

GROUP 2 ENGINE

SECTIONS IN GROUP 2

Section	Subject	Page	Section	Subject	Page
2-A	Engine Specifications	2-1	2-E	Replacement of Crankshaft and Connecting Rod Bearings, Pistons and Rings	2-29
2-B	Engine Description	2-8	2-F	Cooling and Oiling Systems Service	2-38
2-C	Engine Tune Up and Trouble Diagnosis	2-16	2-G	Service on Engine Mountings, Flywheel and Housing	2-44
2-D	Cylinder Head and Valve Mechanism Service	2-21			

SECTION 2-A ENGINE SPECIFICATIONS

CONTENTS OF SECTION 2-A

Paragraph	Subject	Page	Paragraph	Subject	Page
2-1	Engine Tightening Specifications	2-1	2-3	Engine Dimensions, Fits and Adjustments	2-4
2-2	Engine General Specifications	2-2			

SERVICE BULLETIN REFERENCE

Bulletin No.	Page No.	SUBJECT

2-1 ENGINE TIGHTENING SPECIFICATIONS

Use a reliable torque wrench to tighten the parts listed, to insure proper tightness without straining or distorting parts. These specifications are for *clean and lightly lubricated threads only*; dry or dirty threads produce increased friction which prevents accurate measurement of tightness.

Part	Location	Thread Size	Torque Ft.Lbs.
Plug	Spark	14 MM	22-28
Plug	Crankcase Drain	28 MM	30-35
Bolt	Lower Crankcase	3/16-18	6-15
Bolt	Flywheel Housing to Upper Crankcase	1/8-14	55-60
Bolt	Timing Gear Cover	3/8-16	15-20
Bolt	Valve Push Rod Cover	3/16-18	4-5
Nut	Valve Rocker Arm Cover	3/8-24	4-5
Bolt	Water Pump Mounting	3/8-16	25-30
Nuts	Manifold Stud	3/8-24	25-30
Bolts	Cylinder Head	1/4-14	65-70

Part	Location	Thread Size	Torque Ft.Lbs.
Nuts	Con. Rod Bolt—Ser. 40-44-50	3/8-24	40-45
Nut	Con. Rod Bolt—Series 70	1/8-24	60-65
Bolt	Piston Pin Clamp	3/16-24	25-30
Bolt	Crankshaft Bearing Cap	1/2-13	90-100
Bolt	Balancer Retaining	3/4-16	100-110
Nut	Flywheel to Crankshaft—Synchronesh	3/8-24	35-40
Bolt	Flywheel to Crankshaft—Dynaflow	1/8-24	50-55
Bolt	Rocker Arm Shaft Bracket	3/8-16	30-35
Nut	Rocker Arm Shaft Bracket Stud	3/8-24	30-35
Nut	Generator to Bracket Bolt	3/8-24	25-30
Bolt	Generator Mounting Bracket to Crankcase	3/8-16	30-35
Nut	Front Engine Mounting Bracket to Frame Bolt	3/8-24	30-35
Nut	Front Engine Mounting Stud	3/8-24	30-35
Bolt	Transmission Mounting Pad to Rear Bearing Retainer	3/8-16	30-35
Nut	Transmission Mounting Pad to Transmission Support Bolt	3/8-24	30-35
Nut	Transmission Support to Frame Cross Member Bolt	3/8-24	20-25
Nut	Thrust Pad to Transmission Support and Thrust Plate	3/8-24	30-35

2-2 ENGINE GENERAL SPECIFICATIONS**a. General Information (See Par. 2-3 for dimensions)**

