HUDSON

MECHANICAL PROCEDURE MANUAL

CAR YEAR MODELS 1942 TO 1947 INCL.

HETCS #311

FOREWORD

This Mechanical Procedure Manual is intended both as a guide and reference in the servicing of Hudson cars. (1942 thru 1947).

The Table of Contents and Index are placed at the front of the book for easy reference.

Pages are numbered consecutively, as are all illustrations.

The procedures given in this manual are comparable to procedures used in establishing time allowances for the Flat Rate Schedules. A study of the operations together with the tool equipment used in their performances will enable each Hudson Service Station to offer reliable service at a reasonable cost.

Warranty and Owner's Policy is fully covered in the General Service Policies Manual which should be referred to on any question of Owner, Dealer, Distributor or Factory responsibility.

This manual does not go into the details of pre-delivery, 1000 and 2000 mile inspections; however, particular attention should be paid to carrying out these inspections in accordance with the procedure given on the inspection cards which are available, from the factory.

Tools referred to or illustrated in this Manual have been developed through the cooperation of the Hudson Motor Car Company, Service Department with the Kent-Moore Organization, Detroit, Michigan and are sold direct by the Kent-Moore Organization to Hudson Distributors and Dealers at a minimum cost.

Special tools are developed only where it is found that such tools are essential to good workmanship or the time saving is sufficient to warrant the cost.

At the end of each section there are ruled spaces for inserting references to important articles as they appear in forthcoming issues of Service Bulletins.

All Service Bulletins should be filed in your Bulletin Binder for future reference.

CONTENTS

INDEX

Engine

Engine Tune-Up

Fuel System

Lubrication

Model Identification Data

Overdrive

MODEL IDENTIFICATION DATA

MODEL DESIGNATIONS

To simplify identification of the various models referred to in this Procedure Manual model reference will be made to series numbers listed below:

MODELS	SERIES 1942	1946	1947
Six	20T		
Six	20P		
Six Business Cars	20C		
Super Six	21	51	171
Commodore Six	22	52	172
Super Eight		53	172
Commodore Eight	24	54	174
Commodore Eight	25		
Commodore Eight	27		
Hudson Business Cars	28C		
3/4-Ton Commercial		58	178

BODY TYPES AND WEIGHTS

1942 MODELS

SIX 20T, 116" Wheelbase--Serial Numbers 20, 101 and upward. Engine - 6 Cylinder, 3" bore, 4-1/8" stroke, 21.6 A.M.A. HP, 175 cubic inches displacement.

3-Passenger Coupe	2795 lbs.
6-Passenger Club Coupe	2845 lbs.
2-Door Club Sedan	2895 lbs.
4-Door Sedan	2940 lbs.

SIX DELUXE 20P, Wheelbase, Serial Numbers and Engine same as 20T.

3-Passenger Coupe	2845 lbs.
6-Passenger Club Coupe	2900 lbs.
2-Door Club Sedan	2935 lbs.
4-Door Sedan	2975 lbs.
Convertible Sedan	3140 lbs.

SIX BUSINESS CARS 20C, Wheelbase, Serial Numbers and Engine same as 20T.

Cab Pickup	2915 lbs.
Utility Coupe	2900 lbs.
Utility Coach	2905 lbs.

SUPER SIX 21, 121" Wheelbase--Serial Numbers 21.101 and upward. Engine - 6 Cylinder, 3" bore, 5" stroke, 21.6 A.M.A. HP, 212 cubic inches displace-ment.

3-Passenger Coupe	2925 lbs
.6-Passenger Club Coupe	2895 lbs
.2-Door Club Sedan	3035 lbs
4-Door Sedan	3080 lbs.
Convertible Sedan	3200 lbs.
Station Wagon	3315 lbs.

COMMODORE SIX 22, 121" Wheelbase--Serial Numbers 22,101 and upward. Engine same as Super Six 21.

3-Passenger Coupe	2995 lbs.
6-Passenger Club Coupe	3055 lbs.
2-Door Club Sedan	3100 lbs.
4-Door Sedan	3135 lbs.
Convertible Sedan	3280 lbs.

COMMODORE EIGHT 24, 121" Wheelbase--Serial Numbers 24, 101 and upward. Engine - 8 Cylinder, 3" bore, 4-1/2" stroke, 28.8 A.M.A. HP, 254 cubic inches displacement.

3-Passenger Coupe	3120 lbs.
6-Passenger Club Coupe	3205 lbs.
2-Door Club Sedan	3245 lbs.
4-Door Sedan	3280 lbs.
Convertible Sedan	3400 lbs.

COMMODORE EIGHT CUSTOM COUPE 25, 121" Wheelbase--Serial Numbers 25,101 and upward. Engine same as Commodore Eight 24.

6-Passenger Club Coupe	3235 lbs.

COMMODORE EIGHT CUSTOM SEDAN 27, 128" Wheelbase--Serial Numbers 27,101 and upward. Engine same as Commodore Eight.

4-Door Sedan	3395 lbs.

SIX BIG BOY SERIES - 28C, 128" Wheelbase--Serial Numbers 28, 101 and upward.Engine same as Super Six 21.

Cab Pickup	3040 lbs.

1946 - 1947 MODELS

SUPER SIX Series 51 and 171, 121" Wheelbase. Engine - 6 Cylinder, 3" bore, 5" stroke, 21.6 A.M.A HP, 212 cubic inches displacement.

	1946	1947
4-Door Sedan	3085 lbs.	3110 lbs.
Brougham	3030 lbs.	3055 lbs.
3-Passenger Coupe	2950 lbs.	2975 lbs.
Club Coupe	3015 lbs.	3040 lbs.
Convertible		
Brougham	3195 lbs.	32201bs

COMMODORE SIX Series 52 and 172, 121" Wheelbase. Engine same as Series 51 and 171

4-Door Sedan	3150 lbs.	3175 lbs.
Club Coupe	3065 lbs.	3090 lbs.

3/4-TON COMMERCIAL Series 58 and 178, change wheel-base.
Engine same as Series 51 and 171

Cab Pickup	3080 lbs.	3110 lbs.

SUPER EIGHT Series 53 and 173, 121" Wheelbase. Engine -
8 Cylinder, 3" bore 4-1/2” stroke, 28.8 A.M.A HP, 254 cubic inches
displacement

4-Door Sedan	3235 lbs.	3260 lbs.
Club Coupe	3185 lbs.	3210 lbs.

COMMODORE EIGHT Series 54 and 174, 121" Wheelbase. Engine same as Series 52 and 173.

4-Door Sedans	3305 lbs.	3330 lbs.
Club Coupe	3235 lbs.	3260 lbs.
Convertible		
Brougham	3410 lbs.	3435 lbs.

SERIAL NUMBERING SYSTEM

1942 Cars

The car number plate is located on the right front hinge pillar and the first two figures of the car number denote the model. The succeeding figures comprise the actual serial number and these figures are in consecutive order regardless of Model.

Example - 20101 - 21102 - 27103.

First number is a Series 20,
Serial No. 101.
Second number is a Series 21,
Serial No. 102.
Third number is a Series 27,
Serial No. 103.

The engine number is the same as the car number and is located on the top of the Cylinder block, right side, between numbers one and two exhaust ports.

Car number plate is also stamped to indicate whether the car is a "T" (Traveler) "P" (DeLuxe) or "C" (Commercial).

When a Series 20 car is equipped with the 3" x 5" engine the
letter "L" will also be stamped in this space as TL, PL or CL.

1946-1947 Cars

Location of serial numbers for 1946 is the same as for 1942 models. First two digits of serial number are coded to the Series: e.g. 31101 indicates series 52 and 53 respectively. Location of serial numbers for 1947 is the same as for 1942 models. However,in this series the first three digits of the serial number ar coded to the series: e.g. 171101 indicates series 171 while 172101 and 173101 indicates series 172 and 173 respectively.

LUBRICATION

SCHEDULES

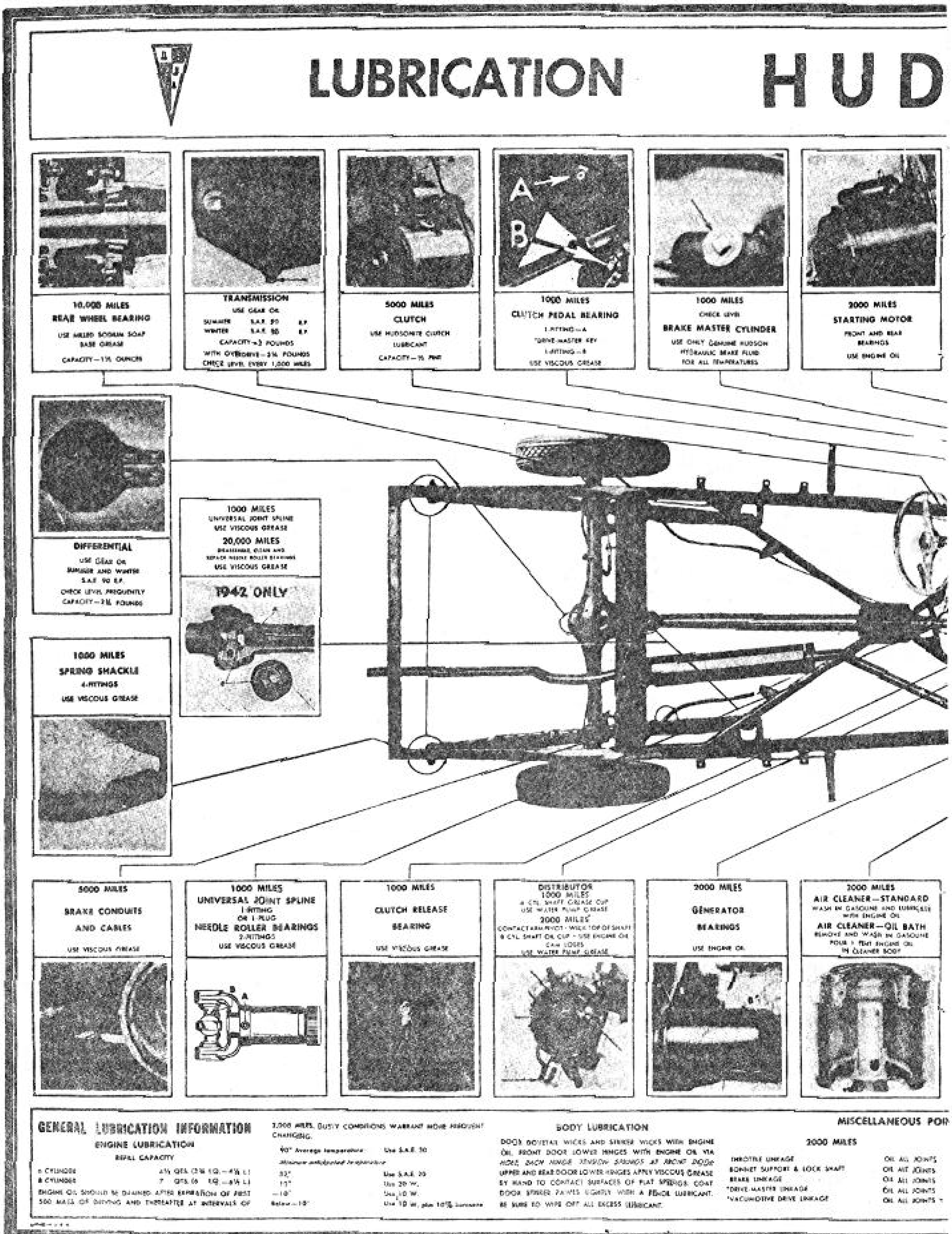
After First 500 Miles

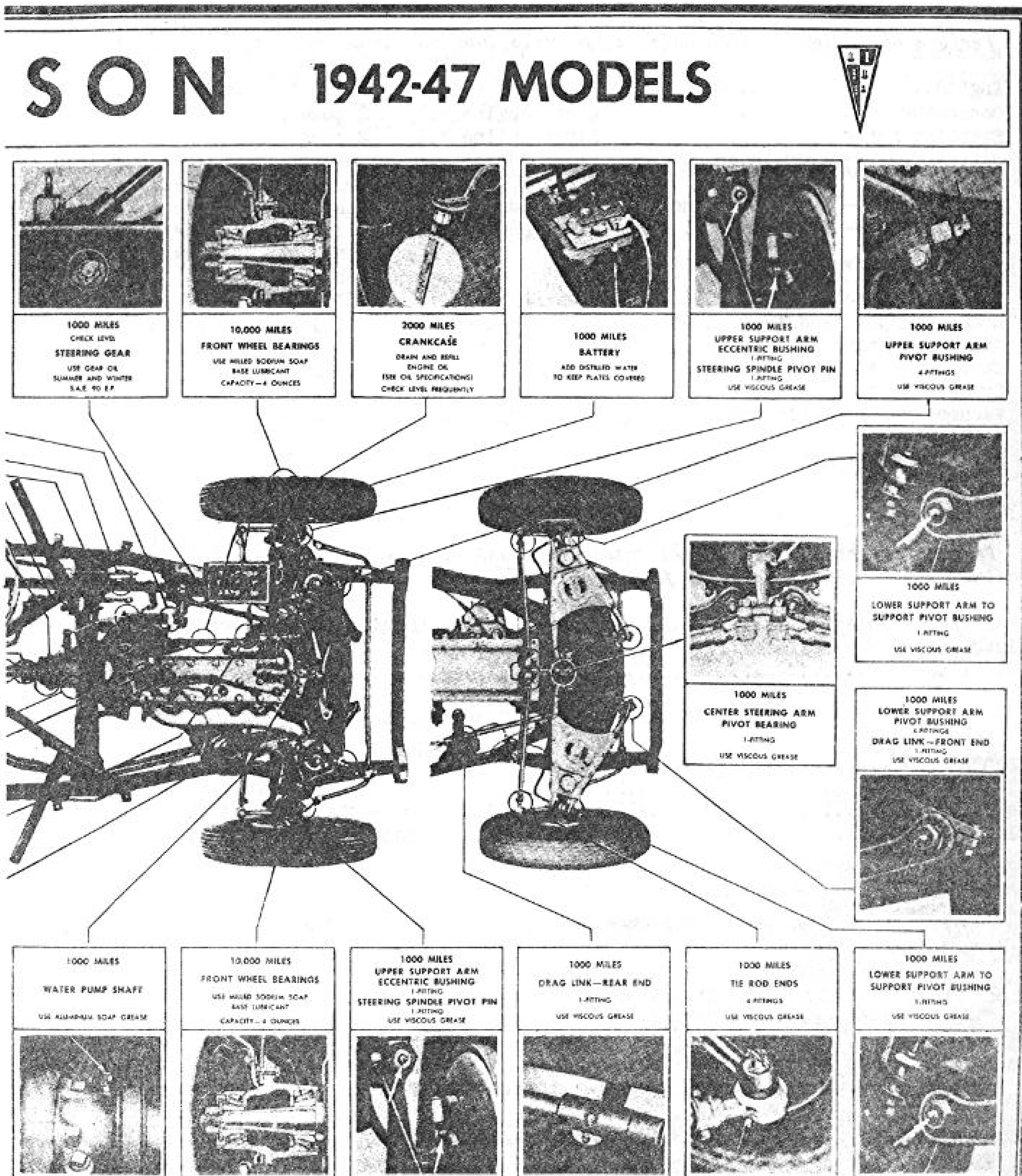
Engine Oil — Refer to "When to Change Engine Oil" Page 14

1,000 Miles

Upper Support Arm Eccentric Bushing	Viscous Chassis Lubricant	2 Fittings
Upper Support Arm Pivot Bushing	Viscous Chassis Lubricant	4 Fittings
Lower Support Arm to Support Pivot Bushing	Viscous Chassis Lubricant	2 Fittings
Lower Support Arm Pivot Bushing	Viscous Chassis Lubricant	4 Fittings
Spindle Pivot Pin	Viscous Chassis Lubricant	2 Fittings
Tie Rod Ends	Viscous Chassis Lubricant	4 Fittings
Steering Center Arm Bearing	Viscous Chassis Lubricant	1 Fitting
Drag Link	Viscous Chassis Lubricant	2 Fittings
Clutch and Brake Pedal Shaft Bushings	Viscous Chassis Lubricant	1 Fitting
* Drive Master Transfer Key Ball Joint	Viscous Chassis Lubricant	1 Fitting
Clutch Throwout Bearing	Viscous Chassis Lubricant	1 Fitting
Universal Joint Spline	Viscous Chassis Lubricant	1 Fitting
Universal Joint Roller Bearing Journals	Viscous Chassis Lubricant	2 Fittings
Rear Spring Rear Shackle Bushing	Viscous Chassis Lubricant	4 Fittings
Water Pump	Aluminum Soap Base Grease or other water resistant type	1 Fitting
Distributor 6 Cylinder Models	Water Pump Grease	Turn grease cup 1 turn
Front Door Lower Hinges	Light Engine Oil	Hole in each lower hinge
Tension Springs at Front Door Upper and Rear Door Lower Hinges	Viscous Chassis Lubricant	Apply by hand to flat contact surfaces
Door Dovetail and Striker	Light Engine Oil	Two places each door
Striker Pawls	Pencil Lubricant	Coat lightly

Engine	Check Oil level and add oil if necessary
Battery	Add water if level is less than 3/8" above plates
Radiator	Check water level and amount of anti-freeze
Transmission	Check level and add E.P. lubricant if necessary
RearAxle	Check level and add E.P. lubricant if necessary
Steering Gear	Check level and add E.P. lubricant if necessary
Brake Master Cylinder	Check level and add Hudsonite fluid if necessary


LUBRICATION
HUD
10,000 MILES
REAR WHEEL BEARING
USE MILLED SODIUM SOAP BASE GREASE
CAPACITY—1½ OUNCES
TRANSMISSION
USE GEAR OIL
SUMMER S.A.E. 90 E.P.
WINTER S.A.E. 80 E.P.
CAPACITY—3 POUNDS
WITH OVERDRIVE—3¼ POUNDS
CHECK LEVEL EVERY 1,000 MILES
5000 MILES
CLUTCH
USE HUDSONITE CLUTCH LUBRICANT
CAPACITY—½ PINT
1000 MILES
CLUTCH PEDAL BEARING
1-FITTING—A
DRIVE-MASTER KEY
1-FITTING—B
USE VISCOUS GREASE
1000 MILES
CHECK LEVEL
BRAKE MASTER CYLINDER
USE ONLY GENUINE HUDSON HYDRAULIC BRAKE FLUID FOR ALL TEMPERATURES
2000 MILES
STARTING MOTOR
FRONT AND REAR BEARINGS
USE ENGINE OIL
DIFFERENTIAL
USE GEAR OIL
SUMMER AND WINTER
S.A.E. 90 E.P.
CHECK LEVEL FREQUENTLY
CAPACITY—2¾ POUNDS
1000 MILES
UNIVERSAL JOINT SPLINE
USE VISCOUS GREASE
20,000 MILES
USE VISCOUS GREASE
1942 ONLY
1000 MILES
SPRING SHACKLE
4-FITTINGS
USE VISCOUS GREASE
5000 MILES
BRAKE CONDUITS AND CABLES
USE VISCOUS GREASE
1000 MILES
UNIVERSAL JOINT SPLINE
1-FITTING
OR 1-PLUG
NEEDLE ROLLER BEARINGS
2-FITTINGS
USE VISCOUS GREASE
1000 MILES
CLUTCH RELEASE BEARING
USE VISCOUS GREASE
DISTRIBUTOR
1000 MILES
6 CYL. SHAFT GREASE CUP
USE WATER PUMP GREASE
2000 MILES
CONTACT ARM PIVOT · WICK TOP OF SHAFT
8 CYL. SHAFT OIL CUP · USE ENGINE OIL
CAM LOBES
USE WATER PUMP GREASE
2000 MILES
GENERATOR BEARINGS
USE ENGINE OIL
2000 MILES
AIR CLEANER—STANDARD
WASH IN GASOLINE AND LUBRICATE WITH ENGINE OIL
AIR CLEANER—OIL BATH
REMOVE AND WASH IN GASOLINE
POUR 1 PINT ENGINE OIL IN CLEANER BODY
GENERAL LUBRICATION INFORMATION
ENGINE LUBRICATION
REFILL CAPACITY
6 CYLINDER 4½ QTS.
8 CYLINDER 7 QTS.
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
32° Use S.A.E. 20
10° Use 20 W.
—10° Use 10 W.
Below—10° Use 10 W. plus 10% kerosene
BODY LUBRICATION
DOOR DOVETAIL WICKS AND STRIKER WICKS WITH ENGINE OIL. FRONT DOOR LOWER HINGES WITH ENGINE OIL VIA HOLE, EACH HINGE. TENSION SPRINGS AT FRONT DOOR UPPER AND REAR DOOR LOWER HINGES APPLY VISCOUS GREASE BY HAND TO CONTACT SURFACES OF FLAT SPRINGS. COAT DOOR STRIKER PAWLS LIGHTLY WITH A PENCIL LUBRICANT. BE SURE TO WIPE OFF ALL EXCESS LUBRICANT.
MISCELLANEOUS POI
2000 MILES
THROTTLE LINKAGE OIL ALL JOINTS
BONNET SUPPORT & LOCK SHAFT OIL ALL JOINTS
BRAKE LINKAGE OIL ALL JOINTS
*DRIVE-MASTER LINKAGE OIL ALL JOINTS
*VACUMOTIVE DRIVE LINKAGE OIL ALL JOINTS



ITS—USE HAND OILER

10,000 MILES

ON CARS WITH POWER CYLINDER USED AS PART OF *DRIVE-MASTER OR *VACUMOTIVE DRIVE, INSERT ONE OUNCE OF HUDSON SHOCK ABSORBER FLUID THROUGH PIPE PLUG HOLE.

*OPTIONAL EQUIPMENT.

SPRING COVERS 10,000 MILES

IF FABRIC COVERS REMOVE AND REPACK. IF METAL COVERS LUBRICATE THROUGH HOLE IN BOTTOM USING SPECIAL TOOL.

USE VISCOUS CHASSIS LUBRICANT

TIRE PRESSURES

MAINTAINING CORRECT TIRE PRESSURE IS ESSENTIAL TO OBTAIN MAXIMUM TIRE LIFE.

CHECK PRESSURES AND INFLATE TO FOLLOWING PRESSURES AT LEAST ONCE A WEEK.

SIZE	FRONT HOT	FRONT COLD	REAR HOT	REAR COLD
6.50 x 16	26 lbs.	28 lbs.	40 lbs.	44 lbs.
All other sizes	26 lbs.	28 lbs.	30 lbs.	33 lbs.

IF CAR HAS BEEN STANDING FOR SOME TIME AND TIRES ARE COOL, INFLATE TO COLD PRESSURES. IF TIRES ARE WARM FROM RUNNING, INFLATE TO HOT PRESSURES.

COOLING SYSTEM

CHECK WATER LEVEL FREQUENTLY

IN WINTER CHECK ANTI-FREEZE STRENGTH.
CAPACITY OF COOLING SYSTEMS IS AS FOLLOWS:

6 CYLINDER	13 QTS. [illegible]
8 CYLINDER	18 QTS. [illegible]

2,000 Miles

Perform operations listed under 1,000-mile lubrication addition to the following:

Engine	Drain and refill	Refer to page 14
Generator	Light engine oil	2 cups
Starting Motor	Light engine oil	2 cups
Distributor -- 6 cylinder	Light engine oil	Contact arm pivot one drop, wick in rotor shaft 5 drops
Distributor -- 6 and 8 cylinder	Water pump grease	Cam lobes, light coating
Distributor -- 8 cylinder	Light engine oil	Fill cup, contact arm pivot one drop, wick in rotor shaft 5 drops
Throttle Linkage	Light engine oil	All joints
Bonnet Support and Lock Support	Light engine oil	All joints (8 places)
Brake Operating Linkage	Light engine oil	All joints (9 places)
Carburetor Air Filter	Engine oil	Clean and refill
* Drive-Master Linkage	Light engine oil	All joints
* Vacumotive Drive Linkage	Light engine oil	All joints

* Optional Equipment

5,000 Miles

Perform the operations listed under 1,000 and 2,000-mile lubrication (except change engine oil) in addition to the following:

Rear Brake Cables	Viscous Chassis Lubricant	Coat cable
Distributor -- 6 Cylinder	Water Pump Grease	Fill grease cup
Oil Filter		Install new cartridge

Drain and Refill These Units:

Transmission	S.A.E. 90 E.P. Summer	Standard-2 lbs
	S.A.E. 80 E.P. Winter	Overdrive 3-1/4 lbs.
Rear Axle	S.A.E. 90 E.P. Summer or Winter	2-3/4 lbs
Clutch	Hudsonite Clutch Compound	1/3 pint

10,000 Miles

Perform the operations listed under 1.,000, 2,000 and 5,000-mile lubrication in addition to the following:

Front Wheel Bearings	Milled Sodium Soap Base Lubricant	4 ounces per wheel
Rear Wheel Bearings	Milled Sodium Soap Base Lubricant	1-1/2 ounces per wheel
Spring Covers	Viscous Chassis Lubricant	Rear only
Vacumotive Drive or Drive-Master Cylinder	Hudson Shock Absorber Fluid	1 ounce

20,000 Miles

Perform the operations listed under 1,000, 2,000, 5,000 and 10,000-mile lubrication in addition to the following:

Universal Joint Bearings, 1942 only	Viscous Chassis Lubricant	2--repack

Miscellaneous Points

OIL LEVEL BAYONET GAUGE. This gauge located on the side of the engine away from the valve tappets has two stamped lines which divide the gauge into the Oil Level Range and the Low Range. For high speed driving the oil supply should be maintained at the top mark. There is sufficient oil in the engine for ordinary driving, whenever the level is above the lower mark.

Two and one-half quarts of oil are required to restore the level from LOW to FULL in both six and eight Cylinder engines.

OIL PAN. All of the engine oil passes through the oil pan and screen before reaching the oil pump. The combination of oil screening and settling by gravity, provided by this design considerably reduces the tendency of gritty particles to be carried into the bearings.

Cleaning of oil pan and screen is recommended at 10,000-mile intervals or at any other time during which the oil pan is removed for accomplishment of other work. The cleaning operation is especially important where the engine is operated in dusty territories.

BODY HARDWARE. After lubricating any body hardware at or adjacent to the doors, be sure to wipe off excess lubricant.

The lower hinges on front doors are provided with oil holes which are accessible when the door is open. Use light engine oil at 1,000-mile intervals.

No facilities are provided for field lubrication of the concealed type hinges which are provided with oil-less bushings. Concealed hinges at the upper location on front doors and lower location on rear doors, incorporate tension springs made of sheet steel which function to hold the door from self-closing when opened. A small amount of viscous chassis lubricant should be hand applied to the hinge contacting surfaces of these springs at 1,000-mile intervals.

The door dovetail wicks (B) Fig. 2, should receive a few drops of light engine oil at 1,000-mile intervals.

The door striker pawls (C) should be lubricated at 1,000-mile intervals, using a stick or pencil type solid lubricant.

BONNET AND BRAKE LINKAGE. The bonnet support and bonnet lock support and all joints in the bonnet operating linkage should receive a few drops of light engine oil at 2,000-mile intervals. Apply light engine oil to all clevis pin joints in brake pedal linkage at sane intervals.

BRAKE CABLES. Coat the cables with viscous chassis lubricant at 5,000-mile intervals. Apply with brakes in the fully applied position.

CLUTCH. This unit should be drained and refilled with the special Hudsonite Clutch Compound at 5,000-mile intervals. Refill capacity is 1/3 of a pint.

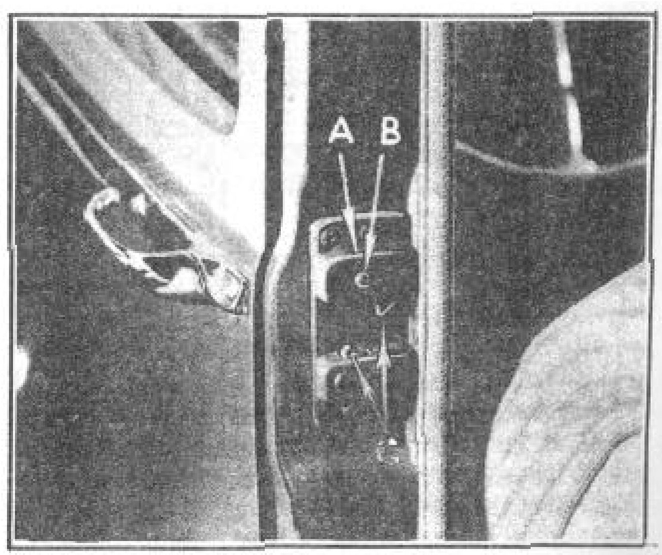


Figure 2
Door Look Oiling Points

To drain the clutch, rotate crankshaft until hexagon head plug in front face of flywheel appears in timing inspection port above the starter motor. Remove the plug, then rotate crankshaft until plug hole is at lowest point. Lowest point is indicated when first star stamped on flywheel face comes into register with pointer at timing inspection port. After clutch has drained, rotate flywheel until plug hole reappears at inspection port then insert 1/3 of a pint of Hudsonite Clutch Compound. Reinstall the plug. The stamped flywheel guard need not be disturbed in performing this work but the drain hole in same must be kept open.

NOTE: On complaints of grabbing or sticking in the engaged position, flush the clutch for 10 to 15 minutes at idling speeds with a solution of 80% tetrachloride of carbon 20% acetone before inserting Hudsonite. Operate pedal at least 50 tines during the flushing period to assist cleaning action of the solvent.

DISTRIBUTOR. Lubrication of the drive shaft on 6 Cylinder models is by means of a grease cup, whereas on the 8 Cylinder units, the shaft is lubricated by an oil cup. Except for these differences, lubrication of both types is similar.

At intervals of 1,000-miles, turn the grease cup one full turn on 6 Cylinder models.

At intervals of 2,000-miles, apply on all models, one drop of light engine oil to contact arm pivot, and 4 or 5 drops to wick in top of shaft under the rotor. Apply thin coating of aluminum soap base high melting-point water pump grease to cam lobes. On 8 Cylinder models, fill the shaft oil cup with light engine oil.

GENERATOR. Use light engine oil, preferably of zero pour test. Insert not more than 3 drops into each oil cup at 2,000-mile intervals.

STEERING GEAR. Lubricant level should be checked twice yearly or every 5,000 miles, and maintained at a level even with the bottom of the filler plug hole boss. There is no necessity for draining and refilling except when the unit is disassembled for repairs. Use SAE 90 extreme pressure gear oil.

THROTTLE CONTROL, VACUMOTIVE AND DRIVE MASTER. LINKAGE. Apply light engine oil to all joints in the linkage at 2,000-mile intervals. On cars with Drive-Master also insert viscous chassis lubricant into fitting on transfer key ball joint at 1,000 mile intervals.

TRANSMISSION AND REAR AXLE. These units should be drained and refilled in the spring and fall or at 5,000-mile intervals, using extreme pressure gear oil. Refer to Lubricant Specifications for data on recommended lubricant.

UNIVERSAL JOINTS. Provision is made on all models for gun lubrication of the slip splines of the front joint. On all 1942 models and early 1946 cars this provision is a pipe plug on the front joint, whereas late production 1946 and 1947 cars carry a Zerk fitting at the same location.

The 4, roller type journal bearings on 1946 and 1947 cars are lubricated directly at 1,000-mile intervals by means of a lubrication gun applied to a grease fitting at each joint. On 1942 cars the similar bearings should be lubricated by disassembly and hand repacking at 20,000 mile intervals. Use viscous chassis lubricant on all models.

WATER PUMP. This unit should be lubricated with an aluminum soap base grease of high melting point or other suitable high melting point water resistant grease every 1,000 miles. The same grease should be used on the distributor cam lobes. Refer to Lubricant Specifications for data on recommended grease.

WHEEL BEARINGS. Front and rear wheel bearings should be removed, cleaned and repacked with milled sodium base grease at 10,000-mile intervals. Four ounces of grease are required for each front wheel hub and 1-1/2 ounces for each rear wheel bearing. Refer to Lubricant Specifications for data on approved grease.

OIL DILUTION

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

The Hudson engine is equipped with the following automatic devices that are designed to reduce oil thinning caused by raw fuel dilution:

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

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

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

GRADE OF OIL TO USE

Oil companies have adopted the viscosity number system which classifies lubricants in terms of viscosity fluidity. The oils with the lower numbers are lighter and flow more readily than do the oils with higher numbers. The SAE number refers only to the viscosity of the oil and has no reference to any other characteristic or properties.

The temperature of the atmosphere which the automobile is to be operated dictates the viscosity designation best suited for the occasion. Viscosity commendations applying to all models shown in Fig. 3.

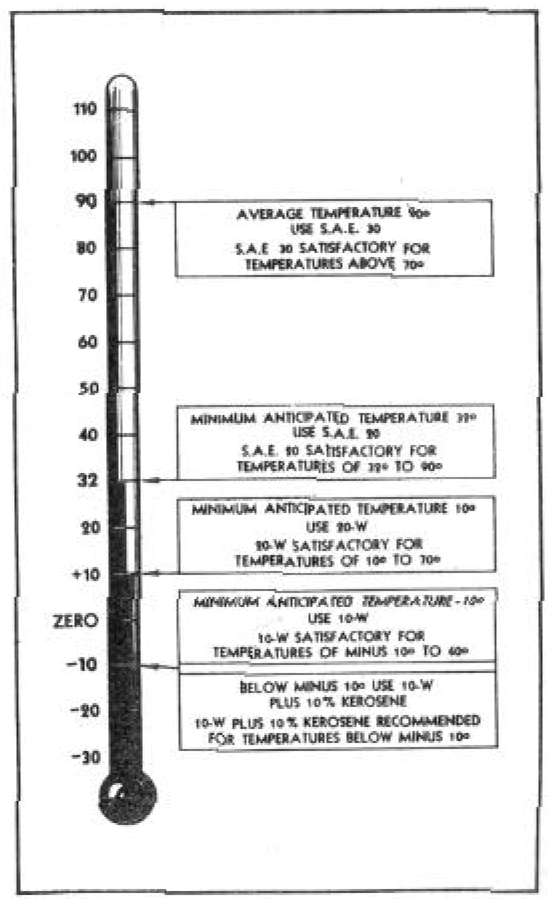


Figure 3
Engine Oil Recommendations

Select the viscosity on the basis ofthe PROBABLE MINIMUM temperature which may be encountered before the next oil change.

During the winter months the selection of crankcase oil should be based on easy starting qualities. The quality brand engine oils are good lubricants at all engine temperatures. It should be remembered however that for high speed driving or driving in hot weather, the amount consumed may be somewhat less if heavier oils are used.

SPECIAL BREAK-IN OILS. These lubricants which usually contain graphite or oil concentrates are not necessary during the breaking-in period.

A light viscosity oil is put in the engine of cars DRIVEN overland from the factory and need not be removed until the first 500 miles of driving has been completed.

CAUTION: Engine oil is drained from the crankcase of all cars SHIPPED IN FREIGHT CARS. A red instruction tag attached to a knob on the instrument panel gives this information.

WHEN SHOULD OIL BE CHANGED

Improved oils, changed driving conditions, and improvements in engines, such as the crankcase ventilating system, have greatly lengthened the life of good lubricating oils. However, to insure continuation of best performance, low maintenance cost and long engine life, it is necessary to change the crankcase oil whenever it becomes contaminated with harmful foreign materials. Under normal driving conditions draining the crankcase and replacing with fresh oil every 2,000 miles should be satisfactory. Under adverse conditions it may become necessary to drain the crankcase oil more frequently.

Driving over dusty roads or through dust storms introduces abrasive material into the engine. Air cleaners decrease the amount of dust that may enter the crankcase; however, if oil becomes contaminated, it should be drained promptly to prevent harmful engine wear. The frequency of draining depends upon conditions and no definite draining periods can be recommended.

Short runs in cold weather, such as city driving, do not permit thorough warming up of engine and water may accumulate in crankcase from condensation of moisture produced by burning of fuel. Under normal driving conditions this water is removed by crankcase ventilator. If water accumulates, it should be removed by draining crankcase as frequently as required.

During winter months light or low viscosity oils are required to obtain easy starting. Therefore, at beginning of winter season, crankcase should be drained and refilled with oil of proper viscosity for winter use. On continuous hard driving, these light oils may thicken and cause starting trouble. More frequent oil changes may therefore be required during winter months, and a drainage period of 1,000 miles for cars subjected to high speed driving conditions may be desirable, but, under very severe conditions, more frequent draining may be required to prevent starting troubles due to thickened oil.

It is always best to drain crankcase after engine has reached normal operating temperature. The benefit of draining is to a large extent lost, if crankcase is drained when engine is cold, as some of the suspended foreign material will cling to the sides of oil pan and will not drain out readily with slower moving oil.

SPECIAL LUBRICANT SPECIFICATIONS

It is recommended that Hudson dealers take advantage of the experience and knowledge of the Hudson engineering staff by requesting that the lubricants they purchase meet the tests and specifications listed herewith.

Aluminum Soap Grease

(USE FOR WATER PUMP BEARINGS AND DISTRIBUTOR CAM LOBES)

Aluminum soap	7.50-8.50%
Mineral oil*	Remainder
Saybolt viscosity of oil at 100° F	400-450 seconds
Pour test of oil	0° F. or under

Grease characteristics:

Free fatty acids	0.3% maximum
Moisture	None
Ash	1.5%
Separating Joint	425° F. minimum

Above grease must be a smooth uniform product free from fillers and grit. It must not separate under ordinary conditions of usage and must be free from offensive odors.

Milled Sodium Soap Grease

(USE FOR WHEEL BEARINGS)

Sodium Soap	19-20%
Mineral oil.	Remainder
Saybolt viscosity of oil at 210° F	100 seconds
Pour test of oil	0º or under
Free fatty acids	0.3% maximum
Moisture	Trace
Ash	2.0% maximum
Penetrometer (worked consistency)	280-310
Melting point	300° F. plus

Above grease should be smooth, non-fibrous, uniform and free from fillers and grit. It must not separate under ordinary conditions of operation, must be free from offensive odors and must show negative on the copper strip corrosion test.

Extreme Pressure Gear Oil

(USED FOR TRANSMISSION, REAR AXLE AND STEERING GEAR)

Summer--S.A.E. 90 E.P.		Winter--S.A.E. 80-E.P.
400° F. Minimum	Flash point	350° F. Minimum
450° F. Minimum	Fire point	400° F. Minimum
+20° F. Maximum	Pourpoint	-10° F. Maximum
125-150 Seconds	Saybolt Viscosity at 210° F.	75--85 Seconds
Not greater than 15 times the viscosity at 210° F.	Saybolt Viscosity at 100º F	Not greater than 9 times the viscosity at 210° F.
Nil	Free Sulphur	Nil
.5% Maximum	Ash	.3% Maximum
Nil	Free Acids	Nil
Nil	Water	Nil
Smooth, free from bubbles	Appearance.	Smooth, free from bubbles

The base for this lubricant may consist of combined sulphur and saponifiable oils, free from fatty acids. This lubricant must be non-corrosive and non-abrasive. A polished copper strip when immersed in the lubricant to which has been added 5% of water must not show any corrosion beyond a slight discoloration of the copper when heated to 200° F. for 3 hours.

LUBRICANT CAPACITIES

Engine Oil Pan

Dry

Model	Dry U.S.Qts.	Imp. Qts.	Litres
6 Cyl	5-1/2	4-1/2	5-1/4
8 Cyl	9	7-1/2	8-1/2
	Refill		
6 Cyl	4-1/2	3-3/4	4-1/4
8 Cyl	7	5-3/4	6-1/2

Clutch

Model	Pints	Imp. Pints	C. C.
All	1/3	1/4	160

Transmission

Without Overdrive

Model	Lbs.	Kgs.
All	2	0.91
	With Overdrive	
All	2-3/4	

Rear Axle

Model	Lbs.	Kgs.
All	2-3/4	1.25

REFERENCES

Source of Information	Date	Subject

ENGINE TUNE-UP

Engine tune-up can be either a major tune-up with a complete carburetor adjustment or a minor tune-up which. does not require a complete electrical and fuel check.

A complete engine tune-up every 5,000 miles will maintain the best engine performance and give the utmost in gasoline economy.

MINOR TUNE-UP

There are many cases when an adjustment of ignition or carburetion for idling is all that is necessary to return the engine to proper performance. A complete minor tune-up should include the following work.

Regap Spark Plugs

After cleaning the spark plugs, adjust the gaps to .032 inch using a wire type feeler for gauging. Never bend the center electrode.

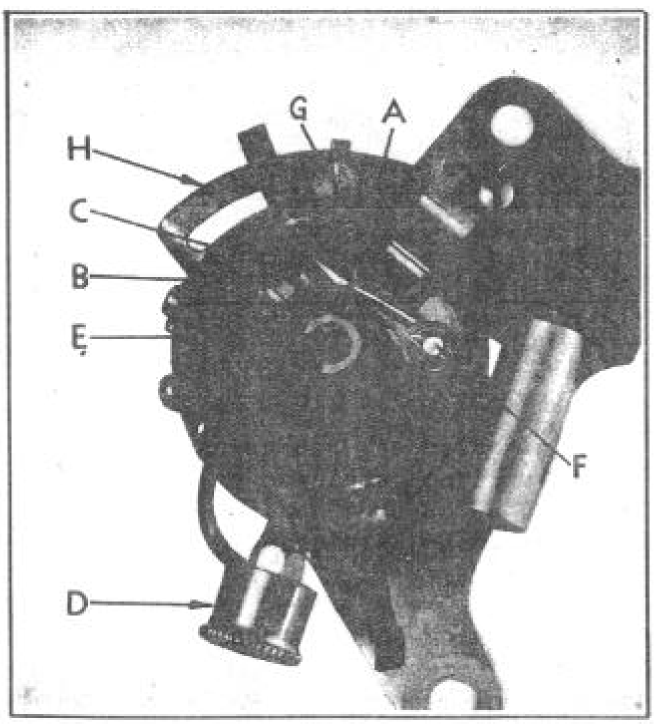


Figure 4
Breaker Point Adjustment - 6 Cylinder

Adjust Breaker Contacts

Recommended gap at contacts is .020 inch for 6 Cylinder distributors, .017 inch for 8 Cylinder models, measured preferably with a wire type feeler gauge.

Contacts should be in full register when closed. If dirty they should be cleaned with tetra-chloride of carbon

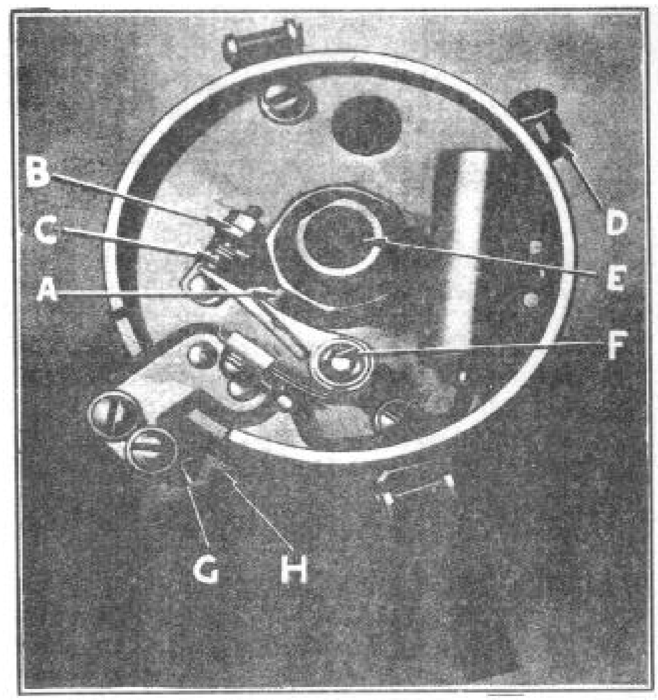


Figure 5
Breaker Point Adjustment - 8 Cylinder

or unleaded gasoline. If contacts are pitted or burned install new ones. Contact face roughness may be corrected by using a thin, flat, Carborundum hone.

To adjust gap, first turn crankshaft until cam follower, portion (A) of contact arms Fig. 4 or 5, is on the highest point of one of the cam lobes. Loosen lock nut (B) and turn adjusting screw (C) until recommended gap is obtained. Recheck the gap after tightening the lock nut, until contact arm fiber cam follower (A) Figs. 4 or 5 is on highest point of cam, then loosen lock nut (B) and turn adjusting screw (C) until proper gap is obtained. Recheck the gap after tightening the lock nut.

Timing The Ignition

SETTING THE CRANKSHAFT. Preparatory to setting or timing the distributor, set the crankshaft in timing position. This is accomplished with the spark plugs removed by pressing the small button under the screw cap at one end of the starter solenoid in quick successive movements while closing off the No. 1 spark plug hole with a finger. Crank in this manner until air pressure against the finger indicates that the piston is coming up on the compression stroke.

Now continue to crank slowly on 6 Cylinder engines until the 2nd of the 4 short marks ahead of the long U.D.C. 1-6 mark on flywheel face is aligned with the pointer at the inspection hole in support plate above the starter motor or, on 8 Cylinder engines, until the long mark at U.D.C. 1-8 is aligned with pointer.

NOTE: The 4 short marks preceding the long U.D.C. mark are spaced 1/4 of an inch or 2-2/3 - 3 degrees apart. When using premium grade 78 or higher octane fuels. the timing may be advanced somewhat but in no case should it be more than 12 degrees early (on first short mark) on Sixes, or 9 degrees early (2nd short mark) on 8 Cylinder models.

DISTRIBUTOR SETTING 6 Cylinder. This distributor is driven anti-clockwise. Loosen the distributor advance diaphragm arm screw (G) Fig. 4 and rotate the distributor housing anti-clockwise to the limit of the slot in the quadrant (H). Remove the central cable from distributor cap and place the bare end 1/8" from the Cylinder head. With the ignition turned on and the 2nd short mark ahead of the long U.D.C. 1-6 mark on flywheel aligned with pointer at the inspection hole, rotate the distributor body clockwise slowly, to, and not beyond that point where a spark jumps from the high tension wire to the Cylinder head. Tighten screw (G) and replace the central cable in the distributor cap and clamp the cap on the distributor. When the distributor cap is in place, the metal strip on the rotor arm should be directly in line with the terminal to which number one spark plug is attached. The other cables should be in the cap terminals in the order 1-5-3-6-2-4 following in an anti-clockwise direction.

DISTRIBUTOR SETTING 8 Cylinder. This distributor is driven clockwise. Loosen the distributor clamp screw (G) Fig. 5 and rotate the distributor housing clockwise to the limit of the slot in the clamping plate (H). Remove the center cable from the distributor cap and place the bare end 1/8" from the intake manifold. With the ignition "on" and the U.D.C. 1-8 mark in line with the pointer on the inspection hole, rotate the distributor body anti-clockwise slowly, to and not beyond that point where a spark jumps from the high tension wire to the manifold. Tighten the clamp screw (G) and replace the central cable in the distributor cap and clamp the cap on the distributor. When the distributor cap is in place, the metal strip on the rotor arm should be directly in line with the terminal to which number one spark plug is attached. The other cables should be in the cap terminals in the order named, 1-6-2-5-8-3-7-4, following in a clockwise direction.

Visual Check of Plug Wires

Make sure that all high tension wires are pressed down securely into their sockets in the distributor cap and ignition coil. Insulation on wires must be in good condition and no corrosion should be permitted to exist at the wire ends or in the distributor cap and coil sockets.

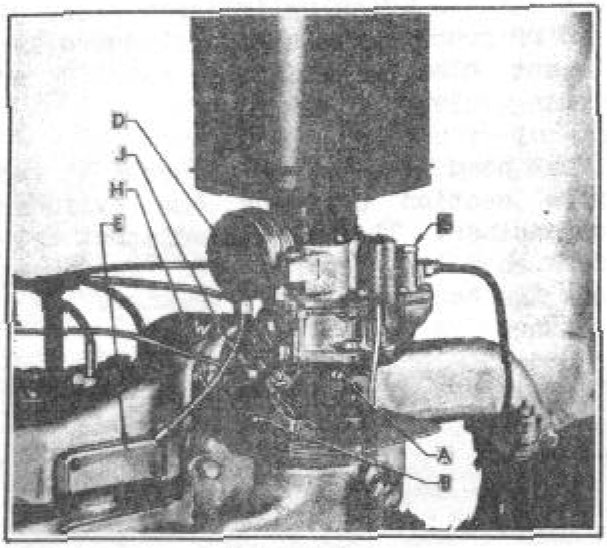


Figure 6
Idling Adjustment Single Carburetor

Carburetor Idle Adjustments

Start the engine and allow it to warm to normal operating temperature.

IDLE MIXTURE. On engines using the single screw type carburetor, turn the idling (A) Fig. 6. clockwise into its and then out (anti-clockwise) exactly one turn, Readjust for smooth idling. The final adjustment should be from 1/2 to 1-1/2

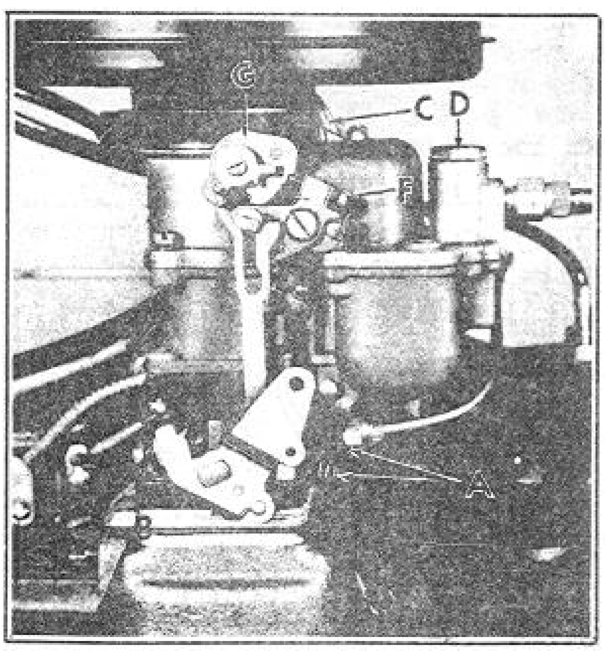


Figure 7
Idling Adjustment Duplex Carburetor

turns of the screw from its full "in" position.

On engines using the duplex type of carburetor, turn both idling adjusting screws (A) Fig. 7, clockwise into their seats alternately and back out (anticlockwise) 3/4 of a turn. Readjust for smooth idling. The final adjustment of the two idling screws should be from 1/2 to 1-1/2 turns out from their full "in" position.

THROTTLE STOP SCREW. Adjust the throttle stop screw (B) on all models so that the engine idles at a car speed of 6-1/2 to 8 miles per hour in high gear. This is equivalent of 600 to 650 revolutions per minute.

MAJOR TUNE-UP PROCEDURE

Equipment Requirements

Accomplishment of a major tune-up as described in the following paragraphs, requires the following equipment or its equivalent:

Balance Tester	KM0-333
Compression Tester	KNO-213
Fuel Pump Tester and Vacuum Gauge KMO-144	
Volts-Ampere Tester	KMO-330
Power Timing Light.	KMO-318
Coil Tester.	KM0-376
Condenser Tester	KMO-377

Before proceeding to any of the tests, it is advisable to make a rough check to see that the battery will readily crank the engine.

Manifold Vacuum and Cylinder Balance — Test 1.

1. Attach a service-station quality vacuum gauge or mercury U tube to the inlet manifold by disconnecting the windshield wiper line and connecting the gauge hose to the manifold fitting from which the cleaner line was disconnected.

2. Adjust the carburetor idle mixture and idling speed as outlined under Minor Tune-up on page 19.

3. With engine idling at 600 rpm, note vacuum reading which should be 18 to 21 (inches of mercury absolute) with gauge hand holding steady or with only a perceptible flutter.

4. If gauge reading cannot be steadied at 18 to 21 inches by readjustment of the idle mixture, the engine is not in tune and/or there is a malfunctioning or derangement of the mechanical or electrical units of the engine and further tests will be required.

5. To get closer to the location of the trouble, bring the speed up to the equivalent of about 20 mph road speed and run the engine on 2 Cylinders by grounding the plug wires to the other Cylinders and note the gauge reading. This can be quickly accomplished by using Cylinder Balancer Tester KM0 -333. Make the same test on all the other Cylinders by running two at a time with the others grounded and compare the vacuum readings on each such trial. Gauge reading should be the same on each pair of Cylinders within one inch. If one pair reads lower than the other pairs by more than an inch, it indicates a bad spark plug, or unequal compression in one or both of the Cylinders being tested.

Compression Pressure - Test 2

1. With engine warm remove all spark plugs. Open carburetor throttle.

2. Insert compression gauge in No. 1 spark plug hole and hold tightly. Crank engine with starting motor until gauge reaches highest reading.

3. Record reading and repeat on balance of Cylinders. Minimum reading should not be lower than 80 pounds - with maximum allowable variation of 10 pounds.

4. TESTING NOTES. If compression gauge reading goes up in jerky steps of 10 to 20 pounds at a time, it generally, but not always, indicates leaking or sticking valves.

Most head gasket leaks occur at the narrow section dividing one Cylinder from another. Thus when 2 adjacent Cylinders show low compression readings, check the head gasket for leakage.

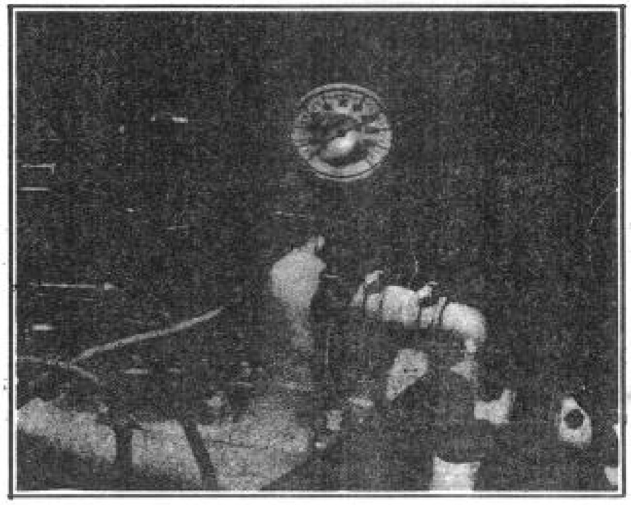


Figure 8
Compression Pressure Test

To determine if the major trouble is in the pistons, rings or valves, inject not more than 3 squirts (from a hand oiler) of heavy oil on top outer edges of the piston in the Cylinder which reads low on compression.

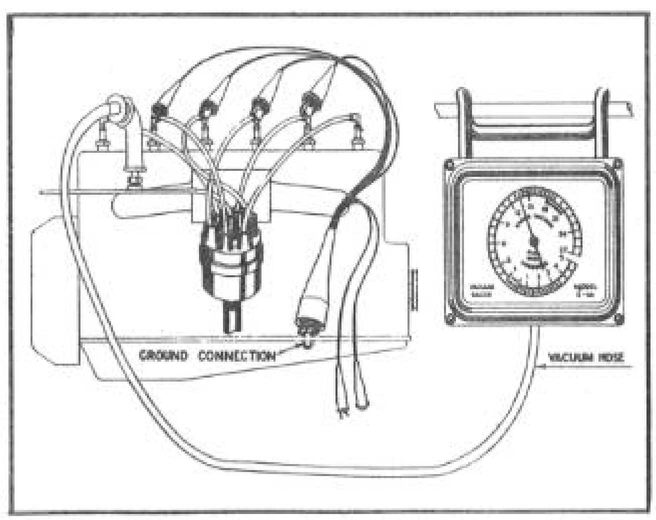


Figure 9
Cylinder Balance Test, Schematic

Crank the engine over a few times and then make a second compression test. If the reading on the compression gauge is about uniform with the other Cylinders, it indicates that the trouble in that Cylinder is due to leakage past the rings.

But, if the compression is not increased in this test to within close range of the rest of the Cylinders, it indicates valves not seating in that Cylinder or a hole or crack in a piston.

Spark Plugs - Test 3

1. Inspect spark plugs to be sure they conform to factory specifications.

2. Clean, regap to .032" and test. Plugs should fire under 75 lbs., pressure in tester. Replace faulty plugs.

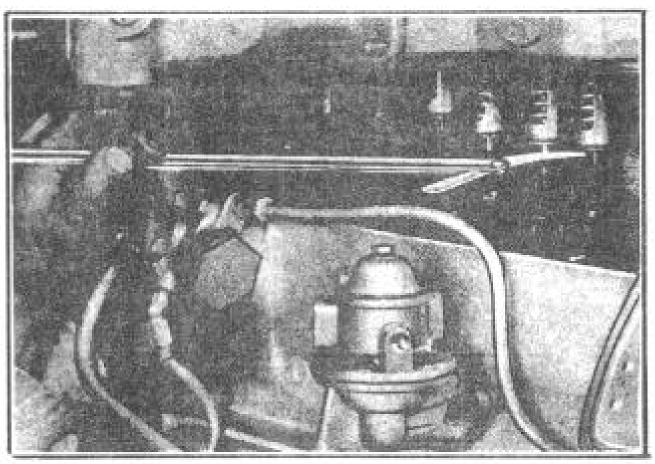


Figure 10
Adjusting the Valve Tappets

3. Always use new spark plug gaskets. Spark plugs should be tightened with a torque wrench to 28 foot pounds.

Valves and Tappets — Test 4

1, Check valve tappet clearance with engine hot and running.

Clearance should be .006" intake, .008" exhaust on the following models:

1942 Sixes 21,22,28.
1942 Six, Model 20, 3" x 4-1/8" with unmarked valve covers.
All 8 Cylinder models.

Clearance should be .010" intake, .012" exhaust on the following models:

1942 Series 20 6 Cylinder with valve covers so marked.
All 1946 and 1947 Series 51,52, 58,171,172,178.

2. Inject gum dissolving oil into intake manifold and run engine for 10 minutes then re-check the compression.

3. If re-check shows any Cylinder is 10 pounds or more lower than another, determine the cause as per notes in Test No. 2. After obtaining owner's permission, recondition engine as needed.

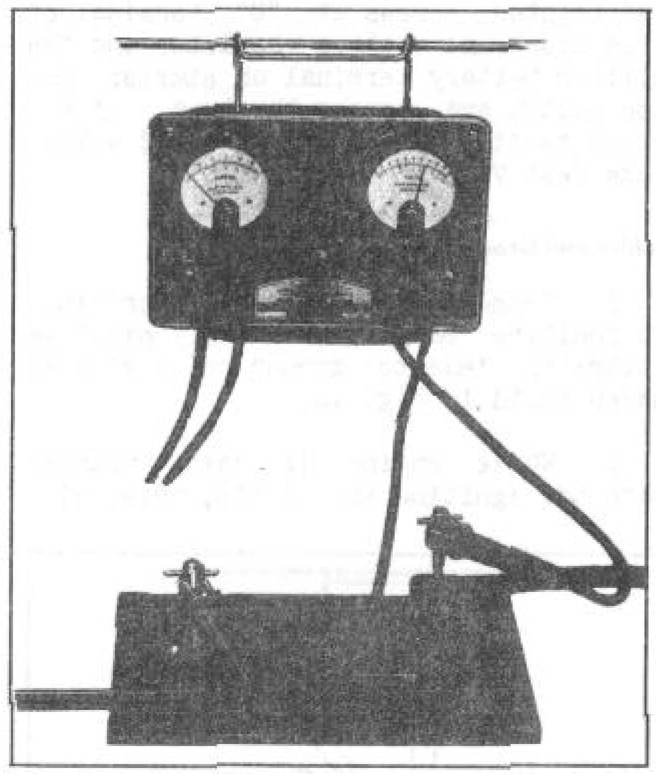


Figure 11
Testing Battery Capacity With KM0-330

Battery Capacity — Test 5

1. Take hydrometer gravity reading. Gravity should be 1225 to 1290 at 70° F.

2. Connect voltmeter leads as shown in Fig. 11, Without current draw, volt-meter reading should be 6to 6-1/2 volts.

3. If gravity or voltage is low recharge or exchange battery.

Battery Voltage Drop - Test 6

1. Connect positive voltmeter lead to positive battery terminal - negative voltmeter lead to negative battery terminal as shown solid in Fig. 12. Remove threaded cap from starter switch solenoid and with ignition turned off, crank engine by depressing solenoid plunger.

2. If the starting motor cranks the engine at a GOOD RATE OF SPEED with the voltmeter reading more than 4-1/2, the starting circuit is satisfactory and Tests 7 and 8 should be omitted.

3. If voltmeter reading is lower than 4-1/2 at average temperature, check and tighten screws at "B" terminal of fuse block and voltage regulator and the similar battery terminal on starter motor switch and repeat the test. If recheck reading is less than 4-1/2 volts, make Test 7.

Cables and Ground Straps - Test 7

1. Connect positive voltmeter lead to positive battery terminal - negative voltmeter lead to ground on engine as shown solid in Fig. 13.

2. While engine is being cranked with the ignition turned off, note volt-meter reading which should not be than 0.25. If reading is higher than 0.25, remove, thoroughly clean and reinstall the positive cable connection atbattery also the engine to body fender and engine to frame ground straps then repeat the test. If recheck reading is not over 0.25, omit Test 8 and remainder of Test 7.

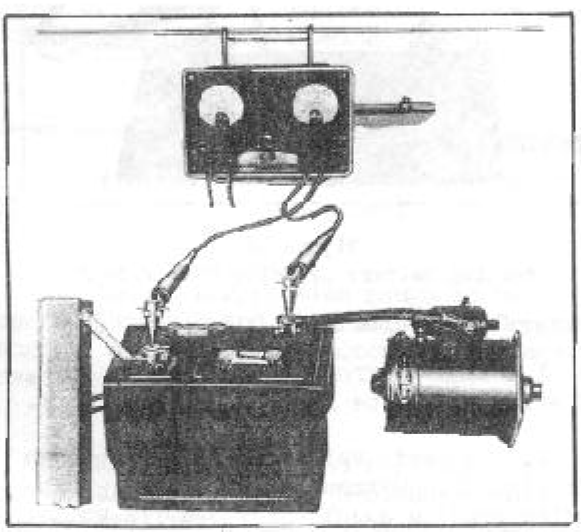


Figure 12
Battery Voltage Drop-Starter System

3. Connect positive voltmeter lead to "BAT" terminal of starter switch - negative lead to negative battery terminal as shown dotted in Fig. 13.

4. With engine cranking and ignition turned off, voltage reading should not b6 higher than 0.25. If higher than this, check battery to starter switch cable and connections at the battery post and switch terminal ends of the cable. Retest after checking and if reading is less than 0.25, omit Test 8.

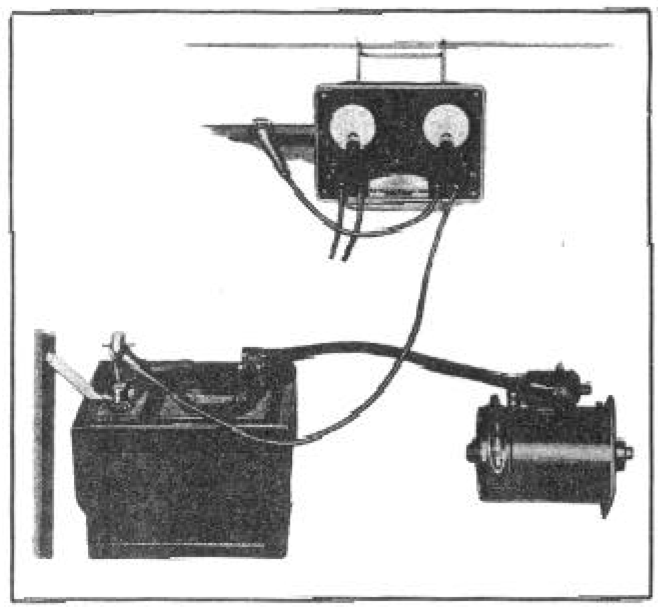


Figure 13
Battery Cable and Cable Connection Test

Starting Motor Switch — Test 8

1. Connect positive voltmeter lead to starting motor terminal of solenoid switch - negative lead to "BAT" terminal of solenoid switch as in Fig. 14.

2. With engine cranking and ignition turned off, voltmeter reading should not be more than 0.2 volt. If more than this, replace switch.

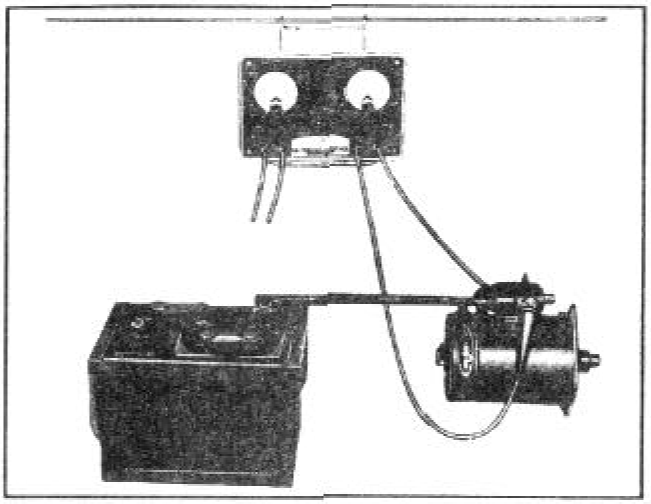


Figure 14
Checking Starter Motor Switch

Distributor Ground - Test 9

1. Connect positive voltmeter lead to ground on engine - negative lead to terminal of distributor as in Fig. 15.

2. Remove distributor cap.

3. Turn distributor shaft until breaker points are CLOSED.

4. Turn ignition switch on.

5. Voltmeter reading should not be more than 0.1 volt.

6. A reading of more than 0.1 volt indicates poor breaker point contact, poor distributor point plate contact or poor distributor housing contact to engine.

To locate the poor contact attach negative voltmeter lead to breaker contact arm, breaker control plate, and to the distributor housing in turn. If voltage reading at one of these locations is less than 0.2 volt, the poor connection exists between the connection just made and the previous one.

Condenser - Test 10

If the KMO-377 Condenser Tester is not available check for grounded or leaky condenser as follows:

1. Connect positive voltmeter test lead to ground on engine - negative voltmeter lead to terminal on distributor as shown in Fig. 15.

2. Turn distributor shaft until points are OPEN.

3. Turn ignition switch on.

4. Voltage between distributor terminal and ground should be exactly same as battery voltage.

5. If voltage is lower than battery voltage the condenser is leaky or grounded and should be replaced.

If the KM0-377 Condenser Tester is available, test the resistance, capacity and insulation of the unit. The capacity should be 0.20 to 0.25 microfarads.

When using KMO-377 Tester connect one lead to distributor terminal, other to condenser casing. Block off the breaker contacts. Permit unit to heat for one minute with switch in microhm position before turning regulator knob.

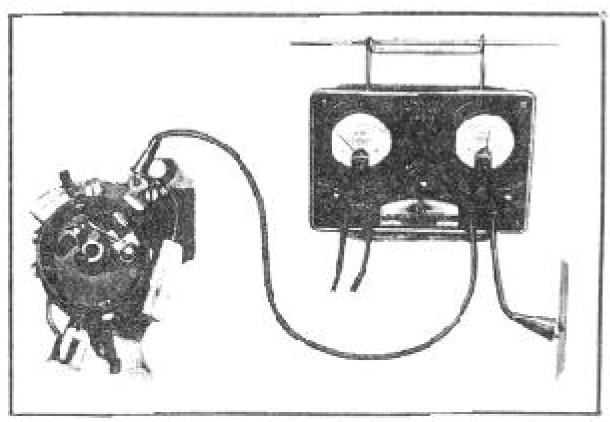


Figure 15
Using KMO-330 Volts-Amperes Tester to
Test Distributor Ground Circuit

Distributor Dwell Angle — Test 11

1. Oil wick at top of shaft.

2. On six Cylinder distributors turn grease cup one turn - on eight Cylinder models fill oil cup.

3. Coat breaker cam lightly with high temperature water pump grease.

4. Place one drop of engine oil on breaker arm pivot.

5. Check automatic advance - governors must work freely.

6. On 6 Cylinder models check vacuum advance. Distributor must rotate freely.

7. Clean breaker points - replace if burned or pitted.

8. Align points.

9. Check breaker arm spring tension which should be 17 to 20 ounces.

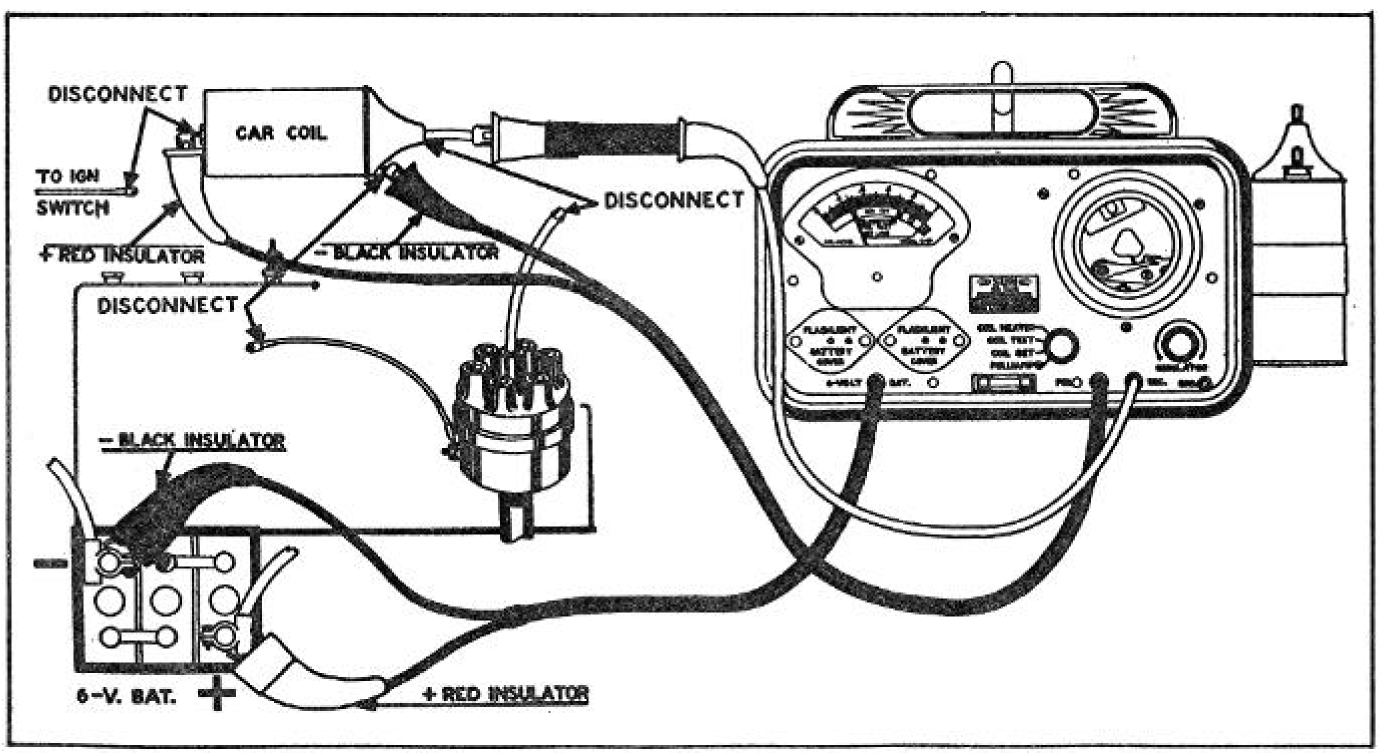
NOTE: If the KMO-298 Dwell Tach Tester is available, use same and adjust breaker contacts to obtain a dwell of 35 degrees on 6 Cylinder distributors, 27.5 degrees on 8 Cylinder distributors.

If Dwell Tester is not available, adjust the breaker contacts as follows:

All 6 Cylinder models 0.020"
All 8 Cylinder models 0.017"

Coil — Test 12

1. Connect the test leads of KMO-376 Coil Tester directly to the coil primary terminals and to the high tension post of the coil by inserting a short test wire as shown in Fig. 16. Keep the model R coil tube as close as possible to secondary post of coil. The coil tester must be in calibration with the Master Coil as per instructions covering the KMO-376 Tester. Flashlight batteries in
tester must test better than one volt.



2. Turn regulator on tester to left as far as it will go.

3. Turn tester switch to "coil set" position.

4. Turn regulator on tester until coil meter reads on "set" line. Turn switch to "coil test position" and the coil meter should read in the blue band marked "good". If meter does not read in the blue band the coil should be replaced.

5. Make a quick check of the ignition primary circuit by re-connecting car primary wires to coil and attaching test leads of breaker motor to opposite ends of primary wires. With breaker motor running and test switch turned to "coil set" position, go over entire primary circuit feeling for loose connections, poor contact in ignition switch, wire broken under insulation etc. Any poor contact will be indicated at once by meter reading dropping below the "set line".

Distributor Timing - Test 13

1. Connect KMO-318 Timing Light as shown in Fig. 17.

2. Run engine at idle speed, and if ignition timing is correct, on 6 Cylinder models the 2nd short mark located 1/2 inch before the long dead center mark will be directly opposite the pointer on rear engine support plate. On 8 Cylinder models the long dead center mark will be directly opposite the pointer. Idle speed is 600 rpm.

3. If timing is not correct, rotate distributor body on six Cylinder distributor clockwise to advance and anticlockwise to retard. On eight Cylinder, rotate distributor anti-clockwise to advance and clockwise to retard.

4. As engine speed is increased mark on eight Cylinder flywheel should move up as much as 2-3/4" at 3400 engine rpm and return to normal position for idle speed.

On six Cylinder distributors the vacuum unit should be in full retard at closed throttle idling and rapid acceleration, but should snap advanced when engine speed is GRADUALLY increased.

FUEL AND ALTITUDE COMPENSATION. When premium fuels which have octane rating of 80 or higher as contrasted to regular brands of approximately 72 octane rating are used, a more advanced spark timing setting should be used and final tests should be made on the road. When operating at high altitudes it will be found that amore advanced spark timing setting can be used than at or near sea level.

To determine proper spark timing for these conditions, with engine at normal operating temperature, accelerate with full throttle from 8 mph in high gear. A "ping" should be noted at 10 to 15 mph.

If no "ping" is heard, loosen the advance diaphragm screw (G), Fig. 4, on 6 Cylinder models and rotate distributor body in a clockwise rotation one graduation mark at a time until the "ping" is heard. On 8 Cylinder models, loosen clamp

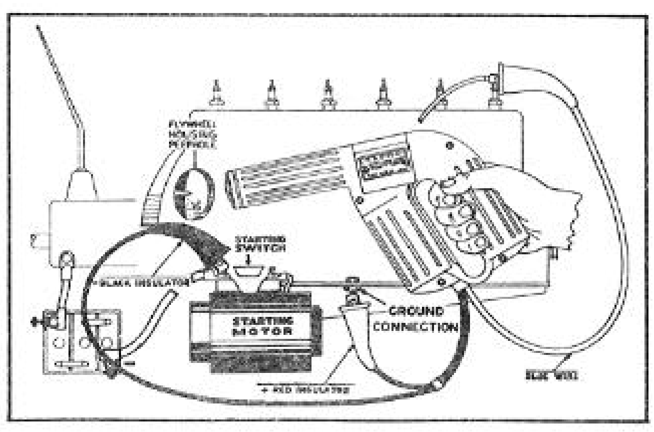


Figure 17
Timing Test Using KMO-318 Light

clamp screw (G), Fig. 5 and rotate distributor body anti-clockwise one graduation mark at a time until "ping" is heard. Under no circumstances, however, should the pointer on the rear engine support be more than 1 inch (first short line) before the U.D.C. 1/6 mark on 6 Cylinder flywheels and 3/4 inch (second short line) before the U.D.C. 1/8 mark on 8 Cylinder flywheels.

If the "pinging" is heard at speeds above those previously mentioned, retard the spark timing by loosening the clamp screw and rotate distributor body in opposite direction, one graduation mark at a time until the proper setting is obtained.

Milliampere Current at Spark Plugs - Test 14

The milliampere scale on the voltmeter of Volts Ampere Tester KM0-330, the Battery-Starter Tester KM0-332 or the Coil Tester KMO-376, can be used in making this test.

This test should be made only after all spark plugs have been cleaned, regapped, tested and reinstalled.

1. Attach one lead of test voltmeter to ground on engine and the other to each spark plug terminal in turn.

2. On all but the KMO-376 Coil Tester turn the volt switch to the "15 volt" position. On the Coil Tester turn the switch to "milliampere" position.

3. Start engine and run same at about 1000 rpm.

4. Read the milliampere scale. The reading should be the same at each spark plug.

If reading is lower on one plug than another it indicates high resistance in the secondary circuit of the low reading plug. Common causes of high resistance are defective distributor cap, corroded cap post, too wide a gap between distributor rotor finger and cap segment or a defective radio noise suppressor.

Average milliampere reading should be 0.4 to 0.6 milliamperes without radio suppressors and 0.2 to 0.4 with suppressors.

Generator Output - Test 15

1. Disconnect "BAT" lead at "B" terminal on voltage regulator.

2. Connect positive ammeter lead to terminal of wire just disconnected - negative ammeter lead to "B" terminal on regulator as shown in Fig. 18.

3. Connect negative voltmeter lead to "B" terminal on regulator - positive voltmeter lead to ground on engine.

4. Connect jumper wire to "F" terminal on regulator and ground on engine.

5. Run engine at speed corresponding to 20 mph for 15 minutes to warm up.

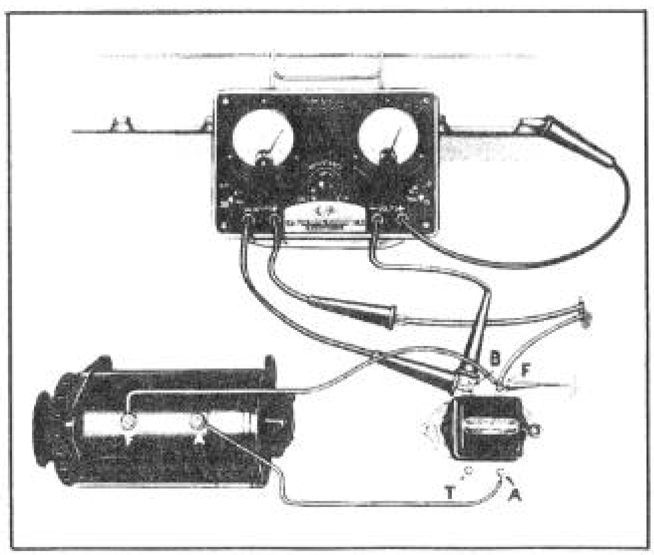


Figure 18
Checking Generator Output Using KMO-330 volts Amperes Tester

6. With resistance turned "out" and engine running at a speed of 1500-1700 rpm, generator output at 8 volts should be not less than 30 (33 maximum) amperes on GDS-4801A generators. On all other models equipped with GEC-4801A generators the output should be not less than 37 amperes (41 maximum). Move 3rd brush anti-clockwise to increase output.

Voltage Regulator — Test 16

1. Disconnect "BAT" lead at "B" terminal on voltage regulator.

2. Connect positive ammeter lead to terminal of wire just disconnected- neg- ative ammeter lead to "B" terminal on regulator.

3. Connect negative voltmeter lead to "B" terminal on regulator - positive lead to ground on engine. Omit jumper wire from regulator to ground.

4. Run engine at approximately 1000 rpm for 15 minutes to warm up.

5. Run engine at 1500-1800 rpm. Turn "in" resistance until ammeter reads 10 amperes.

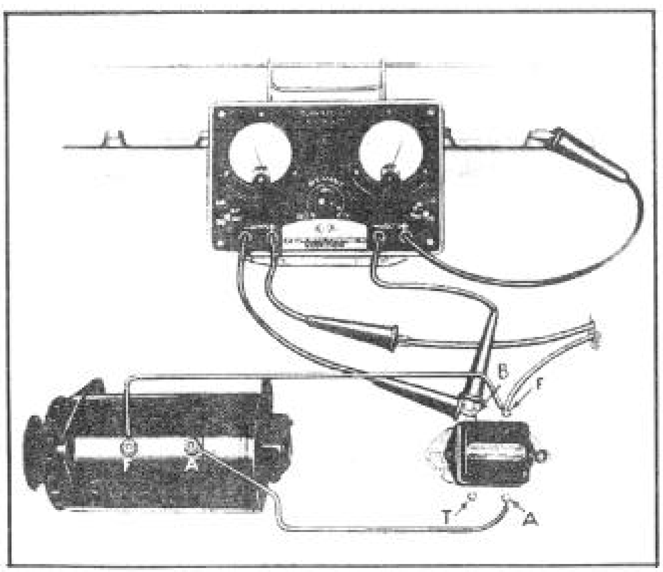


Figure 19
Checking Operating Voltage

6. With regulator at temperature of 70º F. the voltmeter reading must not be less than 7.1 volts or more than 7.4 volts. If the reading is not within this range, the regulator should be replaced with a new or exchanged unit of the same obtained from an authorized Auto-Lite Service Station. DO NOT ADJUST.

Fuel Pump — Test 17

1. Remove sediment bowl and clean.

2. Carefully remove screen and clean, if damaged replace. Check gasket and replace if hard or damaged. On combination fuel and vacuum pump also remove air filter screen cover at the top of the pump and clean the screen.

3. Tighten all fuel pump connections.

4. Check for diaphragm leaks - tighten cover screws.

5. Disconnect fuel line from outlet of pump and connect rubber fitting of KMO144 Fuel Pump Tester to outlet nipple on pump as shown in Fig. 20.

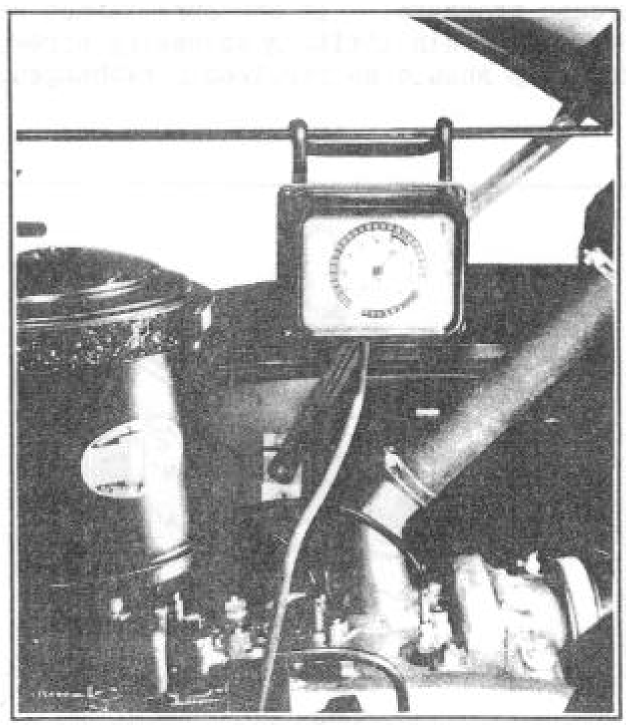


Figure 20
Testing Fuel Pump Pressure With ITT-144

6. Start engine and run same at 1500-1800 rpm on fuel remaining in carburetor.

The type AK pump (stamped 1523289 on mounting flange) with appended bowl as shown in Fig. 21,and type AJ combination fuel and vacuum pump (stamped 1523936 or 1523937 on mounting flange) should show 3-1/2 to 4-1/2 pounds pressure.

Inverted bowl type AF pump (stamped 1523753 on mounting flange) should show 2 to 3-1/2 pounds pressure.

Electric Autopulse pump should show 2-1/4 to 2-3/4 pounds pressure.

7. If pressure is less than stated above it indicates pump wear, ruptured diaphragm or worn, warped, dirty or gummy valves and seats on mechanical pumps.

If pressure is higher than stated, it indicates too tight a diaphragm or too heavy a diaphragm spring.

8. A condition of over-pressure or under-pressure requires removal of the mechanical type pump for repair or exchange. On Autopulse pumps turn adjusting screw (536) Fig. 22, clockwise to increase pressure, anti-clockwise to decrease pressure. If pressure cannot be brought within limits by adjusting screw, the pump should be repaired or exchanged.

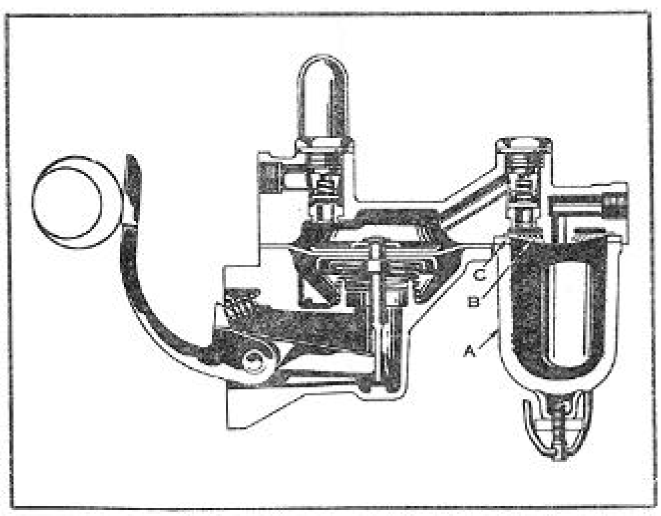


Figure 21
Type AK Number 1523289 Fuel Pump

9. If pressure is within the limits stated above, check pump CAPACITY by removing KMO -144 from pump outlet and connecting thereto the Gas-Per-Mile-Gauge J-1191 F, or equivalent. With engine idling, the pump should deliver a minimum of 0.1 (1/10) of a gallon of fuel in 36 seconds in addition to supplying fuel for idling the engine.

10. If capacity is less than 0.1 (1/10) of a gallon, it usually means that there is an air leak in the intake fuel line. This leak may be located at any point in the line from the fuel tank to the fuel strainer bowl of the pump. Likely locations are poor bowl gasket seal or a leaky diaphragm flange.

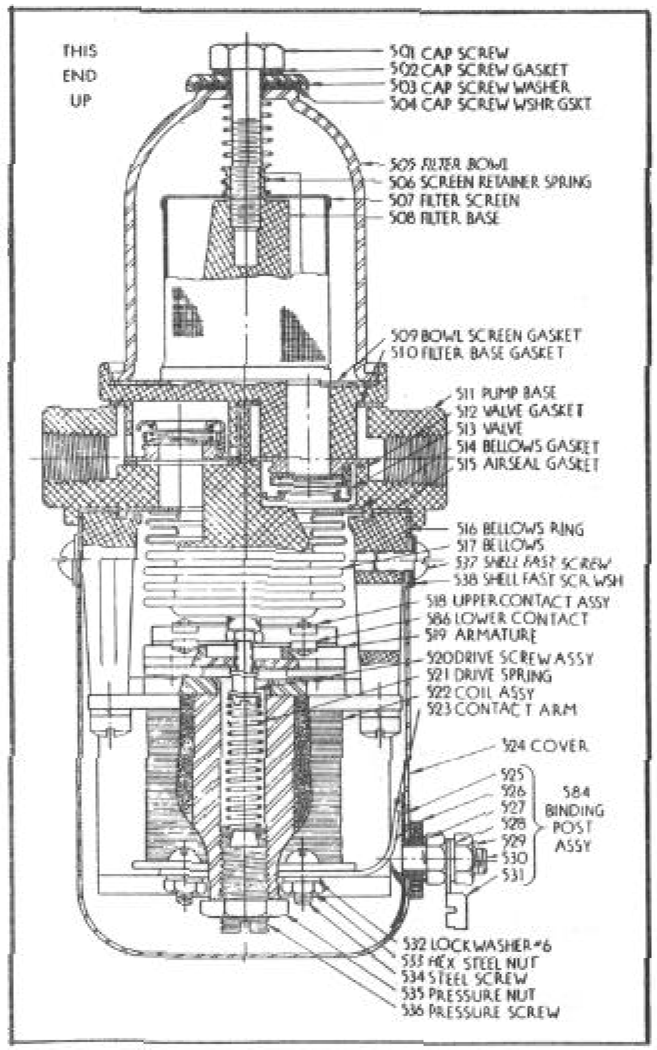


Figure 22
Electric Pump Used on Some 1946 Cars

Climate Control - Test 18

1. Remove cover - clean screen (D) Fig. 25, or replace.

2. Check heat box tube for plugged condition and loose connection.

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

4. When cover (B) is reinstalled, adjust to middle graduation.

Air Filter -Test 19

(OILED GAUZE TYPE)

1. Remove wing nut (A), cover, pad and filter unit (C) Fig. 23.

2. Wash filter unit in gasoline and blow dry.

3. Re-oil by dipping in engine oil same grade as used in engine and permit excess to drain off.

4. Reinstall parts in reverse order of removal.

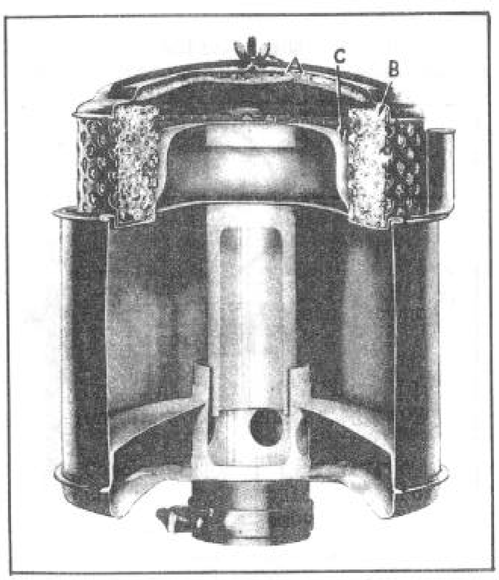


Figure 23
Air Filter - Oiled Gauze Type

(OIL BATH TYPE)

1. Remove assembly from engine.

2. Remove cover and filter unit (E).

3. If necessary, wash filter unit in kerosene and blow dry. DO NOT RE-OIL.

4 Clean old oil and dirt from sump.

5. Refill with one pint of engine oil, same grade as used in engine.

6. Reassemble and reinstall.

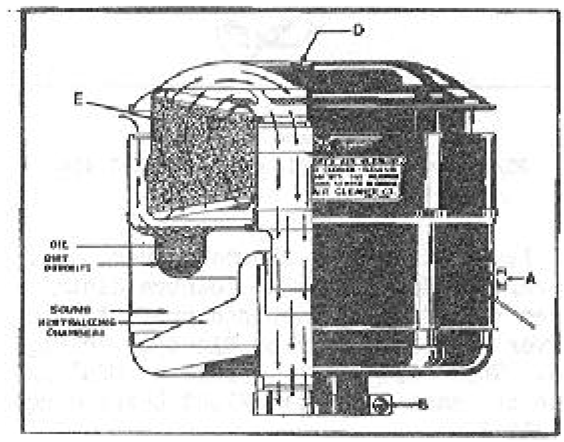


Figure 24
Air Filter - Oil Bath Type

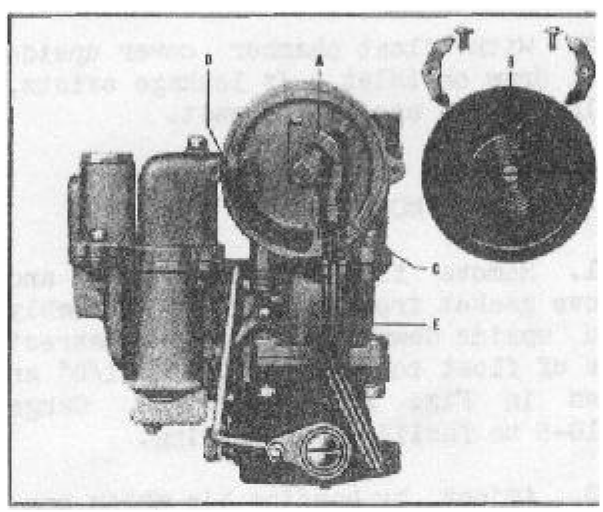
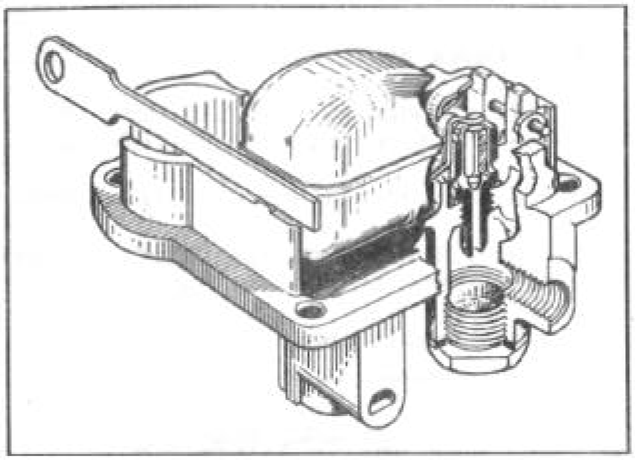


Figure 25
Cutaway View of Automatic Choke

A. Choke Lever
B. Thermostat
C. Piston
D. Screen
E. Passage to intake manifold

Float Setting — Test 20

(SINGLE THROAT MODEL 454S)



COURTESY Of CARTER CARBURETOR CORP.
Figure 26
Float Setting Single Throat Model 454S

1. Remove float chamber cover. Hold cover upside down and measure distance from top of small machined projection on cover to top of seam on float as in Fig. 26. This dimension should be 3/8" and can be measured with Float Level Gauge J-818-2.

2. Adjust by bending lip which contacts the needle valve.

3. With float chamber cover upside down, draw on inlet. If leakage exists, replace valve needle and seat.

(DUPLEX MODELS 501S, 502S)

1. Remove float chamber cover and remove gasket from cover. With assembly held upside down distance from nearest face of float to cover should be 1/8" as shown in Fig. 27. Use Float Gauge J-818-5 to facilitate measuring.

2. Adjust by bending lip which contacts the needle valve.

3. With float chamber cover upside down, draw on inlet. If leakage exists, replace valve needle and seat.

Pump Travel — Test 21

Pump Adjustment Should Always Be Bade BEFORE Setting the Metering Rods.

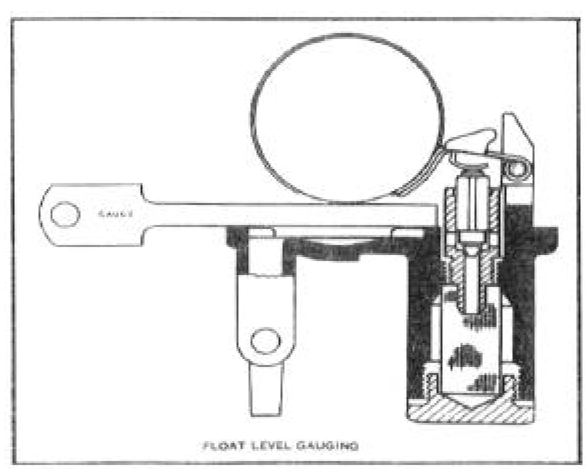
DUPLEX CARBURETORS. With pump connector link in the long stroke (outer) hole in pump arm and with throttle stop screw backed out, the accelerating pump plunger should travel 9/32" from the full down to the full up position. Travel can be checked by marking a line across the pump plunger rod even with the top of cover in the closed throttle position and another in the wide open throttle position and measuring between the two marks. Obtain correct travel by bending the throttle connector rod.

SINGLE CARBURETORS. Accelerating pump link should be in short stroke (nearest countershaft) hole and travel should be 3/16". Adjust in same manner as outlined above for Duplex models.

Metering Rod Setting - Test 22

1. A variation of 1/16" or less from the standard setting will adversely affect carburetor performance.

2. To set the metering rods, first remove the carburetor air horn assembly

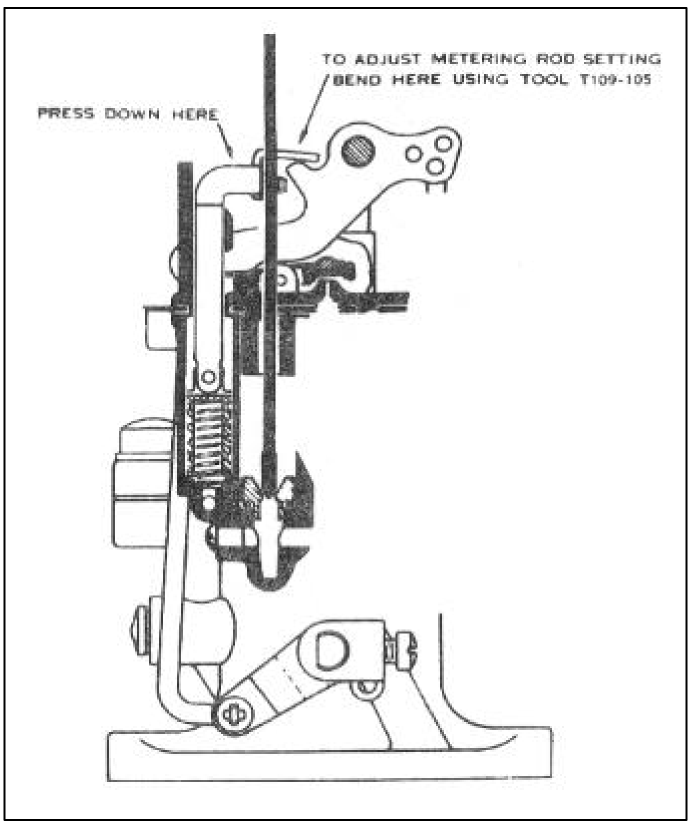


COURTESY Of CARTER CARBURETOR CORP.
Figure 30
Using gauge J-1305 To Set Metering Rods On WDO Duplex Carburetors 501S and 502S

(duplex models only) and then the metering rods from the carburetor. Insert gauge J-1265 (2.468") for single carburetors, one J-1305 (2.280") for duplex carburetors. Reinstall metering rod clevis pin and spring.

3. Turn out the throttle stop screw and hold throttle in fully closed position. Hold gauge vertical to insure proper seating in metering jet. Press down lightly on vacuum piston link.

4. There should be not less than 0.001" and not more than 0.005" gap between metering rod clevis pin and seat on shoulder in notch of gauge. Obtain this gap on duplex carburetors by bending lip or tongue, Fig. 30, on anti-percolator arm. On single throat carburetors bend the equivalent lip on accelerating pump arm Fig. 28.



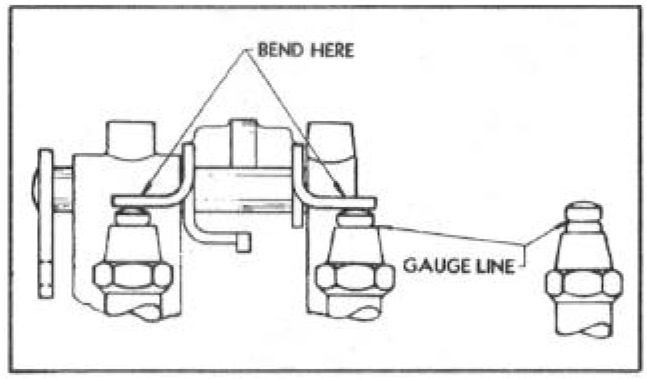
COURTESY OF CARTER CARBURETOR CORP.

Figure 28
Using Gauge J-1265 To Set Metering Rod
On WAI-454S Single Throat Carburetor

Anti-Percolator Valves — Test 23

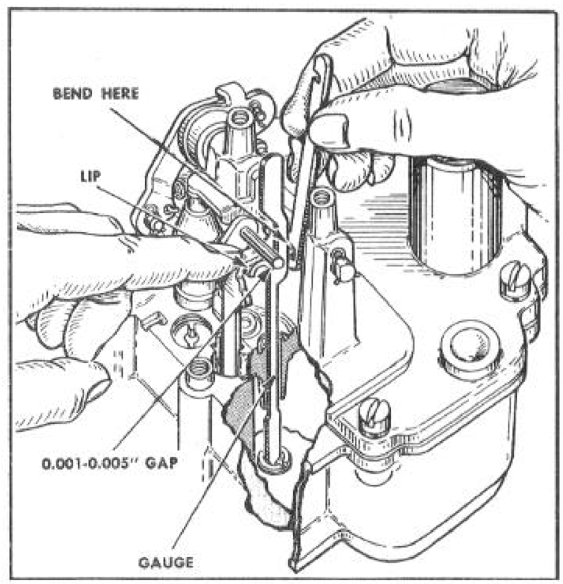
On Duplex Carburetors This Adjustment Must be made AFTER Pimp and Metering Rod Adjustments Have Been Completed.

DUPLEX CARBURETORS. To adjust, back out the throttle stop screw and hold throttle in closed position. Indicator lines on valves should be just flush with tops of plugs as shown in Fig. 29. Bend as shown to obtain this setting.



COURTESY OF CARTER CARBURETOR CORP.

Figure 29
Anti-Percolator Valves Duplex Carburetor



COURTESY OF CARTER CARBURETOR CORP.

Figure 30
Using Gauge 3-1305 To Set Metering Rods
On WDO Duplex Carburetors 501s and 502S

SINGLE CARBURETORS. Insert a .030" diameter rod between lower edge of throttle valve and bore of Carburetor opposite port as in Fig. 31. There should now be not less than .005", and not more than .015" clearance between lip of valve rocker arm and pump arm. Bend valve rocker arm lip to obtain this clearance.

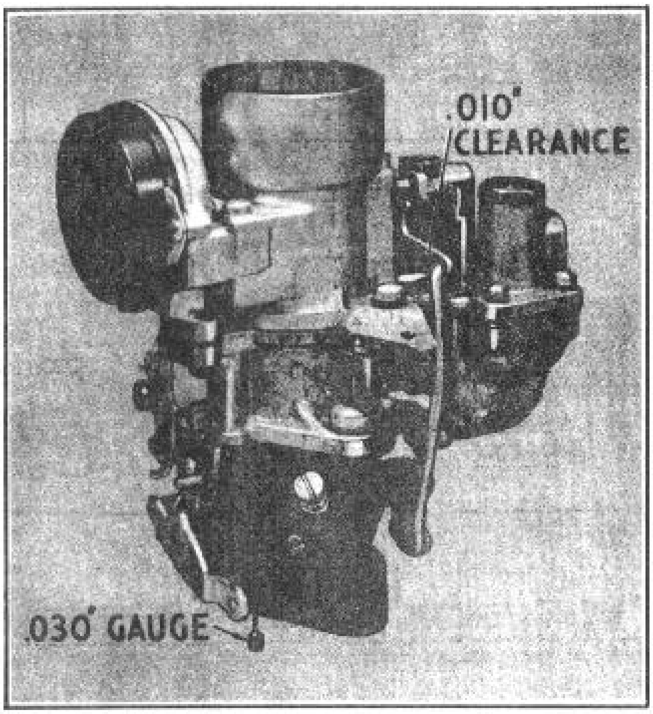


Figure 31
Anti-Percolator Valve Adjustment
Single Throat WA1 Model 454S Carburetor.

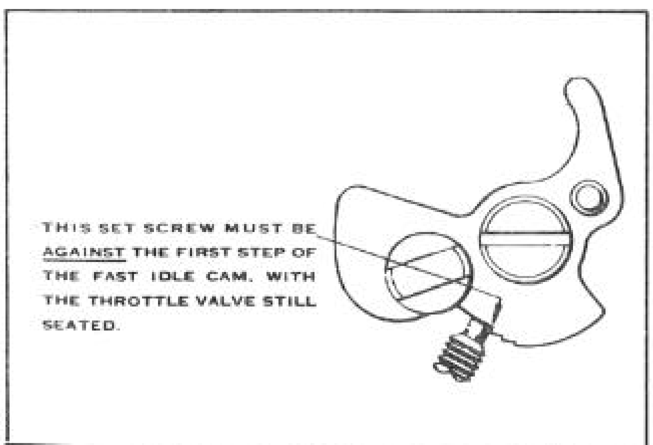


Figure 32
Adjust The Fast Idle on 454S Carburetors With Cam and Screw "B" in This Position

Fast Idle Setting — Test 24

DUPLEX CARBURETORS. Adjust the fast idle by closing the choker valve tightly and placing the upper step of fast idle cam (G) Fig. 7, under fast idle screw as shown. Turn fast idle screw (F) in or out until .045" on 501S, .053" opening on 502S between edge of throttle valve and bore of carburetor (on the side opposite port) is obtained.

SINGLE THROAT CARBURETORS. Hold fast idle cam (A) Fig. 33 in normal idle position and turn throttle lever stop screw (B) in until it just seats against cam. Hold throttle lever closed and pull fast idle cam back until the first (or lower) step on the cam is AGAINST (not on) set screw as in Fig. 32.

There should now be 5/8" clearance between inside wall of air horn and lower edge of choke valve. Obtain this setting by bending the offset portion of the fast idle link (D), Fig. 33.

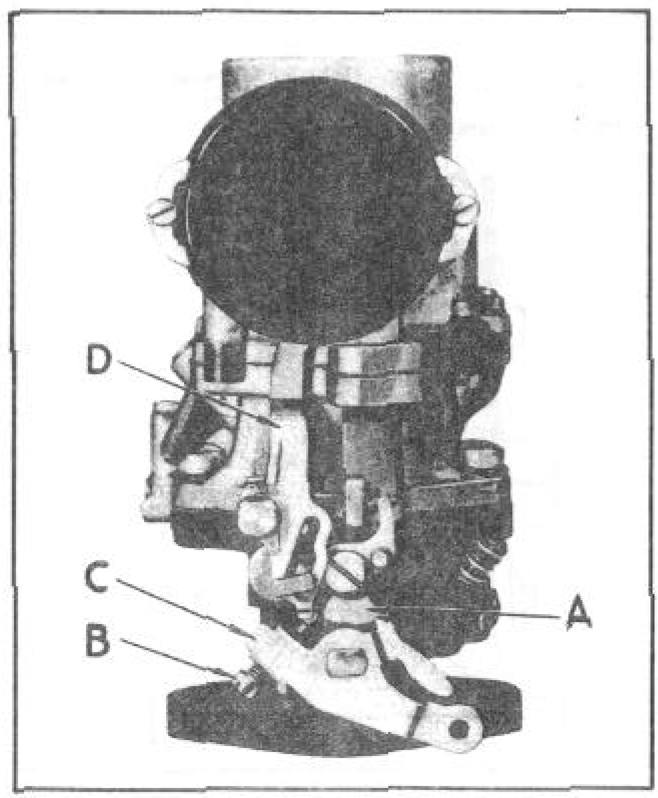


Figure 33
Fast Idle Adjustment Single Throat Carburetors, Refer Also To Fig. 32

REFERENCES

Source of Information	Date	Subject

FUEL SYSTEM

GENERAL SPECIFICATIONS

Carburetor Make	Carter	Mechanical Pump Driven	
Carburetor Type	Down draft	from Camshaft By	Cam
		Air Cleaner and Silencer	
Manifold Heat Control		Oil wetted--Standard	A C
Models 20, 28	Manual	Oil Bath--Optional	United
All Others	Automatic		
		Gasoline Tank Capacity	
Choke Control	Automatic	Models 20T, 20P,	
Fuel Delivery	Mechanical or	20 UCo, 20 UCpe	12-1/2 gallons
	electrical pump	All Others	16-1/2 gallons

CARBURETOR SPECIFICATIONS

Carter WA1 454S

(Used On Some 6 Cyl Engines)

Dimensions	1-1/4" Single, SAE flange -- Primary venturi-11/32" I.D.-- Secondary venturi-11/16"'I.D.--Main venturi-1-1/4" I.D.
Float Height	Distance from seam on float at free end to tip on lower edge of float chamber cover to be 3/8" when needle is seated--Use tool J-818-2.
Outside Vent	No. 10 drill. No inside vent.
Gasoline Intake	Square vertical needle No. 48 drill in needle seat.
Gasoline Line Connection	5/16" Weatherhead nipple.
Low Speed Jet Tubes	Jet No 70 drill size By-pass in body No 53 drill size Economizer in body 0.755" - 0.765" diameter Idle bleed No 50 drill size
Idle Port	Length 0.165" - Width 0.032"
Idle Port Opening	0.122" above valve with valve closed tightly
Idle Screw Seat	No. 46 drill
Set Idle Adjustment Screw	1/2 to 1-1/2 turns open. For richer mixture turn screw out Do not idle engine below 600 rpm which is equivalent to 6 to 8 mph in high gear

Main Nozzles In primary venturi, angle 45° closed tip. Inside diameter No. 30 drill. Upper hole No. 75 drill on 45° angle. Lower hole No. 48 drill on 45° angle.

		Economy Step--Middle Step			Power Step		
	Type	Diam.	Tapers From	Length of Taper	Diam.	Length of Taper	Length of Step
Metering Rod Specifications (454S Single Carburetor)	Standard	.072	.072 to .064	1/8	.044	1/32	21/64
	1st Leaner	.074	.074 to .066	1/8	.046	1/32	21/64
	2nd Leaner	.076	.076 to .068	1/8	.048	1/32	21/64
	3rd Leaner	.078	.078 to .070	1/8	.050	1/32	21/64

Metering Rod Jet 0.096" diameter drill. Metering Rod Setting.- Use gauge No. J-1265 (2.468").

Accelerating Pump Low pressure type with adjustable stroke. Discharge jet No. 70 drill size. Intake ball check No. 62 drill size. Discharge ball check No. 45 drill size. Relief passage (to outside) No. 42 drill.

Pump Adjustment 3/16" plunger travel in short stroke.

Vacuum Spark Port 0.039" to 0.041" diameter. Bottom of port 0.021" to 0.029" above valve.

Next 3 items are based on viewing carburetor with flange down and float chamber at the right.

Throttle Lever At left. Length 1-1/4", in center of travel. Points toward you.

Choke Carter Climatic Control, on left side. Set at center index.

Fast Idle and Unloader On left side.

Carter WDO 501S

(Used On Most 6 Cylinder 3" x 5" Engines)

Dimensions l” Dual-4 bolt flange--Primary venturi 11/32" I.D.--Secondary venturi 21/32" I.D.--Main venturi 1-1/16" I.D.

Float Level Distance from float to bowl cover to be 1/8" when needle is seated--Use tool J-818-5.

Outside Vent No. 10 Drill size 4 holes. No inside vent.

Gasoline Intake Square vertical needle. No. 38 drill hole in needle seat.

Gasoline Connection 5/26" Weatherhead nipple.

Low Speed Jet Tubes Jet size No. 71 drill. By-pass (plug) No. 51 drill. Economizer in body No. 56 drill. Idle Bleed No. 54 drill.

Idle Port Length 0.150". Width 0.030".

Idle Port Opening	0.108" to 0.112" above valve with valve tightly closed.
Lower Port (For Idle Adj. Screw)	0.0615" to 0.0655" diameter.
Set Idle Adjustment Screw	1/2 to 1-1/2 turns open. For richer mixture turn screw out. Do not idle engine below 600 rpm which is the equivalent of 6 to 8 mph in high gear.
Main Nozzle	In primary venturi, angle 45°. Closed tip. Inside diameter No. 30 drill. Top hole No. 70 drill on 45° angle. Lower hole No. 52 drill on 60° angle on early production units, No. 51 drill on late production units.

Metering Rod Specifications (501S Single Carburetor)		Economy Step--Middle Step			Power Step		
	Type	Diam.	Tapers From	Length of Taper	Diam.	Length of Taper	Length of Step
	Standard	.0615	.0615 - .057	3/16	.047	1/64	.147
	1st Leaner	.0625	.0625 - .058	3/16	.048	1/64	.147
	2nd Leaner	.0635	.0635 - .058	3/16	.0469	1/64	.147
	3rd Leaner	.0645	.0645 - .060	3/16	.050	1/64	.147

Metering Rod Jet	0.082".
Metering Rod Setting	Use gauge J-1305 (2.280").
Accelerating Pump	High pressure type-spring operated lever, with adjustable pump stroke. Discharge jets No. 74 drill. Intake ball check No. 40 drill. Discharge needle seat No. 50 drill. Relief passage (to outside) thru slots in air horn.
Pump Adjustment	9/32" plunger travel-in long stroke.
Vacuum Spark Port	0.039" to 0.041" Top of port 0.029" to 0.033" above valve.
Choke Valves	In air horn. Offset butterfly type.

Next 4 items are based on viewing carburetor with flange down and float chamber in rear.

Throttle Lever	Adjusting, on right side. Length 3/4".
Choke	Climatic control on left side. Set one point lean.
Choke Heat Suction Holes	Location, in body. Size No. 34 drill.
Fast Idle and Unloader	On right side.

Carter WDO 502S

(Used On 8 Cylinder Engines)

Dimensions	1-1/4" Dual-4 bolt flange--Primary venturi 11/32" I.D.--Secondary venturi 19/32° I.D.-Main venturi 1-3/16" I.D.
Float Level	Distance from float to bowl cover to be 1/8" when needle is seated--Use tool J-818-5.

Outside Vent	No. 10 drill size. 4 holes. No inside vent.
Gasoline Intake	Square vertical needle. No. 38 drill hole in needle seat.
Gas Line Connection	5/16" Weatherhead nipple.
Low Speed Jet Tube	Jet size No. 69 drill. By-pass (plug) No. 51 drill. Economizer in body No. 56 drill. Idle bleed W. 54 drill.
Idle Port	Length 0.175" - Width 0.030".
Idle Port Opening	0.133" to 0.137" above upper edge of valve with valve tightly closed.
Lower Port (For Idle Adj. Screw)	0.0615" to 0.0655" diameter.
Idle Screw Seat	No. 52 drill.
Set Idle Adjustment Screw	1/2 to 1-1/2 turns open. For richer mixture, turn screw out. Do not idle engine below 600 rpm or 6 to 8 miles per hour in high gear.
Main Nozzle	In primary venturi, angle 45°. Closed tip. Inside diameter No. 30 drill. Top hole No. 70 drill on 45° angle. Lower hole No. 52 drill on 60° angle.

Metering Rod Specifications (502S Single Carburetor)		Economy Step--Middle Step			Power Step		
	Type	Diam.	Tapers From	Length of Taper	Diam.	Length of Taper	Length of Step
	Standard	.061	.061 - .055	.141	.044	1/64	.162
	1st Leaner	.062	.062 - .056	.141	.045	1/64	.162
	2nd Leaner	.063	.063 - .057	.141	.046	1/64	.162
	3rd Leaner	.064	.064 - .058	.141	.047	1/64	.162

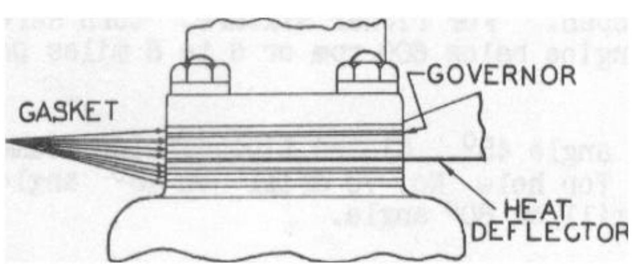
Metering Rod Jet	0.086" drill.
Metering Rod Setting	Use gauge J-1305 (2.280").
Accelerating Pump check	High pressure type (spring operated lever) with adjustable pump stroke. Discharge jets No. 74 drill. Intake ball No. 40 drill. Discharge needle seat No. 50 drill. Relief passage (to outside) thru slots in air horn.
Pump Adjustment	9/32" plunger travel (in long stroke).
Vacuum Spark Port	None.
Choke Heat Suction Hole	Location, in body. Size No. 34 drill.
Choke Valve	In air horn. Offset butterfly type.

Next 3 items are based on viewing carburetor with flange down and float chamber in the rear.

Throttle Lever	Adjusting, on right side. Length 1-1/4", in center of travel. Points up.
Choke	Climatic control on left side. Set one point lean.
Fast Idle and Unloader	On right side.

CARBURETOR INSTALLATION

When mounting a carburetor, the following arrangement of gaskets and insertion of heat deflector must be followed. Place four gaskets on the manifold studs, then the heat deflector, then three more gakets, then the governor with one gasket between the carburetor and the governor. After removing the governor, replace the gasket which will make four gaskets on each side of the heat deflector. Refer to Fig. 34.



Duplex Carburetor Mounting

Figure 34
Carburetor to Manifold Mounting. Note Eight Gaskets and Heat Deflector

CARBURETOR METERING

All carburetors used on 1942-1947 models are of the plain tube downdraft type of Carter design. Features of the design are as follows:

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

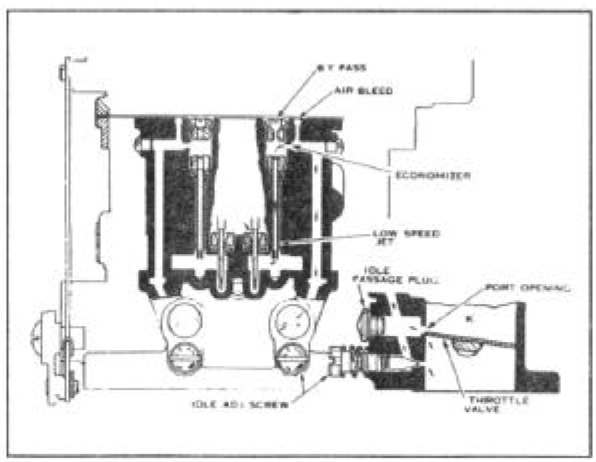
2. Provision of a device to reduce the vapor locking tendencies of volatile fuels at high temperatures. This device which operates on the principle of venting the main nozzle to the atmosphere at closed throttle is called the "anti-percolating valve".

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

IDLE OR LOW SPEED OPERATION

During idling and slow speed operation, liquid gasoline flows from the float bowl through a calibrated orifice called the low speed jet Fig. 35. As the fuel reaches the top of the jet, it is first mixed with air entering through the idle air bleed and the by-pass. This mixture then flows across and downward through a vertical passage to the idle port and idle adjusting screw seat port and into the manifold due to the suction existing below the throttle valve. At closed throttle, the idle port acts as an air bleed to bring the idle mixture to required leanness and in combination with the idle adjusting screw port, as a discharge path for the idle mixture.

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



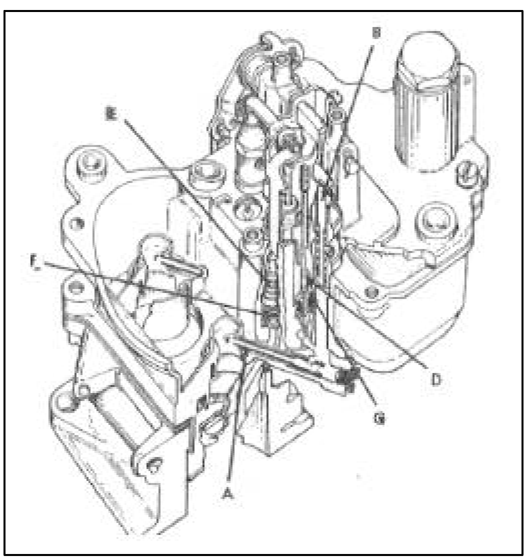
COURTESY OF CARTER CARBURETOR CORP.
Figure 35
Low Speed Circuit of Duplex Carburetors

ANTI-PERCOLATOR VALVE

Due to the small amount of gasoline in the well at the base of the low speed jet, the heat developed in the body of a downdraft carburetor (when the engine is stopped after a hard run in hot weather) tends to cause the gasoline to vaporize. This develops a vapor pressure which would force the gasoline out of the nozzle into the carburetor throat and cause a flooded condition. The anti-percolator valve relieves this vapor pressure by opening the well to the atmosphere when the throttle is closed. Refer to (B) Fig. 36 also to Fig. 37.

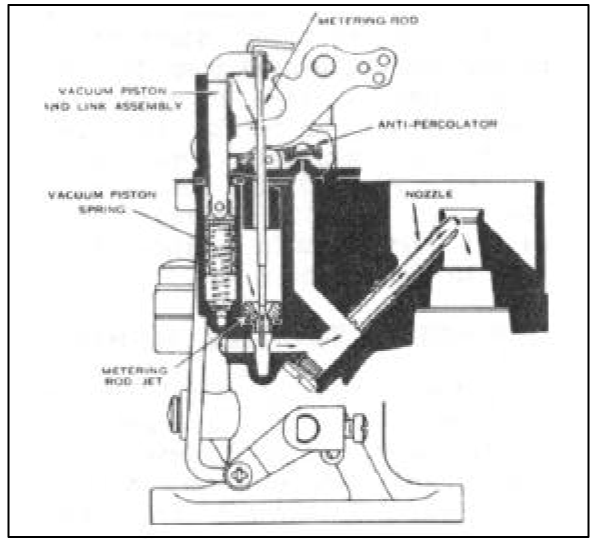
HIGH SPEED OPERATION

As the throttle opening is increased beyond the equivalent of about 20 mph, the velocity of the air flowing down through the carburetor throat creates a slight vacuum on the tip of main nozzle (A) Fig. 36. This suction causEs fuel to flow from the float bowl through the metering rod jet (G) and out the main nozzle (A) into the manifold via the venturi and the throat of the carburetor. Correct proportioning of fuel and air is accomplished by vertical movement of the tapered metering pin (D).



COURTESY OF CARTER CARBURETOR CORP.
Figure 36
High Speed Circuit Duplex Carburetors

The latter being mechanically connected to the throttle increases the effective opening of the metering jet orifice in proportion to the throttle opening, but without relationship to the variation in manifold vacuum produced at any given throttle position by differences in the load imposed on the engine.



COURTESY OF CARTER CABURETOR CORP.
Figure 37
High Speed Circuit Single Throat Models

By interposing a vacuum control on the metering pin movement, the richer mixture demands occurring in the range up to a throttle opening equivalent to about 60 mph, are met by permitting the accompanying drop in vacuum to lift the pin an additional amount over the mechanical lift produced by throttle position. Refer to Figs. 36 and 37.

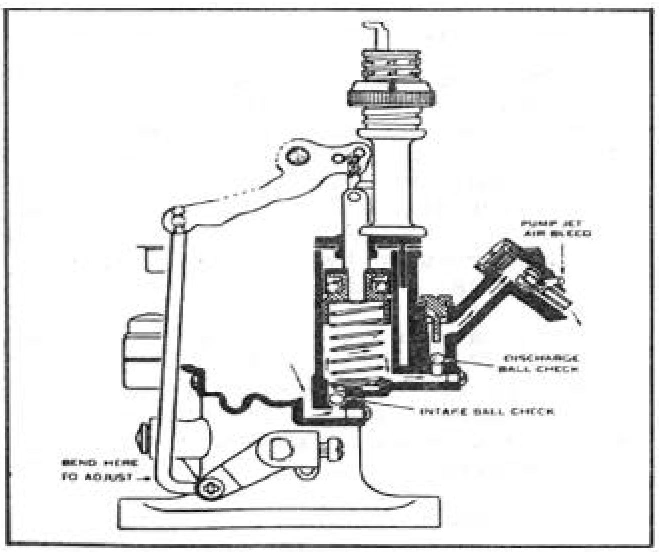
This is accomplished by means of the "vacumetric" control which permits a vacuum opposed spring (F) and piston (E) to move the metering rod out of the jet whenever the vacuum is lower than the spring pressure. As soon as the demand is removed, (as shown by an increase in manifold vacuum to the point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

ACCELERATING

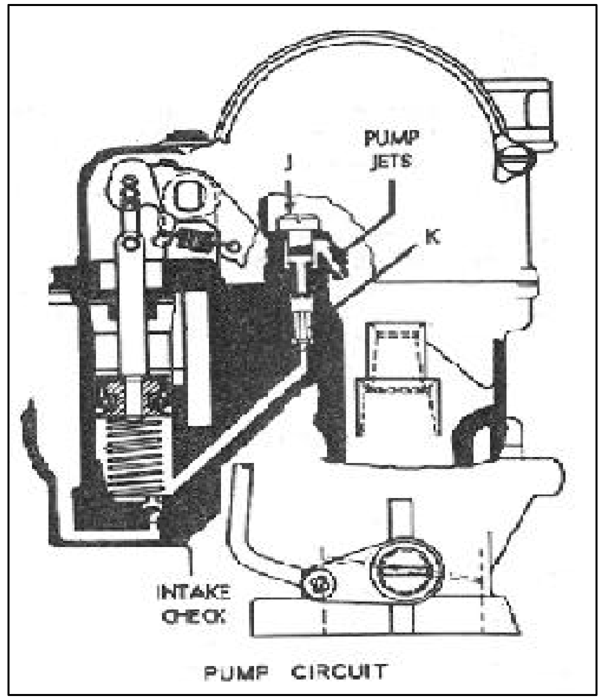
In order to supply the temporarily richer mixture required for maximum acceleration, the carburetor incorporates a throttle operated plunger pump which delivers liquid fuel into the throat when the throttle is opened. On the single throat units, the fuel path into the throat is via an intake ball check, Fig. 38, pump Cylinder discharge ball check and the calibrated pump jet located in the venturi body. On duplex units the path is via an intake ball check, pump Cylinder, a needle type discharge . check (K), Fig. 39, the longitudinally drilled and radially ported air horn screw (J) and the twin calibrated jets mounted in the air horn.

CARBURETOR TROUBLE SHOOTING

Among the causes of carburetor malfunctioning, dirt, gum and carbon are major offenders. It is advisable therefore to dismantle the unit and thoroughly clean all parts in alcohol or suitable petroleum solvent at least once each year.



COURTESY OF CARTER CARBURETOR CORP.
Figure 38
Pump Circuit WA1 454S Single Carburetor
Showing Use Special Pump Travel Indicator



COURTESY OF CARTER CARBURETOR CORP.
Figure 39
Pump Circuit WDO Duplex Carburetor

Idling Mixture Too Rich

Probable causes of this trouble are:

a. Idle mixture screw improperly adjusted.

b. Damaged or worn idle mixture adjusting screw or seat.

c. Leak at upper end of low speed jet.

d. Oversize or damaged metering hole in low speed jet.

e. Leak at main nozzle gasket.

f. Carbon around bore where throttle valve seats.

g. Throttle valve installed wrong.

h. Obstructed air bleed holes,-Indicated when the engine continues to idle with the mixture adjusting screw turned all the way in to its seat.

If careful adjustment of idle mixture adjusting screw does not correct the trouble, remove the low speed jet or jets and clean same thoroughly with compressed air. Make sure that jet is of proper specifications as per "Carburetor Specifi-cations" beginning this section.

Shoulder on jet must form a gasoline-tight seal in bowl casting.

Idling Mixture Too Lean

Common causes include:

a. Restricted or too small idle dis-charge ports.

b. End of idle mixture adjusting screw burred or grooved irregularly.

c. Loose throttle shaft lever.

d. Restricted idle mixture passage.

e. Air leak at flange gasket.

f. Oversize air bleed or by-pass holes in casting.

g. Loose idle port plug.

Poor Acceleration

a. Accelerating pump plunger worn, damaged, or spring weak.

b. Leaky pump inlet valve or discharge valve.

c. Leaky or incorrectly timed anti-percolator valve.

d. Bent pump aim or linkage worn or improperly adjusted.

e. Accelerating pump Cylinder corroded or contains sediment.

Poor Performance Above 20 MPH

Some of the probable causes are:

a. Restricted main nozzle. (Clean with compressed air only.)

b. Main nozzle leaking at the seat. Will also cause excessive fuel consumption and poor idle.

c. Main nozzle end hole too large.

d. Metering rod steps too large in diameter or jet too small. Check parts against Specifications on pages 34 to 39.

e. Malfunctioning of metering rod vacu-metric control such as stuck piston or broken spring.

f. Any of the items listed under "Poor Acceleration" above.

Excessive Fuel Consumption

a. Leaking main nozzle or restricted air bleed in same.

b. Metering pin worn, incorrectly set or too small,or jet too large. Check parts against Specifications on pages 34 to 39.

c. Stuck pump relief or restricted pump to bowl vent.

d. Float valve leaking

e. Float too high or punctured.

f. Choke not operating properly.

g. Restricted air filters.

h. Fuel pump pressure too high.

CARBURETOR ADJUSTMENTS

Idle Mixture

To adjust idle mixture, refer to page 19.

Throttle Stop Screw

To adjust throttle stop screw, refer to page 19.

Fast Idle

To set fast idle, refer to page 32.

Float Setting

To set float, refer to page 30.

Accelerating Pump

To adjust pump travel, refer to page 30.

Metering Rod Setting

To gauge metering rods, refer to page 30.

Anti-Percolator Valves

To adjust anti-percolator valves, refer to page 31.

AUTOMATIC CHOKE

This device called Climatic Control is used in place of the conventional choke control operated from the instrument panel. It will give the proper mixture ratios at all temperatures, relieving the driver of this important operation for the starting and driving of a cold engine.
Climatic Control is controlled by a thermostatic coil (B) Fig. 25, which holds the choke piston (C) at the top of its travel and holds the choke valve completely closed when the engine is cold. This supplies the engine with a rich fuel mixture for starting.

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

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

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

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

Choke Trouble Shooting

CHOKE AIR CLEANER SCREEN. The screen (D) may be clogged and thus restrict the flow of warm air from the manifold stove to cause slow opening of the choke. If screen is badly clogged, the choke will not fully open at the regular idling speed and temperature causing a loping idle. A clogged screen should be replaced or discarded as the choke will operate satisfactorily without one.

CHOKE COVER GASKETS. These may be shrunk or broken. In either case the gaskets will allow cold air to enter the cover thereby slowing up the opening action of the choke with the same results as a clogged air cleaner screen.

CHOKE VALVE. Sticking may be caused by a bent shaft, an improperly installed choke valve, or a warped air horn. A warped air horn may be caused by clamping the air cleaner to the horn too tightly. If the choke valve sticks open it will result in hard starting. If it sticks closed or partly closed it may result in hard starting and will undoubtedly cause poor gasoline economy.

CHOKE LINKAGE. If sticking, bent or improperly adjusted, it will result in the same conditions as described under "Choke Valve" above. The correction is freeing up, replacing, or adjusting properly. Linkage should be free enough to permit choke valve to fall of its own weight.

CHOKE PISTON. On rare cases sufficient grit may get by the choke air cleaner screen (D) to cause the piston (C) to be slow in its action or become entirely stuck. In either case the result will be the same as the condition described under "Choke Valve" above. If the piston and Cylinder cannot be cleaned or if worn they should be replaced.

NOTE: Excessive air leakage between the choke stove (E) Fig. 6, and exhaust manifold on 6 Cylinder engines, will delay the opening of choke valve. In no case should it be possible to insert a 0.010" feeler blade between stove and manifold mounting faces at TUBE end of stove.

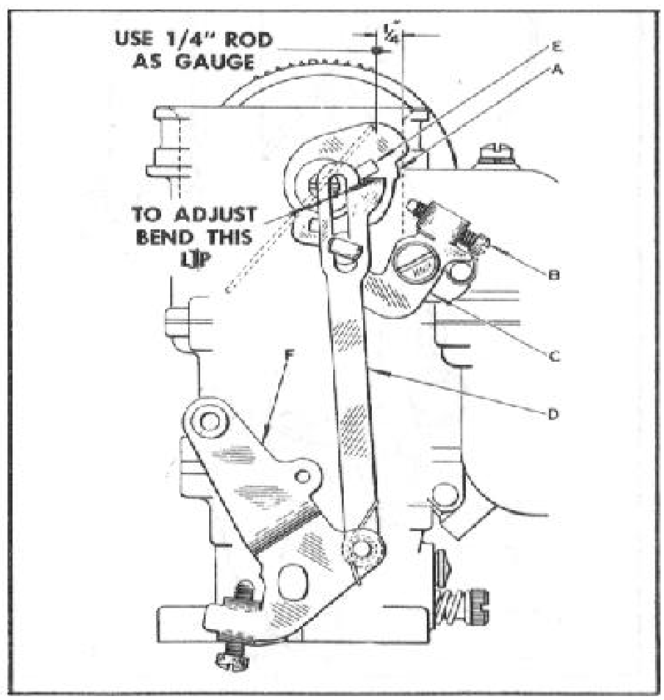
AUTOMATIC CHOKE ADJUSTMENTS

Thermostatic Coil

For average driving and climatic conditions the index mark on the coil housing should be set at the center (raised) mark on the air horn casting. If fuel or climatic conditions dictate a change in the setting, do so by rotating housing one mark at a time clockwise for leaner setting, anti-clockwise for richer setting. Engine must be thoroughly cooled between adjustments. Check heat stove, screen, etc., for malfunctioning BEFORE changing from standard adjustment.

Unloader Adjustment

DUPLEX CARBURETORS. With throttle wide open, the distance between the upper edge of the choke valve and the inner wall of the air horn should be 1/4" as in Fig. 40. Adjustment can be made by bending the lip (indicated by arrow) on the fast idle connector link.



COURTESY OF CARTER CARBURETOR CORP.

Figure 40

On Duplex Carburetors the Choke Unloader Adjustment Also Controls the Lockout

With the throttle wide open push the choker valve open. The choke should lock in its wide open position. If it does not lock, recheck the unloader adjustment. Closing of the throttle will release the choker valve as the choker trip lever is notched out for this setting.

SINGLE CARBURETORS. There should be 7/16" clearance at (A) Fig. 41, between the lower edge of the choke valve and the inner wall of the air horn with the throttle valve wide open.

Adjustment can be made by bending the cam on the throttle lever.

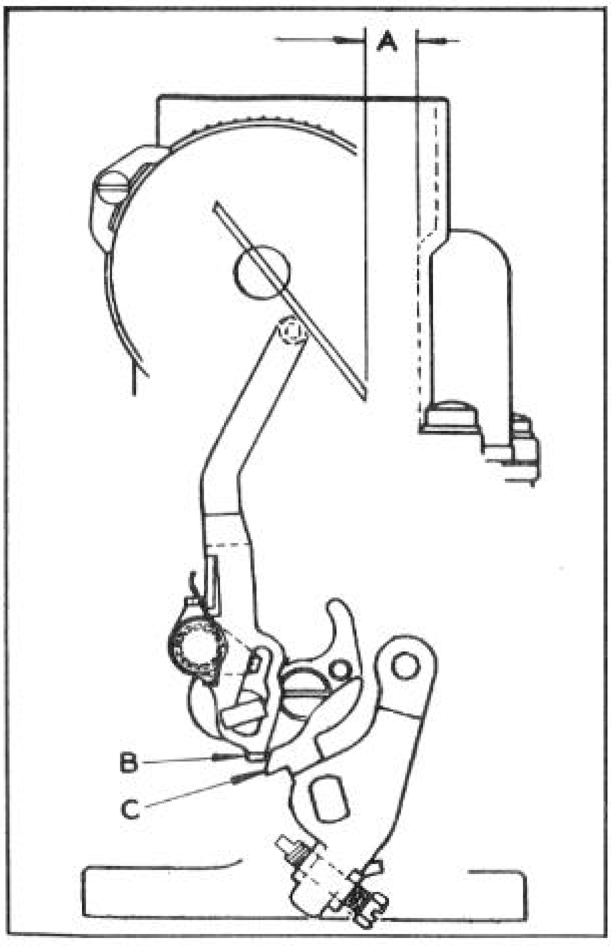


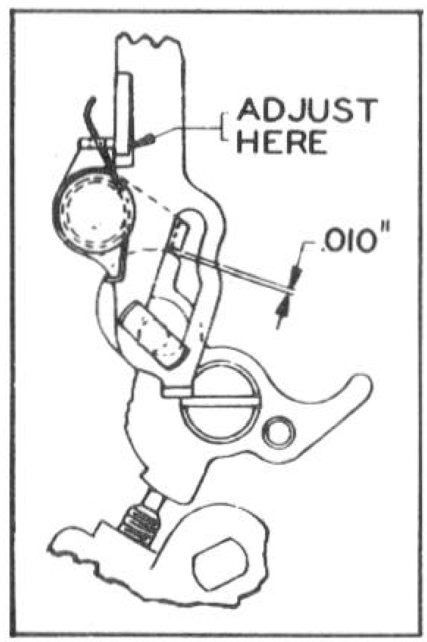
Figure 41
Unloader and Choke Lockout Settings on WAI 4545 Single Carburetor

Lockout Adjustment

SINGLE CARBURETORS. The choke should lock in wide open position when the throttle and choke valve are held wide open.

If lockout does not occur, adjust by bending the lip at the lower end of the fast idle link to give 1/32" clearance between the lip (B) Fig. 41, and the throttle lever cam lock (C) with throttle and choke valves wide open. Use tool J-787 for bending.

After making all choke linkage adjustments on Model 4545 carburetors, hold choke valve tightly CLOSED with pin on fast idle cam resting at bottom of slot in the fast idle link. At this time there should be 0.010" clearance between fast idle cam and trip lever lip as in Fig. 42. Obtain this clearance by adjusting the trip lever stop at point shown.



COURTESY Of CARTER CARBURETOR CORP.
Figure 42
Choke Trip Lever Adjustment On WAI 454S Single Carburetor

DUPLEX CARBURETORS. The choke on these carburetors will lock in the open position automatically, when the throttle is wide open, if the "unloader" has been correctly adjusted and choke valve is opened by hand.

DISASSEMBLY AND REASSEMBLY OF CHOKE

Remove two attaching screws and retainers holding the thermostat coil and housing assembly. Remove set screw holding choke lever and link assembly to choke piston link and shaft assembly. Remove two choke screws and choke valve.

Turn choke lever assembly until the piston is free from the Cylinder and remove assembled parts. Do not lose the piston pin. Remove the piston housing strainer. The thermostatic coil (B) Fig. 25 should never be removed from the cover. If damaged, replace the entire cover and coil assembly.

Wash all parts, except coil and housing assembly in clean gasoline. Then blow through all passages with compressed air. Remove all foreign substances from air horn and other parts.

Reassemble in reverse order while observing the following:

Install choke valve, using new screws. Make certain valve does not bind or rub on inside of air horn bore. Tighten screws securely. Valve should fall open of its own weight after installation.

Install thermostatic coil and housing assembly with notch at bottom Insert attaching screws and retainers loosely and then turn housing anti-clockwise until notch is in line with center mark on piston housing on 454S single carburetors or on 501S and 502S duplex units when notch is aligned with first mark on lean side of center mark on housing then tighten screws securely.

When reassembling carburetor to engine, make certain flexible tubing on eight Cylinder engines and stove on six Cylinder models is properly connected to exhaust manifold.

CARBURETOR TOOLS

Carburetor major servicing should not be attempted unless the shop is equipped with at least the tune-up kit J-819E, which contains the following:

A. J-816-1 Low speed and pump jet wrench - 3/16".
B. J-816-2 Discharge ball check and jet wrench - 1/4".
C. J-816-4 Metering rod jet and float needle seat wrench - 7/16".
D. J-816-6 Ball check plug jet wrench - 11/32".
E. J-816-5 Handle for wrenches.

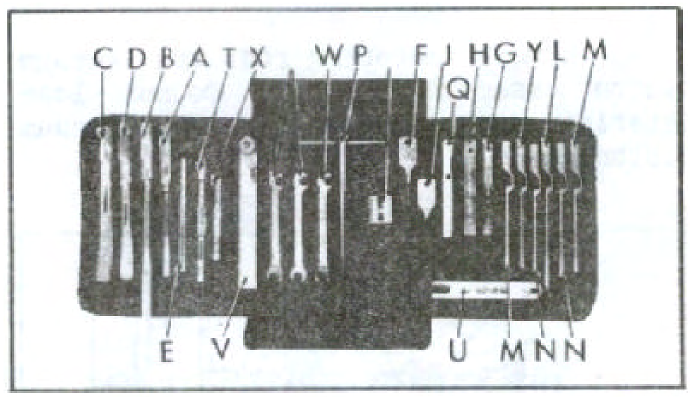


Figure 43
Engine Tune Up Kit J-819-E

F. J-818-5 Float level gauge - 1/8".
G. J-819-B-1 Float level gauge - 15/64".
H. J-818-2 Float level gauge - 3/8".
J. J-818-7 Float level gauge-3/32".
L. J-509 Metering rod gauge- 2.795".
M. J-510 Metering rod gauge - 2.359" pair.
N. J-1305 Metering rod gauge-2.280" pair.
Y. J-1265 Metering rod gauge-2.468".
P. J-508 Jet extractor.
Q. J-787 Spark plug and distributor arm bending tool.
R. J-460 Distributor contact point and contact arm adjusting wrench.
S. J-507 Accelerator pump plunger assembling sleeve.
T. J-882-A Spark plug gap (.032") gauge.
U. J-1062 Anti-percolator valve adjusting gauge.
V. J-815-A Feeler gauge set.
W. KNO-364 Idling adjustment wrench.
X. J-1856 Distributor feeler gauge.

CARBURETOR OVERHAUL
DUPLEX MODELS 501S, 502S

Disassembly

1. Remove dust cover.

2. Remove screws (A) Fig. 44 and air horn assembly. The drilled screw inside air horn beneath choke valve must be removed. Pump discharge needle is located in this hole.

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

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

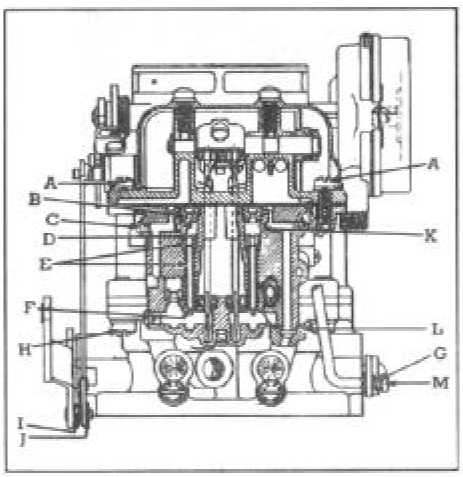


Figure 44
Type WDO Carter Duplex Carburetor
Typical of Models 501S and 502S

B - Bypass bleeder screw plug
D - Bypass
E - Low speed jet
G - Connector rod spring
H - Body flange screw
I - Connector link spring
K - Economizer
L - Idle passage gasket
M - Rod spring retainer

5. Remove strainer from bottom of pump Cylinder and pump discharge needle by inverting carburetor. Also remove retainer ring and pump ball check. Use Tool J-816-6. DO NOT REMOVE PUMP JETS.

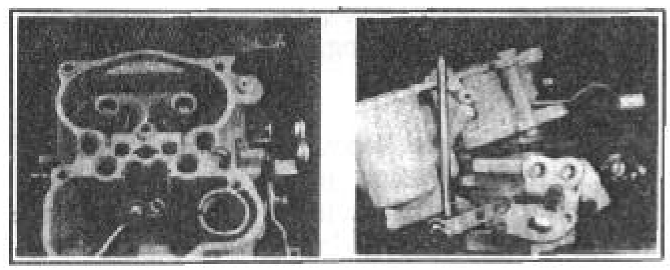
6. Remove anti-percolator valve assemblies.

7. Remove both low speed jet bleeder plugs (B) and both low speed jets (E). Use tool J-816-1 to remove jets.

8. Remove both metering rod jet assemblies and their gaskets. Refer to Fig. 45.

9. Remove body flange assembly from throttle body also flange and idle passage sealing gaskets (L) Fig. 44.

10. Remove both nozzle passage plugs, retainer plugs, nozzles and gaskets



COURTESY OF CARTER CARBURETOR CORP.
Figure 45
Removing Metering Rod Jets and Body Flange from Throttle Body

11. Remove both idle adjusting screws from flange assembly and idle port rivet plugs as in left hand view Fig. 46.

12. Remove throttle shaft arm attaching screw, washer and throttle shaft arm.

13. Remove throttle valve screws and throttle valves and throttle centering screw as in Figs. 46 and 47.

14. Remove throttle shaft and lever assembly, fast idle link and spring.

15. Remove all parts from bowl cover.

16. Remove all parts from air horn.

NOTE: Wash all parts in a good gum solvent, except choke thermostatic coil and housing assembly. Blow out all passages with compressed air and scrape carbon from bores of flange.

Carburetor Repair Notes

(SINGLE AND DUPLEX TYPES)

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

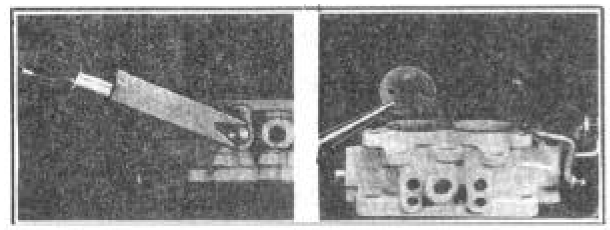
Reject float needle valve and seat if they show leakage or are damaged. New needle not supplied separately but is available as a matched set with seat.

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

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

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

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



COURTESY OF CARTER CARBURETOR CORP.
Figure 46
Left - Removing Duplex Idle Port Plugs
Right - Removing Duplex Throttle Valves

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

Clean carbon deposits from carburetor throat.

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

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

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

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

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

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

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

Reassembling Carburetor

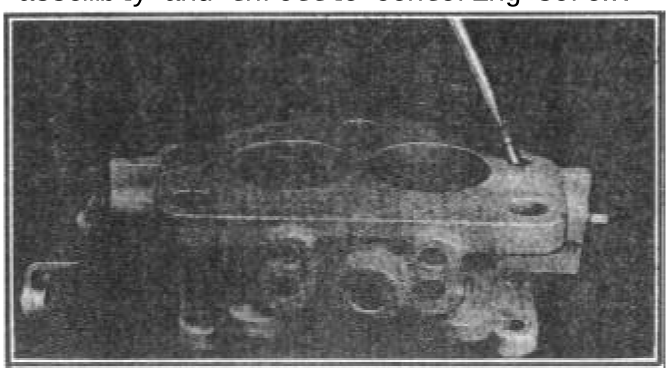
Duplex Models 501S, 502S

Use all new gaskets when reassembling.

1. Install float circuit parts in bowl cover. (Needle seat and gasket, needle, float assembly, float pin, bowl cover strainer and nut and gasket assembly.)

2. Set float height to 1/8", as shown on page 30. Use gauge J-818-5. Gauge both ends of float from machined surface of casting.

3. Insert throttle shaft and lever assembly and throttle centering screw.



COURTESY OF CARTER CARBURETOR CORP.
Figure 47
Installing Throttle Centering Screw

4. Loosen throttle lever centering screw, back out throttle lever stop screw and then install throttle valves from lower side of flange casting. Use new screws. Trademark ("C" in circle) on valves should be toward manifold and on idle port side of bores. Hold valves with fingers and tap lightly with screwdriver on high side of valves. Do not release this grip until all four screws are tightened.

5. Install idle adjusting screws and NEW idle port plugs.

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

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

8. Install anti-percolator valves.

9. Install pump intake check ball and retainer ring at bottom of pump Cylinder. Install strainer.

10. Install pump plunger spring, and pump plunger.

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

12. Install vacuum piston spring and vacuum piston assembly. It is advisable to use a NEW vacuum piston spring each time the unit is serviced.

13. Install new bowl cover gasket and bowl cover as assembled. Tighten screws evenly.

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

15. Install pump arm and collar assembly on shaft. Hold anti-percolator arm and metering rod arm in position, then slide shaft into place. Tighten anti-percolator arm screw.

16. Install connector link on pump rod and in outer (long) hole of pump arm. Pin spring should be at top against outside of pump arm.

17. Install throttle connector rod, spring and spring retainer. Adjust pump plunger travel as outlined on page 30.

18. Adjust metering rod linkage as per page 30. Install metering rods.

19. Adjust anti-percolator valve linkage as per instructions on page 31.

20. Install pump discharge needle and air horn, using new gasket. Do not forget special screw inside air horn. No washer is used on this screw.

21. Install choke shaft assembly and piston.

22. Install choke valve, using new screws. Center valve before tightening screws. Valve must fall open of its own weight after installation.

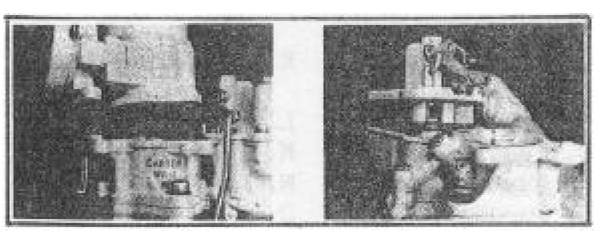
23. Install fast idle link and spring to lever on throttle shaft.

24. On end of choke shaft, install fast idle cam with spring, washer, then choker trip lever and screw.

25. Install Climatic Control screen and thermostatic coil and housing assembly. Coil housing should be set one mark lean from index.

26. Install dust cover, using graphite grease in screw holes.

27. After carburetor is assembled,adjust the fast idle as outlined on page 32, and the choke unloader and lockout as per instructions on page 43.



COURTESY OF CARTER CARBURETOR CORP.
Figure 48
Removing Air Horn and Bowl Cover Units Single Throat WAI Model 454S Carburetor

CARBURETOR OVERHAUL SINGLE THROAT MODEL 454S

Disassembly

1. Remove dust cover.

Examine inside of dust cover for marks that might indicate that the metering rod assembly has been dragging, a condition that is caused by improper installation of the cover.

2. Remove fast idle cam and pin assembly.

3. Remove the air horn and Climatic control assembly as a single unit, Fig. 48, then remove all parts therefrom except the piston housing which is attached to air horn by means of a rivet.

4. Remove the throttle connector rod and check same for wear at both ends also condition of hole in pump arm.

5. Remove the pin spring and connector link from the pump arm.

6. Remove the low speed passage plug and gasket assembly. These are located next to the anti-percolator cap.

7. Remove the bowl cover attaching screws and lockwashers, lift off bowl cover assembly intact, as in Fig. 48 and remove vacuum piston spring from vacuum Cylinder in the casting.

8. Remove the piston from the link by revolving a quarter turn.

9. Remove all parts from the bowl cover assembly.

10. Remove pump strainer and check ball from bottom of pump Cylinder.

11. Remove nozzle passage plug and gasket assembly, nozzle retainer plug and nozzle using tool J-508. Make sure that the small

that the small nozzle gasket is removed from the nozzle passage. See Fig. 49.

12. Remove the metering rod jet (R) Fig. 50.

13. Remove the pump jet passage plug and gasket assembly. Remove pump jet.

14. Remove pump discharge ball retainer, gasket and check ball.

15. Remove low speed jet assembly (G).

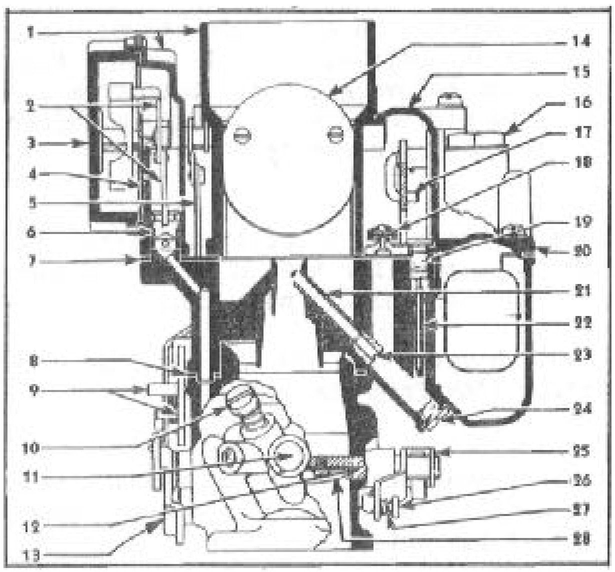


Figure 49
Single Carburetor Type WAI Model 454S

1. Air horn
2. Choke piston lever
3. Thermostatic coil
4. Piston housing strainer
5. Choke lever link
6. Choke piston
7. Air horn gasket
8. Body flange gas-ket
9. Fast idle cam
10. Idle mixture ad-justment screw
11. Idle port plug
12. Throttle shaft
14. Choker valve

16. Strainer nut
17. Connector link
18. Anti-percola-tor cap
19. Idle passage plug
20. Bowl cover
21. Nozzle
22. Low speed jet
23. Nozzle plug
24. Nozzle passage plug
25. Throttle shaft arm
26. Spring retainer
27. Conn.rod spring
28. Throttle valve

16. Remove body flange assembly and gaskets.

17. Remove idle adjusting screw, and idle port rivet plug, (ii) Fig. 49.

18. Remove throttle shaft arm and screw assembly (25).

19. Remove throttle valve screws, throttle valve, and throttle shaft with lever assembly.

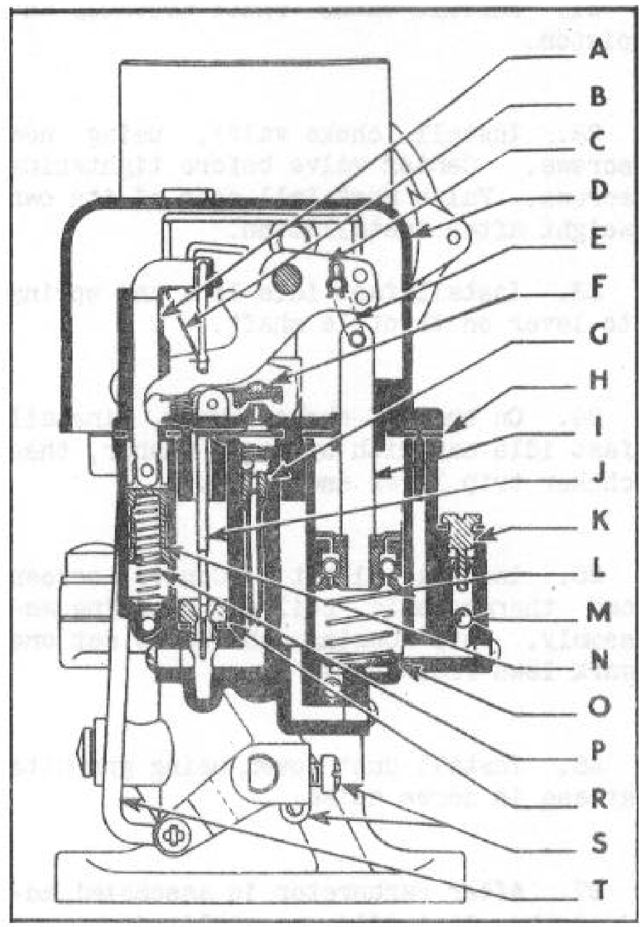


Figure 50
Single Carburetor Type WAI Model 454S
Viewed From End of Throttle Shaft

A. Piston link
B. Metering rod spring
C. Pump arm
D. Dust cover
E. Connector link
G. Low speed jet
H. Bowl cover gasket
I. Plunger and rod
J. Metering rod

K. Pump discharge retainer plug
L. Pump spring
M. Pump check ball
N. Vacuum piston
O. Pump strainer
P. Vac. piston spring
R. Metering rod jet
S. Throttle arm
T. Throttle con. rod

NOTE: Wash all parts in a good gum solvent, except choke thermostat coil and housing assembly. Blow out all passages with compressed air and scrape carbon from throat bores and replace all worn and damaged parts. Don't remove pump jets and clean them only with compressed air.

Repair Notes

Refer to page 47 for data on single and duplex models.

