Hudson

MECHANICAL PROCEDURE MANUAL

HUDSON

480-490 SERIES

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FOREWORD

The information contained herein is to be used as a guide and reference for servicing the 480 Series Hudsons.

A group index and an alphabetical index is placed in the front of the manual for easy reference.

Each section is sell-contained and is headed by its own complete index.

The procedures outlined herein are derived from the procedures established in preparing flat rate time schedules.

A thorough study of the operations, necessary tools and equipment will enable the Hudson Service dealer to perform reliable service at reasonable cost.

Each section contains ruled reference sheets for making notes of important service information pertaining to that particular section.

Special tools that have been developed for the "480 Series Hudson" are shown in their respective positions.

These tools are developed only when it is found to be essential to good workmanship and the time saving is sufficient to warrant the cost of manufacturing.

Tools are developed in conjunction with the Kent Moore Organization and are sold by them direct to Hudson Distributors and Dealers.

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SECTION 1

LUBRICATION

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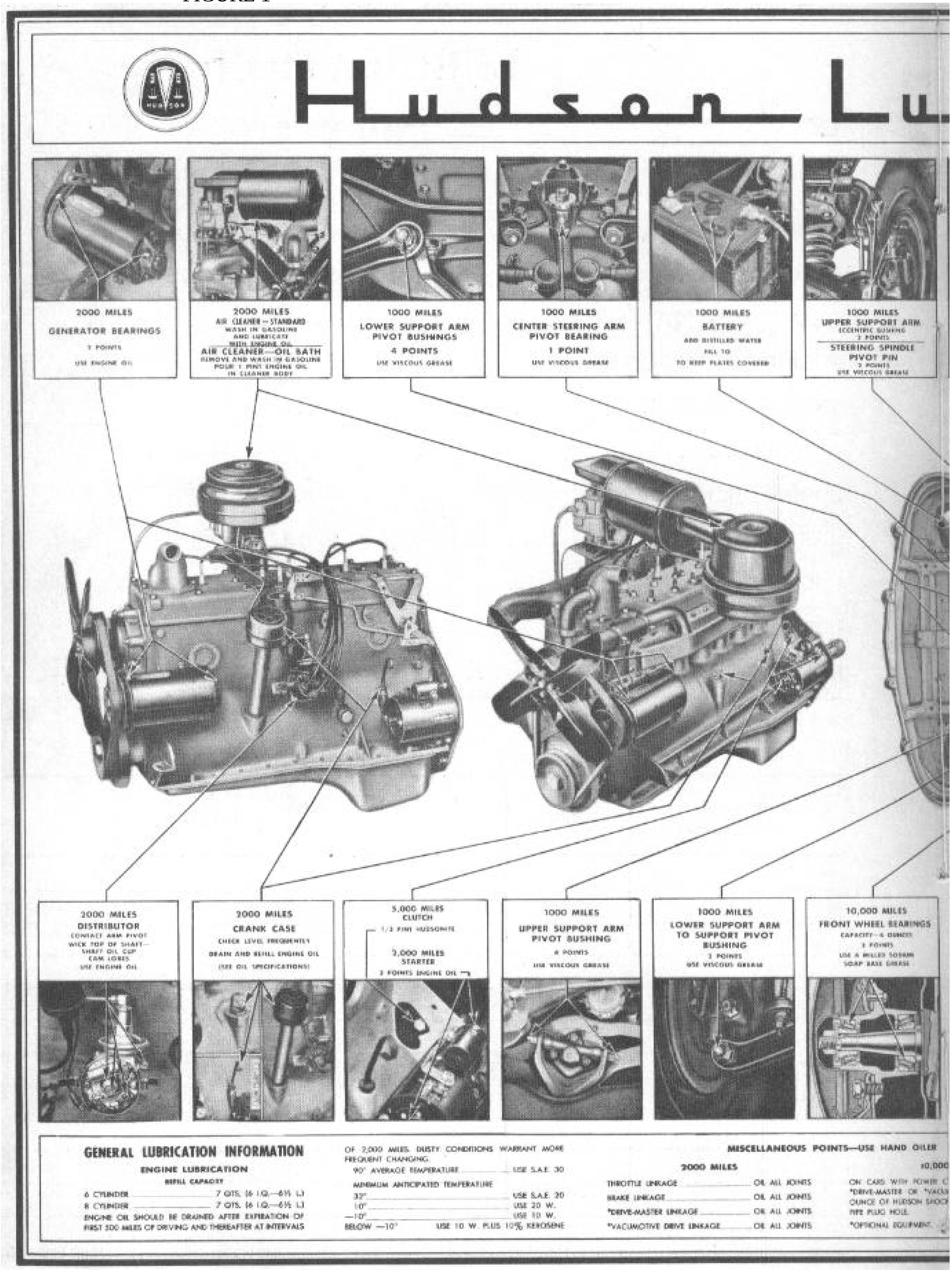
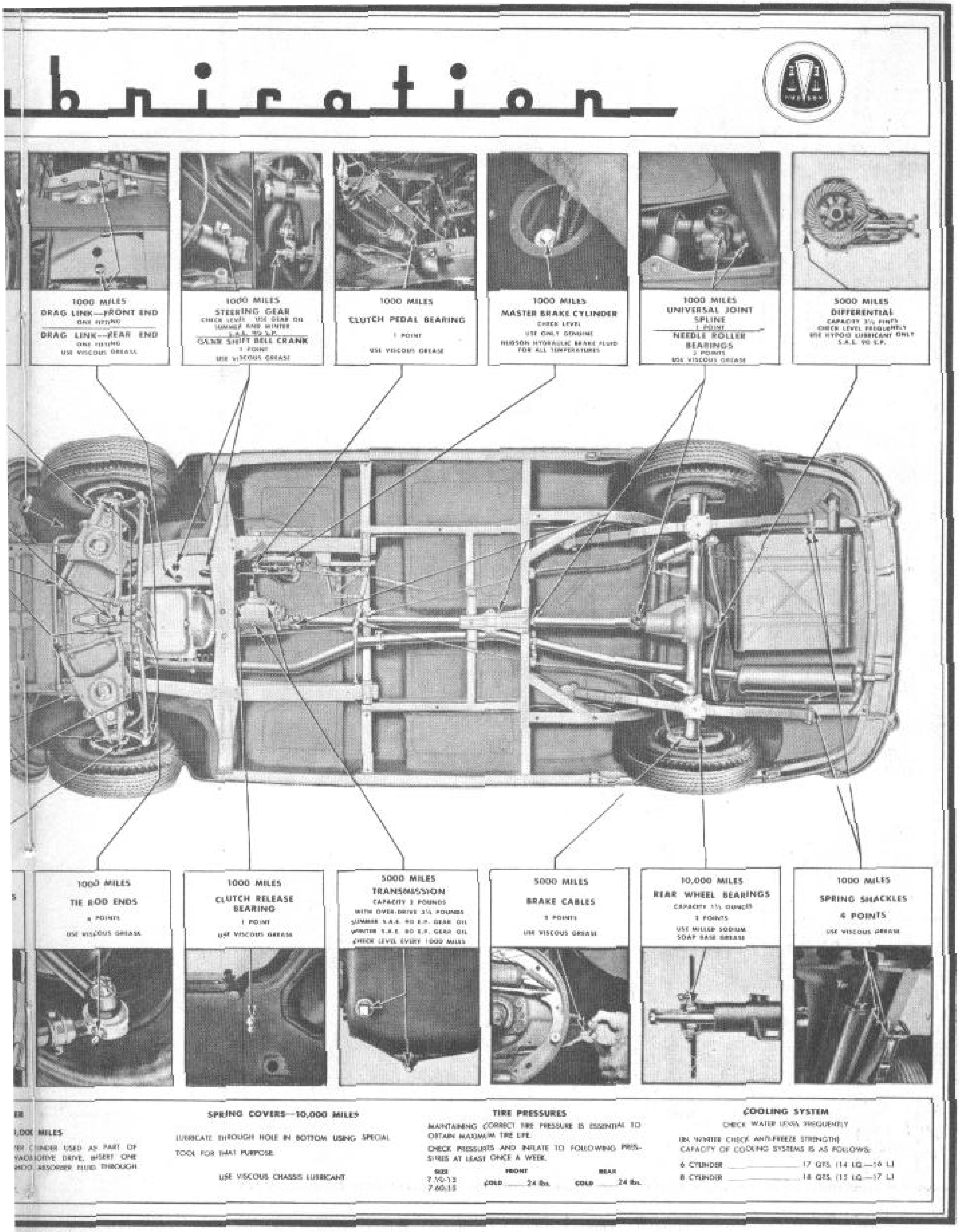
REFERENCE

Source of Information	Date	Subject

FIGURE 1


Hudson
2000 MILES
GENERATOR BEARINGS
2 POINTS
USE ENGINE OIL
2000 MILES
AIR CLEANER — STANDARD
WASH IN GASOLINE
AND LUBRICATE
WITH ENGINE OIL
AIR CLEANER—OIL BATH
REMOVE AND WASH IN GASOLINE
POUR 1 PINT ENGINE OIL
IN CLEANER BODY
1000 MILES
LOWER SUPPORT ARM
PIVOT BUSHINGS
4 POINTS
USE VISCOUS GREASE
1000 MILES
CENTER STEERING ARM
PIVOT BEARING
1 POINT
USE VISCOUS GREASE
1000 MILES
BATTERY
ADD DISTILLED WATER
FILL TO
TO KEEP PLATES COVERED
1000 MILES
UPPER SUPPORT ARM
ECCENTRIC BUSHING
2 POINTS
STEERING SPINDLE
PIVOT PIN
2 POINTS
USE VISCOUS GREASE
2000 MILES
DISTRIBUTOR
CONTACT ARM PIVOT
WICK TOP OF SHAFT—
SHAFT OIL CUP
CAM LOBES
USE ENGINE OIL
2000 MILES
CRANK CASE
CHECK LEVEL FREQUENTLY
DRAIN AND REFILL ENGINE OIL
(SEE OIL SPECIFICATIONS)
5,000 MILES
CLUTCH
1/2 PINT HUDSONITE
2,000 MILES
STARTER
2 POINTS ENGINE OIL
1000 MILES
UPPER SUPPORT ARM
PIVOT BUSHING
4 POINTS
USE VISCOUS GREASE
1000 MILES
LOWER SUPPORT ARM
TO SUPPORT PIVOT
BUSHING
2 POINTS
USE VISCOUS GREASE
10,000 MILES
FRONT WHEEL BEARINGS
CAPACITY—4 OUNCES
2 POINTS
USE A MILLED SODIUM
SOAP BASE GREASE
GENERAL LUBRICATION INFORMATION
ENGINE LUBRICATION
REFILL CAPACITY
6 CYLINDER 7 QTS. (6 I.Q.—6½ L.)
8 CYLINDER 7 QTS. (6 I.Q.—6½ L.)
ENGINE OIL SHOULD BE DRAINED AFTER EXPIRATION OF FIRST 500 MILES OF DRIVING AND THEREAFTER AT INTERVALS OF 2,000 MILES. DUSTY CONDITIONS WARRANT MORE FREQUENT CHANGING.
90° AVERAGE TEMPERATURE USE S.A.E. 30
MINIMUM ANTICIPATED TEMPERATURE
32° USE S.A.E. 20
10° USE 20 W.
—10° USE 10 W.
BELOW —10° USE 10 W. PLUS 10% KEROSENE
MISCELLANEOUS POINTS—USE HAND OILER
2000 MILES
THROTTLE LINKAGE OIL ALL JOINTS
BRAKE LINKAGE OIL ALL JOINTS
*DRIVE-MASTER LINKAGE OIL ALL JOINTS
*VACUMOTIVE DRIVE LINKAGE OIL ALL JOINTS
PIPE PLUG HOLE.
*OPTIONAL EQUIPMENT.


ubrication
1000 MILES
DRAG LINK—FRONT END
ONE FITTING
DRAG LINK—REAR END
ONE FITTING
USE VISCOUS GREASE
1000 MILES
STEERING GEAR
CHECK LEVEL · USE GEAR OIL
SUMMER AND WINTER
S.A.E. 90 E.P.
GEAR SHIFT BELL CRANK
1 POINT
USE VISCOUS GREASE
1000 MILES
CLUTCH PEDAL BEARING
1 POINT
USE VISCOUS GREASE
1000 MILES
MASTER BRAKE CYLINDER
CHECK LEVEL
USE ONLY GENUINE
HUDSON HYDRAULIC BRAKE FLUID
FOR ALL TEMPERATURES
1000 MILES
UNIVERSAL JOINT
SPLINE
1 POINT
NEEDLE ROLLER
BEARINGS
3 POINTS
USE VISCOUS GREASE
5000 MILES
DIFFERENTIAL
CAPACITY 3½ PINTS
CHECK LEVEL FREQUENTLY
USE HYPOID LUBRICANT ONLY
S.A.E. 90 E.P.
1000 MILES
TIE ROD ENDS
USE VISCOUS GREASE
1000 MILES
CLUTCH RELEASE
BEARING
1 POINT
USE VISCOUS GREASE
5000 MILES
TRANSMISSION
CAPACITY 3 POUNDS
WITH OVER-DRIVE 3½ POUNDS
SUMMER S.A.E. 90 E.P. GEAR OIL
WINTER S.A.E. 80 E.P. GEAR OIL
CHECK LEVEL EVERY 1000 MILES
5000 MILES
BRAKE CABLES
USE VISCOUS GREASE
10,000 MILES
REAR WHEEL BEARINGS
CAPACITY 1½ OUNCES
USE MILLED SODIUM
SOAP BASE GREASE
1000 MILES
SPRING SHACKLES
4 POINTS
USE VISCOUS GREASE
SPRING COVERS—10,000 MILES
LUBRICATE THROUGH HOLE IN BOTTOM USING SPECIAL
TOOL FOR THAT PURPOSE.
USE VISCOUS CHASSIS LUBRICANT
TIRE PRESSURES
MAINTAINING CORRECT TIRE PRESSURE IS ESSENTIAL TO
OBTAIN MAXIMUM TIRE LIFE.
CHECK PRESSURES AND INFLATE TO FOLLOWING PRES-
SURES AT LEAST ONCE A WEEK.
SIZE
FRONT
REAR
COLD 24 lbs.
COLD 24 lbs.
COOLING SYSTEM
CHECK WATER LEVEL FREQUENTLY
(IN WINTER CHECK ANTI-FREEZE STRENGTH)
CAPACITY OF COOLING SYSTEMS IS AS FOLLOWS:
6 CYLINDER 17 QTS. (14 I.Q.—16 L.)
8 CYLINDER 18 QTS. (15 I.Q.—17 L.)

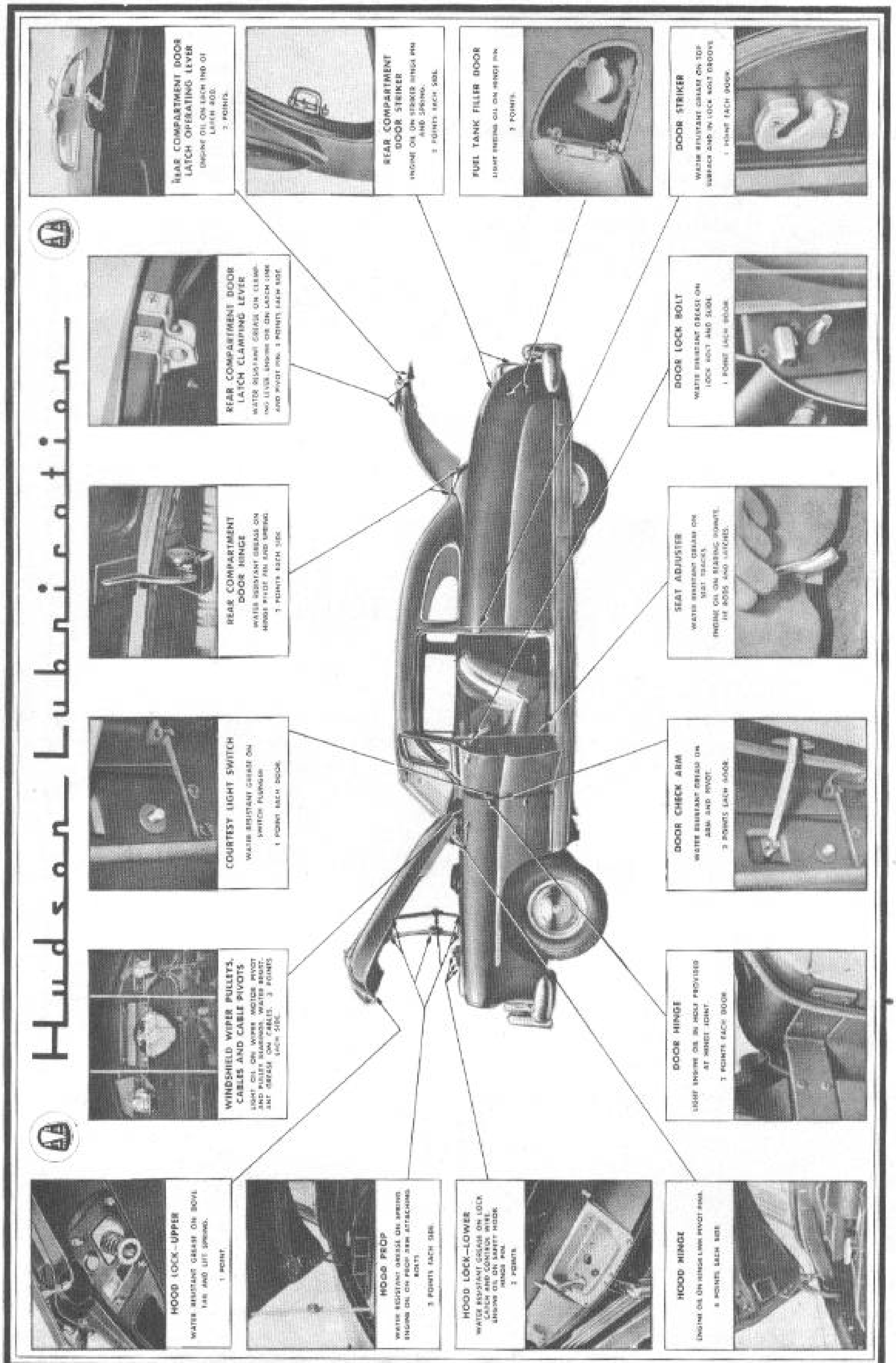

Hudson Lubrication
HOOD LOCK—UPPER
WATER RESISTANT GREASE ON DOVE TAIL AND LIFT SPRING.
1 POINT.
WINDSHIELD WIPER PULLEYS, CABLES AND CABLE PIVOTS
LIGHT OIL ON WIPER MOTOR PIVOT AND PULLEY BEARINGS. WATER RESISTANT GREASE ON CABLES. 2 POINTS EACH SIDE.
COURTESY LIGHT SWITCH
WATER RESISTANT GREASE ON SWITCH PLUNGER
1 POINT EACH DOOR.
REAR COMPARTMENT DOOR HINGE
WATER RESISTANT GREASE ON HINGE PIVOT PIN AND SPRING.
2 POINTS EACH SIDE.
REAR COMPARTMENT DOOR LATCH CLAMPING LEVER
WATER RESISTANT GREASE ON CLAMPING LEVER. ENGINE OIL ON LATCH LINK AND PIVOT PIN. 3 POINTS EACH SIDE.
REAR COMPARTMENT DOOR LATCH OPERATING LEVER
ENGINE OIL ON EACH END OF LATCH ROD.
2 POINTS.
HOOD PROP
WATER RESISTANT GREASE ON SPRING. ENGINE OIL ON PROP ARM ATTACHING BOLTS
3 POINTS EACH SIDE.
REAR COMPARTMENT DOOR STRIKER
ENGINE OIL ON STRIKER HINGE PIN AND SPRING.
2 POINTS EACH SIDE.
HOOD LOCK—LOWER
WATER RESISTANT GREASE ON LOCK CATCH AND CONTROL WIRE. ENGINE OIL ON SAFETY HOOK HINGE PIN.
2 POINTS.
FUEL TANK FILLER DOOR
LIGHT ENGINE OIL ON HINGE PIN.
2 POINTS.
HOOD HINGE
ENGINE OIL ON HINGE LINK PIVOT PINS.
6 POINTS EACH SIDE
DOOR HINGE
LIGHT ENGINE OIL IN HOLE PROVIDED AT HINGE JOINT.
2 POINTS EACH DOOR.
DOOR CHECK ARM
WATER RESISTANT GREASE ON ARM AND PIVOT.
2 POINTS EACH DOOR.
SEAT ADJUSTER
WATER RESISTANT GREASE ON SEAT TRACKS.
ENGINE OIL ON BEARING POINTS, TIE RODS AND LATCHES.
DOOR LOCK BOLT
WATER RESISTANT GREASE ON LOCK BOLT AND SLIDE.
1 POINT EACH DOOR.
DOOR STRIKER
WATER RESISTANT GREASE ON TOP SURFACE AND IN LOCK BOLT GROOVE.
1 POINT EACH DOOR.

FIGURE 2

LUBRICATION

The present day high speed driving, fast acceleration, and precision fitted engine parts have placed engine and chassis lubrication in the category of highly specialized services.

A definite plan of application is necessary to provide the various working surfaces with the right amount of the correct lubricant at the proper time.

Contrary to general belief, one type of lubricant will not suffice to all applications.

Varying load demands and operating conditions call for different types of lubricants.

You as an Authorized Hudson Dealer have been provided with a wall size Lubrication Chart covering correct factory lubrication specifications, and a definite plan of application. Your observance of this chart and its requirements will be definite assurance of customer satisfaction and goodwill.

A copy of the Wall Lubrication Chart is also included in this manual. Additional helpful information regarding the lubrication requirements are given in the Lubrication Schedules and the following paragraphs.

NOTE: The lubricants used at the time of assembly are of the best quality and need not be changed until the recommended change period shown in the Lubrication Schedule has been reached

LUBRICATION SCHEDULES

500 Miles

Drain the original engine oil at 500 miles and refill with a good grade of oil of the viscosity rating shown in the temperature and viscosity illustration, Figure 3, Page 6. For engine oil capacities of six and eight cylinder engines refer to Figure 1--Lubrication Chart and Capacities-- Page 11.

1,000 Miles

Viscous Chassis Lubricant

	Points		Points
Drag Link	2	Steering Spindle Pivot Pins	2
Upper Support Arm Eccentric Bushing	2	Gear Shift Bell Crank Pivot	1
Upper Support Arm Pivot Bushing	4	Clutch Pedal Bearing	1
Lower Support Arm Pivot Bushing	4	Clutch Throwout Bearing	1
Lower Support Arm Support Bushing	2	Universal Joint Spline	1
Center Steering Arm Pivot Bearing	1	Universal Joint Needle Rollers	3
Tie Rod End	4	Rear Spring Shackle Bushing	4

Engine Oil

	Points		Points
Engine	Check Oil Level	Rear Compartment Door Striker	4
Door Hinge	4 or 8	Rear Compartment Latch Rod	2
Gasoline Tank Filler Door Hinge and Spring	3	Hood Hinge	8
		Windshield Wiper Pulleys	4

Water Resistant Lubrication

	Points		Points
Windshield Cables at Pulleys	4	Rear Compartment Door Clamping Lever	2
Door Check Arms	2 or 4	Hood Prop	2
Courtesy Light Switch	2 or 4	Hood Upper Lock	1
Door Lock Bolt and Slide	2 or 4	Hood Lower Lock	1
Door Striker	2 or 4	Hood Lower Lock and Control Wire	2
Rear Compartment Door Hinge	2		

Gear Lubricant

S.A.E. 80 Winter

S.A.E. 90 Summer

Transmission — Check Level

Overdrive — Check Level

Steering Gear — Check Level

Hypoid Lubricant - S.A.E. 90

Rear Axle Check Level

Distilled Water

Check Battery Electrolyte level and gravity.

Water or Anti-Freeze

Check Coolant Level and Anti-Freeze strength.

Hudson Hydraulic Brake Fluid

Check Brake Master Cylinder fluid level.

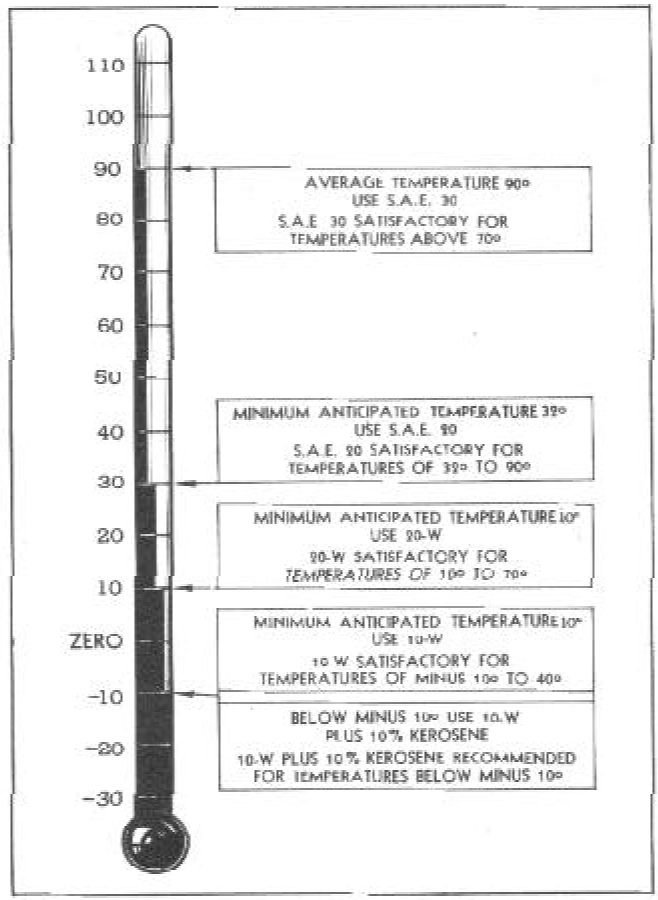


FIGURE 3

2,000 Miles

Perform operations included in 1,000 mile lubrication, in addition to the following:

Engine Oil

Engine - Drain Oil Pan and refill.		Throttle Operating Linkage	All Joints
Generator	2 Points	Oil Filler Pipe Cap (6 cylinder)	Wash and re-oil
Distributor	4 Points	Brake Operating Linkage	All Joints
Air Cleaner - Standard . . . . Wash and re-oil		Drive-Master Operating Linkage.	All Joints
Air Cleaner - Oil Bath	Remove, wash and add new oil	Vacumotive Drive Operating Linkage	All Joints

5,000 Miles

Perform operations included in 1,000 mile and 2,000 mile lubrications, in addition to the following:

Hudsonite Clutch Compound

Clutch	Drain and Refill

E.P. Gear Lubricant--S.A.E. 80 Winter, S.A.E. 90 Summer

Transmission	Drain and Refill	Overdrive	Drain and Refill

Hypoid Gear Lubricant--S.A.E. 90

Rear Axle	Drain and Refill

Viscous Chassis Lubricant

Brake Cables	Clean and Lubricate	Oil Filter	Renew Cartridge

10,000 Miles

Perform operations included in 1,000 mile, 2,000 mile, and 5,000 mile lubrications, in addition to the following:

Viscous Chassis Lubricant

Rear Spring Covers	Inject lubricant with special lubricating clamp

Sodium Soap Base Lubricant

Front Wheel Bearings	Remove, clean, and repack
Rear Wheel Bearings	Remove, clean, and repack

Hudsonite Shock Absorber Oil

Vacumotive Drive Cylinder	Remove plug and inject 1 ounce oil
Drive-Master Power Cylinder	Disconnect elbow and inject 1 ounce oil

IMPORTANT: When checking the level of the lubricant in the rear axle and transmission, make sure that the lubricant has stopped foaming. If the car has been run for a considerable length of time, it should be permitted to stand long enough to allow the oil to reach the true level before checking.

OIL FILTERS

On cars equipped with oil filters the cartridge should be replaced at 5,000 mile intervals or when the oil shows evidence of becoming dirty. When replacing the cartridge, be sure to use a new cover gasket and see that it seats properly to prevent oil leaks.

BREAK-IN OIL

Special compounds or so-called "break- in" oils are not necessary in Hudson engines. In the event it is decided to use them, make sure the supplier guarantees that they contain no harmful ingredients.

ENGINE OILING CIRCUIT

8 CYLINDER

Engine lubrication is by the Duo-Flow system which delivers oil in direct ratio to engine speed to bearing surfaces immediately from the first turn of the crankshaft. The oil is drawn from the oil pan by the double acting oscillating plunger type pump driven by the camshaft.

The oil is drawn from the sump and forced through oil lines to the front and rear of the engine where it is delivered to the front and rear troughs in the oil pan upper tray.

The oil is then picked up by the connecting rod dippers and distributed to the interior working surfaces through splash and a system of channels which convey it into wells over the crankshaft and camshaft bearings and timing gear compartment. Overflow oil running down the crankcase walls is diverted by drains in the oil pan tray into adjacent splash troughs until it reaches the center of the engine.

At this point, it is returned through the opening in the tray, then to the main oil supply where it is cooled and screened before again being used. The new design oil pan with sump at rear is provided with a floating type screened intake. This permits only the cleanest oil to be drawn off by the pump.
Both rear and front main bearing caps are packed to prevent oil leakage and a large oil retainer collects oil from the outside of the rear main bearing and returns it to the oil pan. The oil return tube leading from the rear main bearing to oil pan has a floating disc or "flapper valve", pinned on the lower end to prevent any loss of oil on extreme grades or on quick stops.

An oil check valve is mounted at the rear right side of crankcase, through which the oil from rear lead pipe of oil pump flows and controls a light on the instrument panel. A spring loaded, movable cup shaped plunger lies in the path of the oil flow. When oil pressure is too low, the plunger completes an electric circuit and lights the red dash signal. Normal oil pressure causes the plunger to recede and the circuit is broken.

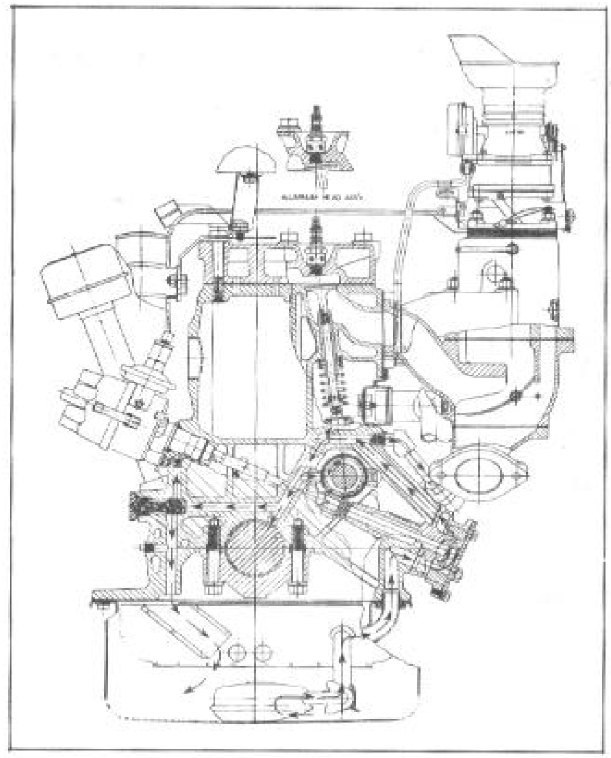


FIGURE 4

OILING CIRCUIT

6 CYLINDER

Full pressure lubrication to bearings of the engine is maintained by a rotor type oil pump mounted on the right side of lower crankcase and driven from a worm gear on the camshaft. Oil is drawn by the suction side of the pump through a pipe connecting with a floating screen in the sump, Figure 4.

The oil pump parts consist of an inner and outer rotor, a shaft, and the body and cover. Outstanding characteristics of the pump are longer life and high pressure maintained at low speeds.

Oil pressure is regulated by a built-in nonadjustable release valve and spring accessible through a plug at the left rear side of the engine.

When starting the engine the release valve has moved to a position that closes the oil passageway to the oil filter and allows full pump flow direct through the main oil gallery extending the full length of the crankcase. This oil gallery is intersected by drilled leads to main and camshaft bearings and valve lifters.

Oil pressure is supplied to the connecting rod bearings through the drilled crankshaft. Rifle bored rods convey the oil to piston pins. The angular hole drilled through the upper half of the connecting rod bearing shell seat is for the purpose of lubricating the cylinder walls. A tube fitted in the front end of main oil gallery directs a small pressure stream of oil at the point where chain meshes with crankshaft sprocket. Returned oil flows over the wide shallow portion of the oil pan where it is cooled before reaching the sump.

The oil measuring gauge seats on a tube pressed in the crankcase at left rear side. A sealed pressure type oil signal switch mounted just above the oil pump and connected with the main oil gallery, is wired to the dash oil signal light. Should oil pressure drop below approximately 13 pounds, the circuit is completed and lights the red dash oil pressure signal. Capacity of the oil pan is 7 quarts for refill and 7-1/2 quarts when pan is removed for cleaning.

ENGINE OIL CAPACITIES

The total engine oil capacity is 7-1/2 quarts for •six cylinder and 9 quarts for eight cylinder engines. When the oil is drained in the conventional manner, the refilling quantity is 7 quarts for both six and eight cylinder engines.

When the oil pan is removed for cleaning or during service work, two quarts should be placed in the oil pan tray of eight cylinder engines before the pan is installed. The remaining seven quarts should then be placed in the pan through the crankcase filler opening. In six cylinder engines the entire quantity is poured through the crankcase oil filler pipe.

CHECKING ENGINE OIL LEVEL

An engine in normal operating condition is expected to use some oil, and it is therefore not unusual to add oil between change periods. Its rate of usage is governed by the individual engine and is dependent on operating speeds, temperatures, and the viscosity and quality of the oil used.

The oil level should be checked each time fuel is added. The gauge is located on the left side of the engine and is marked to show the "Oil Level Range" and the "Low Mark", Figure 5.

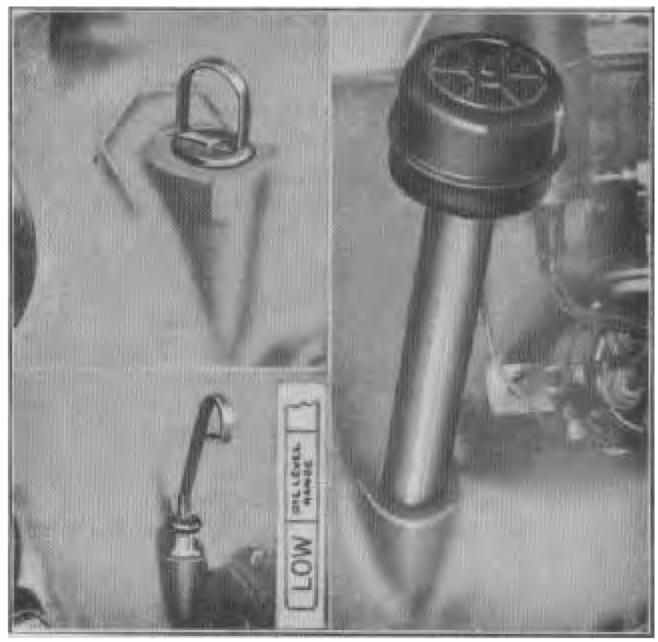


FIGURE 5

For normal operation the oil level is satisfactory when it is within the "Oil Level Range". For high speed operation the level should be maintained at the full mark which is the top line on the "Oil Level Range".

To make an accurate check, wait a minute or two after shutting off the engine to permit the oil to drain back into the oil pan. Approximately three and one-half quarts of oil are required to bring the level from low to full in both six and eight cylinder engines. If the level happens to be low and the speedometer indicates that the oil change period is near at hand, it is more economical to have the oil changed at that time.

WHEN TO CHANGE ENGINE OIL

The oil which is placed in the engine at the factory is satisfactory for the first 500 miles of operation and should then be changed.

Thereafter, at intervals of 2,000 miles, the oil pan should be drained and refilled. If the car is operated in dusty areas or for short distances at low speeds during cold weather, foreign matter and sludge will accumulate and the oil should be changed more frequently. However, the actual change period is largely dependent on the individual driving circumstances.

The oil is drained by removing the plug at the rear of the oil pan. To insure complete draining, it is important that the operation be performed while the engine is warm.

Recommend to your customer that it is a good practice to remove the oil pan at least twice a year, preferably in the spring and fall to permit thorough cleaning of the screens and pan.

CAUTION: The use of flushing oil or compounds is not recommended. However, in the event they are used, it will be necessary to remove the oil reservoir and thoroughly clean it out before installing the new oil.

THE PROPER ENGINE OIL TO USE

The use of high-grade engine oil of the correct type is of the greatest importance in obtaining maximum engine performance. Always select oils from well-known and dependable brands, and of the proper viscosity to suit the seasonal and customer driving requirements.

The oil refiners or marketers supplying engine oils are responsible for the quality of their products and their reputation, is the car owners best assurance of receiving high-grade lubricants.

TYPES OF OIL

The various types of oil marketed for engine lubrication have been defined by the American Petroleum Institute as follows:

REGULAR MOTOR OIL - This term is used to designate a straight mineral oil. Oils of this type are generally suitable under moderate driving conditions.

PREMIUM MOTOR OIL - This term is used to designate an oil having proved oxidation, stability, and bearing corrosion preventative properties. Oils of this type are generally suitable for use where operating conditions are such that regular oils do not give satisfactory service.

HEAVY-DUTY MOTOR OIL - This term is used to designate an oil having proved oxidation, stability, bearing corrosion preventative properties and detergent characteristics. Oils of this type are generally suitable for use in both high-speed diesel and gasoline engines under heavy-duty service conditions.

It is most important that the oil should have the ability to flow at low temperatures to permit easy starting, and at the same time afford adequate lubrication when the engine is at normal operating temperatures. The oil selected should be based on its ability to perform these two functions at the lowest anticipated temperatures expected before the next oil change period. The illustration, Figure 3, will be helpful in making this selection.

NOTE: Kerosene should be added only when temperatures below -10° are expected for long periods.

OIL DILUTION

The lubricating oil in the crankcase is sometimes thinned or diluted due to gasoline leaking by pistons and rings and mixing with the oil. This leakage usually occurs during the "warming-up" period when the fuel is not thoroughly vaporized and burned.

The Hudson engines are equipped with automatic devices that are designed to reduce oil thinning caused by raw fuel dilution.

In order to assist the engine to warm up as quickly as possible the water temperature is controlled by a thermostat which prevents complete water circulation for cooling until a predetermined temperature has been reached.

Another thermostat automatically controls the opening of a valve mounted inside the ex¬haust manifold to vary the amount of heat applied to the walls of the intake manifold. This item combined with the previously mentioned features greatly reduces the cold running periods.

As a further safeguard, the Hudson crankcase ventilating system is utilized to expel from the crankcase any ordinary collection of water or fuel vapors. In this system the rotating crankshaft acts as a blower to force such vapors from the case via the breather tubes on the valve chamber cover.

CRANKCASE VENTILATOR

Inlet:

The crankcase ventilator inlet is part of the crankcase oil filler cap assembly on the 6 cylinder engines. This filler cap contains copper gauze which filters the air passing into the crankcase.

The cap should be inspected every time oil is added and should be thoroughly cleaned at least every 5,000 miles. Clean in gasoline and blow dry. Re-oil the filter element gauze.

Outlet:

The crankcase outlet ventilator is mounted at the rear valve cover on both 6 and 8 cylinder engines.

In cases of excessive oil usage or leaks at rear main bearing, check the outlet breather pipe. This pipe may be plugged with dirt, and on the 8 cylinder engines, it may be restricting at the valve cover baffle. DO NOT tighten the breather outlet pipe attaching bolt more than 2-3/4 to 3-1/4 torque pounds.

CAPACITIES

Engine Oil - Dry	6 Cyl.	8 Cyl.
U.S. Quarts	7-1/2	9
Imperial Quarts	6-1/2	7-1/2
Engine Oil-Refill		
U.S. Quarts	7	7
Imperial Quarts	6	6
Clutch		
U.S. Pint	1/3	1/3
Imperial Pint	1/4	¼
Transmission		
U.S. Lbs.	2	2
Imperial Lbs.	2	2
Transmission & Overdrive		
U.S. Lbs.	3-1/4	3-1/4
Imperil Lbs.	3-1/4	3-1/4
Rear Axle		
U.S. Lbs.	3-1/2	3-1/2
Imperial Lbs.	3	3

REFERENCE

Source of Information	Date	Subject

SECTION 2

ENGINE TUNE-UP

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ENGINE TUNE-UP

Engine Tune-up is most important in maintaining engine performance, fuel economy, dependability, and complete owner satisfaction.

Today's high compression engine and high speed demands accurate diagnosis and adjustment.

Three fundamental divisions of all gasoline engines are Compression, Ignition, and Carburetion which must be synchronized and harmonized to create rhythm, smoothness, and economy in engine operation.

Only by performing the operations in the following procedure and adhering to the limits and specifications given therein is it possible to obtain the maxim performance and economy built into Hudson engines.

Impress on the owner the importance and the advantages of having a complete engine tune-up performed on his car every 5,000 miles.

Always employ a master type engine tester or analyzer to eliminate any questionable diagnosis. If the complete engine tester is not readily available, the equivalent in portable units may be used consisting of the following:

1. Vacuum and Fuel Pump Pressure Gauge
2. Compression Gauge
3. Cylinder Balance Tester
4. Power Timing Light
5. Volt-Ampere Tester
6. Coil Tester
7. Condenser Tester
8. Dwell-Tach Meter
9. Battery Starter Tester
10. Combustion Tester

NOTE: A Distributor Tester is also essential to properly check Distributor operation.

VACUUM AND CYLINDER TEST

1. Attach vacuum gauge to wiper hose connection.

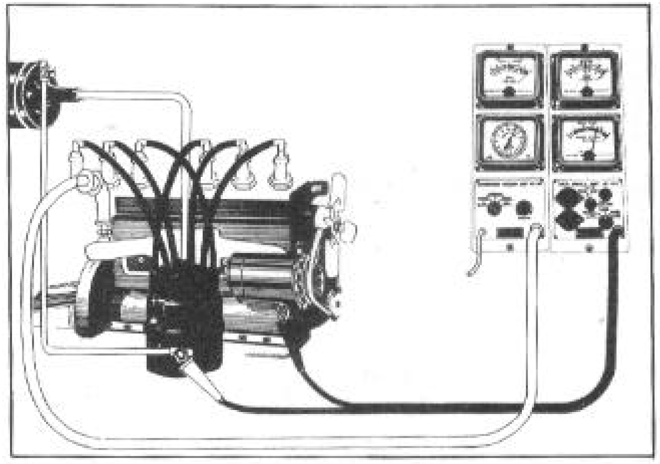

FIGURE 1

NOTE: If engine has a combination fuel and vacuum pump, disconnect the booster line and plug the manifold connection opening.

2. Determine that carburetor and intake manifold nuts are tight.

3. Adjust carburetor idle to obtain smooth operation.

4. Adjust throttle stop screw to obtain an engine speed of from 540 R.P.M. to 560 R.P.M.

NOTE: If the engine is equipped with Drive- Master, the idle speed should be set at 580 R.P.M. to 600 R.P.M.

From sea level up to 2,000 feet elevation, the vacuum gauge reading should be from 18" to 21" and the gauge pointer should hold steady or have a very slight fluttering. Above 2,000 feet elevation, the vacuum gauge reading will be about one inch lower per thousand feet rise in elevation.

NOTE: Both the standard and the combination type fuel pumps should show the same pounds pressure reading.

Steady, high vacuum readings indicate satisfactory engine timing, intake manifold, valves, pistons, and rings. Irregular vacuum readings indicate non-uniform power impulses, which may be caused by sticking, burned, or improperly adjusted valves, poor valve or ignition timing, or a carburetor that is dirty, worn, or out of adjustment. Low readings may indicate worn piston rings or late timing.

Any number of the above conditions may cause the same action of the vacuum gauge. Before condemning any unit to overhaul, inspect the valve timing and action, compression and ignition as outlined in the following steps:

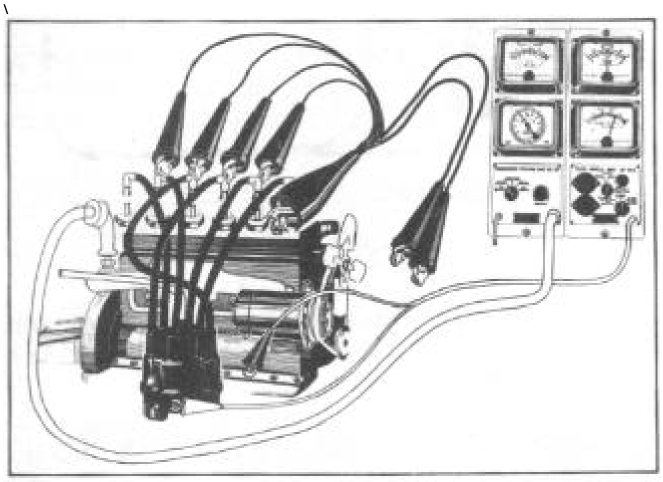

FIGURE 2

CYLINDER BALANCE TEST

1. Set the throttle until engine is running at approximately 1500 R.P.M.

2. Connect vacuum gauge hose and cylinder balance tester as shown in Figure 2.

3. With the engine running on cylinders #1 and #6, note the reading on vacuum gauge, then make the same test on all other cylinders. Move the #2 clip to #1 spark plug and the #5 clip to #6 spark plug. This will allow the engine to run on #2 and #5 cylinders. Now move the #3 clip to #2 spark plug and #4 clip to #5 spark plug.

The engine will then be running on #3 and #4 cylinders. Follow the same procedures on eight cylinder engines, making 4 tests instead of 3.

4. When conducting the cylinder balance test the vacuum gauge reading between each bank of two cylinders should not vary more than one inch.

NOTE: If one bank of cylinders reads lower than another, the indication is either a missing spark plug or unequal compression in a cylinder.

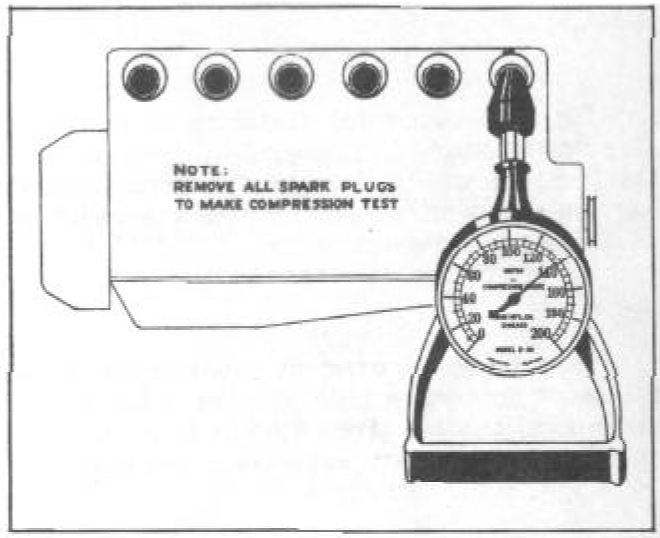

FIGURE 3

COMPRESSION TEST

1. Remove all spark plugs.

2. Record compression reading at each cylinder while cranking the engine at normal cranking speed.

3. The minimum compression readings should not be less than 100 pounds and variation between cylinders not over 10 pounds.

NOTE: If gauge moves up in jerky steps of 10 or 20 pounds at a time, it generally indicates a sticky or leaking valve. If two adjacent cylinders show low compression readings, check cylinder head gasket for leaks.

4. To determine if the trouble is in pistons, rings, or valves, inject a small quantity of oil on the top outer edges of piston and make a second compression test.

NOTE: If the reading is uniform with other cylinders, it indicates leaking rings; if not, then the valves are not seating properly, or a piston may be cracked or damaged.

5. A low compression reading on two adjacent cylinders indicates a leaky head gasket between the two low-reading cylinders.

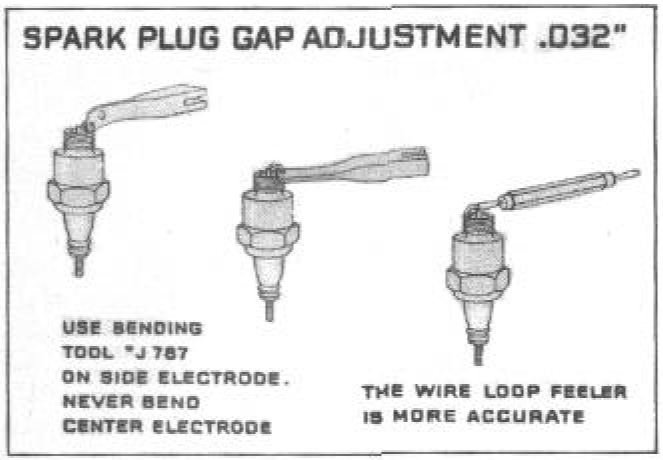

FIGURE 4

SPARK PLUGS

1. Inspect, clean, and adjust the spark plugs.

2. If a visual inspection indicates that the porcelains are burned, blistered. or cracked, or if the electrodes are burned excessively, the spark plugs should be replaced with new ones of the same type. Champion J-9 type plugs are used in engines with cast iron heads and Champion H-10 type plugs with Aluminum cylinder heads.

NOTE: The condition of the spark plugs often indicates other sources of trouble. For example, black carbon or soot deposits indicates overrich carburetion and faulty ignition.

Plugs in this condition cause sluggishness, resulting in the need for a good general tune-up.

3. Spark plugs that can be re-used always should be cleaned with recommended spark plug cleaner equipment. After cleaning, the plugs should be re-inspected for cracks and electrode burn.

4. Adjust spark plug gap to .032 inches to be checked with a wire type feeler as shown at "D", Figure 5, and not a flat feeler as shown at "C".

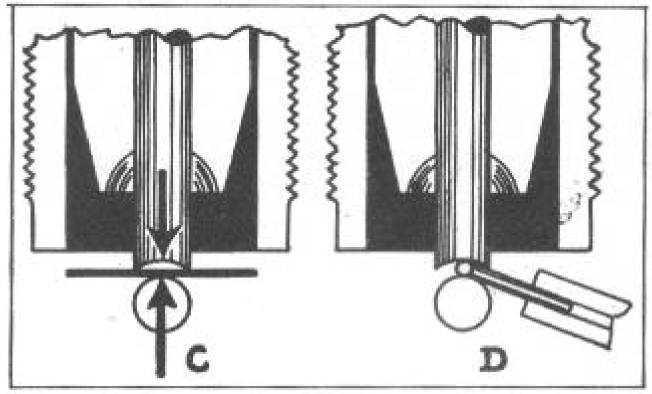

FIGURE 5

NOTE: Always use new gaskets when reinstalling spark plugs and tighten spark plugs with a torque of 20 to 25 foot pounds for both aluminum and cast iron heads.

VALVES AND TAPPETS

Check the valve tappet clearance when engine is at normal operating temperature.

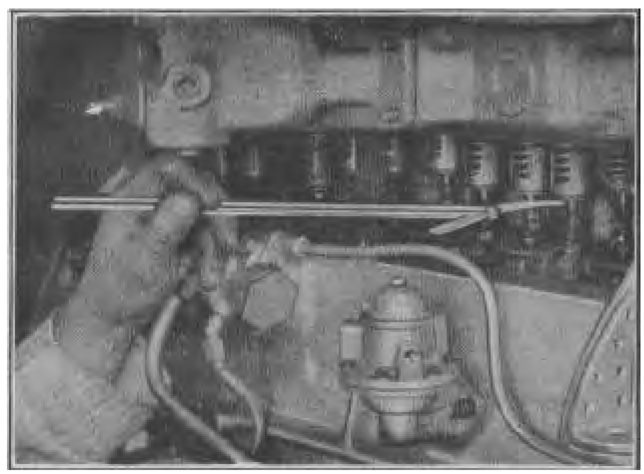

FIGURE 8

The intake valve clearance and exhaust valve clearance is as follows:

	6 Cyl.	8 Cyl.
Intake	.008	.006
Exhaust	.010	.008

TAPPET ADJUSTMENT

To adjust tappets on six or eight cylinder engines, proceed as follows:

1. Raise front end of car and place stand jacks under frame crossmember.

2. Remove the right front wheel.

3. Remove the three headlight wires from terminal block to permit fender side dust shield removal.

4. Place a support below the hood and remove the top (right side) hood prop bolt and allow hood prop to remain attached to fender side dust shield.

5. Remove the twelve 1/4" - 20 hex bolts on the fender side dust shield and remove dust shield down and out under the fender.

6. From under the fender, reach up and remove the front tappet cover bolt.

7. Remove the rear tappet cover bolts and the breather pipe. Remove the rear tappet cover by sliding cover forward and out.

8. Remove the lower breather pipe bracket at engine rear end plate and remove breather pipe.

9. Adjust tappets.

After tappet adjustment has been completed reinstall parts as follows:

INSTALLATION:

1. Install rear tappet cover and breather pipe.

NOTE: Use care when tightening the rear tappet cover and breather pipe attaching screw on eight cylinder engines, so breather pipe will not bottom against valve cover inner baffle restricting ventilator. Tighten to 3 pounds torque.

2. Install front tappet cover.

3. Install side fender dust shield.

4. Connect headlight wires.

5. Install right front wheel.

6. Install hood prop bolt (upper) and remove hood support.

7. Remove stand jacks and lower car.

BATTERY VISUAL INSPECTION

Water should be added if necessary to bring the electrolyte to proper level above the top of the plates. The battery cable clamps should be tight on the battery terminals so that a good contact area is maintained. The cables should be in good condition without broken strands or defective insulation. If the terminals and cable clamps are corroded, the cables should be disconnected so that the clamps and terminals can be cleaned separately.

A coating of petroleum jelly on the cable clamps before replacement and tightening will help retard corrosion. Carefully check battery ground strap at points where they are bolted to the frame and motor support. Also wash off the top of the battery and lightly coat the terminal posts with petroleum jelly.

It may be well also to check the size of the battery in the car to see if it meets the requirements of this particular car. The battery originally supplied with the car is in accordance with factory specifications.

However, it may have been replaced at some later date with a battery of lower capacity which would assuredly invite trouble.

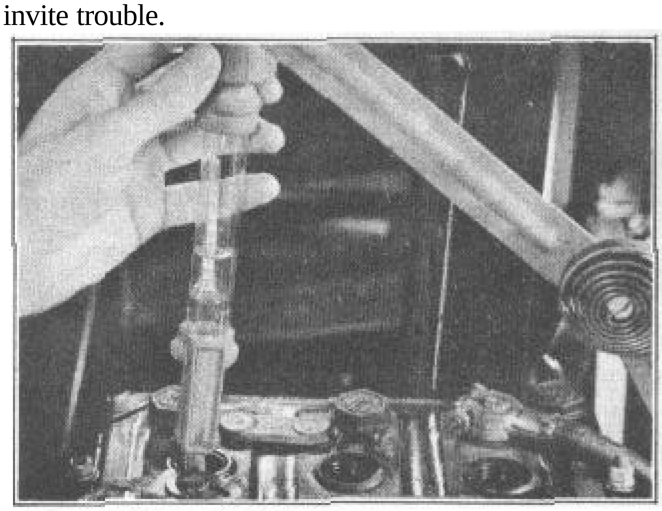

FIGURE 7

BATTERY SPECIFIC GRAVITY

Check the specific gravity of the battery with a hydrometer.

If the hydrometer reading is below 1.225 at 70° Fahrenheit, the battery needs recharging or replacing.

Variations in the specific gravity between cells should not exceed 25 on the hydrometer reading.

If gravity varies more than 25 points between cells, the low cell is shorted or insufficient electrolyte or battery is old and worn out.

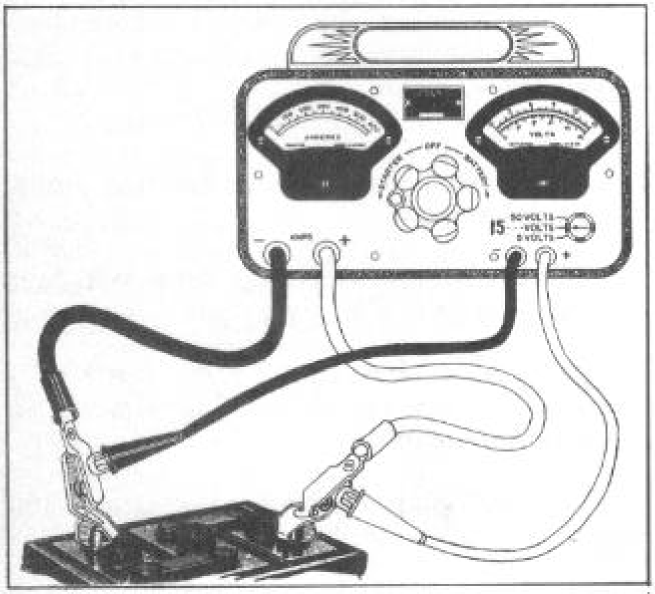

FIGURE 8

BATTERY DISCHARGE TEST

1. Connect the ammeter and voltmeter positive leads to the positive battery terminal post.

2. Connect the ammeter and voltmeter negative leads to the negative battery terminal post.

3. Turn the voltmeter knob to the fifteen (15) volt position.

4. Turn the battery starter tester knob to the battery position until ammeter shows a 300 ampere discharge. Quickly note the voltmeter reading, which should read four (4) volts or more for satisfactory battery capacity.

If the reading is less than four (4) volts, the battery should be recharged or replaced.

After testis completed, turn knobs to "off" position before disconnecting leads from battery.

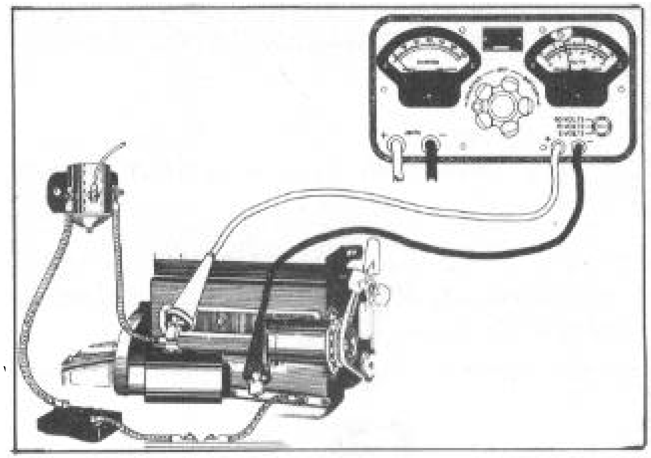

FIGURE 9

STARTER MOTOR CRANKING VOLTAGE

1. Connect the negative voltmeter lead of the starter motor tester to the starter switch terminal, Figure 9.

2. Connect the positive voltmeter lead to engine for a ground.

3. Turn the selector knob to the 15 volt position.

4. With ignition key off, engage the starter motor and note reading on the voltmeter. The cranking voltage should read 5 volts or more.

CAUTION: Crank engine intermittently (not more than 30 seconds) to prevent starter motor from overheating.

5. If the voltmeter reading is less than five (5) volts, it will be necessary to make the following checks to determine the cause for the low reading.

STARTER CABLES AND STARTER SWITCH TEST

1. Move the voltmeter positive lead to the battery ground terminal post.

2. Move the voltmeter negative lead to a ground on the engine.

3. Crank the engine (ignition off) and note voltmeter reading which should not be more than 0.25.

4. If voltmeter reading is more than 0.25, check battery cable connection at battery and ground strap connections.

5. If results are still unsatisfactory, make the following checks.

6. Connect positive lead to "BAT" terminal of starter and negative lead to negative battery post.

7. Crank engine again (ignition off) and check voltmeter reading. If reading is still more than 0.25, make the next test.

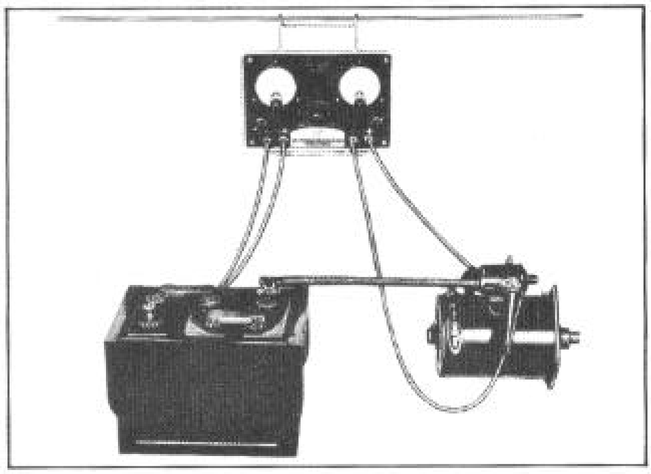

FIGURE 10

8. Connect negative lead to "BAT" terminal of starter solenoid switch and positive lead to starting motor terminal of starter solenoid switch, Figure 10.

   Crank the engine and if the reading is more than 0.2 volts, replace the solenoid switch.

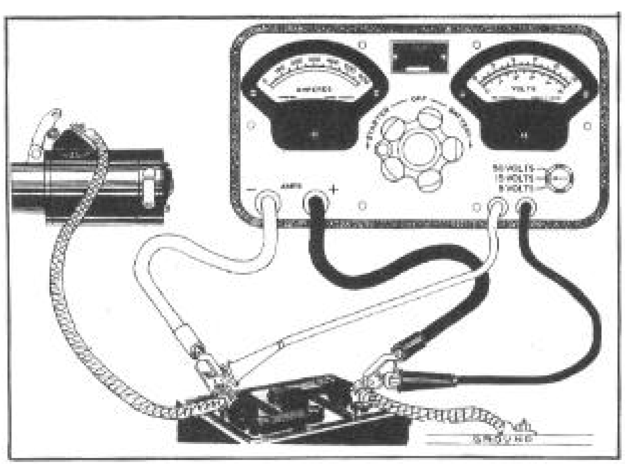

FIGURE 11

STARTER MOTOR AMPERAGE DRAW

1. Turn battery starter tester knob to "Off" position.

2. Turn the voltmeter "selector switch" to the 15 volt position and connect test leads, Figure 11.

3. Press starter switch and crank engine for approximately 15 seconds and note the "exact" reading on voltmeter.

4. Release starting motor switch and turn battery tester control knob clockwise until voltmeter reads "exactly" the same as when cranking the engine with starter.

5. Read "Test Ammeter" for starting motor amperage draw.

6. After completing amperage draw test, turn control knob to "off" position.

7. Readings acquired by the above checks indicate the amount of current required to crank the engine.

   The reading should be approximately 160 amperes at 150 R.P.M.

   Excessively high readings will indicate a short in the starting motor circuit or an excessive drag on the motor due to a bent armature shaft or the field coils touching the armature.

   Low readings indicate excessive resistance in the circuit caused by loose connections, worn brushes, or weak brush spring tension.

   To lubricate starter motor, add 3 to 5 drops of medium viscosity oil every 5,000 miles.

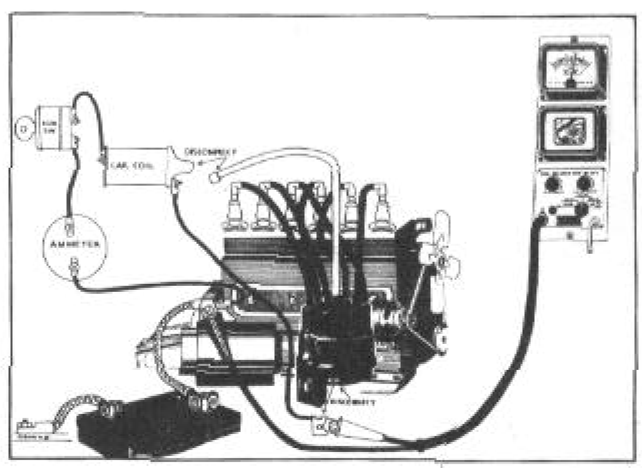

FIGURE 12

COIL TEST

1. Connect leads as shown in Figure 12.

2. Turn on ignition switch.

3. Turn on master control switch on Sun Tester.

4. Turn the switch to "Coil set" and adjust coil set regulator until the meter reads on set line. ,(NOTE: Line one for Auto-lite coils).

5. Turn switch to coil test position, the meter reading must be within the "Good coil" band and hold steady to denote a good coil.

   A reading outside the "Good coil" area or an erratic reading of 3 to 5 division inside "good coil" band indicate a bad coil.

6. Turn ignition switch off.

7. Turn the tester control knob to the milliamp position.

NOTE: If the coil meter does not read in the "Good coil" band, remove the coil cap and get directly to the primary connections.

After making direct connections to the coil, retest, and if the meter does not read in the "good coil" band, replace the coil.

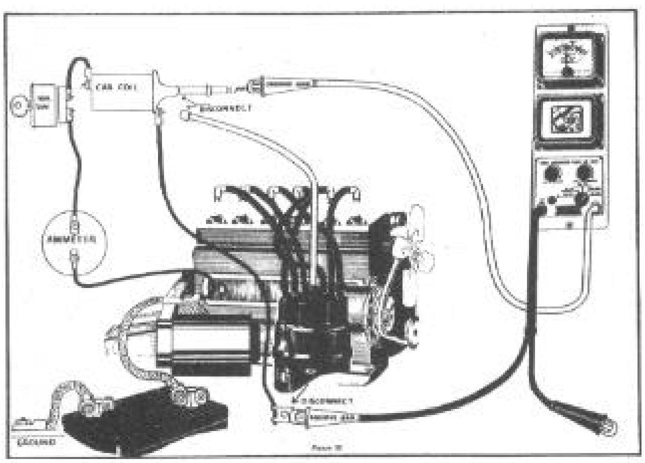

FIGURE 13

COIL SECONDARY RESISTANCE CHECK

1. Connect Ground (Blue) and Positive Primary (red insulator) test leads together.

2. Turn Master switch "On".

3. Turn Tester switch to Dwell-OHM position, and adjust Dwell-OHM Regulator until meter reads on Set Line.

4. Separate the Positive Primary and Ground test leads, connect the Positive Primary lead to the Primary ignition wire which was removed from the Distributor, Figure 13.

5. Insert the short test lead into the High Tension post of the coil and connect the Ground lead directly to the short test lead.

6. Meter should read from 2,000 to 10,000 OHM's resistance, if the meter reads outside this range, replace coil.

CONDENSER TEST

1. Remove distributor cap and block distributor points open with a piece of fibre. Disconnect the primary lead wire at the distributor.

2. Connect the two condenser test leads together, Figure 14.

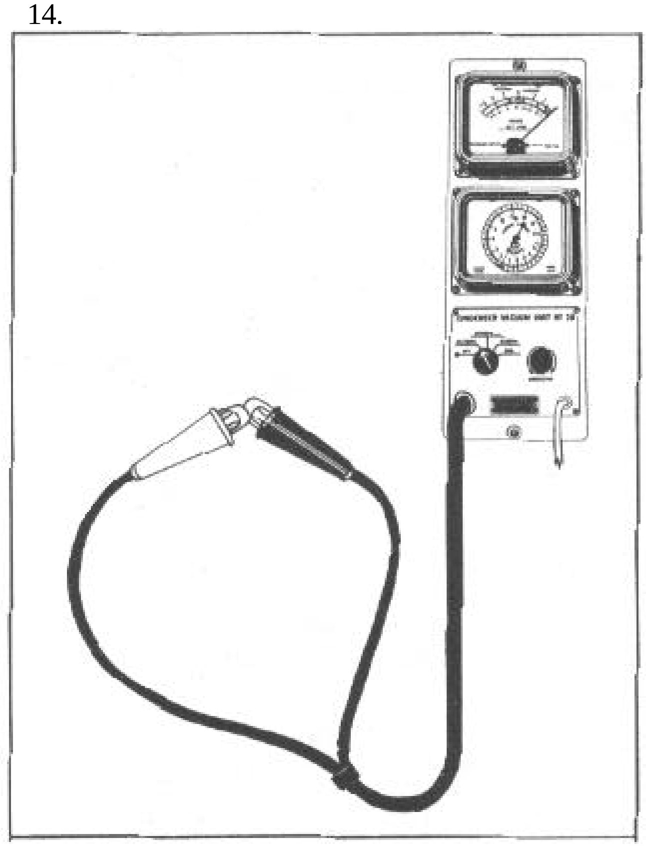

FIGURE 14

3. Turn the condenser control knob to the "Microhm"position and allow the tester to warm up for one minute. Then turn the control knob to read on the set line.

4. Connect the red lead to the distributor primary terminal and connect the black lead to the condenser shell, Figure 15.

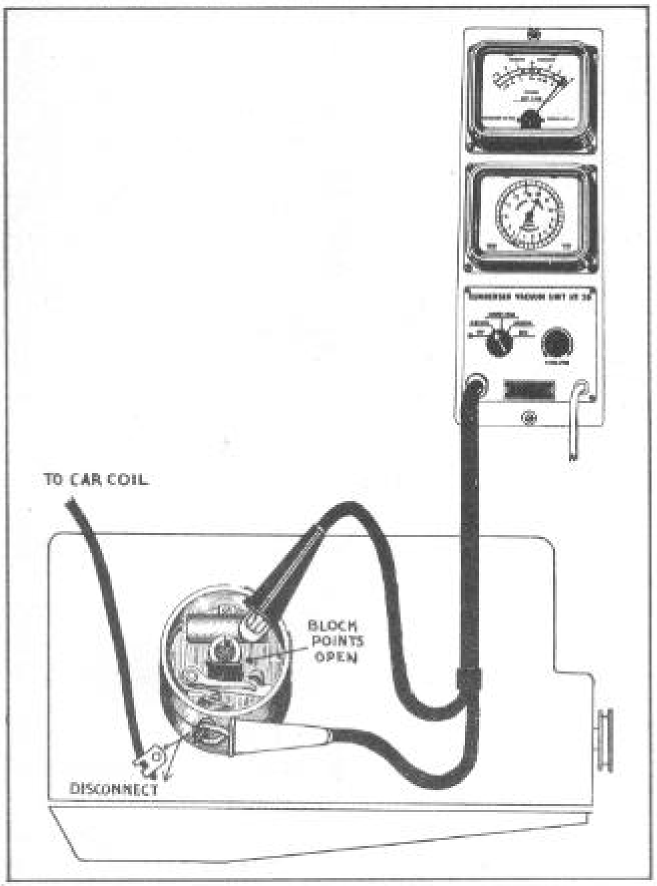

FIGURE 15

5. With the control knob turned to the "Microhm" position, the meter should read in the blue bar marked "MIC " at the right side for satisfactory condenser circuit resistance.

6. Turn the condenser switch to the "Micro- farad" position. The meter should read 25 to 28 microfarads for the Hudson Six and and 20 to 25 for the Hudson Eight.

7. Turn the condenser switch to the "Megohm" position. Meter should now read in the blue bar at left side marked "MEG" for satisfactory condenser insulation. If the meter reads in the red bar or over to the extreme right, replace the condenser.

NOTE: When making the above checks, the condenser should be at operating temperatures.

Always check the condenser lead and contact wires to see that they are not chafed or broken.

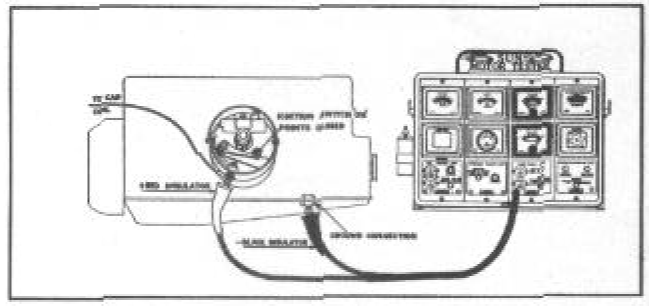

FIGURE 18

DISTRIBUTOR RESISTANCE TEST

Connect the negative lead to the distributor primary terminal, (Sun Tach-Dwell Unit No. 10, Figure 16). Connect the positive lead to the ground. With the distributor contact points closed, the dwell control knob turned to the "6" lobe position, and the ignition key turned on, the meter should read in the band marked "Point Resistance" on the right hand side of the dwell scale for normal distributor resistance.

This test will indicate the condition of the breaker contacts and internal distributor and ground connections. Where the Sun Unit Number 10-A is used, the check is made with the dwell control knob in the "CALIBRATE" position.

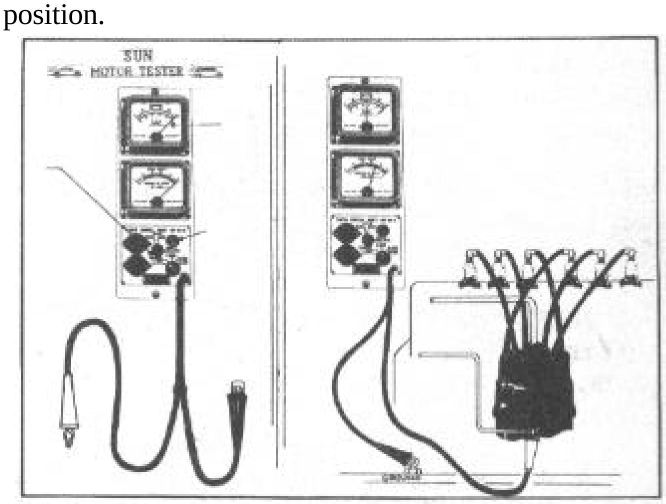

FIGURE 17

DISTRIBUTOR CAM ANGLE DWELL TEST

Turn switch to "Calibrate" position and adjust Dwell Regulator until meter reads to "Set Line".

Connect the negative tach-dwell lead to the distributor primary terminal. Connect the positive tach-dwell lead to ground, Figure 17.

Turn the dwell switch knob to the 6 lobe position for the Hudson Six and the 8 lobe position for the Hudson Eight. Turn on ignition switch and start engine. Note the reading on the Dwell Meter. The dwell angle on the Hudson Six is 38 degrees, breaker points set at .020", and the dwell angle on the Hudson Eight is 27 degrees, breaker points set at .017".

NOTE: Contact point adjustment is made by first loosening the clamp screw holding the stationary contact plate, then turn the eccentric adjusting screw that will move the stationary contact point. Tighten clamp screw.

This test will indicate:

(1) The breaker contact opening.
(2) The condition of the breaker cam.
(3) The condition of the distributor shaft and bearings.
(4) The condition of the breaker plate bearing and support.

If the dwell angle is too great, this will indicate that the contact point gap is set too close. If the dwell angle is too small, it will indicate that the contact gap is too wide.

NOTE: DO NOT try to hone badly pitted contact points.

An erratic reading of the dwell angle meter will indicate faulty contacts, a faulty breaker plate, or a worn distributor shaft and bearings.

A change of dwell angle when accelerating or decelerating the engine will indicate a faulty breaker plate, bearing, or support.

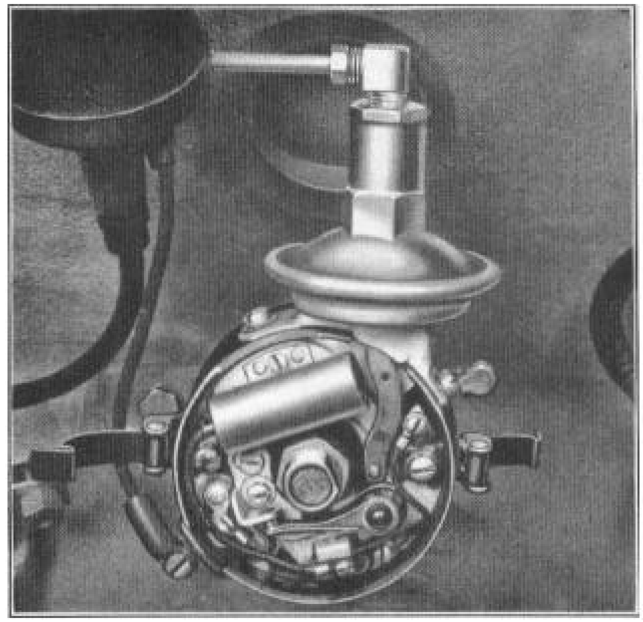

FIGURE 18

VACUUM ADVANCE ADJUSTMENT

Vacuum advance should be checked on a distributor test fixture that has a controlled source of vacuum and a vacuum gauge.

1. Place distributor in the distributor clamp and tighten securely with the hand wheel at the right side of clamp.

2. Adjust the vertical screw so distributor shaft fits down into the drive chuck.

3. Use special wrench to tighten the distributor shaft into the drive chuck.

4. Connect red tipped distributor lead to primary binding post at the side of the distributor.

5. Attach vacuum pump connection.

6. Turn cam lobe switch to Battery Check position. Tachometer indicating hand should read in bar at right end of scale.

7. Test distributor point spring tension scale. The spring tension is 17 to 20 ounces on both the six and eight cylinder distributors.

8. Turn on battery switch at left side of tester head.

9. With the cam lobe switch in the 6 lobe position and distributor contact points closed, the dwell meter indicating hand must read in the black bar for satisfactory point resistance. If the reading is in the red band, it indicates dirty contact points, loose connections, or resistance within the distributor circuit.

10. Turn the motor drive switch to left or right hand rotation as indicated by the specifications for the distributor being tested.

11. Adjust the speed control crank until the Tachometer reads 200 R.P.M's.

12. Adjust the distributor contact points until proper degree of dwell is indicated.

13. Turn graduated degree ring until the arrow flash appears at 0.

14. Then check to see if all flashes appear at 60 degree intervals for the Hudson Six, and at 45 degree intervals for the Hudson Eight. If the flashes do not appear to within one degree of the respective angles, it indicates an inaccurate cam.

15. Turn vacuum switch to the "ON" position.

16. Set degree ring so arrow will be on zero at a most convenient point to read.

17. Adjust vacuum regulator to obtain correct reading on vacuum regulator for the exact point the vacuum advance starts to operate, and compare with specifications. Adjust the vacuum regulator to each specification and check the arrow flash on the degree ring.

18. Watch the arrow on the degree ring as the vacuum regulator is adjusted to the point vacuum advance starts to operate. Compare the reading with specifications and adjust the vacuum regulator to each specification and check the arrow flash on the degree ring.

19. If degree indicated on ring is more than specified, the unit is advancing too quickly showing the return spring is too weak.

20. If the degree indicated on the ring is less than the specifications, the unit is advancing too slowly showing the return spring is too strong.

21. Vacuum advance characteristics are varied by changing the spring pressure or by inserting or removing washers under the end of the spring in the vacuum chamber.

CHECKING THE AUTOMATIC ADVANCE CURVE

1. Adjust speed control so that distributor will rotate at the lowest R.P.M.

2. Set degree ring so arrow will flash at zero at a point most convenient to read.

3. Increase distributor R.P.M. to correspond with specifications marked: "Start".

4. Check the number of R.P.M.'s required to advance the arrow flash to the specifications given.

5. Be sure the advance is opposite the rotation of the distributor shaft.

6. Continue to check the advance curve number of R.P.M.'s against degree of advance and compare this with specifications.

7. If the degree of advance on the degree ring is more than specifications call for at the same R.P.M., it indicates that the governor spring tension is too weak and the advance is too rapid.

8. If the degree of advance on the degree ring is less than specifications call for at the same R.P.M., the spring tension is too stiff and the advance is too slow.

9. Check the advance both up and down the speed range so that the sluggish action of the governor mechanism will be indicated

and may be corrected by cleaning and lubrication.

NOTE: Every 2,000 miles, lubricate contact arm pivot, wick top of shaft, cam lobes, and 3 to 5 drops of medium engine oil at oiler.

IGNITION TIMING

The following procedure and timing applies to both the 6 and 8 cylinder engines:

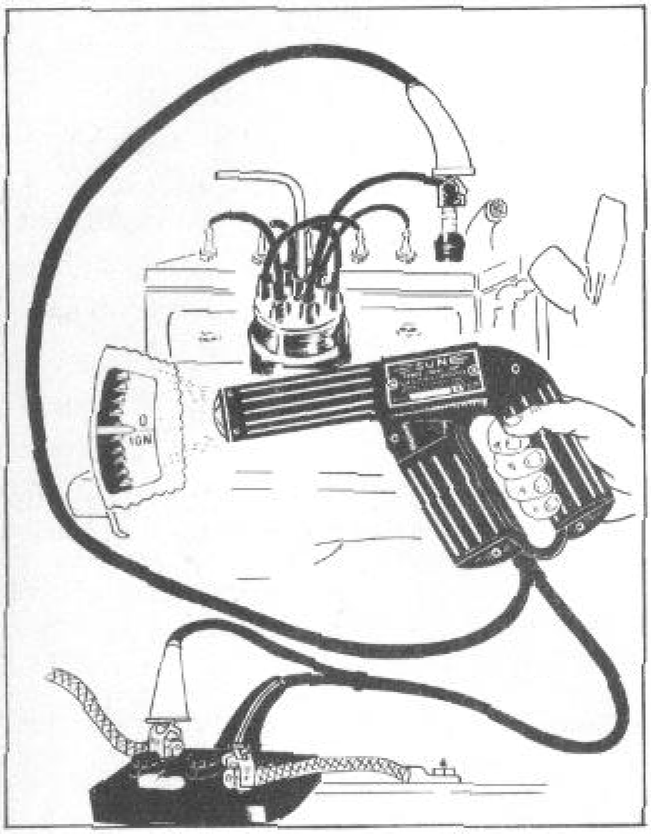

FIGURE 19

1. Connect the power timing light to #1 spark plug and battery as shown in Figure 19.

NOTE: With the engine idling properly the spark should occur when the dead center mark (long line) on the fly wheel is in line with the pointer at the opening of the rear engine support plate.

If timing is off, make the necessary correction by first loosening the distributor advance arm screw (on octane selector) and rotate head clockwise for retard and counter clockwise for advance.

2. Increase engine speed.

NOTE: The vacuum advance should be at full retard position but should advance readily when the engine speed is increased.

Spark setting maybe advanced during continuous high altitude operation or with fuels of high octane rating of 80 or higher.

Maximum performance is attained only with the proper spark setting.

MILLIAMPERE CURRENT TEST AT SPARK PLUGS

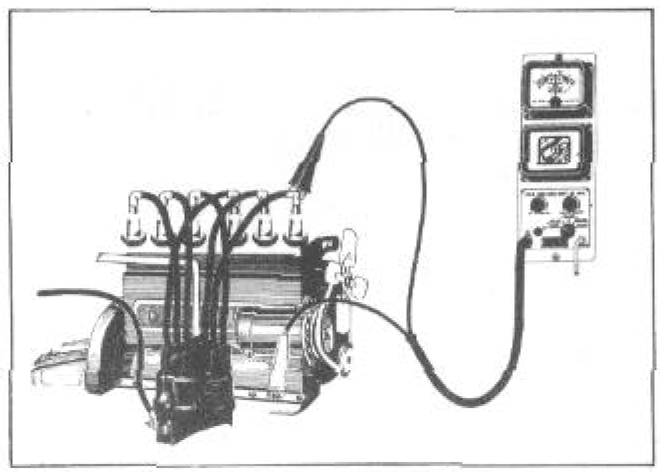

FIGURE 20

1. Connect test leads as shown in Figure 20.

2. Run engine at idle speed.

3. Turn switch to MILLIAMP position.

4. Read the coil meter Milliampere scale.

NOTE: The reading should be the same at each spark plug. A low reading (established on a comparative basis) might indicate a weak coil, excessive resistance either in the primary or secondary circuit, corroded terminals, or poor connections.

GENERATOR OUTPUT TEST

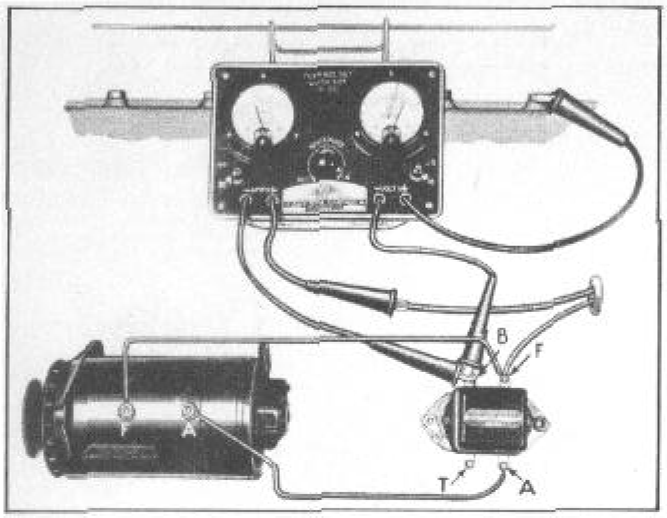

FIGURE 21

1. Disconnect battery lead at voltage regulator "B" terminal and connect positive ammeter lead to wire just disconnected, and negative to the regulator "B" terminal as shown in Figure 21.

2. Connect negative voltmeter lead to the "B" regulator terminal and the positive voltmeter lead to ground.

3. Using a jumper wire, ground the "F" terminal of the voltage regulator.

4. Start engine and allow engine to warm up.

NOTE: With engine running at 1500 to 1700 R.P.M. the resistance turned "out" at 8 volts should show 37 to 41 (maximum) amperes.

If it is necessary to increase the generator output, move the third brush anti-clockwise.

5. Add 3 to 5 drops of medium engine oil to the oiler in the commutator and drive ends every 5,000 miles.

FAN BELT ADJUSTMENT

Adjustment of the fan belt is possible by moving the generator towards the engine or away on the generator adjusting bracket.

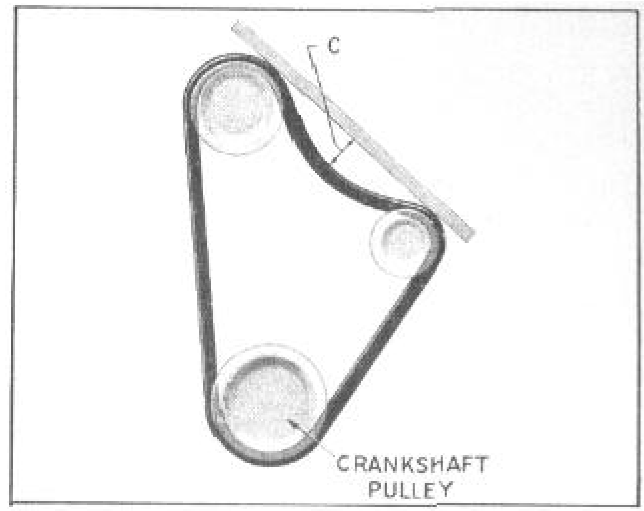

FIGURE 22

This movement increases or decreases the tension on the fan belt. The proper adjustment is 3/4" slack, Figure 22.

NOTE: Be sure to tighten generator attaching bolts securely after adjustment.

VOLTAGE REGULATOR TEST

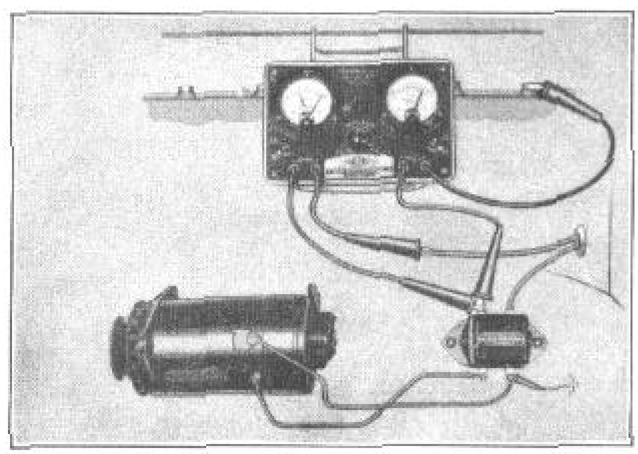

FIGURE 23

1. Remove the jumper wire from the voltage regulator to ground, Figure 23.

2. Rim engine at 1500 to 1700 R.P.M. Turn "in" resistance until ammeter reads 10 amperes. At 70 degrees "F" the voltmeter reading must not be less than 7.1 volts or more than 7.4 volts. If reading is not within this range, replace the regulator.

NOTE: DO NOT TRY TO MAKE ADJUSTMENTS TO THE REGULATOR.

FUEL PUMP TEST

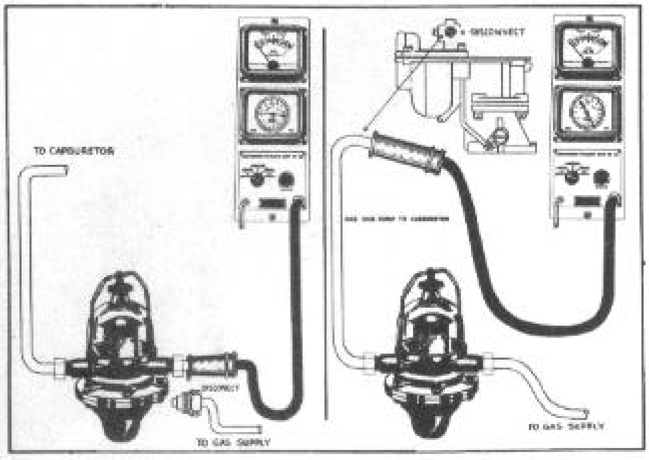

FIGURE 24

The fuel pump should always be tested to make certain that it will draw an adequate supply of fuel from the tank and deliver the fuel to the carburetor at a constant pressure under the varying conditions of fuel consumption and engine speed.

1. Remove and clean the fuel pump sediment bowl and screen.

2. Replace the screen if damaged.

NOTE: If combination fuel and vacuum pump is used, remove and clean the air filter screen located under the cover at the top of the pump.

3. Make sure all connections and cover screws are tight after replacement.

4. Disconnect the fuel line at the carburetor and connect the fuel pump gauge, Figure 24.

5. Start the engine and run at 1500 to 1700 R.P.M. A normal pressure should be 32 to 41 pounds. If pressure is below this, examine the fuel line for dents or kinks which would restrict the flow of the fuel.

6. If the fuel lines are found to be satisfactory, but the pressure is too low or too high or varies materially at different speeds, the trouble lies in the fuel pump, and it should be removed for repairs.

NOTE: The fuel pump pressure requirement of the standard and combination pump is the same.

CLIMATIC CARBURETOR CONTROL

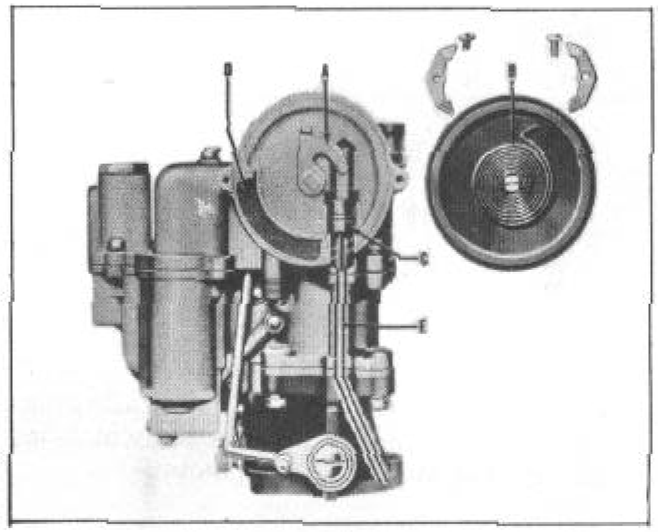

FIGURE 25

1. Remove the climatic cover and clean or replace the screen.

2. Check the heat control tube for leaks or obstruction.

3. Check choke valve for free movement. Choke valve should open of its own weight when cover is removed.

4. Reinstall the cover and set it to center graduation.

AIR CLEANER GAUZE TYPE

1. Remove the attaching wing nut and cover from air cleaner.

2. Wash air filter in kerosene and blow dry.

3. Re-oil with engine oil and after letting it drain, reinstall, reversing procedure of removal.

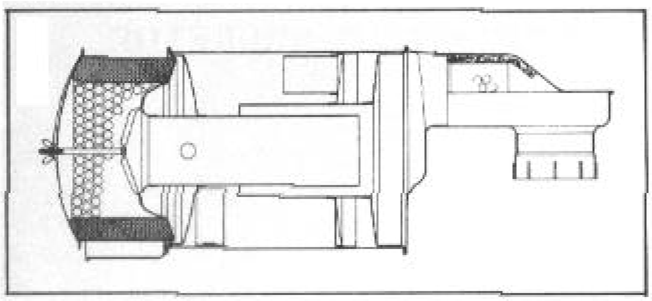

FIGURE 26

AIR CLEANER OIL BATH
8 Cylinder

1. Loosen wing bolt sufficiently to allow the air cleaner reservoir to be slid out from the bracket attached to the motor.

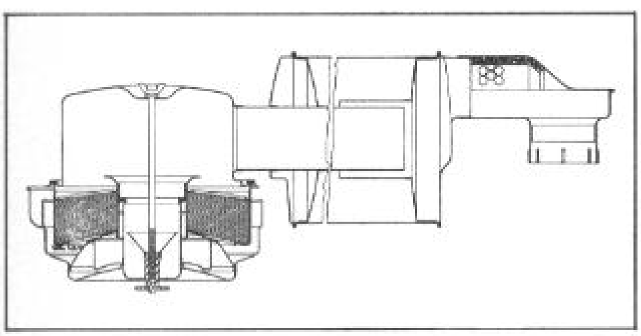

FIGURE 27

2. Remove cover and filter unit.

3. Wash filter unit in kerosene and blow out until partially dry.

4. Clean out old oil and sediment from cleaner reservoir.

5. Refill to oil level line with regular engine oil and reinstall, reversing procedure of removal.

FLOAT SETTING TEST

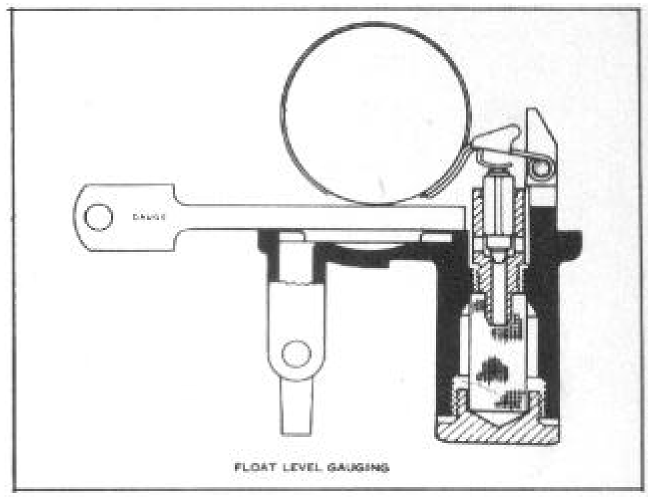

FIGURE 28

1. Remove the float chamber cover, using care not to damage the gasket.

2. Remove the gasket from the cover and clean the cover to give a clean surface.

3. With the assembly held upside down, the distance from nearest face of float to cover should be 3/16 inch on the 6 cylinder carburetor (647-5) and 13/64 inch on 8 cylinder (648-S), Figure 28.

4. Adjustby bending lip (A) which contacts needle valve (B).

5. Draw on carburetor inlet. If leakage exists, replace needle valve and seat (B).

PUMP TRAVEL TEST

Check pump travel before setting metering rods as follows:

1. Set pump connector (A) in outer hole (long stroke) in pump arm (G).

2. Back out throttle stop screw fully.

NOTE: The accelerator pump plunger (C) from the full down to the full top position should be 7/32 inch on 8 cylinder carburetor (648-S) and 9/32 inch on 6 cylinder carburetor (647-S). Adjustment can be made by bending the throttle connector rod (M) at the low angle.

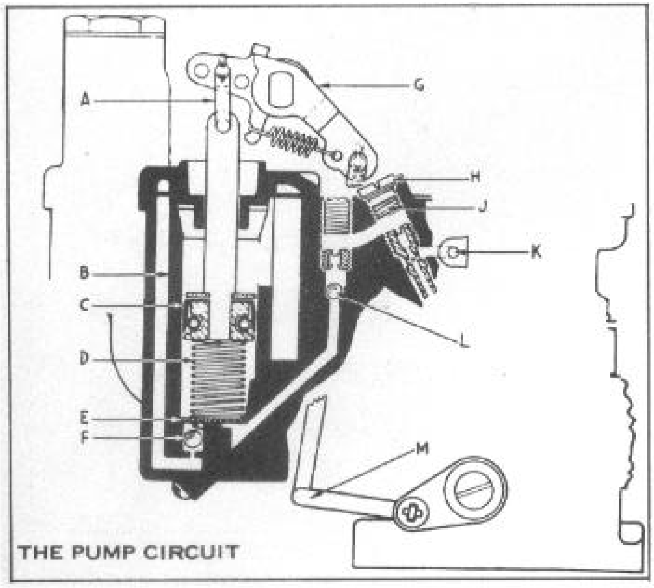

FIGURE 29

METERING ROD SETTING

The following adjustment must be made when assembling the carburetor or when installing leaner than standard metering rods and applies to both 8 and 8 cylinder carburetors.

1. Remove carburetor air horn and the metering rods from the carburetor.

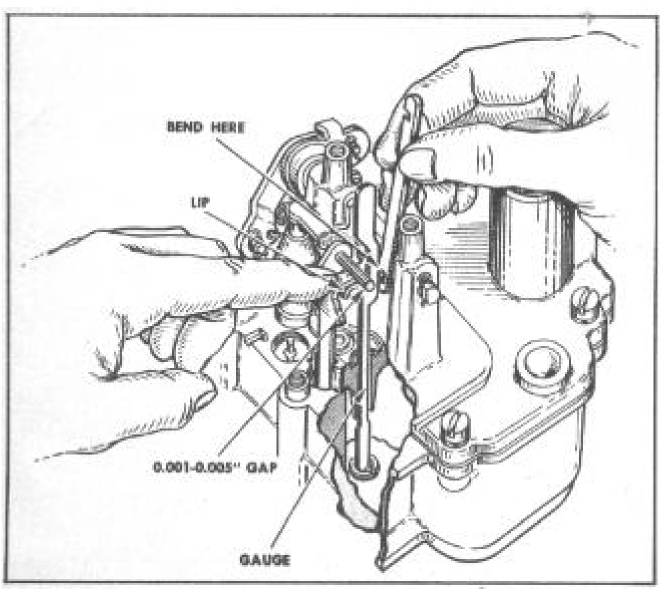

FIGURE 30

2. Insert gauge T-109-113-2 (2.280). Reinstall clevis pin and spring.

3. With throttle stop screw out, hold throttle in closed position. Hold gauge vertical to insure proper seating in the metering jet.

4. Press down lightly on vacuum piston link.

NOTE: There should be less than .005 of one inch gap between the metering rod clevis pin and the seat on shoulder of gauge. Correction can be made by bending the lip or tongue on pump arm with T-109-105.

ANTI-PERCOLATOR ADJUSTMENT

After adjusting the pump stroke and metering rods, bend the lips of the anti-percolator arm so that the center of indicator line on valves is flush with the top of anti-percolator plugs, Figure 31.

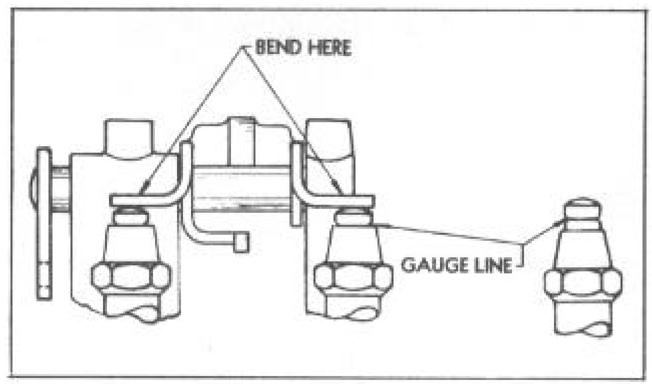

FIGURE 31

Since there are two anti-percolators on the Dual Carburetors, a synchronized adjustment must be made of both valves. Be sure throttle valves are seated when making the adjustment.

UNLOADER ADJUSTMENT

With throttle valves wide open, the distance between the upper edge of choke valve and inner wall of the air horn should be 1/4" Use gauge T-109-22.

To adjust, bend the lip on the fast idle connector link, Figure 33.

When unloader is adjusted properly in the wide open position, the choke valve will lock in the open position.

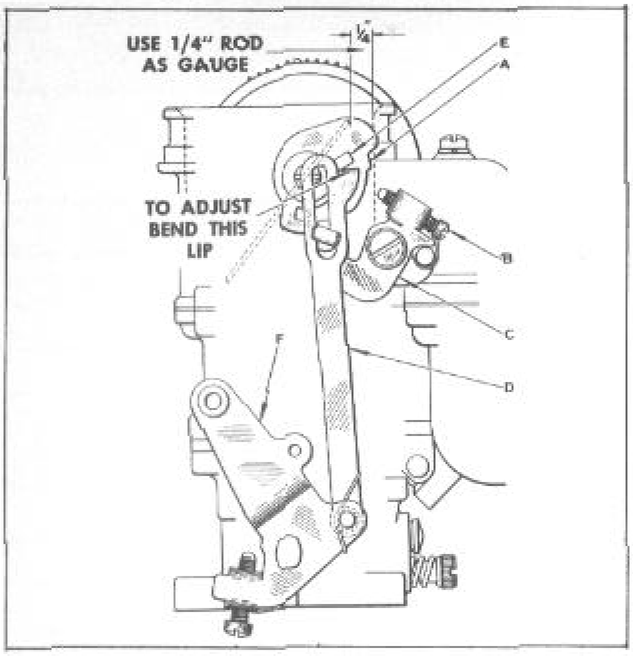

FIGURE 32

FAST IDLE ADJUSTMENT

With the choke valve tightly closed and the fast idle screw on the high step of the fast idle cam, there should be .054 clearance between the throttle valves and bores of carburetor on the side opposite the idle port.

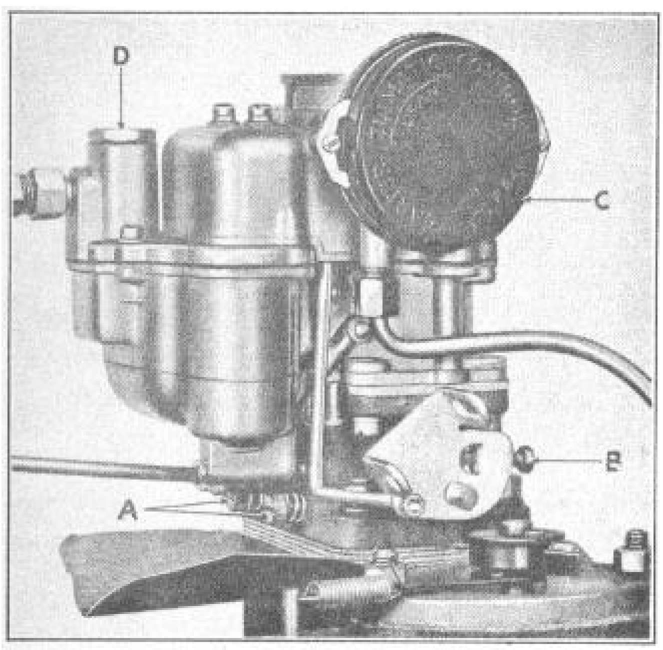

FIGURE 33

To adjust, turn the fast idle adjusting screw (B, high step of cam) until specified clearance is obtained, Figure 33.

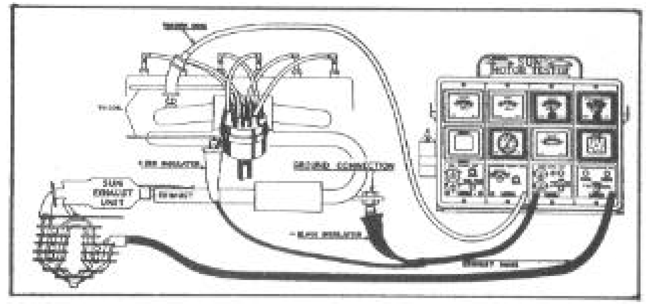

FIGURE 34

COMBUSTION ANALYSIS

1. Start engine and warm up to normal operating temperature.

2. Connect tachometer cables to the distributor and ground one cable, Figure 34.

3. Insert exhaust hose from tester into exhaust pipe.

4. The correct reading for combustion efficiency and performance at idle speed should be 70 plus or minus 3%. If reading is off, adjustment of the idle screw is necessary.

5. Increase the engine speed to 2000 R.P.M. and check the meter reading which should now read 80 plus or minus 5%. If the mixture shows on the rich side, proceed as follows:

   A. Remove the air cleaner and see if the additional air entering carburetor corrects the reading. If so, it indicates some restriction in the air cleaner.

   B. If the mixture still shows rich with the air cleaner removed, it indicates trouble in the carburetor.

6. With engine operating at 2000 R.P.M., advance and release the throttle quickly. The combustion meter reading should move toward "rich" 10% or more. If no movement is noted, the carburetor accelerating pump is not working properly.

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ENGINE SPECIFICATIONS

	All Models 6 Cylinder	All Models 8 Cylinder
Arrangement	L-HD	L-HD
Bore and Stroke	3-9/16 x 4-3/8	3 x /2
Piston Displacement	262 Cu. In.	254 Cu. In.
Actual Horse Power	121 @ 4000 RPM	128 @ 4200 RPM
Compression Ratio - STD	6:50:1 Cast Iron HD	6:50:1 Cast Iron HD
Compression Ratio - Optional	7:00:1 Alum. HD.	7:00:1 Alum. HD.
Engine Mounting	3 Points - (Rubber)	3 Points - (Rubber)
Camshaft Drive	Chain	Gears
Engine Timing		
Inlet opens	7° - 18' BUDC	10° - 40' BUDC
Inlet closes	53° - 42' ALDC	60° - ALDC
Exhaust opens	53° - 18' BLDC	50° - BLDC
Exhaust closes	7° - 42' AUDC	18° - 44' AUDC
Timing marks	On Sprockets & Chain 60 links 3/8 pitch	On Gears

CAMSHAFT BEARINGS

Number - Type	4 steel back babbitt	5 steel back babbitt
Bearing Sizes		
#1	2-3/8 x 1-3/16	2-1/32 x 1-3/8
#2	2 x 15/16	2 x 1-1/16
#3	1-31/32 x 15/16	1-31/32 x 1-1/4
#4	1-1/2 x 1-5/16	1-5/16 x 1-1/16
#5	None	1-1/2 x 1-5/16

CRANKSHAFT

Type	Compensated	Compensated
Number and Type of Bearing	4 steel back babbitt lined	5 steel back babbitt lined
Diameter and Length		
#1	2-1/2 x 1-7/16	2-9/32 x 1-5/8
#2	2-1/2 x 1-3/8	2-5/16 x 1-3/8
#3	2-1/2 x 1-5/8	2-11/32 x 1-7/8
#4	2-1/2 x 1-3/4	2-3/8 x 1-3/8
#5	None	2-13/32 x 2
Thrust	On #3 Main	On #3 Main
End Play	.003 to .009	.006 to .012
Radial Clearance	.0005 to .0015	.001
Adjusting Shims	None	None

CONNECTING RODS

Material	Drop-Forged Steel	Drop-Forged Steel
Weight	34.23 oz.	31.36 oz.
Length - Center to Center	8-1/8	8-3/16
Connecting Rod Bearing	Replaceable	Integral
Type and Material	Babbitt steel back	Spun - Babbitt
Diameter and Length	2-1/8 x 1-5/8	1-15/16 x 1-3/8
End Play	.007 to .013	.007 to .013
Radial Clearance	.0005 to .0015	.0003 to .0006

CONNECTING RODS (Continued)

	All Models 6 Cylinder	All Models 8 Cylinder
Connecting Rod Bushing		
Material	One pc. steel back babbitt	Bronze
Diameter and Length	31/32 x 1-1/8	3/4 x 29/32
Radial Clearance	0000 to .0003 at 70° F.	.0000 to .0003 at 70° F

PISTON

Type	Cam Ground	Cam Ground
Material	Aluminum Alloy	Aluminum Alloy
Weight and Length	18 ± 1/8 oz. x 3-¾	± 1/4 oz. x 3-3/16
Pin Center to top	2-1/16	1-11/16
Piston Clearance	.0015 to .002	.0015 to .002
Ring groove depth	.195	.148
Piston Pin		
Type and Length	Floating - 2-15/16	Floating - 2-7/.16
Diameter	31/32	3/4
Fit in Piston	.0000 to .0003 at 70° F.	.0000 to .0003 at 70° F.
Fit in Rod	Hand push fit at 70° F.	Hand push fit at 70° F.

PISTON RINGS

Material	Cast Iron	Cast Iron
Compression Rings	Two (Pinned)	Two (Pinned)
Width	5/64	3/32
Oil Rings	Two (Pinned) (1-Below piston pin)	Two (Pinned) (1-Below piston pin)
Width Upper	3/16	3/16
Width Lower	5/32	5/32
Gap Clearance	.007 to .012	.004 to .009

VALVES

Intake		
Head outside diameter	1-53/64	1-1/2
Port Diameter	1-11/16	1-3/8
Lift	11/32	11/32
Length & Stem Diameter	5-47/64 x 11/32	5-3/32 x 11/32
Stem to guide clearance	.0015 to .003	.0015 to .003
Operating clearance - Hot	.010	.006
Exhaust		
Head outside diameter	1-9/16	1-3/8
Port Diameter	1-3/8	1-7/32
Lift	11/32	11/32
Length & Stem Diameter	5-47/64 x 11/32	5-3/32 x 11/32
Stem to guide clearance	.002 to .004	.003 to .005
Operating clearance - Hot	.012	.008
Valve angle	7 degrees	Vertical
Valve guide - Length	Removable - 3-5/32	Removable - 2-9/16
Valve spring pressure	77 lbs. at 2-3/16	46 lbs. at 2 inches
Valve Tappets		
Type	Mushroom	Roller Cam
Guides	Integral with block	Removable

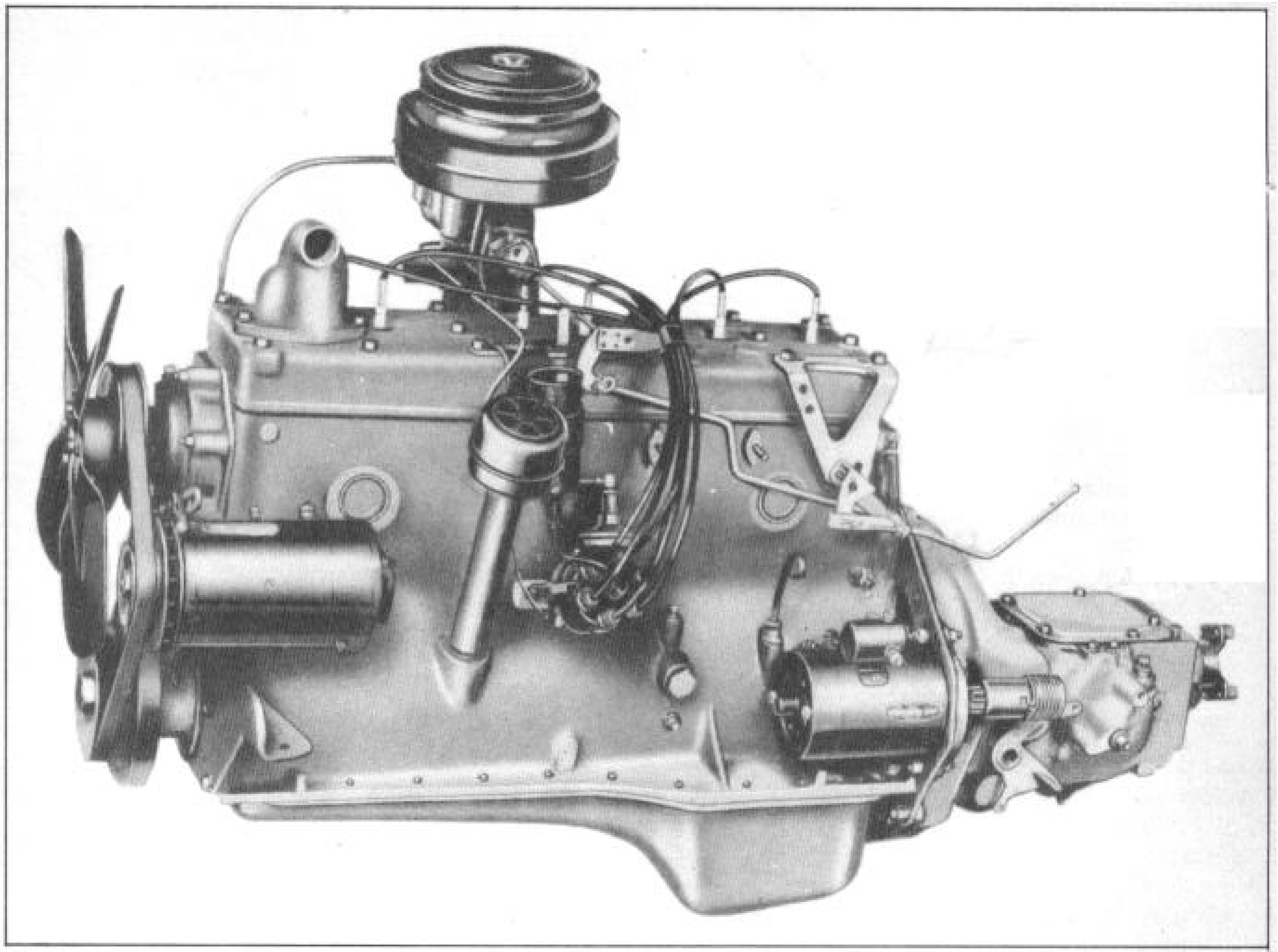


FIGURE 1

GENERAL CONSTRUCTION

The six and eight cylinder engines are of the "L" Head type.

The crankcase and cylinder block are integral to provide maximum strength with a minimum of weight.

The engine is mounted on rubber cushions at three points, one at each side of the engine front support and a rear mounting located under the transmission bell housing on the #3 frame crossmember.

A full counterbalanced crankshaft of a high alloy steel balanced statically and dynamically, set in four bearings on the 6 cylinder and five bearings on the 8 cylinder is used in the 480 series.

Crankshaft thrust is taken by the #3 main bearing.

Main bearing shells for service replacement are available in various undersize dimensions (Refer to your Hudson 480 Series Parts Book).

The eight cylinder engine connecting rods have the spun babbitt type bearings, while the six cylinder engine has replaceable bearing shells with the upper and lower shells being interchangeable.

Aluminum alloy pistons are used in both 6 and 8 cylinder engines. Pistons are cam ground. Two compression rings and two oil rings (one ring below pin) are secured by a steel stake pin at the ring gap to prevent the rings from turning in their grooves.

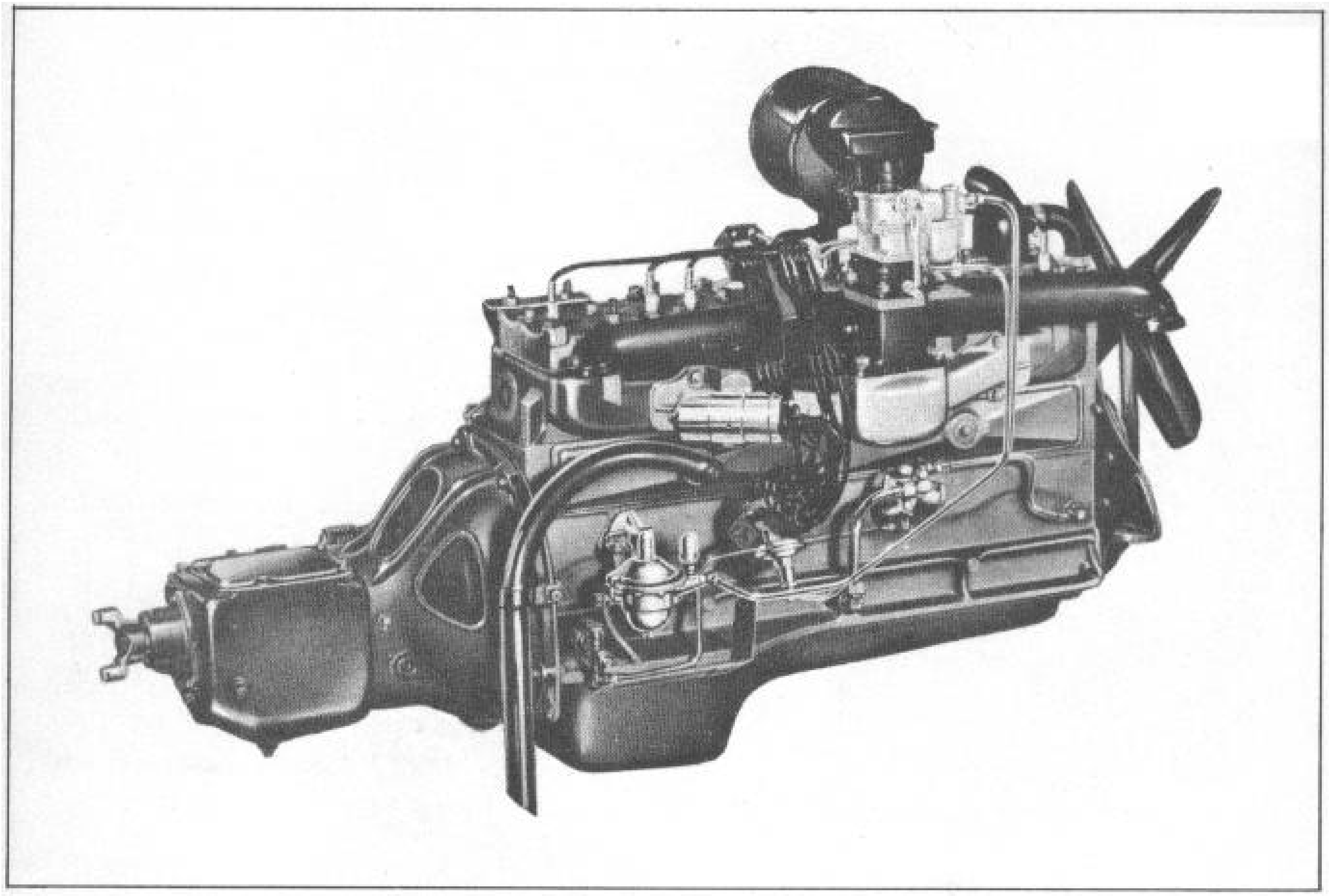


FIGURE 2

Piston Pins are full floating. Lock rings set in grooves in each side of the piston serve to hold the pin in position.

Cam shafts are specially heat-treated alloy iron supported in steel backed-babbitt bearings.

Eight cylinder engines are equipped with a matched set of timing gears for camshaft drive.

Six cylinder engines are equipped with a chain and sprockets.

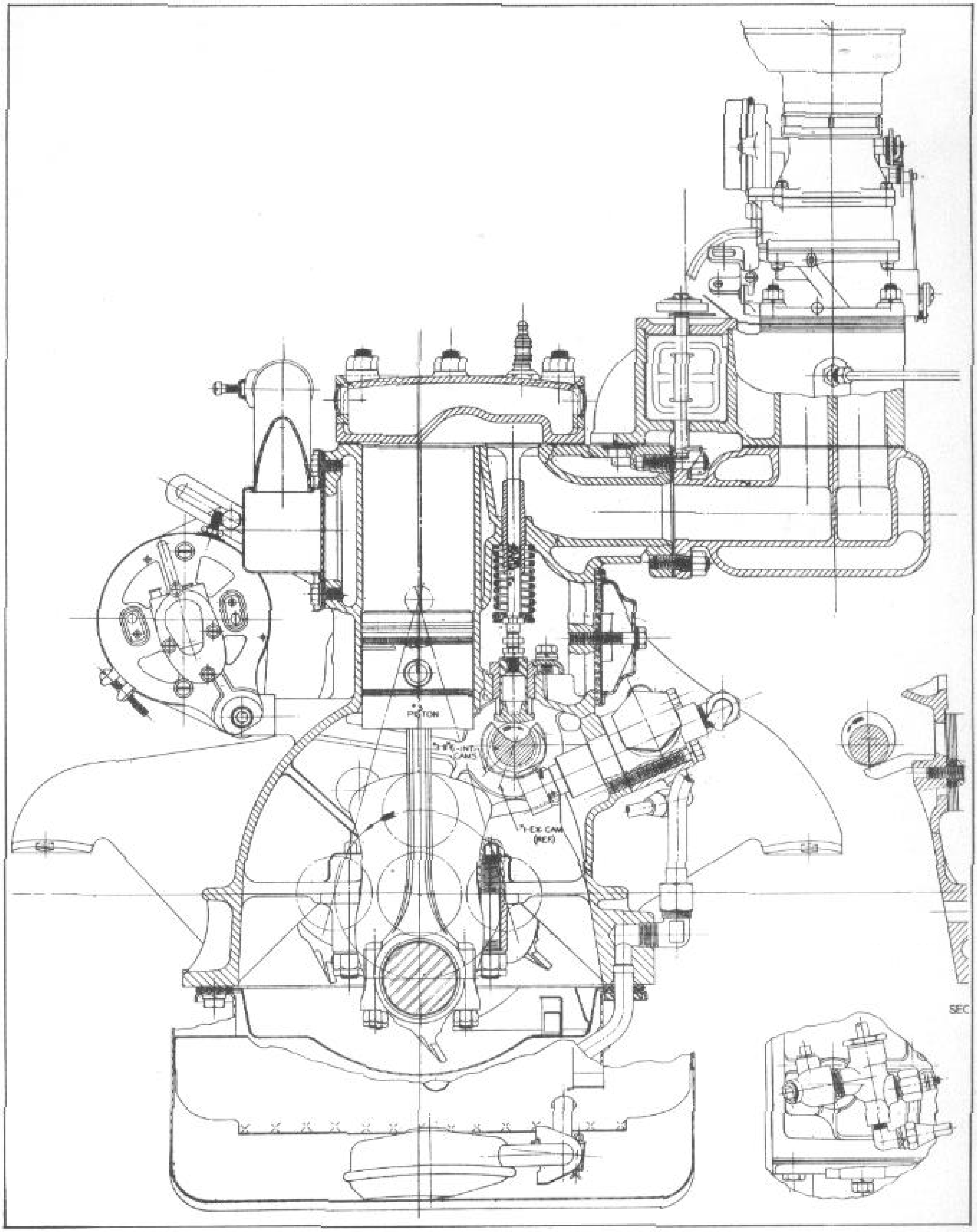
The eight cylinder engine is equipped with roller cam valve tappets fitted in cast iron guides which are held in position by a steel clamp and attaching screw. These tappets and guides can be removed without removing oil pan or cylinder head.

Mushroom type valve tappets are used in six cylinder engines. These tappets are fitted directly in the crankcase and may be removed from the bottom of the crankcase after removing oil pan and camshaft.

LUBRICATION

8 CYLINDER

Engine lubrication is by the Duo-flow system which delivers the lubrication oil in ratio to engine speed to all bearing surfaces immediately from the first turn of the crankshaft.


PISTON
CAMS
EX CAM
(REF)
SEC

The oil is drawn through a pipe connecting with a floating screen in the oil pump by the oscillating plunger type oil pump which is driven from the camshaft.

Oil is forced through oil lines to the front and rear of the engine where it is then deposited in the splash troughs of the oil pan tray.

The oil is then picked up by the connecting rod dippers and vigorously distributed to interior working surfaces by the splash system and a series of channels which convey it to wells over the crankshaft and camshaft bearings.

Overflow oil running down the crankcase wall is diverted by drain troughs in the oil pan tray until it reaches the center splash troughs.

LUBRICATION
6 CYLINDER

Full pressure lubrication to friction surfaces of the engine is maintained by a rotor type centrifugal oil pump which is mounted on the right side of the cylinder block and driven by a worm gear on the camshaft. Oil is drawn from the suction side of the pump through a pipe connecting with a floating screen in the oil pump and forced up into the horizontal oil gallery for distribution to the valve tappets, camshaft bearings, main and connecting rod bearings, and piston pins, Figure 3.

OIL CHECK VALVE
8 CYLINDER

The check valve assembly shown in Figure 4 is used in conjunction with the oscillating plunger type oil pump.

The function of the check valve is to indicate oil flow by building up enough pressure to operate the oil pressure indicator light on the instrument panel. This operating pressure ranges from 4 to 12 pounds.

The unit consists of a housing in which is carried the check ball (4) and a plunger (5) which operates against the pressure of a spring (6).

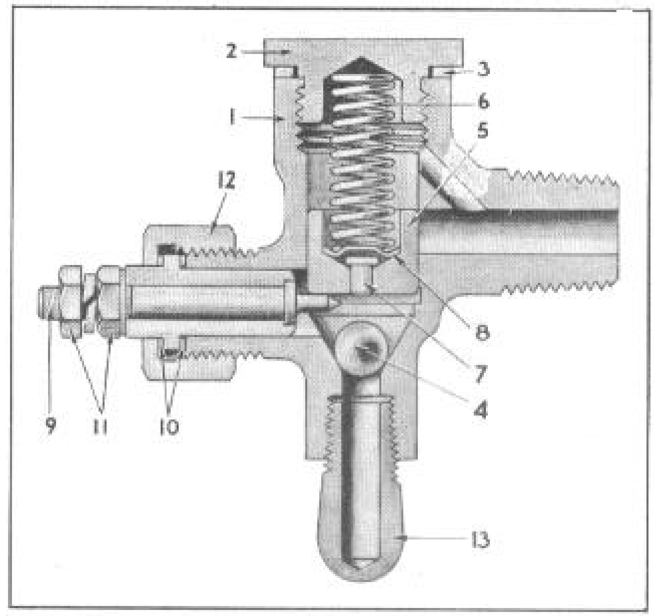


FIGURE 4

1. Valve body
2. Valve body plug
3. Valve body plug gasket
4. Valve ball
5. Valve plunger
6. Valve plunger spring
7. Valve plunger pin
8. Valve plunger pin retainer
9. Valve pressure indicator pin
10. Pressure indicator pin gasket
11. Pressure pin terminal nut
12. Pressure pin contact nut
13. Pump to check valve pipe elbow

When there is no oil flowing and therefore no pressure, the plunger is pushed down by the spring and contacts an insulated pin (9) which is the ground for the signal light. The light will burn until sufficient oil pressure is developed to raise the plunger.

A bleed path is provided between the plunger and pin (7) to allow a small quantity of oil to pass by the piston to the outlet. This hole must be kept clean or the lamp will not light immediately when the oil flow stops because the ball (4) would prevent or delay the escape of oil and delay the contacting of pin (9) by the plunger.

At speeds above idling, the oil pressure holds the check valve plunger off its seat so that the indicator lamp does not burn or flash.

If the indicator lamp does not light when the ignition is turned on, then ground the check valve terminal to the engine. If the lamp does not light, replace the bulb. If the lamp does light, remove the terminal pin and see that it is straight and clean. Take off the plug on top of the check valve housing, remove the plunger and see that it is clean and moves freely up and down. Examine the spring above the plunger.

CAUTION: Oil loss and ruined engines can result from failure to tighten the plug (2) and indicator pin nut (12) on the oil check valve, allowing these parts to back off and become lost. Under such conditions, the driver seldom learns of the difficulty until it is too late as the disablement of the check valve prevents the oil pressure tell-tale signal from doing its job of warning him that something is wrong with the oiling system.

OIL CHECK VALVE
6 CYLINDER

Oil pressure is regulated by a built-in nonadjustable oil check valve consisting of a plunger, spring, plug retainer, and plug gasket, Figure 5. The valve function is similar to the 8 cylinder models.

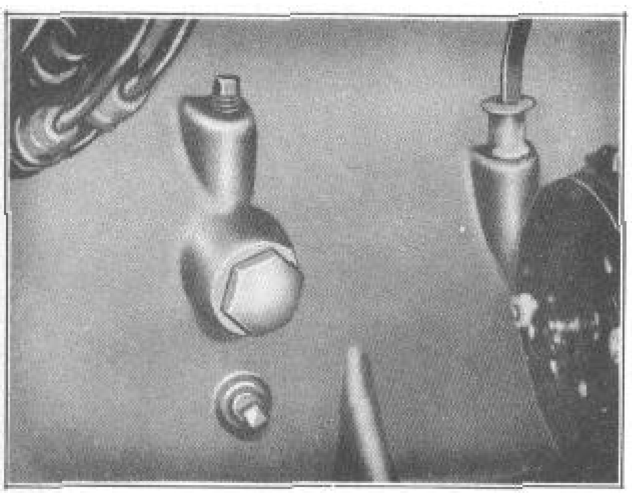


FIGURE 5

OIL CHECK VALVE REMOVAL
8 CYLINDER

1. Remove the right front wheel.

2. Remove four 1/4-28 hex bolts from right front fender side dust shield extension.

3. Disconnect the tell-tale wire and remove bakelite plug from check valve.

4. Disconnect the oil lines at the check valve.

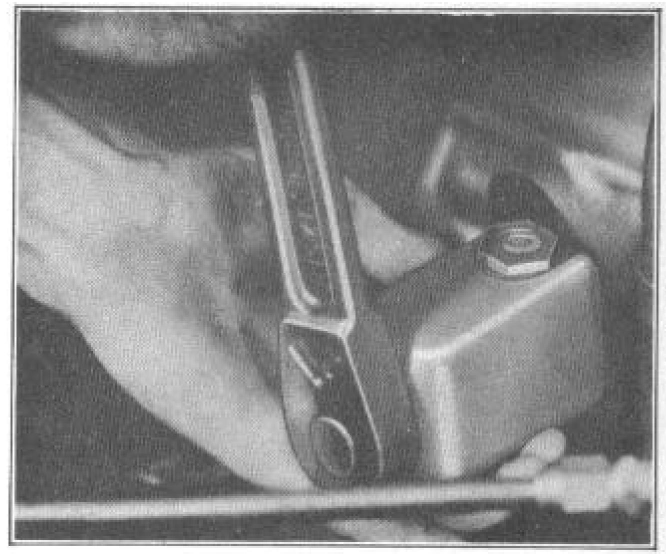


FIGURE 6

5. Remove oil check valve using tool 1-1454.

NOTE: To install, reverse procedure of removal.

OIL PUMP
8 CYLINDER

The oscillating plunger type oil pump is driven by an integral gear on the camshaft.

The reciprocating motion of the plunger allows the slots to register with the inlet and outlet openings of the pump, therefore acting as a double acting piston.

REMOVAL:

1. Disconnect the inlet and outlet lines from the oil pump.

2. Remove the two attaching bolts and remove the oil pump.

DISASSEMBLY:

1. Remove the hex plug (2) and gaskets (3) from either end of oil pump, Figure 7.

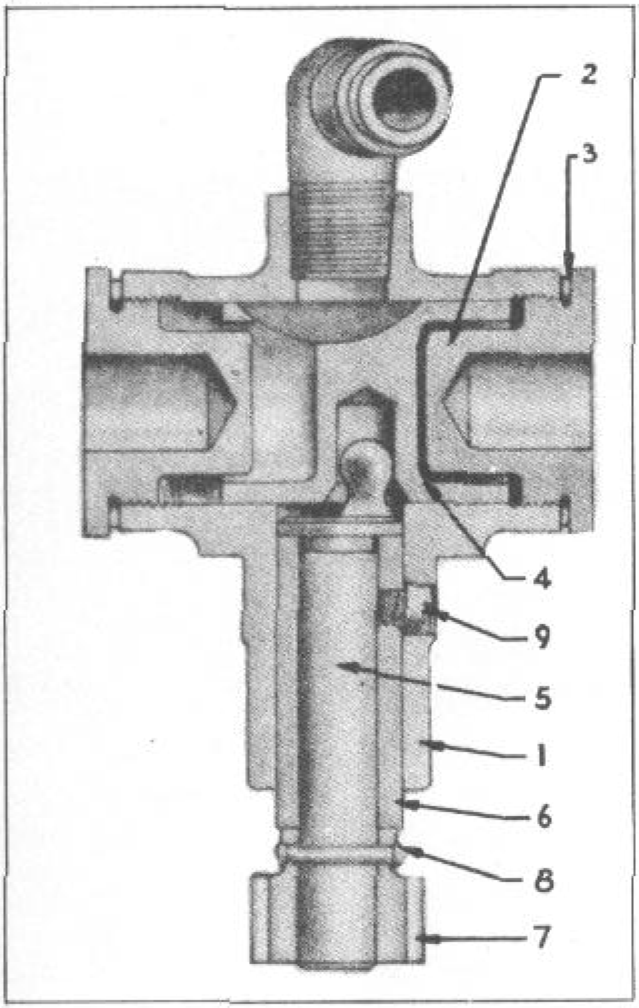


FIGURE 7

1. Oil pump body
2. Oil pump body plug
3. Oil pump body plug gasket
4. Oil pump plunger
5. Oil pump shaft
6. Oil pump shaft bushing
7. Oil pump gear
8. Oil pump gear pin
9. Oil pump shaft bushing retaining screw

2. Remove the oil pump shaft bushing (5) retaining screw (9), and remove the shaft and plunger (4).

3. Wash all parts thoroughly in gasoline and with an air hose, blow parts dry.

REASSEMBLY:

1. Before assembly, dip the pump shaft and plunger in engine oil.

2. Inlet connections at the cylinder block and at the oil pump should be inspected. Leakage at these points will cause air to be sucked into the system and the flow of oil will be reduced and possibly stopped.

INSTALLATION:

To install, reverse procedure of removal.

OIL PUMP
6 CYLINDER

A centrifugal operating rotor type pressure pump is used on all six cylinder engines.

The pump is very simple in construction and efficient to the extent that service of the unit is very seldom necessary.

REMOVAL:

To remove the oil pump and still maintain the correct engine timing during installation, proceed as follows:

1. Lift off distributor cap and rotate crankshaft until distributor rotor is in firing position for #1 cylinder. Keep engine in this position while pump is removed.

