SECTION 6A

ENGINE MECHANICAL

INDEX

GENERAL DESCRIPTION

The 1964 Corvair engine (fig. 1) features a substantial increase in power-to-weight ratio, achieved by increasing the displacement to 164 cubic inches. Engine displacement is increased by increasing the piston stroke to 2.94; the bore size remains $3\frac{7}{16}$".

Engine overall size is not changed, but the following internal revisions are made for 1964:

1. The crankshaft, revised for 2.94" stroke, has a new shorter flywheel hub on the timing gear and an oil slinger at rear oil seal.

2. The cylinder head has a revised combustion chamber and the piston compression height is reduced to permit stroking.

3. New piston rings to accommodate revised piston and oil ring have a new spacer to prevent oil ring rotation.

4. The cylinders and crankcase are relieved to maintain proper clearance for connecting rods.

5. The camshaft lobes are respaced for proper clearances and have new lobe contour and lift.

6. The connecting rods have an increased cross section and heavy duty bearings to accommodate higher piston loads.

7. A step-faced flywheel to accommodate new clutch assembly.

8. A harmonic balancer, used on all engines (except base w/3 speed) requires a new engine rear mount bracket, skid plate and rear center shield similar to 1963 Air Conditioning vehicle engines.

9. The air cleaners used on all engines (except turbo-charged) are oil-wetted paper element type. The passenger Corvair uses a single air cleaner; the air-conditioned vehicles and R-10 use two air cleaners. The turbo-charged engine uses one polyurethane element air cleaner.

10. New rocker arm covers, gaskets and reinforcement springs to provide better gasket retention and oil sealing characteristics.

11. Ignition timing is changed (see Section 7).

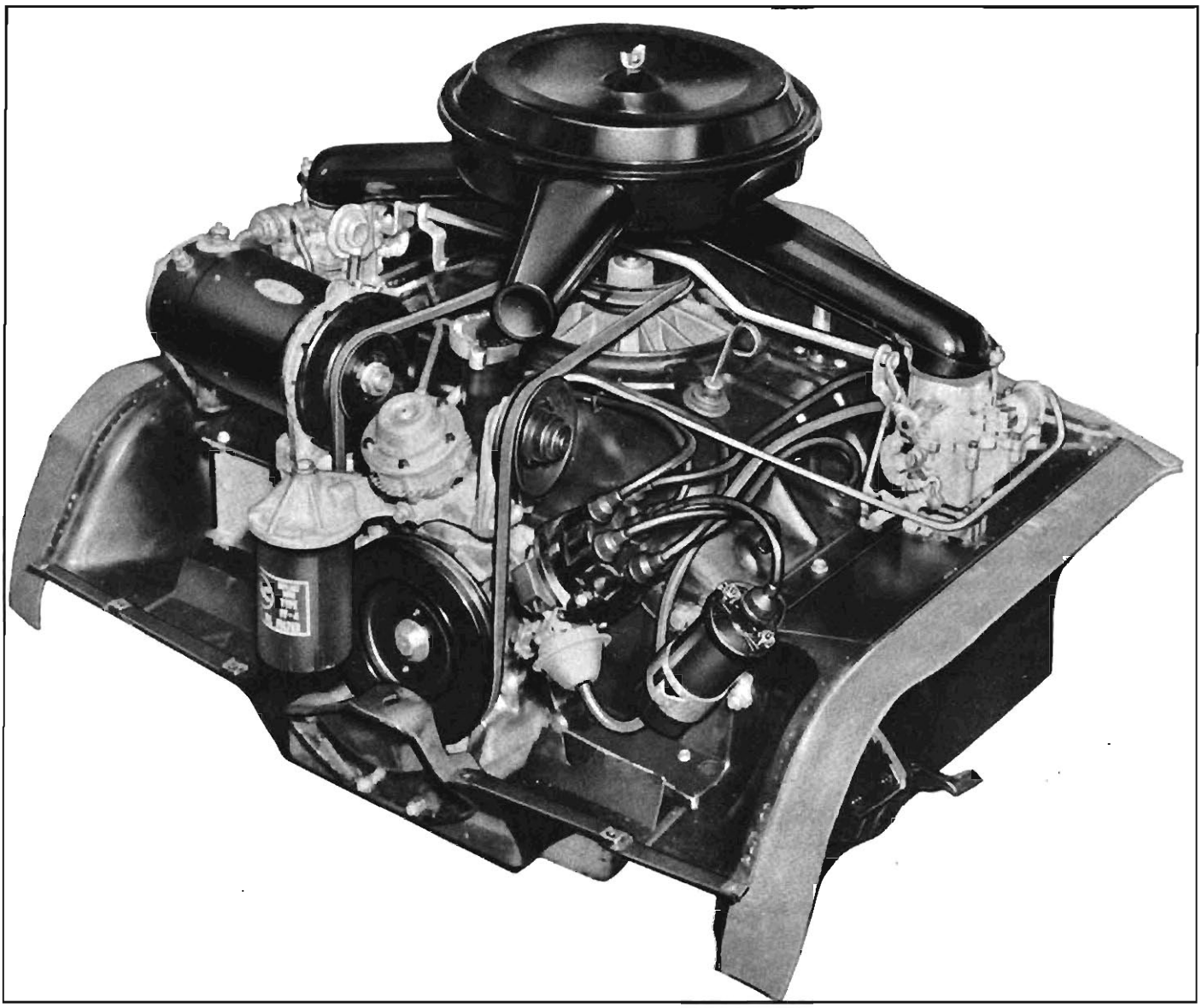

Fig. 1—Sedan Engine

SERVICE OPERATIONS

The following service operations represent only changes or additions to the 1961 Corvair Shop Manual Service Operations.

CARBURETOR REMOVAL

When it is necessary to remove a carburetor to gain access to another part, remove both carburetors and cross shaft as an assembly in order to maintain the present carburetor synchronization. When carburetors are reinstalled, however, synchronization should be checked. The procedure is as follows:

1. Remove air cleaner (or cleaners) and cross-tube.
2. Disconnect accelerator rod and return spring from cross-shaft, choke rods at choke shaft levers, distributor spark hose and fuel lines at carburetor.

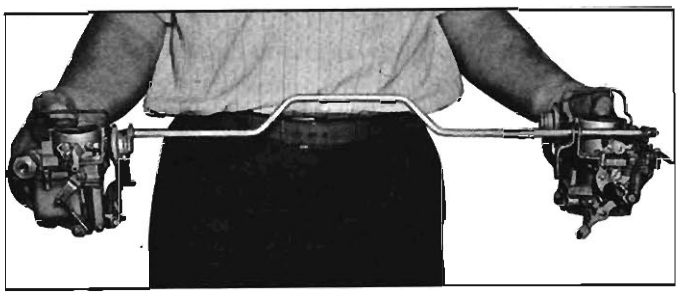

Fig. 2—Carburetors and Cross-shaft Assembly

3. Remove two hold-down nuts at each carburetor and lift carburetors and cross-shaft out as an assembly (fig. 2).
4. Reverse above procedure to install and then check synchronization (outlined in Section 7).

