SPECIFICATIONS AND ADJUSTMENTS

1930

BUILT BY BUICK MOTOR COMPANY

MARQUETTE

1930 Models

Specifications

AND

Adjustments

BUICK MOTOR COMPANY
Division of General Motors Corporation
Flint, Michigan

JUNE 1929

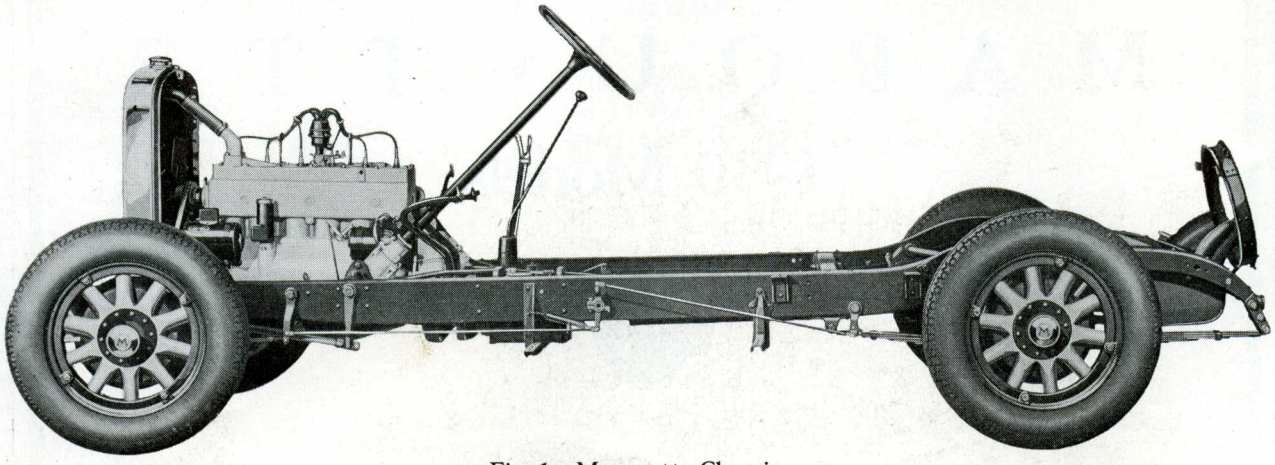

Fig. 1. Marquette Chassis.

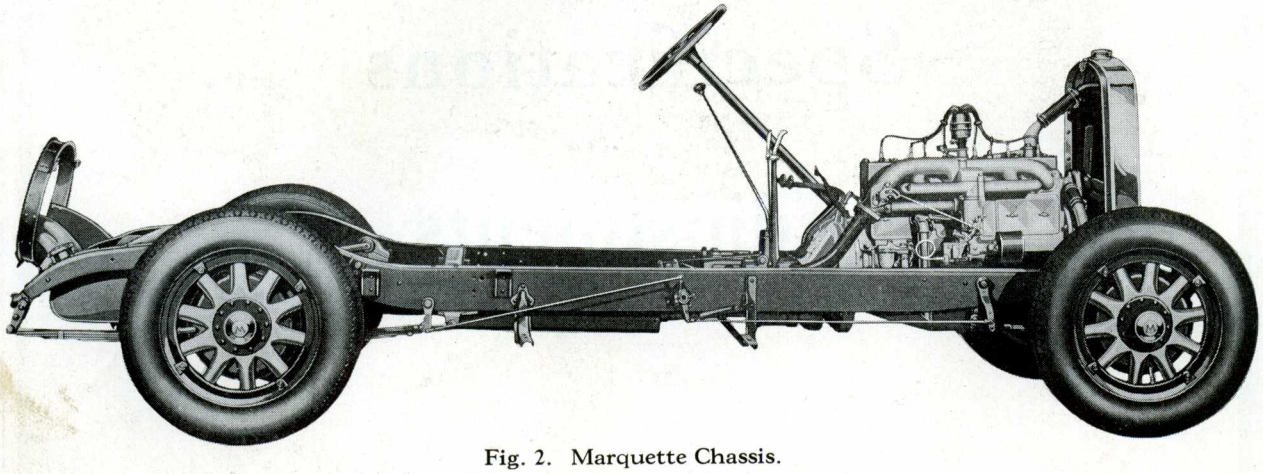

Fig. 2. Marquette Chassis.

Model	
30	Five-passenger two-door sedan
34	Four-passenger roadster
35	Five-passenger phaeton
36	Two-passenger coupe
36-S	Four-passenger sport coupe
37	Five-passenger four-door sedan
Wheelbase	114″
Turning circle	38.6 ft.
Cylinder size	3⅛″ x 4⅝″
Displacement	212.8 cu. in.
H. P. rating, actual	67.5
H. P. Rating, S. A. E.	23.44
Tires	28 x 5.25
Axle ratio	4.54 to 1
Fuel tank capacity	16 gal.

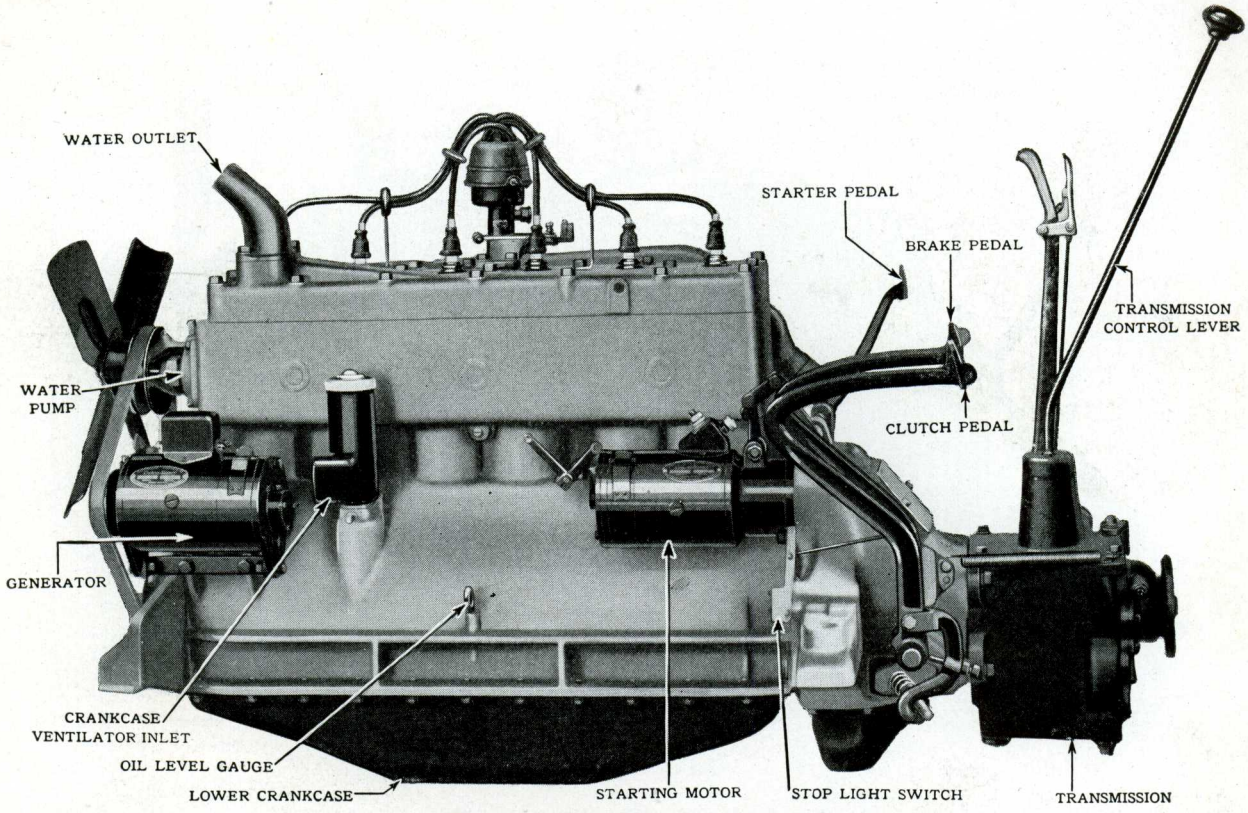

Fig. 3. Left Side View Engine

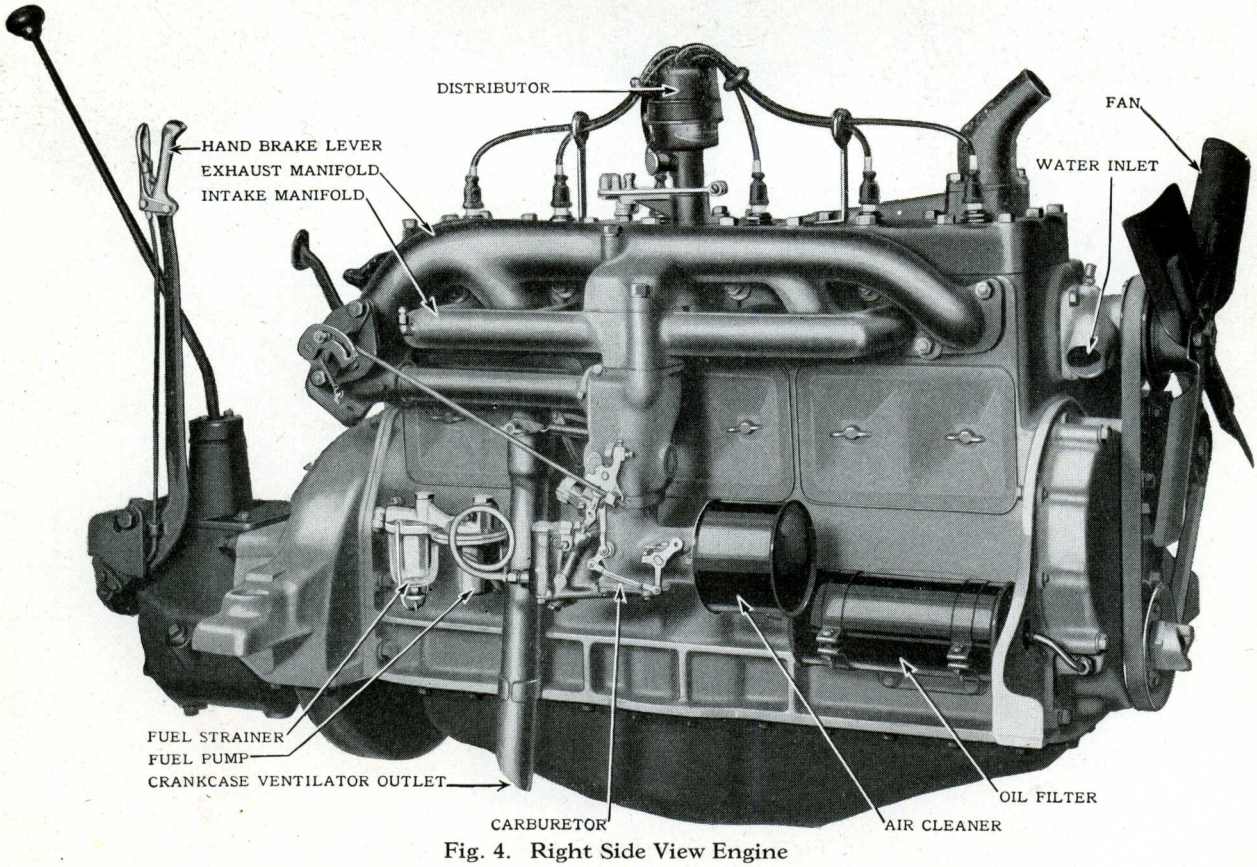

Fig. 4. Right Side View Engine

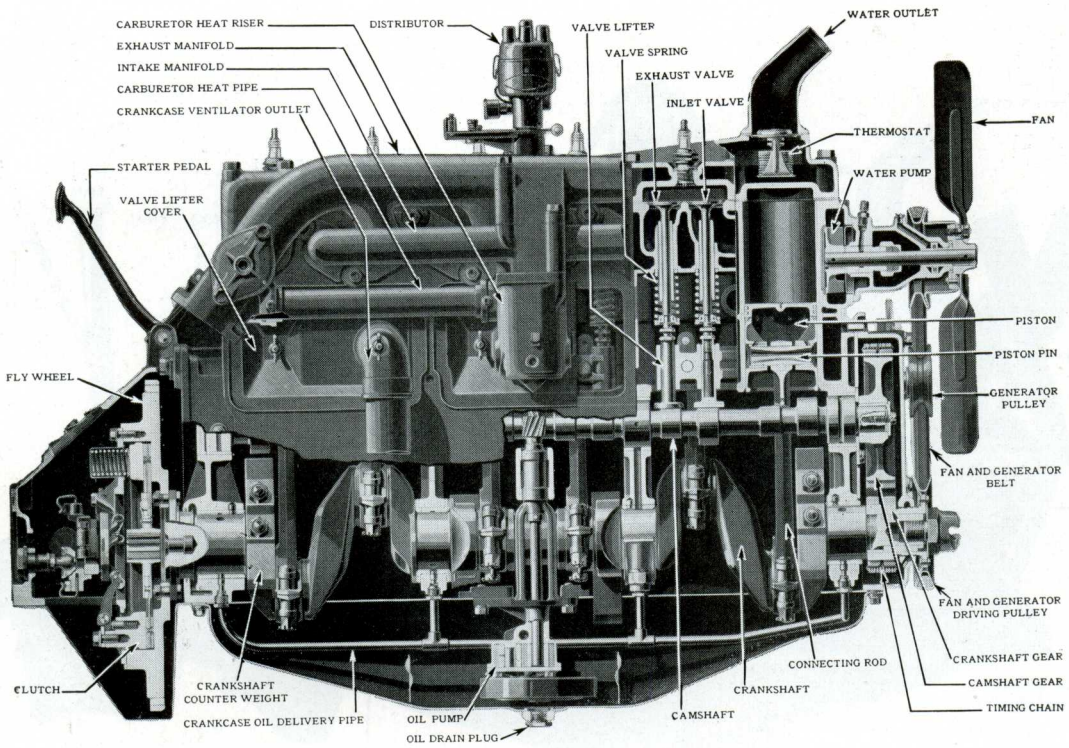

Fig. 5. Engine—Side Cut-a-Way View

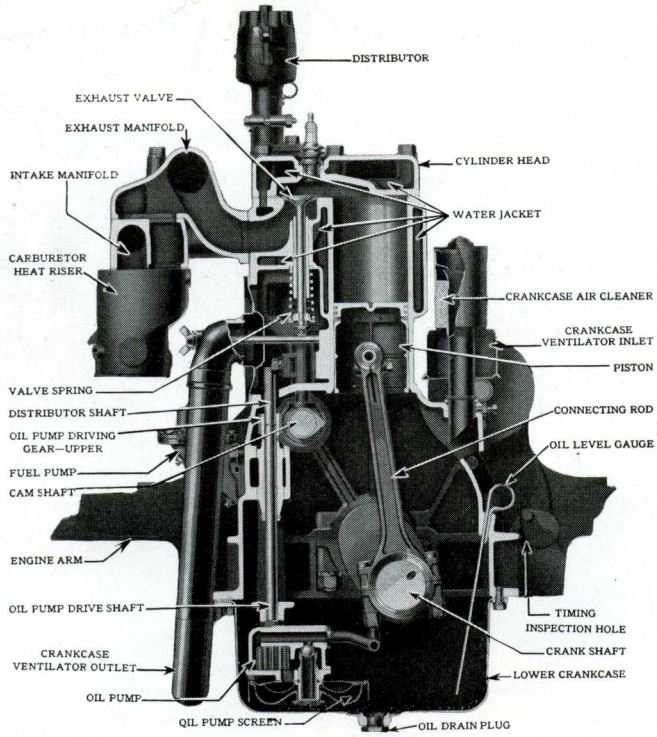

Fig. 6. Engine—End Cut-a-Way View

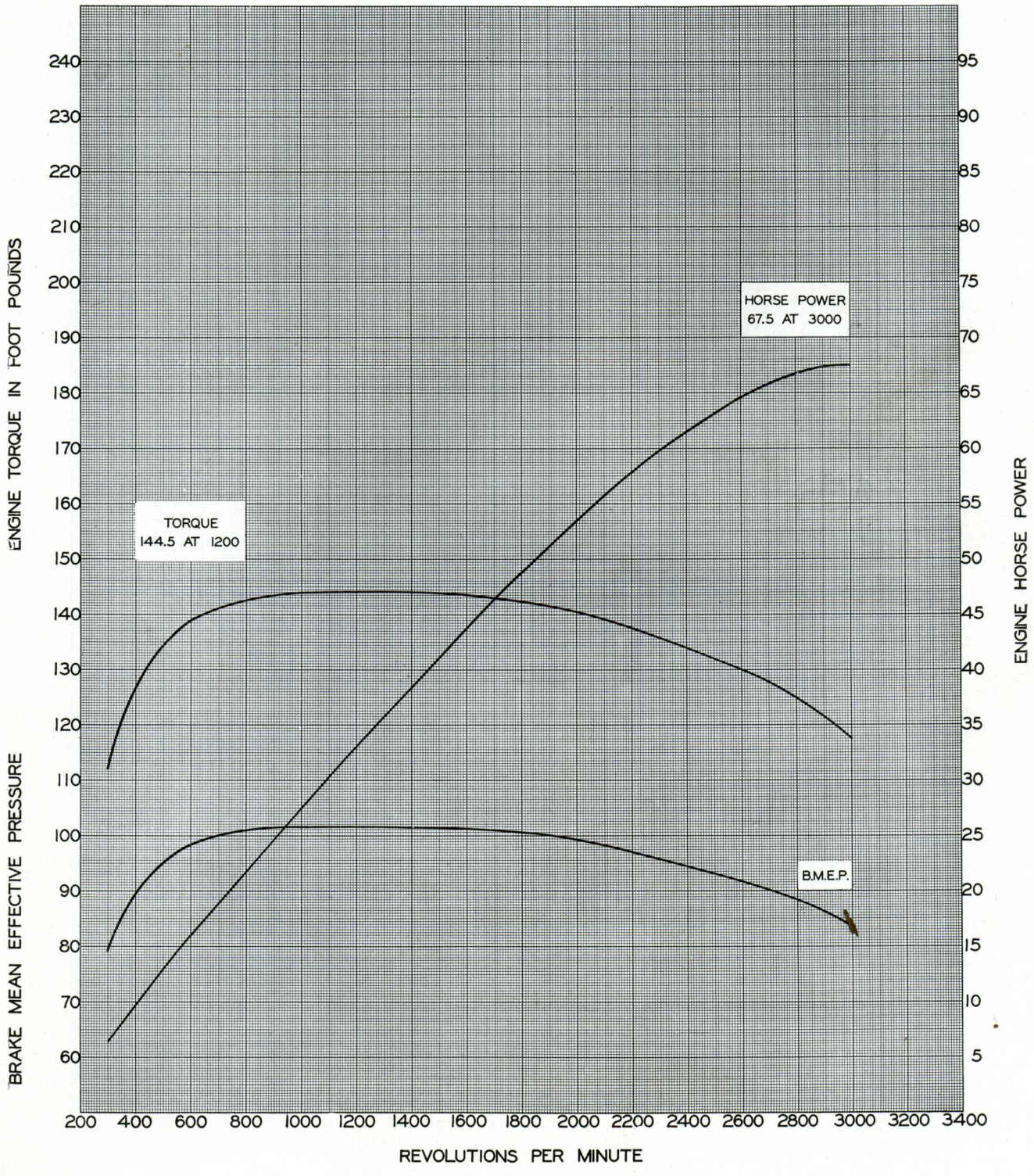

Fig. 7. Engine Horse Power, Torque and Mean Effective Pressure Curves.

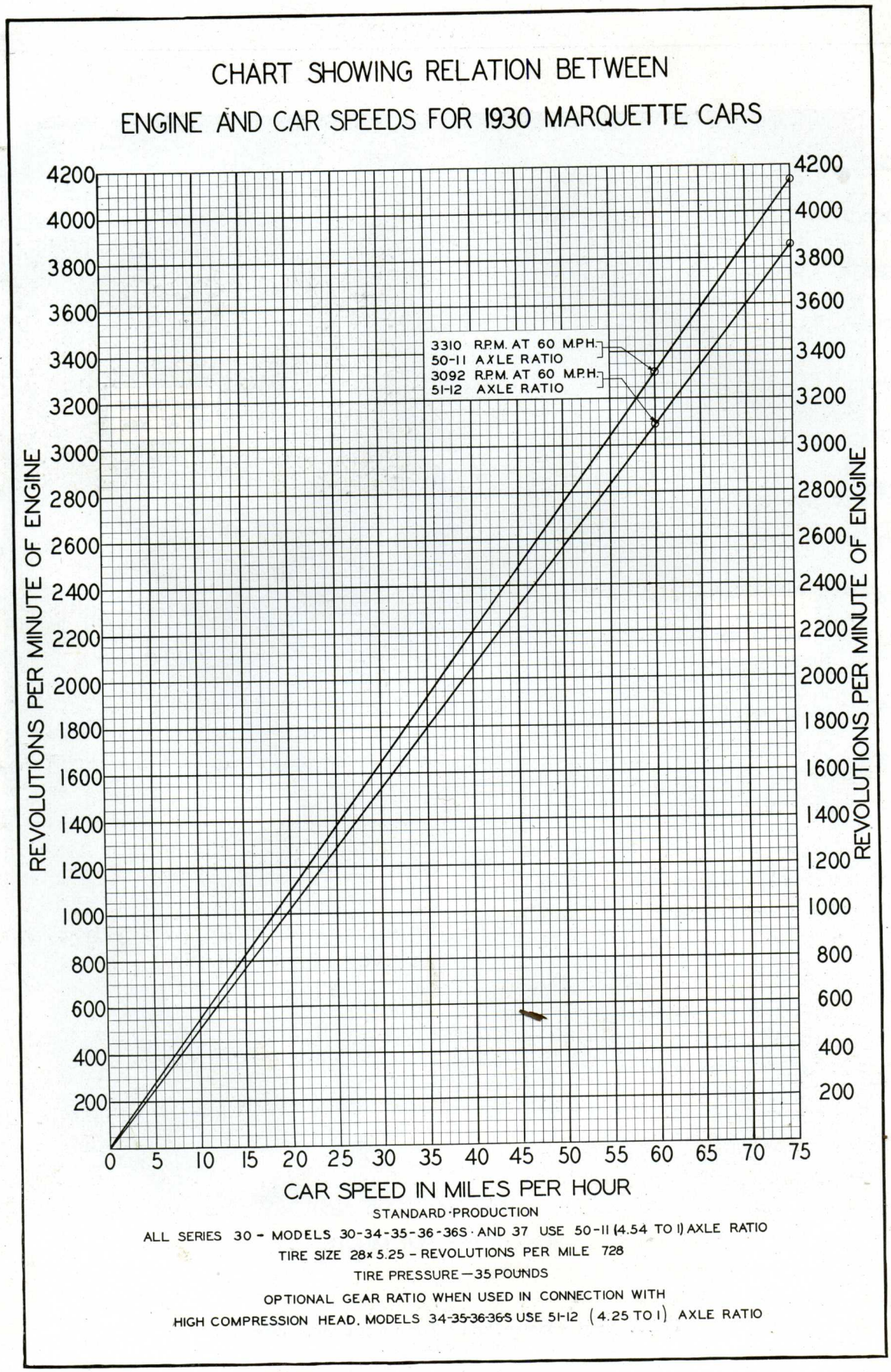

Fig. 8. Relation Between Engine Revolutions and Car Speeds.

Specifications and Adjustments

Engine

Type	L-head
Number of cylinders	Six
Bore and stroke	3⅛" x 4⅝"
Displacement	212.8 cu. in.
Actual H. P. at 3000 R.P.M.	67.5 H. P.
S. A. E. rated H. P.	23.44
Torque at 1200 R. P. M.	144.5 ft. lbs.
Compression	98 lbs. per sq. in.
Compression ratio	5.2 to 1
Firing order	1-5-3-6-2-4

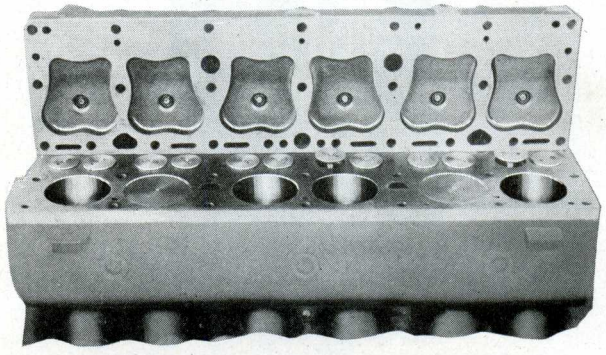

Fig. 9. Contour of Combustion Chamber.

Cylinder Block and Crankcase

The cylinder block and upper crankcase are a one-piece casting of alloy iron. Cylinder bores and valve seats are completely surrounded by water and the water jacket extends below the head of the piston when in its lowest position. Cylinder bores are bored, reamed and honed.

The crankcase is reinforced by radial ribs to each main bearing and by two horizontal ribs extending the full length on the outside of the case.

The bottom face of the case is 2½" below the center line of the crankshaft. This construction provides an exceptionally rigid foundation for the engine.

Cylinder Head

The cylinder head is a single casting of alloy iron attached to the block by twenty-four 7/16" cap bolts. The combustion chamber which is recessed in the head, has been so shaped and the spark plug so located as to produce maximum power, with minimum detonation.

