

GROUP 2

ENGINE

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SECTION 2-A

ENGINE SPECIFICATIONS

CONTENTS OF SECTION 2-A

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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	$\frac{5}{16}$ -18	6-15
Bolt	Flywheel Housing to Upper Crankcase	$\frac{1}{16}$ -14	55-60
Bolt	Timing Gear Cover	$\frac{3}{8}$ -16	15-20
Bolt	Valve Push Rod Cover	$\frac{5}{16}$ -18	4-5
Nut	Valve Rocker Arm Cover	$\frac{5}{16}$ -24	4-5
Bolt	Water Pump Mounting	$\frac{3}{8}$ -16	25-30
Nuts	Manifold Stud	$\frac{3}{8}$ -24	25-30
Bolts	Cylinder Head	$\frac{1}{16}$ -14	65-70

Part	Location	Thread Size	Torque Ft.Lbs.
Nuts	Con. Rod Bolt—Series 40-50	$\frac{3}{8}$ -24	40-45
Nut	Con. Rod Bolt—Series 70	$\frac{7}{16}$ -24	60-65
Bolt	Piston Pin Clamp	$\frac{5}{16}$ -24	25-30
Bolt	Crankshaft Bearing Cap	$\frac{1}{2}$ -13	90-100
Bolt	Balancer Retaining	$\frac{3}{4}$ -16	100-110
Nut	Flywheel to Crankshaft—Syncro-mesh	$\frac{3}{8}$ -24	35-40
Bolt	Flywheel to Crankshaft—Dynaflow	$\frac{7}{16}$ -24	50-55
Bolt	Rocker Arm Shaft Bracket	$\frac{3}{8}$ -16	30-35
Nut	Rocker Arm Shaft Bracket Stud	$\frac{3}{8}$ -24	30-35
Nut	Generator to Bracket Bolt	$\frac{3}{8}$ -24	25-30
Bolt	Generator Mounting Bracket to Crankcase	$\frac{3}{8}$ -16	30-35
Nut	Front Engine Mounting Bracket to Frame Bolt	$\frac{3}{8}$ -24	30-35
Nut	Front Engine Mounting Stud	$\frac{3}{8}$ -24	30-35
Bolt	Transmission Mounting Pad to Rear Bearing Retainer	$\frac{3}{8}$ -16	30-35
Nut	Transmission Mounting Pad to Transmission Support Bolt	$\frac{3}{8}$ -24	30-35
Nut	Transmission Support to Frame Cross Member Bolt	$\frac{3}{8}$ -24	20-25
Nut	Thrust Pad to Transmission Support and Thrust Plate	$\frac{3}{8}$ -24	30-35

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

Items	Series 40	Series 50	Series 70
Type	Valve in Head		
Cylinders and Arrangement	8 in Line		
Bore and Stroke	$3\frac{1}{2}'' \times 4\frac{1}{8}''$	$3\frac{3}{16}'' \times 4\frac{1}{8}''$	$3\frac{7}{16}'' \times 4\frac{5}{16}''$
Piston Displacement (cu. in.)	248.1	263.3	320.2
Compression Ratio—			
Syncro-Mesh	6.6 to 1	6.9 to 1	—
Dynaflow	7.2 to 1	7.2 to 1	7.2 to 1
Compression Pressure @ Cranking Speed (p.s.i.)—			
Syncro-Mesh	114	118	—
Dynaflow	120	120	120
Firing Order	1-6-2-5-8-3-7-4		
Taxable Horsepower	30.63	32.51	37.81
Max. Brake H.P. @ 3600 RPM, Bare Engine—			
Syncro-Mesh	115	124	—
Dynaflow	122	128	152
Engine Weight, Less Clutch & Mountings (lbs.)	719	719	800
Type of Engine Mountings	Controlled Frequency		
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.)	87	90	116
Number of Crankshaft Bearings	5	5	5
Bearing which takes Thrust	Center		
Crankshaft Bearing Type	Replaceable Liners		
Crankshaft Bearing Material	Steel Backed Durex 100-A		
Provision for Bearing Adjustment	None	None	None
Bearing Cap Bolts, No. and Diam.—			
Rear Bearing	Two $\frac{1}{2}''$	Two $\frac{1}{2}''$	Four $\frac{1}{2}''$
Other Bearings	Two $\frac{1}{2}''$	Two $\frac{1}{2}''$	Two $\frac{1}{2}''$
Flywheel—			
Material & Weight (lbs.), Syncro-mesh	C.I.—36.56	C.I.—36.56	—
Material & Weight (lbs.), Dynaflow	Steel—9.23	—	Steel—12.21
Number of Teeth on Ring	146	146	156
Crankshaft Balancer Type	Laminated Steel Flywheel on Steel Leaf Springs		
Balancer Location	Front End of Crankshaft		

