HUDSON JET

MECHANICAL PROCEDURE MANUAL

HUDSON MOTOR CAR COMPANY
DETROIT 15, MICHIGAN, U. S. A.

FOREWORD

This edition of the Mechanical Procedure Manual will serve as a guide and reference for Hudson servicemen in the proper servicing of Hudson Jet and Super Jet models.

The data contained in this Manual includes information covering specifications, adjustments and detailed operations involved in maintenance an d repair procedures. The operations listed herein are predicated on the use of special service tools developed for the purpose where necessary and with the work done by mechanics of average ability.

The special service tools illustrated or referred to in this book are indispensable to good workmanship and in meeting standard flat rate times. They have been developed by and are available from our service tool source, the Kent-. Moore Organization, Inc., 5-105 General Motors Building, Detroit 2, Michigan, with whom order should be placed directly by Distributors and Dealers.

The Hudson Service Merchandiser is published each month by the Service Department to keep servicemen supplied with up-to-date information including suggestions and short cuts received from the Field, dealing with the servicing of Hudson cars. Read this publication regularly and make full use of the help it affords.

For easy reference, the Index at the front of the book is made up of sections in alphabetical order and with each section alphabetically arranged.

ALPHABETICAL INDEX

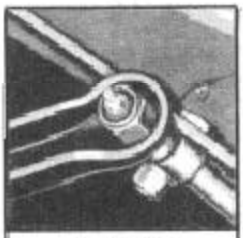
ALPHABETICAL INDEX - CONTINUED

ALPHABETICAL INDEX - CONTINUED

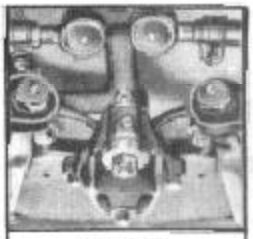
CHASSIS L

2000 MILES
GENERATOR BEARINGS
2 Points
Engine Oil

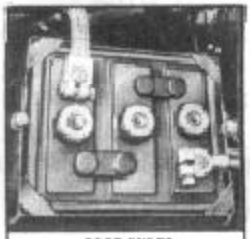
2000 MILES
AIR CLEANER—STANDARD
Wash In Gasoline And Lubricate With Engine Oil
AIR CLEANER—OIL BATH
Remove And Wash In Gasoline Pour 1 Pint Engine Oil In Cleaner Body



1000 MILES
LOWER SUPPORT ARM INNER
4 Points
Viscous Grease

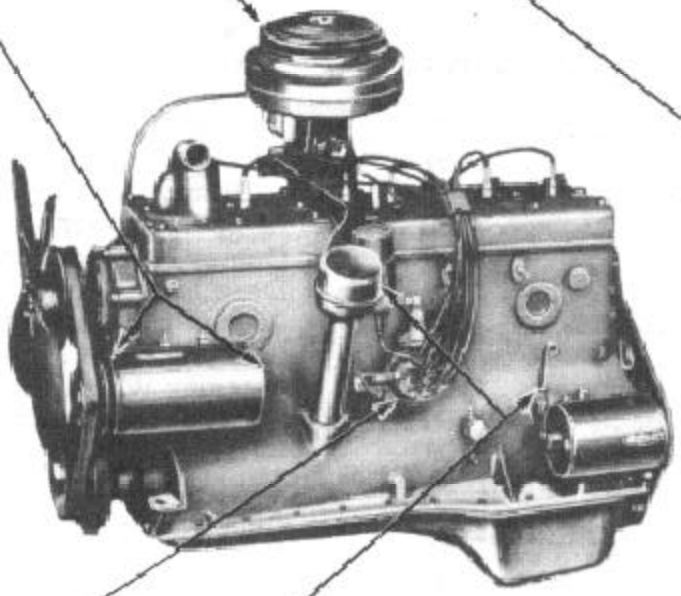


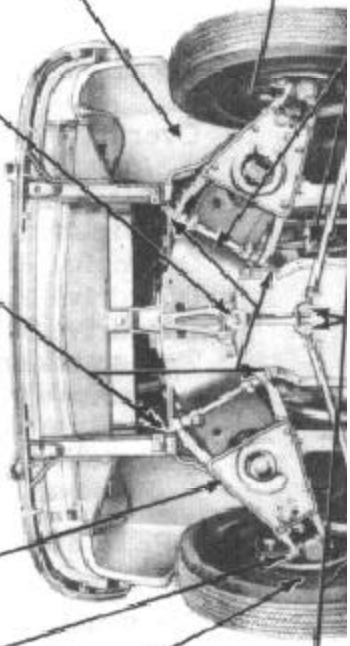
1000 MILES
CENTER STEERING ARM PIVOT BEARING
1 Point
Viscous Grease



1000 MILES
BATTERY
Add Distilled Water
Fill to ☐
Keep Plates Covered

1000 MILES
UPPER SUPPORT ARM
2 Points—Viscous G
STEERING SPIND PIVOT PINS
2 Points—Viscous G



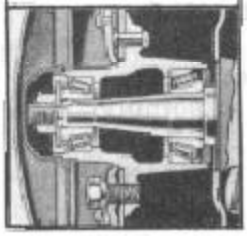


2000 MILES
DISTRIBUTOR
Contact Arm Pivot
Wick Top Of Shaft
Shaft Oil Cup
Cam Lobes
Engine Oil

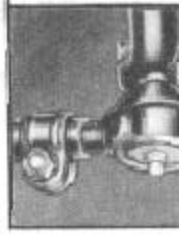
2000 MILES
CRANK CASE
Check Level Frequently
Drain And Refill—Engine Oil
(See Oil Specifications)

1000 MILES
UPPER SUPPORT ARM INNER
4 Points
Viscous Grease

1000 MILES
LOWER SUPPORT ARM OUTER
2 Points
Viscous Grease



10,000 MILES
FRONT WHEEL BEARINGS
Capacity—4 Ounces
2 Points
Milled Sodium Soap Base Grease



1000 MILES
TIE ROD ENDS
4 Points
Viscous Grease

GENERAL LUBRICATION INFORMATION

ENGINE LUBRICATION
REFILL CAPACITY

5 Quarts 4¾ Imp. Qts.—4¾ Liters

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 20W
−10	USE 10W
Below −10°	USE 5W

OR 10W PLUS 10% KEROSENE

MISCELLANEOUS POINTS
(USE HAND OILER)

Throttle Linkage	Oil All
Brake Linkage	Oil All
Hydro-Matic Drive Linkage	Oil All

BRICATION

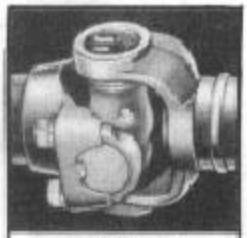
1000 MILES
G LINK—FRONT END
One Fitting
G LINK—REAR END
One Fitting
Viscous Grease

1000 MILES
STEERING GEAR
CHECK LEVEL
Gear Oil S.A.E. 90 E.P.
(Summer and Winter)

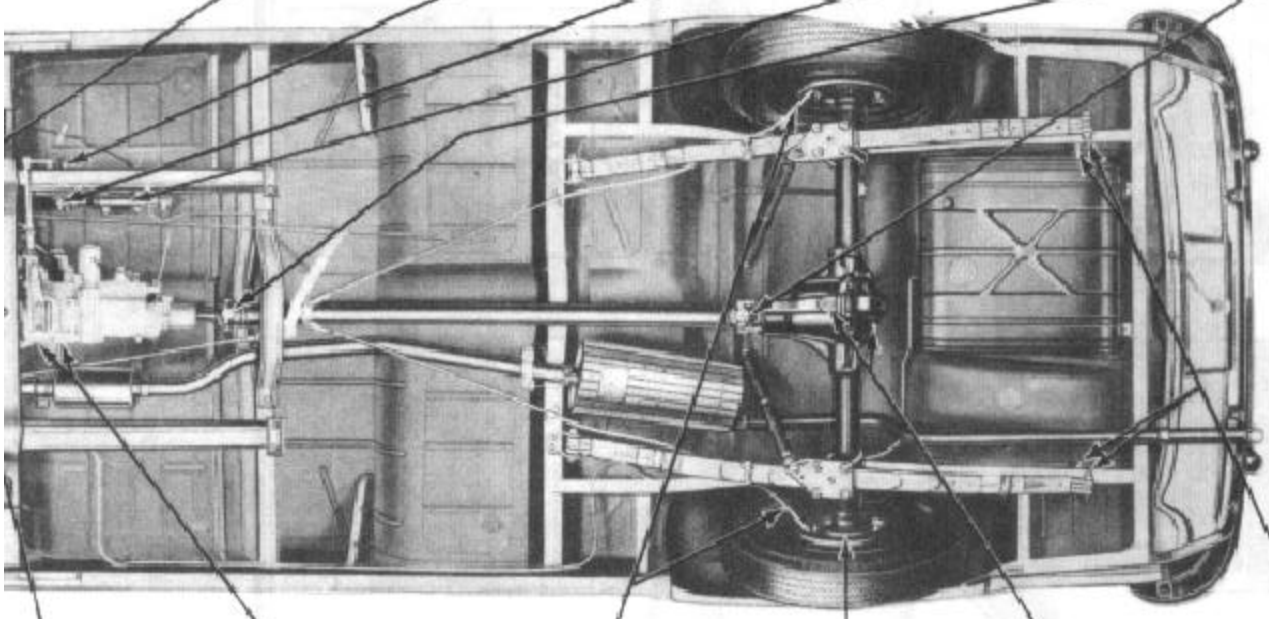
1000 MILES
CLUTCH PEDAL BEARING
1 Point
Viscous Grease

1000 MILES
BRAKE PEDAL BEARING
1 Point
Viscous Grease

1000 MILES
BRAKE MASTER CYLINDER
Check Level
Use Only Genuine
Hudson Hydraulic Brake
Fluid For All Temperatures



1000 MILES
UNIVERSAL JOINT NEEDLE
ROLLER BEARINGS
2 Points
S.A.E. 140 Gear Oil



1000 MILES
OTE CONTROL SHIFT
LEVER
1 Point
Engine Oil

5000 MILES
TRANSMISSION*
Capacity 1½ Pints
* With Overdrive 2½ Pints
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
2 Points
Viscous Grease

10,000 MILES
REAR WHEEL BEARINGS
Capacity 1½ Ounces
2 Points
Milled Sodium
Soap Base Grease

30,000 MILES
DIFFERENTIAL
Capacity 2½ Pints
Check Level Frequently
S.A.E. 90
Multi-Purpose
Gear Lubricant

1000 MILES
SPRING SHACKLES
4 Points
Viscous Grease

25,000 MILES
*HYDRA-MATIC TRANSMISSION
AIN AND REFILL.....10 QUARTS
E ONLY HUDSON APPROVED HYDRA-MATIC
VE FLUID
PTIONAL EQUIPMENT

TIRE PRESSURES
CHECK AND INFLATE AT LEAST ONCE A WEEK

SIZE	FRONT	REAR
5.90 x 15	24 pounds cold	24 pounds cold
6.40 x 15	24 pounds cold	22 pounds cold

COOLING SYSTEM
CHECK WATER LEVEL FREQUENTLY
(IN WINTER CHECK ANTI-FREEZE STRENGTH)
CAPACITY OF COOLING SYSTEM IS AS FOLLOWS:
WITH HEATER.....16 QUARTS
WITHOUT HEATER.....15 QUARTS

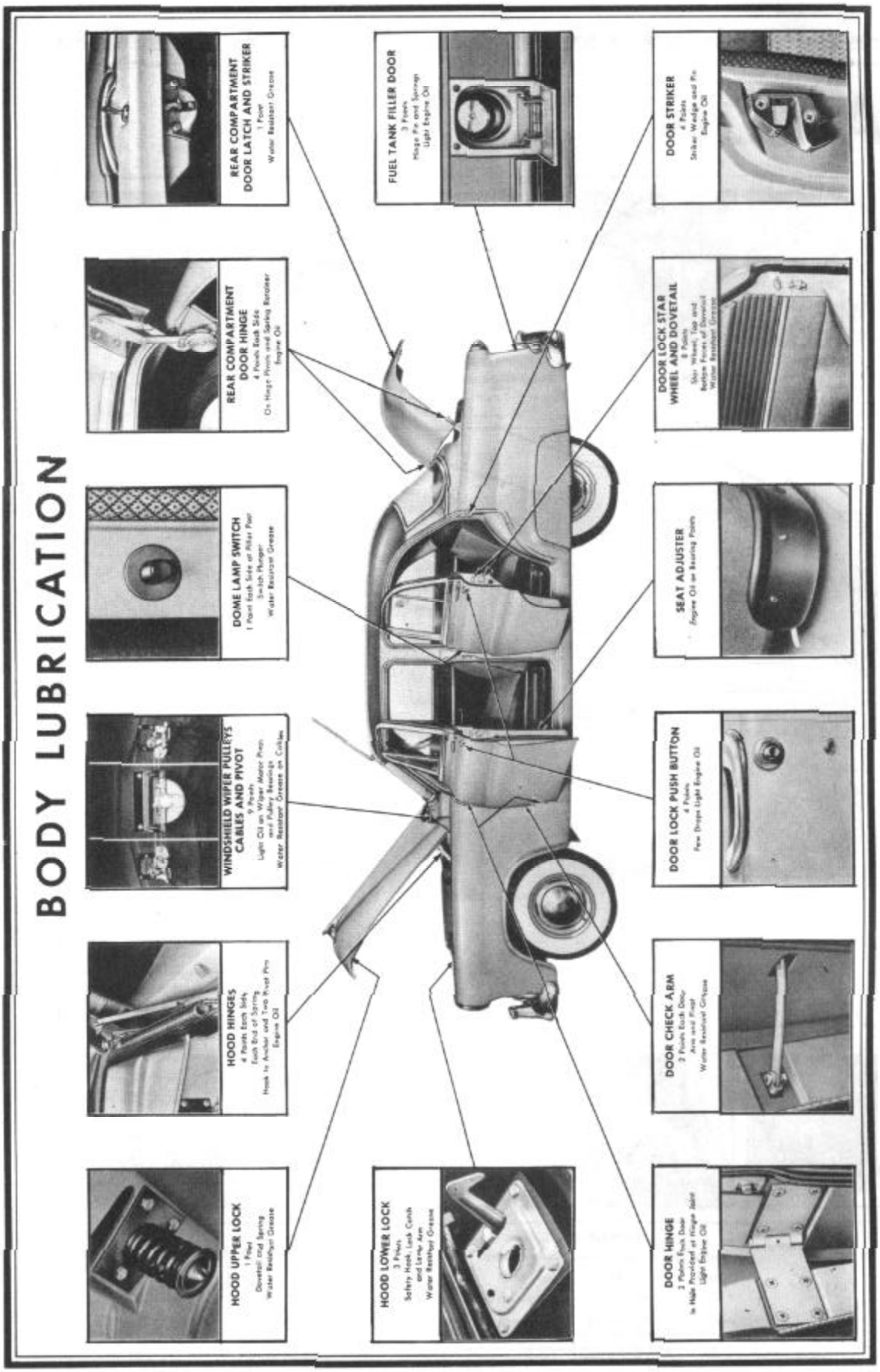

BODY LUBRICATION
REAR COMPARTMENT DOOR LATCH AND STRIKER
1 Point
Water Resistant Grease
FUEL TANK FILLER DOOR
3 Points
Hinge Pin and Springs
Light Engine Oil
DOOR STRIKER
4 Points
Striker Wedge and Pin
Engine Oil
REAR COMPARTMENT DOOR HINGE
4 Points Each Side
On Hinge Pivots and Spring Retainer
Engine Oil
DOOR LOCK STAR WHEEL AND DOVETAIL
8 Points
Star Wheel, Top and Bottom Faces of Dovetail
Water Resistant Grease
DOME LAMP SWITCH
1 Point Each Side at Pillar Post
Switch Plunger
Water Resistant Grease
SEAT ADJUSTER
Engine Oil on Bearing Points
WINDSHIELD WIPER PULLEYS CABLES AND PIVOT
9 Points
Light Oil on Wiper Motor Pivot and Pulley Bearings
Water Resistant Grease on Cables
DOOR LOCK PUSH BUTTON
4 Points
Few Drops Light Engine Oil
HOOD HINGES
4 Points Each Side
Each End of Spring
Hook to Anchor and Two Pivot Pins
Engine Oil
DOOR CHECK ARM
3 Points Each Door
Arm and Pivot
Water Resistant Grease
HOOD UPPER LOCK
1 Point
Dovetail and Spring
Water Resistant Grease
HOOD LOWER LOCK
3 Points
Safety Hook, Lock Catch and Lever Arm
Water Resistant Grease
DOOR HINGE
2 Points Each Door
In Hole Provided at Hinge Axis
Light Engine Oil

FIGURE 2

SECTION 1
LUBRICATION

Proper lubrication is the life of every piece of mechanism. This is particularly true of the motor car. Correct lubrication spells the difference between long life or rapid and premature wear.

For this reason, a definite plan and schedule for application is necessary in order to provide the various bearing surfaces with the right amount of the correct lubricant at the proper intervals.

It is a well-known fact that one type of lubricant will not suffice for all applications. The degree of load carried and operating conditions make necessary the use of different types of lubricants.

In order to familiarize Hudson mechanics on the proper lubrications of the engine, chassis and body; lubricating charts indicating points to be lubricated, type of lubricant to be used and the frequency of application are shown in this Manual.

NOTE: Quality lubricants are used in the course of assembling every new car. These need not be changed until the recommended mileage period shown in the Lubricating Schedule.

ENGINE OILING CIRCUIT

Pressure lubrication to all engine bearings is maintained by a rotor type oil pump m o u n t e d on the right side of crankcase and driven by a worm gear on the camshaft. Oil is drawn by the suction side of the pump through a pipe connecting with a floating screen fixed in the oil pan.

The oil pump parts consist of an inner and outer rotor, a shaft and the body and cover. No adjustment of the pump is required. Oil pressure is regulated by a built-in, nonadjustable release valve and spring. These are accessible for inspection or cleaning through a plug opening at the left rear side of engine.

When the engine is started, the release valve has moved to a position that closes the oil passage-way to the oil filter passageway and permits 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 all main and camshaft bearings and the valve tappets.

Through the drilled crankshaft, oil pressure from the main bearings is distributed to each connecting rod bearing. An angular hole drilled through the large end of each connecting rod and upper half of bearing shell deposits a uniform spray of oil on all cylinder walls.
Fitted in the front end of main oil gallery is an oil trough that conducts a small stream of oil to the timing chain and sprockets.

The oil measuring gauge seats on a tube pressed in the crankcase at the left rear side. A pressure type oil signal switch mounted above the oil pump and connected with the main oil gallery operates the dash oil signal light which shows red when the oil pressure drops below approximately 13 pounds

ENGINE OIL

Select oils from the well-known brands and of the proper viscosity to suit your seasonal and driving requirements.

The oil refiners or marketers supplying oils are responsible for the quality of their product and their reputation is the car owner's assurance of receiving high-grade lubricants.

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 a t 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 following table will be helpful in making this selection.

FOR	USE
90° Average Temperature	S.A.E. 30
32° Minimum Temperature	S.A.E. 20
10° Minimum Temperature	20W
-10º Minimum Temperature	10W
Below -10° Temperature,	5W. or 10W plus 10% Kerosene

Your Authorized Hudson Dealer, who has had long experience with the brands of oil available in your locality, will be glad to help you with your lubrication problems.

ENGINE OIL LEVEL - The level should be checked each time you purchase gasoline. The oil level gauge is located on the left side of the engine.

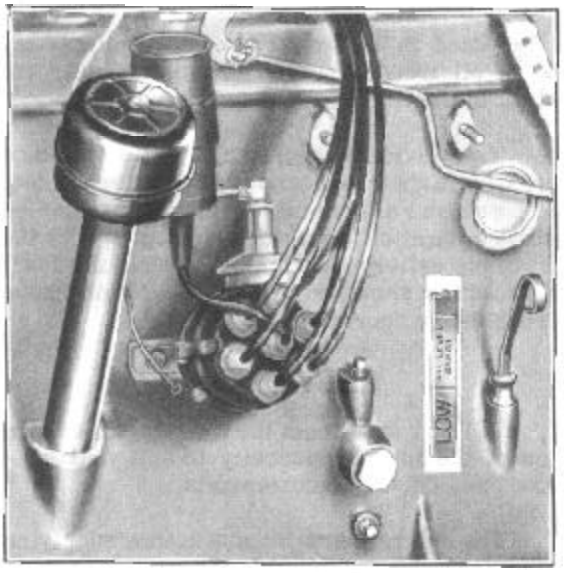


FIGURE 3

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 near the full mark. (Top line on the "Oil Level Range.") Figure 3.

To make an accurate check, it is best to wait a minute or two after shutting off the engine to permit the oil to drain back into the reservoir (oil pan). Oil is added through the oil filler opening by removing the filler cap.

WHEN TO CHANGE ENGINE OIL

The oil which is placed in the engine at the factory should b e drained and replaced after the first 500 miles of operation.

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

NOTE: Darkening or discoloration of oil does not always mean that it is unsatisfactory. But evidence of dilution or dirt is good indication that the oil should be changed and the filter cartridge should be replaced.

CAUTION: The use of flushing oils or compounds is not recommended. However, in the event they are used, the oil reservoir should be thoroughly drained before installing new oil.

ENGINE OIL CAPACITIES - The total engine oil capacity is 5-1/2 quarts. When the oil is drained in the conventional manner, the refilling quantity is 5 quarts.

Approximately two quarts of oil are required to bring the level from the "Low" to "Full" mark.

BREAK-IN OIL - Should the use of so called "break- in" oils or special compounds for breaking in new engines be decided upon, make sure the supplier guarantees that they contain no harmful ingredients.

LUBRICATION SCHEDULE

The lubricants placed in your car 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.

AT 500 MILES

Drain engine oil reservoir and refill with new oil of good quality. See "Engine Oil" - Page 4.

EVERY 1,000 MILES

VISCOUS CHASSIS LUBRICANT

	Points		Points
Drag Link	2	Center Steering Arm Pivot Bearing.	1
Upper Support Arm Outer	2	Tie Rod End	4
Upper Support Arm Inner	4	Steering Spindle Pivot Pins	2
Lower Support Arm Outer	2	Clutch Pedal Bearing	1
Lower Support Arm Inner	4	Rear Spring Shackle Bushing	4
Brake Pedal Bearing	1		

ENGINE OIL

	Points		Points
Engine	Check Oil Level	Hood Hinge	8
Door Lock Push Button	4	Windshield Wiper Pulley	4
Door Hinge	8	Remote Control Shift Lever	1
Door Striker Wedge	4	Rear Compartment Door Hinge	8
Fuel Tank Filler Door Hinge and Spring	3		

WATER RESISTANT LUBRICANT

	Points		Points
Windshield Wiper Cables at Pulleys	4	Dome Light Switch	2
Door Lock Star Wheel and Dovetail ..	8	Door Striker	4
		Hood Upper Lock	1
Rear Compartment Door Latch and Striker	1	Hood Lower Lock	2
Door Check Arm	4		

E. P. GEAR LUBRICANT - S.A.E. 80 WINTER, S.A.E. 90 SUMMER

Transmission	Check Level	Steering Gear	Check Level
Overdrive	Check Level		

HYDRA-MATIC DRIVE FLUID

Hydra-Matic Drive Transmission — Check Level

MULTI-PURPOSE GEAR LUBRICANT - S.A.E. 140

Rear Axle Check Level

GEAR OIL - S.A.E. 140

Universal Joint Needle Rollers — 2 Points

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

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EVERY 2,000 MILES

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

ENGINE OIL

Engine - Drain Oil Reservoir and Refill. See "Engine Oil," Page 4.		Air Cleaner - Oil Bath - Remove, wash and add new oil.	
Generator	2 Points	Oil Filler Pipe Cap - Wash and Re-oil.	
Distributor	4 Points	Throttle Operating Linkage	All Joints
Air Cleaner - Standard - Wash and Re-oil		Brake Operating Linkage	All Joints

EVERY 5,000 MILES

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

Oil Filter — Renew cartridge

E. P. LUBRICANT - S.A.E. 80 WINTER, S. A. E. 90 SUMMER

Transmission	Drain and Refill	Overdrive	Drain and Refill

VISCOUS CHASSIS LUBRICANT

Brake Cables — Clean and Lubricate

EVERY 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

If springs are equipped with metal covers use Viscous Chassis Lubricant using special lubricating clamp. If springs do not have metal covers, do not lubricate.

MULTI-PURPOSE GEAR LUBRICANT - S.A.E. 90

Rear Axle — Drain and Refill

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.

Hydra-Matic Oil Level Indicator — Clean

SODIUM SOAP BASE LUBRICANT

Front Wheel Bearings	Remove, Clean and Repack
Rear Wheel Bearings	Remove, Clean and Repack

VERY 25,000 MILES

HYDRA-MATIC DRIVE FLUID

Hydra-Matic Drive Transmission — Drain and Refill

SECTION 2
ENGINE TUNE-UP
SPECIFICATIONS

Cylinder Compression	Minimum 100 lbs.
Vacuum, Intake Manifold	17-20" Hq.
Valve Tappet Clearance (Hot)	Intake .010" - Exhaust .012"
Battery Specific Gravity	1.270
Starting Motor	
Cranking Voltage	5 0 Volts
Cranking Amperage	Approximately 160 Amps
Stall Test:	
Volts	2 0 Volts
Amperes	Maximum Amps 280
Torque	Min. Ft. Lbs. 4.4
Coil Amperage Draw:	
Engine Stopped	5.0 Amps
Engine Idling	1 5 - 2.0 Amps
Distributor:	
Point Gap	.020"
Cam Angle - (Dwell)	39º
Spring Tension	17 to 20 oz.
Condenser Capacity	21-25 Mfd.
Advance: Automatic	Vacuum
0° at 300 R.P.M.	0° at 5-1/4"
1° at 350 R.P.M.	1° at 5-3/4"
4.5° at 500 R.P.M.	4° at 7-1/2"
12° at 1325 R.P.M.	6° at 8-3/4"
13.5° at 1500 R.P.M.	7.5° at 9-1/2"
Generator Output:	
Cold - at 870 to 970 R.P.M	6 4 Volts 0 Amps
Cold - at 1925 to 2125 R.P.M.	8.0 Volts 45.0 Amps
Hot - at 950 to 1050 R.P.M	6.4 Volts 0 Amps
Hot - at 2350 to 2550 R.P.M.	8.0 Volts 45.0 Amps
Voltage Regulator:	
Contact Point Gap	Minimum .015"
Contact Close	6.3 to 6.8 Volts
Contact Open (After 15 Amp Charge)	4.1 to 4.8 Volts
Voltage Regulator Operates	7.25 Volts 22 Amps at 100° F.
Spark Plug Gap	.032"
Fuel Pump (Carter)	
Pressure	4 lbs. min. - 5 lbs. max. @ 1800 R.P.M.
Volume	1 quart 60 seconds 500 R.P.M.
Carburetor	Carter - Model WAI-2009S
Float Setting	1/2"
Pump Travel	16/64"
Idle Adjustment	1/2 to 1-1/2 turns open
Climatic Control	Set one point lean

ENGINE TUNE-UP

Engine tune-up is important in maintaining engine performance, fuel economy, dependability, and complete owner satisfaction. Modern high speed engines demand accurate diagnosis and adjustments. It is recommended that the engine be tuned every 5,000 miles.

The tune-up procedure that follows is arranged in the usual order of performance, which is generally: compression, ignition, carburetion. Various manufacturers of testing equipment have set up specific procedures for their units which may be followed.

Many of the tests involved in the tune-up are dependent upon a battery in good condition. If the battery is below standard it should be recharged, or replaced with a fully charged battery before the tune-up.

ENGINE

COMPRESSION

An engine that fails to develop proper compression cannot be tuned. Compression should be checked with the engine at operating temperature with a reliable compression gauge. Test is made with ignition switch off and all plugs removed.

1. Loosen spark plugs to break free any accumulated carbon.
2. Use an air hose and blow out all dirt and carbon from spark plug cavities before removing plugs.
3. Remove all plugs.
4. Insert compression gauge in each spark plug hole in turn and crack engine with starter at least 4 compression strokes.

NOTE : Check reading on first and final stroke.

5. Compression at each cylinder should be at least 100 pounds and should not vary more than 10 pounds.

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

To differentiate between ring and valve leak, place a small quantity of oil on top of each piston and re-test. Oil will temporarily seal a ring leak and result in near normal compression. Little or no improvement will be noted if valve is leaking.

Correct any unsatisfactory condition found during the compression test before continuing with the tune-up.

SPARK PLUGS

Upon satisfactory completion of the compression test, inspect, clean and adjust spark plugs.

1. Spark plugs with burned, blistered or cracked porcelains, o r with pitted o r burned electrodes, should be replaced with new plugs of the same type. For cast iron and aluminum cylinder heads, use Champion H-8 spark plugs. See "Electrical Section".
2. Adjust spark plug gaps to .032" using a bending tool and wire loop gauge.
3. Install new gaskets on the plugs and replace plugs in cylinder head. Tighten to 25 to 30 pounds with a torque wrench.
4. Examine spark plug wires for loose terminals, cracked or broken insulation. Replace defective wires.

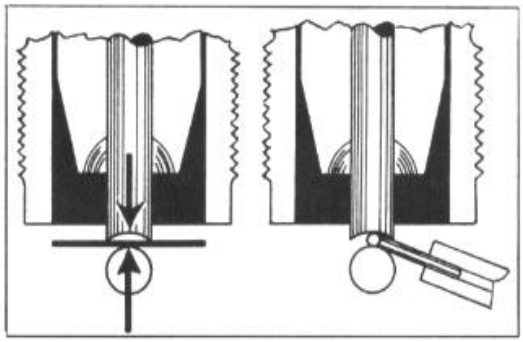

FIGURE 1

VACUUM TEST

An engine in good :condition - will show a steady, or slight fluctuating , high vacuum reading from 18" to 21". Vacuum readings are affected by altitude. Over 2000 feet the vacuum gauge will show about one inch lower for each 1000 feet of elevation.

1. Remove wiper hose at intake manifold and connect vacuum gauge hose. (If the engine has a combination fuel and vacuum pump,disconnect the booster pump line at intake manifold.)

2. Check carburetor and intake manifold nuts for tightness.

3. Connect one lead of tachometer to the distributor primary terminal and the other lead to engine for ground. Adjust carburetor to obtain a smooth idle at 540 to 580 R.P.M. If car is equipped with Hydra-Matic Transmission, set idle speed at 490-510. Vacuum readings at sea level may be interpreted generally as follows:

18 - 21" Steady or with slight fluctuation: Engine in good condition.
15" Steady: Incorrect ignition timing.
10" Steady: Incorrect valve timing, or burned valves.
15 - 21" Fluctuating: Sticking valves or compression leak.
12 - 16" Drifting: Carburetor too rich or too lean

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Any number of engine conditions may cause the same action of the vacuum gauge. The exact cause must be established by process of elimination.

VALVE TAPPETS

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

Correct valve clearances are .010" for intake valves, .012" for exhaust valves.

TAPPET ADJUSTMENT

1. Raise front of car, place stand jack under frame cross member and remove right front wheel.

2. Remove bolts on the fender side dust shield and attaching parts and take out shield from under the fender.

3. Remove front and rear tappet covers and breather pipe . Take out the rear tappet cover by sliding cover forward and out.

4. Adjust tappets and re-install parts.

CYLINDER BALANCE TEST

The Cylinder Balance Tester compares the eveness of the power output of each cylinder in the engine.

1. Connect the vacuum gauge in Figure 2 and set the throttle until engine is running at 1500 R.P.M.

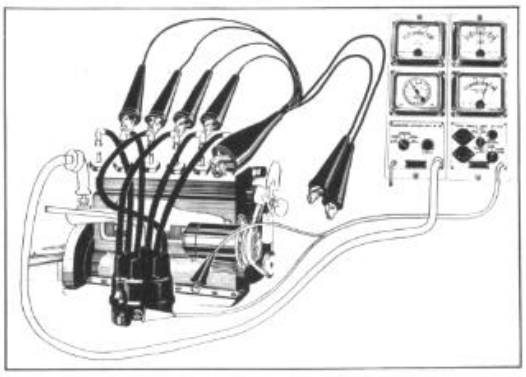


FIGURE 2

2. Ground the master clip of the cylinder balance tester and connect individual leads to the spark plugs 2-3-4 and 5. Engine will now run on 1 and 6.

3. Note the reading on the vacuum gauge. Make the same test on each pair of cylinders in the following sequence. 6 Cylinders 1-6, 2-5, 3-4.

NOTE: A variation of more than 1 inch of vacuum or 40 R.P.M. between pairs of cylinders being tested indicates either a defective plug or unequal compression in a cylinder.

To isolate one weak cylinder, short out half the cylinders. The half giving the lower reading will include the weak cylinder.

Air bubbles prevalent in the radiator filler neck (radiator filled with coolant to th e overflow pipe) indicates a leaking cylinder head gasket, cylinder head or internal cracks in the water jackets.

An extreme blow-by at the oil filler pipe indicates defective piston rings. (Compression pressure by-passing the piston rings.)

BATTERY SPECIFIC GRAVITY

Check the battery specific gravity with a hydrometer. A battery when fully charged should read 1.270 specific gravity at 70° F. A uniform hydrometer reading below 1.225 at 70° F. indicates a low battery that should be recharged.

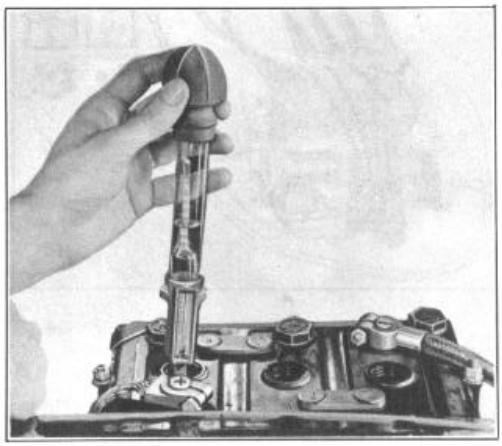


FIGURE 3

BATTERY LOAD TEST

Battery may be tested under load by connecting a voltmeter across the terminals and cranking the engine. Battery is satisfactory if it will crank the engine for 1/2 minute and the voltage does not drop below 4-1/2 volts. Slow cranking speed or lower voltage may be due to high resistance in the starter circuit. Check cables and retest. (DO NOT crank for more than 1/2 minute at a time.)

A standard cell tester may be used to make the load test. The cell tester has a shunt across the terminals which places each cell under load. Each cell should show 1-1/2 volts or over, and the variation between cells should not exceed .15 volts.

If a Starter-Battery Tester is not available, a voltmeter can be connected across the battery terminals while cranking t he engine with the starting motor. The battery is in good condition if the starter cranks the engine at a good speed for 1/2 minute and the voltage does not fall below 4-1/2 volts. DO NOT crank for more than 30 seconds without allowing starter motor to cool.

NOTE: A slow cranking speed or voltage lower than 4-1/2 volts indicates a weak cell or high resistance in the connections to the starter. Check battery cables and connections and repeat the "Load Test".

DISTRIBUTOR

1. Remove wires from cap anu inspect cap and rotor for cracks and burned or corroded contacts. Replace defective parts.

2. Clean spark plug cable sockets with tool No. KMO-230.

CONTACT POINTS

1. Inspect distributor contact points f o r alignment, corrosion, burning o r pitting and clean with carbon tetracholoride.

2. Replace burned or corroded points. If points are badly pitted, check condenser for over or under capacity.

3. With a feeler gauge set the points for the proper gap. Correct gap is .020".

NOTE: Contact points adjustment is made by loosening the clamp screw (B) Figure 4, holding

the stationary contact plate, then turning eccentric adjusting screw (D) to move the contact point. Tighten clamp screw when correct gap is secured.

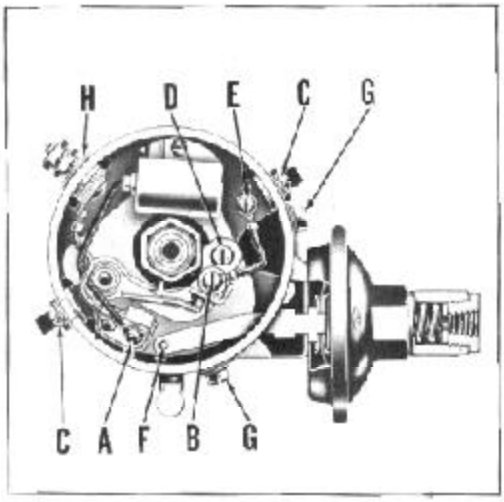


FIGURE 4

4. Bend stationary contact point if necessary to secure correct alignment.

BREAKER ARM SPRING TENSION

1. Hook a spring scale to the breaker arm at the contact and pull at right angles to the contact surfaces. Tension should be 17 to 20 ounces just as the points open.

2. Adjust spring tension by loosening screw attaching breaker arm spring to plate and move end of spring in or out of clip as necessary.

CONDENSER

1. Inspect condenser lead to see that it is not frayed or broken and is connected securely to breaker arm clip. Condenser mounting screw must make tight ground to breaker plate. Ground wire from breaker plate to subplate must be securely connected.

Check condenser with suitable equipment and if capacity is not within range of .20 to .25 MFD, replace with new part.

DISTRIBUTOR DWELL TEST

Check distributor cam angle or dwell on a distributor tester to determine the cam angle or degrees of dwell of the distributor point. This should be 39 degrees with distributor contact point set at .020".

If the dwell angle is too great, the contact point gap is set too close. If the dwell angle is too small, the contact gap is too wide. An erratic reading of the Dwell Meter will indicate faulty contact, a faulty breaker plate, a worn distributor shaft and bearings. A change of dwell angle when accelerating or deaccelerating, the engine will indicate a faulty breaker plate, bearing or support plate.

VACUUM ADVANCE ADJUSTMENT

Vacuum should be checked on a distributor tester that has a controlled source of vacuum and a vacuum gauge

. If the vacuum advance range does n ot conform with specifications, it may be varied by inserting or removing washers under the sp r in g in the vacuum chamber. Carefully check for leaky diaphragm and sticking linkage.

AUTOMATIC ADVANCE

Place distributor on tester and check the advance curve R.P.M.'s against the degree of advance.

If the degree of advance 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.

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

In most cases, the tension of the spring may be increased or decreased by bending the brackets on the weight plates to which the springs are attached, in order to make the springs conform to specifications.

Check the advance both up and down the speed range so that the sluggish action of the governor 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.

COIL

If a faulty coil is ,suspected, the coil should be tested with a test light or approved coil testing equipment.

A quick test with the coil on the car can b e made by removing the high-tension wire from the center of distributor cap and hold end of wire 1/4" from cylinder head and while cranking engine, if a spark occurs regularly the coil can be considered satisfactory.

IGNITION TIMING

1. Place a chalk mark on the long line before No. 1-U.D.C. on the vibration dampener, Figure 5.

FIGURE 5

2. Connect one lead of the power timing light to No. 1 spark plug and the other lead to the negative terminal of the battery.
3. With the engine idling properly, the timing light flash should occur when the chalk mark is in line with the pointer on the timing chain cover.

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

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

To set the timing without a timing light, remove No. 1 spark plug and crank engine until No. 1 piston starts up on compression stroke. Continue cranking until long line on dampener lines up with pointer. Loosen distributor quadrant screw and rotate distributor clockwise to the limit of the slot in the quadrant. Remove secondary wire from center of distributor cap and hold bare end of wire about 1/8" from the cylinder head. With ignition switch on, slowly rotate the distributor counterclockwise just until a spark jumps from the wire to the cylinder head; then tighten quadrant screw.

Spark setting may be advanced with fuels of high octane rating.

Correct ignition timing is indicated by a slight "ping" at about 15 M.P.H. when accelerating at full throttle from 10 M.P.H. in high gear. If no "ping" is heard, timing should be advanced one quadrant graduation mark at a time until the "ping" is heard.

CRANKING VOLTAGE

1. Connect the negative voltmeter lead to the starter switch terminal (where the battery to starter cable is connected), Figure 6.

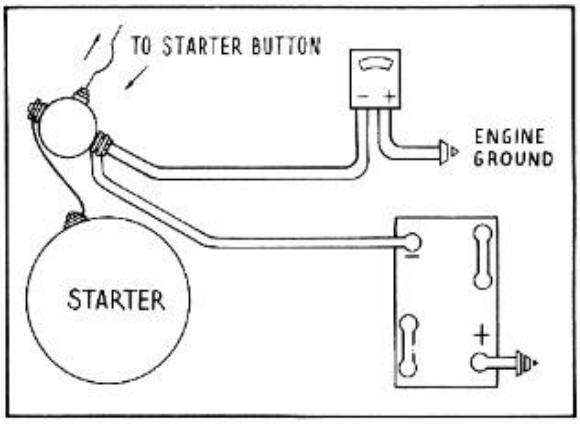


FIGURE 6

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

3. With the ignition key off, engage the starter motor and note the 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.

volts, check the battery and engine ground cables, starter cable and the starter solenoid to determine the low reading.

BATTERY AND ENGINE GROUND STRAPS

1. Connect the voltmeter positive lead to the battery ground terminal, Figure 7.

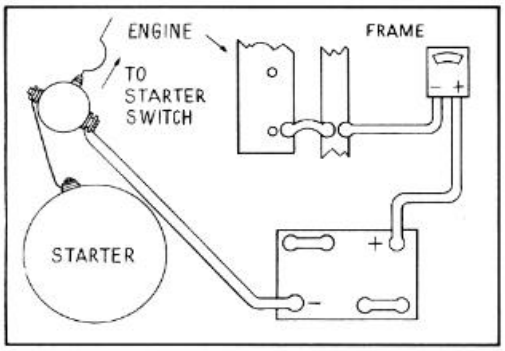


FIGURE 7

2. Connect the voltmeter negative lead to engine ground and a jumper to the frame.
3. With ignition off, crank engine and make volt meter reading, (should not be more than .2).
4. If more than .2, check ground strap connections from battery to engine. Replace defective ground straps.

STARTER CABLE

1. Connect the positive voltmeter lead to the "BAT" terminal of the starter and the negative lead to negative battery post.
2. Crank engine again (ignition off). If the voltmeter reading is more than .2, check for loose connections or frayed cables.

STARTER SOLENOID

1. Connect negative voltmeter lead to "BAT" terminal of starter solenoid switch and positive lead to motor terminal of the solenoid switch, Figure 8.
2. Close the solenoid electrically to crank the engine; and if the reading is more than .2 volts, replace solenoid switch.

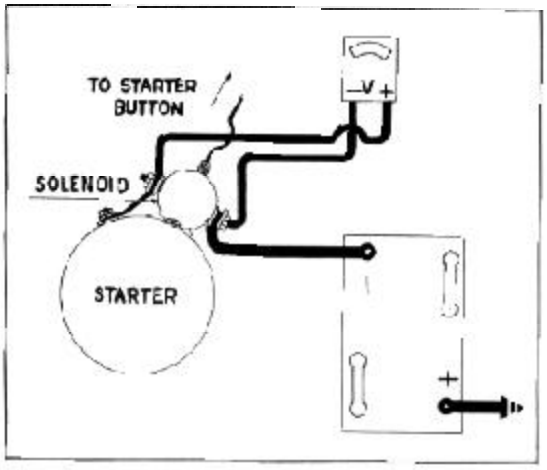


FIGURE 8

AMPERAGE DRAW TEST

1. Turn battery starter test know to "off" position and the voltmeter "selector switch" to the 15 volt position and connect test leads, Figure 9.

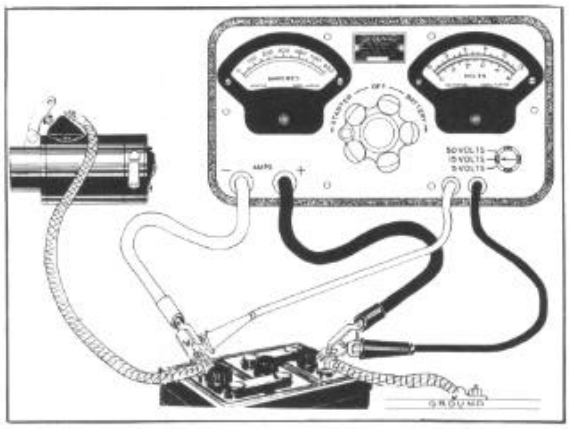


FIGURE 9

2. Press starter switch and crank engine for approximately 15 seconds and note the "exact" reading on voltmeter.
3. Release Starter Switch and turn Starter-Battery Tester knob clockwise until the voltmeter reads "exactly" the same as when cranking the engine. Ammeter reading should be 140 to 160 amperes (engine warm).

4. Turn tester to off position after completing test.
NOTE: Excessively high readings 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 indicates excessive resistance in the circuit caused by loose connections, worn brushes, or weak brush spring tension.

FAN BELT ADJUSTMENT

1. Loosen generator adjusting bracket bolt (A - Figure 10), Nut (B) and 2 generator support bracket bolts (D), three to four turns.
2. Apply a torque wrench approximately 12" long and as nearly vertical as possible to head of generator adjusting bracket bolt (C) and pull generator against fan belt.
3. With torque wrench indicating 10-1/2 foot pounds tighten generator adjusting nut (B) securely. Remove torque wrench and tighten - remaining 3 bolts securely.

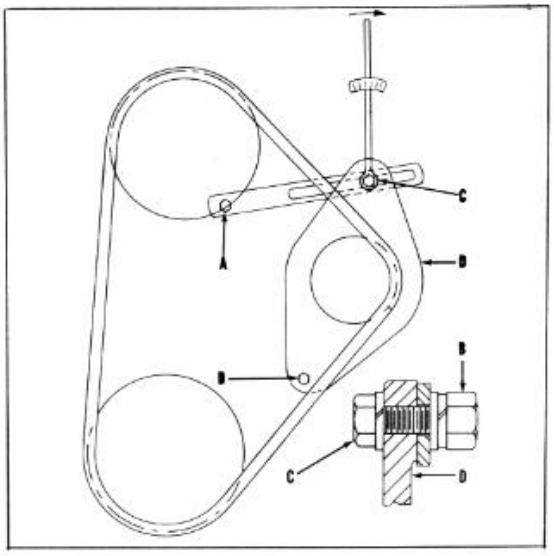


FIGURE 10

GENERATOR

GENERATOR OUTPUT CHECK

1. Disconnect battery lead at voltage regulator "B" terminal; connect the ammeter negative lead to the regulator "B" terminal and the positive lead to the wire disconnected from the regulator, Figure 11.

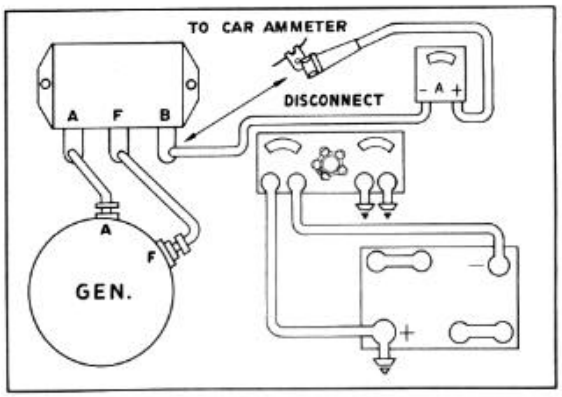


FIGURE 11

2. Install a jumper from generator field terminal to a ground. Momentarily raise the engine to about 1250 R.P.M. the reading on the ammeter should read 45 amperes minimum output.

CAUTION: The engine MUST NOT be run for more than a few seconds while making the above test, due to danger of burning out the generator. All lights and accessories must be turned off also to prevent damage due to excessive voltage.

NOTE: A 11 generator tests should be made with the generator circuit at normal operating temperature.

GENERATOR CIRCUIT RESISTANCE CHECK

1. Disconnect battery lead at voltage regulator "B" terminal; connect the ammeter negative lead to the regulator "B" terminal and the positive lead to the wire disconnected from the regulator, Figure 12.

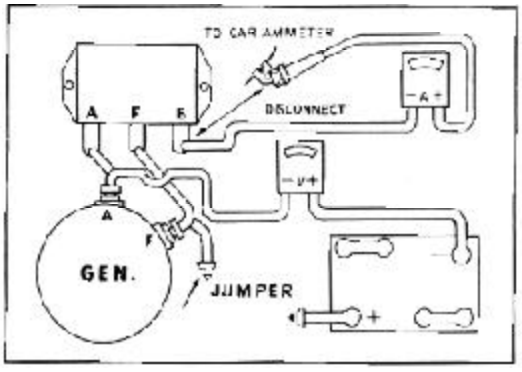


FIGURE 12

2. Install the negative voltmeter lead to the generator "A" terminal an d the positive voltmeter lead to the battery negative terminal.
3. Connect a jumper between t he generator "F" terminal and a ground.
4. Run the engine at a speed to deliver 20amperes. The voltmeter should not read more or less than 8 (tenths) of a volt.
5. If the resistance is more than .8, make the following checks with the ammeter connected as in paragraph 1.
   a. Remove the positive voltmeter lead from the battery and install to the "A" terminal at the voltage regulator. Ammeter should show less than .1 (tenth).
   b. Connect the voltmeter negative lead to the regulator "A" terminal and the volt- m e t e r positive lead to the regulator "B" terminal. Ammeter should not show more than .3 (tenths).
   c. Next, connect the voltmeter positive lead to the battery negative terminal, negative lead to "B" terminal on regulator. Ammeter should not show more than .5 (tenths).
   d. Connect the voltmeter positive leads to en g in e ground, negative wire to base of regulator. Ammeter should show .2 (tenths) or less.

CIRCUIT BREAKER CHECK

To determine whether the circuit breaker points are closing at the proper generator voltage and also whether they will open upon deceleration by amperage from the battery proceed as follows:

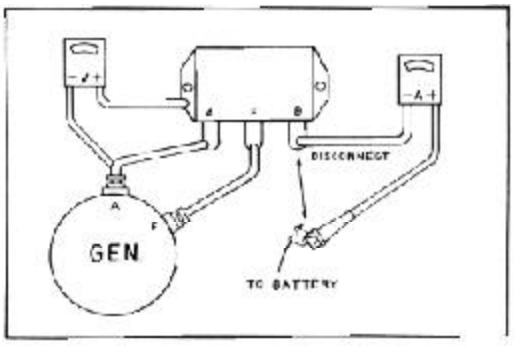


FIGURE 13

1. Disconnect the battery wire at the voltage regulator "B" terminal and connect the ammeter between the voltage regulator " B" terminal and the wire disconnected, Figure 13.
2. Connect voltmeter positive lead to base of regulator and negative voltmeter to the generator "A" terminal.
3. Set carburetor adjusting screw so engine will idle at approximately 400 R.P.M.
4. Increase engine R.P.M. by carefully rot a t in g the accelerator bellcrank while watching the voltmeter.

NOTE: When the voltmeter reads at any point between 6.3 to 6.8 volts the circuit breaker points should close and the ammeter will show the generator is charging. When the circuit breaker points close, a slight drop back of the voltmeter needle will be noticed. In the eve nt the drop back is not evident, slightly discharge the battery and recheck.

5. Next, slowly reduce engine speed and watch the ammeter.

NOTE: When the ammeter reads 4 to 6 amperes, negative side of zero, the circuit breaker should open and the ammeter needle will return to zero. Perform operation 4 and 5 several times until you are sure your readings are correct.

6. Proper adjustments can be made by bending the spring hanger on the circuit breaker. Increasing the tension raises the opening voltage; decreasing the tension lowers the opening voltage. Contact gap must not be less than .015".

VOLTAGE REGULATOR CHECK

1. Disconnect the battery wire at the voltage regulator "B" terminal and connect the test ammeter between the voltage regulator "B" terminal and the wire disconnected, Figure 14.
2. Connect the voltmeter positive lead to the regulator base and the negative lead to the regulator "B" terminal.
3. Run engine at approximately 2,000 R.P.M.
4. Vary resistance until ammeter reads 19 amperes and then check the voltmeter reading which should be 7.25 volts. (Hot, cover in place.)

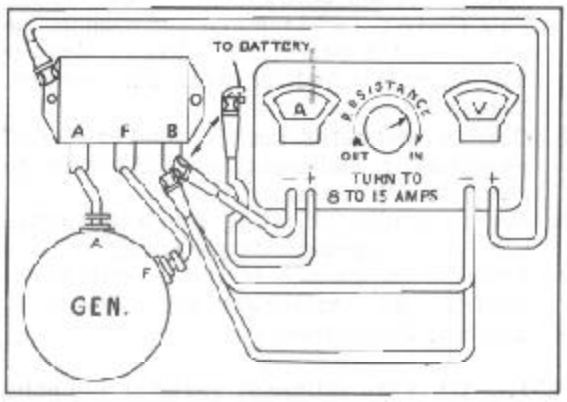


FIGURE 14

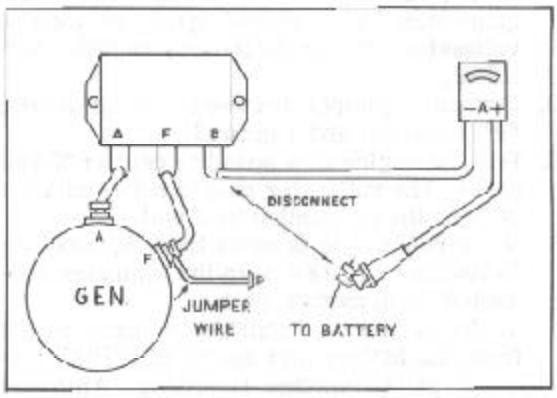


FIGURE 15

NOTE: If the car is out of warranty the voltage regulator can be set by bending the spring hanger to get this necessary reading. The unit must be final-checked with the voltage regulator cover in place as generally it will change the reading from .1 to .2 of a volt and must be compensated for in making this adjustment.

5. Stop engine, disconnect battery negative terminal and then proceed to remove the tester leaks from the voltage regulator and install the wires back on the "B" terminal of the regulator.

6. Install voltage regulator cover.

VOLTAGE REGULATOR ADJUSTMENT

1. Remove cover and change the armature spring tension by bending the lower spring hanger. Increasing the tension raises the operating voltage; decreasing the tension lowers it.

2. Replace cover and recheck.

3. After each adjustment, stop the engine and restart. Bring up engine speed to deliver 15 amperes before taking a reading.

CURRENT REGULATOR CHECK

1. Disconnect the battery wire terminal "B"and connect the test ammeter between the voltage regulator "B" terminal and the wire disconnected, Figure 15.

2. Connect a Starter-Battery Tester directly across the battery and set load to 45 amperes or use the equivalent in sealed beam lamps.

3. Run engine to approximately 2000 R.P.M. amperage reading should be 36 amperes. If it is not within a tolerance of one or two amperes of this reading, the unit should be taken to an authorized Auto-Lite dealer for replacement.

NOTE: If car is out of warranty, remove the voltage cover and adjust the current regulator spring hanger to the necessary 36 ampere output. To prevent operation of the voltage regulator unit place a jumper across voltage regulator points during this test. For final test always replace the cover on the unit.

CAUTION: Momentarily touch t he negative battery cable to the battery negative post to determine that there is no spark between the battery negative post and cable terminal then connect negative cable.

CURRENT REGULATOR ADJUSTMENT

1. Remove cover and change armature spring tension by bending the lower spring hanger. Increasing the tension raises the operating amperage, decreasing the tension lowers it.

2. Replace cover and recheck. Stop and start engine after each adjustment. Take readings with cover in place.

FUEL PUMP

FUEL PUMP TEST

To determine if the fuel pump is operating properly, make the following tests:

1. Be sure fuel lines are not blocked, leaking or have a stricture that would retard the flow of fuel to the pump. The flexible hose should be carefully checked for deterioration or cracks.

2. Remove and clean sediment screen.

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

3. Make sure all connections are tight after replacement.

4. Disconnect the fuel line at the carburetor and connect the fuel pump gauge, Figure 16.

5. Start engine and run at 1800 R.P.M. normal pressure should be 4 lbs. minimum to 5 lb s . maximum. Stop engine and watch pressure gauge. Pressure should not fall perceptible after engine is stopped.

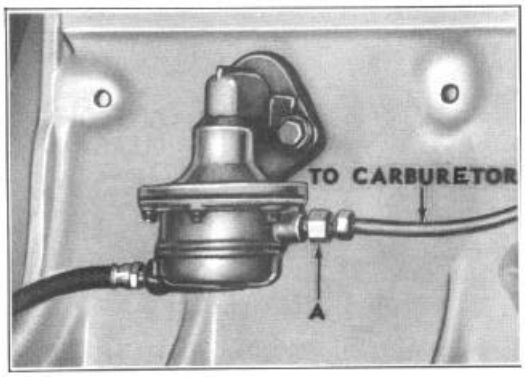


FIGURE 16

6. If pressure falls; leaking pump valves are indicated.

7. If pressure is below specifications, attach the vacuum gauge to the inlet port of the pump and operate the engine. Gauge should show a minimum of 6 inches of mercury for satisfactory operation.

VACUUM BOOSTER CHECK

To check the action of the vacuum portion of the combination fuel and vacuum pump, connect a vacuum gauge to the inlet port and disconnect outlet. Gauge should show 8-1/2" of mercury at 120 R.P.M. and 12" at 1800 R.P.M.

MANIFOLD HEAT CONTROL

Check the manifold heat control valve to see that spring is in good condition and valve is free. If damper shaft is stuck, remove the thermostat and spring, apply penetrating oil or kerosene and tap shaft for end play to break carbon or corrosion. The shaft should not be oiled. When properly freed, check springs and thermostat before installing and replace them if weak.

CARBURETOR

CLIMATIC CONTROL

1. Remove t he carburetor Climatic Control Cover. Check the heat control tube for leaks or obstruction and the choke valve and piston for free movement. Choke valve should open of its own weight when cover is removed.

2. Reinstall the cover with graduations down and rotate counter clockwise to one point lean of center graduation.

CARBURETOR INLET STRAINER

1. Remove bowl cover strainer nut, gasket, and strainer screen. Clean screen and replace if corroded or damaged.

CARBURETOR FLOAT LEVEL

1. Remove air cleaner, carburetor dust cover and screws attaching carburetor air horn.

2. Disconnect throttle connector r o d, bowl cover and check float level with gauge J-818-1 Figure 17. Float level should be 1/2".

3. To adjust, make sure needle is seated, raise float and press down on float lever lip with a screw driver. Bend only a small amount at a time and do not disturb the curvature of the lip.

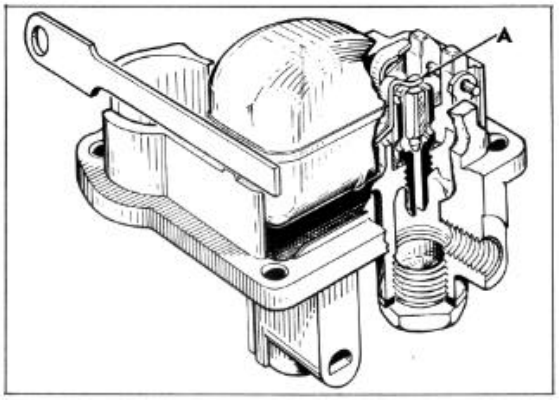


FIGURE 17

PUMP TRAVEL

1. With throttle valve seated and connector link i n lower hole (short stroke) pump travel should be 16/64". Use Carter Pump stroke gauge T-109-117-S if available.
2. Adjust pump travel by bending throttle connecting link at lower angle.

METERING ROD SETTING

NOTE: The correct setting of metering rod is important and must be made after pump adjustment o r when leaner than standard rods are installed.

1. With air cleaner and dust cover off remove hairpin clip and disconnect spring from metering rod, remove metering rod and disc.
2. Insert metering rod gauge, J-1265 (Carter No. T-109-102). Hold gauge vertical and be sure gauge is seated in metering rod jet, Figure 18.
3. Press down on vacuum piston link directly over piston until it contacts the pump arm. Clearance between metering r o d pin and shoulder of gauge should be less than .005" with throttle valve seated. Gauge must not drag on pin.
4. Adjust by bending lip on piston link at (A). 5. Re move gauge and install metering rod and disc and connect metering rod spring.

ANTI-PERCOLATOR ADJUSTMENT

NOTE: Carburetor must be removed from engine.

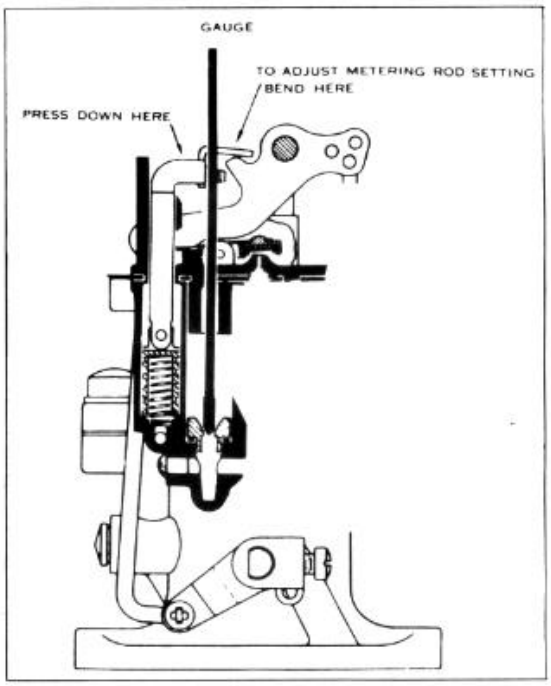


FIGURE 18

1. Crack throttle valve .020" by placing gauge J-1633 (Carter No. T-109-29) between throttle valve and bore of carburetor on side opposite the idle port, Figure 19.

