individual

crankshaft by a slight pressure of the hand. **DO NOT FORCE BAR WITH A HAMMER.**

(d) Place a .010-inch feeler gage on the side of the crankpin between the master rod bearing and the crankshaft rear cheek.

(e) When the proper clearance has been obtained, remove the clamp bolt and remove the spreader, plunger, and pin.

(f) Lubricate the washer and the threads of the cap screw with white lead base, anti-seize compound. With the washer under the head of the cap screw, insert the cap screw in the crankshaft cheek and tighten from .004 to .005 inch stretch with wrench, tool No. 3103, and a three-foot extension. Safety with cotter pin. Remove aligning bar and feeler gauges.

NOTE — The final master rod end clearance with normal thickness gage drag should be a minimum of .008 inch and a maximum of .015 inch.

(g) Place the front crankcase section, the rear ball bearing, the intermediate ball bearing, and the thrust bearing cage in an oven and heat to approximately 93.5° C. (200° F.). A container of oil heated to 93.5° C. (200° F.) is satisfactory to heat the bearings. Allow the thrust bearing to remain at room temperature.

(h) Install the crankshaft assembly in support, tool No. A-4093, with tail shaft up. Oil the rear ball bearing journal.

(i) Remove the rear main ball bearing from the oven and place it over the tail shaft with the loading slot towards the crankshaft cheek and install the bearing on its journal. Make sure that the bearing comes to rest in full contact with the crankcheek. Oil the bearing thoroughly with aircraft engine lubricating oil.

(j) Place the crankshaft assembly in support, tool No. A-4288, with propeller shaft up. Oil front crankshaft bearing journal and install the front main bearing spacer washer.

(k) Remove the front crankshaft bearing from the oven and install. Use the same procedure as employed with the rear main bearing.

(l) Install the crankshaft assembly on the blocks and test each main ball bearing for concentricity. Maximum allowable out-of-round is .001 inch.

(m) Install the crankshaft assembly on a suitable fixture with crankshaft ball bearings supporting the crankshaft assembly. Place dial

OVERHAUL INSTRUCTIONS — Continued

indicators in position and rotate the crankshaft to check crankshaft run-out. This run-out must not exceed .005 inch at the front propeller cone position or .002 inch at the oil feed bearing position on the rear end of the crankshaft.

NOTE — It is strongly recommended that the run-out in excess of .001 inch at the rear oil feed bearing location, or .002 inch at the front propeller cone position be corrected by loosening the crankshaft clamp bolt and shifting the crankshaft rear section slightly.

11. CRANKSHAFT AND CRANKCASE FRONT HALF ASSEMBLY

(a) Install the crankshaft in tool No. A4288, with propeller shaft up.

(b) Install bearing spacer on crankshaft.

(c) Remove thrust bearing cage from oven and place the cold thrust bearing in the cage with the loading slot down, and return to the oven.

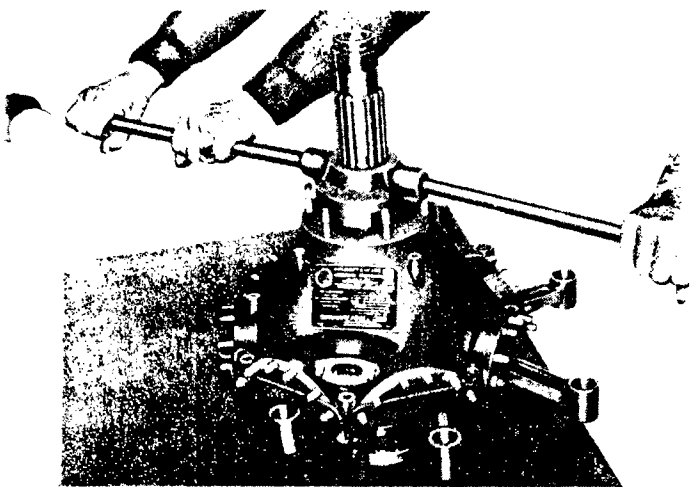


Figure 79 — Tightening Front Crankshaft Thrust Bearing Nut

(d) Remove the nose section from the oven and drop thrust bearing and cage in place in the crankcase front half. The flange of the cage should be snug against the face of the nose section. Place crankcase in position on the crankshaft.

NOTE — Make sure that the master rod is aligned in the No. 1 cylinder port and the articulating rods in their respective ports. Use tools Nos. A4230 and 3396 to press the nose section in place so that the thrust bearing contacts the crankshaft bearing spacer firmly.

(e) Place the oil slinger over the crankshaft with the convex side down. Install the thrust bearing nut with a coat of white lead base, anti-seize compound on the threads. Tighten the nut to specified limits shown in section XV holding the crankshaft with a spline wrench. (See figure 79.)

(f) Install the thrust bearing cover plate. Tighten the retaining nuts finger tight. The clearance (with the nuts to finger tightness) between the cover plate and the thrust bearing cage must be between .004 and .006 inch. Remove the cover plate after the clearance has been checked.

(g) Apply a thin coat of gasoline and oil resistant grease to the inner face of the front bearing cover plate. The sealing compound should not be closer than $\frac{1}{4}$ inch to the oil holes in the cover plate or the inside surface. Install the cover plate and secure with an aluminum spacer, a plain steel washer and a plain nut on each of the attaching studs. Tighten the nuts to 250 to 300 inch-pounds torque and install palnuts.

Section 13

FINAL ASSEMBLY AFTER OVERHAUL

1. GENERAL

(a) The procedure outlined in this section includes the instructions necessary for final assembly of the various unit sub-assemblies that comprise the completed engine.

(b) Special assembly instructions and precautions listed at the beginning of section XII are to be observed. It is particularly important that mechanics guard against small pieces of safety wire and cotter pins getting into the engine when trimming the ends with side cutters.

(c) It is assumed that all unit sub-assembly operations have been completed as outlined in section XII. Machined flanges, between which gaskets or rubber packing is not used, may be coated with gasoline and oil resistant grease prior to assembly. Use only a very thin coat.

(d) Refer to section XII, paragraph 1, (e), for instructions on the use of corrosion-preventive mixture.

NOTE — Care should be taken to select a 1/32-inch gasket for the carburetor. Do not use a 1/16-inch gasket.

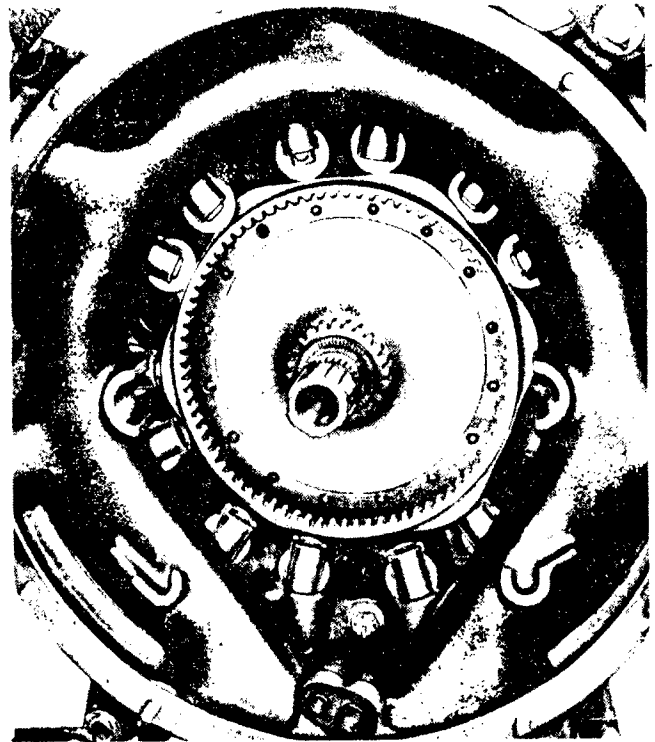


Figure 81 — Rear Bearing Spacer and Cam Ring Installed on Tail Shaft

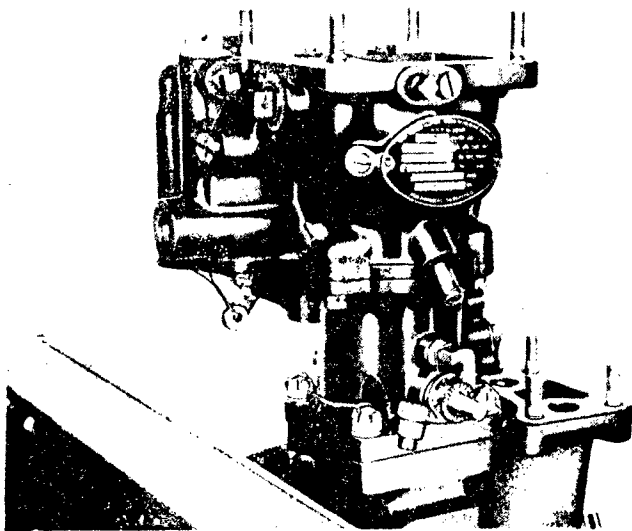


Figure 80 — Stromberg H8R60 Carburetor Installed

2. FINAL ASSEMBLY

a. Crankcase

(1) Attach the rear crankcase to the assembly stand and place in the horizontal position. Place a gasket on the studs at each tappet pad and install the 14 tappet guides over the studs.

(2) Place the carburetor in position on the rear crankcase with the float chamber facing No. 1 cylinder port. (See figure 80.)

Secure with four plain washers, castle nuts and safety wire. Safety the front two nuts together and the two rear nuts and include the 7/8-inch brass plugs in the crankcase.

(3) Place crankshaft and front case assembly in position on the rear crankcase half; install the crankcase bolts.

CAUTION — Care will be taken when installing the crankshaft assembly to prevent damage to the rear bearing liner.

(4) There are six short and one long crankcase bolts. One long bolt is installed in the bottom position on the crankcase with a plain washer under the head of the bolt and a plain washer under the castle nut. The nut is safetied with a 3/32-inch cotter pin inside the rear case. The two upper bolts between cylinders No. 1 and 7, and 1 and 2 are installed with plain washers under the head and the lifting eyes under the castle nut. All others have washers

OVERHAUL INSTRUCTIONS — Continued

on each end. The bolts will be tightened to 350 to 400 inch-pounds torque. All bolts are pinned with a 3/32-inch cotter pin. Install master rod and articulating rod protector straps.

(5) Rotate the engine to the vertical position. Dip the roller end of the tappets in oil and slide each tappet into its guide. Put the tappet rollers and roller pins in place by sliding each tappet in to receive its roller and pin, and then pushing it out far enough so its roller pin will not fall out. Install circlips immediately to prevent loss of tappet rollers.

(6) Install the rear bearing spacer on the tailshaft and place the cam ring in position, pushing the cam followers out of the way. (See figure 81.)

(7) Lubricate the tailshaft, cam hub and cam drive gear thoroughly. Place the cam drive gear in position on the tailshaft.

(8) Install a spare starter gear on the tailshaft. Make sure the serrations are properly meshed and tighten the nut to the specified torque (~~360~~ to ~~400~~ inch-pounds). Check the clearances between the cam hub and the cam drive gear (.010 inch is desired), minimum is .008, maximum .012 of an inch. If excessive clearance is present, replace the cam ring. If insufficient clearance exists, face off the cam hub to obtain desired clearance. After a satisfactory check, remove the starter gear.

b. Accessory Case

(1) Place the gasket on the rear crankcase half so that the low pressure oil hole in the gasket is in line with the low pressure oil hole in the accessory case. Place scavenge oil line gasket in position on the rear crankcase.

(2) Lubricate cam track, cam gear, cam drive gear, cam followers, tailshaft and the threads inside the tailshaft.

(3) With the crankshaft starter gear pushed back against the accessory case, place the accessory case in position over the tailshaft. (See figure 82.)

(4) Turn the case slightly to the right of its proper position and press lightly toward the main case until the accessory case is against the attaching studs.

(5) Turn the case to left until the case lines up on the studs.

(6) If the studs lack about 1/8 inch of being flush with the outside of the case, the cam has not engaged the cam gear.

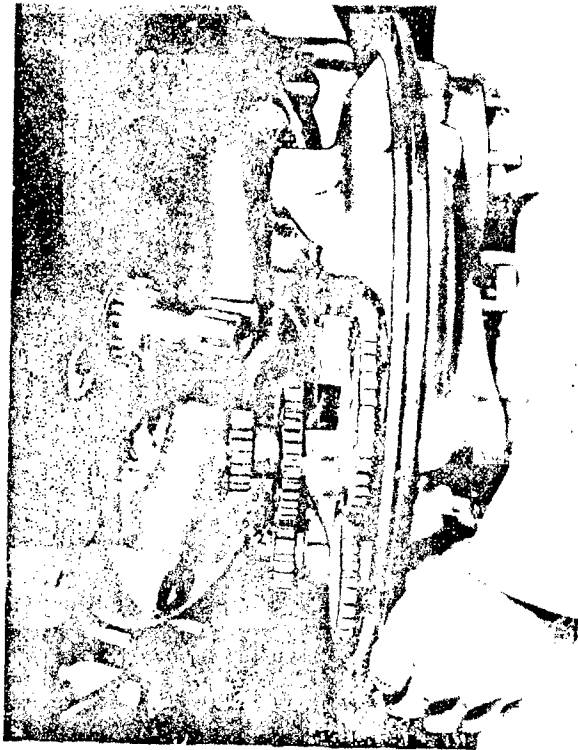


Figure 82 — Installing Accessory Case

(a) Exert light pressure on the case evenly in two positions.

(b) With the tool inserted in the generator step-up drive, rotate the gears back and forth until the studs appear flush with the accessory case holes.

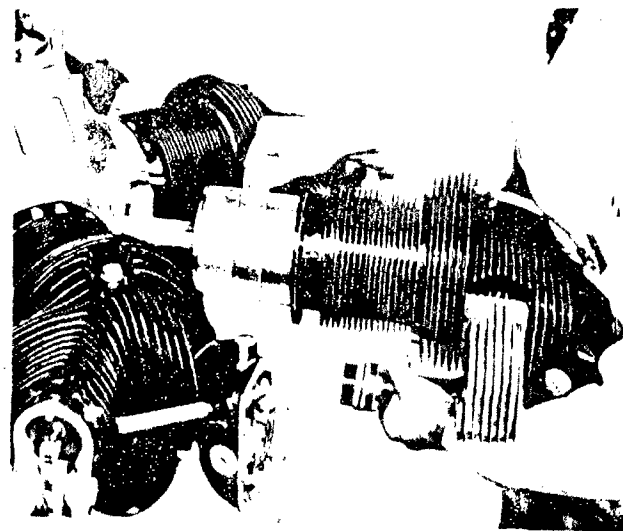


Figure 83 — Installing Cylinder

OVERHAUL INSTRUCTIONS — Continued

(7) Enter the tailshaft spline into the crankshaft starter gear shaft by exerting pressure on the accessory case with the left hand at the rear of No. 7 cylinder port and the knee against the generator speed step-up drive. Rotate or rock the crankshaft backward and forward. When the gear teeth and the serrations are lined up, the accessory case will slide in until the rear crankshaft nut meets the end of the tailshaft.

CAUTION — Do not force the accessory case into position on the crankcase nor tighten the rear crankshaft nut without properly meshing the valve timing serrations.

(8) Turn the crankshaft starter gear nut; observe the cam gear serrations for proper alignment; and ascertain that the magneto gears are not jammed behind the crankshaft starter gear.

(9) Temporarily secure the accessory case to the main case with four plain washers and plain nuts.

NOTE — Do not safety the crankshaft starter gear nut until the cam has been timed. It has been found that the accessory case, magnetos, pumps and accessories sometimes loosen up on the test block and leak oil. Therefore, no safety wiring will be done on these parts until after the test run.

3. CYLINDERS

a. Install Pistons

(1) Place engine in the horizontal position and rotate the crankshaft so that the master rod is in the top center position. Thoroughly lubricate piston pin and master rod bushing and install the piston with the number on the piston pin boss toward the propeller end of the engine. Place piston pin oil plugs in the piston pin. These plugs are hand pressed into position. Space the piston ring gaps an equal distance from each other and apply oil generously to the piston, piston rings and cylinder walls. Remove the master rod protector strap from the case. Install the rubber seal under the cylinder flange around the skirt.

b. Install Cylinder (See figure 83)

(1) With a suitable ring compressor, compress the piston rings and install the No. 1 cylinder, guiding the intake pipe into its port as the cylinder is installed. Turn the intake pipe gland nut well into its threads. Do not attempt to force the gland nut into place. Move the top

of the cylinder slightly until the threads line up and the nut turns freely with the fingers.

(2) Tighten the hold-down nuts to a snug position to insure that the cylinder is seated on the crankcase section. Then, loosen one nut at a time and retighten until contact is just made with the cylinder flange. From this position, tighten each nut to the specified torque shown in section XV. All nuts will be tightened slowly and smoothly until the proper torque limit is reached. Once the nut has started turning, there must be no stopping until the proper torque has been applied. Jerking of the torque wrench should be avoided. Care will be taken at all times to insure that the socket of the wrench does not contact the cylinder wall during the tightening procedure, as such contact will cause an erroneous torque reading.

(3) Remaining cylinders may be installed in like manner in the direction of engine rotation. After all cylinders are installed, tighten the intake pipe packing nuts to secure an air-tight joint. Tighten intake pipe flange nuts 160 to 200 inch-pounds torque and install palnuts.

(4) Install the oil sump with gaskets in place

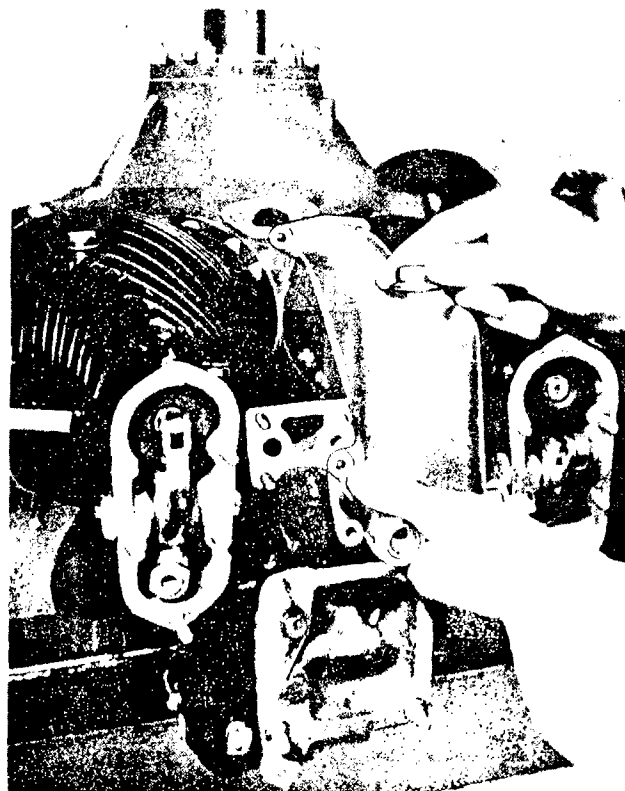


Figure 84 — Installing Oil Sump

OVERHAUL INSTRUCTIONS — Continued

and secure to the front crankcase half with two 5/16-inch castle nuts, washers and palnuts. (See figure 84.)

(5) Install No. 5 cylinder exhaust elbow. Secure with four brass castle nuts, plain washers and safety wire.

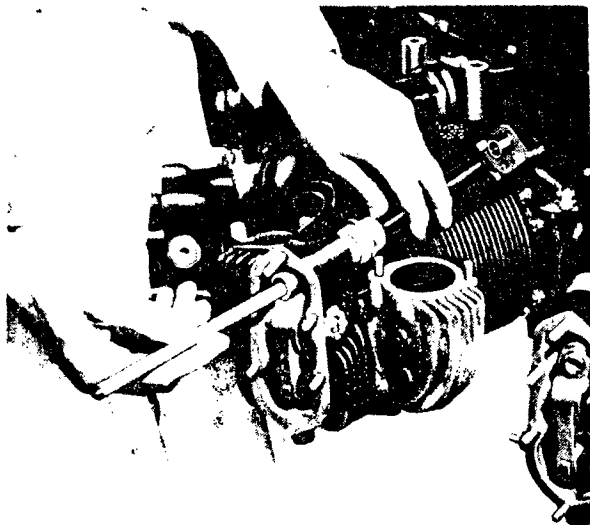


Figure 85 — Installing Push Rod and Push Rod Housing

1. PUSH ROD HOUSINGS (See Figure 85)

a. Place push rod housing packing nut, packing, retainer and lead gasket on push rod housing. *NOTE: INTAKE + EXHAUST DIFFER,*

(1) Install gasket between push rod housing flange and case. *INTAKE IS STRAIGHT*

(2) Start the retainer nut into the rocker box three or four turns by hand and then secure flange with two plain nuts, washers and palnuts.

(3) Tighten the retainer in rocker box to 275 to 300 inch-pounds torque.

(4) Tighten the packing flange nut to obtain an oil-tight seal.

b. Install the push rod by inserting it through the hole for the valve adjusting screw.

c. Install the valve adjusting screw and lock nut

5. VALVE TIMING (See Figure 86)

a. Rotate assembly stand until engine is in vertical position. Install timing disc and pointer, tool No. A3363. Install top center indicator, tool No. A-3247, in the spark plug port of No. 1 cylinder.

b. Cam timing may be accomplished in the following manner:

(1) Set timing pointer on cylinder No. 1 top center, in accordance with the following:

(a) Remove the two upper nuts from the thrust bearing cover and install a timing disc point, tool No. 3491, and replace the nuts on the studs.

(b) Observing the indicator point, rock crankshaft back and forth so that the piston moves in the vicinity of its top center position.

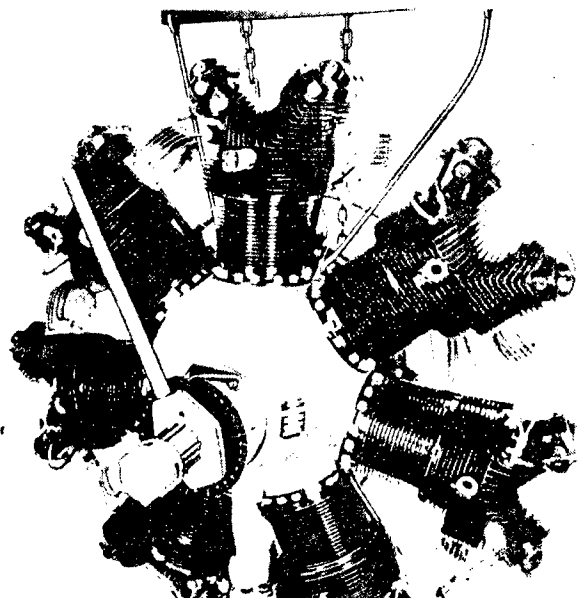


Figure 86 — Timing Tools Installed Prior to Timing Engine

Stop the crankshaft at the position where the indicator pointer is at the lowest point of its sweep.

(c) Loosen the screws of the timing disc assembly so that the disc can be moved within its elongated screw holes. Move the disc so that its zero mark is directly in line with the mark on the pointer.

NOTE — When setting the crankshaft during any timing operation, always turn the crankshaft opposite to the direction of rotation beyond the desired point of setting, and then turn it gradually in the direction of rotation to the point of setting.

(d) Turn the crankshaft opposite the direction of rotation to approximately 40 degrees before top center. Gradually, by lightly tapping the timing disc bar handle, move the crankshaft in the direction of rotation until the indi-

OVERHAUL INSTRUCTIONS — Continued

cator pointer exactly lines up with the uppermost graduation of the indicator scale.

(e) Note this "B. T. C." (before top center) reading on the timing disc. Continuing in the direction of rotation turn the crankshaft until the indicator pointer exactly lines up with the same graduation of the indicator scale, each movement of the crankshaft being extremely minute as the desired setting is approached.

(f) Note this "A.T.C." (after top center) reading on the timing disc. Any variations in the two readings must be corrected for by moving the disc so that either the smaller reading is increased by one-half the amount of difference between the two readings, or the larger reading is decreased by the same amount.

EXAMPLE — If one reading is 19 and the other is 23, the difference is 4. Adding 2 ($\frac{1}{2}$ of 4) to the smaller reading, the result is 21; or subtracting 2 from the larger reading (23), the result is also 21. Then the disc must be moved until the reading is 21.

(g) When the disc is set so that the two readings are the same, turn the crankshaft so that the indicator point is exactly on the zero mark ("O") of the timing disc. This will put the piston on exact top center.

(h) Without moving the timing disc, tighten the two screws that hold it.

(2) Close valve timing serrations at random by tightening the rear crankshaft nut.

CAUTION — Whenever closing the valve timing serrations, be sure that mating serration teeth engage in full mesh.

(3) Turn the crankshaft until the No. 1 cylinder intake and exhaust valve tappets are definitely between cam lobes. Then set clearances to .124 inch, using thickness gauge, tool No. 2889.

(4) To set the cam ring, turn the crankshaft in direction of rotation until cylinder No. 1 exhaust valve opens and then closes. Stop rotation when the rocker roller just releases its pressure on the valve stem.

(5) Loosen the rear crankshaft nut sufficiently to completely disengage the valve timing serrations.

CAUTION — Hold crankshaft steady with the timing disc handle when loosening or tightening the rear crankshaft nut.

(6) Turn the crankshaft, bring No. 1 cylinder up on top center as indicated on the timing disc.

(7) Tighten timing serrations.

(8) Slowly turn the crankshaft clockwise while testing the exhaust rocker roller for free rotation.

(9) Continue turning the crankshaft by tapping the timing disc handle until this roller "freezes" due to its pressure against the valve stem. At this point rotation of the crankshaft should be stopped and the number of degrees before bottom center noted from the timing disc pointer.

(10) The exhaust valve should open (when the rocker arm roller "freezes" the valve has just started to open) at 49 degrees B.B.C. (before bottom center). The difference between what it actually opens at and 49 degrees, divided by six, will give the number of serrations the crankshaft should be moved without permitting the cam ring to move.

(a) This can be accomplished by loosening the rear crankshaft nut, which will disengage the valve timing serrations.

(b) Each serration on the rear crankshaft gear is 6 degrees of valve timing. Therefore, the valves may be set within their permissible variation of 3 degrees.

(c) It is more desirable to set the valves a little late than early.

(11) After the cam ring has been timed to open the exhaust valve correctly, continue turning the crankshaft clockwise to a little before top center (about 200 degrees after the correct exhaust valve opening position).

(a) Continue turning the crankshaft clockwise while testing the free rotation of No. 1 cylinder exhaust rocker arm roller. This roller should loosen and rotate when the timing disc pointer is at top center. Some small variation may exist due to grinding tolerances on the cam ring lobe.

(b) Continue turning the crankshaft in a clockwise direction by tapping the timing disc handle.

(c) The intake rocker roller should "freeze up" (the valve starts opening at this point) at 4 degrees after top center. Continue rotating the crankshaft in a clockwise direction until the intake rocker roller again rotates (valve closes)

OVERHAUL INSTRUCTIONS — Continued

which should occur at 21 degrees after bottom center.

(12) Turn the crankshaft further to 49 degrees before bottom center (two full turns after the opening of the exhaust valve originally was set).

(a) This second opening of the exhaust valve and subsequent timing check will be actuated by the second lobe on the cam ring.

(b) Check the exhaust valve opening and closing; the intake valve opening and closing, as described in paragraph 11, this section.

(13) Turn the crankshaft again two turns. Recheck all timing again, continuing crankshaft rotation in a clockwise direction. This time the valves will be actuated by the third lobe on the cam ring.

(14) When the exhaust valve has been set to open correctly, the cam ring will be considered serviceable if all other timing valves (exhaust closing, intake opening and closing) are within 6 degrees of specification. If the opening of the exhaust valve is set correctly and any other valve timing is incorrect more than 6 degrees beyond specification, the cam ring will be replaced with a new or serviceable one.

c. After the valves have been properly timed, tighten the rear crankshaft nut. Safety with its special washer and install the washer and the washer retaining circlip.

CAUTION — The retaining circlip will be installed so as to encompass at least five corners of the rear crankshaft nut.

d. Adjust valve clearance to .010 inch on each cylinder on firing dead center.

e. Turn crankshaft two turns and check or adjust each valve again. (See figure 87.)

f. Turn crankshaft again two turns and check and adjust valves the third time. Three checks are necessary because of the tolerances of the cam between each of the three cam lobes.

g. Valve clearances will not be set at less than .010 inch between any cam lobe.

h. After completing the valve check, install the tachometer drive assembly with coupling and gasket. Secure with four washers, four nuts and four palnuts.

i. Install all 13 washers, nuts and palnuts to secure the accessory case. Torque nuts to 200 inch-pounds.

6. INSTALLATION AND TIMING OF THE IGNITION SYSTEM (W670-6A)

a. Right Magneto (Scintilla Model VMN-7DF)

(1) Take up backlash in gear train by turning the crankshaft opposite the direction of rotation to about 45 degrees before top center.

(2) Turn in the direction of rotation so that No. 1 cylinder will be exactly at 32 degrees before top center on the compression stroke.

(3) Rotate the magneto drive shaft until the



Figure 87 — Adjusting Valves

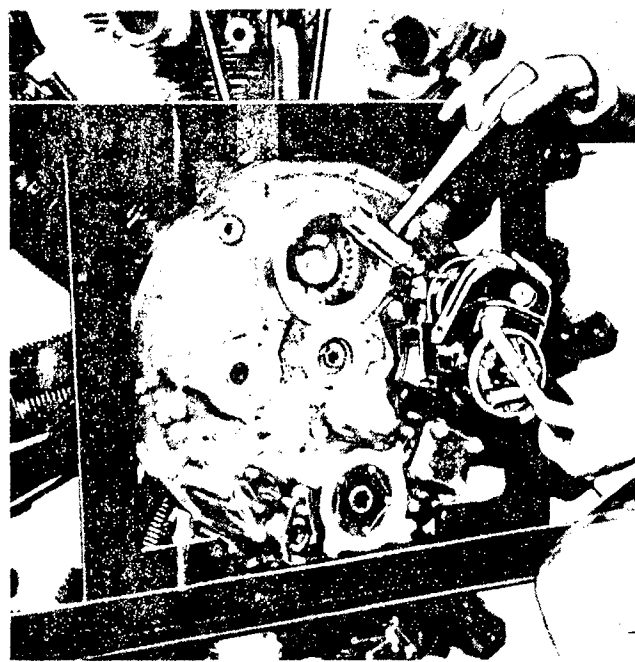


Figure 88 — Installing and Timing Magnetos

OVERHAUL INSTRUCTIONS — Continued

engraved marks on the teeth of the large distributor gear are lined up with corresponding marks on the inside of the front plate.

(4) Place a gasket on the right hand mounting pad of the accessory case and mount the magneto on the studs of the accessory case, meshing the coupling into the serrations of the magneto drive gear. (See figure 88.)

(5) Rotate the magneto within the range of the studs on the magneto flange to determine whether the breaker points are opening. If this is not determined, the magneto must be re-mounted with the coupling meshing with the magneto drive gear one spline to the right or left of its old position.

(6) Rotate the magneto to its extreme counter-clockwise position. Secure with three plain washers and castle nuts. Tighten lightly so the magneto may be moved.

(7) If timing light is not available, insert a .0015-inch feeler gauge between the breaker points. Hold the feeler gauge between the thumb and forefinger and exert a slight pull.

(8) Carefully rotate the magneto clockwise by tapping with a fiber hammer. The moment the feeler gauge can be pulled from between the breaker points with a slight drag, stop rotating the magneto.

NOTE — Use timing light (Bendix-Scintilla No. 11-851 or equivalent) whenever available to determine the opening of the contacts. Insofar as possible, avoid the use of feeler strips between the contact points.

(9) Turn the engine in its direction of rotation two complete revolutions until the timing disc shows that the piston in No. 1 cylinder is approaching a position 32 degrees before top center. Continue turning a little at a time until the magneto breaker points offer a slight resistance to the withdrawal of the feeler gauge, or if timing light is used, the light begins to flicker.

(10) Note the position indicated by the timing disc. If it shows No. 1 piston is 32 degrees before top center, the magneto is timed correctly.

(11) As soon as the magneto is timed correctly, tighten the flange nuts and safety with wire.

b. Left Magneto

The left magneto may be timed in the same manner as the right magneto except the breaker

points are set to open at 29 degrees before top center.

7. INSTALLATION AND TIMING OF THE IGNITION SYSTEM (W670-6N, 16 and 17, and R670-11A)

a. Right Magneto (Scintilla Model SF7RN-1)

(1) Take backlash in gear train by turning the crankshaft opposite the direction of rotation to about 45 degrees before top center. Turn in direction of rotation so No. 1 cylinder will be exactly at 32 degrees before top center on the compression stroke.

(2) Remove the main cover, breaker cover, and distributor block. Turn the magneto drive shaft until the timing mark "A" on the distributor finger is approximately opposite the timing mark "B" on the inside of the front end plate when a straight edge "K" placed on the step cut in the cam coincides with the timing marks "M" at the breaker end of the magneto housing.

(3) At this position, the high tension electrode "D" on the distributor finger will be opposite the distributor block electrode "E" for firing the No. 1 cylinder. Install the magneto to the engine in the foregoing relation, but do not tighten the nuts to the extent that further adjustment cannot be made.

(4) When the exact timing is to be made, all adjustments must be made at the drive end and not by altering the adjustment of the contact points.

(5) Make adjustments by turning magneto through the angle provided by the slots in the mounting flange so that the contact points just begin to open when a straight edge "K" placed on the step of the cam coincides with the timing marks "M" at the breaker end of the housing.

(6) It may be found that timing mark "A" on the distributor finger is not exactly opposite the timing mark "B" on the inside of the front end plate after making the final adjustment by the straight edge "K" coinciding with the timing marks "M." However, a slight variance of the distributor finger timing mark "A" will not affect the operation of the magneto as this is merely used to locate the approximate firing position of the magneto for the No. 1 cylinder.

(7) Complete the timing and checking of the magneto in accordance with paragraphs 6. a. (9), (10), (11), and 6. b., this section.

OVERHAUL INSTRUCTIONS – Continued

b. Magneto Breaker Assembly Control Rod

Install the magneto breaker assembly control rod between the right and left magneto.