ENGINE SHEET METAL COMPONENTS

Engine sheet metal has been changed to accommodate the automatic choke (fig. 3). Their service procedures change as follows:

UPPER SHROUD ASSEMBLY

Removal

1. Remove air cleaner assemblies and supports.
2. Disconnect fuel lines at carburetors and at fuel pump "tee" fitting. Disconnect spark advance hose at right carburetor.
3. Disconnect accelerator rod at cross-shaft, disconnect choke control rod at choke lever and remove upper choke control rod.
4. Disconnect and remove carburetors and cross-shaft as an assembly. Remove blower belt.
5. Remove crankcase ventilation tube and (on sedan) the oil dipstick.
6. Remove wire from each spark plug and remove vacuum balance tube.
7. Remove generator outboard bracket bolts at upper

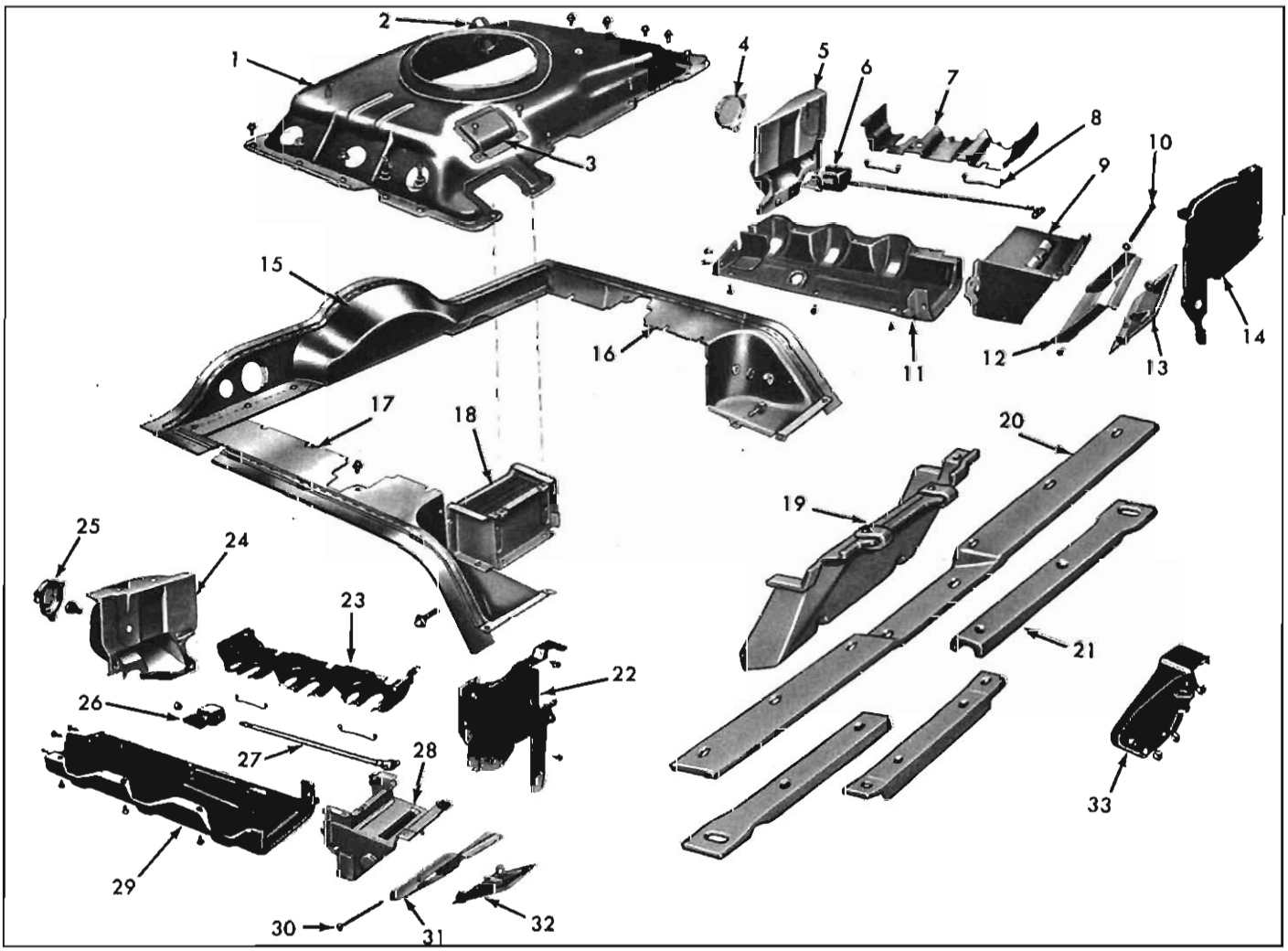

Fig. 3—Engine Sheet Metal—Exploded

1. Engine Upper Shroud
2. Heater Connection
3. Oil Cooler Access Hole Cover
4. Engine Front Shroud Assembly Cover
5. Engine Front Shroud Assembly—R.H.
6. Thermostat, Bracket and Actuating Rod
7. Engine Cylinder Air Baffle—R.H.
8. Engine Cylinder Air Baffle Retainer
9. Engine Exhaust Duct—R.H.
10. Exhaust Duct Door Shaft
11. Lower Shroud—R.H.
12. Exhaust Duct Opening
13. Exhaust Duct Damper Door
14. Engine Rear Shroud—R.H.
15. Engine Front Shield
16. Engine Side Shield Assembly—R.H.
17. Engine Side Shield Assembly—L.H.
18. Oil Cooler
19. Engine Rear Center Shield
20. Engine Rear Seal
21. Engine Rear Seal Retainer
22. Engine Rear Shroud—L.H.
23. Engine Cylinder Air Baffle—L.H.
24. Engine Front Shroud—L.H.
25. Engine Front Shroud Cover
26. Thermostat and Bracket
27. Actuating Rod
28. Exhaust Duct—L.H.
29. Lower Shroud—L.H.
30. Exhaust Duct Door Shaft
31. Exhaust Duct Opening
32. Exhaust Duct Damper Door
33. Engine Rear Mounting Bracket

shroud and remove generator as outlined in Section 8 of this manual.

8. Disconnect heater hose (if so equipped) at engine compartment wall.
9. Remove remaining upper shroud retaining screws and lift out shroud with heater hose attached.

NOTE: Raise front of shroud first and rotate clockwise to clear oil filter and generator adapter.

Installation

1. Install upper shroud in same manner of removal.

NOTE: When tightening retaining screws, turn the blower to assure adequate clearance of blower to shroud.

2. Install upper shroud screws and torque 30 to 40 inch lbs. and install and tighten generator (as outlined in Section 8) to prevent breaking generator mounting.
3. Connect heater hose (if so equipped), install vacuum balance tube.
4. Install spark plug wires and blower belt.
5. Install crankcase vent tube and oil level dipstick and boot.
6. Install carburetors and cross-shaft as an assembly. Connect choke control rods and accelerator rod. Adjust choke rods.
7. Connect spark advance hose at right carburetor and install fuel lines to carburetors.
8. Install air cleaner brackets and air cleaners.
9. Check carburetor synchronization.