2. Remove the three oil pump to block attaching studs and remove oil pump.

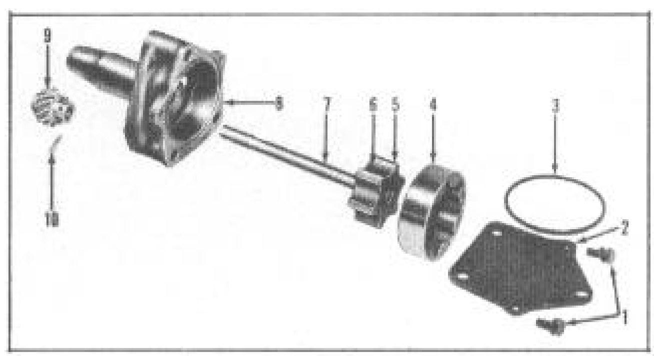


FIGURE 8

DISASSEMBLY:

1. Remove cover screws (1), Figure 8, cover (2), and gasket (3).

2. Hold hand over cover opening and with pump upside down, turn drive shaft until outer rotor (4) slips out.

3. Drive out straight pin (10) which holds pump drive gear (9) to shaft.

4. Press shaft (7) out of gear (9) by supporting oil pump body (8) on cover face in a suitable arbor press allowing inner rotor and shaft to clear when pressing shaft out of gear.

5. Wash all parts in dry cleaning solvent and dry with compressed air.

INSPECTION

1. Install rotors and shaft in pump body with inner rotor rotated so that one lobe of inner rotor is contacting the corresponding notch in the outer rotor. Measure clearance between opposite lobe of inner rotor and outer rotor. This clearance should be .010" or less. If more than this, replace both rotors and shaft.

NOTE: The shaft, inner rotor, and outer rotor are sold in matched sets only.

2. Measure thickness and diameter of outer rotor. This thickness should be .873" or more and diameter 2.746 or more. If rotor measures less than these figures, replace with a new shaft assembly and new rotors.

3. Inner rotor thickness should be .873". If less than this figure, replace with new rotors and shaft assembly.

4. With rotors and shaft assembled in pump body, place a straight-edge across pump body between screw holes and using a feeler, measure clearance between top of rotors and straight edge. This clearance should be .004" or less. If clearance is greater than this, replace oil pump body.

5. With outer rotor (4) pressed to one side of pump body, with feeler gauge, measure clearance between the outer rotor and body at opposite side. This clearance should measure .008". If clearance is more than this, replace pump body.

NOTE: Inspection operations #4 and #5 should be made after determining that the old rotor are satisfactory or new rotors used.

6. Body cover (2) should be smooth. It should be replaced if scratched, grooved, or worn. Lay a straight-edge across the inner surface of cover and try to insert a .002" feeler between cover and straight-edge. If feeler can be inserted, replace cover.

ASSEMBLY:

1. Install outer rotor (4) in pump body, Figure 8.

2. Slide shaft (7) and rotor (5) assembly into pump body.

3. Support oil pump body and shaft, and rotors assembly on a suitable clean surface and press oil pump drive gear (9) on shaft (7). End play between hub of gear and pump body should be .004" to .008".

4. Install gear pin, peening over both ends securely.

5. Make sure pump Is thoroughly clean, then install cover gasket (3) in recess of pump body.

6. Install cover (2). Tighten screws evenly and securely.

INSTALLATION:

NOTE: If the engine has been rotated after the pump has been removed, the timing will be disturbed. It will then be necessary to proceed as follows:

1. Remove distributor mounting screw and disconnect octane selector tube. Remove distributor.

2. Set flywheel timing with #1 piston on T.D. C.

3. Insert aligning tool 1-2794 in the distributor shaft hole with aligning pin in line with the distributor mounting screw hole, Figure 9.

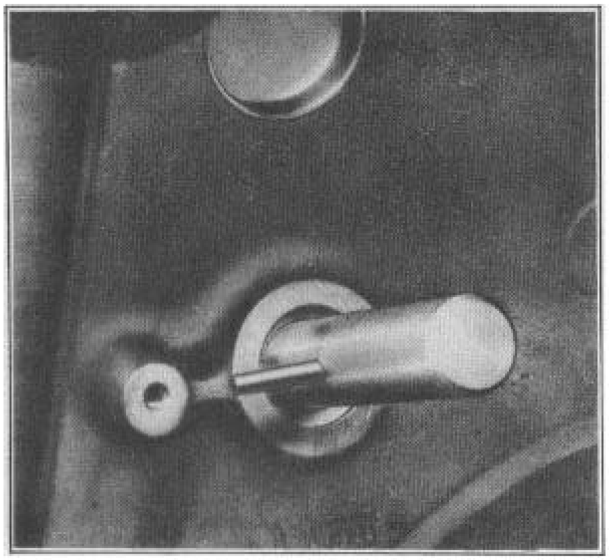


FIGURE 9

4. Install the oil pump, engaging oil pump drive gear with camshaft worm gear and engaging slot in the oil pump shaft with tongue on aligning tool, entering pump and at the same time, pushing out tool J-2794.

NOTE: The slot in the oil pump drive shaft is off center, also the tongue on end of the distributor shaft, Figure 10.

6. Set distributor in #1 firing position and install.

7. Install distributor mounting screw, distributor cap, octane selector connector, and coil lead wire.

OIL PAN
8 CYLINDER

REMOVAL:

1. Raise front end of car and place stand jacks under each side at #3 frame crossmember.

2. Drain oil from engine and reinstall drain plug.

3. Place a hydraulic jack under the center of #2 frame crossmember and raise jack until pressure is exerted against the #2 cross-member sufficiently to hold the member in place against the coil spring expansion pressure when the attaching studs are removed.

NOTE: The #2 crossmember has two locating dowels (one each side) to insure proper alignment of the front suspension in the frame side-members.

4. Remove one bolt and loosen the second bolt in each shock absorber anchor plate which will allow the shock absorbers to slide out of the anchor plates.

5. Remove the outer bolt (each side) of #2 crossmember at front of coil springs and insert the 1/2"-20 x 6" special studs.

6. Remove two bolts (each side) from #2 crossmember at rear of coil springs and insert the remaining four 1/2"-20 x 6" special bolts.

7. Remove the other four bolts holding cross-member at front of coil springs.

NOTE: All the pressure exerted by the front coil springs against the crossmember is now supported by the hydraulic jack.

8. Release the pressure of the hydraulic jack slowly and allow the crossmember to settle on the heads of the six special studs.

9. Remove two bolts from the flywheel dust cover and remove cover.

10. Remove the 5/16" hex bolts from the oil pan and remove pan.

NOTE: The 1/2"-20 x 6" hex bolts must be made special and the 6" dimension under head must be followed precisely since a longer bolt could not be used.

The bolts should not be threaded more than 1" from bolt end to avoid suspension hanging up on threads.

The clearance gained by dropping the #2 crossmember will be 5 inches which will be ample to clear oil pan and trough.

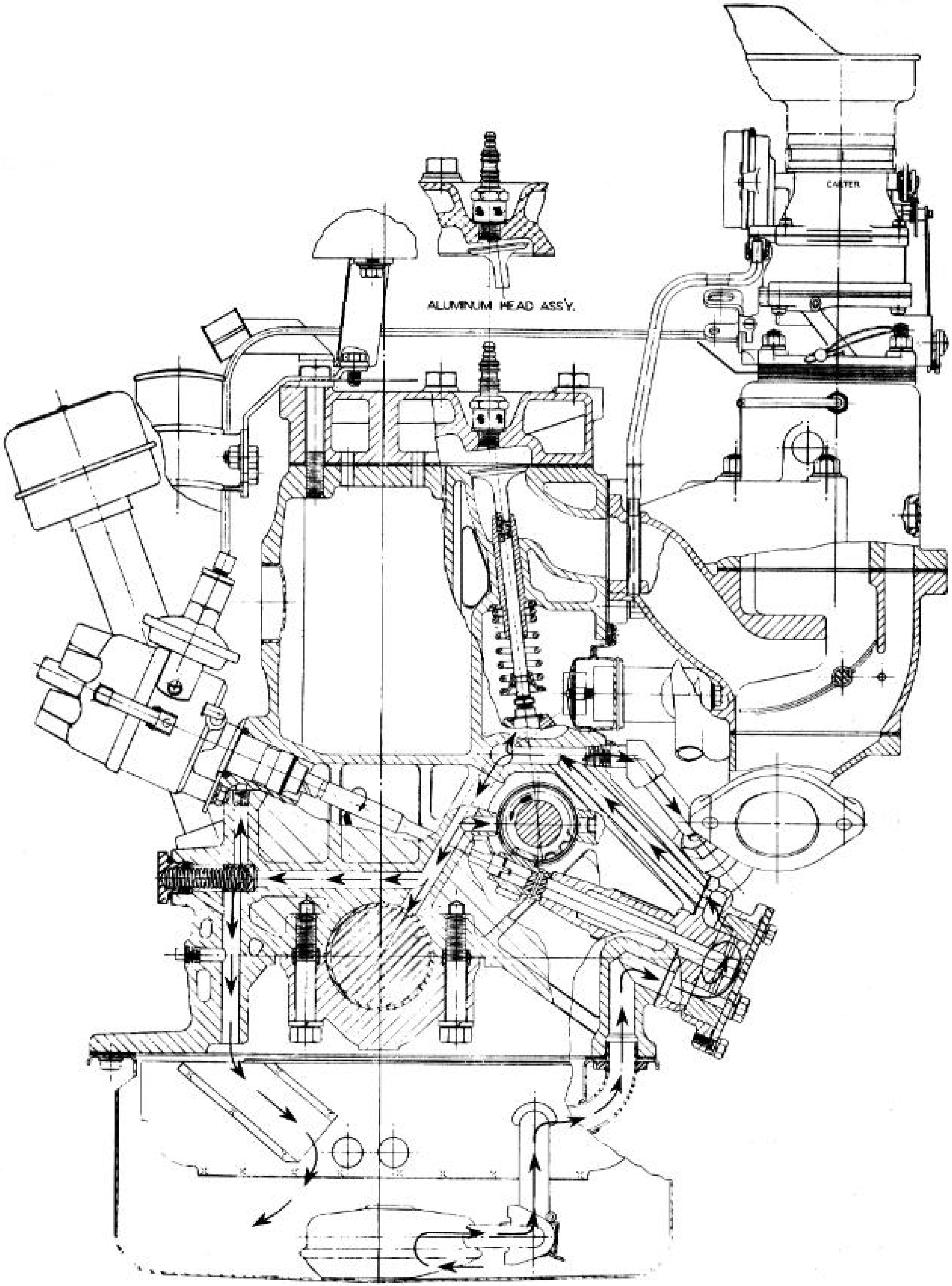


FIGURE 10

INSPECTION

1. Remove all traces of old gaskets from oil pan trough and oil pan. Install new gaskets. (Apply a light coat of Hudson Perfect Seal Gasket Paste on both sides of gasket when installing new gaskets).

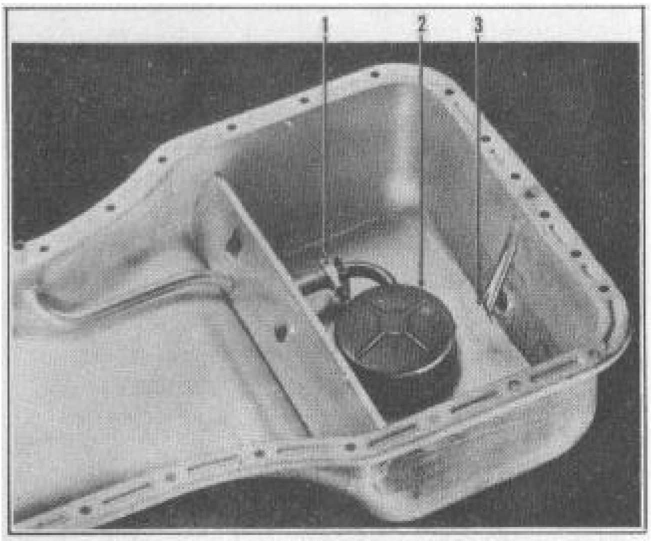


FIGURE 11

2. Remove cotter pin (1) attaching FlotoScreen to outlet pipe. Clean screen thoroughly or replace.

3. Install Floto-Screen to outlet pipe. Check to make sure there is no binding action and screen swivels freely.

4. Secure ends of cotter pin.

INSTALLATION:

1. Install rubber gasket on outlet tube.

2. Before installing oil pan, place two quarts of recommended oil in the oil pan troughs, and install oil pan to engine, installing two screws each side to hold oil pan until all screws have been entered.

3. Tighten screws evenly to 15-20 lbs. torque.

4. Raise jack until the #2 crossmember dowels are located and insert two front suspension attaching bolts (each side). Remove the six special bolts and install the remaining standard bolts.

If this part of the job is done properly, the alignment of the front suspension will not have been disturbed.

NOTE: Balance of installation, reverse procedure of removal. Refill engine with seven quarts of recommended engine oil. This is in addition to the two quarts placed in oil pan troughs.

OIL PAN
6 CYLINDER

REMOVAL:

1. Raise car and place stand jacks under the #2 frame crossmember.

2. Remove the three bolts attaching the center steering arm support bracket to #2 cross- member which will allow the center steering arm and tie rods to drop.

3. Remove two bolts attaching flywheel dust cover and remove cover.

4. Remove oil pan plug and drain oil.

5. Remove bolts and lockwashers attaching oil pan to cylinder block, remove oil pan.

NOTE: Do not lose the round rubber gasket at oil outlet tube.

INSPECTION:

Follow same procedure as outlined for 8 cylinder Oil Pan Inspection.

INSTALLATION:

Reverse procedure of removal. Check to make sure that center steering support bracket is properly secured.

Refill oil pan with seven quarts of recommended oil.

CYLINDER HEAD REMOVAL
8 CYLINDER

1. Drain cooling system.

2. Loosen carburetor air horn attaching screw and clamp. Remove brace from opposite side and remove air cleaner.

3. Disconnect top radiator and by-pass hose.

4. Disconnect heater hoses (if so equipped).

5. Disconnect throttle rod at carburetor.

6. Disconnect Bowden wire at cylinder head Weather Control valve.

7. Disconnect temperature gauge wire at cylinder head sender unit.

8. Disconnect spark plug wires and remove spark plugs.

9. Remove cylinder head stud nuts and washers and remove cylinder head.

10. Remove Weather-Control valve.

11. Remove temperature gauge sender unit from cylinder head.

CYLINDER HEAD REMOVAL
6 CYLINDER

Follow the same procedure as outlined under "Cylinder Head Removal - 8 cylinder" and in addition the following operation:

Remove vacuum advance tube at octane selector.

INSTALLATION:

1. Make sure cylinder head is free from carbon and dirt.

Check cylinder head with a straight edge for warpage or roughness, especially in cases of frequent "blowing" of head gaskets.

2. Install new head gasket with letters on gasket facing up. (Head gasket should be treated with a light coating of "Hudson Perfect Seal Gasket Paste").

NOTE: Cylinder head and gasket installation on 6 cylinder can be facilitated by using two J-2969 locating studs to position the gasket and head. These studs have a screw driver slot for removal after the cylinder head has been positioned. Figure 12.

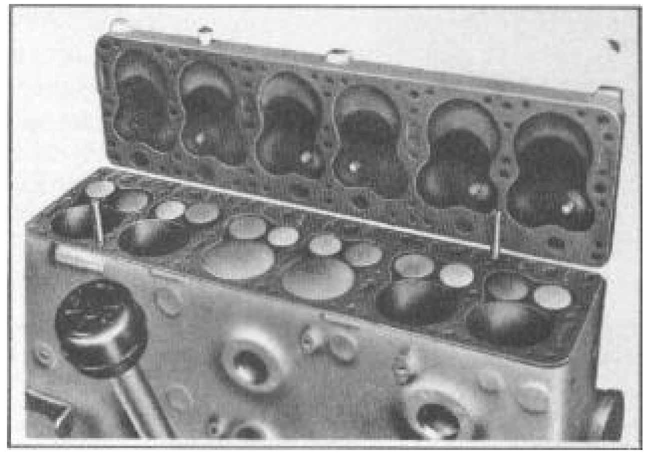


FIGURE 12

Cylinder head nuts should be tightened to 45-50 foot pounds on 8 cylinder and 70-75 foot pounds on 6 cylinder, using torque wrench J-1264, Figure 13.

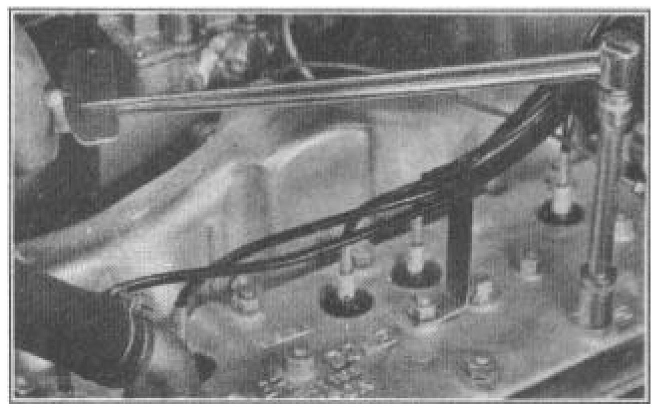


FIGURE 13

Tighten each nut or cap screw in the proper sequence shown in Figure 14.

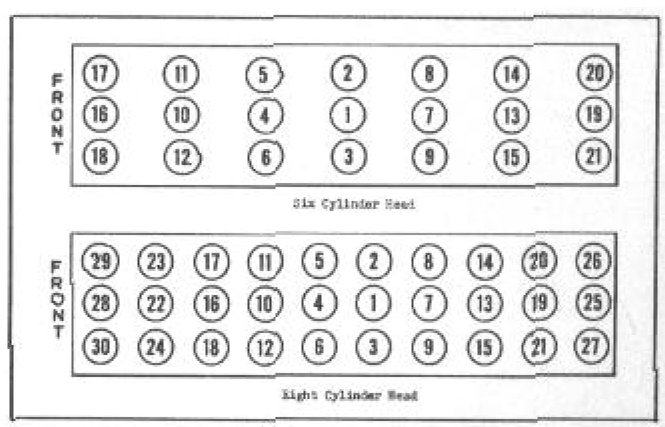


FIGURE 14

CAUTION: If the threads in the cylinder block are corroded or filled with dirt, an incorrect reading will be indicated on the torque wrench as a large percentage of the torque will be absorbed by the threads. ALWAYS CLEAN OUT THREADS IN CYLINDER BLOCK BEFORE INSTALLING CYLINDER HEAD. Apply "Hudson Perfect Seal Gasket Paste" to the threads of cap screw to facilitate the tightening of the cap screw to the proper tension.

MAIN BEARINGS
6 CYLINDER

REMOVAL:

Main bearing caps and shells can be removed from the 6 cylinder engine without removing the crankshaft.

1. Remove main bearing cap screws and remove No. 2 and No. 3 main bearing caps.

2. Remove front and rear main bearing caps with Puller J-2955, Figure 15.

CAUTION: DO NOT DAMAGE the engine timing gear cover plate gasket when removing the front bearing cap.

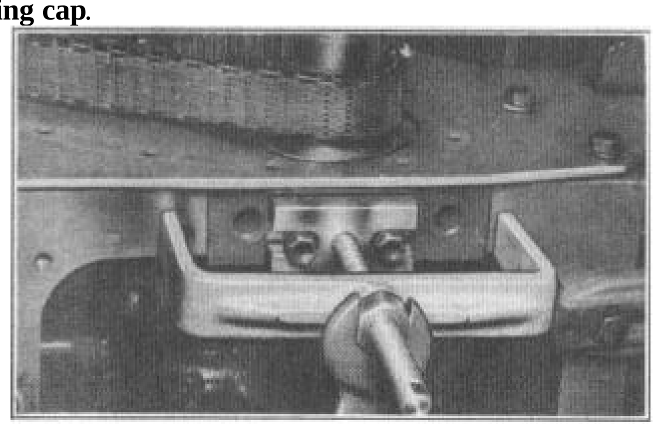


FIGURE 15

3. Install Upper Bearing Shell Removing Tool KMO-734 in oil hole of crankshaft and turning crankshaft in usual rotation, the hinged head of the pin will engage the upper half of the bearing and turn it out with the rotating action of the crankshaft, Figure 16.

NOTE: Check main bearing oil seal for leaks and if it is necessary to replace the seal, the crankshaft will have to be removed. (See crankshaft removal, Page 30).

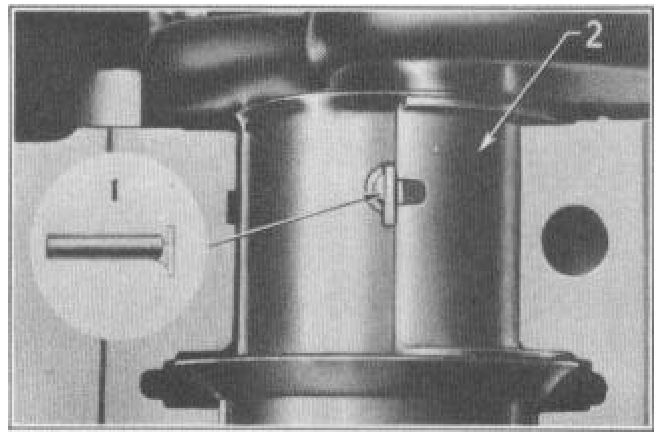


FIGURE 16

INSTALLATION:

Recommended total diametral clearance between crankshaft journals and main bearings is 0.0005 to 0.0015". It is important that these close clearances be maintained when fitting new bearings.

NOTE: Hudson main bearings are furnished in the following sizes:

300260	Bearing No. 1	Standard
300261	Bearing No. 2	Standard
300262	Bearing No. 3	Standard
300263	Bearing No. 4	Standard
301286	Bearing No. 1	.001 U.S.
301287	Bearing No. 2	.001 U.S.
301288	Bearing No. 3	.001 U.S.
301289	Bearing No. 4	.001 U.S.
300436	Bearing No. 1	.010 U.S.
300437	Bearing No. 2	.010 U.S.
300438	Bearing No. 3	.010 U.S.
300439	Bearing No. 4	.010 U.S.

Bearing upper and lower halves are interchangeable. However, bearing No. 1 is not interchangeable with bearing No. 2 or 4. Bearing shells are stamped with part number or size for easy identification.

1. After the proper bearing sizes have been selected, start the upper shells in place, and with KMO-734 Bearing Shell Remover and Replacer Tool entered in oil hole of crankshaft and with hinged head of Replacer against bearing end, rotate crankshaft, pulling the bearing into position, Figure 16.

NOTE: The bearing shells are held in position by a raised tongue in the bearing shell which fits into a machined groove in the bearing cap. When installing the upper shells, the end opposite the notched end should be entered first. When installing the bearing cap, the end with the machined groove should be on the same side and next to the corresponding groove in the cylinder block.

REAR MAIN BEARING CAP

INSTALLATION:

Check the rear bearing cap oil seal and if replacement of the seal is necessary, proceed as follows:

1. Crowd the seal material into the outer groove of the bearing cap by hand and with Main Bearing Oil Seal Installer J-2779, drive the seal tightly into the groove by tapping handle of tool with a bronze hammer, Figure 17.

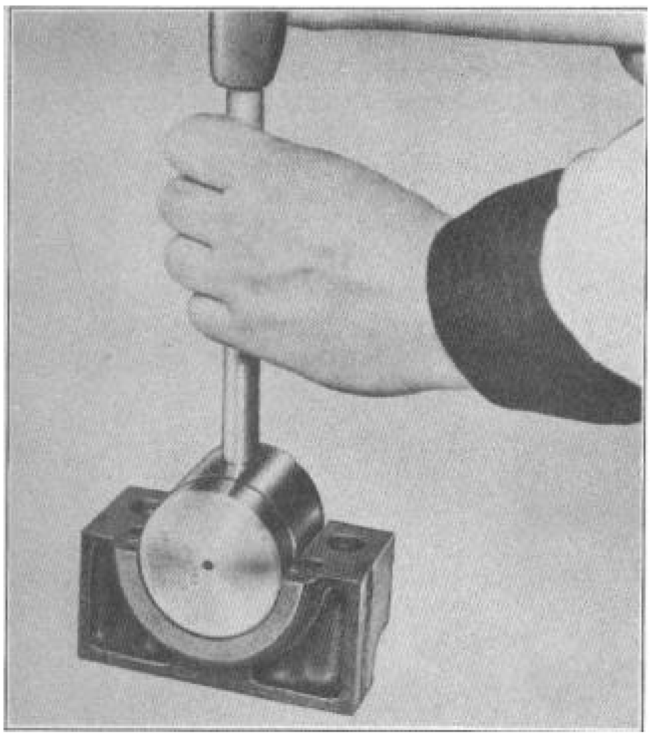


FIGURE 17

NOTE: Large diameter of the tool cylinder should be to the front of cap with the lesser dimension compressing the seal at rear of cap.

2. After the seal has been properly seated in the bearing cap and in the block, and while the tool is still compressing the seal, cut the seal off flush with the top face of the cap. Make a good clean straight cut so that no frayed ends will be clamped between upper and lower caps. **DO NOT CUT SEAL TOO SHORT**. The seal must entirely fill the groove; otherwise an oil leak will occur.

3. Install upper and lower bearing shells.

CAUTION: Do not file bearing shells or bearing caps.

4. Tighten all bearing cap bolts to 70-80 pounds with J-1264 torsion wrench.

After installation of new bearing shells, check crankshaft end play which should be .003 minimum to .009 maximum.

5. Install wood packing into the vertical holes (1) and (2) in front and rear caps first, then into the horizontal holes (3) of the front bearing cap, Figure 18.

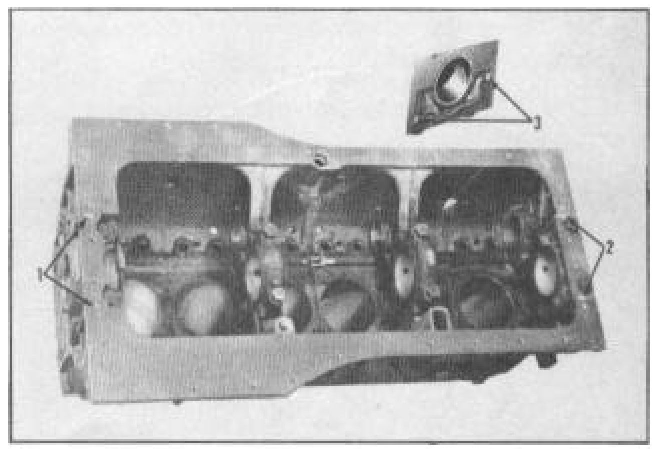


FIGURE 18

Packing must be soaked in engine oil before installing and should be driven until seal bottoms. DO NOT allow seal to protrude beyond top face and front face of bearing cap.

MAIN BEARINGS
8 CYLINDER

REMOVAL:

The upper and lower main bearing shells are each held in place in the crankcase and bearing caps with slotted flat head brass machine screws.

NOTE: Crankshaft bearings are not adjustable as no shims are used. NEVER FILE bearings or bearing caps to reduce clearance.

1. If all new main bearings are to be installed, it is advisable to remove the engine from the chassis and place in a suitable overhaul stand. See "Engine Removal", page 19.

2. Remove oil pan and trough.

3. Remove main bearing cap screws and remove bearing caps.

NOTE: Front and rear bearing caps can be easily removed with Bearing Cap Puller J-2955, Figure 15.

CAUTION: DO NOT DAMAGE the front end plate gasket when removing front bearing cap.

4. Thoroughly clean all traces of cotton packing from the grooves in the case and cap Figure 19 to avoid clogging of the oil passages.

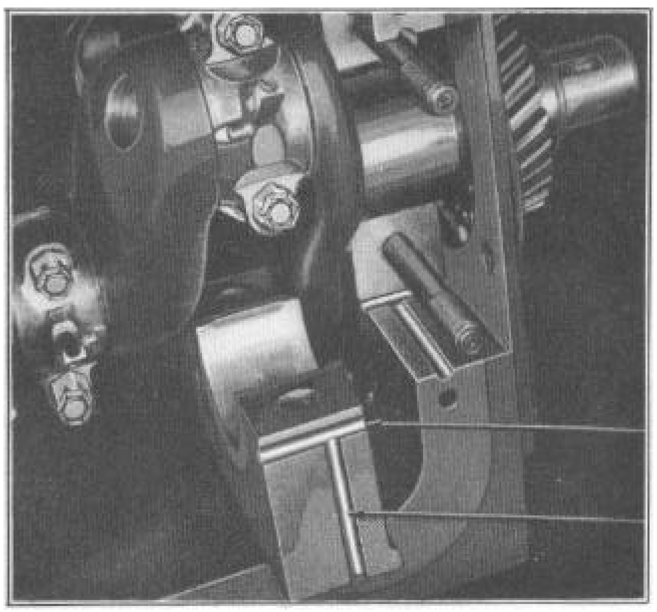


FIGURE 19

5. Remove crankshaft (See "Crankshaft Removal", page 30.

6. Remove slotted screws retaining bearings in cylinder block and remove bearings.

INSTALLATION:

Recommended total diametral clearance between crankshaft journals and main bearings is .001. This close clearance must be maintained when fitting new bearings.

NOTE: Hudson main bearings are furnished in standard or .010 undersize finished reamed, or unfinished (for shops with line reaming equipment).

SIZE CODE

When replacing crankshafts, the undersize dimension is located on the front face of No. 1 counterweight.

When replacing main bearings, the .010 undersize dimension is noted by a spot of green paint and the part number stamped on the bronze back in indelible ink for eight cylinder engines. On six cylinder engines the part number and size are stamped on the steel back of the bearing shells only. Refer to your 480 series parts book for proper identification.

Engines built with undersize associate parts are identified by the following designated marks stamped on the bottom face of the cylinder block at the left front corner in a clear area beyond the oil pan gasket.

P.U. means crankshaft has .010 undersize crank pins.

M.U. means crankshaft has .010 undersize main bearing journals.

P.M.U. means crankshaft has .010 undersize pins and main bearing journals.

In cases where new unfinished bearings are being fitted, the caps and bearing shell assemblies should be installed in the case and tightened to 70 to 75 foot pounds torque, then line reamed to size.

Crankshaft should have .006 to .012 end play measured at the center main bearing in each case. When installing new factory unreamed shells, it may be necessary to machine the thrust flange face of the center bearing shells in order to obtain this amount of end play.

When assembling new or old bearing shells to caps, tighten the retaining screws just snugly to allow self-centering of shell on screw. Make sure that screw heads are below the babbitt surface.

Shells are punch marked on the edge to facilitate correct reassembly.

NOTE: Shells should fit flush with parting face of case, but should project .002 beyond parting face of caps to provide a slight "pinch" for correct seating.

Before bolting front and rear caps and shell assemblies into case for reaming, and always at final assembly, they should be centralized on studs for proper bearing alignment. This can be easily accomplished by inserting a 1/4" drill rod in the vertical packing holes before tightening bearing cap bolts.

At final assembly after the cap and shell assemblies have been bolted in place with 70-80 pounds tightening torque, the palnuts must be installed and the packing inserted in front and rear bearing caps as follows:

Install palnut with smooth face next to nut and spin onto stud until it just contacts the nut. Tighten palnut 1/4 to 1/3 of a turn further for final locking.

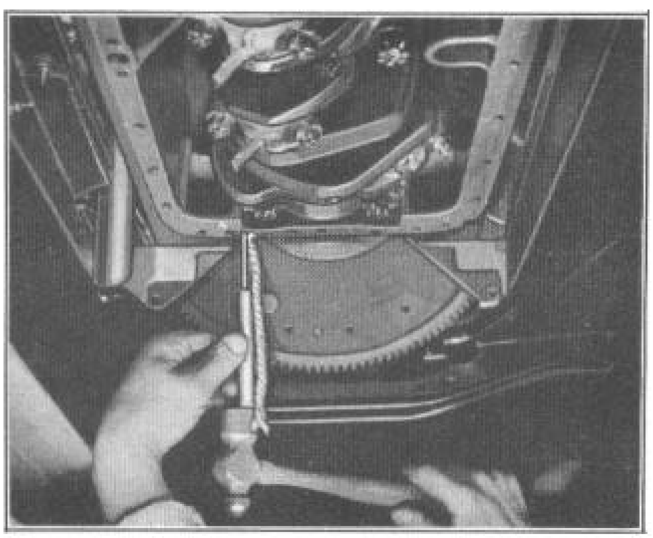


FIGURE 20

Install cotton wicking into the vertical holes in front and rear caps first, then into the horizontal holes of the front bearing cap. Insertion of packing is greatly facilitated by using tool J-392, Figure 20.

EIGHT CYLINDER ENGINE

REMOVAL:

NOTE: The engine and transmission are removed as one unit with electrical units and carburetor attached to engine.

The sequence of operations follows:

REMOVING HOOD:

1. Remove the two hood hinge bolts (each side) at the rear of the hood.

2. Before removing the hood prop bolts (one each side) place a support under the front of the hood.

3. Lift and remove the hood.

PREPARATION OF ENGINE FOR REMOVAL:

1. Drain cooling system, open drain at bottom right side of radiator and remove plug from left rear side of engine.

2. Disconnect the throttle linkage.

3. Disconnect fuel line at junction of fuel pump flexible hose and steel gas line.

4. Remove the bolts from exhaust pipe to exhaust manifold flange.

5. Remove radiator hoses.

6. Disconnect the remote control cable from steering column to the transmission by removing the hairpin lock at steering column and leave attached to transmission.

7. Disconnect wire at starter solenoid.

8. Disconnect wire at starter motor and remove cable from battery.

9. Disconnect the water temperature gauge wire from the side of the cylinder block.

10. Disconnect the oil gauge check light wire.

11. Disconnect the vacuum tube from the windshield wiper motor.

12. Remove the two generator lead wires.

13. Disconnect the coil wire.

REMOVING CRANKCASE BREATHER:

1. Remove slotted head screw holding breather to rear tappet cover.

2. Remove bolt from bracket attaching breather to engine end plate.

REMOVING RADIATOR

1. Disconnect hood lock conduit; pull wire at lower hood lock support.

2. Remove the nine hex cap screws from the fender tie panel and hood lock support panel and remove tie panel.

3. Remove the four hex bolts attaching radiator to channel. (Note: Remove the nuts located inside the radiator channel).

4. The radiator may now be lifted up and forward out of the channel. (Note: Approximately 8" of forward clearance is gained by removing the radiator).

5. Remove the two front engine mounting bolts.

REMOVING CONNECTION BENEATH CAR:

1. Drain the transmission oil and leave the drain plug out. (Note: The drain plugs in some cases have caused interference when removing the engine; therefore, it is recommended that plugs be left out.

2. Drain engine oil from oil pan.

3. Remove propeller shaft center bearing support bolts to allow rearward movement of the drive line to clear companion flange at transmission.

4. Disconnect front propeller shaft at the transmission companion flange.

5. Remove the bolt and bracket attaching exhaust pipe to engine rear end plate.

6. Remove two bolts from the clutch cross shaft bracket, disconnect clevis and remove cross shaft.

7. Remove remote control shifter lever rod from transmission and leave rod attached to frame.

8. Remove the engine (rear) mounting bolts.

9. Attach Motor Lift Bracket J-2782 and raise engine up and out of chassis, Figure 21.

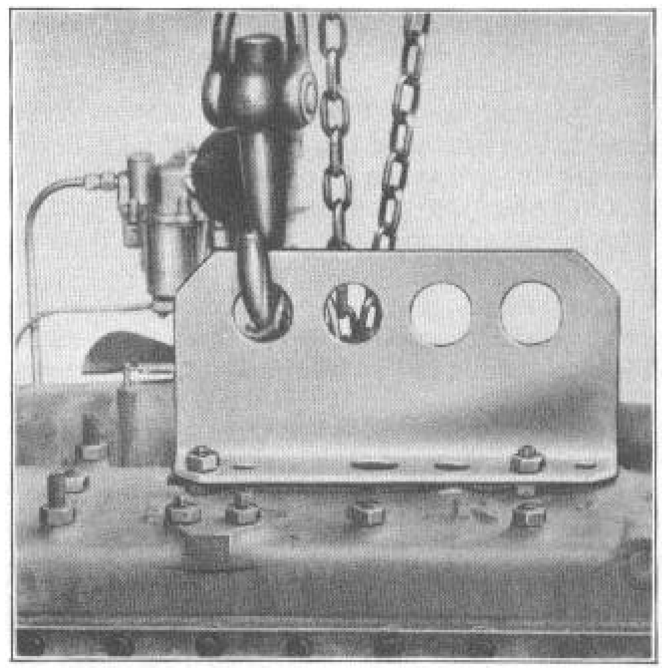


FIGURE 21

ENGINE
8 CYLINDER

INSTALLATION:

1. Loosen bolts holding front motor insulators to cross-member.

NOTE: This will allow proper front motor support alignment when entering motor to car.

2. Enter engine to car using care to enter at a proper angle

3. Align engine with front motor support bolts, install nuts and washers, but do not tighten at this time.

4. Raise car and place stand jacks.

5. Align rear motor support with holes in crossmember and install spacers, flat washers, lockwashers, and nuts; tighten securely.

6. Install transmission drain plug.

7. Install clutch cross shaft and bracket assembly.

NOTE: Use a new rubber bushing at clutch cross shaft.

8. Install clutch adjusting rod and make necessary adjustment.

9. Install clutch pull back spring.

10. Install shift shaft to control tube rod assembly.

11. Install speedometer driven gear and speedometer cable.

12. Install universal joint to transmission companion flange and lock plates securely.

13. Install propeller shaft center support bracket and attaching screws.

14. Install exhaust pipe flange at manifold before tightening clamp at transmission.

15. Tighten front motor support bolts to 40 lbs. torque.

16. Install oil pressure indicator contact (bakelite) and wire. Use care in tightening to prevent breakage.

17. Install exhaust pipe clamp at rear motor support.

18. Install flexible gas line.

19. Insert 2 pounds of S.A.E. 80 or 90 E.P. lubricant in transmission, 3-1/4 lbs. with overdrive.

20. Lower car.

21. Remove motor lifting bracket.

22. Install oil gauge wire at check valve, coil wire, temperature gauge wire, generator wire, starter solenoid wire, voltage regulator wire, starter cable, and windshield wiper hose.

23. Install remote control cable to control tube and attach-bracket to control lever support bracket.

NOTE: Shifter lever at steering wheel and transmission must be in neutral to insure proper shift.

24. Install Weather Control cylinder head unit, apply Hudson Perfect Seal on threads and connect control wire.

25. Install hose at weather control and at water pump.

26. Install air cleaner.

27. Install radiator and hose.

28. Attach headlight harness to junction post.

29. Install frontfender tie panel and hood lock support and attach hood lock release cable wire.

30. Attach accelerator rod at throttle bell crank and insert cotter pin and nut.

31. Install hood, reverse procedure of removal.

32. Refill crankcase to recommended level. See "LUBRICATION".

SIX CYLINDER ENGINE

REMOVAL:

NOTE: Follow the same procedure as outlined in "Eight Cylinder Engine Removal and Installation."

PISTONS, PINS, AND RINGS

ROD AND PISTON REMOVAL
(6 & 8 CYLINDER)

NOTE: Before removing rods and pistons, remove the ridge from the top of cylinder walls with an accredited

ridge reamer. This precaution will prevent cracked or broken piston ring lands or piston rings.

The 6 cylinder connecting rods and pistons must be removed through the top of the cylinder block while the 8 cylinder rods and pistons can be removed from either the top or bottom. Thus, on the 6 cylinder engine it will be necessary to remove the oil pan and cylinder head. Although it is not necessary to remove the cylinder head in order to remove the rod and piston assemblies on the 8 cylinder, it is advisable in order to facilitate proper checking of cylinder walls and fitting of piston rings as well as removing cylinder ridge and carbon deposits.

PISTON RINGS

PRODUCTION RINGS

The piston rings used in factory production on 6 and 8 cylinder engines are cast iron of one-piece type and are pinned to prevent rotation in the piston grooves.

The rings are notched on the inner diameter at approximately the gap slot, Figure 22.

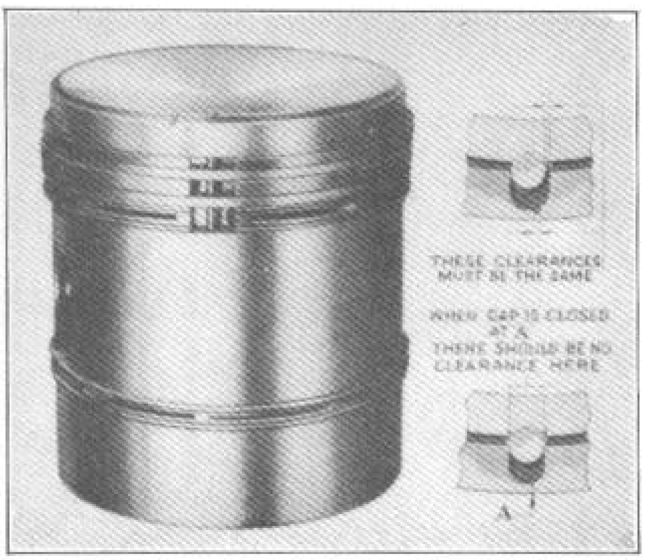


FIGURE 22

Width of the notch is .125 total of which approximately .075 is at one end of the ring and .050 at the other end. This offsetting of the notch enables a single pin to anchor the 3 top piston rings without having the gaps aligned on adjacent rings.

It will also be noted by reference to Figure 22 that the end gap is equal to the backlash of the ring notch on pin. Therefore, if the ends of a ring are filed to obtain the desired .004 to .009 gap on 8 cylinder and .006 to .014 on 6 cylinder, it is necessary to file an equal amount from the notch in order to maintain the pin backlash at the same value as the gap.

NOTE: To insure that the gap and backlash be maintained equal, ring filing to fit a bore size smaller than the ring size should be avoided.

Production type rings are available in .003, .005, .010, .015, .020 over-size for both 6 and 8 cylinder, and .030 over-size for 8 cylinder only. They are to be used only in cylinders that are being reconditioned by boring, honing, grinding or other recommended process.

When installing rings to piston, be sure that successive rings are assembled to the grooves with their gap on opposite sides of center line of the ring retaining pin. In other words, if the top ring is installed with the short half of the notch on the right side of the pin, the 2nd ring should be installed with the short half on the left side of the pin and the 3rd in the same relative position as the first.

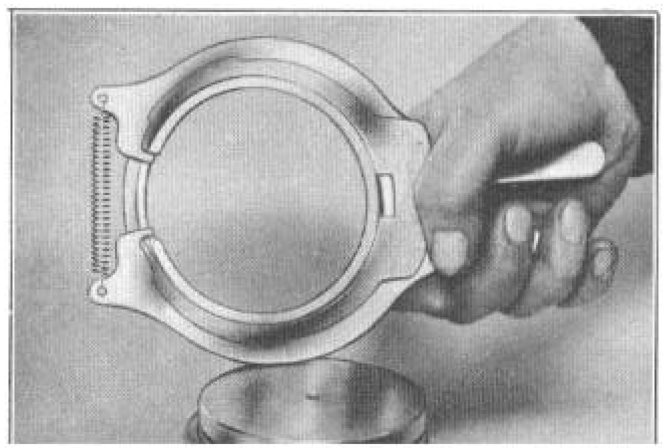


FIGURE 23

To avoid damaging piston rings or pistons use KMO 297 H Piston Ring Remover and Installer, Figure 23.

SPECIAL RINGS FOR SERVICE
(8 Cylinder)

The factory production type piston rings described in preceding paragraphs are not intended for use in worn cylinders. There are available, however, special service piston rings designed to correct excessive oil consumption (resulting from cylinder wear) without recourse to cylinder reconditioning.

These service rings are available in two types based on the principle that the amount of bore wear dictates the allowable initial unit wall pressure.

Both types of service rings listed below are pinned to prevent rotation on the piston and with the exception of the steel segments used in some kits, the .0125 pin notch is offset with respect to the ring end gap.

RINGS FOR SLIGHT WEAR

The ring kits listed below are intended for installation in cylinders that are not more than .003 out-of-round and which have not more than .005 of taper.

Engine	Nominal Cyl. Size	Kit No.
8 Cyl.	3.00 to 3.0075	166327
8 Cyl.	3.008 to 3.018	166448
8 Cyl.	3.0185 to 3.028	166449

The above rings are cast iron and they differ from the production type in that the compression ring in the No. 2 groove and the oil ring in the No. 3 groove are provided with a steel expander. When installing these rings to pistons be sure that successive rings are assembled with their gap on opposite sides of the ring retaining pin. In other words, if the top ring is installed with the short half of the notch on left side of pin, the 2nd ring should be installed with the short half of the notch on the right side of the pin and so on.

Avoid filing of rings wherever possible but check to see that end gap and notch backlash on pin is not less than .005 and not more than .015 on compression rings and not less than .008 and not more than .022 on both oil rings. **These gap and backlash dimensions are to be measured at the point of minimum wear in the ring traveled part of the bore.**

BADLY WORN CYLINDERS

The ring kits listed below are intended for installation in cylinders that are more than .003 out-of-round and which have more than .005 of taper.

Engine	For Bore Sizes	Kit No.
8 Cyl.	3.00 to 3.0075	166493
8 Cyl.	3.008 to 3.018	166494
8 Cyl.	3.0185 to 3.028	166495

The above ring kits differ from the production type in that the compression ring (B), Figure 24, in the No. 2 groove and oil ring (G) are provided with steel expanders. Also the oil ring (E) in the No. 3 groove is a 4-piece type employing a steel expander (F), a cast iron wall contacting element (E) and 2 steel wall contacting segments (D).

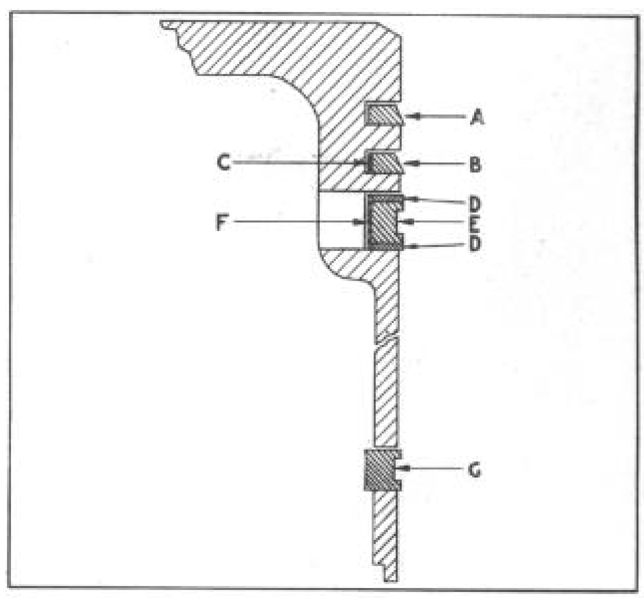


FIGURE 24.

Avoid filing of rings wherever possible and check end gap and backlash of all but the No. 3 oil ring to same limits as kits listed in opposite column. In the case of the No. 3 oil ing, the steel segments and narrow iron ring should have not less than .013 and not more than .040 gap and backlash measured at the point of minimum wear in the ring traveled part of the bore.

PISTON SIZE CODE
(8 Cylinder)

A code letter is stamped on the cylinder block along the lower face of the valve chamber, Figure 25, to show the original size of each cylinder.

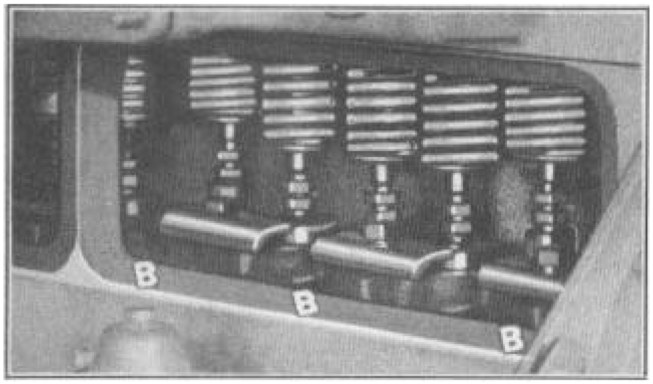


FIGURE 25

A code letter and the piston weight in ounces and quarter ounces is stamped on the head of each piston. In addition to these size and weight marks, all original factory piston installations are numbered on the head of the piston with the block number and the number of the cylinder in which the piston is fitted.

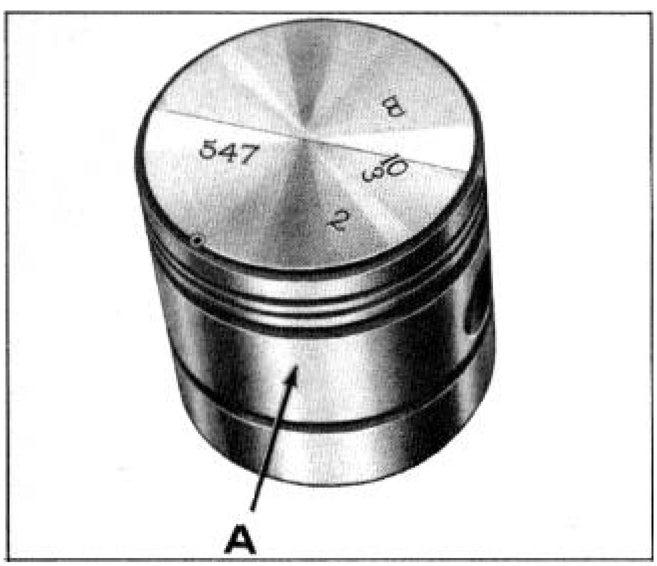


FIGURE 26

Example - The piston from No. 2 cylinder of a certain engine is marked as shown In Figure 26. The mark "547" is for identifying this piston which is one of a matched set so that it will be installed in the cylinder selected. The cylinder block is also stamped "547" on the front end face to the right of water pump. The mark "B" is the code letter stamped on both the piston and the lower face of the valve chamber and can be translated into a definite size by referring to the code tables shown on page 24. The mark $\frac{\text{"10"}}{3}$ indicates the weight and means 10-3/4 ounces. (If marked $\frac{\text{"10"}}{1}$ the weight would be 10-1/4 ounces). The mark "2" is the number of the cylinder in which the piston is installed.

When any piston is being replaced, it should be of the same weight as the one removed. A complete set of new pistons should always be of the same weight because unequal piston weight will cause rough engine operation.

KEY TO CODE MARKINGS
(8 Cylinder)

PISTON, CYLINDER, RING SIZES
(Ring Oversizes Apply Only To Production Type Rings)

Cylinder		Piston		Piston Ring
Size	**Code**	**Code**	**Size**	**Size**
3.000	A	A	2.998	3.000
3.0005	B	B	2.9985	3.000
3.001	C	C	2.999	3.000
3.0015	D	D	2.9995	3.000
3.002	E	E	3.000	3.000
3.0025		F	3.0005	3.000
3.0045		J	3.0025	3.003
3.0055		L	3.0035	3.005
3.0075		P	3.0055	3.005
3.010	AO	AO	3.008	3.010
3.0105	BO	BO	3.0085	3.010
3.011	CO	CO	3.009	3.010
3.0115	DO	DO	3.0095	3.010
3.012	EC	EO	3.010	3.010
3.0125		FO	3.0105	3.010
3.0145		JO	3.0125	3.015
3.0175		PO	3.0155	3.015
3.0155		LO	3.0135	3.015
3.0205		BB	3.0185	3.020
3.0215		DD	3.0195	3.020
3.0225		FF	3.0205	3.020
3.0305			3.0285	3.030
3.032			3.030	3.030

The difference between the cylinder size in the chart and the piston size in the chart gives the recommended clearance.

Cylinder bore sizes from standard to .030 oversize are given in this chart and the recommended piston sizes and ring sizes for each bore size.

Same sizes of piston rings are recommended for more than one piston size and it is always advisable to hone the cylinder to the smallest dimension for which a given ring is recommended. Ring oversizes shown in table are available only in production type rings.

PISTON SIZE CODE
(6 Cylinder)

A code letter is stamped on the cylinder block along the lower face of the valve chamber, Figure 25, to show the original size of each cylinder. A corresponding letter appears at the top of the piston. The numbers 1 to 6 indicate the cylinder in which the piston is installed.

KEY TO CODE MARKINGS

(6 Cylinder)
PISTON, CYLINDER, RING SIZES

Cylinder Size	Cylinder Code	Piston Code	Piston Size	Piston Ring Size
3.5625	B	B	33.560	3.5625
3.563	C	C	3.5605	3.5625
3.5635	D	D	3.561	3.5625
3.564	E	E	3.5615	
3.5645	F	F	3.562	3.565
		J	3.564	3.5675
		L	3.565	3.5675
		P	3.567	3.572
3.572	AO	AO	3.5695	3.572
3.5725	BO	BO	3.570	3.572
3.573	CO	CO	3.5705	
3.5735	DO	DO	3.571	3.572
3.574	EO	EO	3.5715	3.577
3.5745	FO	FO	3.572	3.577
		LO	3.575	3.577
3.5825	BB	BB	3.580	3.5825
3.5835	DD	DD	3.581	3.5825
3.5845	FF	FF	3.582	3.5825

Cylinder bore sizes from standard to .020 oversize are given in this chart and the recommended piston sizes and ring sizes for each bore size.

It is advisable to hone the cylinder to the smallest dimension for which a given ring is recommended. Ring oversizes shown in table are available only in production rings.

FITTING PISTONS

Before fitting pistons remove the ridge from the top of the cylinder with a suitable ridge reamer.

The piston skirt is cam ground to elliptical shape and tapered. Maximum skirt diameter is at "A", Figures 26 and 28, just below the third ring groove at right angles to the piston pin. The cam grinding makes it necessary that a .0015 feeler blade 1/2" wide be used directly opposite the skirt slot when checking piston clearance.

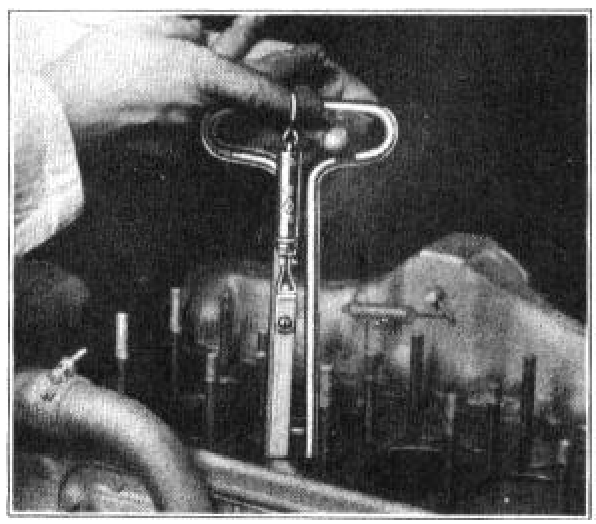


FIGURE 27

After inserting the piston in the cylinder with the .0015 feeler gauge in the position described above, the feeler should be movable under a 3 to 4 pound pull. Use tool 1-888 Piston Feeler Scale to measure this pull as in Figure 26.

CAUTION: A thousandth of an inch variation will change the pull on the feeler only a few pounds and the use of this scale will eliminate guessing.

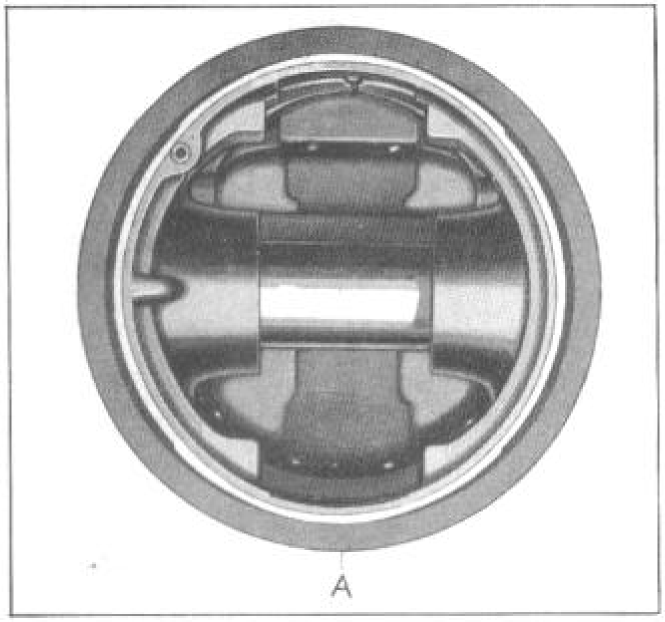


FIGURE 28

CAUTION: When pistons are fit to reconditioned bores, the cylinder block should be allowed to cool to normal room temperature and the piston fit re-checked before installing pin in piston.

Cylinder bores can be readily checked for wear with "Cylinder Checking Gauge KM0- 913."

Reconditioned cylinder bores should be held to not more than .0005 out-of-round or taper.

NOTE: It is important that reconditioned cylinder bores are thoroughly washed to remove all traces of abrasive material.

PISTON PINS

Piston pins are of full-floating design. The pin rotates in the connecting rod bushing and has sufficient movement in the piston to equalize wear. The piston pin hole in the piston is diamond bored for close fitting of the pin.

The removal and installation of piston pins from and to pistons is facilitated by the use of J-1218 Piston Vise and J-2789 Remover & Installer- (6 cylinder) and J-742 Remover & Installer (8 cylinder), Figure 29.

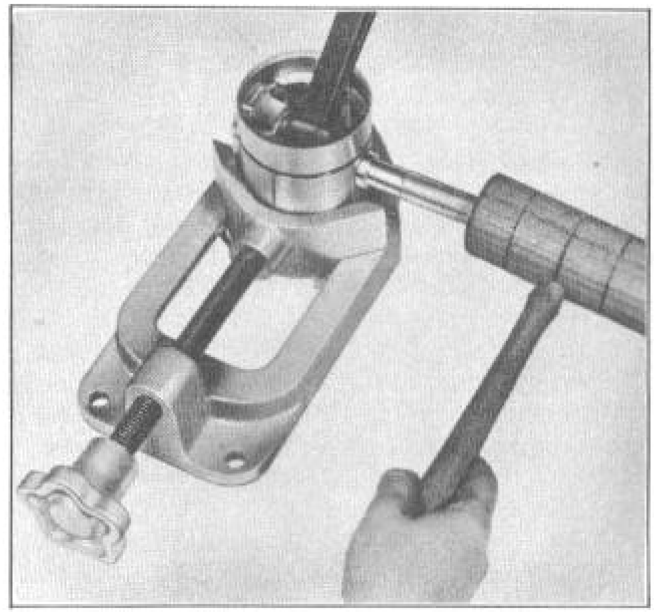


FIGURE 29

The piston pin and connecting rod bushing should be replaced when necessary by selecting the proper size pin to fit the piston and reaming the connecting rod bushing to size.

NOTE: See "Connecting Rod Bushing Replacement" for proper procedure, page 22.

Piston pins are furnished in standard, .002, .005, and .010 oversizes.

Piston pins should be a hand push fit when piston is heated to 200° F.

Heat the piston in boiling water or an electric furnace. NEVER heat piston with a blow torch as this will distort the piston.

`After fitting pins to pistons, check piston pin in connecting rod bushing. Ream bushing to .0003 larger than the pin diameter.

Check the fit by holding the piston with the connecting rod in a horizontal position. The rod should just turn on the pin under its own weight.

PISTON PIN LOCK RINGS

The piston pin is retained in the piston by two snap rings held in grooves at each end of the piston pin bore. This ring can be removed with any suitable pliers.

CONNECTING ROD BUSHINGS
(6 & 8 Cylinder)

The piston pin bushing in the upper end of the connecting rod is of bronze, burnished in place, and broach finished on the 8 cylinder engine; and steel backed, bronze bushing, burnished in place and diamond bored on the 6 cylinder engine.

Replacement:

1. Press out old bushings by supporting the bushing end of the connecting rod on Bushing Burnisher Block J-2850 for 6 cylinder and J-2951 for 8 cylinder. Remove the bushing, Figure 30.

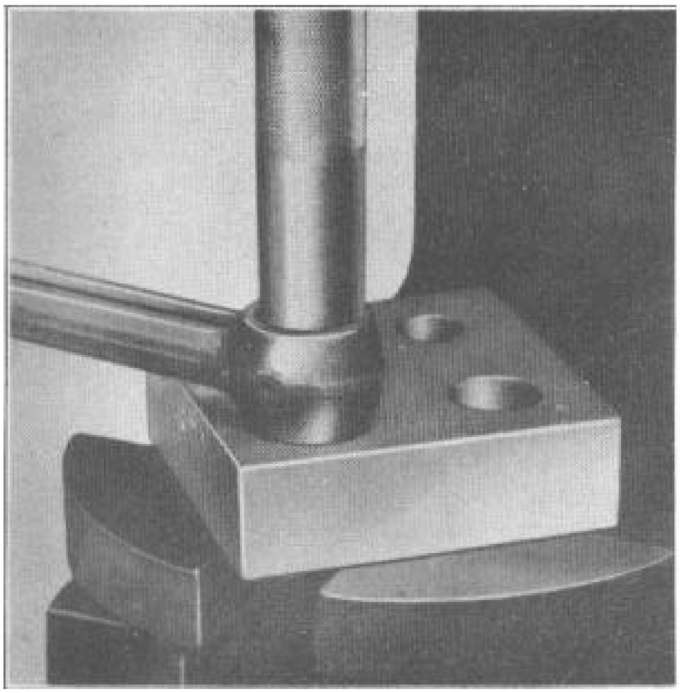


FIGURE 30

2. Install new bushings, reverse procedure of removal using the same tools required for removing.

3. After bushing has been pressed into the rod, use Burnisher Block J-2950, 6 cylinder and .1-2951, 8 cylinder and with J-2791 Burnisher and Broach 6 cylinder and J-2949 Burnisher 8 cylinder iron the bushing in place in the rod, Figure 31.

NOTE: This operation swages or expands the bushing into eye of the rod. This is important as the bushings may work out of the rod if they have not been properly burnished in place.

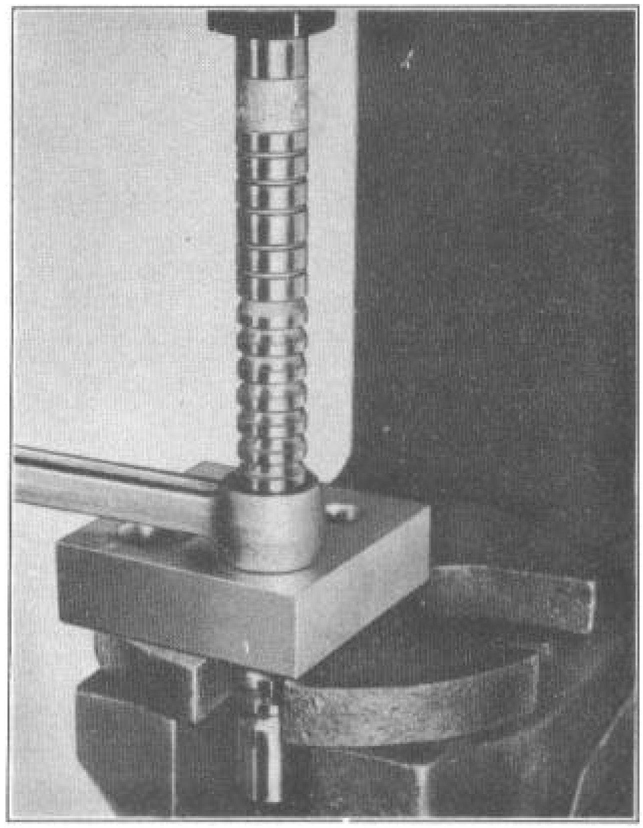


FIGURE 31

4. Remove the bearing cap of the connecting rod and install connecting rod on Aligning Fixture J-874-H arbor, 1.9375 -- 8 cylinder, 2.2505 -- 6 cylinder. (Tighten rod on arbor and lock arbor in position with lock screw located on side of alignment fixture).

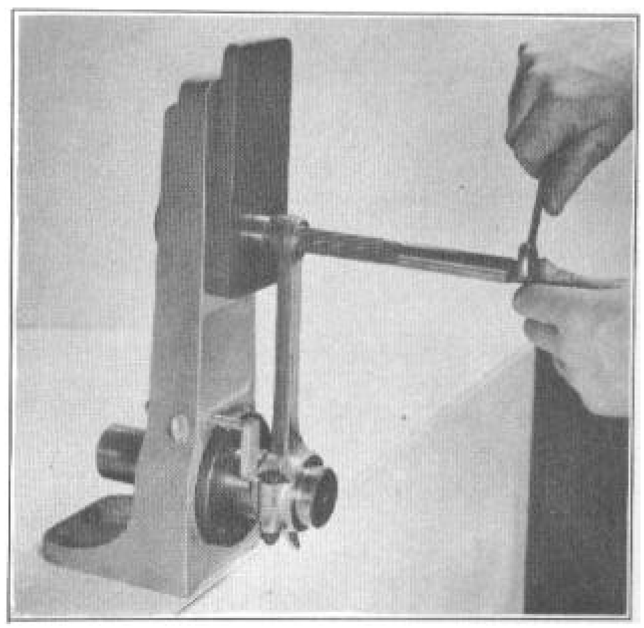


FIGURE 32

5. Insert the reamer pilot in the upper hole in the alignment fixture face plate and align bushing hole of rod with pilot hole in face plate.

6. Insert reamer pilot bushing in upper hole in fixture and lock lower arbor in place with locking handle.

7. Insert reamer through connecting rod bushing and into pilot bushing, Figure 32.

8. Perform reaming operation to the following dimensions:

   6 Cylinder -- .9685 to .9688
   8 Cylinder -- .7496 to .750

CONNECTING RODS
(8 Cylinder)

The connecting rods have steel side thrust faces. A lead tin alloy bearing metal is used to line the connecting rods and the bearing lining thickness is .015.

The radial clearance at the connecting rod big end is .001 and the end clearance is .007 to .013.

Connecting rods are right and left hand; the crankshaft end being offset on the rod proper.

8 cylinder engines.
Connecting Rods 1-3-5-7 are Right hand.
Connecting Rods 2-4-6-8 are Left hand.

The connecting rod bearing does not lend itself to adjustment.

DO NOT FILE bearing caps to take up radial clearance.

CONNECTING RODS
(6 Cylinder)

Connecting rods are heat treated, drop-forged steel with I-beam section rifle-drilled for pressure oil feed to piston pins. An oil metering hole is also provided in the upper half of the connecting rod bearing to provide additional cylinder wall lubrication. This oil metering hole indexes with the hole drilled in the crankshaft as the piston approaches top dead center on each piston stroke, thereby spraying the exposed cylinder wall with an additional supply of oil.

Connecting rods have steel-backed babbitt lined bearings, interchangeable on all rods upper and lower, and are held in position by extensions stamped in edge of bearing shell and located in machined notches in cap and rod.

Replacement bearings require no reaming or fitting.

Connecting rods are interchangeable in the 6 cylinder engine, 1 through 6.

When replacing with new rods, weight should not vary 1/4 oz. in any one group of rods.

CONNECTING ROD BOLT NUT LOCK

Tighten the regular connecting rod bolt nuts on both 6 and 8 cylinder to 40-45 foot pounds.

After properly tightening the bolt nuts, place the Palnut on the bolt with the smooth face against the bolt nut, spin the Palnut with the fingers until it is snug against the bolt nut. Then tighten the Palnut 1/4 to 1/3 more to lock the Palnut.

Always use new Palnuts when reassembling rods.

CONNECTING ROD ALIGNMENT
Pin to Rod Alignment - (6 & 8 Cylinder)

Clamp the connecting rod on the arbor.

NOTE: It is necessary to remove the bearing shells on the 6 cylinder rod before clamping rod to arbor. (Use Arbor J-874-32 -- size 2.2505).

Place the "V" block against either the piston or piston pin, Figure 33. The amount of misalignment will be shown between the pins on the "V" block and the face plate.

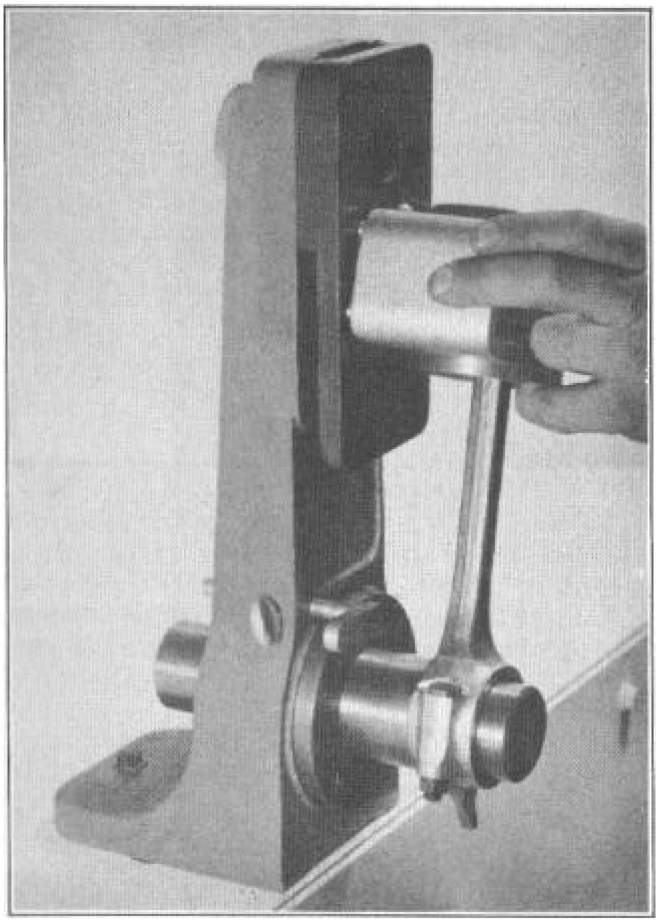


FIGURE 33

Connecting Rod Bend or Twist

If the two top pins rest against the alignment fixture face plate and the two bottom pins are away from the face plate, it indicates the connecting rod is cocked or bent. This is also true if the two bottom pins rest against the face plate and the top pins are away from the plate. If the two horizontal pins on the front side rest against the face plate and the two back pins are away from the plate or vice-versa, it will indicate that the rod is twisted.

Connecting Rod Offset
(8 Cylinder ONLY)

1. Place "V" block on the piston pin so that the block rests against the outside edge of the connecting rod (pin end) and move the rod and "V" block toward the face plate until all four pins of "V" block touch it. Place the index pin (located at the bottom of the fixture) so that it touches the connecting rod bearing end.

2. Remove the rod from the arbor and turn the rod around and reassemble the rod to the arbor, placing the "V" block on the piston pin in the same place as when checking the opposite side.

3. Move the connecting rod and the "V" block toward the face plate until either the index arm touches the bearing at the lower end or the "V" block pins touch the face plate.

NOTE: If the index arm does not touch the rod bearing with the four pins touching the face plate, c heck the distance between the index arm and the rod bearing. This should not exceed .025. If greater than this dimension, rod should be straightened. If the index arm touches the rod bearing and the four pins do not touch the face plate, check the distance between the pins and the face plate. This should not exceed .025. If this distance is greater, straighten the rod until the pins of the "V" block touch the face plate and the index arm is within .025 of touching the rod bearing.

Use two Bending Bars HM 3-R, one to hold the rod and the other to bend the rod into proper alignment.

ALIGNING ROD WITH PISTON
(6 & 8 Cylinder)

A quick check of a piston and connecting rod assembly can be made for both twist and bend without disassembling the piston from the connecting rod.

1. Mount the connecting rod and piston assembly on the alignment fixture and set the piston in line with the connecting rod, Figure 34.

2. Place the "V" block on the piston skirt and if both pins on the block contact the face plate, then the rod is not straight.

3. With the "V" block on the piston skirt and the pins against the face plate, tip the piston first in one direction and then in the other.

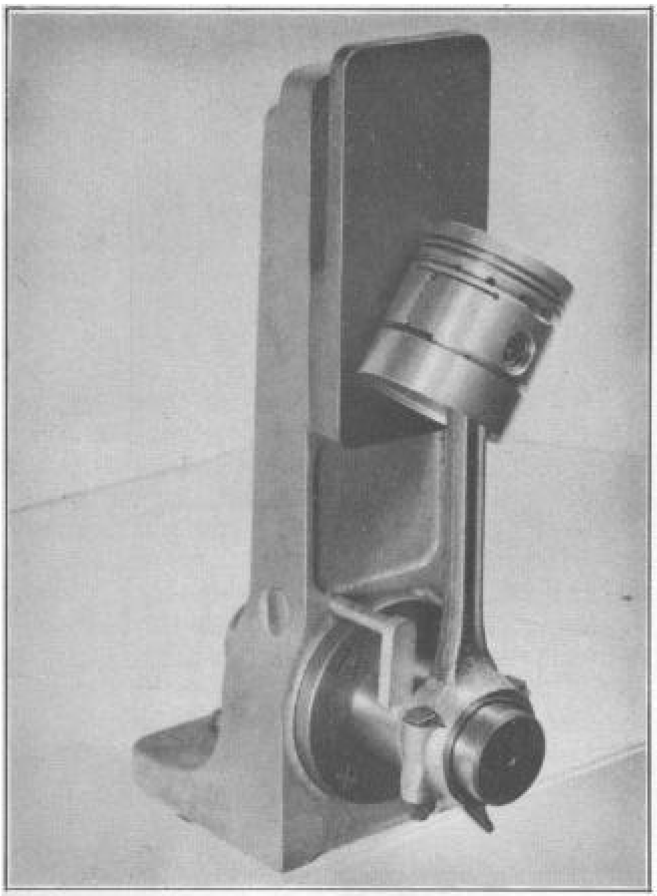


FIGURE 34

NOTE: If the pins on the "V" block follow the face plate there is no twist in connecting rod, but if one pin leaves the face plate while the piston is being tipped in one direction and the other pin leaves the face plate while the piston is in the other direction, then the connecting rod is twisted and should be straightened until both pins follow the face plate.

Rod Straightening

Always bend beyond the straight position and then bend back to straight so as to relieve the strains that are set up by bending. If this is not done, the rod will not remain straight after it is installed in the engine.

PISTON AND ROD INSTALLATION
(6 and 8 Cylinder)

When installing connecting rods and pistons to engine, oil metering hole in upper half of connecting rod bearing in 6 cylinder engines must be toward the valve side of engine, Figure 36. On the 8 cylinder engine the connecting rod dipper opening must be toward valve side of engine, Figure 37.

NOTE: The notches in the lower and upper caps should be on the same side when installing rods to crankshaft.

Use Piston Inserter KMO-357 when installing piston and ring assemblies. This tool is designed to compress the rings in the piston grooves so the piston assembly may be installed in the cylinder without damaging the piston rings or piston.

CRANKSHAFT

Removal
(6 & 8 Cylinder)

The crankshaft can be removed from the engine on either 6 or 8 cylinder without removing the engine from the car. However, it is recommended to be more practical to remove the engine when replacing the crankshaft.

Follow the procedure of engine removal, pages 19 and 21 and proceed as follows:

1. Remove transmission and clutch assembly.
2. Remove flywheel and crankshaft oil thrower.
3. Remove oil pan and oil pan baffle.
4. Remove vibration dampener lock screw, lock, and remove vibration dampener using Puller J-676-C, Figure 35.

DO NOT HAMMER DAMPENER to remove.

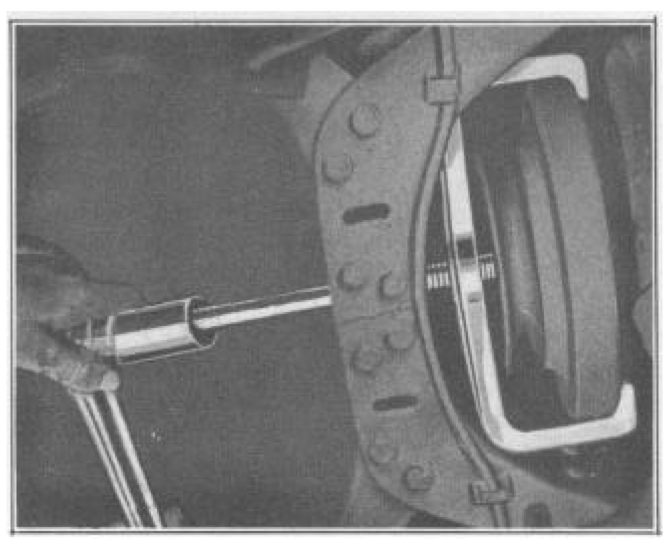


FIGURE 35

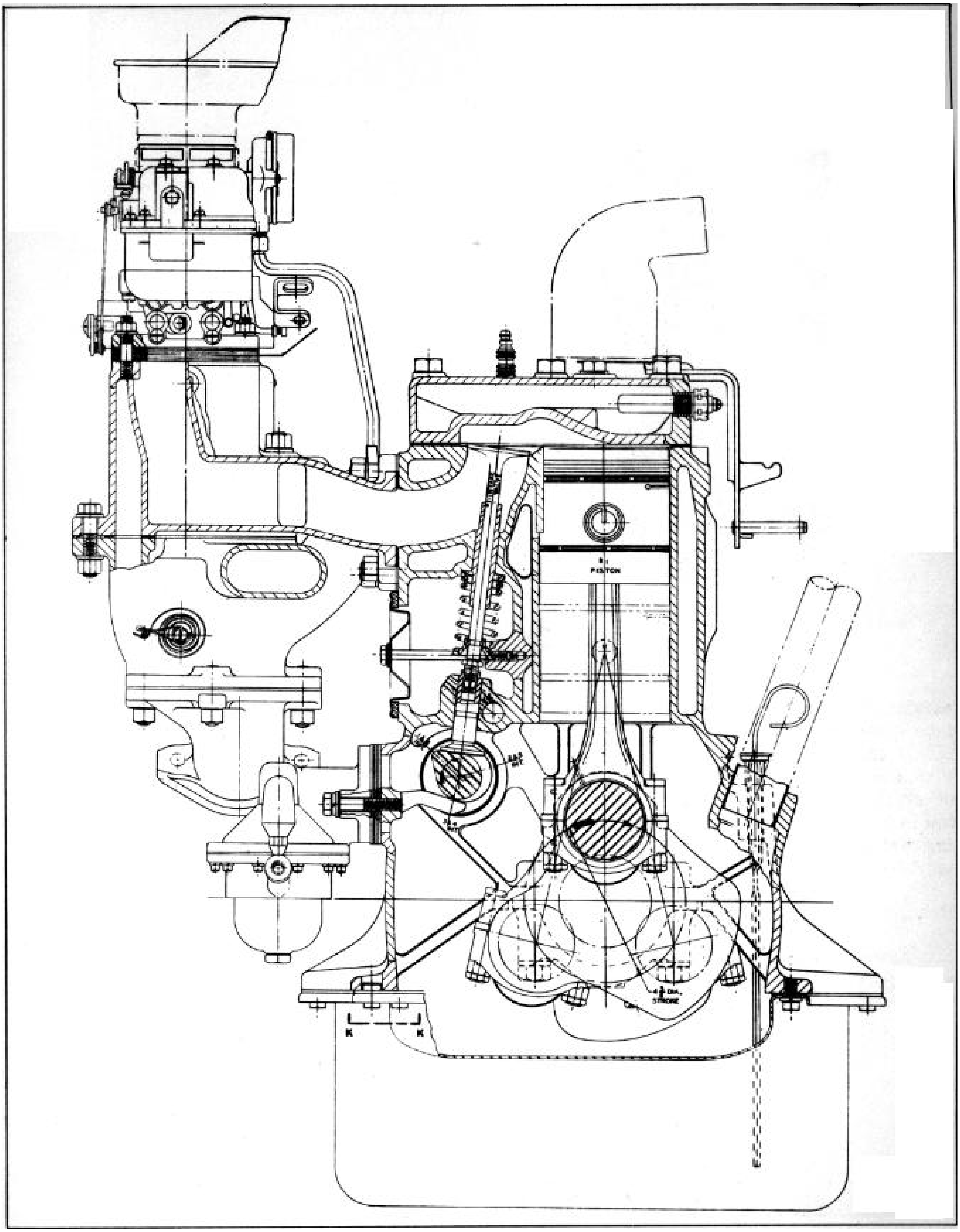


FIGURE 36

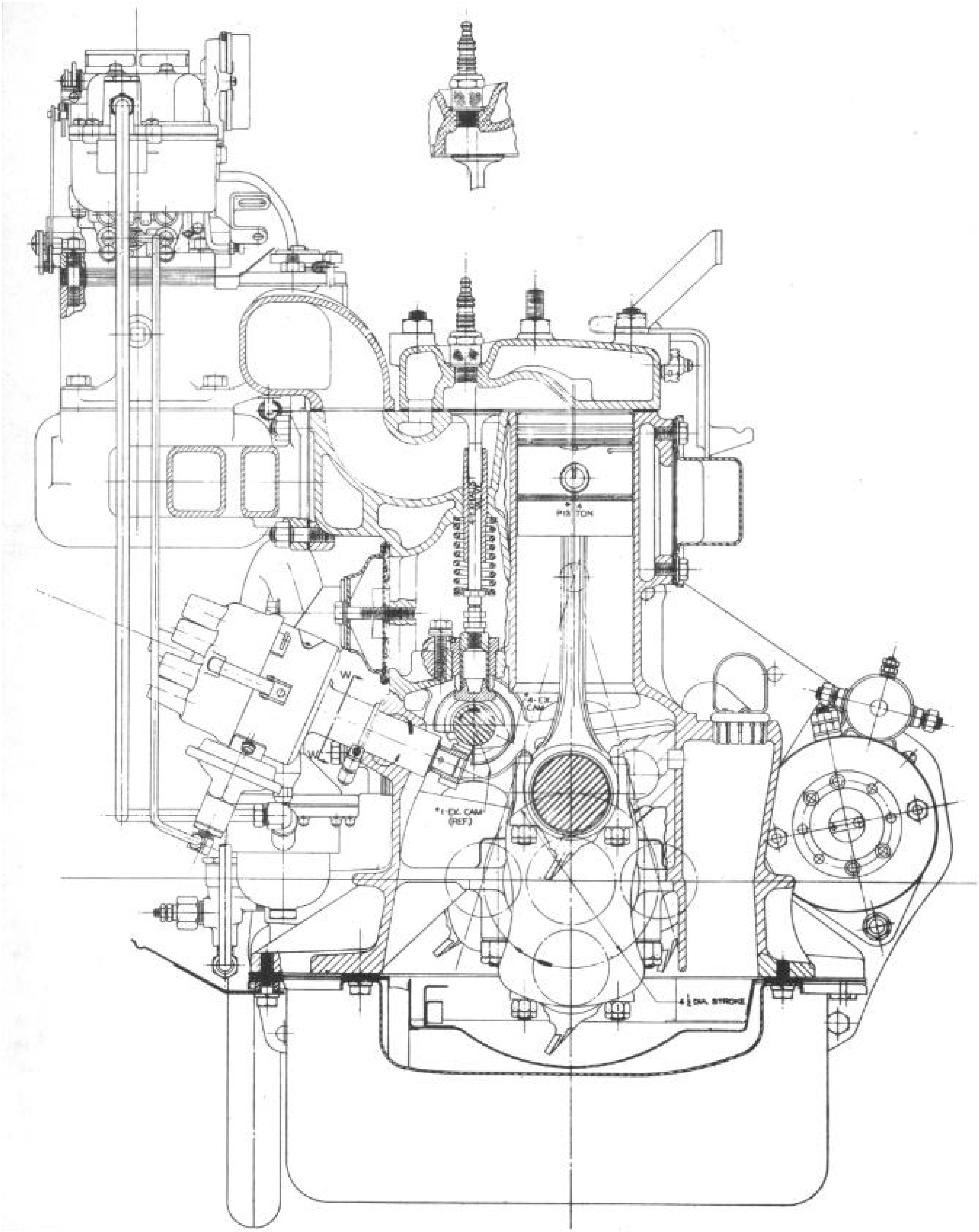


FIGURE 37

5. Remove gear case cover and camshaft plunger (8) cylinder).

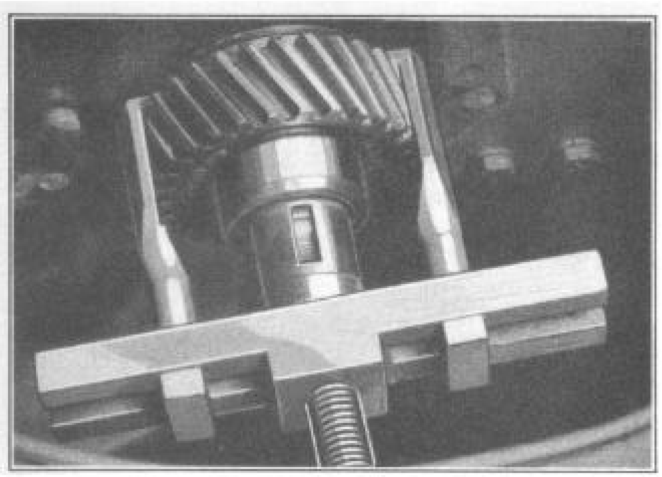


FIGURE 38

6. Using puller J-471, remove crankshaft gear, Figure 38.

NOTE: It is necessary to remove the camshaft gear and timing chain on the 6 cylinder engine before crankshaft gear can be removed.

7. Remove connecting rods and pistons.
8. Remove front and rear main bearing caps with Puller J-2955, remove balance of bearing caps.
9. Using a rope sling and chain fall, remove the crankshaft.

NOTE: Before replacing crankshaft, check condition of crankshaft journals and pins, bearings, and bearing clearances. Clean the oil pan and screen and blow out oil lines.

To install, reverse procedure of removal, check the information contained under "Main Bearings, Connecting Rods, and Pistons; Remove and Replace Engine; Remove and Replace Clutch; Remove and Replace Timing Gears or Timing Chain and Gears."

NOTE: On 8 cylinder engines, before installing the flywheel to the crankshaft, check to make sure that lower half oil retainer fits squarely and tightly against the upper half retainer. Also make sure that gaskets are in good condition.

Screw holes in cap mounted oil retainer are elongated to permit it to be squarely contacted with the upper retainer. If contacting faces are nicked, install new retainer as a gap or other discontinuity of contact will permit loss of oil.

TIMING GEARS
(6 & 8 Cylinder)

Timing Gear Cover Removal

1. Drain cooling system.

2. Disconnect hoses and remove radiator (2 bolts each side of radiator cradle).

3. Remove fan blade, pulley, and fan belt.

4. Remove dampener screw, lock, and dampener. (Use Puller J-676C to remove dampener, Figure 35).

5. Remove timing gear cover and gasket.

Timing Gear Removal

Perform operations under "Timing Gear Cover Removal" to No. 5 inclusive and proceed as follows:

1. Crank engine until timing gear marks line up and remove camshaft gear and thrust plunger (8 cylinder).

2. Using Puller-471, remove crankshaft gear, Figure 38.

NOTE: It is necessary to remove the camshaft gear and timing chain on the 6 cylinder engine before crankshaft gear can be removed.

Timing Gears Installation
8 Cylinder

1. Install crankshaft gear using Pusher tool J-483, Figure 39.

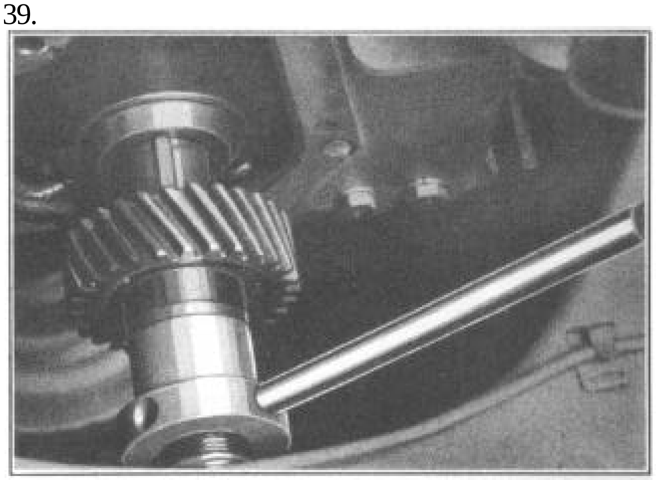
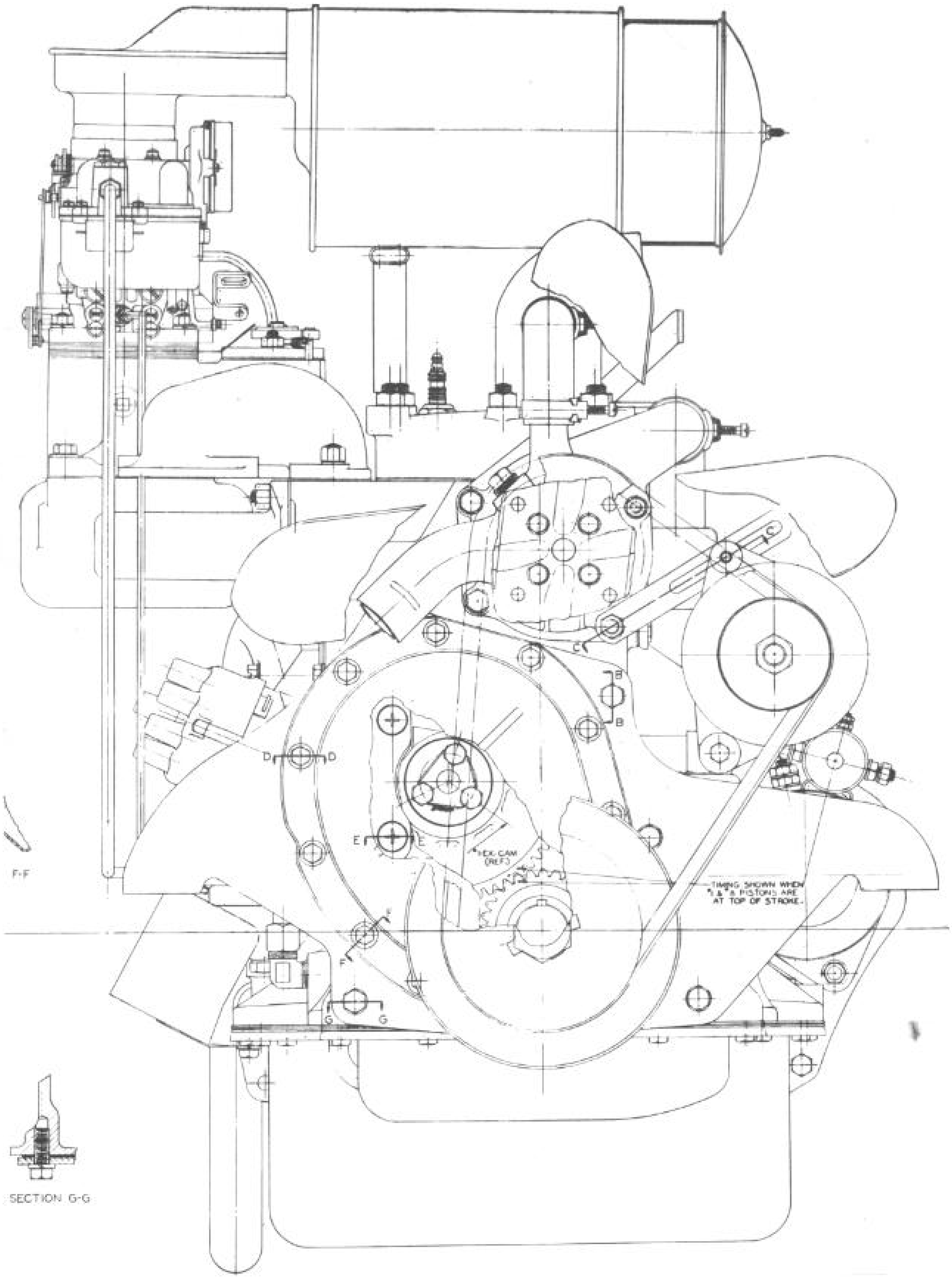


FIGURE 39



HEX-CAM (REF)
TIMING SHOWN WHEN
PISTONS ARE
AT TOP OF STROKE.
F-F
SECTION G-G

FIGURE 40

2. Install camshaft gear, meshing the punch marked tooth of the crankshaft gear between the two punch marked teeth of the camshaft gear, Figure 40; install camshaft screws and lock wire. Gear backlash should be .002 to .004.

CAUTION: Care must be exercised when installing the aluminum gear to avoid any blow or pressure that might cause damage to the teeth and result in noisy gears. Any small burrs on high spots should be dressed down with a honing stone or 6 inch knife edge mill file.

Balance of installation refer to "Timing Gear Cover Installing".

Timing Gear Installation
6 Cylinder

1. Install crankshaft gear with Pusher Tool J-483, Figure 39.

2. Place timing chain on camshaft gear and install both, at the same time engaging the chain with the crankshaft gear.

NOTE: If crankshaft has not been rotated during the removal, it will not be necessary to check the timing. If timing has been disturbed, refer to sections "Camshaft Installing and Valve Timing".

Balance of installation refer to "Timing Gear Cover Installing".

TIMING GEAR COVER OIL SEAL REPLACEMENT

The timing gear cover has a leather oil seal which fits closely over the vibration dampener spacer to prevent oil leaking out of the front end. The oil seal is a tight press fit in the cover and can be removed with J-2776 Timing Cover Oil Seal Remover and Installer Set, Figure 41, by placing the collar so that slot in collar engages depression in cover, supporting the cover when driving out the seal with the straight side of the driver.

NOTE: The tool head is reversible on the handle. The side with the tapered pilot is used for installing and the large size for removing.

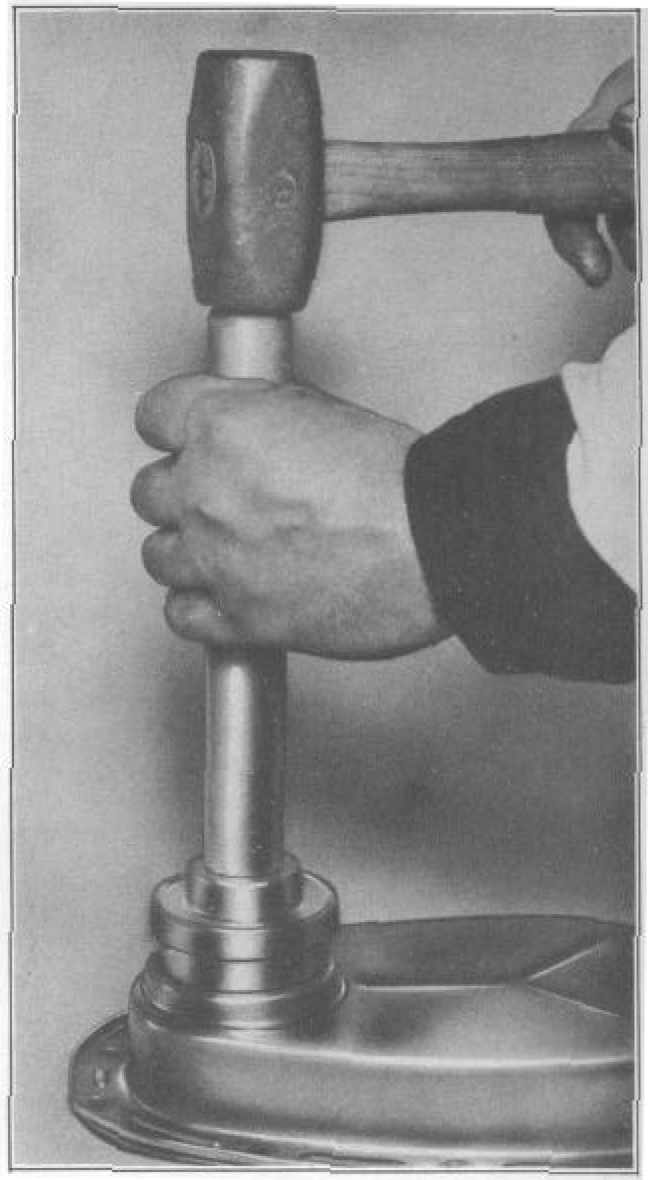


FIGURE 41

Check leather oil seal to be certain that leather lip is not curled over. Before installing a new oil seal, apply a coating of white or red lead in the well in the timing cover.

With J-2776 Oil Seal Installer set, install oil seal in cover using tapered pilot side of tool, Figure 42, using J-872-5 handle screwed into opposite side of tool, and with a suitable arbor press or soft hammer, press the seal tightly in place.

After seal is installed, recheck to make certain that lip of leather is in good condition.

FIGURE 42

Timing Gear Cover Installation

To Install, reverse procedure of removal.

Use a new timing gear cover gasket; tighten Vibration Dampener screw to 100-120 pounds and turn lip of Dampener screw lock.

FRONT ENGINE MOUNTING AND ENGINE SUPPORT PLATE

Front Engine Support
Removal

Perform operations under "Timing Gears Removal" and proceed as follows:

1. Place a wood block under oil pan and block up engine while removing the self-locking nuts at front insulators.
2. Remove two countersunk bolts, five bolts and lock-washers, holding end plate to cylinder block and remove end plate.

Installation:

Clean all traces of old gasket from front face of cylinder block. Install a new or the original support plate and a new gasket. Reinstall balance of parts in reverse order of their removal.

Check location of timing gear marks; adjust fan belt, and refill cooling system.

Front motor insulators can be removed without removing engine support plate by placing a block under oil pan to support engine, and after removing self-locking nuts from insulator bolts, jack engine up sufficiently to clear threads of bolts and remove insulators.

CAMSHAFT

Removal: - 8 Cylinder

1. Drain cooling system, disconnect radiator hoses and remove radiator. (See "Cooling for Radiator Removal").
2. Remove cylinder head. (See "Cylinder Head Removal", pages 14 and 15.
3. Remove Right Hand front wheel.
4. Remove Right Hand fender side shield.
5. Disconnect vacuum pump line, windshield wiper, hose and fuel pump.
6. Remove distributor.
7. Disconnect oil lines at oil pump and remove oil pump.
8. Remove valve covers and breather pipe. (Disconnect clamp at transmission housing and bolt at valve cover).
9. Remove coil and bracket.
10. Using valve lifter KMO-484, remove valve keepers and valves, Figure 43.

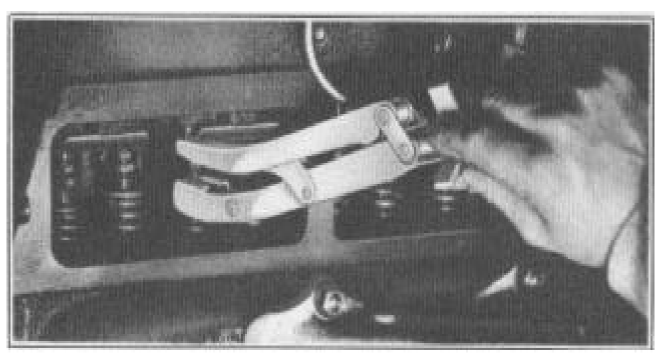


FIGURE 43

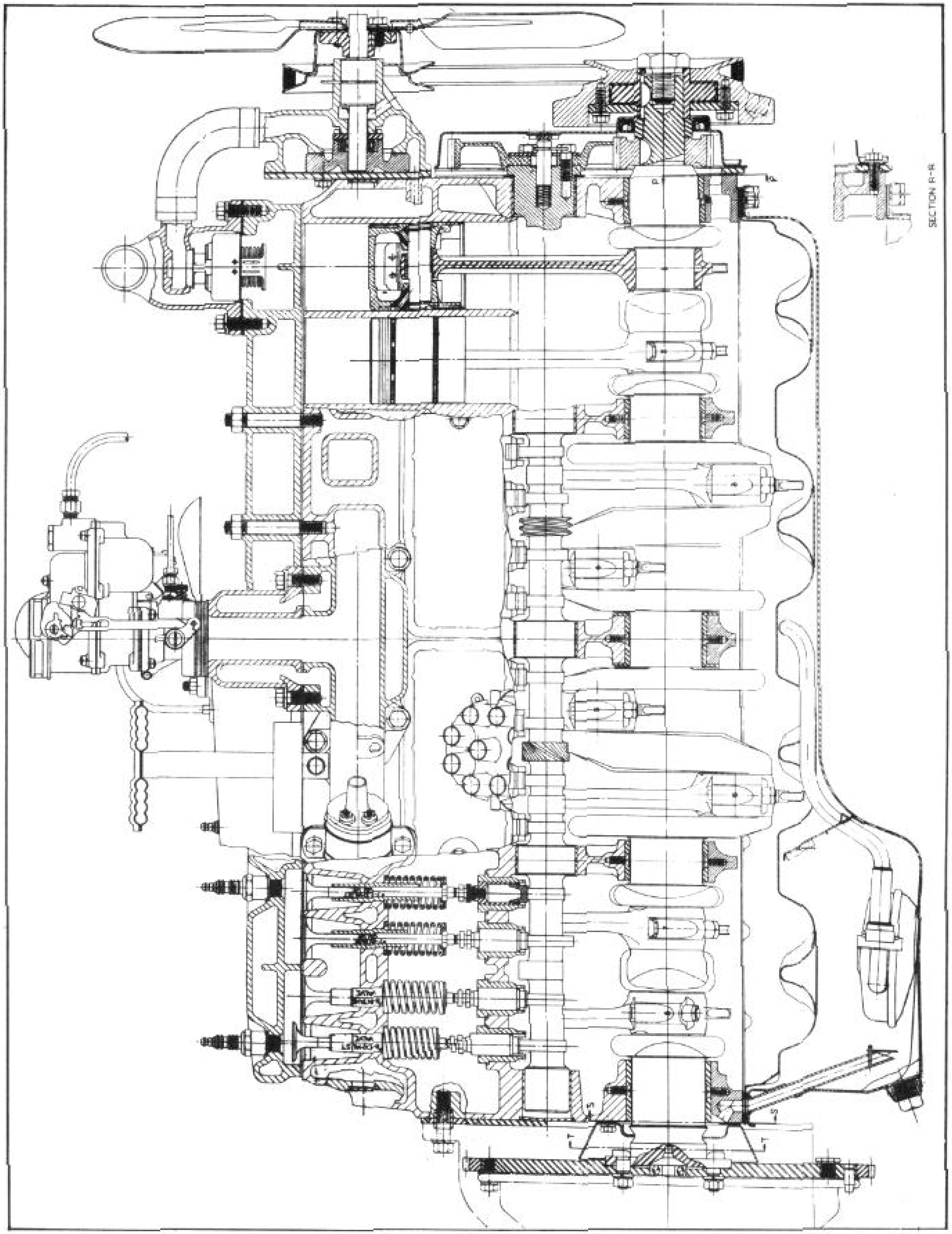


FIGURE 44

11. Remove valve springs, tappet retainer screws, plates, washers, and lockwashers, tappets and guides.

12. Remove grille center support cover, (held by 2 screws), upper baffle and R.H. moulding (one screw at center bar, one screw attaching right and left baffle behind grille center support, one screw under R.H. fender, and one screw at radiator grille baffle side support).

13. Remove grille intermediate baffle and moulding R.H. (Held by one screw at center support, one screw behind support, one screw under fender, and one screw at radiator grille baffle side support).

14. Place a block of wood between oil pan and head of jack, and raise engine 12 inches so camshaft will clear front splash guard upon removal.

15. Remove vibration dampener, screw lock and dampener.

16. Remove dampener key and gear case cover.

17. Align gear markings and remove camshaft gear and thrust plunger.

18. Remove camshaft and thrust washer.

Remove camshaft slowly and carefully to prevent damage to camshaft bearings.

CAMSHAFT BEARINGS
(6 & 8 Cylinder)

Replacement camshaft bearings are available through the service parts department in both reamed and unfinished state. The finish-reamed bearings are sufficiently oversize so that when pressed into place they will be the proper dimensions, thus eliminating the need for scraping or reaming. The unfinished bearings have sufficient wall thickness to permit line reaming where proper equipment is available for this operation. These bearings should be line reamed after installation to a diameter .001 larger than the individual camshaft journals.

Service replacement camshaft bearings are a press fit of .0026 to .0055 in cylinder block.

When pressing in new bearings, always install bearings with the locating notch at the top.

It is advisable to remove the engine from the car if itis found necessary to replace camshaft bearings.

CAMSHAFT

Installation
8 Cylinder

1. Use anew fibre thrust washer when installing camshaft.

NOTE: Use care when installing the camshaft to avoid damaging bearings or camshaft lifts. Use a bronze drift through oil pump, distributor and fuel pump holes to guide camshaft through bearings.

2. Install camshaft gear al i fining timing marks with crankshaft gear. Install lock wire through bolt heads and secure.
3. Install gear case cover; remove old gasket, and replace. (Check end plate gasket and gear cover oil seal).
4. Install dampener spacer, key, dampener, lock and lock screw, (Use new lock).
5. Install tappets and guides in sequence removed.

NOTE: Tappet guides must be accurately aligned with cams on camshaft. Position of guides is controlled by the guide clamps; the inner sides of which should be in full contact with matching flat surfaces on front face of each pair of tappet guides within .0015, Figure 45.

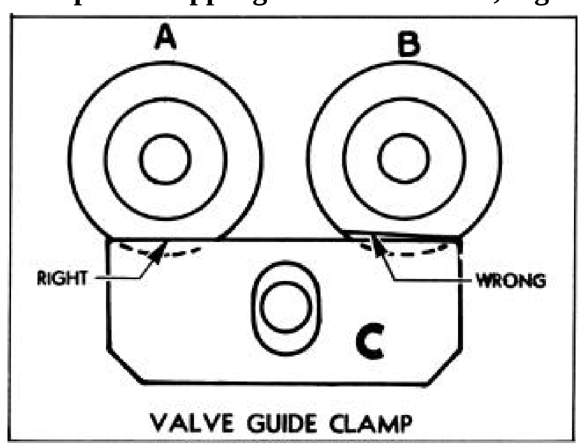


FIGURE 45

6. Install guide clamps, flat washers, lock-washers, and screws.

7. Install valve springs and retainers.

NOTE: Installation of valve springs on the 8 cylinder will be facilitated by the use of J- 587-A Valve Spring Inserter, Figure 46.

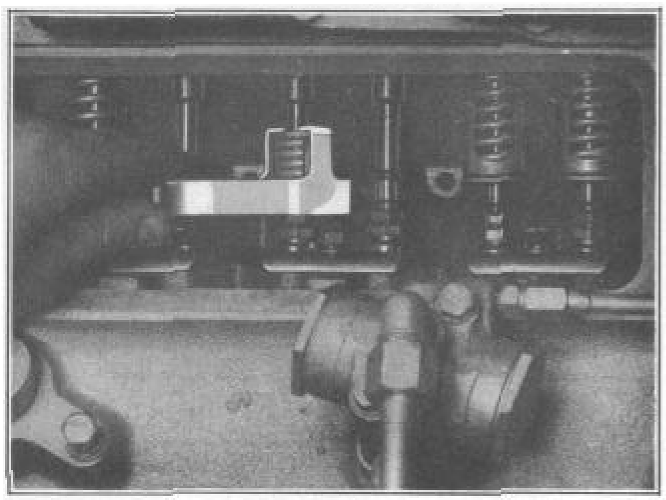


FIGURE 46

8. Install valves in sequence removed, compress springs, and install valve keepers. (Valves should be checked for warpage and cracks and replaced as necessary).

9. Install oil pump and connecting lines.

10. Use new gasket, install cylinder head (Tighten to 45-50 lbs.).

11. Install carburetor and accelerator linkage.

12. Install radiator; connect hoses (Use Hudson Perfect Seal at all connections).

13. Continue with balance of cylinder head installing operations as outlined in "Cylinder Head Installing".

14. Check timing and install distributor and cap.

15. Install coil and coil bracket.

16. Install fuel pump and connect oil lines.

17. Install right hand upper, lower, and intermediate grille baffle and mouldings.

18. Replace coolant and start engine.

19. Adjust tappets (engine hot). (See "Tappets & Valves").

20. Replace tappet covers and breather pipe.

NOTE: When tightening breather pipe attaching screw, do not bottom breather pipe against the inner wall of the valve cover as this will close of the venting action of the pipe and create high crankcase pressure.

21. Replace fender side dust shield and rear inspection shield. (Tie cord of boot to front suspension).

22. Install wheel and lower car.

23. Connect hood prop to hood and align hood.

CAMSHAFT

Removal - (6 Cylinder)

Perform operations under "8 cylinder Camshaft Removal items 1 to 9 and 12 to 17 inclusive.

Valve springs can be removed on the 6 cylinder engines by compressing the springs with a KMO-484 valve lifter and a suitable hook-type tool.

NOTE: Tappets should be raised and secured by the use of spring type wood clothes pins or some other practical means, sufficiently to allow removal of the camshaft.

Installation
6 Cylinder

To install, reverse procedure of removal.

Timing chain and sprockets should be installed with #1 Piston on top dead center in firing position with marks on sprockets 14 pitches or 7 full lengths apart, Figure 48.

Timing chain is not adjustable. **NOTE: Refer to "Specification" Page 1 for "Engine Timing".**

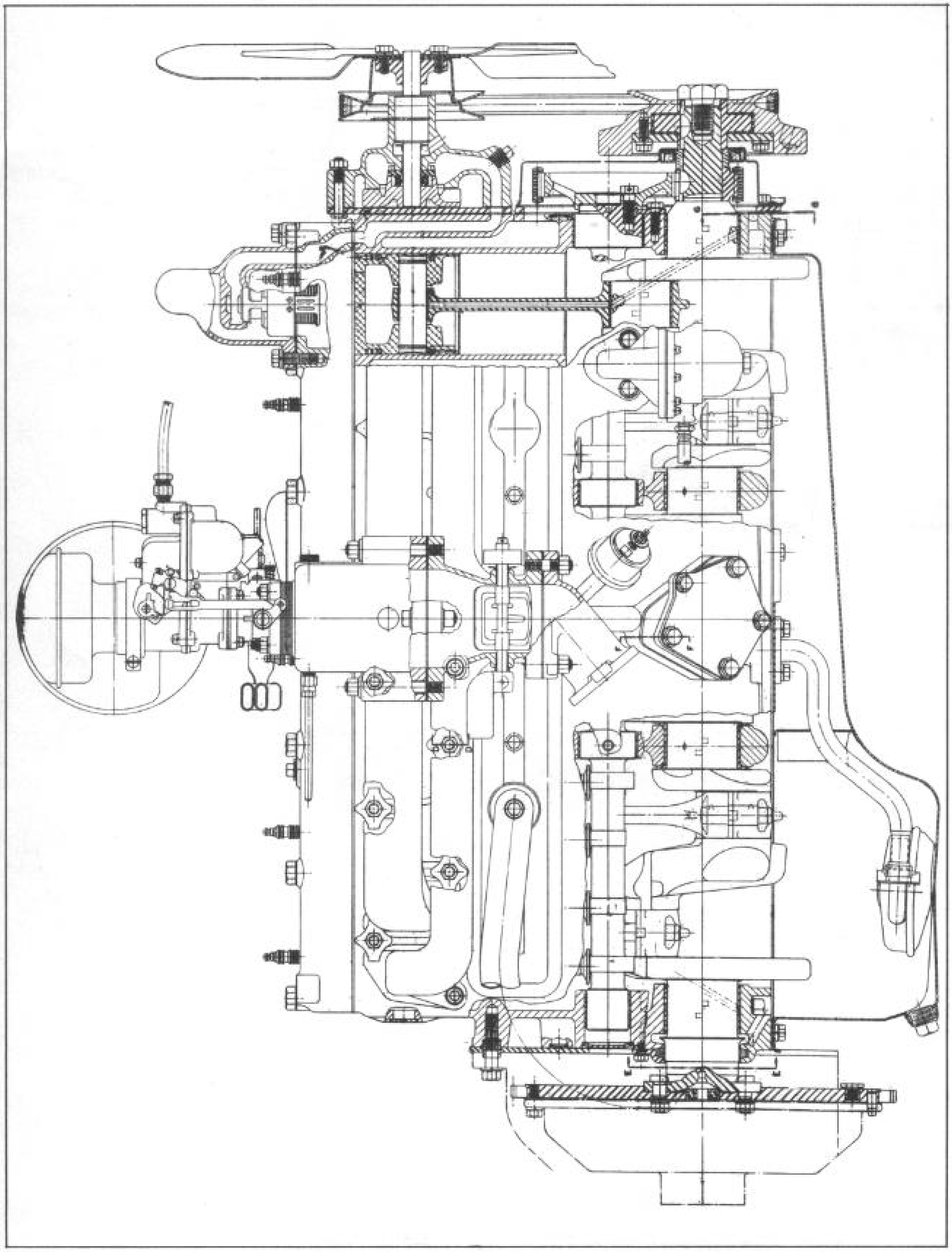


FIGURE 47

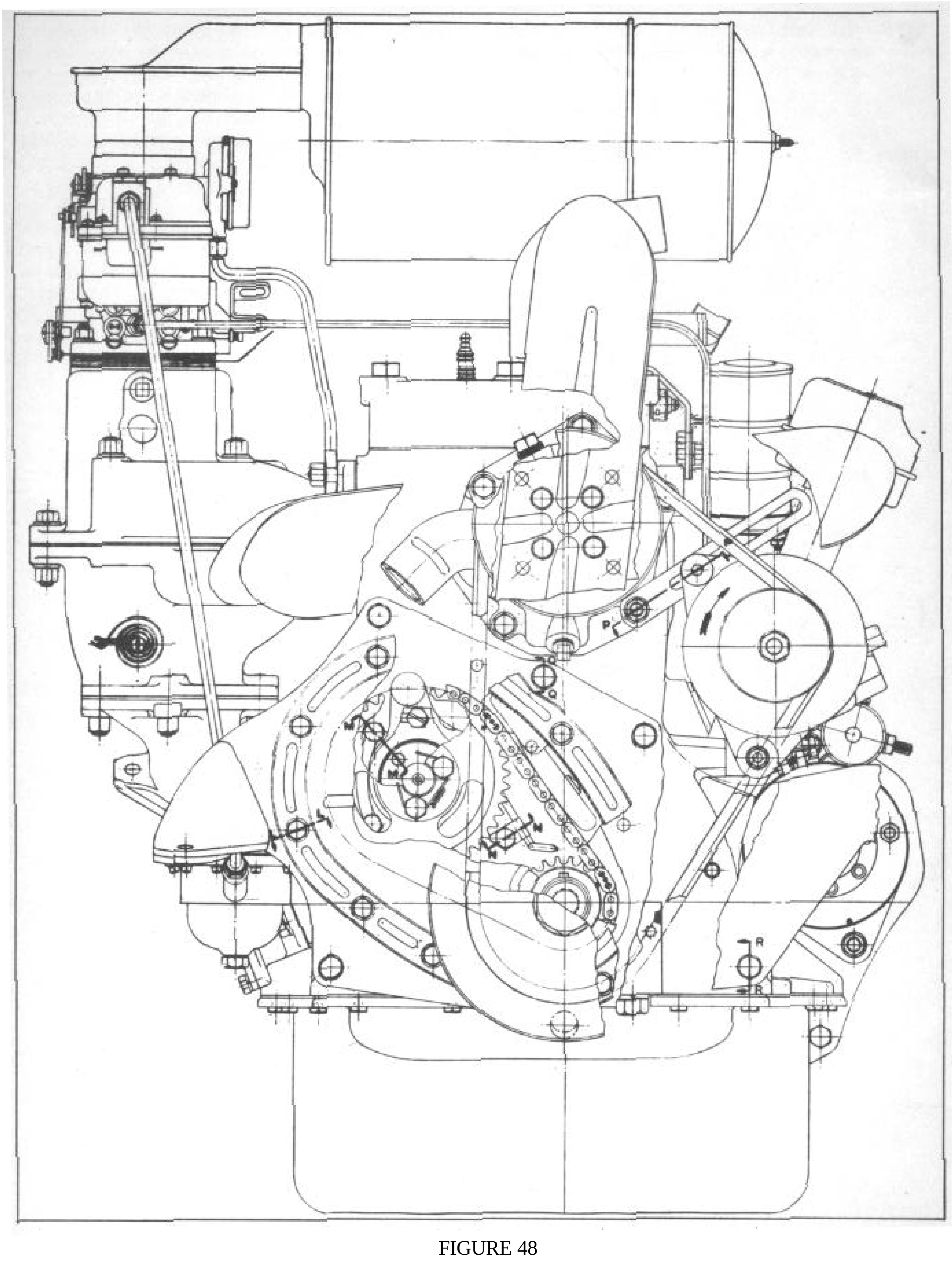


FIGURE 48

NOTE: To facilitate installation of two piece valve keepers, use Valve Keeper Installer J-1953, Figure 49.

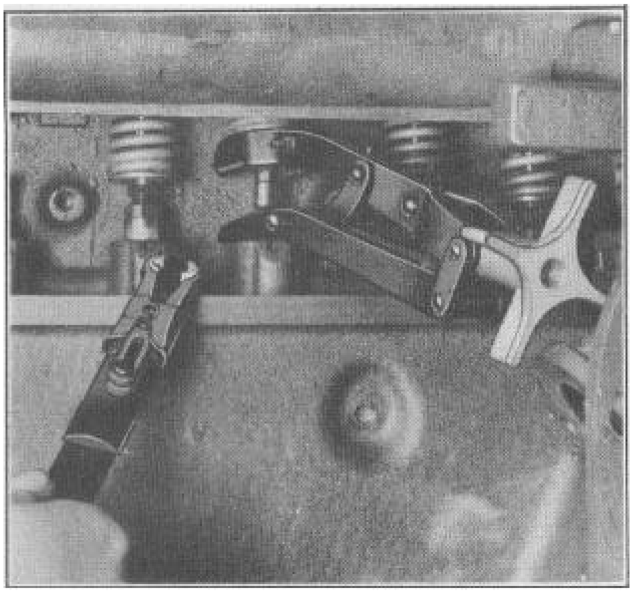


FIGURE 49

NOTE: Refer to "Oil Pump Installation" when installing the oil pump assembly.

VALVE SYSTEM

Tappets and Guides 8 Cylinder

The tappets and guides can be removed without removing the cylinder head. However, it is recommended that the head be removed when more than two tappets are to be replaced.

Removal

1. Remove cylinder head.
2. Remove R.H. front wheel and fender side dust shield.
3. Remove valve covers and breather pipe.
4. Use valve lifter and remove valve keepers, valves, and springs.
5. Remove tappet guide clamp bolts, washers, clamps and remove tappet and guide assemblies.

To install, reverse the order of removal. Observe the following points during reinstallation:

NOTE: Tappet guides must be accurately aligned, with cams on camshaft. Position of guides is controlled by the guide clamps; the inner sides of which should be in full contact with matching flat surfaces on front face of each pair of tappet guides within .0015, Figure 45.

One method of obtaining alignment is to tighten clamp nuts just less than snugly, then bump outer face of clamps sharply inward using a wide piece of fiber or brass interposed between the hammer and the clamps. This will tend to jar the tappet guides into parallelism with clamps. When clamps are tightened, it should not be possible to insert a .002 feeler blade at any point between inner edge of clamps and mating face of tappet guides.

Tappets and Guides 6 Cylinder

To remove valve tappets on the 6 cylinder engine, it is necessary to remove the oil pan and camshaft.

Perform the operations under "Camshaft and Oil Pan Removal - 6 Cylinder".

Valve Tappet Adjustment (6 & 8 Cylinder)

1. Remove R.H. Front Wheel.
2. Remove fender side shield with side shield extension.
3. Remove valve covers and breather pipe.

Adjust tappets on 6 cylinder to inlet .010 hot exhaust .012 hot. On 8 cylinder--inlet .006 hot and exhaust .008 hot.

Valves and Seats

The valves seat directly in the chrome alloy iron cylinder block. (No valve inserts are employed).

Valves should be refaced with a 45° cutting tool. Valve seats in the cylinder block should be cut with a suitable valve seat cutter. The seats should be cut only enough to remove pits and surface glaze. (To eliminate chattering, insert a piece of emery cloth over cutter with abrasive face contacting seat. When new seats are finished, valves and seats may be lightly lapped together with a suitable valve grinding compound to assure a tight seat.

NOTE: Care must be taken during the valve reconditioning to make certain all grinding grit and compound is removed from valves, valve seats, intake parts, and cylinder blocks.

Seating surface in valve seats should be 5/64" wide on exhaust and 1/16" wide on intake for the 8 cylinder and 3/32"wide on exhaust, and 5/64" wide on intake for the 6 cylinder. See "Specifications", Page 2, for further valve dimensions.

Valve Guides

Valve guides that are worn more than .005 oversize should be replaced.

Valve guides on both 6 and 8 cylinder can be removed without removing the tappets by using extreme care not to damage the tappets when driving out the valve guides.

NOTE: Valves can be driven out with a suitable driver into the valve chamber or pulled out through the top with a suitable puller.

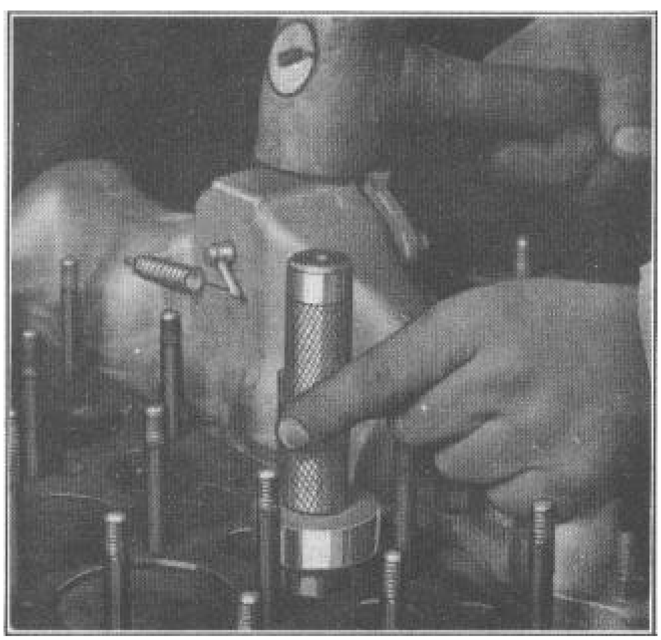


FIGURE 50

Valve guide installation can be properly performed by using J-883-A Valve Guide Installer which consists of a handle, stop collar, and two pilots calibrated to insure that guides are driven to the proper depth on the 8 cylinder engine, Figure 50. The top of valve guide should be driven to 15/16" below top face of block.

Valve guides for the 6 cylinder engine should be installed with 1-883-A Valve Guide Installer Handle, T-883-7 Pilot block, J-883-9 and J-883-8 Valve Guide Installer Pilots, Figure 51.

FIGURE 51

The installer pilots are fitted with collars to insure that the 1-3/32" exhaust guide and 1-7/16" inlet guide dimension from top of guides to top of valve seats are maintained.

After the valve guides are pressed into the cylinder block they should be reamed with a solid type reamer (J-129-3) to 11/32" (.3437) for 8 cylinder. This will give a clearance of from .0015 to .003 for the intake and .003 to .004 for the exhaust. Valve stem diameters .3397 for exhaust and .3412 for intake.

For the 6 cylinder use (1-129-4 Reamer) Valve stem diameters on the 6 cylinder valves are .3407 on exhaust and .3417 on intake.

Valve guide cleaning should never be overlooked whenever valve work is being done as carbon will build up in bore and counterbore at the top of the exhaust valve stem guide.

We recommend the use of KMO-122 Metal Brush for cleaning the main bore of valve guides. The counterbore can be cleaned by the use of a 13/32" drill.

Valve Springs

After valve springs are removed from the engine they should be tested for seating pressure with spring tester KMO-607. Springs for 6 cylinder should exert not less than 60 pounds pressure when compressed to 2-3/16". Reject springs under 60 pounds. Springs for 8 cylinder engines should exert not less than 34 or more than 40 pounds pressure when compressed to 2". Reject springs under 34 pounds.

When installing valve springs, closely coiled ends must be to top and against cylinder block.

VALVE TIMING

6 cylinder

Inlet opens 7°-18' BUDC
Inlet closes 53°-42' ALDC
Exhaust opens 53°-18' BLDC
Exhaust closes 7°-42' AUDC

8 cylinder

Inlet opens 10°-40' BUDC
Inlet closes 60°-0' ALDC
Exhaust opens 50° BLDC
Exhaust closes 18°-44' AUDC

VALVE MAINTENANCE

If valve tappets, with proper clearance, are noisy the following points should be checked:

1. Tappets loose in their guides.

2. Tappets not properly rotating, causing uneven wear on tappet faces.

3. Weak valve springs.

4. Valves sticking in valve guides.

5. Valves loose in valve guides.

6. Valve springs cocked or not seating properly.

7. Warped valve.

3. Valve seat and guide not in alignment.

CYLINDER BORING OR HONING

Careful washing and careful protection before reconditioning the cylinder bores will save a great deal of expense later.

Crankshaft bearings, camshaft bearings, connecting rod bearing surfaces on the crankshaft, crankcase walls, in fact the entire part of the engine below the bottom of the cylinder bores must be protected from any particles of grit, chips, etc.

After reboring the cylinders or honing them, it is necessary that they be thoroughly washed.

All traces of abrasive material will have to be removed or extremely rapid wear of the new parts will result.

SECTION 4

FUEL SYSTEM & EXHAUST

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REFERENCE

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GENERAL SPECIFICATIONS

Carburetor (All Models)	Carter
Manifold Heat Control and Climatic Control	Automatic
Fuel Pump Mechanical (All Models)	Camshaft Drive
Fuel Pump Type - A.H. Standard, A.J. Combination - Optional	
Air Cleaners (Dry)	Standard
Air Cleaners (Oil Bath)	Optional
Gasoline Tank Capacity (All Models)	20 Gallons

CARBURETOR SPECIFICATIONS

	6 Cylinder	8 Cylinder
Carter Model Numbers	647-S	648-S
Dual Downdraft	1-1/4" - 4 bolt	1-1/4" - 4 bolt
Main Venturi	1-3/16" - I.D.	1-3/16" - I.D.
Primary Venturi	1-1/32" - I.D.	11/32" - I.D.
Secondary Venturi	19/32" - I.D.	19/32" - I.D.
Float Level	3/16"	1-3/64"
Idle Adjustment	1-1/4 to 1-3/4 Turns open	1 to 1-1/2 Turns open

Pump Plunger Travel from Closedto Wide Open Throttle.. 9/32" 7/32"

		6 Cylinder	8 Cylinder
Low Speed Jet Tube		Jet size #67 drill	Jet size #68 drill
	By-pass (plug)	size #51 drill	size #54 drill
	Economized in body	size #56 drill	size #56 drill
	Idle bleed		size #54 drill

Vents	Outside Only. No. 10 drill size. Four holes.
Gasoline Intake	Square vertical needle. No. 38 drill hole in needle seat.
Gasoline Connection - (Both).	5/16" Weatherhead nipple.
Idle Ports - (Both)	Length .200", Width .030".
Idle Port Opening - (Both)	157" to .167" above upper edge of valve with valve closed tight.
Lower Port - (Both) (For Idle Adjustment Screw)	Size .0615" to .0655" diameter.
Main Nozzle - (6 Cylinder)	In primary venturi, angle 45°, closed tip. Inside diameter No. 30 drill. Upper hole: .028" diameter drill on 45° angle. Lower hole: .0635" diameter drill on 60° angle.
Main Nozzle - (8 Cylinder)	Flush type (angle tip) seats in primary venturi. Discharge, size .061" diameter.
Metering Rod Jet - (Both)	.086" diameter.

Metering Rod (Vacumeter Type):
(6 Cylinder) — Economy step, .063" diameter. Middle step tapers to .0565" diameter. Power step, .048" diameter. Length 2-59/64".

(8 Cylinder) — Economy step, .069" diameter. Mile step tapers to .063" diameter. Power step, .057" diameter. Length - 2-59/64.

Metering Rod Specifications			Economy Step - Middle Step			Power Step		
Hudson No.	Carter No.	Type	Diam.	Tapers From	Length of Taper	Diam.	Length of Taper	Length of Step
6 - Cylinder								
301943	75-610	Standard	.063"	.063" to .0565"	.172"	.048"		
301944	75-623	1st Leaner	.064"	.064" to .0585"	.172"	.050"	1/64"	.147"
301945	75-624	2nd Leaner	.065"	.065" to .0605"	.172"	.052"	1/64"	.147"
301946	75-625	3rd Leaner	.065"	.065" to .062"	.172"	.054"	1/64"	.147"
							1/64"	.147"
8 - Cylinder								
301948	75-607	Standard	.068"	.068" to .063"	.125"	.055"	1/64"	.189"
301949	75-627	1st Leaner	.069"	.069" to .0645"	.125"	.057"	1/64"	.189"
301950	75-628	2nd Leaner	.070"	.070" to .0655"	.125"	.059"	1/64"	.189"
301951	75-629	3rd Leaner	.0705"	.0705" to .067"	.125"	.061"	1/64"	.189"

Metering Rod Setting (Both) — Use Gauge, part No. J-1305 (2.280) inches.

Accelerating Pump (Both) — High pressure type (spring operated lever), with adjustable pump stroke. Discharge jets (twin) size #74 drill. Intake ball check, Size #40 drill. Discharge (needle seat), size #50 drill. Relief passage (to outside), through slots in air horn.

Pump Adjustment (Both) — 9/32" plunger tracel (full throttle position) long stroke. Use gauge No. T-109-1175.

Choke (6 Cylinder) — Set 1 point lean.
(8 Cylinder) — Set on index
Butterfly type, offset valve. Choke heat suction hole (in body), size 34 (.111") drill.

Vacuum Spark Part (Both) — 039" to .041" diameter. Top of port 030" to .040" above valve

CARBURETOR METERING

All carburetors used in the 480 series six and eight cylinder models are of the dual plain tube downdraft type of Carter design. Features of the design are as follows:

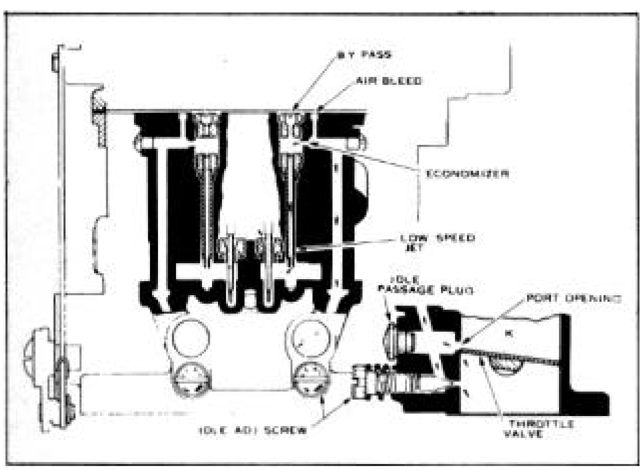
1. Metering of the fuel through all except the idle range is controlled primarily by a stepped and tapered metering rod which is actuated jointly by mechanical movement of the throttle and the amount of vacuum in the inlet manifold. This is known as the "vacumetric" metering rod control.

2. Provision of a device to reduce the vapor locking tendencies of volatile fuels at high temperatures. This device which operates on the principle of venting the main nozzle to the atmosphere at closed throttle is called the "anti-percolating valve".

3. Provision of automatic choking and fast idle for easy starting and smooth operation during warm-up.

IDLE OR LOW SPEED OPERATION

During idling and slow speed operation, liquid gasoline flows from the float bowl through a calibrated orifice called the low speed jet, Figure 1. As the fuel reaches the top of the jet, it is first mixed with air entering through the idle air bleed and the by-pass. This mixture then flows across and downward through a



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 1

vertical passage to the idle port and idle adjusting screw seat port and into the manifold due to the suction existing below the throttle valve. At closed throttle, the idle port acts as an air bleed to bring the idle mixture to required leanness and in combination with the idle adjusting screw port, as a discharge path for the idle mixture.

The idle position of the throttle is such that at an idle speed of 600 rpm it leaves enough of the slotted port as a reserve to cover the range in speed between idle and the time the high speed system begins to cut in.

ANTI-PERCOLATOR VALVE

Due to the small amount of gasoline in the well at the base of the low speed jet, the heat developed in the body of a downdraft carburetor (when the engine is stopped after a hard run in hot weather) tends to cause the gasoline to vaporize. This develops a vapor pressure which would force the gasoline out of the nozzle into the carburetor throat and cause a flooded condition. The anti-percolator valve relieves this vapor pressure by opening the well to the atmosphere when the throttle is closed. Refer to (B) Figure 2 also to Figure 3.

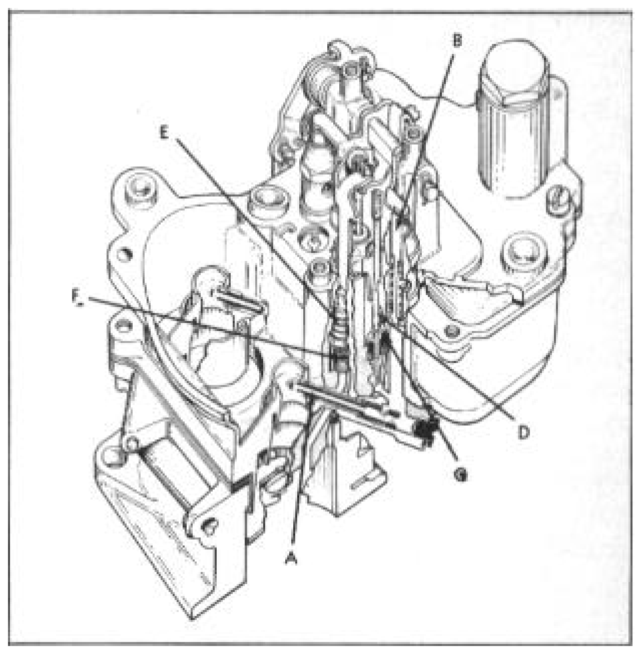
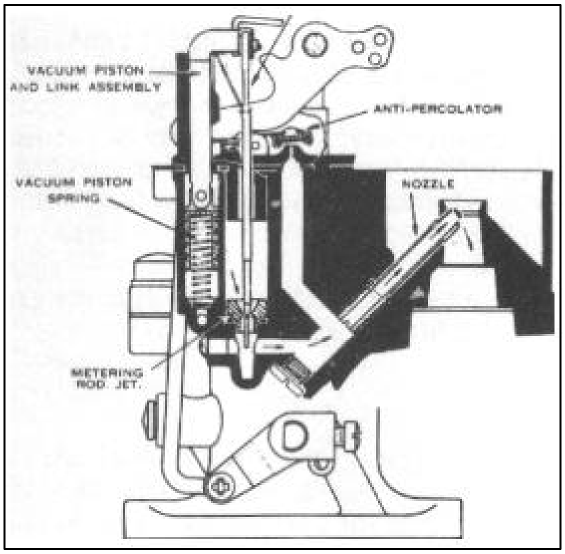


FIGURE 2

HIGH SPEED OPERATION

As the throttle opening is increased beyond the equivalent of about 20 mph, the velocity of the air flowing down through the carburetor throat creates a slight vacuum on the tip of main nozzle (A) Figure 2. This suction causes fuel to flow from the float bowl through the metering rod jet (G) and out the main nozzle (A) into the manifold via the venturi and the throat of the carburetor. Correct proportioning of fuel and air is accomplished by vertical movement of the tapered metering pin (D). The latter being mechanically connected to the throttle increases the effective opening of the metering jet orifice in proportion to the throttle opening, but without relationship to the variation in manifold vacuum produced at any given throttle position by differences in the load imposed on the engine.