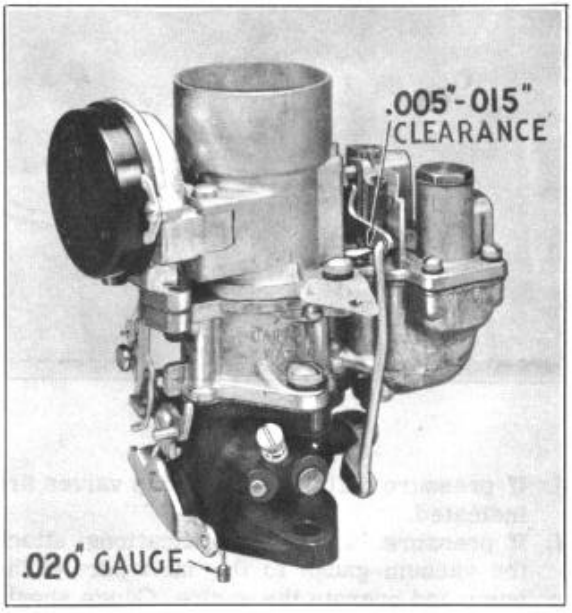


FIGURE 19

2. Clearance between percolator rocker arm lip and pump arm should be .005" to .015"

3. Adjust by bending the rocker arm, using Bending Tool J-1389 to make this adjustment.

FAST IDLE ADJUSTMENT

1. With fast idle cam in normal idle position, tighten throttle lever adjusting screw (A), Figure 20, until it just seats against the cam.

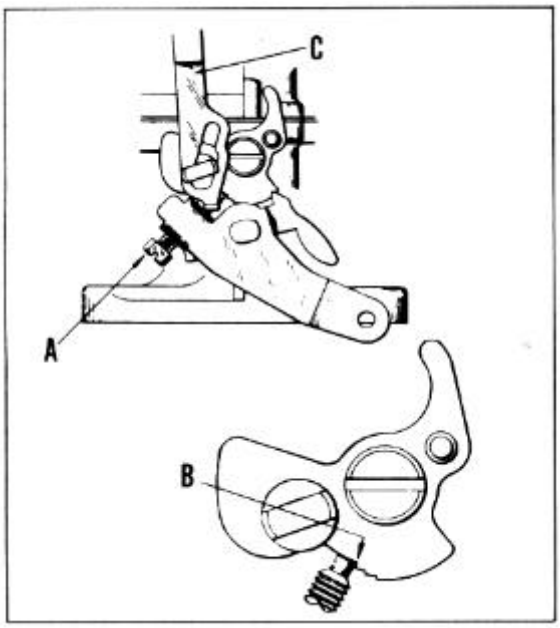


FIGURE 20

2. Hold throttle lever closed an d pull cam back until low step is against but not on set screw (B), Figure 20.

3. Clearance between lower edge of choke valve and air horn should be 5/8" as shown at (A), Figure 21.

4. Adjust by bending fast idle link at offset.

UNLOADER ADJUSTMENT

I. Open throttle wide and check clearance between lower edge of choke valve and air horn. Clearance should be 7/16" (A), Figure 21.

2. Adjust by bending cam (B) on throttle lever.

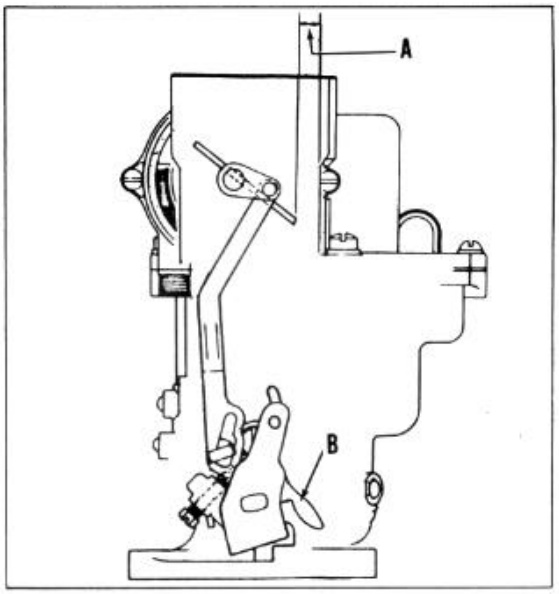


FIGURE 21

IDLE ADJUSTMENT

1. Start engine and allow to warm up.
2. See that choke valve is wide open.
3. Set idle adjustment screw (A), Figure 22, 1/2 to 1-1/2 turns open to obtain smooth idle. Cars equipped with Hydra-Matic; set idle at 490-510 R.P.M., 540 to 560 for standard transmission and 575 for overdrive.

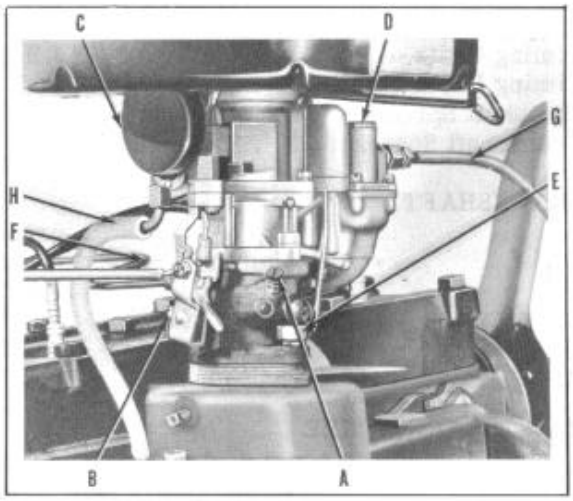


FIGURE 22

SECTION 3
ENGINE
SPECIFICATIONS

ENGINE - GENERAL

Arrangement	L Head
No. Cylinders	6
Compression Pressure	100 lbs. minimum
Firing Order	1-5-3-6-2-4
Serial No. Location	Right Hand Front of Block
Bore	3"
Stroke	4-3/4"
Piston Displacement .	202 Cu. In.
Horsepower - Taxable	21.6
Horsepower - Actual.	104
Torque	158 ft. lbs. @ 1400 R.P.M.

CRANKSHAFT

Drive	Silent - Chain
Bearings	4
Type	Interchangeable - Steel Back Babbitt

No.	Diameter		Length
1.	2.375"	x	1"
2.	1.997"	x	11/16"
3.	1.965"	x	11/16"
4.	1.497"	x	1-1/8"
Radial Clearance	.0005"	x	.0015"

End Play	.003 to .005
Timing Marks	On Sprockets and Chain
Timing Chain	60 Links 3/8" Pitch
Timing Chain Width	1"
Camshaft Sprocket	42 Teeth
Crankshaft Sprocket	21 Teeth

CRANKSHAFT

No.	Diameter	Journal Length
1.	2.4988" to 2.4998"	1.530"
2.	2.4988" to 2.4998"	1.500"
3.	2.4988" to 2.4998"	1.500"
4.	2.4988" to 2.4998"	1.750"

MAIN BEARING SIZE

1.	2.5006" to 2.5010"	x 1.312"
2.	2.5006" to 2.5010"	x 1.250"
3.	2.5006" to 2.5010"	x 1.494"
4.	2.5006" to 2.5010"	x 1.500"

Diametral Clearance	.0005" to .0015" None
Adjusting Shims	1.937" to 1.938"x
Crankpins	1.125"
End Play	.003" to .009"
Thrust	On No. 3 Bearing

CONNECTING RODS

Material	Forged Steel
Weight	26 ozs.
Length - Center to Center	8.183" to 8.193"
Bearing - Lower End	Precision Insert Removable
Type	Steel Back Babbitt
Diameter & Length	1.9375" x .962"
End Play	.007" to .013"
Diametral Clearance.	.0005" to .0015"
Shims	None
Bushing - Upper End:	
Material	Steel Back Babbitt
Diameter & Length	.8465" x .870"
Diametral Clearance	0" to .0003"

PISTON

Type	Cam Ground
Material	Aluminum Alloy
Weight	10-1/4 oz.
Length (Overall)	3.1875"
Length - Pin Center to Top	1.6875"
Piston Clearance	.0015" to .002"
Ring Groove Depth	.148"

PISTON PIN

Type	Floating
Length	2.4375"
Diameter	.7497" to .750"
Fit in Piston	.000" to .0003" Hand
Fit in Rod	Push Fit at 70° F.

PISTON RINGS

Material	Cast Iron
Compression Rings	Two (Pinned)
Width	5/64"
Oil Rings	Two (Pinned)
Width - Upper	3/16"
Width - Lower	5/32"
Gap Clearance	.004" to .009"

INTAKE VALVES	
Angle of Seat	45°
Head Outside Diameter	1.500"
Port Diameter	1.418"
Lift	.356"
Length	.5.045"
Stem Diameter	.3412" to .3422"
Stem to Guide Clearance	.0015" to .0025"
Operating Clearance - Hot	.010"
Inserts	None

EXHAUST VALVES

Angle of Seat	45°
Head Outside Diameter .	1.395"
Port Diameter	1.315"
Lift	.356"
Length	5.022"
Stem Diameter	.3402" to .3412"
Stem To Guide Clearance	.003" to .004"
Operating Clearance - Hot	.012"
Valve Angle.	7°
Inserts	None

VALVE GUIDES

Type	Removable
Length:	
Intake	2-5/8"
Exhaust	2-5/8"
Inside Diameter	.3435"

VALVE SPRINGS

Free Length	2-3/16"
With Valve Closed	.1.953"
With Valve Open	1.607"
Total Coils	8-½
Spring Pressure -Closed	40-48 lbs.
Open	.116-124 lbs.

VALVE TAPPETS

Type	Mushroom
Guides	Integral with Block
Guide Size	.6245" to .625"
Tappet Size	.62325" to .62375"
Fitting Clearance	..00075" to .00175"
Length	2.310"

VALVE TIMING

Inlet Opens	26.8° BTC 9
Inlet Closes	9.7° ABC
Exhaust Opens	64.9° BBC 4
Exhaust Closes	5.7° ATC
Timing Marks	On Vibration Dampener

LUBRICATION

Engine Lubricating Method	Pressure
Normal Pressure	40 lbs. @ 30 M.P.H.
Oil Pump Type	Rotor
Oil Pump Drive	Worm on Camshaft
Oil Capacity	5-1/2 qts. Total
	5 qts. refill.

TORQUE SPECIFICATIONS - ENGINE

	SIZE	FT. LBS.
Camshaft Gear Bolt	3/8-16	20-30
Connecting Rod Bolt	3/8-24	40-50
Crankshaft Bearing Cap Screw	1/2-13	75-80
Cylinder Head Cap Screw	7/16-14	
Cylinder Head Water Outlet Bolt	3/8-16	20-30
Engine Mounting Bolt (Front)	7/16-20	40-45
Engine Mounting Bolt (Rear)	7/16-14	40-50
Engine Mounting to Frame Bolt (Rear)	5/16-18	12-15
Manifold (Exhaust)	3/8-16	20-30
Manifold (Intake)	5/16-18	12-15
Oil Pan Bolt	5/16-18	15-20
Spark Plugs	14 M.M.	25-30
Timing Gear Cover Bolt	5/16-18	15-20
Vibration Dampener Screw	5/8-18	80-90
Water Pump To Cylinder Bolt	3/8-16	20-30

GENERAL CONSTRUCTION

The Hudson Jet and Super Jet engines are of the "L" head design.

Crankcase and cylinder block are integra1, made of chrome alloy iron to provide maximum strength with minimum cylinder wear and weight.

The engine is cushioned against shock and vibration by rubber mountings at three points in cars e quipped with standard synchromesh transmissions. One cushion is mounted on the frame side rail at each side of the engine front support plate. The rear of the engine assembly is supported on the No. 3 frame crossmember, the cushion being attached to the under side of the clutch bell housing. Models equipped with Hydra-Matic transmissions have four rubber engine mountings, - one at each side of the transmission supporting the engine at the rear at the No. 3 crossmember. Front engine mountings are identical for both types of transmissions.

A fully counter balanced crankshaft of forged alloy steel is balanced statically and dynamically. Four precision insert type steel back babbitt main bearings support the shaft. Main bearing inserts of several undersize dimensions are available for service 'requirements. (See Parts Book) Crankshaft end thrust is taken at the No. 3 main bearing.

Connecting rods have replaceable precision insert steel back babbitt bearing shells which are interchangeable.

Aluminum alloy cam ground pistons are provided. Four piston rings are utilized on each piston, steel stake pinned at the ring gaps to prevent ring rotation in the ring grooves.

Piston pins are of the full floating type held in position with steel lock rings fitted into grooves machines near each end of the piston pin bore. Piston pins operate in steel backed bronze bushings pressed in the upper ends of the rods.

The camshaft is made of especially heat treated alloy iron mounted in four steel back babbitt bearings. A Morse chain and sprockets are utilized to drive the camshaft.

Mushroom type rotating valve tappets are used. The tappets are fitted directly in the crankcase and may be removed from the bottom of the crankcase after removal of the oil pan and camshaft.

Valves seat directly in the engine block with no valve seat inserts required. The exhaust valves have welded stems with the valve head and upper stem made of Austenetic Alloy steel to provide maximum heat transfer from the exhaust valve. Removable valve guides are provided for both intake and exhaust valves.

LUBRICATION

Engine lubrication is provided by pressure to friction surfaces of the engine, Figure 4. A positive rotor type oil pump is mounted on the right side of the cylinder block. The pump is driven by a worm gear integral with the camshaft.

Oil is drawn through a floating oil screen in the oil pan and the intake pipe to the pump. From the pump oil under pressure is forced up into the horizontal oil gallery. From the oil gallery, oil is distributed to valve tappets and camshaft bearings. Circulation is also provided through oil laterals to engine main bearings and through holes in the crankshaft to the connecting rod bearings which also provide cylinder wall lubrication. The oil check valve located in the crankcase on the left side regulates oil pressure.

NOTE: Normal oil pressure is 40 pounds at 30 M.P.H.

OIL PRESSURE SWITCH

An oil pressure switch assembly is used in conjunction with the rotor type pressure pump. The function of the pressure switch is to Indicate by means of an instrument panel light when there is no oil pressure.

The unit consists of a spring loaded diaphragm and a set of electrical contact points normally closed when the engine is not operating. The closed contact completes a ground connection to the instrument panel lighting the lamp. When the oil pump begins to operate, oil pressure breaks the ground contact, and the lamp goes out.

OIL CHECK VALVE

Oil pressure is maintained by a non-adjustable oil check valve consisting of a plunger, spring, plug retainer and plug gasket. The assembly is located in the left side of the crankcase slightly below the distributor. Oil pressure against the end of the plunger and spring forces the plunger off its seat allowing oil to return to the oil pan, Figure 1.

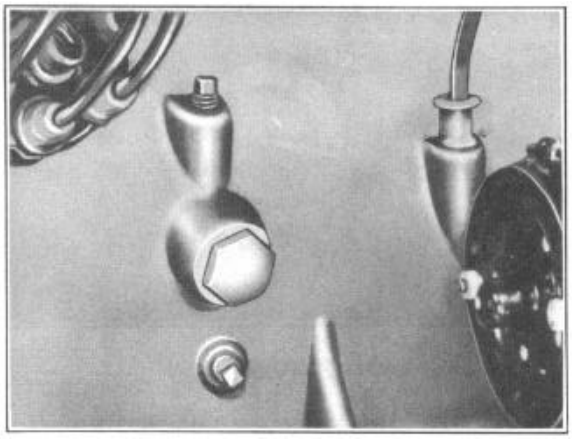


FIGURE 1

OIL PUMP

The oil pump is of simple construction and very efficient providing high volume. It is a rotor type pressure pump. Service is seldom required.

REMOVAL

Care must be exercised to maintain correct engine ignition timing when it is necessary to remove the pump for servicing. The recommended procedure is as follows:

1. Lift off the distributor cap and rotate the engine crankshaft until the distributor rotor is in firing position for the number one cylinder. Do not disturb this position of the engine while the oil pump is removed.
2. Remove the two oil pump to block attaching screws and remove the oil pump.

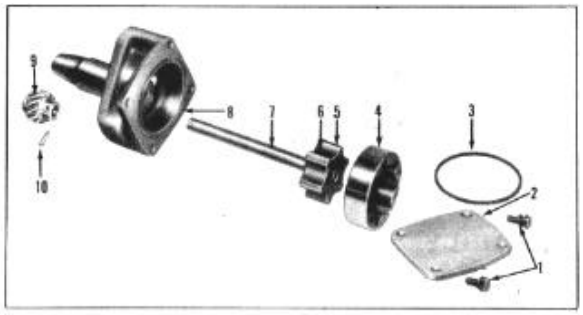


FIGURE 2

DISASSEMBLY

1. Remove the cover screws (1), Figure 2, cover (2) and gasket (3).
2. Hold hand over cover opening and with the pump upside down, turn shaft until the pump rotor (4) falls out in the hand.
3. Drive out straight pin (10) which holds pump drive gear to pump shaft.
4. Press shaft (7) out of gear (9) by supporting the oil pump body (8) on the cover face in an arbor press allowing the inner rotor and shaft to clear when pressing the shaft out of the pump gear.
5. Wash all parts in cleaning solvent and dry with compressed air.

INSPECTION

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

2. With rotors and shaft assembled in the pump body place a straight edge across the pump body between the screw holes and using a feeler gauge, measure the clearance between the top of the rotors an d the straight edge. This clearance should be .004" or less. If the clearance is greater than this limit, the pump body must be replaced.

3. With the outer rotor (4) pressed against one side of the pump body, with a feeler gauge measure the clearance between the outer rotor and pump body at the opposite side. If this clearance is more than .008", replace the pump body.
4. 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 check with .002" feeler gauge between the cover and straight edge. If the feeler gauge can be inserted, the cover is worn and must be replaced.

ASSEMBLY

1. Install the outer. rotor (4) in the pump body (8), Figure 2.
2. Slide the pump shaft (7) and rotor (5) assembly into the pump body.
3. Support oil pump body, shaft and rotors assembly on a clean surface and press pump drive gear (9) on pump shaft (7). End play between the hub of the drive gear and pump body should be .004" to .008".
4. In stall gear pin and peen over both ends securely.
5. After inspecting to see that pump is thoroughly clean, install cover gasket (3) in the recess in the pump body.
6. Install cover (2). Tighten cover screws (1) evenly and securely.

INSTALLATION

If the engine crankshaft has been rotated inadvertently during the interval the oil pump was out being repaired, ignition timing will be incorrect. The following steps will then be necessary to remedy the improper timing.

1. Remove the distributor mounting screw, dis connect the distributor vacuum control tube, disconnect the coil lead wire and remove the distributor.
2. Set dampener timing with the No. 1 piston on T.D.C.
3. Insert aligning tool J-2794 in the distributor shaft hole with the aligning pin in line with the distributor mounting screw hole, Figure 3.

NOTE: The slot in the end of the oil pump shaft is machined off center as is the tongue on the end of the distributor shaft, Figure 4.

4. Install the oil pump, engaging the oil pump drive gear with the camshaft worm gear teeth. The pump shaft must be aligned to engage the shaft slot with the tongue on the end of the aligning tool. Then push the tool out as the pump is seated against the block mounting face.
5. Remove aligning tool J-2794'.
6. Set distributor in No. 1 firing position and install.
7. In stall distributor mounting screw, distributor c a p , distributor vacuum control tube and connect the coil lead wire.

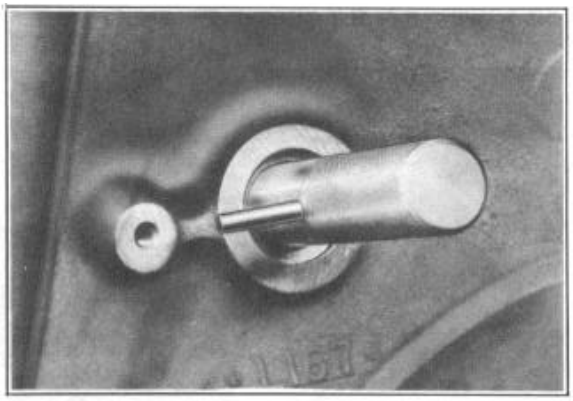


FIGURE 3

OIL PAN

REMOVAL

1. Raise car and place stand jacks under the No. 2 frame crossmember.
2. Remove the three bolts attaching the center steering arm support bracket to the No. 2 crossmember. This permits the center steering arm and tie rods to drop.
3. Remove the two attaching bolts, flywheel dust cover to bell-housing, and remove dust cover.
4. Remove oil pan drain plug and drain oil. 5. Remove bolts and lockwashers attaching oil pan to cylinder block and remove oil pan.

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

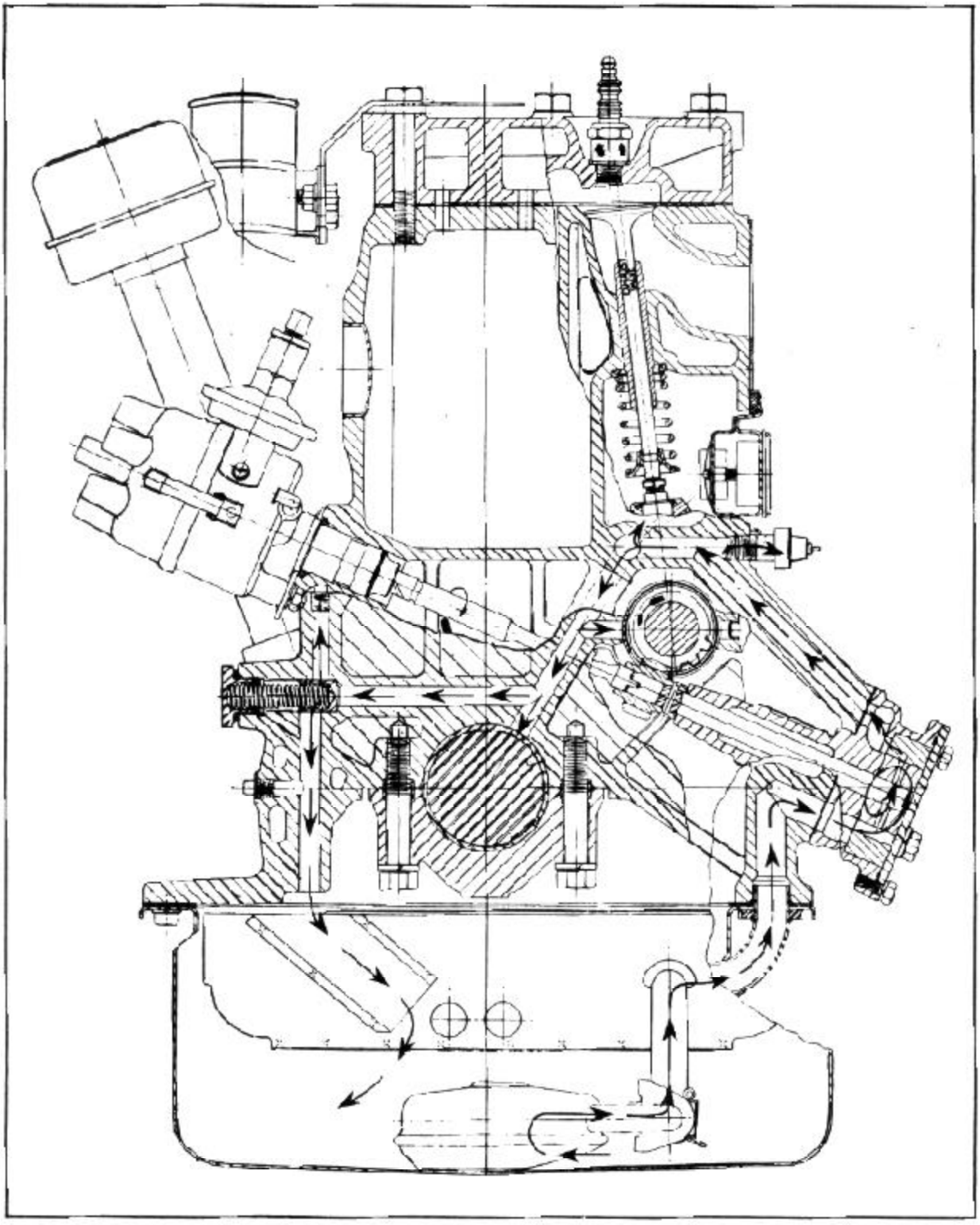


FIGURE 4

INSPECTION

1. Remove all traces of old gaskets from the pan and crankcase. In s t all new gasket, applying a light coat of Hudson Perfect Seal Gasket Paste on both sides of the new gasket.
2. Remove cotter pin (1) Figure 5, attaching oil pan screen to the outlet pipe. Clean screen thoroughly or replace.
3. Install oil pan screen to outlet pipe. Check to be certain there is no binding action and screen swivels freely.
4. Secure ends of cotter pin.

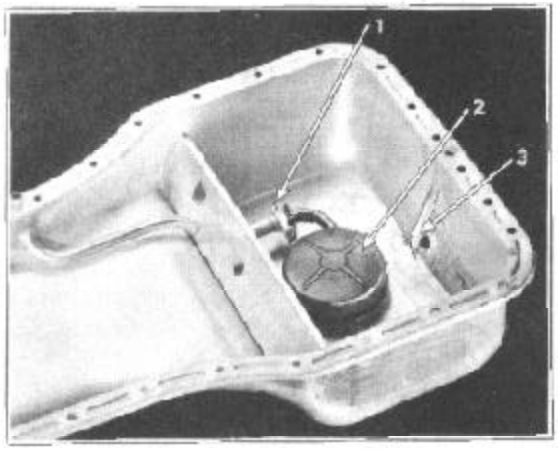


FIGURE 5

INSTALLATION

1. Install rubber gasket on outlet tube.
2. Install the oil pan to the engine, using two screws on each side until all screws have been started.
3. Tighten oil pan screws evenly to 15 to 20 pounds torque.
4. Install oil pan drain plug.
5. Install flywheel dust cover.
6. Install center steering arm support bracket and tighten bolts securely.
7. Fill oil pan with 5-1/2 quarts of motor oil of the recommended viscosity

CYLINDER HEAD

REMOVAL

1. Drain cooling system.
2. Loosen carburetor a i r horn attaching screw and clamp and lift off air cleaner.
3. Disconnect and remove vacuum advance control tube.
4. Disconnect top radiator hose.
5. Disconnect heater hoses (if so equipped).
6. Disconnect throttle rod at carburetor.
7. Disconnect temperature gauge wire at cylinder head sender unit.
8. Disconnect spark plug wires and remove spark plugs.
9. Remove cylinder head cap screws and lift off cylinder head.
10. Remove temperature gauge sender unit from cylinder head.

INSTALLATION

1. Make certain cylinder head is free of -carbon and dirt. Check cylinder head with a straight edge to detect roughness or warping, especially in those instances of frequent "blowing" of head gaskets. With a .010" feeler gauge, check between the straight edge and the machined surface of the cylinder head. If the feeler gauge enters at any point, the head must be remachined or replaced.
2. In stall new head gasket with lettering on gasket up. (Apply a light coating of "Hudson Perfect Seal Gasket Paste".)

NOTE: Cylinder head and gasket installation can be facilitated by using two J-2969 cylinder head locating studs t o align the gasket and head. These studs have a screw driver slot for easy removal after the cylinder head has been aligned, Figure 6.

3. Cylinder head cap screws should be tightened to 75-80 foot pounds, (Cold) using a torque wrench and retighten when engine is at normal operating temperature.

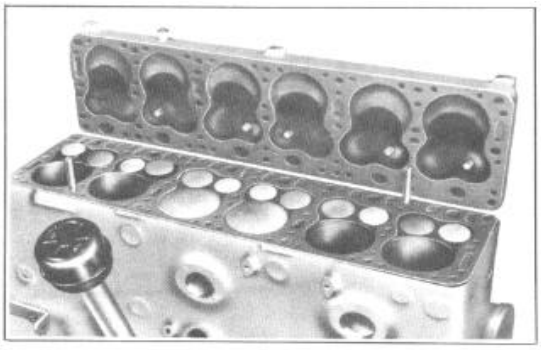


FIGURE 6

4. Cylinder head cap screws should be tightened in the sequence illustrated in Figure 7.

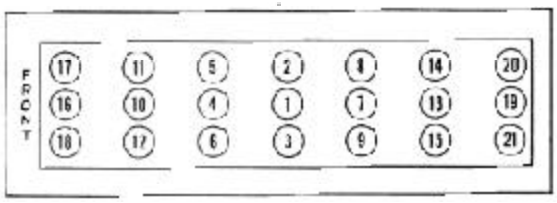


FIGURE 7

CAUTION: Always clean out threads in cylinder block before installing cylinder head. If threads in the block are corroded or filled with dirt, an incorrect torque wrench reading will be indicated, as a percentage of the torque will be absorbed by the threads. Apply "Hudson Perfect Seal Gasket Paste" to threads to facilitate tightening of the cap screws to the proper tension.

VALVE SYSTEM

VALVE TAPPET ADJUSTMENT

1. Remove right front wheel.
2. Remove fender side shield.
3. Remove valve covers and breather. Adjust tappets as follows:

Intake	.010" hot
Exhaust	.012" hot

VALVE REMOVAL

The engine block is of hard chrome alloy iron and the valves seat directly in the block with no valve seat inserts required. The following procedure is recommended for removing valves:

1. Drain cooling system.
2. Remove cylinder head. See 'Cylinder Head Removal", Page 27.
3. Raise car and remove right front wheel and fender shield with extension.
4. Remove front an d rear valve covers and crank case breather tube.
5. Compress valve springs and remove s p ring keepers an d retainers (use tool KMO-484 Valve Spring Lifter).

NOTE: Place corks or wood plugs in valve chamber oil return holes to prevent valve locks from dropping through those holes into the oil pan.

6. Remove valve s from engine and place them in proper sequence in a valve rack to assure their installation on the seats from which they were removed.
7. Check all valves and replace those badly burned, warped or cracked.

REFACING VALVES

Remove enough metal to clean up pits and burns. Grind until a clean metal surface is obtained to provide a good seal on the seat. Do not grind to a knife edge at the top of the valve. At least 1/16" of metal should remain, measured from the upper edge of the valve seat to the top of the valve shown at (D), Figure 9. If this thickness of metal does not remain after grinding, replace the valve.

REFACING VALVE SEATS

Before refacing valve seats, it is necess a r y to clean all carbon and varnish from valve guides. Cleaning can be quickly accomplished using a KMO-122 Valve Guide Cleaner Metal Brush mounted in a small electric drill. Place a cloth below the valve guides in the valve chamber to catch dirt and excess thinner and prevent it from dropping into the oil pan.

The valve guides must also be checked for excessive wear before attempting to reface the valve seats. Excessive valve guide wear can usually be detected by an oily deposit on the under side of the intake valve heads or in the intake valve ports.

STANDARD CLEARANCES

VALVE GUIDES & VALVE STEMS

	INTAKE	EXHAUST
Valve Guide Bore	.3437	.3437
Valve Stem Diameter	.3417	.3407
Clearance	.002	.003

When valve guides must be replaced, they may be removed by driving them out with J-267 valve guide remover after taking out tappet adjusting screws.

Valve guides can be properly installed with the J-883-A Valve Guide Installer using pilot I-883-10. The installer consists of the driven handle, stop collar and a pilot calibrated to limit the depth to which the guides are driven. The valve guides are inserted to a depth of 1-9/32" from the top of the valve seat to the top of the guides for both intake and exhaust valve guides. (See Figure 8.)

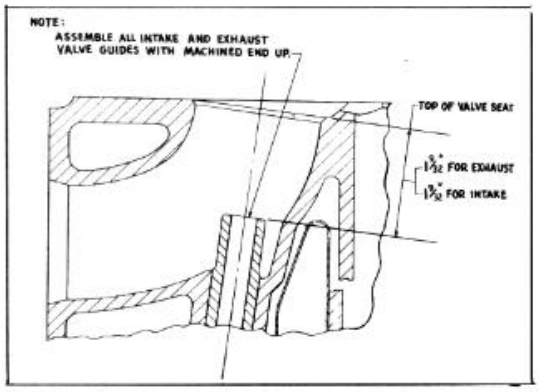


FIGURE 8

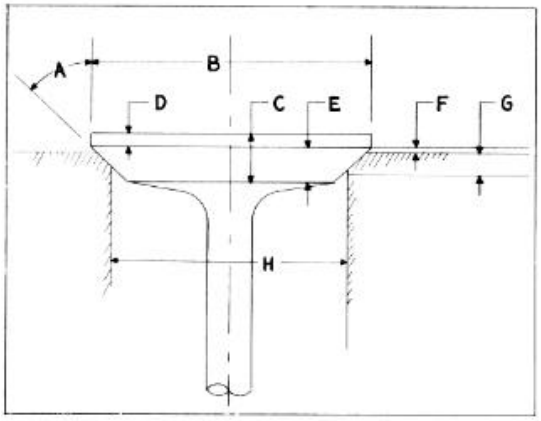


FIGURE 9

INTAKE	EXHAUST
A - 45°	45°
B - 1.831"	1.561"
C - .1135"	.1525"
D - .0495"	.0496
E - .083"	.103"
F - .016"	.008"
G - .054"	.075"
H - 1-11/16"	1-3/8"

Before starting to reface the valve seat, be sure that the stone is clean and true. Touch the valve seat lightly with the stone to avoid chatter o f the grinder. Grind seat until all pits are removed and the seat is clean.

Seats should be held to a width of from 1/16" to 3/32" inch. When the seat is too wide, difficulty is encountered trying to obtain a good seal. If a wide seat is found, grind the edge with a 20° stone until proper seat width is obtained. If necessary, an additional cut can be taken at the port end with a 75° stone if the valve does not contact the valve seat within the gauge line limits. (See Figure 9.)

VALVE TAPPETS

Valve tappets are of the mushroom rotating type with self-locking tappet adjusting screws.

The valve tappets must be removed from the bottom of the cylinder block. To accomplish this, the oil pan, and camshaft must be removed, while holding the valves wide open with J-1612-3 tappet and valve holders.

Valve tappets should be carefully inspected f or pitting and scratches on t he mushroom faces that might damage the cam lobes. Replace any tappets that are pitted or scratched.

If the valve tappet guides are worn excessively, the tappets should be removed, the guides reamed and oversize tappets installed. Tappets available are standard, .002", .004" and .010" oversizes.

PISTONS, RINGS & CONNECTING RODS

REMOVAL

Pistons and connecting rods must be removed through the top of the cylinder block. The oil pan and cylinder head must, therefore, be removed prior to servicing pistons and connecting rods.

NOTE: Before rods and pistons are removed, t he ridge must be removed from the upper cylinder walls with a Ridge Reamer. This is necessary to prevent cracked or broken piston lands or piston rings.

PISTON & SIZE CODE

A code letter is $tamped on the cylinder block along the lower race of the valve chamber to show the original size of each cylinder.

A code letter and the piston weight in ounces and quarter ounces is stamped on the head of each piston. In addition, each piston is also stamped during original factory installation with the block number and the number of the cylinder in which each piston is fitted.

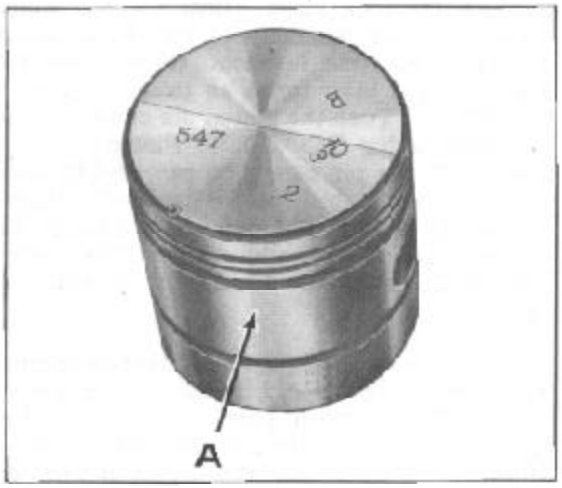


FIGURE 10

EXAMPLE: The piston from the No. 2 cylinder of a certain engine is marked as shown in Figure 10. The number "547" stamped on the piston is for identifying this piston as one of a matched set to be installed in the No. 2 cylinder of the engine block bearing the s am e number. The number is stamped on the front of the cylinder block td the right of the water pump. The mark "B" i s the code le t t e r stamped on both the piston and the lower face of the valve chamber. By referring to the Code Marking Chart, in the next column, the definite size of the piston and cylinder bore can be determined. The "$\frac{10}{3}$" stamped on the top of this indicates that the weight of this piston is 10-3/4 ounces. Similarly, a piston stamped "$\frac{10}{1}$" would indicate a piston weight of 10-1/4 ounces. The number "2" is the number of the cylinder in which the piston is to be installed.

When a 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 can cause unbalance and rough engine operation.

NOTE: Piston sizes shown in the chart are t he major diameters at the top of the piston skirt at "A", Figure 10, just below the chamfer under the No. 3 ring groove.

The difference between the cylinder size shown on the chart and the piston size shown give s the recommended piston and cylinder clearance.

KEY TO CODE MARKINGS
PISTON, CYLINDER, RING SIZES
(Ring Oversizes Apply Only to Production Type Rings)

CYLINDER		PISTON		PISTON RING
Size	Code	Size	Code	Size
3.005	B	B	2.9985	3.000
3.0015	D	D	2.9995	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
3.0105	BO	BO	3.0085	3.010
3.0115	DO	DO	3.0095	3.010
3.0125		FO	3.010	3.010
3.0145		LO	3.013	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		B000	3.0285	3.030
3.032		E000	3.030	3.030

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

It is always advisable to hone the cylinder to the smallest dimension for which a given ring is recommended. Ring oversizes shown in the table are available only in production type rings. Service piston rings are available in .003", .005", .010", .015", .020", and .030" oversize for this engine.

PISTON FITTING

Pistons are cam ground to eliptical shape.

Under normal operating temperatures, expansion of the piston bosses forces the piston to assume a circular form.

The pistons are also tapered, measuring approximately .0007" to .0012" larger at the bottom of the piston skirt than at the thrust face.

Cam grinding makes careful fitting of the piston in the cylinder bore necessary. A .002" feeler gauge 1/2" wide, extending the full length of piston travel, is inserted between the cylinder bore and the thrust face of the piston directly opposite the valve mechanism. The feeler gauge should be moved by a pull of from 3 to 4 pounds. Use Tool J-888 to measure the pull. A variation of .001" will change the pull on the feeler gauge only a few pounds. Use of the scale will eliminate guesswork.

NOTE: Check the piston fit in the cylinder bore when both the cylinder block and piston are at room temperature (70° F). Always be certain that the ridge at the top of the cylinder has been removed before attempting to fit pistons.

CYLINDER BORING

Before fitting pistons, examine the cylinder walls for scratches, scores and wear. Cylinders should be checked for taper and out of round with a Cylinder Checking Gauge KMO-913. It is recommended that the cylinder bores be reconditioned when the taper exceeds .020" and out of round is greater than .005"

Honing will remove cylinder wall scratches and scores up to .005" metal depth. An experienced operator can remove metal up to .010" to .015" depth. Reboring is recommended only where cylinders are so badly scored, worn, tapered or out of round that honing will not provide a satisfactory finish.

After boring operations have been completed, the cylinder walls should be polished with crocus cloth dipped in kerosene. If the cylinder walls have been either honed or rebored, they should be thoroughly washed with soap and water, using a brush to remove all traces of grit, chips and abrasive materials. Otherwise, extremely rapid wear of new parts will result.

PISTON PINS

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

The piston pin and connecting rod bushing should be replaced if necessary. Select the proper size pin to fit the piston and ream the connecting rod bushing to size.

To remove the piston pin, remove the piston pin lock rings. Heat the piston and connecting rod assembly to 200°F. in water or in an electric furnace. (Never heat-the piston with a blow torch as this may distort the piston.) Push the piston pin out with hand pressure, using Tool J-2948 Piston Pin Remover. If the pin cannot be removed by hand pressure, tap lightly on the tool with a hammer while holding the piston in one hand. Do not hold the piston solidly during this operation as distortion and misalignment could result.

Piston pins should be a tight hand push fit in the piston bores with the pistons heated to 200° F. Piston pins are available for service in the oversizes shown and are identified with a color code by a spot of paint on the end of each pin. Following is a chart show in g pin sizes, color code and bushing diameters after reaming:

	PISTON		BUSHING
SIZE	PIN DIAMETER	COLOR	DIAMETER
Standard	.7499	None	.7502
.001"	.7509	Yellow	.7512
.002"	.7519	Orange	.7522
.005"	.7549	White	.7552
.010"	.7599	Blue	.7602
.015"	.7649	Green	.7652
.020"	.7699	Brown	.7702

If the pin selected cannot be installed with hand pressure, enlarge the hole with an expansion reamer or a hone. Take very light cuts until the pin can be fitted to the piston as outlined above.

CONNECTING ROD BUSHINGS

Connecting rod bushings are steel back bronze burnished in place in the connecting rod bore and

and diamond bored to very close tolerance.

REMOVAL AND REPLACEMENT

Press out the old bushing by supporting the bushed end of the connecting rod on Bushi n g Burnisher Block J-2951 and press the bushing out, using Bushing Remover and Replacer J-2948. Press the new bushing in place in the connecting rod bore. Be certain the oil hole in the bushing is aligned with the oil hole in the connecting rod bore. Burnish the bushing in place, using burnishing tool Z-2949, (Figure 11).

NOTE: This operation swages or expands the bushing i n the rod bore. This prevents the bushing from working out of the rod.

The bushing should b e reamed .0003" larger than the piston pin diameter. To ream, remove the connecting rod bearing cap and mount o n Aligning Fixture J-874-H Arbor (1.9375 diameter). (Tighten rod on arbor and lock in position by tightening the arbor lock screw located on the side of the fixture.)

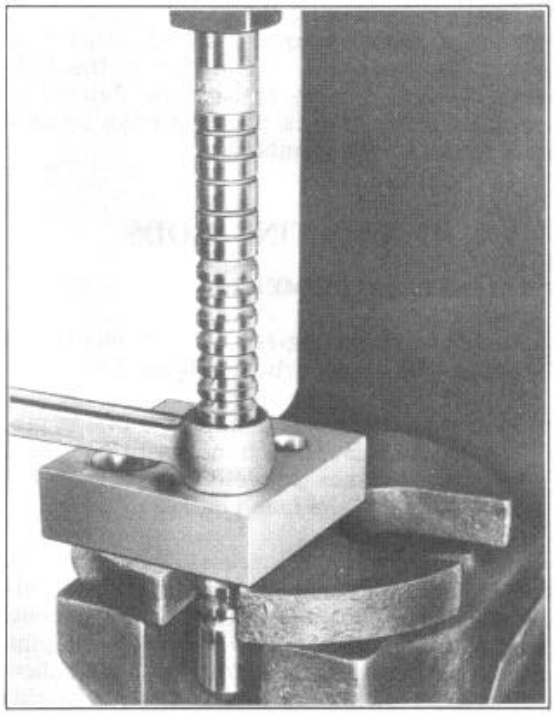


FIGURE 11

Mount the reamer pilot bushing in the face plate bore on the upper end of the fixture and lock the lower arbor in place with the locking handle. Insert the reamer through the connecting rod bushing and into the pilot bushing an d perform the reaming operation, (Figure 12).

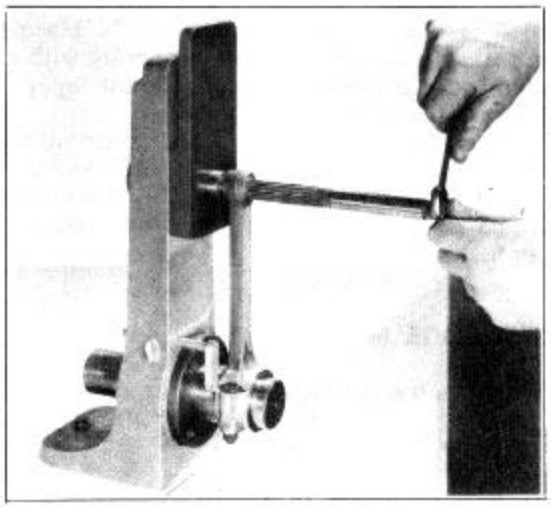


FIGURE 12

CONNECTING RODS

Connecting rods are drop forged heat treated steel with an I-beam section. An oil metering hole is provided in the upper half of the connecting rod bearing to provide an oil spray for cylinder wall lubrication. This oil metering hole indexes with the hole drilled in t he crankshaft as the piston approaches top dead center on each piston stroke. This sprays additional oil on the exposed cylinder wall.

Connecting rods have steel backed babbitt lined bearing inserts, with upper and lower halves interchangeable in all rods. Bearing halves are held in position by the extruded portion of the bearing shell fitted into notches machined in the rod and cap.

Replacement bearings require no reaming or fitting. Connecting rods are interchangeable. When replacing rods, the weight of new rods should not vary more than 1/4 ounce in any one group of rods.

NOTE: New bearing inserts should be installed only in pairs. Never file bearing caps to provide proper clearance when installing new bearings.

Before installing new connecting rod bearings, the crankpin journals should be checked for wear, out of round and taper. Crankpin out of round should not exceed .0015" and taper no more than .001". Measure journals vertically and horizontally with a micrometer and check at both ends for taper.

Diametral clearance of the connecting rod bearing should be .0005" to .0015" and the rod end play .007" to .013". The clearance can be checked either by the plastigage or shim method.

PLASTIGAGE METHOD

1. Remove the bearing caps one at a time and insert a length of plastigage slightly shorter than the cap width.
2. Install the bearing cap with a new standard insert and tighten to 40 to 45 foot pounds torque. Do not rotate the crank-shaft while the plastigage is in place.
3. Remove the bearing cap and check the width of the flattened plastigage. If the width is not over .00225", a standard bearing should be installed.

SHIM METHOD

1. Place brass shim stock .0015" thick, 1/2" wide by 7/8" long in the bearing cap with a new standard bearing in place.
2. Tighten the bearing cap to 40 to 45 foot pounds torque.
3. Try to move the rod endwise by hand, then tap lightly with a hammer. If the rod will not move by hand, but moved when tapped with the hammer, a standard bearing should be used. If the rod can be moved by hand, install an undersize bearing.

Bearing shell thickness, crankpin diameters and connecting rod bores are given for standard and various undersize bearings.

CONNECTING ROD BEARING SIZES, CRANKPIN DIAMETERS AND CONNECTING ROD BORES

BEARING SIZE	SHELL THICKNESS	CRANKPIN DIAMETERS	CONNECTING ROD BORES
Standard	.0622"	1.938"	2.0630"
	.0619"	1.937"	2.0625"
.0005" US	.0627"	1.9376"	2.630"
	.0624"	1.937"	2.0625"
.002" US	.0632"	1.936"	2.0630"
	.0629	1.935"	2.0625"
.010" US	.0672"	1.928"	2.630"
	.0669"	1.927"	2.0625"
.012" US	.0682"	.1926"	2.0630"
	.0679"	.1925"	2.0625"

After tightening the connecting rod bolt nuts to the proper torque, install Palnuts snug against the bolt nuts. Then tighten the Pal- nuts 1/4 to 1/3 more to lock the Palnuts in position. New Palnuts should always be used when rods are reassembled.

CONNECTING RODS

PIN TO ROD ALIGNMENT

1. Remove connecting rod bearing shells and mount rod on the arbor, (Figure 13).
2. Place the "V" block against the piston pin. The amount of misalignment will be shown by the clearance between the pins on the "V" block and the face plate.

If the two top pins contact against the face plate and the two bottom pins fail to contact the face plate, the rod is cocked or bent. The same condition exists if the bottom pins contact the face plate and the upper pins show a clearance. When the pins in a horizontal plane contact the face plate and the other two do not, the connecting rod is twisted.

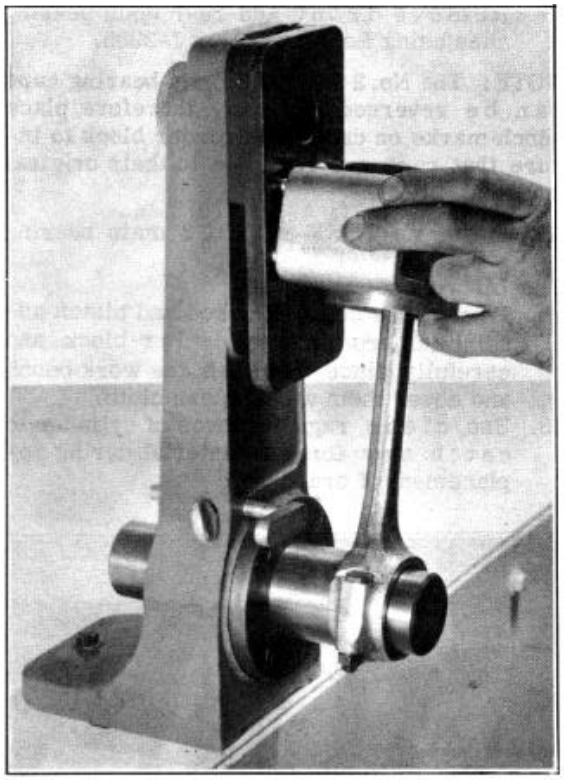


FIGURE 13

ALIGNING ROD WITH PISTON

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

1. Mount the connecting rod and piston assemby on the alignment fixture and set the piston in line with the connecting rod.
2. Place the "V" block on the piston skirt. If both pins on the "V" block contact the face plate, then the rod is straight.
3. With the "V" block on the piston skirt and the pins against the face plate, rotate the piston first in one direction and then in the other. If the pins on the "V" block contact the face plate at all points, the connecting rod is not twisted. If one pin leaves the face plate while being rotated in one direction and the other while being rotated in the opposite direction, the rod is twisted.

To straighten a bent or twisted rod, use two Bending Bars HM-3-R, one to hold the rod and the other to bend or twist the rod into proper alignment. Always bend beyond the true alignment position and then bend back straight to relieve the stress that results from the bending operation. If the stress is not relieved, the rod will not hold its alignment after installation in the engine.

CRANKSHAFT

The crankshaft can be removed from the engine without removing the engine from the car. However, it is more practical to remove the engine when replacing the crankshaft.

ENGINE REMOVAL

NOTE: After removing the transmission the engine can be removed as one unit with the electrical units and carburetor attached.

1. Re move the two hood hinge bolts from each side at the rear of the hood.
2. Lift and remove hood.
3. Drain cooling system, open drain at bottom right side of radiator. Remove drain plug from left rear side of the engine.
4. Disconnect the throttle linkage.
5. Disconnect the fuel line at the junction of the fuel pump flexible hose and steel gas line.
6. Remove the bolts from the exhaust pipe to the exhaust manifold flange.
7. Remove the radiator hoses.
8. Disconnect the remote control rods at the transmission.
9. Disconnect the wire at the starter motor and remove the cable from the battery.
10. Disconnect the water temperature gauge wire from the side of the cylinder head.
11. Disconnect the oil gauge light wire.
12. Disconnect the vacuum tube from the windshield wiper motor.
13. Remove the two generator lead wires.
14. Disconnect the primary coil wire.
15. Remove slotted head screw holding the breather tube to the rear tappet cover.
16. Remove the bolt from the bracket attaching the breather to the engine end plate.
17. Remove the nine hexagon head self-tapping screws holding the hood lock lower support panel to the fender tie panel and remove the support panel.

18. Remove the four hex bolts attaching the radiator to the channel, also remove the four nut s located inside the radiator channel. Lift the radiator up and out of the channel.
19. Remove the two front engine mounting bolt nuts.
20. Drain engine oil.
21. Disconnect the rear end of the propeller shaft at the rear axle companion flange, lower shaft and pul1 rearward out of transmission. Remove transmission.
22. Remove the nuts from the clutch throwout lever release rod.
23. Attach motor lift bracket and raise engine up and out of chassis, and place engine on bench or motor rebuilding stand.

CRANKSHAFT REMOVAL

1. Remove the flywheel housing dust cover.
2. Remove the clutch. See "Clutch Removal", and remove the flywheel.
3. Remove the oil pan.
4. Remove the vibration dampener cap screw, lock, and remove the vibration dampener. Using Puller J-5371, Figure 14. See "Vibration Dampener Removal".

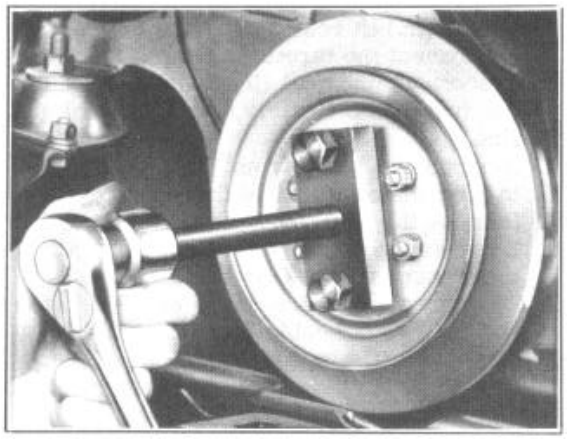


FIGURE 14

Do not hammer on dampener to remove.

5. Remove gear case cover.
6. Remove camshaft gear and timing chain.
7. Using Puller J-471, remove the crankshaft gear (Figure 15).
8. Remove connecting rod palnuts, attaching nuts and remove connecting rod caps. Be sure caps are installed on connecting rods
9. Remove front and rear main bearing caps using Bearing Puller J-2955.

NOTE: The No.2 and No.3 main bearing caps can be reversed in error, therefore place punch marks on caps and cylinder block to insure that caps are returned to their original position.

10. Remove No. 2 and No. 3 main bearing caps.
11. Lift out the crankshaft.
12. Remove the connecting rod and piston assemblies from the cylinder block and carefully place them on the work bench and cover them with a clean cloth.
13. Use clean rags in bores of cylinder to catch any foreign material during replacement of crankshaft.

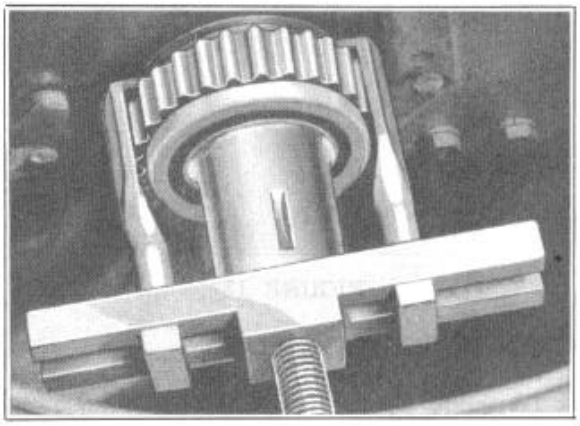


FIGURE 15

Before installing the crankshaft a n d bearings, the crankshaft should be checked for wear, out of round and taper. The limit on out of round and taper of main bearing journals should be no greater than .001". Check with micrometers horizontally and vertically.
The recommended main bearing clearance is .0005" to .0015". Proper clearance can be checked by either the plastigage or shim methods.

To check clearance with shim stock, remove one bearing cap at a time. Install a pie ce of brass shim stock, .002" thick by 1/2" wide by 1" in length c r o s s w i se in the bearing. Oil the shim stock freely to avoid bearing or journal damage. Tighten the bearing cap bolts to a torque of 75 to 80 foot pounds. A considerable drag indicates

correct clearance. Rotate the crankshaft only 1/4 to 1/2 revolution. If no drag is felt and the crankshaft can be rotated freely by hand, an undersize bed ring shell should be installed, Figure 16.

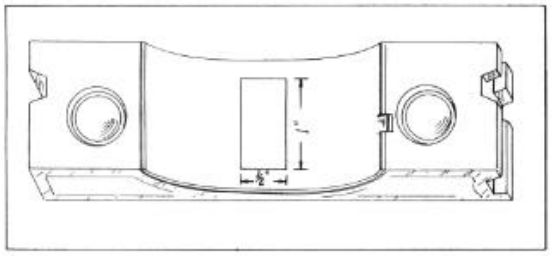


FIGURE 16

Ma in bearings are available in .001", .002", .010" and .012" undersizes. Bearing upper and lower halves are interchangeable. Bearing she are ink stamped on the back with the part number. Bearings should be replaced in pairs; never use a new bearing half with an old bearing half.

Main bearing insert sizes, crankshaft and cap bores are shown in the following table:

MAIN BEARING, CRANKSHAFT AND CAP BORE DIAMETERS

BEARING SIZE	SHELL THICK-NESS	CRANK-SHAFT DIA.	CAP BORE DIA.
Standard	.0955" .0952"	2.4998" 2.4988"	2.692" 2.691"
.001" U. S.	.0960" .0957"	2.4998" 2.4988"	2.692" 2.691"
.002" U. S.	.0965" .0962"	2.4978" 2.4973"	2.692" 2.691"
.010" U. S.	.1005" .1002"	2.4898" 2.4893"	2.692" 2.691"
.012" U. S.	.1015" .1012"	2.4878" 2.4873"	2.692" 2.691"

Main bearing upper halves can be removed and replaced without removing the crankshaft from the engine. Use tool KMO-734 Bearing Shell Remover and Replacer, Figure 17. En ter tool in crankshaft oil hole with hinged head against the bearing end. Bearing shells are held in position by an extruded end end fitting into a machined notch at one end of the main bearing caps and bores. Place the tool at the end of the upper bearing insert opposite the notch and rotate the crankshaft in a clockwise direction to remove. Turn in a counter-clockwise direction to install new bearing upper halves.

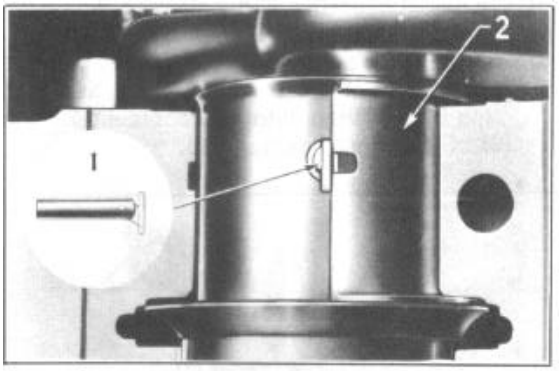


FIGURE 17

REAR BEARING OIL SEAL

1. Remove old seals from crankcase and rear bearing caps and thoroughly clean grooves and flanges.
2. Using a new seal coat lips of seal and groove with liquid soap and press seal over flange in crankcase and bearing cap.

NOTE: Both halves of seal are identical and must be pressed in place so that bottom of groove i n seal contacts the bearing cap and crankcase flange all around: Edges of upper and lower seals may project slightly beyond parting line of cap and crankcase.

CRANKSHAFT INSTALLATION

1. Remove the rags from cylinder bores, oil bores, clean pistons, rings and connecting rods and install in block.
2. Place crankshaft in main bearings and install main bearings and bearing caps.
   Tighten bearing cap bolts to 70-80 ft. lbs.
   After installation of new main bearing shells, crankshaft end play must be checked. The shaft thrust limits are .003" to .009".
   End play can be determined by using a dial indicator.
   Move the crankshaft in one direction until the shaft thrust surface contacts against the bearing thrust surface as outlined above.

Mount a dial indicator on the block with the indicator pin against the crankshaft rear flange. Pry the shaft in the opposite direction to its limit and note the total amount of end play shown on the dial indicator.

3. Install connecting rods to crankshaft, torque connecting rod bolt nuts t o 40-45 foot pounds and install palnuts.
4. Install wick packing into the vertical holes (1) and (2), Figure 18, in front and rear caps first, then into the horizontal holes (3) of the front bearing cap.

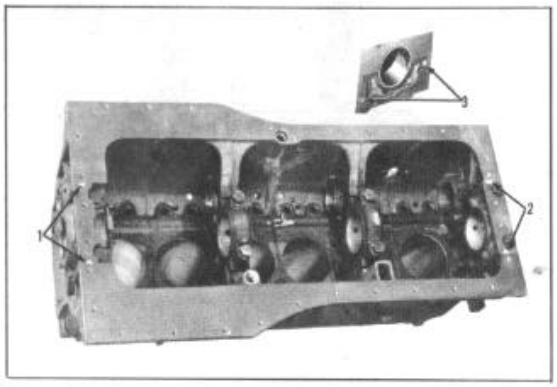


FIGURE 18

NOTE: When installing a new packing, use a blunt punch with a diameter slightly smaller than the packing groove. Punch end should be not shorter than 4 inches to insure seal bottoming.

Packing must be compressed until it bottoms in the packing grooves, and enough packing installed to make a solid seal flush with front face and bottom face of the bearing caps.

5. Clean all traces of the old front support gasket from front face of cylinder block. Install a new gasket and the front support plate.
6. Install new oil pan gaskets and oil pan. Tighten all screws to 15-20 foot pounds.

TIMING CHAIN AND SPROCKETS

The timing chain is non-adjustable. To check for chain and sprocket wear, rotate the crankshaft until the upper span of the chain is tight. Deflection of more than 3/4" from a straight line at the lower span indicates a worn chain that should be replaced. Check the sprockets for excessive wear conditions. If considerably worn, replace the sprockets.