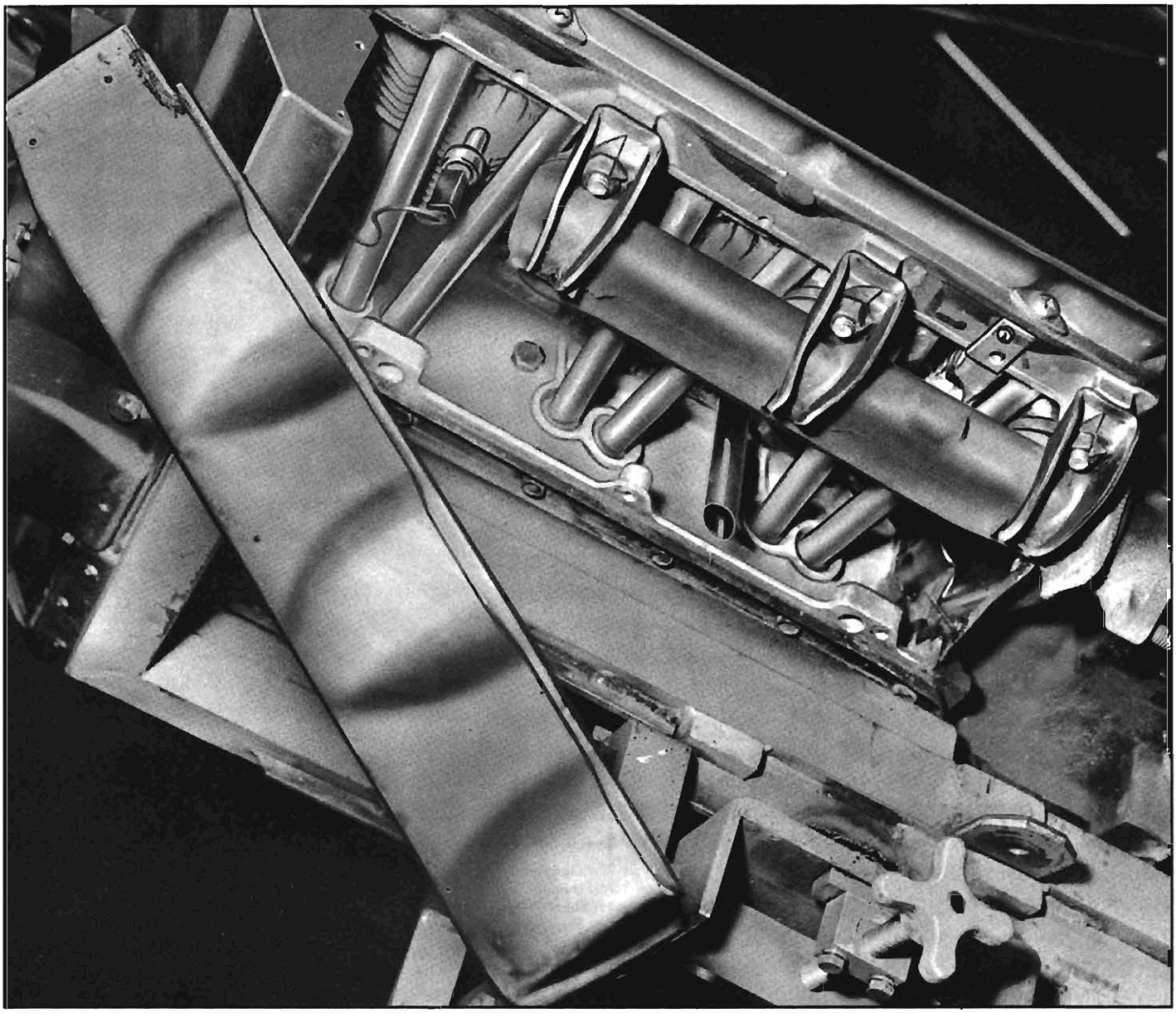

Fig. 4—Lower Shroud Removal

FRONT SHIELD

Removal

1. Disconnect battery ground strap at battery.
2. Remove air cleaners and air cleaner supports.
3. Remove vacuum balance tube and heater hose if so equipped.
4. Remove front seal retainer and disconnect accelerator rod at cross-shaft.
5. Remove front shield retaining screws and move shield rearward to gain access to starter solenoid connections and fuel line connection.
6. Disconnect fuel line from tank at fuel pump.
7. Disconnect fuel line hose connection at rear line and remove fuel line rearward through shield. Remove grommet from shield.
8. Disconnect battery cable at solenoid and the other two wires at quick-disconnect in engine compartment. Slide wires through grommet opening in shield.
9. Remove shield over accelerator rod and dust boot.

Installation

Reverse the Removal procedure to install.

LOWER SHROUD (Fig. 4)

The lower shroud is a separate piece from the exhaust duct and damper assembly. The exhaust duct damper thermostat is in the same location and is adjusted in the same manner. The lower shroud, however, may be removed without the duct and damper assembly to service engine temperature sending unit and the choke stove unit.

The procedure is as follows for both right and left sides.

Removal

1. Remove sheet metal screws to duct assembly.
2. Remove eight shroud-to-head and crankcase cap screws.
3. Lower the duct and move it rearward enough to release thermostat tension and disconnect thermostat rod at damper door.
4. To replace either the shroud, shield or bracket, remove assembly as outlined above, remove thermostat assembly, then drill out the rivets with a $\frac{9}{64}$" drill and reassemble required new parts using ¼-20 bolt and self-locking nut.

Installation

1. Reverse the removal procedure for installation.
2. Check adjustment of duct damper.

FRONT SHROUD (Fig. 5)

Removal

1. Remove lower shroud.
2. Remove exhaust manifold.

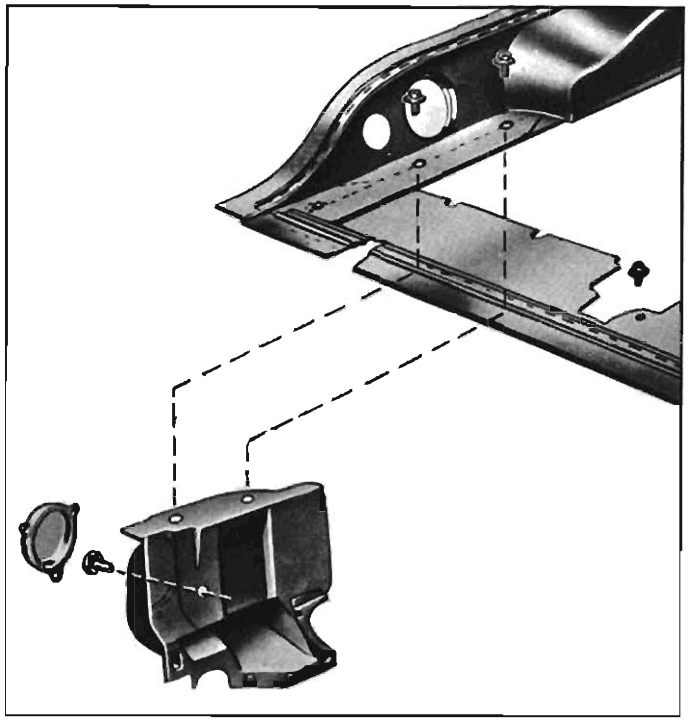

Fig. 5—Front Shroud Attachments

3. Remove three screws from front shield in upper compartment.
4. On right side remove two bolts holding exhaust muffler shield.
5. Remove heater duct hoses if direct air heater equipped.
6. Remove remaining bolts and remove front shroud assembly. (On left side one bolt is inside heater duct opening.)