d. Connecting Rods, Pistons and Rings

Connecting Rod Bearing Type	Replaceable Liners		
Connecting Rod Bearing Material	Steel Backed Durex 100-A		
Provision for Bearing Adjustment	None	None	None
Number & Diam. of Cap Bolts	Two $\frac{3}{8}''$	Two $\frac{3}{8}''$	Two $\frac{1}{16}''$
How are Rods & Pistons Removed	From Top of Cylinder		
Weight of Connecting Rod Assembly (lbs.)	1.825	1.756	2.267
Piston Type	Full Skirt		
Piston Material and Surface Treatment	Aluminum Alloy—Anodized		
Piston Weight, Less Pins & Rings (lbs.)	.861	.807	1.121
Piston Features	Turbulator Top, Cam Ground, Transverse Slots		
Compression Rings per Piston	2	2	2
Type	Inside Bevel		
Oil Rings per Piston	2	2	2
Type, Upper	Channeled—Oil Return Slot		
Type, Lower	Flex-Fit		
Location of All Piston Rings	Above Piston Pin		

e. Camshaft and Valve Mechanism

Items	Series 40	Series 50	Series 70
Camshaft Drive	Link Belt Chain		
Number of Camshaft Bearings	5	5	5
Camshaft Bearing Material	Steel Backed Babbitt		
Camshaft Thrust Control	Plate at Front End		
Camshaft Sprocket—			
Material and Width	Cast Iron, $1\frac{3}{16}$ "		
No. of Teeth	38	38	38
Crankshaft Sprocket—			
Material and Width	Steel, $1\frac{3}{16}$ "		
No. of Teeth	19	19	19
Timing Chain Width	$1\frac{3}{16}$ "	$1\frac{3}{16}$ "	$1\frac{3}{16}$ "
Valve Lifter Type—			
Series 40 Syncro-mesh only	Plain Sleeve		
Series 50 Syncro-mesh & all Dynaflow	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)	6 $\frac{1}{2}$ (*8)	8 (*9 $\frac{1}{2}$)
Refill	5 $\frac{1}{2}$ (*7)	5 $\frac{1}{2}$ (*7)	7 (*8 $\frac{1}{2}$)
	(*With Dry Oil Filter)		
Oil Level Gauge—Type and Location	Rod in R. Side of Crankcase		
Oil Pressure Gauge—Make	AC	AC	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	13 (**14)	13 (**14)	17 $\frac{3}{4}$
With Heater	14 $\frac{1}{4}$ (**15 $\frac{1}{4}$)	14 $\frac{1}{4}$ (**15 $\frac{1}{4}$)	19
	(**With Dynaflow 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	.86 to 1	.9 to 1
Water Pump Bearing Type	Sealed Double-Row Ball		
Water Pump Seal Type	Spring Loaded, Packless		
Fan Diameter	18"	18"	18"
Number of Blades	4	4	5
Radiator Make	Harrison		
Core Type	Vee Cellular		
Core Material	Copper		
Core Frontal Area (sq. in.), Syncro-mesh	415	415	—
Dynaflow Drive	485.4	484	484
Core Thickness	2"	2"	3"
Radiator Pressure Control	Valve in Filler Cap		
Radiator Pressure (lbs.)	7	7	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	Series 50	Series 70
Crankshaft Bearing—Nominal Diam. x Length—			
Front.....	$2\frac{5}{16}'' \times 1\frac{17}{64}''$	$2\frac{9}{16}'' \times 1\frac{17}{64}''$	$2\frac{9}{16}'' \times 1\frac{9}{32}''$
Front Center.....	$2\frac{3}{8}'' \times \frac{15}{16}''$	$2\frac{9}{16}'' \times 1\frac{1}{32}''$	$2\frac{5}{8}'' \times \frac{31}{32}''$