Cylinder Head Replacement

When replacing cylinder head, always use a new gasket coated on both sides with light cup grease or cylinder oil. Tighten the cylinder head bolts in the order as shown in Fig. 10, drawing all bolts down and then repeating the operation in the same order until all are normally tight. After engine has been run sufficiently long to bring to normal operating temperature, bolts should be given a final tightening.

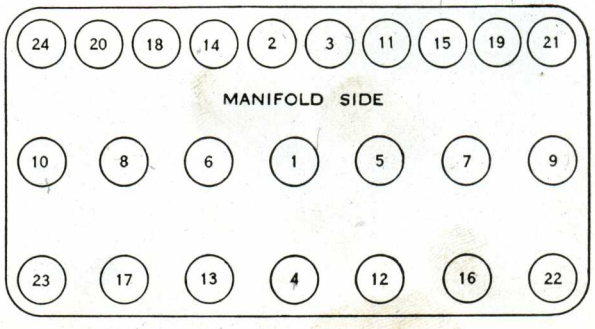

Fig. 10. Tighten Bolts in Order Shown.

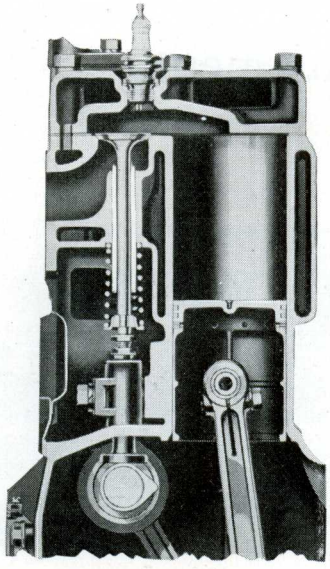

Fig. 11. Cross Section Combustion Chamber.

Lower Crankcase

Lower crankcase is made of pressed steel with transverse baffles, one ahead and one behind the oil pump to prevent surging of oil. Oil drain plug is located at the lowest point on the bottom.

Crankshaft

The crankshaft is a four bearing, four counterweight type, made of drop forged, heat treated carbon steel. The bearing journals and throws are exceptionally heavy. Main bearing journals are "step" type, the rear journal being the largest in diameter. The four counterweights are each attached to the shaft by two studs, the nuts of which are spot welded. Because of the short length of this shaft and the "stepped" main bearings a torsion balancer is not used. The assembly of shaft and counterweights is balanced both statically and dynamically within $\frac{7}{8}$ ounce inch.

Weight—Shaft with counterweights, 75 lbs.

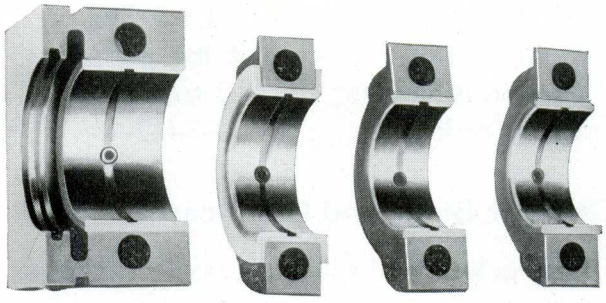

Fig. 13. Main Bearing Caps.

Main Bearings

Main bearings are steel backed babbitt lined dowelled in crankcase and bearing caps. Caps are inset in crankcase ensuring maintenance of alignment. Each cap is held by two studs $\frac{9}{16}$" diameter.

BEARINGS	DIAM.	LENGTH
Front	$2\frac{5}{16}$"	$1\frac{15}{32}$"
Front center	$2\frac{3}{8}$"	$1\frac{1}{2}$"
Rear center	$2\frac{1}{2}$"	$1\frac{1}{2}$"
Rear	$2\frac{9}{16}$"	$1\frac{29}{32}$"

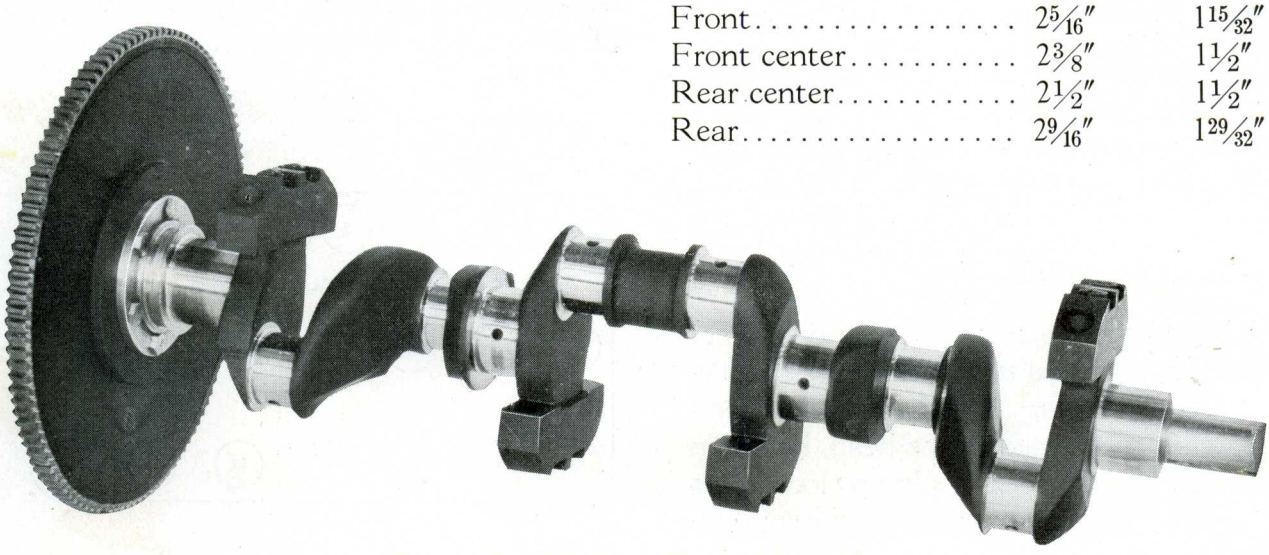

Fig. 12. Crankshaft and Flywheel Assembly.

Main Bearing Clearance

Shims are provided to allow adjustment for wear without necessity of filing the caps.

Radial clearance.....0015" to .0025"
End clearance.....
Rear center..... .004" to .007"
Other three.....1/32" at each end

Flywheel

The flywheel is of proper weight to ensure good low speed idling and is balanced statically within 3/4 ounce inch and dynamically within 1/2 ounce inch. The starter ring gear is shrunk on the flywheel and spot welded to it.

Diameter.....14 7/16"
Weight with ring gear.....31 lbs.
Teeth in ring gear.....114
Teeth in pinion.....9
Pitch.....8-10
Reduction.....12.66 to 1

Flywheel and Clutch Housing

The upper section of the housing is made of cast iron with integral engine arms and the lower pan of pressed steel. The upper section is bolted to the rear of the crankcase and two 1/2" dowels maintain alignment. The rear face is counterbored to receive the transmission front bearing and maintain alignment of transmission main shaft and crankshaft.

Pistons

Pistons are exceptionally light and made of cast iron. They are relieved at pin bosses and the bosses are bronze bushed to receive piston pin. Three ring grooves are provided, all above the piston pin. The lower groove is drilled with ten 5/32" oil return holes.

Each piston is selected for its respective bore to pass of its own weight on a feeler of a thickness to correspond with the minimum clearance and hold its own weight on one corresponding to the maximum clearance. Feelers used are 1/2" wide.

Height—overall.....3 13/16"
Height—pin from bottom..1 9/16"
Offset of pin toward camshaft.....3/32"
Piston clearance..... .0015" to .0025"

Piston Rings

Three diagonally split rings, all above the pin, are used on each piston. The upper two are plain compression rings 1/8" wide and the lower is a double slotted oil control type 3/16" wide.

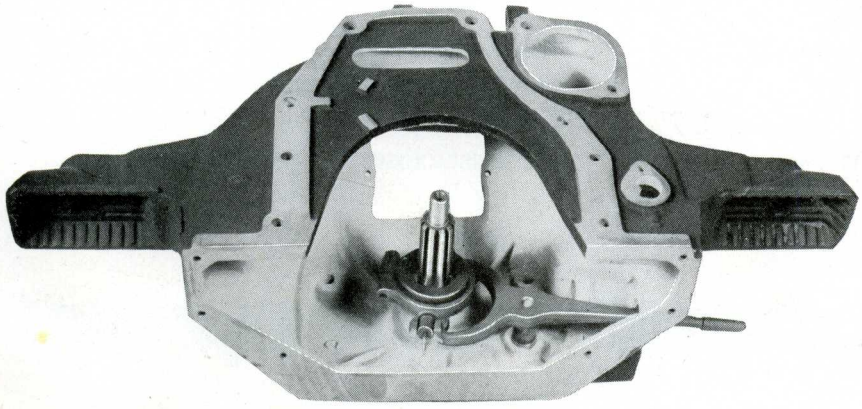

Fig. 14. Flywheel Housing.

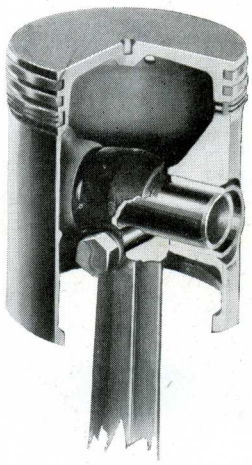

Fig. 15. Piston Cut-a-Way.

Piston Pins

Piston pins are hardened and ground and hollow to reduce weight. The hole is tapered from either end with greatest wall thickness at center for maximum strength where clamped in the connecting rod. Pin oscillates in bronze bushings in the piston. Pins are offset in piston 3/32" toward camshaft side.

Diameter of pin..... 13/16"

Fig. 16. Connecting Rod.

Connecting Rods

Connecting rods are heat treated drop forged steel with I-beam section. The lower end bearing is babbitt lined bonded directly to the steel of rod and cap. Shims are provided to allow adjustment without filing.

Length—center to center..9 3/4"
Lower Bearing
Diameter..... 2 1/8"
Width..... 1 3/8"
Bearing bolts..... Two—7/16"
Bearing clearance
Radial..... .0015" to .0025"
Side—total..... .005" to .009"

Camshaft

The camshaft is made of heat treated drop forged steel and is supported in the upper crankcase in four bronze bushings. Cam and bearing surfaces are case hardened and ground. The oil pump and distributor shaft drive gear is integral with the camshaft. Camshaft is driven from the crankshaft by a silent type chain.

BEARING SIZES	DIAM.	LENGTH
Front	2 1/16"	1 3/16"
Front center	2 1/32"	1 3/16"
Rear center	2"	1 3/16"
Rear	1 25/32"	1 1/16"

Valves

Valves are one-piece construction. Inlet valves are made of chrome nickel steel and exhaust valves of Silchrome No. 1 steel.

Valve stems are guided in the cylinder casting in removable cast iron guides.

Valve Sizes

Clear—dia....	Inlet 1 1/2"	Exhaust 1 3/8"
Stem—dia....	Inlet 3/8"	Exhaust 3/8"
Lift.....	.324"	
Lash—hot..	.006" Cold..	.007"

Timing

Inlet opens.....	5° Before U.D.C.
Inlet Closes.....	45° After L.D.C.
Exhaust opens.....	45° Before L.D.C.
Exhaust closes.....	18° After U.D.C.

Fig. 17. Camshaft.

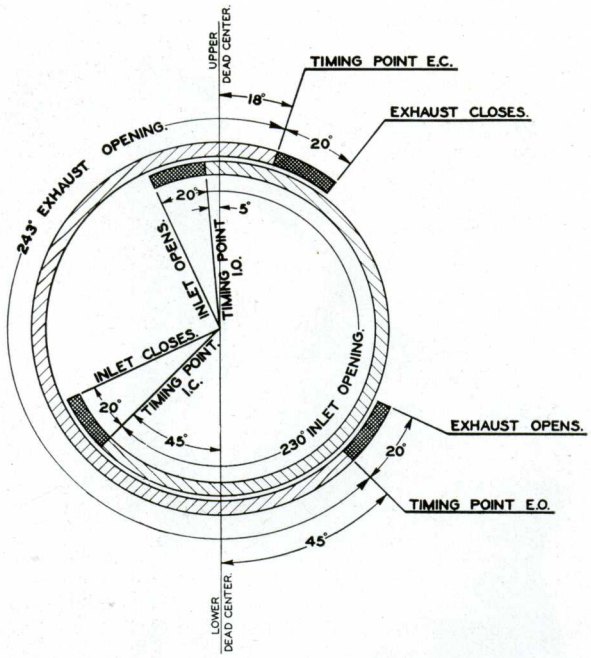

Fig. 18. Valve Timing Chart.

Valve Lifters

Valve lifters are mushroom type of two-piece construction. The body is tubular to reduce weight and is pressed onto a boss on the solid head. Both the body and head are hardened and ground.

Lifters are carried in three removable cast iron guides in compartments at the side of the cylinder block. These compartments are open to the crankcase to provide lubrication for the lifters, guides and valve stems.

Lifters are offset from the center of the cams to cause rotation and prevent wear of the heads and to provide uniform side pressure in the guide.

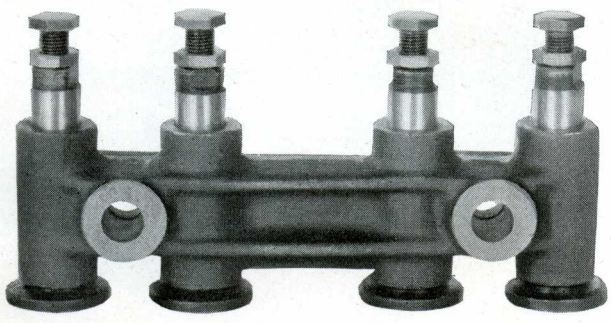

Fig. 19. Valve Lifter Assembly.

Lifter Sizes

Body diameter.....5/8"
Head diameter.....1 5/16"
Length—total.....2 15/16"

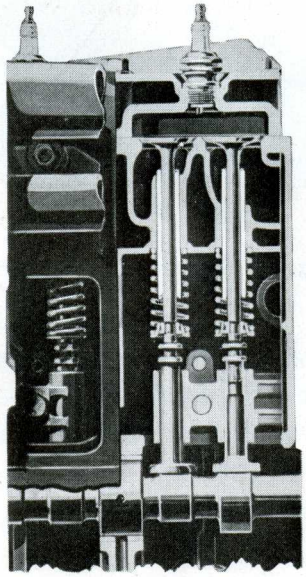

Fig. 20. Cross Section Through Valves.

Valve Springs

Springs are made of Manganese steel, tapered from 1" diameter at the top to 1 1/8" at the bottom.

Free length.....2 7/8"
Valve closed—Length.....2 1/4"
Pressure.....40 to 46 lbs.
Valve open—Length.....1 15/16"
Pressure.....65 to 71 lbs.

Lifter Compartment Covers

Lifter compartments are provided with pressed steel covers and sealing gaskets. Each cover is held by two studs and wing nuts.

Timing Chain and Sprockets

Camshaft is driven by silent chain. No adjustment of chain is provided. Width of chain, 1¼".

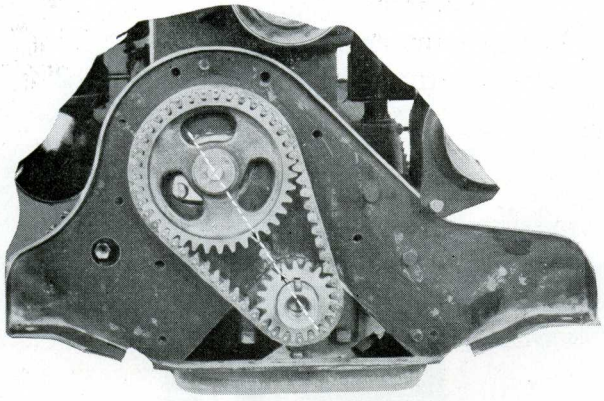

Fig. 21. Sprocket Timing Marks.

The camshaft is correctly timed when the arrows on the camshaft and crankshaft sprockets are in the line of centers of the two shafts as shown in Fig. 21.

The crankshaft sprocket is a push fit, the camshaft sprocket is a press fit.

To remove the chain, the camshaft and its sprocket must be pulled forward as a unit at the same time that the crankshaft sprocket is slipped from the crankshaft.

To replace the chain, reverse the operation.

Cooling System

Capacity of system.....3 gal.

Radiator

Radiator core is a Harrison vertical flow, ¼" Hex cellular type. Water passages and cooling fins are all copper. A pressed steel shell encloses the core and supports it on the frame cross member to which it is attached by two bolts.

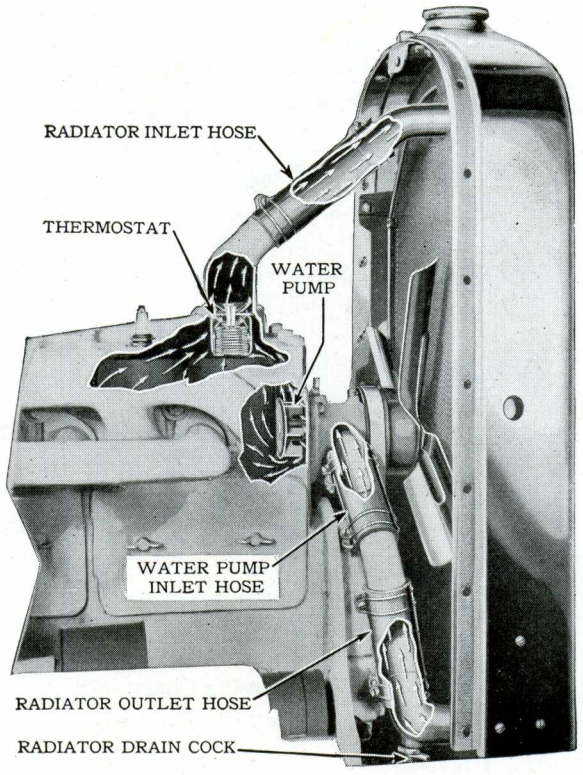

Fig. 22. Cooling System Cut-a-Way.

Core

Frontal area.....430 sq. in.
Thickness.....2¼"

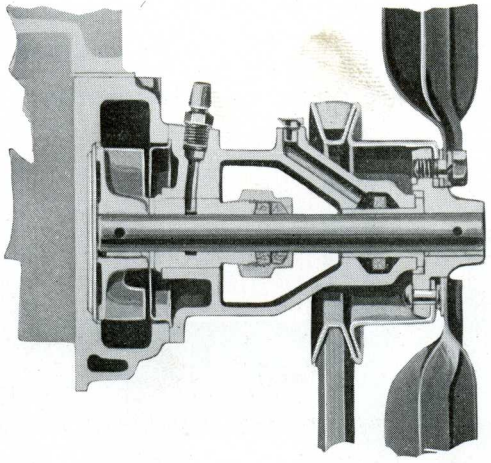

Fig. 23. Cut-a-Way Pump and Fan.

Fan

A four blade fan is mounted on the water pump shaft which is driven at 1 1/16 times engine speed by a "V" type belt from a pulley on the crankshaft. Belt tension may be regulated by moving the generator which is held in position by a slotted strap and bolt.

Fan blade diameter, 16 7/8".

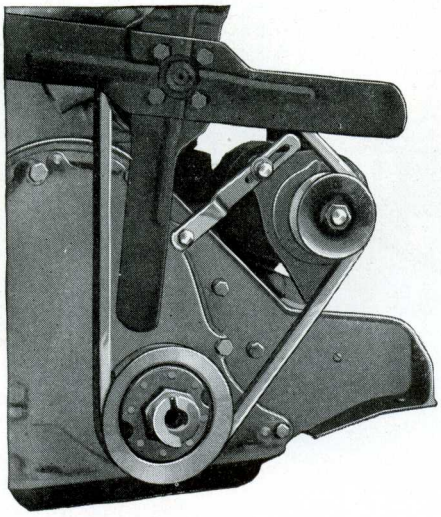

Fig. 24. Fan Belt Adjustment.

Water Pump

A centrifugal type water pump is mounted in the front end of cylinder block and driven by a "V" type belt from a pulley on the crankshaft. The hardened and ground pump shaft is supported by a bronze bushing in the pump body and by an outboard bearing directly in line with the fan belt track. The bronze bearing in the pump body should be lubricated with transmission lubricant No. A-150, through a Zerk connection provided.

The outboard bearing, made of porous bronze, is provided with an oil reservoir and a circular wick which surrounds the bearing and keeps it saturated with oil. The reservoir should be filled with engine oil.

Impellor diameter . . . . . 2 7/8"
Impellor width . . . . . 13/16"
Shaft diameter . . . . . 39/64"

Thermostatic Water Control

Circulation of water is controlled by a thermostat placed in the cylinder head outlet to the radiator. This unit consists of a metallic bellows directly connected to a poppet valve. The valve remains in a closed position and prevents circulation when water temperature is below 130°. When the temperature reaches 130° the bellows expands opening the valve and permitting water circulation through the cooling system.

This control ensures quick warm up of the engine after starting, maintains a temperature above 130° while engine is operating and prevents thermosyphon circulation after engine has been stopped.

The thermostat requires no adjustment and may be easily removed for inspection.

Water Temperature Gauge

A water temperature gauge is mounted on the instrument panel. The element is attached to the cylinder head.

Lubrication System

Engine lubricating system is a force feed type. Oil is supplied under pressure to the main, connecting rod and camshaft bearings, and to the timing chain and sprockets.

The gear type pump, driven by a vertical shaft through helical gears from the camshaft, is located at the lowest part of the lower crankcase. The pump delivers oil

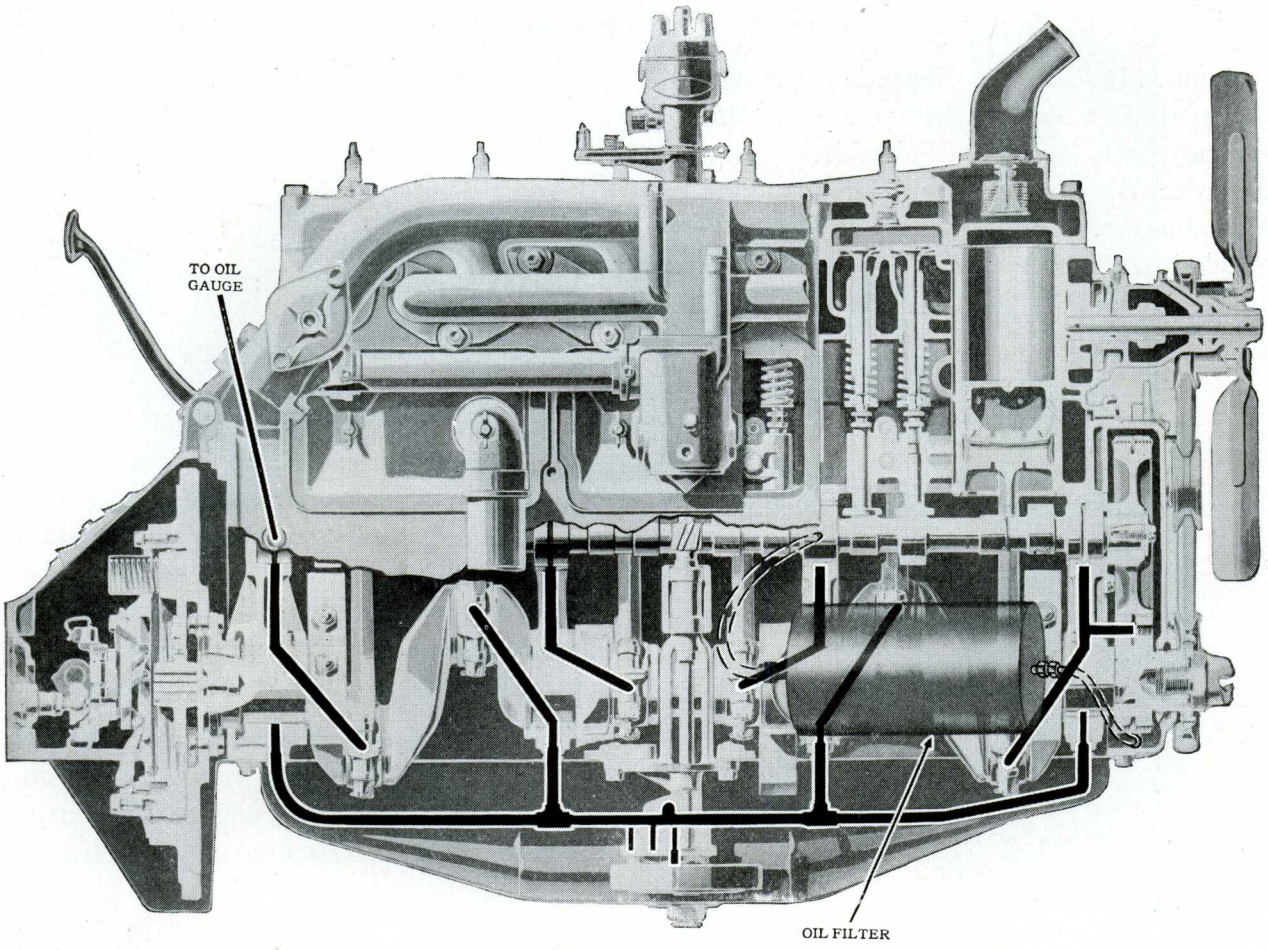

Fig. 25. Engine Lubrication System.

under pressure, through a header pipe, to the four main bearings. When the pressure becomes sufficient, in the header pipe, a ball check valve, located within the pump body, opens against spring pressure allowing part of the oil to discharge directly into the intake side of the pump.