Items	Series 40-50	Series 70
Type	Valve in Head	Valve in Head
Cylinders and Arrangement	8 in Line	8 in Line
Bore and Stroke	$3\frac{1}{16}" \times 4\frac{1}{8}"$	$3\frac{1}{16}" \times 4\frac{1}{8}"$
Piston Displacement (cu. in.)	263.3	320.2
Compression Ratio—		
Synchronesh—Series 40 only	6.6 to 1	—
Synchronesh—Series 50 only	6.9 to 1	—
Dynaflow—All Series	7.2 to 1	—
Compression Pressure (a. Cranking Speed (p.s.i.)—		
Synchronesh—Series 40 only	114	—
Synchronesh—Series 50 only	118	—
Dynaflow—All Series	120	—
Firing Order	1-6-2-5-8-3-7-4	—
Taxable Horsepower	32.51	37.81
Max. Brake H.P. @ 3600 RPM, Bare Engine—		
Synchronesh—Series 40 only	120	—
Synchronesh—Series 50 only	124	—
Dynaflow—All Series	128	152
Engine Weight Less Clutch & Mountings (lbs.)	719	800
Number of Mountings and Material	3 Synthetic Rubber	—

b. Cylinder Crankcase and Cylinder Head

Cylinder Crankcase Type	Block Cast Integral with Crankcase
Cylinder Head Type and Material	One Piece, Cast Iron
Combustion Chamber	Cast in Head
Head Bolts, Number and Diameter	22, $\frac{1}{16}"$

c. Crankshaft Bearings, Flywheel Balancer

Crankshaft Weight (lbs.)	90	116
Number of Crankshaft Bearings	5	5
Bearing which takes Thrust	Center	Center
Crankshaft Bearing Type	Replaceable Liners	Replaceable Liners
Crankshaft Bearing Material	Steel Backed Durex 100-A	Steel Backed Durex 100-A
Provision for Bearing Adjustment	None	None
Bearing Cap Bolts, No. and Diam.—		
Rear Bearing	Two $\frac{1}{2}"$	Four $\frac{1}{2}"$
Other Bearings	Two $\frac{1}{2}"$	Two $\frac{1}{2}"$
Flywheel—		
Material & Weight (lbs.), Synchro-mesh	C.I.—36.56	—
Material & Weight (lbs.), Dynaflow	Steel—9.23	Steel—12.21
Number of Teeth on Ring	146	156
Crankshaft Balancer Type	Laminated Steel Flywheel on Steel Leaf Springs	Laminated Steel Flywheel on Steel Leaf Springs
Balancer Location	Front End of Crankshaft	Front End of Crankshaft

d. Connecting Rods, Pistons and Rings

Connecting Rod Bearing Type	Replaceable Liners	Replaceable Liners
Connecting Rod Bearing Material	Steel Backed Durex 100-A	Steel Backed Durex 100-A
Provision for Bearing Adjustment	None	None
Number & Diam. of Cap Bolts	Two $\frac{3}{8}"$	Two $\frac{1}{16}"$
How are Rods & Pistons Removed	From Top of Cylinder	From Top of Cylinder
Piston Type	Full Skirt	Full Skirt
Piston Material and Surface Treatment	Aluminum Alloy—Anodized	Aluminum Alloy—Anodized
Compression Rings per Piston	2	2
Type	Inside Bevel	Inside Bevel
Oil Rings per Piston	2	2
Type, Upper	Channeled—Oil Return Slot	Channeled—Oil Return Slot
Type, Lower	Flex-Fit	Flex-Fit
Location of All Piston Rings	Above Piston Pin	Above Piston Pin

e. Camshaft and Valve Mechanism

Items	Series 40-44-50	Series 70
Camshaft Drive	Link Belt Chain	
Number of Camshaft Bearings	5	5
Camshaft Bearing Material	Steel Backed Babbitt	
Camshaft Thrust Control	Plate at Front End	
Camshaft Sprocket—		
Material and Width	Cast Iron, $1\frac{1}{4}$ "	
No. of Teeth	38	38
Crankshaft Sprocket—		
Material and Width	Steel, $1\frac{1}{4}$ "	
No. of Teeth	19	19
Timing Chain Width	$1\frac{3}{16}$ "	$1\frac{3}{16}$ "
Valve Lifter Type—		
Series 40-44 Syncro-mesh only	Plain Sleeve	
Series 50 Syncro-mesh & all Dynaflo	Hydraulic	
Valve Type—Inlet	Streamlined	
Exhaust	Mushroom	
Valve Seat Angle—Inlet and Exhaust	45 Degrees	
Valve Spring Type	Dual Helical	
Valve Guide Type and Material	Removable, Cast Iron	