Center.....	$2\frac{1}{16}'' \times 1\frac{5}{8}''$	$2\frac{9}{16}'' \times 1\frac{35}{64}''$	$2\frac{11}{16}'' \times 1\frac{15}{32}''$
Rear Center.....	$2\frac{1}{2}'' \times \frac{15}{16}''$	$2\frac{9}{16}'' \times 1\frac{1}{32}''$	$2\frac{13}{16}'' \times 2\frac{15}{32}''$
Rear.....	$2\frac{9}{16}'' \times 1\frac{35}{32}''$	$2\frac{9}{16}'' \times 1\frac{35}{32}''$	$2\frac{13}{16}'' \times 2\frac{15}{32}''$
Crankshaft Journal Diameters—			
Front.....	2.3105"-2.3115"	2.5625"-2.5635"	2.5605"-2.5615"
Front Center.....	2.3735"-2.3745"	2.5625"-2.5635"	2.6235"-2.6245"
Center.....	2.4355"-2.4365"	2.5625"-2.5635"	2.6855"-2.6865"
Rear Center.....	2.4985"-2.4995"	2.5625"-2.5635"	2.7485"-2.7495"
Rear.....	2.5605"-2.5615"	2.5625"-2.5635"	2.8105"-2.8115"
Crankshaft Journal to Bearing Clearance.....	.0005" to .002"		
Crankshaft End Play at Center Bearing.....	.004" to .008"		
Fit of Main Drive Gear Pilot Bearing in Crankshaft.....	.004"T to .0012"L		
Connecting Rod Bearing Nominal Diam. x Length.....	$2 \times 1.212''$	$2\frac{1}{8}'' \times 1.030''$	$2\frac{1}{4}'' \times 1.306''$
Crankpin Journal Diameter.....	1.998"-1.999"	2.125"-2.126"	2.248"-2.249"
Crankpin Journal to Bearing Clearance.....	.0005"-.0018"		
End Clearance of Connecting Rod on Crankpin.....	.005"-.010"		
Connecting Rod Length, Center to Center.....	$7\frac{5}{8}''$	$7\frac{3}{8}''$	$8\frac{1}{4}''$

b. Cylinders, Pistons, Pins and Rings

Cylinder Bores, Standard Size.....	3.091"-3.094"	3.186"-3.189"	3.436"-3.439"
Piston Length, Overall.....	4 ²¹ / ₆₄ "	3 ⁴⁹ / ₆₄ "	4 ⁹ / ₁₆ "
Piston Diameter, Top of Skirt, at 90° to Piston Pin—			
Standard.....	3.0910"-3.0922"	3.1860"-3.1872"	3.4358"-3.4370"
.005" Oversize.....	3.0966"-3.0972"	3.1916"-3.1922"	3.4414"-3.4420"
.010" Oversize.....	3.1016"-3.1022"	3.1966"-3.1972"	3.4464"-3.4470"
.020" Oversize.....	3.1116"-3.1122"	3.2066"-3.2072"	3.4564"-3.4570"
.030" Oversize.....	3.1216"-3.1222"	3.2166"-3.2172"	3.4664"-3.4670"
Piston Clearance in Cylinder Bore at Top of Skirt.....	.0015"-.0021"		
Piston Fit @ 70° F., using Feeler Gauges, Allowing Piston to Drop on its Own Weight.....	.0015" GO—.002" NO GO		
Piston Pin Length.....	2 ¹¹ / ₁₆ "	2 ¹¹ / ₁₆ "	3 ¹ / ₁₆ "
Piston Pin Diameter.....	.8124"-.8129"	.8744"-.8749"	
Piston Pin Fit in Piston at 70° F.....	Finger Push Fit (.0003"—.0004")		
Width of Compression Rings.....	3 ³² / ₁₆ "	3 ³² / ₁₆ "	3 ³² / ₁₆ "
Width of Channeled Oil Rings.....	3 ³ / ₁₆ "	3 ³ / ₁₆ "	3 ³ / ₁₆ "
Width of Flex-Fit Oil Rings.....	.186"—.187"		
Width of Gap, Ring in Bore—			
Compression & Upper Oil Ring.....	.010"—.020"		
Flex-Fit Oil Ring.....	No Checking or Fitting Required		
Side Clearance of Rings in Piston Groove—			
Compression Ring.....	.0015"—.0035"		
Upper Oil Ring.....	.0015"—.003"		
Flex-Fit Ring.....	.001"—.003"		

