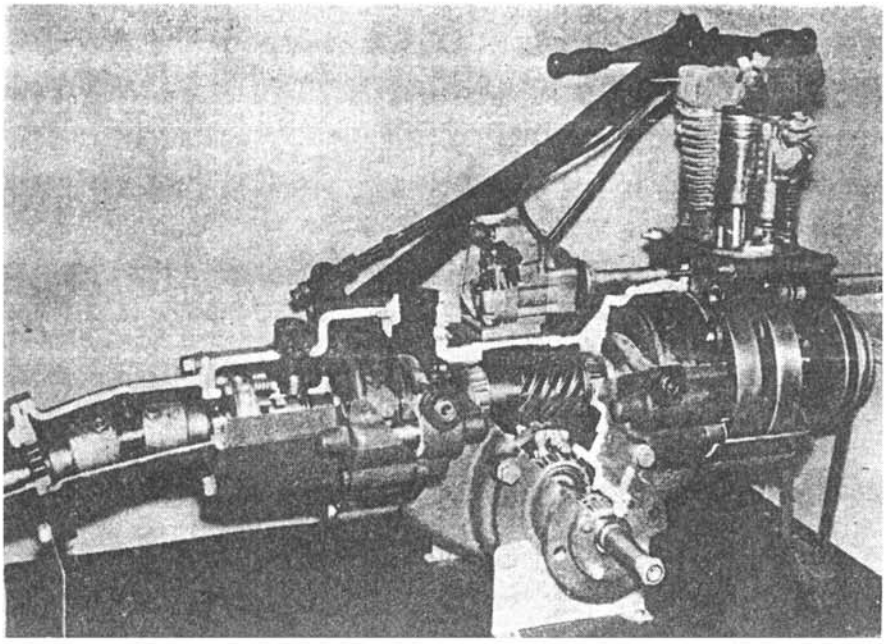


Fig. GR2—Cutaway of Gravely power plant showing Tee head engine having double internal flywheels, detachable main journals and crankpin and two-piece crankcase.

SERVICING THE GRAVELY MODEL L ENGINE

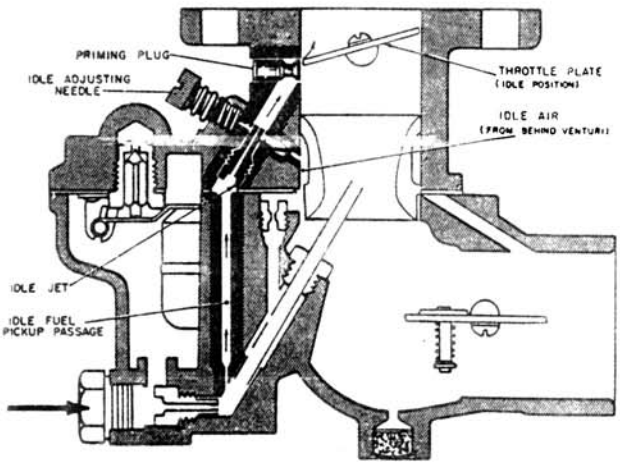


Fig. GR1 — Zenith series 161-7 carburetor with only an idle mixture adjustment. In some installations a main power adjustment is provided by substituting a needle valve for the plug shown by a heavy arrow.

Data in this section applies to the engine portion of the power plant used in Gravely garden type tractors for which numerous attachments are available. The power plant including clutch and gearset is shown in Fig. GR2.

KEY TO MODEL PREFIXES

The prefix "M" in serial number on name plate means 100,000. Thus tractor serial 100105 would be shown as M105.

MAINTENANCE

SPARK PLUG. Recommended spark plug is Auto-Lite TT-15 or equivalent. The electrode gap is 0.033.

CARBURETOR. Zenith carburetor Model 161-7 assembly 9995A or 9995C is used.