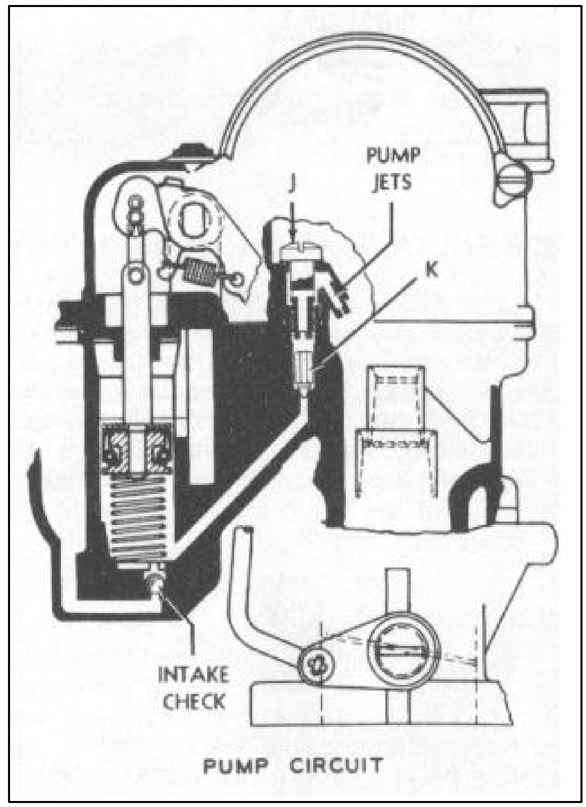
COURTESY OF CARTER CARBURETOR CORP.
FIGURE 3

By interposing a vacuum control on the metering pin movement, the richer mixture demands occurring in the range up to a throttle opening equivalent to about 60 mph, are met by permitting the accompanying drop in vacuum to lift the pin an additional amount over the mechanical lift produced by throttle position. Refer to Figures 2 and 3.

This is accomplished by means of the "vacumetric" control which permits a vacuum opposed spring (F) and piston (E) to move the metering rod out of the jet whenever the vacuum is lower than the spring pressure. As soon as the demand is removed, (as shown by an increase in manifold vacuum to the point where the vacuum force exceeds the spring force), the rod is pulled down to the lean position into contact with the throttle pump arm from where it is controlled solely by throttle movement until another rich mixture demand arises.

ACCELERATING

In order to supply the temporarily richer mixture required for maximum acceleration, the carburetor incorporates a throttle operated plunger pump which delivers liquid fuel into the throat when the throttle is opened. The path is via an intake ball check, pump cylinder, a needle type discharge check (K), Figure 4, the longitudinally drilled and radially ported air horn screw (I) and the twin calibrated jets mounted in the air horn.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 4

CLIMATIC CONTROL
(Automatic Choke)

Climatic Control is controlled by a thermostatic coil (B) Figure 5 which holds the choke piston (C) at the top of its travel and holds the choke valve completely closed when the engine is cold. This supplies the engine with a rich fuel mixture for starting.

When the engine starts, the vacuum in the intake manifold acting on the choke piston and

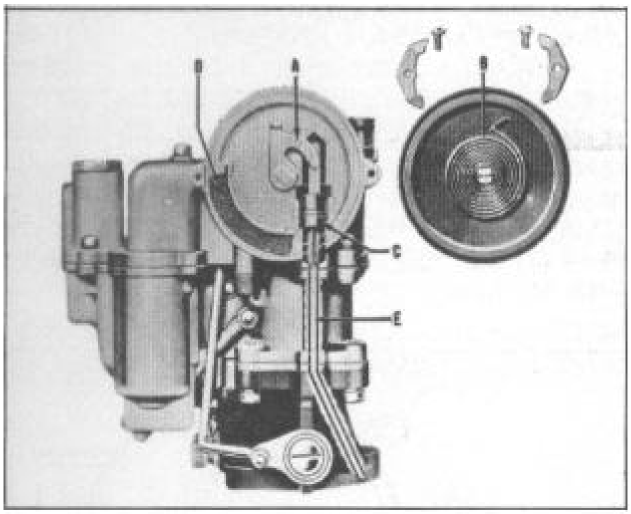


FIGURE 5

the unbalanced choke valve partly opens the choke valve until it takes the position where the tension of the thermostatic coil (B) is balanced by the pull of the vacuum on the piston (C) and valve. Slots in the sides of the choke piston cylinder allow the vacuum of the intake manifold to draw warm air from the exhaust manifold stove connecting tube; through the choke air cleaner screen (D); past the thermostatic coil (B) and into the intake manifold via the drilled passage (E).

This flow of warm air heats the thermostatic coil (B) and causes it to decrease its tension. The pull of the vacuum on the piston (C) working against a decreasing tension of the spring gradually opens the choke in such a way that it is fully open when the engine is warm enough to run on the regular idle mixture.

If the engine is accelerated during the warm up period, the vacuum will drop off which it always does automatically with acceleration. This drop in vacuum allows the thermostatic coil (B) to partly close the choke for a moment, thus providing the engine with a fuel mixture that is rich enough for acceleration.

The intake manifold vacuum drops to practically zero at low engine speeds with a wide open throttle. It would be possible for the choke to be closed by the thermostatic spring under such a condition thereby causing an excessively rich fuel mixture. To prevent this a lockout and unloader arrangement is built into the choke linkage so that on all wide open throttle operations the choke is held partly open.

CARBURETOR ADJUSTMENTS

PUMP TRAVEL

Pump adjustment should always be made before setting metering rods.

With the pump connector link in outer hole in pump arm (long stroke) and the throttle adjusting screw backed out, the pump plunger should travel 9/32" on six cylinder (model 647-S) and 7/32" on eight cylinder (model 648-S) from closed throttle to the wide open position.

Pump travel can be gauged by placing gauge T-109-117S on the boss of bowl cover around the plunger shaft.

The projecting portion of the indicator should be placed on the top surface of the connector link where it extends through the plunger shaft.

The difference in readings should be as heretofore mentioned.

To obtain correct readings, bend throttle connector rod at the lower angle.

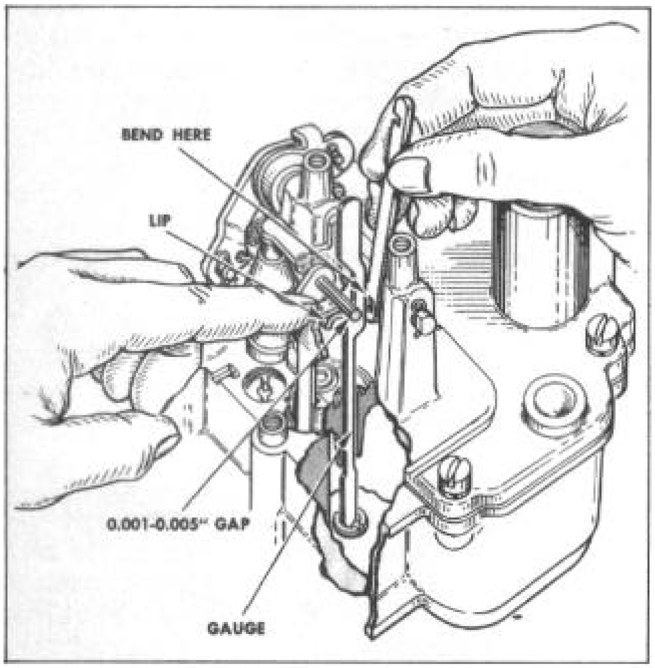
METERING ROD ADJUSTMENT

The following adjustment must be made when assembling the carburetor or when leaner than standard metering rods are installed.

DO NOT disturb the pump adjustment and proceed as follows:

1. Back out throttle lever adjusting screw until throttle valves seat.

2. Insert metering rod gauge T109-113 in place of the metering rod, Figure 6. (Be sure gauge seats in metering rod jet).



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 6

3. Install the metering rod pin and spring in vacuum piston link assembly.

4. Press lightly on top of vacuum piston link until lip contacts the anti-percolator arm.

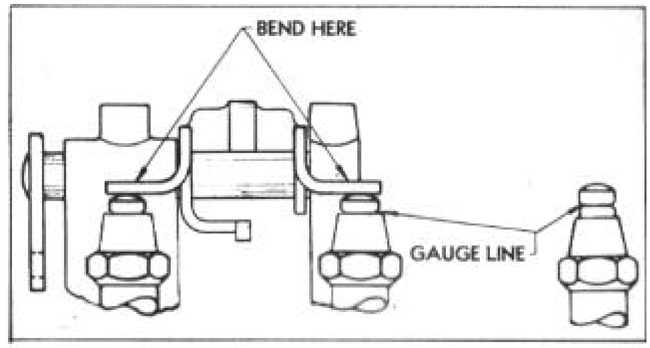
NOTE: Clearance between the metering rod pin and the shoulder in notch of gauge with throttle valve seated should be less than .005. To adjust to .005, bend the tongue on the pump arm using T-109-105.

5. Remove gauge and metering rod pin and install metering rods, discs, spring, pin, and pin spring. Hook spring to metering rod.

NOTE: Vacuum piston and link must not bind or drag in any position.

ANTI-PERCOLATOR ADJUSTMENT

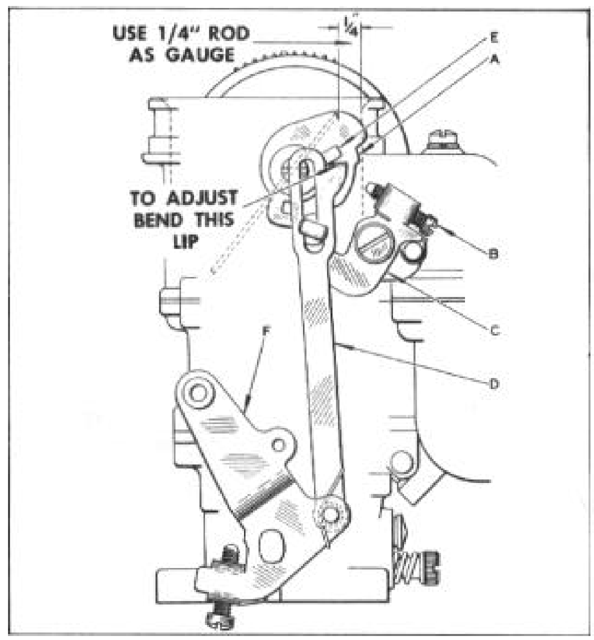
After adjusting the pump stroke and metering rods, bend the lips of the anti-percolator arm so that the center of indicator line on valves is flush with the top of anti-percolator plugs, Figure 7.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE '7

Since there are two anti-percolators on the Dual Carburetors, a synchronized adjustment must be made of both valves.

NOTE: Be sure throttle valves are seated when making the adjustment.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 8

UNLOADER ADJUSTMENT

With throttle valves wide open, the distance between the upper edge of choke valve and inner wall of the air horn should be 1/4". Use gauge T-109-31, Figure 8.

To adjust, bend the tip on the fast idle connector link. When unloader is adjusted properly in the wide open position, the choke valve will lock in the open position.

FAST IDLE ADJUSTMENT

With the choke valve tightly closed and the fast idle screw on the high step of fast idle cam, there should be .054" clearance between the throttle valves and bores of carburetor opposite side from idle port.

To adjust turn the fast idle adjusting screw (high step of cam) until specified clearance is obtained.

CARBURETOR OVERHAUL

DISASSEMBLY:

1. Remove hairpin clip (1), retainer spring (2), and fast idle link (3), Figure 9.

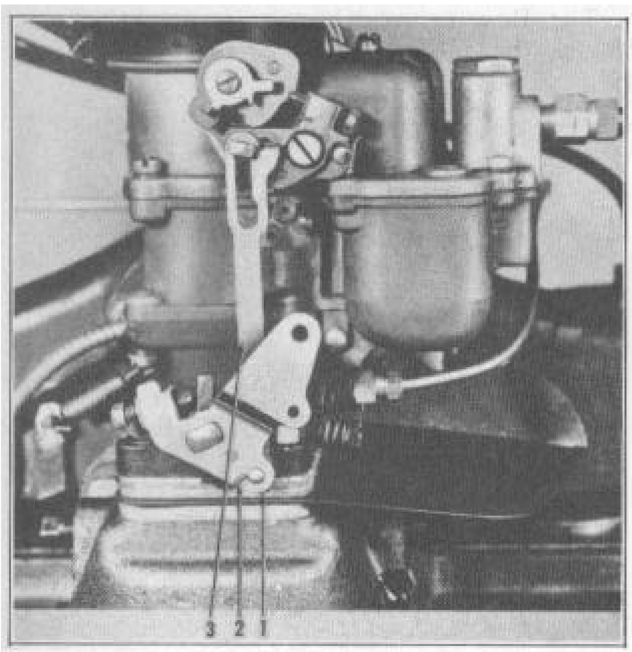


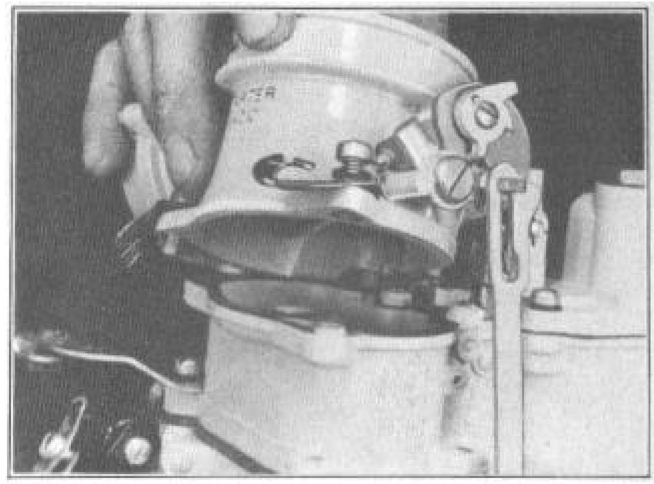
FIGURE 9

2. Remove air horn attaching screws and remove air horn with all parts attached, Figure 10.

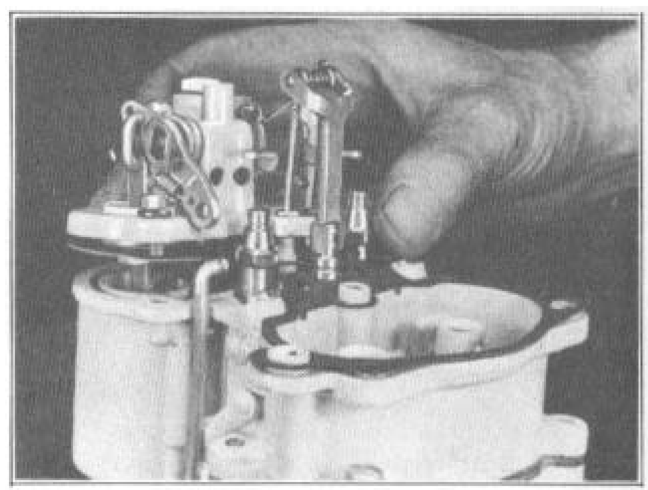
NOTE: The drilled screw inside air horn beneath each choke valve must be removed. Pump discharge needle is located in this hole.

3. Disconnect throttle connector rod at both ends and remove bowl cover assembly and all attached parts, Figure 11.

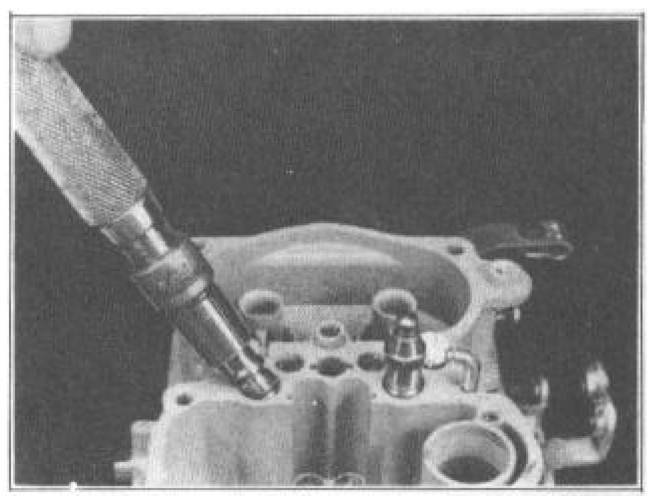
4. Remove metering rods and vacuum piston assembly intact. Do not lose metering rod discs. Lift out vacuum piston spring.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 10

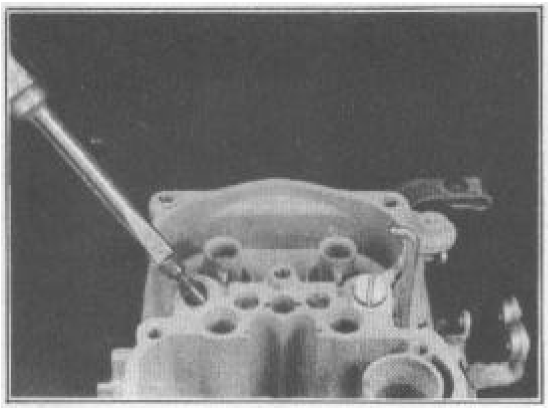


COURTESY OF CARTER CARBURETOR CORP.
FIGURE 11



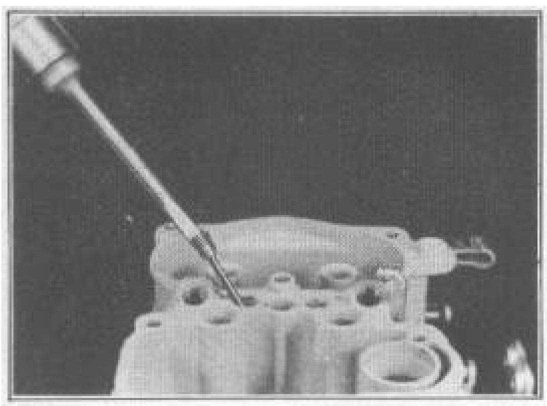
COURTESY OF CARTER CARBURETOR CORP.
FIGURE 12

5. Remove anti-percolator valve assemblies, Figure 12.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 13

6. Remove both low speed jet bleeder plugs using tool J-508 and both low speed jets, Figure 13.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 14

7. Remove both by-pass bleeder plugs and low speed jets, Figure 14.

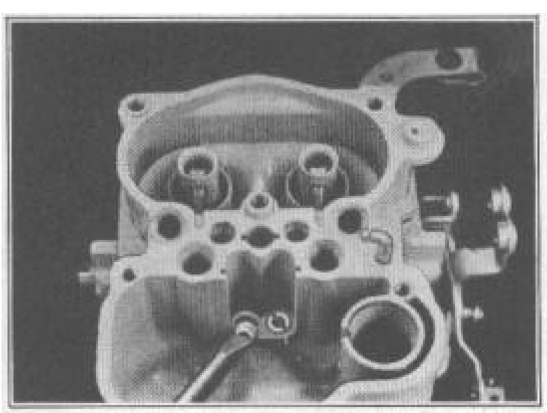
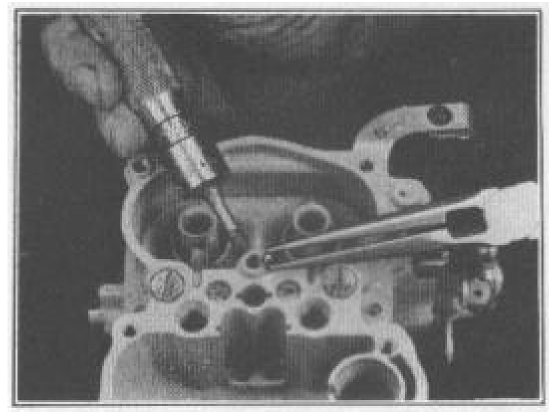


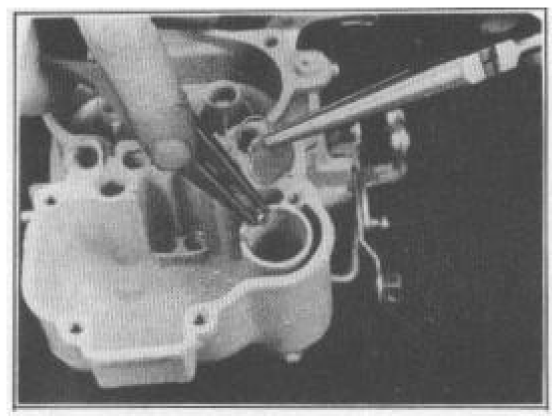
FIGURE 15

8. Remove both metering rod jet assemblies and fibre gaskets. Refer to Figure 15.



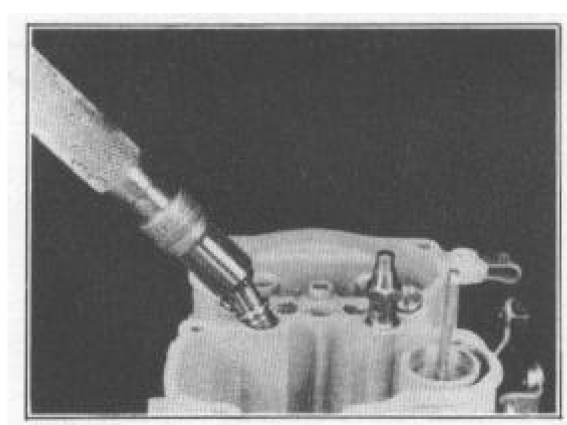
COURTESY OF CARTER CARBURETOR CORP.
FIGURE 16

9. Remove pump discharge ball retainer plug and check ball, Figure 16.



OURTESY OF CARTER CARBURETOR CORP.
FIGURE 17

10. Remove pump strainer, pump check ball retainer ring and check ball. Use Tool J-816-6, Figure 17.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 18

11. Remove both nozzle passage plugs, retainer plugs, nozzle valves, Figure 21.

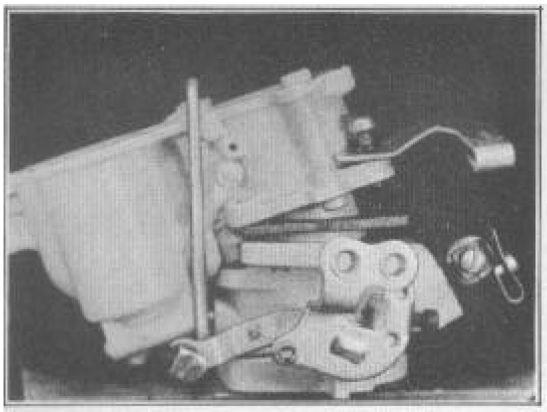


FIGURE 19

12. Remove body flange assembly from throttle body, also flange and idle passage sealing gaskets, Figure 19.

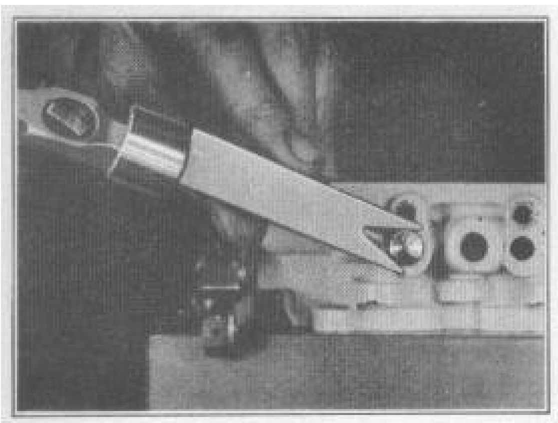


FIGURE 20

13. Remove both idle adjusting screws from flange assembly and idle port rivet plugs as in left hand view, Figure 20.

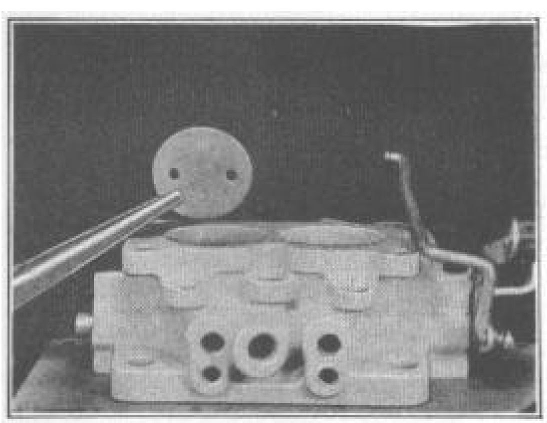


FIGURE 21

14. Remove throttle valve screws and throttle valves, Figure 21.

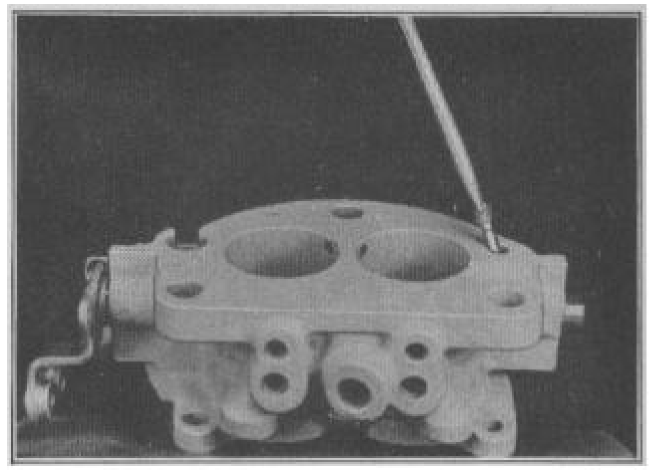


FIGURE 21

15. Remove throttle centering screw, throttle shaft and lever assembly.

16. Remove all parts from bowl cover.

17. Remove all parts from air horn and piston housing.

18. Wash all parts (except cork pieces) with clean gasoline, clean throttle bores, blow out all passages with compressed air and scrape carbon from flange.

NOTE: All relief passages to outside must be clean.

CARBURETOR REPAIR NOTES

NOTE: Any excessively worn parts of the carburetor should be rejected and new parts installed. A partial list of items to be inspected follows:

1. Reject float needle valve and seat if they show leakage or are damaged. New needle not supplied separately, but is available as a matched set with seat.

2. If holes in float for float pin are worn or if float contains fuel, reject the float assembly. Reject float pin if worn.

NOTE: If the float pin or the hole in the float pin bracket is worn, an erratic action of the float will result that will be similar to the effect created by a high float level.

The contour of the float lip is very important for smooth operation of the needle and should not be changed.

NOTE: If the float lip is worn or has a ridge in it, smooth the rough spot by drawing a strip of fine emery cloth back and forth on the contoured face of the lip. Do not use a file.

3. Clean all air bleed holes with wires or drills of proper size.

4. Clean carbon deposits from carburetor throat.

5. Clean idle discharge and idle adjustment screw ports using wires or drills of proper size.

6. Flush out idle mixture passages with gum solvent. If obstructed badly, remove aluminum plugs from body casting and clean passage with wire and compressed air.

7. If throttle shaft is worn badly enough to affect idle port opening, install a new shaft and lever assembly and/or throttle body assembly.

8. Clean restricted main nozzles only with compressed air. Do not use rods or drills.

9. Reject any leaking pump intake or discharge ball type check valves. Do not attempt to clean these parts.

10. If pump plunger shows leakage, reject the plunger and rod assembly.

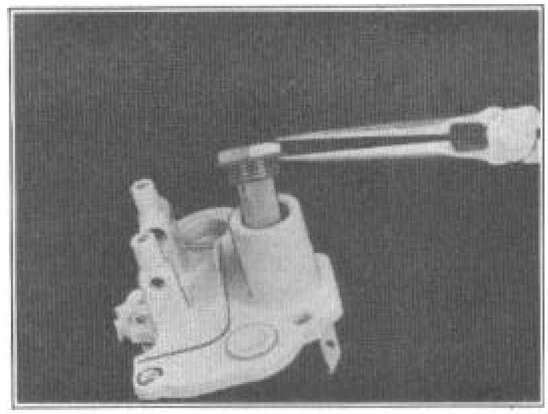
11. If idle mixture adjusting screw is burred or grooved, reject it.

REASSEMBLY:

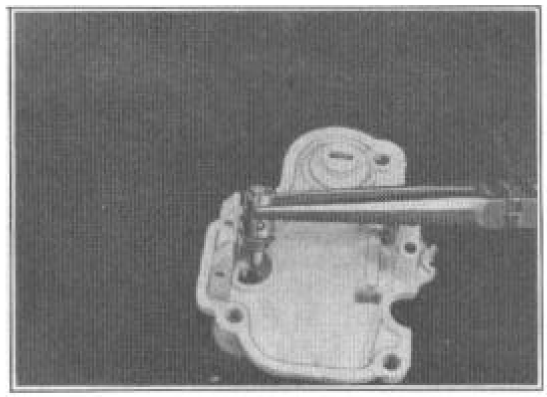
NOTE: Use all new gaskets when reassembling carburetor.

1. Install bowl cover strainer gauze, strainer nut, and gasket assembly, Figure 23.

2. Install needle seat and gasket assembly, Figure 24.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 23



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 24

3. Install needle float pin and float and lever assembly. Set float level to 3/16" for 6 cylinder using gauge J-818-3 and 13/64" for 8 cylinder using gauge J-818-4, Figure 25. Gauge both ends of float from machined surface of casting.

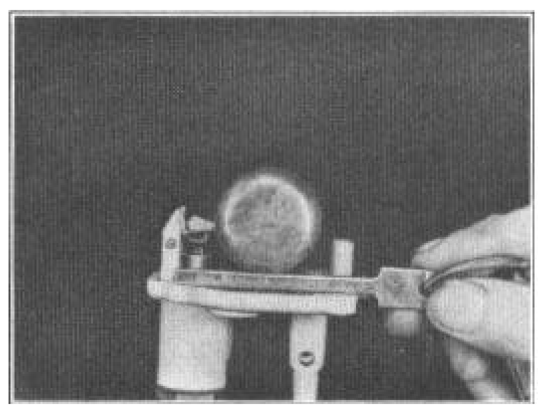
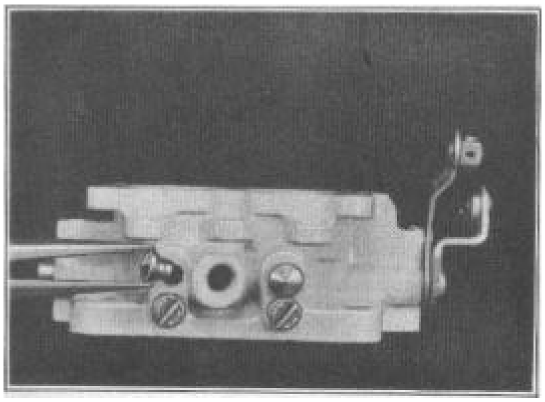


FIGURE 25

NOTE: Make adjustments by bending float lip-- NOT FLOAT.

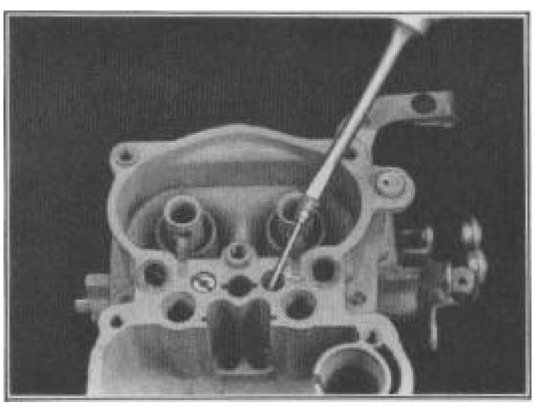
4. Install throttle shaft and lever assembly, loosen throttle lever and throttle centering screw. Back out throttle lever adjusting screw, Figure 22.

5. Loosen throttle lever centering screw, back out throttle lever stop screw and then install throttle valves from lower side of flange casting. Use new screws. Trade-mark ("C" in circle) on valves should be toward mani-fold and on idle port side of bores. Hold valves with fingers and tap lightly with screwdriver on high side of valves. DO NOT release this grip until all four screws are tightened.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 26

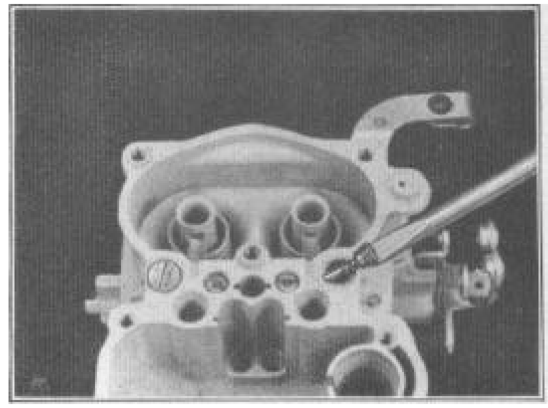
6. Install idle adjusting screws and NEW idle port plugs, Figure 26.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 27

7. Install new idle passage gasket washers and body flange gasket and attach body flange to throttle body.

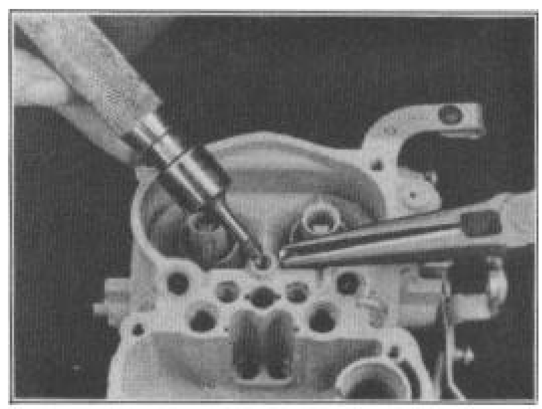
8. Install low speed jet assemblies and low speed jet bleeder plugs into bowl in casting, Figure 27. Work jets well into casting to insure good seat.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 28

9. Install pump jets and pump jet plugs, Figure 28. Make certain that jets are clear of all restrictions and seat properly.

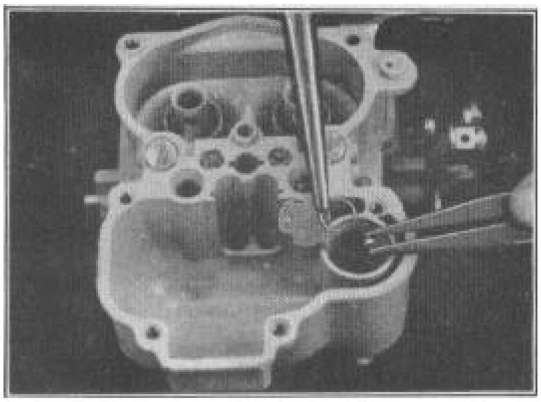
NOTE: No washers are used beneath jet plugs. Check to see that outside bleed hole in casting is not restricted.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 29

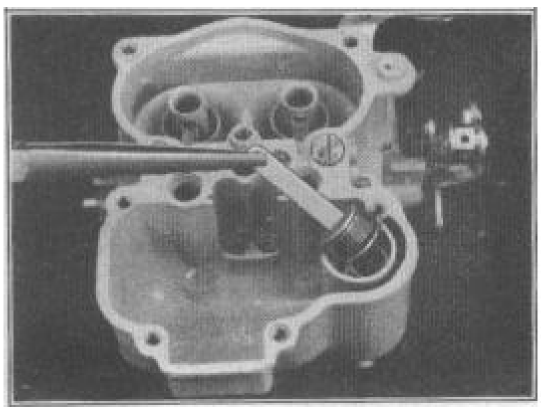
10. Install check ball and pump discharge ball retainer plug, Figure 29.

11. Install intake check ball, pump check ball retainer ring, and pump strainer, Figure 30.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 30

12. Install pump spring, pump plunger, and rod assembly, Figure 31.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 31

NOTE: Replace entire plunger assembly if leather shows wear or mutilation.

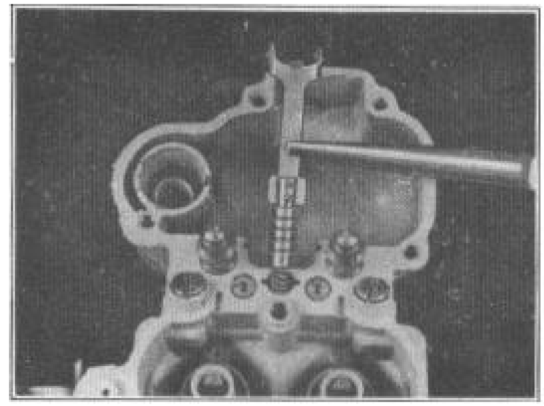
13. Install both metering rod jets and gaskets. Jets must be installed snugly, but not so tightly as to cause distortion, Figure 15.

14. Install anti-percolator valves, Figure 12.

15. Install vacuum piston spring and vacuum piston assembly. It is advisable to use a NEW vacuum piston spring each time the unit is serviced, Figure 32.

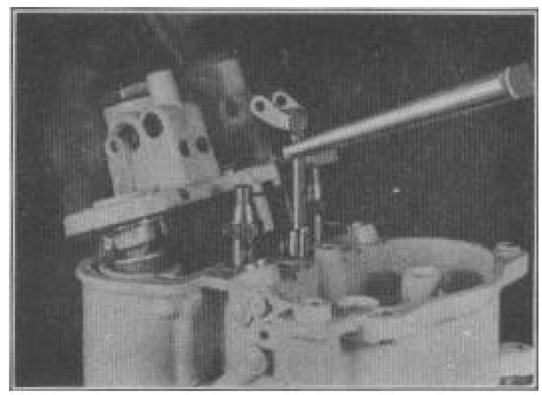
NOTE: If piston is loose on shaft, replace piston and link.

16. Raise vacuum piston and link assembly and install bowl cover with parts attached, Figure 33.



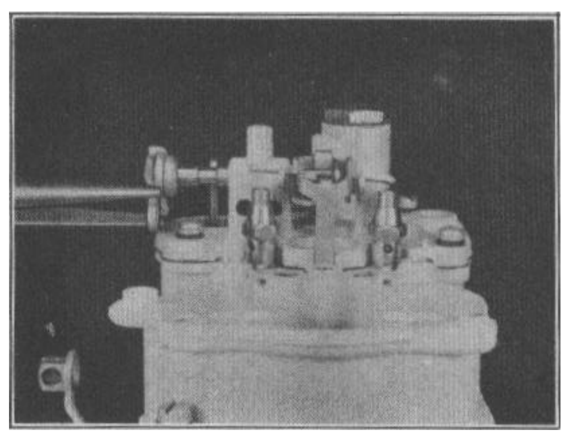
COURTESY OF CARTER CARBURETOR CORP.
FIGURE 32

NOTE: Use new gasket and tighten screws evenly.



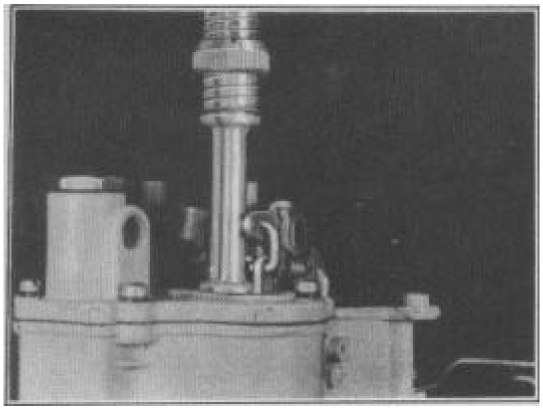
COURTESY OF CARTER CARBURETOR CORP.
FIGURE 33

17. Install anti-percolator arm and screw assembly, pump operating lever, countershaft assembly and pump arm and collar assembly, Figure 34.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 34

NOTE: Install Connector link on pump rod and in outer hole (long stroke) of pump arm. Pin spring should be at top against outside of pump arm.



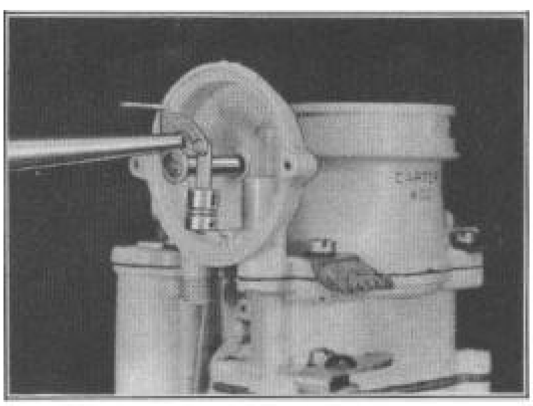
COURTESY OF CARTER CARBURETOR CORP.
FIGURE 35

18. Install throttle connector rod, Figure 35. Gauge pump stroke. (See "Pump Travel Adjustment").

NOTE: Check throttle connector rod for wear at both ends of rod.

19. Be sure that old nozzle gaskets have been removed from casting. Install both nozzles (flat side up), new nozzle gaskets and nozzle retainer plugs, tightening securely. Then install both nozzle passage plugs, Figure 18.

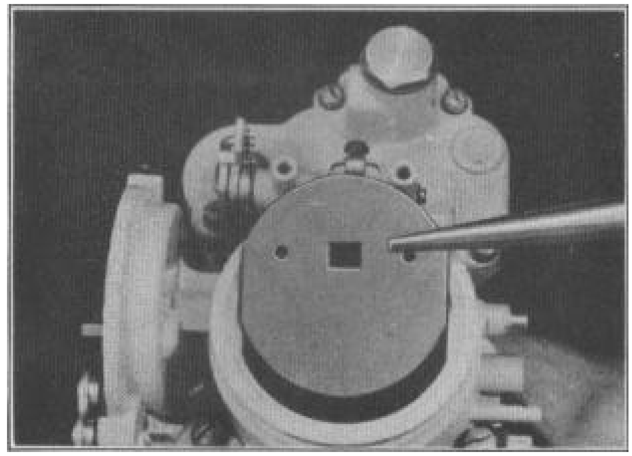
20. Adjust metering rods and anti-percolator valves as outlined under "Carburetor Adjustments", page 7.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 36

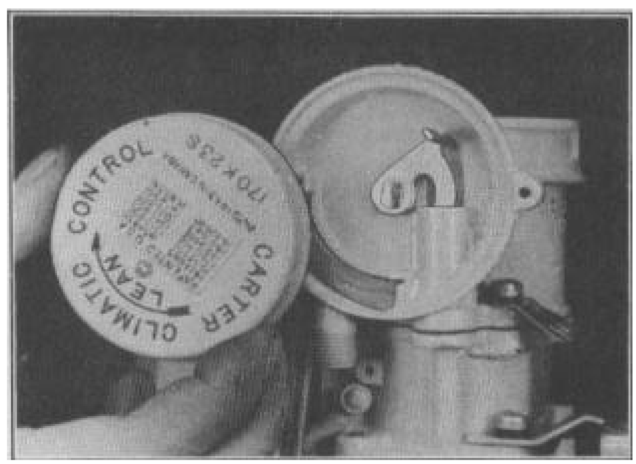
Install pump discharge needle, air horn, and piston housing on body, Figure 36. Then install choker piston lever, link, and shaft assembly. (Use new air horn gasket).

NOTE: Do not forget special screw inside air horn. NO washer is used on this screw.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 37

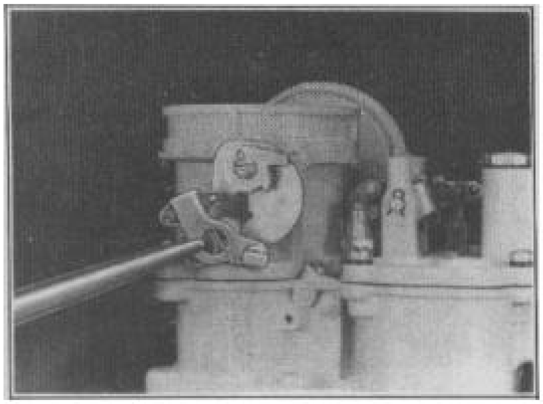
21. Install choke valve, Figure 37, using new screws. Center valve before tightening screws. Valve must fall open of its own weight after installation.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 38

22. Install Climatic Control screen and thermostatic coil and housing assembly, Figure 38. Coil housing should be set one mark lean from index for 6 cylinder, and on index for 8 cylinder.

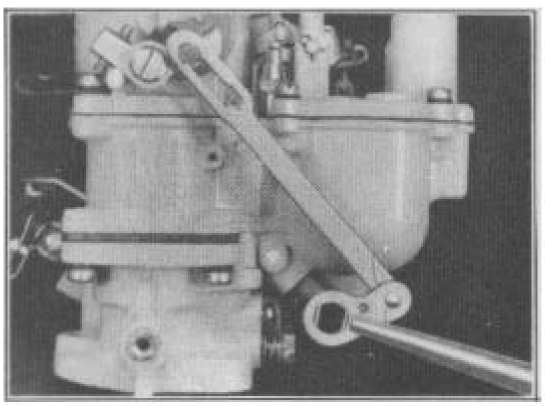
23. Install fast idle cam, washer, and choker trip lever on choker shaft, Figure 39.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 39

Then install fast idle arm, pin and screw assembly and fast idle arm spring, Figure 39.

24. Install fast idle connector link, throttle shaft arm and pin assembly, washer and spring, Figure 9.



COURTESY OF CARTER CARBURETOR CORP.
FIGURE 40

25. Adjust fast idle, choke unloader, and lockout as outlined under ("Carburetor Adjustments").

CARBURETOR

REMOVAL:

1. Remove air cleaner. Loosen clamp at air horn and on 8 cylinder engines, loosen brace opposite side.

2. Disconnect throttle linkage from carburetor.

3. Disconnect gas line and vacuum line from carburetor to fuel pump, Figure 41.

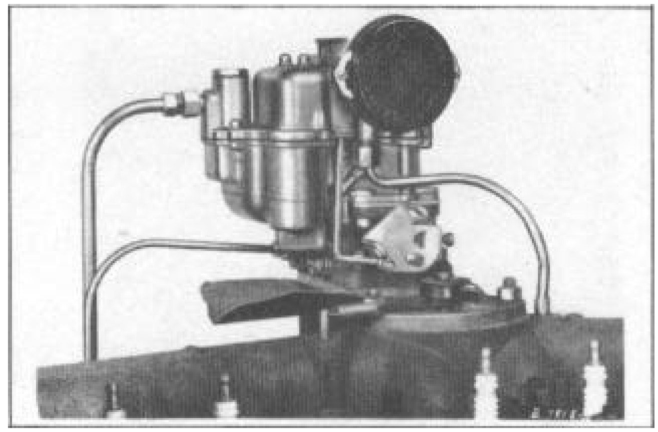


FIGURE 41

4. Disconnect vacuum line from carburetor to distributor.

5. Remove the four nuts and lockwashers from the carburetor mounting studs and remove carburetor assembly.

INSTALLATION:

1. Install carburetor and install the four nuts and lockwashers on the carburetor mounting studs.

NOTE: Place four gaskets on each side of heat deflector as shown in Figure 42.

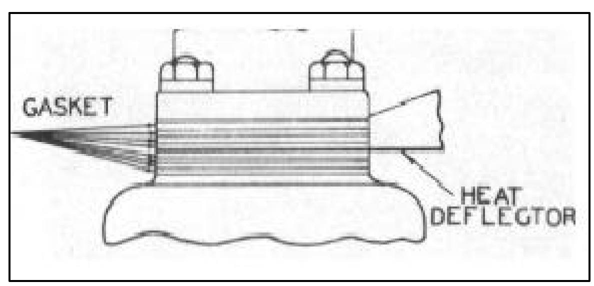


FIGURE 42

2. Connect vacuum line from distributor to carburetor.

3. Connect gas line from fuel line to carburetor.

4. Connect throttle linkage to carburetor; install clamp.

5. Adjust and test carburetor for maximum performance.

6. Install air cleaner.

AIR CLEANER
Dry (Oiled Wetted Type)

The oil wetted type air cleaner is used as standard equipment on all models. In this type cleaner the wire gauze is oil soaked and as the air passes through it, foreign particles are removed, thereby permitting only clean air to enter the carburetor.

The air cleaner section should be cleaned at least every 2,000 miles, oftener if local conditions warrant.

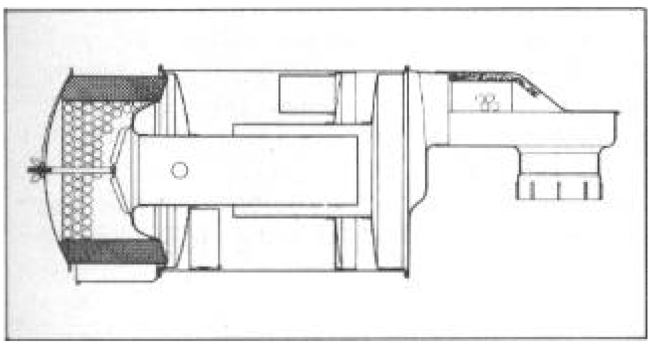


FIGURE 43

This filter can be cleaned by removing the attaching wing nut and lifting out unit. Clean off old oil and dirt by dipping it in kerosene and blow dry. Re-oil by dipping unit in engine oil, (using the same grade as is used in the engine). Permit excess oil to drain off and reinstall unit in cleaner.

Oil Bath Type
8 Cylinder

The oil bath air cleaner is available as an option. In this unit, dirt is washed out of the air by the oil spray created as the incoming air strikes the oil in the sump.

The oil bath type air cleaner should be serviced at 2,000 mile intervals or more frequently during severe dust conditions as follows:

1. Unscrew and remove wing bolt at top of cleaner.

2. Remove lower section of cleaner by pulling it outward toward the left side of the car.

3. Lift out filter element; clean in gasoline and drain.

4. Remove old oil, wash out base, and refill to level indicated with new oil of the same grade as used in the engine.

5. Place filter element and container in position without oiling and install lower section of cleaner with dirt shield facing the front of the car.

6. Install and tighten wing bolt.

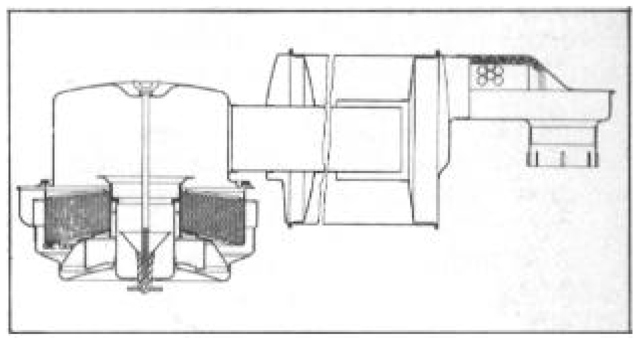


FIGURE 44

FUEL PUMP

Mechanically driven fuel pumps and combination fuel and vacuum pumps are used in the 480 series on both 6 and 8 cylinder. Pumps are manufactured by the A. C. Spark Plug Co. under the following numbers:

Factory No.	Series	Repair Kit	Diaphragm Kit Fuel	Diaphragm Kit Vacuum
1539109	AH	R-30	D-18	
1539108	AJ	R-30	D-10	D-28

Factory part number is stamped on mounting flange.

The mechanical operation of the A.H. (Standard) and A.J. (Optional) fuel pumps is the same, therefore disassembly and overhaul instructions will not vary, with the exception of the vacuum addition to the combination pump.

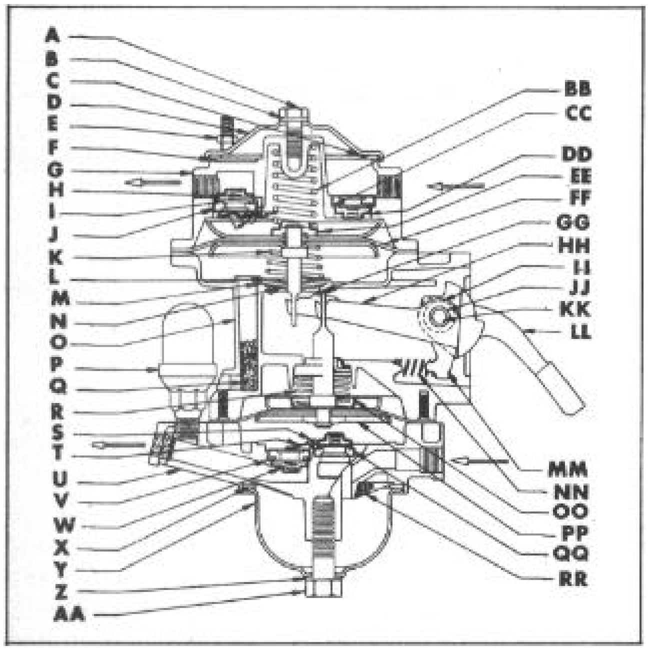


FIGURE 45

A. Cover screw
B. Screw gasket
C . C over gasket
D. Cover plate
F. Screen
G. Body
H. Valve plate
I. Plate screw
J. Valve and cage
K. Oil seal spring
L. Oil seal retainer upper
M. Oil seal washer
N. Oil seal retainer lower
O. Body and oil seal
P. Air dome
Q. Filter hair
R. Diaphragm spring
S. Valve plate screw
T. Valve plate
U. Cover
V. Cage gasket
W. Valve and cage
X. Bowl gasket
Y. Metal bowl
Z. Gasket
AA. Bowl screw
BB. Diaphragm spring
CC. Cage gasket
DD. Valve and cage
EE. Diaphragm spring seat
FF. Pull rod and diaphragm
HH. Fuel pump link
II. Spacers
JJ. Bushings
KK. Rocker arm Pin
LL. Rocker arm
MM. Link spacer
NN. Rocker arm spring
OO. Spring retainer
PP. Pull rod and diaphragm
QQ. Valve and cage
RR. Screen assembly

Rotation of the eccentric on the engine camshaft actuates the rocker arm (LL) Figure 45, which is pivoted and in turn pulls the pull rod and diaphragm assembly (PP) downward against the diaphragm spring, thus creating a vacuum in the pump chamber and opening the suction valve.

Fuel from the tank enters through the inlet into the sediment bowl and then through the strainer and the suction valve into the pump chamber. On the return stroke, the spring pressure pushes the diaphragm upward forcing fuel from the pump chamber through the outlet valve (T) to the carburetor and closing the suction valve (QQ).

The following instructions apply to the combination fuel and vacuum pump. Therefore, when overhauling standard pumps, omit the instructions for the vacuum section.

REMOVAL:

1. Remove gas line from carburetor to fuel pump.
2. Remove vacuum line from carburetor to fuel pump.
3. Remove two nuts and washers from the coil bracket to intake manifold.
4. Remove coil wires to distributor and coil wire to ignition.
5. Remove windshield wiper vacuum tube from fuel pump.
6. Disconnect fuel pump flexible tubing at junction with steel tubing to gas tank.
7. Remove two bolts and bracket attaching fuel pump to block and remove fuel pump.

DISASSEMBLY:

Before proceeding with the following operations, wash the unit with cleaning solvent and blow off with compressed air to remove dirt and grease.

1. Mark edges of fuel cover and body diaphragm flanges with a file. The parts may then be reassembled in the same relative position.

2. Remove fuel cover screws and lockwashers. Separate cover from body by jarring cover loose with a screwdriver handle.

3. Mark edges of vacuum cover and body diaphragm flanges. The parts may then be reassembled in the same relative position.

4. Remove two screws from opposite sides of the vacuum cover, and substitute for them two No. 10 - 32 x 1-1/2 inch fillister head screws. Turn the two long screws all the way down, and then remove the balance of the regular cover screws. Alternately back off the two long screws, a few turns at a time, until the force of the heavy vacuum diaphragm spring is no longer effective. Remove the two long screws, the cover assembly, diaphragm spring, and spring retainer.

5. File riveted end of rocker arm pin (KK) flush with steel washer, or drill off end with 3/8" drill. Drive out rocker arm pin with a driftpunch. Wiggle rocker arm until links unhook from both diaphragms. Then remove rocker arm spring, rocker arm, and the link assembly.

6. Remove bushings (Jr) from rocker arm before removing rocker arm (LL), two vacuum links (HH), one fuel link, link spacer (MM) and link washers.

7. Lift vacuum diaphragm (FF) out of body, and remove lower oil seal retainer (N) by turning until slot lines up with flat of pull rod. Remove oil seal washer (M), upper oil seal retainer (L), and oil seal spring (K).

8. Remove fuel diaphragm (PP) by pulling straight out. **CAUTION: DO NOT TILT EXCESSIVELY OR STAKED-IN OIL SEAL WILL BE DAMAGED**. Lift diaphragm spring (R) and spring retainer (00) from pump body.

9. Remove valve and cage retainer screw and lift out retainer, two valve and cage assemblies (QQ) and two gaskets.

10. Remove bowl screw (AA) and gasket (Z). Then remove bowl (Y), bowl gasket (X), and screen (RR).

11. Remove cover plate screw (A) with gasket (B). Lift off the cover (D), cover gasket (C), screen retainer, and screen (F).

12. Blow out all passages with compressed air.

INSPECTION:

Inspect Pump parts as follows:

1. Top Cover and Pump Body - Make visual check for cracks and breakage. Inspect for diaphragm flange warpage by testing on a smooth flat surface. Examine all threaded holes for stripped or crossed threads. Broken, damaged, or severely warped castings must be replaced.

2. Valve and Cage Assemblies -Replace. Extent of wear cannot be determined visually.

3. Strainer Screen - Replace. Inspect new screen for damage or obstruction. Screen must fit snugly around inner edge.

4. Rocker Arm - Inspect for wear or scores at camshaft pad and at point of contact with link and pull rod.

5. Rocker Arm Pin and Washer - Replace bullet type pin with head type pin and washer.

6. Link - Replace link because amount of wear cannot be determined visually.

7. Rocker Arm Spring - Replace. Spring may be weak from distortion or corrosion.

8. Diaphragm - Always Replace.

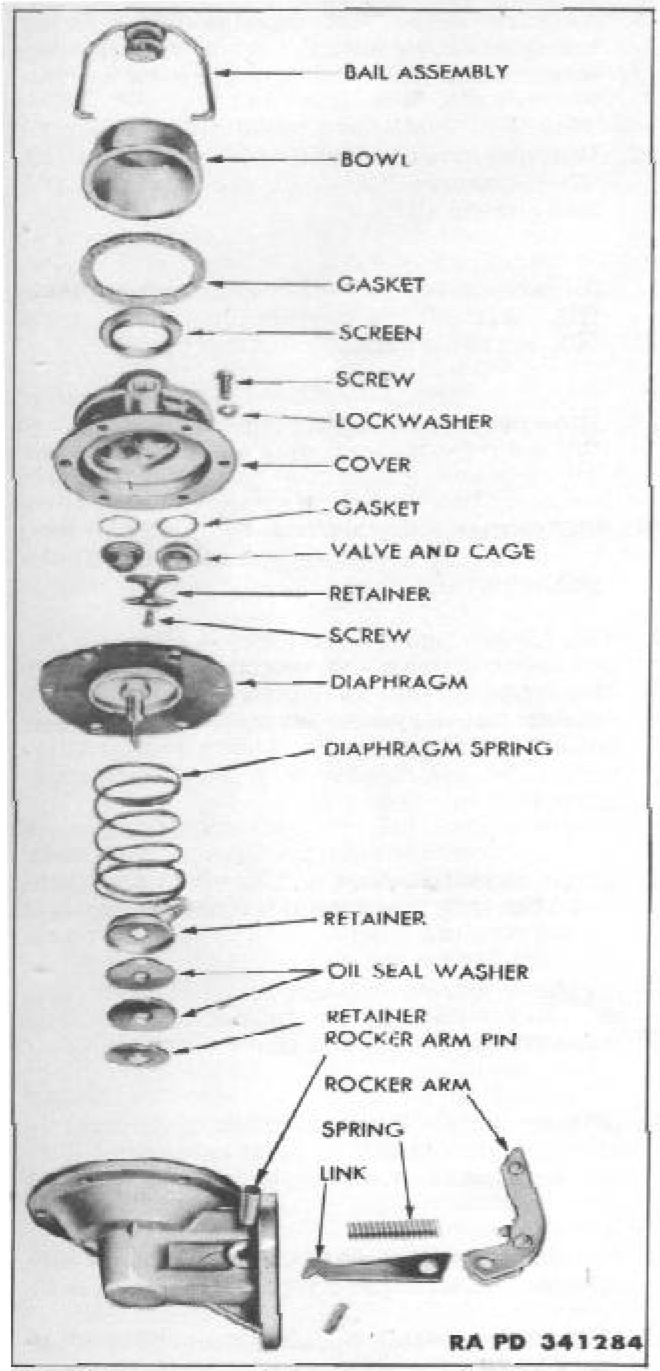


FIGURE 46

9. Gaskets and Oil Seal - Always replace gaskets and oil seal to assure tight seals.

REASSEMBLY:

Soak new diaphragms in clean kerosene while performing the following steps. Fuel oil or gasoline may be used. Refer to Figure 47 for assembly procedure.

FUEL SECTION
(Combination Pump)

1. Assemble link spacer over fuel link. Place one vacuum link on each side of the fuel link. The hook ends of the vacuum link should come together so that they surround the fuel link. All link hooks should point in the same direction. Place assembly of links and spacer between lobes of rocker arm with one spacer washer on the outer side of each vacuum link. Slide rocker arm bushing through holes in rocker arm, spacer washers, and links.

2. Stand the pump body on the bench, fuel flange down. Set rocker arm spring in position with one end over cone cast into the body. Slide rocker arm and link assembly into body. Outer end of all link hooks must point toward vacuum flange. Temporarily retain rocker arm and link assembly with tool PT-6.

3. Turn the pump body over so the fuel diaphragm flange is up. Set the diaphragm spring on the staked-in oil spring. Push diaphragm pull rod through retainer, spring and oil seal. Flat of pull rod must be at right angles to link. Hook diaphragm pull rod to fuel link. FUEL LINK IS THE SHORT, CENTER LINK. DO NOT TILT DIAPHRAGM PULL ROD EXCESSIVELY AS THIS MAY DAMAGE THE OIL SEAL.

4. Drive tool PT-6 out with permanent rocker arm pin. Place washer over small end of pin and spread pin end.

5. Place valve and cage gasket or two separate gaskets in recesses provided. Place valves and cages on top of gaskets. Inlet valves must have three-legged spider facing out of cover, and outlet valve must have three-legged spider facing into cover. Secure valve assemblies with retainer and screw.

6. Install strainer screen, cover gasket, cover, cover screw gasket, and cover screw in the order named. If Used, install air dome in threaded hole in projection of casting for outlet.

7. Install cover on body, making sure that file marks on cover and body line up. Push on rocker arm until diaphragm is flat across body flange. Install cover screws and lockwashers loosely until screws just engage lockwashers. Pump the rocker arm three or four full strokes and tighten cover screws securely.

8. Diaphragm must be flexed before tightening cover screws, or pump will deliver too much pressure.

VACUUM SECTION

9. Place two gaskets and two valve and cage assemblies in cover. Inlet valve must have three-legged spider facing out of cover, and outlet valve must have three-legged spider facing into cover. Secure valve and cages with retainer screw.

10. Turn cover over, and set screen in recess over valve hole. Set screen retainer on screen. Place cover gasket, cover, cover screw gasket, and cover screw in position in the order named. Tighten cover screw.

11. Assemble oil seal on vacuum diaphragm pull rod in the following sequence: oil seal spring, upper retainer, oil seal washers, and lower retainer. Turn lower retainer 90 degrees to lock in position.

12. Lift the pump body above eye level, facing the vacuum diaphragm flange. The two vacuum links will swing down so that the diaphragm pull rod can be hooked to both links.

13. While holding vacuum diaphragm in position, the body should be clamped in a vise, vacuum side up. Clamp by one of the mounting flange ears. The vacuum diaphragm must be held level with body flange during the following operations by inserting a 3/32" piece of metal between rocker arm stop and body. This spacer can be made from piece of steel, 3/16 to 3/32 inch by 8 inches. Bend one end to form a right angle hook, 3/8" from bend to end. This tool is available from your AC jobber as tool PT-8.

14. Place spring retainer on riveted end of diaphragm pull rod, and the spring on retainer. Place vacuum cover over springs, and align the file marks.

15. Insert two No. 10 - 32 x 1-1/2" screws in two opposite holes in cover flange. Turn these long screws down, alternating a few turns on each. Insert regular screws with lock washers, and tighten until screws just engage lockwashers. Replace two long screws with regular screws and lock- washers.

16. Remove 3/32 inch spacer from rocker arm position. This allows the heavy vacuum spring to push diaphragm into a flexed position. Tighten all cover screws securely.

17. Combination fuel and vacuum pump cannot be bench tested because of the heavy vacuum section spring. The only adequate test for this type pump is with a vacuum gauge such as the KMO-144 when the pump is mounted on the engine.

INSTALLATION:

1. Install fuel pump and gasket to cylinder block. Replace old gaskets.

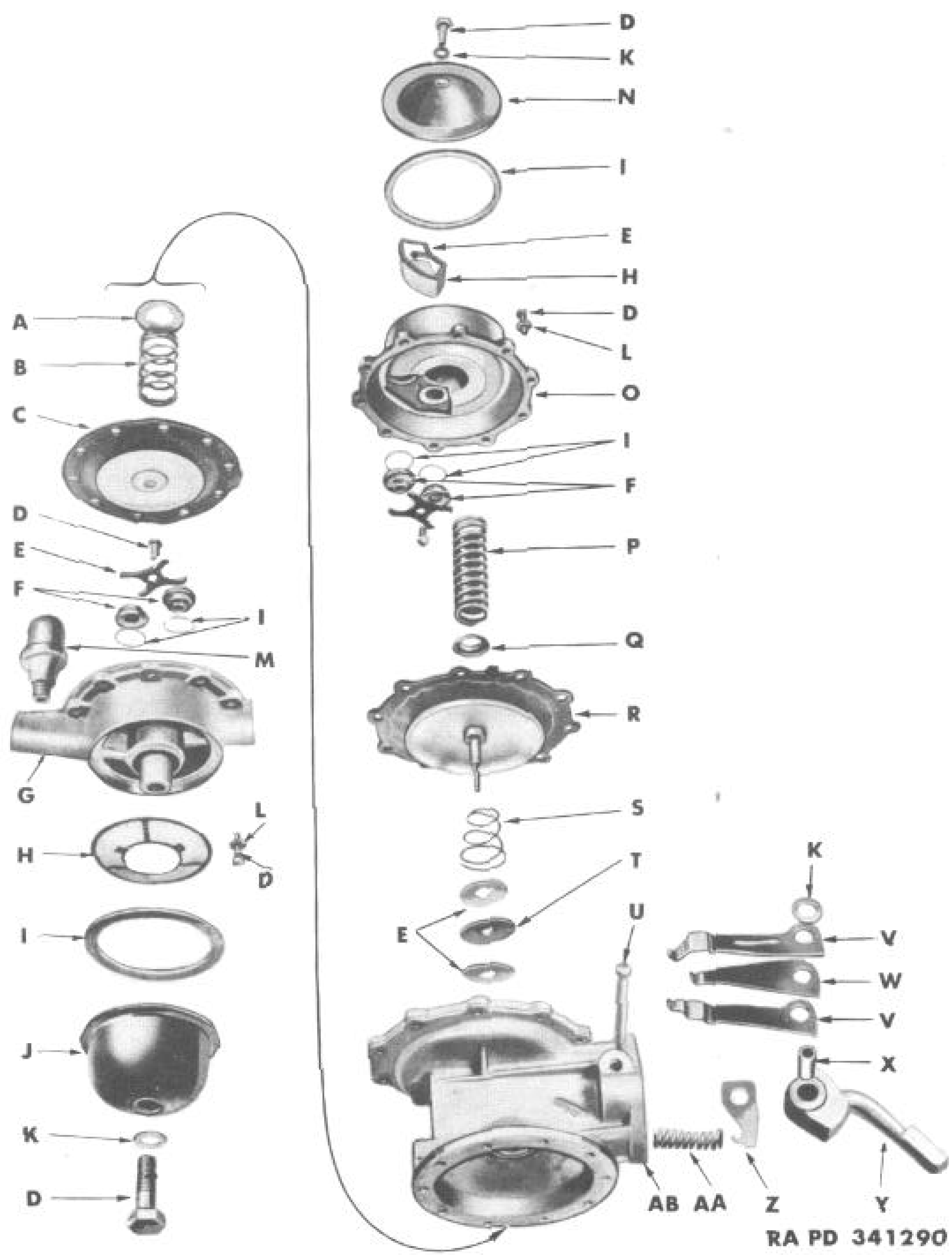
2. Connect steel gas line to flexible hose at fuel pump.

3. Connect gas line from carburetor to fuel pump.

4. Connect vacuum line from carburetor to fuel pump.

5. Connect windshield wiper vacuum hose to fuel pump.

6. Install coil and bracket to intake manifold.



A—RETAINER
B—FUEL DIAPHRAGM SPRING
C—FUEL DIAPHRAGM
D—SCREW
E—RETAINER
F—VALVE AND CAGE
G—FUEL COVER
H—SCREEN
I—GASKET
J—BOWL
K—WASHER
L—LOCKWASHER
M—AIR DOME
N—PLATE
O—VACUUM COVER
P—VACUUM DIAPHRAGM SPRING
Q—SPRING RETAINER
R—VACUUM DIAPHRAGM
S—OIL SEAL SPRING
T—OIL SEAL
U—PIN
V—VACUUM LINK
W—FUEL LINK
X—BUSHING
Y—ROCKER ARM
Z—LINK SPACER
AA—SPRING
AB—BODY

FIGURE 47

7. Attach coil wires and plug coil lead wire to distributor.

8. Recheck fuel pump pressure as outlined under "Engine Tune-up - Fuel Pump Test".

NOTE: To test vacuum portion of combination pumps proceed as follows:

1. Disconnect both the inlet and the outlet lines from the vacuum element of the pump.

2. Attach KMO-144 or equivalent vacuum gauge or mercury column to the inlet port which is the side of the pump connected to the windshield wiper line.

3. Operate engine at 1000 to 1200 rpm at which time the gauge should show 7 to 12 inches of vacuum.

4. If less than 7 inches of vacuum are produced, it can be assumed that the vacuum section of the pump needs repairing.

CAUTION: Always make this test of the vacuum pump with outlet open because internal pressure due to closing the outlet will damage the pump mechanism.

NOTE: Oil smoke in engine exhaust may indi-- cate a punctured vacuum diaphragm. Make final decision by holding a piece of paper in front of outlet (line connected to intake manifold) with engine running. If oil spray collects on paper, the vacuum pump has a faulty diaphragm or seal and should be removed for corrective repairs.

FUEL LEVEL GAUGE

This electrical device consists of a sending unit mounted in the fuel tank and a receiving unit mounted on the instrument panel. Each unit incorporates a bi-metal element over which a heating coil is wound. Refer to Figure 48.

The two heating coils are connected in series and the gauge circuit is completed to ground through a set of contacts in the tank unit. The feed wire is connected to the accessory terminal of the ignition switch so that the gauge registers only with the ignition on.

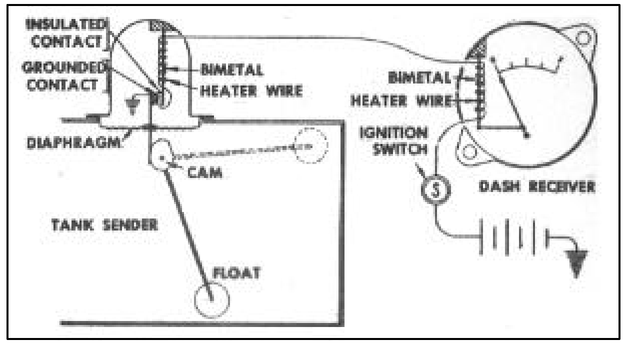


FIGURE 48

The ground contact for the tank unit is attached to the upper end of a movable arm which is mounted centrally in a fabric diaphragm as shown in the illustration. The lower end of the arm is actuated by a cam on the upper end of the float arm. When the float moves up to follow the gasoline, the cam moves the arm so that contact pressure and the length of time the contacts remain closed is increased.

When the tank contacts are closed a current flows through the heating coils of both the tank and the dash units. This causes the bimetal arm in the dash unit to bend, moving the needle, and showing a reading on the dash unit. At the same time the heating coil in the tank unit causes its bi-metal arm to bend, opening the contacts and interrupting the current flow. When this occurs the heating action stops and the cooling of the bi-metal arm causes it to flex in the opposite direction and again close the contacts. In operation this cycle takes place very rapidly and a steady reading is obtained on the dash unit.

GAUGE TROUBLE SHOOTING:

If the fuel level gauge becomes inoperative, it is recommended that an extra tank unit be used for testing. If there is any question about the tank test unit being correct, then hook it up in series with a receiver known to be correct and 6 volts of battery current. Operate the tank unit by hand and see if receiver reads zero with tank unit float in bottom position and full with tank unit float in the top position. Use two ten foot lengths of insulated wire equipped with clip terminals at each end. These lengths will permit the checking by one person in front of the dash unit.

Do not remove either the dash or tank unit from the automobile until the elimination tests outlined below prove them in need of replacement.

1. Disconnect the lead of the tank unit on the car and connect this lead to the tank test unit and ground same to the car frame. Turn on ignition switch and operate tank test unit float by hand. With the float of the test unit at the bottom position the car dash unit should register at the bottom mark on the dial as in Figure 48. Move float rod up to top position and the car dash unit should move to top mark on the dial, as shown in Figure 49. Allow one minute for dash unit pointer to come to rest.

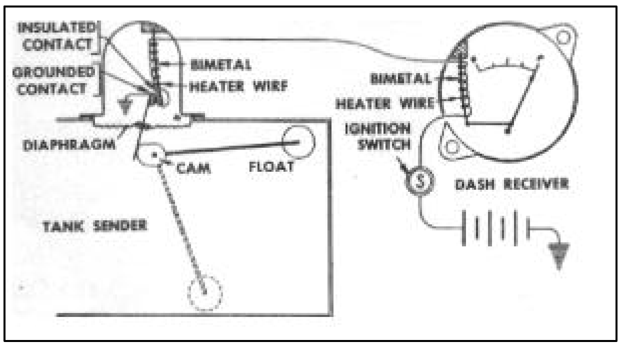


FIGURE 49

a. The tank unit is grounded through the the case. Check the ground connections. See that paint and grease are removed under the flange and that surfaces are making good contact.

b. If the car is radio equipped, check the condenser on the tank unit. If the condenser is shorted, it will cause the dash unit to over-read. When replacing condenser it is preferable to use one of .10 microfarad capacity but up to .50 can be used to cut out radio interference.

c. If the ground (see paragraph a) and condenser (see paragraph b) are correct, then replace the car tank unit.

2. If the car dash unit does not operate, or fails to operate correctly, then check the wire lead to the dash unit and replace the wire if faulty.

3. If the wiring is satisfactory, then replace the car dash unit and check it with the tank unit on the car. If the dash unit now fails to operate when connected to car tank unit, install a new tank unit.

CAUTION: Do not attempt the repair or calibration of any dash unit or tank unit as this is not practical.

Install new unit whenever the old one is found inoperative.

Renewal of Dash Unit

1. To install a new dash unit, remove the wiring to the fuel gauge. There are two wires, one is the hot lead from the ignition circuit (red) and the other (black) leads to the fuel gauge tank unit.

2. Remove fuel gauge from the panel by removing the two screws.

GASOLINE TANK

REMOVAL:

1. Raise car and place stand jacks under frame.

2. Drain the gasoline tank and disconnect the fuel gauge wire and the fuel line.

3. Remove three phillip head screws in rear compartment and remove the sponge rubber retainer.

4. Remove the rubber grommet and overflow drain hose at gas tank filler door.

5. Remove the two nuts and spacers attaching gas tank straps to body crossmember and remove the gas tank.

6. Remove the gas tank gauge unit.

7. Remove rubber shield from gas tank inlet pipe.

8. Remove gas tank outlet pipe.

INSTALLATION:

1. Install gas tank gauge unit (use new gasket) .

2. Install gas tank outlet.

3. Install rubber shield to gas tank inlet elbow (use new clamps).

4. Install sponge rubber pad on gas tank inlet.

5. Install gas tank using care when entering inlet pipe through floor and fender opening.

6. Install gas tank straps and draw up tank into position.

7. Install grommet and overflow drain hose at gas tank filler door opening.

8. Push sponge rubber against underbody panel and attach 3 retainer plates with phillip screws and speed nuts.

9. Release jacks and lower car.

10. Hook up gas gauge wire and gas tank outlet line and refill gas tank.

NOTE: The gas tank gauge unit can also be removed without removing gas tank.

INTAKE MANIFOLD
(8 Cylinder)

REMOVAL:

1. Remove air cleaner, loosen clamp at carburetor intake, loosen bracket from air cleaner to cylinder head.

2. Remove the distributor to spark plug wires bracket from the intake manifold.

3. Remove distributor cap, remove coil wire to cap and fold up spark plug wires to top of cylinder head out of the way.

4. Remove the four nuts and lockwashers from the carburetor riser to the intake manifold.

5. Remove the eight nuts attaching intake manifolds to block and remove coil, bracket and manifold.

6. Remove all traces of old gasket material.

INSTALLATION:

1. Install intake manifold, new gaskets, coil bracket and eight attaching nuts.

2. Install distributor cap, coil wire and spark plug wire bracket to manifold.

3. Install the four nuts and washers on studs from intake manifold to carburetor riser.

EXHAUST MANIFOLD
(8 Cylinder)

REMOVAL:

1. Remove air cleaner, loosen clamp at intake, and loosen bracket opposite side.

2. Remove throttle linkage from carburetor.

3. Disconnect gas line and vacuum line from carburetor to fuel pump.

4. Disconnect vacuum line from carburetor to distributor.

5. Remove the four nuts and lockwashers from the carburetor mounting studs and remove carburetor.

6. Remove locks and nuts from exhaust pipe to manifold flange.

7. Remove the ten nuts from the exhaust manifold outlet flanges.

8. Remove four bolts from the carburetor riser connecting outlet and inlet manifolds.

9. **NOTE: Use an air hose to blow away dirt particles before removing exhaust manifolds.**

10. Remove heater drain tube from clip and move to opposite side of engine.

11. Remove vacuum line connection at carburetor and fuel pump.

12. Remove distributor cap, remove spark plug wire bracket from cylinder head.

13. Remove exhaust manifold.

14. **NOTE: Clean all old gasket material from manifold outlet ports.**

INSTALLATION:

1. Install exhaust manifold and new gaskets.

2. Install the ten attaching nuts and flat washers at manifold outlet flanges.

3. Attach exhaust pipe flange to exhaust manifold with two nuts and nut locks.

4. Install four nuts on studs at carburetor riser to intake manifold.

5. Install carburetor and insert the four carburetor attaching bolts.

6. Attach gas line and vacuum line from fuel pump to carburetor.

7. Attach vacuum line from distributor to carburetor.

8. Install distributor cap and install spark plug wire bracket on cylinder head.

9. Install heater drain hose in clip provided.

10. Connect throttle linkage to carburetor.

11. Install air cleaner.

MANIFOLD HEAT CONTROL
(8 Cylinder)

Exhaust and intake manifolds are separate castings bolted to the cylinder block and also to each other as there are interconnecting passages through which the exhaust gases flow to heat the fuel mixture. The amount of exhaust gases directed on to the walls of the inlet manifold and the duration of time during which these gases are so directed is controlled by a suitable heat resistant valve set into the exhaust manifold, which is controlled according to the under hood temperature by a thermostatic coil spring.

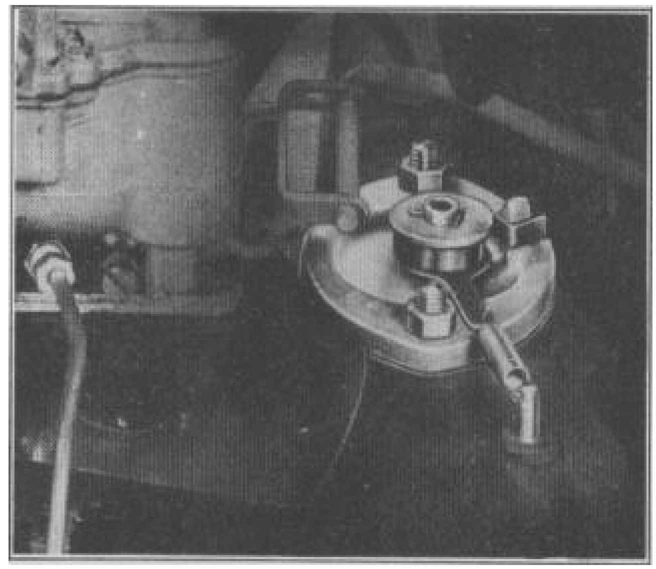


FIGURE 50

HEAT CONTROL VALVE

REMOVAL:

NOTE: For removal, follow same procedure as exhaust manifold removal and in addition the following operations:

1. Remove the two nuts holding cover to manifold, Figure 50.

2. Disconnect spring from lever.

3. Remove cotter key from shaft and remove washer.

4. Remove heat control spring. 5. Remove springs from lower pin and shaft.

6. Use adrift to remove the tapered pin. This will allow removal of the shaft and butterfly

NOTE: To install, reverse procedure of removal.

EXHAUST AND INTAKE MANIFOLDS
(6 Cylinder)

Remove both manifolds as a single unit as follows:

REMOVAL:

1. Remove air cleaner by loosening the attaching screw at the carburetor air horn.

2. Remove the throttle connection from carburetor.

3. Remove the fuel line and vacuum line from carburetor.

4. Remove heat riser tube from the carburetor.

5. Remove the fourteen nuts and retainers attaching manifolds to block and remove manifolds with carburetor attached.

6. Clean off all traces of old gasket material.

NOTE: To install, reverse the procedure or removal.

HEAT CONTROL VALVE
(6 Cylinder)

REMOVAL:

For removal, follow same procedure as exhaust and intake manifold removal and in addition, perform the following operations.

1. Remove exhaust manifold elbow from exhaust manifold.

2. Remove spring retainer, cotter pins, and heat control spring.

3. Remove heat riser shaft. Use a hack saw blade to cut shaft each side of butterfly. This will allow removal of shaft and butterfly.

NOTE: Counterweight can be salvaged by driving out retaining pin (weight to shaft).

INSTALLATION:

1. Assemble new shaft with counterweight and butterfly.

NOTE: The butterfly should be equally spaced on the shaft to eliminate any binding. After determining that fly is in the open position, securely weld the butterfly to shaft.

2. Install spring retainer, spring and cotter key.

3. Install exhaust manifold elbow to manifold.

4. Install both manifolds and carburetor on engine.

FRONT EXHAUST PIPE
(8 Cylinder)

REMOVAL:

1. Raise car and place stand jacks under the front and rear.

2. Spread the locks and remove the two nuts attaching exhaust pipe flange to exhaust manifold.

3. Remove exhaust pipe bracket at clutch bell housing.

4. Remove oil pump heat shield attached to oil pan to gain more clearance for removal of pipe.

5. Remove oil check light wire and bakelite plug from oil check valve.

6. Remove gas line from carburetor to fuel pump.

7. Remove vacuum line from carburetor to distributor.

8. Remove distributor cap and wire to coil. Remove distributor.

9. Remove exhaust pipe clamp at junction of front and rear exhaust pipes and disconnect from rear pipe.

10. Remove the front exhaust pipe by pulling forward and up over the radiator.

INSTALLATION:

1. Install the new front exhaust pipe and install clamp at junction with rear pipe. (Do not tighten bolts at this time).

2. Install the two bolts, nuts, and locks, through exhaust pipe flange to exhaust manifold. (Do not tighten bolts at this time).

3. Install exhaust pipe bracket at clutch bell housing.

4. Now tighten bolts at connection to exhaust manifold and in clamp connecting front and rear pipes.

5. Install the oil pump heat shield and insert the two cap screws in oil pan.

6. Install oil check valve bakelite plug and connect oil check light wire.

7. Install the distributor, distributor cap, and coil wires.

8. Connect vacuum line from carburetor tq distributor and check timing.

9. Connect gas line from carburetor to fuel pump.

10. Remove stand jacks and lower car.

FRONT EXHAUST PIPE
(6 Cylinder)

REMOVAL:

1. Raise car and place stand jacks under front and rear.

2. Remove the two bolts attaching exhaust pipe flange to exhaust manifold.

3. Remove bolt from bracket attaching exhaust pipe to engine support plate.

4. Remove bolt and clamp at junction of front and rear exhaust pipes.

5. Disconnect exhaust pipe and remove from under car.

INSTALLATION:

1. Install new front exhaust pipe under car and insert into rear exhaust pipe.

2. Install clamp at engine support plate.

3. Install clamp at junction of front and rear exhaust pipes.

4. Connect exhaust pipe to manifold. 5. Remove stand jacks and lower car.

REAR EXHAUST PIPE
(6 and 8 Cylinder)

REMOVAL:

1. Remove bolt and clamp at junction of front and rear exhaust pipes.

2. Remove the bolt and clamp at #6 frame crossmember.

3. Remove bolt and clamp attaching rear exhaust pipe to muffler assembly and remove rear exhaust pipe.

NOTE: To install, reverse procedure of removal.

MUFFLER ASSEMBLY
(6 and 8 Cylinder)

Muffler Inlet	1-3/4"
Muffler Outlet	2"

REMOVAL:

1. Raise car.

2. Remove bolt from exhaust muffler rear bracket.

3. Remove two bolts from exhaust muffler bracket to frame and remove bracket.

4. Remove muffler from rear exhaust pipe.

NOTE: To install reverse procedure of removal.

SECTION 5

COOLING SYSTEM

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REFERENCE

Source of Information	Date	Subject

SPECIFICATIONS

Water Circulation	6-Vane Impeller Pump
Water Pump Drive	Fan V Belt
Water Pump Output	30 G.P.M. at 50 M.P.H.
Water Pump Bearings	Two Sealed Ball Bearings
Lubrication	Pre-Lubricated
Fan Belt Adjustment	Generator Mounting
Fan Drive	Pump Shaft
Fan	4 Blade - 17"
Fan to Radiator Clearance	13/16"
Cooling System Capacity:	
6-Cylinder	17 Quarts
8-Cylinder	18 Quarts

ANTI-FREEZE CHART

	Ethylene Glycol (Prestone)			Methanol or Alcohol		
Temperature	U. S. Quarts	Imp. Quarts	Metric Liters	U. S. Quarts	Imp. Quarts	Metric Liters
+ 20°	3	2-1/2	2-3/4	3	2-1/2	2-3/4
+ 10°	4-1/2	3-3/4	4-1/4	4-3/4	4	4-1/2
0°	6	5	5-1/2	6	5	5-1/2
-10°	7	6	6-1/2	7-1/3	6	7
- 20°	7-3/4	6-1/3	7-1/4	8-1/2	7	8
- 30°	8	6-1/2	7-1/2	9-1/2	8	9

GENERAL DESCRIPTION

The cooling system is of the pressure type, employing a cellular, tubular radiator, centrifugal pump, and a four blade fan. The cooling system capacity is 17 quarts for the 6 cylinder engine and 18 quarts for the 8 cylinder engine.

The 6 cylinder engine employs a water distributing tube with holes properly spaced to direct the coolant against the exhaust valve ports. The tube is located between the cylinders and the valve ports near the top of the cylinder block.

The 8 cylinder engine uses a water jacket attached to the left side of engine.

By-pass type thermostats are used which permit quick engine warm-up by restricting the coolant circulation through the radiator and by-pass it around the cylinder block. The thermostat begins to open at 1530 (mean temperature opening) and is fully open at 1850.

The temperature of the water in the cylinder block is indicated by a gauge on the instrument panel. This gauge is connected by a wire to a sender unit inserted into the water jacket of the cylinder head.

DRAINING SYSTEM

To drain the cooling system, open the radiator drain cock located at the lower right hand corner and remove the drain plug in the cylinder block located at the rear left hand side at the throttle bell crank bracket.

NOTE: Always remove radiator cap when draining cooling system.

RUST AND SCALE DEPOSITS

Scale or rust tends to obstruct the flow of coolant through the water passages of the cylinder block and radiator, and when such formation is excessive, it prevents proper heat dissipation and resultant overheating. This, in turn, causes loss in lubricating efficiency and accumulation of carbon, varnish, and sludge.

CLEANING COOLING SYSTEM

If overheating exists due to clogging of the engine portion of the cooling system, the condition should be corrected by the use of a reputable solvent, instead of reverse flushing.

REVERSE FLUSHING

Reverse flushing of the cooling system is the forcing of water through the system using air pressure and flushing in a direction opposite to that of the normal flow of water.

Reverse flushing is necessary in order to get behindthe rust deposits and force them out.

The recommended procedure for reverse flushing of the radiator is as follows:

1. Disconnect hoses from engine.

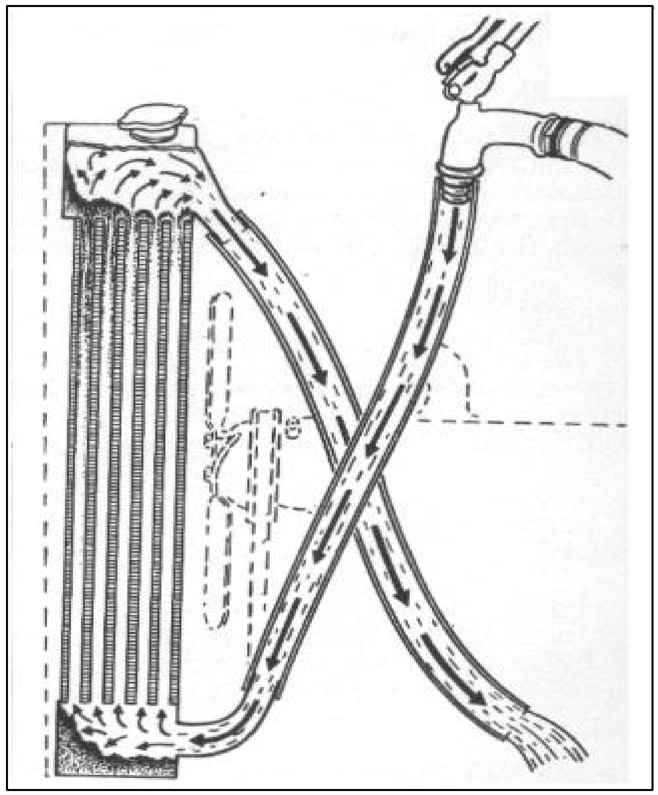


FIGURE 1

2. Install radiator cap and attach long hoses to radiator connections as shown in Figure 1. Insert the flushing gun as shown.

3. Connect water hose of gun to a pressure water source and air hose of gun to a pressure air source. Turn on the water, and when the radiator is full, turn on the air in short blasts. Allow the radiator to fill between the blasts of air. Continue this procedure until water from the lead-away hose runs clear.

USE OF INHIBITOR

The regular use of a cleaning and inhibiting fluid in the cooling system and periodic reverse flushing will greatly reduce the formation of rust, scale, and corrosion. The logical time for flushing and introduction of inhibitor is when the anti-freeze is installed in the fall and when it is removed in the spring.

A good combination inhibitor and cleaning solution should be kept in the cooling system at all times.

CAUTION: Care must be used in the selection of an inhibitor and cleaner as some of them contain strong acids or caustics that will react with the metal of the radiator core, eating holes through the metal and causing the raditor to leak.

The effectiveness of any inhibitor is limited to about six months after which the cooling system should be flushed, refilled, and new inhibitor added.

Hot water heaters should be flushed separately.

Rust deposits build up in the heater core just the same as they do in the radiator core and will decrease the efficiency of the heater.

ANTI-FREEZE SOLUTION

There are several anti-freeze solutions available that are satisfactory for automobile cooling systems. Among these are denatured alcohol, methanol (synthetic wood alcohol) and ethylene glycol. It is recommended that the cooling system be cool before adding an antifreeze solution. To facilitate accurate testing of freezing points, it is advisable not to mix different basic types of anti-freeze.

The alcohol anti-freeze solutions are subject to evaporation, especially on heavy runs, and should be tested at least once a week, and the necessary quantity of anti-freeze added to protect the cooling system for the lowest anticipated temperature.

CAUTION: These liquids, if spilled on the vehicle, should be washed off immediately with a generous quantity of water to prevent damage to lacquer or enamel.

When using ethylene glycol, it is necessary to clean the entire cooling system before putting in the anti-freeze solution.

It is also advisable to tighten or replace all hose connections. It is important that the cylinder head gasket be kept tight to prevent leakage.

If there are leaks in the system, they should be located and stopped. If evaporation occurs with the use of ethylene glycol, it is only necessary to add water to the solution; however, the cooling system should be watched closely for leaks, and should be tested when additional water is required.

CAUTION: Solutions containing salt, calcium chloride, soda, sugar, or mineral oils such as kerosene or engine oil should NEVER be used in the cooling system as they either clog the water passages or damage the hose connection and other parts.

TESTING ANTI-FREEZE SOLUTION

The freezing point of an anti-freeze solution maybe determined by using a hydrometer. When testing the solution, it should be tested at the temperature for which the hydrometer is calibrated, and the correct hydrometer for the solution should be employed in testing.

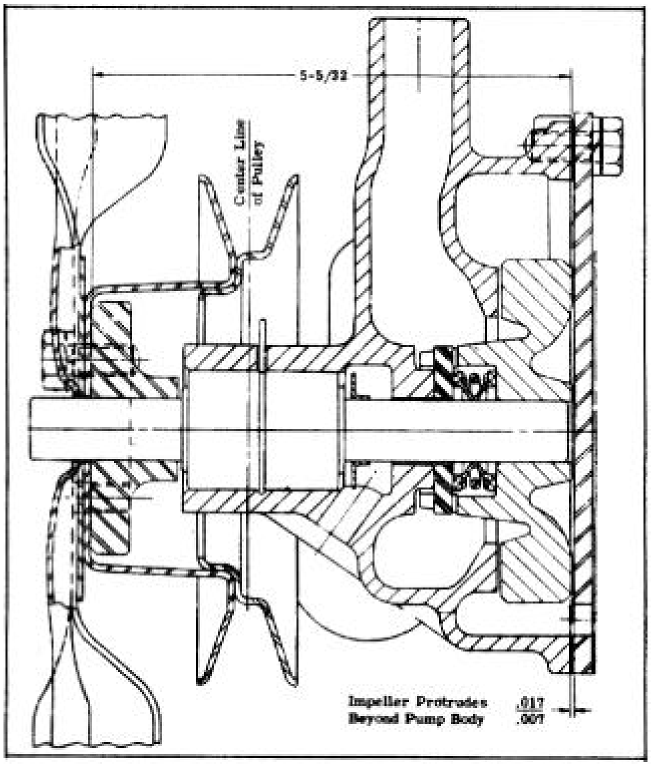


FIGURE 2

WATER PUMP
(6 Cylinder)

The water pump features a permanently lubricated ball bearing (18) Figure 2 for the pump shaft and a non-adjustable packing (13). A permanent seal, which makes repacking unnecessary, consists of a graphite washer (14) adjacent to the impeller (12), backed with a neoprene seal (13) and brass spring and retainer (8) for maintaining constant contact on these two units. The graphite washer (14) is prevented from turning in the impeller (12) and housing by means of four ears which are retained by four corresponding slots in the impeller. The neoprene seal stops any fluid which might pass between the graphite washer and impeller.

A large drain hole at bottom side of pump body allows for drainage and acts as a vent to minimize moisture formation in the pump assembly.

The pump shaft is mounted in a permanently lubricated double row ball bearing with grooves in the shaft to furnish race-ways for the bearing balls and provide a means of taking end thrust of the fan and pump.

The bearing and shaft are retained in the pump housing by the shaft bearing retainer (6).

REMOVAL:
6 Cylinder

1. Drain the cooling system by opening drain cock at lower right side of radiator and remove the pipe plug from left rear side of cylinder block.

NOTE: It is not necessary to remove the radiator to remove the pump; however, use care when removing and installing the pump.

2. Loosen the bolt in the fan belt and generator adjusting bracket and move generator in toward the cylinder block to remove the fan belt.

3. Disconnect hose from the water pump inlet.

4. Remove the bolt and nut from the generator adjusting bracket to cylinder block and remove bracket.

5. Remove the four bolts and lockwashers attaching fan blades to fan pulley and hub, and remove the fan blades.

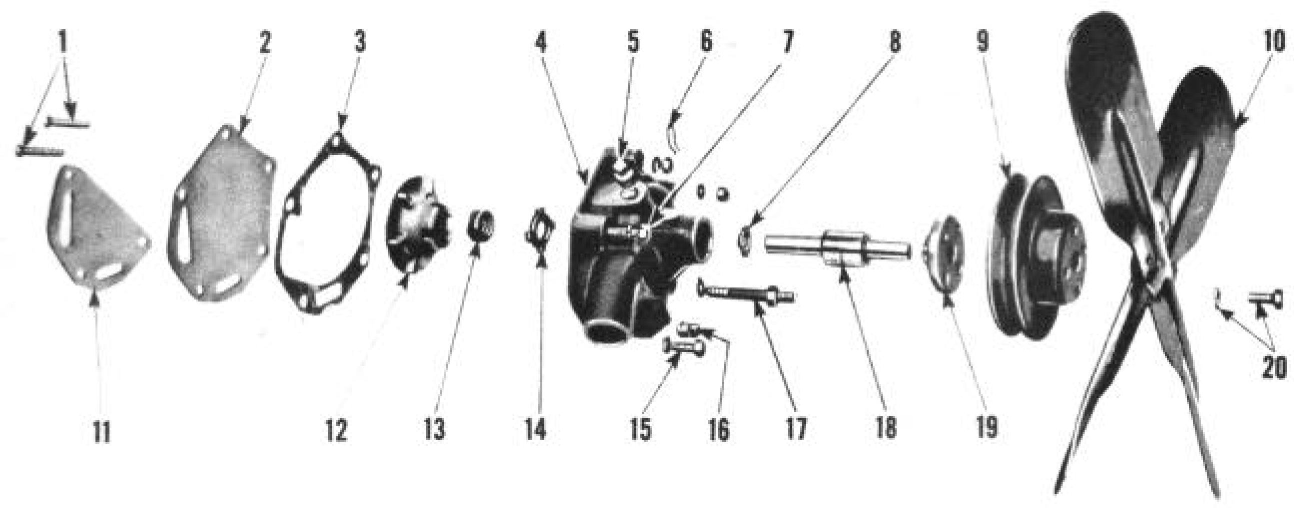
6. Remove bolts attaching water pump to block and remove the water pump.

DISASSEMBLY:
6 Cylinder

1. Remove the water pump shaft retainer (6), Cover (2), and gasket (3), Figure 3.

2. Place the water pump assembly in "Water Pump Holding Fixture J-2778, and using shaft driver contained in the set, press out the pump shaft and bearing assembly (18) with water pump pulley hub (19) attached.

NOTE: The fixture is designed to support the water pump body on a level plane while removing the shaft from the impeller. The height of the support stud is controlled by adjusting nuts which are run up on the stud to level the water pump body. The large hole in the base plate provides clearance for the pulley hub.



WATER PUMP 6 CYLINDER ENGINE

FIGURE 3

LEGEND

1. Cover bolt
2. Body cover
3. Body to cover gasket
4. Body
5. Body pipe plug
6. Bearing retainer
7. Body to block bolt
8. Shaft slinger
9. Pulley assembly
10. Fan blade assembly
11. Body cover gasket
12. Impeller
13. Shaft seal
14. Shaft seal washer
15. Body to cylinder block bolt
16. Body pipe plug
17. Body to cylinder block stud
18. Bearing and shaft assembly
19. Pulley hub
20. Fan blade bolt and lockwasher

The slotted adaptor is placed between the body and the pulley hub to support the lower part of the body to eliminate spring-back and possible body fracture when removing the water pump shaft.

The bearing and shaft is serviced as an assembly only. The water pump pulley hub (19) is not part of the shaft and must be removed from the old shaft and installed on the new shaft. The adaptor included in J-2778 Holding Fixture Kit can be used to remove the pulley hub.

3. Clean the bore in the pump body before reassembly.

NOTE: Check the water pump body bore with an inside micrometer. If this dimension is greater than 1.1015, replace the water pump body.

Also check the pump body at the area of the impeller and if the impeller has been scraping the body, it indicates the excessive end thrust and complete pump should be replaced.

WATER PUMP SHAFT AND BEARING INSPECTION

1. Revolve bearing slowly by hand, using hand thrust load. If bearing does not drag or feels rough, it can be reused.

2. If steel seals at ends of bearings, outer races are loose so that they can be turned with the fingers, the bearing should be replaced.

3. Check shaft and if less than .6255", replace. Shafts with worn grooves should be replaced.

REASSEMBLY: -
6 Cylinder

1. Assemble the shaft and bearing in the water pump body.

NOTE: Bearing should be slight press fit into pump body, and assembled so that the groove on the outer race is aligned with the retainer wire slot in pump body bore.

CAUTION: When pressing bearing and shaft in housing, press against face of outer ring, not against shaft.

2. Lubricate shaft with castor oil and install the fan pulley hub (19). Support the flange of the hub and apply pressure on the impeller end of the shaft. Maintain proper pulley spacing. This dimension should be 5-5/32" from outside edge of hub to cover face of pump body, Figure 4.

NOTE: Pump body should be allowed to float during this operation.

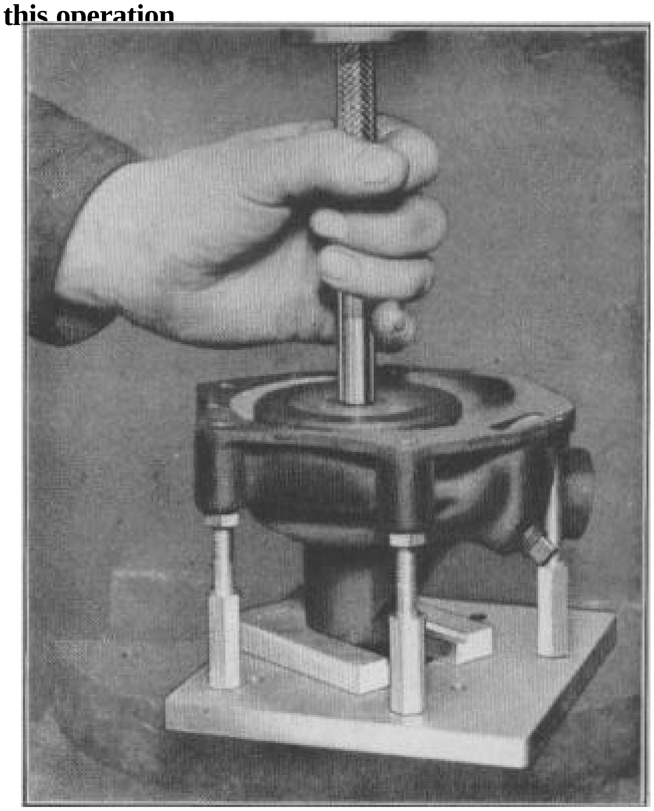
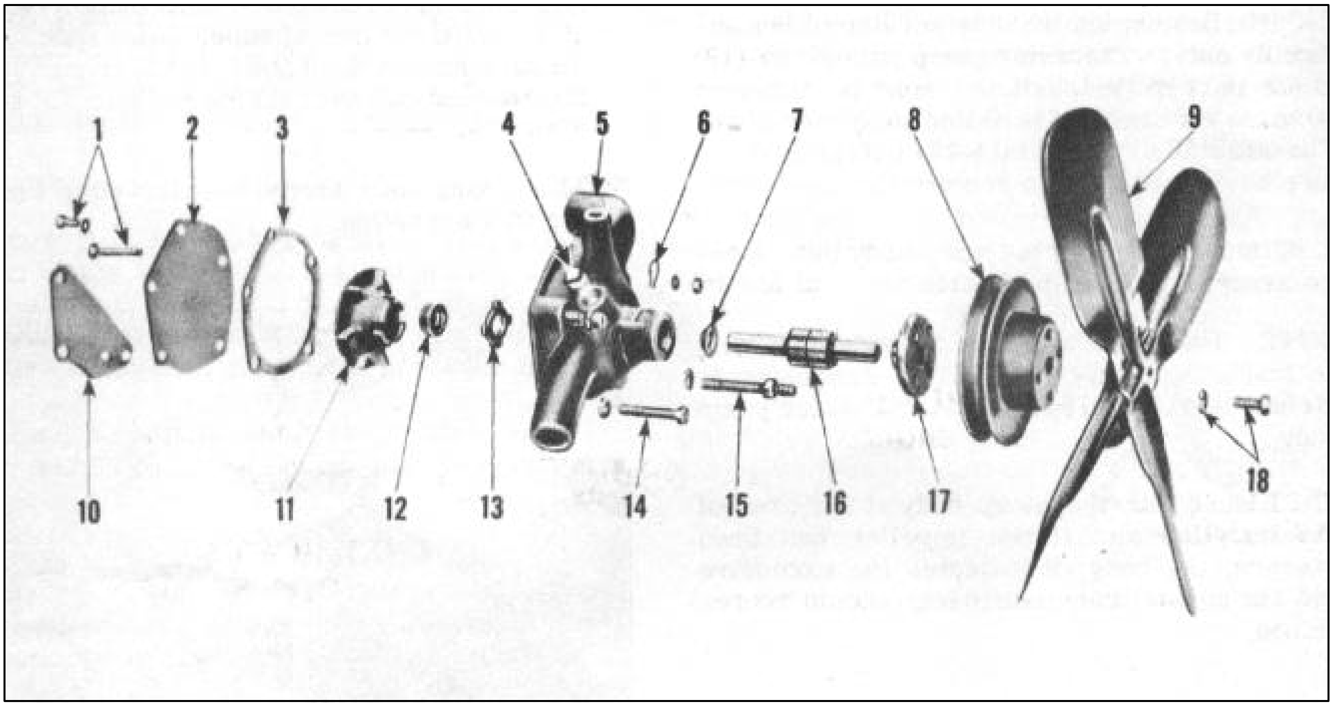


FIGURE 4

3. Lubricate shaft with caster oil to facilitate assembly and assemble the seal (13) and carbon washer (14) and retainer (8) in the impeller and install impeller by supporting the assembly on the fan end of the shaft as shown in Figure 4.

NOTE: Impeller must protrude .007 to .017 beyond cover face of pump body.

4. Install the water pump shaft and bearing retainer (6), Figure 3.



WATER PUMP 8 CYLINDER ENGINE

FIGURE 5

LEGEND

1. Cover bolt
2. Body cover
3. Body to cover gasket
4. Body pipe plug
5. Body
6. Bearing retainer
7. Shaft slinger
8. Pulley assembly
9. Fan blade assembly
10. Body cover gasket
11. Impeller
12. Shaft seal
13. Shaft seal washer
14. Body to cylinder block bolt
15. Body to cylinder block stud
16. Bearing and shaft assembly
17. Pulley hub
18. Fan blade bolt and lockwasheR

5. Use a new cover gasket (3) and install body cover (2).

6. Install fan hub (9), fan blades (10), lock- washers (20), and screws (21). Tighten screws to 12 to 15 lbs. Torque.

NOTE: Dimension from center line of fan pulley to outside face of cover should now be 3-13/16, Figure 4.

DISASSEMBLY: - 8 Cylinder

Follow the same procedure as outlined for 6 cylinder Disassembly and Assembly. Refer to Figure 5 for order of parts removal and installation.

WATER PUMP

8 CYLINDER ENGINE

INSTALLATION:
6 & 8 Cylinder

1. Remove all traces of the old pump to block gasket and install new gasket and pump to engine. Install attaching bolts.

NOTE: Clearance from outside edge of fan blade to radiator case should be 13/16.

2. Install generator adjusting strap and fan belt.

3. Install hoses.

4. Install generator adjusting strap bolt in generator bracket and adjust fan belt.

5. Refill radiator.

FAN BELT ADJUSTMENT

NOTE: The fan belt must be operated with a definite amount of slack to prevent an overload being placed on the water pump and generator bearings.

Adjustment of the belt is obtained by swinging the generator on its mountings as follows:

1. Loosen the two generator bracket bolt nuts (D) and (5) and adjusting arm bolt (F), Figure 6.

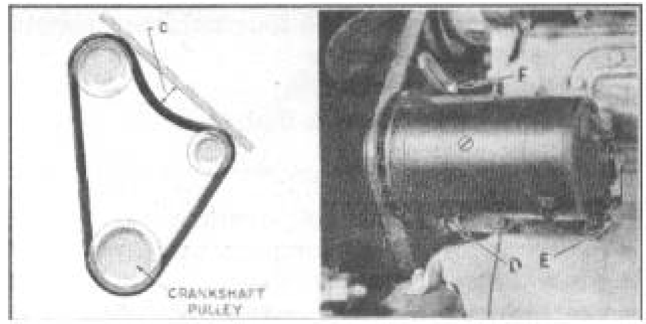


FIGURE 6

Swing generator away from the engine until the slack in the fan belt is such that the section between the water pump pulley and the generator pulley can be pushed down 3/4" below a straight edge laid across the pulleys as shown at (C).

After proper adjustment, tighten adjusting arm and generator mounting bracket bolts and nuts.

THERMOSTATS

The temperature at which the thermostat opens is very important and it should be checked whenever the complete cooling system is being checked.

CAUTION: In cases of extreme overheating or freezing, check the thermostat, as the excessive temperature may have caused the bellows to take a set in the expanded position.

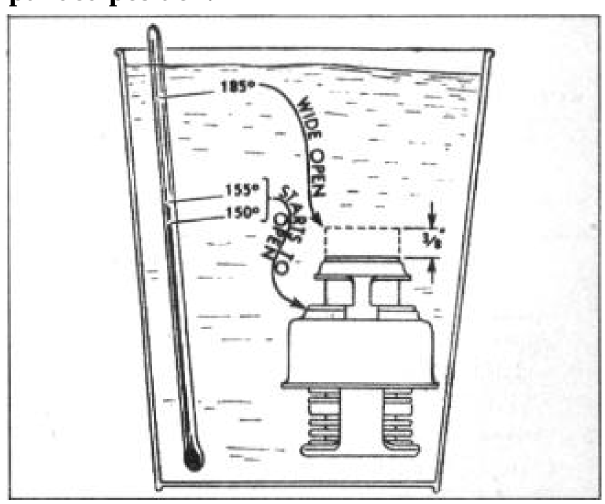


FIGURE 7

Place the thermostat in a pail of water with a thermometer and heat the water until the thermostat starts to open. The thermometer should show from 150° to 155° F, Figure 7.

Continue heating the water until the thermostat is wide open. The thermometer should show 185° F.

Discard thermostats that:

Do not open completely.
Open at too low a temperature.
Open at too high a temperature.

A thermostat that opens too soon will cause the engine to operate at too low a temperature and if it opens too late or is sticking, it may cause the engine to overheat.

WATER TEMPERATURE GAUGE

This electrical device consists of a sending unit mounted in the left rear side of cylinder head and a receiving unit mounted on the instrument dash board. Each unit incorporates

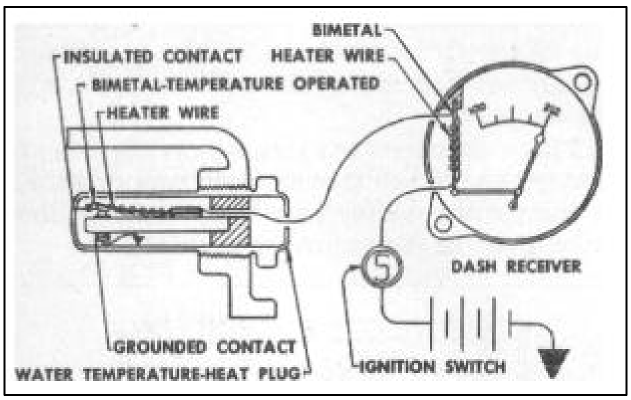


FIGURE 8

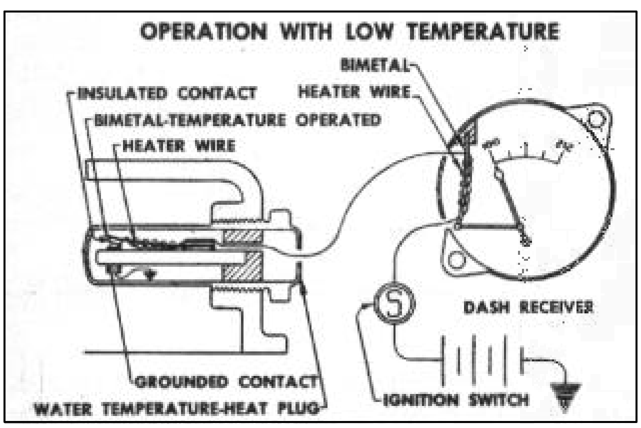


FIGURE 9

a bi-metal element over which a heating coil is wound. Refer to Figures 8 and 9.

The at-rest position of the indicator hand on the receiving unit is at the "H" or hot end of the dial, as shown in Figure 9.

One wire connects the engine unit to the dash unit.

The sending unit consists of a fixed grounded contact so positioned that the bi-metal insulated contact presses against it heavily when cold and lightly or not at all when the bi-metal is heated.

At low temperatures, considerable heat is required to make this bi-metal bend away from the grounded contact. With the temperature of the engine cooling water low, all of this heat must be made electrically and this same current flowing through the heater wire of the dash unit creates an equal amount of heat there, and results in bending of the dash unit bi-metal, as shown in Figure 8 causing the pointer to show a low temperature reading.

As the cooling water temperature rises, the heat of it aids in bending the engine unit bimetal. Less heat is generated electrically and the resulting bending of the dash unit bi-metal is less, as shown in Figure 9. This gives a higher temperature reading.

GAUGE TROUBLE SHOOTING

It is impossible to adjust or repair either unit of the water temperature gauge.

The method of elimination testing to determine which unit is faulty is basically the same as for the fuel gauge except that the test sending unit in this case should be installed in the cylinder head when making the tests.

WATER JACKET PLUG

Water jacket plugs are a drive fit in the cylinder block. When installing new plugs, always place a light coat of Hudson Perfect Seal Paste on the outside of plug to facilitate installation and to insure proper sealing.

Water Jacket Plug Installer J-2793 permits quick and accurate installation of the water jacket plugs in the 6 cylinder engine.

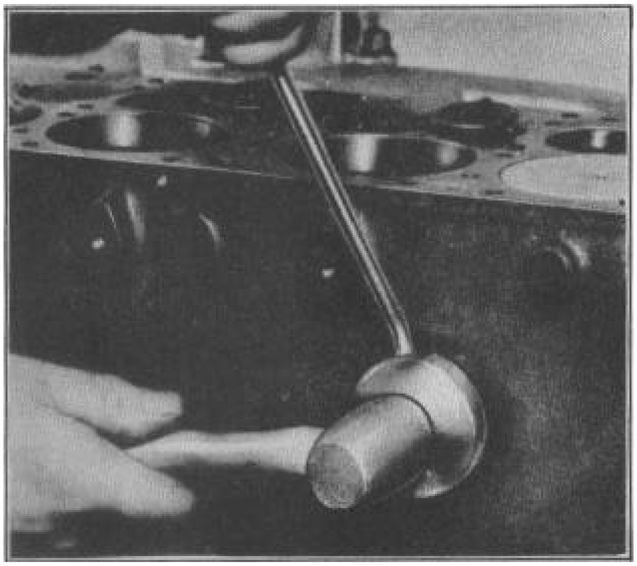


FIGURE 10

The plug is started into place and then driven into the block with the installer until the shoulder of the installer contacts the block, Figure 10.

RADIATOR

The radiator is mounted in a "U" channel with attaching bolts mounted through rubber grommets attaching the sides of the radiator to the channel.

The outlet of the overflow pipe is located high in the filler neck to permit the use of a "Sealed cooling" pressure cap if desired.

REMOVAL:

1. Drain radiator and disconnect hoses.

2. Remove two sheet metal screws attaching deflector shield to fender tie panel.

3. Disengage headlamp wiring from retaining clips at front of radiator.

4. Remove the four hexagon bolts attaching radiator to "U" channel and remove radiator.

NOTE: To install, reverse procedure of removal.

COOLING SYSTEM DIAGNOSIS

Excessive Engine Temperature Causes:

1. Ignition timing too late or too early.

2. Fan Belt slipping.

3. Radiator or cylinder block clogged or restricted.

4. Radiator core outside surface covered by grille covers, ornaments, etc.

5. Outward air passages clogged with bugs or dirt accumulations.

6. Thermostat defective.

7. Collapsed water pump inlet hose.

8. Pump impeller loose on shaft or improper clearance of impeller in pump housing.

9. Engine fan blades not set at proper pitch.

10. High engine friction resulting from:
    a. Insufficient internal clearance
    b. Internal misalignment
    c. Use of heavy engine oil
    d. Inadequate oil circulation

11. Dragging brakes or tight wheel bearings.

12. Use of certain types of anti-freeze solutions in warm weather.

13. Slipping clutch.

Water Pump Noise Causes:

1. A squealing noise may indicate a tight fan belt.

2. A scraping noise indicates excessive end play of water pump shaft and impeller rubbing the water pump housing.

REFERENCE

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SECTION 6

ELECTRICAL

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GENERAL SPECIFICATIONS

BATTERY

All Models	All Models
Make	National
Voltage	6 Volt
Plates	51
Capacity in ampere hours	120 Amp.
Size	W-7-1/8
	L-10-9/16
	H-9-1/16
Terminal Grounded	Positive

STARTER MOTOR

Make	Auto-lite
Model	MCL-6006
Voltage	6 Volt
Poles	Four
Brushes	Four
Brush Spring Load	42-53 ozs.
Maximum End Play	.005 Minimum
Drive	Bendix

STARTER SWITCH SOLENOID

Contacts Close	3-4 volts
Contacts Open	0.5-1.25 volts
Voltage Drop Per 100 Amperes	0.40 volts

GENERATOR

Make	Auto-lite
Model	GEC-4801A
Type	Third brush set
Drive	Fan belt
Chg. Rate - Cold	43 amps @ 8 volts
Chg. Rate - Hot	37 amps @ 8 volts
Number of Brushes	Two
Number of Poles	Two
Ground Polarity	Positive
Rotation, Viewed Drive End	Clockwise
Current Control	3rd Brush
Voltage Control	Vibrating Regulator
Fuse	None
Bearing - Drive End	Ball
Commutator End	Absorbent Bronze
Clearance	.001-.0025
Bushing Bore - Installed	626-.627
Armature End Play	003-.010
Brush Spring Load, Ozs.	35 - 53
Field Draw Total, to 6 Volts	1.60-1.78
Motorizing Draw, @ 6 Volts	4.85-5.40

(Field Terminal Grounded to Frame)

VOLTAGE REGULATOR

Ground Polarity	Positive
Model	VRR-4001-A
Make	Auto-lite
Voltage Regulator Setting @ 10 Amperes Rate	120°F. 7.18 to 7.63 Volts
Allowable Variation	± .15 Volts
Carbon Resistors on Base Total Resistance	30 Ohms
Armature Air Gap	.048 to .052
Contact Point Gas	.012 Minimum

COIL

Make	Auto-lite
Model	CE-6006-A
Capacity	6 Volt
Amperage Draw	
Engine Stopped	4.5
Engine Idling	2.5

SPARK PLUGS

Make - 6 Cylinder	Champion 14 MM
8 Cylinder	Champion 14 MM
Type - 6 Cylinder	J-7 Cast Iron Head
8 Cylinder	J-7 Cast Iron Head
Type - 6 Cylinder	H-10 Aluminum Head
8 Cylinder	H-10 Aluminum Head
Gap - 6 Cylinder	.032
8 Cylinder	.032

HORNS

High Pitch	Short Horn
Low Pitch	Long Horn
High Pitch Diaphragm	.0195
Low Pitch Diaphragm	.015
High Pitch - Air Gap	.027 to .029
Low Pitch - Air Gap	.032 to .034

DISTRIBUTOR

	6 Cylinder	8 Cylinder
Make	Autolite	Autolite
Model	IGS-4213-1	IGT-4204-A-1
Rotation	Clockwise	Clockwise
Drive	Oil Pump	Camshaft
Advance Control	Full Automatic	Full Automatic
Automatic Advance Curve		
(Stated in Distributor Degrees and R.P.M.)		
Start	0° at 400 RPM	0° at 300 RPM
Intermediate	1° at 540 RPM	1° at 330 RPM
Intermediate	6° at 1200 RPM	3° at 400 RPM
Intermediate	11° at 1870 RPM	16° at 1570 RPM
Full Advance	12° at 2000 RPM	17.5° at 1700 RPM
Vacuum Advance		
(Distributor Degrees and Inches of Mercury)		
Start	0° at 9-1/2"	0° at 9-1/2"
Intermediate	1° at 10"	1° at 10"
Intermediate	4° at 11-1/2"	4° at 11-1/2"
Intermediate	7° at 13-1/4"	7° at 13-1/4"
Full Advance	8.5° at 14"	8° at 14"
Rotor Shaft Side Play	.005"	.005"
Rotor Shaft End Play	.003"-.010"	.003"-.010"
(Measured after distributor drive gear is assembled)		
Condenser Capacity	. 20 to .25 microfads	.20 to .28 microfads
Bearings	2 Absorbent bronze	2 Absorbent bronze
Point Gap - Contacts aligned	.020	.017
Points Open	T.D.C.	T.D.C.
Breaker Arm Spring Tension	17-20 ounces	17 ounces
Cam Dwell Angle	38°	27°
Timing Mark Location	At Flywheel	At Flywheel
Flywheel Teeth	134	134
Firing Order	1-5-3-6-2-4	1-6-2-5-8-3-7-4

LIGHT BULBS - 6 VOLT

	No.	C.P.	Base
Headlight (Sealed Beam Type)	4030	Sealed	Sealed
Bonnet Light	55	2	Single
Parking Light with Direction Indicator	1154	21-3	Double
Tail and Stop Light	1154	21-3	Double
License Light	63	3	Single
Dome Light - Front	87	15	Single
Rear Quarter Lights (2)	81	6	Single
Clock	55	2	Single
Speedometer	55	2	Single
Instrument Cluster	55	2	Single
Direction Indicator	55	2	Single
Radio	55	2	Single
Headlight Beam Indicator	55	2	Single
Ignition Lock	55	2	Single
Courtesy Light	87	15	Single
Fog Light - Sealed Beam	4015A	Sealed	Sealed
Spot Light - Sealed Beam	4535	Sealed	Sealed
Parking Light	63	3	Single
Generator and Oil Indicator	55	2	Single

WIRING

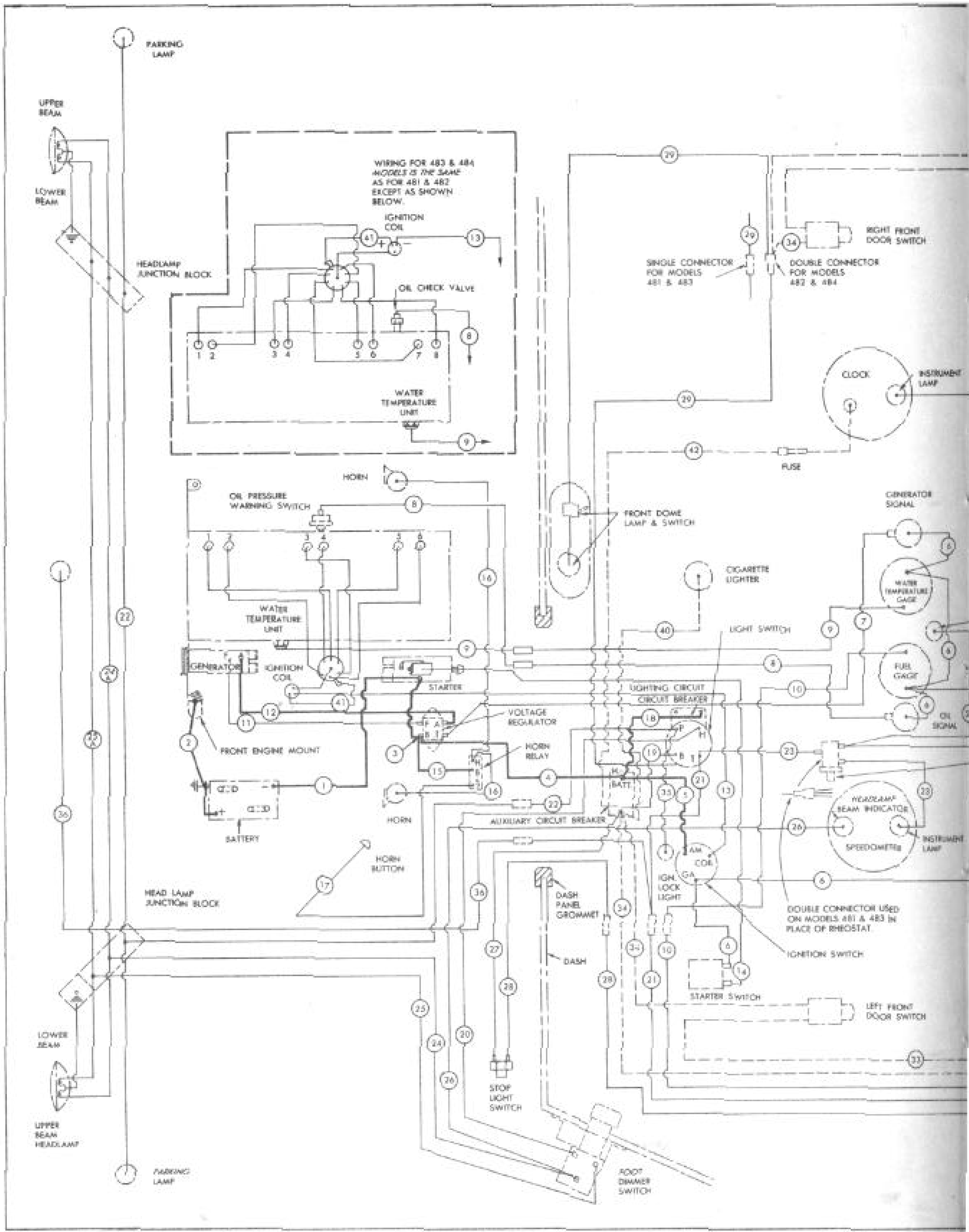
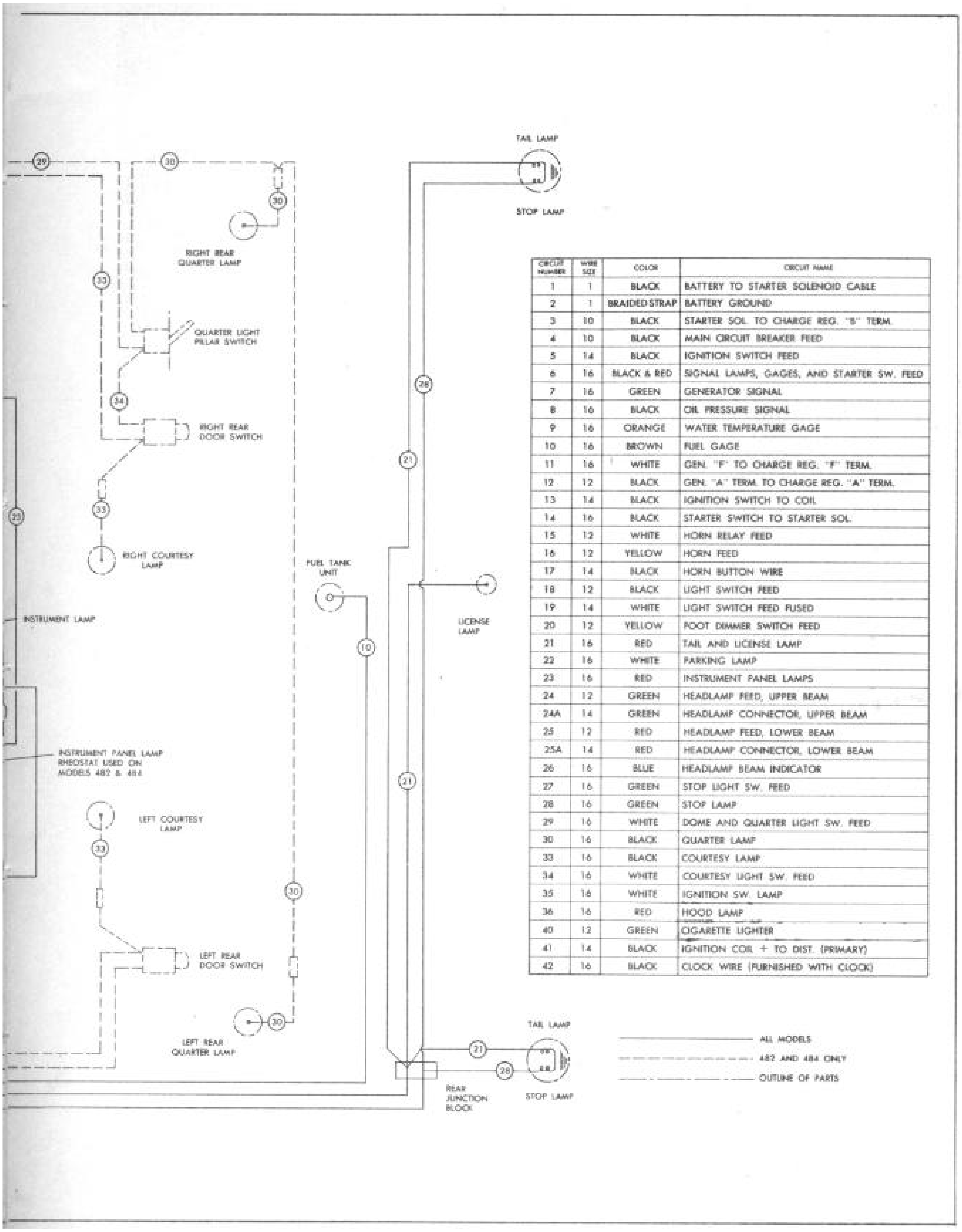


FIGURE 1

DIAGRAM



CIRCUIT NUMBER	WIRE SIZE	COLOR	CIRCUIT NAME
1	1	BLACK	BATTERY TO STARTER SOLENOID CABLE
2	1	BRAIDED STRAP	BATTERY GROUND
3	10	BLACK	STARTER SOL. TO CHARGE REG. "B" TERM.
4	10	BLACK	MAIN CIRCUIT BREAKER FEED
5	14	BLACK	IGNITION SWITCH FEED
6	16	BLACK & RED	SIGNAL LAMPS, GAGES, AND STARTER SW. FEED
7	16	GREEN	GENERATOR SIGNAL
8	16	BLACK	OIL PRESSURE SIGNAL
9	16	ORANGE	WATER TEMPERATURE GAGE
10	16	BROWN	FUEL GAGE
11	16	WHITE	GEN. "F" TO CHARGE REG. "F" TERM.
12	12	BLACK	GEN. "A" TERM. TO CHARGE REG. "A" TERM.
13	14	BLACK	IGNITION SWITCH TO COIL
14	16	BLACK	STARTER SWITCH TO STARTER SOL.
15	12	WHITE	HORN RELAY FEED
16	12	YELLOW	HORN FEED
17	14	BLACK	HORN BUTTON WIRE
18	12	BLACK	LIGHT SWITCH FEED
19	14	WHITE	LIGHT SWITCH FEED FUSED
20	12	YELLOW	FOOT DIMMER SWITCH FEED
21	16	RED	TAIL AND LICENSE LAMP
22	16	WHITE	PARKING LAMP
23	16	RED	INSTRUMENT PANEL LAMPS
24	12	GREEN	HEADLAMP FEED, UPPER BEAM
24A	14	GREEN	HEADLAMP CONNECTOR, UPPER BEAM
25	12	RED	HEADLAMP FEED, LOWER BEAM
25A	14	RED	HEADLAMP CONNECTOR, LOWER BEAM
26	16	BLUE	HEADLAMP BEAM INDICATOR
27	16	GREEN	STOP LIGHT SW. FEED
28	16	GREEN	STOP LAMP
29	16	WHITE	DOME AND QUARTER LIGHT SW. FEED
30	16	BLACK	QUARTER LAMP
33	16	BLACK	COURTESY LAMP
34	16	WHITE	COURTESY LIGHT SW. FEED
35	16	WHITE	IGNITION SW. LAMP
36	16	RED	HOOD LAMP
40	12	GREEN	CIGARETTE LIGHTER
41	14	BLACK	IGNITION COIL + TO DIST. (PRIMARY)
42	16	BLACK	CLOCK WIRE (FURNISHED WITH CLOCK)

BATTERY

The battery is of the 51 plate type, 120 ampere hour capacity and has the positive post grounded.

The battery is protected from being overcharged by a voltage regulator mounted on the dash panel.

Electrolyte level in the battery should be 3/8" above plates maintained at the square opening above the top of the plates. USE ONLY PURE DISTILLED WATER.

Battery level should be checked every time oil is added or at least every two weeks.