Each main bearing has a ring groove cut around its center. Communicating with each groove is a hole drilled through each web of the crankcase forming a passage for oil to each of the four camshaft bearings.

The crankshaft is drilled from the main journals to the crank pin journals as follows:

Main Bearing		Crank Pins
No. 1	feeds	No. 1
No. 2	feeds	Nos. 2 and 3
No. 3	feeds	Nos. 4 and 5
No. 4	feeds	No. 6

A pipe connection to the oil passage bebetween the front main and front camshaft bearings sprays two streams of oil on the timing chain and sprockets. Surplus oil from the timing chain case flows back to the lower crankcase.

Two holes are drilled through No. 2 camshaft journal, 90° apart, forming a cross. Two holes are also drilled through the camshaft bearing 90° apart. One of these is the

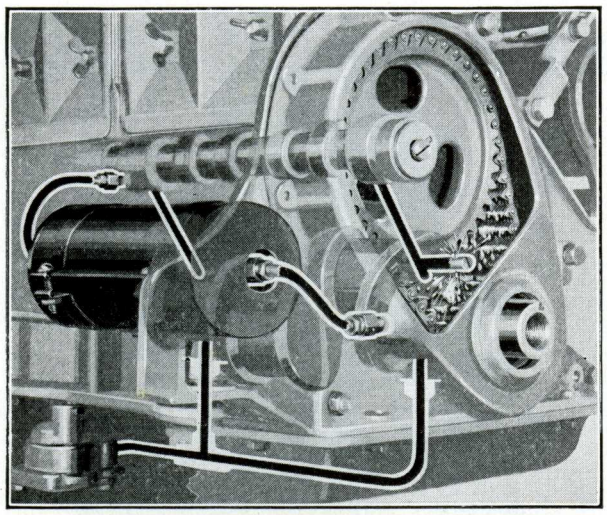

Fig. 26. Chain and Sprocket Lubrication.

lead from the main bearing and the other, through the crankcase wall, is connected to the inlet side of the oil filter.

As the camshaft rotates, first one and then the other pair of holes through camshaft journal, register with the holes in the bearing, forming momentarily a passage through which oil is forced from the main bearing to the oil filter.

The filter is protected from excessive pressure due to the fact that the rate of rotation of the camshaft definitely limits the volume of oil delivered to the filter. After passing through the filter the oil is delivered through a pipe to the timing chain case.

A line from No. 4 camshaft bearing leads to the oil pressure gauge on the instrument panel.

Cylinder walls, pistons, piston pins and bearings are lubricated by oil sprayed through a small hole drilled, 40° from the center line of rod, on the upper side of each connecting rod bearing. Oil is sprayed through this hole once each revolution of the crankshaft.

The combination oil filler and crankcase breather is located on the left side of the crankcase. An oil measuring stick is also provided.

Oil Capacity
Dry engine.....7 qts.
Refill.....6 qts.

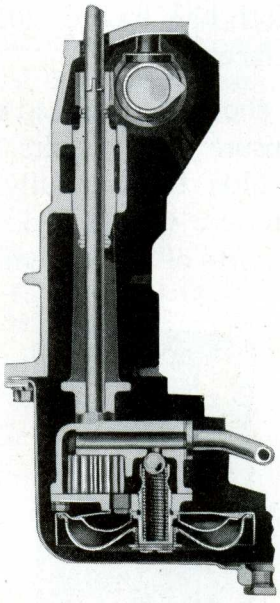

Fig. 27. Cut-a-Way Oil Pump.

Oil Pump

The oil pump is located at the lowest part of the lower crankcase between two transverse baffles which prevent surging of the oil. Pump consists of two steel gears 1" wide enclosed in a cast iron housing. Oil is drawn to the pump through a fine mesh screen at the bottom. The pump is driven from the camshaft through helical gears and the driving gear of the pump is attached to the shaft by a Woodruff key. The by-pass valve is a ball and spring type set for 40 lbs. maximum pressure at the gauge.

Oil Filter

A sealed container type oil filter is connected in the pressure oiling system on the "by-pass" plan. By this method a portion of the oil from the pump flows through the filter continuously. A pipe from No. 2 camshaft bearing delivers oil under pressure

to one end of the filter. After it has passed through the filtering element it is discharged through a second pipe to the timing chain case. The filtering element is a rolled up cloth bag having 400 sq. in. of filtering surface.

The filter should be replaced every 10,000 miles to ensure best results. However, should the filter become fully clogged, it will not interfere with the distribution of oil to other parts of the system.

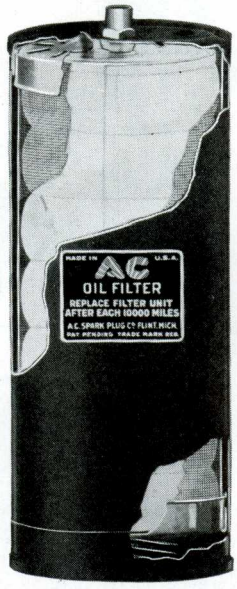

Fig. 28. Cut-a-Way Oil Filter.

Crankcase Ventilator

The combination oil filler and crankcase breather has an opening toward the front through which air is blown into the crankcase by the fan. A filtering pad is provided in this breather to clean the ingoing air. An outlet tube is fitted to the rear valve lifter compartment cover and extended below the side pan. The air stream passing through the crankcase carries off vapors of both fuel and water, thereby keeping dilution of engine oil to a minimum. This type of ventilator has no moving parts and requires no attention.

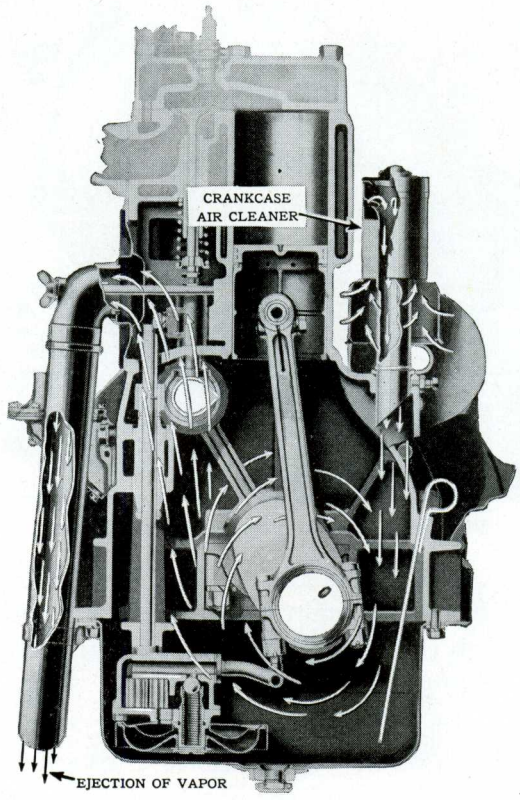

Fig. 29. Crankcase Ventilator.

Inlet Manifold

The inlet manifold is a four port type with main runner and leads of circular section. A hot spot is provided at the central portion as an aid to complete vaporization in addition to the heat riser between manifold and carburetor. Steel ferrules are provided at two ports and the manifold is clamped to the cylinder block by studs and nuts, two to each port.

Inside diameter . . . . . $1\frac{3}{16}$"

Carburetor

The carburetor is a Marvel, model VM, automatic air valve, multiple nozzle type.

This instrument consists of a main body or mixing chamber to which is attached a

float chamber bowl, a double walled heat riser, in which the throttle is carried, heated by gases from the exhaust manifold under automatic control of a damper valve therein, and an exhaust outlet pipe.

Within the mixing chamber are three non-adjustable nozzles which proportion the gasoline for a proper mixture. One of the nozzles called the "low speed," is located in the center of the venturi which is a fixed air opening. The other two nozzles called "high speed" and "intermediate high speed" are located just under the air valve and controlled by it. An air adjustment screw is provided for regulating the pressure of the air valve spring enclosed therein and is the only mixture adjustment required. Within this screw is also enclosed a plunger connected by a link to the air valve. The function of this plunger is to provide a resistance in addition to that of air valve spring to richen the mixture for acceleration. This arrangement of plunger, spring and hollow screw is termed the dash pot.

A further control of the "high speed" and "intermediate high speed" jets is provided by the "economizer" which is a fuel metering valve operated by the carburetor throttle. This valve provides the maximum fuel feed to these nozzles when the throttle is fully opened for high speeds, hard pulling, and for quick "pick-up." During the part throttle driving range this valve controls the amount of fuel being used, thus providing all the economy possible. This valve is entirely automatic and requires no adjustment.

Choker and By-Pass

A choke button is provided on the instrument board to assist in starting. Pulling out this button performs two operations in the carburetor. First, it closes a butterfly choker valve in the air inlet of carburetor, which restricts the air opening and consequently produces a very rich mixture in mixing chamber. Second, it opens a by-pass valve in a passage from the mixing chamber to the riser passage above the throttle. Due to the high suction existing above the throttle, the over-rich mixture in mixing chamber is immediately drawn through the fixed opening in by-pass valve, up past the throttle and on into the engine. Partial release of choker button on instrument board after starting, releases choker valve so that it positions itself to the needs of the engine, due to the action of a compensating spring attached to the choker valve shaft. Choker now becomes automatic in its action, the spring allowing the valve to open or close in proportion to the engine speed and volume of air passing through carburetor. This partial release of choker button does not, however, change position of by-pass valve, which remains open, and engine therefore runs at an increased idling speed during this period, same as would be obtained if the throttle were manually opened slightly and there was no by-pass valve. This gives the car a speed of approximately 14 to 15 miles per hour on the road automatically, without the necessity of opening the throttle, and is of great assistance in getting under way after starting a cold engine.

As soon as engine is sufficiently warmed choker button should be completely released, which returns by-pass valve to closed position and choker valve automatically locks in wide open position.

Heat Control

The carburetor and manifolds have been

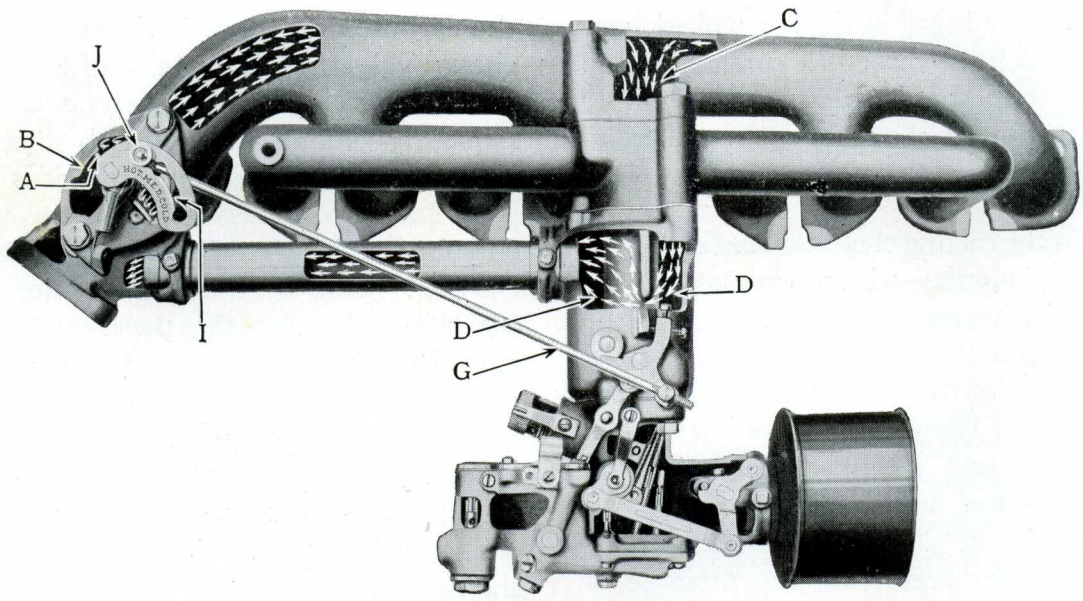

Fig. 30. Heat Control—"Hot" Setting.

designed to utilize the exhaust gases of the engine to insure complete vaporization and a consequent minimum consumption of fuel. This is accomplished by a double walled riser placed between the carburetor and intake manifold. This riser is connected with the exhaust manifold in such a manner that the exhaust gases pass through a hot spot section of the intake manifold, enter an opening at the top and back of riser, pass through riser jacket, and return through a tube to exhaust pipe. The amount of heat thus furnished is controlled by the damper valve "A" in the exhaust manifold just above the outlet tube from the riser. See Fig. 30.

This damper valve is connected to the throttle stop lever of carburetor by a connecting rod in such a manner that the greatest amount of heat is had in jacket of riser when the throttle is only partly opened, as in idling and at low speeds, and a decreasing amount as the throttle is opened further for higher speeds. By means of a season adjusting stud on the heat control lever on damper valve shaft, this automatic action of the heat valve may be varied to suit weather and driving conditions.

The damper valve described above is assembled in the exhaust manifold casting. On the inside of this damper valve cover is a boss acting as a locating stop for the damper valve. This stop determines the closed position of the damper valve and is to be used in assembling connecting rod to throttle stop lever. The normal position of damper valve is slightly clear of this boss when the season adjusting stud on heat control lever is set at "hot" position with throttle closed.

An adjustment for seasonal control of heat is provided on the damper valve lever whereby the amount of exhaust heat deflected to the riser jacket may be decreased by setting damper adjusting stud "J" in either hook-up hole marked "medium" or "cold" thus initially opening damper valve at closed throttle position

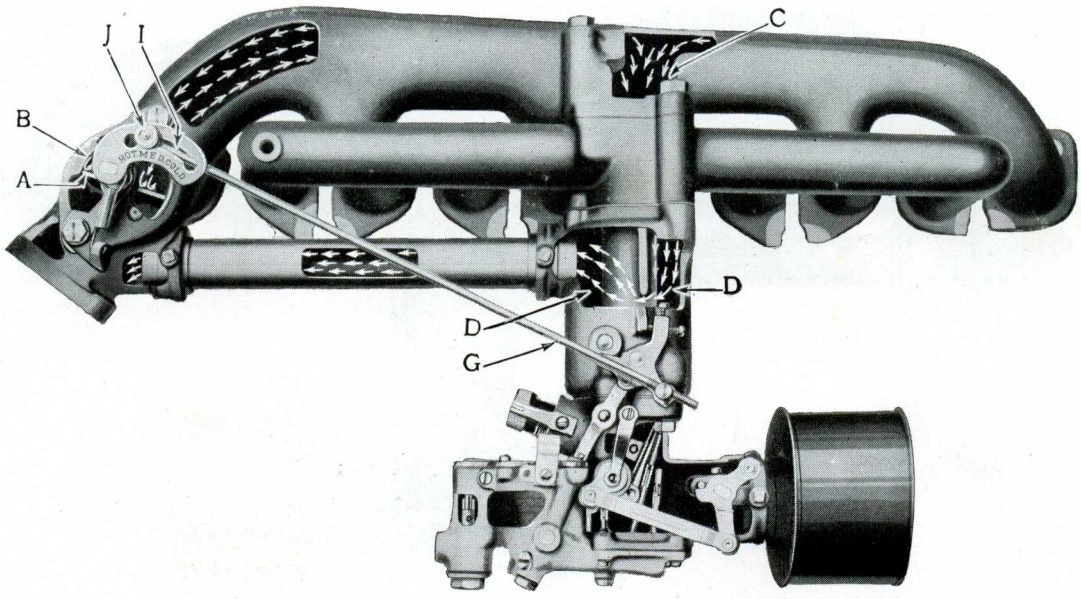

Fig. 31. Heat Control—"Medium" Setting.

and greatly reducing the heat application.

Valve "A," see Fig. 30, is connected by rod "G" to throttle stop lever. As throttle is opened, valve "A" is also opened and the volume of exhaust gas through heat jacket of riser will be lessened as the engine speed increases.

Fig. 30 shows heat control in "hot" setting. At closed throttle valve "A" is at extreme right edge of the land "B" in exhaust manifold. As throttle is opened, the valve "A" rotates counter clock-wise and its edge passes across land "B." The valve, however, does not open until it clears the land "B," ensuring maximum heat in riser jacket up to the amount of throttle opening which will provide a speed of approximately 35 to 40 miles per hour. At higher speeds, further opening of the throttle automatically moves valve "A" rapidly away from land "B" which allows freer flow of exhaust gas and consequently reduces heat to riser. This "hot" setting of the heat control should be used throughout the cold season.

Fig. 31 shows heat control in "medium" setting. At closed throttle, valve "A" is near the extreme left edge of land "B" in exhaust manifold and ready to open with very little throttle opening. This setting, therefore, ensures less deflection of exhaust heat to riser jacket than in the "hot" position, and valve "A" as before moves rapidly to its open position as throttle is fully opened.

This "medium" setting of heat control should be used throughout the normal seasons, when the weather is neither the extreme of hot nor cold.

Fig. 32 shows heat control in "cold" setting. At closed throttle, valve "A" is beyond the edge of land "B" in exhaust manifold. As throttle is opened, valve "A" rapidly moves to full open position, to give the least deflection of heat through riser jacket.

This "cold" position should be used in climates where extreme hot weather is experienced, or where very high test or light fuels are used.

The adjustment of heat control is purely seasonal and largely controls the car per-

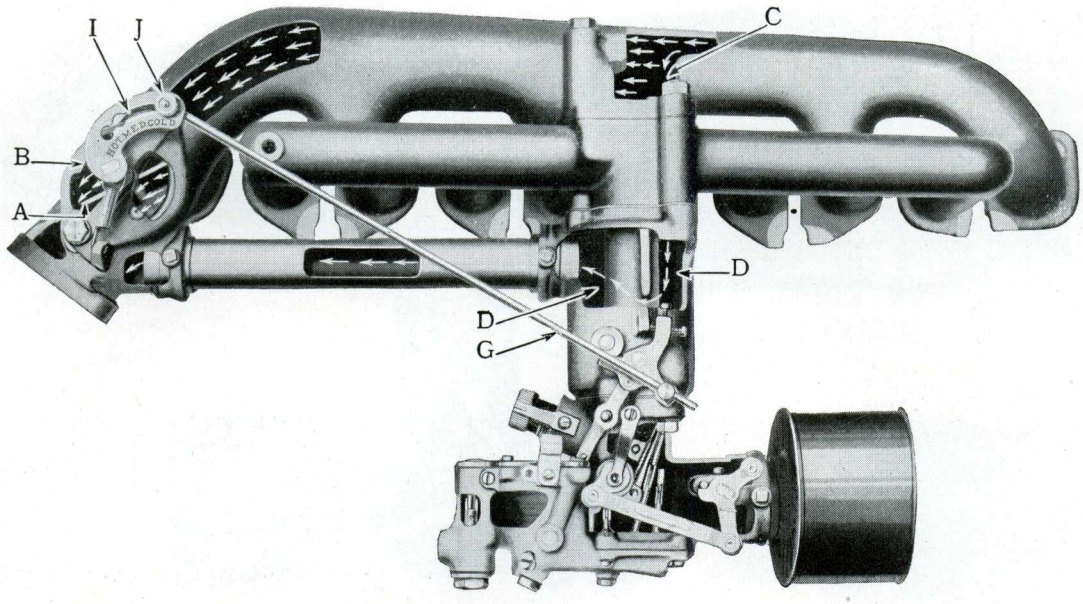

Fig. 32. Heat Control—"Cold" Setting.

formance, or the effect of the "rich" or "lean" action in the carburetor. Therefore, in cold weather, adjustment should be set at "hot" to provide quick warm-up after starting, and sufficient heat for good performance. In extremely warm weather, setting should be at "cold," and for all intermediate seasons, at "medium" for most average driving.

Starting

To start engine, pull out choke button all the way. Advance spark by pushing spark button all the way in and depress starter pedal.

The moment the engine fires the choke button should be pushed in very slightly and engine allowed to run at normal speed for a few minutes. If engine hesitates, pull out choke button slightly and push back in to a point where engine runs smoothly during this short period, the object being to secure momentarily a richer mixture to assist engine in warming up. The automatic heat control of the carburetor makes it entirely unnecessry to use an excessive amount of fuel by overchoking while engine is warming up, and thereby prevents dilution of engine oil.

Adjustment

No changes should be made in the carburetor adjustment until after an inspection has been made to determine if the trouble is in some other unit. It should be noted that the gasoline lines and strainer are clear; that the fuel pump is properly supplying fuel; that there are no leaks at connections between carburetor and engine; that the ignition system is in proper condition; and, that there is even compression in all cylinders.

If it is necessary to test adjustments or to make a readjustment, proceed as follows:

Set air screw so that end is flush with the end of ratchet spring bearing against it.

Set heat control in "hot" setting and leave in this setting while making adjustment. Pull out choker to closed position and start engine in usual manner. As soon as engine has fired, release choker very slightly.

Run engine for a few moments until warmed up, remembering never to use choker more than necessary, as when not needed it has a tendency to foul up engine and dilute the lubricating oil in the crankcase.

Next, set air screw for good idle by either turning it to the right a little or backing out to the left as the needs of the engine require. With the engine warmed up, the adjustment of the air screw for proper idling is easily accomplished. If the air screw is turned in too tight, the motor will roll or appear sluggish. If the air screw is not tight enough, the motor will hesitate and stumble, and perhaps stop entirely. To adjust for best idling, turn air screw back to the left until engine hesitates, which indicates that mixture has too much air and is too lean; next, turn air screw in to the right three or four notches at a time until engine runs smoothly. This idle setting accomplished, the proper adjustment for the entire range of the engine will have been attained.

If the engine idles too fast with throttle closed, the latter may be adjusted by means of throttle lever adjusting screw.

Specifications

Air intake diam.	1¾″
Air valve diam.	1¾″
Throttle diam.	1 7/16″
Air valve spring	No. 24-315
High speed jet	No. 49-95-C-32
Intermediate high speed jet	No. 49-100-E-24
Low speed nozzle	No. 49-130-A-10
Meter pin jet	No. 84-086
Meter pin	No. 173-528
Venturi diam.	⅜″

Air Cleaner

The air cleaner prevents dust particles from entering the combustion chambers through the air intake of the carburetor. The suction created in the intake manifold by the pistons draws air through the cleaner. At the inlet to the cleaner are directing vanes which give the air stream a spiral rotation. Centrifugal force throws the dust particles against the outside wall of the cleaner from which they are swept through an opening at the bottom. The clean air stream reverses its direction and passes through the center of the cleaner to the carburetor.

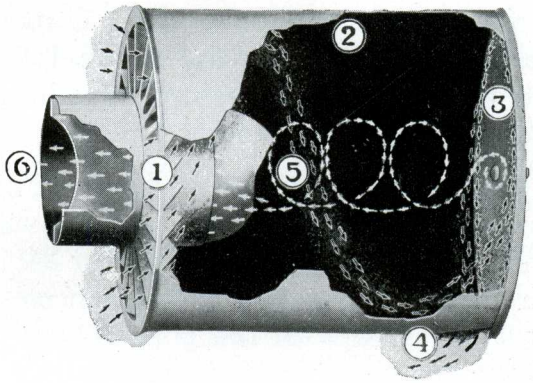

Fig. 33. Cut-a-Way Air Cleaner.

Fuel Pump

The AC Type B variable stroke diaphragm fuel pump is attached to the right rear side of the crankcase and driven by an eccentric on the camshaft. The fuel filter is an integral part of the pump.

Operation of Pump

See Fig. 34.

The rotation of eccentric H on camshaft actuates rocker arm D, pivoted at E, which pulls linkage F, and in turn diaphragm A, downward. The downward movement of the diaphragm creates a vacuum in chamber M which draws fuel through suction valve L in the outlet of fuel filter. On the return

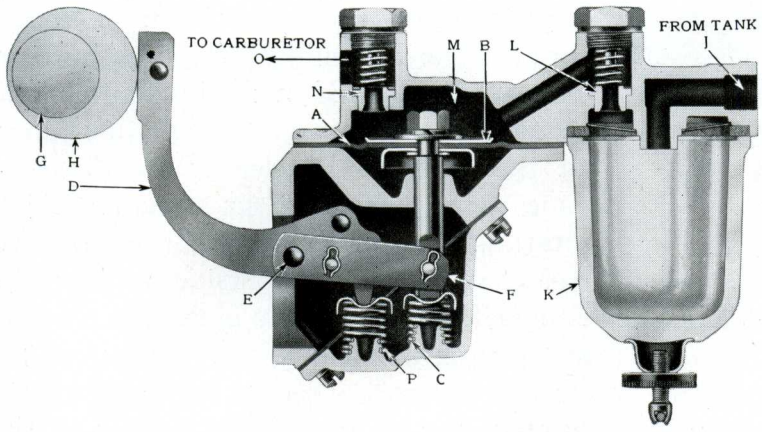

Fig. 34. Cut-a-Way Fuel Pump.

stroke of the rocker arm, spring C moves diaphragm upward forcing the fuel from chamber M through pressure valve N and opening O to the carburetor.

When carburetor bowl is filled the carburetor float closes the inlet needle valve which creates a pressure in chamber M. As the pressure above the diaphragm increases, its stroke lessens to the point where the pressure in chamber M overcomes that of spring C and the movement of the diaphragm ceases until the lowering of the fuel in the carburetor opens the inlet valve needle.