CAUTION — Adjust the length of the control rod so that the coupling clevis pins will insert when both breaker assembly control arms are in full advance position.

8. OIL SUMP

Install the oil sump, 5/8-inch hose nipple and gasket.

9. ROCKER SCAVENGE OIL LINES

Install the external inter-cylinder rocker scavenge oil lines. (See figure 89.)

10. IGNITION ASSEMBLY

Install the complete ignition assembly and the primer manifold assembly. (See figure 90.)

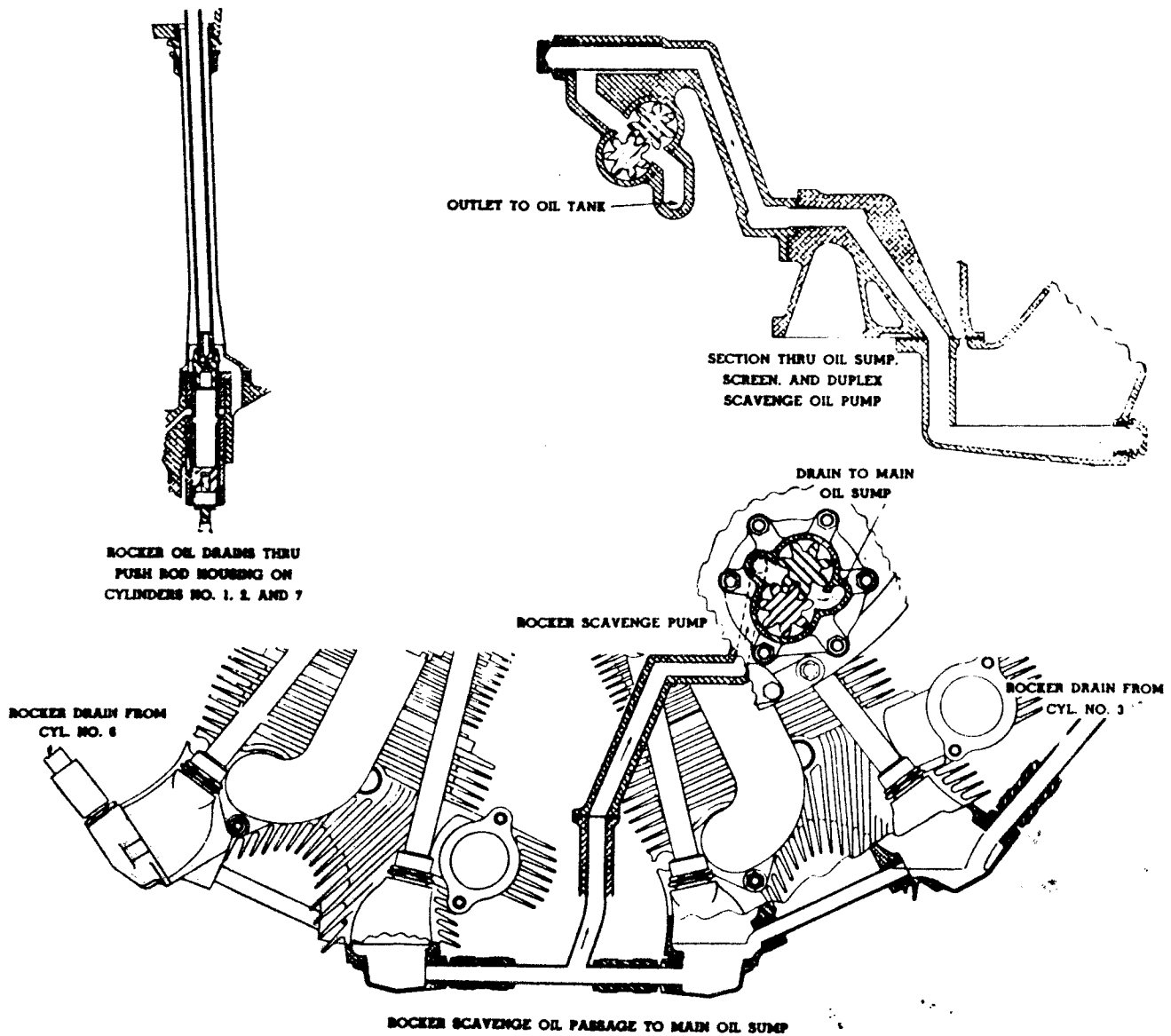


Figure 89 – Scavenge Oil System Diagram

OVERHAUL INSTRUCTIONS — Continued

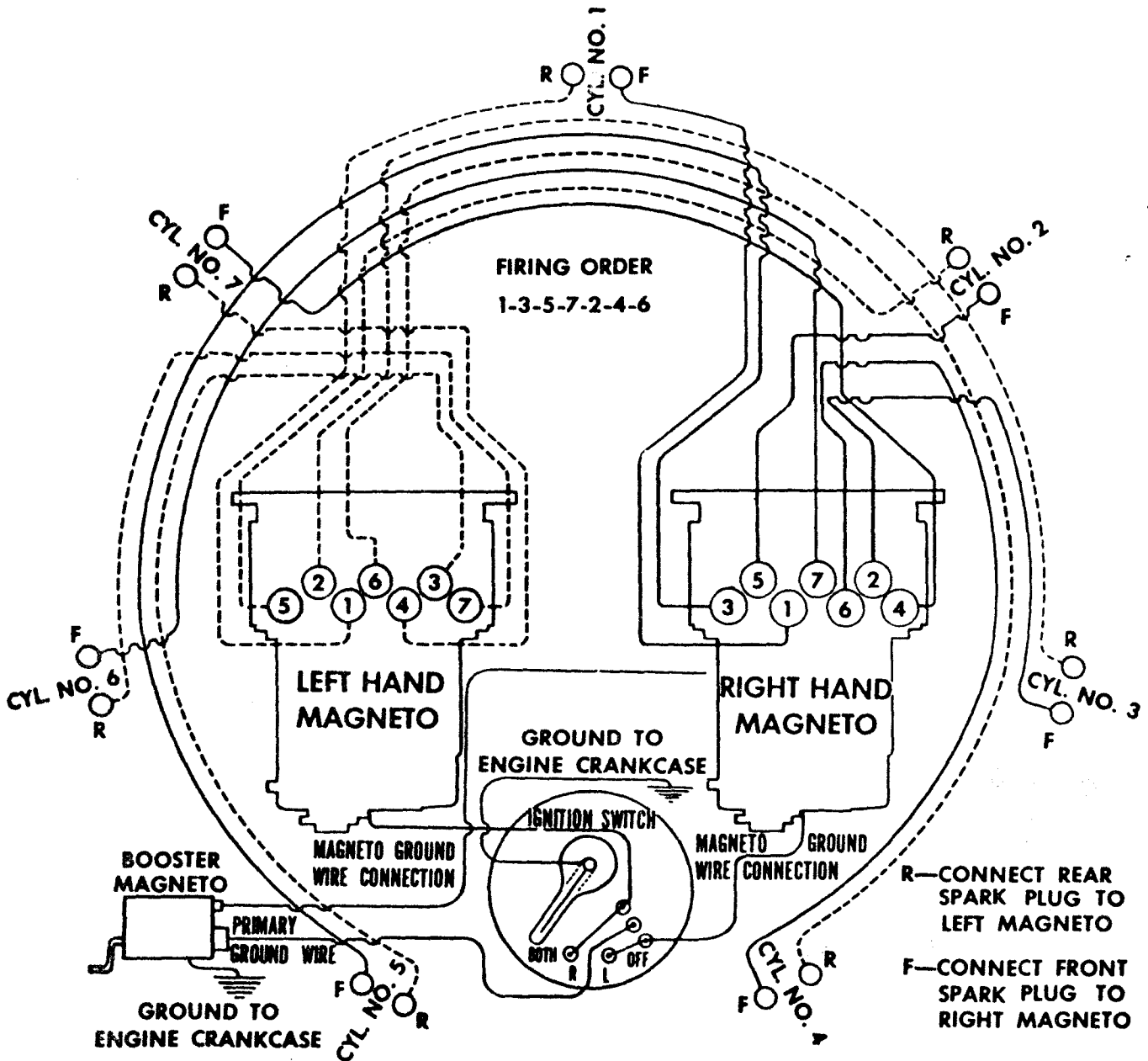


Figure 90—Ignition Wiring Diagram

Section 14

TEST AND RUN-IN SCHEDULE AND PREPARATION FOR STORAGE

1. RUN IN

(a) The Continental W670 engine should be run-in directly following its overhaul. The run-in period should in no case be less than of five hours duration, and the operating limits con-

tained in the Operating and Maintenance Instructions Manual must govern.

(b) The following chart shows a typical factory run-in test period.

OVERHAUL INSTRUCTIONS — Continued

| Time | R.P.M. | Minimum Oil Inlet Temperature | | Absolute Manifold Press (" of HG.) | Duration (Min.) |
|------|--------|-------------------------------|-----|------------------------------------|-----------------|
| | | °C. | °F. | | |
| 0:00 | 700 | 60 | 140 | Warm Up | 15 |
| :15 | 800 | 60 | 140 | 15.3 | 15 |
| :30 | 900 | 60 | 140 | 15.5 | 15 |
| :45 | 1000 | 60 | 140 | 15.8 | 15 |
| 1:00 | 1100 | 60 | 140 | 16.2 | 15 |
| 1:15 | 1200 | 60 | 140 | 16.7 | 15 |
| 1:30 | 1300 | 60 | 140 | 17.2 | 15 |
| 1:45 | 1400 | 60 | 140 | 17.9 | 15 |
| 2:00 | 1500 | 60 | 140 | 18.8 | 15 |
| 2:15 | 1600 | 60 | 140 | 19.7 | 15 |
| 2:30 | 1700 | 60 | 140 | 21.0 | 15 |
| 2:45 | 1800 | 60 | 140 | 22.5 | 15 |
| 3:00 | 1900 | 60 | 140 | 24.3 | 15 |
| 3:15 | 2000 | 60 | 140 | 26.1 | 15 |
| 3:30 | 2075 | 60 | 140 | 27.6 | 90 |
| 5:00 | | | | | |

(Test propeller must be calibrated to absorb the full horsepower of the engine at its full rated r.p.m., at standard atmospheric temperature of 10° C. (60° F.), and at sea level pressure of 29.9 inches of mercury.)

(c) After the run-in period is completed, the crankshaft thrust bearing nut should be checked

to be certain that it is drawn up to specified torque limits.

2. PREPARATION FOR STORAGE

(a) If for any reason the engine is to be stored for a week or longer before use, the following precautionary measures must be observed.

(b) Drain all gasoline from the tank, or tanks, lines and carburetor. Using the necessary amount of a good grade of clear unleaded fuel, run the engine for fifteen minutes at 800 to 900 r.p.m.

(c) Spray interior of cylinders, all valves, etc., with any good corrosion preventive compound which will neutralize acids formed by the combustion of ethylized fuels.

(d) Apply a thin coating of melted petrolatum by brush or spray to all external unpainted steel and aluminum parts, including the magnetos and carburetor.

(e) Preparation of the engine for service that has been stored will necessitate the removal of the corrosion preventive compound and the petrolatum.

Section 15

TABLE OF LIMITS
CONTINENTAL MODEL W670 ENGINE

1. GENERAL

The Table of Limits included herein is for use in conjunction with Charts 1 and 2, Limits and Lubrication Charts for Continental W-670 and R-670 Engines, May 1940 Edition.

The Limits listed herein are for use by service facilities only and must not be used for engineering purposes. Any values beyond the minimum and maximum limits listed require replacement.

1. Dimension Limits

| Ref. No. (Fig. 91) | Chart No. | Description of Limits | Min. | Max. |
|-----------------------|-----------|---|---------------------|--------|
| 1 | 1 | Piston | | |
| | | Piston in cylinder (top land)..... | .034L | .037L |
| | | Piston in cylinder (second and third lands)..... | .031L | .034L |
| | | Piston in cylinder (skirt)..... | .023L | .030L |
| 2 | 1 | Piston ring | | |
| | | Piston ring in groove (first compression)..... | .006L | .009L |
| | | Piston ring in groove (second compression)..... | .004L | .007L |
| | | Third and fourth rings in groove..... | .002L | .006L |
| | | Installed gap clearance..... | .025L | .035L |
| | | Free gap clearance..... | $\frac{1}{16}$ inch | |
| 3 | 1 | Plug in piston pin..... | Size | .003L |
| 4 | 1 | Piston pin | | |
| | | Piston pin and plugs in cylinder (end clearance)..... | .0315L | .0925L |
| | | Piston pin in piston (diameter)..... | .0002L | .0007L |
| | | Piston pin in rod (diameter)..... | .0018L | .0022L |
| 5 | 1 | Piston pin bushing in rod (diameter)..... | .0028T | .0048T |
| 6 | 1 | Crankpin to rear crankshaft (diameter)..... | .0006T | .0014T |
| | | Crankpin clamp bolt..... | .013L | .020L |
| 7 | 1 | Rear crankshaft main ball bearing | | |
| | | Crankshaft in rear main bearing..... | .0003L | .0008T |
| | | Main bearing in crankcase liner..... | .0003L | .0016L |
| | | Main bearing liner in crankcase (diameter)..... | .005T | .007T |
| 8 | 1 | Master rod bushing in rod (diameter)..... | .001T | .002T |
| 9 | 1 | Master rod | | |
| | | Master rod to crankpin (diameter)..... | .0023L | .0037L |
| | | Master rod to crankpin (end play)..... | .010L | .015L |
| 10 | 1 | Knuckle pin bushing in rod (diameter)..... | .0018T | .0038T |
| 11 | 1 | Oil plug in knuckle pin (diameter)..... | Size | .0015T |
| 12 | 1 | Knuckle pin | | |
| | | Knuckle pin in articulating rod (diameter)..... | .0015L | .0025L |
| | | Knuckle pin in master rod (diameter)..... | .0004T | .001T |
| | | Articulating rod in master rod (end clearance)..... | .0105L | .0145L |

CONTINENTAL W 670 AIRCRAFT ENGINES

TABLE OF LIMITS — Continued

| Ref. No. (Fig. 91) | Chart No. | Description of Limits | Min. | Max. |
|-----------------------|-----------|--|--------|--------|
| 13 | 1 | Front crankshaft main ball bearing | | |
| | | Main bearing in crankcase liner..... | .0003L | .002L |
| | | Main bearing liner in crankcase (diameter)..... | .005T | .007T |
| | | Crankshaft in front main bearing..... | .0002L | .0009T |
| 14 | 1 | Thrust bearing, ball | | |
| | | Thrust bearing on crankshaft..... | Size | .0011T |
| | | Thrust bearing in cage..... | Size | .0014L |
| | | Thrust bearing outer race between cage and cover..... | .004T | .006T |
| 15 | 1 | Thrust bearing cage in crankcase (diameter)..... | .001L | .001T |
| 16 | 1 | Thrust bearing cover in thrust bearing cage (Pilot diameter).... | .0019L | .0044L |
| 17 | 1 | Thrust bearing nut | | |
| | | Thrust nut in cover (diameter)..... | .0265L | .0385L |
| | | Thread pitch diameter on crankshaft..... | .002L | .0098L |
| 18 | 1 | Front crankshaft front oil plug (thread pitch diameter)..... | .0005T | .0035L |
| 19 | 1 | Gasket dowel | | |
| | | Gasket dowel in crankcase ($\frac{3}{8}$ inch)..... | Size | .005T |
| | | Gasket dowel in crankcase ($\frac{1}{16}$ inch)..... | Size | .005T |
| 20 | 1 | Crankcase bolts in crankcase..... | .001L | .0005T |
| 21 | 1 | Cylinder barrel | | |
| | | Cylinder barrel in crankcase (diameter)..... | .0025L | .0105L |
| | | Cylinder barrel bore — taper wear..... | | .0045 |
| | | Cylinder barrel — rebore over standard..... | | .020 |
| | | Cylinder barrel bore — out of round wear..... | | .0045 |
| 22 | 1 | Intake pipe | | |
| | | Intake pipe in flange and gland nut..... | .021L | .051L |
| | | Intake pipe in crankcase..... | .011L | .031L |
| 23 | 1 | Gland packing nut | | |
| | | Packing nut in crankcase (thread pitch diameter)..... | Size | .0088L |
| | | Packing nut in crankcase (plain diameter)..... | .041L | .066L |
| 24 | 1 | Starter gear bushing in accessory case (diameter)..... | .002T | .004T |
| 25 | 1 | Starter gear | | |
| | | Starter gear in bushing (diameter)..... | .0015L | .005L |
| | | Starter gear in bushing (end clearance)..... | .005L | .040L |
| 26 | 1 | Cam hub in cam ring ($6\frac{3}{4}$ inch diameter)..... | Size | .002L |
| 27 | 1 | Cam hub | | |
| | | Cam hub to cam drive gear ($1\frac{7}{8}$ inch diameter)..... | .0025L | .0055L |
| | | Cam hub and clearance..... | .010L | .018L |
| 28 | 1 | Rear crankshaft in cam drive gear..... | .0002L | .0017L |
| 29 | 1 | Rear crankshaft in crankshaft starter gear..... | .0002L | .0017L |
| 30 | 1 | Crankshaft oil feed bushing in accessory case..... | .0015T | .0035T |
| 31 | 1 | Starter gear in oil feed bushing ($1\frac{7}{8}$ inch)..... | .0025L | .0055L |
| 32 | 1 | Crankshaft starter gear spline | | |
| | | Crankshaft in starter gear (width)..... | .0005L | .0038L |
| | | Crankshaft in starter gear (spline od)..... | .008L | .011L |
| | | Crankshaft in starter gear (spline) (root diameter)..... | .006L | .019L |

CONTINENTAL W 670 AIRCRAFT ENGINES

TABLE OF LIMITS — Continued

| Ref. No. (Fig. 91) | Chart No. | Description of Limits | Min. | Max. |
|-----------------------|-----------|---|--------|--------|
| 50 | 1 | Valve tappet clearance (engine cold) For timing (exhaust and intake) .124 desired For running (exhaust and intake) .010 desired | | |
| 52 | 1 | Valve guide in cylinder head (exhaust)..... | .002T | .004T |
| 53 | 1 | Exhaust valve in guide..... | .0035L | .0065L |
| 54 | 1 | Rocker arm ball bearing Bearing in rocker arm..... | Size | .0009T |
| | | Rocker arm bolt in bearing..... | .0009L | .0001L |
| | | Bearing side clearance in rocker box..... | .0032T | .0058L |
| 55 | 1 | Rocker arm bolt in head..... | .0003L | .0012T |
| 56 | 1 | Valve guide in cylinder head (intake)..... | .001T | .003T |
| 57 | 1 | Intake valve in guide..... | .001L | .004L |
| 58 | 1 | Valve seat insert in head..... | .0065T | .0105T |
| 59 | 1 | Tachometer pinion in coupling (flats)..... | .003L | .006L |
| | | Tachometer pinion in coupling (corners)..... | .002L | .011L |
| | | Tachometer pinion in housing (thickness)..... | .005L | .025L |
| 60 | 1 | Tachometer gear (diameter) Tachometer gear in tachometer drive housing..... | .001L | .004L |
| | | Tachometer gear shaft in pilot..... | .001L | .004L |
| 61 | 2 | Tachometer housing pilot Tachometer housing pilot in tachometer housing..... | Size | .0015L |
| | | Tachometer housing pilot in accessory case..... | .0005L | .003L |
| 62 | 2 | Tachometer gears Tachometer gears in housing (thickness)..... | .005L | .025L |
| 63 | 2 | Tachometer coupling SAE tachometer shaft in tachometer gear..... | .006L | .012L |
| | | SAE tachometer shaft tongue in tachometer gear..... | .008L | .016L |
| 64 | 1 | Push rod — overall length..... | 10.920 | 10.875 |
| 65 | 1 | Cam follower Length over roller pin and a 7/16 inch ball in socket..... | 4.271 | 4.256 |
| 66 | 1 | Cam follower in cam follower guide..... | .0015L | .0025L |
| 67 | 1 | Cam follower guide in crankcase..... | Size | .0015L |
| 68 | 1 | Cam follower roller Cam follower roller in tappet (end clearance)..... | .007L | .013L |
| | | Cam follower roller in guide..... | .007L | .013L |
| 69 | 1 | Cam follower roller pin Roller pin in roller..... | .0023L | .0047L |
| | | Roller pin in cam follower (diameter)..... | .0013L | .003L |
| | | Roller pin in guide (end clearance)..... | .0053L | .0098L |
| 70 | 2 | Ignition gear bushing in accessory case..... | .002T | .004T |
| 71 | 2 | Ignition gear Ignition gear in bushing (1 1/4 inch diameter)..... | .0015L | .0045L |
| | | Ignition gear in bushing (end clearance)..... | .005L | .005L |
| 72 | 2 | Magneto coupling in gear..... | .008L | .004L |
| 73 | 2 | Magneto pilot in accessory case (W670-6A)..... | Size | .004L |
| | | Magneto pilot in accessory case (W670-6N)..... | .001L | .005L |
| | | Magneto oil seal in accessory case | | |

TABLE OF LIMITS — Continued

| <i>Ref. No.</i> <i>(Fig. 91)</i> | <i>Chart No.</i> | <i>Description of Limits</i> | <i>Min.</i> | <i>Max.</i> |
|-------------------------------------|------------------|--|-------------|-------------|
| 74 | 2 | Rocker scavenge pump gears in pump body (thickness)..... | .006L | .014L |
| 75 | 2 | Rocker scavenge pump | | |
| | | Cover pilot to accessory case..... | .0055L | .0075L |
| | | Cover pilot to pump housing..... | Size | .002L |
| | | Fuel pump pilot to pump housing (W670-6N)..... | Size | .004L |
| | | Fuel pump pilot to pump housing (W670-6A)..... | .0005L | .0035L |
| 76 | 2 | Oil pump drive gear bushing in accessory case..... | .001T | .003T |
| 77 | 2 | Oil pump drive gears | | |
| | | Gears in bushing (diameter)..... | .001L | .004L |
| | | Gears in bushing (end clearance)..... | .005L | .060L |
| 78 | 2 | Duplex pressure and scavenge oil pump (W670-6A) | | |
| | | Driven shaft in driving gear (flat side)..... | .005L | .007L |
| | | Driven shaft in driving gear (corners)..... | .0175L | .022L |
| 78 | 2 | Rocker scavenge oil pump | | |
| | | Driven shaft in driving gear (flat side) (W670-6N)..... | .003L | .005L |
| | | Driven shaft in driving gear (corners) (W670-6A)..... | .0175L | .022L |
| 79 | 2 | Fuel pump drive coupling | | |
| | | Pump gear to coupling (flat side)..... | Size | .003T |
| | | Pump gear to coupling (corners)..... | .002L | .011L |
| | | Coupling to fuel pump drive shaft (flat side)..... | .003L | .006L |
| 79 | 2 | Coupling to fuel pump drive shaft (corners)..... | .002L | .011L |
| | | Oil seal in rocker scavenge oil pump body (W670-6N)..... | .001T | .007T |
| 80 | 2 | Duplex scavenge oil screen in accessory case (diameter)..... | .042L | .082L |
| 81 | 2 | Oil pump return check in guide..... | .0065L | .013L |
| 82 | 2 | Oil pump shaft in body and cover..... | .0015L | .004L |
| 83 | 2 | Duplex pressure oil pump | | |
| | | Gears in pump body (diameters)..... | .003L | .006L |
| | | Gears in pump body (width)..... | .002L | .006L |
| 84 | 2 | Duplex scavenge oil pump | | |
| | | Gears in pump body (width)..... | .001L | .006L |
| | | Gears on pump body (diameter)..... | .0015L | .003L |
| | | Gears on drive shaft (diameter)..... | .0015L | .003L |
| | | Gears on driven shaft (diameter)..... | .0015L | .003L |
| 85 | 2 | Duplex scavenge oil pump | | |
| | | Gears in pump body (width)..... | .001L | .006L |
| | | Gears in pump body (diameter)..... | .004L | .009L |
| | | Gears on drive shaft (diameter)..... | .0015L | .003L |
| | | Gears on driven shaft (diameter)..... | .0015L | .003L |
| 86 | 2 | Duplex oil pump in accessory case | | |
| | | R-670-5 engines, 2 1/16 inch diameter shoulder..... | .0525L | .1038L |
| | | R-670-5 engines, 1 3/8 inch diameter, pilot..... | .0005L | .0025L |
| 87 | 2 | Oil relief valve in housing (low pressure)..... | .003L | .006L |
| 88 | 2 | High pressure relief valve plunger in body..... | .0015L | .0035L |
| 89 | 2 | High pressure relief valve in guide..... | .002L | .005L |

TABLE OF LIMITS — Continued

2. Gear Teeth Backlash Limits

Refer to Limits and Lubrication Charts Nos. 1 and 2 for location of the gears referred to below. **NOTE** — Measurements with Dry Gear Teeth.

| Ref. No. (Fig. 91) | Chart No. | Item | Minimum and Desired | *If Backlash Exceeds |
|-----------------------|-----------|---|---------------------|----------------------|
| B1 | 1 | Starter gear to crankshaft gear..... | .004 | .040 |
| B2 | 1 | Crankshaft drive pinion and intermediate gear..... | .004 | .040 |
| B3 | 1 | Intermediate drive pinion to drive gear..... | .004 | .040 |
| B4 | 1 | Intermediate drive gear and generator drive pinion..... | .004 | .040 |
| B5 | 1 | Generator drive gear to final drive pinion..... | .004 | .040 |
| B6 | 2 | Tachometer pinion to drive gears..... | .004 | .040 |
| B7 | 1-2 | Rocker scavenge oil pump gears..... | .004 | .040 |
| B8 | 2 | Accessory drive gear to magneto drive gear..... | .004 | .040 |
| B9 | 2 | Magneto drive gear to oil pump drive gear..... | .004 | .040 |

(*) Check accessory case bushing, sizes and location gears, and gear shafts.

3. Torque Limits

The following limit values will apply at all locations indicated by torque reference numbers on the Limits and Lubrication Charts Nos. 1 and 2: **NOTE** — Values apply when parts are assembled at normal room temperatures.

| Ref. No. (Fig. 91) | Chart No. | Item | Torque in Inch-Pounds |
|-----------------------|-----------|---|----------------------------|
| T1 | 1 | Spark plug..... | 300-360 |
| T2 | 1 | Nut — Crankshaft thrust bearing..... | **600 300 |
| T3 | 1 | Nut — $\frac{1}{8}$ -24, rear lower oil sump..... | 160-200 125-170 |
| T4 | 1 | Plug — 1 x 18 inches, oil sump drain..... | Oil tight |
| T5 | 1 | Bolt — Crankcase assembling..... | 350-400 |
| T6 | 1 | Nuts — $\frac{1}{8}$ -24, rear lower oil sump..... | 160-200 125-170 |
| T7 | 1 | Nut — $\frac{1}{8}$ -24, carburetor to crankcase..... | 160-200 125-170 |
| T8 | 1 | Nut — $\frac{3}{4}$ -16, generator drive gear..... | 175-215 |
| T9 | 1 | Nut — $\frac{1}{8}$ -18, intermediate cam drive gear..... | 275-300 |
| T10 | 1 | Bolt — Crankshaft clamp..... | .004 inch stretch |
| T11 | 1 | Nut — $\frac{3}{8}$ -24, thrust bearing cover..... | 250-300 |
| T12 | 1 | Nut — $\frac{3}{8}$ -24, cylinder to crankcase..... | 400-450 350-400 |
| T13 | 1 | Nut — $\frac{1}{8}$ -24, intake flange to cylinder..... | 160-200 125-170 |
| T14 | 1 | Plug — Oil, front end of crankshaft..... | 250-275 |
| T15 | 1 | Nut — Gland, intake pipe..... | Air tight |
| T16 | 1 | Nut — $\frac{1}{8}$ -24, accessory case to crankcase..... | 160-200 125-170 |
| T17 | 1 | Nut — $\frac{3}{8}$ -24, starter cover..... | 250-300 200-250 |
| T18 | 1 | Nut — $\frac{1}{8}$ -24, generator set-up cover..... | 160-200 125-170 |
| T19 | 2 | Nut — $\frac{1}{8}$ -24, scavenge oil pump to accessory case..... | 160-200 125-170 |
| T20 | 1 | Nut — $\frac{1}{8}$ -18, rocker arm bolt..... | 100-275 |
| T21 | 1 | Nut — $\frac{1}{4}$ -28, cover to rocker box..... | 100-125 65-85 |
| T22 | 1 | Nut — Valve adjusting screw lock..... | 250-275 |

TABLE OF LIMITS — Continued

| Ref. No. (Fig. 91) | Chart No. | Item | Torque in Inch-Pounds |
|-----------------------|-----------|--|----------------------------|
| T23 | 1 | Retainer — Push rod housing..... | 275-300 |
| T23 | 1 | Nut — Gland, push rod housing retainer..... | Oil tight |
| T23 | 1 | Nut — 1/4-28, push rod housing to crankcase..... | 160-200 65-85 |
| T24 | 2 | Nut — Magneto drive coupling..... | 160-185 |
| T25 | 2 | Nut — 1/8-24, magneto to accessory case..... | 160-200 125-170 |
| T26 | 2 | Screen Assembly — Scavenge Oil | Oil tight |
| T27 | 2 | Nut — 1/8-24, scavenge oil pump cover..... | 160-200 125-170 |
| T29 | 1 | Plug — Oil screen and relief valve..... | Oil tight |
| T30 | 1 | Nut — Rear crankshaft | 860-900 500-600 |

(**) Foot-pounds.

4. Spring Pressure Limits

| Ref. No. (Fig. 91) | Chart No. | Description of Part | Part No. | Wire Dia. | Compress to | Lbs. Min. | Lbs. Max. |
|-----------------------|-----------|---|----------|-----------|------------------------------|------------------|-----------------------|
| S1 | 1 | Spring — Oil screen relief valve..... | 2848 | .035 inch | 1 1/2 inch | 21 1/4 | 23 1/4 |
| *S2 | 1 | Spring — Valve outer..... | 2840 | .177 inch | 1 3/8 inch | 72 | 78 |
| S2 | 1 | Spring — Valve intermediate..... | 3840 | .148 inch | 1 1/2 inch | 58 | 62 |
| S2 | 1 | Spring — Valve inner..... | 20385 | .105 inch | 1 1/8 inch | 30 | 34 |
| S3 | 2 | Spring — Low pressure oil relief valve.. | 20248 | .041 inch | 1-35 1/64 inch | 1 3/8 | 1 5/8 |
| S5 | 2 | Spring — Oil return check valve..... | 22196 | .028 inch | 3/4 inch | .63 | .77 |
| S6 | 2 | Spring — High pressure oil relief valve.. | 22216 | .098 inch | 2 1/4 inch 1 9/16 | 22 22 | 29.6 8 3/4 |
| *S7 | | Spring — Oil pump air relief | 22203 | .010 inch | 1/2 inch | .080 | .044 |

NOTE — All springs will be replaced when their limits do not fall within the above table.

(*) S2 — Less three per cent for service and overhaul replacement.

(*) S7 — This reference has been added recently and does not appear on present charts. Personnel charged with maintenance of charts will mark this number in its proper location on Chart No. 2.

STEEL PIPE PLUGS IN ALUMINUM AND MAGNESIUM CASES

0 Prox
measured
1/2
3/8
1/2
5/8

| Thread Size | Torque Limits | |
|-----------------------|---------------|---------|
| | Minimum | Maximum |
| 1 1/4 in. A. N. P. T. | 30 | 40 |
| 1 1/8 in. A. N. P. T. | 30 | 40 |
| 1 1/4 in. A. N. P. T. | 70 | 85 |
| 3/8 in. A. N. P. T. | 95 | 110 |
| 1/2 in. A. N. P. T. | 140 | 160 |
| 3/4 in. A. N. P. T. | 210 | 230 |
| 1 in. A. N. P. T. | 285 | 315 |
| 1-1/4 in. A. N. P. T. | 355 | 385 |

STANDARD STUDS

| Thread Size | Driving Torque Limits | | |
|-------------|-----------------------|-------|---------|
| | Minimum | | Maximum |
| | Plain and Necked | Plain | Necked |
| 8-32 | 10 | 30 | 30 |
| 10-24 | 15 | 45 | 40 |
| 1/4-20 | 40 | 105 | 95 |
| 5/16-18 | 85 | 230 | 210 |
| 3/8-16 | 160 | 425 | 375 |
| 7/16-14 | 200 | 675 | 600 |
| 1/2-13 | 250 | 1050 | 950 |
| 9/16-12 | 425 | 1500 | 1400 |
| 5/8-11 | 625 | 2100 | 1900 |
| 3/4-10 | 1100 | 3800 | 3500 |

GENERAL RECOMMENDATIONS

NUTS, BOLTS AND SCREWS

| Thread Size | Torque Limits | |
|-------------|---------------|------|
| | Min. | Max. |
| 6-32 | 8 | 10 |
| 8-32 | 15 | 20 |
| 8-36 | 15 | 20 |
| 10-24 | 20 | 30 |
| 10-32 | 20 | 30 |
| 1/4-20 | 50 | 70 |
| 1/4-28 | 65 | 85 |
| 5/16-18 | 110 | 150 |
| 5/16-24 | 125 | 170 |
| 3/8-16 | 200 | 270 |
| 3/8-24 | 225 | 300 |

| Thread Size | Torque Limits | |
|-------------|---------------|------|
| | Min. | Max. |
| 7/16-14 | 325 | 430 |
| 7/16-20 | 360 | 480 |
| 1/2-13 | 500 | 650 |
| 1/2-20 | 560 | 750 |
| 9/16-12 | 700 | 950 |
| 9/16-18 | 800 | 1050 |
| 5/8-11 | 1000 | 1300 |
| 5/8-18 | 1150 | 1500 |
| 3/4-10 | 1700 | 2300 |
| 3/4-16 | 2000 | 2600 |

NOTE

A standard nut has a height approximately equal to the diameter of the bolt. Unless otherwise specified, where the height of the nut is half the diameter of the bolt (thin nuts) reduce the listed torque values by one-half. Castellations are additional and do not affect the torque values.