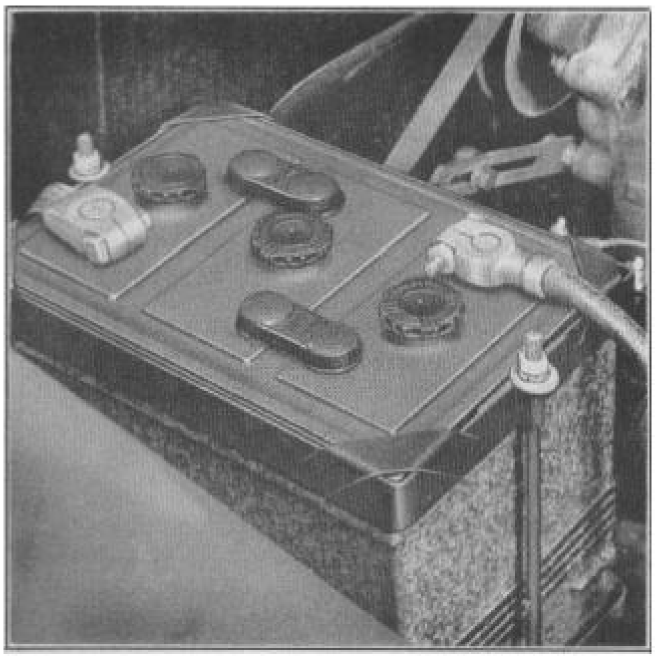


FIGURE 2

CAUTION: Never allow a flame or spark near the battery. By the nature of the chemical reactions which take place in battery a mixture of hydrogen and free oxygen is produced when the battery is charging. This mixture is explosive in nearly any proportions. Always keep filler caps tight.

MEASURE STATE OF BATTERY CHARGE

The battery should be checked periodically for state of charge.

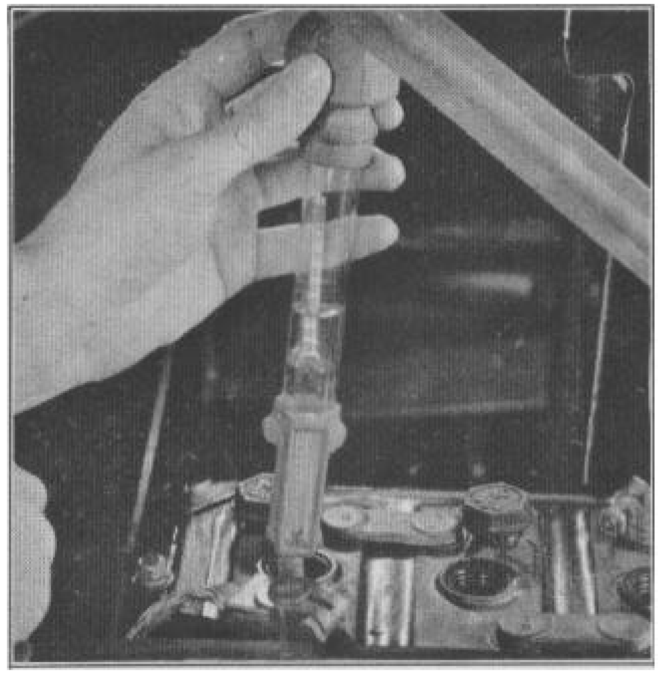


FIGURE 3

A hydrometer of the syringe type, Figure 3, used to measure the specific gravity of the electrolyte in a cell, gives an indication of how much unused sulphuric acid remains in the solution and is therefore a convenient measure of the approximate capacity still available in a normal cell. The liquid level of each cell should be at normal height and electrolyte must be thoroughly mixed before taking a reading. Hydrometer readings must never be taken immediately after water has been added. The water should be thoroughly mixed with the underlying electrolyte through normal engine operation or by charging before hydrometer values are reliable.

The following table illustrates a typical range of specific gravity for a cell in various states of charge with respect to its ability to crank the engine at 80° F.

1.280 Sp. Gr.	100% charged
1.250 Sp. Gr.	75% charged
1.220 Sp. Gr.	50% charged
1.190 Sp. Gr.	25% charged
1.160 Sp. Gr.	Very little useful capacity
1.130 Sp. Gr.	Discharged

In reading a hydrometer, the barrel must be held vertically, Figure 3, and just the right amount of acid be drawn up into the barrel to lift the float freely so that it does not touch either side, top nor bottom stoppers of the barrel.

NOTE: A fully charged battery will not freeze in temperatures ordinarily encountered, but a battery with 1.150 specific gravity will freeze at 50 F., above zero, while a battery with 1.100 specific gravity will freeze at 19° F., above zero.

Battery hold-down frame should be tightened enough to keep the battery from bouncing or sliding, but not too tight to cause the hold-down to cut into the battery top. Recommended tightening torque 2 to 3 foot pounds. Battery terminals should be removed and thoroughly cleaned.

NOTE: Do not use pliers to remove cable clamping bolt nuts. Use a suitable wrench and terminal puller for this operation.

When replacing, put a light coat of engine oil on terminal posts. Top of battery should always be cleaned.

A loose battery connection will cause excessively high generator voltage, which is likely to burn out light bulbs, pit and burn ignition breaker points and cause damage to the generator and other electrical equipment.

GENERATOR

The generators used on all models are fully ventilated, high output type with third brush adjustment and voltage regulation. The generator is driven from the crankshaft through a "V" type, adjustable fan belt.

A suction fan integral with the generator drive pulley provides adequate ventilation to prevent overheating. The path of cool air is through the openings in the rear end plate, over the armature and out through the openings in the front end plate.

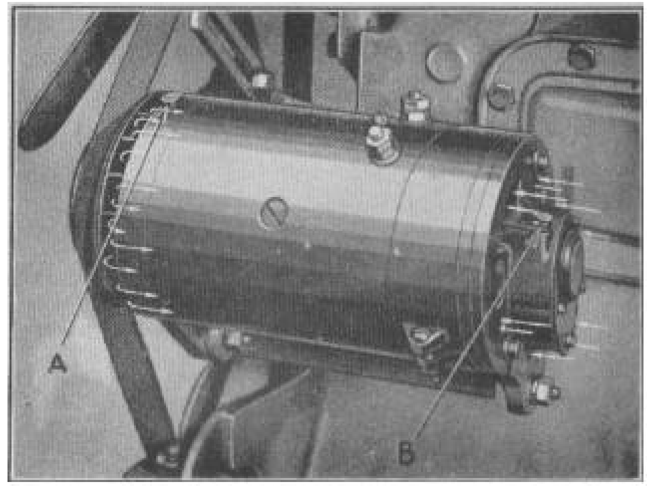


FIGURE 4

PRELIMINARY TESTS

Before removing the generator for overhaul, it is advisable in many cases, to give it a preliminary visual and electrical check to prove or disprove the need for removal and overhaul.

The visual and electrical inspection is readily accomplished after removing the head band assembly and should include the following:

1. Smell the interior of the generator. If burning has recently occurred, there will be a distinct odor. Visually observe for signs of melted solder in casing and on head band and loss of solder where armature wires are connected to commutator bars. If solder is missing from commutator, the assembly should be removed for overhaul, even though the electrical test shows that unit is charging normally.

2. Check condition of brushes and brush springs. The brushes should slide freely in their holders. If brushes are worn to less than one-half of their original length or are oil-soaked, they should be replaced. Length of a new brush is approximately 1/2 inch.

   Each brush spring should require a minimum of 35 ounces to unseat the brush from commutator when a spring scale is attached to end of holder.

IMPORTANT - If the tension is excessive the brushes and commutator will wear very rapidly, also if the tension is low arcing between the brushes and commutator and reduced output will result.

NOTE: To insure satisfactory installation of brushes, the operation should be performed with the generator on the bench.

3. If the commutator is dirty or discolored, it should be cleaned by holding a piece of No. 00 sandpaper lightly against it with generator operating. Blow the sand out of generator after cleaning the commutator. If commutator is eccentric or burned, or if mica insulation and copper bars are nearly flush, the unit should be removed for correction.

4. To determine whether generator is charging, connect an ammeter in series with the voltage regulator as shown in Figure 4, after disconnecting the "BAT" lead at the "B" terminal on regulator and grounding the "F" terminal on regulator with a jumper wire or screwdriver. If generator does not show charge on ammeter when engine is running at 1000 rpm, remove the "A" lead from regulator and flash it on ground. If no spark occurs, the generator is faulty or the "A" lead is broken. This latter test may be used to detect a non-charging generator when an ammeter is not available.

DISASSEMBLY:

After removing generator from engine, mount it in a vise, being careful not to distort generator frame by overtightening.

1. Remove generator bracket and armature shaft nut.

2. Using puller tool J-2158, remove generator pulley.

3. Remove commutator band, housing bolts, brush lead screws, and the commutator end plate assembly.

4. Remove armature with drive end frame.

5. Remove brushes.

6. Remove bearing and inner retainer.

7. Remove commutator end frame outer retainer and gasket.

8. Remove third brush holder and oil wick.

9. Remove bushing if worn.

10. Remove field coils.

11. Clean generator frame thoroughly.

BENCH TEST

Electrical checks outlined in the following paragraphs may be performed with 110 volt test prods.

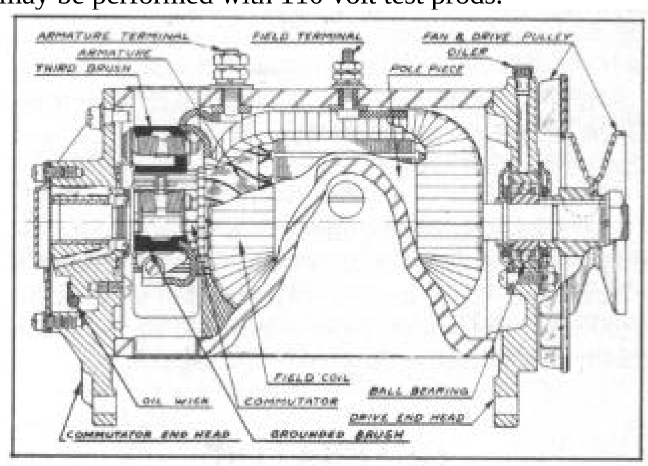


FIGURE 5

FIELD CONTINUITY:

Place a test prod on each end of field coil to brush leads. If test lamp fails to light, the coil circuit is shorted and should be corrected.

BRUSH GROUND:

Place the test prod leads, one to ground and the other to the brush. If the test lamp lights, the brush holders are grounded and should be replaced. If test lamp does not light, the brush holders should be replaced.

POSITIVE TERMINAL GROUND

Place one test prod on the positive terminal and the other on the generator frame. If the test lamp lights, the terminal insulation has a short circuit and the frame or unit should be replaced. If the lamp does not light, the insulation is satisfactory.

ARMATURE GROUND. Place the test prod leads, one to the armature core and the other to the commutator bars. If the test lamp lights, the armature is grounded and should be replaced. If the test lamp does not light, the armature is not grounded.

NOTE: Use KMO- 909 growler or its equivalent to completely check armature windings.

ARMATURE SHORT. Place the armature on the growler and with a saw blade over the armature core and on the bars, rotate the armature and test. If the saw blade vibrates, the armature is short circuited.

In order to determine whether the armature winding or the commutator is shorted, clean out between the commutator bars and recheck the armature. If the saw blade still vibrates, the armature is short circuited and should be replaced.

REPAIR:

If the commutator is to be trued, it is advisable that armature be mounted in its own centers during the truing operation. When undercutting the commutator, be sure to undercut the mica squarely the full width of the slot and 1/32" deep.

When new brushes are installed, they should be carefully sanded in by drawing a strip of No. 00 sandpaper between the commutator and brush in the direction of armature rotation. Sand until a 75% bearing is obtained, then run generator under load on the brush until a 90% bearing is obtained. Generator output (third brush setting) should not be adjusted until after the brushes are thoroughly seated. Be sure, after sanding the brushes, to blow the sand and brush dust out of the generator.

The armature shaft ball bearing should be thoroughly cleaned and packed half full of high temperature grease before reassembly in the drive end head.

If bushing in commutator end head has more than .004" diametral clearance on shaft, it should be renewed or a new end head with bushing installed.

Before reassembling the commutator end head, remove the oiler felt wick and soak same in light engine oil. Reinstall the wick being sure that it lays on the bottom of the oil pocket. Fill the pocket with light engine oil.

ASSEMBLY:

1. Install field coils.

2. Assembly inner retainer and bearing to armature and assembly drive end frame to armature.

NOTE: Use new felt washer, install inner and outer felt retainer, felt is compressed between these two retainers.

3. Install armature and drive end frame to generator.

4. Install new bushing in commutator end frame, align oil wick hole in bushing with hole in casting and assemble new wick.

5. Replace third brush holder and spring retainer.

6. Replace gasket and retainer. 7. Install commutator end frame.

NOTE: Bolts should be entered with insulator over body of bolt.

8. Install brushes.

9. Install cover band.

10. Install pulley and nut.

11. Install generator bracket.

After assembling, the generator should be given a complete bench test before being installed on the car. While testing, set the third brush for the correct maximum output. See output specifications on page 2 for the generator that is being tested.

GENERATOR POLARITY. To prevent the generator polarity being reversed, the generator should be "flashed". Flashing is done by connecting a jumper wire to the starting motor battery terminal and tapping it several times against the "A" terminal of the generator.

To check the generator after flashing it, start the engine and speed it up. The generator charge indicator light should go out and stay out as long as the engine is running above idle speed. Turn off the ignition until the engine stops, then turn it on again. The generator charge indicator light should turn on, indicating that the circuit breaker points are not stuck.

LUBRICATION

At 5,000 miles Add 3 to 5 drops of medium engine oil to the oiler at the top of the drive end head. Fill the commutator end oil pocket with medium engine oil.

GENERATOR CHARGING INDICATOR

The indicator mounted on the upper right side of the instrument panel is a red warning light, behind which is mounted a small 6 volt lamp bulb.

When ignition is first turned on and also when engine is operating at idle speed the red light is on, indicating that the generator is not charging.

As engine speed is increased, light will go out which indicates the generator is charging.

When the ignition switch is turned on the circuit is completed from the ignition switch, through the bulb, to the "T" terminal of the voltage regulator, Figure 6 to the insulated contact points (A), to the grounded strap (B) of the cut-out relay. As the engine is started and generator speed is increased to a car speed of approximately 10 miles per hour, the generator develops sufficient voltage to pull down the cut-out armature (C), closing the main contact points (D), opening the insulated points (A) causing the light to go out.

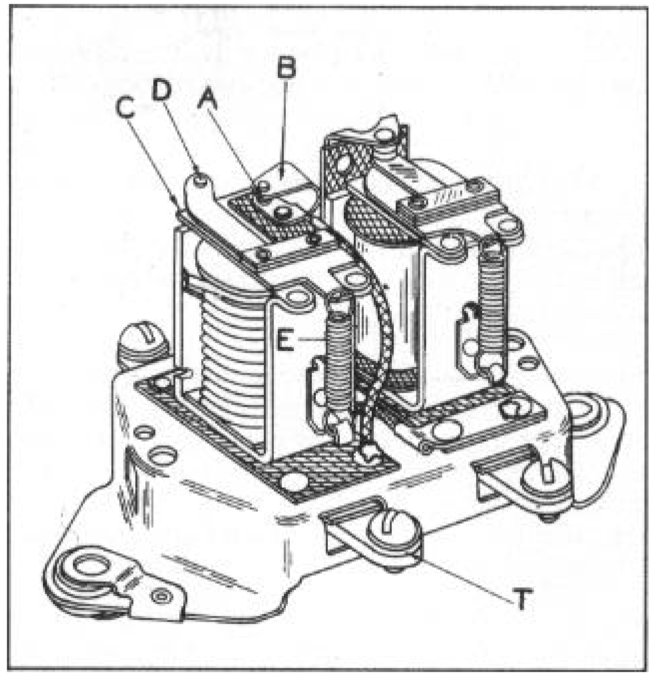


FIGURE 6

If the lamp bulb does not light when ignition is turned on, ground the "T" terminal to the engine (not to "B" terminal). If the bulb still does not light, check for burned out bulb or loose connections. If the lamp lights when the "T" terminal is grounded, it is an indication that the main contact points (D) are closed due to fusing, or the armature spring (E) is weak or broken.

VOLTAGE REGULATOR

The voltage regulator includes two individual units in the one housing. One of these is the circuit breaker which closes the circuit between the generator and battery when the generator is charging and opens the circuit when it is not charging. The other unit is the voltage regulator which holds the voltage of the system constant within very close limits.

The generator current is controlled by a conventional adjustable third brush.

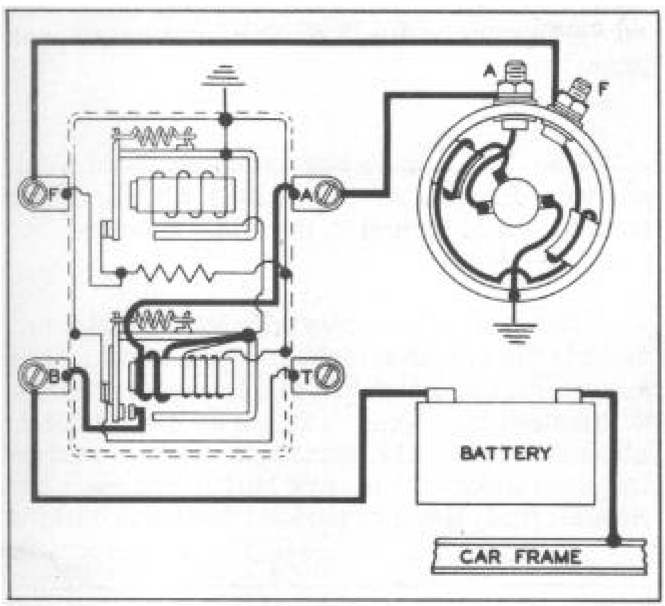


FIGURE 7

The voltage regulator has a single winding which is connected directly across the generator brushes, see Figure 7. When generator voltage reaches the value for which the regulator is set 7.18 to 7.63 volts at 120°F., the regulator armature vibrates, opening and closing the regulator contact points to hold the voltage down to the set value.

The circuit breaker points should close at 6.4 to 7.00 volts. Points should open at 2 amperes discharge.

A carbon resistor marked 30, with resistance of 28 to 32 ohms is attached to back of regulator.

Regulators that do not check or operate properly should be exchanged through an Authorized Electric Auto-Lite Service Station. DO NOT attempt to adjust the instrument. The cover is sealed and the seal should not be broken.

CURRENT AND VOLTAGE RATE

If it is desired to translate any generator revolutions per minute into engine rpm, it can be done by dividing the generator rpm by 1.75 and the result will be engine rpm. To obtain the car miles per hour, divide the engine rpm by 50. These divisors apply to Hudson cars only and are computed by the Engineering Department from the ratio of the generator pulley to the crankshaft pulley.

THIRD BRUSH (AMPERES) SETTING

To check current output,disconnect "BAT" lead at "B" terminal on regulator, as in Figure 8.

Connect positive ammeter lead to terminal of wire just disconnected - negative ammeter lead to "B" terminal on regulator as shown.

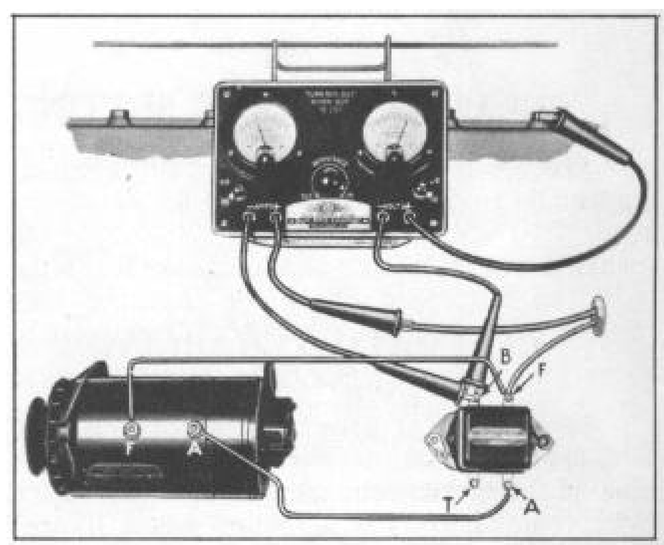


FIGURE 8

Connect negative voltmeter lead to "B" terminal on regulator - positive voltmeter lead to ground on engine.

Connect jumper wire to "F" terminal on regulator and ground on engine.

Run engine at speed corresponding to 20 mph for 15 minutes to warm up.

With resistance turned "Out" and engine running at a speed of approximately 35 mph. at 8 volts, amperage reading should be not less than 30 amperage on all model 480 series. When necessary to reset amperage adjust third brush in an anti-clockwise direction to increase output, and clockwise to decrease output.

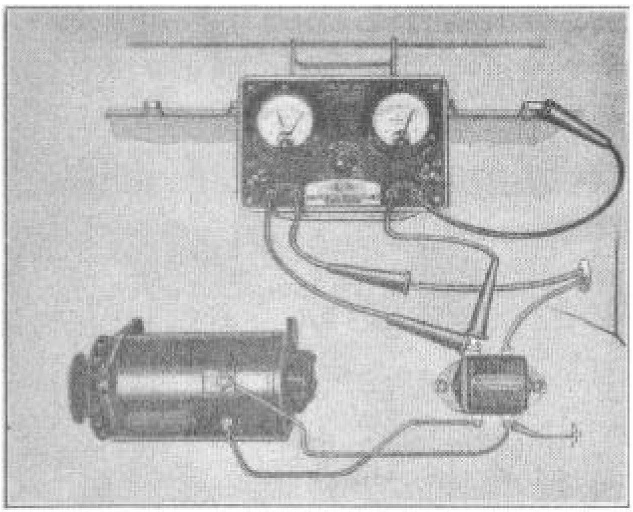


FIGURE 9

REGULATOR VOLTAGE SETTING

Disconnect "BAT" lead at "B" terminal on voltage regulator, see Figure 9.

Connect voltmeter and ammeter leads the same as described above for checking amperage, but omit jumper wire from regulator to ground as shown in Figure 9.

Run engine at speed corresponding to 20 mph for 15 minutes to warm up. Then run engine at speed corresponding to 35 mph. Turn "in" resistance until ammeter reads 10 amperes.

With regulator at temperatures of 70° F. the voltmeter reading must not be less than 7.1 volts or more than 7.4 volts.

If the reading is not within this range, the regulator should be replaced with a new or exchanged unit of the same type obtained from an Authorized Electric Auto-Lite Service Station. DO NOT ADJUST.

STARTING MOTOR AND BEN DIX DRIVE

The starting motor and drive assembly is bolted to the front face of the flywheel housing on the left side of both 6 & 8 cylinder engines, Figure 11. It is controlled on all models by the combination of a solenoid relay (magnetic) switch located on top of the starting motor case and a control button located on the instrument panel./
The instrument panel control button will activate the starter motor only when the ignition switch is turned to the "on" position.

The end of the starting motor armature shaft is fitted with an inboard type Bendix drive engaging mechanism, the pinion of which meshes with a steel ring gear mounted on the rim of the steel flywheel. The armature shaft is carried in an oil absorbent bronze bushing at each end. An external oiler is provided for each bushing.

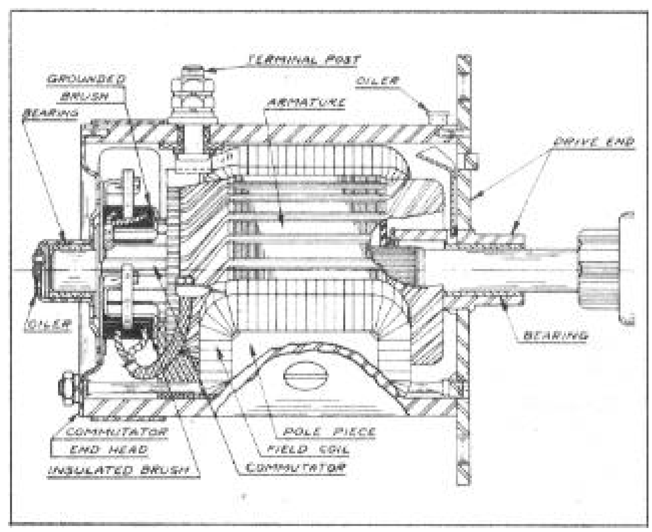


FIGURE 10

Starting motor used on both 6 & 8 cyl. models is a 4" diameter, 4 pole, 4 brush, model MCL-6006 Auto-Lite unit, shown in Figure 10.

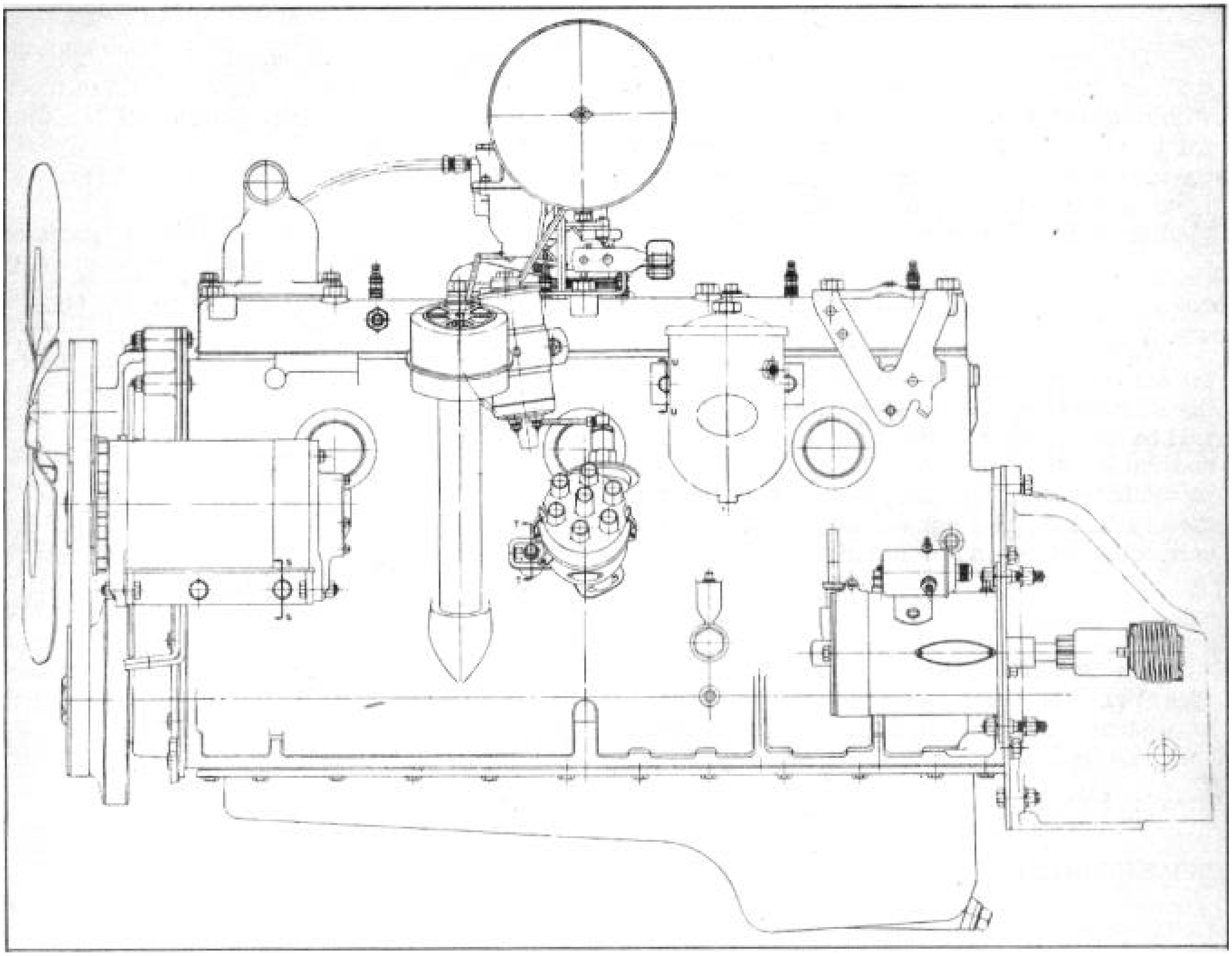


FIGURE 11

NOTE: Removal of a small threaded cap at the rear end of the solenoid unit exposes a plunger end which can be pushed forward to crank the engine without pressing the instrument panel button.

REMOVAL:

To remove the starter motor assembly, disconnect all cables from the solenoid switch and remove the mounting stud nuts.

Tape the end of battery cable to prevent accidental shorting and a possible fire.

WIRING:

The starting circuit should be inspected to be sure all connections are clean and tight and that the insulation on the wires is not worn or damaged. The starting circuit should be given a voltage loss test to make sure there is no loss of starting motor efficiency due to high resistance connections. In making this check the voltage loss from the battery terminal to the starting motor terminal should not exceed .20 volts maximum for each 100 amperes. The loss in voltage between the battery ground post and the starting motor frame should not exceed .20 volts maximum for each 100 amperes. If the voltage loss is greater than the above limits the voltage should be measured over each part of the circuit to locate the resistance causing voltage loss.

BENCH TEST

The motor should first be checked to see that the free running voltage and current are within specifications. To test, connect the motor to a battery, ammeter, and voltmeter. If the current is too high, check the bearing alignment and end play to make sure there is no binding or interference.

Using a spring scale and torque arm check the stall torque to see that the motor is producing its rated cranking power. The stall torque will be the product of the spring scale reading and the length of the arm in feet. If the torque is not up to specifications, check the seating of the brushes on the commutator and the internal connection of the motor for high resistance.

The Bendix should be checked for correct operation. The Bendix pinion should be checked to see that it shifts when the motor is operated under no load.

DISASSEMBLY:

1. Remove Bendix drive by removing lock ring, spring retainer, and pin attaching adaptor drive.

2. Remove commutator cover band and three bolts that attach end frame to starter.

3. Drive end frame held by 2 countersunk screws.

4. Remove armature.

5. Pry up brush springs and remove brushes from holders.

6. Brushes are soldered at field leads and at commutator end plate.

7. Remove solenoid.

8. Remove field coils.

9. Thoroughly clean all parts prior to inspection.

STARTER OVERHAUL NOTES

1. If commutator is rough, it should be refaced in a lathe, mounted on its own centers. After turning, polish with No. 00 or finer, sandpaper.

2. To test brush holder for ground, place one test prod on the end head, the other on the brush holder. If test lamp lights, the brush holder is grounded. If lamp does not light, the holder is electrically O.K.

BRUSHES

To replace the insulated brushes, unsolder the brush pigtail from the field coil and remove the brush. When inserting the pigtail of the new brushes, it will be necessary to open up the loop slightly in the field coil. Be sure the pigtail is inserted the full depth of the loop, after which it should be clinched to hold the pigtail securely before resoldering. A good soldering job must be done to give full efficiency.

Brushes should be correctly installed and connected as previously outlined in order to be sure of proper starting motor efficiency. Proper brush seating should be insured by sanding the brush to fit the commutator. To sand the brush wrap a strip of 00 sandpaper around the commutator and turn the armature slowly in the direction of rotation. Blow the sand out of the motor after sanding.

Brush spring tension should be checked with a spring scale. To check the tension of reaction type brush springs hook the scale under the brush spring near the brush and pull on a line parallel with the side of the brush. Take the reading just as the spring leaves the brush.

If the brush spring tension is too low there will be a loss of efficiency due to poor brush contact. If the tension is too great the commutator and brushes will wear excessively and have short life. It is therefore important that the brush spring tensionbe kept within the limits specified. To change the spring tension twist the spring at the holder with long nosed pliers.

The armature should be visually inspected for mechanical defects before being checked for shorted or grounded coils.

To test the armature for grounds touch one point to a commutator segment and touch the core or shaft with the other probe. Do not touch the points to the bearing surface or to the brush surface as the arc formed will burn the smooth finish. If the lamp lights, the coil connected to the commutator segment is grounded.

To test for shorted armature coils a growler is necessary. The armature is placed against the core and a steel strip held on the armature. The armature is then rotated slowly by hand. If a shorted coil is present the steel strip will become magnetized and vibrate.

Starter armature shaft bushings should be replaced if clearance is greater than .005". Replacement bushings are of such dimensions that they require no final sizing after installation.

Armature end play should be not less than .005" and not more than .0625".

FIELD COILS

Using test probes, check the field coils for both open circuits and grounds. To test for grounds place one probe on the motor frame or pole piece and touch the other probe to the field coil terminals. If a ground is present the lamp will light.

To test for open circuits, place the probes on the field coil terminal and an insulated brush. If the light does not light, the coil has an open circuit.

STARTER MOTOR

ASSEMBLY:

1. Install field coil.

2. Solder new brushes into position.

NOTE: The brushes should slide freely in their holders and make full contact on the commutator.

3. Turn commutator, undercut and install armature.

4. Install new bushing in drive end plate and install plate to starter.

NOTE: The fibre washer is installed between end plate and armature.

5. Install commutator end plate, brushes and thru bolts.

NOTE: Fibre washer between armature and end plate, thru bolts should be entered with insulator over body of bolt.

6. Install cover band.

7. Install solenoid.

8. Install Bendix Drive.

LUBRICATION

Starting motors are equipped with absorbent bronze bushings. These bushings are able to absorb 25% of their own volume in oil.

When the starting motor is overhauled, the bushings should be soaked in light engine oil and the bushings seats should be given a light wipe of oil.

Always use the proper size arbors when installing absorbent bronze bushings.

Add 3 to 5 drops of medium engine oil to the oilers every 5,000 miles.

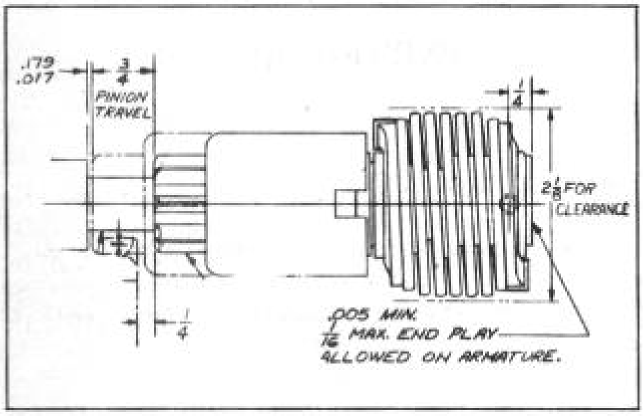


FIGURE 12

BENDIX DRIVE UNIT

All parts of the drive mechanism except the drive spring are located within the pinion barrel, shown in Figure 12.

The threaded sleeve is mounted loosely on an extension of the drive head and is retained by the stop nut which is screwed and staked in place on the outer end of the head.

The pinion is integral with the barrel or drive sleeve and is mounted loosely on the starter shaft.

The starter drive is through lugs on the control nut or driving ring on the screw shaft which engage slots in the end of the pinion barrel.

The pinion barrel is held in place on the control nut by a locking ring within the end of the barrel directly behind the driving lugs.

A coil type anti-drift spring is mounted on the threaded sleeve ahead of the control nut and a meshing spring is located within the head of the barrel ahead of the drive head stop nut.

The pinion, barrel, and control nut operate as a unit so that the pinion is moved out into mesh with the flywheel gear, as the control nut is threaded along the threaded sleeve. If the pinion teeth strike the ends of the flywheel teeth, the free longitudinal movement of the threaded sleeve on the drive head allows the pinion to turn slightly and mesh properly. This free movement is important to insure correct meshing and to prevent jamming and consequent damage to the flywheel teeth and pinion teeth.

FAILURE TO ENGAGE

NOTE: In cases where the Bendix Drive fails to engage with the flywheel gear in cold weather, it is probably due to gum and dirt or frost on the screw threads of the Bendix drive.

Clean as follows:

1. Mesh the pinion with the flywheel ring gear by hand, use a brush dipped in KEROSENE and brush the screw threads. Rotate the pinion while brushing.

CAUTION: Use very little kerosene and do not use gasoline as it will remove all lubrication.

2. Start the engine several times so as to work the kerosene into the gum on the screw threads.

3. Remove excess kerosene after cleaning by wiping with a clean cloth.

4. With pinion rotated to neutral position, clean exposed portion of ARMATURE SHAFT with kerosene and then lubricate with SAE 10 engine oil.

CAUTION: Do not apply any lubricant to the screw threads.

5. If the pinion jams or does not mesh properly with the flywheel gear teeth, first clean the assembly as outlined in paragraph one above. If jamming continues, proceed as follows:

.

6. If sticky operation still persists, look for a cocked or deformed drive spring. Such a spring will cause threaded sleeve to drag on armature shaft or on drive head extension.

7. Thread the pinion back on threaded sleeve to the demeshed (neutral) position. If the shaft is rough, remove burrs with emery cloth and lubricate with SAE No. 10 oil.

8. Check for bent armature shaft and straighten or renew if bent.
9. Make sure that drive spring screw does not project through the sleeve and bind on drive head extension or armature shaft.

PINION POSITION

Pinion when at rest should be 1.949" to 2.071" when measured from the face of the mounting flange to the edge of the pinion. Measure with armature thrust to each end. Adjust by installing thrust washers just inside either end head as required.

DISTRIBUTOR

The Distributors for the 6 & 8 cylinder engines rotate in a clockwise direction. The lower end of the 8 cylinder distributor is provided with a spiral gear which meshes with a similar type of gear on the camshaft. Six cylinder distributor shafts have an offset tongue end which fits into a corresponding slot at the end of the oil pump shaft gear which meshes with a gear on the camshaft driving both pump and distributor as a unit.

The 6 cylinder Distributor is located on the left side of the engine and the 8 cylinder distributor is located on the right hand side, Figure 13.

The distributor incorporates an automatic governor advance and in addition, a diaphragm advance control (A), operated by engine vacuum.

The automatic governor advance provides the proper ignition timing in direct proportion to engine speed.

The diaphragm advance control provides additional spark advance over the governor advance, through the engine vacuum, for maximum fuel economy. When the engine is running under light load and engine vacuum is high, the distributor is rotated to the maximum advanced position. However, under heavy load conditions, as when the throttle is opened for additional acceleration or hill climbing, and engine vacuum is low, the distributor is rotated to the retarded position to prevent fuel detonation or pinging.

Correct spark setting is obtained with the number one cylinder at top dead center, rotor facing #1 terminal of distributor cap, and distributor set in mid-position in the quadrant.

BREAKER POINT ADJUSTMENT

Breaker points can be adjusted with distributor installed on car as follows:

1. Remove distributor cap and rotor.

2. Crank engine until the fibre block on the contact arm rests on the highest point of the cam lobe.

3. Loosen the contact support lock screw and turn the eccentric adjusting screw until the correct gap is obtained. Distributor point gap is .017" on eight cylinder engines and .020" on six cylinder engines.

4. Tighten contact support lock screw and recheck point cap.

NOTE: Breaker points should be dressed with a breaker point file, so that they are clean and make flat contact with each other. Use a wire feeler gauge to set contact gap.

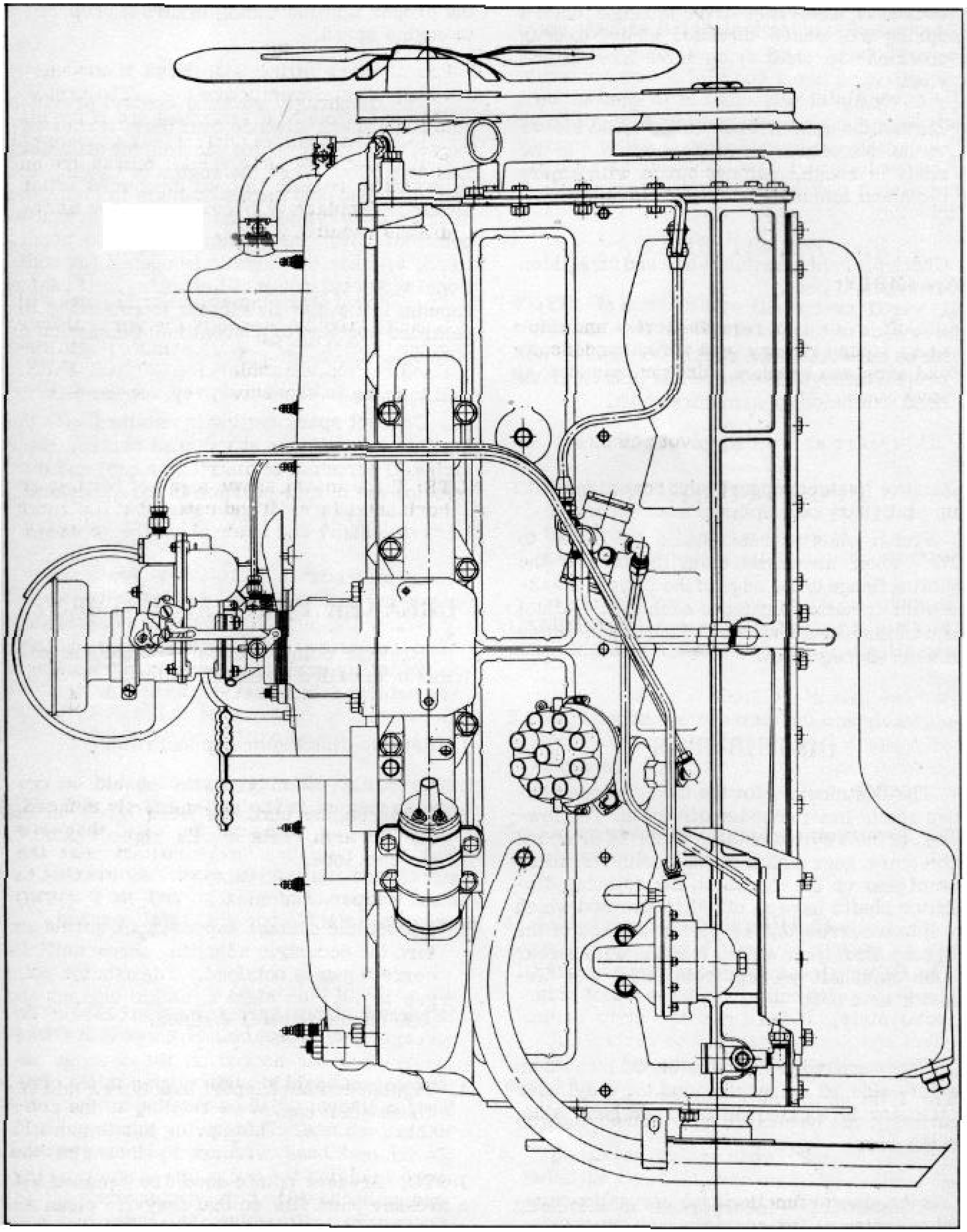


FIGURE 13

REMOVAL:

1. Disconnect vacuum control line and low tension wire.

2. Remove distributor cap with spark plug wires.

3. Remove lock plate hold-down screw attaching distributor to quadrant and remove distributor.

DISASSEMBLY:

1. Lift off rotor and remove screw and clip which holds primary lead wire, condenser lead wire, and breaker point spring and remove condenser.

2. Lift breaker arm off its pivot point.

3. Remove contact support lock screw and lift up stationary point plate.

4. Remove vacuum unit.

5. Remove breaker plate screws, bearing retainer clips which are next to distributor cap clips, and lift out breaker plate.

6. Remove hairpin retainer in oil well of cam assembly and lift cam from shaft.

7. Governor weights and springs will now be accessible.

NOTE: Governor springs must never be distorted.

INSPECTION

1. The Rotor should be checked for cracks. If evidence of burning is found on top of rotor metal strip, it indicates the strip is too short and the rotor should be replaced.

NOTE: If the end of rotor metal strip is slightly burned, it can be cleaned with refined carbon tetrachloride.

2. The condenser function is to prevent excessive arcing at the contacts. Correct condenser capacity is necessary to insure good performance and to protect the life of the breaker contacts.

NOTE: Contact pitting will result if condensers of incorrect capacity are used. The breaker contacts should be examined and if the pit mark is on the positive contact, the condenser is over capacity while if the pit marks are on the negative contact the condenser is under capacity. Replace with new condenser as the conditions require.

3. The Distributor Cap after normal use will become slightly burned on the vertical face of the inserts, this can be removed with refined carbon tetrachloride. DO NOT FILE. If burning is excessive, replace the cap.

NOTE: If the insert shows signs of burning on its horizontal face, it indicates that the rotor strip is too short and rotor should be replaced.

4. Breaker Contacts that show a grayish color, and are pitted only slightly and are within .002" of the correct maximum gap need not be replaced or adjusted.

NOTE: Badly pitted contacts should be replaced as they cannot be satisfactorily refaced. When replacing contacts, be sure they are aligned and that they make contact near the center. Bend the stationary contact bracket to secure proper alignment. DO NOT BEND BREAKER ARM.

5. Breaker Arm Spring tension should be checked when contacts are inspected. Use a spring scale hooked on the arm at the contact and held at right angles to the contact surfaces. Take a reading as the contacts separate. This spring tension should be 17 to 20 ozs. Adjust by loosening the screw holding the end of the contact spring and slide the end of the spring in or out as necessary. Retighten the screw and recheck the tension.

NOTE: If the tension is too weak, the contacts will chatter at high speed giving poor performance. If the tension is too strong, excessive wear of the cam and breaker arm rubbing block will result.

6. Governor And Vacuum Advance Adjustment should not be attempted except with a suitable distributor test fixture which will show the spark advance in degrees at the correct speeds and vacuum.

NOTE: It is well to check the advance both up and down the speed range so that any sluggish action of the governor mechanism will be detected. If there is a variation in the advance between increasing the speed and decreasing the speed it is an indication of friction in the assembly which should be corrected.

7. Distributor Shaft Bushings. In the case of a complete inspection or overhaul, the distributor shaft will be removed from the base. If the diametral clearance between the shaft and bushings is greater than .005", new bushings or a new base and bushings assembly should be installed. If the shaft is worn more than .002", it should be replaced.

Bushings are of the absorbent bronze type and should be installed using a suitable pilot to prevent too much reduction of bore diameter. Bushings do not require sizing before or after installation. After the gear or collar is pinned to the distributor shaft, check the end play which should be not less than .003" and not more than .010".

End play can be increased by face lapping the thrust washer collar or gear.

When a distributor is serviced and the base and bushings have been washed clean of lubrication, they should be thoroughly oiled before reassembly. If possible, the bushings should be immersed in oil for at least 15 minutes before installing the shaft.

REASSEMBLY:

To reassemble, reverse procedure of disassembly after items have been checked as covered in "Inspection".

DISTRIBUTOR LUBRICATION

Distributors are provided with a grease cup to lubricate the shaft bushings.

The grease cup should be turned "in" one complete turn every 1,000 miles and refilled with grease every 5,000 miles.

At 2,000 mile intervals lightly coat the cam lobes with water pump grease and at the same time, apply a drop of light engine oil to the contact arm pivot, Figure 13.

INSTALLATION:

To install, reverse procedure of removal and check timing.

IGNITION TIMING

Remove spark plug from #1 (front cylinder), place finger over spark plug hole and crank the engine until air pressure against the finger indicates that the piston is coming up on the compression stroke. Then continue cranking slowly until the mark "U.D.C. 1-6" (six cylinder engines) or "U.D.C. 1-8" (eight cylinder engines) lines up with opening in the rear engine support plate, as shown in Figure 14.

The engine can be cranked by removing the knurled cap on the starting motor solenoid and pressing the button in quick succession.

The distributor rotation is clockwise. Loosen the distributor advance arm screw and rotate the distributor housing clockwise to the limit of the slot in quadrant. Take off the distributor cap and remove the central wire from the cap. Place the bare end 1/8" from the cylinder head. Turn on the ignition and rotate the distributor body counter-clockwise slowly just until a spark jumps from the high tension wire to the cylinder head. Tighten advance arm screw, replace central cable in cap, and clamp cap on distributor.

With the distributor cap in position, the metal strip on the rotor should be directly in line with No. 1 terminal. The cables should be in the cap terminals in the order, 1-5-3-6-2-4 or 1-6-2-5-8-3-7-4 following in a clockwise rotation.

The foregoing is approximate normal timing for regular or non-premium fuels at or near sea level. For final setting see "Fuel and Altitude Compensation."

FUEL AND ALTITUDE COMPENSATION

When Ethyl or premium fuels are used in place of the regular or non-premium grades, a more advanced spark timing should be used and final tests should be made on the road. Also when operating a car at high altitudes, it will be found that a more advanced spark timing can be used than at or near sea level.

To determine proper spark timing for these conditions, with engine at normal operating temperature, accelerate at full throttle from 10 miles per hour in high gear. A "ping" should be noted at approximately 15 miles per hour. If no "ping" is heard, loosen the distributor quadrant screw and rotate distributor body in a counter-clockwise direction one graduation mark at a time until the "ping" is heard. Under no circumstances, however, should the pointer on the rear engine support be more than one inch (on 1st short mark) before the U.D.C. 1-6 or U.D.C. 1-8 mark on flywheels.

If the "pinging" is heard at speeds above those previously mentioned, retard the spark timing by loosening the clamp screw and rotate distributor body in opposite direction, one graduation mark at a time until the proper setting is obtained.

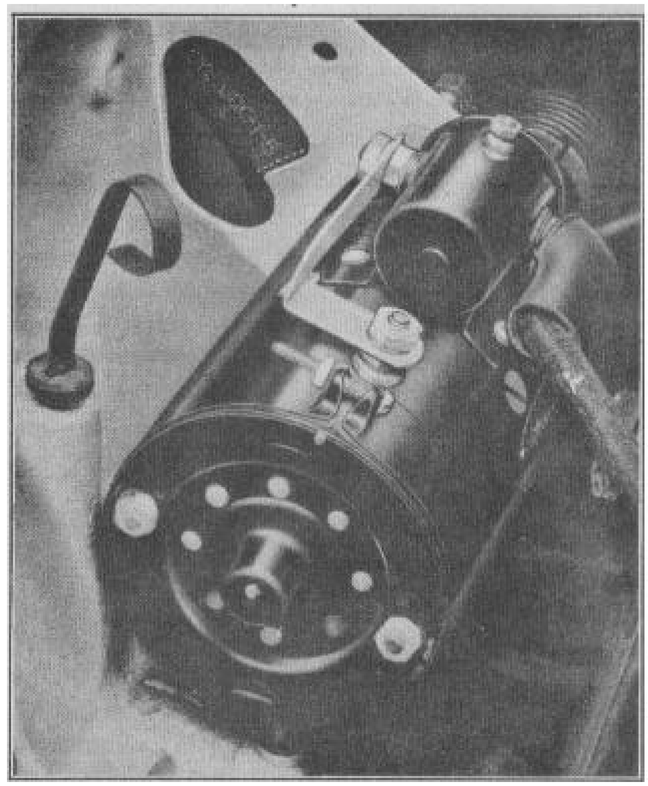


FIGURE 14

SPARK PLUGS

There are two definite requirements of a spark plug. The first is the ability to warm up fast. Cold plugs have a tendency to collect and condense the fuel mixture and it is during this warming up period that spark plugs usually become fouled. A hot plug vaporizes even a cold mixture and prevents condensation and consequent fouling.

The second requirement of a spark plug is its ability to throw off or dissipate heat at operating temperatures so that it will not cause pre-ignition. It is difficult to increase either one of these qualities without decreasing the other. The range between the two conditions is called the heat range of the plug.

Classification of a plug according to heat range is according to its ability to transfer heat from the tip of the insulator to the engine coolant and this factor is controlled principally by the shape of the cylinder end of the insulator and the distance from its tip to the inside gasket.

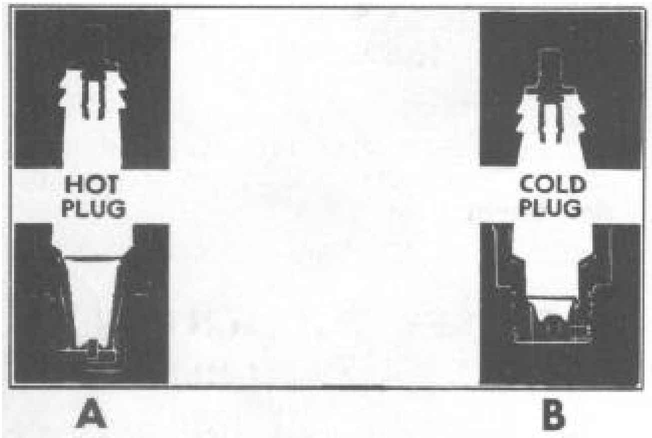


FIGURE 15

Plug "A" in Figure 15 is a hotter plug than "B" because of the farther distance the heat travels to the water. Spark plugs are chosen for car production to meet the average operating conditions and in cases when most of the driving is fast driving or slow driving the spark plugs should be changed to meet this new condition. Although the design is unchanged, the recommended models of Champion plugs have been redesignated as listed blow.

The number J-7 cold plug is used in engines equipped with cast iron cylinder heads having a compression ratio of 6:50-1.

The H -10 hot plug is used in engines equipped with aluminum cylinder heads having a compression ratio of 7:00-1.

The spark plugs used with the cast iron cylinder head have a length of 3/8" from the gasket seat to the lower end of the shell. Do not use plugs with a longer thread length as the bottom of the shell will project into the combustion chamber and present a hot spot that might cause pre-ignition. Excessive idling or low speed driving, especially in cold weather, causes fouling and the use of a hotter plug will lessen this fouling.

Dead white color or scaling of the insulator at the center electrode tip, indicates that the plug is running too hot. This may be due to wrong model of plug or to the correct model plug being loose in the cylinder head or the insualtor loose in the shell causing gas leakage which will greatly increase the insulator temperature.

To determine whether a plug is too hot, try it out by driving the car fast and then immediately checking its condition. If the dead white color or scaling is present then it is certain that the plug is running too hot and should be replaced with a colder plug. Do not check a plug suspected of being a too hot type after the car has been driven very far at low or moderate speeds, as the plug is very apt to show a healthy light brown color instead of the dead white color or scaling condition.

Glossy black deposit on the porcelain indicates an excessive amount of oil in the combustion chamber.

A dull black deposit indicates a rich fuel mixture, weak ignition, improper plug gaps, or weak compression.

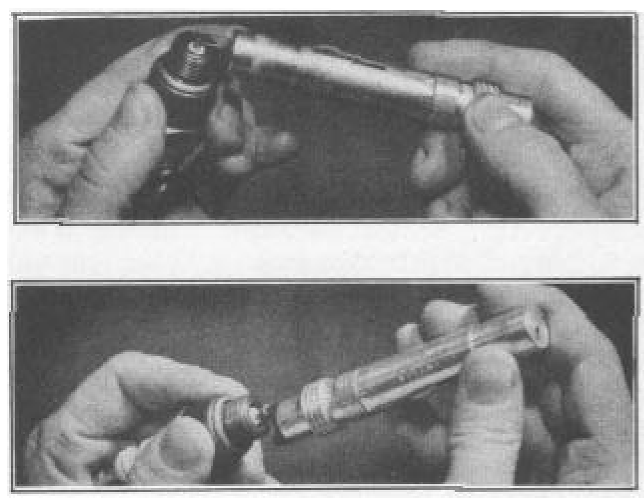


FIGURE 16

Spark plug gaps must be properly maintained or poor fuel economy and rough engine wear will result. A wire type feeler gauge should be used for gap checking, Figure 16. Adjust plugs to .032". Always use new plug gaskets and tighten to 20-25 foot pounds.

IGNITION COIL

Amperage draw engine stopped	4.5
Amperage draw engine running	2.5

NOTE: Refer to "Engine Tune-up" for coil testing.

IGNITION LOCK SWITCH

The ingition switch is wired to the primary circuit as shown in the wiring diagram.

The lock cylinder is installed in the instrument panel and is held in the lock case by a retaining ring.

To remove the ignition lock-switch disconnect the three wires from switch, remove attaching bolts, and remove switch.

The remove the cylinder proceed as follows:

1. Loosen the bolts holding the assembly to the instrument panel. Insert key and turn to extreme right or "on" position.

2. Insert a pointed tool or a 3/64" diameter wire (a paper clip may be used) into the radial hole in the side of the lock housing. This hole faces slightly to one side when switch is installed.

3. Press in on the wire hardenough to depress the retainer and while pressing on wire, rotate key to left or "off" position which will release the lock cylinder from the lock body.

4. When reinstalling the cylinder, place key in "on" position, then turn to "off" position.

BLANK LOCKING CYLINDERS

Blank lock cylinders that have not had the tumblers cut to match a certain key (uncoded) are available from the factory Parts Department. See "Blank Lock Cylinders For Coding", Body Manual.

STOP LIGHT SWITCH

Mounted on the rear of the master cylinder, the stop light switch has two protruding prongs for the attaching wires.

NOTE: Be careful when replacing stop light switches or leaking brake fluid will necessitate a brake bleeding operation.

STARTER AND LIGHTING PANEL SWITCHES

The starter button or panel switch has only an "off" and "on" open position. The lighting switch has two "on" positions, the first of which turns on the instrument panel, bonnet, tail, and fender (if used) lights. The second "on" position of the button adds the headlights to those already turned on in the first position.

HEADLAMPS

The headlamps are the "Sealed Beam" type, designed so that the bulb, reflector, lens, and the gasket are assembled in one securely sealed unit making them dust and moisture free, Figure 17.

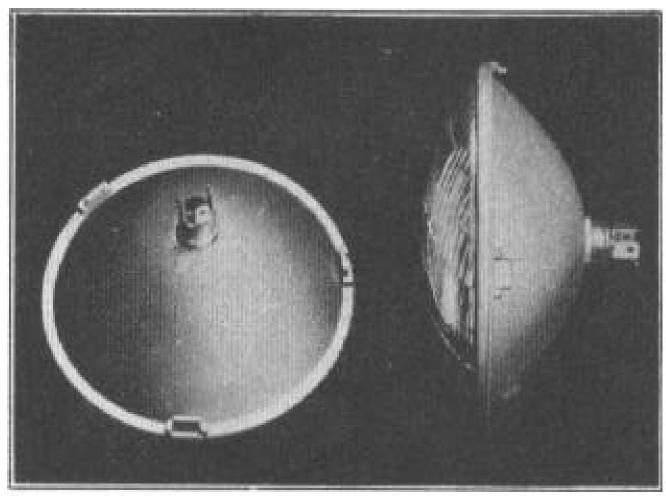


FIGURE 17

When the filament burns out, or the lens break, the entire unit is discarded and a new one installed, thereby assuring maximum lighting efficiency through the life of the car.

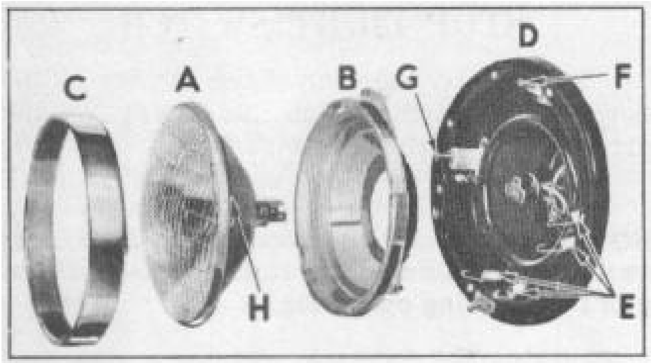


FIGURE 18

The Sealed Beam reflector unit (A) Figure 18 is held to a sub-body (B) by the retainer (C) and three screws. The sub-body (B) forms a ball and socket joint with the lamp housing (D) and is held to the housing by four coil springs (E) plus the vertical adjustment screw (F) and the horizontal adjustment screw (G).

The three locating lugs (H) are located so that the reflector unit can be mounted in only one position.

The Sealed Beam unit in interchangeable right and left.

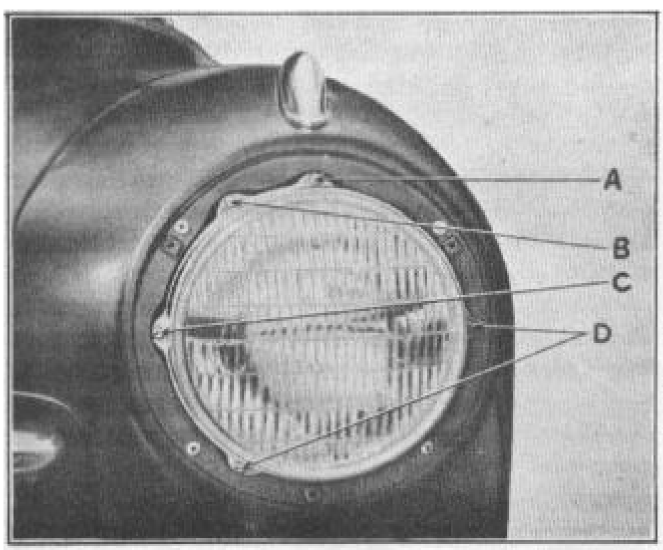


FIGURE 19

SEALED BEAM UNIT
REPLACING

1. Remove headlamp lens rim by taking out the three screws.

2. Loosen, but do not remove, the three screws and (D), Figure 19, holding the retainer. Do not disturb the aiming screws (A) and (C) at the top and left side of the unit.

3. Remove retainer by rotating counter-clockwise, allowing the Sealed Beam Unit to be removed.

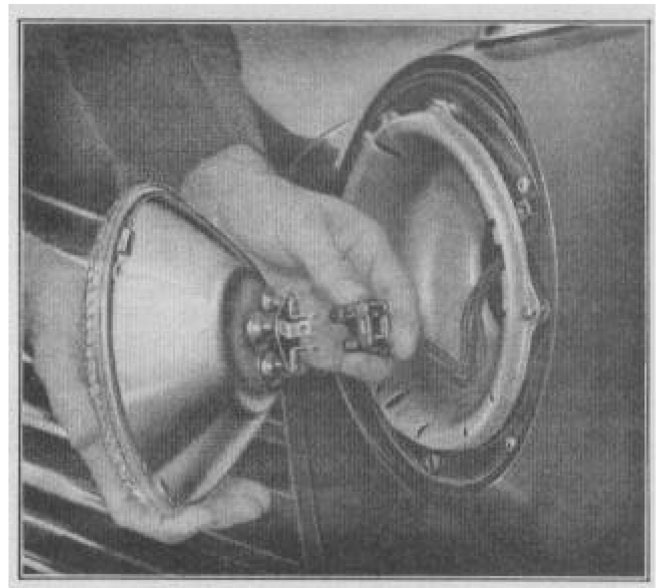


FIGURE 20

4. Remove the reflector plug from the unit as shown in Figure 20.

5. Install new unit by reversing above operations.

HEADLAMP AIMING

Place the car on a level surface with a light colored vertical screen 25 feet ahead of headlamp lens.

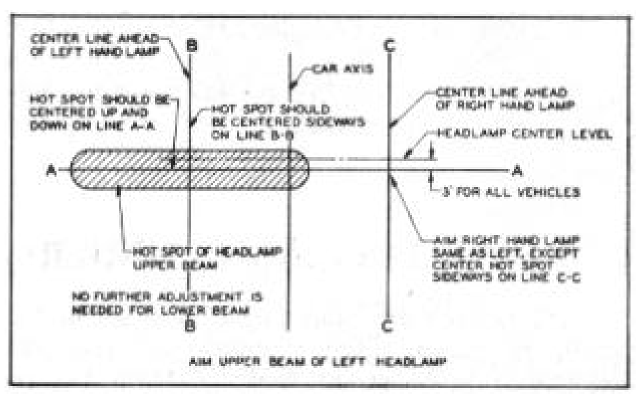


FIGURE 21

Draw a horizontal line on this surface at the level of a point 3" below the headlamp center, as shown in Figure 21. This line is 26-3/4" above the floor line. If, however, your state requires a loading allowance, draw this horizontal line below the above line by whatever amount that is required in your state.

Locate center of car by sighting through the center of the rear window along the right and then along left of windshield center bar and mark these two points on the horizontal line. The point midway between these two lines in the center of the car which should be temporarily located on the screen.

Draw vertical lines (B-B) and (C-C), on the screen to the right and left of the center line at a distance equal to one-half of the center to center distance (28 inches) between the two lamps.

Place lighting switch in position which produces highway (upper) beam on screen.

Remove headlamp lens rim.

Move the light beam to the right or left by turning the horizontal adjustment screw (G) Figure 18. Raise or lower the beam by turning the vertical adjustment screw (F) Figure 19.

Cover one lamp to obscure the beam of light and then adjust the beam from the other lamp so that the center of the zone of highest intensity falls on the intersection of the horizontal line (A-A), Figure 21, 3" below the headlamp center and the vertical line directly ahead of the lamp.

Repeat the operation for the other lamp. No further adjustment is needed for the traffic (lower) beam.

CIRCUIT BREAKERS & FUSES

The main circuit breaker is incorporated in the car headlight switch and is connected to an auxiliary circuit breaker by a jumper wire.

The auxiliary circuit breaker is located on the steering column brace under the dash panel.

NOTE: WHEN ACCESSORY ITEMS SUCH AS CLOCK, CIGAR LIGHTER, AND ETC., ARE INSTALLED THEY MUST BE CONNECTED TO THE AUXILIARY CIRCUIT BREAKER TERMINAL OPPOSITE THE BATTERY LEAD, FROM THE MAIN CIRCUIT BREAKER.

Fuses are used for the protection of optional equipment as follows:

Electric Clock - A three amperage fuse in a fuse case at back of clock.

Weather Control - A fourteen amperage fuse in a fuse case on left side of weather control housing.

Radio - A fourteen amperage fuse incorporated in the radio "A" lead wire.

Drive - Master - A ten amperage fuse in the drive-master control switch on the instrument panel.

Direction Indicator - A ten amperage fuse attached to the flasher unit lead wire.

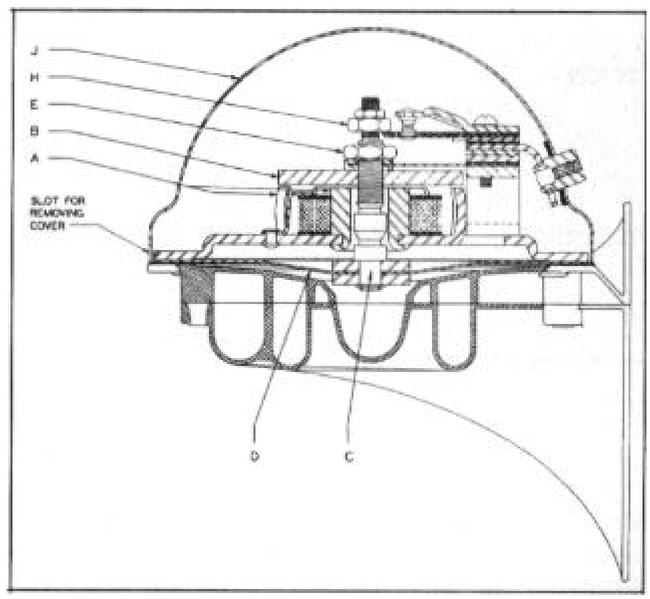


FIGURE 22

HORNS

Two electric air horns are standard equipment on all models.

Current for the horns is derived from a magnetic type motor which consists of a field armature, a coil, and a set of breaker points which interrupt the flow of current in the coil.

The armature is securely attached to the diaphragm.

Interruption of the current in the coil causes the diaphragm to vibrate which produces the sound.

The twin horns are constructed in such a manner as to produce different tone frequencies and the frequencies of each horn are synchronized to produce a harmonious tone when the horns are sounded together.

The major items that govern the frequencies of tone are as follows:

1. The form and thickness of diaphragm.

2. The weight attached to diaphragm.

3. The length of the air column.

4. The air gap setting between field and armature.

The high pitch horn has a diaphragm approximately .0195 thick and is used with the short air column.

The low pitch horn has a diaphragm approximately .015 thick and is used with the long air column.

Adjustment of horn tone qualities is very seldom necessary; however, if an adjustment of tone is desired, proceed as follows:

NOTE: It is advisable to have only one horn connected when the following adjustment is being made. Remove the wire from the horn not being adjusted at the horn relay terminal. Proceed in this manner with each horn, and after each horn has been tested, connect both to relay and shound together, then replace cover "J", Figure 22.

1. Remove cover (J) by inserting a screw driver in opening provided at edge of cover.

2. With car engine running at proper R.P.M. to de liver the maximum charging rate, loosen the lock nut and turn the adjusting nut (H) up or down until the desired tone is. obtained.

3. After adjustment is made, be sure to tighten lock nut against the adjusting nut (H).

The air gap between field "A" and the armature "B" should be:

.

027" to .029" on the high horn
.032" to .034" on the low horn

The armature "B" is threaded on to diaphragm stud "C" which is attached to diaphragm "D". Armature "B" is locked in the desired position by lock nut "E". Therefore, to set air gap between field "A" and armature "B", loosen lock nut "E" and turn armature "B" in a clockwise direction to decrease air gap and counter-clockwise to increase air gap. Tighten lock nut "E" securely before checking gap. Gap can be checked with standard feeler thickness gauge. The armature "B" should be approximately parallel with the field "A". If it is out of parallel, this can be corrected with a hammer and punch, tapping the armature down on the open side.

After the air gap has been properly adjusted, it will be necessary to readjust adjusting nut "H" to obtain maximum volume and the best tone.

If for any reason the front housing and air column assembly has been removed, care should be taken when replacing it to see that the gasket between the diaphragm, front housing, and air column assembly is in good condition.

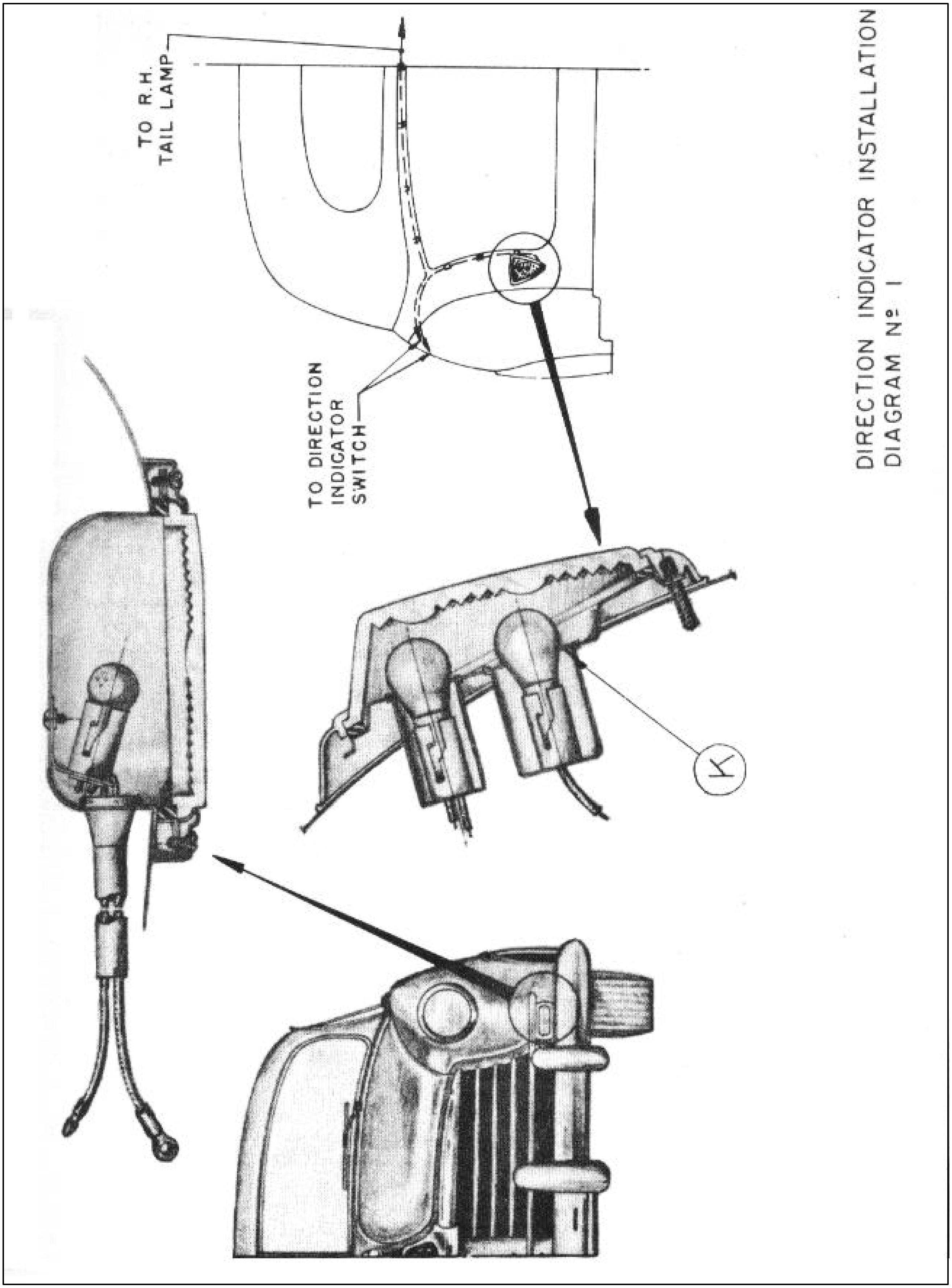


DIAGRAM 1
FIGURE 23

A new gasket is recommended as any air leak in the air column reduces the volume and quality of tone.

The short air column "I" (note raised letters "HI") is used in conjunction with the thick diaphragm for the high horn. The long air column "I" (note raised letters `LO') is used in conjunction with the thin diaphragm for the low horn.

DIRECTION INDICATOR

The direction indicator switch is operated by a lever located on the steering column and this lever is turned manually in the same direction that the steering wheel is to be turned (up for left or down for right turn). The switch turns off automatically as the turn is being made. If the lever is turned to signal for one direction but the turn is made in the opposite, the switch will be turned off automatically as the turn is made.

A jeweled light on the left end of the instrument panel flashes to indicate unit is operating.

INDICATOR LAMPS AND WIRE HARNESS

(installation rear)

1, Assemble the direction indicator light sockets to tail lamps by plugging into the provided opening shown as (K) diagram I and according to the following identification:

Right side wire - yellow
Left side wire - blue

See diagram 3, Figure 25.

2. Clip rear indicator wires to deck opening trough by existing clips and following the trough to the left upper corner of deck opening as shown in Diagram 1, Figure 23.

3. Remove left rear door scuff plate on Sedan or left door scuff plate on Bro. & Cpes.

4. Starting from in front of rear door lock pillar between frame and rocker panel, insert a fish wire at point (A) diagram 2 which is between the rear pillar andfender and above the fender to frame seal. Guide the fish wire upward and back between the wheelhouse and fender so as to project into the rear compartment. Attach the rear wire harness to the fish wire and withdraw the fish wire.

5. Install loom (3/8 I.D. x 6" long) over wire harness to protect wires at base of pillar shown as (A) diagram 2.

6. At the left front fender wheel opening, lift the lower outside corner of the rubber stone guard and insert a fishwire between the rocker panel and frame at a point shown as (B) diagram 2. Guide fish wire back through to where scuff plate has been removed. Attach wire harness to fish wire, then withdraw fish wire.

7. From the engine compartment, enter a fish wire, with hooked end, through the opening between dash panel and stone guard (C) diagram 2. Guide the fish wire down till engagedwith the wire harness. Then withdraw the fish wire bringing the wire harness out through opening shown as (C) diagram 2, Figure 24.

8. Enter the rear wire harness through the existing grommet in the dash panel shown as (D) diagram 2, Figure 24 and pull through from inside of car.

9. Wrap a strip of electrical friction tape around the rear wire harness and lay across the top of frame at a location centered with the scuff plate attaching holes shown as (E) in Diagram 2, Figure 24.

10. Reinstall scuff plate.

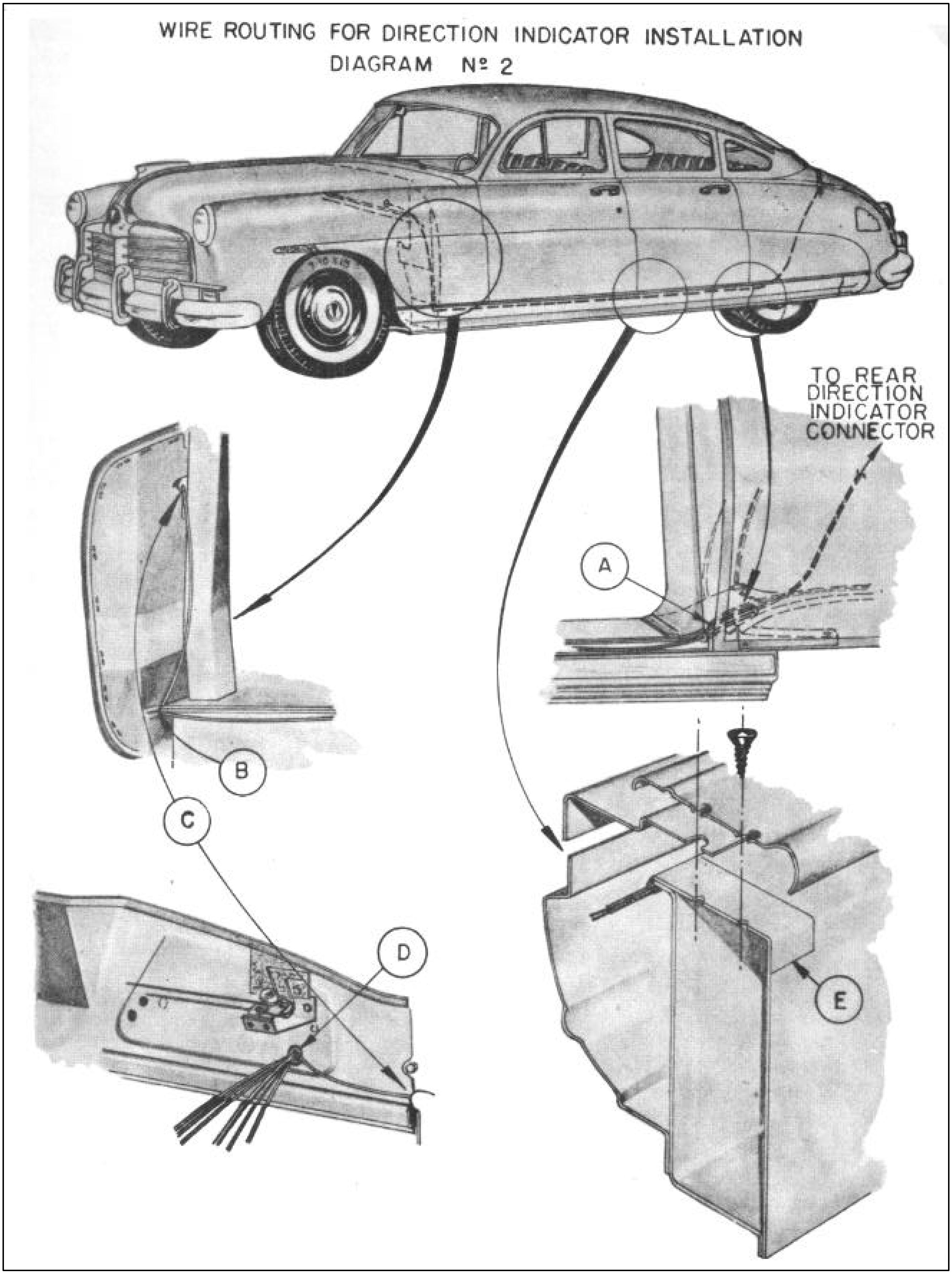


DIAGRAM 2
FIGURE 24

INDICATOR LAMPS AND WIRE HARNESS
(installation front)

1. Remove the front fender parking light lens and bezel assemblies by extracting the two screws on face of bezel. (See diagram 1, Figure 23).

2. Remove the socket bracket and wire assemblies by extracting the screw on the back face of the lamp housing and disconnecting the wire terminals at junction block. Then pull the wire out through the rubber grommet in lamp.

3. Install the (#213420) socket bracket and wire assemblies to parking lamp housings and tighten the socket bracket retaining screw securely. Then attach the white insulated wire to the parking light terminal of junction block.

4. Install bulbs (#170363) in sockets and reassemble the lens and bezel assemblies.

5. Install a (#153622) connector to each terminal of the direction indicator wires from the parking lights.

6. To the right hand indicator light connector insert the terminal of the yellow jumper wire and clip with the existing clips used for the headlamp wires in the path followed to the left hand junction block. Then attach a (#153622) connector to the terminal of the yellow jumper wire.

7. To the connector of the right hand jumper wire insert the terminal of the yellow wire of the front indicator wire harness. To the left hand indicator light wire connector, insert the blue wire terminal of the front indicator wire harness.

8. Attach the front wire harness to the existing clips as used for the headlight wires on the left front fender side dust shield.

9. Enter the wire harness through the existing grommet as shown as (D) diagram 2, Figure 24. Then pull through from inside of car.

JACKET TUBE AND SWITCH
(installation)

1. Disconnect horn wire at horn relay.

2. Loosen lower control lever tube bracket bolt.

3. Loosen bolt in jacket tube clamp.

4. Remove four screws attaching horn ring assembly and take off the assembly.

5. Remove steering wheel nut and lift off the wheel.

6. Remove bolt and set screws from upper control lever tube bracket.

7. Remove two bolts from steering column bracket cap at instrument panel and remove cap.

8. Remove the jacket tube and bearing assembly.

9. Install jacket tube and bearing assembly #300550 or #300738 contained in kit.

10. Tighten the lower control lever tube bracket bolt.

11. Tighten the jacket tube clamp bolt.

12. Install direction indicator steering column switch and conduit assemblies to the up- p e r gear shift support using the same screws and one of the following switch assemblies:

    Switch 300823 - Models 481-483
    Switch 300874 - Models 482-484
    Conduit 160265 - Models 481-483
    Conduit 161706 - Models 482-484

NOTE: Indicator switch case and cover assembly replace the upper control lever tube bracket.

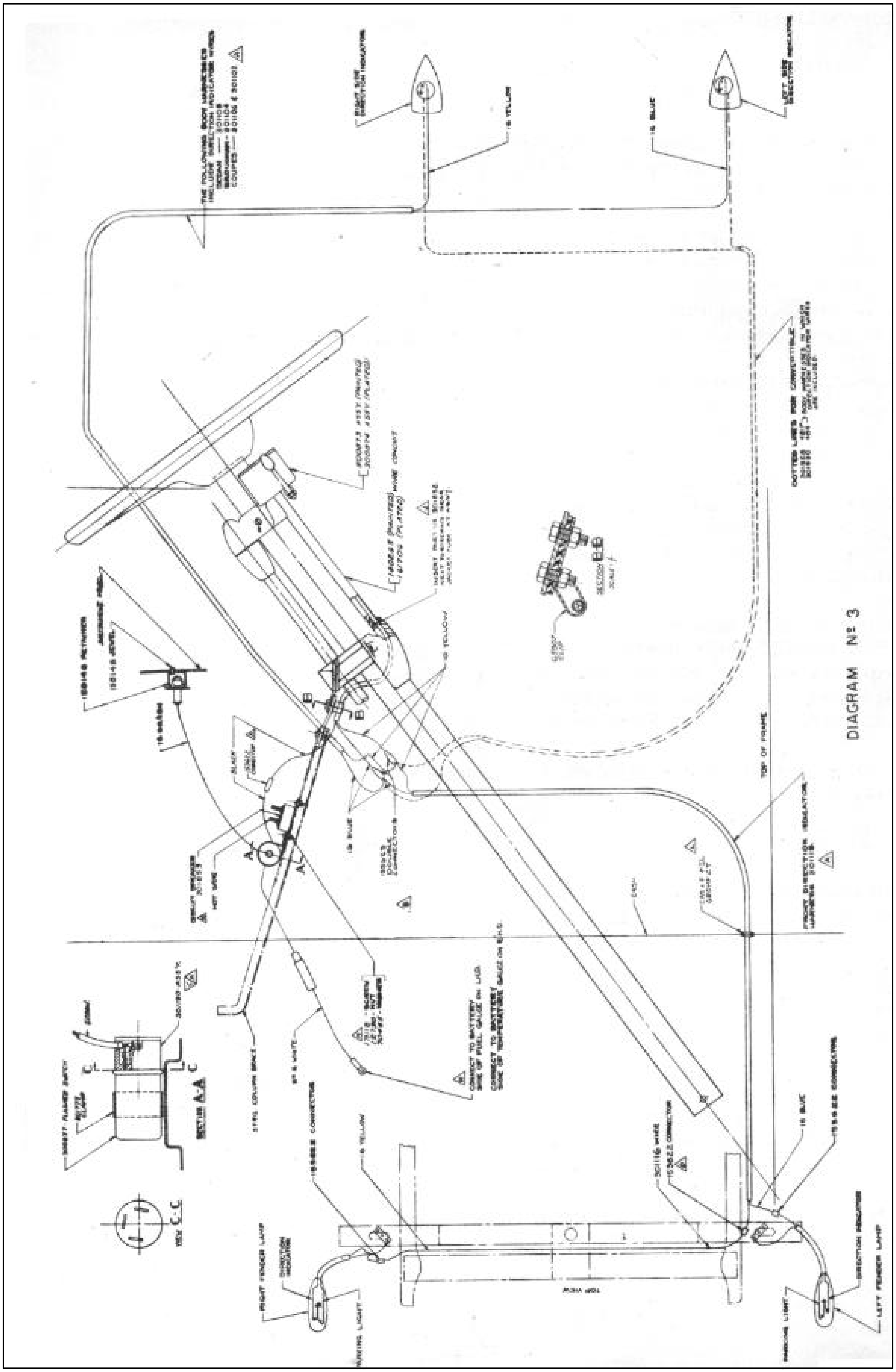


DIAGRAM 3
FIGURE 25

13. Insert between the steering column, switch wires, and under the conduit a piece of rubber (301852). See Diagram 3, Figure 25.

14. Install t h e steering column bracket cap over the conduit using the same screws and one of the following caps:

    Cap - 141258 - Model 481-483
    Cap - 211507 - Model 482-484

15. Tighten the steering column bracket bolts securely.

16. Clamp wires from steering column switch with clamp (65907) attached to the steering column brace as shown in view BB, diagram 3, Figure 25.

17. Install flasher switch in the hole in the steering column brace located at rear of auxiliary circuit breaker. See diagram 3, Figure 25.

18. Use a letter (F) drill and drill a .257 diameter hole through the instrument panel for the jeweled light. Locate hole 3 inches from left end of instrument panel and 5/8" down below instrument panel upper bead.

19. Assemble the jewel light and retainer to instrument panel.

20. Connect horn wire at horn relay.

21. Install the steering wheel and attach steering wheel nut. Tighten nut to 20-30 pounds torque.

22. Install the horn ring assembly and attaching screws.

WIRING INSTRUCTIONS

for

FRONT AND REAR HARNESSES

1. Insert the yellow wire terminals of the front and rear harnesses and the steering column switch into a double connector (#153623).

2. Insert the blue wire terminals of the front and rear harnesses and the steering column switch into a double connector (#153623).

3. Assemble a single connector (#153622) to the black wire of the flasher switch and join the black wire of the steering column switch.

4. Connect the green wire of the jewel indicator light to the post marked (P) on the flasher switch and plug the light into the jewel retainer.

NOTE: For complete illustration of wiring, see diagram 3, Figure 25.

5. Connect the white wire from the positive post of t h e flasher switch to the battery side of the fuel gauge for left hand drive or to the temperature gauge for right hand drive.

SECTION 7

CLUTCH

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REFERENCES

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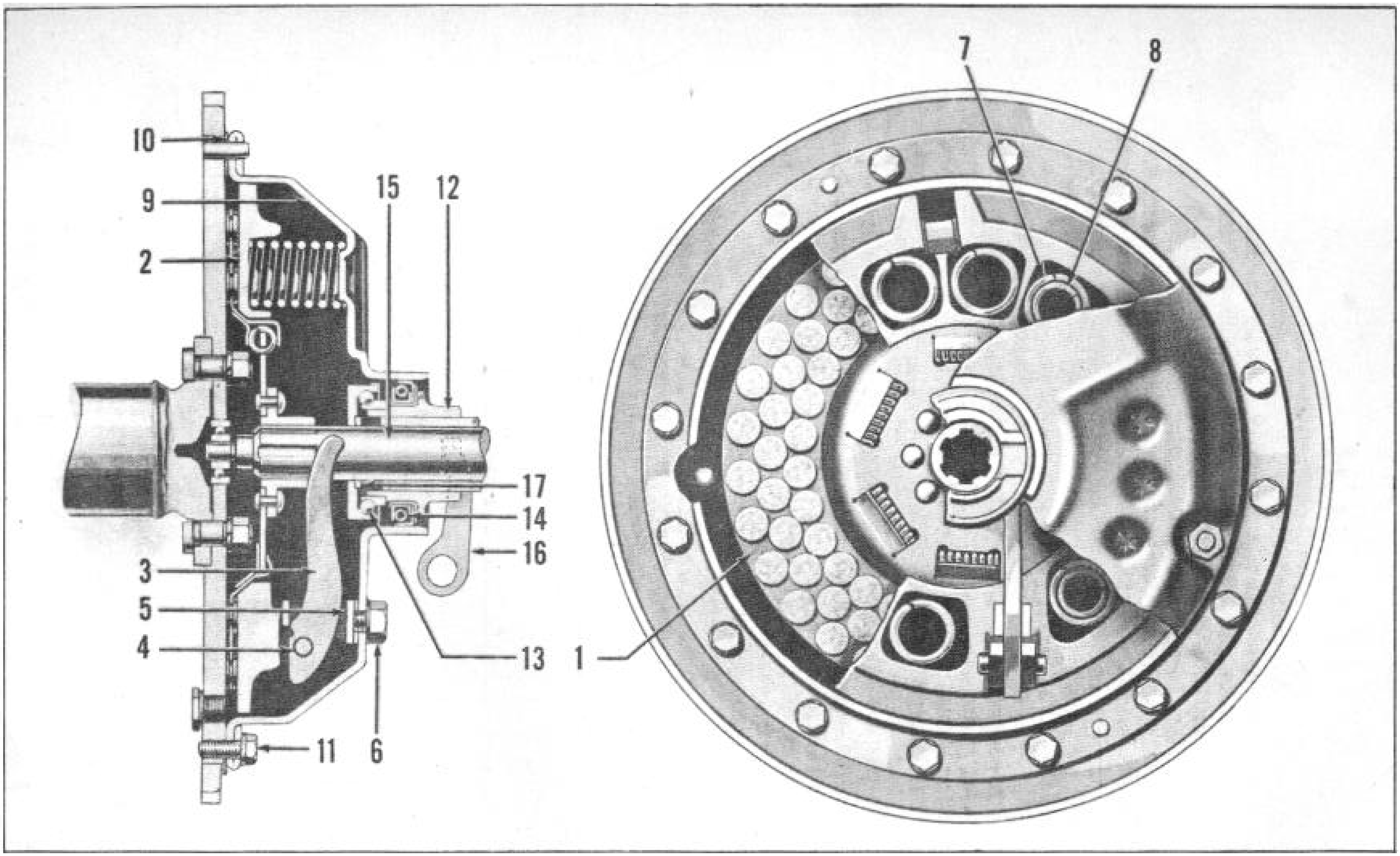

FIGURE 1

1. Clutch driving plate assembly
2. Clutch pressure plate
3. Clutch throwout finger
4. Clutch throwout finger pin
5. Clutch throwout finger retainer
6. Clutch throwout finger retainer nut
7. Clutch engaging spring
8. Clutch engaging spring--inner
9. Clutch cover
10. Clutch cover gasket
11. Clutch cover bolts
12. Clutch collar assembly
13. Clutch throwout bearing
14. Clutch oil seal
15. Main drive gear
16. Clutch shifter yoke
17. Clutch throwout bearing grease retainer

SPECIFICATIONS

Plate diameter	10"
Type	Single Plate in oil
Fluid Used	Hudsonite Compound
Plate Facing	Cork Inserts
Number of Corks	108,
Pilot Bearing	Ball
Throwout Bearing	Ball
Number of Engaging Fingers	3
Location Lubricating Plug	Front of Flywheel
Throwout Bearing Lubricant	Viscous Chassis lube
Fitting Location	Right Side Clutch Housing

Pedal to Floorboard Clearance	1-1/2"
Engaging Spring Tension lbs.	
Inner (3) @ 1-5/8"	135-145
Outer (12) @ 1-5/8"	180-190
Clutch Tightening Torque Ft. Lbs.	
Throwout Finger Retainer Nuts.	40-45
Cover Cap Screws	20-25
Cover Driving Lug Nuts	40-45
Clutch Housing Cap Screws	40-45
Flywheel Bolt Nuts	20-25

CONSTRUCTION AND OPERATION

Details of this single plate oil cushioned type clutch are shown in the sectional view Figure 1. The unit is sealed against oil leakage at the throwout bearing and on the parting line at the face of the flywheel.

Engagement and disengagement of the clutch is controlled by the clutch foot pedal which is connected by linkage to the shifter yoke (16). When the clutch pedal is depressed, the yoke moves forward carrying with it the throwout bearing (13) which bears against the 3 throwout fingers (3) which react against the retainers (5) to move the pressure plate away from the driving plate and flywheel against the pressure of the engaging springs (7). This action disconnects the driving plate (1) and drive gear (15) from the flywheel.

CLUTCH PEDAL ADJUSTMENT

To assure full disengagement of the clutch to prevent clashing when shifting gears and also to prevent the clutch pedal from riding against the floor board, 1-1/2" clearance must be maintained between the floor board and rear face of pedal, Figure 2.

This can be adjusted by loosening lock nut (A), Figure 3, removing cotter pin and clevis pin (C) and turning yoke (B) to increase or decrease the clearance as required. Replace clevis pin and cotter pin and tighten lock nut securely.

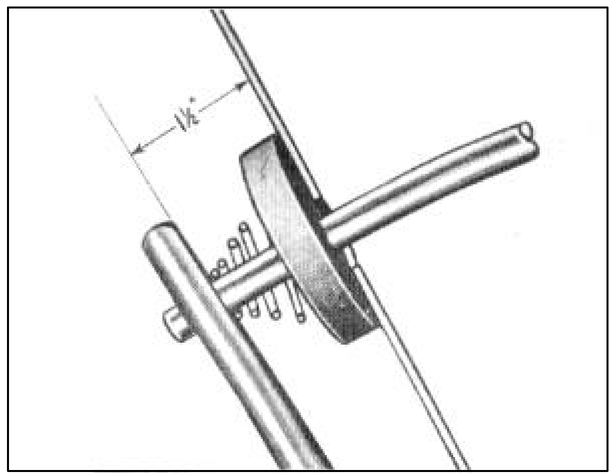

FIGURE 2

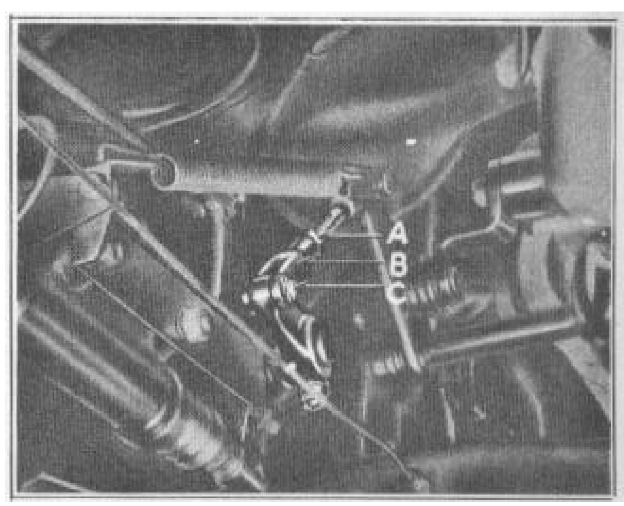

FIGURE 3

DRAIN AND REFILL CLUTCH

The clutch assembly should be drained and refilled with Hudsonite Clutch Compound every 5000 miles as follows:

1. Remove plug (A) Figure 4 using socket wrench J-472.

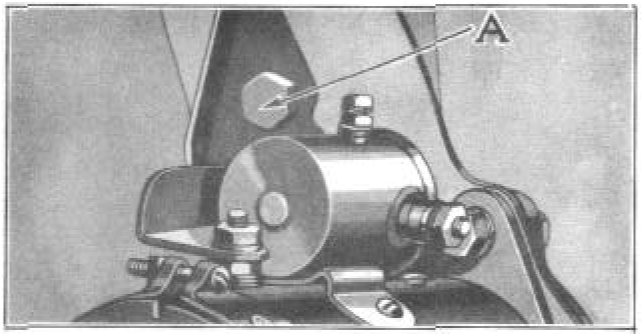

FIGURE 4

2. Crank engine slowly until the star on flywheel is aligned with the timing pointer at the timing inspection hole. This will bring the drain hole to the bottom of flywheel and allow complete drainage.

3. Crank engine until the drain hole again appears at the timing inspection hole and insert 1/3 of a pint of Hudsonite Clutch Compound using I-485 Clutch Filler Gun.

4. Install plug (A).

The measuring cup J-486 is calibrated and should be used for measuring the clutch compound unless the "one shot" 1/3 pint can is used.

NOTE: Cars equipped with. Vacumotive Drive or Hudson Drive-Master can be lubricated by raising car and removing flywheel dust cover. Crank engine until plug appears at bottom of flywheel, remove plug and drain.

Crank engine until plug has moved upward approximately 3 inches from drain position and insert Hudsonite Clutch Compound using gun
J -485.

Replace plug and flywheel dust cover.

CLUTCH GRABS OR STICKS

Drain Hudsonite Clutch Compound, flush clutch using 1/3 pint solution of 80% carbon- tetrachloride and 20% acetone.

Run engine at idle speed for 10 minutes, operate clutch pedal at least 50 times during the flushing period to assist cleansing action of the solvent solution.

Drain flushing solution completely, then insert 1/3 pint of Hudsonite Clutch Compound. Replace drain plug.

CLUTCH REMOVAL FROM CAR

1. Remove front seat cushion.

2. Remove the four bolts attaching the bottom of front seat frame to seat track, remove two screws attaching seat adjusting lever to seat frame, and remove seat back and base from car.

3. Disconnect accelerator pedal at accelerator rod.

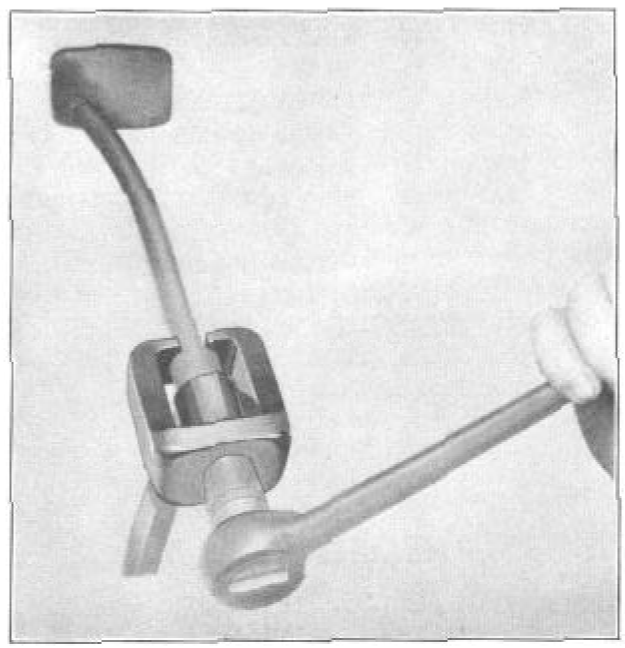

FIGURE 5

4. Remove foot brake pedal rod from brake lever using tool J-2795, Figure 5.

5. Pull the steering column hole rubber cover up out of the way.

6. Remove the floor mat.

7. Remove Hudson Weather Control unit held by 4 screws, (2 each side). Remove Bowden wire at weather control valve.

8. Remove the floor opening cover, (held by 5 screws at cowl kick pad, 12 screws along floor and 1 bolt and nut at steering gear floor opening cover.)

9. Disconnect the propeller shaft at transmission companion flange. Remove screws attaching propeller shaft center support bracket and move propeller shaft rearward to clear transmission companion flange.

NOTE: Use a wire or rubber band to prevent the trunnions from slipping off the "U" joint spider

10. Unhook the clutch pedal lever return spring.

11. Remove the two clutch cross shaft bracket bolts, remove clutch cross shaft bracket.

12. Remove the clutch control link clevis pin and unhook clevis.

13. Remove shifter shaft outer lever nut and washer, this will disconnect the linkage connecting the Handy Shift to the transmission.

14. Remove 2 screws and remove flywheel guard from bottom of clutch housing.

15. Remove the two engine rear mounting bolts and nuts at third crossmember.

16. Jack up rear end of engine about 1/2" off the frame.

CAUTION: Place a block of wood under head of jack to prevent damage to the oil pan.

17. Disconnect speedometer cable at transmission and install wood plug.

18. Remove two . top screws holding clutch housing to engine endplate and install two headless screws J-2969 to support the transmission until the balance of the screws are removed.

19. Remove breather pipe bracket from clutch housing, and bolt attaching breather pipe and rear tappet cover.

20. Pull transmission and clutch housing back towards the rear and up through the floor opening. Hoist J-1502 will be helpful in handling the assembly.

NOTE: See "Overdrive Section" on cars equipped with Overdrive.

21. Loosen all clutch-cover-to-flywheel screws slightly to release the tension of clutch engaging springs. Remove the screws and lift off the clutch assembly and driven disc.

DISSEMBLY AND INSPECTION

DRIVING PLATE

1. A black glaze on surfaces of corks generally indicates the use of unsuitable clutch fluid or that unit was operated with insufficient fluid. If corks are blackened but not burned, soak the plate in Hudsonite Compound to clean the corks. If soaking does not remove the black coating, replace the plate assembly. Clean cork surfaces are necessary for smooth soft operation of clutch.

2. Driving plate should run true at cork faces within .010" when rotated on Vee blocks with mandrel inserted in hub spline.

3. Hub splines must be free of burrs and nicks and must slide freely on splines of main drive gear (clutch shaft) without appreciable backlash.

4. Examine spring loaded hub for broken springs or stampings. Spring cages should retain the hub in the plate without appreciable angular backlash or sidewise lost motion and springs should be a tight fit with no clearance between ground ends of springs and clutch inner driven disc to insure proper frictional load between inner and outer driving plates.

Plates that do not meet above specifications should be replaced.

PRELIMINARY COVER CHECK

Before proceeding with disassembly of cover and pressure plate assembly, check for general condition of cover, fingers and retainers. This test should be made regardless of whether the pressure plate appears to be in good or bad condition.

1. Mount the pressure plate and cover assembly on base plate or on a standard flywheel with a standard driving plate and ONE standard gasket interposed.

2. Bring cover into firm contact with flywheel or base plate using an arbor press or other means, then install and tighten 8 of the 16 cover-to-flywheel cap screws.

The measurements described in the next paragraph should always be made with the cover held to base plate or flywheel at the front flange, not at the hub or rear wall of the cover.

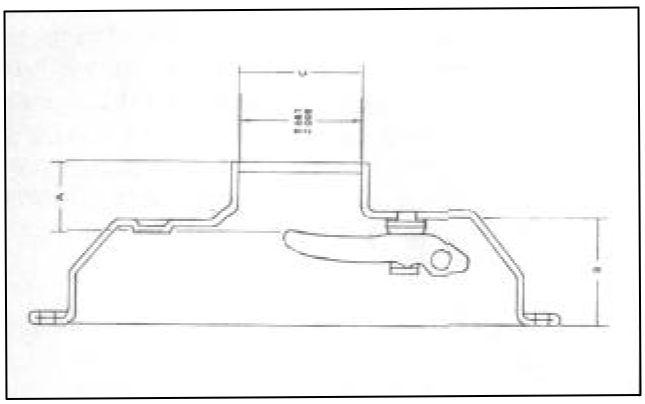

FIGURE 6

3. Using a machinists combination square or depth micrometer, measure the distance from clutch throwout bearing contacting surface of lowest finger to top of cover hub (A) as shown in Figure 6. On a clutch in good condition, the distance should be 1- 1/4" to 1- 1/2" when the interposed driving plate is .200" to .213" and the gaskets are .028" to .032" uncompressed thickness.

If distance is greater than 1-1/2" the throwout fingers and/or retainers are excessively worn or the cover is distorted inwardly. The assembly should be disassembled for inspection of its component parts.

If distance is less than 1-1/4", it can be assumed that the fingers, cover and retainers are not excessively worn and further disassembly is optional except for testing the pressure of the engaging springs or replacing the pressure plate. It can be assumed as satisfactory, providing fingers clear hub of cover by at lease 1/8".

PRESSURE PLATE

NOTE: Before proceeding with disassembly of the cover and pressure plate assembly, look for the correlation punch mark near the outer edge of the pressure plate and a corresponding mark near it on the cover flange. These marks indicate the relative position of the parts when the assembly was balanced at the factory and the marks should be kept together to maintain the original balance.

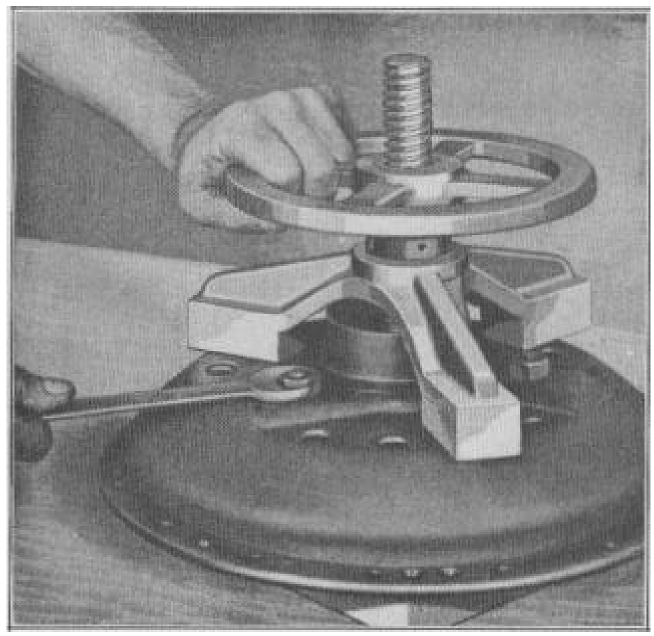

FIGURE 7

Use clutch fixture J-298-H Figure 7 to compress the engaging springs. With spring load relieved, remove the 3 nuts from back of cover and remove the cover, springs, fingers, finger retainers and sealing washers.

Pressure plate should be free of cracks, burns or scores and should be true within .010". Scrape all gummed oil from pressure plate. Warpage maybe readily checked by laying pressure plate on a surface plate. If a .010" feeler can be inserted at any point between surface plate and pressure plate, the pressure plate should be replaced. If a surface plate is not available, use a new pressure plate or flywheel to serve as a surface plate.

ENGAGING SPRINGS

If clutch pressure plate shows signs of overheating, it is likely that the engaging springs will require replacement. Inner and outer springs should be checked for tension at each overhaul using the Valve Spring Tester Tool KMO-607 and checking against the tension data as follows:

Inner all @ 1-5/8" -- 135 to 145 lbs.
Outer all @ 1-5/8" -- 180 to 190 lbs.

THROWOUT FINGERS

Visually check the fingers for wear and uneven surfaces at the points where the fingers contact the throwout bearing and retainers, also check the retaining pin bores. Replace fingers that show noticeable wear.

RETAINERS AND WASHERS

Check retainers for wear at slot where they contact the lobed surface of the fingers. The bearing surface on the retainers is practically a line contact. If bearing area of retainer is grooved deeper than .005" replace the retainer. If, however, there is only one such groove, the retainer may be safely continued in service by rotating it 180 degrees from former position when it is being installed. Changing the retainer position by half a turn will bring unworn portion into contact with finger fulcrum lobe.

NOTE: The plain copper or steel washers interposed between retainers and cover function as oil seals. Top and bottom faces of these washers must be flat and free of scores, otherwise they should be replaced.

CLUTCH COVER

Inner surface of cover must be flat and free from scores adjacent to the holes for the finger retainers. Cover must be flat within .005" when front face is checked on a surface plate.

Distance from front face of cover where it contacts the flywheel gasket, to points on front wall of cover where retainer sealing washers fit (B) Figure 6, should not be less than 2.350" and not more than 2.370" measured 1/8" from edge of each of the 3-finger retainer holes. Variation in distance at any of the 3 holes should not exceed .008". Covers that are not within these limits should be replaced unless equipment and skill is available for doing an accurate job of straightening.

Cover hub bore (C) against which the throw-out collar oil seal contacts, must be smooth and free from nicks and burrs.

If cover hub bore (C) shows considerable wear and scoring, it is an almost certain indication of misalignment. Whenever this condition is encountered, be sure to thoroughly check the engine rear support plate, flywheel and clutch bell housing, for shaft concentricity and face alignment in both planes.

THROWOUT BEARING AND SEALS

In the removal of clutch from engine, the throwout bearing (13), Figure 1, grease retainer (17) and clutch oil seal (14) will be removed as a single unit with the collar (12).

Leather element of seal must be free of glaze and cuts or cracks and must be firmly attached to the stamped steel element. Leather must not rotate in relation to the stamping and the seal assembly must be stationary on the clutch collar. Check to see that coil spring is intact and not loose.

Replacement of the oil seal necessitates removal of the throwout bearing from the clutch collar. Use care when pressing new seal onto collar, apply a steady pressure to the (INNER) metal edge. As the seal assembly can be quickly made ineffective by careless installation, it is important to use a close fitting pressing sleeve so as to confine all the load to the inner edge.

The throwout bearing should be free from roughness or lumpiness when rotated after cleaning and oiling, otherwise it should be replaced. If both the throwout bearing and the oil seal require replacement, it is usually as economical to install a new collar assembly.

When installing throwout bearing to collar, do so with a press having a ram adaptor large enough to cover the entire front face of the bearing. DO NOT drive the bearing into place on the collar as such action is likely to mark or brinnell the races causing subsequent noise in operation.

NOTE: When assembling throwout bearing to collar, do not fail to install a new grease retainer (17) Figure 1, to annular recess in the bearing. Make sure that the washer is fully seated in recess.

Grease retainer (17) and oil seal assembly should be soaked in engine oil for at least 30 minutes before they are installed.

PILOT BEARING

The main drive gear pilot ball bearing in flywheel should run freely. If lumpy or rusty or badly worn replace bearing. Inertia type expanding jaw puller J-877 facilitates removal of bearing from flywheel, Figure 8.

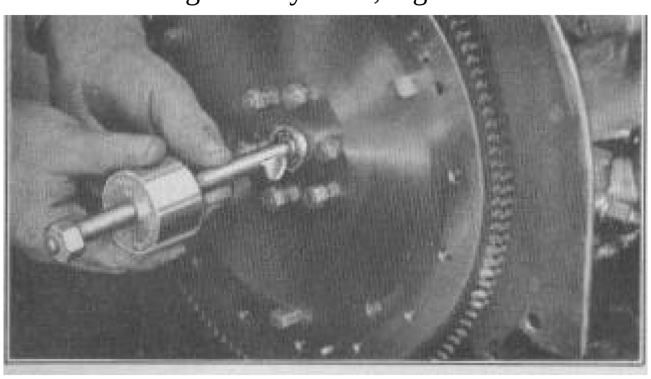

FIGURE 8

FLYWHEEL

Check flywheel for smoothness and flatness. If burned or warped more than .010", it should be replaced. Make sure that flywheel attaching bolt nuts are tightened to 40-45 foot pounds torque.

REAR SUPPORT PLATE AND CLUTCH BELL HOUSING

Check cylinder block rear support plate very carefully for tightness and alignment. This is especially important in cases where car has been subject to chronic clutch trouble. Make a similar check of clutch bell housing. In lieu of highly precise equipment, use a steel straight-edge to check steel rear support plate and a surface plate or other flat surface to check the front face of clutch bell housing. Both units should be flat and in plane within .005".

REASSEMBLY

1. Install the throwout fingers to pressure plate. (DO NOT FORGET TO INSTALL THE COTTER PINS.) Place a finger retainer over each finger with threaded end of retainers facing up.

NOTE: Retainers may be rotated 180 degrees to present a new bearing surface to fingers.

2. Lay the pressure plate with fingers and retainers installed, on base plate of fixture, J-298-H.

3. Assemble the previously tested engaging springs into seats on pressure plate, spacing inner spring arrangement equally to insure proper balance.

4. Check position of corrolation marks on cover and pressure plate, align the marks then lower the cover onto the pressure plate while guiding each of the 3 finger retainers into their respective holes in cover.

5. Using clutch assembly fixture J-298-H Figure 7, or other suitable means, pull cover into place by compressing engaging springs. Install lockwasher and nut on each finger retainer and draw nuts up to 40-45 foot pounds torque after cover is pressed all the way down.

6. Remove assembly from fixture. Using a suitable heavy duty end wrench engage flat portion of retainers and turn same until all fingers are centered sideways in retainer slots. THIS IS AN IMPORTANT PART OF THE JOB. Make sure that shoulder of each retainer is fully seated on wall of cover.

7. Reinstall clutch cover and pressure plate assembly to flywheel or base plate of fixture after having first placed a driving plate and ONE gasket underneath.

8. Install and tighten 8 of the 16 cover to flywheel cap screws.

9. Using a scale or adjusting gauge 1-774, measure from lowest finger at contact end to top of cover hub. If measurement is within limits of 1-1/4" to 1-1/2" synchronize the fingers as outlined in next paragraph. If measurement is greater than 1-1/2", the cover is probably distorted and same should be checked as outlined under "Disassembly and Inspection Clutch Cover Check".

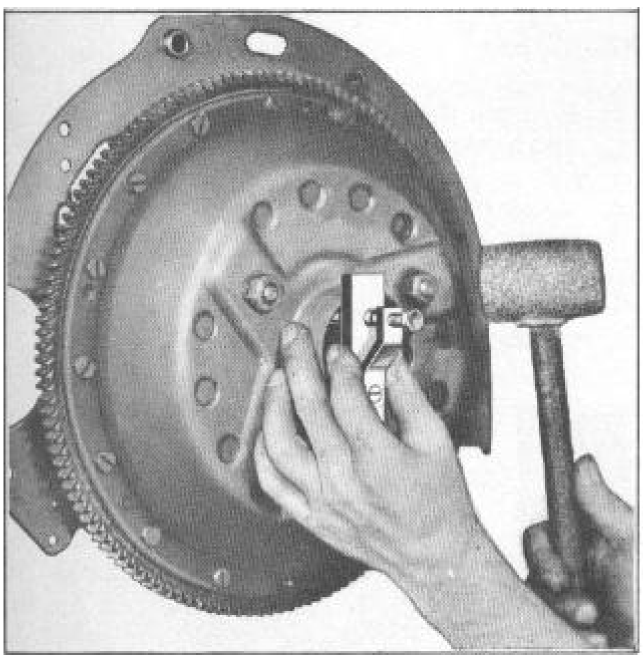

FIGURE 9

10. Using finger setting gauge J-774, as shown in Figure 7, check relative height of each finger. Reading should be same for each finger within .010".

If any finger is higher than another by not more than .029", it should be brought to height of others (lowered) by striking the nut end of its retainer sharply with a soft hammer.

If any finger is more than .030" higher than another, it should be lowered to level of other fingers by installing a thin (about .005" thick) washer between clutch cover and retainer of the high finger.

11. Remove assembly from fixture.

INSTALLATION OF CLUTCH ASSEMBLY TO ENGINE

1. Install ONE new clutch cover gasket and shellac it in place on front face of cover flange.

NOTE: If clutch has been properly reconditioned only one gasket of 1/32" free thickness is required to give correct release and engagement. Avoid the installation of two or more gaskets as each added gasket reduces the effective pressure of engaging springs by an amount equal to the thickness of each additional gasket.

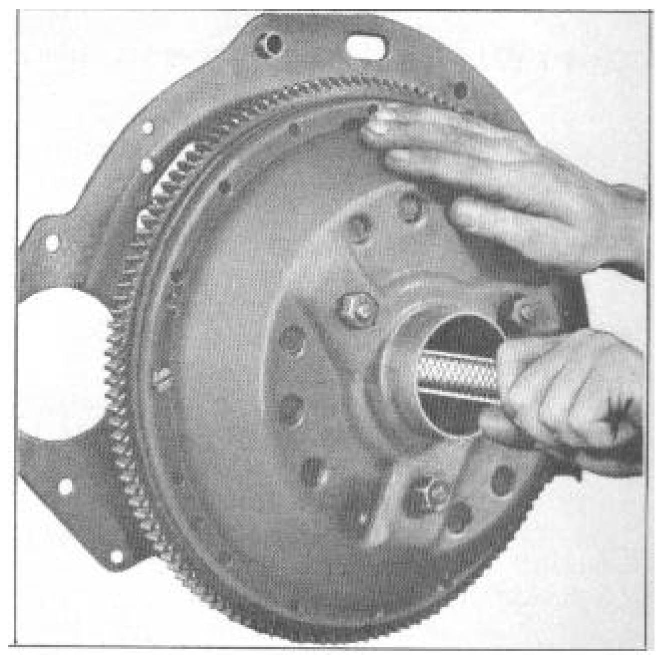

FIGURE 10

2. Place driving plate on pressure plate then insert the aligning arbor J-449, Figure 10, through cover and splines of driving plate and into pilot bearing in flywheel. Push the assembly up into place on the flywheel and

secure with the cap screws. Keep the arbor in position so as to keep the driving plate centered. This will assist installation of the transmission.

3. Tighten the cap screws gradually drawing down opposite screws instead of in rotation so that a good gasket seal is insured. Using a torque wrench, tighten all cover screws to 20-25 foot pounds. Withdraw the arbor.

4. Insert 1/3 of a pint of Hudsonite into clutch via the cover hub opening.

5. Install clutch collar and throwout bearing assembly to clutch cover hub bore after spreading a thin coat of engine oil over bore wall. Care must be exercised to prevent damaging the lip of the oil seal or curling it over in the bore.

6. Center the throwout bearing grease retainer leather washer (17), Figure 1, (not the oil seal) by temporarily inserting the aligning arbor through it. Rotate collar and throwout bearing to position for proper alignment with throwout yoke on transmission.

7. Tighten all rear engine support plate screws.

8. Install two headless screws .T-2969 in engine endplate to assist in supporting transmission at installation.

9. Bring the transmission assembly to position where main drive gear (clutch shaft) is aligned with bore of throwout collar, then carefully push forward to enter drive gear through grease retainer leather washer, splines of driving plate and into pilot bearing. During this operation the main drive gear must be relieved of the overhanging weight of the transmission until the bell housing engages the dowels.

NOTE: Before transmission assembly is moved up against rear support plate, make a last inspection to verify that the end face of throwout collar in clutch is properly aligned with throwout yoke on transmission and that oil seal lip has not turned under.

CAUTION: Alignment of bell housing with engine is controlled by the sleeve dowel in the upper left location of the bell housing attaching bolt circle and by the dowel bolt at the lower right location viewed from rear of car. Make sure that the former is in place and entered in bell housing hole before tightening bolts. Install lower right bolt (dowel bolt) first. NEVER grind or otherwise reduce the diameter of the dowel bolt to facilitate installation.

10. Remove the two headless screws or guide studs.

11. Install remaining clutch housing attaching bolts and tighten to 40-45 foot pounds.

12. Complete installation b y reversing the order of removal of the remaining parts.

CLUTCH PEDAL LEVER, HOUSING AND BUSHING

REMOVAL:

1. Remove the nuts and washers from clutch and brake penal rod and lever.

2. Using puller tool J-2795 remove clutch and brake pedal rods.

3. Disconnect clutch pedal lever return spring.

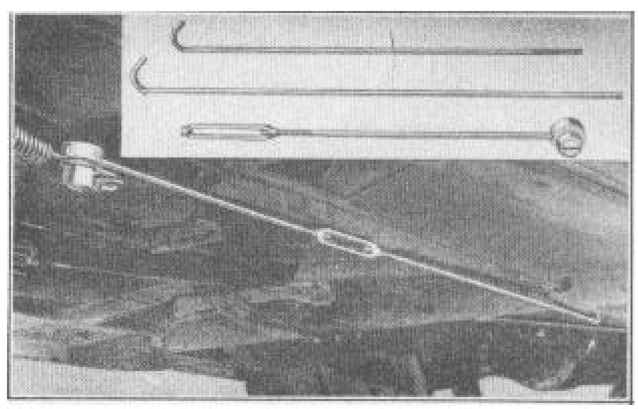

FIGURE 11

4. Remove clutch overcenter spring using tool Z-2956, Figure 11.

5. Remove cotter key and pin from clevis to clutch cross shaft lever.

6. Remove cotter key and pin from clevis attaching brake lever to master cylinder push rod.

7. Remove the two stop light wires and two brake line connections from rear of master cylinder.

8. Remove the bolt from the rear of master cylinder bracket which will allow the master cylinder and bracket
assembly to swing down.

9. Remove the lock screw and Woodruff key from the clutch cross shaft lever and slide the clutch pedal lever and cross shaft out of the frame.

10. Remove the two bolts from the pedal lever housing and bushing assembly to frame and remove the master cylinder and bracket assembly, the brake pedal lever and the pedal lever housing and bushing assembly as one unit and disassemble on a bench.

11. Remove lock ring from the pedal lever and housing assembly and remove the master cylinder and bracket assembly and brake pedal.

INSTALLATION

Reverse procedure of removal.

NOTE: Check adjustment of clutch pedal after assembly.

TROUBLE SHOOTING

CHATTERING

Improper clutch adjustment
Binding drive plate hub
Unequal contact of pressure plate face
Uneven spring pressure
Improper alignment of transmission
Worn splines on transmission main drive gear
Binding pressure on fingers or fulcrums

GRABBING

Improper clutch adjustment
Uneven spring pressures
Binding on release levers or fulcrum studs.
Sticking clutch pedal
Worn rubber engine mountings
Improper alignment of transmission with clutch and rear engine plate

SLIPPING

Improper lubricant
Excessive lubricant
Worn or glazed driving plate
Improper clutch adjustment
Warped driving plate
Binding pressure on fingers
Binding clutch pedal
Insufficient free pedal travel
Improper alignment of clutch, engine and transmission.

DRAGGING

Improper clutch adjustment
Improper pedal adjustment
Bent clutch driving plate
Worn or burnt corks
Clutch driving plate hub binding on main drive gear splines
Sticking release sleeve
Binding pilot bearing
Improper alignment

RATTLING

Worn parts in release assembly
Worn splines on clutch shaft or in plate hub
Worn release hearing
Worn pilot bearing
Unequal clutch finger setting
Worn fulcrum pins
Excessive backlash in transmission or propeller shaft
Worn transmission main drive gear bearing
Improper alignment

VIBRATING

Improper balance of clutch assembly Bent clutch shaft
Improper alignment with transmission Loose engine mountings
Loose flywheel or flywheel out of balance Worn transmission rear bearing
Defective vibration dampener
Worn Universal joints

REFERENCE		
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SECTION 8

VACUMOTIVE DRIVE

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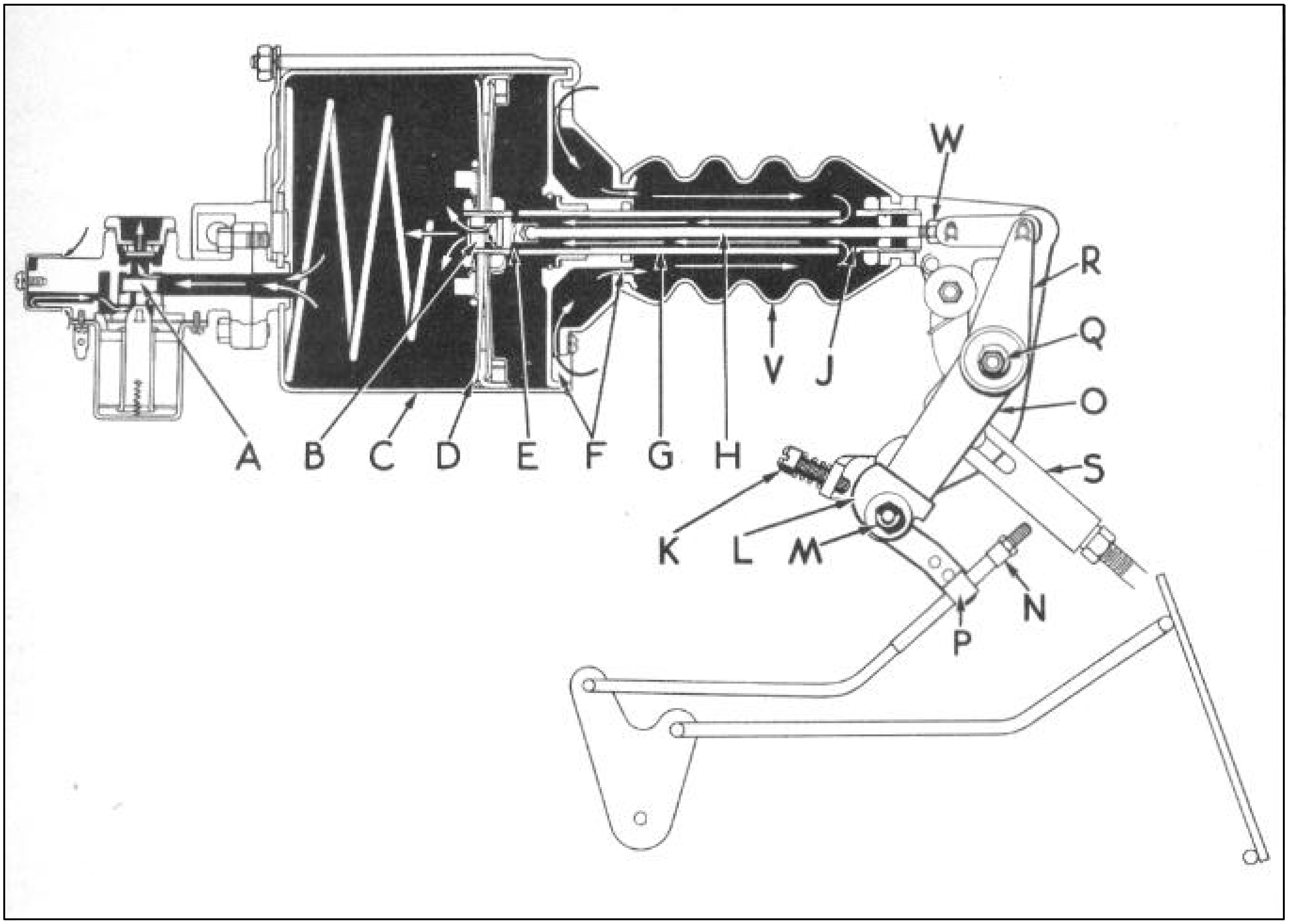


FIGURE 1

A. Solenoid valve

B. Valve plunger

C. Vacuum power cylinder

D. Vacuum piston

E. Piston rod air passage

F. Air cleaner passage

G. Piston rod

H. Valve rod

J. Piston rod air passage

K. Cushion point stop screw

L. Valve lever cam

M. Valve lever cam pivot

N. Threaded sleeve

O. Valve lever

P. Accelerator linkage and guide trunnion

Q. Valve lever pivot

R. Operating bell crank

S. Bell crank to coupling lever rod link

V. Piston rod rubber guide

W. Valve rod locknut

GENERAL

Vacumotive Drive provides automatic clutch operation making it unnecessary to depress the clutch manually under any driving condition. Power for operating the clutch is provided by the power cylinder which uses engine manifold vacuum for its operation.

All units included in Vacumotive Drive are also incorporated in Hudson Drive-Master. They are as follows

1. **POWER UNIT -** operated by vacuum supplies the mechanical effort to automatically operate the clutch.

2. **INSTRUMENT PANEL SWITCH -** mounted on the instrument panel permits the driver to change from conventional clutch operation to automatic operation by merely turning the knob.

3. **ACCELERATOR SWITCH -** makes it possible to start with a wide open throttle for rapid acceleration.

4. **GOVERNOR SWITCH -** prevents automatic clutch disengagement when in high gear at speeds of 16 to 21 miles per hour.

5. **THE SHIFT RAIL SWITCH -** permits automatic clutch operation in low, second or reverse gears regardless of car speeds.

POWER UNIT

The power cylinder piston rod is connected by linkage to the clutch throwout yoke shaft so that the clutch is disengaged when the piston is moved forward. When the piston moves toward the rear, the clutch is engaged.

The movement of the piston is controlled by linkage from the power unit valve to the accelerator pedal. When the accelerator is in its released position, full manifold vacuum is obtained on the front of the power cylinder piston and atmospheric pressure on the rear of the piston moves it forward and the clutch is disengaged.

When the accelerator pedal is depressed, the valve is moved to equalize the pressure on both sides of the piston and the clutch is engaged by the pressure of the clutch springs on the pressure plate.

ELECTRICAL CIRCUITS

The system is turned on and off by an electric switch on the instrument panel. The electric circuit is from a point on the ignition switch which is "hot" when the ignition is on.

The circuit is completed through a solenoid valve mounted on the power cylinder then to the accelerator switch from which there are ground circuits to the transmission shift rail switch and the governor switch.

When the circuit is complete to either or both "Grounds", the solenoid is energized, opening the valve in the line which connects the power cylinder to the engine manifold.

When the circuit is broken the solenoid valve closes the passage to the manifold cutting off the vacuum and opens a passage from the power cylinder to atmosphere so that the clutch engages immediately.

OPERATION

Figure 1 shows the position of the power unit and linkage with engine running and clutch engaged at the instant the accelerator pedal reaches the closed throttle position and before disengagement has started.

The electrical circuit is closed so that the solenoid valve (A) is open and manifold vacuum is impressed on the front side of the power unit

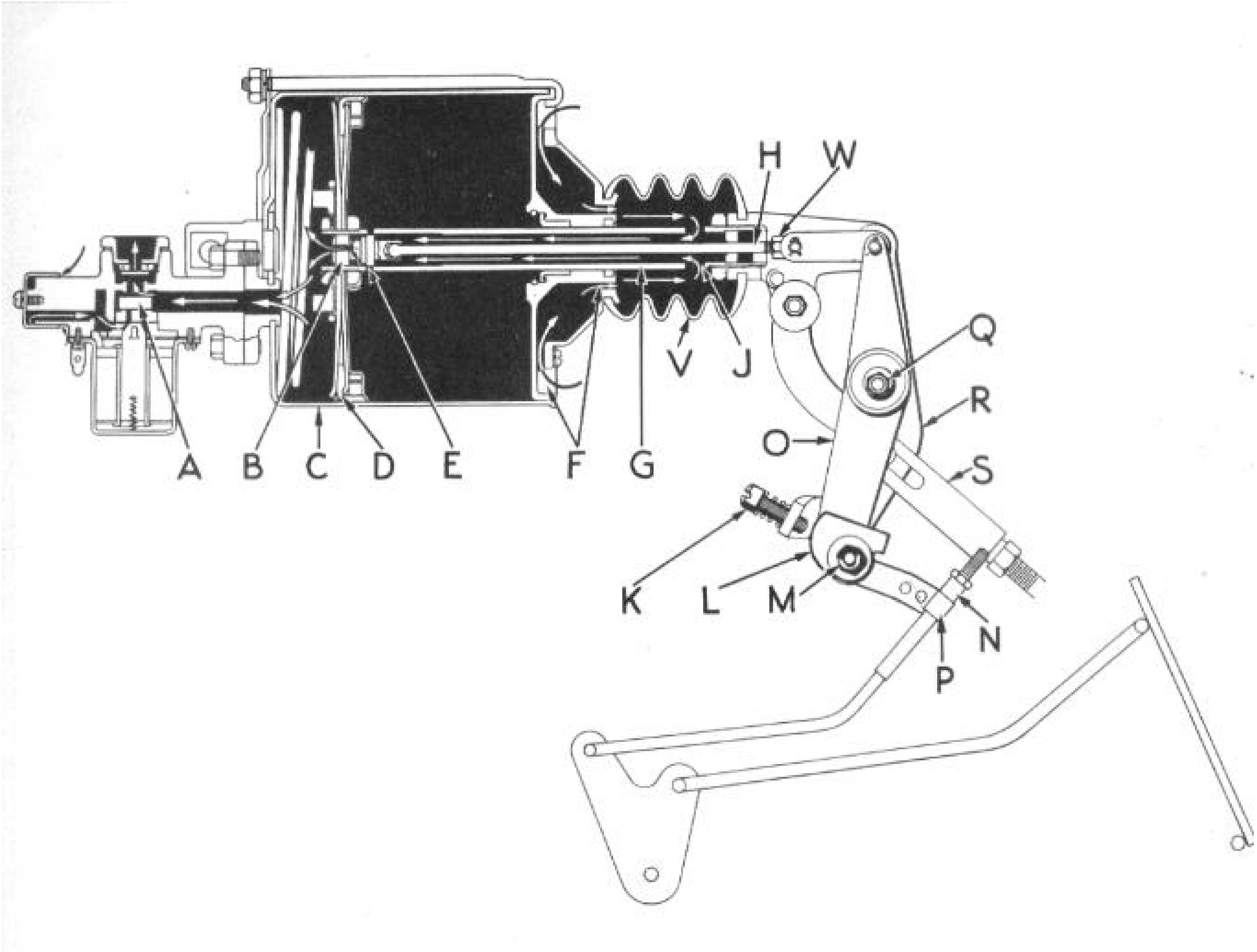


FIGURE 2

piston (D). The shoulder (N) on the sleeve of the valve pull rod (H) has moved away from the trunnion block (P) on the valve cam lever (L) so that the piston (B) has moved forward due to the vacuum acting on its forward surface, thus sealing the forward end of the cylinder from the rear and also opening the ports (E) in the piston rod (G) to admit air to the cylinder. The pressure differential due to vacuum on the front and atmosphere on the rear of the piston causes the piston to move forward and through the linkage, disengage the clutch.

DISENGAGEMENT

Figure 2 shows the conditions existing after the clutch has been disengaged. The piston has moved forward and the control linkage has been moved to correspond to this piston position.

It should be noted that the trunnion block (P) on the valve cam lever (L) has been moved backward by the rotation of the piston rod bell-crank (R) so that it is against the shoulder on the rod sleeve (N).

The movement of the piston valve (B) has been stopped and the piston (D) has continued to travel so that the valve now covers the ports (E) in the piston rod (G), preventing entrance of additional air into the rear of the cylinder and stopping the forward movement of the piston. The sleeve (N) is threaded on the rod, so that the point at which the trunnion block contacts the shoulder of the sleeve and stops the piston, is adjustable.