f. Engine Oiling System

Oiling System Type	Forced Feed
Oil Supplied to Bearing Surfaces—	
Crankshaft Bearings	Pressure
Connecting Rod Bearings	Pressure
Pistons and Pins	Spray
Camshaft Bearings	Pressure
Timing Chain and Sprockets	Metered Jet and Spray
Rocker Arms and Valves	Low Pressure
Valve Lifters	Gravity Flow from Rocker Arms
Location of Oil Filler	In Valve Rocker Arm Cover
Location of Oil Drain	Plug in Lower Crankcase
Oil Reservoir Capacity—Quarts	
Dry Engine	6 $\frac{1}{2}$ (*8)
Refill	5 $\frac{1}{2}$ (*7)
	(**With Dry Oil Filter)
Oil Level Gauge—Type and Location	Rod in R. Side of Crankcase
Oil Pressure Gauge—Make	AC
Normal Oil Pressure	35 lbs. @ 35 MPH
Oil Pump Type	Helical Gear
Oil Pump Location	Suspended in Lower Crankcase
Oil Screen Location	On Float Attached to Pump
Oil Pressure Regulator Type	Non-Adjustable Spring and Valve

g. Engine Cooling System

Cooling System Type	Pressure
Water Temperature Control	Thermostat and Fixed By-Pass
Cooling System Capacity—Qts.	
Less Heater	12 (**13 $\frac{1}{2}$)
With Heater	13 $\frac{1}{2}$ (**15)
	(**With Dynaflo Drive)
Location of Drains	Cocks in Radiator and in R. H. Side of Crankcase
Water Pump Type	Centrifugal
Water Pump Location	Front End of Crankcase
Water Pump and Fan Drive—With Generator	Single Vee Belt
Water Pump to Crankshaft Speed Ratio	.86 to 1
Water Pump Bearing Type	Sealed Double-Row Ball
Water Pump Seal Type	Spring Loaded, Packless
Fan Diameter	18"
Number of Blades	4
Radiator Make	Harrison
Core Type	Vee Cellular
Core Material	Copper
Core Frontal Area (sq. in.), Syncromesh	415
Dynaflo Drive	484
Core Thickness	2"
Radiator Pressure Control	Valve in Filler Cap
Radiator Pressure (lbs.)	7
Radiator Thermostat—Make	Harrison
Thermostat Location	In Housing Above Water Pump
Thermostat Calibration	See Par. 2-3, f

2-3 ENGINE DIMENSIONS, FITS AND ADJUSTMENTS

NOTE: Dimensions and limits for fit of parts apply to new parts only. Where limits are given, "T" means tight and "L" means loose.

a. Crankshaft and Connecting Rod Bearings

Items	Series 40-49-50	Series 70
Crankshaft Bearing—Nominal Diam. x Length—		
Front.....	2 $\frac{9}{16}$ " x 1 $\frac{17}{16}$ "	2 $\frac{9}{16}$ " x 1 $\frac{9}{16}$ "
Front Center.....	2 $\frac{9}{16}$ " x 1 $\frac{1}{16}$ "	2 $\frac{9}{16}$ " x 1 $\frac{1}{16}$ "
Center.....	2 $\frac{9}{16}$ " x 1 $\frac{35}{64}$ "	2 $\frac{11}{16}$ " x 1 $\frac{15}{16}$ "
Rear Center.....	2 $\frac{9}{16}$ " x 1 $\frac{1}{16}$ "	2 $\frac{13}{16}$ " x 2 $\frac{15}{16}$ "
Rear.....	2 $\frac{9}{16}$ " x 1 $\frac{35}{64}$ "	2 $\frac{13}{16}$ " x 2 $\frac{15}{16}$ "
Crankshaft Journal Diameters—		
Front.....	2.5625"-2.5635"	2.5605"-2.5615"
Front Center.....	2.5625"-2.5635"	2.6235"-2.6245"
Center.....	2.5625"-2.5635"	2.6855"-2.6865"
Rear Center.....	2.5625"-2.5635"	2.7485"-2.7495"
Rear.....	2.5625"-2.5635"	2.8105"-2.8115"
Crankshaft Journal to Bearing Clearance.....	←.0005" to .002"→	←.004" to .008"→
Crankshaft End Play at Center Bearing.....	←.004" T to .0012" L→	←.004" to .008"→
Fit of Main Drive Gear Pilot Bearing in Crankshaft.....	2 $\frac{1}{8}$ " x 1.030"	2 $\frac{1}{4}$ " x 1.306"
Connecting Rod Bearing Nominal Diam. x Length.....	2.125"-2.126"	2.248"-2.249"
Crankpin Journal Diameter.....	←.0005"-.0018"→	←.0005"-.0018"→
Crankpin Journal to Bearing Clearance.....	←.005"-.010"→	←.005"-.010"→
End Clearance of Connecting Rod on Crankpin.....	7 $\frac{3}{8}$ "	8 $\frac{1}{4}$ "
Connecting Rod Length, Center to Center.....		