Reassembly

1. Install needle seat assembly, strainer, nut and gasket to bowl cover.

2. Install float, needle and lever pin. Set float level as per page 30.

3. With the manifold side of the carburetor flange facing up, install the throttle shaft and lever assembly. Back out the throttle lever adjusting screw.

4. Install the throttle valve using new screws. The trademark on the valve should be facing up and to the idle port side. With the valve screws loose, tap throttle valve lightly to centralize it in the carburetor bore. The throttle lever adjusting screw must be backed off so that the valve will seat.

5. Install the throttle shaft arm and screw assembly. Set the arm and tighten the screw so that the throttle will move freely.

6. Install idle port plug, idle adjusting screw and spring. Use a new idle port plug. If the idle adjusting screw is burred it should be replaced.

7. Install body flange assembly to throttle body using a new gasket.

8. Install low speed jet. Make certain that the hole at the lower end is open. Work the jet well into its seat by moving it back and forth and then remove it and examine to be certain that the jet seats in the casting at the shoulder.

9. Install the pump jet and pump jet passage plug using a new gasket. Make certain the small hole in the casting from the pump jet passage to the outside is open.

10. Install discharge check ball and ball retainer and a new gasket for same.

11. Install intake check ball in bottom of pump Cylinder; pump strainer; pump spring; plunger and rod assembly.

12. Install metering rod jet using a new gasket.

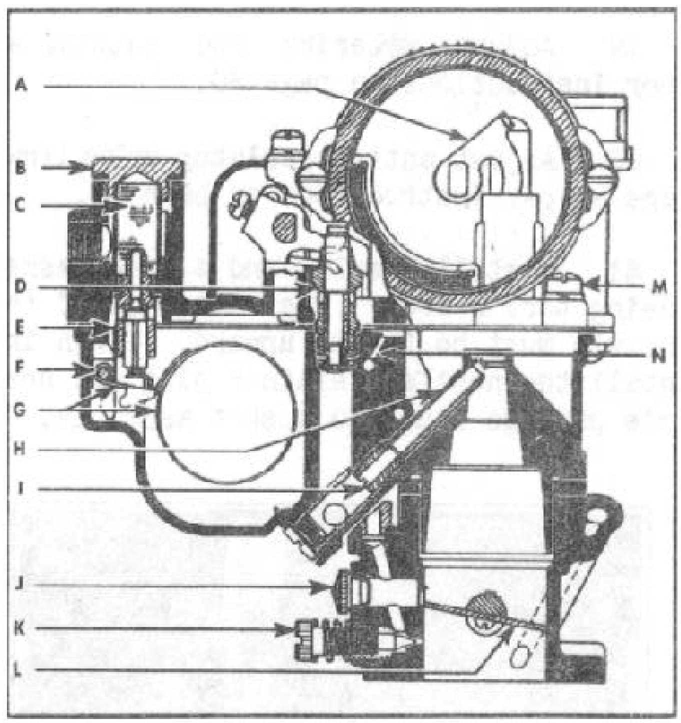


Figure 51
Duplex Carburetor Looking at End of Throttle Shaft

A. Choke shaft	H. Nozzle
B. Strainer nut	I. Nozzle plug
C. Strainer gauze	J. Idle port plug
D. Anti-percolator	K. Idle adj. screw
E. Needle and seat	L. Throttle valve
F. Float lever pin	M. Air horn screw
G. Float and lever	N. Air bleed

13. Install pump spring and pump plunger and rod assembly. Be careful not to turn lip of plunger under during installation.

14. Install bowl cover assembly using new gasket.

15. Install idle passage plug and new gasket. Plug is located adjacent to anti-percolator cap in bowl cover.

16. Install anti-percolator cap,rocker arm assembly and spring. Make sure leather in cap is in good condition.

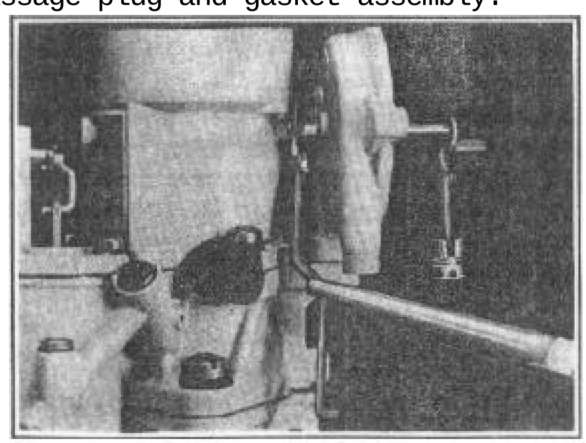
17. Install pump arm and countershaft assembly to bowl cover. Connect link in LOWER hole of arm with pin spring at top and ends of link away from piston. Install throttle connector rod.

18. Adjust pump travel to 3/16" as per instructions on page 30.

19. Adjust metering rod setting as per instructions on page 30.

20. Adjust anti-percolator valve linkage as per instructions on page 32.

21. Install nozzle and a new gasket using tool J-508. The flat side of the nozzle must be facing upward. Then install the nozzle retainer plug and nozzle passage plug and gasket assembly.



COURTESY OF CARTER CABURETOR CORP.

Figure 52
Method of Installing Choke Shaft and Piston On Type WAI Single Carburetor

22. Install a new air horn gasket; air horn and piston housing assembly. Install the screw under the piston housing.

23. Place choker lever screw and link assembly behind the piston housing as shown in Fig. 52, then install the choke shaft and piston assembly as shown.

24. Install the choker valve and use new choker valve screws. Loosen the choker valve screws and tap the choker valve lightly to centralize it in the air horn. Tighten the screws.

Choker valve should move freely in the air horn. Tighten choker lever screw.

Choke should fall open of its own weight.

25. Install strainer in the piston housing. If the strainer is dirty or clogged, it should be replaced.

26. Install thermostat housing and coil assembly with the word "Climatic" at the bottom and turn it anti-clockwise until the center marking on the housing indicates that the choke is set at the index. Install housing retainers and attaching screws and tighten securely.

27. Hold choker valve wide open, then tighten choker lever screw as shown in Fig. 53.

28. Install fast idle cam with attaching screw.

29. Adjust fast idle -- see page 32.

30. Adjust unloader and lockout as per instructions on pages 43 and 44.

31. Pack the dust cover attaching screw hole in the bowl cover with graphite grease and install the cover screw and lockwasher.

GOVERNOR

All new cars are equipped with a speed governor installed between the carburetor body flange and intake manifold to prevent high speed driving during the breaking-in period. The unit limits the top speed to approximately 45 miles per hour.

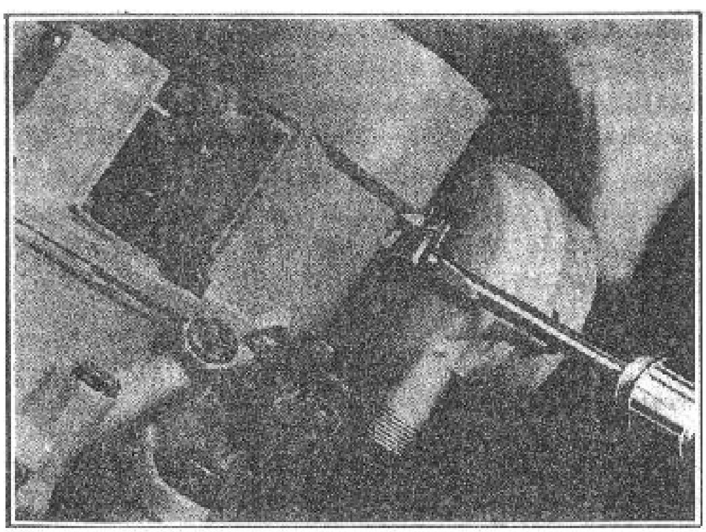
This governor is sealed by the HUDSON factory at the time of installation.

The governor will restrict acceleration as well as high speed operation and will slightly increase the carburetor air intake noise.

The governor is removed by the HUDSON Dealer at the time of the 500-mile new car inspection.

AIR FILTER

The standard equipment oiled gauze type of air filter and the optional equipment oil bath type air filter should be cleaned at intervals of each 2000 miles or oftener. Method of servicing the filters is outlined in Test 19 on Page 29.



COURTESY OF CARTER CARBURETOR CORP.
Figure 53
Tighten Choke Lever Screw With Valve Open

FUEL PUMP MODELS

Mechanically driven fuel pumps and mechanically driven combination fuel and vacuum pumps used on 1942,1946 and 1947 Hudson cars are manufactured by the AC Spark Plug Company, of Flint, Michigan.

The electrically driven fuel pumps used on part of the production of 1946 cars are manufactured by the Autopulse Corporation of Detroit, Michigan. Pumps used are listed below:

Factory No.	Series	Exch. Pump	Repair Kit	Diaphragm Kit Fuel	Diaphragm Kit Vacuum
1523289	AP	499	R-34	D-20	-
1523753	AF	509	R-21	D-15	-
1523936	AJ	-	R-30	D-18	D-28
1523937	AJ	-	R-30	D-18	D-28
165980	500	Elec.	-	-	-

Factory Part Number For Mechanical Pumps is Stamped on Mounting Flange.

FUEL PUMP OPERATION

AC Mechanical Pumps

In the AF and AP types, rotation of the eccentric on the engine camshaft actuates the rocker arm (B) Fig. 54, which is pivoted and in turn pulls the pull rod and diaphragm assembly (E) downward against the diaphragm spring, thus creating a vacuum in the pump chamber (G) and opening suction valve (K).

Fuel from the tank enters through the inlet into the sediment bowl and then through the strainer and the suction valve into the pump chamber. On the return stroke, the spring pressure pushes the diaphragm upward forcing fuel from the pump chamber through the outlet valve (L) to the carburetor and closing the suction valve (K).

When the carburetor bowl is filled, the float in the float chamber will shut off the inlet needle valve thus creating a pressure in the pump chamber. This pressure holds the diaphragm downward against the spring pressure where it remains inoperative until the carburetor requires further fuel and the needle valve opens.

The rocker arm spring is merely for the purpose of keeping the rocker arm in constant contact with the eccentric so as to eliminate noise.

The air dome is a chamber on outlet side of pump which provides a pocket where fuel under pressure can compress a certain amount of air. When pressure is relieved (pump on suction stroke), the pocket of compressed air pushes fuel into carburetor. An air dome minimizes flow variations and increases the pump output.

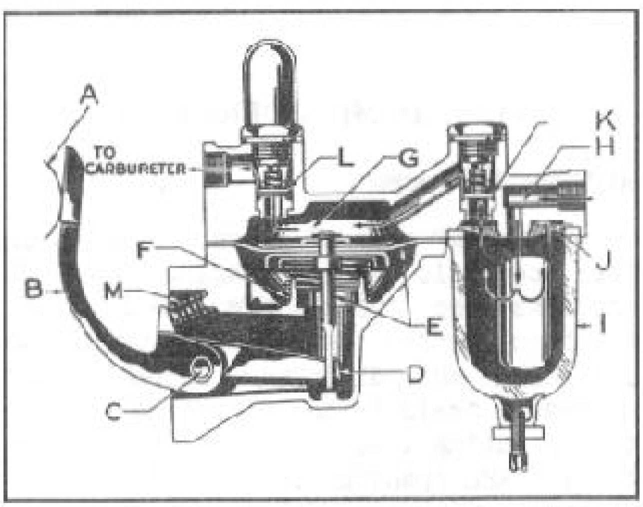


Figure 54
Type AP Number 1523289 AC Fuel Pump

A. Camshaft eccentric
B. Rocker arm
C. Rocker arm pin
D. Link
E. Pull rod and diaphragm
F. Diaphragm spring
G. Pump chamber
H. Inlet
I. Sediment bowl
J. Strainer
K. Suction valve
L. Pressure valve
M. Rocker arm spring

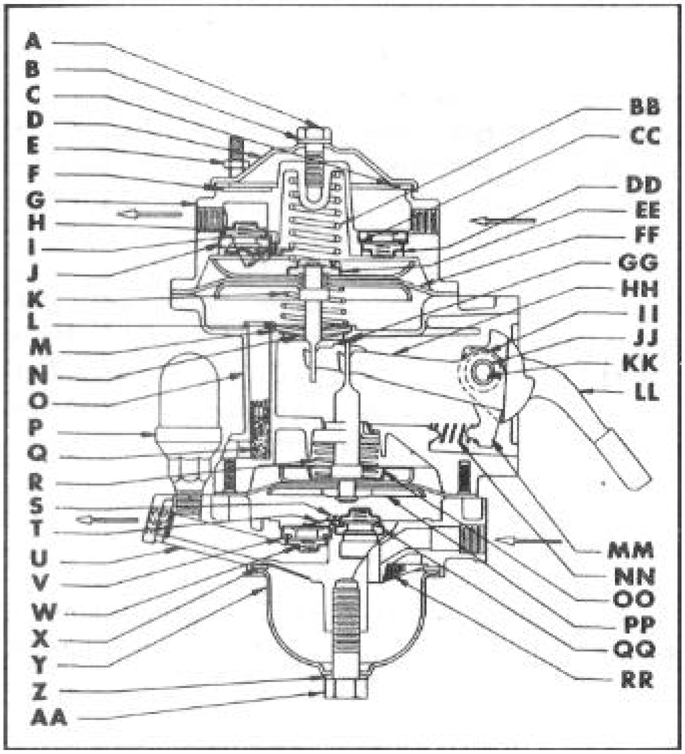
In the AJ combination fuel and vacuum pump, the fuel pump section operates as described for the AF and AP types. The vacuum section of the pump acts as a booster to the intake manifold suction thus providing uniform operation of the vacuum windshield wiper at all engine speeds and loads as follows:

Both sections of the combination pump are operated by a single rocker arm (LL) Fig. 55. Rocker arm movement' through the link and pull rod, pushes the diaphragm (FF) into the air chamber against the 60 to 80 pounds pressure of spring (BB). Pressure created by the diaphragm movement expels air through the outlet port and into the intake manifold. The return stroke of the rocker arm releases the compressed diaphragm spring (BB), creating a vacuum which draws in air from the windshield wiper via the pump inlet valve (DD).

When manifold vacuum is greater than that created by the pump, the manifold vacuum pulls the diaphragm into the air chamber against spring pressure thus moving the link out of engagement with the rocker arm. Under this condition the rocker arm continues to move with the engine camshaft eccentric but produces only a fluttering effect on the diaphragm. The windshield wiper then operates without assistance from the pump. When intake manifold vacuum is low as on acceleration or at high speed, the vacuum created by the pump will assure operation of the wiper.

Autopulse Electric Pump

This pump differs from the mechanically driven AC pumps in utilizing an accordion type metallic bellows (517) Fig. 56 actuated by a 6 volt electric solenoid to obtain the pumping action performed by the diaphragm and engine camshaft operated rocker arm in the



igure 55
Type AJ Combination Fuel and Vacuum Pump

A. Cover screw
B. Screw gasket
C. Cover gasket
D. Cover plate
F. Screen
G. Body
H. Valve plate
I. Plate screw
J. Valve and cage
K. Oil seal spring
L. Oil seal re-
tainer upper
M. Oil seal washer
N. Oil seal retainer
lower
O. Body and
seal
P. Air dome
Q. Filter hair
R. Diaphragm spring
S. Valve plate
screw
T. Valve plate
U. Cover
V. Cage gasket
W. Valve and cage
X. Bowl gasket
Y. Metal bowl
Z. Gasket
AA. Bowl screw
BB. Diaphragm
spring
CC. Cage gasket
DD. Valve and cage
EE. Diaphragm
spring seat
FF. Pull rod and
diaphragm
HH. Fuel pump link
II. Spacers
JJ. Bushings
KK. Rocker arm
pin
LL. Rocker arm
MM. Link spacer
NN. Rocker arm
spring
OO. Spring retainer
PP. Pull rod and
diaphragm
QQ. Valve and cage
RR. Screen assembly

mechanical pump. The electric pump also differs from the mechanical in being provided with a pressure adjustment (536). Repair parts and service for the electric pump are available from the Auto- pulse Corporation, Detroit, Michigan, and from their authorized distributors.

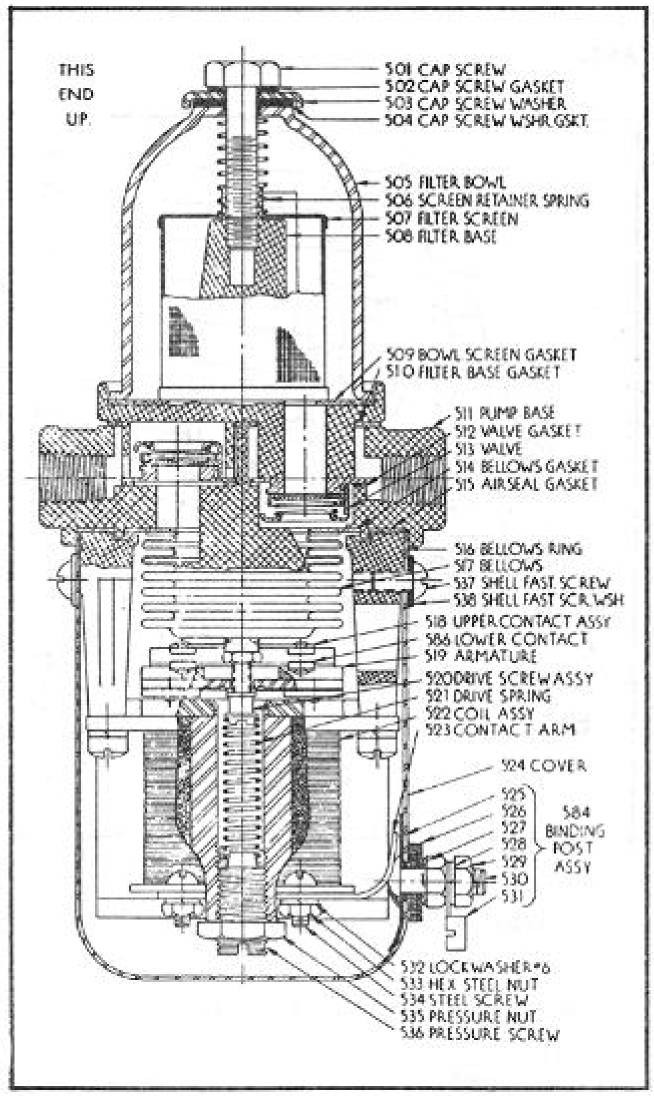


Figure 56
Autopulse Type 500 Electric Fuel Pump
Regular Equipment on Some 1946 Cars
Screw 536 Adjusts Pump Pressure

FUEL PUMP
REMOVAL AND INSTALLATION

Because of the effect on pump pressure and vapor locking of the fuel, it is extremely important that no deviation be made from the factory set-up with respect to oil baffles, spacers and gaskets.

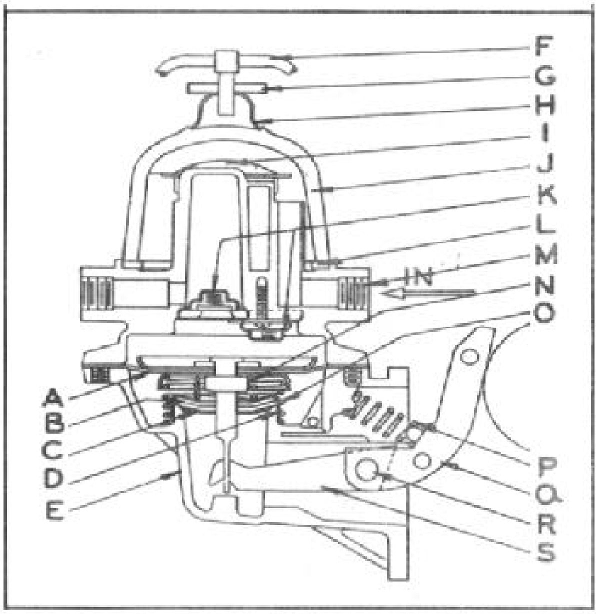


Figure 57
Type AF Number 1523753 AC Fuel Pump

A. Pull Rod and diaphragm
B. Oil seal washers
C. Oil seal re-tainer--lower
D. Oil seal re-tainer--upper
E. Body
F. Bail and screw assembly
G. Bail thumb nut
H. Bowl seat
I. Screen
J. Bowl
K. Valve and cage assembly
L. Bowl gasket
M. Cover
N. Oil seal spring
O. Diaphragm spring
P. Rocker arm spring
Q. Rocker arm
R. Rocker arm pin
S. Link

AC Type AK

The order of installation of attaching parts is shown in Fig. 58. It will be noted that the 0.275" thick woven steel and asbestos spacer, part 153273, contacts the pump mounting flange face,. next is the steel baffle, part 153274 with bulged side facing the engine, and lastly the 0.015" rubber asbestos gasket, part 153275. The wire woven thick asbestos spacer 153273, used on this pump, should not be used on the combination fuel and vacuum pump.

Note also that a bakelite sleeve is to be installed over each mounting cap screw.

Of the 3 washers, the composition insulating washer, part 154193, contacts the pump flange, next comes the plain steel washer, part 71638, and lastly on the outside the lockwasher, part 70414.

AC Type AF

No special precautions are needed on this installation which is shown in Fig. 60. Pump to Cylinder block gasket is part 156704.

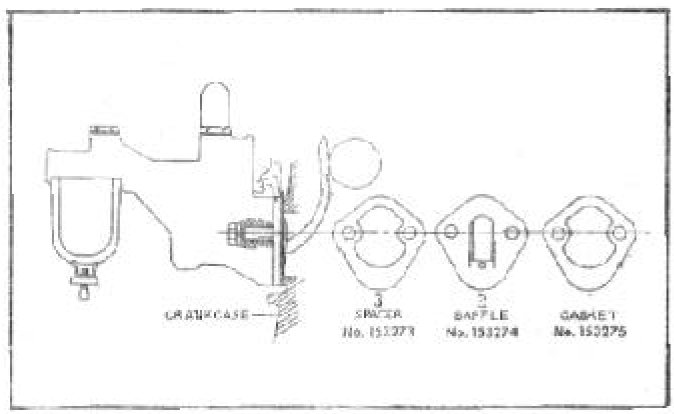


Figure 58
Order of Assembly, Pump to Engine Mounting Parts of AC Type AK Pump Number 1523289

Autopulse Electric Pump

Because this pump has no direct mechanical connection with the engine, no special precautions are required for correct installation.

AC Type AJ

(Combination Fuel and Vacuum Dump)

The order of installation of attaching parts is shown in Fig. 59. It will be noted that the part 153275 gasket contacts the pump mounting flange face, next is the 0.165" thick spacer plate, part 158667, and finally the asbestos spacer, part 158666, which contacts the Cylinder block.

FUEL PUMP TESTS ON ENGINE

To test types AF, AP and AJ Pumps, stamped 1523753, 1523289 and 1523936 or 1523937 respectively, on the mounting flange, proceed as outlined in Test 17 Page 27, of Engine Tune-Up Section.

1. To test vacuum pump portion of combination pumps, disconnect both the inlet and the outlet lines from the vacuum (upper) element of the pump. Refer to Fig. 59.

2. Attach KMO-144 or equivalent vacuum gauge or mercury column to the inlet port which is the side of the pump connected to the windshield wiper line.

3. Operate engine at 1000 to 1200 rpm at which time the gauge should show 7 to 12 inches of vacuum.

4. If less than 7 inches of vacuum are produced, it can be assumed that the vacuum section of the pump needs repairing.

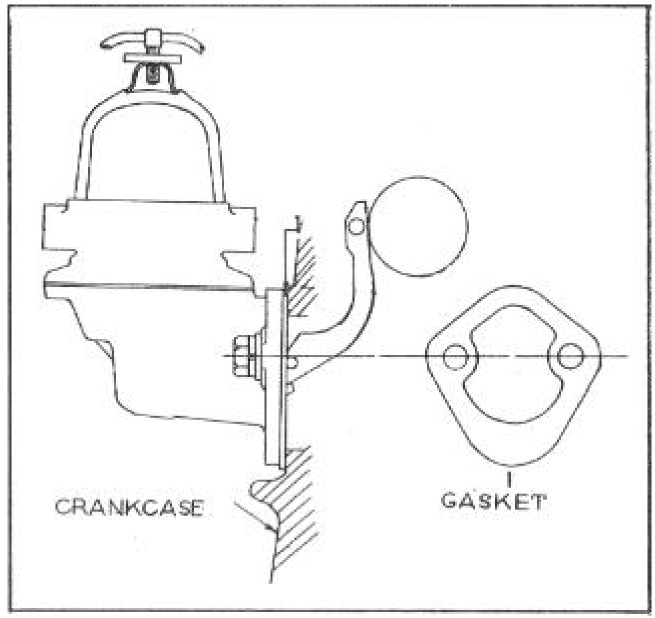


Figure 60
Type AF Pump 1523753

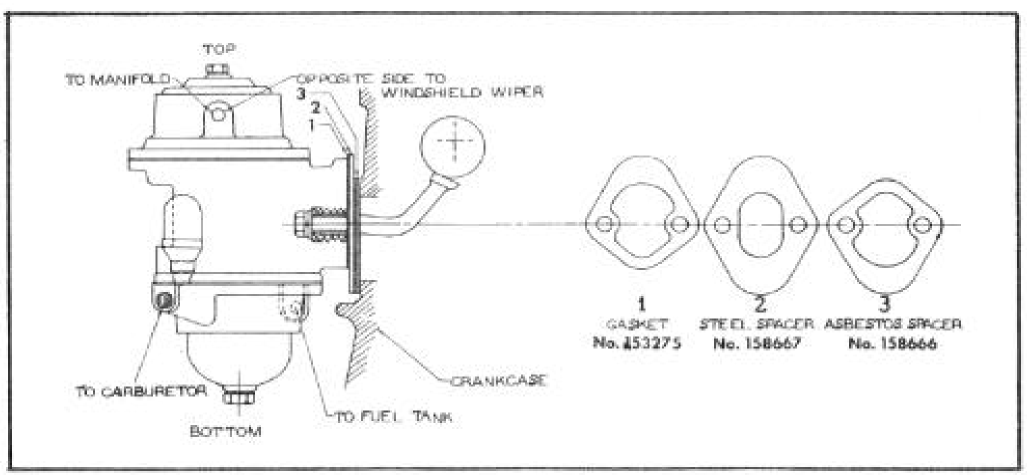


Figure 59
Order of Assembly for Pump to Engine Mounting Parts, Applying to the Combination Fuel and Vacuum Type AJ Pumps, Numbers 1523936 and 1523937.

CAUTION: Always make this test of the vacuum pump with outlet open because internal pressure due to closing the outlet will damage the pump mechanism.

NOTE: Oil smoke in engine exhaust may indicate a punctured vacuum diaphragm. Make final decision by holding a piece of paper in front of outlet (line connected to intake manifold) with engine running. If oil spray collects on paper the vacuum pump has a faulty diaphragm or seal and should be removed for corrective repairs.

Test the electric pump in same manner as for AF and AK mechanical AC pumps as outlined in Test 17 of Tune-Up Section.

As a further test, close off the pump outlet and turn on the current. The pump should now stop stroking, but if it continues to do so, even slowly, it indicates leaky pump valves which should be serviced as per paragraph one, page 67.

AC PUMP SERVICING

Fuel pumps of AC manufacture can be serviced by 4 methods.

1. Complete replacement with a NEW pump.

2. Complete replacement with a REBUILT AC exchange pump.

3. Diaphragm repair with AC DIAPHRAGM kit.

4. General overhaul with AC REPAIR kit.

The procedures for handling service by methods 1 and 2 are taken care of in this manually the paragraphs pertaining to Installation and testing on Engine. In the following paragraphs, the procedure for Diaphragm Repair and General Overhaul will be covered.

OVERHAULING TYPE AF PUMP (FACTORY NO. 1523753)

Disassembly

Before proceeding with the following operations, wash the outside of the unit with cleaning solvent and blow off with compressed air.

1. Loosen bail and thumb nut, swing bail and screw assembly out of position, and remove bowl and bowl gasket. Refer to exploded view Fig. 61.

2. Remove screen from top cover.

3. Bark edges of top cover and body with a file to assure reassembly in the same relative position.

4. Remove top cover screws and lock-washers and separate cover from body.

5. Lay top cover on bench with diaphragm flange up.

6. Remove two screws holding valve and cage retainer.

7. Lift out valve and cage retainer, two valve and cage units and gasket.

8. Rest pump body on edge of vise and drive out rocker arm pin with drift punch and hammer.

9. Remove rocker arm, spring and link.

10. Remove diaphragm assembly.

11. Clean and rinse all metal parts in cleaner or solvent.

12. Blow out all passages with compressed air.

Inspection Type AF Pump

Inspect Fuel- Pump Parts as Follows:

(a) Top Cover and Pump Body - Make visual check for cracks and breakage. Inspect for diaphragm flange warpage by testing on a smooth flat surface. Examine all threaded holes for stripped or crossed threads. Broken, damaged, or severely warped castings must be replaced.

(b) Valve and Cage Assemblies- Replace. Extent of wear cannot be determined visually.

(c) Strainer Screen - Replace. Inspect new screen for damage or obstruction. Screen must fit snugly around inner edge.

(d) Rocker Arm - Inspect for wear or scores at camshaft pad and at point of contact with link and pull rod.

(e) Rocker Arm Pin and Washer - Replace bullet type pin with head type pin and washer.

(f) Link - Replace link because amount of wear cannot be determined visually.

(g) Rocker Arm Spring - Replace. Spring may be weak from distortion or corrosion.

(h) Diaphragm Spring - Replace. Spring may be weak from distortion or corrosion.

(i) Diaphragm - Always Replace.

(j) Gaskets and Oil Seal - Always replace gaskets and oil seal to assure tight seals.

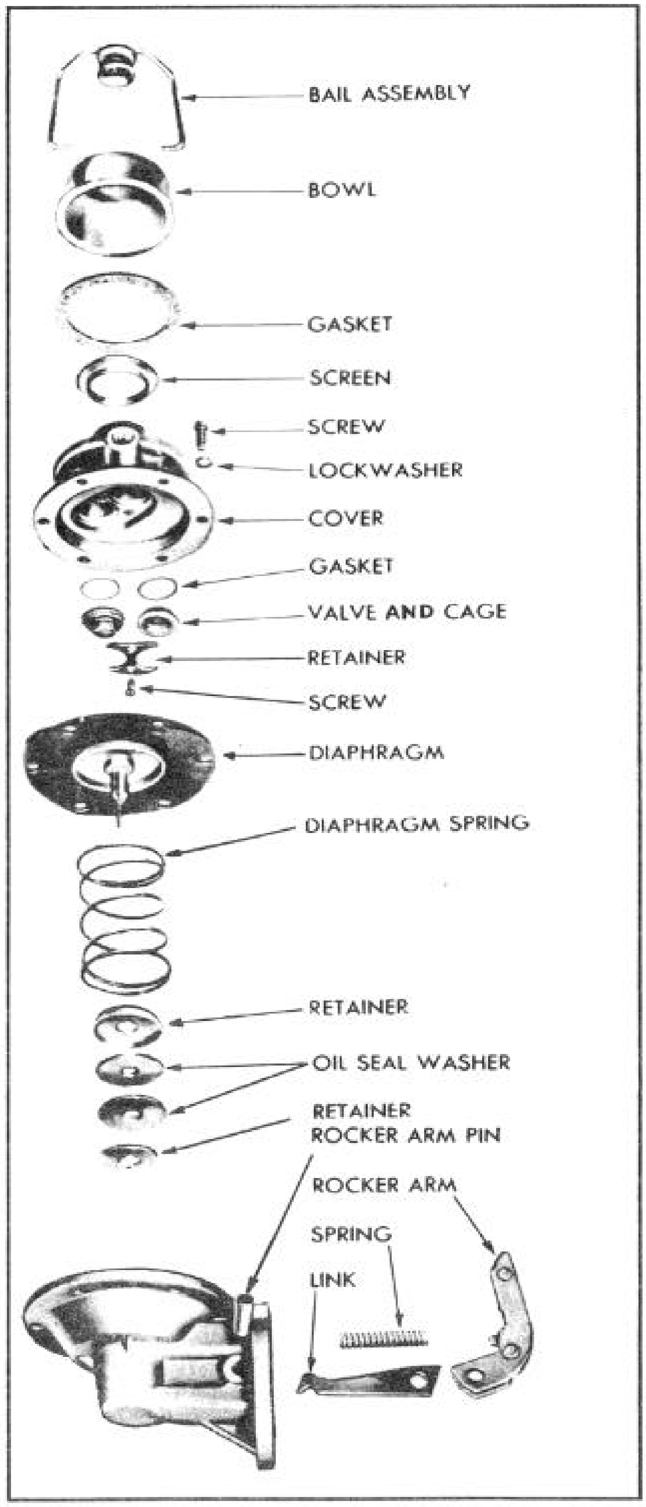


Figure 61
Exploded View Model. AF Number 1523753 Pump During Overhaul Replace the Bullet Type Rocker Arm Pin With Head Type Pin.

Reassemble and Test AF Pump

Soak new diaphragm assembly in clean kerosene while performing the following steps. Fuel oil or gasoline may be used if kerosene is not available.

1. Assemble link and rocker arm.

2. Place rocker arm and link in body with link hook down.

3. Align rocker arm pin hole with hole in body and drive in the rocker arm. pin.

4. Install washer on small end of rocker arm pin and spread end of pin.

5. Install diaphragm spring and oil seal over diaphragm pull rod.

6. Install assembly of diaphragm spring and oil seal with diaphragm pull rod, down through well of body.

7. Hook diaphragm assembly to link by pressing diaphragm against spring.

8. Place valve gaskets in position in cover and insert two valve and cage assemblies.

NOTE: Outlet valve should have three-legged spider into cover and inlet valve should have three-legged spider facing out of cover.

9. Secure valve and cage assemblies by means of valve retainer and two retainer screws.

10. Turn cover so diaphragm flange rests on bench.

11. Install screen, bowl gasket, bowl, in the order named. Swing wire bail into position and tighten thumb nut.

12. Install top cover on pump body, being sure to line up the file marks.

13. Install top cover screws and lock-washers loosely until screws just engage lockwashers.

14. Push rocker arm in full stroke. Allow it to snap out under power of diaphragm spring.

CAUTION: Sufficient diaphragm cloth must be pulled inside pump before tightening screws or pump will deliver too much pressure.

15. Tighten the cover screws alternately and securely.

16. Test operation of pump valves by attaching pressure gage to outlet and operating rocker arm.

NOTE: Pressure should not fall off rapidly.

OVERHAULING TYPE AP PUMP

(Factory Number 1523289)

Disassembly

Before proceeding with the following operations, wash the outside of the unit with cleaning solvent and blow off with compressed air.

1. Loosen bail screw nut and remove bowl, bowl gasket, and bowl seat.

2. Remove screen from top cover.

3. Remove valve plug and gasket from top cover over strainer.

4. Remove the inlet valve spring and valve.

5. Remove the air dome and gasket from top cover over diaphragm.

6. Remove the outlet valve spring and outlet valve.

7. Bark edges of top cover and pump body with edge of a file.

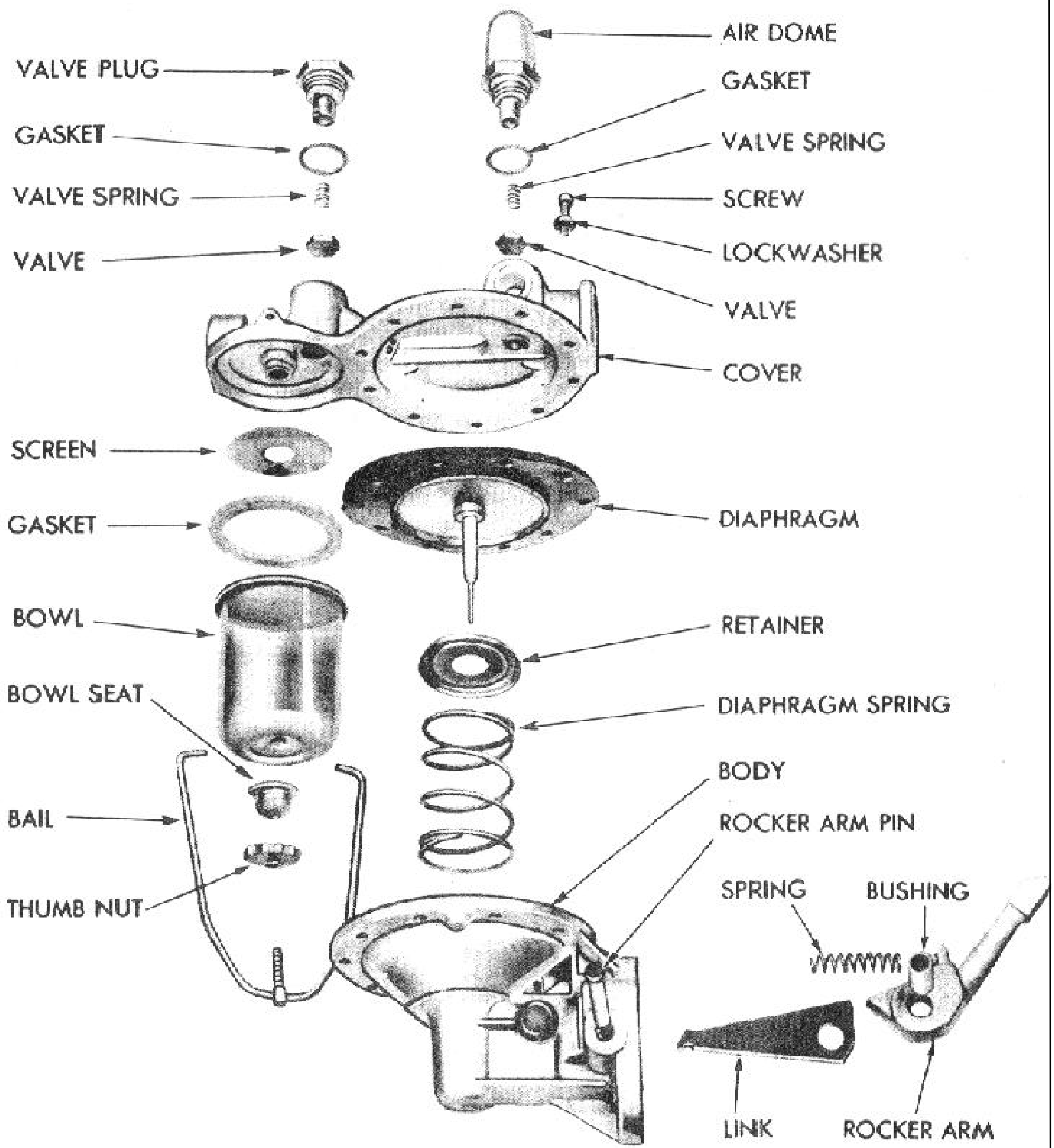


Figure 62
Exploded View of AC Type AP Pump Number 1523289 Used on 1942, 1946, and 1947 Models.
Number is Stamped On Mounting Flange. Refer To Page 53 for Repair Kit Data.

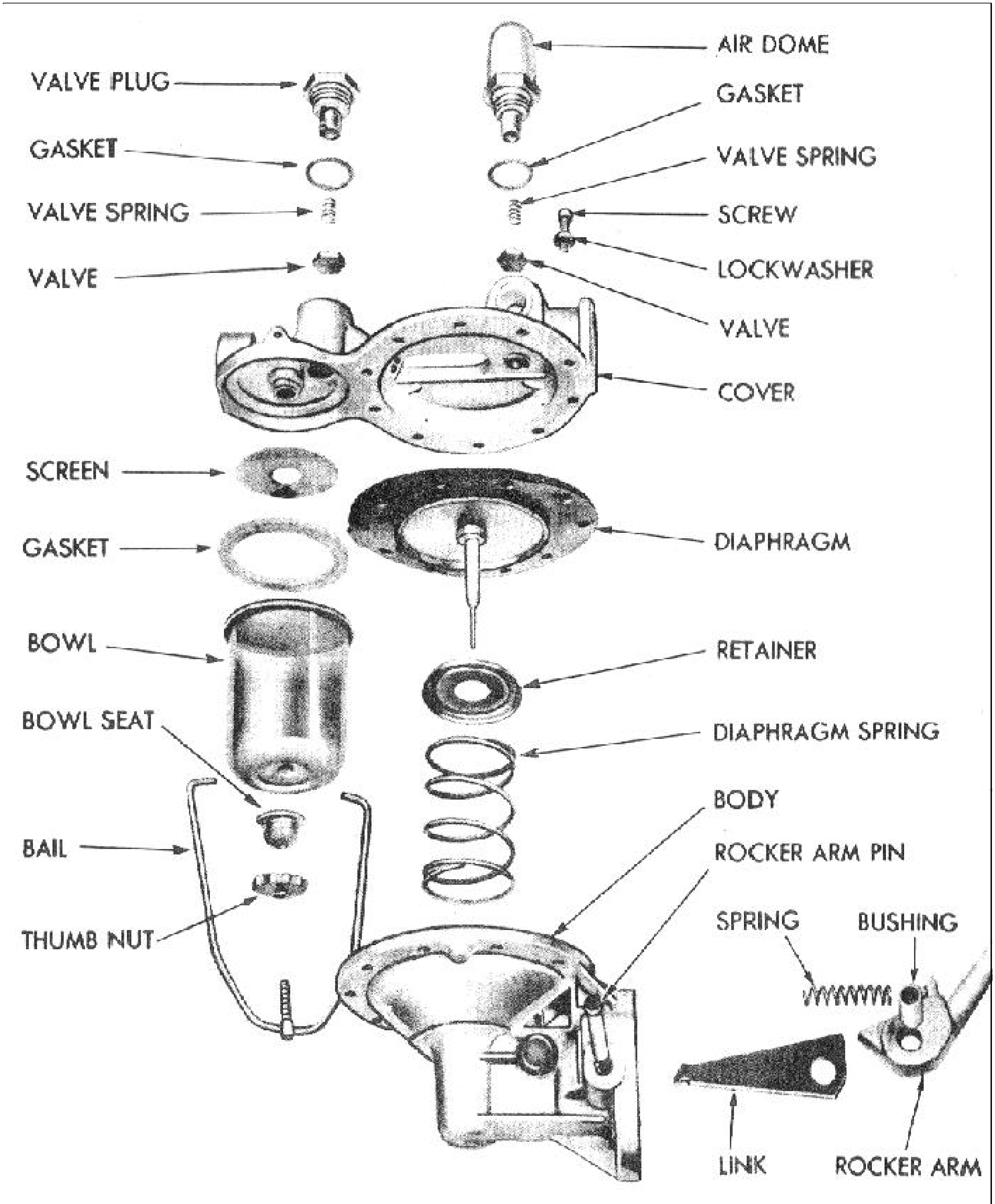


Figure 62
Exploded View of AC Type AP Pump Number 1523289 Used on 1942, 1946, and 1947 Models.
Number is Stamped On Mounting Flange. Refer To Page 53 for Repair Kit Data.

5. Place diaphragm spring over pull rod boss in body and insert diaphragm, hooking link to the pull rod.

6. Install top cover on pump body, making sure that file marks on cover and body line up.

7. Install the top cover screws and lockwashers loosely until screws just engage lockwashers.

8. Push rocker arm in full stroke. Allow it to snap out under power of diaphragm spring.

CAUTION: Sufficient diaphragm cloth must be pulled inside pump before tightening screws or pump will deliver too much pressure.

9. Tighten the cover screws secure- ly.

10. Install gaskets on valve plug and air dome.

11. Place a drop of light oil on outlet valve and install in chamber over diaphragm.

12. Insert valve spring in air dome.

13. Install dome assembly and gasket in top cover over diaphragm, holding pump on its side. Make sure that spring seats properly by observing through fuel outlet hole as air dome is tightened securely.

14. Place a drop of light oil on inlet valve and install chamber over retainer.

15. Insert spring in valve plug and install valve plug and gasket over strainer holding pump on its side as plug is tightened to be sure that spring seats properly.

16. Install strainer screen and bowl gasket in top cover.

17. Install bowl seat on bowl screw.

18. Install filter bowl, swing bail into position over bowl, and tighten bail nut securely.

19. Test operation of pump valves by attaching pressure gage to outlet and operating rocker arm.

NOTE: Pressure should not fall off rapidly.

OVERHAULING TYPE AJ PUMP

(Factory Numbers 1523936 and 1523937)

Disassembly

Before proceeding with the following operations, wash the outside of the unit with cleaning solvent and blow off with compressed air to remove loose grit and grease.

1. Bark edges of fuel cover and body diaphragm flanges with a file. The parts may then be reassembled in the same relative position. Note that the fuel diaphragm flange is symmetrical, and the vacuum diaphragm flange has bulges where the screw holes occur.

2. Remove fuel cover screws and lock washers. Separate cover from body by jarring cover loose with a screwdriver handle.

3. Mark edges of vacuum cover and body diaphragm flanges. Bark at heat shield stud if used. The parts may then be reassembled in the same relative position.

4. Remove two screws from opposite sides of the vacuum cover, and substitute for them two No. 10 - 32 x 1-1/2 inch fillister head screws. Turn the two long screws all the way down, and then remove the balance of the regular cover screws. Alternately back off the two long screws, a few turns at a time, until the force of the heavy vacuum diaphragm spring is no longer effective. Rap the cover with a screwdriver handle if the flanges stick together. Remove the two long screws, the cover assembly, diaphragm spring, and spring retainer.

5. File riveted end of rocker arm pin flush with steel washer, or cut off end with 3/8" drill. Drive out rocker arm pin with a drift punch and hammer. Wiggle rocker arm until links unhook from both diaphragms. Then remove rocker arm spring, rocker arm, and the link assembly.

6. Remove bushing from rocker arm to disassemble rocker arm, two vacuum links, one fuel link, link spacer, and link washers (there may be one or two link washers).

7. Lift vacuum diaphragm out of body, and remove lower oil seal retainer by turning until slot lines up with flat of pull rod. Remove oil seal washer, upper oil seal retainer, and oil seal spring.

8. Remove fuel diaphragm by pulling straight out. CAUTION: DO NOT TILT EXCESSIVELY OR STAKED-IN OIL SEAL WILL BE DAMAGED. Lift diaphragm spring and spring retainer from pump body.

9. Remove valve and cage retainer screw and lift out retainer, two valve and cage assemblies, and two gaskets.

10. Remove bowl screw and gasket. Then remove bowl, bowl gasket, and screen.

11. Remove valve and cage retainer screw. Lift out retainer, two valve and cage assemblies, and two gaskets.

12. Remove cover plate screw with gasket. Lift off the cover, cover gasket, screen retainer, and screen.

13. Blow out all passages with compressed air.

Inspection Type AJ Pump

Inspect Pump Parts as Follows:

(a) Top Cover and Pump Body - Make visual check for cracks and breakage. Inspect for diaphragm flange warpage by testing on a smooth flat surface. Examine all threaded holes for stripped threads. Broken, damaged, or severely warped castings must be replaced.

(b) Rocker Arm - Inspect for wear or scores at camshaft pad and at point of contact with link and pull rod.

Replace Pump Parts as Follows:

(1) Strainer screen

(2) Valve and cage assemblies

(3) Rocker arm pins, and springs

(4) Links

(5) Diaphragms - fuel and oil

(6) Diaphragm springs

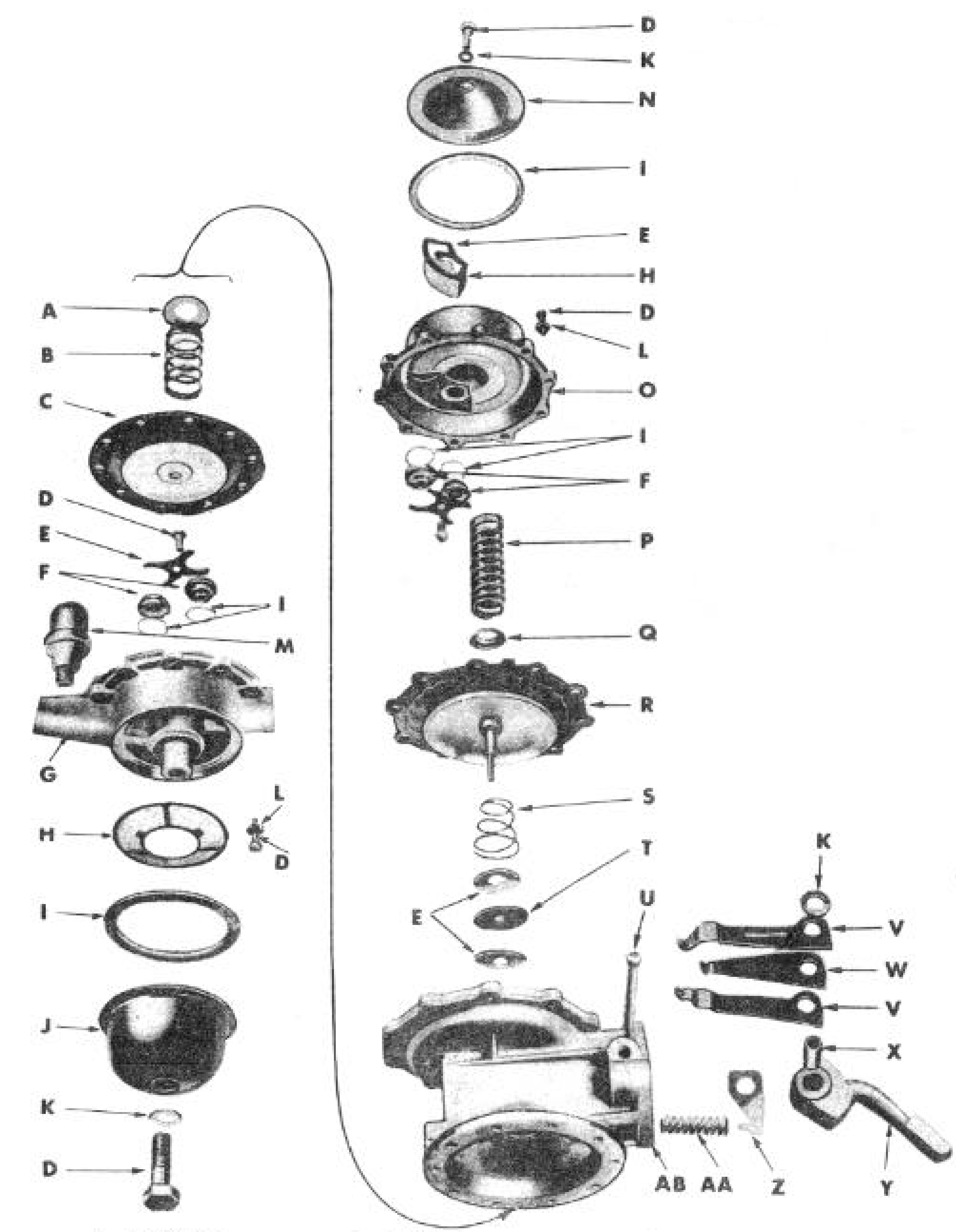
(7) All gaskets and oil seals

Reassemble and Test AJ Pump

Soak new diaphragms in clean kerosene while performing the following steps. Fuel oil or gasoline may be used but do not use shellac or cement.

FUEL SECTION

1. Assemble link spacer over fuel link. Place one vacuum link on each side of the fuel link. The hook ends of the vacuum link should come together so that they surround the fuel link. All link hooks should point in the same direction. Place assembly of links and spacer between lobes of rocker arm with one spacer washer on the outer side of each vacuum link. Slide rocker arm bushing through holes in rocker arm, spacer washers, and links.



A—RETAINER
B—FUEL DIAPHRAGM SPRING
C—FUEL DIAPHRAGM
D—SCREW
E—RETAINER
F—VALVE AND CAGE
G—FUEL COVER
H—SCREEN
I—GASKET
J—BOWL
K—WASHER
L—LOCKWASHER
M—AIR DOME
N—PLATE
O—VACUUM COVER
P—VACUUM DIAPHRAGM SPRING
Q—SPRING RETAINER
R—VACUUM DIAPHRAGM
S—OIL SEAL SPRING
T—OIL SEAL
U—PIN
V—VACUUM LINK
W—FUEL LINK
X—BUSHING
Y—ROCKER ARM
Z—LINK SPACER
AA—SPRING
AB—BODY

Figure 63
This AC Series AJ Combination Fuel and Vacuum Pump is Optional Equipment

2. Stand the pump body on the bench, fuel flange down. Set rocker arm spring in position with one end over cone cast into the body. Slide rocker arm and link assembly into body. Outer end of rocker arm spring slips over projection on link spacer, and the open end of all link hooks must point toward vacuum flange. Temporarily retain rocker arm and link assembly with tool PT-6.

3. Turn the pump body over so the fuel diaphragm flange is up. Set the diaphragm spring on the staked-in oil seal, and the retainer on top of the spring. Push diaphragm pull rod through retainer, spring and oil seal. Flat of pull rod must be at right angles to link. Hook diaphragm pull rod to fuel link. *FUEL LINK IS THE SHORT, CENTER LINK. DO NOT TILT DIAPHRAGM PULL ROD EXCESSIVELY AS THIS MAY DAMAGE THE oil, SEAL.*

4. Drive tool PT-6 out with permanent rocker arm pin. Place washer over small end of pin and spread pin end.

5. Place valve and cage gasket or two separate gaskets in recesses provided. Place valves and cages on top of gaskets. Inlet valve must have three-legged spider facing out of cover, and outlet valve must have three-legged spider facing into cover. Secure valve assemblies with retainer and screw.

6. Install strainer screen, cover gasket, cover, cover screw gasket, and cover screw in the order named. If used, install air dome in threaded hole in projection of casting for outlet.

7. Install cover on body making sure that file marks on cover and body line up. Push on rocker arm until diaphragm is flat across body flange. Install cover screws and lock washers loosely until screws just engage lock washers. Pump the rocker arm three or four full strokes and tighten cover screws securely.

8. Diaphragm must be flexed before tightening cover screws, or pump will deliver too much pressure.

VACUUM SECTION

9. Place two gaskets and two valve and cage assemblies in cover. Inlet valve must have three-legged spider facing out of cover, and outlet valve must have three-legged spider facing into cover. Secure valve and cages with retainer screw.

10. Turn cover over, and set screen in recess over valve hole. Set screen retainer on screen. Place cover gasket, cover, cover screw gasket, and cover screw in position in the order named. Tighten cover screw.

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

12. Lift the pump body above eye level, facing the vacuum diaphragm flange. The two vacuum links will swing down so that the diaphragm pull rod can be hooked to both links.

13. While holding vacuum diaphragm in position, the body should be clamped in a vise, vacuum side up. Clamp by one of the mounting flange ears. The vacuum diaphragm must be held level with body flange during the following operations by inserting a 3/32-inch piece of metal between rocker arm stop and body. This spacer can be made from piece of steel, 3/16 x 3/32 inch x 8 inches. Bend one end to form a right angle hook, 3/8 inch from bend to end. This tool is available from your AC jobber as type PT-8.

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

15. Insert two No. 10 - 32 x 1-1/2 inch screws in two opposite holes in cover flange. Turn these long screws down, alternating a few turns on each. Insert regular screws with lock washers, and tighten until screws just engage lock washers. Replace two long screws with regular screws and lock washers.

16. Remove 3/32-inch spacer from rocker arm position. This allows the heavy vacuum spring to push diaphragm into a flexed position. Tighten all cover screws securely.

17. Combination fuel and vacuum pump cannot be bench tested because of the heavy vacuum section spring. The only adequate test for this type pump is with a vacuum gauge such as the KMO-144 when the pump is mounted on the engine.

OVERHAULING ELECTRIC PUMP

1. SERVICING THE VALVES. To gain access to valves Fig. 64, remove the filter screen assembly and2 screws and lift out the valves. Clean valves thoroughly and check for wear and warpage. Valve seats may be resurfaced using crocus cloth. When reassembling, use new gaskets, 510 and 512.

2. ARMATURE REMOVAL. Remove cover (524) Fig. 65, also screw (536) and spring (521). To separate coil assembly from rest of pump, use a 1/4" magneto wrench to loosen drive screw nut (565) located below the bellows stud. Insert thin screwdriver into coil hole and loosen screw (520). Remove coil mounting screws (547). Separate coil from armature by removing armature mounting screws.

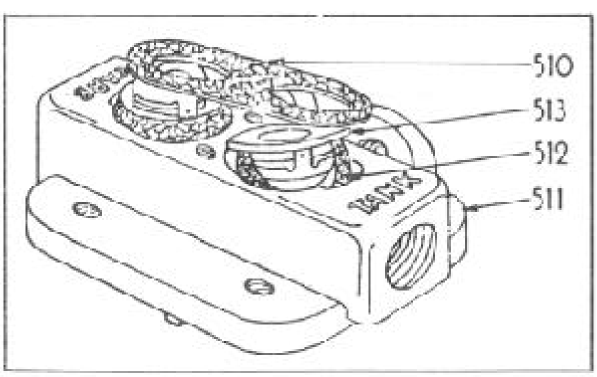


Figure 64
Inlet and Outlet Valves Electric Pump

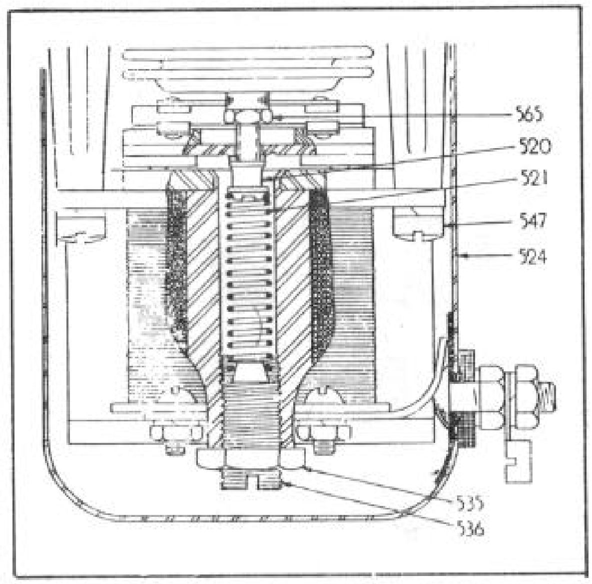


Figure 65
Electric Pump Coil and Armature

3. REPLACEMENT OF BELLOWS. To remove bellows (517) Fig. 66, proceed as in preceding paragraph until coil and armature are free, then remove the screws (542A) and gaskets (514 & 515). Faces of (516) and (511) should be thoroughly clean when reassembling and new gaskets must be installed.

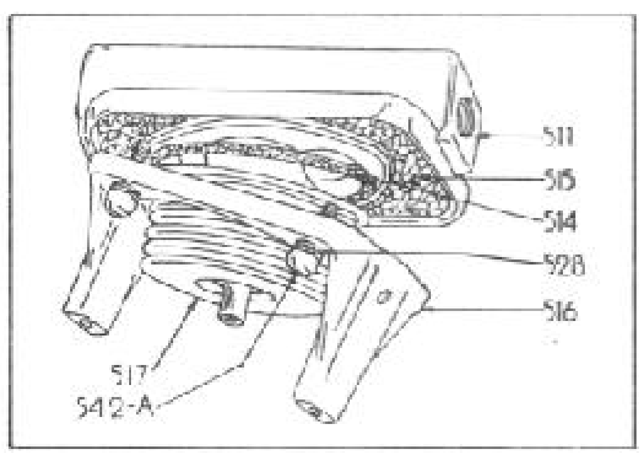


Figure 66
Removing Bellows From Electric Pump

4. RENEWAL OF ARMATURE. When the armature contacts (B) Fig. 67, are badly worn or the armature is otherwise in poor condition, replace the armature and contacts as a unit. For best results, the armature, magnet and bellows should be accurately aligned, using the Autopulse Armature Centering Tool (A) Which is available from the Autopulse Corporation, 2821 Brooklyn Ave., Detroit 1, Michigan.

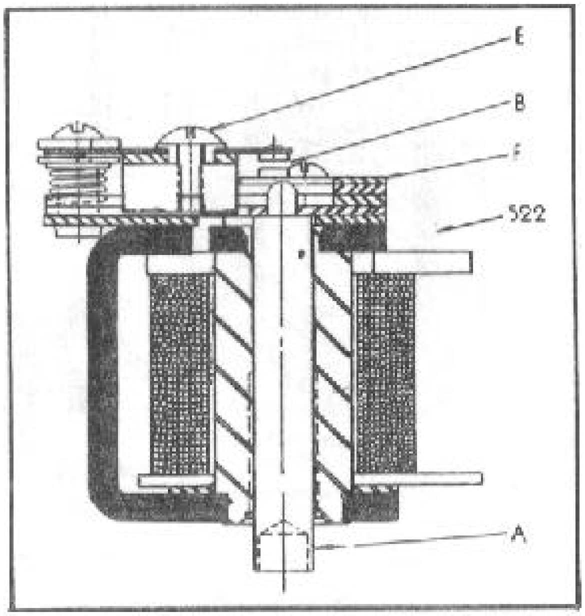


Figure 67
Armature and Contacts of Electric Pump

Insert the centering gauge (A) in magnet core hole as shown. Place armature flat on top of magnet (522) so that armature is free on centering tool and tool is free in core hole. Hold units in this position and reassemble armature and coil. Once this correct relationship is established, do not disturb in any way.

5. ADJUSTMENT OF CONTACTS. Remove armature centering tool and with drive screw assembly (520) Fig. 68 still removed, check contact gap at (B) Fig. 67.

a. When armature is held down at point (F) and spring at point (E), contact gap (B) should be 0.020°.

b. When armature is held down at point (F) and breaker spring is left free, contact gap should be 0.040".

Make both adjustments by bending breaker spring with long-nosed pliers. Assemble drive screw (520) to ARMATURE.

6. ASSEMBLY OF PUMP UNITS. After aligning and assembling armature and coil and adjusting the contacts, complete the assembly as follows:

Assemble the coil and armature unit to the bellows ring (516) Fig. 68, using screws (547) and lockwashers. Press armature plate flat against coil head (B) and install drive screw (520) into bellows stud (C) until bellows just starts downward movement. After releasing armature, tighten lock nut (565) using 1/4" magneto wrench. Insert drive spring (521), adjusting screw (536) and lock nut (535). This completes the assembly of pump and the remaining adjustments should be made with the pump in test rack.

7. FINAL ADJUSTMENT. If a test rack Fig. 69 is not available mount the pump so that inlet is two feet above fuel container. Turn on current. Pump will race.

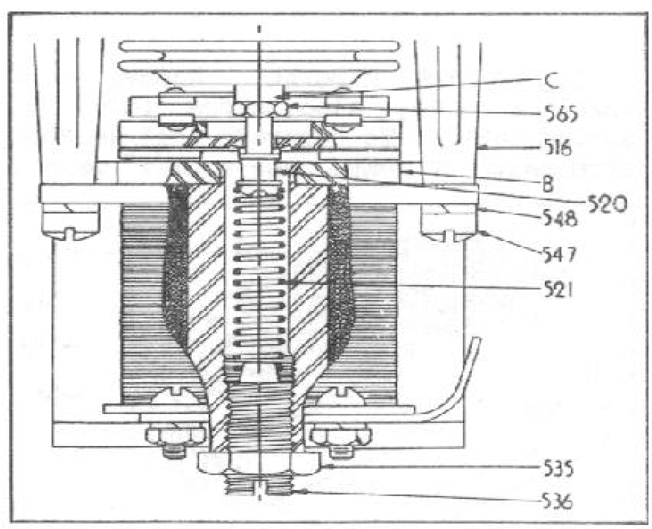


Figure 68
Partial Assembly Electric Fuel Pump

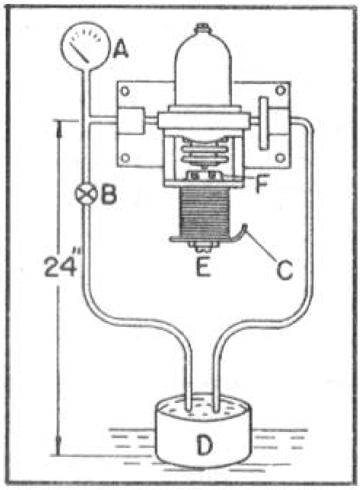


Figure 69
Test Rack For Electric Fuel Pump

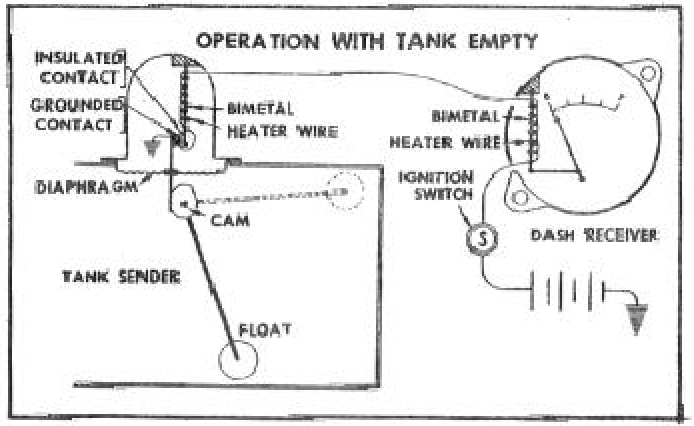


Figure 70
Fuel Gauge Operation with Tank Empty

noisily until it picks up fuel. When it is established that pump is delivering fuel, close off the outlet. Pump should now stop stroking but if it continues to do so, even slowly, it indicates leaky valves which should be serviced as per paragraph one. Adjust to 2-1/4 - 2-3/4 pounds pressure by turning screw (E) Fig. 69 or (536) Fig. 68.

FUEL LEVEL GAUGE

This electrical device consists of a sending unit mounted in the fuel tank and a receiving unit mounted on the instrument board. Each unit incorporates a bi-metal element over which a heating coil is wound. Refer to Fig. 70.

The two heating coils are connected in series and the gauge circuit is completed to ground thru a set of contacts in the tank unit. The feed wire is connected to the accessory terminal of the ignition switch so that the gauge registers only with the ignition on.

The ground contact for the tank unit is attached to the upper end of a movable arm which is mounted centrally in a fabric diaphragm as in the illustration. The lower end of the arm is actuated by a cam on the upper end of the float arm. When the float moves up to follow the gasoline, the cam moves the arm so that contact pressure and the length of time contacts remain closed is increased.

When the tank contacts are closed a current flows thru the heating coils of both the tank and the dash units. This causes the bi-metal arm in the dash unit to bend moving the needle, and showing a reading on the dash unit. At the same time the heating coil in the tank unit causes its bi-metal arm to bend, opening the contacts and interrupting the current flow. When this occurs the heating action stops and the cooling of the bimetal arm causes it to flex in the opposite direction and again close the contacts. In operation this cycle takes place very rapidly and a steady reading is obtained on the dash unit.

Gauge Trouble Shooting

If the fuel level gauge becomes inoperative, it is recommended that an extra tank unit be used for testing. If there is any question about the test tank unit being correct, then hook it up in series with a receiver known to be correct and 6 volts of battery current. Operate the tank unit by hand and see if the receiver reads zero with tank unit float in bottom position and full with tank unit float in the top position. Use two ten foot lengths of insulated wire equipped with clip terminals at each end. These lengths will permit the checking by one person in front of the dash unit.

Do not remove either the dash or tank unit from the automobile until the elimination tests outlined below prove them in need of replacement.

1. Disconnect the lead of the tank unit on the car and connect this lead to the test tank unit and ground same to the car frame. Turn on ignition switch and operate test tank unit float by hand. With the float of the test unit at the bottom position the car dash unit should register at the bottom mark on the dial as in Fig. 70. Move float rod up to top position and the car dash unit should move to top mark on the dial, as shown in Fig. 71. Allow one minute for dash unit pointer to come to rest.

a. The tank unit is grounded thru the case. Check the ground connections. See that paint and grease are removed under the flange and that surfaces are making good contact.

b. If the car is radio equipped, check the condenser on the tank unit. If the condenser is shorted it will cause the dash unit to over-read. When replacing condenser it is preferable to use one of .10 microfarad capacity but up to .50 can be used to cut out radio interference.

c. If the ground (see paragraph a) and condenser (see paragraph b) are correct then replace the car tank unit.

2. If the car dash unit does not operate, or fails to operate correctly, then check the wire lead to the dash unit and replace the wire if faulty.

3. If the wiring is satisfactory then replace the car dash unit and check it with the tank unit on the car. If the dash unit now fails to operate when connected to car tank unit, install a new tank unit.

CAUTION: Do not attempt the repair or calibration of any dash unit or tank unit as this is not practical.

Install new unit whenever the old one is found inoperative. Order from HUDSON PARTS DEPARTMENT

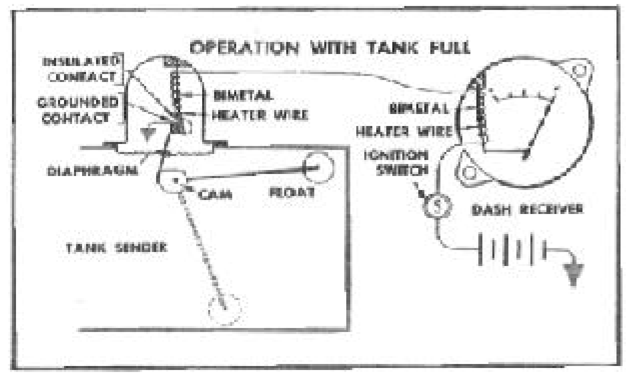


Figure 71
Fuel Gauge Operation with Tank Full

Renewal of Dash Unit

1. To install a new dash unit remove the wiring to the fuel gauge. There are two wires, one is the hot lead from the ignition circuit (red) and the other (black) leads to the fuel gauge tank unit.

2. Remove fuel gauge from the panel by removing the two screws.

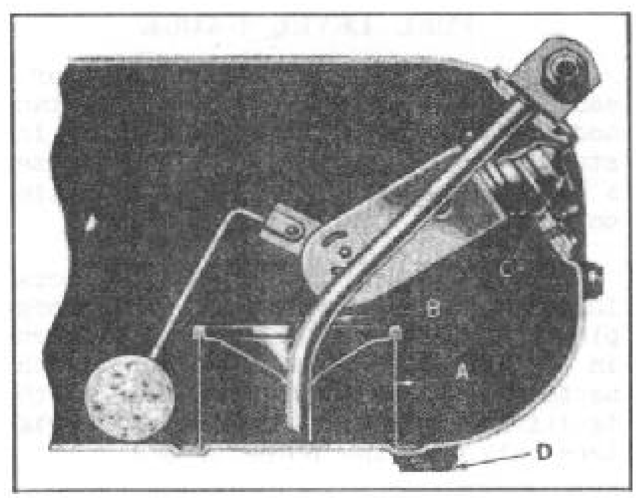


Figure 72
Gasoline Tank Gauge Unit, Suction Pipe and Strainer

A. Gasoline tank strainer.

B. Gasoline suction pipe.

C. Gasoline tank gauge unit.

D. Gasoline tank drain.

GASOLINE TANK REMOVAL

The gasoline tank is held by straps, the rear ends of which are self-retained in a slot in the frame crossmember and the front ends in the rear seat pan by means of two carriage bolts with spring type nuts.

To remove the gasoline tank:-

1. Raise the car with a hoist.

2. Drain the tank and disconnect the gauge wire and the fuel line.

3. Disconnect the fuel tank support straps and remove the rubber cushion and grommet in the body quarter panel,around the filler neck.

4. Lower the tank enough to permit disengaging the filler pipe from the hole in the body. This can be done by dropping the end opposite the filler pipe and rotating the tank until it is free.

REFERENCES

Source of Information	Date	Subject

Water Circulation	Centrifugal pump	Pump Capacity	30 gpm at 50 mph
Water Capacity - Complete System		Radiator	Cellular
6 Cylinder	13 Quarts	Thermostat Location	Cylinder head water outlet
8 Cylinder	18 Quarts		
Water Pump Drive	V Belt	Thermostat Used Model 25,27,54 and 174	By-pass type
Fan Drive	Pump shaft		
Belt Adjustment	Generator mounting	Thermostat Used All Others	Choke type
Water Pump Bearings	Bronze	Thermostat Begins to Open	150° to 155°
Pump Lubrication	Grease fitting	Thermostat Fully Open	185°
Water Pump Impeller	6 blade	Temperature Gauge	Electric type

Anti-Freeze Filling Chart

6-Cylinder Models

Temperature	Hudson Anti-Freeze			Ethylene Glycol (Prestone or Equivilant)			Methanol or Denatured Alcohol		
	Quarts		Liters	Quarts		Liters	Quarts		Liters
	U.S.	Imp.	Metric	U.S.	Imp.	Liters	U.S.	Imp.	Metric
+20°	2 1/2	2	2 1/3	2	1 1/2	1 3/4	2	1 1/2	1 3/4
+10°	3 3/4	3 1/4	3 1/2	3	2 1/2	2 3/4	3 1/2	3	3 1/3
0°	4 1/2	3 3/4	4 1/4	4	3 1/2	3 3/4	4 1/4	3 1/2	4
-10°	5	4	4 3/4	5	4 1/2	4 3/4	5 1/4	4 1/2	5
-20°	5 1/2	4 3/4	5	5 1/2	4 3/4	5	6	5	5 1/2
-30°	6 1/2	5 1/2	6	6	5	5 1/2	6 3/4	5 1/2	6 1/3
8-Cylinder Models									
+20°	3 1/2	3	3 1/3	3	2 1/2	2 3/4	3	2 1/2	2 3/4
+10°	5 1/4	4 1/2	5	4 1/2	3 3/4	4 1/4	4 3/4	4	4 1/2
0°	6 1/4	5 1/4	6	6	5	5 1/2	6	5	5 1/2
-10°	7	6	6 1/2	7	6	6 1/2	7 1/3	6	7
-20°	8	6 1/2	7 1/2	7 3/4	6 1/3	7 1/4	8 1/2	7	8
-30°	9 1/2	8	9	8	6 1/2	7 1/2	9 1/2	8	9

DRAINING COOLING SYSTEM

Two drain points are provided. One is at the lower left corner of the radiator and is provided with a drain cock. Opening this drain cock drains the radiator and a portion of the coolant in the engine block.

The second drain located at the rear left lower corner of the engine block is provided with a pipe plug. Removing this plug permits complete to draining of the cooling system.

CIRCULATION CONTROL

Choke Thermostat

On models 20,21,22,24,25,28,51,52,53 58,171,172,173,174 and 178, the thermostat is located in the water outlet (C), Fig. 73, and restricts circulation of the coolant through the radiator until the water has reached a temperature of 150° to 155° F. At this temperature the thermostat, which is of the choke type, begins to open and is fully opened at 185° F., permitting circulation of the coolant through the radiator as designated by arrows (A). After being cooled by circulating through the radiator, the coolant is brought back by the pump as designated by arrows (B) and is again pumped through the engine.

By-Pass Thermostat

On models 25,27,54 and 174 the Cylinder head water outlet fitting (D), Fig.74 has two outlets, one a small by-pass outlet (C) and the other the full size outlet (A) to the radiator. The by-pass outlet (C) is connected to the water pump intake. The thermostat seated in the Cylinder head water outlet (D) has 'openings in it that allow a small amount of water to pass by it and this water goes through the by-pass to the pump instead of to the radiator. This water that is by-passed to the pump is forced back through the engine maintaining a circulation of water in the engine at all times. The thermostat starts to open the main passage to radiator and to close the by-pass at 1500 to 155° of water temperature and fully opens the former and fully closes the latter at 185° F.

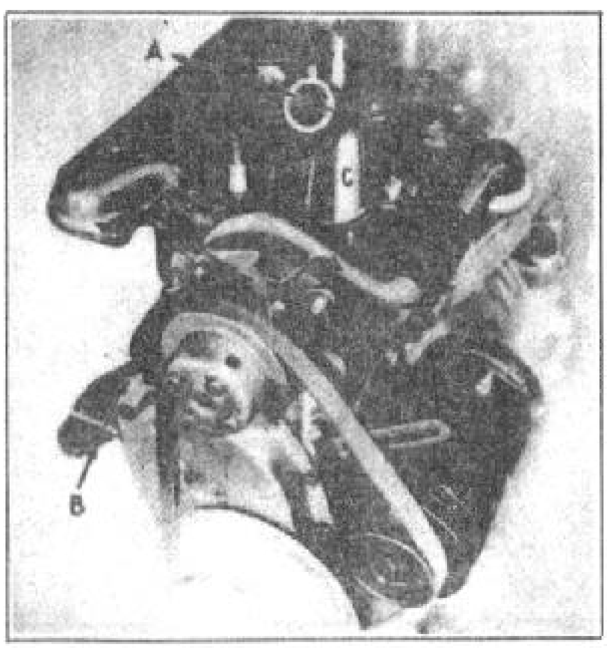


Figure 73
Water Circulation With Choke Thermostat

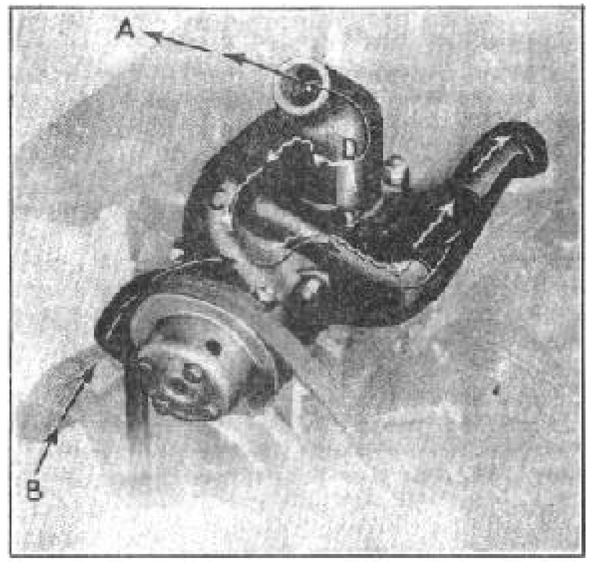


Figure 74
Water Path With By-Pass Thermostat

RUST AND SCALE DEPOSITS

The most common difficulty in the cooling system is rust and lime clogging the water passages of the radiator core. These formations finally prevent dissipation of the engine heat and the engine becomes overheated, causing loss of antifreeze and water out of the over-flow pipe of the radiator.

Overheating may lead to burned valves, cracked Cylinder heads, scored Cylinders and pistons.

USE OF INHIBITOR

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

A good combination inhibitor and cleaning solution should be kept in the cooling system at all times. Hudson Radiator Cleaner and Corrosion Inhibitor is an engineering tested preparation to be used for this purpose.

Care must be used in the selection of an inhibitor and cleaner as some of them contain strong acids or caustics that will react with the metal of the radiator core, eating holes through the metal and causing the radiator to leak.

The effectiveness of any inhibitor is limited to about six months after which the cooling system should be flushed, refilled, and new inhibitor added.

REVERSE FLUSHING

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

Reverse flushing is necessary in order to get behind the deposits and force them out.

The recommended procedure for reverse flushing of the radiator is as follows:

1. Remove the thermostat as cold water will cause it to close and will result in building up pressure which might cause damage.

2. Install radiator cap and attach long hoses to radiator connections as shown in top view of Fig. 75. Insert the flushing gun as shown.

3. Connect water hose of gun to a pressure water source and air hose of gun to a pressure air source. Turn on the water and when the radiator is full turn on the air in short blasts. Allow the radiator to fill between the blasts of air. Continue this procedure until water from the lead-away hose runs clear.

Flush the Cylinder block as follows:

4. Attach hoses as shown in. lower view of Fig. 75. Close the by-pass outlet if car is equipped with by-pass type water pump Fig. 74.

5. Proceed as in paragraph 3 above.

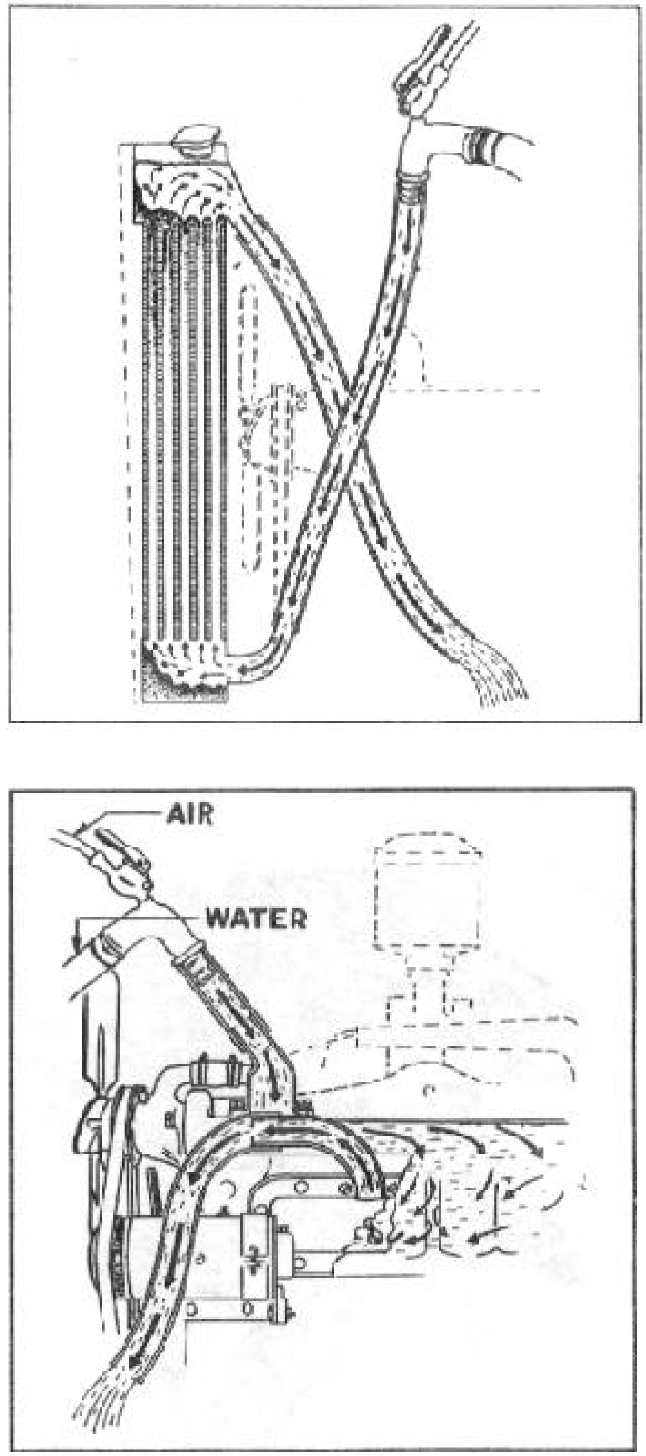


Figure 75
Reverse Flushing Radiator and Block

Hot water heaters should be flushed separately.

Rust deposits build up in the heater core just the same as they do in the radiator core and will decrease the efficiency of the heater.

INSTALLING ANTI-FREEZE

Before installing anti-freeze, the following steps should be taken:

Drain radiator and flush cooling system thoroughly.

Tighten Cylinder head stud nuts.

Fill cooling system with required amount of anti-freeze (see chart at beginning of this chapter) preferably when the engine is warm so that the thermostat is open - thus allowing the system to be filled completely.

Tighten Cylinder head stud nuts again after engine is warm.

Check all water connections for leaks with engine hot.

WATER PUMP

The packless centrifugal type pump Fig. 76, incorporates a spring loaded composition shaft seal (5) and a hardened and lapped seal thrust washer (6) of steel. The latter revolves with the impeller and seals against the face of the rear, bronze, shaft bushing. The keyless pulley flange and impeller are retained on the opposite ends of the shaft by means of a press fit and spinning over of the shaft ends.

The unit used on models 25,27,54 and 174 has both a main and a by-pass outlet, all other models carry pumps with a single main outlet. All pump component parts are interchangeable, except the body.

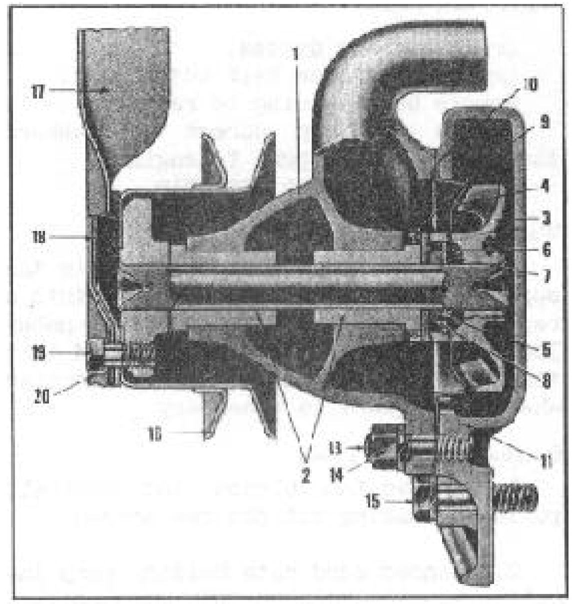


Figure 76
Pump Shaft is Spun Over at Both Ends

1. Body
2. Body bushings
3. Impeller
4. Impeller cup
5. Shaft seal
6. Seal thrust washer
7. Seal spring
8. Seal retainer
9. Retainer spring
10. Body gasket
11. Impeller housing
13. Housing stud
15. Housing to Cylinder bolt
18. Fan blade cushion
19. Fan blade bolt
20. Blade bolt lock

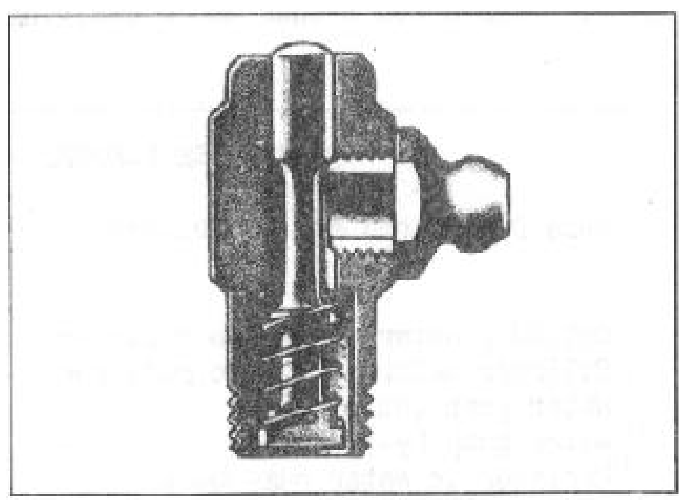


Figure 77
When the Water Pump Grease Reservoir is Completely Filled the Spring Loaded Valve in This Special Grease Fitting Closes - Thus Preventing Insertion of Excess Grease From Pressure Gun.

Water Pump Removal

Drain cooling system.
Loosen generator belt adjustment.
Remove hose leading to radiator.
Remove the cap screws and washers that attach water pump to engine.
Remove water pump assembly.

Water Pump Repair Kit

The items listed in the box in the opposite column have been made into a repair kit and sold under part number 166286 because it has been found that these parts are most frequently required when an overhaul is necessary.

WATER PUMP REPAIR KIT

2	150228	Body bushing
1	158938	Impeller
1	166281	Shaft end pulley hub
1	155290	Shaft seal
1	150232	Shaft seal thrust washer
1	150233	Seal compression spring
1	158939	Compression spring washer
1	157695	Shaft seal retainer
1	150235	Seal retainer spring
1	150219	Water pump body gasket
1	150222	Impeller housing gasket

Overhauling Water Pump

1. Remove fan blades and fan belt pulley by taking out the cap screws.

2. Remove stud nuts holding pump impeller housing to pump body.

3. Install the body (No. 1 item of the water pump reconditioning set J-733- B) to the water pump with the three attaching studs as shown in Fig. 79.

4. Clamp the pulley flange in a vise.

5. Insert the cutter (item 3) into the thumbscrew (item 2) and then install the assembly into the tool body (item 1) as shown. Cut the metal from the spun-over end of pump shaft by rotating the cutter with a box wrench while applying feed pressure with the thumbscrew. In where the shaft end is unusually hard, the spun-over metal can be removed faster by grinding off the metal with a power emery wheel. Do not worry about removing metal from the impeller, as a new one must be used in every case due to enlargement of the bore which occurs during original installation of impeller to shaft.

6. After removing burr from end of shaft, install thumbscrew and driver assembly (item 4) to pump as in Fig. 80. Turn driver clockwise as shown, until the pump shaft is pressed out of the impeller, then remove thumbscrew and impeller and seal assembly from pump.

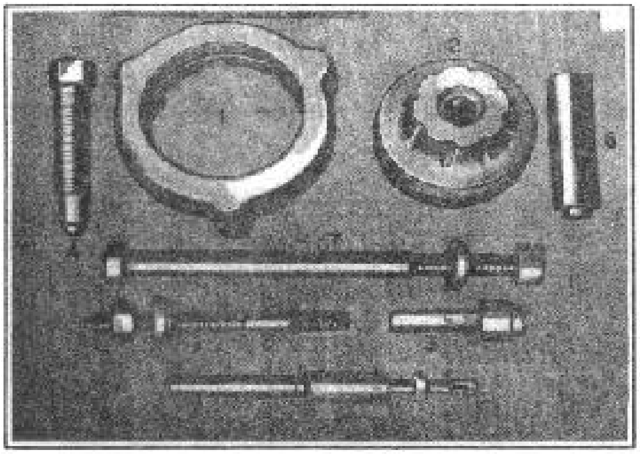
7. Reinstall tool body (item 1) to pump.

WATER HOSE LENGTHS - RADIATOR AND WATER PUMP

Hose Dimensions are as follows

	MODELS	I.D.	LENGTH
Cylinder water outlet to radiator	All Sixes	1 1/2"	10"
Cylinder water outlet to radiator	All Eights	1 1/2"	7 3/4"
Water pump outlet hose	All	1 1/2"	3 1/4"
Water pump by-pass hose	25,27,54 and 174	1"	2 5/16"
Radiator to water pump hose	All Eights	1 5/8"	10"
Radiator to water pump hose:	All Sixes	1 5/8"	8 1/2"

Water hose is supplied by the Hudson Parts department in all inside diameters and in 36" lengths. It can be cut to the length desired with a cutter tool KMO-102.



1.	J-733-1	Body
2.	J-733-2	Feed Nut
3.	J-733-4	3- {Cutter Shank
3.	J-733-5	{Shaft Cutter
5.	J-733-6	Inner Bushing Remover
4.	J-733-7	Shaft Removing Screw
6.	J-733-8	Outer Bushing Remover
7.	J-733-10	Outer Bushing Replacer
8.	J-733-A-1	Burnishing Tool and Adapter

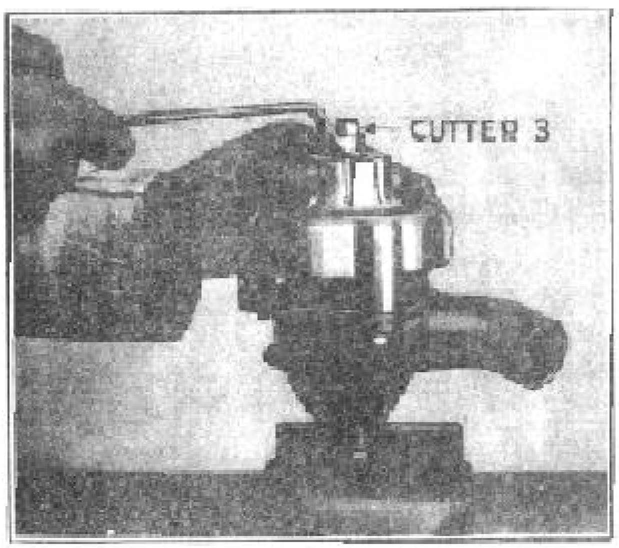


Figure 79
Cutting Burr from Water Pump Shaft
With Item 3 of Tool Set J-733B

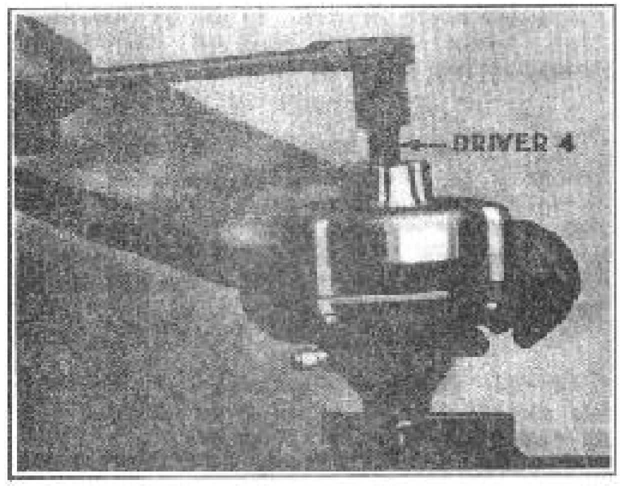


Figure 80
Removing Water Pump Shaft With
Item 4 of Tool Set J-733B

8. Install the thumbscrew into the tool body on the pump, then insert the bushing puller (item 5) with washer and nut on top.

9. Thread the bushing puller into the rear bushing until puller has taken a firm hold. Pull bushing by turning nut clockwise as shown in Fig. 81.

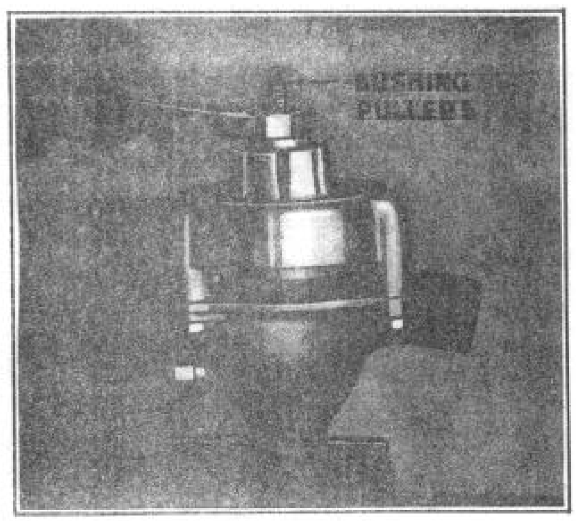


Figure 81
Removing Water Pump Rear Bushing With
Item 5 of Tool Set 3-733B

10. Remove the thumb screw and install threaded driver (item 4) thereto. Also install pilot end of unthreaded driver (item 6) into FRONT bushing.

11. Reinstall thumb screw and driver assembly to tool body on pump and turn driver clockwise until it contacts top end of unthreaded driver (item 6). Reposition pump and tools assembly in vise as shown in Fig. 82 and push out FRONT bushing as shown.

NOTE: The pump bushings are made of oil absorbent bronze. They should NOT be reamed to obtain final sizing.

Inside diameter of new bushings when they are out of the pump is 0.6205" to 0.6206". The inside diameter of these bushings after being pressed into the water pump is .0.6185" to 0.6190". The desired running clearance between pump shaft and bushings is 0.0015" to 0.0025".

In order to obtain the recommended running clearance without processing the bushing bores the bushings must be protected against collapse during installation. This is accomplished by using the puller and pilot, (item 7) of the pump reconditioning tool set.

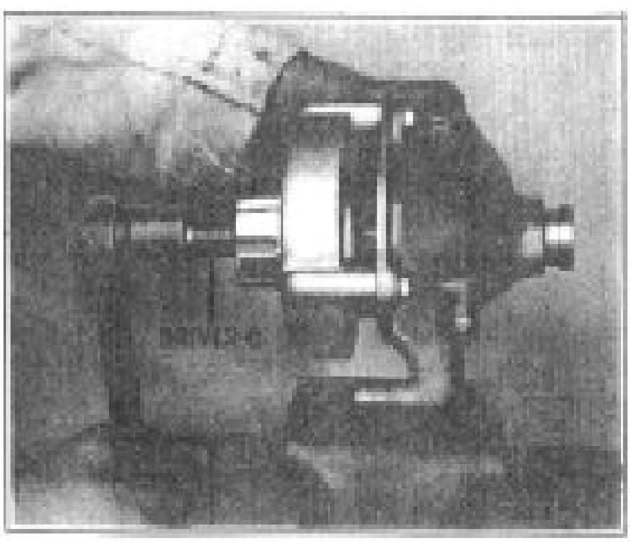


Figure 82
Removing Water Pump Front Bushing With Items 4 said 6 of Tool Set J-7338

12. INSTALLING NEW BUSHINGS. Insert the new FRONT bushing so that it is just started into the water pump body. Insert the combination puller and pilot (item 7) through the bushing and water pump body as Illustrated in Fig. 83. Place washer and nut on the pilot and pull bushing into place by turning the nut as shown.

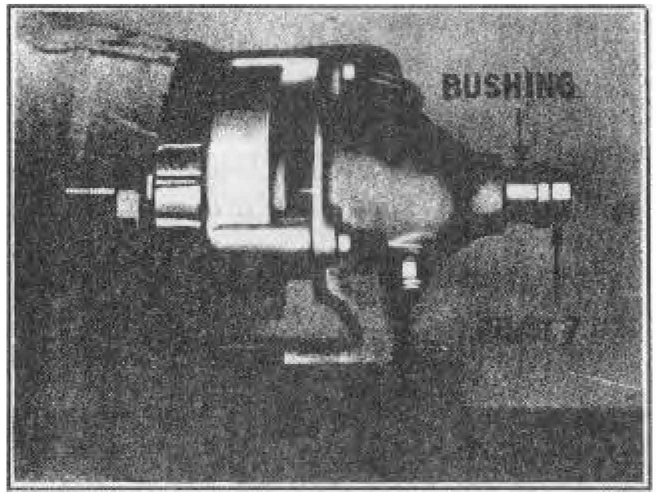


Figure 83
Installing Water Pump Front Bushing With Item 7 of Tool Set J-7338

13. Remove the pilot. Install the rear bushing so that it is just started into the water pump body, then reinsert the pilot, threaded end to the front, through both bushings, as illustrated in Fig. 84.

14. Insert short threaded driver (item 4 of tool set) into thumb screw and push the REAR bushing into place by turning the driver clockwise as shown.

15. Place the burnishing tool (item 8 of the reconditioning tool set) in the REAR bushing. Install the thumb screw into the tool body and over the hexagon head of the burnisher.

16. Using the thumb screw to exert a light pressure of burnishing tool against face of bushing, rotate the burnisher rapidly with a brace handle socket

wrench. Repeat the burnishing until a dentless highly polished surface is produced on the end flange face of the bushing. Bushings too deeply indented to be corrected by burnishing should first be refaced in a lathe.

If the rotation of the burnishing tool is stopped while heavy pressure is on it, an undesirable crease may be formed on the bushing face. Use light feed pressure to prevent occurence of creases.

17. REASSEMBLY OF PUMP. Assemble the seal components into the impeller in the order shown in Fig. 76. Be sure to install the steel thrust washer so that lapped face of same faces out so as to contact the end of pump bushing.

18. Insert the shaft and pulley flange unit into the pump body. Insert a 0.010" feeler blade between pulley flange and end of pump body front bushing, then press the impeller and seal unit onto the pump shaft.

NOTE: If the impeller and seal assembled unit is immersed in boiling water for 5 minutes, it can readily be pressed onto the shaft with very light pressure.

19. Place the pulley flange on a solid surface and peen the IMPELLER end of the pump shaft.

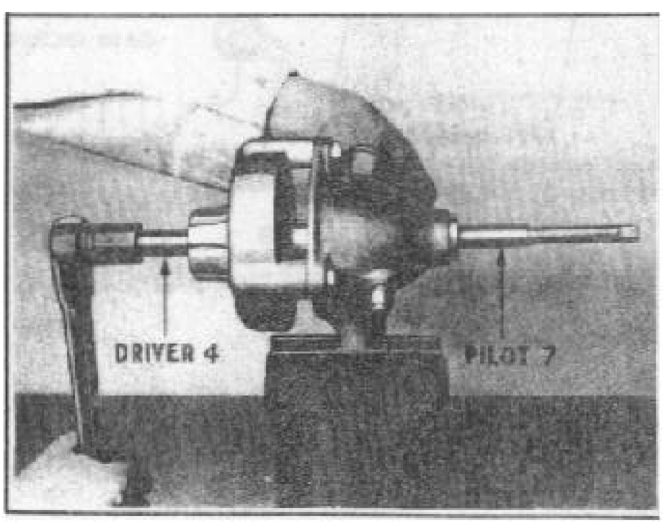


Figure 84
Installing Water Pump Rear Bushing
Using Items 4 and 7 of Tool Set J-7335

20. Remove feeler blade and check and play which should be 0.010" to 0.014". If not within these limits,
move impeller on shaft accordingly.

21. Assemble impeller housing to the body and install fan pulley and blades. Fill the water pump grease reservoir with an aluminum soap base lubricant via the grease fitting on body.

FAN BELT

The "V" type fan belt is adjusted by swinging the generator on its mounting as follows:

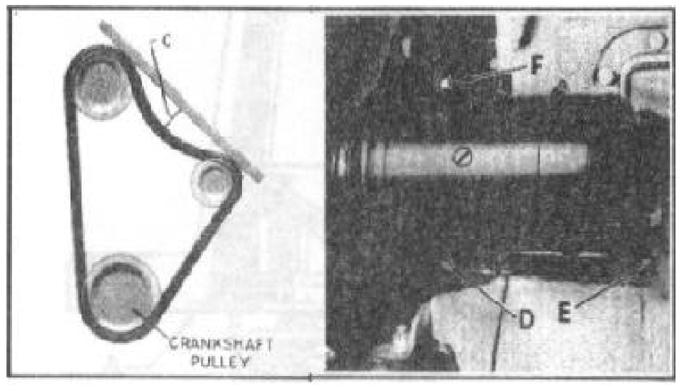


Figure 85
Left - Belt Should Have 3/4" of Slack
Right - Bolt "F" Controls Belt Tension

The belt must be operated with a definite amount of slack to prevent an overload being placed on the water pump and generator bearings.

Loosen the two generator bracket bolt nuts (D) and (E), and the adjusting arm bolt (F) Fig. 85.

Pull generator away from the engine until the slack in the fan belt is such that the section between the water pump pulley and the generator pulley can be pushed down 3/4" below a straight edge laid across these pulleys as shown at (C).

Tighten adjusting arm bolt nut and generator mounting bracket nuts.

THERMOSTATS

The temperature at which the thermostat opens is very important and it should be checked whenever the complete cooling system is being checked.

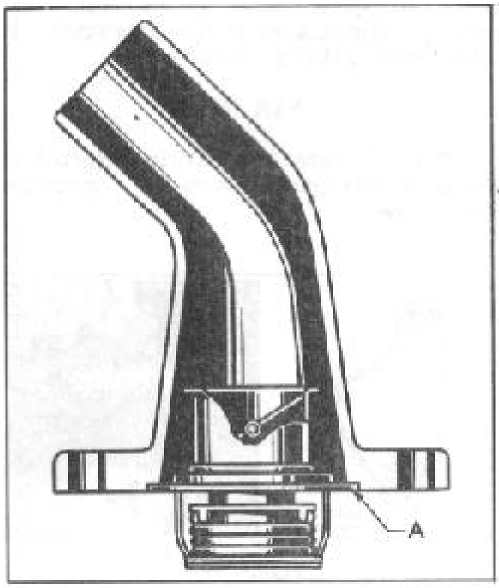


Figure 86
Cylinder Head Water Outlet
With Thermostat in Place

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.

Continue heating the water until the thermostat is wide open. The thermometer should show 185° F.

Discard thermostats that:

Do not open completely.
Open at too low a temperature.
Open at too high a temperature.

A thermostat that opens too soon will cause the engine to operate at too low a temperature and if it opens too late or is sticking, it may cause the engine to overheat.

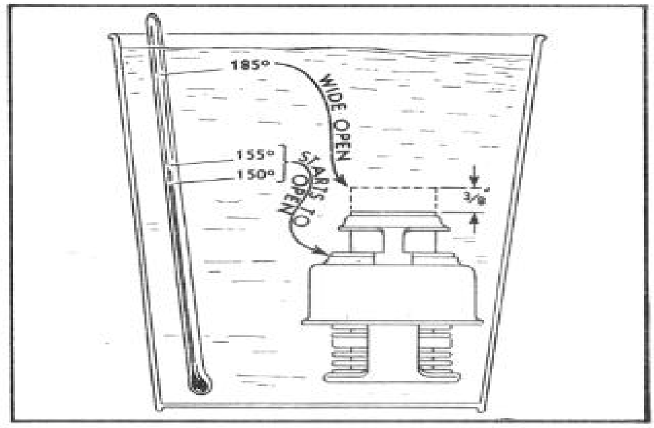


Figure 87
Testing the Thermostat Opening Point

WATER TEMPERATURE GAUGE

This electrical device consists of a sending unit mounted in the left rear side of Cylinder head and a receiving unit mounted on the instrument dash board. Each unit incorporates a bimetal element over which a heating coil is wound. Refer to Figs. 88 and 89.

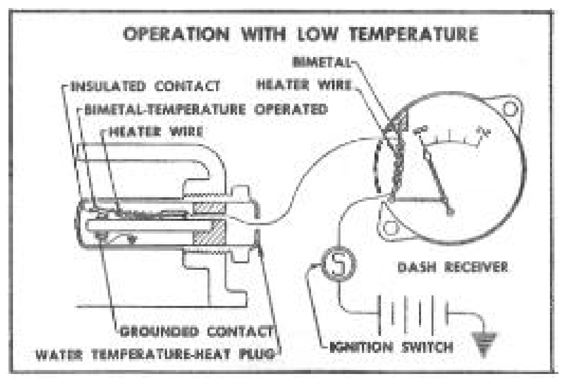


Figure 88
Water Temperature Gauge-Low Temperature Operation

The at-rest position of the indicator hand on the receiving unit is at the "H" or hot end of the dial, as shown in Fig. 89.

One wire connects the engine unit to the dash unit.

The sending unit consists of a fixed grounded contact so positioned that the bi-metal insulated contact presses against it heavily when cold and lightly or not at all when the bi-metal is heated.

At low temperatures, considerable heat is required to make this bi-metal bend away from the grounded contact. With the temperature of the engine cooling water low, all of this heat must be made electrically and this same current flowing thru the heater

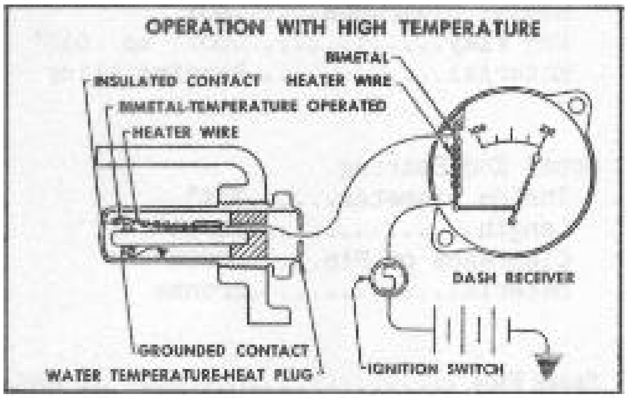


Figure 89
Water Temperature Gauge-High Temperature Operation

wire of the dash unit creates an equal amount of heat there and results in bending of the dash unit bi-metal, as shown in Fig. 88, causing the pointer to show a low temperature reading.

As the cooling water temperature rises, the heat of it aids in bending the engine unit bi-metal. Less heat is generated electrically and the resulting bending of the dash unit bi-metal is less, as shown in Fig. 89. This gives a higher temperature reading.

Gauge Trouble Shooting

It is impossible to adjust or repair either unit of the water temperature gauge.

The method of elimination testing to determine which unit is faulty is basically the same as for the fuel gauge except that the test sending unit in this case should be installed in the Cylinder head when making the tests.

REFERENCES

Source of Information	Date	Subject

ENGINE

SPECIFICATIONS

Mounting and General

Mounting Type	Rubber 3 points
Bore	3"
Stroke - Series 20	
(6 Cyl)	4-1/8"
Series 21,22,51,52,58,171, 172 and 178	
(6 Cyl)	5"
All 8 Cyl.	4-1/2"

Displacement

3" x 4-1/8" 6 Cyl.	175 cubic inches
3" x 5" - 6 Cyl.	212 cubic inches
3" x 4-1/2" 8 Cyl.	254 cubic inches

Camshaft

Gear Material	Phenolic 1942 Aluminum 1946
Timing Gear Lash	.002" to .004"

Camshaft Bearings

Type	Steel backed, Bermax lined

Diameter and Length

6 Cyl,	
No. 1	2.000" x 1-1/4"
No. 2	1.968" x 1-1/16"
No. 3	1.5625" x 11/16"
8 Cyl.	
No. 1	2.029" x 1-3/8"
No. 2	1.998" x 1-1/16"
No. 3	1.966" x 1-1/4"
No. 4	1.9355" x 1-1/16"
No. 5	1.498" x 1-5/16"
Radial Clearance	.002" to .0025"

Connecting Rods

Material	Forging Steel
Weight	
3" x 4-1/9" 6 Cyl.	30-3/4 oz.
All Other Models	30 oz.
Length - Center to Center	
3" x 4-1/8" 6 Cyl.	8-5/8"
All Other Models	8-3/16"

Lower End Bearing

Inside Diameter	1.937
Length	1.375
Radial Clearance	.001"
End Play	.007" to .013"
Material	Bearing Alloy

Upper End Bearing

Inside Diameter	3/4"
Length	15/16"
Clearance on Pin	.0003"
Material	Bronze

Spark Plug	Champion J9 Hudson 14 M.M.

Crankshaft

Type	Fully compensated
Bearings	
6 Cyl.	3
8 Cyl.	5
Bearing Material	Bearing alloy
Bearing Diameter and Length	
6 Cyl	
No. 1	2.343 x 1.625
No. 2	2.375 x 1.750
No. 3	2.406 x 2.375
8 Cyl	
No. 1	2.281 x 1.625
No. 2	2.312 x 1.375
No. 3	2.343 x 1.875
No. 4	2.375 x 1.375
No. 5	2.406 x 2.000
End Play Taken By	Center bearing
Bearing End Play	.006" - .012"
Radial Clearance	.001"
Adjustment Type	None

Pistons

Type	Cam ground
Material	Lo-Ex aluminum
alloy	
Weight	10.5 oz.
Length	3-3/16"
Pin Center to Top	1-11/16"
Clearance	
Skirt	.001" to .002"
Top of Piston	.016"
Depth of Grooves	5/32"
Piston Pin Hole-Size	.750"

Piston Pin

Type	Floating
Method of Locking	Snap rings
Diameter	.750"
Length	2-7/16"
Fit in Piston	
(At 200° F.)	.0003"
Fit in rod.	.0003"

Piston Rings

Material	Cast iron
Joint Type	Straight cut
and pinned	
Compression Rings	
Number Used	2
Width	3/32"
Oil Rings	
Number Used	2
Width-Upper	3/16"
Width-Lower 3" x 5"	
6 Cyl., All 8 Cyl.	5/32n
Width-Lower 3"x 4-1/8"	
6	3/16"

Valve Locations
(From the Front)

6 Cyl. Intake	2-4-5-8-9-11
6 Cyl. Exhaust	1-3-6-7-10-12
8 Cyl. Intake	2-3-6-7-10-11-14-15
8 Cyl. Exhaust	1-4-5-8-9-12-13-16

Valve Timing and Tappets

1942 Models 21,22,28 Six 3" x 5".
1942 Model 20 Six Cylinder 3" x 4-1/8" With Unmarked Valve Cover Plates.
1942, 1946, 1947 All Eight Cylinder Models.

Tappet Clearance	Inlet .006"
	Exhaust .008"
Intake Opens	10º 40' B.U.D.C.
Closes	60º A.L.D.C.
Exhaust Opens	50° B.L.D.C.
Closes	18° 44' A.U.D.C.

1942 Model 20, 3" x 4-1/8" with Valve Covers Marked .010" and .012".
1946 and 1947 All Six Cylinder Models 51,52,58,171,172,and 178.

Tappet Clearance	Inlet .010"
	Exhaust .012"
Intake Opens	27° 30' B.U.D.C.
Closes	68° 10' A.L.D.C.
Exhaust Opens	51° 50' B.L.D.C.
Closes	32° 10' A.U.D.C.
Tappet in Guide	.0002" to .0018"

Valve Stem Guide

6 Cyl. Sets 1-1/16" below top of Cylinder block.
8 Cyl. Sets 15/16" below top of Cylinder block.

Length	2-9/16"

Compression Ratio

3" x 4-1/8" 6 Cyl.	7-1/4 to 1
All Other Models	6-1/2 to 1

Inlet Valve

Material	Silicon steel
Head Diameter Overall	
6 Cyl.	1-3/8"
8 Cyl.	1-1/2"
Lift	.343"
Overall Length	
6 Cyl.	5-11/32"
8 Cyl.	5-3/32"
Stem Diameter	.341"
Stem Clearance	.0015" to .003"

Exhaust Valve

Material	XB Silichrome steel
Head Diameter	1-3/8"
Lift	.343"
Overall Length	
6 Cyl.	5-11/32"
8 Cyl.	5-3/32"
Stem Diameter	.339"
Stem Clearance	.003" to .005"

Valve Spring Pressure

At 2"	34 to 40 lbs.

Lubrication System

Type	Duo-Flo Automatic
Pump Type	Oscillating plunger
Pump Drive	Worm on Camshaft
Oil Filter Screen	40 mesh

Tightening Torque hi Ft. Lbs.

Connecting Rod Bolt	40-45
Cylinder Head Studs	
6 Cyl.	40-45
8 Cyl.	45-50
Main Bearing Bolts	70-80
Flywheel to Crankshaft Bolts	40-45
Front Engine Support Bolts	40-45
Spark Plugs	25-30
Water Jacket Cover Bolt	20-30
Oil Pan	15-20
Timing Gear Cover	15-20
Camshaft Gear Bolt	20-30
Cylinder Support Plate	20-30
Intake Manifold	15-20
Exhaust Manifold	20-30
Cylinder Head Water Outlet	20-30

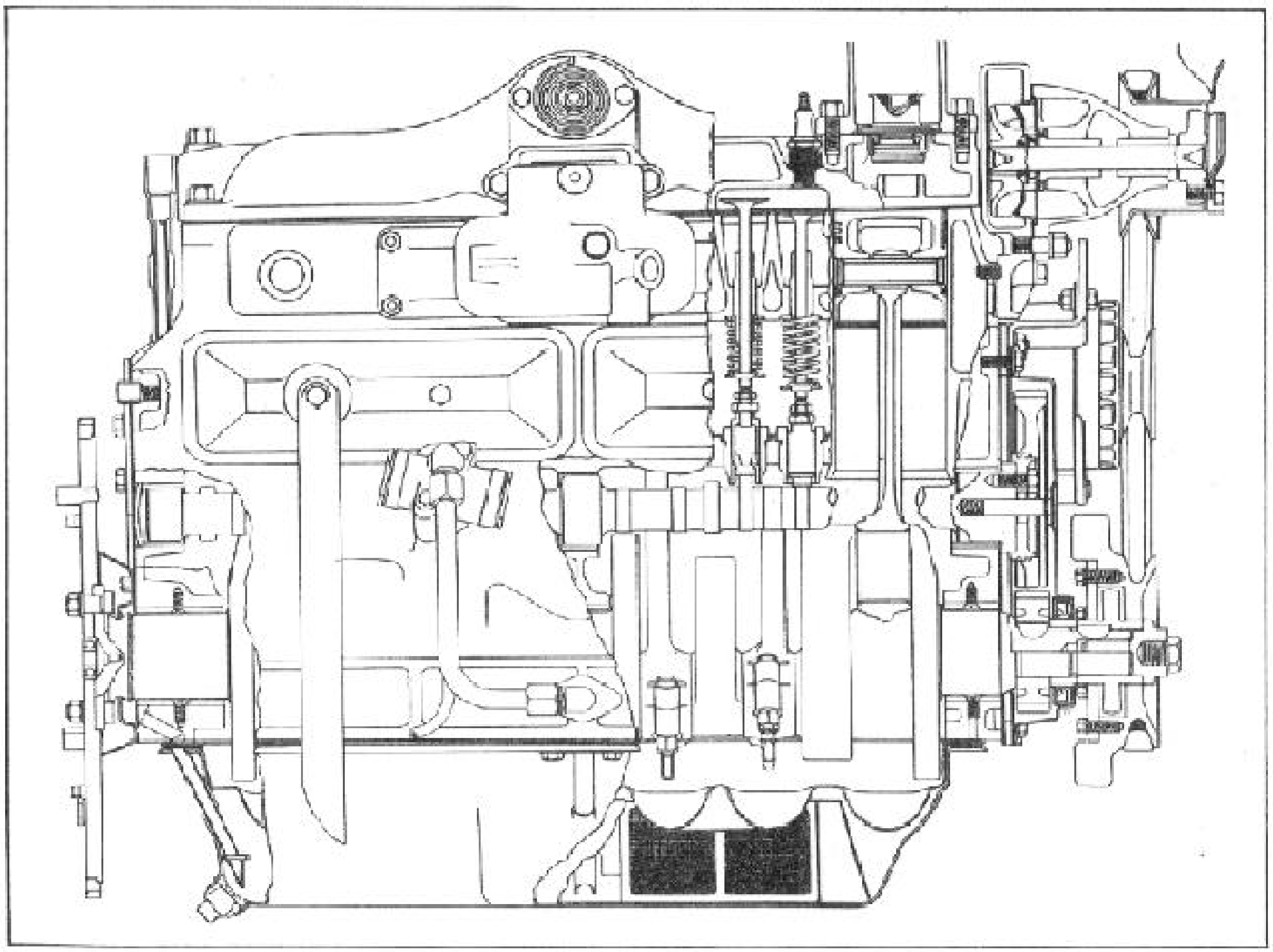


Figure 90
Cross Section Six Cylinder Engine

GENERAL

All engines, whether 6 cylinder or 8 cylinder, are the vertical in line type.

The crankcase and cylinder block is a single casting to provide maximum strength with the minimum of weight. A chromium alloy is used in the cylinder block to strengthen it and to increase the life of the bores; valve seats and the other wearing parts.

The crankshaft is drop forged, having integral weights which are drilled in the process of manufacture to give static and dynamic balance.

MOUNTING

The engine is mounted on rubber at three points. Two rubber cushions are used at each front corner and a large rubber block is used under the transmission bell housing and attached to the rear engine support frame member.

Mount bolts provided with self locking slotted hex nuts are used. These nuts eliminate the need for cotter pins. The nut has a slight chamber at the contact face and as it is tightened the slots in the hex close up, thus automatically closing the threads in the nut tighter on the threads of the stud.

When the wrench is applied to the nut and the tension on the contact face is released, the slots again spread open and the nut is removed in the conventional manner.

The nuts can be used over again.

Tighten engine front support bolt with a torque wrench to 40-45 foot pounds.

Replacement Front Support

REMOVAL

Drain cooling system (Petcock at bottom of radiator and 1/8" pipe plug near lower rear corner of water jacket cover).

Remove generator; fan belt; and radiator outlet hose.

Raise the front end of the car and remove radiator lower tank shield.

Remove starting crank jaw and vibration dampener using Tool J-676-B.

Remove timing gear cover and gasket (See Page 104),

Turn engine over until timing marks on gears coincide.

Remove camshaft gear and thrust plunger.

Remove crankshaft gear using tool J-471 as per Page 105.

Block up the front end of, the engine. Remove front engine mounting bolts and nuts.

Remove engine support bolts and locks, Remove plate.

REINSTALLATION

Clean all traces of the old gasket from front face of cylinder block. Install new or original support plate using a new gasket. Reinstall other parts in reverse order of their removal while observing the following notes:

The punch marked tooth or crankshaft gear must be between the punch marked teeth on the camshaft gear.

Be sure to adjust fan belt and refill cooling system.

REMOVE AND INSTALL ENGINE

Removal

The 6 and 8 cylinder engines can be removed in the following manner.

1. Remove bonnet hinge and support bolts and take bonnet off.

2. Remove:
   - Front seat cushion
   - Accelerator pedal
   - Front floor mat
   - Transmission hole floor cover
   - Clutch housing to engine bolts
   - Engine ground strap

3. Drain cooling system (petcock at bottom of radiator and l/8" pipe plug near lower rear corner of water jacket cover).

4. Remove horns.

5. Remove all radiator hose.

6. Remove radiator tie rods and the two bolts holding radiator to frame and remove radiator.

7. Disconnect wires at generator, starter, temperature gauge and remove wiring harness attached by clips on left side of engine.

8. Disconnect fuel pump flexible connection at pump. Remove fuel line running from fuel pump to carburetor.

9. Disconnect throttle linkage leading from accelerator cross shaft and remove cross shaft by pulling toward the spring and slipping cross shaft out of opposite bracket.

10. Disconnect windshield wiper hose at manifold.

11. Disconnect wire at oil check valve. Remove high tension wires at spark plugs; high tension wire bracket and distributor cap.

12. Remove carburetor and air cleaner.

13. Disconnect exhaust pipe at manifold.

14. Remove front engine support bolts and nuts.

15. Attach tool J-917 to engine and lift out of the chassis moving it forward carefully to detach from the transmission.

16. Remove generator, distributor, fuel pump and clutch.

Reinstallation

To reinstall the unit reverse the procedure of removal.

Install starting motor after engine is in place in chassis frame.

Before installing the engine, wrap a single strand of soft wire around the leather seal of the clutch throwout bearing to prevent it from curling over when the engine is being placed in the chassis. Twist the wire and place the long ends upward thru the clutch housing and twist off after the engine is in its place in the chassis.

Engine should be lowered into the chassis carefully and over the mainshaft drive gear so as to engage the splines in the clutch driving disc.

OILING CIRCUIT

The oiling system is called Duo-Flo because the oil flows in two large streams. The double acting pump delivers exactly half its output to each end of the engine at the oil pan tray. No oil is side-tracked back into the main oil pan. There are no valves or bypasses in the pump and no adjustments can be made.

The oil pan is the main oil reservoir and is equipped with a series of baffles that force the oil to flow around the side of the pan where it is cooled by the outside air before passing through the filtering screen into the sump. The oil is lifted from the oil sump to the two ends of the engine at the oil pan tray by the double acting pump.

The oil pan tray is above the oil pan and has a depression or oil trough under each connecting rod so that the instant the engine starts, the connecting rod dippers start splashing oil, thus forming a heavy but fine particled mist. The baffles and conveyors in the oil tray and crankcase direct the flow of oil down the side of the crankcase wall so as to maintain proper level in all the troughs. The fact that the oil is instantly whipped by the connecting rod dipper is very important because in cold weather there is no waiting for adequate lubrication of pistons and cylinders.

The connecting rod dipper has a lead up to the connecting rod bearing so that each time the scoop passes through its trough a quantity of oil is delivered to the bearing. A groove in the lower half of the bearing assists distribution.

The amount of oil particles flying through the air in the crankcase is very great and due to this great amount of oil striking the various surfaces within the engine, rapid cooling of any local hot spots is accomplished.

Grooved shelves along the right crankcase wall collect oil which is fed by gravity to the main bearings. The upper half of each main bearing has a groove which assists in oil distribution. Bearings act as their own pumps.

Timing gears are lubricated in the 8 cylinder engines by one of the two main oil lines from the pump. The oil enters the timing gear compartment through a hole in the front face of the crankcase. When the oil has reached a pre-determined height it overflows through a hole in the crankshaft front bearing cap into the number one oil trough. Timing gears on the 6 cylinder engines are lubricated by splash from the connecting rods through a hole in the front face of the crankcase. This hole also permits the oil to flow back into the number one oil pan tray. A baffle plate is built into the timing gear cover and assists in maintaining the proper oil level by controlling the movement of the oil that is being circulated by the gears.

The rear oil line from the pump on all engines delivers its volume through a check valve. This supplies the No. 6 or 8 oil trough. The purpose of this check valve is to operate the tell-tale light on the instrument panel if, for any reason, the oil supply is interrupted.

Cylinder walls are lubricated by a large portion of the oil scooped up by the connecting rod dippers which throw the oil directly against the cylinder walls. In addition to this the churning and splashing action within the crankcase that creates the heavy but fine particled mist further lubricates the cylinder walls and piston pins.

Valves and valve tappets are lubricated by the heavy mist created by the agitated oil in the crankcase which passes through holes in the floor of the valve chamber.

Oil conveyors and oil baffles in the oil pan trays differ in location and construction on the 6 cylinder 92 H.P., 6 cylinder 102 H.P. and 8 cylinder engines.

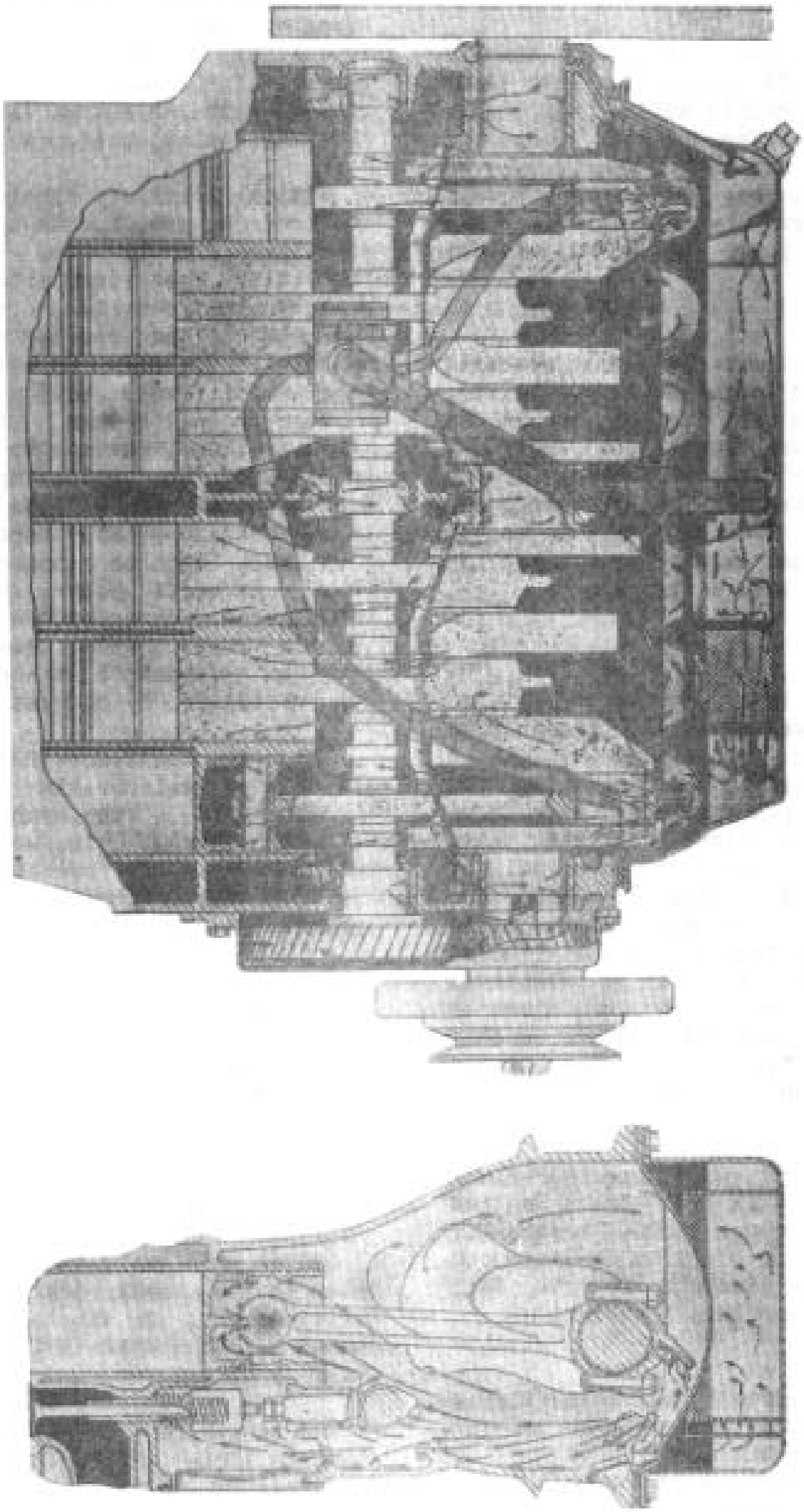


Figure 91
Engine Lubrication System

OIL PUMP AND LINES

The oil pump is an oscillating plunger type driven by a gear on the camshaft. The rotary oscillating motion imparted to the plunger by the eccentric on the pump shaft, together with its reciprocating motion, causes slots in the plunger to alternately register with ports in the body of the pump which are connected to the inlet and outlet. The plunger is therefore a double acting piston and a sleeve valve.

The double acting piston and drive shaft are the only moving parts and these move at only 1/12 crankshaft speed insuring low wear and long life.

REMOVAL. The oil pump can be removed by disconnecting the inlet and outlet lines and removing the two mounting cap screws.

DISASSEMBLY. To disassemble remove end hex caps and gaskets,

Remove dowel screw from pump mounting sleeve.

Withdraw shaft and plunger. Wash all parts thoroughly and blow dry. Dip the shaft and plunger in engine oil.

INSPECTION. The inlet to the pump consists of two 1/2" tubes, one from the reservoir to the crankcase side wall and the other from the crankcase side wall to the pump, in series.

The lower suction line should extend to within 15/32" of the bottom of the reservoir.

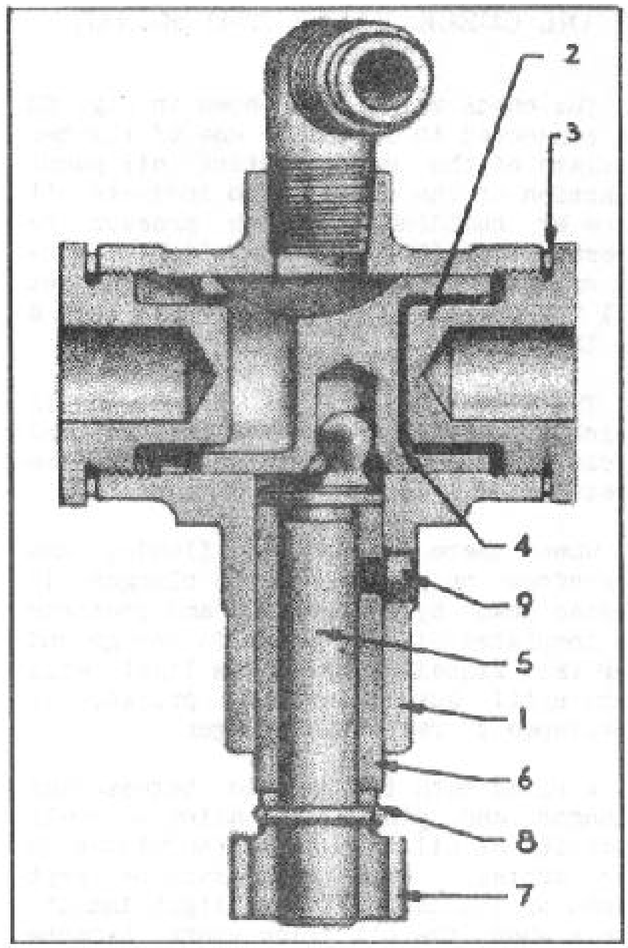


Figure 92
Section Through the Externally Mounted Oscillating Plunger Type Oil Pump

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

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

OIL CHECK VALVE AND SIGNAL

The check valve unit shown in Fig. 93 is connected in series to one of the two outlets of the double acting oil pump. Function of the valve is to indicate oil flow by building up enough pressure to operate the oil flow signal light mounted on the instrument panel. With hot oil the operating pressure ranges from 4 to 12 pounds.

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

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

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

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

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

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

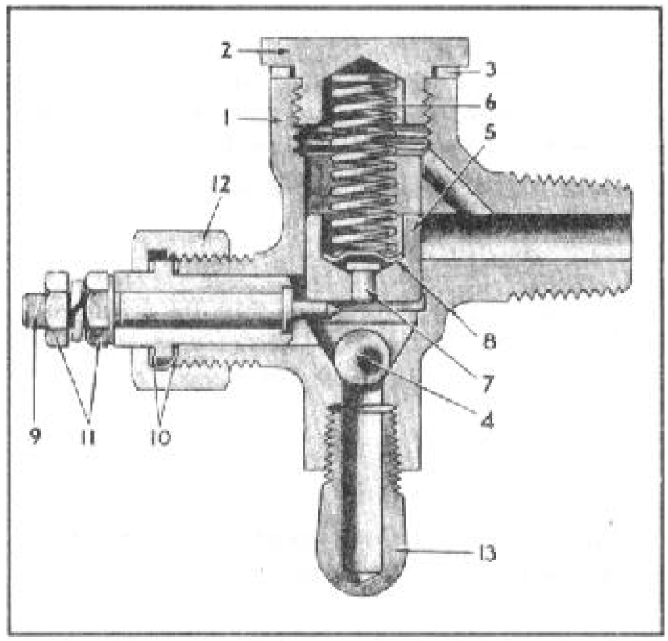


Figure 93
Oil Pump Check Valve Unit Including Switch for Oil Flow Signal Light

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

OIL FILTER

(Approved Accessory)

The engine oil filter used is of special construction designed for use with the low pressure oil system used in Hudson engines.

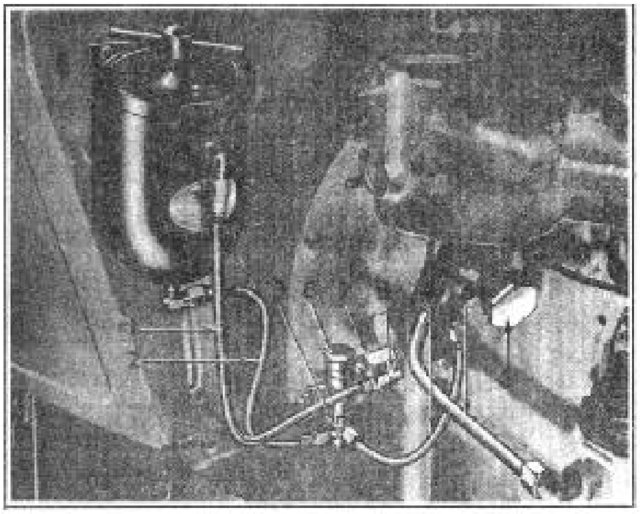


Figure 94
Installation of Approved Oil Filter

1. Outlet hose
2. Inlet hose
3. Three-way tee
4. Oil pipe from oil pump
5. Oil pump to cylinder pipe
6. Oil pump
7. Oil check valve body extension
8. Oil check valve body plug
9. Oil filter pipe elbow

The oil filter kit consists of --

1 oil filter assembly including the mounting bracket
2 of oil filter mounting bracket to dash bracket bolt, plain washer, nut and lockwasher
1 oil filter inlet hose
1 oil filter outlet hose
1 oil check valve body extension
3 elbows
1 oil check valve

Installation

In dust areas this oil filter and the oil bath air cleaner should be used.

1. Remove fuel pump bowl on 8-cylinder engines only.

2. Disconnect the tell-tale wire at the oil check valve.

3. Disconnect the oil lines at the oil check valve.

4. Remove oil check valve using tool J-1454.

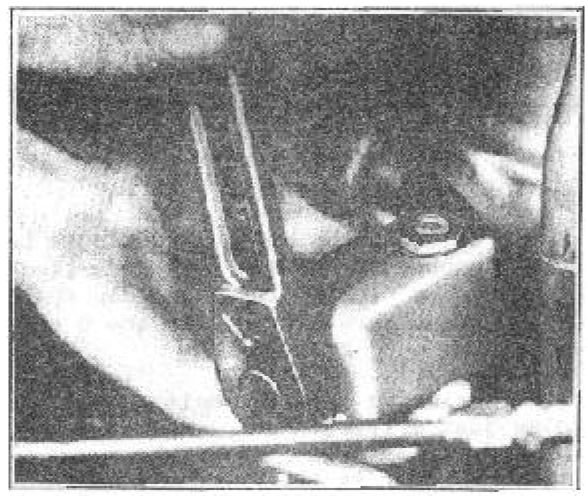


Figure 95
Oil Check Valve Removing and Installing Tool J-1454

5. Install oil check valve body extension to the oil check valve. Install one of the three kit elbows in the extension.

NOTE: Locate this elbow (9) so that it is horizontal and toward the front of the car with the opening pointed away from the engine.

6. Remove the elbow from the bottom of the check valve and discard it. Replace with the special three-way tee (3) in the kit. Locate this tee with the 5/16" outlet toward the front of the car.

7. Install oil check valve assembly on the engine using tool J-1454.

8. Attach the oil line (4) from oil pump to the 5/16" outlet of the three- way tee.

9. Attach the tell-tale wire to the check valve (7).

10. Use the template in the kit to properly locate the oil filter unit, This is necessary in order to avoid interference with heater hose and to have the filter hose installed without kinks or sharp bends.

11. Drill oil filter unit holes in the dash according to the template.

12. Install the remaining two elbows in the kit in the oil filter unit.

The inlet elbow at the bottom must point toward the engine.

The outlet elbow at the top must be set at approximately 45° from a vertical position and toward the engine on the 8 cylinder and straight down on the 6 cylinder.

13. Bolt the filter unit thru the holes just drilled.

14. Keeping it clear of any obstructions, connect the short or inlet hose (2) from the three-way tee to the elbow at the bottom of the filter.

15. Keeping it clear of any obstructions, connect the long or outlet hose (1) from the elbow in the oil check valve body extension to the elbow near the top of the filter.

Use two wrenches and tighten the hose. This is to prevent strain on the hose.

Run the engine for about ten minutes and inspect all connections for leaks.

Replace the oil filter cartridge after it has been in use for 5000 to 6000 miles or when the oil becomes cloudy a condition that can be determined by an examination of the oil at the oil level gauge.

When installing the oil filter cover always rotate the cover with the handle until the four indentations in the cover flange are past the top edge of the filter body.

A new cover gasket is furnished with replacement cartridges.

Replacement cartridges can be obtained from any Hudson Dealer or the Hudson Factory Parts Department.

EXCESSIVE OIL CONSUMPTION

In cases where an exceptionally large quantity of oil is being used, look for these conditions:

1. Scored cylinders.
2. Scored pistons.
3. Broken piston.
4. Piston rings weak or broken.
5. Piston rings seized in grooves.
6. External oil leaks.
7. Piston rings loose in grooves.
8. Oil return holes in rings or pistons clogged.
9. Cylinders out of round.
10. Improper grade of oil.
11. Inferior oil or diluted oil.
12. Worn valve guides.
13. Leaking cylinder head gasket.

No attempt is made in the above list to arrange causes in the order of probable occurrence.

Improper ignition or compression allows unburned gas to dilute the oil on the moving parts. This thin mixture of gas and oil finds its way past the piston rings further diluting the oil in the oil troughs and oil pan causing consequent excessive consumption.

Cylinder head gasket leaking will lower the compression and might permit water to enter the cylinders and further dilute the oil.

EXHAUST SYSTEM

Manifold Heat Control

Exhaust and intake manifolds are separate castings bolted to the cylinder block and also to each other as there are interconnecting passages through which the exhaust gases flow to heat the fuel mixture. The amount of exhaust gases directed on to the walls of the inlet manifold and the duration of time during which these gases are so directed is controlled by a suitable heat resistant valve set into the exhaust manifold. The method of controlling the heat valve is either manual or automatic depending on the car model.

Only the 1942 models 20 and 28 are fitted with a manual heat control valve. This valve should be set so that the arrow on its cover points straight up to the N" cast on top of manifold for summer and winter operation.

All other models are fitted with an automatic heat control valve which is controlled according to the under hood temperature by a thermostatic coil.

Automatic Choke Heat Source

All models are equipped with automatic carburetor chokes, the thermostats of which are exposed to exhaust manifold heat by suitable heat transfer connections.

All 6 cylinder models use a heat control box on the exhaust manifold connected by a tube to the carburetor choke.

All 8 cylinder models use an automatic choke heat tube which is a press fit into a reamed hole in the exhaust manifold. The tube can be replaced by removing exhaust manifold and drilling out the tube.

CRANKSHAFT AND BEARINGS

Size Code

Some engines are built with 0.010" undersize crank pins, some with 0.010" undersize main bearing journals and some with 0.010" undersize crank pins and bearing journals.

Identification markings are as follows:

PU means crankshaft has 0.010" undersize crank pins.

MU means crankshaft has 0.010" undersize main bearing journals.

PMU means crankshaft has 0.010" undersize crank pins and also 0.010" undersize main bearing journals.

These identification marks are stamped on the bottom face of the cylinder block at the left front corner in the clear area beyond the oil pan gasket.

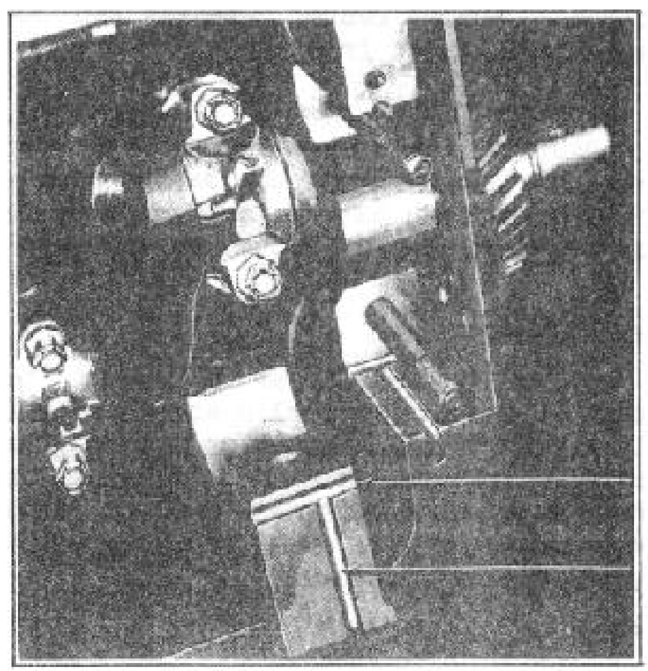


Figure 96
Crankshaft Front Bearing Cap Showing Vertical and Horizontal Packing Grooves

Crankshaft Replacement

The crankshaft assembly maybe removed and new bearings installed if necessary, without removing the engine from the chassis by following the procedure outlined below:

Drain cooling system. Remove bonnet. Remove radiator hoses and radiator. Remove starting crank jaw and vibration dampener. Remove fan blades, loosen generator and remove fan belt. Remove timing gear cover. Remove camshaft gear (3 bolts). Remove crankshaft gear.

Remove transmission assembly as outlined in Section 9.

Remove clutch assembly as outlined in Section 8. Remove flywheel.

Remove oil reservoir. Disconnect connecting rods from crank and push up out of the way. Remove front and rear bearing caps with tool J-377 and clean packing thoroughly from caps and cylinder block. Remove center bearing cap and lower crankshaft from car.

CAUTION: The crankshaft will drop with the loosening of the center bearing cap; therefore, extreme care must be observed when removing this cap.

Main Bearings

The upper and lower halves of the crankshaft bearing shells are each held in place in the crankcase and bearing caps by machine screws. The front and rear caps enter machined openings in the crankcase so that they are flush with the bottom of the case.

Crankshaft bearings are not adjustable as no shims are used. NEVER FILE the caps to reduce clearance. Use new factory line-reamed bearings.

Front and rear bearing caps have to be removed with a puller because sufficient force has to be used to shear off the packing in the grooves.

CAUTION: The packing should be thoroughly cleaned from the grooves in the case and the cap to avoid clogging the oil passages.

NOTE: Hudson main bearings are furnished either reamed (finished to standard size) or not reamed (for shops with line reaming equipment). Bearing assemblies reamed 0.010" undersize can be supplied if desired.

In cases where new unfinished bearings are being fitted, the caps and bearing shells assemblies should be installed in the case and tightened to 70 to 80 foot pounds torque, then line reamed to size.

Recommended total diametral clearance between journals and main bearings is 0.0005" to 0.0011". It is important that this close fit and narrow range be maintained when fitting new bearings.

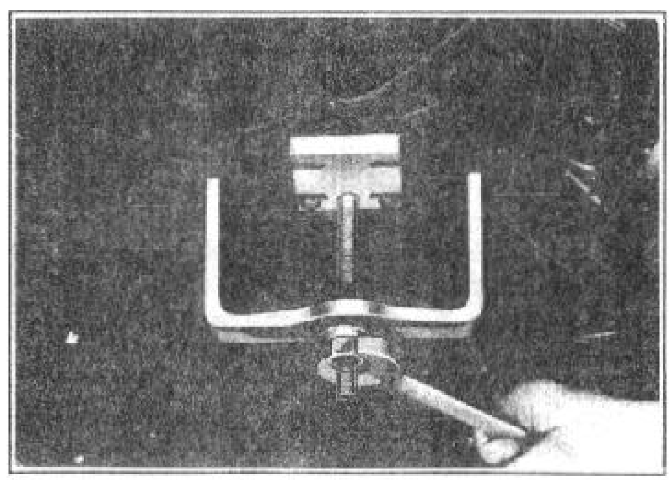


Figure 97
Use Special Puller J-377 to Remove Front and Rear Main Bearing Caps

Crankshaft should have 0.006" to 0.012" end play measured at the center main bearing in each case. When installing new factory unreamed shells, it may be necessary to machine the thrust flange face of the center bearing shells in order to obtain this amount of end play.

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

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

Shells should fit flush with parting face of case, but should project 0.002" beyond parting face of caps to provide a slight "pinch" for correct seating.

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

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

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

Install cotton wicking into the vertical holes in front and rear caps first, then into the horizontal holes of the front bearing cap. Insertion of packing is greatly facilitated by using tool J-392, shown in use in Fig. 99.

CRANKSHAFT OIL THROWER. Before installing the flywheel to the crankshaft, check to make sure that lower half retainer fits squarely and tightly against the upper half retainer, Also make sure that gaskets are in good condition.

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

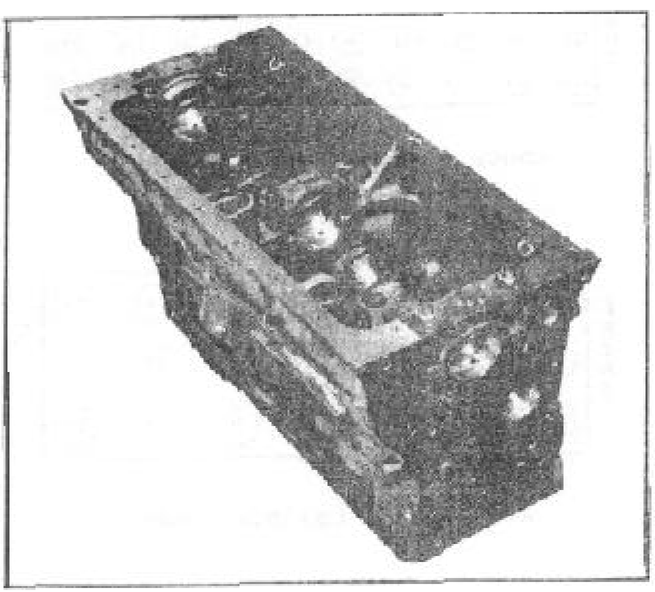


Figure 98
View of Six Cylinder Crankcase Showing Main Bearing Caps and Shells Installed

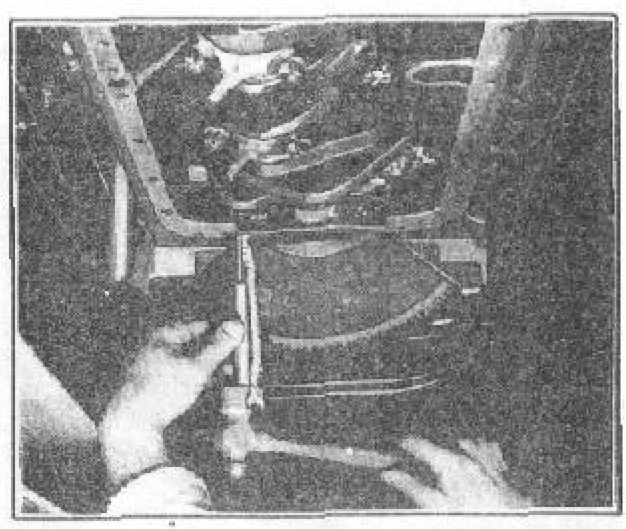


Figure 99
Bearing Cap Vertical and Lateral Packing Is Easily Inserted With Tool 3-392

CYLINDER HEAD

Lugs cast on the side of the cylinder head permit the use of a pry bar in removing head from cylinder block.

Whenever the head is removed and especially where frequent "blowing" of head gaskets is encountered, check the block face adjacent to the studs for the condition shown in lower view of Fig. 101. Use a straightedge for checking and if metal is raised as shown, be sure to counterbore the head holes sufficiently as shown in upper view, to compensate for the block condition.

Head gaskets should be treated with a light coating of Perfect Seal Gasket Paste on both faces before installing to engine.

We recommend Perfect Seal Gasket Paste as being superior because it will not dry out, crystalize, or form a cement, and best of all it WILL NOT dissolve in oil, gasoline, water or anti-freeze. Yet the gasket can be removed easily at any time.

See Hudson Perfect Seal applicator kit (Part No. 152172) or 3 ounce tube (Part No. 47567) or 8 ounce tube (Part No. 47568).

Install gasket on the cylinder block with letters on the gasket facing up.

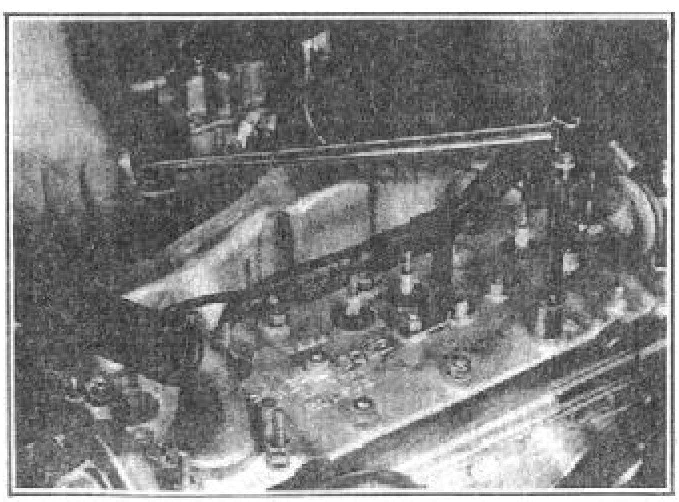


Figure 100
Tightening Head Nuts With a Torque Wrench

Head nuts should be tightened to 4045 foot pounds on 6-cylinder and 45-50 foot pounds on 8-cylinder, using an accurate torque wrench. Tighten each nut a little at a time in the sequence shown in Fig. 102 until all are up to specified tightness.

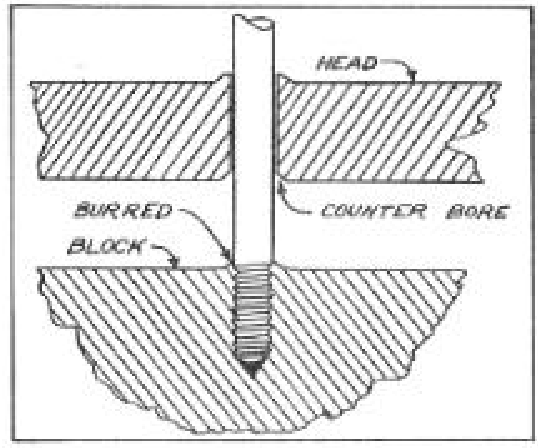


Figure 101
Compensate For a Burred Cylinder Block
By Counterboring the Cylinder Head

Above - Eight Cylinder Head

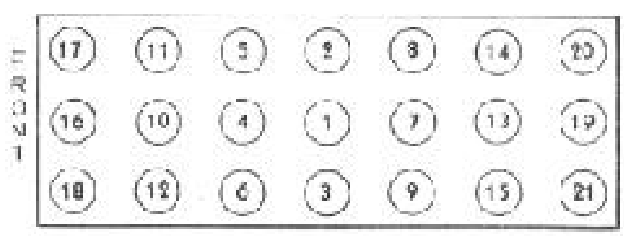


Figure 102
Tighten the Cylinder Head Stud Nuts In
The Sequence Shown Here

PISTONS, PINS AND RINGS

Rod and Piston Removal

The 6 cylinder connecting rods and pistons must be removed from the top while the 8 cylinder connecting rods and pistons can be removed from either the bottom or top. Thus on the 6 cylinder engine it will be necessary to remove the oil pan and cylinder head and caps while on the 8 cylinder models, it is not necessary to remove the cylinder head in order to remove the rod and piston assemblies.

Piston Rings

PRODUCTION RINGS

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

As will be seen in Fig. 103, the rings are notched on the inner diameter approximately at the gap slot.

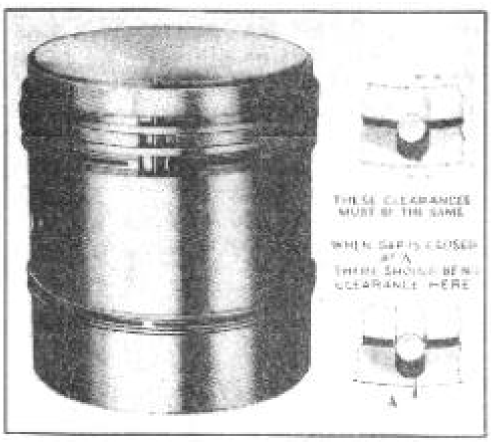


Figure 103
Piston Ring Gap and Pin Clearance

Width of the notch is 0.125" total of which approximately 0.075" is at one end of the ring and 0.050" at the other end. This offsetting of the notch enables a single pin to anchor the 3 top piston rings without having the gaps aligned on adjacent rings.

It will also be noted by reference to Fig. 103 that the end gap is equal to the backlash of the ring notch on pin. Therefore, if the ends of a ring are filed to obtain the desired 0.004" to 0.010" gap, it is necessary to file an equal amount from the notch in order to maintain the pin backlash at the same value as the gap.

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

Production type rings are available in 0.003, 0.005, 0.010, 0.015, 0.020 and 0.030" oversize. They are to be used only in cylinders that are being reconditioned by boring, honing, grinding or other recommended process.

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

SPECIAL RINGS FOR SERVICE

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

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

Both types of service rings listed below are pinned to prevent rotation on the piston and with the exception of the steel segments used in some kits, the 0.0125" pin notch is Offset with respect to the ring end gap.

RINGS FOR SLIGHT WEAR. The ring kits, listed below are intended for installation in cylinders that are not more than 0.003" out-of-round and which have not more than 0.005" of taper.

Engine	Nominal Cyl. Size	Kit No.
6 Cyl.	3.00 to 3.0075	166325
6 Cyl.	3.008 to 3.018	166444
6 Cyl.	3.0185 to 3.028	166445
8 Cyl.	3.00 to 3.0075	166327
8 Cyl.	3.008 to 3.018	166448
8 Cyl.	3.0185 to 3.028	166449

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

Avoid filing of rings wherever possible but check to see that end gap and notch backlash on pin is not less than 0.005" and not more than 0.015" on compression rings and not less than 0.008" and not more than 0.022" on both oil rings. These gap and backlash dimensions are to be measured at the point of minimum wear in the ring traveled part of the bore.