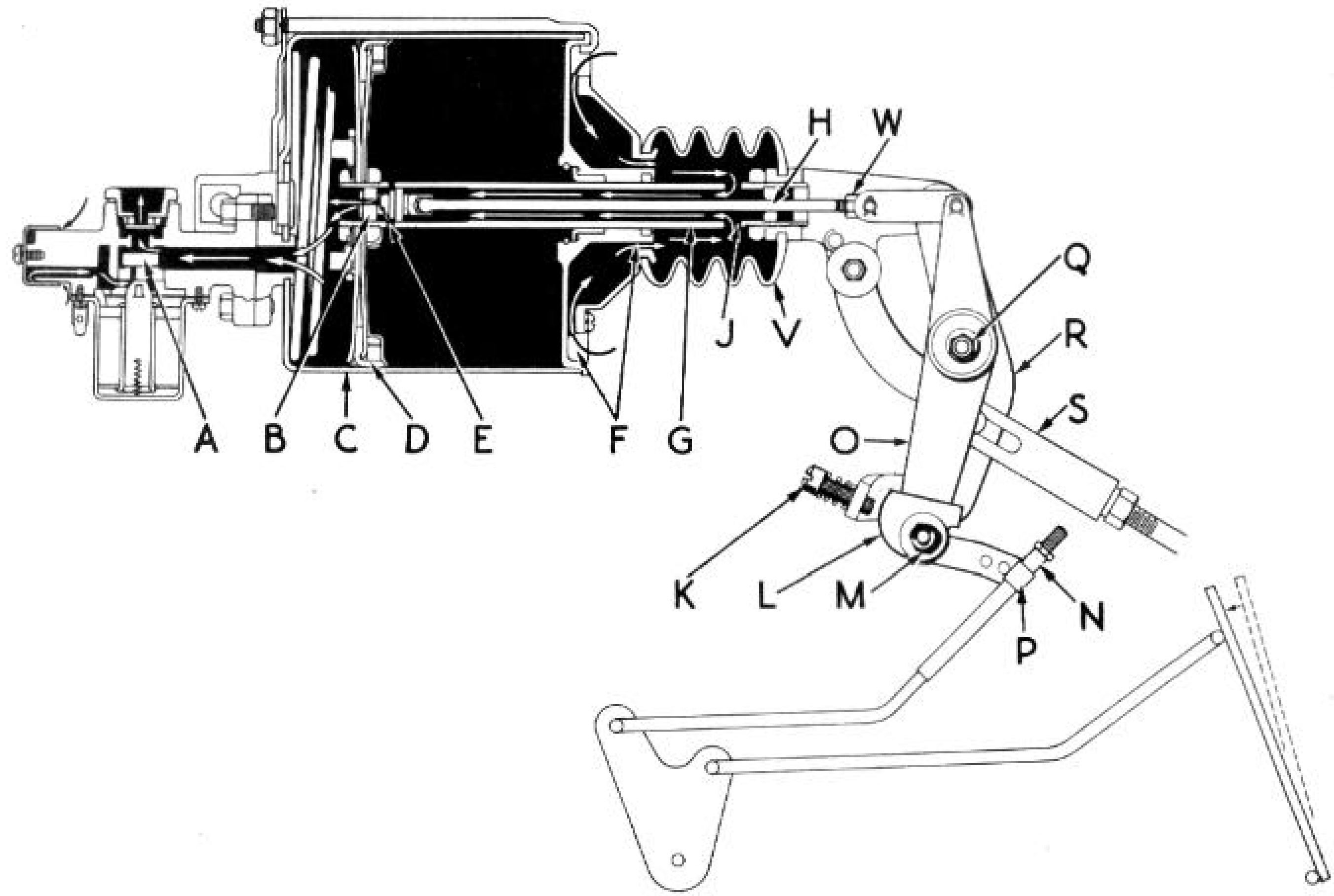


FIGURE 3

ENGAGEMENT

Figure 3 shows the linkage in position of partial throttle opening and the piston in the forward position before engagement has started.

The shoulder (N) on the rod sleeve has pulled the valve cam lever (L) forward moving the piston valve (B) backward.

The valve in moving behind the ports (E) in the piston rod (G), has cut off the entrance at atmospheric air to the rear of the cylinder and opened the ports in the piston rod to give direct passage from the front to the rear of the piston. As the air in the rear of the cylinder flows through the ports to the front of the piston the pressures are equalized and the piston moves freely to the rear through the pull of the clutch engaging springs.

As the piston moves backward, the valve lever cam (L) mounted on the piston rod lever, moves forward. When the cam rests against the stop screw (K), the piston valve is held stationary. The piston continues to move backward and the piston rod ports are partially covered restricting the flow of air from the rear of the cylinder and slowing down the final engagement of the clutch. The point where the retarding of the engagement takes place is known as the cushion point and is determined by the position of the stop screw (K).

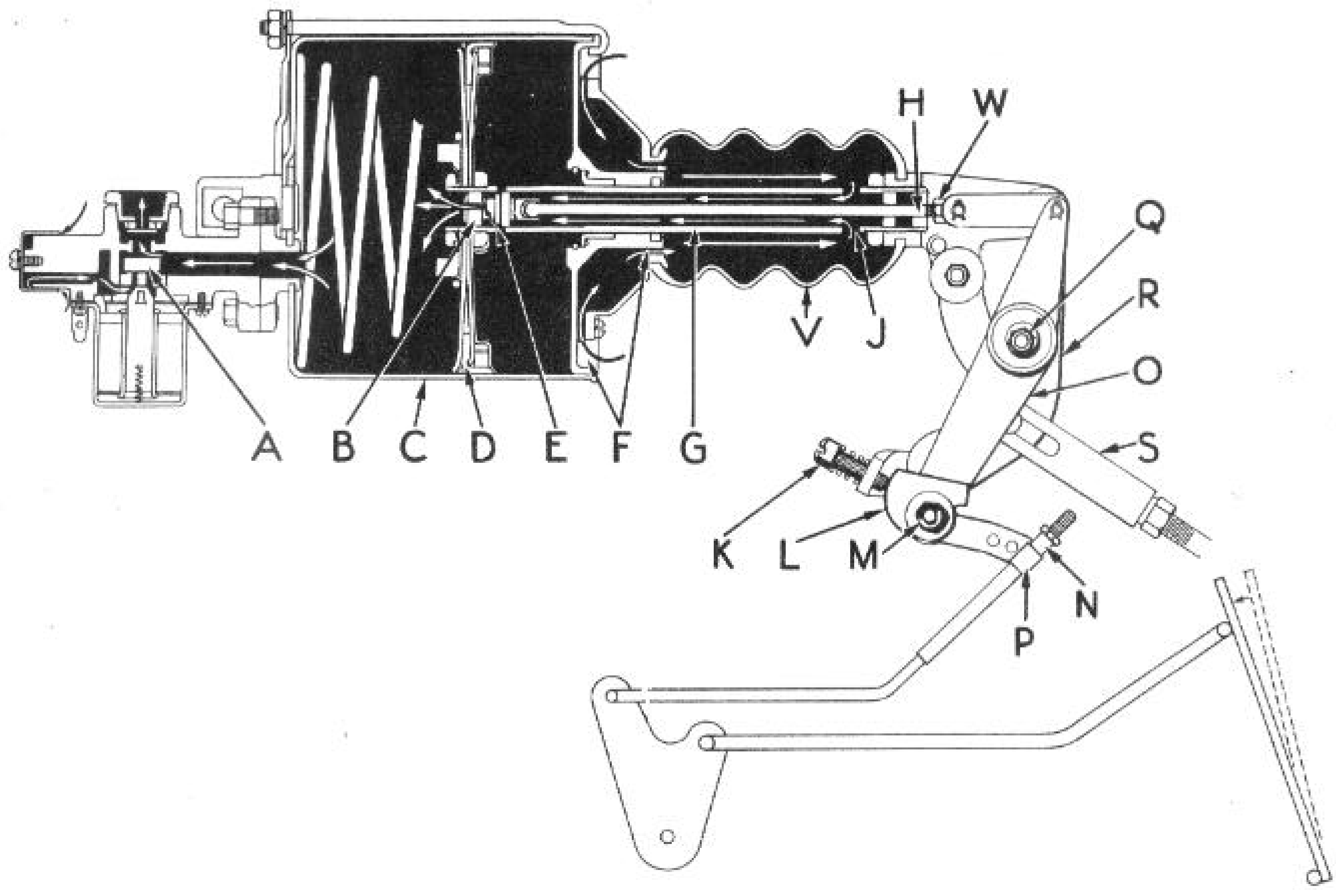


FIGURE 4

CUSHION POINT

Figure 4 shows the conditions at the time the cushion point is reached.

It should also be noted that the further the accelerator pedal is depressed, the greater the rotation of the cam (L). As the cam rotates, greater movement is required before it contacts the stop screw and cushions the final engagement. This prevents excessive engine speed before clutch engagement.

During all the preceding discussion the solenoid valve (A) has been open to the manifold vacuum. It is readily seen that if the solenoid valve were allowed to move upward, closing the passage to the intake manifold and opening the atmospheric passage to the front of the piston, much more rapid clutch engagement would be obtained.

Rapid engagement is required when starting with more than half throttle in first or second gear or when shifting to second or high gear when the vehicle is moving from 16 to 21 miles per hour.

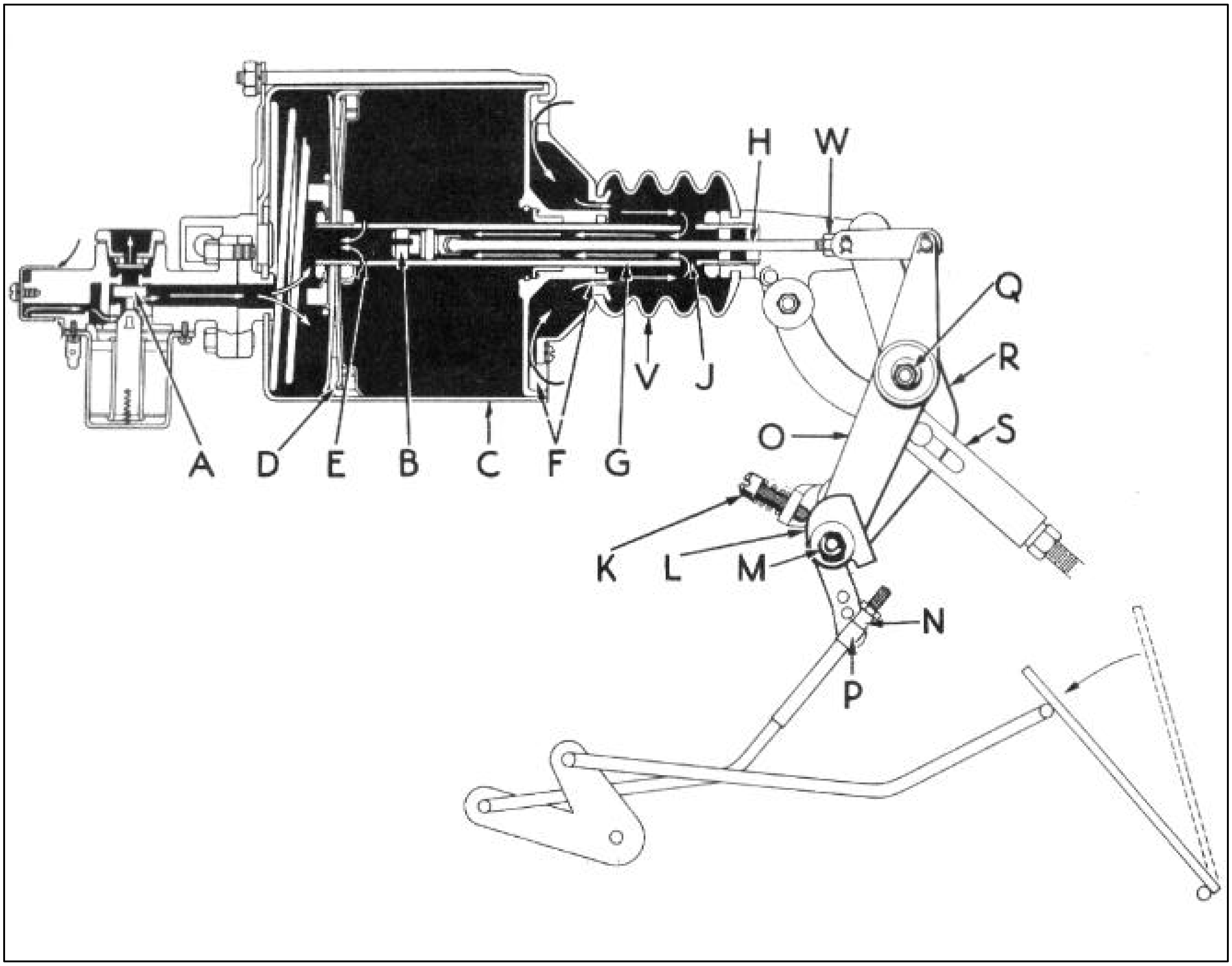


FIGURE 5

Figure 5 shows the conditions at the beginning of such an engagement. The accelerator is depressed to give over half throttle opening.

The piston valve is in its rearward position opening the passages between the front and rear of the piston and the solenoid valve in its upward position.

Figure 6 shows the wiring diagram and the conditions under which the circuits will be opened and the solenoid valve in its upward position as shown in Figure 5.

The circuit through the accelerator switch to the shift rail switch, is closed when the accelerator pedal is in the closed to half throttle position. The shift rail switch is closed except when the transmission is in high gear. The clutch engagement is, therefore, controlled by the piston valve when starting or accelerating in reverse, low or second gear with less than half throttle. When over half throttle is used, the accelerator switch circuit is open and quick clutch engagement is obtained due to the closed solenoid valve as previously explained.

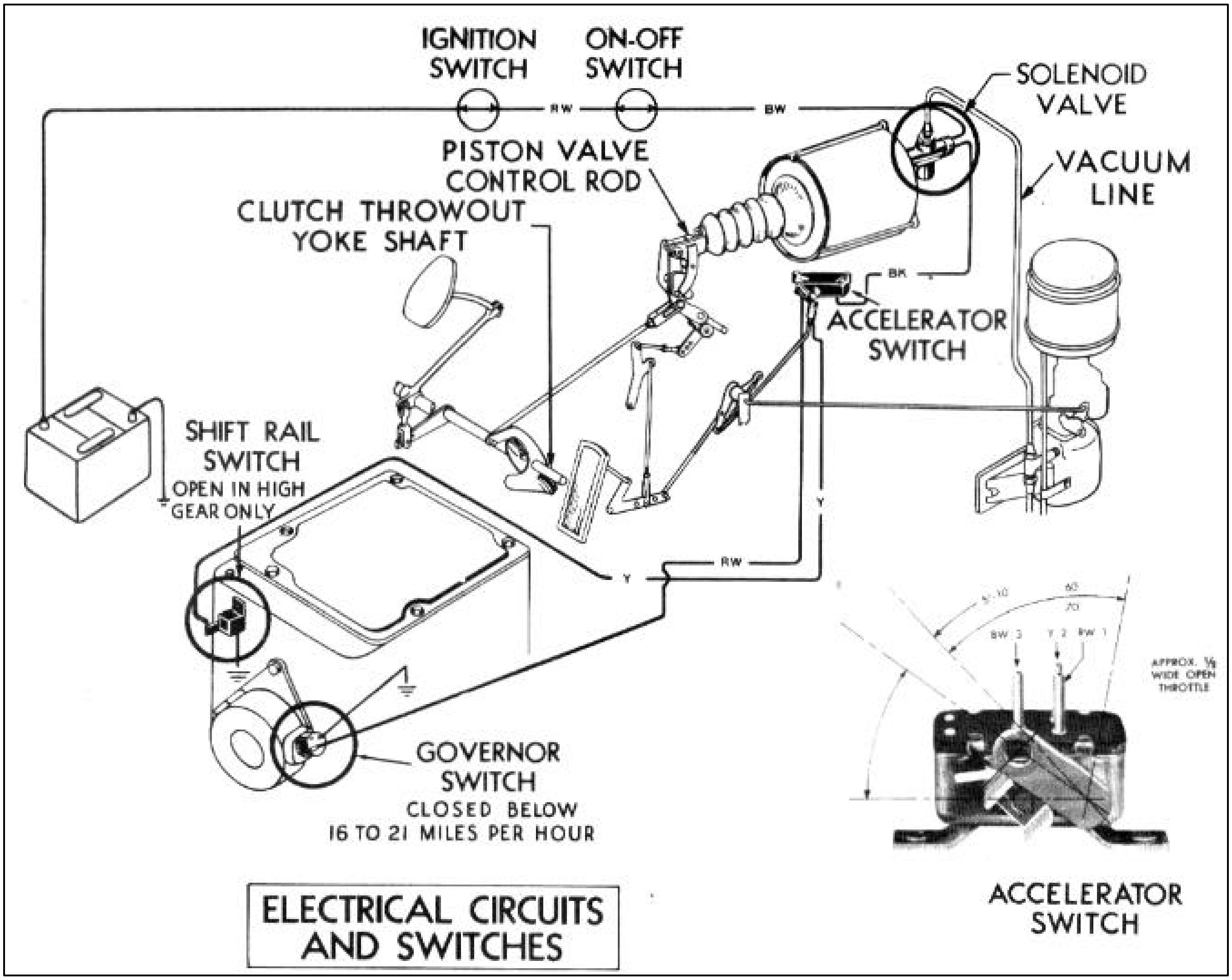


FIGURE 6

It should be noted here that the clutch disengages immediately when the foot is removed from the accelerator pedal, when the transmission is in reverse, low or second gear as the ground circuit is closed by the shift rail switch,

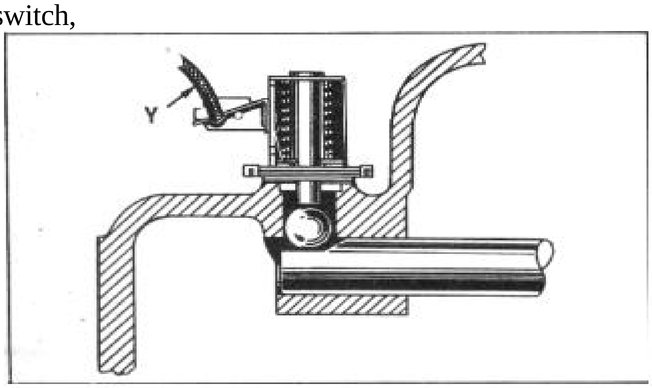


FIGURE 7

Figure 7. This gives a free wheeling effect which is desirable when manuevering the car in these gears.

When the transmission is shifted into high gear, the shift rail switch is open so the only ground from the accelerator switch is through the governor switch. The governor switch is closed to ground at speeds below 16 to 21 miles per hour and open above those speeds.

When shifting into high gear at speeds below 16 to 21 miles per hour the clutch engagement is controlled by the power unit piston valve if the accelerator is depressed only slightly to give less than 100 movement of the accelerator switch arm. Under this condition the circuit is closed through the accelerator switch to the governor ground. This gives a very slow engagement of the clutch.

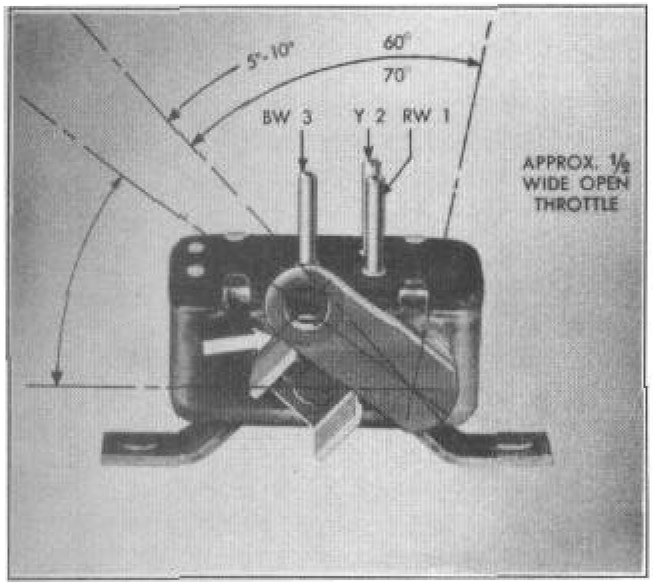


FIGURE 8

The accelerator switch Figure 8 contains two sets of contacts. One point of each set is connected to the (BW#3) terminal. The other point of the sets is connected - one to the (Y#2) terminal and the other to the (RW#1) terminal.

The accelerator switch lever operates both sets of points, when the lever is against the stop (closed throttle position) both sets of points are closed, completing the circuit to both the shift rail switch and the governor.

When the accelerator switch lever is rotated away from the stop, ten degrees, (throttle slightly opened) the points to which the (RW#1) wire (governor) is connected opens, breaking the circuit to the governor.

When the accelerator pedal is depressed to give approximately half open throttle, the accelerator switch arm opens the points (Y#2) connected to the shift rail switch.

Because the circuit to the governor is broken by the accelerator switch before the circuit is broken to the shift rail switch, the governor has no effect on the engagement or disengagement of the clutch except when the shift rail switch is opened by shifting the transmission into high gear.

If the accelerator is depressed sufficient to rotate the accelerator switch arm more than 10 degrees, the circuit through the accelerator switch to the governor switch is opened, the solenoid valve closes and rapid engagement is obtained. This rapid engagement prevents the engine from running above car speed and gives the quick action necessary for maneuverability.

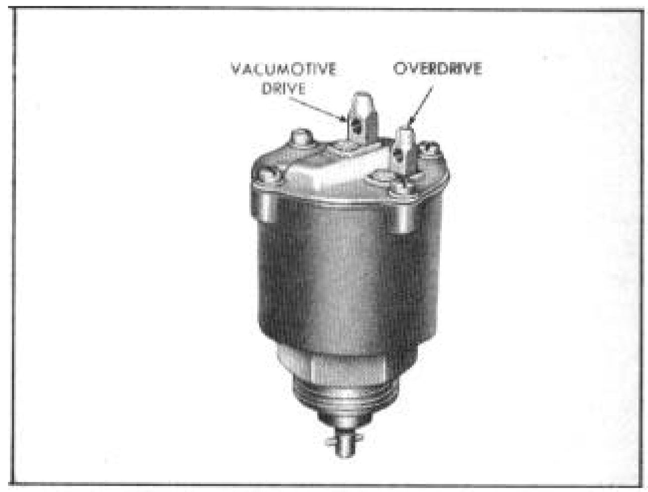


FIGURE 9

The governor switch Figure 9 is operated by the speedometer drive gear located at the rear of the transmission and prevents automatic clutch disengagement when in high gear in speeds over 16 to 21 miles per hour.

NOTE: With the governor switch open above 16 to 21 miles per hour and the shift rail switch open when the transmission is in high gear, the clutch will not disengage when the foot is removed from the accelerator pedal. There is, therefore, no free-wheeling action in high gear above 16 to 21 miles per hour and the engines can be used for braking the car speed in the normal manner.

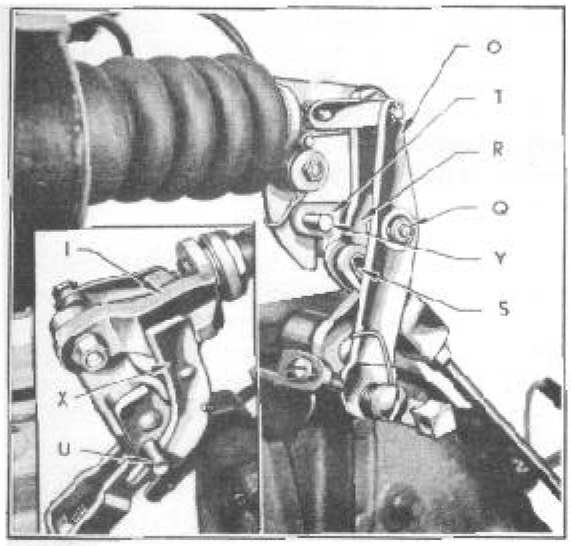


FIGURE 10

CLUTCH VACUUM CONTROL COMPENSATOR

When the engine has stopped, the clutch cork inserts become saturated with lubricant creating a frictional difference in the driving plate corks.

The clutch compensator lever automatically adjusted this condition by changing the rate of engagement.

Attached to the bell crank (R) is a two position compensation lever which turns the eccentric pivot (Q) changing the relation of the valve lever (0) with respect to its pivot point on the bell crank (R).

When first starting the car, the clutch pedal is depressed manually (by the driver's foot) and the action that takes place is--the end of the bell crank yoke (S) strikes the pin (Y) and swings the lever (T) both forward and upward, see Figure 10.

This moves the center of the valve lever pivot backward and permits the clutch to engage farther, to compensate for the cork inserts being covered with oil.

Normal driving position of the compensator lever follows and as soon as the clutch is automatically engaged and after the first shift into high gear, the trip lever (X) which is mounted on the piston rod end (I) will engage the pin (U) and the compensator lever will be rotated back to a position for normal driving. See Figure 10.

The compensator lever must be in an upward position as shown in Figure 10 before making any automatic clutch adjustment.

NOTE: When the compensator is turned up, with clutch disengaged by vacuum the piston rod should move back slightly. If it moves forward, the eccentric is assembled wrong.

ADJUSTMENTS

Do not attempt adjustment of the vacumotive drive until the engine has reached normal operating temperature.

The engine must be in proper tune and should idle smoothly at 580 to 600 R.P.M., when the vacumotive instrument panel knob is at the "on" position.

1. To assure full disengagement of the clutch, a 1-1/2" clearance must be maintained between the floor board and rear face of pedal.

2. Check all joints of throttle linkage and Vacumotive Drive linkage to see that they work freely.

3. Adjust length of accelerator pedal rod (N) to get 4-31/32" between under side of accelerator pedal tip and floor mat.

4. Check that throttle is wide open when accelerator is fully depressed. If throttle is not wide open, recheck instructions No. 2 and No. 3. Release pedal slowly and check that bellcrank arm (0) comes solidly against stop (P).

5. With the accelerator in the released position tion, that is, bellcrank arm (0) against stop (P) loosen screws (D) on accelerator switch and slide forward on the mounting bracket until lever arm (C) bottoms against stop on switch. Tighten screws.

6. Set the brakes; place the remote control lever in the neutral position; depress clutch pedal and start engine, holding clutch pedal down until Vacumotive Drive Cylinder takes up load.

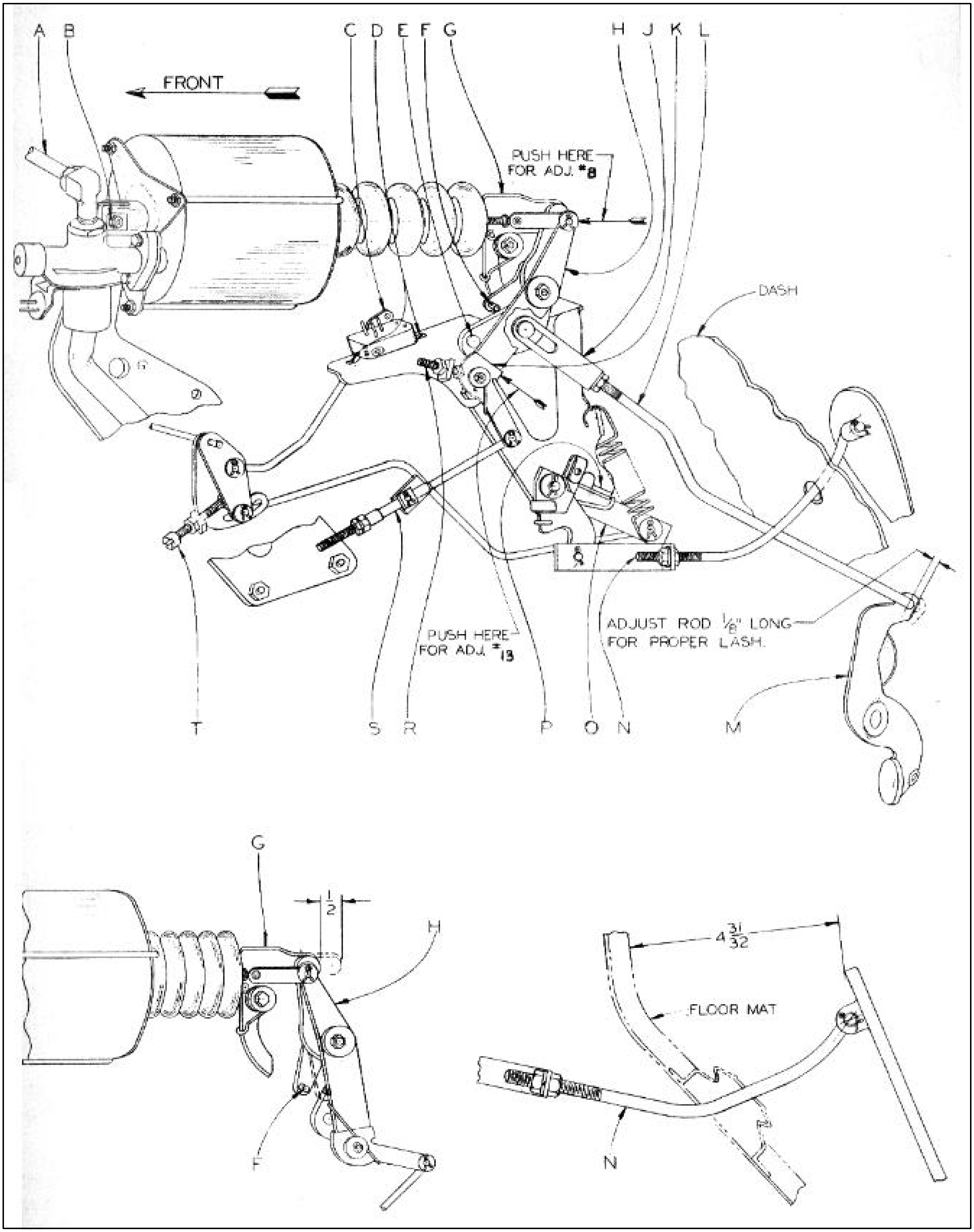

A
B
C
D
E
F
G
H
J
K
L
FRONT
PUSH HERE FOR ADJ. #8
DASH
ADJUST ROD 1/8" LONG FOR PROPER LASH.
PUSH HERE FOR ADJ. #13
T
S
R
P
O
N
M
G
1/2
H
F
4 31/32
FLOOR MAT
N

FIGURE 11

7. Run engine until normal operating temperatures are reached. With Vacumotive Drive control on, check the engine idle speed. This should be 580 to 600 R.P.M.

8. Adjust threaded sleeve (S) until piston is 1/2" from its extreme forward position; this is checked by pushing on valve lever (H) as indicated by arrow, and then releasing.

9. Pushing lever down to its normal running position will cause piston to move forward. If piston moves backward, the eccentric is assembled upside down.

10. Back out cam adjusting screw (R) until there is approximately 1/2" gap between cam and screw.

11. Stop the engine. Push piston rod (G) all the way out. Check for the required 1/8" lash in the clutch pull rod by pulling the rod (L) up and forward. If lash is correct, front end of slotted clevis (J) will touch compensator lever pin (F).

12. Depress clutch pedal (IMPORTANT) and start engine; do not race engine. Put transmission in second gear and release the brakes. Slowly rotate accelerator bell- crank (0) until clutch drags. Adjust throttle cross shaft screw (T) until there is a slight increase in engine speed to 800-1000 R.P.M. at the time car begins to move.

13. Stop engine; depress clutch pedal (IMPORTANT) and restart engine--Do not race engine. Set the brakes leaving the transmission in second gear. Screw cam adjusting screw (R) in fully. Push cam (K) against screw, as shown by arrow, and back out adjusting screw (R) until engine stalls.

14. Road check this adjustment for slow and fast starts as follows:

a. To check slow start, depress accelerator pedal very slowly -- engine should speed up slightly just before car starts to move. If necessary, adjust screw (T) to meet this requirement.

b. To check fast start, depress accelerator pedal 1/2 way to floor--car should move forward smoothly without excessive slipping of clutch. If necessary adjust screw (R) "in" or "out" to meet this requirement. Do not screw (R) "in" toward cam more than two (2) turns from No. 13 adjustment setting.

IMPORTANT: Note that adjustments 8, 12, and 13 are made with the compensator in the starting position, that is, with pin (F) forward as shown in solid lines in partial view.

CAUTION: Too frequent operation of the clutch will cause it to become overheated, making satisfactory adjustment impossible.

NOTE: In high gear, Vacumotive Drive must automatically become inoperative at a speed of 16 M.P.H. Min. to 21 M.P.H. Max. and remain inoperative at all higher speeds.

LUBRICATION

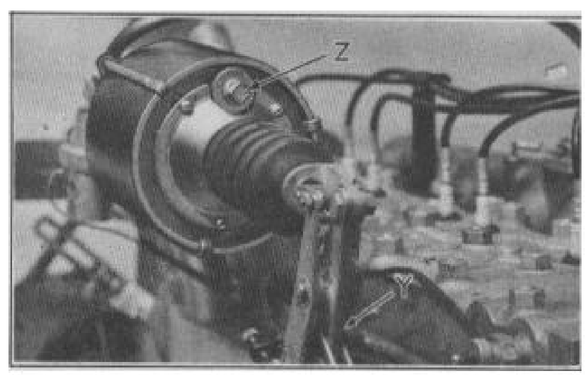
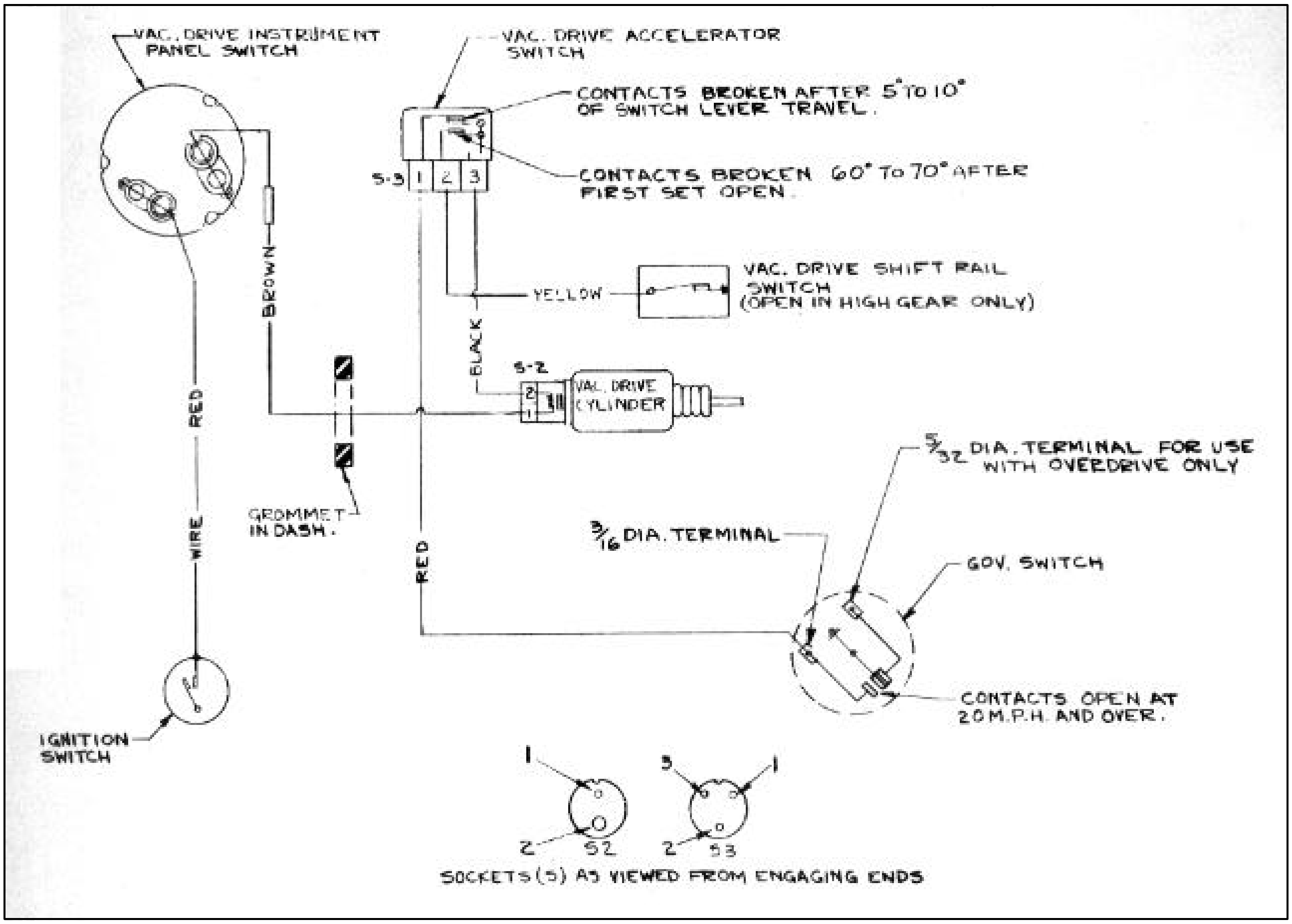


FIGURE 12

1,000 miles

At intervals of 1,000 miles all pivot points in the mechanism should be lubricated with a few drops of light engine oil. Be sure to put a few drops of oil in the bell-crank bracket oil hole (Y) Figure 12.



10,000 MILES

At intervals of 10,000 miles, remove pipe plug (Z), Figure 12 in rear end of power cylinder, and spray one ounce of Hudson Shock Absorber Fluid through plug opening.

TROUBLE SHOOTING

CONDITION NO. 1

CLUTCH DOES NOT DISENGAGE

A. Check vacuum lines for leaks or collapsed hose.

B. Remove plug (2 cont act) at Vacumotive Drive Solenoid Figure 14 and connect test lamp between No. 1 socket of plug and ground. When ignition and Vacuum Drive switches are turned "ON", lamp should light.

C. If light does not light, check instrument panel switch (Unit Check B) "UNDER UNIT CHECKS", Pages 15 and 16.

FIGURE 14

NOTE: On H.D.M. equipped cars, also check fuse at rear of instrument panel switch.

D. If light does not light, check connector in wire from switch to unit located six inches from instrument panel switch and also feed wire from ignition switch to instrument panel switch.

E. Connect test lamp between # 2 socket of plug and battery negative post; lamp should light. If lamp does not light, move test lamp t o # 2 socket of accelerator switch plug. Now if lamp does not light, shift rail switch (Unit Check J) or the wire in the harness is defective.

NOTE: Above check to be made with gear shift lever in neutral.

F. If lamp lights, check for defective accelerator switch plug (Unit Check A). If plug is OK, check accelerator switch (Unit Check C).

G. If above checks show completed circuits, check for defective Vacumotive Drive Solenoid or connections (Unit Check E).

CONDITION NO. 2

CLUTCH DOES NOT DISENGAGE WHEN COMING TO A STOP

A. See adjustment instructions #2, #4, and #5.

B. If above adjustments are OK, remove plug at accelerator switch and connect test lamp between #1 socket of plug and battery negative post. Lamp should light.

C. If lamp does not light, check plug (Unit Check A) or connections at governor switch.

D. If plug connections at governor are OK, ground wire at governor switch. With test lamp still connected as indicated above, a light indicates a defective governor (Unit Check F), no light indicates a defective harness.

E. If lamp lights, (in test B), check plug (Unit Check A) at accelerator switch. If plug is OK, accelerator switch is defective (Unit Check C).

CONDITION NO. 3

CAR FREE WHEELS AT ALL SPEEDS IN HIGH GEAR

Use procedure as outlined under "Condition No. 2", Items B, C, D, and E.

CONDITION NO. 4

TOO MUCH ENGINE SPEED ON START

See "Adjustment Instructions", Item 14, Page 12.

CONDITION NO. 5

ENGINE STAGGERS OR STALLS ON START

See "Adjustment Instructions", Item 14, Page 12.

CONDITION NO. 6

CLUTCH CHATTERS ON ENGAGEMENT

See "Adjustment Instructions", Item 14, Page 12.

NOTE: Less engine speed as car starts to move will reduce chatter. If chatter persists, check clutch operation in manual drive

CONDITION NO. 7

ENGINE STALLS ON FAST STOP

A. Time up engine and if necessary, follow instructions under "Condition No. 2" A through E, Page 14.

B. Check to see that car starts to free wheel at not less than 16 M.P.H. If car does not free wheel at less than 16 M.P.H. when in high gear, check drive pinion for proper number of teeth. If pinion is OK, check governor (Unit Check F).

CONDITION NO. 8

HARD SHIFTING AND GEAR CLASH

Above complaint is due to incomplete clutch disengagement. See "Vacumotive Drive Adjustments", Items 8 and 11, Page 12.

UNIT CHECKS

A. PLUG CHECK

Insert 1/8" diameter rod successively into each socket of plug for a distance of 1/4". Socket should grip tightly enough to make a good electrical contact.

Use a 5/32" diameter rod in the No. 2 socket of Vacumotive Drive Solenoid.

B. INSTRUMENT PANEL SWITCH -VACUMOTIVE DRIVE

Ignition switch on. Ground long lead of test lamp. Switch button turned to "Vacumotive Side". Test lamp prod to Vacumotive Terminal (1) wire should light test lamp.

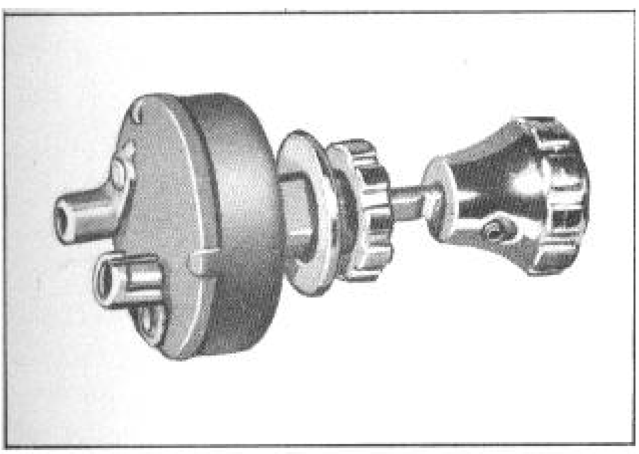


FIGURE 15

C. ACCELERATOR SWITCH

Remove connector plug. Ground one lead of jumper wire, other lead to #2 prong of accelerator switch. Long lead of test lamp to negative terminal of battery. Test lamp prod to #1 prong of accelerator switch, should light test lamp. Moving lever 10 degrees from stop, light should go out. Test lamp prod to #3 prong, should light test lamp. Moving lever 2/3 from stop, light should go out.

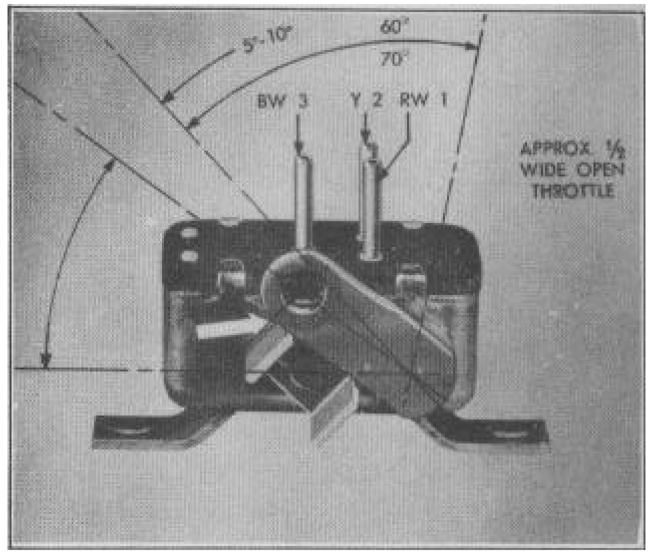


FIGURE 16

D. SHIFT RAIL SWITCH

Long lead of test lamp to negative terminal of battery. Prod of test lamp to #2 socket of accelerator switch. Shift handy shift. No light on high gear, lamp lights on all others. Replace connector socket.

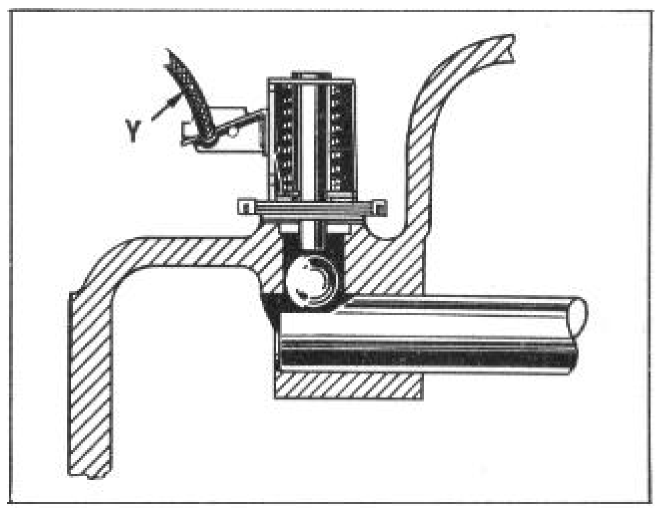


FIGURE 17

E. VACUMOTIVE DRIVE SOLENOID

Remove connector socket. Ground one lead of jumper wire, other lead to #2 prong of solenoid. Long lead of test lamp to negative terminal of battery. Test lamp prod to #1 prong of solenoid, valve should operate, test lamp should light dim. Replace connector socket.

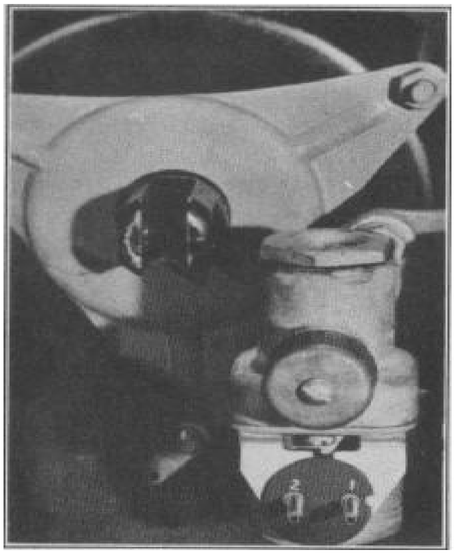


FIGURE 18

F. GOVERNOR SWITCH

A check of the governor switch c an b e made in road-test. Be sure (R.W.) wire is attached to the governor. Accelerate to speed of 30 M.P.H. in high gear and release the accelerator pedal. Rest the foot lightly on the clutch pedal. As the speed drops to 16 to 21 miles per hour, the clutch should be felt to release.

NOTE: On cars equipped with Drive-Master refer to "Governor Switch Check" under Drive- Master Unit Checks.

If the clutch does not engage at this speed, or if the clutch disengages at all times in high gear, replace governor switch.

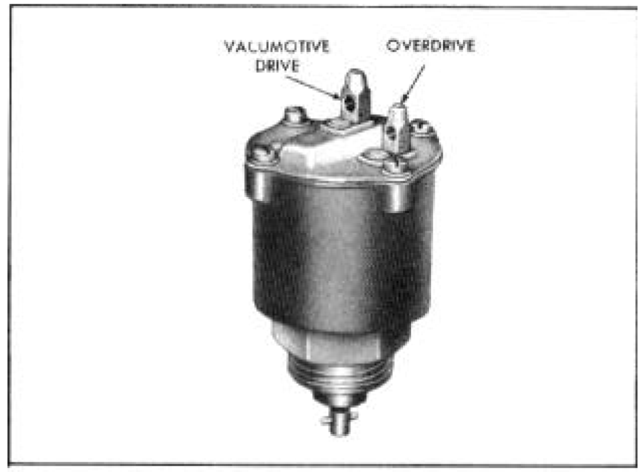


FIGURE 19

A separate terminal for use with overdrive, should light test lamp at speeds above 16 to 21 miles per hour.

SECTION 9

TRANSMISSION

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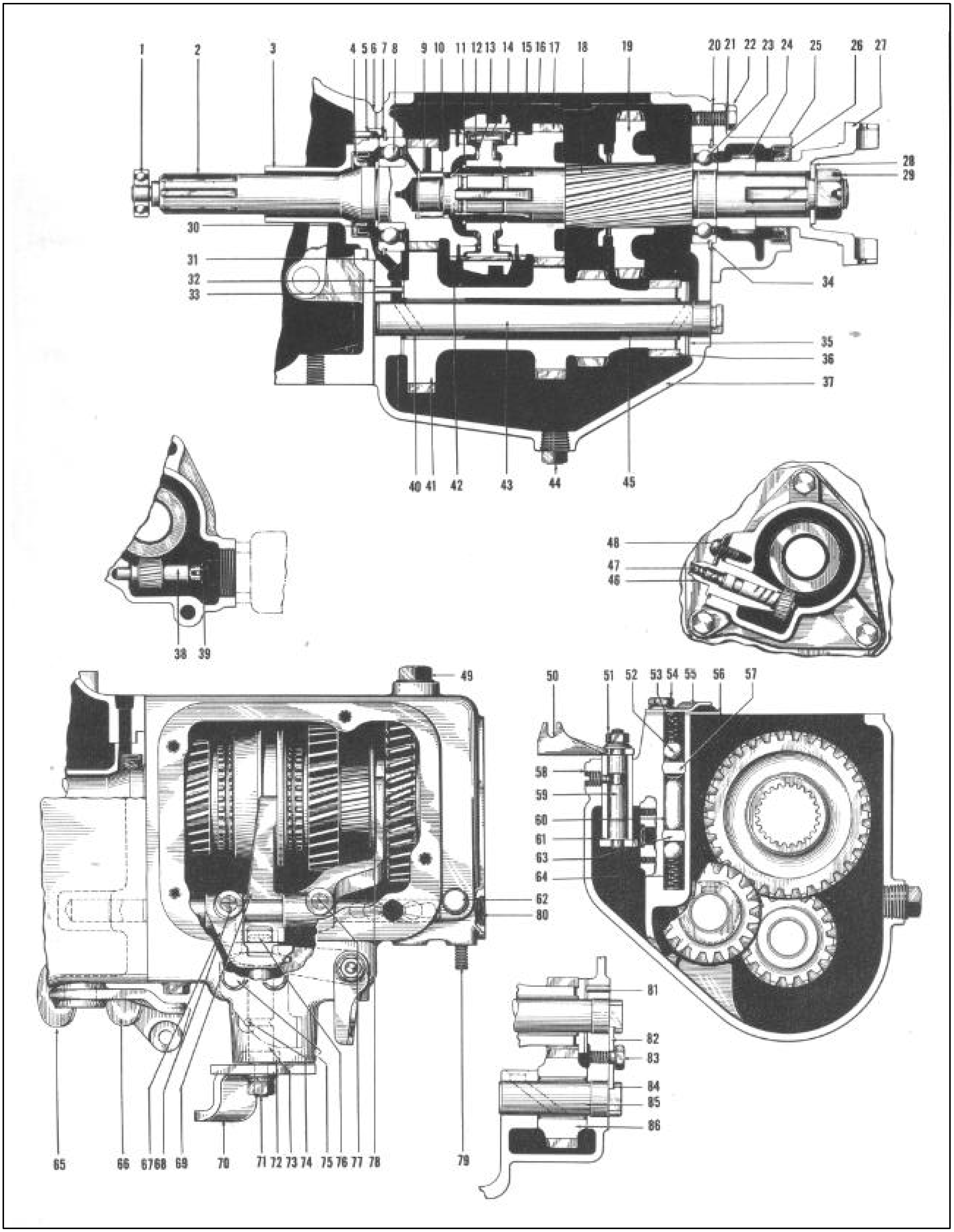
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86

FIGURE 1

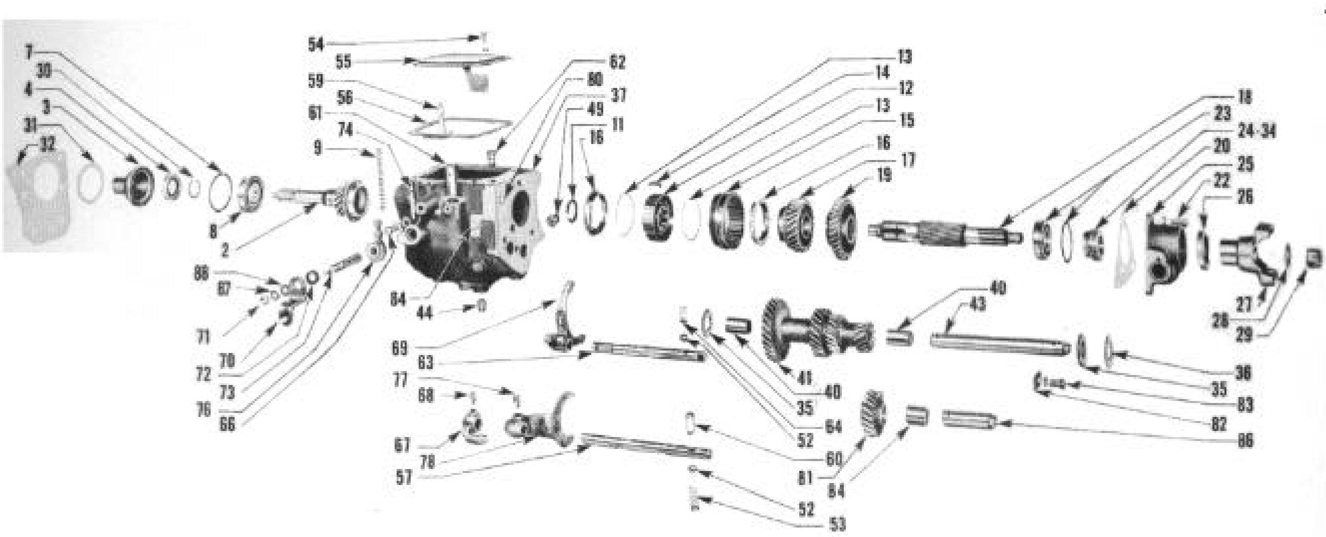

FIGURE 2

1. Gear Pilot Bearing
2. Main Drive Gear
3. Gear Bearing Retainer
4. Gear Oil Seal
5. Retainer Locating Pin
6. Clutch Housing
7. Washer Pin Front
8. Gear Bearing
9. Shaft Pilot Bearing
10. Main Shaft Needle Roller Re tainer
11. Shift Hub Lock Ring
12. Synchronizer Shift Sleeve Hub
13. Synchronizer Spring (2 places)
14. Synchronizer Shift Plate
15. Synchronizer Shift Sleeve
16. Synchronizer Ring (2 places)
17. Shaft Intermediate Gear
18. Main Shaft
19. Shaft Lower and Re- verse Gear
20. Gear Housing Gasket
21. Speedometer Gear Hous- ing Washer
22. Gear Housing Bolt (3 places)
23. Shaft Rear Bearing
24. Speedometer Gear
25. Speedometer Gear Housing
26. Gear Housing Oil Seal
27. Companion Flange
28. Flange Washer
29. Flange Nut
30. Gear Lock Ring
31. Retainer Gasket
32. Case Gasket
33. Washer Pin Front
34. Main Shaft Snap Ring
35. Cluster Thrust Washer
36. Cluster Steel Washer
37. Case
38. Governor Gear OD HDM CVC
39. Governor Gear Ring OD HDM CVC
40. Cluster Bushing Front
41. Countershaft Gear Cluster
42. Main Drive Gear (clutch gear)
43. Countershaft
44. Drain Plug
45. Cluster Bushing Rear
46. Speedometer Cable
47. Speedometer Pinion
48. Speedometer Cable screw
49. Filler Plug
50. Selector Lever Outer
51. Selector Shaft Nut
52. Rail Lock Ball (2 places)
53. Rail Lock Spring Low and Reverse
54. Cover Screw
55. Transmission Cover
56. Cover Gasket
57. Low and Reverse Shift Rail
58. Bushing Set Screw
59. Shift Selector Lever
60. Shift Rail Interlock
61. Selector Shaft Bushing
62. Breather
63. High and Second Shift Rail
64. High and Second Ball Spring
65. Clutch Throw Out Lever
66. High and Second Rail Stop Screw
67. Low and Reverse Shifter
68. Low and Reverse Shifter Set Screw
69. High and Second Shift Fork
70. Shift Lever Outer
71. Shift Shaft Nut
72. Shift Shaft Seal
73. Shift Shaft
74. Shift Shaft Pin
75. Shifter Control Wire Bracket Screw
76. Shift Lever, Inner
77. Low and Reverse Fork Set Screw
78. Low and Reverse Shift Fork
79. Case Stud
80. Expansion Plug
81. Washer Pin Rear
82. Counter Shaft Lock Plate
83. Lock Plate Screw
84. Idler Gear Bushing
85. Idler Gear Shaft
86. Reverse Idler Gear

SPECIFICATIONS

GEAR RATIO

All Series Without Drive-Master		All Series With Drive-Master
2.61 to 1	Low	2.88 to 1
1.65 to 1	Second	1.82 to 1
1 to 1	High	1 to 1
3.17 to 1	Reverse	3.5 to 1

TEETH

Countershaft Gear Cluster

2.61 to 1 Ratio	
C/S Drive	25 teeth
C/S Intermediate	21 teeth
C/S Low	17 teeth
C/S Reverse	14 teeth

Countershaft Gear Cluster

2.88 to 1 Ratio	
C/S Drive	26 teeth
C/S Intermediate	21 teeth
C/S Low	17 teeth
C/S Reverse	14 teeth

Main Drive Gear

		18 teeth
2.61 to 1 Ratio	18 teeth	17 teeth
2.88 to 1 Ratio	17 teeth	

Mainshaft - Intermediate

		25 teeth
Helical	25 teeth	30 teeth
Clutch	30 teeth	

Mainshaft - Low and Reverse

	32 teeth
External	24 teeth
Spline Internal	

END PLAY

Countershaft	.006" to .016"
Mainshaft Intermediate Gear & Synchronizer	.003" to .016"

BEARINGS AND BUSHINGS

Main Drive Gear	Ball
Mainshaft Pilot	Needle Roller
Mainshaft Rear	Ball
Reverse Idler Gear	Steel Back Tin Base
Countershaft Gear	Steel Back Tin Base

SPEEDOMETER DRIVE GEAR

	Axle Ratio	Tire Sizes	Teeth
Less Overdrive	4-1/10	7.10-15	10
	4-1/10	7.60-15	11
	4-5/9	All	11
With Overdrive	All	All	11

SPEEDOMETER PINIONS

Axle Ratio	Tire Sizes	Teeth
4-1/10	7.10-15	15
4-1/10	7.60-15	16
4-5/9	7.10-15	18
4-5/9	7.60-15	11

SPEEDOMETER CABLE

Without Overdrive	58"
With Overdrive	64"

LUBRICATION

Capacity of transmission is 2-1/4 pints or pounds if disassembled an d parts washed. Capacity of transmission is 2 pints or pounds is drained and refilled. S.A.E. 90 E.P. Summer. S.A.E. 80 E.P. Winter.

TRANSMISSION REMOVAL FROM CAR

1. Remove front seat cushion.

2. Remove the four bolts attaching the bottom of front seat frame to seat track. Remove two screws attaching seat adjusting lever to seat frame and remove seat back from car.

3. Disconnect accelerator pedal at accelerator rod.

4. Remove foot brake pedal rod from brake lever.

5. Pull the steering column hole rubber grommet up out of the way.

6. Remove the floor mat.

7. Remove Hudson Weather Control blower unit held by 4 screws, (2 each side) Remove Bowden wire at weather control valve at cylinder head.

8. Remove the floor opening cover over the transmission.

9. Disconnect the front universal joint at transmission. Remove screws attaching center bearing support bracket and move propeller shaft rearward to clear transmission companion flange.

NOTE: Use a wire or rubber band to prevent the trunnions from slipping off the "U" joint spider.

10. Disconnect the clutch pedal lever return spring.

11. Remove the two clutch cross shaft bracket bolts and remove clutch cross shaft bracket.

12. Remove the clutch control link clevis pin and unhook clevis.

13. Remove shifter shaft outer lever, nut and washer, this will disconnect the linkage connecting the Gear Shift to the transmission.

14. Remove 2 screws and remove flywheel guard from bottom of clutch housing.

15. Remove the two engine rear mounting bolts and nuts at #3 crossmember.

16. Jack up rear end of engine about off the frame.

CAUTION: Place a block of wood under head of jack to prevent damage to the oil pan.

17. Disconnect speedometer cable at transmission and install wood plug.

18. Remove the two top screws holding clutch housing to engine endplate and install two headless screws or studs to support the transmission until the balance of the screws are removed.

19. Remove breather pipe bracket from clutch housing and bolt attaching breather pipe and rear tappet cover.

20. Pull transmission and clutch housing back towards the rear and up through the floor opening. Hoist J-1502 will be helpful in handling the assembly.

DISASSEMBLY OF TRANSMISSION

NOTE: Refer to the Overdrive Section for removal of overdrive unit on cars so equipped. Unless otherwise specified, all reference numbers shown in text are outlined in Figures 1 and 2.

1. Remove the six screws that hold clutch housing to the transmission case and detach the clutch housing and attached clutch throw-out shaft, yoke, sleeve and bearing assembly from the transmission.

2. Remove drain plug at bottom of case and drain lubricant. Place case assembly in Holding Fixture J-1584 and bolt securely at front end of case with two clutch housing cap screws, Figure 3.

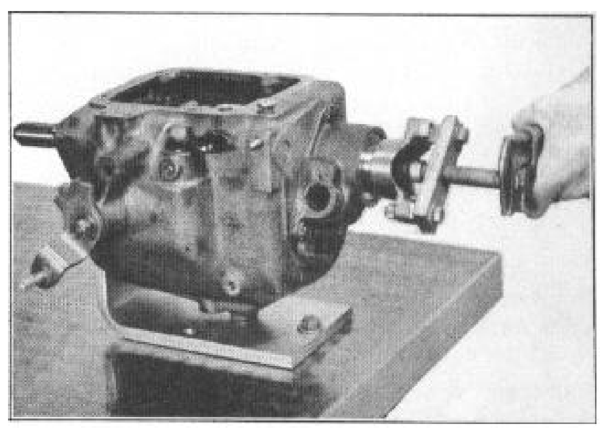

FIGURE 3

3. Remove governor at speedometer gear housing on cars equipped with Over-drive, Drive Master or Vacumotive Drive.

4. Remove universal joint companion flange nut and companion flange from mainshaft.

DO NOT HAMMER. Use Universal Joint Companion Flange Puller to remove a tight flange from mainshaft, Figure 3.

5. Remove four screws and lockwashers and lift transmission cover off cautiously to prevent the shift rail lock spring from jumping out. Remove the spring and lock ball.

6. Flush out and thoroughly clean inside of case and gears.

7. Remove speedometer gear housing cap screws and speedometer gear housing using care to prevent damaging the housing oil seal. Remove the speedometer drive gear.

8. Remove 2nd and high shift rail stop screw.

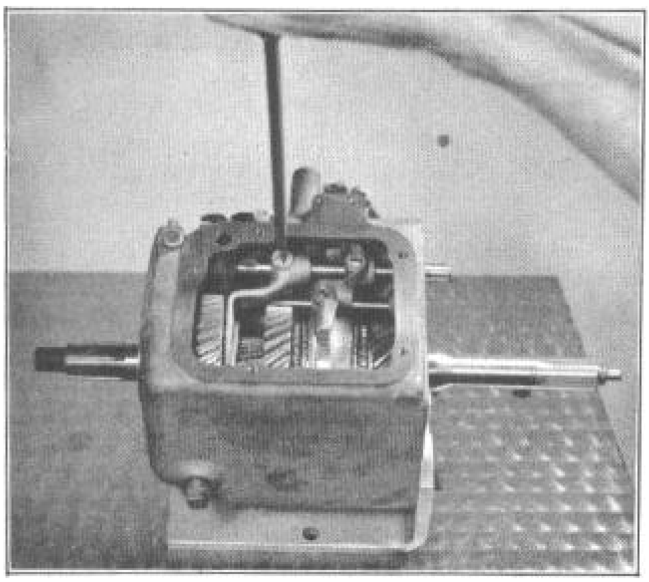

FIGURE 4

9. Remove lock screw from low speed shifter fork and lock screw from the low speed shifter, Figure 4.

NOTE: To remove these special self-locking screws, use a screw-driver having a straight blade or a blade with a slightly reverse taper that will enter to bottom of screw slot

"DO NOT USE A TAPERED BLADE SCREW DRIVER."

10. Slide low and reverse shift rail out of front of case, then remove shift fork and shifter, also the shift rail interlock.

11. Remove the set screw from 2nd and high shift fork, then slide the shift rail out of front of case. Remove the lock ball and spring from case.

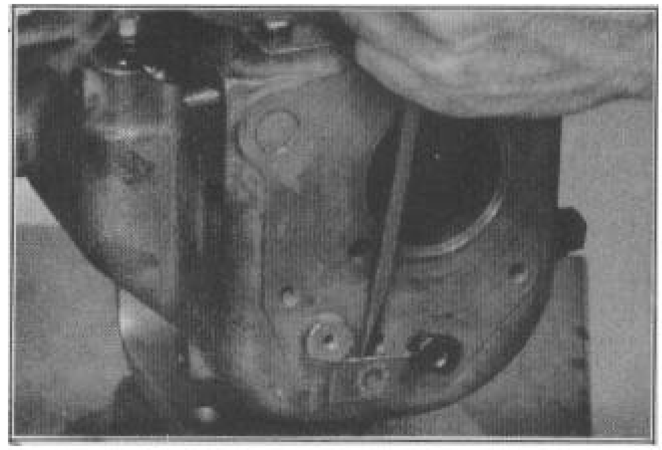

FIGURE 5

12. Remove screw and countershaft and reverse idler gear shaft lock plate, Figure (5).

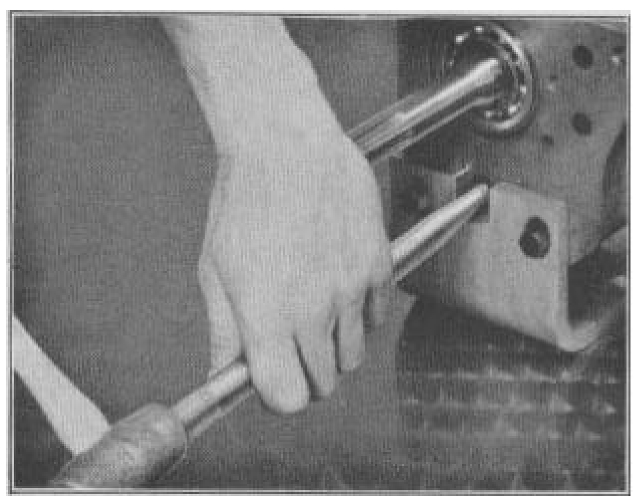

FIGURE 6

13. Drive countershaft out of rear end of case with Bronze Driver J-1574, Figure 6. Countershaft gear can now be lowered to bottom of case.

14. Pull main shaft rearward by hand far enough to provide clearance for bearing puller jaws behind bearing or bearing retainer snap ring. If shaft does not move rearward easily, temporarily reinstall the companion flange and with a soft hammer tap the flange carefully rearward until above clearance is obtained.

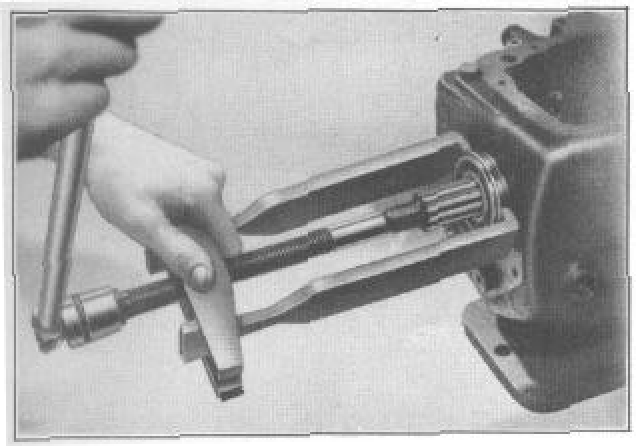

FIGURE 7

15. Pull bearing from mainshaft with puller J-1134-H, Figure 7.

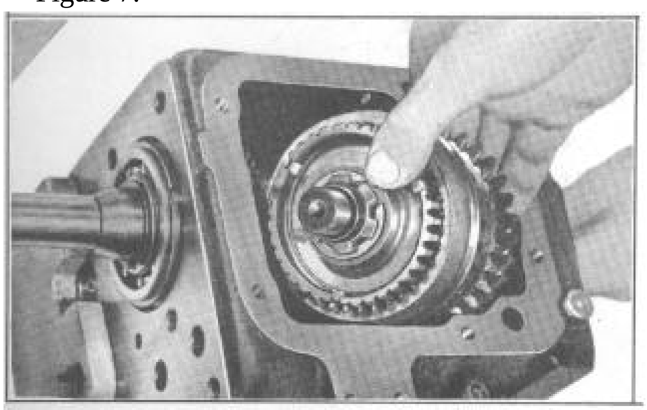

FIGURE 8

16. Pull mainshaft rearward and main drive gear forward until mainshaft is fully withdrawn from needle roller pilot bearing in rear end of main drive gear. Move synchronizer shift sleeve into 2nd speed position and low reverse sliding gear as far rearward as it will go, then lift mainshaft assembly out through cover opening in case, Figure 8.

a. Disassemble mainshaft assembly on the bench by first sliding the low reverse gear off the shaft.

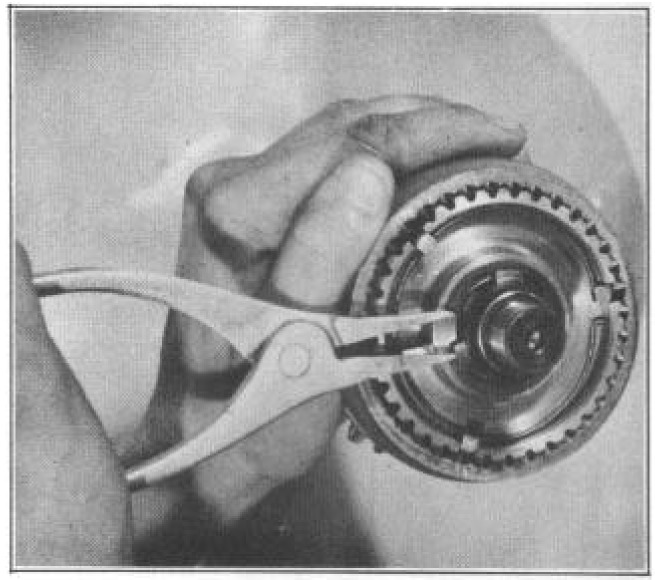

FIGURE 9

b. Remove shift sleeve hub lock ring with special pliers, KMO-630, Figure 9.

17. Pull main drive gear forward far enough to clear bearing retainer snap ring. Remove snap ring, then bump the drive gear forward and lift out through cover opening in case.

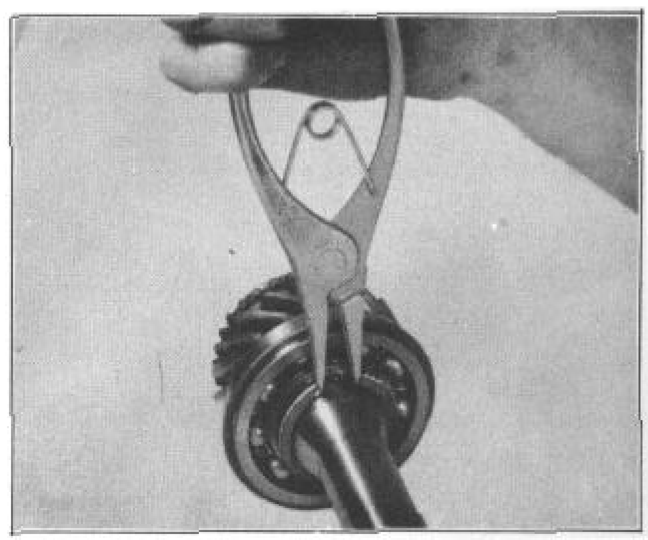

FIGURE 10

a. To remove the bearing from main drive gear, remove the main drive gear lock ring. Figure 10.

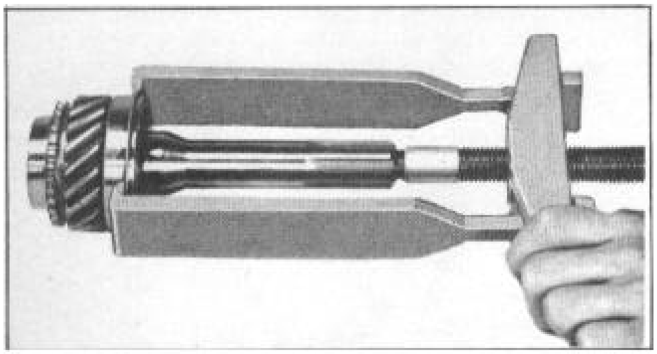

FIGURE 11

b: Remove main drive gear bearing using Puller J-1134-H with cup type, adaptor on puller screw, Figure 11.

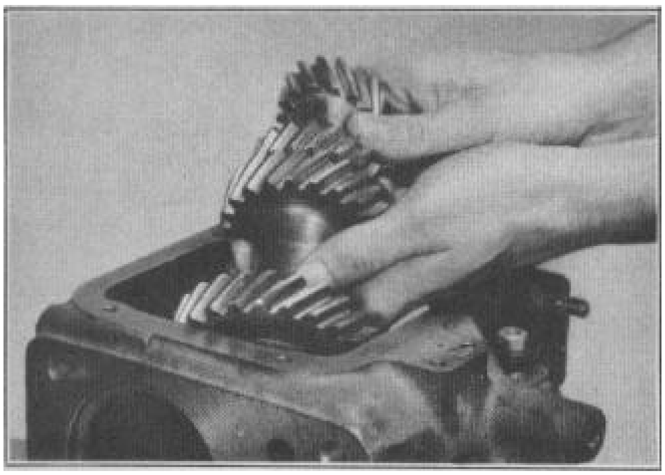

FIGURE 12

18. Remove shift shaft inner lever.

19. Remove countershaft gear cluster, one thick steel thrust washer, and two bronze thrust washers through cover opening, Figure 12.

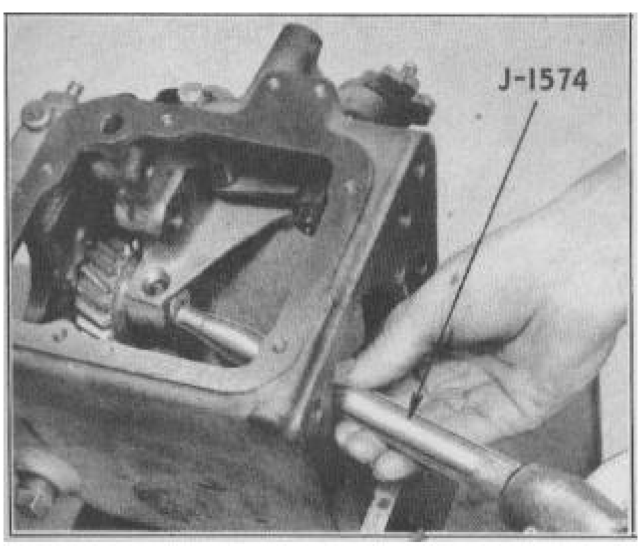

FIGURE 13

20. Working through mainshaft bearing hole in front face of case drive-out reverse idler gear shaft with Driver J-1574, Figure 13. When shaft is driven all the way out, lift reverse idler gear from case.

21. Remove shift selector shaft nut and washers, lift off selector outer lever.

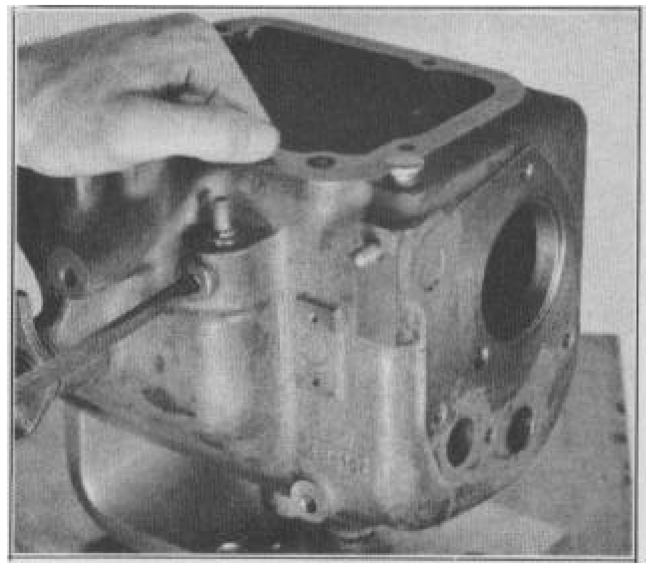

FIGURE 14

22. Remove shift selector shaft set screw, Figure 14.

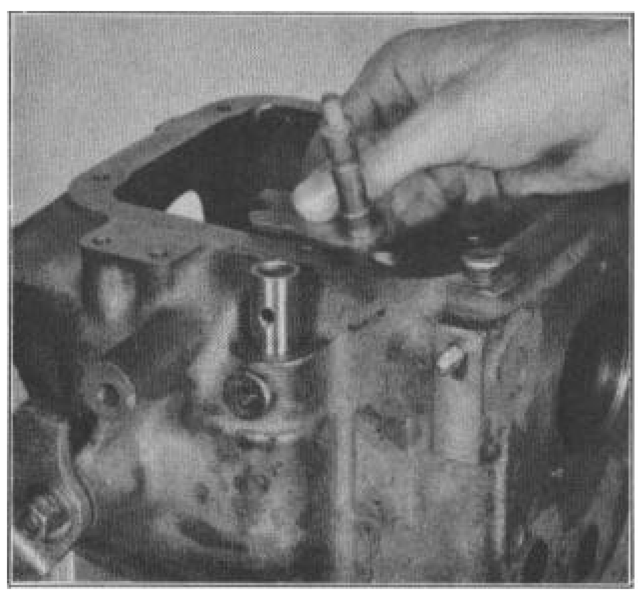

FIGURE 15

23. Remove shift selector shaft from inside of case. Remove steel bushing by pulling upward, Figure 15.

24. Remove shift shaft outer lever after removing nut and washers.

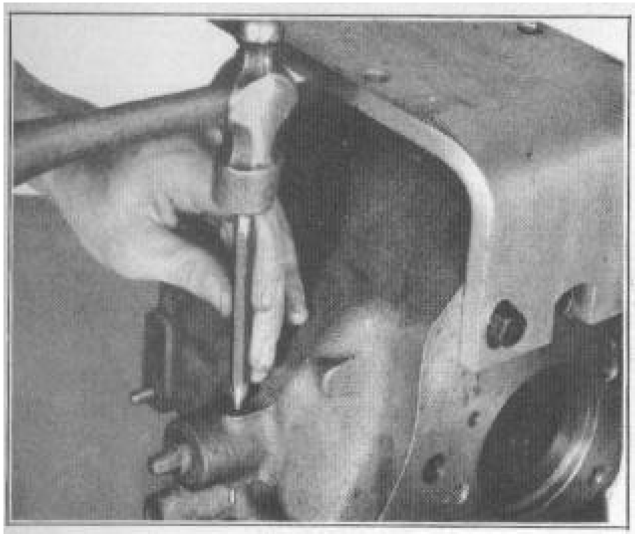

FIGURE 16

25. Remove shift shaft tapered pin, Figure 16, with pin punch and then withdraw shift shaft and shaft seal.

REPLACING MAIN DRIVE GEAR OIL SEAL

26. Remove main drive gear bearing retainer by bumping it rearward out of housing, Figure 17.

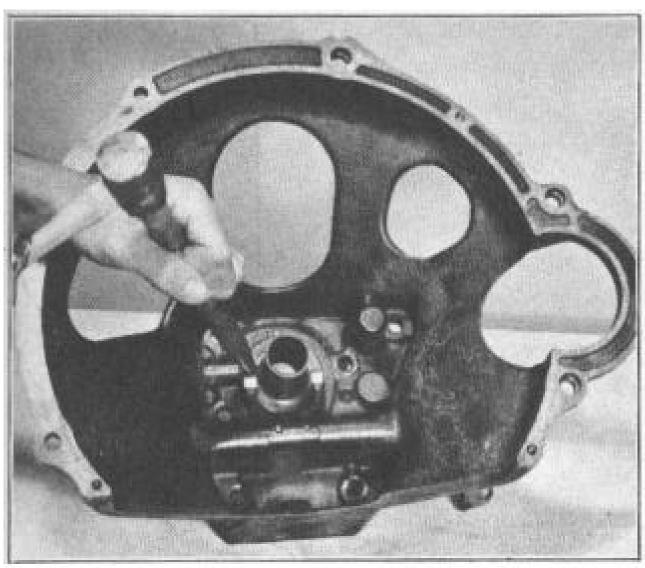

FIGURE 17

27. With retainer removed from case, insert the two seal engaging jaws of Oil Seal Remover J-1576, one at a time between metal portion of seal and retainer. Place the drift (part of remover set) between the jaws and drive out seal assembly, Figure 18.

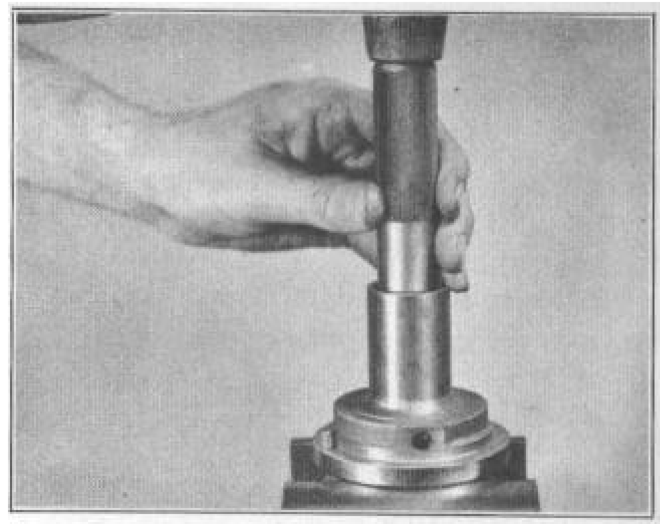

FIGURE 18

28. Install new oil seal by pressing into place with tool J-1569, Figure 19.

FIGURE 19

INSPECTION AND REPAIR
TRANSMISSION CASE BREATHER

Inspect each transmission case to make

sure that the two side holes in the breather (62) Figure 2, are fully exposed below the inside roof of the case and pointed directly to the front and rear of case, parallel with the shift rail. The single hole at the bottom of the breather and the two side holes should be unobstructed.

COVER BAFFLE

The baffle plate welded to the transmission cover should be so arranged as to almost touch the case boss when cover screws are installed. Bend baffle to obtain this position.

TRANSMISSION BALL BEARINGS

DO NOT place bearings where dirt is liable to mix with the lubricant in the bearing.

Bearings should be washed in clean gasoline or kerosene. DO NOT SPIN the bearings and particularly do not spin bearings with an air hose. Spinning a bearing at high speeds will almost certainly do considerable damage. After washing the bearings, blow them out with clean, dry air. Direct the flow of air into the open face of the bearing while holding the inner race and slowly rotate the outer race by hand. DO NOT ALLOW the air to spin the bearing.

a. Inspect the bearings for cracks and defects.

b. Lubricate the bearing with clean, new engine oil, rotating the bearings by hand in order to spread the lubricant over all surfaces.

Transmission mainshaft bearings are built originally with end play and because they may feel quite loose, it does not necessarily indicate that they are worn and unfit for use.

COUNTERSHAFT GEAR CLUSTER ASSEMBLY

Inspect all gears on cluster for damaged teeth. Remove any and all raised edges from teeth surfaces by hand stoning. Recommended diametrical clearance between countershaft and bore of cluster bushings is .001" to .0025" Replace bushings if clearance i s greater than .005". Bushings can be removed with any suitable arbor press and driver.

Place both bushings in position in the gear cluster, being sure that the annular groove in each bushing is nearest the adjacent e n d of shaft. Install with Bushing Replacer J-1572, Figure 20, and turn until both bushings

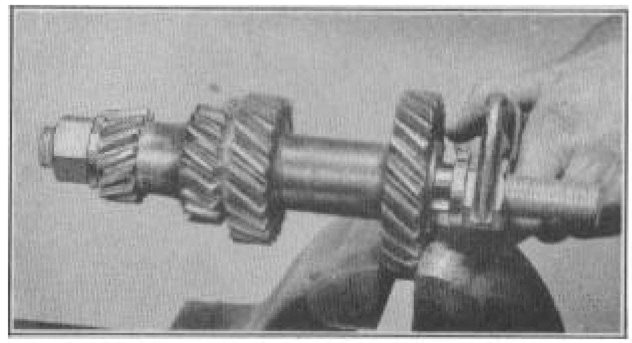

FIGURE 20

are drawn into gear to within .015" beyond each end of gear thrust face.

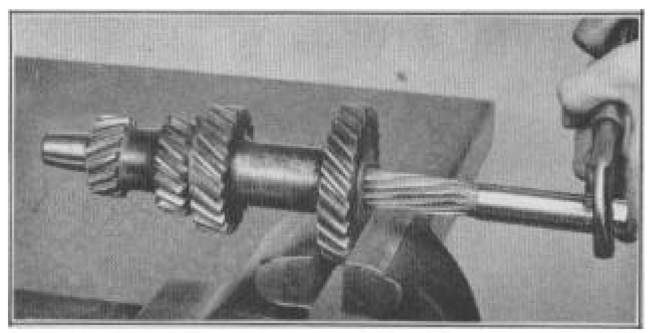

FIGURE 21

Insert loose pilot guide of Reamer KMO- 338 in one end of gear cluster and ream bushing to .865", Figure 21. Insert removable pilot inbore of reamed bushings and ream remaining bushing from opposite end of gear.

REVERSE IDLER GEAR

Recommended diametrical clearance between idler shaft and bore of idler gear bushings is .001" to .0025". Replace bushing if clearance is in excess of .005".

FIGURE 22

Start new bushing into gear bore, then pull bushing into position with Bushing Replacer J-1572, Figure 22. Ream bushing to .865" using Reamer KMO-338 with pilot. Figure 23.

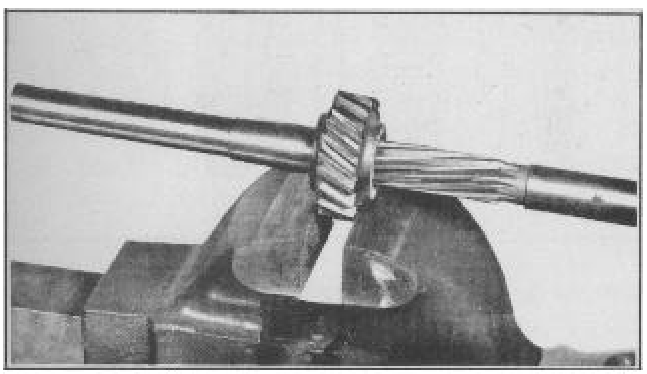

FIGURE 23

SELECTOR AND SHIFT SHAFTS

Recommended clearance between selector shaft and bushing i s .001" to .0035", but clearance of twice this amount if not accompanied by oil leakage is permissible.

If a new shift shaft seal is installed, make sure that it does not interfere with rotation of the shift shaft.

SPEEDOMETER GEAR HOUSING SEAL

If the seal is hard, cracked, or glazed or if signs of oil leakage are apparent at disassembly, install a new seal.

REASSEMBLY OF TRANSMISSION

SELECTOR AND SHIFT SHAFT LEVERS

1. Make sure the transmission case is thoroughly clean inside and outside.

2. From inside the case, install the shift selector shaft bushing. Apply a few drops of oil on shaft, then insert the shaft in the bushing. Install set screw.

3. Place outer selector lever in position (pointing toward left of case), install plain washer, shakeproof washer and nut and tighten securely.

4. Apply a few drops of oil to shift-shaft, then insert shaft in case and lock in position with shift-shaft pin, Figure 15. Install the rubber sealing washer, outer shift lever, plain washer, shakeproof washer, and nut an d tighten securely. U more than a slight drag is felt when rotating shaft, check oil seal for interference.

5. Install shift shaft inner lever on the splined shift shaft with the lever in straight up position.

REVERSE IDLER GEAR AND GEAR CLUSTER

Place reverse idler gear in position inside of case after applying a few drops of oil to gear bushing. Insert one end of idler shaft with countershaft lock plate into slot in shaft. Sight through hole in lock plate and when same is centered over hole for lock screw, start reverse idler shaft into hole in case. Holding shaft in this position, bump shaft into case. When shaft is well started, apply a coat of red lead or other suitable sealer to exposed portion of shaft and drive shaft into final position with a soft hammer.

Coat the two thin countershaft gear cluster thrust washers with viscous grease, then install these washers on the retaining pins and install in case with the bronze surface of washer towards gear thrust face.

Install steel washer on rear face of cluster gear with lug on washer engaging slot in end of cluster gear. Apply light oil to bushings in cluster gear, then place cluster gear and steel washer unit into transmission case, being careful not to dislodge the thrust washers.

NOTE: Replace scored or worn washers in order to maintain proper clearance.

DO NOT install the countershaft at this time.

MAIN DRIVE GEAR

Install bearing to main drive gear using Bearing Replacer T-1570, Figure 24. Note position of retainer ring groove. DO NOT INSTALL RETAINER RING AT THIS TIME.

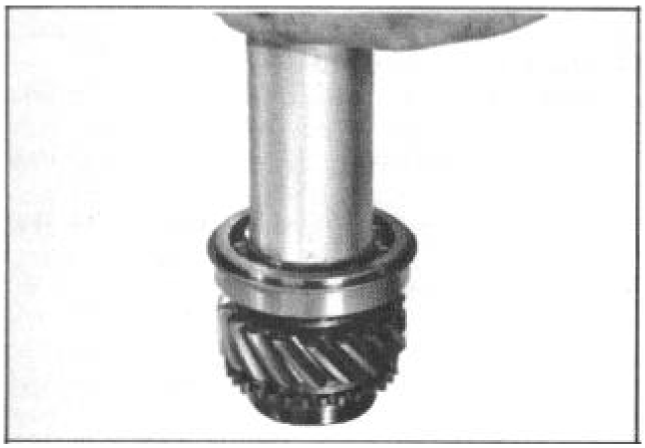

FIGURE 24

Insert gear and bearing assembly through cover opening into front opening of case far enough to expose the ring retainer groove, then install the snap ring into groove.

Apply a coating of viscous grease to recess in end of main drive gear and insert the 16 individual rollers comprising the pilot bearing.

MAIN SHAFT ASSEMBLY

1. Install the low reverse gear to main shaft splines with oil holes in gear registered over shaft spline oil channels as shown in Figure 25. Shift fork flange on gear should be toward front of shaft.

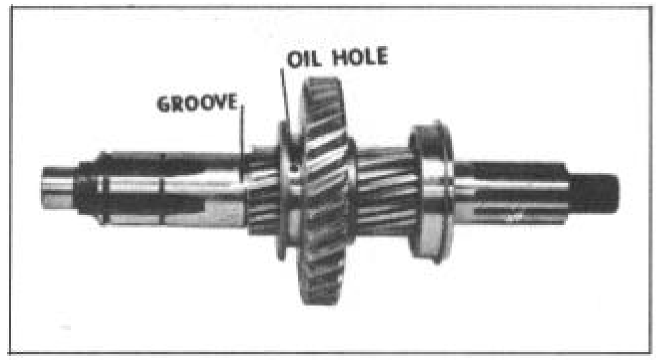

FIGURE 25

NOTE: Four of the helical splines are provided with an oil channel at the front end of the splines.

2. Slide intermediate gear over front end of shaft with ground tapered hub toward front of shaft.

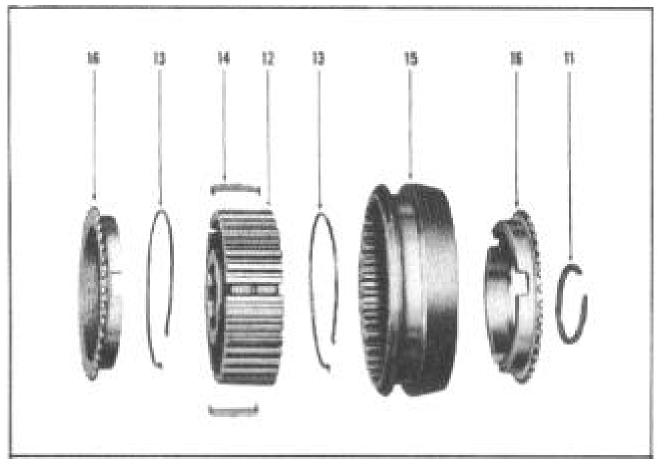

FIGURE 26

ASSEMBLY OF SYNCHRONIZER

1. Place the 3 synchronizer shift plates in the shift sleeve hub. Install the two synchronizer springs so that one end of each spring rests in the same groove of shift plate with the free ends running in opposite directions, Figure 26.

2. Assemble the synchronizer hub, plates and springs into shift sleeve.

NOTE: Undercut on hub and shifter fork groove in sleeve should point toward rear of transmission.

5. Assemble the two bronze synchronizer rings t o the shift sleeve hub with the 3 plate end slots engaging the shift plates.

6. Install the synchronizer unit on the main shaft with the tapered side of the shift sleeve toward the front of the transmission.

7. Install synchronizer shift sleeve hub lock ring on end of main shaft using Pliers J-1575. USE A NEW LOCK RING. The lock ring is available in only one thickness .087" and must be carefully fitted into shaft groove to eliminate all end play.

8. Move the synchronizer shift sleeve towards rear of mainshaft (2nd gear position), then carefully insert mainshaft and gears assembly through cover opening of case with threaded end of mainshaft towards rear of case. Carefully enter the front end of mainshaft into pilot bearing mounted in end of main drive gear.

9. Install the speedometer gear housing over the main-shaft bearing and with 3 bolts 1/2" longer than the standard bolts removed, draw the bearing on the shaft carefully with even pressure until speedometer gear housing contacts the transmission case. Remove the speedometer gear housing.

10. Install the speedometer drive gear to rear end of main-shaft.

11. Install speedometer gear housing assembly and new gasket to end of case.

12. Install the companion flange being careful to prevent injury to the oil seal. Install plain washer and self-locking nut. Tighten to 90-100 foot pounds using a torque wrench. THIS NUT MUST BE KEPT TIGHT.

COUNTERSHAFT

Insert Countershaft Driver J-1574 int o countershaft cluster gear through hole in front end of case. Raise cluster gear up into alignment (determining that the front and rear thrust washers are properly positioned) and then insert beveled end of countershaft into case and gear cluster from rear end of case.

Drive Countershaft forward with a soft hammer and when it is within 1-1/2" of being fully entered, apply a coating of red lead to exposed portion. SHAFT MUST BE TURNED TO CORRECT POSITION FOR INSTALLATION OF LOCK PLATE AND FRONT THRUST WASHER ALIGNED WITH HOLE IN CASE. Drive shaft all the way forward and install the lock plate and screw, tighten securely.

SHIFTER RAILS AND FORKS

1. Install the shift rail lock ball spring and lock ball into hole in case.

	LOW AND REVERSE RAIL	2ND AND HIGH RAIL
STANDARD TRANSMISSION	9 lbs.	9 lbs.
WITH OVERDRIVE	30 lbs	19 lbs.
WITH HDM	19 lbs.	19 lbs
WITH OVERDRIVE AND HDM	30 lbs.	19 lbs.

NOTE: Low and Reverse and Second and High lock ball springs are of equal tension with standard transmission. The above chart should be referred to for Overdrive and HDM as these transmissions are equipped with heavier springs in both Low and Reverse and Second and High shift rails.

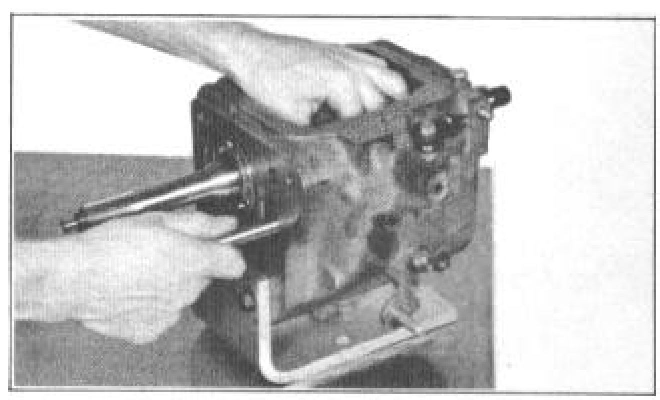

FIGURE 27

2. Place second and high shift fork in groove of synchronizer shift sleeve and while holding the fork in this position, insert the shift rail into case through hole in fork, Figure 27.

Install and tighten slotted set screw using a straight blade screwdriver. Install rail stop screw and lock washer.

NOTE: The rail stop screw must not bottom on shift rail.

CAUTION: Make sure at this time that the previously installed inner shift shaft lever is correctly positioned. Inner shift lever and milled end of shift shaft should be in a true vertical position.

3. Install shift rail interlock plunger.

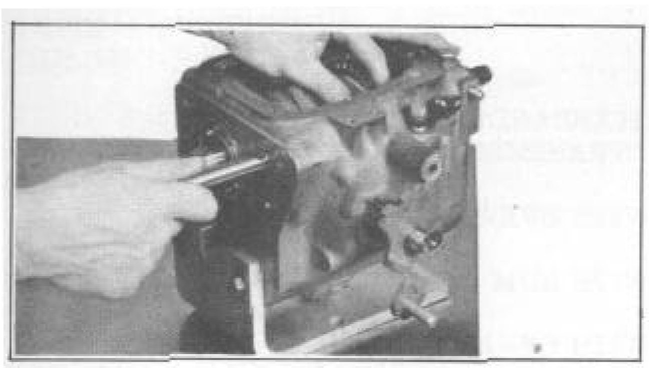

FIGURE 28

4. Start the 1ow and reverse shift rail into transmission case. Install low and reverse shifter in position and slide shift rail into shifter, Figure 28.

5. Place low and reverse shift fork in groove of low and reverse sliding gear and slide shift rail through hole in fork and into hole at end of case.

6. Install slotted head lock screw into shifter and tighten securely. Follow the same procedure on shift fork and lock screw.

7. Shift transmission into all 4 gear positions successively and also into neutral. If operation is satisfactory install the remaining shift rail lock ball and lock spring.

8. Install transmission cover using a new gasket.

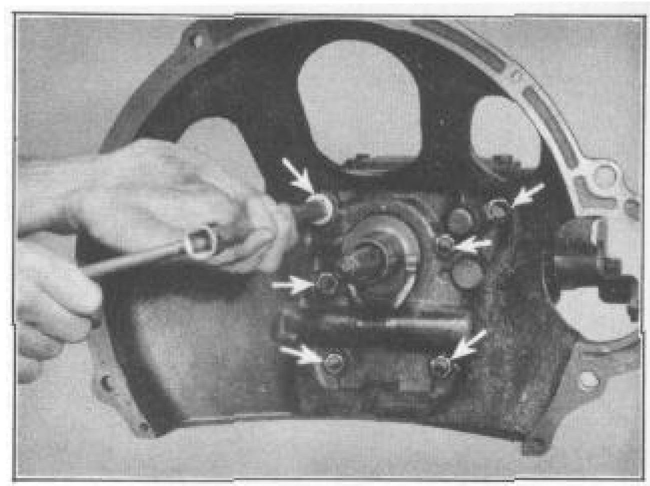

FIGURE 29

Install clutch bell housing, (use new gasket). Tighten each of the 6 cap screws to 45 foot pounds.

Install drain plug and insert 2-1/4 pounds of S.A.E. 80 E.P. Winter or S.A.E. 90 E.P. Summer lubricant through filler plug opening. Install and tighten filler plug.

INSTALLING TRANSMISSION

1. Install two headless screws or studs in engine end plate to assist in supporting the the transmission at installation.

NOTE: Before installing transmission to engine rear support plate, check cylinder block rear support plate very carefully for tightness and alignment. This is especially important it cases where the car has been subject to chronic transmission trouble, noisy and jumping out of gear. Make a similar check of transmission clutch bell housing.

In lieu of highly precise equipment, use a steel straightedge to check steel rear support plate and a surface plate or other flat surface to check the front face of clutch bell housing. Both units should be flat and in plane within .005".

Be sure to check position of clutch driving plate and see that it is perfectly centralized within the clutch assembly. This can be done by using the J-449 aligning arbor o r with a standard main drive gear if arbor is not available. If this precaution is not taken, difficulty will be encountered when installing the transmission and the front end of the drive gear shaft and pilot

bearing in the flywheel will be damaged.

2. Rotate clutch collar and throwout bearing to position for proper alignment with throw-out yoke on transmission.

3. Tighten all rear engine support plate to block screws.

4. Bring the transmission assembly to position where the main drive gear (clutch shaft) is aligned with bore of clutch throwout collar, then carefully push transmission forward to enter drive gear splined shaft through grease retainer leather washer, splines of clutch driving plate and into pilot bearing in flywheel.

NOTE: During this operation the main drive gear must be relieved of all over hanging weight of the transmission until the bell housing engages the dowels on engine rear support plate. Before transmission assembly is moved up against rear support plate make a last inspection to verify that end face of throwout collar in clutch is properly aligned with throwout yoke on transmission and that oil seal lip has not turned under.

CAUTION: Alignment of bell housing with engine is controlled by the sleeve dowel in the upper left location of the bell housing attaching bolt circle and by the dowel bolt at the lower right location viewed from rear of car. Make sure that the former is in place and entered in bell housing hole before tightening bolts. Install lower right bolt (dowel bolt) first. NEVER grind or otherwise reduce the diameter of the dowel bolt to facilitate installation.

5. Remove the two headless screws or guide studs, J-2969.

6. Install remaining clutch bell housing bolts and screws and tighten with a torque wrench to 40-45 foot pounds.

7. Complete remainder of installation by reversing the order of removal of the remaining parts.

TROUBLE SHOOTING
SERVICING THE TRANSMISSION

JUMPING OUT OF GEAR

Jumping out of gear is likely to be caused by one of the following conditions:

1. Misalignment of the transmission with the engine (chips, dirt, buckled gasket) between the clutch bell housing and transmission may cause jumping out of high gear.
2. Engine mountings improperly adjusted may cause jumping out of high gear.
3. Mainshaft or countershaft end play is excessive, might cause jumping out of high or second.
4. Synchronizing unit worn or damaged.
5. Loose fitting bearings or bushings.
6. Failure to move gearshift lever far enough to complete engagement.
7. Low and reverse shift rail lock ball spring lacks sufficient tension (should have 19 pound load) at 11/16" for standard transmission and 30 pounds at 13/16" with Overdrive.

NOTE: If transmission has jumped out of gear many times while under load, it may be necessary to replace the mating gears because the gear teeth may have become beveled.

NOISE IN GEAR

Misalignment of transmission
Worn, scored countershaft bushings
Worn, rough reverse idler gear
Eccentric countershaft gear assembly
Sprung or worn countershaft
Excessive backlash in constant mesh gear Excessive end play in countershaft or reverse idler gear
Worn mainshaft pilot bearing
Scuffed gear tooth contact surface
Insufficient lubrication
Incorrect grade of lubricant

Worn, rough mainshaft rear bearing Sliding gear teeth rough, chipped, tapered Excessive second speed mainshaft end play Noisy speedometer gears

Noise may occur in neutral or in any one or more speeds. Some gear noise is to be expected in all except high speed. Trace the gears that are under load and examine them for damage, checking the bearings and amount of end play. Noise in neutral in the from of a constant regular click indicates a nicked gear of faulty bearing.

End play on countershaft to be not less than .006" nor more than .016". If a check shows end play of more than .016" it indicates worn thrust washers that should be replaced. End play on mainshaft intermediate gear and synchronizer shift sleeve to be from .003" to .006" and if more than .016" it indicates a worn synchronizer shift sleeve hub lock ring that needs replacing. End play on the reverse idler gear is from .003" to .010" and any end play in excess of .010" requires replacement of gear.

OTHER NOISE CAUSES

Out-of-balance fan
Defective torsional damper
Out -of -balance flywheel
Unbalanced clutch assembly
Loose transmission mounting Loose engine mountings
Worn universal joints
U-joints improperly installed
Misaligned or sprung propellor shaft
Incorrect driveshaft assembly

STICKING IN GEAR

Improperly operating clutch
Insufficient chamfer on shift rail ball notches
Sliding gear tight on mainshaft splines
Misaligned mainshaft
Improper linkage adjustment

SLIPPING OUT OF FIRST GEAR

First and reverse sliding gear loose on main-shaft splines
Sliding gear teeth worn or tapered
Worn, misaligned mainshaft splines
Worn countershaft first speed gear
Excessive end play of reverse idler Insufficient gear mesh Too much chamfer on shift rail ball notch Improper linkage adjustment

LOSS OF LUBRICANT

Lubricant level too high
Damaged or improperly installed gaskets
Damaged or defective oil seals
Loose drain plug, transmission cover
Cracked transmission housing
Use of excessively foaming lubricant
Stopped up transmission breather
Worn mainshaft bearings

HARD SHIFTING

Improperly operating clutch
Sliding gear tight on shaft splines
Insufficient chamfer of sliding gear teeth
Burred mainshaft splines
Misaligned mainshaft
Damaged synchronizing unit
Worn shifter rails
Worn or sprung shifter fork
Improper adjustment of shifting linkage

Difficult gear shifting, especially into second gear, is often caused by the improper adjustment of the cross-shift control wire or by looseness of the cable anchor clip which secures it to the bell housing. This results in insufficient movement being imparted to the transmission inner shift shaft lever to allow it to fully engage the shift forks. In cases of hard shifting the "Gear Shift" lever and cross shift control cable should be adjusted if necessary as follows:

A. Place "Gear Shift" Control Lever, Figure 30 in the extreme upper position.
B. Loosen control wire casing anchor bracket bolt. Pull upper anchor bracket (18) up' until all slack is out of casing and the shift shaft inner lever is fully over into the low and reverse shifter. (Check this in transmission). Tighten anchor bracket bolt (35) Figure 30. The control wire anchor should have clearance at top and bottom.

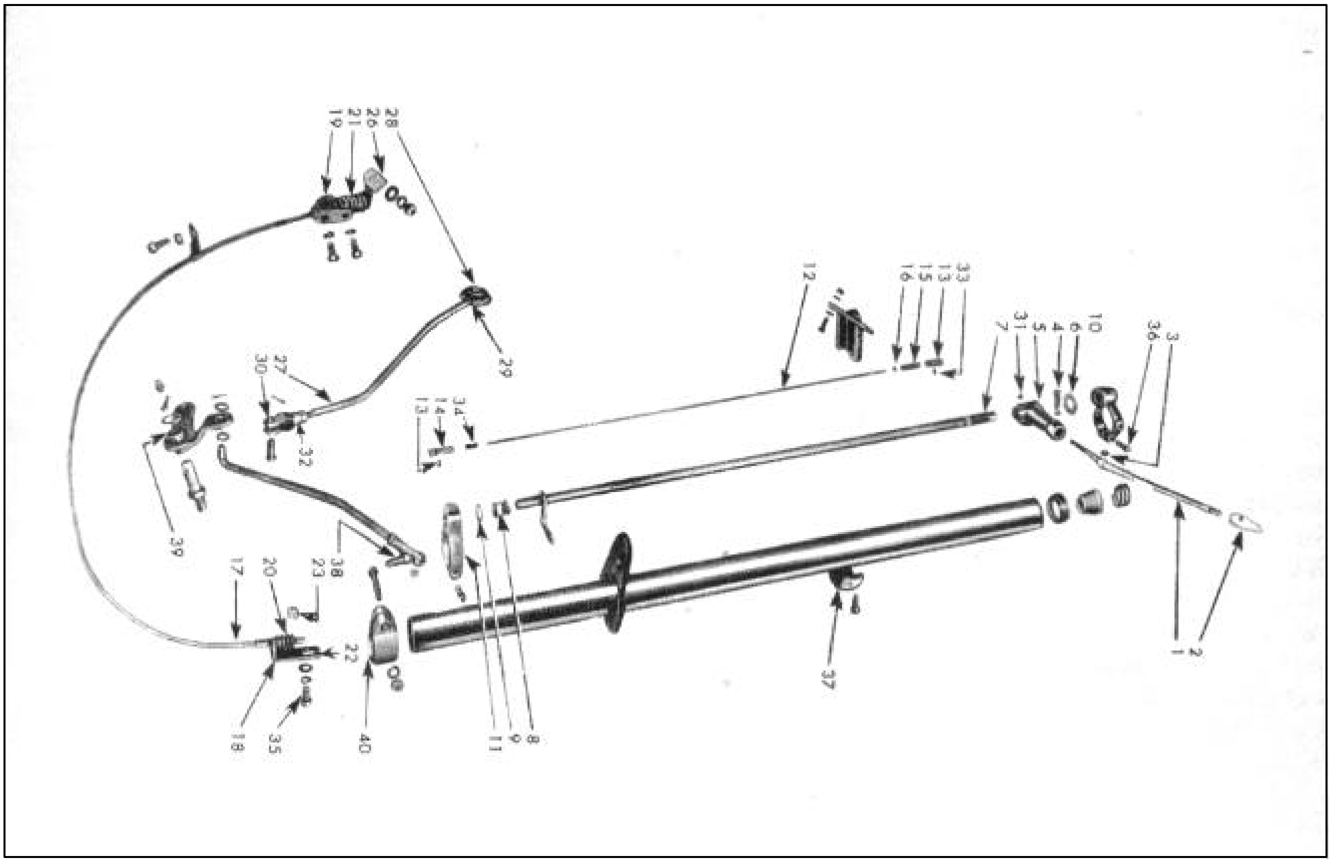

FIGURE 30

1. Control lever
2. Control lever knob
3. Control lever anti-rattle washer
4. Control lever fulcrum screw
5. Control lever fulcrum bracket
6. Control lever fulcrum bracket ring
7. Lever tube and fulcrum bracket
8. Control lever compression spring
9. Compression spring seat
10. Control lever tube bracket - upper
11. Control lever tube bracket - lower
12. Control lever push rod
13. Push rod end - upper
14. Push rod end - lower
15. Push rod upper compression spring
16. Push rod spring seat
17. Control wire, casing and bracket
18. Control wire anchor bracket - upper
19. Control wire anchor bracket - lower
20. Control wire dust boot (steering end)
21. Control wire dust boot (trans. end)
22. Control wire anchor
23. Control wire anchor hairpin clip
24. Transmission shift shaft outer lever
25. Shift shaft outer lever pin
26. Trans. shift selector lever, outer
27. Trans. lever to bell crank rod
28. Bell crank rod grommet
29. Bell crank rod washer
30. Bell crank rod clevis
31. Control tube upper bracket set screw
32. Bell crank rod locknut
33. Push rod end key
34. Push rod lower compression spring
35. Control wire anchor clamp bolt
36. Control tube upper bracket clamp bolt
37. Steering jacket tube clamp
38. Control lever to bell crank rod
39. Control crank (at steering gear)
40. Jacket tube lower clamp

NOTE: Check shift selector lever (26) Figure 30 to which cross shift control wire is attached, to be sure the lever is tight on its shaft. Check bracket (19) to be sure it is tight on the transmission case.

Increased viscosity of t he transmission lubricant during cold weather is another factor to be considered when dealing with hard shifting, as the thickening of the lubricant is apt to interfere with the action of the synchronizing mechanism.

During cold weather operating, it is recommended that the lubricant be thinned by the addition of kerosene when hard shifting is encountered. Add approximately 2 ounces of kerosene after draining a like quantity of lubricant.

C. The "Gear Shift" control should be inspected and if the gear control lever (1) Figure 30, is not in a true-crosswise position when in neutral, it should be adjusted by removing the cotter pin and clevis pin at the front end of the control tube to transmission rod (27). Loosen lock nut (32) and turn clevis (30) in the rod. When properly adjusted (transmission in neutral and Handy Shift control lever exactly crosswise), the clevis pin hole in the clevis (30) will line up with the hole in lever (39).

GEAR SHIFT

The gear shifting mechanism is operated from a control lever pivoted in a housing attached to the steering gear jacket tube just below the steering wheel.

The backward and forward movement of the gearshift lever (1) Figure 30 imparts a rotary motion to the tube and lever (7). This rotary motion moves the control lever to bell crank rod (38), bell crank to shift shaft outer lever rod (27) and outer shift shaft lever (24) back and forth. The lever (24) is attached to the transmission shift shaft, a n inner lever mounted on the shift shaft moves the gear into the desired positions.

ADJUSTMENT

Place the gear shift lever (1) in neutral position, remove the cotter pin and clevis pin from rod (27) at bell crank (39).

The transmission shift lever (24) and the gear shift lever (1) must be in the neutral position. Loosen rod lock nut (32) on rod (27) and turn clevis (30) in or out until the clevis pin will drop into bell crank hole (39).

GEAR SHIFT LEVER TUBE AND FULCRUM BRACKET

REMOVAL

1. Remove horn ring and steering wheel. See Steering Gear Section.

2. Raise carpet sufficiently to clear area of steering gear.

3. Remove steering gear floor opening metal and rubber dust cover.

4. Remove set screw (31) and clamp bolt (36) and remove gear shift upper bracket from jacket tube.

NOTE : Check condition of lever fulcrum bracket spacer ring and replace if less than .025 thick.

5. Remove retainer plate at instrument panel.

6. Remove steering jacket tube clamp (37) at instrument panel.

7. Remove hair pin clip (23) attaching gear shift control cable (17) to lever (7) and remove cable anchor bracket clamp bolt (35).

NOTE: When re-installing bracket (18) and cable (17) to lever tube bracket (7) the gear shift lever (1) must be in the extreme up position, (between the low and reverse positions). Pull bracket (5) and tube (7) upward until all slack is out of the casing and control wire and that the shift lever at the transmission is completely over to the low and reverse side. (To be checked at transmission). Before tightening bolt (35) assure that anchor (22) in control wire (17) has clearance at the top and bottom of travel.

8. Disconnect rod (38) at control lever (7).

9. Remove spring (8) and flat washer (9).

10. Control tube can now be removed.

NOTE: If Steering Gear Jacket Tube is to be removed with control tube attached proceed as follows:

a. Loosen steering gear housing mounting bolts to allow steering gear to drop sufficiently to allow clearance for jacket tube removal.

b. Loosen jacket tube clamp (40) at steering gear housing and lift jacket tube by swinging the lever up and to the right and out through opening at floor cover.

To Install, reverse procedure of removal.

GEAR SHIFT CONTROL LEVER PUSH ROD

REMOVAL

1. Remove steering wheel.

2. Remove upper bracket (5) and ring (6).

3. Remove gear shift lever fulcrum screw (4), lever (1), and anti-rattle spring washer (3).

4. Remove hairpin clip anchor (22) at lower end of control tube and disconnect cable (17).

5. Remove bolt (35) attaching anchor bracket to lower support bracket.

6. Pull lower push rod end 414) down far enough to remove the key attaching push rod (12) to push rod end (13).

7. Remove push rod upper end (13).

8. Remove upper compression spring (15) and seat (16) with a wire hook.

INSTALLATION

Install the upper compression spring seat (16) and spring (15) on the push rod (12) and install in control tube (17).

NOTE: Apply a coat of viscous chassis lubricant to the push rod ends when assembling them in the control tube.

Reverse procedure of removal on remaining parts.

REFERENCE

Source of Information	Date	Subject

REFERENCE

Source of Information	Date	Subject

SECTION 10

HUDSON DRIVE-MASTER

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OPERATION

The Hudson car equipped with Drive-Master has the same controls as the conventional car and cae driven in exactly the same manner. The owner has the choice of three driving methods. Turning the control knob on the instrument panel to the left position provides automatic clutch operation with manual gear shifting. With the control knob turned to the right position, automatic clutch operation with automatic gear shifting in pick-up and high gear is obtained. With the control knob in the center or "off" position, manual operation of the clutch and shifting of gears is required and the car is driven in the conventional manner.

To Start, merely place the gear shift lever in-high gear position, depress the accelerator pedal and the car moves forward in pick-up gear. When the car has reached the speed at which the driver desires to shift into high gear, he simply releases the accelerator pedal momentarily and the shift is made quickly and the car goes ahead in high gear. When coming to a stop, the transmission is automatically shifted from high to pick-up gear and the car is ready to start.

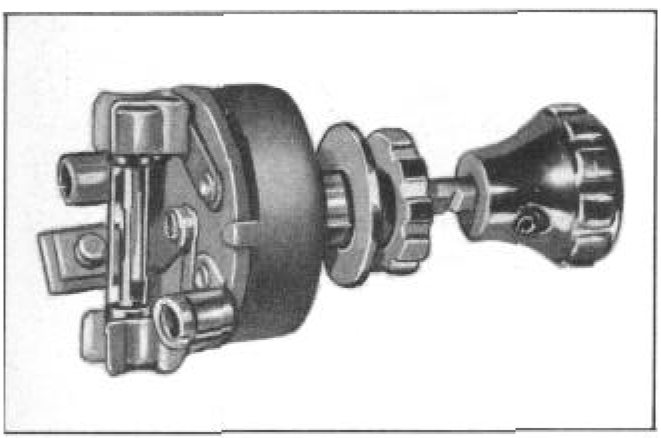


FIGURE 1

DRIVE-MASTER UNITS

Hudson Drive-Master consists of the following units.

INSTRUMENT PANEL SWITCH

The instrument pane 1 switch Figure 1, controls Drive-Master operation and is used to select any of the three methods available to the driver of a car equipped with Hudson Drive - Master. It is mounted on the instrument panel just to the left of the lighting switch and contains a 10 ampere fuse to protect the Drive- Master units.

Turning the switch control knob to the left position provides automatic clutch operation with manual gear shifting. Turning the knob to the right position; automatic clutch operation and automatic gear shifting is obtained. With the switch in the center or "off" position Drive-Master is inoperative and the clutch operation and gear shifting are done manually in the conventional manner.

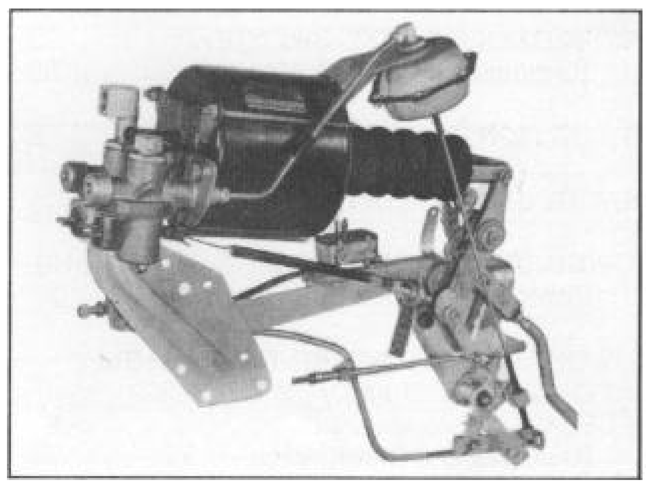


FIGURE 2

CLUTCH POWER UNIT

The clutch power unit Figure 2, is mounted on the left side at the top of the engine. A vacuum line connects to the engine intake manifold to provide the power for operation.

The power is transmitted from the vacuum cylinder piston through a rod direct to the clutch throwout yoke shaft.

The engaging and disengaging control is obtained through the accelerator switch and linkage connected with the accelerator pedal.

The unit used with the Drive-Master is identical with the mechanism used with Vacumotive Drive. It, however, is fitted with a throttle locking device which holds the throttle and the accelerator switch closed to prevent gear clash while the transmission shift is being made.

The throttle lock consists of a vacuum operated diaphragm connected to the accelerator linkage through a cable. Vacuum in the cylinder pulls up on the cable closing the throttle and holding the accelerator switch against the stop even if the accelerator pedal itself is pushed to. , the wide open position. A solenoid mounted beside the clutch control solenoid controls the vacuum to the throttle lock.

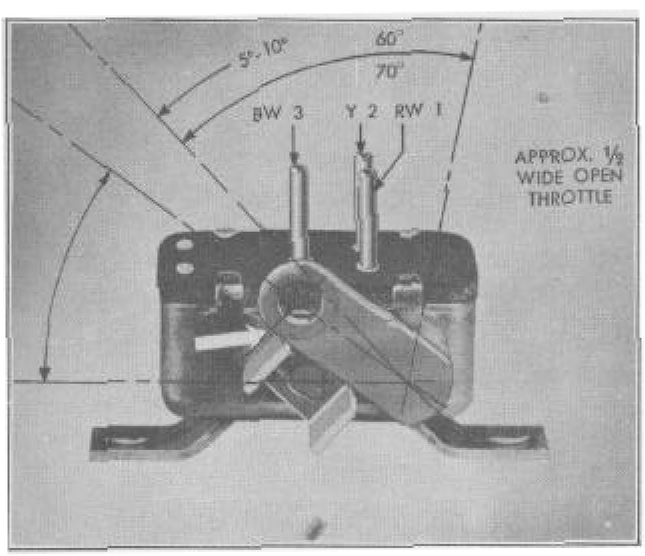


FIGURE 3

ACCELERATOR SWITCH

The accelerator switch, Figure 3, used in conjunction with the Clutch Power Unit makes starting possible with wide open throttle for rapid acceleration.

When the foot is removed from the accelerator and the throttle is closed, the accelerator switch closes the electrical circuit through the clutch control solenoid, opening the vacuum valve and the clutch is disengaged.

Depressing the accelerator pedal opens the points of the accelerator switch permitting the clutch to re-engage.

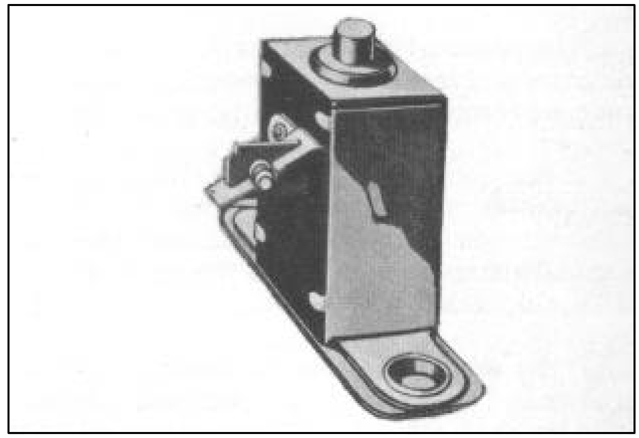


FIGURE 4

The shift rail switch, Figure 4, permits Automatic Clutch operation in low, second, or reverse gears regardless of car speeds. The shift rail switch is also used with Vacumotive Drive.

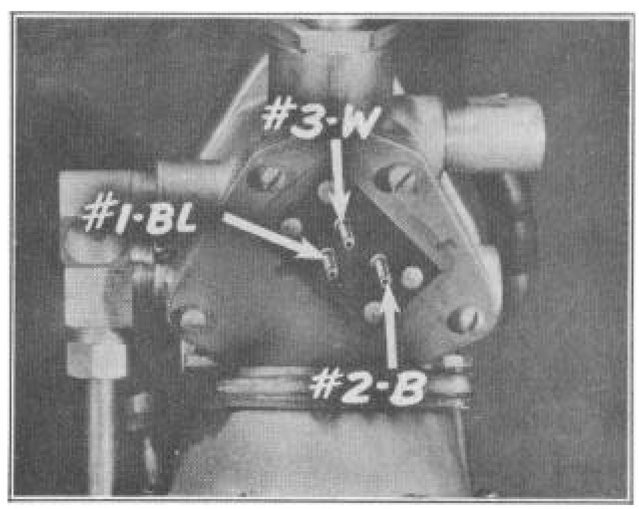


FIGURE 5

TRANSMISSION POWER UNIT

The transmission power shifting unit, Figure 5, is made up of the transfer diaphragm cylinder and the power cylinder together with the solenoid valves to control the transfer diaphragm and the movement of the piston in the power cylinder.

The power cylinder piston is connected to the piston rod, which in turn is connected through linkage to the power shift lever on the transmission. Both ends of the cylinder are closed except for the vacuum lines to the solenoid control valves.

The solenoid selector valve assembly is comprised of the transfer diaphragm solenoid, a second gear solenoid and a high gear solenoid.

If the solenoid valve controlling the rear end of the cylinder is energized, the valve opens to the vacuum line and the piston move] to the rear. This movement shifts the transmission into pickup gear.

If the solenoid valve controlling the forward end of the cylinder is energized, the piston is moved forward, shifting the transmission into high gear.

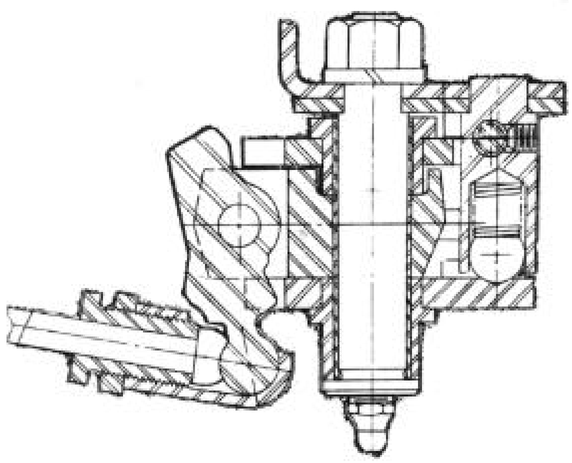


FIGURE 6

OPERATING LINKAGE AND TRANSFER KEY

The movement for Manual or Power Shifting is transferred to the transmission lever through a rod from the transfer key lever, mounted on a stationary shaft at the rear of the power unit mounting bracket, Figure 6.

This shaft also carries the manual an d power shifting levers, each provided with a notch for engagement with the transfer key.

Normally the transfer key is held in the manual shifting lever notch by spring pressure exerted on the transfer diaphragm rod. When the control knob on the instrument panel is turned to the right, electrical connections open the solenoid valve, admitting vacuum to t h e transfer diaphragm cylinder, turning the transfer key so that it engages in the notch of the power shift lever. This operation prepares the transmission for automatic or power shifting.

When the gear shift lever is moved to neutral and lifted through the "neutral gate" as required to make a shift to reverse or low, the circuit is broken to the solenoid operating the transfer diaphragm and the spring pressure behind the diaphragm turns the transfer key so that it re-engages in the manual shift lever notch. Low or reverse gear can then be shifted with the gear shift lever in the regular manner.

Returning the gearshift lever t o neutral and dropping through the "neutral gate" again closes the transfer key circuit causing the key to engage the power shift lever notch. This again prepares the transmission for power shifting.

TRANSMISSION CONTROL SWITCH ASSEMBLY

This switch box, Figure 7, bolted to the power unit bracket on the left side of the engine, contains the mechanically operated switches used to control the Drive-Master.

The switches contained in this unit are:
(A) Transfer Switch
(B) Clutch Switch
(C) Selector Switch
(D) Neutral and Limit Switch

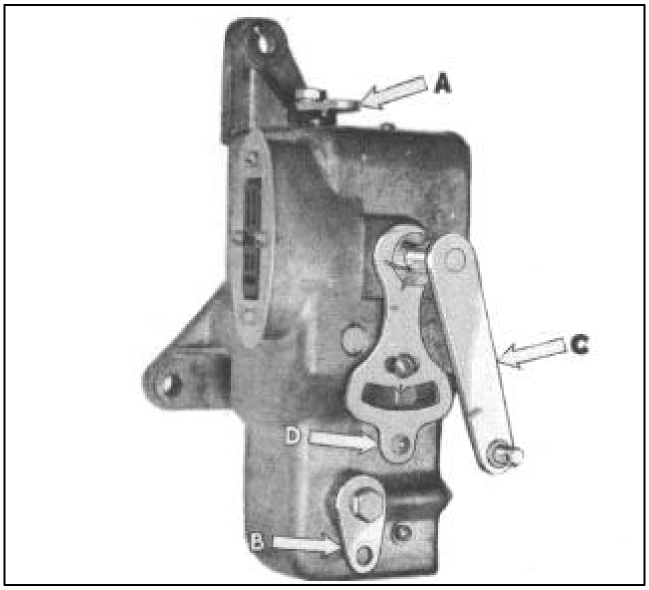


FIGURE 7

(A) THE TRANSFER SWITCH, Figure 7, is located at the top of the transmission switch and is operated by a non-adjustable link connected to the transmission cross shift selector lever.

The gear shift lever, when in neutral must return by means of its own return spring, to the second-high side when released from any position in the cross over. It must work free.

When the gear shift lever on the steering column is moved through the neutral or cross over to second-high side, the transfer switch lever is moved forward closing the switch points. This completes a circuit to the solenoid of the power unit, which controls the transfer diaphragm drawing the diaphragm back and connecting the power shift lever to the transmission shift lever through the transfer key.

When the gear shift lever is again moved to the low-reverse side, the transfer switch lever moves backward, opening the switch. The diaphragm spring moves the transfer key and linkage to disconnect the power shift lever and reconnect the manual shift thus preparing it for shifting into low or reverse.

(B) THE CLUTCH SWITCH is located at the bottom of the transmission switch housing. It is s operated by a non-adjustable link connected to the clutch throwout shaft lever. When the clutch is disengaged the clutch switch lever is moved backward.

One set of points close to complete the circuit to the starter button.

A second set of points is closed completing the circuit to the selector, neutral and limit switches.

The clutch switch is open when the clutch is engaged, therefore, no current is used when the car is being driven in any gear speed.

(C) THE SELECTOR SWITCH lever is connected to the transmission manual shift lever by a non-adjustable rod. When the gear shift lever on the steering column is moved to second gear position, the selector switch lever closes the circuit to the power unit causing the power unit piston to move into second or pick-up gear position.

When the gear shift lever is moved to the high gear position, the selector switch lever closes the circuit to the governor, which automatically selects the pick-up or high gear.

When the gear shift lever is placed in neutral, the selector switch closes a circuit to the neutral switch.

(D) THE NEUTRAL SWITCH AND LIMIT SWITCH. Both neutral and limit switches are operated by the same lever. This lever is connected to the transmission power shifting lever by an adjustable rod.

The neutral switch has two sets of points, both of which are open when the transmission is in neutral. When the transmission gears are in pick-up or high gear position, one set of points are closed and the other open.

If neutral is selected on the gear shift lever and the transmission gears are in high gear position, the circuit then is from the neutral point on the selector switch to the closed points of the neutral switch and from there to the power unit solenoid which controls the shift forward to pick-up gear position. The piston then moves rearward shifting the gear out of high toward neutral. When the shift reaches the neutral position, the neutral switch paints are open and the shift stops.

If the transmission gears are in pick-up position when neutral is selected the other set of points in the neutral switch are closed and complete the circuits to the power unit solenoid which controls forward movement of the power cylinder. As' before, when the transmission reaches neutral, the neutral switch points are opened and the shift stops.

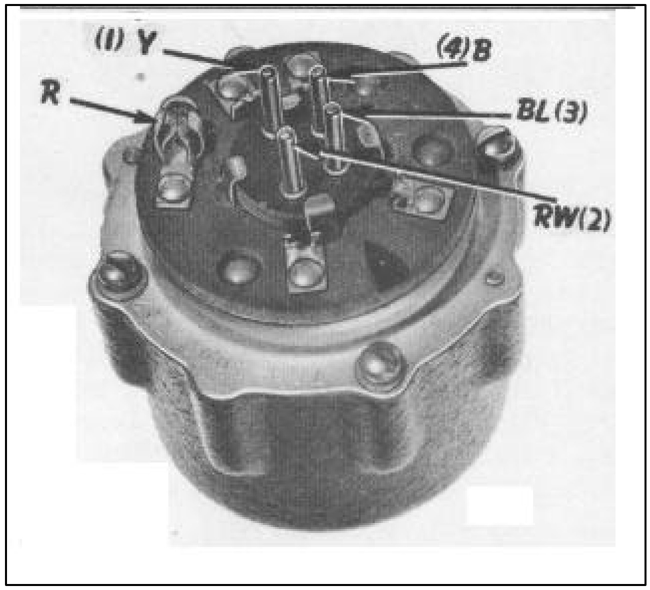


FIGURE 8

The limit switch also has two sets of points, but both are closed when the transmission is in neutral. One set of points are opened when the sift to high gear is completed and the other set of points open only when the shift to pick-up gear is completed.

The switch also completes the circuit to the throttle lock solenoid on the clutch control, thus preventing the throttle being opened until each shift is entirely completed.

GOVERNOR SWITCH

The governor switch, Figure 8, is located on the rear of the transmission and operated by the speedometer drive gear.

The governor controls circuits in the clutch control unit and in the transmission power unit. The separate (R) terminal is used only with cars equipped with overdrive.

When the gear shift lever is in the high gear position, the circuit is completed from the selector switch to the #1 or "Y" terminal of the governor. At speeds below 9 to 13 miles per hour the points are closed to connect the #1 or "Y" terminal to #3 or "BL" terminal.

The #3 or "BL" terminal is connected with the transmission power unit so as to actuate the rear of the power cylinder and shifts into pick-up gear.

At speeds above 9 to 13 miles per hour the #1 or "Y" terminal is connected to the #4 or "B" terminal actuating the front of the power cylinder and the transmission is shifted into high gear.

SERVICING THE DRIVE-MASTER

In the servicing of Drive-Master any units which t h e following tests prove to be faulty must be replaced in this entirety rather than to attempt internal repairs. This applies to the Clutch Unit and Solenoids, Power Shift Unit, and Solenoids, Transmission Switch, Governor Switch, Accelerator Switch, and Instrument Panel Switch.

As power for operating the Vacumotive Clutch Unit and the power unit of the Drive-Master is obtained from engine vacuum, it is very important that engine performance b e checked first when servicing the Drive -Master. The vacuum gauge should read from 19 to 21 to insure proper engine performance as well as correct Drive Master operation.

Before proceeding with checking other units of the Drive-Master it should be determined if Vacumotive Drive or the automatic clutch control system is operating properly. This unit can be checked by turning the knob to the left on the instrument panel and operate the car shifting the gears manually. If this 5. unit works as it should, that portion of the system can be, eliminated from further checking.