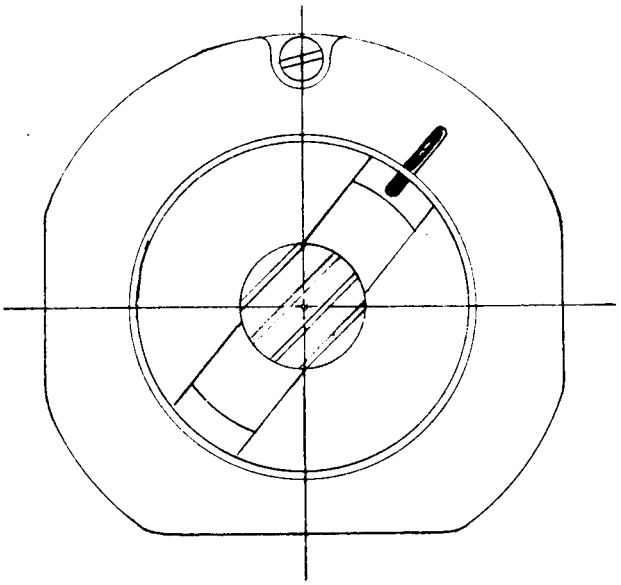


Fig. GR3—Magneto face plate showing one form of timing marks.

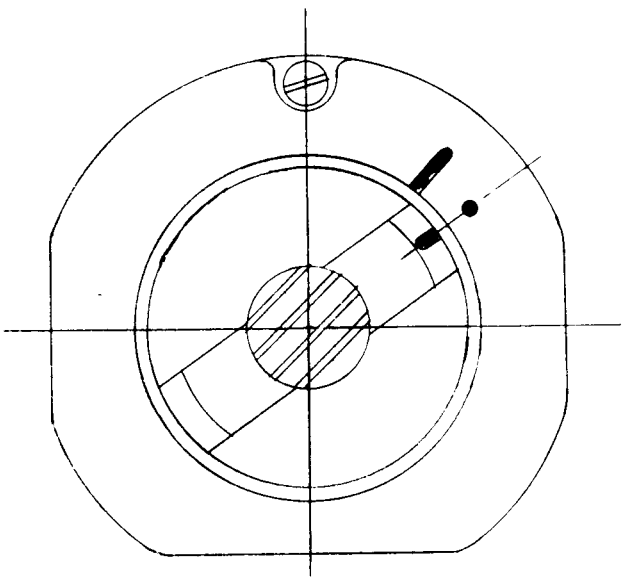


Fig. GR4—Magneto face plate showing double timing marks.

Model	No. Cylinders	Bore	Stroke	Displacement
L	1	3¼	3½	20.03

Gravely parts number for latest carburetor is L-806Z. Clockwise rotation of the main adjusting needle (if one is provided) leans the mixture and similar rotation of the idle mixture needle leans the mixture. Refer to Fig. GR1. Float level is 1 5/32-inch, plus or minus 3/64-inch, when measured from farthest face of float to gasket surface of top cover.

MAGNETO AND TIMING. Magneto is a non flywheel type Wico XH-2049 or Bendix Scintilla series H and is provided with an impulse coupling. Breaker contact gap is 0.015. Spark timing is 30 degrees or 5/16-inch piston travel before top center. If piston contacting type of timing gauge is not available remove cylinder head to obtain 5/16-inch position.

To time magneto bring piston to position 5/16-inch before top center on the compression stroke. Bend up ear on impulse coupling lock nut and loosen same until the split sleeve moves on the camshaft. It may be necessary to gently tap the sleeve. If the face of magneto has only a timing line as shown in Fig. GR3 rotate coupling (while holding magneto extension against rotation) until line on coupling is in register with line on magneto face as shown. If there are two marks on the magneto face as shown in Fig. GR4 bring the line on the coupling into register with the dot on the magneto as shown.

Coupling should have 1/64-inch end play. To obtain desired end play and to complete the timing job, temporarily insert a 0.015 feeler blade between coupling fiber block and coupling flange. While holding the marks in register tighten and lock the coupling lock nut.