Spring P, is not a part of the operating mechanism but is merely for the purpose of keeping rocker arm D in contact with eccentric H to eliminate noise.

Inspection and Corrections

Service on the AC fuel pump is available through United Motors Service Branches and Authorized AC Service Stations, who are prepared with parts and fixtures for repairing all types of pumps. There are some service operations on this fuel pump that can, if necessary, be done without referring to the service station and these are tabulated in the following paragraphs.

In some instances trouble is attributed to the fuel pump which in reality is caused by some other condition. These should be carefully checked to avoid the needless replacement of fuel pumps.

Lack of Fuel at the Carburetor

Gasoline tank empty—Refill.

Leaky tubing or connections—Replace tubing and tighten all pipe connections at the fuel pump and gasoline tank.

Bent or kinked tubing—Replace tubing.

Glass bowl loose—Tighten thumb nut, making certain that cork gasket lies flat in its seat and is not broken.

Dirty screen—Remove glass bowl and clean the screen. Make certain that cork gasket is properly seated when reassembling.

Loose valve plug—Tighten valve plug securely, replacing valve plug gasket if necessary.

Dirty or warped valves—Remove valve plugs and valves. Wash valves in gasoline. If damaged or warped, replace them. Ex-

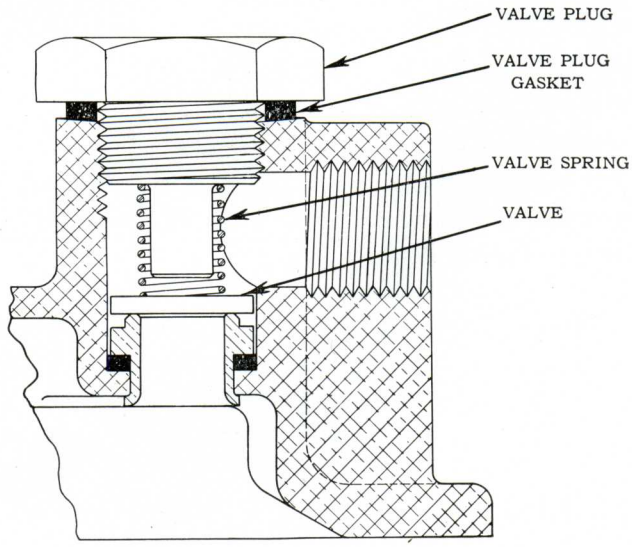

Fig. 35. Cut-a-Way Fuel Valve.

amine valve seat to make certain there are no irregularities which prevent proper seating of valves. Place valve in valve chamber with the polished side downward. Make certain that valve lies flat on its seat and is not left standing on edge. Reassemble valve plug and spring, making certain that spring is around the lower stem of the valve plug properly. Use new gasket under valve plug if necessary.

Leakage of Fuel at the Diaphragm

Loose cover screws—Tighten cover screws alternately and securely.

CAUTION: Do not disassemble the pump body.

NOTE: Sometimes there appears to be a leak at the diaphragm, whereas the leak actually exists at one of the pipe fittings and the fuel has run down the pump to the diaphragm flange, appearing to originate there.

Flooding of Carburetor

Carburetor needle valve not seating—Check carburetor for proper adjustment.

IMPORTANT: Do not attempt to disassemble the fuel pump further than described above, because it is absolutely necessary to use a special fixture in reassembling the pump when once taken apart. When the above remedies do not correct the condition, replace with a new fuel pump sending the old fuel pump to your nearest AC service station.

Fuel Filter

The fuel filter is an integral part of the fuel pump. It comprises a glass bowl with a double screen of fine mesh, through which the fuel must pass upward. Dirt and water settle in the bowl which may be easily removed for cleaning.

Fuel Tank

The gasoline tank located at the rear of frame is neatly covered by sheet metal. Filler tube located at the right end of the tank is fitted with a bayonet type cover.

Tank capacity.....16 gallons

K-S Telegage

The K-S telegage consists of three units—tank unit, head and air line. In operating condition the air tube and air chamber of the tank unit and the air line connecting the tank unit to the head are filled with air. See Figs. 38 and 39. The fuel tends to rise to the same level in the tank unit as it is in the tank and thereby exerts a pressure on the air trapped between the bottom of the tank unit and the liquid in the head. This pressure is directly proportional to the amount of fuel in the tank, therefore the height of the red liquid in the "U" tube of the head indicates the depth of fuel in the tank. The scale is calibrated to give a reading in gallons.

The tank unit, Fig. 36 shows the air

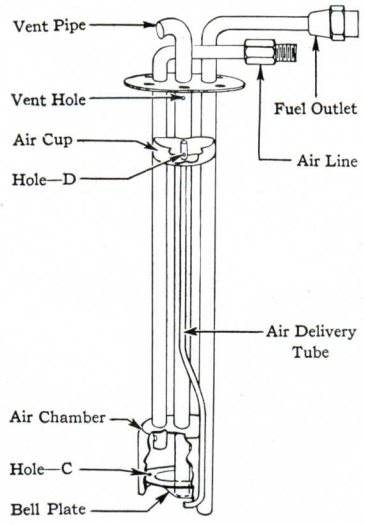

Fig. 36. Cut-a-Way Tank Unit.

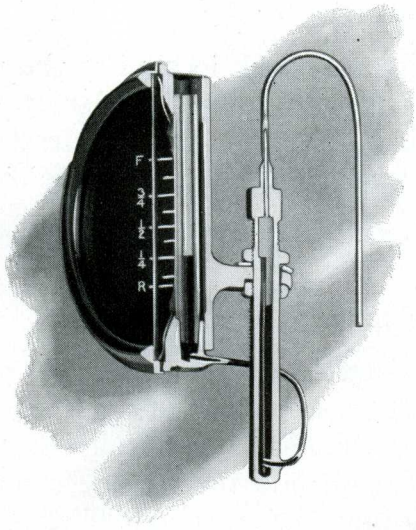

Fig. 37. Cut-a-Way Fuel Gauge.

chamber and air tube which must always be filled with air. The pressure of the fuel is communicated through the hole C. The vent tube which is open at the top is not an operating part of the unit but is provided as a safety device to protect the unit against high pressure.

An air cup and air delivery tube function to supply air to the air chamber to overcome the loss due to absorption by the fuel and contraction due to a lowering of the temperature. When the air cup is above the level of the fuel in the tank it is constantly filled by the surge and splash of the fuel when the car is in motion. This fuel runs through the drain hole D and through the air delivery tube drawing with it bubbles of air. These bubbles leave the bottom end of the air delivery tube under the air chamber and pass through hole C displacing any fuel that might be in the chamber. When the air chamber is filled with air the bubbles pass upward through the fuel in the tank and are not used.

The head, Fig. 37, mounted in the instrument panel is a U-tube containing a special heavy red liquid. The front leg of the U is a glass tube open at the top. The rear leg is a brass tube connected at the top to the air line and at the bottom to the lower end of the glass tube.

The air line, connects the air tube of the tank unit to the top of the vertical brass tube of the head. The pressure of the air in the air line forces the liquid downward in the brass tube and upward in the glass tube. The difference in level of the liquid in the two tubes is an exact measure of the pressure of the air in the air line. Since this pressure is directly proportional to the

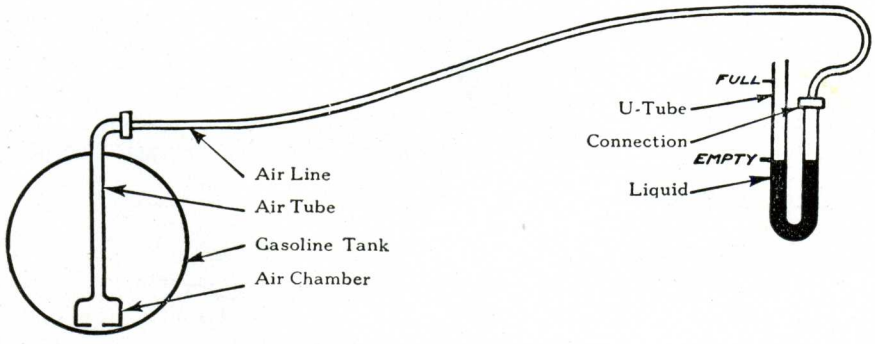

Fig. 38. Chart Showing Tank Empty.

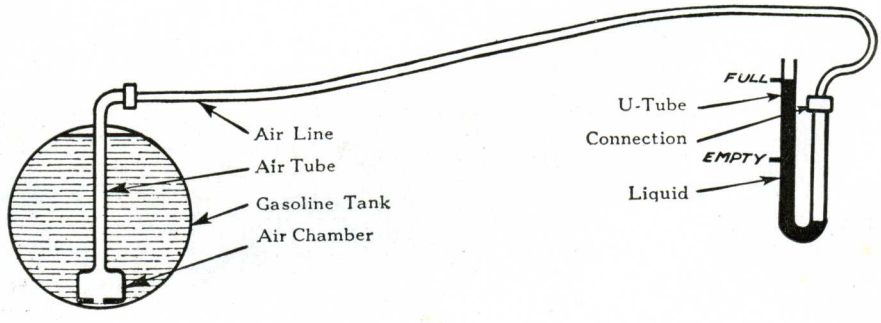

Fig. 39. Chart Showing Tank Filled.

depth of the fuel the height of the red liquid exactly records on the graduated scale the number of gallons of fuel in the tank.

To have the gauge read correctly three conditions must be maintained:

1. The red liquid in the head must be set at the bottom line on the scale when the air line is disconnected and this setting should be permanent. If the head will not hold this setting it should be returned to the King-Seeley Corporation or their service representatives for replacement.

2. The air system must be free from leaks or obstructions. The most common obstruction is fuel which can only be driven into the line when there is an air leak or the connections are not properly made. Fuel being a moving obstruction will cause an erratic reading of the gauge.

3. The tank unit must supply air by the surge and splash of the fuel as described above.

When these three conditions are correct and a quantity of fuel is placed in the tank the red liquid will rise in the glass tube when the car is driven until it records the true contents of the tank. Stopping, starting, and turning corners will hasten the rise of the red liquid. After the correct level has been obtained the reading will always be correct unless the air line leaks or is disconnected.

Reserve

The Telegage provides a reserve of approximately one gallon. The bottom gallon in the tank is not recorded on the scale as the hole C is above the gasoline suction pipe opening.

Above the mark R on the scale the gauge registers accurately gallon for gallon the amount of fuel placed in the tank.

Adjustments and Checks

Correction of a faulty Telegage is very simple if the following adjustments and checks are made exactly as outlined and in the proper order. Do not remove the head from the instrument board until the instructions have been followed:

Adjustments

1. Remove tank filler cap. Do not replace until adjustments have been completed.

2. Disconnect air line from the head and make the red liquid read even with the bottom line on the scale. If necessary liquid may be added or removed at the top of the brass tube at the connection for the air line. To fill use a medicine dropper. To remove liquid use a match or tooth pick to absorb some of the liquid.

Use only K-S Telegage liquid which has been selected because of its specific gravity and other characteristics. No other liquid will function properly. This liquid may be purchased from the manufacturer of the gauge.

3. Dry the air line.

Use a hand tire pump only. Never use air supplied by an air compressor. Remove the metal connection from the hose, push the end of hose over the instrument panel end of air line and give the pump at least 40 full strokes.

4. Verify that the gauge has held its reading. If the reading has dropped the head leaks and must be replaced. If reading has held to the line reconnect the air line to the head and check to see that the connection at the tank unit is tight. Replace the tank filler cap.

Check No. 1 should now be made to determine that the trouble has been corrected by the above adjustments.

Checks

1. Determine if the gauge can be brought to the proper reading by supplying air to the tank unit. The only method of supplying air is by driving the car. Stopping, starting and turning corners will bring the reading up quickly as the supply of air depends upon the surge of the fuel in the tank. If the reading will stay set with car standing the gauge is correct. If no reading can be secured by driving the car or if the reading does not hold when the car is standing locate the failure by Check No. 2.

2. Determine whether the failure is in the air line or the tank unit.

Disconnect the air line at both ends.

Inspect the connections for dirt or flaws.

Hold a finger over one end of the line and suck on the other. If the suction created will hold the tongue for one minute the air line is not at fault.

If the air line shows a leak it should be replaced.

If air line and connections are correct the defect is in the tank unit which should be replaced.

CAUTION: Whenever repairs are made on a Telegage the air line should be blown out to clear it of any fuel which may have been driven into the line when it was disconnected from the head.

Liquid

K-S Telegage liquid may be secured from the King-Seeley Corporation in the following quantities:

1/8 oz. sufficient for filling 3 gauges,
1 oz. sufficient for filling 20 gauges,
2 oz. sufficient for filling 40 gauges,
6 oz. sufficient for filling 125 gauges.

Exhaust Manifold

The exhaust manifold is a six port type attached to the cylinder block by twelve studs and nuts, two to each port. It is flanged to the hot spot of the intake manifold and carries the carburetor heat control valve just above the flange connection for the exhaust pipe.

Inside diameter body.....1⅜" to 2"
Inside diameter ports.....1⅜"

Exhaust Pipe

Exhaust pipe connecting exhaust manifold and muffler is a steel tube. It is attached to the manifold by a two-bolt flange and inserted into and clamped to the front header of the muffler.

Diameter.....2"

Muffler

Muffler is made entirely of sheet steel and consists of an outer shell which encloses four compartments separated by baffles. Extending through the center of three compartments is a perforated tube also divided into two compartments and supported by two baffles. Exhaust gases pass successively through the inner and outer shell compartments to the tail pipe. This con-

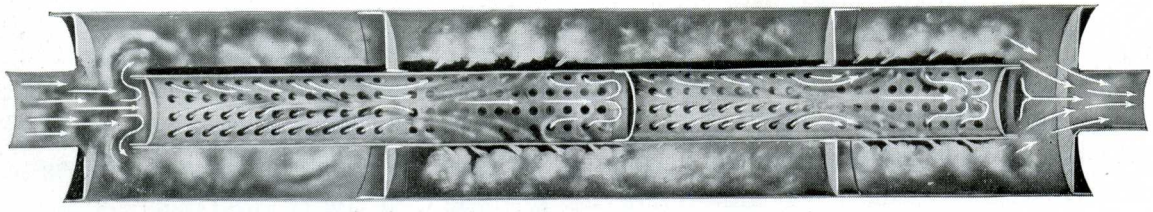

Fig. 40. Muffler in Section.

struction provides a quiet exhaust with a minimum of back pressure.

Diameter ..... $5\frac{13}{64}$"
Length ..... 28"

Tail Pipe

The tail pipe is made of steel tubing extending from muffler to rear of car. Its length is such that the gases are discharged behind the car and exhaust noise is lessened.

Diameter ..... $1\frac{1}{2}$"

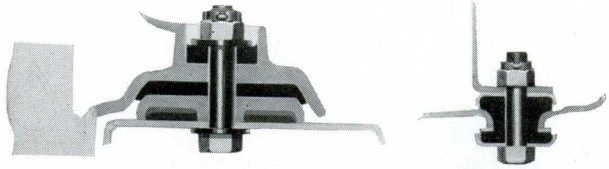

Fig. 41. Rear Front. Engine Mountings.

Engine Suspension

The engine is suspended at four points and insulated from the frame by rubber mounting.

The forward arms are a part of the pressed steel plate bolted between front of crankcase and timing chain cover. The rear arms are cast integral with the flywheel housing.

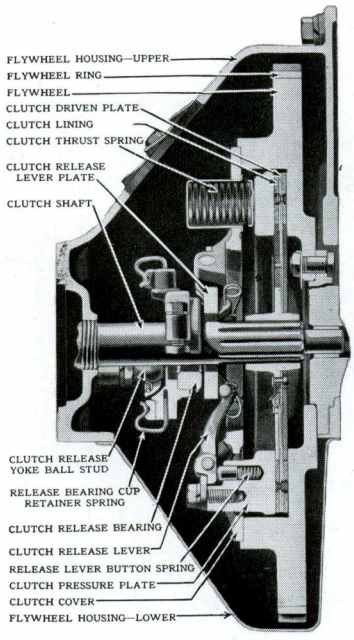

Fig. 43. Clutch—Sectional.

Clutch

The clutch is a single dry disc type, 9" diameter completely inclosed in the flywheel housing. The single driven disc, which is flexibly mounted on the hub by means of eight coil springs absorbs shocks of engagement and dampens vibrations in the power line. This spring steel disc carries two moulded facings on arched segments

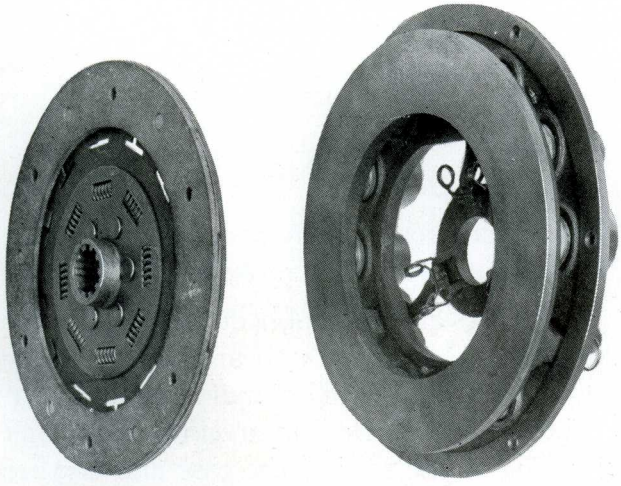

Fig. 42. Clutch Disc—Driving Member, Front.

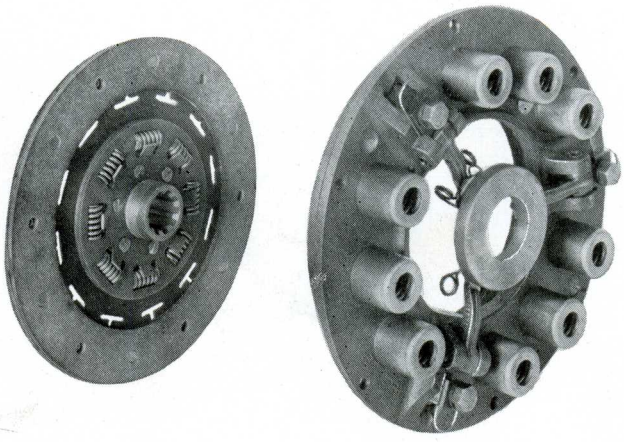

Fig. 44. Clutch Disc—Driving Member, Rear.

which provide easy gradual engagement with the driving plate and the flywheel.

The clutch is held in engagement by nine coil springs in the driving member. These springs require no adjustment.

The clutch release bearing, mounted in a trunnion yoke, is self-aligning and made of baked carbon graphite which is self-lubricating and noiseless.

Area frictional surface
64.8 sq. in.

Facing dimensions,
$8\frac{7}{8}$" OD x $6\frac{1}{8}$" ID x $\frac{1}{8}$" thick

The clutch requires no adjustment, however an adjustment is provided at the lower end of the clutch pedal consisting of a cap screw and lock nut to provide clearance at the clutch release bearing.

To make this adjustment loosen lock nut at the clutch pedal adjusting lever. Turn adjusting screw to the left or counter-clockwise until pedal pad has a free travel of 1" to $1\frac{1}{4}$". Tighten lock nut.

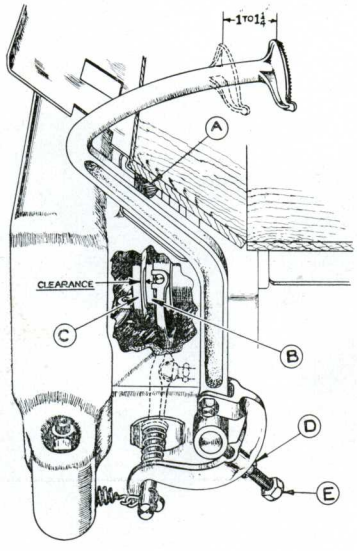

Fig. 45. Clutch Pedal Adjustment.

Transmission

The transmission is a three speed selective type bolted to the flywheel housing. The clutch shaft rear bearing recesses in a counterbore in the flywheel housing to ensure correct alignment of transmission main shaft with the crankshaft.

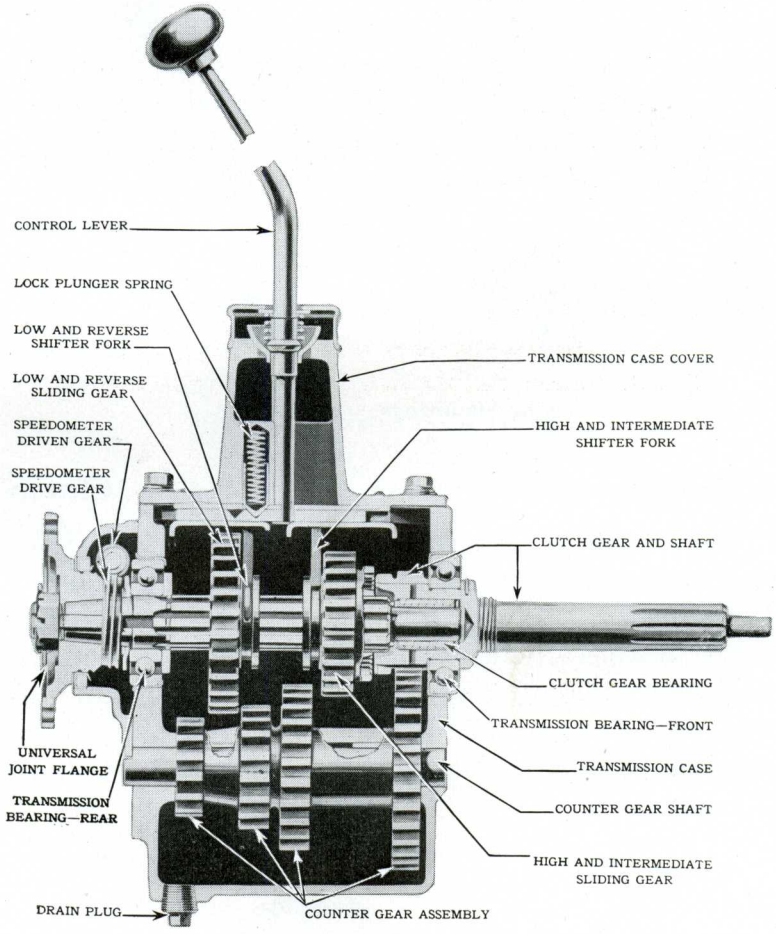

Fig. 46. Transmission—Cross Section.

All gears are made of heat treated chrome alloy steel and the teeth are burnished for quiet operation. The main shaft is ten splined and carried in a single row ball bearing in the rear of the case and a roller bearing in the rear end of the clutch shaft.

The clutch shaft is carried in a single row ball bearing in the transmission case and in an oilless bronze bushing in the rear end of the crankshaft.

The counter gear assembly is machined from a single drop forging and carried on two bronze bearings on the stationary shaft.

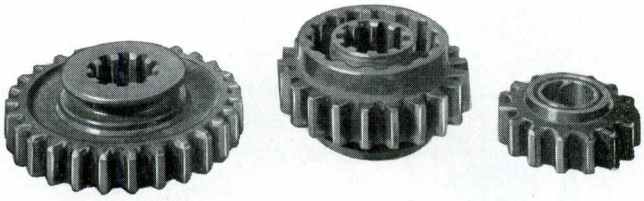

Fig. 50. Sliding Gears—Idler Gear.

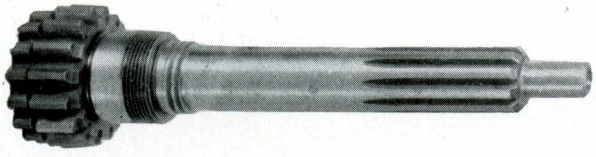

Fig. 47. Clutch Shaft.

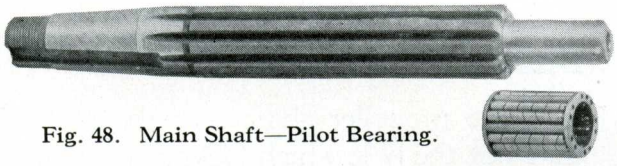

Fig. 48. Main Shaft—Pilot Bearing.

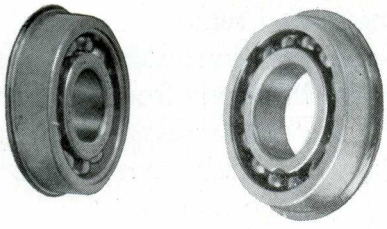

Fig. 49. Transmission Bearings.

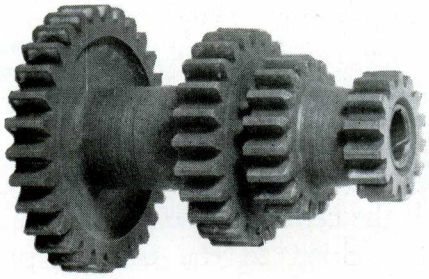

Fig. 51. Counter Gear Assembly.