INSTALLATION

1. Align keyway in crankshaft sprocket with key in crankshaft.
2. Using J-5369, Installer, and with a hammer drive crankshaft gear on until it seats against shoulder on crankshaft, Figure 19.

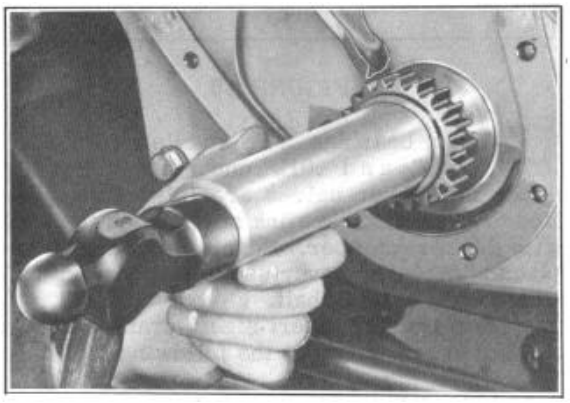


FIGURE 19

NOTE: After the crankshaft sprocket is insta lle d, rotate the crankshaft until the key way is in a vertical position at the top, Figure 20. The timing mark on the crankshaft sprocket will be approximately 60° from the vertical. (This places the #1 piston at top dead center in firing position.)

The timing chain has two punched side links 7 full lengths apart, shown as (A), Figure 20.

3. Mount the timing chain on the camshaft sprocket with the marks matched on the sprocket and chain.
4. In s t all the timing chain over the crankshaft sprocket with the chain and sprocket timing marks matched.
5. Rotate the camshaft until the camshaft screw holes match those in the camshaft sprocket and install the three mounting cap screws.
6. Install safety wire through the three cap screw heads.

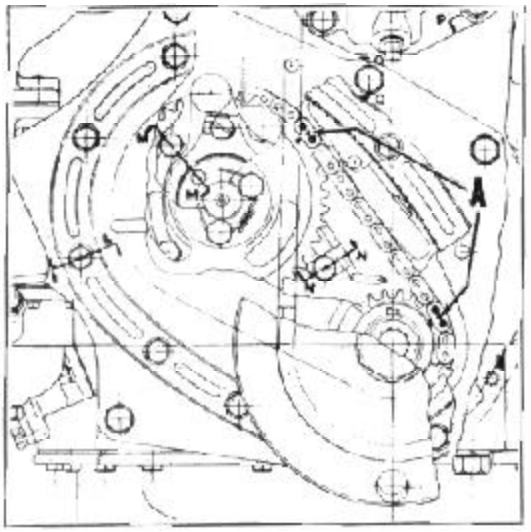


FIGURE 20

TIMING GEAR COVER OIL SEAL REPLACEMENT

The timing gear cover has an oil seal which fits closely over the vibration dampener hub to prevent oil leaks at the forward end of the crankshaft. The oil seal is a tight press fit in the cover and can be removed with the J-2776 Timing Gear Oil Seal Remover and Installer.

1. Place the collar with the slot engaging the depression in the cover.
2. Support the cover and drive the seal out with the straight side of the driver.
3. Before installing a new seal, apply a coating of white or red lead in the well in the timing cover and install the oil seal in the cover using the tapered side of the driver tool to press the seal tightly in place.

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

TIMING GEAR COVER INSTALLATION

1. Use a new timing gear cover gasket and install cover assembly. Install all screws finger tight.
2. With radiator off and engine raised install vibration dampener assembly (see Vibration Dampener Installation).
3. Then tighten timing gear cover screws toapproximately 15-20 ft. lbs.

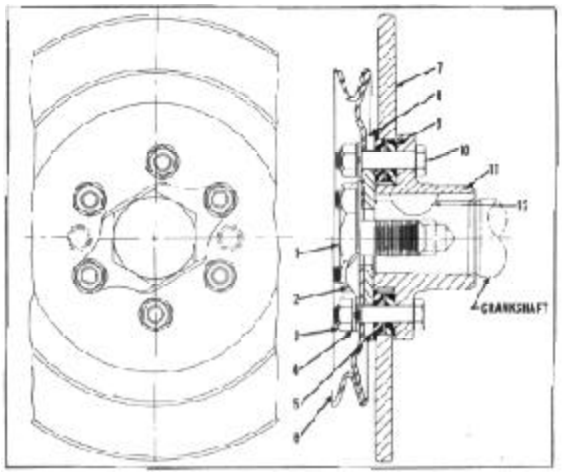


FIGURE 21

1 Dampener cap screw.
2. Dampener cap screw lock.
3. Pulley attaching screw nut.
4. Pulley attaching screw lockwasher.
5. Dampener cushion (front).
6. Dampener pulley.
7. Dampener.
8. Dampener cover plate.
9. Dampener cushion (rear).
10. Pulley to dampener screw.
11. Dampener hub.
12. Dampener key.

VIBRATION DAMPENER

NOTE: One of the six bolts attaching the pulley to the vibration dampener is offset 1/16" to insure assembly in original position, Figure 21.

REMOVAL

1. Drain cooling system and remove radiator. Remove nuts from front motor support and raise engine approximately 1/2 inch.
2. Remove dampener screw (1) and lock plate (2) install J-5371, Vibration D ampe ne r Puller and remove dampener assembly.

INSTALLATION

1. Align the dampener hub keyway (12) on the crankshaft.
2. Using J-5369, Installer, and soft hammer install vibration dampener assembly.
3. Install lock plate (2) and dampener screw (1). Tighten screw (1) to 80-90 ft. lbs.
4. Lower engine, replace motor support nuts, radiator and engine coolant.

REAR MAIN BEARING OIL SEAL REPLACEMENT

(ENGINE IN CAR)

1. Drain engine oil and remove flywheel dust pan and engine oil pan.
2. Remove the two bolts holding rear main bearing cap in place and loosen No. 2 and No. 3 bearing cap bolts 2 to 3 turns.
3. Using J-2955 Puller, remove No. 4 main bearing.
4. Using a blunt screw driver raise lip of oil seal at rear of crankcase, and with 1/4" brass rod drive out old seal sufficiently so that end of seal can be grasped with pliers and pulled out.
5. Remove oil seal from main bearing cap and clean the channel at the crankcase rear flange and in the bearing cap by forcing a swab through the channel several times and wipe dry.
6. Apply a liberal amount of liquid soap to both ends of the Brummer seal and along the groove of the seal.
7. Insert the end of the seal in the crankcase groove and work the seal carefully around the crankshaft until the end appears on the opposite side.

CAUTION: Exercise extreme care during seal installation to void scuffing the soft center sealing cushion at the bottom of the seal groove.

8. Install the new seal in the bearing cap being careful to see that the flange on cap fits the groove in the seal.
9. Apply oil liberally between the seal flange and the crankshaft journal and install rear bearing cap.
10. Install the rear bearing cap bolts and tighten to 75-80 ft. lbs. torque.
11. Tighten the cap screws on No. 2 and No. 3 main bearing to 75-80 ft. lbs.
12. Install wicking in the grooves between the No. 4 bearing cap and crankcase, Figure 18, Page 37.

CAMSHAFT AND BEARINGS

Camshaft bearings are line bored in or iginal production to close tolerance and seldom have to be replaced. If bearing clearance becomes excessive, new bearings can be pressed in place after the camshaft and oil bearings have been removed.

Replacement bearings are available f o r service both reamed and unfinished. The finished bearings are sufficiently oversize to the proper dimensions when pressed into place. This eliminates the necessity of reaming or scraping bearing for proper clearance.

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

NOTE: When pressing new bearings in, always install bearings with the locating notch at the top. It is advisable to remove the engine from the car if it is necessary to replace all camshaft bearings.

CAMSHAFT REMOVAL

1. Drain cooling system, remove radiator hoses and remove radiator.
2. Remove right front wheel.
3. Remove right hand fender side shield.
4. Disconnect vacuum pump line, windshield wiper hose and fuel pump.
5. Remove distributor.
6. Remove oil pump.
7. Remove valve covers and crankcase breather pipe.
8. Using KMO-484 Valve Lifter, compress valve springs and raise tappets.

Hold tappets in the raised position using J-1612-3 Tappet Holders or an alternate method as outlined in the April, 1951 is- s u e of the Service Merchandiser, Page 180.

9. Loosen front motor support bolt nuts and raise engine 1/2" to facilitate removal of dampener.
10. Remove vibration dampener screw, lock plate nuts and lock plate and pull off dampener with Puller J-5371.
11. Remove dampener key and gear case cover.
12. Align gear markings and remove camshaft sprocket, chain and crankshaft sprocket using tool J-471.

NOTE: Before the camshaft is removed from t he block end play should be checked. The range should be .003" to .005". With a pry bar, move the camshaft toward the rear of the engine.

Check between the camshaft forward bearing and thrust plate with a feeler gauge. If end play is more than .010", replace the thrust plate.

13. Remove camshaft and thrust washer.

NOTE: The camshaft can be removed between the grille louvres, rotate the camshaft and withdraw slow ly and carefully to prevent camshaft or bearing damage.

I**NSTALLATION**

To install, reverse procedure of removal.

NOTE: Timing chain and sprockets should be installed with No. 1 piston on top dead center with marks on sprockets 7 links or 14 inches apart as shown in Figure 20.

VALVE TIMING

The valve lash should b e set at .010 on the intake and .012 on the exhaust for checking the timing events, if the dial gauge on the valve head is to be used to indicate the point of opening and closing. If the points of opening and closing are to be determined by the use of feeler gauge the valve lash should be increased from the above dimensions by the thickness of the feeler gauge used.

The timing events in crankshaft angles are as follows:

Intake Opens	26.8° BTC
Intake Closes	99.7° ABC
Exhaust Opens	64.9° BBC
Exhaust Closes	45.7° ATC

The above figures are for a new engine. The initial chain stretch which occurs within the first 5,000 miles of driving is usually sufficient to retard the events approximately 2°.

VALVE TIMING CHECK

To determine if valve timing is correct without dismantling the engine, the following procedure may be used:

1. Remove the front tappet cover and adjust the tappet clearance of No. 1 intake valve to .010 with engine hot or .012 with engine cold.
2. Insert a .002" feeler gauge in No. 1 intake tappet and rotate engine in direction of rotation until exhaust valve begins to close. Continue to rotate engine very slowly until a light drag is felt on the feeler gauge.
3. At this point, inspect the timing marks on the dampener. The engine is correctly timed when the No. lUDC mark (long mark) is 1" from the pointer. This would show the first small mark 1/4" before the pointer.

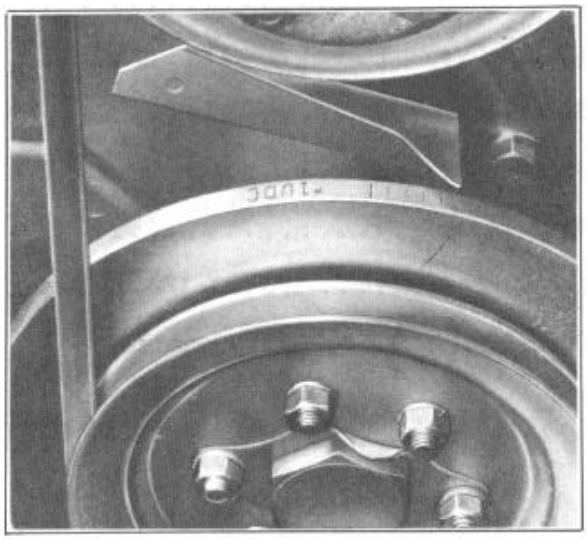


FIGURE 22

4. Reset No. 1 intake valve to recommended clearance of .010" hot or .012" cold and reinstall tappet cover.

VALVE MAINTENANCE

If valve tappets, with proper clearance, are noisy the following 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. Valve sticking in valve guides.
5. Valves loose in valve guides.
6. Valve springs cocked or not seating properly.
7. Warped valve.
8. Valve seat and guide not in alignment.

SECTION 4
FULL SYSTEM & EXHAUST
SPECIFICATIONS

Make	Carter WA1-2009S
Type	Single Throat Down Draft
Main Venturi	1-3/8"
Primary Venturi	11/32" I.D.
Flange Size	1-3/8"
Secondary Venturi	11/16" I.D.
Float Level	1/2"
Idle Adjustment	1/2 to 1-1/2 turns open
PumpPlunger Travel from closed to Wide Open Throttle	16/64"
Low Speed Jet Tube	Jet Size No. 65 drill. By-pass size No. 53 (.0595") drill. Economizer, in body .0545" - .0555" diameter. Idle bleed, size No. 53 (.0595") drill.
Vent	Outside only No. 10 drill.
Gasoline Intake	Square vertical needle.
Idle Port	Length .165", Width .030".
Idle Port Opening	120" to .124" above valve with valve tightly closed.
Idle Screw Seat	No. 46 drill.
Main Nozzle	Slip nozzle, flush type, (angle tip) seats in primary venturi at 45° angle. Discharge jet size .110" diameter inner nozzle (seats in slip nozzle),. Inside diameter No. 31 drill (.120") drill.
Metering Rod Jet	.1015" Diameter
Metering Rod	(75 - 864)

Metering Rod Setting:

Use Gauge J-1265 Carter T-109-102

Accelerating Pump:

Pressure type spring operated lever with adjustable stroke.

Pump Adjustment - 16/64" plunger travel. (Medium stroke). Use gauge No. T-109-117S

Choke: Climatic control, set 1 point lean. Butterfly type, off set valve. Choke heat suction hole in body, size No. 40 (.098") drill.

Anti-Percolator Valve Saxophone Key

Vacuum Spark Port: .051" - .054" diameter. Bottom of port .020" above valve.

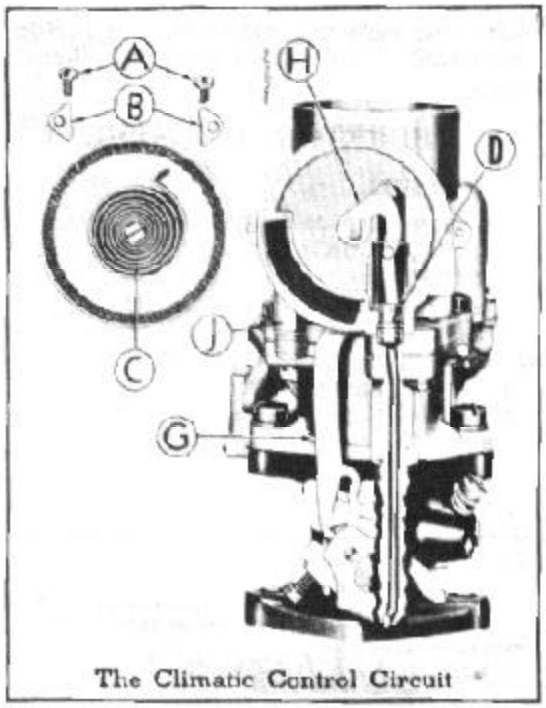


FIGURE 1

CLIMATIC CONTROL (CHOKE)

The Climatic Control c1oses the choke valve when the engine is cold. The Climatic Control is connected to the exhaust manifold by a tube (J-Figure 1) which allows exhaust gases to enter through the opening into the control housing and warm the thermostatic spring (C) and decreases the spring tension. A Vacuum piston (D) is connected to the choke valve and operates from the vacuum of the intake manifold. The pull of the piston against the thermostatic spring opens the choke valve (H) as the engine becomes warm.

FAST IDLE

A cam on the choke valve shaft is brought against an adjusting screw when the choke is closed.

The screw is adjusted to hold the throttle open sufficiently to provide necessary engine speed (fast idle) during the warm up period.

An unloader (G) is provided in the choke linkage to open the 'choke valve when the accelerator pedal is fully depressed. This allows the engine to clear itself of excess fuel if the engine is flooded during the starting period.

As the choke valve opens, the fast idle cam moves away from the screw allowing the engine to run at normal idle speed.

ANTI-PERCOLATOR VALVE

When the car stands in extreme ly hot weather or after a hard run, fuel in the carburetor bowl may vaporize and set up pressure in the bowl. To prevent this pressure forcing the fuel out the high speed nozzle (percolating), a saxophone key type anti-percolator valve vents the carburetor bowl to the atmosphere when the throttle is closed, relieving the pressure in the bowl, Figure 2. An anti-percolator valve that opens too early will allow excess air to be drawn into the high speed circuit. If the valve fails to open, it will cause difficult starting when the engine is hot.

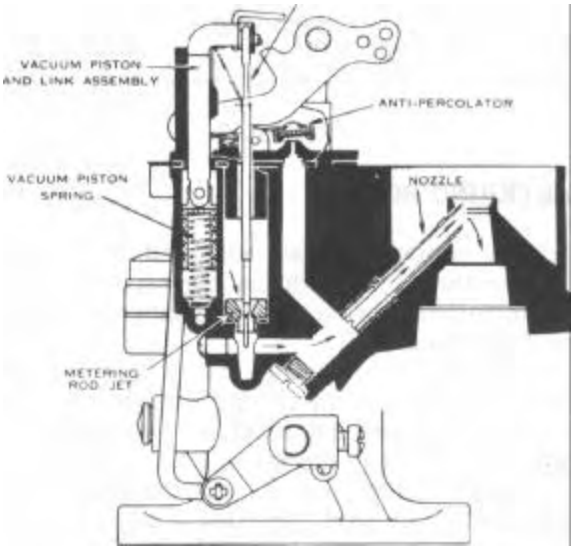


FIGURE 2

ACCELERATING PUMP

The carburetor incorporates a throttle operated accelerating pump, Figure 3, which discharges additional fuel into the carburetor

throat when the throttle is opened. The discharge is prolonged by the pressure of the pump and the restriction of the pump jet. This discharge allows time for the high speed circuit to furnish necessary fuel.

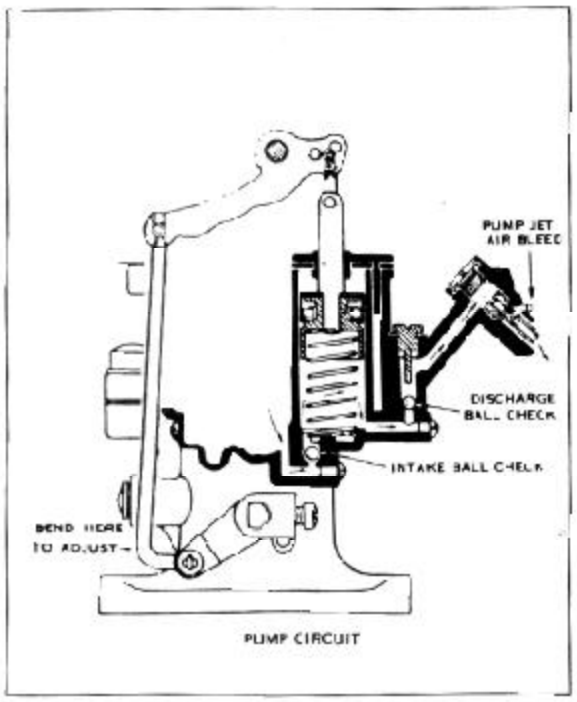


FIGURE 3

METERING RODS

The amount of fuel admitted to the carburetor throat through the high speed circuit is controlled by a stepped and tapered metering rod. Figure 2. Opening the throttle raises the metering rod allowing more fuel to pass through the jet.

At top speed the smallest section of the metering rod is in the jet.

Under heavy load at part throttle and for acceleration at part throttle, a richer than normal air fuel ratio is required. To provide this richer mixture, regardless of throttle position, the metering rod is connected to a vacuum piston. Under normal operating conditions the vacuum piston holds the metering rod down against the throttle link. When the engine vacuum drops, a spring under the vacuum piston raises the piston and metering rod, allowing more fuel to flow through the jet. As soon as the engine vacuum rises, the need for rich mixture passes and the vacuum piston returns the metering rod to normal position for mechanical operation through the throttle linkage.

CARBURETOR ADJUSTMENT

PUMP TRAVEL

1. Remove the carburetor dust cover and back out throttle adjusting screw to seat throttle valve.
2. Pump connector link should be in the lower hole (short stroke), Figure 3.
3. Pump travel should be 16/64". Use Carter Universal Pump Stroke Gauge T-109-117-S if available. Adjust pump travel by bending throttle connecting link at lower angle. Figure 3.

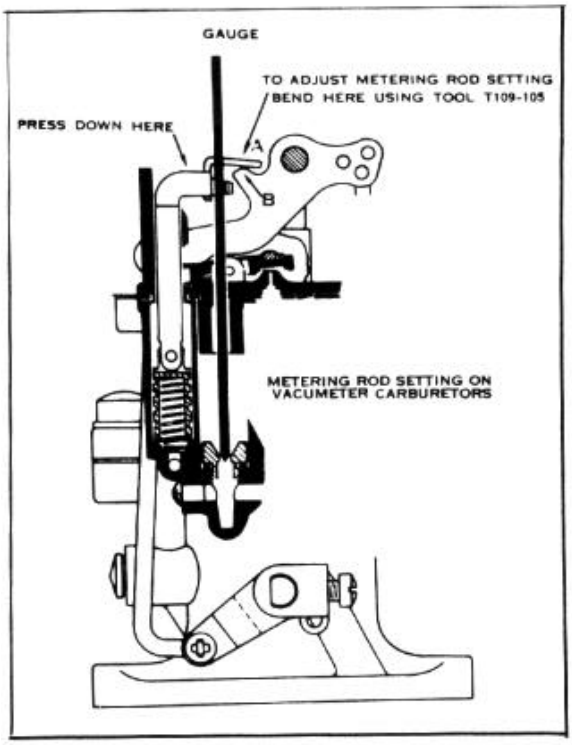


FIGURE 4

METERING ROD SETTING

1. Remove air cleaner and carburetor dust cover.
2. Remove hairpin clip and disconnect spring from metering rod and remove metering rod and disk.

3. Insert metering rod gauge J-1265 (Carter No. T-109-102). Hold gauge vertical and be sure gauge is seated in metering rod jet, Figure 4.
4. Press down on vacuum piston link directly over piston until it contacts the pump arm. Clearance between metering rod pin and shoulder of gauge should be less than .005" with throttle valve seated. Gauge must not drag on pin. Adjust by bending lip on piston link at (A).
5. Remove gauge, install metering rod, disk and reconnect metering rod spring.

ANTI-PERCOLATOR ADJUSTMENT

NOTE: Carburetor must be removed from engine.

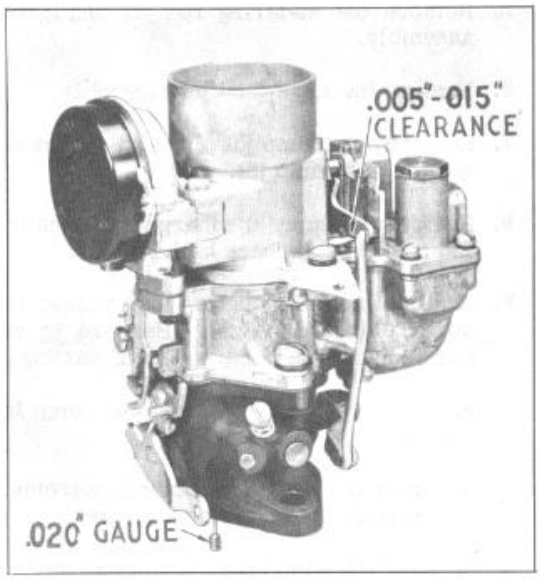


FIGURE 5

1. Crack throttle valve .020" by placing gauge 1-1633 (Carburetor No. T-109-29) between throttle valve and bore of carburetor on side opposite the idle port, Figure 5.
2. Clearance between percolator rocker arm lip and pump arm should be .005" to .015", Figures 5 and 6.
3. Adjust by bending the rocker arm at (A) Figure 6, using bending Tool 1-1389 to obtain this clearance.

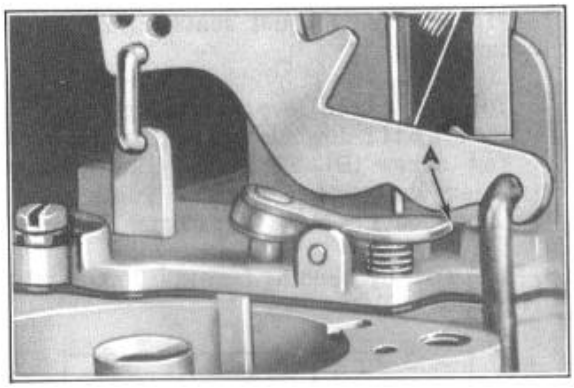


FIGURE 6

UNLOADER ADJUSTMENT

1. Remove carburetor air cleaner, open throttle wide open and check between lower edge of choke valve and air horn (A) Figure 7, clearance should be 7/16".
2. Adjust by bending cam (B) on throttle lever using Bending Tool J-1137.

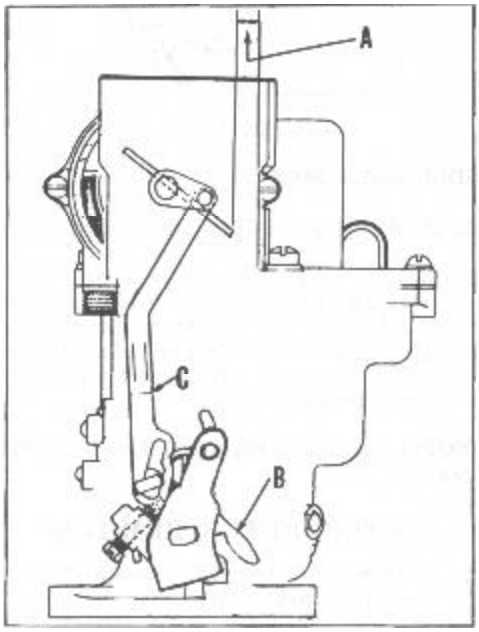


FIGURE 7

FAST IDLE ADJUSTMENT

1. With fast idle cam in normal idle position tighten throttle lever adjusting screw (A), Figure

8, until it just seats against the cam.

2. Hold throttle lever closed and pull cam back until low step is against but not on set screw (B), Figure 8. Clearance between lower edge of choke valve and air horn should be 5/8" (A), Figure 7.

3. Adjust by bending fast idle link at offset portion, (C).

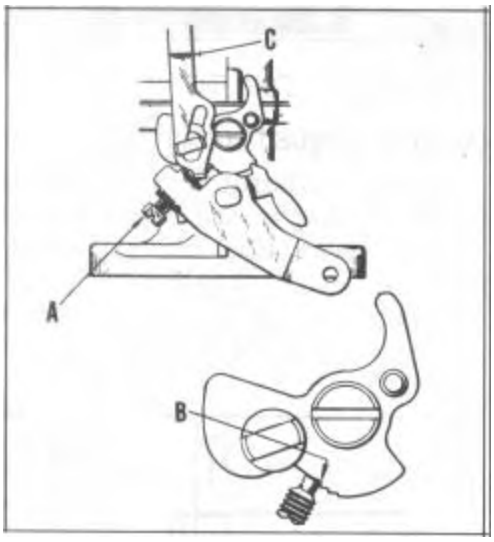


FIGURE 8

IDLE ADJUSTMENT

1. Start engine and allow engine to warm up.

2. See that choke valve is wide open and set idle adjustment screw to obtain smooth idle at 540 to 560 R.P.M. on cars equipped with Standard Transmission (490-510 R.P.M. for cars e quipped with HydraMatic Transmission).

NOTE: Normal setting is 1/2 to 1-1/2 turns open.

CARBURETOR REMOVAL

1. Remove air cleaner and disconnect throttle linkage at carburetor.

2. Disconnect gas line from carburetor to fuel pump and disconnect vacuum line from carburetor to distributor.

3. Disconnect heat riser tube from exhaust manifold to carburetor.

4. Remove nuts and lockwashers from the carburetor mounting studs and remove carburetor assembly.

DISASSEMBLY

1. Remove fast idle cam and pin assembly.

2. Remove air horn and climatic control assembly and lift off air horn gasket.

3. Disconnect throttle connector rod; then remove bowl cover with all parts attached. Remove throttle shaft arm assembly.

4. Check throttle rod for wear at both ends and at hole in pump arm. Remove bowl cover gasket and pump spring.

5. Remove the metering rod jet and gasket assembly.

6. Remove the low speed jet assembly.

7. Remove the pump jet plug and gasket assembly and pump jet.

8. Remove the pump discharge ball retainer and gasket, and check ball.

9. Remove nozzle passage plug, nozzle retainer plug and nozzle. (Be sure to remove small nozzle gasket from casting.)

10. Remove the pump strainer and pump intake ball check.

11. Separate the body from flange assembly and remove the body flange gasket.

12. Remove idle adjustment screw and spring.

NOTE: Check for groove on seating surface.

13. Remove idle port rivet plug with rivet extractor KMO-481.

14. Remove throttle valve screws, valve and throttle shaft and lever assembly. Check shaft for wear or loose lever and throttle rod hole in lever for wear.

15. Remove choke valve screws, choke valve, shaft and piston assembly from air horn.

Do not remove the piston housing (attached to the air horn with rivets).

16. Remove all parts from the bowl cover.

ASSEMBLY

1. Clean casting and metal parts thoroughly with a good commercial carburetor cleaning compound.

2. Examine each p art and replace any part that shows wear. Use all new choke gaskets, and new screws on throttle and choke valve.

3. Install strainer and strainer nut and gasket assembly.

4. Install needle seat and gasket assembly.

NOTE: Check for wear. II either the needle or the seat shows wear, replace both.

5. Install the needle, float and lever assembly, and float lever pin. Check float for dents and wear on lip, and float pin for wear. Check bowl cover for wear in hole. Set float lever to 1/2" by bending lip (A), Figure 9, that contacts the needle. Do not bend float. Measure distance from projection on b owl cover to soldered seam of float.

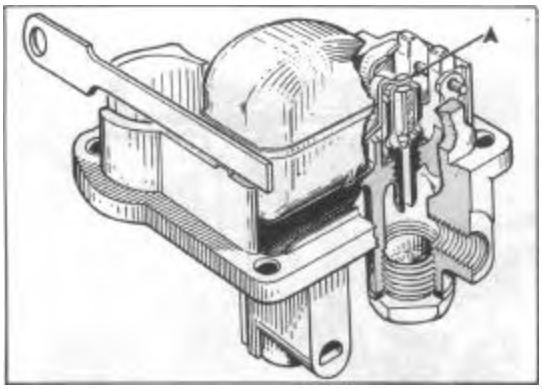


FIGURE 9

6. Install throttle shaft and lever assembly and throttle valve. Small "C" in circle should be toward idle port facing manifold side of flange Figure 10. Center the valve by tapping valve lightly before tightening screws. Peen ends of screw threads to keep screws from loosening.

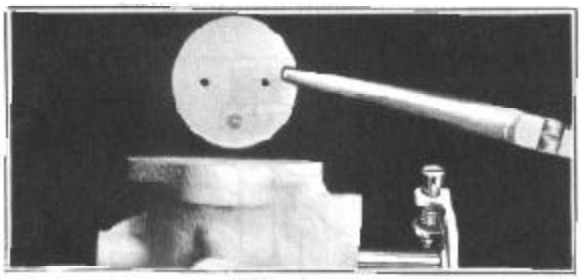


FIGURE 10

NOTE: Back out throttle lever adjustingscrew before installing shaft assembly.

7, Install idle port rivet plug.

8. Install idle adjustment screw and spring. Back out from seated position 1/2 to 1-1/2 turns. (Make final adjustment after installation).
9. Assemble body and flange assembly. Install screws and lockwashers. Pul1 screws down evenly.
10. Install low speed jet assembly. (Be sure jet seats firmly in casting.)
11. Install pump jet and pump jet passage plug and gasket assembly. (Be sure jet is clear of all restrictions and seats properly.)
12. Install pump check ball and pump discharge ball retainer and gasket.
13 Install pump intake check ball and pump strainer.
14 Install pump spring and pump plunger and rod assembly. Examine leather of plunger for damage. If leather is not in good condition, replace entire plunger assembly.
15. In stall metering rod jet and gasket assembly. Examine for wear. If jet is worn, replace both metering rod and jet.
16. Install the bowl cover assembly. Pull screws down evenly. Install idle passage plug and gasket assembly. (Center of bowl cover) .
17. Install the anti-percolator cap and rocker arm assembly and spring. (Make certain that leather is in good condition and that pin is not worn.)

18. Install pump arm and countershaft assembly. Install connector link on pump shaft in lower hole in pump arm.

19. Install the throttle shaft arm and screw assembly and throttle connector rod. Check throttle shaft arm for wear.

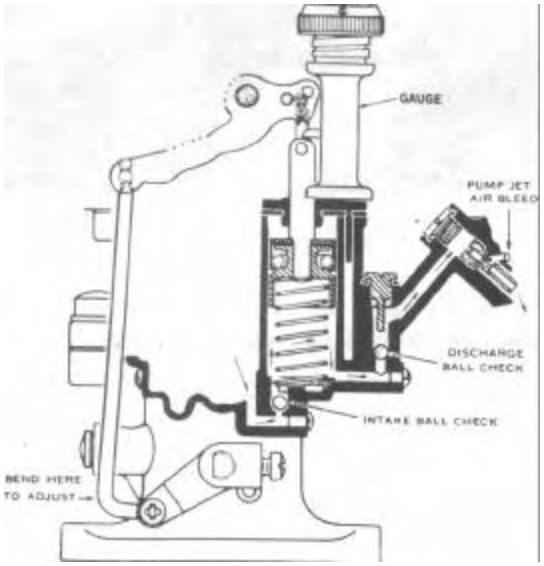


FIGURE 11

20. With the throttle connector rod in place, adjust pump stroke. Use Carter Universal Pump Travel Gauge T-109-117S or machinists scale, Figure 11, and set pump travel 16/64". Adjust by bending throttle connector rod at lower angle.

21. Adjust metering rod after pump adjustment is made. (See Figure 4). Insert metering rod gauge 1-1265 in place of metering rod, seating tapered end in jet. With throttle valve seated, press down lightly on piston link directly over piston. There should be less than .005" clearance between metering rod pin and shoulder of notch in gauge. Gauge must not drag on pin. Adjustment can be made by bending lip (A) on piston link so that it contacts hump on pump arm (B). Remove gauge, install rod and disc, and connect spring.

22. Adjust anti-percolator as outlined on Page 44, Figure's 5 and 6.

23. Install nozzle, nozzle retainer plug and nozzle passage plug and gasket assembly.

24. Install air horn and piston housing assembly. Install screws and lockwashers. Tighten screws evenly.

25. With choke, lever,screw and link in place, install choke shaft and piston assembly. Check for loose lever on shaft.

26. Install choke valve. Center choke valve on shaft and in bore by tapping lightly. Hold in place with finger while tightening screws. Peen ends of screw threads to keep screws from loosening.

27. Install the piston housing and thermostatic coil assembly with indicator marks at bottom and rotate counter-clockwise to center graduation.

28. Hold choke valve wide open, then tighten the choke lever screw. Be sure that the linkage does not bind in any position. Fast idle, unloader and lockout adjustments should be made as specified under "Carburetor Adjustments".

29. Install fast idle cam and pin assembly.

CARBURETOR INSTALLATION

NOTE: Place one gasket above and seven below the deflector. Replace broken or damaged gaskets and straighten deflector if damaged

.

1. Install carburetor and install nuts and lock washers on the carburetor mounting studs (E), Figure 12.

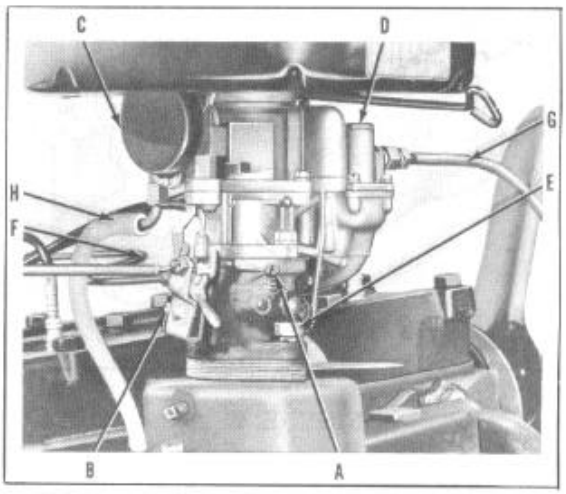


FIGURE 12

2. Connect vacuum line from distributor to carburetor (F) and gas line from fuel pump to carburetor (G).

3. Connect heat riser tube from exhaust manifold to carburetor (H) and throttle to carburetor, install clamp.

4. Adjust and test carburetor for maximum performance.

5. Install air cleaner.

NOTE: Do not tighten air cleaner clamp so tight that carburetor air horn will be distorted

.

AIR CLEANER, DRY (OIL WETTED TYPE)

The oil wetted type air filter can be cleaned by removing the attaching wing nut and lifting out the unit. Clean off old oil and dirt by dipping in kerosene and blowing dry. Re-oil by dipping unit in engine oil (using the same grade as used in the engine). Permit excessive oil to drain off and reinstall unit in the cleaner.

AIR CLEANER (OIL BATH)

1. Loosen long clamp screw at cleaner base, lift off complete cleaner.
2. Remove the wing nut at top of cleaner, lift out filter element and wash element in kerosene. DO NOT oil.
3. Remove oil, wash out base and refill to level indicated with one pint of S.A.E. 50 oil at temperatures above 32° and S.A.E. 20 oil at temperature below 32 degrees.

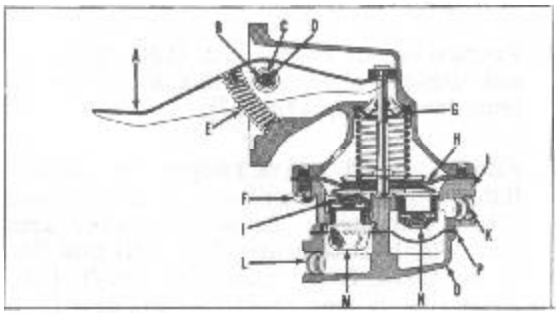


FIGURE 13

FUEL PUMP

A Carter mechanical fuel pump M-729SZ Figure 13, is used as standard equipment. A combination fuel and vacuum pump is also available as an option. The pump cam lever (A) fits under an eccentric on the camshaft. Rotation of the camshaft forces the cam lever down against the diaphragm spring (G) pressure, raising the diaphragm (H). Fuel is drawn into the fuel chamber through the inlet port (L) screen (M), and the inlet valve (I). When the low side of the eccentric is against the cam lever, the diaphragm spring forces the diaphragm down, expelling fuel through the o u t le t valve (N) and outlet port (K) to the carburetor bowl.

Continued pump operation fills the carburetor bowl, and the float needle valve closes the carburetor inlet. Fuel pressure built up in the pump fuel chamber opposes the diaphragm spring, resulting in shorter strokes until the pump stops completely. Normal diaphragm stroke is about 1/64".

FUEL PUMP TEST

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

2. Disconnect the fuel line at the carburetor and connect the fuel pump pressure gauge.

3. Start the engine and run at 1800 R.P.M. Pre s sure should be 4 to 5 pounds. Stop engine and watch pressure gauge. Pressure should not fall perceptibly.

4. If pressure falls, leaking pump valves are indicated.

5. If pressure s below specifications, attach vacuum gauge to inlet port of pump and operate engine. Gauge should show 6" of mercury or higher for satisfactory operation.

6. If fuel pump pressure is low, but vacuum reading satisfactory, difficulty is in the gasoline tank or lines to the pump.

7. If pump pressure and vacuum are both low, pump should be repaired or replaced.

VACUUM BOOSTER TEST

To check the action of the vacuum portion of the combination fuel and ;vacuum pump, connect a vacuum gauge to the inlet port and disconnect outlet. Gauge should show 8-1/2" of mercury at 120 R.P.M. and 12" at 1800 R.P.M. If vacuum is not within these limits, repair or replace pump.

REMOVAL

1. Disconnect fuel lines from pump. On combination pump disconnect vacuum lines also.

2. Remove cap screws, fuel pump and gasket pack.

FUEL PUMP DISASSEMBLY (CARTER)

1. Mark pump body and valve housing with a file to insure correct reassembly.

2. Remove cam lever return spring (E), Figure 13, cam lever pin rivet plug (B), retainer (C), and pin (D), and cam lever (A).

3. Remove six valve housing screws (F), valve housing (I), the two valve housing cover attaching screws, valve housing cover (0), outlet air dome diaphragm (P), and strainer (M).

4. Remove diaphragm assembly (H).

NOTE: Do not remove valve cage assemblies (I) and (N) unless they are to be replaced.

5. Clean all parts in gasoline. (Do not use a strong solvent or cleaner on valve housing.)

6. Inspect parts for wear.

FUEL PUMP ASSEMBLY (CARTER)

1. Assemble strainer (M), outlet air dome diaphragm (P), valve housing cover (0), and attach to valve housing.
2. Install diaphragm assembly (H), in pump body with flat spaces on sides towards port.
3. A1ign mark on pump body with mark on valve housing (J) and install housing, but DO NOT tighten screws.
4. Install cam lever (A), pin (D), pin retainer (C), and new rivet plug (B).
5. Flex diaphragm and hold in maximum down position and tighten valve housing attaching screws.
6. Install cam lever return spring (E).

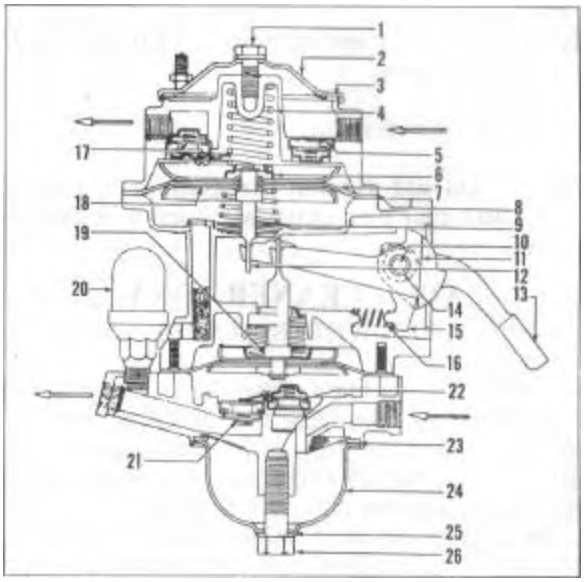


FIGURE 14

FUEL AND VACUUM PUMP (AC) - DISASSEMBLY

1. Mark the vacuum section cover and fuel section cover to insure parts are reassembled in their correct position.

2. Hold pump in vise, remove 2 fuel cover screws from opposite sides and insert 2 headless screws No. 10-32 x 1-1/2". After guide screws are installed remove balance of screws and vacuum section cover.

3. Press down on rocker arm (13), Figure 14 and unhook diaphragm link assembly (9) from inner pump arm (12).

4. File riveted end of rocker arm pin (10) flush with steel washer or drill off end with a 3/8" drill. Drive out rocker arm pin. Wiggle rocker arm (13) until link (11) is unhooked from diaphragm shaft (19). Re move rocker arm bushings, arm (13), spring (16), link (15), link (12) and link (ii).

5. Remove fuel pump cover screw (26), gasket (25), cover (24), gasket (23) and screen.
6. Remove screws attaching fuel section to center section and remove fuel section, diaphragm (19), valves (21) and (22).

ASSEMBLY

1. Assemble link spacer (15) over fuel link (11). Place one vacuum link (11) and (12) 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 (14) through holes in rocker arm spacer washers and links. Retain the parts in position by using AC Tool PT-6 or a long straight 3/16" pin.

2. Place diaphragm spring in position and assemble pull rod and diaphragm assembly (19) through boss in fuel body, hooking pull rod over end of link.

3. Drive out tool PT-6 with a new rocker arm pin (10). Place washer over small end of new pin and spread pin end with a round nose punch.

4. Place valve and cage gaskets in recesses on fuel cover. Inlet valve must have three legged spider facing out of cover, outlet valve must have three-legged spider facing into cover. Install retainer and screw.

5. Install strainer screen, bowl gasket (23), bowl (24), bowl screw gasket (25) and bowl screw (26). Install air dome (20).

6. In stall fuel 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 alternately until secure. Diaphragm must be flexed before tightening cover screws, or pump will deliver too much pressure.

7. Place two gaskets and two valves and cage assemblies (17) and (5) in cover. Secure valve and cages with retainer and screw.

8. Turn cover over and set screen in recess over valve hole. Set screen retainer on screen. Place cover gasket (3), cover (2), cover screw gasket and cover screw (1) in position and tighten cover screw.

9. Assemble oil seal on vacuum diaphragm pull rod in the following sequence: oil seal spring, upper retainer, oil seal washer, and lower retainer. Turn lower retainer 90 degrees to lock in position.

10. 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.

11. While holding vacuum diaphragm in position, the body should be clamped in a vise, v a c u u m side up. Clamp by one of the mounting flange ears. The vacuum diaphragm must be held leve1 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 a piece of steel, 3/16" to 3/32" 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).

12. Place spring retainer on riveted end of diaphragm pull rod, and place spring on the retainer. Place vacuum cover and valve assembly over spring and align the file marks.

13. Insert the two No. 10-32 x 1-1/2" screws in opposite holes in cover flange. Turn these long screws down as far as they will go without forcing, alternating a few turns on each. Insert regular screws with lock washers and tighten until screws just engage lockwashers. Place two long screws with regular screws and lockwashers.

14. Remove 3/32" spacer from rocker arm position. This allows the heavy vacuum spring to push diaphragm into a flexed position. Tighten all cover screws alternately until secure.

15. Combination fuel and vacuum pump cannot be bench tested because of the heavy vacuum spring. Use a vacuum gauge and test pump while pump is assembled to engine.

INSTALLATION

Install in reverse order of removal. Make sure the flange gasket, mounting stud insulator bushings and washers are installed properly.

FUEL LEVER INDICATOR

The fuel level indicator is of the constant voltage type. It consists of a voltage regulator, panel indicator and a tank level unit connected by a single wire system between the units. Figure 15.

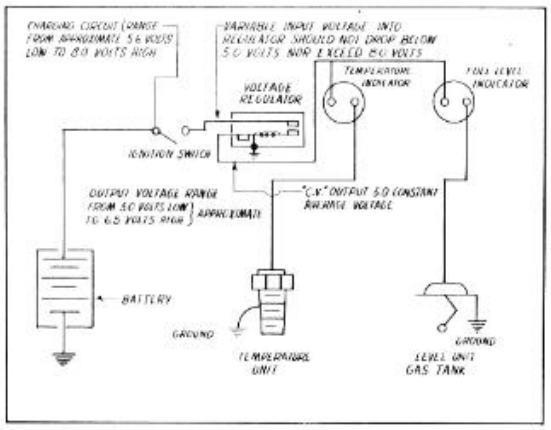


FIGURE 15

VOLTAGE REGULATOR

Its function is to regulate the variable (input) voltage available from the car storage battery, or the charging system, to produce a constant 5.0 volt output to the gauges. This regulator is a simple device, operating with a heater bimetal in conjunction with a pair of contacts.

FUEL LEVEL GAUGE

With the tank empty, the float holds the slide rheostat (variable resistance) at maximum resistance causing the gauge to read empty.

With the tank full, the slide rheostat is moved to the minimum resistance point causing the gauge to read "Full" with the ignition switch on. The use of the bimetal in the fuel indicator provides stability of reading and eliminates pointer fluctuation incidental to surging in the tank and the float bobbing on the surface of the fuel.

GAUGE TROUBLE DIAGNOSIS

GAUGE TESTING EQUIPMENT

One new OK tank level unit (constant voltage type), one new OK panel fuel indicator gauge and three ten-foot lengths of No. 16 insulated wire equipped with clip terminals at each end of wire.

VOLTAGE REGULATOR

The constant voltage regulator is common to both fuel and temperature system, that is, one regulator is used to operate both systems

.

METHOD OF CHECKING

1. If both gauges read considerably too high- for example, if the gas gauge reads up the scale with an empty gas tank and the temperature gauge reads up scale with a cold engine, the constant voltage regulator is not working properly and should be replaced: (Check ground connections of the voltage regulator as grounding is essential to the proper functioning of the regulator).
2. If both gauges read too low, either the input voltage to the C.V. regulator is below 5.0 volts or the voltage regulator is inoperative and should be replaced. Check battery voltage output before replacing regulator.

PANEL INDICATOR CHECK

1. Disconnect lead wire at gas tank gauge unit.
2. Hook in a new tank unit.• Ground tank unit. Place float in empty position. Turn on ignition switch. Panel gauge should read at (E) on dial.
3. Move float to full position, panel gauge should read full (F).

NOTE: If check 2 and 3 are OK, both panel gauge and lead wire are OK. If checks 2 and 3 are not OK, hook up a new tank unit to proper terminal of panel gauge and eliminate the lead wire from the panel indicator to the unit from the regulator circuit. Repeat empty and full check. If now operating OK, correct or replace bad wire between tank unit and panel gauge.

GAS TANK UNIT

If there is any question about the tank level unit being OK, took the tank unit up in series with a panel indicator and a constant voltage regulator known to be OK and a six volt battery. Operate tank level unit by hand and see if panel indicator reads empty (E) with tank level unit float in bottom position, and reads full with level unit float in top position. If the panel indicator and lead wire function properly with a new OK tank unit, but did not function properly with original unit, replace original unit.

NOTE: Be sure tank unit is properly grounded to gas tank and also that the tank is grounded to the frame.

GASOLINE TANK

REMOVAL

1. Raise car and drain the gasoline tank and dis connect the fuel gauge wire and fuel line.
2. Remove the two nuts and washers attaching gas tank straps to rear compartment floor and re move gas tank.
3. Remove the gas tank gauge unit and gas tank outlet pipe.

INSTALLATION

1. Install gas tank gauge unit (use new gasket).
2. Install outlet tube and install gas tank.
3. Install gas tank straps and draw tank up into position.
4. Connect gauge wire and fuel line and lower car.

EXHAUST AND INTAKE MANIFOLDS

REMOVAL

Remove both manifolds as a single unit.

1. Remove air cleaner by loosening the attaching screw at the carburetor air horn.
2. Disconnect the throttle rod at carburetor.
3. Remove the fuel line, vacuum line and heat riser tube from carburetor.
4. Re m o v e the two bolts attaching exhaust pipe flange to exhaust manifold.
5. Remove the eight nuts, four washers, and four retainers attaching manifolds to block and re move manifolds with carburetor attached.

INSTALLATION

Reverse the procedure of removal.

HEAT CONTROL VALVE

REMOVAL

NOTE: For removal, follow same procedure as exhaust manifold removal and, in addition the following operation.

1. Disconnect outer spring and retainer and remove heat control spring.
2. Remove the two nuts holding cover to manifold. Remove c over and anti-rattle spring.
3. Use a drift to remove the tapered pin. This will allow removal of the shaft and butterfly.

INSTALLATION

Reverse procedure of removal.

FRONT EXHAUST PIPE

REMOVAL

1. Raise car.
2. Remove two bolts attaching exhaust pipe flange.
3. Remove bolt and nut from bracket attaching exhaust pipe to engine support plate.
4. Remove bolt and nut and clamp attaching exhaust pipe to auxiliary muffler.
5. Disconnect exhaust pipe and remove from under car.

NOTE: Forcing the auxiliary muffler to the rear on the mounting will help in the removal of the exhaust pipe.

INSTALLATION

1. Install new front exhaust pipe from under car, and connect at front of auxiliary muffler, do not tighten clamp.

2. Install clamp at engine support plate but do not tighten.

3. Connect exhaust pipe flange to exhaust manifold and tighten securely.

4. Tighten clamps at auxiliary muffler, also at engine support plate.

SECTION 5
COOLING SYSTEM

ANTI-FREEZE CHART

Protection Temperature	Hudson Anti-Freeze Qts.	Methonal Qts.	Ethylene Glycol (Prestone or Equivalent) Qts.
10	4-1/4	3-1/4	4
0	5-1/2	4-1/4	5-1/4
-10	6-3/4	5-1/4	6-1/4
-20	7-3/4	6	7
-30	8-3/4	6-3/4	7-3/4

DESCRIPTION AND OPERATION

The cooling system is of the pressure type and has a cellular tubular radiator, a centrifugal six vane impeller pump and a 17" four blade radiator fan with the blades unevenly spaced to minimize noise.

The engine block contains a brass water distributing tube with holes properly spaced to direct the flow of water around the cylinders for efficient cooling.

By-pass thermostats are used to permit rapid engine warm up by restricting circulation of the coolant through the radiator and by-passing it through the cylinder block until the coolant temperature rises sufficiently to open the thermostat. The temperature range of the thermostats is as follows:

The standard thermostat starts to open at 150° to 155° and is fully open at 175°.

The high temperature thermostat starts t o open at 165° to 170° and is fully open at 195°. (For use with Permanent Anti-Freeze.)

A pressure type radiator cap which is designed t o maintain a constant pressure in the cooling system under normal operating conditions is used

.

CAUTION: When removing pressure cap while the engine is hot, always turn cap slowly counter clockwise until the stop is reached. Keep the cap in this position until all pressure is dissipated; then turn cap fully and remove.

DRAINING SYSTEM

To drain the cooling system open the radiator drain cock located at the lower right corner. Also remove the pipe plug in the cylinder block located at the rear left side. Remove the radiator cap to prevent air lock.

RUST AND SCALE -DEPOSITS

Scale or rust tends to obstruct the flow coolant through the water passages of the cylinder block and radiator, when such formation is excessive, it prevents proper heat

dissipation and results in overheating. This, in turn, cause loss in lubrication efficiency and accumulation of carbon, varnish and sludge.

If overheating exists due to clogging of the engine portion of the cooling system, the conditions should be corrected by the use of a reputable solvent or a reverse flushing.

CAUTION: Care must be used in the selection of cleaners 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 radiator to leak.

REVERSE FLUSHING

Reverse flushing of the cooling system is the forcing of water through the radiator using air pressure and flushing in a direction opposite to that of the normal flow of water

.

USE OF INHIBITOR

The regular use of a cleaning and an inhibiting fluid in the cooling system and periodic reverse flushing will greatly reduce the formation of rust, s c ale and corrosion. The logical time for flushing and introduction of inhibitor is when the antifreeze is installed in the fall and when it is removed in the spring.

A good inhibitor should be kept in the cooling system at all times. 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. 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 them are denatured alcohol, methanol (synthetic wood alcohol) and ethylene glycol. Do not mix different basic types of antifreeze.

The alcohol type antifreeze solutions are subject to evaporation, especially on heavy runs, and should be tested frequently. Add as necessary to protect the cooling system for the lowest anticipated temperature:

CAUTION: These liquids, if spilled on the car, should be washed off immediately with a generous quantity of water to prevent damage to the finish.

It is advisable to tighten or replace all hose connections. It is important that the cylinder head be kept tight to prevent leakage.

If evaporation o c cur s 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 connections and other parts.

WATER PUMP

The water pump features a permanently lubricated ball bearing for the pump shaft and a non-adjustable packing. A permanent seal, which makes repacking unnecessary, is used to prevent leakage around the water pump shaft.

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 lubricate d double row ball bearing with grooves in the :shaft to furnish race-way 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.

WATER PUMP REMOVAL

1. Drain the cooling system.

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 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 bolts and nut from the generator adjusting bracket to cylinder block and remove bracket.

5. Remove the four bolts and lock washers 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

1. Remove the water pump shaft retainer (7) and old gasket (13), Figure 1.

2. Press out the pump shaft and bearing assembly with water pump pulley hub attached using adapter plate between body and pulley hub.

The slotted adapter 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 adapter (J-2778-3) is included in S-2778 Holding Fixture.

The bearing and shaft is serviced as an assembly only. The water pump pulley hub is not part of the shaft and must be removed from the old shaft and installed on the new shaft.

WATER PUMP SHAFT, SEAL AND BEARING INSPECTION

1. Clean the bore in the pump body and check for scores and wear.

2. Check the pump body at the area of the impeller and if the impeller has been scraping the body, it indicates improper clearance.

3. Check seat and if necessary replace seal. Using a brass drift and working through hub bore of pump, drive out seal assembly.

4. Revolve bearing slowly by hand, using hand thrust load. If bearing does not drag or feel rough, it can be reused.

5. If steel seals at ends of bearing, outer races are loose so they can be turned with fingers, the bearing should be replaced.

6. Worn shafts and shafts with a worn spring retainer groove should be replaced.

ASSEMBLY

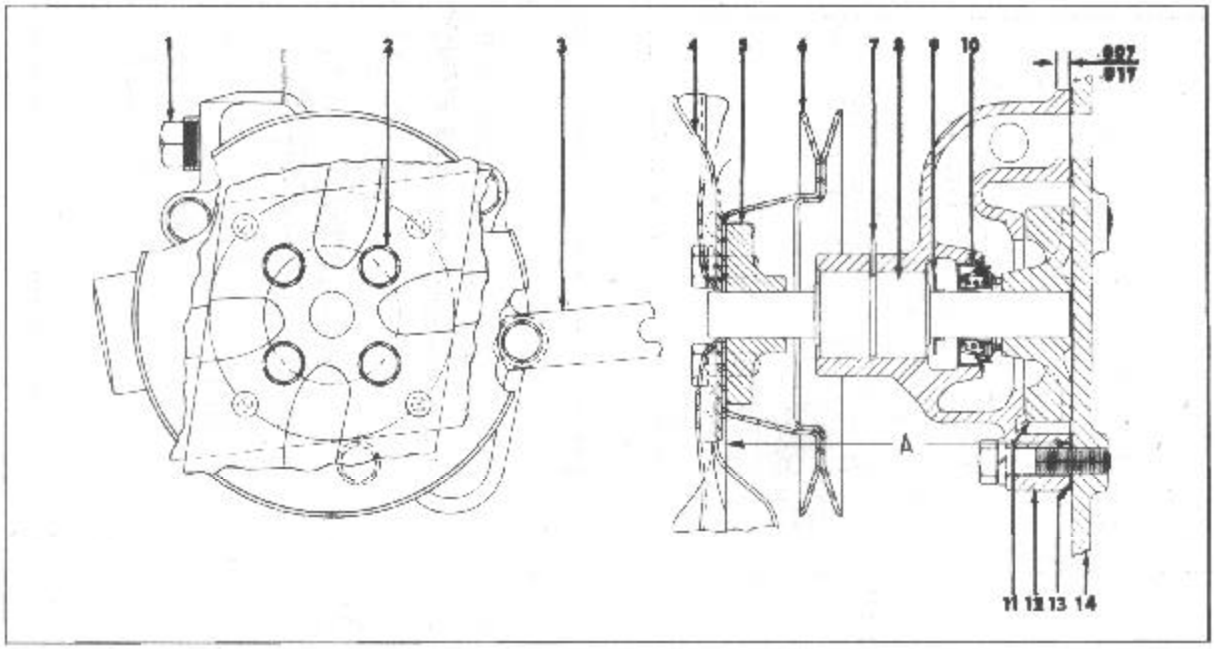
1. Assembly the shaft and bearing in the water pump body.

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. In stall seal assembly (10) as seal outer retainer is a press fit in pump body. Be sure seal is properly aligned. Use of a steel tube 1-5/8" outside diameter will facilitate assembly.

3. Lubricate the shaft with engine oil and press on the



WATER PUMP - LEGEND

1. Body pipe plug
2. Fan blade bolt and lockwasher
3. Generator adjusting bracket
4. Fan blade assembly
5. Pulley hub
6. Pulley assembly
7. Bearing retainer
8. Bearing and shaft assembly
9. Shaft slinger
10. Shaft seal
11. Impeller
12. Body
13. Body to cylinder block gasket
14. Cylinder block

fan pulley hub. Support the flange of the hub and apply pressure on the impeller end of the shaft. Maintain proper pulley spacing. This dimension should be 5-1/64" from the front face of pulley hub to rear end of shaft (A-Figure 1).

4. Install impeller on shaft, be sure front face of impeller is free of nicks and burrs. Support pump on fan end of shaft when installing impeller.

NOTE: Impe11er and shaft must protrude .007" to 017" beyond cover face of pump body, Figure 1.

INSTALLATION

1. Remove all traces of the old pump to block gasket and install new gasket and pump to engine. Be sure the proper gasket is used in order to insure correct impeller to body clearance and install attaching bolts and tighten to 20 to 30 foot pounds.

2. Install fan belt.

3. Install pulley hub (5), fan blades (4), lock washers and screws (2). Tighten screws to 12 to 15 pounds torque.

NOTE: Clearance from outside edge of fan blade to radiator cap should be 7/8".

4. Install generator adjusting bracket.

5. Install hoses.

6. Install adjusting bracket bolt in generator bracket and adjust fan belt.

7. Refill radiator.

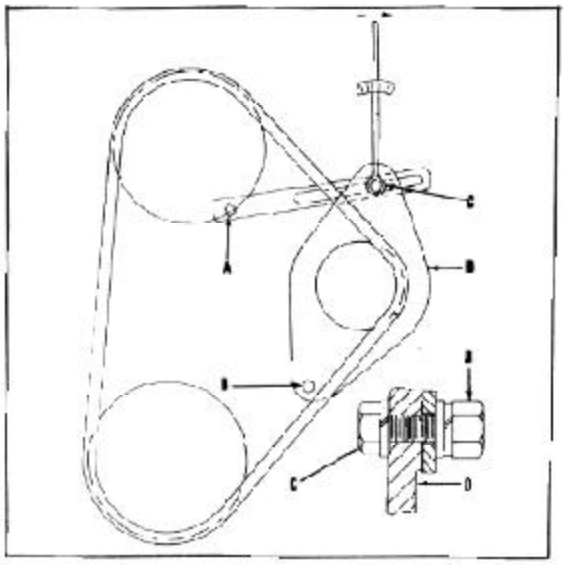


FIGURE 2

FAN BELT ADJUSTMENT

1. Loosen generator adjusting bracket bolt (A) Figure 2 nut (B) and two generator support bracket bolts (D) three t o four turns.