GOVERNOR. A centrifugal type speed governor is available as an extra cost attachment. Variations in engine speed are obtained by increasing the tension of governor spring by means of the remote hand throttle lever. If governor does not respond readily to changes in load or is overly sensitive and causes the engine speed to surge, proceed as follows: With engine not running make sure that carburetor throttle is held wide open when hand lever is positioned so that governor spring is under tension. Make sure that throttle rod moves freely and that governor pulley bears firmly in contact with fan drive belt.

If linkage is O.K. you can obtain some adjustment by means of the 5 different holes in the throttle lever. To increase the sensitivity (responsiveness) hook governor spring in hole nearer throttle lever hub. If speed surge is encountered hook the spring into a hole further from throttle lever hub.

LUBRICATION. Recommended oil is SAE No. 40 for temperatures above 32 deg. F., SAE No. 20 for temperatures between 10 deg. F. and 32 deg. F.; SAE No. 10 for temperatures below 10 deg. F. Crankcase capacity is 5 pints. Oil pressure is supplied to connecting rod and main bearings by a gear type pump.

REPAIRS

CONNECTING ROD. As will be seen in Fig. GR5 connecting rod (56) lower end is not split as in conventional rods. To remove rod first remove the cylinder from crankcase then separate the crankcase halves (49) and (86). Remove spreader bolt nut (59) and press the crankpin (61) out of one of the two flywheels (58). On current production engines crankpin diameter is 1.497-1.498 and crankpin bronze bushing in lower end of rod is reamed to 1.500 to provide 0.002-0.003 running clearance. On early production engines crankpin diameter may be other than 1.497-1.498 diameter so measure crankpin and size the bushing to obtain the desired 0.002-0.003 running clearance.

The diameter at each end of crankpin (61) is 0.001-0.003 larger than the holes in the flywheels, to provide a heavy interference type fit. Mount first flywheel in press and press pin into flywheel until bottomed against shoulder on crankpin. Press second flywheel on to opposite end of crankpin or pull into position against crankpin shoulder using a bolt larger in diameter than the crankpin spreader bolt (62). Check after assembly to make sure flywheels are perfectly parallel (spaced equally all around) to each other.

PISTON RINGS, PISTON AND PISTON PIN. One chrome faced compression ring (top groove) a steel compression ring (middle groove) and a scraper type oil ring (bottom groove) are mounted on the aluminum piston. Top ring should have 0.002-0.003 side clearance in groove. Other rings should have not less than 0.0015 side clearance. End gap all rings should be 0.012-0.015; reject if more than 0.030. Piston rings are available in oversizes of 0.005, 0.010, 0.015, 0.020, 0.025 and 0.030.

Piston (52) can be removed after removing the cylinder (23), extracting the snap rings (53) from piston bosses and pushing piston pin (54) out of rod and piston. If pin does not push out easily by hand pressure, heat the piston slightly. Piston pin should have 0.001-0.002 clearance in rod bushing and should be a light push fit in bosses of a HEATED piston. Oversize pins are not furnished.

Recommended clearance of piston skirt in cylinder bore is 0.003-0.005 measured at right angles to the piston pin. Pistons are furnished in oversizes of 0.005, 0.010, 0.015, 0.020, 0.025 and 0.030. For easy practical method for determining when cylinder should be rebored refer to CYLINDER in next paragraph.

CYLINDER. Recommended minimum clearance of piston in cylinder bore is 0.003; recommended maximum new clearance is 0.005. Cylinder should be rebored when clearance exceeds 0.0065. Gravely method of determining when cylinder should be rebored is accomplished without use of expensive instruments, as follows: Insert a piston ring (preferably a new one) in cylinder at a point ½-inch from bottom of bore. With ring squared in bore (use a piston to do the squaring) carefully measure the end gap of the ring with a feeler gauge. Now insert and square same ring into bore at top of travel (½-inch from top of cylinder) and again measure the end gap. Subtract smaller gap reading from larger gap reading then divide by 3. If the resulting value is greater than 0.006 the cylinder should be rebored to the next 0.010 oversize. Pistons with fitted pins are furnished in oversizes of 0.005, 0.010, 0.015, 0.020, 0.025 and 0.030.