Transmission Bearings

Clutch gear shaft—Rear	No. 1208 N. D. single row
Clutch gear shaft—Front	Durex 5/8″ x 11/16″
Main shaft—Pilot	Hyatt No. RA-135, 3/4″ ID x 1 1/8″ OD x 1 1/2″ long
Roller diam.	3/16″
Main shaft—Rear	No. 1306 N. D. single row
Counter gear—Bushings	Two 7/8″ diam. x 1 3/4″ plain bronze
Idler gear bushing	One 7/8″ diam. x 13/16″ plain bronze

Transmission Gears

	NO. TEETH	PITCH
Clutch gear	15	7
High and intermediate sliding	21	7
Low and reverse sliding	27	7-9
Countershaft—Constant mesh	30	7
Countershaft—Intermediate	24	7
Countershaft—Low speed	18	7-9
Countershaft—Reverse	14	7-9
Reverse idler	15	7-9

Gear Reductions

IN TRANSMISSION	AT WHEELS
High—Direct	4.545
Intermediate—1.75 to 1	7.953
Low—3.00 to 1	13.635
Reverse—3.857 to 1	17.53

Lubricant required to fill to proper level—2 1/4 pints or pounds.

Universal Joints

Two metallic universal joints are used.

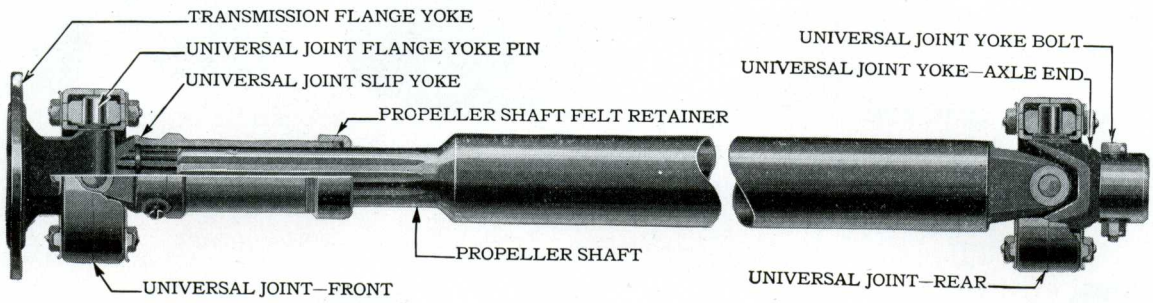

Fig. 52. Universal Joints and Propeller Shaft.

The rear joint is attached to the pinion shaft by four splines and retained by a bolt through the center. The front yoke of this joint is welded to the tubular propeller shaft.

The front joint is attached to the main shaft of transmission by means of a flange and six bolts. The rear yoke of this joint is attached to the propeller shaft by means of a ten-splined "slip joint." This joint is required because of the forward and backward movement of the rear axle as its position relative to the frame changes due to load or road conditions.

Outside diameter . . . . . 3 7/8"
Yoke pin diameter . . . . . 19/32"

Construction

The principal parts of this joint are the housing made in two parts; the yokes with driving trunnions, and the four bushings. The housing, which also serves as the connecting driving member, is made of two steel stampings the edges of which are surface ground. The narrow surfaces and the extremely great pressure that the eight nuts exert when drawn into place, makes for a very high unit of pressure between the surfaces in contact, and causes the two surfaces to fit each other perfectly and make an absolutely tight joint.

End thrust is taken on the flat ends of trunnions against flat surfaces on inner periphery of universal joint housing.

Disassembly

If the propeller shaft is to be removed take out the bolt which locks rear universal joint to the pinion shaft. Push shaft forward enough to remove the hub from the splined end of pinion shaft, and pull splined end of propeller shaft from the slip joint of the front universal. To remove front universal joint assembly remove the six bolts in the companion flange.

If it is desired to disassemble the joint proper, it can be done very easily by removing the eight nuts holding the two oil retaining housings together. After all of the nuts have been removed, a slight tapping on the ends of the protruding studs will cause the housings to separate. Care should be taken not to damage the ground surfaces where the two half housings joint. In reassembling care should be taken to see that all four cork packing washers are in place, and that they have not been damaged in handling. All of the eight nuts should be drawn up a little on each stud so that they are all brought home together. It is advisable to paint the ground surfaces of the housings with a thin shellac.

The spline must be entered in slip yoke so as to bring the trunnions of the yoke on rear end of shaft parallel with the trunnions of the slip yoke on front end of shaft. This is done by bringing the two arrows in line as shown in Figure 53. If this is not done a rough and unsatisfactory performing joint will result.

Lubrication

Because of these features of construction every bearing point operates within the oil chamber where it can be thoroughly flooded with oil, and the moment the joint begins to revolve, a pressure due to centrifugal force is set up in the oil which really tends to make the bearings pressure oil lubricated.

The lubrication of the spline or slip joint is also provided for. The spline fitting operates in a self-contained chamber which has no connection whatsoever with the joint proper. A special plug is provided for lubrication of the splines.

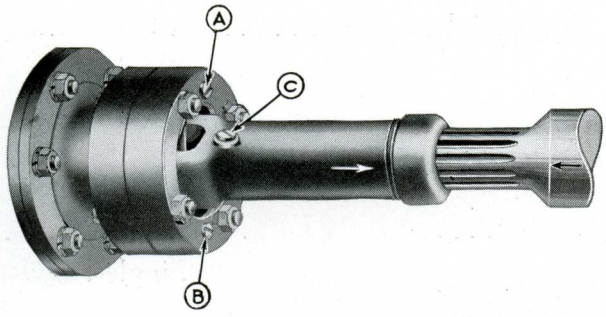

Fig. 53. Front Universal Joint.

There are two oil plugs provided in each joint. When filling joints with oil turn same so that the two plugs are in a perpendicular position. Remove both plugs. Screw a Zerk connection in lower hole allowing upper hole to serve as an air vent. Using the pressure gun, force lubricant into the joint. When oil runs out of the upper hole the joint is filled and the plug should be inserted. Remove the Zerk connection and replace with the second plug. CAUTION: Do not replace oil plugs in joint housing with the fittings as furnished with special pressure oil or grease guns. Such fittings are not designed to hold oil and centrifugal force may cause leakage. A heavy oil suitable for use in rear axle or transmission is satisfactory.

Propeller Shaft

The propeller shaft consists of a steel tube 2″ outside diameter, with a spline shaft welded to the forward end. This end provides the slip joint in connection with the front universal joint. The front yoke of the rear universal joint is welded to the rear end of the shaft.

Rear Axle

The rear axle is a semi-floating type employing a one-piece pressed steel housing and a malleable differential carrier. The differential is a two-pinion type enclosed in a single malleable casting supported on two single row ball bearings. The drive pinion shaft which is forged of high carbon steel integral with the pinion is supported in the differential carrier on one single row and one double row ball bearing. Both differential and pinion assemblies are removable from the carrier without removing axle from the car.

Ring gear and pinion are spiral bevel cut.

Axle shafts are forged of Manganese steel and heat treated. Inner ends are 10-splined to carry the differential side gears and are locked to the gears by means of a split washer. End thrust is taken by the differential bearings, a steel spacer block, being placed between the inner ends of

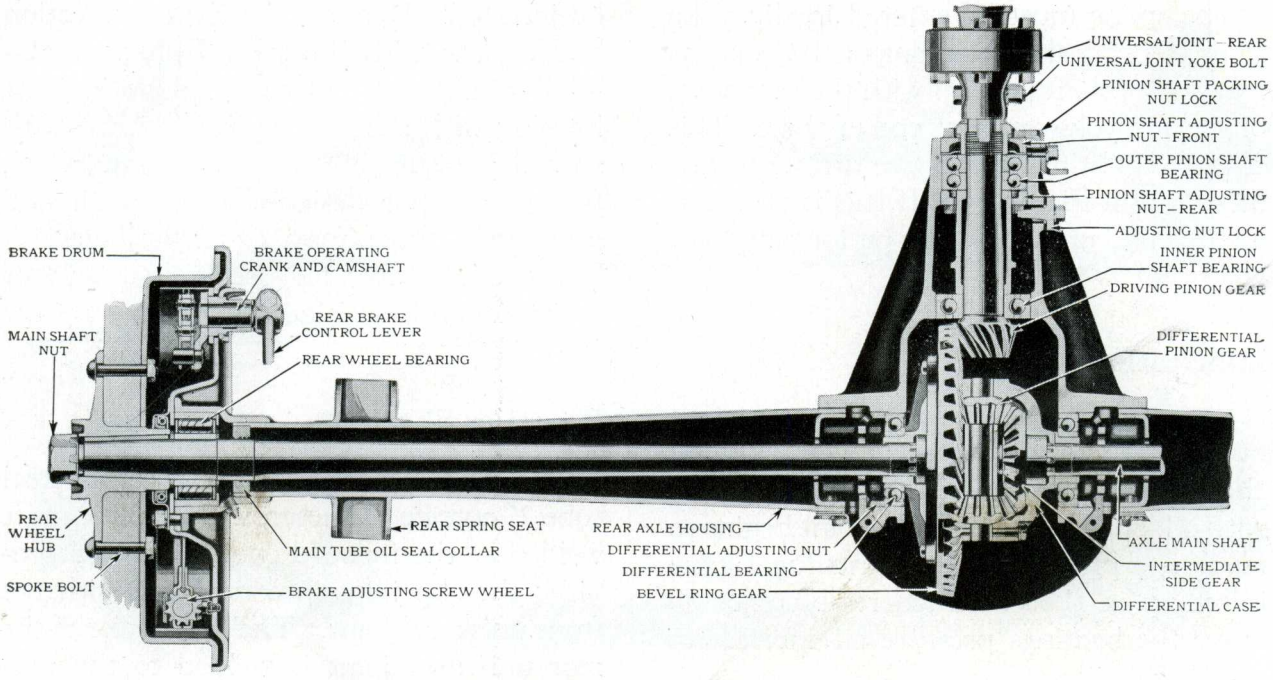

Fig. 54. Rear Axle—Sectional.

shafts and retained by the differential pinion shaft.

Springs seats are welded to the housing.

A baffle is attached to housing cover to direct a continuous stream of oil to the differential gears.

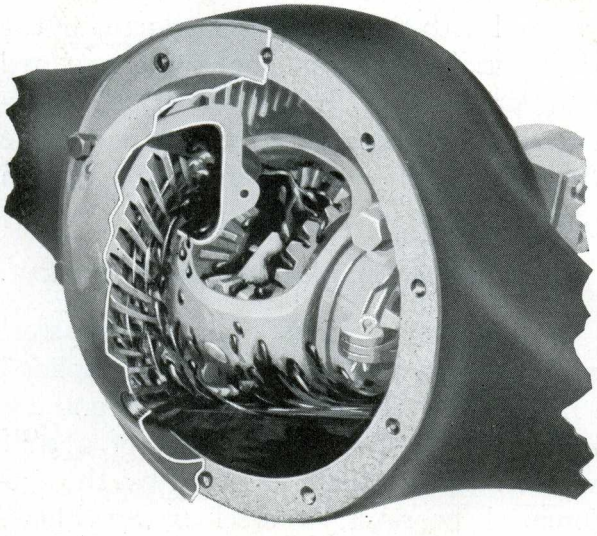

Fig. 55. Differential Lubrication.

Axle Details

Housing tube—Smallest diameter . . . . . 2½″
Housing—Wall thickness . . 3/16″
Differential bearings . . . . . No. 0208 N. D. Single Row
Pinion shaft bearings
Outer . . . . . No. 5306 N. D. Double Row
Inner . . . . . No. 1307 N. D. Single Row
Pinion shaft dia. . . . . 15/32″
Differential pin dia. . . . . ¾″
Tread—Rear wheels . . . . . 57″
Teeth in ring gear 50
Teeth in pinion 11
Ratio . . . . . 4.545 to 1
Axle shaft dia.
At wheel bearing . . . . . 1⅜″
Center portion . . . . . 1 1/16″
At intermediate gear . . 1⅛″

Lubricant required in housing.....3 pints or lbs.

Clearance under center of housing.....8″

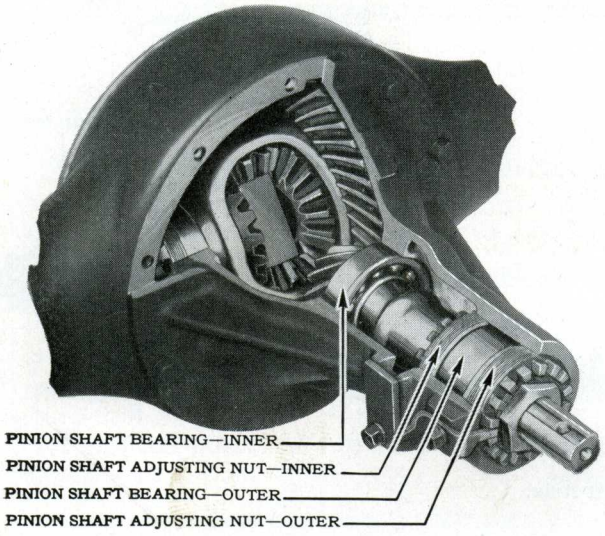

Fig. 56. Pinion Adjustment.

Ring Gear and Pinion Adjustment

Ring gear and pinion are both adjustable to provide the proper tooth contact. Differential bearings are provided with adjusting nuts by which the differential and ring gear may be moved transversely in relation to the pinion.

The pinion and pinion shaft, together with the single and double row ball bearings, as a unit may be adjusted. This adjustment may be made fore and aft by two adjusting nuts which are located, one ahead and one behind the double row bearing. The rear nut is adjusted through a hole under a cover plate in the right side of the differential carrier and the front one is exposed at the forward end of carrier. When pinion has been located in proper position both nuts should be set tight against the double row bearing and locked in place.

This adjustment is made with the propeller shaft in place. See Fig. 56.

Front Axle

Front axle is a reverse Elliott type drop forged of high carbon steel and heat treated. The portion of the axle between the spring pads has an I section. The ends outside of the spring pads have an oval section to resist the torsional strains due to the front wheel brakes.

The ends of the axle are machined to receive the king pins, which are inclined outward at the bottom at an angle of 9½°. The center line of the king pin extended will strike the ground very close to the center of the wheel track.

Steering knuckles are machined with an angle of 10¼°, measured between the king pin center line and the spindle center line. The combination of these two angles produces a downward inclination of the spindle and gives the wheels a camber of 1¾°. These angles are fixed and do not change unless the axle is bent. This construction provides ease of steering because of the reduction of side pressures on the king pin bearings in the knuckles and the reduction of the arc through which the point of the tire in contact with the road travels when the wheels are given the proper toe-in, because the inclined wheel tends to roll in a circle whose center lies in the direction of the inclination of the wheel at the top.

The axle is mounted to springs in such manner that the king pins tilt backward at the top. This angularity is called castor. Due to the castor angle, the center line of the king pin extended will strike the ground at a point slightly in advance of the point of the tire contact. This results in a trailing effect on the wheels. Insufficient castor

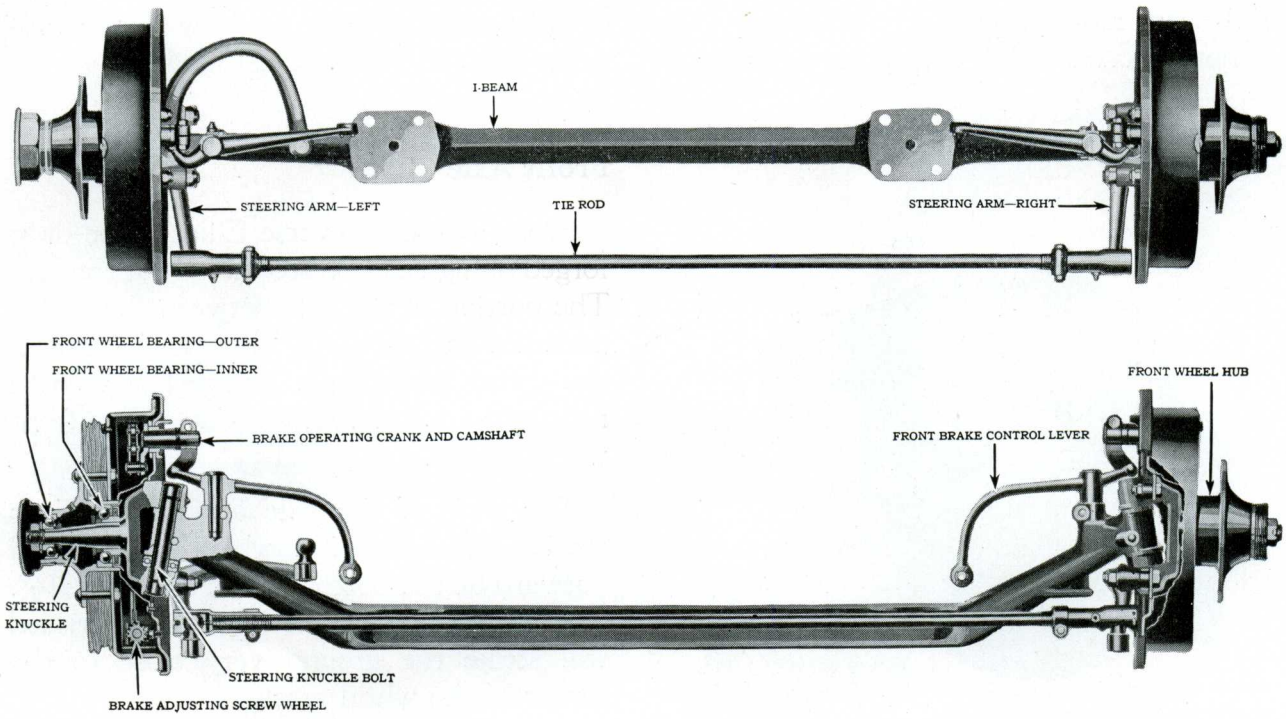

Fig. 57. Front Axle.

angle causes the car to wander. Too much castor may produce, at certain speeds, a condition in which the wheels wabble or shimmy. If the castor angle has changed due to sagging of the springs it should be corrected by the use of wedges between the springs and the I-beam.

Steering knuckles are drop forged of nickel alloy steel and heat treated. Each knuckle carries two bronze bushings for the king pins.

King pins are made of high carbon steel, heat treated, hardened and ground. Pins are locked in the axle ends.

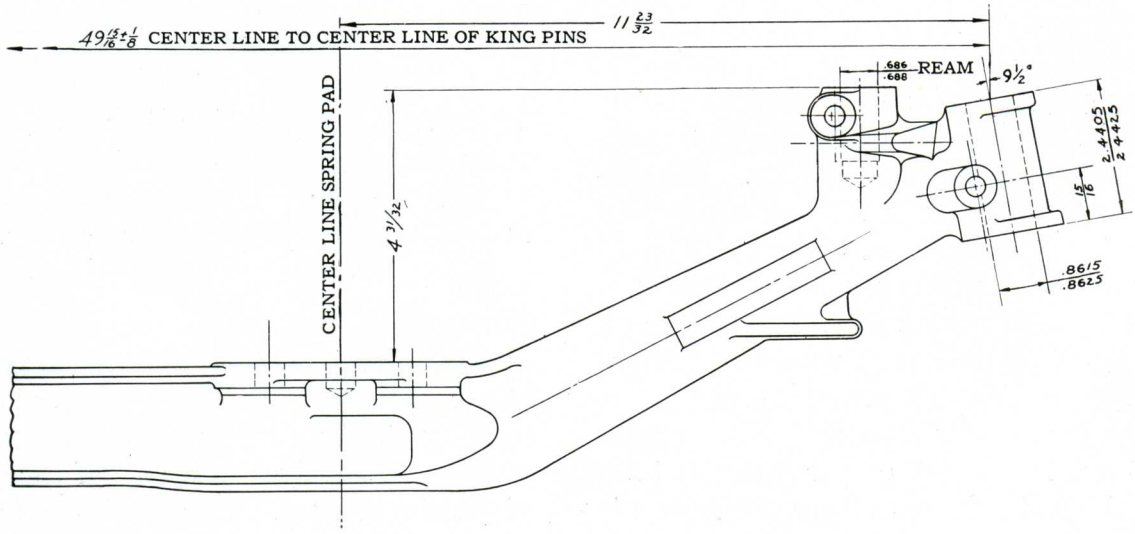

Fig. 58. Front Axle—Dimensions.

Axle Details

I-Beam section . . . . . 2⅛" x 7/32" x 1¾" wide

Knuckles

Spindle dia.—Inner . . . . . 1 5/16"

Spindle dia.—Outer . . . . . ¾"

King pin—Dia. . . . . ⅞"

King pin—Bushings . . . . . Two—Bronze 1¼" long

King pin—Thrust bearing . . . . . Seventeen—¼" balls

Tie rod—Outside dia. . . . . ¾"

Axle tread . . . . . 56 17/32"

Clearance under I-beam . . . . . 8⅛"

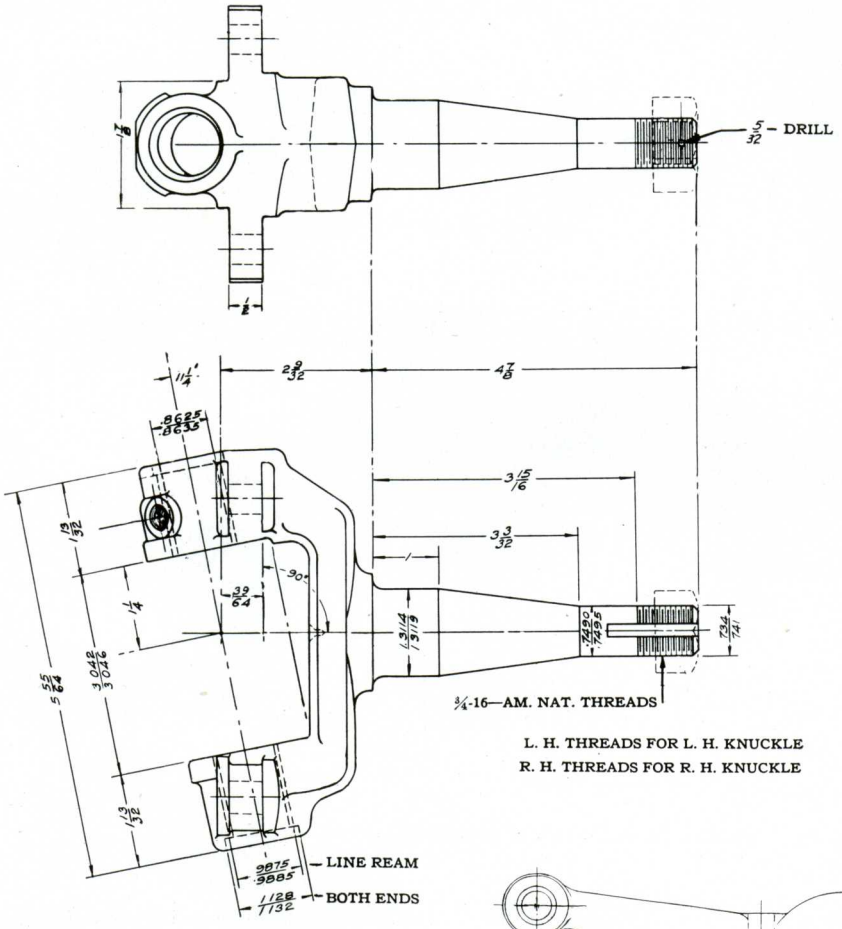

Fig. 59. Steering Knuckle—Dimensions.

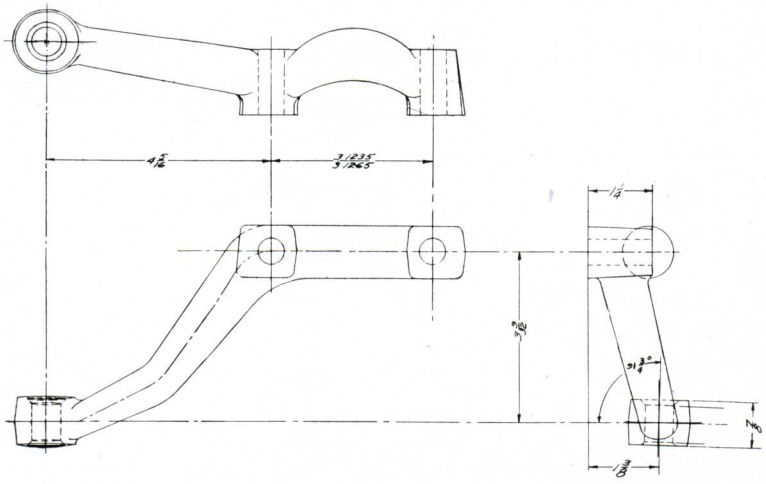

Fig. 60. Steering Arm, Right—Dimensions.

Tie Rod

Tie rod is made of a 3/4" rod threaded on either end to adjustable ball socket nuts.

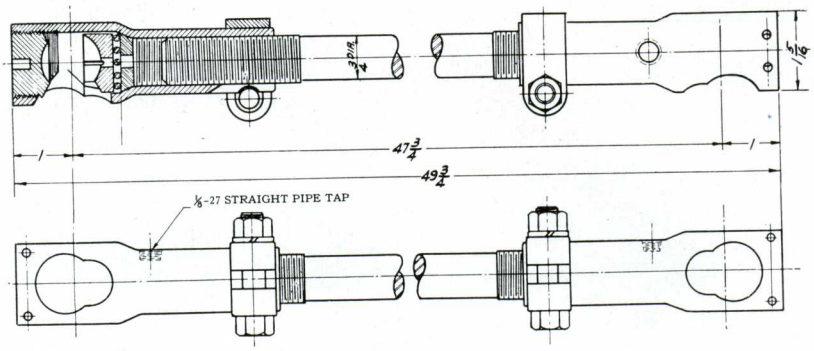

Fig. 61. Tie Rod—Dimensions.