2. Apply a torque wrench approximately 12" long and as nearly vertical as possible to the head of generator adjusting bracket bolt (C) and pull generator against fan belt.

3. With torque wrench indicating 10-1/2 foot pounds tighten generator adjusting nut (B) securely. Remove torque wrench and tighten remaining three bolts securely.

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 excessive temperature may have caused the bellows to take a set in the expanded position.

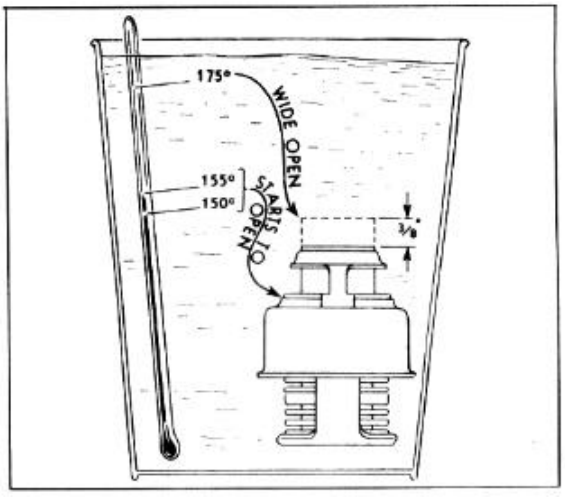


FIGURE 3

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 6.

Continue he a tin g the water until the thermostat is wide open. The thermometer should show 175° 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.

NOTE: High temperature thermostats are also available, these start to open at 165° to 170° F. These should be used with permanent type Anti-Freeze to insure maximum heater efficiency.

WATER TEMPERATURE GAUGE

When the coolant is cold, the high resistance in the unit causes the instrument panel gauge to read at the cold end of the dial with ignition switch turned on, Figure 4.

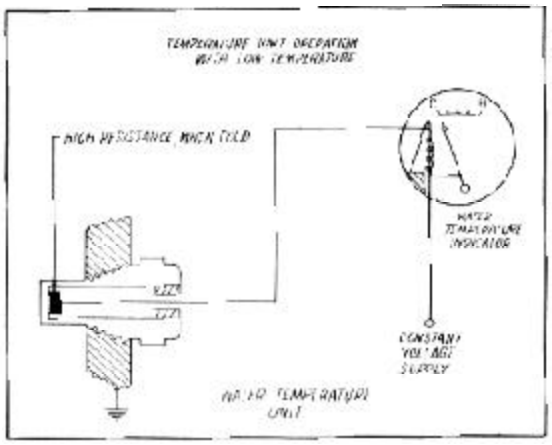


FIGURE 4

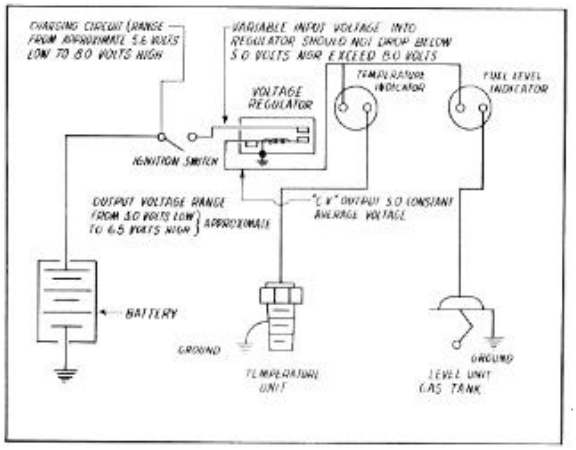


FIGURE 6

When the coolant is hot, the low resistance in the unit causes the instrument panel gauge to read at the hot side of the dial with ignition switch on, Figure 5.

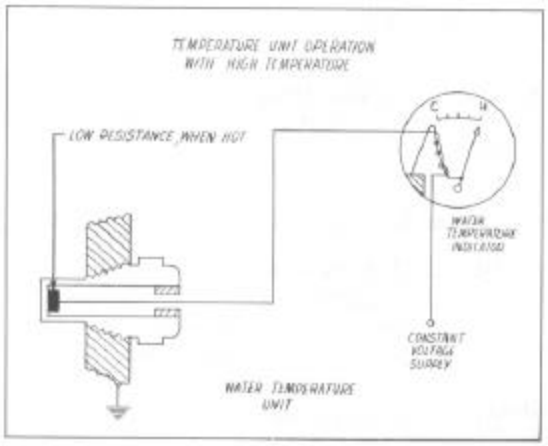


FIGURE 5

VOLTAGE REGULATOR

The constant voltage regulator is common to both the temperature and fuel systems, that is, one regulator is used to operate both systems, Figure 6.

METHOD OF CHECKING

1. If both gauges read too high for example, if the temperature gauge reads up scale with a co1d engine, and the gas gauge reads up scale with an empty gas tank, the constant voltage regulator is not working properly and should be replaced. (Check ground connections of the voltage regulator as grounding is essential to the proper functioning of the regulator).

2. If both gauges read too low, either the input voltage to the C.V. regulator is below 5.0 volts or the voltage regulator is inoperative and should be replaced. Check battery voltage output before replacing regulator.

NOTE: It is not advisable to attempt any repairs or adjustments to either unit of the gauge since they are factory calibrated and attempt to repair is impractical.

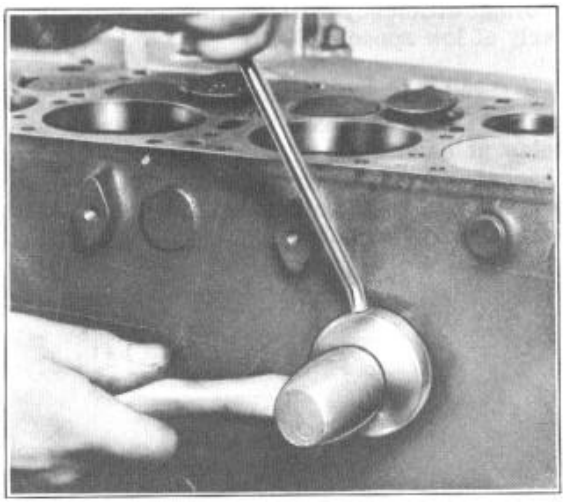


FIGURE 7

The water jacket plugs used in the left side of the cylinder block are a drive fit and can be easily installed fusing tool J-2793 as illustrated in Figure 7. Use a light coat of H u d s on Perfect Seal Paste to facilitate installation and improve the sealing. 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 7.

RADIATOR

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 the radiator to "U" channel and remove radiator.

INSTALLATION

Reverse procedure of removal.

NOTE: Proper clearance between the fan blades and radiator core is 7/8".

Should the f an be too close, there is danger of damaging the radiator on an emergency stop. If set too far from the core, cooling efficiency will be impaired particularly at low speed.

Provision for adjusting the positions of the radiator core is by means of elongated holes at each side of the radiator mounting channel. A cap screw and a lip in each bracket fits in the elongated holes and limits the amount of adjustment.

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 bearing.

12. Use of certain types of anti-freeze solutions in warm weather.

13. Slipping clutch.

SECTION 6
ELECTRICAL SYSTEM
SPECIFICATIONS

GENERATOR

Make and Model	Auto-Lite GGW-4802A
Type and Volts	Shunt - 6 Volt
Control	Vibrating type current - Voltage Regulator
Controlled Output	45 Amperes
Poles	2
Brushes	2
Brush Spring Tension	35 to 53 ounces with new brushes
Bearings:	
Commutator End	Bronze
Drive End	Ball
Armature Shaft End Play	003" to .010"
Ground Polarity	Positive
Field Coil Draw	1.4 to 1.5 amperes at 5.0 volts. Measure from armature to field terminals.
Motorizing Draw	4.1 t o 4.6 amperes at 5.0 volts. Have field grounded to frame and measure from armature terminal to a ground on the frame.
Output Test:	
Cold	6 4 volts, 0 amperes at 870 to 970 RPM 8.0 volts, 45.0 amperes at 1925 to 2125 RPM
Hot	6 4 volts, 0 amperes at 950 to 1050 RPM 8.0 volts, 45.0 amperes at 2350 to 2550 RPM

GENERATOR REGULATOR

Make and Model	Auto-Lite VBE-6104A
Volts	6
Ground Polarity	Positive
Resistors:	
R1	34.5 to 42.0 OHMS (Marked 38)
R2	6 5 to 8.0 OHMS (Marked 7)
Cutout Relay	Resistance of voltage winding 29.8 to 33.0 ohms
Armature Air Gap	031" to .034" contacts should be open and the armature against the upper stop. Measure the gap with the gauge as near to the hinge as possible.
Contact Point Gap	015" minimum
Contacts Close	6.3 to 6.8 Volts
Contacts Open	4.1 to 4.8 Volts after a charge of 15 amperes
Current Regulator	
Armature Air Gap	.048" t o .052" contacts should be closed with the high limit gauge in place and open with the low limit gauge in place on the contact side and next to the brass armature stop pin.
Operating Amperage	43-47 (at 70°)
Armature Spring	14-1/2 turns

Voltage Regulator:

Air Gap	048" to .052"
Armature Spring	14-1/2 turns
Operating Voltage	(at 22 ampere charging rate plus or minus 1.15 volts)

STARTER MOTOR

Make and Model	Auto-Lite MZ 4172	Auto-Lite MZ 4167
Volts	6	6
Poles	4	4
Brushes	4	4
Brush Spring Tension	42 to 53 ounces	42 to 53 ounces

DISTRIBUTOR

	IAT-4016
Make	Auto-Lite
Rotation	Clockwise
Drive	Oil Pump
Point Gap	0.20"
Points Open	T.D.C.
Cam Angle	39°
Arm Spring Tension	17-20 oz.
Condenser Capacity	21-25 MFD
Firing Order	1-5-3-6-2-4
Shaft Bearings	2 absorbent Bronze
Shaft Side Play	.005" max.
Shaft End Play	.003" to .010"

ADVANCE—

Automatic	Vacuum
0° at 300 RPM	0° at 5-1/4"
10 at 350 RPM	1º at 5-3/4"
4.5° at 500 RPM	4° at 7-1/2"
12° at 1325 RPM	6° at 8-3/4"
13.5° at 1500 RPM	7.5° at 9-1/2"

Allowable variation from curve, plus or minus 1°.

Timing Marks	Vibration Dampner

COIL

Make	Auto-Lite
Model	CR-6012A
Amperage Draw:	
Engine Stopped	5.0 amps.
Engine Idling	1.5-2.0 amps.

SPARK PLUGS

Make	Champion H8
Gap	032"
Thread Size	14 M.M.

BATTERY

Make	National 1W-90
Capacity	90 Ampere hours at 20 hour rate
Number of Plates Per Cell	15

ELECTRICAL SYSTEM

The starting system uses a 6 volt starter mot or and left hand inboard type Bendix drive, on cars not equipped with Hydra-Matic Drive, and a right hand outboard Bendix Drive with cars equipped with Hydra-Matic Drive. The starter motor is energized by the battery through a solenoid. Turning ignition sw itch key to the extreme right activates the solenoid.

BATTERY

The battery used i s a National, Model 1W-90, 45 plate 6 volts 90 ampere hour storage battery. Electrolyte level should be at the bottom of the square in filler cap opening. Use distilled water in the battery. Level should be checked at lubrication periods and more often in warm weather. Battery terminals should be kept clean and tight at all times.

BATTERY TEST

HYDROMETER

Under normal conditions a hydrometer reading of the specific gravity of each cell will determine the state of charge. A specific gravity of 1270 at 70° F indicates a fully charged battery. A specific gravity of 1.130 indicates a fully discharged battery. If specific gravity varies more than 25 points between cells, recharge and retest or test under load.

VOLTMETER

A battery that fails to perform properly after charging should be tested with a volt-meter. Each cell should show two volts or over under no load, and the voltage across the terminal posts should be six volts or over.

If these readings cannot be obtained the battery should be replaced.

LOAD TEST

A load test should be made to eliminate possibility of a weak cell. Use Battery-starter tester or a standard cell tester with a heavy shunt across the terminals. With the cell tester the difference between cells should be not more than 1.5 volts, and each cell should test at least 1.5 volts. With the Battery-Starter Tester, meter should show at least 4 volts at 300 amperes discharge.

If a tester is not available, a voltmeter may be connected across the battery terminals while engine is cranked with the starter motor.

Battery is serviceable if the starter cranks the engine at a good speed for 1/2 minute and the voltage does not fall below 4-½ volts. DO NOT CRANK MORE THAN 1/2 MINUTE WITHOUT ALLOWING THE STARTER MOTOR TO COOL.

A slow cranking speed or voltage lower than 4-1/2 indicates a weak cell or high resistance in the connections to the starter, and the battery cables should be checked and load test repeated.

BATTERY CABLE CHECK

1. Connect a negative voltmeter lead to th e negative battery terminal and the positive lead to the starter motor terminal. Crank the motor with the starter. Voltage should not exceed .2 volts.

2. Connect the positive voltmeter lead to the battery ground post and connect the negative lead to car frame. Crank the motor with the starter. Voltage should not exceed .2 volts.

3. Connect positive voltmeter lead to car frame and negative lead to starter motor frame. Crank the motor with the starter. Voltage should not exceed .2 volts.

4. If voltage loss is greater than above, terminal posts, ground strap and connections, and starter solenoid should be checked for high resistance.

CRANKING VOLTAGE TEST

1. Connect the negative voltmeter lead of the starter motor tester to the starter switch terminal and the positive lead to the engine for a ground.

2. With the 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.

3. If the voltmeter reading i s less than 5 volts, check the battery cables, and starter solenoid to determine the causes for the low reading.

STARTER SOLENOID TEST

1. Connect negative lead to "Bat" terminal of starter solenoid switch and positive lead to the starting motor terminal of starter solenoid switch, Figure 1.

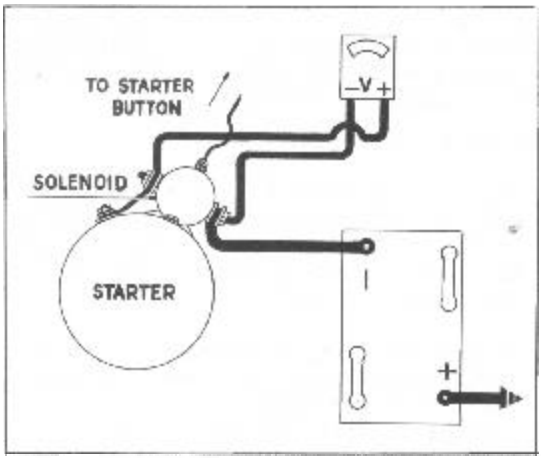


FIGURE 1

2. Close the solenoid electrically to crank the engine; if the reading is more than 0.2 volts, replace the solenoid switch.

STARTER REMOVAL

1. Disconnect cable at battery negative terminal and remove cable at starter motor post.

2. Remove the two starter mounting stud nuts and remove the starter motor assembly.

DISASSEMBLY

1. On cars equipped with the outboard type starter, remove the two through bolts attaching the Bendix housing to starter frame and remove the Bendix housing, drive out pin attaching adapter to shaft and remove adapter, sleeve and pinion.
2. On inboard type Bendix, remove lock spring from end of Bendix drive, and remove spring and retainers.
3. Remove two countersunk screws attaching drive end head and remove head.
4. Remove commutator cover band and remove brushes from holders.
5. Remove commutator end head and armature.

ASSEMBLY

1. Replace armature in frame and install drive end head and attaching screws.
2. Install commutator end head and through bolts and pry up brush springs and insert brushes in holders and replace band cover.
3. Replace Bendix sleeve, pinion, spring retainer, spring, stop nut, pin and lock ring.
4. On Hydra-Matic Drive equipped cars, install Bendix Drive Housing and through bolts.

INSTALLATION

Reverse procedure of removal.

GENERATOR

Generator output is controlled by a three unit vibrating type current voltage regulator.

The voltage regulator holds the generator output at 45 amperes or below, depending on the load requirements.

A signal system incorporated in the regulator operates the signal light on the dash. The signal lights when the ignition switch is turned on and remains lighted until the generator starts to charge the battery.

The electrical system is positive grounded and whenever a generator is installed or reinstalled on the engine it should be polarized with the battery to prevent burning of regulator contacts points and damage to the electrical units.

To polarize the generator, ground the field terminal to the frame and touch the armature lead briefly to negative terminal of the battery.

Generator brushes may be replaced without disassembling generator. Brushes should be replaced if they are oil soaked or worn to less than 1/2 of their original length.

1. Remove cover band and disconnect brush leads.

2. Lift brush arms, remove old brushes, install new brushes in holders and connect brush leads.

3. Cut a strip of 00 sandpaper the exact Width of the commutator, slide sandpaper under brush with sanded side against brush.

4. Pull the sandpaper so that brush is forced against holder. Once or twice is sufficient.

NOTE: Blow sand and carbon dust out of generator.

5. Run generator under load to obtain perfect brush seating and re-install cover band.

GENERATOR MOTORIZING DRAW

After generator is assembled and brushes properly fitted, the motorizing draw should be checked to assure proper assembly and alignment.

1. Connect an ammeter and battery in series with the armature terminal and frame.
2. Ground the field terminal to the frame.
3. Connect a variable resistor in series with the battery and generator.
4. Connect a voltmeter from the armature to the frame.
5. Generator should operate as a motor with the armature turning slowly.
6. Adjust voltage to 5 volts and read ammeter.
7. Motorizing draw should be 4.1 to 4.6 amperes. If motorizing draw is higher, or armature does not turn, worn bearings, incorrect bearing alignment, short circuits, or improper assembly is indicated.

GENERATOR CIRCUIT RESISTANCE

1. Disconnect battery lead to voltage regulator "B" terminal; connect the ammeter negative lead to the regulator "B" terminal and the positive lead to the wire disconnected from the regulator, Figure 2.

2. Install the negative voltmeter lead to the generator "A" terminal and the positive volt meter lead to the battery negative terminal.

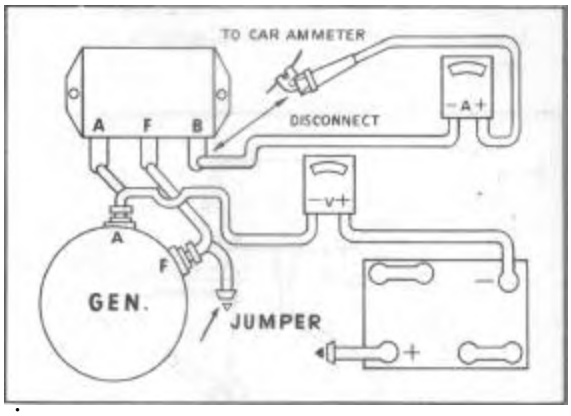


FIGURE 2

3. Connect a jumper between the generator "F" terminal and a ground.

4. Run the engine until am meter shows 20 amperes. The voltmeter should not read over .9 (tenths) or less.

5. If the resistance is more than .9, make the following checks with the ammeter connected as in paragraph 1.

A. Remove the positive voltmeter lead from the battery and connect it to the "A" terminal at the voltage regulator. Ammeter should show less than .1 (tenth).

B. Connect the voltmeter negative lead to the regulator "A" terminal and the voltmeter positive lead to the regulator "B" terminal. Ammeter should not show more than .3 (tenths).

C. Next, connect the voltmeter positive lead to the battery negative terminal, negative lead to "B" terminal on regulator. Ammeter should not show more than .5 (tenths).

D. Connect the voltmeter positive leads to engine ground, negative to base of regulator. Ammeter should show .2 (tenths) or less.

CIRCUIT BREAKER CHECK

To determine whether the circuit breaker points are closing at the proper generator voltage and also whether they will open upon deceleration by amperage from the battery proceed as follows:

1. Disconnect the battery wire at the voltage regulator "B" terminal and connect the ammeter between the voltage regulator "B" terminal and the wire disconnected, Figure 3.

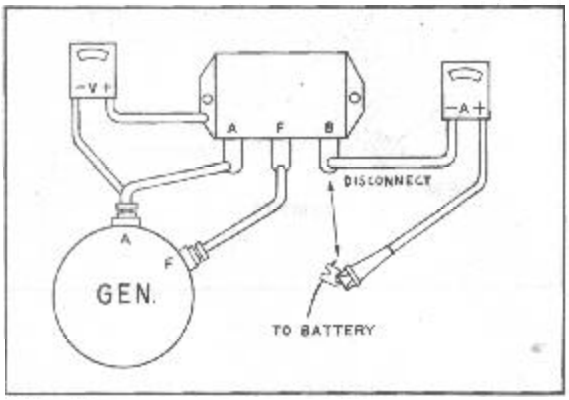


FIGURE 3

2. Connect voltmeter positive lead to base of regulator and negative voltmeter lead to the generator "A" terminal.
3. Set carburetor throttle lever adjusting screw so engine will idle at approximately 400 R.P.M.
4. Increase engine R.P.M. by carefully rotating the accelerator bell-crank while watching the voltmeter gauge. When the voltmeter reads at any point between 6.3 to 6.8 volts the circuit breaker points should close and the ammeter will now show that the generator is charging.
5. Next, slowly reduce the engine speed and watch the ammeter. When the ammeter reads 4 to 6 amperes, negative side of zero, the c i r cuit breaker should open and the ammeter needle will return to zero. Perform operations 4 and 5 several times until you are sure your readings are correct.
6. Proper adjustments can be made by bending the spring hanger on the circuit breaker.

VOLTAGE REGULATOR CHECK

1. Disconnect the battery wire at the voltage regulator "B" terminal and connect the test ammeter between the voltage regulator "B" terminal and the wire disconnected, Figure 4.
2. Connect the voltmeter positive lead to the regulator base and the negative lead to the regulator "B" terminal.

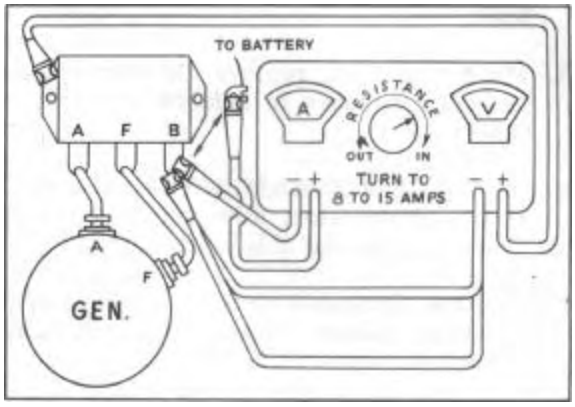


FIGURE 4

3. Run engine approximately 2000 R.P.M.
4. Vary resistance until ammeter reads 19 amperes and then check the vo1t meter reading which should be 7.25 volts. (Hot, cover in place.)

NOTE: If car is out of warranty the voltage regulator can be set by bending the spring hanger to get this necessary reading. The unit must be first checked with the voltage regulator cap in place as generally it will change the reading from .1 to .2 of a volt and must be compensated for in making this adjustment.

5. Stop engine, disconnect battery negative terminal and then proceed to remove the tester leads from the voltage regulator and install the wires back onto the " B" terminal of the regulator.
6. Install the regulator cover.

CURRENT REGULATOR CHECK

1. Disconnect the battery wire terminal "B" and connect the test ammeter between the v o 1 t age regulator "B" terminal and the wire disconnected, Figure 5.
2. Connect a starter battery tester directly across the battery and set load to 45 amperes or use the equivalent in sealed beam lamps.
3. Run engine to approximately 2000 R.P.M.; amperage reading should be 36 amperes. If it is not within a tolerance of one to two amperes

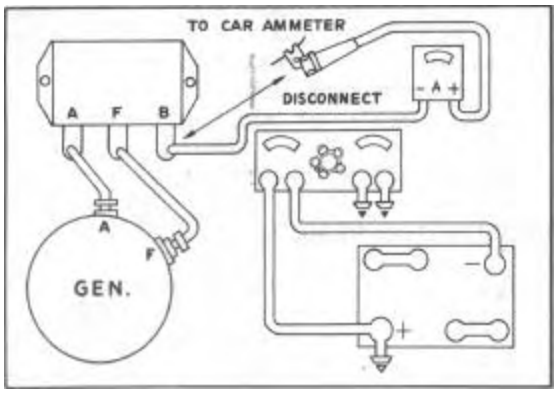


FIGURE 5

of this reading, the regulator should be removed and taken to an authorized Auto-Lite dealer for replacement.

NOTE: If car is out of warranty, remove the cover and adjust the current regulator spring hanger to the necessary 36 ampere output.

To prevent operation of the voltage regulator unit while making this adjustment place a jumper across the voltage regulator points. For final checking, the regulator cover must be in place on regulator.

CAUTION: Momentarily touch the negative battery cable to battery negative post to determine that there is no sparking between the battery negative post and cable terminal, then connect negative cable.

REGULATOR CONTACT POINTS

In normal use the contact points on all three regulator units will become grayed. If the contacts are burned, dirty, or rough, the points should be filed just enough to secure a smooth surface. File parallel with and lengthwise to the armature. Clean the points with a piece of linen or lintless bond tape dipped in carbon tetrachloride and follow with dry tape. Use clean tape for each set of contacts.

DISTRIBUTOR

The distributor rotates in a clockwise direction. The distributor shaft has an offset tongue end which fits into a slot at the end of the oil pump shaft gear.

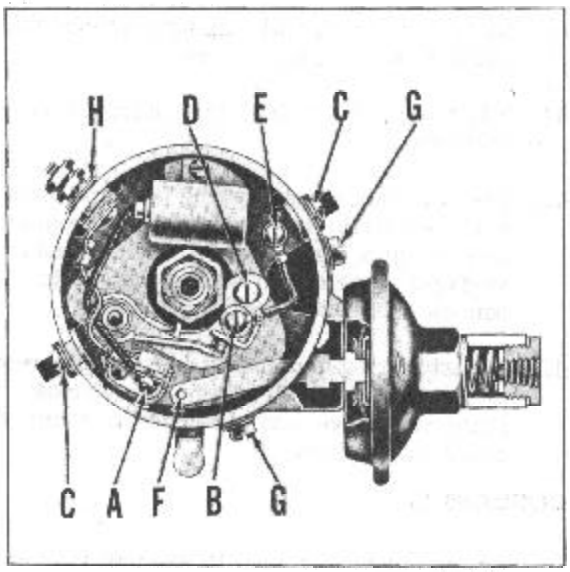
Incorporated in the distributor is an automatic centrifugal advance and vacuum advance control. The automatic centrifugal advance provides the proper ignition timing in relation to engine speed. The vacuum advance control provides additional spark advance over the centrifugal advance through the engine vacuum. When the engine is running under light load and engine vacuum is high, the breaker plate is rotated to the maximum advanced positions. However, under heavy load conditions, as when the throttle is opened for additional acceleration or hill climbing, the engine vacuum is low, the breaker plate is rotated to the retarded position to prevent detonation or pinging.

Correct spark setting is obtained when the number one cylinder is at top dead center on compression stroke, rotor facing No. 1 terminal of distributor cap, distributor set in mid-position in the quadrant, and contact points just opening.

BREAKER POINT ADJUSTMENT

Breaker points may be adjusted with distributor installed in car as follows:

1. Remove distributor cap and rotor.
2. Crank engine until the fibre block on the contact arm rest on the highest point of the cam lobe.
3. Loosen the contact support lock screw (B) Figure 6, and turn the eccentric adjusting screw (D) until the correct gap is obtained. Distributor point gap is .020".
4. Tighten contact support lock screw and recheck point gap. If necessary bend stationary contact to secure correct alignment.



BREAKER POINT RENEWAL

1. Remove distributor cap and rotor.

2. Remove hairpin clip at (F), Figure 6, screws (0) attaching vacuum control unit to distributor housing and remove vacuum control unit.

3. Remove the two screws at (C) and the two nuts, washers and insulators at (H).

4. Disconnect breaker point wires at (E) and (Id) and remove complete contact support plate and contacts with condenser attached for bench disassembly.

5. Re move screw and clip (A) attaching breaker arm spring and remove breaker arm spring.

6. Remove lock screw (B) attaching stationary contact and remove the contact.

7. Install a new breaker arm and attach primary and condenser lead wires to breaker spring clip and install clip and screw (A).

8. Install a new stationary contact but do not tighten lock screw; connect wires at (E) and (H) and install condenser.

9. Install complete contact support plate and stationary contact as an assembly and install screws (C) and terminal nuts (H).

10. Check alignment of contact points. Bend the stationary contact arm if necessary to secure proper alignment and contact. DO NOT bend breaker arm.

11. Tighten screw (D) and adjust breaker point gap.

12. Check breaker arm spring tension. Hook a spring scale to the arm at the contact and pull at a right angle to the contact surface. T e n s i on should be 17 to 20 ounces just as the contact separate.

13. Adjust spring tension by loosening screw at (A), attaching breaker arm spring to plate, and move end of spring in or out of clip as necessary.

CONDENSER

Check condenser lead to see that it is not frayed or broken and is connected securely to breaker arm clip. Condenser mounting screw must make tight ground to breaker plate. Ground wire from breaker plate to subplate must be securely connected.

Check condenser with suitable equipment and if capacity is not within range of .21 to .25 MFD, replace with new parts.

DISTRIBUTOR REMOVAL

1. Remove wires from distributor cap and remove cap.

2. Disconnect vacuum line and the distributor primary wire.

3. Re move the lock plate and the hold down screw attaching distributor quadrant to engine and remove distributor from engine.

DISASSEMBLY

1. Remove rotor.

NOTE: R e m o v e stationary contact support with condenser, stationary contact and breaker arm as an assembly. See operations 2 through 4, under "Breaker Point Renewal".

2. Remove oil wick from cam, remove hair pin retainer from oil well and pull cam off shaft.

3. Remove centrifugal weights and springs, using care to prevent distortion of springs.

4. Drive out pin from distributor shaft collar and remove shaft through top of distributor.

ASSEMBLY

1. If clearance between shaft and bushings is greater than .005", install new shaft and bushings. Soak bushing in engine oil for 15 minutes before installing shaft.

2. Install distributor shaft, thrust washers, collar and pin. Peen over pin.

3. Check distributor shaft end play for minimum of .010" and install centrifugal weights and springs.

4. Install cam, hairpin retainer, and oil wick. Apply a drop of engine oil to centrifugal weight pivots and cam slots.

5. Pack breaker plate bearing 1/2 full of (high melting point) grease and install breaker plate, bearing retainers and breaker plate screws. Install breaker points and condenser on breaker plate before installing plate. Install plate and distributor cap clips and screws and install primary lead screw. (Do not allow wire from breaker arm to primary terminal to ground on breaker plate.)

6. Attach primary and condenser leads to clip (A) Figure 6, on breaker arm spring and check spring tension. Adjust point gap.

7. Install vacuum control unit.

NOTE: Make sure ground wire (E), is securely attached to upper and lower sections of breaker plate and that condenser lead and mounting are tight.

8. Coat cam lobes lightly with water pump grease and soak the oil wick with engine oil. Place a drop of light engine oil on the breaker arm pivot and install rotor.

INSTALLATION

1. Place a chalk mark on the long line before No. 1-U-D-C on the vibration dampener, Figure 7.

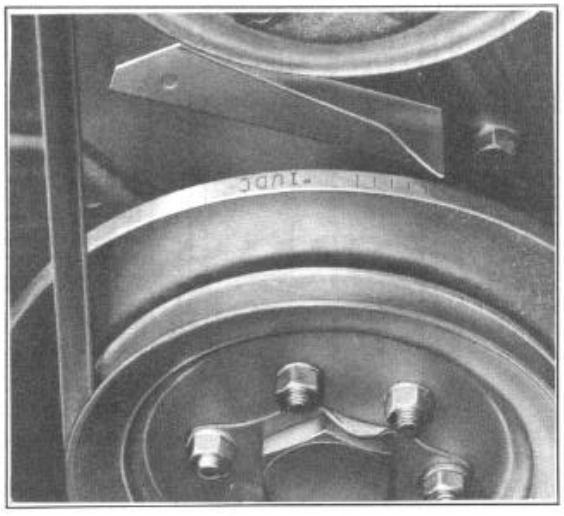


FIGURE 7

2. Set distributor rotor to point to No. 1 contact in the distributor cap, Figure 8, and insert and engage distributor shaft in slot in oil pump gear.

3. Install lock plate and hold down screw attaching distributor quadrant to engine. Set distributor midway on the quadrant an d tighten screw.

4. Replace distributor cap, secondary wire and spark plug wires.

5. Place three to five drops of engine oil in shaft oiler and adjust timing.

For distributor testing and ignition timing, see Engine Tune-Up section.

SPARK PLUGS

Champion H-8 plugs are used. Gap should be .032". Check gap with a wire feeler gauge and adjust by bending the ground (side) electrode.

When replacing spark plugs always use new gaskets. Seat the plug finger tight an d use a torque wrench to tighten to 25-30 ft. lbs.

COIL

If a faulty coil is suspected, the coil should be tested with a test light or approved coil testing equipment.

A quick test with the coil on the car can be made by removing the high-tension wire from the center of the distributor cap and hold end of wire 1/4" from cylinder head and while cranking engine if a spark occurs regularly the coil can be considered satisfactory.

HEAD LAMPS

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 a n d moisture free.

When the filament burns out or the lens break, the entire unit is discarded and a new one installed, thereby assuring maximum lighting efficiency. The Sealed Beam units are interchangeable right and left.

WIRING

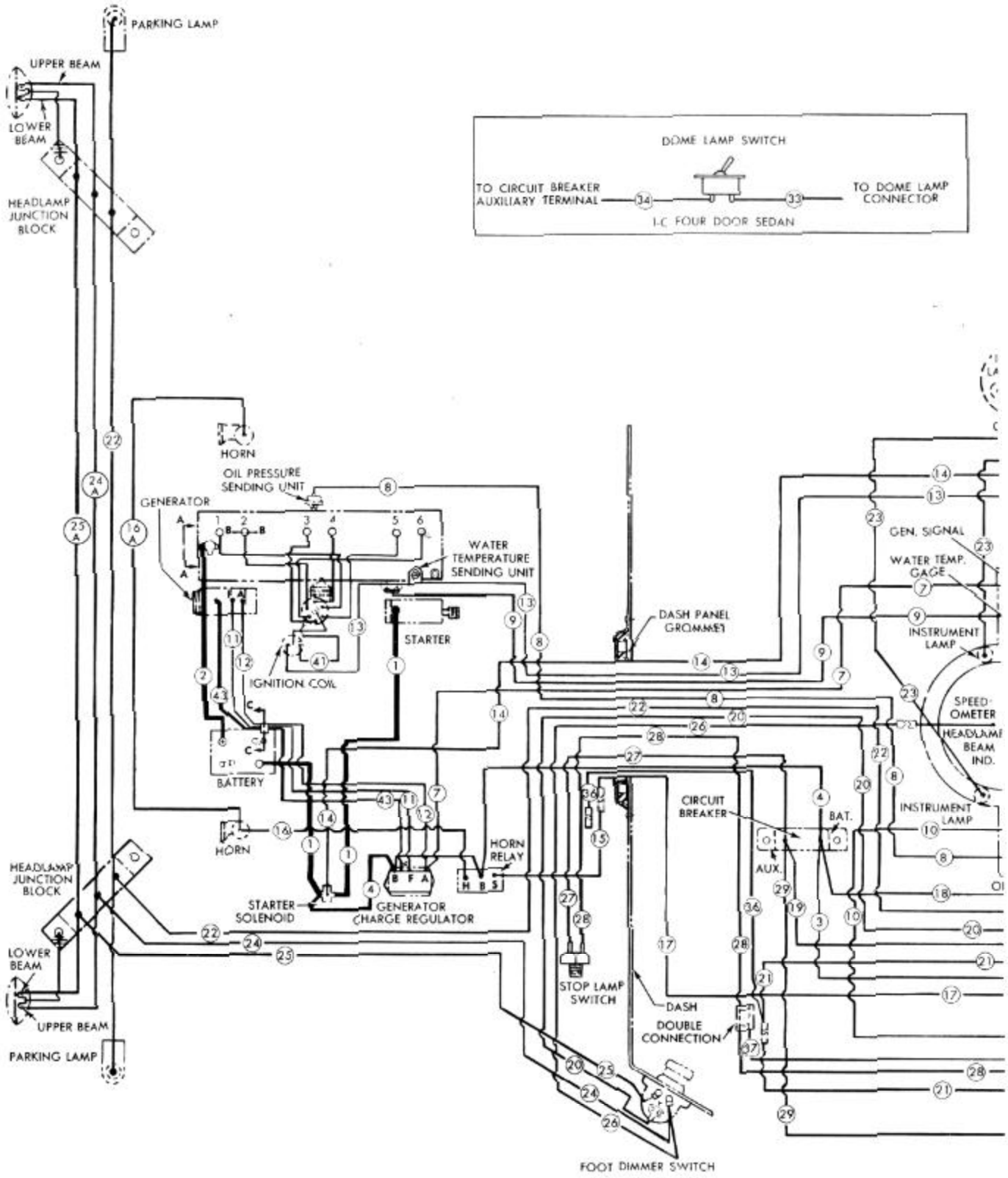
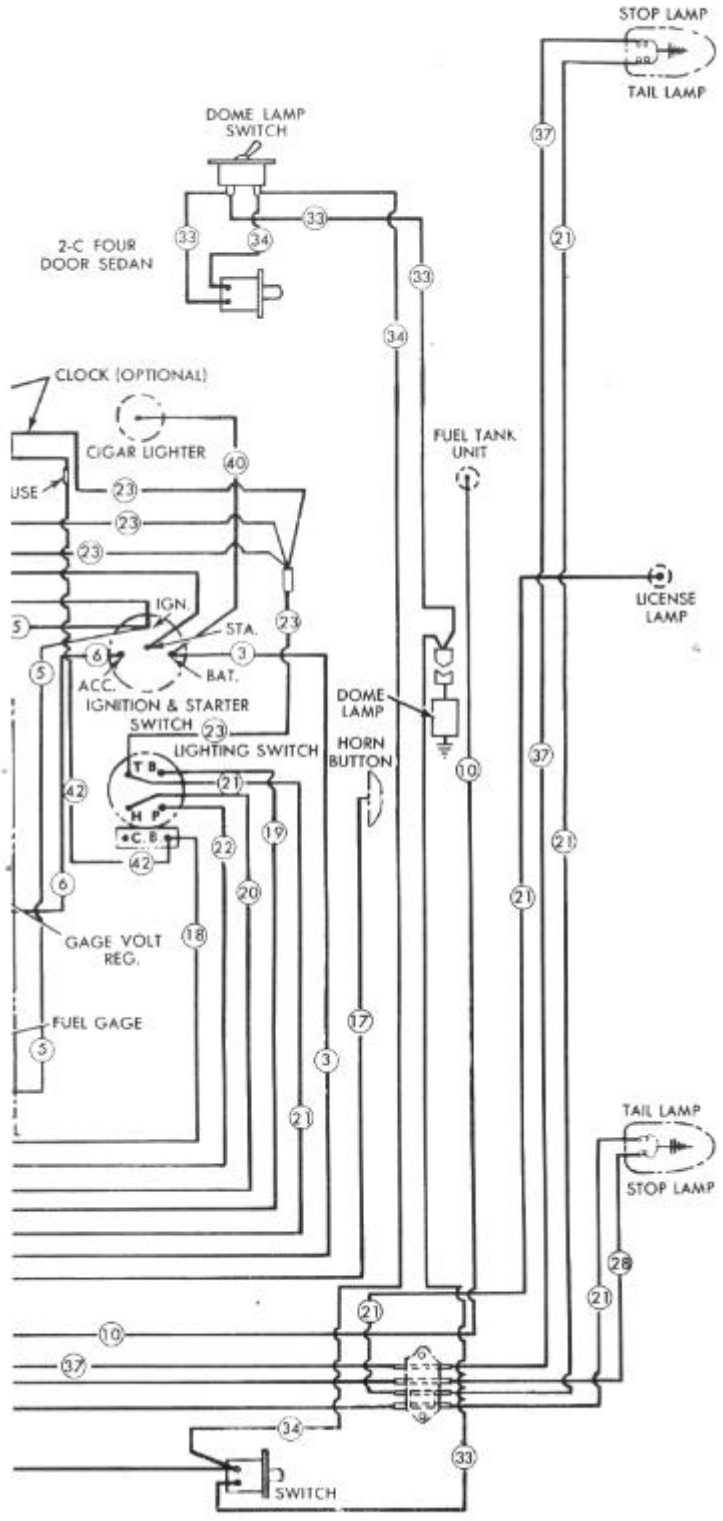


FIGURE 8

AGRAM



CIRCUIT NO.	WIRE SIZE	COLOR	CIRCUIT NAME
1	2	BLACK	BATTERY TO STARTER CABLES
2		BRAIDED	BATTERY GROUND
		STRAP	
3	12	YELLOW	IGNITION SWITCH FEED
4	10	BLACK	STARTER SOL TO CHARGE REG. "B"
			TERMINAL
			MAIN CIRCUIT BREAKER & HORN RELAY
			FEED
5	18	RED	TELL TALE LAMPS FEED
6	18	BLACK &	IGNITION SWITCH TO GAGE VOLTAGE
		RED	REG.
7	18	GREEN	GENERATOR SIGNAL
8	16	BLACK	OIL PRESSURE SIGNAL
9	18	ORANGE	WATER TEMPERATURE GAGE
10	16	BLUE	FUEL GAGE TO TANK UNIT
11	16	WHITE	GEN. "F" TERM. 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	IGNITION SWITCH TO STARTER SOLENOID
15	16	BLACK &	HORN RELAY TO HORN BUTTON WIRE
		YELLOW	CONN.
16	10	YELLOW	HORN FEED
16A	12	YELLOW	HORN CONNECTOR
17	14	WHITE	HORN BUTTON WIRE
		OR BLACK	
18	12	BLACK	LIGHT SWITCH FEED
19	14	WHITE	LIGHT SWITCH FEED TO AUX. CIRCUIT
			BREAKER
20	12	YELLOW	FOOT DIMMER SWITCH FEED
21	14	GREEN	TAIL AND LICENSE FEED (INSTRUMENT
			HARNESS)
	16	BLACK &	TAIL AND LICENSE LAMP (BODY HARNESS)
		GREEN	
22	18	WHITE	PARKING LAMP
23	14	RED	INSTRUMENT LAMP HARNESS FEED
	18	RED	CLOCK & INSTR. LAMP HARNESS
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	18	BLUE	HEADLAMP BEAM INDICATOR
27	16	BLACK &	STOP LIGHT SWITCH FEED
		GREEN	
28	16	RED	STOP LIGHT SWITCH (INSTRUMENT
		(ORANGE)	HARNESS) STOP LIGHT FEED
29	16	WHITE	DOME AND QUARTER LIGHT SWITCH FEED
33	16	BLACK	DOME AND COURTESY LAMP
34	16	WHITE	DOME AND COURTESY LAMP SWITCH FEED
36	14	RED	UTILITY CONNECTION
37	16	BLACK &	STOP LAMP FEED (RIGHT) BODY HARNESS
		YELLOW	& WIRE ASS'Y.
40	14	BLACK &	CIGAR LIGHTER (FURNISHED WITH CIGAR
		RED	LIGHTER)
41	14	BLACK	IGNITION COIL + TO DISTRIBUTOR
			(PRIMARY)
42	16	BLACK	CLOCK WIRE (FURNISHED WITH CLOCK)
43	8	RED	GEN. GROUND TO VOLTAGE REG.
			ATTACHING SCREW

SEALED BEAM UNIT

REPLACEMENT

1. Remove headlamp lens rim by taking out the screw at bottom of rim.

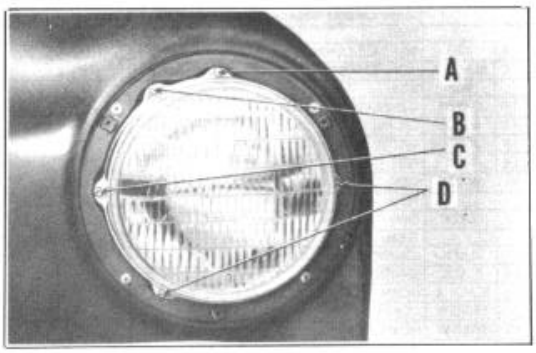


FIGURE 9

2. Loosen, but do not remove, the three screws (B) and (D), Figure 9, holding the retainer. Do not disturb the aiming screws (A) and (C) at the top and left side of the unit.

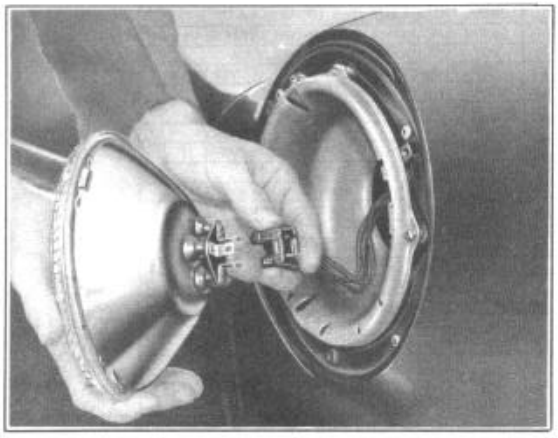


FIGURE 10

3. Remove retainer by rotating counter clockwise, allowing the Sealed Beam Unit to be removed.

4. Remove the reflector plug from the unit as shown in Figure 10.

5. Install new unit by reversing above operation.

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 clocks or cigar lighters are installed, they must be connected as shown in the wiring diagram.

Fuses are used for the protection of optional equipment as follows:

Electric Clock - Three ampere fuse in a fuse case at back of clock.

Weather Control - Fourteen ampere fuse in a fuse case on left side of weather control housing.

Radio - Fourteen ampere fuse incorporated in the radio "A" lead wire.

Direction Indicator - Ten ampere fuse attached to the flasher unit lead wire.

Overdrive Circuit - Thirty ampere fuse on Overdrive relay.

HORN

The horn is operated by a magnetic type motor which consists of a field, armature 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 re synchronized to produce a harmonious tone when the horns are sounded together.

SECTION 7
CLUTCH

SPECIFICATIONS

Type	Dry
Clutch Facings	Woven Molded Asbestos
Facing Inside Diameter	6-1/8"
Facing Outside Diameter	9-1/8"
Facing Thickness	.125"
Facings Required	2
Pressure Springs	6
Pressure Spring Compre-sIon Height.	1-1/2"
Release Levers	3
Clutch Pedal Lash	3/4" to 1-1/4"
Clutch Release Bearing	Ball

CONSTRUCTION

The clutch for models 1C and 2C is a single dry disc type. No adjustment for wear is provided in the clutch assembly. The adjustment to compensate for lining wear is provided by the clutch pedal linkage. Individual clutch release lever adjustments are made when the clutch is assembled but should never be disturbed except after disassembly for replacement of worn parts. A ball type clutch release bearing, pre-lubricated during manufacturing, is utilized and needs no additional lubrication. A steel clutch cover is bolted to the flywheel and contains the pressure plate, clutch pressure springs , clutch release levers and clutch drive plate.

OPERATION

The clutch plate has molded woven asbestos facings riveted t o both sides. Six dampening springs absorb shocks and cushions torque loads.

Pressure on operation of the clutch pedal moves the release bearing and collar assembly toward the release levers (5) which are pivoted on pins (8) in the eye bolts (9), adjustable t o control release lever heights. Pivot pins float in the eye bolt bores to permit release lever movement. The outer ends of t he release levers engage the pressure plate lugs through fulcrums (7) providing knife edged contacts between the levers and lugs, Figure 6.

CLUTCH PEDAL ADJUSTMENT

Full clutch disengagement must be provided to prevent gear clashing when shifting and to prevent the clutch pedal from riding against the floor boards. The clutch pedal clearance should be from 3/4" t o 1-1/4", Figure 1.

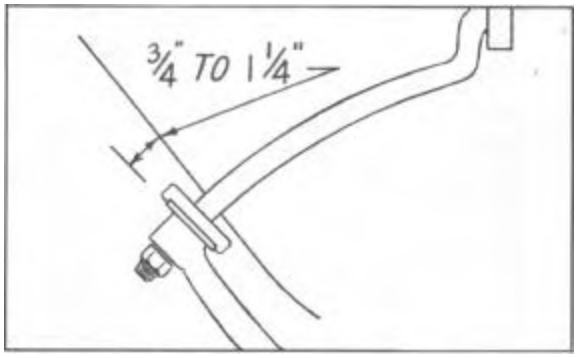


FIGURE 1

To adjust the clutch pedal to maintain proper clearance proceed as follows:

1. Loosen lock nut (3) Figure 1 on clutch adjusting link (2).
2. Back off o r tighten adjusting nut (4) to in crease or decrease the clearance as required.

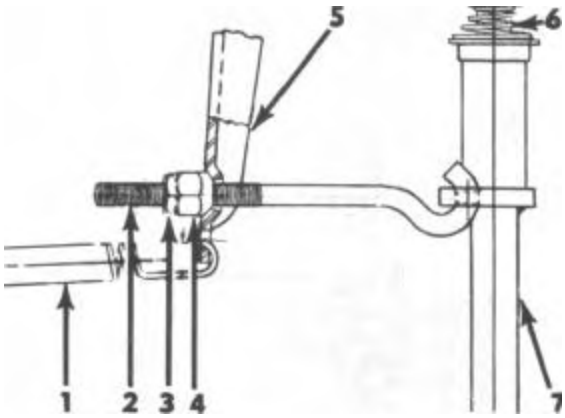


FIGURE 2

3. Lock the adjusting nut (4) with lock nut (3).

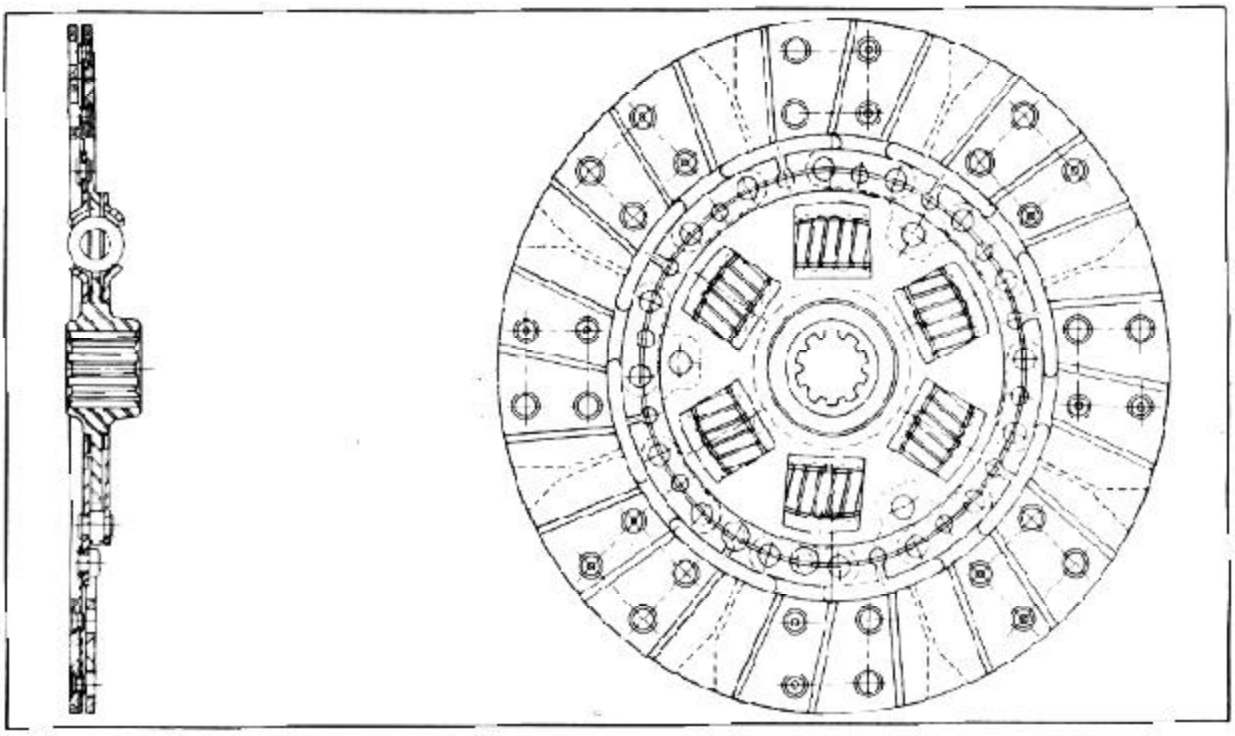


FIGURE 3

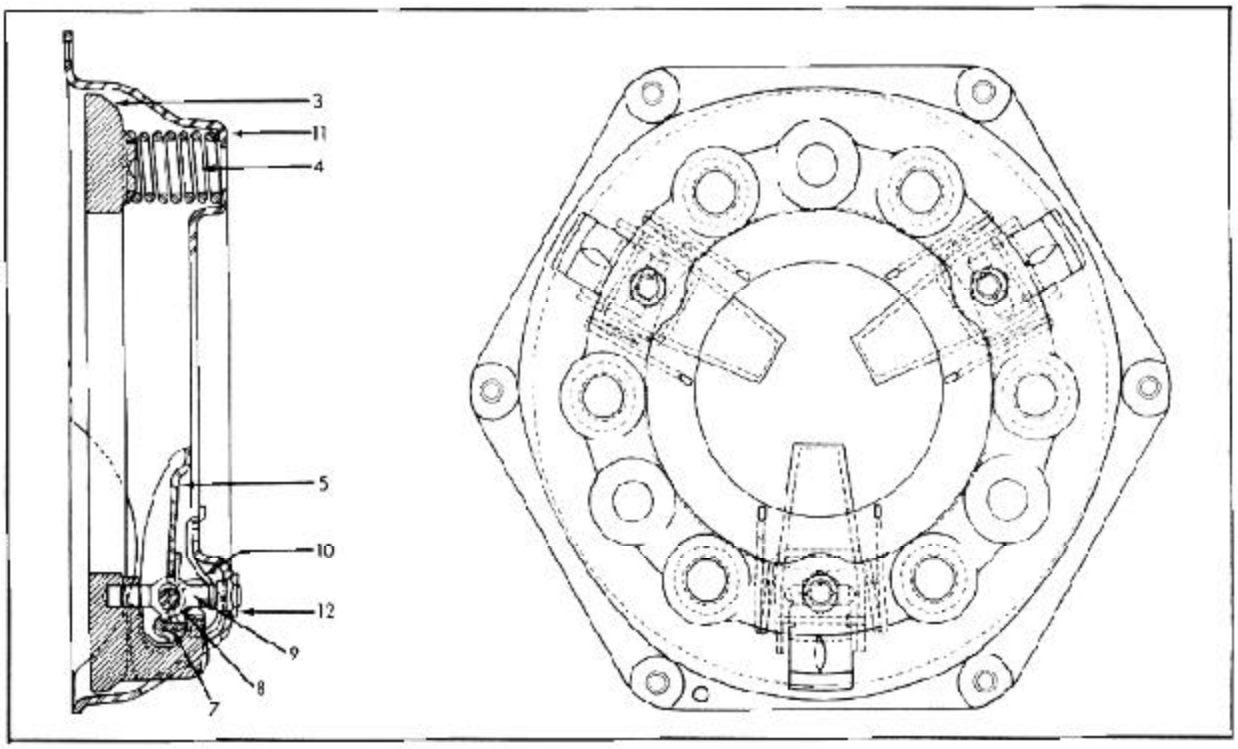


FIGURE 4

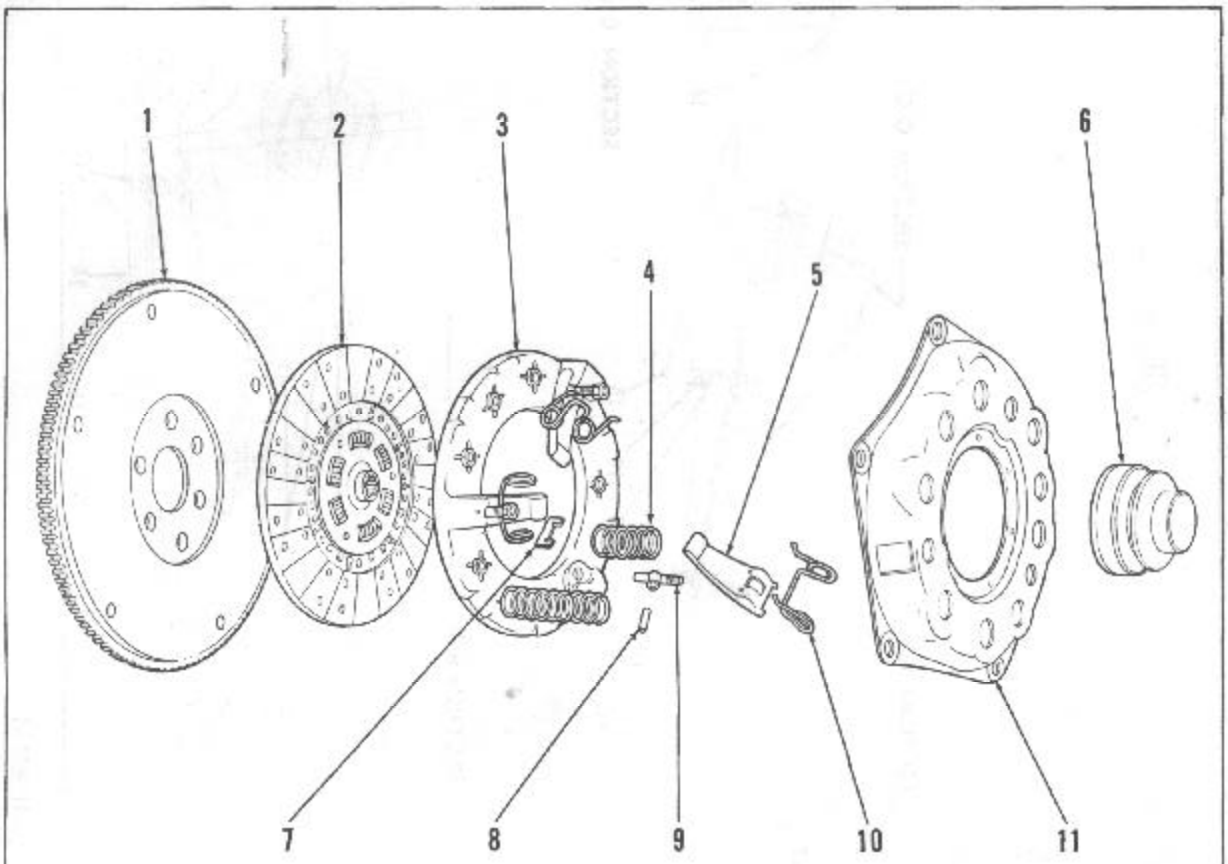


FIGURE 6

LEGEND

1. Flywheel
2. Driven disc plate assembly
3. Pressure plate
4. Clutch engaging spring
5. Release lever
6. Release bearing and collar
7. Release lever retainer
8. Release lever eyebolt pin
9. Release lever eyebolt
10. Release lever anti-rattle spring
11. Clutch cover
12. Release lever eyebolt nut

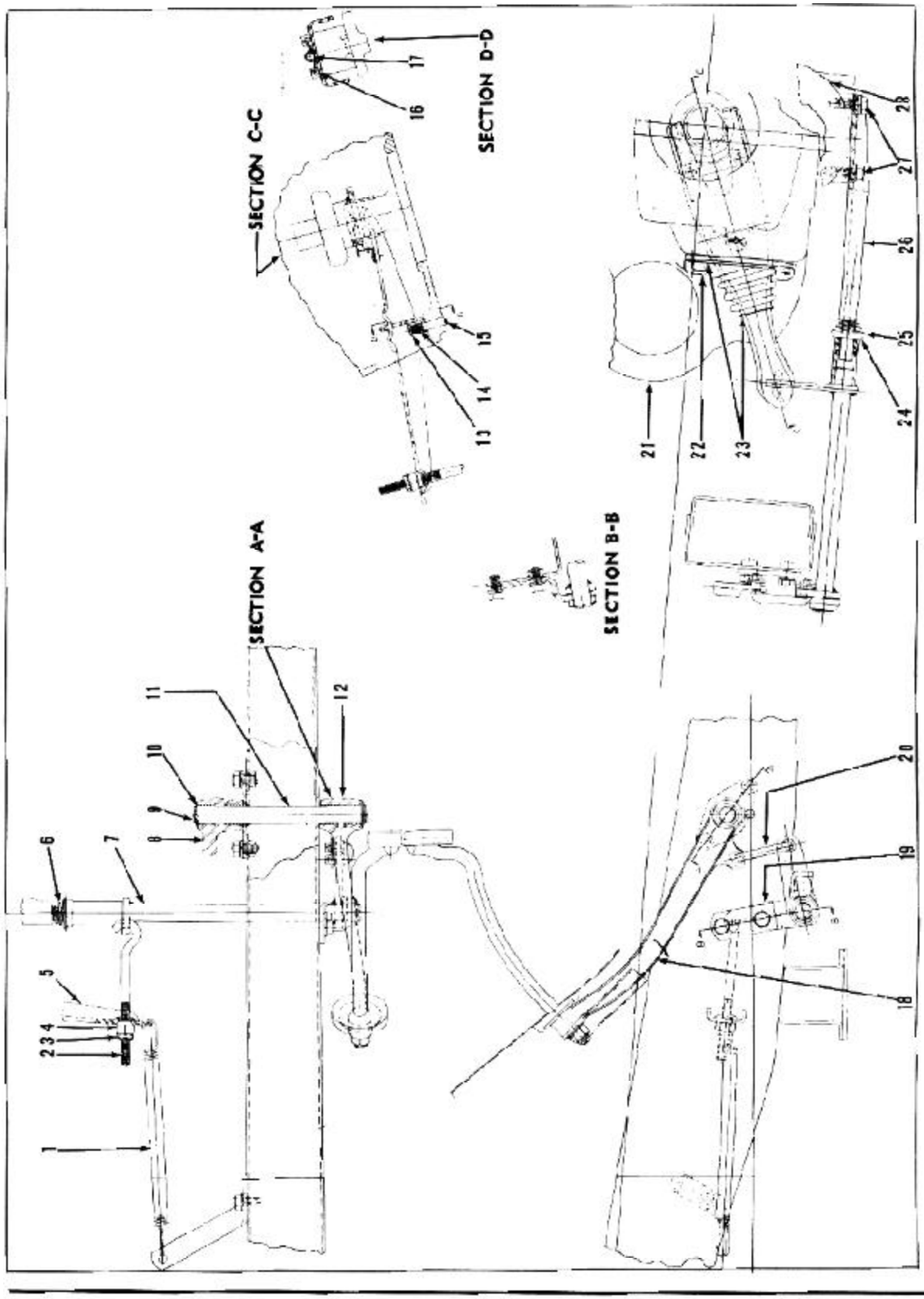

SECTION C-C
SECTION D-D
SECTION A-A
SECTION B-B
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FIGURE 6

CLUTCH REMOVAL FROM CAR

The clutch assemblies of models 1C and 2C can be removed from the car without dismounting the clutch bell housing from the engine. The floor panel is welded in position and cannot be removed. Therefore, all clutch work must be done from beneath the car. To remove the clutch assembly from the car, proceed as follows:

1. Raise car and place jack stands under front suspension lower support arms.

2. Disconnect the propeller shaft companion flange and remove the shaft.

3. Disconnect the speedometer cable.

4. Disconnect the shift selector levers from the transmission.

NOTE: Electrical wiring must be disconnected from the control switch, solenoid and governor and the wiring harness released from the clips on transmissions equipped with overdrive.

