Springs

The bolts through the front and rear ends of the chassis springs, as well as the bolts through the rear shackles of the front and rear springs, are provided with lubricant gun nipples. A high-grade fluid gear lubricant of heavy body should be forced through the nipples at these points at intervals of every 500 miles.

Lubricant should never be used between the leaves of these springs. If it is ever necessary to remove dust from between the leaves, a light penetrating oil (containing no graphite) may be used because it will evaporate readily and leave the surfaces of the leaves clean and free from substances which are liable to cause improper spring action and improper steering action at high speed.

Brakes

The transmission hand brake rod connections should be oiled every 2000 miles with a few drops of engine oil.

Steering Gear

Frequent lubrication of the entire steering mechanism provides easy steering. The steering gear housing should be filled every 5000 miles with special heavy steering gear lubricant. This lubricant should be diluted with engine oil, in extremely low temperatures, if necessary. Never use cup grease or any oil or grease containing graphite in the steering gear.

General Description and Repair Operations

Engine

The power plant of the Dodge Brothers Six is of the unit type, having a six-cylinder engine, of the L-head, four-cycle, poppet valve construction. The cylinder head and oil pan are removable.

Lubrication is accomplished by a full force feed system to all crankshaft, connecting rod, and camshaft bearings as well as to the chain which drives the camshaft. The cylinder walls, piston pins and the entire valve mechanism are lubricated by spray thrown from the ends of the connecting rod bearings. An oil filter passes the oil through treated fabric which removes dirt and sediment and returns the oil, cooled and cleansed, to the oil pan.

The water pump, in the front of the cylinder block, draws cool water from the bottom of the radiator and, through a system of graduated outlets and large passages, forces circulation around each cylinder and valve seat.

The camshaft is driven by the crankshaft through a silent chain. The ignition distributor, which has single breaker points and semi-automatic spark advance, is accessibly mounted above the cylinder block and driven by a spiral gear on the camshaft.

Pistons and Rings

Each piston is light in weight, of special slotted skirt design. The rings are all above the piston pin which floats free in the connecting rod with

a slight creep in the piston (when hot). The piston pin is retained in the piston by snap rings at either end. Concentric, angle cut compression rings are assembled in the upper grooves of the piston. A special oil control ring is used in the bottom groove.

Pistons are fitted with .0015″ to .002″ clearance at skirt, .027″ to .032″ clearance at the head. Piston pins are fitted with .00025″ to .00075″ clearance which is a tight thumb push fit at normal room temperatures. This exact fit will allow proper lubrication at operating temperatures. When the pistons are being reassembled to an engine the slot in the skirt should face toward the side of the engine opposite the valves.

All piston rings have a gap measure of .005″ to .010″. When assembling new parts the exact clearance must be allowed and the rings should move freely in the grooves when the piston is shaken. Piston and connecting rod assemblies should be removed from the top of the engine.

Dodge Brothers Six pistons and rings were selected only after exhaustive tests proved them most efficient for this engine. Under no consideration should so-called trouble-proof pistons and rings be installed. Dodge Brothers pistons and rings are the results of very elaborate, painstaking and expensive research and under no circumstances should any of these parts be used unless obtained directly through Dodge Brothers Approved Service Stations, as having come from the Dodge Brothers Corporation, because trouble will otherwise inevitably result. If for any reason it should ever be necessary to replace one or more pistons, care should be exercised when selecting them so that the variation in weight is not more than $\frac{1}{8}$ of an ounce in the entire set of six pistons. If this limit is not followed excessive vibration may result. Dodge Brothers Six owners should always insist upon the use of genuine parts.

Bearings

The crankshaft is positively balanced dynamically and statically, and mounted in seven babbitt-lined bearings. The crankshaft main bearings are a special interchangeable type, manufactured to such close limits that new bearings may be installed without reaming, scraping, or burnishing. The camshaft, driven by the crankshaft through a silent chain, is mounted in four large bearings: the three front are bronze-backed, babbitt-lined, while the rear bearing is machined in the crankcase. The connecting rods are manufactured to exact size and are interchangeable without fitting, having bearings of babbitt, spun into place by a centrifugal process, thereby providing a perfect bond and a dense bearing free from flaw or foreign substance.

Due to the full force feed oiling system, all engine bearings are assembled with a clearance of .002″, so that there is always a film of oil under pressure as a cushion between the bearings and shaft. The side clearance of the connecting rod bearings is .006″. This is important as the internal lubrication of the engine depends on this clearance.

Damaged bearings are positively and quickly repaired at small cost by installing new bearings, which restore the original factory alignment. Bearings are otherwise not adjustable. These bearings should not be tampered with in any way other than to replace them. *A bearing cap should never be filed.*