91A

CRUSH TYPE ASBESTOS GASKETS

| Thread Pitch on Part to be Tightened | Angle of Turn | |
|--------------------------------------|-------------------|-----------------|
| | Aluminum Asbestos | Copper Asbestos |
| 8 threads per inch | 135° | 67° |
| 10 threads per inch | 135° | 67° |
| 12 threads per inch | 180° | 90° |
| 14 threads per inch | 180° | 90° |
| 16 threads per inch | 270° | 135° |
| 18 threads per inch | 270° | 135° |
| 20 threads per inch | 270° | 135° |
| 24 threads per inch | 360° | 180° |
| 28 threads per inch | 360° | 180° |

NOTE

Install all crush type gaskets except the self centering type, with the unbroken surface against the flange of the plug or part being tightened against the seal. Turn the mating part until the sealing surfaces are in contact and then tighten to the angle of turn listed for the appropriate thread size.

Section 16

ILLUSTRATED PARTS LIST

This parts list is arranged in four divisions, namely: Illustrated Parts List, Group Assembly Parts List, Numerical Parts List, and Oversize Parts List. Any part may be located in the Group Assembly Parts List by the reference number obtained from either the Illustrated Parts List or Numerical Parts List. All parts should be ordered by both part number and part name.

The following usage code will be employed in the Group Assembly Parts List to designate the particular engine models to which each part is applicable:

| Engine Model | Usage Code |
|--------------|------------|
| W670-6A | A |
| W670-6N | N |
| W670-K | K |
| W670-M | M |
| W670-16 | B |
| W670-17 | C |
| W670-24 | D |
| W670-23 | E |

The "No. Required" column will designate the quantity of each part required per engine with the exception of parts which are components of a sub-assembly, in which case the quantity shown will be per assembly.

The following designations will be used throughout the Group Assembly Parts List to indicate the conditions shown:

(*o*) — Available in Oversize

(**) — Not to be stocked or ordered as individual parts

Pages 92, 93 + 94 Not used

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

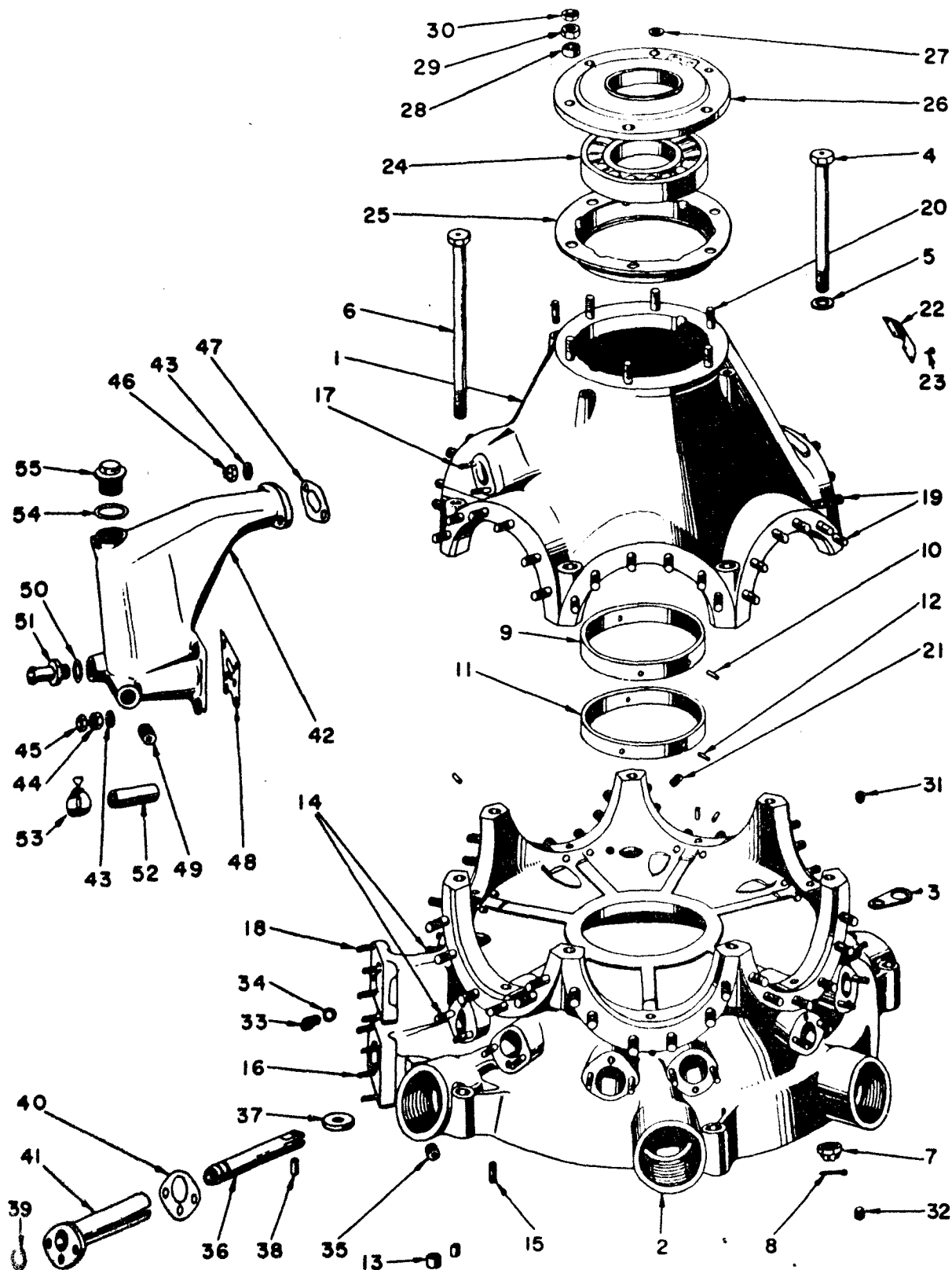


Figure 91. Crankcase Assembly

CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|--------------------|-------------|---|---|---|---|---|-----------|---------|
| 91- | A6447 | | | | | Crankcase Assembly - Complete. | 1 | ABCDKN |
| 91- | A6768 | | | | | Crankcase Assembly - Complete. | 1 | E |
| 91- | A6418 | | | | | Crankcase Assembly - Complete. | 1 | M |
| -1 | No Number | | | | | . Crankcase - Front. | Not Sold | |
| -2 | No Number | | | | | . Crankcase - Rear. | Not Sold | |
| (ATTACHING PARTS) | | | | | | | | |
| -3 | 2027 | | | | | . Eye - Lifting | 1 | All |
| -4 | 2835 | | | | | . Bolt - Crankcase, short | 6 | All |
| -5 | 2475 | | | | | . Washer - 7/16 in. plain | 12 | All |
| -6 | 20997 | | | | | . Bolt - Crankcase, long. | 1 | All |
| -7 | 2459 | | | | | . Nut - 7/16-20, castle | 6 | All |
| -8 | 2506 | | | | | . Cotter Pin - 3/32 OD x 3/4 in. lg. | 6 | All |
| ----- | | | | | | | | |
| -9 | £3005 | | | | | . Liner - Front bearing | 1 | ABCDEKN |
| -9 | £3250 | | | | | . Liner - Front bearing | 1 | M |
| -10 | 2520 | | | | | . Pin - 5/32 OD x 5/8 in. long | 3 | All |
| -11 | £3006 | | | | | . Liner - Rear bearing | 1 | All |
| -12 | 2520 | | | | | . Pin - 5/32 OD x 5/8 in. long | 3 | All |
| -13 | 2868 | | | | | . Dowel - Crankcase scavenge gasket | 1 | All |
| -13 | 20256 | | | | | . Dowel - Rocker scavenge gasket | 1 | All |
| -14 | £20988 | | | | | . Stud - 1/4-20 x 1/4-28 x 1-3/16 in. long | 28 | All |
| -15 | £20991 | | | | | . Stud - 5/16-18 x 5/16-24 x 1-1/4 in. long | 13 | All |
| -16 | £20992 | | | | | . Stud - 5/16-18 x 5/16-24 x 1-3/8 in. long | 4 | All |
| -17 | £20992 | | | | | . Stud - 5/16-18 x 5/16-24 x 1-3/8 in. long | 2 | All |
| -18 | £22145 | | | | | . Stud - 5/16-18 x 5/16-24 x 1-3/8 in. long | 4 | All |
| -19 | £22006 | | | | | . Stud - 3/8-16 x 3/8-24 x 1-3/8 in. long | 84 | ABCDKMN |
| -19 | £22006 | | | | | . Stud - 3/8-16 x 3/8-24 x 1-17/32 in. long | 76 | E |
| -19 | £20099 | | | | | . Stud - 3/8-16 x 3/8-24 x 1-1/2 in. long | 8 | E |
| -20 | £20994 | | | | | . Stud - 3/8-16 x 3/8-24 x 2-3/8 in. long | 6 | ABCDKMN |
| -20 | £25193 | | | | | . Stud - 3/8-16 x 3/8-24 x 2-3/8 in. long | 6 | E |
| -21 | 2024 | | | | | . Plug - 1/8 in. pipe. | 1 | All |
| -22 | 22067 | | | | | Plate - Engine data. | 1 | A |
| -22 | 23249 | | | | | Plate - Engine data. | 1 | B |
| -22 | 23402 | | | | | Plate - Engine data. | 1 | C |
| -22 | 22657 | | | | | Plate - Engine data. | 1 | N |
| -22 | 22660 | | | | | Plate - Engine data. | 1 | K |
| -22 | 22659 | | | | | Plate - Engine data. | 1 | M |
| -23 | 2223 | | | | | Screw - Drive, engine data plate | 6 | BCDKMN |
| -24 | 2542 | | | | | Bearing - Ball, crankshaft thrust | 1 | ABCDKN |
| -24 | 20429 | | | | | Bearing - Ball, crankshaft thrust | 1 | M |
| -25 | 35204 | | | | | Cage - Thrust bearing. | 1 | ABCDKN |
| -25 | 3252 | | | | | Cage - Thrust bearing. | 1 | M |
| -26 | 3253 | | | | | Cover - Thrust bearing. | 1 | ABCDKN |
| -26 | 35169 | | | | | Cover - Thrust bearing. | 1 | M |
| | 22845 | | | | | Oil Seal - Bearing cover | 1 | M |
| (ATTACHING PARTS) | | | | | | | | |
| -27 | 2474 | | | | | Washer - 3/8 in. plain | 6 | ABCDKMN |
| -28 | 20245 | | | | | Washer - Special, thrust bearing cover | 6 | ABCDKMN |
| -29 | 2441 | | | | | Nut - 3/8-24 | 6 | ABCDKMN |
| -30 | 2561 | | | | | Palnut - 3/8-24 | 6 | ABCDKMN |
| ----- | | | | | | | | |
| -31 | 20882 | | | | | Plug - 1/8 in. manifold primer hole. | 1 | ABCDKMN |
| -32 | 20882 | | | | | Plug - 1/8 in. manifold pressure hole | 1 | A |
| -33 | 2265 | | | | | Plug - 5/8 in. manifold thermometer hole. | 1 | All |
| -34 | AN900-10 | | | | | Gasket - 5/8 in. dia | 1 | All |
| -35 | 20288 | | | | | Plug - 1/4 in. intake manifold. | 1 | All |
| | A20292-A | | | | | Valve Tappet Assembly - Complete | 14 | All |
| -36 | A20292 | | | | | . Tappet Assembly - Valve | 1 | All |
| | *20292 | | | | | . . Tappet - Valve | 1 | All |
| | *20293 | | | | | . . Insert - Tappet | 1 | All |

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | Description | Per Assy. | Code |
|--------------------|-------------|---|-----------|---------|
| 91-37 | 2129 | . Roller - Tappet | 1 | All |
| -38 | 20255 | . Pin - Tappet roller | 1 | All |
| -39 | 20294 | . Circlip - Tappet | 14 | All |
| -40 | 20268 | . Gasket - Tappet guide | 14 | ABCDKMN |
| -40 | 531102 | . Gasket - Tappet guide | 14 | E |
| -41 | 3360 | . Guide - Tappet | 14 | All |
| -42 | 5194 | . Sump - Oil | 1 | AKM |
| -42 | 5578 | . Sump - Oil | 1 | CD |
| -42 | 5195 | . Sump - Oil | 1 | BN |
| -42 | 530510 | . Sump - Oil | 1 | E |
| (ATTACHING PARTS) | | | | |
| -43 | 2473 | . Washer - 5/16 in. plain | 6 | All |
| -44 | 2439 | . Nut - 5/16-24 | 4 | All |
| -45 | 2560 | . Palnut - 5/16-24 | 4 | All |
| -46 | 2457 | . Nut - 5/16-24, castle | 2 | All |
| ----- | | | | |
| -47 | 20951 | . Gasket - Oil sump, front | 1 | ABCDKMN |
| -47 | 531094 | . Gasket - Oil sump, front | 1 | E |
| -48 | 20952 | . Gasket - Oil sump, rear | 1 | ABCDKMN |
| -48 | 531095 | . Gasket - Oil sump, rear | 1 | E |
| -49 | 2026 | . Plug - 1/4 in. pipe | 1 | All |
| -50 | AN900-12 | . Gasket - 3/4 in. dia | 1 | All |
| -51 | 20273 | . Nipple - 5/8 in. hose | 1 | All |
| -52 | 20275 | . Hose - 5/8 in. ID | 1 | All |
| -53 | 745-2A | . Clamp - Hose | 2 | All |
| -54 | AN900-16 | . Gasket - Sump drain plug | 1 | All |
| -55 | 20877 | . Plug - 1-18, sump drain | 1 | AKM |
| -55 | 2832 | . Plug - 1-14, sump drain | 1 | CD |
| -55 | 22826 | . Plug - 1-20, sump drain | 1 | E |
| | 20274 | . Plug - 3/4-16, sump scavenge inlet | 1 | E |
| ----- | | | | |
| 92- | No Number | Crankcase Assembly - Front Half | Not Sold | E |
| -1 | 22059 | . Stud - 5/16-18 x 5/16-24 x 2-5/16 in. long | 4 | E |
| | A25218 | . Gear Assembly - Intermediate governor drive | 1 | E |
| -2 | 40754 | . Gear - Intermediate governor drive | 1 | E |
| -3 | 25176 | . Bushing - Intermediate drive gear | 1 | E |
| -4 | 25213 | . Packing - "O" ring | 1 | E |
| | A25197 | . Shaft Assembly - Intermediate drive gear | 1 | E |
| -5 | 25197 | . Shaft - Intermediate drive gear | 1 | E |
| -6 | 25198 | . Pin | 1 | E |
| -7 | 25199 | . Set Screw - Hex socket, 5/16-24 x 1/4 in. long | 1 | E |
| -8 | 530854 | . Gasket - Governor adapter | 1 | E |
| | A36153 | . Adapter Assembly - Propeller governor | 1 | E |
| -9 | 40752 | . Adapter - Propeller governor | 1 | E |
| -10 | 25175 | . Bushing - Governor drive gear | 1 | E |
| -11 | 24907 | . Plug - 1/16 in. | 1 | E |
| -12 | A36131 | . Gear Assembly - Governor drive | 1 | E |
| -13 | 25232 | . Circllet - Governor drive gear | 1 | E |
| -14 | 531083 | . Gasket - Governor or cover | 1 | E |
| -15 | 36181 | . Cover - Governor pad | 1 | E |
| (ATTACHING PARTS) | | | | |
| -16 | 2473 | . Washer - 5/16 in. plain | 4 | E |
| -17 | 2439 | . Nut - 5/16-24 | 4 | E |
| -18 | 2560 | . Palnut - 5/8-24 | 4 | E |
| ----- | | | | |
| | A40753 | . Cage Assembly - Thrust bearing | 1 | E |
| -19 | 40753 | . Cage - Thrust bearing | 1 | E |
| -20 | 36141 | . Sleeve - Propeller governor oil control | 1 | E |
| -21 | 25196 | . Pin - 1/8 x 3/8 | 1 | E |
| -22 | 532503 | . Bearing - Ball, crankshaft thrust | 1 | E |
| -23 | 532873 | . Seal - Crankshaft oil, 2.93 ID x 3.623 OD x 0.375 in. thick | 1 | E |

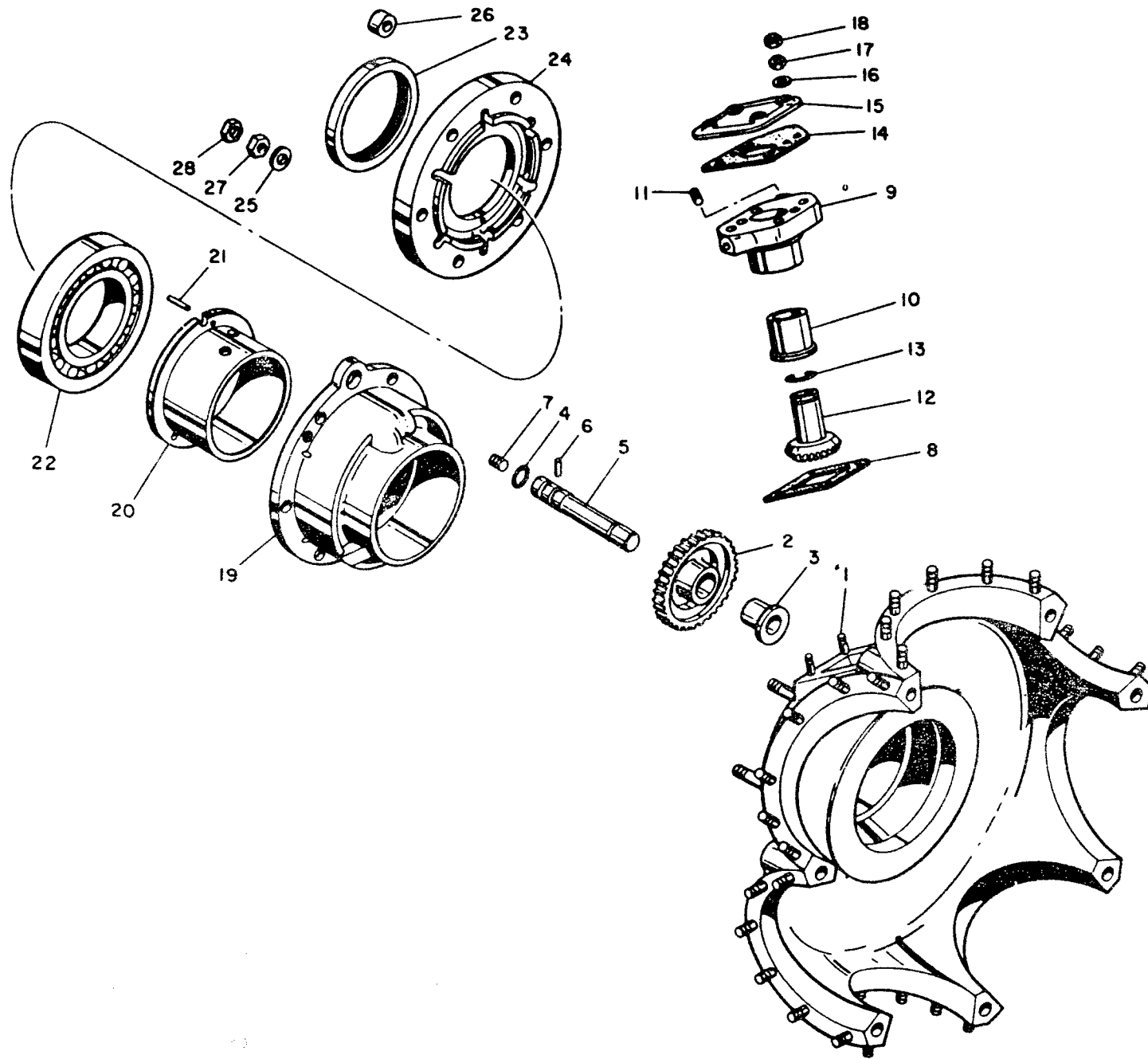


Figure 92. Crankcase Assembly—Front Half

CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|--------------------|-------------|---|---|---|---|--|-----------|---------|
| 92-24 | 532872 | . | . | . | . | Cover - Thrust bearing | 1 | E |
| | | | | | | (ATTACHING PARTS) | | |
| -25 | 2474 | . | . | . | . | Washer - 3/8 in. plain | 6 | E |
| -26 | 20245 | . | . | . | . | Washer - 25/64 in. | 6 | E |
| -27 | 2441 | . | . | . | . | Nut - 3/8-24 | 6 | E |
| -28 | 2561 | . | . | . | . | Palnut - 3/8-24 | 6 | E |
| | | | | | | -----* | | |
| 93-1 | A50079 | . | . | . | . | Crankshaft Assembly | 1 | ABCDKN |
| -1 | A50338 | . | . | . | . | Crankshaft Assembly | 1 | M |
| -1 | A5515 | . | . | . | . | Crankshaft Assembly | 1 | M |
| -2 | 20278 | . | . | . | . | Plug - Oil | 1 | ABCDKMN |
| -3 | 24752 | . | . | . | . | Spacer - Crankpin | 1 | ABCDKMN |
| -4 | 2050 | . | . | . | . | Bolt - Crankshaft clamp | 1 | ABCDKMN |
| -5 | 2052 | . | . | . | . | Washer - Clamp bolt | 1 | ABCDKMN |
| -6 | 2511 | . | . | . | . | Cotter pin - Clamp bolt | 1 | ABCDKMN |
| -7 | 2053 | . | . | . | . | Washer - Front bearing | 1 | ABCDKMN |
| -8 | 2542 | . | . | . | . | Bearing - Ball, front main | 1 | ABCDKMN |
| -8 | #20429 | . | . | . | . | Bearing - Ball, front main | 1 | M |
| -9 | 20428 | . | . | . | . | Bearing - Ball, rear main | 1 | ABCDKMN |
| -10 | 22986 | . | . | . | . | Spacer - Bearing | 1 | ABCDKMN |
| -10 | #20437 | . | . | . | . | Spacer - Bearing | 1 | M |
| | #A22841 | . | . | . | . | Sleeve Assembly - Oil control | 1 | M |
| | #22841 | . | . | . | . | Sleeve - Oil control | 1 | M |
| | #22842 | . | . | . | . | Bushing - Oil control sleeve | 1 | M |
| | #20439 | . | . | . | . | Thrust Washer - Oil control sleeve | 1 | M |
| | #20440 | . | . | . | . | Crank - Oil control sleeve | 1 | M |
| | #20441 | . | . | . | . | Guide - Oil control sleeve | 1 | M |
| | #40442 | . | . | . | . | Lever - Oil control | 1 | M |
| | #AN310-3 | . | . | . | . | Nut - 10-32, castle | 1 | M |
| | #AN910-16 | . | . | . | . | Gasket | 1 | M |
| -11 | 2045 | . | . | . | . | Thrower - Crankshaft oil | 1 | ABCDKMN |
| -12 | 35461 | . | . | . | . | Nut - Crankshaft thrust | 1 | ABCDKMN |
| -12 | #22858 | . | . | . | . | Nut - Crankshaft thrust | 1 | M |

Crankshaft Assembly part No. A5515 is applicable only to W670-M engines having the two-positioned propeller control.

These parts to be used with crankshaft A5515.

GROUP ASSEMBLY PARTS LIST - Continued

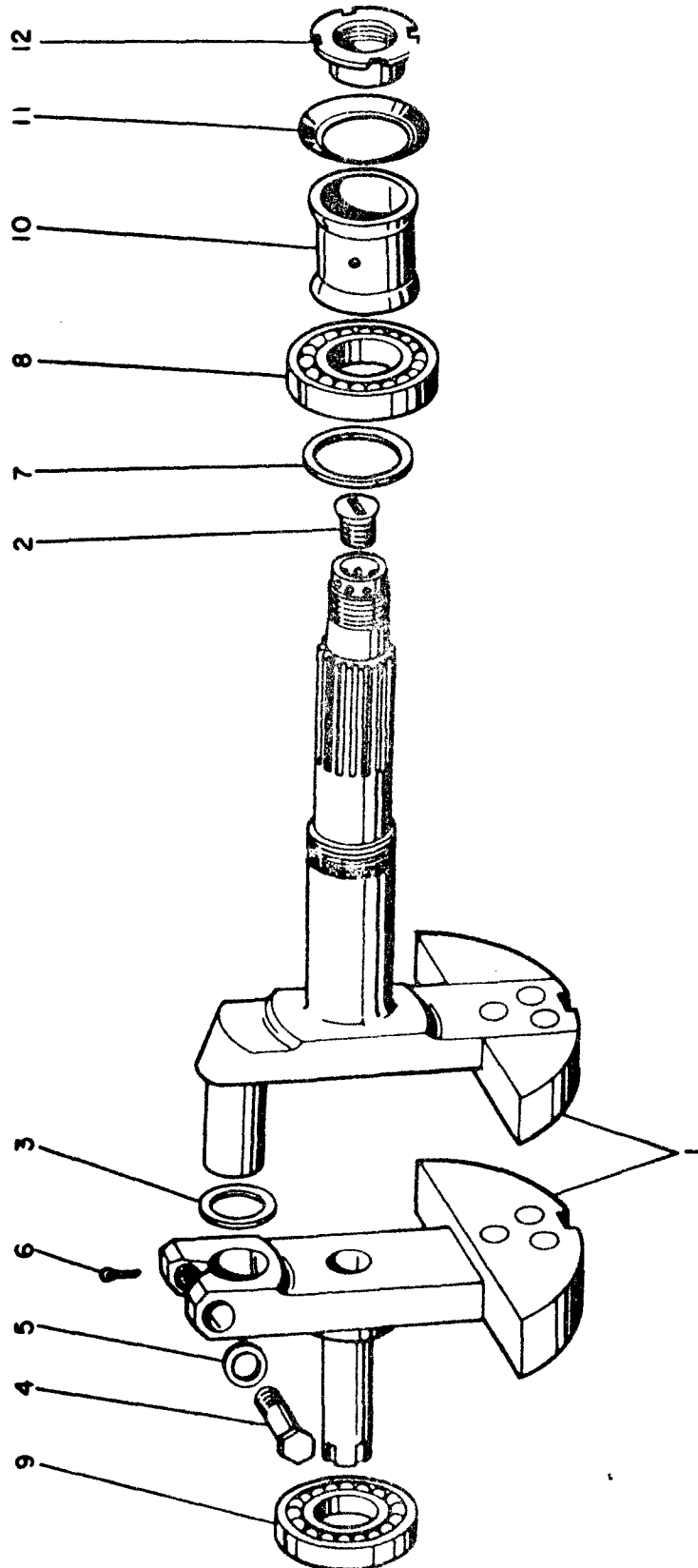


Figure 93. Crankshaft Assembly

CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 2 3 4 | Description | Per Assy. | Code |
|-----------------------|-------------|---------|--|--------------|------|
| 94-1 | A50440 | | Crankshaft Assembly | 1 | E |
| -2 | 2781 | | . Plug - Oil | 1 | E |
| -3 | 24752 | | . Spacer | 1 | E |
| -4 | 2048 | | . Plug - Oil | 1 | E |
| -5 | 2050 | | . Bolt - Crankshaft clamp | 1 | E |
| -6 | 2052 | | . Washer - Clamp bolt | 1 | E |
| -7 | AN380-4-3 | | . Cotter Pin - Clamp bolt | 1 | E |
| -8 | 25214 | | Packing - "O" ring, 1-5/16 in. OD. | 2 | E |
| -9 | 25211 | | Gasket | 2 | E |
| -10 | A36152 | | Tube Assembly - Crankshaft Oil Transfer | 1 | E |
| -11 | 25285 | | Plug - Front crankshaft | 1 | E |
| -12 | 25288 | | Gasket | 1 | E |
| -13 | 25287 | | Cover - Front crankshaft oil plug | 1 | E |
| -14 | 25286 | | Lock - Front crankshaft oil plug | 1 | E |
| -15 | AN500A10-8 | | Screw - Fillister head, No. 10-24 | 2 | E |
| -16 | 22366 | | Screw - Crank spline stop, No. 10-32 x 11/32 in. long. | 1 | E |
| -17 | 24012 | | Washer - Front crankshaft bearing | 1 | E |
| -18 | 532455 | | Bearing - Roller, front main | 1 | E |
| -19 | 25178 | | Key - 1-1/4 x 3/16 x 3/4 in. long | 1 | E |
| -20 | 36132 | | Gear - Crankshaft governor drive | 1 | E |
| -21 | 532454 | | Bearing - Roller, rear main | 1 | E |
| | A36142 | | Adapter & Ring Assembly - Crankshaft | 1 | E |
| -22 | 36142 | | . Adapter - Front crankshaft | 1 | E |
| -23 | 36184 | | . Ring - Crankshaft oil seal | 7 | E |
| -24 | 2045 | | Thrower - Crankshaft oil | 1 | E |
| -25 | 35461 | | Nut - Crankshaft thrust | 1 | E |