CRANKSHAFT AND SEALS. The drive pinion shaft (42—Fig. GR5) and timing pinion shaft (78) form the main journals of crankshaft. The inner tapered end of each pinion shaft is anchored in it's respective flywheel by means of a Woodruff key and a flywheel nut. Nut (69) retains the timing pinion shaft and nut (47) the drive pinion shaft. To remove either shaft from the assembly it will be necessary to first remove cylinder from crankcase, separate the crankcase halves and remove one flywheel from the crankpin as mentioned in a preceding paragraph. Next remove the appropriate shaft retaining nut (47 or 69) and bump shaft out of flywheel.

Diameter of a new drive pinion journal (42) is 0.9965-0.9975 and drive pinion bushing (43) located in crankcase should be sized after installation to provide 0.002-0.004 running clearance. Bushings are available in undersizes of 0.005 and 0.025. To facilitate installation of bushing into crankcase either heat the crankcase slightly or freeze the bushing with dry ice.

The timing pinion shaft (78) is supported on the annular ball bearing (81) which controls end play of shaft. If bearing does not readily enter a cold crankcase heat same slightly. Oil seal (101) which is of the double type is accessible after removing the bearing oil pump cap (94).

CAMSHAFT AND BEARINGS. Separate camshafts (63 and 64) are provided for the exhaust and inlet valve. Oil seals are provided for the camshafts at the driving pinion ends of shafts and expansion plugs seal the opposite ends. Camshafts can be removed from engine by first separating the crankcase halves.

Camshaft bearing journals are 0.748-0.749 diameter and should have running clearance of 0.001-0.003 in bushings (38, 41, 73 & 77) mounted in crankcase halves. This clearance will be obtained with a standard (preferably piloted type) 0.750 reamer. Reaming should be done after bushings are installed and with crankcase halves bolted together.

VALVE TIMING. On early production engines the camshaft gears are provided with timing marks. Because of the gear train arrangement the marks will not come into register every revolution but may require 16 or more revolutions of crankshaft. The Gravely Company, however, recommends that whenever engines are being repaired the cam relationship with respect to a straightedge be checked as shown in the two views of Fig. GR6. The straightedge can be positioned as shown when crankcase halves have been separated.

If cam to straightedge relationship is not as shown in View C discard the camshafts and install new latest shafts. To make a double check of the valve timing set both tappets to exactly 0.0015 gap. Rotate engine in normal direction, slowly. If inlet valve just starts to open when piston begins to move down from top center, and exhaust valve is just fully closed when piston is 5/32 inch down from top center of same stroke, valves are correctly timed. Reset both tappets to 0.012 cold, for running.

VALVE SYSTEM. Adjustable type tappets are used. Valve tappet gap, with engine cold, is 0.012 for both valves. Valve face angle and seat angle is 45 degrees. Seat width is 3/64-5/64 inch. If valve seat in cylinder exceeds 5/64 inch, narrow with a 60 degree stone or reamer. Valve guides are replaceable and inlet valve stem to valve guide clearance is 0.002-0.004. Since September, 1955, hardened exhaust valve guides are used which cannot be reamed. Gravely recommends that old style exhaust guides be replaced with the new style hardened exhaust valve guides.

The 0.7485-0.7495 valve guide plungers (tappets) should have 0.0005-0.0025 clearance in the valve plunger guides. Valve sleeve gaskets should be Permatexed or shellaced.

OIL PUMP. Pump is mounted in the cap (94—Fig. GR5) at fan pulley end of engine. Idler gear (92) can be removed after removing the cap. Pump master gear shaft (89) which carries the pump drive gear (79) at its opposite end can be removed after separating the crankcase halves. Bushing (87) for master gearshaft should have 0.0007-0.002 running clearance. Gearshaft journal diameter is 0.4363-0.4368 inch.