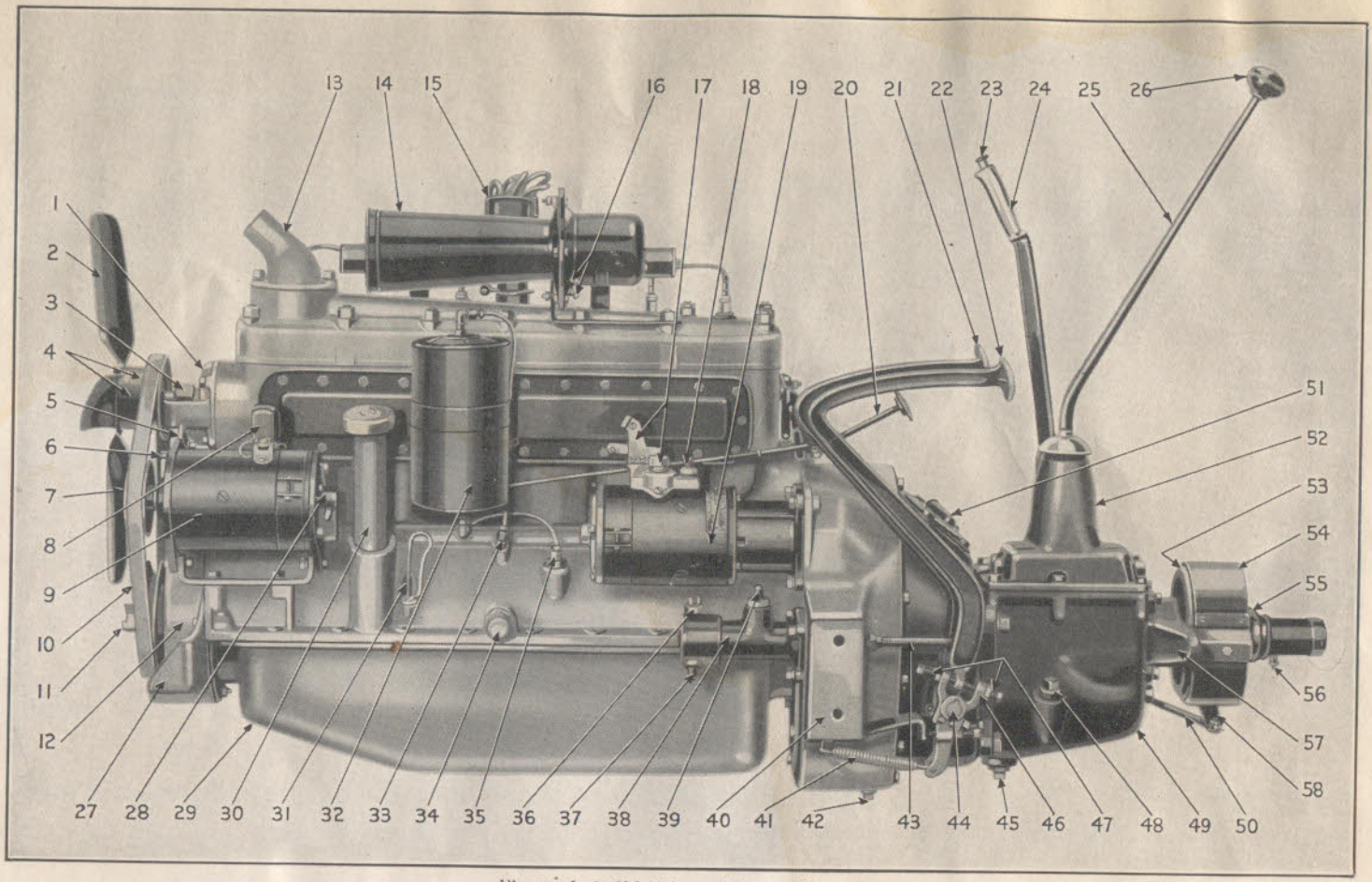

Fig. 1—Left Side View of Power Plant

Valves and Valve Timing

Extra large valves are mounted along the right side of the cylinder block and are lifted by adjustable tappets of the mushroom type. The inlet valves are of chrome-nickel steel. The exhaust valves are of silchrome steel. Valve stems operate in cast iron guides, generously lubricated. The valve tappets are mounted in cast iron brackets, easily removed.

To Set Valve Timing

Retiming the valves is necessary only when the engine has been disassembled or a new chain is installed. The crankshaft sprocket has only one keyway, while the camshaft sprocket has one offset flange bolt, making it impossible to assemble these incorrectly. The crankshaft and camshaft sprockets are each marked with an "x". When the "x's" are together in line with the crankshaft and camshaft centers, the valves are correctly timed. (Fig. 7.)

To Check Valve Timing

The valve tappets of cylinder No. 1 should first be adjusted while the engine is cold with .007″ clearance for the intake and exhaust. This clearance is necessary when checking the valve timing but should be changed to .006″ for the exhaust and .004″ for the intake when the engine is warm and as soon as the checking is completed, because the latter is the proper setting for quiet valve operation. The crankshaft should be rotated until No. 1 piston is coming up on exhaust stroke and stopped when the piston is at top dead center. The No. 1 intake valve tappet should be up just enough to be tight and the valve just about to open. No. 1 cylinder exhaust valve closes six degrees of crankshaft rotation later; therefore, at upper dead center the tappet should be up fairly tight against the valve stem. The timing diagram should be consulted. The exhaust valves are Nos. 1-4-6-7-9-12.

Fig. 1—Left Side View of Power Plant

1—Water pump body
2—Fan blades
3—Water pump packing nut
4—Fan hub and pulley
5—Generator adjusting strap
6—Generator front bearing oil cup
7—Generator pulley
8—Reverse current cutout
9—Generator
10—Fan belt
11—Crankshaft starting jaw
12—Timing chain case
13—Cylinder water outlet elbow
14—Horn
15—Distributor
16—Horn terminals
17—Starter switch
18—Starter cable terminal
19—Starting motor
20—Accelerator pedal
21—Brake pedal
22—Clutch pedal
23—Brake hand lever button
24—Brake hand lever
25—Gear shift lever
26—Gear shift lever knob
27—Engine front support
28—Generator rear bearing oil cup
29—Oil pan
30—Oil filler (breather)
31—Oil level indicator
32—Oil filter
33—Oil filter inlet tube elbow (at engine)
34—Oil pressure relief valve cap
35—Oil filter outlet tube connection
36—Signal lamp switch
37—Brake master cylinder outlet connection
38—Brake master cylinder
39—Brake master cylinder inlet connection
40—Engine rear support (flywheel housing)
41—Pedal pull-back spring
42—Drain plug
43—Brake master cylinder piston push rod
44—Clutch release fork and shaft (integral)
45—Transmission drain plug
46—Clutch pedal adjusting collar
47—Clutch pedal adjusting collar set screw
48—Transmission oil level or filler plug
49—Transmission case
50—Transmission brake pull rod
51—Clutch hand hole cover
52—Transmission case cover (gear shift housing)
53—Transmission brake drum
54—Transmission brake band
55—Universal joint—front
56—Universal joint oil nipple
57—Transmission brake support
58—Transmission brake operating lever