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

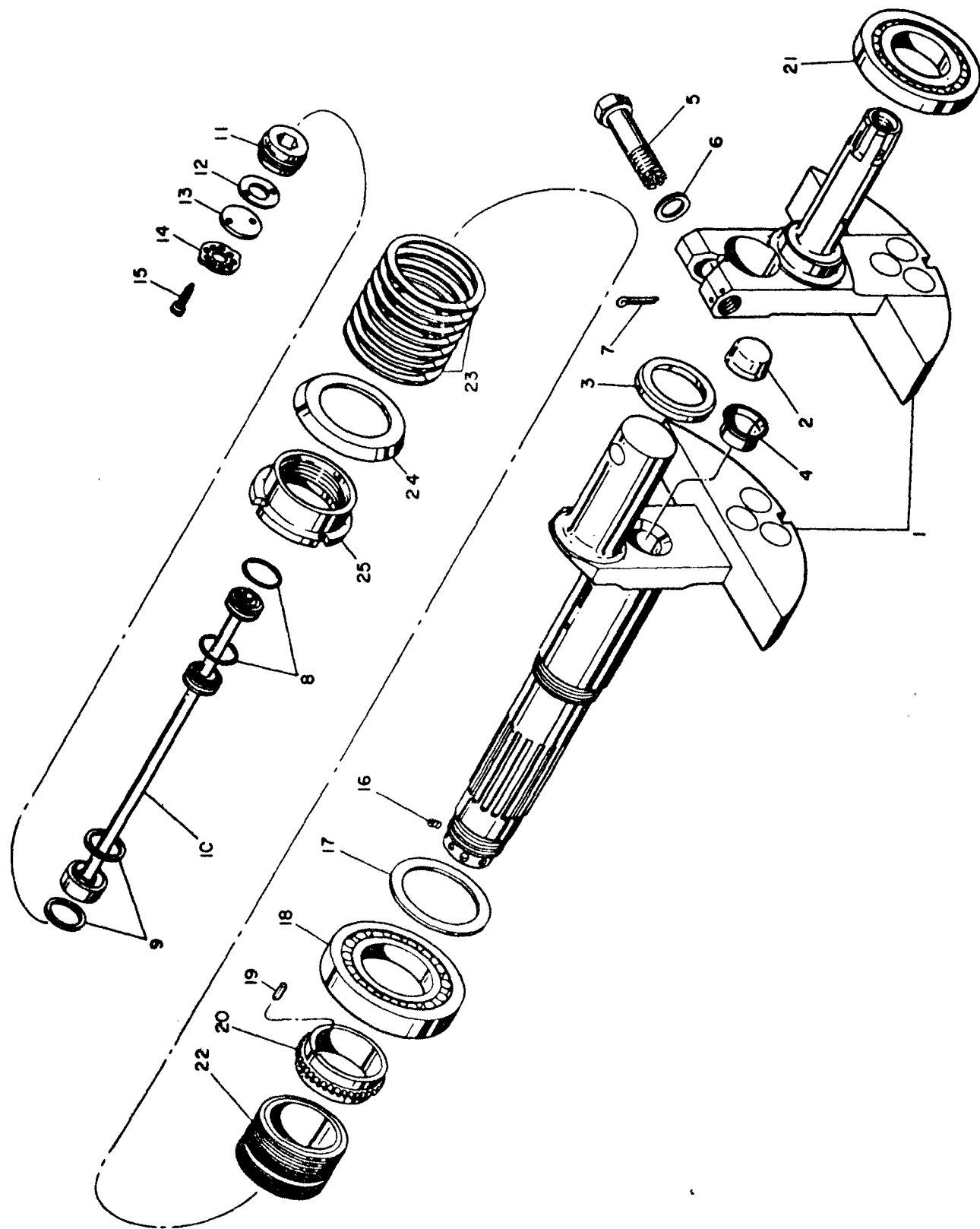


Figure 94. Crankshaft Assembly

GROUP ASSEMBLY PARTS LIST - Continued

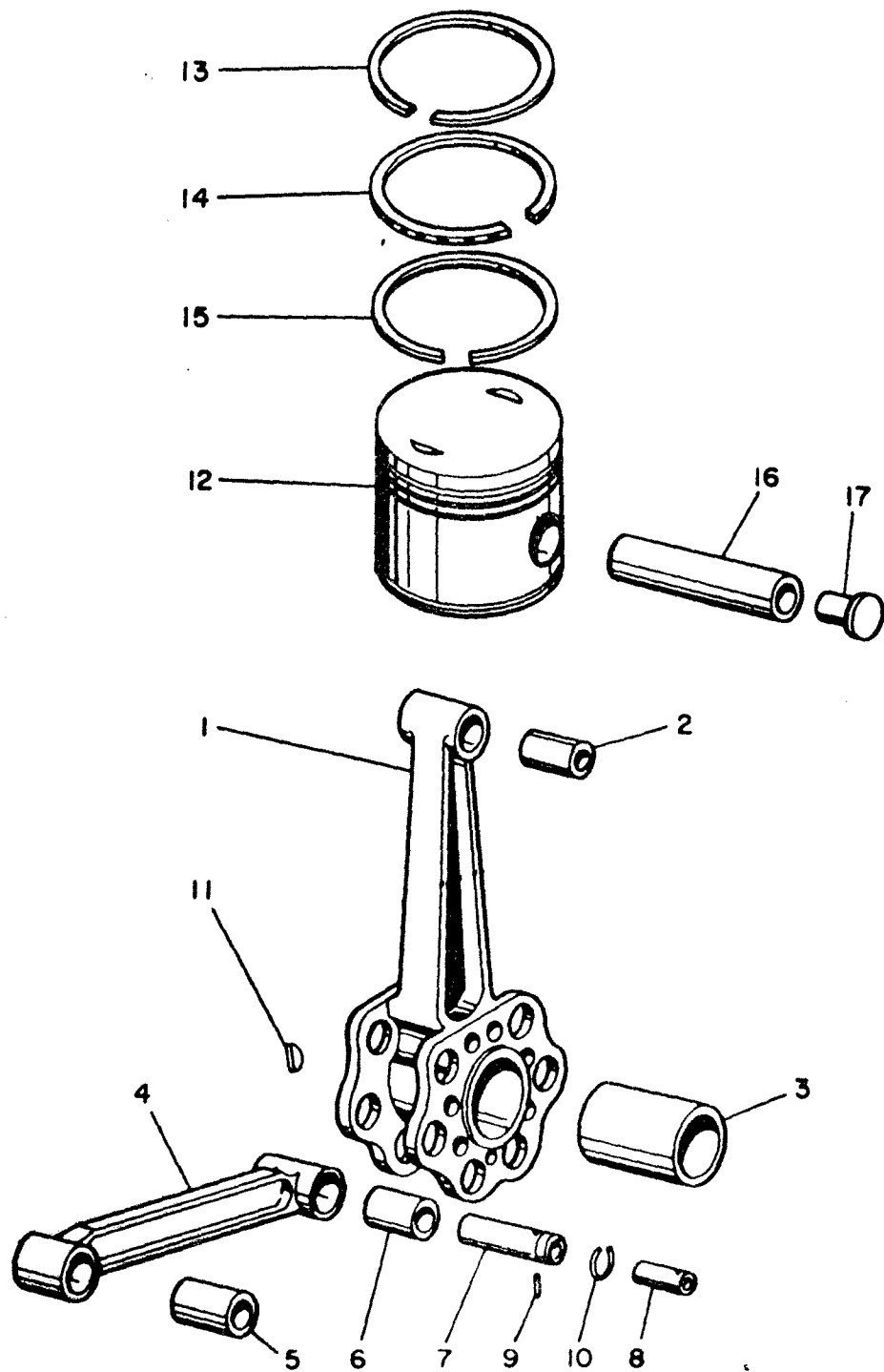


Figure 95. Master and Articulated Rod Assembly

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

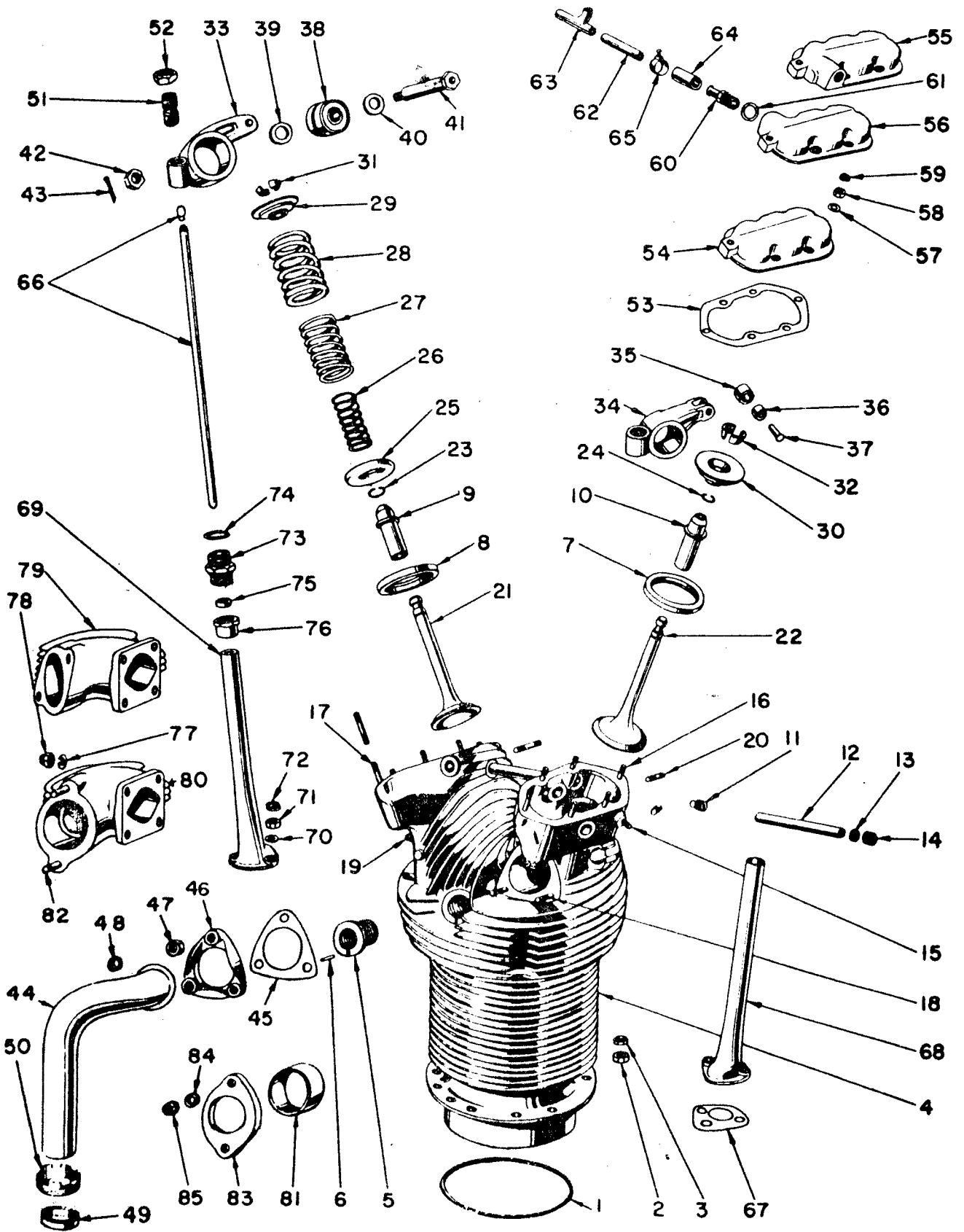


Figure 96. Cylinder Assembly
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CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 2 3 4 | Description | Per Assy. | Code |
|--------------------|--------------|---------|--|-----------|---------|
| 95- | A50347-A1 | | Master and Articulated Rod Assembly - Complete | 1 | All |
| | A50347 | | . Master Rod Assembly | 1 | All |
| | *C-5071 | | . Master Rod Assembly | 1 | M |
| -1 | 50347 | | . . Master Rod | 1 | All |
| -2 | 2110 | | . . Bushing - Piston pin | 1 | All |
| -3 | 24753 | | . . Bearing - Crankpin. | 1 | All |
| -3 | *23524 | | . . Bearing - Crankpin. | 1 | M |
| | A3192 | | . Rod Assembly - Articulated | 6 | All |
| -4 | 3192 | | . . Rod - Articulated | 1 | All |
| -5 | 2110 | | . . Bushing - Piston pin | 1 | All |
| -6 | 2859 | | . . Bushing - Knuckle pin | 1 | All |
| | £A23152 | | . Knuckle Pin Assembly - Articulated rod | 6 | All |
| -7 | **23152 | | . . Knuckle Pin. | 1 | All |
| -8 | **23153 | | . . Plug - Knuckle pin | 1 | All |
| -9 | **AN420-3-16 | | . . Rivet - Knuckle pin plug | 1 | All |
| -10 | 2860 | | . Circlip - Knuckle pin | 6 | All |
| -11 | 2219 | | . Key - Woodruff 1/8 in. x 5/8 in. long | 6 | All |
| | £4180-A1 | | Piston Assembly (CR6.1:1) | 7 | M |
| | £4180-A3 | | Piston Assembly (CR6.1:1) | 7 | E |
| | £4177-A1 | | Piston Assembly (CR5.4:1) | 7 | ABCDKN |
| -12 | £4180 | | . Piston | 1 | EM |
| -12 | £4177 | | . Piston | 1 | ABCDKN |
| -13 | £35294 | | . Ring - Compression (1st and 2nd grooves) | 2 | ABCDKMN |
| -13 | £35594 | | . Ring - Plain (4th groove) | 1 | ABCDKMN |
| -13 | £35528 | | . Ring - Compression (1st groove) | 1 | E |
| -14 | £35596 | | . Ring - Oil control (3rd groove) | 1 | ABCDKMN |
| -14 | £35596 | | . Ring - Oil control (4th groove) | 1 | E |
| -15 | £35294 | | . Ring - Compression (2nd and 3rd grooves) | 2 | E |
| | £A20260 | | . Pin Assembly - Piston | 1 | All |
| -16 | 20260 | | . . Pin - Piston | 1 | All |
| -17 | 20261 | | . . Plug - Piston pin | 2 | All |
| | £A22208 | | Set - Piston ring (includes all rings for 7 pistons). | AR | ABCDKMN |
| | £35528-A1 | | Set - Piston ring (includes all rings for 7 pistons). | AR | E |
| 96-1 | 2845 | | Packing - Cylinder base | 7 | All |
| | 5234-A1 | | Cylinder Assembly - Complete, Cylinders 1, 2 and 7 | 3 | ABCDKN |
| | 5198-A1 | | Cylinder Assembly - Complete, Cylinders 3, 4, 5 and 6. | 4 | ABCDKN |
| | A5481-A1 | | Cylinder Assembly - Complete, Cylinders 1, 2 and 7 | 3 | M |
| | A5197-A1 | | Cylinder Assembly - Complete, Cylinders 3, 4, 5 and 6. | 4 | M |
| | A50504-A1 | | Cylinder Assembly - Complete | 7 | E |
| | | | (ATTACHING PARTS) | | |
| -2 | 2557 | | Nut - 3/8-24, special, cylinder base | 84 | All |
| -3 | 2561 | | Palnut - 3/8-24 | 84 | All |
| | | | * * * * * | | |
| -4 | A5234 | | . Cylinder Assembly - Cyl's 1, 2 and 7 | 1 | ABCDKN |
| -4 | A5198 | | . Cylinder Assembly - Cyl's 3, 4, 5 and 6 | 1 | ABCDKN |
| -4 | A5481 | | . Cylinder Assembly - Cyl's 1, 2 and 7 | 1 | M |
| -4 | A5197 | | . Cylinder Assembly - Cyl's 3, 4, 5 and 6 | 1 | M |
| -4 | A50504 | | . Cylinder Assembly | 7 | E |
| -5 | £2002 | | . . Insert - Spark plug | 2 | All |
| -6 | 22676 | | . . Pin - Spark plug insert | 2 | All |
| -7 | 2831 | | . . Insert - Intake valve seat | 1 | All |
| -8 | 20864 | | . . Insert - Exhaust valve seat | 1 | All |
| -9 | 20400 | | . . Guide - Exhaust valve | 1 | All |
| -10 | 20241 | | . . Guide - Intake valve | 1 | All |
| -11 | 20270 | | . . Plug - Rocker box, cylinders 1, 2 and 7 | 2 | All |
| -12 | 20269 | | . . Tube - Interrocker box, cylinders 3, 4, 5 and 6 | 1 | All |
| -13 | 20271 | | . . Packing - Rocker box tube or plug | 2 | All |
| -14 | 20272 | | . . Nut - Rocker box tube gland, cylinders 3, 4, 5 and 6 | 2 | All |
| -15 | £22001 | | . . Stud - 1/4-20 x 1/4-28 x 3/4 in. lg | 1 | All |
| -16 | £20988 | | . . Stud - 1/4-20 x 1/4-28 x 1-1/8 in. lg | 10 | All |

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | Description | Per Assy. | Code |
|--------------------|-------------|--|-----------|---------|
| 96-17 | 22539 | Stud - 1/4-20 x 1/4-28 x 1-9/16 in. lg. | 2 | All |
| -18 | 20991 | Stud - 5/16-18 x 5/16-24 x 1-1/4 in. lg. | 3 | All |
| -19 | 22003 | Stud - 5/16-18 x 5/16-24 x 1-1/8 in. lg. | 4 | All |
| -20 | 20991 | Stud - 5/16-18 x 5/16-24 x 1-1/4 in. lg. | 2 | E |
| -21 | 3299 | Valve - Exhaust | 1 | All |
| -22 | 20240 | Valve - Intake | 1 | All |
| -23 | 20401 | Circlip - Exhaust valve | 1 | All |
| -24 | 20242 | Circlip - Intake valve | 1 | All |
| -25 | 500049 | Washer - Valve spring | 2 | All |
| -26 | 20385 | Spring - Valve inner | 2 | All |
| -27 | 20384 | Spring - Valve intermediate | 2 | All |
| -28 | 3840 | Spring - Valve outer | 2 | All |
| -29 | 3292 | Seat - Exhaust valve spring | 1 | All |
| -30 | 3271 | Seat - Intake valve spring | 1 | All |
| -31 | 20399 | Lock - Exhaust valve spring seat | 2 | All |
| -32 | 20366 | Lock - Intake valve spring seat | 2 | All |
| | A3993-A1 | Rocker and Bearing Assembly - Exhaust valve | 1 | All |
| | A3992-A1 | Rocker and Bearing Assembly - Intake valve | 1 | All |
| | A3993 | Rocker Assembly - Exhaust valve | 1 | All |
| | A3992 | Rocker Assembly - Intake valve | 1 | All |
| -33 | 3349 | Rocker - Exhaust valve | 1 | All |
| -34 | 3348 | Rocker - Intake valve | 1 | All |
| -35 | 2254 | Roller - Rocker | 1 | All |
| -36 | 2255 | Bushing - Rocker arm roller | 1 | All |
| -37 | 2256 | Pin - Rocker arm roller | 1 | All |
| -38 | 20250 | Bearing - Ball | 1 | All |
| -39 | 20251 | Washer - Rocker shaft inner | 4 | All |
| -40 | 2157 | Washer - Rocker shaft outer | 4 | All |
| -41 | 20249 | Shaft - Valve rocker | 2 | All |
| -42 | 2152 | Nut - 9/16-18 | 2 | All |
| -43 | 2505 | Cotter Pin - 3/32 OD x 7/8 in. long | 2 | All |
| -44 | 4173 | Pipe - Intake | 1 | All |
| -45 | 2827 | Gasket - Intake flange | 1 | All |
| -46 | 2834 | Flange - Intake pipe | 1 | All |
| (ATTACHING PARTS) | | | | |
| -47 | 2439 | Nut - 5/16-24 | 3 | All |
| -48 | 2560 | Palnut - 5/16-24 | 3 | All |
| -49 | 2096 | Packing - Intake pipe flange | 1 | All |
| -50 | 2833 | Nut - Intake packing gland | 1 | All |
| -51 | 20252 | Screw - Valve adjusting | 14 | All |
| -52 | 20253 | Nut - Valve adjusting screw | 14 | All |
| -53 | 20254 | Gasket - Rocker box cover | 14 | ABCDKMN |
| -53 | 531091 | Gasket - Rocker box cover | 14 | E |
| -54 | 4722 | Cover - Rocker box, cyl's 1, 2 and 7 | 6 | All |
| -54 | 4722 | Cover - Rocker box, cyl No. 3 exhaust | 1 | All |
| -54 | 4722 | Cover - Rocker box, cyl No. 6 intake | 1 | All |
| -55 | 4721 | Cover - Rocker box, cyl's 3, 4 and 5 intake | 3 | ABCDKMN |
| -55 | 4721 | Cover - Rocker box, cyl's 3 and 5 intake | 2 | E |
| -56 | 4720 | Cover - Rocker box, cyl's 4, 5 and 6 exhaust | 3 | ABCDKMN |
| -56 | 4720 | Cover - Rocker box, cyl's 4 and 6 exhaust | 2 | E |
| -56 | 4723 | Cover - Rocker box, cyl's 4 intake and 5 exhaust | 2 | E |
| (ATTACHING PARTS) | | | | |
| -57 | 2472 | Washer - 1/4 in. plain | 84 | All |
| -58 | 2437 | Nut - 1/4-28 | 84 | All |
| -59 | 2886 | Palnut - 1/4-28 | 83 | All |
| -60 | 20273 | Nipple - 5/8 in. hose, cyl's 3, 4 and 5 intake rocker cover | 3 | All |
| -60 | 20273 | Nipple - 5/8 in. hose, cyl's 4, 5 and 6 exhaust rocker cover | 3 | All |
| -61 | AN900-12 | Gasket - 3/4 in. dia. scavenge nipple | 6 | All |
| -62 | 20276 | Tube - Intercylinder rocker scavenge | 2 | All |
| -63 | 3249 | Tee - Rocker scavenge | 1 | ABCDKN |

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 2 3 4 | Description | Per Assy. | Code |
|--------------------|-------------|---------|---|-----------|---------|
| 95-63 | 5113 | | Tee - Rocker scavenge | 1 | M |
| -63 | 50506 | | Tee - Rocker scavenge | 1 | E |
| -64 | 20275 | | Hose - 5/8 in. ID, cyl's 3, 4 and 5 intake and 4, 5 and 6 exhaust rocker scavenge nipples | 6 | All |
| -65 | 745-2A | | Clamp - Hose, rocker scavenge connections | 12 | All |
| -66 | A20267 | | Rod Assembly - Push | 14 | All |
| -67 | 24335 | | Gasket - Push rod housing | 7 | ABCDKMN |
| -67 | 531099 | | Gasket - Push rod housing | 7 | E |
| -68 | A20263 | | Housing Assembly - Intake pushrod | 7 | All |
| -69 | B20263 | | Housing Assembly - Exhaust push rod | 7 | All |
| (ATTACHING PARTS) | | | | | |
| -70 | 2472 | | Washer - 1/4 in. plain | 28 | All |
| -71 | 2437 | | Nut - 1/4-28 | 28 | All |
| -72 | 2886 | | Palnut - 1/4-28 | 28 | All |
| -----* | | | | | |
| -73 | 20515 | | Retainer - Pushrod housing | 14 | All |
| -74 | AN900-16 | | Gasket - Retainer | 14 | All |
| -75 | 20266 | | Packing - Gland | 14 | All |
| -76 | 20516 | | Nut - Pushrod housing gland | 14 | All |
| | A3931 | | Elbow Assembly - 65° Exhaust, cyl's 1, 2, 3, 4, 6 and 7 | 6 | ABCDKMN |
| | 530249 | | Elbow Assembly - 65° Exhaust, cyl's 1, 2, 3, 4, 6 and 7 | 6 | E |
| | A3930 | | Elbow Assembly - 90° Exhaust, cyl No. 5 | 1 | ABCDKMN |
| | 530251 | | Elbow Assembly - 90° Exhaust cyl No. 5 | 1 | E |
| (ATTACHING PARTS) | | | | | |
| -77 | 2473 | | Washer - 5/16 in. plain | 28 | All |
| -78 | 2463 | | Nut - 5/16-24 | 28 | All |
| -----* | | | | | |
| -79 | 5193 | | . Elbow - 65° Exhaust | 1 | ABCDKMN |
| -79 | 530248 | | . Elbow - 65° Exhaust | 1 | E |
| -80 | 5192 | | . Elbow - 90° Exhaust | 1 | ABCDKMN |
| -80 | 530250 | | . Elbow - 90° Exhaust | 1 | E |
| -81 | 20277 | | . Liner - Exhaust elbow | 1 | ABCDKMN |
| -82 | 20990 | | . Stud - 5/16-18 x 5/16-24 x 1-1/4 in. long | 2 | ABCDKMN |
| -82 | 20992 | | . Stud - 5/16-18 x 5/16-24 x 1-3/8 in. long | 2 | E |
| -83 | 20886 | | Flange - Exhaust pipe | 7 | All |
| (ATTACHING PARTS) | | | | | |
| -84 | 2473 | | Washer - 5/16 in. plain | 14 | All |
| -85 | 2463 | | Nut - 5/16-24 | 14 | All |
| -----* | | | | | |
| 97-1 | 3112 | | Gasket - Accessory case | 1 | ABCDKMN |
| -1 | 531085 | | Gasket - Accessory case | 1 | E |
| | A6180-A1 | | Accessory Case and Gear Assembly | 1 | A |
| | A6317-A1 | | Accessory Case and Gear Assembly | 1 | BCDN |
| | 530512-A2 | | Accessory Case and Gear Assembly | 1 | E |
| | A6420-A1 | | Accessory Case and Gear Assembly | 1 | KM |
| (ATTACHING PARTS) | | | | | |
| -2 | 2473 | | Washer - 5/16 in. plain | 11 | All |
| -3 | 2439 | | Nut - 5/16-24 | 13 | All |
| -4 | 2560 | | Palnut - 5/16-24 | 13 | All |
| -----* | | | | | |
| | A6180 | | . Accessory Case Assembly | 1 | A |
| | A6317 | | . Accessory Case Assembly | 1 | BCDN |
| | 530512-A1 | | . Accessory Case Assembly | 1 | E |
| | A6420 | | . Accessory Case Assembly | 1 | KN |
| -5 | 6157 | | . . Accessory Case | 1 | A |
| -5 | 6317 | | . . Accessory Case | 1 | BCDN |
| -5 | 530511 | | . . Accessory Case | 1 | E |
| -5 | 6420 | | . . Accessory Case | 1 | KM |
| | 530513 | | . . Sleeve - Generator oil drain | 1 | E |

GROUP ASSEMBLY PARTS LIST - Continued

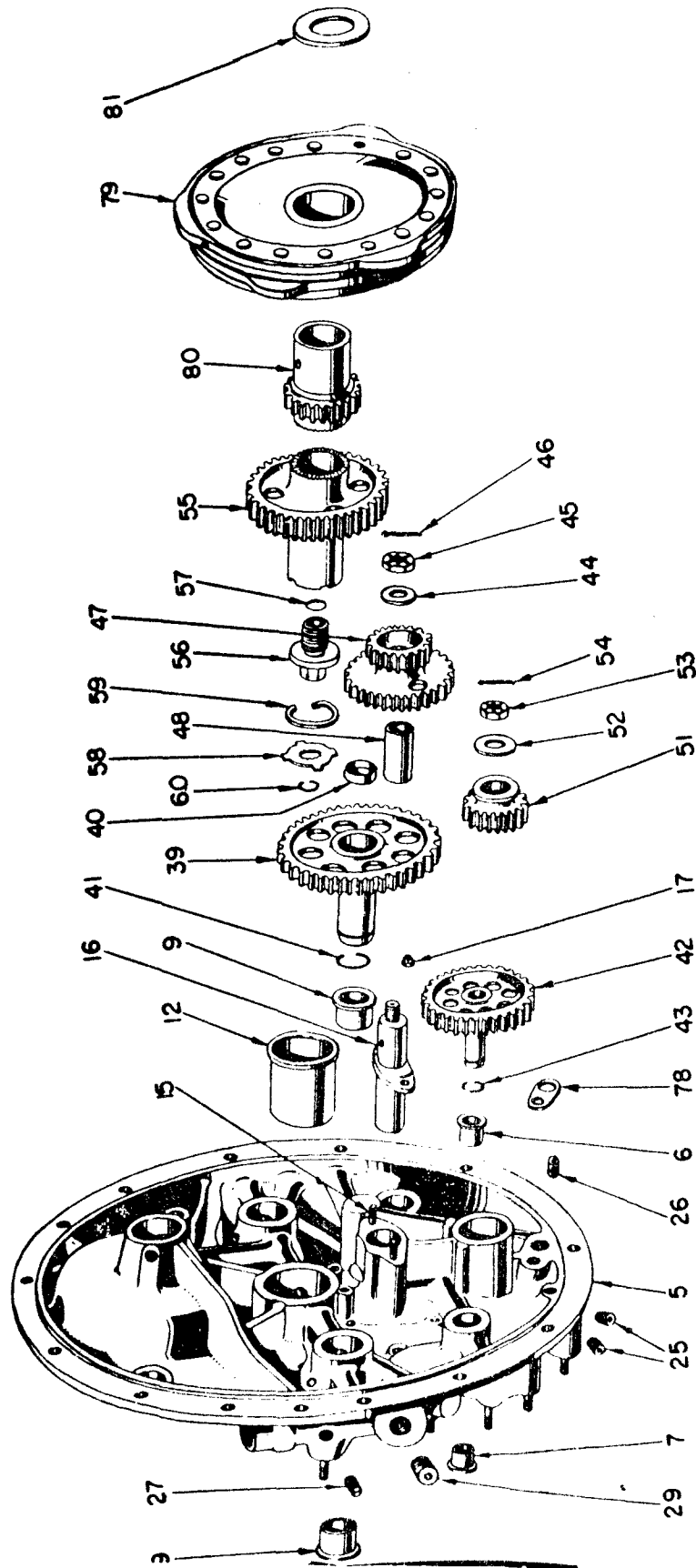


Figure 97. Accessory Case (Rear)

CONTINENTAL W 670 AIRCRAFT ENGINES

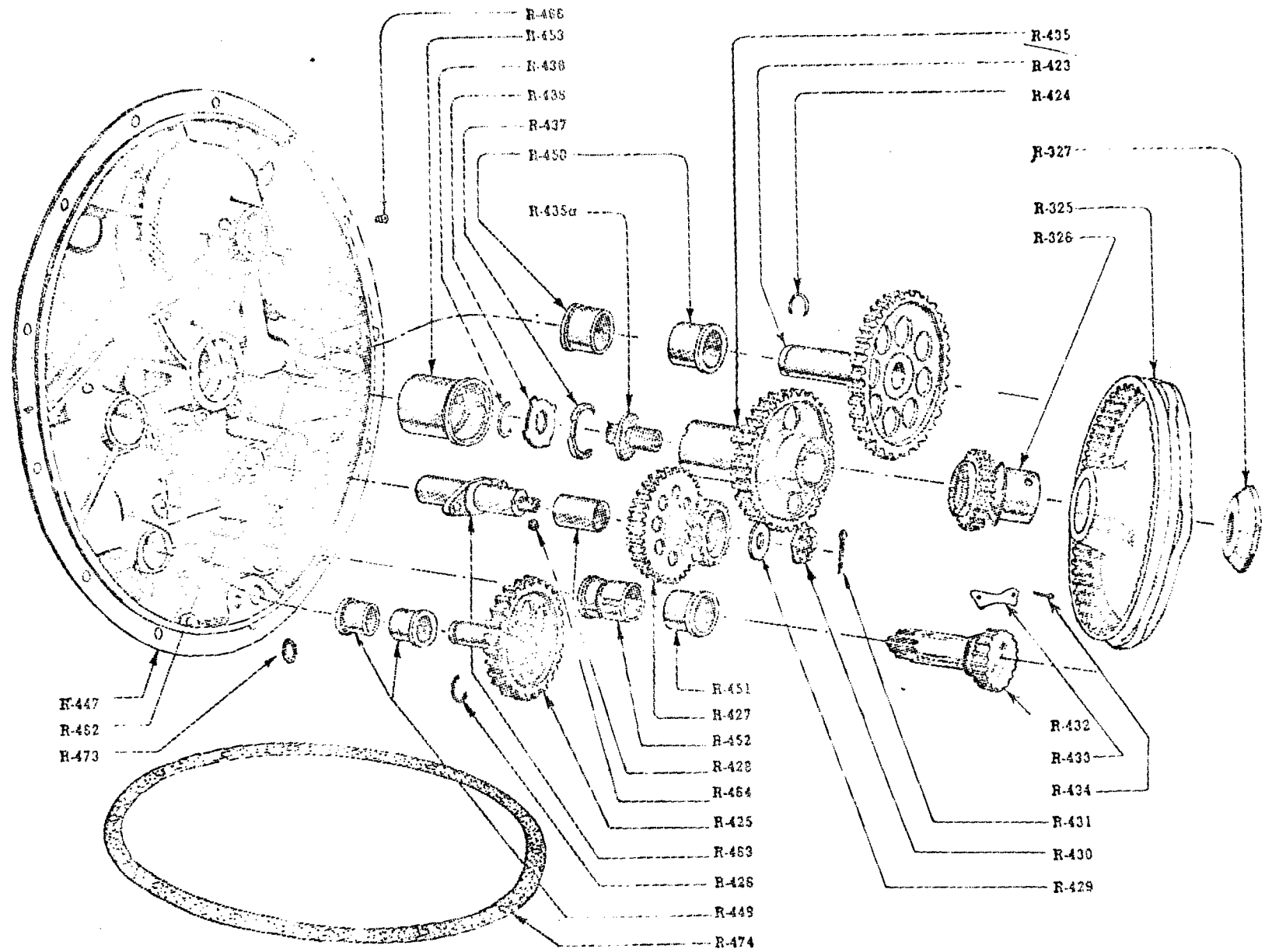
GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|--------------------|-------------|---|---|---|---|---|-----------|------|
| 97-6 | 2581 | . | . | . | . | Bushing - Rocker scavenge pump drive | 2 | All |
| -7 | 2581 | . | . | . | . | Bushing - Duplex pump drive shaft | 2 | All |
| -8 | 2580 | . | . | . | . | Bushing - Generator drive front | 1 | All |
| -9 | 2580 | . | . | . | . | Bushing - Ignition drive | 4 | All |
| -10 | 2580 | . | . | . | . | Bushing - Starter drive | 2 | All |
| -11 | 22097 | . | . | . | . | Bushing - Generator drive rear | 1 | All |
| -12 | 2574 | . | . | . | . | Bushing - Crankshaft oil feed | 1 | All |
| -13 | 220988 | . | . | . | . | Stud - 1/4-20 x 1/4-28 x 1-1/8 in. lg | 2 | All |
| -14 | 222004 | . | . | . | . | Stud - 1/4-20 x 1/4-28 x 1-3/8 in. lg | 4 | All |
| -15 | 222003 | . | . | . | . | Stud - 5/16-18 x 5/16-24 x 1-1/8 in. lg | 2 | All |
| -16 | 3113 | . | . | . | . | Pin - Cam drive | 1 | All |
| (ATTACHING PARTS) | | | | | | | | |
| -17 | 2457 | . | . | . | . | Nut - 5/16-24 | 2 | All |
| *-----* | | | | | | | | |
| -18 | 220991 | . | . | . | . | Stud - 5/16-18 x 5/16-24 x 1-1/4 in. lg | 4 | All |
| -19 | 220992 | . | . | . | . | Stud - 5/16-18 x 5/16-24 x 1-3/8 in. lg | 4 | All |
| -20 | c20992 | . | . | . | . | Stud - 5/16-18 x 5/16-24 x 1-3/8 in. lg | 6 | All |
| -21 | 220993 | . | . | . | . | Stud - 5/16-18 x 5/16-24 x 1-1/2 in. lg | 6 | All |
| -22 | 220974 | . | . | . | . | Stud - 5/16-18 x 5/16-24 x 3-1/8 in. lg | 5 | All |
| -23 | 220100 | . | . | . | . | Stud - 3/8-16 x 3/8-24 x 1-5/8 in. lg | 6 | All |
| -24 | 2024 | . | . | . | . | Plug - 1/8 in. pipe | 1 | All |
| -25 | 2024 | . | . | . | . | Plug - 1/8 in. pipe | 3 | All |
| -26 | 2024 | . | . | . | . | Plug - 1/8 in. pipe | 1 | All |
| -27 | 20882 | . | . | . | . | Plug - 1/8 in. pipe | 3 | All |
| -28 | 2026 | . | . | . | . | Plug - 1/4 in. pipe | 10 | All |
| -29 | 2025 | . | . | . | . | Plug - 3/8 in. pipe | 1 | All |
| -30 | 2025 | . | . | . | . | Plug - 3/8 in. pipe | 1 | All |
| -31 | 2025 | . | . | . | . | Plug - 3/8 in. pipe | 1 | All |
| -32 | 20889 | . | . | . | . | Seal - Ignition drive oil | 2 | All |
| -33 | 3915 | . | . | . | . | Gear - Starter | 1 | All |
| | A22197 | . | . | . | . | Retainer Assembly - Starter gear | 1 | All |
| (ATTACHING PARTS) | | | | | | | | |
| -34 | 24196 | . | . | . | . | Washer - 5/16 in. special | 1 | All |
| -35 | AN75-11 | . | . | . | . | Screw - 5/16-24 x 1-1/8 in. long | 1 | All |
| *-----* | | | | | | | | |
| -36 | 22169 | . | . | . | . | Retainer - Starter gear | 1 | All |
| -37 | 22197 | . | . | . | . | Bar - Starter gear retainer | 1 | All |
| -38 | AN420-3-16 | . | . | . | . | Rivet - Starter gear retainer | 1 | All |
| | A3891 | . | . | . | . | Gear Assembly - Ignition drive | 2 | A |
| | A3841 | . | . | . | . | Gear Assembly - Ignition drive | 2 | All |
| -39 | 3061 | . | . | . | . | Gear - Ignition drive | 1 | AEKM |
| -39 | 3891 | . | . | . | . | Gear - Ignition drive | 1 | BCDN |
| -40 | 2878 | . | . | . | . | Plug - Oil, Ignition drive gear | 2 | All |
| -41 | 2578 | . | . | . | . | Circllet - Ignition drive gear | 2 | All |
| -42 | 3064 | . | . | . | . | Gear - Oil pump drive | 2 | All |
| -43 | 2590 | . | . | . | . | Circlip - Oil pump drive gear | 2 | All |
| | A3062 | . | . | . | . | Gear Assembly - Intermediate cam drive | 1 | All |
| (ATTACHING PARTS) | | | | | | | | |
| -44 | 2583 | . | . | . | . | Washer - Thrust | 1 | All |
| -45 | 2152 | . | . | . | . | Nut - 9/16-18 | 1 | All |
| -46 | 2505 | . | . | . | . | Cotter Pin - 3/32 OD x 7/8 in. long | 1 | All |
| *-----* | | | | | | | | |
| -47 | 3062 | . | . | . | . | Gear - Intermediate cam drive | 1 | All |
| -48 | 2582 | . | . | . | . | Bushing - Intermediate cam drive gear | 1 | All |
| | 50051-A1 | . | . | . | . | Gear Assembly - Generator drive | 1 | All |
| | 50081 | . | . | . | . | Gear - Generator drive | 1 | All |
| -50 | 2807 | . | . | . | . | Rivet - Generator drive assembly | 1 | All |
| -51 | 500053 | . | . | . | . | Pinion - Generator drive | 1 | All |
| (ATTACHING PARTS) | | | | | | | | |
| -52 | 2480 | . | . | . | . | Washer - Generator drive pinion | 1 | All |
| -53 | 2923 | . | . | . | . | Nut - 3/4-16 | 1 | All |
| -54 | 2508 | . | . | . | . | Cotter Pin - 3/32 OD x 1-1/8 in. long | 1 | All |

CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

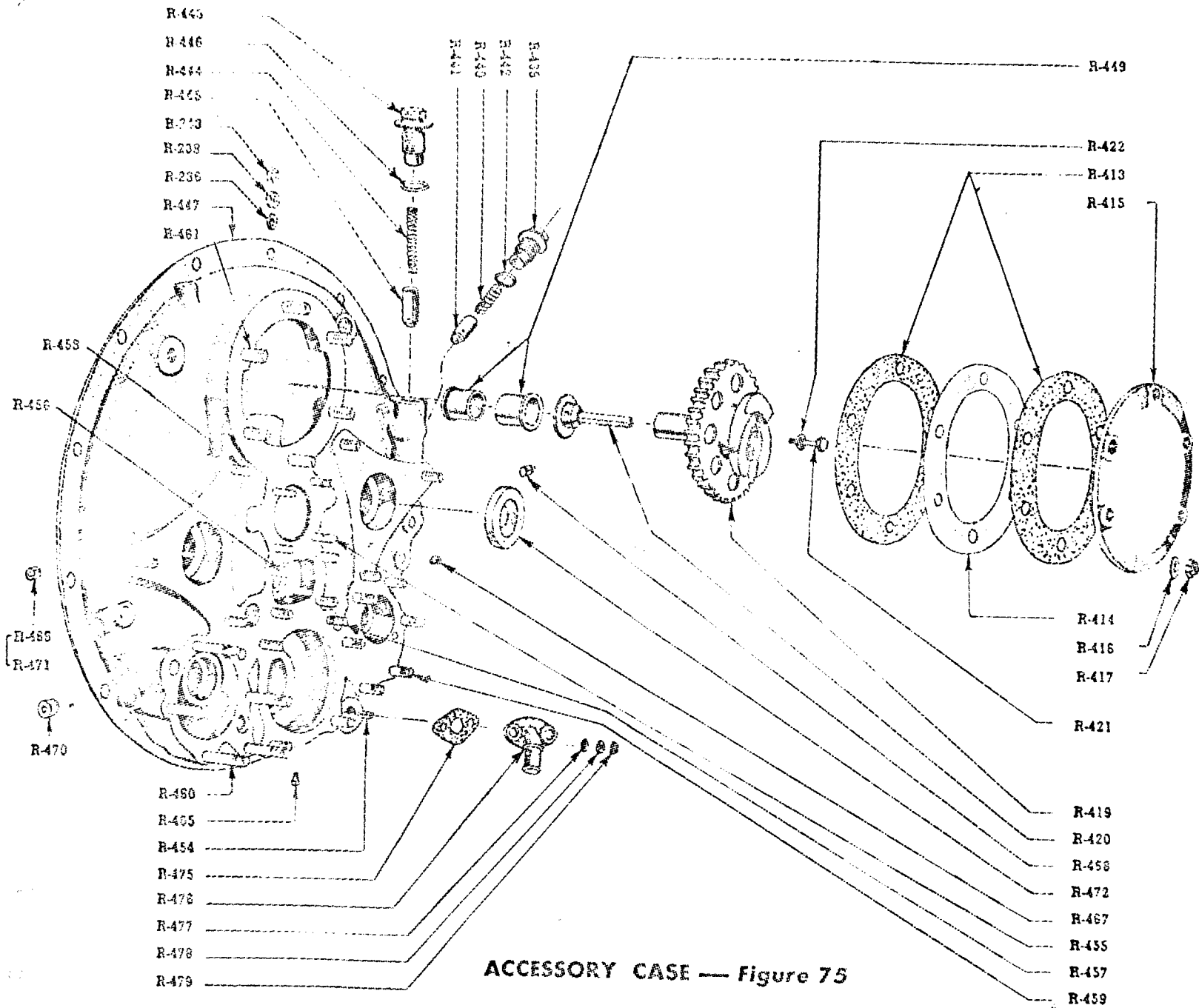
GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|--------------------|-------------|---|---|---|---|---|-----------|---------|
| 97- | 3067-A1 | . | . | . | . | Gear Assembly - Crankshaft starter | 1 | All |
| -55 | 3067 | . | . | . | . | Gear - Crankshaft starter | 1 | All |
| | 2872-A1 | . | . | . | . | Nut Assembly - Rear crankshaft | 1 | All |
| -56 | 2872 | . | . | . | . | Nut - Rear crankshaft | 1 | All |
| -57 | 2526 | . | . | . | . | Plug - 5/8 in. expansion | 1 | All |
| -58 | 2576 | . | . | . | . | Lock washer - Crankshaft rear nut | 1 | All |
| -59 | 22094 | . | . | . | . | Ring - Extractor | 1 | All |
| -60 | 2079 | . | . | . | . | Circlip - Rear crankshaft nut | 1 | All |
| -61 | 20467 | . | . | . | . | Gasket - Rocker scavenge elbow or cover | 1 | ABCDKMN |
| -61 | 531092 | . | . | . | . | Gasket - Rocker scavenge elbow or cover | 1 | E |
| | 20466 | . | . | . | . | Elbow - Rocker scavenge | 1 | EKM |
| -62 | 20567 | . | . | . | . | Cover - Rocker scavenge elbow pad | 1 | ABCDN |
| (ATTACHING PARTS) | | | | | | | | |
| -63 | 2472 | . | . | . | . | Washer - 1/4 in. plain | 2 | All |
| -64 | 2437 | . | . | . | . | Nut - 1/4-28 | 2 | All |
| -65 | 2886 | . | . | . | . | Palnut - 1/4-28 | 2 | All |
| -----* | | | | | | | | |
| -66 | AN502-10-4 | . | . | . | . | Screw - No. 10-32 | 1 | All |
| -67 | 835-8 | . | . | . | . | Nipple - 5/8 in. hose | 1 | All |
| -68 | 2249 | . | . | . | . | Gasket - Starter | 2 | ABCDKMN |
| -68 | 531090 | . | . | . | . | Gasket - Starter | 2 | E |
| -69 | 2667 | . | . | . | . | Spacer - Starter gasket | 1 | All |
| -70 | 2304 | . | . | . | . | Cover - Starter drive | 1 | All |
| (ATTACHING PARTS) | | | | | | | | |
| -71 | 2474 | . | . | . | . | Washer - 3/8 in. plain | 6 | All |
| -72 | 2441 | . | . | . | . | Nut - 3/8-24 | 6 | All |
| -73 | 2561 | . | . | . | . | Palnut - 3/8-24 | 6 | All |
| -----* | | | | | | | | |
| -74 | 20247 | . | . | . | . | Valve - Low pressure oil relief | 1 | All |
| -75 | 23168 | . | . | . | . | Spring - Low pressure oil relief | 1 | All |
| -76 | AN900-14 | . | . | . | . | Gasket - Valve housing | 1 | All |
| -77 | 20246 | . | . | . | . | Housing - Relief valve | 1 | All |
| -78 | 20421 | . | . | . | . | Gasket - Scavenge oil line | 1 | All |
| -79 | A5160 | . | . | . | . | Cam Ring Assembly | 1 | All |
| -80 | 3068 | . | . | . | . | Gear - Cam drive | 1 | All |
| -81 | 20259 | . | . | . | . | Spacer - Rear crankshaft bearing | 1 | All |



ACCESSORY CASE — Figure 74

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ACCESSORY CASE — Figure 75

MODEL W670-9A ILLUSTRATED PARTS LIST

ASSEMBLY PARTS LIST — Continued

| Ref. No. | Part No. | Part Name | No. Req'd |
|-------------|------------------|--|--------------|
| R-411 | A20878 | (1) SCREEN ASSEMBLY — SCAVENGE OIL..... Includes the oil screen, ferrule, and nut | 1 |
| R-412 | AN900-16 2220 | (1) Gasket — 1" dia. — scavenge oil screen accessory case UAR Wire — lock — scavenge oil screen to accessory case | |
| R-413 | 2249 | (2) Gasket — starter flange | |
| R-414 | 2667 | (1) Spacer — starter flange | |
| R-415 | 2304 | (1) Cover — starter flange (shipping and overhauling only) | |
| R-416 | AN936-B616 | (6) Washer, Lock — starter or cover to accessory case | |
| R-417 | 2458 | (6) Nut — $\frac{3}{8}$ -24 — castle — starter or cover to accessory case | |
| R-418 | 2220 | UAR Wire — lock — starter or cover | |
| | A6158-A1 | (1) ACCESSORY CASE AND GEAR ASSEMBLY..... Includes the following parts and assemblies: | 1 |
| | A3915 | (1) GEAR ASSEMBLY — STARTER..... | 1 |
| R-419 | 3915 | (1) Gear — starter | |
| R-420 | A22197 | (1) RETAINER ASSEMBLY — STARTER GEAR..... Includes the retainer, bar and rivet | 1 |
| R-421 | AN75-11 | (1) Screw — $\frac{1}{8}$ -24 x $1\frac{1}{8}$ — drilled — hex head — starter gear retainer bar | |
| R-422 | 24196 | (1) Washer — $\frac{1}{8}$ — special — starter gear retainer bar screw | |
| | 2220 | UAR Wire — lock — starter gear retainer bar screw | |
| R-423 | A35099 | (2) GEAR ASSEMBLY — IGNITION DRIVE..... Includes oil plugs | 2 |
| R-424 | 2578 | (2) Circlip — $1\frac{1}{8}$ dia. — ignition drive gear | |
| | 3978 | (1) Gear — duplex pump — drive | |
| R-425 | 3978 | (1) Gear — rocker scavenge oil pump — drive | |
| R-426 | 2590 | (2) Circlip — $\frac{1}{2}$ dia. — oil pump drive gear | |
| | A3979 | (1) GEAR ASSEMBLY — INTERMEDIATE CAM DRIVE..... | 1 |
| R-427 | *3979 | (1) Gear — intermediate cam drive | |
| R-428 | 2582 | (1) Bushing — intermediate cam drive gear | |
| R-429 | 2583 | (1) Washer — $\frac{1}{8}$ — thrust — intermediate cam drive gear | |
| R-430 | 2152 | (1) Nut — $\frac{1}{8}$ -18 — shear — cam drive gear pin | |
| R-431 | 2505 | (1) Cotter Pin — $\frac{3}{32}$ x $\frac{7}{8}$ — cam drive gear pin | |
| R-432 | 3942 | (1) Gear — generator — drive | |
| R-433 | 2592 | (1) Retainer — generator drive gear | |
| R-434 | 2602 | (2) Screw — No. 10-32 x $\frac{5}{8}$ — drilled — fillister head — generator drive gear retainer to accessory case | |
| | 2220 | UAR Wire — lock — generator drive gear retainer screws | |
| | 4378-A1 | (1) GEAR ASSEMBLY—REAR CRANKSHAFT—STARTER | 1 |
| R-435 | 4378 | (1) Gear — rear crankshaft starter | |
| R-435a | 2872-A1 | (1) NUT ASSEMBLY — REAR CRANKSHAFT (Includes plug)..... | 1 |
| R-436 | 2576 | (1) Washer — crankshaft rear nut — lock | |
| R-437 | 22094 | (1) Ring — rear crankshaft — extractor | |
| R-438 | 2079 | (1) Circlip — $\frac{7}{8}$ dia. — rear crankshaft nut | |
| R-439 | 2599 | (1) Housing — high pressure — oil relief valve | |
| R-440 | 22812 | (1) Spring — high pressure — oil relief valve | |
| R-441 | 2600 | (1) Valve — high pressure — oil relief | |
| R-442 | AN900-16 | (1) Gasket — high pressure — oil relief valve | |

*Parts not to be stocked or requisitioned as detailed parts.

MODEL W670-9A ILLUSTRATED PARTS LIST

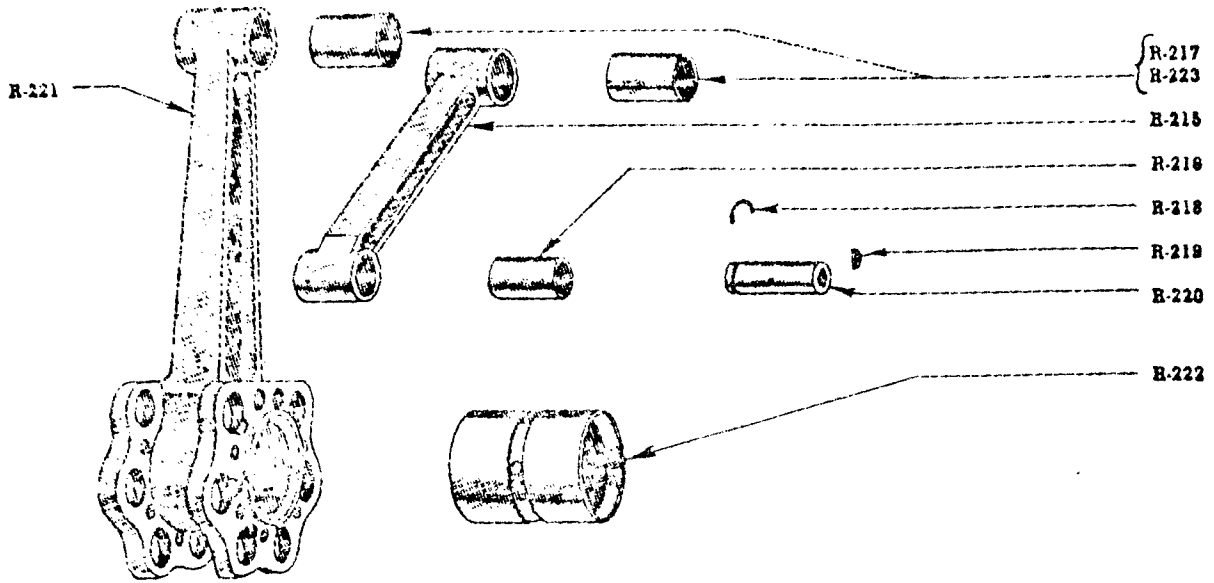
ASSEMBLY PARTS LIST — Continued

| Ref. No. | Part No. | Part Name | No. Req'd |
|--------------------------|------------|--|-----------|
| | 2220 | UAR Wire — lock — high pressure — oil relief valve | |
| R-443 | 20246 | (1) Housing — low pressure — oil relief valve | |
| R-444 | 20248 | (1) Spring — low pressure — oil relief valve (Replaces 23168) | |
| R-445 | 20247 | (1) Valve — low pressure — oil relief | |
| R-446 | AN900-14 | (1) Gasket — low pressure — oil relief valve | |
| R-447 | A6305 | (1) ACCESSORY, STUD, BUSHING AND PLUG ASSEMBLY..... 1 | |
| | *6158 | (1) Case — accessory | |
| | 2581 | (2) Bushing — oil pump — drive gear | |
| R-448 | 2581 | (2) Bushing — rocker scavenge oil pump drive gear | |
| R-449 | 2580 | (2) Bushing — starter gear | |
| R-450 | 2580 | (4) Bushing — ignition drive gear | |
| R-451 | 2580 | (1) Bushing — generator drive shaft — front | |
| R-452 | 22097 | (1) Bushing — generator drive shaft — rear | |
| R-453 | † 2574 | (1) Bushing — crankshaft — oil feed | |
| R-454 | †20988 | (2) Stud — $\frac{1}{4}$ -28 x $1\frac{1}{8}$ — rocker scavenge elbow | |
| R-455 | †22004 | (4) Stud — $\frac{1}{4}$ -28 x $1\frac{3}{8}$ — tachometer drive housing | |
| R-456 | †20991 | (4) Stud — $\frac{1}{8}$ -24 x $1\frac{1}{4}$ — high pressure oil screen housing | |
| R-457 | †20992 | (4) Stud — $\frac{1}{8}$ -24 x $1\frac{3}{8}$ — drilled — generator pulley support | |
| R-458 | †20992 | (6) Stud — $\frac{1}{8}$ -24 x $1\frac{3}{8}$ — drilled — magneto | |
| R-459 | †20993 | (6) Stud — $\frac{1}{8}$ -24 x $1\frac{1}{2}$ — drilled — rocker scavenge pump | |
| R-460 | † 2403 | (5) Stud — $\frac{1}{8}$ -24 x $2\frac{1}{2}$ — drilled — duplex oil pump | |
| R-461 | † 2418 | (6) Stud — $\frac{3}{8}$ -24 x $1\frac{5}{8}$ — starter or cover | |
| R-462 | †22003 | (2) Stud — $\frac{1}{8}$ -24 x $1\frac{1}{8}$ — drilled — cam drive gear pin | |
| R-463 | 3113 | (1) Pin — cam drive gear | |
| R-464 | 2457 | (2) Nut — $\frac{1}{8}$ -24 — castle — cam drive gear pin | |
| | 2220 | UAR Wire — lock — cam drive gear pin — nut | |
| R-465 | AN502-10-4 | (1) Screw — No. 10-32 x $\frac{1}{4}$ — accessory case drain | |
| R-466 | 2024 | (1) Plug — $\frac{1}{8}$ — pipe — countersunk head — high pressure oil line | |
| R-467 | 2024 | (3) Plug — $\frac{1}{8}$ — pipe — countersunk head — rocker scavenge oil line | |
| | 2024 | (1) Plug — $\frac{1}{8}$ — pipe — countersunk head — starter shaft oil hole | |
| R-468 | 20882 | (3) Plug — $\frac{1}{8}$ — pipe — square drilled head — oil pressure gauge holes | |
| R-469 | 2026 | (9) Plug — $\frac{1}{4}$ — pipe — countersunk head — accessory case oil lines | |
| R-470 | 2025 | (1) Plug — $\frac{3}{8}$ — pipe — countersunk head — crankcase scavenge oil line | |
| R-471 | 2026 | (1) Plug — $\frac{1}{4}$ — pipe — countersunk head — scavenge screen outlet | |
| R-472 | 20889 | (2) Seal — ignition drive gear shaft — oil | |
| ASSOCIATED PARTS: | | | |
| R-473 | 2867 | Gasket — Scavenge oil line..... | 1 |
| R-474 | 3112 | Gasket — accessory case to crankcase..... | 1 |
| | 2473 | Washer — $\frac{1}{8}$ — accessory case to crankcase..... | 13 |
| | 2439 | Nut — $\frac{1}{8}$ -24 — accessory case to crankcase..... | 13 |
| | 2560 | Palnut — $\frac{1}{8}$ — accessory case to crankcase..... | 13 |

Parts not to be stocked or requisitioned as detailed parts.

† Available in oversize.

MODEL W570-9A ILLUSTRATED PARTS LIST



MASTER CONNECTING AND ARTICULATING ROD ASSEMBLY — Figure 69

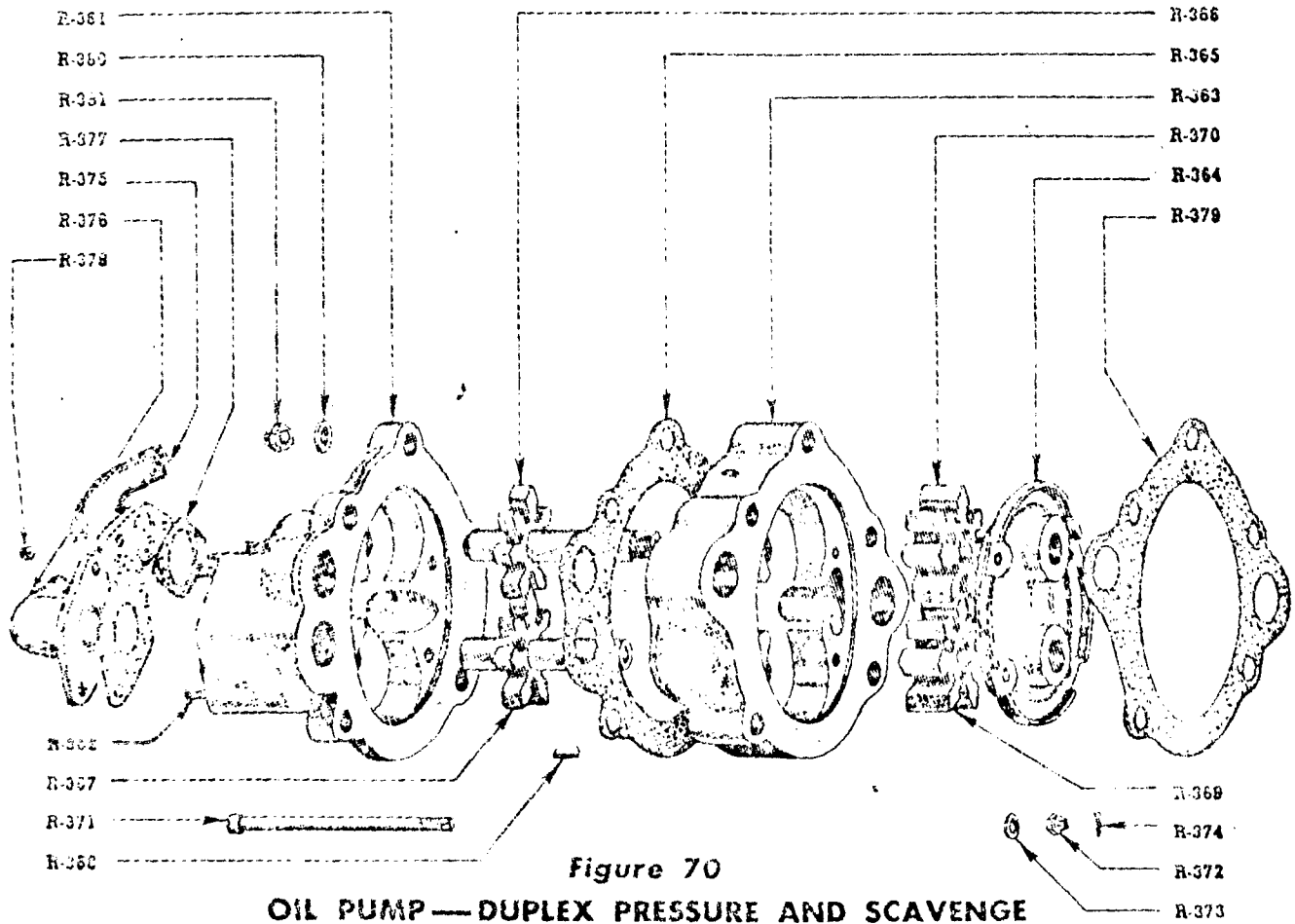


Figure 70

OIL PUMP — DUPLEX PRESSURE AND SCAVENGE

MODEL W670-9A ILLUSTRATED PARTS LIST

ASSEMBLY PARTS LIST — Continued

| Ref. No. | Part No. | Part Name | No. Req'd |
|----------|-------------|--|-----------|
| R-336 | 2437 | (4) Nut — 1/4-28 — tachometer drive housing to accessory case | |
| R-337 | 2886 | (4) Palnut — 1/4 — tachometer drive housing to accessory case | |
| | 5231-A1 | (1) GENERATOR PULLEY SUPPORT ASSEMBLY..... | 1 |
| R-338 | 5231 | (1) Support — generator pulley | |
| R-339 | 3943 | (1) Shaft — generator drive | |
| R-340 | 22778 | (1) Bearing — ball — lubriscal | |
| R-341 | 500056 | (1) Thrower — generator shaft oil | |
| R-342 | 20962 | (1) Gasket — bearing retainer | |
| R-343 | 20641 | (1) Retainer — bearing | |
| R-344 | 20589 | (1) Key — No. 6 — Woodruff — generator drive shaft | |
| R-345 | 2923 | (1) Nut — generator drive shaft | |
| R-346 | 2480 | (1) Washer — 3/4 — generator drive shaft | |
| R-347 | 2508 | (1) Cotter Pin — generator pulley nut | |
| R-348 | 501A10-8 | (5) Screw — bearing retainer to pulley support | |
| | 2220 | UAR Wire — lock — bearing retainer screws | |
| R-349 | 3941 | (1) Pulley — generator drive | |
| R-350 | 4292 | (2) Belt — generator drive | |
| R-351 | 20595 | (1) Gasket — governor to pulley support | |
| R-352 | †20624 | (4) Stud — 3/8 x 1 1/8 — drilled — governor to pulley support | |
| R-353 | 2453 | (4) Nut — 3/8-24 — castle, governor to pulley support | |
| R-354 | 2220 | UAR Lock Wire — governor to pulley support | |
| R-355 | 20979 | (1) Coupling — generator drive | |
| R-356 | 20961 | (1) Retainer — drive coupling | |
| R-357 | 500060 | (1) Gasket — pulley support to accessory case | |
| R-358 | 2473 | (4) Washer — 1/8 — pulley support to accessory case | |
| R-359 | 2439 | (4) Nut — 1/8-24 — pulley support to accessory case | |
| R-360 | 2560 | (4) Palnut — 1/8 — pulley support to accessory case | |
| | A4174-A1 | (1) PRESSURE AND SCAVENGE OIL PUMP ASSEMBLY — | |
| | A4174 | COMPLETE (LVT-1 and LVT-2) | 1 |
| | 4174-A1 | (1) PRESSURE AND SCAVENGE OIL PUMP ASSEMBLY | |
| | | (1) PRESSURE OIL PUMP BODY WITH STUDS | |
| R-361 | *4174 | (1) Body — pressure pump | |
| R-362 | †22003 | (4) Stud — 1/8 x 1 1/8 — dr.-connections to pressure body | |
| R-363 | 4057 | (1) Body — duplex pump — scavenge | |
| R-364 | 3118 | (1) Cover — duplex pump — scavenge body | |
| R-365 | 2595 | UAR Gasket — duplex pump — pressure body to scavenge body | |
| R-366 | 3199 | (1) Gear — duplex pump — pressure section — drive | |
| R-367 | 3200 | (1) Gear — duplex pump — pressure section — driven | |
| R-368 | 2219 | (1) Key — Woodruff — duplex — pump — driven gear shaft | |
| R-369 | 2593 | (1) Gear — duplex pump — scavenge section — drive | |
| R-370 | 2594 | (1) Gear — duplex pump — scavenge section — driven | |
| R-371 | <u>2596</u> | (4) Bolt — duplex pump — pressure section to scavenge section | |
| R-372 | <u>2456</u> | (4) Nut — 1/4-28 — castle — pressure section to scavenge section | |
| R-373 | <u>2472</u> | (4) Washer — 1/4 — pressure section to scavenge section | |
| R-374 | AN380-2-2 | (4) Cotter Pin — pressure section to scavenge section | |

*Parts Not to be stocked or requisitioned as detailed parts.

†Available in oversize.

MODEL W670-9A ILLUSTRATED PARTS LIST

ASSEMBLY PARTS LIST — Continued

| Ref. No. | Part No. | Part Name | No. Req'd |
|----------|----------|--|-----------|
| R-375 | 35175 | (1) Connection — oil pump inlet — (LVT-1 and LVT-2) | |
| R-376 | 22085 | (1) Connection — oil pump outlet — (LVT-1 and LVT-2) | |
| R-377 | 20291 | (2) Gasket — elbow connection to duplex pump | |
| R-378 | 2457 | (4) Nut — $\frac{1}{8}$ "-24 — castle — elbow — connection to duplex pump | |
| | 2220 | UAR Wire — lock — elbow — connection to duplex pump | |
| R-379 | 2597 | (1) Gasket — duplex pump to accessory case | |
| R-380 | 2473 | (5) Washer — $\frac{1}{8}$ " — duplex pump to accessory case | |
| R-381 | 2457 | (5) Nut — $\frac{1}{8}$ "-24 — castle — duplex pump to accessory case | |
| | 2220 | UAR Wire — lock — duplex pump to accessory case | |
| | A4170-A | (1) ROCKER SCAVENGE OIL PUMP ASSEMBLY—COMPLETE | 1 |
| | A4170-A1 | (1) ROCKER SCAVENGE OIL PUMP ASSEMBLY..... | 1 |
| | A4170 | (1) BODY ASSEMBLY — ROCKER SCAVENGE OIL PUMP..... | 1 |
| R-382 | *4170 | (1) Body — rocker scavenge oil pump | |
| R-383 | †20991 | (4) Stud — $\frac{1}{8}$ " x $1\frac{1}{4}$ " — fuel pump or cover to rocker scavenge pump | |
| R-384 | 20422 | (1) Dowel — $\frac{1}{4}$ " x $\frac{3}{8}$ " — rocker scavenge pump body to cover | |
| R-385 | 20418 | (1) Gear — rocker scavenge pump — drive | |
| R-386 | 20419 | (1) Gear — rocker scavenge pump — driven | |
| R-387 | 3248 | (1) Cover — rocker scavenge pump | |
| R-388 | 20532 | (1) Gasket — rocker scavenge pump — cover | |
| R-389 | 20420 | (1) Coupling — fuel pump — drive | |
| R-390 | 20426 | (1) Cover — fuel pump — drive | |
| R-391 | 20423 | (1) Gasket — fuel pump or cover | |
| R-392 | 2473 | (4) Washer — $\frac{1}{8}$ " — fuel pump or cover | |
| R-393 | 2439 | (4) Nut — $\frac{1}{8}$ "-24 — fuel pump or cover | |
| R-394 | 2560 | (4) Palnut — $\frac{1}{8}$ " — fuel pump or cover | |
| R-395 | 20425 | (1) Gasket — rocker scavenge pump to accessory case | |
| R-396 | 2473 | (6) Washer — $\frac{1}{8}$ " — rocker scavenge pump to accessory case | |
| R-397 | 2457 | (6) Nut — $\frac{1}{8}$ "-24 — castle — rocker scavenge pump to accessory case | |
| | 2220 | UAR Wire — lock — rocker — scavenge pump to accessory case | |
| | A500014 | (1) SCREEN AND HOUSING ASSEMBLY — HIGH PRESSURE OIL | 1 |
| R-398 | 500015 | (1) SCREEN ASSEMBLY — HIGH PRESSURE OIL..... | 1 |
| | | Includes the oil screen, ferrule, and nut | |
| R-399 | 500014 | (1) Housing — high pressure oil screen | |
| R-400 | AN900-24 | (1) Gasket — $1\frac{1}{2}$ " dia. — screen assembly to housing | |
| R-401 | 2349 | (1) Ball — $\frac{1}{8}$ " — steel — by-pass valve | |
| R-402 | 2848 | (1) Spring — by-pass valve | |
| R-403 | 2265 | (1) Plug — $\frac{5}{8}$ "-18 — hex head — oil screen nut | |
| R-404 | 2265 | (1) Plug — $\frac{5}{8}$ "-18 — hex head — by-pass valve | |
| R-405 | AN900-10 | (1) Gasket — $\frac{5}{8}$ " dia. — screen plug | |
| R-406 | AN900-10 | (1) Gasket — $\frac{5}{8}$ " dia. — by-pass valve plug | |
| R-407 | 2589 | (1) Gasket — high pressure oil screen housing to accessory case | |
| R-408 | 2473 | (4) Washer — $\frac{1}{8}$ " — pressure oil screen housing to accessory case | |
| | 2220 | UAR Wire — lock — screen assembly and plugs | |
| R-409 | 2439 | (4) Nut — $\frac{1}{8}$ "-24 — pressure oil screen housing to accessory case | |
| R-410 | 2560 | (4) Palnut — $\frac{1}{8}$ " — pressure oil screen housing to accessory case | |

Parts not to be stocked or requisitioned as detailed parts.

†Available in oversize.