LEAKS IN THE VACUUM LINES will cause sluggish operation or failure of the Drive-Masters.

All vacuum line fittings should be checked and hose connections given particular attention. These are as follows:

1. Between clutch power unit and intake manifold.

2. Between clutch power unit solenoids.

3. Between throttle lock solenoids an d diaphragm.

4. Between transmission power unit and air cleaner.

5. Between transmission and clutch power unit.

6. Between front of power cylinder and solenoid housing.

7. Between rear of power cylinder and solenoid housing.

ELECTRICAL CONNECTIONS

The battery should be in good condition and gravity not less than 1225.

ALL TERMINAL CONNECTIONS should be clean and in solid contact.

The important points to be checked are as follows:

1. Connector plugs on clutch power unit.

2. Connector plug on accelerator switch.

3. Power unit plug.

4. Transmission control switch plug.

5. Shift rail terminal.

6. Governor switch plug.

At this point it might be well to get acquainted with a few details that will be of help later in diagnosing service problems.

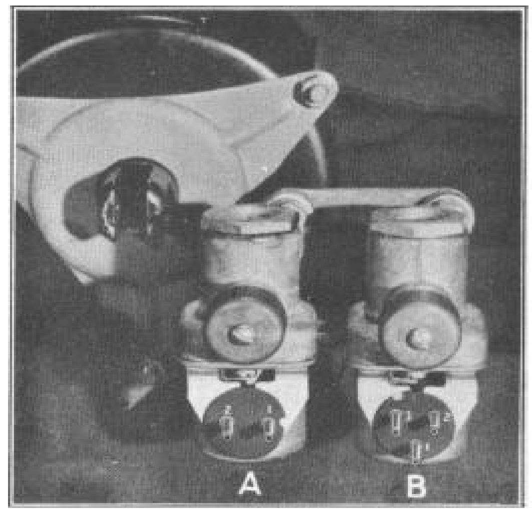


FIGURE 9

CLUTCH CONTROL SOLENOID

This solenoid (A), Figure 9, contains a single winding and each end is brought out to a terminal. The white wire (plug socket #1) is the hot wire from the instrument panel switch. The blue wire with two yellow tracers (plug socket #2) leads to the accelerator switch (plug socket #3).

THROTTLE LOCK SOLENOID

This solenoid (B), Figure 9, looks like the clutch control solenoid but the inside construction is different. This unit contains two windings. One end of each winding connects to a plug prong while the other end is grounded in the solenoid housing. One winding operates the valve which applies the throttle lock when shift i s being made to pick-up gear and the other when a shift is being made to high gear.

NOTE: The third prong is a marker only to prevent interchanging plugs.

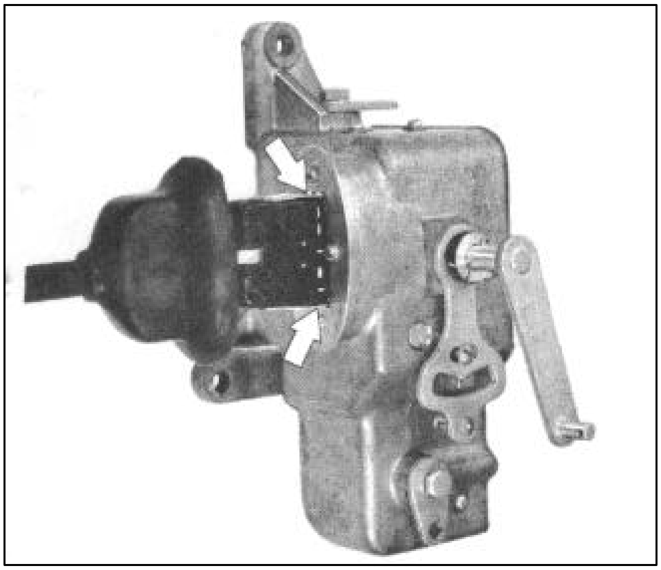


FIGURE 10

TRANSMISSION SWITCH PLUG

This plug is held in place by clips, Figure 10. When replacing, be sure clips enter and engage behind the plug cover plate. The plug is released by pressing the clips together indicated by arrows.

NOTE: Be sure the boot is in place to keep water from entering the switch housing.

The prongs and sockets are silver coated to eliminate corrosion.

INSTRUMENT PANEL SWITCH

Always determine that the instrument panel switch is on. A simple check can be made by moving the gear shift lever back and forth through neutral with the engine running. The transfer key can be heard operating.

LINKAGE

While checking power unit wires and plugs, make sure all the rods and linkage are in place and properly connected

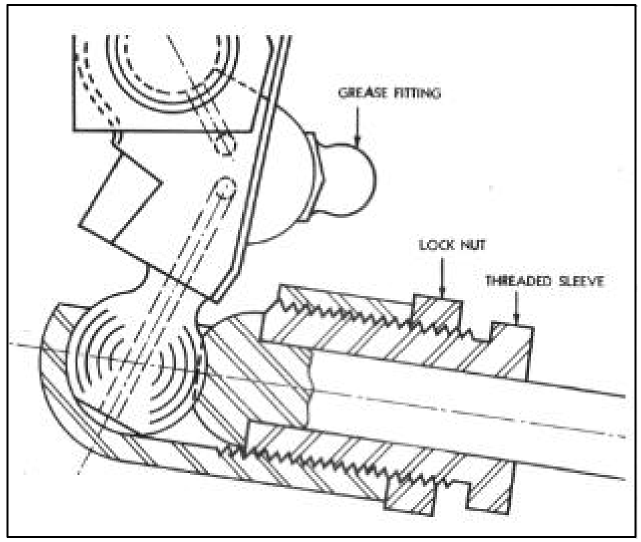


FIGURE 11

and properly connected

Recheck the ball and socket joint at the transfer k e y. This is s a specially designed joint t o permit adjustment without affecting clearance of the ball in the socket, Figure 11.

Adjustment is made by loosening the lock nut and turning the threaded sleeve inward so that it has no appreciable looseness and yet works free. Lubricate this joint and the transfer key pivot with viscous chassis lubricant through the fitting on the transfer key.

The accelerator linkage and the bell crank with the torsional spring assembly must work freely and should be well lubricated.

The accelerator switch lever must return solidly against the stop when the accelerator is released, otherwise, the clutch will not release and the Drive-Master cannot work, Figure 12. This is Very Important.

CLUTCH SWITCH

Before checking the operation of the clutch switch, (housed in Transmission Switch Assembly), check clutch pedal lash. Clutch pedal must have 1-1/2" free play. With engine not operating, ignition switch turned on and starter

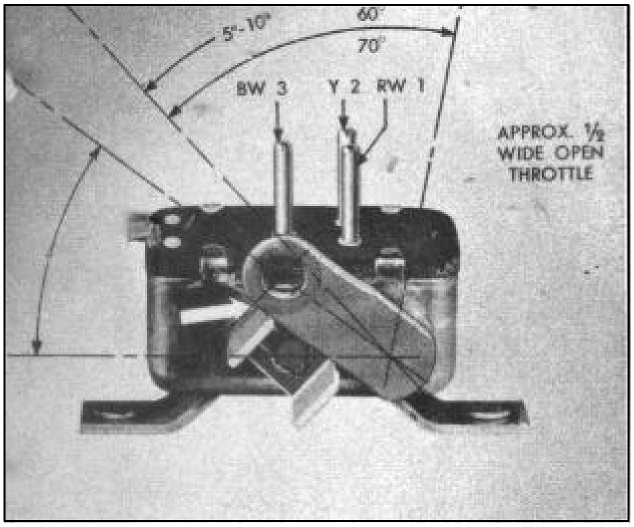


FIGURE 12

button depressed, slowly push the clutch pedal down. The starter should operate before the pedal is within two inches of the toeboard.

TRANSFER SWITCH

When the gear shift lever is in neutral, it must return to the second-high side when released from any position in the cross over by means of its own return spring. If it sticks, it will cause incomplete shifting, throttle locking, engine racing, etc. The hand gear shift lever must be on the second and high side at all times to energize the transfer cylinder and hold the transfer key engaged in the power shift lever.

Check the operation by moving the gear shift lever through the neutral cross over. The key should engage in the manual lever during the upper part of the movement and engage the power shift lever, during the lower half of the movement.

The preceding checks are general, but experience has shown that it is good practice to make these checks before attempting any changes or adjustments.

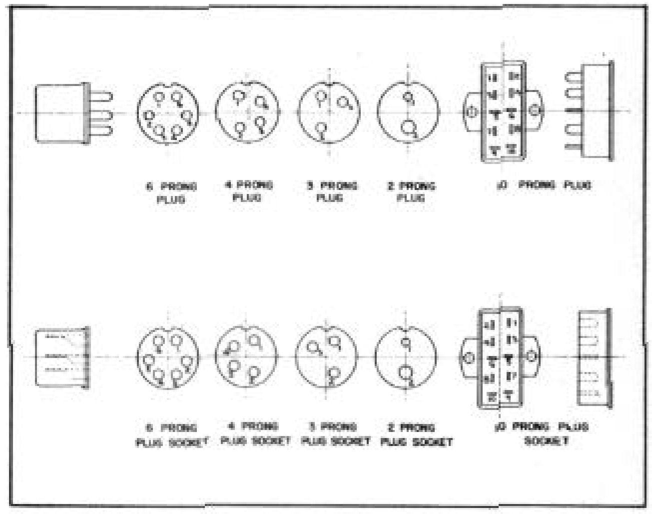


FIGURE 13

PLUGS AND SOCKETS

In Figure 13 we show the various plugs and sockets used with wiring and the Drive-Master harness. As will be noted, all plugs are numbered in a counter-clockwise direction starting from the indentation on the outside of the plug. The mating sockets are numbered clockwise from the same starting point.

DRIVE-MASTER TESTING EQUIPMENT

One Test wire #16 - 40" long with 1/8" diameter test prod at one end and 1/2" clamp terminal at other end.
One dumper wire #16 - 24" long, one end with clamp 3/16", other end 1/2" clamp.
One Test lamp with wires, one wire 28" long #16 with 1/8" diameter prod, other wire 84" long with 5/8" clamp terminal.
One Transmission Control switch testing Harness KM0 -670.
One Allen set screw wrench 1/8".

The Vacumotive Drive Unit should be functioning properly before using it in the Drive-Master combination. On Pages 10 and 11 we deal with t h e mechanical adjustments which should be checked as outlined under "Trouble Shooting" under the particular condition encountered.

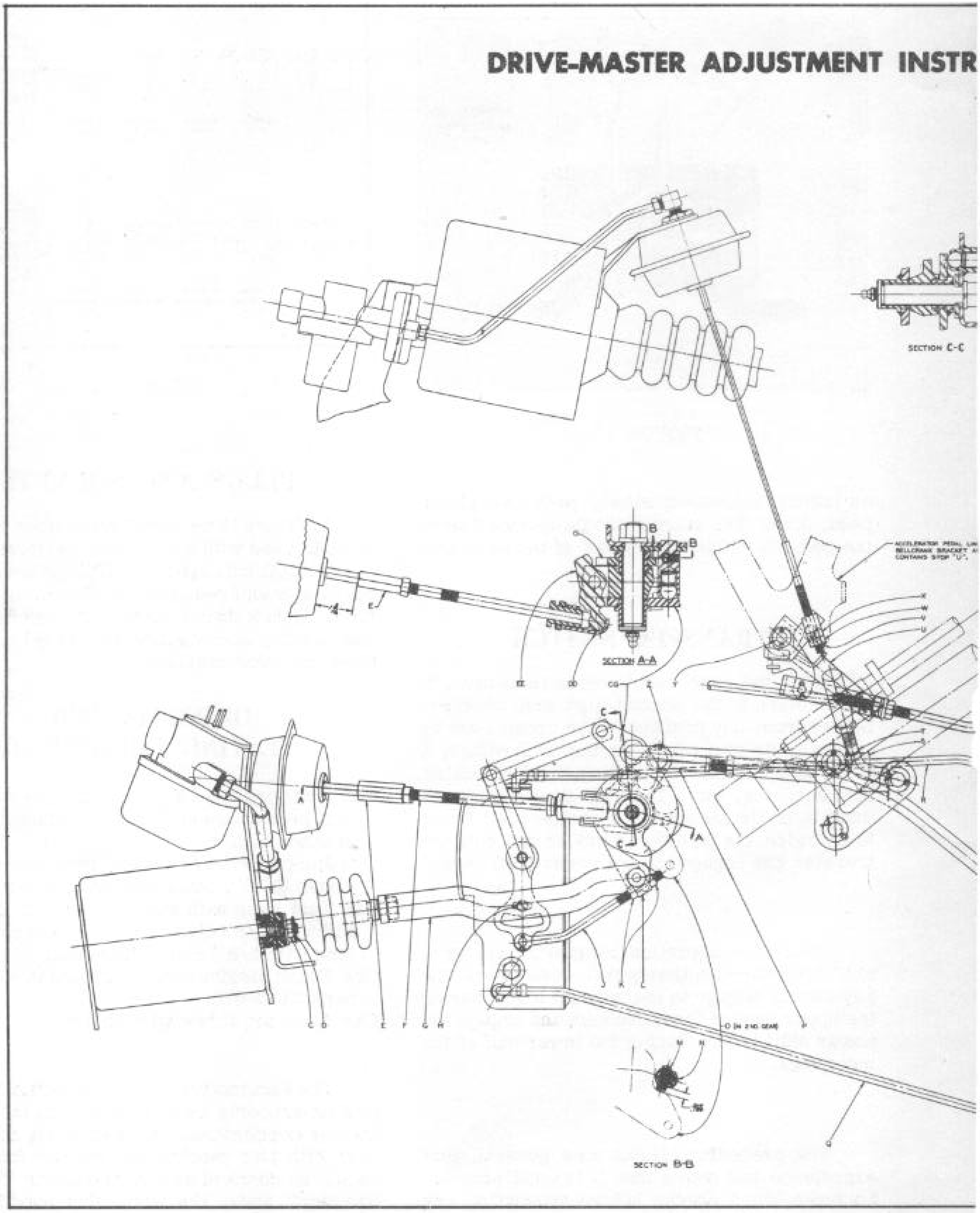
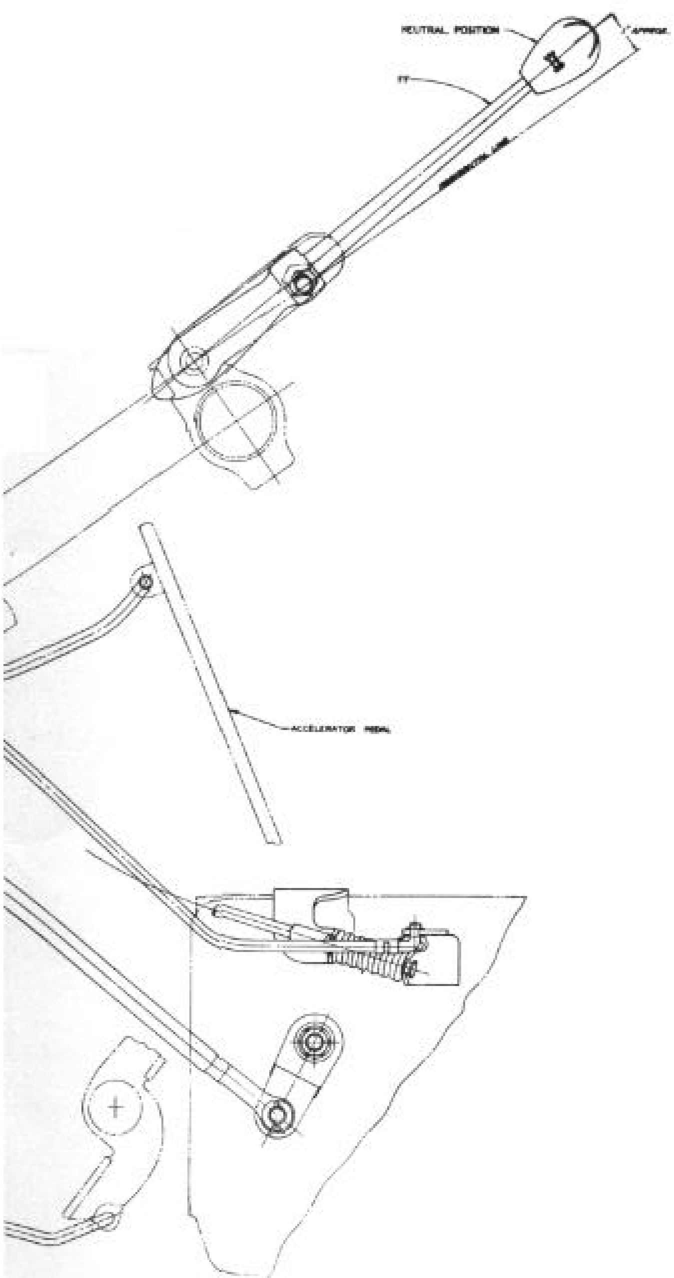

DRIVE-MASTER ADJUSTMENT INSTR
SECTION C-C
SECTION A-A
SECTION B-B

FIGURE 14

UCTIONS



ADJUSTMENT INSTRUCTIONS

1. Check adjustment of ball joint (DD) for free rotation without perceptible end play.

2. With lever (CC) in neutral, check rod (F) and adjustment if necessary to get 1-3/16" between front face of rod end (E) and rear face of diaphragm cylinder. See Section (A-A).

CAUTION: Loosen lock nut and hold diaphragm rod end (E) with a wrench to prevent rod from turning, which would damage the diaphragm, while turning rod (F) with pliers at the knurled surface.

3. With transmission in neutral, disconnect transmission shift rod assembly (P) at front end. Push or pull slightly on rod (P) until a free crossover is obtained. Jiggle lever (CC) until ball is seated solidly in neutral detent. Adjust length of rod (P) so that it can be reconnected without moving either of the levers to which it is attached. If crossover becomes stiffer when rod is connected, shorten or lengthen rod in 1/2 turn steps until crossover becomes free.

4. Adjust length of rod assembly (T) so that when in neutral the end of the hand lever (FF) is approximately 1" above a transverse horizontal line, as shown.

5. With engine running and HDM panel switch "on", shift to second gear. Turn stop screw (M) down until it contacts shift lever (O) and then turn it down 1/2 turn more. Lock in place with Allen head set screw (N).

6. With engine running, operate throttle lock by running a jumper wire from the battery negative post to either one of the throttle lock solenoid pins. Adjust nut (X) on diaphragm cable until lever (U) is held solidly against stop (V) when accelerator pedal is depressed. Lock nut with nut (W). Cable should not be so short that shaft (Y) is deflected when throttle lock operates.

7. Neutral switch adjustment:

   (a) With HDM switch "on" and engine running, shift transmission to neutral, and disconnect shift rod (P) at front end.

   (b) With shift rod (P) disconnected, move hand lever (FF) to second, and back to neutral.

   (c) Push or pull slightly on rod (P) to obtain a free crossover in transmission.

   (d) If shift rod (P) appears too short to go back on pin (Z), shorten neutral switch rod (J), if too long, lengthen neutral switch rod. Repeat (C), (D), and (E) until rod (P) can be reconnected without moving either of the levers to which it is attached.

NOTE: Do not change length of shift rod (P) as this length is determined by adjustment No. 3.

FINAL CHECK:

To eliminate sticky crossover, recheck adjustments No. 3 and No. 7. Also check to see that crossover switch rod (R) is centered in clip (S) at clutch housing.

NOTE: Transmission shift from second to high must take place between 9.5 and 14 M.P.H.

Transmission shift from high to second must take place between 9 and 12 M.P.H.

In high gear, Vacumotive Drive must automatically become inoperative at a speed of 16 M.P.H. Min. to 21 M.P.H. Max. and remain inoperative at all higher speeds.

TROUBLE SHOOTING

CONDITION NO. 1

STARTING MOTOR WILL NOT OPERATE

A. Check to see that clutch switch operating rod is connected at each end and that the rod operates the clutch switch lever mounted on the transmission control switch when the clutch pedal is pushed down.

B. Remove the friction tape from wire splice about 6" to rear of power shift unit harness plug and run a jumper wire from this connection to small terminal on starting motor solenoid.

C. If starter does not operate when starter button is pushed, trouble is in the regular starting circuit.

D. If starter does operate, the trouble is in either the transmission control switch (Check J) or the wire harness.

E. To check harness remove plug from transmission control switch. Start across plug prongs #9 and #10 while pressing the starter button.

F. If starter does not operate, trouble is in harness.

G. If starter operates, troubles is in transmission control switch (Check n.

H. To check the switch remove the ten contact plug and connect to a spare transmission control switch held in hand.

I. If the harness is OK, starter should operate when starter button is pushed and clutch switch lever on spare switch is turned in the clockwise direction.

NOTE: Position of other levers is unimportant.

J. If starter operates, see transmission control switch test (Check J).

CONDITION NO. 2

TRANSMISSION REMAINS IN NEUTRAL

With engine running, car standing and gear shift lever in high gear position.

NOTE: It is assumed starter operates; if not, see condition #1. Also that clutch disengages and engages. (If not, see "Vacumotive Drive Clutch Trouble Shooting Chart").

A. Place shifting lever in second gear position.

B. If transmission shifts to second gear, connect #1 and #3 sockets at governor wire harness plug with a short jumper wire.

C. If transmission shifts from neutral to second either the governor wire harness plug (Check A) or the governor (Check C) is defective.

D. If shift does not occur, either the wire harness or the transmission control switch is faulty (Make Checks A and J) before replacing switch or harness.

E. Lift gear shaft lever through cross-over and return.

F. If transfer diaphragm does not work, make the following checks:

See that transfer switch rod is properly connected to operate switch.

With engine idling, attach jumper wire from negative battery post to #3 pin on power unit.

G. If transfer key does not operate, check for vacuum line to power unit leaks and for defective solenoid or ruptured diaphragm.

H. If it does operate, connect test lamp between ground and#3 socket of plug at power unit.

I. If lamp lights, plug is at fault (Check A).

J. If lamp does not light, remove ten prong plug from transmission control switch.

With test lamp connected from negative battery terminal to the #3 socket of plug at power unit, ground #1 prong of ten prong plug.

K. If lamp does not light, white wire in harness is broken or improperly soldered to plug.

L. If lamp lights, check transmission control switch (Check J).

Move gear shift lever from neutral to second while watching power unit.

M. If power shift cylinder does not work, make the following check:

With engine idling touch jumper wire from negative battery post to #1 and #2 pin alternately; power cylinder piston rod should move "out" and "in".

N. If it does not, check for air leaks in vacuum lines to each end of cylinder. Also check for defective second gear solenoid (Check I).

With gear shift still in second gear connect test lamp between ground and #1 socket of plug.

O. If lamp lights, plug is at fault.

P. If lamp does not light, replace transmission control switch (Check J).

CONDITION NO. 3

DOES NOT SHIFT INTO SECOND FROM HIGH

A. If transmission shifts from neutral to second, but not from high to second; make sure that binding or sticking throttle linkage is not causing the clutch to fail to disengage.

B. if clutch disengages but transmission stays in high gear, make (Check C) and check governor wire harness plug (Check A).

CONDITION NO. 4

DOES NOT SHIFT OUT OF SECOND INTO NEUTRAL

If transmission does not shift out of second and into neutral, make the following check:

A. With engine idling, attach jumper wire from negative battery post to #2 pin on power unit solenoids. Power cylinder rod should move "in".

B. If it does not, check for air leaks in lines to end of cylinder. Also check for defective high gear solenoid (Check I).

C. With gear shift lever in neutral, connect test lamp between ground and #2 socket of power unit plug.

D. If lamp lights, plug is at fault (Check A).

E. If lamp does not light, fault is in transmission control switch (Check I).

CONDITION NO. 5

DOES NOT SHIFT OUT OF SECOND INTO HIGH

A. Remove four contact plug from governor and install jumper wire between #1 and #4 socket contacts in plug. Start engine and shift lever to automatic (high) positions while holding the clutch pedal down lightly with foot. Shift to high gear will be indicated by an increase in pressure on foot caused by the de-energizing of the Vacumotive Drive Power Unit.

B. If shift to high gear does occur, either the wire harness plug at the governor (Check A) or the governor itself (Check C) is faulty.

WARNING: Set brakes and do not remove foot from clutch pedal during this check.

C. If shift to high gear does not occur, check wire between governor socket #4 and power shift unit plug socket #2 for an open circuit, also check both plugs (Check A).

CONDITION NO. 6

SHIFT INCOMPLETE - STOPS IN NEUTRAL

Make (Check D).

CONDITION NO. 7

FREE WHEELS AT SPEEDS ABOVE 25 M.P.H.

A. If free wheeling never continues for more than 2 or 3 seconds, check spring behind gear shift lock detent. See Section GG in Figure 14. This should be a 30 lb. spring, (Part No. 41236).

B. If free wheeling continues more than 2 or 3 seconds, make (Check C) and see "Vacumotive Drive Trouble Shooting, Condition No. 3".

CONDITION NO. 8

THROTTLE REMAINS LOCKED

NOTE: A locked throttle indicates an incomplete shift.

A. If locking occurs when shifting from second to neutral, make checks for failure to shift from second to neutral.

B. If locking occurs on some other shift, check accordingly.

C. Follow with (Checks D, E and F) in order. Also check "Vacumotive Drive Adjustments" No. 4 and 6.

CONDITION NO. 9

SLOW RELEASE OF THROTTLE LOCK

In cold weather too heavy of a lubricant in the transmission will result in slow shifting causing the throttle t o remain locked for a longer period of time. Refer to "Lubrication Section" for proper seasonal transmission lubrication instructions.

CONDITION NO. 10

NOISY CROSS-OVER

This is due to looseness in the transfer diaphragm rod ball joint. See "Adjustment Chart", Items No. 1 and 2.

CONDITION NO. 11

STICKY CROSS-OVER

See "Adjustment Chart", Items No. 3 and 7.

CONDITION NO. 12

SQUEAK DURING POWER SHIFT

Check for damaged grommet on throttle lock diaphragm housing.

CONDITION NO. 13

GEARS CLASH DURING, SHIFT

Make (Check D).

WIRING DIAGRAM

Referring to the HDM Wiring Diagram (Schematic) Figure 15, following the wiring in the Transmission Switch, we come to a resistance (zig-zag line connecting to Socket #1. Full voltage is applied on the diaphragm solenoid only when the clutch is closed (clutch disengaged).

NOTE: To prove the electrical circuits in any of the Drive-Master units ,including V acumotive Drive, use a test lite and jumper wire to make any of the following tests and replace units or repair if they do not check.

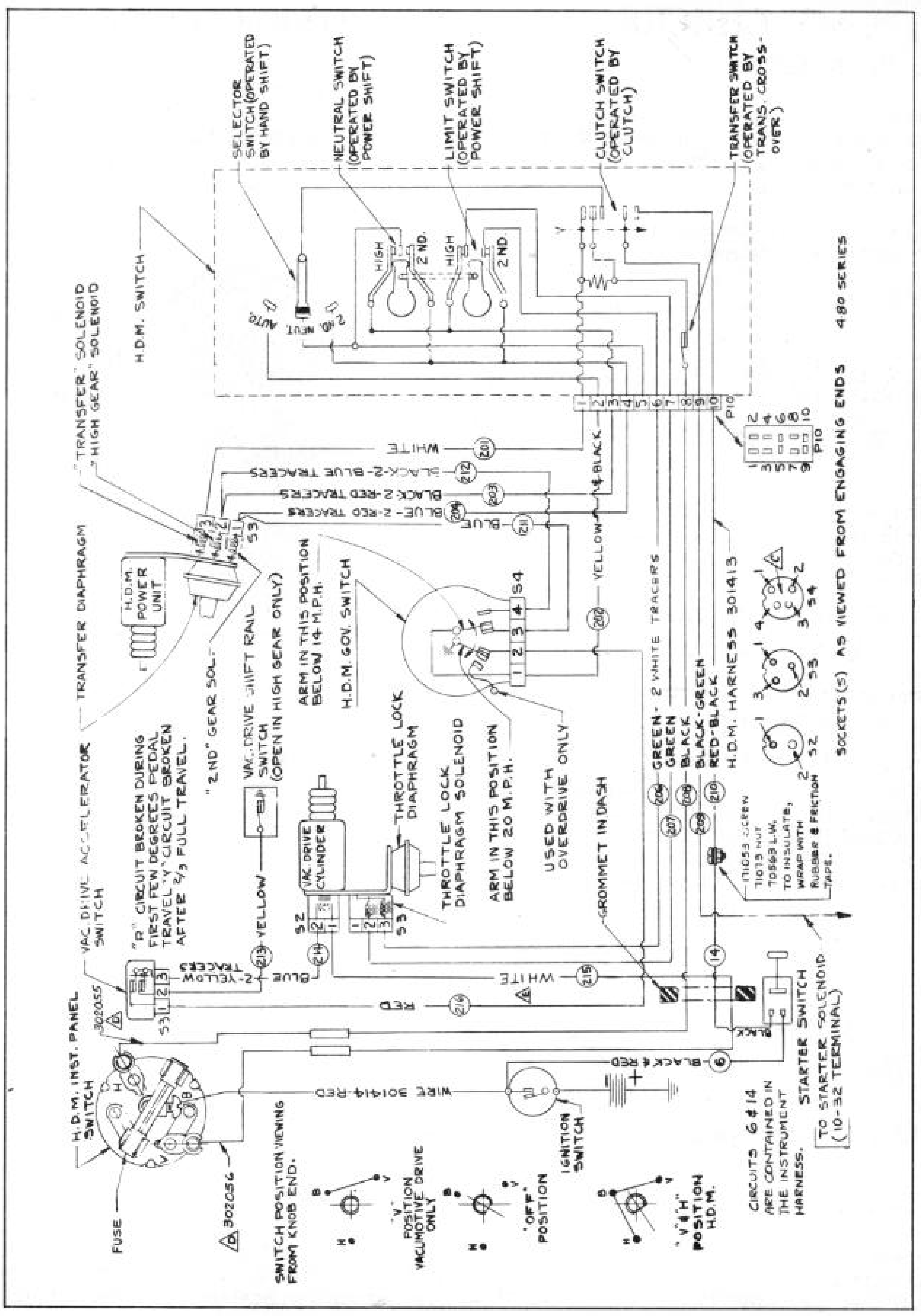

SELECTOR SWITCH (OPERATED BY HAND SHIFT)
NEUTRAL SWITCH (OPERATED BY POWER SHIFT)
LIMIT SWITCH (OPERATED BY POWER SHIFT)
CLUTCH SWITCH (OPERATED BY CLUTCH)
TRANSFER SWITCH (OPERATED BY TRANS. CROSS-OVER)
H.D.M. SWITCH
"TRANSFER" SOLENOID
"HIGH GEAR" SOLENOID
TRANSFER DIAPHRAGM
H.D.M. POWER UNIT
WHITE
BLACK-2-BLUE TRACERS
BLACK-2-RED TRACERS
BLUE-2-RED TRACERS
BLUE
YELLOW
ARM IN THIS POSITION BELOW 14 M.P.H.
H.D.M. GOV. SWITCH
"2ND" GEAR SOL.
VAC. DRIVE SHIFT RAIL SWITCH (OPEN IN HIGH GEAR ONLY)
THROTTLE LOCK DIAPHRAGM
THROTTLE LOCK DIAPHRAGM SOLENOID
ARM IN THIS POSITION BELOW 20 M.P.H.
USED WITH OVERDRIVE ONLY
GROMMET IN DASH
GREEN-2 WHITE TRACERS
GREEN
BLACK
BLACK-GREEN
RED-BLACK
H.D.M. HARNESS 301413
SOCKETS (S) AS VIEWED FROM ENGAGING ENDS
480 SERIES
VAC. DRIVE CYLINDER
VAC. DRIVE ACCELERATOR SWITCH
"R" CIRCUIT BROKEN DURING FIRST FEW DEGREES PEDAL TRAVEL "Y" CIRCUIT BROKEN AFTER 2/3 FULL TRAVEL.
H.D.M. INST. PANEL SWITCH
FUSE
302055
302056
SWITCH POSITION VIEWING FROM KNOB END.
"V" POSITION VACUMOTIVE DRIVE ONLY
"OFF" POSITION
"V&H" POSITION H.D.M.
IGNITION SWITCH
WIRE 301414-RED
BLACK & RED
RED
STARTER SWITCH
TO STARTER SOLENOID (10-32 TERMINAL)
CIRCUITS 6 & 14 ARE CONTAINED IN THE INSTRUMENT HARNESS.

FIGURE 15

UNIT CHECKS

A. PLUG CHECK

Insert a 1/8" diameter rod successively into each socket of plug for a distance of 1/4". Socket should grip rod tightly enough to make a good electrical contact.

Use a 5/32" diameter rod in No. 2 socket of Vacumotive Drive Solenoid.

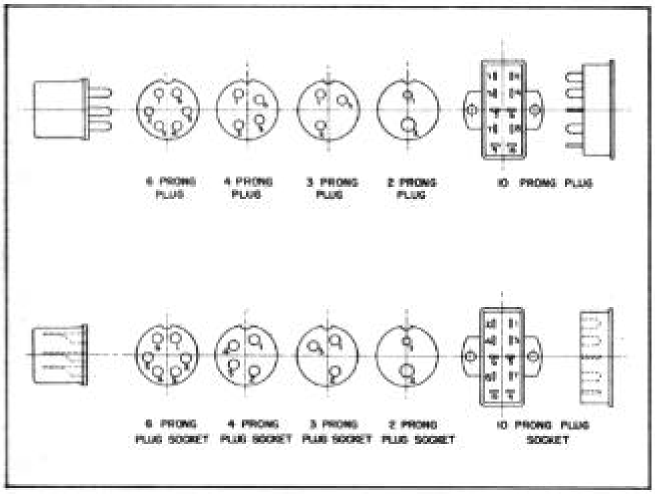


FIGURE 16

B. INSTRUMENT PANEL SWITCH CHECK

Ignition Switch on. Ground long lead of test 1 a m p. Switch button turned to DRIVE-MASTER SIDE (Right Side). Examine fuse and if fuse is OK, test lamp prod to No. 2 or No. 3 terminal Figure 17 should light test lamp.

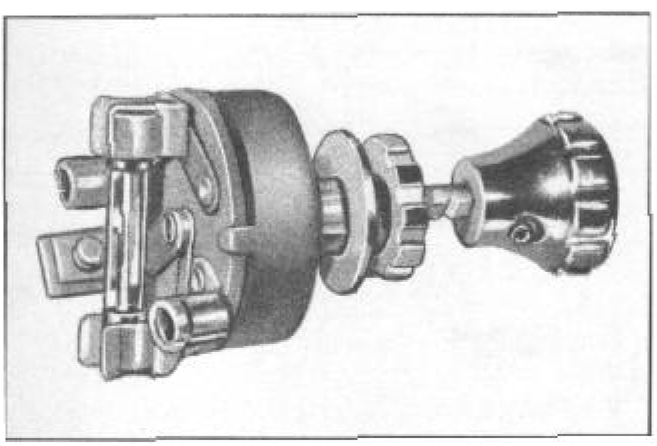


FIGURE 17

C. GOVERNOR SWITCH

Rear wheels on stands. Start engine, shift to high gear. Remove connector plug. Long lead to test lamp to negative terminal of battery. Test lamp prod to #2 prong of governor Figure 18 should light test lamp when clutch is disengaged and also when clutch is engaged up to 16 to 21 miles per hour.

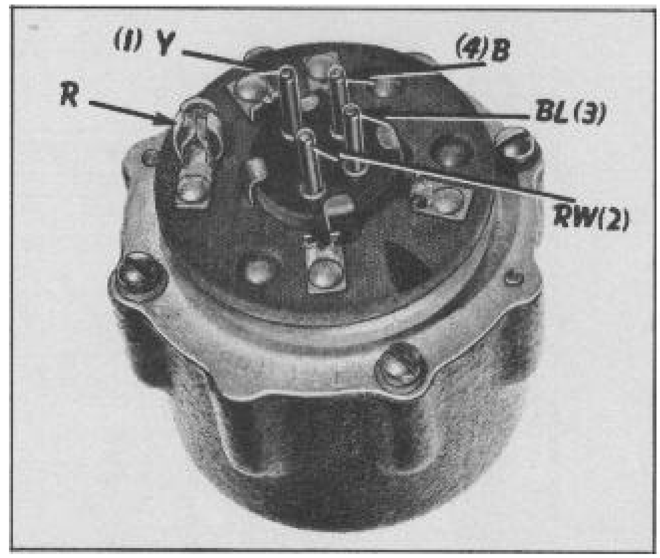


FIGURE 18

Ground #1 prong of governor, test lamp prod to #3 prong should light test lamp up to 9 13 miles per hour, above that speed with test prod to #4 prong should light test lamp.

A separate terminal for use with overdrive should light test lamp at speeds of 16 to 21 miles per hour and remain lighted at higher speeds.

D. THROTTLE LOCK FAILURE

It is the function of the throttle lock t o hold the throttle closed until a shift is complete. Failure to shift through neutral and clashing gears when accelerator pedal is pushed down again immediately after releasing is a sign of defective throttle lock.

To check proceed as follows:

With engine idling and H.D.M. turned on, shift from neutral to second, throttle should lock momentarily. Next shift from second back to neutral, throttle should again lock momentarily. If proceeding checks were OK put transmission in second gear by pulling the hand lever down into automatic (high) position. Stop engine, pull plug connector from shifter unit, start engine and move hand lever to neutral. Throttle should lock. Jack up rear wheels and push accelerator down t o floor while holding foot lightly on clutch pedal to stop it if clutch control should release suddenly.

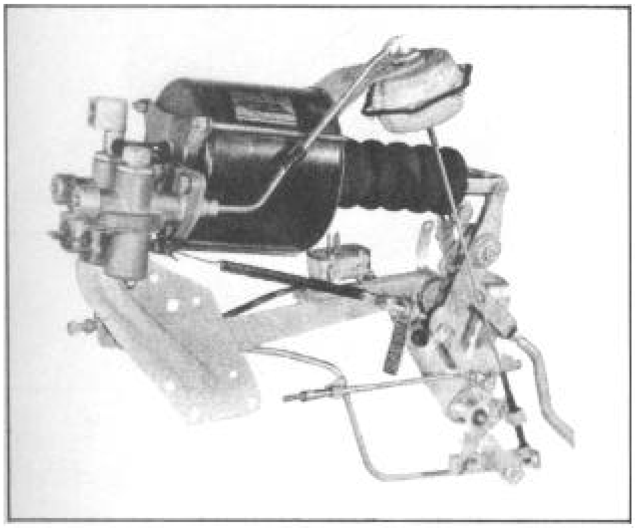


FIGURE 19

Throttle lock should hold engine at idling speed while accelerator pedal is at floor. If it does not, adjust cable length (Adjustment Instruction #6). If this adjustment does not stop pedal from breaking through throttle lock, check adjustment #8 an d #11 of Vacumotive Drive Adjustment Instructions. If these adjustments fail to correct trouble, change transmission control switch.

If throttle failed to lock on either the shift into or out of second, check as follows:

With engine idling attach jumper wire from negative battery post successively to each of the three throttle lock solenoids. Lock should operate in each case. If it does not operate, check for defective solenoid, ruptured diaphragm, or defective throttle lock ground wire.

If it does operate, adjust length, of cable per adjustment instructions. Also connect test lamp successively between ground and #2 and #3 sockets in harness plug. In each case lamp should flash when gear shift lever is moved from neutral to second and back to neutral. If lamp flashes in both cases, plug is at fault. Make (Check A).

If lamp does not flash in both cases, replace transmission control switch, (Check J) or harness from plug socket #2 at throttle lock to #7 prong at ten prong plug and from #3 prong of plug at throttle lock to #6 prong of ten prong plug.

E. ACCELERATOR SWITCH

Ground one lead of jumper wire, other lead to #2 prong of accelerator switch, figure 20, long lead of test lamp to negative terminal of battery. Lever against stop, test lamp prod to #1 prong of accelerator switch, should light test lamp. Moving lever 10 degrees from stop, light should go out. Lever against stop, test lamp prod to #3 prong, should light test lamp. Moving lever 60 to 70 degrees from stop, light should go out.

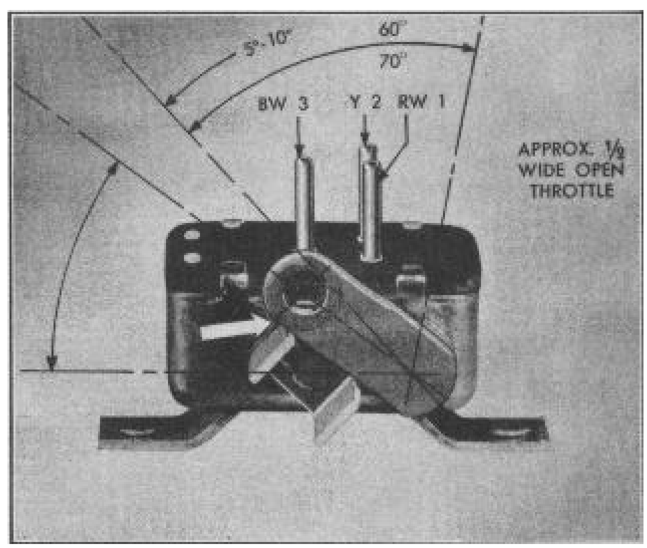


FIGURE 20

F. SHIFT RAIL SWITCH

Stop engine, long lead of test lamp to negative terminal of battery. Prod of test lamp #2 socket of accelerator switch. Shift handy shift. No light on high gear, lamp lights on all others. Replace connector socket.

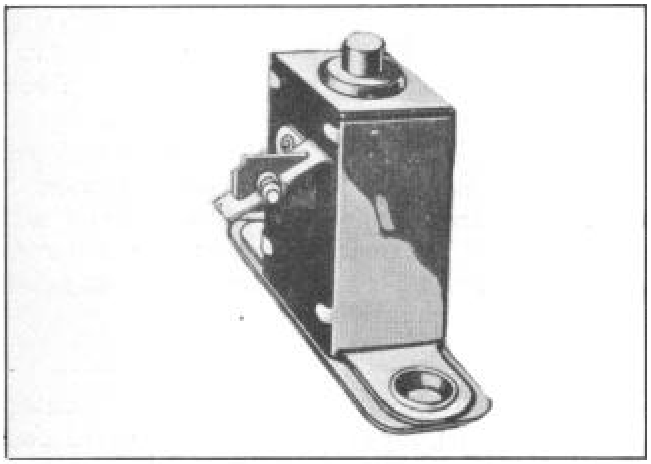


FIGURE 21

G. VACUMOTIVE CLUTCH SOLENOID

Remove connector socket. Ground one lead of jumper wire, other lead to #2 prong of CVC solenoid, Figure 22 indicated by arrow. Connect one lead of a second jumper wire to negative terminal of battery to #1 prong of CVC solenoid, valve should operate. Replace connector socket.

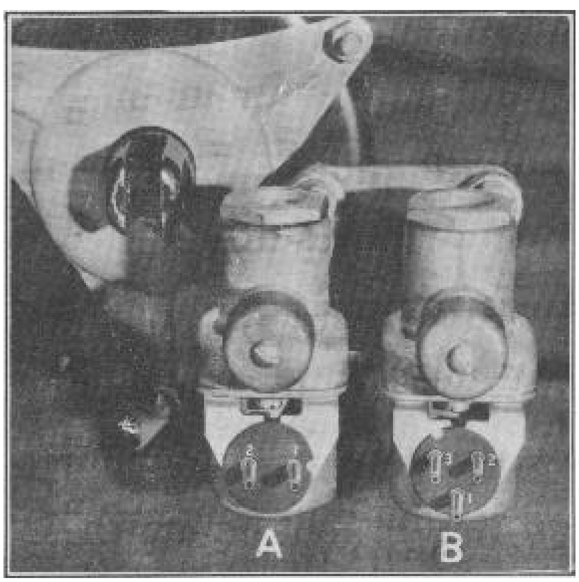


FIGURE 22

H. THROTTLE LOCK SOLENOID

Remove connector. One lead o f jumper wire t o negative terminal of battery. Other lead to #2 prong of throttle lock solenoid, Figure 23, indicated by arrow valve should operate. Move jumper wire from #2 prong to #3 prong, valve should operate. Replace connector socket.

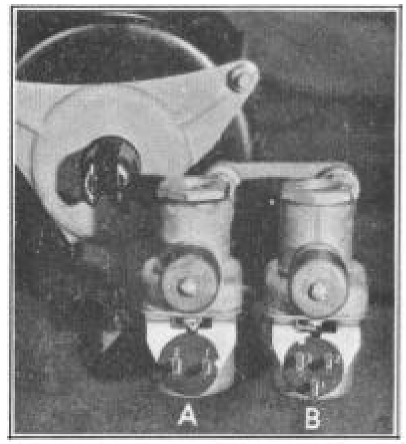


FIGURE 23

I. TRANSMISSION POWER UNIT

Start engine. Remove connector socket. Lead of jumper wire to negative terminal of battery. Other lead to #1 prong of power unit. Piston rod should move "out". To #2 prong piston rod should move "in". To #3 prong should operate transfer diaphragm. Replace connector socket.

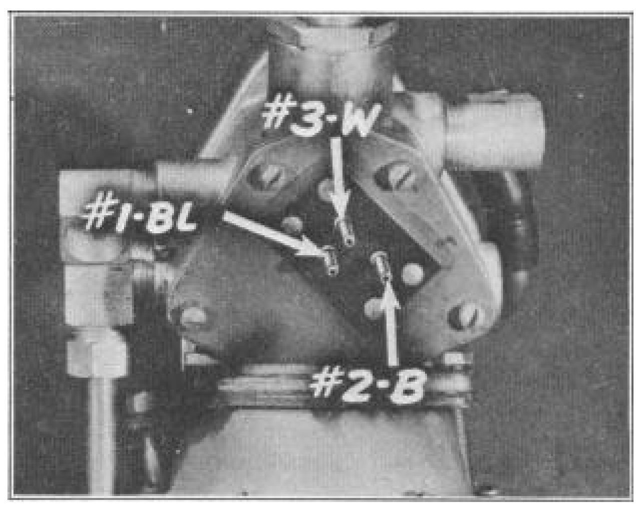


FIGURE 24

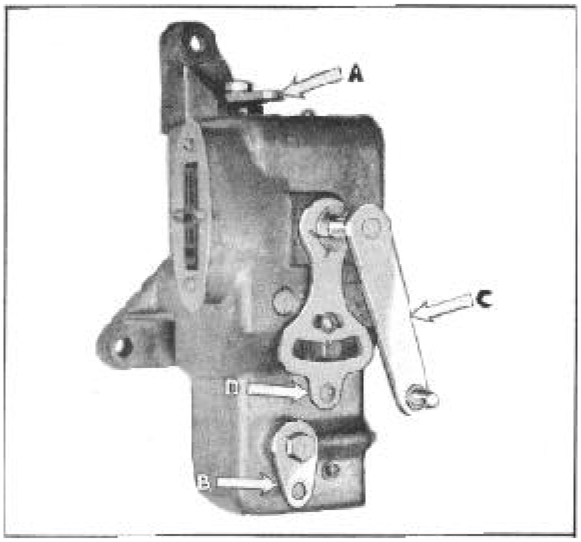


FIGURE 25

J. TRANSMISSION SWITCH

Place handy shift in neutral. Remove connector plug. Insert plug of test harness. Long lead of test lamp to negative terminal of battery. Test lamp prod free for testing.

		Test Lamp from battery to Prong #	Ground lead to Prong	Lamp Lights
(A) Clutch and Transfer Switch	Disconnect clutch operating rod.	8	1	Yes*
	Move switch lever to rear (on).	8	5	Yes
	Gear shift lever in neutral.	9	10	Yes
(B) Selector Switch	Clutch switch on.	1	4	Yes
	1. - Move handy shift to second gear.	1	5	No
	Neutral switch in neutral	1	2	No
	2. - Move handy shift to neutral.	1	5	Yes
	Neutral switch in neutral.	1	2	No
		1	4	No
	3. - Move handy shift to high.	1	2	Yes
	Neutral switch in neutral.	1	4	No
		1	5	No
(C) Neutral and Limit Switch	1. - Move power lever to neutral	3	7	Yes
	(center). Gear shift lever in	3	5	No**
	neutral.	4	5	No**
		4	6	Yes
	2. - Move power lever to second	3	7	Yes
	(forward). Gear shift lever in	3	5	Yes
	neutral.	4	6	No
		4	5	No
	3. - Move power lever to high	3	7	No
	(rear). Gear shift lever in	3	5	No
	neutral.	4	6	Yes
		4	5	Yes

Remove test harness and replace plug.

* When clutch switch is moved forward (off) the lamp should burn dim, and brighten when lever is moved to rear (on).

** If lamp lights, recheck neutral switch adjustment, before proceeding further.

DRIVE-MASTER POWER CYLINDER AND TRANSFER DIAPHRAGM

REMOVAL

1. Disconnect diaphragm engaging rod (F) from rod end (E).

2. Disconnect shift strap (G) by removing bolt attaching strap to power cylinder.

3. Disconnect battery cables, battery hold down, battery, battery tray, an d battery support (held by 3 screws).

4. Disconnect vacuum lines at transfer diaphragm solenoids.

5. Remove two cotter pins, nuts, ferrules, flat washers, and rubber bushings attaching the power cylinder to power cylinder support bracket and remove power cylinder and transfer diaphragm.

INSTALLATION

1. Place complete unit in position and enter mounting studs with flat rubber bushings inserted between power cylinder support bracket and mounting bracket.

2. Install two bushings (with collar) over studs and through holes of mounting bracket and install brass ferrules over studs with flanged ends of ferrules entered in counter-bore of the rubber bushings.

3. Install flat washers, nuts, and cotter pins. Tighten nuts sufficiently to enter cotter pins, then back off nuts until face of nut touches cotter pin.

4. Attach power cylinder shift strap and transfer diaphragm engaging rod. (Adjust engaging rod to obtain 1-3/16" between front face of rod end (E) and rear face of diaphragm).

NOTE: Hold diaphragm rod (E) with a wrench to prevent rod from turning and damaging the diaphragm.

5. Adjust sleeve nut so that joint is loose on transfer key ball without any appreciable end play.

6. Connect vacuum lines at diaphragm.

7. Install battery support, tray, battery, battery hold down, and battery cables.

8. Recheck operation of unit an d adjust as necessary.

POWER UNIT SOLENOID VALVES AND TRANSFER DIAPHRAGM

REMOVAL

NOTE: Use same procedure as outlined in "Power Cylinder and Transfer Diaphragm Removal and Installation" and remove transfer diaphragm unit from power unit on bench by removing the transfer diaphragm attaching screws.

NOTE: The solenoid valves are not serviced separately.

TRANSMISSION CONTROL SWITCH

REMOVAL

1. Lift off distributor cap.

2. Disconnect coil wire at distributor vacuum control tube, distributor attaching screw and remove distributor (6 cylinder only).

3. Disconnect clutch operating rod, transfer switch rod, neutral and limit switch rod and selector switch rod.

4. Remove one bolt, lockwasher and nut attaching transmission switch to support bracket at top and one bolt, lockwasher and nut at bottom an d remove transmission switch.

INSTALLATION:

Reverse procedure of removal, attaching upper bolt first. Make sure all cotter pins have been locked securely. Check adjustment and engine timing.

POWER UNIT MOUNTING BRACKET REMOVAL

NOTE: The power unit mounting bracket and the transmission control switch mounting bracket a r e welded together as a complete unit. It will be necessary to follow procedure for power unit and transmission switch removal and disconnect the shift rod and cross - over rod at power shift and manual shift bell crank, disconnect clutch rod at transmission control switch. After removal of the power unit and transmission switch, remove two bolts at lower bracket support, one bolt at oil pan bolt at front and two nuts and lockwashers at side of cylinder block. This will allow removal of the complete bracket with power shift shaft and shift levers attachedfor disassembly on bench.

POWER UNIT TRANSFER DIAPHRAGM ENGAGING ROD AND/OR ROD END AND SLEEVE

REMOVAL:

1. Hold diaphragm rod end with a suitable wrench and loosen the lock nut.

2. Hold diaphragm engaging rod with pliers and back out sleeve nut sufficiently to remove shift rod from transfer key ball.

INSTALLATION:

To install, reverse procedure of removal and adjust diaphragm engaging rod to obtain 1-3/16" betweenfront face of rodend and rear face of diaphragm housing with sleeve nut adjusted so that rod swivels freely on transfer key ball without any appreciable end play.

POWER UNIT SHIFT STRAP

REMOVAL:

1. Remove bolt and shakeproof lockwasher at power cylinder.

NOTE : When replacing shift strap, use a heavy internal tooth or heavy standard split lockwasher.

2. Remove cotter pin, plain washer and disconnect neutral and limit switch rod.

3. Remove inner cotter pin, flat washer, anti- rattle washer and remove shift strap.

INSTALLATION: Reverse procedure of removal.

TRANSFER KEY

REMOVAL:

Use procedure of "Power Unit Transfer Diaphragm Engaging Rod" and remove cotter pin and clevis pin from transfer key.

NOTE: Push shift shaft to rear to allow clearance for cotter pin removal.

INSTALLATION: Reverse procedure of r emoval and check adjustment.

NOTE: To lubricate transfer key, grasp diaphragm engaging rod and pull towards front of car. This action will allow clearance at transfer key alemite for lubrication gun.

DRIVE-MASTER SHIFT SHAFT AND/OR SHIFT SHAFT LEVERS

REMOVAL:

1. Remove shift shaft nut located at rear of Drive-Master support bracket. (It will be necessary to disconnect transfer switch rod at transmission switch to allow more wrench clearance.

2. Remove cotter pin and clevis pin and disconnect power shift rod.

3. Slide shift shaft out toward fender (use care as detent balls and springs may fall out of their retainers).

INSTALLATION: Reverse procedure of r re-moval and make sure the detent ball springs are properly positioned as follows. Part # 163442-19 pound spring when compressed to 11/16" is assembled in Drive-Master mounting bracket pin for the (Hand Shift)

Lever Assembly. Part #41236 a 30 pound spring when compressed to 13/16" is assembled on the shift shaft lever pin of the shift shaft lever (power Shift).

The detent balls should be well lubricated with water resistant grease prior to assembly.

NOTE: If replacement of the transfer key hub bushing is necessary, remove bushing with a driver having a .625 pilot. Bushing inside diameter to be .625 to .626 after assembly. Shift shaft bushing also have a .625 to .626 inside diameter to allow a shift shaft clearance of .0025" to .0035".

INSTRUMENT PANEL. SWITCH

REMOVAL

1. Remove set screw from switch knob and remove knob.

2. Remove switch lock nut and washer.

3. Push extension through hole in instrument panel and remove wires and fuse.

INSTALLATION: Reverse procedure of removal.

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OVERDRIVE

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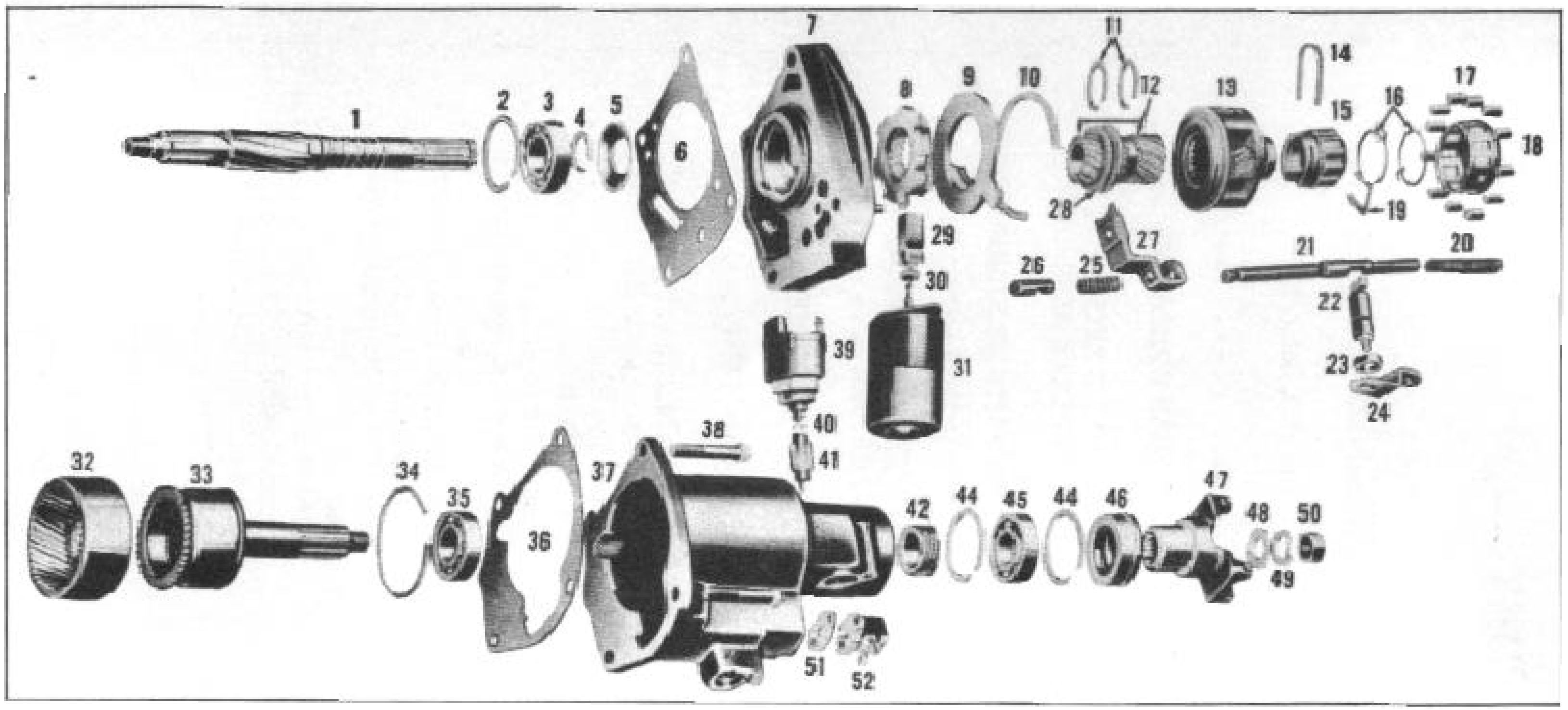

FIGURE 1

1. Transmission mainshaft
2. Transmission mainshaft snap ring
3. Transmission mainshaft bearing
4. Transmission snap ring
5. Bearing oil baffle
6. Overdrive to transmission case gasket
7. Overdrive housing adapter
8. Stationary gear plate & balk ring
9. Stationary gear plate cover
10. Cover plate snap ring
11. Stationary gear snap ring
12. Stationary gear
13. Pinion cage assembly
14. Pinion cage retainer clip
15. Cam assembly
16. Cam roller retainer spring
17. Cam roller
18. Cam roller retainer
19. Cam retainer clip
20. Shift rail retractor spring
21. Shift rail
22. Control shaft
23. Control shaft oil seal
24. Control lever
25. Shift rail sleeve spring
26. Shift rail sleeve
27. Shift fork
28. Stationary gear collar
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30. Stationary gear pawl oil seal
31. Solenoid assembly
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34. Snap ring
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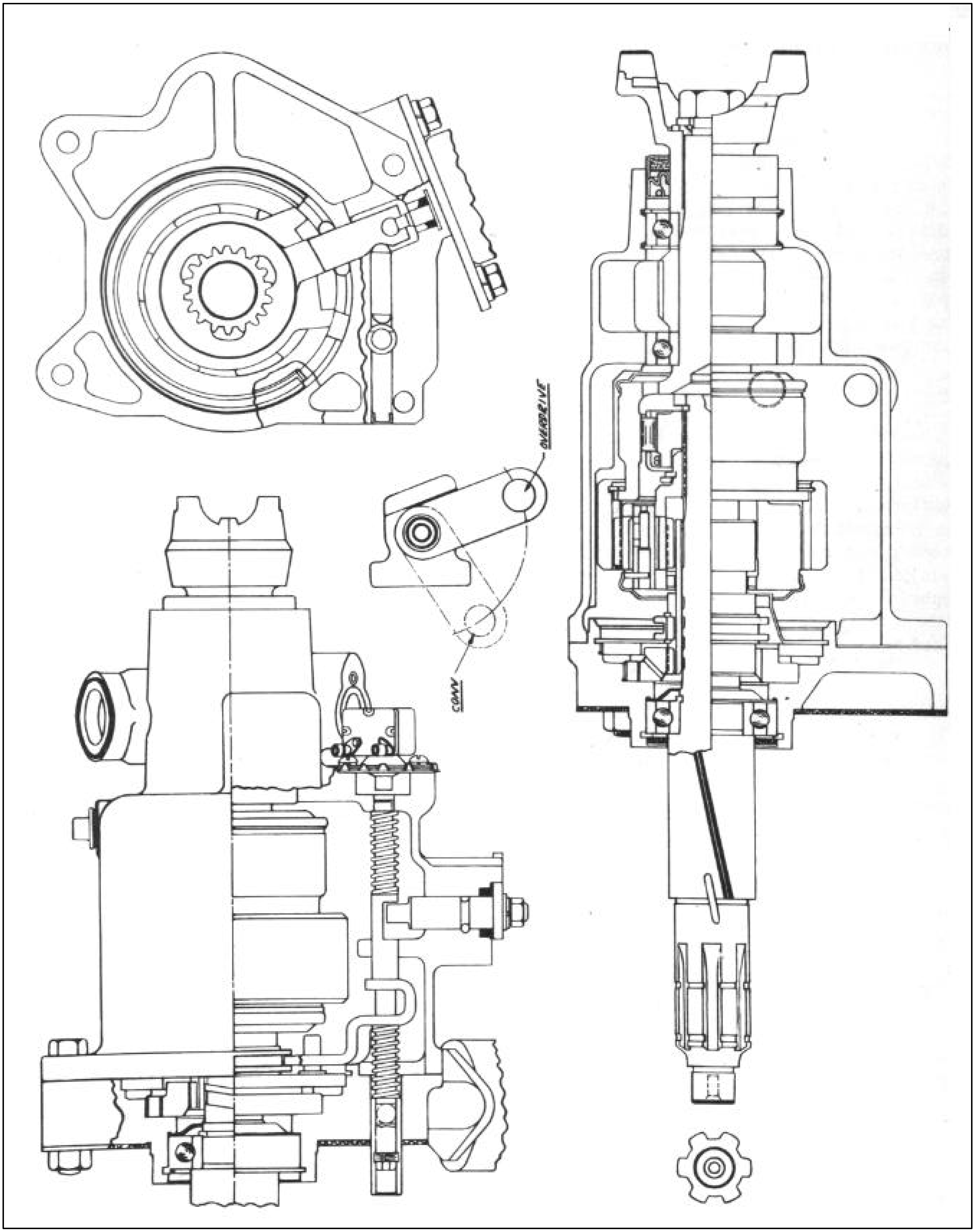
37. Overdrive housing
38. Overdrive housing to adapter bolt
39. Governor switch
40. Lock ring
41. Governor pinion
42. Speedometer drive gear
44. Shaft bearing snap ring
45. Overdrive mainshaft bearing -rear
46. Overdrive mainshaft oil seal
47. Companion flange
48. Mainshaft plain washer
49. Mainshaft lockwasher
50. Mainshaft nut
51. Control switch gasket
52. Control switch


OVERDRIVE
CONV

TRANSMISSION OVERDRIVE

CONSTRUCTION AND OPERATION

Overdrive provides a driving ratio of engine speed to rear wheel speed that is numerically lower than direct drive. In overdrive the engine revolves 30% slower than in direct gear at the same car speed. This reduction is obtained by the use of planetary pinions which rotate around the stationary gear and revolve in the internal tooth ring gear permitting the propeller shaft to rotate 43% faster than the engine. Overdrive operation results in less wear on engine parts as well as greater fuel and oil economy and smoother operation at high speeds.

The overdrive transmission is divided into two parts, the transmission unit and the overdrive unit. The fundamental shifting of three speeds forward and one in reverse is performed in the transmission unit. The overdrive unit is made operative by stopping the planetary system gear plate, and inoperative by releasing the gear plate. The power to release and to stop the gear plate is provided by a solenoid attached to the overdrive unit.

Three switches and a relay connected in series control the operation of the solenoid. These units are: the overdrive control switch, the governor switch, throttle switch and overdrive relay.

During conventional transmission drive the governor circuit is open at the overdrive control switch and the solenoid pawl is locked in the released position, the stationary gear is locked in the pinion cage which prevents the rotation of the pinion gears on the ring gear. The stationary gear plate assembly rotates freely with the sun gear.

In conventional transmission, the drive is through the transmission mainshaft, the pinion cage and pinions, ring gear and the overdrive mainshaft to the propeller shaft.

When the overdrive control button is pushed all the way in, the shift shaft moves the shift rail and shift fork, which in turn moves the stationary gear forward unlocking the pinion gears. (The circuit through the overdrive control switch is now closed). Between 18 and 21 miles an hour the governor switch completes the overdrive relay circuit and energizes the overdrive solenoid.

When the solenoid is energized, the plunger moves out compressing a spring which pushes against the pawl rod. The pawl moves out till it is stopped by the balk ring. Then as the accelerator s momentarily released and the engine slows down to overdrive speed the stationary gear slows down, stops, and starts to turn in the opposite direction carrying the balk ring with it. When the outer rim of the balk ring has moved backward about 5/8", the balk ring slot lines up with the pawl and the solenoid plunger spring pushes the pawl down through the slot and against the stationary gear plate which is also turning slowly. As soon as a slot in the gear plate is lined up, the pawl is pushed on down with it. The gear is then held stationary and the power circuit is transferred to the overdrive gearing.

As soon as the pawl moves in against the balk ring, the main closing coil in the solenoid is automatically cut out. The small holding coil remains energized as long as the car is in overdrive, but requires only a small amount of current.

In overdrive, the drive is through the same gearing as it is in direct. However, in direct drive the stationary gear is locked to the pinion cage causing the transmission main shaft, the pinion cage, the sun gear, the ring gear, and the overdrive main shaft to turn as a unit. In overdrive, the stationary gear is locked to the transmission case and the planetary gears rotate around it and cause the ring gear an d overdrive main shaft to make approximately four revolutions t o three of the transmission main shaft.

On deceleration, when the car coasts down to speeds between 19 and 16 miles per hour, the governor switch breaks the overdrive relay circuit and de-energizes the overdrive solenoid, which causes the overdrive to disengage and return to conventional drive.

The throttle switch mounted on the toe-board below the accelerator pedal, Figure 3, permits reverting to direct drive temporarily when additional acceleration is required.

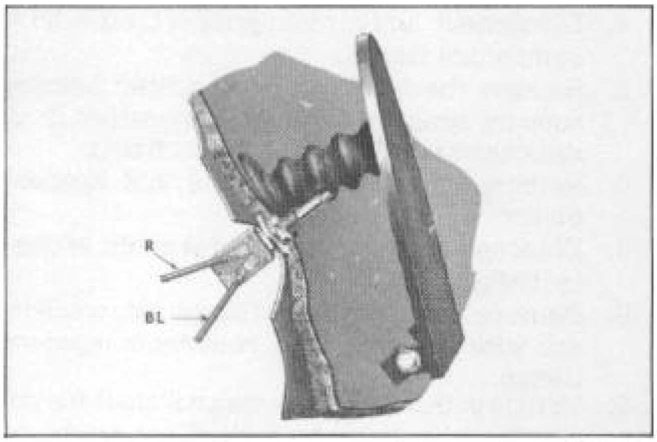


FIGURE 3

When the accelerator pedal is depressed beyond the wide - open throttle position, the throttle switch is opened and breaks the solenoid hold - in coil circuit. This permits the solenoid plunger spring to exert a force tending to withdraw the solenoid pawl. Because the engine torque load on the pawl prevents its disengaging from the gear plate, the ignition circuit is grounded momentarily through the relay and the solenoid. As the engine torque is reversed, the solenoid spring pulls the gear pawl out of the slot in the stationary gear plate and permits the stationary gear to rotate freely for direct drive.

When the accelerator is released sufficiently to close the throttle switch, the circuit is again closed. The solenoid coils are energized and the solenoid plunger compresses the pawl rod spring.

Overdrive can now be restored by momentarily releasing the accelerator pedal provided the car is moving faster than 18 to 21 miles per hour.

The complete solenoid operation is so rapid and the ignition is interrupted for so short an interval that it is hardly apparent to the operator.

REVERSE GEAR OPERATION

It is not necessary to pull out the overdrive control button to shift into reverse. If reverse gear is used while the overdrive control button is pushed in, the reverse shift fork moves the overdrive shift rail to the rear, breaking the governor circuit at the overdrive control switch. The possibility of energizing the solenoid and engaging the overdrive is thus prevented for reverse gear operation.

NOTE: To disengage overdrive and prevent free wheeling when in overdrive, momentarily depress accelerator pedal to floor while pulling out on control. Continue to pull on control while releasing accelerator. When driving at lower than overdrive cut-in speed, follow the same procedure except that it will not be necessary to depress accelerator pedal all the way to floor. Never attempt to pull out the control knob unless the engine is pulling the car (not coasting) or the clutch is disengaged.

OVERDRIVE REPAIR

SERVICING EXTERNAL UNITS

Governor Switch and Pinion

Servicing of governor switch and governor switch pinion may be accomplished by disconnecting wire or wires at governor switch and then screwing governor switch out of Overdrive case. When reconnecting wires on cars not equipped with H.D.M., make sure that the Overdrive wire (Red) is inserted in the 5/32" dia. terminal and not in the 3/16" dia. terminal which is used for Vacumotive Drive.

Control Switch

The control switch is attached to the Overdrive housing by two 10-24 screws. Before reinstalling, check for damaged gasket and defective wire terminals.

Solenoid

Detach the solenoid by removing the two mounting screws and turning solenoid 1/4 turn either way while pulling out. To install, reverse this procedure. After holes in flange and housing are lined up, but before installing cap screws, pull straight out on solenoid. If it can be pulled out, the ball at the end of the solenoid rod was not locked in the pawl.

Oil Seal (O.D. Mainshaft)

1. Disconnect universal joint at transmission companion flange.

2. Drive a sharp chisel into the side of the old grease retainer and pry old retainer out of rear of case.

NOTE : DO NOT DAMAGE overdrive case bore.

To install, reverse procedure of removal and coat outside of seal with a film of white lead and drive seal into place with a suitable driver.

Oil Seal (O.D. Control Shaft)

Remove control lever and pry out seal with sharp punch. Coat outside of new seal with white lead and drive into place with suitable tool.

Oil Seal (O.D. Solenoid)

Remove solenoid and pry out seal. Coat outside of new seal with white lead and drive into place with suitable tool.

SERVICING UNITS REQUIRING REMOVAL OF HOUSING

Repairs to the overdrive case, overdrive mainshaft, mainshaft ring gear, free wheeling cam, pinion cage assembly, stationary gear, shift rail and fork assembly, overdrive main-shaft rear and front bearing, overdrive main-shaft oil seal, speedometer drive gear, solenoid pawl and interlock plunger may be performed underneath the car by removing the overdrive housing without disturbing the transmission. See "Overdrive Housing Removal". However if the transmission mainshaft, overdrive adapter, or transmission mainshaft bearing are to be replaced, it will be necessary to proceed as outlined under "Transmission and Overdrive Removal".

OVERDRIVE HOUSING REMOVAL

1. Place car on stand jacks.
2. Remove drain plugs and drain transmission and overdrive cases.
3. Disconnect governor switch and overdrive switch wires.
4. Disconnect universal joint at overdrive companion flange.
5. Remove the bolts attaching center bearing support bracket and move propeller shaft rearward to clear companion flange.
6. Remove speedometer cable and speedometer driven gear.
7. Disconnect overdrive control cable at control shaft lever.
8. Remove the companion flange nut, washer, and with puller J-820, remove companion flange.
9. Drive out the overdrive control shaft tapered pin and pull control shaft out as far as possible t o disengage the operating cam of the shift shaft from the slot in shift rail.

NOTE: Small end of taper pin is down.

10. Remove the four bolts attaching the overdrive housing to transmission and overdrive adapter.
11. Remove overdrive housing. (Lightly tap the end of the overdrive mainshaft with a rawhide mallet to prevent mainshaft from coming off with the overdrive housing and spilling the free wheeling rollers).

REMOVAL OF PARTS FROM REAR OF ADAPTER

Overdrive mainshaft and ring gear, free wheeling cam, pinion and cage assembly, shift rail and fork, stationary gear, stationary gear cover plate, stationary gear plate cover plate, overdrive mainshaft bearings, and oil seal removal.

NOTE: Perform operations outlined under "Overdrive Housing Removal" and proceed as follows:

1. Install one bolt removed from housing to hold adapter plate to transmission case.

2. Remove the overdrive mainshaft and ring gear assembly (Catch the rollers as they drop out of the free wheeling cam roller retainer.) Remove lock ring (2) Figure 4, which will permit removal of ring gear.

3. Remove the free wheeling cam retainer clip. (This will allow removal of the free wheeling cam and pinion cage assembly).

4. Remove the "U" clip located between the free wheeling cam and pinion cage and separate these units.

5. Remove the overdrive stationary gear,shifter fork, and shifter rail as a unit.

6. Drive out O.D. Shift rail pin (2), Figure 5, remove sleeve (1), spring (3), and shifter fork (4).

7. Remove the solenoid attaching screws, turn the solenoid one-quarter turn clockwise and remove.

8. Remove the large snap ring at the adapter plate. (This will allow removal of the stationary gear plate cover plate,
balk ring and stationary gear plate assembly, and the solenoid pawl.)

9. The interlock lock plunger can be removed by removing the plug at the adapter with a sharp punch and remove interlock by pushing the interlock through opening uncovered, by the plug. Use a stiff wire and work through opening uncovered by the solenoid pawl.

DISASSEMBLY OF HOUSING

1. Place overdrive housing on front face and use a brass drift against the rear face of speedometer drive gear to drive out the overdrive mainshaft front bearing and speedometer drive gear.

2. Remove the overdrive mainshaft old seal with Remover J-943.

3. Remove the two bearing snap rings and remove overdrive mainshaft rear bearing.

INSPECTION

Bearings

DO NOT place bearings where dirt is liable to mix with the lubricant in the bearing.

Bearings should be washed in clean gasoline or kerosene. DO NOT SPIN the bearings and particularly do not spin bearings with an air hose. Spinning a bearing at high speeds will almost certainly do considerable damage. After washing the bearings, blow them out with clean dry air. Direct the flow of air into the open face of the bearing while holding the inner race and slowly rotate the outer race by hand. DO NOT ALLOW the air to spin the bearing.

a. Inspect the bearing for cracks and defects.

b. Lubricate the bearing with clean, new engine o i 1, rotating the bearings by hand in order to spread the lubricant over all surfaces.

Transmission mainshaft bearings are built originally with end play and because they may feel quite loose, it does not necessarily indicate that they are worn and unfit for use.

Gears

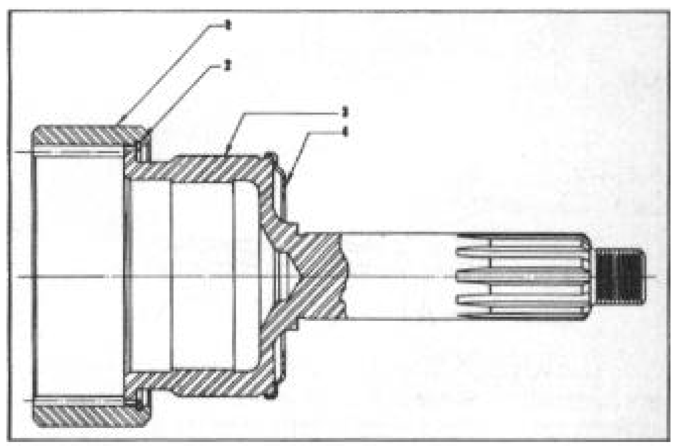


FIGURE 4

1. Ring Gear
2. Snap Ring
3. Overdrive mainshaft
4. Oil collector ring (front)

Removing lock ring (2) will permit the removal of the ring gear from the overdrive mainshaft. The oil slinger (4) can be pried off and replaced if required.

Inspect all gears for damaged teeth. Remove any and all raised edges from tooth surfaces by hand stoning. Pitted and worn gears should be replaced.

Control Shaft and Seal

Recommended clearance between control shaft and overdrive housing bore is .001 to .003 but clearance of twice this amount if not accompanied by oil leakage is permissable.

If a new control shaft seal is installed make sure that it does not interfere with rotation of control shaft.

Overdrive Mainshaft Oil Seal

If the seal is hard, cracked, or glazed, or if signs of oil leakage are apparent at disassembly, install a new seal.

Overdrive Shift Rail

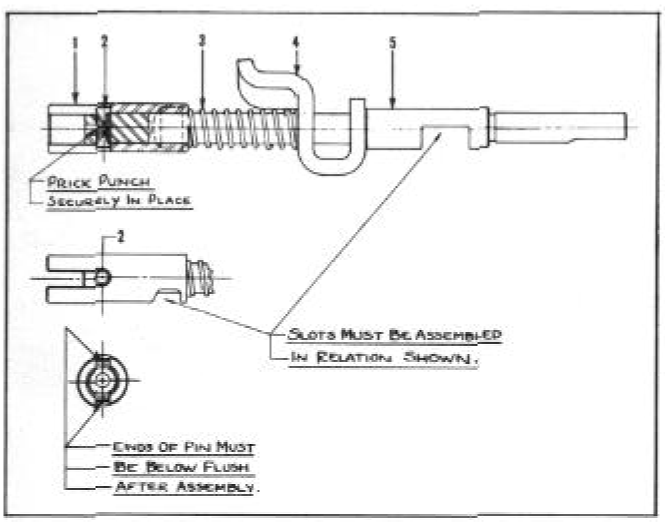


FIGURE 5

1. Shift rail sleeve
2. Shift rail sleeve pin
3. Shift rail sleeve spring
4. Shift fork
5. Shift rail

Check weight of shift rail springs. The s h if t rail sleeve spring should have a free length of 2-7/32" and 1-25/64" length under load of eight pounds. The retractor spring has a free length of 2-3/4" and 1-21/32" under load of 12 pounds.

NOTE: The shorter of the two springs is the shifter rail sleeve spring and should be assembled as shown in Figure (5).

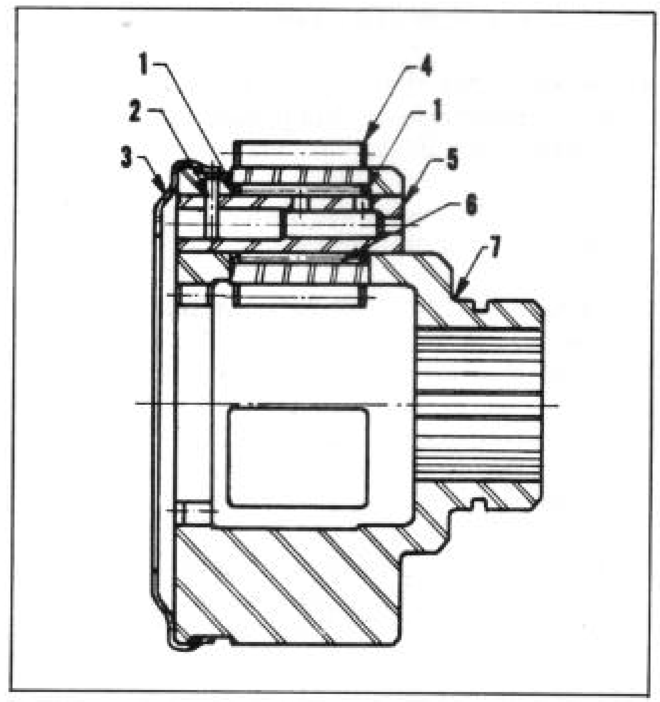


FIGURE 6

1. Pinion
2. Pinion bearing spacer
3. Pinion shaft pin
4. Oil Collector ring
5. Pinion shaft
6. Pinion roller
7. Pinion cage

REASSEMBLY OF HOUSING

1. Install overdrive mainshaft rear bearing rear lock ring, r ear bearing, and front lock ring.
2. Install new oil seal in overdrive case.
3. Install speedometer drive gear and overdrive mainshaft front bearing.
4. Before installing the shift shaft in the overdrive housing, coat the shift shaft oil seal counterbore with white lead and tap in a new seal. Dip the threaded end of the shift shaft in liquid soap, and using care, push the shaft

shaft through the new oil seal, turn the shaft so that the lug will be in an upright position.

INSTALLATION OF PARTS TO REAR OF ADAPTER

To install, reverse procedure of removal.

NOTE: Check position of shift rail slots as shown in Figure 5 at assembly. (THIS IS IMPORTANT).

To facilitate installation of the mainshaft on the free wheeling cam rollers, insert the free wheeling rollers in the cage, using heavy grease to hold them in position. Then turn the cage and rollers counter-clockwise until the rollers are in their low positions and snap a tight fitting rubber band around them. Inst all the overdrive mainshaft and ring gear on the pinion cage and free wheeling unit assembly, and check the following items before assembly:

1. The large adapter lock rings are furnished in the following thickness: .0625", .0665", and .0705", select the size required for a tight fit in groove in overdrive adapter.
2. Replace any "U" clips that are worn or damaged.
3. Shifter fork should be a sliding fit in stationary gear shift sleeve groove.
4. The interlock plunger is furnished in six different lengths. With pawl fully engaged in slot in stationary gear and one end of interlock plunger contacting shift rail (not sleeve) .008" to .021" clearance should exist between the other end of the plunger and the side of the pawl. Select a plunger of proper length to give this clearance.
5. If shift rail assembly has been taken apart, prick punch pin (3), Figure 5, securely in place before reinstalling assembly.

OVERDRIVE HOUSING INSTALLATION

1. Install overdrive to adapter gasket.
2. Install overdrive case, hold speedometer gear with a drift for alignment until case has been installed in position.
3. While case is being installed, push the control shaft inward and engage the slot in the shift rail with the control shaft lug. (Lug must be up and lever down.)

Insert (J-1597) O.D. Aligning Pilot in lower right hand hole of adapter and housing while tightening the other three Overdrive to transmission case bolts. Tighten all 4 bolts to 2030 ft. lbs. torque.

1. Install control shaft locating pin, large end up.

2. Install shift rail switch, governor pinion, and governor switch.

3. Install companion flange, washer, and nut. Tighten nut to 90-100 lbs. torque.

Add lubricant to get proper level in both transmission and O.D. units.

SERVICING UNITS THAT REQUIRE REMOVAL OF COMPLETE ASSEMBLY

Removal

1. Remove front seat cushion.
2. Remove the four bolts attaching the bottom of front seat frame to seat track. Remove two screws attaching seat adjusting lever to seat frame and remove seat back from car.
3. Disconnect accelerator pedal at accelerator rod.
4. Remove foot brake pedal rod from brake lever.
5. Pull the steering column hole rubber grommet up out of the way.
6. Remove the floor mat.
7. Remove Hudson Weather Control blower unit held by four screws, (2 each side). Remove Bowden wire at weather control valve at cylinder head.
8. Disconnect two wires at overdrive throttle control switch.
9. Release speedometer cable from clip on under side of floor opening cover.
10. Remove the floor opening cover over the transmission.
11. Raise car and place stand jacks.
12. Drain transmission and overdrive.
13. Disconnect wires at governor switch, solenoid, and overdrive control switch (located at left rear side of overdrive case).
14. Disconnect speedometer cable and remove speedometer driven gear.
15. Disconnect overdrive control cable from overdrive shift shaft lever.

16. Disconnect the front universal joint at transmission. Remove bolts attaching center bearing support bracket and move propeller shaft rearward to clear transmission companion flange.

NOTE: Use a wire or rubber band to prevent the trunnions from slipping off the "U" joint journal.

17. Disconnect the clutch pedal lever return spring.
18. Remove the two clutch cross shaft bracket bolts and remove clutch cross shaft bracket
19. Remove the clutch control link clevis pin and unhook clevis.
20. Remove shifter shaft outer lever, nut and washer. This will disconnect the linkage connecting the Handy Shift to the transmission.
21. Remove two screws and remove flywheel, guard from bottom of clutch housing.
22. Remove the two engine rear mounting bolts and nut at #3 crossmember.
23. Jack up rear end of engine about 1/2" off the frame.

CAUTION: Place a block of wood under head of jack to prevent damage to oil pan.

24. Remove the two top screws holding clutch housing to engine endplate and install two J-2969 headless screws or studs to support the transmission until the balance of the screws are removed.
25. Remove breather pipe bracket from clutch housing and bolt attaching breather pipe and rear tappet cover.
26. Pull transmission and clutch housing back towards the rear and up through the floor opening. Hoist J-1502 will be helpful in handling the assembly.

REMOVAL OF HOUSING

1, Remove the companion flange nut washer and companion flange.

NOTE: DO NOT HAMMER, use J-820 Flange puller.

2. Drive out the overdrive control shaft tapered pin. (Pin retains control shaft in overdrive case). Small end of pin is down. Pull out the control shaft as far as possible to disengage the operating cam of control shaft from the slot in shift rail.
3. Remove overdrive housing. (Lightly t a p the end of the overdrive mainshaft to prevent it from coming off with the overdrive housing and spilling the free wheeling rollers).

NOTE: F or removal of parts from rear of adapter, see instructions on page (6).

NOTE: For disassembly of housing, see instructions on page (7).

DISASSEMBLY COMPLETE UNIT

1. Remove six bolts attaching clutch housing to transmission case and remove housing.
2. Install transmission on bench holding fixture J-1584 and remove transmission cover, gasket, shift rail ball spring and ball.
3. Remove low and reverse shifter fork lock screws.

NOTE: To remove these special self locking screws, use a screwdriver having a straight blade the will enter to the bottom of screw slot. DO NOT USE A TAPERED BLADE SCREW DRIVER.

4. Slide low and reverse shift rail out of front of case, then remove shift fork and shifter, also the shift rail interlock.
5. Remove the set screw from second and high shift fork and the shift rail stop screw, then slide the shift rail out of front of case. Remove the lock ball and spring from case.
6. Pull mainshaft rearward an d main drive gear forward until mainshaft is fully withdrawn from needle roller pilot bearing in rear end of main drive gear.

NOTE: Some of the bearing rollers may fall into transmission case at this time.

7. Remove mainshaft lock ring with Lock Ring Pliers KMO-630, Figure 7.

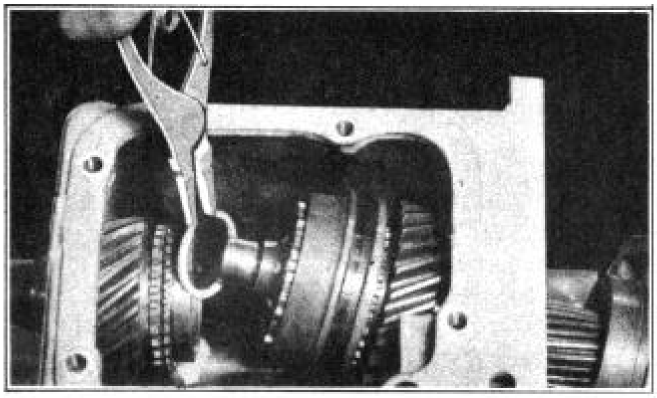


FIGURE 7

8. Remove the synchronizer shift sleeve and hub assembly, intermediate gear low and reverse gear through cover opening in transmission and pull out mainshaft with overdrive housing adapter.

DISASSEMBLY OF ADAPTER ASSEMBLY

1. Remove the mainshaft rear bearing snap ring, Figure 8.

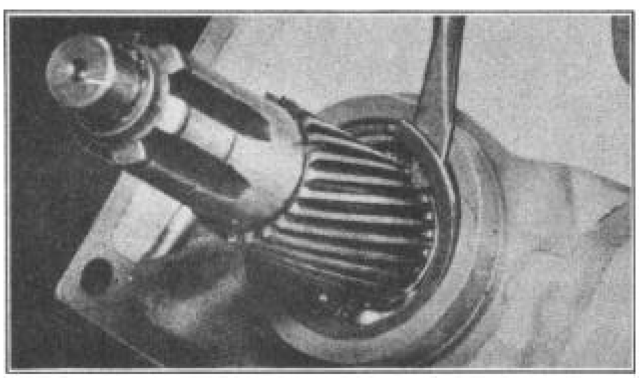


FIGURE 8

2. Remove transmission mainshaft rear bearing and oil baffle from adapter.

NOTE: For inspection procedure, see instruction on page (7).

REASSEMBLY-ADAPTER ASSEMBLY

1. Thoroughly clean both transmission and overdrive cases.
2. Install transmission mainshaft bearing and oil baffle on mainshaft and in overdrive adapter.
3. Install bearing lock ring in adapter.

REASSEMBLY COMPLETE UNIT

1. Install new overdrive adapter to transmission case gasket.

2. Install transmission mainshaft part way in transmission case and install low and reverse gear with shifter fork groove toward front of shaft.

It is important that the four oil holes be lined up with the grooves in mainshaft.

NOTE: The transmission mainshaft and transmission gears are a select fit. If it is ever necessary to replace a transmission mainshaft or a complete overdrive assembly, the fit between the involute splines of the mainshaft and splines in the gears should be free from any binding. In the event this condition exists, it may be necessary to stone the splines of the mainshaft to obtain proper clearance.

3. Slide intermediate gear on mainshaft with the tapered side of the hub toward the front of the mainshaft.

4. Install synchronizer shift sleeve assembly and two bronze synchronizer rings on the mainshaft with the tapered end of the shift sleeve toward the front of the mainshaft.

5. Install synchronizer shift sleeve hub lock ring on end o f mainshaft using lock ring pliers.

6. Apply a coating of viscous grease to main- shaft pilot bearing recess in end of main drive gear. Insert the sixteen individual rollers comprising the pilot bearing.

7. Engage front end of mainshaft in pocket of main drive gear and press firmly in place.

NOTE: Do not hammer on end of mainshaft.

8. Place one bolt to hold adapter to transmission case while performing balance of assembly.

9. Install second and high shift rail lock ball and spring in transmission case.

10. Place second and high shift fork in position in synchronizer shift sleeve groove and install shift rail and set screw.
11. Install shift rail stop screw.
12. Install shift rail interlock.
13. Place low and reverse shifter in position behind shift shaft inner lever.
14. Place low and reverse shift fork in position, install shift rail and shift fork and shifter set screw.

Install parts per "Installation of parts to rear of adapter".

Reassemble and install housing per "Reassembly of Housing & "Installation of Housing".

TRANSMISSION AND OVERDRIVE INSTALLATION

Follow procedure used with standard transmission. Check adjustments and refill transmission and overdrive. A total of 3-1/4 pounds of lubricant is required, two pounds for transmission and 1-1/4 pounds for the overdrive unit.

TROUBLE SHOOTING

To properly check the electrical units of the Overdrive system, the following equipment is required:

One Jumper wire 10 ft long (1/2" Clamp terminal each end)

Two jumper wires 2ft long (3/16"Clamp terminal each end)

One test light with two wires at least 10ft long, one wire to have a prod 1/8"in diameter and one wire with a clamp type terminal.

One Relay Test Harness, consisting of 4 #16 wires 10" (for 2-3-5-6) and 2 #12 wires 8" (for 1 & 4) soldered in correct position on 164082 socket and 165832 shell, other end to have sleeve rubbers 31548 and bullet terminals 170406. Wires to have tabs numbered 1 to 6 to identify the wire position in the socket.

CONDITION NO. 1

DOES NOT SHIFT INTO OVERDRIVE

A. Place gear shift lever in neutral and push Overdrive control button "in",

NOTE: The control circuit has considerable inductive "kick". To avoid shock, keep clear of uninsulated connections when circuit is broken.

B. Relay should click when either terminal of the throttle switch is grounded. If this happens, control circuit is OK up to this point. Proceed to check (E). If relay clicks when one terminal is grounded, but does not click when the other is grounded, make check (C). If chattering noise is heard, check power circuit beginning with check (L).

C. Remove relay plug and connect test lamp to the #1 socket and ground. If lamp fails to light, either wire harness is faulty or Overdrive feed wire (#12 red) is disconnected at "B" terminal of Voltage Regulator.

D. If lamp did light in the preceding check (C), connect test lamp between relay socket terminals #1 and #3. Lamp should light when one of the throttle switch is grounded. If lamp does not light, the wire harness is defective between the relay and the throttle switch. If lamp does light, relay is defective. Before discarding relay, make Unit Check (AA).

E. Ground the two terminals of Overdrive control switch successively. If relay does not click when either terminal is grounded, harness is defective between throttle switch and shift rail switch. If the relay clicks when one terminal of the throttle switch is grounded, but does not when the other terminal is grounded, the throttle switch is defective, (Unit Check EE).

NOTE: Before replacing switch, make sure that Overdrive control switch is "in" and that transmission is in neutral.

F. If relay clicked when each shift rail switch terminal was grounded in, check (E). Ground the Overdrive terminal on the governor. If relay does not click, the wire between the Overdrive control switch and the governor is at fault.

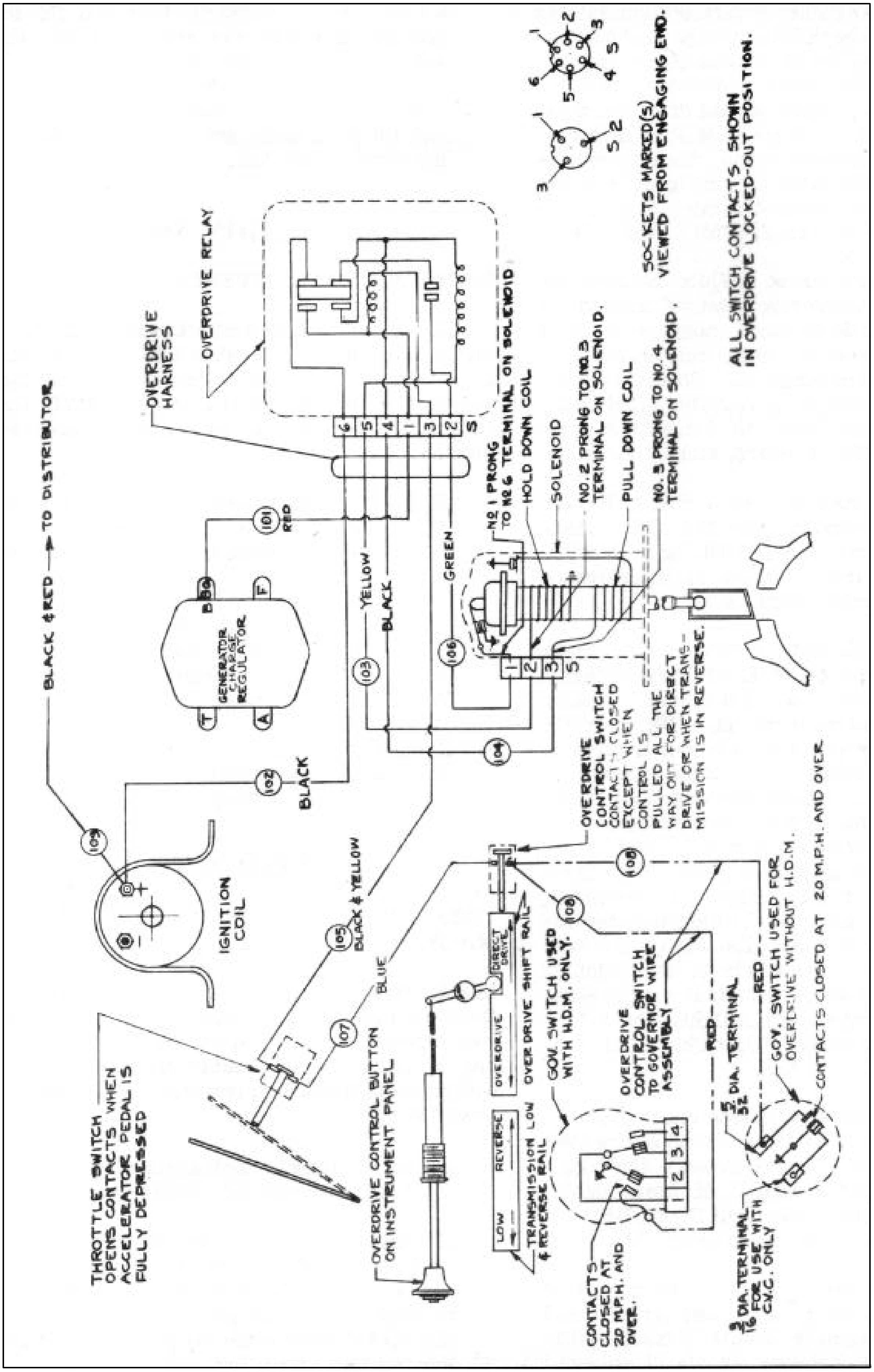

BLACK & RED → TO DISTRIBUTOR
OVERDRIVE HARNESS
OVERDRIVE RELAY
GENERATOR CHARGE REGULATOR
IGNITION COIL
YELLOW
BLACK
GREEN
RED
BLACK & YELLOW
BLUE
NO. 1 PRONG TO NO. 6 TERMINAL ON SOLENOID
HOLD DOWN COIL
SOLENOID
NO. 2 PRONG TO NO. 3 TERMINAL ON SOLENOID.
PULL DOWN COIL
NO. 5 PRONG TO NO. 4 TERMINAL ON SOLENOID.
SOCKETS MARKED (S) VIEWED FROM ENGAGING END.
ALL SWITCH CONTACTS SHOWN IN OVERDRIVE LOCKED-OUT POSITION.
OVERDRIVE CONTROL SWITCH CONTACTS CLOSED EXCEPT WHEN CONTROL IS PULLED ALL THE WAY OUT FOR DIRECT DRIVE OR WHEN TRANSMISSION IS IN REVERSE.
THROTTLE SWITCH OPENS CONTACTS WHEN ACCELERATOR PEDAL IS FULLY DEPRESSED
OVERDRIVE CONTROL BUTTON ON INSTRUMENT PANEL
TRANSMISSION LOW & REVERSE RAIL
OVER DRIVE SHIFT RAIL
GOV. SWITCH USED WITH H.D.M. ONLY.
OVERDRIVE CONTROL SWITCH TO GOVERNOR WIRE ASSEMBLY
5/32 DIA. TERMINAL
GOV. SWITCH USED FOR OVERDRIVE WITHOUT H.D.M.
CONTACTS CLOSED AT 20 M.P.H. AND OVER
CONTACTS CLOSED AT 20 M.P.H. AND OVER.
3/16 DIA. TERMINAL FOR USE WITH CV.C. ONLY

FIGURE 9

G. If relay clicked when governor terminal was grounded in check (F),raise the rear wheels, start engine, and put transmission in high. Release the clutch and depress accelerator pedal slowly. Relay should click when car reached a speed of 16-21 M.P.H. If it does not, remove governor and check drive pinion to see that teeth are not worn so badly that governor does not rotate. If pinion is OK, replace governor, (Unit Check CC).

H. Power circuit check. While holding one hand on the Overdrive solenoid, ground the control circuit at some convenient point such as governor, shift rail switch, or throttle switch terminal. Solenoid should be felt and heard to operate. If it does, make check (J) next. If it does not make check (K). If it chatters, make check (L).

J. If solenoid operated when check (H) was made, the electrical circuit is OK. Check solenoid (Unit Check BB), and look for mechanical trouble such as interference from Overdrive interlock.

K. If solenoid did not operate during check (H), remove wire from solenoid terminal marked (4) and connect test lamp between wire terminal and ground. Circuit is OK if lamp light s when control system is grounded at governor or some other convenient point. Check solenoid (Unit Check (BB). If lamp does not light, connect test lamp leads between #3 socket of #3 contact solenoid plug and ground. If lamp lights when control circuit is grounded, check wires at solenoid plug adapter for grounds and open circuits. Also make sure that the wire from #3 pin on the solenoid adapter goes to #4 terminal on the solenoid. If lamp does not light, check both wire harness plugs, (Unit Check DID), and relay (Unit Check AA).

L. If solenoid chattered during check (H), connect test lamp between solenoid screw terminal marked (3) and ground and again ground control circuit. If lamp lights, check solenoid. See (Unit Check BB). If lamp does not light, go to check (M).

M. Connect test lamp between #2 socket of harness plug at solenoid and ground and then ground control circuit. If lamp lights, check wiring between #2 pin at solenoid adapter and solenoid terminal (3) for grounds and open circuits. If lamp does not light, make check (N).

N. Check plugs (Unit Check DID) at solenoid and relay. If plugs are all right, make relay (Unit Check AA).

CONDITION NO. 2

HARD SHIFT INTO REVERSE

NOTE: A car equipped with Overdrive is normally more difficult to shift into reverse than a car with a standard transmission. When the car is new and all controls a little stiff, the shift into reverse will be easier if done as follows:

A. Shift lever into reverse position as far as as it will go easily, then allow clutch to engage slightly while continuing to push on lever.

B. If unusual difficulty is experienced at any time, shift to reverse can be made much easier by pulling Overdrive control button "out" before shifting.

C. If shift to reverse is impossible, make check under Condition 8 "Remains in Overdrive after car is stopped".

CONDITION NO. 3

FREE WHEELS AT SPEEDS OVER 16 - 21 M.P.H.

NOTE: If car is equipped with Vacumotive Drive or Hudson Drive-Master, checkto see if free wheeling is caused by disengagement of clutch. If it is, see trouble shooting for this equipment in Hudson Drive-Master, Section 10, Page 12.

A. If free wheeling is continuous, make checks for failure to shift into Overdrive.

B. If intermittent, check for poor electrical contacts in all parts of Overdrive wiring. Check circuit from #3 solenoid terminal through #2 solenoid pin and socket to relay pin #5 for bare wire which might cause intermittent grounding.

CONDITION NO. 4

SHIFTS OUT OF OVERDRIVE AT SPEEDS ABOVE 21 M.P.H.

See check for intermittent free wheeling under "Free Wheels at Speeds Over 16-21 M.P.H.".

CONDITION NO. 5

WILL NOT KICK DOWN OUT OF OVERDRIVE

A. Drive car in Overdrive at 40 M.P.H. Push accelerator down hard against throttle switch. Snap ignition switch off and on again quickly. If transmission remains in Overdrive, make Check (B). If it kicks down to direct, make checks (C) and (D).

B. Check throttle switch by grounding each terminal successively while accelerator pedal is pushed down hard against switch. Switch is OK if relay does notclick for one terminal, but does for the other. Before replacing switch, make sure that accelerator pedal operates switch through its full travel.

C. Check ignition grounding circuit by connecting test lamp between negative terminal of battery and #6 terminal of solenoid (#6 solenoid terminal screw holds the solenoid connection plug bracket to the solenoid).

D. Drive car on road or jack up car and run in gear. Lamp should light as soon as car is in Overdrive. If lamp does not light, solenoid is defective. Make Unit Check (BB). If lamp lights, stop car, disconnect plug at relay, and ground relay plug socket #2. If lamp does not light, check wiring between relay plug socket#2 through solenoid plug socket #1, solenoid pin #1, and solenoid terminal #6 for an open circuit. If lamp does light, check (E).

E. If lamp lit when #2 relay plug socket was grounded, connect it between #6 relay plug socket and ground. Turn ignition "on" and crank engine with starter. Lamp should go "on" and "off" alternately. If it does, check relay (Unit Check AA). If it does not, check for open circuit between relay plug socket #6 and distributor terminal.

CONDITION NO. 6

TRANSMISSION LOCKED

NOTE: If the transmission does not shift out of Overdrive when the car is brought to a stop and the car then rolls backward slightly, the transmission will lock. The car can not be moved forward or backward by the engine or by towing.

A. To disengage the transmission, disconnect the wire harness plug at the solenoid and loosen the solenoid mounting screws.

B. If this does not unlock the transmission, remove mounting screws completely and pull straight out on solenoid to disengage solenoid pawl from slot in the Overdrive stationary gear. To prevent a recurrence of this condition, make checks outlined in Condition No. 7.

CONDITION NO. 7

FAILS TO SHIFT OUT OF OVERDRIVE BELOW 16-21 M.P.H.

A. Check wirefrom relay pin #3 through relay plug socket #3, throttle switch and shift rail switch to governor Overdrive terminal for bare spots which might cause grounding of circuit. Make governor check, (Unit Check CC).

CONDITION NO. 8

REMAINS IN OVERDRIVE AFTER CAR IS STOPPED

If car is in Overdrive, a clicking noise willbe heard whenever relay plug is connected or disconnected. To remedy, make check as outlined under Condition No. 7.

CONDITION NO. 9

ENGINE CUTS OUT ON DECELERATION AT 21-16 M.P.H.

If the above trouble occurs occasionally in high gear and consistently in second gear, the overdrive relay is defective (Unit Check AA).

UNIT CHECKS

AA. OVERDRIVE RELAY CHECK

NOTE: Disconnect plug at relay and install relay checking harness. A jumper wire must be connected between #1 pin and negative terminal of battery at all times during check (AA). Connect the test lamp successively between ground and #2, 4, 5, and 6 contact pins. The test lamp should not light on any of these checks. Ground the #3 pin and connect lamp successively between ground and #4 and #5 pins. The lamp should be bright on #4, dimmer on #5. Connect test lamp between #1 pin and #6 pin and ground #2 and #3 & #5 pin. The lamp should flash momentarily when the ground of #3 is interrupted.

BB. SOLENOID CHECK

A. CLOSING COIL - Remove solenoid from transmission. Connect a jumper wire between positive terminal of battery and mounting flange of solenoid. Connect a second jumper wire between negative terminal of battery and solenoid terminal #3. Make contact momentarily with a third jumper wire between solenoid terminals #3 and #4, which should cause the solenoid pawl rod to move out.

B. HOLDING COIL - Pawl rod should remain out after jumper between #3 and #4 is removed.

C. CLOSING COIL BREAKER POINT - Connect test lamp between solenoid terminals #3 and #4. The lamp should not light.

D. ENGAGING SPRING — Remove test lamp from #3 and #4 solenoid terminals and place ball end of solenoid against bench. Push down on solenoid shell. The pawl rod should move in 3/8" under a load of not less than 8 lbs. nor more than 12. Pawl should move out to extended position when load is removed.

E. IGNITION GROUNDING CONTACT. Place test lamp between negative battery terminal and solenoid terminal #6. Lamp should light when this connection is made. Remove jumper from between negative battery terminal and solenoid terminal #3. Pawl rod should snap "in" and test lamp should go out.

F. RETRACTING SPRING - Attach spring scale to pawl rod ball and pull. Rod should move out 3/8" under a pull of 8 to 12 lbs.

CC. GOVERNOR CHECK

Remove Overdrive wire at governor and connect test lamp between governor Overdrive terminal and negative terminal of battery. Drive car on road or raise on jacks. The lamp should light at a car speed of between 18.5 to 21 M.P.H. Upon decreasing speed, the lamp should go out at between 18.5 and 16 M.P.H. Differential between light "on" and light "off" should be 2 or 3 M.P.H. car speed.

DD. CONNECTOR PLUG CHECK

Insert a 1/8" diameter rod successively into each socket of plug for a distance of 1/4". Socket should grip rod tightly enough to make good electrical contact.

EE. THROTTLE SWITCH CHECK

Remove Overdrive wires at terminals. Ground one terminal. Connect test lamp between negative battery terminal and the other switch terminal. Lamp should light and should go out when switch plunger is pushed in.

FF. CONTROL SWITCH CHECK

Remove Overdrive wires at terminals. Ground one terminal. Connect test lamp between other terminal and battery negative terminal. Put transmission in neutral. Lamp should light when Overdrive control is pushed in and should go out when control is pulled out. If switch is tested after removal from car, lamp should light when switch plunger is "out" and should not light when plunger is "in".

SECTION 12

PROPELLER SHAFT AND UNIVERSAL JOINTS

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REFERENCES

Source of Information	Date	Subject

SPECIFICATIONS

ALL MODELS

Front Shaft	One Universal
Rear Shaft	Two Universals
Center Bearing	Annular Ball
Center Bearing Support Cushions	Three - Rubber
Center Bearing Lubrication	Factory Sealed Lubrication
Spline Lubrication	Zerk Fitting
Universal Lubrication	Zerk Fitting
Universal Bearing	Needle Roller

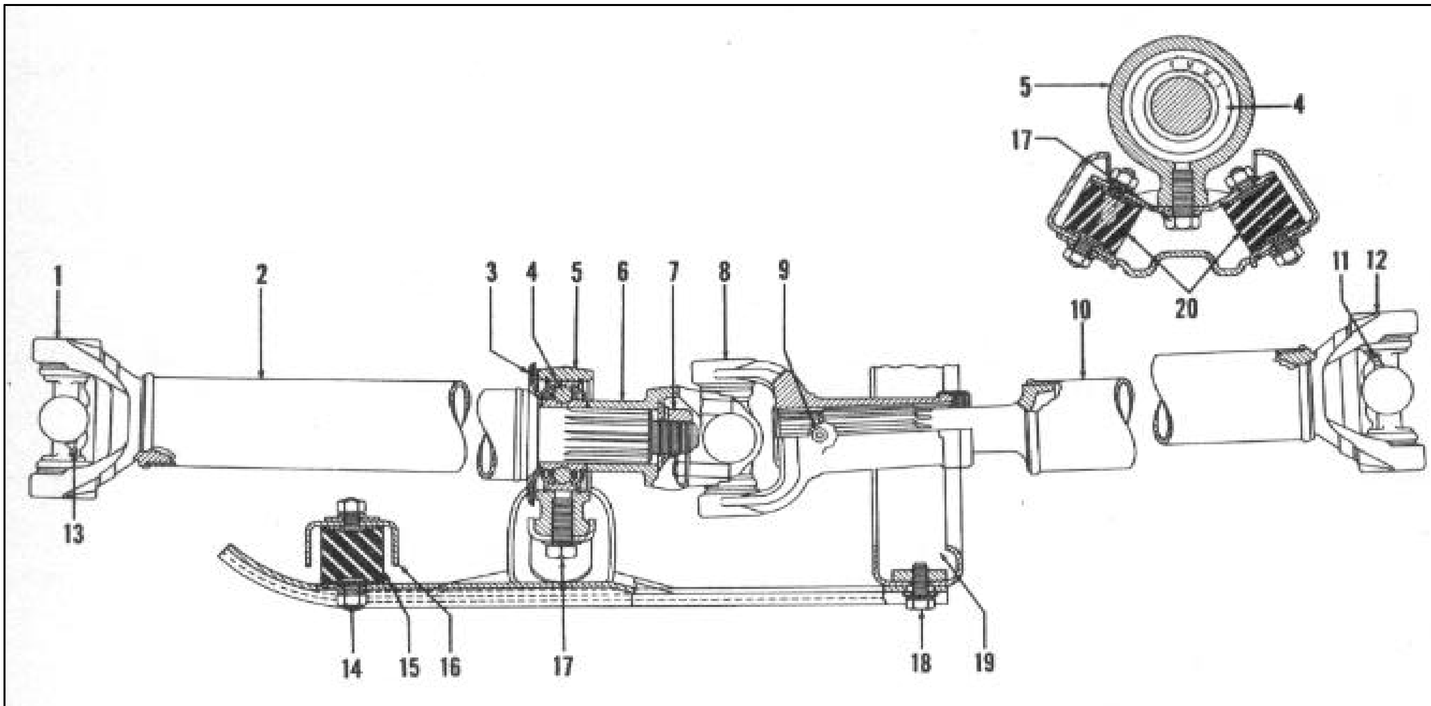

FIGURE 1

1. Universal joint
2. Propeller shaft (front)
3. Dust shield
4. Center bearing
5. Center bearing housing
6. Companion flange
7. Companion flange nut
8. Universal joint
9. Grease fitting
10. Propeller shaft (rear)
11. Grease fitting
12. Universal joint
13. Grease fitting
14. Center bearing support cushion bolt (front)
15. Support cushion (front)
16. Center bearing support crossmember #5
17. Center bearing cushion bolts (2)
18. Center bearing support bolts at #6 cross-member
19. #6 crossmember
20 Center bearing support cushions (2)

CONSTRUCTION

The propeller shafts are of tubular construction with needle roller bearing type crosses with slip yoke assembled to front of rear shaft to take care of telescoping necessary due to rear spring action. No adjustments are provided to compensate for wear of any of the universal joint parts. Parts that show wear must be replaced.

The rear end of the front shaft is supported in a permanently sealed annular bearing contained in a malleable housing supported by rubber cushions.

The rear propeller shaft is connected by a universal joint at the center bearing support and the rear axle carrier housing.

Universal joints are provided with means of lubrication for the needle roller bearings by zerk grease fittings and should be lubricated regularly every 1,000 miles.

PROPELLER SHAFT
(FRONT AND REAR)

REMOVAL:

1. Raise car and place stand jacks under all four wheels.

2. Remove the three attaching bolts from the propeller shaft center bearing support to frame cross member, Figure 1.

3. Remove attaching bolt from brake cable guard crossmember to center bearing support.

4. Remove cotter and clevis pin from one brake cable clevis.

5. Remove two bolts from brake cable guard crossmember to frame.

6. Remove the nuts, lock plates, "U" bolts at the center universal joint. The propeller shaft can then be removed.

NOTE: Use adhesive tape or rubber band to keep journal bearings assembled to Universal journal when removing the propeller shaft.

7. Remove nuts, lock plates, "U" bolts, and disconnect universal joint at transmission companion flange.

8. Remove front shaft with center bearing and support attached.

9. Remove nuts, lock plates, "U" bolts, and disconnect universal joint at rear axle companion flange and remove rear propeller shaft and sleeve yoke assembly.

1. Wash all joints, yokes, and bearings (except center bearing) in a cleaning solvent.

2. Check splines of all shafts and sleeve yoke for excessive wear.

3. Check yokes, journals, and bearings for damage or excessive wear.

NOTE: The bearing surfaces on the journal should be free of grooves or ridges.

INSTALLATION:

1. Lift front propeller shaft into position and insert the three bolts through center bearing support bracket to frame.

NOTE: Do not tighten bolt nuts or difficulty will be encountered in connecting universal joint at transmission companion flange.

2. Insert bolt through center bearing support bracket crossmember to frame.

3. Connect front universal joint at transmission.

NOTE: The journal bearings should be compressed so that the outside edge of bearing clears raised lip at edge of companion flange otherwise propeller shaft will not be in proper balance. Tool J-881-A can be used to facilitate this assembly.

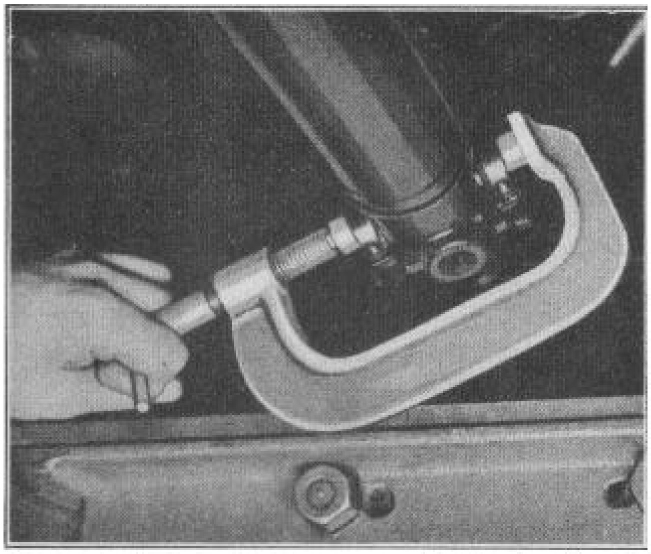

FIGURE 2

NOTE: The ears on the lock plates must be turned over against the flat of the lock nuts.

4. Tighten bolts in center bearing support bracket.

5. Insert bolt through center bearing support bracket to crossmember.

6. Connect brake cable clevis.

7. Connect rear propeller shaft to center universal connection.

NOTE: The arrow on the spline end of the propeller shaft and the arrow on the front universal joint yoke must be lined up. If arrows are not lined up, rough car operation will result which will cause wear or failure of parts and put an unbalanced load on transmission, clutch, engine, and rear axle.

All propeller shaft "U" bolt nuts should be tightened to 20 to 25 pounds torque.

8. Connect propeller shaft to rear axle carrier housing.

9. Raise car; remove stand jacks, and lower car.

UNIVERSAL JOINTS

When disassembling the universal joints to inspect for wear, proceed as follows:

1. Remove the nuts and lock plates from the propeller shaft "U" bolts and remove the "U" bolts.

2. Remove two bearing assemblies.

NOTE: Do not allow the bearing cups to fall from the journal.

3. The two remaining bearings can now be removed by compressing their snap ring.

4. Use a light soft hammer and tap on one bearing carefully to drive out the opposite cup.

5. Tap on the end of the journal from which the bearing was just removed and remove the • remaining bearing cup and rollers.

6. Wash all parts in gasoline and replace all worn parts.

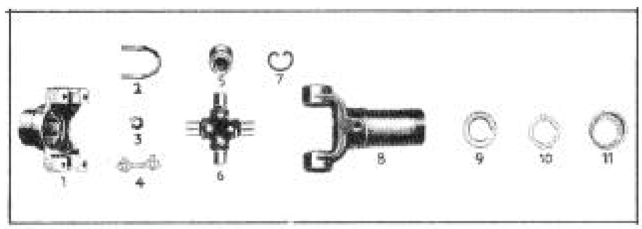

FIGURE 3

1. Companion Flange
2. Propeller shaft U bolt
3. Propeller shaft U bolt nut
4. Propeller shaft U bolt lock
5. Journal bearing assembly
6. Journal
7. Journal bearing race snap ring
8. Sleeve yoke assembly
9. Sleeve yoke dust washer
10. Sleeve yoke dust washer retainer
11. Sleeve yoke dust cap

ASSEMBLY:

1. Coat all bearing assemblies with viscous chassis lubricant.

2. Use new oil seals on the inner end of the journal.

3. Hold the yoke and journal so that one bearing assembly can be inserted from the bottom.

4. Hold the yoke and journal so that the other bearing assembly can be inserted from the bottom. The rollers in their race will not fall out if installed from the bottom.

5. Install the journal bearing race snap ring.

6. Install the other two bearing assemblies on the journal and compress them with the universal joint assembling tool J-881-A, Figure 2.

7. Install the U bolts, lock plates and nuts.

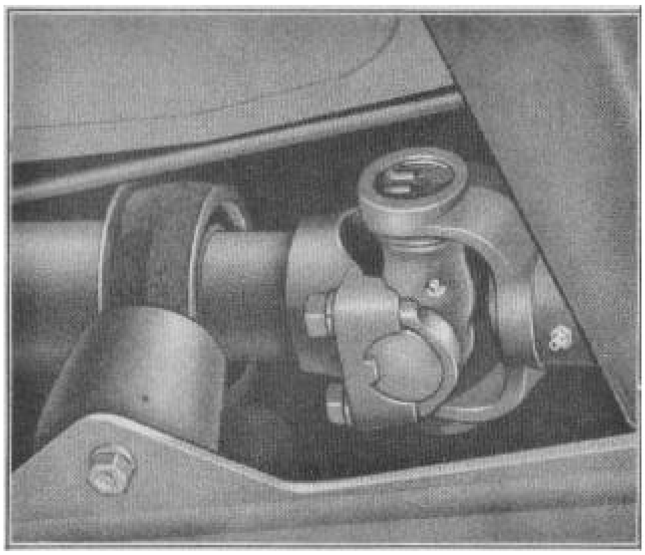

FIGURE 4

PROPELLER SHAFT CENTER BEARING REPLACEMENT

If it is ever necessary to replace the propeller shaft center bearing, proceed as follows:

1. Remove the nuts, lock plates, and "U" bolts from universal joint at front end of rear shaft and lower shaft support.

2. Remove nut and washer attaching flange to rear of front propeller shaft.

3. Use puller tool 1-820 and pull companion flange from splined shaft.

4. Remove the bolt attaching center bearing and housing assembly to cushion frame support.

5. Remove the center bearing and housing assembly from shaft.

NOTE: The center bearing is a press fit in the housing and may be removed and replaced without difficulty.

6. Remove the lock rings from either side of bearing and press bearing from housing. Use a tubular tool that clears the inner race and press against outside race only.

NOTE: For installation, reverse procedure of removal.

The specified torque for the center bearing companion flange bolt nut is 90-100 pounds.

PROPELLER SHAFT CENTER BEARING SUPPORT CUSHION
(FRONT & REAR)

These cushions are furnished in three Degrees of Durometer hardness.

Front 301612 Red moulded or painted red Standard Production 40 Durometer Hardness

Front 301968 Gray moulded or painted gray Special Service 80 Durometer Hardness to be used as an aid to correct propeller shaft vibration

Rear 300609 Black moulded 60 Durometer Hardness (Two used on rear support only).

NEW PROPELLER SHAFT CENTER BEARING SUPPORT

A new type propeller shaft center bearing support has been incorporated on all models after production of approximately 80,100 new cars.

The new center bearing support is not interchangeable and can not be incorporated on previous models due to a change in design of the frame #4 and #6 cross members which are now drilled and have tapping plates installed to provide for mounting of the new type center bearing support.

TROUBLE SHOOTING

PROPELLER SHAFT

Excessive Vibration

Improper alignment of flanges
Misaligned or sprung drive shaft
Worn torque tube bushing
Worn needle bearings in U-joint
Worn splines on shaft or companion flange
Loose U-joint flange nut
Shifted rear axle
Sprung frame
Excessive end thrust Careless braking
Overloading the vehicle Too short shaft
Improper lubrication

Metallic Rattle, Click, or Growling

Lack of lubrication
Worn universal joint seals
Broken or worn universal joint bearings
Worn universal joint cross
Universal joint bearings not seated properly in flange or yoke
Propeller shaft support mounting studs loose
Propeller shaft support bearing worn, brinelled, or rough
Loose intermediate flange
Propeller shaft support improperly installed (upside down)

UNIVERSAL JOIN TS

Out of Balance

Loose flange nut
Grease fitting interference
Breakage
Erratic driving and braking
High angle drive Overloading
Weak rear springs Misaligned drive shaft
Misaligned rear axle

Lubricant Loss

Worn seals
Broken or worn bearings
Worn cross
Bearings not seated properly in flange or yoke

REFERENCE

Source of Information	Date	Subject

SECTION 13

REAR AXLE

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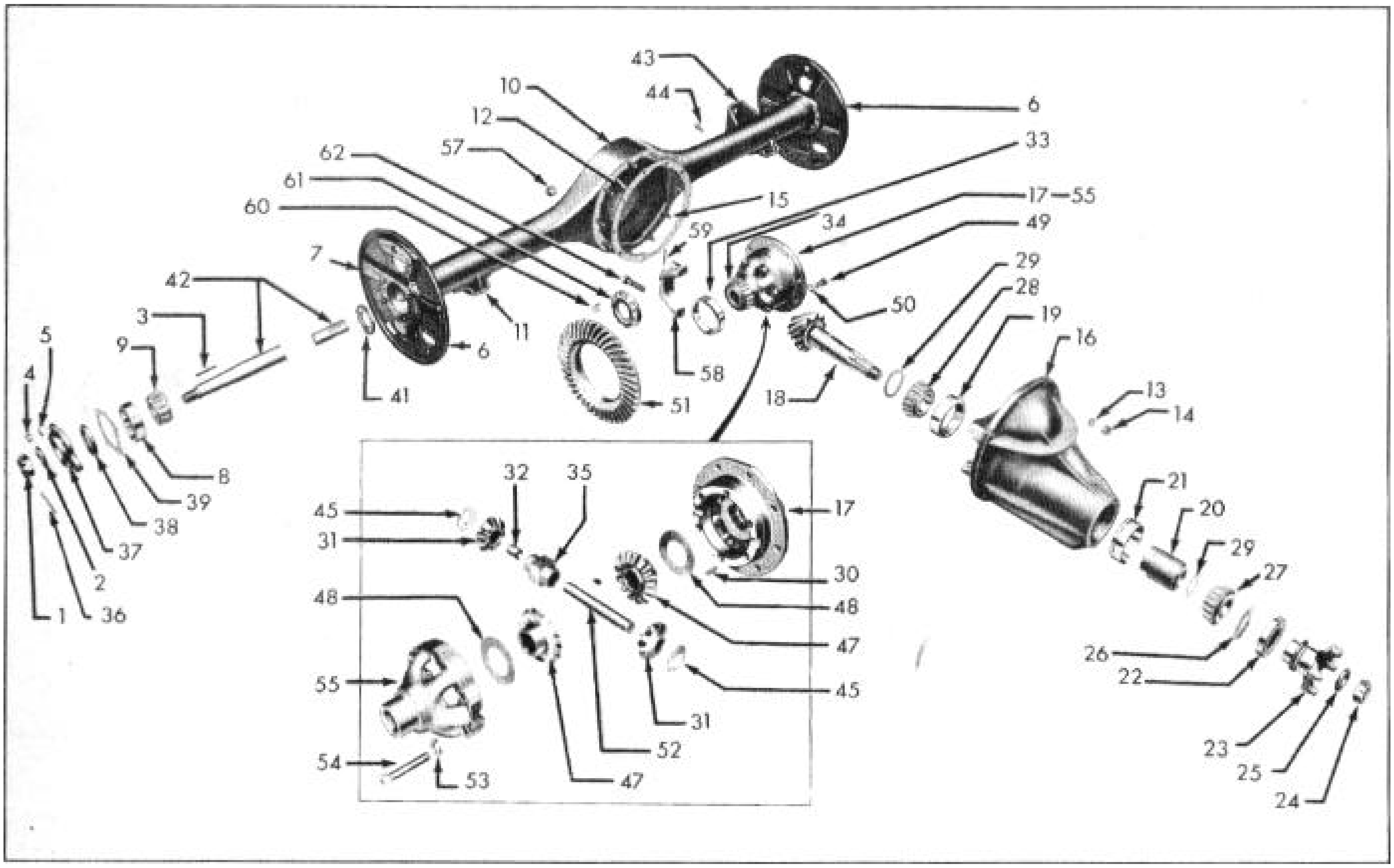


FIGURE 1

1. Drive shaft nut
2. Drive shaft nut washer
3. Drive shaft key
4. Adjusting cap bolt nut
5. Adjusting cap bolt nut lockwashers
6. Brake backing plate
7. Adjusting cap bolt
8. Wheel bearing cup
9. Wheel bearing cone
10. Axle housing
11. Spring mounting pad
12. Differential carrier gasket
13. Differential carrier to housing bolt lock-washer
14. Differential carrier to housing bolt nut
15. Differential carrier to housing bolt
16. Differential carrier to cap assembly
17. Differential case bottom half
18. Drive pinion
19. Rear pinion bearing cup
20. Pinion bearing spacer
21. Front pinion bearing cup
22. Pinion oil seal
23. Rear axle companion flange
24. Rear axle companion flange nut
25. Rear axle companion flange washer
26. Drive pinion oil washer
27. Front pinion bearing cone
28. Rear pinion bearing cone
29. Rear pinion bearing shim
30. Differential pinion shaft locating screw

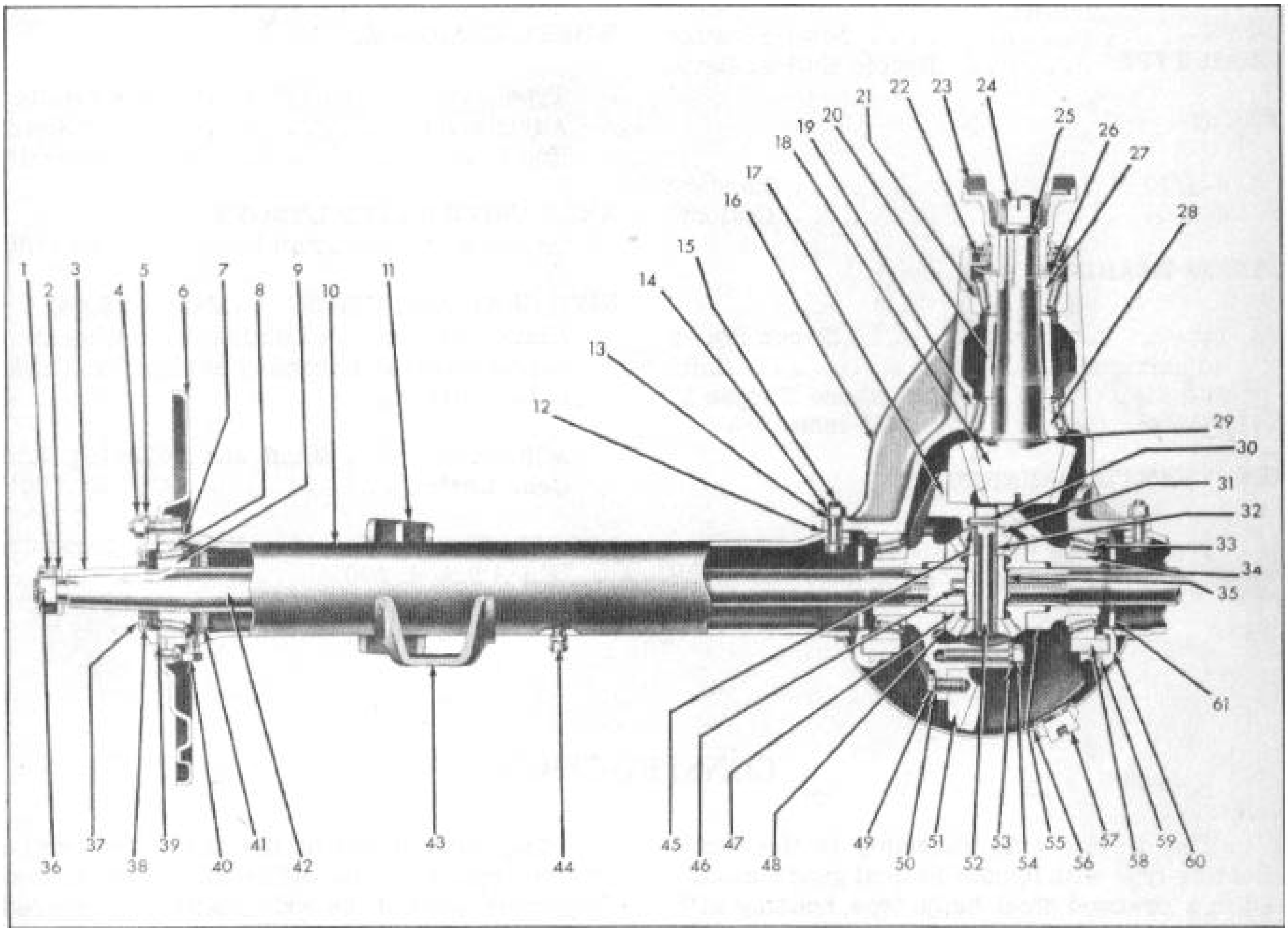


FIGURE 2

31. Differential pinion assembly
32. Differential pinion bushing
33. Differential bearing cup
34. Differential bearing cone
35. Drive shaft thrust spacer
36. Drive shaft nut cotter
37. Wheel bearing adjusting cap
38. Wheel bearing adjusting cap oil seal
39. Wheel bearing adjusting cap shims
40. Wheel bearing grease hole plug
41. Drive shaft oil seal assembly
42. Drive shaft
43. Rear axle housing stabilizer bracket
44. Rear axle housing vent assembly
45. Differential pinion thrust washer
46. Drive shaft thrust button
47. Differential gear
48. Differential gear thrust washer
49. Drive gear bolt
50. Drive gear bolt lockwasher
51. Drive gear
52. Differential pinion shaft
53. Differential case screw lockwasher
54. Differential case screw
55. Differential case upper half
56. Housing cover
57. Housing cover drain plug
58. Differential bearing adjusting cap
58. Differential bearing adjusting nu t lock cotter
60. Differential bearing adjusting nut lock
61. Differential bearing adjusting nut
62. Differential bearing adjusting cap screw

SPECIFICATIONS

TYPE Semi-Floating
GEAR TYPE Hypoid Helical Bevel

RATIO

4-1/10	Standard
4-5/9	Optional

PINION BEARINGS: 2

Type	Taper Roller
Adjustment	Shim
End Play	Resistance Torque 17 to 32 inch. lbs.

DIFFERENTIAL BEARINGS: 2

Type	Taper Roller
Adjustment	Adjusting Nut .008" to.012" Tension between Bearings

WHEEL BEARINGS:

Type
Adjustment
End Play

AXLE DRIVE SHAFT LENGTH

(including thrust button)

RING GEAR AND PINION - (Matched Sets)
(Ratio stamped on outside o f differential carrier and cap assembly at right hand side at bolt circle.)

Adjustment Shims and Adjusting Nuts Gear Lash .004" to .006"

LUBRICATION: Hypoid - Extreme pressure (E.P.)
S.A.E. #90
Summer and Winter Capacity 3-1/2 pints

CONSTRUCTION

The driving axle assembly is the semi- floating type with Hypoid Helical gears mounted in a pressed steel banjo type housing with adjustments provided for all bearings, ring gear and pinion.

The drive pinion is supported by two tapered roller bearings which are held in a correctly spaced position by the pinion bearing spacer. Adjustment of the pinion and bearings are provided for by a number of shims between the bearing spacer and the front bearing and between the front face of the pinion and the rear bearing. Oil leakage is prevented by a hydraulic type, inner spring oil seal of chrome leather.

The ring gear is mounted on the differential case flange by eight special alloy steel bolts. In order to insure quiet smooth operation, the ring gear and pinion will be serviced only in matched sets.

The differential case assembly is suspended between two tapered roller bearings, and is held securely by two carrier caps and four bolts.

The splined end of the alloy steel ax le shafts engage in the differential side gears. The outer ends of the axle shafts are tapered and are provided with keyways for attaching the rear wheel hubs, which are supported by adjustable tapered roller bearings pressed on the axle shafts. Side thrust from the wheels is transferred from one shaft to the other by hardened steel thrust buttons through a medium of the drive shaft thrust spacer.

Rear wheel bearings are adjusted for end play by shims inserted between the bearing caps and housing flange. Oil leakage at this point is prevented b y pressure type chrome leather oil leads.