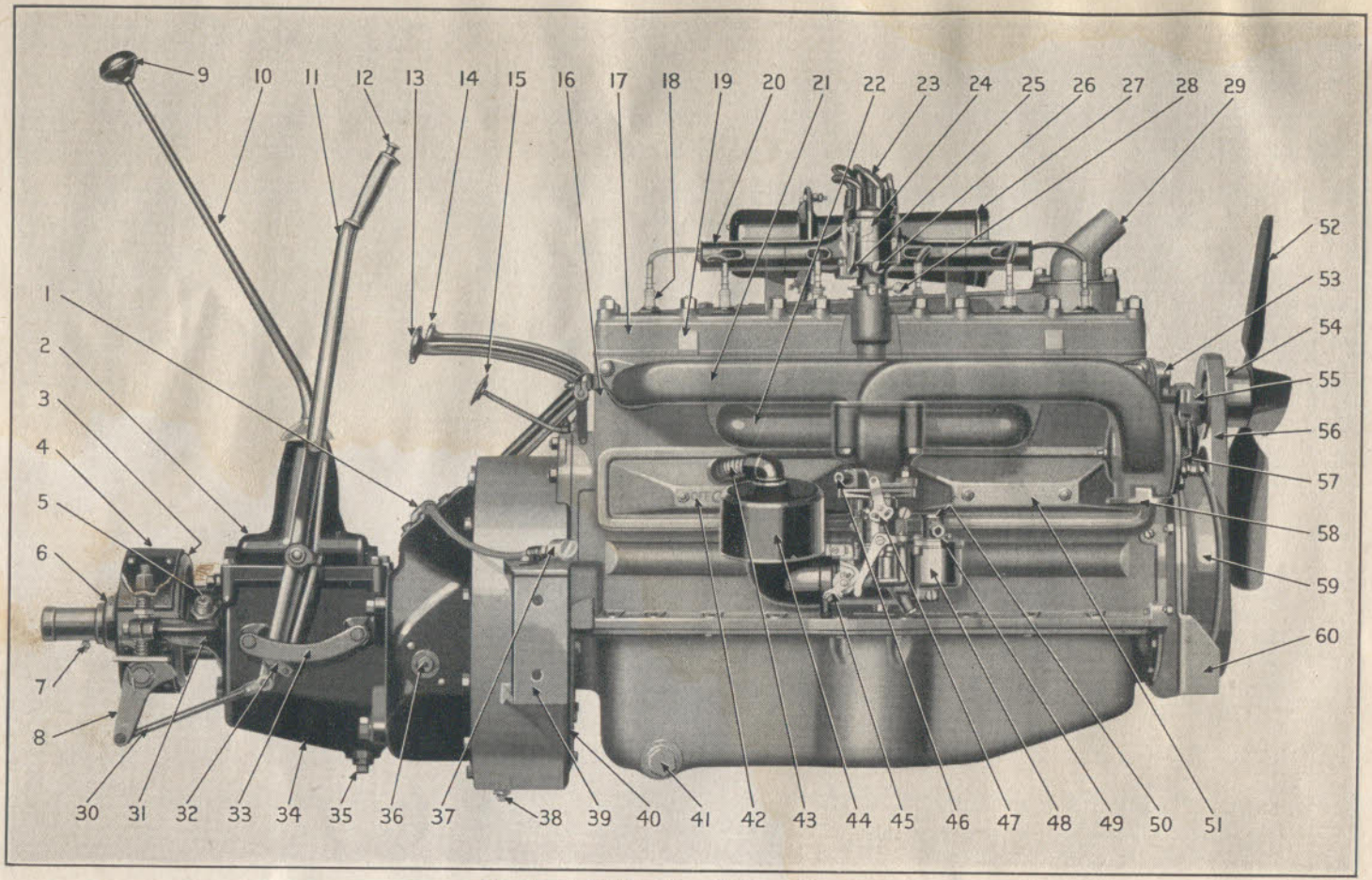

Fig. 2—Right Side View of Power Plant

Valve Grinding

The water should be drained from the cooling system and the upper hose removed from the radiator. The cylinder head stud nuts should next be removed.

If the cylinder head should stick a sharp instrument should not be placed between it and the cylinder block as this will cause damage to the gasket and render impossible a tight joint after assembly. If necessary to use force to dislodge the cylinder head, it should be tapped lightly on the lugs on the sides of the casting, using a wooden mallet or soft metal hammer. Eye bolts screwed into the spark plugs provide the best method of loosening and lifting the cylinder head. The valve spring cover plates should next be removed. The valve spring should be compressed and the retainers and locks removed.

The design and chemical specifications of the Dodge Brothers Six valve springs contribute considerably to the high-speed efficiency of this engine and, because of all factors entering into their design, so-called "flutter" at high speed is reduced to a minimum; therefore, *it is of vital importance that they be never compressed to a length of less than* $1\frac{11}{16}$*", otherwise they will take a permanent "set" and the engine efficiency will be impaired.*

A soft steel scraper should be used to remove all traces of carbon from the surfaces of the cylinder block, valves and pistons. Care should be exercised to not allow any carbon to fall between the pistons and cylinder walls.