b. Cylinders, Pistons, Pins and Rings

Cylinder Bores, Standard Size.....	3.186"-3.189"	3.436"-3.439"
Piston Length, Overall.....	3 $\frac{9}{16}$ "	4 $\frac{9}{16}$ "
Piston Diameter, Top of Skirt, at 90° to Piston Pin—		
Standard.....	3.1860"-3.1872"	3.4358"-3.4370"
.005" Oversize.....	3.1916"-3.1922"	3.4414"-3.4420"
.010" Oversize.....	3.1966"-3.1972"	3.4464"-3.4470"
.020" Oversize.....	3.2066"-3.2072"	3.4564"-3.4570"
.030" Oversize.....	3.2166"-3.2172"	3.4664"-3.4670"
Piston Clearance in Cylinder Bore at Top of Skirt.....	.0012"-.0018"	.0014"-.0020"
Piston Fit @ 70° F., using Feeler Gauges, Allowing Piston to Drop on its Own Weight.....	←.0015" GO—.002" NO GO→	←.0015" GO—.002" NO GO→
Piston Pin Length.....	2 $\frac{11}{16}$ "	3 $\frac{1}{16}$ "
Piston Pin Diameter.....	.8124"-.8129"	.8744"-.8749"
Piston Pin Fit in Piston at 70° F.....	←Finger Push Fit (.0003"—.0004")→	←Finger Push Fit (.0003"—.0004")→
Width of Compression Rings.....	3 $\frac{3}{16}$ "	3 $\frac{3}{16}$ "
Width of Channeled Oil Rings.....	3 $\frac{3}{16}$ "	3 $\frac{3}{16}$ "
Width of Flex-Fit Oil Rings.....	←.186"—.187"→	←.186"—.187"→
Width of Gap, Ring in Bore—		
Compression & Upper Oil Ring.....	←.010"—.020"→	←.010"—.020"→
Flex-Fit Oil Ring.....	←No Checking or Fitting Required→	←No Checking or Fitting Required→
Side Clearance of Rings in Piston Groove—		
Compression Ring.....	←.0015"—.0035"→	←.0015"—.0035"→
Upper Oil Ring.....	←.0015"—.003"→	←.0015"—.003"→
Flex-Fit Ring.....	←.001"—.003"→	←.001"—.003"→