c. Camshaft and Valve Mechanism

Camshaft End Play.....	← .004" — .008" →		
Camshaft Bearings—Diam. x Length—			
No. 1.....	← 2 ⁵ / ₃₂ " x 1 ¹ / ₈ " →		
No. 2.....	← 2 ¹ / ₈ " x ³ / ₄ " →	2 ¹ / ₈ " x 1 ¹ / ₈ " →	
No. 3.....	← 2 ³ / ₃₂ " x 1 ¹ / ₈ " →		
No. 4.....	← 2 ¹ / ₁₆ " x ³ / ₄ " →	2 ¹ / ₁₆ " x 1 ¹⁵ / ₁₆ " →	
No. 5.....	← 1 ³ / ₄ " x ³¹ / ₃₂ " →		
Camshaft Clearance in Bearings.....	← .0005" — .0035" →		
Valve Lifter Diameter.....	← .9975" — .9985" →		
Valve Lifter Clearance in Crankcase.....	← .0005" — .0025" →		
Rocker Arm Shaft O.D.....	1 ³ / ₁₆ "	1 ³ / ₁₆ "	1 ³ / ₁₆ "
Rocker Arm Clearance on Shaft.....	← .002" — .004" →		
Valve Head Diameter—Inlet.....	1 ¹⁷ / ₃₂ "	1 ¹⁷ / ₃₂ "	1 ²⁵ / ₃₂ "
Exhaust.....	1 ¹¹ / ₃₂ "	1 ¹¹ / ₃₂ "	1 ⁷ / ₁₆ "
Valve Seat Angle—Inlet and Exhaust.....	← 45 degrees →		
Valve Lift—Inlet.....	.348"	.348"	.347"
Exhaust.....	.342"	.342"	.348"
Valve Stem Diameter—Inlet.....	← .3715" — .3725" →		
Exhaust.....	← .3711" — .3719" →		

Items	Series 40	Series 50	Series 70
Valve Stem Clearance in Guide—			
Inlet.....	← .0015" — .0035" →		
Exhaust.....	← .0021" — .0039" →		
Valve Guide Extension from Top of Cyl. Head.....	1 $\frac{5}{16}$ "	1 $\frac{5}{16}$ "	1 $\frac{5}{16}$ "
Inner Valve Spring, used with <i>Adjustable Valve Lash</i> —			
Valve Opens (lbs. @ length).....	48-54 @ 1 $\frac{5}{16}$ "	—	—
Valve Closes (lbs. @ length).....	17.5-22.5 @ 1 $\frac{1}{2}$ "	—	—
Outer Valve Spring, used with <i>Adjustable Valve Lash</i> —			
Valve Opens (lbs. @ length).....	74-80 @ 1 $\frac{9}{16}$ "	—	—
Valve Closes (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 $\frac{1}{2}$ " →		
Outer Valve Spring, used with <i>Hydraulic Lifters</i> —			
Valve Open (lbs. @ length).....	← 116-124 @ 1 $\frac{9}{16}$ " →		
Valve Closed (lbs. @ length).....	← 49-55 @ 1 $\frac{15}{16}$ " →		

d. Valve Lash

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.....	$\frac{5}{8}$ " $\frac{5}{8}$ " $\frac{5}{8}$ "
Fan Hub Fit on Bearing Shaft.....	← .001" T to .0025" T →
Fan Hub Position on Shaft.....	← $\frac{13}{64}$ " from end →
Radiator Hose Inside Diam. and Type.....	← 1 $\frac{9}{16}$ " 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 →