The valves should be removed from the cylinders. The exhaust valves, being made of silchrome steel, are so hard that valve grinding compound will make a very slight impression upon them. Therefore, it is necessary to grind their beveled surfaces in a *valve refacing grinder* before attempting to grind the seats. It is advisable to grind the inlet valve faces in the same manner to eliminate excessive grinding away of the valve seats.

Fig. 2—Right Side View of Power Plant

1—Clutch hand hole cover
2—Gearshift housing (transmission case cover)
3—Transmission brake drum
4—Transmission brake band
5—Speedometer shaft connection (retaining sleeve)
6—Universal joint—front
7—Universal joint grease nipple
8—Transmission brake operating lever
9—Gearshift lever ball
10—Gearshift lever
11—Transmission brake hand lever
12—Transmission brake hand lever button
13—Brake pedal
14—Clutch pedal
15—Accelerator pedal
16—Cylinder block
17—Cylinder head
18—Spark plug
19—Cylinder head removal lug (cylinder head)
20—Spark plug cable tube
21—Exhaust manifold
22—Intake manifold
23—Spark plug cables
24—Distributor
25—Distributor condenser
26—Distributor grease cup
27—Horn
28—Distributor advance arm
29—Cylinder water outlet elbow
30—Transmission brake pull rod
31—Transmission brake support
32—Transmission brake hand lever pawl or latch
33—Transmission brake hand lever ratchet or sector
34—Transmission case
35—Transmission drain plug
36—Clutch release fork and shaft (integral)
37—Clutch release bearing grease cup
38—Drain plug
39—Engine rear support (flywheel housing)
40—Flywheel dust cover
41—Oil pan drain plug
42—Crankcase ventilator control (valve chamber cover—rear)
43—Crankcase ventilator tube
44—Air cleaner
45—Carburetor choke lever
46—Vacuum tube connection
47—Carburetor throttle lever
48—Carburetor bowl or float chamber
49—Carburetor inlet connection
50—Carburetor fuel strainer
51—Valve chamber cover—front
52—Fan blade
53—Water pump body
54—Fan pulley
55—Manifold heat control valve spring bracket
56—Fan belt
57—Manifold heat control valve cover
58—Exhaust manifold
59—Timing chain case cover
60—Engine front support