c. Camshaft and Valve Mechanism

Camshaft End Play.....	←.004"—.008"→	←.004"—.008"→
Camshaft Bearings—Diam. x Length—		
No. 1.....	←2 $\frac{1}{2}$ " x 1 $\frac{1}{8}$ "→	←2 $\frac{1}{8}$ " x 1 $\frac{1}{8}$ "→
No. 2.....	2 $\frac{1}{8}$ " x 3 $\frac{1}{4}$ "	2 $\frac{1}{8}$ " x 1 $\frac{1}{8}$ "
No. 3.....	←2 $\frac{1}{2}$ " x 1 $\frac{1}{8}$ "→	←2 $\frac{1}{8}$ " x 1 $\frac{1}{8}$ "→
No. 4.....	2 $\frac{1}{16}$ " x 3 $\frac{1}{4}$ "	2 $\frac{1}{16}$ " x 1 $\frac{15}{16}$ "
No. 5.....	←1 $\frac{3}{4}$ " x 1 $\frac{1}{8}$ "→	←1 $\frac{3}{4}$ " x 1 $\frac{1}{8}$ "→
Camshaft Clearance in Bearings.....	←.0015"—.004"→	←.0015"—.004"→
Valve Lifter Diameter.....	←.9975"—.9985"→	←.9975"—.9985"→
Valve Lifter Clearance in Crankcase.....	←.0005"—.0025"→	←.0005"—.0025"→
Rocker Arm Shaft O.D.....	1 $\frac{1}{16}$ "	1 $\frac{1}{16}$ "
Rocker Arm Clearance on Shaft.....	←.002"—.004"→	←.002"—.004"→
Valve Head Diameter—Inlet.....	1 $\frac{11}{16}$ "	1 $\frac{15}{16}$ "
Exhaust.....	1 $\frac{11}{16}$ "	1 $\frac{15}{16}$ "
Valve Seat Angle—Inlet and Exhaust.....	←45 degrees→	←45 degrees→
Valve Lift—Inlet.....	.348"	.347"
Exhaust.....	.342"	.348"
Valve Stem Diameter—Inlet.....	←.3715"—.3725"→	←.3715"—.3725"→
Exhaust.....	←.3711"—.3719"→	←.3711"—.3719"→

Items	Series 40-44-50	Series 70
Valve Stem Clearance in Guide—		
Inlet.....	← .0015" — .0035" →	
Exhaust.....	← .0021" — .0039" →	
Valve Guide Extension from Top of Cyl. Head.....	1 $\frac{5}{32}$ "	1 $\frac{5}{32}$ "
Inner Valve Spring, used with <i>Adjustable Valve Lash</i> —		
Valve Open (lbs. @ length).....	48-54 @ 1 $\frac{5}{16}$ "	—
Valve Closed (lbs. @ length).....	17.5-22.5 @ 1 $\frac{1}{2}$ "	—
Outer Valve Spring, used with <i>Adjustable Valve Lash</i> —		
Valve Open (lbs. @ length).....	74-80 @ 1 $\frac{19}{32}$ "	—
Valve Closed (lbs. @ length).....	29.5-34.5 @ 1 $\frac{15}{16}$ "	—
Inner Valve Spring, used with <i>Hydraulic Lifters</i> —		
Valve Open (lbs. @ length).....	← 49-55 @ 1 $\frac{5}{16}$ " →	
Valve Closed (lbs. @ length).....	← 22-26 @ 1 $\frac{1}{4}$ " →	
Outer Valve Spring, used with <i>Hydraulic Lifters</i> —		
Valve Open (lbs. @ length).....	← 116-124 @ 1 $\frac{19}{32}$ " →	
Valve Closed (lbs. @ length).....	← 49-55 @ 1 $\frac{15}{16}$ " →	

d. Valve Lash—Series 40-44-50 Synchromesh

NOTE: Does not apply to engines equipped with hydraulic valve lifters.

Valve Lash at Road Operating Temp.—		
Inlet and Exhaust.....	.015"	—
Valve Lash Using Shop Procedure.....	.017" Go—.018" No Go	—

e. Engine Oil System

Pump Shaft to Bearing Clearance.....	← .001" to .0025" →
Pump Idler Gear Bearing Clearance.....	← .001" — .0025" →
Pump Driving Gear Backlash.....	← .003" — .005" →
Pump Drive and Idler Gears Backlash.....	← .003" — .006" →
Pump Drive and Idler Gears End Clearance.....	← .0005" — .004" →
Oil Pressure Valve Clearance in Body.....	← .003" — .006" →

f. Engine Cooling System

Fan Belt Adjustment.....	← $\frac{5}{16}$ ", See fig. 2-35 →
Fit of Bearing in Water Pump Body.....	← .0006" L to .0009" T →
Pump Bearing Shaft Diameter.....	$\frac{5}{8}$ "
Fan Hub Fit on Bearing Shaft.....	← .001" T to .0025" T →
Fan Hub Position on Shaft.....	← $\frac{3}{4}$ " from end →
Radiator Hose Inside Diam. and Type.....	← 1 $\frac{5}{16}$ " Elbow →
By-Pass Hose Inside Diam.....	← 1 $\frac{3}{4}$ " →
Standard (151°) Radiator Thermostat Calibration, @ Atm. Press.—	
Start to Leave Seat.....	← 148°F to 155°F →
Fully Open.....	← Not over 176° →
High Temp. (182°) Radiator Thermostat Calibration, @ Atm. Press.—	
Start to Leave Seat.....	← 178°F to 185°F →
Fully Open.....	← Not over 211°F →