BADLY WORN CYLINDERS. The ring kits listed below are intended for installation in cylinders that are 0.003" out-of-round and which have more than 0.005" of taper.

Engine	For Bore Sizes	Kit No.
6 Cyl.	3.00 to 3.0075	166329
6 Cyl.	3.008 to 3.018	166462
6 Cyl.	3.0185 to 3.028	166453
8 Cyl.	3.00 to 3.0075	166493
8 Cyl.	3.008 to 3.018	166494
8 Cyl.	3.0185 to 3.028	166495

The above ring kits differ from the production type in• that the compression ring (B) Fig. 104, in the No. 2 groove and oil ring (G) are provided with steel expanders. Also the oil ring (E) in the No. 3 groove is a 4-piece type employing a steel expander (F), a cast iron wall contacting element (E) and 2 steel wall contacting segments (D).

Avoid filing of rings wherever possible and check end gap and backlash of all but the No. 3 oil ring to same limits as kits listed in opposite column. In the case of the No. 3 oil ring, the steel segments and narrow iron ring should have not less than 0.013" and not more than 0.040" gap and backlash measured at the point of minimum wear in the ring traveled part of the bore.

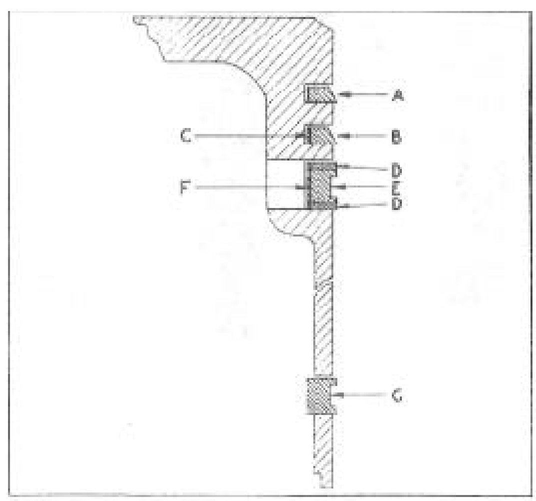


Figure 104
Segment Ring in No. 3 Groove

Piston Size Code

A code letter is stamped on the cylinder block along the lower face of the valve chamber, Fig. 105, 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 to these size and weight marks, all original factory piston installations are numbered on the head of the piston with the block number and the number of the cylinder in which the piston is fitted.

Example - The piston from No. 2 cylinder of a certain engine is marked as shown in Fig. 105. The mark "547" is for identifying this piston which is one of a matched set so that it will be installed in the cylinder selected. The cylinder is also stamped "547" on the front end. The mark "B" is the code letter stamped on both the piston and the lower face of the valve chamber and can be translated into a definite size valve by referring to the code table in adjacent column. The mark "$\frac{10}{3}$" indicates the weight and means 10-3/4 ounces. (If marked "$\frac{10}{1}$" the weight would be 10-1/4 ounces). The mark "2" is the number of the cylinder in which the piston is installed

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

PISTON, CYLINDER, RING SIZES

(Ring Oversizes Apply Only To Production Type Rings)

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

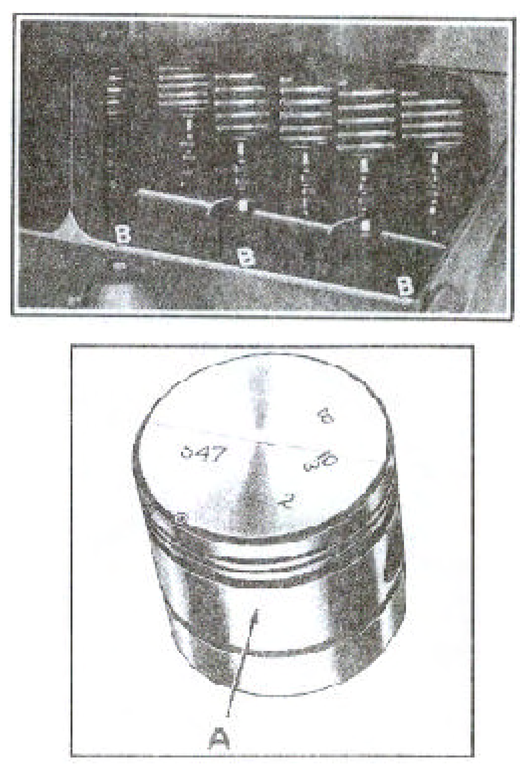


Figure 105
Cylinder Bore Size and Piston Size and Weight Code Marks are Stamped as Shown. Refer to Table for Key to Code Markings,

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

Cylinder bore sizes from standard to 0.020" oversize are given in this chart and the two recommended piston sizes and ring sizes for each bore size.

Same sizes of piston rings are recommended for more than one piston size and it is always advisable to hone the cylinder to the smallest dimension for which a given ring is recommended. Ring over- sizes shown in table Page 99 are available only in production type rings.

Fitting Pistons

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

The piston skirt is cam ground to elliptical shape and tapered. Maximum skirt diameter is at "A" Fig. 107, just below the third ring groove at right angles to the piston pin, The cam grinding makes it necessary that a 0.0015" feeler blade 1/2" wide be used directly opposite the skirt slot when checking piston clearance.

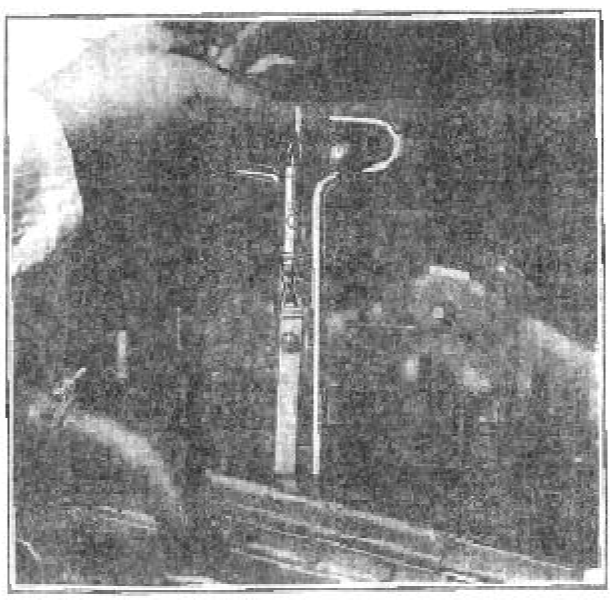


Figure 106
Piston Feeler and Scale Tool J-888

After inserting piston in the cylinder with the 0.0015" feeler gauge in the position described above, the feeler should be movable under a 3 to 4 pound pull. Use tool J-888 Piston Feeler Scale to measure this pull as in Fig. 106.

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

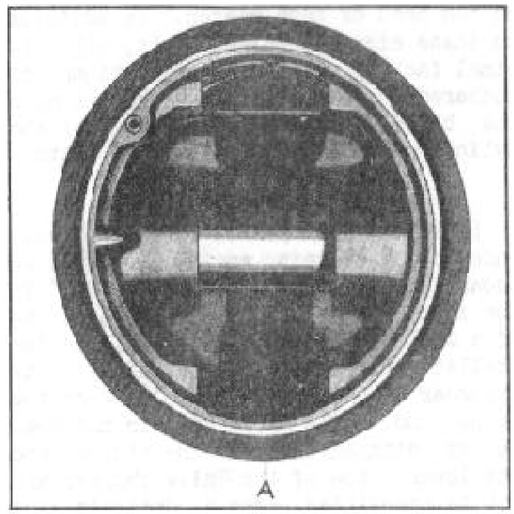


Figure 107
Check Piston Clearance With Feeler At Point "A"

Piston Pins

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

We recommend using new piston pins to fit the piston boss bores and new piston pin bushings in the connecting rods, reamed to size.

The care with which the piston pin is made and the careful diamond boring of the piston pin bosses in the piston makes it unwise to ream the piston.

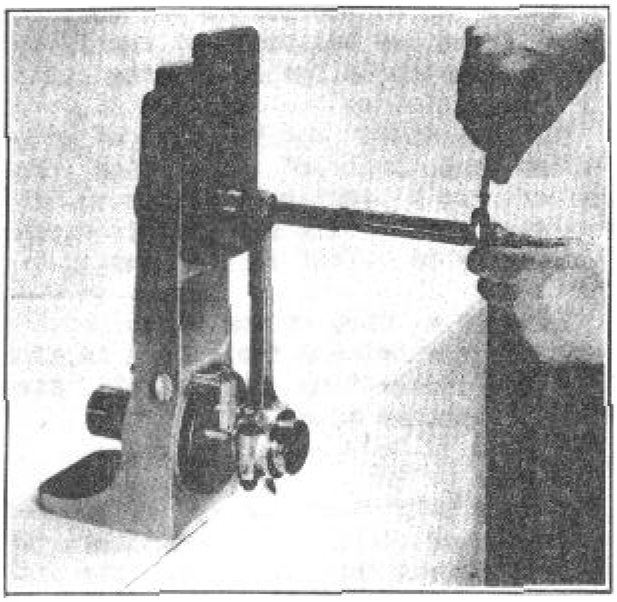


Figure 108
Sizing Piston Pin Bushing Using An Expansion Reamer With Rod Mounted In Connecting Rod and Piston Aligner J-874H

The piston pin and piston pin bushing should be replaced when necessary by selecting the proper size pin to fit the piston bosses and then reaming the bushing to size. See Fig. 108.

Piston pins are furnished in standard (3/4" or 0.750") and in 0.002", 0.005" or 0.010" oversizes.

When replacing piston pins select pins which can be pushed into the piston bosses with the heel of the hand when the piston is heated to 200° F.

Heat the piston in boiling water or in an electric furnace. Heating with a blow torch or other concentrated heat or driving the new pin in or out of the bosses will distort the piston.

Having selected the proper pin, replace the piston pin bushing and ream or burnish to 0.0003" larger than the pin diameter.

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

The procedure for reaming piston pin bushings with the connecting rod mounted in Aligning Fixture J-874H is outlined on Page 104,

PISTON PIN SNAP RINGS. The piston pin is held in the piston by snap rings placed at each end of the pin. Snap rings can be removed byapointed instrument or suitable pliers.

CONNECTING RODS

The connecting rod bolts are of centerless ground type fitted in reamed holes. The connecting rod bolt nuts are locked by a spring steel companion nut known as the Palnut.

The connecting rods have steel side thrust faces. A lead tin alloy bearing metal is used to line the connecting rods and the lining thickness is 0.015".

The radial clearance at the connecting rod big end is 0.001" and the end clearance is 0.006" to 0.010".

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

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

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

The connecting rod bearing does not lend itself to adjustment.

It is highly inadvisable to file the connecting rod or its cap to reduce clearance unless special precision equipment is available. Preferred method is to replace connecting rods having excessive clearance.

Tighten the regular connecting rod bolt nut to 40-45 foot pounds torque.

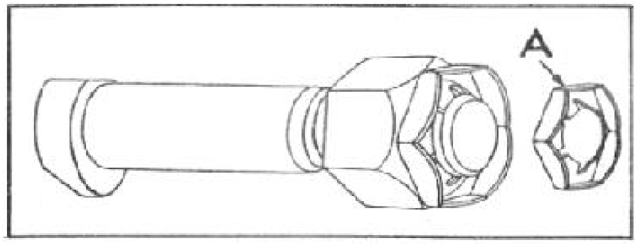


Figure 109
Connecting Rod Bolt Palnut

CONNECTING ROD BOLT NUT LOCK. After the regular nuts are tightened, place the Palnut (A) on the bolt with the smooth face against the hexagon nut and spin the Palnut with the fingers until it is snug against the hexagon nut. Then tighten Palnut with a wrench from 1/4 to 1/3 more to lock it.

We recommend the use of new Palnuts when reassembling rods.

Aligning Fixture J-874-H

The aligning fixture consists of a heavy cast base to which is mounted a sleeve bearing for supporting the arbor on which the connecting rods are to be mounted.

The sliding face plate is operated by a knurled nut which allows the face plate to be extended for any length of connecting rod.

The face plate is demountable so that a "V" block can be mounted in its place for aligning the piston when line reaming for oversize piston pins.

The face plate and the 'V" block have a guide hole in which there is a removable sliding bushing to receive the pilot end of the reamer.

In order to line up the connecting rod with the face plate or to line up the "V" block with the piston, a stepped arbor is furnished.

The "U" shaped device is for checking the alignment of the piston assembly and for checking the alignment of the piston pin in relation to the face plate.

The connecting rod bearing rod arbor has one step 1-15/16" in diameter for standard and a smaller step for 0.010" undersize rods. The piston pin expansion reamer is 0.750" in diameter.

There is a stop on the base with a set screw for setting the piston in line With the connecting rod. This stop should be set as shown in Fig. 110.

Pin To Rod Alignment

To make this test the rod is clamped on the arbor (Fig. 111) and the "V" block is placed against either the piston or the piston pin. The amount of misalignment will be shown between the pins on the "V" block and the face plate.

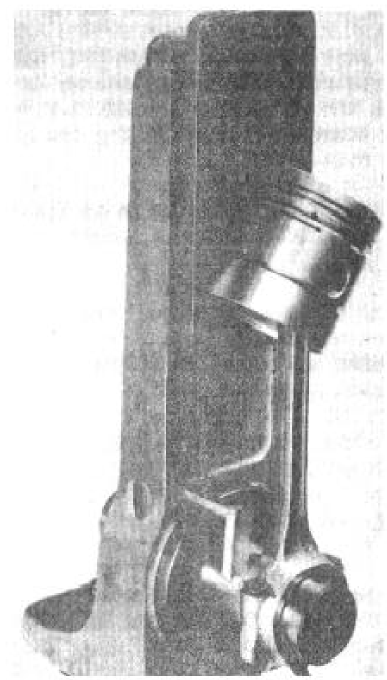


Figure 110
Setting Piston In Line With The Connecting Rod On J-874H

CHECKING BEND OR TWIST

To check the rod for bend or twist, place the piston pin in the rod and assemble the rod and the pin to the arbor on the fixture. Place the "V" block on the piston pin and move the rod and arbor toward the face plate. The vertical pins on the "V" block will indicate a bent or cocked rod.

EXAMPLE - If the two top pins rest against the face plate and the two bottom pins are away from the face plate, the connecting rod is cocked or bent.

If the two bottom pins rest against the face plate and the top pins are away from it, the rod is cocked or bent.

If the two horizontal pins, on the front side, rest against the face plate and the two back pins are away from it then the rod is twisted.

Also, if the two back pins rest against the face plate and the two front pins are away from the face plate, it indicates that the rod is twisted.

CHECKING ROD OFFSET

Place "V" block on the piston pin so that it rests against the outside edge of the connecting rod and then move the rod and "V" block toward the face plate until all four pins touch it.

The index (on the bottom of the fixture) is then placed so that it touches the connecting rod bearing.

Remove the rod from the arbor and turn it around. Assemble it on the arbor and place the "V" block on the piston pin in the same place as when the other side was checked.

Move the rod and the "V" block toward the face plate until either the index touches the bearing or the pins touch the face plate.

If the index does not touch the rod bearing with the four pins touching the face plate then the distance between the rod bearing and the index should be checked with a feeler gauge.

If this distance is more than 0.025" the rod should be straightened until both the pins touch the face plate and the index is within 0.025" of touching the rod bearing.

Use two bending bars H 1.1 3-B, one to hold the rod and the other to bend the rod into the proper position.

If the index touches the rod bearing and the four pins do not touch the face plate, the distance between the pins and the face plate should also be checked with a feeler gauge.

If this distance is more than 0.025" the rod should be straightened until the pins on the "V" block touch the face plate and the index is within 0.025" of touching the rod bearing.

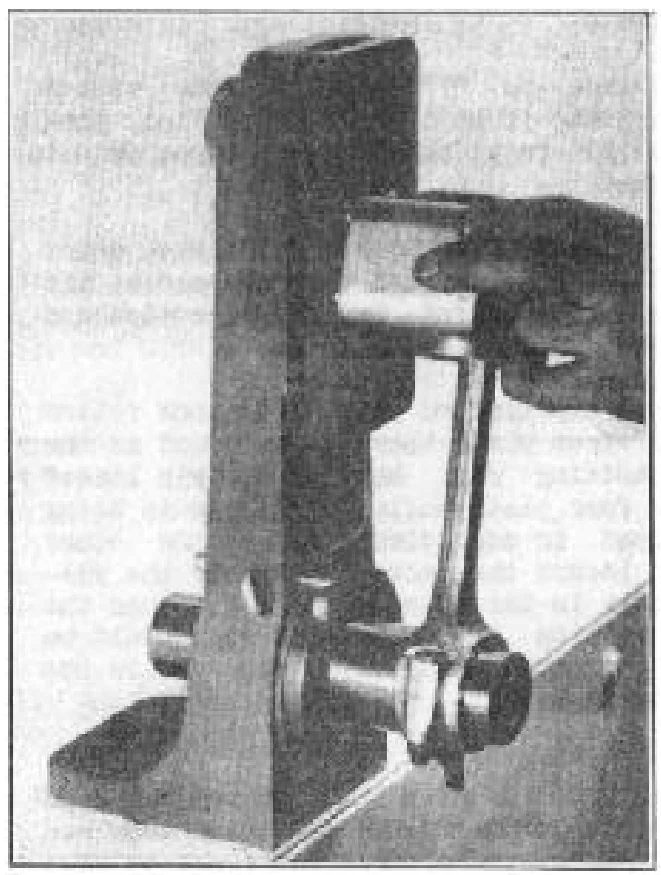


Figure 111
Checking Connecting Rod Alignment
With “V” Blocks on Fixture J-847H

ALIGNING ROD WITH PISTON. Assemble the connecting rod to the piston and lock the piston pin by means of the piston pin snap rings.

Assemble the piston and connecting rod assembly to the alignment fixture and check with the "V" block resting against the piston skirt to see that the rod and piston are in alignment. Both pins on the "V" block should rest against the face of the plate on the fixture. The piston should be in the same alignment as the connecting rod when this check is• made.

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

Mount the connecting rod and piston assembly on the alignment fixture and set the piston in line with the connecting rod.

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

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

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

PISTON PIN BUSHING REAMER. The bronze bushing in the top of the connecting rod for the piston pin can be reamed to size on the connecting rod aligning and reaming fixture J-874-H.

Place the connecting rod on the arbor and tighten it. Refer to Fig. 108.

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

Insert reamer pilot bushing in upper hole in fixture.

Insert reamer thru connecting rod bushing and into pilot bushing.

Perform reaming operation.

Rod Straightening

The Connecting Rod Aligning and Reaming Fixture J -874 -H is strong enough to hold the connecting rod during any straightening operation which can be done with the bending tool H M 3-R.

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

TIMING GEARS

Timing Gear Cover Removal

Drain cooling system (Petcock at bottom of radiator and 1/8" pipe plug near lower rear corner of water jacket cover).

Loosen generator mounting bolt nuts and remove fan belt.

Remove radiator outlet hose.

Remove vibration dampener-See Page 108.

Removing timing gear cover bolts:

Timing gear cover
Timing gear cover gasket
Vibration dampener spacer

Remove leather oil seal from cover.

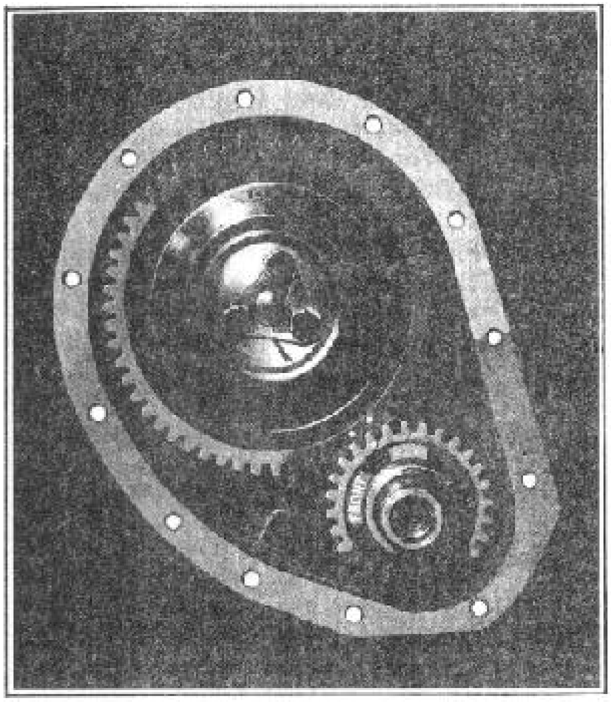


Figure 112
Timing Gear Marks Properly Meshed.

Timing gear cover installation is the reverse order of removal.

Timing gear cover has a hydraulic leather oil seal which fits closely over the vibration dampener spacer to prevent oil leaking out of the front end. The oil seal is a tight press fit in the cover and can be replaced when necessary.

Before installing a new oil seal, apply a coating of red lead or white lead in the recess in the timing gear cover and make certain that the oilseal is pressed tightly in place.

Check leather oil seal to be certain that it is not curled over, as this will cause oil to seep thru.

When installing the timing gear cover always replace the two special bolts in exactly the same holes from which they were removed. These two bolts are located at the lower left hand corner of the timing gear cover.

Use a new timing gear cover gasket.

Timing Gear Installation

The 1942 engines were equipped with a cast iron crankshaft pinion and a laminated phenolic composition camshaft gear of 20 degree pressure angle as shown in Fig. 112.

All 1946 engines except early production units are fitted at the factory with a cast iron crankshaft pinion of different pitch than used formerly and with a camshaft gear of aluminum alloy.

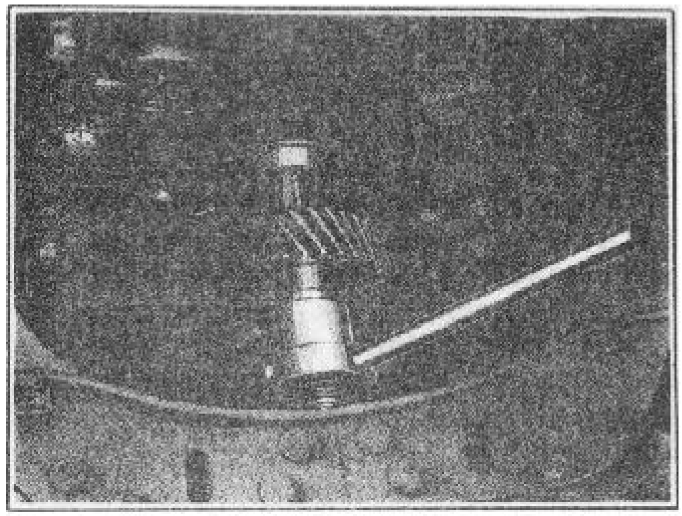


Figure 113
Installing Crankshaft Gear With Pusher
J-483

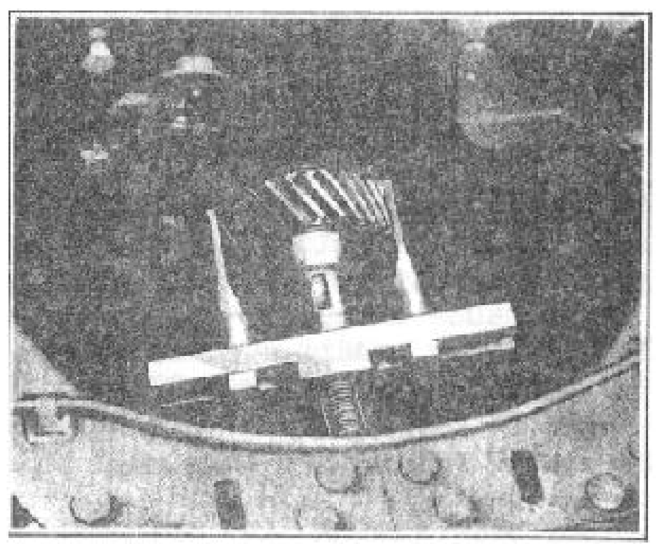


Figure 114
Removing Crankshaft Gear With Puller
J-471

Installation of the aluminum type gears into engines originally equipped with this type is accomplished without special procedure. However, when installing the aluminum type gears into engines not so equipped originally, the front support plate and cylinder block must be altered as outlined hereafter:

1. Remove front support plate as outlined on Page 85. Unbolt the old cam gear and remove old crankshaft pinion using puller J-471 as shown in Fig. 114.

2. With front support plate removed from the engine, file or grind back 3/32" the cut-out or radius shown at (A) Fig. 115. This is needed to provide additional clearance for the gear hub:

3. Countersink the two 13/32" holes shown at (B) from the front side of the support plate to permit the heads of the 2 special countersunk head screws and lock washers furnished with the gear, to come flush with the plate. These screws are used in place of the hex head screws which should be discarded.

4. Countersink the two tapped holes in the front of the block into which these screws go, just enough to prevent the special washers from bottoming before the support plate is drawn up.

NOTE: Use a 3/4 or 1 inch diameter 820 countersink with standard drill shank, procurable from first class hard ware or machine tool store.

CAUTION: Care must be exercised in handling and installation of the aluminum gear to avoid any blow or pressure that might cause damage to the teeth and result in noisy gears. Inspect both gears carefully before installing. Any high spots or burrs may be dressed down using a4 or 6 inch knife edge mill file.

5. Correct timing is obtained by meshing the punch marked tooth of the crankshaft gear between the two punch marked teeth of the camshaft gear as in Fig. 112.

Gear backlash should be 0.002" to 0.004".

Reinstall all parts in reverse order of removal, being sure to install new seals etc., included in the Timing Gear Service Kit No. 165907, itemized below.

When replacing timing gears on engines originally equipped with 1946 aluminum type gears, it is not necessary to alter the front support plate or cylinder block.

Timing GEAR SERVICE KIT NO. 165907

Quantity	Part No.	Part Name
1	16 5908	Timing Gear Set
1	165903	Camshaft Gear Reinforcing Plate
3	170898	Camshaft Gear Bolt
1	116 59	Camshaft Gear Bolt Lock Wire
2	170899	Supt. Plate (Front) C'sunk Screw
1	165909	Replacement Instructions
1	40150	Cover Gasket
1	40151	Cover Oil Seal
1	40286	Vibr. Damper Spacer

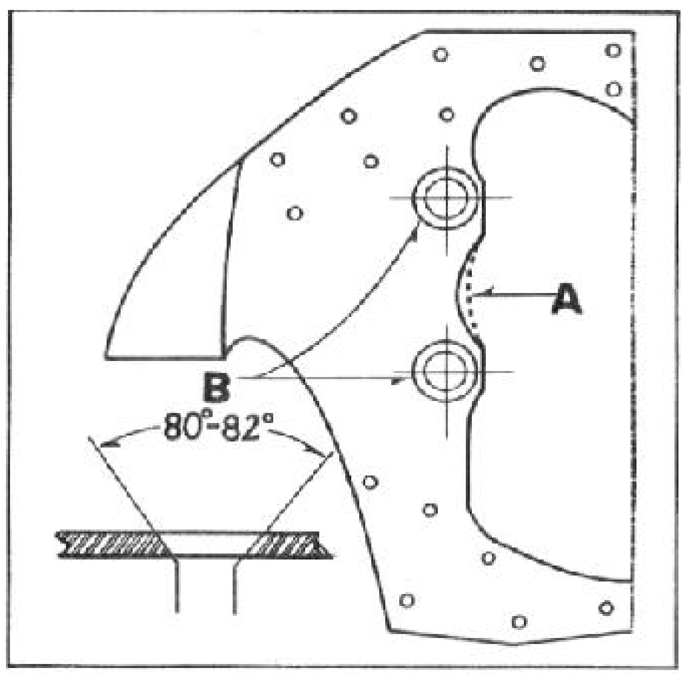


Figure 115
Points Where Front Support Must Be Reworked for Timing Gear Installation

CAMSHAFT

The camshaft is of iron alloy and electric furnace hardened.

A treating process is used that is a form of etching by means of which certain undesirable particles that have no wear resisting qualities are eliminated from the finished surfaces of both the cams and other parts of the shaft.

This process produces a black .and a seemingly rough surface on the entire shaft. The surface, however, acts as a series of minute oil reservoirs and provides a cushion of oil for the tappets, bearings and gears during operation.

A compression spring in the front end of the camshaft prevents end play and holds the shaft against a fibre thrust washer under the head of the shaft.

Camshaft Removal

Drain cooling system (Petcock at bottom pf radiator and 1/8" pipe plug near lower rear corner of water jacket cover).

Remove bonnet and radiator. Remove louvre panel assembly.

Remove starting crank jaw and vibration dampener - See Page 108.

Remove fan blades and fan belt.

Remove timing gear cover.

Remove camshaft gear (3 bolts). Remove valve chamber cover. Remove valves and tappets.

Remove oil pump, fuel pump and distributor.

Remove camshaft with the thrust button and spring by pressing down the radiator lower tank shield to give clearance.

Renewal of Bearings

Replacement camshaft bearing shells are available in both finished and semifinished state. The finished bearings are reamed at the factory sufficiently oversize so that when pressed into place they will be the proper dimensions for running fit, thus eliminating the need for scraping or reaming.

Also available from the Factory Parts Department are the standard bearings with sufficient wall thickness to permit line reaming where proper equipment is available for this operation. These bearings should be line reamed after installation to a diameter 0.001" larger than the individual camshaft journals.

Procedure for installation of new bearings is as follows:

1. Remove camshaft as described in preceding paragraphs.

2. Remove oil pan.

3. Press out the old camshaft bearings.

4. Press in the new bearing shells. Always install shells with the locating notch at the top. The 1/16" chamfer facilitates insertion of the shell into the cylinder block holes.

5. Use a new thrust washer and new gaskets when reinstalling camshaft.

6. Make sure that tappet guides are accurately aligned with cams on camshaft when installing tappet assemblies. If not properly aligned, cams may strike and damage the tappet guides. Each tappet guide clamp (C) Fig. 116 should be in full contact with sides of both tappet guides and it should not be possible to insert a 0.002" feeler blade at any point between inner edge of clamp and mating face of tappet guides. Refer also to last column on next page.

VIBRATION DAMPENER

The vibration dampener is mounted on the front end of the crankshaft to absorb the torsional or twisting motion which may be set up in the crankshaft at certain speeds.

The dampener consists of a hub keyed to the crankshaft and a flywheel which is driven from the hub thru two rubber discs. The flexibility of the rubber drive allows a small amount of relative movement between the parts to dampen any tendency of the crankshaft to vibrate torsionally.

The dampener flywheel has a V groove for the belt which drives the fan, water pump and generator.

Vibration dampener removal on all 6-cylinder cars can be accomplished from underneath the car without removal of either the radiator core or louvre panel.

Remove radiator louvre panel center moulding.

Remove front bumper bracket bolts and allow bumper to drop down.

Remove fan belt.

Remove radiator if 8 cylinder car.

Unscrew the crankshaft starting jaw.

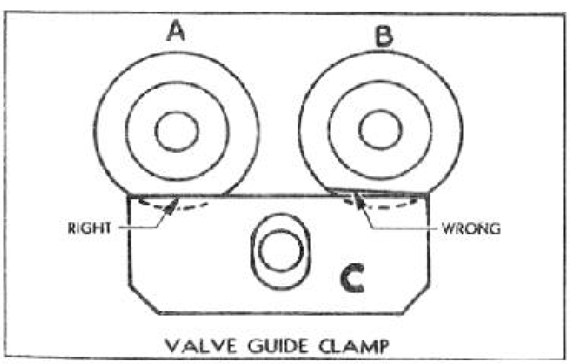


Figure 116
Tappet Guides Must Be Accurately Aligned With Clamps "C" To Avoid Striking Camshaft

Place jaw of vibration dampener puller J-676-C over the dampener and place the screw of the puller tool thru the starting crank hole.

Turn the screw to draw off the dampener and remove it from underneath on 6-cylinder, and from the top on the 8 cylinder engines.

VALVE SYSTEM

Tappets and Guides

The tappets and tappet guides can be removed without removing the cylinder head as follows:

1. Follow removal of parts as for tappet adjustment.
2. Back off all the tappet adjusting screws as far as they will go. Remove all spring seat retainers (horse shoes) using Valve Spring Compressor Tool J-915.
3. Remove all tappet adjusting screws.
4. Remove all valve springs.
5. Remove tappet guide clamps.
6. Remove tappets and guides.

Reinstall tappets and guides by reversing the order of removal. Observe the following points during reinstallation:

7. Make sure that tappet guides are accurately aligned with cams on camshaft. Position of guides is controlled by the guide clamps (C) Fig. 116, the inner sides of which should be in full contact with matching flat surfaces on sides of each pair of tappet guides.

One method of obtaining alignment is to tighten clamp nuts just less than snugly, then bump outer face of clamps sharply inward using a wide piece of fiber or brass interposed between the hammer and the clamps. This will tend to jar the tappet guides into parallelism with clamps. When clamps are tightened, it should not be possible to insert a 0.002" feeler blade at any point between inner edge of clamps and mating face of tappet guides.

Valve Tappet Adjustment

Jack up front end of car.

Remove right front wheel.

Remove horn mounting bolts and push horn forward out of the way.

Remove fender dust shield to fender bolts, dust shield to frame bolts and fender apron support bolt. Remove dust shield.

Remove valve tappet chamber breather tube.

Remove valve chamber cover.

Adjust tappets to inlet 0.006", exhaust 0.008" engine warm on the following models:

1942 Sixes 21,22,28, 3" x 5" engine.
1942 Sixes Series 20, 3" x 4-1/8" with unmarked valve cover plates.
All 8 cylinder models.

Adjust tappets to inlet 0.010", exhaust 0.012" on the following models:

1942 Series 20, 3" x 4-1/8" engine with valve covers marked 0.010" and 0.012".
All 1946 and 1947 Six cylinder models 51,52,58,171,172 and 178.

Valves and Seats

Exhaust valves are silichrome steel, intake valves are of silicon steel. The valves seat directly in the chrome alloy iron cylinder block.

Valves and seats should be refaced with a 45 degree cutting tool. To cut through hard surface glaze on old seats with metallic cutter without chattering, insert piece of emery cloth over cutter with abrasive face contacting seat.

Seating surface in cylinder block should be 1/16" wide.

Valve locations counting from the front of the engine are -

6 cylinder intake 2-4-5-8-9-11
6 cylinder exhaust 1-3-6-7-10-12
8 cylinder intake 2-3-6-7-10-11-14-15
8 cylinder exhaust 1-4-5-8-9-12-13-16

Valve Springs

Springs are anodized to prevent rusting and corrosion.

After removing springs from engine, they should be tested for seating pressure with spring tester U-15. Springs should weigh not less than 34 nor more than 40 pounds when compressed to 2". Reject springs under 34 pounds.

Valve Stem Guides

Valve guides that are worn. more than 0.005" oversize should be replaced.

When replacing guides use puller J-267 to remove and drift J-883--A to install them. The drift is designed to drive the 6 cylinder guides 1-1/16" below the top of the cylinder block and 8 cylinder guides 15/16" below top of block. These positions should be closely observed.

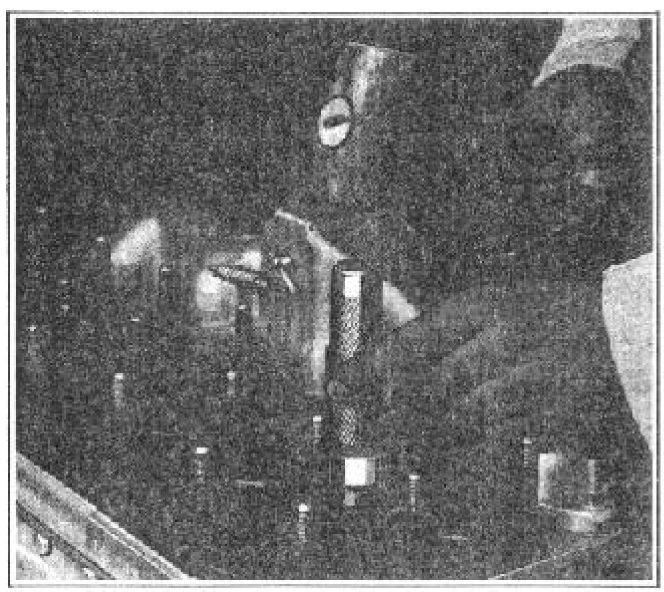


Figure 117
Tool 3-883A Positions Valve Guides To Proper Height From Top of Cylinder Block

After the guides are pressed into the cylinder block they should be reamed with a solid type reamer (J-129-2) to 11/32" (0.3437). This will give a clearance of from 0.0015" to 0.003" for the intake and 0.003" to 0.005" for the exhaust. The difference in clearances is due to the difference in valve stem diameters which are 0.3397" for exhaust and 0.3412" for intake.

Valve guide cleaning should never be neglected whenever valve work is done as carbon will build up in the guide and particularly in the counterbore at the. top of the exhaust valve stem guide. Sticking and burned valves are caused by allowing this carbon to accumulate.

For cleaning the main bore of guides, we recommend KMO-122 Metal Brush. If a reamer is used for cleaning, keep an extra one available to be used only for final sizing.

For cleaning the 25/64" diameter counterbore at the top of exhaust valve guides use a 13/32" drill.

Valve Timing

Correct timing is had by meshing the tooth of the crankshaft gear that has a punch mark on it between the two teeth of the camshaft gear that have punch marks on them. See Fig. 112.

CYLINDER BORING OR HONING

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

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

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

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

REFERENCES

Source of Information	Date	Subject

ELECTRICAL SYSTEM

SPECIFICATIONS

Generator

Make	Auto-Lite 6
Volts	GDS-4801A
Models, Standard	GEC-4801A
	GEA-4803B
Models, Optional	GEB-4802B
	GEG-4801A
Number of Brushes	
Models GDS, GEC	3
Models GEA, GEE, GEG	2
Number of Poles	2
Ground Polarity	Positive
Rotation, Viewed Drive End	Clockwise
Drive	Fan belt
Current Control Standard Generator	3rd Brush
Voltage Control, Standard Generator	Vibrating regulator
Current And Voltage Control, Optional Generator	Vibrating regulator
Fuse	None
Bearing, Drive End	Ball
Bearing, Commutator End	Ball
Models GEB, GEG	
Models GDS, GEA, GEC	Absorbent bronze
Bearing Clearance	0.001 - 0.0025
Bushing Bore, Installed	0.626 - 0.627
Armature End Play	0.003 - 0.010
Brush Spring Load,Ounces	
Models GEB, GEG	64 - 68
Models GDS, GEA, GEC	35 - 53
Field Draw Total, @6 Volts	
GDS-4801A	1.65 - 1.82
GEA-4803B	1.57 - 1.75
GEB, GEC, GEG	1.60 - 1.78
Motorizing Draw @6 Volts (Field Terminal Grounded to Frame	
GDS-4801A	5.10 - 5.45
GEA-4803B	4.45 - 4.90
GEB-4802B	4.00 - 4.50
GEC-4801A	4.35 - 5.40
GEG-4801A	4.70 - 5.20

Maximum Output @ 8 Volts	
GDS-4801A @ 1250 rpm	34
GEA-4803B @ 1600 rpm	35
GEB-4802B-2 1300 rpm	35
GEC-4801A @ 1290	43
GEG-4801A @ 1550 rpm	40

Regulator

Ground Polarity	Positive
Model Used With -	
Generator GDS-4801A	VRR-4001A
Generator GEA-4803B	VRP-4008B
Generator GEB-4802B-2	VRP-4008D
Generator GEC-4801A	VRR-4001A
Generator GEG-4801A	VRP-4008A
Voltage Regulator Setting @ 10 Amperes Rate,110°F	7.1-7.4 volts
Current Regulator Setting	
VRP-4008A	39-41 amperes
VRP-4008B	34-36 amperes
VRP-4008D	34-36 amperes
Carbon Resistors On Base, Total Resistance	
VRP-4008A.	75 ohms
VRP-4008B	45 ohms
VRP-4008D	75 ohms
VRR-4001A	30 ohms

Starting Motor

Make	Auto-Lite
Volts	6
Models	MAB-4100
	MZ-4092
Poles	4
Brushes	4
Brush Spring Load, Ounces	42-53
Bearings Absorbent Bronze	
Maximum End Play	1/16"
Transmission, (Drive)	Bendix inboard

No Load Draw, Minus Switch
MAB-4100 @ 5.5 Volts, 3700 RPM 60 amps
MZ-4092 @5.5 Volts, 4300 RPM 70 amps

Stall Torque, Minus Switch
MAB-4100 @3 Volts, 580 Amps. 15.8 ft.lbs
MZ-4092 @3 Volts, 420 Amps 7.8 ft.lbs

Starting Switch Solenoid

Contacts Close	3-4 volts
Contacts Open	0.5-1.25 volts
Voltage Drop Per 100 Amps	0.40 volts

Distributor

Make	Auto-Lite
Volts	6
Models 8 Cylinder	IGP-4008A IGP-4008B
Models 6 Cylinder	IGW-4203A
Rotation Viewed From Top	
IGP-4008A and B	Clock
IGW-4203A	A-clock
Type Automatic Control	
IGP-4008A and B	Centrifugal
IGW-4203A	Centrifugal and vacuum
Governor Advance Curve Stated In Distributor Degrees And RPM	
IGP-4008A and B	
300 RPM	0°
400 RPM	3°
850 RPM	8°
1300 RPM	13°
1700 RPM	17.5°
IGP-4203A	
400 RPM	0°
700 RPM	3°
1000 RPM	6°
1300 RPM	9°
1570 RPM	11.75°
Vacuum Advance Curve Stated In Distributor Degrees And Hg. Abs.	
IGW-4203A	
6-3/4 Hg. Abs	0°
7-5/8 Hg. Abs	2°
8-1/2 Hg. Abs	4°
9-3/8 Hg. Abs	6°
10 Hg. Abs	7.5°
Breaker Arm Spring	17-20 oz.
Cam Dwell, Degrees	
IGP-4008A and B	27.5
IGW-4203A	35
Rotor Shaft Side Play	0.005"
Rotor Shaft End Play	0.003-0.010
Contact Gap	
IGP-4008A and B	0.017
IGW-4203A	0.020
Flywheel Teeth	134
Degrees to a Tooth	2-2/3

Ignition Coil

Make	Auto-Lite
Location	Engine side of dash
Model 6 Cylinde	IG-4098
Model 8 Cylinder	CE-4029
Amperage Draw	
Engine Stopped	4.5
Engine Idling	2.5
Lock Cylinder Location	End of coil cable
Lock Cylinder Removal	Spring type retainer
Lock Key Series	H601 to H1100
Lock Blank Cylinders	Tumblers cut to match key

Spark Plugs

Make	Champion
Model	J-9 or J-7
Thread	14 mm.
Gap	0.032

Battery

Make	National
Number of Plates	
Six Cylinder	51
Eight Cylinder	57
Terminal Grounded	Positive
Water Level Above Plates	3/8"
Dimensions - 6 Cylinder	
Length	10-1/2"
Width	7-1/8"
Height	7-13/16"
8 Cylinder	
Length	11-3/4"
Width	7-1/4"
Height	7-13/16"

Horns

TWIN ELECTRIC AIR TYPE

Used On	All pass. cars
High Pitch	Short horn
Low Pitch	Long horn
Diaphragm Thickness	
High Pitch	0.0195"
Low Pitch	0.015"
Air Gap - High Pitch	0.025"-0.027"
Air Gap - Low Pitch	0.029"-0.031"

Relay Points Close	3 - 4 volts
Relay Points Open	2 volts
Relay Coil Resistance @700 F	7.3-8.9 ohms
Fuse Location On Dash	Under bonnet
Fuse Size	30 amperes

SINGLE VIBRATOR TYPE

Used On	Comm. cars
Adjustment Screw Located	Outer edge of cover

Governor Switches

Rotation Viewed From Top	Anti-clockwise
End Play	0.003-0.010

TGA-4001

On Acceleration-Makes Contact (Cadmium Plated Terminal) And Breaks Contact (Copper Plated Terminal)	700 rpm
On Deceleration-Breaks Contact (Cadmium Plated Terminal) And Makes Contact (Copper Plated Terminal)	535 rpm
Differential Between Make and Break,	80 rpm

TGA-4002

On Acceleration-Makes Contact (Terminal With 5/32" Hole) And Breaks Contact (Terminal With 3/16" Hole)	700 rpm
On Deceleration-Breaks Contact (Terminal With 5/32" Hole) And Makes Contact (Terminal With 3/16" Hole)	535 rpm
Differential Between Make and Break, Minimum	80 rpm

TGB-4001, TGB-4002

On Acceleration-Terminal "BL" Breaks Contact With Terminal "Y" And Terminal "B" Makes Contact With Terminal "Y"	430 rpm
Terminal "RW" Breaks Contact With Ground and Terminal "R" Makes Contact With Ground	700 rpm
On Deceleration-Terminal "BL" Makes Contact With Terminal "Y" And Terminal "B" Breaks Contact With Terminal "Y"	300 rpm
Terminal "RW" Makes Contact With Ground And Terminal "R" Breaks Contact With Ground	535 rpm
Differential Between Make and Break, At Terminals	
"BL" and "B", Desired	30 rpm
"RW" and "R", Minimum	80 rpm

Light Bulbs, 6 Volt Only

Mazda Candle No.	Power	
Headlamp, Domestic	40/30 watts	Sealed Beam
Headlamp, Export	45/20 watts	Sealed Beam
Bonnet Side Panel	55	2
Bonnet Ornament	55	2
Ignition Lock	55	2
Speedometer, Cars With Inst. Light, Rheostat	55	2
Speedometer, No Rheostat	51	1
Clock	55	2
Fuel Gauge, Cars With Inst. Light, Rheostat	55	2
Fuel Gauge, No Rheostat	51	1
Glove Compartment, Accessory	55	2
Generator and Oil Telltale	51	1
Direction Indicator Telltale	51	1
Light Beam Indicator	51	1
Fender Lamp With Turn Indicator	1158	21-3
Fender Lamp Without Turn Indicator	63	3
License Plate Lamp	63	3
Radio	51	1
Courtesy & Dome All Models	88	15
Fog Lamp, Accessory	4015A	Sealed Beam
Spot Lamp, Accessory	1209S	32
Tail and Stop Lamp All Passenger Cars	1154	21-3
Tail and Stop Lamp Commercial Cars	1158	21-3

CODE	COLOR	CODE	COLOR	CODE	COLOR
BW	BROWN—WHITE TRACER	BLW	BLUE—WHITE TRACER	GW	GREEN—WHITE
BK	BLACK	BLR	BLUE—RED TRACER	Y	YELLOW
BKG	BLACK—GREEN TRACER	R	RED	YBK	YELLOW—BLACK
BKBL	BLACK—BLUE TRACER	RW	RED—WHITE TRACER	YG	YELLOW—GREE
BKY	BLACK—YELLOW TRACER	RY	RED—YELLOW TRACER	YR	YELLOW—RED T
BKR	BLACK—RED TRACER	RBK	RED—BLACK TRACER	W	WHITE
BKW	BLACK—WHITE TRACER	G	GREEN	WR	WHITE—RED TR
BL	BLUE	GBK	GREEN—BLACK TRACER	WBK	WHITE—BLACK
		B	BROWN		

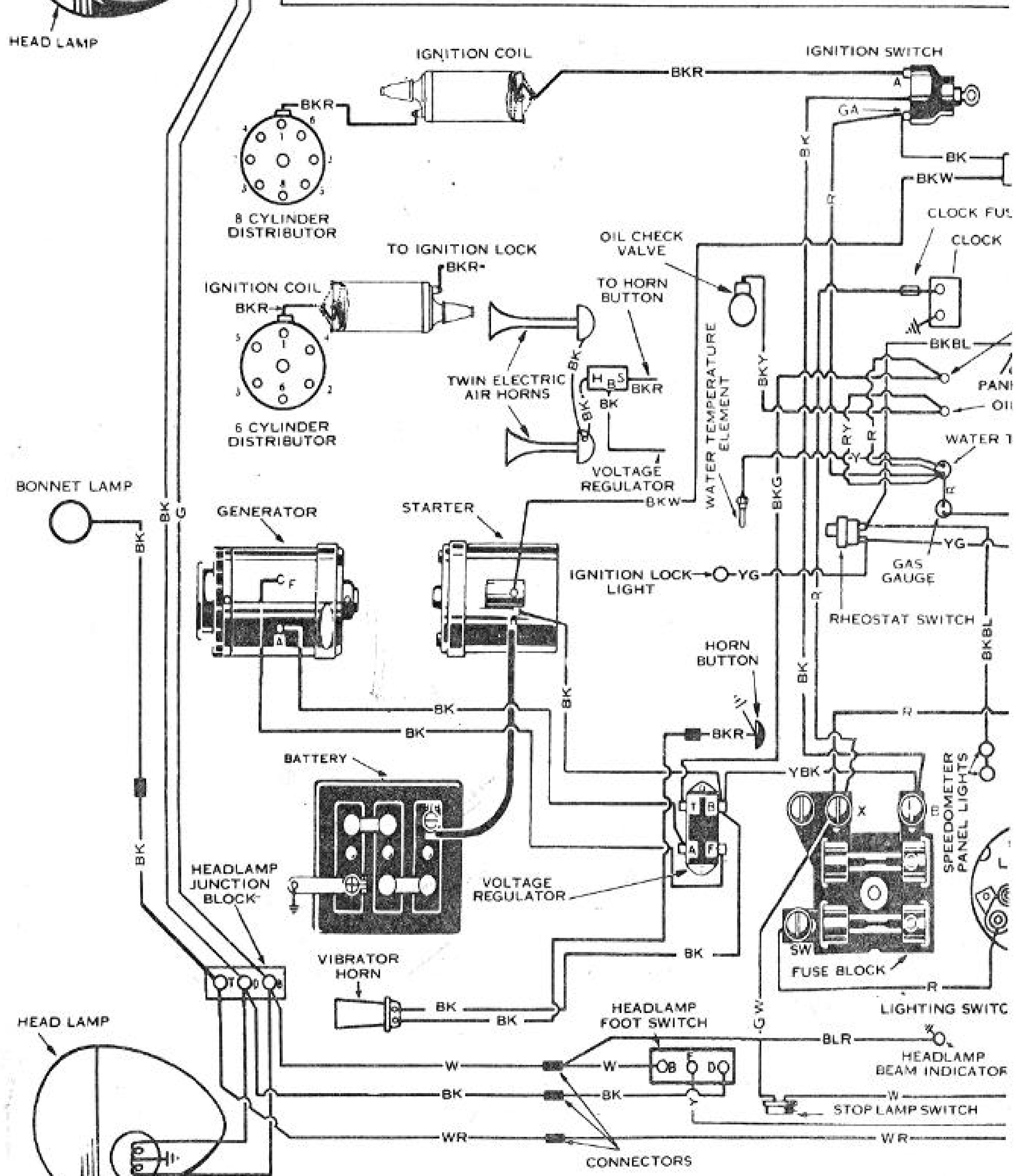
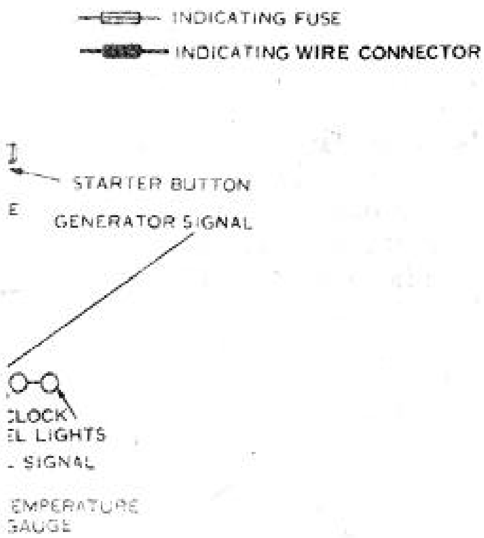


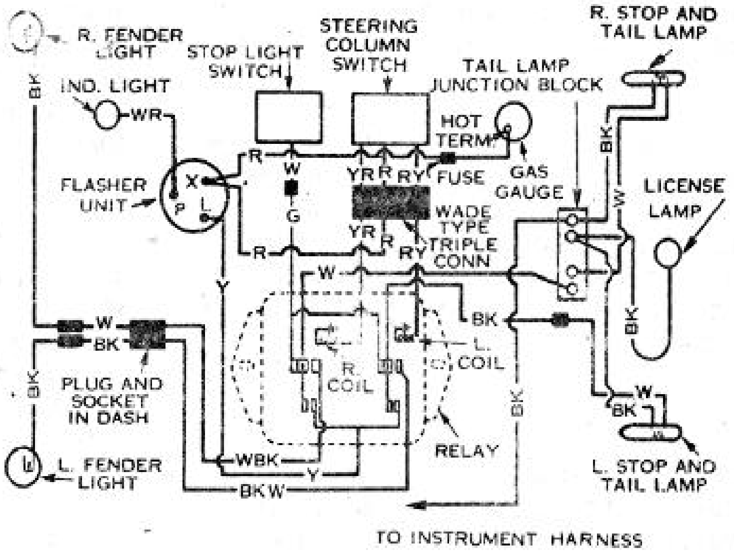
Figure 118 - Consolidated Wiring Diagram

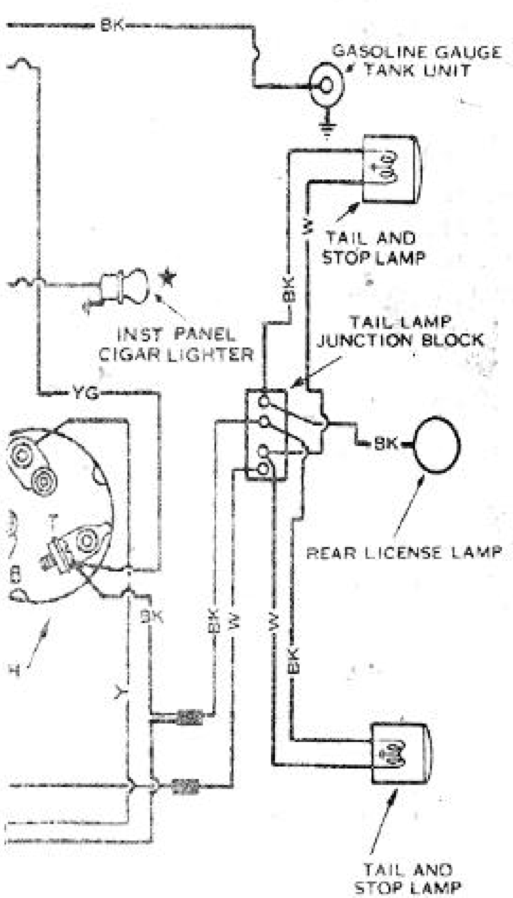
FUSE DATA

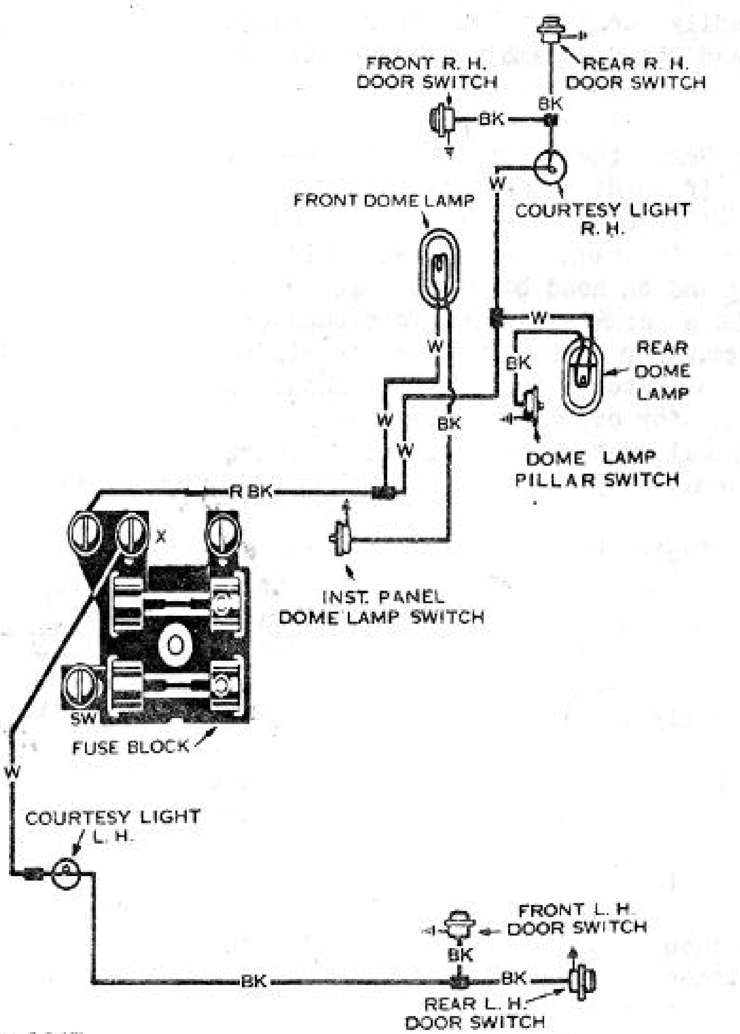
Circuit	No. Used	Capacity
LIGHTING	1	30 AMP.
ACCESSORY	1	30 AMP.
CLOCK	1	3 AMP.
DIRECTION INDICATOR	1	10 AMP.
WEATHERMASTER	1	14 AMP.
RADIO	1	20 AMP.



WIRING FOR DIRECTION INDICATOR







Pertaining to All 1942 Thru 1947

OVERHAUL, STANDARD GENERATORS

These are of the high rate, adjustable third brush type with voltage regulation.

A suction fan integral with the generator drive pulley provides adequate ventilation to prevent overheating. The path of cool air is through the openings in the rear end plate, over the armature and out through the openings in the front end plate.

Preliminary Tests

Before removing the generator for overhaul, it is advisable in many cases, to give it a preliminary visual and electrical check to prove or disprove the need for removal and overhaul.

The visual and electrical inspection is readily accomplished after removing the head band assembly and should include the following:

1. Smell the interior of the generator. If burning has recently occurred, there will be a distinct odor. Visually observe for signs of melted solder in casing and on head band and loss of solder where armature wires are connected to commutator bars. If solder is missing from commutator, the assembly should be removed for overhaul, even though the electrical test shows that unit is charging normally.

2. Check condition of brushes and brush springs. If brushes are worn to less than one-half of their original length or are oil soaked, they should be replaced. Length of a new brush is approximately 1/2 inch.

Each brush spring should require a minimum of 35 ounces to unseat the brush from commutator when a spring scale is attached to end of holder.

To insure satisfactory installation of brushes, the operation should be performed with the generator on the bench.

3. If the commutator is dirty or discolored, it should be cleaned by holding a piece of No. 00 sandpaper lightly against it with generator operating. If commutator is eccentric or burned, or if mica insulation and copper bars are nearly flush, the unit should be removed for correction.

4. To determine whether generator is charging, connect an ammeter in series with the voltage regulator as shown in Fig. 121, after disconnecting the "BAT" lead at the "B" terminal on regulator and grounding the "F" terminal on regulator with a jumper wire or screwdriver. If generator does not show charge on ammeter when engine is running at 1000 rpm, remove the "A" lead from regulator and flash it on ground. If no spark occurs, the generator is faulty or the "A" lead is broken. This latter test may be used to detect a non-charging generator when an ammeter is not available.

Disassembly and Bench Tests

After removing generator from engine, mount it in a vise, being careful not to distort generator frame by overtightening

Remove generator pulley, using the rear axle differential bearing puller J-2158 after removing the shaft nut. Remove head band, brush lead screws, two through bolts and the commutator end plate assembly.

Remove the drive end head with armature.

Use puller J-2158 to remove ball bearing from shaft.

Most of the electrical tests outlined in the following paragraphs may be performed with 110 volt test prods. One exception is the complete armature winding test which requires use of a growler such as 1010-909.

FIELD CONTINUITY. Place one test prod on each end of the field coil leads. If test lamp does not light, the coil circuit is open and should be corrected.

BRUSH LEAD CONTINUITY. Place test prods, one on the end of brush lead wire and the other on the positive terminal. If the test lamp lights, the wire is satisfactory. If the test lamp does not light, the wire is open circuited and should be replaced.

POSITIVE TERMINAL GROUND. Place one test prod on the positive terminal and the other on the generator frame. If the test lamp lights, the terminal insulation is broken down and should be replaced. If the lamp does not light, the insulation is satisfactory.

BRUSH GROUND. Place the test prod leads, one to ground and the other to the brush. If the test lamp lights, the brush holders are grounded and should be replaced. If test lamp does not light, the brush holders are satisfactory.

ARMATURE GROUND. Place the test prod leads, one to the armature core and the other to the commutator bars. If the test lamp lights, the armature is grounded and should be replaced. If the test lamp does not light, the armature is not grounded.

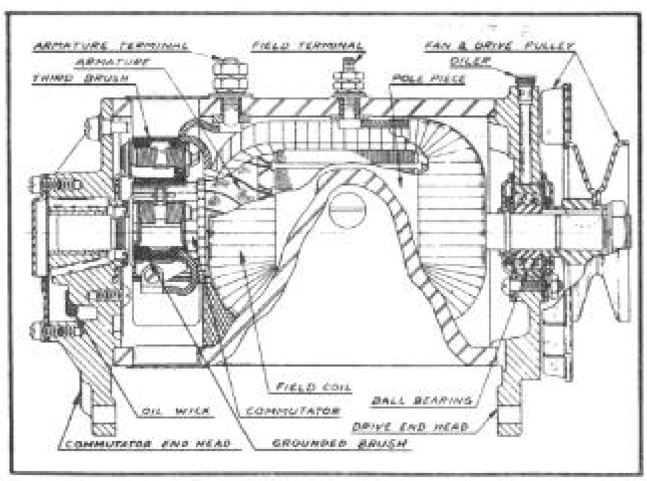


Figure 119
Standard Generators Are Third Brush Type
Auto-Lite Models GEC-4801A And GEC-4801A

ARMATURE SHORT. Place the armature on the growler and with a saw blade over the armature core and on the bars, rotate the armature and test. If the saw blade vibrates, the armature is short circuited.

In order to determine whether the armature winding or the commutator is shorted, clean out between the commutator bars and recheck the armature. If the saw blade still vibrates, the armature is short circuited and should be replaced.

Repair and Assembly

If the commutator is to be trued, it is advisable that armature be mounted on its own centers during the truing operation. When undercutting the commutator, be sure to undercut the mica squarely the full width of the slot and 1/32" deep.

When new brushes are installed, they should be carefully sanded in by drawing a strip of No. 00 sandpaper between the commutator and brush in the direction of armature rotation. Sand until a 75% bearing is obtained, then run generator under load on the brush until a 90% bearing is obtained. Generator output (third brush setting) should not be adjusted until after the brushes are thoroughly seated. Be sure, after sanding the brushes, to blow the sand and brush dust out of the generator.

The armature shaft ball bearing should be thoroughly cleaned and packed half full of high temperature grease before reassembly in the drive end head.

If the bushing in commutator end head has more than 0.004 diametral clearance on shaft, it should be renewed or a new end head with bushing installed.

Before reassembling the commutator end head, remove the oiler felt wick and soak same in light engine oil. Reinstall the wick being sure that it lays on the bottom of the oil pocket. Fill the pocket with light engine oil.

Reassemble the generator by reversing the disassembly procedure.

After assembling, the generator should be given a complete bench test before being installed on the car. While testing, set the third brush for the correct maximum output. See output specifications on page 111 for the generator that is being tested.

GENERATOR POLARITY. To prevent the generator polarity being reversed, the generator should be "flashed". Flashing is done by connecting a jumper wire to the starting motor battery terminal and tapping it several times against the "A" terminal of the generator.

To check the generator after flashing it, start the engine and speed it up. The generator charge indicator light should go out and stay out as long as the engine is running above idle speed. Turn off the ignition until the engine stops, then turn it on again. The generator charge indicator light should turn on, indicating that the circuit breaker points are not stuck.

SPECIAL GENERATORS

Special generators are available for use on Hudson cars that are used in Police, State Highway, Sheriff Departments, and some Special Taxicab use. These cars are driven in a different manner than are the standard automobiles.

Special generator requirements are divided into three classes:

SLOW DRIVING as is done with Prowl cars with radio receiving equipment only. Recommended is Auto-Lite shunt wound generator GEB-4802B-2 with Voltage Current Regulator VRP-4008D and HT 19 plate National Battery. This combination is designed to cut in at 6 mph and reaches its peak output of 35 amperes at about 15 mph, remaining constant throughout the higher speed range. This means that the generator is charging at low speeds or when idling and also that a constant maximum output is maintained at slow cruising speed.

NORMAL AND FAST DRIVING with radio receiving equipment only. This is the special generator ordinarily used because it meets most requirements of a special duty generator. Recommended is Auto-Lite shunt wound generator GEA-4803B with Current Voltage Regulator VRP-4008B and HT 19 plate National Battery.

This combination cuts in at approximately 9 mph and reaches its peak output of 35 amperes at 18 mph, remaining constant during the higher speed range. This means that the generator cuts in to start charging above the normal idling speed and the maximum output is reached at a slightly higher speed.

CARS WITH RADIO RECEIVING AND SENDING EQUIPMENT. Recommended is Auto-Lite shunt wound Generator GEG-4801A with Current Voltage Regulator VRP-4008A and HT 19 plate National Battery.

This combination cuts in at 9 mph and reaches its peak output of 40 amperes at 17 mph, remaining constant through the higher speed ranges. This means that this generator has sufficient output to assure the current requirements of cars equipped with radio receiving and sending equipment cruising at slow and high speeds.

Checking Special Generators

Current and voltage of these two brush shunt wound generators, is controlled by an external, sealed, 3 unit regulator, comprising a cut-out relay, a current control unit and a voltage control unit.

To check maximum output of shunt wound generators such as those listed above proceed as follows:

1. Temporarily ground the "F" terminal on voltage current regulator.

2. Disconnect battery lead from "BAT" terminal on regulator and connect Volts Ampere Tester KMO-330 or equivalent ammeter in series with wire and terminal. In other words, connect one ammeter lead to end of wire disconnected from regulator and the other ammeter lead to terminal on regulator.

3. Start engine and SLOWLY increase speed until ammeter reads 35 amperes for the GEA and GEB models or 40 amperes for the GEG model. These current values should be obtained at 1300 generator rpm for the GEB, 1550 rpm for the GEG and 1600 rpm for the GEA generators.

4. If foregoing current values are not obtained at the approximate speeds, the generator should be inspected for worn brushes, burned field coils or shorted armature.

CAUTION: Do not exceed the above speeds, as serious damage to the generator winding may result when the field is grounded as in this test. Never operate a shunt wound generator on open battery circuit, as such action may burn out the armature.

VOLTAGE REGULATOR

(Standard VRR-4001A Only)

The voltage regulator includes two individual units in the one housing. One of these is the circuit breaker which closes the circuit between the generator and battery when the generator is charging and opens the circuit when it is not charging. The other unit is the voltage regulator which holds the voltage of the system constant within very close limits.

The generator current is controlled by a conventional adjustable third brush.

The voltage regulator has a single winding which is connected directly across the generator brushes, see Fig. 120. When generator voltage reaches the value for which the regulator is set 7.1 to 7.4 volts at 70° F., the regulator armature vibrates, opening and closing the regulator contact points to hold the voltage down to the set value.

The circuit breaker points should close at 6.4 to 7.00 volts. Points should open between 2 to 6 amperes discharge.

A carbon resistor marked 30, with resistance of 28 to 32 ohms is attached to back of regulator.

Regulators that do not check or operate properly should be exchanged through an Authorized Electric Auto-Lite Service Station. DO NOT attempt to adjust the instrument. The cover is sealed and the seal should not be broken.

Current and Voltage Rate

If it is desired to translate any generator revolutions per minute into engine rpm, it can be done by dividing the generator rpm by 1.75 and the result will be engine rpm. To obtain the car miles per hour, divide the engine rpm by 50. These divisors apply to Hudson cars only and are computed by the Engineering Department from the ratio of the generator pulley to the crankshaft pulley.

THIRD BRUSH (AMPERES) SETTING

To check current output, disconnect "BAT" lead at "B" terminal on regulator, as in Fig. 121.

Connect positive ammeter lead to terminal of wire just disconnected - negative ammeter lead to "B" terminal on regulator as shown.

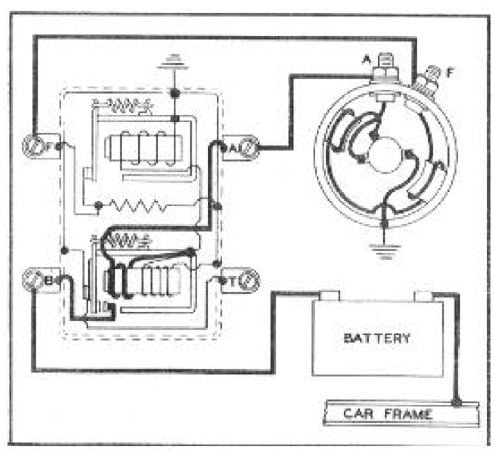


Figure 120
Wiring Voltage Regulator And Cutout Relay
Auto-Lite VRR-4001A Used On All Models

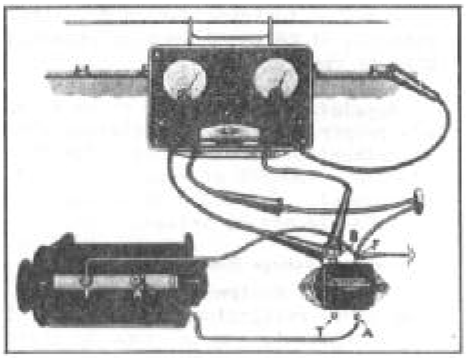


Figure 121
Checking Generator Charging Rate

Connect negative voltmeter lead to "B" terminal on regulator - positive voltmeter lead to ground on engine.

Connect jumper wire to "F" terminal on regulator and ground on engine.

Run engine at speed corresponding to 20 mph for 15 minutes to warm up.

With resistance turned "out" and engine running at speed corresponding to 35 mph, at 8 volts, amperage reading should be not less than 30 amperes on Models 20 and 28. On all other models amperage should be not less than 38. Adjust third brush in an anti-clockwise rotation to increase output.

REGULATOR VOLTAGE SETTING

Disconnect "BAT" lead at "B" terminal on voltage regulator, see Fig. 122.

Connect voltmeter and ammeter leads the same as described above for checking amperage, but omit jumper wire from regulator to ground as shown in Fig. 122.

Run engine at speed corresponding to 20 mph for 15 minutes to warm up.

Run engine at speed corresponding to 35 mph. Turn "in" resistance until ammeter reads 10 amperes.

With regulator at temperature of 70° F. the voltmeter reading must not be less than 7.1 volts or more than 7.4 volts.

If the reading is not within this range, the regulator should be replaced with a new or exchanged unit of the same type obtained from an Authorized Electric Auto-Lite Service Station. DO NOT ADJUST.

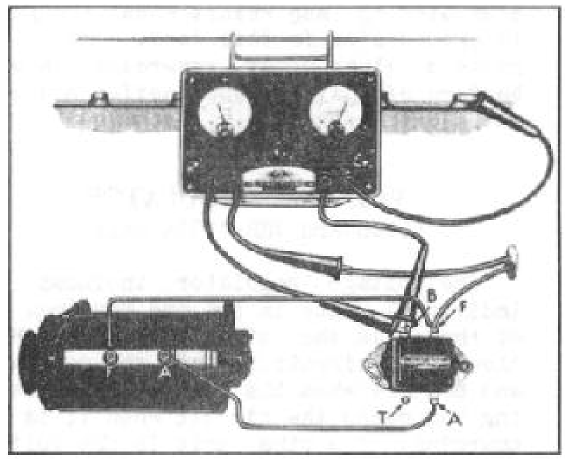


Figure 122
Checking Voltage Regulator Setting

STARTING MOTOR AND DRIVE

The starting motor and drive assembly is bolted to the front face of the flywheel housing on the left side of the engine. It is controlled on all models by the combination of a solenoid relay (magnetic) switch located on top of the starting motor case and an isolated control button located on the instrument panel.

The instrument panel control button will activate the starter motor only when the ignition switch is turned to the "on" position.

The end of the starting motor armature shaft is fitted with an inboard type Bendix drive engaging mechanism, as in Fig. 123, the pinion of which meshes with a steel ring gear mounted on the rim of the steel flywheel. The armature shaft is carried in an oil absorbent bronze bushing at each end. An external oiler is provided for each bushing.

Starting motor used on 6 cylinder models is a 4" diameter, 4 pole, 4 brush, model MZ-4092 Auto-Lite unit, shown in Fig. 123. The 8 cylinder engines are equipped with a larger 4-1/2" diameter, 4 pole, 4 brush, model MAB-4100 AutoLite unit of similar design.

NOTE: Removal of a small threaded cap at the rear end of the solenoid unit exposes a plunger end which can be pushed forward to crank the engine without pressing the instrument panel button.

Starter Overhaul

REMOVAL. To remove the starter assembly, disconnect all cables from the solenoid switch and remove the mounting stud nuts.

Tape the end of battery cable to prevent accidental shorting and a possible fire.

DISASSEMBLY. To disassemble starter motor, remove the solenoid switch, head band, Bendix drive unit, through bolts and drive end head. Remove the brushes from their holders and the commutator end head assembly with the armature.

STARTER OVERHAUL NOTES

1. If commutator is rough, it should be refaced in a lathe, mounted on its own journals. After turning, polish with No. 00, or finer, sandpaper.

2. To test brush holder for ground, Place one test prod on the end head, the other on the brush holder. If test lamp lights, the brush holder is grounded. If lamp does not light, the holder is electrically O.K.

3. BRUSHES. To replace the insulated brushes, unsolder the brush pigtail from the field coil and remove the brush. When inserting the pigtail of the new brushes, it will be necessary to open up the loop slightly in the field coil. Be sure the pigtail is Inserted the full depth of the loop, after which it should be clinched to hold the pigtail securely before resoldering. A good soldering job must be done to give full efficiency.

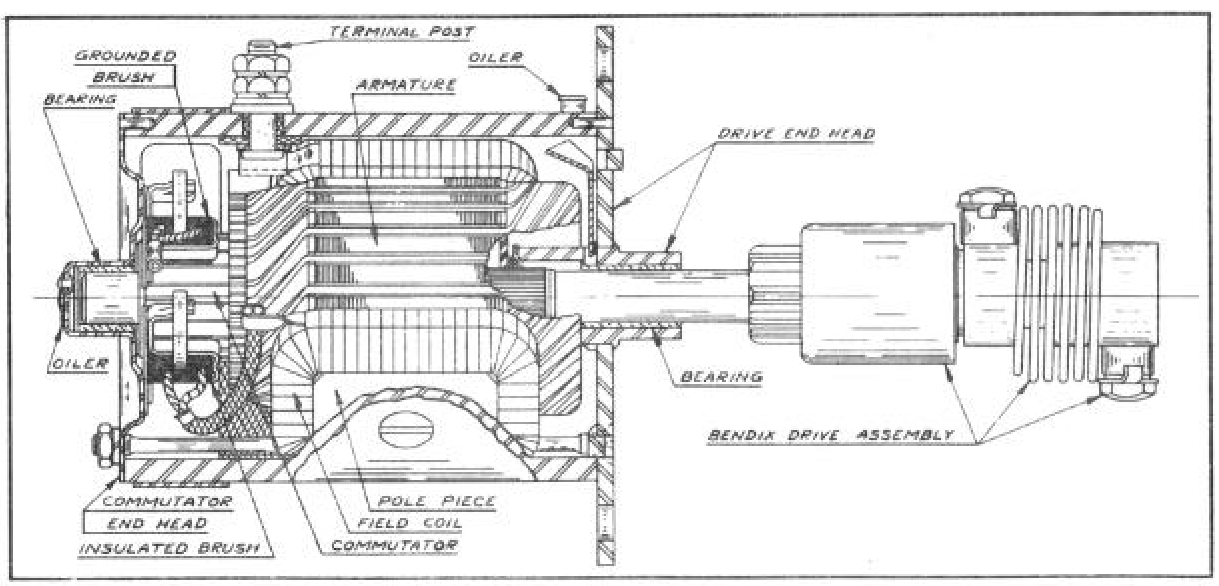


Figure 123
Model MZ-4092 Starter Used on Sixes. The MAB-4100 Used On Eights Is Similar But Larger

Starter armature shaft bushings should be replaced if clearance is greater than 0.005". Replacement bushings are of such dimensions that they require no final sizing after installation.

Armature end play should be not less than 0.005 and not more than 0.062".

Bendix Drive Unit

All parts of the drive mechanism except the drive spring are located within the pinion barrel, shown in Fig. 124.

The threaded sleeve is mounted loosely on an extension of the drive head and is retained by the.stop nut which is screwed and staked in place on the outer end of the head.

The pinion is integral with the barrel or drive sleeve and is mounted loosely on the starter shaft.

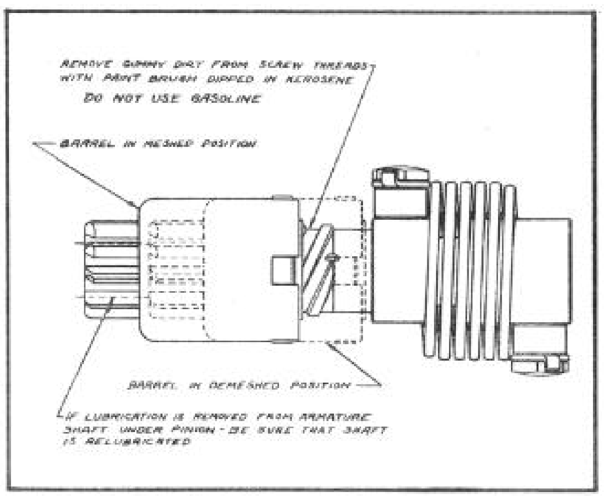


Figure 124
Maintenance Hints For Bendix Unit

The starter drive is through lugs on the control nut or driving ring on the screw shaft which engage slots in the end of the pinion barrel.

The pinion barrel is held in place on the control nut by a locking ring within the end of the barrel directly behind the driving lugs.

A coil type anti-drift spring is mounted on the threaded sleeve ahead of the control nut and a meshing spring is located within the head of the barrel ahead of the drive head stop nut.

The pinion, barrel, and control nut operate as a unit so that the pinion is moved out into mesh with the flywheel gear, as the control nut is threaded along the threaded sleeve. If the pinion teeth strike the ends of the flywheel teeth, the free longitudinal movement of the threaded sleeve on the drive head allows the pinion to turn slightly and mesh properly. This free movement is important to insure correct meshing and to prevent jamming and consequent damage to the flywheel teeth and pinion teeth.

FAILURE TO ENGAGE

1. In cases where the Bendix Drive fails to engage with the flywheel gear in cold weather, the reason is probably gum and dirt or frost on the screw threads of the Bendix drive.

Clean as follows:

a. Manually mesh the pinion with the flywheel ring gear, then use a paint brush dipped in KEROSENE and brush the screw threads with same. Rotate the pinion while brushing.

CAUTION: Use very little kerosene and do not use gasoline because it removes all lubrication.

b. Start the engine several times so as to work the kerosene into the gum on the screw threads.

c. Remove excess kerosene after cleaning by brushing with a dry brush or wiping with a clean cloth.

d. With pinion rotated to demeshed position, clean exposed portion of ARMATURE SHAFT with kerosene and then lubricate with SAE 10 engine oil.

Do not apply any lubricant to the screw threads.

2. If the pinion jams or does not mesh properly with the flywheel gear teeth, first clean the assembly as outlined in paragraph one above. If jamming continues, proceed as follows:

a. Look for a cocked or deformed drive spring. Such a spring will cause threaded sleeve to drag on armature shaft or on drive head extension.

b. Thread the pinion back on threaded sleeve to the demeshed (neutral) position. If the shaft is rough, smooth same with emery cloth and lubricate with SAE No. 10 oil.

c. Check for bent armature shaft and straighten or renew if bent.

d. Make sure that drive spring screw does not project through the sleeve and bind on drive head extension or armature shaft.

DISTRIBUTOR

IGW-4203A Used on Sixes

On 6 cylinder engines, the distributor is located aft of the cylinder block on a level with the cylinder head as shown in Fig. 125. The distributor drive includes a spiral gear integral with the camshaft and an intermediate shaft mounted in the support housing (S). Two absorbent bronze bushings in the support housing carry the intermediate shaft which is slotted at its upper end to receive the tongue end of the distributor shaft. The lower end of the shaft is provided with a spiral gear which meshes with similar type gear on the camshaft. To prevent incorrect installation, both the tongue on the distributor shaft Fig. 126 and the slot in the distributor drive shaft (intermediate element) are offset from the center.

The model IGW-4203A distributor is of the 6 lobe single breaker type with centrifugal and vacuum controlled automatic advance. Rotation is anti-clockwise viewed from the top. The 0.20 - 0.25 microfarad condenser is mounted on the outside of the distributor housing. Firing order of the engine is 1-5-3-6-2-4.

Approximately 12 distributor degrees of the automatic advance is provided by a centrifugal governor located under the breaker cup, as shown in Fig. 126. The vacuum element provides 7.5 distributor degrees of advance.

Vacuum chamber contains a spring loaded diaphragm shown in sectional view Fig. 126, which is connected to a graduated quadrant (H) Fig. 125 through arm (C). The diaphragm is actuated by intake manifold vacuum through a copper tube connected to a port in the carburetor body near the throttle valve.

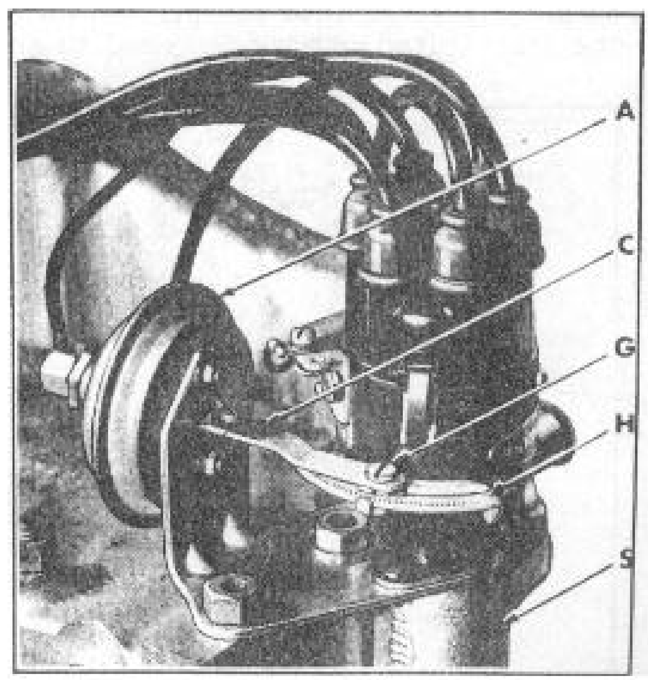


Figure 125
Distributor Mounting - 6 Cylinder Engine

Under level road operating conditions, when maximum manifold vacuum is available, the diaphragm is drawn forward against the diaphragm spring advancing the ignition timing to provide maximum fuel economy. As the engine is placed under wide-open throttle or heavy load operation and manifold vacuum drops, the diaphragm spring reacts against the diaphragm, retarding the ignition timing, thereby eliminating fuel detonation.

Since the additional advance produced by the vacuum unit would result in poor idling, the vacuum is taken from a position in the carburetor barrel which is ABOVE the throttle in idling position. The vacuum advance is thus turned off for best idling at closed throttle operation.

IGP-4008A, 40088 Used on Eights

On the 8 cylinder engines, the distributor is located on the right side between cylinders No. 4 and 5 at the level of the camshaft. The distributor is driven by a spiral gear integral with the camshaft which meshes with a similar type gear pinned to the end of the distributor shaft. Two absorbent bronze bushings pressed into the piloted end of the distributor housing are used to support the distributor shaft

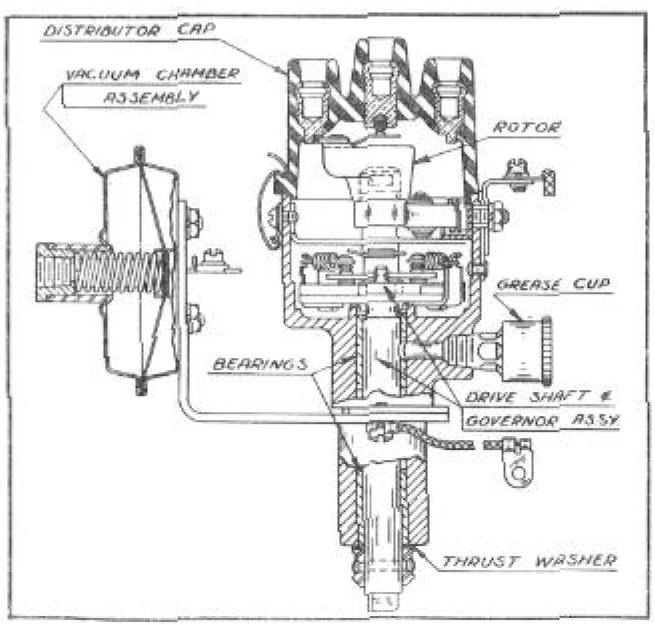


Figure 126
Distributor IGW-4203 Used On Sixes

and carry the driving loads.

The IGP-4008A distributor differs from the 4008B only in the governor details. They are interchangeable and have identical advance characteristics. Both are of the single breaker 8 lobe cam type. The full advance is provided by a centrifugal governor. Rotation is clockwise viewed from the top. The 0.20 - 0.25 microfarad condenser is located on the breaker plate as shown in Fig. 127. Engine firing order is 1-6-2-5-8-3-7-4.

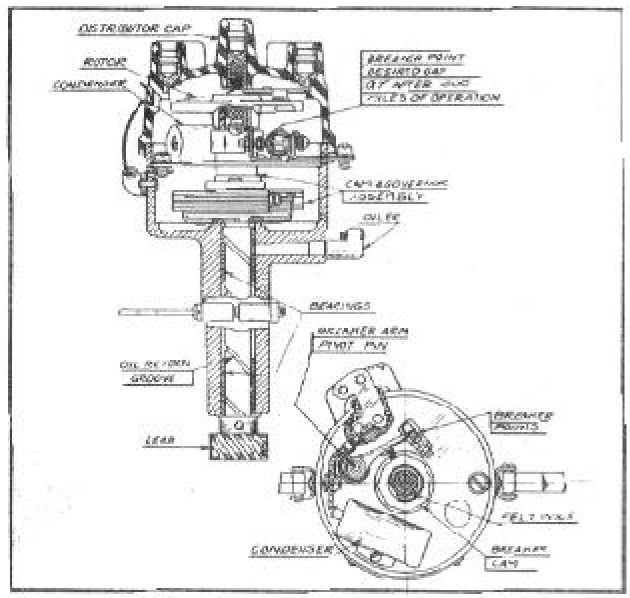


Figure 127
Distributor IGP-4008A And B Used. On Eights

Distributor Lubrication

IGW-4203A USED ON SIXES

These distributors which are used on the 6 cylinder engine are provided with a grease cup for lubrication of the shaft bushings. The cup should be screwed inward one turn every 1000 miles and be refilled with water pump grease at 5000 mile intervals.

At 2000 mile intervals, the cam lobes should be lightly coated with water pump grease and at the same time one drop of light engine oil should be applied to the contact arm pivot (F) Fig. 128 and 3 or 4 drops to the felt wick (E).

IGP-4008A AND 4008B

These distributors which are used on the 8 cylinder engines are provided with an oil cup for lubrication of the shaft bushings. This cup should receive a few drops of light engine oil at intervals of 2000 miles. At the same time, 3 or 4 drops of the same oil should be applied to the felt wick Fig. 127 and one drop to the contact arm pivot. Also apply a light coating of water pump grease to the cam lobes.

Maintenance and Overhaul

The distributor electrical tests, outlined in the Tune-up Section of this manual, should be a part of every major tune-up and should be included whenever the unit is removed for repairing. The following visual inspections and additional tests should also be applied.

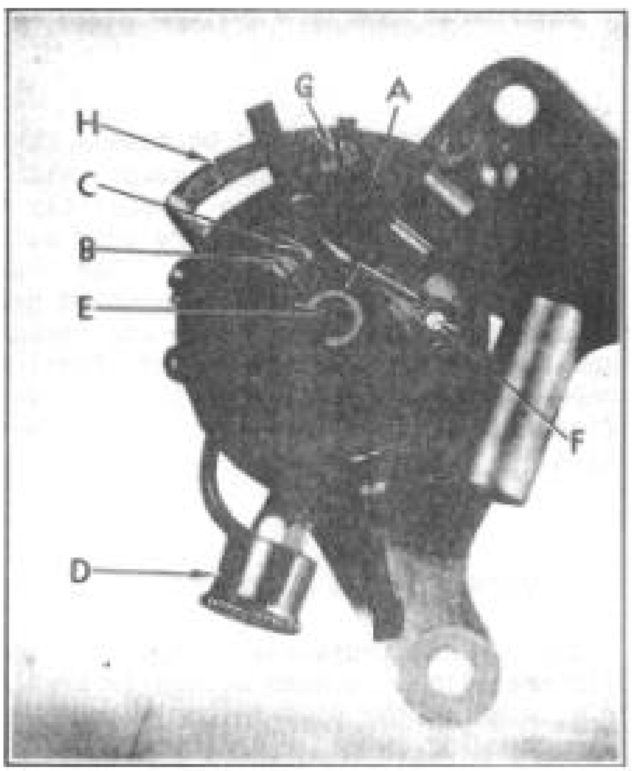


Figure 128
Distributor Used On 6 Cylinder Cars

DISTRIBUTOR CAP AND ROTOR

1. Check for cracks in the insulating material and burning of the metal parts of the rotor. Slight burning on the end of the metal strip is normal but if signs of burning are seen also on the top of the metal strip, it indicates too wide an air gap and the rotor should be replaced. Replace the rotor if even a slight crack is found in the non-metallic portion of the unit.

2. Check the distributor cap for corroded or badly burned high tension inserted segments. If segments are burned on both faces or excessively on either face, replace the cap. Do not file the segments. Any slight crack in the nonmetallic portion of the cap requires replacement of the cap.

CONDENSER

3. If breaker contacts are badly burned, be sure to test the condenser for leakage and capacity.

BREAKER CONTACTS

4. Breaker contacts should be cleaned with a brush or lintless cloth wetted with refined carbon tetrachloride. Remove any residue by pulling a clean dry strip of lintless cloth between the contacts.

5. Contacts showing a grayish color, that are slightly pitted and are set within 0.002" of recommended gap, need not be refaced, adjusted or replaced.

6. Deeply pitted or burned contacts should always be replaced. In an emergency when new contacts are not available, the original ones may be refaced on a suitable grinding wheel providing that at least 0.015" thickness of tungsten remains on each contact.

7. When replacing contacts, be sure that they are in register and alignment. Bend the stationary contact screw bracket to obtain alignment. Do not bend the breaker arm.

8. A wire type feeler gauge or dial indicator set up is considerably more accurate than a flat feeler blade for measuring the contact gap. To adjust contacts, first turn the distributor shaft until breaker arm rubbing block is on one of the 6 or 8 high points (lobes) of the cam. Loosen stationary contact lock nut (B) Fig. 129 and turn adjusting screw (C) until 0.017" gap is obtained on 8 cylinder model IGP-4008A or IGP-4008B distributors or 0.020" on 6 cylinder IGW-4203A distributors. After tightening the lock nut, recheck the gap and reset if necessary.

9. BREAKER ARM SPRING TENSION. Check the breaker arm spring tension especially on complaints of a high speed miss. If loading is less than the recommended limits, the contacts are likely to chatter at high speed and if too high, the breaker arm rubbing block or cam will wear prematurely.

Measure the spring tension by hooking a suitable spring scale on the breaker arm at the contact. While pulling at right angles to the contact surfaces, note the scale reading as the contacts separate. The recommended tension is 17 to 20 ounces. If test reading is not within 17 to 20 ounce limit, adjust by loosening the retaining screw and shifting the spring in or out until tension is correct. Recheck with the spring scale after tightening the screw.

CENTRIFUGAL GOVERNOR

10. In order to obtain the correct governor advance curve, care must be taken that the weight springs are not interchanged. When correctly installed, the heavier spring is mounted on the spring lug which has the flat auxiliary spring in back of it. Move governor from retard to full advance position manually. If normal, it should return automatically from the advance to the retard, position without any hesitancy. As the final operation, apply water pump grease to the pockets in the laminated governor

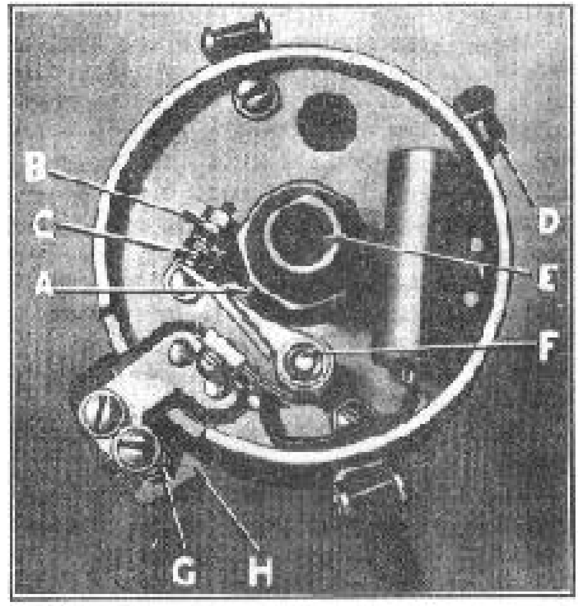


Figure 129
Distributor Used On 8 Cylinder Engines

11. No attempt should be made to check or adjust the governor except with a suitable testing fixture preferably of the oscillograph type. Where such suitable equipment is available, the centrifugal governor should be checked both up and down the speed range and checked against the advance curve specifications shown under "Distributor" in the specifications at the beginning of this section.

VACUUM UNIT - 6 CYLINDER ONLY

12. Unless a suitable distributor test fixture with a vacuum source is available, work on the distributor vacuum unit of the IGW-4203A distributor must be limited to visual inspection and replacement of faulty components. Do not stretch the diaphragm spring or remove or install spacer washers except when a fixture test indicates the need for a change. If a vacuum test shows a leaky diaphragm, replace the vacuum chamber assembly.

DISTRIBUTOR SHAFT BUSHINGS

13. In the case of a complete inspection or overhaul, the distributor shaft will be removed from the base. If the diametral clearance between the shaft and bushings is greater than 0.005", new. bushings or a new base and bushings assembly should be installed. If the shaft is worn more than 0.002", it should be replaced.

14. Bushings are of the absorbent bronze type and should be installed using a suitable pilot to prevent too much reduction of bore diameter. Bushings do not require sizing before or after installation. After the gear or collar is pinned to the distributor shaft, check the end play which should be not less than 0,003" and not more than 0.010". End play can be increased by face lapping the thrust washer collar or gear.

15. When a distributor is serviced and the base and bushings have been washed clean of lubricant, they should be thoroughly oiled before reassembly. If possible, the bushings should be immersed in oil for at least 15 minutes before installing the shaft.

IGNITION TIMING

For complete ignition timing instructions, refer to page 18 of Tune-Up Section.

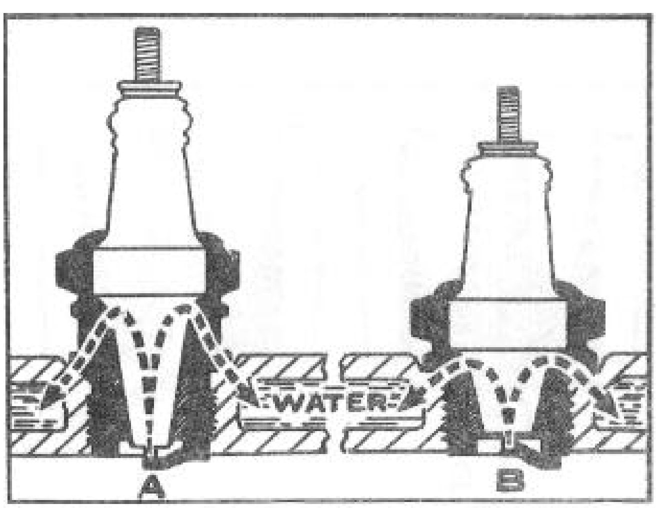


Figure 130
The Longer Heat Transfer Path Of Type ft
Makes It A Hotter Plug Than Plug B

SPARK PLUGS

There are two definite requirements of a spark plug. The first is the ability to warm up fast. Cold plugs have a tendency to collect and condense the fuel mixture and it is during this warming up period that spark plugs usually become fouled. A hot plug vaporizes even a cold mixture and prevents condensation and consequent fouling.

The second requirement of a spark plug is its ability to throw off or dissipate heat at operating temperatures so that it will not cause pre-ignition. It is difficult to increase either one of these qualities without decreasing the other. The range between the two conditions is called the heat range of the plug.

Classification of a plug according to heat range is according to its ability to transfer heat from the tip of the insulator to the engine coolant and this factor is controlled principally by the shape of the cylinder end of the insulator and the distance from its tip to the inside gasket.

Plug "A" in Fig. 130 is a hotter plug than "B" because of the farther distance the heat travels to the water. Spark plugs are chosen for car production to meet the average operating conditions and in cases when most of the driving is fast driving or slow driving, the spark plugs should be changed to meet this new condition. Although the design is unchanged, the recommended models of Champion plugs have been re-designated as listed below.

	Champion Designation	
	New	Old
Standard production plug	J7	J9
Cooler plug for use when mostly HIGH SPEED driving is done.	J6	J10 Comm.
Hotter plug for use when mostly SLOW DRIVING is done, especially in cold weather with short runs and frequent stops	J11	J5

The spark plugs used with the cast iron cylinder head have a length of 3/8" from the gasket seat to the lower end of the shell. Do not use plugs with a longer thread length as the bottom of the shell will project into the combustion chamber and present a hot spot that might cause pre-ignition. Excessive idling or low speed driving, especially in cold weather, causes fouling and the use of a hotter plug will lessen this fouling.

Dead white color or scaling of the insulator at the center electrode tip,, indicates that the plug is running too hot. This may be due to wrong model of plug or to the correct model plug being loose in the cylinder head or the insulator loose in the shell causing gas leakage which will greatly increase the insulator temperature.

To determine whether a plug is too hot, try it out by driving the car fast and then immediately checking its condition. If the dead white color or scaling is present then it is certain that the plug is running too hot and should be replaced with a colder plug. Do not check a plug suspected of being a too hot type after the car has been driven very far at low or moderate speeds, as the plug is very apt to show a healthy light brown color instead of the dead white color or scaling condition.

Glossy black deposit on the porcelain indicates an excessive amount of oil in the combustion chamber.

Dull black deposit indicates a rich fuel mixture, weak ignition, improper plug gaps, or weak compression.

Spark plug gaps must be properly maintained or poor fuel economy and rough engine performance will result. A wire type feeler should be used as shown in "D", Fig. 131, and not a flat feeler gauge as shown in "C". It can readily be seen from the two views that the flat gauge is inaccurate except on comparatively new plugs, as it gives a lower than-actual gap reading.

IGNITION COIL

Amperage Draw	
Engine Stopped	4.5 Amps.
Engine Idling	2.5 Amps.
Auto-Lite Coils Used Are:	
Model, 6 Cylinder	IG-4098
Model, 8 Cylinder	CE-4029

Procedure for testing ignition coils is outlined in Test 12 of Tune-up Section in this manual.

IGNITION SWITCH AND LOCK

Lock Cylinder Replacement

The combination ignition switch and ignition lock is placed in the primary circuit as shown on the wiring diagram Fig.118. The lock cylinder is installed on the instrument panel and is held in the switch case (on the end of the ignition coil cable) by a wire retaining ring. To remove the cylinder proceed as follows:

1. Loosen the bolts holding the assembly to the instrument panel. Insert key and turn to extreme right or "on" position.

2. Insert a pointed tool or a 3/64" diameter wire (a paper clip may be used) into the radial hole in the side of the lock housing. This hole faces slightly to one side when switch is installed.

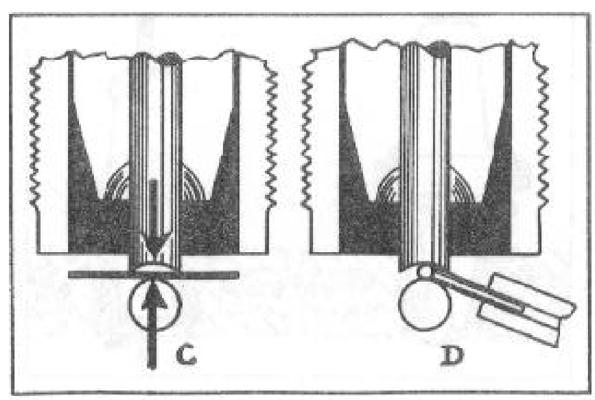


Figure 131
Use Wire Feeler D To Measure Plug Gap

3. Press in on the wire, Fig. 132, hard enough to depress the retainer and while pressing on wire, rotate key to left or "off" position which will release the lock cylinder from the lock body.

1. When reinstalling the cylinder, place key in "on" position, then turn to "off" position.

REPLACEMENT OF SWITCH. To replace the ignition switch:

1. Remove the ignition switch by taking off the two mounting bolts fastening it to the instrument panel ledge and disconnecting all leads.

2. Remove ignition coil and switch cable as a unit from the dash.

3. Remove the stakings on the lock case retaining cover and pull the cover and entire rotor and switch base assembly out of the case.

4. Replace the rotor and switch base as a unit. See that the prong on the lock cylinder enters the slot in the face of the adapter on the forward end of the rotor and switch base assembly and that the ridge in the lock case registers with the slot on the side of the switch base. Push assembly into the lock case, replace the cover and stake same securely.

Blank Locking Cylinders

Blank lock cylinders that have not had the tumblers cut to match a certain key (uncoded) are available from the factory Parts Department. See "Blank Lock Cylinders For Coding," Body Section.

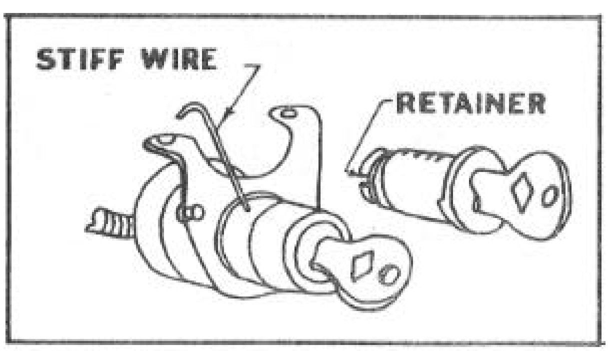


Figure 132
Removing Ignition Lock Cylinder

Starter and Lighting Panel Switches

The starter button or panel switch has only an "off" and "on" open position. The lighting switch has two "on" positions, the first of which turns on the instrument panel, bonnet, tail and fender (if used) lights. The second "on" position of the button adds the headlights to those already turned on in the first position.

These switches are of the swinging push button type. The buttons are held in place by a steel wire hinge pin (B) Fig. 133, that is swedged after installation. The button bracket is held to the switch by a 3/8" - 24 nut (C) on the end of the switch push plunger. The button bracket is held to the instrument panel by two bolts.

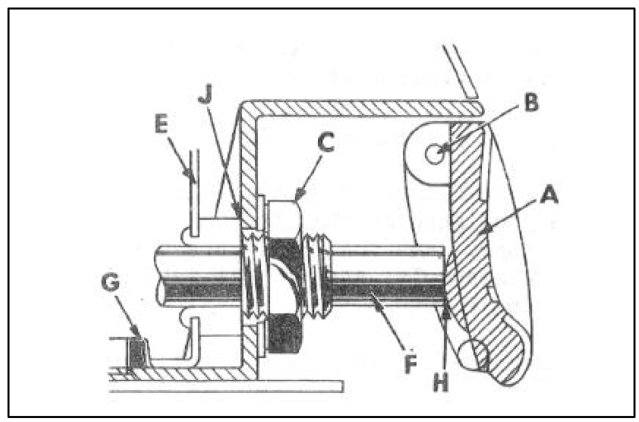


Figure 133
Panel Mounted Starter And Lighting Switch

A. Push button
B. Push button pin
C. Push rod to bracket nut
E. Switch electric contacting unit
F. Switch push rod

To replace a button (A), clip or file off the swedged end of the button pin (B) and push the pin out.

To avoid repeated breakage of switch button, make sure that end play of 0.015" to 0.020a exists at (H) when button is released. Obtain clearance by filing end of plunger (F) or installing shim washer at (J).

STOP LIGHT SWITCH

The switch has two snap terminal connections.

The plunger travels 3/32" from the normal "on" to the "off" position. Check the spring condition occasionally to see that it is returning the plunger to the "off" position.

Terminal contact surfaces are silver plated which gives a clean contact indefinitely free from the corrosion which causes many of the difficulties in electrical systems.

Voltage drop across the stop light switch terminals should not exceed 50 my at 10 ampere load.

NOTE: When replacing a stop light switch, use a HUDSON switch with silver plated terminal contacts.

HEADLAMPS

The headlamps are the "Sealed Beam" type, designed so that the bulb, reflector, lens, and the gasket are assembled in one securely sealed unit making them dust and moisture free.

When the filament burns out, or the lens break, the entire unit is discarded and a new one installed, thereby assuring maximum lighting efficiency through the life of the car.

The Sealed Beam reflector unit (A) Fig. 135 is held to a sub-body (B) by the retainer (C) and three screws. The sub-body (B) forms a ball and socket joint with the lamp housing (D) and is held to the housing by four coil springs (E) plus the vertical adjustment screw (F) and the horizontal adjustment screw (G).

The three locating lugs (H) are located so that the reflector unit can be mounted in only one position.

The Sealed Beam unit is interchangeable right and left.

Replacing Sealed Beam Unit

1. Remove headlamp lens rim by taking out the three screws.

2. Loosen, but do not remove, the three screws (C), Fig. 134, holding the retainer. Do not disturb the aiming screws (F) and (G) at the top and left side of the unit.

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

4. Remove the reflector plug from the unit as shown in Fig. 136.

5. Install new unit by reversing above operations.

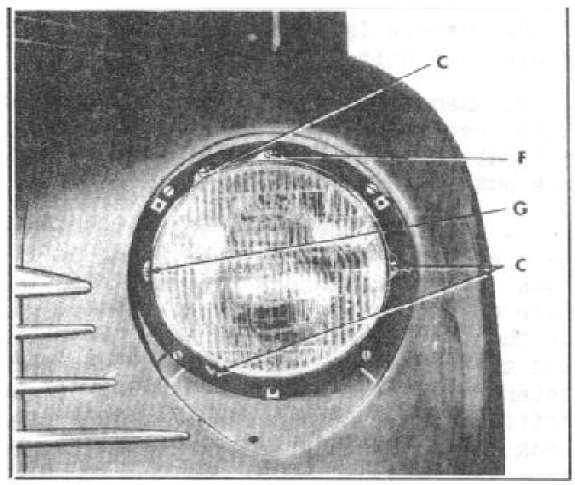


Figure 134
View Sealed Beam Headlamp With Lens Rim Removed. Top Screw "F" Controls Vertical Aiming. Side Screw "G" Controls Horizontal Aiming

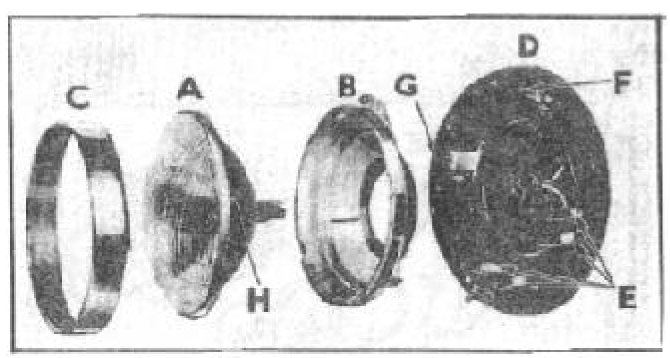


Figure 135
Components of Headlamp Assembly "F" And "G" Are Aiming Screws

Headlamp Aiming

Place the car on a level surface with a light colored vertical screen 25 feet ahead of headlamp lens.

Draw a horizontal line on this surface at the level of a point 3" below the headlamp center, as shown in Fig. 137. This line is 26-3/4" above the floor line. If, however, your state requires a loading allowance, draw this horizontal line below the above line by whatever amount that is required in your state.

Locate center of car by sighting through the center of the rear window along the right and then along left of windshield center bar and mark these two points on the horizontal line. The point midway between these two lines in the center of the car which should be temporarily located on the screen.

Draw vertical lines (B-B) and (C-C), Fig. 137, on the screen to the right and left of the center line at a distance equal to one-half of the center to center distance (28 inches) between the two lamps.

Place lighting switch in position which produces highway (upper) beam on screen.

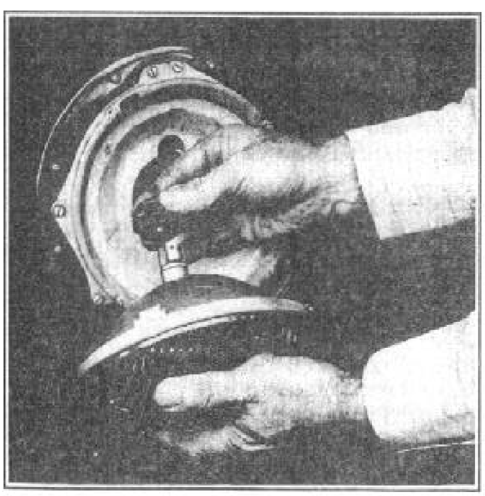


Figure 136
Replacement Sealed Beam Unit

Remove headlamp lens rim.

Move the light beam to the right or left by turning the horizontal adjustment screw (G) Fig. 135. Raise or lower the beam by turning the vertical adjustment screw (F) Fig. 134.

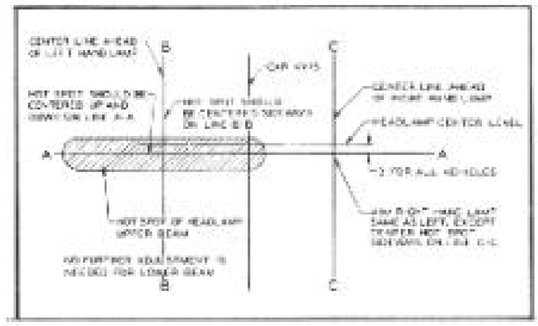


Figure 137
Wall Screen For Aiming Headlamps

Cover one lamp to obscure the beam of light and then adjust the beam from the other lamp so that the center of the zone of highest intensity falls on the intersection of the horizontal line (A-A), Fig. 137, 3" below the headlamp center and the vertical line directly ahead of the lamp.

Repeat the operation for the other lamp. No further adjustment is needed for the traffic (lower) beam.

DIRECTION INDICATOR

The direction indicator switch is operated by a lever located on the steering column and this lever is turned manually in the same direction that the steering wheel is to be turned (up for left or down for right turn). The switch turns off automatically as the turn is being made. If the lever is turned to signal for one direction but the turn is made in the opposite, the switch will be turned off automatically as the turn is made.

A pilot light on the left end of the instrument panel flashes to indicate that the direction indicator is working and if the pilot light does not flash after the lever has been set for a turn, see if either the fender lamp or stop lamp or pilot bulb is burned out. The flasher switch interrupts the circuit giving an intermittent flashing until the trip pin engages the trigger in the direction indicator switch. The flashing operation takes place only with the ignition switch on.

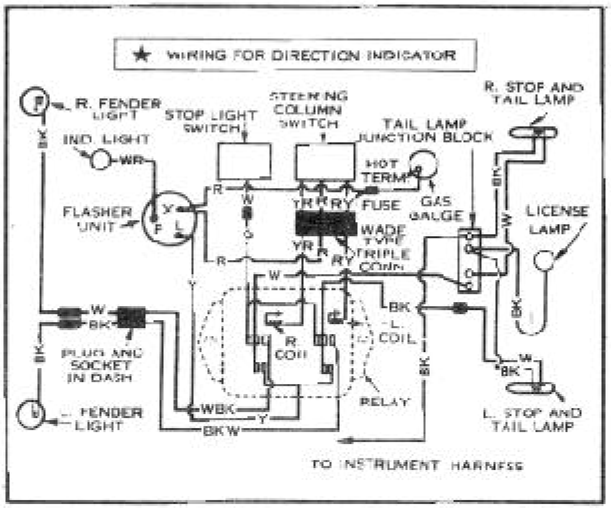


Figure 138
Wiring For Direction Indicator

FUSES AND BREAKERS

The fuses protecting the lighting and the accessory circuits are located in a fuse block attached to the lower edge of the instrument panel between the ignition lock and the steering column bracket.

The lower fuse in the fuse block protects the lighting circuit and the upper fuse protects the accessory circuit. These two fuses are of 30 ampere capacity and have silver plated caps. The fuse clips of the fuse block are also silver plated.

On cars equipped with Drive Master, this equipment is protected by a circuit breaker rated at 8 amperes.

Silver maintains a clean contact indefinitely and the use of silver plated fuses will maintain light efficiency and accessory lire. Corrosion at this point which adversely affects lighting efficiency is greatly reduced.

Replacement silver plated fuses should always be used and are available through the Hudson Factory Parts Department.

A list of the fuses used for regular and special electrical equipment is tabulated below.

Circuit	Fuse
Lighting	30 Amp.
Accessory	30 Amp.
Clock	3 Amp.
Direction Indicator	10 Amp.
Weathermaster Heater	14 Amp.
Recirculating Heater	14 Amp.
Radio	20 Amp.

GENERATOR CHARGING INDICATOR

This is a telltale device mounted on the instrument panel to indicate to the driver when the generator is charging the battery. The telltale element is a panel mounted red window behind which is mounted a small 6 volt lamp bulb. The bulb lights whenever the ignition is turned on and generator is not charging. The lamp bulb is connected to the GA terminal on the ignition switch.

When the ignition switch is turned on the circuit is completed from the ignition switch, through the bulb, to the "T" terminal of the voltage regulator, Fig. 139, to the insulated contact points (A), to the grounded strap (B) of the cut-out relay. As the engine is started and generator speed is increased to a car speed of approximately 10 miles per hour, the generator develops sufficient voltage to pull down the cut-out armature (C), closing the main contact points (D), opening the insulated points (A) causing the light to go out.

If the lamp bulb does not light when ignition is turned on, ground the "T" terminal to the engine (not to "B" terminal). If the bulb still does not light, check for burned out bulb or loose connections. If the lamp lights when the "T" terminal is grounded, it is an indication that the main contact points (D) are closed due to fusing, or the armature spring (E) is weak or broken.

In this event the regulator should be replaced with a new or exchanged unit secured from an Authorized Electric Auto-Lite Service Station. The case is sealed. DO NOT BREAK SEAL.

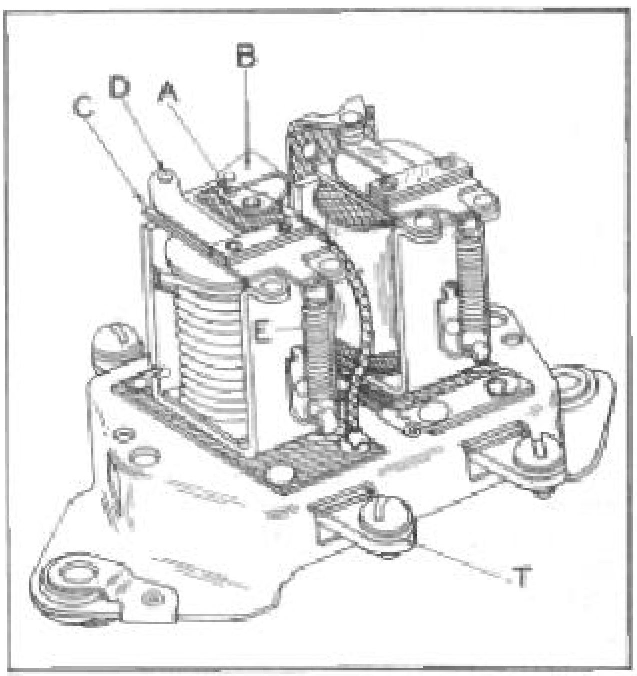


Figure 139
Voltage Regulator With Cover Removed

HORNS

Single Type

On the single unit vibrator type horn, a slotted screw and lock nut will be found in the exact center of the cover, where the tone adjusting screw is ordinarily placed. This screw is used to control the air gap in manufacture and should never be disturbed when making horn adjustments.

For the purpose of adjusting the tone, a separate round head screw equipped with a lock nut as in Fig. 140, or a fillister head self-locking screw, is provided. The adjusting screw is locatedat some distance from the center, near the outer row of six cover screws.

ADJUSTMENT

Before attempting an adjustment to improve an unsatisfactory tone, however, the following items should be checked:

1. Poor electrical connections.
(a) Examine the connections at horn and wires to make sure they are clean and tight.
(b) Check contacts in horn button. They should be bright and clean.

2. Loose particles, dust or water in projector.
(a) Clean drain hole in bottom of front cover.

3. Loose bracket screws.
(a) Tighten bracket screws solidly both at dash and horn mechanism.

4. If none of these conditions are responsible and correction must be made by adjustment, proceed as follows:

(a) With engine running at a speed just sufficient to keep relay points closed, turn the adjusting screw clockwise or anti-clockwise, 1/8 turn at a time until best tone is obtained.

(b) Check adjustment with engine running at a speed corresponding to a car speed of 30 mph with all lights off and again with the engine shut off and all lights on.

If adjusting screw is provided with a lock nut, tighten same making sure that adjusting screw does not turn during the tightening process.

DO NOT DISTURB ANY OTHER SCREWS OR POINTS OF ADJUSTMENT.

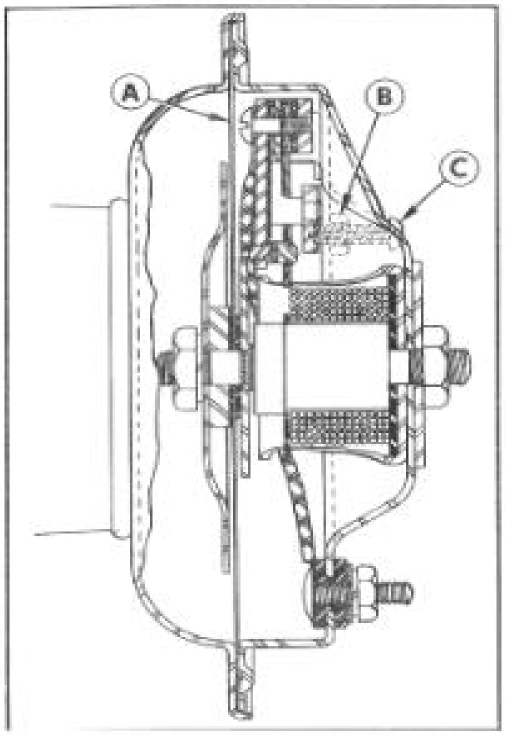


Figure 140
Single Horn. Note Tone Adjusting Screw "C". Do Not Disturb Center Screw.

Twin Horns

The twin electric air horns are standard on all passenger car models. *The shorter horn is the high pitch and the longer the low pitch.*

The power is derived from a magnetic type motor consisting of a field, armature, coil and a set of breaker contacts which interrupt the flow of current in the coil. The armature is attached rigidly to the diaphragm and the interruption of the current in the coil causes the diaphragm to vibrate.

The horns are in pairs constructed in such a manner as to produce two frequencies or tones and these frequencies are of the proper interval so as to produce a harmonious tone when the two horns sound together.

The high pitched horn has a diaphragm 0.0195" thick and a short air column. The low pitched horn has a diaphragm 0.015" thick and a long air column.

ADJUSTMENT

Before making an adjustment to correct an unsatisfactory tone, check all electrical connections including the horn button contacts and make sure that bracket screws are tight.

Adjustment is by means of an adjusting nut under the motor cover. It is advisable to have only one horn operating when adjustment is being made. Remove the wire between the horn not being adjusted and the horn relay, at the terminal on the relay. Proceed in this manner with each horn and after each horn has been tested, connect both to the relay and sound them together:

1. Remove the motor cover (J) by prying it off with a screwdriver, Fig, 141. With the engine speeded up to give the maximum charging rate, move the adjusting nut (H) up or down until the desired tone is obtained. Lock adjusting nut by tightening the lock nut.

2. If satisfactory results are not obtained after the above adjustment, check the air gap between the field (A) and the armature (B) with a feeler gauge. This should be 0.025" to 0.027" on the high pitch horn and 0.029" to 0.031" on the low pitch horn.

(a) The armature is threaded on a diaphragm stud (C) which is attached to the diaphragm (D). The armature can be locked in any position desired, by lock nut (E). Therefore, to set the air gap between the field (A) and the armature (B) loosen the lock nut (E) and turn the armature (B) in a clockwise direction to decrease the air gap and anticlockwise to increase the air gap.

(b) Tighten the lock nut (B) securely before and after checking the air gap.

(c) The armature should be approximately parallel with the field. If it is out of parallel this can be corrected with a hammer and punch. Tap the armature down on the open side.

3. After the air gap has been properly adjusted, it will be necessary to readjust the adjusting nut (H) to obtain the maximum volume and the best tone.

NOTE: If the projector assembly is removed, the gasket between the diaphragm and the projector assembly must be in good condition as any air leak whatsoever in the air column reduces the volume and tone quality of the horn.

The short projector is used with the thick diaphragm on the high horn and the long projector with the thin diaphragm on the low horn.

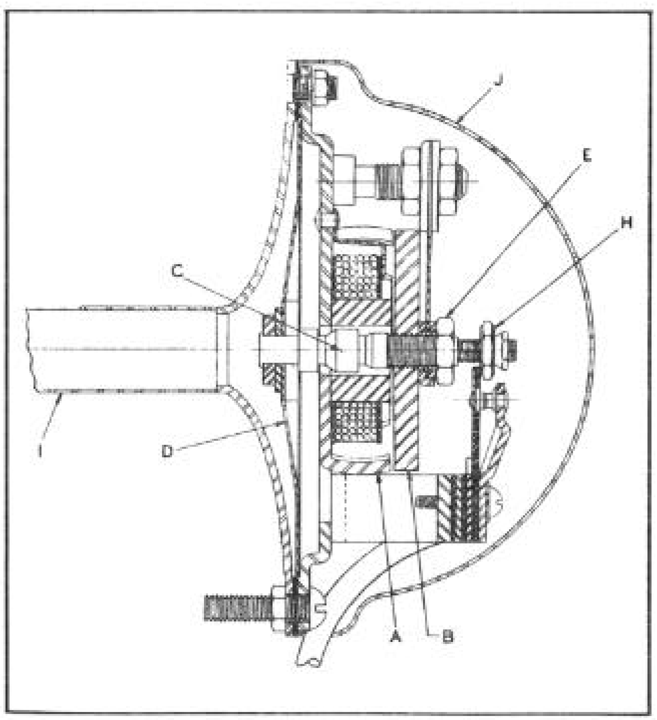


Figure 141
One Of The Twin Electric Horns
Showing Minor Adjustment Nut "H",
Air Gap Lock "E".

Horn Relay

A horn relay mounted on the dash is used with the twin electric air horns.

The coil resistance is 7.3 - 8.9 ohms at 700 F.

The contact points must close positively with a minimum of 3 volts and a maximum of 4 volts and open with not less than 2 volts across the coil with the relay in an upright position which is with the terminals down.

LAMP BULBS AND LENSES

Bulb specifications and methods of replacement are covered in the following paragraphs:

Fender Lamp

Replacement of a lens or bulb is accomplished by removing the single external Phillips head screw from the lamp body. On cars equipped with turn indicator, the bulbs are Mazda No. 1158 with a double contact filament of 3 and 21 candlepower. On cars without turn indicator the bulbs are single contact Mazda No. 63 of 3 candlepower.

Tail and Stop Lamp

Raise trunk compartment lid and remove bulb from lamp socket. Bulb on passenger cars is a Mazda No. 1154 with a double filament of 3 and 21 candlepower, while commercial cars are equipped with a Mazda No. 1158 of similar candlepower. Remove screws to replace lens.

License Plate Lamp

Raise trunk compartment lid, then remove bulb and socket assembly by pulling straight out. Bulb is a Mazda No. 63 single contact of 3 candlepower.

Bonnet Lamps

On front or side bonnet lamp, remove bulb by pulling bulb and socket assembly straight out. Bonnet lamp bulbs are Mazda No. 55 of 2 candlepower.

Courtesy and Dome Lamps

Courtesy lamps are set into the bottom of body door pillar posts. Replace bulb by removing both lenses which makes socket accessible. Bulb is either a Mazda No. 88 double contact of 15 candlepower or on later production, a Mazda No. 87 single contact.

Oil and Generator Telltale

Open glove compartment door. Withdraw bulb and socket assembly by first pushing in and rotating assembly about 1/5 of a turn then pulling straight out. Bulbs are Mazda No. 51, of one candlepower.

Ignition Lock

To replace bulb, reach in behind instrument panel and pull bulb and socket assembly straight out. Bulb is Mazda No. 55 of 2 candlepower.

Temperature Gauge

Replace bulb by reaching behind instrument panel and pulling bulb and socket assembly straight out. Bulb is a Mazda No. 55 of 2 candlepower, if car is equipped with instrument light rheostat. On cars without rheostat, use the one candlepower Mazda No. 51.

Fuel Gauge Bulb

Replace bulb by reaching behind instrument panel and pulling bulb and socket assembly straight out On cars with instrument light rheostat, use a 2 candle power Mazda No. 55. On cars without rheostat, install the one candlepower Mazda No. 51.

Speedometer

Replace bulb by reaching behind instrument panel and pulling bulb and socket assembly straight out. On cars with instrument light rheostat, use a 2 candlepower Mazda No. 55. On cars without rheostat, install the one candlepower Mazda No. 51.

Headlight Beam Indicator

Replace this Mazda No. 51 bulb by reaching behind instrument panel and pulling bulb and socket assembly straight out.

Direction Indicator Telltale

Replace this Mazda No. 51 bulb by reaching behind instrument panel and pulling bulb and socket assembly straight out.

Dome Lamps

To replace the bulb used in front and rear dome lamps, first remove lens and rim assembly by pulling downward and forward or backward. Remove bulb from socket. Lens and rim assembly is held to lamp body by convex dimples on rim extension engaging concave depressions in lamp body. Bulb is either a Mazda No. 88 double contact type of 15 candlepower or on later production a Mazda No. 87 single contact type.

Clock Panel Bulb

This Mazda No. 55 is replaced by first pushing in and rotating bulb and socket assembly about 1/5 turn then pulling straight out.

REFERENCES

Source of Information	Date	Subject

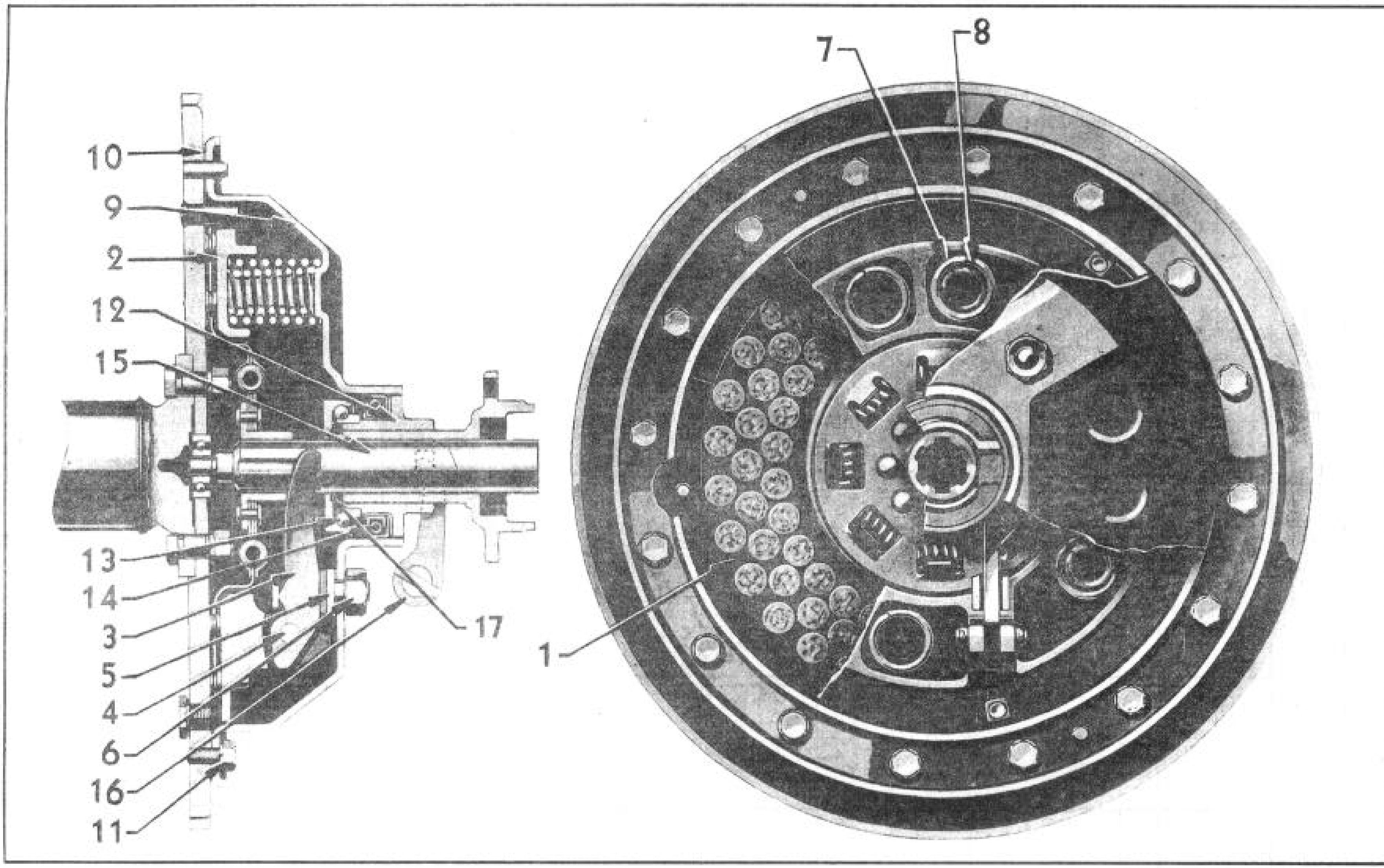


Figure 142 - Clutch Assembly

1. Clutch driving plate assembly
2. Clutch pressure plate
3. Clutch throwout finger
4. Clutch throwout finger pin
5. Clutch throwout finger retainer
6. Clutch throwout finger retainer nut
7. Clutch engaging spring
8. Clutch engaging spring--inner
9. Clutch cover
10. Clutch cover gasket
11. Clutch cover bolt
12. Clutch collar assembly
13. Clutch throwout bearing
14. Clutch oil seal
15. Main drive gear
16. Clutch shifter yoke
17. Clutch throwout bearing grease retainer

CLUTCH

SPECIFICATIONS

General

Pedal to Floorboard Clearance	1-1/2"
Type	Wet
Fluid Used Hudsonite	
Number Driving Plates	One
Plate Facing	Corks
Number of Corks	
9" Clutch	90
10" Clutch	108
Type of Pilot Bearing	Ball
Type of Throwout Bearing	Ball
Number Engaging Fingers	3
Plate Diameter	9" & 10"

Plate Size and Engaging Springs

SERIES WITH STANDARD DRIVE

20 With 3" x 4-1/8" Engine, 9” Plate	3 inner 9 outer
20 With 3" x 5" Engine Also 21,51,52,171, and 172, 9" Plate	6 inner 9 outer
All 22,28,58,178 Also Police & Taxi Optional Also Approximately 2500 Units, Series 51,52, 10" Plate	0 inner 12 outer
24,25,27,53,54,173 and 174, 10" Plate	3 inner 12 outer

WITH DRIVE MASTER, OVERDRIVE OR VACUMOTIVE DRIVE

20,21,51,52,171 and 172, 10" Plate	0 inner 12 outer

Engaging Spring Tension Lbs.

Inner All Spring 155224	@ 1-5/8"	135-145
Outer 9" Plate Spring 45148 or 166250	1-3/4"	165-175
Outer 10" Plate Springs 45149 or 166251	@ 1-5/8"	180-190

Tightening Torque Ft. Lbs.

Throwout Finger Retainer Nuts	40-45
Cover Cap Screws	20-25
Cover Driving Lug Nuts	40-45
Housing Screws and Bolts	40-45
Flywheel Flange Bolts	20-25

CONSTRUCTION AND OPERATION

Details of this single plate oil cushioned type clutch are shown in the sectional view Fig. 142. The unit is sealed against oil leakage at the throw-out bearing and on the parting line at the face of the flywheel.

The pressure plate is a steel forging and interposed between it and the ground face of the flywheel is the light weight pressed steel driving plate which is friction-faced by means of 90 or 108 cork inserts pressed into perforations in the plate.

Engagement and disengagement of the clutch is controlled by the clutch foot pedal which is connected by linkage to the shifter yoke (16). When the clutch pedal is depressed, the yoke moves forward carrying with it the throwout bearing (13) which bears against the throw-out fingers (3) which react against the retainers (5) to move the pressure plate away from the driving plate and flywheel against the pressure of the engaging springs (7). This action disconnects the driving plate (1) and drive gear (15) from the flywheel.

Engagement of the clutch takes place when foot pressure is released from the pedal at which time the engaging springs return the pressure plate to the engaged position as shown in Fig. 142. In the engaged position, the flywheel, driving plate, pressure plate and main drive gear rotate as a single unit.

Foot pressure required to disengage the clutch is held to a minimum by use of an assist or coil spring connected to the pedal and anchored to the frame side member. The geometry of the assist or spring hookup utilizes the over-center principle to reduce pedal effort without decreasing the load transmitting ability of the engaging springs.

The Hudsonite lubricant in the clutch in addition to lubricating the working parts, also cools the friction surfaces and keeps he pores of the corks clean.
The cushioning effect during engagement is obtained by having the corks saturated with lubricant. As the pressure plate and the flywheel come into contact with the cork, the lubricant is wiped off the surface and engagement starts.

As the pressure is increased by further release of the clutch pedal, the lubricant is squeezed out of the corks providing a film on the frictional surfaces so that engagement is gradual. When the surfaces are wiped dry, the engagement is complete.

PEDAL ADJUSTMENT

The length of the rod which connects the clutch pedal to the cross shaft lever should be adjusted so that the face of the clutch pedal shaft is 1-1/2" from the underside of the toeboard as in Fig. 144.

Less clearance may cause the pedal to ride the toeboard and cause the clutch to slip. More clearance reduces the pressure plate movement with the possibility of preventing complete clutch disengagement and also reduces the load exerted on the linkage by the pedal spring so that rattles may result.

To adjust, loosen lock nut (B) Fig. 143. Remove clevis pin (A) and turn yoke (C) to shorten or lengthen the rod as necessary. The levers to which the clevis rod is connected have more than one hole for the clevis pin. The correct hookup varies according to car model and drive equipment as outlined below.

Series 20 with 175 cubic inch engine- connect the link into inner hole of short lever and outer hole of long lever as in Fig. 143.

Series 20 with 212 cubic inch 3" x 5" engine, and models 21, 51, 52, 171, 172 and 178 with standard transmission and 9" clutch - connect link in outer hole of both levers as shown.

All Series with 10" clutch connect link into outer hole of short lever and center hole of long lever.

To identify 10" clutch, note rear face of clutch cover which will have 12 depressions for the engaging springs arranged in 3 sets of 4 depressions each. The 9" clutch covers have 9 engaging spring depressions.

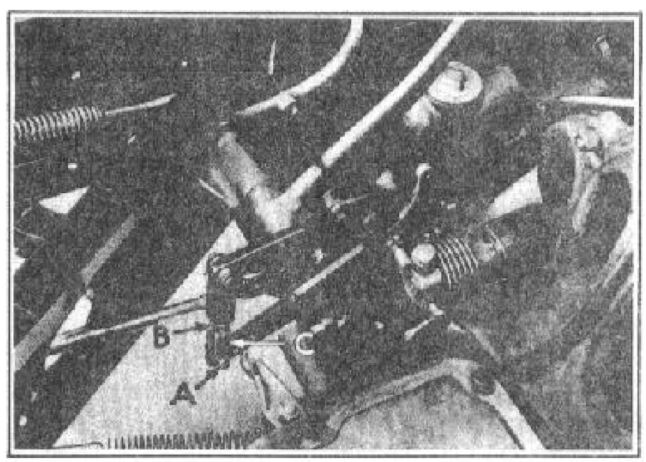


Figure 143
Clutch Pedal Adjustment

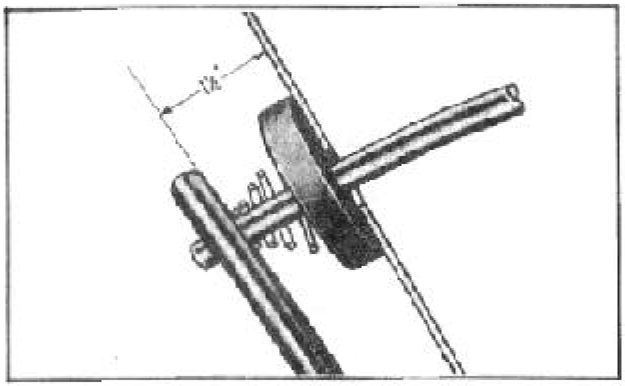


Figure 144
Clutch Pedal Clearance

DRAIN AND REFILL CLUTCH

The clutch assembly should be drained and refilled with Hudsonite Compound every 5000 miles as follows:

1. Remove plug (A) Fig. 145. Socket wrench J-472 is specifically designed for this job.

2. Turn engine slowly (about 1/3 of a revolution) until the star on flywheel face is aligned with the timing pointer at the timing inspection hole. This brings the drain hole to the bottom and permits the old lubricant to drain.

3. Turn the engine until the drain hole is in the timing opening and insert 1/3 of a pint of Hudsonite Clutch Compound using J-485 gun.

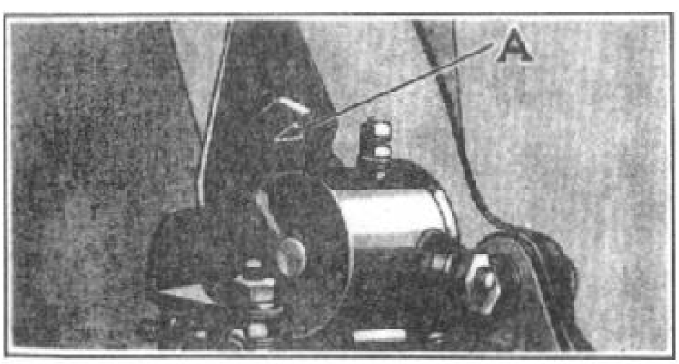


Figure 145
Clutch Lubrication

The measuring cup J-486 is calibrated and should be used for measuring the clutch compound unless the "one shot" 1/3 pint can is used.

Grabbing or Sticking

On complaints of grabbing or sticking during engagement, flush clutch for 10 to 15 minutes at idling speed with a 1/3 pint solution of 80% tetrachloride of carbon and 20% acetone after draining. Operate pedal at least 50 times during the flushing period to assist cleansing action of the solvent solution.

Drain solvent solution completely, then insert 1/3 pint of Hudsonite Compound.

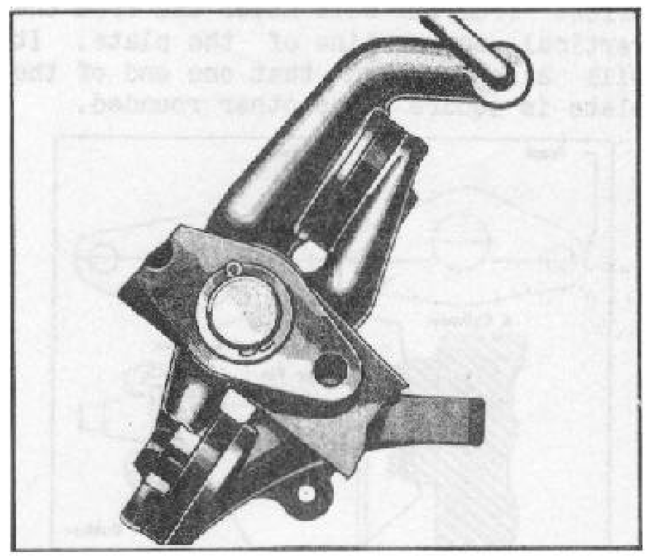


Figure 146
Clutch Linkage Rubber Pads

CLUTCH NOISE

Part of the clutch pedal linkage is carried in the clutch bell housing and the remainder on the chassis frame. The design is such as to permit the engine to float on its mounting without interference with the clutch operation. The linkage is connected by rubber pads on a double end lever on the yoke shaft and these pads bear against similar pads on a similar coupling lever as shown in Figs. 146 and 147.

In-order to prevent noise arising from metal to metal contact occurring when the engine rocks in the rubber mountings, it is necessary that 1/4" minimum end clearance be maintained at the lever ends as shown, in Fig. 147.

To obtain the 1/4" end clearance, pry the cross shaft lever outward and install additional No. 18227 washers after removing the cotter pin. Refer to Fig. 147.

Support Plate

In all cases of noise and intermittent vibration also check the attachment of. the cross shaft support plate (P) to the pedal bracket casting. This plate is unsymmetrical in that the large hole is offset from the bolt holes and from the vertical center line of the plate. It will also be noted that one end of the plate is square - the other rounded.

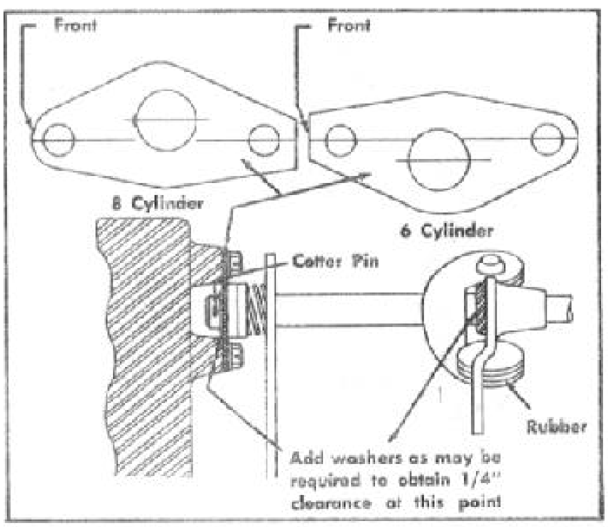


Figure 147
Clutch Shaft Lever Clearance

On all 6-cylinder models, the plate should be mounted on the pedal bracket with the flat end to the front of the car and the shaft hole beneath the center line of the bolt holes.

On all 8-cylinder models, install the plate tithe reverse manner, that is, with the flat end to the rear of the car and with the shaft hole above the center line of the bolts. This reversal compensates for the thick rear rubber mounting unit used on the 8-cylinder engines.

REMOVAL OF ASSEMBLY

1. Install. anti-grease covers on front of seat back.

2. Remove front seat cushion.

3. Remove the four bolts attaching the bottom of front seat frame to track assembly.

4. Slide the seat back assembly to the rear of body.

5. Remove accelerator pedal by removing clevis pins from anchor bracket and bellcrank link.

6. Pull the steering column hole rubber cover up out of the way.

7. Remove the screws holding the kick pad to the dash and remove the six floor mat trim clips. Remove floor mat.

8. Remove the cover from the floor opening over the transmission.

CAUTION: After removing transmission floor opening cover, fasten the accelerator pedal operating rod in such a way that it will not drop on the starter motor solenoid,

9. Disconnect the front universal joint.

10. Unhook the clutch pedal lever return spring.

11. Remove the two cross shaft bracket bolts,

12. Remove the clutch control link clevis pin.

13. Release clutch pedal assisting spring.

14. Disconnect linkage connecting the Handy Shift to the transmission assembly,

15. Remove transmission case lower anchor bracket screws and bracket. Remove shift shaft outer lever nut, washer and lever.

16. Remove capscrews and stamped flywheel guard from bottom of clutch housing. Remove the two engine rear mounting bolts.

17. Jack up rear end of engine about 1/2" off the frame.

18. Remove the clutch bell housing to cylinder block bolts and screws.

19. Disconnect speedometer cable at transmission.

20. Pull transmission and clutch bell housing assembly back and lift out. If transmission is equipped with overdrive disconnect control linkage and wiring connections and use J-1502-H hoist to lower the unit onto the floor dolly.

21. Loosen all clutch-cover-to-flywheel screws slightly to release the tension of the engaging springs. Remove the screws and lift off the clutch assembly.

DISASSEMBLY AND INSPECTION

Parts Kit 9" Clutch

Whenever a clutch repair is undertaken that requires a driving plate assembly, it is also necessary to install a new cover gasket and in nearly every case an oil seal and throwout bearing grease retainer. A refill of Hudsonite is always required.

A service kit Part 161377 containing these very necessary parts is available and contains:

1 Clutch Driving Plate Assy. - 9".
1 Clutch Cover Gasket.
1 Throwout Bearing Oil Seal.
1 Clutch Throwout Bearing Grease Retainer.
1 Can containing 1/3 Pint of Genuine HUDSONITE Clutch Lubricant.

This kit can be used on Hudson cars from 1934 to 1947 inclusive, having the 9" clutch.

Driving Plate

1. A black glaze on surfaces of corks generally indicates the use of unsuitable clutch fluid or that the unit was operated with insufficient fluid. If corks are blackened but not burned, soak the plate in Hudsonite Compound to clean the corks. If soaking does not remove the black coating, replace the plate assembly. Clean cork surfaces are necessary for smooth soft operation of the clutch.

2. Driving plate should run true at cork faces within 0.010" when rotated on Vee blocks with mandrel inserted in hub spline.

3. Hub splines must be free of burrs and nicks and must slide freely on splines of main drive gear (clutch shaft) without appreciable backlash.

4. Examine spring loaded hub for broken springs or stampings. Spring cages should retain the hub in the plate without appreciable angular backlash or sidewise lost motion.

Plates that do not meet above specifications should be replaced.

Preliminary Cover Check

5. Before proceeding with disassembly of cover and pressure plate assembly, check for general condition of cover, fingers and retainers. This test should be made regardless of whether the pressure plate appears to be in good or bad condition.

a. Mount the pressure plate and cover assembly on base plate or on a standard flywheel with a standard driving plate and ONE standard gasket interposed.

b. Bring cover into firm contact with flywheel or base plate using an arbor press or other means, then install and tighten 8 of the 16 cover-to-flywheel cap screws.

The measurements described in the next paragraph should always be made with the cover held to base plate or flywheel at the front flange, not at the hub or rear wall of the cover.

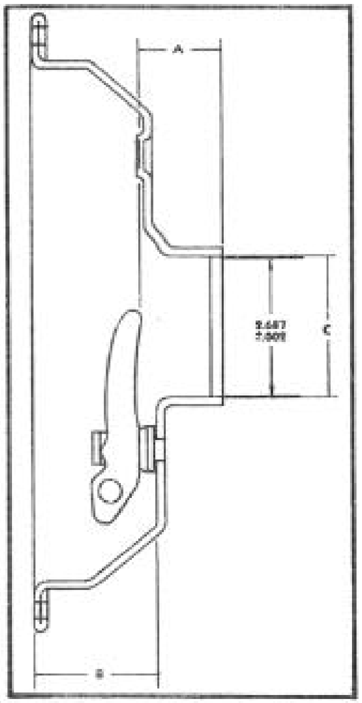


Figure 143
Clutch Cover Showing Finger Height and Oil Seal Clearance

c. Using a machinists combination square or depth micrometer, measure the distance from clutch throwout bearing contacting Surface of lowest finger to top of cover hub (A) as shown in Fig. 148. On a clutch in good condition, the distance should be 1-1/e to 1-1/2” when the interposed driving plate is 0.200” to 0.213" and the gaskets are 0.02e to 0.032” uncompressed thickness.

If distance is greater than 1-1/2", the throwout fingers and/or retainers are excessively worn or the cover is distorted inwardly. The assembly should be disassembled for inspection of its component parts.

If distance is less than 1-1/4”, it can be assumed that the fingers, cover and retainers are not excessively worn and further disassembly is optional except for testing the pressure of the engaging springs or replacing the pressure plate. It cam be assumed as satisfactory, providing fingers clear hub of cover by at least 1/8".

Pressure Plate

NOTE: Before proceeding with disassembly of the cover and pressure plate assembly, look for the correlation punch mark near the outer edge of the pressure plate and a corresponding mark near it on the turn of the cover flange. These marks indicate the relative position of the parts when the assembly was balanced at the factory and the marks should be kept together to maintain the original balance.

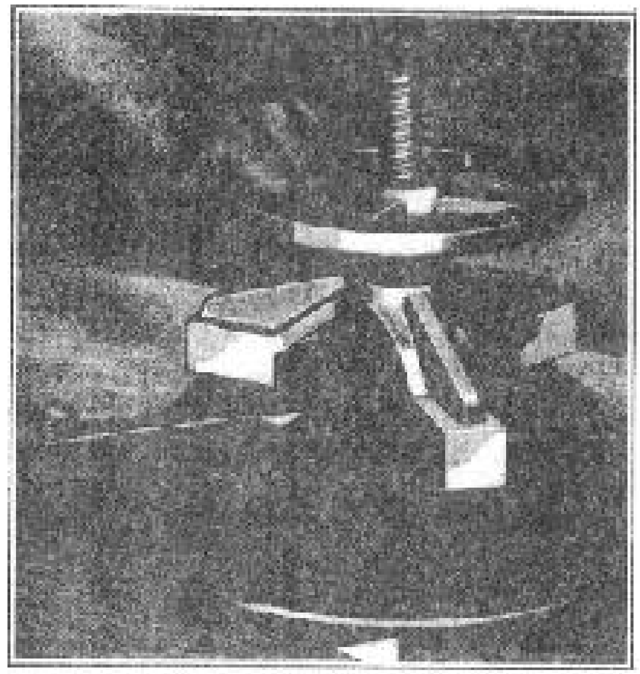


Figure. 149
Disassembling Clutch Using Tool 3-298-H

6. Use clutch fixture J-298-H Fig. 149 to compress the engaging springs. With spring load relieved, remove the 3 nuts (6) Fig. 142 from back of cover and remove the cover, springs, fingers and finger retainers with sealing washers.

7. Pressure plate should be free of cracks, burns or scores and should be true within 0.010”. Scrape all gummed of from plate. Warpage may be readily checked by laying pressure plate on a surface plate. If a 0.010” feeler can be inserted at any point between surface plate and pressure plate, the latter should be replaced. If a surface plate is not available, two a new pressure plate or flywheel to serve as a surface plate.

Engaging Springs

8. If clutch pressure plate shows signs of overheating, it is likely that the engaging springs will require replacement. Inner and outer springs should be checked for tension at each overhaul using the Valve Spring Tester Tool No. U15 and checking against the tension data contained on page 138 and below.

Plate Size	Spring	Spring Part #	Tension Lbs.	At Length
9"	Inner	155224	135-145	1-5/8"
10"	Inner	155224	135-145	1-5/8"
9"	Outer	45148	165-175	1-3/4"
9"	Outer	166250	165-175	1-3/4"
10"	Outer	45149	180-190	1-5/8"
10"	Outer	166251	180-190	1-5/8"

Springs of same tension supercede and are interchangeable with each other.

Throwout Fingers

9. Visually check the fingers for wear and uneven surfaces at the points where the fingers contact the throwout bearing and retainers also check the retaining pin bores. Replace fingers that show noticeable wear.

Retainers and Washers

10. Check retainers for wear at slot where they contact the lobed surface of the fingers. The bearing surface on the retainers is practically a line contact. If bearing area of retainer is grooved deeper than 0.005" replace the retainer. If however there is only one such groove, the retainer may be safely continued in service by rotating it 180 degrees from former position when it is being installed. Changing the retainer position by half a turn will bring unworn portion into contact with finger fulcrum lobe.

11. The plain copper or steel washers interposed between retainers and cover function as oil seals. Top and bottom faces must be flat and free of scores, otherwise they should be replaced.

Clutch Cover

12. Inner surface of cover must be flat and free from scores adjacent to the holes for the finger retainers. Cover must be flat within 0.005" when front face is checked on a surface plate.

13. Distance from front face of cover where it contacts the flywheel gasket, to points on front wall of cover where retainer sealing washers fit (B) Fig. 148, should be not less than 2.350" and not more than 2.370" measured 1/8" from edge of each of the 3-finger retainer holes. Variation in distance at any of the 3 holes should not exceed 0.008". Covers that are not within these limits should be replaced unless equipment and skill is available for doing an accurate job of straightening.

14. Cover hub bore against which the throwout collar oil seal contacts, must be smooth and free from nicks and burrs.

If cover hub bore (C) Fig. 148, shows considerable wear and scoring, it is an almost certain indication of misalignment. Whenever this condition is encountered, be sure to thoroughly check the engine rear support plate, flywheel and clutch bell housing for shaft center concentricity and face alignment in both planes.

Throwout Bearing and Seals

In the removal of clutch from engine, the throwout bearing (13) Fig. 142, grease retainer (17) and clutch oil seal (14) will be removed as a single unit with the collar (12).

15. Leather element of seal must be free of glaze and cuts or cracks and must be firmly attached to the stamped steel element. Leather must not rotate in relation to the stamping and the seal assembly must be stationary on the clutch collar. Check to see that coil spring is intact and not loose.

Replacement of the oil seal necessitates removal of throwout bearing from collar. Use care when pressing new seal onto collar, being careful to apply a steady pressure to the INNER metal edge. As the seal assembly can be quickly made ineffective by careless installation, it is important to use a close fitting pressing sleeve so as to confine all the load to the inner edge.

16. The throwout bearing should be free from roughness or lumpiness when rotated after cleaning and oiling, otherwise it should be replaced. If both the throwout bearing and the oil seal require replacement, it is usually as economical to install anew collar assembly, part No. 42630, which includes bearing and seal, as to remove the oil and install the new seal and bearing to the old collar casting.

When installing throwout bearing to collar, do so with a press having a ram adaptor large enough to cover the entire front face of the bearing. DO NOT drive the bearing into place on the collar as such action is likely to mark or brinnell the races causing subsequent noise in operation.

NOTE: When assembling throwout bearing to collar, do not fail to install a new grease retainer (17) Fig. 142, Part No. 42587, to annular recess in the bearing. Make sure that the washer is fully seated in recess.

Grease retainer (l7) and oil seal assembly should be soaked in engine oil for at least 30 minutes before they are installed.