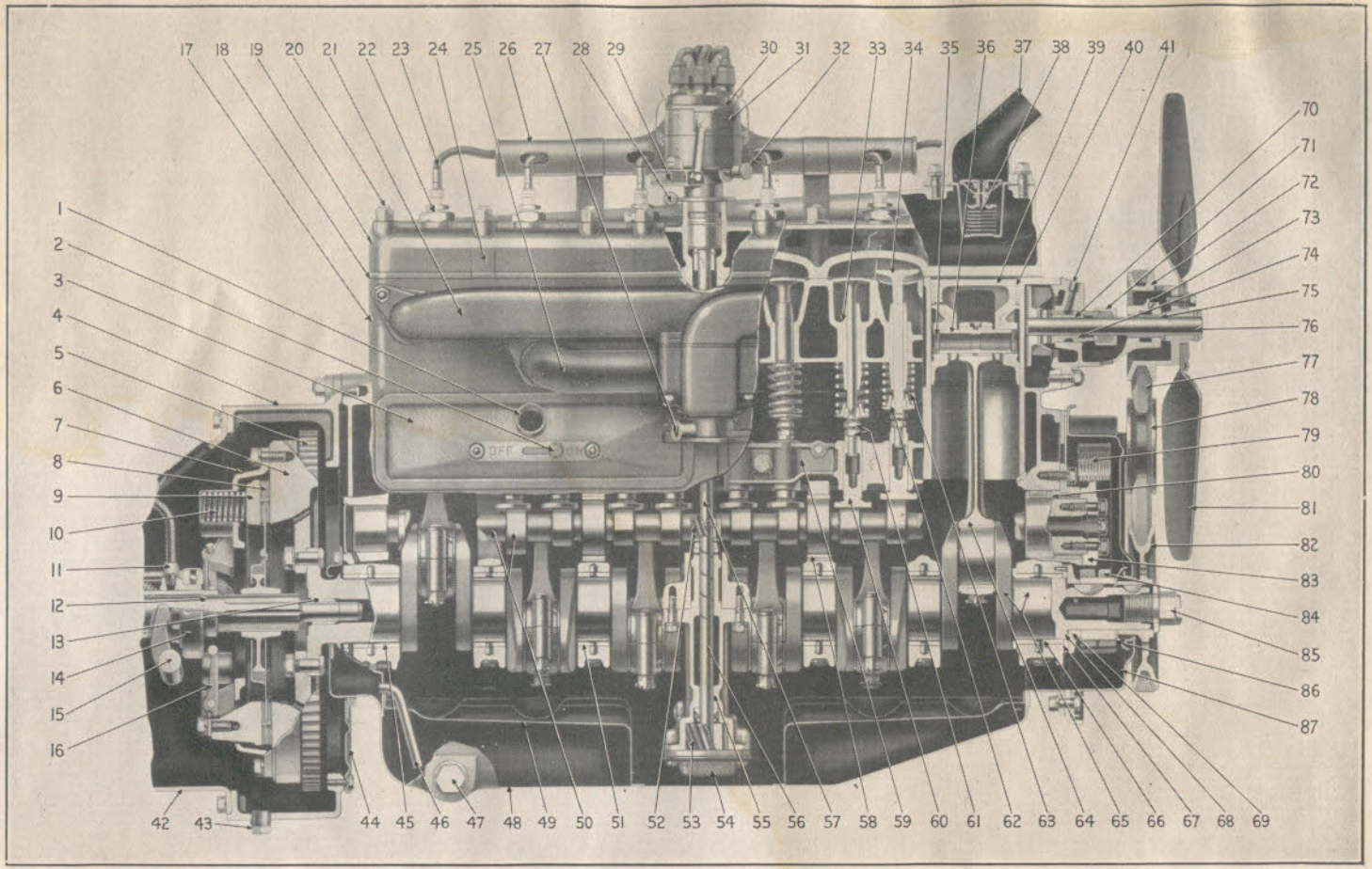

Fig. 3—Side Sectional View of Engine

After the valve faces have been machine-ground, a thin coat of medium valve grinding compound should be applied to the valve face. Excessive quantities of grinding compound should be avoided.

The grinding operation can be facilitated by placing a light coil spring, of sufficient weight to lift a valve, under the head and then the valve returned to the port from which it was taken. With a screwdriver or grinding tool the valve should be oscillated, occasionally relieving pressure to allow the spring to lift the valve from the seat. A valve being ground should not be turned throughout a complete revolution because this has a tendency to cut grooves in the seat. After having oscillated the valve for a few minutes, it should be removed and the valve grinding compound wiped off the valve as well as the valve seat.

A lead pencil mark should be placed across the bevel face of the valve at intervals of about ¼" entirely around the circumference, the valve replaced in its seat and turned about ¼ revolution, exercising light pressure. If all pencil marks are broken, a good seat is indicated.

When grinding is completed, the valves should be removed and washed, as well as the valve seats, with water or kerosene to remove all of the valve grinding compound. Positively none of the compound should be allowed to reach the valve guides or cylinders. All valves should be treated in the same manner.

Fig. 3—Side Sectional View of Engine

1—Crankcase ventilator port (valve chamber cover—rear)
2—Crankcase ventilator control valve
3—Valve chamber cover—rear
4—Engine rear support flywheel housing
5—Flywheel starting ring gear
6—Flywheel
7—Clutch back plate
8—Clutch driven disc
9—Clutch pressure plate
10—Clutch spring
11—Clutch release bearing grease tube
12—Transmission drive gear and clutch shaft (integral)
13—Transmission drive gear pilot bushing
14—Clutch release bearing
15—Clutch release fork and shaft
16—Clutch release lever
17—Cylinder block
18—Cylinder head gasket
19—Cylinder head
20—Cylinder head stud
21—Exhaust manifold
22—Spark plug
23—Spark plug cable
24—Cylinder head
25—Intake manifold
26—Spark plug cable tube
27—Vacuum tank suction tube opening
28—Distributor advance arm
29—Distributor condenser
30—Distributor cap
31—Distributor body
32—Distributor grease cup
33—Valve stem guide
34—Valve
35—Piston pin lock ring
36—Piston pin
37—Cylinder water outlet elbow
38—Thermostat
39—Piston
40—Piston rings
41—Water pump bushing oiler
42—Clutch housing
43—Drain plug
44—Flywheel dust cover
45—Crankshaft bearing bushing—rear
46—Drain back tube
47—Oil pan drain plug
48—Oil pan
49—Oil pan baffle plate (oil pan)
50—Camshaft
51—Crankshaft bearing bushing—rear center intermediate
52—Oil pump and distributor drive gear
53—Oil pump driven gear
54—Oil pump screen
55—Oil pump body
56—Oil pump drive shaft
57—Distributor drive shaft
58—Camshaft front intermediate bushing
59—Valve tappet guide—front
60—Valve tappet
61—Valve tappet adjusting screw and lock nut
62—Valve spring retainer
63—Valve spring
64—Connecting rod
65—Crankshaft
66—Crankshaft bearing bushing—front
67—Crankshaft thrust washer
68—Crankshaft thrust shims
69—Crankshaft bearing thrust plate
70—Water pump shaft rear bushing and retainer
71—Water pump packing nut
72—Fan pulley
73—Water pump bearing oiler
74—Water pump shaft rear bushing retainer and bushing
75—Water pump shaft front bushing
76—Water pump and fan shaft
77—Fan belt
78—Generator pulley
79—Timing chain
80—Camshaft front bushing and retainer assembly
81—Fan blade
82—Water pump, fan and generator drive pulley
83—Camshaft sprocket
84—Crankshaft sprocket
85—Crankshaft starting jaw
86—Crankshaft oil slinger
87—Timing chain case cover