CAUTION. If new pump gears or a new pump cover are to be installed be sure when assembling the pump to the engine that pump gears have necessary end play. The Gravely recommended procedure is as follows: When installing cover (94) to crankcase rotate the pump gears by placing a speed socket on pump drive gear nut "72" (inside crankcase) while drawing up the cover screws evenly. If resistance to rotation is encountered it indicates that gears are too long for the depth of the bore in the cover. Since the gears are harder than the aluminum in the cover they can function as an end mill to deepen the bore in the cover, by rotating the gears with the speed socket while gradually tightening the cover screws. Gears should turn freely when cover is fully tightened. After gears are fitted remove pump and flush with gasoline so as to remove metal cuttings.

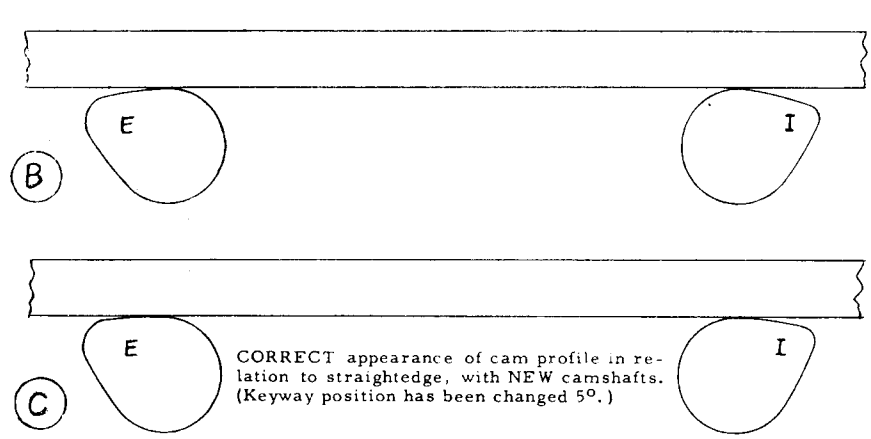
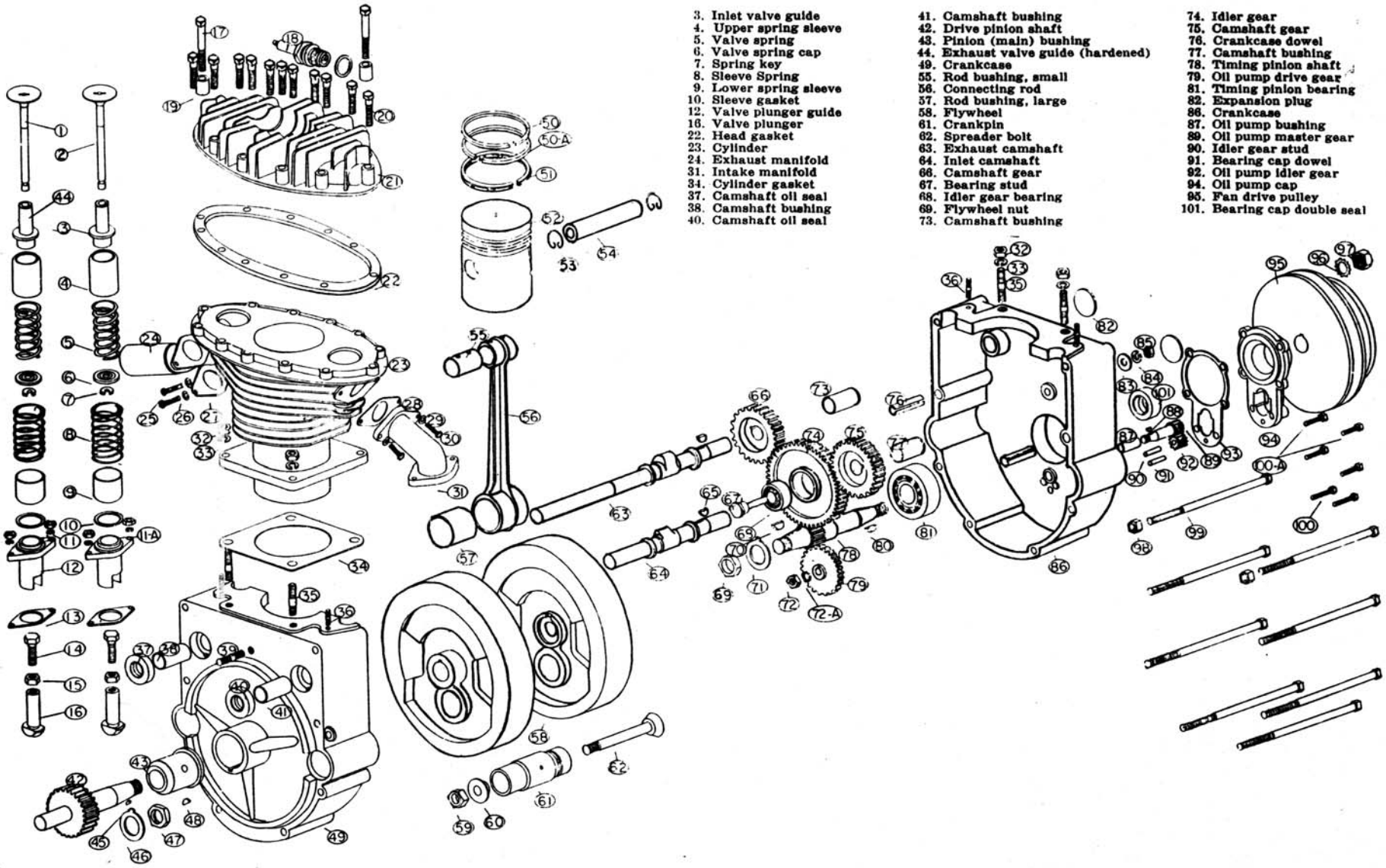