5. Remove the two screws (27) attaching the clutch cross shaft support assembly (26) to the transmission and remove the support, Figure 6.

6. Place transmission floor jack under the transmission.

7. Disconnect the adjusting rod (2) from the outer end of the clutch throw-out lever (5).

8. Remove the three attaching screws from the throw-out lever boot (22) and remove retainer and boot off the lever.

9. Remove the four cap screws attaching the transmission to the clutch bell housing. Slide the transmission toward the rear of the car until the transmission main shaft clears the bell housing and lower carefully to the floor.

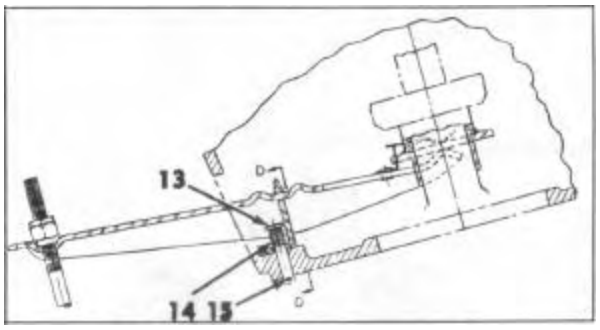

FIGURE 7

10. Remove the cotter pin (15), pivot pin (13) and pivot pin spring (14) from the clutch bell housing and throw-out lever pivot, Figure 7. Remove the throw-out lever and the clutch release bearing assemblies from the bell housing.

11. Punch mark the clutch cover, pressure plate lug and flywheel for correct positioning during reassembly.

12. Remove the six cap screws attaching the clutch assembly to the flywheel and carefully remove the assembly.

NOTE: When removing the clutch assembly, loosen each cap screw only a few turns at a time until the spring tension is relieved. Otherwise distortion of the clutch cover might result leading to a chattering clutch condition when reassembled.

CLUTCH DISASSEMBLY

The clutch pressure plate and cover assembly is always under spring tension. Exercise c are when disassembling the unit to avoid injury or damage to parts.

To disassemble clutch proceed as outlined below:

1. Mount the clutch assembly on the clutch fixture or on a press. Place a wood block on the cover in position where it does not interfere with the three eyebolt nuts Figure 8.

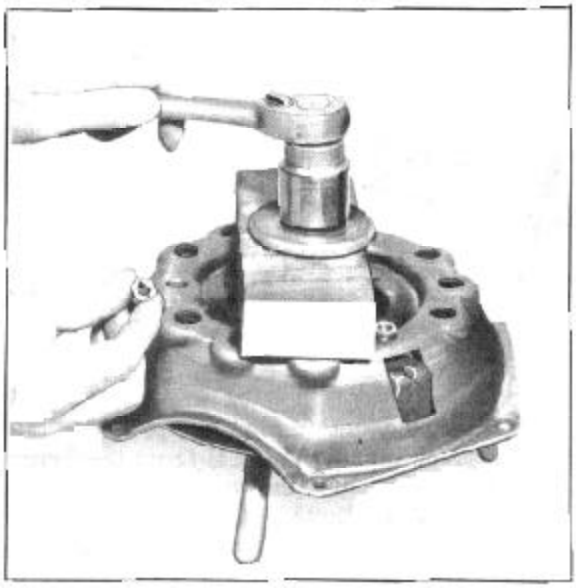

FIGURE 8

2. Tighten the clutch fixture nut until the pressure springs are compressed sufficiently to relieve the pressure on the release levers and remove the three eyebolt nuts Figure 8.
3. Loosen the clutch fixture nut carefully until the spring tension is relieved.

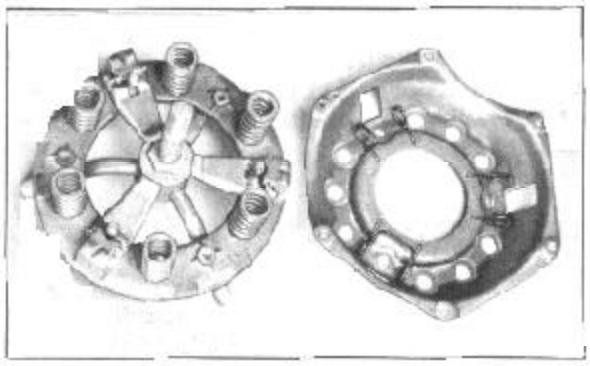

FIGURE 9

1. Lift off the clutch cover and remove the pressure springs, Figure 9.
2. Grasp the release lever and eyebolt between the thumb and fingers holding them close together. See Figure 10. With the eyebolt held in the pressure plate socket, lift the fulcrum over the end of the lever
6. Lift the eyebolt and release lever assembly out of the pressure plate socket.

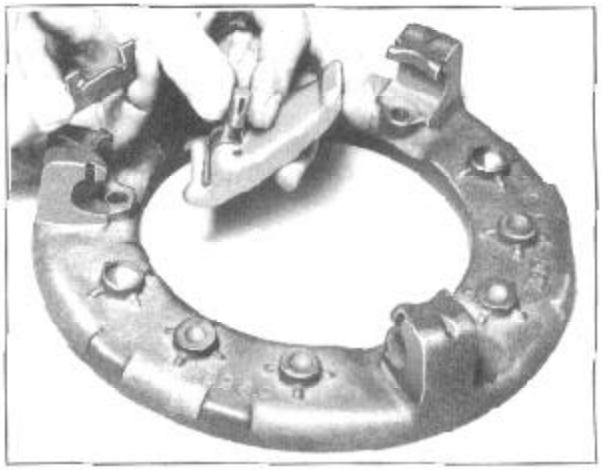

FIGURE 10

INSPECTION

CLUTCH SPRINGS

Clutch springs must be thoroughly inspected for cracks, burn s and for proper tension at a give n length. Use KMO-607 Valve and Clutch Spring Tester. 195 pounds pressure plus or minus 6 pounds should be required to compress the spring to a height of 1-1/2".

DRIVE PLATE

Repairs to the drive plate are not recommended except replacement of the facings. Carefully check for wear in the splines of the plate hub and for looseness of the dampening springs. Excessive wear of the splines or loose dampening springs may cause excessive back lash and noise.

When replacing worn facings, never punch the old rivets out as this might result in p late distortion. Use a 3/16" drill and cut away the rolled portion of the rive t and remove.

Rivet the new facings to the plate being certain they are held securely in position. Loose or uneven facings may cause the clutch to drag.

PRESSURE PLATE

The pressure plate must be true and free of scoring or cracks to provide smooth clutch application. Check for evidence of burning and overheating.

Place on a surface plate and check with feeler gauges to detect distortion. The maximum distortion should be no greater than .004" to .006".

Inspect the pressure plate lugs for wear at the fulcrum contacts. If excessive wear is noted the pressure plate must be replaced.

CLUTCH COVER

Care must be exercised during removal and installation of the clutch assembly. The clutch assembly is under spring tension and the six mounting screws attaching the cover to the flywheel must be loosened or tightened evenly to prevent cover distortion. If severe damage or distortion is noted replace the cover.

NOTE: The mounting screws are of a special hardened steel and in no case should substitutions be made.

FLYWHEEL AND PILOT BUSHING

After the clutch assembly has been removed from the flywheel carefully inspect the surface of the flywheel for any roughness. Check the tightness of the flywheel stud nuts. Use a torque wrench and tighten to 40-45 foot pounds torque.

Check the crankshaft pilot bushings for looseness in the crankshaft bore and for scoring or excessive wear. If the bushing is badly worn it can be re moved by using a 11/16" - 16 tap. As the tap is turned in, threads will be cut in the bushing. After the tap has bottomed ins the crankshaft bore, the bushing will be forced out.

Install the new bushing in the crankshaft using tool J-5442.

ASSEMBLY OF CLUTCH

The release lever fulcrums must be lubricated with a small amount of lubriplate grease before assembly. Below are the assembly steps:

1. Mount the p r e s sure plate on the clutch fixture, Figure 9.

2. Assemble the release lever pin in the eyebolt and release lever.

3. Hold the eyebolt and release lever upper ends as closely together as possible in one hand; then enter the lower end of the e ye bolt in the pressure plate bore and install the fulcrum, Figure 10.

4. Use the same procedure for installing the other two release lever assemblies.

5. Check to see that the anti-rattle springs are in place in the cover. Figure 9.

6. Place the six p re s sure springs one on each plate boss and install the cover over the springs. Be certain the springs seat in the cover recesses and the punch marks on the pressure plate and cover are aligned.

7. Tighten the eyebolt nuts until they are flush with the upper ends of the eyebolts.

8. Release the clutch assembly and remove from the clutch fixture.

CLUTCH LEVER ADJUSTMENT

1. Place the clutch Finger Adjusting Gauge J-4708, Figure 11 on a fly w he e 1 in the same position as the driven disc.

2. Place the clutch assembly on the flywheel and align the machined surfaces of the gauge directly under the pressure plate levers. Tighten the cover mounting s c re w s uniformly a few turns at a time until the cover is drawn down against the flywheel.

3. Depress each lever several times before checking the lever height to seat the levers in their operating positions.

FIGURE 11

4. Place the Lever Height Gauge J-5490-1 on the Gauge plate hub with the height gauge offset down, Figure 12.

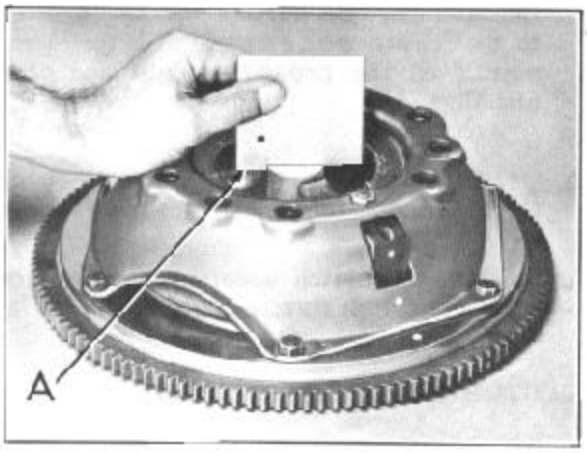

FIGURE 12

5. Adjust the release levers until they just contact the lower surface of the lever height gauge. Tightening the eyebolt nuts will raise the levers and loosening them will lower the levers. Operate the levers several times and recheck heights.

6. After rechecking the lever heights to verify their setting stake the eyebolt nuts with a dull punch and a hammer, Figure 13.

7. Remove the clutch assembly from the fixture. Always handle the Plate Gauge with care to prevent damage.

FIGURE 13

CLUTCH RELEASE BEARING

The clutch release mechanism Figure 6 consists of the clutch throw-out lever (5) pivot (16) and linkage. The inner end of the throw-out lever contacts the flange of the throw-out collar. The clutch throw-out or release bearing fits over the inner end of the collar assembly and contacts the release levers when the clutch pedal is partially depressed, Figure 14.

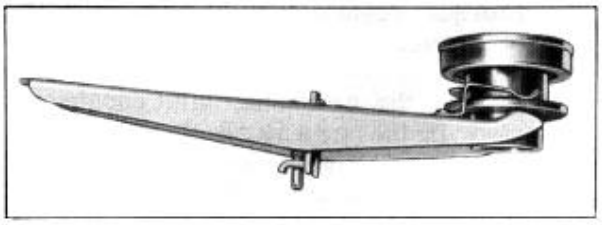

FIGURE 14

The clutch release bearing is lubricated and s e ale d during manufacture. It should never be washed in gasoline or solvents. Solvents entering the bearing will dissolve the lubricant.

Check the bearing for roughness and wear. If found defective press the old bearing off the clutch collar and replace with a new bearing.

INSTALLING CLUTCH ASSEMBLY IN CAR

To install the clutch assembly on engine, proceed as outlined below:

1. Place clutch assembly in position on flywheel with driving plate between flywheel and pressure plate. Driving plate must be in s fa ffe d with side stamped ((Flywheel side" toward flywheel.
2. Center the clutch disc on the flywheel using aligning arbor J-5442 or a transmission main drive gear shaft, Figure 15.

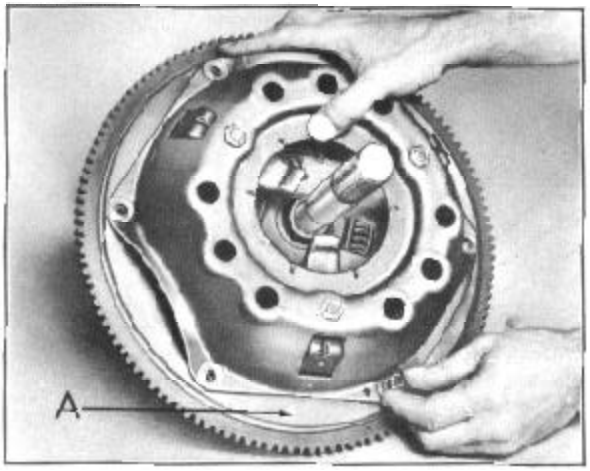

FIGURE 15

The clutch disc must be centered to permit entering the transmission main shaft in the driven plate hub splines.

3. Align the punch marks placed, on the clutch cover and pressure plate hub with the one on the flywheel (A - Figure 15). Start the six cap screws attaching the clutch assembly to the flywheel T i g h t e n the cap screws evenly a few turns at a time until the assembly is drawn up tight on the flywheel. Ti g h t e n the mounting screws to 20-25 foot pounds torque.
4. Install the clutch throwout lever pivot (16) on the lever (5) and secure in position with the attaching spring (17) Figures 6 and 14.
5. Hold the clutch release bearing assembly in one hand with the bearing toward the flywheel. Insert the throw out lever through the bell hou sing opening. The spring at the inner slotted end of the throwout lever will hold the thrust bearing assembly in place, (Figures 16 and 17).

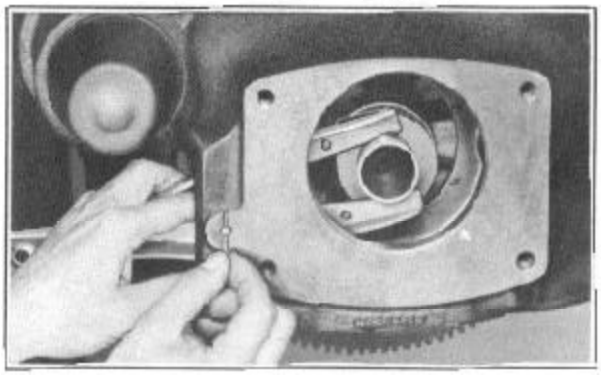

FIGURE 16

6. Hold the throwout lever and release bearing assembly in one hand and install the pivot spring on the throwout lever pivot pin. Insert the end of the pin through the bores in the pivot and the bell housing. Insert a cotter pin through the pivot pin and clinch securely.

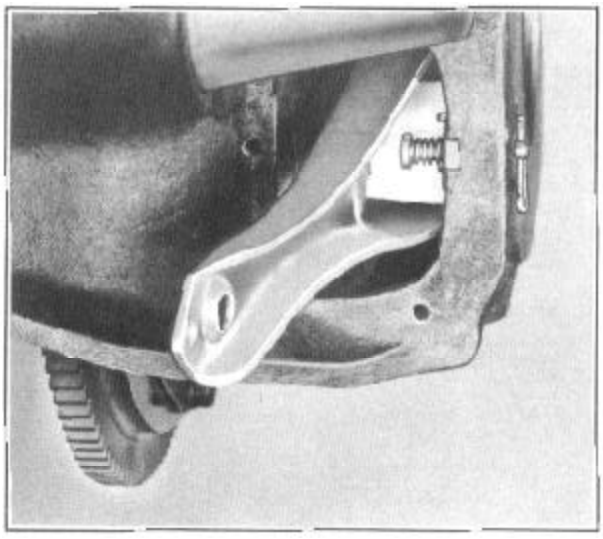

FIGURE 17

7. Raise the transmission, align the main shaft and slide the transmission forward against the bell housing.
8. Install and tighten the four transmission to bell housing attaching screws and tighten to 35-40 pounds torque.
9. Install throwout lever boot (23) and retainer (22), Figure 6.
10. Connect transmission shift lever clutch control linkage speedometer cable and propeller shaft.
11. Check for correct clutch pedal clearance (See Clutch Pedal Adjustment - Page 72).

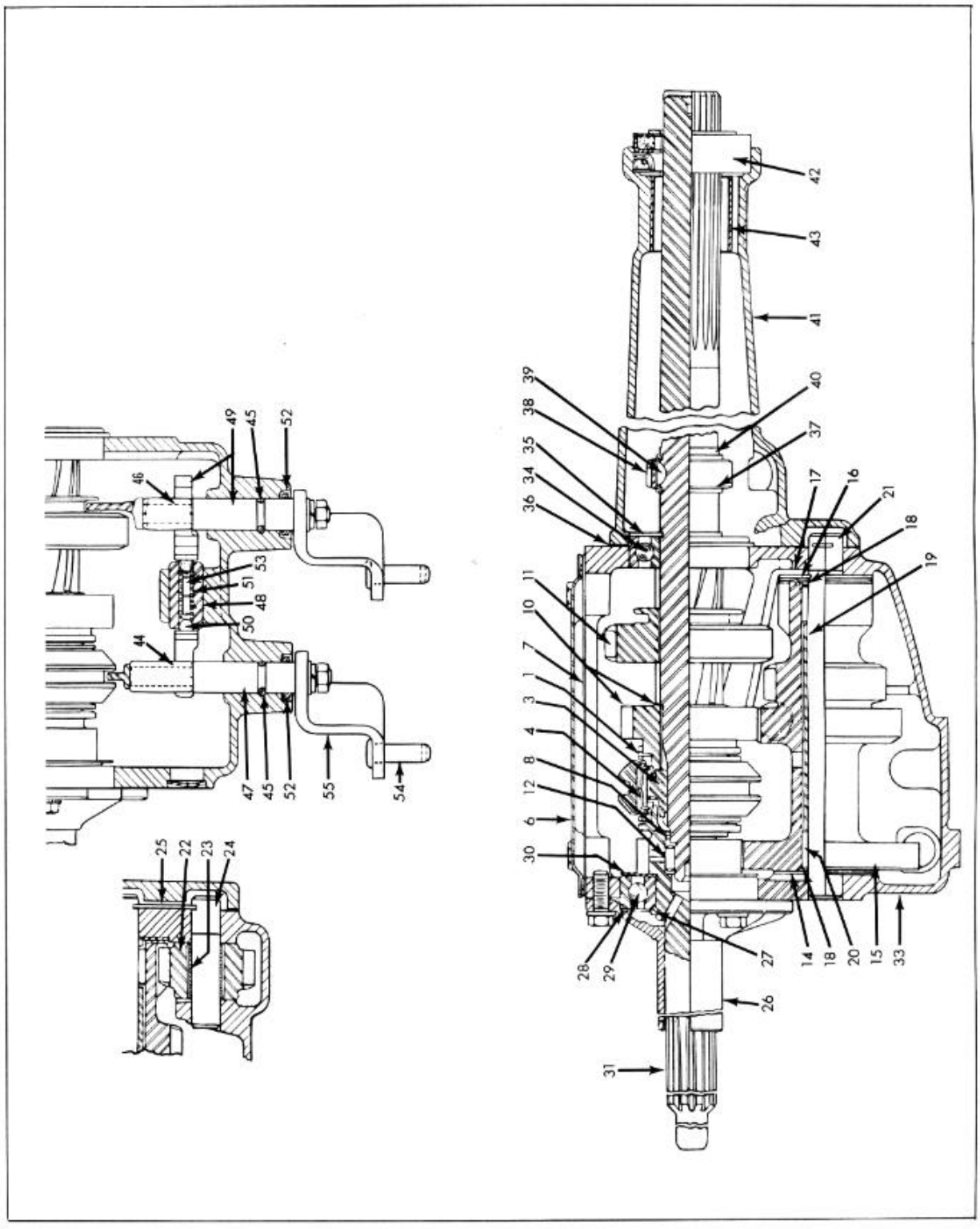
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FIGURE 1

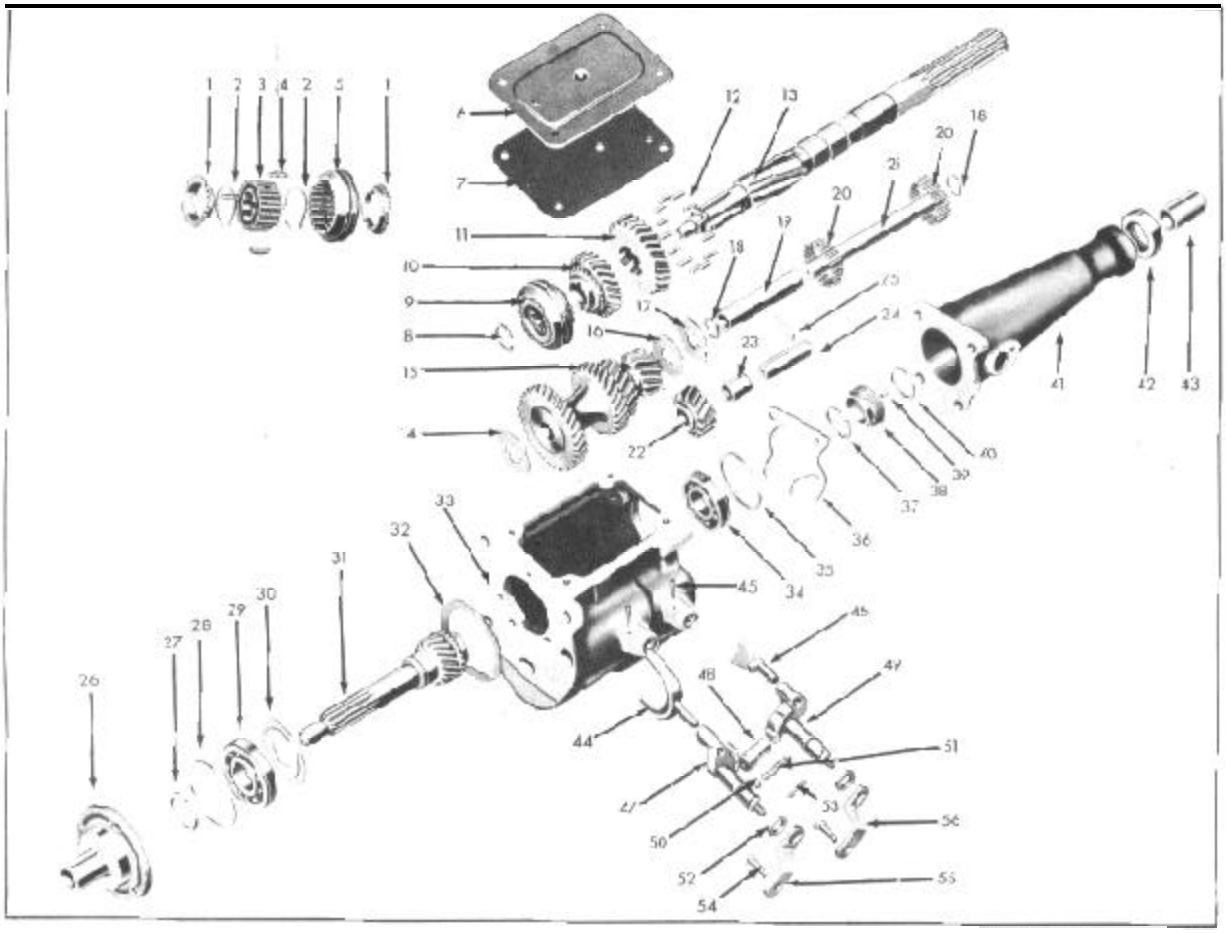

FIGURE 2
LEGEND

1. Synchronizer rings
2. Synchronizer springs
3. Synchronizer hub
4. Synchronizer shift plates
5. Synchronizer sleeve
6. Cover
7. Cover gasket
8. Main shaft snap ring
9. Synchronizer assembly
10. Second speed gear and bushing
11. Low and reverse gear
12. Mainshaft front rollers
13. Mainshaft
14. C.S. thrust washer (front)
15. C.S. gear cluster
16. C.S. rear thrust washer (inner)
17. C.S. rear thrust washer (outer)
18. C.S. bearing washer
19. C.S. gear spacer
20. C.S. bearing rollers
21. Counter shaft
22. Reverse idler gear
23. Reverse idler gear bushing
24. Reverse idler gear shaft
25. Idler and C.S. lock plate
26. Drive gear bearing retainer
27. Drive gear snap ring
28. Bearing snap ring
29. Drive gear bearing
30. Oil retaining washer
31. Drive gear
32. Bearing retainer gasket
33. Transmission case
34. Mainshaft bearing (rear)
35. Mainshaft bearing snap ring
36. Bearing retainer gasket
37. Speedometer gear snap ring (front)
38. Speedometer gear
39. Speedometer gear lock key
40. Speedometer gear snap ring (rear)
41. Mainshaft bearing retainer
42. Mainshaft oil seal
43. Mainshaft bushing
44. Shift fork (second and high)
45. Taper pin
46. Shift fork (low and reverse)
47. Shift shaft (second and high)
48. Shift shaft interlock sleeve
49. Shift shaft (low and reverse)
50. Shift rail lock ball
51. Shift rail lock ball spring
52. Shift shaft oil seal
53. Shift lever interlock pin
54. Control lever outer clevis pin
55. Second and high control lever (outer)
56. Low and reverse control lever (outer)

SECTION 8
TRANSMISSION

SPECIFICATIONS

GEAR RATIOS

Low	2.605:1
Second	1.630:1
High	1.000:1
Reverse	3.536:1

SNAP RING THICKNESS

Main Drive Gear Bearing	.073" and .076"
Main Drive Gear	.087", .090", .093", .096" and .103"
Mainshaft Bearing Rear	.073" and .076"
Mainshaft Rear Bearing	.087", .090", .093" and .096"

MARKING	LENGTH
"A"	1.295"
"B"	1.291"
"C"	1.287"
"D"	1.303"
No Marking	1.299"

LUBRICATION

Transmission - 1-1/2 Pts.
S.A.E. - 90 Summer
S.A.E. - 80 Winter

CONSTRUCTION

The transmission is of the all-helical gear type with synchro-mesh second and high gears.

The rear of the main drive gear is supported by a ball bearing mounted in the transmission case and the front end pilots in a bronze bushing. The front end of the main-shaft operates in rollers carried in the main drive gear and the rear end of the main-shaft is supported by a ball bearing mounted in the case. Oil retention is by means of a hydraulic leather oil seal in the rear bearing retainer.

The main-shaft second speed gear and the reverse idler gear operate on their shafts through precision fitted, bronze alloy bushings. The countershaft gear cluster operates on the stationary countershaft through needle rollers at each end held in position by a spacer tube and washers. Countershaft gear cluster end thrust is taken by a single stationary, bronze faced thrust washer at the front and by a rotating bronze washer and a stationary steel washer at the rear.

Separate shift shafts with integral cams on the inside and actuating levers on the outside, operate the low and reverse and second and high gears through forks and an interlock arrangement common to both shafts. Separate rubber mounted rods connect the outer shift shaft levers to the levers on the transmission control

The transmission is mounted at the front on the clutch housing with four bolts passing through lugs on the transmission case from the rear into the clutch housing. This simplifies transmission removal and replacement since the clutch housing and floor cover do not have to be disturbed.

The main drive gear be a r i n g retainer positions the transmission in a machined locating hole in the clutch housing.

Breathing or venting is through a small opening in the front of the cover and two holes in the rear of the gasket, which is held away from the cover at the center by a depression stamped in the cover.

REMOVAL

1. Drain transmission lubricant.
2. Disconnect the universal joint at the rear axle companion flange, push propeller shaft f o r ward to release bearing cups from seats in companion flange, then pull propeller shaft rear-ward to release the sleeve yoke from the

rear end of transmission and remove complete propeller shaft. Use tape around bear in g cups to retain cups and rollers in position.

3. Disconnect the low and reverse, and second and high shift rods at the transmission shift levers.

4. Disconnect speedometer cable at transmission and remove the speedometer pinion.

5. Remove the two screws attaching the clutch cross shaft support assembly to the transmission case and remove the support.

6. Using a universal socket on a 10" extenstion, remove the two top bolts attaching the transmission to clutch housing and insert two guide studs (J-2969) to guide transmission during removal.

7. Lower the transmission and clean the outside thoroughly before disassembly.

DISASSEMBLY

1. Remove the four cover screws and remove cover (6) and gasket (7), Figure 2.

2. Remove the four bolts from the mainshaft rear bearing retainer (41) and remove retainer and gasket (36).

NOTE: The rear bearing retainer has a reamed bushing at the rear end of the retainer and care should be used when removing the retainer.

3. Remove the snap ring (40) at the rear of the speedometer gear, remove the speedometer gear (38), key (39) and snap ring (37).

4. Remove the three bolts attaching the main drive gear bearing retainer and remove retainer (26) and gasket (32).

5. Using a brass drift and hammer Figure 3, drive countershaft rearward enough to free the lock plate in the shaft recess and remove lock plate.

6. A dummy shaft is necessary to replace the countershaft in the transmission gear cluster to allow shaft and gear cluster to be lowered to bottom of case for removal of the main drive gear.

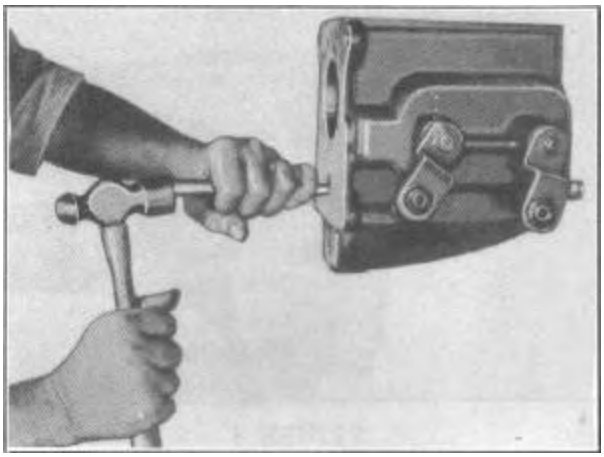

FIGURE 3

The dummy shaft can be made from a piece of 11/16" diameter cold rolled steel and cut to exactly 5-7/8" long and drill a 3/16" diameter hole 1" deep in each end to provide a means of raising the cluster assembly with two small punches.

NOTE: The purpose of the dummy shaft is to retain in position the needle rollers, spacer and thrust washers when removing and installing the countershaft cluster gear.

7. Place end of dummy shaft against front end of countershaft, and with a soft hammer, drive the countershaft to the rear out of transmission case.

NOTE: Be sure the dummy shaft remains in constant contact with the countershaft during this operation; otherwise, the thrust washers and needle rollers will fall out of place.

8. Use a small pointed brush and paint a fine line across the synchronizer rings, sleeve and second and high gear to insure reassembly of these parts in their proper location, Figure 4.

9. In removing main drive gear, use a brass drift a g ain s t the rear face of the drive gear teeth (not synchronizer teeth) and carefully drive gear forward out of case.

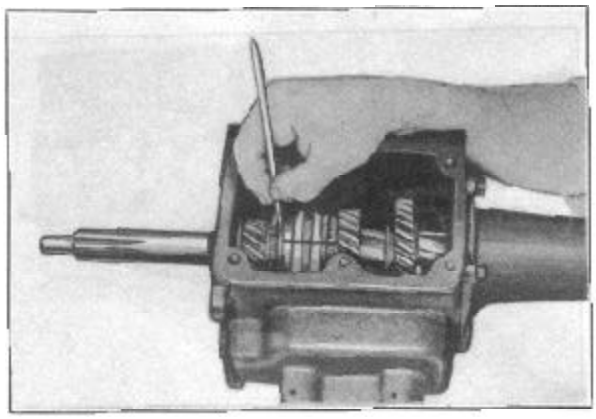

FIGURE 4

10. Use the same brass drift on the pilot end of the mainshaft and drive mainshaft rearward to remove mainshaft bearing from rear of case.

11. Use snap ring pliers to remove snap ring., from front of mainshaft, Figure 5.

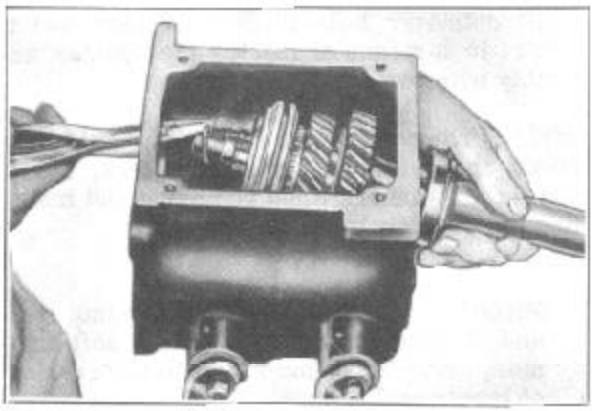

FIGURE 5

12. Hold the synchronizer assembly and the second and low gears together as a unit and move mainshaft assembly to the right of transmission case as far as possible to disengage the high and intermediate shifter fork from the synchronizer collar and the low and reverse fork from the collar and the low gear. Turn mainshaft and while holding the gears with-draw the mainshaft through the gears and out of rear of case, Figure 6.

13. With a long curved brass drift drive the reverse idler gear shaft out of rear of transmission case and remove the idler gear.

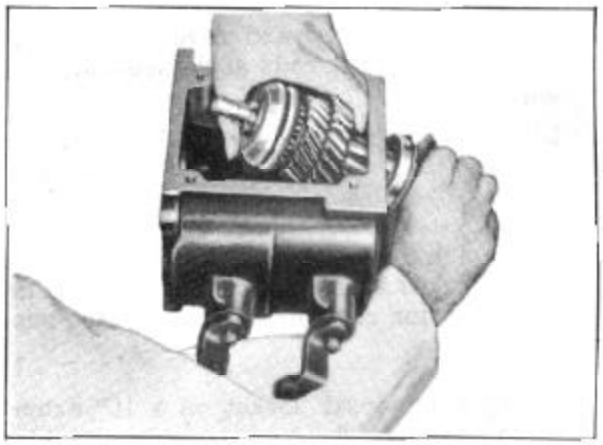

FIGURE 6

14. Lift the countershaft gear cluster up and out of case Be careful dummy shaft does not slide out and spill the needle rollers, roller washers and thrust washers.

Note the position of the front and rear thrust washers to insure exact replacement.

15.. Using a pin punch drive taper pins securing shift shafts up and out of case, Figure 7.

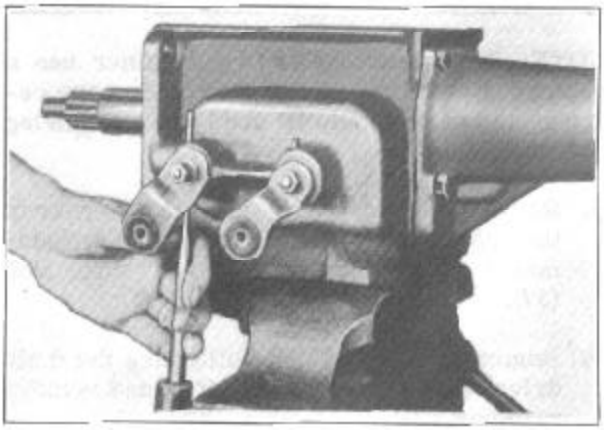

FIGURE 7

16. Remove the nuts, washers and levers (55) and (56), Figure 2, from shift shafts (47) and (49) and remove shafts from case. The interlock balls (50), sleeve (48), spring (51) and pin (53) may also be removed.

INSPECTION

Thoroughly clean and carefully inspect all parts for wear, nicks, scores, etc., to determine if any parts need replacement.

Regardless of appearance, all oil seals and gaskets should be replaced to prevent the possibility of oil leaks.

To replace the mainshaft rear oil seal (42), drive old seal from rear flange and install a new seal, tapping it into bearing retainer from rear of retainer using Seal Installer Tool J-1354.

The rear face of the seal projects 1/4" out of retainer when properly installed.

The shift shaft oil seals (52) are replaced by driving the old seals out from inside of transmission case and driving new ones in from outside of case.

NOTE: When installing new .oil seals, it is good practice to coat the outside diameter of the seal and the inside of the housing with white lead or gasket sealer to prevent oil leaks. Leather seals must be soaked in engine oil for 24 hours before using.

The mainshaft second speed gear (10) and the reverse idler gear (22) fitted with bronze bushings must be replaced with a gear and bushing assembly if excessive wear is noted, since replacement of bushings in the field is impracticable.

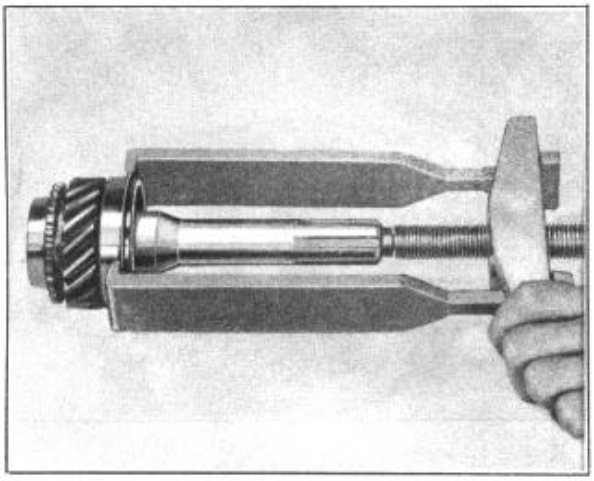

FIGURE 8

If the main drive gear ball bearing (29) or the main shaft rear bearing (34) appear rough or show excessive wear or damage, they should be replaced, using remover J-1134-H with with thimble thimble removed, Figure 8 and replacer J-2995-1 Figure 9.

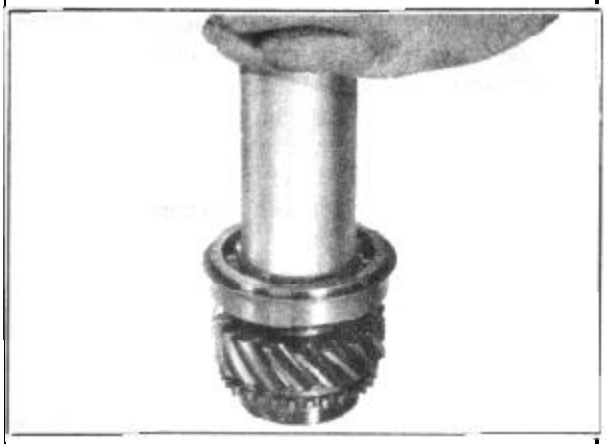

FIGURE 9

ASSEMBLY

SHIFT SHAFTS AND INTERLOCK

1. Install the low and reverse shift shaft (49) Figure 2, in the transmission case. Use care to avoid damage to the oil seal, align the neutral detent of the cam with the interlock boss opening in transmission case and install the taper pin (45) through shift shaft and case.

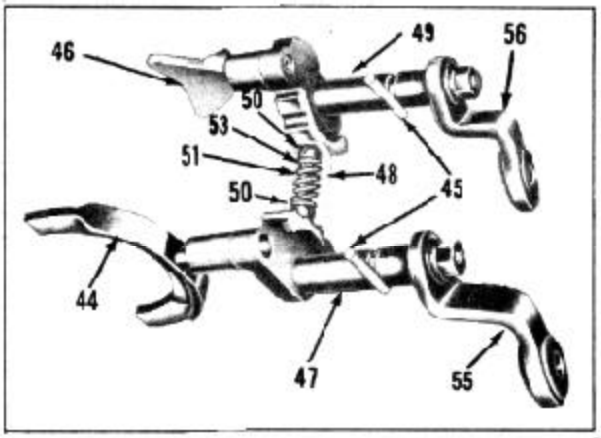

FIGURE 10

NOTE: It is necessary to install low and reverse shift shaft (49) first due to interference by the boss of the reverse idler gear shaft.

2. Install interlock sleeve in case and insert an interlock ball in sleeve. Then install the sleeve spring (51) and

pin (53), Figure 10.

3. Install the second and high shift shaft (47) in case and move shaft toward outside of case as far as possible. Install the other interlock ball (50) in the sleeve compressing spring as far as possible; then slide the shift shaft toward center of case aligning neutral detent with interlock ball. Install the taper pin (45) through shift shaft and case.

4. Install shift shaft levers, short lever (56) (low and reverse) on rear shaft (49) and long lever (55) (second and high) on front shaft. Shift either lever into any gear and with one end of interlock contacting the shift shaft cam, use a feeler gauge as shown in Figure 11 and check the clearance at opposite end of interlock sleeve and cam.

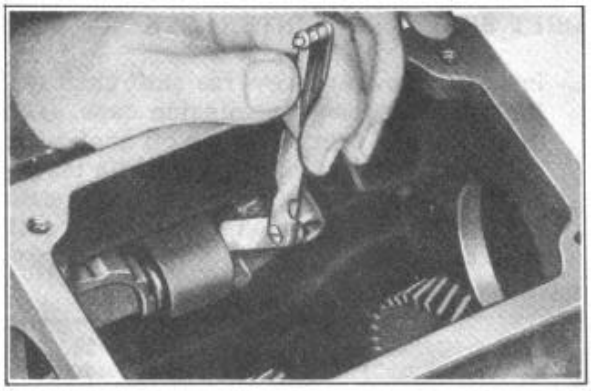

FIGURE 11

Clearance should be .001 to .007". If not within these limits, the sleeve must be removed and replaced with one of proper length. Consult the "Specifications" page for sleeve dimensions.

COUNTERSHAFT GEAR CLUSTER

1. To assemble the countershaft gear cluster, insert the dummy shaft and needle roller spacer (19) Figure 2, in the gear cluster (15). Stand assembly on one end apply viscous grease between shaft and bore of gear cluster. Insert 20 rollers (20) and place the second roller washer (18) on top of rollers. Turn assembly end for end and perform same operation.

2. Cover the thrust washers (14), (16), and (17) and ends of gear cluster with viscous grease and place thrust washers in position. The f r on t washer (14) has bronze face to gear and lug to top. Rear washer (16) (inner) bronze mu st be installed so the two lugs in center of washer engage cluster gear and the (outer) steel washer
(17) with the lug to top.

3. With cluster gear assembly complete on the dummy shaft, carefully lower the assembly into the transmission case.

   Position the assembly with the countershaft holes in case and start countershaft through rear of case. Tap the countershaft forward and keep in constant contact with the dummy shaft to prevent rollers and washers from becoming dislodged.

   Drive the countershaft forward just far enough to enter front end in front of case since it must be removed again after checking end play.

4. Insert a feeler gauge between the two rear thrust washers to check gear cluster end play, which should be .006" to .016". If clearance is more, the thrust washers should be replaced, Figure 12.

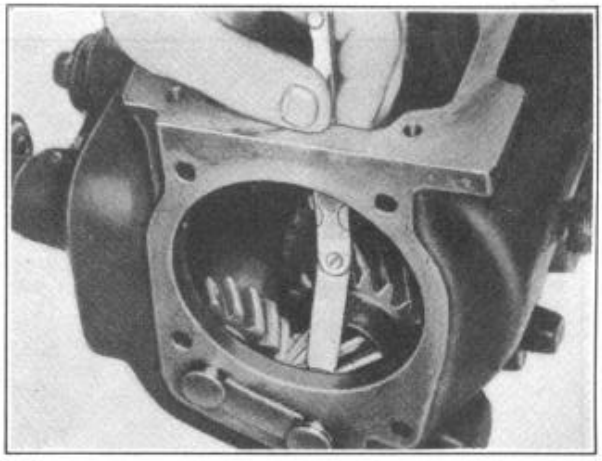

FIGURE 12

5. Enter the dummy shaft into front of case and tapping lightly with a soft hammer, drive the countershaft out through rear of case, being careful to keep both shafts

butted together at all times. Then lower the gear cluster assembly with dummy shaft to bottom of case.

REVERSE IDLER GEAR

1. Install idler gear (22) Figure 2, in position (long hub to front), and drive in idler gear shaft (24) with slot for lock place in position for alignment with slot in the countershaf t. Do not seat shaft tightly since it may be necessary to turn it when countershaft is installed.

   Idler gear end play tolerance is .003" to .010".

MAINSHAFT ASSEMBLY

1. Install the mainshaft bearing on the main- shaft so that inner race of bearing bottoms against end of spiral splines and install the proper thickness span ring. These snap rings are furnished in five thicknesses. See "Specifications" Page 83.

2. Insert the mainshaft and rear bearing assembly through rear of transmission case an d install the low and reverse sliding gear (11) with the shift collar to rear of case.

3. Install the low and reverse shift fork (46) (offset to rear) and engage fork in collar of low and reverse sliding gear (11).

4. Install the second speed gear (10) and assemble the synchronizer clutch hub, shift plates, shift sleeve, springs and synchronizer rings and install the assembly on the ma in shaft with the long hub of the clutch hub to front of transmission.

NOTE: When installing synchronizer springs (2) the hooked ends of both springs must engage the same shift plate on opposite sides.

Be sure the paint marks on the synchronizer parts are properly aligned.

5. Install the mainshaft snap ring, Figure 5, retaining the gears in position and check end play of the second gear by inserting a feeler gauge between the rear face of gear and the front ends of the mainshaft spiral splines. End play may be from .003" to .016". Excessive end play at this point can only be corrected by installing new parts.

6. Install the second and high shift fork (44) in the second and high shift shaft and move mainshaft assembly to right of case, align shift fork with clutch sleeve and move mainshaft to center to engage fork in synchronizer clutch sleeve.

7. Complete the installation of mainshaft and bearing assembly b y tapping the rear bearing outer with a plastic or rawhide hammer until bearing case snap ring is flush with rear of transmission case.

MAIN DRIVE GEAR

1. Coat inside of main drive gear pocket with heavy viscous grease and assemble the bearing rollers (12) in position in the gear pocket.

2. Install the mainshaft drive gear and bearing assembly, tapping outer race of bearing lightly and evenly with a soft hammer until the snap ring in the bearing is flush with the front of case.

CAUTION: When installing the gear, be sure bearing rollers are not dislodged before pilot end of mainshaft enters drive gear.

MAIN DRIVE GEAR BEARING RETAINER

1. Tap the main drive gear bearing face lightly with a soft hammer to make sure the bearing snap ring is fully seated on the transmission case.

2. Install a new bearing retainer gasket and install the bearing retainer with three cap screws and tighten evenly.

NOTE: Be sure oil drain hole in bearing retainer flange is aligned with oil drain back hole in transmission case.

COUNTERSHAFT

1. To raise the gear cluster and dummy shaft to align with the countershaft holes in case, insert two suitable punches through countershaft hole s in the transmission case and engage the 3/16" holes drilled in ends of dummy shaft. Raise the gear c l u s t e r assembly to alignment with the countershaft hole s in the case and while forcing the countershaft cluster against the case with one pin punch to maintain alignment remove the other pin punch and start the countershaft through rear of case.
2. Tap the countershaft forward and hold front end of dummy shaft to keep constant contact with the countershaft at all times to prevent thrust washers and needle rollers from dropping from gear cluster. Line up slot in countershaft w ith slot in idler gear shaft and install lock plate. Drive both shafts in case securely to retain lockplate.

MAINSHAFT REAR BEARING RETAINER

1. Tap the rear face of mainshaft rear bearing (34) Figure 2, outer race to be sure bearing snap ring is seated firmly against transmission case.
2. Install snap ring (37), position woodruff key (39) and slide the speedometer drive gear (38) on mainshaft and install rear snap ring (40).
3. Place rear bearing retainer (with new oil se al installed) with a new gasket (36) in position on rear of transmission; install the four attaching screws and tighten.
4. Install the transmission cover, using a new gasket.

NOTE: The two gasket vent holes go to the rear while the vent hole in cover goes to the front, install the four capscrews, lockwashers and tighten cover screws.

TRANSMISSION INSTALLATION

1. Install the two guide studs (J-2969) in upper bolt holes of clutch housing to assist in supporting the transmission during installation.
2. Raise the transmission assembly into position and enter guide studs in top holes of case flange.
3. Check the position of the clutch driving plate and see that it is perfectly centralized within the clutch assembly. Use 1-5442 Aligning Arbor for this operation.
4. Move the assembly forward and engage mainshaft splines in clutch plate hub. Be sure the throwout bearing and collar are properly positioned in the throwout lever.
5. Install the clutch cross shaft support assembly to the bottom of the transmission case.
6. In stall the two lower bolts, attaching transmission to clutch housing. Then remove the guide studs at top and install the two upper bolts.
7. Install speedometer drive pinion and connect speedometer drive shaft and cable.
8. Connect the second and high and low and reverse shift rods to shift shaft levers on transmission and adjust.
9. Place the universal joint needle roller cups in position on rear axle companion flange , install clamps, washers and tighten nuts 14-17 ft. albs., be sure bearing cups are properly seated under retaining lugs of companion flange.
10. Tighten drain plugs, remove filler plug and fill transmission to bottom of plug opening (1-1/2 albs) of S.A.E. 80 Winter o r S.A.E. 90 Summer gear oil. Replace and tighten filler plug.

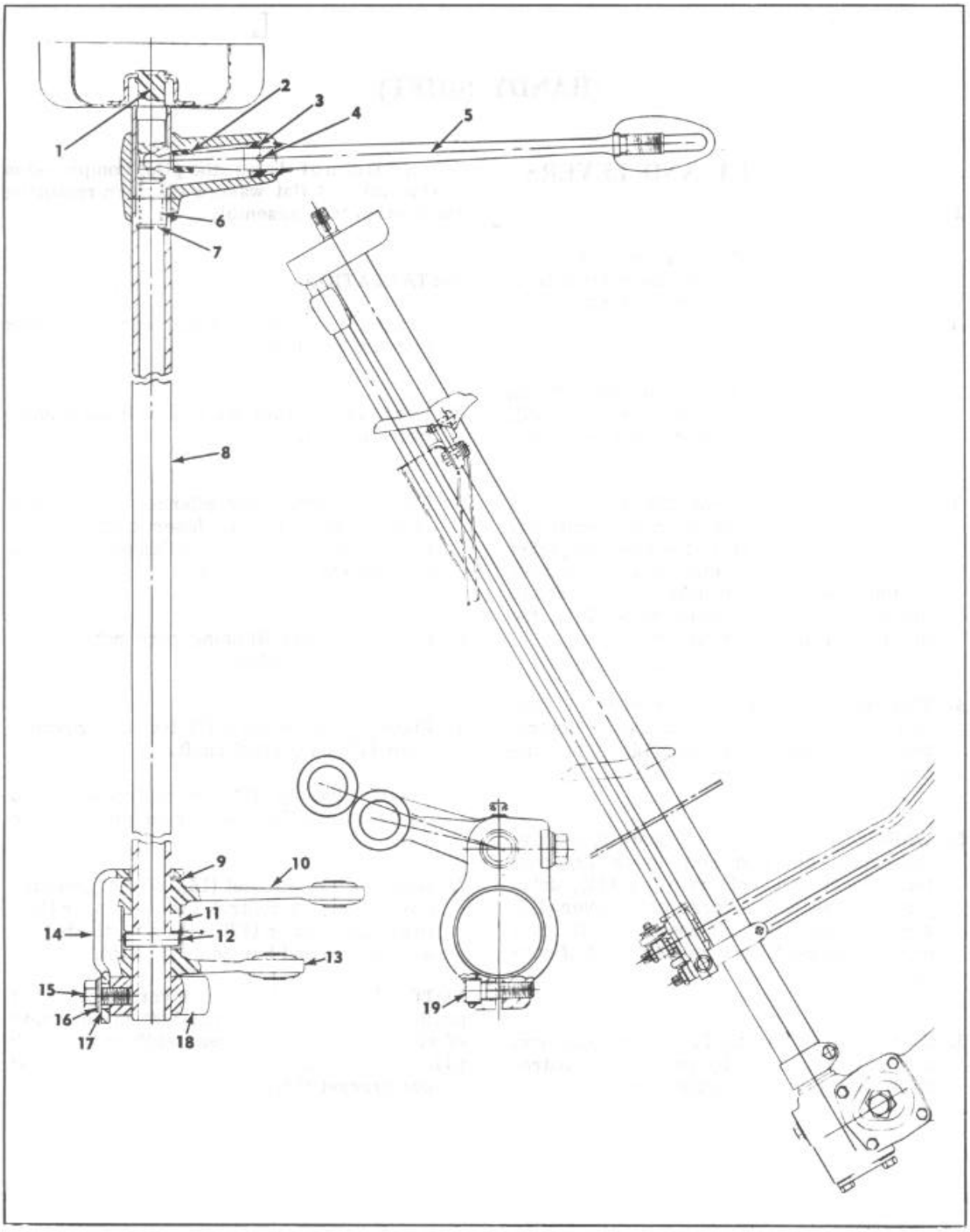

FIGURE 13

TRANSMISSION CONTROL

(HANDY SHIFT)

CONTROL SHAFT AND LEVERS

REMOVAL

1. Disconnect low and reverse and second and high shifter rods at the control shaft levers by removing the cotter pins and flat washers.

2. Remove the control lever fulcrum pin (4), Figure 13, control lever grommet (3), silencer (2) and take out control lever (5).

3. Loosen the Allen screw (19) at the control shaft lower bracket attaching the (Handy Shift) control shaft to the steering jacket tube and slide the bracket and levers down on the tube approximately 2-1/4 inches to clear the control shaft pilot (1) at the steering jacket tube housing.

4. Remove the screw (15), lockwasher (16), and plain washer (17) attaching the control shaft lever anchor bracket (14) to the control shaft lower bracket (18).

5. While holding the control shaft (8) remove the second and high shift lever (13), control shaft drive pin retainer (11), drive pin (12), low and reverse shift lever (10), spring washer (9) and control shaft lever anchor bracket (18) from lower end of control shaft.

6. Control shaft (8) and fulcrum bracket can now be removed by pulling the control shaft away from the jacket tube.

NOTE: Do not lose the pilot compression spring (6) and flat washer (7) when removing the control tube assembly.

INSTALLATION

1. Install spring (6) and washer (7) into fulcrum bracket.

2. In stall fulcrum and shift control shaft over pilot (1).

3. Install control lever silencer (2), control lever grommet (3). Insert control lever through grommet, silencer, fulcrum bracket and in socket of pivot.

4. Insert lock pin (4) using care not to damage fulcrum bracket.

5. Place spring washer (9) low and reverse lever (10) on control shaft.

6. Install drive pin (12) onto control shaft and retain in position with drive pin retainer (11).

7. Slide anchor bracket (14), second and high lever (13) and control bracket lower (18). Install washer (17), external tooth lock washer (16) and hex head bolt (15).

NOTE: Place gear shift lever in each shift position. Pin (11) must not bottom in groove of either lever in any gear shift position. If p i n bottoms make necessary adjustments at anchor bracket (14).

SECTION 9
OVERDRIVE

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, resulting in less wear on engine parts as well as greater fuel and oil economy and smoother operation at high speeds.

SERVICING UNITS REQUIRING REMOVAL OF OVERDRIVE HOUSING ONLY

Repairs to the overdrive case, overdrive mainshaft, mainshaft ring gear, free wheeling cam, pinion cage assembly, stationary gear, shift rail and fork assembly, overdrive mainshaft rear bearing, overdrive mainshaft 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 wire at control switch, also two wires at solenoid.
4. Remove nuts and washers from "U" clamps attaching propeller shaft universal cross to rear axle pinion companion flange.
5. Lower rear end of propeller shaft and pull complete assembly backward out of transmission.

NOTE: Use masking tape to hold bearings to universal joint.

6. Remove speedometer cable and speedometer driven gear.
7. Disconnect overdrive control cable at control shaft lever.
8. Drive out the overdrive control shaft tapered pin,

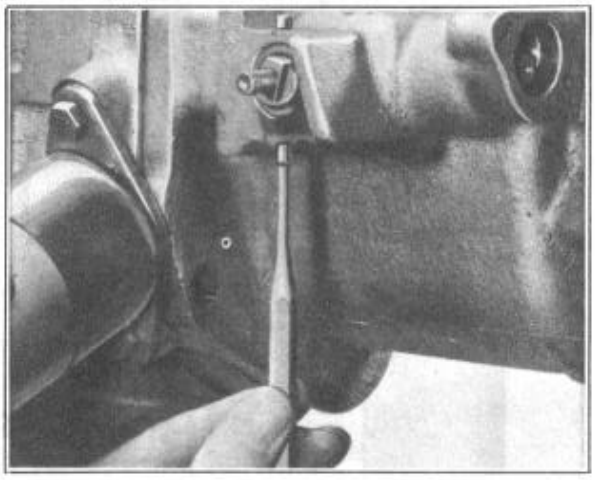

FIGURE 1

Figure 1, and pull control shaft out as far as possible to disengage the operating cam of the shift shaft from the slot in shift rail.

NOTE: Small end of taper pin is down.

9. Remove the three bolts and lock washers and remove the mainshaft rear bearing retainer.
10. Remove the four bolts attaching the overdrive housing to transmission and overdrive adapter.
11. Remove the overdrive mainshaft rear bearing snap ring (105) and spacer washers 104, Figure 2.
12. 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.)

NOTE: Removal of the overdrive housing will expose the governor gear, speedometer gear, overdrive mainshaft and ring gear free wheeling cam, pinion and cage assembly, shift rail and fork, stationary gear, stationary gear cover plate and overdrive mainshaft bearing.