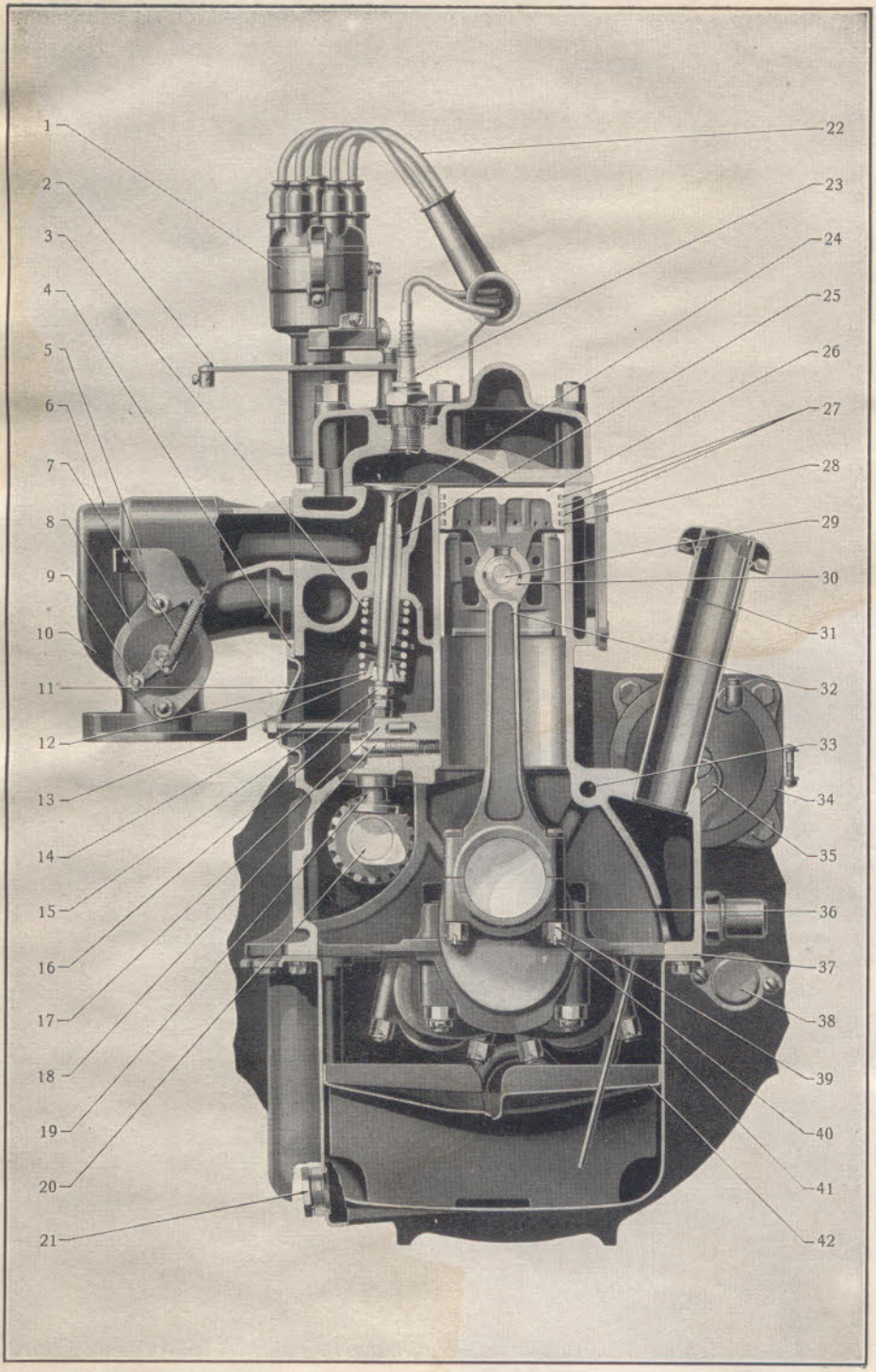

Fig. 4—Front Sectional View of Engine

Valves, seats, and guides should be lubricated immediately after grinding in order to prevent rusting, especially if water grinding compound has been used. The valves should next be installed and the timing checked and tappets adjusted as described on Page 23 under "To Check Valve Timing".

Carbon should be removed from the cylinder head with a scraper or

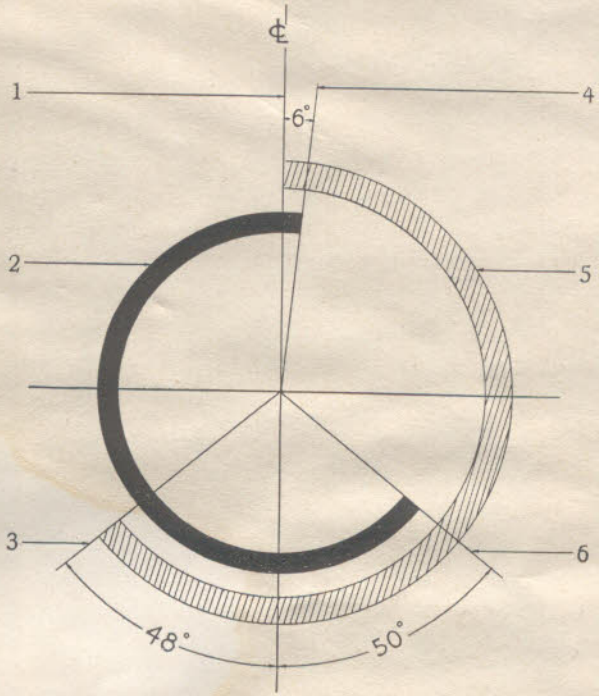

Fig. 5—Valve Timing Diagram

1—Intake opens—dead center
2—Duration of exhaust valve opening—236°
3—Intake closes
4—Exhaust closes
5—Duration of inlet valve opening—228°
6—Exhaust opens

Fig. 4—Front Sectional View of Engine

1—Distributor
2—Distributor advance arm
3—Valve spring
4—Valve spring chamber cover gasket
5—Manifold heat control valve spring bracket
6—Exhaust manifold
7—Manifold heat control valve spring
8—Manifold heat control valve cover
9—Manifold heat control valve lever assembly
10—Intake manifold
11—Valve chamber cover—front
12—Valve spring retainer
13—Valve spring retainer lock
14—Valve chamber cover stud
15—Valve tappet adjusting screw
16—Valve tappet adjusting screw lock nut
17—Valve tappet guide—front
18—Valve tappet guide screw
19—Valve tappet (lifter)
20—Camshaft
21—Oil pan drain plug
22—Spark plug cables
23—Spark plug
24—Valve
25—Valve stem guide
26—Piston
27—Piston rings—upper (plain)
28—Piston ring—lower (oil wiper)
29—Piston pin
30—Piston pin bushing
31—Oil filler (breather)
32—Connecting rod
33—Oil passage (cylinder block)
34—Starting motor
35—Oil level indicator (gauge rod)
36—Connecting rod cap (connecting rod)
37—Oil pan gasket
38—Flywheel inspection hole cover
39—Connecting rod bolt nut
40—Connecting rod bolt
41—Oil pan
42—Oil pan baffle plate (oil pan)