Installation

1. Reverse removal procedure to install.
2. Check adjustment on exhaust duct damper.

ROCKER ARM COVER AND GASKET (Fig. 6)

The rocker arm cover is designed to locate the gasket using inside (or inboard) tabs instead of outboard tabs and cover notches. A new bolt reinforcement spring assures even rocker arm cover retention and oil sealing. The service gasket is designed with both internal and external locating tabs for service back through 1960 vehicles. For service from 1960-63 use the service gasket as is. For 1964 engines, trim off the external tabs (as shown in Figure 6) before installing.

VALVE LASH ADJUSTMENT— ENGINE RUNNING

1. After the engine has been normalized, remove valve cover and install a reworked valve cover (cut the top out of a used valve cover) and gasket on cylinder heads to prevent oil from running out.

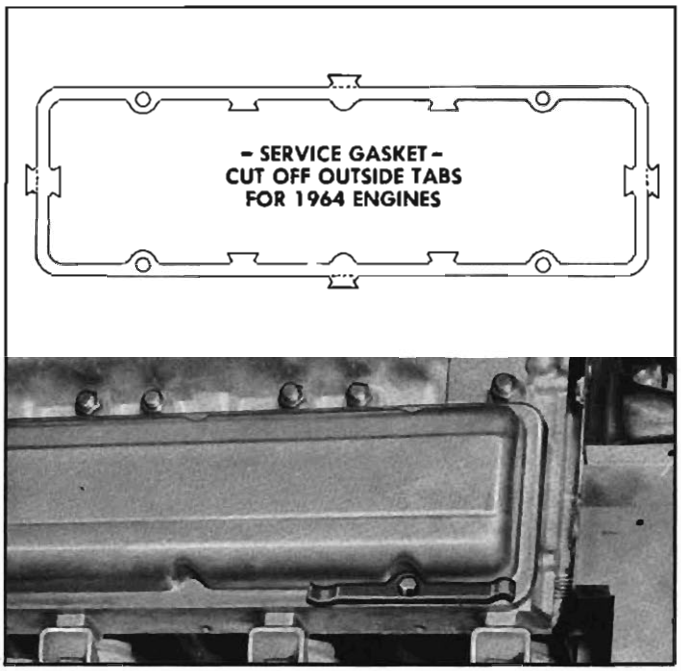

Fig. 6—Rocker Arm Cover and Gasket

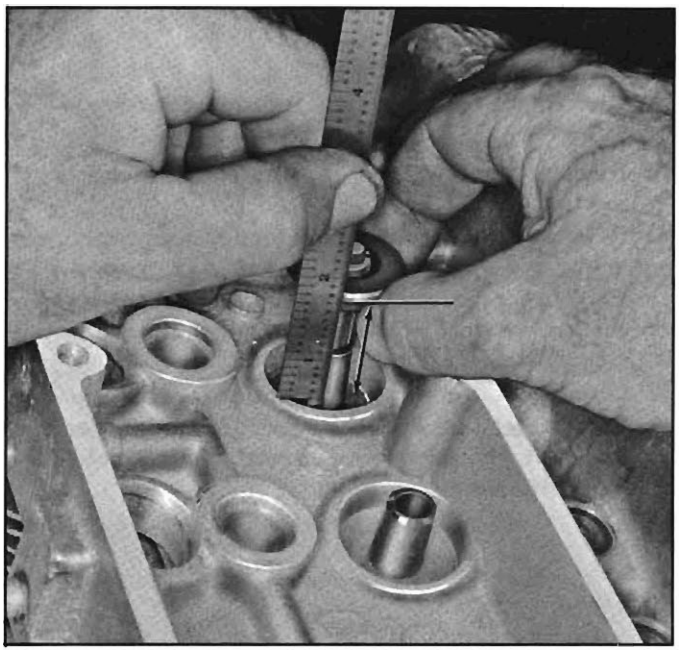

Fig. 7—Measuring Valve Spring Installed Height

2. With the engine running at idle, back off valve rocker arm nut until the valve rocker arm starts to clatter.
3. Turn rocker arm nut down slowly until the clatter just stops. This is the zero lash position.
4. Turn nut down ¼ additional turn and pause 10 seconds until engine runs smoothly. Repeat additional ¼ turns, pausing 10 seconds each time, until nut has been turned down 1 full turn from the zero lash position.

   NOTE: This 1 turn pre-load adjustment must be done slowly to allow the lifter to adjust itself to prevent the possibility of interference, between the inlet valve head and top of piston, which might result in internal damage and/or bent push rods. Noisy lifters should be replaced.

5. Repeat Steps 2, 3 and 4 to adjust the rest of the valves.
6. Remove reworked cover and install valve cover, using new gasket.

VALVE PUSH RODS

Push rods on Corvair engines must be installed with side oil hole (paint marked end) to rocker arm.

VALVE LIFTERS

The lower shroud for 1964 makes it easier to remove or replace valve lifters. Remove lower shroud as previously outlined and then follow 1961 shop manual outline to complete the job.

New or rebuilt valve lifters should be refilled with oil before installation to the engine. This can be accomplished by submerging the lifter in a can of engine oil and working the lifter plunger up and down several times.

CYLINDER HEADS

Cylinder head removal procedure changes from 1961 because the automatic choke control rod passes through the head to reach the thermostat and must be removed before the head can be removed.

VALVE SPRING INSTALLED HEIGHT MEASUREMENT (Fig. 7)

The valve spring seat on Corvair cylinder heads is recessed, presenting a problem to measure installed height. This measurement can be easily performed before the spring is installed as follows:

1. After the valve face and seat have been refinished, install the valve in its bore, then install the spring cap and valve keepers without the spring.
2. Hold the spring cap and pull the valve against its seat in the head.

   NOTE: This locates the spring cap in its installed position.

3. While holding the valve as above, measure distance between spring cap and spring seat.

   NOTE: A cutaway scale will help.

4. Remove the spring cap and valve keeper then install necessary shims and assemble the valve and spring assembly.

   NOTE: Spring Shims are available in ½" thickness. Do Not Shim if shim will bring installed height below minimum specification.

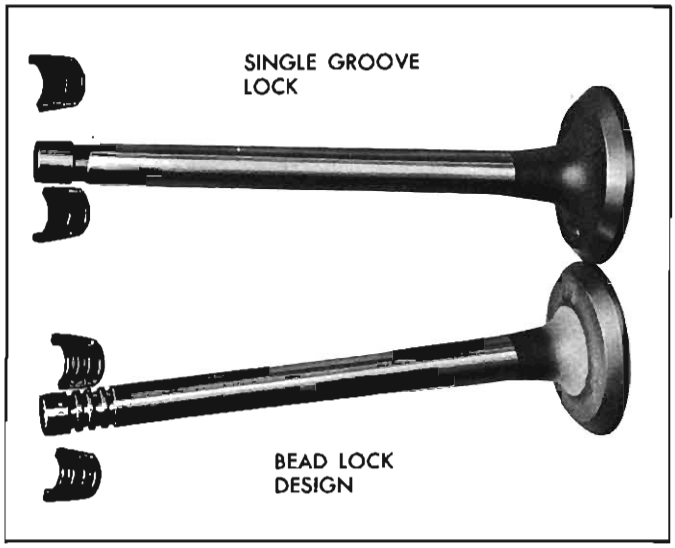

Fig. 8—Bead Lock Exhaust Valve

VALVES

One inlet valve is provided for all engines and is identified with a no. 1 on underside of the head.