CONTINENTAL W 6 7 0 A I R C R A F T E N G I N E S

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|--------------------|-------------|---|---|---|---|---|-----------|---------|
| 97- | 3067-A1 | . | . | . | . | Gear Assembly - Crankshaft starter | 1 | All |
| -55 | 3067 | . | . | . | . | Gear - Crankshaft starter | 1 | All |
| | 2872-A1 | . | . | . | . | Nut Assembly - Rear crankshaft | 1 | All |
| -56 | 2872 | . | . | . | . | Nut - Rear crankshaft | 1 | All |
| -57 | 2526 | . | . | . | . | Plug - 5/8 in. expansion | 1 | All |
| -58 | 2576 | . | . | . | . | Lock washer - Crankshaft rear nut | 1 | All |
| -59 | 22094 | . | . | . | . | Ring - Extractor | 1 | All |
| -60 | 2079 | . | . | . | . | Circlip - Rear crankshaft nut | 1 | All |
| -61 | 20467 | . | . | . | . | Gasket - Rocker scavenge elbow or cover | 1 | ABCDKMN |
| -61 | 531092 | . | . | . | . | Gasket - Rocker scavenge elbow or cover | 1 | E |
| | 20466 | . | . | . | . | Elbow - Rocker scavenge | 1 | EKM |
| -62 | 20567 | . | . | . | . | Cover - Rocker scavenge elbow pad | 1 | ABCDN |
| (ATTACHING PARTS) | | | | | | | | |
| -63 | 2472 | . | . | . | . | Washer - 1/4 in. plain | 2 | All |
| -64 | 2437 | . | . | . | . | Nut - 1/4-28 | 2 | All |
| -65 | 2886 | . | . | . | . | Palnut - 1/4-28 | 2 | All |
| -----* | | | | | | | | |
| -66 | AN502-10-4 | . | . | . | . | Screw - No. 10-32 | 1 | All |
| -67 | 835-8 | . | . | . | . | Nipple - 5/8 in. hose | 1 | All |
| -68 | 2249 | . | . | . | . | Gasket - Starter | 2 | ABCDKMN |
| -68 | 531090 | . | . | . | . | Gasket - Starter | 2 | E |
| -69 | 2667 | . | . | . | . | Spacer - Starter gasket | 1 | All |
| -70 | 2304 | . | . | . | . | Cover - Starter drive | 1 | All |
| (ATTACHING PARTS) | | | | | | | | |
| -71 | 2474 | . | . | . | . | Washer - 3/8 in. plain | 6 | All |
| -72 | 2441 | . | . | . | . | Nut - 3/8-24 | 6 | All |
| -73 | 2561 | . | . | . | . | Palnut - 3/8-24 | 6 | All |
| -----* | | | | | | | | |
| -74 | 20247 | . | . | . | . | Valve - Low pressure oil relief | 1 | All |
| -75 | 23168 | . | . | . | . | Spring - Low pressure oil relief | 1 | All |
| -76 | AN900-14 | . | . | . | . | Gasket - Valve housing | 1 | All |
| -77 | 20246 | . | . | . | . | Housing - Relief valve | 1 | All |
| -78 | 20421 | . | . | . | . | Gasket - Scavenge oil line | 1 | All |
| -79 | A5160 | . | . | . | . | Cam Ring Assembly | 1 | All |
| -80 | 3068 | . | . | . | . | Gear - Cam drive | 1 | All |
| -81 | 20259 | . | . | . | . | Spacer - Rear crankshaft bearing | 1 | All |

GROUP ASSEMBLY PARTS LIST - Continued

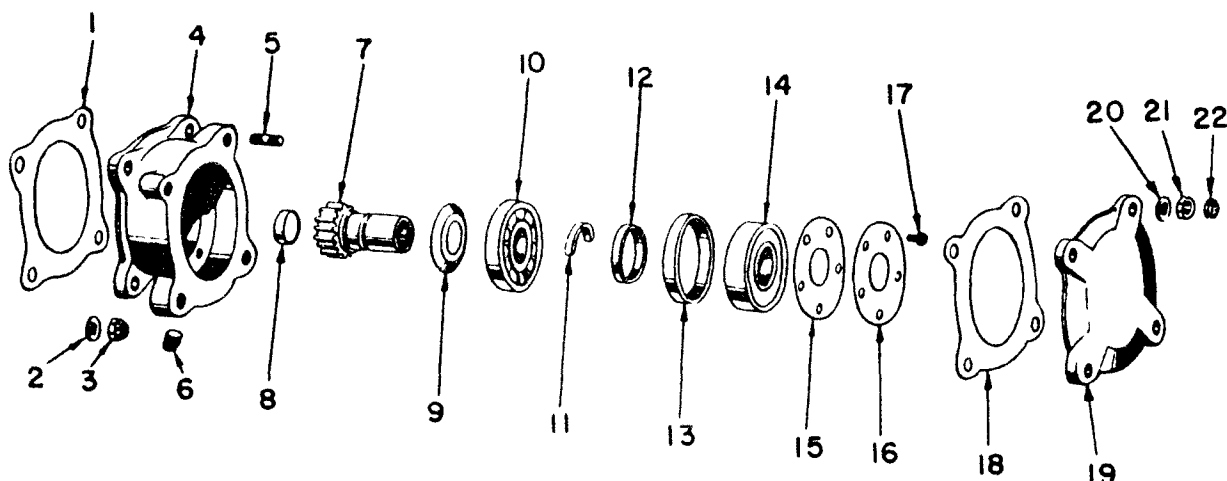


Figure 98. Generator Speed Step-up Drive Assembly

| Figure & Index No. | Part Number | Description | Per Assy. | Code |
|--------------------|-------------|--|-----------|---------|
| 98-1 | 22444 | Gasket - Generator drive housing | 1 | ABCDKMN |
| -1 | 531104 | Gasket - Generator drive housing | 1 | E |
| | A3926 | Drive Assembly - Generator Speed Step-up | 1 | All |
| | | (ATTACHING PARTS) | | |
| -2 | 2473 | Washer - 5/16 in. plain | 4 | All |
| -3 | 2439 | Nut - 5/16-24 | 4 | All |
| | | -----* | | |
| | 4674-A1 | . Housing Assembly - Generator drive | 1 | All |
| -4 | 4674 | . . . Housing - Generator drive | 1 | All |
| -5 | 220991 | . . . Stud - 5/16-18 x 5/16-24 x 1-1/4 in. long. | 4 | ABCDKMN |
| -5 | 22324 | . . . Stud - 5/16-18 x 5/16-24 x 1-3/8 in. long. | 4 | E |
| -6 | 20882 | . Plug - 1/8 in. pipe | 1 | All |
| | A20887 | . Pinion Assembly - Generator step-up. | 1 | All |
| -7 | 500055 | . . . Pinion - Generator step-up | 1 | All |
| -8 | 2878 | . . . Plug - Oil. | 1 | All |
| -9 | 500056 | . Thrower - Oil | 1 | All |
| -10 | 500064 | . Bearing - Ball, step-up pinion, front | 1 | All |
| -11 | 500066 | . Lock - Bearing. | 2 | All |
| -12 | 500059 | . Retainer - Bearing lock. | 1 | All |
| -13 | 500057 | . Spacer - Bearing | 1 | All |
| -14 | 22778 | . Bearing - Ball, step-up pinion, rear. | 1 | ABCDKMN |
| -14 | 531078 | . Bearing - Ball, step-up pinion, rear. | 1 | E |
| -15 | 500062 | . Gasket - Bearing retainer | 1 | ABCDKMN |
| -15 | 531106 | . Gasket - Bearing retainer | 1 | E |
| -16 | 500061 | . Retainer - Bearing | 1 | All |
| | | (ATTACHING PART) | | |
| -17 | 501-A10-8 | . Screw - No. 10-32 x 1/2 in. long fillister head. | 5 | All |
| | | -----* | | |
| -18 | 22442 | . Gasket - Generator | 1 | ABCDKMN |
| -18 | 531101 | . Gasket - Generator | 1 | E |
| -19 | 2303 | . Cover - Generator drive | 1 | All |
| | | (ATTACHING PARTS) | | |
| -20 | 2473 | . Washer - 5/16 in. plain | 4 | All |
| -21 | 2439 | . Nut - 5/16-24. | 4 | All |
| -22 | 2560 | . Palnut - 5/16-24. | 4 | All |

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

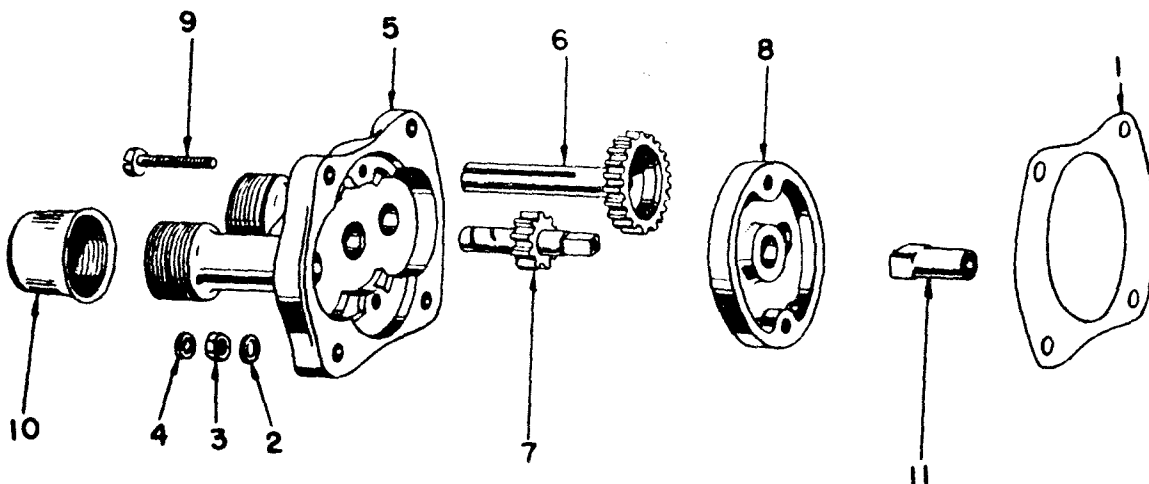


Figure 99. Tachometer Drive Assembly

| Figure & Index No. | Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|--------------------|-------------|---|---|---|---|--|-----------|---------|
| 99-1 | 22443 | | | | | Gasket - Tachometer drive housing. | 1 | ABCDKMN |
| -1 | 531098 | | | | | Gasket - Tachometer drive housing. | 1 | All |
| | A3119 | | | | | Drive Assembly - Tachometer. | 1 | All |
| | | | | | | (ATTACHING PARTS) | | |
| -2 | 2472 | | | | | Washer - 1/4 in. plain. | 4 | All |
| -3 | 2437 | | | | | Nut - 1/4-28. | 4 | ABCDKMN |
| -3 | 22661 | | | | | Nut - Elastic stop, 1/4-28. | 4 | E |
| -4 | 2886 | | | | | Palnut - 1/4-28. | 4 | ABCDKMN |
| | | | | | | ----- | | |
| -5 | 3119 | | | | | . Housing - Tachometer drive. | 1 | All |
| -6 | 2585 | | | | | . Gear - Tachometer driven. | 2 | All |
| -7 | 2584 | | | | | . Gear - Tachometer drive. | 1 | All |
| -8 | 2591 | | | | | . Pilot - Tachometer drive housing. | 1 | All |
| | | | | | | (ATTACHING PART) | | |
| -9 | AN502-10-12 | | | | | . Screw - No. 10-32 x 3/4 in. long fillister head. | 2 | All |
| | | | | | | ----- | | |
| -10 | 2716 | | | | | . Nut - Tachometer drive cover. | 2 | All |
| -11 | 2873 | | | | | Coupling - Tachometer. | 1 | All |
| | | | | | | ----- | | |
| 100-1 | 3710 | | | | | Gasket - Duplex pump. | 1 | ABCDKMN |
| -1 | 531084 | | | | | Gasket - Duplex pump. | 1 | E |
| | A4748 | | | | | Pump Assembly - Duplex Oil. | 1 | All |
| | | | | | | (ATTACHING PARTS) | | |
| -2 | 2473 | | | | | Washer - 5/16 in. plain. | 5 | All |
| -3 | 2457 | | | | | Nut - 5/16-24. | 5 | All |
| | | | | | | ----- | | |
| | A35008 | | | | | . Body Assembly - Pressure oil pump. | 1 | All |
| -4 | 4737 | | | | | . . Body - Pressure oil pump. | 1 | All |
| | **22215 | | | | | . . Pin - Air relief hole. | 1 | All |
| | **22212 | | | | | . . Sleeve - High pressure relief valve plunger. | 1 | All |
| -5 | 22203 | | | | | . . Stud - 5/16-18 x 5/16-24 x 1-1/8 in. long. | 4 | All |
| | A3916 | | | | | . Gear Assembly - Pressure oil pump drive. | 1 | All |
| -6 | 3916 | | | | | . Gear - Pressure pump driven. | 1 | All |
| -7 | 22202 | | | | | . . Ball - 3/16 in. dia., air relief check. | 1 | All |
| -8 | 22203 | | | | | . . Spring - Oil pump air relief. | 1 | All |
| -9 | 22239 | | | | | . . Plug - Oil pump air relief. | 1 | All |

CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

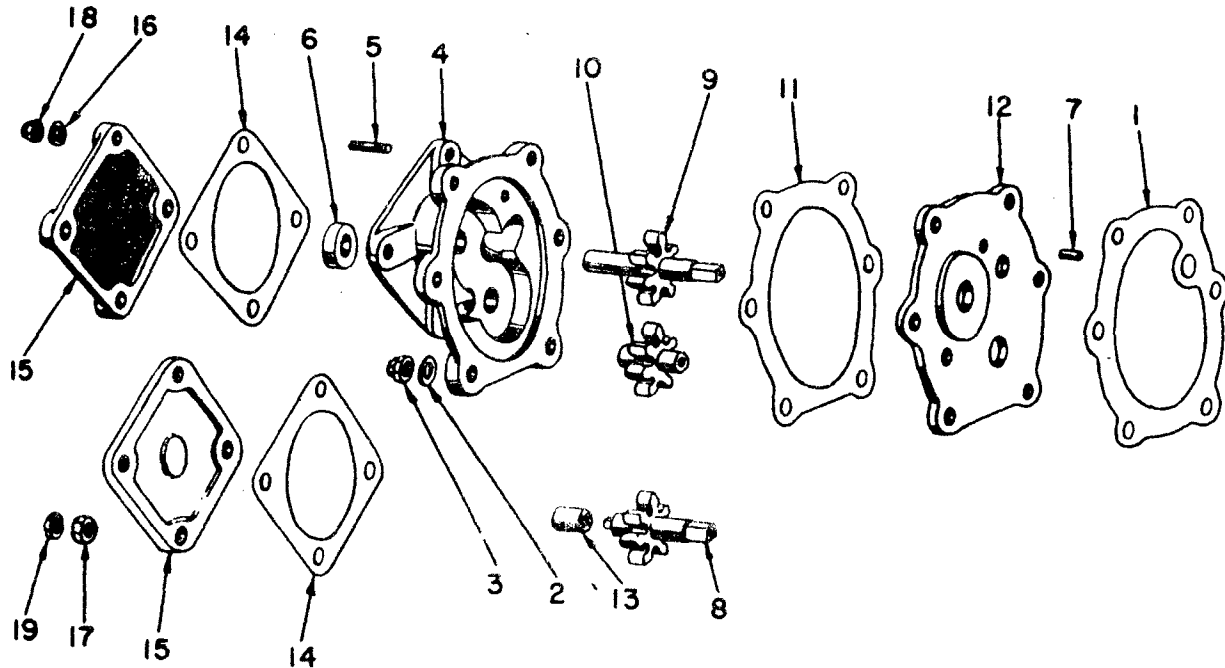


Figure 101. Rocker Scavenge Oil Pump

| Figure & Index No. | Part Number | Description | Per Assy. | Code |
|--------------------|-------------|--|-----------|---------|
| 101-1 | 22446 | Gasket - Scavenge pump | 1 | ABCDKMN |
| -1 | 531097 | Gasket - Scavenge pump | 1 | E |
| | A4170A | Pump Assembly - Rocker Scavenge Oil | 1 | AKM |
| | A3886 | Pump Assembly - Rocker Scavenge Oil | 1 | BCDEN |
| | | (ATTACHING PARTS) | | |
| -2 | 2473 | Washer - Scavenge pump | 6 | All |
| -3 | 2457 | Nut - Scavenge pump | 6 | All |
| | A35536 | Body Assembly - Rocker scavenge pump | 1 | AKM |
| | A3887 | Body Assembly - Rocker scavenge pump | 1 | BCDEN |
| -4 | 4170 | Body - Rocker scavenge pump | 1 | AKM |
| -4 | 4718 | Body - Rocker scavenge pump | 1 | BCDEN |
| -5 | 220991 | Stud - Rocker scavenge pump cover | 4 | AKM |
| -5 | 22141 | Stud - Rocker scavenge pump cover | 4 | BCDEN |
| -6 | 22142 | Oil Seal - Pump shaft | 1 | BCDEN |
| -7 | 20422 | Dowel - Body to cover | 1 | All |
| -8 | 20418 | Gear - Scavenge pump drive | 1 | AKM |
| -9 | 3888 | Gear - Scavenge pump drive | 1 | BCDEN |
| -10 | 20419 | Gear - Scavenge pump driven | 1 | All |
| -11 | 20532 | Gasket - Scavenge pump body | 1 | All |
| -12 | 3248 | Cover - Scavenge pump | 1 | All |
| -13 | 20420 | Coupling - Fuel pump drive | 1 | All |
| -14 | 20423 | Gasket - Fuel pump or cover | 1 | AKM |
| -14 | 22143 | Gasket - Fuel pump or cover | 1 | BCDN |
| -14 | 531089 | Gasket - Fuel pump or cover | 1 | E |
| -15 | 20428 | Cover - Fuel pump drive | 1 | AKM |
| -15 | 22144 | Cover - Fuel pump drive | 1 | BCDN |
| -15 | 22559 | Cover - Fuel pump drive | 1 | E |
| | | (ATTACHING PARTS) | | |
| -16 | 2473 | Washer - 5/16 in. plain | 4 | All |
| -17 | 2439 | Nut - Fuel pump to cover | 4 | AKM |
| -18 | 2457 | Nut - Fuel pump or cover | 4 | BCDEN |
| -19 | 2560 | Palnut - Fuel pump or cover | 4 | AKM |

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

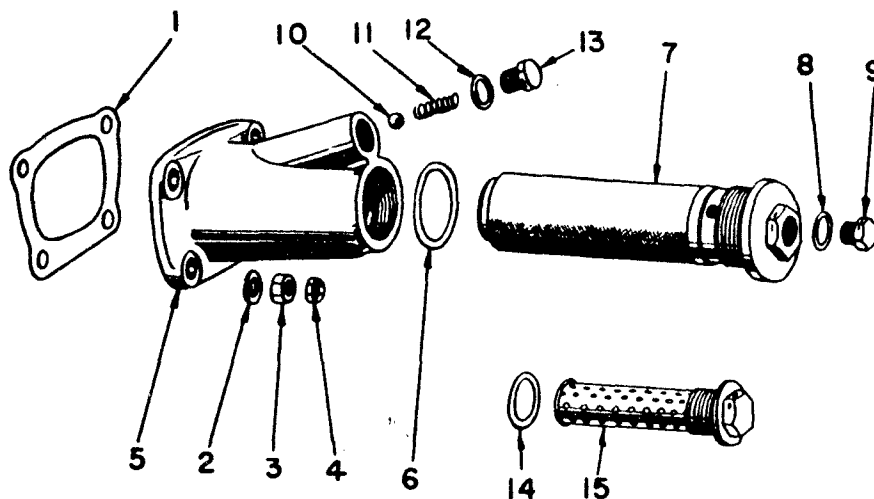


Figure 102. High Pressure Oil Screen Housing Assembly

| Figure & Index No. | Part Number | 1 2 3 4 | Description | Per Assy. | Code |
|--------------------|-------------|---------|--|-----------|---------|
| 102-1 | 2589 | | Gasket - Oil screen housing. | 1 | ABCDKMN |
| -1 | 531093 | | Gasket - Oil screen housing. | 1 | E |
| | A500014 | | Screen and Housing Assembly - High pressure oil. | 1 | All |
| | | | (ATTACHING PARTS) | | |
| -2 | 2473 | | Washer - 5/16 in. plain. | 4 | All |
| -3 | 2439 | | Nut - 5/16-24 | 4 | All |
| -4 | 2560 | | Palnut - 5/16-24 | 4 | All |
| | | | ----- | | |
| -5 | 500014 | | . Housing - Oil screen. | 1 | All |
| -6 | AN900-24 | | . Gasket - Screen assembly | 1 | All |
| -7 | 500015 | | . Screen Assembly - High pressure oil. | 1 | All |
| -8 | AN900-10 | | . Gasket - Oil screen plug | 1 | All |
| -9 | 2265 | | . Plug - Oil screen nut. | 1 | All |
| -10 | 2849 | | . Ball-Bypass valve, 7/16 in. dia. | 1 | All |
| -11 | 2848 | | . Spring - Bypass valve | 1 | All |
| -12 | AN900-10 | | . Gasket - Bypass valve plug. | 1 | All |
| -13 | 2265 | | . Plug - Bypass valve | 1 | All |
| -14 | AN900-16 | | Gasket - Scavenge oil screen. | 1 | All |
| -15 | A20878 | | Screen Assembly - Scavenge oil. | 1 | All |

GROUP ASSEMBLY PARTS LIST - Continued

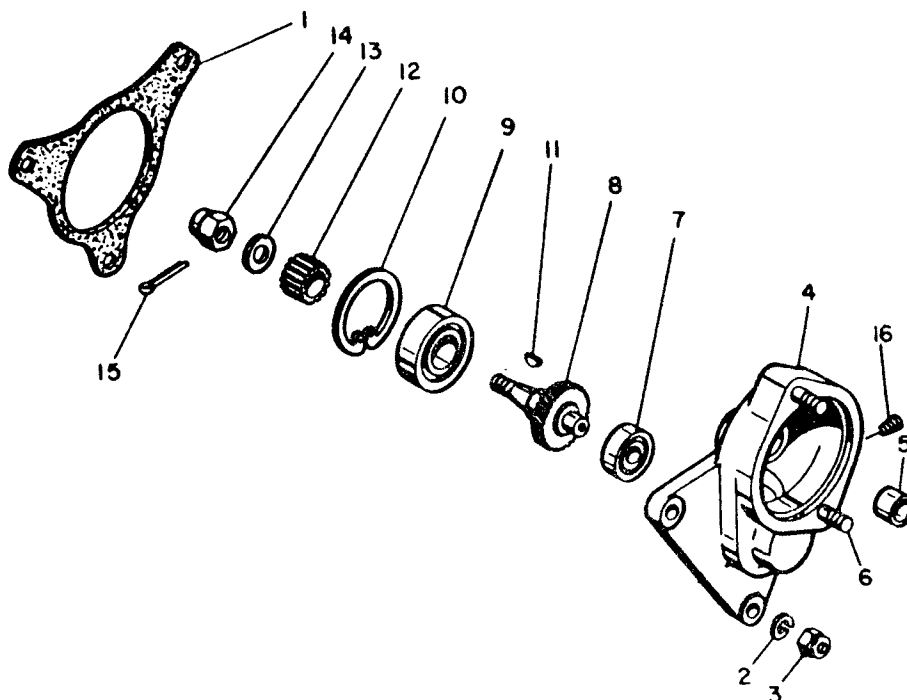


Figure 103. Battery Distributor Adapter Assembly

| Figure & Index No. | Part Number | Description | Per Assy. | Code |
|--------------------|-------------|---|-----------|------|
| 103-1 | 531088 | Gasket - Ignition flange | 1 | E |
| | A36183-A1 | Adapter Assembly - Battery Distributor | 1 | E |
| | | (ATTACHING PARTS) | | |
| -2 | 2555 | Washer - 5/16 in. special | 3 | E |
| -3 | 2457 | Nut - 5/16-24 | 3 | E |
| | A36183 | . Body Assembly - Distributor adapter | 1 | E |
| -4 | 50476 | . . Body - Distributor adapter | 1 | E |
| -5 | 25253 | . . Bushing - 1/2 ID x 5/8 OD x 7/16 in. long | 1 | E |
| -6 | 20992 | . . Stud - 5/16-18 x 5/16-24 x 1-3/8 in. long | 2 | E |
| -7 | 25247 | . Bearing - Ball | 1 | E |
| -8 | 36177 | . Gear - Distributor drive | 1 | E |
| -9 | 23601 | . Bearing - Ball | 1 | E |
| -10 | 25246 | . Ring - Internal retaining | 1 | E |
| -11 | 23495 | . Key - Woodruff, 1/8 x 1/2 in. | 1 | E |
| -12 | 2246 | . Coupling - Magneto drive | 1 | E |
| -13 | 25257 | . Washer - 13/32 ID x 3/4 OD x 3/32 in. thick | 1 | E |
| -14 | 24195 | . Nut - 3/8-16 | 1 | E |
| -15 | 2505 | . Cotter Pin - 3/32 OD x 7/8 in. long | 1 | E |
| -16 | 2024 | . Plug - 1/8 in. pipe | 1 | E |

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

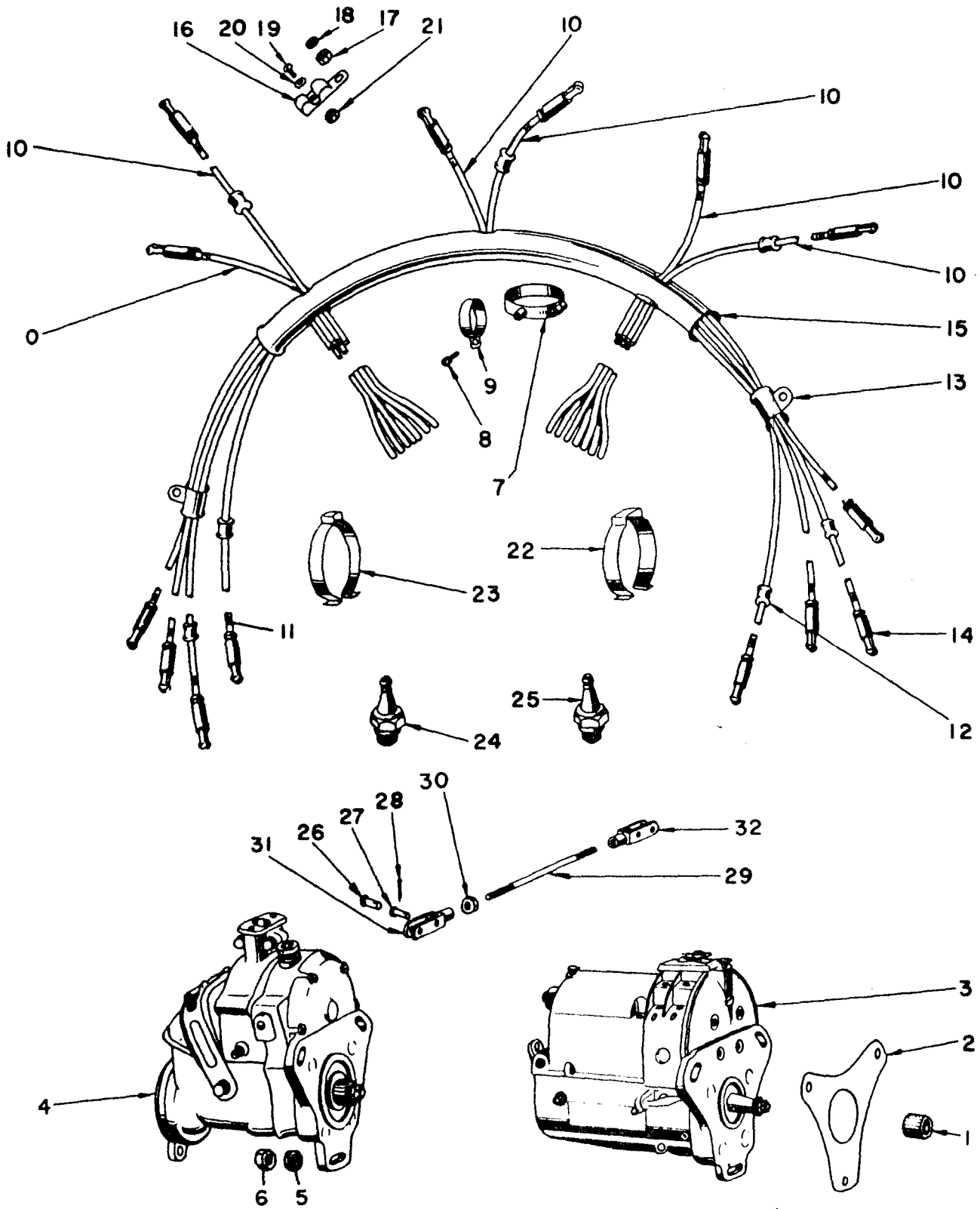


Figure 104. Ignition Assembly Shielded

CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 2 3 4 | Description | Per Assy. | Code |
|--------------------|-------------|---------|---|-----------|---------|
| 104-1 | 2246 | | Coupling - Magneto drive | 2 | AKM |
| -2 | 22931 | | Gasket - Ignition flange. | 2 | BCDN |
| -2 | 2247 | | Gasket - Ignition flange. | 2 | AKM |
| -3 | 4043 | | Magneto - Scintilla Model MN7-DF. | 2 | KM |
| -3 | 5232 | | Magneto - Scintilla Model VMN7-DF. | 2 | A |
| -4 | 5256 | | Magneto - Scintilla Model SF7RN | 2 | BCDN |
| | | | (ATTACHING PARTS) | | |
| -5 | 2555 | | Washer - 5/16 in. special | 6 | ABCDKMN |
| -6 | 2457 | | Nut - 5/16-24 | 6 | ABCDKMN |
| | | | *----- | | |
| -7 | A22227 | | Support Assembly - Ignition cable conduit | 5 | ABCDKMN |
| | A5542-A1 | | Cable and Conduit Assembly - Complete | 1 | AKM |
| | A5543-A1 | | Cable and Conduit Assembly - Complete | 1 | BCDN |
| | | | (ATTACHING PART) | | |
| -8 | 501-A10-6 | | Screw - No. 10-32 | 5 | ABCDKMN |
| | | | *----- | | |
| -9 | 20296 | | . Clip - Cable conduit | AR | ABCDKMN |
| | A5542 | | . Cable and Conduit Assembly | 1 | AKM |
| | A5543 | | . Cable and Conduit Assembly | 1 | BCDN |
| -10 | 20307 | | . . Cable - Ignition | AR | ABCDKMN |
| -11 | AN4028 | | . . Marker - Ignition cable | 14 | ABCDKMN |
| -12 | 23143 | | . . Grommet - Ignition cable | 7 | ABCDKMN |
| -13 | 20458 | | . . Ferrule - Ignition cable | 2 | ABCDKMN |
| -14 | 2306 | | . . Terminal - Spark plug | 14 | ABCDKMN |
| -15 | 3377 | | . . Conduit - Ignition cable | 1 | ABCDKMN |
| -16 | 23142 | | . Clip - Ignition wire and primer line. | 7 | ABCDKMN |
| | | | (ATTACHING PARTS) | | |
| -17 | 2437 | | . Nut - 1/4-28 | 7 | ABCDKMN |
| -18 | 2886 | | . Palnut - 1/4-28 | 7 | ABCDKMN |
| | | | *----- | | |
| -19 | 501-10-6 | | . Screw - Clip | 7 | ABCDKMN |
| -20 | AN936A10 | | . Washer - Internal lock. | 7 | ABCDKMN |
| -21 | AN345-10 | | . Nut - No. 10-32 | 7 | ABCDKMN |
| -22 | 2316 | | . Clip - Ignition cable | 2 | ABCDKMN |
| -23 | 20559 | | . Clip - Ignition cable to No. 6 intake pipe. | 1 | ABCDKMN |
| -24 | 22460 | | Spark Plug - Champion C26 | 14 | All |
| -25 | 20895 | | Spark Plug - Champion M26 (Optional). | 14 | All |
| | 22571 | | Spark Plug Lubricant | AR | All |
| | A4029 | | Rod Assembly - Magneto control | 1 | AKM |
| | A4082 | | Rod Assembly - Magneto control | 1 | BCDN |
| | | | (ATTACHING PARTS) | | |
| -26 | 2310 | | Pin - 3/16 in. dia | 3 | AKM |
| -27 | AN394-15 | | Pin - 1/4 in. dia | 2 | BCDN |
| -28 | 2502 | | Cotter Pin - 1/16 OD x 5/8 in. long | 4 | ABCDKMN |
| | | | *----- | | |
| -29 | 2307 | | . Rod - Magneto control | 1 | ABCDKMN |
| -30 | 2436 | | . Nut - 10-32 | 2 | ABCDKMN |
| -31 | 22496 | | . Fork - Double | 2 | BCDN |
| -32 | 2309 | | . Fork - Double | 2 | AKM |