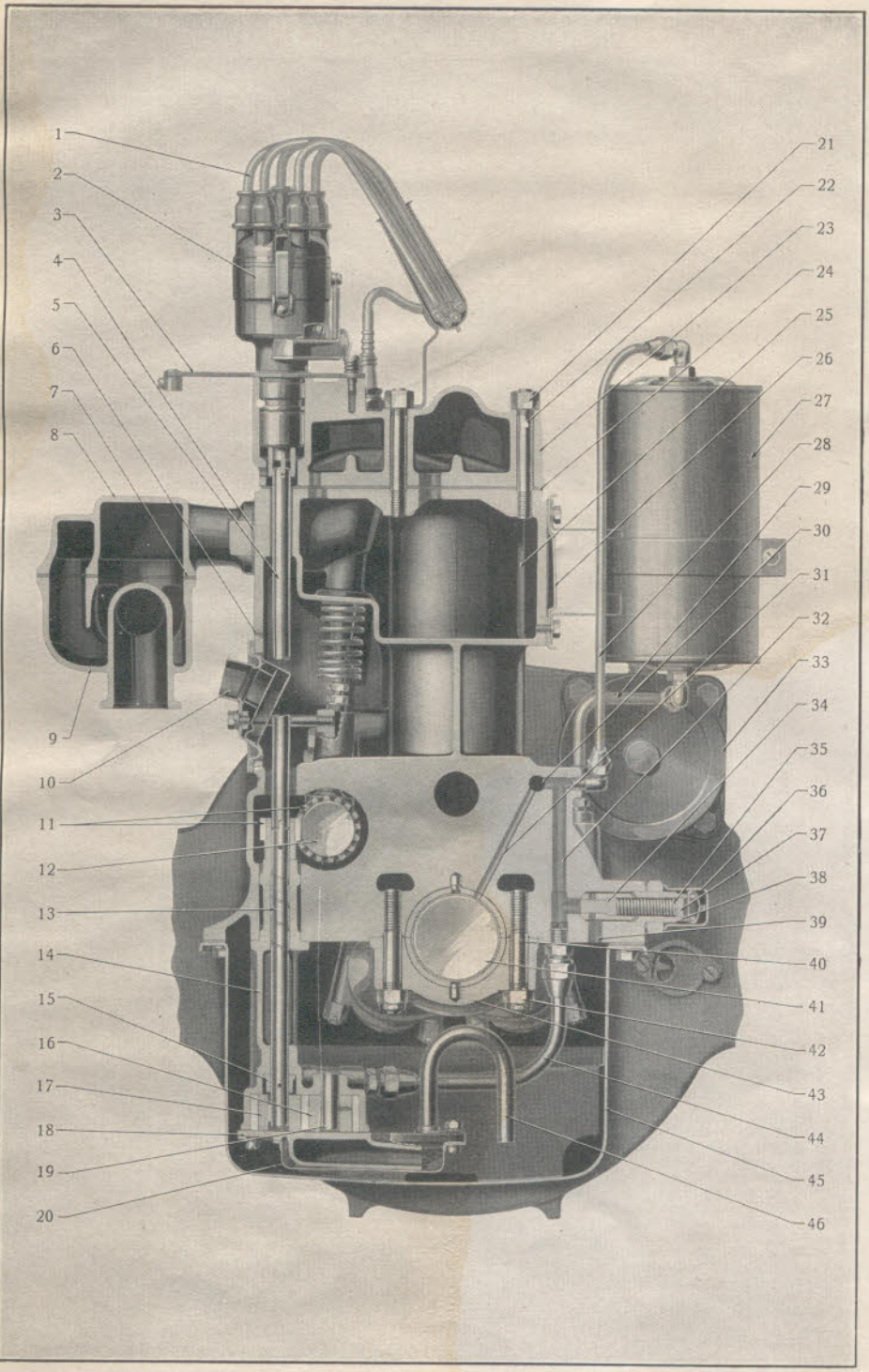

Fig. 6—Center Sectional View of Engine

wire brush. All traces of carbon should be wiped from the milled surfaces of the cylinder head and cylinder block, as well as both faces of the cylinder head gasket. The spark plug electrodes should be adjusted to a gap of .025". It is important that this gap be equal on all spark plugs. The cylinder head may next be assembled, exercising care that it is made equally tight all around. Shellac, white lead, or other compounds should never be used on the surface of cylinder head gaskets. All of the cylinder head stud nuts should be turned down just tight enough to touch the cylinder head, then each nut should be given one turn, beginning with the center stud and working toward each end, repeating this operation until the head is tight, further repeating this operation when engine is warmed up.

After filling the cooling system with clean water, the engine should be allowed to run for about 30 minutes, and the valve tappet adjustment checked when the engine is warm. The valve cover plates should next be assembled and the cylinder head stud nuts tightened again.

The nuts holding the valve cover plates in place should be tightened sufficiently to prevent oil leakage.