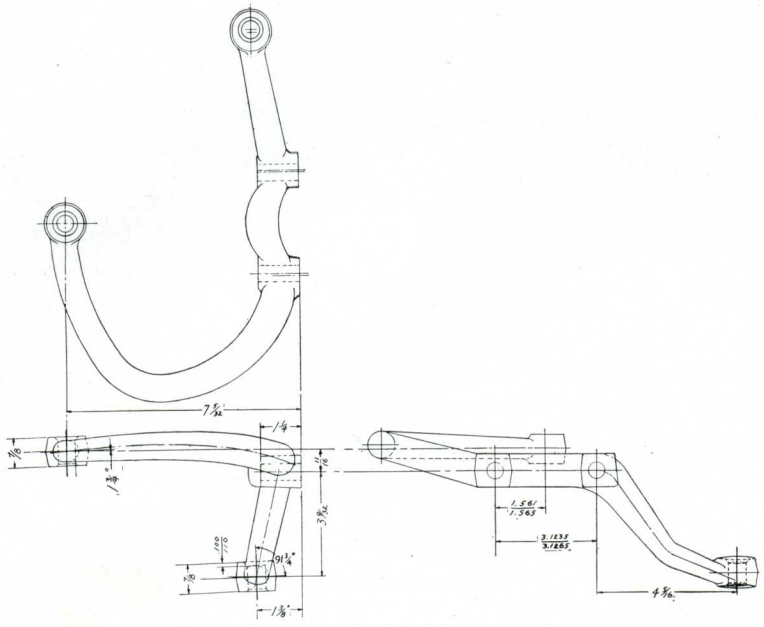

Fig. 62. Steering Arm, Left—Dimensions.

Front Axle and Wheel Alignment

1. See that the Car is Setting on a Level Floor.
2. Balance Front Wheels, Tires, Check Tire Pressure.
3. See that the Tires Run True and do not Wobble.

   This is done by tightening and loosening rim wedges as required.
4. Front Wheel Bearings Must Have Proper Adjustment.

Wheel bearings should be adjusted when shake can be felt on wheel. This shake however must not be confused with that resulting from play in king pin bushings. When adjustment is necessary, remove hub cap, jack up wheel, remove the cotter pin from the bearing nut, and turn nut up tight to make sure that all looseness has been removed. Then back off nut slowly until slight shake can be felt on wheel. Then tighten nut 1/6 of a turn maximum and insert cotter pin.

5. CHECK TOE-IN OF FRONT WHEELS.
See Fig. 64.
For wood wheels the distance X should be 1/8" to 3/16" less than Y, for wood, wire and disc wheels the distance A should be 9/32" to 11/32" less than B, or J should be 7/32" to 9/32" less than K, it being necessary to check at one point only—toe-in is adjusted by loosening two tie rod collar clamp bolts C and turning the center portion of tie rod which has right and left hand threads at ends. Be sure to tighten clamp bolts after proper toe-in is obtained.

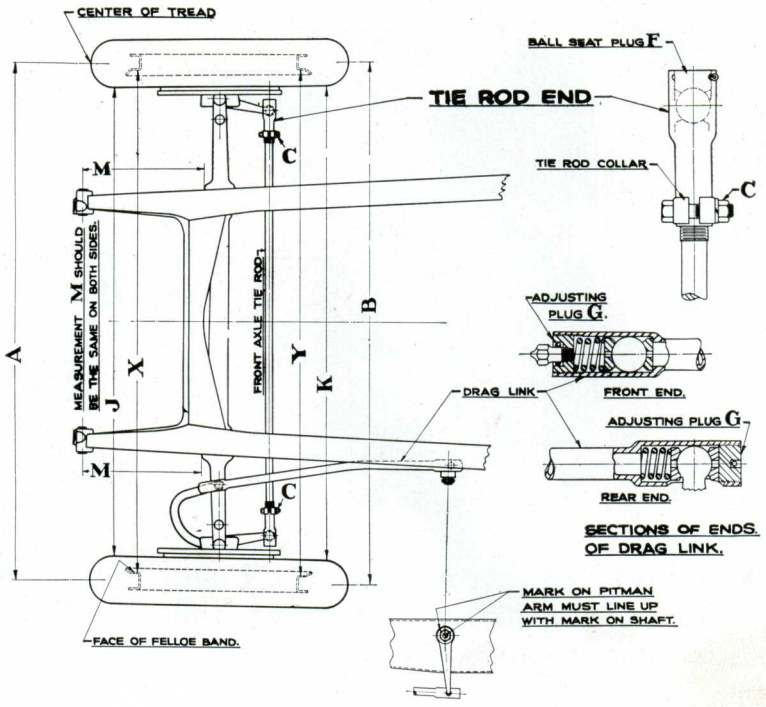

Fig. 64. Wheel Toe-in.

6. CHECK CAMBER OF FRONT WHEELS.
See Fig. 63.
The tires should be closer together at the ground than at the top. D should be 5/16" to 1/2" greater than E.

7. TAKE LOOSENESS OUT OF FRONT AXLE TIE ROD. See Fig. 64.
This is done by tightening plugs G so that the rod can just be rotated by hand.

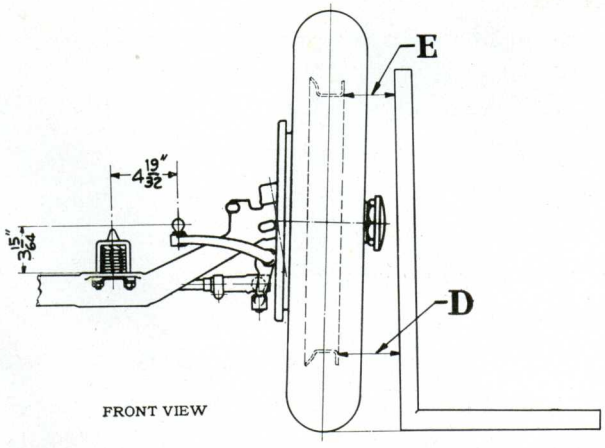

Fig. 63. Wheel Camber.

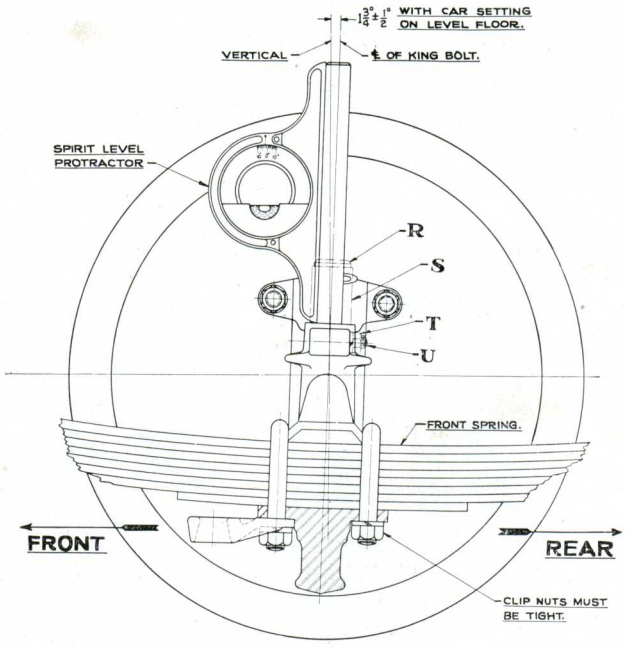

Fig. 65. King Pin Angle.

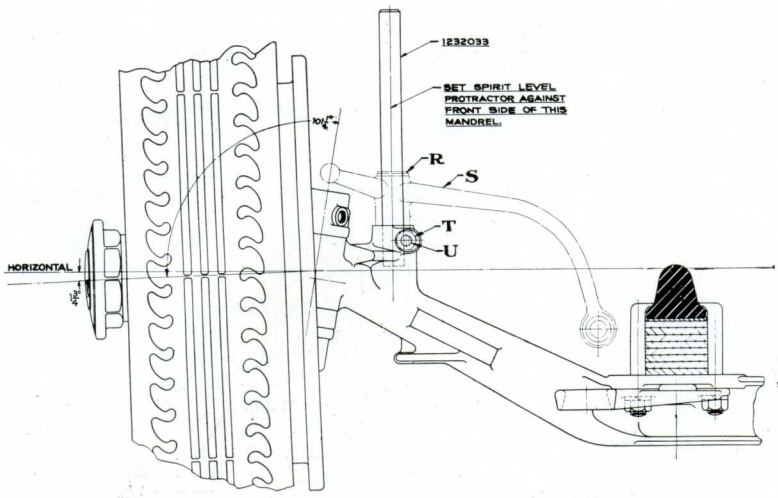

Fig. 66. King Pin and Spindle Angle.

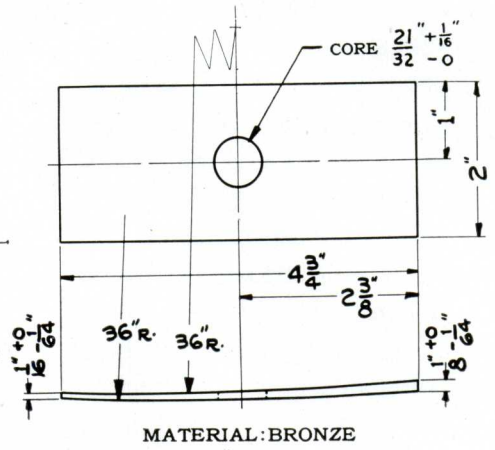

Fig. 68. Shim Details.

8. TAKE LOOSENESS OUT OF DRAG LINK. Tighten plug F down tight and back off one turn.

9. CHECK ANGLE OF KING PINS.
See Figs. 65 and 66.
To do this, remove nut T, draw bolt C, pin R and brake lever S; insert mandrel No. 1232033 and with a spirit level protractor against the front side of mandrel, determine the angle. The king pin must slant back at the top 1¼° to 2¼°. If the top of king pin slants forward, use shim as shown in Fig. 68.

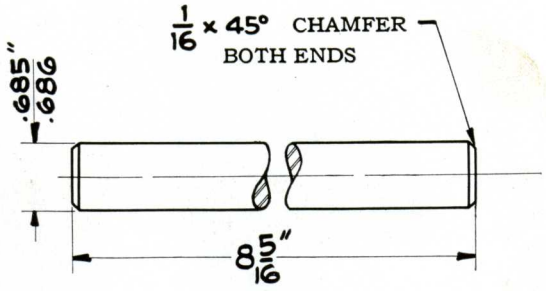

Fig. 67. Mandrel Details.

10. TAKE BACK LASH OUT OF STEERING GEAR.
Adjust to remove the back lash when wheels are in straight ahead position.

11. CHECK HEIGHT OF STEERING ARM BALL. Steering arm ball should be 3 15/64" from spring pad. Check ball and bend steering arm if necessary to raise ball. See Fig. 63.

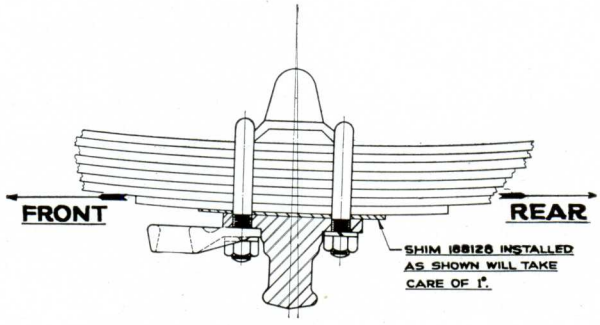

Fig. 69. Shim Installed.

Wheels

Standard equipment wheels are 10-spoke artillery type with steel felloes.

Spoke width.....1¼"
Felloe diameter—at outside leg...17⅝"
Hub flange diameter.....7¼"
Flange bolts.....Ten—⅜"
Rim lugs.....Four

Wheel Bearings

Front wheel bearings are adjustable cup and cone type.

Inner bearing.....Eleven 9/16" balls
Outer bearing.....Nine 15/32" balls

Rear wheel bearings are Hyatt bearing heavy duty type.

Number of rolls.....13
Diameter of rolls.....1/2"
Hyatt.....No. R.A. 307

Rims

Rims are formed with centering bosses which rest on the outside leg of wheel felloe to ensure central mounting.

Rim stock.....1/8"
No. wedges.....Four
Rim base—Outside diam.....18"
Section..... 4"

Tires

Tires are low pressure type of four-ply construction.

Tire size.....28" x 5.25"
Rim size.....18" x 4"
Tire pressure.....35 lbs. front and rear
For high speeds.....38 lbs. front

Springs

Semi-elliptic springs are used both front and rear. Front springs are overslung and rear springs underslung on the axles. Front ends of both front and rear springs are attached to the frame by spring bolts in bronze spring eye bushings. Rear ends of both front and rear springs are attached to the frame by self-adjusting shackles.

Springs should not be lubricated any more than necessary to prevent squeaks.

Front Spring

Length.....35"
Width..... 2"
Bolts.....9/16" diam.

Rear Spring

Length.....54 1/2"
Width..... 2"
Bolts.....5/8" diam.

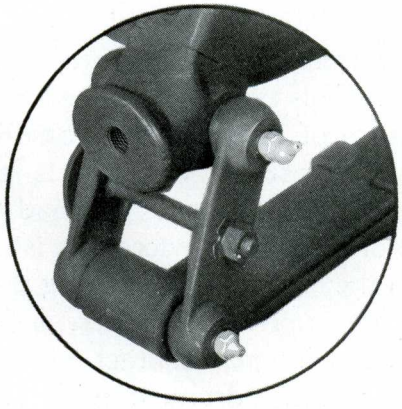

Fig. 70. Rear Spring Shackle.

Spring Shackles

Spring shackles at the rear ends of both front and rear springs are self-adjusting type. The shackle pins are hollow and pressed into the spring eyes and frame hangers. The ends of these pins are tapered and extend into tapered holes in the shackles. The shackles are held together by a bolt through their centers. Under the head of this bolt are two springs which maintain a constant pressure of the shackles against the tapered ends of the pins and conse-

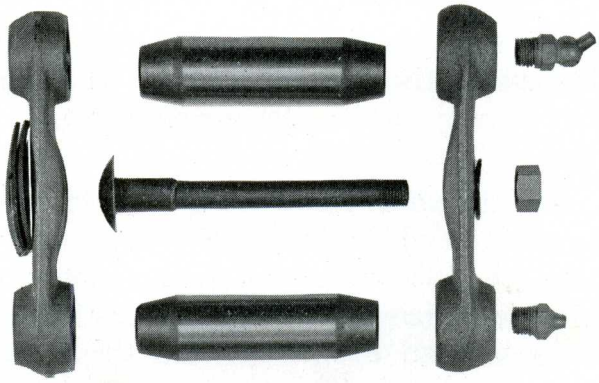

Fig. 71. Shackle Disassembly.

quently prevent shackle rattle. Zerk connections are provided for lubrication through the center of the pin to the bearing of the tapered ends in the shackles.

Brakes

Four wheel internal duo-servo type brakes are used. This type utilizes the force of the momentum of the car to increase braking power. The servo principle is self-contained, and automatic, and is had without the use of auxiliary devices. It is attained through the method of anchoring the shoes, by the operation of the shoes, and by the use of the frictional contact of the shoes with the rotating drum to apply the shoes against the drum.

The primary shoe is not anchored but hinges freely by means of an articulating pin, to the floating end of the secondary shoe. When the brake is applied the rotating drum carries the primary shoe against and with the drum, imparting power to the secondary shoe and wrapping the assembly of the shoes increasingly tighter against the drum as the pedal pressure is applied.

A light pedal pressure is multiplied to a smooth powerful braking action, instantaneous in application and release.

This type of brake has a servo action both forward and backward. The two shoes are identical in size and shape. At the camshaft are two anchor pins, one of which serves as the anchor or buttress for braking in the forward direction and the other serves as the anchor or buttress for braking in the reverse direction.

The two shoes are linked together at the opposite ends by a right and left hand screw through articulating pins in a manner to provide extreme flexibility in their tendency to align themselves with the inner surface of the drum.

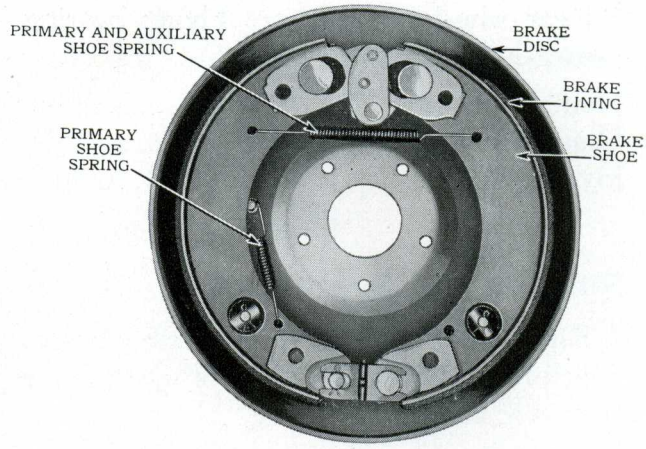

Fig. 72. Brake Assembly.

The shoes are expanded by means of the balanced cam, which does not change its angularity during the entire life of the brake lining. The two trunnion blocks bear on the curved ends of the shoe webs and provide compensation for the movement of the shoes, and for any unequal wear.

In forward rotation the forward shoe assumes the position of the primary shoe and the other that of the secondary shoe. In the reverse direction the rear shoe assumes the position of primary and the other that of secondary. The shoes are centralized in the drum to prevent dragging when in the released position by a simple roller eccentric adjusted from the outside of the drum. There is only one adjustment for wear, the turning of the right and left hand adjusting screw, which by its rotation through the articulating pins, draws the shoes together or spreads them apart.

This brake system has been designed for simplicity of construction, ease of adjustment and maximum safety.

Briefly, the system consists of a pedal and a hand lever, operating independently on the single cross shaft which is supported in self aligning bearings in such manner that the operation of the shaft is not affected by frame distortion.

The brake shoes are operated from the cross shaft, through levers and pull rods.

A safety bearing is provided near the center of the cross shaft which will keep the shaft in alignment and allow the brakes to be operative even though the shaft should be broken on either side of the bearing.

A hand brake lever is provided by which the four wheel brakes may be applied for parking purposes. Either the pedal or hand lever may be used independently of the other.

The hand lever has a greater travel than the pedal for the purpose of providing braking action even though the linings should be worn to the extent that the service brakes become inoperative.

After the levers and pull rods have been set to proper positions, and the joints and bearings properly lubricated periodically, further adjustment is required only to compensate for wear of linings. This adjustment is easily made at the brake shoes without removing the wheels.

Brake Dimensions

Drum—Inside dia. . . . . 12″
Facing—8 pieces . . . . . 1¾″ x 13″
Brake area . . . . . 182 sq. in.

BRAKE ADJUSTMENTS

Make the Following Checks Before Making Any Brake Adjustments

See Fig. 73.

1. All parts must be working freely. Lubricate all working parts.
2. In release position, cross shaft (1) must return freely to stop pin (2).
3. Remove all slack from foot pedal (3) and hand brake lever (4) by adjusting rod (5) for foot pedal, and rod (6) for hand brake lever. When all slack is removed, cross shaft lever (7) must be against stop (2), foot pedal (3) must be against rubber pad and hand brake lever (4) must be in full released position. Rod (5) should be in upper hole in pedal.
4. Disconnect brake rods (8), (9), (10), (11). Operate each brake separately by hand, pulling levers (14) and (13), to see that brakes release freely. Before rods are connected, adjust the lengths so as to allow approximately 1/64″ back lash in brake operating levers (12), (13).
5. The center of ball on operating lever (14) should be over or slightly to rear of center line of king pin, the position of rear control lever (13) should be set so that the distance from lever eye to outside of axle housing is 2 7/8″ plus or minus 1/8″. If the brake levers (12) and (13) are not in the correct position, they can be relocated on serrations of brake camshaft.
6. Replace cotterpins and tighten lock nuts on adjusting rods.
7. Tighten all spring clip nuts.
8. Check front wheel bearings for looseness. Wheel bearings should be adjusted when shake can be felt on wheel. This shake, however, must not be confused with that resulting from play in king pin bushings. When adjustment is necessary, remove hub cap, jack up wheel, remove the cotterpin from the bearing nut, and turn nut up tight to make sure

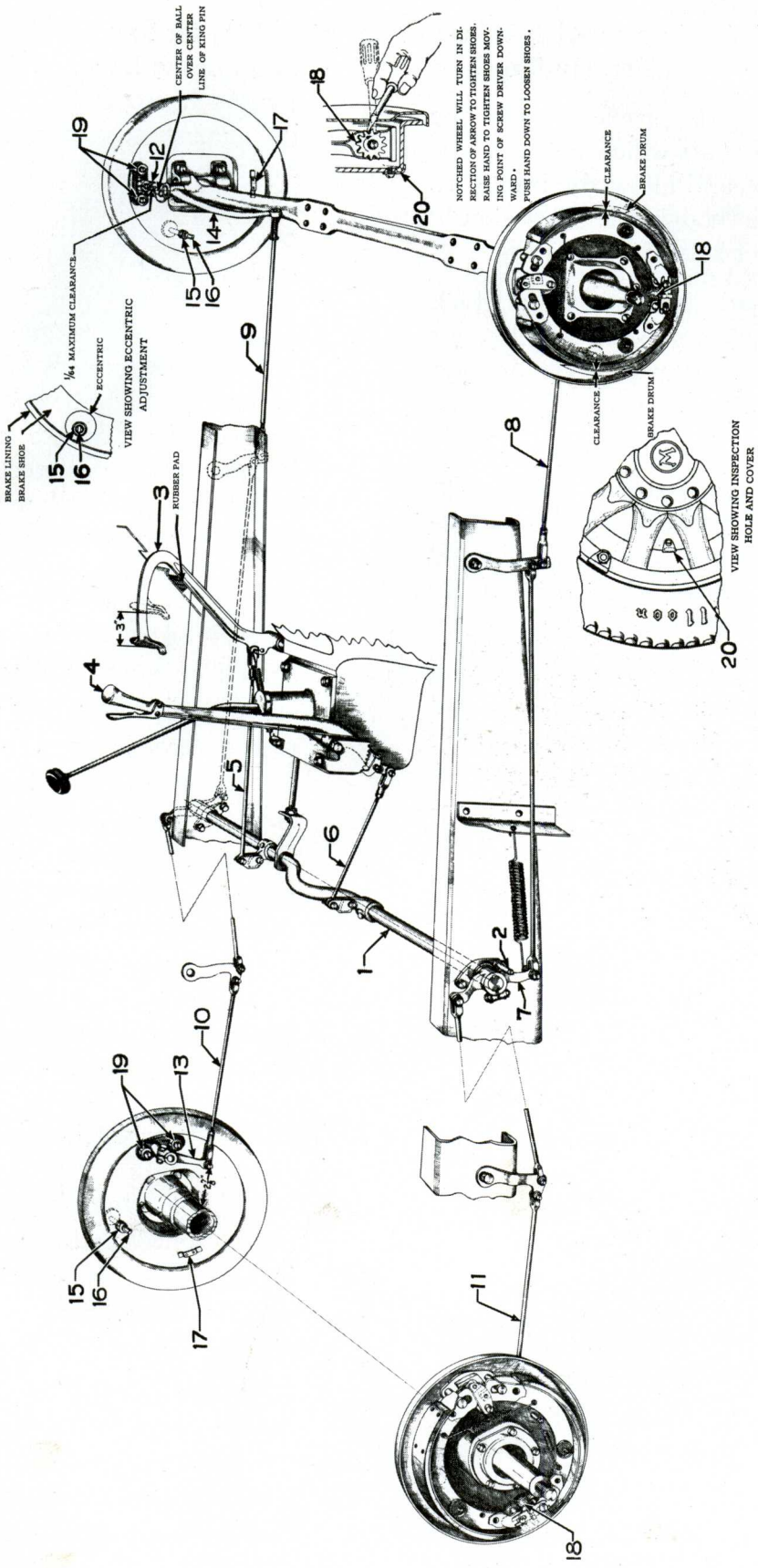

Fig. 73. Brake Adjustment Chart.

all looseness has been removed. Then back off nut until wheel turns freely. Tighten nut 1/6 of a turn maximum and insert cotterpin.

9. Check rear wheels for looseness. They must be drawn up tight on tapers of axle shafts.

Adjustments for Wear and Equalization

1. Jack up all four wheels of car. Set front wheels straight ahead.

2. Centralize shoes as follows: Loosen nut (15) on eccentric stop (16) and turn eccentric in the direction wheel rotates when going forward, until a slight drag is felt on wheel; then turn eccentric in opposite direction until wheel is free. Tighten lock nut while still holding eccentric with wrench.

3. Depress pedal (3) 3", and with suitable means hold pedal in that fixed position.

4. Remove adjusting hole covers (17) from brake discs, insert screw driver or other suitable tool, and turn notched wheel (18) inside of brake drum until brakes drag so that wheel can just be turned with two hands. Adjust shoes so that all wheels require the same hard pull to rotate them. Diagram shows method of tightening or loosening shoes for adjustment.

5. Release pedal (3). Wheels should turn freely without drag between drums and brakes. It may be necessary in some cases to re-centralize shoes if they drag. Proceed as in paragraph No. 2.