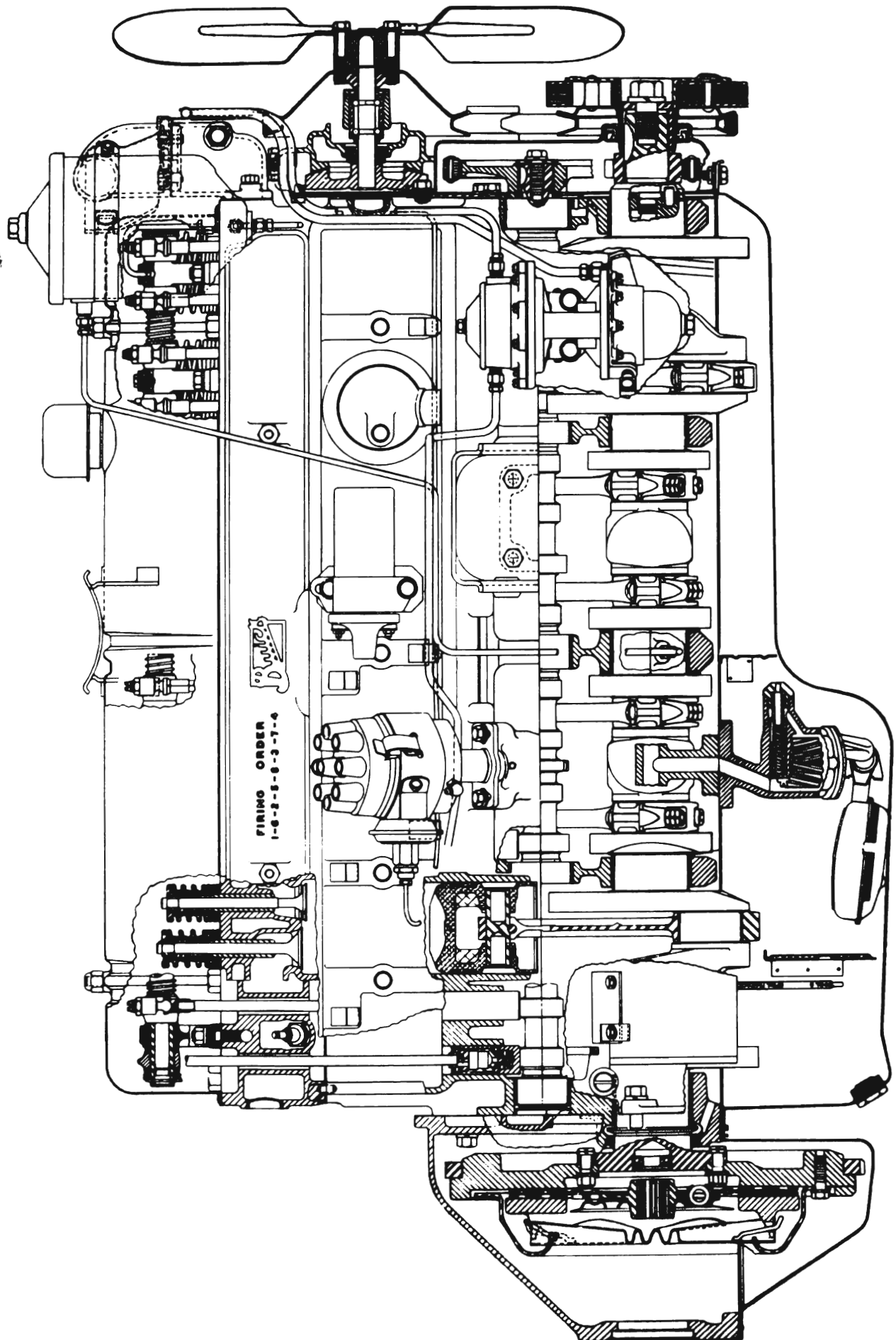


Figure 2-1—Engine Side Sectional View—Series 50