Fig. GR6 — View B shows next to latest valve camshaft setup. Other view shows latest camshafts. Note relationship to straightedge.



3. Inlet valve guide
4. Upper spring sleeve
5. Valve spring
6. Valve spring cap
7. Spring key
8. Sleeve Spring
9. Lower spring sleeve
10. Sleeve gasket
12. Valve plunger guide
16. Valve plunger
22. Head gasket
23. Cylinder
24. Exhaust manifold
31. Intake manifold
34. Cylinder gasket
37. Camshaft oil seal
38. Camshaft bushing
40. Camshaft oil seal
41. Camshaft bushing
42. Drive pinion shaft
43. Pinion (main) bushing
44. Exhaust valve guide (hardened)
49. Crankcase
55. Rod bushing, small
56. Connecting rod
57. Rod bushing, large
58. Flywheel
61. Crankpin
62. Spreader bolt
63. Exhaust camshaft
64. Inlet camshaft
66. Camshaft gear
67. Bearing stud
68. Idler gear bearing
69. Flywheel nut
73. Camshaft bushing
74. Idler gear
75. Camshaft gear
76. Crankcase dowel
77. Camshaft bushing
78. Timing pinion shaft
79. Oil pump drive gear
81. Timing pinion bearing
82. Expansion plug
86. Crankcase
87. Oil pump bushing
89. Oil pump master gear
90. Idler gear stud
91. Bearing cap dowel
92. Oil pump idler gear
94. Oil pump cap
95. Fan drive pulley
101. Bearing cap double seal

Fig. GR5—Exploded view of T head type engine used in Gravely model L tractor. Note flywheels (58), pin (61), rod (56) and shafts (42) and (78) are actually components of a built-up type crankshaft assembly.