6. Remove car from jacks and test on road.

Major Adjustments

Anchor pins should be adjusted only when fitting newly lined shoes, or when anchor pin nuts are found loose. If necessary to adjust anchor pins, proceed as follows:

(a) Jack up all four wheels.

(b) Loosen anchor pin nuts (19) free of lock washers. Loosen lock nut (15) on eccentric adjustment (16) and turn eccentric in direction wheel rotates, when going forward, until a slight drag is felt on the wheel. Still holding eccentric with wrench, tighten lock nut slightly to hold eccentric in temporary position.

(c) Remove cover plate (17) and tighten shoes by inserting screw driver in cover plate hole and revolving notched wheel (18) until wheel can be pulled over with one hand.

(d) Tighten anchor pin nuts (19) with 16" wrench.

(e) Insert screw driver in cover plate hole and loosen shoes by revolving notched wheel (18) approximately 15 notches. Back off eccentric adjustment (16) until wheel turns freely, holding eccentric with wrench while tightening nut (15).

(f) Set front wheels straight ahead. Follow instructions (3), (4), (5) and (6) under "adjustment for wear and equalization."

Shoe clearance can be checked with feeler gauges by removing inspection hole covers (20) in brake drums. This is unnecessary if the above instructions have been carefully followed.

When the proper adjustments have been made, the clearance between the lining and drum at anchor pin end of shoes will be approximately .010" and at the adjusting end of shoes approximately .015".

Steering Gear

Steering gear is Jacox worm and split nut type. The half nuts, made of special bronze, have fine threads in contact with the worm with consequent low unit pressure and minimum wear. Half nuts are guided in the housing for their full length. Hardened and ground steel blocks attached to the lower ends of half nuts contact with hardened and ground steel rollers on the cradle end of Pitman arm shaft. Pitman arm shaft is supported in bronze bushings in the housing.

The steering tube is supported at the upper end in an oilless bushing. A self-centering ball thrust bearing is placed between the upper end of the worm and the adjusting nut at the top of housing. This nut provides adjustment for wear of half nuts and worm.

The nest tubes are separated by spring type ferrules to prevent rattle.

Steering gear is supported at the housing in a trunnion bearing attached to the frame and at the mast jacket in a slotted bracket attached to the instrument panel which allows adjustment for position of steering wheel.

Steering wheels are ebony finished wood rims mounted on black enameled spokes. The large diameter hub prevents the fingers being caught between the light and throttle levers and the wheel spokes.

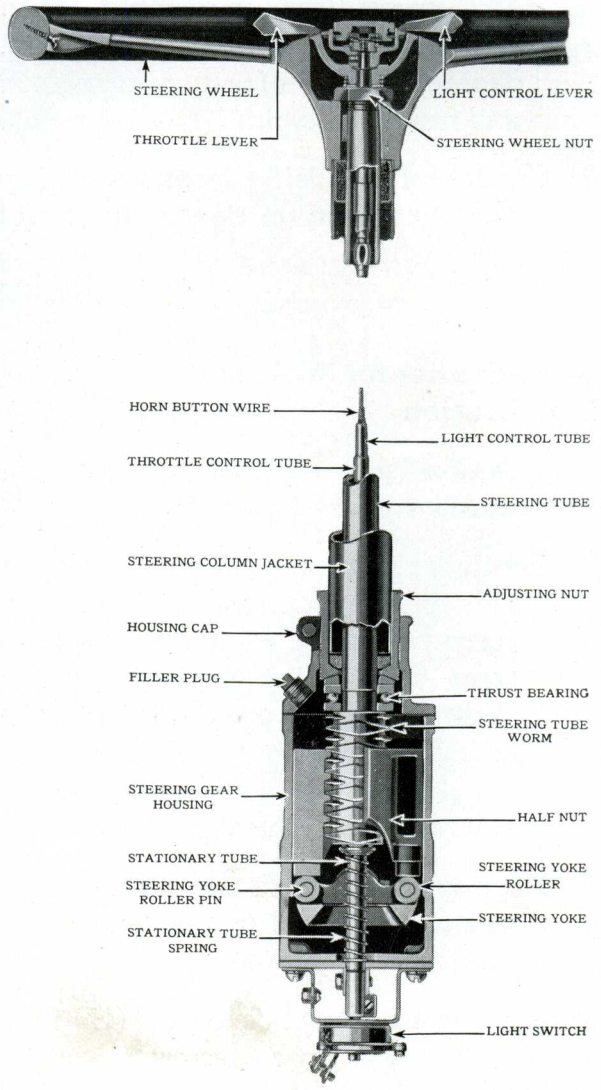

Fig. 74. Steering Gear—Sectional.

Steering Gear Details

Ratio.....16 to 1
Worm dia.....$1\frac{3}{4}$″
Steering tube dia.....$\frac{13}{16}$″
Mast jacket dia.....$1\frac{1}{2}$″
Pitman arm shaft, dia.....$1\frac{1}{8}$″
Pitman arm—Length..... 7″
Pitman arm shaft bearing,
Length .....$4\frac{5}{8}$″
Steering wheel dia.....17″
Turning circle dia..... 38.6 ft. right or left

Pitman Arm

Pitman arm, of drop forged and heat treated steel, is splined to the Pitman arm shaft. A hardened and ground steel ball integral with the lower end connects with the steering connecting rod.

Steering Connecting Rod

The steering connecting rod is made of

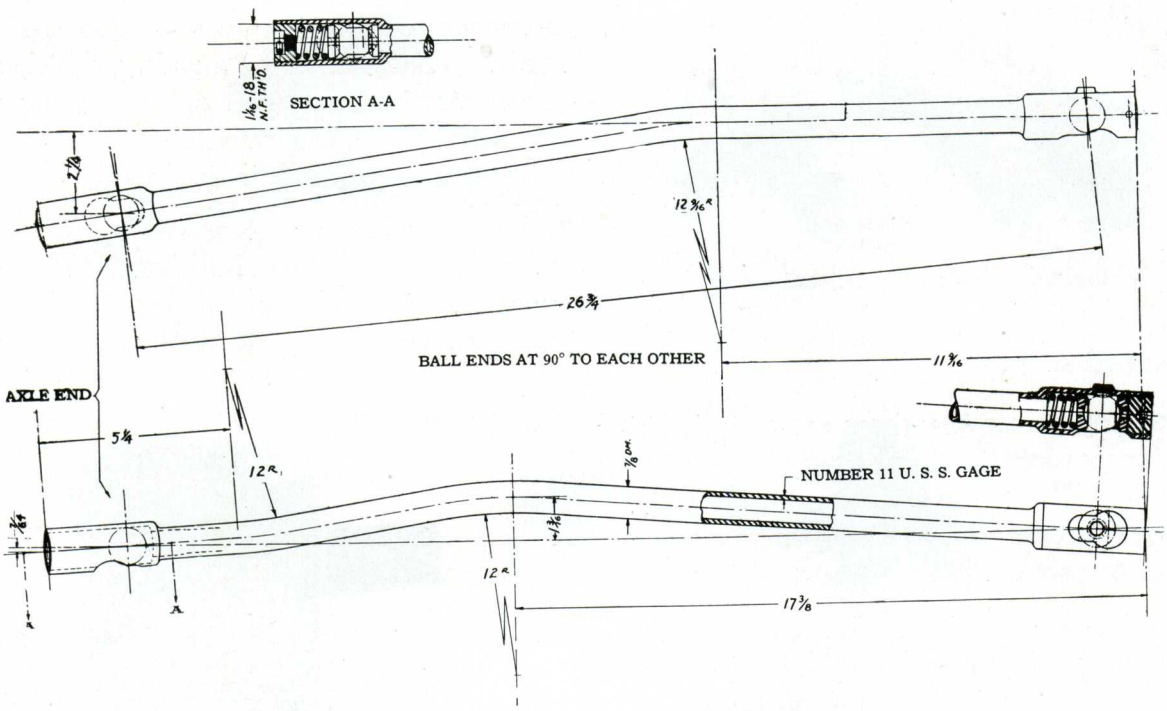

Fig. 75. Steering Connecting Rod—Details.

seamless steel tubing with swaged ends carrying split socket plugs. Each socket is provided with a spring to relieve Pitman arm of road shocks.

Tubing dia. . . . . $\frac{7}{8}$"
Wall thickness . . 11 Gage

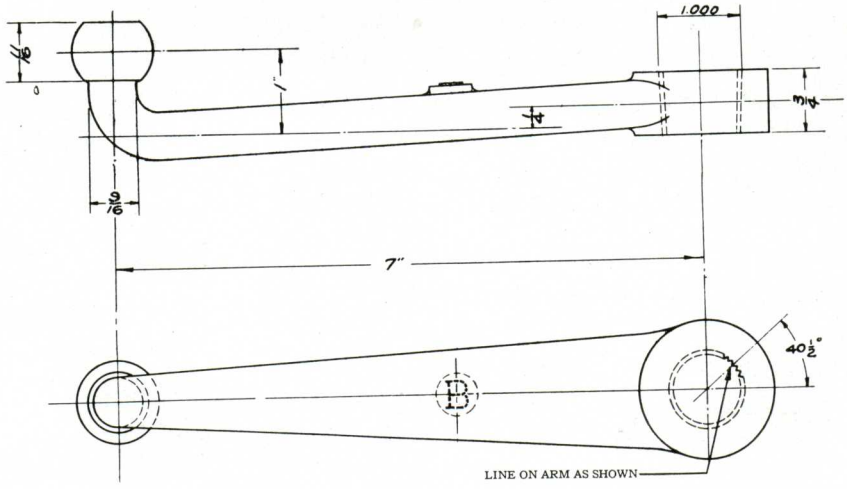

Fig. 76. Pitman Arm—Details.

Speedometer

AC 80-mile speedometers are used on all models.

The speedometer drive gear is keyed to the front universal joint companion flange and the driven gear is supported in the rear cover plate of the transmission.

The gears are lubricated automatically from the transmission.

Speedometer Gears

Driven. 16-T
Driving. 5-T

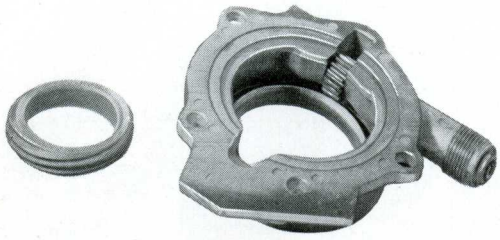

Fig. 77. Speedometer Drive Gears.

Shock Absorbers

Lovejoy shock absorbers are supplied as regular equipment front and rear on all models. These have been calibrated to function properly with the springs of each model to provide best riding qualities.

The size of the by-pass valve is indicated by the number stamped on the heads of the valve nuts as given in following table:

Models 30-35-36-36S

Rear—Right.....1511E -3C
Left.....1511F -3C
Front—Right.....1512L -2C
Left.....1512M-2C

Model 34

Rear—Right.....1511E -5C
Left.....1511F -5C
Front—Right.....1512L -3B
Left.....1512M-3B

Model 37

Rear—Right.....1511E -2C
Left.....1511F -2C
Front—Right.....1512L -2B
Left.....1512M-2B

Frame

The frame side rails are made of heavy pressed steel channels, 5½" deep x 3" wide x ⅛" thick. The lower flange is rolled downward throughout the central portion to stiffen the channels. Five heavy cross members are rigidly gussetted to the side rails. The front cross member, which also supports the front end of the engine and the radiator, is exceptionally heavy to prevent weave of radiator and hood.

The rear end of frame has a "kick up" over the rear axle to allow sufficient "ride" of the rear springs and to provide low car appearance. The side rails taper from a width of 28" at the front to 44⅜" at the rear to provide short turning radius of front wheels and furnish an extremely wide mounting for the body.

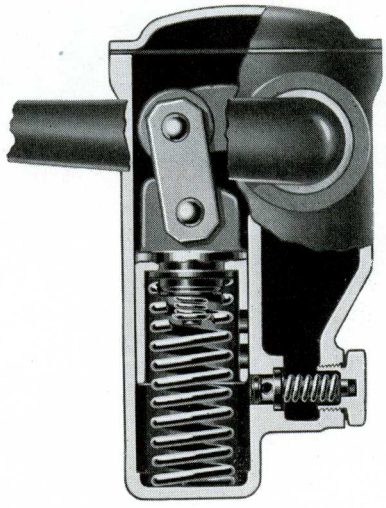

Fig. 79. Cut-a-Way Shock Absorber.

Chassis Lubrication

Zerk high pressure lubrication system is used on the chassis. Hand gun is included in the tool kit.

Tire Carrier

Full circle type carrier is supplied as regular equipment. It is attached to the rear of the frame by two pressed steel brackets.

Starting, Lighting and Ignition

The Delco-Remy system of starting, lighting and ignition is used. This system is a six-volt, single wire or grounded type, the engine and frame of car forming the return side of the circuit. The negative pole of the battery is grounded to the side member of frame and the front engine arm to the front cross member by flexible copper straps.

The equipment consists of the following units:

	Model No.	Buick Part No.
Starting motor	714N	1835377
Generator	943K	829717
Lighting switch	486B	824515
Ignition coil	528Q	1835307
Distributor assembly	639Y	829739
Signal lamp switch	466G	829751
Current limit relay	410A	820871
Cut-out relay	265G	827842
Horn	K-18B	829749
Signal lamp—Black		910406
Signal lamp—Chrome		910407
Battery	3-VXA-13-1	227588
"	Delco-Remy 13-D-W	825713

Starting Motor

The starting motor, mounted on the flywheel housing at the left side of the engine, is a direct drive mechanical shift type. It is a four-pole unit with field coils connected in series with the armature. Two bronze bushings support the armature shaft. Engine oil should be used for lubrication of the outer bearing, inner is self lubricating.

Engagement is made with the flywheel through the drive gear unit, which consists of a pinion, spring, shifting collar and over-running clutch. This unit is mounted on the splined armature shaft and is moved endwise by the shifting yoke. The yoke is connected to starter pedal by a cross shaft.

Initial movement of starter pedal moves pinion into engagement with the flywheel ring gear and further movement closes the starter switch, causing the armature to revolve and crank the engine. If the alignment of pinion and ring gear teeth is such that they do not mesh, the spring behind the pinion compresses and when the armature begins to rotate forces pinion into engagement. The over-running clutch automatically disconnects the drive unit from the armature shaft to prevent the flywheel driving the armature at high speeds before the starter pedal is released.

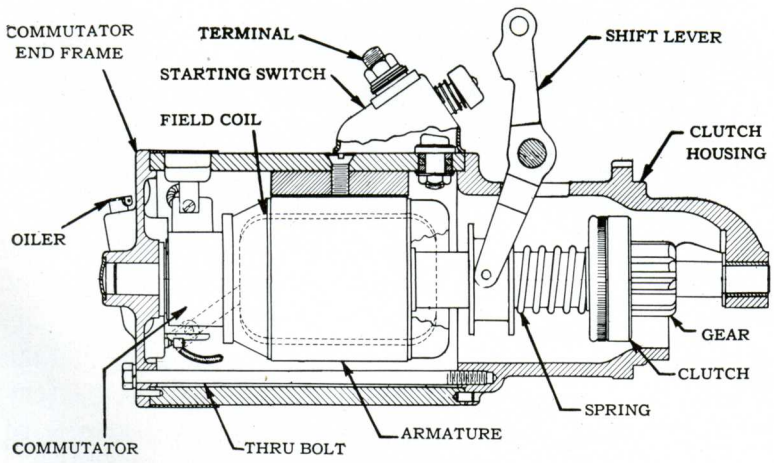

Fig. 80. Starter—Sectional.

The flywheel teeth are cut in a heat treated steel ring shrunk on and welded to the flywheel.

No. flywheel teeth 114

No. pinion teeth 9

Pitch 8-10

Reduction 12.66

Generator

The generator is mounted at the left side of engine and driven by the V type water pump and fan belt. Its position may be adjusted to provide proper tension on belt.

Generator is a two-pole shunt wound unit, with third brush and thermostat regulation of charging rate. The armature is driven at 1½ times crankshaft speed in a clock-wise direction looking at the front end.

The generator starts charging at a car speed of 8 to 10 miles per hour. Below this speed, current is drawn from the storage battery. A cut-out relay is provided to prevent battery from discharging through generator below charging speed.

Control of the charging rate is by a third brush on the commutator and a thermostat in the circuit. The ordinary type of shunt wound generator furnishes a current that increases with the speed. A third brush applied to a shunt wound generator produces a current output that reaches its maximum at a car speed of approximately 25 miles per hour and automatically decreases above that speed. The third brush is mounted on a movable plate locked to the housing by a screw. Adjustment is made by loosening the screw and shifting the position of the brush in the direction required.

Armature is supported by a ball bearing at the front end and a plain bronze bearing at the rear. Engine oil should be used for lubrication.

The thermostat is an automatic switch which allows the maximum flow of current when generator is cold and which reduces the charging rate as the generator becomes hot. Because of this unit, it is unnecessary to change the third brush setting for Winter or Summer driving.

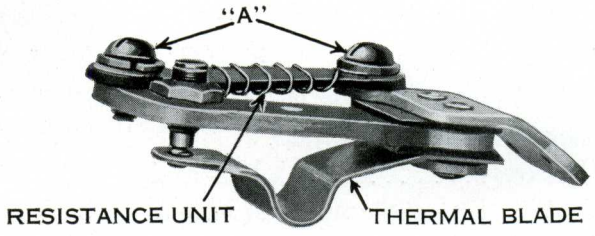

Fig. 82. Thermostat Unit.

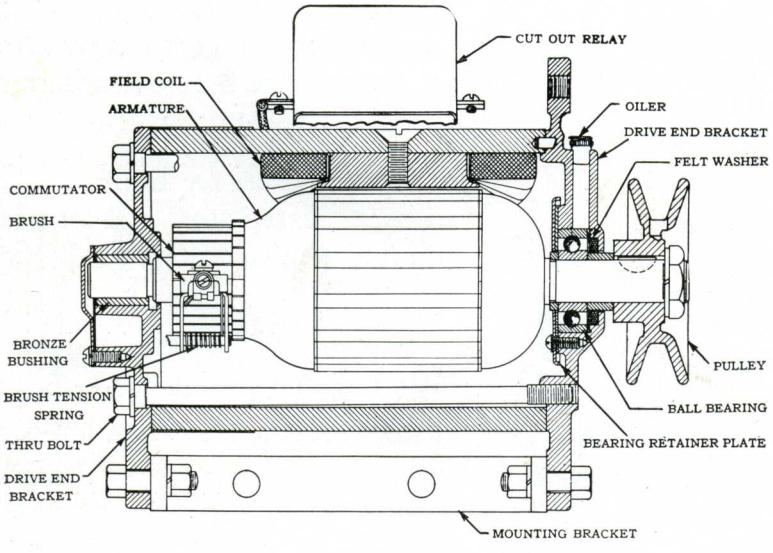

Fig. 81. Generator—Sectional.

Cut-Out Relay

The cut-out relay mounted on the generator is magnetically operated. It closes the circuit between the battery and generator when the voltage of the current generated exceeds that of the battery. It opens the circuit when the generator voltage drops below that of the battery thus preventing discharge of battery through the generator.

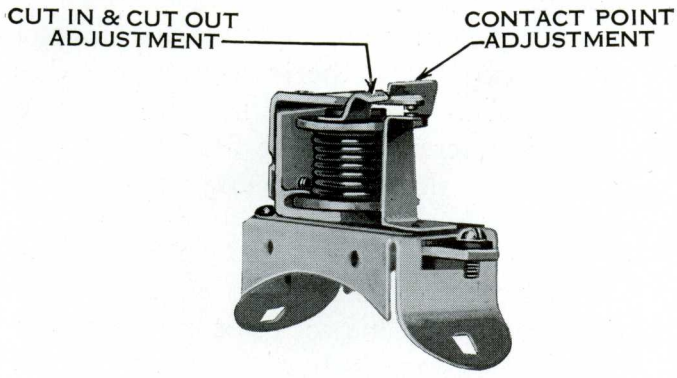

Fig. 83. Cut-Out Relay.

Distributor

The distributor is mounted above the cylinder head and is driven by a spiral gear on the camshaft at one-half crankshaft speed. It is a combined automatic and manual spark advance type. The automatic governor advances or retards the spark in proportion to the engine speed, eliminating the necessity of frequent use of the spark control button on the instrument board.

The distributor in the fully advanced position is set to fire 7° before upper dead center, measured on the flywheel.

The automatic advance cuts in at an engine speed of 400 to 700 R. P. M. and gradually advances the spark 19° to 23° giving a total advance of manual and automatic of 26° to 30°.

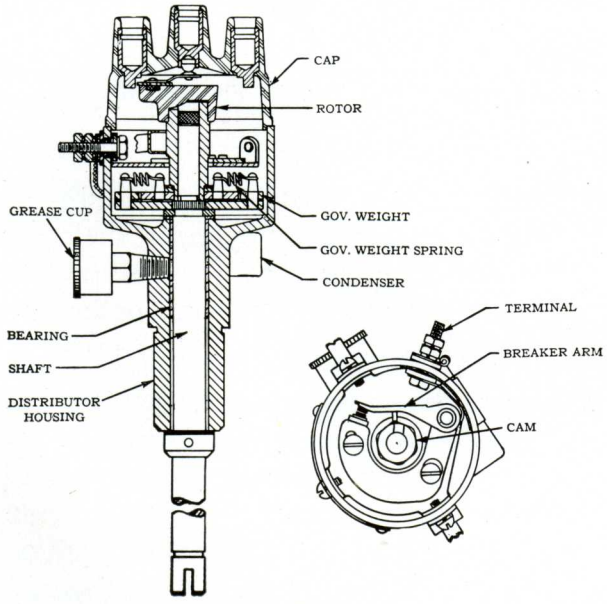

Fig. 84. Distributor—Sectional

Condenser

The condenser contained in a water proof metal case is mounted on the side of the distributor housing. Its purpose is to reduce sparking at the breaker points and to utilize this energy to build up a higher voltage in the high tension circuit than would otherwise be obtained. It is connected in parallel with the breaker points but the current does not pass through the condenser and should show an open circuit when tested with direct current.

Ignition Coil

The ignition coil is mounted on the back of the instrument board. Its purpose is to convert the low voltage primary current from the battery or generator to a very high voltage capable of jumping the gap in the spark plugs.

Because of the type of winding employed no resistance unit is required with this coil. The primary winding is outside the secondary winding. The increased diameter thus obtained adds sufficient wire to the primary circuit to produce the proper resistance value. The resistance in the secondary circuit is low due to the small diameter of the winding which materially adds to the efficiency of the coil.

This type of coil produces an exceptionally hot spark with a low consumption of current and increases the life of the breaker points. The ignition switch and lock are coincidental and mounted in the coil.

Spark Plugs

AC Type G12 metric plugs are used. Gap should be .025″ to .030″.

Ignition Timing

When timing ignition, breaker points should always be adjusted first as shown in Fig. 85.

CAUTION: Always recheck timing after adjusting breaker point opening.

1. Remove spark plug from No. 1 cylinder, as shown in Fig. 86, and crank engine by hand until piston in this cylinder starts upward on its compression stroke. This can be determined by placing thumb over spark plug hole. Continue to crank engine slowly, after uncovering the timing inspection hole on left side of flywheel housing, as shown in Fig. 87, and watch for the "5° advance" mark on flywheel. This mark should be lined up with the corresponding mark on the flywheel housing.

2. Fully advance the spark, as shown in Fig. 88, by making sure that control knob (A) on the instrument board is pushed all the way in, and that the stop screw (B) is at the extreme end of the slot in the timing clamp of the distributor.

3. Remove distributor cap and see that rotor is in line with slot in upper edge of housing, as shown in Fig. 89. This slot should then point toward right side of engine. The high tension wire attached to the terminal directly above the slot should then connect with the spark plug in No. 1 cylinder, the other wires connecting to their respective cylinders in the following order and in a clockwise direction; 1-5-3-6-2-4.

4. Loosen the timing clamp screw (E) and rotate housing, as shown in Fig. 90, in a counter-clockwise direction until the breaker points just barely open. View (C) in Fig. 89 shows the position of the rubbing block (D) on the cam when spark occurs. This can be de-

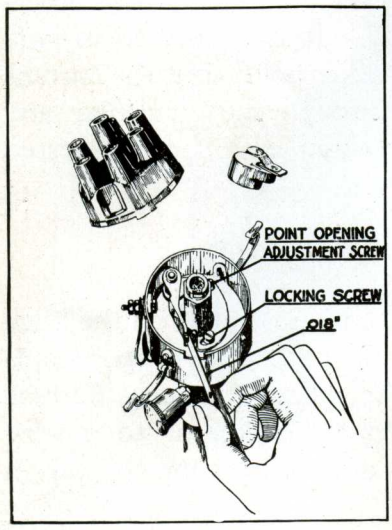

Fig. 85. Braker Adjustment.

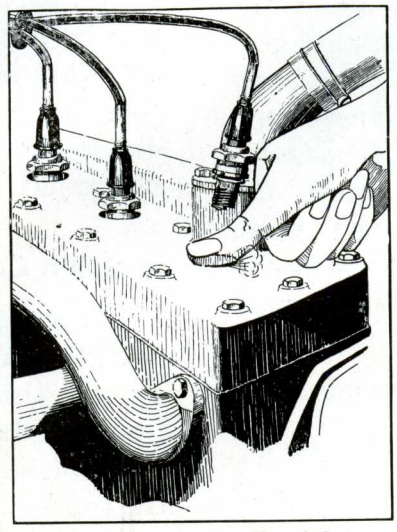
Fig. 86. Determining Dead Center.