GROUP ASSEMBLY PARTS LIST - Continued

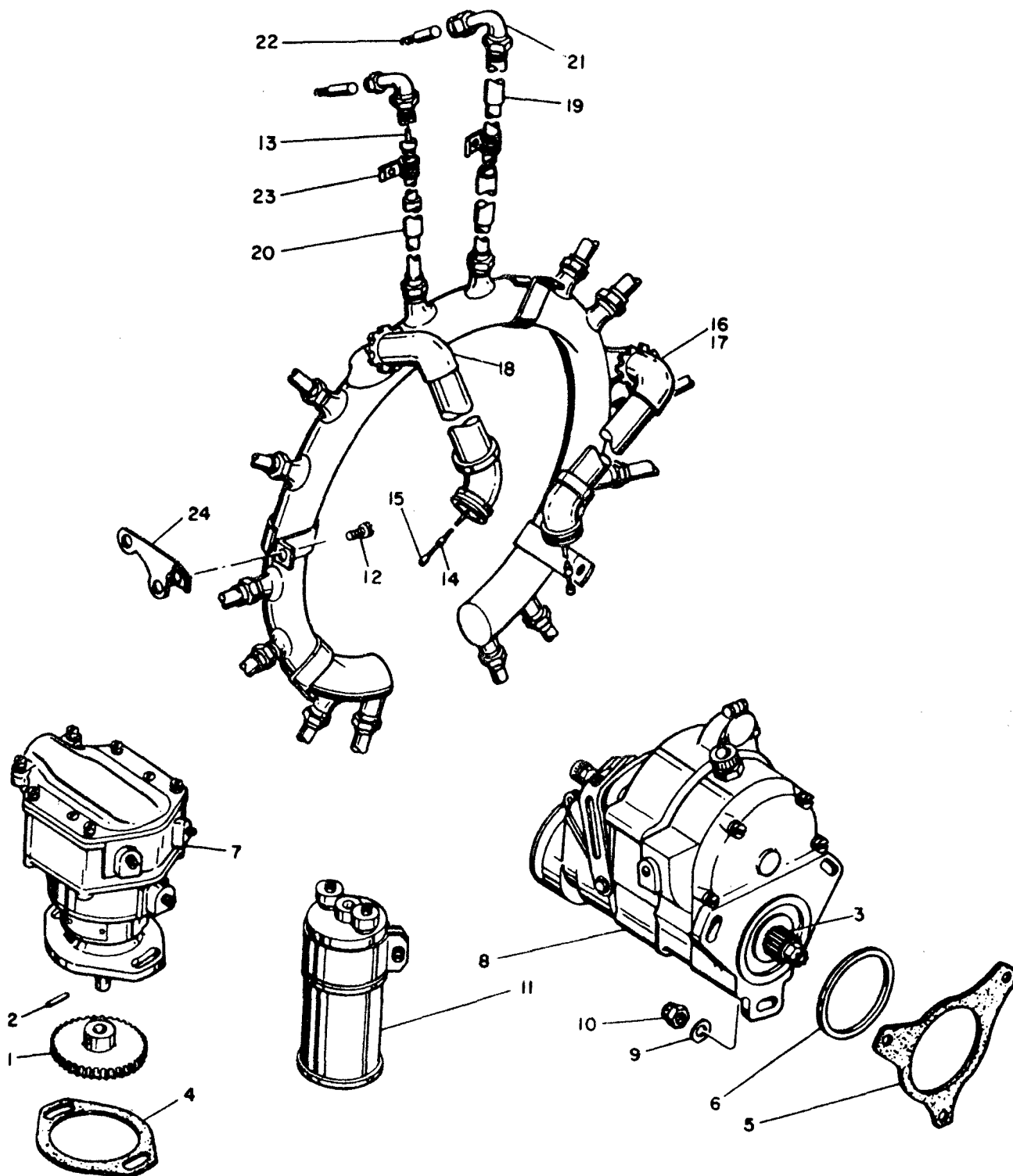


Figure 105. Ignition Shield Assembly

CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 2 3 4 | Description | Per Assy. | Code |
|-----------------------|--------------|---------|--|--------------|------|
| 105-1 | 36155 | | Gear - Distributor shaft | 1 | E |
| -2 | 530247 | | Pin - Taper, No. 3 x 1 in. long | 1 | E |
| -3 | 2246 | | Coupling - Magneto | 1 | E |
| -4 | 531087 | | Gasket - Distributor flange | 2 | E |
| -5 | 531219 | | Gasket - Magneto | 2 | E |
| -6 | 36174 | | Ring - Pilot | 2 | E |
| -7 | 40770 | | Battery - Distributor Unit - Scintilla Model WL7 | 1 | E |
| -8 | 5246 | | Magneto - Scintilla Model VMN7-DFA | 1 | E |
| | | | (ATTACHING PARTS) | | |
| -9 | 2555 | | Washer - 5/16 in. special | 2 | E |
| -10 | 2457 | | Nut - 5/16-24 | 2 | E |
| | | | -----* | | |
| -11 | 36155 | | Coil - Ignition | 1 | E |
| | 530265 | | Shield Assembly - Ignition, Breeze E831-19P-2Y | 1 | E |
| | | | (ATTACHING PART) | | |
| -12 | 22537 | | Screw - 1/4-20 x 5/8 in. long | 4 | E |
| | | | -----* | | |
| -13 | 3126-2Y | | . Cable - Ignition | AR | E |
| -14 | 3785-1 | | . . Marker - Ignition cable, cyl. No. 1 | 2 | E |
| -14 | 3785-2 | | . . Marker - Ignition cable, cyl. No. 3 | 2 | E |
| -14 | 3785-6 | | . . Marker - Ignition cable, cyl. No. 4 | 2 | E |
| -14 | 3785-3 | | . . Marker - Ignition cable, cyl. No. 5 | 2 | E |
| -14 | 3785-7 | | . . Marker - Ignition cable, cyl. No. 6 | 2 | E |
| -14 | 3785-4 | | . . Marker - Ignition cable, cyl. No. 7 | 2 | E |
| -15 | 3828-1 | | . . Ferrule - Ignition cable, cyl. No. 1 | 2 | E |
| -15 | 3828-5 | | . . Ferrule - Ignition cable, cyl. No. 2 | 2 | E |
| -15 | 3828-2 | | . . Ferrule - Ignition cable, cyl. No. 3 | 2 | E |
| -15 | 3828-6 | | . . Ferrule - Ignition cable, cyl. No. 4 | 2 | E |
| -15 | 3828-3 | | . . Ferrule - Ignition cable, cyl. No. 5 | 2 | E |
| -15 | 3828-7 | | . . Ferrule - Ignition cable, cyl. No. 6 | 2 | E |
| -15 | 3828-4 | | . . Ferrule - Ignition cable, cyl. No. 7 | 2 | E |
| -16 | E-1135-2-3 | | . Gasket | 2 | E |
| -17 | E-1199-376 | | | | |
| | -1600 | | . Elbow - Manifold | 1 | E |
| -18 | E-1199-377 | | | | |
| | -2006 | | . Elbow - Manifold | 1 | E |
| -19 | E-1199-36 | | | | |
| | -0600 | | . Conduit Assembly | 7 | E |
| -20 | E-1199-379 | | | | |
| | -2408 | | . Conduit Assembly | 7 | E |
| -21 | E-1124-30-10 | | . Elbow | 14 | E |
| -22 | E-1129-28-1 | | . Terminal | 14 | E |
| -23 | E-1348-1-20 | | . Clamp | 7 | E |
| -24 | A25381 | | Bracket Assembly - Ignition harness | 1 | E |
| -24 | A25380 | | Bracket Assembly - Ignition harness | 3 | E |

GROUP ASSEMBLY PARTS LIST - Continued

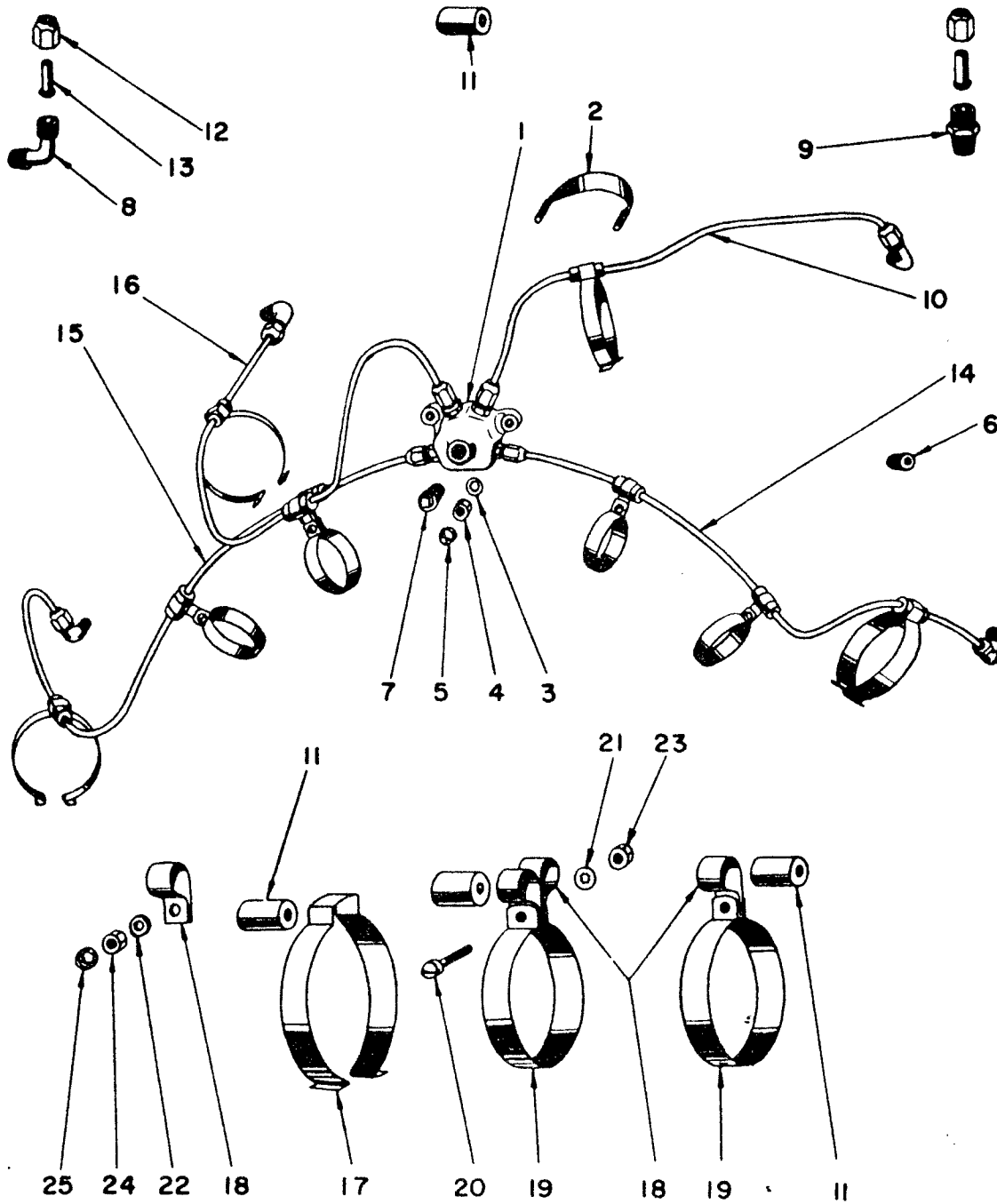


Figure 106. Complete Primer Assembly

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|--------------------|-------------|---|---|---|---|---|-----------|---------|
| 106- | A5477 | | | | | Primer Assembly - Complete | 1 | ABCDKMN |
| | A5187 | | | | | Primer Assembly - Complete | 1 | E |
| -1 | 22161 | | | | | . Distributor - Primer. | 1 | All |
| | | | | | | (ATTACHING PARTS) | | |
| -2 | 22162 | | | | | . U Bolt - 10-32 | 1 | All |
| -3 | AN960-10 | | | | | . Washer - No. 10 plain | 2 | All |
| -4 | AN345-10 | | | | | . Nut - 10-32 | 2 | All |
| -5 | 356-1032 | | | | | . Palnut - 10-32 | 2 | All |
| | | | | | | -----* | | |
| -6 | 2024 | | | | | . Plug - 1/8 in. cylinder heads No. 3, 4, and 5 | 3 | All |
| -7 | 20882 | | | | | . Plug - 1/8 in. primer distributor. | 1 | All |
| -8 | 3665 | | | | | . Jet - Primer, cylinder heads 1, 2, 6 and 7. | 4 | All |
| -9 | AN780-2 | | | | | . Nipple - 1/8 in. primer distributor | 4 | All |
| | A3682 | | | | | . Tube Assembly - Primer No. 1 | 1 | All |
| -10 | 3683 | | | | | . Tube - Primer No. 1 | 1 | All |
| -11 | 21512 | | | | | . Protector - Primer tube | 2 | All |
| -12 | AN805-2 | | | | | . Nut - Union | 2 | All |
| -13 | 20720 | | | | | . Cone - 1/8 in. union | 2 | All |
| | A3876 | | | | | . Tube Assembly - Primer No. 2 | 1 | ABCDKMN |
| | A3684 | | | | | . Tube Assembly - Primer No. 2 and 7. | 2 | E |
| -14 | 3876 | | | | | . Tube - Primer No. 2 | 1 | ABCDKMN |
| -14 | 3685 | | | | | . Tube - Primer, No. 2 and 7. | 1 | E |
| -11 | 21512 | | | | | . Protector - Primer tube | 4 | All |
| -12 | AN805-2 | | | | | . Nut - Union. | 2 | All |
| -13 | 20720 | | | | | . Cone - 1/8 in., union | 2 | All |
| | A3877 | | | | | . Tube Assembly - Primer No. 6 | 1 | ABCDKMN |
| | A3686 | | | | | . Tube Assembly - Primer No. 6 | 1 | E |
| -15 | 3877 | | | | | . Tube - Primer No. 6 | 1 | ABCDKMN |
| -15 | 3687 | | | | | . Tube - Primer No. 6 | 1 | E |
| -11 | 21512 | | | | | . Protector - Primer tube | 5 | ABCDKMN |
| -12 | AN805-2 | | | | | . Nut - Union. | 2 | All |
| -13 | 20720 | | | | | . Cone - 1/8 in., union | 2 | All |
| | A3878 | | | | | . Tube Assembly - Primer No. 7 | 1 | ABCDKMN |
| -16 | 3878 | | | | | . Tube - Primer, No. 7. | 1 | ABCDKMN |
| -11 | 21512 | | | | | . Protector - Primer tube | 3 | ABCDKMN |
| -12 | AN805-2 | | | | | . Nut - union | 2 | ABCDKMN |
| -13 | 20720 | | | | | . Cone - 1/8 in., union | 2 | ABCDKMN |
| -17 | 20559 | | | | | . Clip - Primer tube | 4 | ABCDKMN |
| -17 | 20559 | | | | | . Clip - Primer tube | 7 | E |
| -18 | 20721 | | | | | . Clip - Primer tube | 5 | ABCDKMN |
| -18 | 20721 | | | | | . Clip - Primer tube | 4 | E |
| -19 | 20296 | | | | | . Clip - Primer tube | 4 | ABCDKMN |
| -20 | 501-10-8 | | | | | . Screw - 10-32, fillister head | 4 | ABCDKMN |
| -21 | 936-A-10 | | | | | . Washer - No. 10, lock | 4 | ABCDKMN |
| -22 | 20522 | | | | | . Washer - 1/4 in. plain | 4 | E |
| -23 | AN345-10 | | | | | . Nut - 10-32 | 4 | ABCDKMN |
| -24 | 2437 | | | | | . Nut - 1/4-28, plain | 4 | E |
| -25 | 2886 | | | | | . Palnut - 1/4-28 | 4 | E |

GROUP ASSEMBLY PARTS LIST - Continued

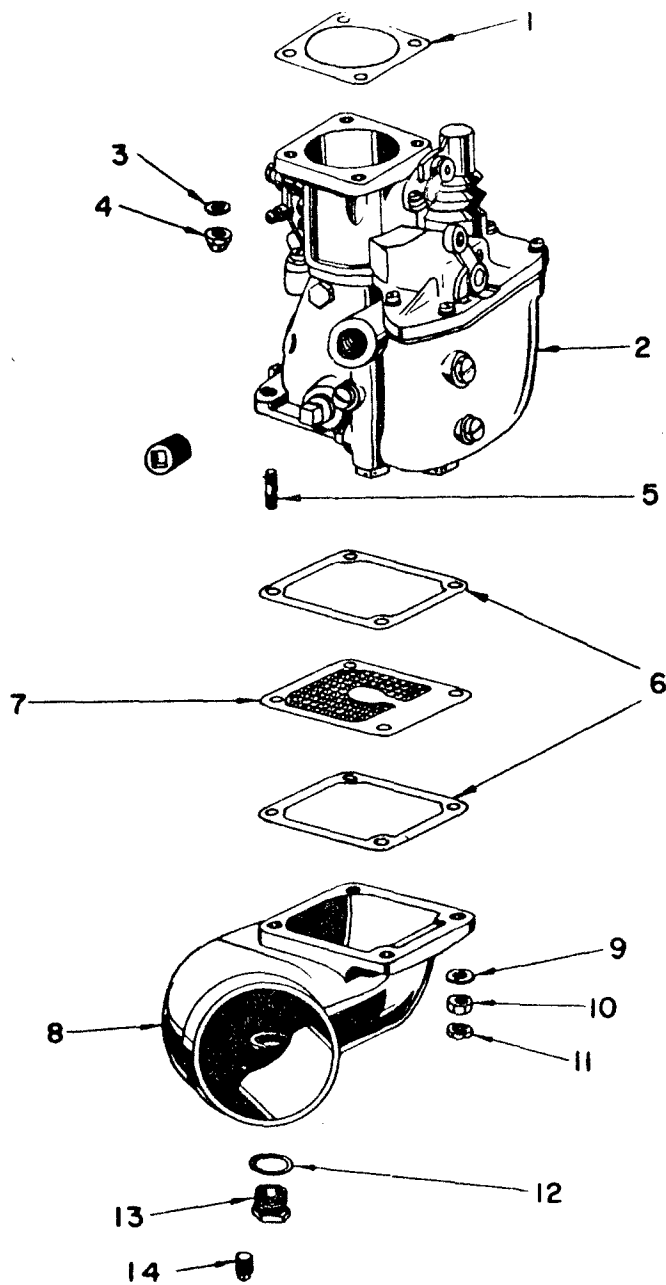


Figure 107. Complete Carburetor Assembly

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Figure & Index No. | Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|--------------------|-------------|---|---|---|---|--|-----------|---------|
| 107-1 | 22803 | | | | | Gasket - Carburetor. | 1 | ABCDKMN |
| -1 | 531105 | | | | | Gasket - Carburetor. | 1 | E |
| -2 | 22677 | | | | | Carburetor Assembly - Complete (NAR6D) | 1 | ABKMN |
| -2 | 4972 | | | | | Carburetor Assembly - Complete (NAR6G) | 1 | CD |
| -2 | 530071 | | | | | Carburetor Assembly - Complete (NAR6G) | 1 | E |
| | | | | | | (ATTACHING PARTS) | | |
| -3 | 2473 | | | | | Washer - 5/16 in. plain. | 4 | All |
| -4 | 2457 | | | | | Nut - 5/16-24 | 4 | All |
| | | | | | | -----* | | |
| -5 | 22324 | | | | | Stud - 5/16-28 x 5/16-24 x 1-3/8 in. long. | 4 | All |
| -6 | 22453 | | | | | Gasket - Air horn | 2 | ABCDKMN |
| -6 | 531096 | | | | | Gasket - Air horn | 2 | E |
| -7 | 3847 | | | | | Grid - Carburetor air intake | 1 | All |
| -8 | 5262 | | | | | Horn - Carburetor air | 1 | All |
| | | | | | | (ATTACHING PARTS) | | |
| -9 | 2473 | | | | | Washer - 5/16 in. plain. | 4 | All |
| -10 | 2439 | | | | | Nut - 5/16-24 | 4 | All |
| -11 | 2560 | | | | | Palnut - 5/16-24 | 4 | All |
| | | | | | | -----* | | |
| -12 | AN900-16 | | | | | Gasket - Air horn plug | 1 | All |
| -13 | 20493 | | | | | Plug - 1 in. | 1 | All |
| -14 | 20882 | | | | | Plug - 1/8 in. | 1 | All |

| Part Number | 1 | 2 | 3 | 4 | Description | Per Assy. | Code |
|-------------|---|---|---|---|--|-----------|---------|
| 20844A-1 | | | | | Service Tool Kit | 1 | AN |
| A20964 | | | | | Service Tool Kit | 1 | All |
| 2330 | | | | | Bar - Cross | 1 | All |
| 20879 | | | | | Wrench - Spark plug socket | 1 | ABCDKMN |
| 530300 | | | | | Wrench - Spark plug socket | 1 | E |
| 20555 | | | | | Wrench - Box socket 1/2 in. hex | 1 | ABCDKMN |
| 24340 | | | | | Wrench - Box socket 1/2 in. hex | 1 | E |
| 3193 | | | | | Wrench - Intake gland nut | 1 | All |
| 20445 | | | | | Wrench - Valve adjusting screw | 1 | All |
| 20446 | | | | | Wrench - Valve adjusting screw nut | 1 | All |
| 20483 | | | | | Wrench - Pushrod housing gland nut | 1 | All |
| 20420 | | | | | Wrench - Pushrod housing retainer | 1 | All |
| 2889 | | | | | Gage - Feeler, valve clearance | 1 | All |
| 3096 | | | | | Compressor - Valve spring | 1 | All |
| 40086 | | | | | Roll - Tool | 1 | ABCDKMN |
| 20528 | | | | | Wrench - Spark plug 11/16 in. | 1 | ABCDKMN |
| 2325 | | | | | Wrench - Dwarf box socket | 1 | All |
| 2326 | | | | | Pliers - Combination | 1 | All |
| 2337 | | | | | Screwdriver | 1 | All |
| 2342 | | | | | Wrench - Magneto | 1 | All |
| 20982 | | | | | Seal | 1 | All |

CONTINENTAL W 670 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST — Continued

| Part Number | Part Name | Code | No. Req'd. |
|-------------|--|------|------------|
| EQ-5088 | INTER-CYLINDER BAFFLING | M | 1 |
| B-5127 | . Baffle Assembly | M | 6 |
| 5127 | . . Baffle -- Front | M | 1 |
| 5129 | . . Baffle -- Side, Large | M | 1 |
| 20524 | . . Bracket -- Baffle to Crankcase | M | 1 |
| 22124 | . . Rivet -- Round Head | M | 2 |
| 4236 | . Baffle -- Side, Small | M | 6 |
| A5130 | . Baffle Assembly -- Sump | M | 1 |
| 5130 | . . Baffle -- Front | M | 1 |
| 5131 | . . Baffle -- Side, Large | M | 1 |
| 4237 | . Baffle -- Sump, Side, Small | M | 1 |
| 20530 | . Spring -- Baffle Retaining | M | 7 |
| 20521 | . Bolt -- Short | M | 6 |
| 501-A10-8 | . Screw -- 10-32 x 1/2 Baffle Bracket | M | 6 |
| 20668 | . Screw -- 10-24 x 3/8, Side to Front Baffles | M | 26 |
| 20656 | . Hex Nut -- Side to Front Baffle Screws | M | 26 |
| 936-A10 | . Lockwasher -- No. 10, Side to Front Baffle Screws | M | 26 |
| 2437 | . Nut -- 1/4-28, Baffle to Cylinder | M | 14 |
| 2472 | . Washer -- 1/4, Baffle to Cylinder | M | 28 |
| A22075 | GASKET SET -- COMPLETE | All | |
| AN900-10 | . Gasket -- Pressure Oil Screen Plug | All | 1 |
| AN900-10 | . Gasket -- High Pressure Oil Screen Relief Plug | All | 1 |
| AN900-12 | . Gasket -- Rocker Box Cover Scavenge Nipple | All | 6 |
| AN900-12 | . Gasket -- Hose, Sump Nipple | All | 1 |
| AN900-14 | . Gasket -- Low Pressure Relief Valve Housing | All | 1 |
| AN900-16 | . Gasket -- Carburetor Air Horn Plug | All | 1 |
| AN900-16 | . Gasket -- High Pressure Adjusting Screw Cap | All | 1 |
| AN900-16 | . Gasket -- High Pressure Adjusting Screw Lock Nut | All | 1 |
| AN900-16 | . Gasket -- Scavenge Oil Screen Plug | All | 1 |
| AN900-16 | . Gasket -- Oil Sump Drain Plug | All | 1 |
| AN900-16 | . Packing -- Push Rod Housing Gland Nut (Optional) | All | 14 |
| AN900-24 | . Gasket -- Oil Screen Nut to Housing | All | 1 |
| 2096 | . Gasket -- Intake Pipe Gland Nut | All | 7 |
| 2248 | . Gasket -- Generator or Cover | All | 1 |
| 2249 | . Gasket -- Starter Flange | All | 2 |
| 531090 | . Gasket -- Starter Flange | E | 1 |
| 2588 | . Gasket -- Tachometer Drive Housing to Accessory Case | All | 1 |
| 2589 | . Gasket -- Oil Screen Housing to Accessory Case | All | 1 |
| 531093 | . Gasket -- Oil Screen Housing to Accessory Case | E | 1 |
| 2827 | . Gasket -- Cylinder Intake Pipe Flange | All | 7 |
| 22803 | . Gasket -- Carburetor to Crankcase | All | 1 |
| 531105 | . Gasket -- Carburetor to Crankcase | E | 1 |
| 2845 | . Packing -- Cylinder Base Oil Seal | All | 7 |
| 3112 | . Gasket -- Accessory Case to Crankcase | All | 1 |
| 531085 | . Gasket -- Accessory Case to Crankcase | E | 1 |
| 3710 | . Gasket -- Duplex Oil Pump to Accessory Case | All | 1 |
| 531084 | . Gasket -- Duplex Oil Pump to Accessory Case | E | 1 |
| 3939 | . Gasket -- Duplex Scavenge to Pressure Plate | All | 1 |
| 531086 | . Gasket -- Duplex Scavenge to Pressure Plate | E | 1 |
| 20254 | . Gasket -- Rocker Box Cover | All | 14 |
| 531091 | . Gasket -- Rocker Box Cover | E | 14 |
| 20262 | . Gasket -- Push Rod Housing to Cam Follower Guide | All | 14 |
| 531099 | . Gasket -- Push Rod Housing to Cam Follower Guide | E | 14 |
| 20266 | . Packing -- Push Rod Housing Gland Nut | All | 14 |
| 20268 | . Gasket -- Cam Follower Guide to Crankcase | All | 14 |
| 531102 | . Gasket -- Cam Follower Guide to Crankcase | E | 14 |
| 20271 | . Packing -- Rocker Box Tube or Plug | All | 14 |
| 20275 | . Hose -- 5/8 Rocker Scavenge Oil Lines | All | 7 |
| 20421 | . Gasket -- Scavenge Oil Line, Accessory Case to Crankcase | All | 1 |
| 70423 | . Gasket -- Fuel Pump or Cover | AMK | 1 |
| 531089 | . Gasket -- Fuel Pump or Cover | E | 1 |
| 20425 | . Gasket -- Rocker Scavenge Pump to Accessory Case | All | 1 |

CONTINENTAL W 6 7 0 AIRCRAFT ENGINES

GROUP ASSEMBLY PARTS LIST - Continued

| Part Number | Part Name | Code | No. Req'd. |
|-------------|---|------|------------|
| 20467 | . Gasket -- Rocker Scavenge Elbow to Accessory Case | All | 1 |
| 531092 | . Gasket -- Rocker Scavenge Elbow to Accessory Case | E | 1 |
| 22453 | . Gasket -- Carburetor Air Horn to Carburetor | All | 2 |
| 20532 | . Gasket -- Rocker Scavenge Oil Pump Body | All | 1 |
| 20748 | . Gasket -- Oil Inlet and Outlet Connections. | All | 2 |
| 531103 | . Gasket -- Oil Inlet and Outlet Connections. | E | 2 |
| 20889 | . Seal -- Magneto Drive Gear Shaft, Oil | All | 2 |
| 20951 | . Gasket -- Oil Sump to Front Crankcase | All | 1 |
| 531094 | . Gasket -- Oil Sump to Front Crankcase | E | 1 |
| 20952 | . Gasket -- Oil Sump to Rear Crankcase | All | 1 |
| 531095 | . Gasket -- Oil Sump to Rear Crankcase | E | 1 |
| 20977 | . Seal -- Pressure Oil Pump Gear Shaft | ABCD | 2 |
| 22142 | . Seal -- Rocker Scavenge Drive Gear Shaft. | BCDN | 1 |
| 22143 | . Gasket -- Fuel Pump or Cover | BCDN | 1 |
| 2247 | . Gasket -- Magneto to Accessory Case (VMN7DF) | AMK | 2 |
| 22931 | . Gasket -- Magneto to Accessory Case (SF7RN) | BCDN | 2 |
| 500060 | . Gasket -- Generator Step-up Drive to Accessory Case | All | 1 |
| 500062 | . Gasket -- Bearing Retainer, Generator Step-up Drive | All | 1 |
| 531106 | . Gasket -- Bearing Retainer, Generator Step-up Drive | E | 1 |
| 530854 | . Gasket Governor Adapter | E | 1 |
| 535011 | Lockwire .040 in. dia. | All | AR |

**Section 17
OVERHAUL TOOL CATALOGUE
ASSEMBLY LIST**

| Part Number | Part Name | No. Req'd. |
|-------------|--|------------|
| EQ-5212 | Overhaul Tool Set -- Complete | 1 |
| A6311 | Assembly Stand -- Engine Overhaul | 1 |
| 22992 | Bar -- Crankshaft Alignment .4998 and .4995 Size | 1 |
| 22993 | Bar -- Crankshaft Alignment .5001 and .5005 Size | 1 |
| A35052 | Beam Assembly -- Engine Lifting. | 1 |
| 35052 | . Beam | |
| 35053 | . Hook | |
| 35054 | . Hook | |
| A3363 | Timing Disc Assembly | 1 |
| | Includes body, disc, screws and nuts, plus the following: | |
| 20453 | Pointer | |
| 500364 | Eye Crankshaft Lifting | 1 |
| A20455 | Plug Gauge Assembly -- Intake Valve Guide | 1 |
| | Includes "go" and "no go" gauges and handle | |
| A500156 | Plug Gauge Assembly -- Exhaust Valve Guide | |
| | Includes "go" and "no go" gauges and handle | |
| A3247 | Indicator Assembly -- Top Center | 1 |
| | Includes arm, bushing, core, dial, spring, pins and rivets | |
| 22360 | Insertor -- Ignition Drive Gear | 1 |
| 22459 | Insertor -- Rocker Scavenge Pump Drive Gear | 1 |
| 22458 | Insertor -- Rocker Scavenge Pump Drive Gear Oil Seal | 1 |
| A4116 | Plate Assembly -- Cylinder Holding, includes plate and studs | 1 |
| A3373 | Puller and Insertor Assembly -- Valve Guide | 1 |
| 500103 | . Bushing -- Exhaust Valve Guide | |
| 20454 | . Bushing -- Intake Valve Guide | |
| 20308 | . Nut -- Valve Guide Puller and Insertor | |
| 20312 | . Nut -- Valve Guide Puller and Insertor Disc | |
| 20310 | . Plate -- Valve Guide Puller | |
| 3246 | . Screw -- Valve Guide Puller and Insertor | |
| 20309 | . Spacer -- Valve Guide Puller and Insertor | |
| 24340 | Wrench -- Boxsocket, 1/2 Hex. | |
| A4230 | Puller Assembly -- Crankcase and Main Bearing | 1 |
| | Includes body, body top, body flange, screws, nut, pin, bushing, washers, arm, and handles, plus the following: | |
| 3484 | . Adapter -- Main Bearing Puller | |
| 3395 | . Adapter -- Front Crankcase Puller | |
| 3396 | . Adapter -- Propeller Shaft to Puller Screw | |
| 3288 | . Spacer | |
| A3893 | Puller Assembly -- Crankcase Bolt | 1 |
| | Includes puller, head and driver | |
| A2344 | Spreader Assembly -- Crankshaft Cheek | |
| 20314 | . Pin -- Crankshaft Cheek Spreader Plunger | |
| 2344 | . Plunger -- Crankshaft Cheek Spreader | |
| A4093 | Support Assembly -- Front Crankshaft | 1 |
| | Includes support, keys and screws | |
| A4288 | Support Assembly -- Rear Crankshaft | 1 |
| | Includes support and cap | |
| A500143 | Assembling and Disassembling Tool Assembly Master Rod | 1 |
| 2852 | . Extractor -- Knuckle Pin | |
| 2853 | . Insertor -- Knuckle Pin | |
| 20411 | . Pilot -- Knuckle Pin | |
| 20323 | . Pilot -- Master Rod Bearing | |
| 3190 | . Plate -- Master Rod Assembling and Disassembling | |
| 2437 | . Nut -- 1/4-28 -- Master Rod Pilot to Plate | |
| 2869 | . Screw -- 1/4-28 x 3 -- Master Rod Pilot to Plate | |
| 2472 | . Washer -- 1/4 Plain | |
| 2495 | . Washer -- 1/4 Lock | |
| 3103 | Wrench -- Crankshaft Clamp Bolt | |
| A35190 | Wrench -- Crankshaft Thrust Bearing Nut (for 2057 Nut) | |
| A35496 | Wrench -- Crankshaft Thrust Bearing Nut (for 35461 Nut) | |

OVERSIZE PARTS LIST

| Part No. | Nomenclature | Oversize | Pa. | Nomenclature | Oversize |
|-----------|---------------|-----------|-----------|-------------------|-----------|
| 2002P003 | Insert | .003 O.D. | 20992P009 | Stud | .009 O.D. |
| 2002P006 | Insert | .006 O.D. | 20993P003 | Stud | .003 O.D. |
| 2002P009 | Insert | .009 O.D. | 20993P006 | Stud | .006 O.D. |
| 3005- | Bearing Liner | O.D. | 20993P009 | Stud | .009 O.D. |
| 3006- | Bearing Liner | O.D. | 20994P003 | Stud | .003 O.D. |
| 4180-10 | Piston | .010 O.D. | 20994P006 | Stud | .006 O.D. |
| 4180-15 | Piston | .015 O.D. | 20994P009 | Stud | .009 O.D. |
| 4180-20 | Piston | .020 O.D. | 22001P003 | Stud | .003 O.D. |
| 4177-10 | Piston | .010 O.D. | 22001P006 | Stud | .006 O.D. |
| 4177-20 | Piston | .020 O.D. | 22001P009 | Stud | .009 O.D. |
| 20099P003 | Stud | .003 O.D. | 22003P003 | Stud | .003 O.D. |
| 20099P006 | Stud | .006 O.D. | 22003P006 | Stud | .006 O.D. |
| 20099P009 | Stud | .009 O.D. | 22003P009 | Stud | .009 O.D. |
| 20100P003 | Stud | .003 O.D. | 22004P003 | Stud | .003 O.D. |
| 20100P006 | Stud | .006 O.D. | 22004P006 | Stud | .006 O.D. |
| 20100P009 | Stud | .009 O.D. | 22004P009 | Stud | .009 O.D. |
| 20241P003 | Guide | .003 O.D. | 22006P003 | Stud | .003 O.D. |
| 21241P006 | Guide | .006 O.D. | 22006P006 | Stud | .006 O.D. |
| 20241P009 | Guide | .009 O.D. | 22006P009 | Stud | .009 O.D. |
| 20260-05 | Pin | .005 O.D. | 22141P003 | Stud | .003 O.D. |
| 20400-03 | Guide | .003 O.D. | 22141P006 | Stud | .006 O.D. |
| 20400-06 | Guide | .006 O.D. | 22141P009 | Stud | .009 O.D. |
| 20400-09 | Guide | .009 O.D. | 22145P003 | Stud | .003 O.D. |
| 20973P003 | Stud | .003 O.D. | 22145P006 | Stud | .006 O.D. |
| 20973P006 | Stud | .006 O.D. | 22145P009 | Stud | .009 O.D. |
| 20973P009 | Stud | .009 O.D. | 22324P003 | Stud | .003 O.D. |
| 20974P003 | Stud | .003 O.D. | 22324P006 | Stud | .006 O.D. |
| 20974P006 | Stud | .006 O.D. | 22324P009 | Stud | .009 O.D. |
| 20974P009 | Stud | .009 O.D. | 22539P003 | Stud | .003 O.D. |
| 20988P003 | Stud | .003 O.D. | 22539P006 | Stud | .006 O.D. |
| 20988P006 | Stud | .006 O.D. | 22539P009 | Stud | .009 O.D. |
| 20988P009 | Stud | .009 O.D. | A23152-01 | Knuckle Pin Assy. | .001 O.D. |
| 20990P003 | Stud | .003 O.D. | A23152-05 | Knuckle Pin Assy. | .005 O.D. |
| 20990P006 | Stud | .006 O.D. | 35294-10 | Ring | .010 O.D. |
| 20990P009 | Stud | .009 O.D. | 35294-20 | Ring | .020 O.D. |
| 20991P003 | Stud | .003 O.D. | 35596-10 | Ring | .010 O.D. |
| 20991P006 | Stud | .006 O.D. | 35596-20 | Ring | .020 O.D. |
| 20991P009 | Stud | .009 O.D. | 35594-10 | Ring | .010 O.D. |
| 20992P003 | Stud | .003 O.D. | 35594-20 | Ring | .020 O.D. |
| 20992P006 | Stud | .006 O.D. | | | |