REMOVAL OF PARTS FROM REAR OF ADAPTER

1. Install one bolt removed from housing to hold the adapter plate to the transmission case.

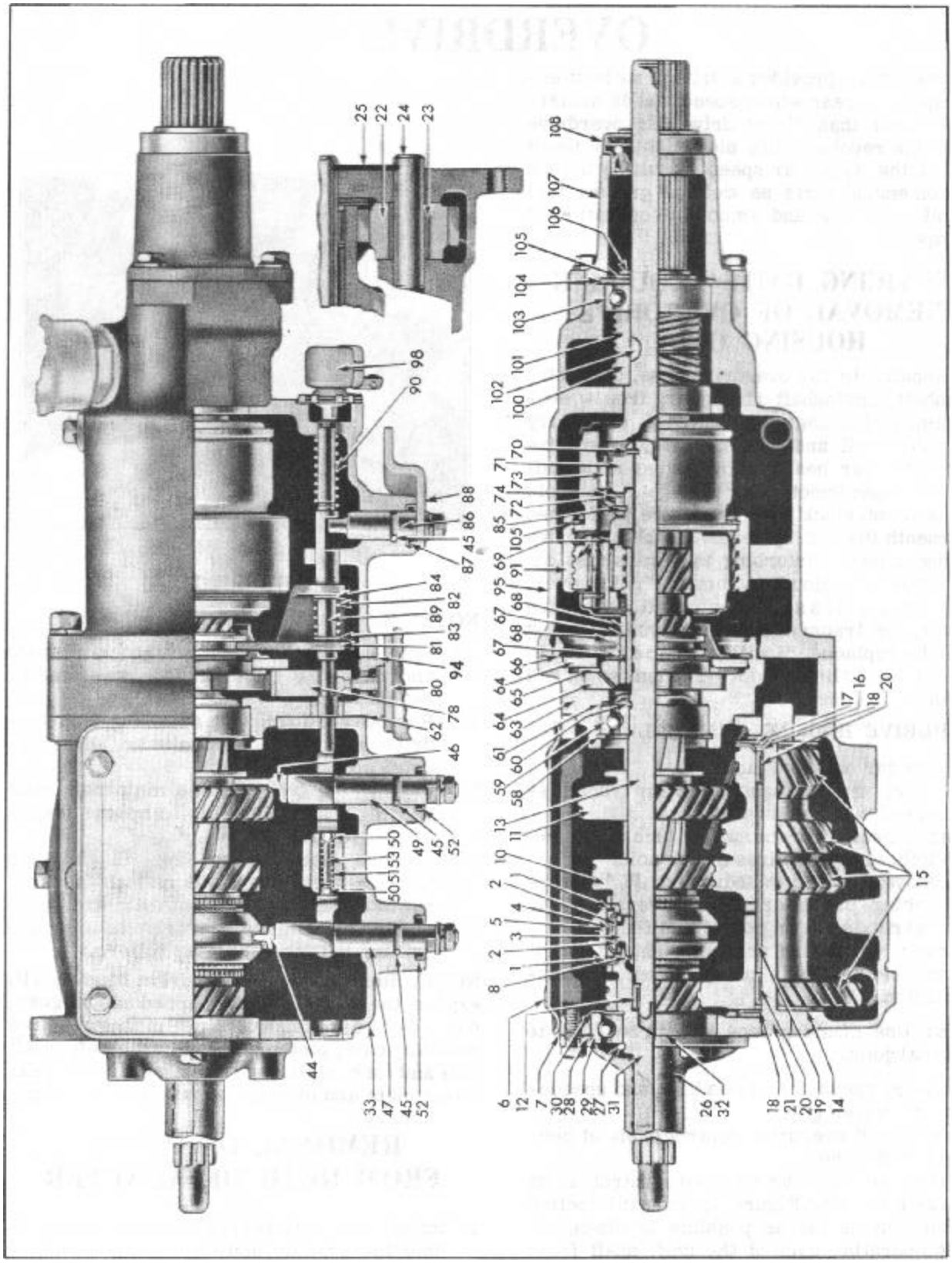
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FIGURE 2

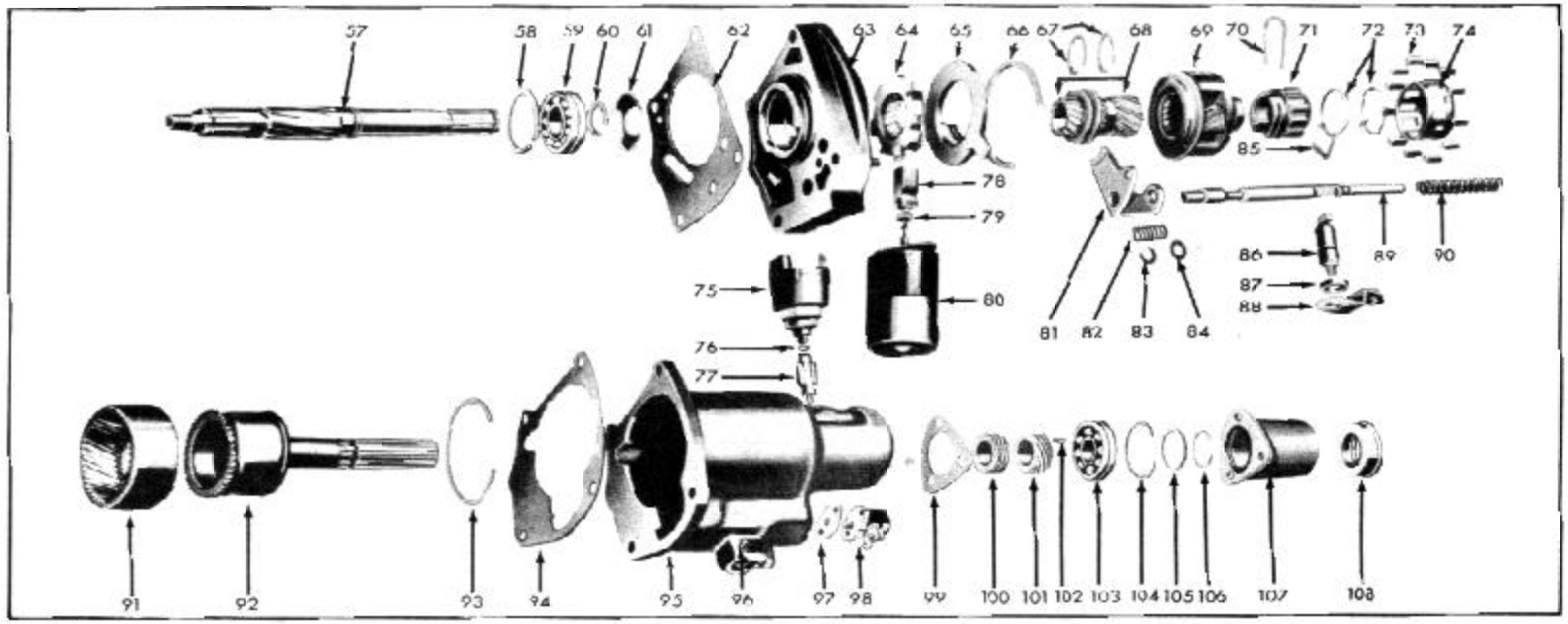


FIGURE 3

LEGEND

57. Mainshaft
58. Trans. mainshaft snap ring
59. Trans. mainshaft bearing
60. Trans. mainshaft snap ring
61. Bearing oil baffle
62. O/D to trans. case gasket
63. Overdrive housing adapter
64. Sun gear plate and balk ring
65. Sun gear plate cover
66. Cover plate snap ring
67. Sun gear snap rings
68. Sun gear and shifting collar
69. Pinion cage assembly
70. Pinion cage retainer
71. Cam assembly
72. Cam roller retainer springs
73. Cam roller
74. Cam roller retainer
75. Governor switch
76. Lock ring
77. Governor pinion
78. Sun gear pawl
79. Sun gear pawl oil seal
80. Solenoid assembly
81. Shift fork
82. Shift rail sleeve spring
83. Lockup rail "C" washer
84. Lockup rail washer cup
85. Cam retainer clip
86. Control shaft
87. Control shaft oil seal
88. Control lever
89. Shift rail
90. Shift rail retractor spring
91. O/D mainshaft ring gear
92. O/D mainshaft output shaft
93. Snap ring
94. Overdrive housing gasket
95. Overdrive housing
96. Control shaft locating pin
97. Control switch gasket
98. Control switch
99. Retainer gasket
100. Governor drive gear
101. Speedometer drive gear
102. Woodruff key
103. Rear bearing
104. Rear brg. retainer snap ring
105. Rear bearing spacer washer
106. Output shaft snap ring
107. Rear bearing retainer
108. Output shaft oil seal

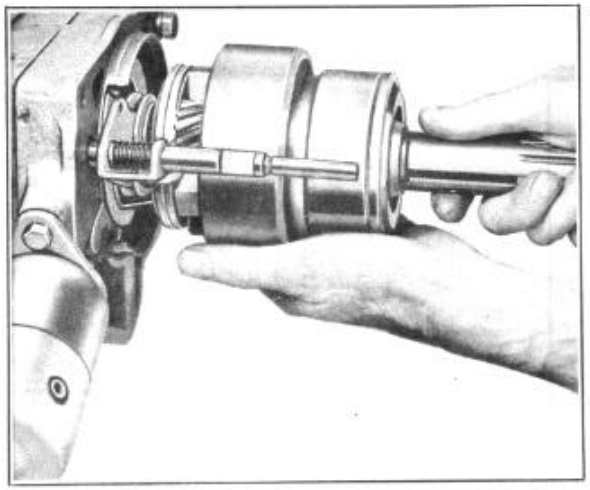


FIGURE 4

2. Remove the overdrive mainshaft and ring gear assembly, Figure 4, (Catch the rollers as they drop out of the free wheeling cam roller retainer).

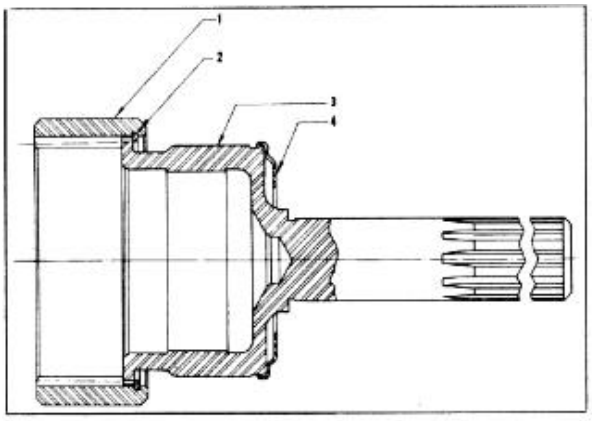


FIGURE 5

3. Removing lock ring (2), Figure 5, will permit the removal of the ring gear (1)

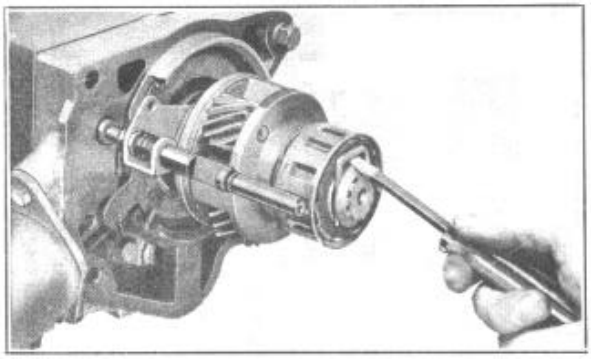


FIGURE 6

from the overdrive mainshaft (3); the oil collector ring (4) is spun securely to the mainshaft to form an oil tight seal.

4. Remove the retaining clip at the end of the clutch cam, Figure 6, this will allow removal of the cam and the pinion cage assembly.

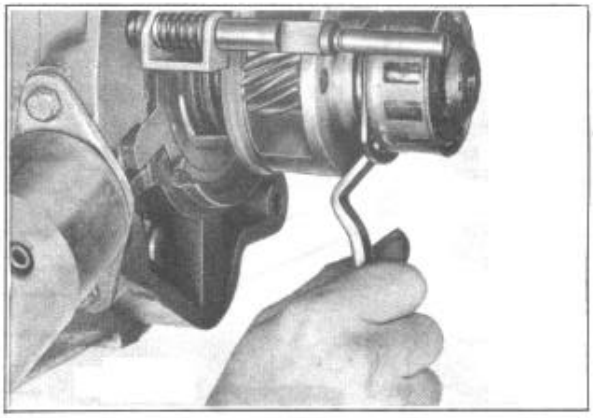


FIGURE 7

5. Remove the "U" clip located between the free wheeling c a m and pinion cage and separate these units, Figure 7.

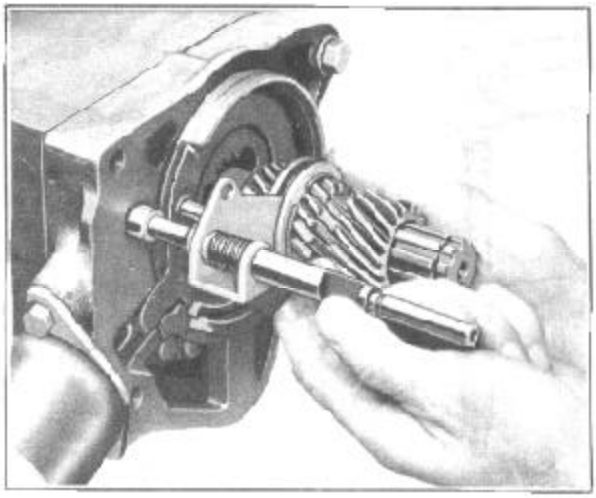


FIGURE 8

6. Remove the sun gear and shift rail assembly, Figure 8.

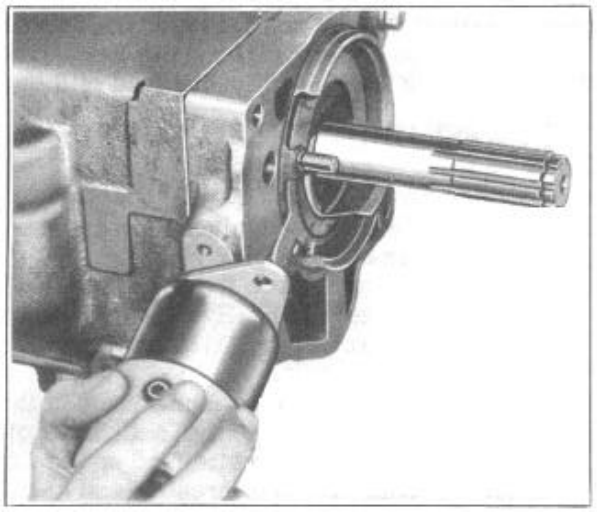


FIGURE 9

7, Remove the solenoid attaching screws, turn the solenoid one-quarter turn clockwise and remove, Figure 9.

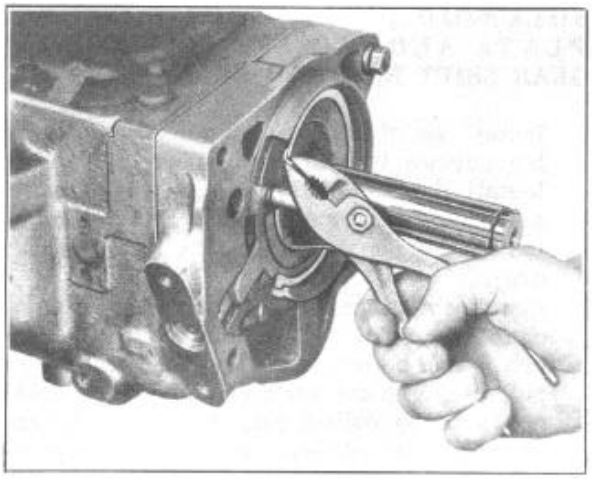


FIGURE 10

8. Remove the large snap ring at the adapter plate, Figure 10.

9. The retainer plate, the sun gear, control plate and blocker assembly, and the pawl can then be removed, Figure 11.

CLEANING AND INSPECTION

As each part is removed from the assembly, wash it with clean solvent and wipe dry. Protect parts from subsequent dirt accumulation.

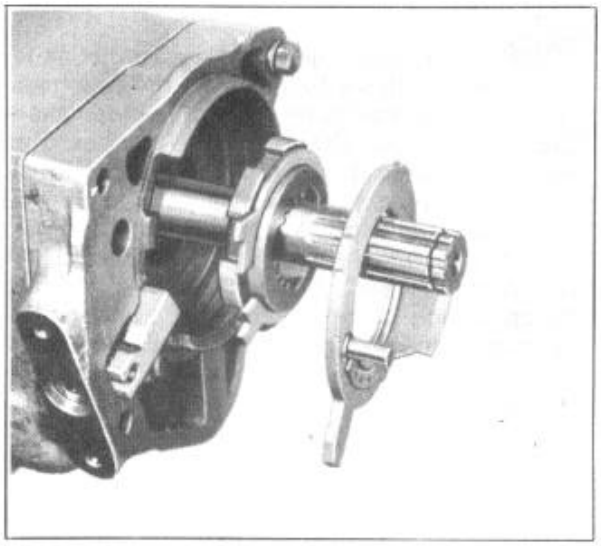


FIGURE 11

After cleaning give parts visual inspection for wear or damage. Replace any broken or excessively worn parts.

Roller clutch parts should be carefully inspected. If rollers show surface markings of any kind they should be replaced. If inner surface of the outer roll shows slight lengthwise indentations, they are normal and do not impair the action of the clutch. However, if the 12 flat surfaces of the cam show such markings, it should be replaced.

Inspect fit and tension of the balk ring on hub as follows:

(a) When pushing one end of balk ring away from opposite end, ring should slide around the hub.

(b) Push one end toward the other, the balk ring should grab and hold to the hub. If the ring does not hold, it should be replaced.

Test the tension of the cam retaining spring after the cam assembly has been thoroughly washed. The springs are designed to twist the cam in a clockwise direction to hold the rollers up on the cam.

NOTE: If the spring tension is weak or retarded, the unit will free-wheel at all times.

To check spring tension, hold hub of cam and turn roller retainer counter-clockwise; suddenly releasing the retainer should cause the retainer to spring back quickly. If the action is slow or retarded, replace springs or complete assembly.

BEARINGS

DO NOT place bearings where dirt is liable to mix with the lubricant in the bearings.

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) In s p e c t the bearing 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 bear in g s are built originally with e n d play and although they may feel quite loose, it does not necessarily indicate that they are worn and unfit for use.

GEARS

Inspect all gears for damaged teeth. Remove any and all raised edges from tooth surfaces b y 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 permissible.

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

DISASSEMBLY

1. Compress the lockup rail spring, pressing it away from the "C" washer (83) Figure (2) and remove the "C" washer.
2. Pull the shift rail shaft out of the shift f ork and remove the spring and plain washer.

NOTE: The retractor spring should have a free length of 2-3/4" and 1-21/32" under load of 12 lbs. The lockup rail spring has a free length of 1-3/8" and 15/16" under load of 8 lbs.

REASSEMBLY OF OVERDRIVE HOUSING

1. Install the overdrive mainshaft rear bearing and rear bearing lock ring.
2. Install a new oil seal in the overdrive rear bearing retainer using Hydra-Matic Rear Bearing Retainer Oil Seal Installer J-1354.
3. Before installing the shift shaft in the overdrive housing, coat the shift shaft oil seal counterbore with white lead and tap in a new oil seal. Dip the threaded end of the shift shaft in liquid soap, and using care, push the shaft through the new seal, turn the shaft so that the shifter lug will be in an upright position.

INSTALLATION OF ADAPTER PLATE, SOLENOID PAWL, SUN GEAR CONTROL PLATE AND BLOCKER, SOLENOID, SUN GEAR SHIFT RAIL AND FORK

1. Install one of the overdrive housing attach.ing screws to hold the adapter in position. Install the solenoid pawl, sun gear control plate and blocker assembly, Figure 11.
2. Install the adapter lock ring (large), Figure 10.
3. Install the solenoid by turning the solenoid counterclockwise one quarter turn, Figure 9, and before installing the cap screws pull straight out on solenoid. If the solenoid can be pulled out, the ball at the end of the solenoid rod was improperly installed (not locked in the pawl).
4. Install the locking rail spring, "C" washer and plain washer on the shift rail and fork assembly.
5. Install the fork in the sun gear shift collar, and while holding the shift fork, shift rail and sun gear together, slide the sun gear onto the main shaft and the shifter rod into the hole in the overdrive adapter.

INSTALLATION OF CLUTCH CAM, PINION CAGE AND OVERDRIVE MAINSHAFT

1. Install the clutch cam and pinion cage, attach the clutch c a m to the pinion cage

assembly with the large retaining clip, Figure 12.

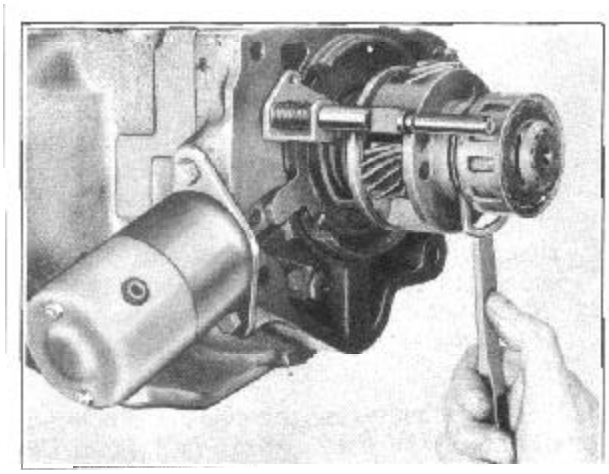


FIGURE 12

2. Install the pinion cage and the clutch cam assembly on the main shaft and secure the assembly in place with the retaining clip, Figure 13.

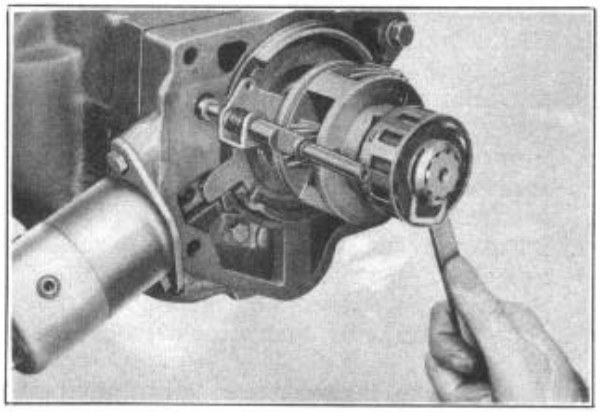


FIGURE 13

NOTE: Replace any "U" clips that are worn or damaged.

3. Install the ring gear (1), Figure 5, on the overdrive mainshaft (3) and lock it in place with the large snap ring (2).

NOTE: To facilitate installation of the mainshaft (output shaft) on the free wheeling cam rollers, insert the free wheeling rollers in the cam roller retainer cage, using heavy grease to hold them in position. Then, with the low gear of the transmission engaged, turn the cage and rollers counter-clockwise until the ro1ler s are in their low positions, and snap a tight fitting rubber band around them. Install the output shaft and ring gear on the pinion cage and free wheeling clutch cam and roller unit assembly, turning the shaft to the left as it assembles over the clutch rollers, Figure 14.

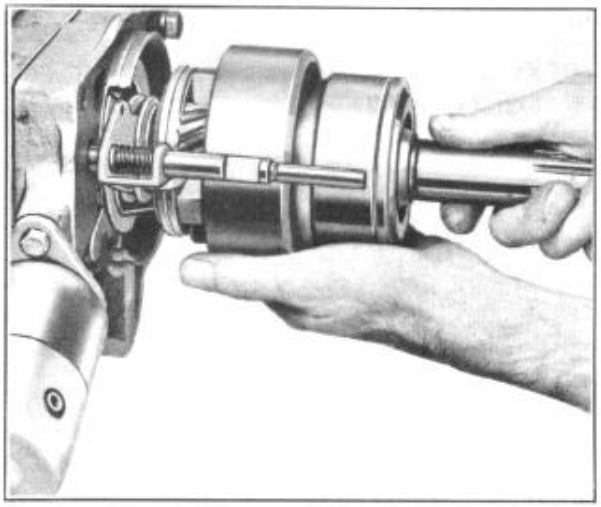


FIGURE 14

OVERDRIVE HOUSING

INSTALLATION

1. Remove bolt holding adapter to transmission case.
2. Install overdrive to adapter gasket.
3. Install overdrive case.
4. With the control switch removed, insert a long thin drift through the housing at the control switch opening to line up the retractor spring and the overdrive shift rail.
5. Whi1e case is being installed, push the control shaft inward and engage the slot in the shift rail with the shifter shaft lug. (Lug must be up and outside control lever down.)
6. Install the four overdrive housing to transmission case bolts and tighten all bolts evenly. Tighten all 4 bolts to 20-30 ft. lbs. torque.
7. Install the control shaft locating pin, large end up.
8. Install control switch, governor pinion, and governor switch.
9. Add lubricant to get proper level in both transmission and O.D. units.

TRANSMISSION AND OVERDRIVE

REMOVAL

1. Remove drain plugs and drain lubricant.
2. Remove the nuts, washers and clamps from the rear axle companion flange and drop the propeller shaft and withdraw propeller shaft with sleeve yoke assembly from transmission.

NOTE: Use a rubber band or tape to hold bearing cups and needle rollers in place.

3. Disconnect the low and reverse and the high and intermediate shift rods at the transmission shifter levers.
4. Disconnect the speedometer cable at transmission and the governor wire at the overdrive control switch.
5. Disconnect the overdrive control cable from the overdrive shift shaft lever.
6. Remove the two screws attaching the clutch cross shaft support assembly to the bottom of the transmission case and remove the support.
7. Remove the governor and governor driven gear and the speedometer driven gear.
8. Using a universal socket on a 10" extension, remove the top bolts attaching the transmission case to clutch housing. Install two J-2969 Guide Studs to support transmission when removing the two lower bolts.
9. Remove the transmission and overdrive assembly, using care not to damage the main drive gear splines and pilot during removal.

DISASSEMBLY

1. In stall transmission in a bench holding fixture and if transmission has not been drained at removal, do so before disassembly.
2. Remove the transmission cover and gasket.
3. Remove the two screws and washers and remove the overdrive control switch and gasket.
4. Use a pin punch and drive out the overdrive control shaft tapered pin, Figure 1. Pull the control shaft outward approximately 3/8" to disengage the operating cam of the shift shaft from the slot in the rail.
5. Remove three screws and washers and remove the output shaft rear bearing retainer and gasket.
6. Remove the mainshaft bearing snap ring and spacer.
7. Remove the four bolts, 5/8" socket, attaching the overdrive housing to the transmission, and overdrive adapter.
8. Slide the overdrive housing rearward carefully. Lightly tap the end of the overdrive mainshaft with a soft hammer to prevent the mainshaft from coming off with the overdrive housing and spilling the free wheeling rollers.

NOTE: After removing the overdrive housing install one of the bolts removed from the housing to hold the adapter plate to the transmission case.

9. Remove the speedometer gear and governor gear from the output shaft. (Do not lose the Woodruff Key).
10. Remove the overdrive mainshaft and ring gear assembly, Figure 4, (Catch the rollers as they drop out of the free wheeling cam roller retainer.)
11. Removing the retaining clip at the end of the clutch cam, Figure 6, will allow removal of the cam and pinion cage assembly.
12. Remove the "U" clip located between the free wheeling cam and pinion cage and separate these units. Figure 7.
13. Remove the sun gear and shift rail assembly, Figure 8.
14. Remove the solenoid by turning the solenoid one-quarter turn clockwise, Figure 9.
15. Remove the large snap ring at the adapter plate, Figure 10, and remove the retainer plate, the sun gear, control plate and blocker assembly and solenoid pawl, Figure 11.

NOTE: With a small pointed brush, paint a fine line across the synchronizer rings, sleeve and the second and high gears to facilitate proper assembly of these parts in reassembly, Figure 4, Page 85.

16. Remove the one bolt previously used to hold the adapter to the case and using a soft hammer, tap the front side of the adapter plate to release the adapter plate from the transmission case and then pull the

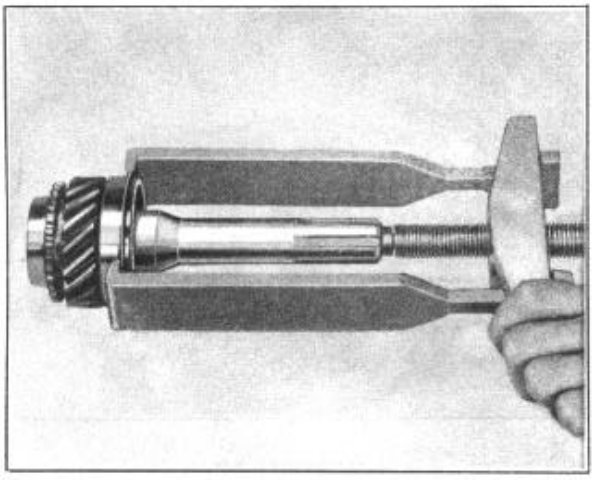
complete main shaft and adapter plate rearward to release the mainshaft from the math drive gear pocket bearing.

NOTE: The synchronizer sleeve will slide off the synchronizer hub and the synchronizer shifter plate may drop into the case.

17. With a brass drift against the gear face of the m a in drive gear, drive the main drive gear and bearing assembly towards front of transmission case to allow tilting of the mainshaft and removal of the synchronizer sleeve.
18. Shift the low and reverse shifter fork to the rear (reverse) position, tilt mainshaft assembly to the right side of case and remove the low and reverse shifter fork.
19. Remove the mainshaft and adapter as an assembly.
20. Remove the synchronizer sleeve and second and high shifter fork.
21. Using a brass. drift move the countershaft rearward just enough to free up the lock plate in the shaft groove.
22. Use a dummy countershaft 11/16" diamete r 5-7/8" long, place end of dummy shaft against the front end of the countershaft and carefully drive the countershaft rearward out of transmission case.

CAUTION: Be sure the dummy shaft remains in constant contact with the countershaft during removal operation, otherwise the thrust washers, needle rollers and spacer will fall out of place .

23. Remove the main drive gear, bearing and snap ring as an assembly.



NOTE: If replacement of the main drive gear bearing is necessary, use Puller J-1134H with thimble removed as shown in Figure 15.

Install bearing with Driver j-2995-1, Figure 16

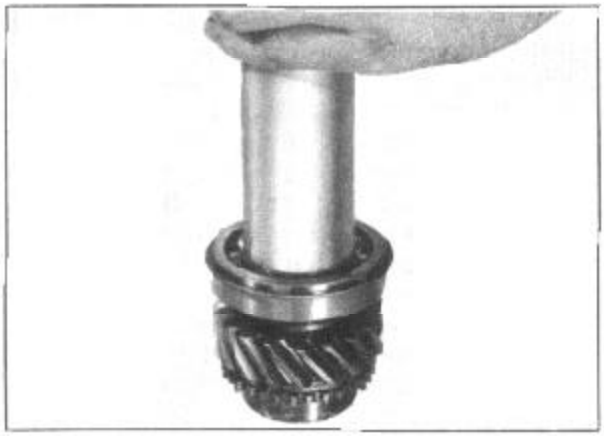


FIGURE 16

24. With the dummy shaft holding the needle rollers and thrust washers in position, lift the countershaft gear cluster up and out of transmission case.

NOTE: Remove the thrust washers from cluster gear noting position to insure exact replacement.

25. Using a long brass drift, drive the reverse idler gear shaft out of rear of transmission case and remove idler gear.

26. Drive out taper pins (96) Figure 2, securing the transmission shift shafts, (small end of taper pin is down).

27. Remove nuts , washers and levers from shift shafts and take shafts out of case. When doing this, also remove interlock sleeve, detent balls, spring and pin.

ASSEMBLY

1. Thoroughly clean both the transmission and overdrive cases.

2. Replace shift shaft oil seals by driving out the old seals from the inside of the transmission case using a pin punch. Coat outside of new seals and inside

of housing bores with red or white lead or gasket sealer and tap new seals in place.

3. Install the low and reverse shift shaft into transmission case. Do not damage the oil seal. Align the neutral detent of shift shaft cam with interlock opening in case and install retainer pin.
4. Install the interlock sleeve in the case and install one interlock ball, the interlock spring and interlock pin.
5. Enter the second and high shift shaft into the transmission case and install the other interlock ball in the interlock sleeve and while compressing the spring, slide the second and high shift shaft toward the center of the case into its correct position and install retaining pin.
6. Rotate either shift shaft into any in-gear position and with one end of the interlock sleeve contacting on e of the cams on either shift shaft, use a feeler gauge and measure the clearance between the opposite end of the interlock sleeve and the cam of the other shift shaft, Figure 17. This clearance should be from .001" to .007". If the clearance is not within these limits remove the shifter shafts and replace the sleeve with one of the proper length.

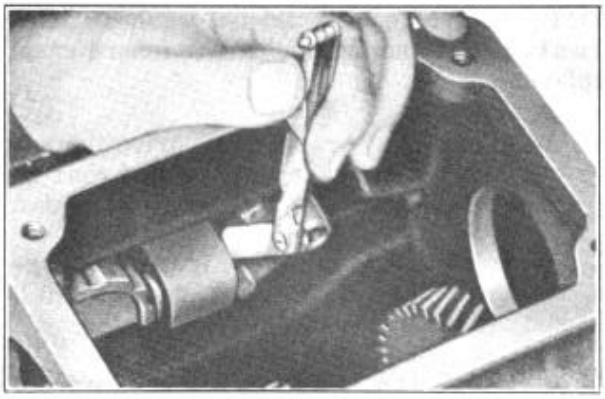


FIGURE 17

NOTE: Interlock sleeves are furnished in five different lengths as follows:

Marking On Sleeve	Length
"A"	1.295"
"B"	1.291"
"C"	1.287"
"D"	1.303"
No Mark	1.299"

7. Install the needle roller spacer tube over the special dummy shaft. Apply viscous grease on shaft and insert the shaft and tube in the cluster gear bore.

8. Insert needle rollers in position between inside of gear and dummy shaft (each end of spacer tube) and follow with a retaining washer at each end.

9. Coat countershaft thrust washers and ends of gear cluster with viscous grease and place washers into position. Install the front washer with the bronze side f acing the gear and the lug on washer pointing up. Install the rear inner (bronze) washer so that the lugs on the washer will engage the slots in the cluster gear and the outer (steel) thrust washer with the lug pointing up.

10. Carefully lower the cluster gear assembly into position in the transmission (lugs on washers pointing up) and enter front end of the countershaft at rear of transmission case, tapping it forward while holding the countershaft in constant contact with the dummy shaft to keep the needle rollers and washers in place.

NOTE: Drive the countershaft forward just far enough to enter the front end of countershaf t in the case as the countershaft must again be removed after checking countershaft end play.

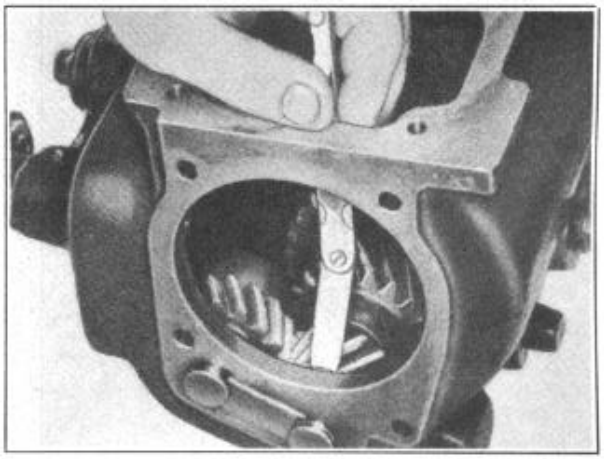


FIGURE 18

11. Check countershaft gear end play by inserting a feeler gauge between the rear thrust washers as shown in Figure 18. End play should range between .006" and .016".

12. After checking for proper end play, enter the dummy shaft in front of transmission case and carefully tap out the countershaf t through rear of case. After the countershaft has been removed, lower the cluster gear with dummy shaft to bottom of case.

13. Install the reverse idler gear in the case (long hub of gear toward front of case) and drive the reverse idler gear shaft in from rear of case.

NOTE: Before fully installing the shaft, make sure the slot in shaft is properly aligned with the slot in countershaft so that the lock plate will seat properly.

14. Check idler gear end play; should be .003" to .010".

15. Install the second and high shift fork in the second and high shifter shaft.

16. Install the transmission mainshaft bearing and oil slinger (lip to inside) on the mainshaft an d in the overdrive adapter and install the large retaining snap ring.

NOTE: The s e snap rings are furnished in four thicknesses, select the ring of the proper thickness.

17. Install the low and reverse sliding gear (shifter collar of gear to rear of transmission).

18. Install the mainshaft second speed gear assembly on the mainshaft.

19. Assemble the synchronizer clutch hub, shift plate, shift sleeve, springs and synchronizer rings together as a unit and install the assembly on the shaft with long end of the synchronizer clutch hub to front of transmission.

NOTE: Be sure that marks painted on the synchronizer parts during disassembly are properly aligned at re-assembly, also that the hooked ends of the two synchronizer springs engage in the same shift plate.

20. Install the snap ring on front of mainshaft and check end play by inserting a feeler gauge between the rear face of the mainshaft second speed gear where it butts up against the mainshaft (at ends of mainshaf t spiral splines). This end play should be from .003" to .016". Excessive end play at this point can only be corrected by installing new parts.

21. Install new adapter plate to transmission gasket and install the mainshaft assembly with the adapter plate; engage the second and high shifter fork in the shift sleeve, then pull mainshaft towards side of case sufficiently to install the low and reverse shifter fork; offset to rear.

22. Install main drive gear bearing on the main drive gear using Driver J-2995-1, Figure 16, an d install the snap ring to retain the bearing on the main drive gear. Make sure the proper thickness snap ring is used.

NOTE: The main drive gear snap rings are furnished in the following thickness: .087", .090", .093", .096" and .103".

The main drive gear bearing snap rings are furnished in .073" and .076" thickness.

23. Coat inside of mainshaft drive gear and mainshaft front rollers with viscous grease and assemble rollers in position in the gear.

24. In stall the mainshaft drive gear and bearing assembly into the front bore of transmission, tapping outer race of bearing with a rawhide hammer until the snap ring in the outer race is flush with front of case.

25. While holding pilot end of mainshaft engaged in pocket bearing of the main drive gear, carefully tip the complete transmission so that the transmission will rest on the gasket face of the transmission cover opening. This will allow the countershaft gear to align with the countershaft holes in the case.

26. With the counter shaf t gear cluster in position, swing the overdrive adapter plate to one side and enter the countershaft through rear of case, tapping it forward and pushing the dummy shaft out through front of case.

NOTE: When installing the countershaft, keep the dummy shaft and countershaft in contact with each other and line up slot in rear end of countershaft for proper installation of lock plate.

27. Pull mainshaft and adapter plate rearward 5/8", place lock plate in correct position engaging slots at ends of counter shaft and reverse idler gear shaft. After installing lock plate, tap both shafts until the lock plate is tightly held.

28. Position the adapter plate to the transmission case making sure pilot end of mainshaft is entered properly in bearing in main drive gear pocket and that shifter forks are properly engaged in the synchronizer shift sleeve and low and reverse sliding gear. Enter one attaching screw to retain adapter in place.

29. Install main drive gear bearing retainer and retainer gasket making sure that the oil drain hole in re tai n e r flange is aligned with drain back hole in case. Tighten screws securely.

30. Install the transmission cover gasket, cover and attaching screws.

NOTE: The cover gasket has three vent holes and must be installed with the holes to rear of transmission. The cover has one vent hole and is installed with the vent hole to front of transmission. See marking on cover.

31. Comp le te balance of assembly as outlined under "Installation of Adapter Plate, Solenoid Pawl, Sun Gear Control Plate and Blocker, Solenoid. Sun Gear, Shift Rail and Fork, Clutch Cam, Pinion .Cage and Overdrive Mainshaft", Pages 97 and 98 also "Overdrive Housing Installation"

TRANSMISSION AND OVERDRIVE INSTALLATION

1. Install two J-2969 Guide Studs in clutch housing to assist in supporting the overdrive and transmission at installation.

2. 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-5442 aligning arbor or 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 f r ont end of the drive gear shaft and pilot bearing in the flywheel will be damaged.

3. Bring the overdrive and 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 bearing retainer through clutch throwout bearing and main drive gear s p lined shaft through splines of clutch d riving plate and into pilot bearing in flywheel.

4. Install two transmission to bell housing attaching bolts and tighten.

5. Remove the two headless screws or guide studs 1-2969 and install the two remaining bolts. Tighten to 40-45 ft. pounds torque.

6. Complete remainder of installation by reversing the order of removal of the remaining parts. Check adjustments and ref ill transmission and overdrive. A total of 2-1/2 pounds of lubricant is required.

SECTION 10
PROPELLER SHAFT

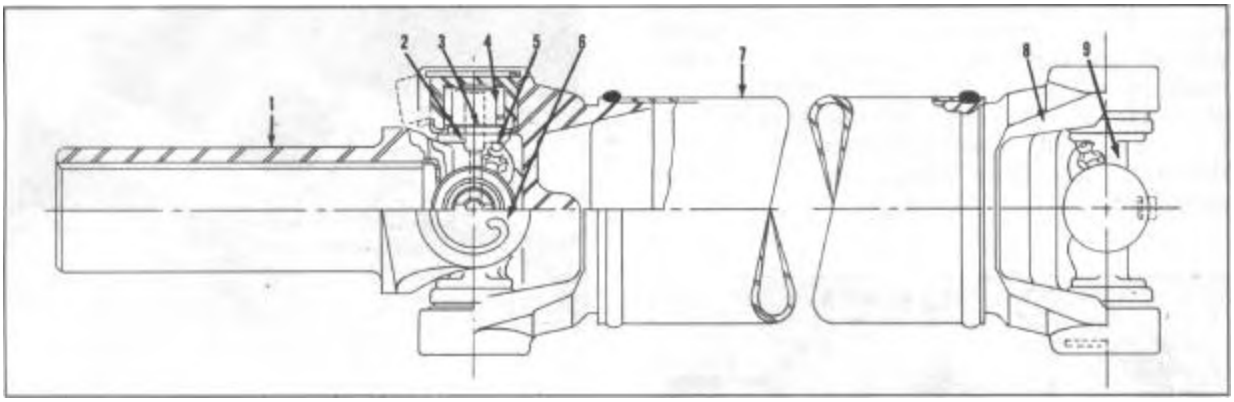


FIGURE 1

1. Sleeve yoke - front
2. Dust washer retainer
3. Dust washer
4. Bearing assembly
5. Grease fitting
6. Snap ring
7. Propeller shaft
8. Yoke - rear
9. Rear universal joint

CONSTRUCTION

The single propeller shaft is of tubular construction, fitted with needle roller bearing universal joints at front and rear end. The front joint carries a splined sleeve yoke which slides on the rear end of the transmission main shaft to compensate for rear axle up and down movement. The needle bearing cups are retained by lock rings in the front joint and by lock rings and "U" bolts in the rear joint.

Universal joints are provided with means of lubrication for the needle roller bearings b y grease fittings and should be lubricated with 140 S.A.E. Mineral Oil every 1000 miles.

NOTE: Sliding front yoke receives lubrication from transmission.

PROPELLER SHAFT

REMOVAL

1. Raise car on hoist or jack stands.

2. Remove nuts, lock plates, "U" bolts from the rear universal joint at the rear axle companion flange (tape needle cups to prevent bearings from coming apart). Lower rear end of propeller shaft and pull complete assembly backward out of transmission. Place assembly on work bench for servicing.

NOTE: With the propeller shaft removed, inspect the rear transmission oil seal and replace if worn, damaged or shows signs of oil leakage.

DISASSEMBLY

When disassembling the universal joints inspect for wear, proceed as follows:

1. Compress and remove snap rings holding bearing cups in place.

2. Use a brass drift and hammer and tap on one bearing cup carefully to drive out the opposite cup.

3. With a brass drift, tap on the end of the journal from which the bearing w a s just removed and remove the remaining bearing cup and rollers.

INSPECTION

After both joints are completely disassembled clean parts and carefully inspect for damage and wear. If the journals of the crosses and the needle bearing cups show signs of wear or brinneling or if the needle rollers are tightened or undersize the parts must be replaced. It is also advisable to replace the oil seals between the bearing cups and the joint crosses replace lock rings if they have lost their tension or are burred or mutilated.

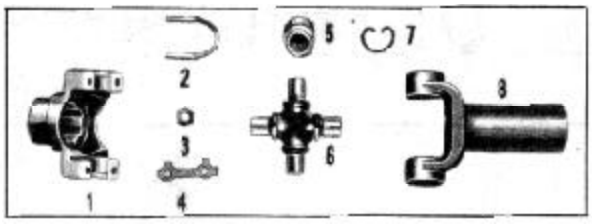


FIGURE 2

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

UNIVERSAL JOINT

ASSEMBLY

1. Use new oil seals on the inner side of the journals.

2. Apply a generous quantity of viscous chassis lubricant to the journal working surfaces and to the inside of the needle bearing cups. Place needle rollers in position against inside of cups.

3. Hold the yokes and journals so the bearing cup assemblies can be inserted from the bottom.

4. The rollers will not be dislodged if the bearing cups are installed from the bottom. Press bearing cups into place with tool J-881-A, Figure 3.

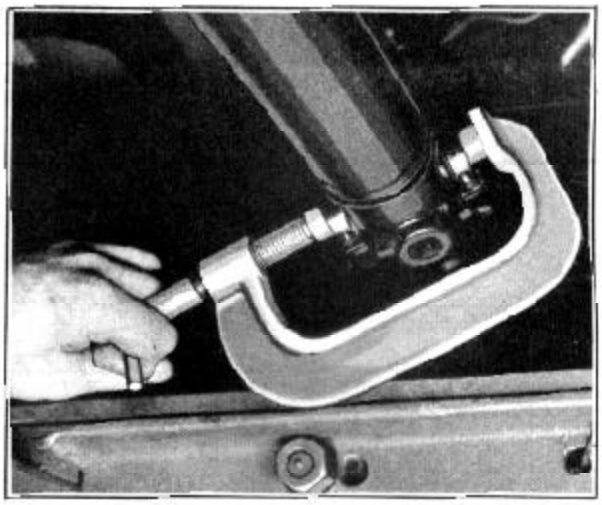


FIGURE 3

5. Install the journal bearing cup snap rings.

The front and rear universal joint journals should be installed so the grease fittings are in alignment to simplify lubrication.

NOTE: The propeller shaft used on both standard transmission and overdrive transmission models is 50-3/8" long from center to center of universal joints. The shaft used on cars equipped with Hydra-Matic Drive is 51-3/4" long - center to center.

INSTALLATION

1. Raise propeller shaft and support yoke and slide into spline on rear of transmission. The sleeve yoke is ahead of the front universal joint; therefore, it can be installed in any position on the transmission mainshaft splines.

2. Connect rear universal joint to companion flange.

NOTE: Journal bearings must be compressed to allow edge of bearing to clear lip at edge of companion flange, otherwise the needle bearing cups will not be properly seated and may come out. Also the propeller shaft will not be in balance. (Tool J-881-A will facilitate assembly.)

3. Propeller shaft "U" bolt nuts should be tightened to 20 to 25 pounds torque.

4. Raise car, remove stand jack, if used and lower car.

SECTION 11

REAR AXLE

SPECIFICATIONS

Teeth in Gear	3.31 (3-4/13)	4.1 (4-1/10)	4.27 (4-3/11)	3.54 (3-7/13)
Teeth in Pinion	43	41	47	46
	13	10	11	13
Standard Transmission	Optional	Standard	Optional	----------
Overdrive Transmission	----------	Optional	Standard	----------
Hydra-Matic Transmission	Optional	----------	----------	Standard

Axle Shaft End Play	.001" to .006"
Gear & Pinion Back Lash	.002" to .006"
Housing Spread for Service	.020" (Max).
Pinion Bearing Pre- Load Torque	10" - 20" lbs.
Pinion Front Bearing Shims.	.003", .005", .010", and .030"
Pinion Rear Bearing Shims	.003", .005", and .010"
Differential Bearing Shims	.003", .005", .010", .030"
Wheel Bearing Shims	.003", .005", .010", .030"

Lubrication SAE 90 Hypoid or Multi-Purpose Gear Lubricant - 2-1/2 Pints

CONSTRUCTION

The rear axle is the semi-floating type.

The axle has a cast malleable iron housing into which the a x le shaft tubes are pressed and welded. An axle housing inspection cover is attached to the rear of the axle housing by ten cap screws.

The differential side gears ride in the case bores and the differential pinions rotate on the pinion shaft, which is locked by a pin through the case and shaft. Treated steel washers are used to take thrust of the differential pinions and side gears.

Thrust of the axle shafts is taken by a spacer block through which the pinion shaft passes. Shims between the differential side bearings and the case control the side mesh of the ring gear and pinion as well as the pre-load on the differential side bearings.

The drive pinion bearing cups, front and rear, are pressed in the axle housing, and shims behind the rear bearing cup provide proper adjustment for the mesh of the drive pinion with the drive gear.

Another shim pack placed between the front bearing cone and shoulder of the pinion controls adjustment and pre-load of the drive pinion bearings.

Oil forced through passages cast in the housing by the drive gear lubricates the differential assembly and drive pinion.

An oil slinger, and leather seal prevents loss of oil at front of the pinion.

Axle shaft splined ends engage the differential side gears and the outer ends are tapered to retain the axle bearings and wheel hubs.

The bearings are tapered roller bearings having a tapered cone which seat on the tapered shaft. The bearing cups are pressed into the axle housing flange.

Axle shaft end play and wheel bearing adjustment is controlled by shims located between the axle housing f1ange and the brake backing plate on the right side only.

Inner oil seals are pressed into the axle shaft tubes to prevent axle lubricant from entering the wheel bearings and the wheel bearing cap leather lip oil seals prevent leakage of wheel bearing lubricant into the brake compartment.

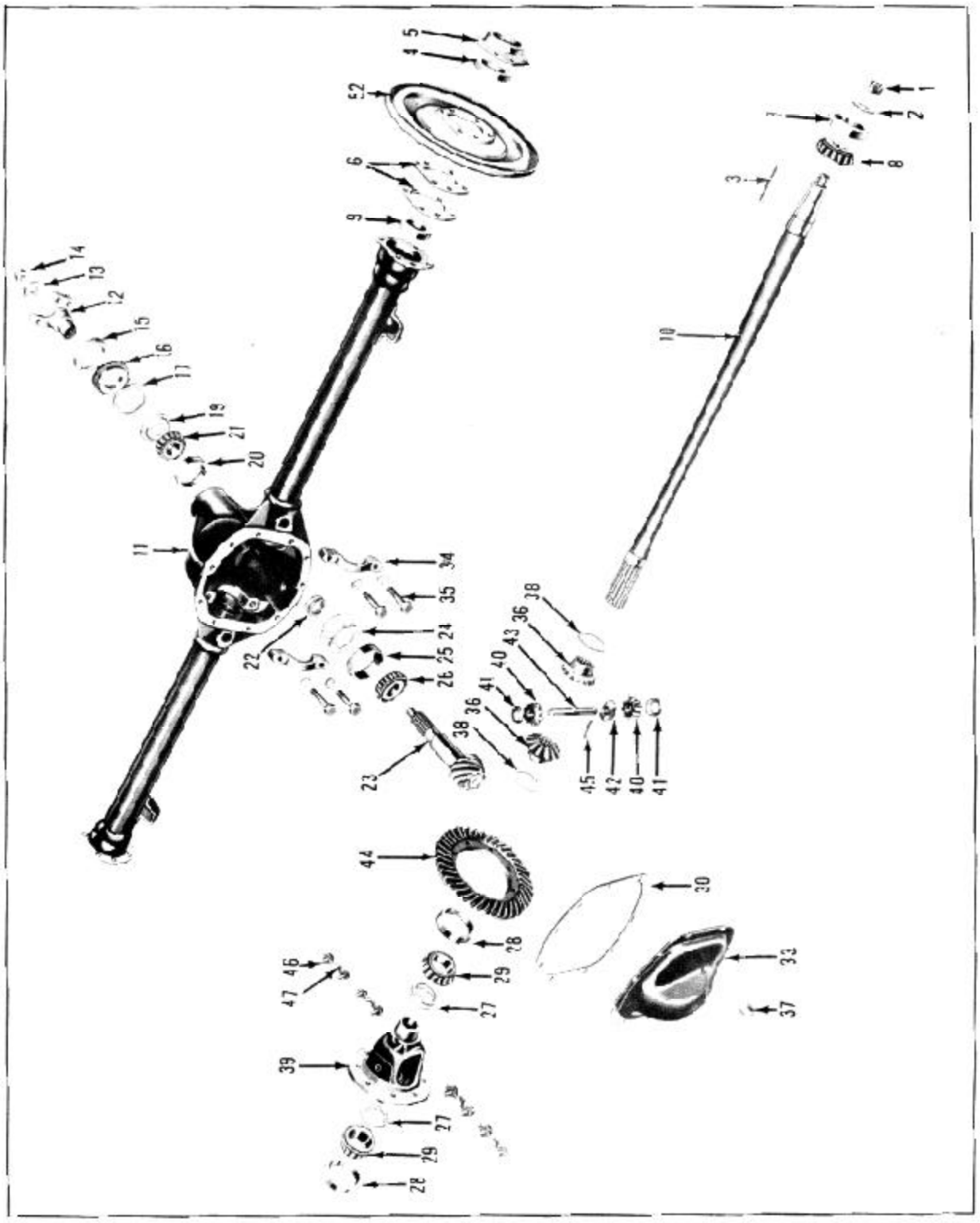
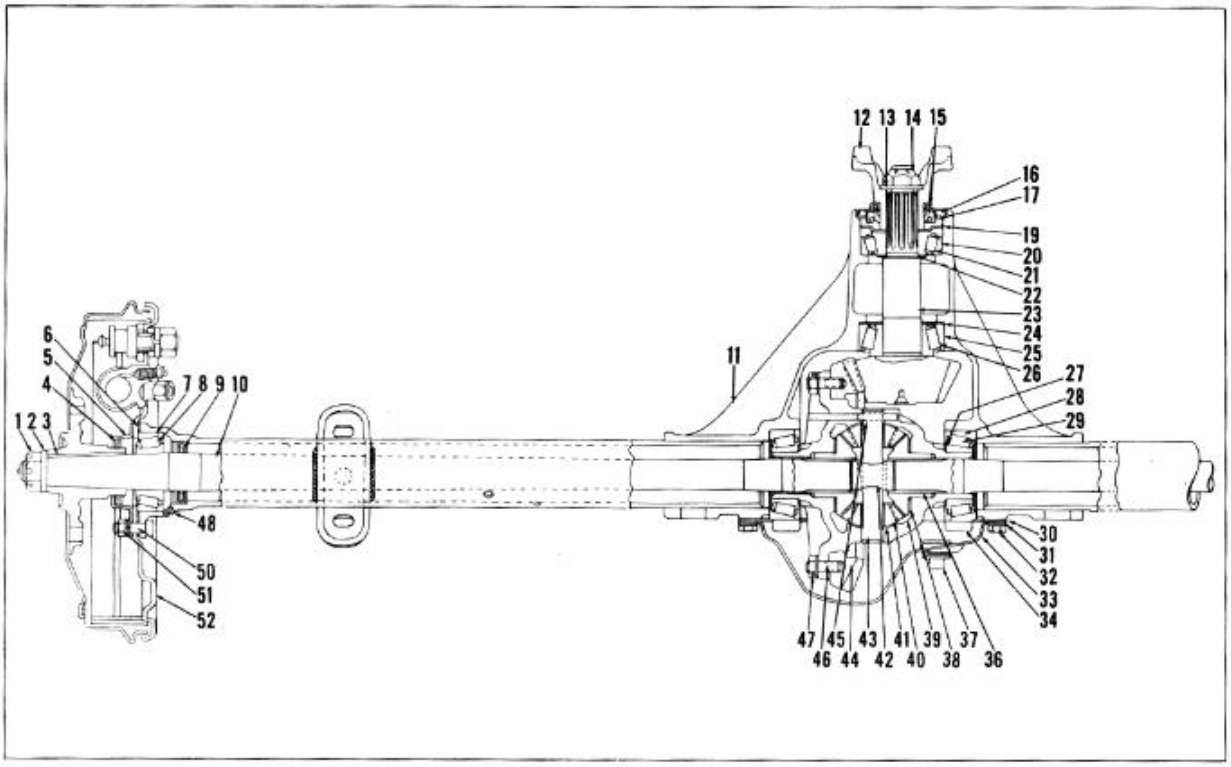


Figure 1



1. Axle shaft nut
2. Axle shaft washer
3. Axle shaft key
4. Wheel bearing adjusting cap oil seal
5. Wheel bearing oil seal cap
6. Wheel bearing adjusting shims
7. Wheel bearing cup
8. Wheel bearing cone
9. Wheel bearing inner oil seal
10. Axle shaft
11. Carrier and tube assembly
12. Companion flange
13. Drive pinion washer
14. Drive pinion nut
15. Drive pinion dirt shield
16. Drive pinion oil seal
17. Drive pinion oil seal gasket
19. Drive pinion oil slinger
20. Drive pinion front bearing cup
21. Drive pinion front bearing cone
22. Drive pinion front bearing shims
23. Drive pinion
24. Drive pinion rear bearing shims
25. Drive pinion rear bearing cup
26. Drive pinion rear bearing cone
27. Differential side bearing shim
28. Differential side bearing cup
29. Differential side bearing cone
30. Housing cover gasket
31. Housing cover bolt lockwasher
32. Housing cover bolt
33. Differential housing cover
34. Differential side bearing cap
35. Differential bearing cap bolt
36. Differential gear
37. Housing cover filler plug
38. Differential gear thrust washer
39. Differential case
40. Differential pinion
41. Differential pinion thrust washer
42. Axle shaft spacer
43. Differential pinion shaft
44. Drive gear
45. Differential pinion shaft locating pin
46. Drive gear bolts
47. Drive gear bolt lock
48. Wheel bearing grease hole plug
50. Wheel bearing adjusting cap bolt
51. Wheel bearing adjusting cap nut
52. Brake backing plate

AXLE REMOVAL

1. Raise car on a hoist or use stand jacks. Remove drain plug and drain axle lubricant.
2. Remove rear wheel covers and take off rear wheels.

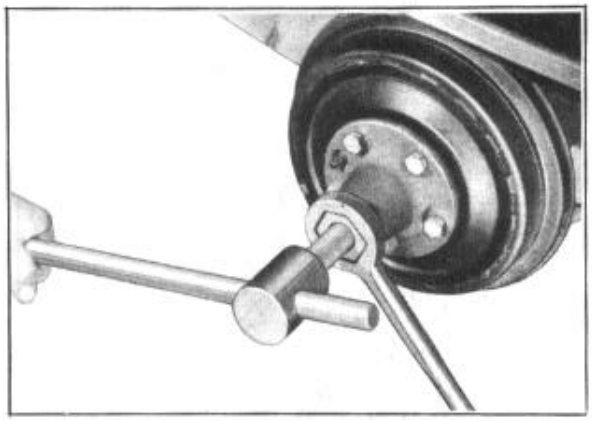


FIGURE 3

3. Remove wheel hubs using puller J-736A (Figure 3).
4. Disconnect brake cables at toggle and unhook the brake cables from the parking brake levers.
5. Disconnect brake hose at the frame connection and brake lines at wheel cylinders.
6. Remove the four backing plate bolts (each side) and remove the backing plates, wheel bearing oil seal caps and the shims (on the right side only). The shims should be tied together until reinstallation.
7. Remove axle shafts, using puller J-352B.
8. Pull axle shaft oil seals, using puller J-943.
9. Disconnect propeller shaft at rear axle companion flange and use masking tape to keep cups from falling off roller bearings.
10. Remove nuts from spring clip "U" bolts and lower studs of shock absorbers.
11. Use a jack under the axle housing and raise assembly slightly.
12. Lower axle assembly to floor and remove mounting plates, cushions and "U" bolts; then place axle on bench or axle stand for further disassembly.

DIFFERENTIAL ASSEMBLY AND DRIVE PINION REMOVAL

1. Thoroughly clean outside of axle housing with a good solvent to preclude the possibility of dirt entering axle housing.
2. Remove bolts from inspection cover and remove cover and gasket.

NOTE: Metal tag under one bolt head denotes axle ratio and must be replaced when axle is reassembled.

3. Use a solvent to thoroughly clean inside of housing and all gears and bearings.

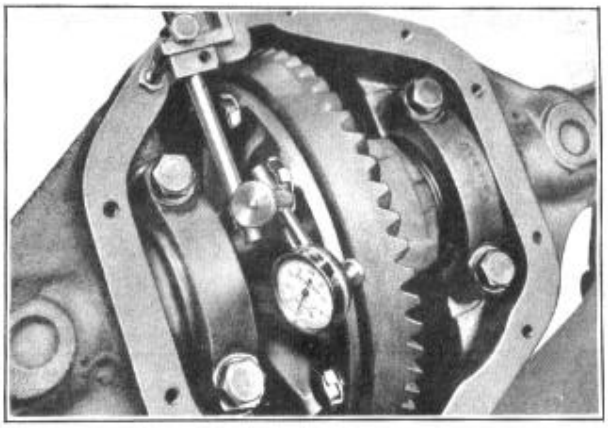


FIGURE 4

4. When axle is clean and before further disassembly, check the drive gear for run-out. Mount a dial indicator as shown, Figure 4, and slowly turn the rear axle drive pinion. If the drive gear run-out is more than .003" check for the possibility of a sprung case, loose drive gear to case bolt or nicks and burrs between drive gear and flange. Remove dial indicator.
5. Remove the four bolts and differential bearing caps.

NOTE: Both caps and each side of housing are stamped with an identifying number or letter. On one side the markings will be parallel with each other; on the opposite side, they will be vertical to each other, Figure 18.

6. Install axle Wising spreader J-5372 in place on housing and mount the dial indicator as shown Figure 5. Use an end wrench to turn the hex handle of the spreader tool until the indicator reads .020" spread.

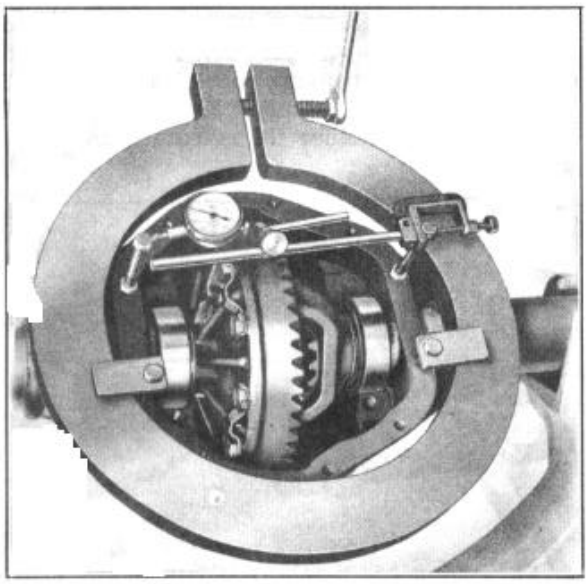


FIGURE 5

NOTE: Do not spread housing more than .020" as it may cause housing to take a permanent set, necessitating replacement of the axle housing.