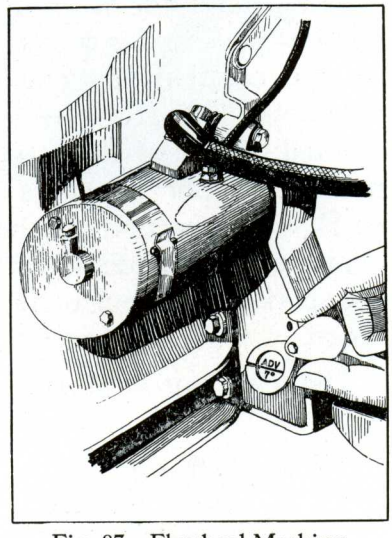

Fig. 87. Flywheel Marking.

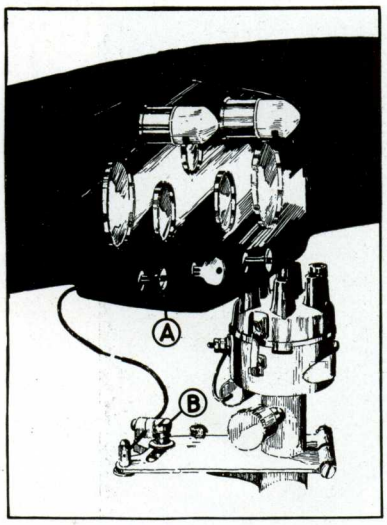

Fig. 88. Spark Advanced.

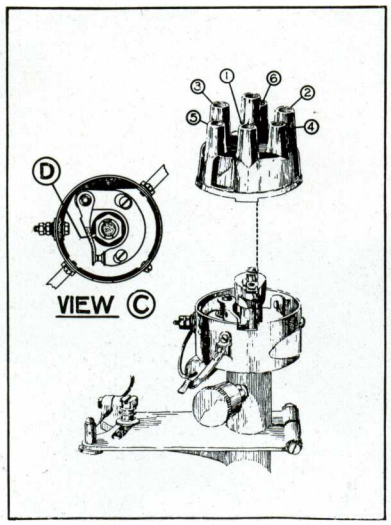

Fig. 89. Rotor Setting.

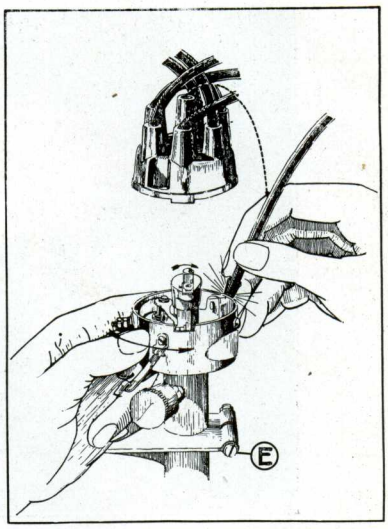

Fig. 90. Checking Timing.

termined by turning on the ignition and holding the wire which connects to the center terminal on distributor cap to form a gap with the metal parts of the housing, as shown in Fig. 90. Tighten adjusting clamp securely, making sure that distributor housing is not moved during this operation.

Head Lamps

The head lamps have an adjustable mounting on a tie rod between the fenders and are supported on rigid posts. Special reflectors and lenses are used and the bulbs are two filament type, both filaments being of the same candle power.

Head Lamp Adjustment

Head lamps should be adjusted to comply with state or local requirements. Reference to Fig. 92 will show the pattern of beams from both lamps when correctly adjusted. This adjustment will be obtained by observing the following procedure:

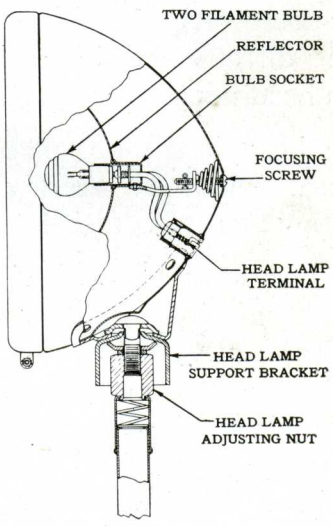

Fig. 91. Head Lamp.

1. Place the car on a level floor with a garage door or other light colored vertical surface 25 feet ahead. Draw a horizontal line on this vertical surface at a level 4″ below the height of the lamp centers, this allowance being made to compensate for the position of head lamps when car is fully loaded. Sight through the center of the rear window over the radiator cap, and so determine a point on the horizontal line midway between the lamps. Lo-

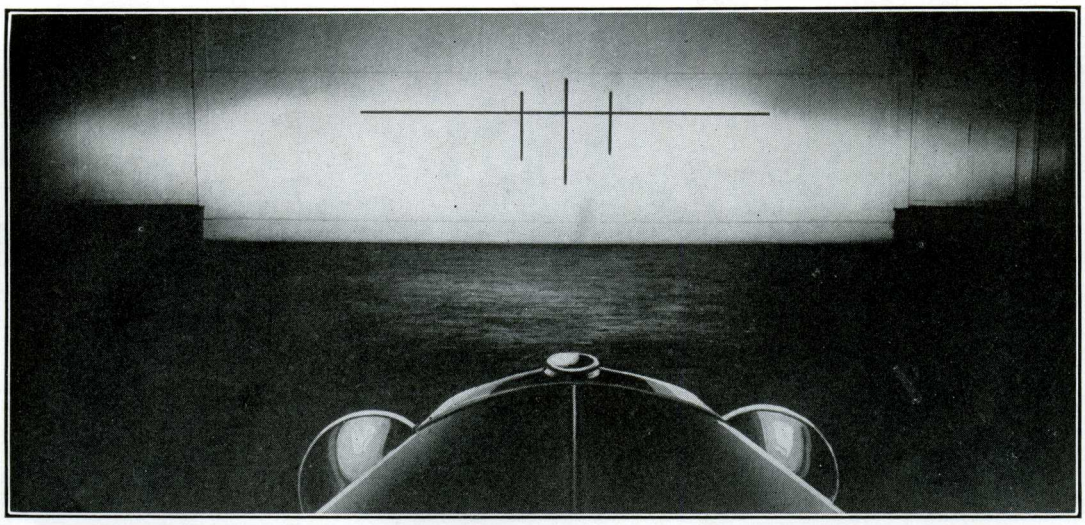

Fig. 92. Head Lamp Adjustment.

cate points on both sides of this center point, directly ahead of the center of each head lamp.

2. Switch head lamps on, place lighting control switch on steering wheel in position marked brt. (bright).

3. Cover one head lamp to obscure the light beam, while adjusting the other. Turn the focus adjustment screw on the back of the uncovered lamp until a beam is obtained having highest intensity at the top and a sharp upper outline and as narrow as possible, measured from top to bottom. Loosen the mounting nut, aim the lamp so that the top of the beam coincides with the horizontal line on the vertical surface, and is equally divided by the vertical line directly ahead of the head lamp center. Tighten the head lamp adjusting nut securely and check the position of the beam to see that it has not changed.

When installing new bulbs always check the head lamp focus to insure against glaring and illegal lights and to provide proper road illumination.

In replacing parts always use genuine parts such as furnished with original equipment.

Current Limit Relay

The current limit relay is mounted on the inside of the dash panel. This device protects the lighting circuits, switch and battery. The normal flow of current does not affect the relay but in the event of a ground

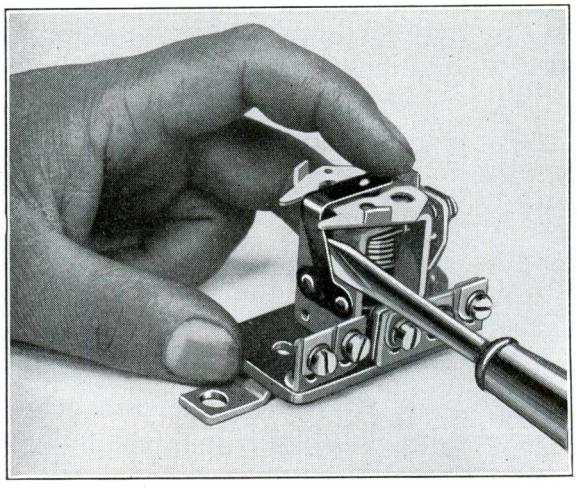

Fig. 93. Current Limit Relay.

in any circuit the relay intermittently breaks the flow of current. The clicking sound from the relay gives a distinctive warning that the short exists and this clicking will continue until the ground is removed or the switch is operated to cut off the defective circuit.

Lighting Switch

The lighting switch is mounted at the base of the steering gear and is operated by a lever above the steering wheel. The four positions of the switch are as follows:

Parking position—Lights the cowl lamps and the tail lamp.

Dim position—Lights the upper filaments of head lamps, which throws the beams directly ahead of car for a passing or courtesy light. This position also lights the tail lamp.

Bright position—Lights the lower filaments of the head lamps, throwing the beams farther ahead than when dim position is used. This position also lights the tail lamp.

Signal Lamp

The signal lamp mounted on the frame side member is a combination stop lamp, tail lamp, and license illuminating lens. Two bulbs are used, one for the tail lamp and license illumination, and the other for the stop lamp.

Signal Lamp Switch

The signal lamp switch, controlling the stop light, is mounted on the left rear engine arm and operated by the brake pedal.

Adjustment

See that brake pedal is against rubber pad under floor board. Disconnect trunion from switch lever. Set switch lever in "Off" position. Adjust trunion on rod to fit freely in upper hole in switch lever then back trunion off two turns and install in the upper hole.

Instrument Board Switch

A switch located at the lower edge of the instrument board controls this light for the instruments and the front compartment.

Lamp Bulbs

	Candle Power
Head lamp	21
Cowl lamp	3
Tail lamp	3
Signal lamp	15
Dome lamp	6
Front compartment and instrument lamps	3

Horn

Horn is a Klaxon vibrator type, Model K-18-B, mounted on the cylinder head at the left side.

Storage Battery

Exide - Type 3-VXA-13-1

Delco-Remy - Type 13-D-W

Both are 13 plate, 6 volt 85 ampere hour Capacity.

Exide Batteries are serviced by Exide Service Stations and Delco-Remy Batteries by United Motors Service Stations.

Special Cylinder Head and Rear Axle Gears

Special high compression cylinder heads and special ratio ring gears and pinions are available. These are designed primarily for the Models 34, 35, 36 and 36S. They may also be used in all models.

This special head increases the compression ratio from 5.2 to 1 to 5.7 to 1. The special rear axle gears increase the gear ratio from 4.545 to 1 to 4.25 to 1.

When using special gear reduction it is necessary to change the speedometer driven gear assembly on rear of transmission to obtain correct speedometer readings.

This special material may be ordered from the parts department under the following parts numbers.

	PART NO.
High compression head	1233005
Ring gear	992728
Pinion	992729
Speedometer driven gear assembly	552750

To obtain the relation between engine revolutions and car speeds multiply the car speed in miles per hour by the factor 51.5.

Specifications

Engine

Type . . . . . L-head
No of cylinders 6
Cylinder size . . . . . 3 1/8" bore, 4 5/8" stroke
Displacement . . . . . 212.8 cu. in.
S. A. E. H. P. rating 23.44
Actual brake H. P. . . . . 67.5 h. p. at 3000 r.p.m.
Torque—Maximum . . . . . 144.5 ft. lbs. at 1200 r.p.m.
Compression—Corrected . . . 98 lbs.
Compression ratio . . . . . 5.2 to 1
Firing order 1-5-3-6-2-4

Crankshaft

Material . . . . . Special carbon steel heat treated
Weight . . . . . 75 lbs.
Bearings—Diameter and Length
Front . . . . . 2 5/16" x 1 15/32"
Front center . . . . . 2 3/8" x 1 1/2"
Rear center . . . . . 2 1/2" x 1 1/2"
Rear . . . . . 2 9/16" x 1 29/32"
Bearing studs—Each bearing . . . . . Two, 9/16" diam.

Camshaft

Material . . . . . Carbon steel—Hardened and ground
Bearings—Diameter and Length
Front . . . . . 2 1/16" x 1 3/16"
Front center . . . . . 2 1/32" x 1 3/16"
Rear center . . . . . 2" x 1 3/16"
Rear . . . . . 1 25/32" x 1 1/16"

Connecting Rods

Material . . . . . Carbon steel
Length C. to C. . . . . 9 3/4"

Lower End Bearings
Material . . . . . Babbitt
Diameter . . . . . 2 1/8"
Length . . . . . 1 3/8"
Cap bolts . . . . . Two, (7/16" x 2 37/64")
Wrist pin diam. . . . . 13/16"

Valves

Material
Inlet . . . . . Chrome nickel steel
Exhaust . . . . . Silcrome No. 1 steel
Clear Diameter
Inlet . . . . . 1 1/2"
Exhaust . . . . . 1 3/8"
Lift . . . . . .324"
Stem diam. . . . . 3/8"
Spring Pressure
Valve open . . . . . 65 to 71 lbs.
Valve closed . . . . . 40 to 46 lbs.
Valve lash . . . . . .006" engine hot .007" engine cold
Timing
Inlet opens . . . . . 5° before upper dead center
Inlet closes . . . . . 45° after lower dead center
Exhaust opens . . . . . 45° before lower dead center
Exhaust closes . . . . . 18° after upper dead center

Camshaft drive

Type . . . . . Chain
Width . . . . . 1 1/4"

Pistons

Material . . . . . Cast iron
Compression rings . . . . . 2 above pin—1/8" wide
Oil control rings . . . . . 1 above pin—3/16" wide

Lubrication System

Type.....Pressure to main, connecting rod and camshaft bearings
Pump type.....Gear
Oil pressure.....40 lbs.
Capacity—Dry engine..7 qts.
Capacity—Refill.....6 qts.
Oil filter.....AC

Cooling System

Type.....Circulating water, thermostat control
Pump type.....Centrifugal
Pump drive.....V-belt
Radiator.....Harrison, vert. flow, ¼" Hex., all copper
Core area (frontal)..430 sq. in.
Core thickness.....2¼"
Capacity system....3 gal.
Fan—Diam.....16⅞"
No. blades.....4
Fan drive.....V-belt
Water pump and fan shaft bear....Rear, plain bronze; Front, porous bronze
Water pump and fan shaft lubr.....Rear, trans. lubr. front, oil

Carburetor

Make.....Marvel
Type.....Automatic air valve, triple jet
Model.....VM-3
Throttle Diam.....1 7/16"
Air valve diam.....1¾"
Choker diam.....1¾"
Heat control.....Marvel automatic
Inlet manifold dia...1 3/16"
Fuel feed.....AC gas pump
Air cleaner.....AC centrifugal type
Riser diam.....1¼"

Crankcase and Cylinder Block

Crankcase—Upper..Integral with cylinder block
Material.....Cast iron
Cyl. head bolts 24-7/16" dia. heat treated

Flywheel

Flywheel weight with ring.....31 lbs.
No. teeth in ring...114
No. teeth in pinion..9
Ratio.....12.66 to 1

Clutch

Type.....9" single plate
Area.....64.8
Pedal reduction....55—1
Facing size.....6⅛" I.D. x 8⅞" O. D. x ⅛" thick

Transmission

Type.....Sliding gear
Location.....Unit with engine
Gear material.....Chrome steel
Pitch of Teeth
Counter shaft drive gear.....7
Intermediate speed gears.....7
Low and reverse gears.....7-9
Gear Reduction—High.....Direct
Gear reduction—Intermediate.....1.75 to 1
Gear reduction—Low.....3 to 1
Gear reduction—Reverse.....3.857 to 1

Counter shaft bearing.....2 (7/8" diam. x 1 3/4") plain bronze
Clutch gear bearing —Front.....5/8" diam. x 11/16" Durex bushings
Main shaft pilot bearing.....Hyatt RA-135—11 Rollers, 3/16" dia., 3/4" I.D. x 1 1/8" O. D. x 1 1/2"
Main bearing—Front.....N.D. No. 1208
Main bearing—Rear.....N.D. No. 1306
Idle gear bearing...7/8" diam. x 13/16" plain bronze
Speedometer driving gear teeth.....5—2.4% fast
Speedometer driven gear teeth.....16—2.4% fast
Lubricant required to fill.....2 1/4 pts. or lbs., A-150

Chassis

Wheelbase.....114"
Tread—Front.....56 17/32"
Tread—Rear.....57"
Rim size.....18" x 4" x 1/8" thick
Tire size.....28 x 5.25
Wheel spokes.....Ten—1 1/4" thick
Frame width—Front.....28"
Frame width—Rear 44 3/8"
Turning circle.....38.6 ft. (right and left)
Clearance—Front axle.....8 1/8"

Rear Axle

Type.....Semi-floating
Housing material...Pressed steel
Drive—Final.....Spiral bevel
Axle shaft material.Manganese steel
Differential case....Malleable iron
Differential type....2-pinion
Wheel bearings.....Hyatt No. 307—13 rollers 1/2" x 1 1/16"
Pinion shaft bearings—Front..N.D. double row ball—No. 5306
Pinion shaft bearings—Rear..N.D. single row ball —No. 1307
Differential bear....N.D. single row ball —No. 0208
Lubricant required to fill.....3 pts. or lbs. A-150
Type drive.....Hotchkiss
Teeth in ring gear (all models).....50
Teeth in pinion gear (all models).....11
Reduction.....4.545 to 1

Propeller shaft and Universal Joint

Diameter of joint...3 7/8"
Diameter of pins...19/32"
Diameter of propeller tube.....2"
Lubrication.....Trans. lubr. A-150

Front Axle

Type.....Reverse Elliott
Section.....“I” beam
Size of section.....2 1/8" x 7/32" x 1 3/4" wide
Material.....High carbon steel
Tie rod location....Rear
Spindle diam.—Large.....1 5/16"
Spindle diam.—Small.....3/4"

King pin diam.....⅞″
Knuckle bearings...Two bronze, 1¼″ long
Vertical thrust bearings.....17 balls—¼″ diam.
Wheel bearings—Inner.....N.D. No. 909024 cup and cone, 11 balls—9/16″ diam.
Wheel bearings—Outer.....N.D. No. 909023 cup and cone, 9 balls—15/32″ diam.

Front Springs

Material.....Carbon steel
Type.....Semi-elliptic
How slung.....Over
Length.....35″
Width.....2″
Spring bolts—Front 9/16″
Shackle bolts—Rear ⅞″ self adjusting shackles
Eye bushing—Material.....Bronze No. 506
Eye bolt lubrication Zerk

Rear Springs

Material.....Silicon Manganese steel
Type.....Semi-elliptic—under slung
Length.....54½″
Width.....2″
Spring bolts—Front ⅝″
Shackle bolts—Rear ⅞″ self adjusting shackles
Eye bushing material.....Bronze
Eye and shackle bolt lubrication...Trans. lubricant

Brakes

Service
Type.....Mechanical—Duo Servo Internal shoe
Location.....Front and rear
Drums—Inside diameter.....12″
Type of lining....Molded to shape
Facing sizes.....1¾″ x 13″—8 pieces
Brake area.....182 sq. in.
Hand brake lever operates service brakes

Steering Gear

Make.....Jacox
Type.....Worm and split nut
Wheel diam.....17″
Ratio.....16 to 1
Steering tube diam. .13/16″
Steering jacket diam.....1½″
Thrust bearing.....12 balls—¼″ diam.

Electrical System

Starter, generator...Delco-Remy
Distributor.....Delco-Remy
Starter reduction...12.66 to 1
No. teeth in pinion.9
Voltage of system...6
Generator charging rate—Cold.....18-20 amps.
Generator speed to crankshaft.....1½ to 1
Distributor point opening.....018″ to .025″
Spark plug.....AC—G12
Spark plug gap.....025″ to .030″
Head lamps.....Tilt ray
Double filament bulb.....21-21 C.P.
Tail and side.....3 C.P.
Instruments lamps..3 C.P.
Dome lamp.....6 C.P.
Stop lamp.....15 C.P.
Battery—Exide....3VXA13-1
Capacity.....85 amp. hrs.
No. plates.....13

Dimension Limits

ENGINE

	Limits for Fitting New
Cylinders and Pistons	
Piston clearance in cylinder bore with feeler ½" wide	.0015"-.0025"
Piston ring gap	.010" -.015"
Piston ring side clearance in groove	.001" -.0025"
Main and Connecting Rod Bearings	
Connecting rod radial clearance on crank pin	.0015"-.0025"
Connecting rod side clearance on crank pin	.005" -.009"
Crankshaft end play at rear center bearing	.004" -.007"
Main bearing radial clearance on crankshaft	.0015"-.0025"
Camshaft and Valve Mechanism	
Camshaft radial clearance in bushings—	
Front	.0005"-.0025"
Other three	.0005"-.0035"
Camshaft end clearance	.002" -.006"
Valve stem clearance in guide (exhaust)	.0035"-.0055"
Valve stem clearance in guide (intake)	.0015"-.0035"
Valve tappet adjustment	.006" hot-.007" cold
Valve spring tension (when compressed to 1 15/16")	65-71 lbs.
Oil Pump Assembly	
Lash between oil pump driving and idler gear	.004" -.006"
Clearance between oil pump driven gear and shaft	.0005"-.0025"
Drive shaft bearing clearance	.0005"-.0025"
Clearance between gears and cover	.0015"-.0055"
Water Pump and Fan Assembly	
Clearance between shaft and bearings	.0015"-.0035"
End play of shaft	.002" -.003"

AXLES

Front Axle	
Front wheel toe-in	See page 37
Castor (car unloaded)	1¼°-2¼°
Camber	See page 37
King pin inclination (bottom outward)	9½°
Clearance between king pin and spindle bushings	.0005"-.0025"
Clearance between spindle and bearing cones—	

Front Axle—continued

Inner	.0004″-.0014″
Outer	.0003″-.0013″

Rear Axle

Clearance between splines on axle shaft and splineways in side gears	Max.-.004″

CLUTCH

Clutch pedal free movement	1″-1¼″
Clutch spring pressure at 1 11/16″	105-115 lbs.

ELECTRICAL SYSTEM

Charging rate (cold) (dash reading)	18-20 amps.
Spark plug gap	.025″ -.030″
Breaker point gap	.018″ -.025″
Ignition timing	7° Advance

Bodies

General Exterior and Interior Specifications

All Models are built with a wheelbase of 114″ and use the same gear ratio in the rear axle. The following general equipment is common to all models:

One piece fenders.
Cowl lamps.
Windshield wiper
Cowl mouldings chrome plated.
Head lamp posts chrome plated.
Gas tank cover.
Bumper brackets integral with frame.
Steering column adjustable for clearance between wheel and cushion.
Tail and stop light in combination.
Large dust proof head lamps.
Distinctive colors for each model.
Exterior polished parts chrome plated.

Instrument Panel

Instrument panel carries the following instruments neatly grouped and visible to both driver and passenger—

Speedometer.
Fuel gauge.
Oil gauge.
Water temperature gauge.
Ammeter.

Included with the instruments are the ignition lock, carburetor choke, spark control and windshield wiper buttons.

Instrument panel and front compartment are lighted by two lamps, the switch for which is located at the lower edge of the panel.

Closed Model Details

Bodies by Fisher.
Non-glare Fisher V-V type windshield.
Adjustable front seats. Model 30, driver's seat only.
Military sun visor.
Specially designed hardware.
Dome lights.
Foot rests.
Robe rails.
Ash receivers in sedan models.
Automatic windshield wiper.
Rear vision mirror.
Upholstery of good quality mohair plush in colors selected to harmonize with exterior colors.
Remote control door handles.
Easy operating window regulators.
Pockets in doors.
Arm rests in rear compartment of sedan models.
Front compartment completely trimmed.
Rubber floor mat in front compartment.

Special Equipment

The following special equipment may be had for any model:

Fender wells.
Trunk rack.
Bumpers.
Demountable wire, disc and wood wheels.
Special rear carrier for demountable wheel.

Model 30—Five Passenger Two-Door Sedan

This is a roomy comfortable all purpose car. The doors are wide and the folding front seats allow easy access to the rear compartment.

Model 34—Four Passenger Sport Roadster

This model is specially finished, having full chrome plated head and cowl lamps, natural wood wheels, and a dickey seat in the deck compartment. A side door is also provided for easy access to the deck compartment.

The top folds into a neat thin package. Bows are natural wood fitted with chrome plated slat irons.

Seats are low and comfortable and there is plenty of leg room for driver and passenger.

Trimming is a good grade of leather. Front and rear compartments are completely finished and fitted with rubber mats.

The windshield is a ventilating and folding type.

Model 35—Five Passenger Phaeton

This is a roomy five passenger, all purpose open car. It has well proportioned front and rear compartments which are completely finished.

Top is fitted with well finished weatherproof side curtains with large lights, and fitted with supports to permit them being opened with the doors.

The windshield is a ventilating and folding type.

Model 36—Two Passenger Business Coupe

This is a well proportioned sturdy two passenger business coupe. The large deck door hinged at the front gives access to the spacious rear compartment. This combined with the large front doors makes this a model particularly adapted for business use.

Model 36-S—Sport Coupe

This is an especially finished four passenger coupe with dickey seat, natural wood wheels and full chrome plated head and cowl lamps. The large doors provide easy access and good driving vision. A small door on the right side gives easy access to the deck compartment.

Model 37—Five Passenger Sedan

This is a four-door sedan which will comfortably accommodate five full size passengers. Doors and seats are especially wide.

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