Pilot Bearing and flywheel

17. Main drive gear pilot ball bearing in flywheel should run smoothly and freely. If lumpy or rusty or badly worn replace it. Inertia type expanding jaw puller J-877 facilitates greatly, removal of bearing from engine.

18. Check flywheel for smoothness and flatness. If burned or warped more than 0.010", it should be replaced. Make sure that flywheel attaching bolts are tightened to 40-45 foot pounds torque.

Rear Support Plate and Clutch Bell Housing

19. Check cylinder block rear support plate very carefully for tightness and misalignment. This is especially important in cases where car has been subject to chronic clutch trouble. Make a similar check of clutch bell housing. In lieu of highly precise equipment, use a steel straight-edge to check steel rear support plate and a surface plate or other flat surface to check the front face of clutch bell housing. Both units should be flat and in plane within 0.005".

REASSEMBLY

1. Install the throwout fingers to pressure plate. Do not forget to install the 3 cotter pins. Place a finger retainer over each finger with threaded end of retainers facing up.

NOTE: Retainers may be rotated 180 degrees to present a new bearing surface to fingers. Refer to paragraphs pertaining to Inspection, preceding.

2. Install a sealing washer, part No. 170663 or 170695, to stud portion of each retainer.

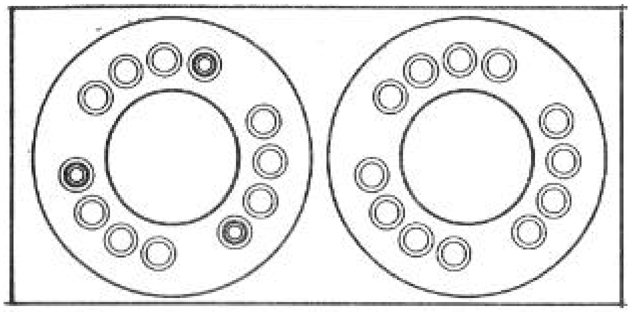


Figure 150
Clutch Spring Arrangement For Nine-Inch Clutch

No. 1 - Series 20 With 3"x 4-1/3" Engine
Standard Drive 9" Clutch

No. 2 - Series 20 With 3" x 5" Engine,
Also 21, 51, 52, 171 and 172
Standard Drive 9" Clutch

Views are from closed end of clutch.

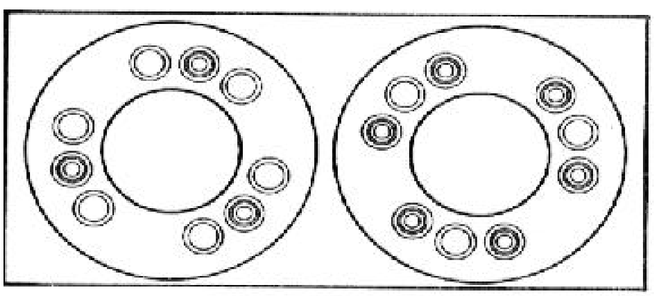


Figure 151
Clutch Spring Arrangement For Ten-Inch Clutch

No. 1 - Series 24, 25, 27, 53, 54, 173 and 174 10" Clutch Standard Drive

No. 2 - Series 22, 28, 58, 178 also 20, 21, 51, 52, 171 and 172. When equipped with Drive Master, Overdrive or Vacumotive Drive. Optional on Police Cars and Taxicabs.

3. Lay the pressure plate with fingers and retainers installed, on top of bench mounted flywheel or base plate of fixture,

4. Assemble the previously tested engaging springs into seats on pressure plate in accordance with the arrangement specifications shown in Figs. 150 and 151.

5. Check position of correlation marks on cover and pressure plate, align same then lower the cover onto the pressure plate while guiding each of the 3 fingers retainers into their respective holes in cover.

6. Using clutch assembly fixture J-298-H, Fig. 149, or other suitable means, pull cover into place by compressing engaging springs. Install lock-washer, part No. 70867, and nut on each finger retainer and draw nuts up to 40-45 foot pounds torque after cover is pressed all the way down.

7. Remove assembly from fixture or flywheel using a suitable heavy duty end wrench - engage flat portion of retainers and turn same until all fingers are centered sideways in retainer slots. THIS IS AN IMPORTANT PART OF THY: JOB. Hake sure that shoulder of each retainer is fully seated on wall of cover.

8. Reinstall clutch cover and pressure plate assembly to flywheel or base plate of fixture after having first placed a driving plate and ONE gasket underneath.

9. Install and tighten 8 of the 16 cover to flywheel cap screws.

10. Using a scale or adjusting gauge J-774, measure from lowest finger at contact end to top of cover hub. If measurement is within limits of 1-1/4" to 1-1/2" synchronize the fingers as outlined in next paragraph, If measurement is greater than 1-1/2", the cover is probably distorted and same should be checked as per paragraph 13, page 145.

Figure 152
Clutch Finger Alignment Using Clutch Finger Adjusting Gauge J-774

11. Using finger setting gauge J-774, as shown in Fig. 152, Check relative height of each finger. Reading should be same for each finger within 0.010".

If any finger is higher than another by not more than 0.029", it should be brought to height of others (lowered) by striking the nut end of its retainer sharply with a soft metallic hammer.

If any finger is more than 0.030" higher than another, it should be lowered to level of other fingers by installing a thin (about 0.005" thick) washer between clutch cover and retainer of the high finger.

12. Remove assembly from fixture.

Installation on engine

1. Install one new clutch cover gasket and shellac it in place on front face of cover flange.

CAUTION: If clutch has been properly reconditioned only one gasket of 1/32" free thickness is required to give correct release and engagement. Avoid the installation of two or more gaskets as each added gasket reduces the effective pressure of engaging springs by an amount equal to the thickness of each such additional gasket.

2. Place driving plate on pressure plate then insert the aligning arbor J-449 or equivalent through cover and splines of driving plate. Push the assembly up into place on the flywheel and secure with the cap screws. Keep the arbor in position so as to keep the driving plate centered. This will assist
installation of the transmission.

3. Tighten the cap screws gradually drawing down opposite screws instead of in rotation so that a good gasket seal is insured. Using a torque wrench, tighten all cover screws to 20-25 foot pounds. Withdraw the arbor.

4. Insert 1/3 of a pint of Hudsonite into clutch via the cover hub opening.

5. Install clutch collar and throw- out bearing assembly to clutch cover hub bore after spreading thin coat of engine oil over bore wall. Care must be exercised to prevent damaging the lip of the oil seal or curling it over in the bore. A hose clamp of correct size may be used to contract the seal.

Center the throwout bearing grease retainer leather washer (not the oil seal) by temporarily inserting the aligning arbor through it. Rotate collar and throwout bearing to position for proper alignment with throwout yoke on transmission.

NOTE: Remove lower right hand cap screw which passes through rear support plate into cylinder block. Make sure that sleeve dowel for this screw is entered in hole in support plate. If dowel is missing or not in place in support plate hole, install it properly then reinstall the cap screw. Tighten all support plate-to-block screws.

6. Bring the transmission assembly to position where main drive gear (clutch shaft) is aligned with bore of throwout collar, then carefully push forward to enter drive gear through grease retainer leather washer, splined of driving plate and into pilot bearing. During this operation the main drive gear must be relieved of the overhanging weight of the transmission until the hell housing engages the dowels.

NOTE: Before transmission assembly is moved up against rear support plate, make alast inspection to verify that end face of throwout collar in clutch is properly aligned with throwout yoke on transmission and that oil seal lip has not turned under.

CAUTION: Alignment of bell housing with engine is controlled by the sleeve dowel in the upper left location of the bell housing attaching bolt circle and by the dowel bolt at the lower right location viewed from rear of car. Make sure that the former is in place and entered in bell housing hole before tightening bolts. Install lower right bolt (dowel bolt) first. NEVER grind or otherwise reduce the diameter of the dowel bolt to facilitate installation.

7. Install remaining clutch ball housing bolts and screws and tighten with a torque wrench to 40-45 foot pounds.

8. Complete remainder of installation by reversing the order of removal of the remaining parts.

REFERENCES

Source of Information	Date	Subject

YEAR 1941

Gear Ratios

Model 10 with 3" x 4-1/8" Engine		All Other Models Including Model 10 With 3" x 5" Engine
2.88 to 1	Low	2.61 to 1
1.82 to 1	Second	1.65 to 1
1 to 1	High	1 to 1
3.5 to 1	Reverse	3.17 to 1

YEARS 1942 THRU 1947
ALL MODELS

Gear Ratios

2.88 to 1	Low
1.82 to 1	Second
1 to 1	High
3.5 to 1	Reverse

Teeth

Reverse Idler	18 Teeth
Main Drive Gear	
2.88 to 1 Ratio	17 Teeth
2.61 to 1 Ratio	17 Teeth
Countershaft Gear Cluster 2.88 to 1 Ratio	26 Teeth
	21 Teeth
	17 Teeth
	14 Teeth
Countershaft Gear Cluster 2.61 to 1 Ratio	25 Teeth
	21 Teeth
	17 Teeth
	14 Teeth
Mainshaft - Low and Reverse.	32 Teeth External
	Spline-24 Teeth Internal
Mainshaft - Intermediate	Helical - 25 Teeth
	Clutch - 30 Teeth

End Play

Countershaft	.006" to .016"
Mainshaft Intermediate Gear and Synchronizer Shift Sleeve	.003" to .016"
Reverse Idler Gear	.003" to .010"

Speedometer Drive Gear 10 Teeth

Speedometer Pinions

Axle Ratio	Tire Sizes	Teeth
4-1/9	All	15
4-5/9	6.25x16, 6.50x16, 7.00x15	16
4-5/9	5.50x16, 6.00x16, 6.50x15	17
4-7/8	6.50x16, 7.00x15	17
4-7/8	5.50x16, 6.00x16, 6.25x16 6.50x15	18

Governor Pinion

4-1/9 Axle Ratio All Tire Sizes	15 Teeth
4-5/9 or 4-7/8 Axle Ratio All Tire Sizes	17 Teeth

Bearings and Bushings

Main Drive Gear	Ball
Mainshaft Pilot	Needle Roller
Mainshaft Rear	Ball
Reverse Idler Gear	Steel Back Babbit
Countershaft Gear Cluster	Steel Back Babbit

LUBRICANT

See "Lubrication" Section for Specifications. Capacity of transmission is 2-1/4 pints or pounds if disassembled and parts washed. Capacity of transmission is 2 pints or pounds if drained and refilled.

Construction

All gears of the transmission are of the Helical type, the unit being provided with synchronizing clutches (synchro-mesh) for engagement of second and high gears. Sliding mesh of the helical gears for low and reverse is made possible by helical splines (18) Fig. 153 on the main shaft.

The rear end of the main drive gear (10) (clutch shaft) is carried on a ball bearing (11) at the front end of the transmission case and is piloted at its forward end in a ball bearing (13) Fig. 154, mounted in the engine flywheel. The front end of the splined mainshaft is piloted in a straight roller bearing (21) set into the hollow end of the main drive gear and the opposite end is carried by a ball bearing (23) mounted in the rear wall of the transmission case. When the transmission is equipped with an overdrive unit, the rear end of the mainshaft extends back into the overdrive unit case and is supported by a ball bearing mounted in the front wall boss of the overdrive case.

The four gears comprising the counter-shaft gear cluster (33) are cut on the single forging, the bore of which carries two steel-backed bronze or lead-tin lined bushings. These bushings are anchored in the countershaft cluster and rotate on the stationary countershaft (36). End thrust of the cluster is taken by one steel and one bronze thrust washer (37) and (38) at the axle end of the shaft and a bronze washer at the clutch end.

The reverse idler gear (41) Fig. 154 also has a pressed-in steel-backed bronze or lead-tin lined bushing which rotates on the stationary shaft (43). The stationary journal shafts for both the reverse idler and the countershaft cluster are positioned in the case by the lock plate (39).

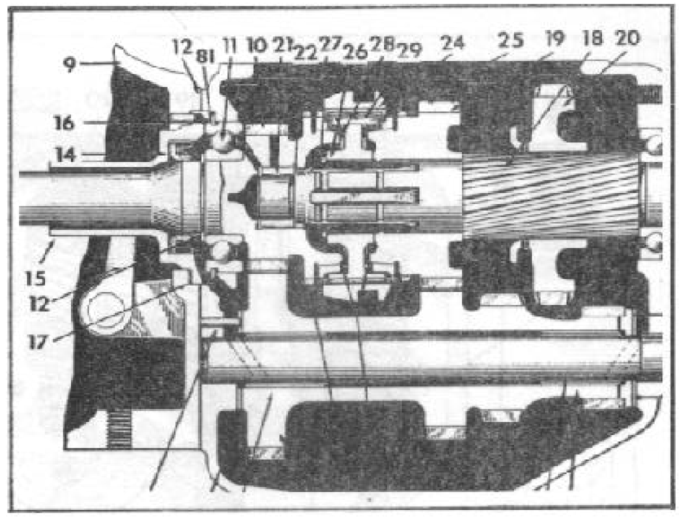


Figure 153
Synchronizer, Main Drive Gear and Main-Shaft Relation

SYNCHRONIZING ACTION

The Flanged Rings (25) Fig. 153 provide the synchronizing effect for second and high gear drive. The front ring synchronizes for the high gear shift, the rear for the shift into second gear. The rings are free to float end-wise but are driven rotationally by the shift plates (29) into which they are slotted.

The shift plates are located in grooves disposed 120 degrees apart on the rim face of the synchronizer shift sleeve hub (26). The plates are urged radially outward by two wire springs (28) on opposite faces of the hub which is splined to the main shaft (18).

When the synchronizer shift sleeve (24) is moved forward to engage high speed or backward to engage second speed gear the shift plates move with it forcing the appropriate synchronizer ring (25) against the conical surface on the hub of the main drive gear (10) or intermediate gear (19) causing the latter to be brought to the same rotational speed as the hub (26) and sleeve (24), Further movement of the synchronizer sleeve brings its internal teeth into mesh over the narrow external teeth (N) Figs. 153 and 154 on main drive gear or mainshaft intermediate gear thus providing a locked or positive drive.

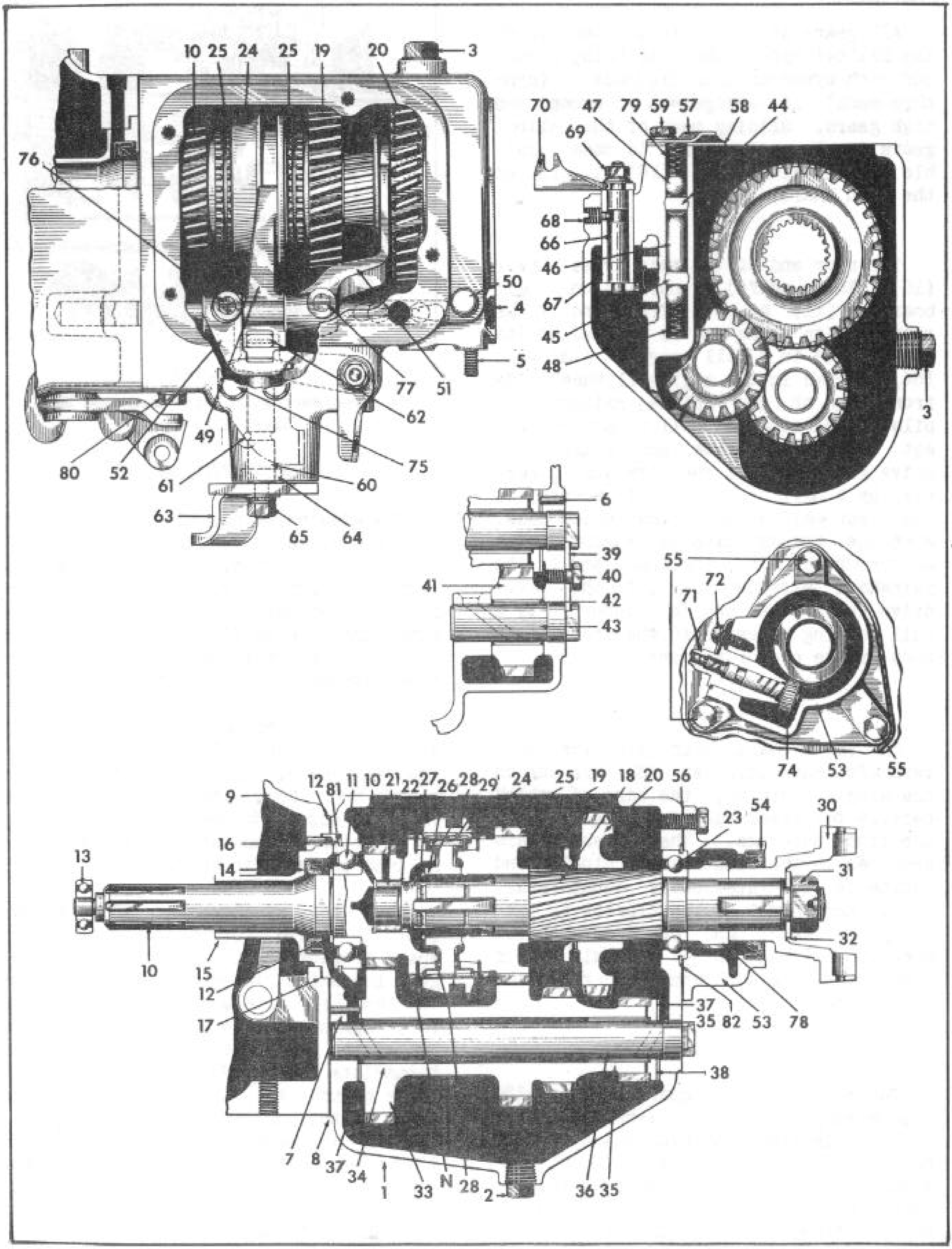

10 25 24 25 19 20 3
76
50
4
5
77 51
62
49
80 52
75
61
60
63
65 64
70 47 79 59 57 58 44
69
68
66
46
67
45
48
3
6
39
40
41
42
43
55
72
71
74 53 55
12 81 11 10 21 22 27 26 28 29 24 25 19 18 20 56
9
16
13
14
54
30
23
31
32
10 15
12
17
37
35 82 53 78
38
7 8 37 34 1 33 N 28 2 36 35

Figure 154 - Transmission

1. Case
2. Drain plug
3. Filler plug
4. Expansion plug
5. Case stud
6. Washer pin rear
7. Washer pin front
8. Case gasket
9. Clutch housing
10. Main drive gear
11. Gear bearing
12. Gear lock ring
13. Gear pilot bearing
14. Gear oil seal
15. Gear bearing retainer
16. Retainer locating pin
17. Retainer gasket
18. Main shaft
19. Shaft intermediate gear
20. Shaft low and reverse gear
21. Shaft pilot bearing
22. Main shaft needle roller retainer
23. Shaft rear bearing
24. Synchronizer shift sleeve
25. Synchronizer ring (2 places)
26. Synchronizer shift sleeve hub
27. Shift hub lock ring
28. Synchronizer spring (2 places)
29. Synchronizer shift plate
30. Companion flange
31. Flange nut
32. Flange washer
33. Countershaft gear cluster
34. Cluster bushing, front
35. Cluster bushing, rear
36. Countershaft
37. Cluster thrust washer (2 places)
38. Cluster steel washer
39. Countershaft lock plate
40. Lock plate screw
41. Reverse idler gear
42. Idler gear bushing
43. Idler gear shaft
44. Low and reverse shift rail
45. High and 2nd shift rail
46. Shift rail interlock
47. Rail lock ball (2 places)
48. High and 2nd ball spring
49. High and 2nd shift fork
50. Breather
51. Low and reverse shift fork
52. Low and reverse shifter
53. Speedometer gear housing
54. Gear housing oil seal
55. Gear housing bolt (3 places)
56. Gear housing gasket
57. Transmission cover
58. Cover gasket
59. Cover screw
60. Shift shaft
61. Shift shaft pin
62. Shift lever, inner
63. Shift lever, outer
64. Shift shaft seal
65. Shift shaft nut
66. Shift selector lever
67. Selector shaft bushing
68. Bushing set screw
69. Selector shaft nut
70. Selector lever, outer
71. Speedometer cable
72. Speedometer cable sorew
74. Speedometer pinion
75. Shifter control wire bracket screw
76. Low and reverse shifter set screw
77. Low and reverse fork set screw
78. Speedometer gear
79. Rail lock spring low and reverse
80. High and 2nd rail stop screw
81. Main drive gear snap ring
82. Main shaft snap ring

The main drive gear (10) Fig. 154, is positioned fore and aft in the transmission case by the combination of the clutch bell housing (9) and the snap ring (81) on the drive gear bearing. The bearing is a press fit on main drive gear and a light push fit in the transmission case.

Leakage of lubricant from the transmission into the clutch housing via the main drive gear (10) (clutch shaft) is prevented by the oil seal (73) mounted in the main drive gear bearing retainer (15).

Fore and aft positioning of the main shaft is taken care of in the same manner as the main drive gear. In this case the parts involved are the transmission case, mainshaft, bearing, snap ring (82) and the companion flange nut (31), which serves to clamp the bearing between transmission case and speedometer housing. Mainshaft bearing is a press fit on the main shaft and a light push fit in the transmission case. Oil leakage past the universal companion flange hub is prevented by the oil seal (54).

Further safeguards against leakage of lubricant are a grease directing baffle mounted in the cover (57) and the air breather (50). On models equipped with overdrive, the grease directing baffle is anchored to the inside of the transmission case Instead of on the cover.

The additional details of the transmission are evident by an examination of the various views in Figs. 153 and 154. The pinion for driving the speedometer flexible shaft is shown at (74).

The steering column gearshift or power shifting device on some models is connected to the shift selector shaft (66) and to the outer shift lever (63). Movement of selector shaft (66) connects the outer shifter lever with either the low and reverse shift rail (44) or the 2nd and high shift rail (45) after which further movement of the steering column gearshift lever accomplishes the actual shifting by imparting movement to one or the other of the shift forks (49) and (51),

TRANSMISSION REMOVAL FROM CAR

The following removal instructions consider the transmission assembly as a single unit made up of the transmission and clutch bell housing.

1. Remove front seat cushion.

2. Install anti-grease covers on front seat back.

3. Remove the four bolts attaching the bottom of front seat frame to track assembly.

4. Slide the seat assembly to the rear of body.

5. Remove accelerator pedal by removing clevis pins from anchor bracket and bellcrank link.

6. Pull the steering column hole rubber cover up out of the way.

7. Remove the screws holding the kick pad to the dash also the floor mat trim clips. Remove the floor mat.

8. Remove the cover from the opening in the floor over the transmission.

CAUTION" After removing transmission floor opening cover, fasten the accelerator pedal operating rod in such a way that it will not drop on the starter motor solenoid,

9. Disconnect the front universal joint.

10. Unhook the clutch pedal lever return spring.

11. Remove the two cross shaft bracket bolts.

12. Remove the clutch control link clevis pin.

13. Disconnect the clutch pedal assister spring.

14. Disconnect the linkage connecting the Handy Shift to the transmission assembly.

15. Remove transmission case lower anchor bracket screws and bracket, also shift shaft, outer lever nut, washer and lever (63) Fig. 154.

16. Remove capscrews and stamped flywheel guard from bottom of clutch bell housing. Also remove the two engine rear mounting bolts.

17. Jack up rear end of engine about 1/2" off the frame.

18. Remove clutch bell housing to cylinder block and support plate bolts and screws.

19. Disconnect speedometer cable at transmission.

20. Pull transmission and clutch bell housing assembly back towards rear of car until main drive gear clears clutch then lower the assembly to the floor. Hoist J-1502 will be helpful in handling the assembly.

DISASSEMBLY OF TRANSMISSION

Main Shaft Assembly

Beginning with the 1942 models the overall diameter of the synchronizer shift sleeve and mating teeth for same on the main drive gear and 2nd speed gear was increased. This change affects the disassembly procedure as follows:

a. On 1942 and later cars, neither the main drive gear or mainshaft assembly can be removed without first removing the transmission from the engine.

b. The main drive gear must be re• moved rearward and out through the cover opening and this cannot be done without first removing the countershaft

d. If it is possible to remove the mains of assembly without removing the countershaft However, it is easier and probably safer to remove the countershaft BEFORE removing the main shaft.

NOTE: Disassembly procedure for transmission equipped with overdrive is different than for the plain transmission. The main difference is that the main shaft lock ring and all shaft components must be removed from main shaft before the overdrive unit can be withdrawn from the transmission. Refer to Overdrive Section for overdrive unit removal procedure.

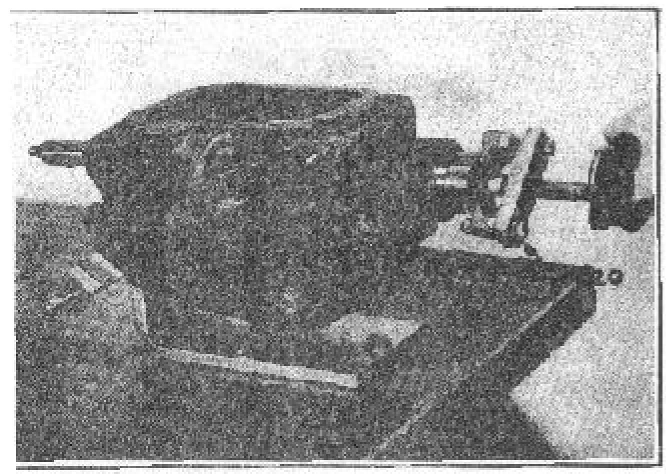


Figure 155
Universal. Joint Companion Flange Puller

1. Remove the six screws that hold clutch bell housing to transmission case and detach the housing and attached throwout linkage assembly from the transmission.

2. Remove drain plug at bottom of case and allow old lubricant to drain. Place assembly in Holding Fixture J-1584 and bolt securely at front end with two clutch housing capscrews, Fig. 155.

NOTE: If car has Overdrive, Drive Master or Vacumotive Drive, it is necessary to unscrew governor switch from speedometer gear housing.

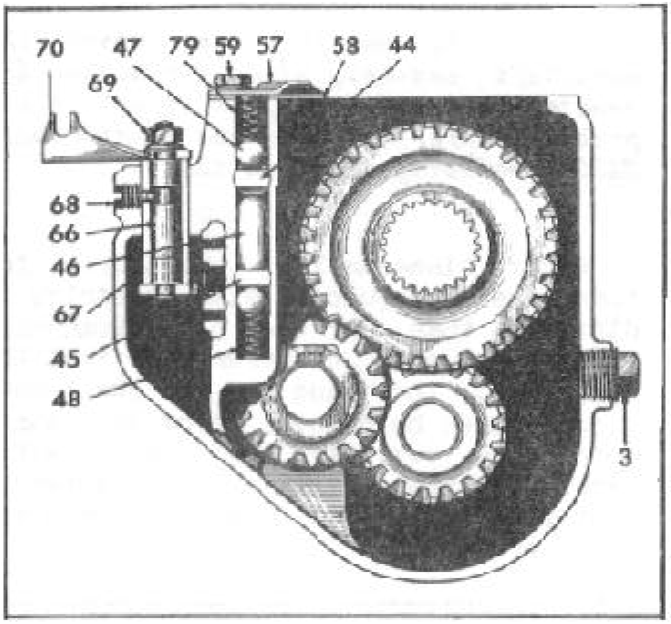


Figure 156
Shifter Rail Position

3. Remove cover screws (59) Fig. 156 and lift cover (57) off cautiously to prevent shift rail lock spring (79) from jumping out. Remove spring and lock ball (47).

4. Flush out and thoroughly clean Inside of case and gears.

5. Remove universal joint companion flange nut and companion flange from main shaft. If flange 15 tight on main shaft, pull off with Universal Joint Puller J-820.

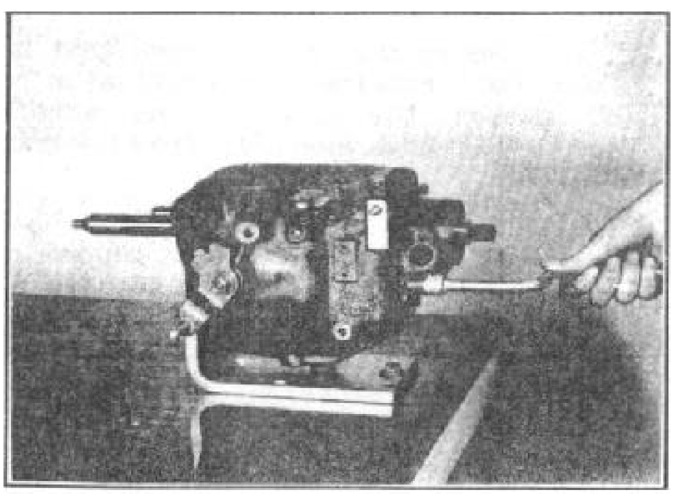


Figure 157
Removing Speedometer Gear Housing

6. Remove speedometer gear housing cap screws Fig. 157, and speedometer gear housing. Remove speedometer gear. Be careful to prevent damaging the housing oil seal.

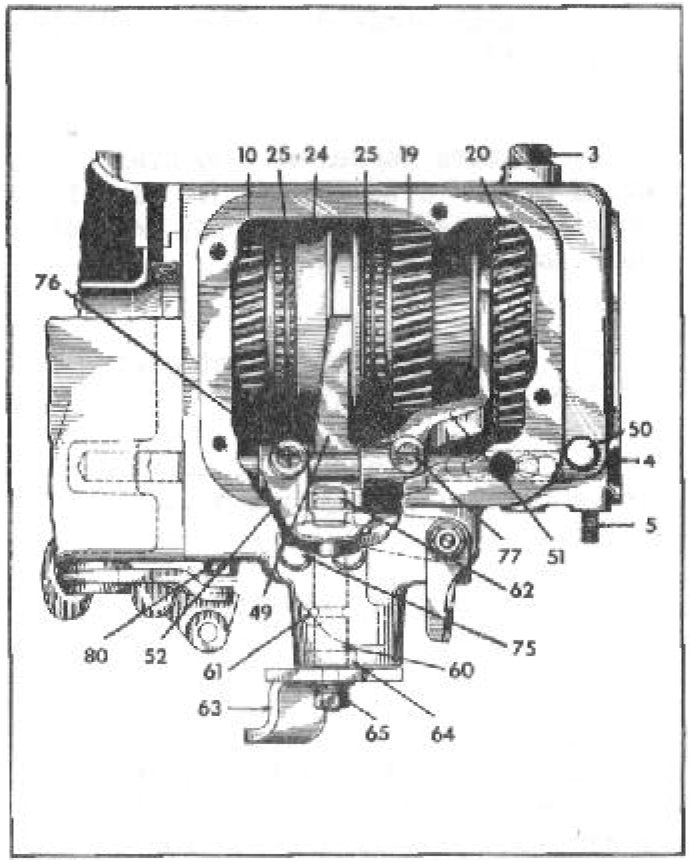


Figure 158
Shifter Fork Location

7. Remove 2nd and high shift rail stop screw (80) Fig. 158.

8. Remove screw (77) from low speed shifter fork and screw (76) from the low speed shifter (52) Fig. 158.

These special self-locking screws have a slot approximately 1/4" deep. The head portion on right side of slot is offset, in the direction of the slot, with respect to the portion on the opposite side of slot. This offsetting process makes the screw self-locking.

CAUTION: To remove or install these screws, use a screwdriver having a straight blade or a blade with a slightly reverse taper that will enter to bottom of screw slot. Considerable trouble may be encountered especially when removing the screws, if a tapered blade screwdriver is used.

9. Slide low and reverse shift rail (44) Fig. 156 out of front of case then remove the released shift fork and shifter, also the shift rail interlock (46) Fig. 156.

10. Remove set screw from 2nd and high shift fork (49) Fig. 158, then slide shift rail (45) Fig. 156 out of front of case. Remove lock ball and spring (48) from case.

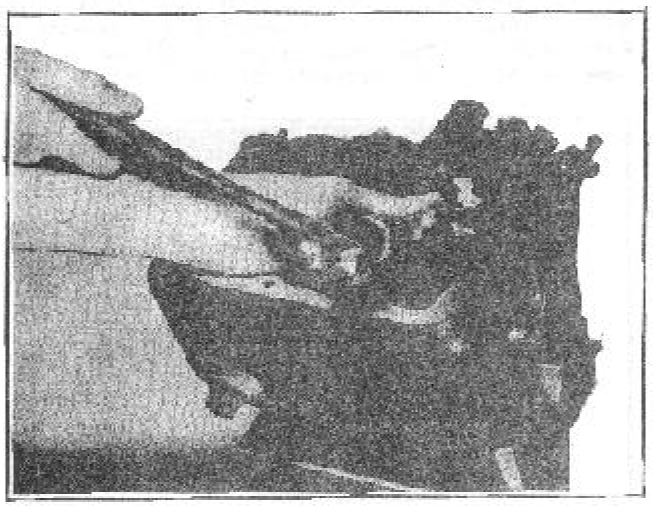
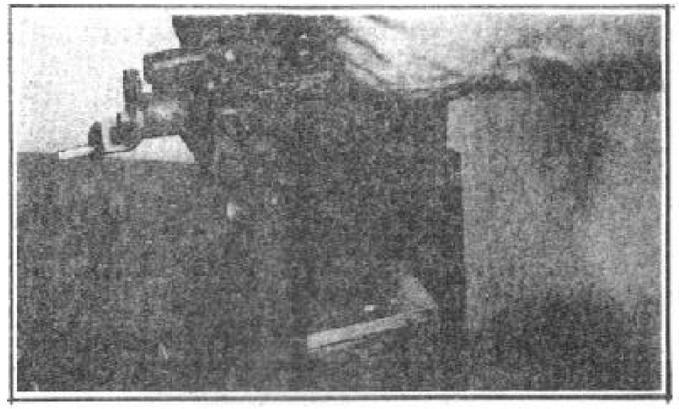


Figure 159
Marking Position of Slain Shaft inner Lever on Shin Shaft

11. Using a prick punch or other suitable means, place correlation. marks on Shift shaft inner lever (62) and shift shaft (60) to assure reassembly on same spline, then remove the lever (62). Refer to Figs, 158 and 159.



Removing Countershaft and Reverse Idler Shaft Lock Plate

12. Remove countershaft and reverse idler shaft lock plate, Fig. 160, and drive countershaft out of rear end of case with Bronze Driver J-1574 as shown in Fig. 161.

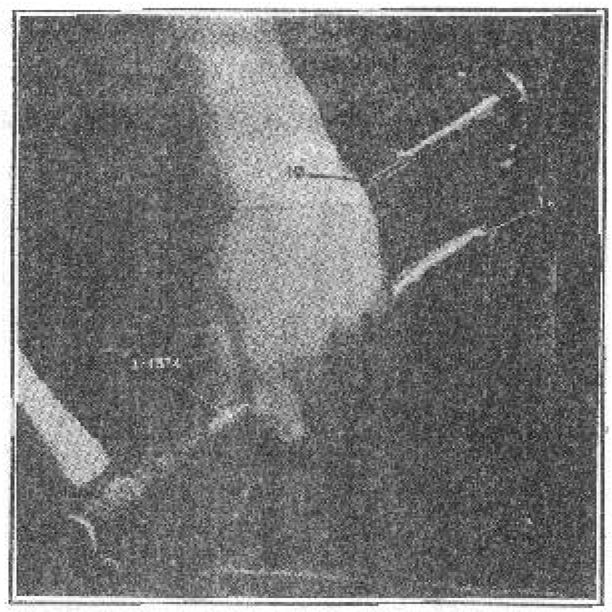


Figure 161
Driving Out Countershaft From Rear End of Case With Bronze Driver 3-1574

13. Pull main shaft rearward by hand far enough to provide clearance for bearing puller jaws behind bearing or bearing snap ring. If shaft does not Mlle rearward easily, Temporarily reinstall the companion flange and bump rearwardly on same lightly and carefully with a soft hammer.

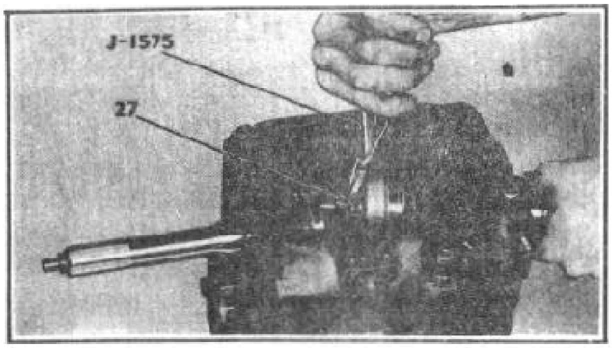


Figure 162
Remove or Install Synchronizer Shift Sleeve Hub Lock Ring with Pliers J-1575

CAUTION: If countershaft is in place, the mainshaft cannot be moved rearward any further than shown in Fig. 162 due to cluster gear interference. Do not try to force the shaft further without first removing the countershaft or chipped gears will result.

14. Pull bearing from mainshaft with puller J-1134-H.

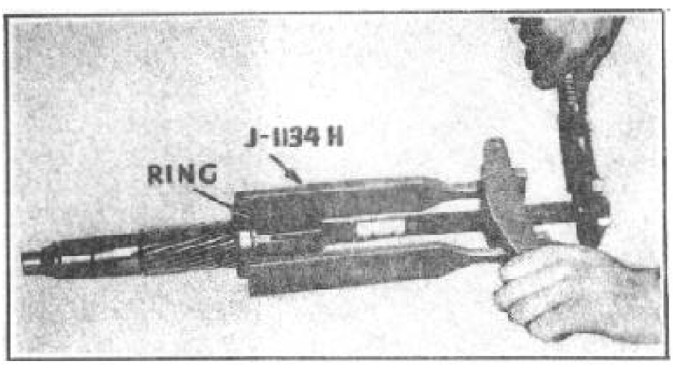


Figure 163
Pulling Off Main Drive Gear Bearing With Tool J-1134-H.

NOTE: If countershaft has been previously removed, the puller jaws can be engaged on front face of bearing. If mainshaft assembly is being removed with countershaft still in place, the puller jaws will have to be engaged with the bearing snap ring as shown in Fig. 163, as shaft cannot be moved rearward further than shown due to countershaft cluster interference.

Move synchronizer shift sleeve forward to position where direct drive is almost engaged.

15. Pull mainshaft rearward and main drive gear forward until mainshaft is fully withdrawn from needle roller pilot bearing in rear end of main drive gear. Some of the bearing rollers may fall into the case at this time. Lift mainshaft assembly out through cover opening in case, after moving synchronizer shift sleeve into 2nd speed mesh position and low reverse sliding gear as far forward as it will go.

a. Disassemble mainshaft assembly on the bench by first sliding the low reverse sliding gear off the shaft.

b. Remove shift sleeve hub lock ring with special Pliers J-1575 as shown in Fig. 162. The remaining components can now be slid or bumped off the shaft.

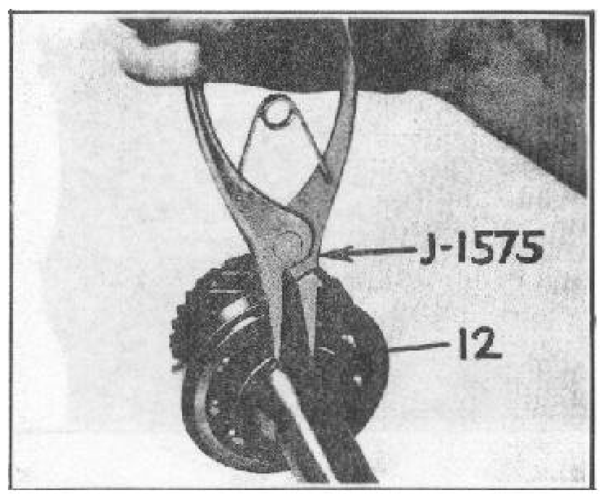


Figure 164
Removing Main Drive Gear Bearing Retaining Lock Ring Using Pliers J-1575

16. Bump main drive gear forward far enough to clear bearing snap ring. Remove snap ring then bump drive gear rearward and lift out through cover opening in case.

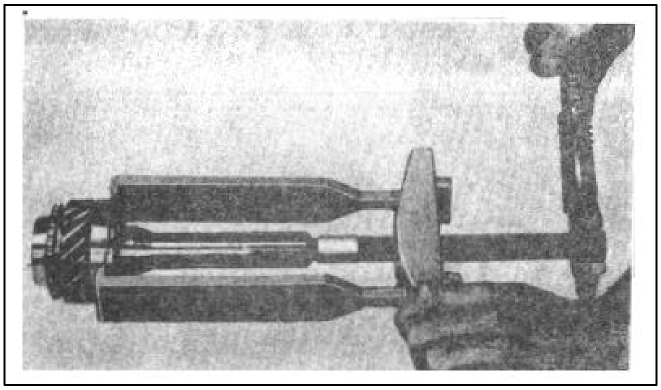


Figure 165
Pulling Main Drive Gear Ball Bearing
With Tool J-1134-H

a. To remove bearing from main drive gear, remove main drive gear lock ring (12) by spreading with Pliers J-1575, Fig. 164. Using Puller J-1134-H with cup type adaptor on puller screw, remove bearing as shown in Fig. 165.

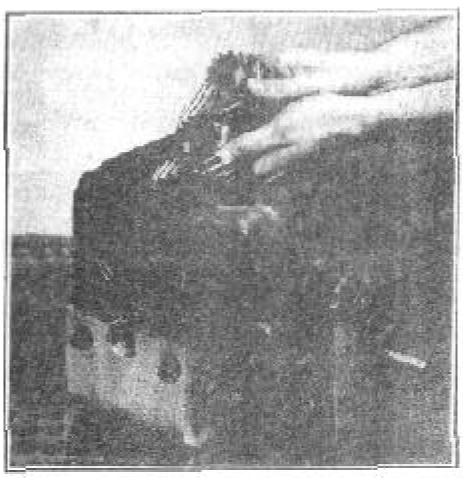


Figure 166
Removing Countershaft Gear Cluster

17. Remove countershaft gear cluster, one thick steel thrust washer and two bronze thrust washers through cover opening in case.

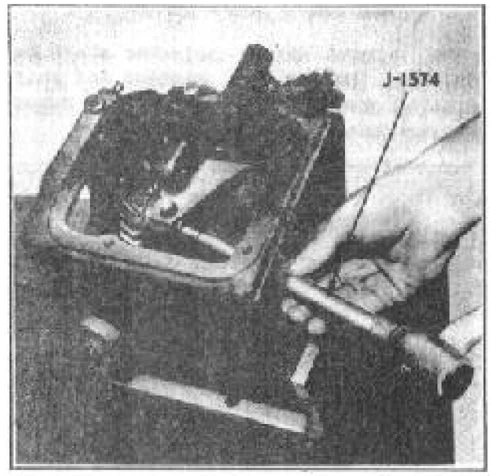


Figure 167
Driving Out Reverse Idler Shaft With
Driver J-1574

REMOVING REVERSE IDLER GEAR

18. Working through mainshaft bearing hole in front face of case, drive out reverse idler gear shaft (43) with Driver J-1574 as shown in Fig. 167. Removal of shaft will be facilitated by "backing-up" the rear face of the case adjacent to the idler shaft with a heavy bar or pipe while driving the shaft rearward. When shaft is driven all the way out, lift reverse idler gear from case.

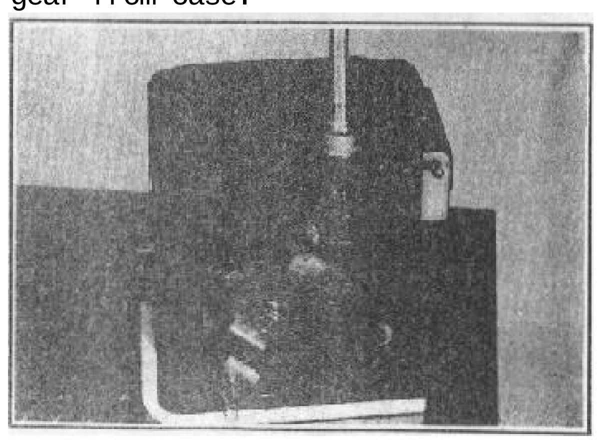


Figure 168
Removing Shift Selector Shaft Nut

REMOVING SELECTOR SHAFT AND SHIFT SHAFT LEVERS

19. Remove shift selector shaft nut (69) Fig. 156 and 168, washers, and shift selector outer lever (70). Also remove the set screw (68) Fig. 169.

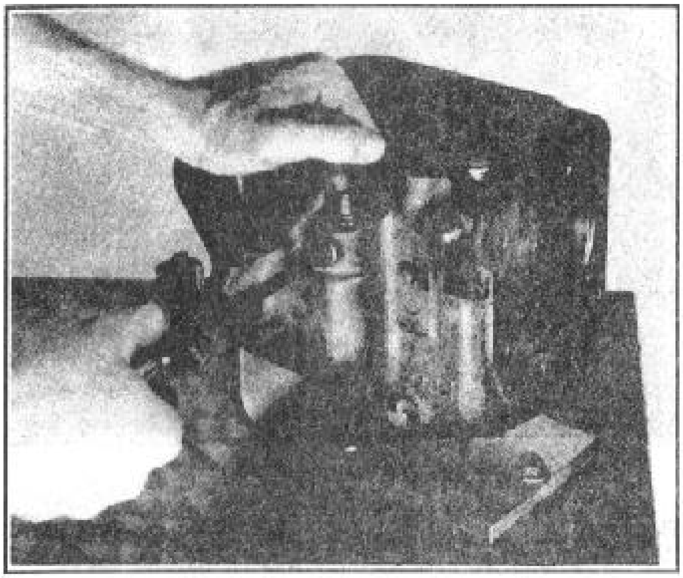


Figure 169
Removing Shift Selector Shaft Set Screw

20. Remove shift selector shaft (66) from inside of case. Remove steel bushing (67) by pulling upward see Fig. 170.

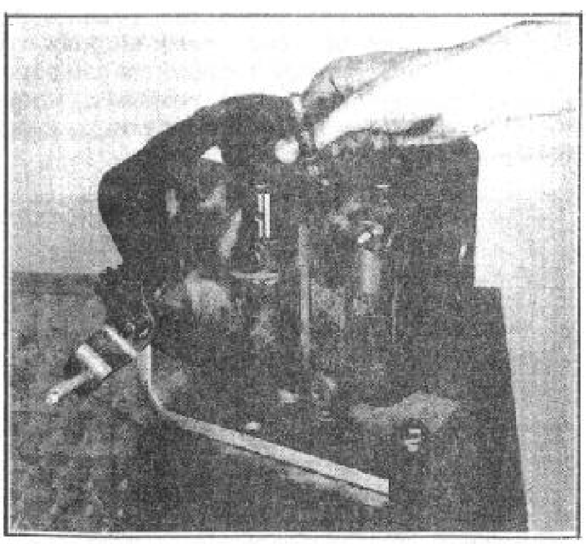


Figure 170
Removing Shift Selector Shaft and Shift Shaft Bearing

21. Remove shift shaft outer lever (63) after removing nut (65) and washers. Figs. 158 and 171.

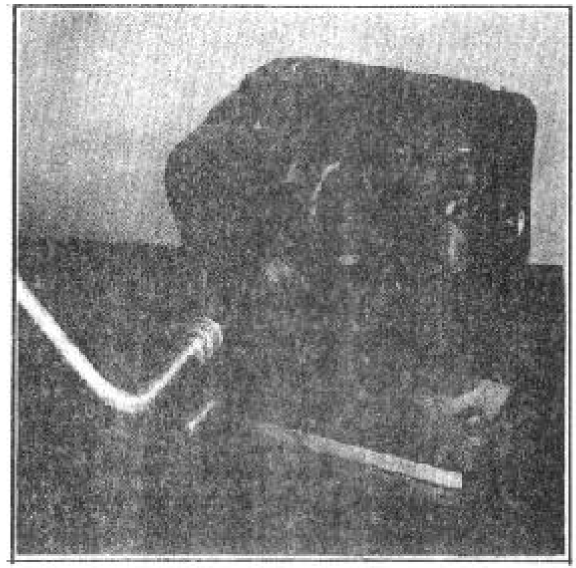


Figure 171
Removing Shift Shaft Cuter Lever

22. Remove shift shaft tapered pin (61) Figs. 158 and 172, with pin punch and then withdraw shift shaft (60) and shaft seal (64).

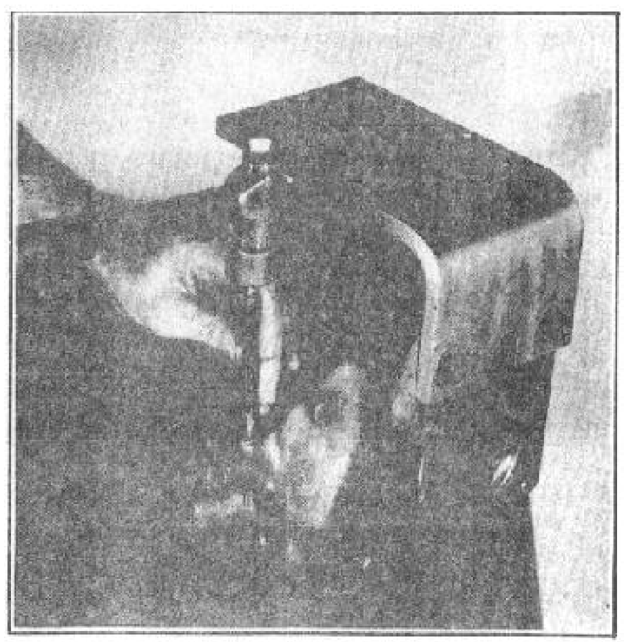


Figure 172
Removing Shift Shaft Tapered Pin

REPLACING MAIN DRIVE GEAR OIL SEAL

A Collection of transmission lubricant on the interior of the clutch bell housing and adjacent parts indicates the probability of a leaking main drive gear oil seal (14). Fig. 154.

This statement is based on the easily recognized difference in appearance and viscosity of the clutch compound (Hudsonite) or chassis grease which might collect in the bell housing as a result of clutch seal leakage or over-lubrication of the clutch throwout bearing.

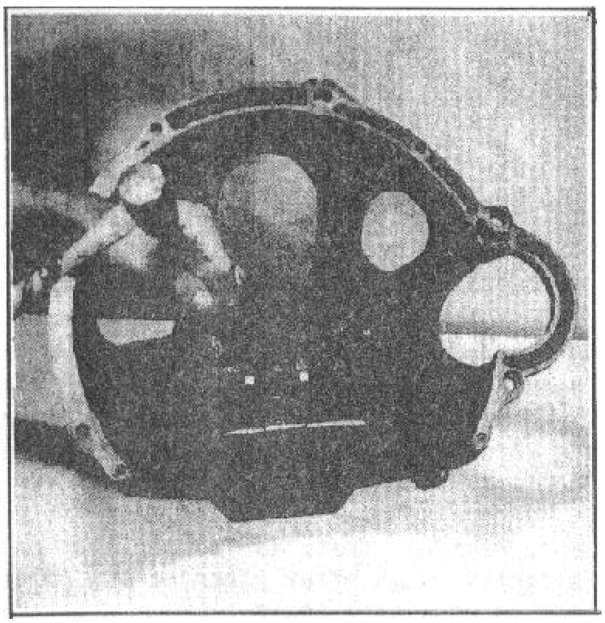
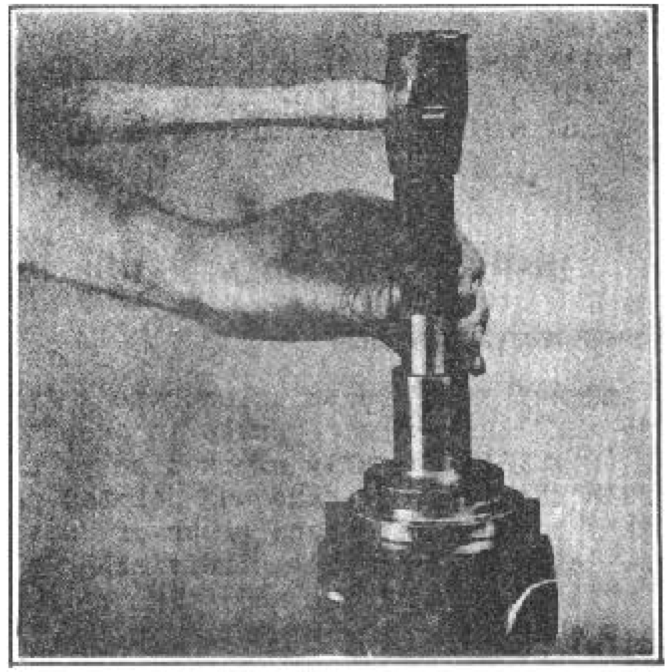


Figure 173
Removal of Gear Bearing Retainer

23. First step in removing oil seal is to remove the retainer (15) by bumping it rearwardly out of housing with a soft hammer Fig. 173.

24. With retainer removed from case, insert the two seal engaging jaws of Oil Seal Remover J-1576, one at a time between metal portion of seal and retainer. Place drift portion of remover between jaws and drive out seal assembly as shown in Fig, 174.



Fide 174
Removing Main Drive Gear Oil Seal Using Tool J-1576

25. Install new seal by pressing or driving into place with Tool J-1569 as shown in Fig. 175.

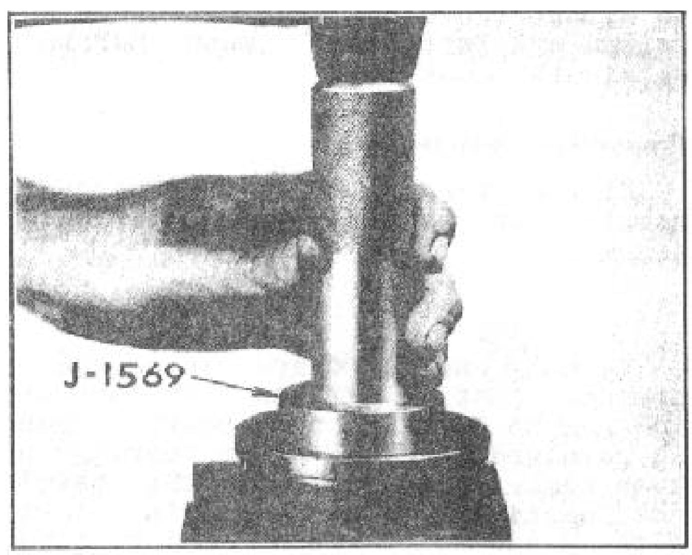


Figure 175
Replacing Main Drive Gear Oil Seal Using Tool 3-1569

26. Place new gasket (17) Fig. 153 on retainer and install retainer assembly to bell housing, being sure to match retainer locating pin (16) Figs. 153 and 154 with hole in clutch bell housing.

INSPECTION AND REPAIR

Transmission Case Breather

Inspect each transmission case to make sure that the two side holes in breather (50) Fig.154 are fully exposed below the inside roof of the case and pointed directly to the front and rear of case, parallel to shift rail. The single hole at bottom of breather and the two side holes should be unobstructed. If side holes are not fully exposed on inside of case, remove the breather and spot face the top of case at breather hole not to exceed case thickness of 3/8 inch. Reinstall the breather and check to see that side holes are fully exposed fore and aft, and that breather assembly is not choked up with dirt.

Cover Baffle

The baffle plate welded to the transmission cover should be so arranged as to almost touch the case boss when cover screws are installed. Bend baffle to obtain this position.

Transmission Ball Bearings

Dirt or foreign matter is present in nearly every bearing removed during disassembly.

In many cases, there IS enough dirt present that it affects the operation and can be felt in the bearing when it is revolved by hand. After bearings have been removed, 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.

Do not lay bearings down on a bench where dirt is liable to mix with the lubricant in the bearing. Wrap bearings in any dry, clean paper until they can be washed and re-lubricated and then inspect them thoroughly.

Bearings should be washed in clean gasoline or kerosene. Hang them on a wire and remove oil, grease or dirt by moving them back and forth in the cleaning fluid, keeping them off the bottom to prevent dirt being picked up. Blow out the bearings with clean, dry air. Allow the air to run a while to clear all dirt and moisture out of the line.

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 compressed air to spin the bearing. Lubricate the bearing with clean,. new engine oil, rotating the bearings by hand in order to spread the lubricant over all surfaces.

Inspect the bearing for cracks and defects. Revolve the bearing slowly by hand with enough pressure on the races to force the balls into their proper contact.

A bearing that is smooth or only slightly rough after cleaning and oiling can be used over again.

Transmission mainshaft bearings are built originally with end play and because they may feel quite loose, it does not necessarily indicate that they are worn and unfit for use.

Roughness, in most cases, is due to slight indentations in the races caused by steel chips scale or grit in the oil. These indentations seldom effect the life of the bearing unless the races are badly roughened up and when this is the case the bearing will still be very rough after cleaning and should be replaced.

COUNTERSHAFT GEAR CLUSTER ASSEMBLY

Inspect all gears on cluster for damaged teeth, presence of metal chips or raised metal on edge of nicks Remove any and all raised edges from teeth surfaces by hand stoning.

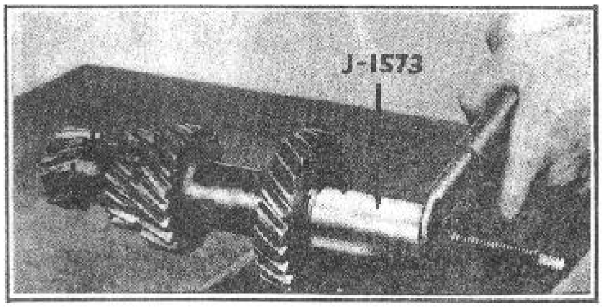


Figure 176
Removing Countershaft Gear Cluster Bushings With Tool J-1573

Recommended diametrical clearance between countershaft and bore of cluster bushings is 0.001" to 0.0025". Renew bushings if clearance is greater than 0.005". If bushings require replacement, place cluster in vise and thread tapered end of Bushing Puller J-1573 firmly into bushing. Assemble puller sleeve washer and nut on puller threads as shown in Fig. 176 and turn nut until bushing is extracted. Repeat the operation at opposite end of shaft on remaining bushing.

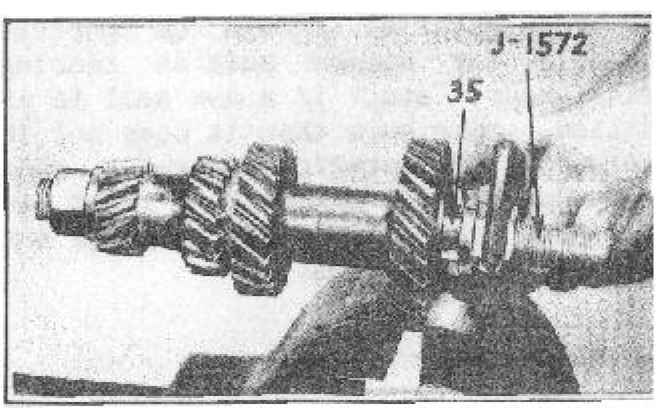


Figure 177
Installing Countershaft Gear Cluster Bushings With Tool j-1572

Place both bushings in position in gear cluster, being sure that annular groove in each bushing is nearest the adjacent end of shaft. Install Bushing Replacer J-1572 as shown in Fig. 177 and turn nut until both bushings are drawn into gear until they are flush with each end of gear thrust face.

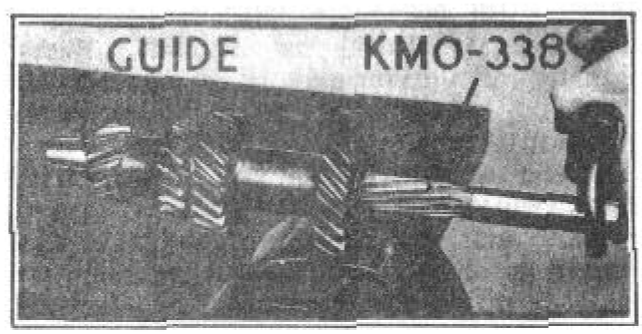


Figure 178
Reaming Countershaft Gear Cluster Bushings With Tool KMO-338

Insert loose pilot guide of Reamer KMO-338 in one end of gear cluster and ream bushing to 0.865" as shown in Fig. 178. Insert removable pilot bore of reamed bushings and ream remaining bushing from opposite end of gear.

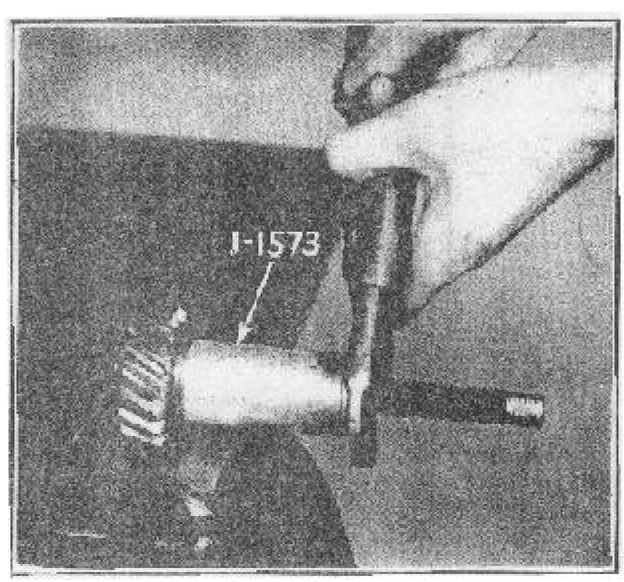


Figure 179
Removing Reverse Idler Gear Bushing With Puller J-1573

Reverse Idler Gear

Inspect gear for damaged teeth, presence of metal chips or raised metal on edge of nicks. Remove any and all raised edges from teeth surfaces by hand stoning.

Recommended diametrical clearance between idler shaft and bore of idler gear bushings in 0.001 to 0.00254. Renew bushing if clearance is in excess of 0.005". If bushing is to be replaced, place idler gear in vise and thread tapered end of Bushing Puller J-1573 firmly into bushing. Assemble puller sleeve, washer and nut on screw shaft in same manner as shown in Fig. 179, and turn nut until bushing is extracted.

Start new bushing into gear bore then pull into position with Bushing Replacer J-1572 in same manner as shown in Fig. 180.

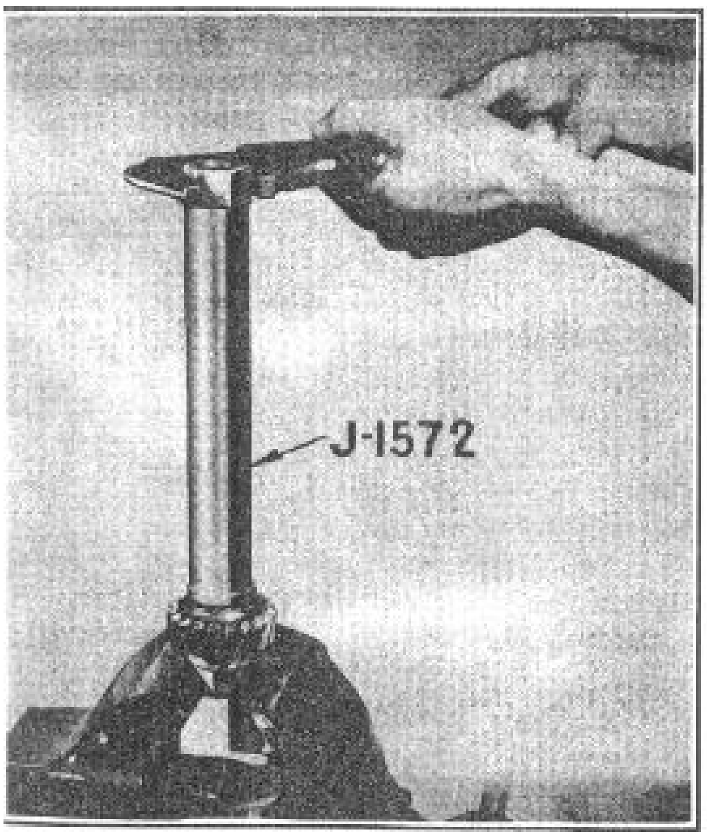


Figure 180
Installing Reverse Idler Gear Bushing
With Tool J-1572

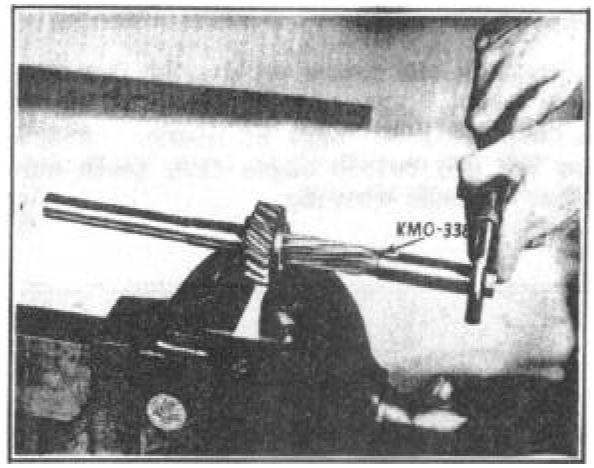


Figure 181
Reaming Bushing in Reverse Idler Gear

Ream bushing to 0.865" using Reamer KMO-338 as shown in Fig. 181.

Selector and Shift Shafts

Most of the components involved in the above shaft and lever systems can be checked for condition by normal visual inspection.

Recommended clearance between selector shaft (66) and bushing (67) Fig.154, is 0.001" to 0.0035", but clearance of twice this amount if not accompanied by oil leakage, is permissible.

The shift shaft seal of synthetic rubber type material should be inspected visually for damage such as tearing, brittleness, etc. If a new seal is installed, make sure that it does not interfere with rotation of shift shaft (60). Cutting off excess mold flash from seal with razor blade will usually correct any interference.

Gear Housing Seal

Visually inspect gear housing oil seal (54) for damage. If seal is hard, cracked or glazed or if signs of oil leakage are apparent at disassembly, install a new seal.

REASSEMBLY OF TRANSMISSION

Selector and Shift Shaft Levers

1. Make sure that transmission case is thoroughly clean inside and outside.

2. From inside the case, install shift selector shaft bushing (67) Fig. 170 into case. Apply a few drops of oil on shaft (66) then insert same in bushing. Install set screw (68) Fig. 169.

3. Place outer selector lever (70) Fig. 169 in position (pointing toward left of case), install plain washer, shakeproof washer and nut (69) and tighten securely.

4. Apply a few drops of oil to shift shaft, then insert in case and lock in position by installing the small lock pin as in Fig. 173. Install synthetic sealing washer (64), Fig. 154 outer shift lever (63), plain washer, shakeproof washer and nut (65) and tighten securely. If more than a slight drag is felt when rotating shaft (60), trim synthetic seal (64) at point of interference.

5. Install shift shaft inner lever (62) on the splined shift shaft (60) so that punch marks match.

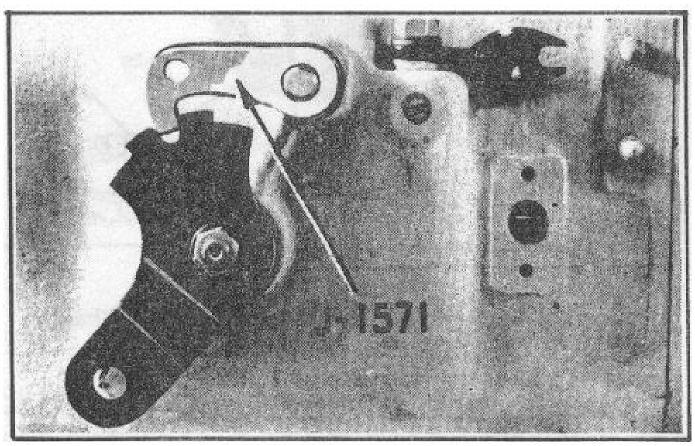


Figure 182
Indexing Tool 3-1571

NOTE: In the event these parts were not marked prior to removal, use indexing Tool J-1571 to position them correctly as shown in Fig. 132.

6. Install tool in drilled boss above lever and engage index finger in slot on lever. Then install inner lever (62) Fig. 154 in a true vertical position.

In the absence of Tool J-1571, the lever may be set to correct position as follows:

Move external lever (63) until center of slot in rim of same is aligned with center of front screw or screw hole (75) on top of transmission case. Install inner lever (62) in a true vertical position on shaft splines.

Reverse Idler and Gear Cluster

Place reverse idler gear (41) in position inside case after applying a few drops of oil to gear bushing. Insert one end of idler shaft and countershaft lock plate into slot in shaft. Sight through hole in lock plate and when same is centered over hole for lock screw (40) start reverse idler shaft into hole in case. Holding this position, bump shaft into case with soft hammer. When shaft is well started, apply a coat of red lead or other suitable sealer to exposed portion of shaft and drive shaft into final position with soft hammer.

Coat the two thin countershaft gear cluster thrust washers with viscous grease, then install on retaining pins (7) in case. Bronze surface of washer at each end of case should face in.

Install steel washer to rear face of cluster gear with lug on washer engaging slot in end of cluster. Apply oil to bushings in cluster gear then place cluster gear and steel washer unit into case being careful not to dislodge the thin thrust washers.

NOTE: Do not use thrust washers that are scored or worn. Use new washers in order to maintain proper clearances.

DO NOT install the countershaft at this time.

Main Drive Gear

After placing bearing (11) on main drive gear, with bearing ring toward front end of gear, drive bearing in place with Replacer J-1570 Fig. 183.

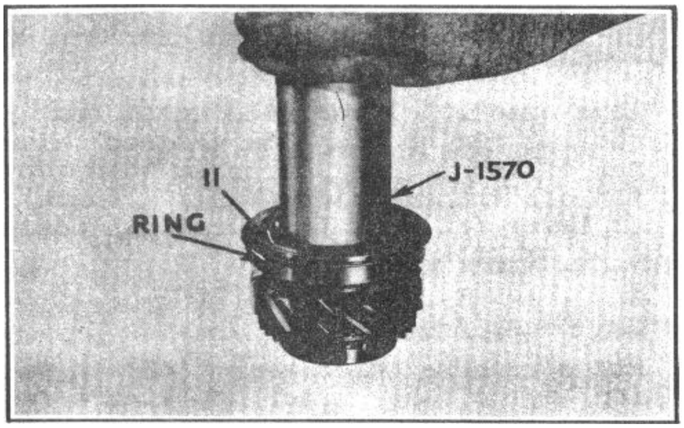


Figure 183
Pressing Main Drive Gear Bearing in Place With Tool J-1570

Insert main drive gear assembly minus the bearing outer race snap ring through covering opening into front opening of case. Bump towards front until bearing circumferential groove is exposed, then install snap ring into groove.

Apply coating of viscous grease to mainshaft pilot bearing recess in end of main drive gear. Insert the 16 individual rollers comprising the pilot bearing.

Main Shaft

Assemble the main shaft as follows:

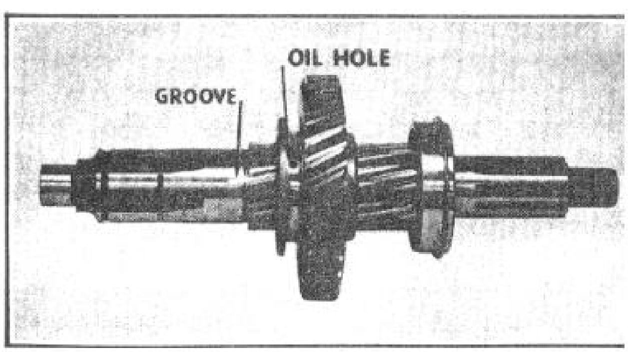


Figure 184
Lining Up Oil Hole in Low and Reverse Gear With Oil Groove In Main Shaft

1. Note that four of the helical splines are provided with an oil channel at the front end of the splines Fig.184. Install low reverse gear to shaft splines with oil holes in gear registered over shaft spline oil channels as shown. Shift fork flange on gear should be toward front of shaft.

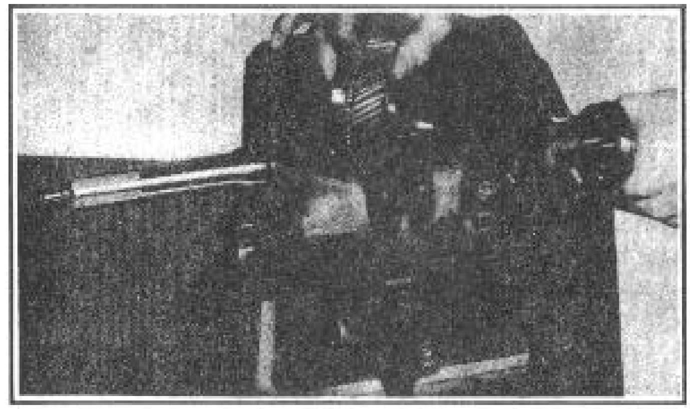


Figure 185
Intermediate Gear is Installed With Tapered Side of Hub Toward Front

2. Slide intermediate gear Fig. 185 over front end of shaft with ground tapered surface of same toward front of shaft.

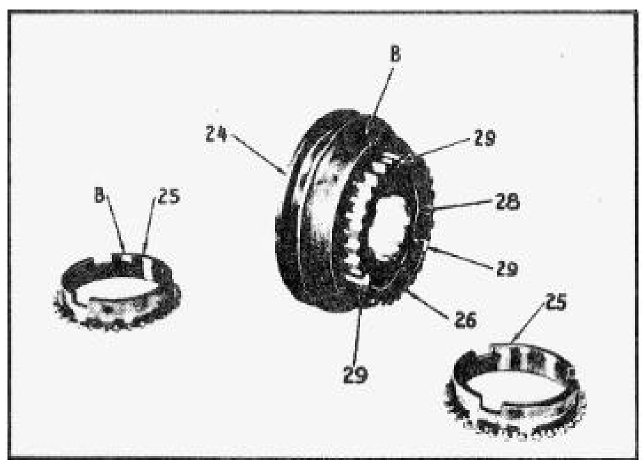


Figure 186
Countersunk Face of Synchronizer Shift Sleeve Hub Toward Rear

3. ASSEMBLY OF SYNCHRONIZER; Place the 3 synchronizer shift plates (29) Fig. 186, in the shift sleeve hub (26). Install the two synchronizer springs (28) so that one end of each spring rests in the same groove of shift plate (29) with the free ends running in opposite directions.

NOTE: DO NOT install mainshaft ball bearing at this time.

4. Assemble the synchronizer hub (26), plates (29) and springs (28) into shift sleeve (24). Undercut on hub and shifter fork groove in sleeve should point toward rear of transmission.

5. Assemble the two bronze synchronizer rings (25) to the shift sleeve hub (26) with the 3 plate end slots engaging the plates.

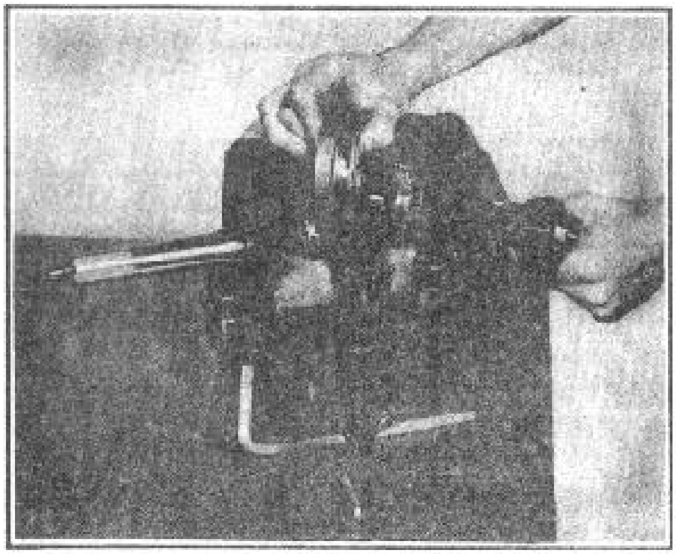


Figure 187
Installing Synchronizer Unit With Tapered Side of Sleeve Toward Front

6. Install synchronizer unit on main shaft with the tapered side of the shift sleeve (24) toward the front of the transmission Fig. 187.

7. Install synchronizer shift sleeve hub lock ring (27) on end of main shaft (18) using Pliers J-1575, as shown in Fig. 162. USE A NEW LOCK RING. No appreciable end play is permissible. The lock ring is available in only one thickness, 0.087" and must be carefully fitted into shaft groove.

Move synchronizer shift sleeve towards rear of mainshaft (2nd speed position) then carefully insert mainshaft into case. Carefully enter front end of main shaft into pilot bearing mounted in end of main drive gear.

Bump main drive gear rearward as far as it will go.

Install mainshaft bearing and snap ring assembly on end of main shaft with snap ring toward rear of transmission. Drive bearing on shaft using a piece of pipe or Replacer J-1570 that will contact only the INNER race of bearing.

Install speedometer gear (78) Fig. 153 to rear end of main shaft.

Install gear housing assembly (53) and new gasket to end of case. Refer to Fig. 157.

Install companion flange, being careful to prevent injury to the oil seal. Install plain washer (32) Fig. 154, and self-locking nut (31) which should be tightened to 90-100 foot pounds using a torque indicating wrench.

Bump main drive gear rearwards until bearing on gear is flush with front face of case. Move synchronizer shift sleeve (24) and low reverse sliding gear into neutral position. If assembly has been properly executed, it should be possible to rotate the mainshaft while holding the main drive gear (10) stationary.

Countershaft

Insert Countershaft Driver J-1574 into countershaft cluster gear through hole in front end of case. Raise cluster gear up into alignment and then insert beveled end of countershaft into case and cluster from rear end of case. Bump shaft forward with soft hammer and when it is within 1-1/2" of being fully entered, apply a coating of red lead or other suitable sealer to exposed portion. Make sure that shaft is turned to correct position for installation of lock plate (39) Fig. 160 and that thrust washer at front end is aligned with hole in case. Bump shaft all the way forward then install lock plate (39) and screw (40) Fig. 154.

Shifter Rails and Forks

Install the lighter tension shift rail lock ball spring (48) and lock ball into hole in case, Fig. 156.

NOTE: The 2nd and high lock spring which has a tension of 7 to 11 pounds at 11/16" is weaker than the first and reverse springs (79) parts numbers 163442 or 41236 and should not be interchanged. The latter springs have a "weight of 19 pounds and 30 pounds respectively at 11/16" and 13/16" respectively".

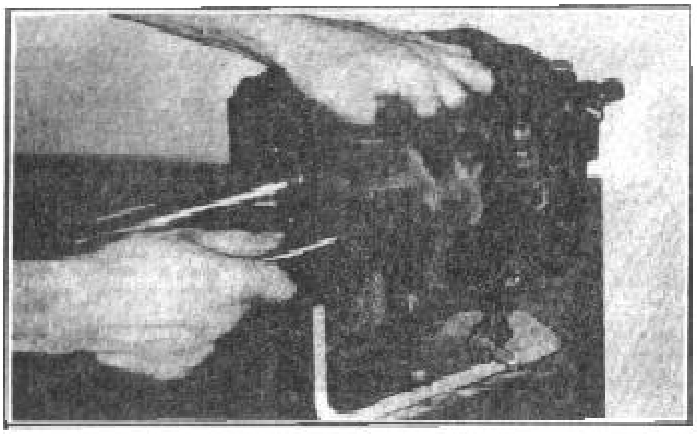


Figure 188
Installing High and 2nd Shift Rail in Position

Place 2nd and high shift for (49), Fig. 158, in groove of synchronizer shift sleeve and while holding in this position insert shift rail (45) into case through hole in fork. Center the hole in fork over notch in rail then install and tighten slotted set screw using a straight blade screw-driver as mentioned in the disassembly instructions. Install rail stop screw (60) Fig. 154, and lock washer.

NOTE: Screw (80) must not bottom on shift rail.

CAUTION: Make sure at this time that the previously installed inner shift lever (62) Fig.154, is correctly positioned. Check by moving external lever (63) until center of slot in rim of same is aligned with center of the front screw or screw hole (75) on top of transmission case. With external lever in this position, the inner shift lever should be standing in a true vertical position. If inner shift lever is not vertical at this time, remove the shifter fork and reset the inner lever before proceeding further.

Drop shift rail interlock plunger (46) Fig. 156, into hole in case.

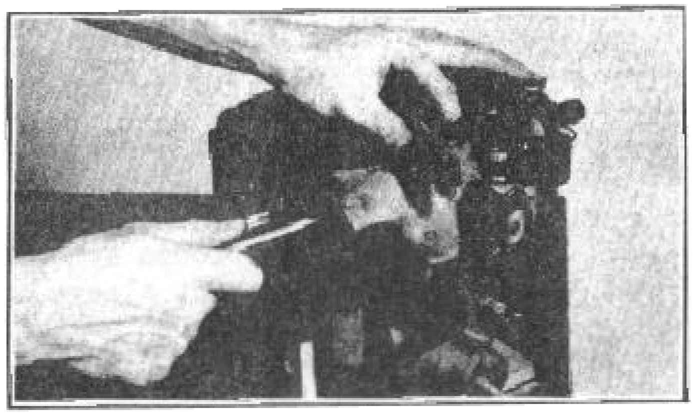


Figure 189
Installing Low and Reverse Shift Rail Into Position

Start the low and reverse shift rail (44) into case. Install shifter (52) in position shown in Figs. 189 and 154 and slide shift rail into shifter.

Place low and reverse shift fork (51) in groove of sliding gear (20) and slide shift rail through hole in fork and into hole at end of case.

Align hole in shifter (52) directly over notch in rail, then insert slotted head screw (26) and tighten securely with a straight blade screwdriver. Follow the same procedure on shift fork (51) and set screw (77), Fig. 158.

Shift transmission into all 4 gear positions successively and also into neutral.

If operation in all gears and neutral is satisfactory, install the remaining shift rail lock ball (47) and the heavier lock spring (79), Fig. 156.

Install transmission cover using new gasket.

Install clutch bell housing (9) Fig. 154, with new gasket to transmission case by means of cap screws and lock washers. Tighten each of the 6 capscrews to 40-45 pounds torque using an approved torque indicating wrench.

Install drain plug and insert 2-1/4 pounds of SAE 80 or 90 E.P. lubricant through filler plug opening. Install and tighten filler plug (3).

Installing to Engine

1. Before installing transmission to engine rear support plate, check cylinder block rear support plate very carefully for tightness and misalignment. This is especially important in cases where the car has been subject to chronic transmission trouble, noisy and jumping out of gear. Make a similar check of transmission clutch bell housing.

In lieu of highly precise equipment, use a steel straightedge to check steel rear support plate and a surface plate or other flat surface to check the front face of clutch bell housing. Both units should be flat and in plane within 0.005".

Be sure to check position of clutch driving plate and see that it is perfectly centralized within the clutch assembly. This can be done by using the J-449 aligning arbor 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 front end of the drive gear shaft and pilot bearing in the flywheel will be damaged.

2. Rotate clutch collar and throwout bearing to position for proper alignment with throwout yoke on transmission.

3. Tighten all rear engine support plate to block screws.

4. Bring the transmission assembly to position where the main drive gear (clutch shaft) is aligned with bore of clutch throwout collar, then carefully push transmission forward to enter drive gear splined shaft through grease retainer leather washer, splines of clutch driving plate and into pilot bearing in flywheel.

NOTE: During this operation the main drive gear must be relieved of all overhanging weight of the transmission until the bell housing engages the dowels on engine rear support plate. Before transmission assembly is moved up against rear support plate make a last inspection to verify that end face of throwout collar in clutch is properly aligned with throwout yoke on transmission and that oil seal lip has not turned under.

CAUTION: Alignment of bell housing with engine is controlled by the sleeve dowel in the upper left location of the bell housing attaching bolt circle and by the dowel bolt at the lower right location viewed from rear of car. Make sure that the former is in place and entered in bell housing hole before tightening bolts. Install lower right bolt (dowel bolt) first. NEVER grind or otherwise reduce the diameter of the dowel bolt to facilitate installation.

5. Install remaining clutch bell housing bolts and screws and tighten with a torque wrench to 40-45 foot pounds.

6. Complete remainder of installation by reversing the order of removal of the remaining parts.

SERVICING THE TRANSMISSION

Hard Shifting

Difficult gear shifting, especially into second gear, is often caused by the improper adjustment of the cross shift control wire or by looseness of the cable anchor clip which secures it to the bell housing. This results in insufficient movement being imparted to the transmission inner shift shaft lever to allow it to fully engage the shift forks. In cases of hard shifting the "Handy Shift" lever and cross shift control cable should be adjusted if necessary as follows:

a. Place Handy Shift Control Lever Fig. 204 in the extreme upper position.

b. Loosen control wire casing anchor bracket bolt. Pull upper anchor bracket (18) up until all slack is out of casing and the shift shaft inner lever is fully over into the low and reverse shifter. (Check this in transmission). Tighten anchor bracket bolt (35) Fig. 204. The control wire anchor should have clearance at top and bottom.

NOTE: Check shift selector lever (26) Fig. 204, to which cross shift control wire is attached, to be sure the lever is tight on its shaft. Check bracket (19) to be sure it is tight on the transmission case.

Increased viscosity of the transmission lubricant during cold weather is another factor to be considered when dealing with hard shifting, as the thickening of the lubricant is apt to interfere with the action of the synchronizing mechanism. During cold weather operating it is recommended that the lubricant be thinned by the addition of kerosene' when hard shifting is encountered. Add approximately 2 ounces of kerosene after draining a like quantity of lubricant.

c. The "Handy Shift" control should be inspected and if the gear control lever (1) Fig. 204, is not in a true crosswise position when in neutral, it should be adjusted by removing the cotter pin and clevis pin at the front end of the control tube to transmission rod (27). Loosen lock nut (32) and turn clevis (33) in the rod. When properly adjusted (transmission in neutral and Handy Shift control lever exactly crosswise), the clevis pin hole in the clevis (33) will line up with the hole in lever (34).

Jumping Out of Gear

Jumping out of gear is likely to be caused by one of the following conditions:

1. Misalignment of the transmission with the engine (chips, dirt, buckled gasket) between the clutch bell housing and transmission may cause jumping out of high gear

2. Engine mountings improperly adjusted may cause jumping, out of high gear.

3. Mainshaft or countershaft end play if excessive, might cause jumping out of high or second.

4. Synchronizing unit worn or damaged.

5. Loose fitting bearings or bushings.

6. Failure to move gearshift lever far enough to complete engagement.

7. Low and reverse shift rail lock ball spring lacks sufficient tension (should have 19 pound load).

8. If transmission has jumped out of gear many times while under load, it may be necessary to replace the mating parts because the gear teeth may have become beveled.

Noise may occur in neutral or in any one or more speeds. Some gear noise is to be expected in all except high speed. Trace the gears that are under load and examine them for damage, checking the bearings and amount of end play. Noise in neutral in the form of a constant regular click indicates a nicked gear or bearing.

End play on countershaft to be not less than 0.006" nor more than 0.016". If a check shows end play of more than 0.016" it indicates worn thrust washers that should be replaced. End play on mainshaft intermediate gear and synchronizer shift sleeve to be from 0.003" to 0.016" and if more than 0.016" it indicates a worn synchronizer shift sleeve hub lock ring that needs replacing. End play on the reverse Idler gear is from 0.003" to 0.010" and any end play in excess of 0.010" requires replacement of the gear.

TRANSMISSION

YEAR 1937 THRU 1940

SPECIFICATIONS

Gear Ratio

2.42 to 1	Low
1.61 to 1	Second
1 to 1	High
2.99 to 1	Reverse

Teeth

Reverse Gear - Sliding	17 Teeth
Stationary	21 Teeth
Main Drive Gear	19 Teeth
Countershaft Gear Cluster	
Countershaft Drive Gear	23 Teeth
Intermediate Gear	18 Teeth
Low and Reverse	15 Teeth
Mainshaft	
Sliding Low & Reverse Gear	30 Teeth
Sliding Intermediate Gear	24 Teeth

End Play

Countershaft	.005" to .009"
Mainshaft	.008" to .012"
Mainshaft Intermediate Gear	.006" to .014"

Speedometer Gears

Drive Gear	Pinion	Axle Ratio	Tire Sizes
5	15	4-1/9-1	6.25x16-5.50x16 6.00x16
6	20	4-5/9-1	5.25x17-5.50x17 6.00x16-6.50x16
3	11	4-7/8-1	6.00x16-7.00x15 6.25x16-5.50x16

Bearings and Bushings

Main Drive Gear	Ball
Mainshaft Pilot	Needle Roller
Mainshaft Rear	Ball
Reverse Gear	Steel Back Babbitt
Countershaft	Steel Back Babbitt

LUBRICANT

Capacity of transmission is three pints or pounds.

Viscosity -	Summer	S.A.E. 90 E.P.
	Winter	S.A.E. 80 E.P.

Construction

The transmission, Fig. 190, is of compact design, incorporating helical cut alloy steel gears in second and high gear positions. Spur gears are used in low and reverse positions.

External shift rail locks are provided to prevent gears from demeshing while in operation.

The rear end of the main drive gear (6) is carried on a ball bearing (8) at the front end of the transmission case and is piloted at its forward end in a ball bearing (7) mounted in the engine fly-wheel. The front end of the splined mainshaft is piloted in a needle roller bearing (12) set into the hollow end of the main drive gear and the opposite end is carried by a ball bearing (14) mounted in the rear wall of the transmission case. The end thrust between the shafts is taken by the seven steel balls running in races machined in the end of the shafts (11) Fig. 190.

End play in the main drive gear and main shaft is adjusted by selection of the shim pack located between the front face of the transmission case and the main drive gear bearing retainer (4).

The main drive gear bearing is a press fit on the main drive gear and a light push fit in bearing retainer (4).

Leakage of lubricant from the transmis-sion into the clutch housing via the main drive gear (6) is prevented by the oil seal (9) mounted in the main drive gear bearing retainer (4).

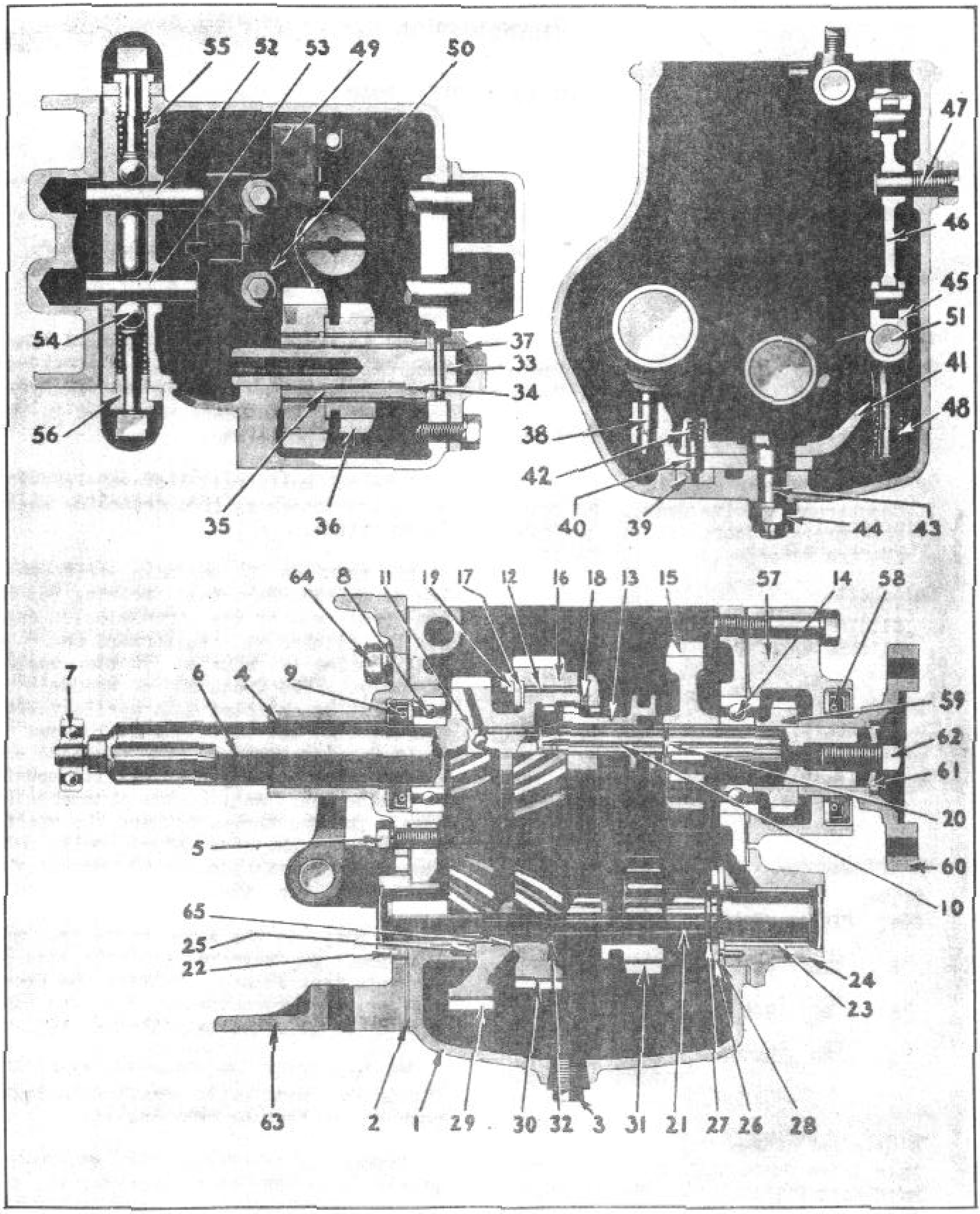


Figure 190
Transmission Assembly

1. Transmission Case
2. Transmission Case Gasket
3. Drain Plug
4. Main Drive Gear Bearing Retainer
5. Main Drive Gear Bearing Retainer Screw
6. Main Drive Gear Assembly
7. Main Drive Gear Pilot Bearing
8. Main Drive Gear Bearing
9. Main Drive Gear Bearing Oil Seal
10. Mainshaft Assembly
11. Mainshaft Thrust Ball Seat
12. Mainshaft Needle Roller
13. Mainshaft Second and High Shift Sleeve
14. Mainshaft Bearing
15. Mainshaft Low and Reverse Gear
16. Mainshaft Intermediate Gear Assembly
17. Mainshaft Intermediate Gear Thrust Washer (front)
18. Mainshaft Intermediate Gear Thrust Washer (rear)
19. Mainshaft Intermediate Gear Thrust Washer Retainer
20. Mainshaft Low and Reverse Gear Retainer
21. Countershaft
22. Countershaft Bushing (front)
23. Countershaft Bushing (rear)
24. Countershaft Cap Assembly (rear)
25. Countershaft Drive Gear Thrust Washer Assembly (front)
26. Countershaft Thrust Washer (rear)
27. Countershaft Thrust Washer Retainer
28. Countershaft Thrust Washer (spacer)
29. Countershaft Drive Gear
30. Countershaft Intermediate Gear
31. Countershaft Low and Reverse Gear
32. Countershaft Intermediate Gear Retainer
33. Reverse Gear Shaft (Stationary)
34. Reverse Gear Shaft (Rotating) Bushing
35. Reverse Gear (Stationary) Retainer
36. Reverse Gear (Sliding)
37. Reverse Gear Shaft Cap
38. Reverse Gear Shifter
39. Reverse Gear Shift Lever Locater Seat
40. Reverse Gear Shifter Lever Locater Pin
41. Reverse Gear Shifter Pick-Up Lever
42. Reverse Gear Shifter Pick-Up Lever Plunger Spring
43. Reverse Gear Shifter Lever Fulcrum
44. Reverse Gear Shifter Lever Fulcrum Nut
45. Low and Reverse Shifter Fork Assembly
46. Low and Reverse Shifter Intermediate Lever
47. Low and Reverse Shifter Intermediate Lever Stud
48. Low and Reverse Shifter Fork Spring
49. Low and Reverse Shifter Assembly
50. Second and High Shifter Fork
51. Low and Reverse Shifter Fork Shaft
52. Low and Reverse Shift Rail
53. Second and High Shift Rail
54. Lock Ball
55. Lock Ball Spring
56. Lock Ball Spring Cap
57. Speedometer Gear Housing
58. Speedometer Gear Housing (Oil Seal)
59. Speedometer Gear
60. Companion Flange
61. Companion Flange Screw Washer
62. Companion Flange Screw
63. Clutch Housing Assembly
64. Clutch Housing to Transmission Case Bolt
65. Countershaft Intermediate Gear Retainer

Fore and aft positioning of the mainshaft is taken care of in the same manner as the main drive gear. The mainshaft bearing (14) is a press fit on the mainshaft (10) and a light push fit in the transmission case. Oil leakage past the universal companion flange hub is prevented by the oil seal (58) mounted in the speedometer gear housing (57) Fig. 190.

The companion flange screw (62) must be kept tight as it is depended upon to hold the mainshaft low and reverse gear, mainshaft bearing and speedometer drive gear in the correct position on the shaft.

CAUTION: At no time should mainshaft or main drive gear be pounded on end when assembling or checking end play.

The countershaft is carried on two steel backed babbitt bushings (22 and 23) while the thrust is taken on bronze and steel thrust washers (25,26 and 28) against the front and rear of the case. End play is adjusted by the selection of the shim pack between the rear face of the transmission case and the rear bearing cap (24), Fig. 190.

A positive locking device is fitted to both transmission shifting rails and operated by the clutch linkage, Fig. 191. When the clutch is engaged, the shifter ball, (77) as shown on Fig. 191, is locked in the shifting rail notch. When the clutch pedal is depressed, the lock rod (78) moves up so that the notch is in line with the end of the lock plunger (79) and the ball (77) is held in the rail notch by the pressure of the spring (80) only. The links (81) should be adjusted so that the notch in the rod is below the plunger (79) when the clutch is engaged. When the clutch pedal is depressed halfway, the rod should have moved upward far enough to bring the notch in line with the plunger so that the shift can be made.

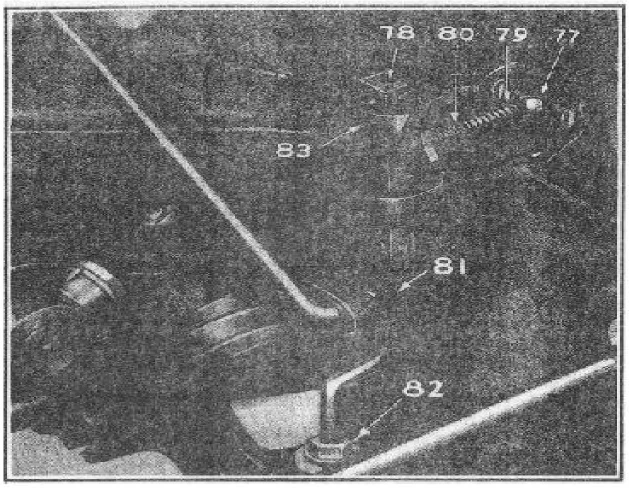


Figure 191
Transmission Interlocking Device

DISASSEMBLY OF TRANSMISSION

1. Remove the capscrews holding the transmission cover to the case and remove hand control bars and cover as an assembly.

2. Remove the hex nut from the bottom of connecting link (81) of the high and intermediate and low and reverse shift rail locking device and remove links (81) and rail lock rods (78).

3. Remove the six screws (64) Fig. 190 that hold clutch bell housing to transmission case.

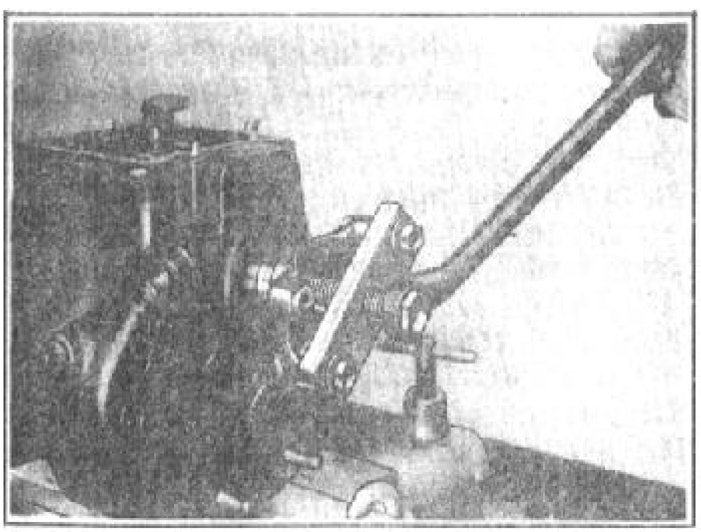


Figure 192
Removing Companion Flange Using J-820 Companion Flange Puller

4. Remove drain plug (3) at bottom of case and allow old lubricant to drain.

5. Remove universal joint companion flange capscrew and companion flange from mainshaft. If flange is tight on mainshaft use Companion Flange Puller J-820 Fig. 192.

6. Remove speedometer gear housing capscrews and speedometer gear housing (57) Fig. 190. Remove speedometer drive gear (59).

7. Remove low and reverse and high and intermediate lock ball spring caps (56), lock ball springs (55), lock balls (54), lock plungers (79) Fig. 191 and shift rail lock rod guides (83) Fig. 191.

8. Remove low and reverse and high and intermediate shifter lock screws(50) Fig. 190 and remove shift rails (52 and 53) and shifter forks (45 and 49).

9. Remove three capscrews (5) securing main drive gear bearing retainer (4) to case, by bumping it rearwardly out of the housing with a soft hammer.

10. To remove mainshaft (10) and main drive gear assembly (6), drive mainshaft low and reverse gear (15) backward on mainshaft far enough to allow removal of the split lock ring (20), using Transmission Gear Drift J-786.

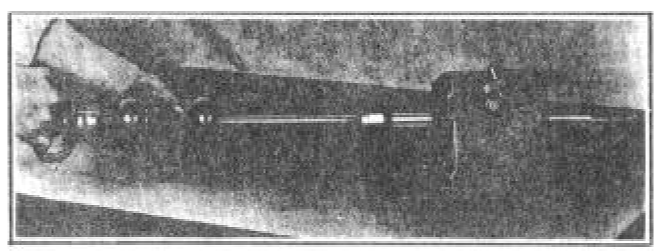


Figure 193
Removing Mainshaft and Rear Bearing Using Adapter Tool J-778 and Puller 3-352

11. Remove mainshaft (10) and main--shaft rear bearing (14) from transmission case using Shaft Puller J-352 and Adapter J-778 Fig. 193,

12. Remove mainshaft low and reverse gear (15) Fig. 190 and second and high shift sleeve (13) through cover opening of case.

13. Remove mainshaft drive gear assembly (6) through cover opening of case.

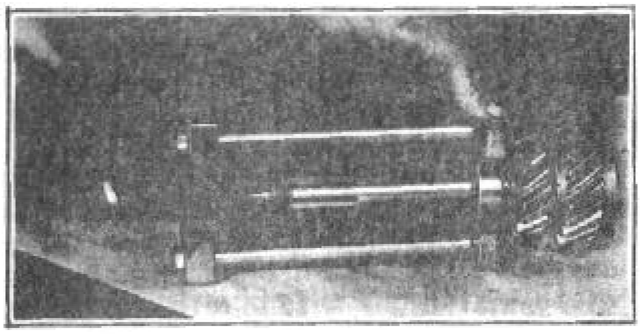


Figure 194
Removing Main Drive Gear Bearing Using Puller S-782

14. Remove main drive gear ball bearing from gear using Bearing Puller J-782 as shown in Fig. 194.

REMOVING MAINSHAFT DRIVE AND INTERMEDIATE GEARS

15. Remove the seven mainshaft thrust balls and the 26 mainshaft needle rollers,

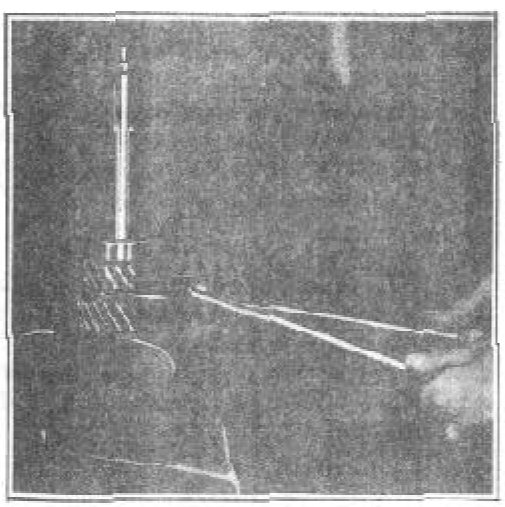


Figure 195
Removing mainshaft Intermediate Gear Retainer Using Tool j-448-1

Fig. 190. Using Lock Ring Retainer Remover J-448-1, insert one jaw through the opening milled in the gear, gripping the lock or retaining ring (19) and placing the opposite jaw just above the lock ring as shown in Fig. 195. Compress the lock ring remover and lift one side of the lock ring out of the groove; then with a blunt punch, tap the other side of the lock ring and the ring will snap out. Complete disassembly operation by removing intermediate gear and front and rear thrust washers (17 and 18), Fig. 190.

REMOVING REVERSE GEARS

16. Remove the two reverse gear shaft screws and withdraw the cap (37) and shaft (33). This will permit lifting the rotating shaft and gear assembly out of case.

The stationary gear and rotating shaft are pressed together and finish ground in assembly and cannot be serviced except as an assembly.

REMOVING COUNTERSHAFT

17. Remove capscrews holding countershaft rear bearing (23) and cap (24) to transmission case. This will permit removal of the cap (24), thrust washer (26) and spacer (28).

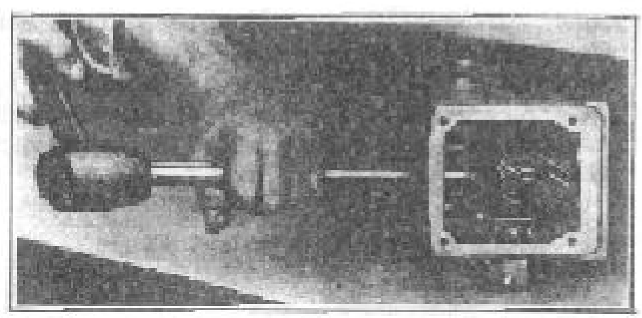


Figure 196
Removing Countershaft Gears Using Drift J-786

18. Insert the beveled edge of the Transmission Gear Drift J-786 between the countershaft drive gear (29) and the countershaft intermediate gear (30) and separate the gears. The countershaft (21) should be forced back out of the splines of the countershaft drive gear (29). The countershaft should be turned slightly so that the splines of the shaft butt against the splines of the drive gear.

19. Insert Gear Drift J-786 through mainshaft rear bearing hole in transmission case and drive countershaft intermediate gear forward, placing the brass end of the drift against the gear hub as shown in Fig. 196. (Do not drive the gear entirely off the shaft).

20. With the low and reverse shifter lever in reverse position, move the countershaft to one side far enough to move shifter lever to neutral position. Holding the three countershaft gears together, remove the countershaft through the rear end of the transmission.

21. Remove the low and reverse intermediate lever stud (47) and take out lever (46), Fig. 190.

22. Remove the small Allen set screw from the right hand side of transmission case and drive low and reverse shifter for shaft (51) out of transmission case.

23. Remove cotter pin and castellated nut (44) from bottom of transmission case; this will permit removal of the reverse gear shifter lever fulcrum (43), reverse gear shifter pickup lever (41), reverse gear shifter lever, reverse gear shifter (38), locator pin (40), pickup plunger and plunger spring (42).

INSPECTION AND REPAIR

Transmission Case and Bearings

1. Thoroughly clean transmission case determining that the case is free from steel chips, dirt and scale.

Dirt or foreign matter is present in nearly every bearing removed during disassembly.

In many cases, there is enough dirt present that it affects the operation and can be felt in the bearing when it is slowly revolved by hand.

CAUTION: Do not spin bearings at any time.

2. Wash bearings in clean gasoline or kerosene, dry bearings thoroughly, inspect for cracks and undue looseness, then lubricate with a light engine oil. Rotate bearing by hand in order to spread lubricant over all bearing surfaces.

NOTE: Transmission mainshaft bearings are built originally with end play and because they may feel quite loose, it does not necessarily indicate that the bearings are worn and unfit for use.

Countershaft and Gear

3. Inspect all gears removed from countershaft, for damaged teeth, presence of metal chips or raised metal on edge of nicks. Remove any and all raised edges from teeth or spline surfaces by hand stoning.

Recommended diametrical clearance between countershaft and countershaft bushings is 0.0015" to 0.0035". Renew bushings if clearance is greater than 0.005".

4. If renewal of countershaft bushing is necessary, the old bushings should be driven out with Bushing Remover J-450 and the new bushings replaced with Bushing Replacer J-780 as shown in Fig. 197.

5. After installation of new bushings they should be line-reamed to exact size and alignment as shown in Fig. 198, using Countershaft Bushing Line Reamer J-466.

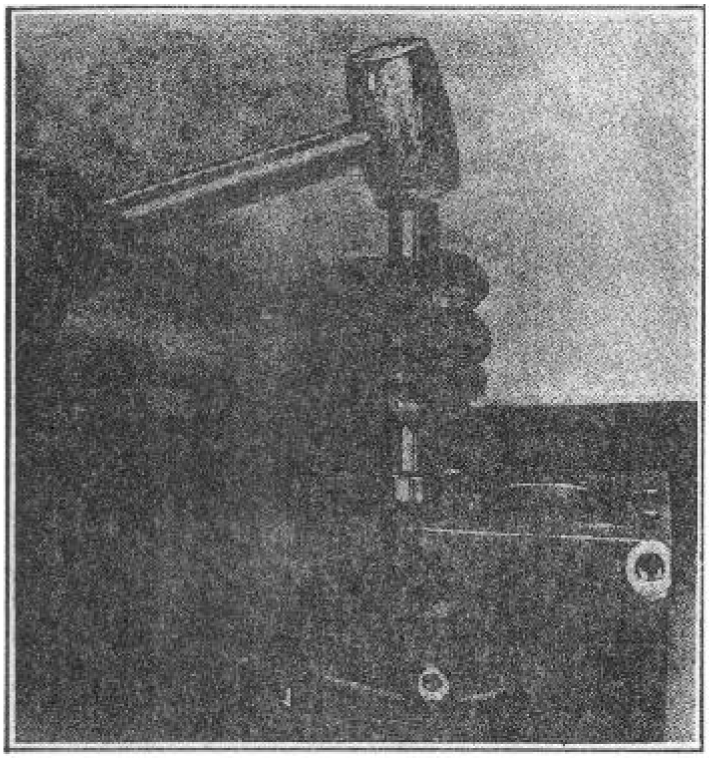


Figure 197
Removing and Replacing Countershaft Bushings with J-450 Bushing Drive and J-780 Bushing Replacer

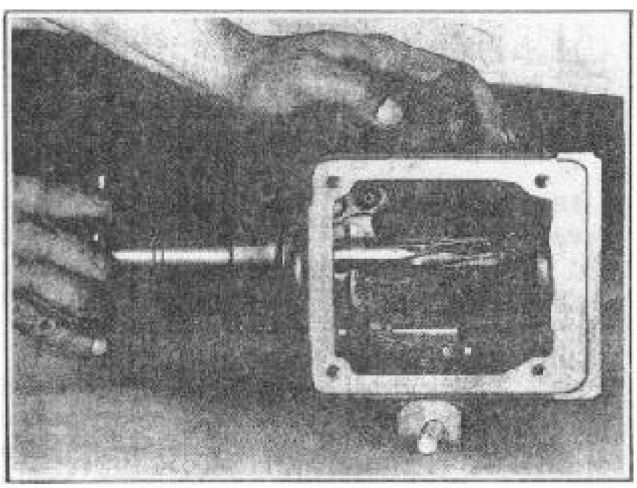


Figure 198
Reaming Countershaft Bushings Using 3-468 Countershaft Bushing Line Reamer

When reaming the front bushing, insert the reamer through the countershaft rear bearing cap, bolt cap in place and enter pilot of reamer in front bushing. In reaming the rear bushing, the reamer is passed through the front bushing and is piloted in the rear bushing cap which is bolted in position.

6. Install expansion plugs in front bushing and rear bushing cap, and remove rear bushing cap from case.

Reverse Gears

7. Inspect gears for damaged teeth, raised metal on edge of nicks. Remove any and all raised edges from teeth surfaces by hand stoning.

Recommended diametrical clearance between idler shaft and bore of idler gear bushing is 0.002" to 0.0035". Renew bushing if clearance is in excess of 0.006".

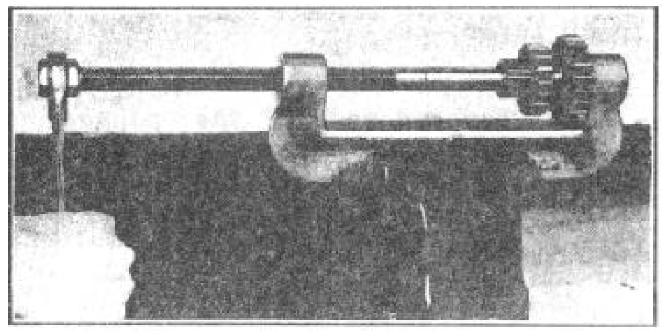


Figure 199
Removing Reverse Gear Bushings Using 3-488 Bushing Press and Adapters

8. When replacing bushings (34) in the reverse gear rotating shaft assembly, the old bushings should be removed and new bushings installed using Hand Bushing Press J-488, as shown in Figs. 199 and 200. The necessary adaptors are furnished with this press to press out the old bushings and to press the new bushings in place - these bushings are furnished to size so that no reaming is necessary.

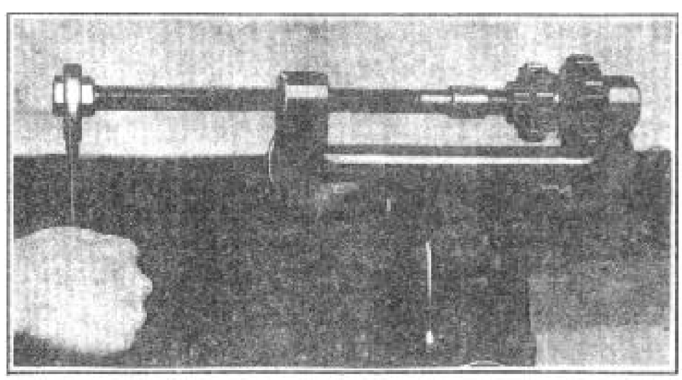


Figure 200
Installing Reverse Gear Bushings Using J-488 Bushing Press and Adapter

REASSEMBLY OF TRANSMISSION

Reverse Gear Shifter

1. Make sure that the transmission case is thoroughly clean inside and outside.

2. Place the reverse gear shifter lever and the reverse gear shifter pickup lever (41) Fig. 190, together in their proper positions with the plunger and the plunger spring (42) in the shifter lever, and the locator pin (40) in the lower lever.

The beveled ends of the plunger and locator pins must point to the bottom of the case and in order to insure easy shifting, they must be highly polished, Pee from nicks and not worn.

3. These parts as a group are then placed in the bottom of the transmission case and assembled by inserting the fulcrum (43) through the levers and the case and assembled with the copper gasket under the fulcrum Nut (44).

4. Install reverse gear shifter (38) in lever.

5. Install low and reverse shifter fork shaft (51) in case and assemble low and reverse shifter fork assembly (49). Lock shaft securely in position with Allen set screw, using wrench J-785.

6. Install low and reverse intermediate lever (46) and stud (47), and draw up stud nut securely. BE SURE to place a copper washer under the stud nut.

Countershaft

7. Install countershaft thrust washer retainer (27) on countershaft using Tool J-781 as shown in Fig. 201.

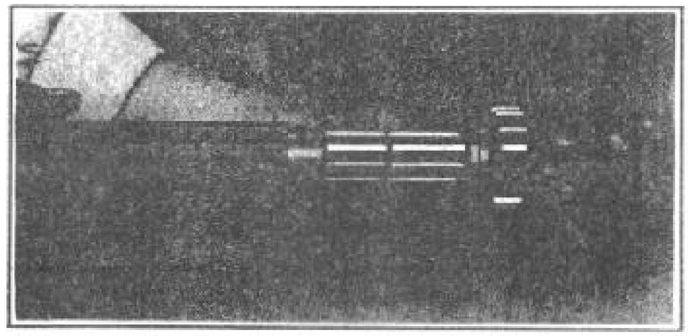


Figure 201
Installing Thrust Washer Retainer Using J-781 Countershaft Retainer Ring Replacer

8. Assemble countershaft low and reverse gear (31) in correct position, Fig. 190.

9. Install countershaft intermediate gear retainer (32) on countershaft using Tool J-781, Fig. 201.

10. Install countershaft intermediate gear (30) Fig. 190, on countershaft so that front end of gear will be flush with edge of countershaft spline.

11. Place countershaft drive gear (29) and countershaft front thrust washer (25) in their correct relation over the front end of the countershaft.

12. Place low and reverse shifter lever in neutral position (straight-up) and the three countershaft gears held together, install assembly in transmission case.

13. Shift low and reverse shifter into reverse position moving to the front of the case and entering countershaft low and reverse gear (31) into low and reverse shifter (49).

14. Align countershaft drive gear so that countershaft splines are entered in the hub, then drive countershaft forward until the intermediate gear hub (30) is over the retaining ring (32).

15. Install spacer (26) on rear end of countershaft with oil groove facing rear, place bronze thrust washer on front end of rear bushing cap.

16. Install cap and thrust washer in position, placing a sufficient quantity of shims between the countershaft rear bearing cap and the case to allow an end play of 0.005a to .009". See that the countershaft cap gasket is in good condition and draw the capscrews up tightly.

Reverse Idler Gear

17. Install sliding gear (36) onto the rotating shaft with shifting fork collar to the front of case.

18. Install reverse rotating shaft stationary gear assembly and gear (36) in transmission case, entering the sliding gear collar on the reverse gear shifter (38).

19. Assemble stationary shaft (33) in reverse gear shaft cap (37) securing the shaft in the cap with a dowel pin, then install the shaft, gasket and cap as an assembly in case, secure with capscrews.

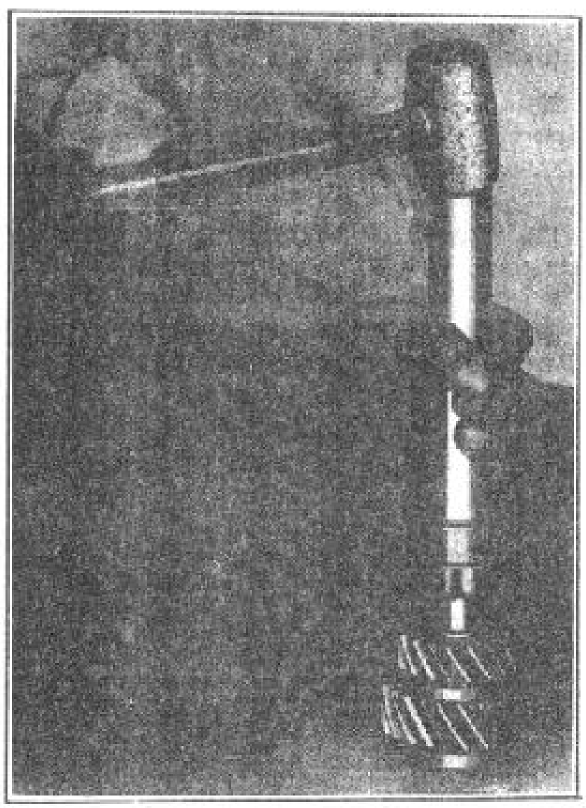


Figure 202
Installing Main Drive Gear Bearing Using Installing Tool J-779

Mainshaft, Drive and Intermediate Gears

20. Install main drive ball bearing (8) on maindrive gear (6) using Bearing Installing Tool J-779 as shown in Fig. 202.

21. Install mainshaft needle roller retaining using ring Tool J-780.

22. Install mainshaft intermediate gear rear (bakelite) thrust washer (18), Fig. 190 in gear (16).

23. Assemble mainshaft intermediate gear (16) to the main drive gear (6).

24. Install intermediate gear thrust washer retainer (19) on main drive gear (6) ahead of bearing journal.
6. Enter rear end of main drive gear into intermediate gear and install the front thrust washer (17) (split) with the BABBITT face downward.

When, because of excessive wear or for other reasons, rebushing of the mainshaft intermediate gear becomes necessary, only a new gear assembly or factory reconditioned part should be used. A special steel-backed babbitt bushing is used at this point which is diamond-bored by special machinery to insure the accuracy necessary for quiet operation and long life.

26. Center retainer (19) so that the gap in the ring will be exactly a quarter turn away from the slots or openings in the intermediate gear.

27. Using Snap Ring Installer J-448-5 Fig. 203, force the retainer (19) into the groove.

28. Install the seven thrust balls and the 26 needle rollers (12), Fig. 190 packing with cup grease to hold them in place while assembling in transmission.

29. Insert main drive gear assembly through opening in top of case.

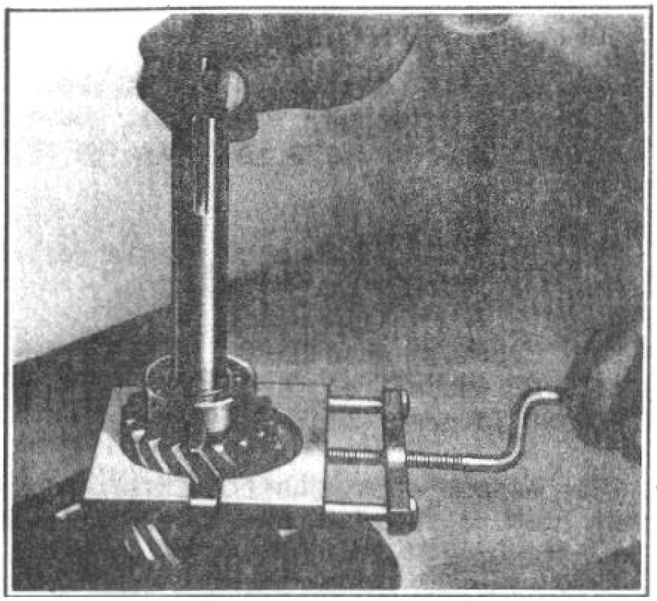


Figure 203
Installing Mainshaft Intermediate Gear Thrust Washer Retainer Using Installing Tool. J-488-5

30. Install mainshaft rear bearing (14) on main shaft about one inch from rear end.

31. Insert mainshaft through opening in rear of transmission case and install mainshaft low and reverse gear, and the second and high shift sleeve. The shifter collar must be to the rear.

32. Install the mainshaft low and reverse gear retainer (20) in groove in mainshaft, using cup grease to hold parts of ring in place.

33. Holding mainshaft firmly against the thrust balls, place Bearing Installing Tool J-779, Fig. 202, over mainshaft rear bearing (14) Fig. 190, and drive bearing in place. This will also drive the main-shaft low and reverse gear forward to cover the retainer (20).

34. Install speedometer drive gear (59) and speedometer gear housing (57), making sure that the gasket and oil seal (58) are in good condition, and that the three capscrews are drawn up tight.

35. Install companion flange (60), cork gasket washer seal, steel washer (61) and capscrew. The capscrew must be tight.

36. Install main drive gear bearing retainer (4). Before replacing the retain-er, the leather oil seal (9) should be carefully checked. If seal is hard, cracked or glazed or if signs of oil leakage were apparent at disassembly, install a new seal. Make sure that the leather has not turned under, when the new seal is installed as this will cause a front end leak. Place the necessary number of shims between retainer and transmission case to provide a total of from 0.008" to 0.012" end play in mainshaft.

To insure accuracy when checking trans-mission end play, and accurate dial indicator such as J-390 must be used, The indicator should be mounted on the top flange of the transmission case and readings taken from the front end of main drive gear shaft.

37. Tighten main drive gear bearing retainer capscrews (5) securely.

Shifter Rails and Forks

38. Install second and high shifter fork (50) in transmission and insert the shifter rail (53) through case and fork.

39. Install shift rail interlock plunger.

40. Install low and reverse shifter fork (49) and shift rail (52).

41. Install lock balls (54), lock ball springs (55) and plungers (79), Figs. 190 and 191.

42. Install lock rod guides (83) and caps (56) on both sides, using the correct number of shims between lock rod guides and transmission case to give a clearance of 0.005" between end of plungers (79) and lock rods (78).

43. Install low and reverse and high and intermediate lock rods (78) in guides (83) and place cotter pins through holes at top.

44. Install clutch bell housing assembly (63) with new gasket to transmission case by means of capscrews and lock washers. Tighten each of the capscrews to 40-45 foot pounds torque using an approved torque indicating wrench.

45. Insert threaded ends of the nigh and intermediate and low and reverse shift rail lock rod links into the holes provided in clutch throwout and locking device levers. Assemble sleeves, springs, plain and lock washers on threaded ends of links and install nuts and lock nuts.

46. Connect upper ends of links (81) Fig. 191, to slots in lock rods (78) and insert clevis and cotter pins.

47. Replace drain plug (3) and fill transmission with gear lubricant to height of filter plug opening on left side of case or liquid measure 3 pints. Use only high-grade lubricants having extreme pressure characteristics and having and S.A.E. 80 E.P. viscosity for winter and S.A.E. 90 E.P. for summer.

48. Install transmission cover to transmission case using a new gasket.

Installing to Engine

1. Before installing transmission to engine rear support plate, check cylinder block rear support plate for tightness and misalignment. This is especially important in cases where the car has been subject to chronic transmission trouble, noisy and jumping out of gear. Make a similar check of transmission clutch bell housing. Both units should be flat and in plane within 0.005".

NOTE: Clutch driving plate must be perfectly centralized within the clutch assembly. This can be done by using the J-449 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 front end of the drive gear shaft and pilot bearing in the flywheel will be damaged

2. Rotate clutch collar and throwout bearing to position for proper alignment with throwout yoke on transmission.

3. Bring transmission assembly to position where the main drive gear (clutch shaft) is aligned with bore of clutch throwout collar, then carefully push transmission forward to enter drive gear splined shaft through splines of clutch driving plate and into pilot bearing in flywheel.

During this operation the main drive gear must be relieved of all overhanging weight of the transmission until the bell housing engages the dowels on engine rear support plate.

4. Install clutch bell housing attaching bolts and tighten with a torque wrench to 40-45 foot pounds.

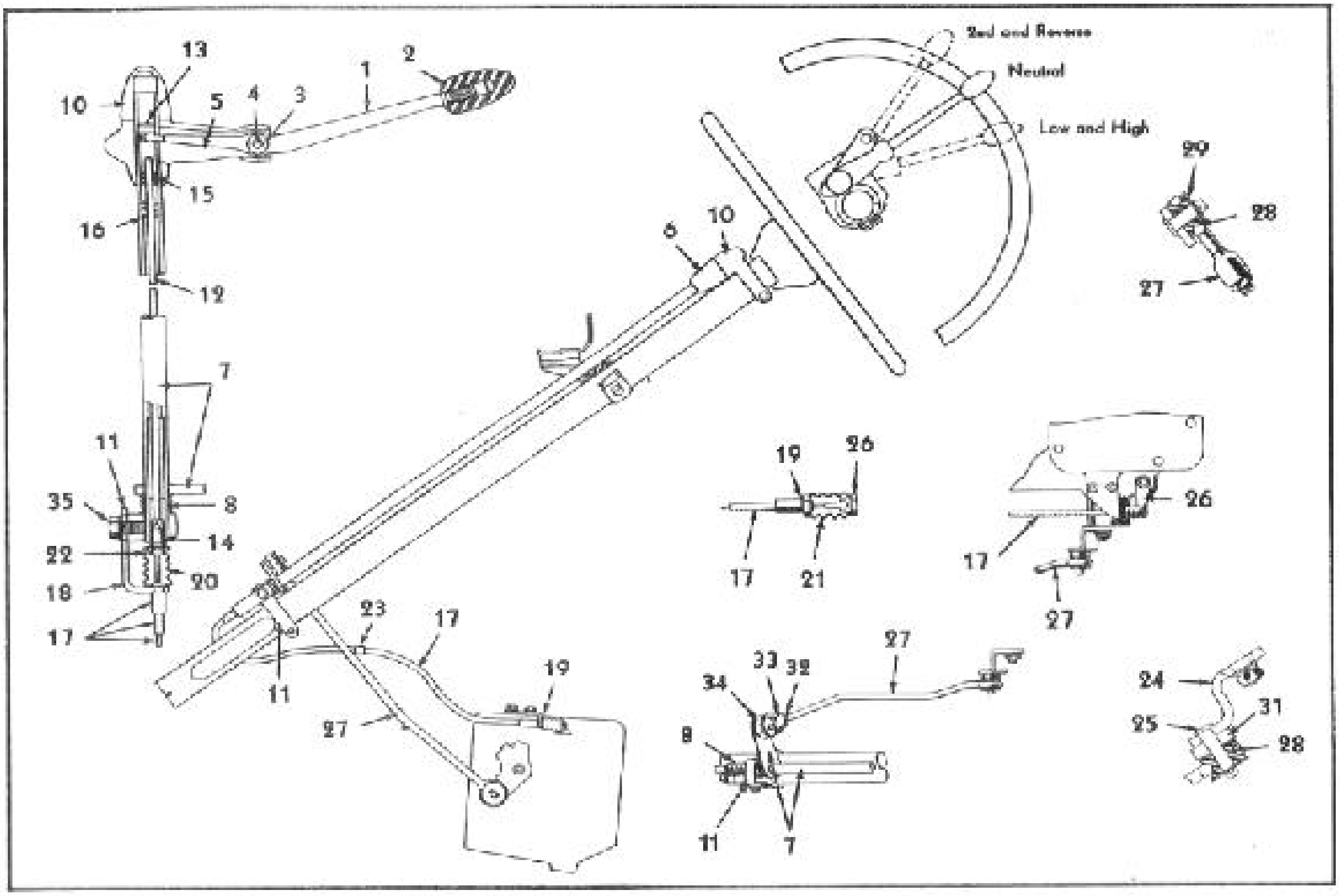


Figure 204 - Handy Shift Details

1. Control lever
2. Control lever knob
3. Control lever anti-rattle washer
4. Control lever fulcrum
5. Control lever fulcrum bracket
6. Control lever fulcrum bracket ring
7. Control lever tube and fulcrum bracket
8. Control lever compression spring
9. Control lever compression spring seat
10. Control lever tube bracket - upper
11. Control lever tube bracket - lower
12. Control lever push rod
13. Control lever push rod end - upper
14. Control lever push rod end - lower
15. Control lever push rod upper compression spring
16. Control lever push rod spring seat
17. Control wire, casing and bracket
18. Control wire anchor bracket - upper
19. Control wire anchor bracket - lower
20. Control wire dust boot (steering end)
21. Control wire dust boot (trans. end)
22. Control wire anchor
23. Control wire casing clip (at clutch housing)
24. Trans. shift shaft outer lever
25. Trans. shift shaft outer lever pin
26. Trans. shift selector lever, outer
27. Control tube to trans. rod
28. Control tube to trans. rod end grommet
29. Control tube to trans. rod end pin washer
30. Control tube to trans. rod clevis
31. Control tube to trans. rod spacer
32. Control tube to trans. rod locknut.
33. Control tube to trans. rod clevis.
34. Control tube lower lever
35. Control wire anchor bracket clamp bolt

HANDY SHIFT

Construction

"Handy Shift" gear shifting mechanism is operated from a control lever located just below the steering wheel. This lever is pivoted in a housing that is attached to the upper end of a tube placed just above and parallel with the steering column.

The backward and forward movement of the gearshift lever (1) Fig. 204, imparts a rotary motion to the tube (7) and lever which is welded to its lower end. This rotary motion moves the control tube to the transmission rod (27) and shift shaft outer lever (24) backward and forward. The shift shaft is fastened in the transmission case and is operated by this outer lever. An inner lever mounted on the shift shaft moves the gears into their different positions.

Adjustment of the Handy Shift Operating Rod is made by placing the gear shift control lever in neutral position and removing the cotter pin and clevis pin from the steering end of the rod (7).

The transmission shift lever (24) and the Handy Shift lever (1) must be in the neutral position. Loosen rod lock nut (32) on rod (27) and turn clevis (33) in or out until the clevis pin will drop into the control lever tube lower lever (34).

Handy Shift Cross Shifting

This is a sidewise shifting movement enabling engagement of the gears desired. A wire cable (17) operates the shift selector lever outer (26) Fig. 204, which is mounted on the shift selector shaft.

Adjustment of the Handy Shift Cross Shifting is made with the hand control lever in the extreme up position which is between the low and reverse positions.

Loosen bolt (35) at the lower end of the steering column and pull the casing bracket (5) upward until all slack is out of the casing and the shift lever at the transmission is fully over to the low and reverse side. Check this position at transmission.

Tighten the bracket capscrew (35) in place. The anchor (22) in control wire should have clearance at the top and bottom of travel.

HANDY SHIFT CONTROL TUBE UPPER BRACKET AND CONTROL LEVER REMOVAL

1. Remove horn button and steering wheel. (See "Steering Gear Section").

2. Remove control tube upper bracket (10) clamp bolt, using a Phillips screwdriver.

3. Remove upper bracket (10) and fulcrum bracket ring (6).

4. Remove control lever fulcrum screw (4).

5. Remove lever (1) and anti-rattle washer (3).

6. Remove control wire anchor (22) at the bottom of the steering column and push end (14) of push rod (12) upward to expose control lever push rod end, upper (13).

To reassemble, reverse the procedure of removal. Apply a small amount of viscous chassis grease in the bracket (10) before installing.

HANDY SHIFT CONTROL LEVER FULCRUM BRACKET REMOVAL

1. Remove front seat cushion and install anti-grease covers of front seat back.

2. Remove accelerator pedal by removing clevis pins from anchor bracket and bell crank link.

3. Remove the screws holding the kick pad to the dash also the floor mat trim clips and remove the floor mat.

4. Remove transmission opening floor cover.

5. Remove horn button and steering wheel.

6. Disconnect control rod (27) at• steering gear end.

7. Remove control wire casing anchor bracket bolt and wire anchor (22).

8. Remove jacket tube bracket cap.

9. Remove jacket tube and control tube (7) from the steering column jacket tube.

10. Remove control tube upper bracket clamp bolt, bracket (10) and bracket ring (6).

11. Remove control lever fulcrum (4), control lever (1) and anti-rattle washer (3).

NOTE: When necessary to remove the fulcrum bracket (5), remove fulcrum bracket set screw, mark control tube (7) and fulcrum bracket to insure the bracket being reinstalled in the proper position and press the tube out of the bracket.

To reassemble, reverse the procedure of removal and be careful to replace the fulcrum bracket (5) on the control tube (7), in exactly the same position from which it was removed.

Adjust the casing anchor bracket before the final tightening of the control wire casing anchor bracket bolt. Proper clearance must be left at the top and bottom for the cable anchor (22).

HANDY SHIFT CONTROL TUBE LOWER BRACKET REMOVAL

1. Remove the steering jacket tube and control tube (7) as outlined under "Handy Shift Control Lever Fulcrum Bracket Removal" steps 1 thru 9, inclusive.

2. Remove the lower bracket clamp bolt and slide off bracket (11).

To reassemble, reverse the procedure of removal and make certain that the control tube compression spring seat (9) is placed in position below the spring (8).

Adjust the wire casing anchor bracket to provide proper clearance at the top and bottom for the wire anchor (22).

HANDY SHIFT CONTROL LEVER PUSH ROD REMOVAL

1. Remove horn button and steering wheel.

2. Remove upper bracket clamp bolt to allow removal of upper bracket (5) and ring (6).

3. Remove control lever fulcrum (4) control lever (1) and anti-rattle washer (3).

4. Remove wire anchor (22) at the lower end of the steering column and disconnect wire (17).

5. Loosen wire casing anchor bracket bolt (35) and detach wire casing anchor (19) from lower bracket.

6. Pull lower push rod end (14) down far enough to remove the key attaching push rod (12) to push rod end (13).

7. Remove push rod upper end (13).

8. Remove upper compression spring (15) and seat (16) with a wire hook.

HANDY SHIFT CONTROL LEVER PUSH ROD INSTALLATION

1. Install the upper compression spring seat (16) and spring (15) on the push rod (12) and install in control tube (17).

Apply a coat of viscous chassis lubricant to the push rod ends when assembling them in the control tube.

2. Assemble upper push rod end (13) to push rod (12) with key assembled toward front of car.

3. Install lower push rod end (14) on push rod (12) and assemble with key toward front of car.

4. Install control lever (1) and anti-rattle washer (3) with end of lever engaged in push rod (13).

5. Install control lever fulcrum (4) with shakeproof lock washer.

6. Install control wire (17) in lower push rod end (14) and install wire anchor (22).

Hold control lever in extreme up position and adjust control wire casing anchor bracket (18) and tighten bolt (35) securely.

7. Install steering wheel and horn button.

REFERENCES

Source of Information	Date	Subject

REAR AXLE

SPECIFICATIONS

Type	Semi-floating
Gear Type	Helical Bevel
Pinion Bearings	
Type	Taper roller
Adjustment	Shim
End Play	.000" - .001"
Differential Bearings	
Type	Taper roller
Adjustment	Adjustment nut
Wheel Bearings	
Type	Taper roller
Adjustment	Shim
End Play	.002" - .004"

Pinion and Gear (Matched Gears)

(Ratio Stamped on Outside of Differential Carrier & Cap Assy. Right hand Side at Bolt Circle)

Adjustment	Shim
Lash in Gears	.0005"--.0035"

Lubrication

Type--Summer and Winter	S.A.E. 90 E.P.
Capacity in Lbs (1.24 Kgs)	2-3/4 lbs.

REAR AXLE USAGE WITH 10" BRAKES

Small Rear Wheel Bearing

Series 10TR, 10PA, 10DL, 20T, (except UT. Co.- UT. Cpe.) 20DL, 20P., except with 3 x 5 engine and except with 11" brakes.

Large Rear Wheel Bearings

Series 10CM, 11, 12, 18, 20C, (except with 3 x 5 engine) 20P with 3x 5 engine, 20T, UT. Co., UT. Cpe., 21, 22, 28C, 28P, and all models through 1947 with 10" brake.

REAR AXLE USAGE WITH 11" BRAKES

Large Rear Wheel Bearing

Series 14, 15, 17, 20P, 24, 25, 27, 28P, and all models through 1947 with 11" brake.

CONSTRUCTION

The rear axle for all models is of the semi-floating type having helical cut bevel gears mounted in a pressed steel, banjo type housing.

The differential unit is the two pinion type having the differential housing in two sections fastened with studs and nuts. The drive gear is nickel molybdenum steel and is fastened to the differential case flange by special alloy steel bolts. The entire differential assembly is mounted on two large tapered roller bearings.

The drive pinion integral with the pinion shaft is supported on two adjustable tapered roller bearings. A sleeve between the two bearings holds them in their correct positions. Adjustment of the pinion bearings is provided for by a shim pack between the sleeve and the front bearing. The fore and aft mesh of the pinion with the drive gear is taken care of by shim pack between the front face of the pinion and the rear bearing.

The universal joint flange is mounted on the drive pinion shaft. A hydraulic type leather oil seal rides on the flange and prevents pinion shaft oil leaks.

The axle drive shafts are of alloy steel. Rear wheel hubs are taper machined and are secured to the axle shafts by keys and castellated nuts. Axle shaft end thrust is taken on hardened steel thrust buttons at the inner end of the shafts, contacting the differential thrust spacer.

The universal joint flange is mounted on the drive pinion shaft. A hydraulic type leather oil seal rides on the flange and prevents pinion shaft oil leaks.

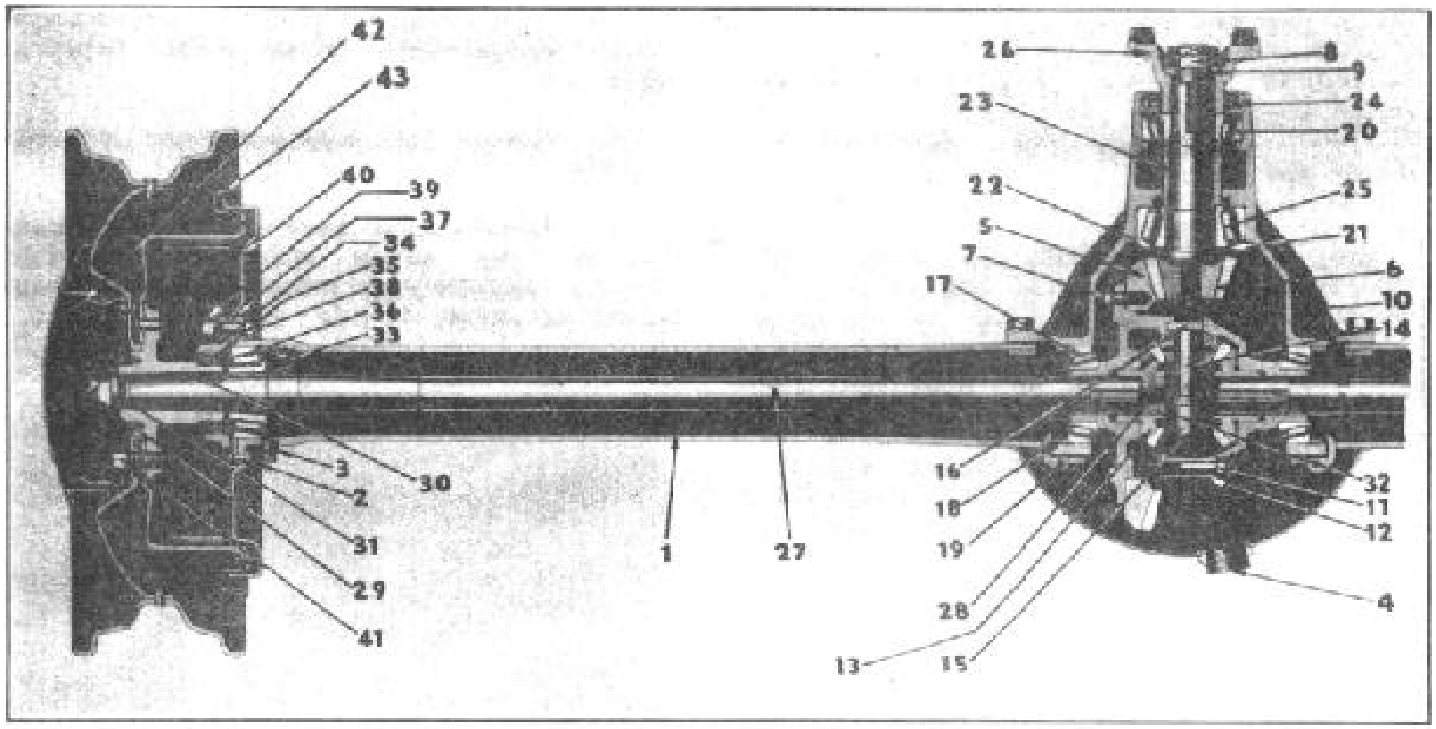


Figure 205 - Rear Axle Assembly

1. Axle housing
2. Housing to backing plate rivet
3. Wheel bearing grease hole plug
4. Drain plug
5. Drive gear
6. Drive pinion
7. Drive gear bolt
8. Drive pinion nut
9. Drive pinion washer
10. Differential carrier and cap assy.
11. Differential case stud nut
12. Differential case stud
13. Differential gear
14. Differential pinion
15. Differential pinion shaft
16. Differential shaft locating pin
17. Differential bearing assembly
18. Differential bearing adjusting nut
19. Differential bearing adjusting nut lock
20. Front pinion bearing assembly
21. Pinion rear bearing shim
22. Pinion rear bearing shim retainer
23. Pinion bearing spacer
24. Pinion oil seal
25. Rear pinion bearing assembly
26. Pinion companion flange
27. Drive shaft assembly
28. Drive shaft thrust button
29. Drive shaft nut
30. Drive shaft key
31. Drive shaft nut washer
32. Drive shaft thrust spacer
33. Drive shaft oil seal assembly
34. Wheel bearing adjusting cap assy
35. Wheel bearing oil seal
36. Wheel bearing assembly
37. Adjusting cap shim
38. Adjusting cap bolt
39. Adjusting cap bolt nut
40. Backing plate assembly
41. Hub bolt
42. Hub cap clip
43. Brake drum seal

The axle drive shafts are of alloy steel. Rear wheel hubs are taper machined and are secured to the axle shafts by keys and castellated nuts. Axle shaft end thrust is taken on hardened steel thrust buttons at the inner end of the shafts, contacting the differential thrust spacer.

Rear wheel bearings are adjustable tapered roller type with the outer cups seating in the outer ends of the axle housing. Two types of bearings are used. See "Specifications" on page 186 for usage. Adjustment for end play is by shims inserted between the bearing retaining cups and the housing flange. Oil leakage is prevented by hydraulic type leather oil seals, held tight by spring pressure.

Lubrication

Rear axle lubrication should be checked every 1,000 miles and the lubricant level should be kept even with the plug. Lubricant should be completely drained at the end of the first 5,000 miles, flush thoroughly and refill with 2-3/4 pounds of S.A.E. 90 E.P. lubricant for summer or winter use.

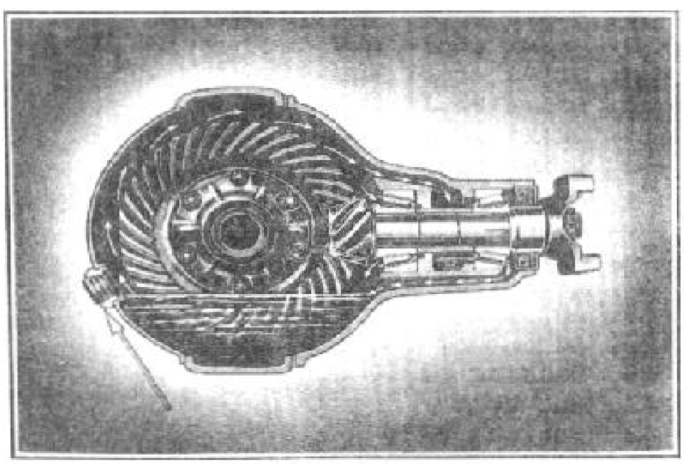


Figure 206
Circulation of Lubricant in Differential

DIFFERENTIAL CARRIER AND GEAR SET REMOVAL

1. Raise rear of car with hoist or jack.

2. Remove hub caps and take off rear wheels.

3. Remove axle shaft nuts (29, washers 31) and using wheel Puller Tool J-736, remove rear wheel hubs and brake drums as shown in Fig. 207.

Figure 207
Rear Wheel Rub Removing With J-736 Puller

CAUTION: Do not use a knock-out type puller for this operation as serious and costly damage can be done to the differential parts by this method.

4. Remove the four nuts (39) and remove wheel bearing adjusting cap assembly (34) and shims (37), Fig. 205.

5. Remove rear wheel bearings and axle shafts using axle shaft and Bearing Puller Tool J-352.

6. Remove wheel bearing adjusting cap oil seal assembly (35) Fig. 205, and install a new seal using Tool J-353-1 as shown in Fig. 208.

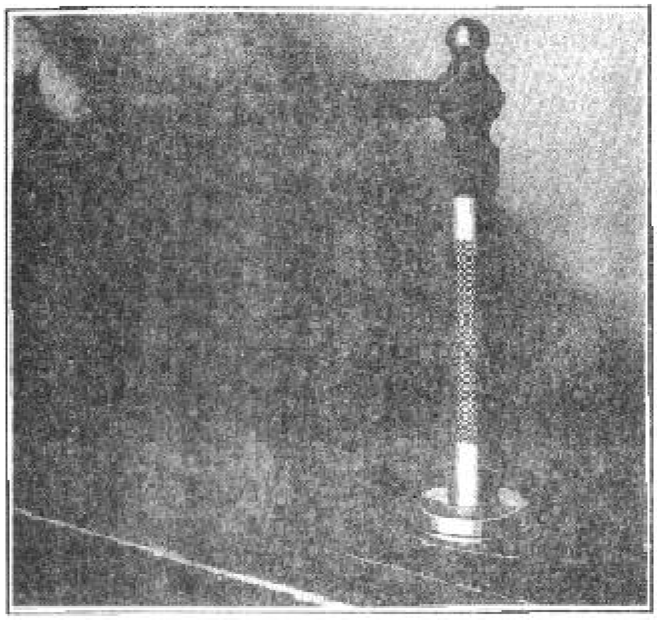


Figure 208
Rear Wheel Bearing Cap Oil Seal and Pinion Shaft Oil Seal Replacer Tool J-353-1

7. Remove rear wheel bearing cone and rollers (36) from axle shafts using Bearing Remover Tool J•358-H as shown in Fig. 209.

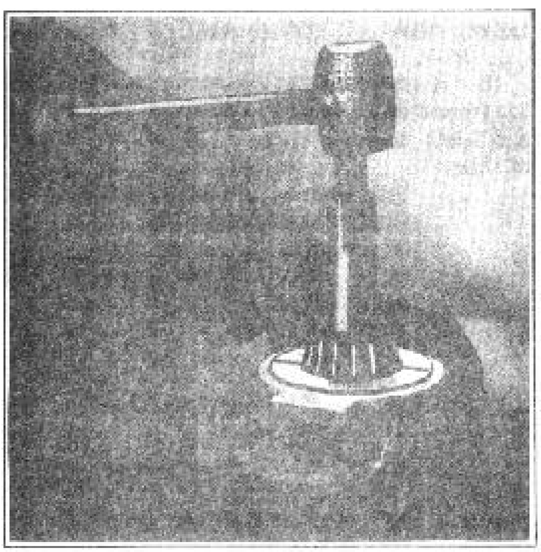


Figure 209
Axle Shaft and Wheel Bearing Remover J-358-E

8. Remove axle shaft oil seal and retainer (33) using axle shaft and pinion shaft oil seal Remover Tool J-943.

9. Remove bolts attaching propeller shaft to pinion companion flange and lower rear end of propeller shaft using care to protect needle roller bearings from being damaged.

10. Remove bolt nuts attaching the differential carrier to axle housing and lift out carrier and gear set assembly.

DIFFERENTIAL CARRIER AND GEAR SET DISASSEMBLY

1. Mount unit in differential Holding Fixture J-814.
2. Remove cotter pins from differential bearing adjusting nut locks and take out the locks (19).
3, Remove capscrews from differential bearing caps and take off caps and adjusting nuts. Differential assembly and drive gear can now be removed from differential carrier.
4. Remove cotter pin from pinion shaft nut (8), remove nut and washer (9), Fig. 205.

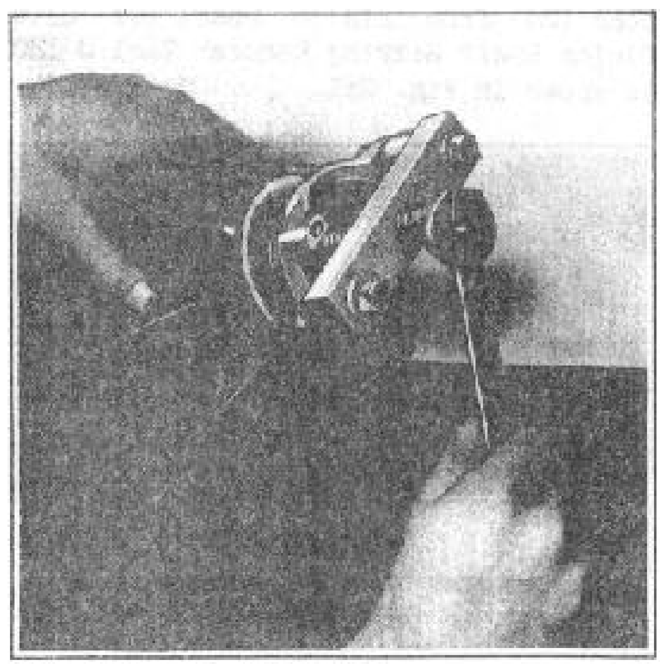


Figure 210
Pinion Shaft Companion Flange Removal with J-820 Puller

5. Remove pinion shaft companion flange (26) using companion Flange Puller Tool J-456 as shown in Fig. 210. Pinion (6), bearing spacer (23) and shims can now be removed from inside of carrier.

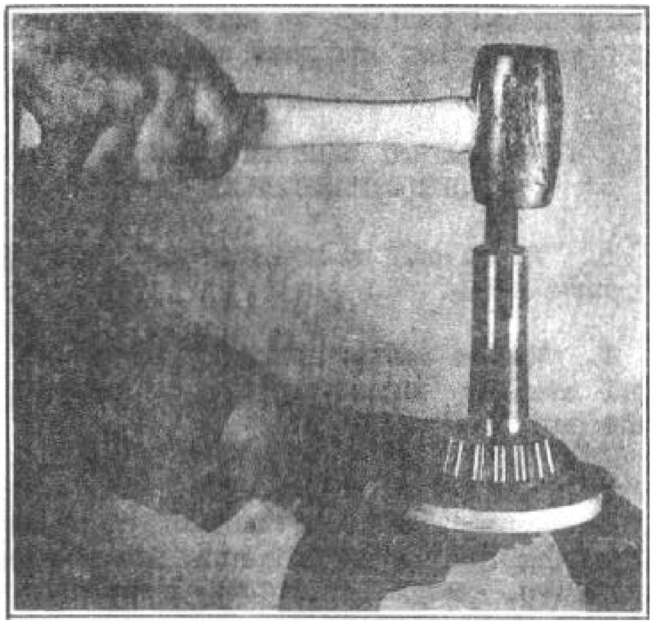


Figure 211
Rear Pinion Shaft Bearing Remover and Installer Tool W-1301

6. Remove rear pinion shaft bearing cone (25) from pinion shaft (6) using Pinion Shaft Bearing Remover Tool J-1301 as shown in Fig. 211.

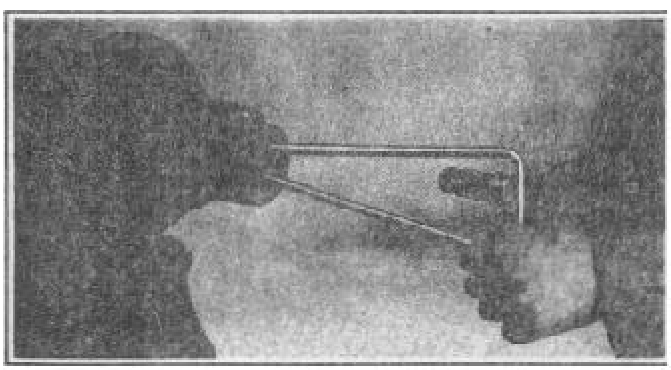


Figure 212
Pinion Shaft Oil Seal Removing With J-943 Tool

7. Remove pinion shaft oil seal (24) from carrier using Pinion Shaft Oil Seal Puller Tool J-489 as shown in Fig. 212. Pinion shaft front bearing cone (20) can now be removed.