The bead lock design exhaust valve (fig. 8) is used on all engines except R-10 which uses the single groove type lock and valve rotators.

CHECKING VALVE STEM-TO-GUIDE CLEARANCE

Excessive valve stem clearance in guide bore can cause a decrease in engine power, increased oil consumption, rough idling and noisy valves. Insufficient clearance can cause valve seizure or noisy and irregular valve action, resulting in engine vibration and power loss.

Intake valve stem-to-guide bore clearance should be .001" to .0027" when a new valve is used in either a new guide or in a worn guide that has just been reamed. Valve clearance in a worn guide must be within .001" to .004" to permit use of the guide without re-reaming. The exhaust valve stem clearance should be .0014" to .0029" (new) and .002" to .005" (worn).

The amount of valve stem-to-guide clearance that exists at any location can be accurately determined by the following method:

Clamp a dial indicator on one side of the cylinder head rocker cover gasket rail, locating the indicator so that movement of the valve stem from side to side (crosswise to the head) will cause a direct movement of the indicator stem. The indicator stem must contact the side of the valve stem just above the cylinder guide. With the valve head dropped about 1/16" off the valve seat; move the stem of the valve from side to side, using light pressure to obtain a clearance reading. If clearance exceeds the limits stated above it will be necessary to utilize one of the corrective procedures described in the following paragraphs.

CORRECTING EXCESSIVE VALVE-STEM-TO-GUIDE CLEARANCE

If results of the valve stem-to-guide clearance check outlined above indicate that a guide is worn to the extent that a new valve with standard diameter stem cannot be utilized in that guide; the technician should then select, from the two service procedures listed below, the method that he will use to obtain proper valve to guide clearance.

INSTALLATION OF OVERSIZE VALVES

Oversize valves can be utilized to obtain proper valve to guide clearance in all cases except when the guide is either cracked or is worn to the extent that reaming will not clean-up the guide bore to permit use of the largest oversize valve available.

Valves are available with: standard diameter, .003", .010" and .020" oversize stems.

1. Remove and disassemble cylinder head as outlined on pages 6A-20 and 6A-33 of the 1961 Corvair Shop Manual.
2. Select from the reamers listed below, the smallest diameter oversize reamer that will provide proper refinish of the guide bore.

Reamer J-5830-1 use for .003" oversize valve
Reamer J-5830-4 use for .010" oversize valve
Reamer J-5830-5 use for .020" oversize valve

NOTE: Reamers listed above are included in Hand Reamer Set J-5830-02, which was introduced in 1961.

3. Ream bore of valve guide, starting at the combustion chamber side and flushing with cutting oil to avoid scoring. Do not force or withdraw reamer during reaming operation. Reamer should pass completely through bore and be removed at the valve spring side of the cylinder head. Wipe refinished bore to remove cutting oil and chips; inspect bore.
4. Inspect valve seat insert and reface as necessary to obtain correct seat angle and concentricity with guide bore.
5. Select and use valve in same nominal oversize as that of reamer last used in refinishing the guide bore.
6. Inspect and assemble cylinder head as outlined under the heading, "Assembly of Cylinder Head."

VALVE GUIDE REPLACEMENT

Replacement valve guides that are useable at either inlet or exhaust valve locations are available for all Corvair engines except the Turbocharged version. The installation of a service valve guide will allow use at that location of a valve with standard diameter stem. Even cylinder heads that would normally have been

scrapped due to cracked or excessively worn valve guides can now be salvaged by installing the replacement valve guide where necessary. New special tools required for valve guide replacement are now available; their usage is explained in the valve guide replacement procedure detailed later in this article.

Replacement valve guides for all Corvair engines, except the turbocharged engine, are now available in O.D. oversizes of .002" (replacement standard), .010". and .020". The service guides are bored to permit use of valves with standard diameter stems.

After removing and disassembling the cylinder heads, as described on pages 6A-20 and 6A-33 of the 1961 Corvair Shop Manual, carefully inspect all installed valve guides. Guides showing cracks or that are otherwise damaged or worn beyond utilization with service oversize valves, should be replaced as follows:

Valve Guide Removal

Remove worn guides using the J-21280 Remover and a hammer (2 lb. minimum). Drive valve guide from the spring seat side (Fig. 9) so that the guide will exit on the combustion chamber side of the cylinder head.

Selection of Replacement Valve Guides

Wipe out valve guide bore in cylinder head and closely inspect for scoring or damage during guide removal. Use the following method to select the replacement valve guide required for each location:

a. If guide bore in cylinder head appears smooth and free from scoring, select standard size replacement guide.

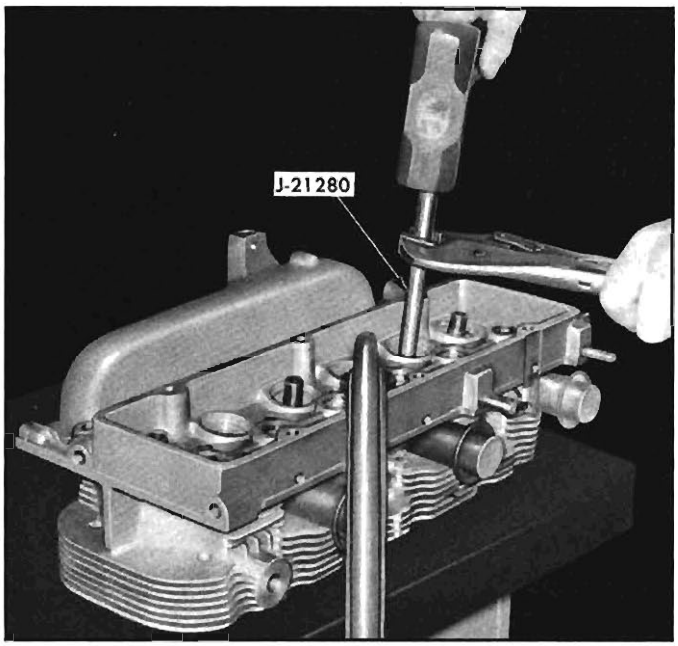

Fig. 9—Removing Corvair Engine Valve Guide

Fig. 10—Reaming Cylinder Head Valve Guide Bore

b. If some damage in bore is evident, ream bore with .010" oversize (J-21282) Hand Reamer starting at the combustion chamber side and flushing with cutting oil to avoid scoring (Fig. 10). Do not force or remove reamer during reaming operation and pass reamer completely through bore and remove from valve spring side. Wipe refinished bore to remove cutting oil and chips; inspect bore. Finish bore diameter should now be .524" - .525". If bore is smooth and free of scoring after reaming, select .010" O.D. oversize valve guide.

c. If reaming with the .010" reamer did not clean the guide bore in the cylinder head, use the .020" oversize (J-21283) Hand Reamer and select .020" O.D. oversize valve guide. Wipe valve guide bore to remove cutting oil and chips. Finished bore diameter should now be .534" - .535".