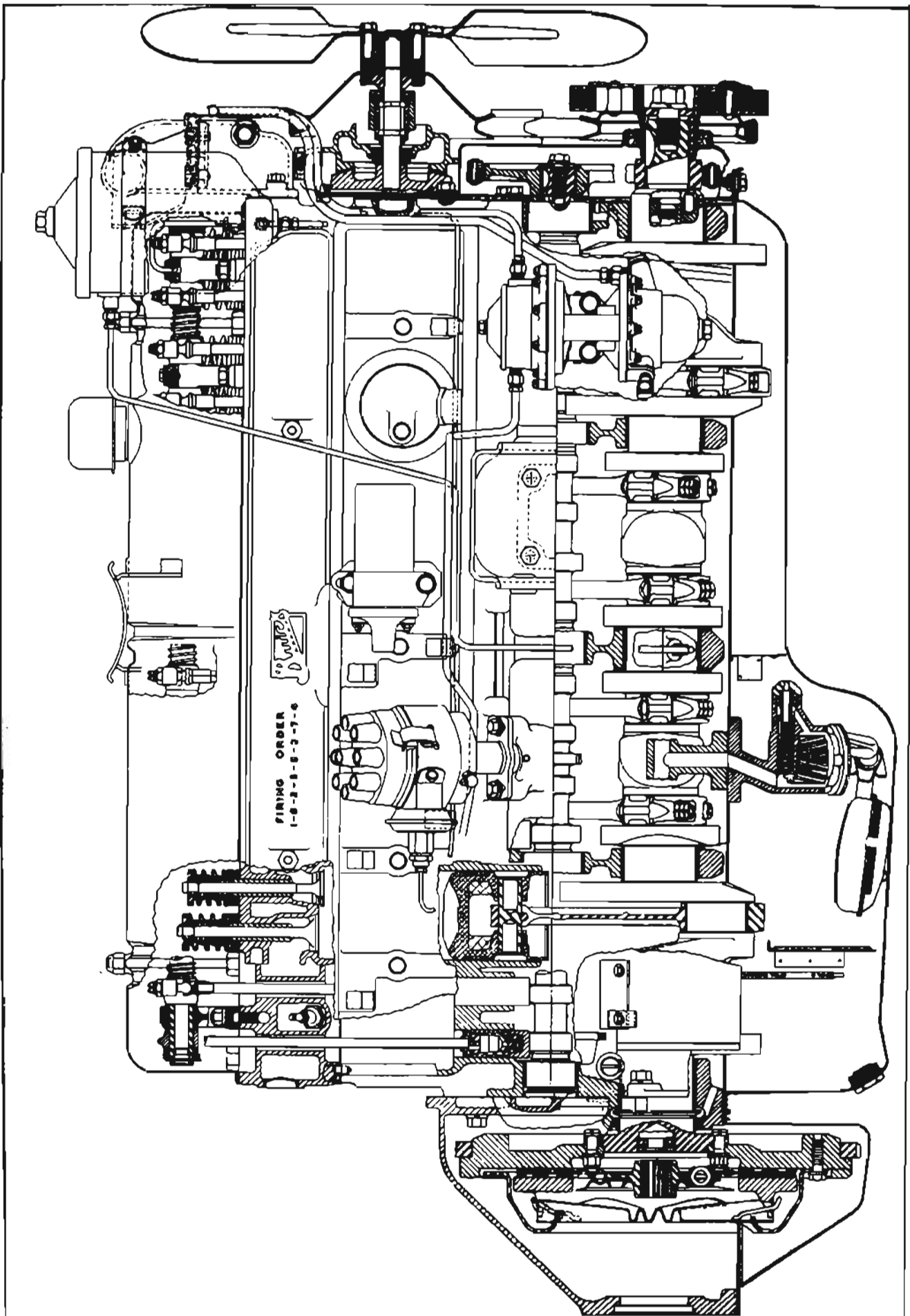


Figure 2-1—Engine Side Sectional View—Series 40-44-50