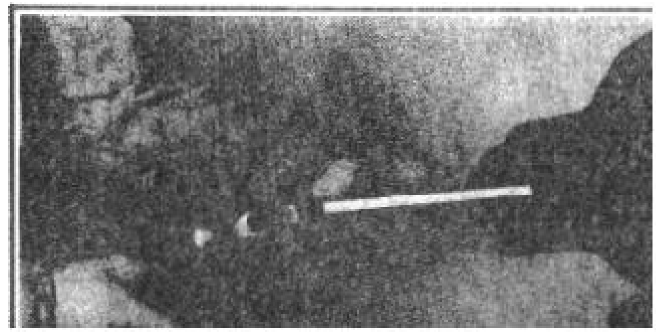


Figure 213
Front and Rear Pinion Shaft Bearing Cup Remover HM-63

8. Remove front and rear pinion shaft bearing outer cups from carrier using pinion bearing cup remover HM-63 as shown in Fig. 213.

DIFFERENTIAL DISASSEMBLY

1. Remove differential bearing cones (17) from differential case hubs using Bearing Puller Tool J-2158. Puller fingers fit in the notches of the differential case.

2. Remove drive gear bolts and bolt locks, take off drive gear (5) Fig. 205.

3. Remove castellated nuts (11) from differential case. Separate the right and left cases, this will allow removal of the -

Differential pinion shaft (15)
Differential pinions (14)
Differential gears (13)
Drive shaft thrust spacer (32)
Differential pinion thrust washers
Differential gear thrust washers

DIFFERENTIAL REASSEMBLY

1. Wash all parts thoroughly and inspect for wear, burrs or fractures and replace any worn or damaged parts.

2. Place differential case in "V" blocks to check eccentricity and side runout using dial Indicator J-390X. If they do not run true within 0.002", it will be necessary to true up the flange in a lathe or install a new case assembly.

3. Install differential gear (13) and thrust washer in left hand differential case.

Differential gear thrust washers are available in various oversize thicknesses. Select washers that will give no apprecia-ble end play when the unit is reassembled. It is permissible to remove play to the extent that the differential gears can just be turned by hand when grasping the axle shafts. Install washers with rough side next to the differential case and the smooth side in contact with the differen-tial gear.

Assemble differential pinions (14), spacer (32) and thrust washers on the differential pinion shaft (15) and place them in left hand differential case so that the hole in the shaft will line up with the pin (16) in the case.
Install differential gear thrust washer and differential gear in right hand differen-tial case and assemble to left case.

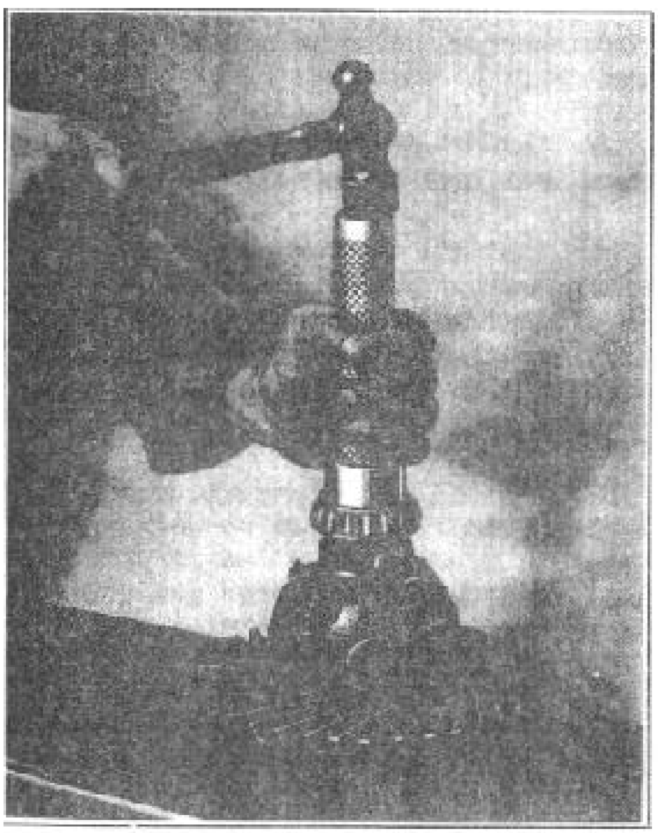


Figure 214
Differential Bearing-Cone and Roller Installing with J-355 Tool

Replace nuts (11) on differential case studs (12) and tighten securely. Insert and spread cotter pins in all studs.

7. Install drive gear on differential case flange so that the holes line up properly. Install locks and bolts and draw bolts up tight.

The drive gear and differential case flange must be free of nicks and burrs and see that no dirt or foreign matter finds its way between the gear or flange or a noisy operation will result.

8. Install differential bearing cones (17) Fig. 214, on differential case hubs using Differential Bearing Driver Tool J-355.

DIFFERENTIAL AND GEAR SET REASSEMBLY

1. Determine that the differential carrier is free from dirt and steel chips.

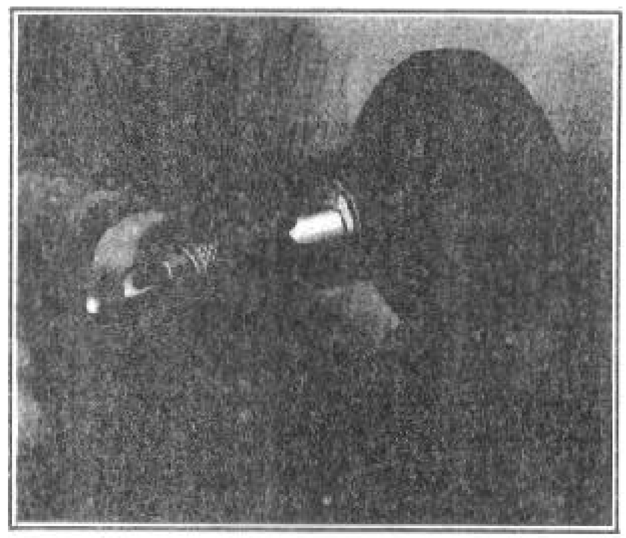


Figure 215
Pinion Shaft Bearing Cups Installing With J-270-H Tool

2. Install pinion shaft front and rear bearing cups using Pinion Shaft Bearing CUD Replacer Tool J-270-H, as shown in Fig. 215.

3. Place front bearing cone (20) Fig. 205,in position in cup and install pinion shaft oil seal (24) using Pinion Shaft Oil Seal Replacer Tool J-353-1. (Note: This tool also is used for the rear wheel bearing cap oil seal installation).

The oil seal leather must be smooth and not worn thru at the retaining spring.

4. Install pinion rear bearing shim pack, and pinion shaft rear bearing cone (25) on the drive pinion (6) using Pinion Shaft Bearing Remover and Installer Tool J-1301.

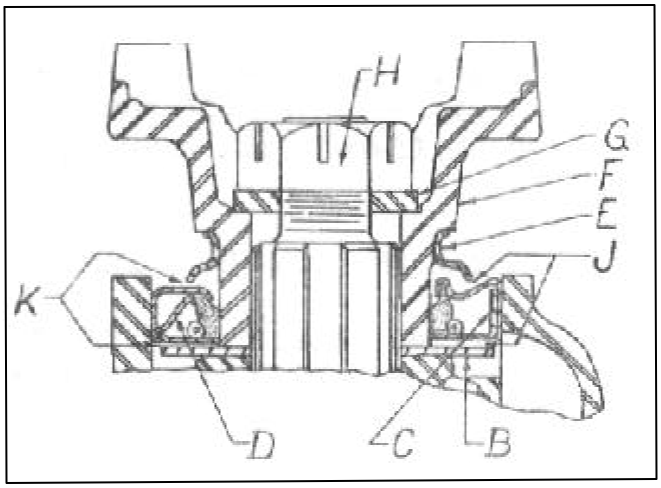


Figure 216
Pinion Shaft Oil Seals

B. Oil washer (travels with shaft)
C & D. Oil seal
E. Oil seal dirt shield
F. Companion flange
G. Plain washer
H. Self-locking nut
I & K. Clearance between oil seal and oil washer.

NOTE: There have been two types of oil seal used as shown in Fig. 216 "C" and "D". They are installed in the same manner, however, the clearance between the dirt shield (E) and oil washer (B) must be maintained at equal distances. This clearance is to prevent noise between the oil washer which revolves with the pinion shaft and the oil seal which is stationary the differential housing.

Shim pack consists of thin, medium and thick shims. Use the same number and thickness of shims as were removed at disassembly.

5. Install the bearing spacer (the 4-7/8 to 1 axle uses a different spacer than is used on the 4-1/9, 4-5/9 to 1). This spacer (23) Fig. 205, is placed on the pinion shaft ahead of the rear bearing cone. Place the pinion bearing front adjusting shims (.003", .004" and .015" thick) on the pinion ahead of the spacer.

6. Install the pinion and assembled parts in position in the carrier, inserting the forward end of the pinion thru the pinion shaft front bearing cone.

7. Install companion flange (26) on the front end of drive pinion and assemble pinion shaft nut (8) and washer (9). Tighten the nut with a torque wrench to 200 foot pounds using the Flange Holding Tool J-820.

NOTE: If the correct number of shims have been used between the pinion shaft front bearing (20) and spacer (23), it should be just possible to turn the pinion shaft with one hand. If the adjustment is tighter than this, add one thin front bearing shim at a time until this hand test is obtained.

8. Insert cotter pin in the pinion shaft and lock securely.

9. Install differential and drive gear assembly in the carrier and assemble differential bearing adjusting nuts (18), so that the drive gear (5) and drive pinion (6) teeth bottom.

10. Install differential bearing caps in place and insert cap screws and lockwashers, drawing them up finger tight. Make sure the lockwashers are under the cap screws and are in good condition.

11. Turn the left hand adjusting nut to right (clockwise) until no play can be felt between drive gear and pinion shaft.

12. Turn the right hand adjusting nut to right (clockwise) and draw it up tight using Differential Bearing Adjusting Nut Wrench J-972.

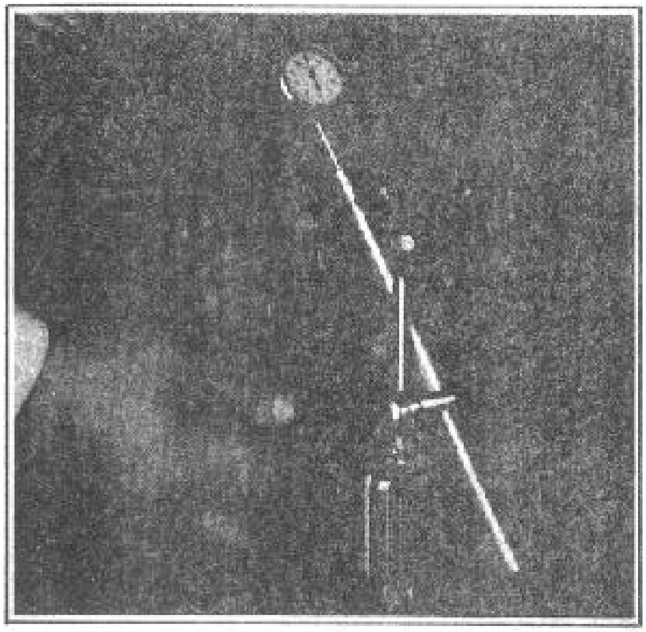


Figure 217
Drive Gear and Pinion Backlash with
KMO-30 Dial Indicator

13. Mount Dial Indicator KMO-30, Fig. 217, on the differential carrier flange and turn left hand adjusting nut to the left (Counterclockwise) one half notch. Turn right hand adjusting nut to the right (clockwise) one half notch.

14. Rest plunger of dial indicator on the outer edge of the drive gear. Note amount of play or backlash between the drive gear and pinion teeth on the indicator. This backlash should be between .0005" and .0035". If it is not, turn adjusting nuts one half notch at a time until it is obtained.

15. Tighten left bearing cap screws. Turn right differential bearing adjusting nut to the right (clockwise) one full notch. This additional tightening provides the necessary "spread" to the differential carrier for proper operation.

16. Draw up capscrews tightly on right differential bearing cap.

17. Install differential bearing adjusting nut locks (19) and secure them with cotter pins.

DIFFERENTIAL CARRIER AND GEAR SET INSTALLING IN AXLE HOUSING

1. Examine the differential carrier and gear set as well as the axle housing and thoroughly check for dirt, chips, or foreign matter of any kind. Damage to gears and bearings from such causes will make costly repairs necessary.

2. Install a new gasket between the differential carrier and axle housing.

3. Install differential carrier and gear set and tighten carrier capscrews, using lock washers under all nuts. Tighten with a torsion wrench to 35 foot pounds. Check for tightness at the end of first 500 miles.

4. Assemble propeller shaft to pinion shaft flange.

WHEEL BEARING AND AXLE SHAFT INSTALLATION

1. Install axle shaft oil seal assemblies (33) using "Oil Seal Replacer J-358-H" as shown in Fig. 218.

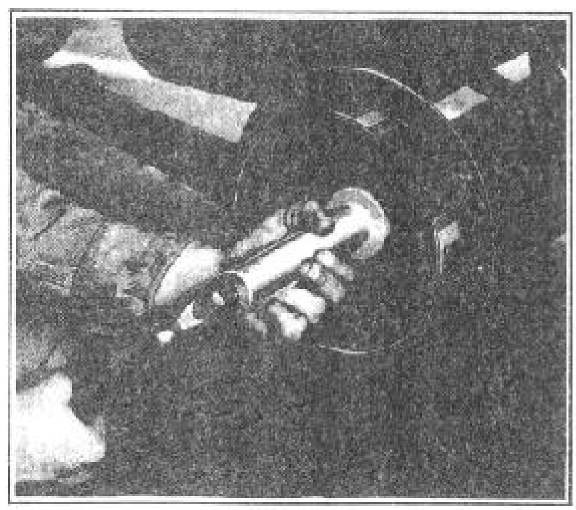


Figure 218
Axle Shaft Oil Seal Replacing Tool
J-353-2

2. Install rear wheel bearing cone on axle shaft using Rear Bearing Replacer Tool J-358-H.

3. Install axle shaft with bearing cone in housing and assemble rear wheel bearing outer cup in axle.

4. Pack bearings with wheel bearing lubricant.

5. Install wheel bearing adjusting shims (37), Fig. 205, between adjusting cap (34) and end of housing. Nuts (39) with lock washers under them should be drawn up tight.

NOTE: Dial Indicator Gauge J-390-X should be clamped to brake backing plate so that dial plunger rests against the end of the axle shaft.

6. Check end play which should be from 0.002" to 0.004" each wheel, adjust end play be removing or adding shims (37) between the axle housing and bearing adjusting cap (34).

7. Install axle shaft keys in keyways and place rear wheel hubs also brake drums on axle shafts.

8. Install drive shaft nut washers (31) and nuts (29) on axle shafts and tighten nuts using torque wrench and tighten to 90 foot pounds.

9. Adjust brake shoes.

10. Bleed all wheel cylinders.

11. Replace wheels and tighten wheel hub bolts securely.

12. Place roller jack under center of axle housing, raise car and remove stand jacks.

Apply hand brake and with car in this position apply an extra tightening operation to axle shaft nuts, replace cotter pins and install hub caps.

13. Fill axle to proper level with S.A.E. 90 E.P. Lubricant through filler hole and replace filler plug.

REAR AXLE HOUSING REMOVAL

1. Jack up rear end of car and place stand jacks under frame side members just head of rear springs.
2. Place roller jack under center of axle housing.

3. Disconnect rear lateral stabilizer at axle end.

4. Disconnect rear shock absorbers at lower end.

5. Remove bolts attaching propeller shaft to pinion shaft and drop rear end of propeller shaft.

6. Disconnect brake cables and conduits at backing plate.

7. Remove rear spring clip nuts and clips.

8. Lower roller jack and remove axle housing from under car. To instal] reverse procedure of removal.

NOTE: Tighten rear spring clip nuts using a torque wrench to 55 pounds.

AXLE SHAFT REMOVAL

1. Raise the rear end of the car and place on stand jacks.

2. Remove the rear wheel.

3. Remove the brake drum and hub using Puller J-736 as shown in Fig. 207.

4. Remove rear wheel bearing adjusting cap and shim.

5. Remove rear wheel bearing and axle shaft using Puller J-352.

NOTE: To remove a broken axle shaft stub end use Shaft Remover HM-540 as shown in Fig. 219.

6. Remove rear wheel bearing cone from axle shaft using Tool J-1301, Fig. 211.

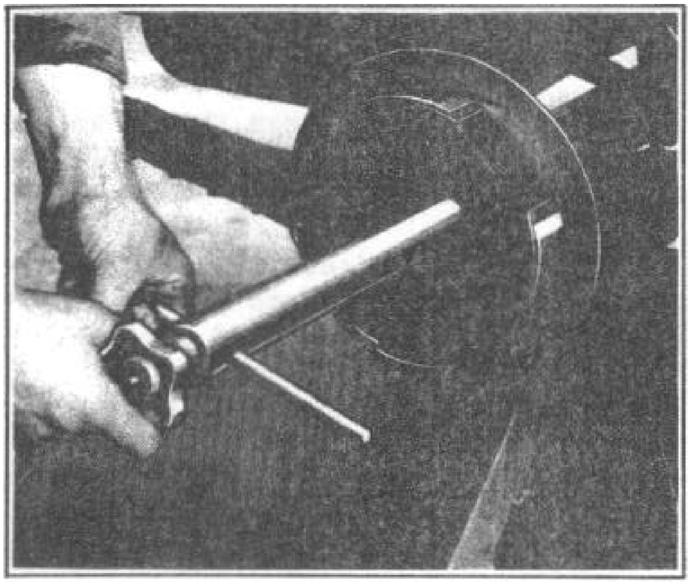


Figure 219
Broken Axle Shaft Remover HM -540

AXLE SHAFT INSTALLATION

1. Install bearing cone using Tool J-1301.

2. Install axle shaft.

3. Install bearing cap and oil seal assembly on axle.

4. Install rear wheel bearing shims and adjust cap.

5. Adjust end play of axle shaft.

6. Install brake drum.

7. Install wheel.

8. Tighten axle shaft nut with a torsion wrench to 120 foot pounds.

AXLE SHAFT THRUST BUTTON RENEWAL

1. Grind off thrust button (28) Fig. 205, flush with the end of the shaft on an emery wheel.

2. Center punch the remainder of the thrust button and drill an 11/32° hole through the center. Tap out the button with a 3/8"-16 tap and screw a 3/8"-l6 hexagon cap screw that is 1-1/2” or 2” long into the tapped hole.

Place head of screw in a vise and (using a soft hammer) tap the end of the axle shaft removing the button.

4. Clean out the thrust button hole.

5. Drive in a new thrust button making certain it is firmly seated in the shaft.

REAR SPRING

Rear Spring Mounting

The spring seat is welded to the axle housing. A rubber cushion is fitted over the top and bottom of the spring so that no metal to metal contact exists between the parts.

The rubber cushion prevents noises from the road or the axle being transmitted through the springs to the chassis and body.

The U bolts should be drawn tight and tightened every time axle or brake or wheel work is done.

KEEP U BOLTS TIGHT.

NOTE: Tighten rear spring clip nuts with a torsion wrench to 55 foot pounds.

REAR AXLE NOISES

DO NOT confuse tire noise or muffler noise as axle noise. Tire noise is usually attributable to low pressures, incorrect wheel alignment or uneven tire wear. This noise is more pronounced between 20 and 26 miles per hour, whereas axle noise will show a variation under different operation conditions such as part throttle, acceleration and deceleration.

Determine that the tires are not the source of the noise, test to determine what type of axle noise is present. There are three types of axle noise:

Drive Noise
Coast Noise
Bearing Noise

NOTE: In diagnosing the type of noise, a level concrete road should be chosen, as normal tire noise is least noticeable on this type of road. The lubricant in the rear axle should be warm before a definite test is made.

After the axle has been brought to operating temperature, the types of noise may be diagnosed as follows:

Drive Noise

This is noticeable on constant acceleration from 15 to 45 MPH and is most pronounced between the speeds of 22 to 35 MPH. When determining the extent of this noise or hum, it must be remembered that a slight hum is normal if noticeable within a two to five-mile range.

However, if the noise is of a heavy pitch and increases as car speeds are increased, the differential should be adjusted.

Coast Noise

This should be checked as follows: Bring the car up to a predetermined speed, preferably above 45 MPH and then with clutch engaged, release the throttle, allowing the car to decelerate through its speed range to approximately 15 MPH. Here again discretion should be used in determining the noise, as here also a slight noise or hum is permissible.

If the noise is heavy and irregular, the differential should be adjusted.

Bearing Noise

Bearings improperly adjusted, worn or rough, will aggravate the above conditions. Bearing noise may be distinguished from the other two types by the very irregular drive noise on acceleration and a very rough and irregular coast noise on deceleration.

NOTE: Roller bearings that have dug in or brinnelled will cause a clicking noise.

Assembling and disassembling of bearings should always be done with the special tools designed for that purpose.

J-270-H for Pinion Bearing Cup Installing.
HM-63 for Pinion Bearing Cup Removing.
J-1301 for Axle Shaft and Pinion Shaft Bearing Removing and Replacing.
J-354-A Differential Bearing Cone Remover.
J-355 Differential Bearing Cone Installing.

Never force a cup or a cone by hammering as improperly applied force will cause brinnelling and noise or failure.

Should it be determined that axle noise exists or if it is necessary to replace any of the parts, the disassembly procedure should be followed.

In correcting the noise condition, considerable care should be taken to adjust within proper limits and in general should be made by moving the pinion in or out on the ring gear teeth.

To make these corrections it will be necessary to add to or subtract from the drive pinion shim pack.

The back lash should be checked after either of the above mentioned adjustments, these adjustments will either increase or decrease the amount of back lash, depending upon which adjustment is made and the amount. This back lash adjustment should range from .0005* to .0035".

BRAKES

SPECIFICATIONS

Type used (all models) 4 wheel Bendix Hydraulic

Drum Type Centrifuse

Drum Diameter 10"

Series 10, 11, 12, 18, 20P, 20T, 20DL, 20C, (except with 3 x 5 engine) 21, 22, 23, 28C, 51, 52, 171 and 172.

Drum Diameter 11"

Series 14, 15, 17, 24, 25, 27, 28P, 53, 54, 58, 173, 174 and 178.

Lining

Primary Shoe	Moulded
SecondaryShoe	Woven
Width	1-3/4"
Thickness	7/32"

Length Per Wheel

10" brake	22 1/8"
11" brake	23 15/16"

Lining Area in Square Inches

10" brake	155 sq. in.
11" brake	167-1/2 sq. in.

Adjustments

Anchor Pin - - Radially - - Single
Anchor Pin Nut - Torsion Wrench
- - - - - Tighten to 80 foot pounds.

Lining clearance	.0075"
Mechanical follow-up	1-7/16"
Pedal to floor board clearance	1/4"

HYDRAULIC BRAKES

Brake equipment of all models is the four wheel "Bendix Hydraulic" consisting of a master cylinder operated by an adjustable link from the brake pedal, four double piston wheel cylinders mounted on the brake backing plates and all connecting tubing. Depressing the brake pedal forces fluid out of the master cylinder into the wheel cylinders where it separates the pistons and applies the brakes. When the brake pedal is allowed to return to its normal position the brake shoe springs return the wheel cylinder pistons to their normal position and the fluid is pressed back into the master cylinder.

MECHANICAL BRAKES

Mechanical brake system on rear wheels only. The rear wheel brakes are connected for mechanical emergency operation by cable and conduit connections to the hand brake, also foot pedal linkage.

Should the hydraulic system become inoperative for any reason, continued pressure on the foot brake pedal causes a pedal push rod adjustable end nut (16) Fig. 220 to contact the front face of pedal push rod (14). Push rod adjustable end (15) is a sliding fit in the push rod (14).

To prevent mechanical braking during the normal hydraulic operation, also to make certain the proper action of the mechanical brake cables in case the hydraulic system does not operate a clearance of 1-7/16" must be maintained between the rear face of nut (16) and the front face of push rod (14).

Mechanical braking power is transmitted thru the push rod to the cable lever (10) and finally thru cables (23 and 24) to the rear brake shoes.

The operation of the cables on the rear shoes is by means of the brake link (13) Fig. 220, mounted between the shoes and actuated by brake lever (10), which is pivoted on the secondary shoe.

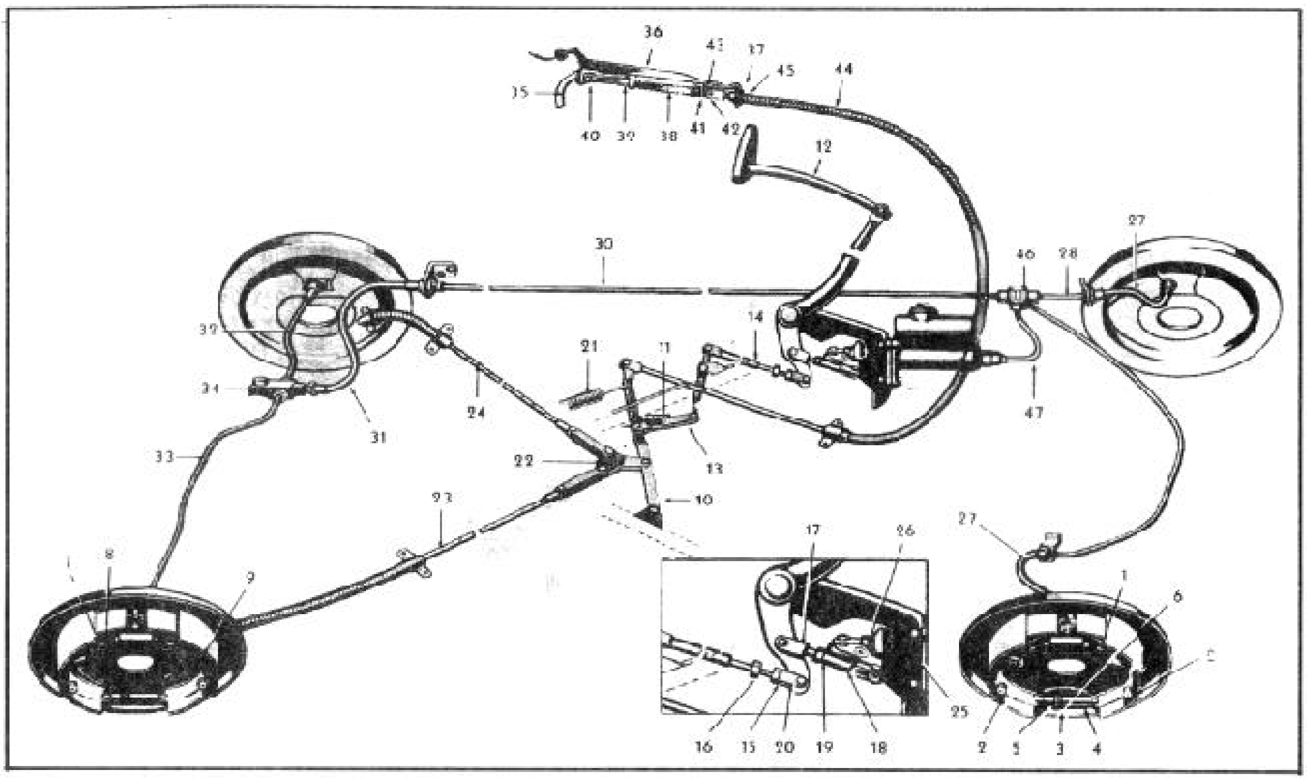


Figure 220 - Brake Control

1. Brake shoe to anchor pin spring
2. Brake shoe hold-down spring cup
3. Brake adjusting screw (star wheel)
4. Brake adjusting screw pivot nut
5. Brake adjusting screw socket
6. Brake adjusting screw spring
7. Brake shoe cable lever
8. Brake shoe cable lever strut
9. Brake shoe to anchor bracket spring
10. Hand brake cable lever
11. Brake control return spring (brake control lever to frame brace)
12. Brake pedal
13. Brake play link assembly
14. Pedal to brake control lever push rod
15. Push rod adjustable end yoke lock nut
16. Push rod adjustable end
17. Pedal link clevis
18. Pedal link
19. Pedal link clevis nut
20. Push rod adjustable end yoke
21. Brake control return spring (hand brake cable lever to frame brace)
22. Hand brake lever toggle assembly
23. Rear brake cable assembly
24. Rear brake cable assembly
25. Master cylinder mounting bracket
26. Master cylinder operating lever assembly
27. Brake hose to right and left front wheel
28. Brake tube - frame tee to left hand front hose
30. Brake tube - frame tee to rear axle hose
31. Hose - brake tube to rear axle tee
32. Brake tube - rear axle tee to left hand rear wheel
33. Brake tube - rear axle tee to right hand rear wheel
34. Rear axle tee
35. Hand brake grip
36. Hand brake mounting bracket
37. Mounting bracket support
38. Hand brake ratchet rod
39. Hand brake ratchet rod lock spring
40. Hand brake ratchet rod housing
41. Hand brake ratchet rod stabilizer - inner
42. Hand brake ratchet rod stabilizer - outer
43. Hand brake ratchet rod stabilizer - spring
44. Hand brake cable and conduit assembly
45. Hand brake cable to dash retainer
46. Frame tee
47. Brake tube - master cylinder to frame tee
   A different tube is used when the car is equipped with Hill Hold

BRAKE SHOE CONSTRUCTION

All models use the single anchor, two shoe duo servo action brake. The two shoes are marked "P” for primary and "S" for secondary or rear.

Regardless of the position in which the brake assembly is mounted, the primary shoe (2, Fig. 224) is always "ahead" of the anchor (1) in the direction of the forward rotation of the drum and transmits servo action to the secondary shoe (4) thru the adjusting screw (8) during a forward braking application. In reverse, the opposite brake application takes place.

HAND BRAKE

Hand braking is thru a pull type, pistol grip, self-locking, hand control located under the instrument panel to the left of the steering column.

The hand brake can be applied much easier, by depressing the brake pedal in the ordinary way and at the same time pulling upward on the hand brake lever. This relieves the load on the hand brake cables, in expanding the shoes against the brake drums and eliminating any possibility of a vacuum being created in the rear wheel cylinders, which might draw air into the hydraulic system past the rubber cups behind the pistons as the shoes are manually expanded.

BRAKE MASTER CYLINDER

The brake master cylinder is a combined supply tank and master cylinder. It maintains a constant volume of fluid in the system at all times and regardless of heat or cold conditions causes expansion or contraction. It acts as a during bleeding operations.

The piston (2) Fig. 221, is returned to a released position much faster than the fluid returns into the master cylinder thru the outlet.

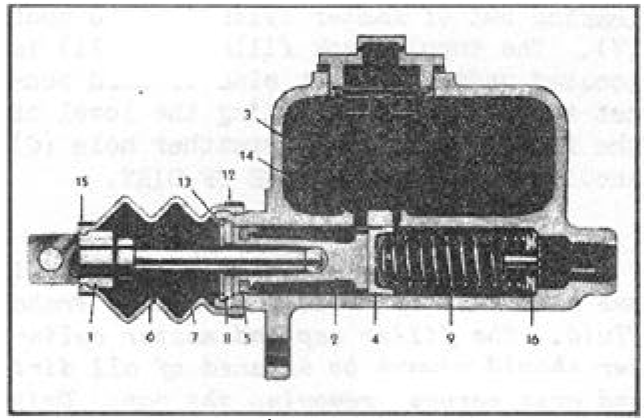


Figure 221
Master Cylinder

1. Push rod
2. Piston
3. Outlet port
4. Piston cup primary
5. Piston cup secondary
6. Push rod guard breather hole
7. Push rod guard
8. Piston stop plate
9. Piston spring
11. Filler cap
12. Push rod guard strap-large
13. Piston stop plate lock wire
14. Inlet port
15. Push rod guard strap-small
16. Check valve

A momentary vacuum will exist in the cylinder barrel and additional fluid drawn into the system from the reservoir thru drilled holes in the piston (2) and past the lip of the cup (4).

The brake shoe retracting springs exert a pressure on the fluid sufficiently strong to lift valve (16) off its seat and permits fluid from the lines to return to the master cylinder. Excess fluid is returned by port (3) into the reservoir, filling the cylinder for the next brake application.

It is necessary that rod (1) which is attached to the brake pedal operating rod, be adjusted for clearance where it seats in piston (2) so that there is 1/4” free movement of the brake pedal pad before the pressure stroke starts. Cup (4 is thus permitted to be clear of port (3 when piston (2) is in its released position.

If this port is not cleared by the piston, the compensating action of the master cylinder will be destroyed and the brakes will drag.

Secondary cup (5) prevents fluid from leaking out of master cylinder into boot (7). The supply tank filler cap (11) is located under the left side of hood bonnet to facilitate checking the level of the fluid. The boot breather hole (6) should be kept open, FREE OF DIRT.

Master cylinder should be kept at least one half full of Hudson Hydraulic Brake Fluid. The filler cap and master cylinder should always be cleaned of all dirt and grit before removing the cap. Grit in the fluid will cause scoring of the. cylinders and possible plugging of lines and ports.

The master cylinder operating lever for 1941 cars has the flat boss, which operates the stop light switch, extended, to conform with a revised position of the stop light switch.

The brake drum dust shield is a press fit on the drum and is also staked in 4 equally distant places to the drum.

BRAKE REPAIR

MASTER CYLINDER REMOVAL

1. Disconnect brake line tube at master cylinder.

2. Remove cotter pin, clevis pin at master cylinder operating lever assembly (26), Fig. 220.

3. Remove the three nuts, lock washers and bolts attaching master cylinder to master cylinder mounting bracket (25) and remove master cylinder. To install reverse procedure of removal.

MASTER CYLINDER DISASSEMBLING

1. Remove large push rod guard strap (12) Fig. 221, that fastens boot to cylinder casting.

2. Remove push rod guard (7) (boot), push rod (1) and rod guard strap (15).

3. Remove piston strap plate lock wire (13).

4. Remove internal parts.

Check condition of rubber parts and the cylinder bore for scratches or pits; Cylinder walls that are scratched or pitted should be honed. The walls must be highly polished for efficient operation.

MASTER CYLINDER ASSEMBLING

1. Wash master cylinder and parts in clean alcohol.

2. Dip master cylinder and all parts in "Hudson Hydraulic Brake Fluid" for lubrication.

Use new rubber cups.

3. Install check valve (16), and piston return spring (9).

4. Install primary cup (4) piston assembly (2) and piston stop plate (8).

5. Snap piston stop plate lock wire (13) in its groove.

6. Assemble push rod guard (boot) (7) and push rod (1) in place.

7. Replace push rod guard strap (12).

FRONT WHEEL CYLINDER REMOVAL

1. Disconnect tube from hose at frame or axle bracket.

2. Remove hose lock nut at frame bracket.

3. Remove the two cylinder fastening screws on rear of shield.

4. Place Wheel Cylinder Clamp KMO-145 on wheel cylinder as shown in Fig. 223.

5. Remove brake shoe retracting springs (3) and (5), which permits shoes to move outward, Fig. 223.

6. Remove connecting links between cylinder pistons and brake shoes. Cylinder and hose may be withdrawn as a unit.

REAR WHEEL CYLINDER REMOVAL

1. Disconnect tube from cylinder fitting.

NOTE: The removal procedure of the rear wheel cylinder is the same as for the front wheel cylinder, except item number one.

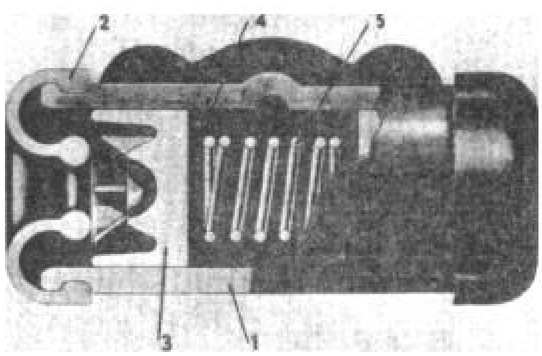


Figure 222
Wheel Cylinder

1. Wheel cylinder
2. Wheel cylinder end guard.
3. Piston
4. Piston cup
5. Piston cup spring

WHEEL CYLINDER DISASSEMBLING

1. Remove cylinder end guards (2), Fig. 222.

2. Remove pistons (3).

3. Remove piston cups (4).

4. Remove piston cup springs (5).

Check condition of rubber parts, and the cylinder bore for scratches or pits. Cylinder walls that are scratched or pitted should be honed or replaced.

WHEEL CYLINDER ASSEMBLING

1. Wash wheel cylinder and parts in clean alcohol.

2. Dip wheel cylinder and all parts in "Hudson Hydraulic Brake Fluid' for lubrication.
Use new rubber cups.

3. Assemble as shown in Fig. 222.

NOTE: The wheel cylinder screws should be tightened with torque wrench J-1300 at 16 foot pounds.

FRONT BRAKE DISASSEMBLING

Whenever servicing the mechanical section of the brakes, such as replacing springs or shoes, and it is not necessary to disturb the wheel cylinders; proceed as follows:

1. Install Wheel Cylinder Clamp KMO- 145 on wheel cylinder as shown in Fig.223 to prevent the piston seals being forced out of position.

2. Remove the brake shoe to anchor pin springs (3) and (5).

3. Press bland turn hold down spring cups (6) and remove cups, springs and pins on both shoes.

4. Remove shoes.

5. Remove adjusting screw (8).

6. Disconnect adjusting screw spring (9).

7. Thoroughly clean away all traces of rust and apply a coating of "Bendix Lubriplate" to the shoe ramps on the backing plates, shoe ends and all other frictional points.

To install shoes, reverse procedure of disassembly. Position anchor pin as described in "Major Brake Adjustment", paragraph 16, Page 208.

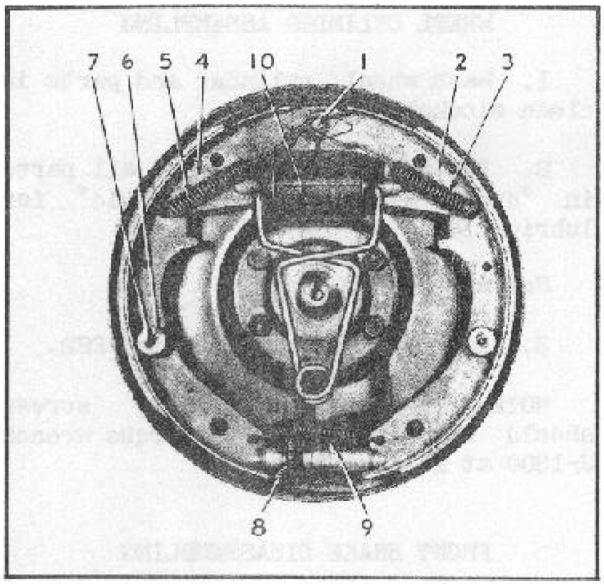


Figure 223
Front Brake

1. Brake anchor pin
2. Primary brake shoe
3. Primary brake shoe to anchor spring
4. Secondary brake shoe
5. Secondary brake shoe to anchor spring.
6. Brake shoe hold down spring cup
7. Brake shoe hold down spring pin
8. Brake adjusting screw
9. Brake adjusting screw spring
10. Wheel cylinder.

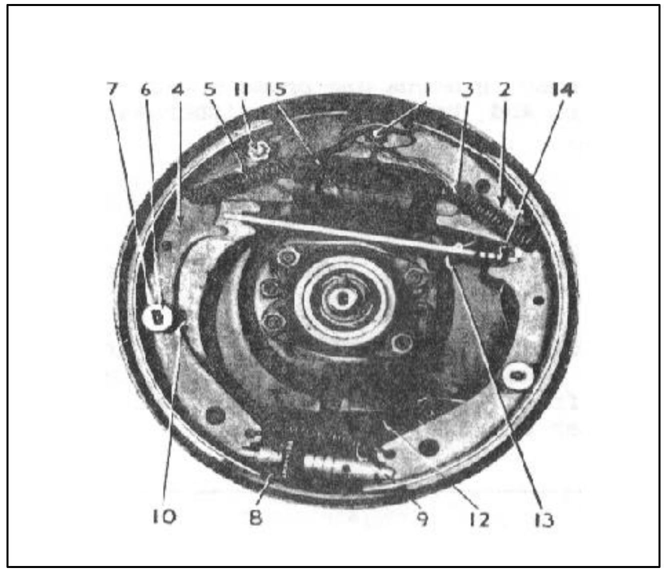


Figure 224
Rear Brake

1. Brake anchor pin
2. Primary brake shoe
3. Primary brake shoe to anchor spring
4. Secondary brake shoe
5. Secondary brake shoe to anchor spring
6. Brake shoe hold-down spring pin
7. Brake shoe hold-down spring cup
8. Brake adjusting screw
9. Brake adjusting screw spring
10. Brake shoe cable lever
11. Brake shoe cable lever to shoe pin
12. Brake cable spring
13. Brake shoe cable lever strut.
14. Brake shoe cable lever strut to shoe spring
15. Wheel cylinder

REAR BRAKE DISASSEMBLING

The disassembly and reassembly procedure of the rear brake is the same as for the front brake, except for the removal of brake shoe lever to shoe pin (11), Fig. 224, brake shoe cable lever. (10), and cable lever strut (13).

After the brake shoe to anchor springs (3) and (5) have been taken off, remove nut and take out pin (11). Strut (13) and spring (14) will drop out of place. Disconnect end of brake cable from brake shoe cable lever.

To reassemble, reverse procedure of disassembly.

BLEEDING BRAKE LINES

Air in the braking system seriously impairs braking efficiency resulting in soft, spongy pedal action. It must, therefore, be removed by bleeding the lines if the fluid level has been allowed to get too low or any part of the braking system has been disconnected or replaced.

NOTE: The bleeding operation should be performed at only one wheel cylinder at a time and repeated at other wheel cylinders if necessary.

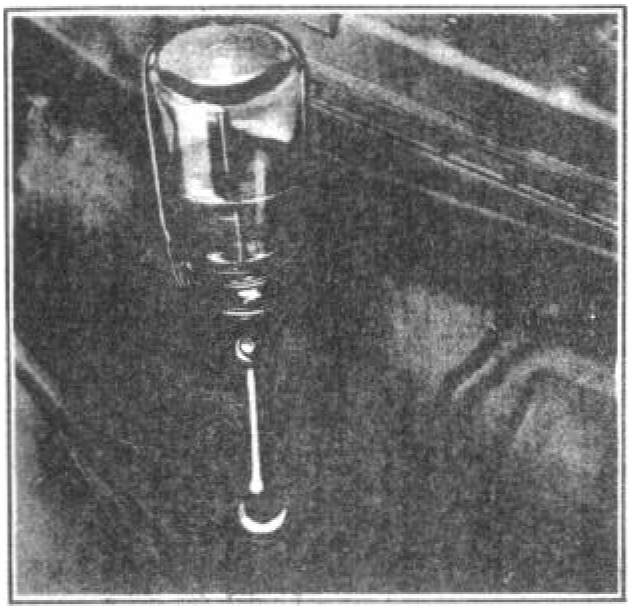


Figure 225
Filling Brake Master Cylinder

1. Fill the bottle J-713, Fig. 225, using "Genuine Hudson Hydraulic Brake

2. Put nozzle in master cylinder reservoir and open filler bottle valve before starting. This will keep master cylinder reservoir half full of fluid during bleeding operation.

3. Remove screw, Fig. 226, from end of bleeder valve and attach bleeder tube J-628. Allow tube to hang in a clean container partly filled with fluid.

4. Unscrew bleeder valve, Fig. 226 three fourths of a turn and depress foot pedal by hand, allowing pedal to return to released position slowly. This gives a pumping action which forces fluid through the tubing and out at the wheel cylinder carrying with it any air that may be present.

After the brake pedal is depressed, it must be allowed to return slowly, otherwise air may be drawn into the system,

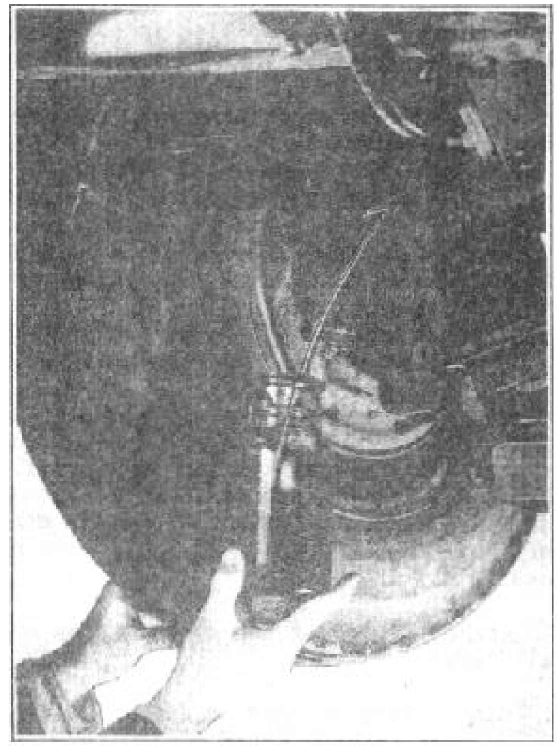


Figure 226
Bleeding Wheel Cylinder

NOTE: The free end of the bleeder hose must be kept below the surface of the fluid in the pint jar.

Watch the flow of fluid from hose and when all air bubbles cease to appear, the bleeder screw should be closed tightly before taking the bleeder hose out of the container of fluid.

Fluid withdrawn in any bleeding operation should. not be used again,

Replenish fluid in the master cylinder after each cylinder is bled. If filler bottle J-713-C (filler and threaded adapter) is used, this constant check on the master cylinder is not necessary because of its larger capacity and the fact that the quantity is easily watched.

If the master cylinder is drained during the bleeding operation, air will enter the system and the bleeding will have to be done all over again at all four wheels.

When bleeding operation is completed the master cylinder must be refilled.

Check fluid level in master cylinder every 1000 miles.

BRAKE FLUID

Hydraulic brake fluid must have a high boiling point to prevent evaporation and to prevent any tendency to vapor lock, yet at the same time a good brake fluid must remain fluid at cold temperatures.

There are some types of brake fluid that are composed of ethyl alcohol and castor oil; cellosolve and castor oil; alcohol, water, and glucose with some chromate added to retard corrosion; mineral oil; anti-freeze alcohols with no castor oil added.

Brake fluids of the above types are all harmful because -

Ethyl alcohol has a lower boiling point than HUDSON BRAKE FLUID, causing it to vaporize more rapidly and increasing the tendency to produce a vapor lock in the lines.

Cellosolve has a rather severe action on the rubber parts and should not be used for that reason.

Water and glucose is worthless as water will corrode the metal parts of the system and glucose forms a sticky mass when exposed to air and has no lubricating qualities.

Mineral oil of any kind is the fluid to guard against. The slightest trace of mineral oil will destroy the sealing qualities of the rubber piston cups in two or three days. Newer wan any hydraulic brake parts in gasoline as even the slightest amount of mineral oil present in gasoline will affect the rubber parts.

Hudson Brake Fluid mixes with other brake fluids recommended by automobile manufacturers. However, do not mix Hudson Brake Fluid with any fluids containing glycerine, sugar, glucose, mineral oil or water.

ADJUSTMENT

HAND BRAKE LEVER ADJUSTMENT

Pull the hand brake lever two notches from full release or until a 1/81 clearance is obtained between the hand brake control lever (10) Fig. 220, and the end of the slot in the lever guide plate.

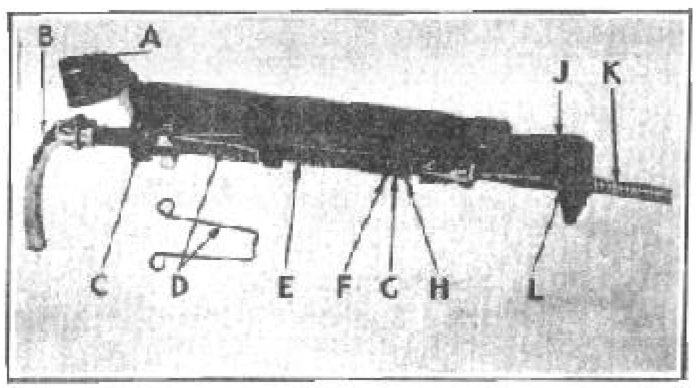


Figure 227
Hand Brake

A. Hand brake mounting bracket
B. Hand brake grip
C. Hand brake ratchet rod housing
D. Hand brake ratchet rod lock spring
E. Hand brake ratchet rod
F. Hand brake ratchet stabilizer - inner
G. Hand brake ratchet stabilizer spring
H. Hand brake ratchet stabilizer - outer
J. Mounting bracket support
K. Hand brake cable and conduit assembly
L. Hand brake to dash retainer

BRAKE PEDAL ADJUSTMENT

The pedal return spring holds the bottom of master cylinder operating lever (26) Fig. 220 against the stop.

Check to see if the lever is in position.

If the pedal shank (in the fully released pedal position) touches the floor board or has more thug 1/4" clearance, it should be adjusted.

1. Loosen pedal link clevis nut (19), Fig. 220.

2. Remove pedal link clevis pin.

3. Turn pedal link (18) to increase or decrease its length until clevis pin can be installed in the master cylinder operating lever with the lever against its stop and the pedal exactly 1/4" from the floor board.

4. Tighten pedal link clevis nut.

5. Recheck pedal to floor board clearance.

This adjustment is important because if the master cylinder piston does not return to the end of the cylinder, the brakes mill drag.

NOTE: The master cylinder operating lever (26) is provided with two holes spaced 1/2" apart for soft or hard pedal application, Fig. 220.

Recheck pedal adjustment to be sure that the pedal is exactly l/4" from the floorboard when the pedal is released.

PEDAL PUSH ROD ADJUSTMENT

To assure mechanical application of the rear wheel brakes in the event the hydraulic system became inoperative, there must be 1-7/16" clearance between the rear face of the hex on the pedal push rod end (16) and front face of pedal push rod (14) Fig. 220.

This adjustment is important in order to obtain the proper mechanical follow-up to the hydraulic operation of the rear brakes. The safety factor of having mechanical brakes following the hydraulic brake. action is lost unless this adjustment is checked 04 every cars whenever brake work or inspection is done.

LINKAGE LUBRICATION

A thin film of chassis lubricant should be applied to parking brake cable connections, brake eccentrics, anchor links and all moving or possible friction contact points.

A film of lubriplate should be placed on the brake shoe support ledge on the backing plate so as to combat rust and insure free brake shoe action.

NOTE: This lubrication should be done at time of brake adjustment, with hubs and drums removed and with brake cylinder clamps In place. Slide the brake shoes away from the backing plate.

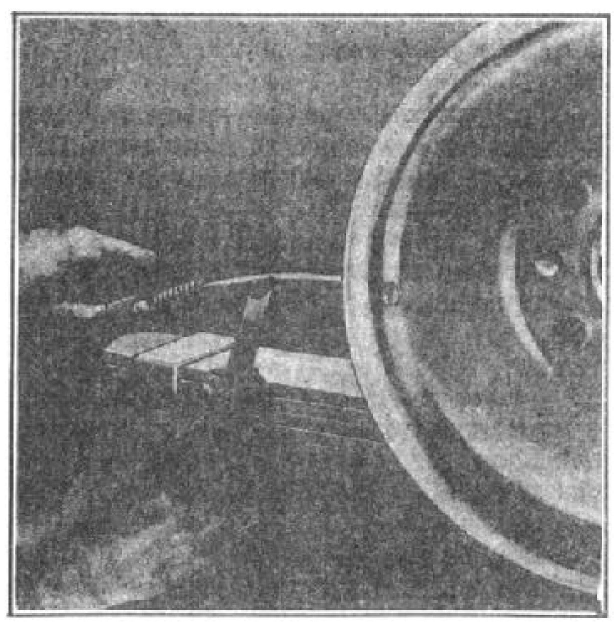


Figure 228
Lubrication Brake Cables

MINOR BRAKE ADJUSTMENT

NOTE: Brake drum should be at approximately room temperature when making brake shoe adjustments. If brakes are adjusted when the drams are hot and therefore expanded, The shoes may drag when the drums cool and contract.

1. Jack up all wheels clear of the floor.

2. Check and remove end play in wheel bearings if necessary.

3. See that parking brake lever is in the fully released position.

Check parking broke cables connecting to the rear brakes to insure that the cables have not been adjusted so short that the shoes have been moved off of their anchor pin seat (in other words, the brakes are partially applied).

4. The brake pedal shank should not have more than l/4″ clearance with the brake pedal in its fully released position.

The brake control lever should be against its stop when the push rod is 1-7/16" from its rear face to the front end of the push rod.

5. Check the anchor pin nut with a J-1313 torque wrench to make sure it is tight. It should check to 80 foot pounds.

NOTE: If an anchor pin nut is found loose, reset the anchor according to instructions under °Major Brake Adjustment”.

6. Remove adjusting hole cover from the backing plate Fig. 229. Expand the brake shoes by turning adjusting screw. Move handle of Brake Adjusting Tool J-1028 as shown in Fig. 229, until the brake drum can just be turned by hand, then back off adjusting screw moving handle of Tool J-1028 approximately 14 notches.

Back off each screw the same number of turns.

NOTE:. Make this adjustment at all four wheels. The brake drum should turn freely and if there is a heavy drag between shoes and drum, reset the anchor pin as given under "Major Brake Adjustment”, paragraph 16.

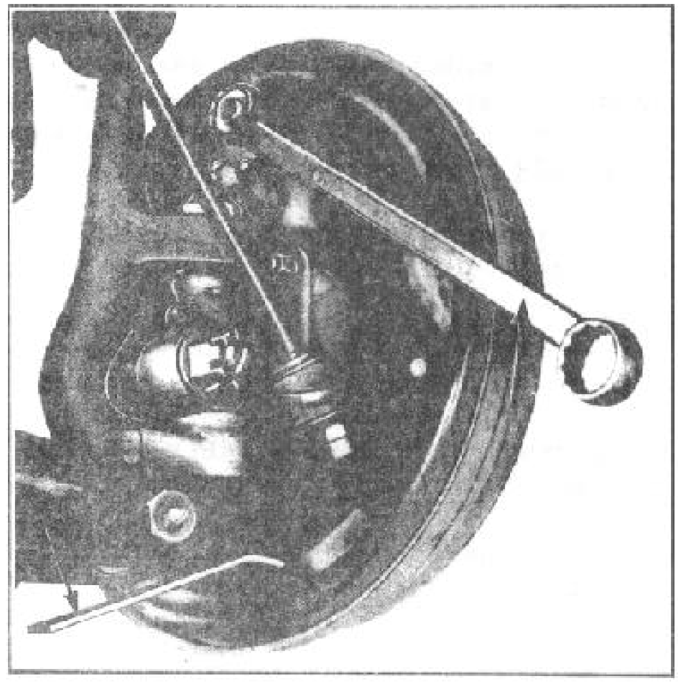


Figure 229
Brake Adjustment

7. Re-install the adjusting hole covers in the backing plates.

8. With the hand brake fully released, the brake cables should permit the anchor ends of the rear brake shoes to rest on the anchor pin. If shoes do not rest on anchor pin readjust the cables as follows:

With the hand brake grip two notches from full release, 1/8″ clearance should exist between hand brake cable lever (10) Fig. 220 and end of slot in lever guide plate (13). If not--adjust hand brake cable clevis.

9. Pull rear brake cables tight and adjust ends so that clevis pins just enter holes in toggle (22). All slack should be removed when clevis pins are in place and hand brake applied two notches. Releasing hand brake will provide proper slack in cables.

Examine hand brake ratchet rod lock springs to see that they engage properly in the rod ratchet. Replace springs if worn or broken.

10. Pull cables tight and adjust the ends so that the clevis pins just enter the holes in the toggle (22), Fig. 220.

11. Release hand brake.

12. Reinstall wheels and lower the car.

Test for operation on a level road. Do not test on the side of a crowned road.

NOTE: Lubricate brake cables with viscous chassis lubricant.

MAJOR BRAKE ADJUSTMENT

A complete brake adjustment is necessary when a minor adjustment fails to give satisfactory results or when replacing shoe and lining assemblies.

1. Jack up all wheels clear of the floor.

2. Remove wheels.

3. Check linings for wear and loose rivets. Inspect linings for metal or foreign particles that may be imbedded in the surfaces and remove any that are found.

Shoe and lining assemblies haying linings soaked with lubricant or Hydraulic brake fluid should be replaced. They cannot be satisfactorily cleaned.

NOTE: Use wheel cylinder clamp KMO-145 if brake shoes are to be removed. This clamp prevents the piston being forced out of the wheel cylinder either from the natural back pressure in the hydraulic system (combined with the spring pressure between the cups), or by an accidental movement of the brake pedal. Piston ejection would cause loss of fluid and allow air to enter the hydraulic system, necessitating bleeding the system to remove the air.

4. Inspect each drum braking surface and rebore the drum if necessary.

Remove only sufficient metal to provide a smooth and true surface. If excess material is removed, the drum may be weakened to the extent that erratic braking and lining wear may result.

5. Disconnect hand brake cables at the toggle bar.

6. Thoroughly clean shoes and brake backing plates with a steel wire brush. All brake frictional points should be thoroughly cleaned after which a thin coat of Bendix Lubricate should be applied at these points.

7. Clean the exposed portion of all hand brake cables and then pull the cables thru conduit from the wheel end to expose that part of cable that is sheathed by the conduit. Clean this portion of the cable and lubricate freely with viscous chassis grease.

8. Push cable into conduit and after the shoes have been reinstalled, connect the cable to the shoe cable lever (10), Fig. 224, leaving the adjustable yoke end of cable disconnected from toggle bar.

9. To connect brake cable to shoe operating lever move cable return spring away from cable end and place end into groove at the end of operating lever.

After the cable is in place allow the cable return spring to return against the lever to hold the cable in place.

10. Inspect backing plates for looseness and tighten if necessary.

NOTE: When newly lined shoes are installed it will be necessary to back off on the adjusting screw to provide clearance for drum installation. After rear shoes are in place attach the cable end to the rear brake lever but do not connect front end of cable.

11. Lubricate the front wheel bearings by applying a milled sodium soap base lubricant to the bearings and races only (3 ounces is sufficient).

Excessive looseness at front or rear wheel bearings should be corrected.

12. Before installing the front wheel hub and drum, remove any excess grease from inside the hub to prevent grease leakage onto the brake assembly.

13. Check the level of lubricant in the rear axle housing. This should not be above the lower edge of the filler plug hole. Too high a level will cause lubricant leaks at the rear wheel oil seals.

14. After installing hubs and drums, insert a pry between the lining of the secondary shoe and the drum (thru drum feeler gauge hole) and move the shoe assembly until the primary shoe is against the opposite side of the drum. The primary shoe can be pried against the drum by inserting the 0.015" feeler gauge between the adjusting screw and of secondary shoe lining and the drum and then spreading the shoes by rotating the adjusting screw.

NOTE: The secondary shoe is always toward the rear and the primary shoe toward the front of the car.

15. Insert a .015" feeler gauge between the secondary shoe lining and the drum and check the clearance between the lining and the drum at each end of the secondary shoe.

A clearance of .015" at each end of secondary shoe with the primary shoe against the opposite side of the drum indicates a good anchor pin and adjusting screw positioning. This will give a .0075" clearance between lining and drum all around.

NOTE: If a .015" clearance cannot be obtained at both ends of the secondary shoe by rotating the adjusting screw, the anchor pin must be adjusted.

16. The anchor pints adjusted radially. Loosen the anchor pin nut just enough to permit moving the pin by tapping the nut with a soft hammer.

CAUTION: Do not back the nut off too much as this would result in moving the shoes out of position when re-tightening the nut.

NOTE: To reduce the clearance between the lining and the drum at the anchor end of the secondary shoe, move the anchor pin away from the center.

To reduce the clearance at the adjusting screw end, move the anchor pin toward the center.

NOTE: After moving the anchor pin it will be necessary to pry the primary shoe against the drum by inserting a pry between the lining of the secondary shoe and drum (thru the drum feeler gauge hole) and move the shoe assembly until the primary shoe is against the opposite side of the drum. The primary shoe can be pried against the drum by inserting the .015" feeler gauge between the adjusting screw end of the secondary shoe lining the drum and then spreading the shoes by rotating the adjusting screw.

17. Insert the .015" feeler gauge between the secondary shoe lining and drum and check the lining to drum clearance at each end of the secondary shoe. The clearance should be .015" at both ends of the secondary shoe.

18. Tighten the anchor pin nut to 80 foot pounds using torque wrench J-1313.

Make sure -that the anchor pin does not move during the tightening operation by again checking the secondary shoe clearance after tightening the nut.

19. At the rear wheels only, tighten the adjusting screws until the wheels can hardly be turned by hand. Be sure that parking brake lever is applied approximately two notches or l/8" at brake control lever from the fully released position.

20. Adjust parking brake cable so that all cable slack is removed when the cable is connected.

21. Back off adjusting screw at the rear wheels approximately 14 notches.

22. Replace adjusting screw hole covers in the backing plate and feeler gauge hole cover on the drum at all four wheels.

23. Install wheels and tighten wheel attaching bolts.

24. Install hub caps.

MAINTENANCE

Brake Pedal Goes to Floorboard

Cause -

1. Normal wear of lining.

2. Improperly adjusted brake shoes.

3. Leak in hydraulic system.

4. Air in hydraulic system.

5. No fluid in system.

Remedy -

1. When it is necessary to pump the pedal several times before the brakes take hold, it is an indication that the brake linings are worn and that it is necessary to set the shoes closer to the brake drums.

2. Shoes should be set to 0.015" clearance. See paragraphs 14 thru 19 in "Major Brake Adjustments.

3. A connection leak in the hydraulic system will allow the brake pedal to go to the toe board gradually.

A cup leak does not necessarily result in any loss of the travel of the pedal but will be shown by a loss of fluid in the master cylinder.

If no leaks are found at the wheels or connections, remove master cylinder and check the bore for scores or scratches.

4. Air in the hydraulic system will cause a springy or rubbery action of the pedal. Should a sufficient quantity of air be allowed to get into the system, the pedal will go to the toe board under normal pressure. In this case the hydraulic system should be bled.

5. The master cylinder should be checked for fluid. If the tank ever becomes empty, air will get into the hydraulic system making a bleeding operation necessary.

All Brakes Drag

Cause -

1. Mineral oil in system.

2. Porthole in master cylinder is closed.

Remedy -

1. The use of any oil having a mineral base (engine oil, kerosene, gasoline, etc.) will cause the rubber piston cups in master and wheel cylinders to swell and distort, making them useless, and it is necessary to replace all piston cups. Brake hoses will become swollen and plugged and should be replaced.

NOTE: The system will have to be thoroughly flushed out with clean alcohol and then refilled with "Genuine Hudson Hydraulic Brake Fluid".

2. The porthole (3) Fig. 221, must not be blocked by the piston cup not returning to its proper release position. Refer to paragraph 13, (Brake Pedal Adjustment).

One Brake Drags

Cause -

1. Brake shoe return spring is weak.

2. Brake shoe set too close to the drum.

3. Wheel cylinder cups distorted.

4. Loose wheel bearings.

5. Dirt in the line.

Remedy -

1. Replace brake shoe return spring.

2. Readjust brake shoes to 0.015" clearance. See paragraphs 14 thru 19 in "Major Brake Adjustment.

3. See "All Brakes Drag".

4. Adjust wheel bearings.

5. Remove dirt and flush out entire system with alcohol and then refill with Hudson Hydraulic Brake Fluid.

Car Pulls to One Side

Cause -

1. Lining on one wheel grease soaked.

2. Brake shoes set incorrectly.

3. Brake backing plate loose on axle.

4. Brake linings have different friction qualities on different shoes.

5. Improperly inflated tires.

6. Caster of front wheels is incorrect.

7. Loose wheel bearing.

8. Dirt in lining or drum scored.

Remedy -

1. Oil or grease-soaked linings cannot be saved by washing or cleaning. Replace the linings with "Genuine Hudson Lining".

2. The construction of the braking system will cause a slight pull or drift to one side in cases where a brake shoe is set too close on a front wheel. Adjust brake shoes as outlined in, "Major Brake Adjustment".

NOTE: A rear wheel brake that is set too close will not cause this pull or drift, but will make one of the rear wheels lock and slide before the other.

3. A loose backing plate will allow the brake assemblies to shift on their locating bolts which determine the exact centers and any shift causes an unequal brake efficiency. Tighten backing plates and readjust shoes.

4. Different makes of brake linings are built to reach a certain aim of the manufacturer and the mixing of two different makes of linings on any of the wheels will very possibly give what is known as "Soft Pedal Action" on one shoe and "Hard Pedal Action" on another shoe and these shoes may be on one wheel or different wheels.

Genuine Hudson Lining sets are supplied in a package together with rivets. The primary shoe lining is moulded and the secondary shoe lining is woven. The linings are accurately ground and carefully inspected to assure you of the "Hudson Standard of Service Material".

5. Check front tires for proper inflation and approximate equal wear.

6. Check front wheel caster. Refer to the "Front Axle and Suspension Section".

7. Adjust wheel bearing.

8. Remove dirt or foreign matter from face of the lining. Seriously scored brake drums should be replaced.

Brake Pedal Action Springy or Spongy

Cause -

1. Brake shoes improperly adjusted.

2. Air in hydraulic system.

Remedy -

1. Adjust Brakes - See paragraph 14 in "Major Brake Adjustment".

2. Air in hydraulic system. Bleed system. Refer to paragraph "Bleeding Brake Lines".

Brake Pedal Pressure Excessive and Stop Unsatisfactory

Cause -

1. Brake shoes improperly adjusted.

2. Improper grade of lining.

3. Oil or grease on lining.

4. Lining making only a partial contact with brake drum.

5. Pedal rod adjustment incorrect.

Remedy -

1. Adjust brake shoes.

2. The use of the improper grade of brake lining will cause it to lose its gripping power in a short time, requiring extra heavy pressure on the brake pedal in an attempt to make up for the lost gripping power the lining should be giving.

3. Oil or grease that is soaked in the lining cannot be washed off. Replace with “Genuine Hudson Brake Lining”.

4. Remove high spots.

5. Adjust pedal rod link (18) Fig. 220. (See "Pedal Push Rod Adjustment")

Light Pedal Pressure But Severe Brakes

Cause -

1. Brake shoes incorrectly adjusted.

2. Loose backing plate.

3. Lining grease soaked.

4. Improper lining.

Remedy -

1. Adjust brakes.

2. Tighten backing plates.

3. Replace brake lining.

4. Install Hudson Lining.

Brakes Squeak

Cause -

1. Backing plates bent or shoe twisted.

2. Dirt imbedded in lining.

3. Lining rivets loose

Remedy -

1. Straighten or replace damaged parts.

2. Remove dirt or foreign matter from lining surface.

3. Replace rivets, lining or shoes.

HUDSON HYDRAULIC HILL HOLD

If the car is brought to a stop on an upgrade and both clutch and brake pedal are depressed, Hill Hold automatically keeps the brakes applied while the clutch pedal is depressed even if the brake pedal is entirely released. This allows the right foot to remain free to operate the accelerator pedal when the car is again started.

On cars equipped with Vacumotive Drive in addition to Hill Hold, the clutch pedal must be depressed manually while the car is standing.

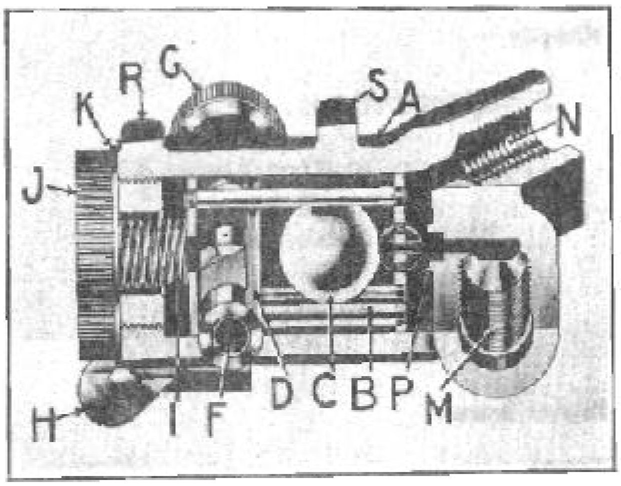


Figure 230
Hill Hold with Clutch Pedal not Depressed

A. Valve body
B. Ball and cage assembly
C. Ball
D. Camshaft
F. Camshaft spring
G. Valve body plug--camshaft chamber
H. Valve lever and rod guide assembly
I. Ball and cage spring
J. Valve body plug--ball cage chamber
K. Valve body plug gasket
M. Inlet
N. Outlet fitting
P. Valve seat
R. Boss
S. Boss

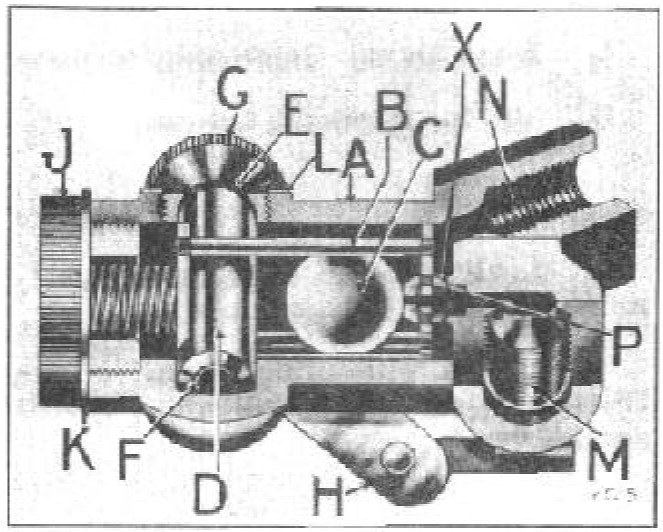


Figure 231
Hill Hold. with Clutch Pedal Depressed

A. Valve body
B. Ball and cage assembly
C. Ball
D. Camshaft
E. Camshaft sealing washer
F. Camshaft spring
G. Valve body plug--camshaft chamber
H. Valve lever and rod guide assembly
J. Valve body plug--ball cage chamber
K. Valve body plug gasket
L. Valve body plug gasket
M. Inlet
N. Outlet fitting
X. Ball seat

OPERATION

Figs. 230 and 231 show the various parts of the unit. (A) is the valve body having an inlet (M) which is connected direct to the master cylinder and an outlet (N) which is connected to the wheel cylinder lines. The valve cage (B) contains a ball (C) which is free to slide in the valve body. Fig. 230 shows the position of the various parts when the clutch pedal is not depressed. When the brake pedal is depressed, fluid is forced from the master cylinder into (M) through the valve seat (P) and out (N) to the wheel cylinder applying the brakes.

If the clutch pedal was depressed before the brakes were applied, the parts would have been in the position as shown in Fig. 231. Here the cage (B) is seated on the valve seat (P) so that the brake fluid would force the ball (C) away from the seat (X) and the fluid would pass around the cage and out (N) to apply the brakes.

With the brakes applied and the clutch pedal depressed, the foot can be removed from the brake pedal and the fluid will still be retained in the wheel cylinders since the cage (B) is on its seat (F) and the ball (C) blocks the return of the fluid through the cage valve (X).

When the clutch pedal is released, the cage (B) is moved forward by the rotation of the camshaft (D), permitting the fluid to return to the master cylinder from the wheel cylinders, as shown in Fig. 230, from (N) through (P) to (M). It should be noted that the ball (C) is free to roll in cage (B).

When the car is headed upgrade, the ball will always roll back against the seat (X) and operation will be as previously described. If the car is headed downhill the ball will roll to the front of the cage so that the passage will always be open, and the brakes will not remain applied, so that the device does not function during the normal operation of the car except to prevent roll back when starting on an upgrade.

TO DISASSEMBLE UNIT

Loosen lock screw in lever (H), Fig. 230, center punch shaft and lever to facilitate reassembly and remove lever. Remove head (J), gasket (K) and spring (I). Remove camshaft plug (G), camshaft (D) and spring (F). Remove ball cage (B) and ball (C). Clean and inspect all parts particularly the valve seat (X) in the cage.

TO REASSEMBLE UNIT

Insert ball cage (B), Fig. 230, being sure the two large ball rails are on the underside of the camshaft (D). Insert spring (F) in camshaft (D) and insert both in the housing. Be sure spring (F) remains in place in the shaft. Install plug (G). Replace valve lever (H) being sure it is in the same position on the camshaft (D) as when taken off and pointing downwards. Place a new gasket (K) on head (J) and put spring (I) in head and install in body.

INSTALLATION

1. Place car on level floor. If car must be raised then raise all four wheels an equal amount. Remove and discard brake tubing from outlet end of master cylinder to frame tee (Q), Fig. 232. Remove and discard outlet fitting from end of master cylinder.

2. Attach Hill Hold unit to master cylinder with bolt (B), see Fig. 232, valve body should be above master cylinder outlet hole. Do not tighten bolt (B).

3. Place a small accurate spirit level crosswise on either boss (C) or (D) and swivel unit around bolt (B) and tighten bolt (B) securely when unit is in a level crosswise position. Place the spirit level lengthwise on bosses (C) and (D) and swivel unit around bolt (E) until unit is level lengthwise; then tighten bolt (E) securely.

4. Connect tubing (H) to frame tee (Q) and to outlet fitting (A) on Hill Hold.

Tighten tube nut securely. Recheck bosses (C) and (D) for crosswise and lengthwise level position. The fundamental operation of the Hill Hold depends upon the unit being level.

5. Assemble operating lever (J) on motor side of clutch operating level (L). Secure with original clevis pin and with U-bolt (G). U-bolt (G) should straddle clutch operating lever (L) and go through holes provided in lever (J). Secure with nut and lock washer.

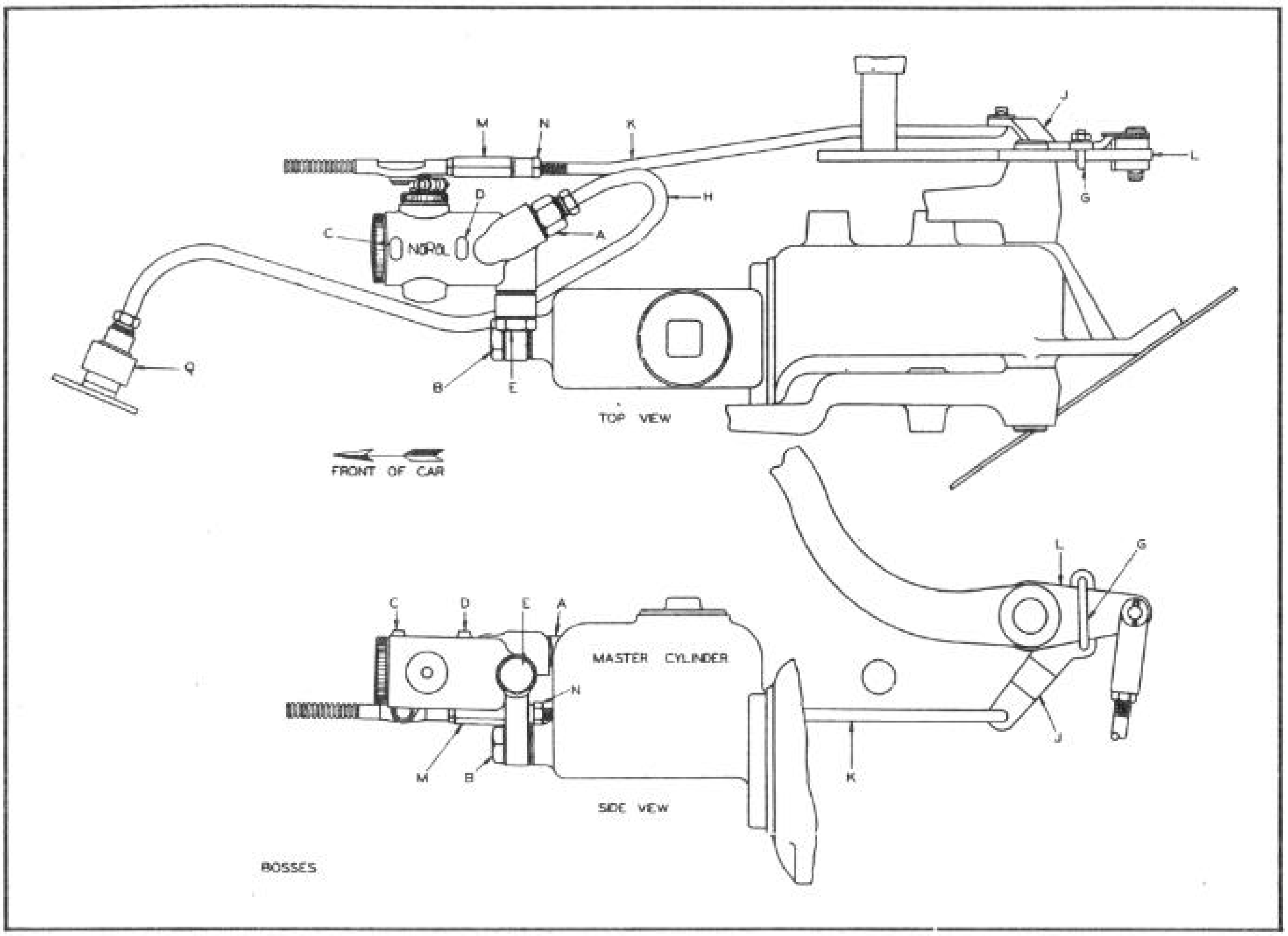


Figure 232
Hill Hold Installation

Assemble clutch rod (K) as shown on lever (J) and secure with washer and cotter pin.

6. Bleed system at all wheels to remove air and refill master cylinder with genuine Hudson Hydraulic Brake Fluid. Wipe all connections dry. Hold brake applied for one minute after which, examine connections for leaks.

7. Start the engine, fully depress the clutch pedal, engage low gear and apply the brake. Release brake pedal but continue to hold the clutch pedal fully depressed. Slowly engage clutch noting where the Hill Hold releases the brakes in relation to clutch engagement.

If engine has a tendency to stall, it will indicate that the brake release is delayed. This condition may be corrected by backing off nut (N) and threading rod connector (M) off rod (K) or away from the clutch pedal, thus lengthening rod (K). Should the brakes release before the clutch engages back off nut (N) and thread connector (M) onto rod (K) or toward the clutch pedal, thus shortening rod (K). When the Hill Hold is properly adjusted, the brakes release as the clutch plate engages. Lock nut (N) should be securely tightened after final adjustment is made. The car should be tested on a slight incline to ascertain that the adjustment has been properly made.

SERVICE OPERATIONS

There are only two major adjustments to be made on this unit.

1. Proper leveling. See step 3 above. This insures ball (C) being on its seat at the back of cage (B) when car is headed upgrade and off its seat when headed downgrade, Figs. 230 and 231. The proper position will also insure the ball rolling forward when the brakes are applied when the car is moving forward.

2. Proper adjustment. See step 7 under Installation. This insures proper timing, permitting the application and release of the unit with clutch engagement and clutch disengagement.

REMOVAL FROM CAR

Disconnect brake tube (H), Fig. 232, from connection (A) at Hill Hold. Disconnect clutch rod (K) from lever (J) by removing cotter pin and washer. Remove bolt (B) and remove unit.

REFERENCES

Source of Information	Date	Subject

FRONT SUSPENSION

1942 THRU 1947 SPECIFICATIONS

		FRONT	REAR
Caster	1/2° to 1-1/2° at curb height	4-7/16"	4-13/16"
Camber	1/2° to 1-1/2° at curb height	4-7/16"	4-13/16"
Maximum variation between right and left wheel caster or camber	1/2°		
Toe-In	0 to 1/16" measured at wheel rim		
Pivot Pin Inclination	4° 36′		
Toe-Out variation	± 30' between wheels		
Spindle Pivot Pin Thrust Bearing	Ball		
Wheel Bearing Type	Taper roller		
Wheel Bearing End Play	001" to .003"		
Tie Rod End Type	Plain Bearing		
Tie Rod Adjustment	Turn rod right and left		
Tie Rod Adjustment - To Increase	Turn in direction of forward wheel travel		
Tie Rod Adjustment - To Decrease	Turn in opposite direction		
Steering center arm bolt nut	Tighten to 60 foot pounds		
Steering arm nut - tighten to	100 foot pounds		

CONSTRUCTION

Independent front wheel suspension. permits either front wheel to take road irregularities without any appreciable effect on the opposite front wheel.

The ability of one front wheel to act independently of the other minimizes road variations that cause "wander" of the car and steering wheel "fight".

Road variations seldom occur simultaneously at both front wheels and when the front wheels are tied together the tendency of one wheel is to follow the other which causes "wander" and creates much of the energy that causes wheel shimmy and the driver to "fight" the steering wheel.

Steering is from a center point which permits easy steering because it is possible to eliminate frictional points not possible with off-center steering.

The vertical (up and down) movement of the front wheels on the road is taken care of by the front suspension upper and lower supports.

Front Suspension Upper Support

The brake backing plate is bolted to the steering spindle.

The steering spindle is attached to the spindle support by a hardened and ground steel pivot pin which has seven ball bearings at the top to carry the thrust load. The steering spindle is held at the bottom by a pivot pin riding in a hardened and ground steel bushing in the spindle support. At the top it is held by an eccentric bushing which is clamped in a centralized position by a lock screw.

This eccentric bushing has several duties to perform. It is the adjustment for front wheel caster and camber. It also joins the spindle support to the upper support arm and pivot, The upper support arms and pivot are one unit and the pivot is not removable. This assembly rides in bushings at the front and rear of the pivot which is fastened to the frame front cross member by three bolts. The outer end is fastened to the steering spindle support by the eccentric bushing.

Front Suspension Lower Support

The lower support arms carry the vertical movement of the front wheels and they are joined to the steering spindle support by a threaded pivot pin and nut. The steel seat for the coil springs is riveted to the lower support arms. The upper end of the coil spring is carried in the frame front cross member which is recessed for it. Between the upper end of the coil spring and its seat is a silencer of sound deadening material to eliminate noise, also a shim for adjustment of spring height. In the center of the coil spring is the shock absorber and it operates in a vertical plane. The lower support arms fasten to a pivot that is held to the front frame cross member.

A rubber bumper is attached to the frame side bracket and this limits the downward movement of the suspension. Another rubber bumper is attached to the lower support arm and limits the upward movement of the suspension.

Front Wheel Suspension Bushings

Front wheel suspension bushings are at all of the following attaching points:

Lower support arm pivot, see (13), Fig. 235.

Lower support arm to spindle support pivot, see (17), Fig. 235.

Upper support arm pivot bushing - Front, see (K), Fig. 236.

Upper support arm pivot bushing - Rear, see (L), Fig. 236.

Eccentric bushing,see (24), Fig. 237.

These five points are fitted with hardened steel threaded bushings which provide means of adjustment.

The clearance is from .012" to .026" between the threaded pins and their bushings. This provides clearance for lubrication, side adjustment and freedom of action.

The pivot pins and their hardened and ground steel bushings are threaded into one another, thus they are tied together even though one fits loosely in the other, due to wear.

LUBRICATION

Lubrication of the threaded bushings used in the front end suspension should be thorough and with the weight of the car off the bearings.

The front end of the car should be lifted with a jack placed under the front cross member so that the car is supported at the frame and the front suspension relieved of all weight.

See Lubrication Section for specifications of lubricant and lubricate every 1,000 miles.

FRONT WHEEL SUSPENSION

REMOVAL OF EITHER RIGHT OR LEFT HAND ASSEMBLY AS A COMPLETE UNIT

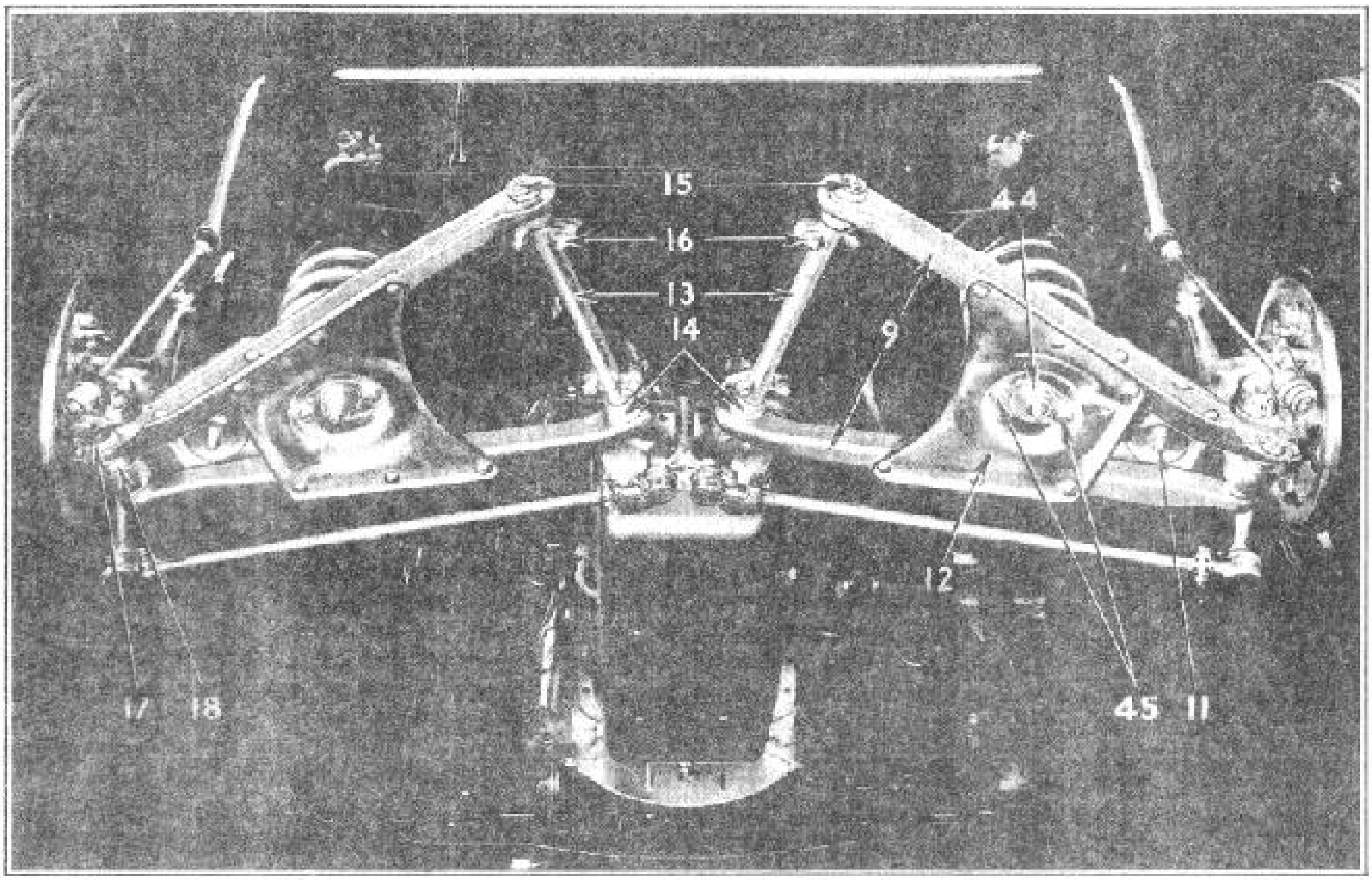
1. Raise car and place stand jacks under inner ends of the lower support arms (9), Fig. 235.

2. Remove wheel.

3. Remove shock absorber upper stud nut and palnut (I) Fig. 236.

4. Remove shock absorber lower mounting nuts, (45) Fig. 235 washers and remove shock absorber.

5. Remove lower support arm pivot to frame bolts, (16), nuts and lockwashers.



9. Lower support arm assembly
11. Lower support arm rubber bumper stud
12. Lower support an spring seat
13. Lower support arm pivot
14. Lower support arm pivot seal
15. Lower support arm pivot bushing front
16. Lower support arm pivot to frame bolt
17. Lower support arm to spindle support pivot
18. Lower support arm to spindle support bushing
44. Shock absorber lower mounting plate
45. Shock absorber lower mounting nuts

6. Raise car, allowing coil spring to expand and remove the spring.

7. Remove auto poise connector, (0) Fig. 238.

8. Remove tie rod end from center steering arm using "Steering Arm Ball Stud Screw Press" J-624-H

9. Remove retainer clip (V) and disconnect front wheel hydraulic brake hose (R) at frame bracket, Fig. 236.

10. Remove upper support arm pivot to frame bolt nuts and lockwashers (J).

11. Remove front wheel suspension assembly.

INSTALLATION

1. Replace assembly and install upper support arm pivot (B) to frame cross member and fasten securely. Fig. 236.

2. Install coil spring (50), Fig. 237. Flat end is to the top and rests in the frame cross member, also be sure open end of spring rests over the convex recess in the lower support arm.

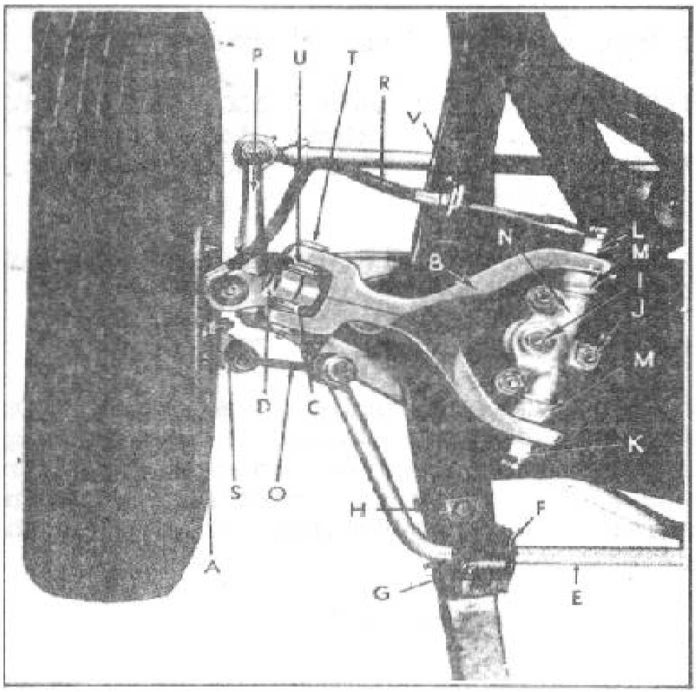


Figure 236 - Front Suspension Detail

A. Front wheel brake backing plate
B. Upper support arm
C. Upper support arm eccentric bushing
D. Upper support arm eccentric bushing lock screw
E. Auto-poise bar
F. Auto-poise rubber bushing
G. Auto-poise bracket
H. Auto-poise bracket bolt
I. Shock absorber upper stud nut
J. Upper support arm pivot to frame bolt
K. Upper support arm pivot front bushing
L. Upper support arm pivot rear bushing
M. Upper support arm pivot seal
N. Upper support arm pivot
O. Auto-poise connector
P. Steering arm
R. Front wheal hydraulic brake line
S. Auto-poise connector bracket on steering spindle
T. Upper control arm pivot bolt
U. Eccentric bushing seal
V. Front brake hose retainer clip

3. Lower the car, which will compress spring and position lower support arm pivot to frame cross member.

4. Install lower support arm pivot attaching bolts and tighten securely.

5. Install shock absorber (42), Fig. 237.

6. Install auto poise connector (0), Fig. 236.

7. Install tie rod end at center steering arm.

8. Connect hydraulic brake hose (R), Fig. 236 and install retainer clip (V).

9. Install wheel assembly.
10. Remove car from stand jack and lower car to the floor.

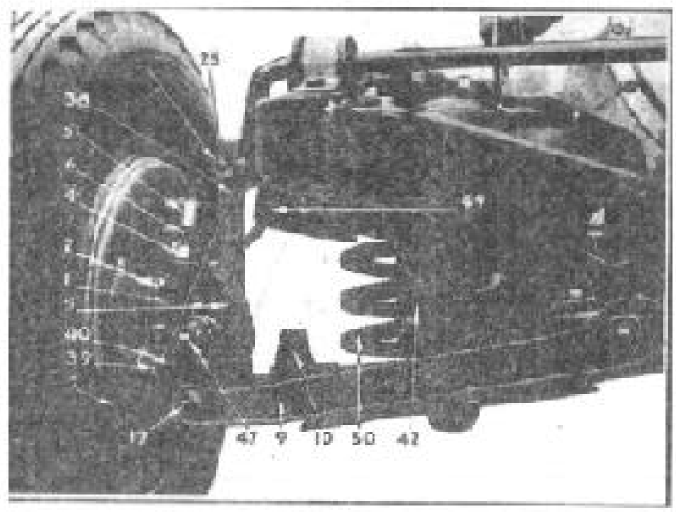


Figure 23 - Front Suspension Detail

1. Steering spindle
2. Steering spindle to backing plate bolt
4. Steering spindle pivot pin upper bearing
5. Steering spindle support
6. Steering spindle pivot pin grease fitting
7. Front wheel brake backing plate
8. Lower support arm assembly
10. Lower support arm rubber bumper
17. Lower support arm to spindle support pivot
24. Upper support arm eccentric bushing
25. Upper support arm eccentric bushing lock screw
38. Auto-poise connector
39. Auto-poise connector cushion
40. Auto-poise connector cushion retainer
42. Shock absorber
47. Steering arm

RIDING HEIGHT AND COIL SPRING SAG

Where the car does not seem to be level and a check of the coil spring height is desired, place the car so that the front end is level crosswise and then rock the car sidewise several times and allow the car to settle. This will remove any binding that might cause a dimensional difference.

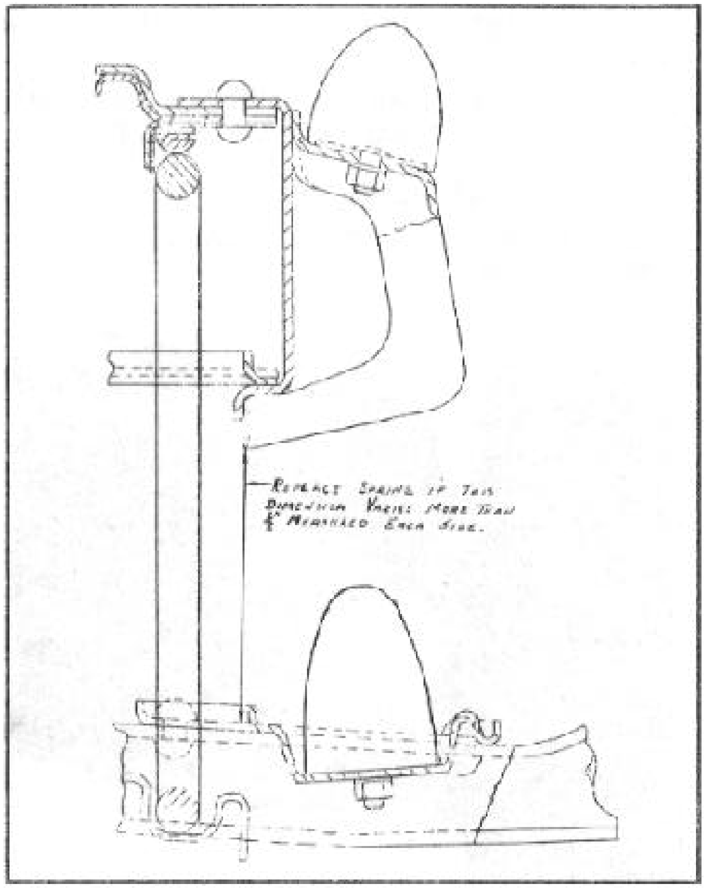


Figure 238 - Riding Height or Spring Sag Dimensional Check

Measure the distance from the top of the seat of the lower support arm rubber bumper to the bottom of the upper rebound bracket and rubber assembly which is riveted to the frame.

Measure the distance at the opposite suspension assembly.

If the two measurements are not approximately the same, a shim of .120° thickness can be added at the top of the coil spring, having the lesser dimension.

If more than two shims are required, it is advisable to replace the coil spring.

NOTE: A rubber and fibre insulator or silencer is assembled in the upper seat of the frame cross member.

The coil springs may be identified by the following markings:

PART NO.	COLOR IDENTI-FICATION	LOAD AT PASS HEIGHT	RATE	SERIES
162530	Bronze	1396	253	20,21,22,51, 52,171,172
162531	Chrome Orange	1456	290	28,58,178
162532	Violet	1630	290	24,25,27,53, 54,173,174
		Right Side		
162533	Saratoga Cream	1735	290	Left Side

Optional on all models is the heavy scale front spring.

160512	White	1630	326

Part numbers, brinnell marks and limit marks show on flat end of each spring. A light limit spring has one grind mark and a heavy limit spring has two grind marks. Use heavy limit springs on the drivers side.

FRONT COIL SPRING REMOVAL

Proceed as outlined in "Front Wheel Suspension Removal," items 1 to 6, inclusive.

NOTE: The coil spring is under heavy pressure and care must be exercised in releasing it.

FRONT COIL SPRING INSTALLATION

Proceed as outlined in "Front Wheel Suspension Installing," items 2 to 5, inclusive.

Flat end of spring must be at top. Bottom end must rest in the seat stamped in the lower support arm spring seat (12), fig. 235. Silencer must be in the upper spring seat. Check "Riding Height" and use-shims if necessary.

FRONT SHOCK ABSORBER REMOVAL

1. Remove upper stud nut (I) Fig. 236.

2. Remove retainer and rubber bushing.

3. Remove the two nuts (45) and screws Fig. 235, which hold shock absorber anchor plate (44) to the lower support arm (9).

4. Turn the shock absorber one-fourth turn and lower through opening.

NOTE: To install, reverse procedure of removal.

LOWER SUPPORT ARM REMOVAL

1. Perform the operations of "Front Wheel Suspension Removal" Items 1 to 6 inclusive.

2. Remove the lower support arm outer pivot (17) Fig. 235.

LOWER SUPPORT ARM INSTALLATION

1. Install the lower support arm outer pivot (17). Figs. 235 and 237.

The 4 lower support arm pivot bushings are self-threading and can be more easily installed if they are lubricated with a tapping compound, such as Lard Oil, This will allow the bushings to out their own thread in the arm without scoring.

2. Install front coil spring.

3. Install lower support arm pivot to frame bolts (16).

4. Install shock absorber, mounting plate, rubber bushings, retainers and retaining nuts.

5. Remove car from jack stand and lower car to floor.

6. Adjust camber, caster and toe-in.

LOWER SUPPORT ARM PIVOT AND BUSHING REMOVAL

1. Jack front wheels clear of the floor.

2. Place stand jack under inner side of lower support arm Fig. 235.

3. Remove front and rear bushings (15)of the lower support arm pivot (13).

4. Remove the four nuts (16) that hold lower pivot to front cross member.

5. Remove lower pivot (13) from lower support arm (9), Fig. 235.

Figure 239 - Maintaining Lower Support Alignment Using Tool J-1052

NOTE: Use tool J-1052, Fig. 239 to maintain the exact distance of 11-1/2" between the inner faces of support arms and an exact distance of 1-1/2" between the inner face of support arm and the center line of the nuts holding the pivot to the cross member. These distances must be maintained.

A .010" oversize lower support arm to support bolt bushing is available for wear of the steering spindle support.

LOWER PIVOT PIN AND BUSHING REMOVAL

1. Place a jack under the lower support arm (9) Fig. 235, and raise the car off the floor,

2. Remove cotter pin, nut and washer from the pivot pin (17).

3. Remove the lower pivot pin (17) and bushing.

LOWER PIVOT PIN AND BUSHING INSTALLATION

1. Install bushing in spindle support.

2. Hold the steering spindle support (5) Fig. 237, squarely between the yoke (formed by lower supporting arm) (9).

3. Install the outer pivot pin (17) and index the pin so that the spindle support (5) is centralized between the inner faces of the outer end of the lower support arm (9).

4. Install the outer pivot pin (17) in place.

5. Install the washer, nut and cotter pin.

6. Check caster, camber and toe-in.

UPPER STEERING SPINDLE SUPPORT ARM AND PIVOT REMOVAL

Drop Forged Upper Control Arm

1. Jack up car so that wheels clear the floor.

2. Remove wheel assembly.

3. Remove shock absorber retainer nut, retainer and rubber bushing.

4. Remove cap screws (J) holding pivot to cross member, Fig. 236.

5. Remove eccentric bushing (C), Fig. 236.

6. Remove upper steering spindle arm and pivot (B), Fig. 236.

7. Remove lock screw (0).

8. Unscrew eccentric bushing from upper support arm (B), Fig. 236.

9. Remove upper support arm and pivot assembly.

NOTE: To install reverse procedure of removal, check caster and camber after installation.

Pressed Steel Upper Control Arm

Proceed as outlined in “Drop Forged Upper Control Arm Removal”, items 1 to 4, inclusive.

5. Remove Cotter pin and nut from upper control arm pivot bolt (T), Fig. 236.

6. Unscrew upper control arm pivot bolt (T) supporting upper control arm at steering spindle support.

7. Remove upper support arm and pivot assembly.

Eccentric bushing will remain in steering spindle support.

NOTE: To install, reverse procedure of removal.

Check caster and camber after installation.

UPPER STEERING SPINDLE SUPPORT PIVOT FRONT AND REAR BUSHING REMOVAL

Drop Forged Upper Control Arm

1. Jack up car so that wheels clear the floor.

2. Remove upper brace clamp bolt.

3. Remove upper support arm pivot front bushing (K), Fig. 236.

4. Screw bushing (L) out of upper support arm and off the pivot arm.

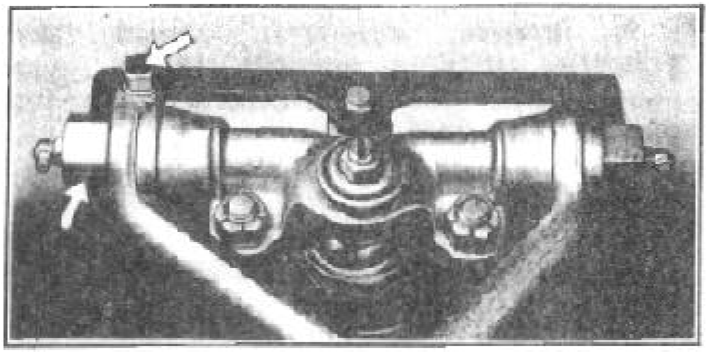


Figure 240 - Locating Pivot Bushing with Tool J-1360 (Drop Forged Upper Control Arm)

NOTE: Use tool "J-1360" to reinstall the bushing. Place the tool on the outer stud of the pivot (J) Fig. 236, and locate the bushing so that the pivot is central with the tool.

Pressed Steel Upper Control Arm

NOTE: The upper support arm pivot is self threading. The assembling of the upper support arm pivot and bushings requires special tool J-1860 to maintain a proper spread of the pressed steel support arm to insure proper tension on the threads of the pivot after the bushings have been installed.

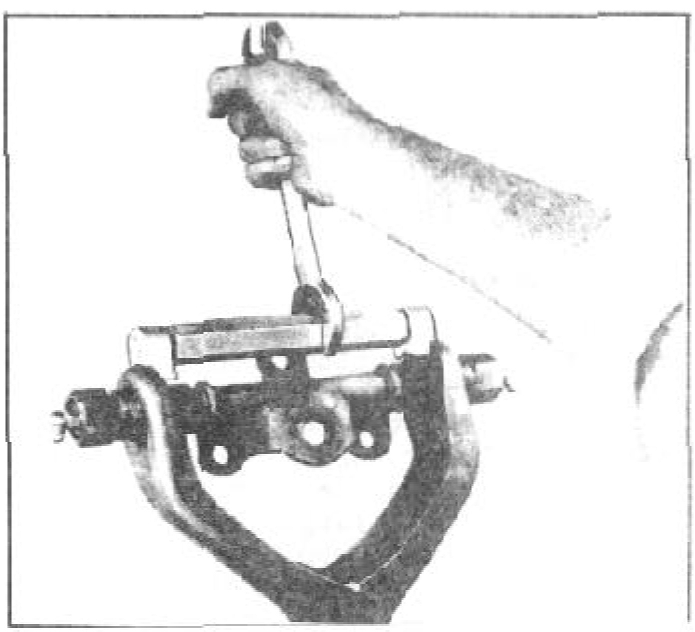


Figure 241 Upper Support Arm Spreader J-1860

1. Install the gauge tool J-1862 on the outer stud of the pivot. Install the pivot so that it is central with the tool. Install the spreader tool J-1860 so that the two ends of the tool rest against the inner faces of the upper control arms and the flange of the control arms fits in the slots machined in the ends of the spreader tool. Turn the hexagon portion of the spreader tool until the gauge rests against outer surface of the arms. This will spread the arms 1/16. Fig. 242.

2. Just start the bushings on both ends of the pivot. Lubricate them with a tapping compound such as lard oil which will allow the bushings to cut their own threads in the support arm without scoring. Install the upper support arm pivot centering gauge J-1862. Thread the bushings into the support arm until the head seats tighten to 110 foot pounds. Remove both tools.

NOTE: The upper spindle support arm assembly must have free movement so that it is free to drop of its own weight, plus not more than a five pound pressure, from a horizontal position. It must have no perceptible shake. The pivot must not be rotated as this will throw the pivot off center with the support arm.

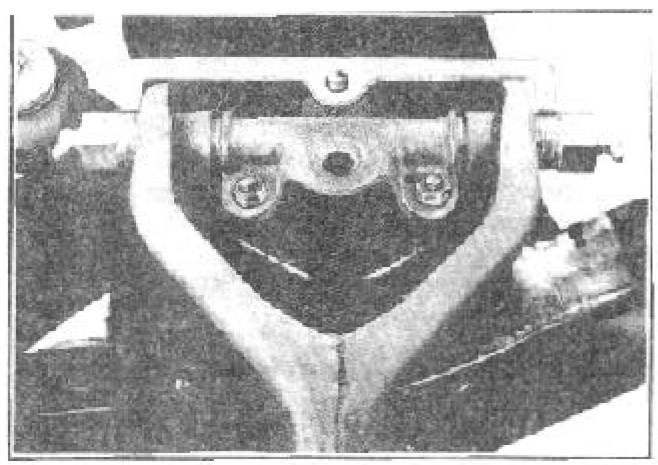


Figure 242
Upper Support Arm Spreader Gauge J-1862

ECCENTRIC BUSHING REMOVAL

Drop Forged Upper Control Arm

1. Place jack under lower support arm and raise the car off the floor.

2. Remove lock screw (D) Fig. 236.

3. Remove bushing (C) from the steering spindle support and upper support arm.

NOTE: Do not remove brake hose but protect it against possible damage by fastening the spindle support to the rebound bumper bracket.

ECCENTRIC BUSHING REMOVAL

Drop Forged Upper Support Arm

Hold the steering spindle support 9/32" away from the boss on the upper support arm. See Fig. 257. Screw the eccentric bushing onto the upper support arm until it starts to enter the steering spindle support. Continue turning the eccentric onto the upper support arm until this upper support arm is located 7/8" from the boss. See Fig. 257. This setting should give a' zero caster and a zero camber and two complete turns (3/16") of the eccentric bushing into the steering spindle support would give a plus 1° of caster and two complete turns (3/16") out of the spindle support would give a minus 1° of caster. The correct caster setting is 1/2° to 1-1/2° at curb height and must not vary more than 1/2° between right and left side of car.

SET CAMBER AND CASTER

Install eccentric bushing locking screw and tighten securely.

ECCENTRIC BUSHING REMOVAL

Pressed-Steel Upper Support Arm

1. Place jack under lower support arm.

2. Remove lock screw (D) Fig. 236.

3. Remove cotter pin, nut, and control arm pivot bolt (C), Fig. 236.

4. Remove eccentric bushing from steering spindle support using upper support arm eccentric bushing adjusting wrench "KMO-336".

ECCENTRIC BUSHING INSTALLATION AND ADJUSTMENT

1. Install eccentric bushing into steering spindle support (Hexagon head of bushing to the front).

2. Install clamp bolt (25) but do not tighten. Fig. 237.

3. Hold the steering spindle support in the center of the upper control arm and install the control arm pivot bolt. Turn the bolt until the head seats tightly.

4. Install nut and cotter pin.

5. Use Wrench KMO-336 to adjust eccentric bushing (Adjust caster and camber as given on page 235.

6. Tighten clamp screw securely.

NOTE: Turning the eccentric bushing two complete turns (3/16") clockwise will give a plus 1° change of caster and two complete turns (3/16") counterclockwise will give a minus 1° change of caster.

Spindle Support Arm Identification

The lower spindle support arms (1), Fig. 235 are identical on the right and left sides with the exception of the diameter of the threaded bosses through which the lower support bolt passes. The bosses that face the front of the car are threaded .010" larger than the ones at the rear. A 1/4 inch hole is punched in the top plate of the left arm assembly to distinguish it from the right arm which has no hole.

Steering Pivot Pin Looseness

Adjust the front wheel bearings before starting any check for looseness in the pivot pin or its bushings. Jack up the front of the car so that the wheels are clear of the floor. Place one hand on the top of the tire and the other hand on the bottom of the tire.

Alternately pull with one hand while pushing with the other so as to determine the amount of play between the pivot pin and its bushings. If there is an apprecia-ble amount of movement in and out at the top of the tire the bushings should be replaced.

Wear at the spindle pivots is very seldom confined to one part and it is advisable, therefore, to renew the parts on both sides.

NOTE: The pivot pin key seal is made of lead and is used with the key that holds the steering arm to the steering spindle. This key also holds the pivot pin and the lead seal prevents lubricant being forced down the outside of the pivot pin into the key way and then outside to cause loss of lubricant.

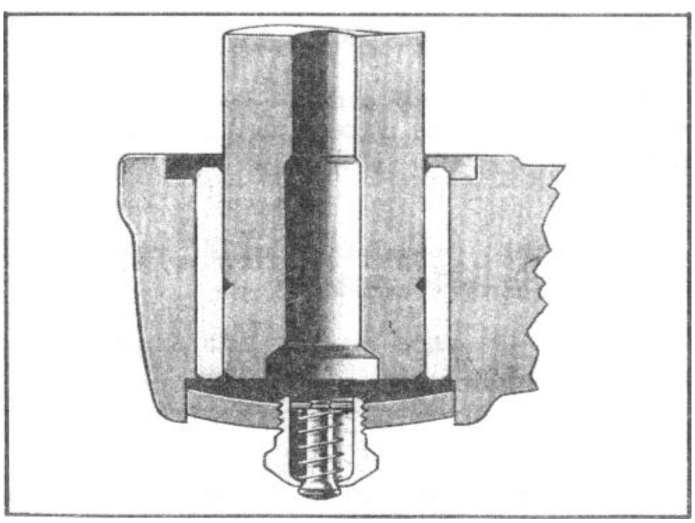


Figure 243
Steering Spindle Pivot Pin Relief Valve

STEERING SPINDLE PIVOT BOLT EXPANSION PLUG AND RELIEF VALVE

Fig, 243. A grease pressure relief valve is fitted into the expansion plug at the bottom of the steering spindle pivot bolt.

This is to relieve excessive grease pressure (500 to 600 lbs. per square inch) that may be applied at the grease fitting at the top of the plug. This prevents grease from leaking out around the expan-sion plug and any possibility of the grease pressure blowing it out.

When lubricating spindle pivot pins, always continue supplying grease until it comes out of the valve

STEERING SPINDLE PIVOT BOLT EXPANSION PLUG AND RELIEF VALVE INSTALLATION

1. Assemble relief valve in the expan-sion plug.

2. Coat edges of expansion plug with white lead.

3. Using a short piece of tubing or hollow pipe that will clear the relief valve, (place the pipe over the relief valve and against the plug), drive plug into place.

STEERING SPINDLE

REMOVAL

1. Jack front wheels clear of the floor.

2. Place stand jack under the outer side of the lower support arms (9). Fig. 235.

3. Remove outer and inner hub caps.

4. Remove steering spindle cotter pins, nuts, spindle washer, and outer bearing cage.

5. Remove front wheels and brake drum assemblies.

6. Remove the four bolts and nuts holding brake plate (7) Fig. 244 to the spindle (1). This will also release the auto-poise connector bracket (S) Fig. 236.

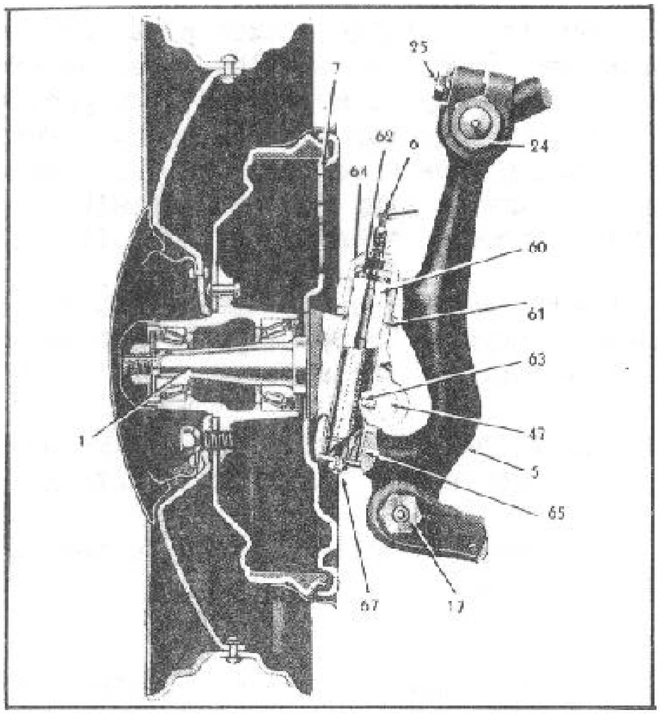


Figure 244 - Steering Spindle Section

1. Steering spindle
2. Steering spindle support
6. Steering spindle grease fitting
7. Brake backing plate
17. Lower control arm pivot bolt
24. Eccentric bushing
25. Eccentric bushing lock screw 47. Steering arm
60. Pivot pin
61. Pivot pin oil seal
62. Pivot pin thrust balls
63. Pivot pin key
64. Pivot pin thrust washer and ball cup
65. Pivot pin bushing
67. Expansion plug and relief valve

7. Remove brake backing plate (7) and wire it to the frame, so as not to injure or disconnect the hydraulic brake hose (R) Fig. 236.

8. Remove key, nut and washer holding the steering arm (47) to the steering spindle (1) Figs. 237 and 244.

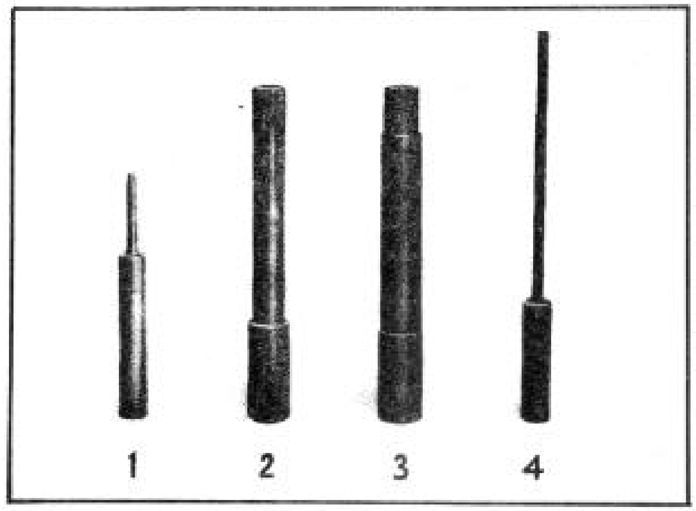


Figure 245
Steering Spindle Pivot Pin and Bushing
Removing and Replacing Set

1. J-479-1 Driver for loosening pivot pin
2. J-469-1 Driver for installing lower bushing
3. J-990 Driver for removing lower bushing and installing upper bushing
4. J-479-2 Driver for removing pivot pin

9. Drive the steering arm (47) out of steering spindle (1) using tool J-1373.

10. Remove cotter pin, nut and lower control arm pivot bolt (17). Fig. 244.

11. Remove eccentric bushing locking screw (25), and upper control arm outer pivot bolt (24). Fig. 244.

Eccentric bushing will remain. in steering spindle support.

NOTE: On cars having the drop forged upper control arm, remove lock screw (25) and unscrew eccentric bushing from upper support arm.

12. Remove steering spindle (1) and steering support (5) together.

13. Remove grease fitting (6) at top of steering spindle (1).

14. After removing the grease fitting insert tool J-479- (no 1- Fig. 245) through the hole at top of steering spindle and begin to drive pivot pin (60) out of spindle. This action will force out expansion plug and relief valve (67) at the bottom of spindle. Then insert the long driver tool J-479 (No. 4-Fig. 245) and drive pivot pin (60) out of spindle (1) and spindle support (5).

Remove steering spindle pivot pin carefully so that the 7 ball bearings (62) will not be lost, Fig. 244.

15. The removal of the steering spin-die pivot pin separates the steering spindle (1) from the steering spindle support (5).

NOTE: To install reverse procedure of removal.

STEERING SPINDLE SUPPORT BUSHING AND THRUST BALL CUP REMOVAL

1. Hold steering spindle support (5), Fig. 244, in a vise so that bushings can be forced out.

2. Drive thrust ball cup (upper bushing) (64) out of spindle using a soft hammer.

3. Insert driver tool J-990 Figs. 244 and 245 into the lower bushing (65) and drive bushing out.

INSTALLATION

1. Support steering spindle support (5), in a vise so that bushing (65) and thrust ball cup (64) can be driven in. Fig. 244.

2. Using tool J-990 install the thrust ball cup upper bushing (64). Have the top of steering spindle support well supported.

3. Using tool J-990 install the lower bushing (65). Have the bottom of steering spindle support well supported.

The bushing and thrust ball cup are hardened and ground and require no reaming after being installed. The thrust ball cup has the thrust washer for the ball bearings pressed into it.

STEERING SPINDLE SUPPORT REMOVAL

Proceed as outlined in “Steering Spindle Removal”, items 1 to 15, inclusive.

STEERING SPINDLE SUPPORT INSTALLATION

NOTE: To install, reverse procedure of removal.

The reassembling of the steering spindle support on the car requires particular attention to two adjustments.

1. Lower pivot pin and its bushing. Proceed as outlined in *Lower Pivot Pin and Bushing Installing" Items 1 to 5 inclusive.

2. Eccentric Bushing - controls the caster and camber setting. Proceed as outlined in "Eccentric Bushing Installing.”

STEERING ARM REMOVAL

1. Remove cotter pin, castellated nut and washer from steering arm (47) Fig. 237.

2. Remove tie rod cotter pin and castellated nut and remove the tie rod using tool HM-844C.

3. Remove steering arm using tool J-1373.

NOTE: To install reverse procedure of removal.

Tighten the steering arm nut with a torsion wrench to 100 foot pounds.

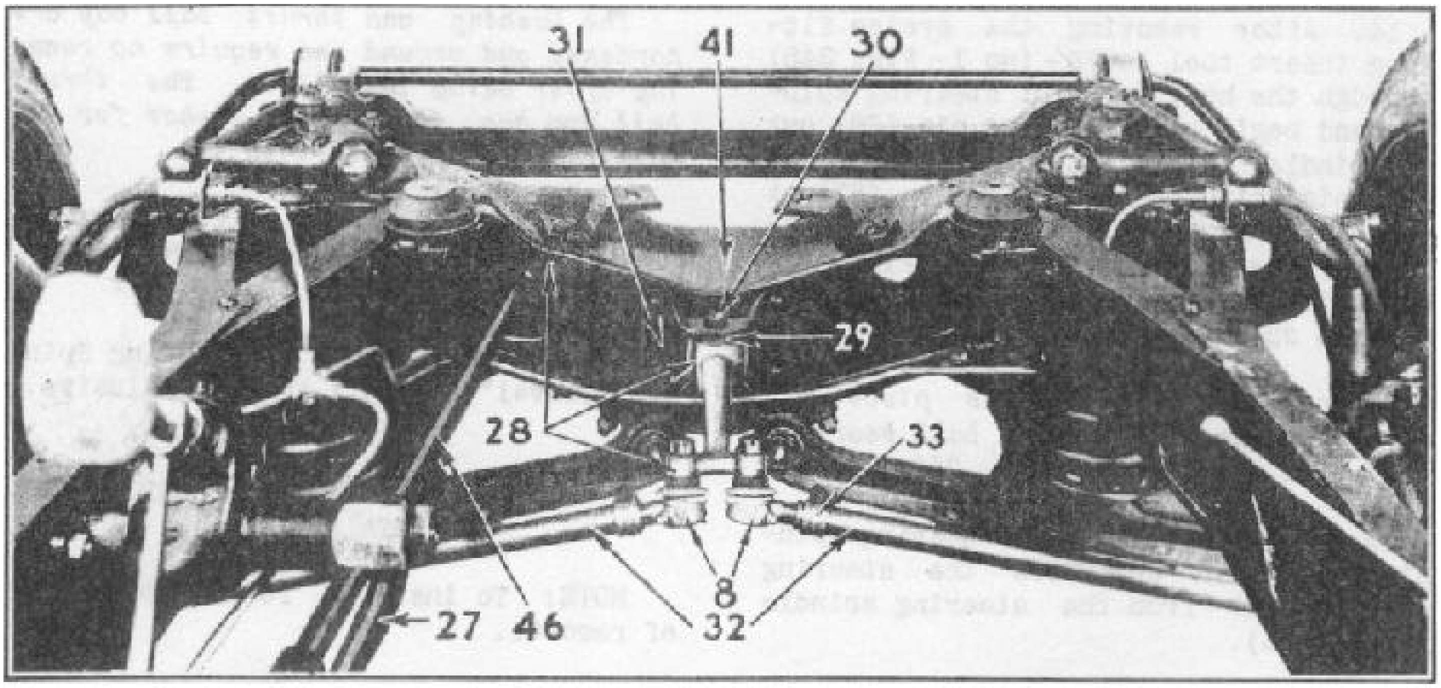


Figure 246 - Front Suspension Detail

8. Tie rod end
27. Steering pitman arm
28. Steering center arm
29. Steering center arm bearing
30. Steering center arm bearing bolt
31. Steering center arm bracket
32. Tie rods
33. Tie Rod clamp
41. Frame front crossmember
46. Drag Link

STEERING CENTER ARM REMOVAL
SIX CYLINDER MODEMS

1. Remove draglink (46) at front by backing off adjusting plug and ball seat thru the hole in the frame front cross member, Fig. 246.

2. Remove tie rod ends (8) from steering center arm (28) using tool J-624-H.

3. Remove bolt (30) holding steering center arm to frame cross member (41).

4. Remove steering center arm (28) Fig. 246.

The needle roller bearing and inner race is a press fit and can be removed with a suitable arbor press.

NOTE: When assembling, pressure must be applied on end of bearing carrying makers name and part number.

STEERING CENTER ARM REMOVAL
EIGHT CYLINDER MODELS

1. Raise the front of the car and place on stand jacks.

2. Remove the drag link at the front end by turning the wheels so that the drag link is in its farthest rear position and then remove the cotter key at the front ball and socket joint.

3. Move the drag link forward so as to enable the removal of the drag link adjusting plug and ball seat through the hole in the frame front cross member.

4. Remove the tie rod ends (8) from the steering center arm with tool J-624-H.

5. Remove the steering center arm bolt nut (30).

6. Remove the radiator louver panel center moulding.

7. Remove the front bumper bracket bolts and allow the bumper to drop down.

8. Loosen the generator mounting bolt and remove the fan belt.

9. Unscrew the starting crank jaw.

10. Place the jaw of the vibration dampener puller tool J-483 over the dampener and place the screw of the, puller tool through the starting crank hole engaging with the threads of the puller jaw.

11. Pull off the dampener just enough to obtain clearance for the removal of the center steering arm bolt.

12. Remove the center steering arm bolt (30). It is necessary to raise the engine slightly to obtain clearance between the bolt head and the timing gear cover.

13. Remove the center steering arm (28).

STEERING CENTER ARM INSTALLATION
6 or 8 CYLINDER

Steering center arm installation is the reverse procedure of removal. Tighten the steering center arm bolt nut with a torsion wrench to 65 foot pounds.

TIE ROD ENDS

Tie rod ends are the self-adjusting type. The ground steel bearing (1), Fig. 248, is located between the stud (2) (which is prevented from loosening or rattling by the tension spring) and the tie rod end forging. A curved steel dust cover (4) makes a tight metal seal, but to insure this being as nearly dust proof as possible a rubber seal (3) also seals the unit.

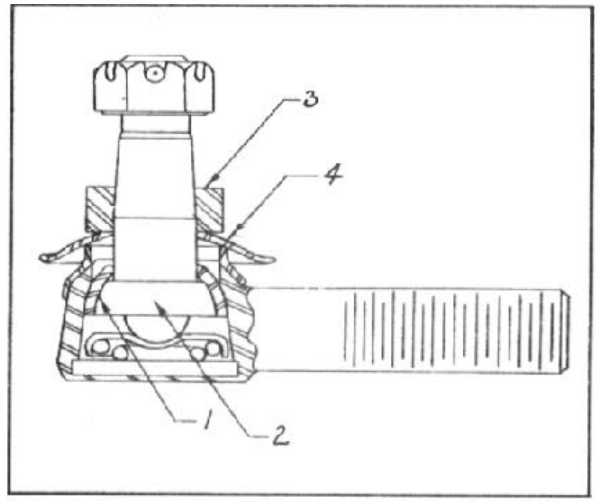


Figure 248 - Tie Rod End

1. Tie rod end bearing
2. Tie rod end stud
3. Tie rod end rubber seal
4. Tie rod end dust cover

TIE ROD REMOVAL

1. Remove cotter pin and nut from both ends of the tie rod.

2. Using tool HM-844 -C remove outer end.

3. Using tool J-624-H remove inner end.

TIE ROD INSTALLATION

It is necessary to adjust toe-in when installing tie rods.

Reverse process of removal and adjust toe in.

TURNING PULL

The amount of steering pull on the front wheels required to turn the wheels is measured with a spring scale hooked over the tread of the tire.

Disconnect drag link and place roller plates under the front wheels. Use a spring scale as described above.

Series 20, 21,22,28,51,52,58,171,172 and 178 should require 28 lbs. maximum pull.

Series 24,25,27,53,54, 173 and 174 should require 27 lbs. maximum pull.

NOTE: If greater pull is required to turn the wheels, lubricate the spindle pivot pins and tie rod ends,

STRAIGHTEN BENT PARTS OF FRONT SUSPENSION SYSTEM

Heat treated parts should not be straightened if they are sprung more than 5°. Parts that are not heat treated may be straightened cold if they are not sprung more than 10°.

If parts are sprung more than these amounts, any attempt to straighten will show strains and cracks that may not be visible if attempted while cold. Straightening hot may destroy the effect of the heat treating and may result in overheating, making the steel soft and weak, while underheating makes the part brittle and easily broken.

MAINTENANCE

Hard Steering

CAUSES

1. Low or uneven tire pressure.

2. Steering gear or steering connections adjusted too tight.

3. Insufficient or incorrect lubricant.

4. Too much caster.

5. Front springs sagged.

6. Frame bent or broken.

7. Steering spindle, steering spindle support or steering arm bent.

REMEDY:

1. Inflate tires according to pressure given in "Chassis Section."

2. Jack up front wheels off the floor and test the steering system for binding. Adjust as necessary.

3. Check lubricant in the steering gear and lubricate steering system. See "Lubrication Section."

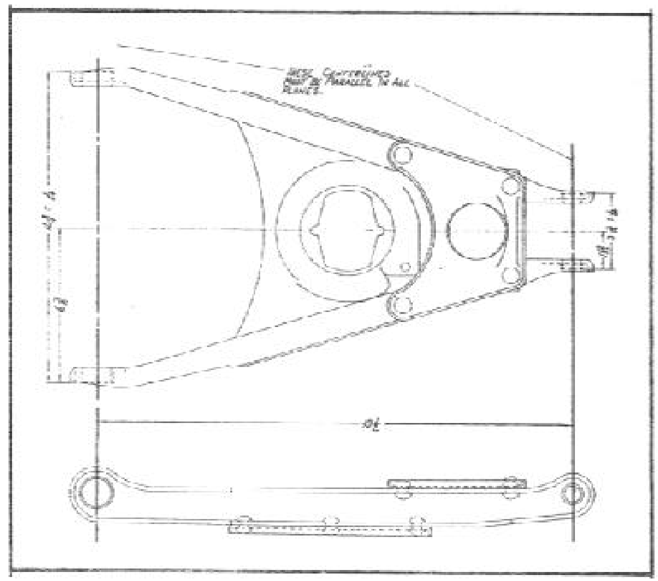


Figure 249 - Lower Support Arm Alignment

4. Support arms bent or twisted. Check wheel alignment by testing camber, steering pivot pin inclination and caster. If support arms have been removed from the car, check specifications as shown in Figs. 249 and 250. Replace arms - do not attempt straightening.

5. Check over-all length of springs. The distance from the bottom of the rebound bumper bracket to the lower support arm bumper bracket should not vary more than 1/2" each side. See Fig. 238.

6. Check frame for proper alignment. See "Chassis Section."

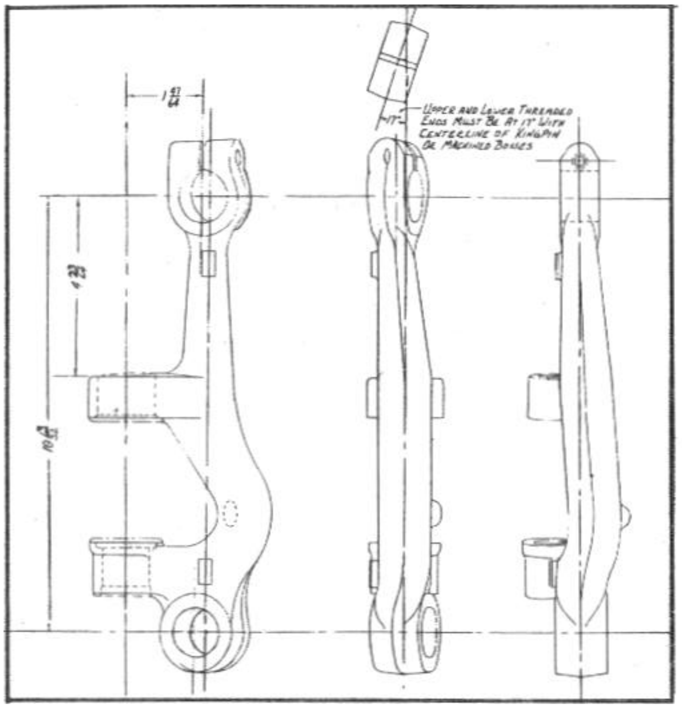


Figure 250
Steering Spindle Support Alignment

7. Check against specifications as shown in Fig. 250, 251 and 252. Replace if bent - do not attempt straightening.

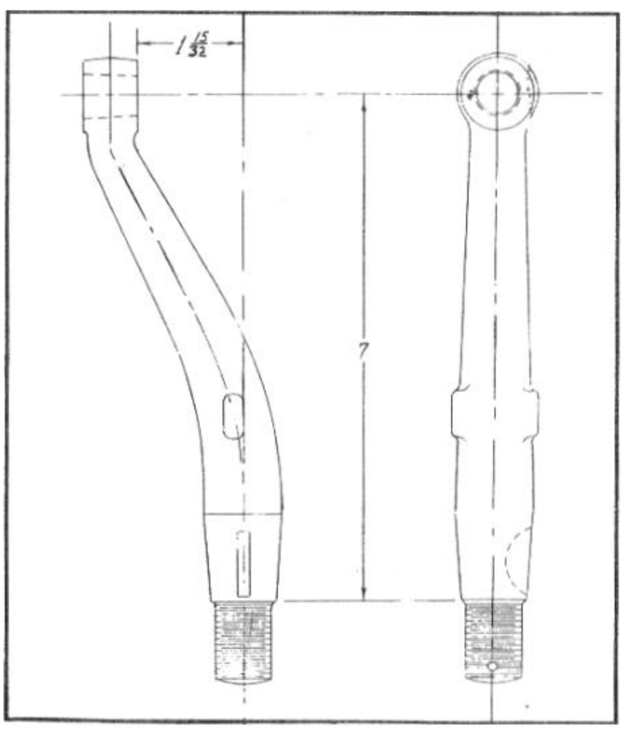


Figure 251
Steering Arm Alignment

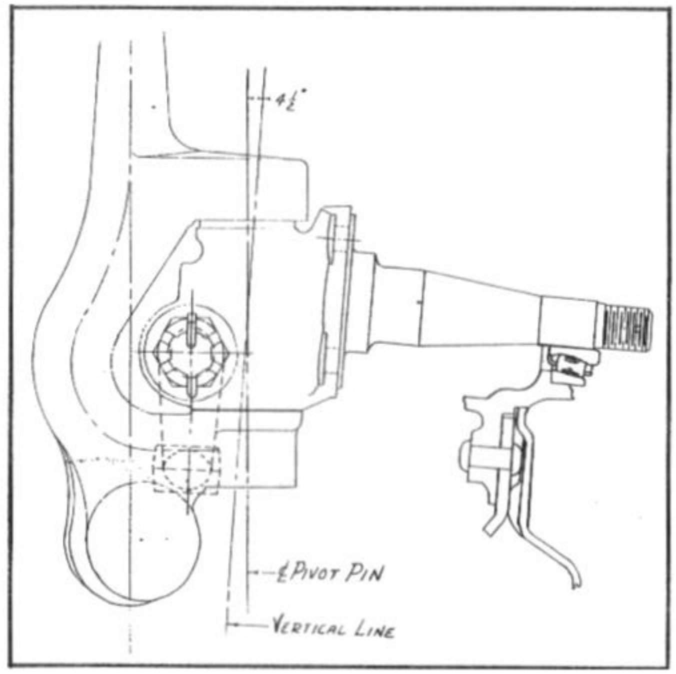


Figure 252 - Pivot Pin Inclination

Excessive Play In Steering System

CAUSE:

1. Steering gear or steering connections either adjusted too loose or worn.

2. Steering spindle bearings worn.

3. Front wheel bearings incorrectly adjusted or worn.

REMEDY:

Refer to the respective sections of this manual for corrections of the above conditions.

Steering Erratic With Brakes Applied

CAUSE:

1. Low or unequal tire pressure.

2. Brakes incorrectly or unevenly adjusted.

3. Oil soaked brake lining.

4. Coil springs weak.

5. Insufficient or uneven caster.

REMEDY:

1. Inflate tires to recommended pressure.

2. Adjust brakes. Refer to “Brake Section."

3. Replace lining.

4. Replace springs or shim as necessary - Refer to "Front Coil Spring Removing and Replacing."

5. Steering spindle or spindle support bent. Check according to Figs. 250' and 252, also see "Wheel Alignment Section."

Car Pulls To One Side

CAUSE:

1. Low or uneven tire pressure.

2. Rear wheels riot tracking with front wheels.

3. Oil soaked brake lining.

4. Shock absorbers not functioning or partly operating.

5. Wheel bearings adjusted too tight.

6. Incorrect toe-in.

7. Incorrect or unequal caster or camber.

8. Coil springs sagged.

9. Rear axle shifted.

10. Frame bent or broken.

11. Auto poise not centralized,

REMEDY:

1. Inflate tires.

2. Check alignment of rear wheels with front wheels and correct as necessary.

3. Replace brake lining.

4. Check shock absorbers for lack of fluid, adjustment, and dirt in the operating parts. Refer to "Shock Absorber Section."

5. Check for binding with front wheels off the floor. Adjust bearings and lubricate.

6. Correct caster and camber. Steering spindle, spindle support, or steering arm bent. Refer to Figs. 250-251252.

7. Refer to “Front Alignment."

8. Check as shown in Fig. 238.

9. Check rear spring clips and tighten. Check rear spring center bolt to determine that it is not sheared. The distance from the rear spring pivot bolt to axle housing should be checked. This distance should be the same on both sides.

10. Check frame for proper alignment and possible breakage. See "Chassis Section."

11. Adjust Auto-Poise as required - See "Auto-Poise Section."

Scuffed Tires

CAUSE:

1. Tires incorrectly inflated.

2. Incorrect toe-in.

3. Wheels or tires out of true.

4. Steering spindle bearings worn.

5. Suspension arms bent or twisted.

6. Unequal caster.

7. Incorrect toe-out on turns.

8. Turning corners at high speeds.

REMEDY:

1. Inflate tires to recommended pressures.

2. Adjust tie rods to give front wheels correct toe-in.

3. Check for wheel and tire wobble.

4. Replace as necessary. Refer to "Steering Section."

5. See "Wheel Alignment." Also refer to Figs. 249 and 250.

6. See "Wheel Alignment", also check steering spindles and spindle arms. See Figs. 250 and 252.

7. Check spindle pivot pin inclination, bent steering arm, tie rods, or steering spindle. See Figs. 250 and 252.

Cupped Tires

NOTE: Normal cupping of tires can be expected - tires should be frequently interchanged.

CAUSE:

1. Tires incorrectly inflated.

2. Dragging brakes.

3. Wheels, tires or brake drums out of balance.

4. Steering spindle bearings or wheel bearings worn or out of adjustment.

5. Unequal caster.

6. Steering spindle, spindle support or tie rods bent.

Car Wander

CAUSE:

1. Low or unequal tire pressure.

2. Steering gear or connections too loose or worn.

3. Steering gear or connections adjusted too tight, or not properly lubricated.

4. Steering spindle bearings worn.

5. Wheels toe-in too much or toe-out in straight ahead position.

6. Caster incorrect or unequal.

7. Steering spindle or spindle pivot pin bent.

8. Rear axle shifted.

9. Auto poise not centralized.

10. Steering gear not on high point.

11. Tread better on rear tires than on the front.

NOTE: Put tires with best tread on the front wheels.

REMEDY:

Refer to page 232, paragraph under heading "Car Pulls to One Side," for corrections.

Front Wheel Shimmy

CAUSE:

1. Low or unequal tire pressure.

2. Steering connections worn or incorrectly adjusted.

3. Steering Gear incorrectly adjusted. See "Steering Gear."

4. Wheels, tires or brake drums out of balance.

5. Incorrect or unequal caster.

6. Shock absorbers low, out of fluid or dirt in them.

7. Steering spindle or tie rods bent.

8. Lack of lubrication or wrong lubricant.

9. Eccentric or bulged tires.

10. Auto-Poise incorrectly installed.

Wheel Tramp

CAUSE:

1. Wheels, tires and brake drums may be out of balance.

2. Weak coil springs.

3. Shock absorbers low or out of fluid.

4. Lack of lubrication. 5. Auto-Poise incorrectly installed,

Road Shock

CAUSE:

1. Low tire pressure.

2. Steering gear or connections incorrectly adjusted.

3. Too much caster.

4. Shock absorbers low or out of fluid.

5. Dirt in shock absorbers.

6. Coil springs weak or sagged.

7. Incorrect size or type of tires.

8. Steering spindle bent.

AUTO-POISE

Auto-Poise control consists of a specially designed bar attached to the frame across the front of the chassis with the ends directed backward to form lever arms.

The lever arms of the Auto-Poise bar (E), Fig. 236, are connected to the brake backing plate (A) by means of connectors (0).

The Auto-Poise bar being connected to the brake backing plate is immediately affected by anything that turns the front wheels out of a straight ahead position because the brake backing plate turns with the wheels.

Side winds, road shock, rough roads and even the action of the driver in turning the wheels with the steering wheel sets up a twisting of the bar and Immediately it tends to untwist and bring the wheels back into a straight ahead position.

The Auto-Poise effect is in addition to the caster of the front wheels and does not take the place of caster but is independent of it.

Caster and camber of the front wheels is the adjustment of the front wheels which permits easier steering because of gravity, but gravity is not always present in the same amount, as for instance when the wheels leave or nearly leave the ground on very rough roads and if this is accompanied by sudden gusts of side wind then caster does not function.

Refer to paragraphs covering Caster and Camber under "Front Alignment."

AUTO-POISE rides in rubber bushings, Fig. 236, held to frame by brackets, (G) and the connectors (0) holding the Auto-Poise to the brake backing plate (A) are cushioned in rubber.

NOTE: No lubrication is necessary.

Auto-Poise Bar Must Be Centralized

Auto-Poise bar must be centralized and when the Auto-Poise has been removed and it is necessary to make a new installation, precaution should be taken to obtain proper centralization of the Auto-Poise bar in the rubber bushings.

AUTO POISE REMOVAL

1. Disconnect Auto-Poise bar (E) Fig. 236 at the top of connectors (0) (both sides).

2. Remove Auto-Poise bushing brackets (G) (on frame).

3. Cut one rubber bushing (F) Fig. 236 off from AUTO-POISE bar, slicing through the bushing so that the bushing can be used again.

4. Work shaft out of the hole in the fender on the opposite side from which the rubber bushing was cut.

5. Remove the shaft from the other fender, working from bonnet opening.

Auto-Poise Installation

NOTE: If a new Auto-Poise bar is to be installed it will be necessary to slice one bushing and remove it from the bar before installing to facilitate installation.

The rubber bushings cannot be pulled through the holes in the fenders; therefore, the cutting of one rubber bushing makes it possible to work under the bonnet and work the Auto-Poise bar out and in from that point.

1. Install the AUTO-POISE bar through the bonnet opening, installing the end without the bushing through the fender hole first.

2. Work the end with the bushing on through the opposite fender hole.

3. Install the rubber bushing and both bushing brackets.

4. Connect Auto-Poise bar to connectors. Be sure to centralize bar in bushings before final tightening.

FRONT WHEEL ALIGNMENT

Correct front wheel alignment produces easy positive steering with a minimum of scuffing action between the tire and the road.

All of the five factors of front wheel alignment are inter-related but each has a specific purpose. These control the front wheels and steering under varying conditions of weight and speed.

Should one of the 5 angles get out of position the harmonious relationship is destroyed. Each angle depends upon the proper setting of the others if the front wheels are to lead properly.

In making corrections to front wheel alignment, or installing new front wheel suspension parts, all five angles in both front wheels should be checked in the following order:

Pivot Pin Inclination

PIVOT PIN INCLINATION is the inward tilt of the steering spindle pivot pin at the top.

Caster

CASTER is the backward tilt of the steering spindle pivot pin usually measured in degrees.

Camber

CAMBER is the outward tilt of the front wheels at the top and usually measured in inches or degrees.

Toe-In

TOE-IN is the drawing together of the front wheels at the front.

Steering Geometry

STEERING GEOMETRY or toe-out on turns is controlled by the movement and angularity of the tie rods.

GENERAL INSPECTION

Before checking the alignment of the front wheels, the following operations should be performed in the order listed. A successful alignment job cannot be accomplished unless these inspection operations are performed. Should inspection reveal the necessity for removing, installing, or adjusting any part of the front wheel suspension, or steering, prior to aligning the front wheels, complete instructions will be found in the respective sections of the manual.

1. Inflate all tires to recommended pressure.

2. Check condition of tires (blowout patches, thin treads, vulcanizing, etc). Changing the direction of tire rotation is recommended.

3. Check wheel and tire run out, (wobble) and eccentricity. See Chassis Section".)

4. Check brakes for dragging. (See "Brake Section".)

5. Check wheels for proper balance (See "Chassis Section".)

6. Check front wheel bearing adjustment. (See 'Chassis Section".)

7. Check pivot pin bushing clearance.

8. Check front spring height.

9. Check control arm bushings,

10. Check rear springs and "U" bolts.

11. Check steering connections for lost motion.

12. Check steering gear adjustments. (See "Steering Section".)

13. Check shock absorber control.

When checking front wheel alignment, the car should be placed on a level floor. The car should be empty, and any luggage or load should be removed from the trunk compartment. The weight of the car must be on the wheels and the tires properly inflated. The car must also be level crosswise.

NOTE: Always rock the car back and forth several times and allow it to settle. This action will place the front springs and shock absorbers in their "normal" position. Do not rock at the bumper but at the side of the car.

The car must remain in this "normal" position while the front wheel alignment is being checked. If one side of the car is lower than the other, due to someone getting into or out of the car, the gauge readings will be incorrect, unless the foregoing operation is repeated.

Pivot Pin Inclination

Pivot pin inclination is the inward tilt of the pivot pin at the top toward the center of the car as viewed from the front of the car.

NOTE: Before checking pivot pin inclination, always perform the operations under "General Inspection."

Pivot Pin inclination should be 4° 36'. The difference from one side to the other should not be over 1/2°. See Fig. 252. Pivot pin inclination can be accurately checked with Tool J-800-A, Fig. 255, when used with two full floating turn tables.

Incorrect pivot pin angle indicates bent steering spindle support suspension arms, or steering spindle supports.

PIVOT PIN INCLINATION AND CAMBER CHECKING WITH JIFFY GAUGE

1. Make sure the tire pressure is correct in all four tires and the car on a level floor.

When turning angle plates are used, wooden blocks 1-1/4" thick should be placed under the rear wheels to compensate for the height of the turning angle plates.

2. Set wheels in a straight ahead position and adjust scales on turning angle plates to zero.

3. Remove hub cap and grease cap, from front wheels.

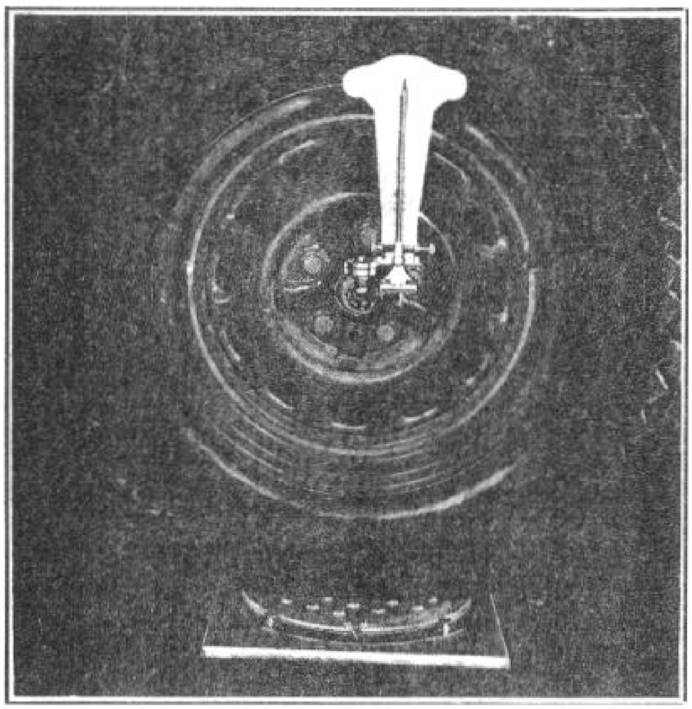


Figure 253
Jiffy Gauge and Turn Plate
in Starting Position

4. Remove left hand spindle cotter pin, nut and washer and install, "Jiffy Gauge" as shown in Fig. 253,so that level bubble is between gauge lines, when pointer is set at zero.

5. Turn the head of the "Jiffy Gauge" so that it is parallel to the axle as shown in Fig. 254, with wheels still straight ahead and adjust the pointer with the thumbscrew until the level bubble is between the lines on the glass. The reading taken on lower scale is the camber of the left wheel. A reading toward the wheel is positive and away from the wheel is negative camber.

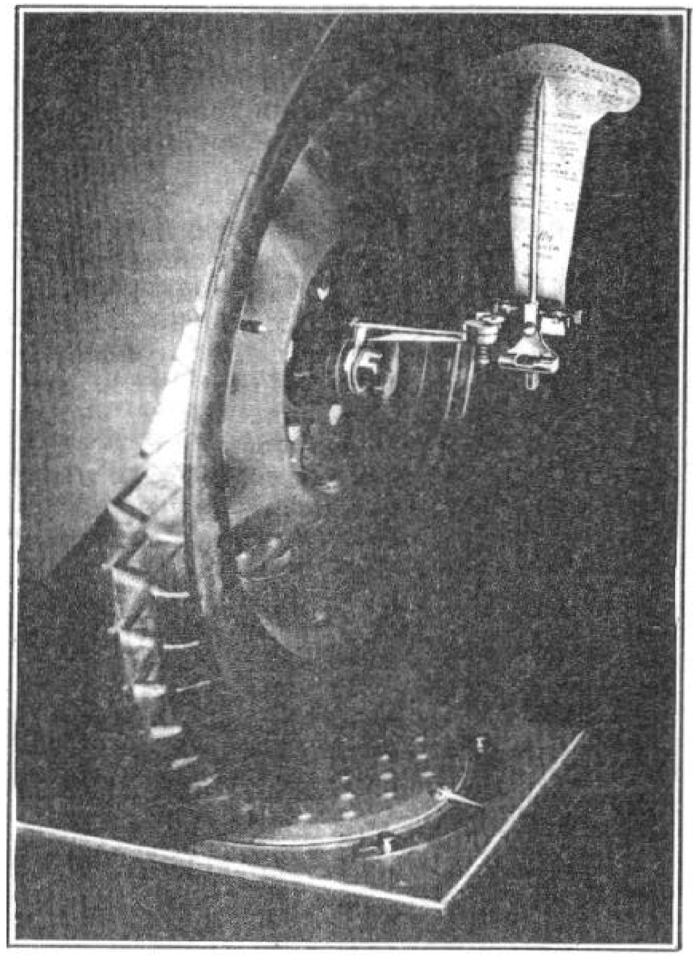


Figure 254
Jiffy Gauge-Checking Camber

When the car is set to 4-7/16" Dimension at the front and 4-13/16" at the rear (curb height), the camber should be 1/2° to 1-1/2° positive. The total variation in camber between right and left side must not exceed 1/2°.

If camber is insufficient or reversed, check pivot pin inclination as follows:

1. Turn the head of the "Jiffy Gauge" parallel to the wheel as shown in Fig. 255, and turn wheels to left until pointer on left turning angle plate points to 25°.

2. Set pointer on zero and turn gauge on spindle until level.

3. Turn left wheel to the right 25° and adjust level. The pointer reading on the top scale is the pivot pin inclination.

The correct pivot pin inclination. is 4° 36'. If the pivot pin inclination and the camber are off in approximately the same amount it is probably due to worn pivot pin bushings. If camber is off and pivot pin inclination is correct, the spindle is bent. Camber should not be more than the specified 1-1/2°; however, a decrease in ember, if pivot pins are not loose in the bushings, is not detrimental to steering unless an actual reverse camber exists.

Caster

Caster is the amount the top of the pivot pin is inclined toward the front or rear of the car as` viewed from the side of the car.

Positive caster is the tilting of the top of the pivot pin toward the rear of the car, while negative or reverse caster is the tilting of the top of the pivot pin toward the front of the car.

Positive caster imparts a trailing action to the front wheels while negative or reverse caster causes a leading action. The correct amount of caster helps to keep the front wheels in the straight-ahead position. When turning a curve, caster and king pin inclination act as a lever, assisting the driver in returning the front wheels to the straight ahead position.

Before checking caster follow "General Inspection" on page 236.

The weight of the car must be on the wheels with the tires properly inflated and the car level lengthwise. Always rock the car back and forth several times and allow it to settle before checking the caster. Do not rock at the bumper but at the side of the car.

No caster correction should be made until after the camber angle and pivot pin inclination angle have been checked.

NOTE: When checking the caster the wheels should be turned on their bearings to bring the high spot or that portion of the tire with the greatest run-out toward the front or the rear. See Wheel and Tire Run-Out," Chassis Section.

The amount of caster a Pont end requires depends on the friction in the spindle pins, tie rod ends and the steering linkage. A well-lubricated car requires less caster than one infrequently lubricated.

CASTER CHECKING WITH JIFFY GAUGE

1. Turn the wheels back to the straight ahead position and reset the "Jiffy Gauge" as shown in Figs. 253 and 254.

2. Turn the wheels to the right until the pointer on the left turn plate is at 25°, level the gauge with the adjusting screw and take the reading of the pointer on the upper scale.

3. Turn the left wheel 25° to the left and level the gauge and take the reading on the upper scale (Fig. 256). If both readings are on the same side of zero, subtract the one from the other to get the caster angle of the left wheel. If the two readings are on opposite sides of zero, add them to get .the caster angle. Readings toward the wheel are positive and away from the Wheel are negative caster angle.

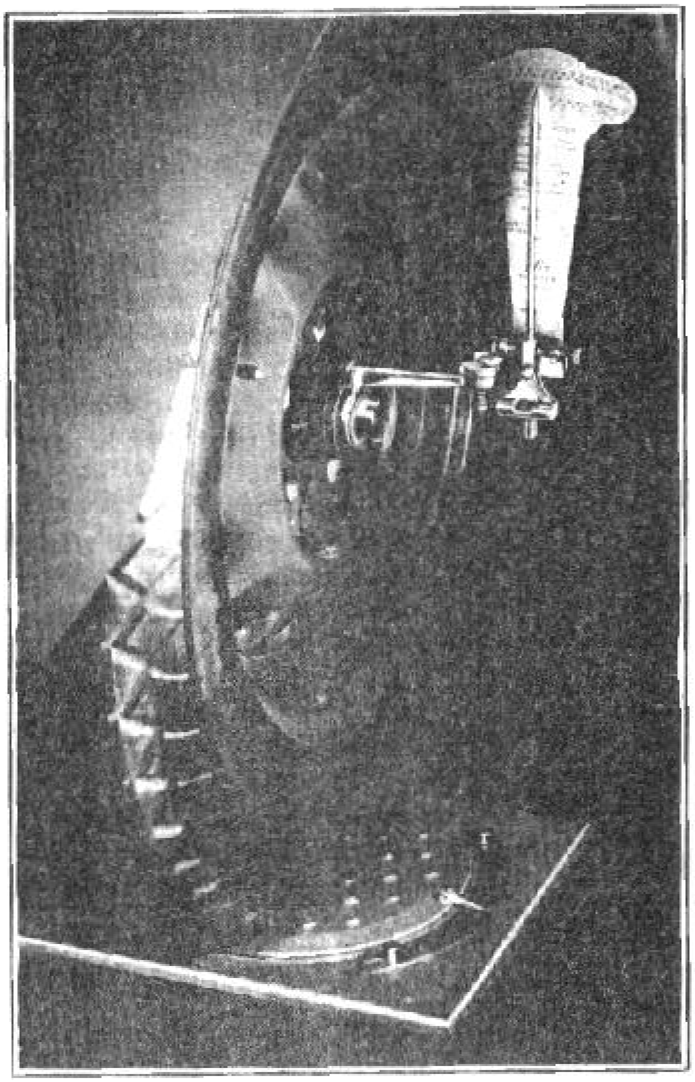


Figure 255
Jiffy Gauge-Checking Caster-First Position

4. Repeat operations under "Camber and Pivot Pin Inclination Checking with Jiffy Gauge" and 1-3 (above) on the right wheel, turning the wheels so that the pointer of the right turn plate reads 25° to the right for the first caster reading, Fig. 255, and 25° to the left for the second caster reading, Fig. 256.

If pivot pin angle is incorrect it indicates bent suspension arms or steering spindle supports, which have a direct effect on the camber.