Timing Chain

In the event that it should become necessary, for any reason, to remove the timing chain, this is accomplished after removing the chain case cover by removing the bolts holding the camshaft sprocket to the front end of the camshaft. The sprocket and chain may then be lifted off.

When replacing the timing chain it should be assembled to the sprockets and the camshaft sprocket bolted to the front end of the camshaft. Care must be taken to see that the timing marks on the camshaft and crankshaft sprockets line up as described under "To Set Valve Timing" (Page 23). The bolt holes in the camshaft and its sprocket are so placed that the sprocket can be put on in only one position.

On some chains, an arrow shows the correct direction of travel. Unmarked chains will operate satisfactorily in either direction.

The timing should be carefully checked after performing any operation on the timing chain. (Pages 23 and 44.)

Fig. 6—Center Sectional View of Engine

1—Spark plug cables
2—Distributor
3—Distributor advance arm
4—Manifold to cylinder gasket
5—Distributor drive shaft
6—Cylinder block
7—Exhaust to intake manifold gasket
8—Exhaust manifold
9—Intake manifold
10—Crankcase ventilator tube port (valve chamber cover—rear)
11—Distributor and oil pump drive gear
12—Camshaft
13—Oil pump drive shaft
14—Oil pump body
15—Oil pump drive shaft collar
16—Oil pump driven gear
17—Oil pump driven gear
18—Oil pump cover
19—Oil pump driven gear shaft
20—Oil strainer screen
21—Cylinder head stud nut
22—Cylinder head stud
23—Cylinder head
24—Cylinder head gasket
25—Water passage (cylinder block)
26—Cylinder water jacket cover plate
27—Oil filter
28—Oil filter inlet tube
29—Oil filter outlet tube
30—Oil passage (cylinder block)
31—Oil passage (cylinder block)
32—Oil passage (cylinder block)
33—Starting motor
34—Oil pressure relief valve plunger
35—Oil pressure relief valve plunger spring
36—Oil pressure relief valve cover
37—Oil pressure relief valve spring retainer
38—Oil pressure relief valve body
39—Oil return passage (cylinder block)
40—Crankshaft bearing cap stud
41—Crankshaft
42—Crankshaft bearing cap stud nut
43—Crankshaft bearing cap
44—Oil pump delivery tube
45—Oil pan
46—Auxiliary oil suction tube assembly

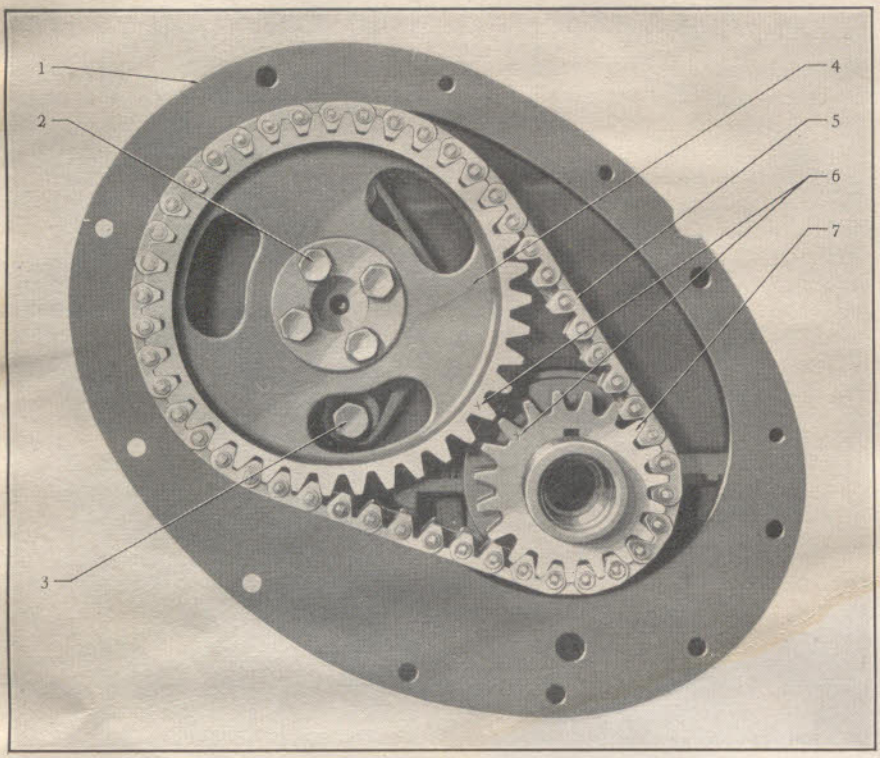

Fig. 7—Timing Chain and Sprockets

1—Chain case (integral with crankcase)
2—Camshaft sprocket screw
3—Camshaft thrust bearing screw
4—Camshaft sprocket
5—Timing chain
6—Timing marks
7—Crankshaft sprocket

Repairs to the timing chain should be entrusted to Dodge Brothers Service Stations, as a variation of only one tooth on the sprocket will make a marked difference in the operation of the car.

Cooling System

The radiator is of the cellular type, connected by short pieces of hose to the engine. The fan is driven by the crankshaft through a V-type rubber cord belt. This belt also drives the generator. The water pump impeller in the cylinder block, just behind the fan, is driven by an extension of the fan shaft.

Care

The cooling system should be drained (drain cock at bottom left corner of radiator) and flushed occasionally to remove dirt and sediment. If the radiator is removed from the car, the ideal way to flush the radiator is to invert it and force the water through the bottom connection to remove large particles collected in the top tank. Very hard or lime water should not be used in the system. Because of the scale-forming chemicals it contains, its use will cause scale to form on the walls of the inside of the