The axle housing is attached to the rear springs by means of "U" bolts and is insulated to eliminate road and tire noise by the use of rubber strips placed between axle and springs. The general construction of the driving axle may be seen in the illustrations which follow:

REAR AXLE ASSEMBLY

REMOVAL

1. Jack up car, place car stands under body frame just forward of rear springs, See Figure 3.

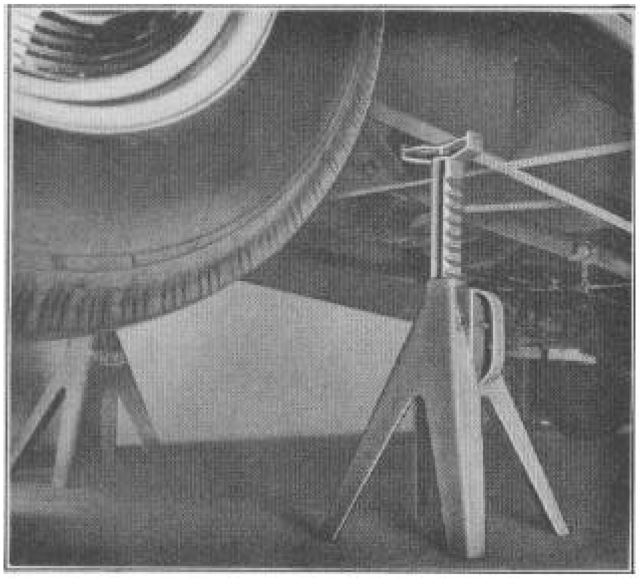


FIGURE 3

NOTE: The construction of the Hudson Monobilt body incorporates a box frame to support the power plant, front suspension, rear springs and axle. This frame is an integral part of the body, and forms a solid one piece all steel body and frame assembly.

This new construction makes it necessary to support the body, by locating the stands under the body frame so that the rear axle will be suspended to permit removal and servicing of the rear axle unit.

2. Remove rear fender shields by lifting up lever (1) (front and rear) over and out away from lever retaining bracket (2) thus allowing the shield to drop, for removal, as shown in Figure 4.

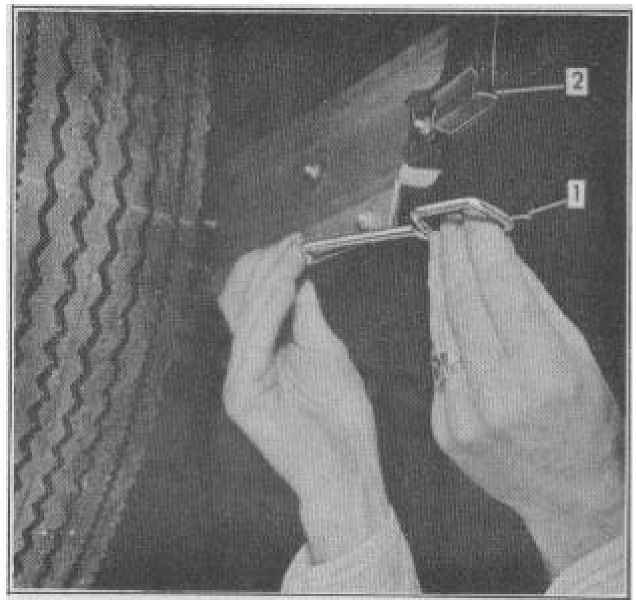


FIGURE 4

3. Remove rear wheels.

4. Brace brake pedal at toe board, so that it cannot be depressed.

5. Disconnect brake line at rear axle tee and remove axle tee from axle.

6. Remove cotterpins (1) and clevis pins (2) that hold brake cable clevis to equalizing bar (3).

7. Unscrew brake cable clevis (4) from brake cable (6) remove locknuts (5) from brake cables as shown in Figure 5.

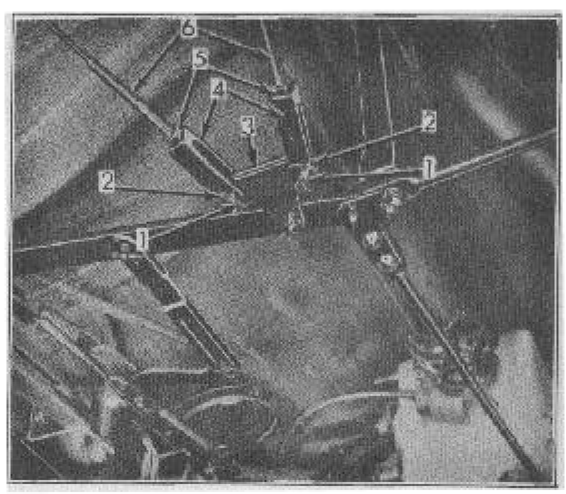


FIGURE 5

8. Loosen nuts (1) that hold brake cable housing clamp (2) to bracket (3) at #6 body cross member as shown in Figure 6. Loosen cable housing by twisting slightly and pulling toward the rear.

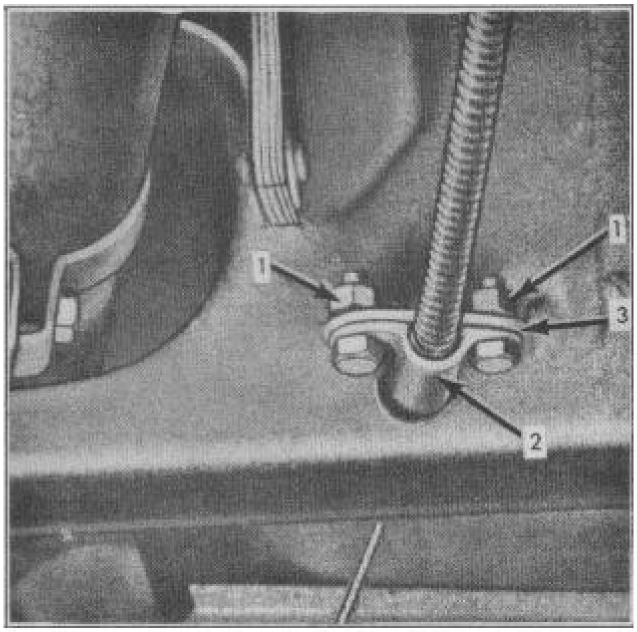


FIGURE 6

9. Remove nuts, lockwashers, and clips that fasten brake cable housing to rear springs, pull cables toward the rear, through guides and clamps at #6 cross member.

10. Remove nuts, locks and "U" bolts that attach propeller shaft to the rear axle companion flange. Lower propeller shaft using care to protect needle bearings from damage.

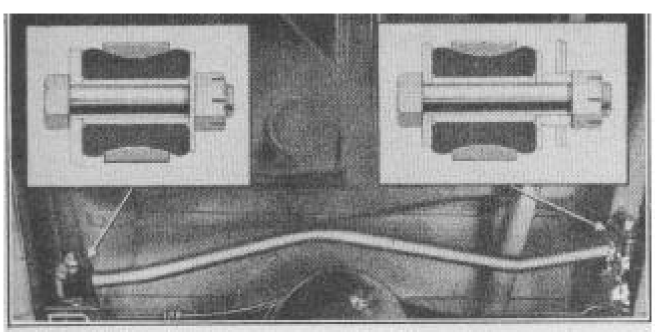


FIGURE 7

11. With roller jack pressure under the rear axle housing, disconnect lower end of shock absorbers.

NOTE: A rear lateral stabilizer is used a s standard equipment. One end o f this device is assembled to the frame side member and the other end to the rear axle housing. Its purpose is to control the horizontal movement of the body and car. It also prevents lateral shake of the axle under the car on rough roads.

IMPORTANT—The ends of the steel bar are cushioned in rubber and no lubrication should be applied to these points.

12. Remove nuts (1) and washers (2) that hold the rear axle stabilizer bar (3) to the rear axle and body frame side rail. See Figure 7.

13. Remove nuts, lockwashers, spring mounting clips, insulators and plates that hold rear axle to springs.

NOTE: The front end of the springs are attached to frame brackets with the pivot bolts cushioned in rubber. The rear ends are attached to the frame through threaded self-adjusting "U" type shackles operating in hardened steel threaded bushings.

IMPORTANT—Rear shackle bushings are right and left hand thread. Rubber seals should be replaced when replacing springs or shackles.

14. Remove rear spring shackle bushings at rear spring shackles, lower rear end of springs.

15. Axle can now be removed with roller jack out from under rear of car.

DISASSEMBLY

AXLE SHAFT

1. Remove cotter pin and nut from axle shaft.

2. Remove hub and drum by means of hub puller J-736 as shown in Figure 8. (Do not strike the end of the axle shaft to loosen the hub because of possible damage to the bearing and the center drive shaft thrust spacer).

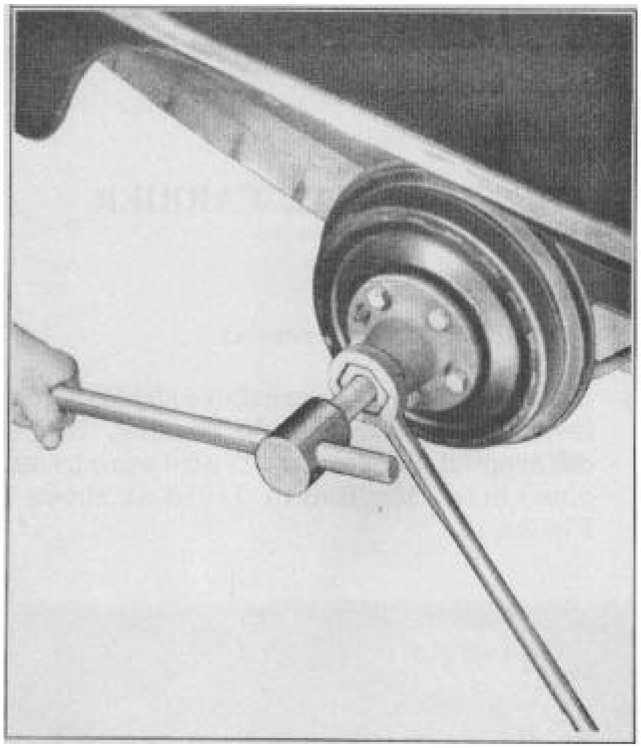


FIGURE 8

3. Remove nuts and lockwashers which hold the rear wheel bearing adjusting cap and oil seal assembly to the backing plate and axle housing.

4. Remove adjusting cap and oil seal assembly and shims.

NOTE: It is important if shims are to be removed from both sides of the axle, that each set should be kept separate, and reassembled in their original location, in order that proper bearing adjustment is maintained. If an axle shaft, bearing, carrier or housing is to be replaced by another part, the axle shaft and play should be checked and corrected.

5. Remove axle shaft and wheel bearing, using axle shaft puller J-352. See Figure 9

FIGURE 9

6. Remove bearing from axle shaft, using bearing remover J-358 - H - 1 Holder and J-2641 Adapter, Figure 10.

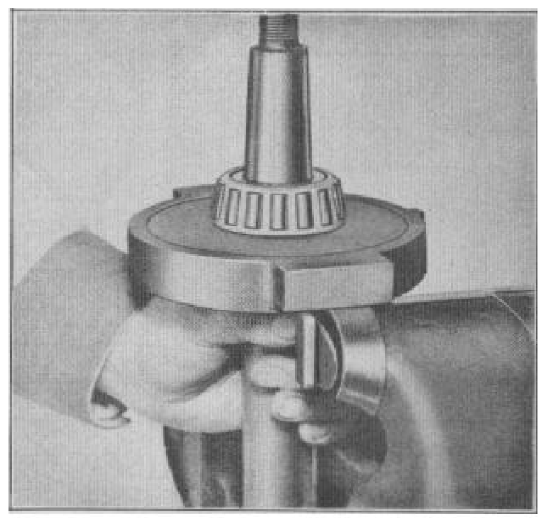


FIGURE 10

7. Remove axle shaft inner oil seal, using tool J-943. See Figure 11.

NOTE: It is advisable to replace old oil seals with new seals in order to prevent leakage.

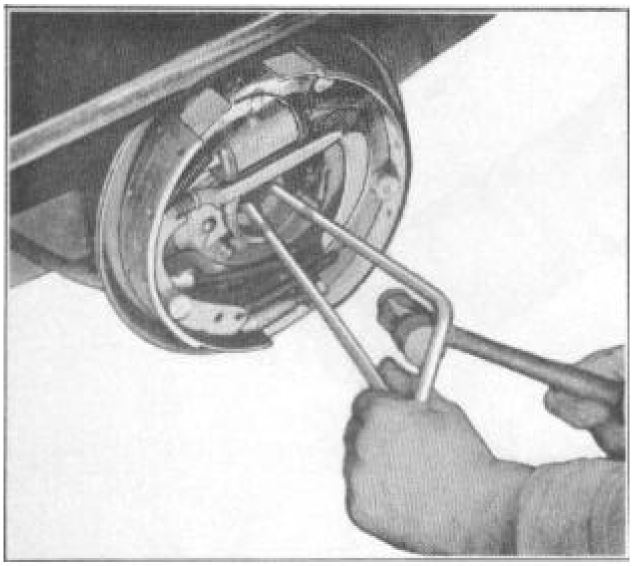


FIGURE 11

8. Remove wheel bearing adjusting cap oil seal, install a new seal using tool J-2159 as shown in Figure 12.

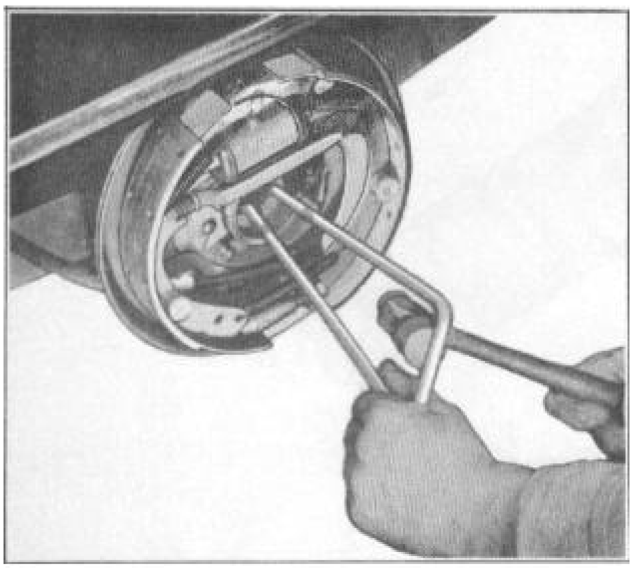


FIGURE 12

AXLE SHAFT THRUST BUTTON REPLACEMENT

1. Grind off thrust button flush with the end of axle shaft.
2. Center punch the shank of thrust button, and drill an 11/32" hole approximately 3/8" deep. Tap out hole, using a 3/8 - 16 tap. Screw a 3/8" - 16 x 2" Hex. Head Bolt into the tapped hole.
3. Place the head of the bolt in a vise an d (using a soft hammer) tap the end of the axle shaft, removing the thrust button shank.

4. Clean out the thrust button hole.

5. Drive anew thrust button in the hole making certain it is firmly seated in the shaft.

DIFFERENTIAL CARRIER

DISASSEMBLY

1. Drain oil from differential.

2. Remove nuts and lockwashers attaching dif - ferential carrier to axle housing, lift out differentail gear carrier assembly and place in holding fixture J-945 as shown in Figure 13.

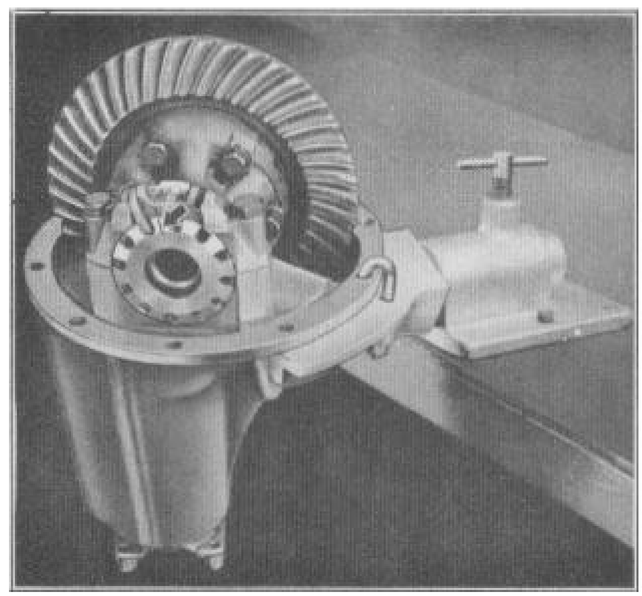


FIGURE 13

3. Remove cotter pins and locks from differential bearing adjusting nuts.

NOTE: In order to save time, it is suggested that the bearing adjusting nuts be marked before removal (see arrow, Figure 13) so that they may be reassembled with approximately the same gear adjustment.

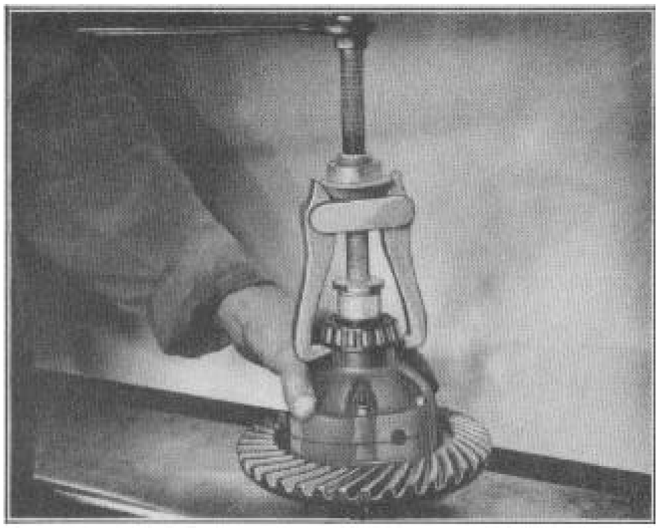


FIGURE 14

4. Remove differential bearing cap screws and lift out differential and ring gear assembly.

5. Remove differential bearing cones from case hubs using bearing puller tool, J-2158, See Figure 14.

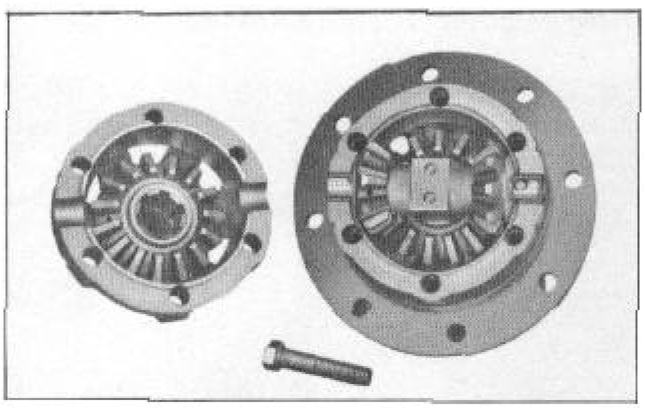


FIGURE 15

DIFFERENTIAL GEARS

1. Remove bolts which hold the ring gear to the differential case.

2. Press ring gear off the differential case flange.

3. Remove bolts and lockwashers from differential case. Separate the right and left hand case, See Figure 15.

4. All internal differential parts will then be loose and can be removed by hand.

DRIVE PINION OIL SEAL

REMOVAL

NOTE: The pinion oil seal can be removed without removingthe pinion gear. This operation can be performed on bench or under car with rear axle pinion oil seal remover J -2647 as follows:

1. With companion flange holding tool J-2637 and J-2971 deep socket remove the drive pinion nut and washer as shown in Figure 16.

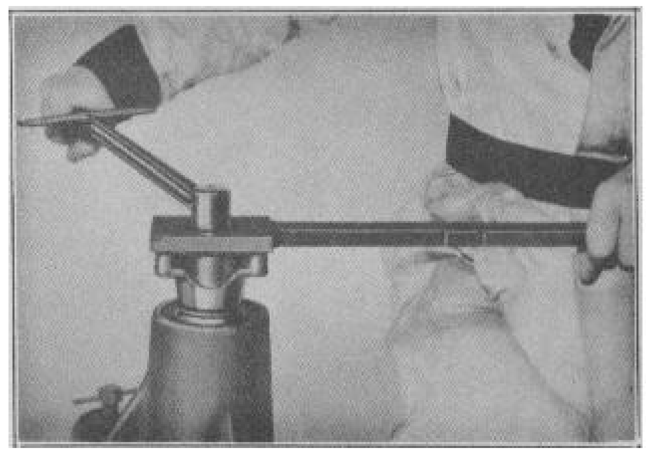


FIGURE 16

NOTE: Under no condition place a wedge between the ring gear and pinion teeth to lock pinion shaft while loosening the drive pinion nut.

2. Remove companion flange with puller J-820.

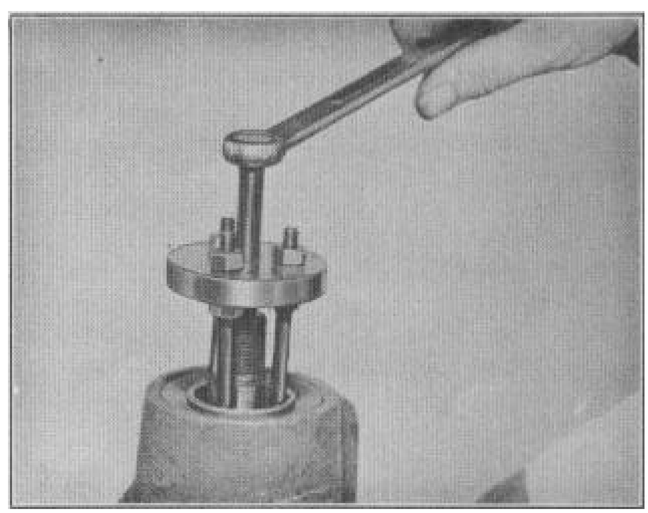


FIGURE 17

3. Remove the three fingers from pinion oil seal remover body 7-2647 and insert hook end of fingers under oil seal entering finger along spline groove of pinion. (Space hook arms equally on pinion splines.) Figure 17.

4. Install body of puller and screw on threaded ends of fingers and install lock nuts.

5. Turn puller screw until conical end of screw seats in pinion gear center, continue turning until oil seal is removed.

FIGURE 18

NOTE: Use rear axle pinion oil seal and pinion front bearing cone replacer J-2639 to install new oil seal. Figure 18, and reverse procedure of removal.

DRIVE PINION

NOTE: The differential assembly must be removed before the drive pinion can be removed.

REMOVAL

Follow the procedure as outlined in DRIVE PINION OIL SEAL REMOVAL, Items #1 and 12 and proceed as follows:

3. Pull out drive pinion, shims and bearing spacer, through rear end of differential carrier. See Figure 19.

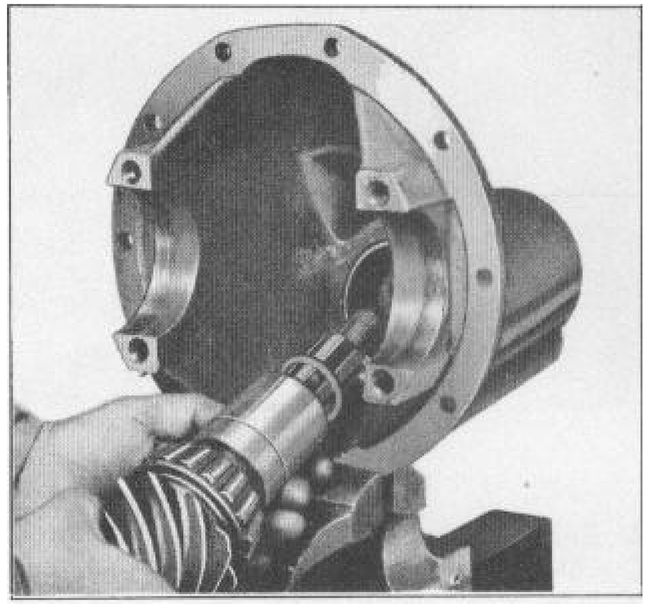


FIGURE 19

4. Remove rear pinion shaft bearing, using bearing remover 7-2640 as shown in Figure 20.

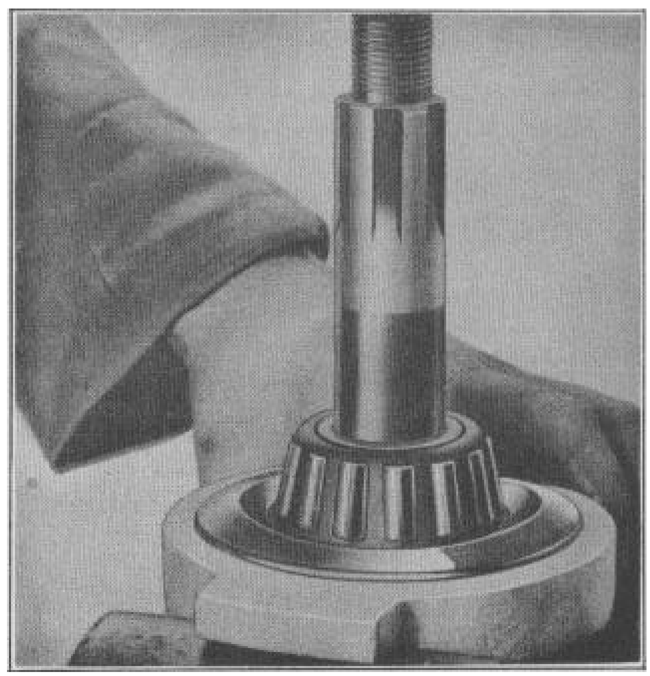


FIGURE 20

5. Remove drive pinion bearing oil seal with rear axle pinion oil seal remover 1-2647, and lift out oil slinger and front bearing.

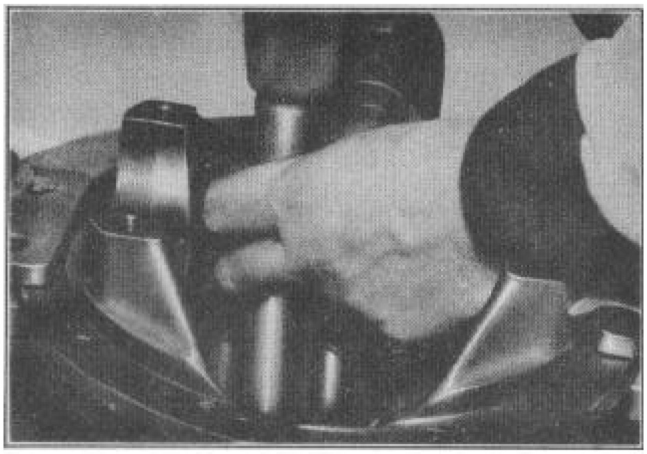


FIGURE 21

6. Remove front and rear drive pinion bearing cups from differential carrier, using remover J-2644 for front cup, Figure 21, and J-2645 for rear cup with handle J-8725, Figure 22.

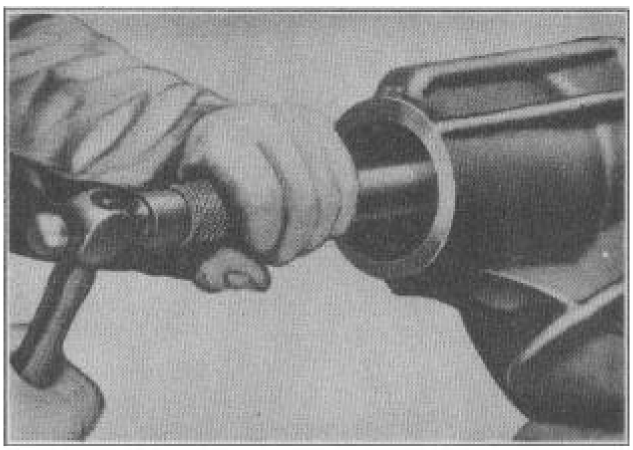


FIGURE 22

INSPECTION
REAR AXLE BEARINGS

Prior to inspection should be:

1. Rotated by hand in clean kerosene or gasoline, until free from grease and oil.
2. Dry out bearing with compressed air, diverting air through bearing while slowly rotating by hand, being sure that all foreign substance has been removed.

NOTE: Do not spin bearing with air pressure.

Due to the presence of moisture in the compressed air line, be sure that all water has been removed.

3. After cleaning, lubricate bearing with clean engine oil and inspect for wear, scoring and rough spots.

When the rear axle has been completely disassembled, gears, carrier and housing should be thoroughly washed. **NEVER INSTALL A DIFFERENTIAL GEAR CARRIER ASSEMBLY IN A DIRTY AXLE HOUSING.**

DIFFERENTIAL GEARS

Should be checked for scoring and proper tooth contact or broken or chipped teeth.

Scoring marks on the pressure face of the gear teeth are caused by instantaneous fusing of the mating gear teeth, and are usually found running from the bottom to the top of the tooth. SCORED GEARS SHOULD BE REPLACED.

REAR AXLE OIL SEALS

Inspection of oil seals may be accomplished after axle has been disassembled. If the leather is scored so that a tight seal on shafts is impossible o r the leather has become charred and hard, the seals should be replaced.

AXLE REASSEMBLY
DRIVE PINION

1. Install front and rear drive pinion bearing cups in carrier using cup replacing tool J-2943 for front cup, Figure 23, and J-2944 for rear cup, Figure 24.

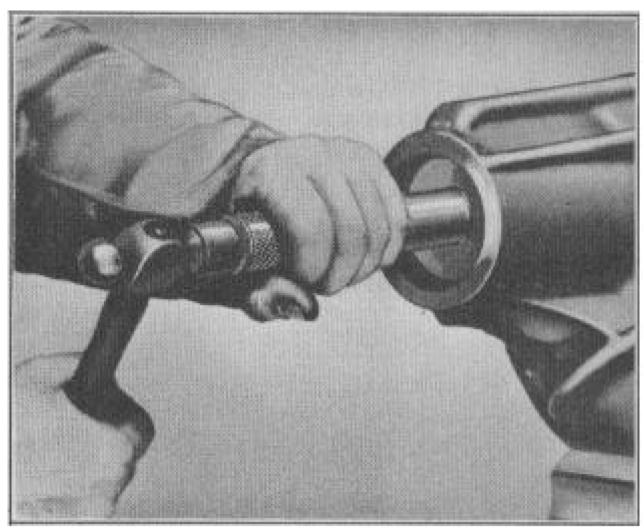


FIGURE 23

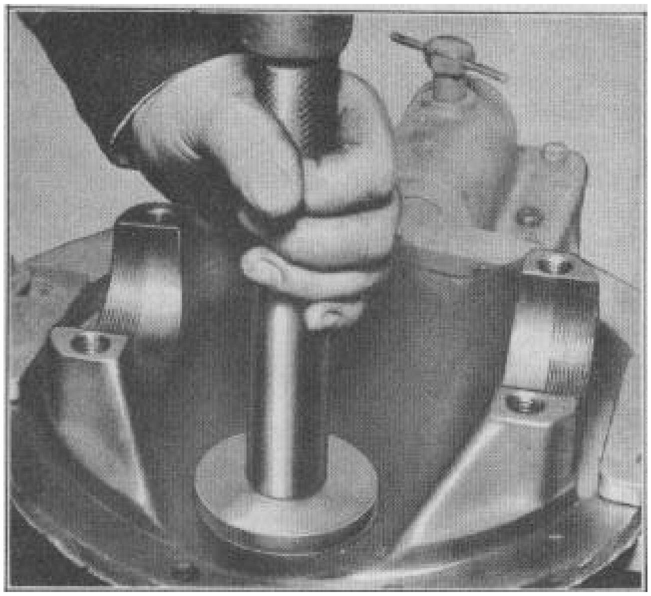


FIGURE 24

2. Place front drive pinion bearing shims and cone in carrier and insert oil slinger.

NOTE: It is important if shims are removed from both ends of the drive pinion that each set should be kept separate and reassembled in their original location, in order that proper bearing adjustment is maintained. Front bearing shims are available in .002", .003", and .004" thickness and should be selected to give the correct bearing resistance torque.

3. Install drive pinion bearing oil seal, using tool J-2639 as shown in Figure 18.

NOTE: When installing drive pinion bearing oil seal, use care, and be certain that the leather is in good condition -- soft and pliable, and soak thoroughly in SAE 20 engine oil prior to installation.

4. Install rear bearing shims (.002" and .003" thick) on the drive pinion shaft. See Note.

5. Slide rear bearing over pinion shaft with taper facing toward the front. Using rear pinion bearing replacer J-2643, seat bearing on pinion shaft, against shims. Figure 25.

6. Install bearing spacer.

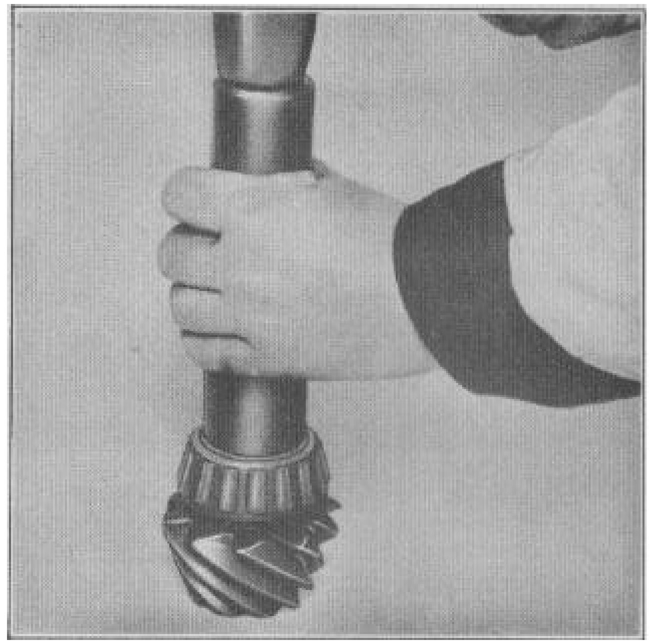


FIGURE 25

7. Install drive pinion and assembled parts in position in the carrier, inserting the forward end of the drive pinion thru shims, front bearing cone, oil slinger and oil seal.

8. Install companion flange on the drive pinion shaft, and assemble pinion shaft nut and washer.

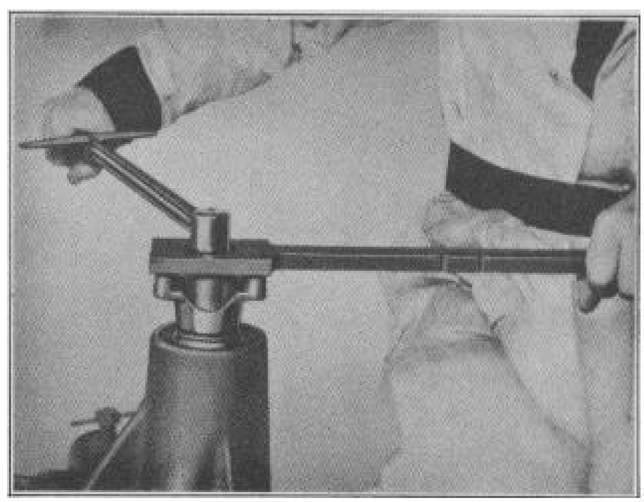


FIGURE 26

9. Holding companion flange with flange holding too1, J-2637 as shown in Figure 26, tighten pinion shaft nut with a torque wrench, until 200 feet pounds has been reached. Drive pinion shaft bearing resistance torque

must then equal 17 to 32 inch pounds, Figure 27.

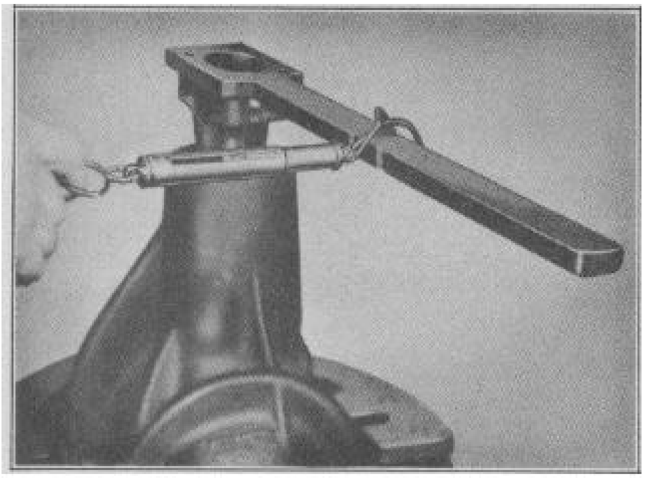


FIGURE 27

If the number of shims that have been used between the pinion shaft front bearing and spacer, do not give the recommended resistance torque, shims will have to be added or removed.

10. Insert cotter pin through nut and shaft and secure.

DIFFERENTIAL GEARS

1. Place differential case assembly in "V" blocks to check side run out, using dial indicator KMO-30. Runout in excess of .002" indicates a sprung differential case and should be replaced.

2. Place differential side gears and thrust washers in right and left hand case respectively.

Differential side gear thrust washers are available in various oversize thicknesses. Select thrust washers that will not give any appreciable end play when unit is assembled.

3. Assemble differential pinions, spacer and thrust washers on the differential pinion shaft, and place in the left hand half of the differential case, lining up the hole in the shaft, with the pin in the case.

4. Replace bolts and lockwashers that hold right and left hand case together, being sure that the machining marks are in alignment as shown in Figure 28, and tighten securely.

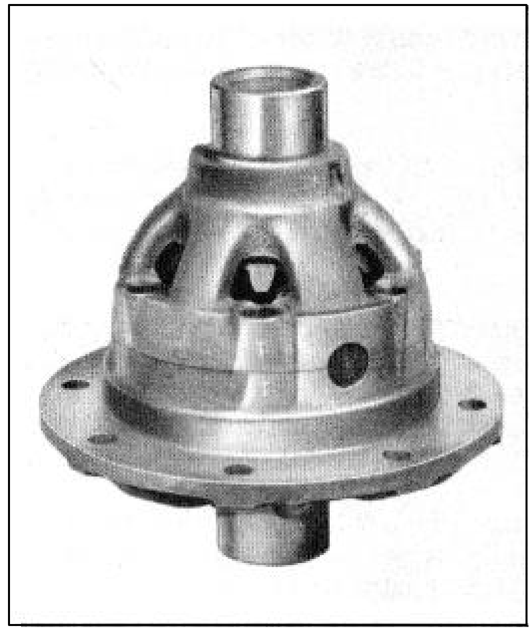


FIGURE 28

5. Using a brass drift pin, guide ring gear on differential case flange. Install lockwashers and bolts. Tighten securely with a torque wrench to 50 foot pounds.

NOTE: It is suggested that the ring ear be heated in water to approximately 2000 F. to aid in assembly:

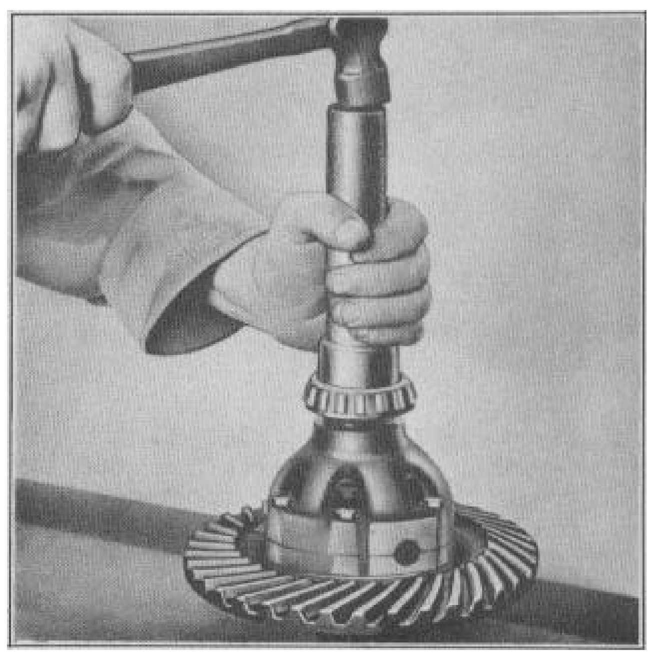


FIGURE 29

6. Install bearing cones on differentials case hubs, using differential side bearing replacer J-2646 as shown in Figure 29.

7. Place differential case assembly in carrier an d assemble differential bearing adjusting nuts.

8. Install differential bearing outer races and caps in place and insert bolts and lock- washers, drawing them up finger tight. (Make sure the bolts and lockwashers are in good condition).

9. Turn the left hand adjusting nut to the right (clockwise) until no play can be felt between ring gear and pinion.

10. Turn the right hand adjusting nut to the right (clockwise) and draw it up tight, using differential bearing adjusting nut wrench J-972, See Figure 30.

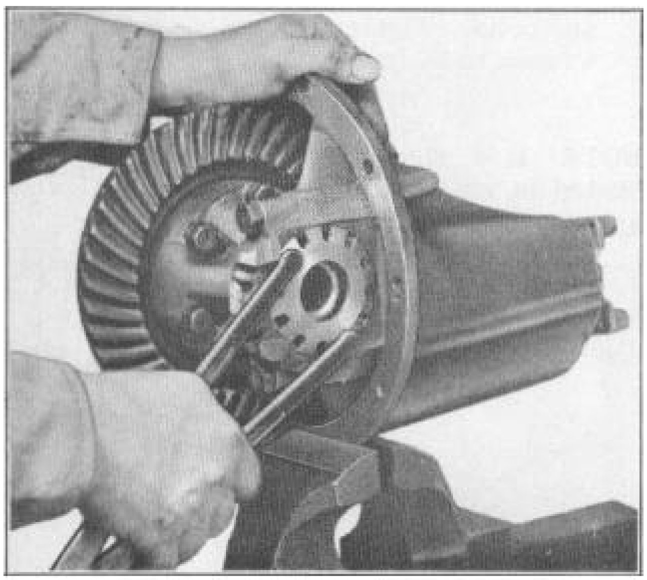


FIGURE 30

11. Mount dial indicator, KMO-30 on the differential carrier flange. Turn left hand adjusting nut to the left (counterclockwise) one half notch. Turn right hand adjusting nut to the right (clockw**ise) one half notch.**

NOTE: It is suggested that while this operation is being accomplished, the ring gear be rotated to allow the tapered bearings to seat properly.

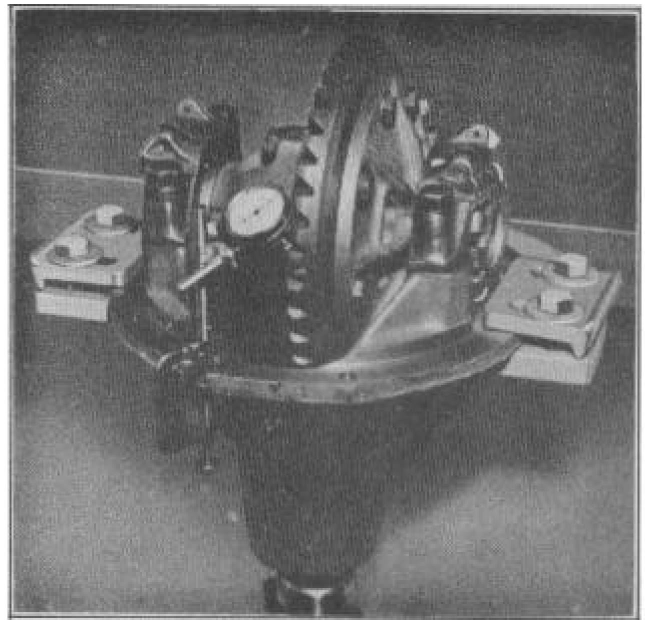


FIGURE 31

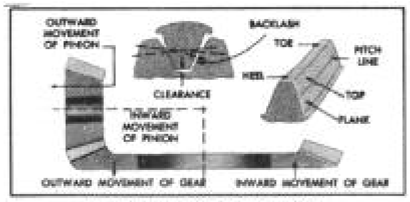
12. Rest plunger of dial indicator on the outer edge of the ring gear tooth. See Figure 31. When moving the ring gear by hand, the back lash should be between .004" to .006". If the reading does not conform to recommended tolerances turn adjusting nuts one half notch at a time until desired reading is obtained.

NOTE: After setting the back lash tolerance, use a small brush and paint seven or eight teeth of the ring gear with red lead. Move the painted teeth of the ring gear over the pinion until a good impression of the tooth contact is assured. The impressions obtained on the gear teeth will be similar to those shown in Figure 32. With this illustration as a guide, make adjustments accordingly,

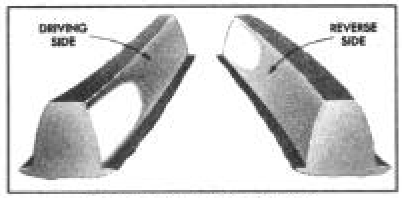
13. Tighten left bearing cap bolts. Turn right differential bearing adjusting nut to the right (clockwise) one full notch.

This additional tightening provides the necessary .008" to .012" "Spread" to the differential carrier for proper operation.

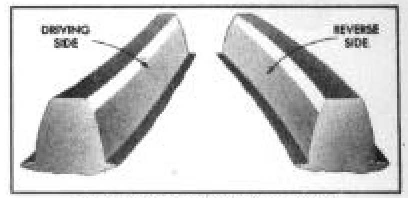
14. Tighten cap bolts securely on right differential bearing cap.



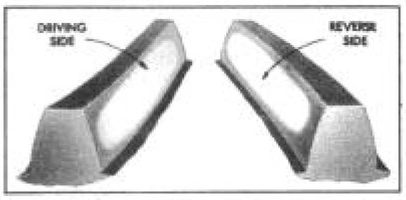
GEAR TOOTH NOMENCLATURE.



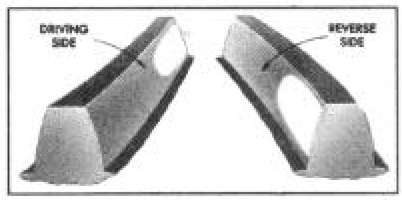
MOVE RING GEAR IN TOWARD PINION OR MOVE PINION IN TO RETAIN PROPER BACKLASH.



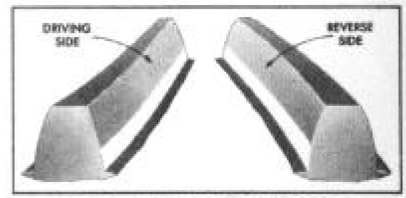
MOVE PINION TOWARD RING GEAR OR MOVE RING GEAR OUT AWAY FROM PINION IF NECESSARY TO RETAIN PROPER BACKLASH.



CORRECT TOOTH CONTACT FOR QUIET OPERATION AND LONG LIFE.



MOVE RING GEAR OUT AWAY FROM PINION OR MOVE PINION OUT TO RETAIN PROPER BACKLASH.



MOVE PINION AWAY FROM RING GEAR, MOVE GEAR IN TOWARD PINION IF NECESSARY TO RETAIN PROPER BACKLASH.

15. Assemble differential bearing adjusting nut locks, and secure the m with cotter pins.

16. Replace differential carrier in axle housing, using a new gasket. Be sure that all dirt, grease and foreign substance on the face of the flange has been removed in order that the new gasket may seat properly, thus eliminating possible oil leakage.

17. Assemble carrier to housing, pulling up nuts evenly and securely, using torque wrench to secure desired pressure of 35 foot pounds.

AXLE SHAFT

1. Replace axle shaft inner oil seals, using oil seal replacing tool J-2159, Figure 33.

2. Install rear wheel bearing cones on axle shafts.

3. Pack bearings with wheel bearing grease.

4. Place axle in housing, twisting slightly to engage splines in differential side gears and assemble wheel bearing cups on bearings.

5. Place bearing adjusting shims over axle and against backing plate.

6. Place adjusting cap over axle and secure with lockwashers and nuts.

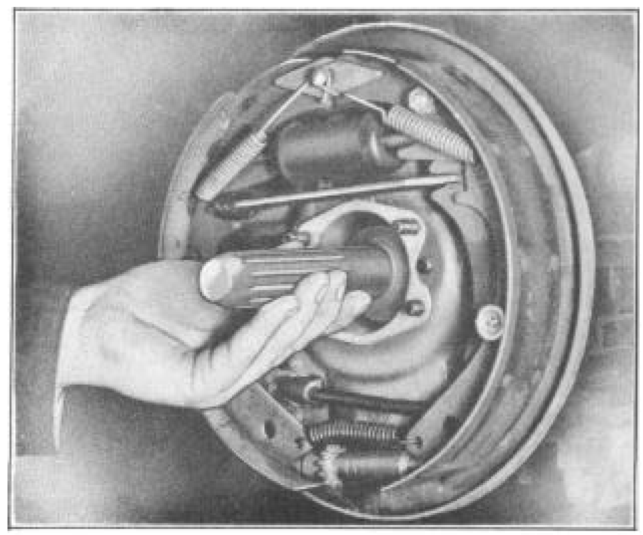


FIGURE 33

7. Rotate axle shafts by hand to be sure bearings and cups are seated.

8. Clamp dial indicator gauge, K MO 30 to backing plate, s o that dial plunger rests against the end of axle shaft. Check end play, which should be maintained between .001" to .004". Adjust for correct amount of end play by adding or removing shims.

9. Place axle shaft key in keyway and install hubs and drums.

10. Install axle shaft washers and nuts, and tighten to 100 to 150 foot pounds with torque wrench. Insert cotter pin a

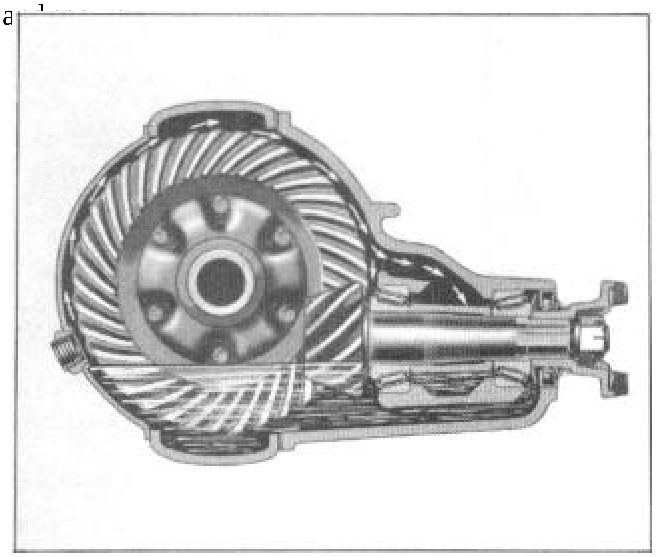


FIGURE 34

11. Fill axle to proper level (bottom of filler plug, see Figure 34) with S.A.E. #90 E.P. Hypoid lubricant, through filler hole and replace filler plug.

LUBRICATION

Rear axle lubricant should be checked at least every 1000 miles, and is to be maintained to the level of the filler plug.

The life of the rear axle gears and bearings can be prolonged if after the first 5000 miles the axle s drained and flushed out and new lubricant installed.

NOTE: DO NOT USE KEROSENE OR GASOLINE FOR THIS OPERATION.

This need only be done once. Refill axle with Hypoid E.P. lubricant (S.A.E. 90) manufactured by a reputable oil company.

REAR AXLE ASSEMBLY

INSTALLATION:

1. Using roller jack, wheel axle into position.

2. Connect rear spring to rear shackle, but do not install shackle bushings at this time.

3. Install spring mounting clips, plates, insulators, washers and nuts, and tighten to 65 foot pounds. Install lock nuts.

4. Install lower end of shock absorber, studs, flat washers and nuts.

5. Align springs an d install rear shackle bushings.

6. Install rear spring shackle bushing lubrication fittings.

7. Install rear stabilizer bar at axle and body frame rail. (use a drift to align bushing at body rail bracket).

8. Attach brake cables to rear spring cable retaining clips and at # 6 crossmember.

9. Place brake cables through guides at propeller shaft center bearing support cross- member, install lock nut an d clevis to cables.

10. Attach brake cables to equalizer bar and check adjustment.

11. Connect rear axle tee to axle and attach rear wheel brake lines.

12. Install propeller shaft, tighten bearing "U" bolts to 25 foot lbs. and turn ends of locks against flat face of nuts. Make sure needle bearing cups a r e in place under retaining lugs.

13. Bleed brake lines.

14. Install wheels and hub caps.

15. Install fender wheel covers.

16. Lower car and remove jacks.

MAINTENANCE

AXLE NOISE

Difficulties with universal joints, muffler roar, tire noises, wheel bearings, body drumming and etc., are at times improperly diagnosed as rear axle noise. Therefore, after checking all possible external causes, the following items on road test should be considered:

1. Select a level, asphalt or tarvia road as this type of road surface minimizes tire noise.

2. Drive car far enough to bring axle lubricant to operating temperature.

3. A heavy pitched continuous hum, which increases as the car speed is increased, is noticeable on acceleration between the speeds of 15 to 45 miles an hour, and is most pronounced between the speeds of 22 to 35 miles an hour indicates that:

   A. The axle shaft, drive pinion, or differential bearings are improperly adjusted.

   B. Differential ring gear and pinion tooth contact is improperly set.

4. Coast noise will be more pronounced by allowing the car to coast from the speed of 45 miles an hour, through the speed range of 15 miles an hour, with clutch engaged and throttle closed; if the noise is heavy add irregular on the coast:

   A. Check condition of wheel bearings.

   B. Check drive pinion adjustment. If necessary, move pinion out away from ring gear, but never more than .006".

5. Bearings improperly adjusted, worn, scored, or rough will aggravate axle noises. Bearing noise may be distinguished from the previously mentioned type by:

   A. Very irregular drive noise on acceleration.

   B. Very rough and irregular coast noise on deceleration.

   C. A pronounced knocking or clicking is caused by bearings that have "dug in" or brinelled.

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SECTION 14

FRONT SUSPENSION

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SPECIFICATIONS

Curb height (Front)	4-1/4"
(Rear)	5-1/4"
Caster	1/2º 1-1/2º
Camber	1/2º 1-1/2º
Maximum variation between right and left wheel caster or camber	1/2º
Toe-In measured at wheel rim	0-1/16"
Pivot Pin Inclination	3º 36"
Toe-out variation between wheels	±30"
Spindle Pivot Pin Thrust Bearing	Ball
Wheel Bearing Type	Taper Roller
Wheel Bearing End Play	.001" to .003"
Tie Rod End Type	Plain Bearing
Tie Rod Adjust-ment	To Increase-Turn counter clockwise
Tie Rod Adjust-ment	To Increase-Turn counter clockwise
Steering center arm bolt nut	Tighten to 70# torque
Steering arm nut - tighten to	#110 to 120# torque

CONSTRUCTION

Independent suspension of front wheels permits either wheel to absorb road irregularities without any effect on the opposite wheel.

Steering is from a center point which permits smooth operation of the steering mechanism. With the center steering arm, it is possible to eliminate frictional points which is not possible with off-center steering.

UPPER SUPPORT ARM:

The upper support arm and pivot are one unit, the assembly rides in bushings located at front and rear of pivot.

The upper support arm pivot bracket is attached to the frame side member by three bolts. The outer end is attached to the steering spindle support by the eccentric bushing pivot bolt.

STEERING SPINDLE:

The steering spindle and the steering spindle support are joined together by the pivot pin. The steering spindle support is attached to the upper support arm b y the eccentric bushing bolt and to the lower support arm by a pivot pin which rides in a steel bushing.

LOWER SUPPORT ARM:

The lower support arms are responsible for the vertical movement of the front suspension. They are joined to the steering spindle support at the outer end and to a pivot that is bolted to the #2 crossmember at the inner end.

The coil spring seat is riveted to the lower support arm and the top of spring fits in a recess of the #2 crossmember.

Two rubber bumpers are located on the front suspension - one limits downward movement of upper support arm - the other limits upward movement of the lower support arm.

BUSHINGS:

The pivot pins and steel bushings are threaded an d therefore securely bound together even though excessive wear may make a loose fit.

Clearance between pins and bushings is from .012 to .026 to allow for lubrication adjustment and free action.

LUBRICATION

Lubrication of threaded bushings must be thorough and with the weight of the car off the bushings.

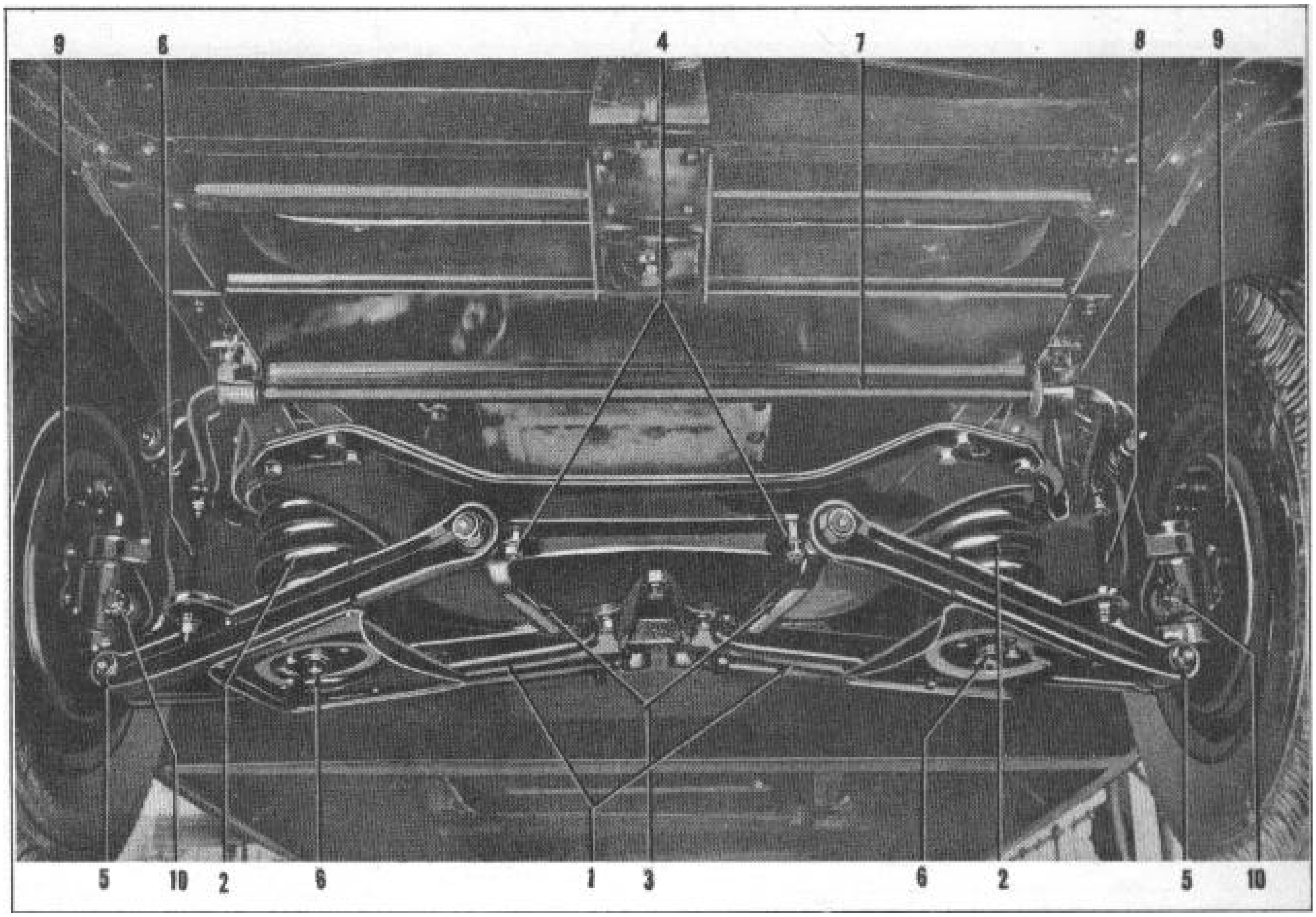

FIGURE 1

1. Lower support arm assemblies
2. Coil spring
3. Lower support arm pivot
4. Lower support arm pivot to frame bolt
5. Lower support arm to spindle support pivot and bushing
6. Shock absorber anchor plate and attaching nuts
7. Front stabilizer bar
8. Stabilizer connectors
9. Brake backing plates
10. Steering arm nut

FRONT SUSPENSION

REMOVAL (RIGHT OR LEFT):

1. Raise car and place stand jacks under inner ends of the lower support arms (1), Figure 1.

2. Remove wheel.

3. Remove shock absorber upper stud nut and palnut (30), Figure 5.

4. Remove shock absorber lower mounting nuts and washers (6) Figure 1. Turn shock absorber 1/4 turn and remove through opening.

5. Remove lower support arm pivot to frame bolts (4), nuts and lockwashers.

6. Raise car, allowing coil springs to expand and remove the spring.

NOTE: Coil spring is under great pressure - Use care when removing coil springs.

7. Remove stabilizer connector (8).

8. Remove outer tie rod end (13) Figure 2, from steering arm using Tool J-2781.

9. Remove fourbolts from brake backing plate and attach backing plate (9) under fender to protect brake hose.

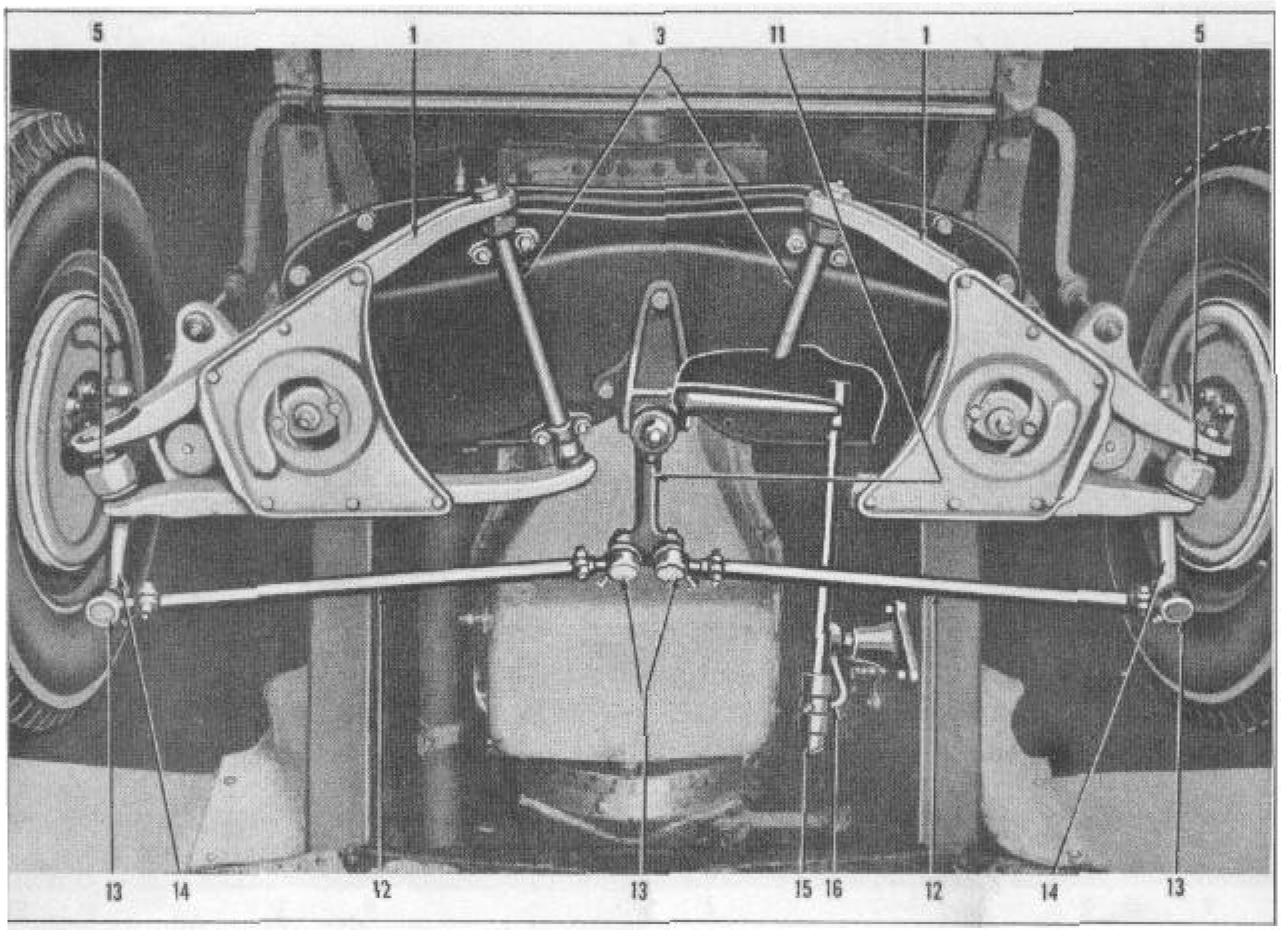

FIGURE 2

1. Lower support arm assemblies
3. Lower support arm pivots
5. Lower support arm to spindle support
   pivot and bushings
11. Center steering arm
12. Tie rod assemblies
13. Tie rod ends
14. Right and left steering arms
15. Drag link assembly
16. Pitman steering arm

10. Remove upper support arm pivot to frame bolt nuts and lockwashers, (29), Figure 5.

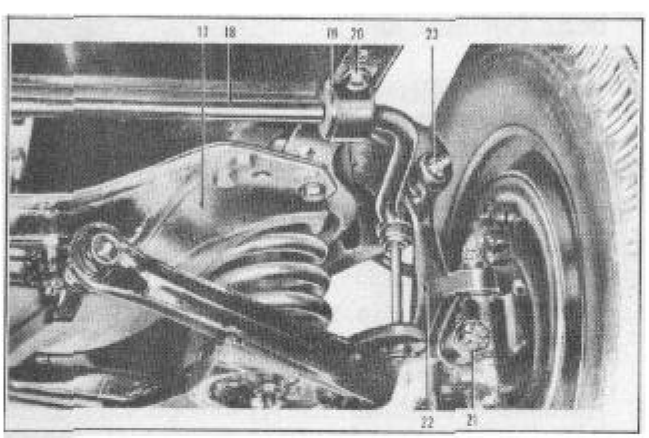

FIGURE 3

11. Remove front wheel suspension assembly.

INSTALLATION:

1. Replace assembly and install upper support arm pivot (28) and bushing bolts (29) and tighten securely, Figure 5.

LEGEND FIGURE 3

17. #2 Frame Cross Member
18. Stabilizer
19. Stabilizer rubber bushings
20. Stabilizer bracket to frame bolt
21. Steering arm nut
22. Steering spindle support
23. Eccentric bushing

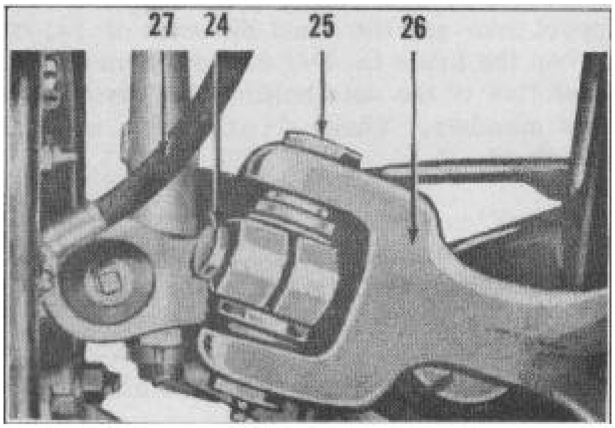

FIGURE 4

24. Eccentric bushing lock screw
25. Eccentric bushing pivot bolt
26. Upper support arm
27. Front wheel brake hose

2. Install coil spring (2), Figure 1.

NOTE: Flat end of spring must be at t op. Bottom must rest in lower support arm spring seat. Be sure silencer is in upper spring seat.

3. Lower the car, which will compress spring and position lower support arm pivot (3) to frame cross-member.
4. Install lower support arm pivot attaching bolts (4) and tighten securely.
5. Install shock absorber.

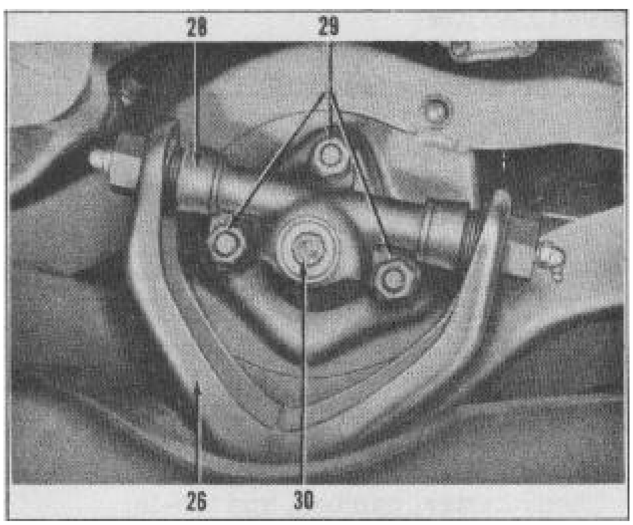

FIGURE 5

26. Upper support arm
28. Upper support arm pivot and bushing
29. Upper support arm pivot to frame bolts
30. Shock absorber upper stud nut

6. Install stabilizer connector (8).
7. Install tie rod end at steering arm (13).
8. Install brake backing plate (9).
9. Install wheel assembly and lower car.

RIDING HEIGHT AND COIL SPRING SAG

When the car does not seem to be level and a check of the coil spring height is desired, place the car so that the front end is level crosswise, and then rock the car sidewise several times and allow the car to settle. This will remove any binding that might cause a dimensional difference.

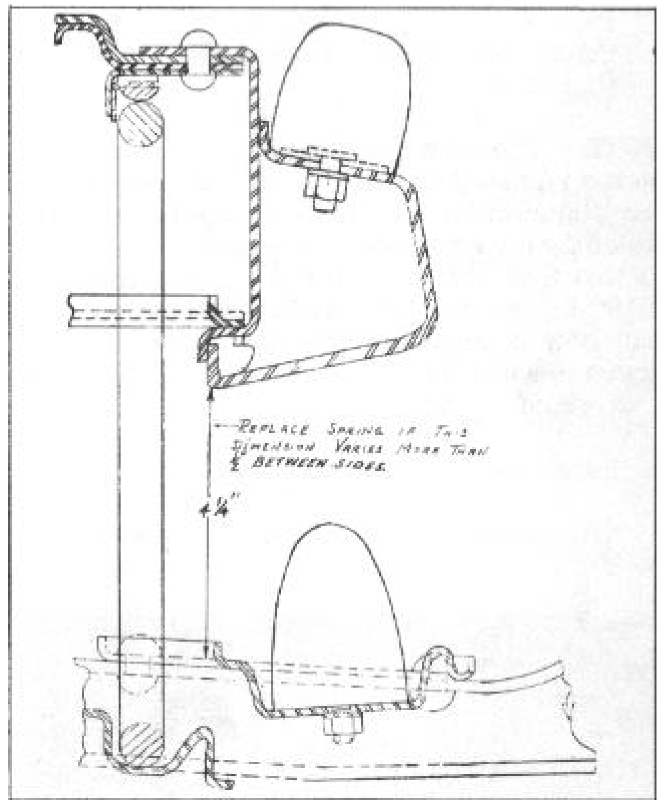

FIGURE 6

Measure the distance from the top of the lower support arm rubber bumper seat to the bottom of the upper rebound bracket, which should be 4-1/4" each side, Figure 6.

If the two measurements vary more than between sides, it is advisable to replace one or both coil springs.

The light and heavy coil springs may be identified by the part number stamped on the top coil of spring.

LOWER SUPPORT ARM PIVOT AND BUSHING

REMOVAL:

1. Jack front wheels clear of the floor.
2. Place stand jack under inner side of lower support arm.
3. Remove front and rear bushings of the lower support arm pivot (3), Figure 1.
4. Remove the four bolts (4) that hold lower pivot to front crossmember.
5. Remove pivot (3) from lower support arm.

INSTALLATION:

1. Install the lower support arm pivot (3), Figure 1.

NOTE: The lower support arms are identical on the right and left sides with the exception of the diameter of the threaded bosses through which the lower support bolt passes. The bosses that face the front of the car are threaded .010" larger than the ones at the rear. A 1/4 inch hole is punched in the top plate of the left arm assembly to distinguish it from the right arm which has no hole.

2. Install front coil spring.

3. Install lower support arm pivot to frame bolts.

FIGURE 7

NOTE: Use tool J-1052 to maintain the exact distance of 11-1/2" between the inner faces of support arm and the exact distance of 1-1/2" between the inner face of support arm and the center line of the nuts holding the pivot to the cross member. These distances must be maintained.

A .010" oversize lower support arm to support bolt bushing is available for wear of the steering spindle support.

4. Install shock absorber, mounting plate, rubber bushings, retainers and retaining nuts. Lower car to floor.

5. Adjust camber, caster, and tow-in.

STEERING SPINDLE SUPPORT LOWER PIVOT PIN AND BUSHING

REMOVAL:

1. Place a jack under the lower support arm (1), Figure 1, and raise the car.

2. Remove cotter key, nut, and washer from the lower support arm to spindle support pivot pin, (5).

3. Remove the lower pivot pin (5) and bushing.

INSTALLATION:

1. Install bushing in spindle support.

2. Hold the steering spindle support (22), Figure 3, squarely between the yoke of lower support arm (1), Figure 1.

3. Install the lower pivot pin (5) and index the pin so that the spindle support (22) is centralized between the inner faces of the lower support arm (1), Figure 1.
4. Install the washer, nut, and cotter pin. 5. Check caster, camber, and toe-in.

UPPER SUPPORT ARM PIVOT

REMOVAL:

1. Jack up car so that wheels clear the floor.

2. Remove wheel assembly.

3. Remove shock absorber stud nut and palnut (30), retainer, and rubber bushing, Figure 5.

4. Remove bolts from upper support arm pivot bracket to frame (29), Figure 5.

5. Remove lock screw from eccentric bushing.

6. Remove cotter key and nut from eccentric bushing pivot bolt (25).

7. Remove eccentric bushing and steering spindle support pivot.

8. Remove upper support arm and pivot assembly.

NOTE: To install, reverse procedure of removal, check caster and camber after installation.

UPPER STEERING SPINDLE SUPPORT PIVOT AND BUSHING

REMOVAL:

1. Jack up car so that wheels clear the floor.
2. Remove upper support arm pivot bolt. 3. Remove upper support arm pivot and bushing.

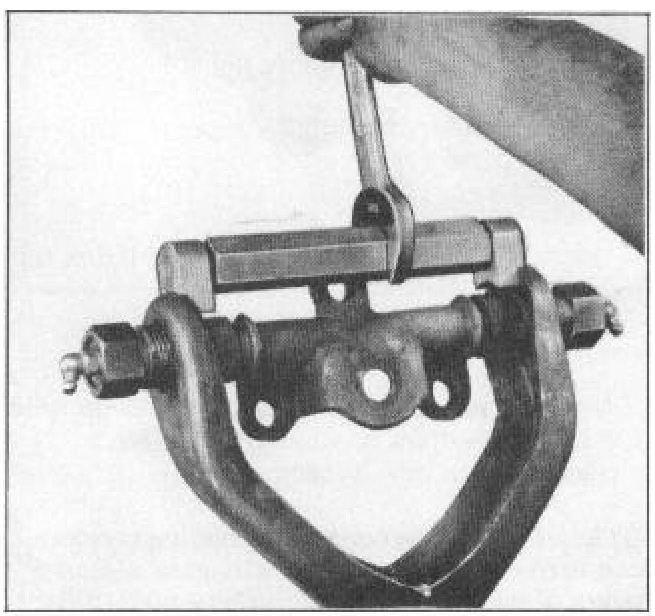

FIGURE 8

4. Screw bushing out of upper support arm and off the pivot arm.

INSTALLATION:

NOTE: The upper support arm pivot is self threading. The assembling of the upper support arm pivot and bushing requires special tool J -1860, Figure 8, to maintain a proper spread of the pressed steel support arm to insure proper tension on the threads of the pivot after the bushings have been installed.

1. Install the gauge tool J-1360, Figure 9, on the outer stud of the pivot.

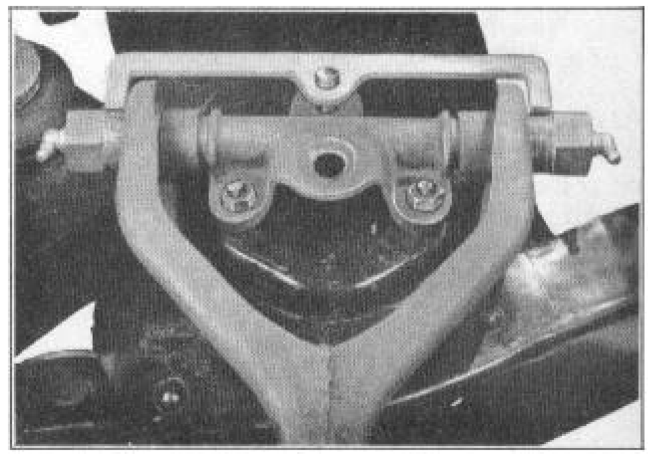

FIGURE 9

Install the pivot so that it is central with the tool. Install the spreader tool J-1860 so that the two ends of the tool rest against the inner faces of the upper support arms and the flange of the support arms fits in the slots machined in the ends of the spreader tool. Turn the hexagon portion of the spreader tool until the gauge rests against outer surface of the arms. This will spread the arms 1/16".

2. Just start the bushings on both ends of the pivot. Lubricate item with a tapping compound such as lard oil which will allow the bushings to cut their own threads in the support arm without scoring. Install the upper support arm pivot centering gauge J -1860 - 2. Thread the bushings into the support arm until the head seats tighten to 110 foot pounds. Remove both tools.

NOTE: The upper support arm assembly must have free movement so that it is free to drop

of its own weight, plus not more than a five pound pressure, from a horizontal position. It must have no perceptible shake. The pivot must not be rotated as this will throw the pivot off center with the support arm.

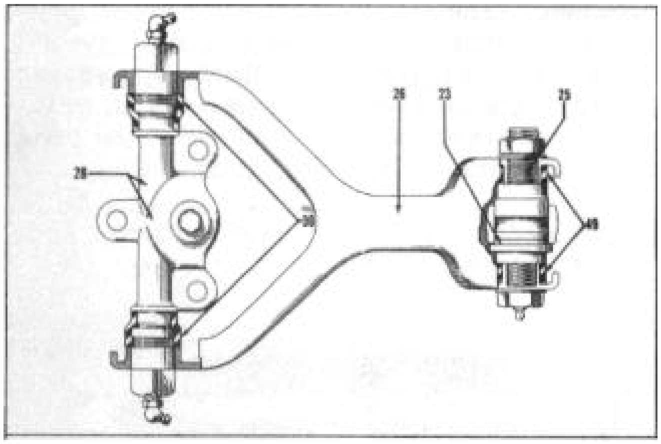

FIGURE 10

23. Eccentric bushing
25. Eccentric bushing pivot bolt
26. Upper support arm
28. Upper support pivot and bracket 36. Upper support arm pivot bushings 49. Eccentric bushing seals

ECCENTRIC BUSHING

REMOVAL:

1. Place a jack under lower support arm and raise the car off the floor.

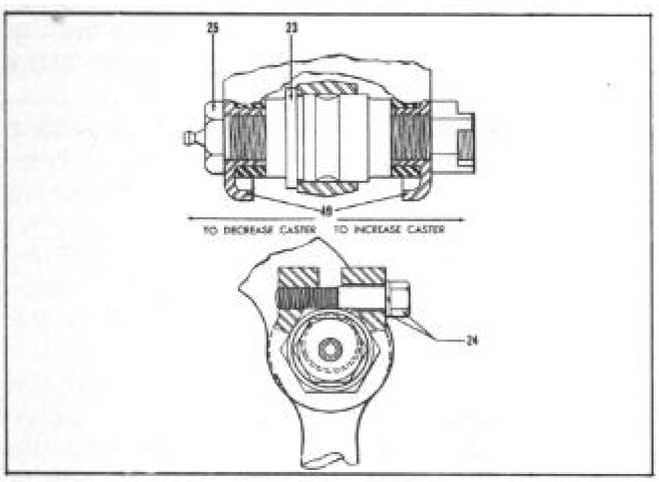

FIGURE 11

2. Remove eccentric bushing lock screw and washer (24), Figure 11.
3. Remove cotter pin, nut, and eccentric bushing pivot bolt (25).
4. Remove eccentric bushing seals (49).
5. Remove bushing (23) from the steering spindle support and upper support arm.
6. Remove eccentric bushing from steering spindle support using upper support arm eccentric bushing adjusting wrench "KMO- 366," Figure 12.

INSTALLATION:

1. Install eccentric bushing into steering spindle support (Hexagon head of bushing to the front).

2. Install eccentric bushing lock screw (24), but do not tighten.

3. Hold the steering spindle support in the center of the upper support arm and install the support arm pivot bolt. Turn the bolt until the head seats securely.

4. Install nut and cotter pin.

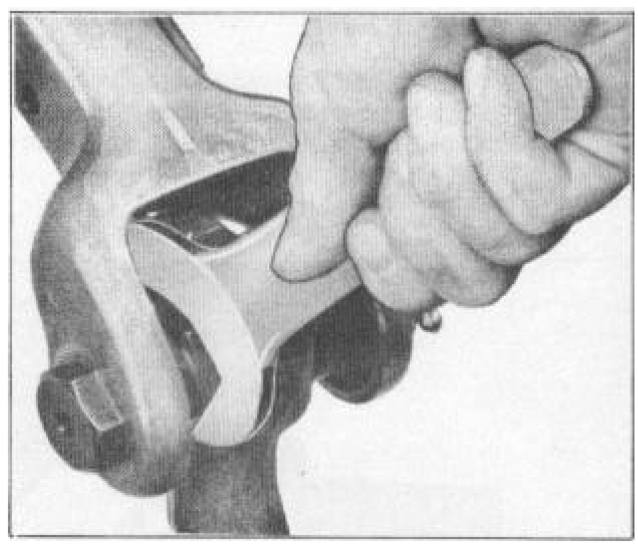

FIGURE 12

5. Use Wrench KMO-366 to adjust eccentric. bushing. Adjust caster and camber.
6. Tighten lock screw securely.

NOTE: Turning the eccentric bushing two complete turns 3/16" clockwise will give a plus 1° change of caster andtwo complete turns 3/16" counterclockwise will give a minus 1° change of caster.

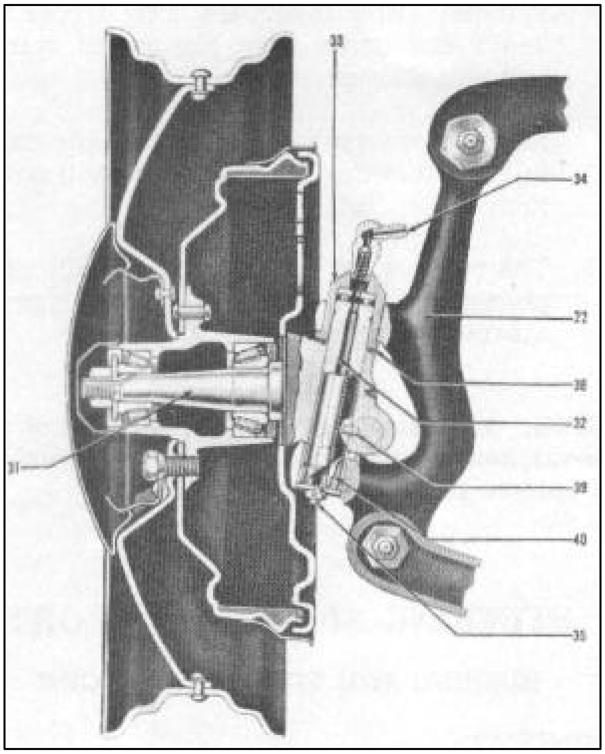

FIGURE 13

22. Steering spindle support
31. Steering spindle
32. Pivot pin
33. Pivot pin thrust washer and ball cup
34. Pivot pin lubrication fitting
35. Expansion plug and relief valve
38. Pivot pin oil seal
39. Pivot pin key
40. Pivot pin bushing

STEERING PIVOT PIN WEAR

Adjust the front wheel bearings before starting any check for wear in the pivot pin or bushings. Place one hand on top of the tire and the other hand on the bottom of the tire and pull with one hand while pushing with the other to determine the amount of play between the pivot p i n and bushing. If there is an appreciable amount of movement due to excessive wear, the bushings should be replaced.

Wear at the spindle pivots is seldom confined to one side. It is therefore advisable to renew the parts on both sides.

NOTE: The pivot pin key seal is lead and is used with the key that holds the steering arm to the steering spindle. This key also holds the pivot pin and the lead seal prevents lubricant being forced down the outside of the pivot pin into the key way and then outside to cause loss of lubricant.

STEERING SPINDLE PIVOT BOLT EXPANSION PLUG AND RELIEF VALVE

A grease pressure relief valve, Figure 14, is fitted into the expansion plug at the bottom of the steering spindle pivot bolt.

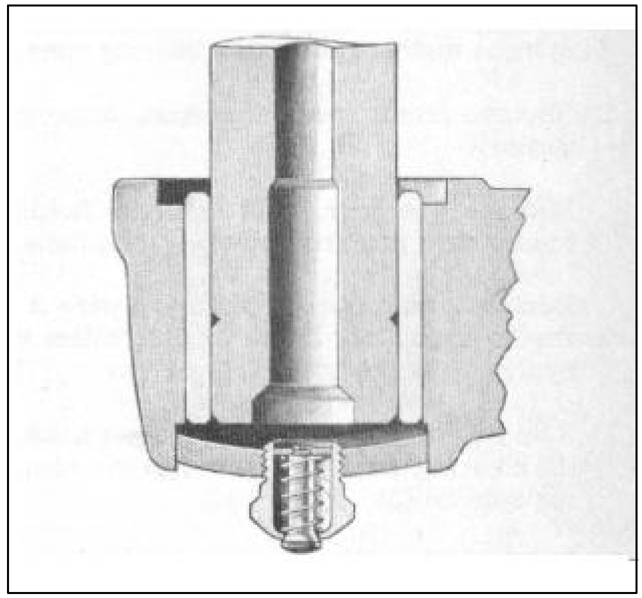

FIGURE 14

This is to relieve excessive grease pressure (500 to 600 lbs. per square inch) that may be applied at the grease fitting at the top of the plug. This prevents grease from leaking out around the expansion plug and any possibility of the grease pressure blowing it out.
When lubricating spindle pivot pins, always continue supplying grease until it comes out of the valve.

RELIEF VALVE

INSTALLATION:

1. Assemble relief valve i n the expansion plug.

2. Coat edges of expansion plug with white lead.

3. Using a short piece of tubing or hollow pipe

that will clear the relief valve, (place the pipe over the relief valve and against the plug); drive expansion plug into place.

STEERING SPINDLE

REMOVAL:

1. Jack front wheels clear of the floor.

2. Place stand jack under the outer side of the lower support arms (1), Figure 1.

3. Remove hub caps and dust caps.

4. Remove steering spindle cotter pins, nuts, spindle washer, and outer bearing cage.

5. Remove front wheel and brake drum assembly.

6. Remove t he four bolts and nuts holding front brake backing plate (9), to spindle.

7. Remove brake backing plate and wire it to the frame, do not injure or disconnect the hydraulic brake hose.

8. Remove cotter key, nut and washer holding the steering arm (14) Figure 2 to the steering spindle (31), Figure 13.

9. Drive the steering a r m out o f steering spindle using tool 3-1373.

10. Remove cotter pin, nut and lower support arm pivot, (5), Figure 1.

11. Remove eccentric bushing locking screw (24), Figure 4, and upper support arm outer pivot bolt bushing (27), Figure 4.

    Eccentric bushing will remain in steering spindle support.

12. Remove steering spindle (31) and steering spindle support (22) together, Figure 6.

13. Remove grease fitting at top of steering spindle.

14. After removing the grease fitting, insert tool 3-479 through the hole at top of steering spindle and begin to drive pivot pin (32), Figure 13, out of spindle. This action will force out expansion plug and relief valve, Figure 14, at the bottom of spindle. Then insert the long driver tool J-479 and drive pivot pin out of spindle and spindle support.

    Remove steering spindle pivot pin carefully so that the 7 ball bearings will not be lost.

15. The removal of the steering spindle pivot pin separates the steering spindle from the steering spindle support.

NOTE: To install, reverse procedure of removal, and lubricate inside of bushings and top of spindle pin with viscous grease.

STEERING SPINDLE SUPPORT

BUSHING AND THRUST BALL CUP

REMOVAL:

1. Hold steering spindle support (22), Figure 3, in a vise so that bushings can be forced out.

2. Drive thrust ball cup (upper bushing) out of spindle using a soft hammer.

3. Insert driver tool J-990, Figure 11, into the lower bushing and drive bushing out.

INSTALLATION:

1. Support steering spindle support in a vise so that bushing and thrust ball cup can be driven in.

2. Using tool 3-990, install the thrust ball cup upper bushing. Have the top of steering spindle support well supported.

The bushing and thrust ball cup are hardened and ground and require no reaming after being installed. The thrust ball cup has the thrust washer for the ball bearings pressed into it.

STEERING SPINDLE SUPPORT

REMOVAL:

Proceed as outlined in "Steering Spindle Removal", items 1 to 15, inclusive.

INSTALLATION:

NOTE: To install, reverse procedure of removal.

STEERING ARM

REMOVAL:

1. Remove the cotter pin, castellated nut and washer from steering arm (14), Figure 2.

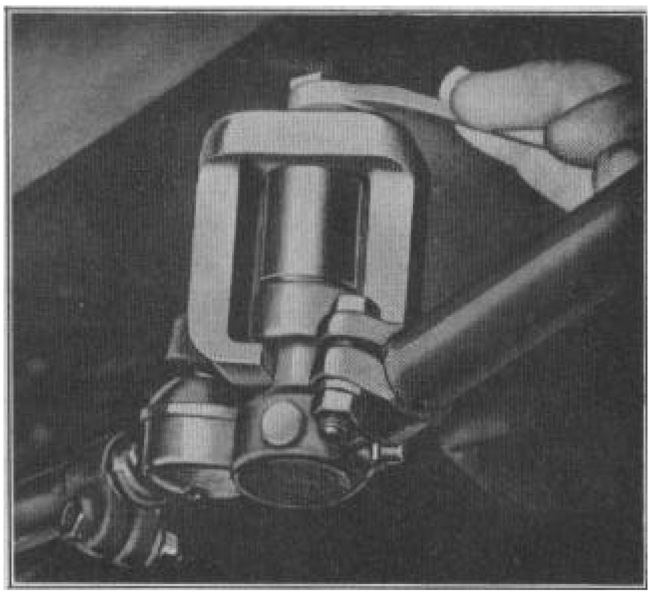

FIGURE 15

2. Remove tie rod cotter pin and castellated nut and rubber dust cover, and remove the tie rod using tool J-2781.
3. Remove steering arm using tool J-1373.

NOTE: To install, reverse procedure of removal.

Tighten the steering arm nut with a torsion wrench to 110 to 120 foot pounds.

CENTER STEERING ARM

REMOVAL:

1. Remove drag-link (15), Figure 2 at front by backing off adjusting plug and ball seat.
2. Remove tie rod ends (13) from steering center arm (11) using tool J-2781.

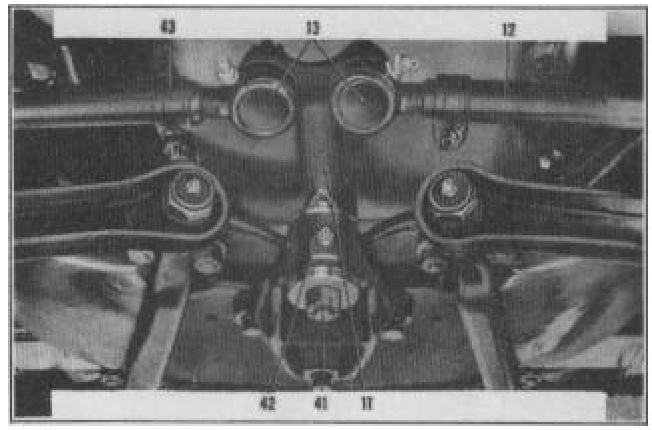

FIGURE 16

11. Center steering arm
12. Tie rod assembly
13. Tie rod ends
41. Center steering arm bolt
42. Center steering arm bracket 43. Tie rod clamp

3. Remove 3 bolts (41) holding center steering arm bracket (42) to #2 cross member (17), Figure 3.
4. Remove steering center arm (11) Figure 2.

The needle roller bearing and inner race is a press fit and can be removed with a suitable arbor press.

NOTE: When installing the bearing, apply pressure on bearing race on end carrying manufacturers name and part number.

STEERING CENTER ARM

INSTALLATION:

Steering center arm installation is the reverse procedure of removal. Tighten the steering center arm bolt nut with a torsion wrench to 70 foot pounds.

TIE ROD ENDS

Tie rod ends are the self-adjusting type. The ground steel bearing (45), Figure 17, is located between the stud (46) (which is prevented from loosening or rattling by the tension spring) and the tie rod end forging. A curved steel dust cover (48) makes a tight metal seal, but to insure this being as nearly dustproof as possible, a rubber seal (47) also seals the unit.

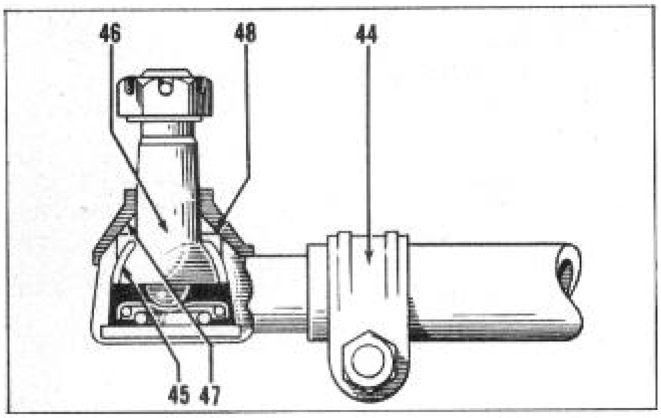

FIGURE 17

44. Tie rod clamp
45. Tie rod end bearing
46. Tie rod end stud
47. Tie rod end rubber seal 48. Tie rod end dust cover

TIE ROD

REMOVAL:

1. Remove cotter pin and nut from both ends of the tie rod.

2. Using tool J-2781 remove outer end.

3. Using tool J-2781 remove inner end.

INSTALLATION:

NOTE: Reverse process of removal. It is necessary to adjust toe-in when installing tie rods.

TURNING PULL

The amount of steering pull on the front wheels required to turn the wheels is measured in the following manner:

1. Disconnect the drag link and place roller plates under the front wheels.

2. Hook spring scale J-544-A over the tread of tire.

NOTE: Resistance pull should be not greater than (28) pounds. If greater pull is required, check for binding at spindle pivot pins and tie rod ends. Lubricate these points with viscous grease.

STRAIGHTEN BENT PARTS OF FRONT SUSPENSION

Heat treated parts should not be straightened if they are sprung more than 5°. Parts that are not heat treated may be straightened cold if they are not sprung more than 10°.

If parts are sprung more than these amounts, any attempt to straighten will show Strains and cracks that may not be visible if attempted while cold. Straightening hot may destroy the effect of the heat treating, and may result in over heating, making the steel soft and weak, while under heating makes the part brittle and easily broken.

TROUBLE SHOOTING

HARD STEERING CAUSES:

1. Low or uneven tire pressure.
2. Steering gear or steering connections adjusted too tight.
3. Insufficient or incorrect lubricant.
4. Too much caster.

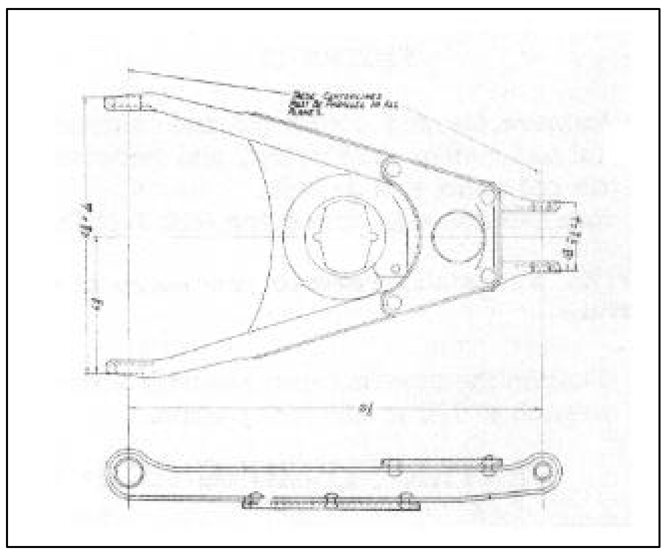

FIGURE 18

5. Front springs sagged.

6. Frame bent or broken.

7. Steering spindle, steering spindle support, or steering arm bent.

REMEDY:

1. Inflate tires to 24 pounds pressure.

2. Check steering system for binding. Lubricate, adjust as necessary.

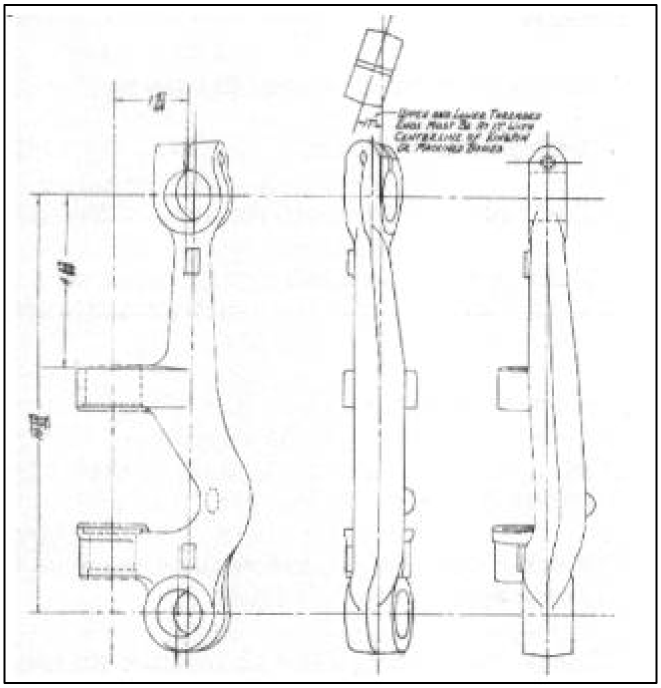

FIGURE 19

3. Support arms bent or twisted. Check wheel alignment by testing camber, steering pivot pin inclination and caster. If support arms have been removed from the car, check specifications as shown in Figure 21. Replace arms - do not attempt straightening.

4. Check height of coil springs; measure distance from top of lower support arm rubber bumper seat t o bottom of upper rebound bracket, which should be 4-1/4" each side (See Figure 6).
If the two measurements vary more than 1/2" each side, it is advisable to replace one or both coil springs.

5. Check frame for proper alignment.

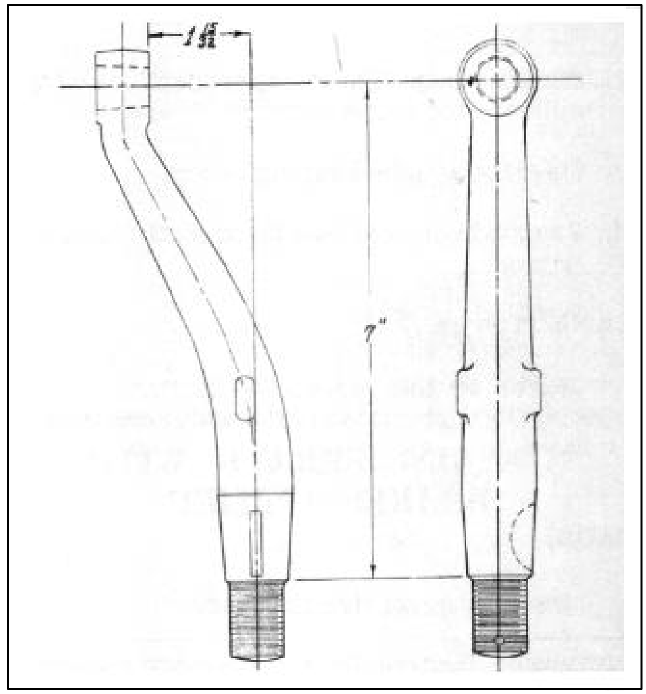

FIGURE 20

6. Check Steering spindle support and steering arm alignment Figure 21 and 20. Replace if bent--do not attempt straightening.

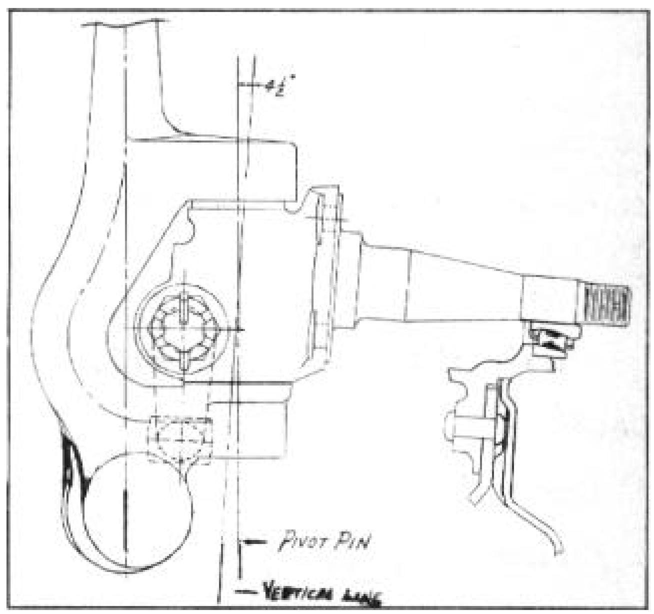

FIGURE 21

EXCESSIVE PLAY IN STEERING SYSTEM

CAUSE:

1. Steering gear or steering connections either adjusted too loose or worn.

2. Steering spindle bearings worn.

3. Front wheel bearings incorrectly adjusted or worn.

REMEDY:

Refer t o the respective sections of this manual for corrections of the above conditions.

STEERING ERRATIC WITH BRAKES APPLIED

CAUSE:

1. Low or unequal tire pressure.

2. Brakes incorrectly o r unevenly adjusted.

3. Oil soaked brake lining.

4. Coil springs weak.

5. Insufficient or uneven caster.

REMEDY:

1. Inflate tires to 24 pounds.

2. Adjust brakes.

3. Replace lining. (Use genuine Hudson brake lining).

4. Replace springs or shim as necessary.

5. Steering spindle or spindle support bent. Refer to Figures 20 and 21.

CAR PULLS TO ONE SIDE

CAUSE :

1. Low or uneven tire pressure.

2. Oil soaked brake lining.

3. Shock absorbers not functioning or only partly operating.

4. Wheel bearings adjusted too tight.

5. Incorrect toe-in, unequal caster, or camber.

6. Coil springs sag.

7. Rear axle shifted.

8. Front frame bent or broken.

9. Front stabilizer not centralized.

REMEDY:

1. Inflate tires to 24 pounds pressure.

2. Replace brake lining.

3. Check shock absorbers for lack of fluid.

4. Check wheels for binding with front wheels off the floor. Adjust the bearings and lubricate.

5. Correct caster, camber, and toe-in. Check steering spindle, spindle support, or steering arm to determine if these parts a r e damaged. Refer to Figures 20 and 21.

6. Check riding height and replace springs if necessary. Refer to Figure 6.

7. Check rear spring clips and tighten as necessary. Rear spring center bolt should be checked to determine that it is not sheared. A distance from the rear spring pivot bolt to axle housing should be checked. This distance should be the same on both sides.

8. Check frame for breakage and proper alignment.

9. Adjust and tighten front stabilizer arms.

SCUFFED TIRES

CAUSE:

1. Tires incorrectly inflated.

2. Incorrect toe - in o r incorrect toe-out on turns.

3. Wheels or tires out of true.

4. Steering spindle bearings worn.

5. Suspension arms bent or twisted.

6. Unequal caster.

7. Turning corner at high speeds and erratic driving.

REMEDY:

1. Inflate tires to 24 pounds pressure.

2. Adjust tie rods to give proper toe-in and toe-out .

3. Check tire and wheel statically and dynamically.

4. Replace spindle pins and bushings as necessary.

5. Replace suspension arms if these are bent or twisted. Do not attempt to straighten. Refer to Figures 18 and 19 for specifications.

6. Adjust caster and camber. Refer to specification page.

CUPPED TIRES

NOTE: Normal cupping of tires can be expected tires should be frequently interchanged on the car.

C**AUSE:**

1. Tires incorrectly inflated.

2. Dragging brakes.

3. Wheels, tires, or brake drums out of balance.

4. Steering spindle bearings or wheel bearings worn or out of adjustment.

5. Steering spindle, spindle support, or tie rods bent.

CAR WANDER

CAUSE:

1. Low or unequal tire pressure.

2. Steering gear or connections loose or warn

3. Steering gear or connections not properly lubricated or adjusted too tight.

4. Steering spindle bearings worn.

5. Wheels toe - in t o o much or toe-out in straight ahead position.

6. Improper caster.

7. Steering spindle or spindle pivot pin bent.

8. Rear axle shifted.

9. Front stabilizer not centralized.

10. Steering gear not on high point.

11. Tread better on rear tires than on the front.

FRONT WHEEL SHIMMY OR ROAD SHOCK

CAUSE:

1. Low or unequal tire pressure.

2. Steering connections worn or incorrectly adjusted.

3. Wheels, tires, or brake drums out of balance.

4. Incorrect or unequal caster.

5. Shock absorbers not operating properly.

6. Steering spindle or tie rods bent.

7. Lack of lubrication.

8. Eccentric or bulged tires.

9. Front stabilizer not equalized.

WHEEL TRAMP

CAUSE:

1. Wheels, tires, and brake drums may be out of balance.

NOTE: Wheels and tires should be balanced statically and dynamically.

2. Weak front spring.

3. Front shock absorbers not operating correctly.

4. Lack of lubrication in front suspension.

5. Front stabilizer not positioned correctly.

FRONT WHEEL ALIGNMENT

All of the five factors of front wheel alignment are inter-related, but each has a specific purpose. These control the front wheels and steering under varying conditions of weight and speed.

Should one of the angles get out of position, the relationship is destroyed. Each angle depends upon the proper setting of the others if the front wheels are to lead properly.

In making corrections to front wheel alignment, or installing new front wheel suspension parts, all five angles in both front wheels should be checked in the following order:

PIVOT PIN INCLINATION

Pivot Pin Inclination is the inward tilt of the steering spindle pivot pin at the top.

CASTER

Caster is the backward tilt of the steering spindle pivot pin usually measured in degrees.

CAMBER

Camber is the outward tilt of the front wheels at the t o p an d usually measured in inches or degrees.

TOE - IN

Toe-In is the drawing together of the front wheels at the front.

STEERING GEOMETRY

Steering Geometry or toe-out on turns is controlled by the movement and angularity of the tie rods.

GENERAL INSPECTION

Before checking the alignment of the front wheels, the following operations should be performed in the order listed. A successful alignment job cannot be accomplished unless these inspection operations are performed. Should inspection reveal the necessity for removing, installing, or adjusting any part of the front wheel suspension, or steering, prior to aligning the front wheels, complete instructions will be found in the respective sections of the manual.

1. Inflate all tires to recommended pressure.

2. Check condition of tires (blowout patches, thin treads, vulcanizing, etc.). Changing the direction of tire rotation is recommended.

3. Wheel and tire turn-out, (wobble) or eccentricity.

4. Brakes for dragging.

5. Wheel balance.

6. Front wheel bearing adjustment.

7. Coil spring height.

8. King pin and bushing clearance.

9. Upper and lower support arm bushings.

10. Steering gear, adjusting points.

11. Shock absorber control.

12. Rear-springs and "U" bolts.

When checking front wheel alignment, the car should be placed on a level floor. The car should be empty, and any luggage or load should be removed from the trunk compartment.

NOTE: Always rock the car back and forth several times and allow it to settle.

This action will place the front springs and shock absorbers in their "Normal" position. Do not rock at the bumper, but at the side of the car.

Make sure the tire pressure is correct in all four tires and the car on a level floor.

NOTE: The car is under curb load when it is loaded with oil, water, spare tire, tools and a full tank of gasoline, but without passengers.

When the car is set to 4-1/4" Dimension at the front and 5-1/4" at the rear (curb height), the camber should be 1/2° to 1-1/2° positive. The total variation in camber between right and left side must not exceed 1/2°.

The correct pivot pin inclination is 3° 36'. If the pivot pin inclination and the camber are off, it is probably due to worn pivot pin bushings. If the camber is off the pivot pin inclination is correct, the spindle is bent. Camber should not be more than the specified 1-1/2°; however, a decrease in camber, if pivot pins are not loose in the bushing, is not detrimental to steering unless an actual reverse camber exists.

Positive caster is the tilting of the top of the pivot pin toward the rear of the car, while negative or reverse caster is the tilting of the top of the pivot pin toward the front of the car.

Positive caster imparts a trailing action to the front wheels while negative or reverse caster causes a leading action. The correct amount of caster helps to keep the front wheels in the straight-ahead position. When turning a curve, caster and king pin inclination act as a lever, assisting the driver in returning the front wheels to the straight ahead position.

No caster correction should be made until after the camber angle and pivot pin inclination angle have been checked.

NOTE: When checking the caster the wheels should be turned on their bearings to bring the high spot or that portion of the tire with the greatest run-out toward the front or the rear.

The amount of caster a front end requires depends on the friction in the spindle pins, tie rod ends and the steering linkage. A well lubricated car requires less caster than one infrequently lubricated.

Replace any bent parts and check the steering geometry whenever new parts are installed because new parts may affect the turning angle of the wheels.

Whenever the eccentric bushing is turned, the caster, camber, and pivot pin inclination must be checked as all three are affected.

NOTE: It is seldom necessary to turn the eccentric bushing over a half turn t o obtain 1/2° for camber and this half turn should be all that is ever necessary for camber adjustment and give a minimum of caster change.

If camber is increased, pivot pin inclination is decreased and if camber is decreased, pivot pin inclination is increased.

NOTE: One complete turn of eccentric bushing changes caster 1 /2°. Set caster to 1° preferred with 1/2° negative or 1/2° positive permissable, but in equal amounts on both wheels if possible, but never over 1/2° variation Right and Left. Set camber with the least possible change of caster. Set the camber to 1/2°.

TOE -IN

Toe-in is the setting or adjusting of the front wheels by means of tie rods, so that the distance between the wheels is less at the front than at the rear. Camber tends to cause the wheels to run out or separate at the front and sufficient toe-in is necessary to compensate this tendency and make the wheels run straight.

Accurate toe-in is of great importance in obtaining the maximum of tire life. Toe - in must be within definite limits of 0" to 1/16" measured at the wheel rim.

PITMAN ARM ANGLE

The proper location of the pitman arm in the straight ahead driving position is necessary in order to obtain the proper toe-out when turning to left or right. If the pitman arm angle is not correct on a turn, it changes the relationship of both front wheels to the extent that it will cause an excessive scuffing action between the tires and the road.

CENTER STEERING ARM

When making adjustment of the center steering arm using tool No. J-2953, Figure 22, centering and toe-in gauge, proceed as follows:

1. T o install the gauge, remove the center steering nut.
2. Remove the front bolt from the center steering arm support bracket.
3. Install gauge clamp over the center steering arm.
4. Install gauge and insert bolt at front of gauge into the center steering arm support bracket.
5. Attach the female screw to the center steering arm shaft.
6. Adjust the gauge rods to contact both sides of front wheel evenly.

NOTE: The same procedure may be followed for opposite wheel. Any necessary adjustment can be made by turning both tie rods an equal amount to obtain the same dimensions between the front and rear wheels.

The center steering arm will now be centered an d steering gear will be on the high point for a straight ahead position.

TOE - OUT

Steering geometry or toe-out on turns is controlled by the movement and angularity of the steering arms.

The toe-out is checked by turning the wheels to the right or left, locating the inside wheel in a definite position.

Toe-out must always be checked with the weight of the car on the wheels.

Front wheels must rest on full floating turn tables and the turning angles should read as follows:

Left Turn
Left Wheel 30° Right Wheel 25°
Right Turn
Right Wheel 30° Left Wheel 25°

The variation between the left and right wheel angle must not vary more than 30 minutes plus or minus.

When the front wheels are turned to the right or left, they separate. slightly at the front depending upon the amount of deflection from the straight ahead course. The wheel making the inside circle turns at a greater angle than the outside wheel, thus making toe-out necessary on curves. The amount of toe - out increases due to a change in angle between tie rods.

When steering arms are bent, wheels will not turn in proper relation on curves. This affects toe-out and results in excessive tire wear. Errors in setting of the outside' wheel are usually due to bent steering arms

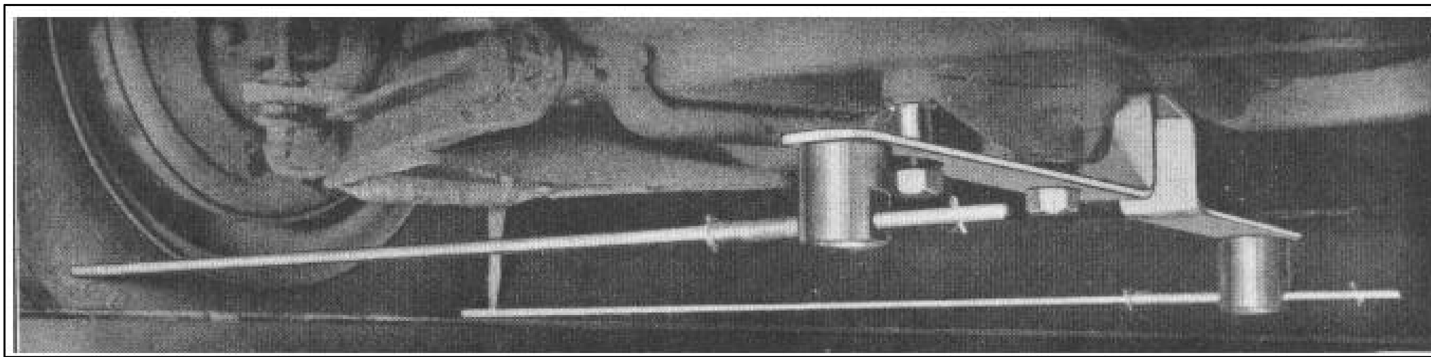

FIGURE 22

SECTION 15

STEERING GEAR

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REFERENCE

Source of Information	Date	Subject

SPECIFICATIONS

	6 Cylinder	8 Cylinder	Cross-Shaft Bearing	Bronze Bushing
Type	Worm and 3 Tooth Roller	Worm and 3 Tooth Roller	High Point	Steering column tube notch facing down
Ratio	20.4 to 1	20.4 to 1	Adjustment	Wormshaft - Shims
Steering Wheel	Standard 17" 481	Standard 17" 483	Lubrication	S.A.E. 90 E.P.
	Standard 18" 482	Standard 18" 484	Steering Wheel Nut Torque	20 Ft. Lbs.
	(Optional 18" 481)	(Optional 18" 483)	Pitman Arm Shaft Nut Torque	140 Ft. Lbs.

CONSTRUCTION

A worm and 3 roller type steering gear is used in the 480 series. The worm is mounted on the steering tube with a tapered roller bearing at each end of the worm. The worm i s adjusted for end play by means of shims located at the housing cover at the lower end of the steering gear housing. The 3 roller tooth is carried on needle bearings. The roller shaft is adjusted for closer mesh with the worm by the adjustment screw located in the roller shaft cover assembly.

The roller shaft rotates on two bronze bushings pressed in the housing. These thin shell bushings are precision machined, and if replacement is necessary, it will be necessary to replace the complete housing. A leather oil seal is installed in the bore of the housing at the outer end of the roller shaft to protect the unit against foreign matter.

The steering gear is attached to the frame by three hexagon head bolts. Elongated holes in the steering gear housing allow for proper alignment.

LUBRICATION

The steering gear is filled at the factory with S.A.E. 90 E.P. lubricant. This lubricant is satisfactory for all seasons. The steering gear filler plug (1) Figure 1, should be removed and lubricant checked at each lubrication period.

CAUTION: Avoid use of graphite, white lead, or heavy solidified oil.

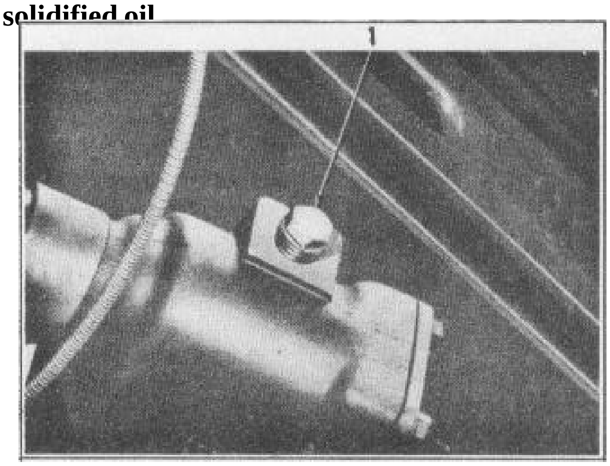

FIGURE 1

HORN RING

REMOVAL

1. Remove four screws (171286), Figure 2, from underside of steering wheel.

2. Remove ornament (301970), (301977) retainer, (301975) spring, and (301976) contact cup as an assembly.

To install, reverse procedure of removal.

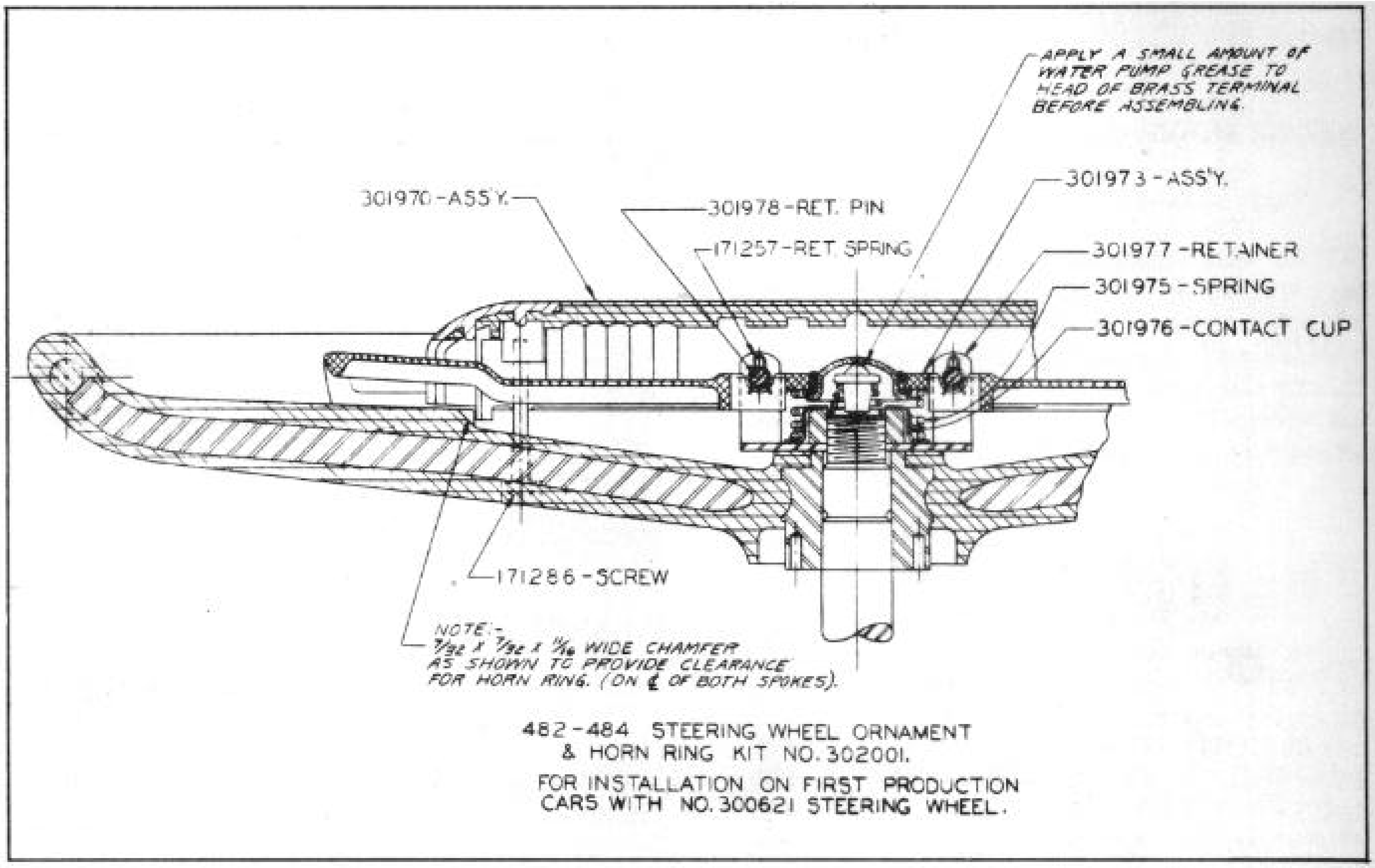

FIGURE 2

NOTE: When installing the new steering wheel ornament on first production cars, chamfer steering wheel spokes. See "Note", Figure 2, to provide horn ring clearance.

STEERING WHEEL

REMOVAL:

1. Remove ornament and horn ring assembly, Figure 2.

2. Disconnect horn wire at horn relay and remove horn wire and terminal.

3. Loosen steering wheel nut, but do not remove nut completely.

4. Place the adapter (split ring .1-739 -10) around the jacket tube and enter the small diameter of the adapter under the steering wheel hub and position the puller foot of puller J73B around the outside (large) diameter of adapter, Figure 3, with the steering wheel nut partially threaded on the column tube, run puller screw down tight against the wheel nut to release the steering wheel.

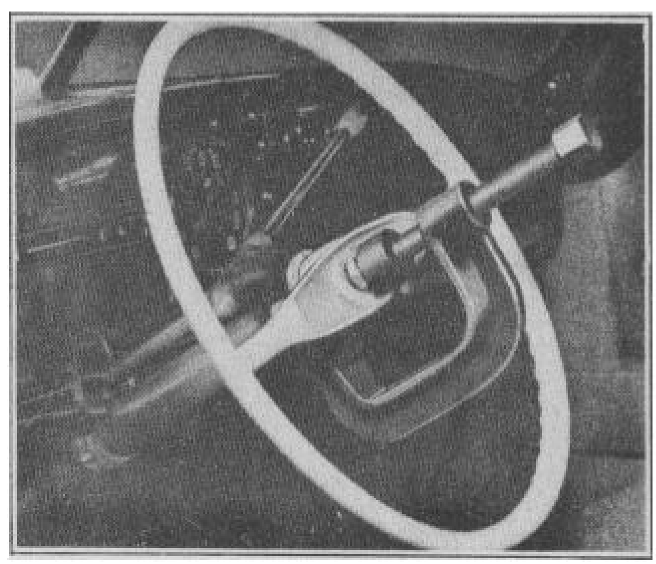

FIGURE 3

CAUTION: DO NOT STRIKE head of screw with a hammer as this action can cause serious damage to column tube worm bearings.

INSTALLATION:

To Install, reverse procedure of removal.

NOTE: When installing steering wheel make sure that wheel spokes are in horizontal plane when steering gear is in straight ahead position. A small notch located on the steering gear main column tube at the serrations should be pointing down when steering gear and front wheels are in straight ahead driving position.

STEERING WHEEL REMOVER TOOL

REWORKING:

Many of our dealers have the o1d style J-739 Steering Wheel Pullers which should be reworked to allow its use with the new style adapter J-739-10 as follows:

Grind the area at the back 1-3/8" wide and 4/8" deep at the angle shown in Figure 4. This re-machining will allow more clearance at the remote control lever upper support clamp and give a more direct pull against the steering wheel adapter.

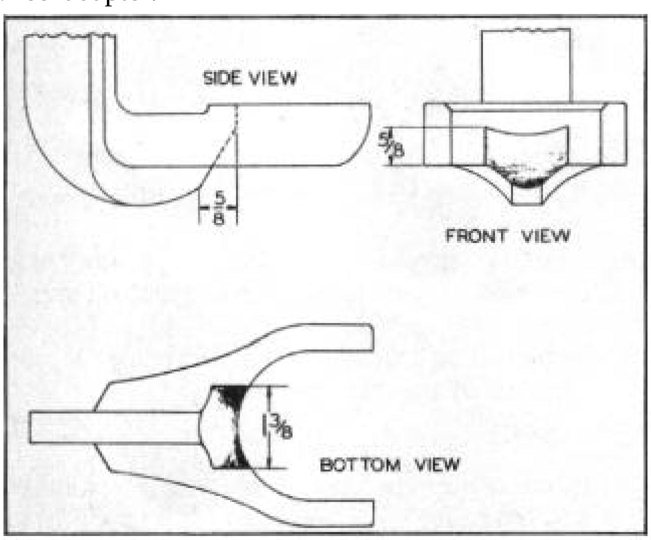

FIGURE 4

JACKET TUBE BEARING

REMOVAL:

NOTE: It is not necessary to remove the complete jacket tube when replacing jacket tube bearing.

1. Remove horn ring and steering wheel.

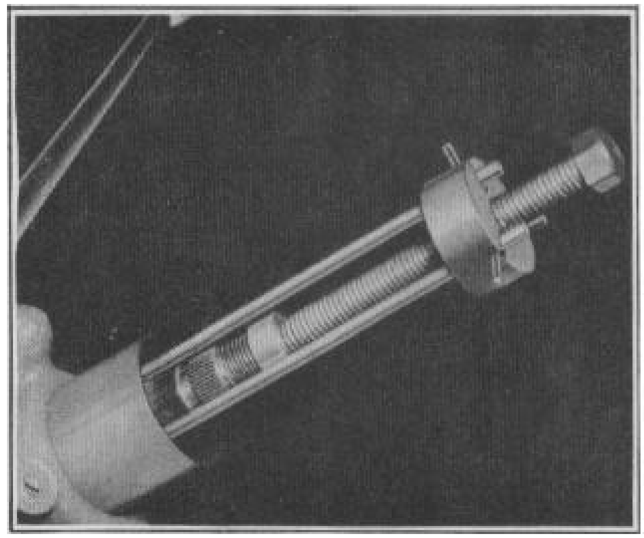

FIGURE 5

2. Engage the fingers of "Bearing Puller J-2792" below the bearing and place locating pins in slots provided in head of puller. Turn the center screw against the steering wheel nut removing bearing, Figure 5.

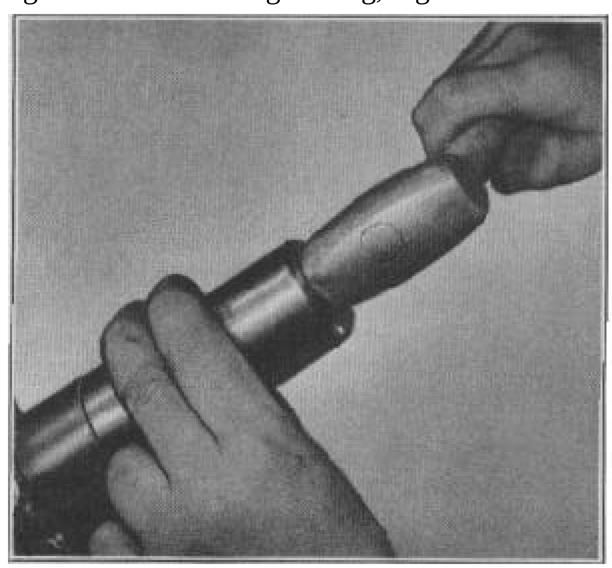

FIGURE 6

INSTALLATION:

1. Start bearing in jacket tube by hand.

2. Drive bearing to proper depth as indicated on outside of "Replacer tool J- 2952", Figure 6.

NOTE: The bearing is piloted inside the jacket tube while driver bears on outside edge of bearing, drive bearing to 31/32" from top of jacket tube.

NOTE: On cars equipped with the direction indicator, it is necessary to drive the bearing into the jacket tube 11/32" to compensate for the direction indicator switch case and cover assembly installation, Figure 6.

STEERING GEAR

REMOVAL:

1. Remove the front seat cushion.

2. Remove two bolts (each side) from the front seat frame to track.

3. Remove two screws from the front seat adjusting lever.

4. Move the seat forward and unhook the two retracting springs from seat frame.

5. Move seat frame back to allow room for removing steering column tube assembly.

6. Raise hood and disconnect horn wire at horn relay.

7. Remove the four screws from horn ring assembly and remove the assembly and horn wire.

8. Loosen the steering wheel nut.

9. Use steering wheel puller .1-739-B and pull steering wheel, Figure 3.

10. Remove accelerator pedal.

11. Remove heater wire from control arm and remove heater drain tube.

12. Remove lead wire from heater to ignition switch.

13. Remove the four attaching screws from weather control motor and fan unit and remove the weather control blower unit.

14. Remove the floor mat.

15. Remove the brake pedal using tool J-2795, Figure 7, by removing the nut from the pedal rod and attaching the adapter to the pedal rod. Lock the adapter and pedal arm together with the puller body, back off adapter removing pedal rod from pedal arm.

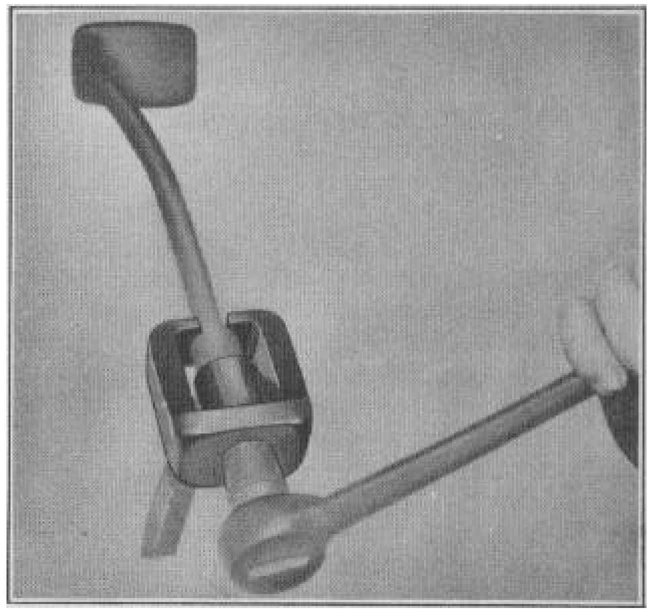

FIGURE 7

16. Remove the steering gear jacket tube hole cover.

17. Remove the transmission opening cover.

18. Remove chrome escutcheon plates from steering column at instrument switch panel.

19. Remove two bolts from the steering column bracket at instrument panel.

20. Remove remote control shifter lever cable and hair pin clip at lower end of remote control tube; remove remote control cable support bolt and disconnect cable.

21. Remove the screw attaching the drag link dust cover at pitman arm and remove the dust cover.

22. Remove key and plug from draglink at pitman arm connection and disconnect the draglink.

23. Remove shifter level bell crank and cross shaft from steering column and remove rod at transmission.

24. Remove three bolts attaching steering column to frame and remove assembly up and out through the transmission opening cover.

DISASSEMBLY:

1. Place steering gear in a vise and loosen lower jacket tube clamp bolt. Remove jacket tub e with remote control tube and lever attached.

2. Remove pitman arm nut (21) and lockwasher (22) and pitman arm using puller J-1374.

3. Remove sector shaft cover screws (1), cover (5), gasket (2), Figure 8.

4. Remove steering gear sector shaft (7).

NOTE: To prevent damaging oil seal, cover serrations on shaft with wax paper before removing shaft.

5. Remove oil seal (17), if necessary to replace.

NOTE: If sector shaft bushings are in need of replacement, it will be necessary to replace the complete housing.

6. Remove steering gear worm cover bolts (9), cover (10), and shims (11) at base of steering gear. The worm cover includes a grease retainer tube (20) and a grease retainer tube silencer (19).

7. Remove the lower bearing (15), bearing cup ring (13), the worm (12), upper bearing (14), and upper bearing cup (16).

ASSEMBLY:

1. Thoroughly clean inside of steering gear housing as well as steering gear w o r m, sector shaft, and bearings.

CAUTION: DO NOT coat any parts with lubricant until all adjustments have been made and assembly completed.

2. Install steering gear housing upper bearing cup.

3. Install column tube an d worm and upper and lower bearing (14) and (15), install lower bearing cup (13).

4. Install worm cover shims and grease tube and cover (10). Make sure silencer (19) is attached to tube, (Held by four screws).

NOTE: When the cover screws are drawn up tight, there should be no perceptible end play in the column and not more than a three quarter pound pull at the r i m of the steering wheel should be required to turn the column tube.

NOTE: Adding shims under the worm cover increases t he clearance and reduces the amount of pull required to turn the tube.

5. Engage the sector shaft thrust washer (8) in the groove in the sector shaft and install sector cover (5) and gasket (2) as an assembly. Install oil seal (17) on the sector shaft (7) and press into recess in housing bore.

6. Install the four housing cover screws (1).

7. Install the pitman arm on the sector shaft and the steering wheel on the column tube to check the adjustment. Turn the steering wheel to the exact mid position (high point mesh) of travel.

NOTE: The steering gear shift nut (21) should be tightened with a torque wrench to 140 foot pounds.

8. If the pitman arm can be moved more than 1/32 of an inch without the main column tube turning the roller shaft, lock screw nut and lock plate should be taken off and the adjusting screw turned in with a screwdriver until the movement is reduced to 1/32".

9. If more than 2 pounds pull (using Tool J-544) is required at the steering wheel rim to move it from its mid position, the roller shaft adjusting screw (6) should be turned out.

10. After adjustment replace the lock plate (4) and lock nut (3) and recheck the pitman arm and the pull required to turn the wheel from the mid position.

11. Fill the housing with lubricant. See "Lubrication" section.

INSTALLATION:

1. Reinstall steering gear assembly and insert the three attaching bolts through the steering housing to frame (DO NOT tighten bolts at this time).