When the ear is set to 4-7/16" dimension at the front and 4-13/16" at rear the caster angle should be from 1/2° to 1-1/2° at curb height and should not vary more than 1/2° between front wheels.

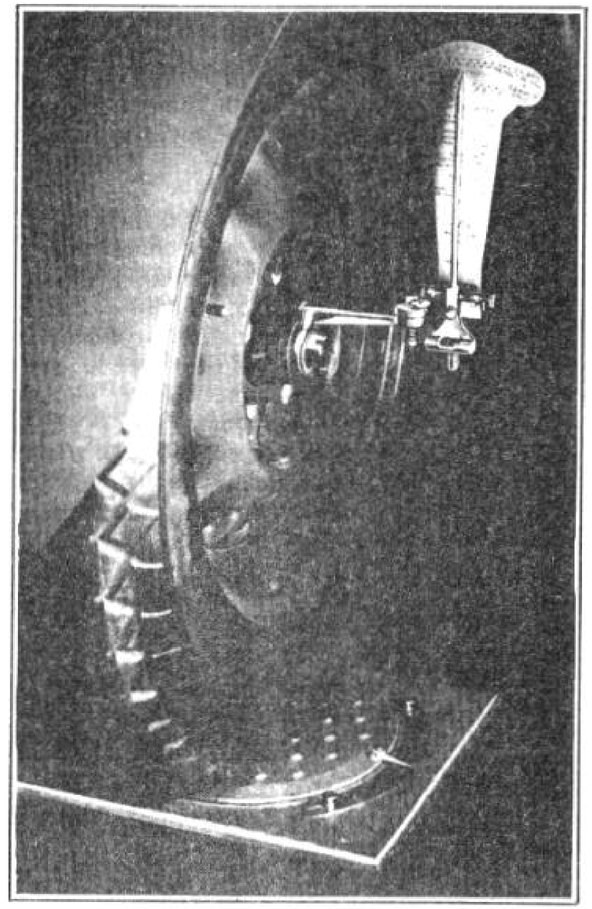


Figure 256
Jiffy Gauge-Checking Caster-Second Position

NOTE: The car is under curb load when it is loaded with oil, water, spare tire, tools and a full tank of gasoline, but without passengers.

Replace any bent parts and check the steering geometry whenever new parts are installed because new parts may affect the turning angle of the wheels.

Whenever the eccentric bushing is turned, the caster, camber and pivot pin inclination must be checked as all three are affected by it

NOTE: It is seldom necessary to turn the eccentric bushing over a half turn to obtain 1/2° for camber and this half turn should be all that is ever necessary for camber adjustment and give a minimum of caster change.
If camber is increased, pivot pin inclination is decreased and if camber is decreased pivot pin inclination is increased.

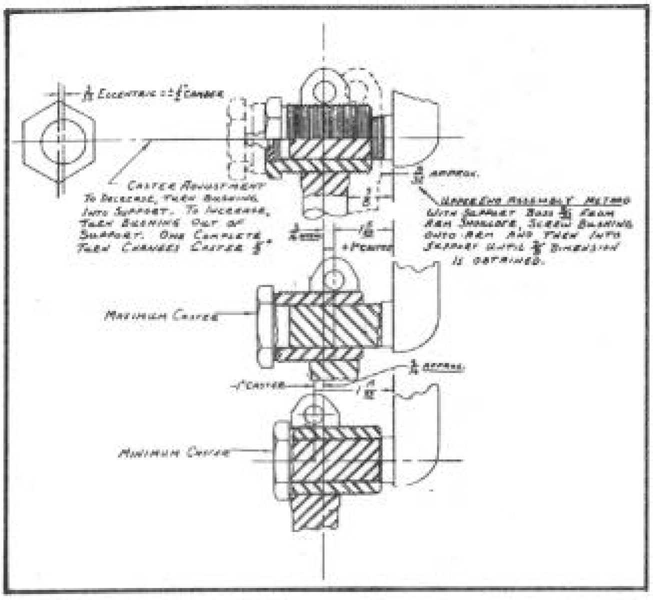


Figure 257 - Caster Adjustment for Cars Having Drop Forged Upper Control Arms

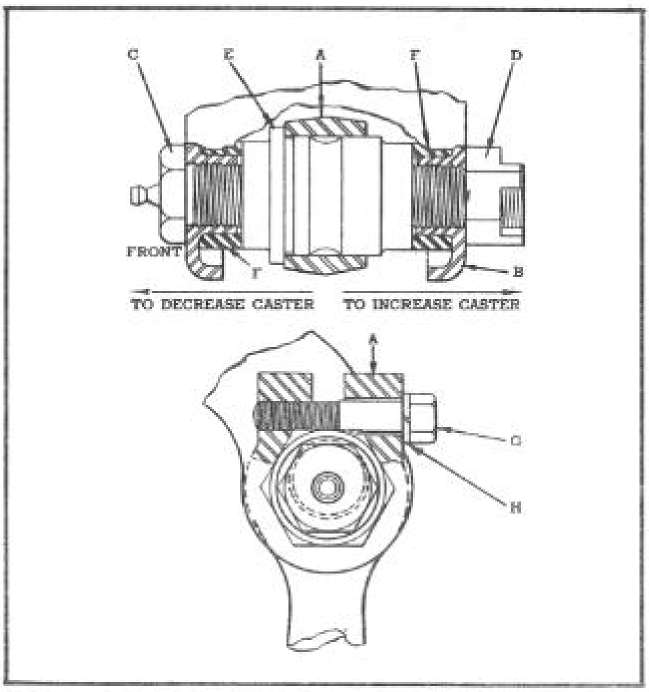


Figure 258 - Caster Adjustment for Cars Having Pressed Steel Upper Control Arms

NOTE: One complete turn of eccentric bushing changes caster 1/2°. Set caster to 1° preferred with 1/2° negative or 1/2° positive permissible, but in equal amounts on both wheels if possible, but never over 1/20 variation Right and Left. Set camber with the least possible change of caster. Set the camber to 1/2° to 1-1/20 with the normal top of the frame horizontal. The car should have oil, gasoline and water but no passengers (curb weight).

When the car is set to 4-7/16" dimension at front and 4-13/16" dimension at rear the caster and camber angles should be 1/2° to 1-1/2° and must not vary more than 1/2° between right and left side of car.

Toe-In

TOE-IN is the setting or adjusting of the front wheels by means of tie rods, so that the distance between the wheels is less at the front than at the rear. Camber tends to cause the wheels to run out or separate at the front and sufficient tie-in is necessary to compensate this tendency and make the wheels run straight.

Accurate toe-in is of great importance in obtaining the maximum of tire life. Toe-in must be within definite limits of 0" to 1/16" measured on the complete car at the wheel rim.

Make the °General Inspection° on page 236 before attempting any check or adjustment of toe-in.

NOTE: The weight of the car must be on the wheels and the wheels and tires made to run as true as possible regardless of the method to be used in measuring the toe-in.

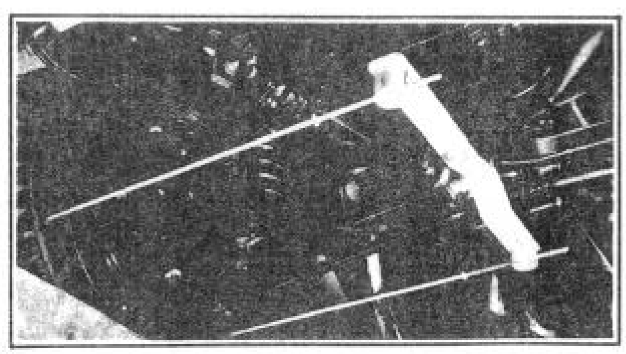


Figure 259
Checking Toe-In and Centralizing Steering Canter Arm with Tool J-1442

When making the adjustment or check, the rear end of the center steering arm should be exactly at the center (lengthwise) of the car. Use tool J-1442, Fig. 259, which attaches to the under side of the frame cross member and is used to centralize the steering center arm in relation to the exact center line of the car. This tool is also used to adjust toe-in and makes possible the setting of the steering center arm on dead center, setting the steering gear on the high point, for the straight ahead position.

To install the gauge remove the center steering arm retainer nut and attach body of tool to under side of frame cross member. Loosen the tie rod end clamps. Place rods of tool against the side walls of tires. To increase the toe-in, turn the tie rods in the direction of wheel travel, and to decrease, turn in the opposite direction.

Turn both tie rods an equal amount to retain the same distance between the rear end of the center steering arm and the front wheels.

When the correct setting is obtained tighten the tie rod end clamps and remove the gauge. Replace the center steering arm retainer nut. Always rock the car back and forth sidewise several times and then. let it settle. This relieves any tension in the front suspension system or in the tires.

NOTE: When checking the toe-in, the front wheels should be in the straight ahead position, and in cases where the measurements are taken from the side of the tire, the wheels must be turned on their bearings so as to bring the high spot or that portion of the tire with the greatest amount of run-out, either at the top tar the bottom of the wheel.

If the toe-in is seriously out it will indicate a possible bent steering spindle arm.

Toe-in must be corrected Wore checking toe-out on turns.

Toe-Out

Steering geometry or toe-out on turns is controlled by the movement and angularity of the steering arms.

The toe-out is checked by turning the wheels to the right or left, locating the inside wheel in a definite position.

Toe-out must always be checked with the weight of the car on the wheels.

Front wheels must rest on full floating turn tables and the turning angles should read as follows:

Left Turn

Left Wheel	Right Wheel
30°	25°

Right Turn

Left wheel	Right Wheel
25°	30°

The variation between the left and right wheel angle must not vary more than 30 minutes plus or minus, from above values.

When the front wheels are turned to the right or left they separate slightly at the front depending upon the amount of deflection from the straight ahead course. The wheel making the inside circle turns at a greater angle than the outside wheel thus, making toe-out necessary on curves.

The amount of toe-out increases as the turn increases due to the change in angle between the tie rods.

NOTE: Errors in the setting of the outside wheel are due to bent steering arms.

When the steering arms are bent the wheels will not turn in their proper relation of curves. This will affect the toe-out and result in excessive tire wear.

When the steering arms are bent they should be replaced. Always check the steering spindle support and support arm to determine if they are bent; the caster and camber if they are correct and equal on both sides; the toe-in; and the front and the rear wheels for being parallel before changing steering arms.

The proper location of the pitman arm in the straight ahead driving position is necessary in order to obtain the proper toe-out when turning to left or right. If the pitman arm angle is not correct on a turn, it changes the relationship of both front wheels to the extent that it will cause an excessive scuffing action between the tires and the road.

Setting Steering Spindle on Dead Center

To properly set the center steering arm,disconnect the drag link at the pitman arm, attach tool J-1442, Fig. 259, on the center steering arm mounting bolt using the threaded bushing and insert the pin in the hole provided for it in the frame cross member.

The clip on the tool snaps around the center steering arm and holds it in line with the center line of the car.

Set steering gear on its high point, see "Setting Front Wheels in Straight Ahead Position," Steering Section.

Toe-in can be checked at the same time with this tool in the position described above.

Steering Gear High Point

The setting of the front wheels in a straight ahead position is given under "Steering Gear" group.

REFERENCES

Source of Information	Date	Subject

FRONT SUSPENSION

1937 THRU 1939 EXCEPT 112 SERIES

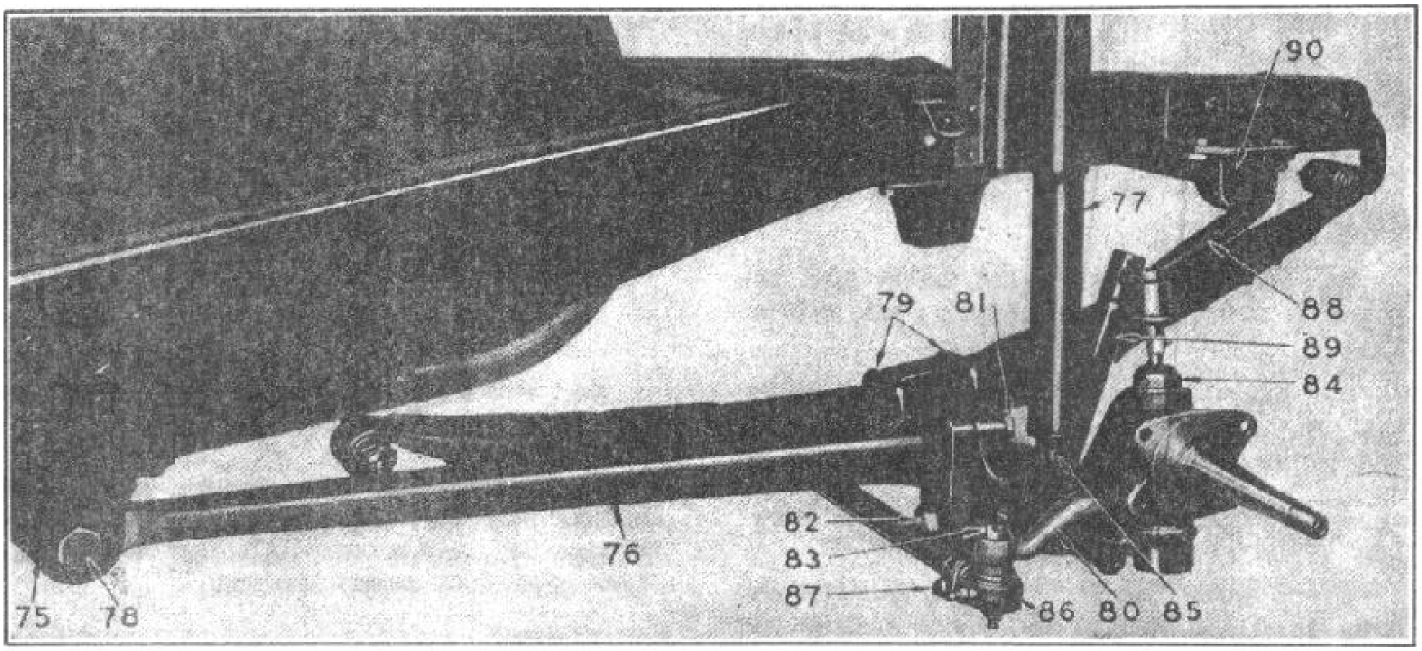


Figure 260 - Front Axle and Mounting
1937-1938-1939 Except 112 Models

75, Torque Ann Frame Bracket
76. Torque Arm
77. Shock Absorber
78. Torque Arm Bracket Bolt
79. Spring "U" Bolts
80. Steering Arm
81. Torque Arm to Axle Bolt-Upper
82. Torque Arm to Axle Bolt-Lower
83. Tie Rod End Stud Nut
84. Pivot Pin Thrust Washer and Ball Cup Assembly
85. Shock Absorber Stud Upper Cushion
86. Tie Rod End
87. Tie Rod End Clamp
88. Stabilizer Bar
89. Stabilizer Link
90. Stabilizer Rubber Bushing

Construction

The front axles are of the Elliot type with the spindles mounted on hardened and ground steel bushings with ball bearings to carry the thrust load,

The axle centers are drop forged steel, while the spindles, spindle pins and steering are are of heat treated alloy steel.

The axles are attached to the chassis both by the front springs and torque arms.

The forged torque arms are bolted directly to the axle center Fig. 260.

The Business, Commercial and 112 Models use a forged axle, having fixed spring seats, on which the torque arms are not employed. The springs are attached with conventional "U" bolts.

The procedure on spindle replacement is the same as on other models.

FRONT AXLE

REMOVAL

1. Jack up front of car with a roller jack under the front axle and place two stand jacks under the frame side rail just back of the torque arm frame brackets (Fig. 260). Lower roller jack until car weight is held on stand jacks but leave roller jack in place to support front axle.

2. Pry off front wheel outer and inner hub caps, pull spindle nut cotter keys.

3. Remove spindle nuts, spindle washer, outer bearing case, front wheels and brake drum assemblies.

4. Remove nuts from four bolts holding brake backing plate to spindles.

5. Remove brake backing plates and hang them on fender supports with hooks made from heavy wire.

6. Remove cotter keys from inner ends of bolts which attach torque arms to frame brackets, remove nuts and press out bolts, using press J-885, Fig. 261.

Due to the rubber grommets clinging to the bolt, a constant pressure is required to remove the bolt.

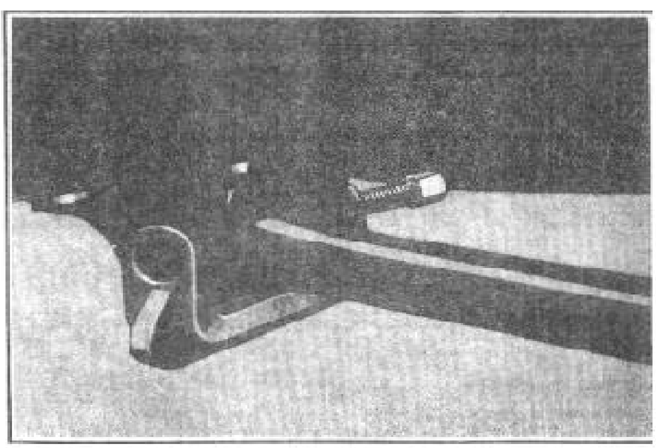


Figure 261
Torque Arm Bracket Bolt Press - J-885

7. Remove nuts, grommet seats and grommets from bottom shock absorber mounting studs.

8. Remove cotter pin from front end of drag link, unscrew plug, remove ball seat and remove drag link from steering arm.

9. Remove spring U-bolt nuts (4 each side).

10. Remove spring seat caps.

11. Lower roller jack until axle is clear of spring and remove axle assembly from under car.

INSTALLATION

1. Put axle assembly on roller jack and roll into position under car.

2. Lubricate the upper and lower halves of the spring seat, put upper halves in place on axle and raise axle into position under springs.

3. Put spring U-bolts and lower halves of spring seats in place and install nuts.

NOTE: Before installing jam nuts on U-bolts, lift rear end of torque arm. (It should fall slowly under its own weight). Re-adjust U--bolt nuts if necessary. A tight spring seat bearing will restrict spring action and cause hard driving, while with loose bearings the proper axle alignment cannot be held.

4. Insert two rubber grommets in eyes of each torque arm and insert bracket bolts through bracket and grommets.

5. Install nuts and insert cotter keys.

NOTE: Dip grommets in gasoline before assembling so that bolt will outer freely - DO NOT USE OIL.

6. Connect drag link to steering arm and connect shock absorbers.

7. Install brake backing plates.

8. Lubricate the bearings of each wheel with 4 ounces of bearing grease and install wheel and brake drum assemblies and hub caps.

NOTE: The axle must now be checked for pivot pin inclination, caster, camber, toe-in and toe-out. Refer to "Front Wheel Alignment Section," Page 248.

SPINDLE PIVOT PINS AND BUSHINGS REPLACING

NOTE: It is not necessary to remove the axle from under the car for this operation.

This can be done by proceeding as follows either with the axle removed from the car or after operations 1 to 5 inclusive under removal of front axle.

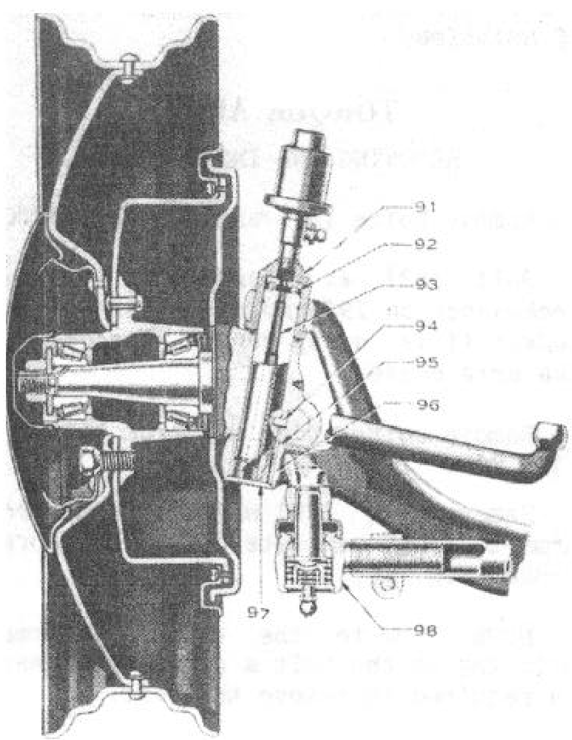


Figure 262 - 1937 Spindle Detail

91. Pivot Pin Thrust Washer and Ball Cup Assembly
92. Thrust Ball
93. Pivot Pin
94. Steering Arm Key
95. Shims
96. Pivot Pin Bushing
97. Expansion Plug

1. Remove tie rod end stud nuts and disconnect tie rod from right and left steering arms.

2. Remove the cotter keys and nuts from the front ends of the steering arms and remove the arms from the spindles.

3. Remove the oilers from the top of the pivot pin upper bushing.

4. Insert driver J-479-1 through hole in upper bushing and drive spindle pin down forcing out expansion plug at bottom of spindle, then insert driver J-479-2 and drive pivot pin out.

NOTE: Remove spindle pin carefully so that the seven ball bearings are not lost.

5. Support the axle end solidly and drive upper bushing out with a copper hammer.

6. Insert driver J-990 into lower bushing and drive it out.

7. Install new upper bushing, using driver J-469, Fig. 263.

8. Install new lower bushing, using driver J-990-1.

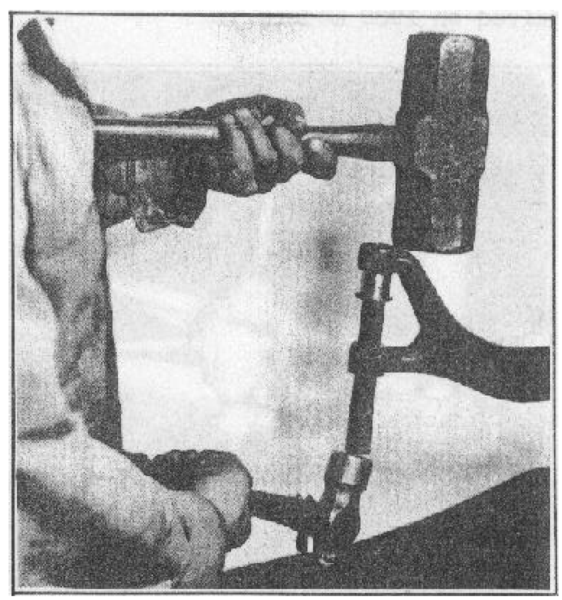


Figure 263 - Installing Pivot Pin Upper Bushing-Tools J-469-2, J-990-2

9. Lubricate inside of bushings and top of spindle pin with viscous grease before inserting spindle pin.

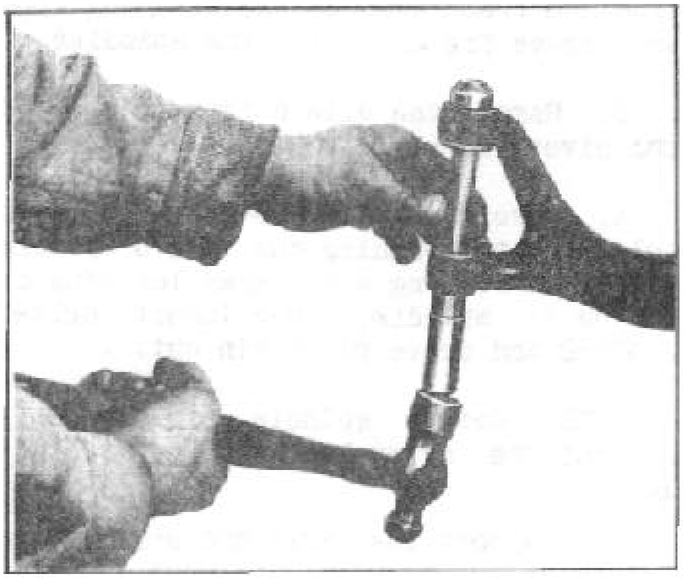


Figure 264 - installing Lower Bushing-
Tools 3-469-1 and 3-990-1

10. Put the spindle in place with sufficient shims under spindle to give an end play of .006" to .0104 and insert spindle pin from bottom about 3/4 of the way with the keyway in the steering arm hole in the spindle. (No shims are required on 1938 models.)

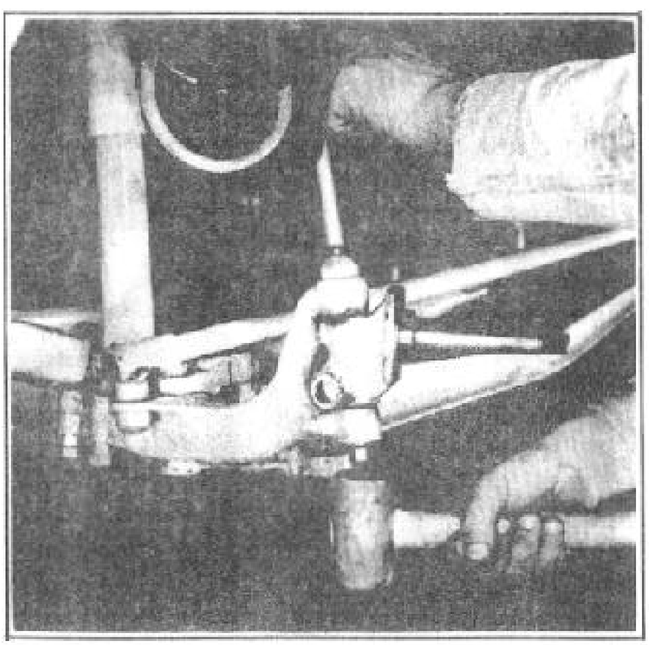


Figure 265 - Installing Pivot Pin-
Tool 3-479-1 used as Guide

11. After the shim pack has been selected, place cork seal in groove in top of 1937 spindle. (A "corprene" seal is used on 1938 models.)

12. Drop 7. new ball bearings through the pressure fitting hole in the top bushing and insert driver J-479-1 to insure keeping balls on their race; drive the pin in until the keyways line up.

13. Assemble the steering arms to the spindle with keys and nuts. Tighten nuts securely and insert cotter pins.
Spindles must turn without perceptible drag.

14. Install expansion plugs in bottom of spindles.

TORQUE ARMS
REMOVING AND INSTALLING

Remove bolts (81) and (82) Fig. 260.

Bolt (82) is secured with a nut and lockwasher on 1938 models, while on 1937 models it is a cap screw threaded into the axle center.

Remove cotter pin, nut from bolt (78) Fig. 260.

Remove bolt (78) which attach torque arms to frame brackets using bolt press J-885, Fig. 261.

NOTE: Due to the rubber grommets clinging to the bolt a constant pressure is required to remove the bolt.
To install reverse procedure of removal.

To install reverse procedure of removal.

NOTE: The tie rod ends should be free enough to permit the stud to be turned by grasping it with the hand. Replace worn or tight tie rod ends. After the tie rod has been installed a pressure of from 3 to 5 pounds applied to the ball of the left hand steering arm should turn the spindles. If greater effort than this is required, steering will be hard and an excess amount of caster may be required to overcome this drag, (to prevent car wander).

FRONT AXLE
1938 AND 1939 HUDSON 112 MODELS

Design

The front axle is of the Elliott type made of a heavy drop-forging of high quality carbon steel. The steering spindles (1), Fig. 266, which are of drop- forged molybdenum alloy steel, are attached to the axle center with alloy steel pivot pins (2) mounted in hardened steel bushings (3 and 4) with ball bearings (5) to carry the thrust on the ends of the pins. The spindle pivot pins are drilled centrally, full length and are provided with a single lubrication fitting (7) located above each pivot pin. A relief valve (8) is fitted in the spindle pivot pin expansion plug (11) to relieve excessive pressure which may be applied to the pivot pin grease fitting to prevent leakage around the plug.

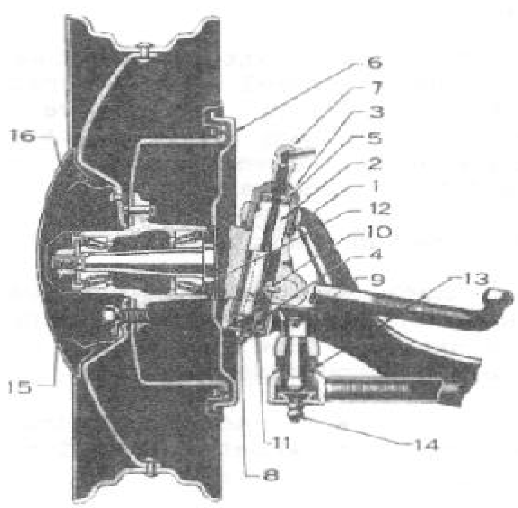


Figure 266
Front Axle Details

The front axle is attached to the frame through the use of long, semi-elliptic springs mounted on the axle perches and held securely by two long spring clips.

The tie rod ends, Fig. 267, are of plain bearing type. The ground steel spherical shaped bearing (1) is located between the spring loaded stud (2) and the tie rod end forging. A curved steel dust cover (3) making a metal to metal contact with the upper part of the forging is supplemented by a rubber seal (4).

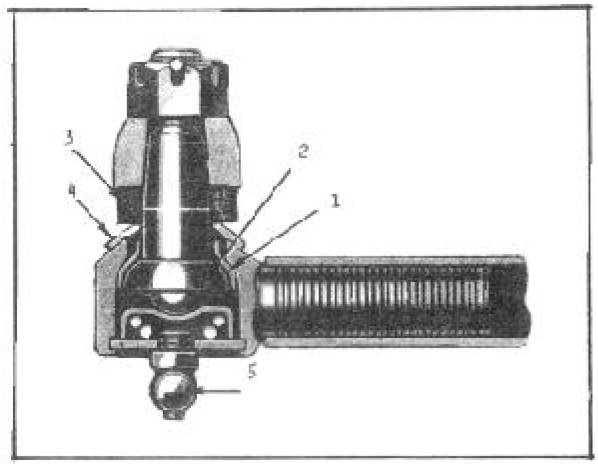


Figure 267
1939 Tie Rod End

Lubrication is effected through a pressure fitting (5) screwed into the retainer at the bottom.

FRONT AXLE
REMOVAL

1. Jack up front end of car and place two stand jacks under the frame side rails just back of the front spring rear brackets. Leave roller jack under axle center to support front axle.

2. Pry off front wheel outer and inner hub caps and remove spindle nut cotter keys.

3. Remove spindle nuts, spindle washers, outer bearings and front wheels and brake drums.

4. Remove nuts from four bolts holding backing plates and Auto-Poise control bar brackets to spindles.

5. Remove brake backing plates and hang them on fender supports with hooks made from heavy wire.

6. Remove nuts, grommet seats and grommets from bottom shock absorber mounting studs.

7. Remove cotter key from front end of drag link, unscrew plug, remove ball seats and remove drag link from steering arm.

8. Remove spring clip nuts.

9. Lower roller jack until axle is clear of springs and remove axle from under car.

INSTALLATION

NOTE: To install reverse procedure of removal.

Be sure to lubricate the wheel bearings with three ounces of milled sodium soap base lubricant.

Axle must now be checked for caster, camber and toe-in. Refer to Section "Front Wheel Alignment", page 248.

SPINDLE PIVOT PINS AND BUSHINGS REPLACING

NOTE: Use instructions applying to 1937 front axle under "Spindle Pivot Pins and Bushings Replacing".

FRONT WHEEL ALIGNMENT 1937 THRU 1939

The correct handling of a car can be obtained only when the following conditions are correct:

1. Caster
2. Camber
3. Toe-in.
4. Spindle pin fit.
5. Wheel bearing adjustment.
6. Tire inflation.
7. Tire balance
8. Tie rod end.
9. Spring mounting.
10. Shock absorber control
11. Steering arms.
12. Steering gear adjustments.
13. Steering gear on high point.
14. Lubrication

Failure to obtain correct handling is frequently attributable to failure to check all conditions and it is, therefore, recommended that the following systematic check be made in all cases. Following the routine set forth will insure satisfactory results in a minimum average time.

The front end alignment is checked with the Jiffy caster and camber gauge and turning angle plates. When these are used it is important that the car is level. A level section of the floor should be marked with zone line paint for the position of the front wheels, while checking.

A wooden block 1-1/4" thick should be placed under the rear wheels to compensate for the height of the turning angle plates.

1. Inflate all tires.

16 x 6.00 - front 24 pounds, rear 32 pounds.
16 x 6.25 - front 24 pounds, rear 32 pounds.
16 x 6.50 - front 22 pounds, rear 28 pounds.
15 x 7.00 - front 22 pounds, rear 28 pounds.

2. Tighten all spring U bolt nuts.

3. Test shackle threaded bushings with pinch bar for looseness in spring eyes.

4. Disconnect bottom of shock absorbers and check control - lower portion of the shock absorbers should move up and down under a steady pressure but should resist a sudden downward jerk. Remove and refill if necessary.

5. Jack up front axle.

6. Check spindle pins and bushings for wear and tie rod and drag link ends for looseness. See that torque arm rubbers are in good condition.

7. Disconnect rear end of drag link from pitman arm. Wheels should turn free throughout their travel.

8. Lower front wheels in straight ahead position onto turning angle plates. (Fig. 253 page 237) and apply the brakes with a pedal jack. A pull or push of 20 pounds on the rim of the tire should turn the wheels in either direction. If greater pull is required to turn the wheels, lubricate the front axle parts.

9. Loosen the steering gear frame bracket bolts, just enough to allow gear to shift in frame to line up the angle determined by height of setting at instrument board column bracket, then re-tighten frame bolts.

10. Loosen the instrument board column bracket and allow it to shift to match gear column position and re-tighten. This will correct any possible misalignment of gear column.

11. Turn hand wheel to the mid-position of its complete travel or turning limits. (Drag link previously disconnected).

Hand wheel has a trade-mark of large depression on the underneath side of the spoke that should now point straight down. Place this marked spoke in correct position and shake ball arm to determine amount of lost motion.

12. If pitman arm ball can be moved more than 1/32 of an inch without the steering column tube turning, the gear mesh must be adjusted to remove the excessive lash.

13. Turn hand wheel throughout full travel to test for free operation. If too tight, readjust more carefully.

NOTE: The worm is generated in such manner that close mesh with SECTOR or ROLLER teeth is provided at the mid-position or place corresponding to the straight ahead driving range, with gradual relief toward the extremes. Since any normal wear is most pronounced at mid-position, this provision allows for subsequent adjustment without fear of binding toward the extremes.

14. A pull of 1-1/2 to 2 pounds at the rim of the steering wheel should turn it in either direction from the high point,

15. Reconnect drag link to pitman arm.

16. Set wheels in straight ahead position and adjust scales on turning angle plates to zero.

17. Remove outer and inner hub caps from front wheels.

18. Remove left hand spindle nut washer and install jiffy caster and camber gauge as shown in Fig. 253 Page 237, so that level bubble is between gauge lines when pointer is set at zero.

19. Turn the head of the jiffy gauge so that it is parallel to the axle as shown in Fig. 254, page 237, with wheels still straight ahead, adjust the pointer with the thumbscrew until the level bubble is between the lines on the glass. The reading taken on the lower scale is the camber of the left wheel. A reading toward the wheel is positive and away from the wheel is negative camber; the correct camber is 1° to 1-1/2° positive. If camber is insufficient or reversed, check spindle pin inclination as follows:

20. Turn the head of the jiffy gauge parallel to the wheel as shown in Fig. 255, page 239, and turn wheels to left until pointer on left turning angle plate points to 25°.

21. Set pointer on zero and turn gauge on spindle until level.

22. Turn left wheel to right 25° and adjust level. The pointer reading on the top scale is the king pin inclination. This should be seven degrees.

NOTE: If the king pin inclination and the camber are off in approximately the same amount (for example, camber 1/2°, king pin inclination 6°), it is probably due to worn spindle pin bushings. If camber is off and king pin inclination is correct, the spindle is bent.

If spindle pin inclination and camber are both off an equal amount and there is no play in spindle pin, the axle center is bent. Camber should not be more than the specified 1-1/2°; however, a decrease in caster, if spindle pins are not loose in the bushings, is not detrimental to steering unless an actual reverse camber exists.

23. Turn the wheels back to the straight ahead position and reset the jiffy gauge as in paragraph 18, Fig. 253, page 237.

24. Turn the wheels to the right until the pointer on the left turn plate is at 25°, level the gauge with the adjusting screw and take the reading of the pointer on the upper scale.

25. Turn the left wheel 25° to the left and level the gauge and take the reading on the upper scale, page 239.

NOTE: If both readings are on the same side of zero, subtract the one from the other to get the caster angle of the left wheel. If the two readings are on opposite sides of zero, add them to get the caster angle. Readings toward the wheel are positive and away from the wheel are negative caster angle.

26. Repeat operations 18 to 25 inclusive on the right wheel, turning the wheels so that the pointer of the right turn plate reads 25° to the right for the first caster reading and 25° to the left for the second caster reading.

The correct caster settings are as follows:

1937 1° - 2°
1938 1° - 2°
1939 1° - 2°

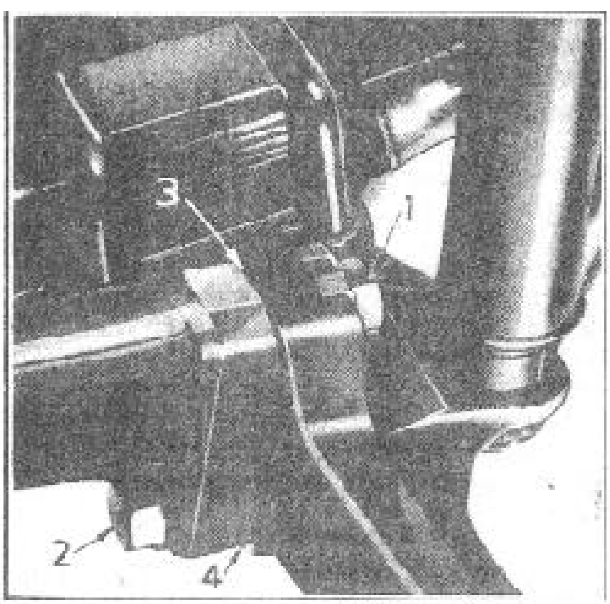


Figure 268
Caster Adjustment 1937, 1938 and 1939 Models Except 112 Series

CORRECTION CASTER 1937 and 1938 MODELS

27. Remove bolts (1) and (2) and locks, Fig. 268.

28. To reduce caster increase thickness of shims at (3) and (or) reduce thickness at (4). To increase caster decrease thickness of shims at (3) and (or) increase thickness at (4).

29. Install bolts (1), (2) and locks.

30. Repeat operation 24 to 26 inclusive to recheck caster.

31. Remove jiffy gauge and replace spindle washer and nut, adjust bearing and insert cotter key.

32. Turn left wheel to left 20°. Right wheel as indicated by point on turning angle plate should be (17 3/4°).

33. Turn right wheel to the right 20°. Left wheel should now be (17-3/4°) to the right.

NOTE: If wheels do not turn to the corresponding angles, recheck tie rod ends for looseness and steering arms to see that they are drawn tightly into the spindles. If no looseness is found, the steering arms are bent and should be replaced.

34. Raise front end of car and remove turning angle plates and lower car. Release brake and roll rear wheels off blocks.

35. Pull car forward by bumper about 10 feet with wheels in straight ahead position to be sure all parts have assumed their normal road position.

36. Place toe-in gauge back of front wheels with rod (8) Fig. 269, against inside felloe band of right wheel and end of sliding head (9) against outside edge of the felloe band of left wheel.

37. Be sure thumbscrew of both sliding head and rod are tight. Move sliding collar (10) to which scale is attached out against standard bracket (11). Make a chalk mark on tire in line with sliding head.

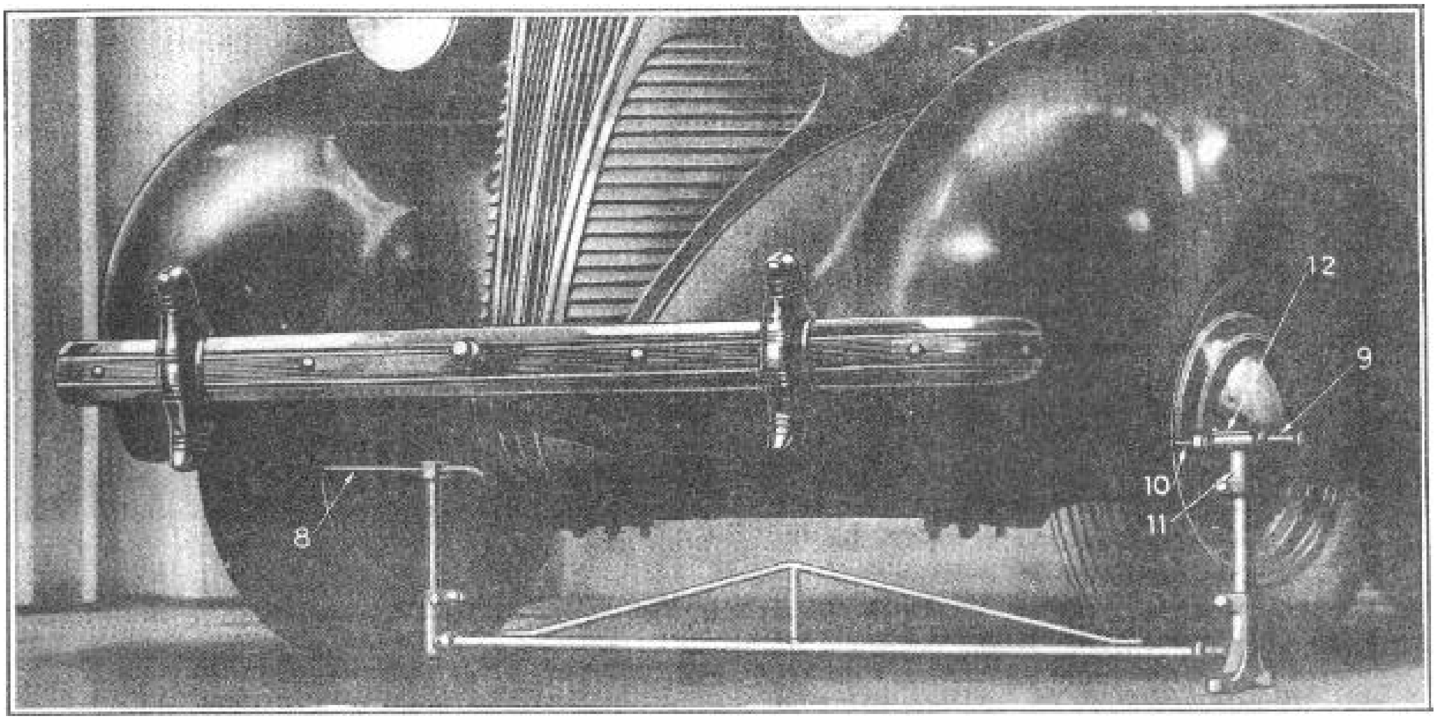


Figure 269 - Toe-in-Gauge-Second Position HMO-20

38. Remove toe-in gauge and pull car forward (not backward) with front bumper until chalk mark is at height of toe in gauge standard at front of wheel.

39. Put toe-in gauge in place as in Fig. 269 with rod against inside edge of right felloe and sliding head in line with outside edge of left felloe at chalk mark on tire.

40. Loosen sliding head lockscrew and push head (9) against edge of felloe. Tighten lockscrew.

41. The scale (12) reading at the inner edge of the standard bracket is the toe-in in inches. This should be zero to 1/8°, preferably 1/81'.

42. To adjust the toe-in, loosen the clamp bolt nuts on the tie rod ends and turn the tie rod with a Stillson wrench. Pulling the wrench handle forward at the bottom decreases toe-in.

43. After getting correct toe-in, tighten tie rod end clamp bolt nuts.

44. Set wheels straight ahead and check steering wheel to see that the trade mark spoke is pointing straight down.

45. If front wheels are not straight ahead, adjust drag link length or change height of steering column. Lengthening the drag link will turn front wheels to left. Lowering steering column will turn front wheels to the left.

NOTE: Whenever the thickness of shims is changed to increase or decrease caster it is necessary to put the steering gear back on the high point.

46. Reconnect the drag link to the pitman arm and lubricate thoroughly,

FRONT END ALIGNMENT
1938 AND 1939 HUDSON 112 MODELS

NOTE: Proceed as outlined on pages 248 thru 251 with the following exceptions.

1. Inflate all tires (cold).

16 x 5.50 - front 24 pounds, rear 32 pounds.
16 x 6.00 - front 24 pounds, rear 32 pounds.
15 x 7.00 - front 22 pounds, rear 28 pounds.
16 x 6.00 Truck Air-wheel - front 24 pounds, rear 40 pounds.
16 x 6.50 Truck Air-wheel - front 24 pounds, rear 40 pounds.
15 x 7.00 Truck Air-wheel - front 24 pounds, rear 40 pounds.

2. Omit reference to torque arm rubbers as these are not used on Hudson 112 models.

3. The correct caster settings are as follows:

	Hudson 112
1938	2° - 2-1/2°
1939	1° - 2°

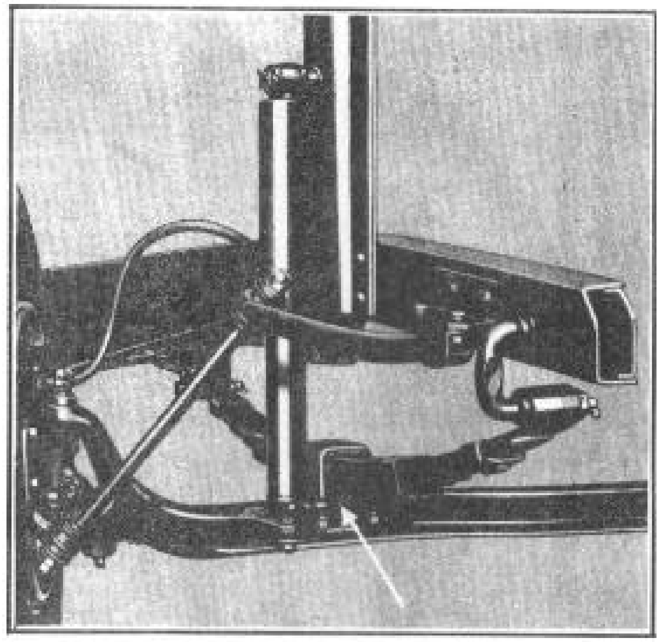


Figure 270
Caster Adjustment-Hudson 112

4. Insert caster wedges between the axle spring pad and spring, Fig. 270, with the thick edge forward to reduce caster and the thick edge to the rear to increase caster.

REFERENCES

Source of Information	Date	Subject

REAR SUSPENSION

SPECIFICATIONS

Light scale rear springs are standard for most models, optional heavy scale springs are also used as outlined in (groups 1 and 2).

Group 1 following, lists the series, body type and spring assembly part number covering original installation.

Group 2 covers the specifications of 58 the spring assembly part numbers shown in (group 1).

NOTE: Springs with metal covers have the part numbers stamped on the bottom leaf at center bolt head. Springs without metal covers have the part numbers stamped on the second spring clip, (checking from rear of car).

GROUP 1

SERIES	MODEL	SPRING ASSEMBLY
20	3 Pass. Coupe	164018
	4 Pass. Coupe	164019
	Brougham	164020
	Sedan, Cvt. Bro.	164021
	Ut. Cpe., Ut. Co.	164031
21,22,	3 Pass. Cpe.	164022
24,25	Brougham	164023
	4 Pass. Coupe	164023
	Sedan	164024
	Cvt. Bro.	164024
	Chassis	164024
	Station Wagon	164075
27,28	5 Pass. Sed. Chassis	164025
50 CM	Cab pickup chassis	164077
51,52	3 Pass. Coupe	165933
53,54	Brougham	165933
	4 Pass. Coupe	165935
	Sedan	165935
51P, 54	Cvt. Brougham	165935
51P, 53	Chassis	165935
51CM	Station Wagon	165075
58	Chassis	159693
58	Cab Pickup	159693
171,172,	Brougham	165933
173,174	3 Pass. Coupe	165933
	Sedan	165935
	4 Pass. Coupe	165935
171P,174	Cvt. Bro.	165935
171 CM	Station Wagon	165075
178 CM	Station Wagon	165075
178	Cab Pickup	165075

GROUP 2

SPRING ASSEMBLY	NO. OF LEAVES	SPRING LENGTH	WEIGHT AND SCALE
159693		60"	1430/355
164018	12	52 1/2"	525/110
164019	7	52 1/2"	600/110
164020	7	52 1/2"	650/110
164021	7	52 1/2"	675/110
164022	7	60"	600/110
164023	8	60"	650/110
164024	8	60"	725/110
164025	8	60"	790/110
164026	8	52 1/2"	610/125
164027	8	52 1/2"	660/125
164028	8	52 1/2"	735/125
164029	7	60"	610/125
164030	7	60"	660/125
164031	7	60"	735/125
164032	7	60"	820/125
164033	7	60"	860/125
165075	8	60"	950/175
165076	10	52 1/2"	955/355

SPRING ASSEMBLY	NO. OF LEAVES	SPRING LENGTH	WEIGHT AND SCALE
165077	10	52 1/2"	1430/355
165078	7	52 1/2"	575/110
165932	8	60"	650/110
165933	8	60"	650/110
165934	8	60"	725/110
165935	8	60"	725/110
165942	7	60"	610/125
165944	7	60"	660/125
165946	7	60"	735/125
165948	7	60"	820/125

NOTE: Number of leaves shown is exclusive of rebound leaf.

CONSTRUCTION

Rear Springs

Rear Springs are splay mounted with the widest portion at the rear. The model 20 spring is 52-1/2" long, all others 60" long.

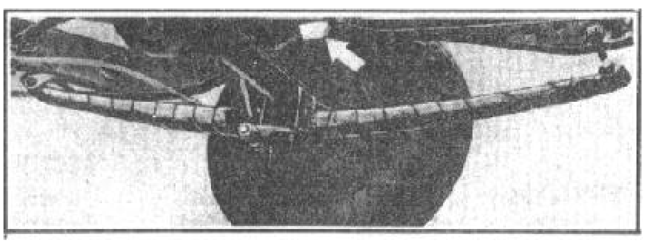


Figure 271
Rear Spring Suspension

The leaf springs clips are doweled for the 1 and 4 locations with spacers between them and this together with the rear lateral stabilizer (all models except Commercial and model 20T) prevents fanning or spreading of the leaves during car operation.

The front end of the rear spring is mounted in rubber and is entirely insulated from the rest of the chassis. This eliminates noise at this point and allows increased riding comfort through reduction of torque and brake reaction shock.

A shoulder pin with a round head is used, the top of which sets flush in the pressed steel bracket and the other end is threaded. The pin is pressed through two rubber bushings fitted in the spring eye. A lockwasher and nut are used to lock the pin and bushings in place.

No lubrication is required at this point.

The rear end of the rear spring is attached to the frame through threaded self-adjusting shackles. The shackles are provided with shoulders to hold rubber dirt seals in place, to prevent dirt and road splash entering the threaded bushings. These dirt seals are in the form of short rubber sleeves and are assembled on the shackle before it is inserted in the bushings or mounted on the frame.

Rubber cushions and retainers are used between the spring and axle housing to reduce road noises to a minimum.

Inter-leaf friction affects performance of springs to a great extent and to keep this friction as nearly constant as possible in all weather and climates, the springs are thoroughly lubricated during car production and spring covers are installed.

The spring covers prevent road dirt from getting between the spring leaves and avoid the necessity of adding lubrication for several thousand miles.

REAR SPRING REMOVAL

1. Jack up the rear axle on a roller jack and place stand jacks under the chassis frame side rails.

2. Disconnect lower end of shock absorbers.

3. Remove the rear spring to axle clip nuts, clip plate and clips.

4. Remove rear spring front mounting pin nut and lockwasher

5. Remove rear spring front mounting pin using J-1438 Rear Spring Pivot Bolt Remover and. Replacer Tool (Fig. 272).

6. Unscrew the threaded bushing in the spring frame bracket at the shackle end of the rear spring.

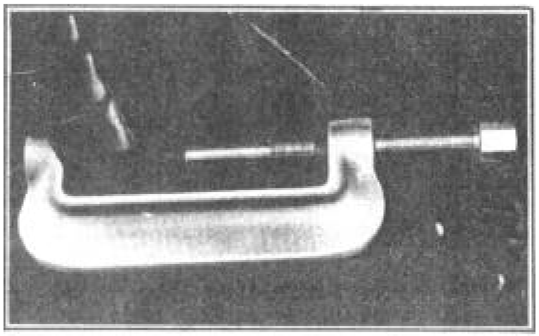


Figure 272 - Rear Spring Front Mounting Pin Remover and Replacer Tool J-1438

On cars having the spare tire well in the rear compartment (trunks) it is first necessary to punch out the knock-out plug in the well in order to remove the upper threaded bushing.

7. Remove the spring from under the car.

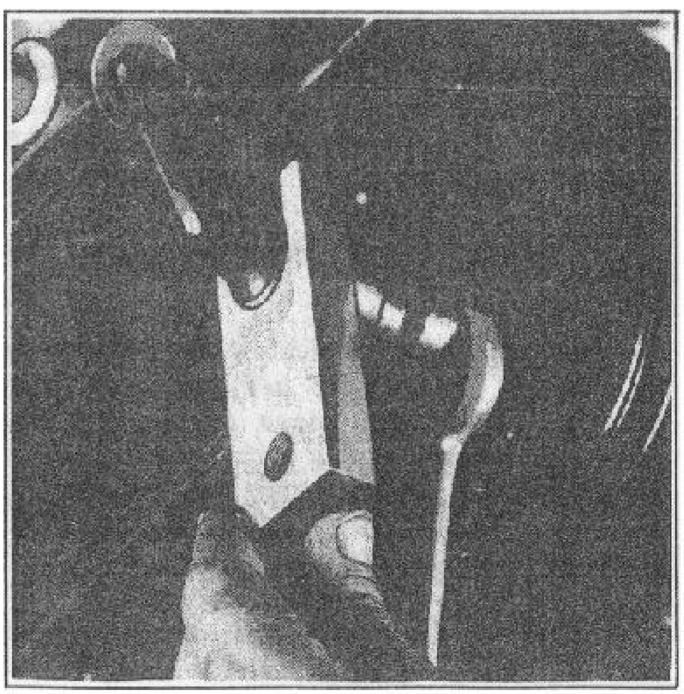


Figure 273 - Rear Spring Shackle Bushing Locating Gauge J-524

REAR SPRING INSTALLING

1. Insert one end of the rear spring shackle through the main leaf eye after placing rubber dust seals in place on shackle and place tool J-524 between the spring eye and shackle as shown in Fig. 273.

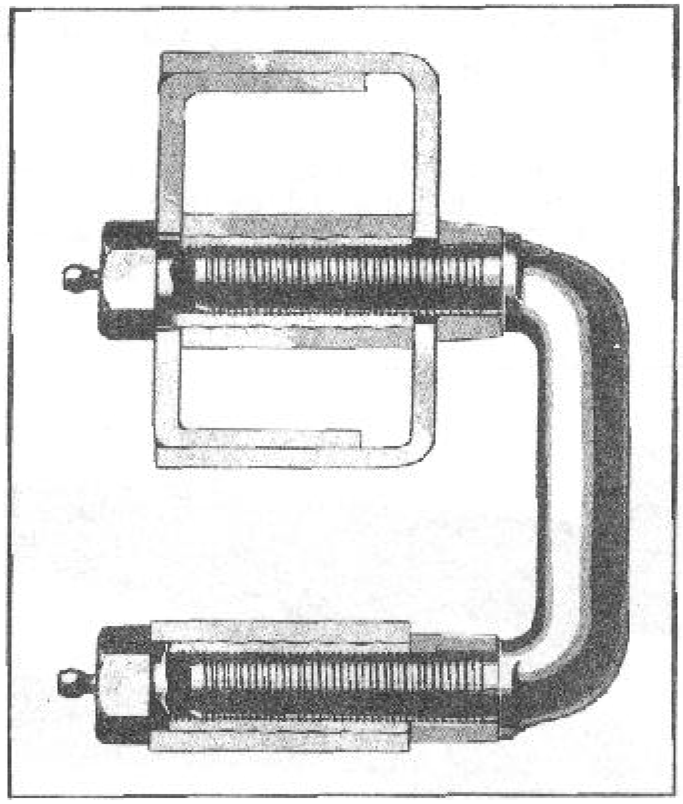


Figure 274
Rear Spring Shackle Mounting

2. Start the threaded bushing in the shackle thread and draw it tightly into the spring eye.

3. Place the spring in position with the shackle passing through the threaded tube welded into the frame side rail.

4. Locate the shackle with the spacer tool J-524 as shown in Fig. 273, and start the threaded bushing on the shackle and draw it tightly into the mounting.

5. Replace rubber bushings in spring assembly.

It is important that the shackle be located properly so as to insure the bushing being threaded far enough on the shackle but not far enough to bottom the thread in the bushing as the shackle moves in its normal operation. Bottoming will cause a hard ride and shackle breakage.

6. Enter mounting pin, washer and nut, see Fig. 275, the nut should not be tightened, until the spring has been compressed to a normal position which will give it a correct camber.

7. When tightening the mounting pin, the rear spring should be mounted so that there is no unnatural twist set up in the rubber bushings.

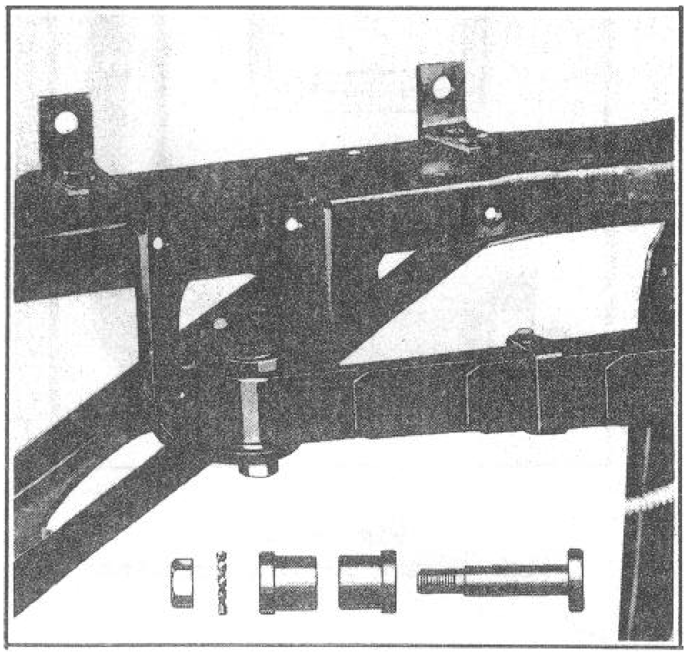


Figure 275
Rear Spring Front Mounting

8. Replace clip plate and clips.

9. Tighten securely.

10. Connect lower end of shock absorber to the clip plate.

11. Remove stand jacks and lower car to floor.

REAR SPRING DISASSEMBLY

1. Clamp the spring in a vise so that the spring leaf center bolt is outside of the jaws of the vise.

2. Unscrew the shackle threaded bushing.

3. Remove the two leaf clip bolt nuts and spacers at the outer ends and cut the two inner clips off. Remove the center bolt and nut.

4. Open the vise and disassemble the spring.

REAR SPRING ASSEMBLING

The leaves should be lubricated with viscous chassis lubricant and assembled in their proper order with a piece of 5/16” rod passing through the center bolt hole of each leaf.

1. Clamp the loose assembly in a vise and draw the leaves together, keeping them in alignment as the vise is tightened.

The bracket for holding the brake cable clip is assembled under the second from front leaf clip.

2. Use two new box type leaf clips, bolts, nuts and spacers.

3. Insert the center bolt and tighten the nut. Use the original leaf clips that are riveted to the bottom spring leaf at outer ends.

4. Install the spacers, bolts and nuts.

REAR SPRING LEAF KIT having an extra No. 2 leaf with leaf clips to take care of the extra thickness can be obtained from the Hudson Parts Department for use when spring reinforcement is necessary, on 1942 models only not available for 1946 or 1947 models.

The extra leaf will be the No. 2 leaf next to the eye leaf and four box type leaf clips with bolts, nuts and spacer (used on bolt) also center bolt will be supplied.

Rear Spring Shackle Identification

The right hand rear spring shackle has right hand threads on both upper and lower ends and the left hand rear spring shackle has right hand threads on the upper and left hand threads on the lower end.

The lower left hand shackle bushing is left hand thread and has an identification groove 1/16* wide on the head.

NOTE: The shackle having the left hand thread has a single forging mark at the shoulder.

If the zerk fitting is removed and replaced for any reason it must not be turned into the tapped hole so tightly as to cause the zerk fitting to bottom on the end of the shackle and thus loosen the plug that is in the end of the shackle bushing.

Rear Axle Stabilizing Bar

Rear axle stabilizing bar is used on all models except 20 T and commercial Cars. This lateral stabilizing bar controls horizontal movement of the car body and frame. It is mounted to the frame at one end and to the axle at the other end.

These points (frame and axle) are cushioned in rubber.

Vertical movement of the frame and body is controlled by the shock absorber.

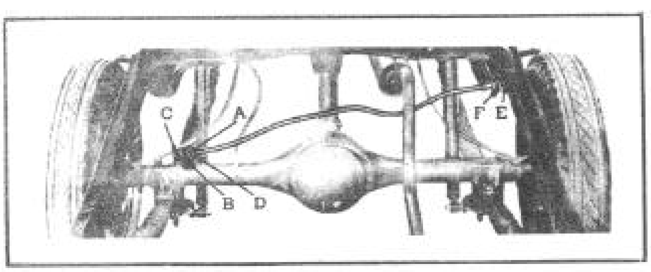


Figure 276 - Stabilizer Bar

A. Cushion (rubber)
B. Cushion washer
C. Outside nut
D. Inside nut
E. Hex nut
F. Guide rod

REAR AXLE STABILIZING BAR REMOVAL

Rear axle stabilizing bar removal is started at the rear axle end of the stabilizing bar by:

1. Remove the palnut and outside nut (C) Fig. 276, the cushion (rubber) (A) and the cushion washer (B).

2. Loosen the inside nut (D) and run It up on the threads.

3. Push the cushion and washer up on the bar and remove the cushion spacer.

4. At the frame end remove the pal nut and the hexagon nut (E).

5. Remove the cushion, the washer and the spacer.

6. Push the stabilizing bar toward the axle stabilizer bracket and remove the frame end of the bar from the frame.

NOTE: Do not lose or destroy the rubber grommet in the frame for the stabilizer bar guide rod (F) (welded to the bar).

7. Pull the bar toward the frame stabilizer bracket and out of the axle stabilizer bracket.

INSTALLATION

Rear Axle Stabilizing Bar Installation is started at the frame end of the stabilizing bar.

1. Have the inside nut at axle end well up on the bar and the cushions and washers in place at both ends.

2. Push the bar through the axle bracket and then put the frame end in place with the cushion and washer and the locating guide rod in the rubber grommet in the frame.

3. Place the outside cushion, spacer and washer on the frame end of the bar and install the hexagon nut.

4. Tighten the nut and install the palnut.

5. Spin the companion or palnut with the smooth face first onto the bolt until it touches the nut.

6. Then tighten the companion nut with a wrench not over one quarter to one third more in order to lock it.

The shoulder on the bar rests against the cushion spacer and frame and allows the bar to pass through the frame far enough to install the nuts and tighten them in place. This locates the bar in position.

7. Place the outside cushion, cushion washer and spacer on the axle end of the bar and install the outer nut. (The nut tightens the spacer against a shoulder on the bar).

8. Run the inside locking nut and rubber cushion down on the threads and. up against the axle bracket.

REAR LATERAL STABILIZER ADJUSTMENT

Adjustment is made:

1. By backing off the lock nuts and nuts on the left end at the rear axle housing bracket until the rubber cushions and washers are entirely free.

2. Next, the nut on the right end should be tightened securely.

A tubular spacer, is used in the assembly to control the compression of the rubber cushions. The nut should be tightened securely to lock the retaining washers against this spacer.

NOTE: Following this, the inner nut on the right end of the bar should be turned just enough to bring the inner rubber cushion and washer up against the axle bracket, after which the outer nut should be similarly adjusted. After this has been done, turn the inner nut to the left and the outer nut to the right an equal amount, compressing both rubber cushions until the retaining washers are bottomed against the tubular spacer.

NOTE: The above adjustment should be made with the car weight on the springs.

3. Tighten all lock nuts securely after adjusting. When the adjustment is made in the above manner the stabilizer bar is permitted to find its correct position.

REFERENCES

Source of Information	Date	Subject

SHOCK ABSORBERS

SPECIFICATIONS

1942 Models

SERIES	BODY TYPE	FRONT	REAR	MFR.	SCALE
20T, 20P, 21	Exc. Cpes and Sta. Wagon	164786	164787	Monroe	Light
20, 21	3 Cpe. - Club Cpe.	164545	164546	Monroe	Light
22	Exc. 3 Cpe - Club Cpe.	160105	160109	Delco	Light
24	Exc. 3 Cpe, Club Cpe, 27	162032	160110	Delco	Light
22, 24	3 Cpe, Club.Cpe, 25	164547	164548	Monroe	Light
28	All - 1942	160106		Delco	Heavy

NOTE: Part number 160106 shock absorber assembly front, used with optional heavy scale springs on all 1942 cars. Part number 160110 shock absorber assembly rear, used with optional heavy scale springs on all 1942 cars except Cab - CABPU.

1946 Models

Monroe shock absorbers, light control, are used on Series 51. Delco shock absorbers, light control, are used on series 52, 53, 54.

Delco shock absorbers, heavy control, are used for front springs on series 58 and are optional with heavy scale front and rear springs on all series.

SERIES	BODY TYPE	FRONT	REAR	MFR.	SCALE
51	Exc. 3 Cpe, Club Cpe	165754	165755	Monroe	Light
51	3 Cpe., Club Cpe	165750	165751	Monroe	Light
52, 53, 54	Exc. 3 Cpe. Club Cpe.	165875	165871	Delco	Light
52, 53, 54	3 Cpe. Club Cpe. 58	165873	165870	Delco	Light
All		165874		Delco	HEAVY

NOTE: Part number 165874 shock absorber assembly front, used with optional heavy scale front and rear springs. Part number 165871 shock absorber assembly rear, used with optional heavy scale front and rear springs.

1947 Models

SERIES	BODY TYPE	FRONT	REAR	MFR.	SCALE
171S, 171P, 171SP	3 and 4 Cpe.	166572	166573	Monroe	Light
171, 171P, 171SP	Exc. 3 and 4 Coupe	166574	166575	Monroe	Light
172, 173, 174	3 and 4 Coupe	165873	165870	Delco	Light
172, 173, 174	Exc. 3 and 4 Coupe	165875	165871	Delco	Light

NOTE: Monroe shock absorbers bearing numbers 166572, 166573, 166574 and 166575 are the permanently sealed type and cannot be serviced except as an assembly.

	Front	Rear
Capacity in Ounces	3-3/4	6-1/4

SHOCK ABSORBER COMPRESSION STROKE

When the car spring is being compressed, the piston (X), Fig. 277, moves toward the lower end of the cylinder. Fluid is forced through the holes in the piston, lifting intake valve plate and entering the upper chamber. The volume of fluid thus displaced by the piston is forced out of the lower chamber through compression valve and into the surrounding reservoir. As this opening is below the level of the fluid in the reservoir, no emulsion of air and fluid can be formed. The resistance to the vehicle spring travel is determined by the orifice in the valve disc and in the spring tension of the spring discs.

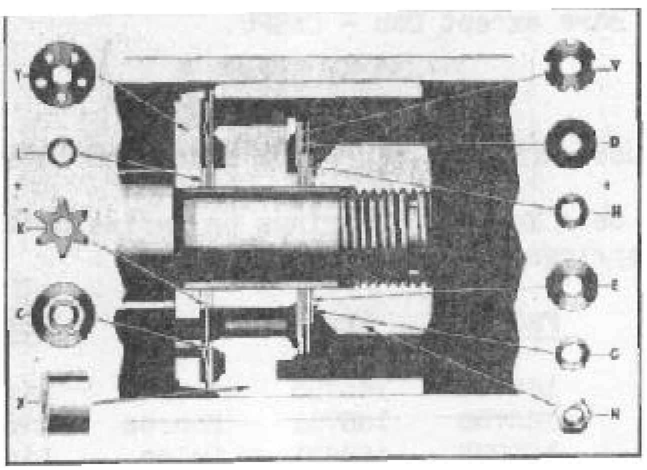


Figure 277
Delco Shock Absorber Relief Valve Detail

C. Piston intake valve plate.
D. Piston pressure relief valve disc. E. Piston pressure relief valve disc.
G. Piston rod nut washer.
H. Piston pressure relief valve disc spacer.
I. Piston intake valve star spring spacer.
K. Piston intake valve star spring.
N. Piston Nut.
V. Piston metering washer.
X. Piston.
Y. Piston support plate.

REBOUND STROKE

When the car spring rebounds, the resistance is instantly effective. As the piston (X), Fig. 277, is pulled up, the fluid in the upper chamber is forced through the slot in valve plate (C) through holes in piston against metering washer (V). This valve assembly is known as a 2 stage valve, see Fig. 277. Metering washer (V) and valve disc (D) can be considered the 1st stage. Valve disc (E) and piston rod nut washer (G) can be considered the 2nd stage.

Disc spacer (H) from its name acts as a means of separating the 2nd stage of the valve from the 1st stage.

The 1st stage of this valve is mainly effective on low velocity fluid movements and controls the car on the "Boulevard Ride." On high velocity fluid movements the 1st stage orifice disc and bending disc move and engage the 2nd stage discs, thereby providing additional shock absorber control.

The action of this valve allows the fluid to pass into the lower chamber. Since the piston is moving out of the inner chamber, the added displacement is compensated by a return flow of fluid drawn into the lower chamber from the surrounding reservoir through compression valve. The valve plate is lifted off its seat in this operation allowing the fluid to fill the inner chamber.

FRONT SHOCK ABSORBER REMOVAL

1. Jack up car and remove wheel.

2. Remove nut (I) Fig. 236, palnut and rubber bushing at the top of the shock absorber.

Use an offset screw driver to prevent the stem from to and a 9/16" open end wrench to remove the nut (r).

3. Remove the two cap screws (45) holding the shock absorber lower support plate (44) Fig. 235 to the lower support arm.

4. Turn the shock absorber a quarter turn and remove.

NOTE: To install reverse procedure of removal.

REAR SHOCK ABSORBER REMOVAL

1. Remove lower stud nut and washer at rear spring clip plate Fig. 271.

2. Remove upper mounting bolt, nut and flat washers (use tool J-991).

3. Remove shock absorber.

NOTE: To install reverse procedure of removal.

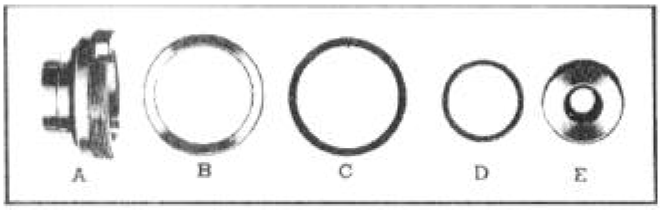


Figure 278
Shock Absorber Valve Parts

A. Piston rod guide
B. Piston rod guide gasket retainer
C. Piston rod guide gasket
D. Oil seal cork gasket
E. Oil seal

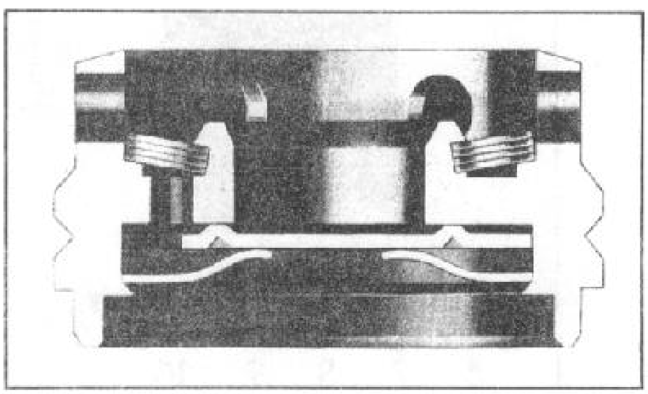


Figure 279
Compression and Intake Valve Assembly

SHOCK ABSORBER CHECK-UP

1. All shock absorber brackets must be tight.

2. Replace all worn mounting rubber bushings.

3. Operate the shock absorber a few full strokes to remove air from pressure cylinder.

The valves should seat instantly and resistance to any movement of the shock absorber should be felt without any lost motion in either direction. If there is any lost motion, a valve is not seating or air has been trapped in the top of the cylinder tube and a new piston guide and seal will likely be required.

4. Work shock absorber back and forth to be sure the piston is not binding in the cylinder tube.

5. Check valve assembly to see that the parts are clean and in correct relation to each other as shown in Fig.277, Delco and Fig. 280, Monroe.

6. Piston nut (N) Fig. 277, and (6) Fig. 280 must be tight.

7. See that rod guide is screwed down tightly and that seal assembly or gasket is not leaking.

SHOCK ABSORBER DISASSEMBLY

1. Extend fully and place the lower loop in a vise using Holding Fixture J-1558. The shock absorber should be kept in a vertical position.

2. Insert the prongs of the piston rod guide Spanner Wrench J-993-2 through the slots in the dirt shield tube.

3. Unscrew the piston rod guide by rotating the wrench in a counterclockwise direction until it is free from the lower tube assembly.

4. Lift the entire upper assembly and inner parts out of the lower assembly.

NOTE: The upper assembly will include the outer tube with piston rod, piston rod guide, piston with relief valve parts, pressure tube and compression valve.

5. Remove the lower part from the vise and empty the old fluid.

6. Remove the rubber gasket at the top of the reservoir tube.

Discard this gasket and use a new gasket when rebuilding.

7. Open the compression valve, by pressing it inward and drain all fluid from the inner chamber.

8. Remove compression valve from bottom of pressure tube.

This valve is alight press fit in the tube and can be easily taken out by placing a punch or screw driver against. the "V" groove machined on the outside of the valve body and tapping lightly with a hammer.

Do not injure pressure tube or valve by placing them in a vise when doing this. The relief valve is assembled as a unit and cannot be taken apart for servicing. If repairs are necessary, replace complete assembly with a new one.

9. Place the upper part of the shock absorber in holding fixture J-1558 and clamp in vise with the open end of the shock absorber up and then push the pressure tube down as far as it will go.

10. Unscrew the piston rod nut and remove the piston and valve parts from the piston rod.

NOTE: Mark the location of the piston on the rod to insure it being returned in the position that it was in originally.

11. Remove the pressure tube.

The piston rod guide can be removed from the rod as it is pressed into the end of the pressure tube and is removable by inserting a wood or fiber rod and tapping the guide against it.

NOTE: It is not necessary to remove the piston rod guide from the tube or from the rod unless the piston rod seal (assembled in the top of the piston rod guide) has shown evidence of leaking and needs re-placing.

12. Wash all parts thoroughly in clean naptha or gasoline.

The component parts of the piston rod guide and oil seal assembly are not replaceable separately; therefore, if parts are worn or not in good condition, the complete assembly should be replaced. This assembly is a light press fit in the pressure tube and is removed by inserting a fibre or wood rod and tapping the guide against it.

SHOCK ABSORBER REASSEMBLY

1. Place end of shock absorber in vise fixture with piston rod and tube pointing upward.

2. Screw thimble supplied in shock absorber repair kit on threaded end of piston rod.

3. Install pressure tube and piston rod guide, sliding oil seal over piston rod.

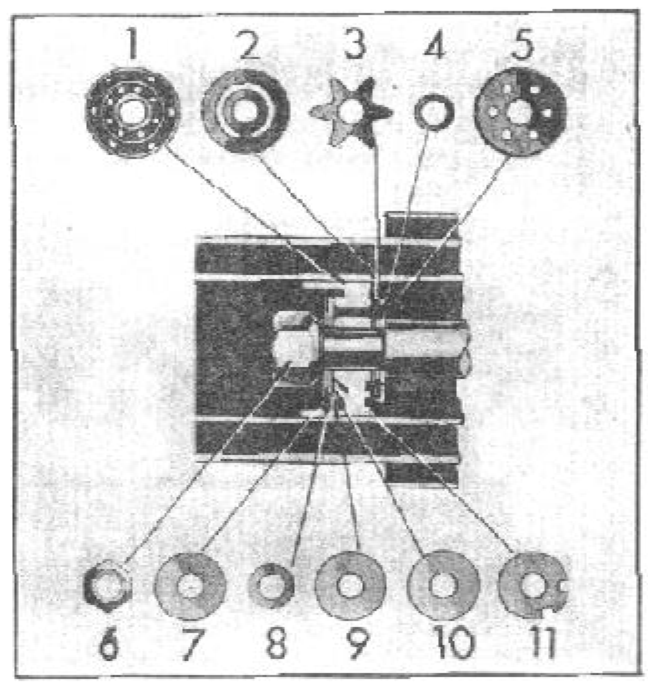


Figure 280
Monroe Shock Absorber

1. Piston
2. Intake valve
3. Intake valve star spring
4. Support washer spacer
5. Support washer
6. Piston rod nut
7. Pressure relief valve disc
8. Pressure relief valve back plate
9. Pressure relief valve disc
10. Metering washer

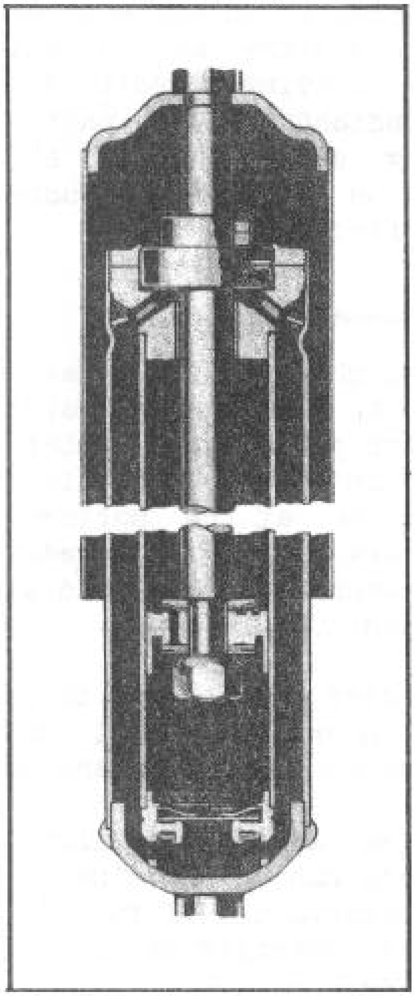


Figure 281
Shock Absorber

4. Install piston and valve parts on piston rod in the reverse order from which they were removed, exactly as shown in (Fig. 280 Monroe, Fig. 277 Delco).

Be sure the marks previously made on the piston and rod line up in order to insure free operation, and that valves and washers face in the proper direction.

5. Replace and tighten piston rod nut.

6. Move pressure tube up and down on piston a few times to check for freedom of movement.

NOTE: If the piston and rod have not been assembled in their original positions and binding results, loosen the piston nut and move pressure tube up and down a few strokes, at the same time turning the piston to a new position and tightening the nut. Repeat this procedure until smooth, free operation without evidence of binding is secured.

With shock absorber filler cup J-993-3-A properly adjusted, measure the exact quantity of genuine HUDSON SHOCK ABSORBER FLUID to fill unit being serviced (3-3/4 ounces for front, 6-1/4 ounces for rear)

7. Pull pressure tube up on piston to full extent or until piston contacts guide; then pour into the tube enough of the fluid in the measuring cup to fill it.

8. Install relief valve assembly in end of pressure tube, tapping it in place, so that shoulder contacts edge of tube all around.

9. Place eye of lower assembly in vise fixture and install beveled piston rod guide gasket retainer in counterbore at top of reservoir tube so that convex side will face open end.

Make sure that retainer is not bent or damaged.

10. Install a new piston rod guide rubber gasket on top of retainer after' soaking it in shock absorber fluid and stretching gasket to fit properly.

11. Securely tighten piston rod nut and stake to prevent loosening.

12. Pour into reservoir tube remainder of the previously measured shock absorber fluid.

13. Turn upper assembly right side up and insert pressure tube into reservoir tube of lower assembly as far down as it will go, then turn it clockwise to engage the threads on the piston rod guide with those in the reservoir tube.

14. Pull up on upper half of shock absorber until the slots in the dirt shield tube are above piston rod guide.

15. Insert double spanner wrench and engage notches in top of guide.

16. Complete tightening operation with spanner wrench, making sure that piston rod guide is pulled down tightly on gasket to prevent leakage.

17. Remove air from pressure tube by moving the upper half of the shock absorber up and down a few times.

This can be done by holding the lower eye in a vise as it is imperative that the unit be held in a vertical position as when on the car.

A certain amount of air is necessary in the reservoir chamber for proper operation. As this is determined by the level of the fluid, it will be seen that it is essential to use exactly the recommended quantity when servicing.

Shock Absorber Fluid Leaks

A slight film of oil on the reserve tube is not an indication of serious leakage and the shock absorber should not be disturbed unless it has lost control or shows other evidence of a considerable fluid loss.

REFILLING

If a shock absorber needs refilling it is necessary to remove it from the car and completely disassemble it. Pour out all of the old fluid, wash the parts and refill with new Genuine Hudson Shock Absorber Fluid. Reassemble as given under °Reassembly."

NOTE: Always install a new reserve Chamber gasket when reassembling. Dip the gasket in Hudson Shock Absorber Fluid and stretch the gasket if necessary to make it fit properly.

Unless the shock absorber has developed serious leakage or there is a loss of control it is not necessary to refill more than every 25,000 miles under ordinary driving conditions. There are some instances where particularly hard driving conditions are encountered and it may be necessary to inspect the units more often.

Shock Absorber Noise

When checking for noise make certain that the front shock absorber top nut with its palnut and rubber bushing are tight and in good condition. The two cap screws at the bottom of the front shock are tight. The rear shock lower stud washer and nut and also the upper bolt and nut are tight.

If dirt is allowed to get into the shock absorber it, will cause noise and also score the piston and cylinder.

Noise that may develop in the rubber grommets can be eliminated by replacing the grommets and if the fit is tight use a small quantity of liquid soap in assembling.

Riding Qualities

It is possible to change the amount of control by removing certain valve parts and replacing them with others. The change affects the riding characteristics or riding qualities of the car and before changing shock absorber valves, the tire pressures should be checked and the quality, also quantity of shock absorber fluid checked.

All four shock absorbers should be changed at the same time. Satisfactory results will not be obtained by changing the front or the rear shock absorbers only.

STEERING GEAR

SPECIFICATIONS

Type

	6 CYL.	8 CYL.
Worm and roller tooth		

Ratio

	18.2 to 1	18.4 to 1

Cross Shaft Bearing

	Bronze Bushing	Needle Roller

Turning Pull

	26 lbs.	27 lbs.

Steering Wheel

	Size 17	
Optional with 17" wheel.		Size 18

Wheel pull to turn from mid position 2 lbs. applied at rim.

High Point

Main column tube notch points down.

Adjustment

Wormshaft - Shims

Lubrication

All seasons S.A.E. 90 E.P.

Cross shaft nut tighten to	70 ft. lbs.
Steering wheel nut tighten to.	20 ft. lbs.
Cross shaft pitman arm nut tighten to	140 ft. lbs.

Steering Gear Attachment

The steering gear bolts to the frame side member front reinforcement, on the inside of the frame with the gear shift on which the ball arm assembles pointing to the inside. Three serrated neck bolts attach the steering gear to the frame.

Construction

Adjustments for the elimination of all play within the steering gear have been provided and these adjustments are external, making it very simple to always keep the steering gear free of lost motion and free of stiffness of operation.

The worm (12) Fig. 282, is mounted in two roller bearings (14 and 15), which run in hardened steel races (13 and 16) adjustable by means of shins (11) located at the bottom between the steering gear housing and the worm housing cover (10).

The roller shaft (7) is fitted in two thin bronze bushings (20) pressed into the housing on all 6 cylinder models.

8 cylinder models use needle roller bearings.

Due to the type and thin wall of the roller shaft bushings (20), these parts are not serviced separately. It is necessary to install a new or factory reconditioned housing assembly.

ROLLER SHAFT MESH IN WORM ADJUSTMENT

Closer mesh of the shaft roller with the worm for the elimination of excessive play, is obtained by means of a slotted adjusting screw, the head of which extends out thru the housing cover on the left hand side (Fig. 283). The inner end of the screw is fitted with a hardened steel thrust washer set in a groove in the roller shaft, see (6) Fig. 282.

The position of the roller contact with the worm is offset from the center of the worm, hence when the screw is tightened the roller is moved into closer mesh with the worm.

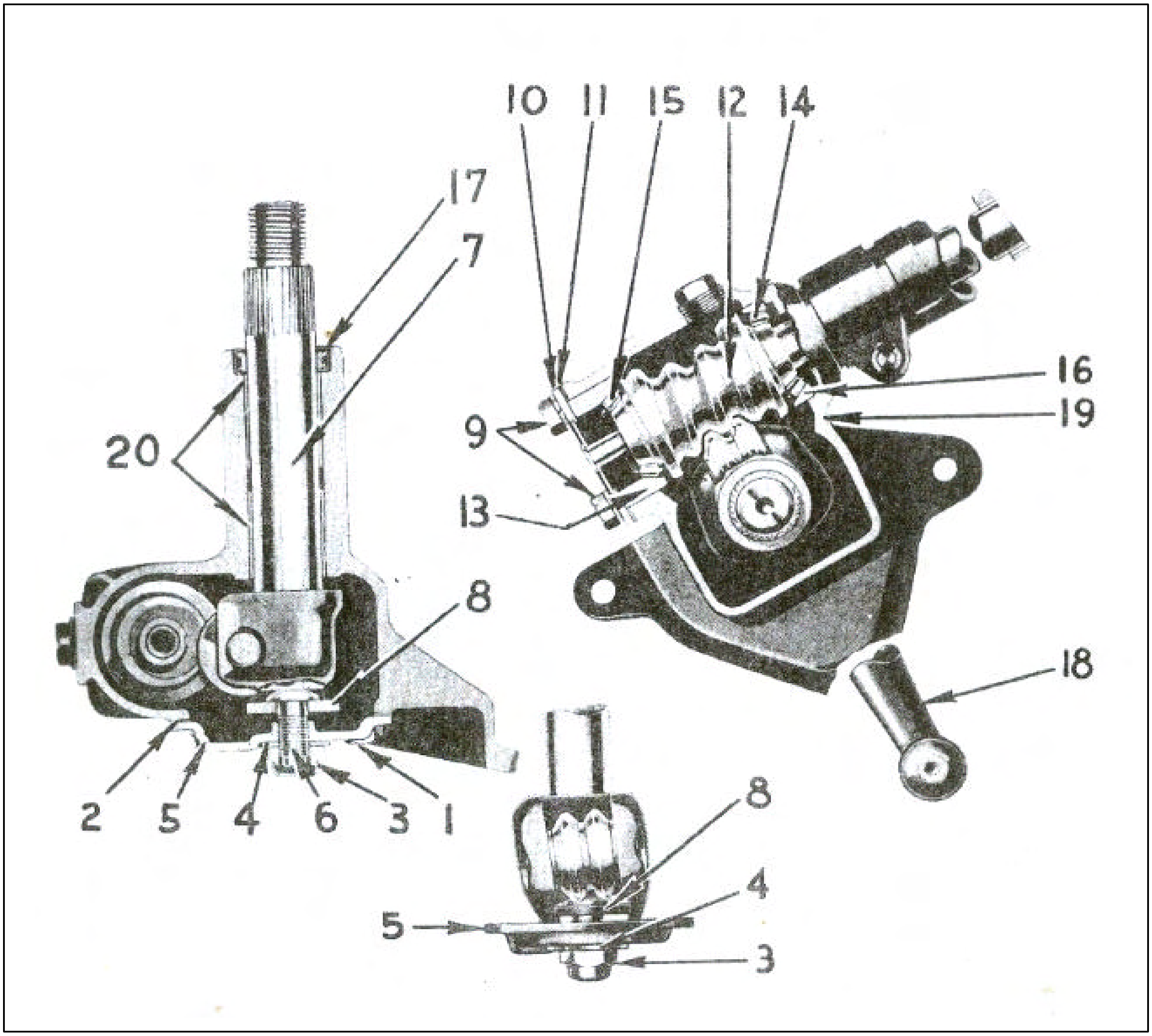


Figure 282
Steering Gear Details

1. Housing cover screws
2. Housing cover gasket
3. Cross shaft adjusting screw lock nut
4. Cross shaft adjusting screw lock plate
5. Steering gear housing cover
6. Cross shaft adjusting screw
7. Cross shaft and roller tooth assy.
8. Cross shaft thrust washer
9. Steering gear worm housing cover bolt
10. Worm housing cover
11. Worm housing cover shim
12. Main column tube and worm assembly
13. Worm bearing lower ring - adj.
14. Worm bearing assembly - upper
15. Worm bearing assembly - lower
16. Worm bearing upper ring - adj.
17. Cross shaft oil seal
18. Cross shaft pitman arm
19. Housing
20. Cross shaft bushings

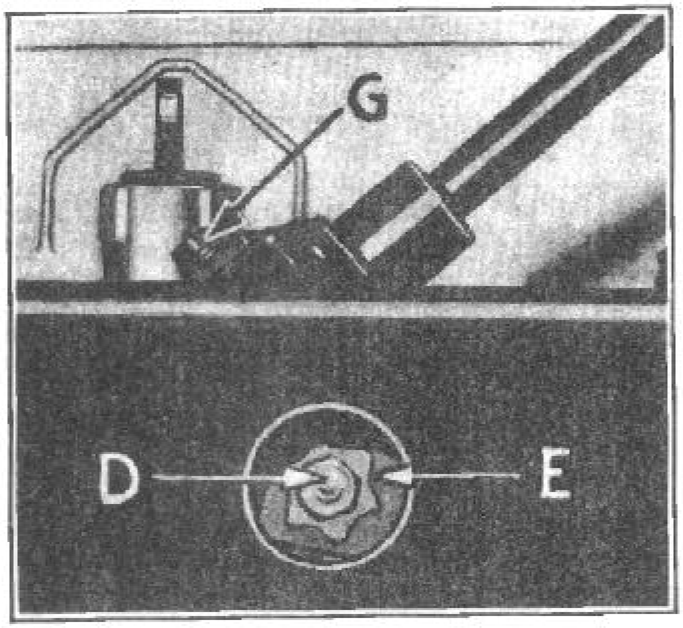


Figure 283
Steering Gear Adjustment and Lubrication

WORM BEARING INSPECTION

It is advisable to check the condition of the worm bearings as follows before starting any adjustment.

1. Raise up the front end of the car.

2. Turn the steering wheel about one turn to the right from a straight ahead driving position.

3. Hold the wheel in this position firmly. This is to prevent any oscillation when the front wheels are shaken violently.

4. Grip the steering column with the other hand just below the steering wheel hub with the side of the finger barely touching the lower end of the steering wheel hub.

5. Have a helper shake the front wheels hard sidewise. Any end play in the worm bearings can be felt at the wheel hub.

If any end play exists, the worm bearings need adjusting.

Make certain the end play is plainly felt and do not become confused with play or give in the jacket bushing.

WORM BEARING ADJUSTMENT

1. Remove the drag link at the steering gear ball arm.

2. Loosen the four worm cover bolts (9) Fig. 282 about 1/8".

3. Use a knife and separate the top shim, passing the knife blade all the way around between the shims (11), Fig. 282, being careful not to damage the remaining shims.

4. Remove only one shim at a time and inspect or check as given above before removing any more shims.

5. Revolve steering wheel to determine if any stiffness exists and if it does, too many shims have been removed or the steering gear is misaligned in the car.

STEERING GEAR ADJUSTMENT

1. Remove the roller shaft adjustment screw lock nut (D), Fig. 283, which is accessible thru a hole in the left frame side rail.

2. Slide the lock plate (E) far enough off to clear the lock boss on the roller shaft cover.

3. Place steering wheel in its mid-position or in the straight ahead driving position.

4. Disconnect drag link at steering gear ball arm.

5. Tighten roller shaft adjusting screw (6), Fig. 282, just enough to remove excessive play between the roller shaft roller tooth and the worm.

6. Check this by determining the amount of play felt at the end of the ball arm.

It is better to leave a slight amount of play at this point than to tighten too much. When tightened beyond the point of taking up lash, steering gear operation and life will be impaired.

7. Slide the lock plate (E) in position against the roller shaft cover in its locked position.

8. Replace the roller shaft adjustment screw lock nut (D) and tighten.

NOTE: Refer to "Steering Assembling," Items 8 to 11, inclusive, page 273.

STEERING GEAR ALIGNMENT

Loosen the frame bracket bolts, just enough to allow the steering gear to shift in the frame so as to line up at an angle determined by the height setting of the steering gear bracket on the instrument board.

Retighten the frame bracket bolts.

Loosen the instrument board steering gear bracket and allow it to shift to match the steering gear column position.

Retighten the steering gear bracket.

STEERING GEAR LUBRICATION

Remove oil filler plug (G), Fig. 283.

Fill with S.A.E. 90 E.P. out of the oil vent.

Replace the oil filler plug.

Do not use graphite, white lead or heavy solidified oil.

Turning Pull

The amount of steering pull on the front wheels that is required to turn the wheels is measured with the spring scale hooked over the tread of the tire as follows:-

Disconnect drag link and place roller plates under the front wheels. Use a spring scale as described above.

Series 20, 21, 22, 28, 51, 52, 58, 171, 172, 178 should require 26 lbs. maximum pull.

Series 24, 25, 27, 53, 54, 173 and 174 should require 27 lbs. maximum pull.

If greater pull is required to turn the wheels, lubricate the spindle pivot pins and tie rod ends. If this does not reduce the pull required, remove the wheels and tie rod ends and check as noted in “Front Suspension” section.

HORN BUTTON REMOVAL
(17" wheel without horn ring)
(1942 thru 1947)

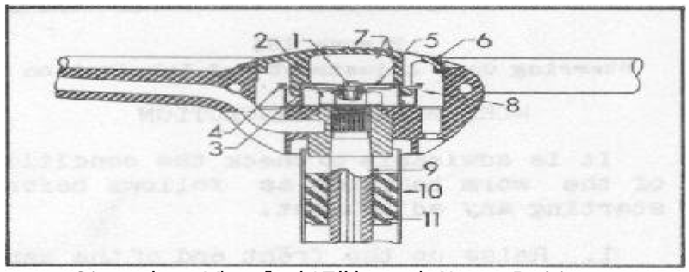
1. Disconnect horn wire (1) at lower end of steering gear.

2. Push down on horn button (7) and rotate to right or left to release from its retainer.

3. Pull horn wire up slightly and push the wire sleeve into the large opening of the contact cup.

4. Lift contact cup (3) from horn button retainer.

NOTE: To remove the button retainer it is necessary to remove wheel nut (2) Fig. 284.



Steering Wheel (17") and Horn Button

1. Horn wire with upper and lower terminals; insulator and rubber sleeve
2. Steering wheel nut
3. Horn button contact cup
4. Horn button retainer
5. Horn button contact spring
6. Horn button escutcheon
7. Horn button assembly
8. Horn button lockwire
9. Main column tube
10. Jacket tube
11. Jacket tube bushing

When replacing be certain the bakelite sleeve on the wire is inserted through the large opening of the contact cup and moved into the small opening with the flange of the sleeve on top of the cup, not underneath.

INSTALLING HORN RING KIT ON 17' WHEEL
(1942 MODELS)

1. Remove horn button and all internal parts as given under "Horn Button on 17" Wheel without Horn Ring."

2. Remove the steering wheel nut and install the contact plate spring retainer (7), Fig. 285.

3. Replace wheel nut (9).

4. Install contact cup (6), contact cup spring (11) (larger of the 2 in kit), contact cup spring retainer.

See that wire, upper terminal, insulator rubber sleeve and lower terminal are in place.

5. Install horn ring contact plate - (4) with its 3 spacers (riveted together) and then attach horn ring (5) with three, No. 6-32 x 3/8" R.H. machine screws (8) and lockwashers.

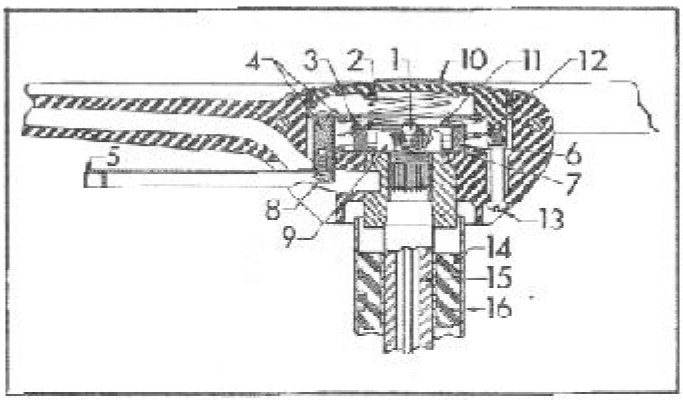


Figure 285
Horn Ring used on Models 20-28
17" Steering Wheel

1. Horn button wire with upper and lower terminals; insulator and rubber sleeve
2. Horn button spring
3. Contact cup spring retainer
4. Contact plate assembly
5. Horn ring
6. Contact cup
7. Contact plate spring retainer
8. Horn ring to tapped spacer screw
9. Steering wheel nut
10. Horn button escutcheon
11. Horn button contact cup spring
12. Horn button contact plate spring
13. Horn button screw
14. Jacket tube bushing
15. Main column tube
16. Jacket tube

6. Install the horn ring ornament (5) with the 2 spring nuts.

7. Install the horn button spring (2) (smaller of the 2 in kit).

8. Place horn button in its proper position and place lockwashers over the threads of the 3 shouldered screws and up against the shoulder (13), Fig. 285.

9. Tighten the screws securely.

NOTE: The horn can be blown by either the button or the ring.

REMOVING HORN RING ON 17" STEERING WHEEL
(1946-1947 MODELS)

1. Remove 3 large fillister head screws and washers holding horn button to wheel (underside of wheel). This will allow removal of the horn button, spring and spring contact.

2. Remove 3 number 6-32 R.H. machine screws and lockwashers (underside of wheel). This will allow removal of the horn ring, horn ring contact plate, horn button spring, contact cup spring, contact spring retainer.

To assemble, reverse procedure of removal.

NOTE: The steering wheel can be removed to facilitate installation of the horn ring, horn ring, contact plate and lower retainer.

Apply a small amount of chassis lubricant to the head of the brass terminal before assembling the contact strip and horn ring assembly.

REMOVING HORN RING FOR 18"
STEERING WHEEL
(1942 MODELS)

1. Remove 2 screws and lockwashers holding escutcheon to steering wheel (underside of wheel) also one sheet metal screw at upper end of bezel.

2. Lift off bezel.

3. Remove wheel to horn wire contact strip.

4. Remove horn ring spring retainer (3) (upper) screw (fastens ring on) see Fig. 286, and its lockwasher.

NOTE: The ring has the tapped spacer (7) at its inner end.

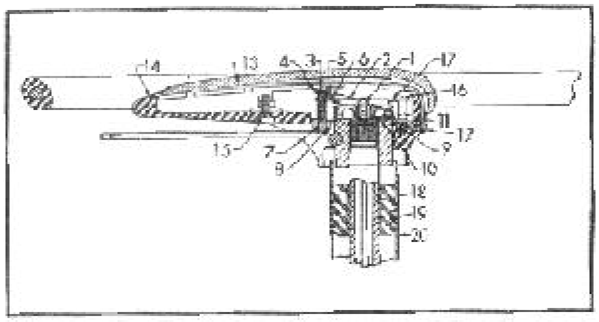


Figure 286
Horn Ring used on 18" Steering Wheel

1. Horn wire with upper and lower terminal, insulator and rubber sleeve
2. Steering wheel to horn wire contact strip
3. Spring retainer upper to spacer screw
4. Horn ring contact clip
5. Steering wheel horn contact strip
6. Horn ring contact strip bakelite spacer
7. Horn ring tapped spacer
8. Horn ring rubber silencer
9. Steering wheel nut
10. Horn ring spring retainer--lower
11. Horn ring spring
12. Escutcheon bezel to wheel tapping screw
13. Steering wheel escutcheon
14, Steering wheel escutcheon bezel
15. Escutcheon bezel to wheel screw
16. Spring retainer upper to wheel screw
17. Spring retainer upper
18. Main column tube
19. Jacket tube
20. Jacket tube bushing

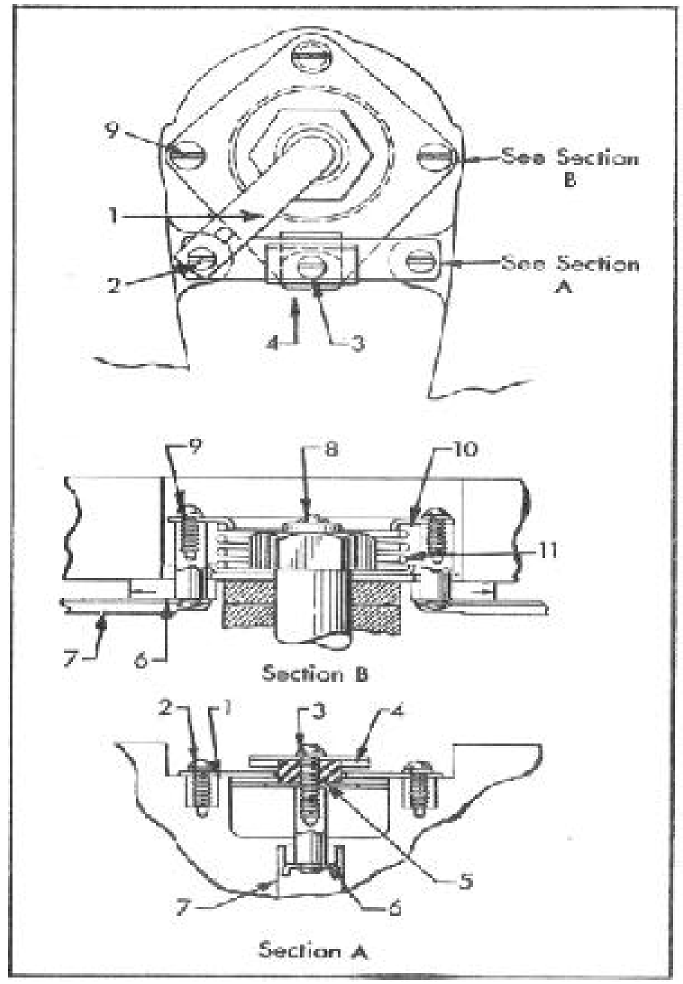


Figure 287
Horn Button Detail

1. Steering wheel horn contact strip
2. Contact strip to wheel screw
3. Spring retainer upper to spacer screw
4. Horn ring contact clip
5. Horn ring contact clip bakelite spacer
6. Horn ring spring retainer--upper
7. Horn ring
8. Horn wire with upper and lower terminals, insulator and rubber sleeve
9. Horn ring tapped spacer screw
10. Horn ring spring retainer--upper
11. Horn ring spring

5. Remove ring silencer rubber.

NOTE: The ring ornament is held on by spring nuts.

6. Remove contact clip (4), contact strip (2), ring contact clip bakelite spacer (6).

7. Remove ring spacer retainer upper spacer screw, (3) fastens into wheel.

8. Remove ring spring retainer, upper (3) and lift out ring spring (11).

The horn wire, upper terminal; insulator, rubber sleeve and lower terminal are now accessible. The spring retainer lower (10) is held by the wheel nut. The reassembly is the reverse of disassembly.

REMOVING HORN RING FOR 18" STEERING WHEEL (1946-1947 MODELS)

Remove 3 screws and 3 finishing washers holding escutcheon to steering wheel, (underside of wheel). This will allow escutcheon, horn ring and contact plate to be removed as an assembly.

NOTE: The lower contact spring plate can be removed by removing steering wheel nut.

To assemble, reverse procedure of removal.

NOTE: Apply a small amount of chassis lubricant to the head of the brass terminal before assembling the contact strip and horn ring assembly.

STEERING GEAR REMOVAL

1. Disconnect horn wire at lower end of steering gear.

2. Remove steering gear jacket tube clamp bolt and nut and slide clamp up on jacket tube.

3. Disconnect drag link at pitman arm.

4. Remove L.H. sod pan by removing 4 self tapping screws at frame rail and 2 at X member.

5. Remove horn button and horn wire.

6. Remove steering wheel nut and steering wheel with puller J-739 and adaptor J-739-7.

7. Remove jacket tube bracket cap and bolts at instrument panel.

8. Slide the jacket tube up far enough to clear collar on steering lower housing.

NOTE: It will not be necessary to disturb the "Handy Shift Control" when removing steering gear.

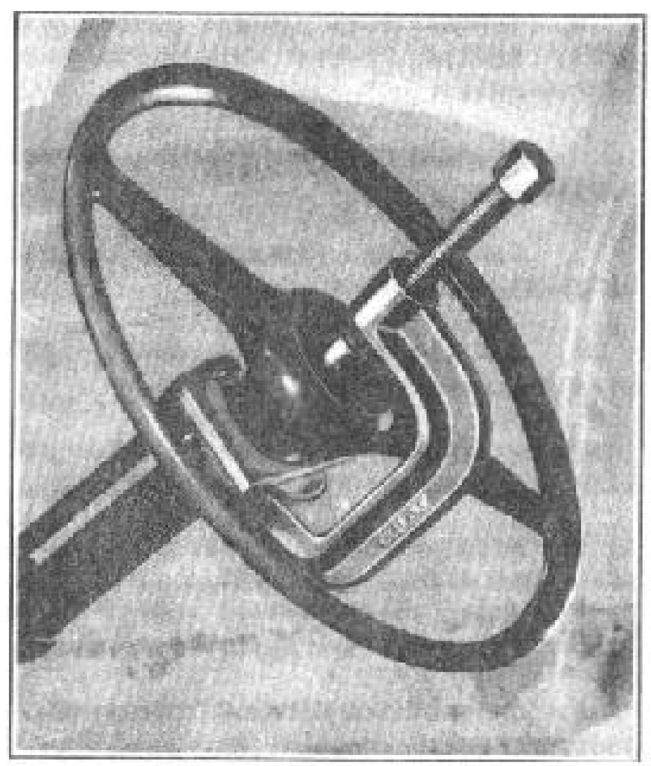


Figure 288
Removing Steering Wheel

9. Remove the steering gear housing mounting stud nuts and washers.

10. The steering gear assembly can then be removed by lowering the housing out through the opening between engine and frame.

STEERING GEAR INSTALLATION

1. Enter steering gear assembly through opening between engine and frame rail entering main column tube at lower end of jacket tube.

2. Insert the roller shaft through the hole in the frame side member and the housing mounting studs in their respective holes.

3. Install the plain washers, lock-washers, and nuts on the steering gear housing mounting studs and turn the nuts up until they just start compressing the lockwashers.

4. Install the jacket tube over the steering gear lower housing and slide jacket tube clamp in place.

5. Install the jacket tube clamp bolt, parking brake cable clamp and tighten nut.

6. Slide the steering gear hole cover in place.

7. Install the jacket tube cap and bolts at instrument panel.

8. Install the steering wheel, horn wire and horn button.

NOTE: Tighten the steering wheel nut with a torque wrench to 20 foot pounds.

The notch at the top of the steering gear main column tube should be pointing downward and the steering wheel be installed with the two spokes horizontal.

9. Connect horn wire at lower end of steering gear.

10. Install the pitman arm, washer and nut.

NOTE: Tighten with a torque wrench to 140 foot pounds.

11. Revolve the steering wheel to the right and left to align the column and tighten the three gear housing stud nuts at the frame side member.

12. Install left hand sod pan.

13. Fill steering gear with S.A.E. 90 E.P. Lubricant. See *Lubrication" Section.

14. Turn steering gear to the high point mesh and attach drag link to the pitman arm. The wheels should be in a straight ahead position.

NOTE: If adjustment is necessary, proceed as instructed under, Drag Link Adjustment."

The steering wheel should be installed with the two spokes in a horizontal position.

SETTING FRONT WHEELS IN STRAIGHT AHEAD POSITION

The steering wheel can be turned to bring the steering gear mesh to its high point, where it should be set to insure easy handling.

Remove the horn button and a small notch will be found on the steering gear main column tube. When the wheels are in the straight ahead driving position the notch should be pointing down.

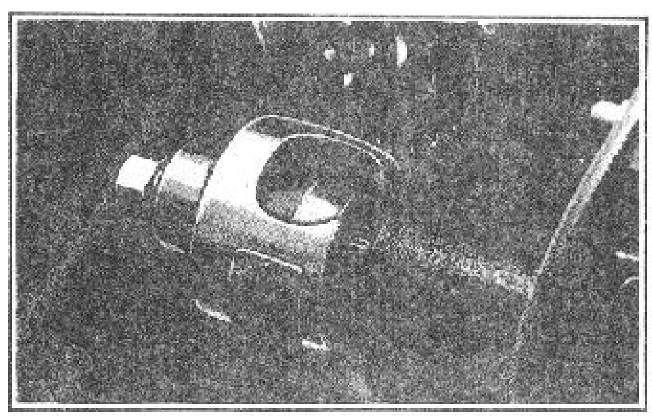


Figure 289
Pitman Arm Puller Tool J-1374

PITMAN ARM REMOVAL

1. Remove pitman arm nut and lock-washer.

2. Remove pitman arm with tool J-1374, Fig. 289.

Do not remove by driving or prying as damage will result.

STEERING GEAR DISASSEMBLY

1. Remove the four housing cover screws (1), Fig. 282, and remove the cover (5), also the cross shaft (7).

2. Disengage the cross shaft thrust washer (8).

3. Remove the four worm cover screws (9), the cover (10) and the shims (11).

4. Push the main column tube and worm (12) out of the bottom of the housing which will remove the lower thrust bearing race (13) and upper (14) and lower (15) thrust bearings.

5. Pull the upper bearing race (16).

STEERING GEAR REASSEMBLY

1. Thoroughly clean the inside of the steering gear housing as well as the steering gear worm, steering arm shaft and bearings. Do not coat any parts with lubricant until adjustments have been completed.

2. Press upper bearing race (16), Fig. 282, in housing.

3. Install the upper worm bearing (14) on the worm and install worm and column (12).

4. Install lower worm bearing (15) and lower bearing thrust race (13) in the housing.

5. Install worm cover (10) shims (11) and the four cover screws (9).

When the cover screws are drawn up tight there should be no perceptible end play in the column and not more than a three quarter pound pull at the rim of the steering wheel should be required to turn the column tube.

Adding-shims under the worm cover increases the clearance and reduces the amount of pull required to turn the tube.

6. Engage the cross shaft thrust washer (8) in the groove the cross-shaft and install the cover (5) and gaskets (2) as an assembly. Install oil seal (17) on the cross shaft (7) and press into place.

7. Install the four housing cover screws (1).

8. Install the pitman arm (18) on the cross shaft and the steering wheel on the column tube to check the adjustment. Turn the steering wheel to the exact mid position (high point mesh) of travel.

NOTE: The steering gear shaft nut should be tightened with a torque wrench to 140 foot pounds.

9. If the pitman arm can be moved more than 1/32 of an inch without the main column tube turning the roller shaft, lock screw nut and lock plate should be taken off and the adjusting screw turned in with a screw driver until the movement is reduced to 1/32".

10. If more than 2 pounds pull (using Tool J-544) is required at the steering wheel rim to move it from its mid position, the roller shaft adjusting screw should be turned out.

11. After adjustment replace the lock plate (4) and lock nut (3) and recheck the pitman arm and the pull required to turn the wheel from the mid position.

12. Fill the housing with lubricant-see "Lubrication" section.

DRAG LINK

The drag link on all models is of the same construction at the front and rear ends. The rear end has a shim adjustment for setting wheels in the straight ahead position.

DRAG LINK ADJUSTMENT OR
STEERING GEAR HIGH POINT

1. Remove drag link dust cover and bolt and nut and remove covers.

2. Remove cotter pin and rear plug (E), Fig. 290.

3. Remove spring (D), Fig. 290, shim pack (A), ball seat (C) and remove Pitman arm ball from drag link.

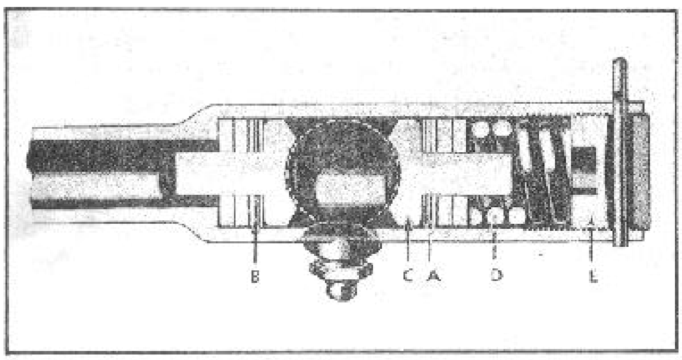


Figure 290
Drag Link Rear End Showing
Shim Adjustment

4. If center line of steering wheel spokes (See "Setting Front Wheels in Straight Ahead Position") is more than 2" from horizontal (measured on the rim of steering wheel), interchange shims between shim packs A and B until horizontal has been attained.

6. Plug should be flush with end of drag link and cotter pin inserted and bent over.

NOTE: Tool J-1442, as shown under "Front Suspension", will hold the center steering arm in position for the "Steering Gear High Point Adjustment".

DRAG LINK REMOVAL

1. Remove drag link dust cover bolt and nut and remove the dust covers.

2. Disconnect drag link at pitman arm, by removing cotter pin and rear plug, spring, washer and ball seat.

3. Pull drag link back and remove cotter key at front ball and socket joint.

4. Lift drag link and move it forward so as to enable the removal of the drag link adjusting plug and ball seat thru the hole in the frame front cross member.

NOTE: To install reverse procedure of removal.

REFERENCES

Source of Information	Date	Subject

CHASSIS

1942 THROUGH 1947 MODEL DESIGNATIONS

To simplify identification of the various models referred to in the Procedure Manual, model reference will be made to series numbers listed below.

Models

Six "T"	20
Six DeLuxe "P"	20
Six Business Cars	20
Super Six	21, 51, 171
Commodore Six	22, 52, 172
Commercial 3/4 Ton	58, 178
Commodore Eight	24, 54, 174
Commodore Eight Custom Sedan	25
Commodore Eight Custom Coupe	27
Hudson Big Boy Business Car	28C
Super Eight	53

CAR SERIAL NUMBERS

1942

Car number plate used on 1942 cars is located on the right front hinge pillar and the first two figures of the car number denotes the model. The succeeding figures comprise the actual serial number and these figures are in consecutive order regardless of Model.

Example - 20101 - 21102 - 27103

First number is a Model 20,
Serial number 101.

Second number is a Model 21,
Serial number 102.

Third model is a Model 27,
Serial number 103.

The engine number is the same as the car number and is located on the top of the cylinder block, right side, between numbers one and two exhaust ports.

The car number plate is also stamped to indicate whether the car is a "T". "P" (DeLuxe) or "C" (Commercial).

Letter T is for Traveler
P is for DeLuxe
C is for Commercial

When a Model 20 car is equipped with the 3" x 5" engine the letter "I," will also be stamped in this space as TL, PL or CL.

1946

The car serial number which is also the engine number is stamped on a small plate attached to the right front door hinge pillar post. These serial numbers are based on a system which codes the first two digits to the series: e.g. 31101 indicates series 51 while 32101 and 33101 indicate series 52 and 53 respectively. The first two digits remain unchanged regardless of the number of cars produced. Cars are also numbered consecutively as they leave the production line without regard to series. As an example the car built after car serial 31999 would be numbered 311000, 321000, 331000, 341000 and 381000, instead of 32000.

1947

The car serial number which is also the engine number is stamped on a small plate attached to the right front door hinge pillar post. These serial numbers are based on a system which codes the first three digits to the series: e.g. 171101 indicates series 171 while 172101 and 173101 indicate series 172 and 173 respectively. The first three digits remain unchanged regardless of the number of cars produced. Cars are also numbered consecutively as they leave the production line without regard to series. As an example, the car built after car serial 171999 would be numbered 1711000, 1721000, 1731000. 1741000 or 1781000, instead of 172000.

The engine number is stamped on the top of the cylinder block between Nos. 1 and 2 exhaust manifold flanges.

CAUTION: Do not confuse engine number with casting or other numbers appearing at different locations on engine.

1942 LICENSE INFORMATION

BODY TYPES	NO. OF CYL.	WHEEL BASE	BORE	STROKE	AMA H.P.	CU. IN. PISTON DISPLACE-MENT	START SERIAL NUMBER	DRY WEIGHT POUNDS
HUDSON SIX - 20 T								
3 Pass. Coupe	6	116"	3"	4-1/8"	21.6	175	20,101	2795
6 Pass. Coupe	6	116"	3"	4-1/8"	21.6	175	2845	
2 Door Sedan	6	116"	3"	4-1/8"	21.6	175	and	2895
4 Door Sedan	6	116"	3"	4-1/8"	21.6	175	up	2940
HUDSON SIX DELUXE - 20 P								
3 Pass. Coupe	6	116"	3"	4-1/8"	21.6	175	20,101	2845
6 Pass. Club Coupe	6	116"	3"	4-1/8"	21.6	175		2900
2 Door Sedan	6	116"	3"	4-1/8"	21.6	175	and	2935
4 Door Tour Sedan	6	116"	3"	4-1/8"	21.6	175	up	2975
Convert - Sedan	6	116"	3"	4-1/8"	21.6	175		3140
HUDSON SIX BUSINESS CARS - 20 C								
Utility Coupe	6	116"	3"	4-1/8"	21.6	175	20,101	2900
Cab Pickup	6	116"	3"	4-1/8"	21.6	175	and	2915
Utility Coach	6	116"	3"	4-1/8"	21.6	175	up	2905
HUDSON SUPER SIX - 21								
3 Pass. Coupe	6	121"	3"	5"	21.6	212	21,101	2925
6 Pass Club Coupe	6	121"	3"	5"	21.6	212		2895
Convert-Sedan	6	121"	3"	5"	21.6	212	and	3200
2 Door Club Sedan	6	121"	3"	5"	21.6	212	up	3035
4 Door Sedan	6	121"	3"	5"	21.6	212		3080
Station Wagon	6	121"	3"	5"	21.6	212		3315
HUDSON COMMODORE SIX - 22								
3 Pass. Coupe	6	121"	3"	5"	21.6	212	22,101	2995
6 Pass. Club Coupe	6	121"	3"	5"	21.6	212	and	3055
2 Door Club Sedan	6	121"	3"	5"	21.6	212	up	3100
4 Door Sedan	6	121"	3"	5"	21.6	212		3135
Convert Sedan	6	121"	3"	5"	21.6	212		3280

BODY TYPES	NO. OF CYL.	WHEEL BASE	BORE	STROKE	AMA H.P.	CU. IN. PISTON DISPLACE-MENT	START SERIAL NUMBER	DRY WEIGHT POUNDS
				HUDSON COMMODORE EIGHT - 24				
3 Pass. Coupe	8	121"	3"	4-1/2"	28.8	254	24,101	3120
6 Pass. Club Coupe	8	121"	3"	4-1/2"	28.8	254	and	3205
2 Door Club Sedan	8	121"	3"	4-1/2"	28.8	254	up	3245
4 Door Sedan	8	121"	3"	4-1/2"	28.8	254		3280
Convert Sedan	8	121"	3"	4-1/2"	28.8	254		3400
				HUDSON COMMODORE EIGHT CUSTOM COUPE - 25				
6 Pass. Club Coupe	8	121"	3"	4-1/2"	28.8	254	25,101 and up	3235
				HUDSON COMMODORE EIGHT CUSTOM SEDAN - 27				
4 Door Sedan	8	121"	3"	4-1/2"	28.8	254	27,101 and up	3395
				HUDSON SIX BIG BOY SERIES - 28 C				
Cab Pick up	6	128"	3"	5"	21.6	212	28,101	2040

1946 LICENSE INFORMATION

BODY TYPES	NO. OF CYL.	WHEEL BASE	BORE	STROKE	AMA H.P.	CU. IN. PISTON DISPLACE-MENT	START SERIAL NUMBER	DRY WEIGHT POUNDS
				HUDSON SUPER SIX - 51				
4 Door Sedan	6	121"	3"	5"	21.6	212	31,101	3085
Brougham	6	121"	3"	5"	21.6	212	and	3030
3 Pass. Coupe	6	121"	3"	5"	21.6	212	up	2950
Club Coupe	6	121"	3"	5"	21.6	212		3015
Conv. Brougham	6	121"	3"	5"	21.6	212		3195
				HUDSON COMMODORE SIX MODEL - 52				
4 Door Sedan	6	121"	3"	5"	21.6	212	32,101	3150
Club Coupe	6	121"	3"	5"	21.6	212	and up	3065
				HUDSON 3/4 TON COMMERCIAL MODEL - 58				
Cab Pick-up	6	128"	3"	5"	21.6	212	38,101 and up	3080
				HUDSON SUPER EIGHT - 53				
4 Door Sedan	8	121"	3"	4-1/2"	28.8	254	33,101	3235
Club Coupe	8	121"	3"	4-1/2"	28.3	254	and up	3185
				HUDSON COMMODORE EIGHT - 54				
4 Door Sedan	8	121"	3"	4-1/2"	28.3	254	34,101	3305
Club Coupe	8	121"	3"	4-1/2"	28.8	254	and up	3235
Conv. Brougham	8	121"	3"	4-1/2"	28.8	254		3410

1947 LICENSE INFORMATION

BODY TYPES	NO. OF CYL.	WHEEL BASE	BORE	STROKE	AMA H.P.	CU. IN. PISTON DISPLACE-MENT	START SERIAL NUMBER	DRY WEIGHT POUNDS
				HUDSON SUPER SIX - 171				
4 Door Sedan	6	121"	3"	5"	21.6		171101	3110
Brougham	6	121"	3"	5"	21.6		and up	3055
3 Pass. Coupe	6	121"	3"	5"	21.6			2975
Club Coupe	6	121"	3"	5"	21.6			3040
Convert Brougham	6	121"	3"	5"	21.6			
				HUDSON COMMODORE SIX - 172				
4 Door Sedan	6	121"	3"	5"	21.6		172101	3175
Club Coupe	6	121"	3"	5"	21.6		and up	3090
				HUDSON 3/4 TON COMMERCIAL - 178				
Cab Pick-up	6	128"	3"	5"	21.6		178101	3110
				HUDSON SUPER EIGHT - 173				
4 Door Sedan	8	121"	3"	4-1/2"	28.8		173101	3260
Club Coupe	8	121"	3"	4-1/2"	28.8		and up	3210
				HUDSON COMMODORE EIGHT - 174				
4 Door Sedan	8	121"	3"	4-1/2"	28.8		174101	3330
Club Coupe	8	121"	3"	4-1/2"	28.8		and up	3260
Conv. Brougtham	8	121"	3"	4-1/2"	28.8			3435

The above weights include spare tire, tube and wheel, but do not include water, oil or gasoline.

ENGINE

MODELS	CYL.	BORE	STROKE	COMP. RATIO	AMA H.P.	CU. IN. PISTON DISPLACE-MENT	ACTUAL HP
20T, 20P, 20C	6	3"	4-1/8"	7.25 to 1	21.6	175	92 at 4000 RPM
28C, 21, 22, 51, 52, 58, 171, 172, 178	6	3"	5"	6.50 to 1	21.6	212	102 at 4000 RPM
24, 25, 27 53, 54, 173, 174	8	3"	4-1/2"	6.50 to 1	28.8	254	128 at 4000 RPM

PROPELLER SHAFT

	LENGTH C. TO C. OF JOINT	LENGTH OF SHAFT ONLY
20, 21, 22, 24, 25, 50, 51, 52, 53, 54, 170, 171, 172, 173, 174 without overdrive	58-7/16"	55-23/32"
20, 21, 22, 24, 25, 504 51, 52, 53, 54, 170, 171, 172, 173, 174 with overdrive	51-l/8"	48-13/32"
27, 28, 58 CM - 78 CM without overdrive	65-3/8"	62-15/32"
27, 28, 58 CM - 78 CM with overdrive	58-1/16"	55-11/32"

WHEELS AND TIRE SPECIFICATIONS

WHEEL SIZE	MODEL	TIRE SIZE	PLY
16 x 3.50 Standard	20T	5.50 x 16	4
16 x 4.00 Standard	20P	6.00 or 6.50 x 16	4
16 x 4.50 Standard	20P, 21, 22, 24, 51, 53, 171,	6.00, 6.25, 6.50 x 16	4
16 x 4.50 Standard	20C, 28, 58, 78	6.00, 6.50 x 16	6
16 x 4.50 Optional	20T, UT, Cpe UT. Co. 58, 78	6.00, 6.50 x 16 Truck Air Wheel	
15 x 5.00 Standard	25, 27, 52, 54, 172, 174	6.50 or 7.00 x 15 Pass. or Truck Air Wheel	
15 x 5.00 Optional	21, 22, 24, 28, 51, 53, 171, 173	6.50 or 7.00 x 15 Pass. or Truck Air Wheel	

TIRE PRESSURES

	FRONT		REAR	
	COLD	HOT	COLD	HOT
5.50" x 16"	32 lbs.	35 lbs.	32 lbs.	35 lbs.
6.00" x 16" 4 and 6 ply	26 lbs.	29 lbs.	30 lbs.	33 lbs.
6.00" x 16" Truck Air Wheel (Opt.)	26 lbs.	29 lbs.	40 lbs.	44 lbs.
6.50" x 16" Truck Air Wheel (Opt.)	26 lbs.	29 lbs.	40.lbs.	44 lbs.
6.25" x 16"	26 lbs.	29 lbs.	30 lbs.	33 lbs.
6.50" x 16" (Opt.)	26 lbs.	29 lbs.	30 lbs.	33 lbs.
6.50" x 15"	26 lbs.	29 lbs.	30 lbs.	33 lbs.
7.00" x 15" (Opt.)	26 lbs.	29 lbs.	30 lbs.	33 lbs.

CHASSIS DIMENSIONS

Over-All Length - (Including Bumpers)

20	195-1/4"
21, 22, 24, 25	200-1/4"
27	203-1/4"
51, 52, 53, 54 / 171, 172, 173, 174}	207"
58, 78	214"

Overall Height

20T, 20P	68"
21, 22, 24, 25, 27 / 51, 52, 53, 54	68-3/4"
171, 172, 173, 174 / 20C, 28C Cab pickup	181"
20C 90-3/4"	

Overcall Width (Including Fenders)

	FRONT	REAR
All 1942, 46, 47	71"	72-3/4"

Road Clearance

SERIES	FRONT	REAR
20T	9-1/4"	8"
20P, 21	9-5/8"	8-3/8"
22, 24	9-3/4"	8-1/2"
25, 27	9-5/8"	8-7/8"
51, 53, 171, 173	9-5/8"	8-3/8"
52,54,58,172,174,178	9-3/4"	8-1/2"

Tread

All Models 42,46,47	56-1/4"	59-1/2"

Turning Radius

20T, 20P, 200	20' 8"
21, 22, 24, 25	21' 1"
51, 52, 53, 54 / 171, 172, 173, 174 / 27, 28C, 58, 178	21' 10"

BOLT AND NUT TIGHTENING SPECIFICATIONS

The proper tightening of bolts and nuts used on the HUDSON automobiles can be the difference between a permanently satisfactory car operation and an unsatisfactory one.

Parts can be tightened too much as well as not enough.

The following tightening chart has been tabulated by HUDSON engineers to provide the mechanic with definite information for the proper tightening of the important bolts and nuts.

	FT. LBS.
Propeller shaft U bolts	20
Clutch and brake pedal rod nuts	20
Brake anchor pin nuts	80
Clutch finger fulcrum nuts	40
Connecting rod bolt nuts	40
Cylinder head studs - 6 cyl	40
Cylinder head studs - 8 cyl	45
Main bearing bolts	75
Flywheel to crankshaft bolts	40
Front engine support bolt	40
Clutch coyer to flywheel bolts	20
Steering wheel nuts	20
Wheel nut	60
Rear axle shaft nut	90
Rear spring clip nuts	55
Spark Plugs	28
Steering arm nut	100
Differential carrier nuts	35
Steering center arm bolt nut	60
Water Jacket coyer bolt	12
011 pan	15
Timing gear coyer	15
Camshaft gear bolt	20
Cylinder support plate	20
Intake manifold	15
Exhaust manifold	20
Cylinder head water outlet	20
Steering spindle support arm (lower)pivot to frame bolt	60

LAMP BULB SPECIFICATIONS

POSITION	MAZDA NO.	C.P.
Headlamp	Sealed Beam	Type
Bonnet Lamp	55	2
Fender Lamp with Direction Indicator	1158	21-3
Fender Lamp without Direction Indicator	63	3
Tail and Stop Lamp	1154	21-3
License Lamp	63	3
Dome Lamp	88	15
Generator and Oil Indicator	51	1
Clock	55	2
Speedometer - Series 51, 53, 58	51	1
Speedometer - Series 52, 54	55	2
Radio	44	1
Direction Indicator	51	1
Headlamp Beam	51	1
Ignition Lock	55	2
Courtesy Lamp	88	15
Fog Lamp	1211S	50
Spot Light	1209S	32

FRAME

The chassis frame side members are of box section construction and extend virtually the entire length of the frame. This minimizes the possibility of twisting due to torque loads and road stress.

A frame front fender cross member is riveted to the extreme front end of the frame side rails to support the front fender.

The front cross member is exceptionally massive and is both welded and riveted to form a sturdy box section to withstand any and all loads imposed on it by the front suspension.

The rear support of the engine is on a frame cross member and the front supports are on the reinforcements riveted and welded to the side members and front cross member.

The extra heavy "X" cross member extends from just forward of the rear engine mounting cross member to the kick up.

The rear axle cross member adds further strength and the frame assembly is tied at the rear by another cross member.

The chassis frame with the above five cross members; "X" member and side members of over seven-inch depth, give exceptional strength.

On cars equipped with overdrive an extra member carrying a rubber cushioned support is added to the front section of the frame "X" member just ahead of the center point to provide additional support for the overdrive unit.

FRAME FOR CONVERTIBLE MODELS

The inherent rigidity of the closed body does not exist in the convertible body and a special frame is used for those models.

The general design of the convertible frame is the same as for other body styles; however, greater rigidity is obtained through using heavier frame side member reinforcements and frame brace members.

FRAME ALIGNMENT

The diagram shown in Fig. 291 with its table gives the more important dimensions used in frame straightening.

Diagonal measurements should be taken when straightening a frame and the comparison of diagonal measurements from similar points on the right and left side should be equal. These measurements make an excellent check for any out-of-square condition and alignment.

FRAME STRAIGHTENING

Improper frame alignment is usually the result of an accident and if the damage is not too extensive can be satisfactorily repaired.

Heat can be applied without materially weakening the steel, however, the heat must be kept below 1200 degrees F. which shows a cherry red in the average shop under subdued sunlight.

Heating to above this 1200 degrees F will weaken the steel structure.

Fig. 291 and chart show various dimensions to be used as a guide in checking frame alignment. These dimensions are the true length between two points as measured with a steel tape.

NOTE: Diagonal measurements will quickly determine which section of the frame is bent and where force should be applied to restore correct alignment.

In cases of frame repairs and member replacement, where re-riveting is difficult, bolts and nuts having S. A. E. threads may be used. The frame holes must be reamed to the next larger bolt size and the threads of the bolts used must be peened or burred to hold the nut on tightly. DO NOT USE lockwashers under the nuts.

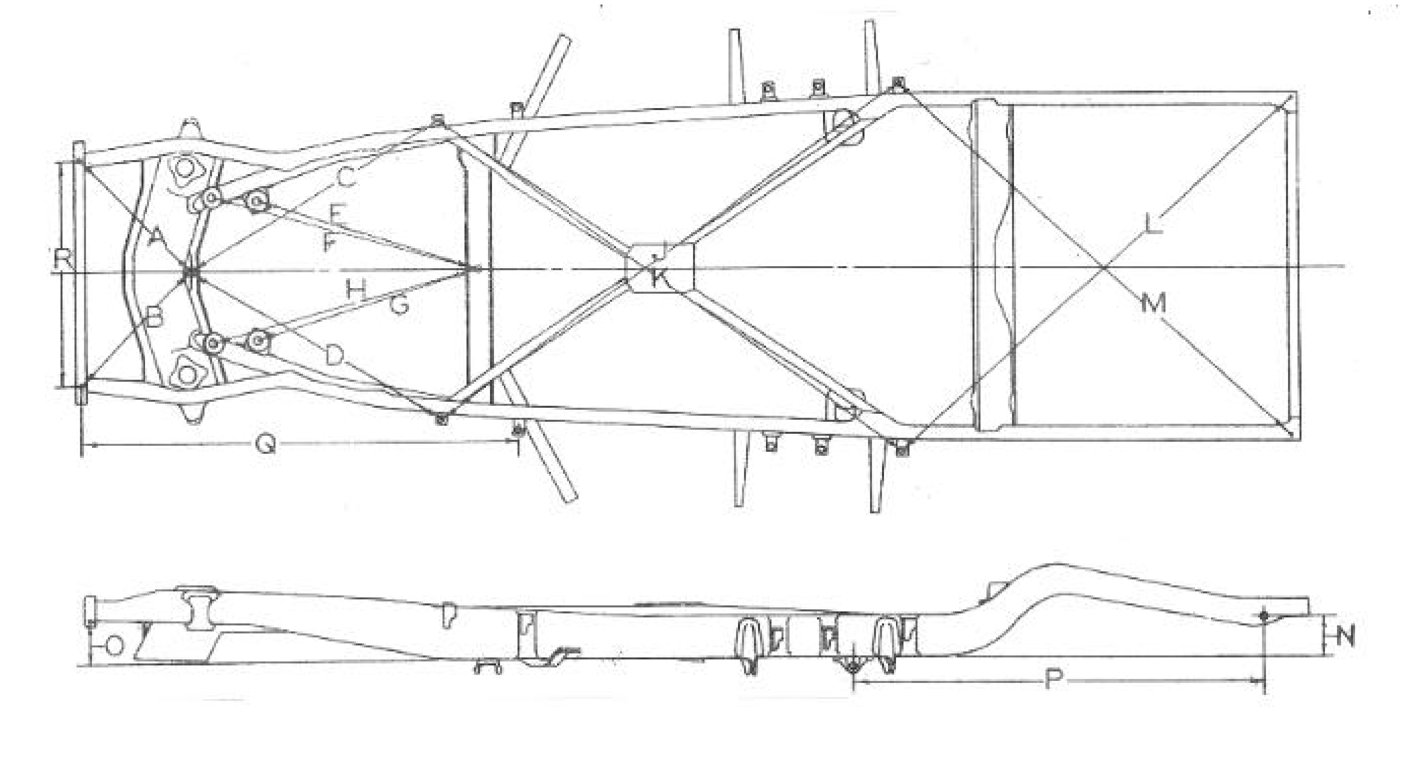


Figure 29 - 1941 Frame Dimensions

SE- RIES	10-20	11	12-21-22	14-15 24-25	51-52 171-172	53-54 173-174	17-27	18-28	58-178
W/B	116”	116”	121”	121”	121”	121”	128”	128”	128”
A	21-3/16	21-3/16	21-3/16	21-7/16	21-7/16	21-7/16	21-3/16	21-3/16	21-7/16
B	21-3/16	21-3/16	21-3/16	21-3/16	21-7/16	21-7/16	21-3/16	21-3/16	21-7/16
C	35-9/16	39-25/32	39-25/32	39-25/32	39-11/16	39-11/16	39-25/32	39-25/32	39-11/16
D	35-9/16	39-25/32	39-25/32	39-25/32	39-11/16	39-11/16	39-25/32	39-25/32	39-11/16
E	30-31/32	30-31/32	30-31/32		31			30-31/32	31
F				37-5/8		37-5/8	37-5/8		
G	30-31/32	30-31/32	30-31/32		31		30-31/32	30-31/32	31
H				37-5/8		37-5/8	37-5/8		
J	78-3/4	78-3/4	78-3/4	78-3/4	78-15/16	78-15/16	84-17/32	84-17/32	84-23/32
K	78-3/4	78-3/4	78-3/4	78-3/4	78-15/16	78-15/16	84-17/32	84-17/32	84-17/32
L	78-3/4	74-41/64	74-41/64	74-41/64	78-3/4	78-3/4	74-41/64	74-41/64	78-3/4
M	74-3/4	74-41/64	74-41/64	71-41/64	74-3/4	74-3/4	74-3/4	74-41/64	74-3/4
N	4-29/32	4-15/16	4-15/16	4-15/16	5	5	5	4-15/16	5
O	5-45/64	5-49/64	5-49/64	5-49/64	7-1/4	7-1/4	7-1/4	5-51/64	7-1/4
P	57-5/64	57-5/64	57-5/64	57-5/64	57-5/16	57-5/16	57-5/64	57-5/64	57-5/16
Q	54-15/16	59-15/16	59-15/16	59-15/16	60	60	59-15/16	59-15/16	59-7/8
R	30-1/2	30-1/2	30-1/2	30-1/2	30-1/2	30-1/2	30-1/2	30-1/2	30-1/2

UNIVERSAL JOINTS

PROPELLER SHAFT AND UNIVERSAL JOINTS

The propeller shaft is of tubular construction with needle roller bearing type universal joints.

Lubrication

1942 MODELS

Every 20,000 miles the universal joint bearings should be disassembled, cleaned and repacked with viscous chassis grease.

1946-47 Models have a grease fitting and should be lubricated every 1000 miles.

The splined end of the propeller shaft should be lubricated every 1000 miles.

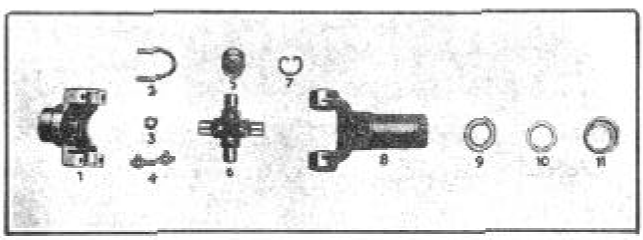


Figure 292 - Universal Joint Construction

1. Companion Flange
2. Propeller shaft U bolt
3. Propeller shaft U bolt nut
4. Propeller shaft U bolt lock
5. Journal bearing assembly
6. Journal
7. Journal bearing race snap ring
8. Sleeve yoke assembly
9. Sleeve yoke dust washer
10. Sleeve yoke dust washer retainer 11. Sleeve yoke dust cap

PROPELLER SHAFT AND UNIVERSAL JOINT REMOVAL

1. Remove the four nuts and lock plates on the U bolts at both ends of the propeller shaft and remove the U bolts. The propeller shaft and the two bearing assemblies can then be removed. Do not allow the bearing cups to fall off the journal.

2. The remaining two bearings now can be removed, by compressing the snap rings.

3. Use a soft hammer and tap on one bearing carefully to drive out the opposite bearing cup and rollers.

4. Tap on the end of the journal from which the bearing was just removed and remove the remaining bearing cup and rollers. The bearing cups have a light press fit.

5. Wash all parts in gasoline and examine for wear.

The bearing surfaces on the journal should be free of grooves or ridges. The bearing cups should be checked for grooves and chipped edges.

PROPELLER SHAFT AND UNIVERSAL JOINT INSTALLATION

1. Pack all bearing assemblies with viscous chassis lubricant.

2. Use new oil seals on the inner end of the journal.

3. Hold the yoke and journal so that one bearing assembly can be inserted from the bottom.

4. Hold the yoke and journal so that the other bearing assembly can be inserted from the bottom. The rollers in their race will not fall out if installed from the bottom.

5. Install the Journal bearing race snap ring.

6. Install the other two bearing assemblies on the journal and compress them with the universal joint assembling tool J881 (Fig. 293).

7. Install the U bolts, lock plates and nuts.

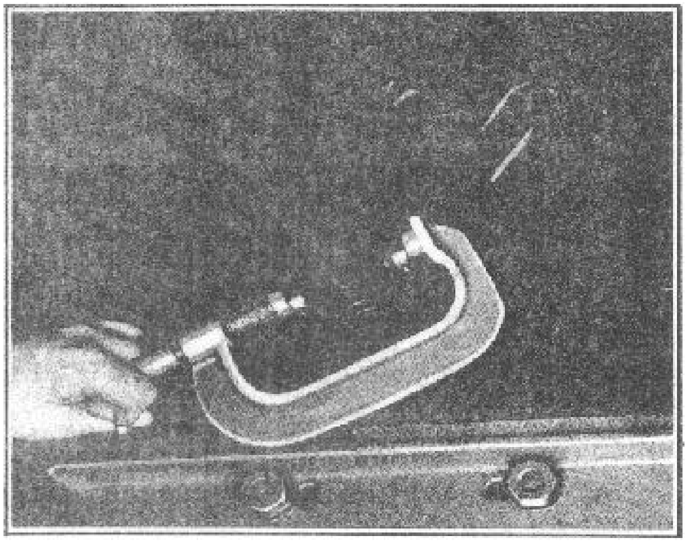


Figure 293
Universal Joint Bearing Tool. J-881

NOTE: The ears on the lock plates must be turned over against flat of the nuts. The complete assembly of the propeller shaft and universal joints has been accurately balanced at the factory and to preserve this balance in the car the arrow on the spline end of the propeller shaft and the arrow on the front universal joint yoke must be lined up.

If these arrows are not lined up, it will cause rough car operation which will cause rapid wear or failure of parts and put an unbalanced load on the transmission, clutch, engine and rear axle.

Propeller shaft U bolt nuts should be tightened with a torsion wrench to 20 foot pounds.

Manifolds

The intake and exhaust manifolds are separate castings bolted to the cylinder block and also to each other, as these have inter-connecting passages through which the exhaust gases flow to heat the fuel mixture.

Be sure to use new gaskets when replacing manifolds to assure proper seal and preclude the possibility of exhaust gas or air leaks.

Series 20 and 28 with single throat carburetors are fitted with a manual heat control valve mounted at the center of the exhaust manifold. This valve should be set to the N" position, that is, with the pointer sloping to the rear and should remain in this position for all seasons operation.

Series 21,22,24,25,27 and all 1946 and 1947 models are equipped with duplex carburetors and fitted with an automatic heat control valve. This valve is operated by a thermostatic spring which regulates and controls the heat to the intake manifold under all operating conditions.

HEAT CONTROL VALVE REMOVAL
SERIES 20 AND 28

Remove carburetor.
Remove two heat control valve retaining nuts.
Remove heat control valve retainer.
Remove heat control valve.
To replace, reverse order of removal.

HEAT CONTROL VALVE REMOVAL
SERIES 21,22,51,52,58,172,173 and 178

Remove carburetor and air cleaner.
Remove valve rod springs.
Remove retainer pins.
Remove stud nuts.
Remove heat control valve assembly. To replace, reverse order of removal.

HEAT CONTROL VALVE RENO PAL
SERIES 24,25,27,53,54,173 and 174

Remove carburetor connections.
Remove exhaust manifold.
Remove damper springs.
Remove retainer pins.
Remove stud nuts.
Remove damper assembly.
To replace, reverse order of removal.

EXHAUST PIPE FLANGE OR
FLANGE GASKET-REMOVAL

Disconnect exhaust pipe at muffler.
Remove pipe to manifold bolts and slide off flange and remove gasket.
To replace, reverse order of removal.

EXHAUST SYSTEM

Mufflers

The mufflers used on all six cylinder models has a 2" inlet and 1-1/2" outlet. Eight cylinder models use a muffler with a 2" inlet and 1-7/8" outlet.

Mufflers are the straight through type and specially developed to accommodate the different engines. The outer shell is specially treated to better resist rust.

MUFFLER ASSEMBLY - REMOVAL

Disconnect exhaust pipe at muffler.
Disconnect tail pipe at muffler.
Remove muffler.
To replace, reverse order of removal.

MUFFLER AND EXHAUST PIPE - REMOVAL

Disconnect exhaust pipe at manifold.
Disconnect tail pipe at muffler. Remove muffler and exhaust pipe.
To replace, reverse order of removal.

MUFFLER TAIL PIPE - REMOVAL

Disconnect tail pipe at muffler.
Disconnect tail pipe at tail pipe clamp.
Remove tail pipe.
To replace, reverse order of removal.

TIRES AND WHEELS

TIRE REMOVAL

Deflate the tube and starting directly opposite the valve stem and working in both directions toward the valve, press both beads of the tire off the rim ledge down into the rim well.

Start removal of one bead at the valve stem, working around the wheel in both directions from this point. Pull the valve back inside of the rim, remove inner tube and remove the second bead by the same procedure used to remove the first.

When the tube is inserted in the casing, the valve should be in line with red dot on the tire side wall. This insures the minimum out of balance which can be obtained with this particular tire and tube assembly. However, if the tire has been in use for several thousand miles it does not insure a proper balance. (See wheel balancing).

TIRE INSTALLATION

Inflate the tube until just rounded out and insert into the casing, with the valve in line with the red dot on the rim and into the rim well at one point so that the remainder of the bead can be worked over the rim.

Press this bead onto its rim seat and insert valve stem through the hole in the rim. After the valve is aligned in the hole, start application of the second bead directly opposite the valve, pressing it into the rim well and working in both directions so that the section of the bead at the valve is the last to be worked onto the rim.

Readjust, if necessary, so that the valve protrudes straight through the rim and pull the valve through from outside until seated snugly against the inside of the rim.

Partially inflate and work both beads onto the rim seats, then complete inflation.

TIRE INFLATION

The stability of the car on the road, particularly at speeds over 50 miles per hour depends to a large extent on the tire pressures. To get maximum stability all tires should deflect the same under the load that the car is carrying. It is desirable that the rear tires do not deflect as much as the fronts and since the variable load in a passenger car is mainly in the rear, the pressure in the front and rear tires should be such that with maximum passenger load the rear tires do not deflect more than the front tires.

When there is doubt about the deflection of tires, it can be checked by measuring the tire across the side walls, just above the road contact, taking the maximum measurement on each tire with a large pair of calipers. If, however, all tires are of the same make and style and all equally worn, the measurement can be taken from the ground to the lowest point of the wheel felloe.

The pressures which will give equal deflection on both front and rear tires, used as original equipment on the various Hudson models, will be found in the Wheels and Tires Specifications" chart.

TIRE WEAR

Tire wear, although actually more rapid on rear tires, it usually more uniform than on front tires. The rear tire treads are flexed (distorted) in one direction while the engine is driving the car and in the opposite direction when the brakes are applied which accounts. for their even wear.

The front tire treads are flexed in the same direction when the car is being driven as when the brakes are applied. This tends to cause spotty wear, particularly if there are any cross-wise lines in the tread design. When the tread consists wholly or partially of blocks, this wear is usually first noticed as a high point or ridge at the back of the block as it rests on the ground. This high or unworn portion is forced down into the tread groove when the brakes are applied, while the forward portion of the block, being backed by the remainder of the block, stands up and is subjected to the braking action and wears more rapidly.

If this condition is allowed to continue it will sooner or later (depending upon driving speed and severity of brake applications) develop into a wavy or spotty wear. If, however, the right and left front wheels and tires are interchanged to reverse the tire rotation when the first uneven wear is readily noticeable (usually from 2500 miles to 5,000 miles), the tire wear will become uniform and in most cases remain so. However, under fast driving and severe brake usage the original conditions may again develop but this time on the reverse side of the tread blocks, making a second change necessary.

Do not be too hasty in diagnosing uneven tire wear as improper front wheel alignment as there are other conditions which can be much more readily checked and which may be the cause.

The following conditions should always be checked when uneven tire wear is encountered and in the order listed.

1. Tire pressure.
2. Wheel bearings.
3. Brakes.
4. Wheel and tire balance.
5. Front wheel alignment.

TIRE PRESSURE

It is important that the recommended pressure be maintained. Tire pressures must be checked at least weekly in the summer. Refer to "Tire Pressure," in Specifications.

Wheel Bearings

Loose or worn wheel bearings, permitting the wheel to wobble, will cause scuffing of tires or even permit brakes to drag intermittently.

FRONT WHEEL BEARING ADJUSTMENT

1. Jack up the wheel so that it will revolve.

2. Remove outer and inner hub caps.

3. Remove cotter pin and turn nut to the right sufficiently to insure that parts are properly seated and then back off the nut until a slight drag is felt when turning the wheel by hand.

4. Loosen the nut sufficiently to allow the wheel to turn freely.

5. Insert cotter key and clinch it.

6. Install inner and outer hub caps and lower car to the floor.

Brakes

Dragging brakes and particularly with eccentric drums will cause spotty wear. Be sure the brake backing plates are mounted securely on the spindles.

FRONT WHEEL ALIGNMENT

If the above checks fail to reveal the cause of the tire wear, a complete alignment test should be made. Alignment procedure is given complete in *Section

WHEEL AND TIRE RUN-OUT

Lateral runout or trueness of the wheel can be checked with a gauge and a piece of chalk.

The allowable run-out or eccentricity is from 1/16" to 3/32". !fore 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 or camber, the place where the chalk mark is should be placed toward the front of the car and in checking toe-in it should be placed at the top of the tire.

WHEEL AND TIRE BALANCE

Wheel and tire balance is very important both for preventing uneven tire wear and also for proper handling of the car at speeds over 50 miles per hour.

All tires used on HUDSON models are balanced before being assembled to the car.

The tire side walls are marked with a red dot to indicate the position in which the valve stem should be placed in order to preserve the original balance.

Tire wear or tire repair will, however affect the balance. This is relatively unimportant on rear tires but very important on front tires.

Front wheel and tire assemblies should be rebalanced every six months on cars driven over 50 miles per hour and

After every front tire change.
After every front tire or tube repair.
After every front wheel change.

BALANCING THE WHEEL AND TIRE

Wheel balance is the equal distribution of. the 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).

There are two ways in which every wheel must be balanced--
Statically
Dynamically

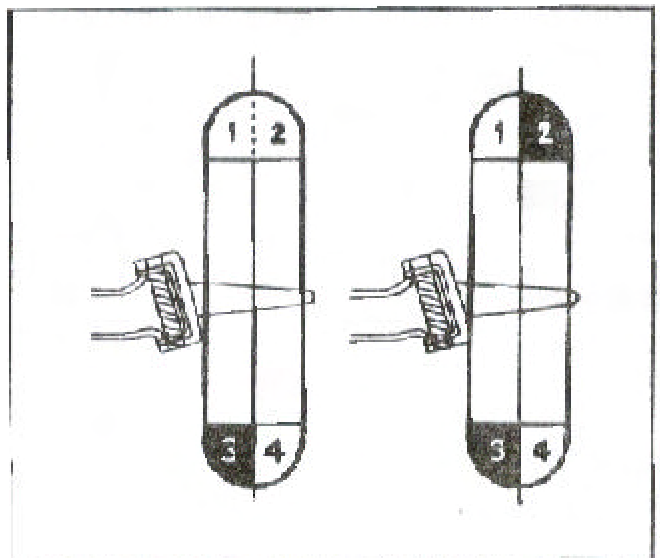


Figure 294 - Static Balancing

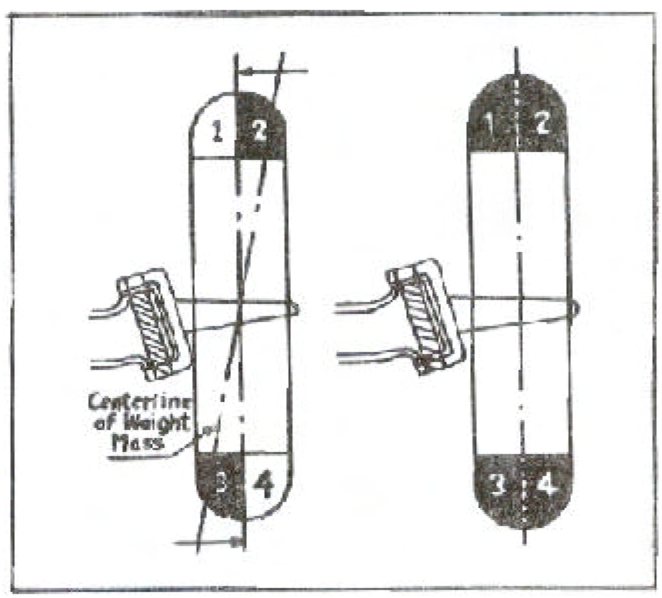


Figure 295 - Dynamic Balancing

Wheel Unbalance is the principal cause of tramp and contributes to other steering difficulties.

Due to irregularities in tread wear, caused by sudden brake applications, misalignment, low inflation pressure, or tube and casing repairs, a casing and tube can lose its original balance.

If the action of the front wheels cause a disturbance at the steering wheel, the first items to check are pressures and the balance of the tire and wheel.

STATIC OR STILL BALANCE IS THE EQUAL DISTRIBUTION OF THE WEIGHT OF THE WHEEL AND TIRE ASSEMBLY ABOUT the axis of rotation in such a manner that it has no tendency to rotate by itself regardless of the position of the wheel and tire.

Static unbalance of a wheel causes a hopping or pounding action (up and down) which leads to road tramp, high speed shimmy and excessive tire wear.

Static unbalance of a tire and wheel causes the heavy portion (3) to go to the bottom as in Fig. 294 and to obtain a true static balance, weights will have to be added on the rim opposite the heavy portion that went to the bottom.

The "Combination Static and Dynamic Wheel Balancer KMO-55-J is available through the Kent-Moore ORGANIZATION, Inc.

The vertical position of the wheel permits balance weights being applied from either side of the wheel.

To balance the wheel and tire assembly a small piece of putty may be used instead of fastening the regular weights onto the rim. The quantity of putty may be added to or reduced until the static balance is obtained, as in Fig. 294.

The putty can then be weighed and balanced weight or weights attached permanently to the rim to correspond to the weight of the putty. The sum of the weights of section (1) and (2) is equal to the sum of the weights of section (3) and (4) Fig. 294, the weight, therefore, is equally distributed about the axis of rotation. The weight at (2) being balanced by the weight at (3). However this wheel is not in dynamic balance because section (1), Fig. 294 is lighter than section (2) and section (4) is lighter than section (3).

Dynamic or running balance requires a wheel to be first in static balance and to also run smoothly at all speeds on an axis that passes through the center line of the wheel and tire and is perpendicular to the axis of rotation.

The wheel and tire is in static balance as shown in Fig. 294, however, with reference to the center line, section (1) is lighter than section (2), also section (3) is lighter than section (4).

This wheel, when started spinning, will cause a center line through the weights at (2) and (3) to attempt to get at right angles to the rotation axis Fig. 295, which exerts a force on the wheel to try to obtain a new center line and thus change the axis of rotation. The wheel in spinning, therefore, tries to equalize the weight at (2) and (3) by moving the center line first in one direction and then in another, causing the wheel to try to rock first in one direction and then another, producing a wobble or shimmy which increases with high speeds.