It is necessary to spread the housing for removal or installation of the differential due to the pre-load of from .005" to .009" between the differential side bearing cups and housing.

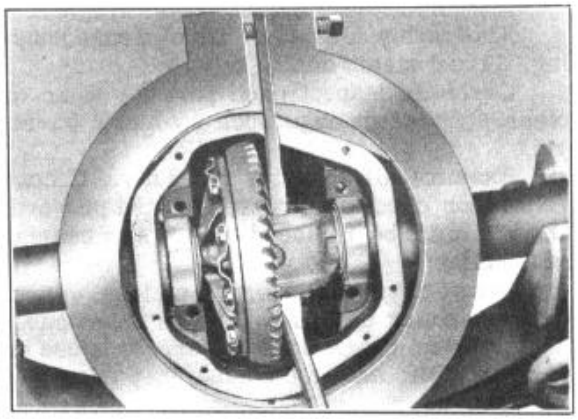


FIGURE 6

7. Remove the differential assembly by prying upward and outward with two large screwdrivers as shown Figure 6.
8. Remove bearing cups from side bearing, if the bearing cups or cones are not damaged or excessively warn, be sure mating parts are kept together for proper reassembly.
9. Remove differential bearing cones from case, using puller J-2241-A with 1-2241-10 adapter; remove shims.

NOTE: Keep shim packs together to be reinstalled in same manner.

10. Use a screwdriver and pry up tabs of the drive gear capscrew lock plates, remove capscrews and locks and remove drive gear.

FIGURE 7

11. With a suitable punch drive out lock pin which secures pinion shaft in differential case Figure 7.
12. Drive the differential pinion shaft from differential housing and remove shaft spacer through one of the differential side gears.
13. Remove the differential pinions and thrust washers, differential gears and thrust washers.
14. Turn axle housing so the drive pinion companion flange is in a vertical position.
15. Remove nut from drive pinion using the J-2637 companion flange holding tool, Figure 8.
16. Remove companion flange, using puller J-820, Figure 9.

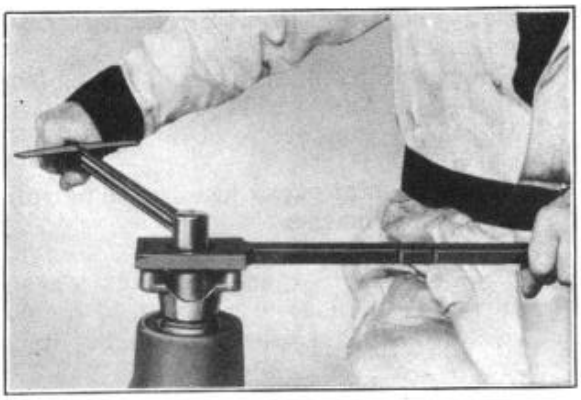


FIGURE 8

17. Attach driver J-1373A to threads on pinion shaft and drive pinion out of front bearing with a brass hammer and a brass drift. Remove the driver from shaft before it contacts the bearing cone and continue tapping drift until pinion can be removed, using care to prevent pinion falling to floor.

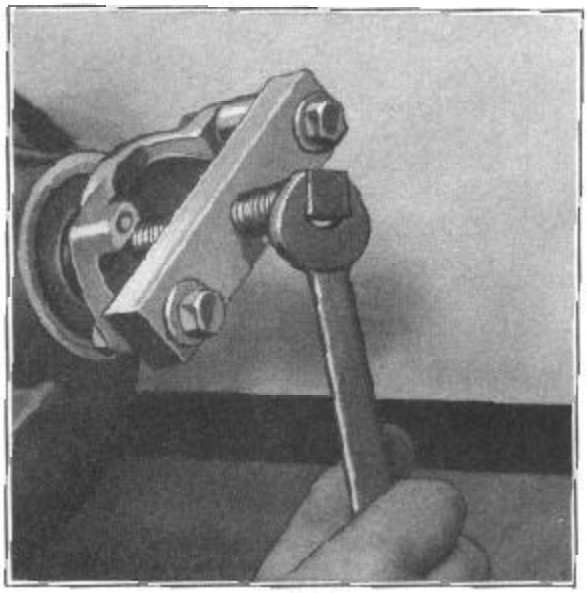


FIGURE 9

18. Remove shim pack from pinion. With a micrometer, check each shim and record total thickness for reinstallation.

NOTE: If necessary to replace pinion shaft cone and rollers using bearing puller J-5365.

19. Remove pinion rear bearing cup from housing using remover tool J-2644 and handle J-872-5 (Figure 10). Remove shims from behind bearing cup, check thickness of each shim, record total thickness and tie shims together for reinstallation.

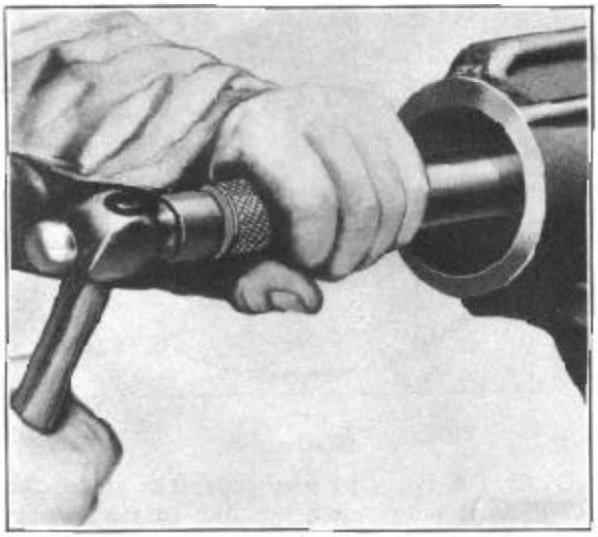


FIGURE 10

20. Use a brass drift to drive out the front pinion bearing cup.

INSPECTION

Thoroughly clean the inside of axle housing. Do not steam clean.

Carefully inspect each part for wear or other signs of damage such as nicks, burrs, etc.

Examine all bearings carefully. If cone rollers or cups are grooved, pitted or worn, they must be replaced with a new bearing assemblies.

Inspect all differential pinions, gears, thrust washers and shaft spacer and case. If pinions or gears appear worn or loose on pinion shaft and in the case, they should be replaced.

Differential cases in which the thrust surfaces are scored, pitted or worn must be replaced.

When necessary to replace drive gear or drive pinion they must both be replaced since they are available only in matched sets and both the gear and pinion carry an identifying number.

Oil and grease seals must be replaced with new parts.

DIFFERENTIAL AND DRIVE PINION

ASSEMBLY AND INSTALLATION

1. Install differential gears, and pinions, thrust washers in case and cover all contact areas and axle shaft spacer with rear axle lubricant.
2. Install the differential pinion shaft and drive in the lock pin, peen case metal over top of pin to lock pin in place.
3. Install drive gear on the differential case and insert bolts and lock plates. Use a torque wrench and tighten bolts to 50-60 lbs. Bend over lock plate ears.
4. Insta1l the differential bearing cones on the differential case hubs without shims using driver J-5364, Figure 11.

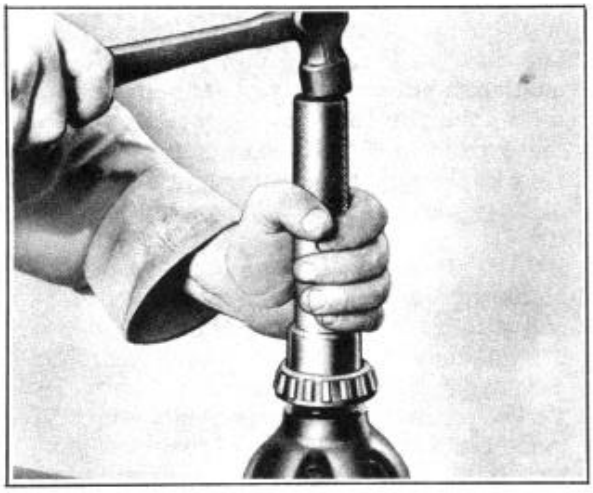


FIGURE 11

5. Clean the bearing cups and place on cones. Be sure cups are not scored, nicked, etc.
6. With axle housing in a vertical position, clean bearing bores in housing and install the differential assembly.
7. In stall the bearing caps in their correct position. Be sure letters or numbers on cap, Figure 18, are in same position as letter or number on housing and tighten bolts finger tight.
8. M o u n t a dial indicator with the control button against back face of the drive gear, Figure 12, insert two screwdrivers between bearing cup and housing and force differential assembly to

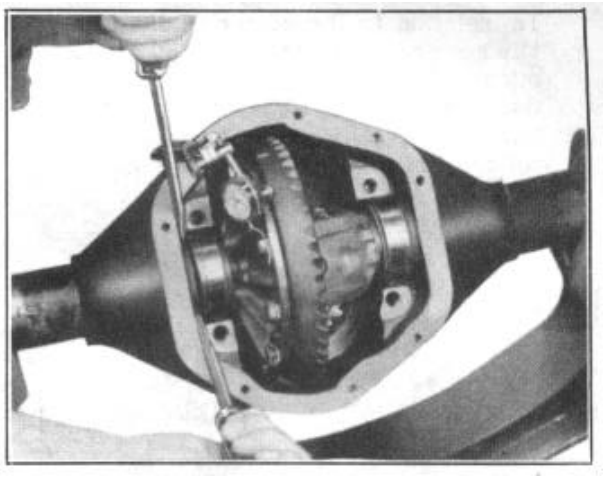


FIGURE 12

one side far as possible.

Set dial indicator to zero and shift differential as far as possible to opposite side, note and record reading on indicator.

This reading denotes the shim requirements between the differential assembly and the bearing cones to be installed later.

9. Remove the side bearing caps and remove the differential assembly.
10. Observe the figures etched on the rear end of the drive pinion. One set of numb e r s will be found identical on both the drive gear and pinion, which denotes a matched set. Another figure will be found on the end of drive pinion which shows a plus or minus sign, Figure 13. This indicates the position of the pinion

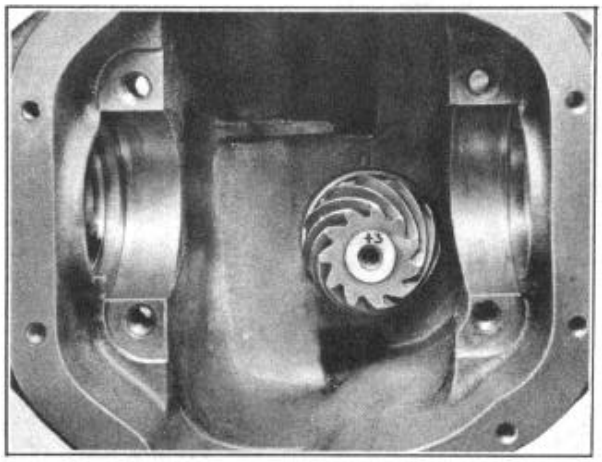


FIGURE 13

in relation to the center of the axle. If there are no figures showing a plus or minus sign, it denotes a zero pinion setting and a zero "0" will be shown.

11. Install drive pinion rear bearing cone and rollers using 1-2643 cone replacer, Figure 14.

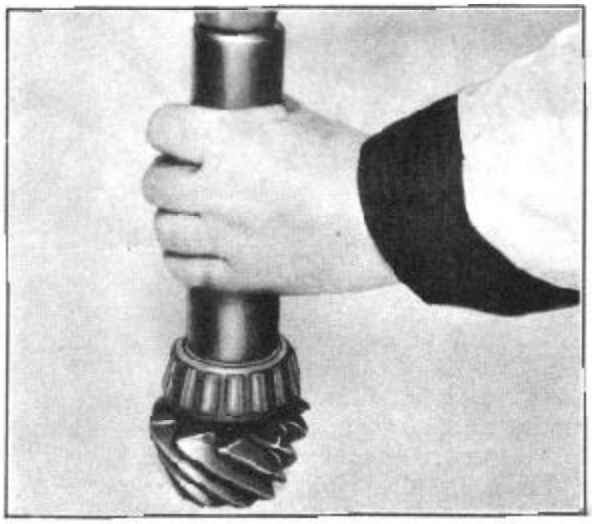


FIGURE 14

12. Install pinion rear bearing cup, using tool J-2645 and handle J-872-5, placing shims between cup and housing.

The amount of shims used is determined by the amount of shims removed at disassembly and by the plus or minus figure etched on pinion. For example, if the original pinion was marked +2 and had a shim pack of .035" behind the rear bearing cup, and the new pinion to be installed is marked -1, the shim pack must be increased by .003" to bring the new pinion to its correct position. The new shim pack will, therefore, be .038" thick. Shims for the rear pinion bearing are available in .003", .005", and .010" thickness.

13. Install the drive pinion front bearing cup, using replacer J-5367. Insert the drive pin ion in position and install the front bearing cone and rollers. Coat bearing with axle lubricant.

14. Make sure the differential bearing bores in housing are clean. Mount discs of pinion setting gauge J-5223 on gauge arbor and install gauge in housing bores, Figure 15. Place differential bearing caps in position and tighten bolts finger tight.

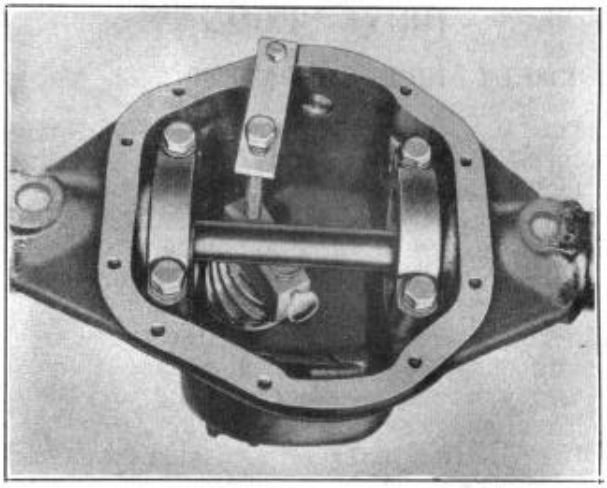


FIGURE 15

15. With gauge block held in position against end of drive pinion by clamp screw, loosen thumb screw in end of gauge block and move plunger out of block until head contacts gauge arbor as shown in Figure 15. Lock plunger by turning thumb screw, using care not to disturb plunger position.
16. Back off screw in clamp holding gauge block against pinion, remove gauge block and with a 2 to 3 inch micrometer, measure distance from end of anvil to top of plunge r head as shown in Figure 16. This measurement represents the distance from the rear face of the drive pinion to the center line of the rear axle and should be 2.343" for the 11 tooth, 4.27:1 ratio and 13 .tooth 3.54:1 and 3.31:1 ratio

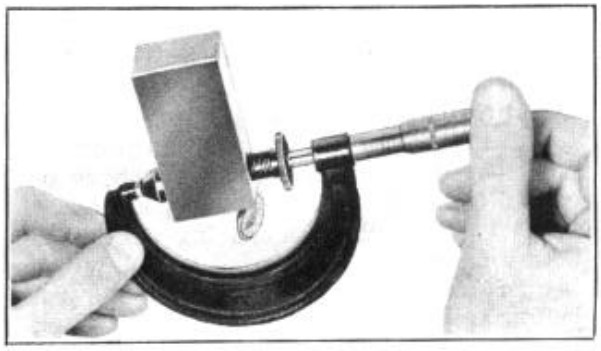


FIGURE 16

pinions. For the 10 tooth, 4.1:1 ratio pinion this measurement should be 2.250". These measurements apply to correctly adjusted pinions carrying zero "0" markings. With a pinion marked +2 the reading should be .003" greater.

17. If the micrometer reading shows the pinion setting is incorrect by more than .002" plus or minus from the given figures, shims equal to that difference must either be added to or removed from the shim pack between the rear bearing cup and housing.

When changing shim packs, it is advisable to check each shim separately t o avoid unnecessary removing an d installing of pinion and depth gauge.

18. When the correct pinion setting is accomplished, install the pinion front bearing shims on shaft and install the front pinion bearing cone and rollers.
19. Install companion flange washer and nut, holding flange with J-2637 holding tool. Tighten pinion nut to 180-200 ft. lbs.
20. Use a spring scale on the J-2637 holding tool and check torque required to turn pinion. The turning torque should b e from 10 to 20 inch pounds. If the reading varies more or less, it will be necessary t o add or remove shims from the front bearing shim pack. The shims are available in .003", .005", .010" and .030".
21. When the proper pre-load is set, remove the pinion nut, washer and companion flange.
22. Install the oil slinger, and install a new gasket in counterbore at front of housing.

Install new oil seal with rear face against gasket using Oil Seal Installer J-5366.

23. Reinstall companion flange, washer and nut,torque to 180-200 ft. lbs.
24. Inspect differential side bearing cones and cups a s well as bearing bores in housing to be sure all are free of dirt and grit. Place cups on cone and rollers and lubricate thoroughly. Install differential assembly in housing.
25. Replace bearing caps in their proper position according to markings an d tighten bolts finger tight.
26. Insert two screwdrivers between bearing cup and housing on the side opposite the drive gear and move the differential assembly and drive gear away from the pinion until the opposite bearing cup is firmly seated against housing. Move the screwdrivers to the drive gear side and force the differential assembly and drive gear over until drive gear teeth contact the pinion teeth.
27. From shim requirements shown by indicator reading (Paragraph 8, page 112 shims between bearing cups and housing Figure 17, dividing total amount of shims between sides to eliminate all backlash.

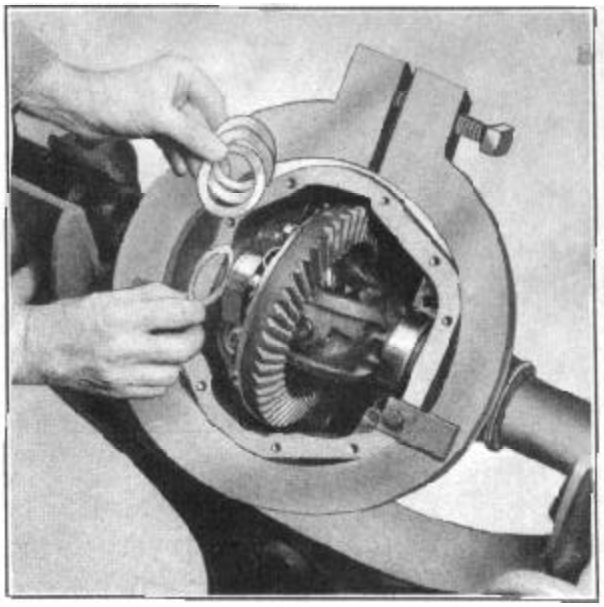


FIGURE 17

28. Remove bearing caps and take out differential assembly and drive gear, keeping each shim pack separate. Use bearing puller J-2241-A, with J-2241-10 adapter, remove the bearing cones from differential case and install the shim packs on their respective hubs. Install an additional 015" thickness of shims behind the differential bearing on the tooth side of the drive gear to provide the proper backlash between the gear and pinion and also provide the proper bearing pre-load. In s tall bearings using Installer J-5364. Lubricate thoroughly.
29. Place axle housing spreader J-5372 in position, mount the dial indicator and spread housing .020" as shown in Figure 5 to permit installation of the differential assembly.

30. Install differential and bearings in housing to insure proper seating in bearings, tap drive gear lightly with a rawhide hammer.
31. Install the bearing caps and use sealing compound on the bolt threads. Be sure identifying marks on caps and housing are aligned, Figure 18

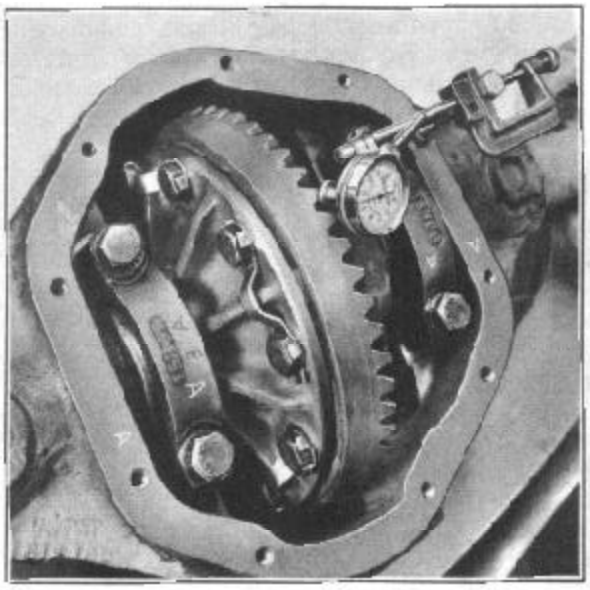


FIGURE 18

32. Remove housing spreader tool and torque bearing cap bolts to 70-90 ft. lbs.
33. Install the dial indicator on housing with contact button resting against edge of gear tooth and check the backlash between drive gear and pinion. Backlash is .002" -.006" and should not vary more than .002" between positions checked.
34. Install the inspection cover, using a new gasket and replacing the ratio tag under one of the capscrews.

AXLE SHAFT

INSTALLATION

NOTE: If axle shaft bearing requires replacement use J-5368 Remover and J-5369 Installer.

1. Install axle shaft inner oil seal using installer J-5370.
2. In stall the axle shafts. Use care when inserting axles in housing not to damage t he new inner oil seals. Lubricate the wheel bearings and start outer outer cups into housing by tapping with a rawhide hammer. Use flange bolts and brake backing plates to draw cups into place.
3. Insert the four attaching bolts and install shim pack (right side only) between the brake backing plate and flanges.
4. Install wheel bearing oil seal caps, bolts, lockwashers and nuts. Install new oil seals in caps and tighten bolt nuts to 12-17 ft. lbs. torque.
5. C heck the axle shaft end-play, which should be .001"-.004". If necessary to adjust end-play, change shims on right side as necessary to obtain correct endplay . Axle adjusting shims are available in .003", .005", .010" and .030".

AXLE ASSEMBLY

INSTALLATION

1. Place axle assembly in position on rear springs and insert retainers and rubber cushions under spring seats. If the rubber cushions are deteriorated, install new ones. Be sure heads of spring center bolts engage holes in spring seats.
2. In stall rear axle "U" bolts and lower spring plates, nuts and lock nuts. Torque nuts to 70-30 ft. lbs.
3. Place a roller jack under the axle housing and raise housing sufficiently to connect both shock absorbers.
4. Remove masking tape from universal joint needle bearing cups and install "U" bolts, washers and nuts. Tighten nuts to 14-17 ft. lbs torque.
5. Connect brake lines at wheel cylinders, hose at frame connections and bleed the brakes.
6. Connect the parking brake cables to levers.
7. Install brake drum and hub assemblies on a xl e shafts. Install washers and axle shaft nuts, tightening to 125-175 ft. lbs. torque. Install cotter pins.
8. Install wheels and tighten hub bolts to 6065 ft. lbs. torque. Install hub caps.
9. Remove axle housing inspection cover filler plug and fill housing to level of plug opening (2-1/2 lbs) of S.A.E. hypoid or multi-purpose gear lubricant. Replace plug and tighten both filler plug and drain plug.
10. Install rear wheel covers and lower car to floor.

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SECTION 12

FRONT SUSPENSION

SPECIFICATIONS

Curb height (Front)	4-5/32"
(Rear)	6-1/16"
Caster	0° ± 1/2°
Camber	1/4° to 1-1/4° Positive
Maximum variation between right and left wheel caster or camber	1/2°
Toe-In measured at wheel rim	0"-1/16"
Pivot Pin Inclination	3° 28'
Wheel Bearing Type	Adjustable Roller Bearing
Wheel Bearing End Play	.001" to .003"
Tie Rod End Type	Plain Bearing
Tie Rod Adjustment	Threaded
(To increase - Turn counter clockwise)	
(To decrease - Turn clockwise)	
Steering Center Arm Pivot Nut	Torque 45-50 Ft. Lbs.
Outer Steering Arm Nut	Torque 110 to 120 Ft. Lbs

CONSTRUCTION

Front suspension is the individual front wheel type with independent support arms and coil springs. This type of front wheel suspension permits either wheel to absorb road irregularities without effecting the other wheel.

Steering is from a center point which permits smooth operation of the steering mechanism.

UPPER SUPPORT ARM

The upper support arm bushings (9) Figure 1, fit into the upper support arm bores and are threaded on to the ends of the pivot.

The assembly is attached to the frame side rails at the No. 2 crossmember by two bolts (7). Shims (10) between the upper support arm pivot and frame member provide caster and camber adjustments. At the outer end of the upper arm a threaded pivot bolt (16) holds t h e spindle pivot upper support (17) to the arm.

STEERING SPINDLE PIVOT PIN

The steering spindle pivot pin (46) i s threaded into the upper support pivot. The outer steering arm (53) is keyed to the steering spindle and the pivot pin. Below the steering arm a t run n i o n is mounted on the pivot pin. Steel threaded bushings (19) fit into bores in the outer end of the lower arm and onto the threaded portions of the lower support arm trunnion.

LOWER SUPPORT ARM

Steel bushings (5) are inserted through bores in the lower support arm at the inner e n d and onto the threaded ends of the inner (23) pivot. Two bolts (47) attach the pivot to the No. 2 crossmember.

The spring seat is riveted and welded to the lower support arm. At the lower end the coil spring (43) fits on the spring seat and the upper end into a recess in the frame at the No. 2 crossmember.

Two rubber bumpers are used on the front suspension, one on the upper arm (44) cushions and restricts downward movement of the upper support arm. The other on the lower support arm (51) restricts upward movement of the assembly.

FRONT SUSPENSION

REMOVAL (RIGHT OR LEFT)

1. Raise car and place jack stands under inner ends of the lower support arms.
2. Remove wheel and tire assembly and on left side remove fender side shield and battery.
3. Remove shock absorber anchor plate bolts, nuts and washers (56). Turn anchor plate 1/4 turn and push upward to clear spring seat.
4. Disconnect stabilizer connector link from lower spring seat.

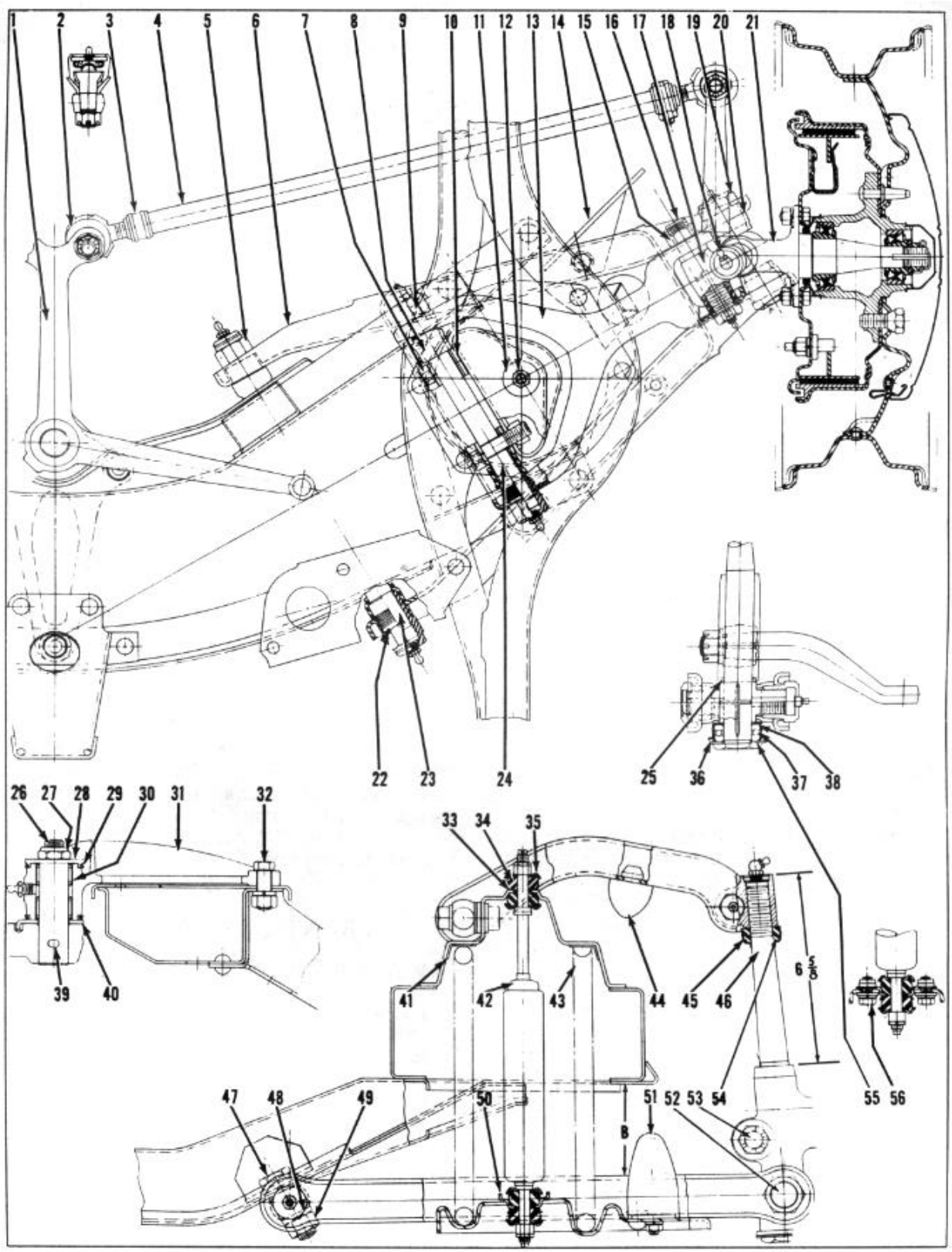
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
22 23 24
25 36 37 38
26 27 28 29 30 31 32
39 40
33 34 35
41 42 43 44 45 46
6 5/8
47 48 49 50 51 52 53 54 55 56
B

FIGURE 1

1.	Center steering arm		29.	Center steering arm seal
2.	Tie rod end		30.	Needle bearing
3.	Tie rod clamp		31.	Center steering arm bracket
4.	Tie rod		32.	Center steering arm to frame nut
5.	Bushing lower support arm inner		33.	Shock absorber cup washer
6.	Lower support arm		34.	Shock absorber cushion
7.	Upper support pivot bolt		35.	Shock absorber retainer
8.	Upper support arm bushing seal		36.	Dust cover seal
9.	Upper support arm bushing rear		37.	Pivot pin dust cover seal retainer washer
10.	Upper support arm shim		38.	Pivot pin lower thrust bearing
11.	Shock absorber retainer		39.	Center steering arm taper pin
12.	Shock absorber palnut		40.	Center steering upper spacer
13.	Upper support arm assembly		41.	Silencer
14.	Steering spindle stop		42.	Front shock absorber
15.	Upper support arm pivot bolt nut		43.	Coil spring
16.	Upper support arm pivot bolt		44.	Bumper upper support arm
17.	Upper support arm steering spindle pivot		45.	Steering spindle upper pivot seal retainer
18.	Grease fitting		46.	Steering spindle pivot pin
19.	Bushing-lower support arm outer		47.	Lower arm pivot to frame bolt
20.	Steering spindle lower seal		48.	Lower arm pivot to frame lock washer
21.	Steering spindle		49.	Lower arm pivot to frame nut
22.	Lower support arm bushing-inner		50.	Shock absorber anchor plate
23.	Lower support arm pivot		51.	Bumper lower support arm
24.	Upper support arm pivot at frame		52.	Lower support arm trunnion bushing
25.	Pivot pin grease lower seal		53.	Outer steering arm
26.	Center steering arm pivot		54.	Steering spindle pivot pin grease seal upper
27.	Center steering arm kick nut		55.	Dust cover seal
28.	Center steering arm spacer lower		56.	Anchor plate bolt

5. Remove lower support arm pivot to frame bolts (47) nuts and lockwashers.
6. Raise car allowing coil springs to expand and remove the spring.

NOTE: Coil springs are under extreme tension. Use care while removing coil springs to avoid damage or injury.

7. Disconnect outer tie rod end from outer steering arm using tool J-2781.
8. Remove four bolts from the brake backing plate and attach the backing plate under the fender with no strain on flexible brake hose.
9. Remove upper support arm pivot to frame bolts, nuts and lockwashers, (7).
10. Remove front suspension assembly. Wire shim packs (10) together and replace exactly as removed.

INSTALLATION

Installation is accomplished by reversing the preceding operations. Check caster, camber and toe-in.

LOWER SUPPORT ARM PIVOT AND BUSHING INNER

REMOVAL

1. Jack up front end of car until wheels are clear of floor.
2. Place jack stand under inner side of lower support arm.
3. Remove front and rear bushings (5) of the lower pivot (23).
4. Remove the two bolts (47) from the lower support arm (6).
5. Remove pivot (23) from the lower support arm.

INSTALLATION

1. Install the lower support arm pivot.

NOTE: Lower support arms are interchangeable for left or right side.

2. Install lower support arm pivot to frame bolts.

NOTE: Maintain the exact distance of 9-1/2" between the inner faces of the support arm while installing bushings. The arm must also be

be centered on the crossmember. The exact distance between the inner face of the support arm and the center line of the bolts holding the pivot to the crossmember should be 1-1/2". These distances must be maintained.

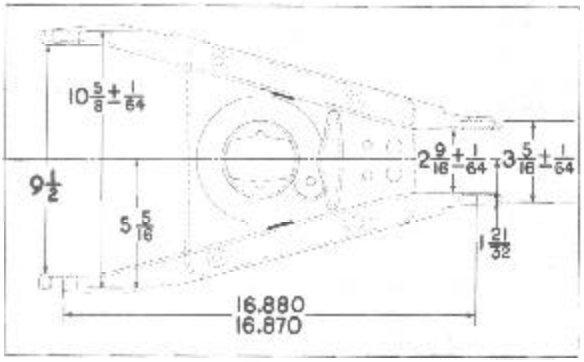

FIGURE 2

3. Lower car to the floor and adjust camber, caster and toe-in.

UPPER SUPPORT ARM PIVOT AND BUSHING INNER

REMOVAL

1. Place jack under lower support arm near wheel and jack up front of car until front wheel is clear of the floor.
2. Remove front fender shield.
3. Remove wheel and tire assembly.
4. Remove bolts (7) from the upper support arm pivot (24) to frame.

NOTE: The battery and battery carrier and fender side shield should be removed to make the left upper support arm pivot and bushing assembly accessible for removal.

4. Remove the nut (15) and pivot pin upper support bolt (16) from the spindle pivot (17).
5. Remove upper support arm (13) and pivot (24) assembly.
6. Remove pivot bushings (9) and pivot (24) from support arm.

INSTALLATION

NOTE: The upper support arm pivot bushing (9) is self threading in the support arm. In assembling of t he upper support arm pivot and bushing it is necessary to maintain a proper spread of the pressed steel support arm to insure correct tension on the threads of the pivot after the bushings have been installed.

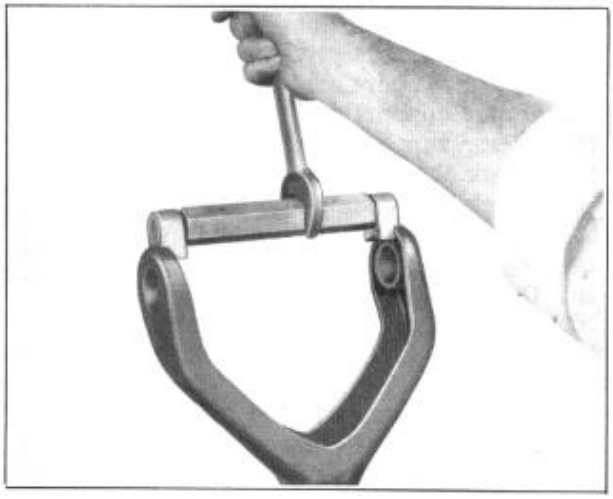

FIGURE 3

1. Install spreader tool (J-3957) Figure 3, with the slotted ends fitting against the inner face of the upper support arm. Turn the hex portion of the spreader tool until the outer surfaces of the support measure 7-1/4" apart. Install the pivot so it is centralized in the support arm.

2. Start the bushings on both ends of the pivot. Lubricate them with a tapping comp o u n d such as lard oil which will permit the bushings to cut their own threads in the support arm without scoring. Thread the bushings into the support arm and tighten to 110 foot pounds torque.

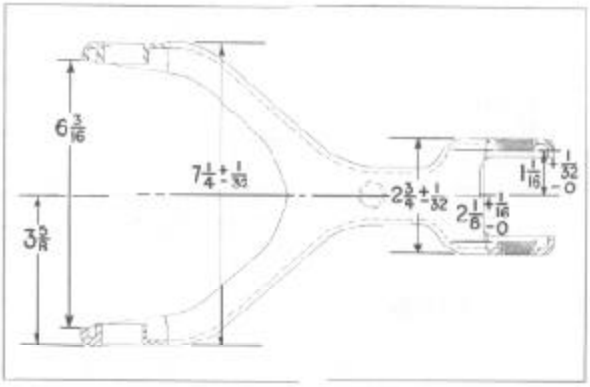

FIGURE 4

NOTE: The distance between the inner faces of the upper support arm is 6-3/16" as shown in Figure 4. The upper support arm assembly must be free to move from a horizontal position by its own weight plus a pressure no greater than 5 pounds applied to the arm. The pivot must not be rotated as this will throw the support arm off center with the pivot.

3. Assemble the upper support arm and pivot to the frame and tighten attaching bolts to 60 to 70 foot pounds torque.

NOTE: Be certain that shim packs are installed exactly as removed. Omission or transposition of shims will alter camber and caster setting.

4 Install spindle pivot upper support bolts (16) and tighten nut to 80 to 90 foot pounds torque.
5. Mount tire and wheel assembly, battery and fender side shield if removed and 1ower car to the floor; check camber, caster and toe-in.

SPINDLE PIVOT PIN

REMOVAL

1. Raise front wheels of car and place jack stands under the frame side rails behind the tie rod assemblies.
2. Remove the wheel and hub and drum assembly.
3. Remove the four bolts attaching the brake backing plate assembly to the steering spindle. Attach brake assembly to fender being careful t o protect brake flexible hose.
4. Remove the shock absorber anchor plate bolts (56), Figure 1. Turn the anchor plate 1/4 turn and push upward to clear the lower support arm spring seat.
5. Remove lower stabilizer link nut from support arm.
6. Place jack under the outer end of the lower support arm and relieve jack stand of greater portion of the car weight.
7. Remove the nut (15) and pivot pin upper support bolt (16) from the spindle upper support, (17), Figure 1. Pull spindle assembly outward slightly.
8. Carefully lower jack until coil spring tension is relieved and remove spring.
9. Back out spindle upper support (17) from threaded upper end of pivot pin (46).
10. Remove cotter pin and nut from outer steering arm (53) and remove outer steering arm and key.
11. Support the lower arm (6), and trunnion (18) assemb1y, tap the pivot pin (46) downward and remove.

NOTE: If the pivot pin sticks in the steering spindle bore, install the 3/4" - 11 support bolt nut on the pivot pin upper end. The pin can then be driven out of the steering spindle without damaging the pivot pin threads.

12. Remove the pivot pin upper grease seal (54), retainer (45), lower grease seal (25), thrust ball bearing (38), dust cover (36), dust cover seal (55), and seal retainer washer (37).

INSTALLATION

1. Install the lower grease seal retainer washer, grease seal and bearing, pivot pin grease seal and retainer.

NOTE: The thrust ball bearing should be a slip fit, having .005" to .015" pin to bearing clearance.

2. Insert the pivot pin through the lower trunnion support and install the steering spindle on the pin.

NOTE: Align the machined groove in the pivot pin with the groove in the steering spindle outer steering arm bore.

3. Install the Woodruff key in the outer steering arm inserting steering arm in spindle and install steering arm nut and cotter pin, tightening nut to 110-120 ft. lbs.
4. Slip the upper pivot pin grease seal retainer and grease seal over the upper end of the pivot pin.
5. Thread the upper pivot support onto the upper end of the pivot pin.

NOTE: The distance between the upper support upper edge and the top of the steering spindle assembly should be 6-5/8", Figure 1.

6. Install the coil spring in the upper spring recess and with a floor jack raise the lower support arm compressing the coil spring.

NOTE: Be sure silencer is in position.

7. Rotate the pivot pin and steering spindle assembly inward at the top and guide the upper pivot into position at the outer end

of the upper support arm. Thread the upper pivot support bolt through one side of the upper support arm and install the dust seal over the pivot support bolt. Thread the support bolt through the upper support pivot, through the other dust seal and through the opposite side of the arm. Install the support bolt nut and tighten to 80-to 90 foot pounds torque.

NOTE: The upper support pivot must be centered on the support bolt at the outer end of the upper support arm. There should be 3/16" bet w e e n the inner face of the upper support arm and the end of the upper support pivot.

8. Install the tie rod to the outer steering arm and tighten the tie rod end nut to 60 to 70 foot pounds torque.
9. Mount the brake backing plate on the steering spindle and tighten the four attaching bolt nuts to 30-35 foot pounds torque.
10. Install wheel hub and drum and wheel and tire assembly.
11. Lower the car to the floor and check caster, camber and toe-in.

CENTER STEERING ARM

REMOVAL

1. Remove drag-link at the front b y backing off the adjusting plug and ball seat.
2. Remove tie rod ends from the steering center arm using tool J-2781.
3. Remove the three bolts attaching the center steering arm bracket (32) to the No. 2 cross-member.
4. Remove the center pivot nut (27) and remove the center steering arm and pivot as an assembly.

INSTALLATION

1. When installing new bearings in the center steering arm bracket space the bearings as shown in Figure 5. Apply pressure on the outer race on the end carrying the part number and manufacturers name.
2. If' necessary to replace the steering arm pivot shaft, the new shaft should be pressed in place maintaining the 2.053" to 2.055" dimension as shown before drilling the hole for the No. 5 taper pin (A).
3. The steering arm seal consists of a steel washer to which synthetic rubber i s bonded. A separate retainer is therefore not required.

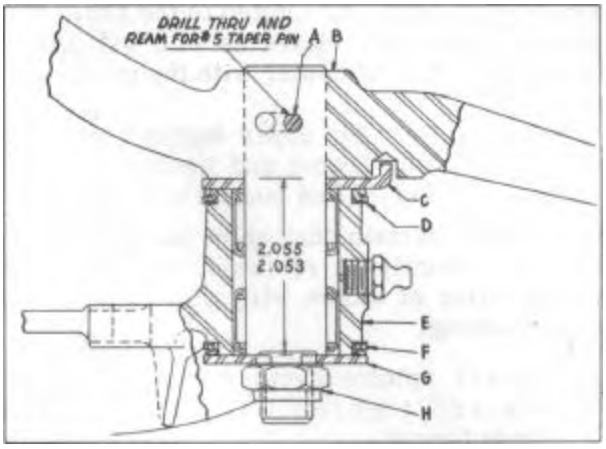

FIGURE 5

4. When installing the seals the rubber lips fit the casting grooves as shown in cross section , Figure 5, and the spacers (C) and (G) are installed as shown.
5. The center steering arm pivot bolt nut (H) should be tightened to 50 to 60 foot pounds torque.

TIE ROD ENDS

Tie rod ends are the self adjusting type. The ground steel bearings (45), Figure 6 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 dust proof as possible, a rubber seal (47) also seals the unit.

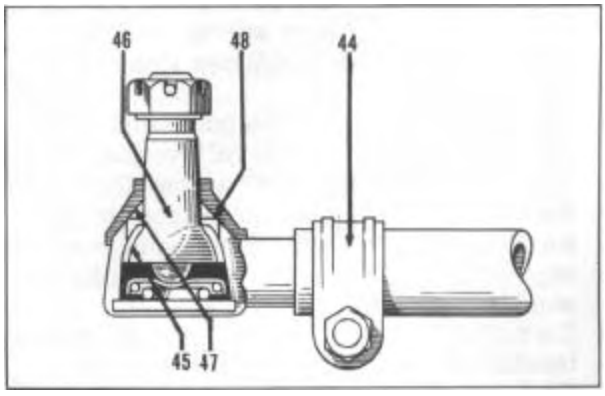

FIGURE 6

TIE RODS

REMOVAL

1. Remove the cotter pins and nuts from both ends of the tie rod.
2. Using tool J-2781, Figure 7, remove the tie rod ends.

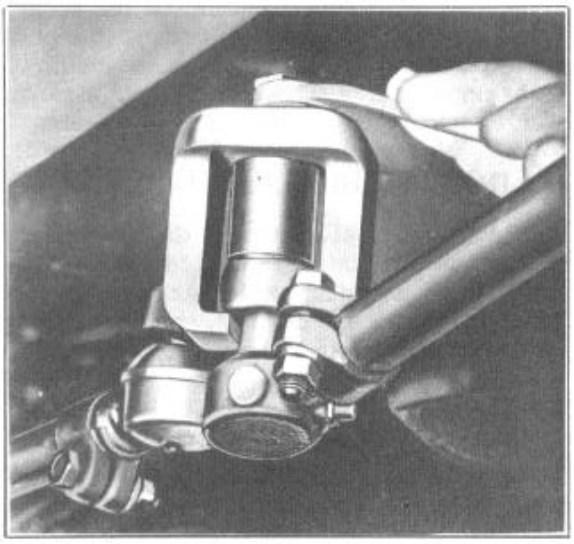

FIGURE 7

3. Using tool J-2781 remove the inner end.

INSTALLATION

New tie rod end installation and reassembly is accomplished by reversing procedure of removal and disassembly.

NOTE: When installing n e w tie rod ends thread the ends into the tie rod equally. Do not tighten clamps too tightly as the resulting distortion will destroy the clamping affect. Correct t or q u e should be (20 to 30) foot pounds . Final toe-in adjustment must be checked with steering gear on high point, while tie rod adjustment is being made .

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 tire tread in a horizontal plane with the wheel spindle center line.

NOTE: A pull no greater than 25 pounds should be required to turn the wheels on the roller plates. Greater pull required indicates binding of pivot pins, tie rod ends or a lack of proper lubrication.

FRONT WHEEL ALIGNMENT

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.

1. Inflate all tires to recommended pressures.
2. Check condition of tires (blowout patches thin treads, vulcanizing, etc).
3. Wheel and tire run-out, wobble o r eccentricity.
4. Brakes for dragging condition.
5. Wheel balance.
6. Front wheel bearing adjustment.
7. Front and rear riding heights.
8. Pivot 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.
13. Location of steering "high point".
14. Divide total toe-in equally between the front wheels.

When checking front wheel alignment, the car must be level. It should be empty with no luggage or load in the trunk.

NOTE: Rock the car back and forth several times and allow it to settle.

RIDING HEIGHT - FRONT

Measure the distance from top of the lower support arm, the lower edge of the upper rebound bracket. This measurement should be 4-5/32" on each side (B), Figure 1. (Curb load - less passengers). If the two measurements vary more than 1/2", replace one or both of the coil springs as required

There are two types of coil spring available for service, low rate and high rate. The springs can be identified by the part number stamped on the top of the coil spring.

RIDING HEIGHT - REAR

Front wheel alignment is affected by weak rear springs or shock absorbers. To determine the riding height measure the distance vertically from the top of the rear axle housing tube to the upper edge of the rear axle rubber bumper, Figure 8. The distance should be 6-1/16" (Curb load - less passengers).

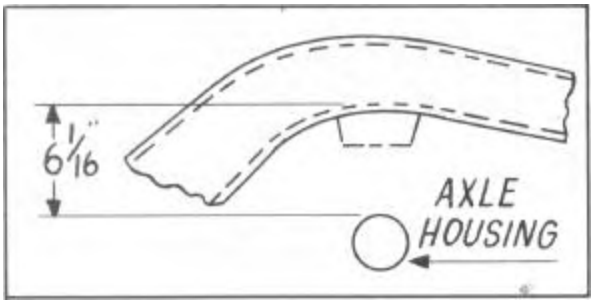

FIGURE 8

WHEEL BEARING ADJUSTMENT

1. Tack up the car until the front wheels are clear of the floor.
2. Remove the outer and inner wheel hub caps.
3. Remove the cotter pin and tighten the nut until all bearing parts are in contact and a slight bind is felt when the wheel is rotated by hand.
4. Back nut off one or two serrations until the wheel revolves freely.
5. Install and clinch the cotter pin.
6. Replace the inner and outer hub caps and lower the car to the floor.

Before proceeding to make a check of front wheel alignment the steering gear must be on the "high point" and the toe-in must be divided equally between the front wheels.

STEERING HIGH POINT

Steering "high point" is the position of the steering worm and sector at their point of minimum clearance when the wheels are in a straight ahead position. The high point can be determined as follows:

1. With the drag link disconnected from the pitman arm, grasp the pitman arm with the hand and move it forward and backward for a short distance along the cent e r of the arc of travel of the arm; no movement should be felt.
2. With the worm and sector on the high point , the steering wheel spokes should be in a horizontal position. If the spokes are not in this position, remove the horn button and check to see that the notch on the upper end of the worm shaft is straight down toward the floor.

FRONT WHEEL ALIGNMENT

Front wheel alignment is the correct adjustment of five inter-related factors to provide easy steering and control of the car. The five factors are camber, caster, king pin inclination and toe-in and toe-out on curves.

CAMBER

Camber is the amount of degrees that the front wheels incline away from a vertical place. With positive camber, the front wheels are farther apart at the top and closer together at the bottom. Negative camber is the reverse of the above, with the wheels closer together at the top and farther apart at the bottom. Camber is necessary to compensate for front spring deflection under load and road crown. Camber specifications is from 1/4° - 1-1/4º Positive with not more than 1/2° variation between wheels ; above values with the equivalent of a 5 passenger load.

NOTE: Adjustment of the camber angle should not be attempted until caster and king pi n inclination have been checked. A change in the camber adjustment will also change the pivot pin inclination.

ADJUSTMENT

Camber adjustment is provided by shims placed between the upper control arm inner pivot and the No. 2 crossmember, Figure 9. Three thickness of shims are provided (1/32", 1/16" and 1/8"). When the caster has been determined to be within specified tolerances the same thickness of shims must be used at each pivot bolt. Adding shims will decrease positive camber setting and subtracting from the shim pack will increase positive camber.

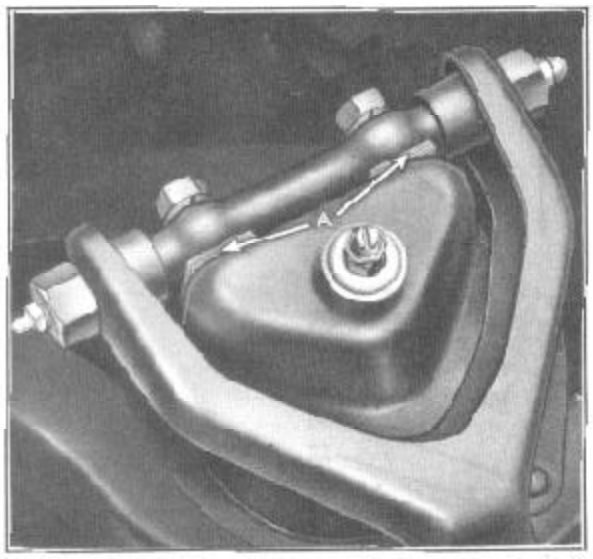

FIGURE 9

CASTER

Caster is the amount in degrees that the pivot pin is inclined away from a vertical plane, either toward the front or rear of the car. Positive caster is the inclination of the top of the pin toward the rear of the car, while negative caster is the tilting of the top of the pin toward the front of the car.

Caster assists in keeping the wheels in a straight ahead position. When turning a curve, the caster lever action helps return the wheels to a straight ahead position. The caster setting helps provide ease of steering and vehicle control. Caster specifications is 0° plus or minus 1/2° above values with the equivalent of a 5 passenger load. If car is empty, caster angle should be minus 1/2°.

ADJUSTMENT

The shim packs between the upper pivot and the No. 2 crossmember provides caster adjustment also. Altering the shim, thickness at either the forward or rear attaching bolt of the pivot changes the caster setting. By adding shims at the forward pivot bolt and removing shims at the rear pivot bolt, positive caster is decreased. Subtracting from the forward shim pack and adding to t he rear shim pack moves the pivot pin toward the rear increasing positive caster.

PIVOT PIN INCLINATION

Pivot Pin inclination is the outward tilt of the pin at the bottom. Its purpose is to reduce the need for excessive camber to put the center of the tire in contact with the road. Correct pivot pin inclination is 3° 28'.

Camber is closely allied with pivot pin inclination and a change in camber setting also effects the pivot pin setting. An incorrect p iv o t pin angle indicates a bent pivot pin, frame, steering spindle or support arm. To correct this condition, the frame must be straightened or the damaged parts replaced.

TOE-IN

Toe-in is the setting of the front wheels closer together at the front than at the rear, measured at the wheel rim. When the car is in forward motion, the front wheels assume parallel positions that minimize lateral tire scuffing.

ADJUSTMENT

Adjustable tie rods provide the means of obtaining correct toe-in setting. Adjustment should be made with the front wheels in a straight ahead position and the steering gear center on the high point.

STEERING GEOMETRY

Steering geometry or toe-out on curves is the mechanics of relative toe-out when the wheels are turned to the right or left. Toe-out is controlled by the movement of the tie rods and the angularity of the outer steering arms.

When caster, camber, pivot pin inclination and toe-in are found within specifications, and toe-out on curves can be assumed to be correct. If there are indications of incorrect toe-out on curves, check for bent outer steering arms.

To check toe-out, place wheels on turn plates. The turning angles should be as follows:

Left Turn

Left Wheel 30° Right Wheel 25°

Right Turn

Left Wheel 30° Right Wheel 25°

The variation between the right and left wheel angle should be no more than 30 minutes plus or minus.

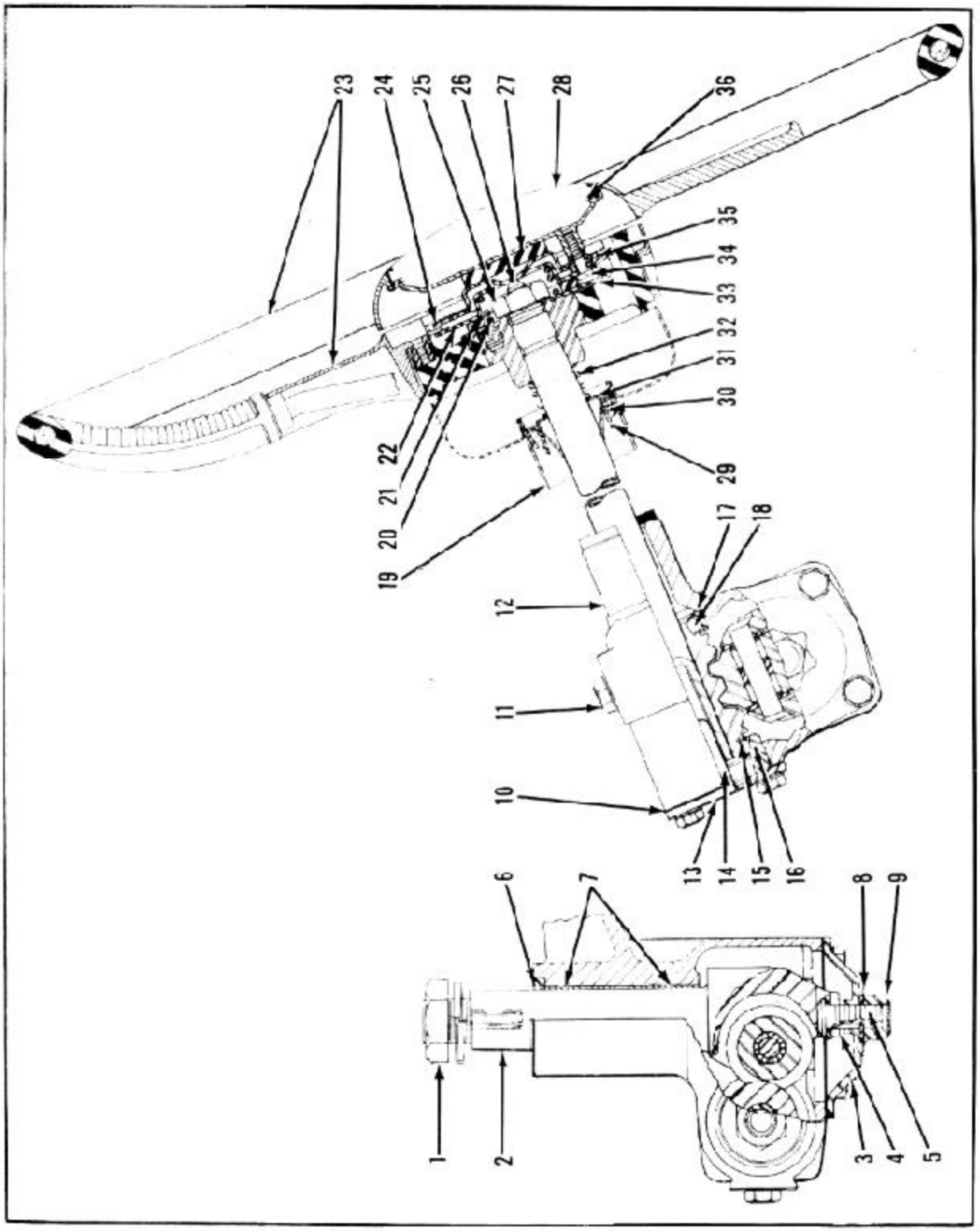
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FIGURE 1

LEGEND

1. Gear shaft nut
2. Gear shaft
3. Gear shaft cover
4. Adjusting screw thrust plate
5. Adjusting screw
6. Oil seal
7. Bushings
8. Adjusting screw lock plate
9. Adjusting screw lock nut
10. Worm cover shims
11. Oil filler plug
12. Housing
13. Worm shaft cover
14. Grease retainer tube
15. Worm shaft lower bearing
16. Worm shaft lower bearing cup
17. Worm shaft upper bearing cup
18. Worm shaft upper bearing
19. Steering jacket tube assembly
20. Index plate spring
21. Index plate shock pad
22. Index plate
23. Steering wheel assembly
24. Horn button contact cup
25. Steering wheel nut
26. Horn wire assembly
27. Pressure contact pad
28. Horn button and horn ring
29. Jacket tube bearing retaining spring
30. Jacket tube bearing assembly
31. Jacket tube bearing spacer
32. Jacket tube bearing spring
33. Horn ring blowing cam
34. Horn ring screw
35. Insulator step washer
36. Steering wheel horn button spacer

SECTION 13
STEERING GEAR

SPECIFICATIONS

Type	Worm and 2 Tooth Roller
Ratio	18.2 to 1
Gear Shaft Bearings	Bronze Bushings
Worm Shaft Bearings	Tapered Roller
High Point	Notch on Steering Column Straight Down
Turning Radius Right	16' 8-1/2"
Left	16' 8-1/2"
Lubrication	S.A.E. 90 E. P. Gear Oil
Wheel Nut Torque	20 to 30 foot pounds
Shaft Nut Torque.	125 to 140 ft. pounds
to Frame Bolts	50 to 60 foot pounds

CONSTRUCTION

The steering gear employs a worm gear and two tooth roller gear shaft.

The worm is pressed on the lower end of the steering column tube and operates on two adjustable tapered roller bearings. The two tooth roller operates on needle bearings. The gear shaft operates in bronze bushings in pressed into the housing.

A leather seal at the end of the gear shaft protects the unit against loss of lubricant. A grease retainer tube is pressed into the worm cover to provide a passage for the horn wire and seal the lubricant in the housing.

A thrust plate is assembled on the end of the gear shaft adjustment screw and fits into a slot in the end of the gear shaft. The adjustment screw is held in place by a lock plate and lock nut. Adjustment of the roller shaft for proper mesh with the worm gear is accomplished b y turning the adjustment screw in the gear shaft cover.

Adjustment of the worm gear for end play i s accomplished b y removing or inserting shims between the worm cover and housing.

LUBRICATION

The steering gear is filled at the factory with S.A.E. 90 E.P. lubricant, which is satisfactory for all seasons. The steering gear f ill e r plug should be removed and lubricant checked at each 1,000 miles lubrication period.

STEERING WHEEL

REMOVAL

1. Disconnect horn wire at horn relay.
2. Push down on horn button (28) Figure 1, rotate to release, and remove button.
3. Remove horn wire assembly.
4. Remove steering wheel nut and pull off steering wheel using puller J-3044.

INSTALLATION

1. With notch in main column tube straight down, place steering wheel in position on tube with spokes straight across.
2. Install steering wheel nut and tighten to 20 to 30 foot pounds.
3. Insert horn wire into steering column tube and apply a little grease on head of terminal.
4. Install horn button and rotate to lock in place.

JACKET TUBE BEARING

REMOVAL

1. Remove steering wheel.
2. Remove jacket bearing spring and spacer. 3. Engage fingers of bearing puller J-2792 below the bearing and place locating pins in slots in head of puller, Figure 2.