Valve Guide Installation

1. Coat outside diameter of the selected valve guide with oil; then using Guide Installer J-21281 and a hammer, start guide, tapered end first, into bore from combustion chamber side of the cylinder head. Final installed height should be approximately 1" from the top surface of the valve seat insert to the end of the guide. Correct height can be determined by aligning the groove on the installer–flush with top surface of the valve seat insert, as shown in Figure 11.
2. Liberally oil valve stem bore and ream through from the combustion chamber side, using Hand Reamer J-21318.
3. Recondition valve seat as necessary to obtain correct seat angle, width, and concentricity with guide

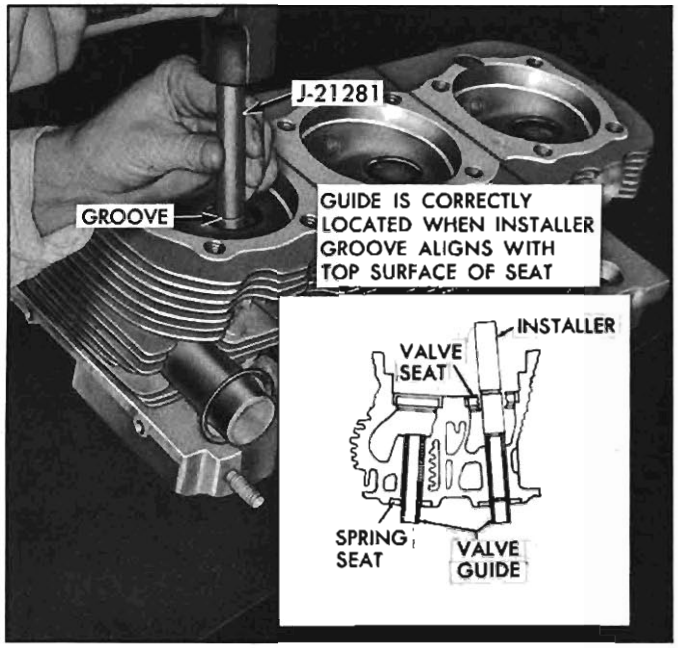

Fig. 11—Installing New Valve Guide

bore (refer to page 6A-35 of the 1961 Corvair Shop Manual).

4. Select and use valves with standard diameter stem at locations where new guides were installed.

Assembly of Cylinder Head

1. Inspect the cylinder head for restrictions in the air circulating passages formed by the cooling fins. Casting flash or a build-up of other foreign material that could decrease cooling efficiency can be easily removed from the air passages using the J-21308 Fin Cleaning Tool (Fig. 12).

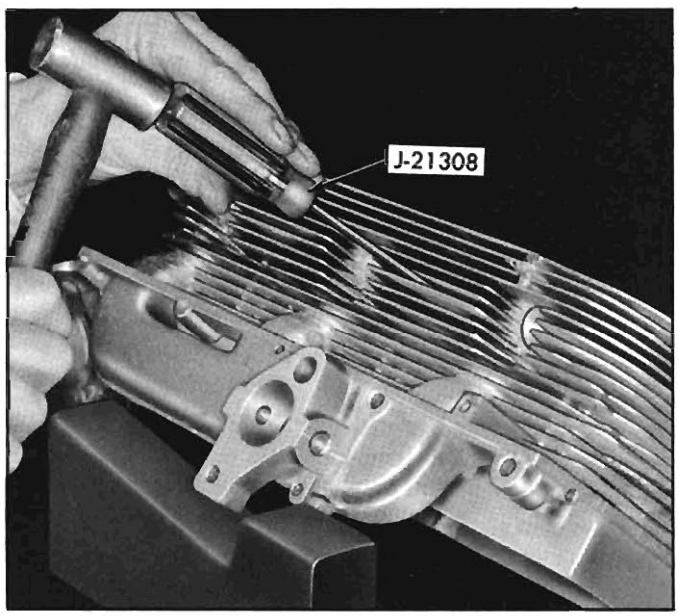

Fig. 12—Cleaning Air Passages Between Fin

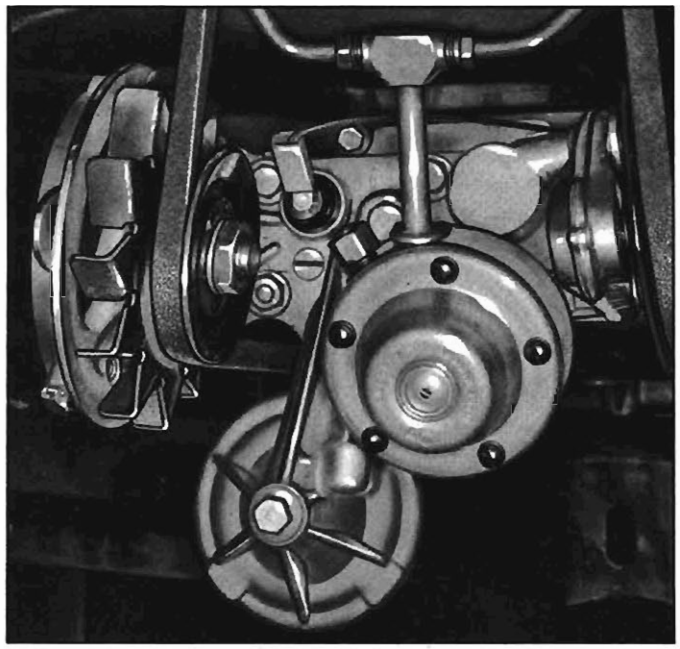

Fig. 13—Oil Pressure Switch Location

2. Complete assembly of the cylinder head as outlined on page 6A-36 of the 1961 Corvair Shop Manual, except final torque all valve rocker studs and cylinder head stud nuts.

OIL PRESSURE SENDING SWITCH (Fig. 12)

The oil presure sending switch is relocated to top of oil filter adapter at left of fuel pump. To replace the switch simply disconnect the wire, replace the switch (use 1⅛-6 point deep socket) and reinstall the wire lead.

OIL FILTER REPLACEMENT (AIR CONDITIONED VEHICLES)

(Refer to fig. 14)

1. Remove bolt through generator-oil filter adapter plate to adapter elbow while supporting oil filter and elbow.
2. Remove oil filter and elbow adapter as an assembly to avoid oil spillage into engine compartment.
3. Remove filter mounting bolt and separate elbow from filter.
4. Discard filter and clean the elbow.
5. Replace all gaskets and use new filter.
6. Reverse Steps 1-3 to install.

NOTE: Apply a light coat of oil on gasket sealing surfaces during installation.