Weights must be added to (1) and (4), Fig. 295 to equal the weight in sections (2) and (3), and in Fig. 295 the weight is evenly distributed about both the axis of rotation and the center line of the wheel. This wheel is statically and dynamically balanced.

A wheel assembly must be statically balanced before it can be dynamically balanced. The wheel assembly must be clean and free of all dirt, weights etc. The tires must be in good condition; properly mounted with the balance mark on the tire lined up with the valve stem in the tube. Bent wheels must be replaced or straightened before being balanced. Tire valve caps must be in place.

BALANCING WEIGHTS

Balancing weights clip over the edge of the wheel rim and are tapped in place with a hammer.

SHIPPING BRACKETS

All cars shipped by freight have an extra bracket assembled to the right and left sides of the frame thru holes provided and the purpose of this is to tie the car down against movement during transit.

The bracket bolts, brackets and tie down chains must be removed upon arrival of the car at its destination.

ANALYZING CAR ROUGHNESS

Vibration or roughness in car operation can be caused by out of balance in: Wheels, Brake Drums, Propeller shaft, Clutch and Engine.

To find the cause proceed as follows:

1. Jack up the rear wheels of the car. Support the rear end of the car at the center of the differential housing.

2. Check run-out of front and rear wheels.

3. Run the rear wheels at different car speeds having the rear wheels and tires in place.

4. Run the rear axle with wheels and tires removed.

NOTE: If the roughness disappears it was due to out-of-balance rear wheels and tires. If the roughness still is present it is in the engine or propeller shaft.

The propeller shaft can be eliminated by shifting the transmission into neutral and running the engine alone. Whenever an engine is being tried out for roughness the clutch must be engaged because an engine operated at high speed with clutch disengaged might be rough and as running at high speeds with clutch disengaged is not normal car operation, no attempt to correct should be made.

5. Run the engine in high gear. If roughness is still present it indicates the propeller shaft is also rough and that the arrow on the spline end of the propeller shaft and the arrow on the front universal joint yoke is not lined up. See "Propeller Shaft and Universal Joint Reassembly" in this section (Chassis).

REFERENCES

Source of Information	Date	Subject

SHEET METAL

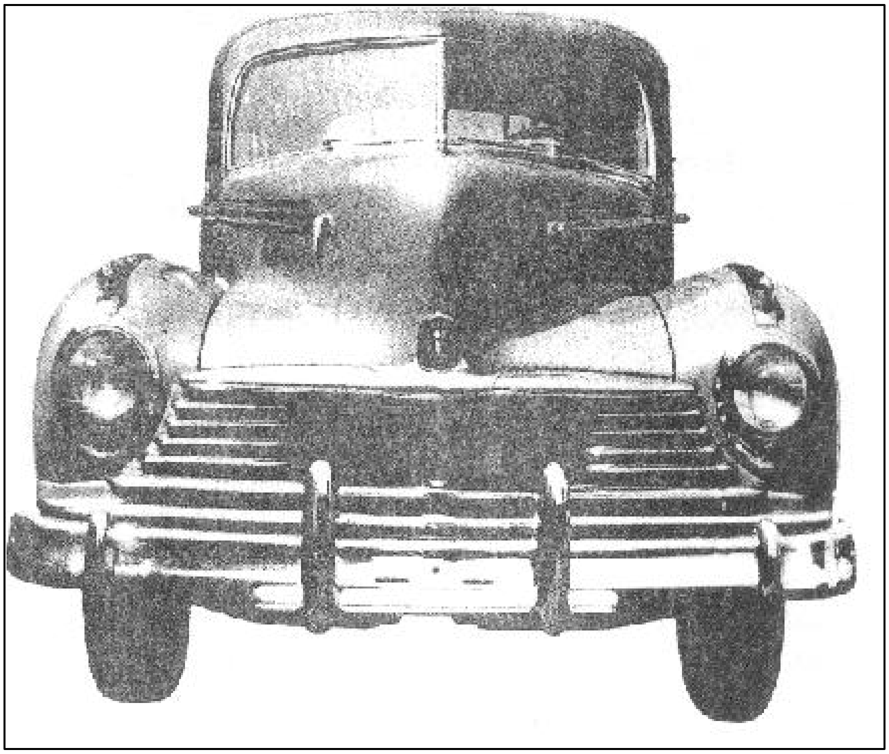


Figure 296
Front View-Commodore Series

BONNET

Bonnet Alignment

Bonnet alignment is provided at the fender ends of the "U" shaped bonnet hinge. A flat bracket having serrated faces is bolted to the inside of the front fender. The holes in the fender are oversize permitting the bracket to be moved up or down, fore or aft, thereby raising or lowering the front of the bonnet forward or backward. This flat serrated bracket is bolted to the bonnet hinge.

The bonnet hinge to flat serrated fender bracket bolt is installed as follows: Slip a flat washer on the bolt and then the rubber shouldered washer. Place this assembly thru the bonnet hinge hole (recessed for the rubber shouldered washer). Install the other rubber washer on the bolt, then a plain washer and then the coil spring. Screw the bolt in the serrated flat fender bracket and install the lock nut.

The front fender tie rods can be used to pull the fenders together or space them farther apart to obtain a fit between the fender and bonnet.

BONNET REMOVAL

1. Unlock and raise bonnet.

2. Remove the bolts holding bonnet support to bonnet.

3. Remove bonnet light wire terminals from fender junction.

4. Remove bonnet to bonnet hinge bolts.

5. Remove bonnet by lifting straight up.

NOTE: To install reverse procedure of removal.

BONNET HINGE ASSEMBLY - REMOVING AND REPLACING

Remove bonnet.

Remove bolts, holding the adjusting bracket to the frame bracket.

To replace, reverse procedure of removal. Align bonnet as outlined under "Bonnet Alignment".

BONNET SUPPORT ARM REMOVAL,

Bonnet support arm removing, is by two bolts holding support arm to fender and top screw holding support arm to Bonnet.

The coil spring can be replaced by pulling it loose from its seat.

Bonnet Mouldings and Ornaments

Bonnet mouldings and ornaments are held by clips, speed nuts or studs cast in the ornament using hexagon nuts and lockwashers.

The fastening devices can be reached from inside the bonnet and in the case of the mouldings on the front end of the bonnet, they can be reached from the front of the car.

BONNET LAMP BULB OR LENS REMOVING AND REPLACING

To replace the bulb, raise the bonnet and pull the bulb out of the lamp housing. To replace the lens, remove the nuts attaching the housing to the bonnet. Lift out the housing and lens.

RADIATOR GRILL AND LOUVER PANEL ASSEMBLY REMOVING

1. Remove bolts and washers from underneath the fender.

2. Remove bolts from side of fender (2 each side).

3. Remove bolts from anchor bracket at front frame rail.

4. Remove the front bolt fastening the front bumper to frame bar and loosen the rear bolt, thus allowing the bumper assembly to drop down.

5. Remove grille and louver panel assembly and lay it carefully to one side to avoid damage.

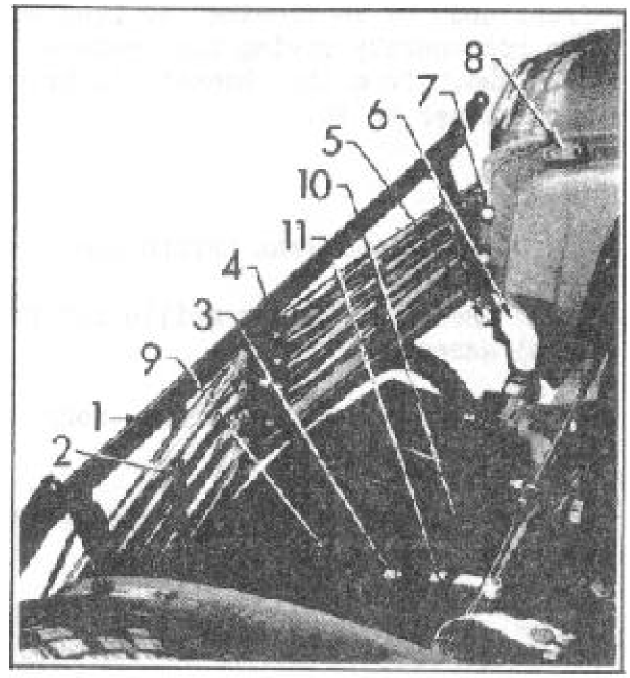


Figure 297
Bonnet Louver and Grille

1. Bonnet hinge
2. Louver bracket
3. Louver center panel
4. Louver Phillip screw
5. Bonnet hinge to bracket bolt
6. Bonnet hinge serrated bracket
7. Louver to fender bracket
8. Bonnet rubber bumper
9. Bumper splash apron
10. Radiator splash apron
11. Fender brace rod

The complete grille assembly includes; the front bumper splash apron and grille base, right and left hand; grille moulding supports, inner and outer; right and left hand; center grille baffle, vane grille center; and grille mouldings,

NOTE: Component parts of the grille assembly can be removed while unit is attached to the car or when removed as a complete assembly.

FENDER BRACE RODS

The fender braces are fastened to the frame at one end and to the fender at the other end. It has a lock nut and a holding nut at the fender end for adjustment.

The fenders can be moved at their front end by shortening or lengthening the rod, thereby moving the fenders further away from the bonnet or bringing them closer to it.

RADIATOR LOWER TANK SHIELD REMOVING

1. Remove radiator grille and louver panel assembly.

2. Remove fender brace rods from frame and fenders.

3. Remove cap screws holding fender brace rod to frame.

4. Remove screws holding radiator lower tank shield to fender.

5. Remove center screw holding radiator lower tank shield to fender support.

NOTE: The front bumper splash guard is bolted to the under part of the fender nose.

FENDERS

RIGHT FRONT FENDER REMOVAL

1. Jack up the car and remove wheel.

2. Lift the bonnet and block it to keep it from falling.

3. Disconnect the headlamp, fender and bonnet lamp wires at the junction block on the left fender and pull the wires through the hole in the right fender.

4. Remove the grommet in this hole.

5. Remove 4 screws holding the fender side dust shield hole cover (for valve adjustment).

6. Remove 2 bolts and nuts holding bonnet support.

7. Remove 2 Phillips head screws holding fender to radiator lower tank shield.

8. Remove all of the sheet metal screws holding the radiator baffle and remove the baffle (this complete removal is necessary to provide clearance when reinstalling the fender).

9. Remove 2 hex head bolts holding grille end bracket to fender.

10. Remove 1 hex head bolt from underneath the car (holds the fender to frame bracket).

11. Remove 2 hex head bolts fastening the fender to the frame cross member.

12. Remove 4 hex head bolts holding fender to front bumper splash guard.

13. Remove 6 hex head bolts holding the fender to the body cowl.

14. Remove 2 hex head bolts holding the serrated bonnet hinge bracket to the fender.

15. Remove fender brace rod nut.

16. Remove the fender and disassemble the mouldings, lamps and brace as follows:

17. Remove 3 headlamp rim screws.

18. Remove 4 headlamp to fender screws .

19. Remove headlamp.

20. Remove 4 headlamp to fender screws speed nuts.

21. Remove 5 fender lamp screws.

22. Remove fender lamp moulding and fender lamp.

23. Remove fender to apron brace bolts (3) and remove brace.

24. Remove fender moulding clips and mouldings.

25. Remove bonnet rubber bumpers.

To reinstall reverse the above procedure. Do not tighten the fender to cowl bolts until after the bonnet fit is checked.

NOTE: Leave the headlamp off until the fender is installed and than install and focus before installing the rim.

LEFT FRONT FENDER REMOVAL

Repeat the operations of "Right Front Fender Removal and Installing".

The battery, which is on the left front fender, must be removed when removing or replacing the left front fender.

REAR FENDER - REMOVING AND REPLACING

Remove wheel and tire assembly.
Remove fender brace to body bolt.
Remove fender to body bolts.
Remove fender.
To Install, reverse order of removal.

REFERENCES

Source of Information	Date	Subject

BODY

CONSTRUCTION

The Hudson built bodies are of steel construction throughout - floor, quarter panels, front end and roof panel welded together to insure maximum strength and rigidity. Suitable insulation is used on all large panels to deaden sound. Sealing compound is used at all joints to prevent the entrance of drafts and dust.

Floor

The body floor panel is a single steel stamping to which all side panels and pillars are welded or riveted. This floor or underbody panel forms the foundation of the body and also acts as a cover panel for the frame to which it is attached by mounting bolts. All reinforcements of the underbody panel are securely spot welded.

Quarter Panel

Assembly is a unit composed of small stampings and the rear pillar (on 2 door sedans and coupes), also the hinge pillar.

Front End

Assembly is a unit composed of the complete front and of the body, from the dash panel back to the front door pillar.
This completes the body structure that is bolted to the floor or underbody and leaves the roof panel (a one piece stamping) and the doors to complete the body shell.

Roof Panel

The roof panel extends from the windshield opening to the rear compartment (trunk), see Fig. 298, and is welded to the front end panel, body header and quarter panels.

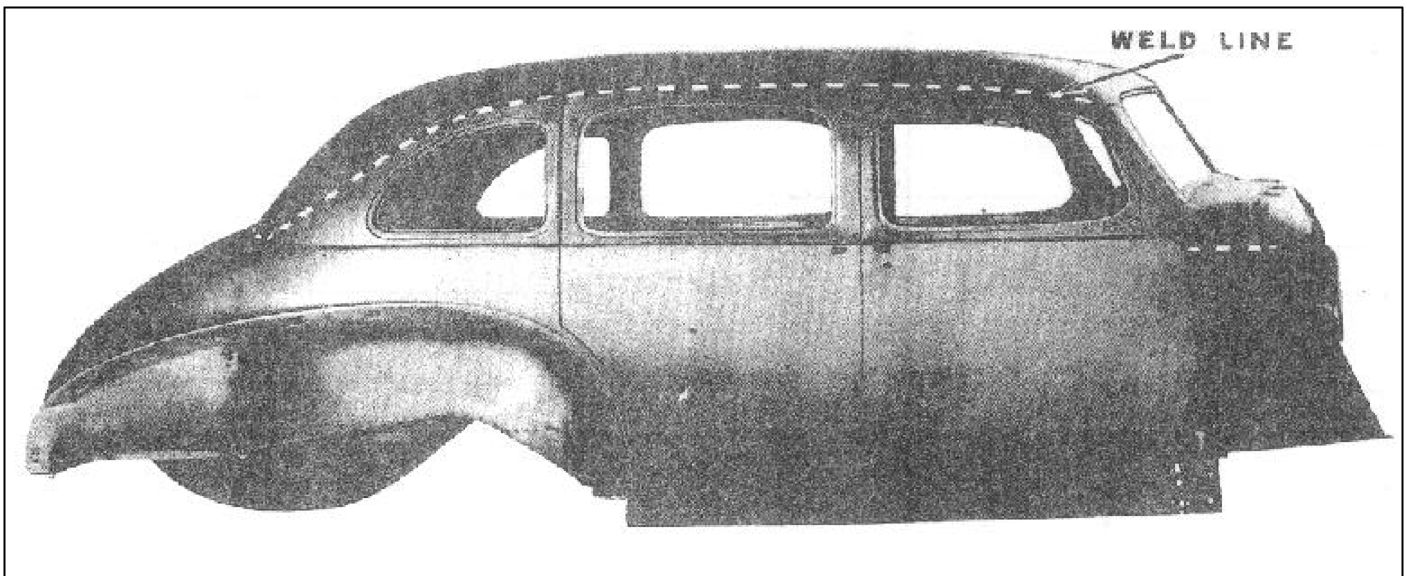


Figure 298
Four Door Sedan Body

FRONT END WELD POINTS

See Fig. 299. The front end panel is welded to the top panel at (1, Fig.299). These joints are soldered after welding and can be located by running the solder out of the joint with a torch.

The cowl side panel is welded to the underbody panel extension at (2), Fig. 299, and to the front end panel at (3).

The dash panel is welded to the front end panel at (4), Fig. 299, to the cowl side panels at (5), to the front pillar to dash bracket and toe board riser at (6).

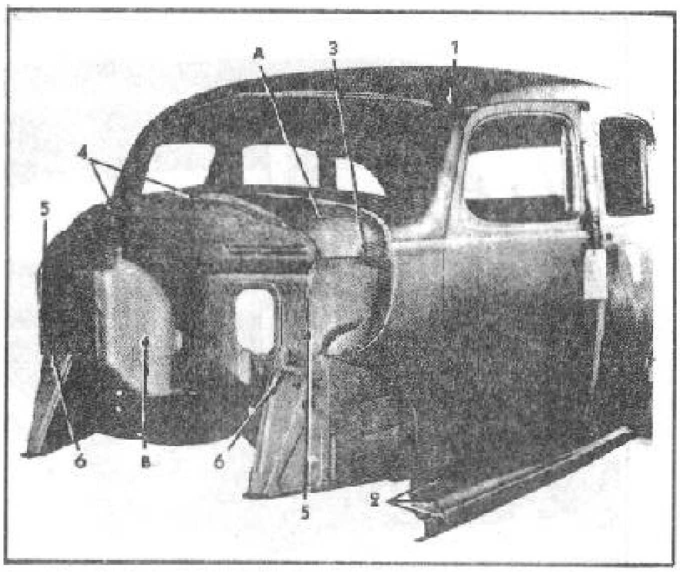


Figure 299
Front End-Assembly - Front View

The front pillars are welded to the body header at (1), Fig. 300, to the windshield header at (2), to the instrument panel at (3), to the cowl side panel at (4), to the toe board riser at (5) and to the underbody panel at (8).

The front pillar to dash bracket and toe board riser is welded to the front pillar at (5), Fig. 300 and to the dash panel at (7 and 8).

The instrument panel is welded to the front end panel at (9), Fig. 300, and is welded and riveted to the front pillar reinforcement at (3), Fig. 300.

The windshield header is welded to the front pillars at (2), Fig. 300, and to the front end panel at (10).

ROOF PANEL WELD POINTS

See Fig. 301. The roof panel extends from the windshield opening to the rear compartment opening.

It is welded at the front end panel at (1) Fig. 301, to the body header at (2), to the body header along point (3) and to the quarter panel along (4).

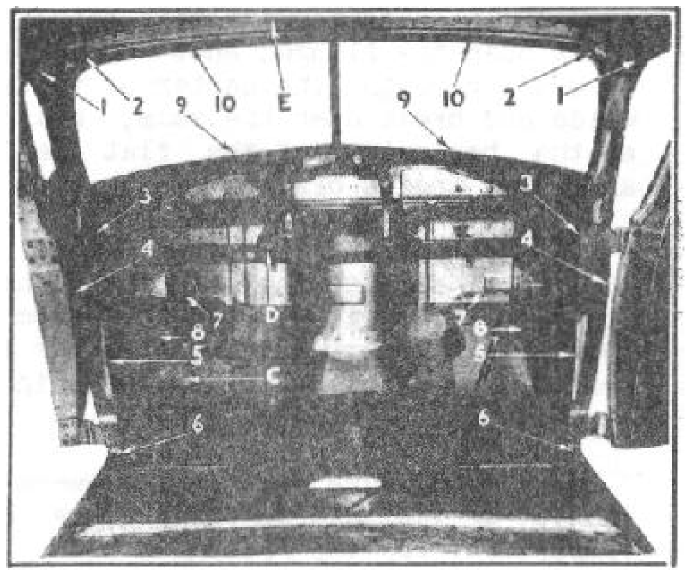


Figure 300
Front End Assembly - Rear View

The rear window frame (1), Fig. 302 is welded to the roof panel and is accurately assembled to the correct size before it is welded in place. Do not disturb this frame - cut around it.

The rear compartment door frame (2), Fig. 302, is welded to the roof panel, to the quarter panels at (3) and to the rear lower panel at (4). The frame is accurately assembled and held to the correct size before it is welded to the above parts. Do not disturb the frame - cut around it.

The roof panel weld line extends from the windshield to the rear window and from the drip moulding line on the one side to the drip moulding line on the other, see Fig. 298.

The sides of the roof panel have both a flange joint part way and a flat lap joint the rest of the distance. The flange extends from the front end all along the drip moulding joint and beyond, to the point where the body line continuing back from the end of the drip moulding blends into the rounded contour at the rear quarter just above the trunk lid. The weld at this point becomes a flat lap weld which continues to the end of the roof panel at the rear compartment opening. The roof panel from the front end to the end of the drip moulding, is welded to the body header and to the drip moulding, see Fig. 298. To disassemble, use a sharp thin chisel and break open the flanged spot welded seams or drill through the center of the spot welds and break open the seam, starting at the beginning of the flat weld cut along the inside of this seam.

At the rear end of the roof panel cut along the edge of the reinforcement in the rear compartment opening from the upper right corner to the upper left corner. This cut should be made in the angle along the flange.

Do not disturb the weld between the flange of the old panel and the rear compartment opening frame.

A new roof panel can be installed after the opening just cut has been straightened; rough spots ground off and the new roof panel trimmed at the rear end to fit the cut made at that point.

NOTE: It is best to center the new panel around the windshield opening first, holding it in place with "C" clamps, tack welds, and then weld the entire length.

The windshield and rear window openings should be checked for binding and size by using the glass or a flat board cut to size as a template.

Body Header Assembly

Body header assembly is welded to the front pillar at (5), Fig. 301. It is welded and riveted to the lock pillar at (6), welded and riveted to the rear pillar at (7) and to the quarter panel at (8).

Pillars

The lock pillar is welded to the underbody panel at (9), Fig. 301. It is welded and riveted to the underbody panel at (10). On two door Sedan and Coupe models the lock pillar is welded to the quarter panel.

The rear pillar is welded to the underbody panel at (11), Fig. 301, to the wheelhouse at (12), to the quarter panel at (13) and to the body header (14).

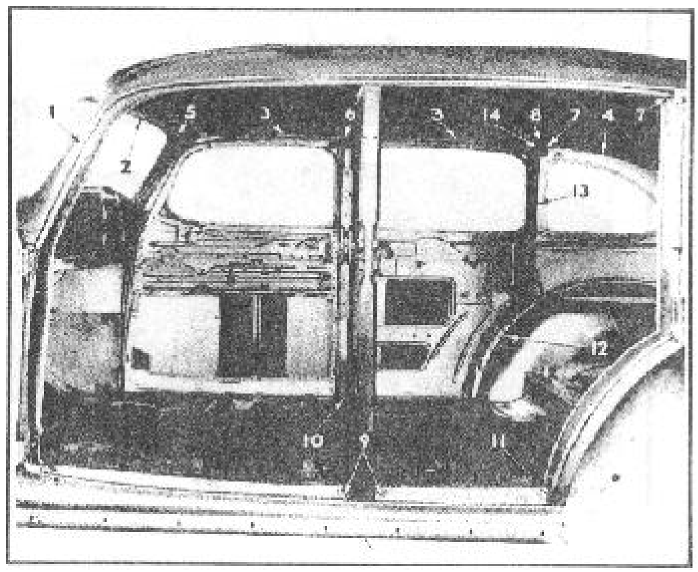


Figure 301
Four Door Sedan - Inside View

The front door lock pillar assembly is different on each of the coach, sedan and coupe bodies.

Quarter Panels

Quarter panels on four door sedans are supplied as an assembly only.

Its removal and replacement by cutting along weld lines and rewelding is as follows:

The quarter panel is joined to the roof panel by a flange joint (5), Fig. 302, along the body line, which is a continuation of the drip moulding joint; the flange joint ends where the body line blends into the rounded contour at the rear quarter (6) just above the compartment door.

The quarter panel weld at the junction of the panel and rear compartment floor (7), is a flat lap weld which continues to the rear compartment opening. To remove, cut along the flat weld from the upper corner of the rear compartment opening where the flange ends just above the compartment lid. Cut from the lower corner of the rear compartment opening to the bottom edge of the side quarter panel (along the weld to the rear lower panel). Cut along the angle at the edge of the flanged recess between the quarter panel and the rear compartment opening to the lower corner of the opening.

Roof Drip Moulding

Roof drip moulding is spot welded to the roof panel all along the roof panel flange and is also spot welded to the body header.

The drip moulding is easily removed by drilling through the spot welds or using a thin sharp chisel to break them loose.

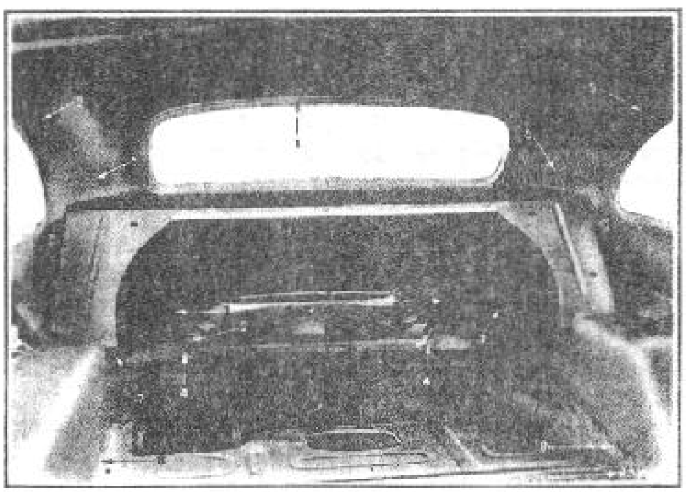


Figure 302
Four Door Sedan - Rear Inside View

Underbody Panel

The rear seat tray and rear compartment floor is one stamping and is welded to the rear quarter panel at the wheelhouse at (7 and 8), Fig. 302. Break loose all these welds.

The rear pillar is a part of the quarter panel, therefore, cut out the rivets in the top bracket (fastens to body header) and also cut out the rivets in the bottom brackets (fastens to wheelhouse on four door sedans and to the underbody on the two door sedans and coupes). Leave the brackets in place on the body whenever possible.

The rear quarter panel on two door sedans should be cut along the flange joining the roof panel to the quarter panel. A new panel can be installed after the opening has been straightened, rough spots ground off and the new quarter panel trimmed at the rear end to fit the cut made at that point.

The new panel must be lined up to fit the door and then held in place with "C" clamps, tack weld and then weld the entire length.

Body Lower Rear Panel

Body lower rear panel is welded at the ends to the extreme lower rear ends of the quarter panels below the rear compartment door. The top edge is welded to the rear compartment opening frame and at the lower edge to the underbody rear seat tray extension.

Instrument Panel

Instrument panel is spot welded to the front end panel, and welded and riveted to the front body pillar reinforcement.

To remove old panel drill out spot welds and cut off rivets with a thin sharp cold chisel.

CAUTION; When installing new panel, take proper precautions to prevent welding heat from burning graining on panel and finish on cowl.

Body Outside Mouldings

Body outside mouldings snap onto retainers, which are held to the body by screws.

If the moulding retainers are removed, the holes in the body for the retainer screws should be sealed to prevent any possibility of water leaks.

HOW TO USE BODY: TRAM FOR CHECKING AND ALIGNMENT

Any major body repair must start with accurately making and checking diagonal measurements at the door openings; front section and center section.

Diagonal measurements are made with a body checking tram (KMO-181) and matching one diagonal measurement against the other. This is known as "X" checking.

CHECKING BODY DOOR OPENINGS

Check the front door openings first.

Measure back 7" from the front hinge pillar (A), Fig. 303, on the underbody panel and mark this point as shown.

Place one end of the rule on this 7" mark just made and measure up 37" on the body hinge pillar. Mark this point (C).

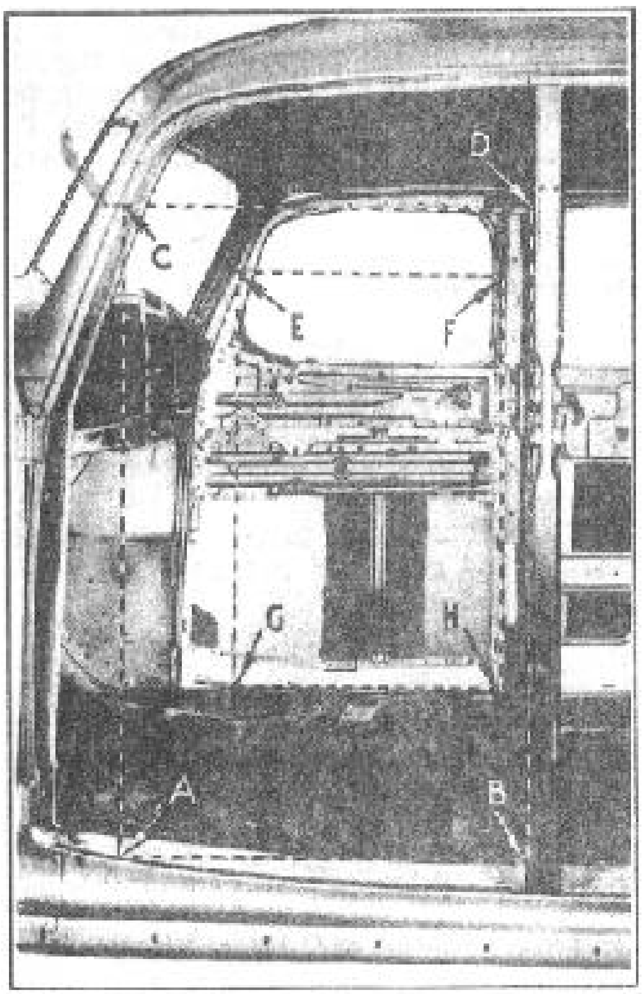


Figure 303
Body Checking

Fig. 303. Measure 37" up on the lock pillar starting from the bottom of the lock pillar where it is welded to the underbody (B). Mark this point (D) with a pencil. Repeat this on the opposite front door. (See points E, F, G, H).

An actual rectangle is thus laid out that will check any shape of door and the use of the body checking tram at these points will give a true indication of door and body alignment.

Place one end of the tram exactly on the 7" mark (A) on the underbody panel, extend the tram and place the other and exactly on the 37" mark on the lock pillar (D). Lock the tram with the set screw. Turn the tram around so that one end is at the base of the lock pillar (B) and the other end directly on the 37" mark (C) on the hinge pillar. If the same tram length will touch each mark it indicates the door opening is in proper alignment.

The same check mist be made at both door openings at the same time as it is possible for one opening to be in proper alignment and the other one to be out of line.

CHECKING FRONT SECTION OF THE BODY

Front section of the body is checked with the tram after the door openings have been aligned. The front section is checked diagonally from one side of the body to the other.

Set one end of the tram at the mark made on the underbody panel (B), Fig. 303, and the other end of the tram at the 37" mark on the hinge pillar on the opposite side of the body (F). Lock the tram in this position.

Reverse the position of the tram by placing one end of the 7" mark (A) and the other end of the tram at the 37" mark on the opposite hinge pillar (E).

The tram ends should rest exactly on the marks made on the body if it is square, and if the tram ends do not lay directly on the marks, the front section must be aligned before any other checking or aligning is done.

CHECKING FRONT SECTION OF BODY WITH CENTER SECTION

The final check is the determining factor whether the front section is in alignment with the center section.

Adjust the tram so that one end is at (B), Fig. 303, and the other end is at (E) on the opposite side of the body. Reverse the position of the tram with one end at (H) on opposite side and the other end at (C). If the two check the front section is square on the center section.

REPLACING THE OUTSIDE DOOR PANEL

There is available through the Hudson Parts Department, the production door outside panel only and the purpose of offering this outer panel only is to make easier door repairing and reduce the cost of repairs of this kind to Hudson owners. There are many cases when the lower panel of the door is damaged and the section above the belt moulding is unhurt. In such cases it is advisable to cut the old panel and the new panel at the same place on the belt moulding. Use a power sander with a No. 24 Grit Disc and cut through the edges of the outer panel, thus leaving the narrow strip of turned over flange spot welded on the door. Use a pair of pliers and pull this strip of turned over flange off from the bottom(and sides of the door. Straighten the flanges and do any other straightening necessary on the inner frame of the door.

Connect a new piece of sound deadener to the inside of the door panel using FS1044 asphaltine cement. Make certain the door panel stiffener lays snugly against the deadener. Install the new panel and support the edge with a dolly block and progressively hammer the flange of the panel over the flange of the door inner frame along the sides and bottom.

Progressive hammering is necessary in order to prevent buckles being formed in the panel.

Tack weld the top of the panel at the belt or preferably braze to prevent heat distortion of the panel. Spot weld the flange of the outer panel to the inner frame at intervals of 6 to 8 inches at both sides and the bottom.

NOTE: Thoroughly clean the welds and if necessary depress the weld at the belt, torch soldering and redrilling the holes for the chrome moulding clips.

Metal finish wherever necessary and in particular the edges of the panel if the dolly block has left any marks during the flanging.

Cowl Ventilator Dust Filter Kit

Cowl ventilator dust filter kit consists of the cowl ventilator dust filter with the necessary clips to attach the dust filter to the cowl ventilator screen.

Cowl Ventilator Cover

The cowl ventilator cover operates on a hinge rod, the end of which protrudes through the side of the air duct underneath the cowl. The end of this hinge rod has a hook-shaped lever fastened to it by a screw and this hook-shaped lever is also fastened (at its lower end) to the vent cover operating rod, which is operated by the lever under the instrument panel.

COWL VENTILATOR COVER REMOVAL

1. Remove the hook-shaped lever from the hinge rod.

2. Remove the screw holding the lever to the hinge rod.

3. Remove four screws holding the vent cover brackets to the air duct. (Two screws at right end of the air duct and two at the left end).

4. Lift the vent cover and from the right end pull it to the right so as to free the hinge rod from its hole in the air duct.

5. The vent cover with the screen and hinge assembly can be lifted from the body.

When assembly has been removed check the working of the hinge assembly and if there is any binding at the rivets replace the rivets.

6. Drill out the rivets holding the links (on the hinge rod) to the hinge link pivot bracket (welded to the deflector on the cover).

NOTE: This bracket should be spread slightly with a screw driver to provide clearance for the hinge links and any roughness filed off the links.

7. Re-rivet the links to the bracket leaving just sufficient clearance for free operation using the spring washer that was originally under the head of the rivet.

NOTE: The cowl vent screen can be removed by pressing the center stud out of its bracket and sliding the screen down out of the cover.

Lubricate all working parts. Replace the assembly in the body from the right side so that the end of the hinge rod enters the hole in the air duct.

8. Spread the hinge and insert the flattened end of the hinge rod through the air duct hole.

9. Install the grommet and retainer.

10. Install the upper lever on hinge rod with the tapped hole at the back and install the screw with washer.

11. Attach the operating rod and spring wire.

12. Install the four bolts, seal washers, plain and lockwashers holding ventilator cover to the air duct.

COWL VENTILATOR DOES NOT OPEN WIDE ENOUGH

Cowl ventilators that do not have sufficient opening, or bind and work hard can be loosened up at the hinge rivets.

See "Cowl Ventilator Cover Removal", Items 1 to 12, inclusive.

WINDSHIELD WIPERS

The combination vacuum and fuel pump is optional equipment on all models. The vacuum part of this combination pump acts as a booster to provide additional vacuum when the intake manifold vacuum becomes inadequate to keep the wiper blades working at an efficient speed.

The chain housing, link assemblies and motors are the same on all models, while the wiper blades and arms differ on the convertible from the closed body models. The windshield wiper motors are retained by two machine screws and a bracket welded to the underside of the cowl. The wiper blades to motor connecting links are a snap fit to the wiper motor arms.

The wiper arm chain housing and caps are retained to the cowl by a "U" shaped bracket on the underside of the cowl. A gasket under the chain housing cap prevents water seeping into the body.

The wiper blade hooks into the arm. The chain housing end of the arm is splined and the chain housing drive is also splined. The arm has a lock spring that hooks behind the chain housing splines to prevent the arm being lost. To remove the arm bend it at right angles to the glass and pull off. To install reverse this procedure.

WINDSHIELD WIPER CHAIN HOUSING REMOVAL

1. Remove the wiper arm and blade assembly.

2. Disconnect the wiper connecting link at the motor shaft arm.

3. Remove the screw and bracket from the chain housing underneath the cowl and remove the cap and link assembly.

WINDSHIELD WIPER DRIVE CHAIN ADJUSTMENT

Windshield wiper drive chain adjustment is by loosening the nut at the lower edge of the chain housing assembly.

Loosen the nut and move the lower end of the chain up to loosen and down to tighten. Tighten the nut securely.
When replacing the wiper cap and connecting link be certain that the rubber gasket is properly sealed, both at the cap and at the cowl panel.

WINDSHIELD WIPER MOTOR REMOVAL

Windshield wiper motor removal requires the taking out of the radio grille (fastened to the instrument panel by screws accessible from underneath the panel) and if the car is equipped with a radio it will have to be removed.

Release the coil spring and clips that retain the connecting links to the wiper shaft arms at the motor.

Disconnect the vacuum lines at the motor.

Remove the screws holding the motor to the bracket and remove motor.

WINDSHIELD WIPER MOTOR INSTALLATION

Attach the wiper motor to the bracket at the underside of the cowl.

One end of the bracket is slotted for the easy removal and installation of the motor.

Connect the vacuum line.

Set the top end of wiper motor shaft arm to the extreme right. This is the parked position of the motor.

Attach the wiper connecting links to the motor. The right connecting link attaches to the top arm of the wiper motor.

WINDSHIELD

Windshield on all models is in two pieces held in a moulded weatherstrip cemented in the body opening. All models except Traveler and Commercial cars have steel reveal mouldings cemented in place between the body flange and glass weather-strip.

WINDSHIELD GLASS REMOVAL

1. Remove the rear view mirror.

2. Remove screws in the upper and lower finish mouldings including the center mouldings and remove the mouldings.

3. Remove the outside center bar. This is held on by the same screws that hold on the inside center finish moulding.

4. Pry the outer rubber lip up around the entire glass, breaking the cement seal.

5. Remove the glass from the inside.

The rubber weatherstrip is cemented to the body and the glass and it may be necessary to work the rubber loose with a knife to free it from the body.

6. Remove the rubber from the glass.

NOTE: It is not necessary to remove the stainless steel reveal moulding.

WINDSHIELD GLASS INSTALLING

1. Check the windshield opening flange with a straight edge to be certain that the glass will not be sprung when it is put in place against this flange. Straighten if necessary.

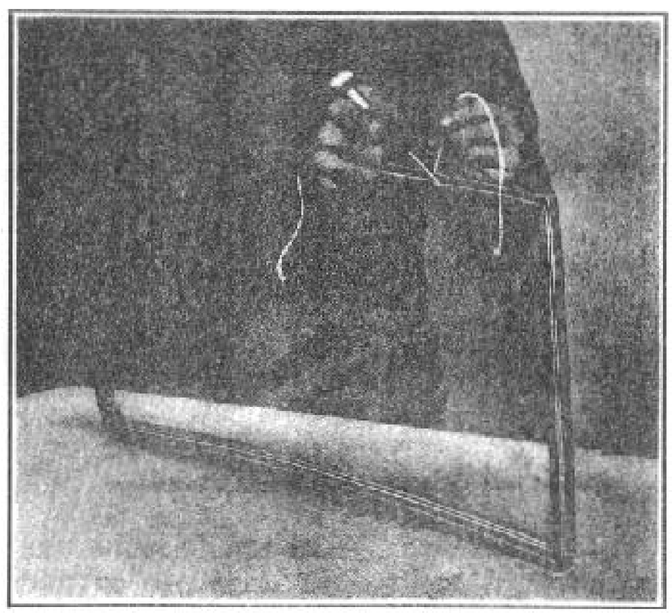


Figure 304
Installing Windshield Glass Weatherstrip

2. Apply a coating of FS-621 windshield sealer, to the glass groove in the rubber and at the same time apply a coating to the inner face of the windshield body opening flange.

Allow the cement to dry to the point where it becomes sticky.

3. Insert the edge of the glass which goes to the center, into its groove in the rubber weatherstrip, and work the glass down into its place in the weatherstrip.

4. Working from the center toward the outer end, put the remainder of the weatherstrip on the glass.

5. Place a piece of strong twine, about 60" long, see Fig. 305, in the outside moulding groove, bringing the ends together at the top and allow them to hang down on the outside of the glass.

6. Hold the glass firmly in position on the inside of the windshield opening and pull the ends of the twine apart, bringing the lip of the weatherstrip over the flange of the opening.

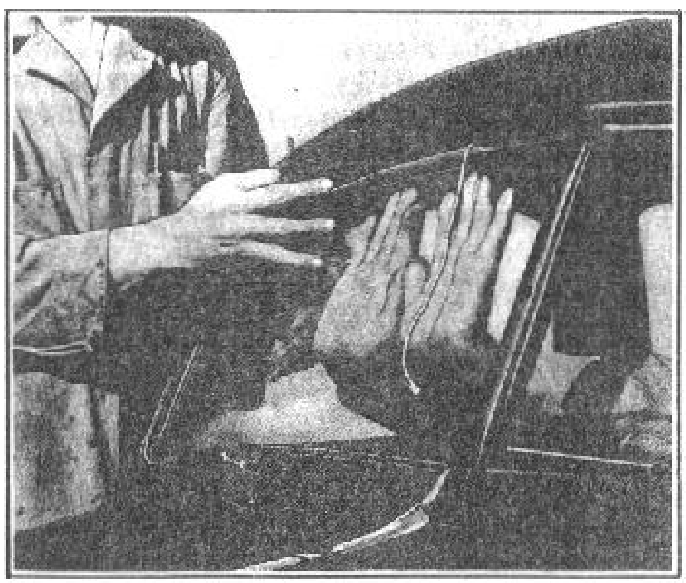


Figure 305
Installing Windshield Glass

7. Cement the outside lip of the weatherstrip to the flange by putting the nozzle of atube of FS-621 windshield sealer under the flange and depositing the cement all around the opening.

8. A force feed gun B-182 can be used to deposit a small bead of cement around the weatherstrip flange.

9. Fill the center finish bar screw holes with FS-621 cement or Plastikon putty and install the inside and outside finish mouldings.

It is very important that this center bar be sealed tight to prevent water leaks at this point.

10. Install the inside finish mouldings and rear view mirror.

WINDSHIELD REVEAL FINISH MOULDING

The stainless steel mouldings around the outer edge of the windshield, used on all models, except 20T, is cemented to the windshield opening under the rubber weatherstrip. It is necessary to remove the windshield glass to remove or replace these mouldings.

WATER LEAK AT WINDSHIELD

Water leaks at the windshield may be from the center moulding or any point around the glass.

Water will enter the body at one point and make its appearance at another point sometimes far distant from where it entered.

Remove the outside center bar by removing the inside screws that fasten the inside center finish moulding. Fill the center bar screw holes with FS-621 cement or Plastikon putty and reinstall the inside and outside finish mouldings. Use Force Feed Gun B-182 or nozzle type tube of FS-621 and deposit a bead of windshield sealer (FS-621) around the weatherstrip rubber flange.

WINDSHIELD GLASS CRACKED

This is caused by high spots on the windshield opening in the body. Use an undamaged piece of windshield glass and a feeler gauge and lay the glass in its opening, feeling the high spots and mark them with a piece of chalk. Use a sheet metal hammer and a body spoon and flatten the high spots. Follow the detail directions given under *Windshield Glass Removing.

REAR WINDOW GLASS - REMOVAL - SEDANS

Working from inside the car, loosen the weatherstrip (with a knife) all around the body opening, pressing the glass outward as the weatherstrip is being loosened.

The stainless steel reveal moulding is used on all models except 20T and is in two "U" shaped pieces joined at the center by sliding clips. The mouldings have clips integral with them that are bent around the weatherstrip.

Disassemble the glass, weatherstrip, and moulding. Be careful not to scratch glass.

Clean off the old cement from body flange.

Check flange for straightness and flatten out any high spots.

REAR WINDOW GLASS - INSTALLING - SEDANS

Apply a coating of Windshield Sealer FS-621 in the groove of the weatherstrip where the glass sits in.

Deposit a small amount of sealer on flange of body opening.

Install weatherstrip on glass.

Where reveal moulding is used, slide clips over one end of moulding and slide both halves of moulding on weatherstrip, driving them into place with a rubber hammer. Slide clips over ends of mouldings and bend clips over weatherstrip.

Put a piece of twine 60" long in groove of the weatherstrip that fits over body flange and bring ends of twine together and allow them to hang down on the inside of the glass.

Working from outside of car, push the top of the glass and weatherstrip through the top of the opening. Press the glass and weatherstrip firmly into the opening and pull the loose ends of the twine from the inside. The twine will pull the inside lip of the weatherstrip into the body and over the edge of the body opening.

Deposit a small bead of cement all around the outside edge of the reveal moulding. Be careful not to use too much sealer as it may soil the headlining. To clean off sealer use cleaners naptha and a soft sponge.

SEALING REAR WINDOWS

For water leaks between glass weatherstrip and glass, separate weatherstrip from glass and apply Windshield Sealer FS-621 with Feed Gun B-182,

Be careful not to scratch glass and apply only sufficient cement to effect a good seal.

For water leaks between weatherstrip and body flange, carefully lift chromium plated moulding off rubber weatherstrip and apply Windshield Sealer FS-621 under chromium moulding, using Feed Gun B-182.

Excess cement can be cleaned off with cleaners naphtha. Test with a water hose.

GLASS DAMAGED BY CHANNEL SCREWS

Door or quarter glass can be chipped by the channel screws or drive nails becoming loose and the heads rubbing on the glass. Remove the drive screw or nail and cement the glass channel in place with heavy rubber cement FS-621.

DOOR ALIGNMENT

A properly hung door should set so that the door closes easily and completely at the top and the bottom.

The door striker should be set as shown in Figure 307. See "Door Striker Operation," and the door bumpers adjusted.

A door that closes at.the top but not at the bottom should be sprung by placing a block of wood between the door and body at the top and pressing against the lower part of the door with the knee.

A door that closes at the bottom but not at the top, can be adjusted by reversing the above procedure. Block the bottom of the door from the inside and push the top of the door toward its closed position.

The front door has an exterior type lower hinge that is riveted to the front pillar and also to the door.

The front door upper and rear door lower hinges are of the concealed type and the screw holes in the door are oversize, permitting adjustment in and out and up and down in the body opening.

The concealed hinges are attached to the body hinge pillars and doors by Special Oval Head Cross Recess combination screws and in the door to a floating tapping plate on the inside of the door. The tapping plate in the hinge pillar does not float as the holes in the pillar are not oversize.

The fit of the door can be checked by opening the door and with a piece of soft chalk, mark every six inches the outer edge of the body panels across the top of the door, the outer face of the body lock pillar, the outer face of the underbody panel and the corner of the body hinge pillar.

Close the door to its full latched position without slamming so that the door and weatherstrip will contact the chalk lines on the body panels.

Open the door and note the chalk contact or lack of contact the weatherstrip on the door has made with the body panels.

NOTE: The portion of the door not having chalk must be brought closer to the body.

A front door that closes at the top but not at the bottom should be sprung by placing a block of wood between the door and the body at the top and pressing against the lower part of the door with the knee. This will spring the lower external type hinge which is not adjustable. A rear door is adjustable by loosening the hinge screws in the door.

A front or rear door that closes at the bottom but not at the top can be adjusted by loosening the hinge screws in the door and moving the upper part of the door inward.

A front door that sets too close to the hinge pillar and leaves a wide gap at the door lock pillar can be adjusted by placing a small hardwood block between the pillar and the door at the lower hinge. Close the door on the hardwood block and spread the hinge. The upper hinge can be loosened on the door half and the door moved to close the gap.

A front or rear door that has the lock edge too high can be adjusted by loosening the hinge screws in the door and moving the upper part of the door.

A front door that has the lock edge too low can be aligned by spreading the lower hinge and if the condition is on a rear door, by loosening the hinge screws in the door and moving the lower part of the door.

A front door that sets too close to the lock pillar can be aligned by springing the body half of the lower hinge with a fiber block and hammer and moving the door at the upper hinge by loosening the door half of the hinge.

Door Hinge Pins and Bushings

A special hinge pin removing tool B-170, can be used for the front door lower hinge which is of the exterior type. The congealed hinges have to be removed to drive out the hinge pin.

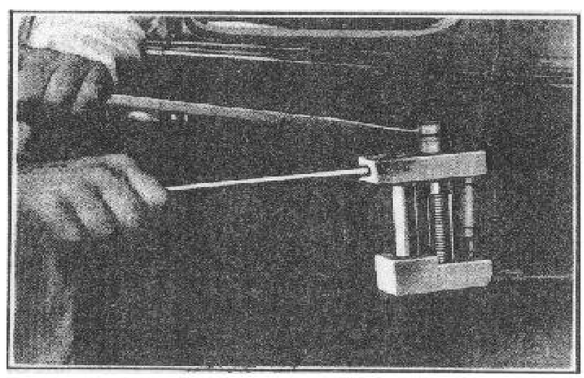


Figure 306
Door Hinge Pin Remover B-170-11

The door half of the concealed hinges are bushed with two bronze oil-less bushings and worn bushings may be re-placed and reamed to fit a standard size hinge pin. To replace concealed hinge bushings it is necessary to remove the hinge from the door and pillar.

Door Striker Operation

In the lock, the bolt (D), Fig. 307, remains stationary (in the extended position) when the door is closed instead of being moved into the lock by the action of its beveled edge against the striker plate as formerly.

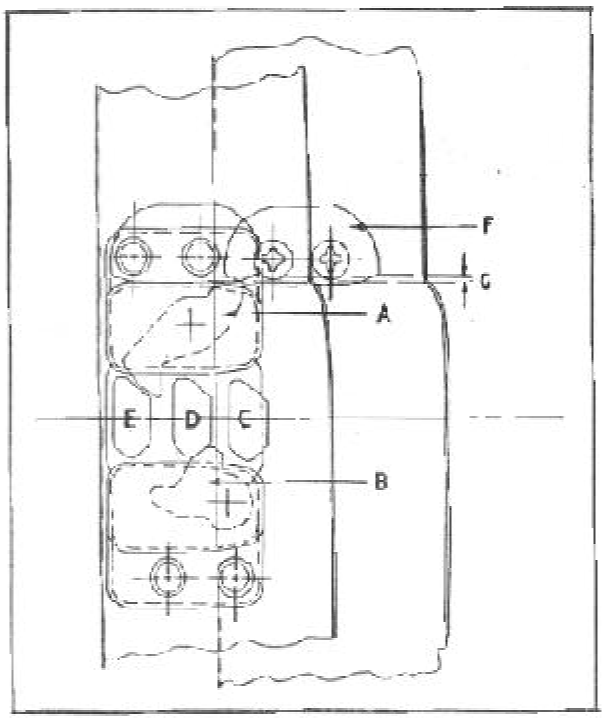


Figure 307
Door Striker Operation

This is accomplished by the use of two pawls or latches which are pivoted in the upper and lower parts of the door striker assembly as shown in (A) and (B), Fig. 309, and held outward by spring pressure.

The lower pawl (B) which is located closer to the outside of the car acts as a safety catch similar to the first position on the old type striker plate.

The upper pawl (A) is located toward the inside of the car and its wedging action against the bevel on bolt serves to keep the door tightly closed.

In Fig. 307, the bolt is shown in three positions, at (C) with the door open, at (D) with the door partly closed and bolt in the safety position and at (E) with the door entirely closed and bolt locked by the wedging action of the upper pawl.

The complete striker assembly, as a unit, is attached to the pillar post by means of four screws (B) Fig. 308, which enter into tapping plates, permitting a considerable range of adjustment both up and down and sideways.

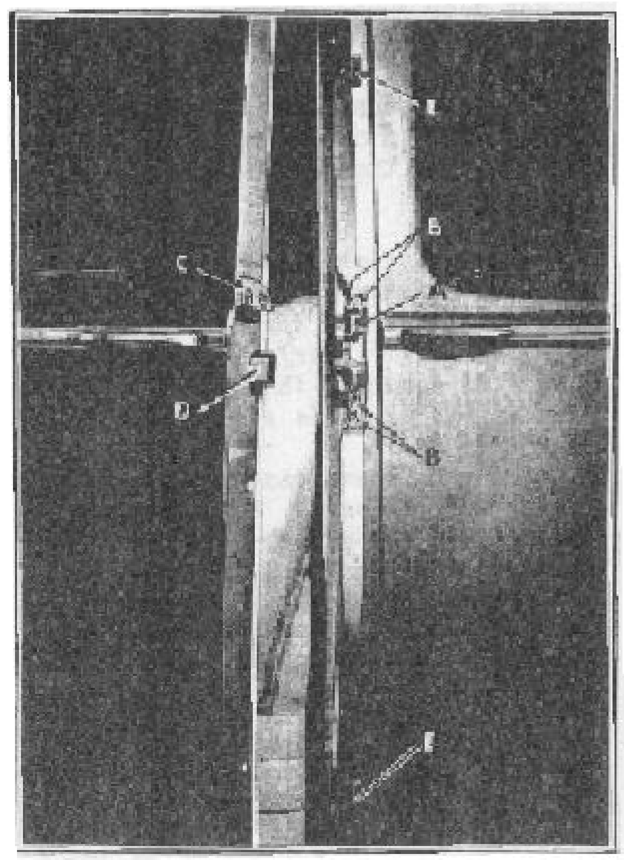


Figure 308
Door Striker Operation

In addition to housing the pawls or latches which control the closing of the door, the striker assembly also acts as one member of the dove-tail, since it carries the weight of the door through the dovetail (F), Fig. 307, which is securely fastened to the door and is not adjustable.

NOTE: When properly adjusted the upper face of the striker will be approximately 1/32” above the bottom face of the dovetail with the door just open, which means that the door will be raised by that amount when closed. This is shown at (G). The wedging action of the upper pawl (A) against the bevel on the bolt provides an automatic take-up and effectually prevents up and down movement of the door and hammering of the dovetail on the striker.

DOOR STRIKER ADJUSTMENT

Set door rubber bumpers (E), Fig. 308, all the way in.

Adjust the striker assembly (A) on the pillar, in as far as it will go, and still permit the door to close and latch very easily.

When making above adjustment, be sure that the striker assembly (A) is set at such a height that the dovetail (C) on the door will interfere by about l/32”. This will result in the door being lifted this amount as it is closed.

Also make sure that the striker assembly is not cocked but is square with the inside edge of the pillar.

After making the above adjustment see if the rubber door bumpers (E) touch the edge of the door flange. If not, set them out until they both touch the flange and exert a slight pressure on the door when closed. The door should still close and latch very easily.

NOTE: To assure doors being properly closed, the striker pawls must pivot freely within the case. If oiling does not produce satisfactory results, install a new striker assembly.

The second cautionary measure is to be sure that doors are not adjusted so that they have to be slammed hard in order to be latched. In this case it is not possible for the upper pawl to catch on the edge of the bolt and seat properly, as shown in Fig. 307.

LOCK BOLT ENGAGEMENT

In cases of insufficient engagement of the door lock bolt, a check of the door lock striker adjustment should be made; see that the door is centralized in its opening and that the lock and handle work freely.

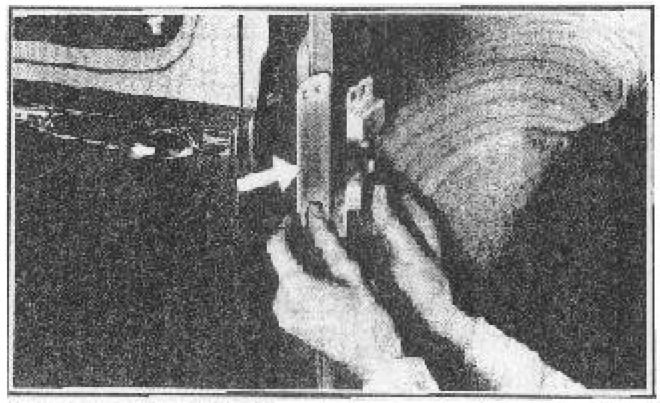


Figure 309
Door Lock Striker Spacer Plate

The lock bolt should extend so that it covers the entire width of the pawl and if it does not a correction can be made by installing a door lock striker spacer plate either 1/8” thick (200181) or 1/16” thick (200298). See Fig. 309.

DOOR LOCK OR OUTSIDE HANDLE BINDING

There are four conditions that can cause stiff or hard operation of the door lock and the outside handle. It is usually difficult to try a lock and determine definitely where the fault is by the feel of the operation. Eliminate the possibilities one at a time in the following order.

1. The door handle may stick when turned and fail to return to its horizontal position. This can be caused by friction between the handle shaft that connects to the lock and the handle escutcheon. Corrosion and dirt will cause friction at this point making the handle hard to operate and sometimes causing it to stick.

Apply a small quantity of dripless oil between the handle and its escutcheon.

2. If the door lock and outside handle still does not operate satisfactorily then remove the door valance (if used) Remove inside handle and regulator handle. Remove garnish moulding. Remove arm rest and door trim panel.

Loosen the two fillister head screws holding door lock (do not remove) on the door inner steel panel. Remove and discard the countersunk head screw holding door lock on the inner steel panel. Loosen (do not remove) the two screws holding the door dovetail.

Work the door handle back and forth three or four times to align the lock with the handle. Tighten up the four screws (two in door lock and two in dovetail).

3. If the door lock and outside handle still binds then the door handle shank is out of line with the recessed catch in the door lock.

This out of line condition is due to the manner in which the outside handle is fastened to the outer panel and the lock is fastened to the inside panel. The two points must line up or binding will occur.

An aligning tool can be easily made of 1" round steel about 14 inches long.

Remove the outside handle. Insert from the outside the aligning tool so that one end fits into the recess in the door lock. Force the lock into a lined up position with the handle hole. Before replacing the outside handle check for free operation in the escutcheon and lubricate thoroughly.

4. Check for binding inside the door lock by removing the handle and inserting a large screw driver in the slot in the lock and testing the lock for free operation. If the binding is in the lock itself it should be removed, cleaned and lubricated at the same time freeing up any points where hard operation or sticking is noticed.

The sticking will generally be found at the rivets holding the various working parts in position as shown in Fig. 310.

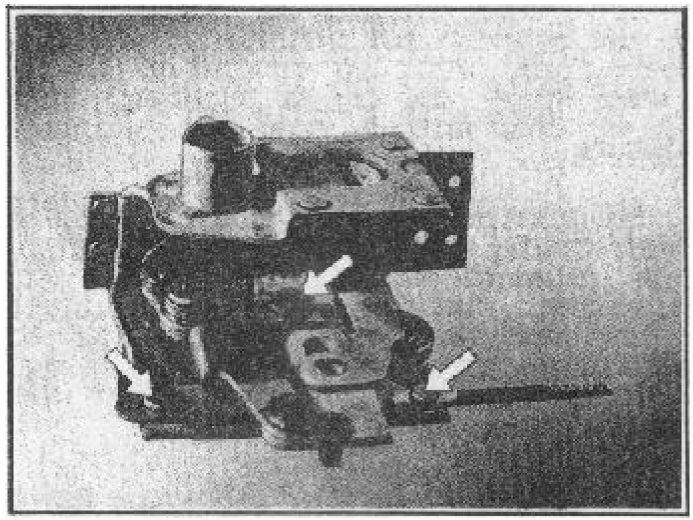


Figure 310
Door Lock

DOOR CYLINDER LOCK REMOVAL

Loosen the set screw in the edge to the door (See Fig. 311).

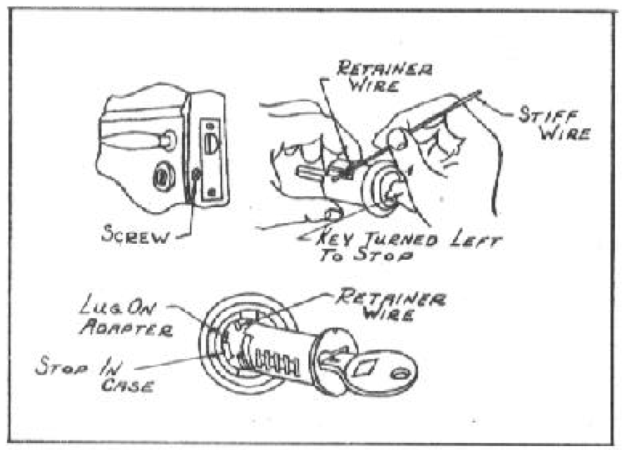


Figure 311
Door Safety Lock Details

With a stiff wire pry up the retainer wire and turn the key to the left to stop, then pull the cylinder out of the case.

Release the wire retainer.

Ignition Lock Cylinder

To remove and replace see “Electrical Section”. Page 129.

Blank Lock Cylinder

For doors and ignition locks.

The coding is done by placing a key in the cylinder and cutting off the tumblers flush with the outside of the cylinder while the key is in place. This can be done with a file and a suitable fixture.

The fixture Is made from a piece of brass tubing two inches long with an inside diameter of 1/2" and 1/16" wall thickness. Cut a slot the entire length of the tube 3/8" wide and taper the edges with a file. Now file another slot directly opposite the first 3/16" wide and 3/4" long.

To cut the tumblers, place the key in the cylinder. Then place the cylinder in the end of the fixture having the short slot. The cut edge of the key blade must be toward the long slot in the fixture for the first filing operation.

Place the fixture in a vise with the long slot up and file the tumblers flush with the contour of the cylinder. Do not cut too deep as this will make it impossible to cut the other end of the tumblers deep enough.

Remove the cylinder and place it in the opposite end of the fixture with the other end of the tumblers protruding through the long slot. File these flush with the contour of the cylinder. Check for burrs on the ends of the tumblers and make sure the tumblers work freely.

To reinstalls cylinder in an ignition lock, insert the key in the cylinder and the cylinder in the housing and turn in the direction of locking.

The key change symbol is stamped on the lock cylinder case and indicates the key series.

Key Cutter J-775 and Code Finder J-776 are recommended for making replacement keys.

Locker Box Lock (In Dash)

TO REMOVE

Remove screws and cups holding the lock.

Hold lock as shown in Fig. 312. Lift up the hook and turn the key to the right. Pull out the cylinder.

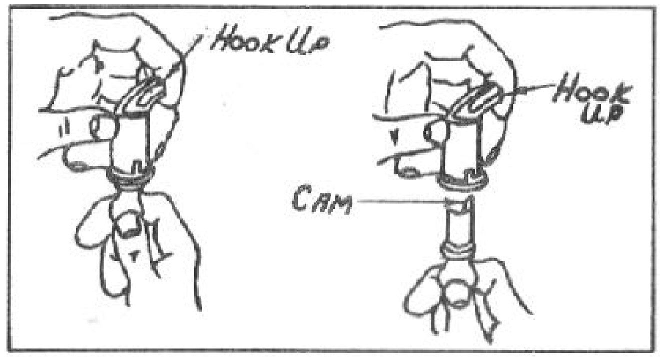


Figure 312
Locker Box Lock Details

TO REPLACE

Hold the lock in the same manner as shown in Fig. 312. With the key in the cylinder, line up the cam with the front of the hook.
Insert the cylinder and turn to the left until the stop is reached.

TRUNK AND REAR COMPARTMENT LOCK REMOVAL

Open the trunk or rear compartment door.

Remove the screws holding the shield, see Fig. 313. Take out the cotter pin and washer to release the link.

Take out screw holding the lock bolt and pull out the cylinder, being careful not to lose the spring washer.

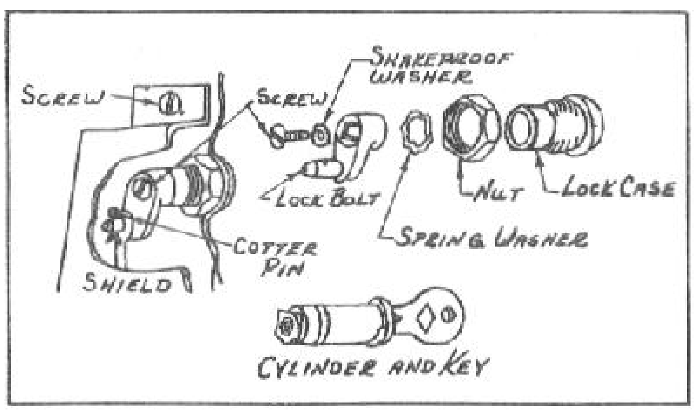


Figure 313
Rear Compartment Lock Details

The large nut holds the case in the trunk lid.

To replace the trunk or rear compartment lock, assemble the parts as shown in Fig. 313.

TO INSTALL DOOR LOCK CYLINDER ON LEFT FRONT DOOR

1. Remove valance, door trim, inside hardware.

2. Slide door outside belt moulding back and remove door handle. Remove dovetail.

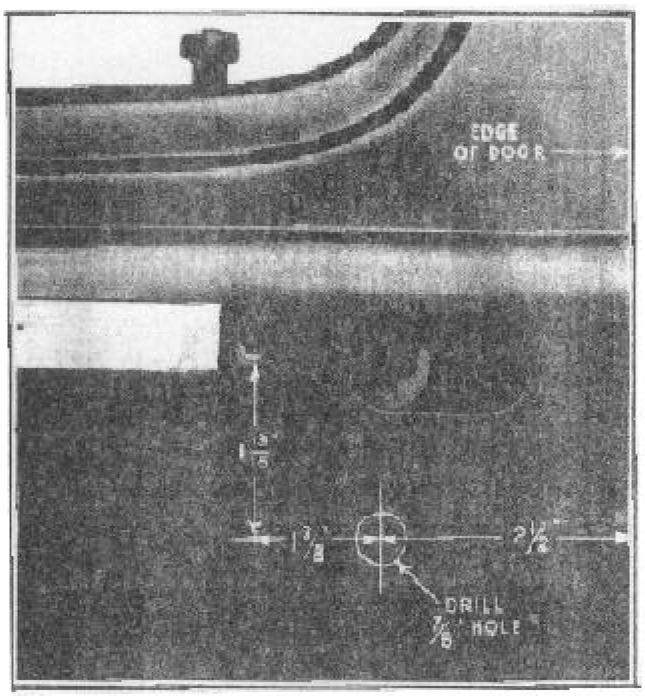


Figure 314
Installing Lock Cylinder
on Left Front Door

Figure 315
Installing Set Screw for Left
Front Door Lock. Cylinder

3. Remove lower glass run screw (under felt). Remove door lock screws and allow old door lock to drop down.

4. Measure 1-13/16" down from the edge of the hole as shown in Fig. 314. Then measure 1-3/8" over from this line as shown in Fig. 314 and mark this point to be certain that it is correctly located. It must be 2-1/2" from the outer edge of the door.

5. Center punch the point and use a 7/8" hole saw and cut through the outer panel.

6. Draw a line that continues the center of this hole onto the door pillar so that a place for drilling a hole for the lock set screw may be located.

7. Locate this set screw hole 1/2" in from the door edge as shown in sketch and after rechecking to be certain that is directly in line with the cylinder hole, drill a 3/8" hole as shown in Fig. 315.

8. Install lock and check for free operation.

DOOR ARM REST

Door Arm Rest is held to the steel inner panel of the door by two steel "L" shaped brackets. One end of the bracket bolts to the door steel inner panel. The other end extends through the door trim panel and the arm rest is bolted from underneath to this bracket. The bolt is put in from the bottom, passes through the bracket, into the arm rest block where it is held by a tapping plate.

QUARTER ARM REST

Quarter Arm Rest is bolted from under the wheelhouse. There are two bolts that are inserted thru holes in the quarter panel wheel housing to hold the arm rest solidly to the body.

QUARTER TRIM

Quarter Trim is retained by sheet metal drive screws in the edge of the body pillar with a drive nail at the top to hold it to the body header steel panel. A spring clip holds the upper and lower rear corners in place.

DOOR TRIM PANEL

Door Trim Panel is fastened by clips to the inside door steel panel. No sheet metal drive screws are used. The panel is removed_ by taking off the garnish moulding. Remove inside door and window regulator handles. Remove arm rest. Pry the trim panel away from the door frame, unsnapping the concealed wire fasteners. These fasteners are at both sides and at the bottom of the panel. The panel may then be removed by pulling outward and down.

WINDOW REVEAL MOULDINGS LOOSE

If the window reveal mouldings are loose or sprung out, use the service moulding clip No. 134296, which is made of round spring wire, and is easy to install, holding the moulding close to the reveal when snapped in place.

Water and Dust Getting Into Body

Adjust doors by loosening the screws and moving the striker and rubber bumpers in as far as possible consistent with proper lock operation. This will bring the greatest part of the door edge in closer contact with the windlaces and weatherstrips.

Use plastic body sealer 122299, for sealing openings around the fender and stone guard bolt, also the rear moulding screws.

Use 163376 grommet, if there is any opening between the gasoline tank filler neck and the compartment floor.

Water or dust that enters the rear compartment at the tail lamp mounting can usually be eliminated by cementing the gasket to the tail lamp and tightening the stud nuts evenly.

Use underbody Sealer FS-1041 at all openings around the bolt holes in the rear compartment. Seal any opening that may exist at the joint of the quarter panel and the rear compartment opening (this will be noticed in the trough at the edge of the rear compartment.)

NOTE: On some four door sedan bodies there are two 13/64" holes in the rear quarter panel above the rear wheel and directly under the rear quarter arm rest. These holes should be plugged with 100782 rubber hole plug. Some cars have rear compartment door weatherstrips which tend to buckle allowing water and dust to get in the rear compartment. In such cases replace with a new weatherstrip.

Door Wing – Friction Type

TO REMOVE

1. Remove inside door lock handle and regulator handle.
2. Remove garnish moulding.
3. Remove door trim panel and regulator handle spring.

4. Loosen door wing screws inside of door (A). Fig. 316,

5. Open wing and press down to release from pivot at top.

6. Pull wing outward and upward and remove.

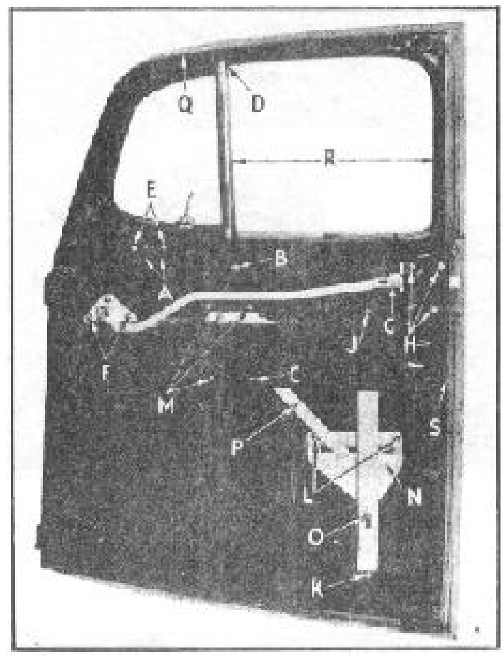


Figure 316
Front Door

A. Door wing clamp bolt
B. Wing center bar glass run screw
C. Wing center bar glass run screw
D. Wing center bar glass run clip
E. Wing clamp to cross member bolt
F. Remote control screws
G. Remote control to door lock connection
H. Door lock screws
J. Window regulator track screw
K. Window regulator track screw
L. Window roller guide to door glass channel screw
M. Door window regulator screws
N. Window roller guide
O. Window regulator track
P. Door window regulator arm
Q. Wing retainer screw
R. Wing center bar glass run
S. Door window glass run clip
T. Door window glass run

To install, reverse procedure of removal.

WING WEATHERSTRIP RETAINER ASSEMBLY REMOVING

1. Remove inside door handle and regulator handle.

2. Remove garnish moulding.

3. Remove door trim panel and regulator handle spring.

4. Remove screw (Q), Fig. 316, at top of door.

5. Remove screws (B) and (C).

6. Bend open felt channel clip (D) at top of door.

7. Remove felt channel.

8. Remove screws (E) and remove wing clamp.

9. Loosen screws (A).

10. Tilt wing and retainer assembly toward outer edge of door and lift out.

WING WEATHERSTRIP RETAINER ASSEMBLY INSTALLING

1. Install wing and retainer assembly and secure with screw at (Q) Fig. 316.

When replacing new assembly be careful not to bend channel.

2. Install channel and reclip at (D).

3. Install screws (B) and (C).

4. Install wing clamp and secure with screws (E).

5. Tighten screws (A),

6. Install regulator handle spring and trim panel.

7. Install garnish moulding, valance and trim panel.

8. Install inside door lock handle and regulator handle.

DOOR WING AND REGULATOR REMOVAL CRANK TYPE

1. Remove inside door lock handle and window regulator handle and door wing handle held on by Phillips head screw.

2. Remove door valance and garnish moulding.

3. Remove door trim panel and remove window regulator handle spring.

4. Remove two screws (A), Fig. 316, attaching regulator to door panel.

5. Open wing and press down to release from pivot at top.

6. Pull wing outward and upward and remove.

To install reverse procedure of removal.

DOOR WING GLASS REMOVING AND REPLACING

The old glass may be removed by inserting gasoline on both sides of the filler seal in order to soften it.

Remove the old glass and thoroughly clean the channel with sandpaper. Remove all rust.

Use Everseal glass channel filler in either 1/32", 1/16" or 3/32" thickness depending upon the glass thickness. Cut this filler about two inches longer than is necessary and pinch the ends together with the fingers so as to hold the ends while the glass is being pushed into the frame.

The glass can be installed without special tools if the proper thickness of filler is used.

Apply a coat of S.A.E. 10 engine oil to the inside of the wing channel. This will enable the material to slide freely into the channel.

Push the glass with the filler into the channel until it is firmly seated.

The oil softens the filler and causes the rubber to swell making a tight water- seal.

Trim off the excess filler material.

It requires 24 hours for the oil to make the rubber filler swell so water leak tests should be made after that time.

FRONT DOOR GLASS REMOVING

1. Remove inside door lock handle and window regulator handle.

2. Remove door window garnish moulding.

3. Remove door trim panel, valance and window regulator handle springs.

4. Remove screws (J), (K), and (L), Fig. 316 and remove window regulator track (0) and window roller guide (N).

5. Remove window regulator arm (P), Fig. 316.

6. Loosen screws (B) and (C) and remove window by lowering.

FRONT DOOR GLASS REPLACING

1. Replace window glass in the glass run channel (R), Fig. 316.

2. Tighten screws (B) and (C), Fig. 316.

3. Lower the regulator arm (P).

4. Replace window regulator track (0) and window roller guide (N), connecting the regulator arm (P) to the roller guide (N) and fasten with screws (J), (K) and (L).

5. Replace trim panel, garnish moulding, regulator handle springs, inside lock handle and regulator handle.

FRONT DOOR WINDOW REGULATOR REMOVING

1. Remove inside door lock handle and regulator handle.

2. Remove door trim pad from valance (clipped on).

3. Remove trim panel and regulator spring.

4. Remove screws (J), (K), and (L), Fig. 316 and remove regulator track (0) and window roller guide (N).

5. Remove screws (M and C) and remove regulator.

FRONT DOOR WINDOW REGULATOR INSTALLING

1. Install regulator and secure with screws (M and C), Fig. 316.

2. Install regulator track (0) and roller guide (N), connecting regulator arm to roller guide.

3. Install screws (s), (K) and (L).

4. Install regulator handle spring and trim panel.

5. Install garnish moulding and valance.

6. Install inside door lock handle and regulator handle.

FRONT DOOR LOCK AND REMOTE CONTROL REMOVING

1. Remove inside door lock handle and regulator handle.

2. Remove door trim pad from valance (clipped on).

3. Remove trim panel and regulator handle spring.

4. On right hand front door only remove set screw at door edge and remove safety lock cylinder.

5. Remove outside door handle.

6. Remove door dovetail.

7. Remove remote control assembly.

8. Remove screws (H), Fig. 316.

9. Remove lower channel retaining clips Fig. 316, located inside door frame.

10. Remove remote control screw (F) Fig. 316.

11. Raise lever up and remove remote control from lock at (G).

12. Remove door lock by dropping lock down.

FRONT DOOR LOCK AND REMOTE CONTROL INSTALLING

1. Replace door lock in position.

2. Install screws (H), Fig. 316.

3. Install lower channel retaining screw (S).

4. Install remote control on lock.

5. Place remote control in position and install screws (F), Fig. 316.

6. Install door dovetail.

7. Install outside door lock handle.

8. Install safety lock cylinder and replace set screw.

9. Install regulator handle spring and trim panel.

10. Install inside door lock handle and regulator handle.

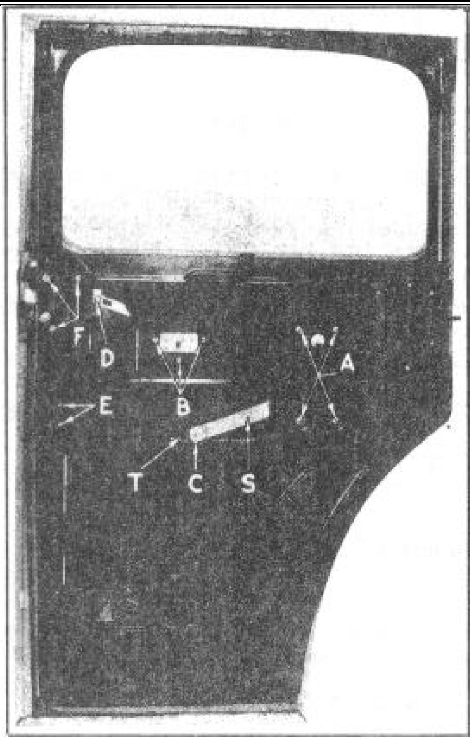


Figure 317
Rear Door

A. Window regulator screws
B. Remote control screws
C. Window regulator arm to glass rest channel connection
D. Remote control to door lock connection.
E. Glass run screws
F. Door lock screws
S. Window regulator arm
T. Glass rest channel

REAR DOOR WINDOW REGULATOR REMOVAL

1. Remove inside door lock handle and window regulator handle.

2. Remove door trim pad (clipped on).

3. Remove door trim panel and window regulator handle spring.

4. Lower the window glass.

5. Remove screws (A), Fig. 317.

6. Release regulator arm (5) from lower glass run channel (T) and (C), Fig. 317.

REAR DOOR WINDOW REGULATOR INSTALLING

1. Install regulator arm (S) in channel (T), Fig. 317.

2. Install four regulator screws and washer (A).

3. Replace regulator handle spring and install trim panel.

4. Replace inside door lock handle and window regulator handle.

REAR DOOR GLASS REMOVING

1. Remove inside door lock handle and window regulator handle.

2. Remove door window garnish moulding.

3. Remove door trim panel and window regulator handle springs.

4. Lower the window, pull in at the top, and raise, so as to free the window glass from the channels.

5. Raise the window as far as possible.

6. Use a screw driver and pry the regulator arm (S) out of the lower glass run channel (T), Fig. 317.

7. Loosen glass run screws (E), Fig. 317.

8. Raise glass and remove.

REAR DOOR GLASS REPLACING

1. Replace window glass in the glass run channel (T) Fig. 317.

2. Install regulator arm (S) Fig. 317 in the glass run channel.

3. Tighten screws (E).

4. Replace trim panel, garnish moulding, regulator handle, springs, inside door lock handle.

REAR DOOR LOCK REMOTE CONTROL REMOVING

1. Remove inside door lock handles and regulator handles.

2. Remove door trim panel and regulator handle spring.

3. Remove screws and nuts (B) Fig. 317.

4. Disconnect remote control from door lock at (D).

5. Remove remote control.

REAR DOOR LOCK REMOTE CONTROL INSTALLING

1. Place remote control on door lock at (D).

2. Install screws and nuts (B).

3. Replace regulator handle spring.

4. Install trim panel and garnish moulding.

5. Install inside door lock handle and regulator.

REAR DOOR LOCK REMOVAL

1. Remove inside door lock handle and regulator handle.

2. Remove trim panel garnish moulding and regulator spring.

3. Remove outside door lock handle.

4. Remove remote control.

5. Remove door dovetail.

6. Remove screws and nuts (E), Fig. 317.

7. Remove screws (F).

8. Remove door lock.

REAR DOOR LOCK INSTALLING

1. Install door lock and replace screws (F).

2. Install screws and nuts (E). Fig. 317.

3. Install remote control.

4. Install door dovetail.

5. Install outside handle.

6. Install regulator handle spring.

7. Install door trim panel and garnish moulding.

8. Install inside door lock handle and regulator handle.

Rear Quarter Window - Solid Type

TO REMOVE

Release rubber lip at outside--using a screw driver or another blunt instrument--breaking loose cement seal. Insert two screw drivers behind rubber weatherstrip at top of seal, catching screw driver under flange of window opening. Pry down on screw driver and with rubber hammer tap out window.

TO INSTALL

Clean cement from window opening flange. Place coat of cement around window opening flange. Apply a coating of sealer FS-621 in glass groove in weatherstrip. Place a piece of strong twine around weatherstrip in groove of outer lip. From inside of body press glass into place. Hold in place and pull twine apart, pulling lip of rubber moulding over flange of window opening.

With rubber hammer, lightly tap around edge from outside to securely seat glass.

Rear Quarter Window - Sliding Type

TO REMOVE

1. Remove rear seat back retaining screws and remove rear seat back.

2. Remove regulator handle.

3. Remove garnish moulding.

4. Remove assist strap.

5. Remove trim panel retainer screws from door frame.

6. Remove screws underneath fender attaching arm rest, and remove arm rest.

7. Untack trim panel at top and bottom of window frame.

8. Remove trim panel, first removing ash tray.

TO INSTALL

1. Install window and attach to regulator with two screws.

2. Install drain trough to window frame.

3. Place window frame assembly in position from inside and fasten with bolts.

4. Install bolt retaining rear of frame to seat back tray reinforcement.

5. Retack headlining to top of window frame.

6. Place regulator handle spring and trim panel in position and install ash tray.

7. Install trim panel retainer screws.

8. Retack trim panel at top and bottom of window.

9. Install arm rest and fasten with two bolts underneath fender.

10. Install garnish moulding regulator handle, and assist strap.

11. Install seat back and secure to floor with screws.

12. Install seat riser and seat cushion.

QUARTER WINDOW REGULATOR REMOVING

1. Remove rear seat cushion and back.

2. Remove regulator handle and garnish moulding.

3. Remove trim panel and regulator handle spring.

4. Remove two screws from underneath fender attaching arm rest and remove arm rest.

5. Remove two screws at each end of regulator support.

6. Lower window and remove regulator arms from window and remove regulator.

QUARTER WINDOW REGULATOR INSTALLING

1. Place regulator arms in glass channel tracks.

2. Install two screws attaching regulator support to window frame.

3. Install regulator handle spring and trim panel.

4. Install arm rest and install two screws underneath fender attaching arm rest to wheelhouse.

5. Install garnish moulding and regulator handle.

6. Install rear seat back and cushions.

Quarter Window Drain Troughs

The drain troughs on models using a sliding quarter window are of rubberized sheeting and are tacked to the quarter window frame. The rear end of the trough is closed. The bottom of the trough slopes to the front and the front end should be placed between the outside quarter panel and door pillar to permit water to drain into a steel trough welded at the front of the wheelhouse. One side is cemented to the quarter window frame and other side to the quarter panel.

Top Bows

Top bows are attached to brackets on the body header by bolts, nuts, and washers. On two door sedan models the rear top bows are fastened to the rear quarter window frames with screws and nuts.

The top bows support the headlining and act as a support for the top silencing pads which are cemented to the body top panel.

HEADLINING REMOVING

1. Remove dome lamp.

2. Remove inside visor and rear view mirror.

3. Remove windshield finish mouldings.

4. Untack headlining at windshield header.

5. Remove body header trim retainer attaching screws from body headers and front pillars.

6. Remove quarter window finish mouldings and loosen quarter trim panels at top edge.

7. Remove rear window and weatherstrip.

8. Remove rear seat back tray trim Panel.

9. Lift windlace and headlining and header trim retainers off header flange.

10. Loosen headlining from cement at window openings.

11. Loosen top bows on one side only,

12. Slide headlining off top bows.

HEADLINING INSTALLING

1. Slide headlining onto top bows.

2. Cement headlining in position in rear window and on quarter window models with solid quarter windows. Also tack headlining to quarter window openings with sheet metal nails. On models with movable quarter windows tack headlining to frame.

3. Install rear seat back tray trim panel.

4. Install rear window.

5. Cement headlining to quarter window frames.

6. Assemble body header trim retainers in slots in cardboard strips on headlining and windlace and place in position on flange of body headers.

7. Install body header trim retainer screws in body headers and front pillars.

8. Place quarter trim panels into position.

9. On cars with movable quarter windows install finish mouldings.

10. Install windshield finish mouldings.

11. Install rear view mirror and inside visor.

12. Install dome lamp.

Air-Foam Seat Cushion Pad

Can be installed on any model not so equipped, by removing the cushion trim held on by wire ring clips at base of seat spring frame.

The use of an air foam pad necessitates the use of a protector over the cushion spring. The air foam pad is placed on top of this protector and the cloth skirt of the air foam pad is tied with wire "hog rings" completely around to top.
The cushion cover has tabs that fasten to the bottom of the cushion frame with the "hog rings". Fit the cover carefully so that the pleat lines of the cover are in the air foam pad crevices.

CARE OF THE CAR INTERIOR

Periodic cleaning of the car interior is as important as the many other maintenance items that should be performed on a motor car.

Dust allowed to accumulate on the upholstery cloth gradually finds its way between the fibres, and its abrasive action will result in early deterioration of the cloth. By vacuum cleaning, or using a whisk broom to clean the cloth, the life can be increased and pleasing appearance retained.

Spots on upholstery cloth can be removed easily by following few practical suggestions.

Avoid the use of gasoline as most brands are tetra-ethyl of lead which is injurious. Avoid the use of hot water and soap unless specifically specified. Avoid the use of ammonia unless specifically specified.

NOTE: ALWAYS RUB WITH THE NAP - NEVER AGAINST IT.

The following procedure should be followed in removing spots and stains:

Grease Spots and Oil

Excessive grease should be scraped off with a dull knife. A cloth moistened with HUDSON UPHOLSTERY CLEANER should be applied to the spot and rubbed lightly in the direction of the nap.

Chewing Gum

Moisten the gum with a few drops of HUDSON UPHOLSTERY CLEANER and scrape it off with a dull knife.

Candy (except chocolate)

Should be removed by rubbing with a cloth and very hot water. If an oily spot remains after drying, sponge lightly in the direction of the nap with HUDSON UPHOLSTERY CLEANER.

Chocolate stains should be sponged with LUKEWARM WATER. After drying, sponge lightly with HUDSON FABRIC CLEANER.

Ice Cream

These stains should be removed by sponging with lukewarm soap suds (neutral soap). Rinse with cold water and allow to dry. If an oil spot remains, sponge it with HUDSON FABRIC CLEANER.

Blood

Sponge with a cloth moistened in (COLD WATER).

Apply a few drops of ammonia to the stained area and sponge again with COLD WATER.

CAUTION: Warm water will set the stain.

Fruit and Wine

Apply a little lukewarm water directly to the stain. Rub the spot lightly with a cloth moistened in lukewarm water. Allow it to dry, then sponge lightly with HUDSON FABRIC CLEANER.

CAUTION: Soap or excessive heat applied to fruit stains will cause the stain to spread and set.

Cosmetics

To remove lipstick and other grease cosmetics, apply a little HUDSON FABRIC CLEANER and absorb it with a blotter. Repeat as necessary to obtain satisfactory results.

Rust

These stains should be removed by sponging with a cloth and warm soap suds (neutral soap).

Leather and Imitation Leather

To clean leather and imitation leather, use lukewarm water. Neutral soap suds may be used sparingly. An occasional application of saddle soap will help to preserve the surface and prevent deterioration.

Care of Folding Tops

Soiled spots on Convertible model folding tops are often permitted to remain for fear of discoloring the top material.

The application of Hudson Dry Cleaner on soiled spots will remove them satisfactorily. The proper method is to select an area slightly larger than the area to be cleaned and rub lightly in a circular manner, gradually working toward the center.

Chromium-Plated Finish

Requires little attention other than an occasional wiping off with a damp cloth. In winter in certain localities when salt and calcium chloride is used to melt ice and snow, these parts should be cleaned more frequently to prevent corrosion and rust.

Bumper bars frequently become scratched and scuffed, due to contact with other cars and if the damaged areas are not protected rust may accumulate and produce an unsightly appearance. A coating of clear lacquer or application of HUDSON CHROME POLISH will give the needed protection. If rust has already appeared, cleaning the area with HUDSON CHROME POLISH, which contains no grit or harmful chemicals, will remove the rust and prevent its reappearance.

Care of the Finish

The high luster finish (lacquer) on HUDSON cars can be preserved indefinitely if given proper attention.

Avoid wiping the finish when it is heavily coated with dust - it is better to wash it carefully to avoid scratching. Spilling anti-freeze solutions or alcohol on the finish is extremely dangerous and great care should be taken when adding or checking these solutions, The spots should be rinsed. immediately with large quantities of water.

Due to a slight dulling of the finish after exposure to the weather, it is recommended that the finish be occasionally cleaned and polished with HUDSON CLEANER AND POLISH to restore the luster.

Hudson polishes are carefully compounded and are entirely free of destructive acids and abrasives. Avoid the use of so-called "speed cleaners and polishes" as they do a quick job of cleaning but at the same time remove considerable of the lacquer. Avoid polishing the oar if it has been standing in the sun. It is better to apply the polish when the body has cooled.

Touched Up Paint

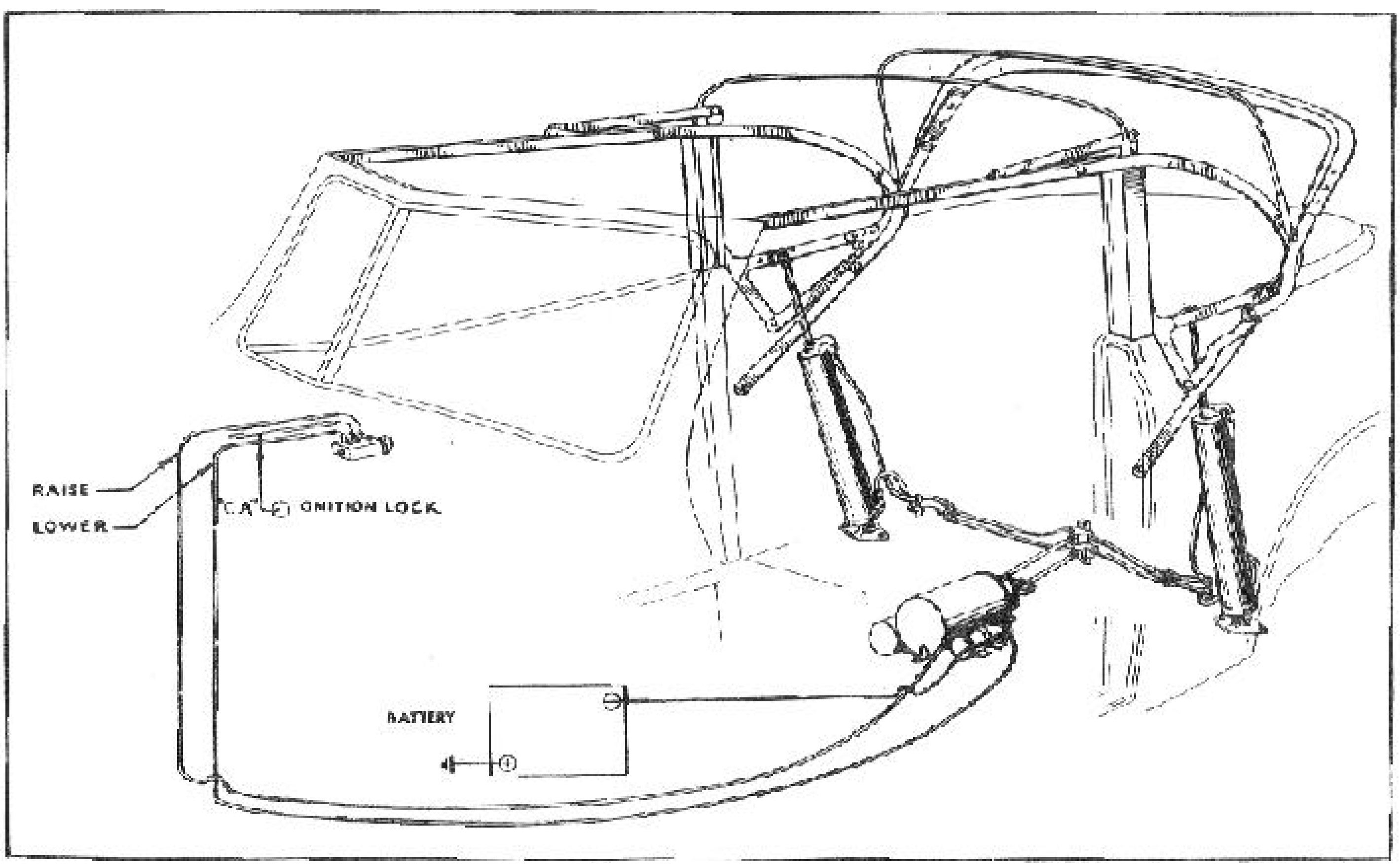
Touched up paint needs a period of time to "set" and to permit the colors to blend and this is particularly true. of spots that have been touched up on new cars. Time is necessary for blending in with the original color and no attempt should be made to retouch or polish out these spots before the 1500- mile inspection period. Tests have shown that touched-up spots will blend perfectly if this length of time is allowed with the car in the owner's use.

NOTE: If unsatisfactory paint conditions on new cars are noticed or called to attention by the car owner he should be told that "green" paint required time to set and blend and that such conditions are best taken care of at the 1500 mile inspection because any attempt to rework the paint before that time frequently results in more dissatisfaction because of the impossibility of blending satisfactorily.

REAR QUARTER WINDOW - FORE AND AFT SLIDING TYPE REMOVAL

Take out the garnish moulding. Remove the window knob and the trim retainer screws that are in the edge of the body pillar. Remove the arm rest (screws are in the top of the wheelhouse). Loosen the quarter trim and headlining (cemented to window frame). Remove four screws that hold the frame assembly to the quarter panel. Remove the frame with glass assembly to a bench and remove the glass in its channel from the rear end of the frame.

CONVERTIBLE FOLDING TOPS



Power Unit

Has a reversible electric motor in the center with fluid reservoir on one side and 2 solenoids on the other. It is mounted under the rear seat cushion to the left of the center of the car. One solenoid permits clockwise rotation and the other counter-clockwise.

Two Hydraulic Cylinders

Lower and raise the top. They are pivoted at the lower end to a bracket attached to the floor which permits the cylinder to assume a more vertical position when the top is lowered. The upper end of the cylinder piston rod projects out of the top of the cylinder and is connected to the top upper hinge brace through a connector yoke.

Each cylinder is double acting, with hydraulic fluid lines connected at the top and bottom ends. These hydraulic lines lead to a valve assembly which is attached to the gear pump mounted on the rear end of the power unit. The line attached to the upper end leads to the left hand or lower fitting on the valve while the lower line leads to the right hand or upper connection on the valve. The system is kept full of fluid by means of a reservoir connected by a single tube to the valve.

Control Switch

Control of the motor for raising the top by forcing fluid into the lower end of the cylinder and for lowering by injecting fluid into the upper end is by means of a two-way switch located on the bracket mounted on the instrument panel. The neutral position of the switch is in the center at which point it is held by springs within the switch.

NOTE: Pushing in the switch all the way lowers the top and pulling it out raises the top.

Because of the two-way principle of the switch it must be held out or in all during the lowering or raising operation.

NOTE: The top can be lowered and raised with or without the engine running but the car MUST BE STATIONARY BEFORE OPERATING THE MECHANISM to prevent damaging the top. As the control switch knob is pushed in, the circuit to the rear or lowering solenoid on the power unit is closed, causing the motor to operate the gear pump drawing fluid from the reservoir and pumping it from the right hand or upper connection of the valve, through the lines to the upper fittings of the hydraulic cylinders. The fluid creates a pressure against the upper surface of the piston and forces the piston rod downward into the cylinder, displacing the fluid below the piston and lowers the top.

The reverse action holds true when the top is raised. That is, the front or raising solenoid is energized, re¬sulting in the power unit changing its direction of rotation, causing the gear pump to force the fluid through the left hand or lower connection of the valve, through the lines to the lower fittings of the cylinder, thereby displacing the fluid above the piston. This pushes the piston rod out of the top of the cylinder, causing the top to be raised into position.

Rear Quarter Curtains

When the top is fitted with the rear quarter windows, these automatically lower and raise with the top as they are attached to the pillar slats.

A weatherstrip is sewed into the top material above the quarter windows on each side and this weatherstrip should be pressed into the groove in the window frame. This can be done by running the finger over the top of the weatherstrip, starting at the front.

On 1942 models not equipped with the quarter windows the top side quarters are held down with four slide fasteners on each side. As the top is lowered the fasteners on the top automatically slide out of the fasteners attached to the body. These must, however, be snapped into place after the top has been raised.

OPERATION

TO LOWER TOP

1. Unlatch center top hold-down clamp followed by two end clamps from windshield header.

2. Raise header slightly by hand until it is free of locating dowels on top of windshield.

3. Loosen zippers and drop rear cur¬tain; unfasten snap fastener outside of body at right and left rear quarter.

4. Push in control switch knob on instrument panel and hold in this position until top is completely lowered.

5. Install top boot.

TO RAISE TOP

1. Remove top boot and see that top is free.

2. Pull out control switch knob and hold in this position until header is within 1/2" of the windshield.

3. Secure rear window zippers and attach snap fasteners, right and left quarter outside of body.

4. Open both front doors to avoid damaging wind cord as top is fastened down.

5. Grasp two end top hold-down clamps and pull top down over locating dowels and fasten all three clamps in place.

NOTE A. If car is equipped with rear quarter windows press weatherstrip into groove at top of quarter windows, starting at front.

B. If car is not equipped with rear quarter windows four fasteners on each side must be snapped into place

If for any reason the power unit should become temporarily inoperative, the top maybe raised or lowered by hand.

CAUTION: Hand operation must be done slowly.

Any rapid movement or unnecessary force will cause a valve action that make the top extremely difficult to move.

Servicing

TOP DOES NOT LOWER OR RAISE FREELY

1. When lowering be sure header is off of locating dowels. When raising be sure top is free. This can be checked by raising header slightly by hand.

2. Be sure top iron joints are free and not binding.

3. Check lower connection to be sure that no bind exists at that point.

4. Check all line fittings for loose connections or fluid leaks. Also check reservoir fluid level. It should be at least half full at all times.

NOTE: Use only Hudson Hydraulic Top Lift Fluid, part 162016.

5. Check all pipes and hose for kinks.

6. Disconnect piston rod at yoke and check piston rod for alignment In upper end plate.

TOP REFUSES TO LOWER OR RAISE

1. If motor operates satisfactorily, check reservoir for fluid. Reservoir should be at least half full. Check for possible leakage at connections or damaged pipes.

2. If motor operates too slowly or does not operate at all, check condition of battery. Also check feed wire from center terminal of switch to "GA" post of ignition switch.

3. If motor works one way but not the other, check front and rear terminals and leads at solenoids.

Be sure all connections are tight and grounds are clean and tight. See Wiring Diagram, Fig. 318.

HYDRAULIC CYLINDER

REPLACING

1. Remove seat cushions and lazy back cushion.

2. Remove the rear quarter trim panels.

3. Remove the hose connections at the top and bottom of the cylinder. Hang hose in container to prevent fluid from running on car floor.

4. Remove the screw attaching the yoke at the upper end of the piston rod and remove the yoke.

5. Remove the cotter pin, plain washer and clevis pin attaching lower end of cylinder to body bracket. Lift out the cylinder.

NOTE: To reinstall, reverse the procedure of removal.

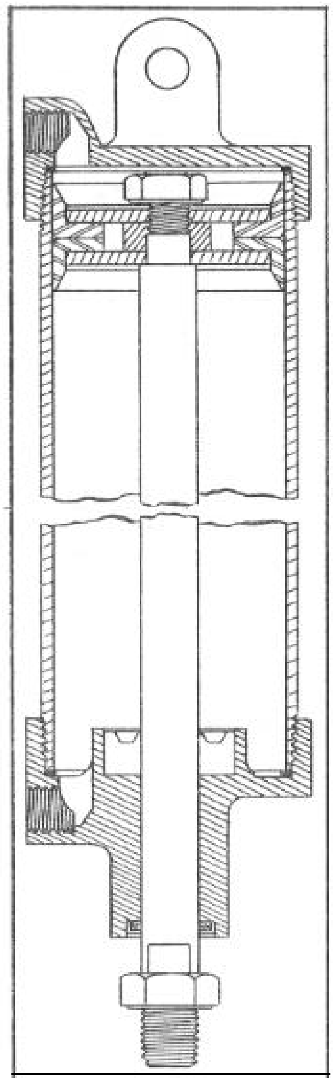


Figure 319
Convertible Top Hydraulic Cylinder

Be sure that lower cylinder connection is free to permit movement of cylinder before attaching yoke at upper end. Also make sure that the hose connections are secure and not kinked.

To expel air from lines, raise top part way and then work top back and forth slightly by alternating position of switch knob.

NOTE: Individual parts of the Hydraulic Cylinder are not supplied separately. In event this assembly requires servicing, replace entire unit.

POWER UNIT REMOVING

1. Remove seat cushion.

2. Disconnect the two flexible lines at valve assembly.

3. Remove power unit from car.

NOTE: To install reverse procedure of removal.

POWER UNIT DISASSEMBLING

1. Remove pipe running from reservoir to valve.

2. Remove four Phillips head screws attaching valve assembly, Fig. 320, to gear pump, Fig. 321, on rear end of power unit and remove valve.

3. Disassemble valve by taking out large end fittings (A), Fig. 320, gaskets (B), check valve springs (C) and check valve assemblies (D).

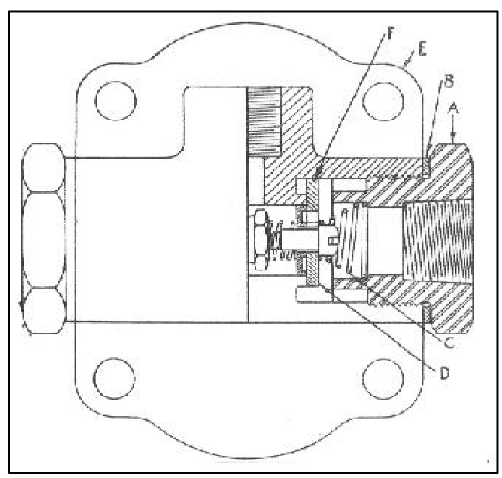


Figure 320
Convertible Hydraulic Top Power Unit Valve

4. Check valve seats (F) in housing (E) for nicks. Seats must be smooth to prevent loss of pressure.

5. To remove gear pump, Fig. 321, take off mounting bracket and screws and lockwashers attaching pump housing to power unit.

6. Pull off pump.

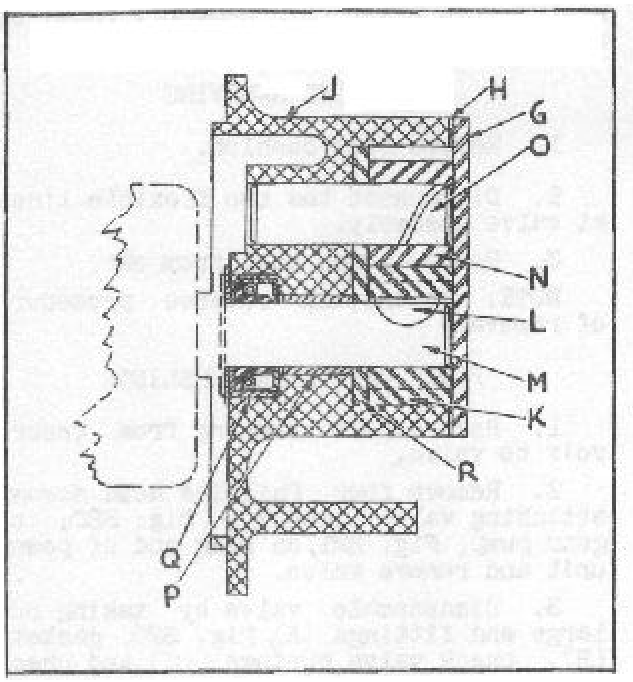


Figure 321
Convertible Hydraulic Top
Power Unit Pump

7. Pump drive gear (K), Fig. 321, is keyed to armature shaft (N) with Woodruff key (L). Remove drive gear by lightly tapping end of armature shaft. Remove gear and key. Driven gear (N) can now be removed from its shaft (O). If it becomes necessary to replace oil seal (Q), it must be turned out on a lathe. Install new seal by pressing it into place.

8. Remove reservoir by taking out three bracket screws and lockwashers.

NOTE: To reassemble power unit reverse procedure of disassembly.

Installation of gears and key can be facilitated by installing key and drive gear first. Be sure new gaskets are used throughout.

NOTE: Check valves (D), Fig. 320, are adjusted at time of assembly and should not be readjusted.

REFERENCES

Source of Information	Date	Subject

TRANSMISSION OVERDRIVE

CONSTRUCTION

Overdrive provides a driving ratio of engine speed to rear wheel speed that is numerically lower than direct drive. In overdrive the engine revolves 28% slower than in direct gear at the same car speed. This reduction is obtained by the use of planetary pinions which rotate on the stationary gear and revolve in the internal-tooth ring gear permitting the propeller shaft to rotate 38% faster than the engine. Overdrive operation results in less wear on engine parts as well as greater fuel and oil economy and smoother operation at high speed.

Switches

The overdrive unit is made operative by stopping the planetary system gear-plate, and inoperative by releasing the gear plate. The power to release and to stop the gear plate is provided by a solenoid and spring arrangement attached to the overdrive unit.

Three switches and a relay control the operation of the solenoid. These are the control switch, governor switch, throttle switch and overdrive relay. The three switches are connected in series.

Control Switch

This switch is mounted on top of the control button bracket which is attached to the lower ledge of the instrument panel. With the button pulled out, the electrical circuit is cut out. As the button is pushed in, the tapered end of the control button shaft raises a plunger in the switch, closing the circuit. The control button also has a mechanical function and this is to move the overdrive control lever backward. This shifts the clutch hub sleeve forward and disengages the front row of internal teeth on the clutch hub sleeve from the external teeth of the free wheeling cam, permitting free wheeling and overdrive operation.

NOTE: To cut out overdrive and prevent free wheeling, the clutch should be disengaged and the control button pulled out. This can be done at any speed up to 60 miles per hour. A slight clash of gears may be noted but this will have no harmful effect.

As the control button is pulled out the first 3/8″ travel opens the control switch and breaks the circuit, thus reverting to direct drive before shifting the clutch hub sleeve.

GOVERNOR SWITCH

The car speed at which the solenoid is energized is determined by a centrifugal governor switch, which is mounted on the right side at the rear end of the overdrive housing and is driven from the speedometer drive gear. The overdrive cut-in speed is approximately 22 miles per hour on cars equipped with the standard axle ratio for overdrive. When optional gear ratios are used, this cut-in speed is proportionately higher. On deceleration, free wheeling becomes effective approximately 3 miles per hour below the cut-in speed.

THROTTLE SWITCH

The third switch is the throttle switch which permits reverting to direct drive temporarily when additional acceleration is required for passing other cars on the highway. This switch is on the toeboard, and is operated by the accelerator which contacts the plunger in the switch when the pedal is depressed beyond full throttle position.

OVERDRIVE RELAY

This relay shown schematically in Fig. 327, is mounted on the left front fender in the engine compartment. This assembly contains a control relay and a timing relay.

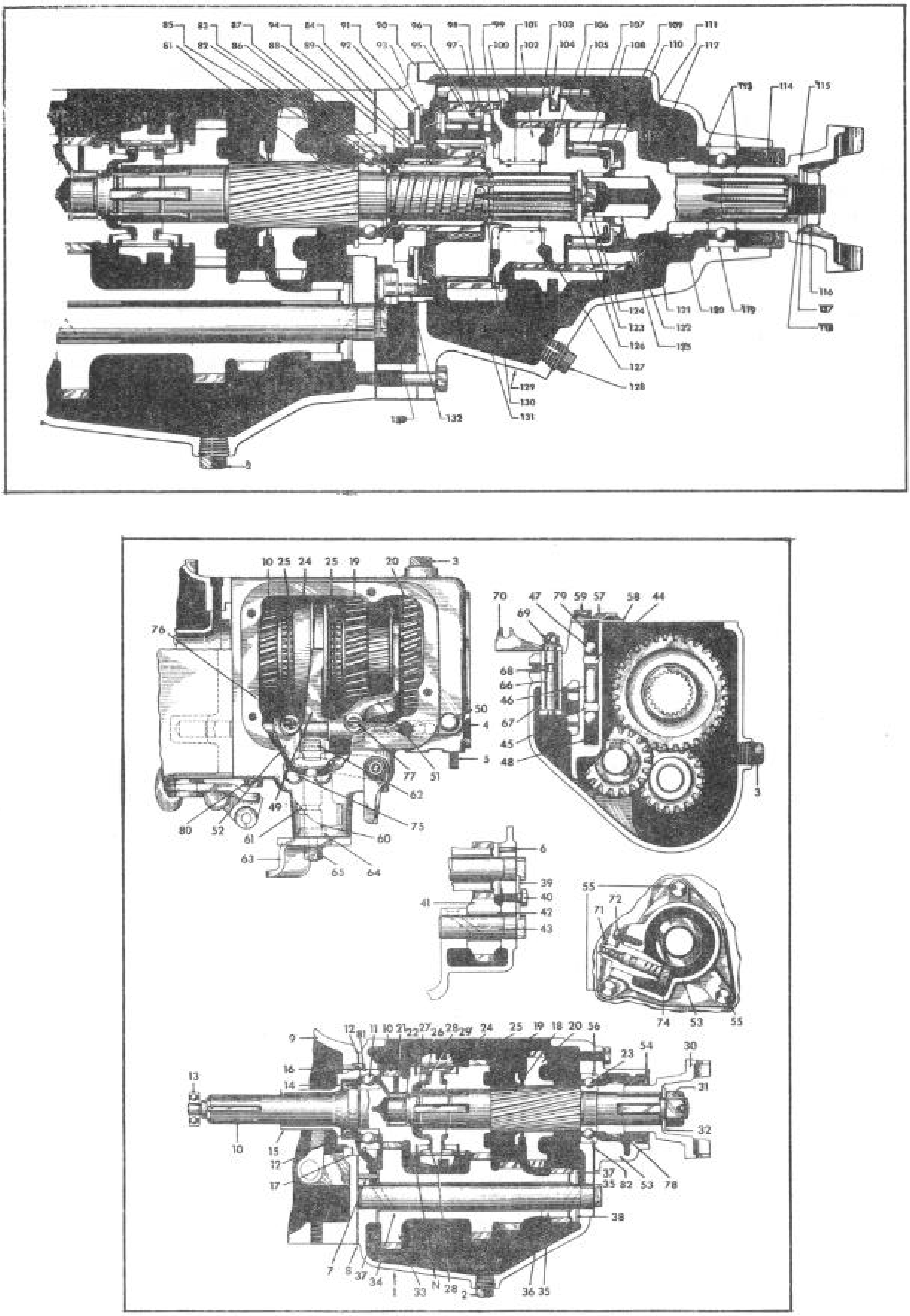


Figure 322 - Overdrive With Transmission

The control relay has two sets of contacts. One set of contacts which is normally open, governs the solenoid control circuit. The other set of contacts which is normally closed governs the ignition grounding circuit. When the governor switch contacts close, this relay is energized and the contacts are closed, completing the circuit to the solenoid pull-in and hold in coils and timing relay.

The timing relay is also fitted with a set of contacts, normally open, which is also in the ignition grounding circuit between the ignition coil and grounding contacts in the solenoid.

When in overdrive, the solenoid control contacts, and the timing relay control contacts are closed and the ignition grounding contacts are open. As the throttle switch contacts are opened through the operation of the accelerator pedal, the control relay is de-energized, opening the solenoid control contacts and de-energizing the solenoid. This action also closes the ignition grounding contacts, thereby grounding the ignition coil. After an interval of a fraction of a second, the timing relay contacts will open, breaking the grounding circuit.

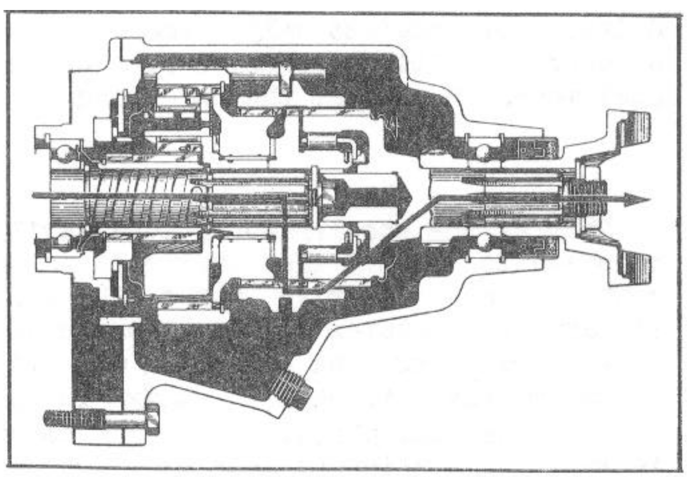


Figure 323
Overdrive Power Circuit (Direct Drive)
Button Pulled Out

OVERDRIVE OPERATION

Drive Circuit

The operation of the overdrive is controlled by the button located on the instrument panel. When this button is pulled out, the drive is from:

1. Transmission main shaft to the -
2. Free wheeling cam to the -
3. Clutch hub sleeve to the -
4. Overdrive main shaft and then through the propeller shaft to the rear axle and wheels, Fig. 323.

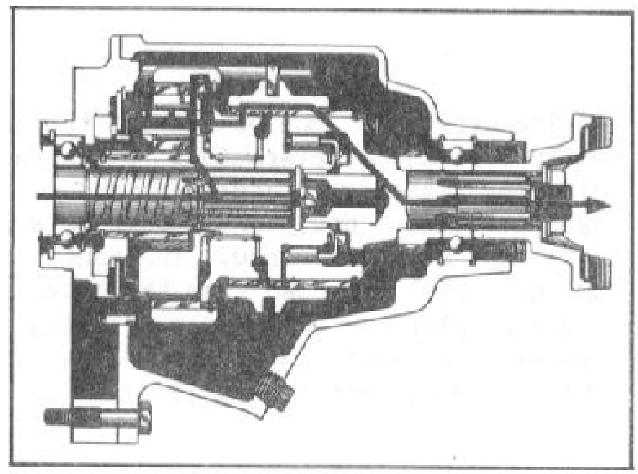


Figure 324
Overdrive Power Circuit
(Overdrive)

Now with the control button pushed in, both overdrive and free wheeling become operative, the overdrive cutting in when the accelerator is momentarily released above about 22 miles per hour. The stationary gear pawl is engaged in the slots in the gear plate and the course of drive is through:-

1. Transmission main shaft to the -
2. Pinion cage and pinions to the -
3. Ring gear to the -
4. Clutch hub to the -
5. Clutch hub sleeve to the -
6. Overdrive main shaft and then through the propeller shaft to the rear axle and wheels, Fig. 324

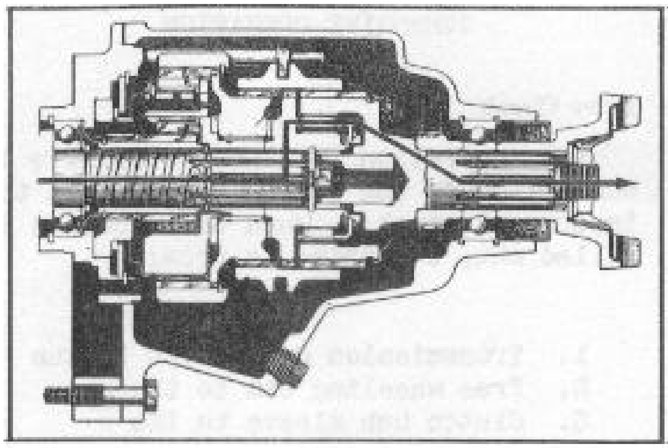


Figure 325
Overdrive Power Circuit
(Free Wheeling)

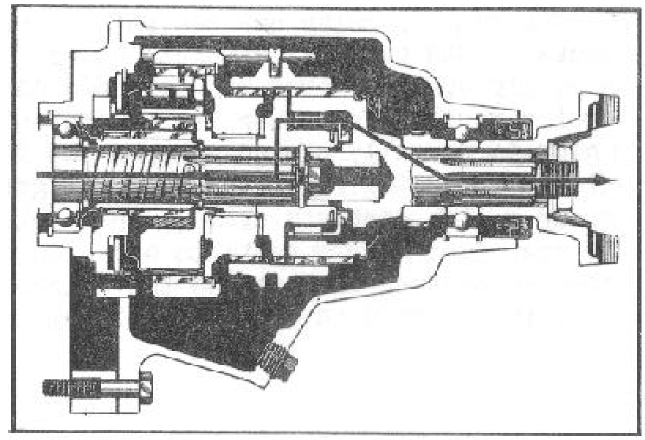


Figure 326
Overdrive Power Circuit
(Step-Down)

The overdrive can be cut-out temporarily for fast acceleration, by depressing the accelerator fully beyond wide-open throttle position. When this is done the solenoid circuit is opened and the gear pawl released from the slots in the gear plate. The course of drive is the same as when operating below the cut-in speed, that is from:

1. Transmission main shaft to the -
2. Free wheeling cam to the -
3. Free wheeling cam rollers to the -
4. Overdrive main shaft and then through the propeller shaft to the rear axle and wheels. Fig. 325.

With the control button pushed in and car operating below the cut-in speed the car is being driven through free wheeling. The course of power is from:-

1. Transmission main shaft to the -
2. Free wheeling cam to the -
3. Free wheeling cam rollers to the -
4. Overdrive main shaft and then through the propeller shaft to the rear axle and wheels. Fig. 326.

SOLENOID AND CLUTCH PAWL OPERATION

When the car is stationary or operating below the cut-in speed the gear pawl is held in the “out" position by a spring in the solenoid. As the car reaches the cut-in speed and the solenoid is energized the pawl is pushed in and engaged with the notch in the balk ring.

When the engagement is completed the main closing coil in the solenoid is automatically cut out and the small holding coil is energized. This remains energized as long as the car is in overdrive, but requires only a small amount of current. This happens as soon as the pawl moves in against the balk ring.

Then as the accelerator is momentarily released to permit the engine to slow down to the overdrive speed, the stationary gear rotates in the opposite direction carrying the balk ring with it, allowing the gear pawl to engage in the slot in the gear plate. As engagement is made the stationary gear stops rotating, transferring the drive through the overdrive unit.

When the accelerator is depressed beyond the wide-open throttle position the throttle switch is opened, which breaks the solenoid holding coil circuit. This permits the solenoid plunger spring to exert a force tending to withdraw the gear pawl. The load on the pawl, due to engine torque, however, prevents the pawl from disengaging the gear plate. The ignition is also interrupted momentarily by the circuit being broken through the solenoid relay. As the engine torque is released by the momentary interruption of the ignition circuit, the solenoid spring pulls the gear pawl out of the slot in the stationary gear plate. This releases the gear plate and permits the stationary gear to rotate freely for direct drive.

As long as the throttle switch is held open the overdrive electrical circuit is open. When the accelerator is released sufficiently to close the throttle switch the circuit is again closed. The solenoid coils are energized and the solenoid plunger compresses the pawl rod spring. When this action is completed the closing coil circuit is broken and the holding coil remains energized which is sufficient to tend to engage the gear pawl, but it will he stopped by the balk ring.

Overdrive can now be restored by momentarily releasing the accelerator pedal above the cut in speed. When the engine slows down to overdrive speed, the stationary gear will reverse its rotation carrying the balk ring with it, allowing the gear pawl to engage with the slot in the gear plate.

The complete solenoid operation is so rapid and the ignition is interrupted for so short an interval, that it is hardly apparent to the operator.

Clutch Hub Sleeve

The clutch hub sleeve (103) Fig. 322, which has two sets of internal teeth, slides back and forth. Its movement is controlled by the button on the instrument panel which is connected to a control lever on the left side of the overdrive housing. This lever actuates a shaft and lever which moves against a shifter fork (104) which rides in the external groove of the sleeve.

The rear set of internal teeth of the sleeve is constantly in mesh with the external teeth of the overdrive main shaft (121). When the control button is out, the sleeve is in the rearward position which meshes the front row of internal teeth with the external teeth of the free wheeling cam (106). When the sleeve is in this position it locks the free wheeling cam with the overdrive main shaft causing all three parts to rotate together, thereby preventing free wheeling and overdrive.

When the control button is pushed in, the sleeve is moved forward disengaging the front row of internal teeth from the free wheeling cam permitting free wheeling and overdrive.

Overdrive Electrical Check

PRELIMINARY CHECKS

1. Check battery to be sure it is in good condition.

2. Overdrive control button must be pushed in unless otherwise stated.

3. Check all connections to see that they are tight and that wiring is according to color code, see "Wiring Diagram", Page 328.

4. Check governor switch to be sure that red wire is assembled in cadmium-plated terminal

5. CAUTION: When disconnecting No. 4 relay terminal wire be careful it is not grounded or brought in contact with car metal as it will cause relay points to weld together.

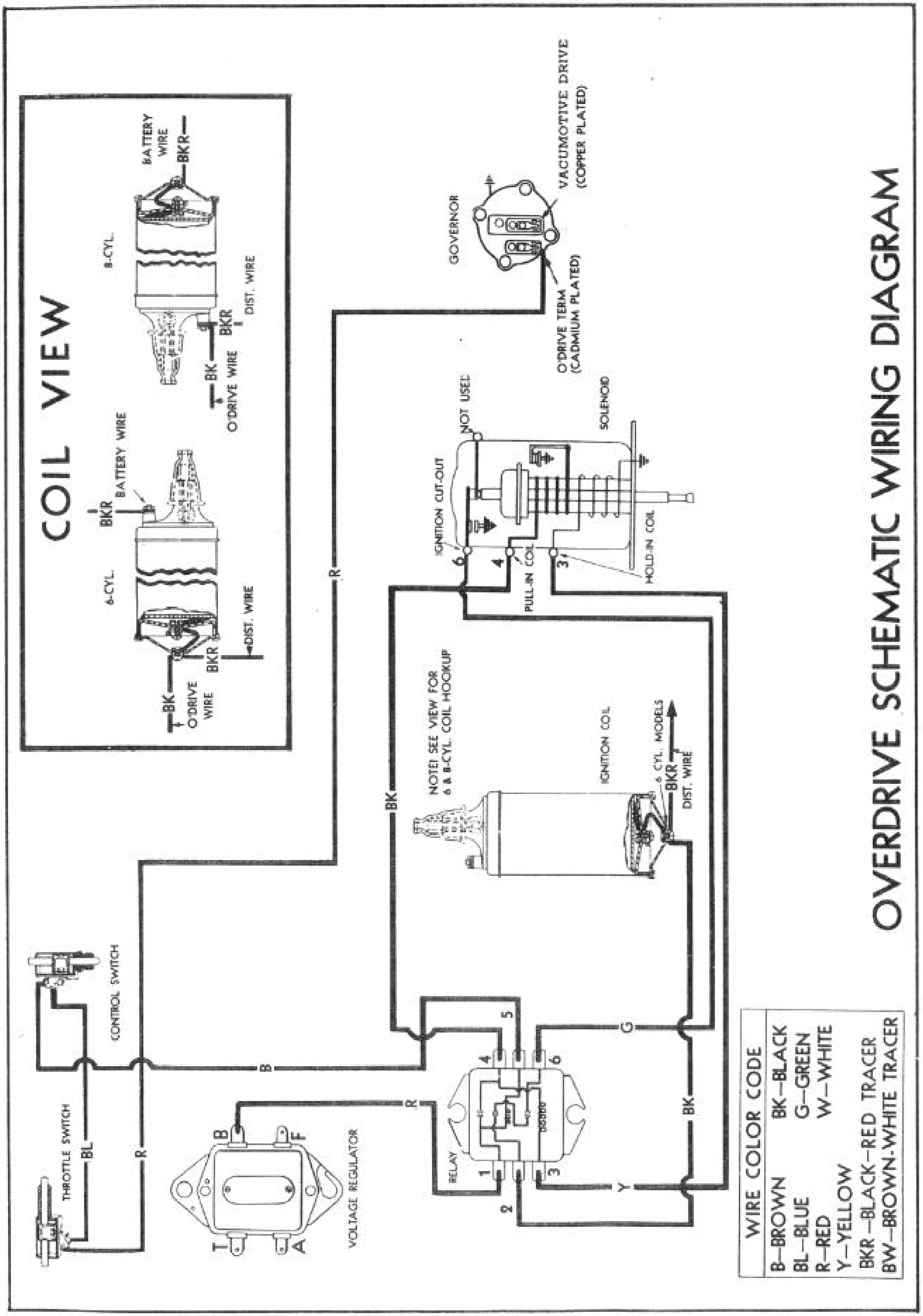


Figure 327
Overdrive Schematic Wiring Diagram

FIRST CHECK

1. Disconnect wires at relay terminals 3 and 4, Fig. 328.

2. Connect jumper wire between relay terminal 1 and the wire disconnected from No. 4 terminal.

NOTE: The result should be a chattering noise in the solenoid.

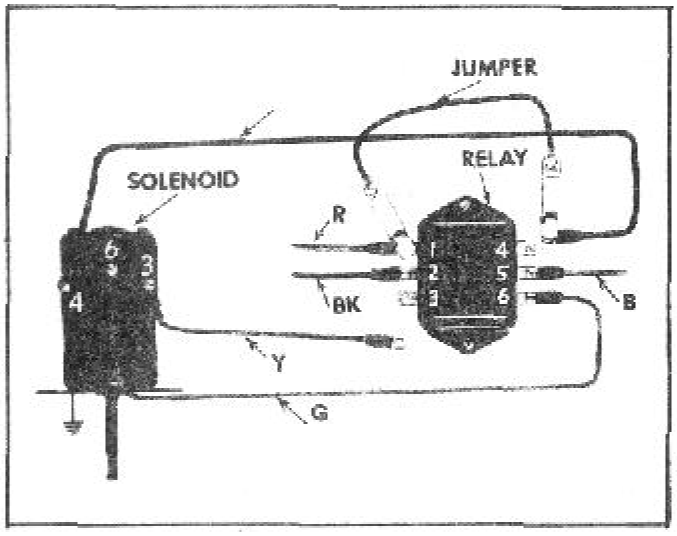


Figure 328 - Overdrive Solenoid Check

3. If the solenoid does not chatter check No. 4 wire for breaks between the relay and solenoid.

4. Check for wrong connection at the solenoid.

5. If all wiring is correct then replace the solenoid.

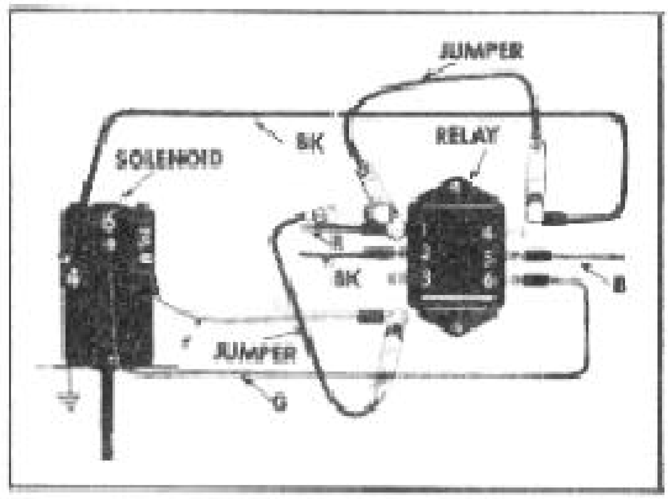
SECOND CHECK

1. Disconnect No. 3 and 4 wires from their relay terminals.

2. Connect a jumper wire between relay terminal No 1 and the wire disconnected from No. 4 relay terminal. Fig. 329.

3. Connect a second jumper wire between relay terminal No. 1 and wire disconnected from relay terminal No. 3.

NOTE: Solenoid should stop chattering. However, if chattering continues make the following check.



29 - Overdrive Solenoid Testing

4. Check No. 3 wire for improper connections or breaks between the relay and solenoid.

NOTE: If wiring is correct then replace the solenoid.

THIRD CHECK

1. Connect No. 4 relay wire to its terminal on the relay.

2. Disconnect No. 5 relay wire, Fig. 330 at the relay terminal.

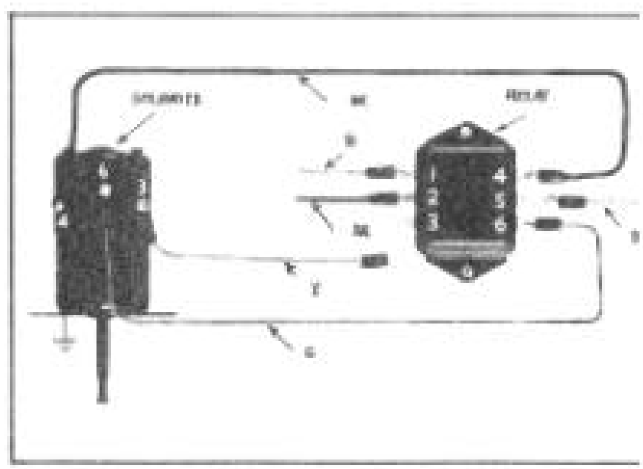


Figure 330 --Overdrive Relay Cheek #1

3. Leave No. 3 relay wire (Y) disconnected from its terminal on the relay.

NOTE: Solenoid should not chatter and it it does chatter, replace the relay.

FOURTH CHECK

1. Disconnect No. 3 relay wire (Y) and No. 5 relay wire (B) from their relay terminals as in Fig. 331.

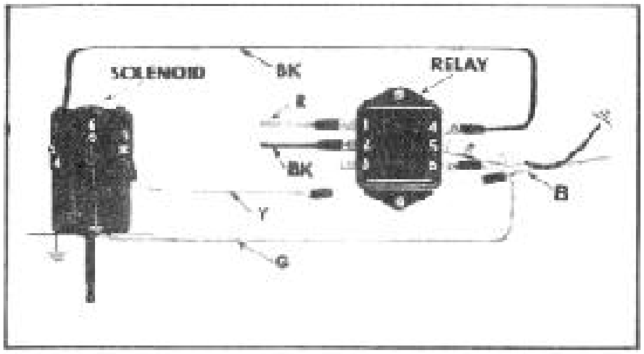


Figure 331 - Overdrive Relay Check #2

2. Connect a jumper wire between No. 5 terminal and ground as shown.
NOTE: Solenoid should chatter. If solenoid does not chatter then replace the relay.

FIFTH CHECK

1. Connect a jumper wire between No. 5 relay terminal and ground as shown in Fig. 332.

2. Touch No. 3 relay wire to its terminal on the relay as shown.

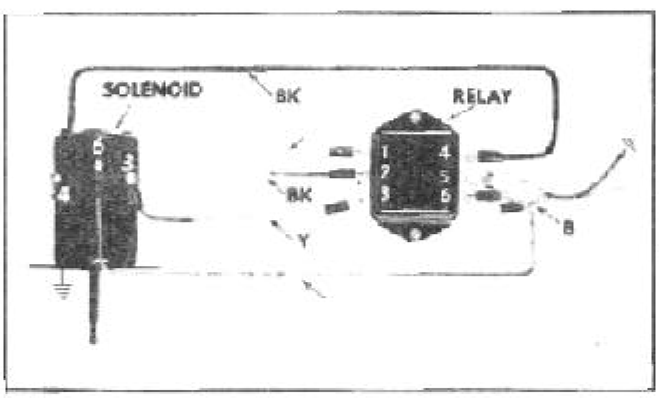


Figure 332 - Overdrive Relay Check #3

NOTE: Solenoid should stop chattering and if it does not, replace the relay.

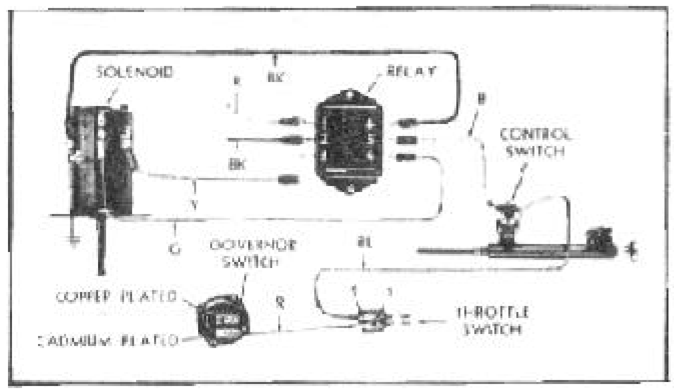


Figure. 333 - Overdrive Control Switch Check

SIXTH CHECK

1. Connect No. 5 relay wire to its terminal on the relay.

2. No. 3 wire remains disconnected from its terminal on the relay, Fig. 333.

NOTE: Solenoid should not chatter. If solenoid chatters and then stops when the red wire is disconnected from the terminal No. 1 on throttle switch, then check for one of the following conditions.

(A) Governor switch contacts are not opening.

(B) Red wire between governor switch and throttle switch is grounded.

NOTE: Be sure red wire is connected to cadmium plated terminal.

If chattering continues:

3. Remove blue wire from throttle switch at (2).

NOTE: A. If chatter stops replace throttle switch.

B. If chatter still continues pull out control button and if chattering then stops the blue wire or control switch is grounded.

C. If chatter continues either the switch or the brown wire from control switch to relay No. 5 terminal is grounded.

SEVENTH CHECK

1. Connect wire (Y) Fig. 334, to relay terminal No. 3.

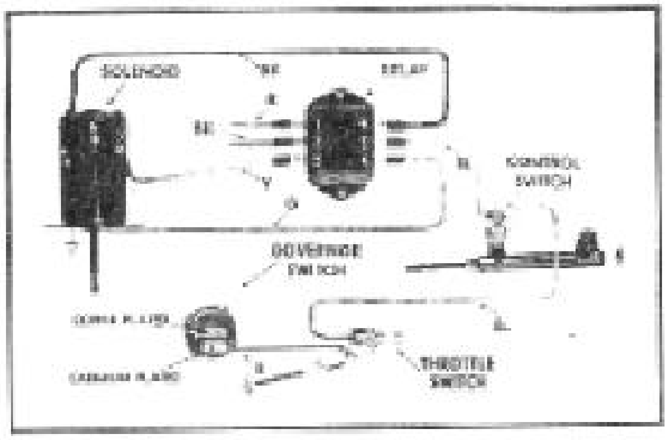


Figure 334 - Overdrive Throttle Switch-Check

2. Attach jumper from red wire terminal of the throttle switch to a ground Fig. 334.

NOTE: Relay and solenoid can be heard operating.

If relay does not operate when grounding this terminal the throttle switch is faulty, the terminals at the control switch are disconnected or the control switch is faulty.

EIGHT CHECK

1. Connect wire to relay terminal No. 3.

2. Attach jumper wire from red wire terminal of throttle switch to ground as shown in Fig. 334.

3. Pull out control wire button 1/2'4 Fig. 335.

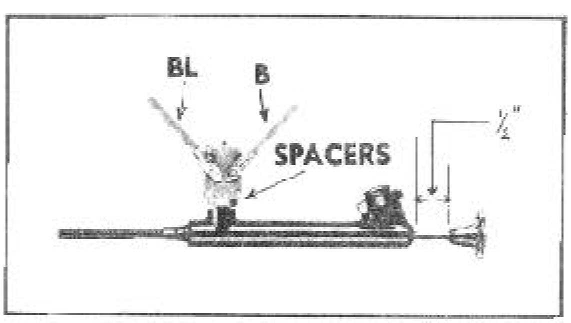


Figure 335 - Overdrive Control Button

NOTE: Relay should operate. If relay does not operate add one or two spacers (part number 170625) between the control switch and its bracket.

If relay still does not operate then replace the control switch.

NINTH CHECK

1. Connect wire to relay terminal No. 3.

2. Attach jumper from red wire terminal of the throttle switch to a ground.

3. Depress accelerator pedal (Engine not running).

NOTE: Relay should operate just after throttle is fully opened.

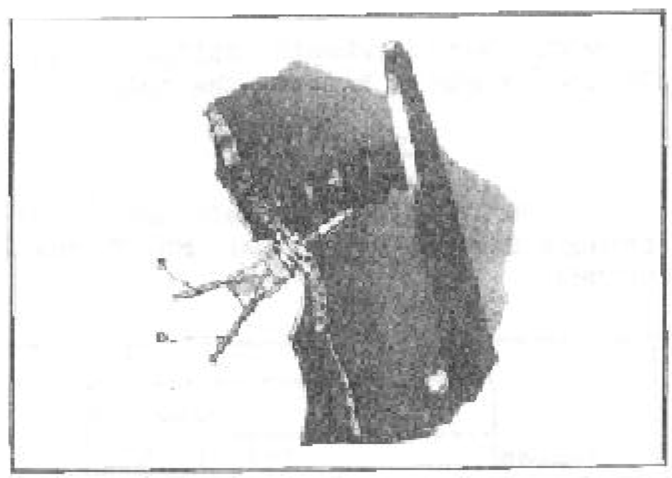


Figure 336 - Overdrive Accelerator Switch

NOTE: If relay does not operate, adjust throttle switch up until accelerator just contacts switch plunger with throttle wide open. Replace the throttle switch if the relay does not operate when the accelerator pedal is depressed beyond the wide open throttle position.

TENTH CHECK

1. Check the connections from the relay terminal No. 2 to the distributor side of the coil.

CAUTION: If this wire is connected to the ignition key side of the coil the relay or solenoid will be damaged.

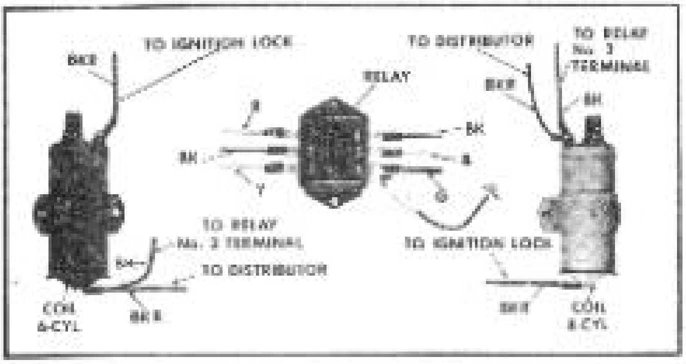


Figure 337
Overdrive Relay Connection Check

The correct connections are shown in Fig. 337 for 6 and 8 cylinder coils.

2. Attach a jumper wire as shown, from the relay terminal No. 6 to a ground with engine running.

NOTE: Engine should continue to run. If engine stalls replace the relay.

ELEVENTH CHECK

1. Start engine. Connect jumper wire between the relay terminal No. 6 and a ground.

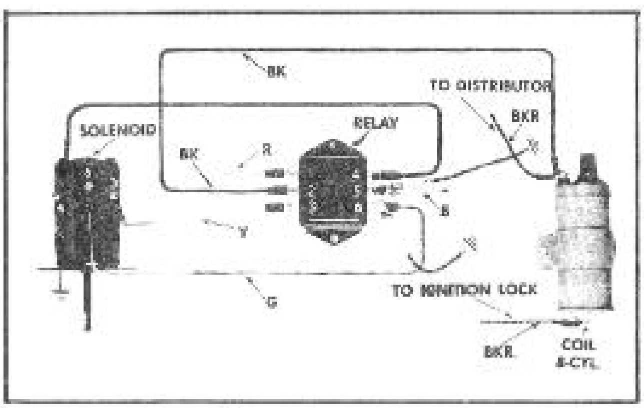


Figure 338 - Overdrive Relay Check

2. Connect another jumper to a ground as shown in Fig. 338. Using opposite end of this jumper, make and break a connection at relay terminal No. 5.

NOTE: When the connection at relay terminal No. 5 is broken the engine should cut out briefly.

If the engine does not cut out or dies completely then the relay should be replaced.

TWELFTH CHECK

The control lever is on the left side of the Overdrive housing and is adjusted as follows:

1. Loosen control lever bolt nut (1), Fig. 339.

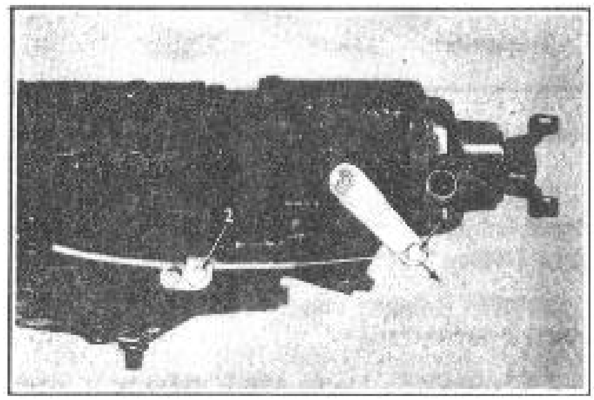


Figure 339
Overdrive Electrical Control Check

2. Pull control wire button out exactly 1/2” as shown in Fig. 335.

3. Move control lever forward until a slight resistance is felt.

NOTE: Do not force the lever forward.

4. Tighten bolt nut securely.

5. Make certain that the control wire button has not moved.

NOTE: It should be possible to pull the control button out when depressing the clutch pedal at any speed above the cut-in speed and up to 60 M.P.H.

If the above action is not possible then recheck the adjustment making certain that the anchor bolt (2) is tight to prevent any possibility of movement of control wire conduit.

THIRTEENTH CHECK

Road test the car and accelerate above the Overdrive cut-in speed.

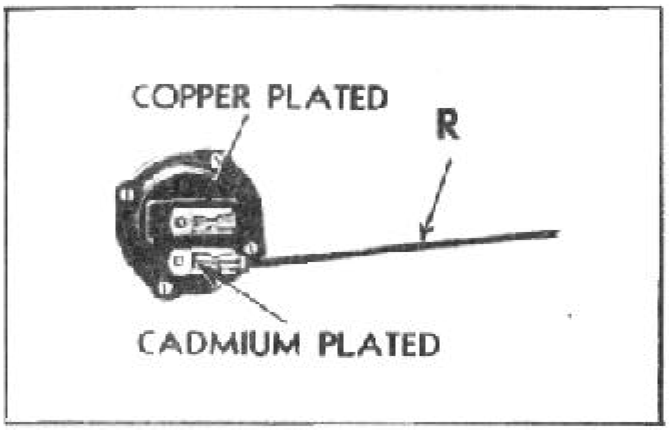


Figure 340 - Overdrive Governor Switch Check

Release the accelerator pedal momentarily and the car should be felt to go into Overdrive.

In case the car free wheels when the accelerator is released above the Overdrive cut-in speed, then replace the governor switch.

FOURTEENTH CHECK

1. While the car is in overdrive completely depress the accelerator pedal.

NOTE: The engine should cut out briefly (felt by a slight surge) and car will revert to conventional drive.

2. If no cutting out is felt check as follows:

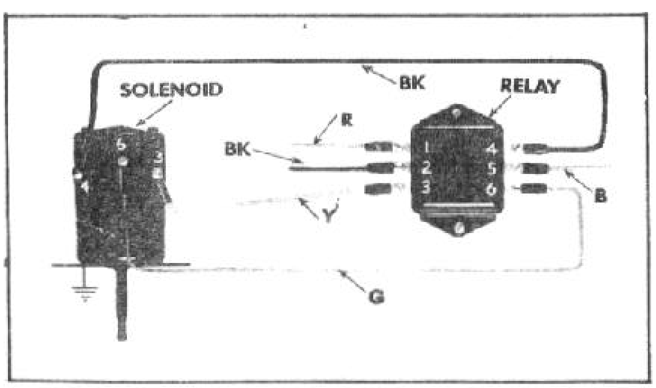


Figure 341
Overdrive To Conventional Drive-Check

3. Check the circuit from relay terminal No. 6 to solenoid terminal No. 6. If it is not broken or incorrectly connected, then replace the solenoid, Fig. 341.

FIFTEENTH CHECK

Test the solenoid on a bench as follows:

1. Lock the pawl rod in position so that it will not move out of the solenoid as the plunger is actuated.

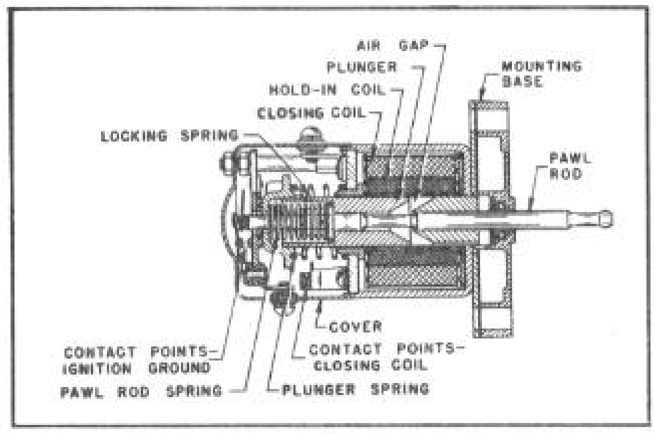


Figure 342 - Overdrive Solenoid

2. Remove solenoid case cover to observe plunger action.

3. Connect battery, voltmeter and variable rheostat between terminals 3 and 4 (connect these terminals together) and ground on solenoid case.

NOTE: Slowly increase and note voltage necessary to actuate the plunger.

4. With case cover removed, measure the current draw of pull (terminal No. 4 and upper pull-in contact points). This should be 31.0 to 34.0 amperes at 6 volts.

5. Measure current draw of hold-in coil (No. 3 terminal and case). This should be 1.4 to 1.6 amperes at 6 volts.

CAUTION: Never force pawl rod into solenoid when cover is off. To do so will damage the flat springs on the contact plate.

SIXTEENTH CHECK

1. When the pawl rod is correctly assembled in the plunger, the distance between the plunger end and the underside of the adjusting nut should be 2.022-2.0237 inches as shown in Fig. 343.

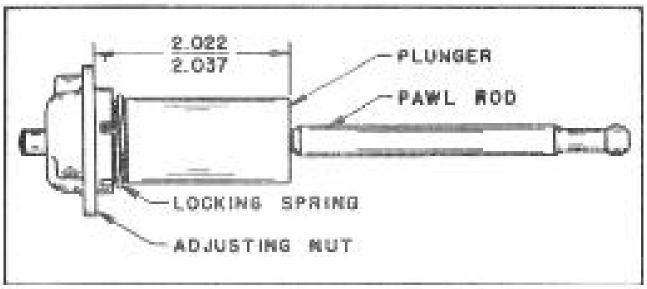


Figure 343
Solenoid Adjustment

2. Adjust by loosening the locking spring and turning the nut up or down on the plunger as required. Avoid distorting the locking spring:

OVERDRIVE REMOVAL

1. Remove six bolts attaching clutch housing to transmission case and remove clutch housing.

2. Remove drain plugs (2 and 128) Fig. 322, in bottom of transmission and over-drive and drain out old lubricant.

3. Place transmission and over-drive assembly in Holding Fixture J-1584 and

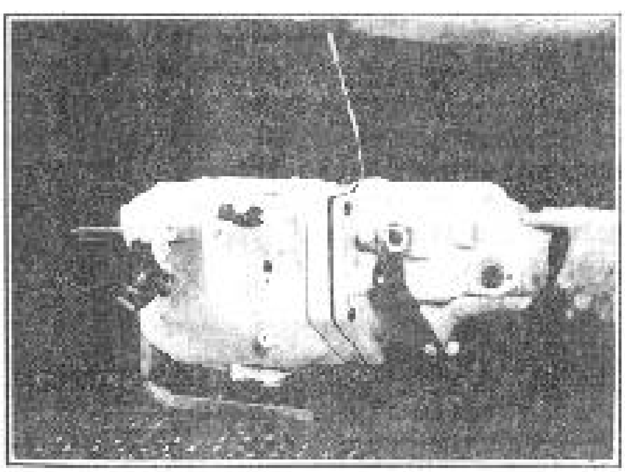


Figure 344
Separating Overdrive Case at Adapter

attach securely to fixture using two clutch housing to transmission case bolts. Remove five bolts attaching over-drive housing to transmission case.

4. Holding overdrive steady with one hand, separate overdrive housing from overdrive housing adapter, using a screw driver as shown in Fig. 344.

5. Remove overdrive housing including overdrive main shaft (121), Fig. 322, free wheeling cam (106), clutch hub (102), shift sleeve (103) and shifter rail fork guide pin (105). Some free wheel cam rollers (107) will drop into case. Be sure all twelve of them are accounted for.

OVERDRIVE DISASSEMBLY

Free Wheeling Cam and Clutch Hub

1. Remove free wheeling cam bolt (124), cam retaining washer (126) and lock washer from end of overdrive main shaft.

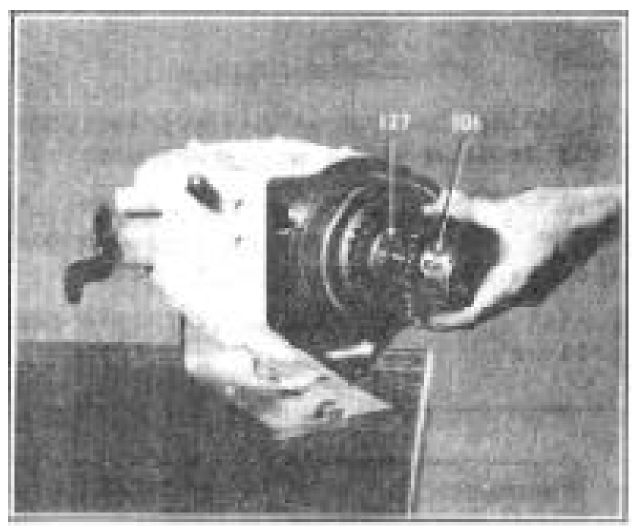


Figure 345 - Removing Free Wheel Cam

2. Slide free wheel cam assembly (106) off main shaft, Fig . 345.

3. Slide off clutch hub rear thrust washer (127).

4. Remove clutch hub (102), Fig. 346, ring gear (131) and pinion cage assembly (98) Fig. 322 as a unit to preclude

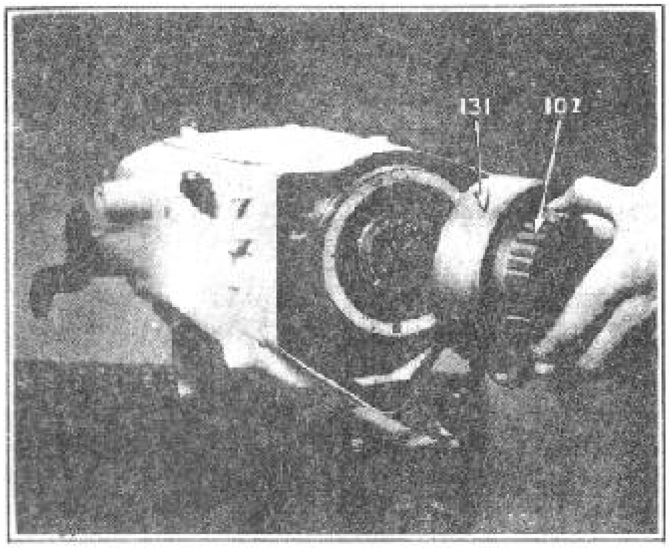


Figure 346 - Removing Clutch Hub

necessity or rewinding split pinions (95 narrow and 97 wide).

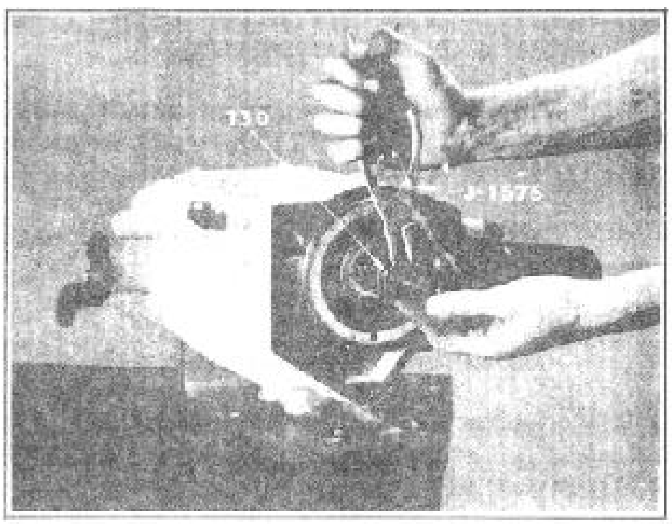


Figure 347 - Removing Pinion Cage Retaining Snap Ring With Pliers J-1575

5. Remove pinion cage retaining snap ring (130), using Pliers J-1575 Fig. 347.

6. Remove the driver pinion cage oil collector ring cover snap ring (93) and slide off oil collector ring cover (92) as shown in Fig. 18.

7. Remove stationary gear assembly (94) as shown in Fig. 349.

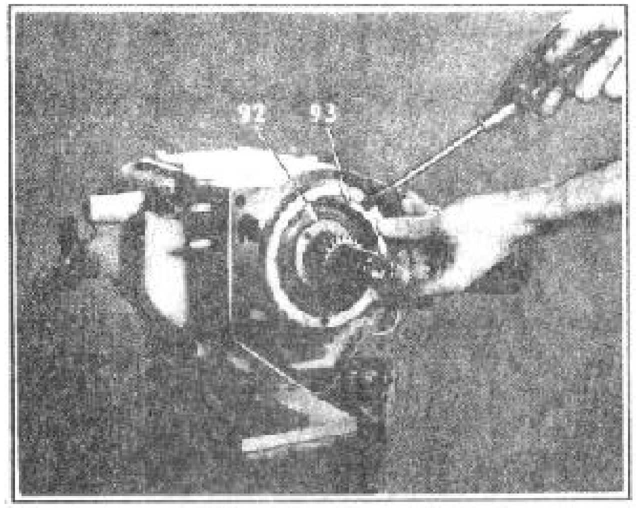


Figure 348 - Removing Pinion Cage Oil Collector Ring Cover Snap Ring

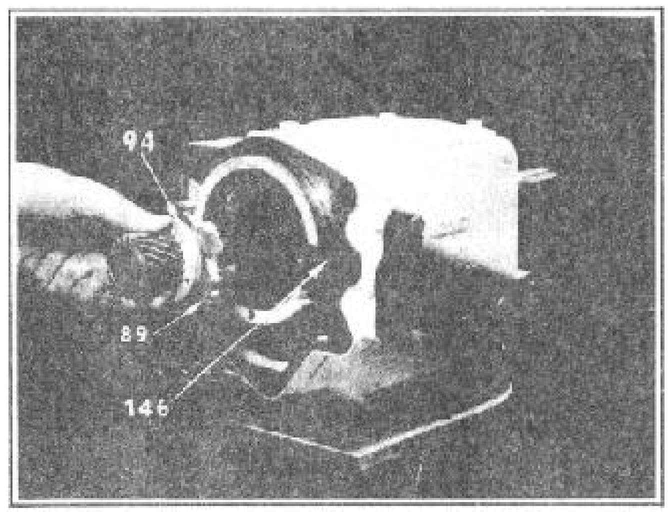


Figure 349
Removing Stationary Gear Assembly

REMOVE SHIFT RAIL AND FORK

8. Remove transmission cover cap screws (59) Fig. 322 and lift off cover (57) carefully to prevent shift rail lock ball spring (79) from springing out. Remove spring and lock ball (47) by tilting case on its side.