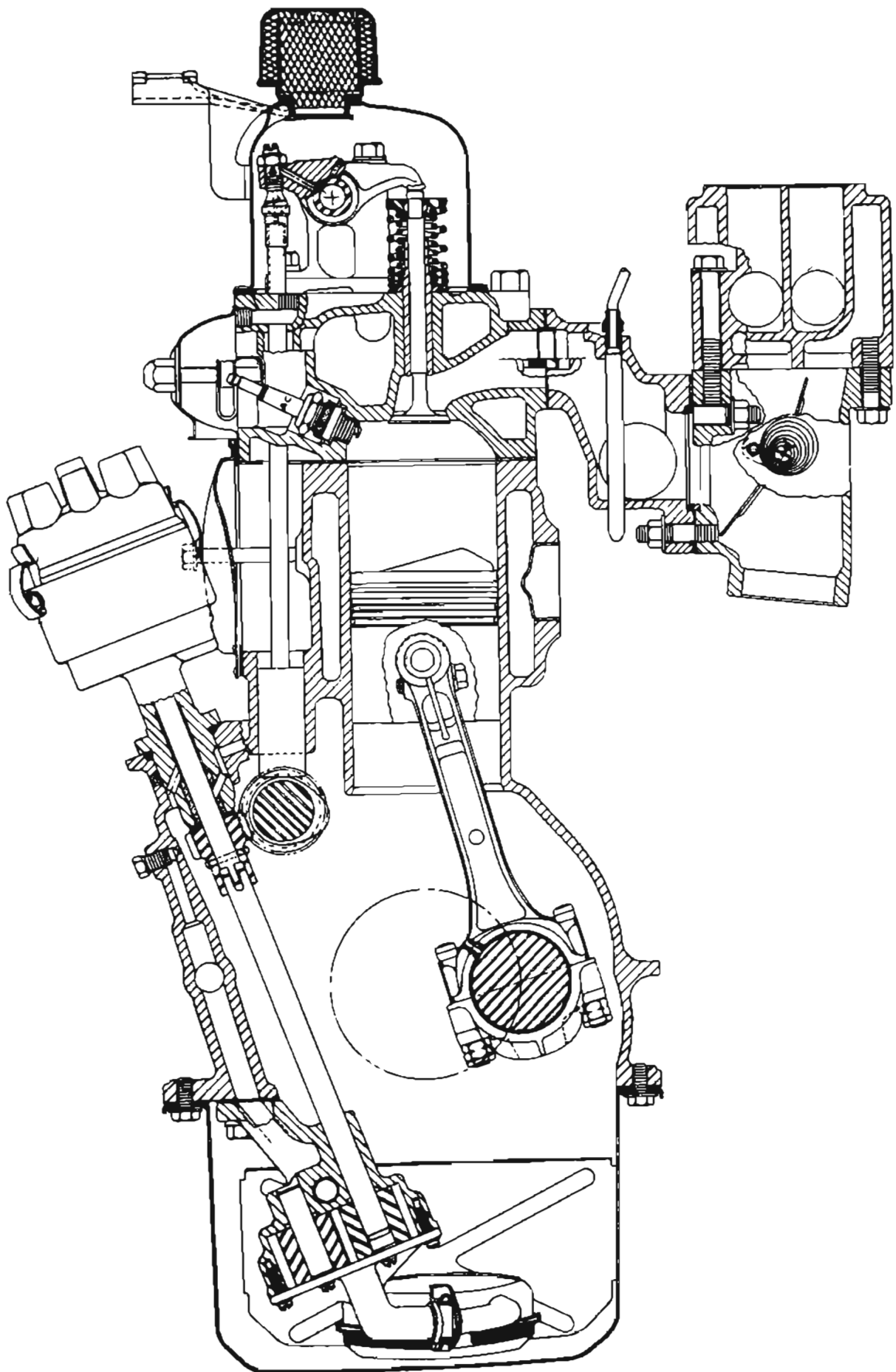


Figure 2-2—Engine End Sectional View—Series 40-44-50