BLOWER BEARING REPLACEMENT

The blower bearing hub is serviced as outlined in 1961 Shop Manual, but the dimension locating the

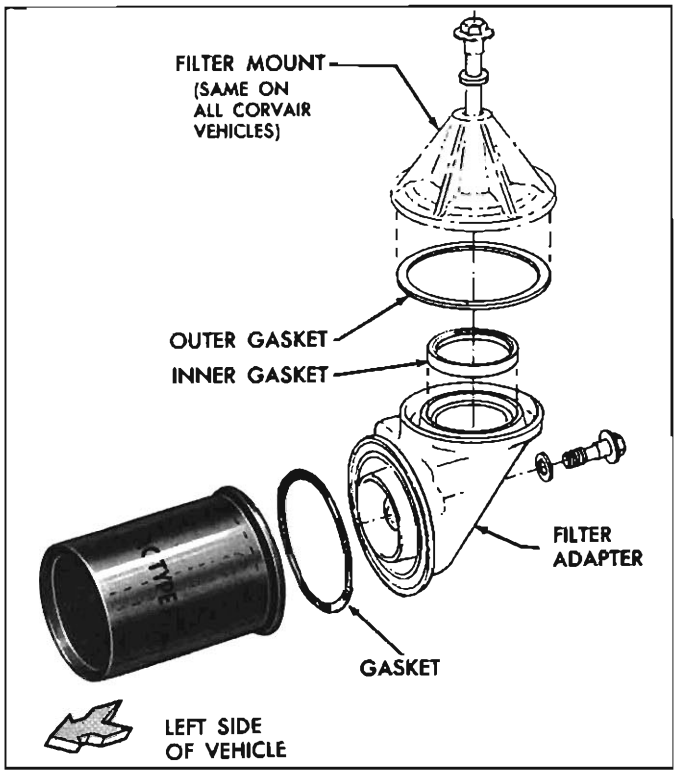

Fig. 14—Oil Filter and Adapter Details

height to lower edge of crankcase cover is changed to 4.475 ± .015 or $4\frac{15}{32}$" to $4\frac{31}{64}$".

NOTE: The shaft is the bearing inner race; to press on bearing or hub when installing shaft in cover will damage the bearing. Press on shaft only.

HARMONIC BALANCER REPLACEMENT (Fig. 15)

A three-piece harmonic balancer, (hub and inertia ring pressed together over a rubber absorber section)

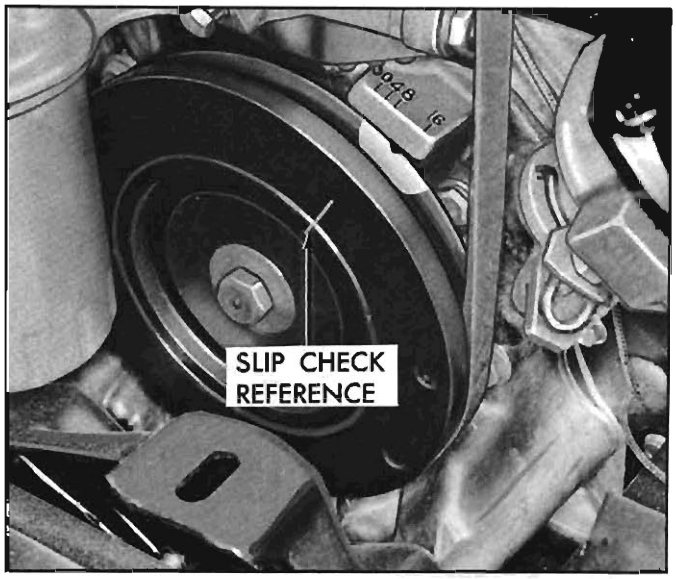

Fig. 15—Harmonic Balancer Installed

is used on all engines except the base engine with manual transmission. The balancers have a groove across the three pieces in line with timing mark. This groove serves as a slip check reference, should the inertia weight move in relation to the hub section, and cause inaccurate timing mark relationship. Balancer replacement is required if slippage occurs.

Balancer replacement procedure is the same as outlined for crankshaft pulley in the 1961 Shop Manual.

Never remove or install balancer by pulling on inertial ring. Use threaded holes provided in hub. Never drive balancer on with a hammer which will disturb tuning and cause possible shift of inertia ring. Use ½" bolt which threads into end of crankshaft.

THE TURBOCHARGED MONZA SPYDER

GENERAL DESCRIPTION

The turbocharged engine (fig. 16) has external changes to provide for mounting the supercharger and internal changes to provide for its increased power. The SUPERCHARGER UNIT SHOULD, THEREFORE, NEVER BE REMOVED FROM THIS SPECIAL ENGINE TO BE INSTALLED ON ANOTHER CORVAIR ENGINE.

Internal changes include the following:

1. Heavy duty main and rod bearings.
2. Heavier connecting rod cross section.
3. Piston rings and crankshaft.
4. Cylinder heads.
   a. L.H. includes sending unit (Thermister), for head temperature gauge.
   b. R.H. includes supercharger oil drain.
   c. 8:1 compression ratio.
5. Crankcase cover vent baffle plates.

External changes include the following:

1. Single side draft Carter YH carburetor.
2. Fuel lines and routing.
3. Distributor assembly and timing tab.
4. Front and right side seal shield revised to bring exhaust pipes to supercharger.
5. R.H. heater duct revised for exhaust pipe clearance.
6. Exhaust pipes and muffler.
7. Front shield material (heat resistant) on right side and heat insulator material around exhaust pipes.
8. Wiring harness changed to include heat indicator and warning buzzer system.
9. Engine rear housing gasket and oil filter adapter changed to provide oil feed to the supercharger.
10. Air recirculation plates—same as air conditioned Corvair vehicles.

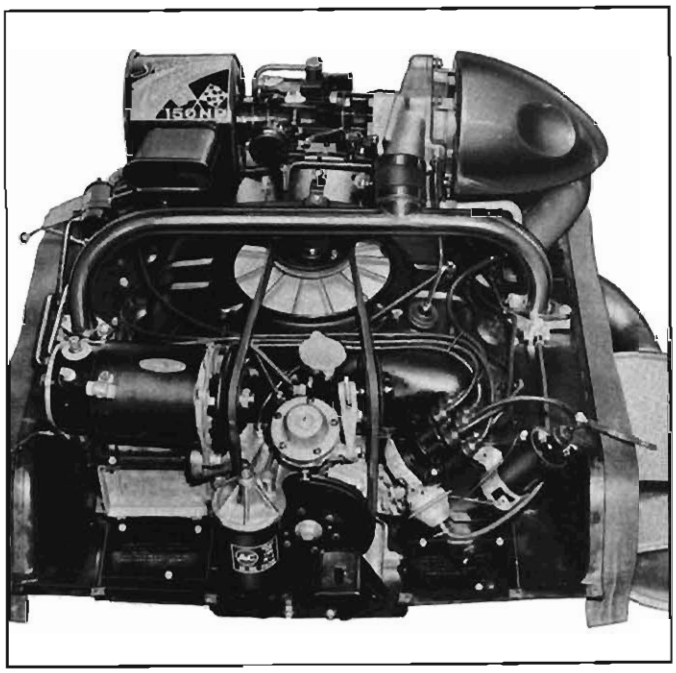

Fig. 16—Turbo-Supercharged Engine

SERVICE OPERATIONS

ENGINE SHROUDING

UPPER SHROUD removal requires removal of supercharger, turbine inlet and exhaust piping, supercharged oil lines, and diffuser tube as previously outlined. Shroud may then be removed in the same manner as on regular Corvair engine.

LOWER SHROUDS may be removed as outlined in Corvair Shop Manual.