NUMERICAL PARTS LIST

| Part No. | Figure & Index No. | No. Req'd. | Part No. | Figure & Index No. | No. Req'd. | Part No. | Figure Index No. | No. Req'd. |
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| 2002 | 96-5 | 14 | 2585 | 99-6 | 2 | 3785-3 | 105-15 | 2 |
| 2024 | 91-21 | 9 | 2589 | 102-1 | 1 | 3785-4 | 105-15 | 2 |
| 2025 | 97-29 | 3 | 2590 | 97-43 | 2 | 3785-5 | 105-15 | 2 |
| 2026 | 91-49 | 11 | 2591 | 99-8 | 1 | 3785-6 | 105-15 | 2 |
| 2027 | 91-3 | 1 | 2593 | 100-17 | 1 | 3785-7 | 105-15 | 2 |
| 2045 | 93-11 | 1 | 2594 | 100-18 | 1 | 3828-1 | 105-16 | 2 |
| 2048 | 94-4 | 1 | 2667 | 97-69 | 1 | 3828-2 | 105-16 | 2 |
| 2050 | 93-4 | 1 | 2716 | 99-10 | 2 | 3828-3 | 105-16 | 2 |
| 2052 | 93-5 | 1 | 2781 | 94-2 | 1 | 3828-4 | 105-16 | 2 |
| 2053 | 93-7 | 1 | 2807 | 97-50 | 1 | 3828-5 | 105-16 | 2 |
| 2096 | 96-49 | 7 | 2825 | 91-4 | 6 | 3828-6 | 105-16 | 2 |
| 2110 | 95-2 | 7 | 2827 | 96-45 | 7 | 3828-7 | 105-16 | 2 |
| 2129 | 91-37 | 14 | 2831 | 96-7 | 7 | 3840 | 96-28 | 14 |
| 2152 | 96-42 | 15 | 2832 | 91-55 | 1 | A3841 | 97- | 2 |
| 2157 | 96-40 | 28 | 2833 | 96-50 | 7 | 3847 | 107-7 | 1 |
| 2219 | 95-11 | 7 | 2834 | 96-46 | 7 | 3876 | 106-14 | 1 |
| 2223 | 91-23 | 6 | 2835 | 91-4 | 6 | A3876 | 106- | 1 |
| 2246 | 103-12 | 2 | 2845 | 96-1 | 7 | 3877 | 106-15 | 1 |
| 2247 | 104-3 | 2 | 2848 | 102-12 | 1 | A3877 | 106- | 1 |
| 2248 | | 1 | 2849 | 102-11 | 1 | 3878 | 106-16 | 1 |
| 2249 | 97-68 | 2 | 2859 | 95-6 | 6 | A3886 | 101- | 1 |
| 2254 | 96-35 | 14 | 2860 | 95-10 | 6 | A3887 | 101- | 1 |
| 2255 | 96-36 | 14 | 2868 | 91-13 | 1 | 3888 | 101-9 | 1 |
| 2256 | 96-37 | 14 | 2872 | 97-56 | 1 | 3891 | 97-39 | 2 |
| 2265 | 91-33 | 3 | 2872-A1 | 97- | 1 | A3891 | 97- | 2 |
| 2303 | 98-19 | 1 | 2873 | 99-11 | 1 | 3915 | 97-33 | 1 |
| 2304 | 97-70 | 1 | 2878 | 97-40 | 3 | 3916 | 100-6 | 1 |
| 2306 | 104-13 | 14 | 2886 | 96-59 | 125 | A3916 | 100- | 1 |
| 2307 | 104-28 | 1 | 2923 | 97-53 | 1 | A3926 | 98- | 1 |
| 2309 | 104-31 | 2 | 3005 | 91-9 | 1 | A3930 | 96- | 1 |
| 2310 | 104-25 | 3 | 3006 | 91-11 | 11 | A3931 | 96- | 6 |
| 2316 | 104-21 | 2 | 3061 | 97-39 | 1 | 3935 | 100-11 | 1 |
| 2436 | 104-29 | 2 | 3062 | 97-47 | 1 | 3936 | 100-10 | 1 |
| 2437 | 96-58 | 149 | A3062 | 97- | 1 | 3938 | 100-14 | 1 |
| 2439 | 91-44 | 58 | 3064 | 97-42 | 2 | 3939 | 100-13 | 1 |
| 2441 | 91-29 | 12 | | | | A3948 | 100- | 1 |
| 2457 | 101-3 | 38 | 3067 | 97-55 | 1 | A3949 | 100- | 1 |
| 2459 | 91-7 | 7 | 3067-A1 | 97- | 1 | A3992 | 96- | 7 |
| 2463 | 96-78 | 42 | 3068 | 97-80 | 1 | A3992-A1 | 96- | 7 |
| 2472 | 96-57 | 146 | 3112 | 97-1 | 1 | A3993 | 96- | 7 |
| 2473 | 91-17 | 97 | 3113 | 97-16 | 1 | A3993-A1 | 96- | 7 |
| 2474 | 91-27 | 12 | 3119 | 99-5 | 1 | A4029 | | 1 |
| 2475 | 91-5 | 12 | A3119 | 99- | 1 | 4043 | 104-3 | 2 |
| 2480 | 97-52 | 1 | 3126-2Y | 105-14 | AR | 4170 | 101-4 | 1 |
| 2502 | 100-33 | 8 | 3192 | 95-4 | 6 | A4170A | 101 | 1 |
| 2505 | 96-43 | 15 | A3192 | 95- | 6 | 4173 | 96-44 | 7 |
| 2506 | 91-8 | 6 | 3248 | 101-12 | 1 | 4177 | 95-12 | 7 |
| 2508 | 97-54 | 1 | 3249 | 96-63 | 1 | 4177-A1 | 95- | 7 |
| 2511 | 93-6 | 1 | 3250 | 91-9 | 1 | 4180 | 95-12 | 7 |
| 2520 | 91-10 | 6 | 3252 | 91-25 | 1 | 4180-A1 | 95- | 7 |
| 2526 | 97-57 | 1 | 3253 | 91-26 | 1 | 4180-A3 | 95- | 7 |
| 2542 | 91-24 | 2 | 3271 | 96-30 | 7 | 4363 | 100-23 | 1 |
| 2555 | 103-2 | 6 | 3292 | 96-29 | 7 | 4674 | 98-4 | 1 |
| 2557 | 96-2 | 84 | 3299 | 96-21 | 7 | 4764-A1 | 98- | 1 |
| 2560 | 91-45 | 58 | 3348 | 96-34 | 7 | 4718 | 101-4 | 1 |
| 2561 | 91-30 | 96 | 3349 | 96-33 | 7 | 4720 | 96-56 | 3 |
| 2574 | 97-12 | 1 | 3360 | 91-41 | 14 | 4721 | 96-55 | 3 |
| 2576 | 97-58 | 1 | 3377 | 104-14 | 14 | 4722 | 96-54 | 8 |
| 2578 | 97-41 | 2 | 3665 | 106-8 | 4 | 4723 | 96-56 | 2 |
| 2580 | 97-8 | 7 | A3682 | 106- | 1 | 4737 | 100-4 | 1 |
| | 97-9 | | 3683 | 106-10 | 1 | A4748 | 100- | 1 |
| | 97-10 | | A3684 | 106- | 2 | A4862 | | 1 |
| 2581 | 97-6 | 4 | 3685 | 106-14 | 2 | 4972 | 107-2 | 1 |
| | 97-7 | | 3687 | 106-15 | 1 | 5071 | 95- | 1 |
| 2582 | 97-48 | 1 | 3710 | 100-1 | 1 | C5071 | 95- | 1 |
| 2583 | 97-44 | 1 | 3785-1 | 105-15 | 2 | C5071-C | 95- | 1 |
| 2584 | 99-7 | 1 | 3785-2 | 105-15 | 2 | 5113 | 96-63 | 1 |

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| A5160 | 97-79 | 1 | 20272 | 96-14 | 14 | 20967 | 100-16 | 1 |
| A5167 | 106- | 1 | 20273 | 91-51 | 7 | 20968 | 100-42 | 1 |
| 5192 | 96-80 | 1 | | 96-60 | | 20970 | 100-44 | 1 |
| 5193 | 96-79 | 6 | 20274 | 91- | 1 | 20971 | 100-20 | 1 |
| 5194 | 91-42 | 1 | 20275 | 91-52 | 7 | 20972 | 100-40 | 1 |
| B5194-B | 91- | 1 | | 96-64 | | 20973 | 100-25 | 1 |
| 5195 | 91-42 | 1 | 20276 | 96-62 | 2 | 20974 | 97-22 | 5 |
| A5197 | 96-4 | 4 | 20277 | 96-81 | 7 | 20977 | 100-12 | 2 |
| A5197-A1 | 96- | 4 | 20278 | 93-2 | 1 | 20978 | 100-27 | 2 |
| A5198 | 96-4 | 4 | 20279 | 93- | 1 | 20988 | 91-14 | 100 |
| A5198-A1 | 96- | 4 | 20280 | | 1 | 20990 | 96-82 | 14 |
| 5232 | 104-3 | 2 | 20288 | 91-35 | 1 | 20991 | 91-16 | 60 |
| 5246 | 105-7 | 1 | 20292 | 91- | 14 | 20992 | 91-16 | 32 |
| A5234 | 96-4 | 3 | A20292 | 91-36 | 14 | 20993 | 97-21 | 6 |
| A5234-A1 | 96- | 3 | A20292-A | 91- | 14 | 20994 | 91-20 | 6 |
| 5256 | 104-4 | 2 | 20293 | 91- | 14 | 20997 | 91-5 | 1 |
| 5262 | 107-8 | 1 | 20294 | 91-39 | 14 | 21512 | 106-11 | 14 |
| A5477 | 106- | 1 | 20296 | 106-19 | 4 | 22001 | 96-15 | 7 |
| A5481 | 96-4 | 3 | 20307 | 104-9 | AR | 22003 | 96-19 | 34 |
| A5481-A1 | 96- | 3 | 20366 | 96-32 | 14 | 22004 | 97-14 | 4 |
| A5515 | 93- | 1 | 20384 | 96-27 | 14 | 22006 | 91-19 | 84 |
| A5542 | 104- | 1 | 20385 | 96-28 | 14 | 22059 | 92-1 | 4 |
| A5542-A1 | 104- | 1 | 20399 | 96-31 | 14 | 22067 | 91-22 | 1 |
| A5543 | 104- | 1 | 20400 | 96-9 | 7 | 22094 | 97-59 | 1 |
| A5543-A1 | 104- | 1 | 20401 | 96-23 | 7 | 22097 | 97-11 | 1 |
| 5578 | 91-42 | 1 | 20418 | 101-8 | 1 | 22141 | 101-5 | 4 |
| | | | 20419 | 101-10 | 1 | 22142 | 101-6 | 1 |
| 6157 | 97-5 | 1 | 20420 | 101-13 | 1 | 22143 | 101-14 | 1 |
| A6180 | 97- | 1 | 20421 | 97-78 | 1 | 22144 | 101-15 | 1 |
| A6180-A1 | 97- | 1 | 20422 | 101-7 | 1 | 22145 | 91-18 | 4 |
| 6317 | 97-5 | 1 | 20423 | 101-14 | 1 | 22161 | 106-1 | 1 |
| A6317 | 97- | 1 | 20426 | 101-15 | 1 | 22162 | 106-2 | 1 |
| A6317-A1 | 97- | 1 | 20428 | 93-9 | 1 | 22169 | 97-36 | 1 |
| A6418 | 91- | 1 | 20429 | 93-8 | 2 | 22196 | 100-21 | 1 |
| 6420 | 97-5 | 1 | | 91-24 | | 22197- | 97-37 | 1 |
| A6420 | 97- | 1 | 20437 | 93-10 | 1 | A22197 | 97- | 1 |
| A6420-A1 | 97- | 1 | 20439 | 93- | 1 | 22202 | 100-7 | 1 |
| A6447 | 91- | 1 | 20440 | 93- | 1 | 22203 | 100-8 | 1 |
| A6768 | 91- | 1 | 20441 | 93- | 1 | A22208 | 95- | AR |
| 20099 | 91-19 | 9 | 20458 | 104-12 | 2 | 22212 | 100- | 1 |
| 20100 | 97-23 | 6 | 20466 | 97- | 1 | 22215 | 100- | 1 |
| 20240 | 96-22 | 7 | 20467 | 97-61 | 1 | 22216 | 100-39 | 1 |
| 20241 | 96-10 | 7 | 20493 | 107-13 | 1 | 22217 | 100-38 | 1 |
| 20242 | 96-24 | 7 | 20515 | 96-73 | 14 | A22227 | 104-7 | 5 |
| 20245 | 92-27 | 6 | 20516 | 96-76 | 14 | 22239 | 100-9 | 1 |
| 20246 | 97-77 | 1 | 20522 | 106-22 | 4 | 22324 | 98-5 | 8 |
| 20247 | 97-74 | 1 | 20532 | 101-11 | 1 | 22366 | 94-16 | 1 |
| 20249 | 96-41 | 14 | 20559 | 106-17 | 7 | 22442 | 98-18 | 1 |
| 20250 | 96-38 | 14 | 20567 | 97-62 | 1 | 22443 | 99-1 | 1 |
| 20251 | 96-39 | 28 | 20720 | 106-13 | 8 | 22444 | 98-1 | 1 |
| 20252 | 96-51 | 14 | 20721 | 106-18 | 5 | 22446 | 101-1 | 1 |
| 20253 | 96-52 | 14 | 20735 | 100-24 | 1 | 22453 | 107-6 | 2 |
| 20254 | 96-53 | 14 | 20747 | 100-35 | 2 | 22460 | 104-23 | 14 |
| 20255 | 91-38 | 14 | 20748 | 100-34 | 2 | 22496 | 104-30 | 2 |
| 20256 | 91-13 | 1 | 20877 | 91-55 | 1 | 22537 | 105-11 | 4 |
| 20259 | 97-81 | 1 | A20878 | 102-16 | 1 | 22539 | 96-17 | 14 |
| 20260 | 95-16 | 7 | 20880 | 100-22 | 1 | 22559 | 101-15 | 1 |
| A20260 | 95- | 7 | 20881 | 100-15 | 1 | 22571 | 104- | AR |
| 20261 | 95-17 | 14 | 20882 | 91-32 | 8 | 22657 | 91-22 | 1 |
| A20263 | 96-68 | 7 | 20884 | 96-8 | 7 | 22659 | 91-22 | 1 |
| B20263 | 96-69 | 7 | 20886 | 96-83 | 7 | 22660 | 91-22 | 1 |
| 20266 | 96-75 | 14 | A20887 | 98- | 1 | 22661 | 99-3 | 4 |
| A20267 | 96-66 | 14 | 20889 | 97-32 | 2 | 22676 | 96-C | 14 |
| 20268 | 91-40 | 14 | 20895 | 104-24 | 14 | 22677 | 107-2 | 1 |
| 20269 | 96-12 | 4 | 20951 | 91-47 | 1 | 22778 | 98-14 | 1 |
| 20270 | 96-11 | 6 | 20952 | 91-48 | 1 | 22803 | 107-1 | 1 |
| 20271 | 96-13 | 14 | 20966 | 100-26 | 1 | 22826 | 91-55 | 1 |

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| A22841 | 93- | 1 | A36153 | 92- | 1 | 531099 | 96-67 | 7 |
| 22841 | 93- | 1 | 36155 | 105-1 | 1 | 531101 | 98-18 | 1 |
| 22842 | 93- | 1 | 36177 | 103-8 | 1 | 531102 | 91-40 | 14 |
| 22845 | 91- | 1 | 36181 | 92-16 | 1 | 531103 | 100-34 | 2 |
| 22858 | 93-12 | 1 | A36183 | 103- | 1 | 531104 | 98-1 | 1 |
| 22931 | 104-2 | 2 | A36183-A1 | 103- | 1 | 531105 | 107-1 | 1 |
| 22986 | 93-10 | 1 | 36184 | 94-23 | 7 | 531106 | 98-15 | 1 |
| 23142 | 104-15 | 7 | 40442 | 93- | 1 | 531219 | 105-5 | 1 |
| 23143 | 104-11 | 7 | 40752 | 92-10 | 1 | 532454 | 94-21 | 1 |
| A23152 | 95- | 6 | 40753 | 92-20 | 1 | 532455 | 94-18 | 1 |
| 23152 | 95-7 | 6 | A40753 | 92- | 1 | 532503 | 92-23 | 1 |
| 23153 | 95-8 | 6 | 40754 | 92-2 | 1 | 532872 | 92-25 | 1 |
| 23168 | 97-75 | 1 | 40770 | 105-6 | 1 | 532873 | 92-24 | 1 |
| 23249 | 91-22 | 1 | A50079 | 93-1 | 1 | 551078 | 98-14 | 1 |
| 23402 | 91-22 | 1 | A50338 | 93-1 | 1 | 358-1032 | 106-5 | 2 |
| 23495 | 103-11 | 1 | 50347 | 95-1 | 1 | 501-10-6 | 104-18 | 7 |
| 23506 | | 1 | A50347 | 95- | 1 | 501-A10-6 | 104-8 | 5 |
| 23524 | 95-3 | 1 | A50347-A1 | | 1 | 501-10-8 | 106-20 | 4 |
| 23601 | 103-9 | 1 | A50440 | 94-1 | 1 | 501-A10-8 | 98-17 | 5 |
| 24012 | 94-17 | 1 | 50476 | 103-4 | 1 | 745-2A | 91-53 | 14 |
| 24195 | 103-14 | 1 | A50504 | 96-4 | 7 | 835-8 | 97-67 | 1 |
| 24196 | 97-34 | 1 | A50504-A1 | 96- | 7 | 936-A-10 | 106-21 | 4 |
| 24335 | 96-67 | 14 | 50506 | 96-63 | 1 | AN75-11 | 97-35 | 1 |
| 23752 | 93-3 | 1 | 500014 | 102-5 | 1 | AN310-3 | 93- | 1 |
| 24753 | 95-3 | 1 | A500014 | 102- | 1 | AN345-10 | 104-20 | 13 |
| 24907 | 92-12 | 1 | 500015 | 102-7 | 1 | AN380-4-3 | 94-7 | 1 |
| 25175 | 92-11 | 1 | 500049 | 96-25 | 14 | An394-15 | 104-26 | 2 |
| 25176 | 92-3 | 1 | 500051 | 97-49 | 1 | AN420-3-16 | 97-38 | 7 |
| 25178 | 94-19 | 1 | 500051-A1 | 97- | 1 | AN500A10-8 | 94-15 | 2 |
| 25193 | 91-20 | 6 | 500053 | 97-51 | 1 | AN502-10-4 | 97-66 | 1 |
| 25196 | 92-22 | 1 | 500055 | 98-7 | 1 | AN502-10-12 | 99-9 | 2 |
| 25197 | 92-5 | 1 | 500056 | 98-9 | 1 | AN505-10-28 | 100-30 | 1 |
| A25197 | 92- | 1 | 500057 | 98-13 | 1 | AN780-2 | 106-9 | 4 |
| 25198 | 92-6 | 1 | 500059 | 98-12 | 1 | AN805-2 | 106-12 | 8 |
| 25199 | 92-8 | 1 | 500061 | 96-16 | 1 | AN900-10 | 91-34 | 3 |
| 25211 | 94-9 | 2 | 500062 | 98-15 | 1 | AN900-12 | 91-50 | 7 |
| 25213 | 92-4 | 1 | 500064 | 98-10 | 1 | AN900-14 | 97-76 | 1 |
| 25214 | 94-8 | 2 | 500066 | 98-11 | 2 | AN900-16 | 91-54 | 20 |
| A25218 | 92- | 1 | 530071 | 107-2 | 1 | AN900-24 | 102-6 | 1 |
| 25232 | 91-14 | 1 | 530247 | 105-2 | 1 | AN936-10 | 106-3 | 2 |
| 25246 | 103-10 | 1 | 530248 | 96-79 | 6 | AN936-A10 | 104-19 | 7 |
| 25247 | 103-7 | 1 | 530249 | 96- | 6 | AN960-10 | 106-3 | 2 |
| 25253 | 103-5 | 1 | 530250 | 96-80 | 1 | AN4028 | 104-10 | 14 |
| 25257 | 103-13 | 1 | 530251 | 96- | 1 | E-831-19P-2Y | 105- | 1 |
| 25285 | 94-11 | 1 | 530265 | 105- | 1 | E-1018-16-1 | 105-19 | 14 |
| 25286 | 94-14 | 1 | 530510 | 91-42 | 1 | E-1124-30-10 | 105-22 | 14 |
| 25287 | 94-13 | 1 | 530511 | 97-5 | 1 | E-1129-28-1 | 105-23 | 14 |
| 25288 | 94-12 | 1 | 530512-A1 | 97- | 1 | E-1135-2-3 | 105-17 | 2 |
| A25380 | 105-12 | 1 | 530512-A2 | 97- | 1 | E-1199-36-0600 | 105-20 | 7 |
| A25381 | 105-12 | 1 | 530513 | 97- | 1 | E-1199-376-1600 | 105-18 | 1 |
| A35008 | 100- | 1 | 530854 | 92-9 | 1 | E-1199-376-2008 | 105-19 | 1 |
| 35169 | 91-26 | 1 | 531083 | 92-15 | 1 | E-1199-379-2408 | 105-21 | 7 |
| 35204 | 91-25 | 1 | 531084 | 100-1 | 1 | E-1348-1-20 | 105-24 | 7 |
| 35294 | 95-13 | 14 | 531085 | 97-1 | 1 | | | |
| 35461 | 93-12 | 1 | 531086 | 100-13 | 1 | | | |
| | 94-25 | | 531087 | 105-4 | 1 | | | |
| 35528-A1 | 95- | AR | 531088 | 103-1 | 1 | | | |
| 35528 | 95-13 | 7 | 531089 | 101-14 | 1 | | | |
| A35536 | 101- | 1 | 531090 | 97-68 | 2 | | | |
| 35594 | 95- | 7 | 531091 | 96-53 | 14 | | | |
| 35596 | 95-14 | 7 | 531092 | 97-61 | 1 | | | |
| A36131 | 92-13 | 1 | 531093 | 101-1 | 1 | | | |
| 36132 | 94-20 | 1 | 531094 | 91-47 | 1 | | | |
| 36141 | 92-21 | 1 | 531095 | 91-48 | 1 | | | |
| 36142 | 94-22 | 1 | 531096 | 107-6 | 2 | | | |
| A36142 | 94- | 1 | 531097 | 101-1 | 1 | | | |
| A36152 | 94-10 | 1 | 531098 | 99-1 | 1 | | | |

CONTINENTAL W 670 AIRCRAFT ENGINES

TABLE OF LIMITS W670-23

| Ref. No. | Chart No. | Description | Serviceable Limits | New Parts | |
|----------|-----------|---|--------------------|------------|------------|
| | | | | Minimum | Maximum |
| 1 | 1 | Piston | | | |
| | | Piston in cylinder (below oil ring groove) dia: | | .059L | .065L |
| | | Piston in cylinder (below third ring and oil ring) dia: | .020L | .013L | .025L |
| 2 | 1 | Piston ring | | | |
| | | Top piston ring in groove (comp) side clearance: | .013L | .0060 | .0075 |
| | | Second and third piston ring in groove (comp) side clearance: | .0095L | .004L | .0055L |
| | | Oil ring in groove side clearance: | .0035L | .0075L | .002L |
| | | Top three rings in cylinder gap: | | .0219 | .0450 |
| | | Oil ring in cylinder gap: | | .0169 | .030 |
| | | Top three rings (std. gap .025-.035) tension: | 10-1/2 lb. | 11-1/2 lb. | 15-1/2 lb. |
| | | Oil ring (std. gap .020-.030) tension: | 9 lb. | 10 lb. | 14 lb. |
| 3 | 1 | Plug in piston pin. dia: | | .000 | .002L |
| 4 | 1 | Piston pin | | | |
| | | Piston pin in rod bushing. dia: | .0035L | .0018L | .0023L |
| | | Piston pin and plugs in cylinder end clearance: | .160L | .032L | .093L |
| 6 | 1 | Crankpin to rear crankshaft. dia: | | .001T | .001T |
| 7 | 1 | Main bearing | | | |
| | | Rear main bearing in liner dia: | | .0003L | .0014L |
| | | Crankshaft rear bearing spacer on crankshaft rear . . dia: | | .006L | .011L |
| | | Main front bearing on crankshaft dia: | | .000 | .0011T |
| 9 | 1 | Master rod | | | |
| | | Master rod bearing on crankpin dia: | .009L | .0023L | .0032L |
| | | Master rod thrust spacer on crankpin dia: | | .0025T | .0042T |
| | | Master rod thrust spacer width: | .3962 | .3992 | .4042 |
| | | Master rod at crank end width: | 3.046 | 3.049 | 3.053 |
| | | Master and articulating rod bearing or bushing twist or convergence per inch of length: | .001 | .000 | .0005 |
| 12 | 1 | Knuckle pin | | | |
| | | Knuckle pin in articulating rod bushing dia: | .004L | .0013L | .0017L |
| | | Knuckle pin in master rod dia: | | .0002T | .001T |
| | | Articulating rod in master rod end clearance: | .020L | .0095L | .0145T |
| 13 | 1 | Front crankshaft main bearing | | | |
| | | Front main bearing in bearing liner dia: | | .0003L | .0014L |
| | | Crankshaft front bearing spacer thickness: | | .187 | .189 |
| 14 | 1 | Thrust bearing, ball | | | |
| | | Crankshaft thrust bearing in cage dia: | | .0006L | .0005T |
| | | Flange face of thrust bearing and flange face of thrust bearing cover assembly clearance: | | .0005 | .0115 |
| 17 | 1 | Thrust bearing nut to thrust bearing cover dia: | | .0475L | .0497L |
| 18 | 1 | Crankshaft front plug to crankshaft pitch diameter: | | .000 | .004L |
| 21 | 1 | Cylinder barrel | | | |
| | | Cylinder bore (full length) dia: | 5.128 | 5.124 | 5.125 |
| | | Cylinder bore (full length) taper on dia: | .003 | .000 | .001 |
| | | Cylinder bore (surface roughness in micro inches) rms: | | 14 | 20 |
| | | Cylinder bore (out-of-round) | .003 | .000 | .001 |

TABLE OF LIMITS W670-23 (Cont.)

| Ref. No. | Chart No. | Description | Serviceable Limits | New Parts | |
|----------|-----------|--|--------------------|-----------|---------|
| | | | | Minimum | Maximum |
| 25 | 1 | Starter gear | | | |
| | | Starter gear in bushing. dia: | .0065L | .0015L | .0035L |
| | | Starter gear retainer bar in starter gear square hole. side clearance: | | .0005L | .0138L |
| | | | | | |
| 27 | 1 | Cam hub | | | |
| | | Cam hub on cam drive gear dia: | .009L | .0025L | .0045L |
| | | Cam hub on cam drive gear end clearance: | .024L | .010L | .014L |
| 31 | 1 | Starter gear in oil feed bushing. dia: | .007L | .0025L | .0045L |
| 36 | 1 | High pressure oil screen | | | |
| | | Oil screen-to-housing pilot dia: | | .0356 | .059L |
| 38 | 1 | Cam drive intermediate gear | | | |
| | | Cam drive intermediate drive gear on pin dia: | .005L | .0016 | .003L |
| | | Cam drive intermediate drive gear on pin . end clearance: | .043L | .008L | .028L |
| 39 | 1 | Generator shaft in generator pinion | | | |
| | | Generator drive pinion (splines OD) : | | .873 | .883 |
| | | Generator drive pinion (splines ID) : | | .695 | .702 |
| | | Generator drive pinion (groove width). : | | .217 | .220 |
| 40 | 1 | Generator step-up on pinion bearings | | | |
| | | Rear bearing in step-up housing dia: | .0009L | .0006L | .0004L |
| | | Spacer in step-up housing dia: | | .0025L | .008L |
| 42 | 1 | Generator pinion bearing lock | | | |
| | | Lock in lock retainer ID: | | .0005L | .0025L |
| | | Lock on pinion gear shaft dia: | | .000 | .002L |
| | | Assembly clearance between bearing and lock : | | .0003L | .0083L |
| 44 | 1 | Generator drive gear | | | |
| | | Gear in bushing dia: | .006L | .0015L | .0035L |
| | | Gear in accessory case end clearance: | .040L | .004L | .022L |
| 48 | 1 | Rocker arm roller | | | |
| | | Bushing on roller pin dia: | .003 | .000 | .0005L |
| 53 | 1 | Exhaust valve | | | |
| | | Exhaust valve stem in valve guide dia: | .0085L | .0035L | .0055L |
| | | Valve insert seat face-to-guide axis angle: | | | 45° |
| | | Valve seat face-to-guide axis angle: | | 45°45' | 46°15' |
| | | Exhaust valve insert seat face width: | | .130 | .134 |
| | | Exhaust valve (max. tip regrind) length: | 4.834 | 4.849 | 4.869 |
| 54 | 1 | Rocker arm ball bearing | | | |
| | | Rocker shaft in cylinder head bosses dia: | | .0003L | .0005T |
| | | Rocker bearing in cylinder head. side clearance: | .045L | .0163L | .0253L |
| | | Bearing on rocker shaft dia: | | .0003L | .0009L |
| 57 | 1 | Intake valve stem in guide : | .005L | .001L | .003L |
| | | Valve insert seat face-to-guide axis angle: | | | 45° |
| | | Valve seat face-to-guide axis angle: | | 45°45' | 46°15' |
| | | Intake valve insert seat face width: | | .130 | .134 |
| | | Intake and exhaust valve warp (full indicator reading : | .004 | | |
| 59 | 1 | Tachometer drive coupling in crankshaft | | | |
| | | Broach nut ID: | | .016L | .024L |
| 60 | 1 | Tachometer drive gear shaft in housing dia: | .0045 | .001L | .0025L |
| 62 | 2 | Tachometer driven gear in housing dia: | .0045L | .001L | .0025L |
| | | Tachometer drive gear in pilot dia: | .0045L | .001L | .0025L |

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TABLE OF LIMITS W670-23 (Cont.)

| Ref. No. | Chart No. | Description | Serviceable Limit | New Parts | |
|----------|-----------|--|-------------------|-----------|---------|
| | | | | Minimum | Maximum |
| 64 | 1 | Pushrod over-all length: | | 10.920 | 10.940 |
| 65 | 1 | Valve tappet assembly | | | |
| | | Length over roller pin and a 7/16-in. ball in socket length: | 4.260 | 4.270 | 4.290 |
| | | Tappet roller on pin dia: | .006L | .0021L | .0035L |
| | | Tappet roller OD: | | 1.3105 | 1.3145 |
| | | Valve tappet insert in tappet dia: | | .0005T | .002T |
| 71 | 2 | Ignition gear | | | |
| | | Ignition drive gear in bushing dia: | .005L | .0005L | .0025L |
| | | Ignition drive gear in accessory case end clearance: | .060L | .008L | .048L |
| 72 | 2 | Ignition drive shaft gear in coupling (spline PD) : | | .0015L | .0065L |
| 73 | 2 | Magneto pilot ring in accessory case pilot dia: | | .0005T | .0025L |
| | | Pilot ring on magneto dia: | | .000 | .004L |
| 75 | 2 | Rocker scavenge pump | | | |
| | | Driven shaft in driving gear (square end) side clearance: | | .003L | .005L |
| | | Drive gear in pump cover dia: | .0055L | .002L | .0035L |
| | | Drive gear shaft in pump body dia: | .005L | .0015L | .003L |
| | | Driven gear in cover dia: | .0055L | .002L | .0035L |
| | | Driven gear in pump body dia: | .005L | .0015L | .003L |
| | | Drive and driven gears in pump body (OD of tooth) : | .008L | .003L | .006L |
| | | Dowel in pump cover dia: | | .000 | .002L |
| | | Dowel in pump body dia: | | .0005T | .0025T |
| | | Oil seal in pump body dia: | | .001T | .007T |
| | | Oil pump bushing in accessory case dia: | | .001T | .003T |
| | | Drive gear in bushing dia: | .0055L | .001L | .003L |
| | | Drive gear in accessory case end clearance: | .070L | .008L | .052L |
| 77 | 2 | Oil pump drive gears | | | |
| | | Drive gear in bushing dia: | .0055L | .001L | .003L |
| | | Drive gear in accessory case end clearance: | .070L | .008L | .053L |
| 80 | 2 | Scavenge oil screen ferrule in accessory case dia: | | .032L | .072L |
| 81 | 2 | Oil pump oil return check valve assembly | | | |
| | | Guide in pump body dia: | | .0005T | .002T |
| | | Seat in lower plate dia: | | .001T | .004T |
| 82 | 2 | Oil pump shaft in body and cover dia: | .005L | .0015L | .003L |
| 83 | 2 | Duplex pressure oil pump | | | |
| | | Gears in pump body end clearance: | .0076 | .002L | .005L |
| | | Drive gear in driven gear (square spline) side clearance: | | .005L | .007L |
| | | Gear shafts in pump body shaft dia: | .005L | .0015L | .003L |
| 84 | 2 | Duplex scavenge oil pump | | | |
| | | Oil pump body in accessory case (inner pilot) dia: | | .0005L | .0025L |
| | | Oil pump body in accessory case (outer pilot) dia: | | .053L | .104L |
| | | Gears in oil pump housing dia over teeth: | .008L | .003L | .006L |
| | | Driver gear keyed on driver gear shaft dia: | | .00175L | .00225L |
| | | Driven gear on shaft dia: | .004L | .00175L | .00225L |
| | | Gears in pump housing end clearance: | .007L | .001L | .005L |
| | | Oil seal in upper plate dia: | | .000 | .003T |
| | | Oil seal in lower plate dia: | | .009L | .015L |