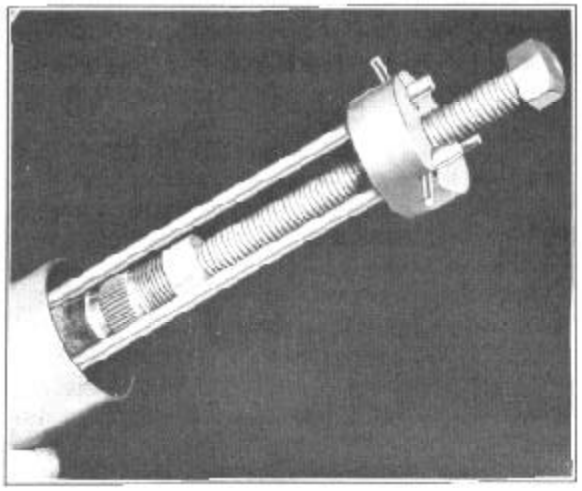

FIGURE 2

4. Turn the center screw of puller against steering column tube and remove bearing.

INSTALLATION

1. Start bearing into jacket tube by hand.

2. Using replacer tool J-2952, Figure 3, drive bearing to a depth of 7/32" from top of tube, with or without directional indicator.

3. Replace jacket bearing spacer and spring.

4. Replace steering wheel

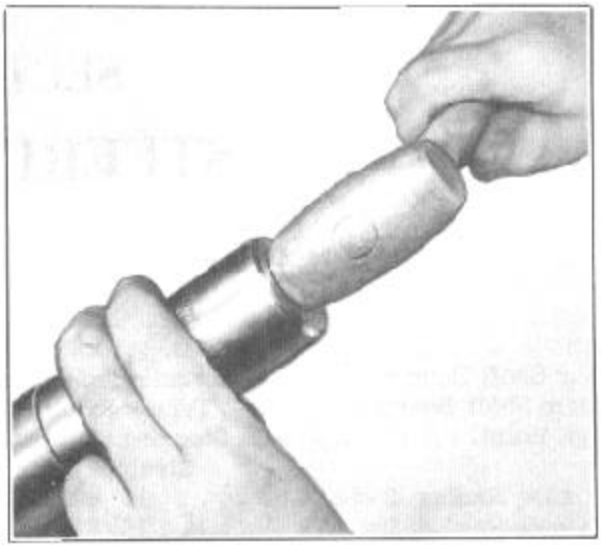

FIGURE 3

STEERING GEAR JACKET TUBE

REMOVAL

1. Remove steering wheel.

2. Remove bearing spring and spacer.

3. On car equipped with directional indicator, remove switch assembly.

4. Remove steering column bracket cap at instrument panel.

5. Loosen remote control tube bracket (lower) and jacket tube clamp at steering gear, and remove jacket tube.

INSTALLATION

Reverse procedure of removal.

STEERING GEAR
(Chuck Assembly)

REMOVAL

1. Remove battery.

2. Remove steering wheel and horn wire.

3. Remove steering gear jacket tube.

4. Remove three bolts attaching steering gear to frame.

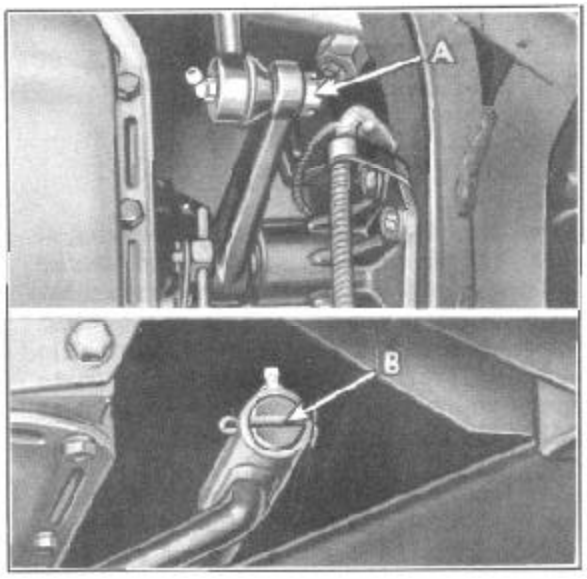

FIGURE 4

5. Remove nut (A) at rear end of drag link Figure 4 and press ball stud out of pitman arm using puller J-2781.

6. Remove pitman arm nut and take off pitman arm using puller J-1374, Figure 5.

7. Slide steering gear forward on frame and remove steering gear by pulling chuck upward through engine compartment.

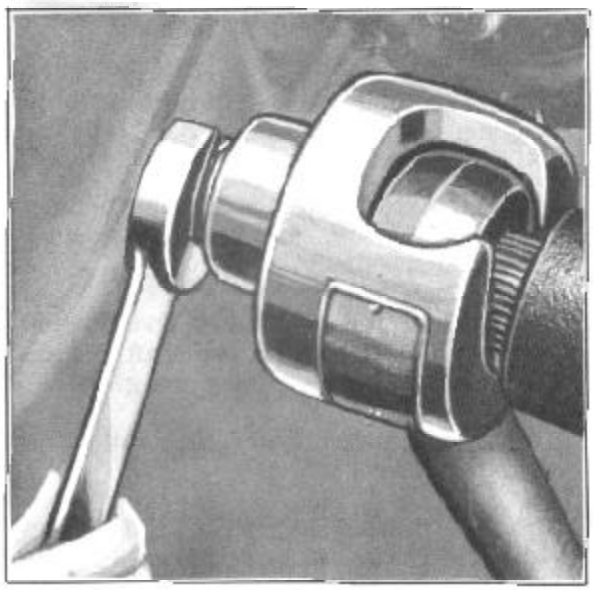

FIGURE 5

DISASSEMBLY

1. Drain lubricant and mount assembly in a vise.

2. Remove gear shaft cover (3), Figure 1.

3. Cover serrations on gear shaft with waxed paper to prevent damage to oil seal and remove gear shaft and roller assembly.

4. Remove oil seal (6).

5. Remove worm gear cover (13) and grease retainer tube assembly; use care to prevent damage to shims (10).

6. Remove lower bearing (15), bearing cup (16), worm and column tube assembly, upper bearing (18) and cup (17). Thoroughly clean inside of steering gear housing and all other parts after disassembly. Carefully inspect all parts for wear and damage and replace where necessary.

ASSEMBLY

1. Assemble upper bearing cup an d bearing in housing and install worm and tube assembly.

2. Install lower bearing and cup.

3. Install worm shaft cover shims and cover and grease retainer tube assembly.

4. Install a new gear shaft oil seal (6) in housing.

5. Turn high point notch on steering column tube straight down and install gear shaft and roller assembly.

6. Assemble thrust plate (4) on adjusting screws (5) into slot in gear shaft and install gear shaft cover using new gasket.

7. Install lock plate (8) and lock nut (9) on adjusting screw.

8. Place pitman arm on gear shaft and tighten to 125 to 140 foot pounds.

9. Check worm for end play. If end play exists, adjust by removing one worm cover shim (10) at a time until end play is eliminated. Rotate column tube after each removal to determine if stiffness exists. Stiffness indicates removal of too many shims.

10. Check gear shaft for excessive play. If pitman arm can be moved more than 1/32" without turning the steering column tube, remove gear shaft adjustment screw lock nut and lift lock plate clear of the cover boss. (Check notch on steering column tube to be sure it points straight down.)

Tighten adjusting screw just enough to remove play between gear and worm. DO NOT TIGHTEN BEYOND THE POINT OF TAKING UP LASH. Replace lock plate and lock nut and tighten nut.

11. Replace felt washer on column tube at steering gear housing.

INSTALLATION

1. In stall steering gear assembly on frame and install bolts but DO NOT tighten.

2. In stall steering gear jacket tube and transmission control parts. Tighten tube in bracket at instrument panel.

3. Tighten the three bolts attaching steering gear to frame 50 to 60 foot pounds.

4. Loosen bolts attaching steering column bracket cup at instrument panel to allow column to shift to match position of steering gear and retighten bolts.

5. Install horn wire and steering wheel with notch in column tube straight down and wheel spokes horizontal. Replace horn button.

6. Check front suspension for stiffness by placing front wheels on roller plates and attaching spring scale to tire tread. Maximum pull required to turn wheels with drag link disconnected is approximately 25 pounds.

7. Set front wheels in straight ahead position and connect drag link.

8. Fill steering gear housing with S.A.E. 90 E.P. Lubricant.

DRAG LINK

The drag link has a spherical bearing at the rear end which is spring loaded to take up looseness and wear and incorporates a tapered pivot which enters the hole in the lower end of the pitman arm. The rear end of the tie rod is spun over to secure the bearing parts in place which requires replacement of the drag link and rear bearing as a unit.

The front end carries a threaded plug and spring loaded ball seats contacting the ball on the center steering arm. No shims are provided and the drag link is not adjustable for wear.

REMOVAL

1. Remove cotter and nut (A) from drag link stud at pitman arm, Figure 4, and disconnect drag link using puller J-2781.

2. Remove cotter and plug (B) from drag link. at center steering arm and remove drag link.

INSTALLATION

1. Set front wheels and steering gear in straight ahead position. Adjust tie rods if necessary to obtain 0" -1/16" toe-in.

2. Attach front end of drag link to center steering arm and rear end to the pitman arm.

WORM BEARING ADJUSTMENT

If end play exists in the worm bearings, the following adjustment is necessary.

1. Disconnect drag link at pitman arm using tool J-2781.

2. Loosen the four worm cover bolts about 1/8".

3. Use a knife to separate the top shim.

4. Remove one shim at a time and retighten cover.

5. After each shim is removed, turn steering wheel through entire radius to determine if any stiffness exists.

6. If stiffness is felt, replace shims unti1 steering wheel turns freely.

7. Attach drag link to pitman arm.

ROLLER MESH INSPECTION

Improper mesh of roller with worm gear is indicated by excess play or stiffness in the steering wheel. Inspection for proper mesh should not be made until worm bearing end pl ay and gear alignment have been checked and corrected if necessary as follows:

1. Disconnect drag link at pitman arm.

2. Turn steering wheel to straight ahead position.

3. Shake pitman arm to determine amount of lost motion. If lost motion exceeds 1/32", adjust roller for proper mesh.

4. Connect pitman arm to drag link.

ROLLER MESH ADJUSTMENT

1. Disconnect pitman arm from drag link.

2. Remove left side dust shield.

3. Turn steering wheel to straight ahead position.

4. Remove roller shaft adjustment screw lock nut and lift lock plate clear of boss on housing.

5. Tighten roller shaft adjustment screw just enough to eliminate lost motion at pitman arm. (It is better to leave a slight amount of play - not in excess of 1/32" - than to tighten too much.)

6. Replace lock plate against cover in locked position and replace and tighten lock nut.

7. Replace dust shield and connect drag link to pitman arm.

IMPORTANT: Before connecting drag link to pitman arm, place the front wheels on roller plates and attach spring scale to tire tread. Maximum pull required to turn wheels at any point in the turning radius is 25 pounds. Any excess pull indicates a binding in the front suspension that should be corrected for proper functioning of steering mechanism.

CENTER STEERING ARM

REMOVAL

1. Remove drag link at front by backing off plug.

2. Remove tie rod ends from steering center arm using tool .T-2781.

INSTALLATION

1. When installing new bearings in center steering arm bracket space as shown in Figure 6 and apply pressure on outer race a t end carrying manufacturers name and part number.

2. If necessary to replace the steering arm pivot, the new pivot should be pressed in place maintaining the 2.053" t o 2.055" dimension a s shown before drilling the hole for the No. 5 taper pin (A).

3. The rubber seals (F & D), consist of a steel washer bonded to synthetic rubber, therefore a separate retainer is not used.

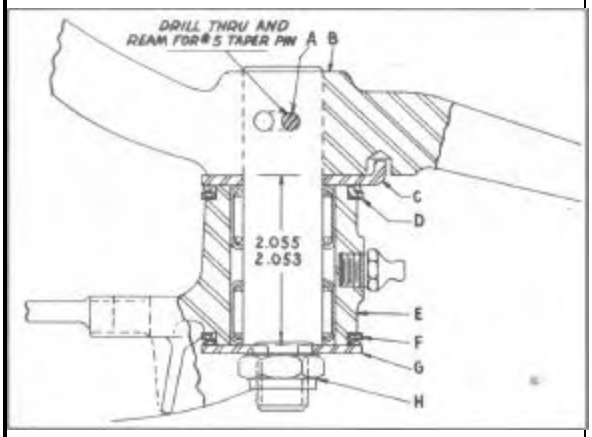

FIGURE 6

4. When installing the seals the rubber lip faces to the casting as shown in cross section and the spacers (C) and (G) positioned as shown.

5. The center steering arm pivot nut (H) should be tightened to 50-60 foot pounds.

Steering center arm installation is the reverse procedure of removal. Tighten th e steering center arm bolt with a torsion wrench to 70 foot pounds.

TROUBLE DIAGNOSIS

HARD STEERING

Insufficient lubrication
Excessive caster
Excessive, positive or negative camber
Worn pivot pins or pivots
Bent or broken-frame
Sagging or broken springs
Weak rear springs
Low tire pressure
Binding steering assembly

LOOSE STEERING

Worn steering linkage
Weak springs in drag link
Worn pivot pins, bushings
Improper steering adjustment
Worn tie rod ends
Worn sector shaft bushing

WANDER OR WEAVE

Insufficient caster
Incorrect toe-in adjustment
Worn pivot pins, bushings
Worn front wheel bearings
Tight steering assembly
Loose spring shackles
Sagging or broken springs
Bent or broken frame
Loose rear spring U-bolts
Overloading
Unequal tire pressure or tire wear

SHIMMY

Too much caster
Loose pivot pins
Loose drag link arm
Loose steering gear
Low tire pressure
Unequal inflation
Loose wheel bearings
Sagging or broken springs
Worn tie rod ends
ROAD SHOCK
Unequal or excessive caster
Weak front springs
Bent steering arm (right or left)
Bent drag link
Defective shock absorbers

SIDE PULL

Unequal caster
Bent steering arm
Bent, broken frame
Tight pivot pins
Weak rear springs
Uneven tire inflation
Oil-soaked brake lining
Sagging front springs

SECTION 14

SPRINGS, SHOCK ABSORBERS AND STABILIZERS

SPECIFICATIONS

SPRINGS

Front Springs	
Type	Coil
Right Side	
Load at Passenger Height	1850
Rate	376
Height at Passenger Load	9-15/16"
Free Height	15"
Left Side	
Load at Passenger Height	1850
Rate	376
Height at Passenger Height	9-15/16"
Free Height	15"
Mounting	Rubber
Heavy Scale Coil Spring	Optional
Load	1875
Rate	440
Rear Springs	
Type	Semi-Elliptic
Light Scale	Standard
Load Weight	700
Rate	100
Length and Width	52" -1-3/4"
Number of Leaves	6
Heavy Scale	Optional
Load Weight	725
Rate	120
Length and Width	52" -1-3/4"
Number of Leaves	6
Shackles	Silent "U" Threaded
Spring Eye Dimension	.870 Rear 1.125 Front

SHOCK ABSORBERS

	Compressed Length	Extended Length
Front	7-3/4"	12"
Rear	12-1/16"	21-1/16"

FRONT RIDING HEIGHT AND SPRING SAG

When the car does not seem level and a check of the coil spring height is desired, place the car so that the front end is level cross-wise and then rock the car sidewise several times and allow the car to settle. This will remove any binding that might cause a dimension difference.

Measure the distance from the top of this lower support arm to the bottom of the upper rebound bracket, which should be 4-5/32" each side. (Curb load without passengers.) Shown at "B", Figure 1, Front Suspension.

If the two measurements vary more than 1/2" between sides, it is advisable to replace one or both coil springs.

NOTE: The high limit spring has Red Paint for identification and White Paint for low limit; these markings will be found at the bottom of the spring.

RIDING HEIGHT REAR

Front wheel alignment is affected by weak rear springs or shock absorbers. To determine the riding height measure the distance vertically from the top of the rear axle housing tube to the upper edge of the rear axle rubber bumper, Figure 8, Front Suspension. This distance should be 6-1/16" (Curb load - less passengers).

FRONT COIL SPRINGS

REMOVAL

1. Raise the car until wheels are clear of floor and place jack stands under inner ends of the lower support arm.
2. Remove wheel.
3. Remove shock absorber upper palnut and stud nut.
4. Remove shock absorbers lower mounting nuts and washers, turn shock absorber 1/4 turn and remove through opening in bottom of lower support arm.
5. Remove lower support arm pivot to frame bolts, nuts and lockwashers.

6. Carefully lower jack allowing coil spring to expand and remove the spring.

CAUTION: The coil spring is under great pressure and care 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. B e sure silencer is in upper spring seat.

2. Place jack under lower support arm compressing the spring. Use a drift to align holes in lower support pivot with corresponding holes in crossmember.
3. Install lower support arm pivot attaching bolts and tighten securely.
4. Install shock absorber in reverse order of removal.

REAR SPRINGS

Rear springs are long leaf, semi-elliptical design. The front ends are attached to frame brackets with pivot bolts cushioned in rubber. (No lubrication is required at this point.) 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 bushings are protected from road splash an d dirt by rubber sleeve seals retained in position by the shoulders of the shackles. These seals are installed on the "U" shackles 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.

NOTE: High limit springs are identified by two paint marks, low limit one paint mark, (located near the center bolt on lower spring leaf.)

REMOVAL

1. Jack up the rear axle on a roller jack and place jack stands under the chassis frame side rails.
2. With jack pressure under axle housing, disconnect lower end of shock absorber at spring mounting clip pad (A), Figure 1.

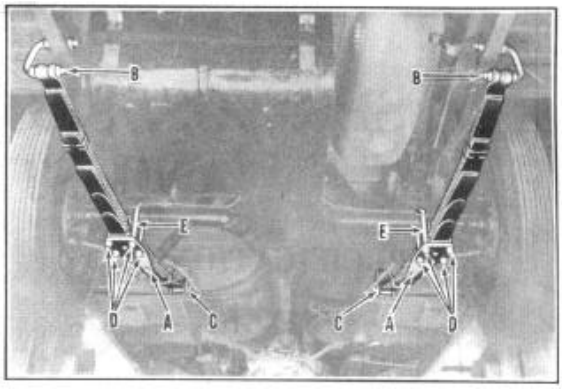

FIGURE 1

3. Remove brake cable to spring retainer clip.

4. Remove the rear spring shackle bushing (B) at rear spring eye and shackle.

5. Remove bolt, nut and bushing (C) at front end of rear spring.

6. Remove rear spring to axle clip nuts (D), washers, clip plates (F) and clips (E). 7. Remove spring from car.

REAR SPRING

ASSEMBLY

If the rear spring has been disassembled the leafs should be assembled in their proper order with a piece of 5/16" rod passing through the center bolt hole of each leaf. Do not lubricate spring equipped with inserts.

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. Insert the center bolt and tighten the nut securely, replace the two wrap around clips and brake cable attaching clip.

NOTE: Spring inserts should be checked and replaced if necessary.

INSTALLATION

1. Place rear spring in position on rear axle mounting pad.

2. Insert one end of the spring rear shackle through the main leaf eye; after insuring the rubber seals are in place on the shackle start the threaded bushing on the shackle. DO NOT TIGHTEN.
3. Install the front end of the spring and spring front bolt (rubber bushings in place).
4. When proper alignment is obtained, attach nut and tighten securely.

NOTE: When tightening the mounting bolt, the rear spring should be mounted so that there is no unnatural twist set up in the rubber b us hing. Squeaks at the 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. DO NOT lubricate the rear spring front bushing.

5. In stall spring pads, mounting clips, nuts and washers, and tighten nuts to 75 to 80 pounds torque.

NOTE: It is important that spring clips be inspected at regular intervals and kept tight to insure against spring breakage.

6. After mounting clip nuts have been properly torqued finish tightening the rear shackle nut.

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NOTE: It is important that the shackle be located properly 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. Spring shackles should b e inspected periodically to make sure that they are tight but not binding.

7. Install brake cable retaining clip on top of the spring.
8. Attach lower end of shock absorbers to spring mounting clip pads.
9. Lubricate the spring shackles and lower car.

REAR SPRING SHACKLE IDENTIFICATION

The right hand rear spring shackle has right hand threads on both upper and lower ends; the left rear spring shackle has right hand threads on the upper end 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: 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.

Use only viscous chassis lubricant at fittings. Springs without covers are equipped with inserts and must not be lubricated.

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 and are mounted diagonally for greatest efficiency and increased stability. At the upper end they are attached t o the frame crossmember, while at the lower end they are assembled to the rear spring clip plates.

Both front and rear shock absorbers are non-serviceable and are not interchangeable. Defective units must be replaced.

Shock absorbers are available in either standard control or heavy control (Optional).

The extra heavy duty control shock absorbers are available as an additional option.

NOTE: All shock absorbers have the part number and code stamped on the outside of the shock absorber.

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 amount of liquid soap at assembly.

FRONT SHOCK ABSORBER

REMOVAL

1. 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.

2. Remove the two cap screws holding the shock absorber lower support plate to the lower support arm.

3. Turn the shock absorber a quarter turn and remove.

NOTE: To install, reverse procedure of removal. Check condition of the grommets.

REAR SHOCK ABSORBERS

REMOVAL

I. Remove lower stud nut, palnut, and retainer at rear spring clip plates, Figure 2.

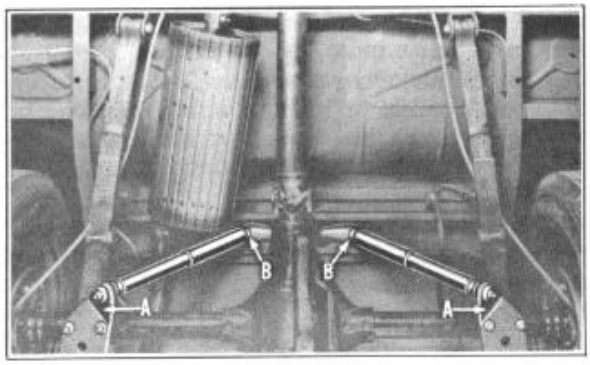

FIGURE 2

2. At rear compartment remove two Phillip head screws retaining the rear shock absorber access hole cover.

3. Remove upper mounting stud nut, palnut and retainer at "B".

4. Remove shock absorber.

INSPECTION

1. Check condition of grommets and replace if worn.
2. Mount shock absorbers 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.

NOTE: Assemble shock absorber with stone shield to front of the car.

INSTALLATION

To install, reverse procedure of removal.

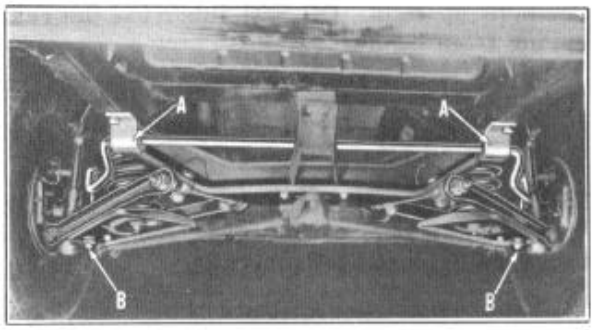

FIGURE 3

FRONT LATERAL STABILIZER

Stabilizer control is by a specially de - signed bar which is attached to the frame side member, Figure 3. The ends of the bar are directed toward the rear to form lever arms and the lever arms are attached to the stabilizer bar connectors which in turn are attached to the lower support arm.

The stabilizer i s mounted in rubber bushings, and requires no lubrication.

REMOVAL

1. Remove nuts and lockwashers from b of - tom of stabilizer connectors (B).
2. Remove two bolts from brackets to frame (each side) (A) and remove stabilizer.

NOTE: To install, reverse procedure of removal and make sure the stabilizer is properly centralized.

SECTION 15
BRAKES

SPECIFICATIONS

Type	Bendix Fixed Anchor
Drum Diameter	9"
Material	Centrifuse Iron
Lining Type	Moulded
Width - Front Shoes	2"
Width - Rear Shoes	1-3/4"
Thickness	.175"
Length Per Wheel	
Front	17.475"
Rear	17.475"
Total Lining Area	132.14"
Wheel Cylinder Size	
Front	1-1/8"
Rear	15/16"
Adjustment	Eccentric Cam
Pedal Free Play	1/4"
Fluid Capacity	1-1/2 U.S. Pints

CONSTRUCTION

The brake equipment is of the Bendix self-centering floating shoe type. Only minor adjustment is re quire d as the shoes center themselves when the brakes are applied assuring uniform brake lining wear. Eccentrics contact the brake shoe ribs to provide adjustment to compensate for lining wear.

The master cylinder is a combined reservoir and master cylinder with hydraulic pressure provided by foot pedal and push rod operation. Displacement of fluid in the master cylinder conveys pressure through tubes and flexible hoses to the wheel cylinders.

Opposed w hee1 cylinder pistons contact the upper ends of the brake shoes. Pressure between the wheel cylinder pistons forces the brake shoes outward into contact with the brake drums.

Brake shoe retracting springs move the shoes inward when the hydraulic pressure has been relieved. As the shoes are retracted, the wheel cylinder pistons are moved toward the center of the cylinder Hydraulic fluid displaced by the wheel cylinder piston retracting m o v e me n t forces the fluid back through the tubes into the master cylinder reservoir.

PARKING BRAKE

Hand braking is provided through a pull type handle, operating a self locking hand control mechanism mounted below the instrument panel.

Application is made easier by depressing the brake pedal in the usual manner, at the same time pulling upward on the brake handle. This relieves the load on the hand brake cables by hydraulically forcing the shoes against the brake drums. This prevents creation of a vacuum which might draw air into the cylinder piston cups when the shoes are expanded manually.

MASTER CYLINDER

The brake master cylinder is a combined reservoir and master cylinder cast integrally. It maintains a constant volume of fluid in the hydraulic system at all times regardless of heat or cold expansion or contraction. It acts as a pump during bleeding operations.

It contains the fluid actuating piston, return spring, check valve and piston push rod that makes contact between the actuating piston and the brake pedal operating lever. Synthetic rubber primary and secondary cups are provided at each end of the piston. When extended, the push rod is enclosed in a synthetic rubber boot which serves to keep grit and dirt out of the hydraulic system. Intake and relief ports open into the reservoir.

The piston (9), Figure 2, is returned to a released position much faster than the fluid returns to the master cylinder from the tube.

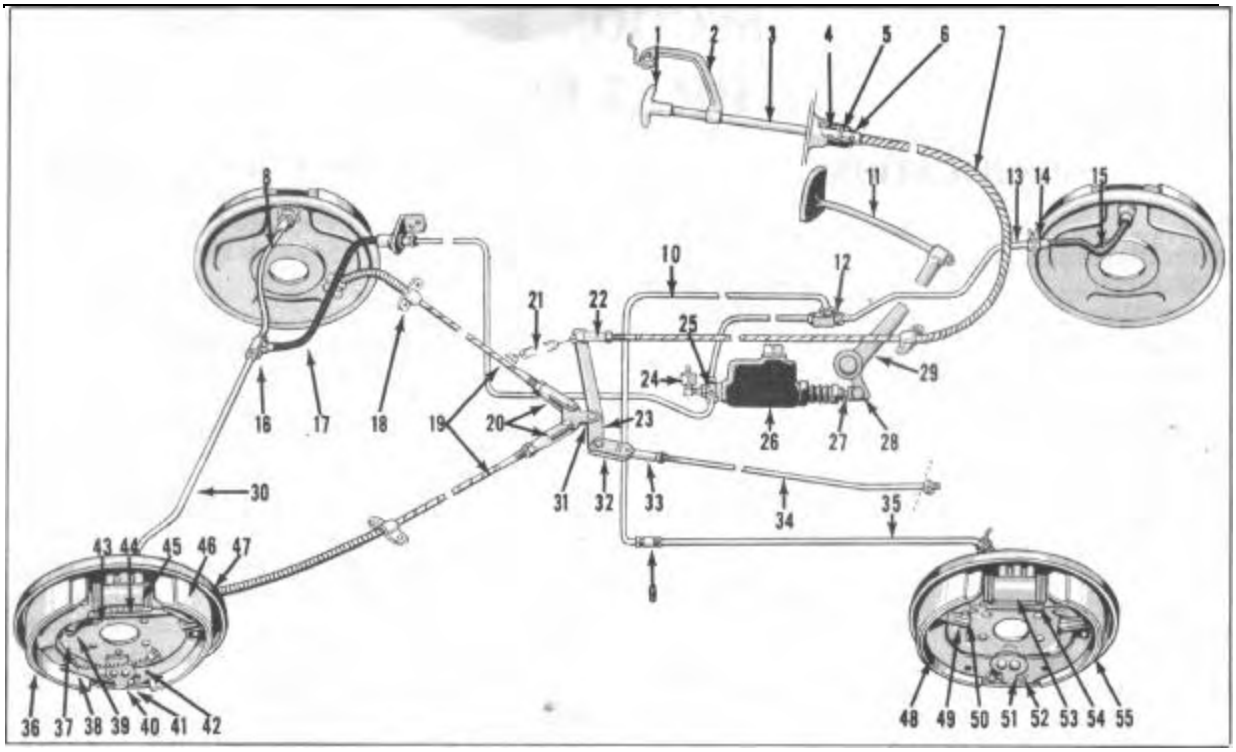

FIGURE 1 - LEGEND

1. Hand brake lever grip
2. Hand brake mounting bracket
3. Hand brake ratchet rod
4. Hand brake cable sleeve
5. Hand brake cable retainer
6. Hand brake dust grommet
7. Hand brake cable
8. Left rear wheel tube
9. Brake tube connector
10. Frame connector tube
11. Brake pedal rod
12. Front brake tee
13. Brake tube assembly
14. Front brake hose connector
15. Front brake hose assembly
16. Rear axle brake tee
17. Rear brake hose
18. Rear brake cable support bracket
19. Rear brake cables
20. Rear brake clevis
21. Brake cable return spring
22. Brake cable clevis
23. Brake cable lever
24. Stop light switch
25. Master cylinder outlet fitting
26. Master cylinder assembly
27. Master cylinder push rod
28. Master cylinder clevis and pin
29. Brake pedal lever
30. Rear wheel brake tube
31. Brake cable toggle assembly
32. Cable lever pivot plate
33. Cable lever brace clevis
34. Cable lever pivot brace
35. Right front brake tube
36. Secondary shoe
37. Adjusting eccentric
38. Brake cable lever
39. Brake hold down spring
40. Anchor ramp
41. Anchor spring
42. Brake cable
43. Brake shoe link
44. Brake shoe pull back spring
45. Wheel cylinder
46. Primary shoe
47. Brake backing plate
48. Secondary shoe
49. Adjusting eccentric
50. Brake hold down spring
51. Anchor ramp
52. Anchor spring
53. Wheel cylinder
54. Brake pull back spring
55. Primary shoe

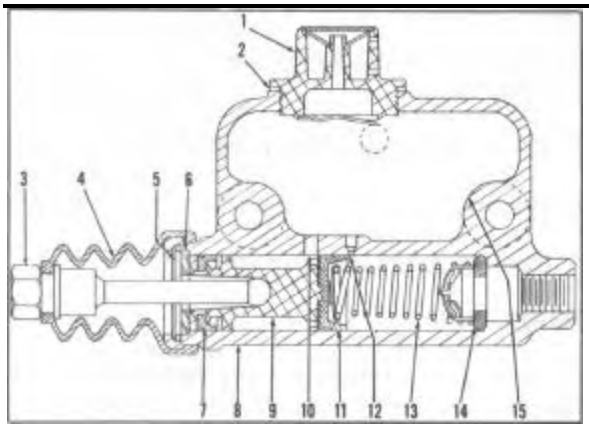

FIGURE 2

When piston (9) has been rapidly retracted, fluid flows from the reservoir (15) through by-pass port (12) into the cylinder. P re s sure from the brake shoe retracting spring forces the wheel cylinders inward forcing fluid toward the master cylinder. The pressure exerted on the check valve (14) forces it off its seat permitting fluid to return to the master cylinder and through port (10) to the reservoir. A residual line pressure of 10 to 12 pounds is maintained in the tubes and wheel cylinders at all times by the check valve. This assures immediate braking upon application of pressure on the brake pedal.

A clearance of 1/4" must be maintained between the end of the push rod (3), Figure 2 and the piston (9). If this clearance is not maintained, the piston cannot return sufficiently to uncover port (10) resulting in high line pressure and dragging brakes.

A diaphragm is incorporated in the stop light switch assembly mounted on the end of the master cylinder. Fluid pressure from the master cylinder against the diaphragm closes electrical contacts to operate the stop lights when the brake pedal is depressed. If the correct push rod clearance is not maintained and high line pressure results, the brake stop lights will continue to burn after the brake pedal has been released.

MASTER CYLINDER

REMOVAL

1. Disconnect the stop light wires at the stop light switch, and the brake tubes at the master cylinder connector.
2. Remove the brake pedal to push rod clevis pin (28) Figure 1, and disconnect the brake pedal retracting spring (22).
3. Remove the two bolts attaching the master cylinder to the frame and remove the master cylinder.

REPAIR

1. Thoroughly clean the exterior of the cylinder before disassembly.
2. Remove the filler plug (1), Figure 2 and drain the brake fluid:
3. Release the rubber boot (4) from the master cylinder groove, and remove the boot and push rod (3).
4. Re move the retainer snap ring (5). This permits removal of the p i s ton stop plate (6), piston (9), piston cup (11), sp ring (13), and check valve (14) for inspection and replacement if necessary.

NOTE: Do not use gasoline, kerosene or carbon tetra-choloride for cleaning solution. Use clean alcohol only. Keep parts free from mineral oil of any kind.

INSPECTION

Inspect the Master cylinder for light pitting or scratches. Hone the cylinder bore to restore the smooth bore necessary for efficient operation. After honing, the by-pass port (12) must be chamfered slightly to remove the burr.

Check the by-pass port to be certain it is unobstructed. Run a wire through the port to clear it of any foreign substances.

ASSEMBLY

1. Wash all master cylinder parts in clean alcohol.
2. After washing, dip all parts in" Hudson Hydraulic Brake Fluid" for lubrication.
3. Install the check valve (14) and piston return spring (13). See Figure 2.
4. Assemble the primary cup (11) and the piston assembly (9) and the piston stop plate (6).

NOTE: Always install new rubber cups.

5. Install the retainer ring (5) in the master cylinder groove.

6. Assemble the push rod (3) and the rubber boot assembly on the master cylinder.
7. Refill the master cylinder to the required level with Filler Bottle J-713 using "Hudson Hydraulic Brake Fluid". Replace the filler plug.

NOTE: After removing the master cylinder or any hydraulic brake system parts, it is always necessary to bleed the system to expel any air that may have entered the system. Refer to "Bleeding Brake System" Page 141.

WHEEL CYLINDERS FRONT

The wheel cylinders are of the straight bore type. Each wheel cylinder has two opposed positioned pistons (4), Figure 3, fitted with rubber cups (2). A spring (3) is assembled between the rubber cups to hold them again s t the pistons. Residual line pressure keeps the lips of the cup s tight against the cylinder bores and pistons. The outer ends of the pistons c o nt a c t the ends of the brake shoes to transmit outward force to the brake shoes.

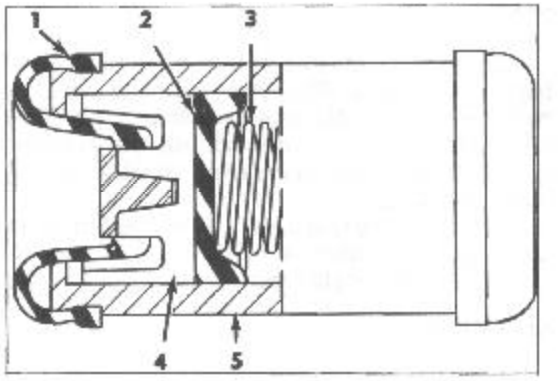

FIGURE 3

REMOVAL

1. Remove wheel and hub and drum assembly.
2. Disconnect brake hose at frame bracket.
3. Disconnect the brake shoe retracting spring.
4. Remove the two wheel cylinder to backing plate attaching screws.
5. Remove the wheel cylinder assembly with the flexible brake hose attached.

DISASSEMBLY

1. Remove the wheel cylinder end guards (1), Figure 3.
2. Remove brake cylinder pistons (4).
3. Remove the piston cups (2).
4. Remove the piston cup spring (3).

INSPECTION

Check the piston cups for frayed edges or swollen and distorted condition and the pistons for scores or scratches and pitting. Hone the cylinder bore if necessary to provide a smooth finish or replace as required.

ASSEMBLY

1. Wash the whee1 cylinder and all parts in clean alcohol.
2. Dip the parts in "Hudson Hydraulic Brake Fluid" for lubrication.
3. Assemble the spring (3), the piston cups (2), pistons (4), and guards (1).

To install the wheel cylinder on the car, reverse the steps of removal.

Tighten the screws attaching the wheel cylinder to the brake backing plate to 12 foot pounds torque using torque wrench J-1300.

WHEEL CYLINDER-REAR

REMOVAL

1. Remove the rear tire and wheel assembly.
2. Install Hub Puller J-736 and remove the hub and drum assembly.
3. Disconnect the wheel cylinder tube to wheel cylinder body.
4. Disconnect the brake shoe retracting spring using tool J-142 Brake Spring Pliers and remove the cable lever link.
5. Remove the two wheel cylinder to backing plate attaching screws.
6. Remove the wheel cylinder.

NOTE: For complete disassembly, inspection and assembly, follow the procedure as outlined for servicing the front wheel cylinders.

To install the wheel cylinder on the car, reverse the steps of removal.

Tighten the screws attaching the wheel cylinder to the brake backing plate to 12 foot pounds torque.

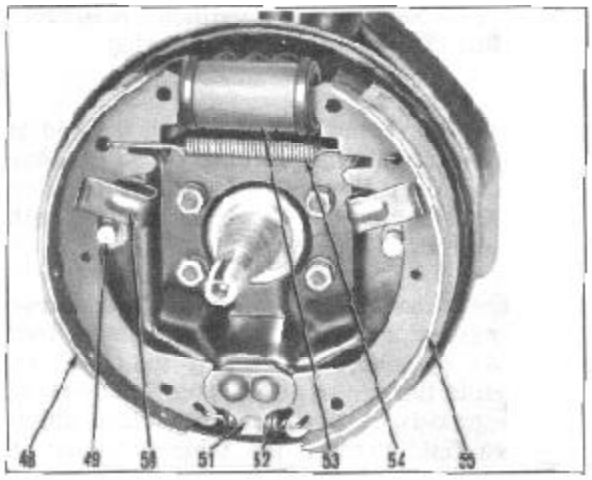

FIGURE 4

NOTE: The front brake assembly consists of the brake backing plate, Figure 4, the two brake shoes, wheel cylinder (53), brake shoe retracting spring (54), eccentric pins (49) and anchor spring (52).

DISASSEMBLY

1. Remove the wheel and hub and drum assembly.

2. Install Wheel Cylinder Clamp KMO-145 so to prevent the pistons or piston cups from being blown out if the brake pedal is depressed accidentally while the brake drum is off.

3. Remove the brake shoe retracting spring using brake Spring Pliers 1-142.

4. Remove brake shoes and disconnect the anchor spring.

5. Thoroughly c le an away all dust and rust and apply Lubriplate grease to the shoe ramps on the backing plate, shoe ends and all frictional points.

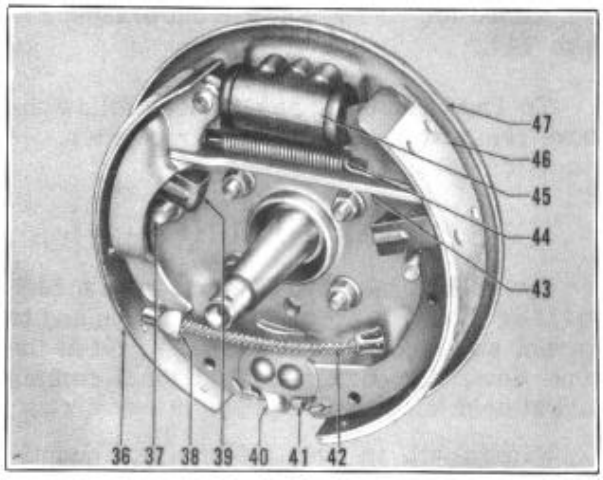

FIGURE 5

INSPECTION

Inspect the brake shoes for evidence of distortion and check to be sure that the lining is square with the brake drum surface.

Before installing the brake shoes, turn the eccentric pins inward as far as possible.

To install the brake shoes, reverse the steps of disassembly procedure.

REAR BRAKE

REMOVAL

1. Remove the rear tire and wheel assembly.

2. Install Hub Puller 1-736-A and pull the hub and drum assembly.

3. Install wheel cylinder clamp KMO-145.

4. Remove the brake shoe retracting spring (44), Figure 5, using brake Spring Pliers 1-142.

5. Remove the brake shoes (36) and (46), cable lever link (43), hand brake cable (42) and anchor spring (41).

6. Thoroughly clean off all dust and rust and apply Lubriplate grease to the shoe ramps on the backing plate, shoe ends and all frictional points.

INSPECTION

Follow the same steps of shoe inspection as outlined for servicing front brakes. See Page 140.

To install the brake shoes follow the above removal steps in the reverse order.

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.

Mineral oil, in even the smallest quantity, should never be used. The slightest trace of mineral oil will destroy the sealing qualities of the rubber piston cups in two or three days. Never wash any hydraulic brake parts in gasoline as the slight amount of mineral oil present in gasoline will affect the rubber parts.

To detect the presence of mineral oil in the fluid, place a small quantity in a clear glass bottle. Separation of the fluid indicates the presence of mineral oil.

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 as follows:

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 the left front wheel and proceed to the right front, left rear, and right rear if required.

CAUTION: Do not depress the brake pedal while the brake drums are removed, unless a b l e e d e r valve has been opened for bleeding brake lines. Remove dirt around master cylinder 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 the entire system with a good grade of clean alcohol.

1. Fill "Master Cylinder Filler Bottle J-713" with genuine "Hudson Hydrau1ic Brake Fluid".

2. Put nozzle in master cylinder reservoir. Open filler bottle valve before starting. This will keep master cylinder reservoir half full of fluid during the bleeding operation.

3. Remove the bleeder screw from the end of the bleeder valve and attach J-628 Bleeder Tube. Insert the free e nd of the bleeder tube into a clean pint jar partly filled with brake fluid.

4. Unscrew the bleeder valve at least three quarters of a turn and depress the foot pedal by hand, allowing the pedal to return to the released position slowly. This produces a pumping action which forces fluid through the tubing and out at the wheel c y 11 n d e r 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 the 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.

NOTE: 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 I-713 (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 over again at all four wheels.

When the bleeding operation is complete, the master cylinder must be refilled.

Check the fluid in the master cylinder every 1,000 miles.

BRAKE PEDAL

REMOVAL

1. Remove the nut and shakeproof washer holding the pedal rod to the brake pedal lever assembly.

2. Remove pedal rod using Pedal Puller Tool J-2795 and washer.

3. Remove the push rod clevis pin (28), Figure 1, disconnect the brake pedal pull back spring (21) and remove the master cylinder push rod (27).

4. Remove the brake pedal retaining snap ring from the pedal shaft, and remove the brake pedal.

Check brake pedal bushings and replace if excessively worn.

To reassemble the brake pedal, reverse the steps outlined above.

ADJUSTMENTS

BRAKE PEDAL ADJUSTMENT

The brake pedal lever (29), Figure 1, should have between 1/4" to 3/8" free play. (Measure at lower end of pedal lever (29.) The free play is the movement of the pedal lever before the master cylinder push rod (27) contacts the master cylinder piston.

This adjustment is important to assure that the master cylinder piston returns to its normal position, otherwise the brakes will drag.

To adjust, loosen the push rod lock nut and increase or decrease the length of the push rod (27) until this free play of 1/4" to 3/8" is obtained.

After correct adjustment has been obtained, tighten the push rod lock nut, lubricate the pedal linkage and recheck free play.

HAND BRAKE LEVER ADJUSTMENT

The hand or parking brake applies the rear wheel brakes by brake cables connected to the hand brake lever and the rear brake shoe cable levers.

To adjust the parking or hand brake, pull the hand brake lever one notch outward from the fully released position.

1. Loosen the clevis lock nut, Figure 1.
2. Remove clevis pin (22) and shorten the brake cable (7) until a slight drag is felt at each rear wheel.
3. Tighten the lock nut and install cotter pin to secure clevis pin (22).

Release the hand brake lever fully and recheck rotation of the rear wheels. They should turn without any brake drag.

MINOR BRAKE ADJUSTMENT

NOTE: Brake drums should be at approximately room temperature when making brake shoe adjustments. If brakes are adjusted when the drums are hot and expanded, the shoes may drag when the drums cool and contract.

The floating shoe type brake assembly has shoes that center them selves in the drums when the brakes are applied. Therefore, the brake linings wear uniformly and no major brake adjustments are required.

1. Jack up all wheels, clear of the floor.
2. Check and remove end play in wheel bearings if required.
3. Check to see that the parking brake lever is fully released and the cable is not tight causing the brakes to drag slightly.
4. Loosen the eccentric lock nut (A), Figure 6, on the rear of the backing plate.
5. Rotate wheel in forward direction and turn eccentric (B) downward until there is a heavy drag indicating complete lining contact with drum.

6. Back the eccentric (B) off until the shoe is free to rotate the wheel without touching the drum. Tighten lock nut (A).

7. The same procedure applies to the other 3 wheels.

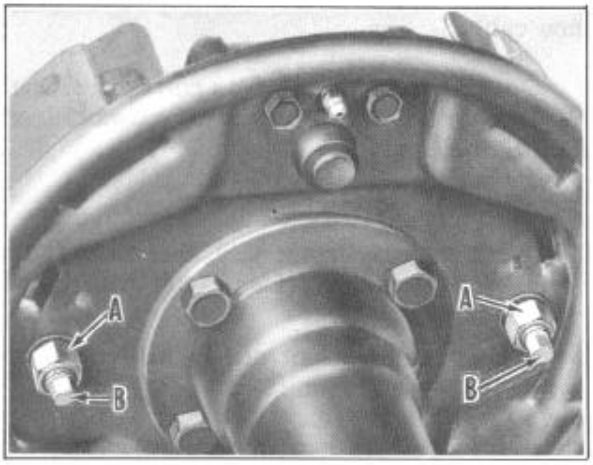

FIGURE 6

LUBRICATION

A thin film of Lubriplate grease should be placed on the brake shoe support ramp on the backing plate to combat rust and insure free brake shoe action.

NOTE: This lubrication should be done at the time of brake reline or adjustment, with hubs and drums removed and with brake cylinder clamps in place.

TO LUBRICATE BRAKE CABLES

1. Disconnect clevis (20), Figure 1 and support bracket (18) at frame rail.

2. Pull cable housing forward out of backing plate (snap-in type).

3. Lubricate cable as in Figure 7, with viscous chassis lubricant, working housing back and forth to distribute lubricant.

4. Push housing into backing plate and connect support bracket and clevis.

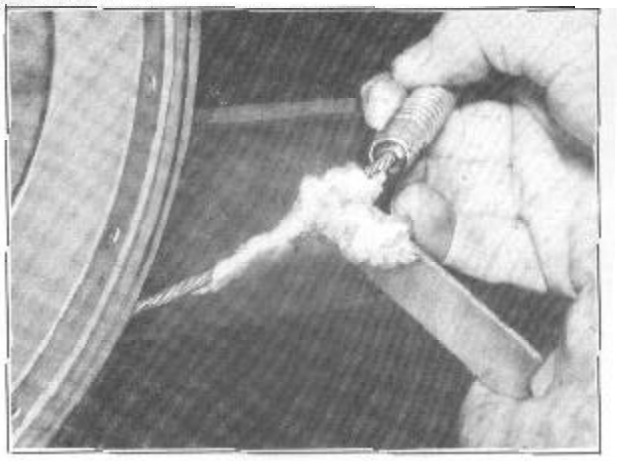

FIGURE 7

TROUBLE SHOOTING

BRAKE PEDAL GOES TO FLOORBOARD

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.

ALL BRAKES DRAG

1. Mineral oil in system.

2. Porthole in master cylinder is closed.

ONE BRAKE DRAGS

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.

BRAKE PEDAL ACTION SPRINGY OR SPONGY

1. Brake shoes improperly adjusted.

2. Air in hydraulic system.

SECTION 16
WHEELS AND TIRES
SPECIFICATIONS

Type	Super Cushion
Tire Size	15 x 5.90
	15 x 6.40
Wheel Sizes	15 x 4.00
	15 x 4.50
Inflation Pressure	
Front 15 x 5.90 24 lbs.	Rear 24 lbs.
	Rear 22 lbs.
Front 15 x 6.40 24 lbs.	

WHEEL AND TIRE BALANCE

The tires and wheels are balanced when they leave the factory, however, subsequent tire wear causes them to go out of balance. To prolong tire life, it is recommended that the wheel and tire assemblies be checked for balance every 2,500 miles and whenever a tire is removed for repair or after it has been recapped.

It is essential to maintain wheel and tire balance at all times to prevent uneven tire wear, high speed wheel tramp and excessive wear on front suspension and steering gear parts . Correct balance also contributes to ease of handling and riding comfort.

The tire side walls have a red dot to indicate where the valve stem is to be placed in order to maintain original balance.

BALANCING THE WHEEL AND TIRE

Wheel balance is the equal distribution f weight of the wheel and tire assembly around the axis of rotation (static balance) and through the center line of the wheel and tire (dynamic balance).

Wheel and tire assemblies must be balanced both statically Figure 1 and dynamically, Figure 2.

If the action of the front wheels causes a disturbance at the steering wheel, the first items to check are air pressure and balance of the front wheels and tires.

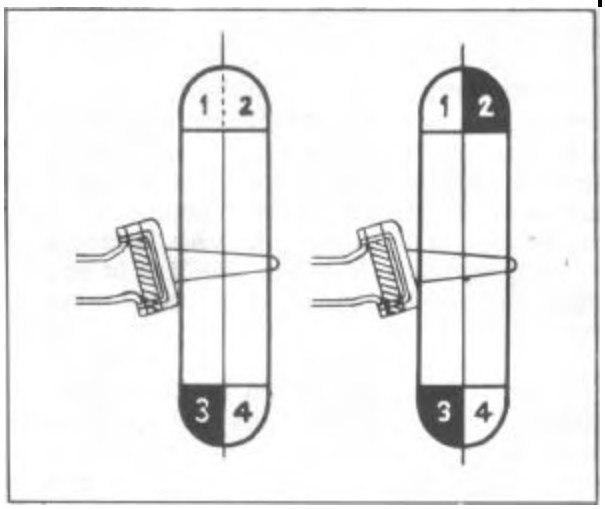

FIGURE 1

Wheels may be statically balanced on the steering spindle of the car, although the use of an accredited wheel balancing fixture will facilitate the operations.

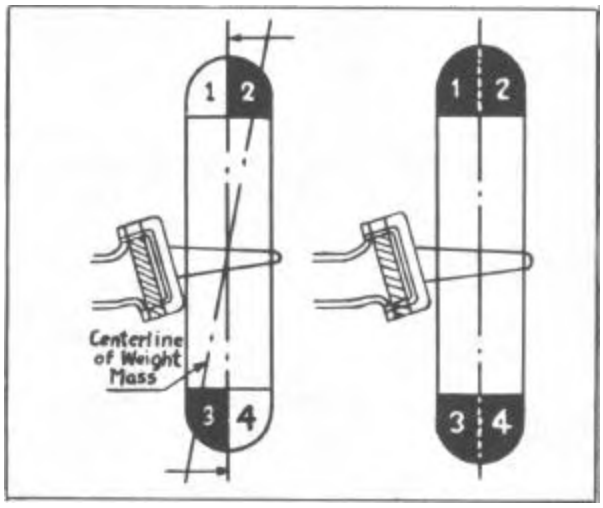

FIGURE 2

NOTE: If wheels are checked for balance on steering spindle - make sure brakes are fully released

and the front wheel bearings properly adjusted.

TIRE INFLATION

To obtain maximum tire life, ease of handling, riding comfort, and gasoline economy the tire air pressure should be checked once a week.

The air pressure in the tires will increase due to road contact and internal friction more so in hot weather and after hard driving. Air pre s s u re should always be checked when tires are cold to compensate for increase of pressure. Never reduce tire build-up pressure in a tire. The tire is so designed to handle the additional pressure safely.

Tire valve caps should be finger tight to prevent loss of air which may escape from a leaky valve, also to prevent dust and dirt getting into the valve. Replace any missing valve caps.

Too much tire pressure will cause tires to wear too fast in the center of the tread and will make it easier to break or bruise. Under inflation will cause rapid wear on the outer edges of the tread.

The correct tire pressures:

Size	Front	Rear
5.90 x 15	24 lbs. cold	24 lbs. cold
6.40 x 15	24 lbs. cold	22 lbs. cold

Tire wear is actually more rapid on rear tires and is more uniform than on front tires. The tire t re ad s are flexed in one direction while the engine is driving the car and in the opposite direction when brakes are applied; this action accounts for their even wear.

Tire rotation is very important to obtain maximum tire wear. Tires should be rotated every 3000 miles. The proper method would be to place the left front tire and wheel assembly on the le f t rear hub and move the right front tire and wheel assembly to the spare wheel position; place the right rear assembly on the left front hub and the left rear assembly to the right front hub. The spare wheel assembly will be installed on the right rear hub, Figure 3. Switching the tires in this manner changes their direction of rotation and equalizes the wear of 5 tires instead of 4.

Never be too hasty in diagnosing uneven tire wear as improper front wheel alignment.

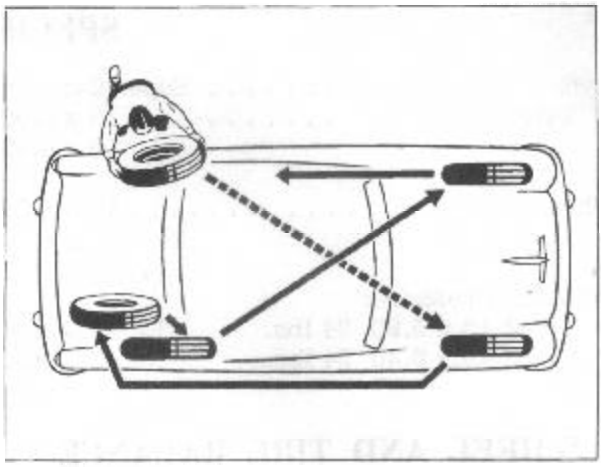

FIGURE 3

The following conditions should always be checked when uneven tire wear is present and in the order listed below:

1. Tire pressure
2. Wheel bearing adjustment
3. Brake adjustment
4. Wheel and tire balance
5. Front wheel alignment

WHEEL BEARINGS

Loose or worn wheel bearings, permitting the whee1 to wobble, will cause scuffing of tires or even permit brakes to drag intermittently.

FRONT WHEEL BEARING

ADJUSTMENT

1. lack up the wheel so it will revolve.
2. Remove outer and inner hub caps.
3. Remove cotter pin and turn adjusting nut to the right sufficiently to insure all parts are properly seated and then back off 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. Install new cotter key and clinch it.
6. Install inner and outer hub caps and lower car to the floor.

BRAKES

Dragging brakes and particularly with out-of-round drums will cause spotty tire wear. Be sure the brake backing plates are securely mounted to the spindles.

If any of the above checks fail to reveal the cause of unnatural tire wear a front end alignment check should be made.

WHEEL AND TIRE RUN-OUT

Wheel and tire assemblies which are eccentric or have excessive run-out will cause premature tire wear.

Lateral run-out or trueness f the wheel can be checked with a gauge and a piece 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 where the most run-out occurs and if it is found necessary to check caster and camber, the place where the chalk mark is should be placed toward the front f the car, and in checking tow-in the mark should be at top f the tire.

DISMOUNTING TIRES

The bumper jack provided with the tool kit may be used to remove the tires from the wheel rim as well as jack up the car. To do so proceed as follows:

1. With the wheel off; deflate tire completely.
2. Place wheel on ground or floor under the car bumper.
3. Arrange jack between bumper and tire and operate jack to force the tire bead down off the wheel rim.
4. If necessary to loosen inner bead turn wheel over and repeat operation.

Push valve stem into the tire. Insert two tire tools about eight inches apart between the bead and rim. Be careful not to pinch the tube. With one tool in position move the other tool around the rim removing the remainder of the bead, remove the tube.

Stand wheel in upright position with inner bead in rim well. Apply liquid soap around both sides f rim. Insert both tire tools between bead and rim and pry tire out f rim.

MOUNTING TIRES

Coat both beads with liquid soap to help slide them over the rim. Inflate tube just enough to round it out, then insert it into the tire. Place the tire on the wheel, carefully guiding valve stem into the hole in the rim. It may be necessary to force a small remaining portion f 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 rim. Leave tool in place and work other tool around bead and force remainder f bead over the rim. Be careful not to damage the tube with the tool.

Inflate tire slowly, carefully checking beads to see that both are seating properly on the rim. The tire may be centered by bouncing it a few times. Inflate tire to recommended pressures.

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 all hub bolts equally while wheel is clear of floor, then 1ower car to floor and retighten to specified torque. All hub bolts are right hand thread.

TORQUE SPECIFICATION

NAME	SIZE	FT. LBS.
Axle (rear) Differential Case Cap Screw	7/16-14	40-45
Axle (rear) Wheel Bearing Adjusting Cap	3/8-24	30-35
Axle (rear) Drive Gear Bolt	7/16-20	50-60
Axle (rear) Differential Carrier Bearing Cap Screw	1/2-13	55-65
Axle (rear) Drive Shaft Nuts	3/4-20	150-200
Battery Hold-Down Bolt Nut	5/16-24	2-3
Brake Shoe Eccentric Adjusting Nut	3/8-24	30-35
Brake Control Tube Nut	3/8-24	8-9
Clutch Release Lever Retainer	7/16-20	40-45
Clutch Cover Bolts	5/16-24	20-25
Clutch Housing Cap Screw	7/16-14	40-45
Clutch Housing to Cylinder Bolt	3/8-16	20-30
Clutch Housing to Cylinder Plate Bolt	3/8-24	30-35
Connecting Rod Bolt	3/8-24	40-45
Camshaft Gear Bolt	3/8-16	20-30
Crankshaft Bearing Cap Screw	1/2-13	75-80
Cylinder Head Cap Screws	7/16-14	75-80
Cylinder Support Plate Bolt	3/8-16	20-30
Cylinder Head Water Outlet Bolt	3/8-16	20-30
Diff. Carrier to Housing Bolt	3/8-24	35-40
Engine Mounting Bolt (rear)	7/16-14	40-50
Engine Mounting Bolt (front)	7/16-20	40-45
Engine Mounting to Frame Bolt (rear)	5/16-18	12-15
Flywheel Bolts	3/8-24	40-45
Front Frame Anchor Bracket Bolt	1/2-20	20-25
Gas Tank Strap Bolt (rear) Nut	5/16-18	4-6
Manifold (intake) Stud Nut	5/16-18	12-15
Manifold (exhaust) Stud Nut	3/8-16	20-30
Overdrive to Trans. Case Bolt	3/8-16	20-30
Oil Pan Bolt	5/16-18	15-20
Pinion Shaft Nut	3/4-20	125-175
Prop. Shaft "U" Bolts	5/16-24	20-25
Pedal Rod Nut	7/16-20	25-30
Rear Spring Clips	1/2-20	70-80
Shock Absorber (Rear) Stud (Lower) to Clip Plate Locking Nut	1/2-20	40-50
Shock Absorber (Rear) Stud (Upper) Bolt Nut	1/2-20	45-55
Spark Plugs	14 M.M.	25-30
Speedometer Housing Screw	5/16-18	15-20
Steering Arm (outer) Nut	3/4-16	110-120
Steering Arm (center) Nut	5/8-18	50-60
Steering Arm Center Pivot Support Bracket Bolt	7/16-20	45-50
Steering Gear Shaft Nut	7/8-14	125-140
Steering Gear to Frame Bolt	7/16-20	50-60
Steering Spindle to Backing Plate Bolt Nut	3/8-24	25-30
Steering Spindle Nut	11/16-18	75*
Steering Spindle Support Clamp Bolt	3/8-24	40-45
Steering Spindle Support Arm (Lower) Pivot to Frame Bolt	7/16-20	60-70
Steering Spindle Support Arm (Upper) Pivot to Frame Bolt	1/2-20	60-70
Steering Spindle Support Arm to Support Bolt Nut	13/16-11	100-120
Steering Wheel Nut	5/8-18	20-30
Tie Rod End Stud Nut	1/2-20	60-70
Timing Gear Cover Bolt	5/16-18	15-20
Vibration Dampener Screw	3/4-16	100-120
Water Pump to Cylinder Bolt	3/8-16	20-30
Water Pump Fan Blade Bolt	5/16-18	12-15
Wheel Hub Bolts	1/2-20	60-65

DECIMAL EQUIVALENTS										
64ths	32nds	16ths	8ths			64ths	32nds	16ths	8ths	
1				.015625		33				.51625
2	1			.3125		34	17			.53125
3				,046875		35				.546875
4	2	1		.0625		36	18	9		.5625
5				.078125		37				.578125
6	3			.9375		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				.296875		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	39	15		.9375
29				.453125		61				.953125
30	15			.46875		62	31			.96875
31				.484375		63				.984375
32	8	4		.5		64	32	16	8	1.

REFERENCE

Source of Information	Date	Subject