LEFT SIDE SHIELD is removed as outlined in Corvair Shop Manual after removal of fuel filter and disconnection of manifold pressure line.

RIGHT SIDE SHIELD is removed as outlined in the Corvair Shop Manual after removing exhaust insulator plate screws and sliding the plate upward ½" to 1" for clearance.

FRONT SHIELD AND SEAL RETAINER removal requires the removal of supercharger assembly (including carburetor and air cleaner) and the fuel filter, then disconnecting accelerator linkage, fuel tank line at pump before proceeding as outlined in Corvair Shop Manual. The right half of the front shield seal is special insulator material and a firewall heat shield is provided above this section. This shield is removable with 4 sheet metal screws if added clearance is needed. When installing front seal, be sure it seats all along as it is an insulator as well as a seal.

AIR CIRCULATING PLATES—The same as used on air conditioned vehicles—remove in winter—installed in summer.

Since the turbo-supercharger is an exhaust driven fuel-air mixture compressor, refer to Section 9, "Fuel and Exhaust," for description and other service procedures.

ENGINE			Base	Hi-Perf. (RPO L62)	Turbo-Charged
GENERAL DATA:					
Horsepower @ rpm			95 @ 3600	110 @ 4400	150 @ 4000
Torque @ rpm			154 @ 2400	160 @ 2800	232 @ 3200
Type				Flat opposed	
Number of Cylinders				6	
Bore				3 7/16	
Stroke				2 15/16	
No. System (Rear to Front)		Left Bank		2—4—6	
		Right Bank		1—3—5	
Firing Order				1—4—5—2—3—6	
Compression Ratio			8.25:1	9.25:1	8.25:1
CYLINDER BORE:					
Out of Round (max.)				.002	
Taper (max.)				.005	
Diameter (base)				3.4370	
PISTONS:					
Oversizes Available				None	
Clearance Limits to Cylinder		Top Land		.022—.031	
		Skirt		.0011—.0017	
Ring Groove Depth		Compression		.1785—.1865	
		Oil		.1717—.1750	
PISTON RINGS:					
Compression		Width		.064—.065	
		Clearance in Groove		.0017—.004	
		Gap		.013—.025	
Oil Ring		Width		.126 ± .0005	
		Clearance in Groove		.0012—.005	
		Gap		.015—.055	
PISTON PINS:					
Length				2.630—2.650	
Diameter				.7999—.8002	
Clearance	In Piston	New		.00015—.00025	
		Wear Limit		.001	
	In Rod			Press fit	
CONNECTING RODS:					
Bearing	Clearance	New		.0007—.0027	
		Max.		.003	
	End Play	New		.005—.010	
CRANKSHAFT:					
End Play				.002—.006	

ENGINE			Base	Hi-Perf. (RPO L62)	Turbo-Charged
CRANKSHAFT (Cont'd.):					
End Thrust Taken by				(#1) Rear main bearing	
Main Bearing Journal	Diameter			#1 & 2 (2.0978—2.0988) #3 & 4 (2.0983—2.0993)	
	Clearance			#1 & 2 (.0012—.0027) #3 & 4 (.0007—.0022)	
	L. Runout (max.)			.001	
	Taper (max.)			.001	
Crankpin Journal	Diameter			1.799—1.800	
	Taper			.001	
	Runout			.001	
CAMSHAFT:					
Lobe Lift Measured at Push Rod		Intake	.257	.260	
		Exhaust	.257	.260	
Journal Diameter		Front		1.440	
		All others		1.200	
Journal Runout (max.)				.0015	
VALVE SYSTEMS:					
Lifters Type				Hydraulic	
Rocker Arm Ratio				1.5:1	
Valve Lash	Intake & Exhaust			1 Turn down from "NO LASH"	
Intake	Face Angle			45°	
	Seat Runout (max.)			.002	
	Seat Angle			45°	
	Recommended Seat Width			1/32—1/16	
	Stem to Guide Clearance			New .001—.0027 Used .001—.004	
	Stem Oversize Available			.003—.010—.020	
	Lift*		.385	.390	
Exhaust	Face Angle		44°		45°
	Seat Runout (max.)			.002	
	Seat Angle			45°	
	Recommended Seat Width			1/16—3/32	
	Stem to Guide Clearance			New .0014—.0029 Used .002—.005	
	Stem Oversize Available			.003—.010—.020	
	Lift*		.385	.390	
Valve Springs	Outer Spring Press. and Length	Free Length		2.08	
		Pressure lb. @ in.		78 to 86 @ 1.660	
		Pressure lb. @ in.		170 to 180 @ 1.260	
	Inner Spring Damper			.045 x .250 Flat Wound Approx. 4 coils	
	Installed Height			1 21/32 ± 1/32	

*Measured at valve stem

ENGINE TORQUE SPECIFICATIONS

SIZE	USED TO ATTACH	TORQUE
1/4-20	Oil Pan Attachment	40-60 in-lbs.
	Oil Pump Cover	60-80 in-lbs.
	Oil Cooler to Cyl. Head	60-80 in-lbs.
	Rear Shroud L.H. & R.H. Attachment	60-80 in-lbs.
	Valve Rocker Cover	30-50 in-lbs.
5/16-18	Crankcase L.H. to R.H.	7-13 ft. lbs.
	Crankcase Cover to Crankcase	7-13 ft. lbs.
	Oil Cooler Adapter to Crankcase	7-13 ft. lbs.
	Oil Filter and Generator Adapter	7-13 ft. lbs.
	Rear Housing to Crankcase	7-13 ft. lbs.
	Clutch Cover and Pressure Plate Attachment	15-20 ft. lbs.
	Clutch Pressure Plate Driving Strap	15-20 ft. lbs.
11/32-24	Flywheel or Drive Plate to Crankshaft Assembly	20-26 ft. lbs.
3/8-16	Flywheel or Clutch Housing to Crankcase	20-30 ft. lbs.
	Oil Cooler Attachment	8-12 ft. lbs.
	Skid Plate to Rear Housing	20-30 ft. lbs.

SIZE	USED TO ATTACH	TORQUE
7/16-20	Crankcase L.H. to R.H.	50-55 ft. lbs.
	Oil Filter to Adapter	9-15 ft. lbs.
1/8-27	Oil Pressure Switch	45-65 in. lbs.
5/16-24	Nut—Connecting Rod	20-26 ft. lbs.
3/8-16	Nut—Distributor Clamp	10-20 ft. lbs.
3/8-16	Nut—Exhaust Manifold to Cylinder Head	12-27 ft. lbs.
3/8-16	Nut—Rear Mounting Bracket	20-30 ft. lbs.
3/8-16	Stud—Rear Mounting	5 ft. lbs.
3/8-24	Nut—Cylinder Head to Crankcase	27-33 ft. lbs.
3/8-16	Stud—Cylinder Head to Crankcase at Assembly to Crankcase	10-30 ft. lbs.
3/8-24	Stud—Valve Rocker Arm Ball	27-33 ft. lbs.
3/8-24	Nut—Valve Rocker Arm Ball Stud	55-125 in. lbs.
1/8 pipe	Oil Pressure Switch	10-15 ft. lbs.
14 MM	Spark Plug	20-25 ft. lbs.