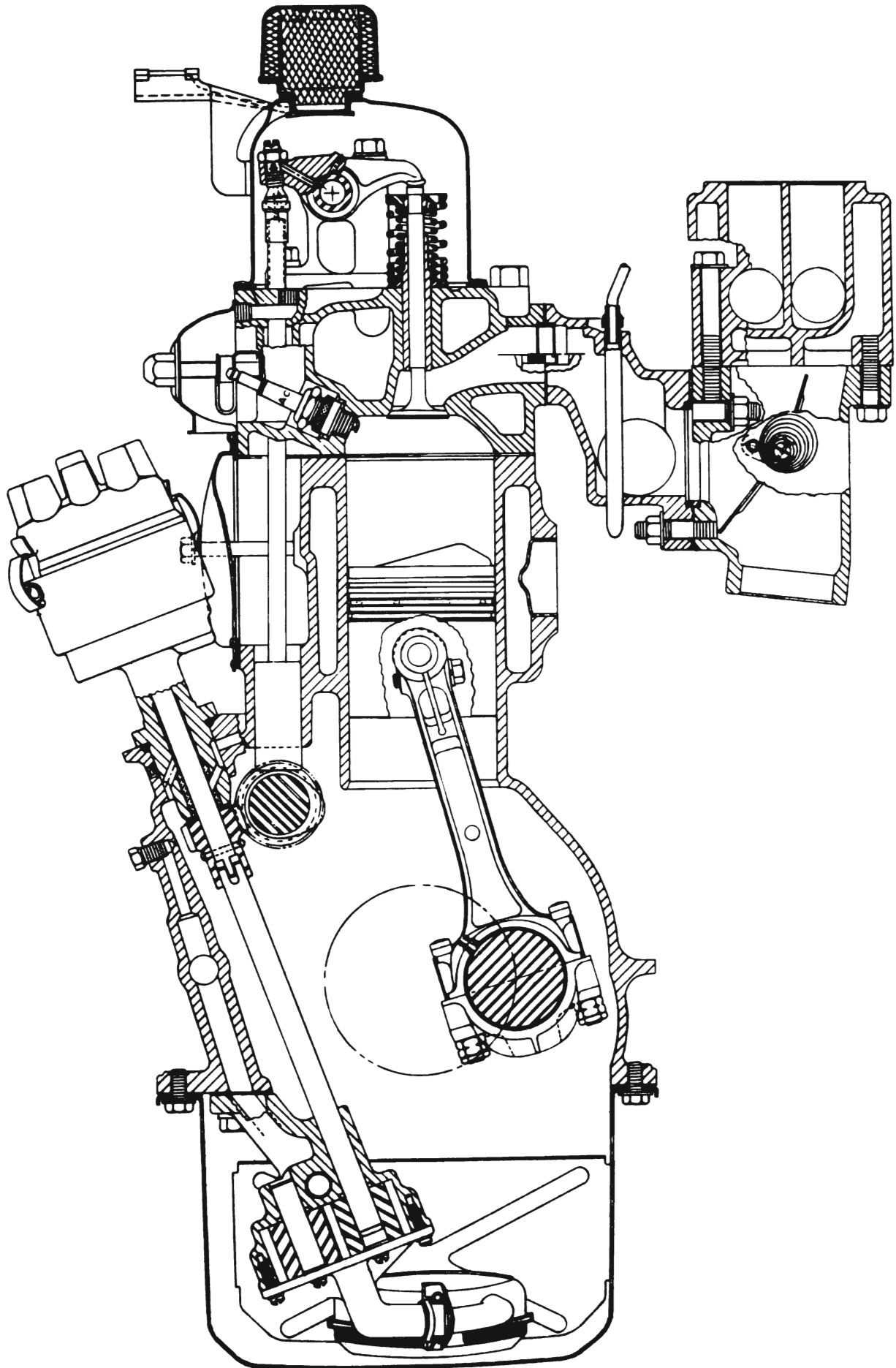


Figure 2-2—Engine End Sectional View—Series 50