2. Raise steering column to position at dash and install steering column bracket an d escutcheon plates.

3. Tighten the three bolts attaching steering gear housing to frame.

NOTE: Before drag link is again connected to steering gear ball arm, swing front wheels throughout their turning radius to determine if any tight spots exist. With wheels on roller plate and drag link disconnected, maximum pull on wheels should be 28 lbs. Pull load is measured with spring scale hooked over tread of tire.

4. Connect drag ink to pitman arm and install plug and cotter key in drag link.

5. Install drag link dust cover.

6. Install shifter bellcrank and bellcrank linkage at steering gear housing.

7. Attach remote control cable at lower end of remote control tube. Install bolt and attach hair pin clip. (Adjust for proper shift).

8. Install the transmission opening cover and insert the attaching cap screws.

9. In stall steering hole floor plate rubber cover and metal attaching plates.

NOTE: Transmission opening cover must be resealed after removal to insure against road splash and dust leaks.

10. Install brake pedal, washer, and rubber grommet on brake pedal rod and install brake pedal rod and tighten nut to 30 foot pounds.

11. Install the floor mat.

12. Install the accelerator pedal and secure cotter pin.

13. Install the weather control blower unit and insert two metal screws each side.

14. Connect the Bowden wire to the heater control lever and install the heater drain tube.

15. Install steering wheel.

NOTE: The steering wheel can be turned to bring the steering gear mesh to its high point, where it should be set to insure easy handling. A small notch will be found o n the steering gear main column tube. When the wheels are in the straight ahead driving position the notch should be pointing down.

16. Install steering wheel nut and tighten to 30 pounds torque.

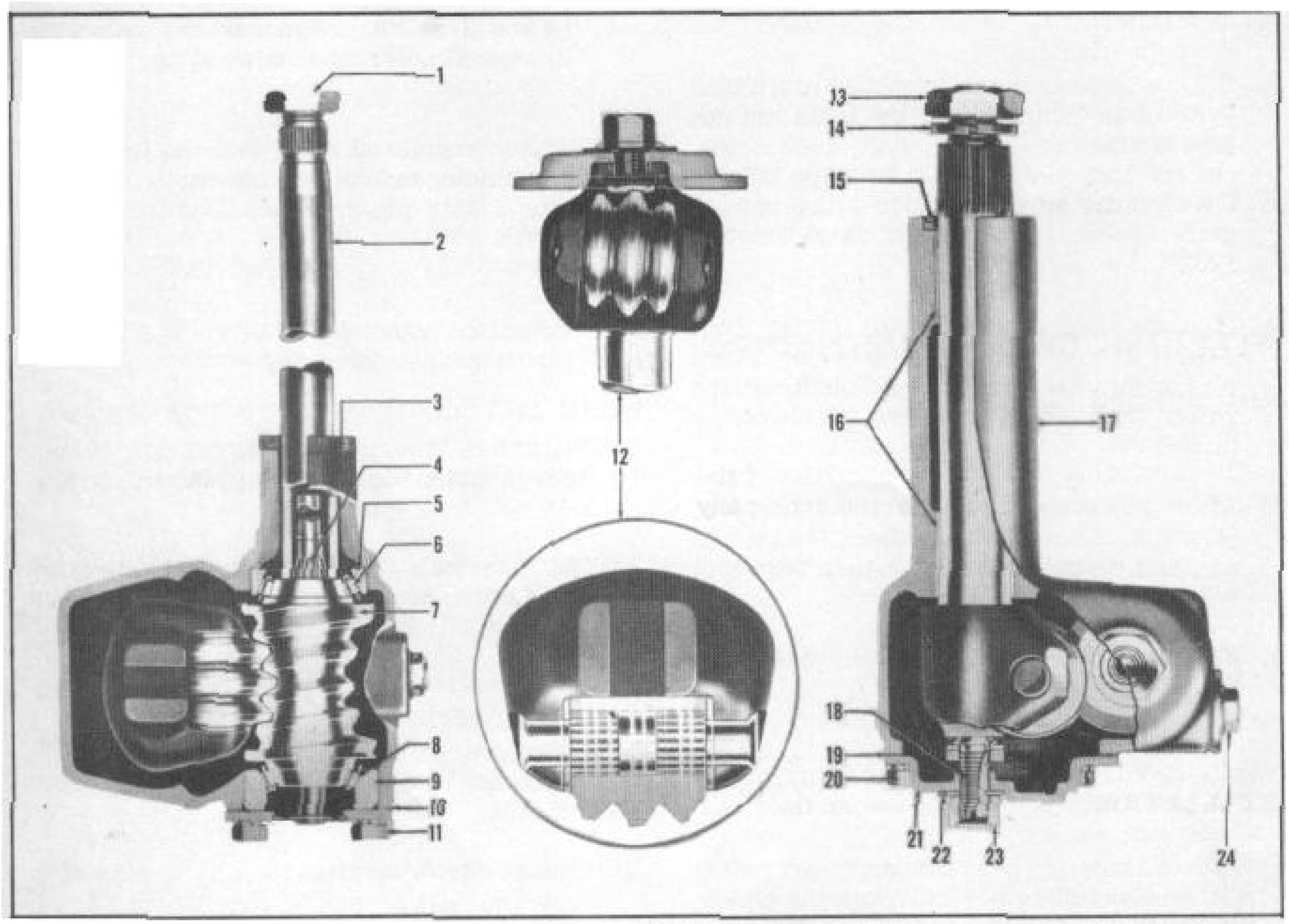

FIGURE 8

1. Steering column nut
2. Column tube
3. Grease retainer tube & cover
4. Grease retainer tube silencer
5. Worm bearing ring-adjustment (upper)
6. Worm bearing assembly (upper)
7. Worm assembly
8. Worm bearing assembly (lower)
9. Worm bearing ring adjustment (lower)
10. Worm housing cover shims
11. Worm housing cover belts
12. Three tooth roller assembly.
13. Pitman arm nut
14. Pitman arm nut lockwasher
15. Sector shaft oil seal
16. Sector shaft bushings (two)
17. Sector shaft, worm & roller housing
18. Sector shaft adjusting screw
19. Sector shaft cover gasket
20. Sector shaft housing cover bolts
21. Sector shaft housing cover
22. Sector shaft adjustment screw lock plate
23. Sector shaft adjustment screw lock nut
24. Grease filler plug

17. Install horn wire through steering column from horn button to horn relay.

18. Install horn ring and ornament and install the four attaching screws.

19. Install front seat frame and bolts and attach retracting springs.

20. Install front seat cushion.

STEERING GEAR ADJUSTMENTS

WORM BEARING INSPECTION

It is advisable to check the condition of the worm bearings as follows before starting any adjustment.

1. Raise up the front end of the car.

2. Turn the steering wheel about one turn to the right from a straight ahead driving position.

3. Hold the wheel in this position firmly. This is to prevent any oscillation when the front wheels are shaken violently.

4. Grip the steering column with the other hand just below the steering wheel hub with the side of the finger barely touching the lower end of the steering wheel hub.

5. Have a helper shake the front wheels hard sidewise. Any end play in the worm bearings can be felt at the wheel hub.

If any end play exists, the worm bearings need adjusting.

NOTE: Make certain the end play is plainly felt and do not become confused with play or give in the jacket bushing.

WORM BEARING ADJUSTMENT

1. Remove the drag link at the steering gear ball arm.

2. Loosen the four worm cover bolts (9) Figure 8 about 1/8"

3. Use a knife blade to separate the top shims and remove only one shim at a time between inspections.

NOTE: Be careful and do not remove too many shims or binding action will result.

4. Revolve steering wheel back and forth to determine if proper adjustment has been attained.

WORM AND SECTOR SHAFT ADJUSTMENT

1. Remove the roller shaft adjustment screw lock nut (3), Figure 8.

2. Slide the lock plate (4) far enough off t o clear the lock boss o n the sector shaft cover (5).

3. Place steering wheel in the straight ahead driving position.

4. Disconnect draglink at steering gear ball arm.

5. Tighten sector shaft adjusting screw (6), Figure 8, just enough to remove excessive play between the roller shaft roller tooth and the worm.

NOTE: When tightened beyond the point of taking up lash, serious results will occur that are detrimental to continued good steering gear results.

6. Check this by determining the amount of play felt at the end of the ball arm.

7. Slide the lock plate (4) in position against the roller shaft cover in its locked position.

8. Replace the roller shaft adjustment screw lock nut (3) and tighten.

STEERING GEAR ALIGNMENT

Loosen the frame bracket bolts enough to allow the steering gear to shift in the frame so as t o line up at an angle determined by the height setting of the steering gear bracket at the instrument pane 1. Retighten the frame bracket bolts.

Loosen the instrument panel steering gear bracket and allow it to shift to match the steering gear column position. Retighten the steering gear bracket.

PITMAN ARM

REMOVAL: (STEERING GEAR IN CAR)

1. Remove cotter key and slotted head plug from rear end of draglink assembly attaching pitman arm.

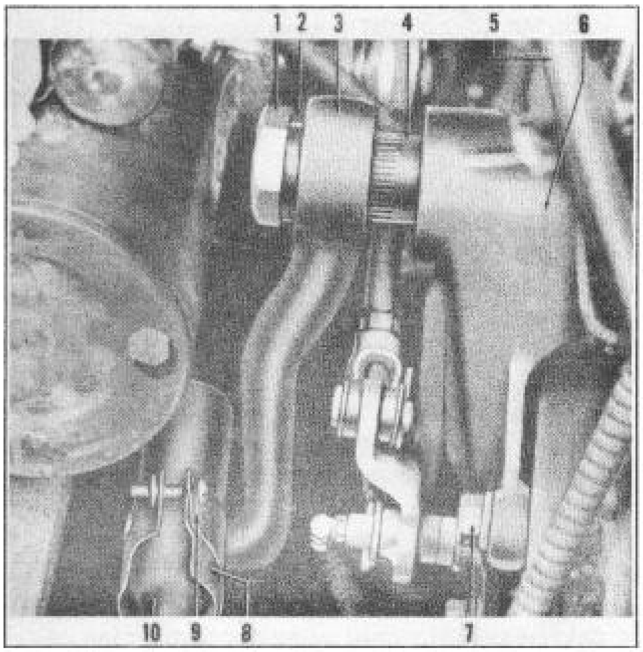

FIGURE 9

2. Disconnect battery cable at battery terminal and at starting motor solenoid.

3. Remove starting motor attaching bolts and remove starting motor assembly.

4. Remove nut (1) lockwasher (2) from sector shaft (4), Figure 9.

5. Install puller jaws of arm Puller J-1374 on inner shoulder of pitman arm (3), Figure 9, and turn puller screw tight against sector shaft removing pitman arm, Figure 10.

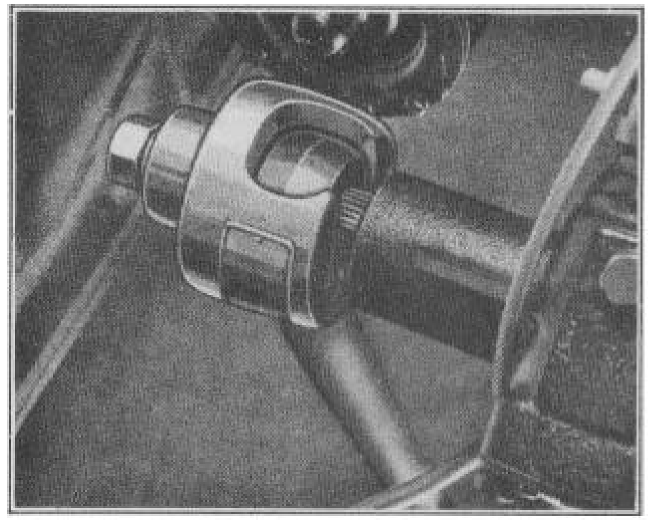

FIGURE 10

NOTE: DO NOT remove arm by driving or prying as damage will result.

6. Remove draglink dust cover bolt (9) an d remove covers (8), Figure 9.

7. Remove cotter pin rear plug, spring, shim part and ball seat, and remove pitman arm ball from draglink.

NOTE: Be careful to note the position of pitman arm on sector shaft and location of springs in relation to ball seats and shims before removing pitman arm.

To install, reverse procedure of removal and check "Steering Gear and Front Wheels" in straight ahead position.

STEERING GEAR SECTOR SHAFT

REMOVAL:

The sector shaft may be removed without removing the steering gear b y the following procedure:

1. Raise front end of car.

2. Remove left front wheel.

3. Remove t he fender dust shield extension (4-1/4-28 bolts).

4. Disconnect starter motor cable at battery and starter.

5. Remove starter motor.

6. Remove pitman arm nut and washer and with puller tool J-1374, remove pitman arm, Figure 10.

7. Remove sector shaft cover, adjusting screw and gasket.

8. Remove sector shaft.

To install, reverse procedure of removal and follow Instructions set forth in "Pitman Arm Removal".

STEERING GEAR JACKET TUBE

REMOVAL:

1. Remove horn wire from horn relay. Loosen lower clamp on jacket tube.

2. Loosen lower clamp on remote control tube.

3. Remove four screws attaching horn ring assembly and remove the assembly.

4. Remove the steering wheel nut and remove steering wheel.

5. Remove remote control upper bracket support.

6. Remove the steering column bracket at instrument panel.

7. Remove the remote control upper bracket support.

8. Remove jacket tube bearing spacer and remove jacket tube.

To Install, Reverse procedure o f removal. Refer to "Remote Control and Gear Shift Lever Removal" for necessary adjustments.

DRAG LINK

The drag link on all models is of the same construction at the front and rear ends. The rear e n d has a shim adjustment for setting wheels in the straight ahead position.

DRAG LINK ADJUSTMENT OR STEERING GEAR HIGH POINT

1. Remove drag link dust cover and bolt and nut and remove covers.

2. Remove cotter pin and rear plug (3), Figure 10.

3. Remove spring (D), shim pack (A), ball seat (C), and remove Pitman arm ball from drag link.

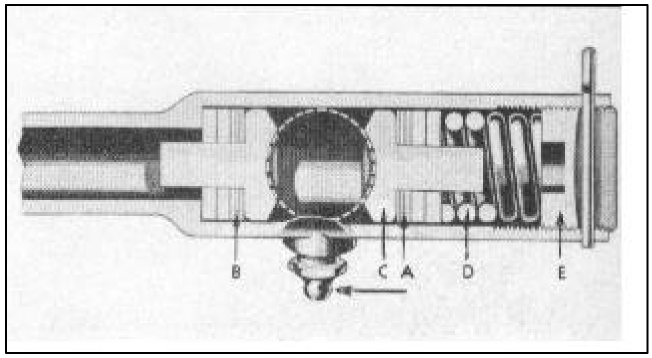

FIGURE 11

4. If center line of steering wheel spokes (See "Setting Front Wheels i n Straight Ahead Position") is more than 2" from horizontal (measured on the rim of steering wheel), interchange shims between shim packs A and B until horizontal has been attained.

5. Plug should be flush with end of drag link and cotter pin inserted and bent over.

NOTE: Tool J-2953 as shown under "Front Suspension", will hold the center steering arm in position for the "Steering Gear High Point Adjustment".

DRAG LINK REMOVAL

1. Remove drag link dust cover bolt (9) and nut and remove the dust covers (8).

2. Disconnect drag link at pitman arm by removing cotter pin and rear plug, spring, washer and ball seat.

3. Pull drag link back and remove cotter key at front ball and socket joint.

14. Lift drag link and move it forward so as to enable the removal of the drag link adjusting plug and ball seat through the hole in the frame front cross member.

NOTE: To install, reverse procedure of removal.

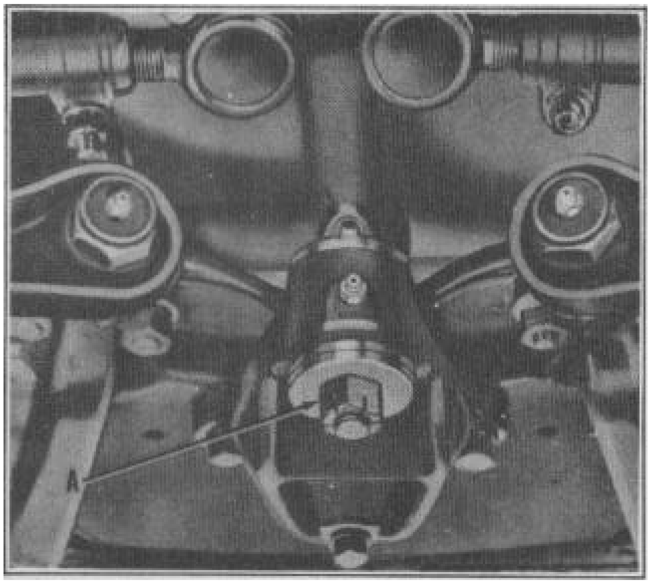

FIGURE 12

CENTER STEERING ARM PIVOT BOLT LOCK NUT

NOTE: 'Whenever necessary to remove t he center steering arm, replace the center steering arm pivot bolt Marsden Type lock nut with the new type elastic stop nut (171262) released for use as an aid in freeing up the steering assembly.

With the newer type nut a lower torque is required which prevents distortion of the pivot spacer.

TROUBLE SHOOTING

HARD STEERING

Excessive caster
Excessive, positive or negative camber
Bent, worn king pin
Spring spindle
Broken frame
Sagging, broken spring
Weak rear springs
Low tire pressure
Binding steering assembly
Insufficient lubrication

LOOSE STEERING

Worn steering linkage
Weak springs in drag link
Worn king pins, bushings
Improper steering adjustment
Worn tie rod ends
Worn sector shaft bushing

WANDER OR WEAVE

Insufficient caster
Incorrect toe-in adjustment
Worn king pins, bushings
Worn front wheel bearings
Tight steering assembly
Loose spring shackles
Sagging, broken springs
Bent, broken frame
Loose U-bolts
Overloading
Unequal tire pressure
Unequal tire wear

SHIMMY

Too much caster
Loose king pins
Loose drag link arm
Loose steering gear
Low tire pressure
Unequal inflation
Loose wheel bearings
Misaligned drag link
Sagging or broken springs
Worn tie rod ends

ROAD SHOCK

Unequal caster
Excessive caster
Weak coil springs
Bent steering arm (right or left)
Bent drag link
Defective shock absorbers

SIDE PULL

Unequal caster
Bent steering arm
Bent, broken frame
Tight king pins
Weak rear springs
Uneven tire inflation
Oil-soaked brake lining
Sagging front springs

SECTION 15

SPRINGS, SHOCK ABSORBERS AND STABILIZERS

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REFERENCE

Source of Information	Date	Subject

SPECIFICATIONS

SPRINGS

Front	
Type	Coil
Light Scale	All Models
Load at Passenger Height	2080
Rate	386
Height at Passenger Load	9-9/16"
Free Height	15-1/16"
Heavy Scale	Optional All Models
Load at Passenger Height	2080
Rate	450
Height at Passenger Load	9-/16"
Free Height	14-5/16"

Identification of the coil springs may be determined by part numbers stamped on top coil.

Rear	
Type	Semi-Elliptic
Light Scale	All Models
Load Weight	875
Rate	120
Length and Width.	54" - 1-3/4"
Number of Leaves Including Rebound Leaf	8
Heavy Scale	Optional
Load Weight	975
Rate	140
Length and Width	54" - 1-3/4"
Number of Leaves Including Rebound Leaf	8
Covers	Metal
Shackles	Silent "U" Threaded
Spring Eye Dimension	870
Spring Load Markings and Part Number Head of Center Bolt	

SHOCK ABSORBERS

Part Number	Mfr	Code	Compressed Length	Extended Length
Front - Light Scale				
300350	Monroe	1-8-10-(4)-10-10-H1	7-3/4"	12"
301240	Delco	22-1-10-(4)-10-10	7-3/4"	12"
Front - Heavy Scale				
301767	Monroe	0-10-10-10-(4)-10-		
301769		10-10-J-5		
Front - Extra Heavy Scale	Delco	0-10-10-(4)-10-10-H1		
301637	Delco	934-E-106/D-2	7-13/16	11-15/16"

Usage - (Front)

Light Scale--Part numbers 300350 Monroe and 301240 Delco use on models 481P-482-483-484. Less Heavy scale springs - Front and Rear 481CM. Less heavy scale front springs.

Heavy Scale--Part numbers 301767 Monroe and 301760 Delco used on models 481CM, Except Station Wagon with Heavy Scale Front Springs. 481P-482-483-484 with Heavy Scale Springs Front and Rear.

Extra Heavy Scale--Part numbers 301637 Delco Optional Model 481CM, Except Station Wagon Optional. 481CM Station Wagon.

SHOCK ABSORBERS

Part Number	Mfr	Code	Compressed Length	Extended Length
Rear - Light Scale				
300351	Monroe	4-10-10-(4)-10-10-C2	13-13/16"	21-15/16"
301241	Delco		13-13/16"	21-15/16"
Rear - Heavy Scale				
301768	Monroe	2-10-10-10-(4)-10-10-10-C2		
301770	Delco	2-10-10-10-(4)-10-10-10-C2		
Rear - Extra Heavy Scale				
301638	Delco	941Y-2B6-J1	13-11/32"	21-13/16"

Usage (Rear)

Light Scale--part numbers 300351 Monroe and 301241 Delco used on Models 481-P-482-483-484 Less Heavy Scale Springs -- Front and Rear, and Rear Only.
Heavy Scale --Part numbers 301768 Monroe and 301770 Delco 481 CM Station Wagon, 481-P-482483-484 With Heavy Scale Springs - Front and Rear and Rear Only.
Extra Heavy Scale--Part numbers 301638 Delco optional Model 481 CM Station Wagon. Optional 481P-482-483-484

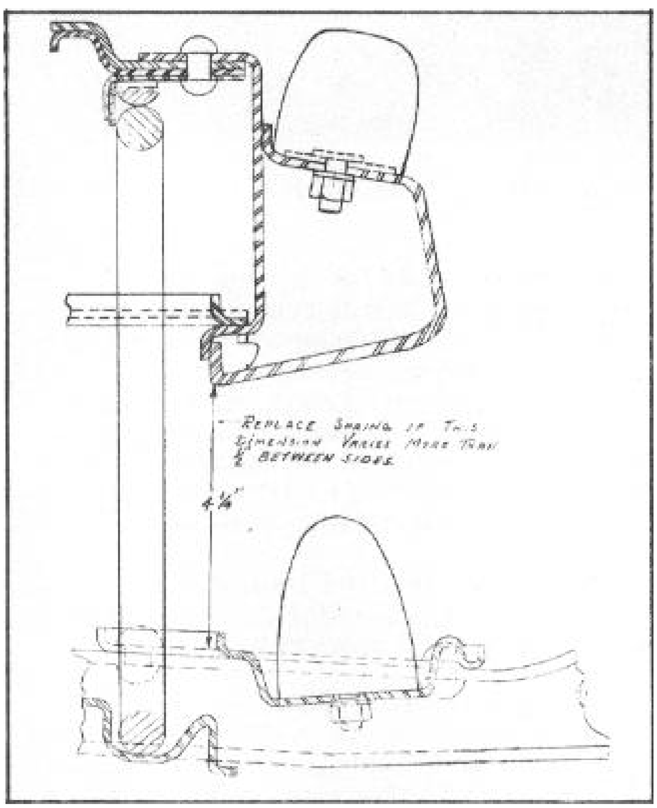

FIGURE 1

RIDING HEIGHT AND COIL SPRING SAG

When the car does not seem to be level and a check of the coil spring height is desired, place the car so that the front end is level crosswise and then rock the car sidewise several times and allow the car to settle. This will remove any binding that might cause a dimensional difference.

Measure the distance from the top of the lower support arm rubber bumper seat to the bottom of the upper rebound bracket, which should be 4-1/4" each side, Figure 1.

If the two measurements vary more than 1/2" between sides, it is advisable to replace one or both coil springs.

The light and heavy coil springs may be identified by the part number stamped on the top coil of spring.

FRONT COIL SPRINGS

REMOVAL:

1. Raise the car and place stand jacks under inner ends of the lower support arms.

2. Remove wheel.

3. Remove shock absorber upper stud nut and palnut.

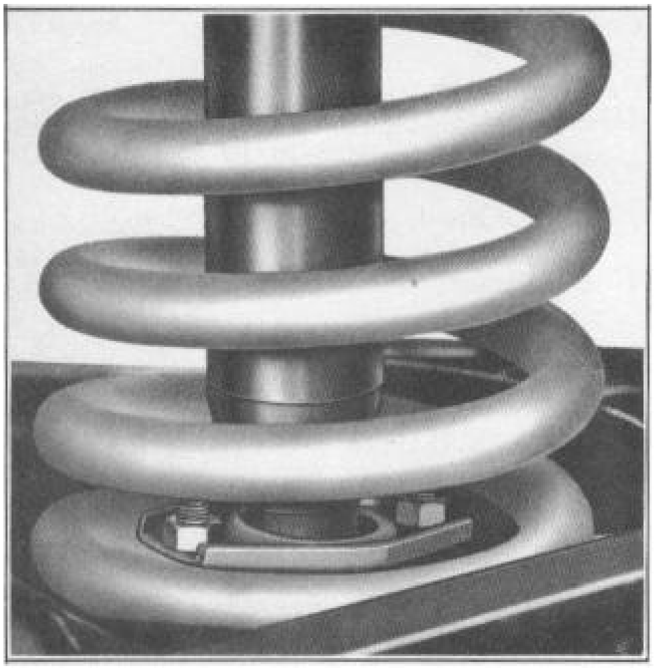

FIGURE 2

4. Remove shock absorbers lower mounting nuts and washers. Turn shock absorber 1/4 turn and remove through opening.

5. Remove lower support arm pivot to frame bolts, nuts, and lockwashers.

6. Raise car, allowing coil spring to expand and remove the spring.

CAUTION: The coil spring is under great pressure and cars should be exercised when removing these springs.

INSTALLATION:

1. Install coil spring.

NOTE: Flat end of spring must be at top. Bottom must rest in lower support arm spring seat. Be sure silencer is in upper spring seat.

2. Lower the car, which will compress spring and position lower support arm pivot t o frame crossmember.

3. Install lower support arm pivot attaching bolts and tighten securely.

4. Install shock absorber.

REAR SPRINGS

Rear springs are long leaf, semi-elliptical design. The front ends are attached to frame brackets with pivot bolts cushioned in rubber. This eliminates noise and allows for increased riding comfort through reduction of torque and brake reaction shock. (No lubrication is required at this point).

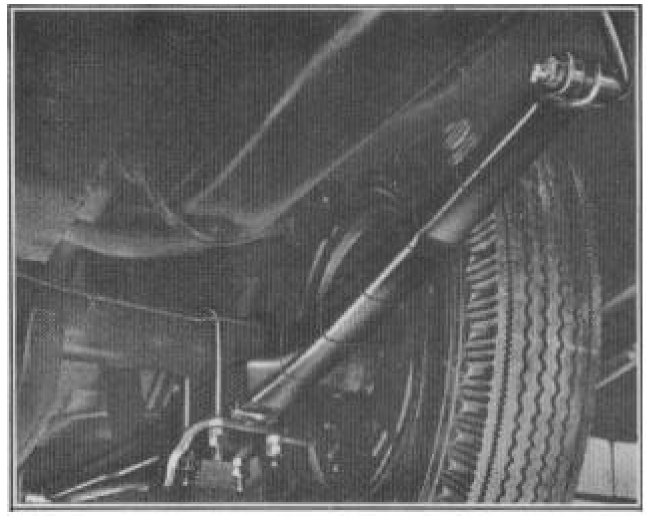

FIGURE 3

The rear ends of the springs are attached to the body frame rails through threaded, self-adjusting "U" type shackles operating in hardened steel, threaded bushings. The bushing threads are protected from road splash and dirt by rubber sleeve seals retained in position by the shoulders of the shackles. These seats are installed on the "U" shackle before inserting the shackles in the bushings.

Rubber cushions and retainers are used between the spring mounting pad and spring to reduce road noise to a minimum.

The rear springs of passenger models are fitted with metal covers, which prevent road dirt from getting between the spring leaves and avoid the necessity of adding lubricant for several thousand miles.

REMOVAL:

1. Jack up the rear axle on a roller jack and place stand jacks under the chassis frame side rails.

2. With jack pressure under axle housing, disconnect lower end of shock absorbers.

3. Remove brake cable to spring retaining clip.

4. Remove the rear spring shackle bushing at rear spring eye and shackle.

5. Remove rear spring front bolt, nut, and bushing.

6. Remove rear spring to axle clip nuts, washers, clip plates, and clips.

7. Remove spring from car.

DISASSEMBLY:

REAR SPRING COVERS

REMOVAL:

The steel spring covers are in two sections (front and rear) and felt strips are used at each end to seal the spring against water and dirt and to retain the lubricant.

When necessary to replace a spring it is possible to remove and reinstall the old covers. Use care in removing the cover. Do not destroy the locking seams.

To remove covers, proceed as follows:

1. Place the spring in a loading fixture and jack up against middle until spring is on a horizontal plane.

NOTE: A spring loading fixture can be made with a piece of heavy channel iron, as a base, having pivoted arms on each end. Drill 6/16 inch holes in upper ends of arms. Use loose 1/2 inch rods or bolts to slide through these holes and eyes of spring.

Bolt fixture to a bench and place a jack between spring an d the base of fixture. Then raise jack until main leaf of spring is straight. A socket which fits top of jack and bottom end of spring center bolt will prevent jack slipping off spring.

2. Open the locking seam using a 60° flat nose chisel and light hammer.

3. Use a screwdriver and pry the locking edge of cover (top) up off the lower edge and remove cover.

4. Remove the spring from loading fixture and clamp the spring in a vise so that the spring leaf center bolt is outside of the jaws of the vise.

5. Unscrew the shackle threaded bushing.

6. Remove the two leaf clip bolt nuts and spacers at the outer ends and cut the two inner clips off. Remove the center bolt and nut.

7. Open the vise and disassemble the spring.

REAR SPRING

ASSEMBLING:

The leaves should be lubricated with viscous chassis lubricant and assembled in their proper order with a piece of 5/16" rod passing through the center bolt hole of each leaf.

1. Clamp the loose assembly in a vise and draw the leaves together, keeping them in alignment as the vise is tightened.

The bracket for holding the brake cable clip is assembled under the second from front leaf clip.

2. Use two new box type leaf clips, bolts, nuts, and spacers.

3. Insert the center bolt and tighten the nut. Use the original leaf clips that are riveted to the bottom spring leaf at outer ends.

4. Install the spacers, bolts, and nuts.

REAR SPRING COVER

INSTALLATION:

1. Place spring in loading fixture.

2. Install cover assembly in place and close locking seam.

NOTE: Use "C" clamps to hold cover in place during locking operation and reform locking edge at cover to approximately a 600 angle with pliers wherever necessary to facilitate final locking.

3. Hammer down the locking edge carefully, work from the center bolt hole and flatten toward each end.

NOTE: Use a slightly curved steel plate between hammer and cover to prevent denting.

REAR SPRING

INSTALLATION:

1. Place rear spring in position on the rear axle mounting pad.

2. Insert one end of the rear spring shackle through the main leaf eye after placing the rubber dust seals in place on the shackle and start the threaded bushing on shackle. (DO NOT TIGHTEN).

3. Install the front end of the spring with rubber bushings in place and attach spring bolt with the spring bolt rubber bushing on the bolt.

4. When proper alignment is obtained, attach nut and tighten.

NOTE: When tightening the mounting bolt, the rear spring should be mounted so that there is no unnatural twist set up in the rubber bushings. Squeaks at rear spring front mounting bolts can be corrected by loosening nuts on rear spring front bolts and loading car with two or more passengers before pulling nuts up tight. N o lubrication is required.

5. Install spring pads, mounting clips, nuts, and washers, and tighten nuts to 55-75 lbs. torque.

NOTE: It is important that spring clips be inspected at regular intervals and kept tight to insure against spring breakage. Tighten spring clip nuts to 55-75 lbs. torque.

6. Finish tightening the rear shackle nut.

It is important that the shackle be located properly so as to insure the bushing being threaded far enough on the shackle but not far enough to bottom the thread in the bushing as the shackle moves in its normal operation. Bottoming will cause a hard ride and shackle breakage.

NOTE: Spring shackles should be inspected periodically to make sure that they are tight but not binding.

7. Install brake cable retaining clip on top of spring.

8. Attach lower end of shock absorbers to spring mounting pads.

9. Lubricate the spring shackles.

10. Lower car and remove jacks.

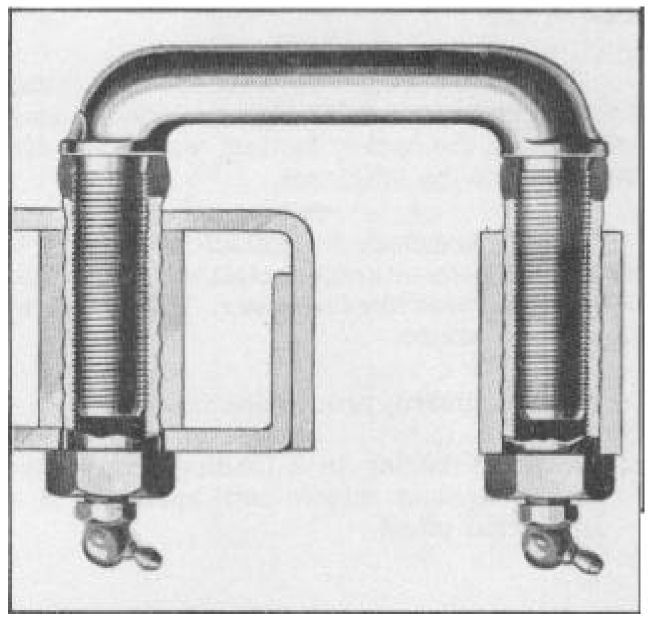

FIGURE 4

REAR SPRING SHACKLE IDENTIFICATION

The right hand rear spring shackle has right hand threads on both upper and lower ends and the left hand rear spring shackle has right hand threads on the upper and left hand threads on the lower end.

The lower left hand shackle bushing is left hand thread and has an identification groove 1/16" wide on the head.

NOTE: The shackle having the left hand thread has a single forging mark at the shoulder.

If the zerk fitting is removed and replaced for any reason it must not be turned into the tapped hole so tightly as to cause the zerk fitting to bottom on the end of the shackle and thus loosen the plug that is in the end of the shackle bushing.

LUBRICATION:

The frequency of lubrication depends upon driving conditions and mileage. Lubrication will usually be required more frequently in hot climates than in cold climates.

Necessity of lubrication will be evidenced by stiff riding and squeaks.

Use only viscous chassis lubricant at fittings and at covers.

Spring covers have a 3/16" hole on the underside through which the lubricant can be forced without removing springs or spring covers.

NOTE: Always take the weight of the car off the springs while lubricating. This action will tend to separate the leaves allowing the lubricant to flow between them.

SHOCK ABSORBERS

Direct double acting hydraulic type shock absorbers are used at the front and rear. The front shock absorbers are mounted axially within the front coil springs and are cushioned at the upper and lower ends in rubber grommets.

The rear units are identical in construction to the front units, except that eyes are fitted at the upper and lower ends instead of studs and are also cushioned in rubber. At the upper end they are attached to the frame cross member, while at the lower end they are assembled to the rear spring clip plates.

Both the front and rear shock absorbers are non-serviceable and are not interchangeable to either front or rear position.

Resistance calibration is different in front and rear shock absorbers and is properly set at the factory.

The principles of operation are the same in the present shock absorbers as previously used shocks. The fluid permits satisfactory operation at temperatures a s low as-40° F. The units are permanently sealed with improved synthetic rubber seals designed to keep the fluid in and the dirt out. Double acting resistance is employed with the proper combination of orifice and blow-off control to give a finely balanced ride without further adjustment. Defective units must be replaced.

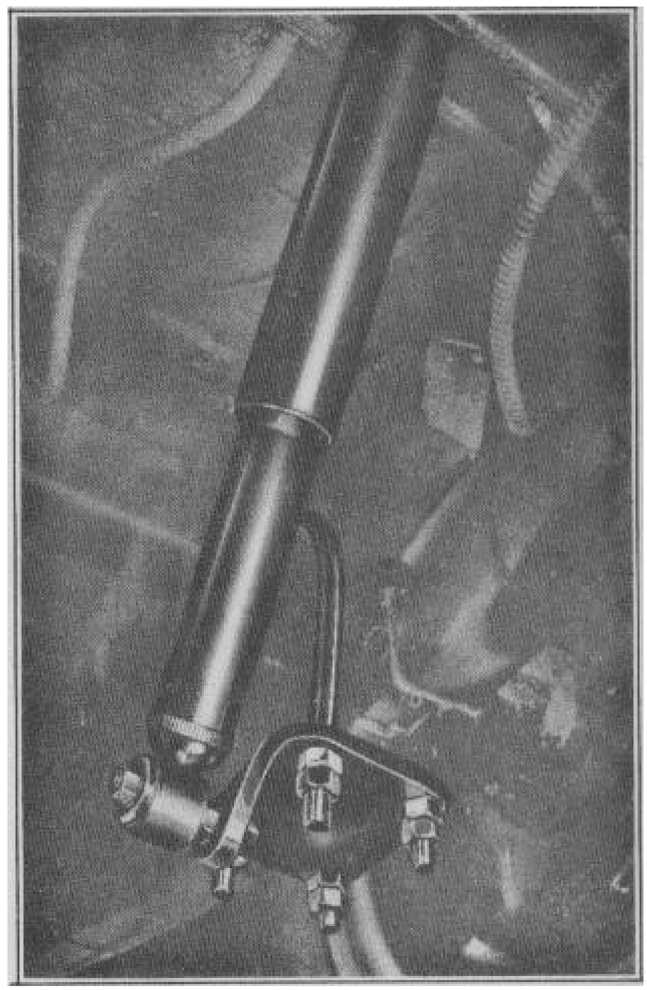

FIGURE 5

Shock absorbers are available in either standard control or heavy duty control (optional) on all models of passenger cars.

The extra heavy duty control is available for commercial use, station wagons, or as an additional option on passenger car models.

Refer to the specifications which head up this section for models and control desired.

NOTE: All shock absorbers have the part number and code stamped on the outside of the shock absorber body.

SHOCK ABSORBER NOISE

When checking for noise, first determine that the noise is coming from shock absorbers and not from other sources.

Check the front shock absorber top nut with its palnut and that rubber bushings are tight and in good condition, also that the cap screws and nuts at the bottom of the front shocks are tight.

Noise that may develop in the rubber grommets can be eliminated by replacing the grommets, and if the fit is tight, use a small quantity of liquid soap at assembling.

FRONT SHOCK ABSORBER

REMOVAL:

1. Jack up car and remove wheel.

2. Remove nut, palnut, and rubber bushing at the top of the shock absorber.

NOTE: Use an offset screw driver to prevent the stem from turning and a 9/16" open end wrench to remove the nut.

3. Remove the two cap screws holding the shock absorber lower support plate to the lower support arm.

4. Turn the shock absorber a quarter turn and remove.

NOTE: To install, reverse procedure of removal. Check condition of grommets.

REAR SHOCK ABSORBER

REMOVAL:

1. Remove lower stud nut and washer at rear spring clip plate.

2. Remove upper mounting bolt, nut and flat washers.

3. Remove shock absorber.

NOTE: To install reserve procedure of removal.

Shock absorber inspection procedure is as follows:

1. Remove units from car.

2. Check condition of grommets and replace if worn.

3. Mount shock absorber in a vise being careful that the larger tube is at the upper end. Move up and down by hand. After six or eight strokes, the unit should be primed. A noticeable lag or lack of resistance is an indication of a faulty unit which should be replaced.

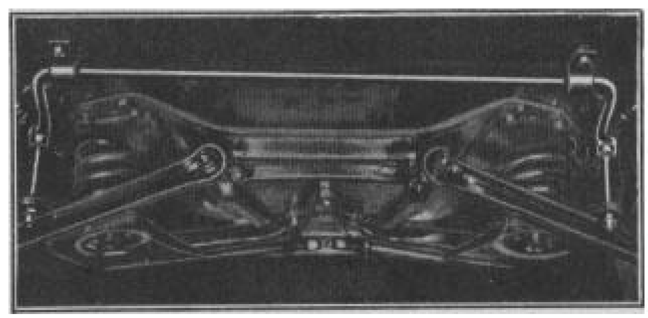

FIGURE 6

FRONT LATERAL STABILIZER

Stabilizer control is by a specially designed bar which is attached to the frame side members. The ends of the bar are directed toward the rear to form lever arms.

The lever arms are attached to the stabilizer bar connectors which in turn are attached to the lower support arm.

The stabilizer is mounted in rubber bushings, and requires no lubrication.

REMOVAL:

1. Remove nuts and lockwashers from bottom of stabilizer connectors.
2. Remove two bolts from brackets to frame (each side) and remove stabilizer.

NOTE: To install, reverse procedure of removal and make sure the stabilizer bar is properly centralized.

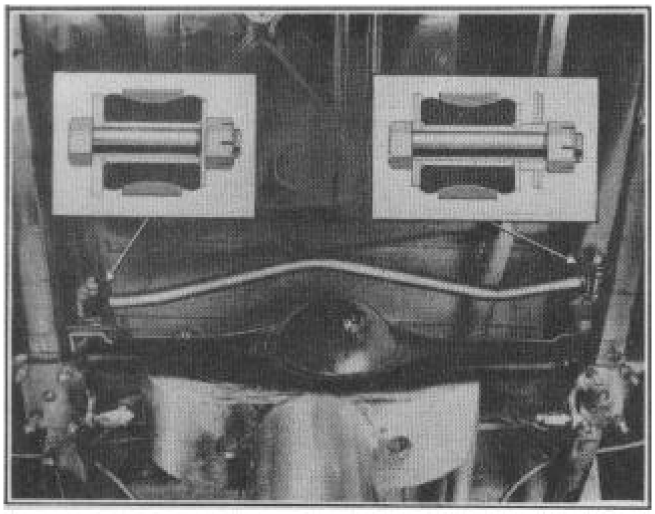

FIGURE 7

REAR LATERAL STABILIZER

A rear lateral stabilizer is used as standard equipment. One end of this devise is assembled to the frame side member and the other end to the rear axle housing. Its purpose is to control the horizontal movement of the body and car. It also prevents lateral shake of the axle under the car on rough roads.

The ends of the steel bar are cushioned in rubber and no lubrication should be applied to these points.

REMOVAL:

NOTE: Rear axle stabilizing bar removal is started at the rear axle end of the stabilizing bar.

1. Remove the palnut and hex nut, Figure 7, the rubber cushion, and washer.
2. Loosen the inside nut and back off on the threads of the bolt.
3. Push the cushion and washer up on the stabilizer bar and remove cushion spacer.
4. At the frame end remove the palnut and the hex nut.
5. Remove the cushion, the washer, and the spacer.
6. Push the stabilizing bar toward the stabilizer bracket and remove the end of the bar from the frame.

NOTE: Do not lose or destroy the rubber grommet in the frame for the stabilizer bar guide rod (welded to the bar).

7. Pull the bar toward the frame stabilizer bracket and out of the stabilizer bracket.

INSTALLATION:

NOTE: Rear Axle Stabilizing Bar Installation is started at the frame end.

1. Have the inside nut at axle and well up on the bar and the cushions and washers in place at both ends.

2. Push the bar through axle bracket and then put frame en d in place with cushion and washer and locating guide rod in the rubber grommet in the frame.

3. Place the outside cushion, spacer, and washer on the frame end of the bar and install the hex nut.

4. Tighten the nut and install the palnut.

5. Spin companion or palnut with smooth face first onto bolt until it touches the nut.

6. Then tighten the nut not over one quarter to one third more in order to lock it. The shoulder on the bar rests against the cushion spacer and frame and allows the bar to pass through frame far enough to install nuts and tighten them in place. This locates the bar in position.

7. Place the outside cushion, washer and spacer on the axle end of the bar and install the outer nut. (The nut tightens the spacer against a shoulder on the bar).

8. Screw the inside locking nut and rubber cushion down on the threads and against the axle bracket.

Reference		
Source of Information	**Date**	**Subject**

SECTION 17
BRAKES
— INDEX—

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REFERENCE

Source of Information	Date	Subject

SPECIFICATIONS

Type	4 Wheel Bendix Hydraulic
Drum Diameter	11"
Material	Centrifuse
Lining Type	Moulded
Width	Front 2-1/4"
Width	Rear 1-3/4"
Length per wheel	20.87"
Length primary shoe	Front 11"
Length primary shoe	Rear 11"
Length Secondary Shoe	Front 11"
Length Secondary Shoe	Rear 11-1/16"
Braking Area	Total 158.7 square inches
Adjustments	
Anchor pin	Radially
Front & Rear Shoe	Screw
Clearance	
Both ends of shoe	.010"
Mechanical follow-up	1-1/4"
Pedal to floor board clearance (free play)	1/4"

HYDRAULIC BRAKES

Brake equipment on all models is of the four wheel "Bendix Hydraulic" consisting of a master cylinder operated by an adjustable link from the brake pedal, four double piston wheel cylinders mounted on the brake backing plates and all connecting tubing. All models use the single anchor, two shoe Duo Servo action brake.

MECHANICAL BRAKES

Mechanical brakes on rear wheels only. Should the hydraulic system become inoperative for any reason, continued pressure on the foot brake pedal causes the pedal pull rod (1) Figure 1 and link (2) to slide forward on anchor pin (3) pulling play link (4) and brake control lever (5) forward, transmitting mechanical braking power through cables (6) to the rear brake shoes.

To prevent operation of the mechanical brakes during the normal hydraulic operation, also to make certain proper action of the mechanical brakes, a clearance of 1-1/4" must be maintained between body of clevis pin (3) and rear end of slide link (2) as shown in Figure 1.

BRAKES

HAND BRAKE

Hand braking is through a pull type pistol grip, self locking, hand control unit mounted below instrument panel.

The hand brake can be applied much easier, by depressing the brake pedal in the ordinary way and at the same time pulling upward on the hand brake lever. This relieves the load on the hand brake cables, in expanding the shoes against the brake drums and eliminating any possibility of a vacuum being created in the rear wheel cylinders, which might draw air into the hydraulic system past the rubber cups behind the pistons as the shoes are manually expanded.

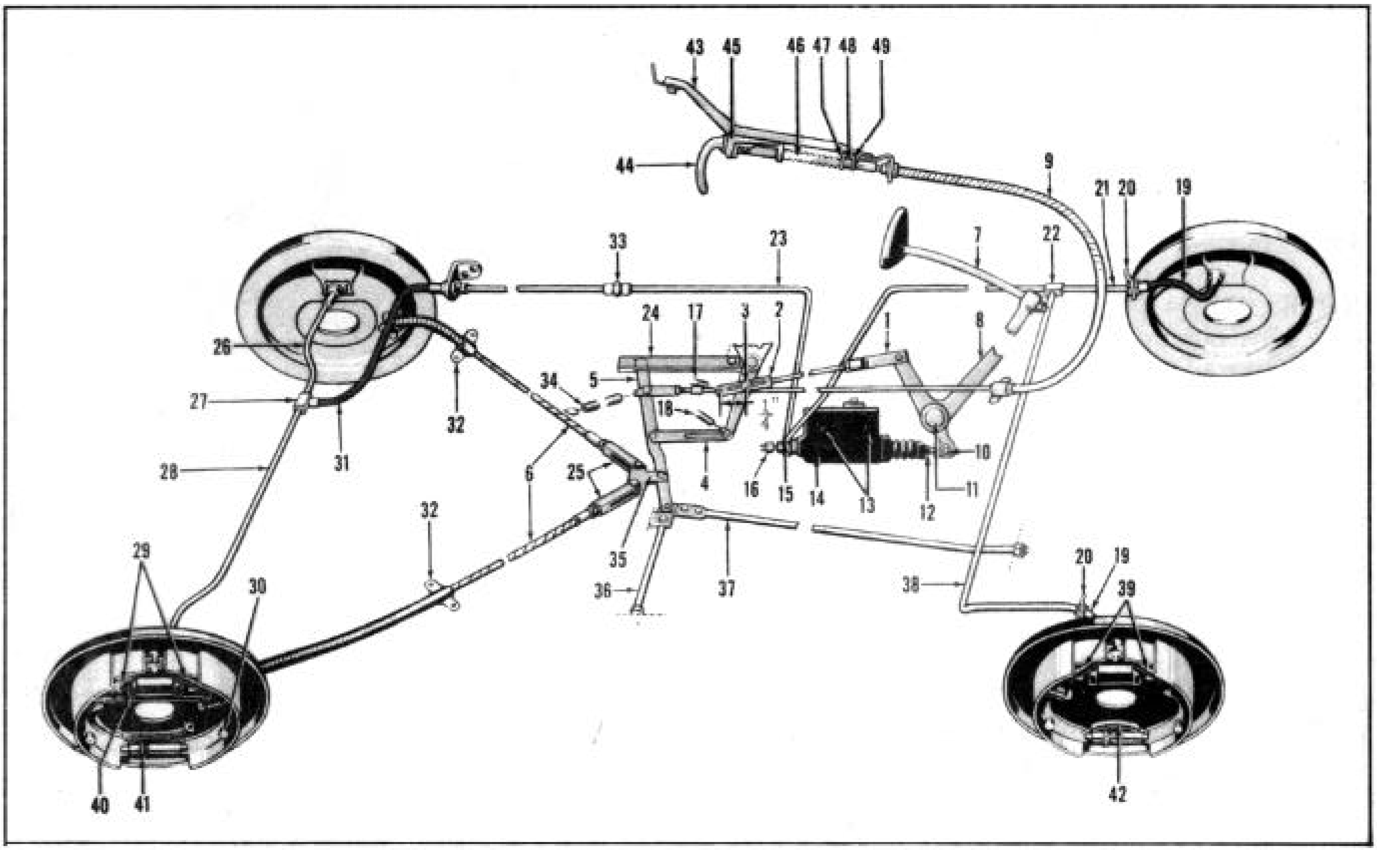
BRAKE MASTER CYLINDER

The brake master cylinder is a combined supply tank and master cylinder. It maintains a constant volume of fluid in the system at all times and regardless of heat or cold conditions causes expansion or contraction. It acts as a pump during bleeding operations.

The piston (13), Figure 2, is returned to a released position much faster than the fluid returns into the master cylinder through the outlet.

A momentary vacuum will exist in the cylinder barrel and additional fluid drawn into the system from the reservoir through drilled holes in the piston (13) and past the lip of the cup (15).

The brake shoe retracting springs exert a pressure on the fluid sufficiently strong to lift valve (18) off its seat and permits fluid from the lines to return to the master cylinder. Excess fluid is returned by port (16) into the reservoir, filling the cylinder for the next brake application.



1. Brake pedal pull rod clevis
2. Brake pull rod slide link
3. Brake pull rod slide link retainer pin
4. Play link assembly
5. Hand brake cable lever
6. Rear brake cable
7. Brake pedal rod assembly
8. Brake pedal lever assembly
9. Hand brake cable assembly
10. Brake pedal to master cylinder push rod clevis
11. Brake pedal lever shaft
12. Brake pedal to master cylinder push rod
13. Master cylinder attaching bolts
14. Master cylinder assembly
15. Master cylinder outlet fitting
16. Master cylinder stop light switch
17. Pedal pull rod to guide hanger return spring
18. Brake control lever to guide hanger return spring
19. Front brake hose assembly
20. Front brake hose to frame assembly
21. Frame tee to left front hose tube assembly
22. Front frame tee
23. Master cylinder to frame connector tube assembly.
24. Handbrake cable lever guide plate assembly
25. Rear brake cable clevis
26. Rear axle tee to left rear wheel tube assembly
27. Rear axle brake tee
28. Rear axle tee to right rear wheel tube assembly
29. Brake shoe to anchor pin spring - rear
30. Brake shoe hold down spring and retainer
31. Rear brake hose assembly
32. Rear brake cable support bracket
33. Brake tube connector
34. Hand brake cable lever return spring
35. Hand brake cable lever toggle assembly
36. Cable lever pivot plate slide brace
37. Cable lever pivot plate and brace assembly
38. Frame tee to right front hose tube assembly
39. Brake shoe to anchor pin spring - front
40. Brake cable lever strut
41. Brake adjusting screw
42. Brake adjusting screw spring
43. Hand brake mounting bracket assembly
44. Hand brake lever grip
45. Hand brake ratchet rod housing
46. Hand brake ratchet rod
47. Hand brake inner ratchet rod stabilizer
48. Hand brake ratchet rod stabilizer spring
49. Hand brake outer ratchet rod stabilizer

It is necessary that rod (5) which is attached to the brake pedal operating rod, be adjusted for clearance where it seats in piston (13) so that there is 1/4" free movement of the brake pedal p ad before the pressure stroke starts. Cup (15) is thus permitted to be clear of port (16) when piston (13) is in its released position.

NOTE: If this port is not cleared by the piston, the compensating action of t he master cylinder will be destroyed and the brakes will drag.

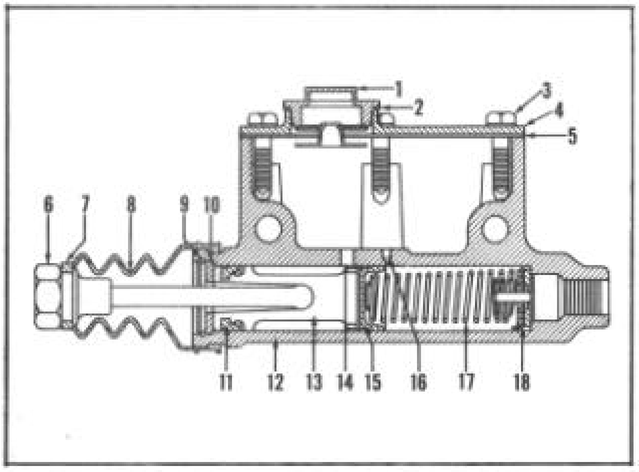


FIGURE 2

1. Filler cap
2. Filler cap gasket
3. Reservoir cover screws
4. Reservoir cover
5. Reservoir cover gasket
6. Push rod
7. Push rod guard strap
8. Push rod guard
9. Piston stop plate lock wire
10. Piston stop plate
11. Piston cup secondary
12. Master cylinder body
13. Piston
14. Inlet port
15. Piston cup primary
16. Outlet port
17. Piston spring
18. Check valve

Secondary cup (11) prevents fluid from leaking out of master cylinder into boot (8). The supply tank filler cap (1) can be reached by raising the front floor mat and removing three self-tapping screws and lifting off the round floor cover.

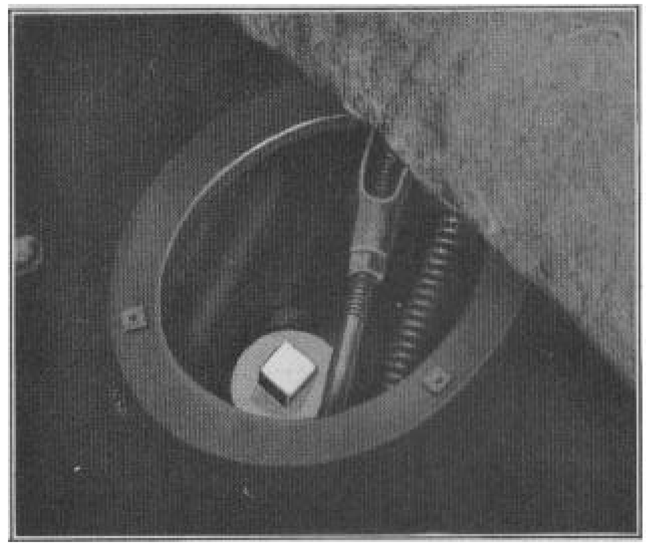


FIGURE 3

NOTE: Master cylinder should be kept at least one half full of Hudson Hydraulic Brake Fluid. The filler cap and master cylinder should always be cleaned of all dirt and grit before removing the cap. Grit in the fluid will cause scoring of the cylinders and possible plugging of lines and ports.

BRAKE DRUM DUST SHIELD

The brake drum dust shield is a press fit on the drum and is also staked in 4 equally distant places to the drum.

MASTER CYLINDER

REMOVAL:

1. Disconnect stop light wires at stop light switch (16) Figure 1 and brake tubes at rear of master cylinder connector (15).

2. Remove one bolt attaching master cylinder frame bracket to frame rail and disconnect clutch pedal pull back spring.

3. Remove cotter key and clevis pin (10) attaching master cylinder push rod (12) t o pedal (8) and remove push rod (12).

4. Allow master cylinder (14) and bracket assembly to swing down and remove the two bolts (13), nuts and lockwashers attaching master cylinder to bracket.

5. Remove master cylinder.

REPAIR:

1. Thoroughly clean exterior of cylinder before disassembling.

2. Remove filler plug (1) Figure 2 and drain fluid.

3. Remove push rod guard strap (7) at push rod and remove push rod (6) and guard (8).

NOTE: Do not use gasoline, kerosene, or carbon tetrachloride for cleaning solution. Use clean alcohol. Keep the parts free from mineral oil of any kind.

4. Remove lock wire (9). This will allow removal of piston (13), piston cups (11) and (15), spring (17), and check valve (18) for inspection and replacement, if necessary.

ASSEMBLING:

1. Wash master cylinder parts in clean alcohol.

2. After washing, dip all parts in "Hudson Hydraulic Brake Fluid" for lubrication.

3. Install check valve (18) and piston return spring (17).

4. Install primary cup (15) piston assembly (13) and piston stop plate (10).

NOTE: Always use new rubber cups.

5. Snap piston stop plate lock wire (9) in its groove.

6. Assemble push rod guard (boot) (8) and push rod (6) in place and install strap (7).

INSTALLATION:

1. Install master cylinder bracket and insert the two 3-1/2" long bolts (13) Figure 1 through bracket and master cylinder housing and tighten securely.

2. Attach the two brake tubes to master cylinder connector (15) and stop light switch wires to stop light switch (16).

3. Install master cylinder push rod assembly (12) to brake pedal lever (8) and insert clevis pin (10) and cotter pin. (Turn ends of cotter pin).

4. Insert the bolt attaching the master cylinder bracket t o frame (located between master cylinder and frame).

5. Attach clutch pull back spring to master cylinder bracket.

6. Refill master cylinder to required level with Filler Bottle J-713 using "Hudson Hydraulic Brake Fluid".

NOTE: After removing master cylinder or any brake hose connections, it is always necessary to bleed the hydraulic brake lines to expel any air that may have entered the system. See "Bleeding Brakes" Page 8.

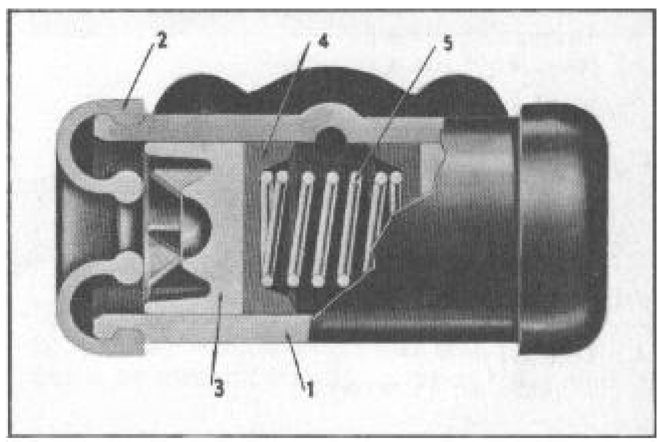


FIGURE 4

1. Wheel cylinder
2. Wheel Cylinder end guard
3. Piston
4. Piston cup
5. Piston cup spring

WHEEL CYLINDERS
(FRONT)

REMOVAL:

1. Remove wheel and hub and drum.

2. Disconnect brake hose at frame bracket.

3. Using tool KMO-526, remove brake shoe retracting springs (39) Figure 1 by placing large end of tool over the anchor pin with the disengaging lug in the opening of the spring hook, rotate the tool 90 degrees and pull outward, Figure 5.

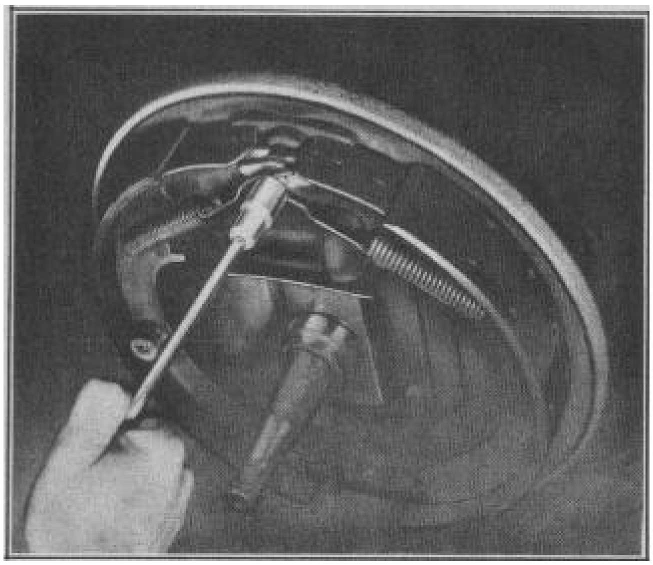


FIGURE 5

4. Remove the two wheel cylinder attaching screws.

5. Remove the connecting links between cylinder pistons and brake shoes. Wheel cylinder and hose maybe with-drawn as a unit.

To Install, Reverse Procedure of Removal.

NOTE: When installing the brake shoe retracting springs, use KMO-526 Replacer. Position small end of tool over anchor pin, place spring hook over shaft of tool and pry spring into position, Figure 6.

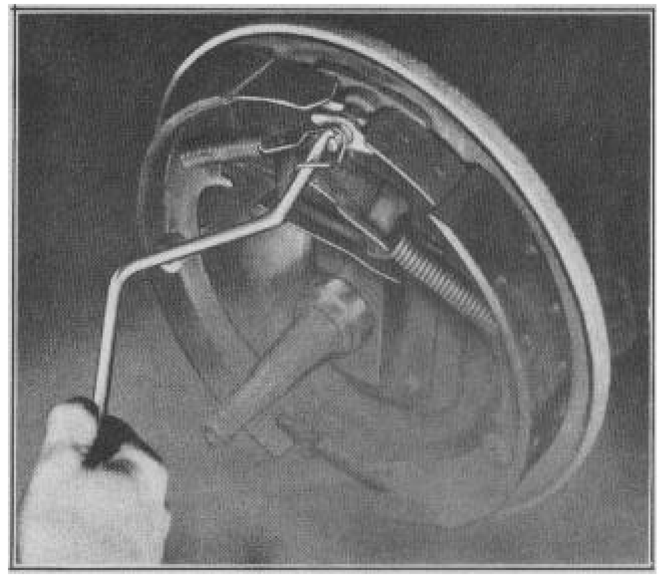


FIGURE 6

WHEEL CYLINDERS
(REAR)

NOTE: Use same procedure as shown for "Front Cylinder Removal & Installation" except item #1.

DISASSEMBLY:

1. Remove cylinder end guards (2), Figure 4.
2. Remove pistons (3).
3. Remove piston cups (4).
4. Remove piston cup springs (5).

Check condition of rubber parts, and the cylinder bore for scratches or pits. Cylinder walls that are scratched or pitted should be honed or replaced.

ASSEMBLY:

1. Wash wheel cylinder and parts in c 1 e an alcohol.
2. Dip wheel cylinder and all parts in "Hudson Hydraulic Brake Fluid" for lubrication. Use new rubber cups.
3. Assemble as shown in Figure 4.

NOTE: The wheel cylinder screws should be tightened with torque wrench J-1300 at 12 foot pounds.

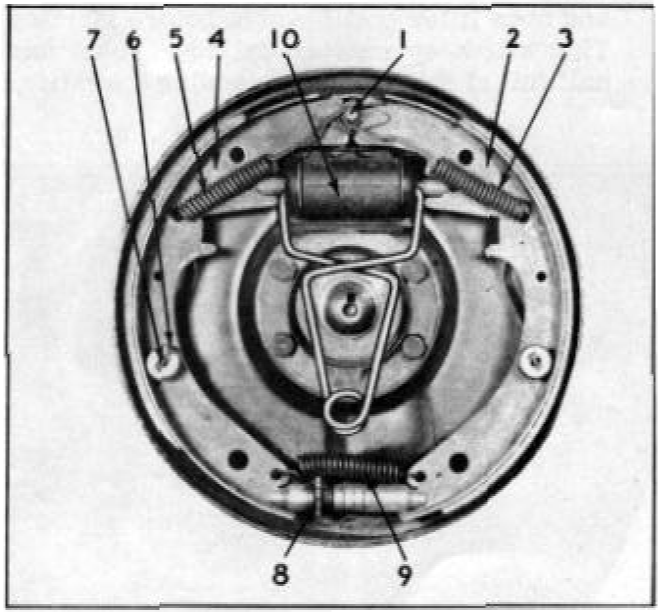


FIGURE 7

1. Brake anchor pin
2. Primary brake shoe
3. Primary brake shoe to anchor spring
4. Secondary brake shoe
5. Secondary brake shoe to anchor spring
6. Brake shoe hold down spring cup
7. Brake shoe hold down spring pin
8. Brake adjusting screw
9. Brake adjusting screw spring
10. Wheel cylinder.

FRONT BRAKE

DISASSEMBLING:

Whenever servicing the mechanical section of the brakes, such as replacing springs or shoes, and it is not necessary to disturb the wheel cylinders; proceed as follows:

1. Install Wheel Cylinder Clamp KMO-145 on wheel cylinders as shown in Figure 7 to prevent the piston seals being forced out of position.

2. Remove the brake shoe to anchor pin springs (3) and (5).

3. Press in the turn hold down spring cups (6) and remove cups, springs and pins on both shoes.

4. Remove shoes.

5. Remove adjusting screw (8).

6. Disconnect adjusting screw spring (9).

7. Thoroughly clean away all traces of rust and apply a coating of "Bendix Lubriplate" to the shoe ramps on the backing plates, shoe ends and all other frictional points.

To install shoes, reverse procedure of disassembly. Position anchor pin as described in "Major Brake Adjustment", Page 12.

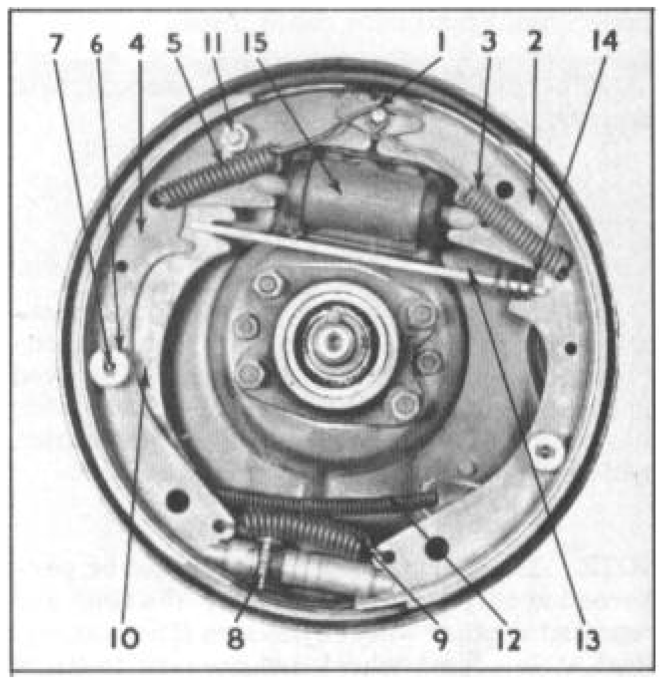


FIGURE 8

1. Brake anchor pin
2. Primary brake shoe
3. Primary brake shoe to anchor spring
4. Secondary brake shoe
5. Secondary brake shoe to anchor spring
6. Brake shoe hold-down spring pin
7. Brake shoe hold-down spring cup
8. Brake adjusting screw
9. Brake adjusting screw spring
10. Brake shoe cable lever
11. Brake shoe cable lever to shoe pin
12. Brake cable spring
13. Brake shoe cable lever strut
14. Brake shoe cable lever strut to shoe spring 15. Wheel cylinder.

REAR BRAKE

DISASSEMBLING

The disassembly and reassembly procedure of the rear brake is the same as for the front brakes, except for the removal of brake shoe lever to shoe pin (11), Figure 8, brake shoe cable lever (10), and cable lever strut (13).

After the brake shoe to anchor springs (3) and (5) have been taken off, remove nut and take out pin (11). Strut (13) and spring (14) will drop out of place. Disconnect en d of brake cable from brake shoe cable lever.

To reassemble, reverse procedure of disassembly.

BLEEDING BRAKE LINES

Air in the braking system seriously impairs braking efficiency resulting in soft, spongy pedal action. It must therefore, be removed by bleeding the lines if the fluid level has been allowed to get too low or any part of the braking system has been disconnected or replaced.

NOTE: The bleeding operation should be performed at only one wheel cylinder at a time and repeated at other wheel cylinders if necessary. Start at left front wheel and proceed to Right front, Left rear, and Right rear if required.

CAUTION: Do not depress brake pedal while the brake drums are removed unless a bleeder valve has been opened for bleedingbrake lines. Remove dirt around filler cap before removal for inspection of fluid level.

NOTE: If there is any doubt as to the grade of brake fluid present in the system, flush out entire system with a good grade of clean alcohol.

1. Fill "Master Cylinder Filler Bottle J-713" with Genuine "Hudson Hydraulic Brake Fluid."

2. Put nozzle in master cylinder reservoir and open filler bottle valve before starting. This will keep master cylinder reservoir half full of fluid during bleeding operation.

FIGURE 9

3. Remove screw, Figure 9, from end of bleeder valve and attach bleeder tube J-628. Insert free end of bleeder tube into a clean pint jar partly filled with brake fluid.

4. Unscrew bleeder valve, Figure 9, three fourths of a turn and depress foot pedal by hand, allowing pedal to return to released position slowly. This gives a pumping action which forces fluid through the tubing and out at the wheel cylinder carrying with it any air that may be present.

After the brake pedal is depressed, it must be allowed to return slowly, otherwise air may be drawn into the system.

NOTE: The free end of the bleeder hose must be kept below the surface of the fluid in the pint jar.

Watch the flow of fluid from hose and when all air bubbles cease to appear, the bleeder screw should be closed tightly before taking the bleeder hose out of the container of fluid.

Fluid withdrawn in any bleeding operation should not be used again.

Replenish fluid in the master cylinder after each cylinder is bled. If filler bottle J-713-C (filler and threaded adapter) is used, this constant check on the master cylinder is not necessary because of its large capacity and the fact that the quantity is easily watched.

If the master cylinder is drained during the bleeding operation, air will enter the system and the bleeding will have to be done all over again at all four wheels.

When bleeding operation is completed the master cylinder must be refilled.

Check fluid level in master cylinder every 1000 miles.

BRAKE FLUID

Hydraulic brake fluid must have a high boiling point to prevent evaporation and to prevent any tendency to vapor lock, yet at the same time a good brake fluid must remain fluid at cold temperatures.

There are some types of brake fluid that are composed of ethyl alcohol and castor oil; cellosolve and castor oil; alcohol, water, and glucose with some chromate added to retard corrosion; mineral oil; anti-freeze alcohols with no castor oil added.

Brake fluids of the above types are all harmful because -

Ethyl alcohol has a lower boiling point than HUDSON BRAKE FLUID, causing it to vaporize more rapidly and increasing the tendency to produce a vapor lock in the lines.

Cellosolve has a rather severe action on rubber parts and should not be used for that reason.

Water and glucose is worthless as water will corrode the metal parts of the system and glucose forms a sticky mass when exposed to air and has no lubricating qualities.

Mineral oil, in even the smallest quantity, should never be used. The slightest trace of mineral oil will destroy the sealing qualities of the two rubber piston cups in two or three days. Never wash any hydraulic brake parts in gasoline as even the slightest amount of mineral oil present in gasoline will affect the rubber parts.

Hudson Brake Fluid mixes with other brake fluids recommended by automobile manufacturers. However, do not mix Hudson Brake Fluid with any fluids containing glycerine, sugar, glucose, mineral oil or water.

ADJUSTMENT

HAND BRAKE LEVER ADJUSTMENT

Pull the hand brake lever two notches from full release or until a 1/8" clearance is obtained between the hand brake control lever (5), Figure 1, and the end of the slot in the lever guide plate (24).

BRAKE PEDAL ADJUSTMENT

The pedal return spring (17) holds the bottom of master cylinder operating lever against the stop.

Check to see if the lever is in position.

If the pedal shank (in the fully released pedal position) touches the floor board or has more than 1 /4" clearance, it should be adjusted.

1. Loosen pedal link clevis nut (1), Figure 1.

2. Remove pedal link clevis pin.

3. Turn pedal link rod clevis (1) to increase or decrease it length until clevis pin can be installed in the master cylinder operating lever with the lever against its stop and the pedal exactly 1/4" from the floor board.

4. Tighten pedal link clevis nut.

This adjustment is important because if the master cylinder piston does not return to the end of the cylinder, the brakes will drag.

Recheck pedal adjustment to be sure that the pedal is exactly 1/4" from the floorboard when the pedal is released.

BRAKE PEDAL

REMOVAL:

1. Raise front of car and place stand jacks.
2. Remove nut and shakeproof washer holding pedal rod to brake pedal lever assembly.
3. Use puller J-2795 and remove pedal rod.
4. Disconnect clutch pull back spring.
5. Remove clevis pin and cotter key and disconnect clutch adjusting rod.
6. Disconnect brake follow up linkage.
7. Disconnect master cylinder push rod.
8. Remove bolt holding bracket at rear of master cylinder.
9. Remove clutch operating lever held by woodruff key and lock bolt.
10. Remove master cylinder push rod.
11. Remove lock ring at brake cross shaft with snap ring pliers KMO-630.
12. Remove master cylinder and brake pedal cross shaft brace.
13. Remove clutch cross shaft support bracket and clutch cross shaft assembly.
14. Remove brake pedal lever assembly.

INSTALLATION:

1. Install brake pedal lever o n brake cross shaft.
2. Install clutch cross shaft and bracket assembly.
3. Install master cylinder and brake cross shaft brace.
4. Install brake cross shaft lock ring.
5. Install master cylinder push rod, boot, clevis pin and cotter pin.
6. Install bolt at master cylinder support bracket.
7. Install clutch release lever, align with key and tighten bolt.
8. Install clutch adjusting rod, clevis pin, and cotter pin.
9. Install brake follow up rod and make necessary adjustment.
10. Hook up brake follow up, brake pull back, and clutch pull back-springs.
11. Install brake pedal arm, nut and washer. (Align a r m with pedal before tightening nut.) Adjust pedal for proper clearance.
12. Lower car and remove jacks.

PEDAL PUSH ROD ADJUSTMENT

There must be a clearance of 1-1/4" between the rear side of retaining pin (3) and end of slide link (2) as shown in Figure 1.

This adjustment is important in order to obtain the proper mechanical follow-up to the hydraulic operation of the rear brakes. The safety factor of having mechanical brakes following the hydraulic brake action is lost unless this adjustment is checked on every car, whenever brake work or inspection is done.

REAR BRAKE CABLES

REMOVAL:

1. Raise car and place on jacks.

2. Remove cotter pins, clevis pins, that hold brake (25) Figure 1 clevises to toggle (35).

3. Unscrew brake cable clevises (25) and nuts from cable ends.

4. Disconnect clamp (32) that holds cable to #6 body cross member.

5. Remove nuts, washers and clips that fasten brake cable to rear springs.

6. Remove rear brake cable dust cover at backing plate.

7. Remove rear brake drums.

8. Disconnect end of brake cable from cable lever at brake shoes.

To Install, Reverse Procedure and Lubricate Cables.

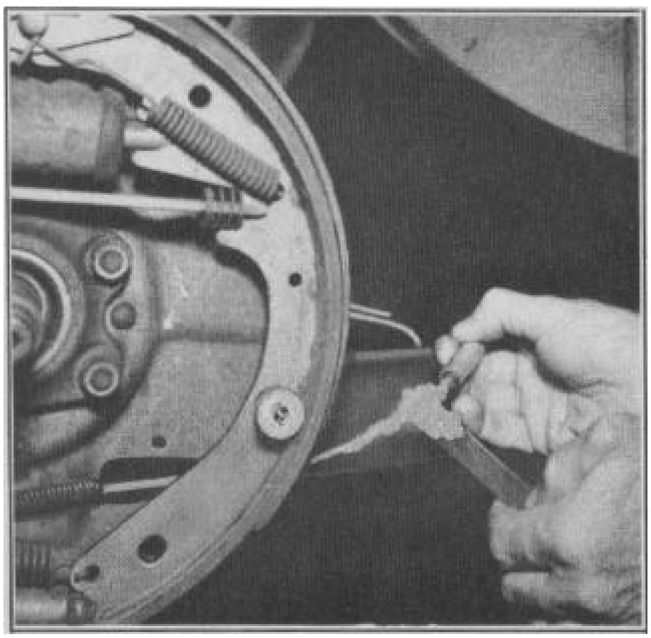


FIGURE 10

LINKAGE LUBRICATION

A thin film of chassis lubricant should be applied t o parking brake cable connections, brake eccentrics, anchor links and all moving or possible friction contact points.

A film of lubriplate should be placed on the brake shoe support ledge on the backing plate so as to combat rust and insure free brake shoe action.

NOTE : This lubrication should be done at time of brake adjustment, with hubs and drums removed and with brake cylinder clamps in place. Slide the brake shoes away from the backing plate.

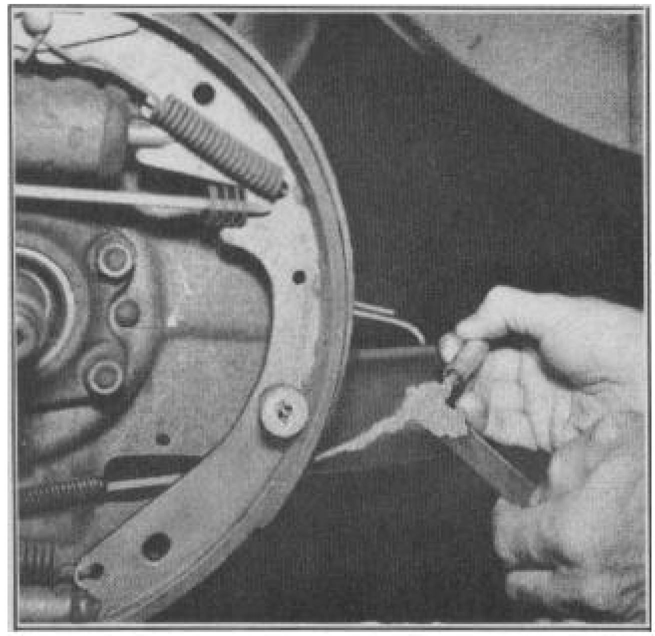


FIGURE 11

MINOR BRAKE ADJUSTMENT

NOTE; Brake drum should be at approximately room temperature when making brake shoe adjustments. If brakes are adjusted when the drums are hot and therefore expanded, the shoes may drag when the drums cool and contract.

1. Tack up all wheels clear of the floor.

2. Check and remove end play in wheel bearings if necessary.

3. See that parking brake lever is in the fully released position.

Check parking brake cables connecting to the rear brakes to insure that the cables have not been adjusted so short that the shoes have been moved off at their anchor pin seat (in other words, the brakes are partially applied).

4. The brake pedal shank should not have more than 1/4" clearance with the brake pedal in its fully released position.

The brake control lever should be against its stop when the push rod is 1-1/4" from its rear face to the front end of the push rod.

5. Check the anchor pin nut with a torque wrench to make sure it is tight. It should check 65.75 foot pounds.

NOTE: If an anchor pin nut is found loose, reset the anchor according to instructions under "Major Brake Adjustment".

6. Remove adjusting hole cover from the backing plate Figure 11. Expand the brake shoes by turning adjusting screw. Move handle of Brake Adjusting Tool J-1028 as shown in Figure 11, until the brake drum can just be turned by hand, then back off adjusting screw moving handle of Tool J-1028 approximately 14 notches.

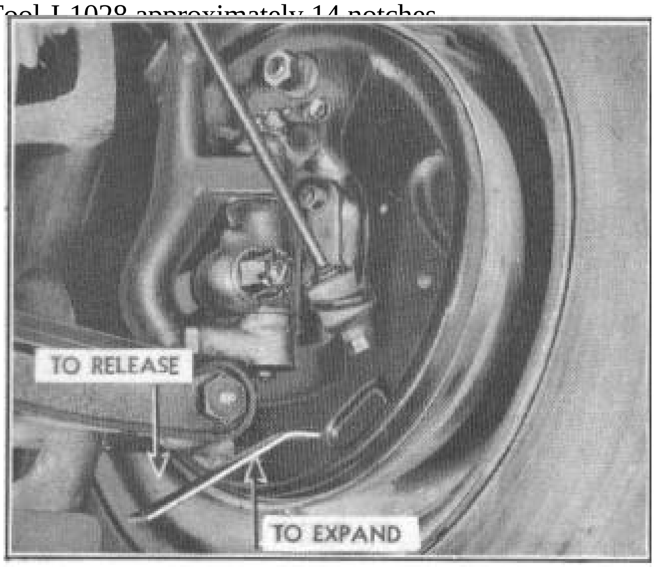


FIGURE 12

Back off each screw the same number of turns.

NOTE : Make this adjustment at all four wheels. The brake drum should turn freely and if there is a heavy drag between shoes and drum, reset the anchor pin as given under "Major Brake Adjustment".

7. Reinstall the adjusting hole covers in the backing plates.

8. With the hand brake fully released, the brake cables should permit the anchor ends of the rear brake shoes to rest on the anchor pin. If shoes do not rest on anchor pin, readjust the cables as follows:

With the hand brake grip two notches from full release, 1/8" clearance should exist between hand brake cable lever (5) Figure 1 and end of slot in lever guide plate (24). If not — adjust hand brake cable clevis.

9. Pull rear brake cables tight and adjust ends so that clevis pins just enter holes in toggle (22). All slack should be removed when clevis pins are in place and hand brake applied two notches. Releasing hand brake will provide proper slack in cables.

Examine hand brake ratchet rod lock springs to see that they engage properly in the rod ratchet. Replace springs if worn or broken.

10. Pull cables tight and adjust the ends so that the clevis pins just enter the holes in the toggle (35), Figure 1.

11. Release hand brake. 12. Reinstall wheels and lower the car.

Test for operation on a level road. Do not test on the side of a crowned road.

NOTE: Lubricate brake cables with viscous chassis lubricant.

MAJOR BRAKE ADJUSTMENT

A complete brake adjustment is necessary when a minor adjustment fails to give satisfactory results or when replacing shoe and lining assemblies.

1. Jack up all wheels clear of the floor.

2. Remove wheels.

3. Check linings for wear and loose rivets. Inspect linings for metal or foreign particles that may be imbedded in the surface and remove any that are found.

Shoe and lining assemblies having linings soaked with lubricate or Hydraulic brake fluid should be replaced. They cannot satisfactorily be cleaned.

NOTE: Use wheel cylinder clamp KMO-145 if brake shoes are to be removed. This clamp prevents the piston being forced out of the wheel cylinder either from the natural back pressure in the hydraulic system (combined with the spring pressure between the cups), or by an accidental movement of the brake pedal. Piston ejection would cause loss of fluid and allow air to enter the hydraulic system, necessitating bleeding the system.

4. Inspect each drum braking surface and rebore the drum if necessary.

Remove only sufficient metal to provide a smooth and true surface. If excess material is removed, the drum may be weakened to the extent that erratic braking and lining wear may result.

5. Disconnect hand brake cables at the toggle (35) Figure 1.

6. Thoroughly clean shoes and brake plates with a steel wire brush. All brake frictional points should be thoroughly cleaned after which a thin coat of lubriplate should be applied at these points.

7. Clean the exposed portion of all hand brake cables and then pull the cables through conduit from the wheel end to expose that part of cable that is sheathed by the conduit. Clean this portion of the cable and lubricate freely with viscous chassis grease. Figure 10.

8. Push cable into conduit and after the shoes have been reinstalled, connect the cable to the shoe cable lever (5), Figure 1, leaving the adjustable yoke ends (25) of cables disconnected from toggle (35).

9. To connect brake cable to shoe operating lever move cable return spring (12) away from cable end and place end into groove at the end of operating lever.

After the cable is in place allow the cable return spring to return against the lever to hold the cable in place.

10. Inspect backing plates for looseness and tighten if necessary.

NOTE: When newly lined shoes are installed it will be necessary to back of on the adjusting screw to provide clearance for drum installation. After rear shoes are in place, attach the cable end to the rear brake lever, but do not connect front end of cable.

11. Lubricate the front wheel bearings by applying a milled sodium soap base lubricant to the bearings and races only (3 ounces is sufficient).

Excessive looseness at front or rear wheel bearings should be corrected.

12. Before installing the front wheel hub and drum, remove any excess grease from inside the hub to prevent grease leakage onto the brake assembly.

13. Check the level of lubricant in the rear axle housing. This shouldnot be above the lower edge of the filler plug hole. Too high a level will cause lubricant leaks at the rear wheel oil seals.

14. After installing hubs and drums, insert a pry between the linings of the secondary shoe and the drum (through drum feeler gauge hole) and move the shoe assembly until the primary shoe is against the opposite side of the drum, Figure 13. The primary shoe can be pried against the drum by inserting the .015" feeler gauge between the adjusting screw end of secondary

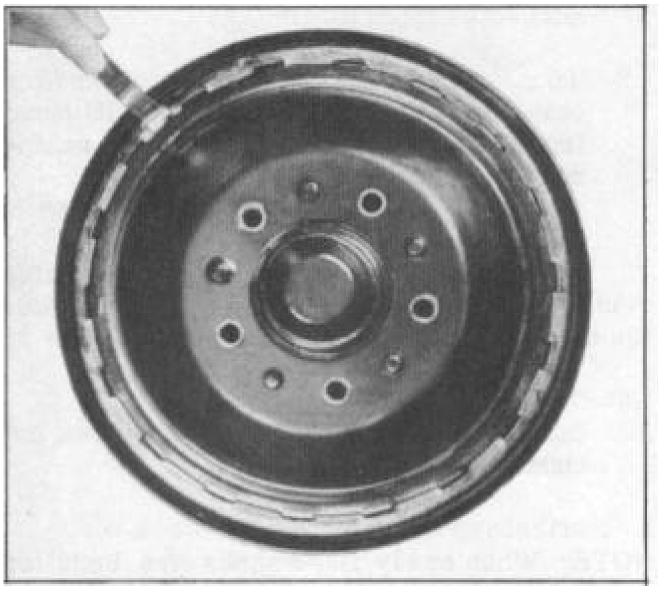


FIGURE 13

shoe lining and the drum and then spreading the shoes by rotating the adjusting screw.

NOTE: The secondary shoe is always toward the rear and the primary shoe toward the front of the car.

15. Insert a .015" feeler gauge between the secondary shoe lining and the drum and check the clearance between the lining and the drum at each end of the secondary shoe.

16. A clearance of .015" at each end of secondary shoe with the primary shoe against the opposite side of the drum indicates a good anchor pin and adjusting screw positioning. This will give a .0075" clearance between lining and drum all around.

NOTE: If a .015" clearance cannot be obtained at both ends of the secondary shoe by rotating the adjusting screw, the anchor pin must be adjusted.

CAUTION: Do not back the nut off too much as this would result in moving the shoes out of position when re-tightening the nut.

NOTE: To reduce the clearance between the lining and the drum at the anchor end of the secondary shoe, move the anchor pin away from the center.

To reduce the clearance at the adjusting screw en d, move the anchor pin toward the center.

NOTE: After moving the anchor pin it will be necessary to pry the primary shoe against the drum by inserting a pry between the lining of the secondary shoe and drum (through the drum feeler gauge hole) and move the shoe assembly until the primary shoe is against the opposite side of the drum. The primary shoe can be pried against the drum by inserting the .015" feeler gauge between the adjusting screw end of the secondary shoe lining the drum and then spreading the shoes by rotating the adjusting screw.

17. Insert the .015" feeler gauge between the secondary shoe lining and drum and check the lining to drum clearance at each end of the secondary shoe. The clearance should be .015" at both ends of the secondary shoe.

18. Tighten the anchor pin nut to 65-75 foot pounds torque.

Make sure that the anchor pin does not move during the tightening operation by again checking the secondary shoe clearance after tightening the nut.

19. At the rear wheels only, tighten the adjusting screws until the wheels can hardly be turned by hand. Be sure that parking brake lever is applied approximately two notches or 1/8" at brake control lever (5) from 1 the fully released position.

20. Adjusting parking brake cable so that all cable slack is removed when the came is connected.

21. Back off adjusting screw at the rear wheels approximately 14 notches.

22. Replace adjusting screw hole covers in the backing plate and feeler gauge hole cover on the drum at all four wheels.

23. Install wheels and tighten wheel attaching bolts.

24. Install hub caps.

TROUBLE SHOOTING

BRAKE PEDAL GOES TO FLOORBOARD

Cause -

1. Normal wear of lining.

2. Improperly adjusted brake shoes.

3. Leak in hydraulic system.

4. Air in hydraulic system.

5. No fluid in system.

Remedy -

1. When it is necessary to pump the pedal several times before the brakes take hold, it is an indication that the brake linings are worn and that it is necessary to set the shoes closer to the brake drums.

2. Shoes should be set to .015" clearance. See "Major Brake Adjustment".

3. A connection leak in the hydraulic system will allow the brake pedal to go to the toe board gradually.

A cup leak does not necessarily result in any loss of the travel of the pedal but will be shown by a loss of fluid in the master cylinder.

If no leaks are found at the wheels or connections, remove master cylinder and check the bore for scores or scratches.

4. Air in the hydraulic system will cause a springy or rubbery action of the pedal. Should a sufficient quantity of air be allowed to get into the system, the pedal will go to the toe board under normal pressure. In this case the hydraulic system should be bled.

5. The master cylinder should be checked for fluid. If the tank ever becomes empty, air will get into the hydraulic system making a bleeding operation necessary.

ALL BRAKES DRAG

Cause -

1. Mineral oil in system.

2. Porthole in master cylinder is closed.

Remedy -

1. The use of any oil having a mineral base (engine oil, kerosene, gasoline, etc.) will cause the rubber piston cups in master and wheel cylinders to swell and distort, making them useless, and it is necessary to replace all piston cups. Brake hoses will become swollen and plugged and should be replaced.

NOTE: The system will have to be thoroughly flushed out with clean alcohol and then refilled with "Genuine Hudson Hydraulic Brake Fluid".

2. The porthole (16) Figure 2 must not b e blocked by the piston cup not returning to its proper release position. Refer to "Brake Pedal Adjustment".

ONE BRAKE DRAGS

Cause -

1. Brake shoe return spring is weak.

2. Brake shoe set too close to the drum.

3. Wheel cylinder cups distorted.

4. Loose wheel bearings.

5. Dirt in the brake line.

Remedy -

1. Replace brake shoe return spring.

2. Readjust brake shoes to .015" clearance. See "Major Brake Adjustment".

3. See "All Brakes Drag".

4. Adjust wheel bearings.

5. Remove dirt and flush out entire system with alcohol and then refill with "Hudson Hydraulic Brake Fluid".

CAR PULLS TO ONE SIDE

Cause -

1. Lining on one wheel grease soaked.

2. Brake shoes set incorrectly.

3. Brake backing plate loose on axle.

4. Brake linings have different friction qualities on different shoes.

5. Improperly inflated tires.

6. Caster of front wheels is incorrect.

7. Loose wheel bearing.

8. Dirt in lining or drum scored.

Remedy

1. Oil or greased - soaked linings cannot b e saved by washing or cleaning. Replace the linings with "Genuine Hudson Lining".

2. The construction of the braking system will cause a slight pull or drift to one side in cases where a brake shoe is set too close on a front wheel. Adjust brake shoes as outlined in "Major Brake Adjustment".

NOTE : A rear wheel brake that is set too close will not cause this pull or drift, but will make one of the rear wheels lock and slide before the other.

3. Loose backing plate will allow the brake assemblies to shift on their locating bolts which determine the exact centers and any shift causes an unequal brake efficiency. Tighten backing plates and readjust shoes.

4. Different makes of brake linings are built to reach a certain aim of the manufacturer and the mixing of two different makes of linings on any of the wheels will very possibly give what is known as "Hard Pedal Action" on another shoe and these shoes may be on one wheel or different wheels.

Genuine Hudson Lining sets are supplied in a package together with rivets. The primary shoe lining is moulded and the secondary shoe lining is woven. The linings are accurately ground and carefully inspected to assure you of the "Hudson Standard of Service Material".

5. Check front tires for proper inflation and approximate equal wear.

6. Check front wheel caster. Refer to the "Front Suspension Section #14".

7. Adjust wheel bearing.

8. Remove dirt or foreign matter from face of the lining. Seriously scored brake drums should be replaced.

BRAKE PEDAL ACTION SPRINGY OR SPONGY

Cause

1. Brake shoes improperly adjusted.

2. Air in hydraulic system.

Remedy -

1. Adjust Brakes - See "Major Brake Adjustment".

2. Air in hydraulic system. Bleed system. Refer to "Bleeding Brake Lines".

SECTION 18
FRAME AND SHEET METAL
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FRAME AND SHEET METAL

SPECIFICATIONS

ALL MODELS

Wheel Base	124"
Overall Length Including Bumpers	207-1/2"
Height - Road to Roof	60"
Width - Fender to Fender	77"
Road Clearance - Front and Rear	8"
Tread	
Front	58-1/2"
Rear	55-1/2"

CAR LICENSE INFORMATION

Series	Models	No. Cyl.	Bore & Stroke	H.P.	Piston Displace-ment	Serial No. - up	Dry Weight
Super---------4 Door	481	6 cyl.	3-9/16" x 4-3/8"	121	262	481101	3500
Commodore-4 Door	482	6 cyl.	3-9/16" x 4-3/8"	121	262	482101	3540
Super---------4 Door	483	8 cyl.	3" x 4-1/2"	128	254	483101	3525
Commodore-4 Door	484	8 cyl.	3" x 4-1/2"	128	254	484101	3600

SERIAL NUMBERS

The car serial number, which is also the engine number, is stamped on a metal plate attached to the right front door piller post. In the car numbering system the first three digits of the serial number indicate the series and model, while the remaining digits represent the actual car number. As the cars leave the production line, they are numbered in consecutive order, regardless of model.

The engine number is stamped on the top of the cylinder block between No. 1 and No. 2 exhaust manifold flanges on eight cylinder engines and on the right side of the cylinder block at the front end on six cylinder engines.

NOTE: DO NOT confuse engine number with casting numbers appearing at different locations on the engine. Be sure this number corresponds with the one shown on your Owner Policy and Identification Card.

A code letter indicating paint color option is stamped on the upper hinge of the right front door.

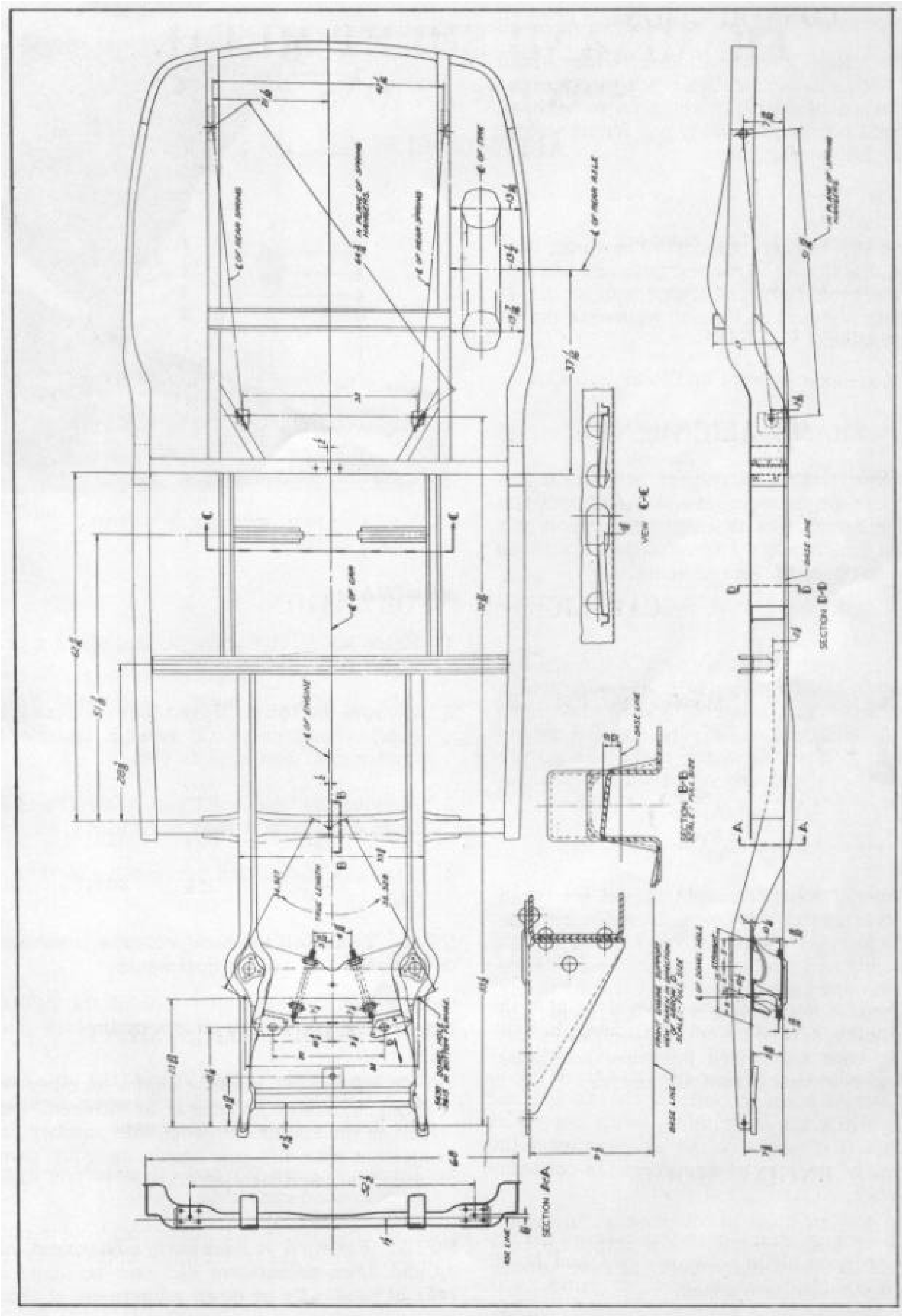

FIGURE 1

CONSTRUCTION

The "New Hudson All Steel" Mono-built BODY AND FRAME includes box type foundation frame of sturdy steel girders with all structural members of body and frame welded together into a single unit.

The front frame supports the Front Suspension, Engine, and Transmission and is welded to the rear body and frame unit at the #3 crossmember and bolted and welded. at the #4 crossmember.

FRAME ALIGNMENT

Correct frame alignment is of great importance in the smooth operation of the vehicle. Frame misalignment is usually the result of a collision which has placed undue strain on various parts of the entire vehicle.

Figure 1 shows the various dimensions that may be used as a guide in checking frame alignments. This illustration shows the more important diagonal measurements that should be checked, however many more diagonal measurements may be measured in the same manner.

Diagonal measurements should b e taken when straightening a frame and the comparison of diagonal measurements from similar points on the right and left side should be equal. These measurements make an excellent check for any out-of-square condition and misalignment, and will quickly determine which section of the frame is bent and where pressure should be applied to restore correct alignment.

ENGINE HOOD

The engine hood is attached at the side hood props and alignment is possible by adjusting of the hood hinge bolts at rear of the hood and attached to fenders.

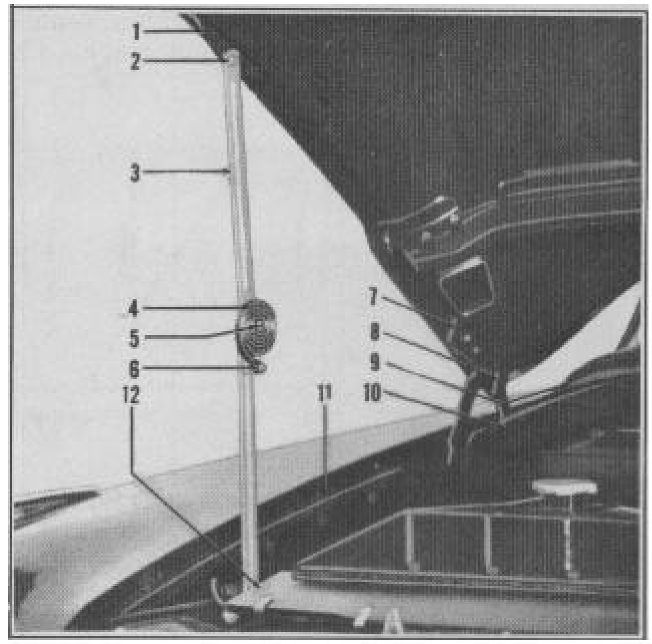

FIGURE 2

REMOVAL:

1. Raise hood (1) Figure 2, and place a prop under front of hood.

2. Remove the two hood prop bolts (2) (one each side). Hood props (3) remain attached to fender side dust shields (12).

3. Remove the two hood hinge bolts (7) and (8) from each side at rear of hood.

4. Have an assistant aid in removing hood from car.

NOTE: To install the hood, reverse procedure of removal and make adjustments.

HOOD ADJUSTMENT

1. Loosen the two bolts (9) and (10) which attach hood hinge to cowl just enough to allow for back or forward movement.

2. Loosen screws (7) and (8) attaching hinge arm to hood each side.

NOTE: Forward or backward adjustment and up and down adjustment can now be made at rear of hood. Up or down adjustment at front of hood can be made by

raising or lowering the three rubber bumpers mounted on front fender tie panel and spring retainer bolt mounted in hood lock upper support.**

3. After all adjustments have been made, tighten all bolts and lock nuts securely.

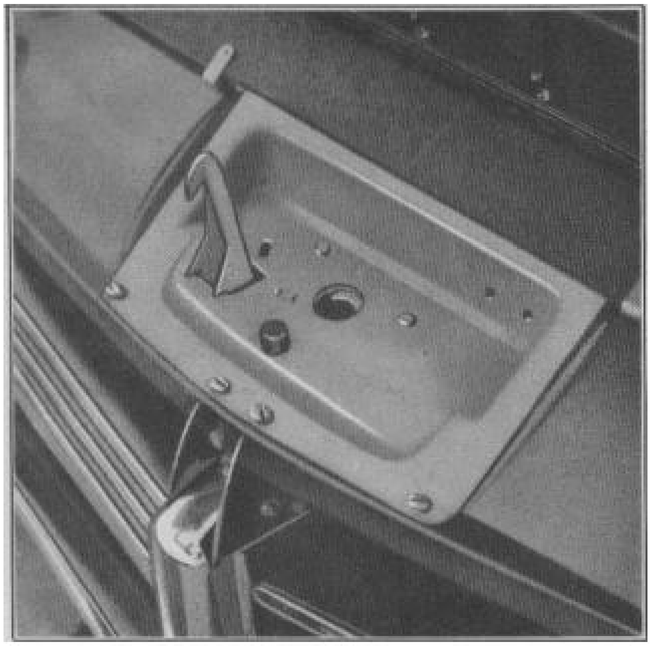

FIGURE 3

HOOD LOCK LOWER SUPPORT

REMOVAL:

1. Disconnect hood lock control wire.

2. Remove four bolts attaching hood lock lower support to fender tie panel and remove lower support.

To Install, reverse procedure of removal. Lock control wire securely and add water resistant grease on hood lock release catch.

FENDER TIE PANEL AND HOOD LOCK LOWER SUPPORT

REMOVAL:

1. Raise hood.

2. Disconnect hood lock control wire

3. Remove two bolts (each side) attaching fender tie panel and hood lock support to fender bracket.

4. Remove two bolts attaching the fender tie pane 1 and hood lock support to radiator mounting channel.

5. Remove two bolts attaching fender tie panel to the front fender skirt.

6. Remove one bolt attaching hood lock support to radiator grille center support and remove the support assembly.

NOTE: To install, reverse procedure of removal.

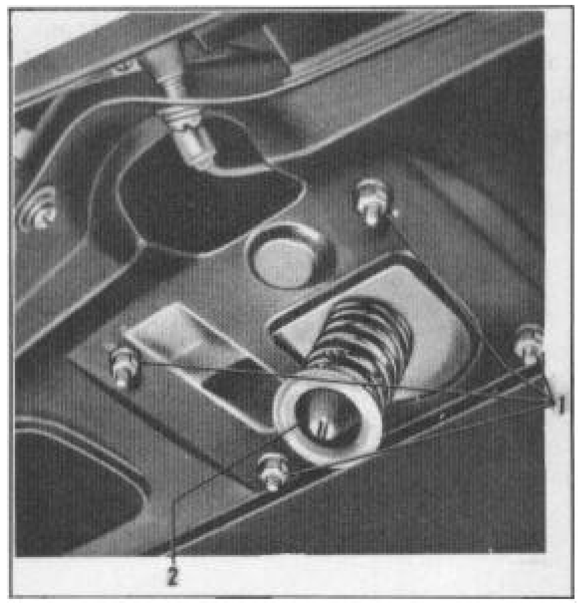

FIGURE 4

HOOD LOCK UPPER SUPPORT

REMOVAL:

1. With a screwdriver remove the spring retainer bolt (2) Figure 4 of lock assembly from attaching nut and remove retainer and spring.

2. Remove the four attaching nuts and washers (2) from lock support plate.

3. Remove the two sheet metal screws from bracket at rear of assembly and slide assembly to one side and remove.

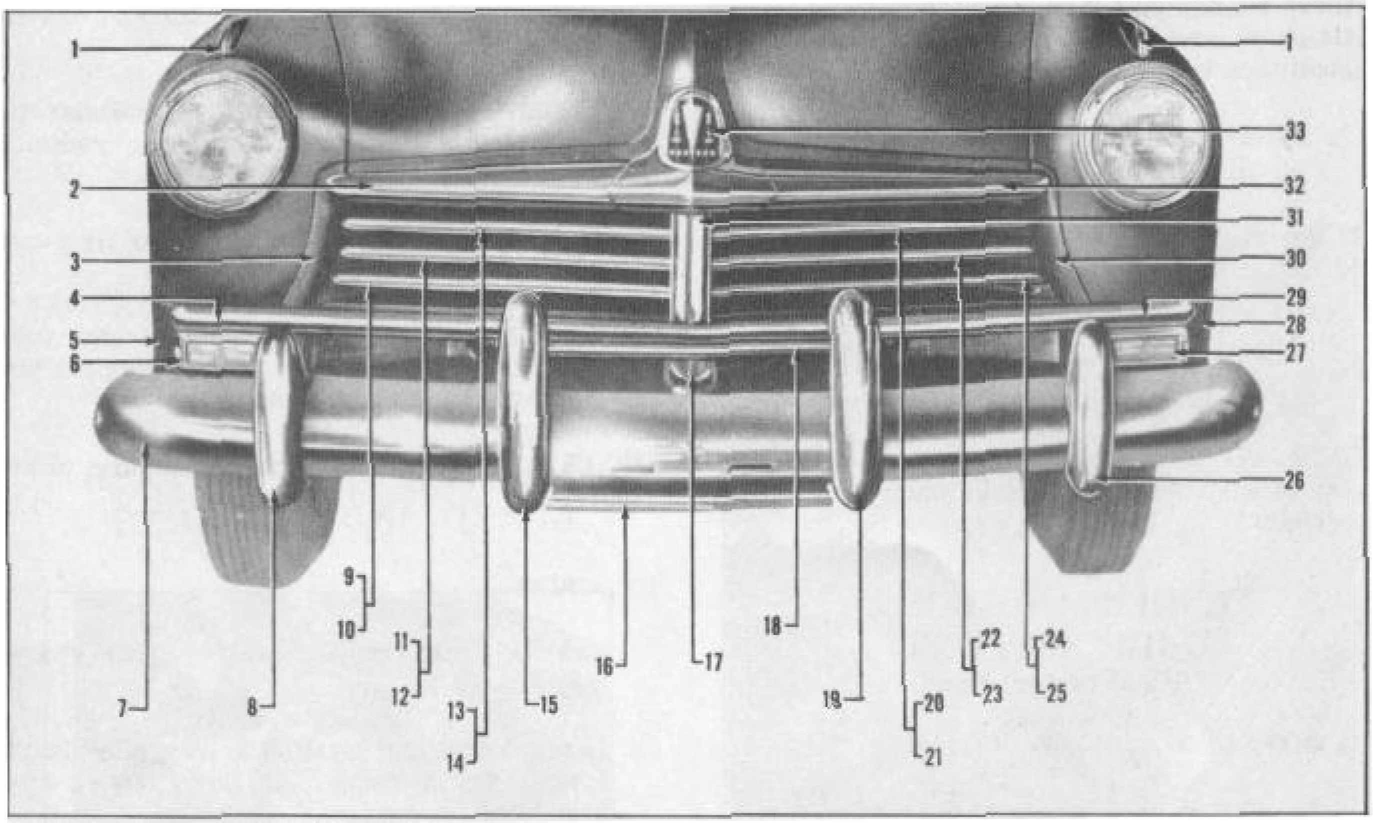

FIGURE 5

1. Front fender ornament
2. Hood louver (R.H.)
3. Radiator grille baffle side support (R.H.)
4. Front splash guard moulding
5. Front fender extension assembly (front R.H.)
6. Parking light assembly
7. Front bumper impact bar
8. Front bumper guard (outer R.H.)
9. Radiator grille moulding (lower R.H.)
10. Radiator grille baffle (lower R.H.)
11. Radiator grille moulding (center R.H.)
12. Radiator grille baffle (center R.H.)
13. Radiator grille moulding (upper R.H.)
14. Radiator grille baffle (upper R.H.)
15. Front bumper guard assembly (inner R.H.)
16. Front bumper license guard (lower)
17. Radiator grille center bar (lower)
18. Front bumper license guard (upper)
19. Front bumper guard assembly (inner L.H.)
20. Radiator grille moulding (upper L.H.)
21. Radiator grille baffle (upper L.H.)
22. Radiator grille moulding (center L.H.)
23. Radiator grille baffle (center L.H.)
24. Radiator grille moulding (lower L.H.)
25. Radiator grille baffle (lower L.H.)
26. Front bumper guard (outer L.H.)
27. Parking light assembly
28. Front fender extension assembly(front L H.)
29. Front splash guard moulding
30. Radiator grille baffle side support (L.H.)
31. Radiator grille center bar
32. Hood louver (L.H.)
33. Hood front ornament assembly

NOTE: To install, reverse procedure of removal and adjust locking spring by turning slotted retainer assembly to left or right.

RADIATOR SPLASH GUARD MOULDING

1. Remove two brass nuts and clips (each side) under fender attaching moulding t o front fender lower extension.

2. Pry off moulding with a screwdriver, use care if moulding is to be used again.

NOTE: To install moulding, it is only necessary to snap the moulding in place and attach to fender.

FENDER AND GRILLE SIDE SUPPORT
(Right or Left Hand)

REMOVAL:

1. Remove the screws attaching radiator grille baffles to side support and center support. Remove baffles.

2. Remove the five bolts wider fender attaching the side panel to fender.

3. Remove the three bolts, nuts, and shake-proof washers attaching the side support to the radiator mounting channel.

4. Remove the three bolts, nuts, and shake-proof washers attaching the side support to the lower front splash guard.

5. Remove the front splash guard and moulding and remove the side support.

NOTE: To install, reverse procedure of removal.

RADIATOR GRILLE CENTER BAR (UPPER)

REMOVAL:

1. Remove two screws and remove the center bar support moulding.

2. Remove bolts attaching grille baffles to center bar.

3. Remove the two bolts attaching center bar to fender tie panel and to front splash guard.

4. Remove center support and splash guard center plate.

NOTE: To Install, reverse procedure of removal.

RADIATOR FRONT SPLASH GUARD AND MOULDING

REMOVAL:

1. Remove front bumper center grille guard (15) Figure 5.

2. Remove one bolt each side attaching front splash guard (center) to front fender and lower splash guard.

3. Remove two brass nuts and clips (each side) under fender attaching f ender to splash guard moulding (4).

4. Remove bolt attaching splash guard to grille lower center bar (17) and remove splash guard.

NOTE: To install, reverse procedure of removal.

RADIATOR SPLASH GUARD
(RIGHT OR LEFT)

REMOVAL AND INSTALLATION:

REMOVAL NOTE: The splash guard consists of two pieces joined at cent e r support and either right or left side may be removed separately.

1. Remove front bumper complete assembly.

2. Remove three bolts each side attaching splash guard to radiator grille side panel.

3. Remove bolt at grille lower center bar (17) and the bolt attaching center plate to right and left hand splash guard.

4. Slide splash guard out.

NOTE: To reinstall, reverse procedure of removal.

RADIATOR GRILLE BAFFLE (UPPER)

Right or Left

REMOVAL:

1. Remove the center support bar moulding.

2. Remove screw at front of center bar and remove screw at rear of center bar.

3. Remove one screw from under fender and one screw at grille baffle side support.

NOTE: To install, reverse procedure of removal.

RADIATOR CHANNEL WITH RADIATOR REMOVED

REMOVAL:

1. Remove headlight wire junction blocks and leave attached to wires.

2. Remove two attaching bolts (each side) from radiator mounting channel to fender.

3. Remove attaching bolts from mounting channel to fender tie panel.

4. Remove the bolt attaching bottom of mounting channel to frame front crossmember.

NOTE: To install, reverse procedure of removal.

FRONT FENDER

REMOVAL:

1. Raise hood and disconnect headlight wires at the junction block on radiator.

2. Remove the headlight rim (three Phillip head screws) and remove the headlamp housing (four screws).

3. Remove the attaching bolts from fender and side dust shield.

4. Remove two bolts attaching fender tie panel and hood lock lower support to fender.

5. Remove the upper hood prop bolt and allow hood prop to be removed with fender side dust shield. Support hood during this operation.

6. Raise car and remove front wheel.

7. Remove three bolts attaching fender t o radiator baffle side shield.

8. Remove three bolts attaching fender t o lower radiator splash guard.

NOTE: Front fender front extension is spot-welded to fender and will have to be removed with fender.

9. Remove moulding and the four self tapping screws attaching fender and moulding clips to front rocker panel.

10. Remove the kick pad in the front seat compartment at dash panel.

11. Remove the screw attaching the door opening belt weatherstrip to fender and front cowl panel.

12. Remove the four bolts from behind the pad attaching fender to dash panel and pillar post.

13. Remove the fender from car.

14. Remove the side hood bumpers, parking lights, and fender moulding ornaments and reinstall on a new fender.

INSTALLATION:

1. With the help of an assistant, align fender at cowl panel and attach screws at kick panel opening and door hinge pillar post.

2. Attach fender to radiator baffle side shield, fender side dust shield, and radiator splash guard.

3. Reverse procedures of removal on balance of installation.

NOTE: Reseal fender at cowl panel and at belt weatherstrip with dolphinite sealer.

If necessary to replace the weatherstrip:

1. Apply a coating of rubber cement to the surfaces of the pillar face and belt weatherstrip.

2. Press the belt weatherstrip into position, then insert and tighten attaching screws.

FRONT FENDER STONE GUARD AND PANEL ASSEMBLY

REMOVAL:

1. Remove four bolts attaching stone guard and panel to front quarter dash panel under the fender, two bolts under rubber pad and one located to left of hood hinge.

2. Remove three Phillip head screws and speed nuts at dust shield extension rubber shield.

3. Remove the panel and stone guard.

NOTE: To install, reverse procedure of removal.

REAR FENDER

REMOVAL:

1. Remove rear wheel fender skirt.

2. Remove rear seat cushion and remove the end section of seat back on same side on which fender is to be removed.

3. Remove the rear quarter window garnish moulding and the valance reveal moulding.

4. Remove the rear quarter trim panel.

5. Remove three Phillip head screws and two self-tapping screws at door pillar post.

6. Remove the spare tire from rear compartment for more accessibility.

7. Remove the seven screws through rear compartment and into the fender and body rear quarter panel.

8. Remove the rear bumper extension at side of fender.

9. Pry off the fender panel lower moulding.

10. Remove the two self-tapping screws attaching fender panel and moulding retainers to rocker panel.

11. Remove the seven bolts and nuts attaching fender panel an d moulding retainers t o rocker panel.

12. Remove rear fender.

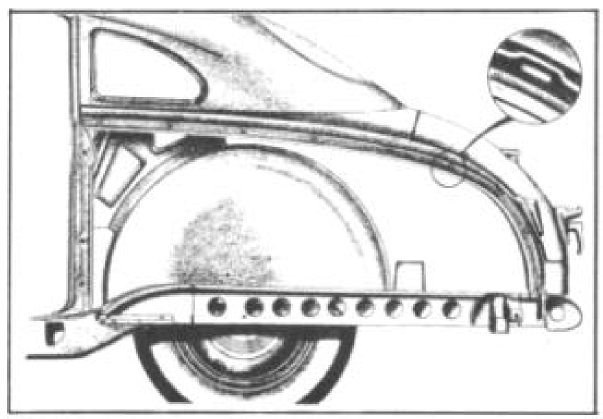

FIGURE 6

INSTALLATION:

NOTE: Before installing the rear fender apply a bead of Permagum Sealer, starting from base of door pillar and across quarter panel flange to frame at rear to area 2 as shown in Figure 6. Care must be taken that bead of sealer be unbroken and clear of all fender attaching holes.

1. Align fender at door pillar post and install attaching screws.

2. Attach all upper bolts at quarter panel flange before attaching fender to rocker panel.

3. Install rear fender seal flush with frame flange raising the front end 1/8" to interfere with rocker panel filler. Cement seal tightly and allow approximately 6" from the end of seal to remain loose until the fender has been installed. Then cement seal securely to frame flange and fender.

METAL SHIPPING BRACKET

On new cars delivered after production of approximately 95,500 units a shipping bracket support plate of three gauge metal (.240) has been incorporated to limit forward movement of the engine and which will prevent fan blades from damaging radiator cores

The new shipping bracket is mounted on the #3 cross-member by two 3/8"-16 bolts and completely covers the rear engine rubber mounting.

The engine rubber mounting is thereby prevented from flexing forward when cars are shunted in transit, thereby preventing damage to radiators.

When new car pre-delivery inspections are performed, be sure to remove the shipping bracket support plate.

Failure to do this will result in very harsh riding qualities, since the shipping bracket prevents the rear motor support from flexing.

REFERENCE

Source of Information	Date	Subject

SECTION 19
WHEELS AND TIRES
— INDEX —

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SPECIFICATIONS

Tire Size

7:10 x 15:00 - 4 Ply	Standard
7:60 x 15:00 - 4 Ply	Optional

Wheel Size

5.00 x 15:00	Standard
5:50 x 15:00	Optional

Inflation Pressure -

Front and rear	24 Pounds

WHEEL AND TIRE BALANCE

Wheel and tire balance is essential to prevent uneven tire wear and high speed wheel tramp, both of which contribute to poor handling, riding discomfort and excessive wear in steering gear and front end parts.

Tires and tubes are balanced at time of assembly to car at the factory.

The tire side walls are marked with a red dot to indicate the position in which the valve stem should be placed in order to preserve the original balance.

Tire wear or tire repair will, however, affect the balance. This is relatively unimportant on rear tires but very important on front tires.

Although tires and wheels a r e balanced when they leave the factory, subsequent tire wear causes them to go out of balance. T o maintain proper balance an d assist in prolonging tire life, it is the tire manufacturers' recommendation that the wheel and tire assemblies be check for balance every 2,500 miles and whenever a tire is repaired or recapped.

BALANCING THE WHEEL AND TIRE

Wheel balance is the equal distribution of weight of the wheel and tire assembly around the axis of rotation (static balance) and v the center line of the wheel and tire (dynamic balance).

There are two ways in which every wheel must be balanced--
Statically--Figure 1
Dynamically--Figure 2

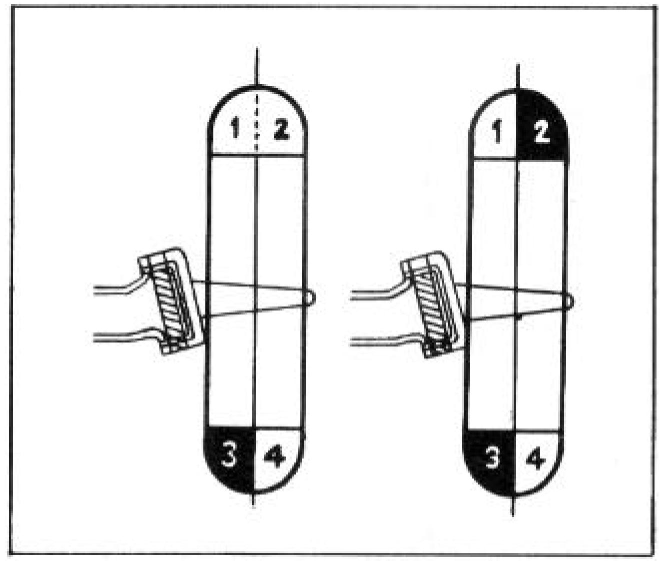

FIGURE 1

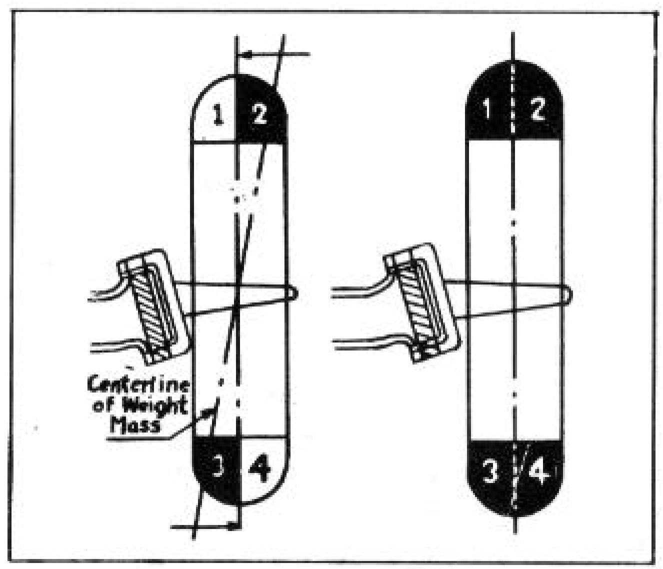

FIGURE 2

Wheel unbalance is the principal cause of tramp and contributes to other steering difficulties.

Due to irregularities in tread wear, caused b y sudden brake applications, misalignment, low inflation pressure, or tube and casing repairs, a casing and tube can lose its original balance.

If the action of the front wheels cause a disturbance at the steering wheel, the first items to check are air pressure and the balance of the tire and wheel.

STATIC OR STILL BALANCE IS THE EQUAL DISTRIBUTION OF THE WEIGHT OF THE WHEEL AND TIRE ASSEMBLY ABOUT the axis of rotation in such a manner that it has no tendency to rotate by itself regardless of the position of the wheel and tire.

Static unbalance of a wheel causes a hopping or pounding action (up and down) which leads to road tramp, high speed shimmy and excessive tire wear.

Wheels may be statically balanced on the steering spindle of the car, although the use of an accredited wheel balancing fixture will facilitate the operation.

NOTE: If wheels are checked on steering spindle, brakes must be fully released so that they do not drag and impede free rotation of the wheel.

Static unbalance of a tire and wheel causes the heavy portion (3) to go to the bottom as in Figure 1 and to obtain a true static balance, weights will have to be added on the rim opposite the heavy portion that went to the bottom. Gradually move the weight apart, equal distances from starting point until wheel is in balance.

NOTE: The wheel is in balance when it will stand In an y position without rotating of its own accord.

To balance the wheel and tire assembly a piece of putty may be used instead of fastening the regular weights onto the rim. The quantity of putty may be added to or reduced until the static balance Is obtained, as in Figure 1.

The putty can then be weighed and balanced weight or weights attached permanently to the rim to correspond to the weight of the putty. The sum of the weights of section (1) and (2) is equal to the sum of the weights of section (3) and (4), Figure 1. The weight, therefore, is equally distributed about the axis of rotation. The weight at (2) being balanced by the weight at (3). However this wheel is not in dynamic balance because section (1), Figure 1 is lighter then section (2) and section (4) is lighter than section (3).

NOTE: Dynamic or running balance requires a wheel to be first in static balance and to also run smoothly at all speeds on an axis that passes through the center line of the wheel and tire and is perpendicular to the axis of rotation.

NOTE: The wheel assembly must be clean and free of all dirt, weights, etc. The tire must be in good condition; properly mounted with the balance mark on the tire lined up with the valve stem in the tube. Bent wheels must be replaced or straightened before being balanced. Tire valve-caps must be in place.

The wheel and tire is in static balance as shown in Figure 1, however, with reference to the center line, section (1) is lighter than section (2), also section (3) is lighter than section (4).

NOTE: Special shop equipment is required to determine the amount it is out of balance and where correct weight should be added without disturbing its static balance.

This wheel when started spinning, will cause a center line through the weights at (2) and (3) to attempt to get at right angles to the rotation axis, Figure 2, which exerts a force on the wheel to try to obtain a new center line and thus change the axis of rotation. The wheel in spinning, therefore, tries to equalize th e weight at (2) and (3) by moving the center line first in one direction and then in another, causing the wheel to try to rock first in one direction and then another, producing a wobble or shimmy which increases with high speeds.

Weights must be added to (1) and (4), Figure 2 to equal the weight in sections (2) and (3), and in Figure 2 the weight is evenly distributed about both the axis of rotation and the center line of the wheel. This wheel is statically and dynamically balanced.

NOTE: The rear wheels may be balanced by the same method used for front wheels. Rear wheels which are not in correct static balance may cause a vibration of the body and front end of the car when driving at high road speeds.

TIRE INFLATION

Maintaining proper tire pressure i s the most important factor in obtaining maximum tire life, proper car handling, and best riding qualities.

Tire air pressure increases due to road contact and internal friction, the air pressure may increase considerably after hard driving during hot weather. For this reason tire inflation and pressure checking should always be done when the tires are cold.

Ordinarily tire pressures should be checked at least once a week. However, if the car is driven extensively, they should be checked every day.

Tire valve caps should be finger tight to prevent loss of air which may be escaping from a leaky valve and also precludes the possibility of dust and dirt getting into the valve. Replace missing valve caps promptly.

Keep tires inflated to the following pressures:

Size	Front	Rear
7.10 x 15 (Standard)	24 lbs.	24 lbs
7.60 x 15 (Optional)	24 lbs.	24 lbs.

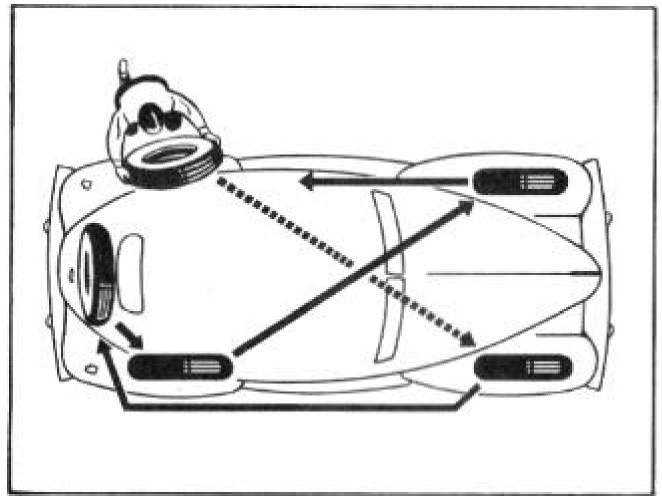

FIGURE 3

MINIMIZING TIRE WEAR

To obtain maximum tire life, it is important to change tire positions at intervals of from 2,500 to 3,000 miles, Figure 3. This involves placing the left front tire and wheel assembly on the left rear hub, moving the right front assembly to the spare wheel position, right rear to left front, left rear to right front and the spare to the right rear hub. Switching the tires in this manner changes their direction of rotation and equalized the wear over 5 tires instead of 4.

TIRE WEAR

Tire wear, although actually more rapid on rear tires, is usually more uniform than on front tires. The rear tire treads are flexed (distorted) in one direction while the engine is driving the car and in the opposite direction when the brakes are applied which accounts for their even wear.

The front tire treads are flexed in the same direction when the car is being driven as when the brakes are applied. This tends to cause spotty wear, particularly if there are any crosswise lines in the tread design. When the tread consists wholly or partially of blocks, this wear is usually first noticed as a high point or ridge at the back of the block as it rests on the ground.

This high or unworn portion is forced down into the tread groove, when the brakes are applied, while the forward portion of the block, being backed by the remainder of the block, stands up and is subjected to the braking action and wears more rapidly.

If this condition is allowed to continue it will sooner or later (depending upon driving speed and severity of brake application) develop into a wavy or spotty wear. If changed to reverse the tire rotation, the tire wear will become uniform and in most cases remain so. However, under fast driving and severe brake usage the original conditions may again develop but this time on the reverse side of the tread blocks, making a second change necessary.

Do not be too hasty in diagnosing uneven tire wear as improper front wheel alignment as there are other conditions which can be much more readily checked and which may be the cause.

The following conditions should always be checked when uneven tire wear is encountered and in the order listed.

1. Tire pressure.
2. Wheel bearings.
3. Brakes
4. Wheel and tire balance.
5. Front wheel alignment.

WHEEL BEARINGS

Loose or worn wheel bearings, permitting the wheel to wobble, will cause scuffing of tires or even permit brakes to drag intermittently.

FRONT WHEEL BEARING ADJUSTMENT

1. Jack up the wheel so that it will revolve.

2. Remove outer and inner hub caps.

3. Remove cotter pin and turn nut to the right sufficiently to insure that parts are properly seated and then back off the nut until a slight drag is felt when turning the wheel by hand.

4. Loosen the nut sufficiently to allow the wheel to turn freely.

5. Insert cotter key and clinch it.

6. Install inner and out hub caps and lower car to the floor.

BRAKES

Dragging brakes and particularly with eccentric drums will cause spotty wear. Be sure the brake backing plates are mounted securely on the spindles.

If the above checks fail to reveal the cause of the tire wear, a complete alignment test should be made.

WHEEL AND TIRE RUN-OUT

Wheel and tire assemblies which are eccentric or run-out excessively will cause premature tire wear.

Lateral run-out or trueness of the wheel can be checked with a gauge and apiece of chalk.

The allowable run-out or eccentricity is 1/16". More than this should be corrected.

Mark the spot on the wheel or tire were the most run-out occurs and if it is found necessary to check caster or camber, the. place where the chalk mark is should be placed toward the front of the car, and in checking toe- in it should be placed at the top of the tire.

DISMOUNTING TIRES

Deflate the tube completely. Stand on the tire with both feet to force the bead away from the rim. Push the valve stem back into the tire. With two tire tools inserted about eight inches apart between the bead and the rim. BE CAREFUL NOT TO PINCH THE TUBE WITH THE TOOLS. With one tool in position, move the other tool around the rim and remove the remainder of the bead. Then remove the tube.

Stand wheel in upright position with inner bead in rim well. Apply liquid soap around both sides of rim. Insert both tire tools between bead and rim and pry tire out of rim.

MOUNTING TIRES

Coat both beads of tire with liquid soap to help slide them over the rim. Inflate tube just enough to round it out, then insert it in the tire. Place the tire on the wheel, carefully guiding valve stem into the hole in the rim. Push the inner bead over the rim and into well at valve stem and force balance of bead over the rim. It may be necessary to force a small remaining portion of the bead over the rim with the tire tool.

Insert the tire tool between outer bead and rim at a point opposite the valve stem and work bead over the rim. Leave tool in place and work other tool around bead and force remainder of the bead over the rim. BE CAREFUL NOT TO DAMAGE THE TUBE WITH THE TOOL.

Inflate tire slowly, carefully checking beads to see that they both are seating properly on the rim. The tire may be centered by bouncing it a few times. Inflate tires to recommended pressure, 24 lbs. front and rear.

TIGHTENING WHEEL HUB BOLTS

Whenever a wheel has been removed it is important to make certain all wheel hub bolts are securely tightened before releasing car. Tighten to 60-65 lbs. torque. Tighten hub bolts equally while the wheel is clear of the floor, then lower car t o floor and check hub bolts again and tighten to specified torque. All hub bolts are right hand thread.

REFERENCE

Source of Information	Date	Subject

DECIMAL EQUIVALENTS

64ths	32nds	16ths	8ths			64ths	32nds	16ths	8ths	
1				**.015625**		33				**.515625**
2	1			**.03125**		34	17			**.53125**
3				**.046875**		35				**.546875**
4	2	1		**.0625**		36	18	9		**.5625**
5				**.78125**		37				**.578125**
6	3			**.09375**		38	19			**.59375**
7				**.109375**		39				**.609375**
8	4	2	1	**.125**		40	20	10	5	**.625**
9				**.140625**		41				**.640625**
10	5			**.15625**		42	21			**.65625**
11				**.171875**		43				**.671875**
12	6	3		**.1875**		44	22	11		**.6875**
13				**.203125**		45				**.703125**
14	7			**.21875**		46	23			**.71875**
15				**.234375**		47				**.734375**
16	8	4	2	**.25**		48	24	12	6	**.75**
17				**.265625**		49				**.765625**
18	9			**.28125**		50	25			**.78125**
19				**.269875**		51				**.796875**
20	10	5		**.3125**		52	26	13		**.8125**
21				**.328125**		53				**.828125**
22	11			**.34375**		54	27			**.84375**
23				**.359375**		55				**.859375**
24	12	6	3	**.375**		56	28	14	7	**.875**
25				**.390625**		57				**.890625**
26	13			**.40625**		58	29			**.90625**
27				**.421875**		59				**.921875**
28	14	7		**.4375**		60	30	15		**.9375**
29				**.453125**		61				**.953125**
30	15			**.46875**		62	31			**.96875**
31				**.484375**		63				**.984375**
32	16	8	4	**.5**		64	32	16	8	**1.**