9. Remove low and reverse shift fork set screw (77) and reverse shifter lock screw (76).

10. Slide shift rail (44) out of front of case. Remove low and reverse shift fork (51) and reverse shifter (52) from case.

11. Remove shift rail interlock (46) by tilting transmission on its side.

12. Remove second and high shift fork set screw.

13. Slide second and high shirt rail (45) out of case. Remove Shift fork (49) from case.

REMOVE TRANSMISSION MAINSHAFT AND GEARS

14. Remove the transmission mainshaft (81) by pulling the mainshaft out of pocket of the transmission main drive gear (10) to expose the mainshaft synchronizer shift sleeve hub lock ring (27) as shown in Fig. 350.

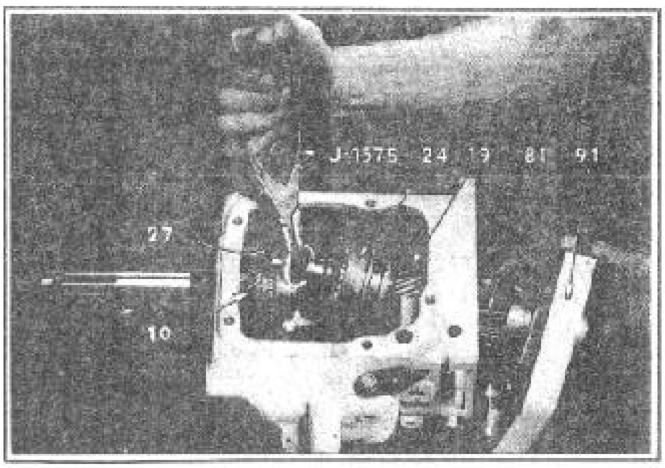


Figure 350
Removing Main Shaft Snap Ring
With Pliers J-1575

15. Remove the lock ring with Pliers J-1575 then remove synchronizer shift sleeve and hub assembly (24), intermediate gear (19) and low and reverse gear in the above order and pull out main shaft (81) with overdrive housing adapter.

OVERDRIVE CASE DISASSEMBLY

1. Remove governor switch from overdrive case.

2. Remove companion flange nut (116), Fig. 322, lock washer (17), plain washer and companion flange (115). If flange is tight on main shaft remove it with Puller J-820.

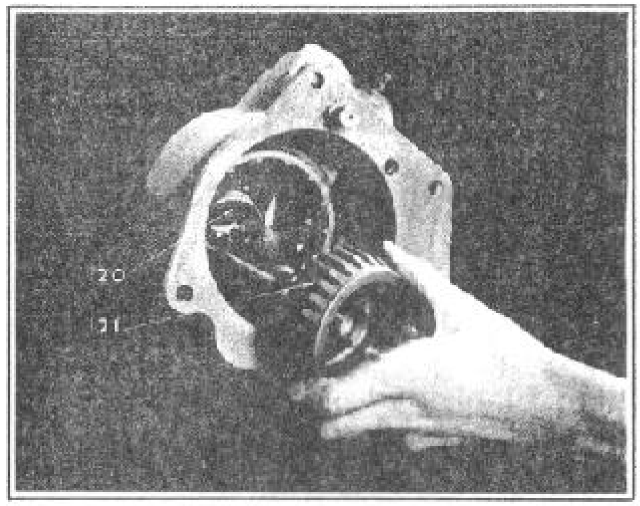


Figure 351
Removing Main Shaft and Speedometer Gear

3. Pull overdrive main shaft (121) out of front of case. Speedometer gear (120) will fall into case.

4. Lift out clutch hub sleeve (103) Fig. 322 and speedometer gear.

5. Remove overdrive main shaft bearing inner snap ring (113) and tap bearing (119) out towards front of case.

6. Tap oil seal (114) out toward rear of case.

REMOVING SHIFTER RAIL FORK

7. Remove overdrive control shaft nut (134) washers and control lever (135) Fig, 361.

8. Remove control shaft pin (136).

9. Remove control shaft (137).

10. Remove shifter head screw headless plug (138) Fig. 352. Insert socket wrench through plug hole and remove shifter head screw (139) and lock washer.

11. Remove shifter rail stop screw (140) and withdraw shifter rail (112), shifter rail retractor spring (111) and shifter rail fork (104).

REASSEMBLING OVERDRIVE CASE

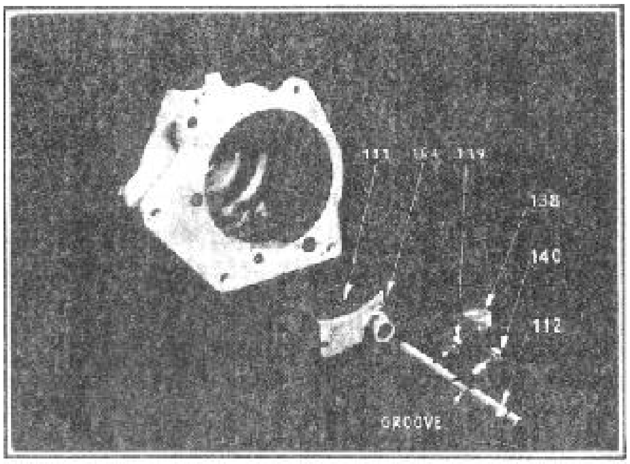


Figure 352
Shifter Rail - Detail

104. Shifter rail fork
111. Shifter rail retractor spring
112. Shifter rail
138. Shifter head headless plug
139. Shifter head screw
140. Shifter rail stop screw

1. Place shifter rail retractor spring (111) and snifter rail fork (104) in overdrive case. Install shifter rail (112) in case and assemble it; in the fork and spring.

Be sure wide groove in shifter rail is in line With shifter stop screw hole in case.

2. Install shifter rail stop screw, lock washer and shifter head screw (139) and washer, tighten securely. Install shifter head screw headless plug (138).

3. Install new control shaft, oil seal and Install control shaft (137) Fig. 361. Assemble control shaft lever (135), washers and nut (134) and tighten securely. Install shifter rail fork guide pin (105), Fig. 322 in case so that it passes through notch in shifter fork (104).

INSTALLING OVERDRIVE MAIN SHAFT IN CASE

1. Install overdrive main shaft bearing (119) locking it in place with inner snap ring.

NOTE: Snap ring is supplied in five different thicknesses. Be sure when replacing it to select one that fits snugly in groove.

2. Install main shaft oil seal assembly (114), leaving it protrude 9/32" from outer edge of case as shown.

3. Assemble clutch hub sleeve (103) in case with shallow groove to front, making sure shifter rail fork groove in sleeve rides on shifter rail fork (104).

4. Place speedometer gear (120), with shoulder facing toward rear, on main shaft (121) and install main shaft in overdrive case.

5. Install companion flange (115), plain washer (118), lock washer (117) and nut (116) and tighten nut only a few turns. This nut should be tightened securely after overdrive case is assembled.

INTERLOCK ARRANGEMENT

The interlock arrangement in the overdrive housing adapter prevents overdrive from engaging when locked in direct drive. Whenever the clutch hub sleeve is pulled back either by pulling the control button out or shifting into reverse the overdrive shift rail is moved backward, pushing the long interlock plunger out of its slot. This tilts the left end of the interlock lever down, raising the short interlock plunger into the notch in the gear pawl preventing it from engaging in the slots of the stationary gear plate.

REVERSE GEAR LOCKOUT

A reverse gear lockout is incorporated to prevent locking the gears in Overdrive when operating in reverse gear in the event of an electrical failure.

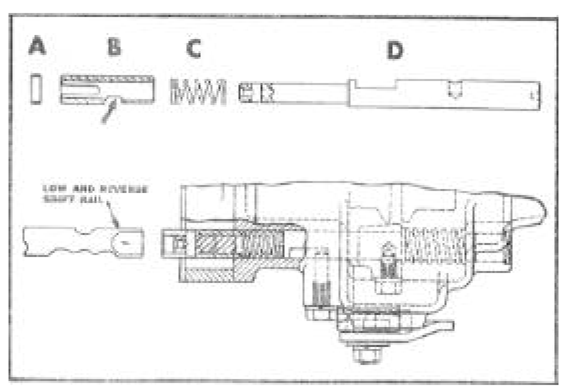


Figure 353
Overdrive Reverse Gear Lockout

This is accomplished through the use of a shift sleeve pin (A) Fig. 353, shift rail sleeve (B), shift rail sleeve spring (0), and shift rail (D). These parts are shown above in their assembled position and their relationship to the transmission low and reverse shift rail is also indicated.

When the shift into reverse is made, the low and reverse shift rail pushes back on sleeve (B) compressing spring (C). As the sleeve moves backward the interlock lever plunger in the Overdrive housing adapter engages in the notch shown in the lower edge of the sleeve.

When the shift into neutral or a forward gear is made, spring (C) moves sleeve (B) forward to the limit of travel permitted by pin (A) which rides in the two slots in the sleeve.

OVERDRIVE HOUSING ADAPTER ASSEMBLY

DISASSEMBLY

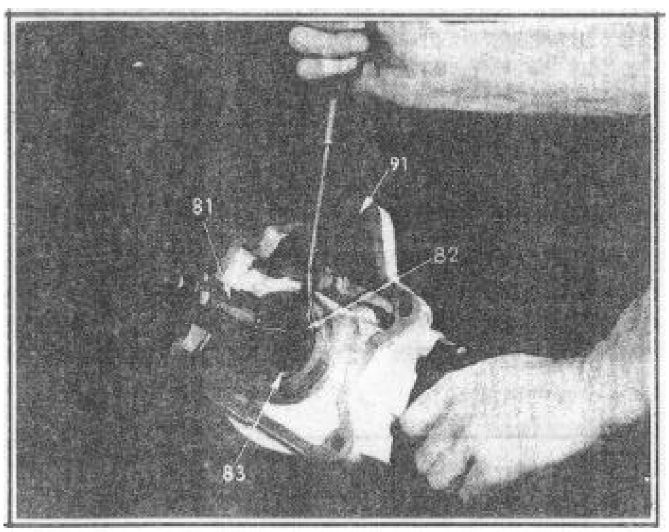


Figure 354
Removing Main Shaft Rear Bearing Snap Ring

1. Remove transmission main shaft rear bearing snap ring (82) with a screw driver and withdraw main shaft (81) and bearing (83) from housing adapter (91), Fig. 354.

2. Remove solenoid (142), solenoid base (144) and stationary gear pawl (146), by removing two solenoid base to adapter bolts (147), Fig. 355.

REASSEMBLY

1. To replace interlock lever (133) drive out interlock lever fulcrum (132), also expansion plugs in adapter above long interlock plunger (148) and below short interlock plunger (149) and remove plungers.

NOTE: Interlock lever plunger - long (148) is supplied in five different lengths.

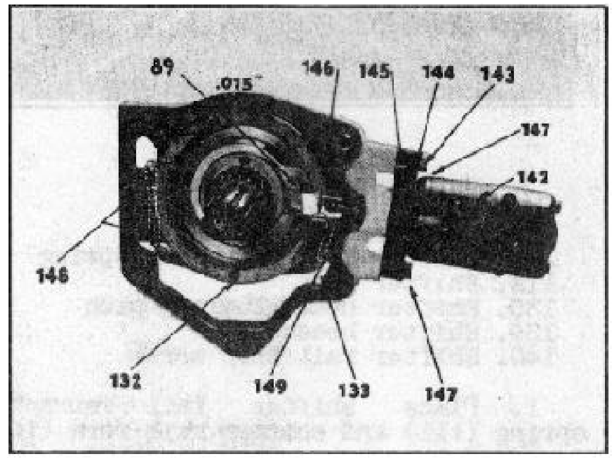


Figure 355
Interlock Lever and Toggle Arrangement

132. Interlock lever fulcrum
133. Interlock lever
142. Solenoid
143. Solenoid gasket
144. Solenoid base
145. Solenoid base gasket
146. Stationary gear pawl
147. Solenoid base to adapter bolt
148. Interlock plunger - long
149. Interlock plunger

Select a long one to maintain .008" to .021" clearance between lower end of plunger (149) and tip of interlock lever (133) with long plunger in shifter rail groove and top of short plunger (149) against side of pawl (146). Plungers must work freely.

NOTE: This is important to properly lock out reverse gear.

2. Place interlock lever (133) in position as shown and install fulcrum (132).

3. Install solenoid base gasket (145), solenoid base (144), solenoid gasket (143), solenoid (142), stationary gear pawl (146) and two bolts (147) and tighten securely. With pawl out to the maximum travel of solenoid, a clearance of .015" must be maintained between end of pawl and balk ring as shown in inset. Shim if necessary to maintain clearance using not more than a total of two solenoid gaskets (143).

4. Install main shaft (81), bearing (83) and oil baffle (86) in adapter and replace snap ring (82), Figs. 322 and 354.

FREE WHEELING CAM ASSEMBLY

DISASSEMBLY

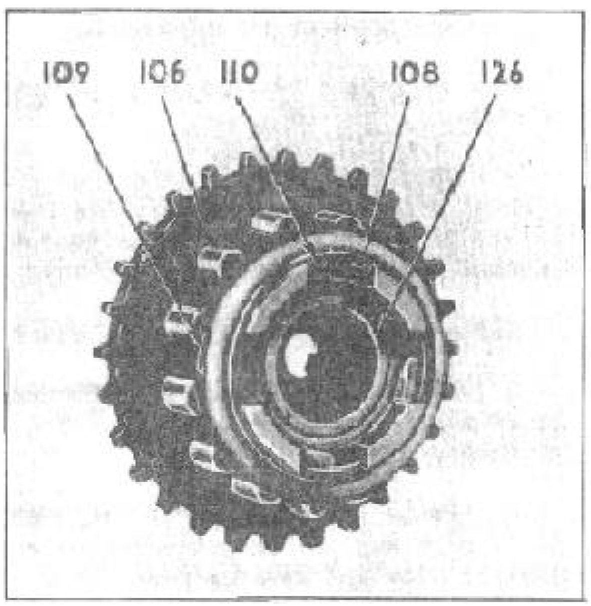


Figure 356
Removing Free Wheel Cam Roller Retainer

1. Remove cam roller retainer snap ring (110) from free wheel cam roller retainer (108), Fig. 356.

2. Pull roller retainer (108) partly off the cam (106) and with pliers pull the end of one spring (109) out of the retainer of cam (106), then pull the retainer further off the hub and pull the second spring out of the retainer of the cam.

Main shaft pilot bushing (126) is a light press fit in the cam and can be replaced separately.

REASSEMBLY

1. Insert ends of springs (109) in cam roller retainer (108) so that ends point in a clockwise direction.

2. With small screw driver work spring around hub of cam and insert ends in holes in cam.

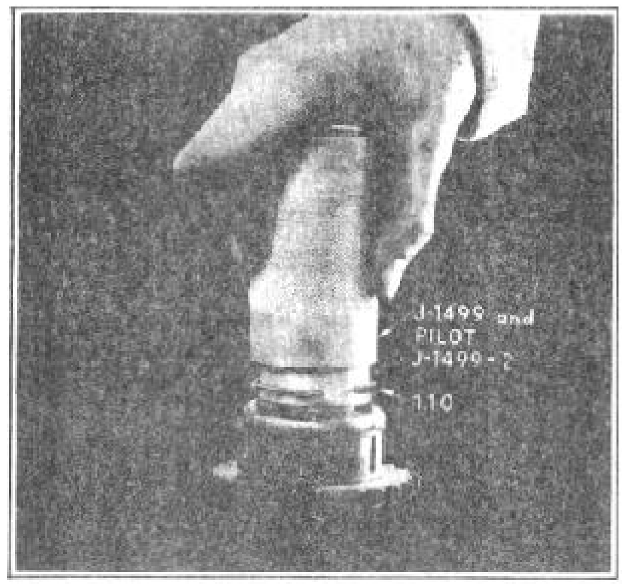


Figure 357 - Replacing Free Wheeling
Cam Roller Retainer Snap Ring

3. Replace snap ring (110) using Snap Ring Replacer J-1499 with Pilot J-1499-2, Fig. 357.

4. Pack grease into roller retainer (108) Fig. 322, and press rollers (107) into their pockets.

To further facilitate holding rollers in their position for assembly into the pocket of the main shaft put a rubber band around outside rollers.

STATIONARY GEAR AND PLATE ASSEMBLY

DISASSEMBLY

Remove snap ring from stationary gear plate (88) Fig. 358 and slide gear out of plate.

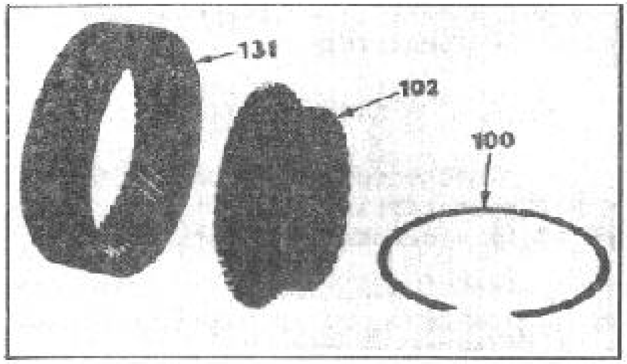


Figure 358
Stationary Gear and Plate Assembly

The balk ring (89) grips the stationary gear plate (88) so that a pull of 8 to 10 pounds is required to rotate the balk ring on the gear plate.

REASSEMBLY

1. Assemble stationary gear (94) in plate (88) so that the two oil slots in gear plate align with the two oil slots in the gear.

2. Replace snap ring in groove in stationary gear plate (88), using Snap Ring Pliers J-1575.

CLUTCH HUB ASSEMBLY

DISASSEMBLY

1. Pull pinion cage assembly including split pinions) out of ring gear (131) Fig. 359.

2. Remove ring gear snap ring (100) with a screw driver and withdraw clutch hub (102) from ring gear.

3. If necessary to replace clutch hub bushing remove and replace it using Bushing Remover and Replacer J-1568.

REASSEMBLY

1. Install clutch hub in ring gear (131) Fig. 359 and install snap ring (100).

NOTE: Snap rings are supplied in three thicknesses.

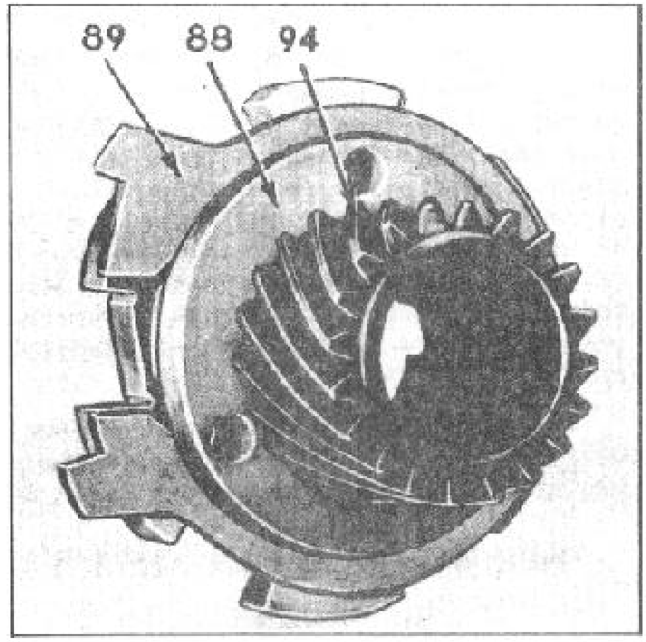


Figure 359 - Clutch Hub Assembly

When replacing be sure it fits snugly in groove.

2. When installing pinion cage assembly it will be necessary to rewind split pinions. This can be done when reassembling clutch hub on main shaft.

INSTALLING TRANSMISSION MAIN SHAFT

1. Place new overdrive to transmission case gasket (84), Fig. 322 on transmission case.

2. Install transmission main shaft (81) part way in transmission case and install low and reverse gear (20) with shifter fork groove toward front of shaft.

It is important that the four oil holes be lined up with the grooves in main shaft.

3. Slide intermediate gear (19) on main shaft with the tapered side of the hub toward the front of the main shaft.

4. Install synchronizer shift sleeve assembly (24) and two bronze synchronizer rings (25) on the main shaft with the tapered end of the shift sleeve (24) toward the front of the main shaft.

5. Install synchronizer shift sleeve hub lock ring (27) Fig. 322, on end of main shaft using pliers J-1575.

6. Engage front end of main shaft in pocket of main drive gear and press firmly in place.

NOTE: Do not hammer on end of main-shaft.

7. Install second and high shift rail lock ball and spring in transmission case.

8. Place second and high shift fork in position in synchronizer shift sleeve groove and install shift rail and set screw.

9. Install shift rail interlock.

10. Place low and reverse shifter in position behind shift shaft inner lever.

11. Place low and reverse shift fork in position, install shift rail and shift fork and shifter set screws.

INSTALLING PINION CAGE ASSEMBLY, CLUTCH HUB ASSEMBLY AND FREE WHEEL CAM ASSEMBLY

1. Install stationary gear (94), Fig. 322, on main shaft and engage gear pawl (146) Fig. 354, In balk ring opening.

2. Install oil collector ring cover (92) Fig. 322 and oil collector ring cover snap ring (93).

3. Install pinion cage pinion cage retaining snap ring (130) on main shaft using Snap Ring Replacer J-1499 with Pilot J-1499-3 threaded into main shaft.

4. Install pinion cage assembly (98) Fig. 322 and clutch hug front thrust washer (99) with lip on washer engaged in cut out in pinion cage on stationary gear (94),

Coat thrust washer faces with grease.

5. Place a screw driver or wedge between low and reverse gear and transmission case to lock gear. Also place a punch or wedge through opening in pinion cage assembly as shown in Fig. 360.

6. Install ring gear (131) on narrow pinions (97) and wind ring gear clockwise so that teeth of narrow pinions pass 1-1/2 teeth of wide pinions (95) or until marked pinion teeth line up, then push ring gear onto wide pinions.

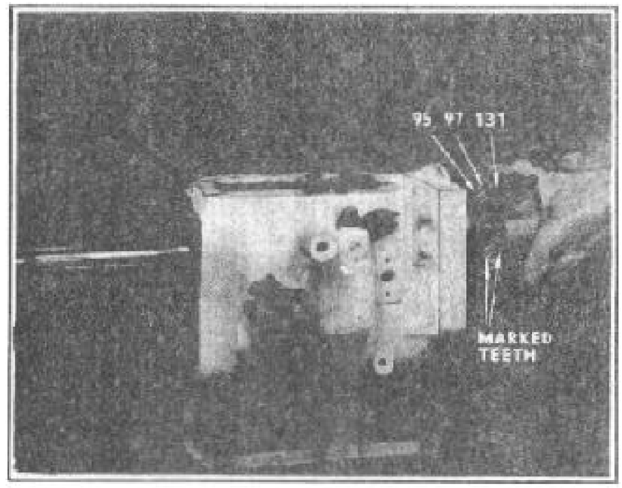


Figure 360
Winding Pinions

7. Remove wedges.

8. Coat both faces of clutch hub rear thrust washer (127) Fig. 322 with grease and place it on front face of free wheel cam assembly.

9. Place free wheel cam assembly (106) on main shaft.

10. Grease roller pockets of can roller retainer (108) and place rollers (107) in position. (There are 12 rollers).

Hold them in place with a rubber band. Rubber band will dissolve la grease.

11. Install free wheel cam retaining washer (126) and bolt (125) and lock washer.

INSTALLING OVERDRIVE CASE ASSEMBLY

1. Install new overdrive housing adapter gasket (90) Fig, 322.

2. Move control lever (135) to forward position, hold overdrive case at slight angle, turn companion flange sharply counterclockwise while pushing case forward into position against adapter, so that free wheel cam rollers enter pocket in overdrive main shaft.

3. Insert J-1597 Overdrive Aligning Pilot in lower hole of overdrive case, adapter and transmission case.

NOTE: This is essential for proper alignment of overdrive case to adapter, to permit free movement of interlock lever (133) and interlock plungers (148 and 149) Fig. 355.

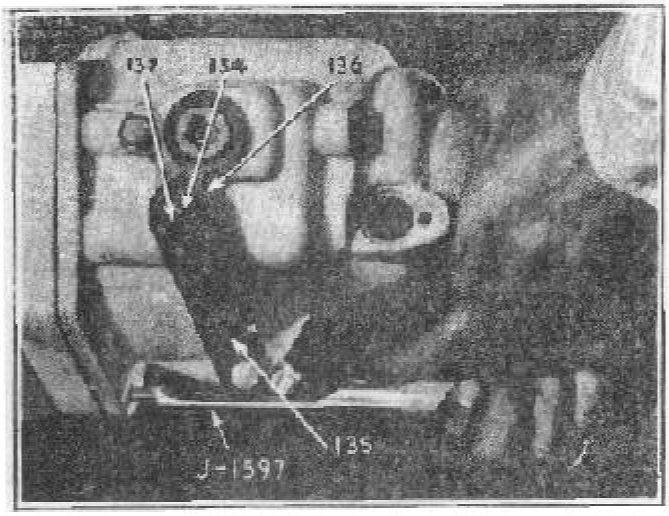


Figure 361
Aligning Overdrive

4. After proper alignment has been secured, install four of the five overdrive case to transmission case bolts and draw up snugly.

5. Remove pilot and install remaining bolt.

6. Install new clutch housing gasket, clutch housing and tighten six bolts securely.

7. Push main shaft (121) as far forward as possible and tighten companion flange nut (116) securely (Fig 322)

8. Fill transmission and overdrive unit with proper amount of required lubricant. A total of 3-1/4 pounds is required - 2 pounds for transmission and 1-1/4 pounds for overdrive unit. Install low and reverse shift rail lock ball (47), lock ball spring (48), cover gasket (58) cover (57) and cap screw and washers.

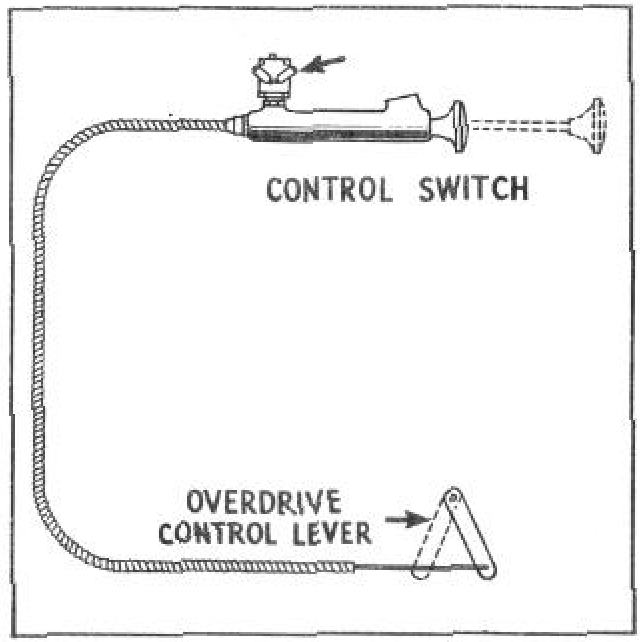


Figure 362
Control Wire Adjustment

CONTROL WIRE ADJUSTMENT

The overdrive control wire is adjustable for length at the control lever on the left side of the overdrive housing. The wire should be released at the binding screw and the lever on the housing pushed back as far as possible. With the lever in this position the overdrive unit is in the engaged position. Move the control button in as far as it will go and then pull it out exactly one half inch. This clearance must be maintained between the end of the button and the control wire casing bracket, when the binding screw is tightened, to insure full engagement of the clutch hub sleeve. Move the overdrive control lever forward to the point where resistance is met and tighten binding screw.

REFERENCES

Source of Information	Date	Subject

VACUMOTIVE DRIVE

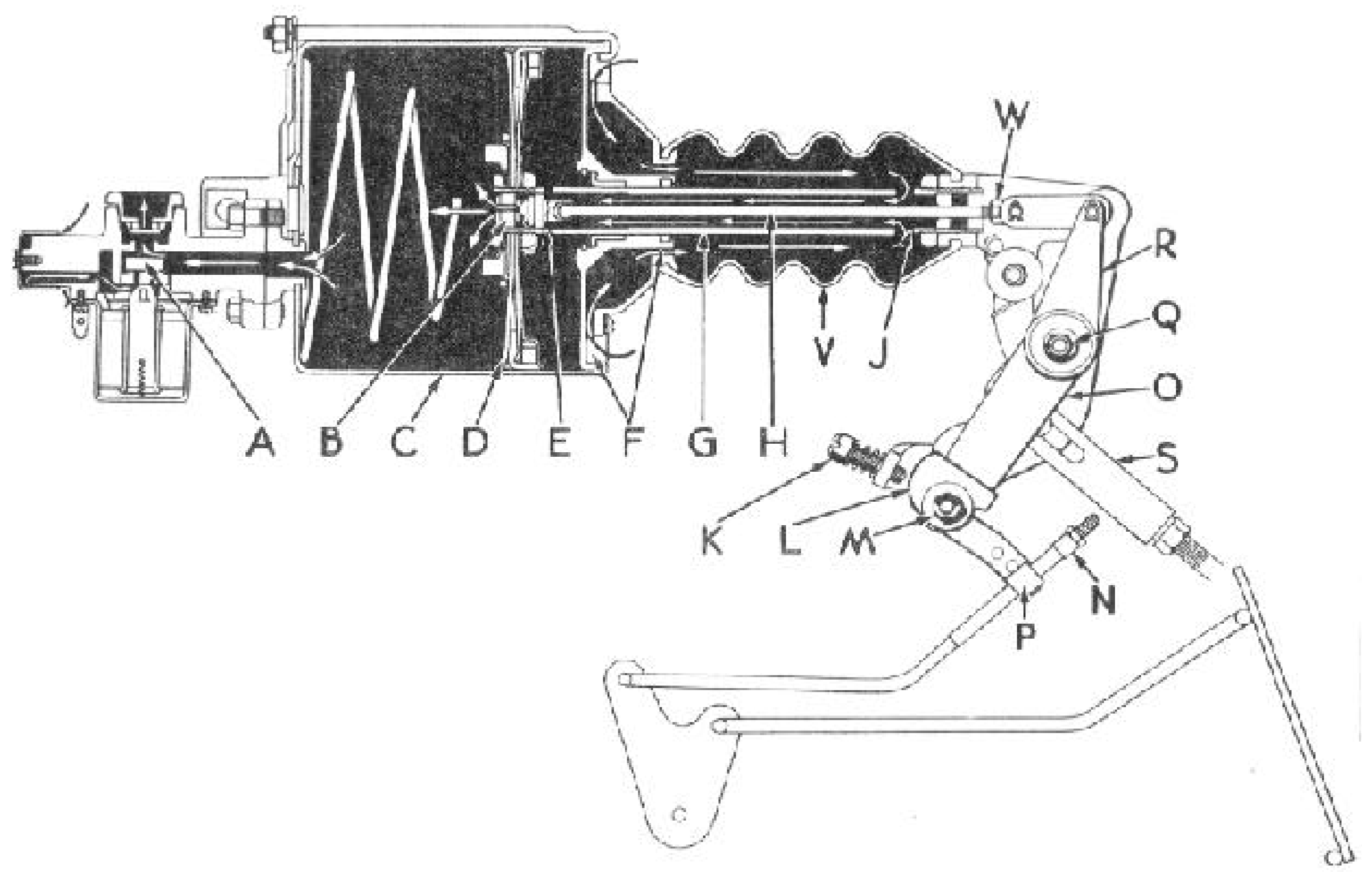


Figure 363 - Vacumotive Drive Power Unit and Linkage

A. Solenoid valve
B. Valve plunger
C. Vacuum power cylinder
D. Vacuum piston
E. Piston rod air passages
F. Air cleaner passage
G. Piston rod
H. Valve rod
J. Piston rod air passage
K. Cushion point stop screw
L. Valve lever cam
M. Valve lever cam pivot
N. Threaded sleeve
O. Valve lever
P. Accelerator linkage and guide trunnion
Q. Valve lever pivot
R. Operating bell crank
S. Bell crank to coupling lever rod link
V. Piston rod rubber guide
W. Valve rod locknut

GENERAL

Vacumotive Drive provides automatic clutch operation making it unnecessary to depress the clutch manually under any driving condition.

Power for operating the clutch is provided by the power cylinder which uses engine manifold vacuum for its operation.

The main units of the Vacumotive Drive are:

1. POWER UNIT - controlled by vacuum supplies the mechanical effort to automatically operate the clutch.

2. INSTRUMENT PANEL SWITCH - buttons marked "VAC" and "OFF", mounted on the instrument panel permits the driver to change from conventional clutch operation to automatic operation by merely pressing in and releasing the "VAC" button.

3. ACCELERATOR SWITCH - makes it possible to start with a wide open throttle for rapid acceleration.

4. GOVERNOR SWITCH - prevents automatic clutch disengagement when in high gear in speeds over 20 miles per hour.

5. THE SHIFT RAIL SWITCH - permits automatic clutch operation in low, second or reverse gears regardless of car speeds.

POWER UNIT

The power cylinder piston rod is connected by linkage to the clutch throwout yoke shaft so that the clutch is disengaged when the piston is moved forward. When the piston moves toward the rear the clutch is engaged.

The movement of the piston is controlled by linkage from the power unit valve to the accelerator pedal. When the accelerator is in its released position, full manifold vacuum is obtained on the front of the power cylinder piston and atmospheric pressure on the rear of the piston moves it forward and the clutch is disengaged.

When the accelerator pedal is depressed, the valve is moved to equalize the pressure on both sides of the piston and the clutch is engaged by the pressure of the clutch springs on the pressure plate.

ELECTRICAL CIRCUITS

The system is turned on and off by an electric switch on the instrument panel. The electric circuit is from a point on the ignition switch which is "hot" when the ignition is on.

The circuit is completed through a solenoid valve mounted on the power cylinder then to the accelerator switch from which there are ground circuits to the transmission shift rail switch and the governor switch.

When the circuit is complete to either or both "Grounds", the solenoid is energized, opening the valve in the line which connects the power cylinder to the engine manifold.

When the circuit is broken the solenoid valve closes the passage to the manifold cutting off the vacuum and opens a passage from the power cylinder to atmosphere so that the clutch engages immediately.

OPERATION

Figure 363 shows the position of the power unit and linkage with engine running and clutch engaged at the instant the accelerator pedal reaches the closed throttle position and before disengagement has started.

The electrical circuit is closed so that the solenoid valve (A) is open and manifold vacuum is impressed on the front side of the power unit piston (D). The shoulder (N) on the sleeve of the valve pull rod (H) has moved away from the trunnion block (P) on the valve cam lever (L) so that the valve piston (B) has moved forward due to the vacuum acting on its forward surface, thus sealing the forward end of the cylinder from the rear and also opening the ports (E) in the piston rod (G) to admit air from the cylinder. The pressure differential of vacuum on the front and atmosphere on the rear of the piston causes the piston to move forward and through the linkage, disengage the clutch.

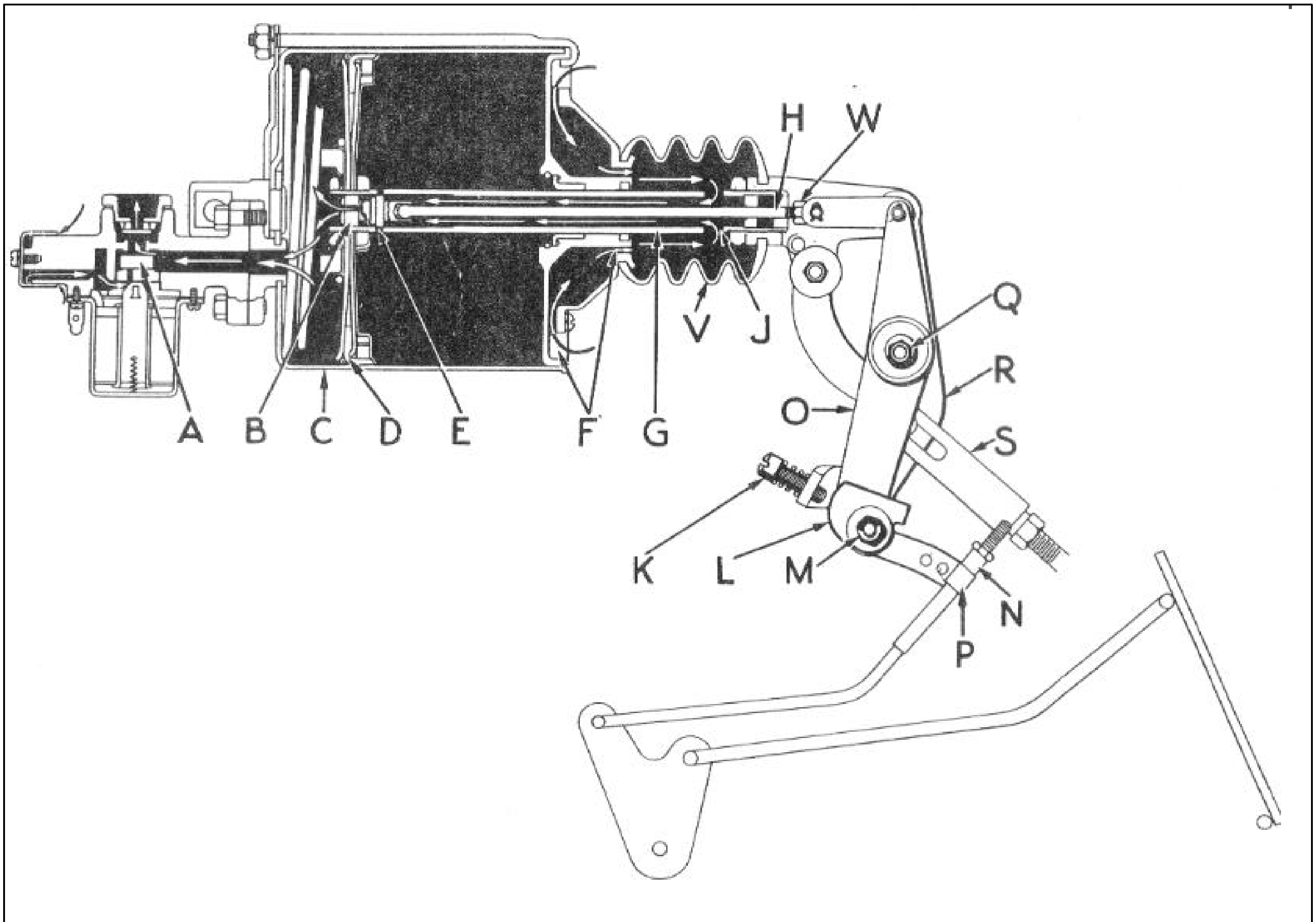


Figure 364

DISENGAGEMENT

Figure 364 shows the conditions existing after the clutch has been disengaged. The piston has moved forward and the control linkage has been moved to correspond to this piston position.

It should be noted that the trunnion block (P) on the valve cam lever (L) has been moved backward by the rotation of the piston rod bellcrank (R) so that it is against the shoulder on the rod sleeve (N).

The movement of the piston valve has been stopped and the piston (B) has over-traveled so that the valve now covers the ports (E) in the piston rod (G), preventing entrance of additional air into the rear of the cylinder and stopping the forward movement of the piston. The sleeve (N) is threaded on the rod, so that the point at which the trunnion block contacts the shoulder of the sleeve and stops the piston, is adjustable.

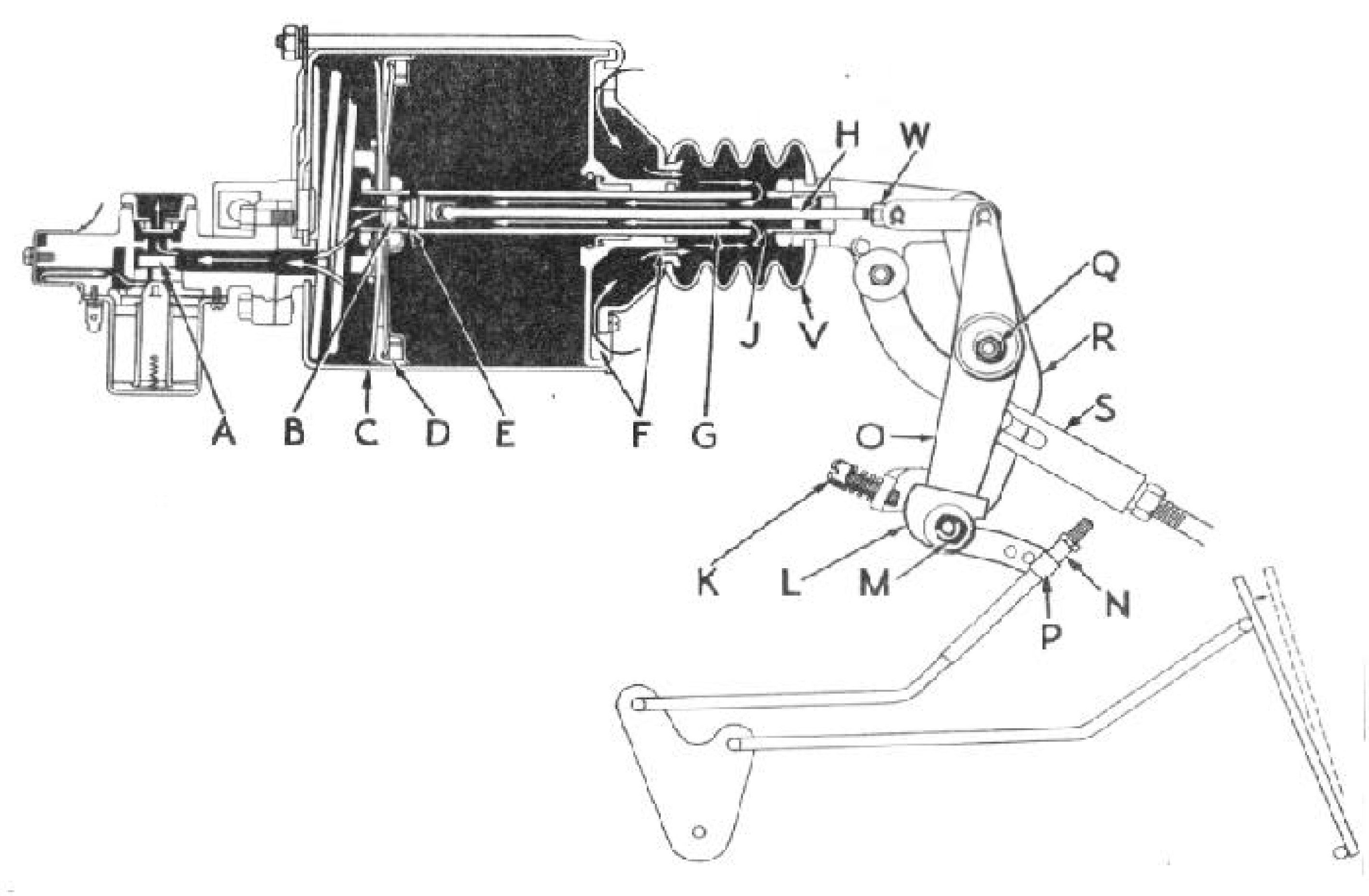


Figure 365

ENGAGEMENT

Figure 365 shows the linkage in position of partial throttle opening and the piston in the forward position before engagement has started.

The shoulder (N) on the rod sleeve has pulled the valve cam lever (L) forward moving the piston valve (B) backward.

The valve in moving behind the ports (E) in the piston rod, (G) has cut off the entrance of atmospheric air to the rear of the cylinder and opened the ports in the piston rod to give direct passage from the front to the rear of the piston. As the air in the rear of the cylinder flows through the ports to the front of the piston the pressures are equalized and the piston moves freely to the rear through the pull of the clutch engaging springs.

As the piston moves backward the valve lever cam (L) mounted on the piston rod lever, moves forward. When the cam rests against the stop screw (K) the piston valve is held stationary. The piston continues to move backward and the piston rod ports are partially covered restricting the flow of air from the rear of the cylinder and slowing down the final engagement of the clutch. The point where the retarding of the engagement takes place is known as the cushion point and is determined by the position of the stop screw (K).

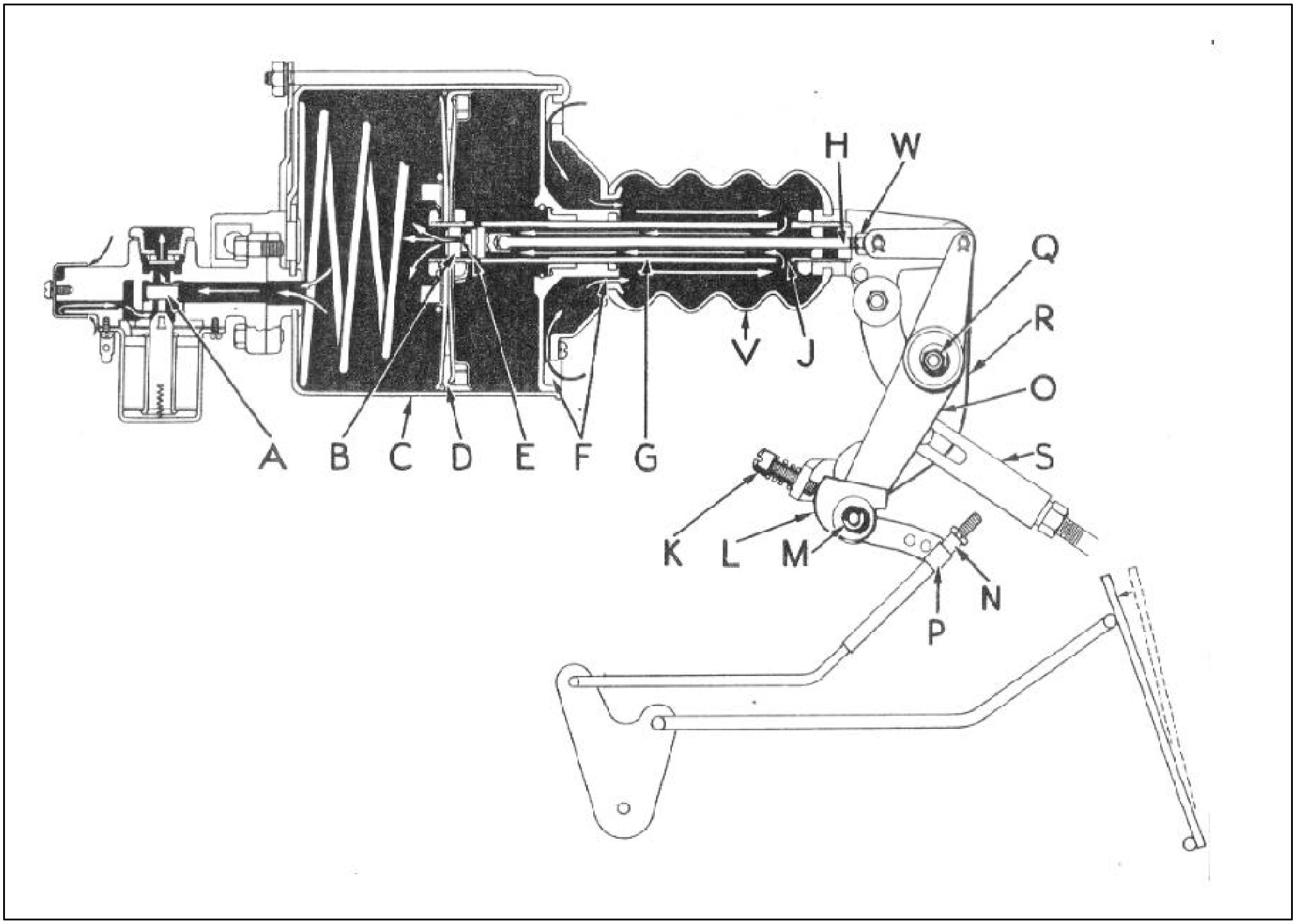


Figure 366

CUSHION POINT

Figure 366 shows the conditions at the time the cushion point is reached.

It should also be noted that the further the accelerator pedal is depressed, the greater the rotation of the cam (L). As the cam rotates, greater movement is required before it contacts the stop screw and cushions the final engagement. This prevents excessive engine speed before clutch engagement.

During all the preceeding discussion the solenoid valve (A) has been open to the manifold vacuum. It is readily seen that if the solenoid valve were allowed to move upward, closing the passage to the intake manifold and opening the atmospheric passage to the front of the piston, much more rapid clutch engagement would be obtained.

Rapid engagement is required when starting with more than half throttle in first or second gear or when shifting to second or high gear when the vehicle is moving over 20 miles per hour.

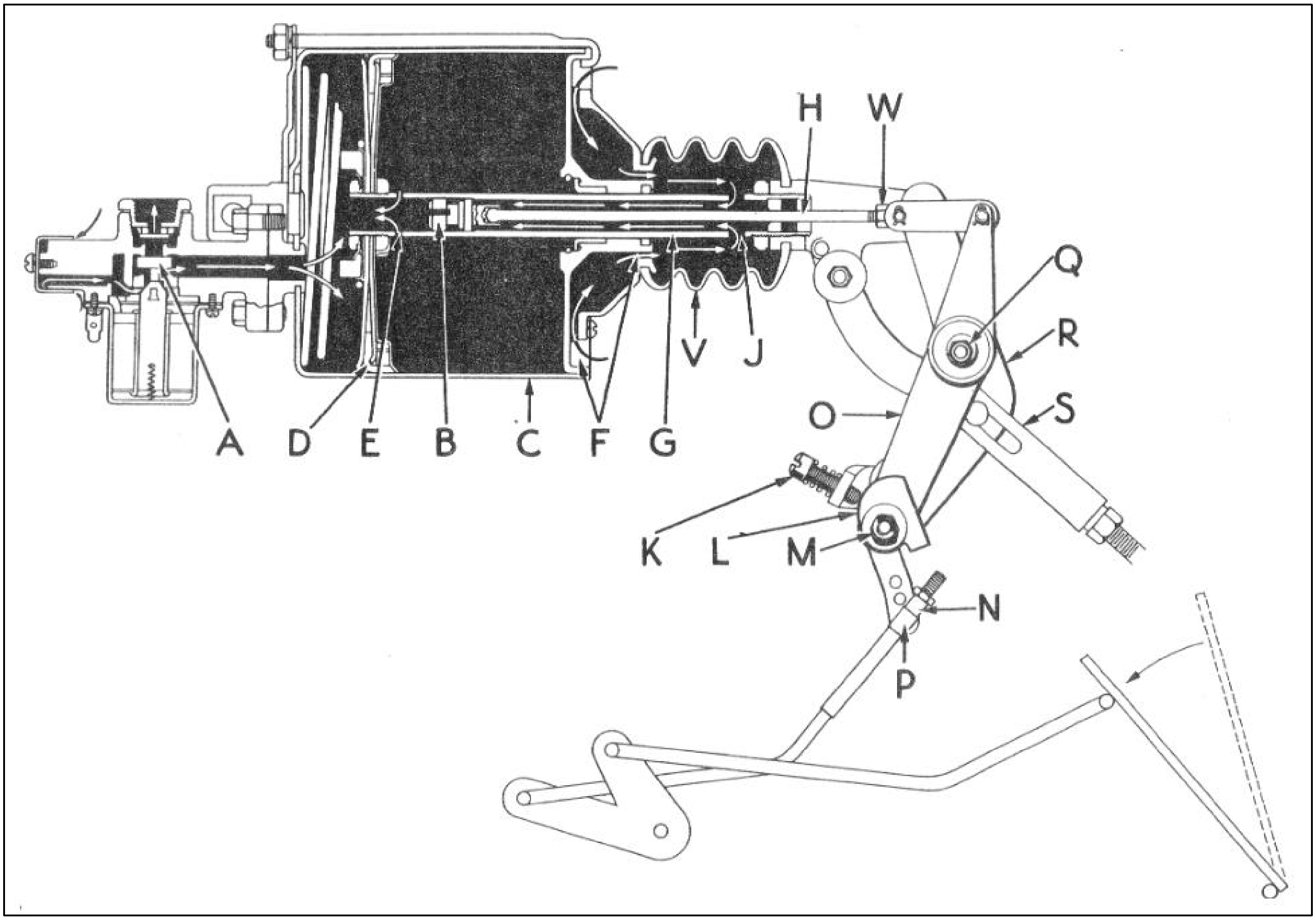


Figure 367

Figure 367 shows the conditions at the beginning of such an engagement. The accelerator is depressed to give over half throttle opening.

The piston valve is in its rearward position opening the passages between the front and rear of the piston and the solenoid valve is in its upward position.

Figure 368 shows the wiring diagram and the conditions under which the circuits will be opened and the solenoid valve in its upward position as shown in Fig. 367

The circuit through the accelerator switch to the shift rail switch, is closed when the accelerator pedal is in the closed to half throttle position. The shift rail switch is closed except when the transmission is in high gear. The clutch engagement is, therefore, controlled by the piston valve when starting or accelerating in reverse, low or second gear with less than half throttle. When over half throttle is used the accelerator switch circuit is open and quick clutch engagement is obtained due to the closed solenoid valve as previously explained.

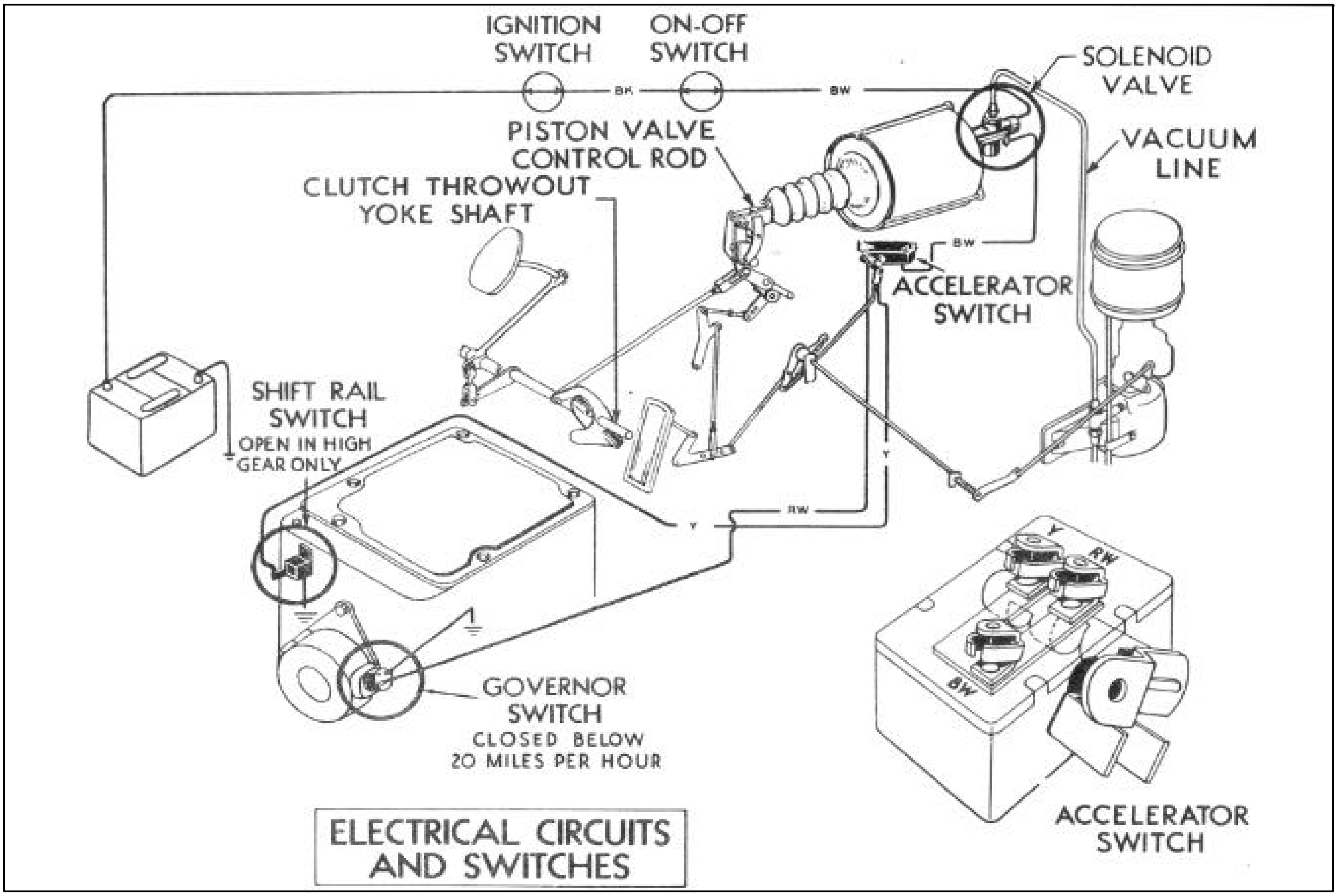


Figure 368

It should be noted here that the clutch disengages immediately when the foot is removed from the accelerator pedal, when the transmission is in reverse, low or second gear as the ground circuit is closed by the shift rail switch, Fig. 369. This gives a free wheeling effect which is desirable when maneuvering the car in these gears.

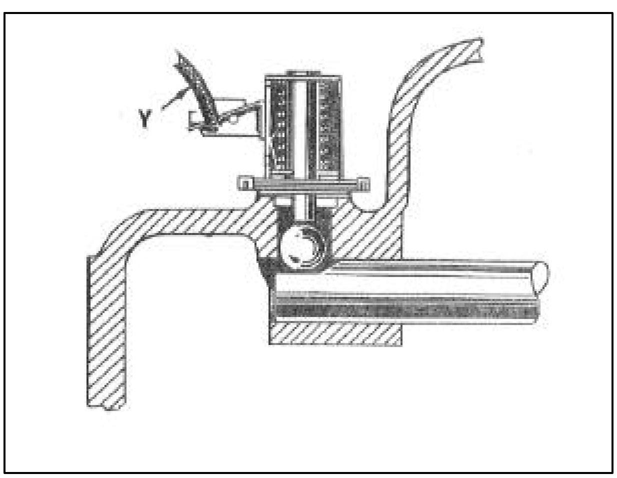


Figure 369 - Shift Rail Switch

When the transmission is shifted into high gear the shift rail switch is open so the only ground from the accelerator switch is through the governor switch. The governor switch is closed to ground at speeds below 20 miles per hour and open above that speed.

When shifting into high gear at speeds below 20 miles per hour the clutch engagement is controlled by the power unit piston valve if the accelerator is depressed only slightly to give less than 100 movement of the accelerator switch arm. Under this condition the circuit is closed through the accelerator switch to the governor ground. This gives a very slow engagement of the clutch even permitting starting in high gear.

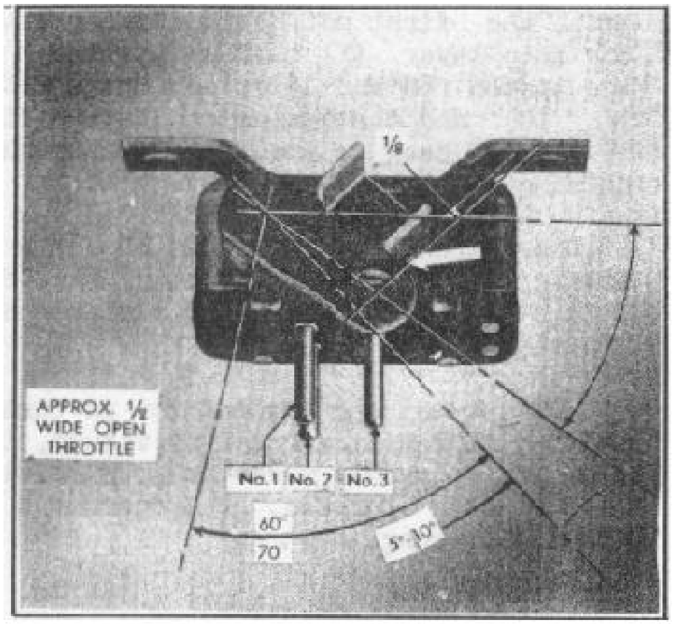


Figure 370 - Accelerator Switch

The accelerator switch Fig. 370 contains two sets of contacts. One point of each set is connected to the (BW) terminal. The other point of the sets is connected - one to the (Y) terminal and the other to the (RW) terminal.

The accelerator switch lever operates both sets of points. When the lever is against the stop (closed throttle position) both sets of points are closed, completing the circuit to both the shift rail switch and the governor.

When the accelerator switch lever is rotated away from the stop, ten degrees, (throttle slightly opened) the points to which the (RW) wire (governor) is connected opens, breaking the circuit to the governor.

When the accelerator pedal is depressed to give approximately half open throttle, the accelerator switch arm opens the points (Y) connected to the shift rail switch.

Because the circuit to the governor is broken by the accelerator switch before the circuit is broken to the shift rail switch, the governor has no effect on the engagement or disengagement of the clutch except when the shift rail switch is opened by shifting the transmission into high gear.

If the accelerator is depressed sufficient to rotate the accelerator switch arm more than 10 degrees, the circuit through the accelerator switch to the governor switch is opened, the solenoid valve closes and rapid engagement is obtained. This rapid engagement prevents the engine from running above car speed and gives the quick action necessary for maneuverability.

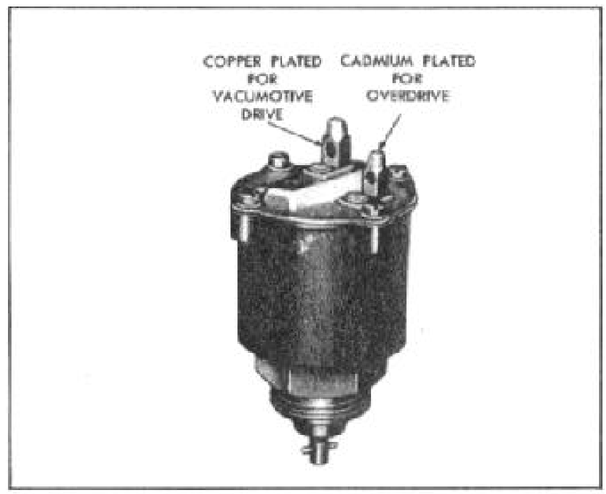


Figure 371 - Governor Switch

The governor switch is operated by the speedometer gear located at the rear of the transmission and prevents automatic clutch disengagement when in high gear in speeds over 20 miles per hour.

NOTE: With the governor switch open above 20 miles per hour and the shift rail switch open when the transmission is in high gear, the clutch will not disengage when the foot is removed from the accelerator pedal. There is, therefore, no free-wheeling action in high gear above 20 miles per hour and the engines can be used for braking the car speed in the normal manner.

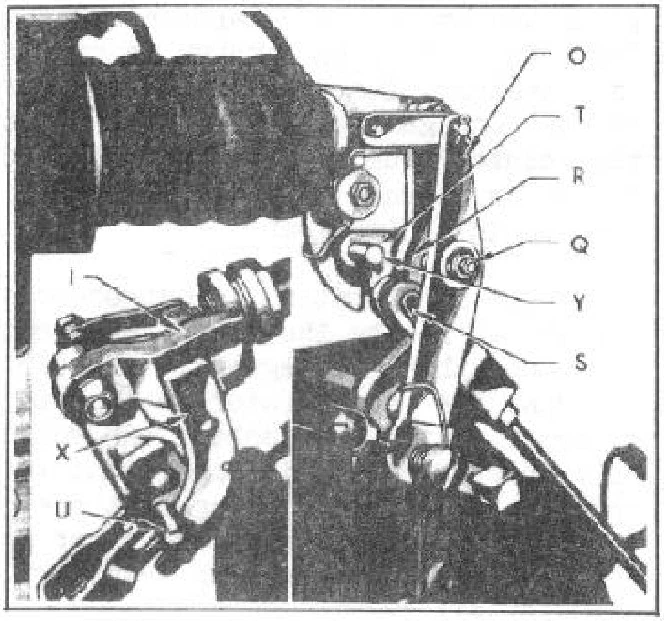


Figure 372 - Clutch Compensator

CLUTCH VACUUM CONTROL COMPENSATOR

When the engine has stopped, the clutch cork inserts become saturated with lubricant creating a frictional difference in the driving plate corks.

The clutch compensator lever automatically adjusts this condition by changing the rate of engagement.

Attached to the bell crank (R) is a two position compensation lever which turns the eccentric pivot (Q) changing the relation of the valve lever (0) with respect to its pivot point on the bell crank (R).

When first starting the car, the clutch pedal is depressed manually (by the driver's foot) and the action that takes place is -- the end of the bell crank yoke (S) strikes the pin (Y) and swings the lever (T) both forward and upward, see Fig. 372.

This moves the center of the valve lever pivot forward and permits the clutch to engage farther, to compensate for the cork inserts being covered with oil.

Normal driving position of the compensator lever follows and as soon as the clutch is automatically engaged and after the first shift into high gear, the trip lever (X) which is mounted on the piston rod end (I) will engage the pin (U) and the compensator lever will be rotated back to a position for normal driving. See Fig. 372.

The compensator lever must be in an upward position as shown in Fig. 372 before making any automatic clutch adjustment.

NOTE: When the compensator is turned up, with clutch disengaged by vacuum, the piston rod should move back slightly. If it moves forward, the eccentric is assembled wrong.

ADJUSTMENT

Adjustment of the Vacumotive Drive should not be started until the engine has been properly tuned and thoroughly warmed so that it idles smoothly. The car should be driven enough to bring the Clutch parts to normal operating temperature.

Figure 373 - Clutch Pedal Adjustment

CLUTCH LINEAGE

To assure full disengagement of the clutch, the face of the pedal lever with clutch fully engaged should clear the underside of the toe-board 1-1/2" as outlined in "Clutch Section", page 140.

Before adjusting the clutch control link, be sure that it is properly positioned. Refer to "Clutch Section" page 140.

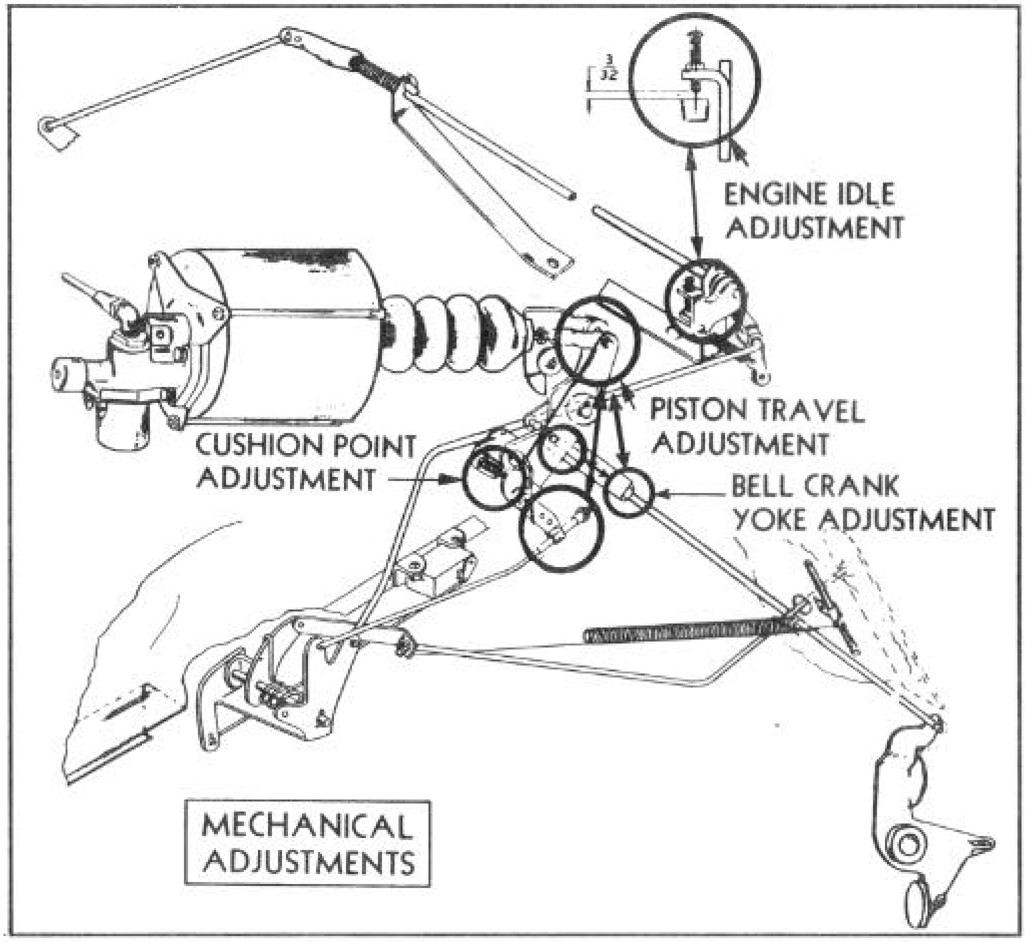


Figure 374

To adjust link, remove cotter pin and clevis pin (A) Fig. 373, loosen lock nut (B) and turn clevis (C) until 1-1/2" clearance is obtained. After obtaining correct clearance, reinstall clevis pin and cotter pin and tighten lock nut.

ENGINE IDLE SPEED

With engine at normal temperature and "VAC" button pushed in, adjust carburetor throttle stop screws to obtain 580600 rpm closed throttle idling speed.

BELLCRANK YOKE

With engine shut off, there should be 1/8" clearance at (D) between clevis pin and end of slot in link (E), Fig. 375.

This can be checked by pulling piston rod backward as far as possible.

At this point, the front end of the pull rod link should be flush with the front edge of the bellcrank as shown at (E).

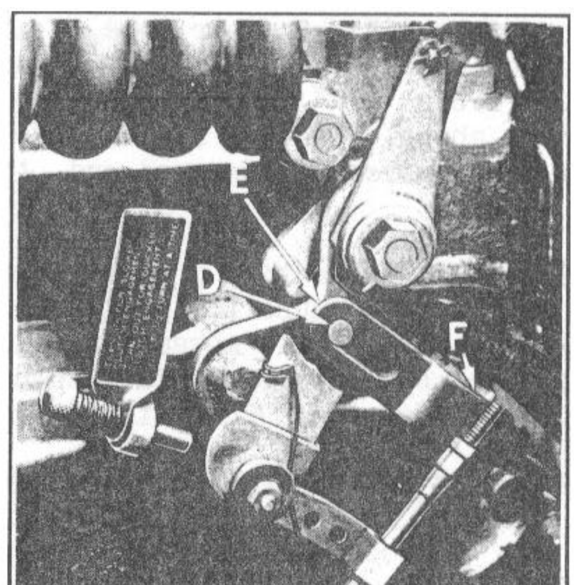


Figure 375 - Bell Crank Yoke Adjustment

If adjustment is required, loosen lock nut and adjust nut (F) in the link to increase or decrease the clearance. Tighten lock nut and recheck as above.

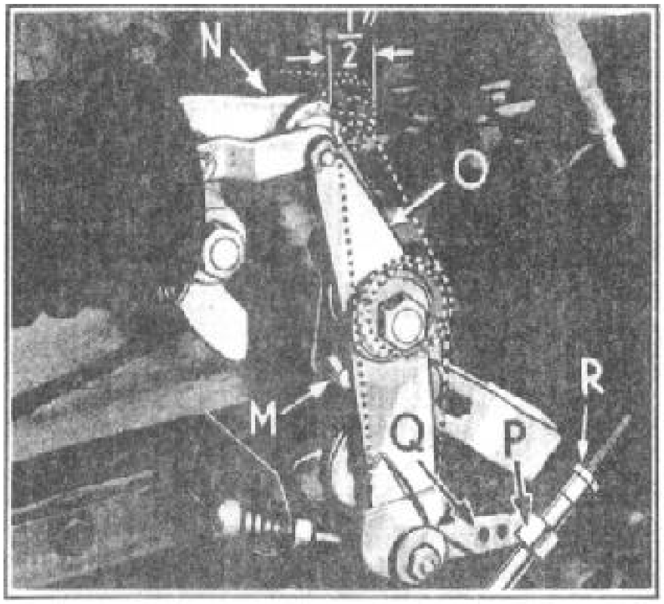


Figure 376 - Piston Travel Adjustment

PISTON TRAVEL

With the engine running and with the compensating pin (1) Fig. 376 away from its stop, check the movement of the piston rod (N). Do this by pressing forward on valve lever (0) and releasing it. When lever is released, piston rod (N) should move back 1/2" as shown dotted on the illustration.

If piston rod does not move back 1/2", check to see that cam swivel (P) is set in rear hole of cam lever (Q). With swivel (P) in rear hole, adjust threaded sleeve (R) until piston rod end (N) travels 1/2" when released as mentioned above. Moving sleeve (R) away from dash moves piston rod end toward the dash.

Pushing compensating pin (N) against its stop should cause the piston to move back slightly. If it moves forward, the eccentric bushing is upside down and should be reversed. Shut off engine.

CHECK THROTTLE LINKAGE AND BELL CRANK SPRING ASSEMBLY FOR BINDING

Check both with "OFF" button in and with "VAC" button in and engine running. Depress accelerator and release slowly.

Linkage should return solidly against stop on accelerator switch. Recheck several times.

Free up if necessary and lubricate.

Do not attempt to correct by adding springs or by shortening present springs.

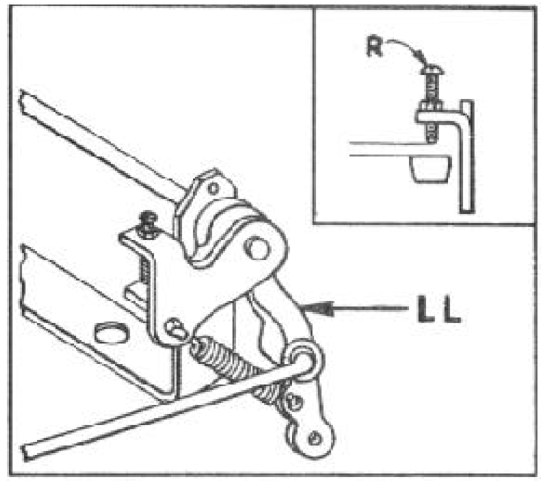


Figure 377
Throttle Cross Shaft Adjusting Screw

THROTTLE CROSS SHAFT SCREW

Depress the clutch pedal (IMPORTANT) and start engine.

Back out cam lever adjusting screw (S), Fig. 378, until there is approximately 1/2" clearance between cam (U) and the screw end.

Slowly rotate lever (LL) Fig. 377 until clutch begins to take hold. Turn adjusting screw (R) in, until there is a slight increase in engine speed when the car begins to move. If engine speed is too great turn out adjusting screw (R). BE SURE TO TIGHTEN LOCK NUT.

CUSHION POINT

Shut off engine. Depress clutch pedal and start engine. (Compensating pin (1) Fig. 378 must now be away from its stop).

Set parking brakes. Place Handy Shift Lever in second gear position. Turn cam screw (S) in, fully. Then hold cam (U) against screw (S) by pressing at point (0) and back out adjusting screw (S) until the engine stalls.

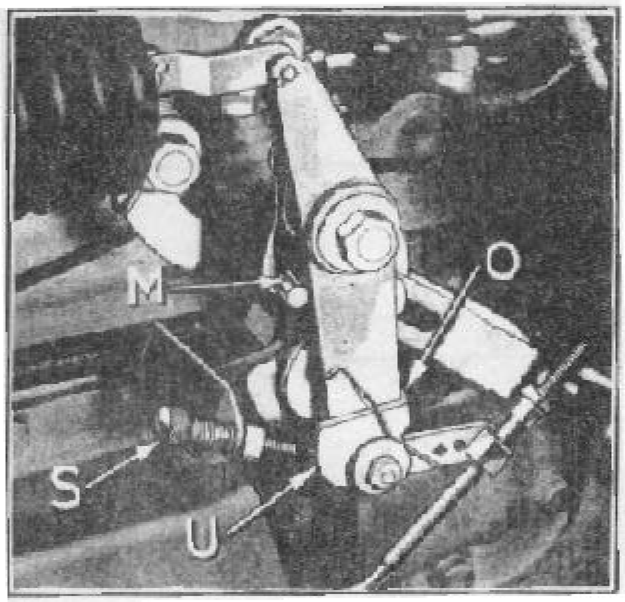


Figure 378 - Cushion Point or Final Adjustment

ROAD TEST

For final check, road test car. If engine shows tendency to stall, turn the cam screw (S) in until smooth operation is obtained.

NOTE: Never turn screw more than 1/2 turn at a time on final adjustment.

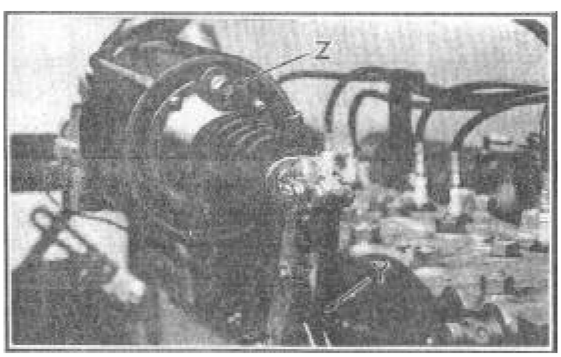


Figure 379 - Power Cylinder Lubrication

AT 1,000 MILES

At intervals of 1,000 miles, all pivot points in the mechanism should be lubricated with a few drops of light engine oil. Be sure to put a few drops of oil in the bellcrank bracket oil hole (Y) Fig. 379.

AT 10,000 MILES

At intervals of 10,000 miles, remove pipe plug (Z), Fig. 379, in rear end of power cylinder, and inject one ounce of Hudson Shock Absorber Fluid. Remove the piston rod end to bell-crank bolt and the valve rod to lever link and rotate the piston with an in-and-out motion to distribute the oil over the entire piston and oil wick.

SLOW OR ERRATIC OPERATION

Common causes of slow or erratic action of the Vacumotive Drive are as follows:

Air leaks in power cylinder or lines.
Sticky solenoid plunger.
Friction in throttle or valve linkage.

AIR LEAKS

Check for piston leaks by sliding piston rod guard forward until the four circular ports in the piston rod are exposed. Start engine and let the clutch remain automatically disengaged. Place the thumb and two fingers over the port holes. Any leak in the piston seal can be felt as a suction action on the fingers at the port holes.

If more than a slight suction is felt, lubricate the power cylinder with shock absorber oil as outlined above.

Check all gaskets, pipes and pipe fittings for air leaks.

STICKY SOLENOID VALVE

Sluggish operation of the Vacumotive Drive may be due to failure of the solenoid valve to work freely because of a binding in the plunger.

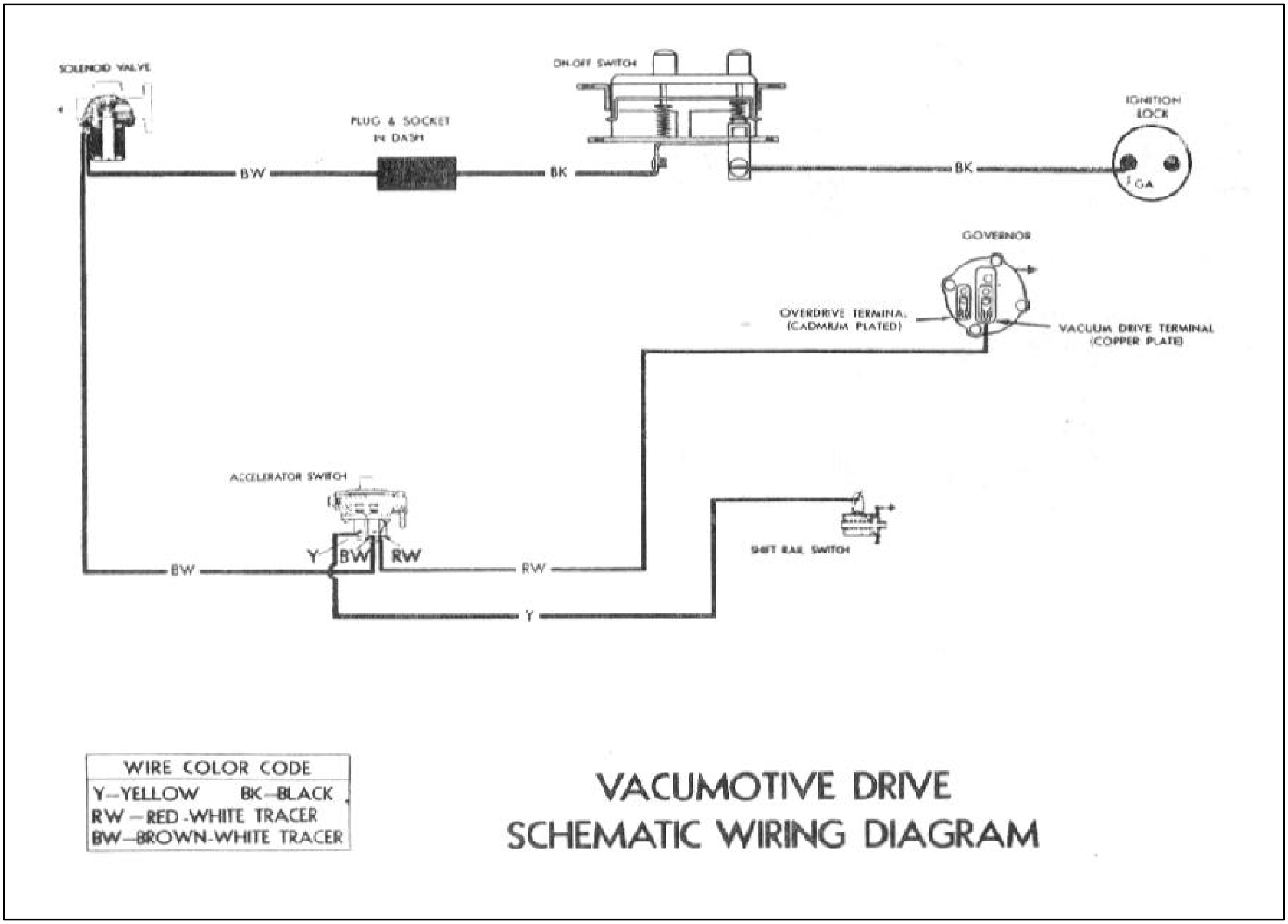


Figure 380

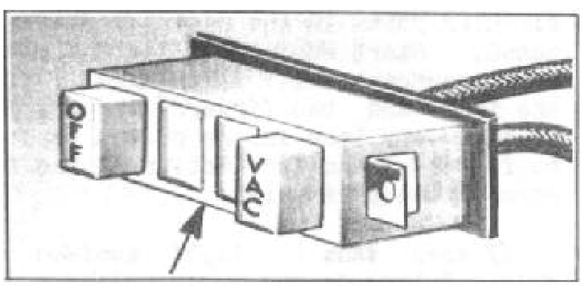


Figure 381 - Dash Panel Switch

DASH PANEL SWITCH

Ignition switch on. Ground long lead of test lamp.

OFF Button on. - Test lamp prod to la should light test lamp.

VAC Button on. - Test lamp prod to #2 should light test lamp.

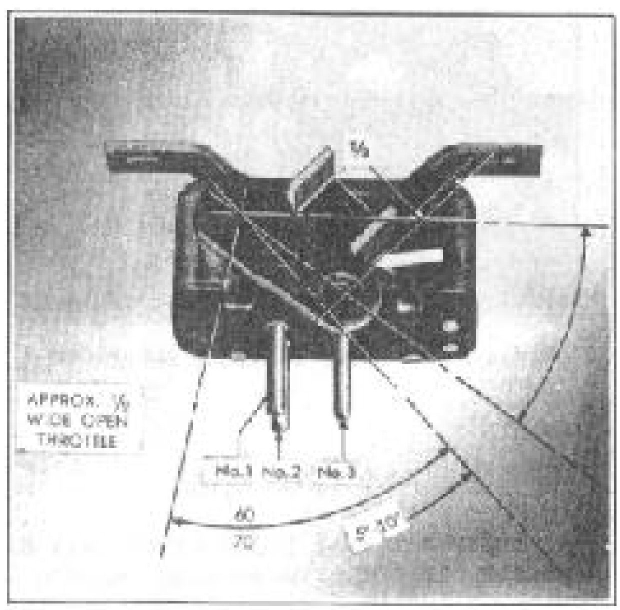


Figure 382 - Accelerator Switch

ACCELERATOR SWITCH

Remove connector plug. Ground one lead of jumper wire, other lead to #2 prong of accelerator switch. Long lead of test lamp to negative terminal of battery. Test lamp prod to #l prong of accelerator switch, should light test lamp. Moving lever 10 degrees from stop, light should go out. Test lamp prod to #3 prong, should light test lamp. Moving lever 2/3 from stop, light should go out.

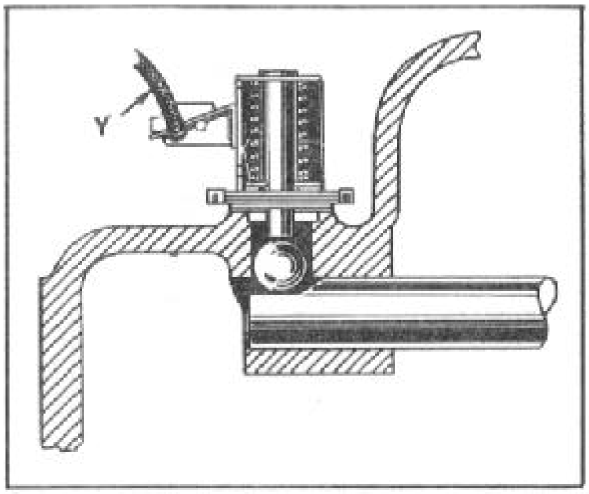


Figure 383 - Shift Rail Switch Test

SHIFT RAIL SWITCH

Long lead of test lamp to negative terminal of battery. Prod of test lamp to #2 socket of accelerator switch. Shift handy shift. No light on high gear, lamp lights on all others. Replace connector socket.

VACUMOTIVE DRIVE SOLENOID

Remove connector socket. Ground one lead of jumper wire, other lead to #2 prong of solenoid. Long lead of test lamp to negative terminal of battery. Test lamp prod to #1 prong of solenoid, valve should operate, test lamp should light dim. Replace connector socket.

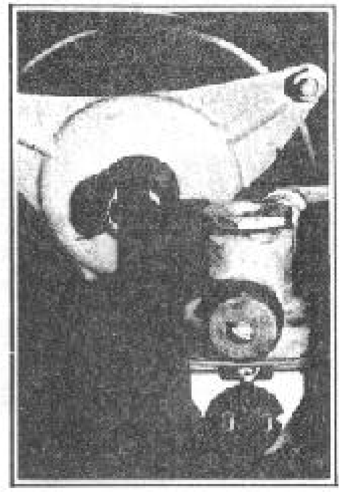


Figure 384 - Vacumotive Drive Solenoid

GOVERNOR SWITCH

A check of the governor switch can be made in road-test. Be sure (R.W.) wire is attached to the governor. Accelerate to speed of 30 M.P.H. in high gear and release the accelerator pedal. Rest the foot lightly on the clutch pedal. As the speed drops to 20 miles per hour, the clutch should be felt to release.

If the clutch does not engage at this speed; or if clutch disengages at all times in high gear, replace governor switch.

A separate terminal for use with over-drive, should light test lamp at speeds above 20 miles per hour.

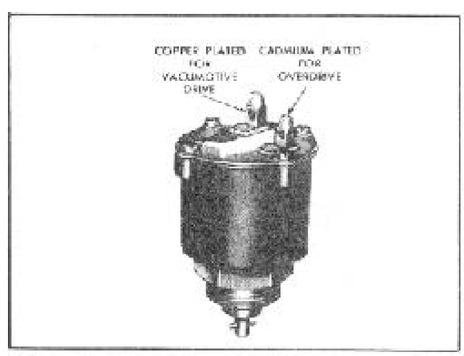


Figure 385 - Governor Switch Test

HUDSON DRIVE-MASTER

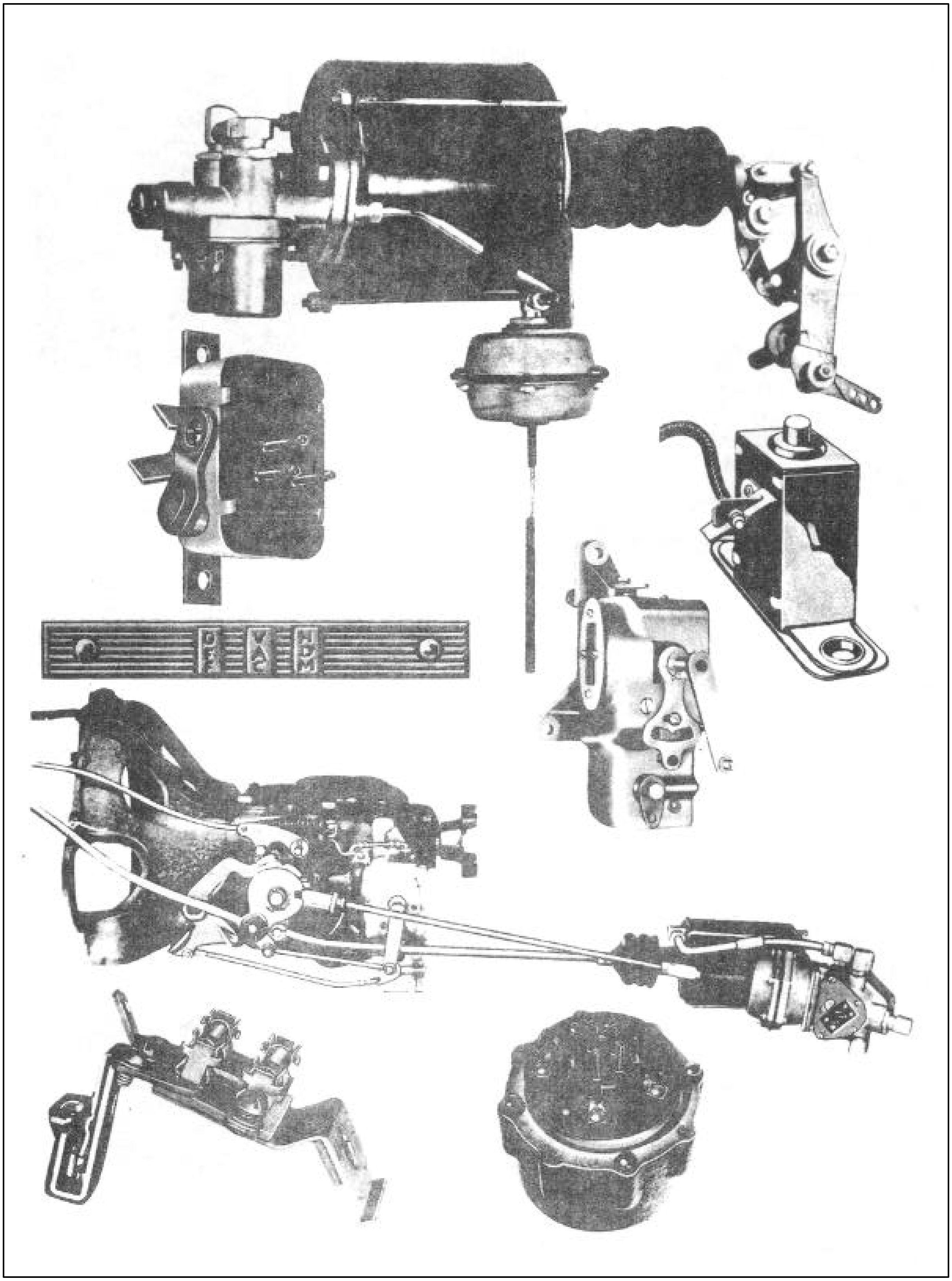


Figure 386 - Drive Master Units

The Hudson equipped with Drive-Master has the same controls as the conventional car and can be driven in exactly the same manner. The owner has the choice of 3 types of driving controls. Pushing the VAC button on the instrument panel switches provides automatic clutch control and gear shifting is done manually. When the HDM button is pushed, automatic clutch operation and automatic gear shifting in pick-up and high gear is obtained. If the OFF button is pushed, the car is ready to drive in the conventional way.

To start, merely press the handy shift lever in high gear position, depressing the accelerator pedal, the car moves forward in pick-up gear. When the car has reached the speed at which the driver desires to shift into high gear, he simply releases the accelerator pedal momentarily and the shift is made quickly and the car goes ahead in high gear.

DRIVE MASTER UNITS

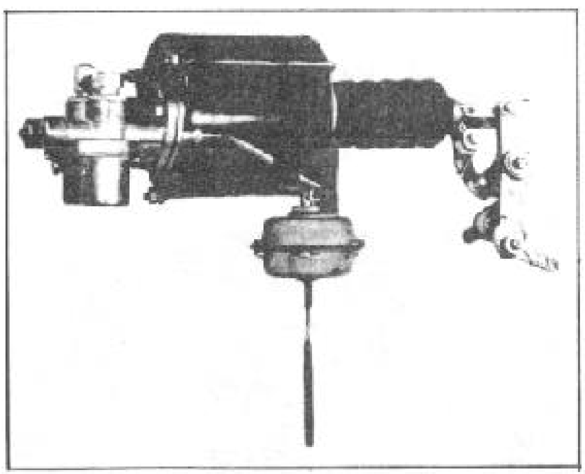


Figure 387 - Clutch Power Unit

CLUTCH POWER UNIT

The clutch power unit provides automatic clutch operation and is the same as the Vacumotive Drive Unit except that a throttle lock has been added. This device is mounted on the clutch control unit and is operated by a solenoid valve. When the diaphragm is raised the throttle is closed to idling position regardless of the position of the accelerator pedal. This is made possible by a wrap-up spring on the accelerator rod bell-crank through which the throttle linkage is driven.

The throttle lock prevents the throttle being opened until a transmission shift is completed when using Drive-Master.

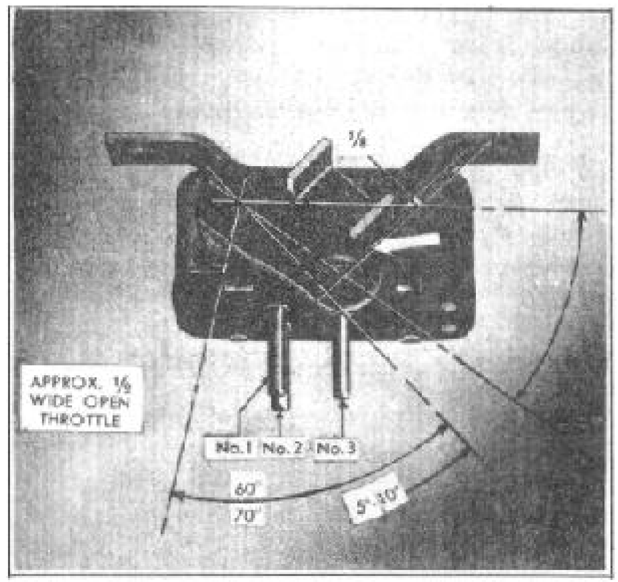


Figure 388 - Accelerator Switch

ACCELERATOR SWITCH

The accelerator switch used in conjunction with the Clutch Power Unit makes starting possible with wide open throttle for rapid acceleration.

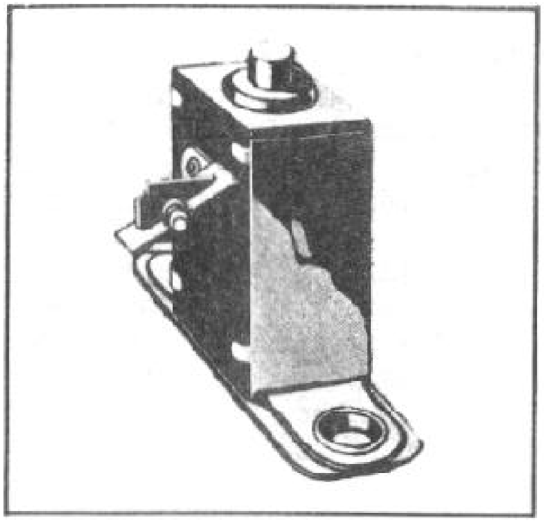


Figure 389 - Shift Rail Switch

SHIFT RAIL SWITCH

The shift rail switch also used with Vacumotive Drive permits Automatic Clutch operation in low, second or reverse gears regardless of car speeds.

The Clutch Power Unit except as noted, the Accelerator switch and the Shift Rail switch are the same for Drive Master and Vacumotive Drive. Refer to Vacumotive Drive, Pages 344 to 358 for further details.

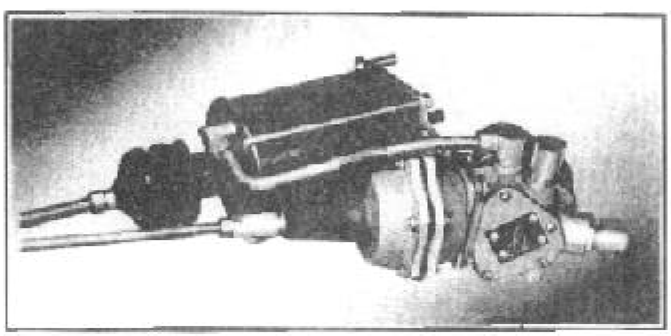


Figure 390 - Transmission Power Unit

TRANSMISSION POWER UNIT

The Transmission power shifting unit is made up of the transfer diaphragm cylinder and the power cylinder together with the solenoid valves to control the transfer diaphragm and the movement of the piston in the power cylinder.

The power cylinder piston is connected to the piston rod, which in turn is connected to the power shift lever on the transmission. Both ends of the cylinder are closed except for the vacuum lines to the solenoid control valves.

The solenoid selector valve assembly is comprised of the transfer diaphragm solenoid, a second gear solenoid and a high gear solenoid.

If the solenoid valve controlling the forward end of the piston is energized the valve opens to the vacuum line and the piston moves forward. This movement then shifts the transmission into pickup gear.

If the solenoid valve controlling the rear of the cylinder is energized the piston is moved backward, shifting the transmission into high gear.

Engine vacuum acting on the power shifting piston moves the power rod forward or backward, thereby shifting gears. The transfer diaphragm, similarly operated by vacuum moves the transfer key forward or backward to engage for power gear shifting.

There is one additional control unit known as the throttle lock. This is described under clutch power unit and its function is to prevent the throttle being opened when the gears are being shifted by Drive-Master.

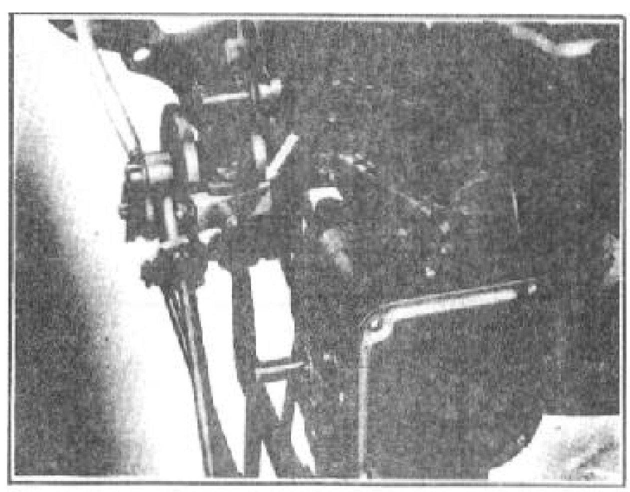


Figure 391 - Transfer Key

TRANSFER KEY

The handy shift control remains unchanged on cars equipped with the Hudson Drive-Master. On the transmission, the shifting lever on the control shaft has been made free turning. It is locked to the shaft only when a power transfer key, carried on a hub fastened to the shaft, is engaged in the shifting lever notch.

With the key engaged in the manual lever, the transmission can be operated through all gears normally by the handy shift lever, in the regular manner.

In addition to the manual lever, a power shifting lever has also been added on the transmission shifting shaft. This is also free turning but can be locked to the shaft by engagement of the transfer key, disengaging it from the notch in the manual lever and engaging it in the power lever.

Normally, the transfer key is held in the manual shifting lever notch by spring pressure. When the "HDM" button on the instrument panel is depressed, electrical connections open the solenoid valve, admitting vacuum to the transfer diaphragm cylinder on the transmission power unit, turning the transfer key so that it engages in the notch of the power shift lever. This operation prepares the transmission for automatic or power shifting.

When the handy shift lever is moved to neutral and lifted through the "neutral gate" as required to make a shift to reverse or low the circuit is broken to the solenoid operating the transfer diaphragm and the spring pressure behind the diaphragm turns the transfer key so that it engages in the manual shift lever notch. Low or reverse gear then can be shifted with the handy shift lever in the regular manner.
Returning the handy shift lever to neutral and dropping through the "neutral gate" again closes the transfer key circuit causing the key to engage the power shift lever notch. This again prepares the transmission for power shifting.

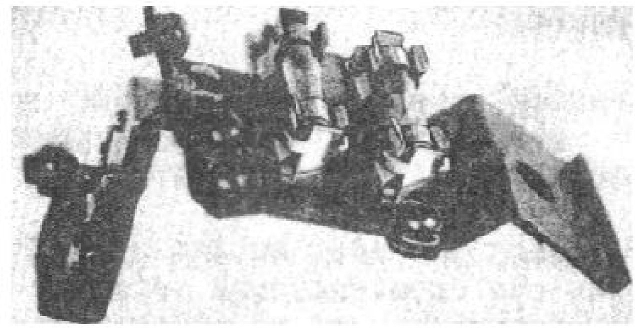


Figure 392 - Circuit Breaker

CIRCUIT BREAKER

Circuit Breaker is a thermostatically operated bi-metal safety switch for protecting the electrical circuits of the Drive-Master and is attached to a special fuse block.

A short in the Drive-Master electrical system causes intermittent heating and cooling of the bi-metal. This opens and closes the points interrupting the circuit, thus protecting the system by limiting current flow.

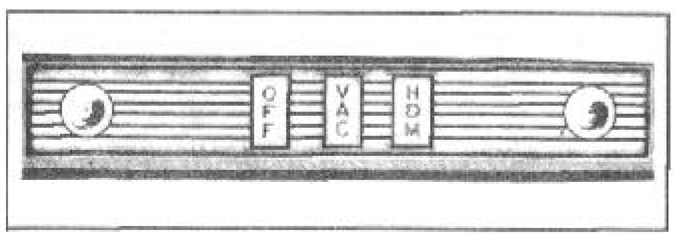


Figure 393 - Instrument Panel Switch

THE INSTRUMENT PANEL SWITCH

This switch is used to select any of the three methods available to the driver of a Hudson car equipped with Drive-Master.

Pressing the right button marked "HDM" prepares the car for driving with automatic clutch operation and automatic shifting of the transmission Pick-Up and High gears.

Pressing the center button marked "VAC" gives automatic clutch operation and manual shifting of gears.

Pressing the left button marked "OFF" reverts to conventional driving with manual operation of the clutch and gear shifting, exactly the same as a car not having Drive-Master Equipment.

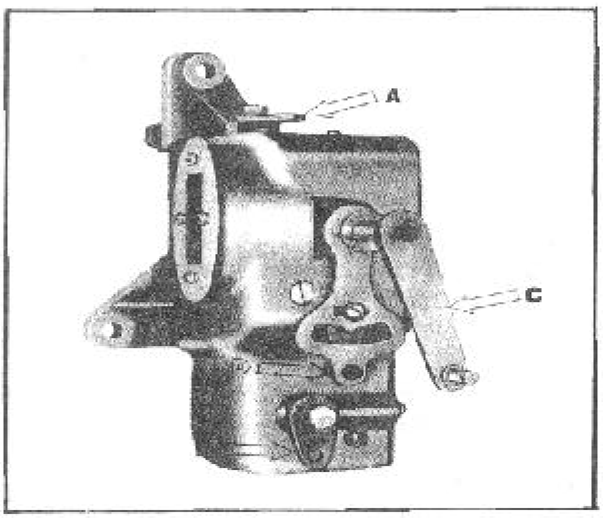


Figure 394
Transmission Switch.

TRANSMISSION SWITCH ASSEMBLY

This switch box of rugged construction, bolted to the side of the transmission, contains the mechanically operated switches used to control the Drive-Master. The switches contained in this unit are:

(A) Transfer Switch
(B) Clutch Switch
(C) Selector Switch
(D) Neutral and limit Switch

(A) THE TRANSFER SWITCH is located at the top of the transmission switch and is operated by a non-adjustable link connected to the cross shift lever.

The handy shift lever, when in neutral must return by means of its own return spring, to the second-high side when released from any position in the cross over. It must work free.

When the handy shift lever on the steering column is moved through the neutral or cross over to second-high side, the transfer switch lever is moved forward closing the switch points. This completes a circuit to the solenoid of the power unit, which controls the diaphragm of the transfer cylinder, drawing of the diaphragm back, and connecting the power shift to the transmission shift shaft.

When the handy shift lever is again moved to the low-reverse side, the transfer switch lever moves backward, opening the switch. The diaphragm spring moves the transfer key and linkage to disconnect the power shift lever and reconnect the manual shift thus preparing it for shifting into low or reverse.
(B) TILE CLUTCH SWITCH is located at the bottom of the transmission switch housing. It is operated by a non-adjustable link connected to the clutch throwout shaft lever. When the clutch is disengaged the clutch switch lever is moved backward.

One set of points close to complete the circuit to the starter button.
A second set of points complete the circuit to the selector, neutral and limit switches.

The clutch switch is open when the clutch is engaged, therefore, no current is used when the car is being driven in any gear speed.

(C) THE SELECTOR SWITCH lever is connected to the transmission shift lever by a non-adjustable rod. When the handy shift lever on the steering column is moved to second gear position, the selector switch lever is moved forward closing the circuit to the power unit causing the power unit piston to move forward into second or pick-up gear.

When the handy shift lever is moved to the high gear position, the selector switch lever is moved to the rear, closing the circuit for shifting into pickup and high gear.

When the handy shift lever is placed in neutral, the selector switch closes a circuit to the neutral switch.

(D) THE NEUTRAL SWITCH AND LIMIT SWITCH. Both neutral and limit switch are operated by the same lever. This lever is connected to the transmission shifting lever by an adjustable rod.

The neutral switch has two sets of points, both of which are open when the transmission is in neutral. When the transmission gears are in pick-up or high gear position, one set of points are closed and the other open.

If neutral is selected on the handy shift lever and the transmission gears are in high gear position, the circuit then is from the neutral point on the selector switch to the closed points of the neutral switch and from there to the power unit solenoid which controls the shift forward to pick-up gear position. The position then moves forward shifting the gear out of high toward neutral. When the shift reaches the neutral point, the neutral switch points are open and the shift stops.

If the transmission gears are in pick up position when neutral is selected, the other set of points in the neutral switch are closed and complete the circuits to the power unit solenoid which controls rearward movement of the power cylinder. As before, when the transmission reaches neutral, the neutral switch points are opened and the shift stops.

The limit switch also has two sets of points, but both are closed when the transmission is in neutral. One set of points are opened when the shift to high gear is completed and the other set of points open only when the shift to pickup gear is completed.

This switch also completes the circuit to the throttle lock solenoid on the clutch control, thus preventing the throttle being opened until each shift is entirely completed.

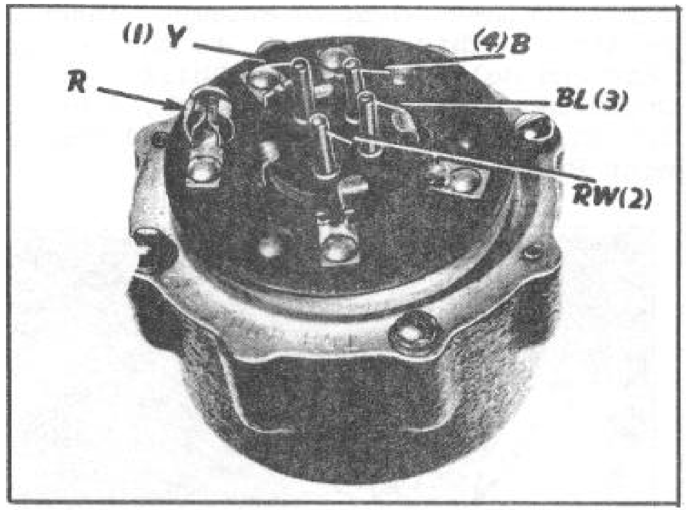


Figure 395 - Governor Switch

GOVERNOR SWITCH

The governor switch is located on the rear of the transmission and operated by the speedometer drive gear.

The governor controls circuits in the clutch control unit and in the transmission power unit. The separate (R) terminal is used only with cars equipped with overdrive.

When the handy shift lever is in the high gear position, the circuit is completed from the selector switch to the #1 or "Y" terminal of the governor. At speeds below 14 miles per hour the points are closed to connect the #1 or "Y" terminal to #3 or "BL" terminal.

The #3 or "BL" terminal is connected with the power unit so as to actuate the front of the power cylinder and shift into pick-up gear.

At speeds above 14 miles per hour, the #1 or "Y" terminal is connected to the #4 or "B" terminal actuating the rear of the power cylinder and the transmission is shifted into high gear.

SERVICING THE DRIVE-MASTER

In the servicing of Drive-Master any units which the following tests prove to be faulty, must be replaced in their entirety rather than to attempt internal repairs. This applies to the Clutch Unit and Solenoids, Power Shift Unit and Solenoids, Transmission Switch, Governor Switch, Accelerator Switch and Instrument Panel Switch.

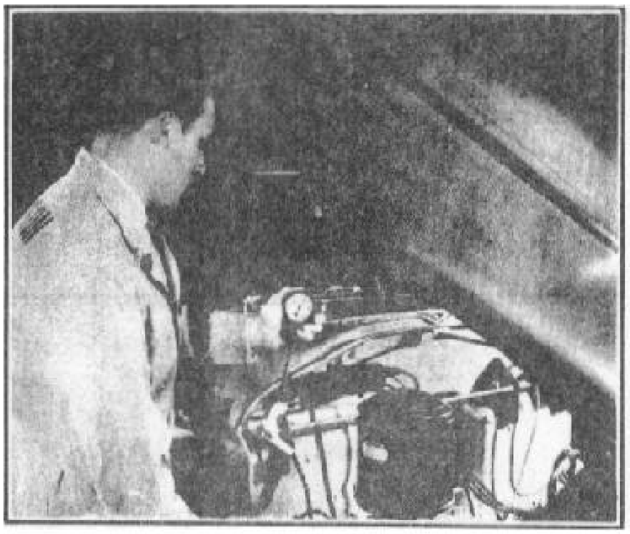


Figure 396 - Checking Engine Vacuum

As power for operating the Vacumotive Clutch Unit and the power unit of the Drive Master is obtained from engine vacuum, it is very important the proper engine performance be checked first when servicing the Drive-Master. The vacuum gauge should read from 19 to 21 to insure proper engine performance as well as correct Drive-Master operation.

Before proceeding with checking other units of the Drive-Master, it should be determined that the Vacumotive Clutch Unit is operating properly. This unit can be checked by depressing the "VAC" button on the instrument panel and operate the car shifting the gears manually. If this unit works as it should, that portion of the system can be eliminated from further checking. Otherwise, check as previously covered under "Vacumotive Drive" Page 344 to Page 358.

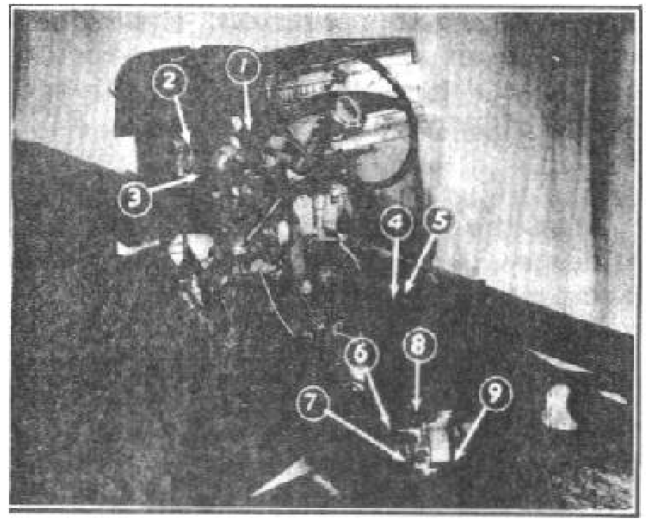


Figure 397 - Vacuum Line Connections

LEAKS IN THE VACUUM LIMES will cause sluggish operation or failure of the Drive-Master.

All vacuum line fittings should be checked and hose connections given particular attention. These are as follows:

1. Between power unit and intake manifold.

2. Between power unit solenoids.

3. Between throttle lock solenoids and diaphragm.

4 and 6. Between transmission power unit and air cleaner.

5 and 7. Between transmission unit and intake manifold.

8. Between front of power cylinder and solenoid housing.

9. Between rear of power cylinder and solenoid housing.

ELECTRICAL CONNECTIONS

The battery should be in good condition and gravity not less than 1225.

ALL TERMINAL CONNECTIONS should be clean and in solid contact.

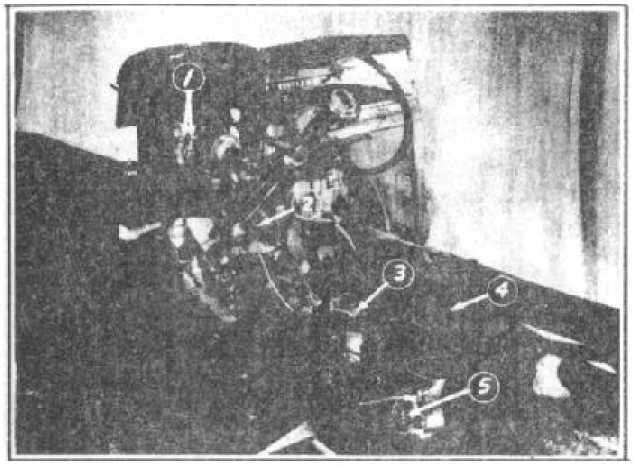


Figure 398 - Electrical Connections

The important points to be checked are indicated on the above illustration and are as follows:

1. Solenoid terminals on clutch unit.

2. Terminals on accelerator switch.

3. Shift rail and transmission switch plug.

4. Governor switch.

5. Power unit terminals.

At this point it might be well to get acquainted with a few details that will be of help later in diagnosing service problems.

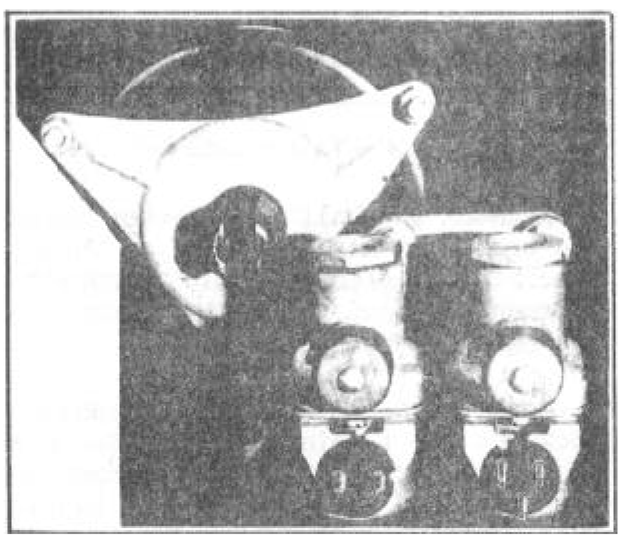


Figure 399 - Clutch Unit Solenoids

CLUTCH CONTROL SOLENOID

This solenoid (left above) contains a single winding and each end is brought out to a terminal. The black wire with white tracer (plug socket #1) is the hot wire from the circuit breaker. The brown wire with white tracer (plug socket #2) leads to the accelerator switch.

THROTTLE LOCK SOLENOID

This solenoid (right above) looks like the clutch control solenoid but the inside construction is different. This unit contains two windings. One end of each winding connects to a plug prong while the other end is grounded in the solenoid housing. One winding operates the valve which applies the throttle lock when shift is being made to pick-up gear and the other when a shift is being made to high gear.

NOTE: The third prong is a marker only and is used to prevent interchanging sockets.

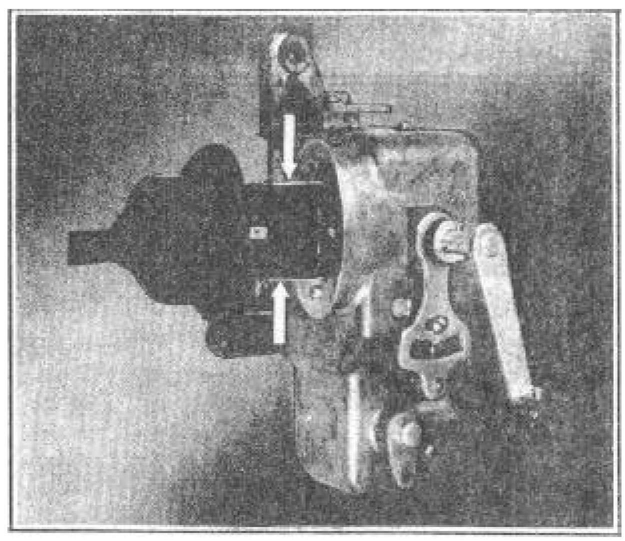


Figure 400 - Transmission Switch Plug

TRANSMISSION SWITCH PLUG

This plug is held in place by clips. NOTE: Be sure the boot is in place to keep water from entering the switch housing.

The prongs and sockets are silver coated to eliminate corrosion.

Figure 401 - Dash Plug

DASH PLUG

Occasionally this plug becomes partially disengaged by being bumped when underhood service is being done. Be sure to check this plug before doing a lot of check-up work or guessing. Pushing in this plug may be all that is necessary to get proper operation.

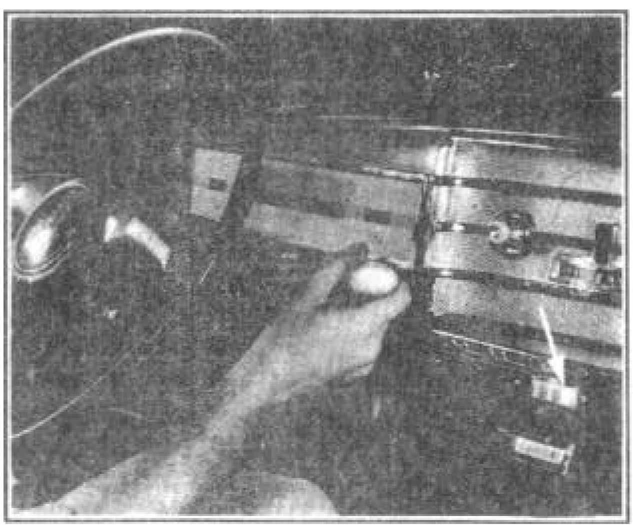


Figure 402 - Instrument Panel Switch

INSTRUMENT PANEL SWITCH

Always determine that the instrument panel switch is on A simple check can be made by moving the handy shift lever back and forth through neutral with the engine running. The transfer key can be heard operating.

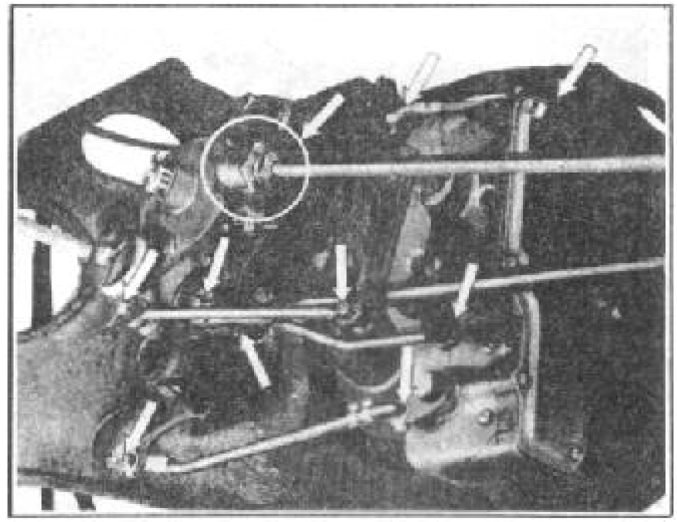


Figure 403 - Linkage

LINKAGE

While under the car checking power unit wires and plugs, make sure all the rods and linkage are in place and properly connected and locked by their clips.

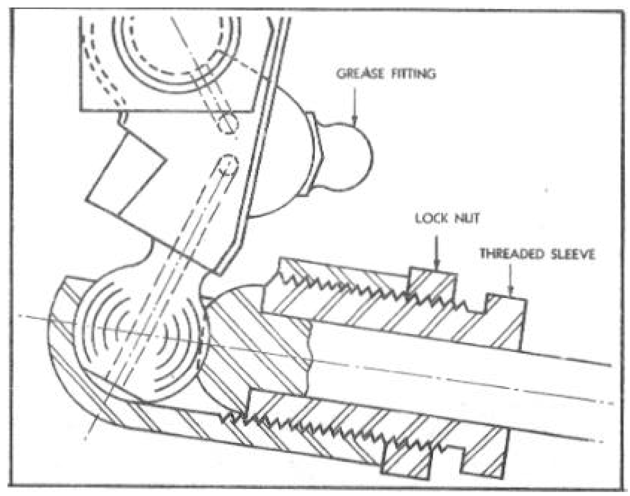


Figure 404 - Ball and Socket Joint

Recheck the ball and socket joint at the transfer key Fig. 404. This is a specially designed joint to permit adjustment without affecting clearance of the ball in the socket.

Adjustment is made by loosening the lock nut and turning the threaded sleeve inward so that it has no appreciable looseness and yet works free. Lubricate this joint and the transfer key pivot with viscous chassis lubricant through the fitting on the transfer key.

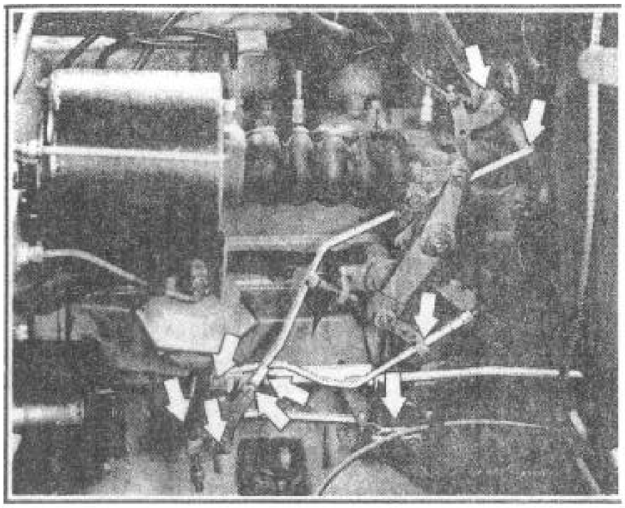


Figure 405 - Accelerator Linkage

The accelerator linkage and the bell crank with the torsional, spring assembly must work freely and should be well lubricated. See Fig. 405.

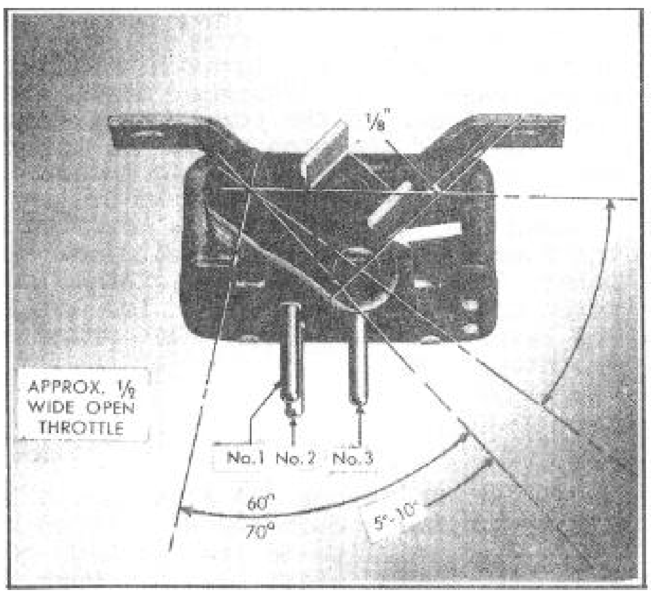


Figure 406 - Accelerator Switch

The accelerator switch lever must return solidly against the stop when the accelerator is released, otherwise, the clutch will not release and the Drive-Master cannot work. Figure 406. This is Very Important.

CLUTCH SWITCH

Before checking the operation of the clutch switch, (housed in transmission Switch Assembly), check clutch pedal lash. Clutch pedal must have 1-1/2" free play. Refer to "Clutch Pedal Adjustment" Page 140. With engine not operating, ignition switch turned on and starter button depressed, slowly push the clutch pedal down. The starter should operate before the pedal is within 2 inches of the toeboard.

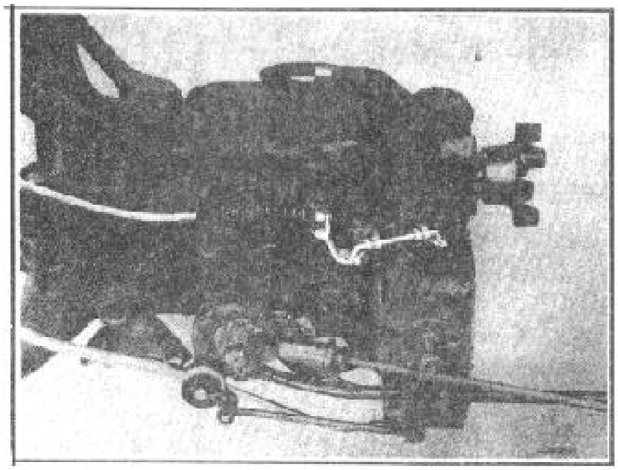


Figure 407 - Transfer Switch

TRANSFER SWITCH

When the handy shift lever is in neutral, it must return to the second-high side when released from any position in the cross over by means of its own return spring. If it sticks, it will cause incomplete shifting, throttle locking, engine racing, etc. The handy shift lever must be on the second and high side at all times to energize the transfer cylinder and hold the transfer key engaged in the power shift lever.

Check the operation by moving the handy shift lever through the neutral cross over. The key should engage in the manual lever during the upper part of the movement and engage the power shift lever, during the lower half of the movement.

The preceding checks are general but experience has shown that it is good practice to make these checks before attempting any changes or adjustments.

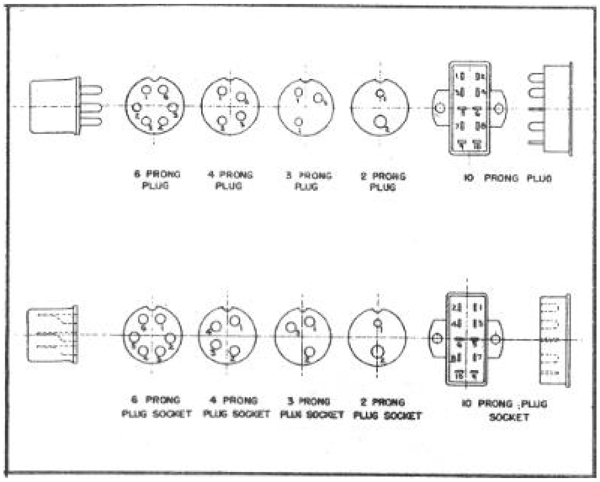


Figure 408 - Plugs and Sockets

PLUGS AND SOCKETS

Here we show the various plugs and sockets used with wiring and the Drive-Master harness. As will be noted, all plugs are numbered in a counterclockwise direction starting from the indentation on the outside of the plug. The mating sockets are numbered clockwise from the same starting point.

TROUBLE SHOOTING

In the preceeding sections we have outlined the various units of Drive-Master, their construction and how they function. Now we will cover methods of correcting a Drive-Master that is not functioning properly or one that has become inoperative.

In the preceeding paragraphs under "Servicing the Drive-Master ,we stressed the importance of checking for vacuum leaks at hose connections and the checking of all electrical connectors and wiring. We also stated that first we must have the Vacumotive Drive Unit functioning as it should before using it in the Drive-Master combination.

The following points should be checked where mechanical adjustments can be made to see that they are properly set:

1. Power Lever Stop
2. Shift Lever Lock Spring
3. Power Cylinder Piston Rod
4. Transfer Diaphragm Rod
5. Throttle Lock
6. Neutral and Limit Switch

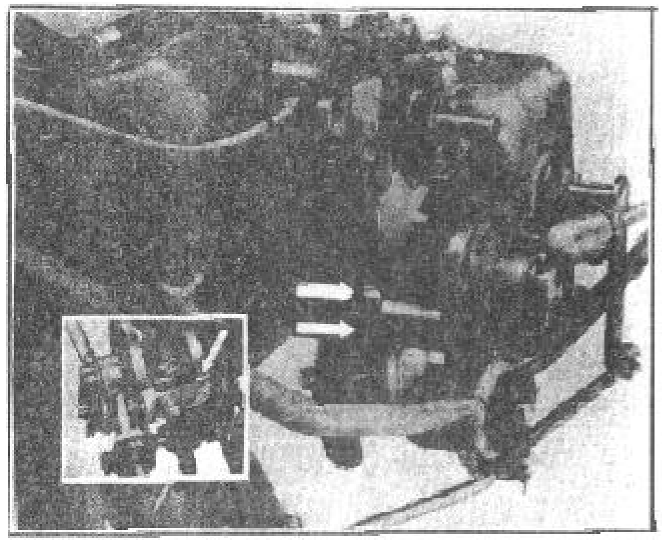


Figure 409 - Power Lever Stop

POWER LEVER STOP

The adjustment controls the position of the power shift lever in high and second gear. The distance between the two stop faces on the power lever, minus the length of the stop screw, determines the travel of the power shift lever.

When the transmission is shifted by the power cylinder into high gear, the power lever rests on top of the stop screw and when shifted into pick-up gear, the lever. rests against the bottom of the stop screw.

TO ADJUST - Loosen the Allen set screw (lower arrow). Turn the stop screw up, shift the transmission into pick-up gear with the handy shift lever. Push the piston rod forward so that the transfer key can be engaged in the notch in the power lever. Turn the stop screw down until it just touches the power lever. Then back off 1/2 turn and lock again with the set screw®

This adjustment can also be made from under the car. Shift the transmission into high gear and turn the stop screw up to the lever, then back off 1/2 turn and lock.

Improper adjustment of the power lever may cause incomplete shifting and cause the throttle lock to stay on.

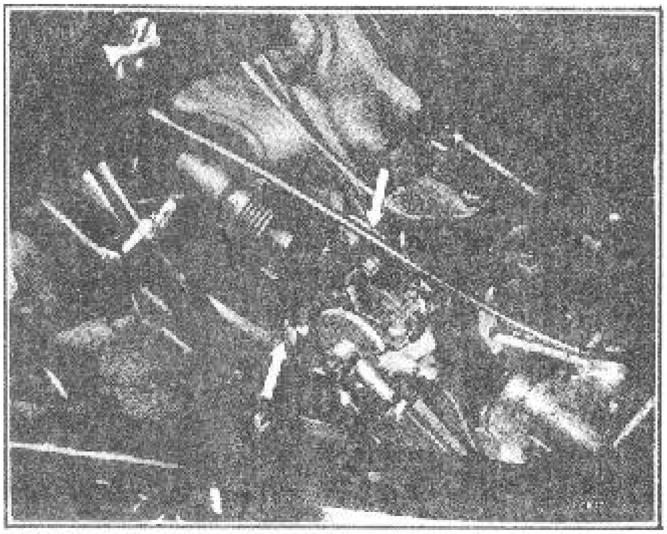


Figure 410 - Shift Lever Look Spring

SHIFT LEVER LOCK SPRING. Be sure it is properly attached at both ends to lock lever and to the clip. The lever and spring working on the cam face of the power lever resists the pull of the diaphragm on the transfer key.

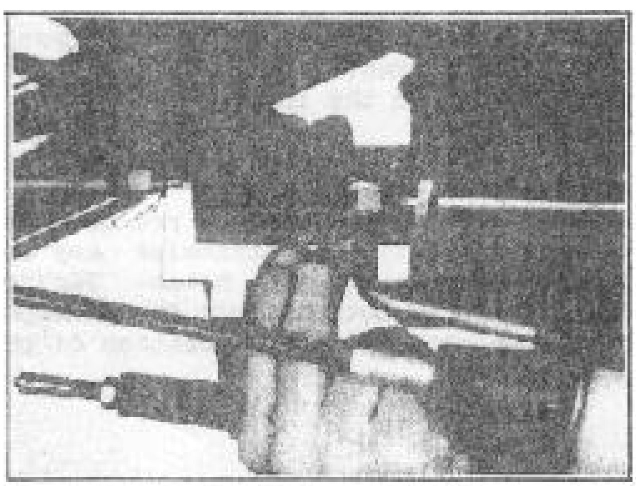


Figure 411 - Power Cylinder Rod Adjustment

POWER CYLINDER-PISTON ROD

To check put the transmission in neutral with the handy shift lever. Pull back on the transfer diaphragm. rod and engage the transfer key in the power lever. The distance from the rim on the front of the housing to the piston shaft end should be 4 inches. Use Tool J-1869.

TO ADJUST - Loosen the shaft lock nut and rotate the shaft until correct measurement is obtained. Tighten lock nut securely.

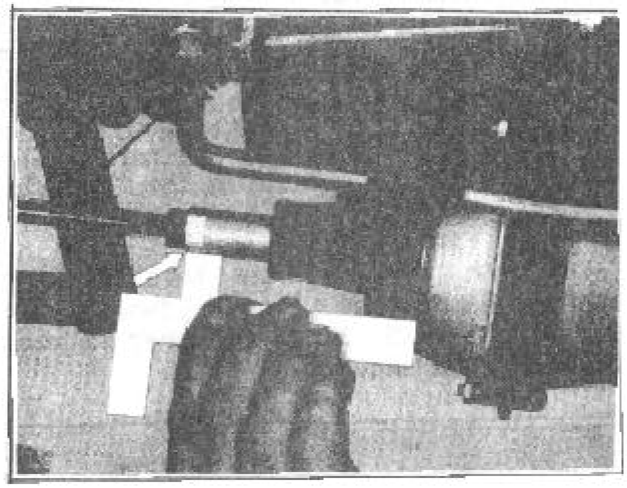


Figure 412 - Transfer Diaphragm Rod Check

TRANSFER DIAPHRAGM ROD

To get complete engagement of the transfer key in either manual or power shift lever, see that the rod is properly adjusted.

Measure the distance from the front of the cover of the diaphragm cylinder to the end of the diaphragm plunger. This should be 3-1/4 inches. Use gauge J-1869.

TO ADJUST - Loosen lock nut and turn rod.

CAUTION: Always hold the diaphragm plunger with a wrench to keep plunger from turning when adjusting rod to prevent damaging the diaphragm.

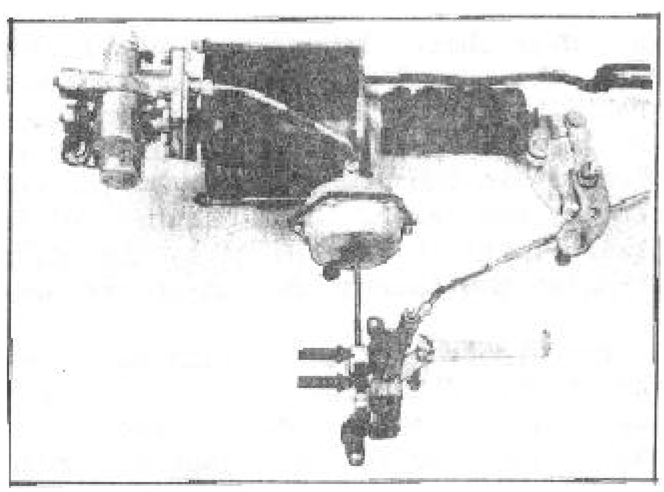


Figure 413 —Throttle Lock Cheek

THROTTLE LOCK

As explained previously, the throttle lock has no other function than preventing the opening of the throttle before a shift is completed.

TO ADJUST - Back off the stop nuts. With engine running and handy-shift in neutral, "HDM" button ON, connect a "hot" jumper wire from the battery to one of the throttle lock solenoid terminals. The cable should pull up on the throttle linkage.

Turn the stop nut up to contact the lever. Remove the "hot" jumper wire. Turn up 2-1/2 turns further and lock with the lock nut.

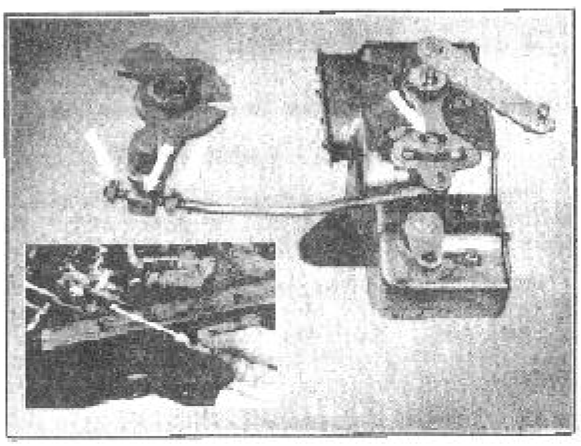


Figure 414 - Neutral and Limit Switch

NEUTRAL AND LIMIT SWITCH

Transfer key notches in the manual and power shift levers must be in line when the manual and power shift levers are in neutral. The neutral point of the manual lever is determined by the plunger in the depressions on the back face. of the lever. The position of the power lever is determined by the point at which the neutral switch points open.

The length of the adjustable rod, therefore, determines when a power shift toward neutral stops. The adjustment should be so that neutral switch points are open when the transmission gears are in exact neutral

When the mark on the neutral switch lever is in line with the mark on the transmission switch housing, the neutral switch points are open.

Remember, in making this adjustment, you are synchronizing the exact neutral point in the transmission with the exact neutral position of the switch.

This adjustment is only necessary when trouble is experienced with cross shifting with HDM on.

TO ADJUST - Align the marks on the housing and switch lever Fig. 411 and put a 10-32 screw through the lever, as shown on the right and tighten. Back off the adjusting nuts, as shown at the left. Shift the transmission into high or pick-up gear and back to neutral to put the internal transmission linkage in neutral for cross shifting.

Align the notch in the power lever so that the transfer key will enter freely by pulling backward on the transfer key rod as shown in the insert.

Move the power cylinder rod backward or forward until the transfer key engages the power lever notch. Tighten the adjusting nuts against the trunnion block to retain this position of the power lever.

If these adjustments are properly made and Vacumotive Drive operates properly, there are only two other units where correction or replacement may be necessary if trouble has not cleared up to this point, outside of wiring harness. These are the transmission power unit solenoids and transmission switch assembly. Make electrical test #7, under "Unit Tests" and test #8 Transmission Switch.

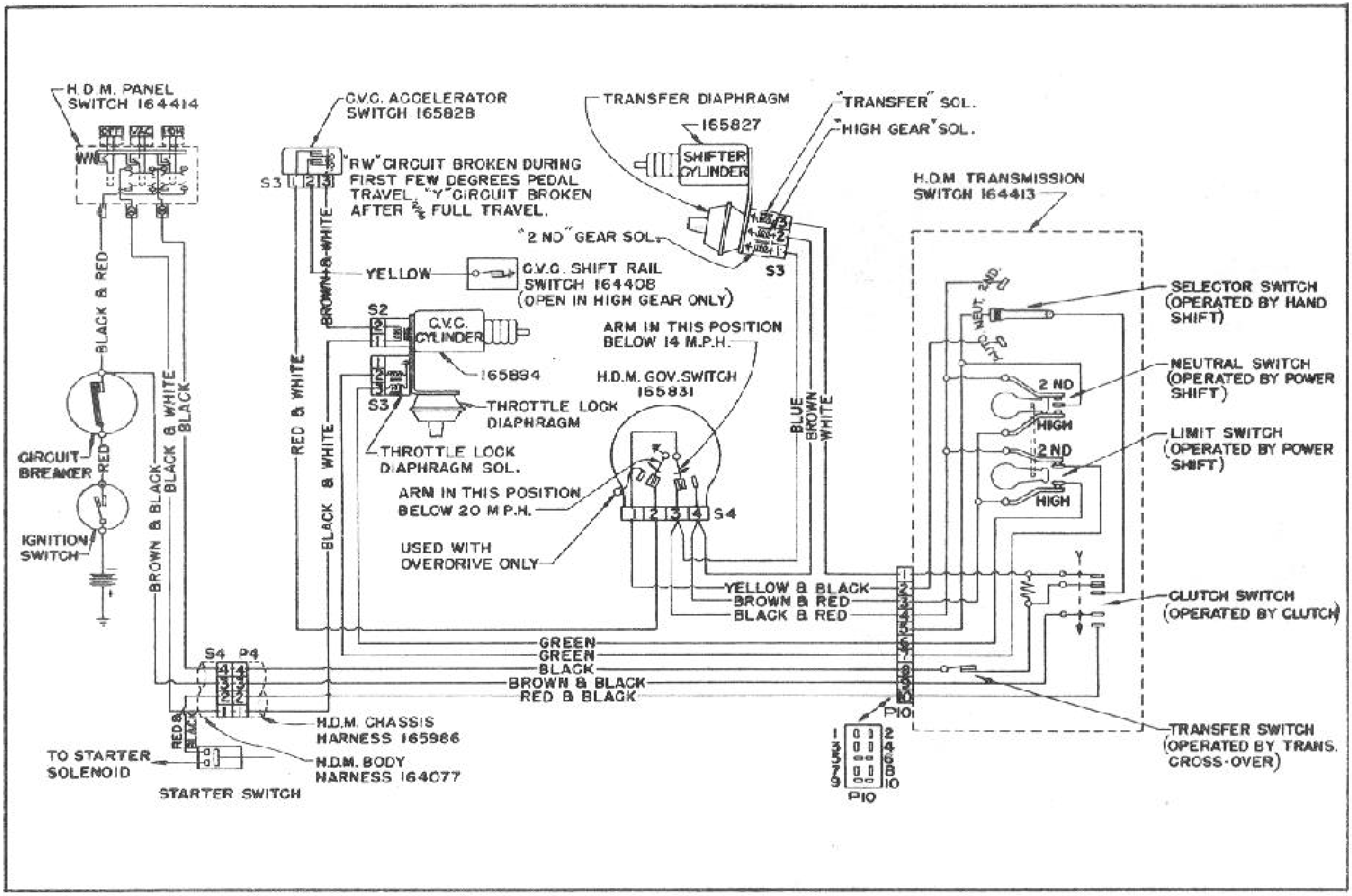


Figure 415 - Hudson Drive Master Wiring Diagram

Referring to the HDM Wiring Diagram (Schematic) following the wiring in the Transmission Switch from Socket #8 through the Transfer Switch, we come to a resistance (zig-zag line) connecting to Socket #1. Full voltage is applied on the diaphragm solenoid only when the clutch is closed (clutch disengaged).

NOTE: To prove the electrical circuits in any of the Drive-Master units, including Vacumotive Drive, use a test lite and jumper wire to make any of the following tests and replace units or repair if they do not check.

DRIVE-MASTER (UNIT TEST) ON CAR

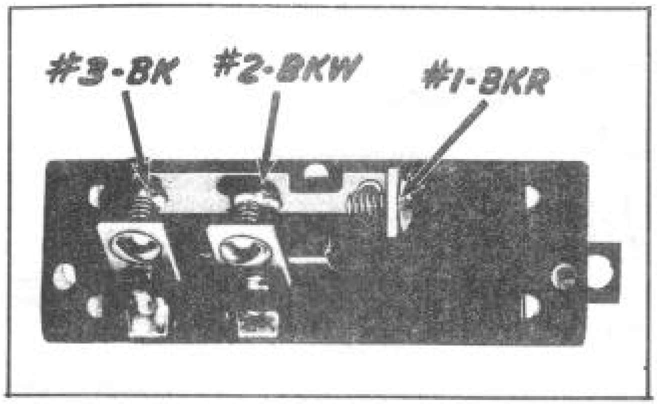


Figure 416 - Instrument Panel Switch

#1-INSTRUMENT PANEL SWITCH

Ignition switch on. Ground long lead of test lamp.

OFF Button in - Test lamp prod to #1 should light test lamp.

VAC Button in - Test lamp prod to #2 should light test lamp.

HDM Button in - Test lamp prod to #2 or #3 should light test lamp

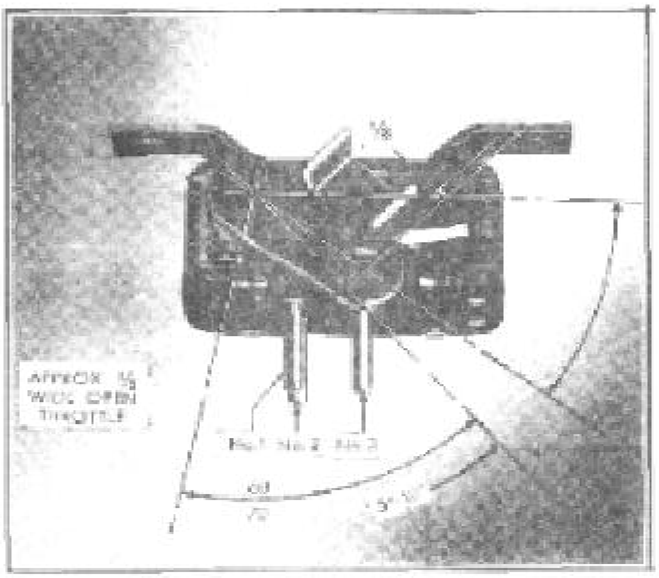


Figure 417 - Accelerator Switch

#2 ACCELERATOR SWITCH

Ground one lead of jumper wire, other lead to #2 prong of accelerator switch, long lead of test lamp to negative terminal of battery. Test lamp prod to #1 prong of accelerator switch, should light test lamp. Moving lever 10 degrees from stop, light should go out. Test lamp prod to #3 prong, should light test lamp. Moving lever 2/3 from stop, light should go out.

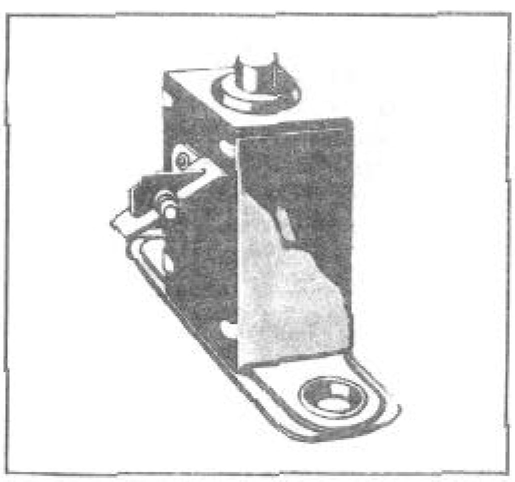


Figure 418 - Shift Rail Switch

#3 SHIFT RAIL SWITCH

Long lead of test lamp to negative terminal of battery. Prod of test lamp #2 socket of accelerator switch. Shift handy shift. No light on high gear, lamp lights on all others. Replace connector socket.

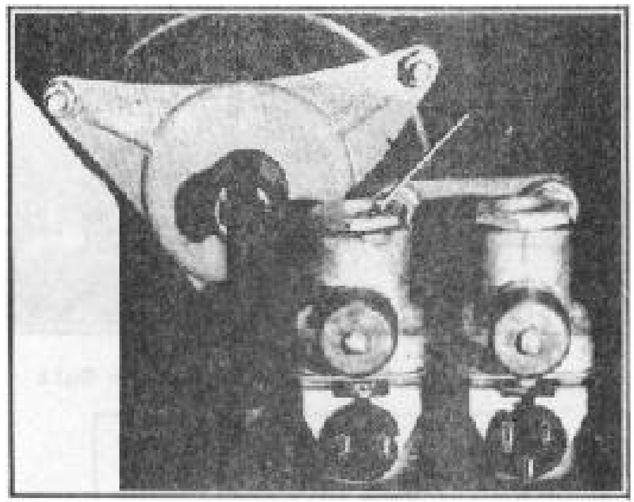


Figure 419 - Vacumotive Clutch Solenoid

#4 VACUMOTIVE CLUTCH SOLENOID

Remove connector socket. Ground one lead of jumper wire, other lead to #2 prong of CVC solenoid. Long lead of test lamp to negative terminal of battery. Test lamp prod to #1 prong of CVC solenoid, valve should operate, test lamp should light dim. Replace connector socket.

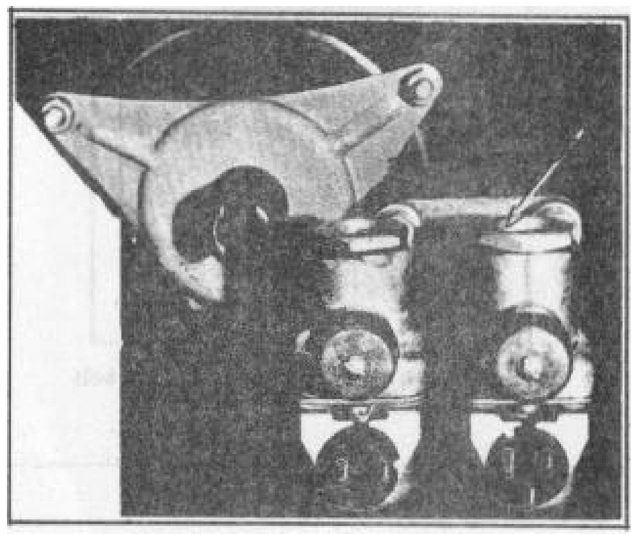


Figure 420 - CVC Solenoid (throttle lock)

#5-CVC SOLENOID (throttle lock)

Remove connector. Long lead of test lamp to negative terminal of battery. Test lamp prod to #2 prong of throttle lock solenoid, valve should operate, test lamp should light dim. Replace connector socket.

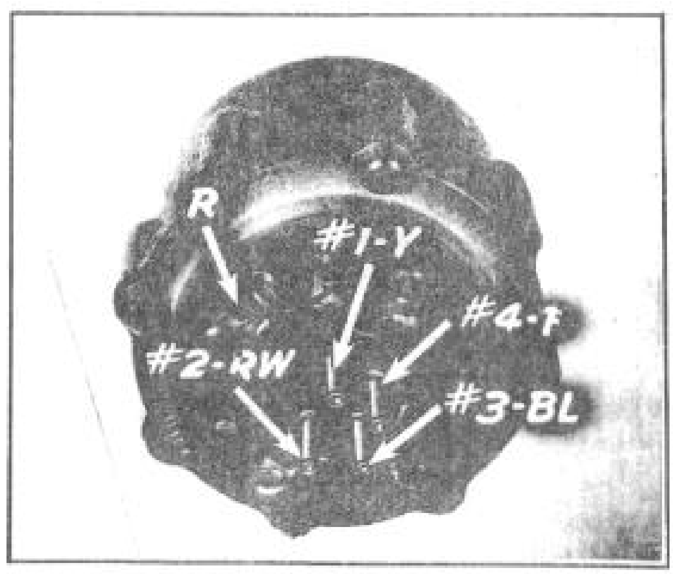


Figure 421 - Governor Switch

#6 GOVERNOR SWITCH

Rear wheels on stands. Start engine. Shift to high gear. Remove connector plug. Long lead of test lamp to negative terminal of battery. Test lamp prod to #2 prong of governor, should light test lamp up to 20 miles per hour car speed. Ground #1 prong of governor, test lamp prod to #3 prong, should light test lamp up to 14 miles per hour car speed. Ground #1 prong of governor, test lamp prod to #4 prong, should light test lamp after 20 miles per hour of car speed.

A separate terminal for use with over-drive, should light test lamp at speeds above 20 miles per hour.

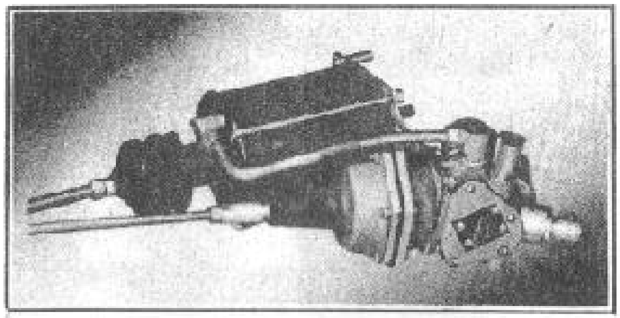


Figure 422 - Transmission Power Unit

#7 TRANSMISSION POWER UNIT

Start engine. Remove connector socket. Long lead of test lamp to negative terminal of battery. Test lamp prod to #1 prong of power unit, should drift to second (forward). To #2 prong should move to high (rear). To #3 prong should operate transfer diaphragm. Replace connector socket.

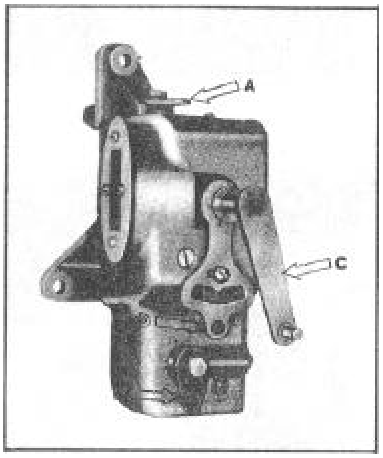


Figure 423 - Transmission Switch

#8 TRANSMISSION SWITCH

Place handy shift in neutral. Remove connector plug. Insert plug of test harness. Long lead of test lamp to negative terminal of battery. Test lamp prod free for testing.

		Test Lamp from battery to Prong #	Ground lead to Prong #	Lamp Lights
(A) Clutch and Transfer Switch	Disconnect clutch operating rod. Move switch lever to rear (on),	8	1	Yes*
		8	5	Yes
		9	10	Yes
(B) Selector Switch	Clutch switch on. 1 - Move handy shift to second gear.	1	4	Yes
		1	5	No
		1	2	No
	2 - Move handy shift to neutral.	1	5	Yes
		1	2	No
		1	4	No
	3 - Move handy shift to high.	1	2	Yes
		1	4	No
		1	5	No

		Test Lamp from battery to Prong #	Ground lead to Prong #	Lamp Lights
(C) Neutral and Limit Switch	1 - Move power lever to neutral (center)	3 3 4 4	6 5 5 7	Yes No** No** Yes
	2 - Move power lever to second (forward)	3 3 4 4	6 5 7 5	Yes Yes No No
	3 - Move power lever to high (rear)	3 3 4 4	6 5 7 5	No No Yes Yes
	Remove test harness and replace plug			
	* When clutch switch is moved forward (off) the lamp should burn dim, and brighten when lever is moved to rear (on). ** If lamp lights, recheck neutral switch adjustment, before proceeding further.			

REFERENCES

Source of Information	Date	Subject